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FERNALD ENVIRONMENTAL MANAGEMENT PROJECT - 1996 STACK TEST REPORTS - MIXED WASTE TREATMENT PROJECT AND RESPIRATOR WASHING FACILITY

01/08/97

C:FCDP(PSI):97-0004
FDF USEPA
3000
REPORT

Fernald Environmental

FERMCO
Restoration Management Corporation

(now renamed Fluor Daniel Fernald)
P. O. Box 538704 Cincinnati, Ohio 45253-8704 (513) 648-3000

January 8, 1997

Fernald Environmental Management Project
Letter No. C:FCDP(PSI):97-0004

Mr. Mike Murphy
United States Environmental Protection Agency
77 West Jackson Boulevard - AE-17J
Chicago, IL 60604-3590

Dear Mr. Murphy:

FERNALD ENVIRONMENTAL MANAGEMENT PROJECT - 1996 STACK TEST REPORTS - MIXED WASTE TREATMENT PROJECT AND RESPIRATOR WASHING FACILITY

Enclosed are the 1996 stack test reports for the periodic confirmatory testing of the Mixed Waste Treatment Project (located in Plant 6) and the Respirator Washing Facility. Submission of these reports to your office is pursuant to Clean Air Act, paragraph D of the 1986 Federal Facilities Compliance Agreement. The stack test results confirm the estimated low levels of emissions as required by 40 CFR 61.93(b)(4)(i) and also verify that the Respirator Wash Facility is being operated in compliance with its permit to operate.

If you have any questions regarding these stack test, please call Tim Miller of my staff at (513) 648-4198.

Sincerely,

Lewis C. Goidell for
Manager, Environmental Compliance
Project Support & Integration

LCG:TEM:mhv
Enclosures

Fernald Environmental

FERMCO

Restoration Management Corporation

(now renamed Fluor Daniel Fernald)

c: <u>With Enclosures</u>

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<u>Without Enclosures</u>

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COMPLIANCE TEST REPORT
DETERMINATION OF PARTICULATE; URANIUM - 233/234 235/236, AND 238; THORIUM - 228, 229, 230, AND 232; RADIUM - 226 AND 228; AND TOTAL URANIUM EMISSIONS FROM THE MIXED WASTE TREATMENT PROJECT
FERNALD ENVIRONMENTAL MANAGEMENT CORPORATION
CINCINNATI, OHIO

Prepared for

FERNALD ENVIRONMENTAL RESTORATION MANAGEMENT CORPORATION
PO Box 398704
Cincinnati, Ohio 45239-8704

Prepared by:

HAYDEN ENVIRONMENTAL GROUP, INC.
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P.N. A96043

November 20, 1996

HAYDEN
ENVIRONMENTAL

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COMPLIANCE TEST REPORT
DETERMINATION OF PARTICULATE; URANIUM - 233/234, 235/236, AND 238; THORIUM - 228, 229, 230, AND 232; RADIUM - 226 AND 228; AND TOTAL URANIUM EMISSIONS FROM THE MIXED WASTE TREATMENT PROJECT FERNALD ENVIRONMENTAL MANAGEMENT CORPORATION CINCINNATI, OHIO

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P.N. A96043
November 20, 1996

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Executive Summary

Hayden Environmental Group, Inc. was retained by Fernald Environmental Management Corporation (FERMCO) to determine the particulate; uranium - 233/234, 235/236, and 238; thorium - 228, 230, and 232; radium - 226 and 228; and total uranium emissions from the Mixed Waste Chemical Treatment Project located in Building #6 at their Fernald, Ohio project site. The evaluation was performed to demonstrate periodic conformity measurements as required by NESHAP Subpart H regulations Emission samples were collected and analyzed using USEPA Reference Methods for stationary source sampling. The tests were conducted on September 19, 1996. The results of the tests are summarized below:

Summary of North Exhaust Stack Emission Rates

Analyte	Emission Rate	Standard Deviation	Units
Total Particulate	0.00E-00	NA	lb/hr
Uranium-233/234	329.0	82.4	pci/hr
Uranium-235/236	BPQL	BPQL	pci/hr
Uranium-238	152.6	63.3	pci/hr
Thorium-228	140.4	56.9	pci/hr
Thorium-230	361.0	83.2	pci/hr
Thorium-232	BPQL	BPQL	pci/hr
Radium-226	BPQL	BPQL	pci/hr
Radium-228	ND	ND	pci/hr
Total Uranium	3.53E-06	3.53E-07	lb/hr

NA: not applicable

BPQL: activity was measured at a level below the practical quantification limits (However the measured activity is recorded in the emission tables located in appendices A and B)

ND: activity was not detected

lb/hr: pounds per hour

pci/hr: picocurie per hour

Summary of South Exhaust Stack Emission Rates

Analyte	Emission Rate	Standard Deviation	Units
Total Particulate	BPQL	NA	lb/hr
Uranium-233/234	50.7	23.0	pci/hr
Uranium-235/236	BPQL	BPQL	pci/hr
Uranium-238	35.8	18.5	pci/hr
Thorium-228	33.4	23.2	pci/hr
Thorium-230	124.3	33.3	pci/hr
Thorium-232	BPQL	BPQL	pci/hr
Radium-226	BPQL	BPQL	pci/hr
Radium-228	ND	ND	pci/hr
Total Uranium	2.69E-06	2.69E-07	lb/hr

NA: not applicable

BPQL: activity was measured at a level below the practical quantification limits (However the measured activity is recorded in the emission tables located in appendices A and B)

ND: activity was not detected

lb/hr: pounds per hour

pci/hr: picocurie per hour

HAYDEN

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1.0 Introduction

Hayden Environmental Group, Inc. (Hayden) was retained by Fernald Environmental Management Corporation (FERMCO) to perform a particulate; uranium - 233/234, 235/236, and 238; thorium - 228, 230, and 232; radium - 226 and 228; and total uranium emissions to demonstrate periodic conformity measurements as required by NESHAP Subpart H regulations on the Mixed Waste Chemical Treatment Project located in Building #6 at their Fernald, Ohio project. The evaluation was performed on September 19, 1996. A single test run was conducted using USEPA Reference Methods 1, 2, 3, 4, 5, and 114. Mr. Tim Miller of FERMCO. coordinated the test schedules with plant operations. Ms. Dawn Wiburs of Hamilton County Department of Environmental Services (HCDES) was on-site to verify process operating conditions and witness testing procedures. The emission tests were performed by the Hayden test team of Mr. Bruce Sarven and Mr. Geoffrey Schoenberger. The emission samples were analyzed by Data Chem Laboratories, Inc. located in Salt Lake City, Utah.

2.0 Process Description

The Mixed Waste Chemical Treatment Project (MWCTP) is operated to treat approximately 334 drums of four waste categories currently being stored at the Fernald site. Treatments will consist of Neutralization, Precipitation, Deactivation, and Stabilization techniques. There are numerous exhaust hoods located along the conveyor system for the above mentioned treatments. The exhaust from the hoods are vented to one of two high efficiency particulate air (HEPA) filtration systems before being released to the atmosphere.

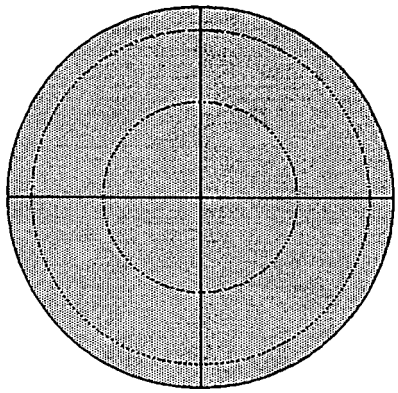
Production was only operating under the South exhaust vent hoods. There was no production taking place under the North exhaust vent hoods.

The process data is included in Appendix C.

3.0 Sampling Site Description

Emissions from the HEPA filters are vented through two identical 12 inch diameter vertical exhaust stacks. Two sampling ports are positioned at 90° angles from each other. The sampling ports are located more than 96 inches or 8.0 stack diameters downstream (elbow) from the last flow disturbance and 24 inches or 2.0 stack diameters upstream to the next flow disturbance (top of stack). A drawing of the sampling site is provided in Figure 3.1.

CROSS SECTIONAL AREA
NOT TO SCALE



Diameter 12"

SAMPLE POINT LOCATION

1.....0.804"
2.....3.000"
3.....9.000"
4.....11.196"

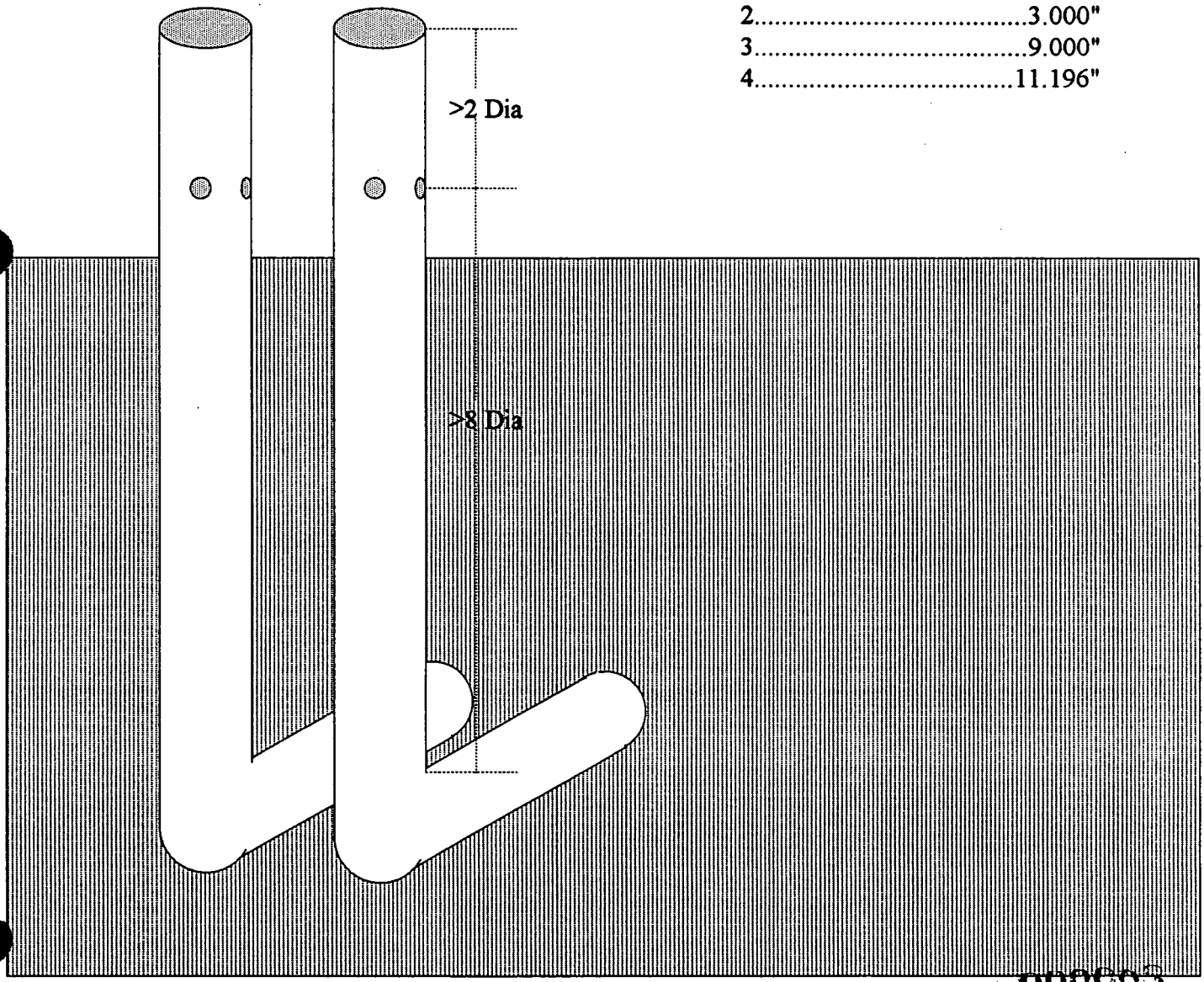


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Figure 3.1 Mixed Waste Treatment Project Sample Site Detail

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4.0 Sampling and Analytical Procedures

The sampling and analytical procedures conformed to the most recent revisions of USEPA Reference Methods for stationary sources. Specifically, USEPA Reference Methods 1A, 2C, 3, 4, 5C, and 114 were used. A brief description of each procedure is included below:

4.1 Measurement Sites (USEPA Method 1A)

The location of measurement sites and the number of traverse points were determined using USEPA Reference Method 1A, "Sample and Velocity Traverses for Stationary Sources with Small Stacks or Ducts.

4.2 Velocities and Volumetric Flow Rates (USEPA Method 2C)

The stack gas velocity and volumetric flow rates were determined using USEPA Reference Method 2C, "Determination of Stack Gas Velocity and Volumetric Flow Rate in Small Stacks or Ducts." The stack gas velocity were measured before and after each test run with an inclined oil filled manometer using a standard pitot tube. The stack gas temperature were measured with a calibrated type "K" thermocouple and Omega digital temperature readout. A schematic of the velocity measurement apparatus is included in Figure 4.1.

4.3 Dry Molecular Weight (USEPA Method 3)

The stack gas dry molecular weight was determined using USEPA Reference Method 3, "Gas Analysis for Carbon Dioxide, Oxygen, Excess Air, and Dry Molecular Weight." Several grab samples were collected and analyzed during each test with Fyrite combustion gas analyzers which directly measure concentrations of O_2 and CO_2.

4.4. Moisture (USEPA Method 4)

The stack gas moisture content was determined using USEPA Reference Method 4, "Determination of Moisture Content in Stack Gases". Moisture samples were collected in a series of chilled impingers. The moisture collected within the impingers was analyzed by gravimetric analysis.

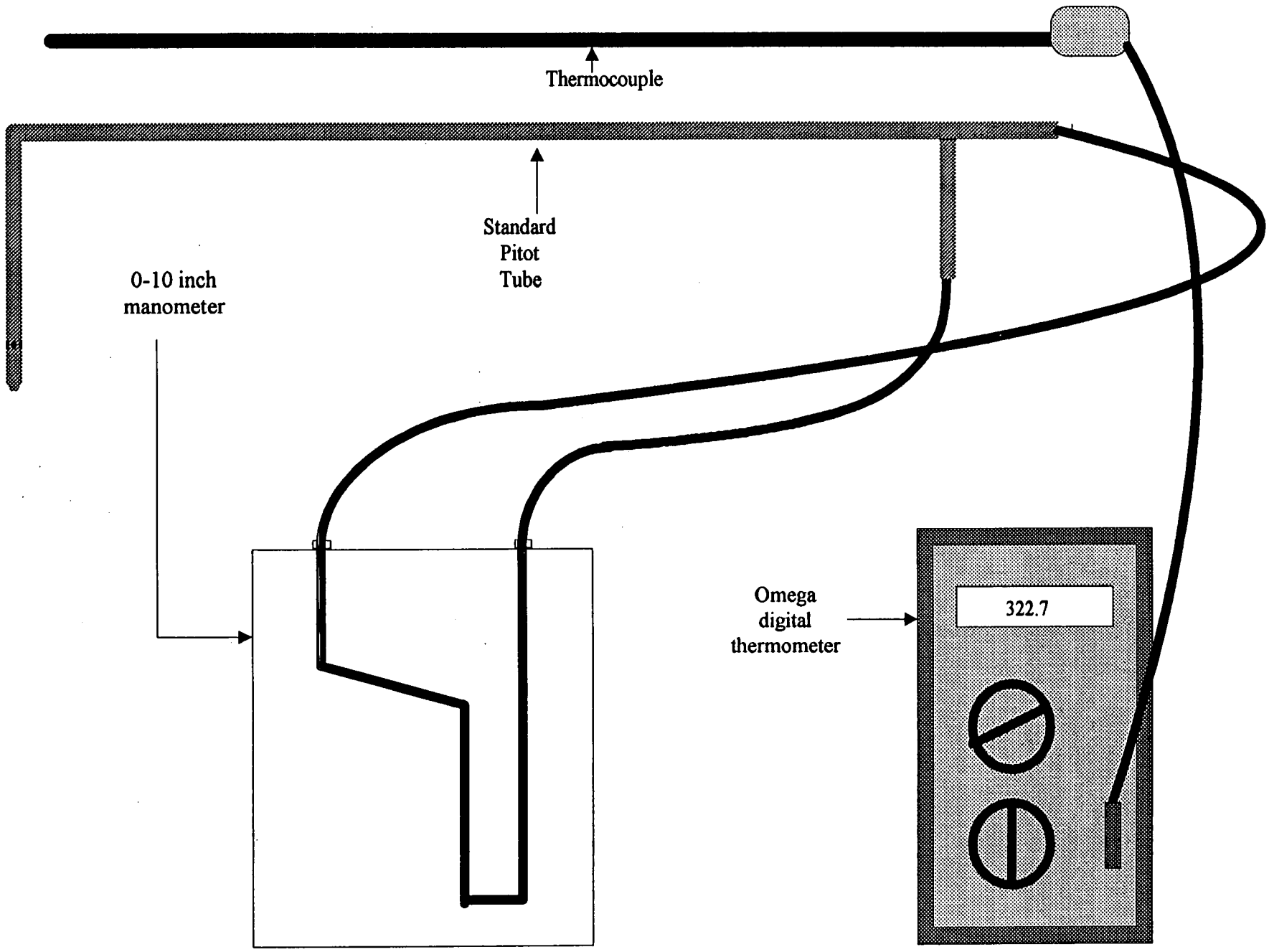

Figure 4.1 Velocity Measurement Apparatus

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4.5 **Particulate Matter (USEPA Method 5C)**

The total particulate emissions were determined using USEPA Reference Method 5C, "Determination of Particulate Emissions from Stationary Sources with Small Stacks or Ducts." The stack gas samples were collected from a single representative point isokinetically through a heated glass lined probe, a heated (248°+/-25°) tared glass fiber filter, and a series of cooled impingers (to condense the moisture). The nozzle, probe, and glassware prior to the filter was rinsed with acetone into a beaker that had been tare-weighed. The impingers and glassware after the filter was rinsed with DI water into a separate beaker that had been tare-weighed. The acetone and DI water were evaporated at temperatures below their boiling points. The acetone particulate residue within the tare-weighed beaker and the filter were analyzed by gravimetric analysis to determine the filterable particulate mass collected. The DI water particulate residue within the tare-weighed beaker was analyzed by gravimetric analysis to determine the condensible particulate mass collected. The filterable and condensible particulate mass were added together to determine the total particulate mass collected. A schematic of the particulate sampling train is provided in Figure 4.2

4.6 **Radiological Analyses (EPA Method 114 + Laser Phosphorimetry (U only))**

The particulate sample residues (filter and probe rinse residue) were recovered, composited for each sample run, and analyzed for uranium - 234, 235, 236, and 238; thorium - 228, 230, and 232; and radium - 226 and 228 by the procedures established in USEPA Method 114. Additionally, the samples were analyzed for total uranium by laser phosphorimetry.

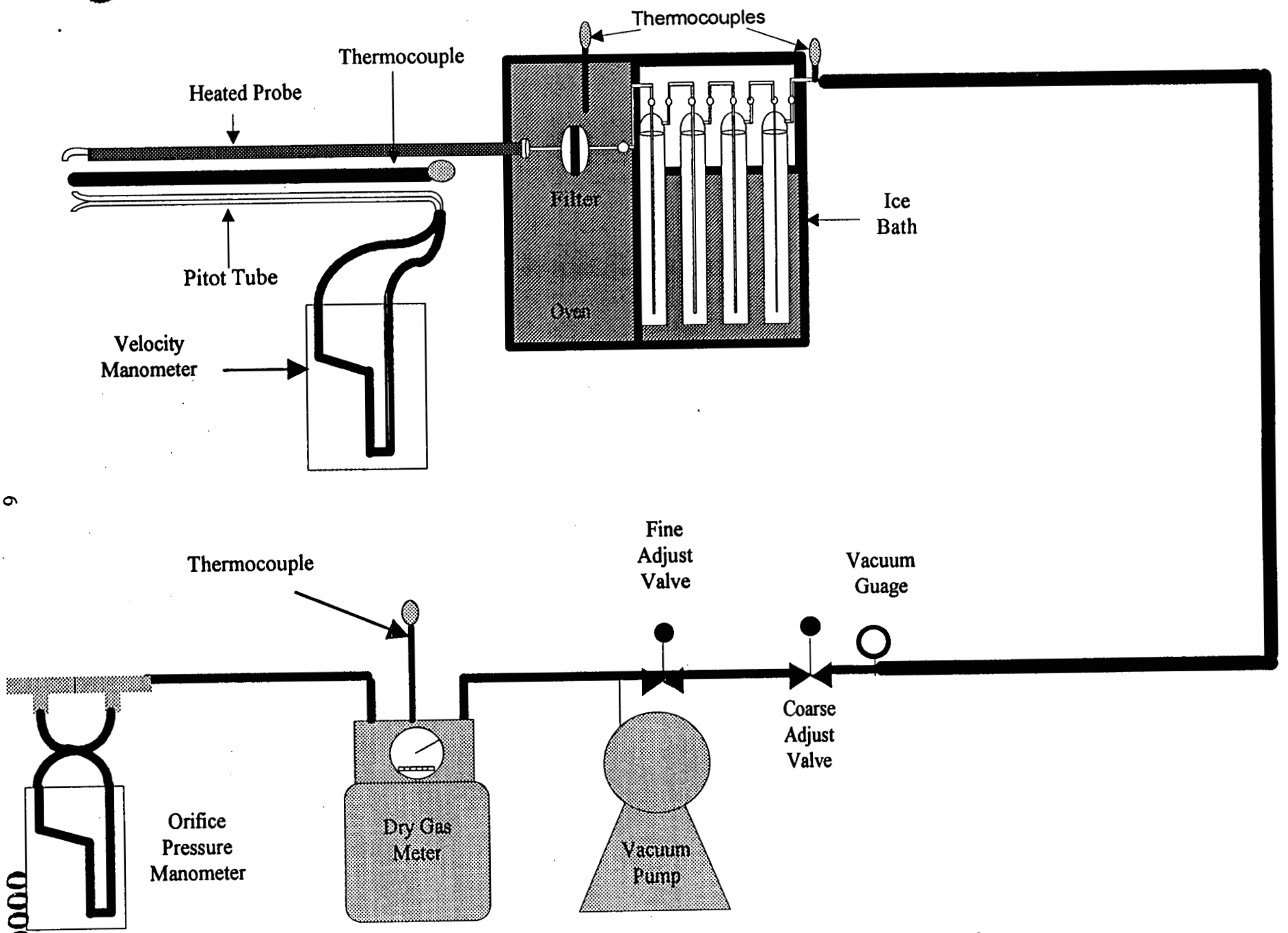

Figure 4.2 Particulate and Radionuclide Sampling Train

5.0 Discussion and Interpretation

Although both exhausts were operating and tested, production was limited to the hoods supplying the South exhaust. There was no production under the hoods serving the North exhaust stack.

A negative weight gain was detected on the sample filters from both the North and South exhaust stacks, after their respective test runs. A weight loss is common on a filter with very lite grain loading. The filter has a tendency to adhere to the gasket material on the filter bell during sample recovery. The filter material is than recovered into the acetone rinse. If this situation occurs a negative weight gain may be observed on the filter. However a net positive weight gain should be observed on the filter and acetone rinse combined. The negative filter weight gain observed on the North exhaust stack can be explained by adherence to the gasket material.

The negative weight gain observed on the South exhaust stack was too consequential to be explained by adherence to the gasket material. After a thorough investigation, an explanation for the anomaly was not discovered.

The Uranium-235/236; Radium-226; and Thorium 232 collected from both exhaust stacks were measured below the practical quantification limit. The measured activity value was used to estimate the stack gas concentrations and emission rates.

Radium-228 was not detected on either stack.

APPENDIX A

NORTH EXHAUST STACK TEST RESULTS

FERMCO, PN. A96043

TABLE A.1 SUMMARY OF STACK GAS CONDITIONS

Mixed Waste Chemical Treatment Facility, North Exhaust

Run No.	Date/Time	Velocity (fps)	Volumetric Flow Rate (acfm)	Volumetric Flow Rate (dscfm)	Temperature (F)	Moisture (%)	O2 (%)	CO2 (%)
N-1	9/19/96 0830-1519	38.9	1,834	1,745	75	1.2	21.0	0.0

fps: feet per second

acfm: actual cubic feet per minute

dscfm: dry standard cubic feet per minute

FERMCO, PN. A96043

TABLE A.2 SUMMARY OF PARTICULATE EMISSIONS

Mixed Waste Chemical Treatment Facility, North Exhaust

Run No.	Date/Time	Concentration (gr/dscf)	Concentration (lb/dscf)	Emission Rate (lb/hr)	NOTES
N-1	9/19/96 0830-1519	0.00E+00	0.00E+00	0.00E+00	BPQL

BPQL: mass collected was below the practical quantification limit

gr/dscf: grains per dry standard cubic foot

lb/dscf: pounds per dry standard cubic foot

lb/hr: pounds per hour

FERMCO, PN. A96043

TABLE A.3 SUMMARY OF TOTAL URANIUM EMISSIONS EMISSIONS

Mixed Waste Chemical Treatment Facility, North Exhaust

Run No.	Date/Time	Concentration		Emission Rate	
		Measured (µg/dscf)	Std. Dev (µg/dscf)	Measured (lb/hr)	Std. Dev (lb/hr)
N-1	9/19/96 0830-1519	1.53E-02	1.53E-03	3.53E-06	3.53E-07

µg/dscf: micrograms per dry standard cubic foot

lb/hr: pounds per hour

FERMCO, PN. A96043

TABLE A.4 SUMMARY OF RADIOACTIVE METAL EMISSIONS

Mixed Waste Chemical Treatment Facility, North Exhaust

Compound	Date/Time	Concentration		Emission Rate		
		Measured (ρci/dscf)	Std. Dev (ρci/dscf)	Measured (ρci/hr)	Std. Dev (ρci/hr)	NOTES
Uranium-233/234	9/19/96 0830-1519	3.14E-03	7.87E-04	329.0	82.4	
Uranium-235/236	9/19/96 0830-1519	3.48E-04	3.94E-04	36.4	41.2	BPQL
Uranium-238	9/19/96 0830-1519	1.46E-03	6.04E-04	152.6	63.3	
Radium-226	9/19/96 0830-1519	4.52E-01	5.47E-01	47,321	57,243	BPQL
Radium-228	9/19/96 0830-1519	-2.48E-02	7.00E-02	(2,595)	7,327	ND
Thorium-228	9/19/96 0830-1519	1.34E-03	5.43E-04	140.4	56.9	
Thorium-230	9/19/96 0830-1519	3.45E-03	7.95E-04	361.0	83.2	
Thorium-232	9/19/96 0830-1519	2.90E-04	3.15E-04	30.4	33.0	BPQL

BPQL: activity was below the practical quantification limit

ND: activity was not detected

ρci/dscf: picocuries per dry standard cubic foot

ρci/hr: picocuries per hour

APPENDIX B

SOUTH EXHAUST STACK TEST RESULTS

FERMCO, PN. A96043

TABLE B.1 SUMMARY OF STACK GAS CONDITIONS

Mixed Waste Chemical Treatment Facility, South Exhaust

Run No.	Date/Time	Velocity (fps)	Volumetric Flow Rate (acfm)	Volumetric Flow Rate (dscfm)	Temperature (F)	Moisture (%)	O2 (%)	CO2 (%)
S-1	9/19/96 0830-1519	16.4	771	733	76	1.2	21.0	0.0

fps: feet per second

acfm: actual cubic feet per minute

dscfm: dry standard cubic feet per minute

FERMCO, PN. A96043

TABLE B.2 SUMMARY OF PARTICULATE EMISSIONS

Mixed Waste Chemical Treatment Facility, South Exhaust

Run No.	Date/Time	Concentration (gr/dscf)	Concentration (lb/dscf)	Emission Rate (lb/hr)	Notes
S-1	9/19/96 0830-1519	-2.14E-03	-3.06E-07	-1.34E-02	BPQL

BPQL: mass collected was below the practical quantification limit

gr/dscf: grains per dry standard cubic foot

lb/dscf: pounds per dry standard cubic foot

lb/hr: pounds per hour

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TABLE B.3 SUMMARY OF TOTAL URANIUM EMISSIONS EMISSIONS

Mixed Waste Chemical Treatment Facility, South Exhaust

Run No.	Date/Time	Concentration		Emission Rate	
		Measured (µg/dscf)	Std. Dev (µg/dscf)	Measured (lb/hr)	Std. Dev (lb/hr)
S-1	9/19/96 0830-1519	2.78E-02	2.78E-03	2.69E-06	2.69E-07

µg/dscf: micrograms per dry standard cubic foot

lb/hr: pounds per hour

FERMCO, PN. A96043

TABLE B.4 SUMMARY OF RADIOACTIVE METAL EMISSIONS

Mixed Waste Chemical Treatment Facility, South Exhaust

Compound	Date/Time	Concentration		Emission Rate		
		Measured (ρci/dscf)	Std. Dev (ρci/dscf)	Measured (ρci/hr)	Std. Dev (ρci/hr)	NOTES
Uranium-233/234	9/19/96 0830-1519	1.15E-03	5.24E-04	50.7	23.0	
Uranium-235/236	9/19/96 0830-1519	1.59E-04	3.11E-04	6.97	13.7	BPQL
Uranium-238	9/19/96 0830-1519	8.15E-04	4.20E-04	35.8	18.5	
Radium-226	9/19/96 0830-1519	3.59E-01	6.45E-01	15,808	28,383	BPQL
Radium-228	9/19/96 0830-1519	4.41E-02	7.93E-02	1,940	3,485	ND
Thorium-228	9/19/96 0830-1519	7.61E-04	5.27E-04	33.4	23.2	
Thorium-230	9/19/96 0830-1519	2.83E-03	7.58E-04	124.3	33.3	
Thorium-232	9/19/96 0830-1519	2.28E-04	2.68E-04	10.0	11.8	BPQL

BPQL: activity was below the practical quantification limit

ND: activity was not detected

ρci/dscf: picocuries per dry standard cubic foot

ρci/hr: picocuries per hour

APPENDIX C

PROCESS DATA

HAYDEN

PLANT 6 MIXED WASTE CHEMICAL TREATMENT PROJECT
PROCESS DATA FOR THURSDAY 9/19/96

Thursday morning: Process began at 8:30

* The crew was shredding LDR failed waste from box #'s 421477 & 421425.
* 12 drums of MEF 1906 HF tank sludge were mixed/neutralized.
* After the HF run, the drums of reprocessed material were slurried & sodium sulfate treated.
* The crew sampled MEF 1906 according to SAP 96-1267 as follows;

MEF	WMB NO.	DRUM NO.	SAMPLE NO.	TIME
1906	421426	W156674	96-1267-3 L&B/metals	0912
1906	421380	W156672	96-1267-1 L&B/metals	0938
1906	421380	W156672	96-1267-2 L&B/metals	0939

HEPA pre-filters readings at 0945: east: 0.4 inches
west: 1.1 inches

Thursday afternoon:

* 13 drums of HF tank sludge (MEF 1906) were neutralized by adding lime.
* 13 drums from box # 421477 with MEF #'s 20145, 2823, 50173 & 61004 were on line and slurried. (Ba)

APPENDIX D

FIELD DATA SHEETS

METHOD 2 VELOCITY FIELD DATA

Client: FERMCO
Project Number: A96043
Date: 9/19/96
Source: MIXED WASTE TREATMENT
Site: NORTH EXHAUST (NEXT TO BUILDING)
Run: N-1
Operators: BS, DS
Barometric Pressure: 29.20
Static Pressure: -0.02

Pilot Tube I.D.: STANDARD
Thermocouple I.D.: 4C
Pre-Test Leak Check:
Post-Test Leak Check:
Stack I.D.:
METHOD 4 DATA
Wet Bulb Thermocouple I.D.:
Dry Bulb Thermocouple I.D.:
Temperatures (°F); Wet: Dry:

Traverse Point #	Δ P ("H_2O)	Stack Temp. (°F)	Traverse Point #	Δ P ("H_2O)	Stack Temp. (°F)
1	0.38	68°F	1	0.23	
2	0.40		2	0.29	
3	0.39		3	0.32	
4	0.35		4	0.30	
5	0.33		5	0.30	
6	0.32		6	0.30	
7	0.32		7	0.30	
8	0.33		8	0.30	
9	0.35		9	0.31	
10	0.37		10	0.31	
11	0.39		11	0.32	
12	0.38		12	0.34	

~~0.5730~~

O_2:
CO_2:
Bws:
Δ P:
✓ Δ P: 0.5730 ✓ BH
Ts:
Vs:
Qa:
Qstd:

SKETCH

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ENVIRONMENTAL CONSULTANTS

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METHOD 2 VELOCITY FIELD DATA

Client: TEAMCO
Project Number: A96043
Date: 9/19/96
Source: MIXED WASTE TREATMENT
Site: NORTH EXHAUST
Run: ~~#7~~ N-1B
Operators: BS, DS
Barometric Pressure: 29.20
Static Pressure: -0.04

Pitot Tube I.D.: STANDARD
Thermocouple I.D.: 4C
Pre-Test Leak Check:
Post-Test Leak Check:
Stack I.D.:

METHOD 4 DATA

Wet Bulb Thermocouple I.D.:
Dry Bulb Thermocouple I.D.:
Temperatures (°F); Wet: Dry:

Traverse Point #	Δ P ("H_2O)	Stack Temp. (°F)	Traverse Point #	Δ P ("H_2O)	Stack Temp. (°F)
1	0.37	85	1	0.28	
2	0.34		2	0.30	
3	0.31		3	0.31	
4	0.32		4	0.31	
5	0.32		5	0.31	
6	0.33		6	0.31	
7	0.38		7	0.31	
8	0.38		8	0.31	
9	0.35		9	0.31	
10	0.37		10	0.31	
11	0.39		11	0.33	
12	0.37		12	0.42	

O_2:
CO_2:
Bws:
Δ P:
√Δ P: 0.5780 ✓ BB
Ts:
Vs:
Qa:
Qstd:

SKETCH

HAYDEN ENVIRONMENTAL GROUP, INC.

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EMISSION TESTING FIELD DATA

Client: FERMO
PN: A96047
Date: 9/19/96
Source: MIXED WASTE TREATMENT
Site: NORTH EXHAUST (NEXT TO BUILDING
Sample Type: M-5
Run: N-1
Operators: BS, DL
Barometric Pressure (Pb): 29.80
Static Pressure (Pg): -0.02

Meter Box: N-1
Sample Box #: 3
Filter #:
Probe Length/Type 3' GLASS
Stack Thermocouple #: NA
Oven Thermocouple #: OV-3
Impinger Thermocouple #: I-3
Pilot Tube #: NA
Stack I.D.: 12
Record Data Every 10 Minutes

Meter ΔH@: 1.960
Meter Y Factor: 0.9754
C Factor: 1.15
Reference ΔP: 0.53
Nozzle I.D.: Avg. ~~0.230~~ ~~0.243~~ 0.230
Pre-test Leak Rate: 0.000 cfm@ 10 "Hg
Post-test Leak Rate: 0.000 cfm@ 3 "Hg
Pilot Tube Leak Check: Pre:___ Post:___
Orsat Train Leak Check: Pre:___ Post:___
Page 1 of ___

Traverse Point Number	Sampling Time (min)	Clock Time (hr)	Meter Reading (cu ft.)	Velocity Pressure ΔP ("H2O)	Desired	Actual	Train Vacuum ("Hg)	Stack	Filter	Probe	IMP	Meter
~~C~~	~~0~~	~~0830~~	~~280.373~~	~~0.39~~	~~1.35~~	~~1.35~~						
C	10	0840	287.660	NA	1.35	1.35	2.0	NA	248	NA	43	59/56
N	20	0850	292.745				2.0		247		43	60/57
T	30	0900	299.850				2.0		243		46	62/58
C	50	0920	311.285				2.0		247		46	63/59
1	60	0930	317.630				2.0		248		49	65/61
	70	0940	323.970				2.0		254		51	66/62
	80	0950	330.310				2.0		261		53	68/63
	90	1000	336.570				2.0		260		56	69/64
	100	1010	342.830				2.0		259		58	70/65
	110	1020	349.245				2.0		257		58	71/66
	119.3	1029.3	354.993				2.0		260		58	72/68

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8019

EMISSION TESTING FIELD DATA

Client: FEMCO
PN: A96043
Date: 9/18/96
Source: MIXED WASTE TREATMENT
Site: NORTH EXHAUST
Sample Type: PART
Run: N-1
Operators: BL, DS
Barometric Pressure (Pb): 29.20
Static Pressure (Pg): -0.02

Meter Box: N-1
Sample Box #: 3
Filter #:
Probe Length/Type 2' GLASS
Stack Thermocouple #: NA
Oven Thermocouple #: OV-3
Impinger Thermocouple #: I-3
Pilot Tube #: NA
Stack I.D.: 12
Record Data Every 10 Minutes

Meter ΔH@: 1.960
Meter Y Factor: 0.9754
C Factor: 1.15
Reference ΔP: 0.53
Nozzle I.D.: ___ ___ ___ Avg. 0.230
Pre-test Leak Rate: 0.010 cfm@ 10 "Hg
Post-test Leak Rate: 0.000 cfm@ 3 "Hg
Pilot Tube Leak Check: Pre: ___ Post: ___
Orsat Train Leak Check: Pre: ___ Post: ___
Page 2 of 2

Traverse Point Number	Sampling Time (min)	Clock Time (hr)	Meter Reading (cu ft.)	Velocity Pressure ΔP ("H2O)	Desired	Actual	Train Vacuum ("Hg)	Stack	Filter	Probe	IMP	Meter
C	130	1240	362.080	NA	1.35	1.35	2.0	NA	258	NA	67	85/84
G	140	1250	368.759				2.0		259		58	87/86
N	150	1300	375.480				2.0		259		62	91/88
T	160	~~1310~~ 1320	381.830				2.0		256		65	95/90
E	170	1330	388.750				2.0		258		66	98/93
R	180	1340	395.480				2.0		257		67	100/95
	190	1350	402.210				2.0		254		67	102/98
	200	1400	408.935				2.0		249		69	104/100
	210	1500	415.790				2.0		252		63	106/102
	220	1510	421.890				2.0		255		62	108/104
	229	1519	427.352				2.0		253		65	108/106
			146.979									80.3

BL

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SAMPLE RECOVERY DATA

Client: Fermco
PN: A9604 3
Date: 9/18/96
Source: HEPA Filter
Site: Outlet
Run #: NORTH-1
Sample Date: 9/19/96
Recovery Date: 9/20/96

Filter No: 000753
Glassware Set No: 3
Sample Box #: 3

IMPINGER DATA

Gravimetric: ✓
Volumetric:

	#1	#2	#3	#4	#5	Total
Contents	100mL DI	100mL DI	MT	Silica Gel		
Final	584.4	519.4	455.5	826.1		
Initial	595.1	504.5	452.5	798.8		
Net	-10.7	14.9	3.0	27.3		34.5 ✓ BA

RECOVERED SAMPLE

Description of Particulate on Filter: No visible part.

Color of Silica Gel: 1/2 spent

Recovered By: Dutch

HAYDEN ENVIRONMENTAL GROUP, INC.

METHOD 2 VELOCITY FIELD DATA

Client: FEMCO
Project Number: A96043
Date: 9/19/96
Source: MIXED WASTE FACILITY
Site: SOUTH EXHAUST
Run: S-1
Operators: BI, DS
Barometric Pressure: 29.20
Static Pressure: -0.07

Pilot Tube I.D.: S-TYPE
Thermocouple I.D.: 4C
Pre-Test Leak Check:
Post-Test Leak Check:
Stack I.D.:
METHOD 4 DATA
Wet Bulb Thermocouple I.D.:
Dry Bulb Thermocouple I.D.:
Temperatures (°F); Wet: Dry:

Traverse Point #	Δ P ("H_2O)	Stack Temp. (°F)	Traverse Point #	Δ P ("H_2O)	Stack Temp. (°F)
1	0.08	65°C	1	0.08	
2	0.08		2	0.08	
3	0.08		3	~~0.08~~ 0.09	
4	0.08		4	0.09	
5	0.08		5	0.09	
6	0.08		6	0.09	
7	0.09		7	0.08	
8	0.10		8	0.08	
9	0.11		9	0.08	
10	0.11		10	0.09	
11	0.11		11	0.10	
12	0.11		12	0.10	
				~~0.2984~~	

O_2:
CO_2:
Bws:
Δ P:
✓ Δ P: 0.2987 ✓ BH
Ts:
Vs:
Qa:
Qstd:

SKETCH

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METHOD 2 VELOCITY FIELD DATA

Client: FEMMCO
Project Number: A96043
Date: 9/14/96
Source: MIXED WASTE TREATMENT
Site: SOUTH EXHAUST
Run: ~~SOUTH~~ S-1B
Operators: BS
Barometric Pressure: 29.2
Static Pressure: -0.01

Pitot Tube I.D.: STANDARD
Thermocouple I.D.: 4C
Pre-Test Leak Check:
Post-Test Leak Check:
Stack I.D.:
METHOD 4 DATA
Wet Bulb Thermocouple I.D.:
Dry Bulb Thermocouple I.D.:
Temperatures (°F); Wet: Dry:

Traverse Point #	Δ P ("H_2O)	Stack Temp. (°F)	Traverse Point #	Δ P ("H_2O)	Stack Temp. (°F)
1	0.04	86	1	0.04	
2	0.05	↓	2	0.04	
3	0.05		3	0.04	
4	0.05		4	0.04	
5	0.05		5	0.04	
6	0.04		6	0.04	
7	0.04		7	0.04	
8	0.04		8	0.07	
9	0.04		9	0.07	
10	0.06		10	0.07	
11	0.07		11	0.07	
12	0.07		12	0.07	

O_2:
CO_2:
Bws:
Δ P:
$\sqrt{\Delta P}$: 0.2246 ✓ BH
Ts:
Vs:
Qa:
Qstd:

SKETCH

HAYDEN ENVIRONMENTAL GROUP, INC.

000033

8019

EMISSION TESTING FIELD DATA

Client: FERMCO
PN: A96043
Date: 9/19/96
Source: MIXED WASTE TREATMENT
Site: SOUTH EXHAUST
Sample Type: PART
Run: 5-1
Operators: BS DI
Barometric Pressure (Pb): 29.20
Static Pressure (Pg): -0.07

Meter Box: N-2
Sample Box #: 1
Filter #:
Probe Length/Type 3' GLASS
Stack Thermocouple #: NA
Oven Thermocouple #: OV-1
Impinger Thermocouple #: I-1
Pilot Tube #: NA
Stack I.D.: 12
Record Data Every 10 Minutes

Meter ΔH@: 1.940
Meter Y Factor: 0.9974
C Factor: 1.15
Reference ΔP: 0.16
Nozzle I.D.: Avg. 0.309
Pre-test Leak Rate: 0 cfm@ 0.008 "Hg
Post-test Leak Rate: 0.015 cfm@ 4 "Hg
Pilot Tube Leak Check: Pre: Post:
Orsat Train Leak Check: Pre: Post:
Page 1 of

Traverse Point Number	Sampling Time (min)	Clock Time (hr)	Meter Reading (cu ft.)	Velocity Pressure ΔP ("H2O)	Desired	Actual	Train Vacuum ("Hg)	Stack	Filter	Probe	IMP	Meter
C	0	0830	468.477									
E	10	0840	475.631	NA	1.30	1.30	1.5	NA	245	NA	53	56/53
N	20	0850	481.660				1.5		253		50	58/55
T	30	0900	488.140				1.5		247		48	62/57
E	50	0920	501.780				1.5		250		53	68/58
R	60	0930	508.250				1.5		248		48	70/62
	70	0940	514.710				1.5		270		52	69/62
	80	0950	521.260				1.5		276		52	70/64
	90	1000	527.620				1.5		273		53	72/65
	100	1010	534.175				1.5		282		55	74/63
	110	1020	540.775				1.5		282		57	70/67
	119.3	1029.3	546.888				1.5		279		58	75/69

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80 19

EMISSION TESTING FIELD DATA

Client: FERMCO
PN: A86043
Date: MIXED WASTE TREATMENT
Source: SOUTH EXHAUST
Site: J
Sample Type: PART
Run: S-1
Operators: BS OS
Barometric Pressure (Pb): 29.20
Static Pressure (Pg): -0.07

Meter Box: N-2
Sample Box #: I
Filter #: 1
Probe Length/Type 3' GLASS
Stack Thermocouple #: NA
Oven Thermocouple #: OV-1
Impinger Thermocouple #: I-1
Pilot Tube #: NA
Stack I.D.: 12
Record Data Every 10 Minutes

Meter ΔH@: 1.940
Meter Y Factor: 0.9474
C Factor: 1.15
Reference ΔP: 0.16
Nozzle I.D.: Avg. 0.309
Pre-test Leak Rate 0.008 cfm@ 10 "Hg
Post-test Leak Rate 0.015 cfm@ 4 "Hg
Pilot Tube Leak Check: Pre: Post:
Orsat Train Leak Check: Pre: Post:
Page 2 of

Traverse Point Number	Sampling Time (min)	Clock Time (hr)	Meter Reading (cu ft.)	Velocity Pressure ΔP ("H2O)	Desired	Actual	Train Vacuum ("Hg)	Stack	Filter	Probe	IMP	Meter
C	130	1240	553.365	NA	1.30	1.30	1.5	NA	263	NA	68	99/93
E	140	1250	559.155				1.5		258		60	82/90
N	150	1300	564.840				1.5		265		62	94/92
T	160	~~1315~~ 1320	570.410				1.5		241		63	99/94
E	170	1330	574.830				1.5		261		64	100/95
R	180	1340	579.420				1.5		244		66	104/101
	190	1350	583.995				1.5		251		66	106/104
	200	1400	588.520				1.5		259		68	107/104
	210	1500	593.~~195~~				1.5		257		64	106/105
	220	1510	598.785				1.5		247		63	107/104
	~~220~~ 220	1519	604.022				1.5		247		64	112/108
			135.545									52.4

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80019

SAMPLE RECOVERY DATA

Client: FCSMCO PN: A96043 Date: 8/18/96
Source: HEPA Filter Site: Outlet Run #: South
Sample Date: 7/19/96 Recovery Date: 9/20/96

Filter No: _____ Glassware Set No: 1 Sample Box #: 1

IMPINGER DATA

Gravimetric: ✓ Volumetric: _____

	#1	#2	#3	#4	#5	Total
Contents	100ml DI	100ml DI	MT	Silica GEL		
Final	641.4	616.9	432.4	620.5		
Initial	646.3	612.3	428.5	593.0		
Net	-4.9	4.6	3.9	27.5		31.1

RECOVERED SAMPLE

Description of Particulate on Filter: No visible loading

Color of Silica Gel: 1/2 spent

Recovered By: [signature]

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APPENDIX E

LABORATORY DATA

APPENDIX F

CALCULATIONS

NOMENCLATURE

A_n = Area of sampling nozzle, ft^2

A_s = Cross-sectional area of stack at sampling site, ft^2

B_{ws} = Proportion water vapor in stack gas by volume

CO = Percent carbon monoxide in stack gas by volume,dry basis, %

CO_2 = Percent carbon dioxide in stack gas by volume, dry basis, %

C_p = Pitot tube coefficient

C_1 = Concentration of particulate in stack gas, grains/dscf

C_2 = Concentration of particulate in stack gas, lb/dscf

$C_{Ra\text{-}226}$ = Concentration of Radium-226 in stack gas, pci/dscf

$C_{Ra\text{-}228}$ = Concentration of Radium-228 in stack gas, pci/dscf

$C_{Th\text{-}228}$ = Concentration of Thorium-228 in stack gas, pci/dscf

$C_{Th\text{-}230}$ = Concentration of Thorium-230 in stack gas, pci/dscf

$C_{Th\text{-}232}$ = Concentration of Thorium-232 in stack gas, pci/dscf

$C_{total\ U}$ = Concentration of total uranium in stack gas, µg/dscm

$C_{total\ U\ 2}$ = Concentration of total uranium in stack gas, µg/dscf

$C_{U\text{-}233/234}$ = Concentration of uranium-233/234 in stack gas, pci/dscf

$C_{U\text{-}235}$ = Concentration of uranium-235 in stack gas, pci/dscf

$C_{U\text{-}238}$ = Concentration of uranium-238 in stack gas, pci/dscf

ER = particulate emission rate, lb/hr

$ER_{Ra\text{-}226}$ = Radium-226 emission rate, pci/hr

$ER_{Ra\text{-}228}$ = Radium-228 emission rate, pci/hr

$ER_{Th\text{-}228}$ = Thorium-228 emission rate, pci/hr

$ER_{Th\text{-}230}$ = Thorium-230 emission rate, ρci/hr

$ER_{Th\text{-}232}$ = Thorium-232 emission rate, ρci/hr

$ER_{Total\ U}$ = total uranium emission rate, lb/hr

$ER_{U\text{-}233/234}$ = Uranium-233/234 emission rate, ρci/hr

$ER_{U\text{-}235}$ = Uranium-235 emission rate, ρci/hr

$ER_{U\text{-}238}$ = Uranium-238 emission rate, ρci/hr

ΔH = Average pressure drop across orifice

%I = Percent isokinetic sampling rate, %

M_d = Molecular weight of stack gas, dry conditions, lb/lb-mole

M_s = Molecular weight of stack gas, stack conditions, lb/lb-mole

Mn_{part} = Particulate catch, mg

$Mn_{Ra\text{-}226}$ = Radium-226 activity, ρci

$Mn_{Ra\text{-}228}$ = Radium-228 activity, ρci

$Mn_{Th\text{-}228}$ = Thorium-228 activity, ρci

$Mn_{Th\text{-}230}$ = Thorium-230 activity, ρci

$Mn_{Th\text{-}232}$ = Thorium-232 activity, ρci

$Mn_{Total\ U}$ = Uranium catch, μg

$Mn_{U\text{-}233/234}$ = Uranium-233/234 activity, ρci

$Mn_{U\text{-}235}$ = Uranium-235 activity, ρci

$Mn_{U\text{-}238}$ = Uranium-238 activity, ρci

N_2 = Percent nitrogen in stack gas by volume, dry basis, %

O_2 = Percent oxygen in stack gas by volume, dry basis, %

Δp = Average velocity head of stack gas, inches H_2O

$\sqrt{\Delta p}$ = Average square root of velocity head pressure, inches H_2O

P_b = Barometric pressure, inches Hg

P_g = Static pressure of stack gas, inches H_2O

P_s = Absolute stack gas pressure, inches Hg

Q_a = Volumetric stack gas flow rate, stack conditions, acfm

Q_{std} = Volumetric stack gas flow rate, dry standard conditions, dscfm

Θ = Elapsed time of test, minutes

T_m = Average dry gas meter temperature, °F

T_s = Average stack gas temperature, °F

V_{lc} = Mass of water collected, g

V_m = Volume of gas measured by dry gas meter, ft^3

V_{mc} = Volume of dry gas meter corrected for leak rate, ft^3

V_{mstd} = Volume of dry gas meter corrected to standard conditions, ft^3

V_{wstd} = Volume of water collected, standard conditions, ft^3

Vs = Stack gas velocity, fps

γ = dry gas meter calibration factor, dimensionless

Note: Standard conditions = 68°F and 29.92 inches Hg.

EXAMPLE CALCULATION
MIXED WASTE CHEMICAL TREATMENT PROJECT NORTH EXHAUST STACK
TEST RUN # 2

1. Volume Metered, Standard Conditions (68°F, 29.92 In Hg)

$$V_{mstd} = (17.647)x(V_m)x(Y)x\frac{(P_b)+\frac{(\Delta H)}{(13.6)}}{(T_m+460)}$$

$$V_{mstd} = (17.647)x(135.545)x(0.9474)x\frac{(29.20)+\frac{(1.300)}{(13.6)}}{(82.4+460)} = 122.397$$

2. Volume Water Vapor Collected, Standard Conditions

$$V_{wstd} = (0.04707)x(V_{lc})$$

$$V_{wstd} = (0.04707)x(31.1) = 1.464$$

3. Proportion Water Vapor, By Volume

$$B_{ws} = \frac{(V_{wstd})}{(V_{wstd}+V_{mstd})}$$

$$B_{ws} = \frac{(1.464)}{(1.464+122.397)} = 0.012$$

4. Molecular Weight of Stack Gas, Dry Conditions

$$M_d = (0.44x\,CO_2)+(0.32x\,O_2)+(0.28x(N_2+CO))$$

$$M_d = (0.44x0.0)+(0.32x21.0)+(0.28x79.0) = 28.84$$

5. Molecular Weight of Stack Gas, Stack Conditions

$$M_s = [M_d x(1-B_{ws})]+(18x\,B_{ws})$$

$$M_s = [28.84x(1-0.012)]+(18x0.012) = 28.71$$

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EXAMPLE CALCULATION
MIXED WASTE CHEMICAL TREATMENT PROJECT NORTH EXHAUST STACK
TEST RUN # 1 (Cont.)

6. Static Pressure, inches H_20

$$Ps = (Pb) + \frac{(Pg)}{(13.6)}$$

$$Ps = (29.20) + \frac{(-0.04)}{(13.6)} = 29.20$$

7. Stack Gas Velocity, fps

$$V_s = (85.49)x(c_p)x(\sqrt{\Delta p})x\sqrt{\frac{(T_s + 460)}{(P_s)x(M_s)}}$$

$$V_s = (85.49)x(0.915)x(0.2617)x\sqrt{\frac{(75.5 + 460)}{(29.20)x(28.71)}} = 16.4$$

8. Stack Gas Flow Rate, acfm

$$Q_a = (60)x(V_s)x(5.454E-03)x(Dia)^2$$

$$Q_a = (60)x(16.4)x(5.454E-03)x(12)^2 = 770.8$$

9. Stack Gas Flow Rate, dscf

$$Q_{std} = (17.647x(Q_a)x(1 - B_{ws})x\frac{(P_s)}{(T_s + 460)}$$

$$Q_{std} = (17.647)x(770.8)x(1 - 0.012)x\frac{(29.20)}{(75.5 + 460)} = 732.9$$

10. Isonkinetic Variation, %

$$\%I = (0.0944)x\frac{(T_s + 460)x(V_{mstd})}{(P_s)x(V_s)x(An)x(\Theta)x(1 - B_{ws})}$$

$$\%I = (0.0944)x\frac{(75.5 + 460)x(122.397)}{(29.20)x(16.4)x(5.21E - 04)x(229)x(1 - 0.012)} = 109.9$$

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EXAMPLE CALCULATION
MIXED WASTE CHEMICAL TREATMENT PROJECT NORTH EXHAUST STACK
TEST RUN # 1 (Cont.)

11. Particulate Concentration, gr/dscf

$$C_1 = \frac{(0.0154)x(Mn)}{(V_{mstd})}$$

$$C_1 = \frac{(0.0154)x(-17.0)}{(122.397)} = (-2.14E-03)$$

12. Particulate Concentration, lb,dscf

$$C_2 = (1.429E-04)x(C_1)$$

$$C_2 = (1.429E-04)x(-2.14E-03) = (-3.06E-07)$$

13. Particulate Emission Rate, lb/hr

$$ER = (C_2)x(Q_{std})x(60)$$

$$ER = (-3.06E-07)x(732.9)x(60) = (-0.013)$$

14. Total Uranium Concentration, µg/dscm

$$C_{TotalU} = \frac{(Mn_{TotalU})}{(V_{mstd})}$$

$$C_{TotalU} = \frac{(3.4)x(35.341)}{(122.397)} = 0.9817$$

15. Total Uranium Standard Deviation Concentration, µg/dscm

$$C_{TotalU\ stdv} = \frac{(Mn_{TotalU\ stdv})}{(V_{mstd})}$$

$$C_{TotalU} = \frac{(0.34)x(35.341)}{(122.397)} = 0.09817$$

EXAMPLE CALCULATION
MIXED WASTE CHEMICAL TREATMENT PROJECT NORTH EXHAUST STACK
TEST RUN # 1 (Cont.)

16. Total Uranium Concentration, µg/dscf

$$C_{Total\,U_2} = \frac{(Mn_{Total\,U})}{(V_{mstd})}$$

$$C_{Total\,U_2} = \frac{(3.4)}{(122.397)} = 2.78E-02$$

17. Total Uranium Standard Deviation Concentration, µg/dscf

$$C_{Total\,U_2\,stdv} = \frac{(Mn_{Total\,U\,stdv})}{(V_{mstd})}$$

$$C_{Total\,U_2\,stdv} = \frac{(0.34)}{(122.397)} = 2.78E-03$$

18. Total Uranium Emission Rate, lb/hr

$$ER_{Total\,U} = \frac{(C_{Total\,U_2})x(Q_{std})x(60)}{(1{,}000{,}000)x(453.59)}$$

$$ER_{total\,U} = \frac{(2.78E-02)x(732.9)x(60)}{(1{,}000{,}000)x(453.59)} = 2.69E-06$$

19. Total Uranium Standard Deviation Emission Rate, lb/hr

$$ER_{Total\,U\,stdv} = \frac{(C_{Total\,U_2})x(Q_{std})x(60)}{(1{,}000{,}000)x(453.59)}$$

$$ER_{Total\,U\,stdv} = \frac{(2.78E-03)x(732.9)x(60)}{(1{,}000{,}000)x(453.59)} = 2.69E-07$$

20. Radionuclide (Uranium-233/234) Concentration, pci/dscf

$$C_{U-233/234} = \frac{(Mn_{U-233/234})}{(V_{mstd})}$$

$$C_{U-233/234} = \frac{(0.141)}{(122.397)} = 1.15E-03$$

EXAMPLE CALCULATION
MIXED WASTE CHEMICAL TREATMENT PROJECT NORTH EXHAUST STACK
TEST RUN # 1 (Cont.)

21. Radionuclide (Uranium-233/234) Standard Deviation Concentration, ρci/dscf

$$C_{U-233/234\,stdv} = \frac{(Mn_{U-233/234\,stdv})}{(V_{mstd})}$$

$$C_{U-233/234\,stdv} = \frac{(0.0641)}{(122.397)} = 5.24E-04$$

22. Radionuclide Emission Rate, ρci/hr

$$ER_{U-233/234} = (C_{U-233/234})x(Q_{std})x(60)$$

$$ER_{U-233/234} = (1.15E-03)x(732.9)x(60) = 50.7$$

23. Radionuclide (Uranium-233/234) Standard Deviation Emission Rate, ρci/hr

$$ER_{U-233/234\,stdv} = (C_{U-233/234\,stdv})x(Q_{std})x(60)$$

$$ER_{U-233/234\,stdv} = (5.24E-04)x(732.9)x(60) = 23.0$$

MIXED WASTE CHEMICAL TREATMENT PROJECT

CLIENT/PROJECT #:		FERMCO, PN. A96043		FERMCO, PN. A96043
SAMPLE LOCATION:		Mixed Waste Chemical Treatment Facil		Mixed Waste Chemical Treatment Facil
DATE/TIME:		9/19/96 0830-1519		9/19/96 0830-1519
RUN #:		S-1		N-1
STATIC PRESSURE ("H2O):		-0.04		-0.03
BAROMETRIC ("Hg):		29.20		29.20
Cp PITOT:		0.92		0.99
METER BOX Y:		0.9474		0.9754
NOZZLE DIAMETER (inches):		0.309		0.230
LENGTH OF TEST (min):		229.0		229.0
VOLUME METERED (CF):		135.545		146.979
SQUARE ROOT DELTA P ("H2O):		0.2617		0.5755
DELTA H (" H2O):		1.300		1.350
STACK TEMPERATURE (F):		75.5		75.0
METER TEMPERATURE (F)		82.4		80.3
STACK DIAMETER (Inches):		12.0		12.0
STACK GAS O2 CONCENTRATION (%):		21.0		21.0
STACK GAS CO2 CONCENTRATION (%):		0.0		0.0
VOLUME LIQUID COLLECTED(ml):		31.1		34.5
PARTICULATE MASS LOADING				
PARTICULATE MASS ON FILTER (mg):		2.8		2.3
PARTICULATE MASS IN ACETONE RINSE (mg):		-19.8		-2.3
ANALYTE #1		Total Uranium		Total Uranium
Mass (ug):		3.4		2.1
Mass Std. Dev.(ug):		0.34		0.21
ANALYTE #2		Uranium-233/234		Uranium-233/234
Activity (pci):		0.141		0.431
Activity Std. Deviation (pci):		0.0641		0.108
ANALYTE #3		Uranium-235/236		Uranium-235/236
Activity (pci):		0.0194	BPQL	0.0477 BPQL
Activity Std. Deviation (pci):		0.0381		0.0540
ANALYTE #4		Uranium-238		Uranium-238
Activity (pci):		0.0997		0.200
Activity Std. Deviation (pci):		0.0514		0.0829
ANALYTE #5		Radium-226		Radium-226
Activity (pci):		44	BPQL	62 BPQL
Activity Std. Deviation (pci):		79		75
ANALYTE #6		Radium-228		Radium-228
Activity (pci):		5.4	ND	-3.4 ND
Activity Std. Deviation (pci):		9.7		9.6
ANALYTE #7		Thorium-228		Thorium-228
Activity (pci):		0.0931		0.184

MIXED WASTE CHEMICAL TREATMENT PROJECT

Activity Std. Deviation (pci):	0.0645		0.0745	
ANALYTE #8	Thorium-230		Thorium-230	
Activity (pci):	0.346		0.473	
Activity Std. Deviation (pci):	0.0928		0.109	
ANALYTE #9	Thorium-232		Thorium-232	
Activity (pci):	0.0279	BPQL	0.0398	BPQL
Activity Std. Deviation (pci):	0.0328		0.0432	

********** CALCULATIONS **********

VOLUME METERED STD. CONDITIONS (dscf):	122.397	137.193
OLUME H2O VAPOR COLLECTED STD. CONDITIONS (dscf):	1.464	1.624
STACK GAS MOISTURE (%):	1.2	1.2
STACK GAS MOLECULAR WEIGHT, DRY CONDITIONS:	28.84	28.84
STACK GAS MOLECULAR WEIGHT, STACK CONDITIONS:	28.71	28.71
STACK GAS STATIC PRESSURE ("H2O)	29.20	29.20
STACK GAS VELOCITY (fps):	16.4	38.9
STACK GAS AIR FLOW, STACK CONDITIONS (acfm):	770.8	1833.5
STACK GAS AIR FLOW, STD. CONDITIONS (dscfm):	732.9	1745.2
STACK GAS TEMPERATURE (F):	75.5	75.0
STACK GAS MOISTURE (%):	1.2	1.2
STACK GAS O2 CONCENTRATION (%):	21.0	21.0
STACK GAS CO2 CONCENTRATION(%):	0.0	0.0
ISOKINETIC VARIATION (%):	109.9	93.4

PARTICULATE RESULTS

CONCENTRATION (gr/dscf):	-2.14E-03	0.00E+00
CONCENTRATION (lb/dscf):	-3.06E-07	0.00E+00
EMISSION RATE (lb/hr):	-0.013	0.000
ANALYTE #1 RESULTS	**Total Uranium**	**Total Uranium**
CONCENTRATION (ug/dscf):	2.78E-02	1.53E-02
CONCENTRATION STANDARD DEVIATION (ug/dscf):	2.78E-03	1.53E-03
EMISSION RATE (lb/hr):	2.69E-06	3.53E-06
EMISSION RATE STANDARD DEVIATION (lb/hr):	2.69E-07	3.53E-07
ANALYTE #2 RESULTS	**Uranium-233/234**	**Uranium-233/234**
CONCENTRATION (pci/dscf):	1.15E-03	3.14E-03
CONCENTRATION STANDARD DEVIATION (pci/dscf):	5.24E-04	7.87E-04
EMISSION RATE (pci/hr):	5.07E+01	3.29E+02
EMISSION RATE STANDARD DEVIATION (pci/hr):	2.30E+01	8.24E+01
ANALYTE #3 RESULTS	**Uranium-235/236**	**Uranium-235/236**
CONCENTRATION (pci/dscf):	1.59E-04	3.48E-04
CONCENTRATION STANDARD DEVIATION (pci/dscf):	3.11E-04	3.94E-04
EMISSION RATE (pci/hr):	6.97E+00	3.64E+01
EMISSION RATE STANDARD DEVIATION (pci/hr):	1.37E+01	4.12E+01

MIXED WASTE CHEMICAL TREATMENT PROJECT

ANALYTE #4 RESULTS	Uranium-238	Uranium-238
CONCENTRATION (pci/dscf):	8.15E-04	1.46E-03
CONCENTRATION STANDARD DEVIATION (pci/dscf):	4.20E-04	6.04E-04
EMISSION RATE (pci/hr):	3.58E+01	1.53E+02
EMISSION RATE STANDARD DEVIATION (pci/hr):	1.85E+01	6.33E+01
ANALYTE #5 RESULTS	**Radium-226**	**Radium-226**
CONCENTRATION (pci/dscf):	3.59E-01	4.52E-01
CONCENTRATION STANDARD DEVIATION (pci/dscf):	6.45E-01	5.47E-01
EMISSION RATE (pci/hr):	1.58E+04	4.73E+04
EMISSION RATE STANDARD DEVIATION (pci/hr):	2.84E+04	5.72E+04
ANALYTE #6 RESULTS	**Radium-228**	**Radium-228**
CONCENTRATION (pci/dscf):	4.41E-02	-2.48E-02
CONCENTRATION STANDARD DEVIATION (pci/dscf):	7.93E-02	7.00E-02
EMISSION RATE (pci/hr):	1.94E+03	-2.60E+03
EMISSION RATE STANDARD DEVIATION (pci/hr):	3.49E+03	7.33E+03
ANALYTE #7 RESULTS	**Thorium-228**	**Thorium-228**
CONCENTRATION (pci/dscf):	7.61E-04	1.34E-03
CONCENTRATION STANDARD DEVIATION (pci/dscf):	5.27E-04	5.43E-04
EMISSION RATE (pci/hr):	3.34E+01	1.40E+02
EMISSION RATE STANDARD DEVIATION (pci/hr):	2.32E+01	5.69E+01
ANALYTE #8 RESULTS	**Thorium-230**	**Thorium-230**
CONCENTRATION (pci/dscf):	2.83E-03	3.45E-03
CONCENTRATION STANDARD DEVIATION (pci/dscf):	7.58E-04	7.95E-04
EMISSION RATE (pci/hr):	1.24E+02	3.61E+02
EMISSION RATE STANDARD DEVIATION (pci/hr):	3.33E+01	8.32E+01
ANALYTE #9 RESULTS	**Thorium-232**	**Thorium-232**
CONCENTRATION (pci/dscf):	2.28E-04	2.90E-04
CONCENTRATION STANDARD DEVIATION (pci/dscf):	2.68E-04	3.15E-04
EMISSION RATE (pci/hr):	1.00E+01	3.04E+01
EMISSION RATE STANDARD DEVIATION (pci/hr):	1.18E+01	3.30E+01

COMMENTS:

APPENDIX G

QUALITY ASSURANCE PROCEDURES AND RESULTS

QUALITY ASSURANCE PROCEDURES AND RESULTS

The sampling equipment used in this test series has been calibrated in accordance with procedures outlined in the USEPA Reference Methods for stationary source sampling and also in the Quality Assurance Handbook for Air Pollution Measurement Systems. All pertinent calibration data for the equipment used in this test series are included in this appendix. The following calibration procedures are employed.

a. **Probe-tips (Nozzles)**
Probe-tips are inspected before use to detect damage or irregularities. If the nozzle shows signs of damage, it is repaired and measured before use. The nozzle diameter is determined in the field by measuring three diameters with a precision micrometer. The average of the three measurements is the nozzle diameter.

b. **Pitot Tubes**
The S-type pitot tubes are built to the design specifications cited in Reference Method 2 and are calibrated annually in a wind tunnel. Standard pitot tubes are supplied from the manufacturer with a coefficient of 0.99. The pitot tubes, connecting lines, and manometers are leak-checked in the field before and after each test run.

c. **Thermocouples**
Thermocouples are calibrated upon receipt and annually thereafter. The thermocouples are calibrated at 32°F, ambient temperature, 212°F, and approximately 450°F.

d. **Fyrite Analyzers**
The fyrite analyzers are leak-checked on-site and the reagents are replenished as needed.

e. **Method 5 Control Consoles**
The dry gas meter and the orifice in the Method 5 control consoles are calibrated at six (6) points from 0 to 4 inches of mercury. The dry gas meter coefficient (y-factor) and the orifice constant (Delta H) are established from this calibration. The dry gas meter is calibrated after each test series to confirm the y-factors is used in all sample volume calculations. Hayden Environmental participates in the USEPA Method 5 Dry Gas Meter Inter-Laboratory Performance Audit.

f. **Barometers**
The aneroid field barometers are calibrated with a stationary mercury column barometer prior to each use. The reference barometer is permanently mounted in the Hayden Environmental Laboratory.

REFERENCE METER CALIBRATION
ENGLISH REFERENCE METER UNITS

DGM Serial # 1334637
Date 2/8/96

Filename: F:\DATAFILE\CALIBRAT\CAL_MENU.DSK\DGM_REF.
Revised: 06/08/95

Barometric Pressure 29.82
Meter Yw 1.00000
K (deg R/inches Hg) 17.64

Time (min)	Pressure (in. H20)	Dry Gas Meter (DGM) Meter Readings Initial	Final	Volume (cubic feet)	Temperature Initial (deg F)	Final (deg F)	Wet Test Meter (WTM) Meter Readings Initial	Final	Volume (cubic feet)	Temp (deg F)	DGM Coefficient Yds	Coefficient Variation Yds-(Avg.Yds)	Flow Rate (CFM)
5.00	-6.40	441.38	447.50	6.12	73.0	75.0	670.495	676.641	6.146	77.0	1.015	-0.002	1.204
5.00	-6.40	447.50	453.63	6.13	75.0	75.0	676.641	682.803	6.162	77.0	1.017	0.001	1.207
5.50	-6.40	453.63	460.39	6.77	75.0	76.0	682.803	689.599	6.796	77.0	1.017	0.001	1.210
									Max Yds - Min Yds =0.002571603 Must be no greater than 0.030				
									Average Yds =1.016523907 Must be between 0.95 to 1.05				
11.00	-4.30	460.39	470.81	10.41	76.0	78.0	689.599	700.105	10.506	77.0	1.020	-0.001	0.936
6.00	-4.30	470.81	476.47	5.66	78.0	78.0	700.105	705.815	5.710	77.0	1.021	0.001	0.932
6.50	-4.30	476.47	482.59	6.12	78.0	78.0	705.815	711.989	6.174	77.0	1.021	0.000	0.930
									Max Yds - Min Yds =0.001620064 Must be no greater than 0.030				
									Average Yds =1.020657586 Must be between 0.95 to 1.05				
14.50	-3.00	482.59	493.83	11.23	78.0	80.0	711.989	723.300	11.311	77.0	1.018	0.002	0.764
7.00	-3.00	493.83	499.27	5.44	80.0	80.0	723.300	728.761	5.461	77.0	1.016	0.000	0.764
7.50	-3.00	499.27	505.12	5.85	80.0	81.0	728.761	734.610	5.849	77.0	1.014	-0.002	0.764
									Max Yds - Min Yds =0.004034120 Must be no greater than 0.030				
									Average Yds =1.016220858 Must be between 0.95 to 1.05				
10.00	-1.80	505.12	510.63	5.52	81.0	81.0	734.610	740.145	5.535	77.0	1.015	0.002	0.542
10.00	-1.80	510.63	516.17	5.54	81.0	81.0	740.145	745.680	5.535	77.0	1.011	-0.002	0.542
10.00	-1.80	516.17	521.69	5.51	81.0	82.0	745.680	751.190	5.510	77.0	1.012	-0.001	0.540
									Max Yds - Min Yds =0.004214902 Must be no greater than 0.030				
									Average Yds =1.012741931 Must be between 0.95 to 1.05				
13.00	-1.20	521.69	526.81	5.13	82.0	82.0	751.190	756.315	5.125	77.0	1.012	-0.001	0.386
13.00	-1.20	526.81	531.91	5.10	82.0	83.0	756.315	761.415	5.100	77.0	1.014	0.001	0.384
35.50	-1.20	531.91	545.89	13.97	82.0	84.0	761.415	775.369	13.954	77.0	1.013	0.000	0.385
									Max Yds - Min Yds =0.001331366 Must be no greater than 0.030				
									Average Yds = 1.0128647 Must be between 0.95 to 1.05				

Overall Average Yds =1.015801796

I certify that the above Dry Gas Meter was calibrated in accordance with E.P.A. Method 5 , paragraph 7.1 ;CFR 40 Part 60, using the Precision Wet Test Meter # 11AE6, which in turn was calibrated using the American Bell Prover # 3785, certificate # F107, which is traceable to the National Bureau of Standards (N.I.S.T.).

Signature _____ Date 2-8-96

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HAYDEN ENVIRONMENTAL GROUP METER POST TEST CALIBRATION

Barometric: 29.46 Date: 30-Sep-96 Calibration Met 1334637 Reference Y: 1.016

Project # A96043 Approved By BS Meter Box I N-1 Pretest Y: 0.9754

	Orifice Reading (H) in H20	Calibration Meter Gas Volume (Vds) ft3	Meter Box Meter Gas Volume (Vd) ft3	Temperature Calibration Meter Average (tds) F	Temperature Meter Box Meter Average (td) F	Time (O) min	Orfice Pressure Differential (H@)	Meter Box Meter Coefficient (Y)
Stop	1.35	354.978	636.536	70.0	72.5			
Start	1.35	348.902	630.326	70.0	70.0	10	2.042	0.993
Average:	1.35	6.076	6.210	70.0	71.3			
Stop	1.35	361.006	642.705	70.0	74.5			
Start	1.35	354.978	636.536	70.0	72.5	10	2.066	0.996
Average:	1.35	6.028	6.169	70.0	73.5			
Stop	1.35	367.064	648.902	70.0	74.0			
Start	1.35	361.006	642.705	70.0	74.5	10	2.043	0.998
Average:	1.35	6.058	6.197	70.0	74.3			
						Average:	2.050	0.996

The meter coefficient (Y) must be within +/- 5% of the pretest Y. Calibrated By: _____

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8019

DGM/ORIFICE CALIBRATION

DATE 9/22/96

BAROMETRIC PRESSURE 29.1 in. Hg

CALIBRATOR DS

METER BOX NO. N-1

REFERENCE METER NO. 1334637

Reference Meter Gamma 1.016

ORIFICE SETTING in. H_2O	REFERENCE METER		DRY GAS METER			TIME θ min.	VACUUM
	GAS VOLUME V_R ft^3	TEMP. T_R °F	GAS VOLUME V_D ft^3	IN TEMP T_i °F	OUT TEMP T_o °F		
0.5	199.614	72	454.837	75	73	13.0	5
	204.692	73	460.069	75	73		
	5.078	72.5	5.232	75/73/74			
1.0	205.070	73	460.451	75	73	10.0	5
	210.538	73	466.091	78	75		
	5.468	73	5.640	76.5/74/75.25			
1.5	210.722	73	466.277	78	75	12.0	5
	218.530	73	474.331	97	93		
	7.808	73	8.054	87.5/84/85.75			
2.0	218.733	73	474.536	97	93	10.0	5
	226.243	73	482.301	98	95		
	7.510	73	7.765	97.5/94/95.75			
3.0	226.734	73	482.803	98	95	10.0	5
	236.026	73°	492.403	100	96		
	9.292	73	9.600	99/95.5/97.25			
4.0	236.341	73°	492.706	100	96	11.0	5
	248.157	73	504.909	102	97		
	11.816	73	12.203	101/96.5/98.75			

HAYDEN ENVIRONMENTAL GROUP, INC.

PRE-TEST METER BOX CALIBRATIONS

Meter Box #	N-1	N-1	N-1	N-1	N-1	N-1
Date	9/22/96	9/22/96	9/22/96	9/22/96	9/22/96	9/22/96
Reference Meter #	1334637	1334637	1334637	1334637	1334637	1334637
Y Reference Meter	1.016	1.016	1.016	1.016	1.016	1.016
Barometric Pressure ("Hg)	29.10	29.10	29.10	29.10	29.10	29.10
Orrifice Setting Delta H ("H2O)	0.50	1.00	1.50	2.00	3.00	4.00
Total Gas Volume Reference Meter (cubic feet)	5.078	5.468	7.808	7.510	9.292	11.816
Temperature Reference Meter (degrees F)	72.5	73.0	73.0	73.0	73.0	73.0
Total Gas Volume Dry Gas Meter (Cubic Feet)	5.232	5.640	8.054	7.765	9.600	12.203
Inlet Temperature Dry Gas Meter (degrees F)	75.0	76.5	87.5	97.5	99.0	101.0
Outlet Temperature Dry Gas Meter (degrees F)	73.0	74.0	84.0	94.0	95.5	96.5
Average Temperature Dry Gas Meter (Degrees F)	74.0	75.3	85.8	95.8	97.3	98.8
Time (min)	13.0	10.0	12.0	10.0	10.0	11.0
Vacuum (psi)	5.0	5.0	5.0	5.0	5.0	5.0
********** Calculations **********						
Meter Box Y	0.9721	0.9711	0.9889	1.0034	1.0043	1.0049
Meter Box Delta H ("H2O)	1.899	1.938	2.016	1.981	1.936	1.928
Average Meter Box Y	0.9908					
Average Meter Box Delta H ("H2O)	1.950					

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Meter Box Field Check

Meter Box #: N-1 Date: 9/22/96 Barometric: 29.10

Y: 0.9908 Calibrator: DS

delta H: 1.950 Leak Check: ✓

Run No.	Initial Volume	Final Volume	Net Volume	Initial Temp.	Final Temp.	Avg. Temp.	Y_c Comparison
1	507.448	515.115	7.667	96/96	98/96	96.5	1.01872
2	515.115	522.843	7.728	98/96	100/97	97.75	1.01182
3	522.843	530.574	7.731	100/97	101/98	99.0	1.01256

$$y_c = \frac{10}{Vm} \times \sqrt{\frac{(0.0319) \times (Tm)}{(Pb)}}$$

Compare with Y_c

$0.97 * Y < Y_c < 1.03 * Y$

$0.97 * Y =$ 0.96108

$1.03 * Y =$ 1.02052

THERMOCOUPLE CALIBRATION

THERMOCOUPLE I.D.: 4-C LENGTH: 4 Ft DATE: 7/16/96

CALIBRATED BY: Dutch Schulz

REFERENCE THERMOMETER: 402947452 Omega

Source	Reference Thermometer Temperature °F	Test Thermocouple Temperature °F	Temperature Difference °F	Thermocouple Simulator Display	Thermocouple Simulator Setting
Ambient Air	74.8	74.8	0	95.9	100
Boiling Water	209.4	204.0	-5.4	203.0	200
Boiling Oil	305.2	300.6	-4.6	302.0	300
Ice Bath	34	35	+1°	96.0	100

F030164.94

THERMOCOUPLE CALIBRATION

THERMOCOUPLE I.D.: ~~[illegible]~~ OV-3 LENGTH: 6" DATE: 7/16/96

CALIBRATED BY: [illegible]

REFERENCE THERMOMETER: 402947452

Source	Reference Thermometer Temperature °F	Test Thermocouple Temperature °F	Temperature Difference °F	Thermocouple Simulator *Display*	Thermocouple Simulator *Setting*
Ambient Air	75.0	75.2	+0.2	95.9	100
Boiling H_2O	206.6	208.0	+1.4	205.4	200

F030164.94

THERMOCOUPLE CALIBRATION

THERMOCOUPLE I.D.: I-3 LENGTH: 6" DATE: 7/16/96

CALIBRATED BY: Dutch Schoenberger

REFERENCE THERMOMETER: 4029474 52

Source	Reference Thermometer Temperature °F	Test Thermocouple Temperature °F	Temperature Difference °F	Thermocouple Simulator Display	Thermocouple Simulator Setting
Air	75.2	75.0	-0.2	95.9	100
Ice Bath	33.9	34.2	+0.3	95.9	100

8019

DATA CHEM
LABORATORIES, INC.
A SORENSON COMPANY

November 19, 1996

Mr. Bruce Sarven
Hayden Environmental
561 Congress Park Drive
Dayton, OH 45459

Phone: (513) 438-3010
FAX: (513) 438-3020

Re.: Isotopic Uranium Analysis

Dear Mr. Sarven:

As per your conversation with Mr. Keith Nicholson in this office on Tuesday, November 19, 1996 the following addresses your issue. As I understand it you would like to have a written response concerning your request for Uranium 235 and the DCL report which has Uranium 235/236 as a result.

As I mentioned when we spoke about this work in July, Table 2 in the bidding information requested U-234, U-235, Th-236, U-238 and this was incorrect. Table 2 should have read U-234, U-235/236, U-238. Uranium-235/236 cannot be separated by existing analytical methods. Uranium-235/236 use the same spectral region of interest by alpha spectrometry and since chemical separation cannot separate these two radionuclides it is impossible to give individual measurements. It is standard to report isotopic uranium as U-234, U-235/236, and U-238 by alpha spectrometry.

If you have any further questions please contact me directly at 1-801-266-7700 x331.

Sincerely,

Robert P. Di rienzo
Project Manager

000060

CINCINNATI LABORATORY
4388 Glendale-Milford Road
Cincinnati, Ohio 45242-3706
513-733-5336, FAX 513-733-5347

NOVATO OFFICE
11 Santa Yorma Court
Novato, California 94945
415 897-9471, FAX 415-893 9469

CORPORATE OFFICE
SALT LAKE CITY LABORATORY
960 West LeVoy Drive
Salt Lake City, Utah 84123-2547
801-266-7700, FAX 801-268-9592

BALTIMORE OFFICE
10 Juliet Lane #203
Baltimore, Maryland 21236-1220
410-529-5675, FAX 410-529-5975

RICHLAND OFFICE
313 Wellsian Way
Richland, Washington 99352-4116
509-943-5858, FAX 509-943-5654

DATA CHEM LABORATORIES
A Sorenson Company

ANALYTICAL REPORT

Form ARF-AL 8019
Page 1 of 1
Part 1 of 1
10039611311638

Date 10/3/96
Laboratory Group Name 96E-0640-01
Account No. 03025

Hayden Environmental
Attention: Bruce Sarven
561 Congress Park Drive
Dayton, OH 45459

FAX (513) 548-3020
Telephone (513) 438-3010

Sampling Collection and Shipment

Sampling Site HAYDEN ENVIRONMENTAL Date of Collection September 19, 1996

Date Samples Received at Laboratory September 25, 1996

Analysis

Method of Analysis Method 5 / PARTICULATE WEIGHT

Date(s) of Analysis 10/2/96

Analytical Results

Field Sample Number	Laboratory Number	Sample Type	Particulate mg/Rinsate	Particulate mg/Filter	Particulate mg/Impinger	Particulate Total mg				
9131,39,40	96E04514	AIR	2.3	-2.3	0.0	0.0				
9135,41,42	96E04515	AIR	2.8	-19.8	0.0	-17.0				
9136,43,44	96E04516	AIR	2.0	-0.7	0.0	1.3				
9137,45,46	96E04517	AIR	3.5	-3.7	0.0	-0.2				
Limit of Detection										
Limit of Quantitation			0.1	0.1	0.1	0.1				

† See comment on last page.
ND Parameter not detected above LOD.
NR Parameter not requested.
** See comment on last page.
( ) Parameter between LOD and LOQ.

Analyst: Jennifer L. Clary

Reviewer:

Laboratory Supervisor:

000051

960 West LeVoy Drive / Salt Lake City, Utah 84123-2547 / (801) 266-7700
FAX (801) 268-9992

DATACHEM LABORATORIES Filter Weight Book No. FWT 06 Page No. 019

Filter Lot #: 7 Temp.: 74 R.H.: 55%

Pure Testing has supplied filters Gemidia GFF GF96-20 to 28 Tared on a Sartorius Research (Radcum) DCL #102683 on 9/16/96 PG

Filter: GF 96-20 (740)
Tare Analyst PG Date 9/16/96
Total Weight ____ mg
Total Weight ____ mg
Avg. Total Weight ____ mg
Tare Weight ~~453.2~~ 447.6 mg
Tare Weight ~~453.2~~ 447.6 mg
Avg. Tare Weight ~~453.2~~ 447.6 mg
SAMPLE No. ____ SAMPLE WT. ____ mg
Total Wt. Anal. ____ Date ____
Check Analyst ____ Date ____

Filter: GF 96-21 (756)
Tare Analyst PG Date ____
Total Weight ____ mg
Total Weight ____ mg
Avg. Total Weight ____ mg
Tare Weight 453.2 mg
Tare Weight 453.2 mg
Avg. Tare Weight 453.2 mg
SAMPLE No. ____ SAMPLE WT. ____ mg
Total Wt. Anal. ____ Date ____
Check Analyst ____ Date ____

Filter: GF 96-22 (752)
Tare Analyst PG Date ____
Total Weight 448.1 mg
Total Weight 448.2 mg
Avg. Total Weight 448.2 mg
Tare Weight 448.9 mg
Tare Weight 448.8 mg
Avg. Tare Weight 448.9 mg
SAMPLE No. 96E04511c SAMPLE WT. -0.7 mg
Total Wt. Anal. [illegible] Date 9/30/96
Check Analyst PG Date 9/30/96

Filter: GF 96-23 (753)?
Tare Analyst PG Date ____
Total Weight 443.8 mg
Total Weight 443.8 mg
Avg. Total Weight 443.8 mg
Tare Weight 446.2 mg
Tare Weight 446.0 mg
Avg. Tare Weight 446.1 mg
SAMPLE No. 96E04514 SAMPLE WT. -2.3 mg
Total Wt. Anal. [illegible] Date 9/30/96
Check Analyst PG Date 9/30/96

Filter: GF 96-24 (753)?
Tare Analyst PG Date ____
Total Weight 452.7 mg
Total Weight 452.8 mg
Avg. Total Weight 452.8 mg
Tare Weight 456.6 mg
Tare Weight 456.3 mg
Avg. Tare Weight 456.5 mg
SAMPLE No. 96E04517 SAMPLE WT. -3.7 mg
Total Wt. Anal. [illegible] Date 9/30/96
Check Analyst PG Date 9/30/96

Filter: GF 96 25 (754)
Tare Analyst PG Date ____
Total Weight ____ mg
Total Weight ____ mg
Avg. Total Weight ____ mg
Tare Weight 447.5 mg
Tare Weight 447.4 mg
Avg. Tare Weight 447.5 mg
SAMPLE No. ____ SAMPLE WT. ____ mg
Total Wt. Anal. ____ Date ____
Check Analyst ____ Date ____

Filter: GF 96-26 (760?)
Tare Analyst PG Date ____
Total Weight ____ mg
Total Weight ____ mg
Avg. Total Weight ____ mg
Tare Weight 451.2 mg
Tare Weight 450.9 mg
Avg. Tare Weight 451.1 mg
SAMPLE No. ____ SAMPLE WT. ____ mg
Total Wt. Anal. ____ Date ____
Check Analyst ____ Date ____

Filter: GF 96-27 (761)
Tare Analyst PG Date ____
Total Weight 429.5 mg
Total Weight 429.5 mg
Avg. Total Weight 429.5 mg
Tare Weight 449.3 mg
Tare Weight 449.2 mg
Avg. Tare Weight 449.3 mg
SAMPLE No. 96E04515 SAMPLE WT. -19.8 mg
Total Wt. Anal. [illegible] Date 9/30/96
Check Analyst PG Date 9/30/96

Filter: GF 96-28 (763)
Tare Analyst PG Date 9/16/96
Total Weight ____ mg
Total Weight ____ mg
Avg. Total Weight ____ mg
Tare Weight 450.9 mg
Tare Weight 450.7 mg
Avg. Tare Weight 450.8 mg
SAMPLE No. ____ SAMPLE WT. ____ mg
Total Wt. Anal. ____ Date ____
Check Analyst ____ Date ____

Filter: ____
Tare Analyst ____ Date ____
Total Weight ____ mg
Total Weight ____ mg
Avg. Total Weight ____ mg
Tare Weight ____ mg
Tare Weight ____ mg
Avg. Tare Weight ____ mg
SAMPLE No. ____ SAMPLE WT. ____ mg
Total Wt. Anal. ____ Date ____
Check Analyst ____ Date ____

TITLE METHOD 5

Project No.
Book No. 3143

DATA CHEM

From Page No.

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ACETONE RINSE / IMPINGER

SAMPLE	BEAKER WT.(g)	BEAKER + RESIDUE(g)		BEAKER WT.(g)	BEAKER + RESIDUE WT.(g)
96E04514	106.7277	106.7300		236.300	236.300
96E04515	106.4482	106.4510		177.985	177.986
96E04516	108.6621	108.6641		239.510	239.510
96E04517	106.2247	106.2282		237.355	237.355

SAMPLE	ACETONE RINSE WT. (mg)	IMPINGER WT. (mg)
96E04514	2.3	0.0
96E04515	2.8	0.0
96E04516	2.0	0.0
96E04517	3.5	0.0

To Page No.

Witnessed & Understood by me	Date	Invented by NOT APPLICABLE	Date
[signature]	10-3-96	Recorded by [signature]	10/3/96

Sample Work Order

8019

QC Clearance: _____

Project Manager: Robert P. Di Rienzo

Client: Hayden Environmental

Account: 03025

Project/Task: COMM-ENV

Date Received: 25-Sep-1996

Date for Mailing Report: 25-Oct-1996

DCL Root Set ID: 96E-0640 *

DCL Lab. Name: 96E04514–96E04517

Total # Samples: 4

Sample Entry: Karyn L. Boyack

Section: WA

Earliest Sampling Date: 19-Sep-1996

Preparation Type:

Rep. Group	Radiochemistry Analytes Requested	Latest Prep. Date	Latest Anal. Date	No. of Samp.	Storage Location	Analysis/Prep. Method	Inst.	Matrix
01	Method 5 Particulate		18-Mar-1997[c]	4		Method 5	GRAV	AIR
02	Isotopic Uranium	1-Oct-1996[c]	18-Mar-1997[c]	4		WR-DC-341 WR-DC-200	AS	AIR
03	ISOTOPIC THORIUM	1-Oct-1996[c]	18-Mar-1997[c]	4		WR-DC-341	AS	AIR
04	Radium 226/228 by gamma spec		18-Mar-1997[c]	4		WR-EP-325 WR-DC-200	GS	AIR
05	Total Uranium by kPA		18-Mar-1997[c]	4		WR-DC-342	kPA	AIR

[c]Based on date of collection

Special Instructions: _____

Section Manager: Charlie C. Walker

Other Sections Receiving Sample Portions: None

SAMPLE LOG-IN SHEET

8019

Group Name: 96E-0648

Lab Name: DataChem Laboratories	Page 1 of 1
Received By (Print Name): Sample Rec. Group	Log-In Date: 9-25-96
Received By (Signature): Zenaida Virgil	
Case Number: —	Sample Delivery Group No.: —
	SAS Number: NA

Remarks:

		Client ID #1 EPA Sample #	Corresponding: Client ID #2 Sample Tag #	Corresponding: Assigned Lab #	Matrix	Fraction	Remarks: Condition of Sample Shipment, etc.
1. Custody Seal(s)	Present/Absent*	200259131	North	96E04514	Filter	R/A	each client
	Intact/Broken*	39			acetone		ID 1 bottle
2. Custody Seal Nos.	N/A	40			water		needs to be
		200259135	South	96E04515	filter		combined
3. Chain-of-Custody Records	Present/Absent*	41			acetone		to create
4. Traffic Reports or Packing Lists	Present/Absent*	42			water		a single
5. Airbill	Airbill/Sticker Present/Absent*	200259136	Blank	96E04516	filter		client ID
		43			acetone		2 (see PPO)
6. Airbill No.	9690684221	44			water		
		200259137	Resp	96E04517	filter		
7. Sample Tags	Present/Absent*	45			acetone		
Sample Tag Numbers	Listed/Not Listed on Chain-of-Custody	46			water		
8. Sample Condition	Intact/Broken*/Leaking						
9. Does information on custody records, traffic reports, and sample tags agree?	Yes/No*						
10. Date Received at Lab	9/25/96						
11. Time Received	1000						

Zenaida Virgil 9/25/96

Sample Transfer	
Fraction: F11	Fraction:
Area #: R-23-1	Area #:
By: ZV	By:
On: 9/25/96	On:

* Contact SMO and attach record of resolution.

Reviewed By:	Logbook No.:
Date:	Logbook Page No.: 000065

FRACTIONS:
C - Cyanide
D - Dissolved Metals
T - Total Metals
F - Full TCL Organics
P - Pesticides
S - Semivolatiles
V - Volatiles

FORM DC-1

R - Rad Chem
A - Particulates

Note: only highlighted portion of client ID #1s entered into DCL computer system ZV 9/25

8019

FERMCO
Remediation Management Corporation

P.O. BOX 538704
CINCINNATI, OH 45253-8704

CHAIN OF CUSTODY / REQUEST FOR ANALYSIS RECORD

REFERENCE DOCUMENT NO.: SPL-96-2875

ORIGINAL MEF NO.: _____ CORRESPONDING REFERENCE DOCUMENT NO.: _____

PAGE 1 OF 2

RELEASE NO.: 1000012382	PROJECT NO.: N/A	FOR SAMPLE RELATED PROBLEMS, ACS CONTACT / PHONE: Tim Miller X4198	CONTRACT PURCHASE ORDER / TASK ORDER NO.: N/A
PROJECT NAME: NESHAP STACK SAMPLING		REQUIRED REPORT DATE / LAB TAT: PARTICULATE (10 DAY) RAD (30 DAY)	SAMPLE SHIPMENT DATE: 9-24-96
PROJECT CONTACT / PHONE: Tim Miller / 4198		RECEIVING LAB NAME: DATACHEM	SAMPLE SHIPPER (Print): G Bell
CHARGE NO.: 7ECG2	LOT MARKING NO.: N/A	RECEIVING LAB ADDRESS: SALT LAKE CITY	OFF-SITE LAB CONTACT: Robert DiRenzo

SAMPLING TEAM (Print) & GROUP NAME / PHONE: Bruce Sawyer HAYDEN ENVIRONMENTAL 513-433-3010 Geoff Schoenberger 9-20-96 HAYDEN

SAMPLING TEAM (Signature & Badge No.): Bruce Sawyer 282-74-1662 G/G D. Schoenberger 267-82-4154

ITEM NO.	SAMPLE NUMBER FACTS ID	CUSTOMER ID / SAMPLE POINT	SAMPLE MATRIX		COMP	GRAB	FILTERED	COLLECTION DATE	COLLECTION TIME	CONTAINER TYPE	CONTAINER VOL.	NO. CONTRS	PRESERVATION	ASL	ANALYSES REQUESTED (If more space is required, use the SPECIAL INSTRUCTIONS block.)	SAMPLE OKAY? (Y/N)* FERMCO	SAMPLE OKAY? (Y/N)* OFF-SITE
1	200259131	NORTH FILTER	AF	AIR FILTER	✓		N/A	9-19-96	0830	F	1460 cfm	1	NONE	B	Particulate & Rad *	Y	
2	200259139	NORTH FRONT 1/2	L1	ACETONE	✓		N/A	9-19-96	0830	P	1 L	1	NONE	B	Particulate & Rad *	Y	
3	200259140	NORTH BACK 1/2	L2	WATER ~~ACETONE~~	✓		N/A	9-19-96	0830	P	1 L	1	NONE	B	Particulate & Rad *	Y	
4	200259135	South Filter	AF	AIR FILTER	✓		N/A	9-19-96	0830	F	1360 cfm	1	NONE	B	Particulate & Rad *	Y	
5	200259141	South Front 1/2	L1 ~~L2~~	ACETONE	✓		N/A	9-19-96	0830	P	1 L	1	NONE	B	Particulate & Rad *	Y	
6	200259142	South Back 1/2	L2	~~ACETONE~~ WATER	✓		N/A	9-19-96	0830	P	1 L	1	NONE	B	Particulate & Rad *	Y	
7	200259136	Filter Blank	AF	AIR FILTER	✓		N/A	9-19-96	0830	F	N/A	1	NONE	B	Particulate & Rad *	Y	
8	200259143	D.I. Blank	L2	WATER	✓		N/A	9-19-96	0830	P	1 L	1	NONE	B	Particulate & Rad *	Y	
9	200259144	ACETONE BLANK	L1	ACETONE	✓		N/A	9-19-96	0830	P	1 L	1	NONE	B	Particulate & Rad *	Y	
10	200259137	Resp. filter	AF	AIR FILTER	✓		N/A	9-19-96	0830	F	2730 cfm	1	NONE	B	Particulate & Rad *	Y	

SPECIAL INSTRUCTIONS: * Samples to be shipped off-site to DATA-CHEM / UTAH, contact Robert DiRenzo
Analysis to be performed are particulate, U-238, U-234, U-235, U-236, Th-228, Th-230, Th-232
Ra-226, Ra-228 and Total Uranium by Laze Phosphorometry

RELINQUISHED ITEM / REASON	RELINQUISHED BY (Signature) / AFFILIATION	BADGE NO.	DATE	TIME	RECEIVED BY (Signature) / AFFILIATION	BADGE NO.	DATE	TIME
1-12 Rad Analysis	Bruce Sawyer / HAYDEN ENV.	1 282-74-1662	9/20/96	1630	Neal Vaughn / SPL	1 75148	9/20/96	1630
1-12 Ship	Neal Vaughn / SPL	2 75148	9-23-96	0800	G Bell SPL	2 630	9-23-96	0800
1-12 Ship	G Bell SPL	3 630	9-24-96	1300	Samples rec. group 12-23-1 [illegible] / DCL	3 5852	9-25-96	1002
		4				4		
		5				5		

DISTRIBUTION OF C[illegible] WHITE ON-SITE - RELEASE FILE / OFF-SITE ANALYTICAL LAB - RETURN TO FEMP YELLOW [illegible]SITE - DISTRIBUTE AS NEEDED / OFF-SITE ANALYTICAL LAB - RETURN TO FEMP BLUE SAMPLI[illegible]H / PROJECT FILE

FG-F-3361 (09-21-[illegible]

SHADED AREAS ARE TO BE COMPLETED BY [illegible]AMPLE RECEIVING GROUP.

* IF "N", THEN COMPLETE APPLICABLE NON-CONFORMANCE PROCEDURE.

1-43013 01-43016

000066

FERMCO

CHAIN OF CUSTODY / REQUEST FOR ANALYSIS RECORD (CONTINUED)

PROJECT NO.: N/A

PROJECT NAME: NESHAP STACK SAMPLING

REFERENCE DOCUMENT NO.: SPL-96-2875 1000012382

CORRESPONDING REFERENCE DOCUMENT NO.:

PAGE 2 OF 2

ITEM NO.	SAMPLE NUMBER: FACTS ID	SAMPLE NUMBER: CUSTOMER ID / SAMPLE POINT	SAMPLE MATRIX		COMP	GRAB	FILTERED	COLLECTION: DATE	COLLECTION: TIME	CONTAINER: TYPE	CONTAINER: VOL.	NO. CONTRS	PRESERVATION	ASL	ANALYSES REQUESTED (If more space is required, use the SPECIAL INSTRUCTIONS block.)	SAMPLE OKAY? (Y/N)* FERMCO	SAMPLE OKAY? (Y/N)* OFF-SITE
11	2000259145	Resp. Front 1/2	L1	ACETONE	✓		N/A	9-20-96	0845	P	1L	1	NONE	B	Particulate & Rad	Y	
12	2000259146	Resp. Back 1/2	L2	~~ACETONE~~ D.I. WATER	✓		N/A	9-20-96	0845	P	1L	1	NONE	B	Particulate & Rad	Y	
		NOTHING FOLLOWS															

SPECIAL INSTRUCTIONS: AF - Air Filter
L1 - Acetone
L2 - D.I. WATER

DISTRIBUTION OF C[illegible] | WHITE ON-SITE - RELEASE FILE / OFF-SITE ANALYTICAL LAB - RETURN TO FEMP | YELLOW [illegible]N-SITE - DISTRIBUTE AS NEEDED / OFF-SITE ANALYTICAL LAB - RETURN TO FEMP | BLUE SAMPLIN[illegible]ECH / PROJECT FILE

FB-F-3361-1 (09-2[illegible])

SHADED AREAS ARE TO BE COMPL[illegible] THE SAMPLE RECEIVING GROUP.

* IF "N", THEN COMPLETE APPLICABLE NON-CON[illegible]CE PROCEDURE.

8019

0000067

TALLY SHEET

8019

RELEASE #: 1000012382 (CAN 1 OF 1)
PO #: NA
DATE SHIPPED: 23-SEP-96
MATERIAL: NESHAP STACK SAMPLING - AIR FILTERS, ACETONE , AND WATER

ANALYSIS: PARTICULATE AND RAD

Composite Sample Number	Lot Number	Sample Container Size	AnaLis/ FACTS Number	Gross Weight lbs.	Tare Weight lbs.	Net Weight lbs.
NORTH FILTER	W050-730-P047-0417	AIR FILTER	200259131	0.101	0.097	0.004
NORTH FRONT 1/2	W050-730-P047-0417	1 L PLS	200259139	0.300	0.220	0.080
NORTH BACK 1/2	W050-730-P047-0417	1 L PLS	200259140	0.300	0.220	0.080
SOUTH FILTER	W050-730-P047-0417	AIR FILTER	200259135	0.101	0.097	0.004
SOUTH FRONT 1/2	W050-730-P047-0417	1 L PLS	200259141	0.300	0.220	0.080
SOUTH BACK 1/2	W050-730-P047-0417	1 L PLS	200259142	0.300	0.220	0.080
FILTER BLANK	W050-730-P047-0417	AIR FILTER	200259136	0.101	0.097	0.004
DI BLANK	W050-730-P047-0417	1 L PLS	200259143	1.251	0.220	1.031
ACETONE BLANK	W050-730-P047-0417	1 L PLS	200259144	0.300	0.220	0.080
RESP. FILTER	W050-730-P047-0417	AIR FILTER	200259137	0.101	0.097	0.004
RESP. FRONT 1/2	W050-730-P047-0417	1 L PLS	200259145	0.300	0.220	0.080
RESP. BACK 1/2	W050-730-P047-0417	1 L PLS	200259146	0.300	0.220	0.080
				3.755	2.148	1.607

32350

8019

FEMP

COVER SHEET

DOCUMENT TYPE ● RSR ○ RWP

SURVEY FOR RWP? ○ YES ● NO

NAME [redacted]

PAGE 1 OF 4

SIGNED [redacted]

LOCATION Lab w2 6

LOCATION CODE

BADGE #	DATE	TIME	BLDG/GRID#	FLR
7323	09/24/96	09:26	15A	1

SURVEY NUMBER 96-09-11-0165

RWP NUMBER -

COMMENTS Sampleshipment Res. Filters + Acetone Rel# 12352

NA

REVIEWER [redacted]

BADGE 7395

SIGNATURE [redacted]

FS-F-4617 (4/22/96)

000069

FEMP
RADIOLOGICAL SURVEY REPORT

SURVEY NUMBER: 96- 9 -11- 165

DATE: 9-24-96	RCT NAME: WILLIAM CHASTEEN	RCT BADGE #: 74323	PAGE:
REVIEWED BY:		REVIEWER BADGE NO: 7395	2 OF 4

MODEL	SERIAL NUMBER	TYPE (α, β, γ)	CALIBRATION-DUE DATE	BKGD. (cpm)	EFF./CF	COUNT TIME (min)	MDA (dpm)	INSP./PERFORMANCE TEST DATE YES	NO
LB5100		αβγ	10-96	.26/1.42	.212/.431	2.0	2/3	✓	
M3		βγ	2-97	60	30	NA	3000	✓	
2221	75447	α	9-96	1.2	.16	1	16.2	✓	

ITEM NUMBER	LOCATION AND/OR DESCRIPTION	HEIGHT (FT.)	DPM/100cm² ALPHA REMOVABLE (1)	DPM/100cm² ALPHA FIXED PLUS REMOVABLE	DPM/100cm² BETA-GAMMA REMOVABLE (1)	DPM/100cm² BETA-GAMMA FIXED PLUS REMOVABLE	CORRECTED DOSE RATE (MREM/HR) γ CONTACT	β CONTACT	γ AT FT.	β AT FT.
1	200259131	NA	-0 *	-7 *	3	<MDCR				
2	200259136		2	-7.5 *	-2 *					
3	200259135		0 *	-7 *	2 *					
4	200259137		-0 *	5 *	5					
5	200259139		5	NA	4					
6	200259141		2		10					
7	200259145		0 *		5			NA		
8	200259140		0 *		0 *					
9	200259144		-0 *		0 *					
10	200259143		-0 *		0 *					
11	200259142		0 *		1 *					
12	200259146		2		5					
13	I/S can	↓	-0 *	↓	0 *	↓				
14	O/S can	NA	0 *	NA	3	<MDCR				
				NA						

Note (1): Values identified by an asterisk (*) indicate results are less than the calculated MDA (RC-RDA-010).

FS-F-1993-1 (REV. 04/18/95)

TUE SEP 24, 1996
GROUP A SMEARS FOR FREE RELEASE (2 MIN)

SAMPLE NUMBER	GROSS ALPHA	GROSS BETA	DPM ALPHA	DPM BETA	TIME OF COUNT
51	0	6	-0	5	08:03:16
52	2	[illegible]	2	-2	08:05:01
53	1	5	0	2	08:07:46
54	0	8	-0	5	08:10:01
55	4	7	5	4	08:12:16
56	2	12	1	10	08:14:01
57	1	8	0	5	08:16:46
58	1	[illegible]	0	0	08:19:01
59	0	[illegible]	-0	0	08:21:16
60	0		-0	0	08:23:01
61	1	4	0	1	08:25:16
62	2	8	2	5	08:28:01
63	0	3	-0	0	08:30:16
64	1	[illegible]	0	3	08:32:00

OPERATION COMPLETE

OPERATION COMPLETE

FEMP RADIOLOGICAL SURVEY REPORT pg 3 of 4
SURVEY # 96-4-11-168 DATED 9/24/96

	(name)	(signature)
RCT:	William Chusterna	[signature]
REVIEWER:	[signature]	[signature]

MATERIAL RESTRICTED RELEASE FORM

ITEM NUMBER	ITEM DESCRIPTION	RCT	MATERIAL RELEASE EVALUATOR PRINT/SIGNATURE [1&3]	MATERIAL OWNER/SURVEY REQUESTOR PRINT/SIGNATURE [2&3]
1-4	Filters	N/A	R Peterson	GORDON BELL
5-12	Acetone	N/A	R Peterson	GORDON BELL
			NA	

Additional Comments: Supplies to DCL-SLC Lic # UT 1800237 EXP 11-31-97

[1] Signature by Material Release Evaluator indicates the material may be released for restricted use in the uncontrolled area of the FEMP site only. This material is not being released for unrestricted use.

[2] Signature by the Material Owner/Survey Requestor indicates acceptance of responsibility for the material while in the uncontrolled area and the material will be returned to the controlled area following use.

[3] Additional approval by the Manager of Radiological Compliance is required prior to allowing the material to exit beyond the FEMP property boundary. This allowance may be annotated in the additional comments section of the form.

FS-F-3916 (06/24/94)

FEMP RADIOLOGICAL SURVEY REPORT pg 1 of 1
SURVEY # 96-9-11-164 DATED 9-29-96
(name) (signature)
RCT: William Chasteen
SUPERVISOR

PROJECT PROTOCOL WORKSHEET

8019

Project:	Fernald Emission Testing	Date: 09/20/96
Client:	Hayden Environmental	Revision: 1.0
Account:	3025	
Proj. Mngr:	Bob Di Rienzo	

Client Contacts:

Reports:

Bruce Sarven
Hayden Environmental
561 Congress Park Drive
Dayton, OH 45459

Phone: (513) 438-3010
FAX: (513) 438-3020

Invoices:

Same with COC

Schedule: Starts 09/20/96

TAT: 30 Calendar Days

Sample Receipt: Use the 96E sample stream. *Notify Project Manager when samples are received.*

Analyses: **Particulates and Radiochemistry**

QA/QC: Overall QA/QC requirements will be based on the DCL Procedures.

EDL: None.

MS/MSD or MD: As per method

Deliverables: RLIMS63 Report, Raw Data, and COC
Paginate entire package

Penalties: None

Questions: If you have any questions, please contact the project manager either directly or by voice-mail at extension 331, or via e-mail on node tigger.

Special Instructions: **See attached Flow Chart and Instructions**
Particulate mesurement is completed first.
Rinsate and Filter Particulate are used for radiochemistry procedures.

PRICE CODES AND ANALYTE GROUPS:

ANALYTE	MATRIX	EST SAMPLE	METHOD	SECT	HOLD CODE	PRICE CODE	ANALYTE GROUP
Particulate	Air	4	Method 5	WA	NA	3025A01NMET5	3025A1MET5
Iso U	Air	4	AS	WA	NA	3025A01NUISO	3025A1UISO
Iso Th	Air	4	AS	WA	NA	3025A01NTISO	3025A1TISO
Radium 226/228	Air	4	GS	WA	NA	3025A01NGS	3025A1GS
Total Uranium	Air	4	kPA	WA	NA	3025A01NTOTU	3025A1TOTU

DATACHEM LABORATORIES CLIENT-RELATED INFORMATION REPORT (CRIR)

CRIR NO. _____

COOLER INFORMATION CHECKLIST
(Fill In or Circle)

Client Name: FernCO

Project/Task/Site:

Date/Time of Receipt: 9/25/96 1000

Number of Coolers Received: 1

Condition of Coolers: Acceptable/Unacceptable

Temperature Control: Present/Not Included

Custody Seals: Present/Absent

Intact/Broken

Location Temperature Taken: Control/Between Samples

Tamper Evident: Yes/No

Are all temperatures within project specific guidelines? Yes/No

Ice Present: Yes/No

Frozen/Melted N/A

Are all applicable pHs within specific guidelines? Yes/No N/A

Cooler Received	DCL Cooler No.	Temp.	Cooler Received	DCL Cooler No.	Temp.	Cooler Received	DCL Cooler No.	Temp.
* 1	MC96 0437	19 °C	4	MC96	°C	7	MC96	°C
2	MC96	°C	5	MC96	°C	8	MC96	°C
3	MC96	°C	6	MC96	°C	9	MC96	°C

Taken By: Karyn Vigil (Signature) Karyn Vigil (Printed Name) 9/25/96 (Date)

* Rad Chem. Analyses: no temp preservation required

CLIENT-RELATED INFORMATION

- ☐ Missing Cooler
- ☐ Cooler Conditions
- ☐ Missing Paperwork
- ☐ Missing/Incorrect Bottle Labels
- ☐ Missing Samples/Bottles
- ☐ Broken/Leaking Samples
- ☐ Incorrect Bottle Type
- ☐ Cooler Temperatures Out Of Range
- ☐ Incorrect Preservation
- ☐ pH Criteria Not Met
- ☐ Head Space in Bottles
- ☐ Insufficient Sample Volume
- ☐ Chain Of Custody Problems
- ☐ Other:

BRIEFLY DESCRIBE THE PROBLEM AND THE ACTION TAKEN:

Faxed to Client? Yes ☐ No ☐ (If yes, attach Fax Cover Sheet)

❖ Response Required Within 24 Hours ❖

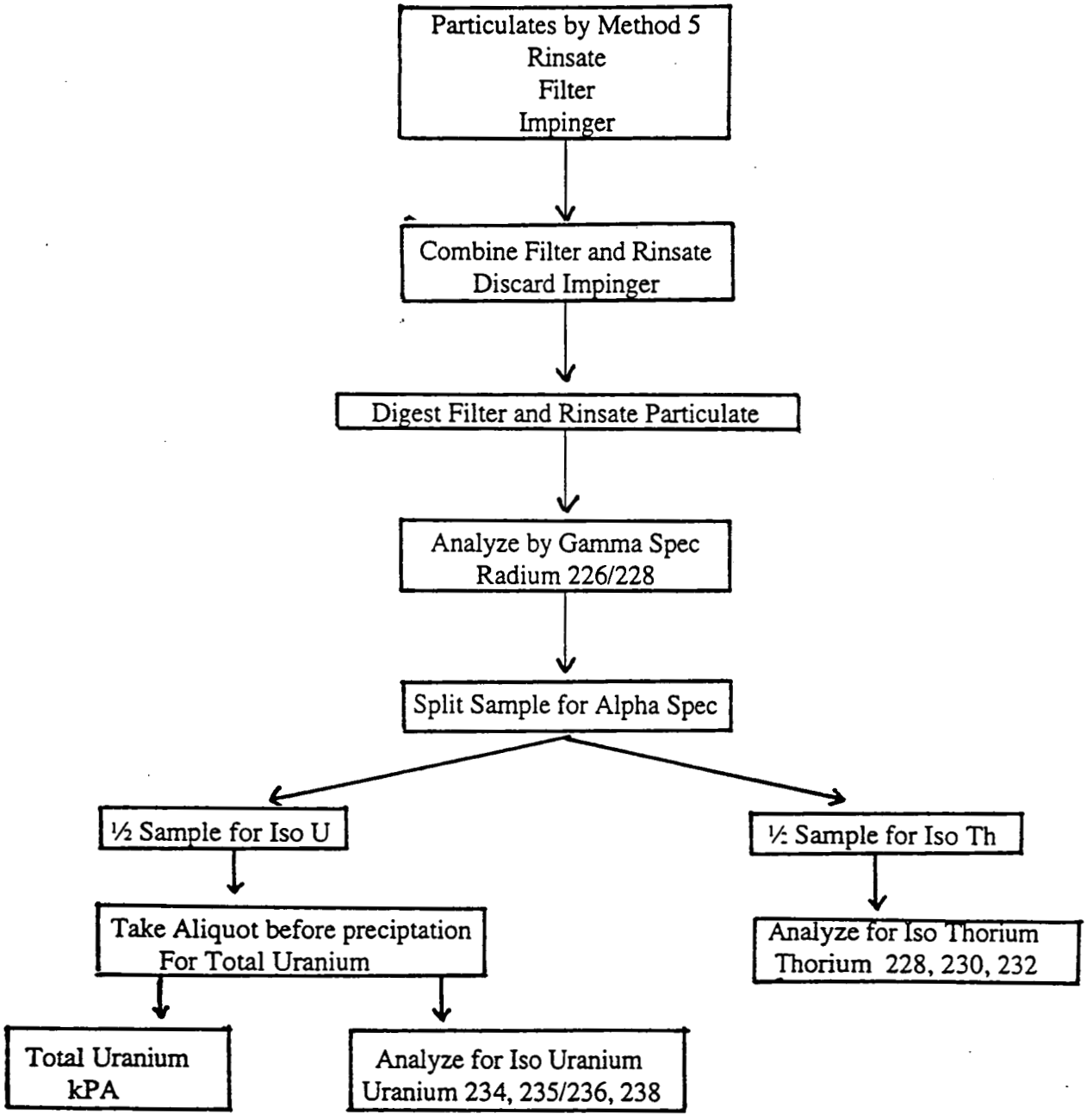
PROJECT MANAGEMENT

PROJECT MANAGER COMMENTS:

Project Manager: _____ (Printed Name) Returned to Sample Receipt by: _____ (Signature) Date: _____

Analytical Scheme
Hayden Environmental - Fernault Emission Testing

3 Samples and Field Blank



DATACHEM LABORATORIES Filter Weight Book No. FWT 06 Page No. 019

Filter Lot #: 7 Temp.: 74 R.H.: 55% 8019

Filter: GF 96-20 (740)
Tare Analyst JK Date 9/16/96
Total Weight ____ mg
Total Weight ____ mg
Avg. Total Weight ____ mg
Tare Weight ~~453.2~~ 447.6 mg
Tare Weight ~~453.2~~ 447.6 mg
Avg. Tare Weight ~~453.2~~ 447.6 mg
SAMPLE No. ____ SAMPLE WT. ____ mg
Total Wt. Anal. ____ Date ____
Check Analyst ____ Date ____

Filter: GF 96-21 (756)
Tare Analyst JK Date ____
Total Weight ____ mg
Total Weight ____ mg
Avg. Total Weight ____ mg
Tare Weight 453.2 mg
Tare Weight 453.2 mg
Avg. Tare Weight 453.2 mg
SAMPLE No. ____ SAMPLE WT. ____ mg
Total Wt. Anal. ____ Date ____
Check Analyst ____ Date ____

Filter: GF 96-22 (752)
Tare Analyst JK Date ____
Total Weight ____ mg
Total Weight ____ mg
Avg. Total Weight ____ mg
Tare Weight 448.9 mg
Tare Weight 448.8 mg
Avg. Tare Weight 448.9 mg
SAMPLE No. ____ SAMPLE WT. ____ mg
Total Wt. Anal. ____ Date ____
Check Analyst ____ Date ____

Filter: GF 96-23 (753)?
Tare Analyst JK Date ____
Total Weight ____ mg
Total Weight ____ mg
Avg. Total Weight ____ mg
Tare Weight 446.2 mg
Tare Weight 446.0 mg
Avg. Tare Weight 446.1 mg
SAMPLE No. ____ SAMPLE WT. ____ mg
Total Wt. Anal. ____ Date ____
Check Analyst ____ Date ____

Filter: GF 96-24 (753)?
Tare Analyst JK Date ____
Total Weight ____ mg
Total Weight ____ mg
Avg. Total Weight ____ mg
Tare Weight 456.6 mg
Tare Weight 456.3 mg
Avg. Tare Weight 456.5 mg
SAMPLE No. ____ SAMPLE WT. ____ mg
Total Wt. Anal. ____ Date ____
Check Analyst ____ Date ____

Fore Testing was supplied filters Gemdia GFF

Tared on a Sartorius Research (Rad Chem) DLL #102683 on 9/16/96 JK

Filter: GF 96 25 (754)
Tare Analyst JK Date ____
Total Weight ____ mg
Total Weight ____ mg
Avg. Total Weight ____ mg
Tare Weight 447.5 mg
Tare Weight 447.4 mg
Avg. Tare Weight 447.5 mg
SAMPLE No. ____ SAMPLE WT. ____ mg
Total Wt. Anal. ____ Date ____
Check Analyst ____ Date ____

Filter: GF 96-26 (760?)
Tare Analyst JK Date ____
Total Weight ____ mg
Total Weight ____ mg
Avg. Total Weight ____ mg
Tare Weight 451.2 mg
Tare Weight 450.9 mg
Avg. Tare Weight 451.1 mg
SAMPLE No. ____ SAMPLE WT. ____ mg
Total Wt. Anal. ____ Date ____
Check Analyst ____ Date ____

Filter: GF 96-27 (761)
Tare Analyst JK Date ____
Total Weight ____ mg
Total Weight ____ mg
Avg. Total Weight ____ mg
Tare Weight 449.3 mg
Tare Weight 449.2 mg
Avg. Tare Weight 449.3 mg
SAMPLE No. ____ SAMPLE WT. ____ mg
Total Wt. Anal. ____ Date ____
Check Analyst ____ Date ____

Filter: GF 96-28 (763)
Tare Analyst JK Date 9/16/96
Total Weight ____ mg
Total Weight ____ mg
Avg. Total Weight ____ mg
Tare Weight 450.9 mg
Tare Weight 450.7 mg
Avg. Tare Weight 450.8 mg
SAMPLE No. ____ SAMPLE WT. ____ mg
Total Wt. Anal. ____ Date ____
Check Analyst ____ Date ____

Filter: ____
Tare Analyst ____ Date ____
Total Weight ____ mg
Total Weight ____ mg
Avg. Total Weight ____ mg
Tare Weight ____ mg
Tare Weight ____ mg
Avg. Tare Weight ____ mg
SAMPLE No. ____ SAMPLE WT. ____ mg
Total Wt. Anal. ____ Date ____
Check Analyst ____ Date ____

DATACHEM LABORATORIES
ANALYTE GROUP LIST
SEARCH STRING: 3025A1MET5

ANALYTE GROUP: 3025A1MET5 ACCOUNT: 03025 DESCRIPTION: Method 5 Particulate

Analyte	Instrument Class	Method	Sub Method	Report Units	Threshold	Lod	Loq
Particulate	GRAV	Method 5		mg/Rinsate			0.1
Particulate	GRAV	Method 5		mg/Filter			0.1
Particulate	GRAV	Method 5		mg/Impinger			0.1
Particulate	GRAV	Method 5		Total mg			0.1

--- END OF LISTING ---

DATACHEM LABORATORIES
ANALYTE GROUP LIST
SEARCH STRING: 3025A1UISO

ANALYTE GROUP: 3025A1UISO ACCOUNT: 03025 DESCRIPTION: Isotopic Uranium

Analyte	Instrument Class	Method	Sub Method	Report Units	Threshold	Lod	Loq
Uranium-233/234	AS	WR-DC-341	WR-DC-200	pCi/Sample			1.0
Uranium-235	AS	WR-DC-341	WR-DC-200	pCi/Sample			1.0
Uranium-238	AS	WR-DC-341	WR-DC-200	pCi/Sample			1.0

--- END OF LISTING ---

000079

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DATACHEM LABORATORIES
ANALYTE GROUP LIST
SEARCH STRING: 3025A1TISO

ANALYTE GROUP: 3025A1TISO ACCOUNT: 03025 DESCRIPTION: ISOTOPIC THORIUM

Analyte	Instrument Class	Method	Sub Method	Report Units	Threshold	Lod	Loq
Thorium-228	AS	WR-DC-341		pCi/Sample			1.0
Thorium-230	AS	WR-DC-341		pCi/Sample			1.0
Thorium-232	AS	WR-DC-341		pCi/Sample			1.0

--- END OF LISTING ---

000080

80 19

DATACHEM LABORATORIES
ANALYTE GROUP LIST
SEARCH STRING: 3025A1GS

ANALYTE GROUP: 3025A1GS ACCOUNT: 03025 DESCRIPTION: Radium 226/228 by ga

Analyte	Instrument Class	Method	Sub Method	Report Units	Threshold	Lod	Loq
Radium-226	GS	WR-EP-325	WR-DC-200	pCi/Sample			95
Radium-228	GS	WR-EP-325	WR-DC-200	pCi/Sample			20

--- END OF LISTING ---

000081

8019

DATACHEM LABORATORIES
ANALYTE GROUP LIST
SEARCH STRING: 3025A1TOTU

ANALYTE GROUP: 3025A1TOTU ACCOUNT: 03025 DESCRIPTION: Total Uranium by kPA

Analyte	Instrument Class	Method	Sub Method	Report Units	Threshold	Lod	Loq
Total Uranium	kPA	WR-DC-342		ug/Sample			0.8

--- END OF LISTING ---

280000

80119

August 6, 1996
Refer to: BD0021

Bruce Sarven
Hayden Environmental
561 Congress Park Drive
Dayton, OH 45459

Phone: (513) 438-3010
FAX: (513) 438-3020

Re: REVISED FAX Quote BD0021

Dear Mr. Sarven:

DataChem Laboratories, Inc.(DCL) appreciates the opportunity to provide you with cost estimates for your project. As I understand your needs, you will be taking three 6 hour stack samples and a blank by Method 5 for particulates and radionulclides analysis. Tared glass fiber filters and sample bottles will be provided for these determinations. The acetone rinse and glass fiber filter will be combined for the analysis of radionuclides.

Uranium 234, Uranium 235/236, Uranium 238, Thorium 228, Thorium 230, and Thorium 232 will be analyzed by alpha spectrometry(AS). Radium 226 and Radium 228 will be analyzed by gamma spectrometry(GS). Total Uranium will be analyzed by kinetic phosphorescence(KPA). According to method 114 these radionuclides will be part of the particulate loading and analysis on the impinger solutions is not required. Combined particulate from the acetone rinse and filter will be analyzed according to DCL standard operating procedures(SOP).

The standard turnaround time for these analysis is 30 calendar days. The requested turnaround time of 10 working days can be accomplished for an additional 25%. The requested detection limits for isotopic analysis can not be met. Minimun Detectable Activity (MDA) is listed on the attached table.

Attached is a Pricing Quotation for these analyses. If you have any question concerning the attached quotation please call me.

Sincerely,

Robert P. Di Rienzo
Project Manager

Revised Pricing Quotation
Project Reference Number: BD-0021

Parameter Analysis	Method	MDA pCi/Sample	Method	Fractions	Price per Sample
Particulate	Method 5		Grav	Acetone Rinse Filter Impinger	$100.00
Uranium 234 Uranium 235/236 Uranium 238	DCL SOP	1 1 1	AS	Particulate*	$312.50
Thorium 228 Thorium 230 Thorium 232	DCL SOP	1 1 1	AS	Particulate*	$312.50
Radium 226 Radium 228	DCL SOP	95 20	GS	Particulate*	$250.00
Total Uranium	DCL SOP	0.8 ug/ Sample	KPA	Particulate*	$187.50

* = Particulate samples are combined acetone rinse and glass fiber filter.

EMISSION MEASUREMENT TECHNICAL INFORMATION CENTER TEST METHOD

Method 5 - Determination of Particulate Emissions from Stationary Sources

1. PRINCIPLE AND APPLICABILITY

1.1 Principle. Particulate matter (PM) is withdrawn isokinetically from the source and collected on a glass fiber filter maintained at a temperature in the range of 120 ± 14°C (248 ± 25°F) or such other temperature as specified by an applicable subpart of the standards or approved by the Administrator, U.S. Environmental Protection Agency, for a particular application. The PM mass, which includes any material that condenses at or above the filtration temperature, is determined gravimetrically after removal of uncombined water.

1.2 Applicability. This method is applicable for the determination of PM emissions from stationary sources.

2. APPARATUS

2.1 Sampling Train. A schematic of the sampling train used in this method is shown in Figure 5-1. Complete construction details are given in APTD-0581 (Citation 2 in the Bibliography); commercial models of this train are also available. For changes from APTD-0581 and for allowable modifications of the train shown in Figure 5-1, see the following subsections.

The operating and maintenance procedures for the sampling train are described in APTD-0576 (Citation 3 in the Bibliography). Since correct usage is important in obtaining valid results, all users should read APTD-0576 and adopt the operating and maintenance procedures outlined in it, unless otherwise specified herein. The sampling train consists of the following components:

2.1.1 Probe Nozzle. Stainless steel (316) or glass with sharp, tapered leading edge. The angle of taper shall be ≤30°, and the taper shall be on the outside to preserve a constant internal diameter. The probe nozzle shall be of the button-hook or elbow design, unless otherwise specified by the Administrator. If made of stainless steel, the nozzle shall be constructed from seamless tubing; other materials of construction may be used, subject to the approval of the Administrator.

A range of nozzle sizes suitable for isokinetic sampling should be available, e.g., 0.32 to 1.27 cm (1/8 to 1/2 in.)--or larger if higher volume sampling trains are used--inside diameter (ID) nozzles in increments of 0.16 cm (1/16 in.). Each nozzle shall be calibrated according to the procedures outlined in Section 5.

directly from the wash bottle being used, and place it in a glass sample container labeled "acetone blank."

Inspect the train prior to and during disassembly, and note any abnormal conditions. Treat the samples as follows:

Container No. 1. Carefully remove the filter from the filter holder, and place it in its identified petri dish container. Use a pair of tweezers and/or clean disposable surgical gloves to handle the filter. If it is necessary to fold the filter, do so such that the PM cake is inside the fold. Carefully transfer to the petri dish any PM and/or filter fibers that adhere to the filter holder gasket, by using a dry Nylon bristle brush and/or a sharp-edged blade. Seal the container.

Container No. 2. Taking care to see that dust on the outside of the probe or other exterior surfaces does not get into the sample, quantitatively recover PM or any condensate from the probe nozzle, probe fitting, probe liner, and front half of the filter holder by washing these components with acetone and placing the wash in a glass container. Deionized distilled water may be used instead of acetone when approved by the Administrator and shall be used when specified by the Administrator; in these cases, save a water blank, and follow the Administrator's directions on analysis. Perform the acetone rinse as follows:

Carefully remove the probe nozzle, and clean the inside surface by rinsing with acetone from a wash bottle and brushing with a Nylon bristle brush. Brush until the acetone rinse shows no visible particles, after which make a final rinse of the inside surface with acetone.

Brush and rinse the inside parts of the Swagelok fitting with acetone in a similar way until no visible particles remain.

Rinse the probe liner with acetone by tilting and rotating the probe while squirting acetone into its upper end so that all inside surfaces will be wetted with acetone. Let the acetone drain from the lower end into the sample container. A funnel (glass or polyethylene) may be used to aid in transferring liquid washes to the container. Follow the acetone rinse with a probe brush. Hold the probe in an inclined position, squirt acetone into the upper end as the probe brush is being pushed with a twisting action through the probe; hold a sample container underneath the lower end of the probe, and catch any acetone and particulate matter that is brushed from the probe. Run the brush through the probe three times or more until no visible PM is carried out with the acetone or until none remains in the probe liner on visual inspection. With stainless steel or other metal probes, run the brush through in the above prescribed manner at least six times since metal probes have small crevices in which particulate matter can be entrapped.

Rinse the brush with acetone, and
quantitatively collect these washings in the sample container. After the brushing, make a final acetone rinse of the probe as described above.

It is recommended that two people clean the probe to minimize sample losses. Between sampling runs, keep brushes clean and protected from contamination.

After ensuring that all joints have been wiped clean of silicone grease, clean the inside of the front half of the filter holder by rubbing the surfaces with a Nylon bristle brush and rinsing with acetone. Rinse each surface three times or more if needed to remove visible particulate. Make a final rinse of the brush and filter holder. Carefully rinse out the glass cyclone, also (if applicable). After all acetone washings and particulate matter have been collected in the sample container, tighten the lid on the sample container so that acetone will not leak out when it is shipped to the laboratory. Mark the height of the fluid level to determine whether leakage occurred during transport. Label the container to identify clearly its contents.

Container No. 3. Note the color of the indicating silica gel to determine whether it has been completely spent, and make a notation of its condition. Transfer the silica gel from the fourth impinger to its original container, and seal. A funnel may make it easier to pour the silica gel without spilling. A rubber policeman may be used as an aid in removing the silica gel from the impinger. It is not necessary to remove the small amount of dust particles that may adhere to the impinger wall and are difficult to remove. Since the gain in weight is to be used for moisture calculations, do not use any water or other liquids to transfer the silica gel. If a balance is available in the field, follow the procedure for Container No. 3 in Section 4.3.

Impinger Water. Treat the impingers as follows: Make a notation of any color or film in the liquid catch. Measure the liquid that is in the first three impingers to within I ml by using a graduated cylinder or by weighing it to within 0.5 g by using a balance (if one is available). Record the volume or weight of liquid present. This information is required to calculate the moisture content of the effluent gas.

Discard the liquid after measuring and recording the volume or weight, unless analysis of the impinger catch is required (see **NOTE**, Section 2.I.7).

If a different type of condenser is used, measure the amount of moisture condensed either volumetrically or gravimetrically.

Whenever possible, containers should be shipped in such a way that they remain upright at all times.

4.3 Analysis. Record the data required on a sheet such as the one shown in Figure 5-3. Handle each sample container as follows:

Container No. 1. Leave the contents in the shipping container or transfer the filter and any loose PM from the sample container to a tared glass weighing dish. Desiccate for 24 hours in a desiccator containing anhydrous calcium sulfate. Weigh to a constant weight, and report the results to the nearest
0.1 mg. For purposes of this Section, 4.3, the term "constant weight" means a difference of no more than 0.5 mg or 1 percent of total weight less tare weight, whichever is greater, between two consecutive weighings, with no less than 6 hours of desiccation time between weighings.

Alternatively, the sample may be oven dried at 105°C (220°F) for 2 to 3 hours, cooled in the desiccator, and weighed to a constant weight, unless otherwise specified by the Administrator. The tester may also opt to oven dry the sample at 105°C (220°F) for 2 to 3 hours, weigh the sample, and use this weight as a final weight.

Container No. 2. Note the level of liquid in the container, and confirm on the analysis sheet whether leakage occurred during transport. If a noticeable amount of leakage has occurred, either void the sample or use methods, subject to the approval of the Administrator, to correct the final results. Measure the liquid in this container either volumetrically to ±1 ml or gravimetrically to ±0.5 g. Transfer the contents to a tared 250-ml beaker, and evaporate to dryness at ambient temperature and pressure. Desiccate for 24 hours, and weigh to a constant weight. Report the results to the nearest 0.1 mg.

Container No. 3. Weigh the spent silica gel (or silica gel plus impinger) to the nearest 0.5 g using a balance. This step may be conducted in the field.

"Acetone Blank" Container. Measure the acetone in this container either volumetrically or gravimetrically. Transfer the acetone to a tared 250-ml beaker, and evaporate to dryness at ambient temperature and pressure. Desiccate for 24 hours, and weigh to a constant weight. Report the results to the nearest 0.1 mg.

NOTE: At the option of the tester, the contents of Container No. 2 as well as the acetone blank container may be evaporated at temperatures higher than ambient. If evaporation is done at an elevated temperature, the temperature must be below the boiling point of the solvent; also, to prevent "bumping," the evaporation process must be closely supervised, and the contents of the beaker must be swirled occasionally to maintain an even temperature. Use extreme care, as acetone is highly flammable and has a low flash point.

4.4 Quality Control Procedures. The following quality control procedures are

suggested to check the volume metering system calibration values at the field test site prior to sample collection. These procedures are optional for the tester.

4.4.1 Meter Orifice Check. Using the calibration data obtained during the calibration procedure described in Section 5.3, determine the $\Delta H_@$ for the metering system orifice. The $\Delta H_@$ is the orifice pressure differential in units of in. H_20 that correlates to 0.75 cfm of air at 528°R and 29.92 in. Hg. The
$\Delta H_@$ is calculated as follows:

$$\Delta H_@ = 0.0319\, \Delta H \frac{T_m\, \theta^2}{P_{bar}\, Y^2\, V_m^{\,2}}$$

where:

ΔH = Average pressure differential across the orifice meter, in. H_20.

T_m = Absolute average DGM temperature, °R.

P_{bar} = Barometric pressure, in. Hg.

θ = Total sampling time, min.

Y = DGM calibration factor, dimensionless.

V_m = Volume of gas sample as measured by DGM, dcf.

0.0319 = (0.0567 in. Hg/°R)(0.75 cfm)^2

Before beginning the field test (a set of three runs usually constitutes a field test), operate the metering system (i.e., pump, volume meter, and orifice) at the $\Delta H_@$ pressure differential for 10 minutes. Record the volume collected, the DGM temperature, and the barometric pressure. Calculate a DGM calibration check value, Y_c, as follows:

$$V_m \left[Y_c = \frac{10^{\omega}\, \Gamma^{\omega} 0.0319^{\omega} T_m}{P_{bar}^{\omega_1}} \right]^{1/2} \omega_1$$

where:

Y_c = DGM calibration check value, dimensionless.

FedEx

USE THIS AIRBILL FOR DANGEROUS GOODS SHIPMENTS ONLY WITHIN THE CONTINENTAL U.S.A., ALASKA AND HAWAII.
USE THE INTERNATIONAL AIR WAYBILL FOR SHIPMENTS TO PUERTO RICO AND ALL NON U.S. LOCATIONS.
QUESTIONS? CALL 800-238-5355 TOLL FREE.

AIRBILL PACKAGE TRACKING NUMBER 9690684721

9690684721

8019

RECIPIENT'S COPY

1 [redacted] Date 09-24-96

From (Your Name) Please Print: Linda Sue Murray, Traffic
Your Phone Number (Very Important): (513)548-4444
Company: [illegible]
Department/Floor No.:
Street Address: 7400 MILLER ROAD
City: PERNALD
State: OH
ZIP Required: 45030

2 To (Recipient's Name) Please Print: Jim Johnston
Recipient's Phone Number (Very Important): (801)266 7700
Company: DataChem
Department/Floor No.:
Exact Street Address (We Cannot Deliver to P.O. Boxes or P.O. Zip Codes.): 960 W. Levoy Drive
City: Salt Lake City,
State: Utah
ZIP Required: 84123

YOUR INTERNAL BILLING REFERENCE INFORMATION (optional) (First 24 characters will appear on invoice.): HNSO # 1890 Charge 7ECG2

H IF HOLD AT FEDEX LOCATION, Print FEDEX Address Here (Not available at all locations)
Street Address:
City:
State:
ZIP Required:

3 PAYMENT 1 [X] Bill Sender 2 [ ] Bill Recipient's FedEx Acct. No. 3 [ ] Bill 3rd Party FedEx Acct. No. 4 [ ] Bill Credit Card 5 [ ] Cash/Check [redacted]

4 SERVICES (Check only one box)

Priority Overnight (Delivery by next business morning†) 11 [ ]
Standard Overnight (Delivery by next business afternoon No Saturday Delivery†) 51 [ ]
Economy Two-Day (Delivery by second business day†) 30 [ ]
Government Overnight (Restricted for authorized users only) 41 [X]

Freight Service (for packages over 150 lbs.)
70 [ ] OVERNIGHT FREIGHT** (Confirmed reservation required)
80 [ ] TWO-DAY FREIGHT**
† Delivery commitment may be later in some areas.
**Call for delivery schedule.

INSTRUCTIONS (Mark appropriate boxes)
- Dangerous Goods as per attached Shipper's Declaration [X]
- Dangerous Goods Shipper's Declaration not required [ ]
- Cargo Aircraft only [ ]

5 DELIVERY AND SPECIAL HANDLING (Check services required)

Weekday Service
1 [ ] HOLD AT FEDEX LOCATION WEEKDAY (Fill in Section H)
2 [X] DELIVER WEEKDAY

Saturday Service
31 [ ] HOLD AT FEDEX LOCATION SATURDAY (Fill in Section H)
3 [ ] DELIVER SATURDAY (Extra charge) (Not available to all locations)
9 [ ] SATURDAY PICK-UP (Extra charge)

Special Handling
4 [X] DANGEROUS GOODS (Extra charge)
6 [ ] DRY ICE Dangerous Goods Shipper's Declaration not required
Dry Ice 9 UN 1845, III ____ X ____ kg. 904
[ ]
12 [ ] HOLIDAY DELIVERY (If offered) (Extra charge)

6 PACKAGES 1 | WEIGHT In Pounds Only 21 | YOUR DECLARED VALUE (See right)
Total 1 | Total 21 | Total

DIM SHIPMENT (Chargeable Weight) [ ] ____ lbs.
L ____ X W ____ X H ____

Received At
1 [ ] Regular Stop 3 [ ] Drop Box
2 [ ] On-Call Stop 4 [ ] B.S.C. 5 [ ] Station

Emp. No. Date
[ ] Cash Received
[ ] Return Shipment
[ ] Third Party [ ] Chg. To Del. [ ] Chg. To Hold
Street Address
City State Zip
Received By: X
Date/Time Received FedEx Employee Number

SIGNATURE RELEASE UNAVAILABLE

Federal Express Use
Base Charges
Declared Value Charge
Other 1
Other 2
Total Charges

REVISION DATE 11/94
Part # 146187/146188
FORMAT #219 GBFE
219
PRINTED IN U.S.A.

9690684721 Page 1 of 1 Pages

Two completed and signed copies of this Declaration must be handed to the operator.

WARNING

Failure to comply in all respects with the applicable Dangerous Goods Regulations may be in breach of the applicable law, subject to legal penalties. This Declaration must not, in any circumstances, be completed and/or signed by a consolidator, a forwarder or an IATA cargo agent.

TRANSPORT DETAILS

This shipment is within the limitations prescribed for: (delete non applicable)
PASSENGER AND CARGO AIRCRAFT | ~~CARGO AIRCRAFT ONLY~~

Airport of Departure:

Airport of Destination:

Shipment type: (delete non-applicable)
NON-RADIOACTIVE ~~RADIOACTIVE~~

NATURE AND QUANTITY OF DANGEROUS GOODS

Dangerous Goods Identification							
Proper Shipping Name	Class or Division	UN or ID No.	Packing Group	Subsidiary Risk	Quantity and type of packing	Packing Inst.	Authorization
Flammable Liquids, n.o.s (Acetone)	3	UN1993	II		(1) Steel Drum x .56 L	Y 305	LTD. QTY.

Additional Handling Information
Call Collect Night or Day - 24 Hour Line 1-513-648-4444
Emergency Response Guide # 127 Applies/Attached

000091

I hereby declare that the contents of this consignment are fully and accurately described above by the proper shipping name and are classified, packaged, marked, and labeled, and are in all respects in the proper condition for transport by air according to the applicable International and National Governmental Regulations.

Name/Title of Signatory: Linda Sue Murray, Traffic
Place and Date: Pernald, Ohio 45030 09-24-96
Signature (see warning above):

Emergency Telephone Number (Required for US Origin or Destination Shipments): 1-513-648-4444 Call Collect Night or Day - 24 Hr. Line

IF ACCEPTABLE FOR PASSENGER AIRCRAFT, THIS SHIPMENT CONTAINS RADIOACTIVE MATERIAL INTENDED FOR USE IN, OR INCIDENT TO, RESEARCH, MEDICAL DIAGNOSIS, OR TREATMENT.

DATA CHEM
LABORATORIES
A SORENSON COMPANY

Case Narrative

Analysis:	Total Uranium	**Client:**	Hayden Env.
Preparation SOP #:	WR-DC-200	**Account:**	03025
Analysis SOP#:	WR-DC-342	**Matrix:**	Filter
Lot/Release/SDG #:	N/A		
DCL Set ID:	96E-0640-05		

General Set Information: This lot consisted of four field and two QC samples.
Method Summary: Samples were analyzed using a laser phosphorimeter to determine total uranium in the samples according to WR-DC-342.
Sample Preparation: Sample preparation was performed according to WR-DC-200.
Holding Times: Holding times were not applicable to this project.
Dilutions: Dilutions were performed to place sample concentrations within the range of the calibration curve. The dilutions that were made are recorded on the form A's for each particular sample.
Method and Sample QC Data:
Laboratory Control Sample: The laboratory control sample (LCS) was within the method acceptance criteria for recovery.
Blank: The blank consisted of acidified DI water and was within QC limits.
Instrument QC: Instrument initial and continuing calibrations were performed in accordance with published procedures.
Nonconformance/Corrective Action Reports (NCR/CAR): No NCR/CARs were required.
Miscellaneous Comments: N/A

Walter R. Spanton 10/24/96
Walter R. Spanton **Date**

DATA CHEM LABORATORIES
A Sorenson Company

COVER FORM (TYPE I)
SINGLE METHOD ANALYSES

SUMMARY INFORMATION

Form RLIMS63M-V1.3
10249610420160
Page 1

G968S02B

Date Reported.....: OCT 25 1996

Date Printed.....: 24-OCT-96 10:42
DCL Report Group..: 96E-0640-05

Client Ref Number.: Not Provided
Release Number....: Not Provided

Analysis Method(s): WR-DC-342

Hayden Environmental
Attention: Bruce Sarven
561 Congress Park Drive
Dayton, OH 45459

Client Sample Name	Laboratory Sample Name	Laboratory Sample ID	Laboratory Group Name	Laboratory Group ID
BL-123241-1	BL-123241-1	S969K018	96E-0640-05	G968S02B
QC-123241-1	QC-123241-1	S969K019	96E-0640-05	G968S02B
9131,39,40	96E04514	S968S06Q	96E-0640-05	G968S02B
9135,41,42	96E04515	S968S06R	96E-0640-05	G968S02B
9136,43,44	96E04516	S968S06S	96E-0640-05	G968S02B
9137,45,46	96E04517	S968S06T	96E-0640-05	G968S02B

Analyst: Walter R. Spanton

Reviewer:

Laboratory Supervisor:

960 West LeVoy Drive / Salt Lake City, Utah 84123-2547 / (801) 266-7700
FAX (801) 268-9992

DATA CHEM LABORATORIES
A Sorenson Company

FORM H (TYPE I)
SINGLE METHOD ANALYSES

SAMPLE GROUP COMMENTS

G968S02B

Date Printed.....: 24-OCT-96 10:42
DCL Report Group..: 96E-0640-05

Client Name...: Hayden Environmental

Release Number....: Not Provided

General Information

The DCL QC Database maintains all numerical figures which are input from the pertinent data source. These data have not been rounded to significant figures nor have they been moisture corrected. Reports generated from the system, however, list data which have been rounded to the number of significant figures requested by the client or deemed appropriate for the method. This may create minor discrepancies between data which appear on the QC Summary Forms (Forms B-G) and those that would be calculated from rounded analytical results. Additionally, if a moisture correction is performed, differences will be observed between the QC data and the surrogate data reported on Form A (or other report forms) and corresponding data reported on QC Summary Forms. In these cases, the Form A will indicate the "Report Basis" as well as the moisture value used for making the correction.
Report generation options: E2X

Result Symbol Definitions

ND - Not Detected above the MDL or IDL (LLD or MDC for radiochemistry).
** - No result could be reported, see sample comments for details.

Qualifier Symbol Definitions

U - Not Detected above the MDL or IDL (LLD or MDC for radiochemistry).
For radiochemistry the nuclide was not identified by the Canberra Nuclear NID program, activity values reported are calculated using the Canberra Nuclear MINACT program.
B - For organic analysis the qualifier indicates that this analyte was found in the method blank.
For inorganic analysis the qualifier signifies the value is between the IDL and PQL.
J - The qualifier indicates that the value is between the MDL and the PQL. It is also used for indicating an estimated value for tentatively identified compounds in mass spectrometry where a 1:1 response is assumed.

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DATA CHEM LABORATORIES
A Sorenson Company

FORM A (TYPE I)
SINGLE METHOD ANALYSES

SAMPLE ANALYSIS DATA SHEET

S969K018

Date Printed.....: 24-OCT-96 14:17
Client Sample Name: BL-123241-1
DCL Sample Name...: BL-123241-1

Client Name.....: Hayden Environmental
Client Ref Number....: Not Provided
Sampling Site.....: Not Applicable
Release Number.....: Not Provided

Matrix.....: AIR
Date Sampled.....: Not Applicable
Reporting Units...: ug/sample

Date Received.....: Not Applicable
DCL Report Group.....: 96E-0640-05

DCL Preparation Group: G969K00V
Date Prepared.....: 21-OCT-96 12:00
Preparation Method...: WR-DC-342
Aliquot Weight/Volume: 1
Net Weight/Volume....: Not Required

DCL Analysis Group: G969K00V
Analysis Method...: WR-DC-342
Instrument Type...: LP
Instrument ID.....: KPA-11
Column Type.....: Not Applicable

Analytical Results

Analyte	Date Analyzed	Detection Limit	Result±Error	Qual.	Dilution	CRDL
Total Uranium	22-OCT-96 12:00	7.0E-1	4.7E-3±4.7E-4		100	8.0E-1

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DATA CHEM LABORATORIES
A Sorenson Company

FORM A (TYPE I)
SINGLE METHOD ANALYSES

SAMPLE ANALYSIS DATA SHEET

S969K019

Date Printed.....: 24-OCT-96 14:17
Client Sample Name: QC-123241-1
DCL Sample Name...: QC-123241-1

Client Name.....: Hayden Environmental
Client Ref Number....: Not Provided
Sampling Site.....: Not Applicable
Release Number.....: Not Provided

Matrix.....: AIR
Date Sampled.....: Not Applicable
Reporting Units...: ug/Sample

Date Received.....: Not Applicable
DCL Report Group.....: 96E-0640-05

DCL Preparation Group: G969K00V
Date Prepared.....: 21-OCT-96 12:00
Preparation Method...: WR-DC-342
Aliquot Weight/Volume: 1
Net Weight/Volume....: Not Required

DCL Analysis Group: G969K00V
Analysis Method...: WR-DC-342
Instrument Type...: LP
Instrument ID.....: KPA-11
Column Type.....: Not Applicable

Analytical Results

Analyte	Date Analyzed	Detection Limit	Result±Error	Qual.	Dilution	CRDL
Total Uranium	22-OCT-96 12:00	7.0E-1	1.7E1±1.7E0		100	8.0E-1

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S968S06Q

DATA CHEM LABORATORIES
A Sorenson Company

FORM A (TYPE I)
SINGLE METHOD ANALYSES

SAMPLE ANALYSIS DATA SHEET

Date Printed.....: 24-OCT-96 14:17
Client Sample Name: 9131,39,40|NORTH
DCL Sample Name...: 96E04514

Client Name.....: Hayden Environmental
Client Ref Number....: Not Provided
Sampling Site.....: Not Provided
Release Number.....: Not Provided

Matrix.....: AIR
Date Sampled.....: 19-SEP-96 08:30
Reporting Units...: ug/Sample
Report Basis.....: ☒ As Received ☐ Dried

Date Received.....: 25-SEP-96 00:00
DCL Report Group.....: 96E-0640-05

DCL Preparation Group: G969K00V
Date Prepared.....: 21-OCT-96 12:00
Preparation Method...: WR-DC-342
Aliquot Weight/Volume: 5.2E2
Net Weight/Volume....: Not Required

DCL Analysis Group: G969K00V
Analysis Method...: WR-DC-342
Instrument Type...: LP
Instrument ID.....: KPA-11
Column Type.....: Not Applicable

Analytical Results

Analyte	Date Analyzed	Detection Limit	Result±Error	Qual.	Dilution	CRDL
Total Uranium	22-OCT-96 12:00	7.0E-1	2.1E0±2.1E-1		100	8.0E-1

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S968S06R

DATA CHEM LABORATORIES
A Sorenson Company

FORM A (TYPE I)
SINGLE METHOD ANALYSES

SAMPLE ANALYSIS DATA SHEET

Date Printed.....: 24-OCT-96 14:17
Client Sample Name: 9135,41,42|SOUTH
DCL Sample Name...: 96E04515

Client Name.....: Hayden Environmental
Client Ref Number....: Not Provided
Sampling Site.....: Not Provided
Release Number.....: Not Provided

Matrix.....: AIR
Date Sampled.....: 19-SEP-96 08:30
Reporting Units...: ug/Sample
Report Basis.....: ☒ As Received ☐ Dried

Date Received.....: 25-SEP-96 00:00
DCL Report Group.....: 96E-0640-05

DCL Preparation Group: G969K00V
Date Prepared.....: 21-OCT-96 12:00
Preparation Method...: WR-DC-342
Aliquot Weight/Volume: 4.8E-2
Net Weight/Volume....: Not Required

DCL Analysis Group: G969K00V
Analysis Method...: WR-DC-342
Instrument Type...: LP
Instrument ID.....: KPA-11
Column Type.....: Not Applicable

Analytical Results

Analyte	Date Analyzed	Detection Limit	Result±Error	Qual.	Dilution	CRDL
Total Uranium	22-OCT-96 12:00	7.0E-1	3.4E0±3.4E-1		100	8.0E-1

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S968S06S

DATA CHEM LABORATORIES
A Sorenson Company

FORM A (TYPE I)
SINGLE METHOD ANALYSES

SAMPLE ANALYSIS DATA SHEET

Date Printed.....: 24-OCT-96 14:17
Client Sample Name: 9136,43,44|BLANK
DCL Sample Name...: 96E04516

Client Name.....: Hayden Environmental
Client Ref Number....: Not Provided
Sampling Site.....: Not Provided
Release Number.....: Not Provided

Matrix.....: AIR
Date Sampled.....: 19-SEP-96 08:30
Reporting Units...: ug/Sample
Report Basis.....: ☒ As Received ☐ Dried

Date Received.....: 25-SEP-96 00:00
DCL Report Group.....: 96E-0640-05

DCL Preparation Group: G969K00V
Date Prepared.....: 21-OCT-96 12:00
Preparation Method...: WR-DC-342
Aliquot Weight/Volume: 5.0E-2
Net Weight/Volume....: Not Required

DCL Analysis Group: G969K00V
Analysis Method...: WR-DC-342
Instrument Type...: LP
Instrument ID.....: KPA-11
Column Type.....: Not Applicable

Analytical Results

Analyte	Date Analyzed	Detection Limit	Result±Error	Qual.	Dilution	CRDL
Total Uranium	22-OCT-96 12:00	7.0E-1	5.4E2±5.4E1		100	8.0E-1

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DATA CHEM LABORATORIES
A Sorenson Company

FORM A (TYPE I)
SINGLE METHOD ANALYSES

SAMPLE ANALYSIS DATA SHEET

S968S06T

Date Printed.....: 24-OCT-96 14:17
Client Sample Name: 9137,45,46|RESP
DCL Sample Name...: 96E04517

Client Name.....: Hayden Environmental
Client Ref Number....: Not Provided
Sampling Site.....: Not Provided
Release Number.....: Not Provided

Matrix.....: AIR
Date Sampled.....: 19-SEP-96 08:30
Reporting Units...: ug/Sample
Report Basis.....: ☒ As Received ☐ Dried

Date Received.....: 25-SEP-96 00:00
DCL Report Group.....: 96E-0640-05

DCL Preparation Group: G969K00V
Date Prepared.....: 21-OCT-96 12:00
Preparation Method...: WR-DC-342
Aliquot Weight/Volume: 5.0E-2
Net Weight/Volume....: Not Required

DCL Analysis Group: G969K00V
Analysis Method...: WR-DC-342
Instrument Type...: LP
Instrument ID.....: KPA-11
Column Type.....: Not Applicable

Analytical Results

Analyte	Date Analyzed	Detection Limit	Result±Error	Qual.	Dilution	CRDL
Total Uranium	22-OCT-96 12:00	7.0E-1	2.8E-1±2.8E-2		100	8.0E-1

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DATA CHEM LABORATORIES
A Sorenson Company

FORM B (TYPE I)
SINGLE METHOD ANALYSES

S969K019

QUALITY CONTROL DATA SHEET
LABORATORY CONTROL SAMPLE (LCS)

Client Name.....: Hayden Environmental
Release Number.....: Not Provided

Matrix.....: FILTER
Reporting Units.....: µg/filter

DCL Preparation Group: G969K00V
Date Prepared.....: 21-OCT-96 12:00
Preparation Method...: WR-DC-342

Date Printed.....: 24-OCT-96 10:42
DCL Sample Name...: QC-123241-1

DCL Analysis Group: G969K00V
Analysis Method...: WR-DC-342
Instrument Type...: LP
Instrument ID.....: KPA-11
Column Type.....: Not Applicable

QC Limit Type.....: Method

Analytical Results

Analyte	Date Analyzed	Target	Result	Percent Recovery	QC Limits	QC Flag
Total uranium	22-OCT-96 12:00	1.8E1	1.7E1	97.6	75.0/125.	

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DATA CHEM LABORATORIES
A Sorenson Company

FORM C (TYPE I)
SINGLE METHOD ANALYSES

S969K018

QUALITY CONTROL DATA SHEET
BLANK SAMPLE

Client Name.....: Hayden Environmental
Release Number.....: Not Provided

Matrix.....: FILTER
Reporting Units.....: µg/sample

DCL Preparation Group: G969K00V
Date Prepared.....: 21-OCT-96 12:00
Preparation Method...: WR-DC-342

Date Printed.....: 24-OCT-96 10:42
DCL Sample Name...: BL-123241-1

DCL Analysis Group: G969K00V
Analysis Method...: WR-DC-342
Instrument Type...: LP
Instrument ID.....: KPA-11
Column Type.....: Not Applicable

QC Limit Type.....: Method

Analytical Results

Analyte	Date Analyzed	Result	CRDL
Total uranium	22-OCT-96 12:00	0.0047	0.8

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DATA CHEM LABORATORIES
A SORENSON COMPANY

Datapackage Table of Contents

8019

Information pertaining to this datapackage is divided into the four categories listed below (see colored divider sheets for an inventory list of each category). If an item on the inventory is not applicable, an "NA" is placed in the corresponding check box. A Case Narrative immediately precedes this Table of Contents and contains pertinent information about this datapackage.

Analytical Forms ..... Yellow
Sample Tracking Documentation ..... Pink
Analytical Documentation ..... Blue
Raw Data ..... Green

♦ ♦ ♦ ♦ ♦ ♦ ♦ ♦ ♦ ♦

Analytical Forms
Inventory Checklist

[X] Case Narrative

[N/A] IRDMIS	[N/A] Commercial Forms
[ ] Data Review and Approval Form	[ ] Analytical or Environmental Report Form
[ ] IRDMIS Reports	[ ] Set Comments
[ ] GC/MS TICs	[ ] Applicable QC Sheets

[X] RLIMS Forms	
[X] Cover Form	[N/A] Matrix Spike/Matrix Spike Duplicate Sample (Form F)
[X] Sample Group Comments (Form H)	[N/A] Surrogate Summary (Form G)
[X] Sample Analysis Data Sheet (Form A)	[N/A] Initial Calibration Form
[X] Laboratory Control Sample (Form B)	[N/A] Initial Calibration Verification (ICV) Form
[X] Blank Sample (Form C)	[N/A] Continuing Calibration Form
[N/A] Matrix Spike Sample (Form D)	[N/A] Serial Dilution Form
[N/A] Matrix Duplicate Sample (Form E)	[N/A] Endrin Breakdown or BFB/DFTPP GC/MS Tuning Form

Analytical Forms
Reviewer Checklist

X The Analytical Forms Inventory Checklist above is complete.

X The Case Narrative was completed in accordance with procedures in DCL SOP XX-DC-020, "Datapackage Preparation and Validation."

X Only the correct report forms are used (IRDMIS or Commercial Forms or RLIMS Forms).

X All fields on the report forms are complete with the correct information, including signatures.

X Results for all samples are reported per client request.

X Units, methods, and dates are correct.

X Sample and/or set comments are complete.

Assembled by: [signature] 10/24/96 (Signature / Date) Reviewed by: [signature] 10/24/96 (Signature / Date)

000103

Rev. 6/95

DATA CHEM LABORATORIES
A SORENSON COMPANY

Sample Tracking Documentation
Inventory Checklist

- [x] LIMS Grouping Reports
- [x] DataChem Laboratories (DCL) Chain-of-Custody Record
- [x] DCL Sample Work Order
- [N/A] Copy of numbered Nonconformance/Corrective Action Report (NC/CAR)
- [N/A] Copy of Client-Related Problem Report (CPR)

Sample Tracking Documentation
Reviewer Checklist

X The Sample Tracking Documentation Inventory Checklist above is complete.

X DCL Chain-of-Custody Record provides signatures for the sample portion reported in this data package.

X DCL Chain-of-Custody Record was completed in accordance with procedures in DCL SOP XX-DC-006 "Chain-of-Custody and Laboratory Tracking."

X Methods specified on the Sample Work Order were performed or an explanation for deviations is provided.

X Special instructions on the Sample Work Order were followed.

X Project Management instructions on the Project Protocol Worksheet were followed.

X Client's requests were met or an explanation is provided in the Case Narrative.

NA NC/CAR and/or CPR were completed in accordance with procedures in DCL SOP QC-DC-006 "Nonconformance/Corrective Action Report (NC/CAR) Procedures."

Assembled by: Walter [signature] 10/24/96 (Signature / Date) Reviewed by: [signature] 10/24/96 (Signature / Date)

Rev. 6/95

DataChem Laboratories
LIMS - Sample Master System
Preparation Group Report

Date: 18-OCT-1996 12:16
User: RICHARDSON

RLIMS15-V1.2

Preparation Run Name: G969K00V

Group ID: G969K00V

Samples: 6

Pos	Laboratory Sample Name	Field Sample Name 1	Field Sample Name 2	Laboratory Sample ID	Laboratory Group Name	Accnt. Number
1	BL-123241-1	BL-123241-1		S969K018	96E-0640-05	03025
2	QC-123241-1	QC-123241-1		S969K019	96E-0640-05	03025
3	96E04514	9131,39,40	NORTH	S968S06Q	96E-0640-05	03025
4	96E04515	9135,41,42	SOUTH	S968S06R	96E-0640-05	03025
5	96E04516	9136,43,44	BLANK	S968S06S	96E-0640-05	03025
6	96E04517	9137,45,46	RESP	S968S06T	96E-0640-05	03025

----- END OF LISTING -----

OCT 24 1996

Earliest Sampling Date: 19-Sep-1996

DataChem Laboratories
CHAIN-OF-CUSTODY

Results due by: 25-Oct-1996

Project/Job/Task: COMM-ENV | Split: | Root Set ID: 96E-0640 * | Reporting Group

Client: Hayden Environmental | Account: 03025

Comments:

Verified: KM 9-25-96

Date Sampled	Field ID Number	DCL Sample Name	DCL Sample ID	QC	Matrix	Customer ID 2					01 Method 5 Particulate	02 Isotopic Uranium	03 ISOTOPIC THORIUM	04 Radium 226/228 by gamma spec	05 Total Uranium by kPA					# Bottles
19-Sep-1996	9131,39,40	96E04514			AIR	NORTH					X	X	X	X	X					3
19-Sep-1996	9135,41,42	96E04515			AIR	SOUTH					X	X	X	X	X					3
19-Sep-1996	9136,43,44	96E04516			AIR	BLANK					X	X	X	X	X					3
19-Sep-1996	9137,45,46	96E04517			AIR	RESP					X	X	X	X	X					3

ORIGINAL FIELD SAMPLE CHAIN-OF-CUSTODY

Relinquished By: (Signature)	Date/Time	Received By: (Signature)	Reason for Transfer/ Storage Location
Walk-in Room/ Shelf/ Fridge R-23-1 TV	9/25/96 1450	Kamyn Vigil	Labeling/Shelving
Kamyn Vigil	9/25/96 1455	Walk-in Room/ Shelf/ Fridge R-23-1 TV	Storage: CW-2
R-23-1 QC	9/30/96 10:00	[illegible]	sample prep
[illegible]	10/06/96 12:15	Rm 311 QC	storage
Rm 311 T.P.	10/8/96 16:00	Ty E. Peterson	sample digestion
Ty E. Peterson	10/9/96 8:00	Robin Jolly	γ spec
Robin Jolly	10/11/96 11:15	Rm 311 RJ	storage
Rm 311 BR	10-18-96 10:00	Bradley Richardson	Sample Prep
Bradley Richardson	10-18-96 12:00	Rm 311 BR	Storage

SAMPLE PREPARATION / ANALYSIS CHAIN-OF-CUSTODY

Sample Prep/Analysis for: Total Uranium

Prepared/Analyzed by: B. Richardson

Lab Notebook No.: 4035

Date/Time:

Relinquished By: (Signature)	Date/Time	Received By: (Signature)	Reason for Transfer/ Storage Location
Bradley Richardson	10-18-96 16:00	Emil O. Knox	Column Sep.
Emil O. Knox	10-22-96 1300	W. Hyman	Total U

Check box if there is a continuation page ☐

Form: COFC1.01-SWV2.30

Printed 9/25/1996 1:49

000106

000119

Sample Work Order

8019

QC Clearance: _____

Project Manager: Robert P. Di Rienzo

Client: Hayden Environmental

Account: 03025

Project/Task: COMM-ENV

Date Received: 25-Sep-1996

Date for Mailing Report: 25-Oct-1996

DCL Root Set ID: 96E-0640 *

DCL Lab. Name: 96E04514-96E04517

Total # Samples: 4

Sample Entry: Karyn L. Boyack

Section: WA

Earliest Sampling Date: 19-Sep-1996

Preparation Type:

Rep. Group	Radiochemistry Analytes Requested	Latest Prep. Date	Latest Anal. Date	No. of Samp.	Storage Location	Analysis/Prep. Method	Inst.	Matrix
01	Method 5 Particulate		18-Mar-1997[c]	4		Method 5	GRAV	AIR
02	Isotopic Uranium	1-Oct-1996[c]	18-Mar-1997[c]	4		WR-DC-341 WR-DC-200	AS	AIR
03	ISOTOPIC THORIUM	1-Oct-1996[c]	18-Mar-1997[c]	4		WR-DC-341	AS	AIR
04	Radium 226/228 by gamma spec		18-Mar-1997[c]	4		WR-EP-325 WR-DC-200	GS	AIR
05	Total Uranium by kPA		18-Mar-1997[c]	4		WR-DC-342	kPA	AIR

[c]Based on date of collection

Special Instructions: _____

Section Manager: Charlie C. Walker

Other Sections Receiving Sample Portions: None

SAMPLE LOG-IN SHEET

Group Name: 96E-8019

Lab Name: DataChem Laboratories	Page 1 of 1
Received By (Print Name): Sample Rec. Group	Log-In Date: 9-25-96
Received By (Signature): Zangar Virgil	
Case Number: —	Sample Delivery Group No.: — / SAS Number: NA

Remarks:

		Client ID #1 EPA Sample #	Corresponding Client ID #2 Sample Tag #	Corresponding Assigned Lab #	Matrix	Fraction	Remarks: Condition of Sample Shipment, etc.
1. Custody Seal(s)	Present/Absent*	200259131	North	96E04514	Water	R/A	each client
	Intact/Broken*	39	↓	↓	Acetate	↓	ID 1 bottle
2. Custody Seal Nos.	N/A	40	↓	↓	Water	↓	needs to be
		200259135	South	96E04515	Water	↓	combined
3. Chain-of-Custody Records	Present/Absent*	41	↓	↓	Acetate	↓	to create
4. Traffic Reports or Packing Lists	Present/Absent*	42	↓	↓	Water	↓	a single
5. Airbill	Airbill/Sticker	200259136	Blank	96E04516	Water	↓	client ID
	Present/Absent*	43	↓	↓	Acetate	↓	2 (see PPQ)
6. Airbill No.	9690684221	44	↓	↓	Water	↓	↓
		200259137	Resp	96E04517	Water	↓	↓
7. Sample Tags	Present/Absent*	45	↓	↓	Acetate	↓	↓
Sample Tag Numbers	Listed/Not Listed on Chain-of-Custody	46	↓	↓	Water	↓	↓
8. Sample Condition	Intact/Broken*/Leaking						
9. Does information on custody records, traffic reports, and sample tags agree?	Yes/No*						
10. Date Received at Lab	9/25/96						
11. Time Received	1000						

Zangar Virgil 9/25/96

Sample Transfer	
Fraction: FII	Fraction:
Area #: R-23-1	Area #:
By: ZV	By:
On: 9/25/96	On:

* Contact SMO and attach record of resolution.

Reviewed By	Logbook No.
Date	Logbook Page No.

FRACTIONS:
C - Cyanide
D - Dissolved Metals
T - Total Metals
F - Full TCL Organics
P - Pesticides
S - Semivolatiles
V - Volatiles

FORM DC-1

R - Rad Chem
A - Particulates

Note: only highlighted portion of client ID #1s entered into DCL computer system

CHAIN OF CUSTODY / REQUEST FOR ANALYSIS RECORD

FERMCO

P.O. BOX 538704
CINCINNATI, OH 45253-8704

REFERENCE DOCUMENT NO.: SPL-96-2875

ORIGINAL MEF NO.: _____ CORRESPONDING REFERENCE DOCUMENT NO.: _____

PAGE 1 OF 2

RELEASE NO.: 1000012382	PROJECT NO.: N/A	FOR SAMPLE RELATED PROBLEMS, ACS CONTACT / PHONE: Tim Miller X4198	CONTRACT PURCHASE ORDER / TASK ORDER NO.: N/A
PROJECT NAME: NESHAP STACK SAMPLING		REQUIRED REPORT DATE / LAB TAT: PARTICULATE (10 DAY) RAD (30 DAY)	SAMPLE SHIPMENT DATE: 9-24-96
PROJECT CONTACT / PHONE: Tim Miller / 4198		RECEIVING LAB NAME: DATACHEM	SAMPLE SHIPPER (Print): G Bell
CHARGE NO.: 2ECG2	LOT MARKING NO.: N/A	RECEIVING LAB ADDRESS: SALT LAKE CITY	OFF-SITE LAB CONTACT: Robert DiRenzo

SAMPLING TEAM (Print) & GROUP NAME / PHONE: BRUCE SARVEN HAYDEN ENVIRONMENTAL 513-438-3010 Geoff Schoenberger HAYDEN

SAMPLING TEAM (Signature & Badge No.): Bruce Sarven 282-74-1268 Geoff D. Schoenberger 267-82-4754

ITEM NO.	SAMPLE NUMBER: FACTS ID	SAMPLE NUMBER: CUSTOMER ID / SAMPLE POINT	SAMPLE MATRIX		COMP	GRAB	FILTERED	COLLECTION DATE	COLLECTION TIME	CONTAINER TYPE	CONTAINER VOL.	NO. CONTRS	PRESERVATION	ASL	ANALYSES REQUESTED (If more space is required, use the SPECIAL INSTRUCTIONS block.)	SAMPLE OKAY? (Y/N)* FERMCO	SAMPLE OKAY? (Y/N)* OFF-SITE
1	200259131	NORTH FILTER	AF	AIR FILTER	✓		N/A	9-19-96	0830	F	146 cfm	1	NONE	B	Particulate & Rad *	Y	
2	200259139	NORTH FRONT 1/2	L1	ACETONE	✓		N/A	9-19-96	0830	P	1 L	1	NONE	B	Particulate & Rad *	Y	
3	200259140	NORTH BACK 1/2	L2	WATER ~~ACETONE~~	✓		N/A	9-19-96	0830	P	1 L	1	NONE	B	Particulate & Rad *	Y	
4	200259135	SOUTH Filter	AF	AIR FILTER	✓		N/A	9-19-96	0830	F	126 cfm	1	NONE	B	Particulate & Rad *	Y	
5	200259141	South Front 1/2	~~L2~~ L1	ACETONE	✓		N/A	9-19-96	0830	P	1 L	1	NONE	B	Particulate & Rad *	Y	
6	200259142	South BACK 1/2	L2	~~ACETONE~~ WATER	✓		N/A	9-19-96	0830	P	1 L	1	NONE	B	Particulate & Rad *	Y	
7	200259136	Filter BLANK	AF	AIR FILTER	✓		N/A	9-19-96	0830	F	N/A	1	NONE	B	Particulate & Rad *	Y	
8	200259148	D.I. BLANK	L2	WATER	✓		N/A	9-19-96	0830	P	1 L	1	NONE	B	Particulate & Rad *	Y	
9	200259144	ACETONE BLANK	L1	ACETONE	✓		N/A	9-19-96	0830	P	1 L	1	NONE	B	Particulate & Rad *	Y	
10	200259137	Resp. Filter	AF	AIR FILTER	✓		N/A	9-19-96	0830	F	293 cfm	1	NONE	B	Particulate & Rad *	Y	

SPECIAL INSTRUCTIONS: * Samples to be shipped off-site to DATA-CHEM / UTAH, contact Robert DiRenzo
Analysis to be performed are particulate, U-238, U-234, U-235, U-236, Th-228, Th-230, Th-232
Ra-226, Ra-228 and Total Uranium by Lazer Phosphorometry

RELINQUISHED: ITEM / REASON	RELINQUISHED BY (Signature) / AFFILIATION	BADGE NO.	DATE	TIME	RECEIVED: RECEIVED BY (Signature) / AFFILIATION	BADGE NO.	DATE	TIME
1-12 Rad Analysis	Bruce Sarven / HAYDEN ENV.	1 282-74-1268	9/20/96	1630	Neil Vaughn / SPL	1 75148	9/20/96	1630
1-12 Ship	Neil Vaughn / SPL	2 75148	9-23-96	0800	G Bell SPL	2 630	9-23-96	0800
1-17 Ship	G Bell SPL	3 630	9-24-96	1300	Sample Rec. Group R-93-1 / DCL	3 5852	9.25.96	1002
		4				4		
		5				5		

DISTRIBUTION OF [redacted]S: WHITE ON-SITE - RELEASE FILE / OFF-SITE ANALYTICAL LAB - RETURN TO FEMP; YELLOW [redacted]N-SITE - DISTRIBUTE AS NEEDED / OFF-SITE ANALYTICAL LAB - RETURN TO FEMP; BLUE SAMPL[redacted]CH / PROJECT FILE

FS-F-3361 (09-2[redacted]

SHADED AREAS ARE TO BE COMPLETED [redacted] SAMPLE RECEIVING GROUP.

* IF "N", THEN COMPLETE APPLICABLE NON-CON[redacted]NCE PROCEDURE.

8019

1-48013 11-43016

FERMCO

CHAIN OF CUSTODY / REQUEST FOR ANALYSIS RECORD (CONTINUED)

PROJECT NO.: N/A

PROJECT NAME: NESHAP STACK SAMPLING

REFERENCE DOCUMENT NO.: SPL-96-2875 1000012382

CORRESPONDING REFERENCE DOCUMENT NO.:

PAGE 2 OF 2

000110

ITEM NO.	SAMPLE NUMBER: FACTS ID	SAMPLE NUMBER: CUSTOMER ID / SAMPLE POINT	SAMPLE MATRIX		COMP	GRAB	FILTERED	COLLECTION: DATE	COLLECTION: TIME	CONTAINER: TYPE	CONTAINER: VOL.	NO. CONTRS	PRESERVATION	A S L	ANALYSES REQUESTED (If more space is required, use the SPECIAL INSTRUCTIONS block.)	SAMPLE OKAY? (Y/N)* FERMCO	SAMPLE OKAY? (Y/N)* OFF-SITE
11	200259145	Resp. Front 1/2	L1	ACETONE	✓		N/A	9-20-96	0845	P	1L	1	NONE	B	Particulate & Rad	Y	
12	200259146	Resp. Back 1/2	L2	~~ACETONE~~ D.I. WATER	✓		N/A	9-20-96	0845	P	1L	1	NONE	B	Particulate & Rad	Y	
		NOTHING FOLLOWS															

SPECIAL INSTRUCTIONS: AF - Air Filter
L1 - Acetone
L2 - D.I. WATER

DISTRIBUTION OF C[illegible] | WHITE ON-SITE - RELEASE FILE / OFF-SITE ANALYTICAL LAB - RETURN TO FEMP | YELLOW [illegible]SITE - DISTRIBUTE AS NEEDED / OFF-SITE ANALYTICAL LAB - RETURN TO FEMP | BLUE SAMPL[illegible]H / PROJECT FILE

FS-F-3361-1 (09-21-[illegible])

SHADED AREAS ARE TO BE COMPLETED BY THE SAMPLE RECEIVING GROUP.

* IF "N", THEN COMPLETE APPLICABLE NON-CONF[illegible]NCE PROCEDURE.

TALLY SHEET

RELEASE #: 1000012382 (CAN 1 OF 1)
PO #: NA
DATE SHIPPED: 23-SEP-96
MATERIAL: NESHAP STACK SAMPLING - AIR FILTERS, ACETONE , AND WATER

ANALYSIS: PARTICULATE AND RAD

Composite Sample Number	Lot Number	Sample Container Size	AnaLis/ FACTS Number	Gross Weight lbs.	Tare Weight lbs.	Net Weight lbs.
NORTH FILTER	W050-730-P047-0417	AIR FILTER	200259131	0.101	0.097	0.004
NORTH FRONT 1/2	W050-730-P047-0417	1 L PLS	200259139	0.300	0.220	0.080
NORTH BACK 1/2	W050-730-P047-0417	1 L PLS	200259140	0.300	0.220	0.080
SOUTH FILTER	W050-730-P047-0417	AIR FILTER	200259135	0.101	0.097	0.004
SOUTH FRONT 1/2	W050-730-P047-0417	1 L PLS	200259141	0.300	0.220	0.080
SOUTH BACK 1/2	W050-730-P047-0417	1 L PLS	200259142	0.300	0.220	0.080
FILTER BLANK	W050-730-P047-0417	AIR FILTER	200259136	0.101	0.097	0.004
DI BLANK	W050-730-P047-0417	1 L PLS	200259143	1.251	0.220	1.031
ACETONE BLANK	W050-730-P047-0417	1 L PLS	200259144	0.300	0.220	0.080
RESP. FILTER	W050-730-P047-0417	AIR FILTER	200259137	0.101	0.097	0.004
RESP. FRONT 1/2	W050-730-P047-0417	1 L PLS	200259145	0.300	0.220	0.080
RESP. BACK 1/2	W050-730-P047-0417	1 L PLS	200259146	0.300	0.220	0.080
				3.755	2.148	1.607

32350

8019

FEMP

COVER SHEET

DOCUMENT TYPE ● RSR ○ RWP

SURVEY FOR RWP? ○ YES ● NO

NAME [redacted]

PAGE 1 OF 4

SIGNED [redacted]

LOCATION Lab WZ6

LOCATION CODE

BADGE #	DATE	TIME	BLDG/GRID#	FLR
7323	09/24/96	09:26	15A	1

SURVEY NUMBER 96-09-11-0165

RWP NUMBER -

COMMENTS Sampleshipment Res. Filters + Acetone Rel# 12352

NA

REVIEWER R Peterson

BADGE 7395

SIGNATURE

FS-F-4617 (4/22/96)

000112

FEMP
RADIOLOGICAL SURVEY REPORT

SURVEY NUMBER: 96- 9 -11- 165

DATE: 9-24-96	RCT NAME: WILLIAM CHASTEEN	RCT BADGE #: 74323	PAGE:
REVIEWED BY:		REVIEWER BADGE NO: 7395	2 OF 4

MODEL	SERIAL NUMBER	TYPE (α, β, γ)	CALIBRATION-DUE DATE	BKGD. (cpm)	EFF./CF	COUNT TIME (min)	MDA (dpm)	INSP./PERFORMANCE TEST DATE YES	NO
LB 5100		αβγ	10-96	.26/1.42	.212/.431	2.0	2/A 3	✓	
M3		βγ	2-97	60	30	NA	3000	✓	
2221	75947	α	9-96	1.2	.16	1	16.2	✓	
					A				
				N					

ITEM NUMBER	LOCATION AND/OR DESCRIPTION	HEIGHT (FT.)	DPM/100cm² ALPHA REMOVABLE (1)	DPM/100cm² ALPHA FIXED PLUS REMOVABLE	DPM/100cm² BETA-GAMMA REMOVABLE (1)	DPM/100cm² BETA-GAMMA FIXED PLUS REMOVABLE	CORRECTED DOSE RATE (MREM/HR) γ CONTACT	β CONTACT	γ AT FT.	β AT FT.
1	200259131	NA	-0 *	-7 *	3	<MDCR				
2	200259136		2	-7.5 *	-2 *					
3	200259135		0 *	-7 *	2 *					
4	200259137		-0 *	5 *	5					
5	200259139		5	NA	4					
6	200259141		2		10					
7	200259145		0 *		5			NA		
8	200259140		0 *		0 *					
9	200259144		-0 *		0 *					
10	200259143		-0 *		0 *					
11	200259142		0 *		1 *					
12	200259146		2		5					
13	I/S can	✓	-0 *	✓	0 *	✓				
14	O/S can	NA	0 *	NA	3	<MDCR				
				NA						

Note (1): Values identified by an asterisk (*) indicate results are less than the calculated MDA (RC-RDA-010)

FS-F-1993-1 (REV. 04/18/95)

TUE SEP 24, 1996
GROUP A SMEARS FOR FREE RELEASE (2 MIN)

SAMPLE NUMBER	GROSS ALPHA	GROSS BETA	DPM ALPHA	DPM BETA	TIME OF COUNT
51	0	6	-0	5	08:03:16
[illegible]	2	[illegible]	2	[illegible]	08:05:31
53	1	9	0	7	08:07:46
54	0	3	-0	3	08:10:01
55	4	7	3	4	08:12:16
56	2	12	1	10	08:14:31
57	1	8	0	5	08:16:46
58	1	[illegible]	0	0	08:19:01
59	0	[illegible]	-0	0	08:21:16
60	0		-0	0	08:23:31
61	1	4	0	1	08:25:46
62	2	8	1	5	08:28:01
63	0	5	-0	0	08:30:16
64	1	[illegible]	0	3	08:32:30

OPERATION COMPLETE

OPERATION COMPLETE

FEMP RADIOLOGICAL SURVEY REPORT pg 3 of 4
SURVEY # 96-9-11-164 DATED 9/24/96

	(name)	(signature)
RCT:	William Chustern	[illegible]
REVIEWER:	[illegible]	[illegible]

MATERIAL RESTRICTED RELEASE FORM

ITEM NUMBER	ITEM DESCRIPTION	RCT	MATERIAL RELEASE EVALUATOR PRINT/SIGNATURE [1&3]	MATERIAL OWNER/SURVEY REQUESTOR PRINT/SIGNATURE [2&3]
1-4	Filters	AAC	R Hudson	GORDON BELL
5-12	Acetone	AAC	R Hudson	GORDON BELL
			NA	

Additional Comments Sample to DCL-SLC Lic # UT1800237 EXP 11-31-97

[1] Signature by Material Release Evaluator indicates the material may be released for restricted use in the uncontrolled area of the FEMP site only. This material is not being released for unrestricted use.

[2] Signature by the Material Owner/Survey Requestor indicates acceptance of responsibility for the material while in the uncontrolled area and the material will be returned to the controlled area following use.

[3] Additional approval by the Manager of Radiological Compliance is required prior to allowing the material to exit beyond the FEMP property boundary. This allowance may be annotated in the additional comments section of the form.

000117

FS-F-3916 (06/24/94)

FEMP RADIOLOGICAL SURVEY REPORT pg 1 of 1
SURVEY # 96-9-11-164 DATED 9-29-96
(name) (signature)
RCT: William Chaston

PROJECT PROTOCOL WORKSHEET

Project:	Fernald Emission Testing	Date: 09/20/96
Client:	Hayden Environmental	Revision: 1.0
Account:	3025	
Proj. Mngr:	Bob Di Rienzo	

Client Contacts:

Reports:

Bruce Sarven
Hayden Environmental
561 Congress Park Drive
Dayton, OH 45459

Phone: (513) 438-3010
FAX: (513) 438-3020

Invoices:

Same with COC

Schedule: Starts 09/20/96

TAT: 30 Calendar Days

Sample Receipt: Use the 96E sample stream. *Notify Project Manager when samples are received.*

Analyses: **Particulates and Radiochemistry**

QA/QC: Overall QA/QC requirements will be based on the DCL Procedures.

EDL: None.

MS/MSD or MD: As per method

Deliverables: RLIMS63 Report, Raw Data, and COC
Paginate entire package

Penalties: None

Questions: If you have any questions, please contact the project manager either directly or by voice-mail at extension 331, or via e-mail on node tigger.

Special Instructions: **See attached Flow Chart and Instructions**
Particulate mesurement is completed first.
Rinsate and Filter Particulate are used for radiochemistry procedures.

PRICE CODES AND ANALYTE GROUPS:

ANALYTE	MATRIX	EST SAMPLE	METHOD	SECT	HOLD CODE	PRICE CODE	ANALYTE GROUP
Particulate	Air	4	Method 5	WA	NA	3025A01NMET5	3025A1MET5
Iso U	Air	4	AS	WA	NA	3025A01NUISO	3025A1UISO
Iso Th	Air	4	AS	WA	NA	3025A01NTISO	3025A1TISO
Radium 226/228	Air	4	GS	WA	NA	3025A01NGS	3025A1GS
Total Uranium	Air	4	kPA	WA	NA	3025A01NTOTU	3025A1TOTU

DATACHEM LABORATORIES CLIENT-RELATED INFORMATION REPORT (CRIR)

CRIR NO. _____

COOLER INFORMATION CHECKLIST
(Fill In or Circle)

Client Name: FernCO

Project/Task/Site:

Date/Time of Receipt: 9/25/96 1000

Number of Coolers Received: 1

Condition of Coolers: Acceptable/Unacceptable

Temperature Control: Present/Not Included

Custody Seals: Present/Absent

Location Temperature Taken: Control/Between Samples

Intact/Broken

Are all temperatures within project specific guidelines? Yes/No

Tamper Evident: Yes/No

Ice Present: Yes/No

Frozen/Melted N/A

Are all applicable pHs within specific guidelines? Yes/No N/A

Cooler Received	DCL Cooler No.	Temp.	Cooler Received	DCL Cooler No.	Temp.	Cooler Received	DCL Cooler No.	Temp.
* 1	MC96 0437	19 °C	4	MC96	°C	7	MC96	°C
2	MC96	°C	5	MC96	°C	8	MC96	°C
3	MC96	°C	6	MC96	°C	9	MC96	°C

Taken By: Karyn Vigil (Signature) Karyn Vigil (Printed Name) 9/25/96 (Date)

* Rad Chem. Analyses: no temp preservation required

CLIENT-RELATED INFORMATION

- ☐ Missing Cooler
- ☐ Cooler Conditions
- ☐ Missing Paperwork
- ☐ Missing/Incorrect Bottle Labels
- ☐ Missing Samples/Bottles
- ☐ Broken/Leaking Samples
- ☐ Incorrect Bottle Type
- ☐ Cooler Temperatures Out Of Range
- ☐ Incorrect Preservation
- ☐ pH Criteria Not Met
- ☐ Head Space in Bottles
- ☐ Insufficient Sample Volume
- ☐ Chain Of Custody Problems
- ☐ Other:

BRIEFLY DESCRIBE THE PROBLEM AND THE ACTION TAKEN:

Faxed to Client? Yes ☐ No ☐ (If yes, attach Fax Cover Sheet)

❖ Response Required Within 24 Hours ❖

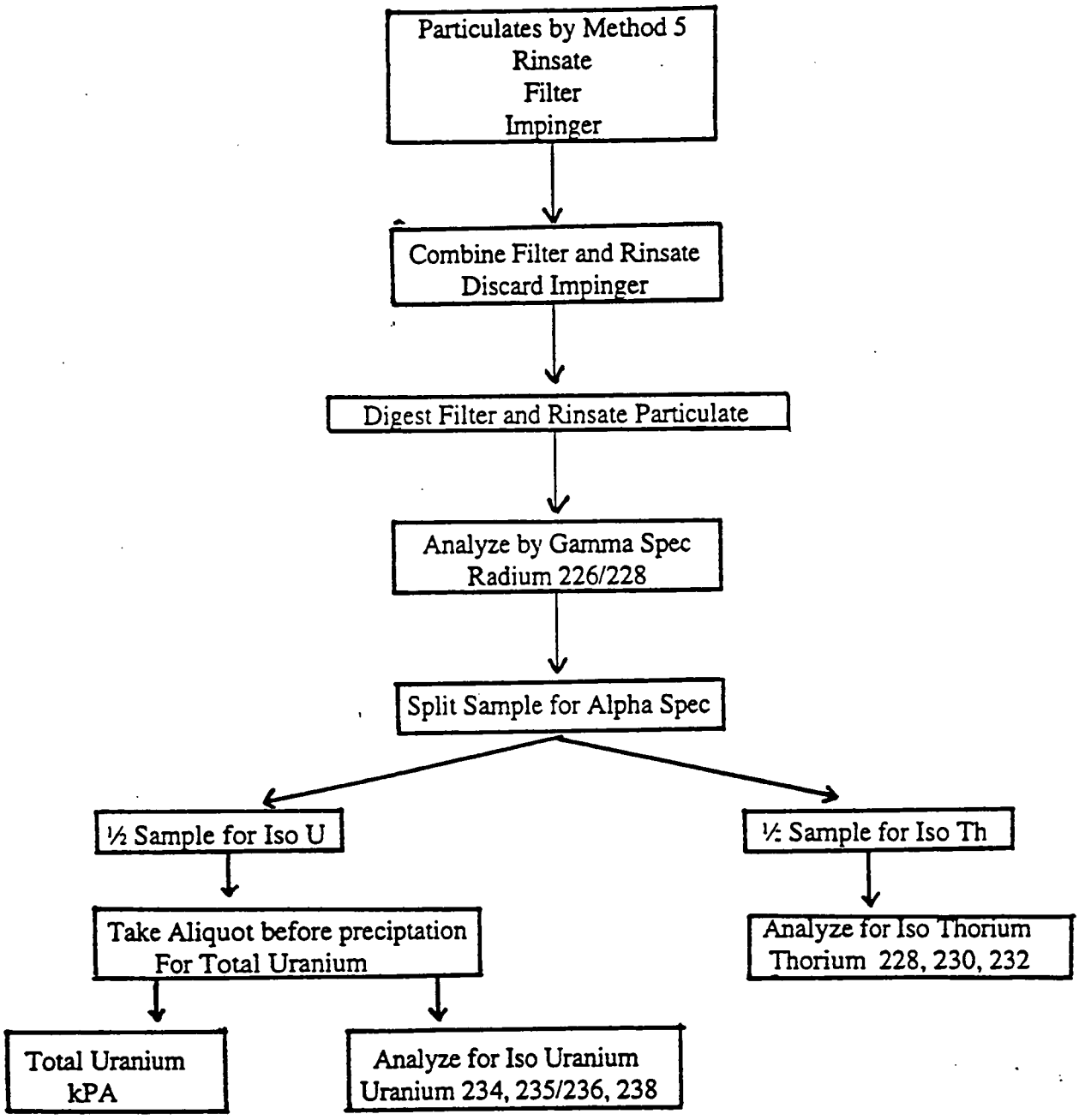
PROJECT MANAGEMENT

PROJECT MANAGER COMMENTS:

DCL Project Manager: _____ (Printed Name) Returned to Sample Receipt by: _____ (Signature) Date: _____

Analytical Scheme
Hayden Environmental - Fernault Emission Testing

3 Samples and Field Blank



DATACHEM LABORATORIES Filter Weight Book No. FWT 06 Page No. 019

Filter Lot #: 7 Temp.: 74 R.H.: 557.8019

Pure Testing was supplied filters Gemidia GFF

Tared on a Sartorius Research (Rad Chem) DLL #102683 on 9/16/96 PG

Filter: GF 96-20 (740)
Tare Analyst PG Date 9/16/96
Total Weight ____ mg
Total Weight ____ mg
Avg. Total Weight ____ mg
Tare Weight ~~453.2~~ 447.6 mg
Tare Weight ~~453.2~~ 447.6 mg
Avg. Tare Weight ~~453.2~~ 447.6 mg
SAMPLE No. ____ SAMPLE WT. ____ mg
Total Wt. Anal. ____ Date ____
Check Analyst ____ Date ____

Filter: GF 96-21 (756)
Tare Analyst PG Date ____
Total Weight ____ mg
Total Weight ____ mg
Avg. Total Weight ____ mg
Tare Weight 453.2 mg
Tare Weight 453.2 mg
Avg. Tare Weight 453.2 mg
SAMPLE No. ____ SAMPLE WT. ____ mg
Total Wt. Anal. ____ Date ____
Check Analyst ____ Date ____

Filter: GF 96-22 (752)
Tare Analyst PG Date ____
Total Weight ____ mg
Total Weight ____ mg
Avg. Total Weight ____ mg
Tare Weight 448.9 mg
Tare Weight 448.8 mg
Avg. Tare Weight 448.9 mg
SAMPLE No. ____ SAMPLE WT. ____ mg
Total Wt. Anal. ____ Date ____
Check Analyst ____ Date ____

Filter: GF 96-23 (757)?
Tare Analyst PG Date ____
Total Weight ____ mg
Total Weight ____ mg
Avg. Total Weight ____ mg
Tare Weight 446.2 mg
Tare Weight 446.0 mg
Avg. Tare Weight 446.1 mg
SAMPLE No. ____ SAMPLE WT. ____ mg
Total Wt. Anal. ____ Date ____
Check Analyst ____ Date ____

Filter: GF 96-24 (753)?
Tare Analyst PG Date ____
Total Weight ____ mg
Total Weight ____ mg
Avg. Total Weight ____ mg
Tare Weight 456.6 mg
Tare Weight 456.3 mg
Avg. Tare Weight 456.5 mg
SAMPLE No. ____ SAMPLE WT. ____ mg
Total Wt. Anal. ____ Date ____
Check Analyst ____ Date ____

Filter: GF 96 25 (754)
Tare Analyst PG Date ____
Total Weight ____ mg
Total Weight ____ mg
Avg. Total Weight ____ mg
Tare Weight 447.5 mg
Tare Weight 447.4 mg
Avg. Tare Weight 447.5 mg
SAMPLE No. ____ SAMPLE WT. ____ mg
Total Wt. Anal. ____ Date ____
Check Analyst ____ Date ____

Filter: GF 96-26 (760?)
Tare Analyst PG Date ____
Total Weight ____ mg
Total Weight ____ mg
Avg. Total Weight ____ mg
Tare Weight 451.2 mg
Tare Weight 450.9 mg
Avg. Tare Weight 451.1 mg
SAMPLE No. ____ SAMPLE WT. ____ mg
Total Wt. Anal. ____ Date ____
Check Analyst ____ Date ____

Filter: GF 96-27 (761)
Tare Analyst PG Date ____
Total Weight ____ mg
Total Weight ____ mg
Avg. Total Weight ____ mg
Tare Weight 449.3 mg
Tare Weight 449.2 mg
Avg. Tare Weight 449.3 mg
SAMPLE No. ____ SAMPLE WT. ____ mg
Total Wt. Anal. ____ Date ____
Check Analyst ____ Date ____

Filter: GF 96-28 (763)
Tare Analyst PG Date 9/16/96
Total Weight ____ mg
Total Weight ____ mg
Avg. Total Weight ____ mg
Tare Weight 450.9 mg
Tare Weight 450.7 mg
Avg. Tare Weight 450.8 mg
SAMPLE No. ____ SAMPLE WT. ____ mg
Total Wt. Anal. ____ Date ____
Check Analyst ____ Date ____

Filter: ____
Tare Analyst ____ Date ____
Total Weight ____ mg
Total Weight ____ mg
Avg. Total Weight ____ mg
Tare Weight ____ mg
Tare Weight ____ mg
Avg. Tare Weight ____ mg
SAMPLE No. ____ SAMPLE WT. ____ mg
Total Wt. Anal. ____ Date ____
Check Analyst ____ Date ____

DATACHEM LABORATORIES
ANALYTE GROUP LIST
SEARCH STRING: 3025A1MET5

ANALYTE GROUP: 3025A1MET5 ACCOUNT: 03025 DESCRIPTION: Method 5 Particulate

Analyte	Instrument Class	Method	Sub Method	Report Units	Threshold	Lod	Loq
Particulate	GRAV	Method 5		mg/Rinsate			0.1
Particulate	GRAV	Method 5		mg/Filter			0.1
Particulate	GRAV	Method 5		mg/Impinger			0.1
Particulate	GRAV	Method 5		Total mg			0.1

--- END OF LISTING ---

DATACHEM LABORATORIES
ANALYTE GROUP LIST
SEARCH STRING: 3025A1UISO

ANALYTE GROUP: 3025A1UISO ACCOUNT: 03025 DESCRIPTION: Isotopic Uranium

Analyte	Instrument Class	Method	Sub Method	Report Units	Threshold	Lod	Loq
Uranium-233/234	AS	WR-DC-341	WR-DC-200	pCi/Sample			1.0
Uranium-235	AS	WR-DC-341	WR-DC-200	pCi/Sample			1.0
Uranium-238	AS	WR-DC-341	WR-DC-200	pCi/Sample			1.0

--- END OF LISTING ---

000122

8019

DATACHEM LABORATORIES
ANALYTE GROUP LIST
SEARCH STRING: 3025A1TISO

ANALYTE GROUP: 3025A1TISO ACCOUNT: 03025 DESCRIPTION: ISOTOPIC THORIUM

Analyte	Instrument Class	Method	Sub Method	Report Units	Threshold	Lod	Loq
Thorium-228	AS	WR-DC-341		pCi/Sample			1.0
Thorium-230	AS	WR-DC-341		pCi/Sample			1.0
Thorium-232	AS	WR-DC-341		pCi/Sample			1.0

--- END OF LISTING ---

DATACHEM LABORATORIES
ANALYTE GROUP LIST
SEARCH STRING: 3025A1GS

ANALYTE GROUP: 3025A1GS ACCOUNT: 03025 DESCRIPTION: Radium 226/228 by ga

Analyte	Instrument Class	Method	Sub Method	Report Units	Threshold	Lod	Loq
Radium-226	GS	WR-EP-325	WR-DC-200	pCi/Sample			95
Radium-228	GS	WR-EP-325	WR-DC-200	pCi/Sample			20

--- END OF LISTING ---

000121

DATACHEM LABORATORIES
ANALYTE GROUP LIST
SEARCH STRING: 3025A1TOTU

ANALYTE GROUP: 3025A1TOTU ACCOUNT: 03025 DESCRIPTION: Total Uranium by kPA

Analyte	Instrument Class	Method	Sub Method	Report Units	Threshold	Lod	Loq
Total Uranium	kPA	WR-DC-342		ug/Sample			0.8

--- END OF LISTING ---

August 6, 1996
Refer to: BD0021

Bruce Sarven
Hayden Environmental
561 Congress Park Drive
Dayton, OH 45459

Phone: (513) 438-3010
FAX: (513) 438-3020

Re: REVISED FAX Quote BD0021

Dear Mr. Sarven:

DataChem Laboratories, Inc.(DCL) appreciates the opportunity to provide you with cost estimates for your project. As I understand your needs, you will be taking three 6 hour stack samples and a blank by Method 5 for particulates and radionulclides analysis. Tared glass fiber filters and sample bottles will be provided for these determinations. The acetone rinse and glass fiber filter will be combined for the analysis of radionuclides.

Uranium 234, Uranium 235/236, Uranium 238, Thorium 228, Thorium 230, and Thorium 232 will be analyzed by alpha spectrometry(AS). Radium 226 and Radium 228 will be analyzed by gamma spectrometry(GS). Total Uranium will be analyzed by kinetic phosphorescence(KPA). According to method 114 these radionuclides will be part of the particulate loading and analysis on the impinger solutions is not required. Combined particulate from the acetone rinse and filter will be analyzed according to DCL standard operating procedures(SOP).

The standard turnaround time for these analysis is 30 calendar days. The requested turnaround time of 10 working days can be accomplished for an additional 25%. The requested detection limits for isotopic analysis can not be met. Minimun Detectable Activity (MDA) is listed on the attached table.

Attached is a Pricing Quotation for these analyses. If you have any question concerning the attached quotation please call me.

Sincerely,

Robert P. Di Rienzo
Project Manager

Revised Pricing Quotation
Project Reference Number: BD-0021

Parameter Analysis	Method	MDA pCi/Sample	Method	Fractions	Price per Sample
Particulate	Method 5		Grav	Acetone Rinse Filter Impinger	$100.00
Uranium 234 Uranium 235/236 Uranium 238	DCL SOP	1 1 1	AS	Particulate*	$312.50
Thorium 228 Thorium 230 Thorium 232	DCL SOP	1 1 1	AS	Particulate*	$312.50
Radium 226 Radium 228	DCL SOP	95 20	GS	Particulate*	$250.00
Total Uranium	DCL SOP	0.8 ug/ Sample	KPA	Particulate*	$187.50

* = Particulate samples are combined acetone rinse and glass fiber filter.

EMISSION MEASUREMENT TECHNICAL INFORMATION CENTER TEST METHOD

Method 5 - Determination of Particulate Emissions from Stationary Sources

1. PRINCIPLE AND APPLICABILITY

1.1 Principle. Particulate matter (PM) is withdrawn isokinetically from the source and collected on a glass fiber filter maintained at a temperature in the range of 120 ± 14°C (248 ± 25°F) or such other temperature as specified by an applicable subpart of the standards or approved by the Administrator, U.S. Environmental Protection Agency, for a particular application. The PM mass, which includes any material that condenses at or above the filtration temperature, is determined gravimetrically after removal of uncombined water.

1.2 Applicability. This method is applicable for the determination of PM emissions from stationary sources.

2. APPARATUS

2.1 Sampling Train. A schematic of the sampling train used in this method is shown in Figure 5-1. Complete construction details are given in APTD-0581 (Citation 2 in the Bibliography); commercial models of this train are also available. For changes from APTD-0581 and for allowable modifications of the train shown in Figure 5-1, see the following subsections.

The operating and maintenance procedures for the sampling train are described in APTD-0576 (Citation 3 in the Bibliography). Since correct usage is important in obtaining valid results, all users should read APTD-0576 and adopt the operating and maintenance procedures outlined in it, unless otherwise specified herein. The sampling train consists of the following components:

2.1.1 Probe Nozzle. Stainless steel (316) or glass with sharp, tapered leading edge. The angle of taper shall be ≤30°, and the taper shall be on the outside to preserve a constant internal diameter. The probe nozzle shall be of the button-hook or elbow design, unless otherwise specified by the Administrator. If made of stainless steel, the nozzle shall be constructed from seamless tubing; other materials of construction may be used, subject to the approval of the Administrator.

A range of nozzle sizes suitable for isokinetic sampling should be available, e.g., 0.32 to 1.27 cm (1/8 to 1/2 in.)—or larger if higher volume sampling trains are used—inside diameter (ID) nozzles in increments of 0.16 cm (1/16 in.). Each nozzle shall be calibrated according to the procedures outlined in Section 5.

directly from the wash bottle being used, and place it in a glass sample container labeled "acetone blank."

Inspect the train prior to and during disassembly, and note any abnormal conditions. Treat the samples as follows:

Container No. 1. Carefully remove the filter from the filter holder, and place it in its identified petri dish container. Use a pair of tweezers and/or clean disposable surgical gloves to handle the filter. If it is necessary to fold the filter, do so such that the PM cake is inside the fold. Carefully transfer to the petri dish any PM and/or filter fibers that adhere to the filter holder gasket, by using a dry Nylon bristle brush and/or a sharp-edged blade. Seal the container.

Container No. 2. Taking care to see that dust on the outside of the probe or other exterior surfaces does not get into the sample, quantitatively recover PM or any condensate from the probe nozzle, probe fitting, probe liner, and front half of the filter holder by washing these components with acetone and placing the wash in a glass container. Deionized distilled water may be used instead of acetone when approved by the Administrator and shall be used when specified by the Administrator; in these cases, save a water blank, and follow the Administrator's directions on analysis. Perform the acetone rinse as follows:

Carefully remove the probe nozzle, and clean the inside surface by rinsing with acetone from a wash bottle and brushing with a Nylon bristle brush. Brush until the acetone rinse shows no visible particles, after which make a final rinse of the inside surface with acetone.

Brush and rinse the inside parts of the Swagelok fitting with acetone in a similar way until no visible particles remain.

Rinse the probe liner with acetone by tilting and rotating the probe while squirting acetone into its upper end so that all inside surfaces will be wetted with acetone. Let the acetone drain from the lower end into the sample container. A funnel (glass or polyethylene) may be used to aid in transferring liquid washes to the container. Follow the acetone rinse with a probe brush. Hold the probe in an inclined position, squirt acetone into the upper end as the probe brush is being pushed with a twisting action through the probe; hold a sample container underneath the lower end of the probe, and catch any acetone and particulate matter that is brushed from the probe. Run the brush through the probe three times or more until no visible PM is carried out with the acetone or until none remains in the probe liner on visual inspection. With stainless steel or other metal probes, run the brush through in the above prescribed manner at least six times since metal probes have small crevices in which particulate matter can be entrapped.

Rinse the brush with acetone, and
quantitatively collect these washings in the sample container. After the brushing, make a final acetone rinse of the probe as described above.

It is recommended that two people clean the probe to minimize sample losses. Between sampling runs, keep brushes clean and protected from contamination.

After ensuring that all joints have been wiped clean of silicone grease, clean the inside of the front half of the filter holder by rubbing the surfaces with a Nylon bristle brush and rinsing with acetone. Rinse each surface three times or more if needed to remove visible particulate. Make a final rinse of the brush and filter holder. Carefully rinse out the glass cyclone, also (if applicable). After all acetone washings and particulate matter have been collected in the sample container, tighten the lid on the sample container so that acetone will not leak out when it is shipped to the laboratory. Mark the height of the fluid level to determine whether leakage occurred during transport. Label the container to identify clearly its contents.

Container No. 3. Note the color of the indicating silica gel to determine whether it has been completely spent, and make a notation of its condition. Transfer the silica gel from the fourth impinger to its original container, and seal. A funnel may make it easier to pour the silica gel without spilling. A rubber policeman may be used as an aid in removing the silica gel from the impinger. It is not necessary to remove the small amount of dust particles that may adhere to the impinger wall and are difficult to remove. Since the gain in weight is to be used for moisture calculations, do not use any water or other liquids to transfer the silica gel. If a balance is available in the field, follow the procedure for Container No. 3 in Section 4.3.

Impinger Water. Treat the impingers as follows: Make a notation of any color or film in the liquid catch. Measure the liquid that is in the first three impingers to within l ml by using a graduated cylinder or by weighing it to within 0.5 g by using a balance (if one is available). Record the volume or weight of liquid present. This information is required to calculate the moisture content of the effluent gas.

Discard the liquid after measuring and recording the volume or weight, unless analysis of the impinger catch is required (see **NOTE**, Section 2.l.7).

If a different type of condenser is used, measure the amount of moisture condensed either volumetrically or gravimetrically.

Whenever possible, containers should be shipped in such a way that they remain upright at all times.

4.3 Analysis. Record the data required on a sheet such as the one shown in Figure 5-3. Handle each sample container as follows:

Container No. 1. Leave the contents in the shipping container or transfer the filter and any loose PM from the sample container to a tared glass weighing dish. Desiccate for 24 hours in a desiccator containing anhydrous calcium sulfate. Weigh to a constant weight, and report the results to the nearest
0.1 mg. For purposes of this Section, 4.3, the term "constant weight" means a difference of no more than 0.5 mg or 1 percent of total weight less tare weight, whichever is greater, between two consecutive weighings, with no less than 6 hours of desiccation time between weighings.

Alternatively, the sample may be oven dried at 105°C (220°F) for 2 to 3 hours, cooled in the desiccator, and weighed to a constant weight, unless otherwise specified by the Administrator. The tester may also opt to oven dry the sample at 105°C (220°F) for 2 to 3 hours, weigh the sample, and use this weight as a final weight.

Container No. 2. Note the level of liquid in the container, and confirm on the analysis sheet whether leakage occurred during transport. If a noticeable amount of leakage has occurred, either void the sample or use methods, subject to the approval of the Administrator, to correct the final results. Measure the liquid in this container either volumetrically to ±1 ml or gravimetrically to ±0.5 g. Transfer the contents to a tared 250-ml beaker, and evaporate to dryness at ambient temperature and pressure. Desiccate for 24 hours, and weigh to a constant weight. Report the results to the nearest 0.1 mg.

Container No. 3. Weigh the spent silica gel (or silica gel plus impinger) to the nearest 0.5 g using a balance. This step may be conducted in the field.

"Acetone Blank" Container. Measure the acetone in this container either volumetrically or gravimetrically. Transfer the acetone to a tared 250-ml beaker, and evaporate to dryness at ambient temperature and pressure. Desiccate for 24 hours, and weigh to a constant weight. Report the results to the nearest 0.1 mg.

NOTE: At the option of the tester, the contents of Container No. 2 as well as the acetone blank container may be evaporated at temperatures higher than ambient. If evaporation is done at an elevated temperature, the temperature must be below the boiling point of the solvent; also, to prevent "bumping," the evaporation process must be closely supervised, and the contents of the beaker must be swirled occasionally to maintain an even temperature. Use extreme care, as acetone is highly flammable and has a low flash point.

4.4 Quality Control Procedures. The following quality control procedures are

suggested to check the volume metering system calibration values at the field test site prior to sample collection. These procedures are optional for the tester.

4.4.1 Meter Orifice Check. Using the calibration data obtained during the calibration procedure described in Section 5.3, determine the $\Delta H_@$ for the metering system orifice. The $\Delta H_@$ is the orifice pressure differential in units of in. H_20 that correlates to 0.75 cfm of air at 528°R and 29.92 in. Hg. The
$\Delta H_@$ is calculated as follows:

$$\Delta H_@ = 0.0319\, \Delta H \frac{T_m\, \theta^2}{P_{bar}\, Y^2\, V_m^2}$$

where:

ΔH = Average pressure differential across the orifice meter, in. H_20.

T_m = Absolute average DGM temperature, °R.

P_{bar} = Barometric pressure, in. Hg.

θ = Total sampling time, min.

Y = DGM calibration factor, dimensionless.

V_m = Volume of gas sample as measured by DGM, dcf.

0.0319 = (0.0567 in. Hg/°R)(0.75 cfm)^2

Before beginning the field test (a set of three runs usually constitutes a field test), operate the metering system (i.e., pump, volume meter, and orifice) at the $\Delta H_@$ pressure differential for 10 minutes. Record the volume collected, the DGM temperature, and the barometric pressure. Calculate a DGM calibration check value, Y_c, as follows:

$$Y_c = \frac{10\,[0.0319\, T_m]^{1/2}}{V_m\, P_{bar}}$$

where:

Y_c = DGM calibration check value, dimensionless.

DATA CHEM LABORATORIES
A SOREASON COMPANY

Analytical Documentation
Inventory Checklist

- [N/A] This is a "dummy datapackage". Data for inventory checklist found with set _____
- [N/A] Copy of TCLP Preparation Logbook Pages
- [X] Copy of Sample Preparation Notebook/Logbook Pages
- [X] Copy of Analyst's Notebook/Method Logbook Pages
- [X] Copy of Instrument Injection Logbook/Instrument Logbook/Run Log Pages
- [N/A] Copy of Reagent Logbook Pages
- [X] Copy of Working Standard Preparation Logbook Pages
- [X] Copy of Secondary or Intermediate Standard Preparation Logbook Pages
- [X] Copy of Primary Standard or Concentrated Stock Standard Preparation Logbook Pages
- [X] Certificates of Analysis for Standards
- [X] Copy of Standard Verification Logbook Pages (including documentation for spiking solutions and/or calibration standards)
- [N/A] Copy of Preparation Logbooks for solutions prepared by QC

All other miscellaneous documentation associated with this set (describe)

- [N/A] _____

Analytical Documentation
Reviewer Checklist

- X The Analytical Documentation Inventory Checklist above is complete.
- X Basic documentation procedures were followed in accordance with DCL SOP XX-DC-004 "Analytical Data Record Keeping."
- X All notebook and logbook pages contain page number, book number, title, and available space for pagination (if required).
- X All notebook and logbook pages were signed and dated by the analyst and reviewer before copying.
- X All copies are legible.
- X Standard preparation is documented in accordance with DCL SOP XX-DC-019 "Standards Purity, Preparation, Traceability and Verification" or by WR-DC-001 "The Acquisition, Preparation, and use of Radioactive Standard Reference Materials."
- X Documentation is provided to verify that standard calibration solutions and spiking solutions are traceable to a vendor certificate.

Assembled by: [signature] 10/24/96 (Signature, Date) Reviewed by: [signature] 10/24/96 (Signature, Date)

Rev. 6/95

TITLE Hayden Environmental Sample Digestion Book No. 31000

From Page No.

8019

Client	Account No.	Set No.	Sample Nos.	Matrix	Balance ID
Hayden Enviro.	3025	96E-0640 *	96E04514-4517	AIR/FILTER	102695

Filters and acetone rinse were combined after acetor was dryed. Samples were placed in metal based teflon beakers and dissolved i 6 mL of HF (hydrofluoric acid) and then taken to near dryness to expell all of the HF. The samples were then transferred t tared P.M.P. jars and brought up to approximately 100.0 g, using 1 M HNO_3 (nitric acid).

Sample Number	Final Mass in Tared PMP.
96E04514	100.0 g
96E04515	106.4 g
96E04516	100.1 g
96E04517	100.1 g

T.P. 10-8-96

To Page N

Witnessed & Understood by me,	Date	Invented by	Date
Bradley J. Richardson	10-21-96	Recorded by Ty E. Peterson	10/8/96

000135

Determination of Selected Actinides by Ion Exchange

Client NA Acct No. 3025 Set No. 96E-0640-05 Matrix Air (Filter)

Requested Analysis: Am__ Cf__ Cm__ Np__ Pu__ Th__ U Total ✓

8019

LCS ID: QC-123241-1 Pipet ID: Eppe 10

Prep Group ID: G969K00V Balance ID 102695

*Activity(pCi) = Conc(pCi/g) * Mass(g)*
or
*Activity(pCi) = Conc(pCi/mL) * Volume(mL)*

Standard Control ID	Conc. (pCi/g or ml)	Aliquot (g or ml)	Activity (pCi)
WSL 3/23 (U238)	60.62 pCi/g	0.1 ml = .09735 g	5.90136
	BR 10-18-96		

Tracer ID	Conc. (pCi/g or ml)	Aliquot (g or ml)	Activity (pCi)
~~WSL 3/55 (U232~~ BR 10-18-96			
		BR 10-18-96	

VESSEL#	SAMPLE#	WEIGHT (g)	VESSEL#	SAMPLE#	WEIGHT (g)
1	BL-123241-1	Reagent	13		
2	QC-123241-1	Reagent	14		
3	96E04514	5.229 g	15		
4	96E04515	5.059 g	16		
5	96E04516	5.032 g	17		
6	96E04517	5.024 g	18		
7			19		BR 10-18-96
8			20		
9		BR 10-18-96	21		
10			22		
11			23		
12			24		

Comments:

*N/A = Not Applicable

000136

Recorded by: Bradley Richardson Date: 10-18-96 Reviewed by: [illegible] Date: 10/22/96

Book No. 4037 Page No. 151

Total Uranium by Kinetic Pulsed Laser Phosphorimetry

Client N/A Acct No. 3025 Instrument 102875

Sample Matrix Filter Set No. 96E-0640-05 Prep. Group ID G969K00V

Date of Last Calibration 10/22/96 Calibration Standard ID ~~WSL~~ 10/22/96 ISL 2/39

Balance ID N/A Blank No(s). BL-123241-1

LCS No(s). QC-123241-1 MD No(s). 96E04514MD

MS No(s). N/A MSD No(s). N/A

LCS Solution ID WSL 3/23 Amount 0.09735 Pipet Used: EPPE10

Spiking Solution ID N/A Amount N/A Pipet Used: N/A

*N/A=Not Applicable

SAMPLE#	FINAL RESULT	Dilutions	SAMPLE#	FINAL RESULT
BL-123241-1	4.7 E-3	100		
QC-123241-1	1.7E1			
96E04514	2.1E0			
~~96E04514MD~~ WSL 10/22/96	N/A			
96E04515	3.4E0			
96E04516	5.4E2			
96E04517	2.8E-1			

Comments: N/A

Recorded by: [signature] Date: 10/22/96 Reviewed by: [signature] Date: 10/24/96

KPA Run Log

Book Number 4072

Instrument ID KPA-11

Date	Analyst	Mode	Sample ID
5/16/96	[illegible]	Manual	*Calibrated 96C-0065-04, 96C-0066-04, 96C-0067-04
5/29/96	[illegible]	Manual	*Calibrated 96C-0205-04
6/10/96	[illegible]	Manual	*Calibrated 96M-0158-04, 96C-0144-04, 96M-0158-02
6/26/96	[illegible]	Manual	*Calibrated 96M-0175-05
7/10/96	[illegible]	Manual	*Calibrated 96M-0191-01, 96M-0191-03
8/7/96	[illegible]	Manual	*Calibrated 96C-0355-01, 96M-0211-01, 96M-0211-01
8/29/96	[illegible]	Manual	*Calibrated 96M-0213-28
9/10/96	[illegible]	Manual	*Calibrated 96M-0248-01, 96M-0248-02
10/10/96	[illegible]	Manual	*Calibrated 96M-0298-01, 96M-0298-03, 96C-0485-06
10/15/96	[illegible]	Manual	*Calibrated 96M-0306-02
10/22/96	[illegible]	Manual	*Calibrated 96C-0517-01, 96E-0640-05

[illegible]

OCT 24 1996

Reviewed By: _____
Signature & Date

From Page # 95

RADIOCHEMISTRY LABORATORY
RADIOACTIVE MATERIAL INVENTORY
WORKING STANDARD LOG

8019

Working Standard ID: WSL 3/23 U 238 Intermediate Standard ID: ISL 2/39

Reference Date/Time*: Oct 1993 0500 RMI Source Log Ref. Book/Page: 2/10

*Use Julian date and military time

DCL Balance ID No.:_____

Date	Inits.	Solvent	Activity (pCi)†	Final Volume	Conc. (pCi/g)†	Witness
11-16-94	T.P. for D.R.	2M HNO_3	6061.5	100.008 g	60.615 pCi/g	T.P. for R.L.

Usage:

	Date	Inits.	Aliquot	Activity (pCi)†	Balance (pCi)†	Destination
1.	10-7-96	T.P.	.1054 g	6.3888	2647.3088	96M-0286-14 96M-0300-08 96M-0290-08 96M-0297-14 LCS
2.	10-9-96	BR	BR 10-9-96 ~~.1054 g~~ .09764 ml	5.9009	2641.4079	96M-0303-08 96M-0304-08 LCS
3.	10-10-96	WM	0.01485 ~~0.00495~~	0.9001 ~~0.3000~~	2640.5078 ~~2641.1079~~ WM 10/10/96	QC,MS 96M-0298-01, 96M-0306-02
4.	10-9-96	T.P.	.2108 g	12.7776	2627.7302 T.P.	G9697-03J G9697-03H 10-10-96 T.P. ~~TRACER~~ LCS (1)(2)
5.	~~10-11-96~~	~~BR~~	BR 10-11-96			
6.	10-15-96	BR	.1947 g	11.8027	2615.9275	96C-0439-12 96C-0443-12 LCS
7.	10-16-96	BR	.09735 g	5.9014	2610.0261	96E-0654-02 LCS
8.	10-17-96	BR	.09735 g	5.9014	2604.1247	96M-0250-01 96M-0323-05 LCS
9.	10-18-96	BR	.09735 g	5.9014	2598.2233	96E-0640-02 LCS
10.	10-18-96	BR	.09735 g	5.9014	2592.3219	96E-0640-05 LCS
11.						
12.						
13.						
14.						
15.						
16.						
17.						
18.						

† All activities are referenced to the source date/time. Decay corrections are to be made on the following page.

To Page:_____

RADIOCHEMISTRY LABORATORY
RADIOACTIVE MATERIAL INVENTORY
INTERMEDIATE STANDARD LOG

8019

Intermediate Standard ID: ISL 2/39 (U238) Standard Source ID: 1848-2

Reference Date/Time*: Oct '93/0500 RMI Source Log Ref. Book/Page: 2/10

*Use Julian date and military time

DCL Balance ID No.: B 310P, 102695

Date	Inits.	Solvent	Activity (pCi)†	Final Weight	Conc. (pCi/g)†	Witness
11/16/94	DR	2 M HNO_3	12122.768	99.994 g	121.23	[illegible]

Usage:

	Date	Inits.	Aliquot	Activity (pCi)†	Balance (pCi)†	Destination
1.	11/16/94	DR	50 g	6061.5	6061.268	WSL 3/23
2.						
3.						
4.						
5.						
6.						
7.						
8.						
9.						
10.						
11.						
12.						
13.						
14.						
15.						
16.						
17.						
18.						

† All activities are referenced to the source date/time. Decay corrections are to be made on the following page.

To Page:_____

RADIOCHEMISTRY LABORATORY
RADIOACTIVE MATERIAL INVENTORY
STANDARD SOURCE LOG

8019

Vendor: US EPA Vendor Source ID: 1843-2

Date Received: 11-22-93 Received By: CC WALKER

CAUTION
RADIOACTIVE MATERIAL
SOL# 1843-2 WT. 5.0g
AMT. 2380 nanocuries/g
ISOTOPE U-238
DATE Oct. 93 0400PST
ENVIRONMENTAL MONITORING SYSTEMS LABORATORY—LAS VEGAS

Place Source Label Above

Source Reference Date/Time*: OCT. '93/0500 Solvent: 0.5M HNO3

ISOTOPE(S)	CONC. (pCi/g)	ISOTOPE(S)	CONC. (pCi/g)
U-238	2380		

*Use Julian date and military time

Usage:

DCL Balance ID No.: DCL #102683

Date	Inits.	Aliquot	Activity (pCi)	Balance (pCi)	Destination	Witness
~~7.5.94~~	~~CCW~~	~~5.0936 g.~~				
11/16/94	OR	5.0936 g.	12122.768	Ø	ISL 2/39	OR

Lec. 11 -
OEW
(J)

8019

U.S. Environmental Protection Agency
Environmental Monitoring Systems Laboratory-Las Vegas
Nuclear Radiation Assessment Division

Calibration Certificate

Description

Principal radionuclide: Uranium-238 Half-life: 4.47×10^9 years

Nominal activity: 11.9 nanocuries

Nominal volume: 5.0 ml in ampoule/bottle number 1843-2

Measurement Activity of principal radionuclide

Activity per gram of this solution

2.38 nanocuries of Uranium-238

October 1993

*Accompanied by 0.11 nanoCuries of Uranium-235 per gram of solution.

Activity of daughter radionuclide

The principal activity was accompanied at the quoted time by

2.38 nanocuries Per gram

of the daughter nuclides Th-234, Pa-234, U-234 assuming secular equilibrium.

Total mass of this solution

Approximately 5.0 grams

Method of measurement

The solution was prepared gravimetrically by dissolving a weighed quantity of the National Bureau of Standards' SRM 950b (99.97±0.02 percent Uranium Oxide (U_3O_8)) in nitric acid and diluting to a known weight. Natural uranium was assumed to consist of 99.28 percent U-238 and 0.711 percent U-235 by weight with specific activities of 3.36×10^2 and 2.16×10^3 nanoCuries per gram respectively. The solution was compared to an earlier preparation (1843-1), which was traced to the National Institute of Standards and Technology (NIST), using liquid scintillation counting.

Useful Life

This radionuclide has decayed through [ ] half lives since it was obtained by EMSL-LV

We recommend that this solution should not be used after INDEFINITE

Purity

The manufacturer states that activities other than that of the principal nuclide and of its daughter nuclides, if any, were estimated/known to be:

(1) Radium-226	less than	0.6 %	of the principal activity
(2)	less than equal to	%	of the principal activity
(3)	less than equal to	%	of the principal activity

The activity of impurity (1) is not (2) is not (3) is not included in the quoted figures of the principal activity.

Random Errors

The precision of this standard was such that the certified value of the radioactive concentration of the principal activity had a standard error (sm) not greater than ± 0.5 %
(The 99.7% confidence limits are given by t(sm) where t is obtained from the student t factor for the degree of freedom (n-1)).

The maximum uncertainty due to the assessable systematic errors (dilution, counting, and known uncertainty of the standard) is obtained by the separate arithmetic summation of the positive and negative systematic error ($+\delta - \delta'$). These have been estimated not to exceed

+2.5 % or - 2.5 %

the overall uncertainty (often called accuracy) is an estimate of the possible divergence of the quoted result from the true value. It is a combination of random error [t(sm)] at the 99.7% confidence limits and the worst case estimate of the systematic errors ($+\delta, -\delta'$)
The overall uncertainty is therefore calculated on the basis of + [t(sm) $+\delta$], - [t(sm) $+\delta'$]
and is + 4.0 %, - 4.0 % of the quoted radioactive concentration.

Decay Schemes

This standardization is based on the following assumptions of the principle nuclide, its daughter nuclides and impurities (no allowance for error in these assumptions or the assumption of quoted half-life have been included in the statement of accuracy above).

Uranium-238 decays by alpha emission to Thorium-234 which decays by two successive beta emissions to Uranium-234. Uranium-234 is assumed to be in secular equilibrium with Uranium-238.

Chemical Composition of Solution

Carrier content per gram of solution:

Other components:
0.5M nitric acid

Preservative:

Remarks

The uranium concentration of the solution is 7.12 milligrams/gram.

Date Certificate Prepared October 27, 1993

Approval Signature Paul B. Wahn

Revised 1/84

DATA CHEM LABORATORIES
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Raw Data
Radiochemistry/Mixed-Waste Department
Kinetic Phosphorescence Analysis
Inventory Checklist

- [x] Section 1. Sample and QC Data
- [x] Section 2. Instrument Performance and Calibration Data

The following signatures verify that the raw data and all inventory and reviewer checklists in each raw data section (all green sheets) are complete and accurate.

Assembled by: _____ Signature 10/24/96 Date Reviewed by: _____ Signature 10/24/96 Date

Rev. 3/95

Section 1. Sample and QC Data
Kinetic Phosphorescence Analysis
Inventory Checklist

- [X] Laboratory Control Sample (LCS) Instrument Print-Out
- [X] Blank Instrument Print-Out
- [X] Accuracy Sample (MS) Instrument Print-Out
- [X] Precision Sample (MSD/MD) Instrument Print-Out
- [X] Field Sample Instrument Print-Outs
- [X] Computer/Manual Calculation Sheets summarizing all calculational inputs and results

Section 1. Sample and QC Data
Kinetic Phosphorescence Analysis
Reviewer Checklist

X The Sample and QC Data Inventory Checklist above is complete.

X All appropriate QC for the project was performed.

X All appropriate QC data met acceptance criteria. Unacceptable QC data were documented, and justifications were provided for data used.

X Print-outs are initialed and dated.

Sample ID BL-123241-1 Date/Time 10/22/96/00:41:45
Description G969K00V,96E-0640-05 Cal Y=1.08E+07X+2312.449
Ref. Ratio 1.068 Intensity 2067 (t= 52 us)
Laser Pulses 1000 Conc 4.74E-05 + 9.66E-07 ug/
Lifetime 224 + .979 us Dilution Factor 100 mL/mL
R2 .9992
Integrated 34465 FINAL RESULT 4.74E-03 + 9.66E-05 ug/
Record 3460 of 3481 Range: LOW

Sample ID QC-123241-1 Date/Time 10/22/96/00:45:07
Description G969K00V,96E-0640-05 Cal Y=1.66E+05X-1.71E+02
Ref. Ratio 1.034 Intensity 21740 (t= 52 us)
Laser Pulses 1000 Conc .17126 + 5.33E-03 ug/
Lifetime 248 + .399 us Dilution Factor 100 mL/mL
R2 .9999
Integrated 384444 FINAL RESULT 17.126 + .533 ug/
Record 3461 of 3481 Range: HIGH

Sample ID 96E04514 Date/Time 10/22/96/00:49:18
Description G969K00V,96E-0640-05 Cal Y=1.08E+07X+2312.449
Ref. Ratio 1.062 Intensity 11118 (t= 52 us)
Laser Pulses 1000 Conc 1.11E-03 + 2.14E-05 ug/
Lifetime 243 + .594 us Dilution Factor 100 mL/mL
R2 .9998
Integrated 189712 FINAL RESULT .111 + 2.14E-03 ug/
Record 3462 of 3481 Range: LOW

Sample ID 96E04514MD Date/Time 10/22/96/00:52:01
Description G969K00V,96E-0640-05 Cal Y=1.08E+07X+2312.449
Ref. Ratio 1.085 Intensity 10851 (t= 52 us)
Laser Pulses 1000 Conc 1.10E-03 + 2.11E-05 ug/
Lifetime 239 + .474 us Dilution Factor 100 mL/mL
R2 .9998
Integrated 185991 FINAL RESULT .11 + 2.11E-03 ug/
Record 3463 of 3481 Range: LOW

Sample ID 96E04515 Date/Time 10/22/96/00:57:22
Description G969K00V,96E-0640-05 Cal Y=1.08E+07X+2312.449
Ref. Ratio 1.138 Intensity 14917 (t= 52 us)
Laser Pulses 1000 Conc 1.57E-03 + 3.06E-05 ug/
Lifetime 236 + .65 us Dilution Factor 100 mL/mL
R2 .9997
Integrated 249946 FINAL RESULT .157 + 3.06E-03 ug/
Record 3466 of 3481 Range: LOW

Sample ID 96E04516 Date/Time 10/22/96/01:00:47
Description G969K00V,96E-0640-05 Cal Y=1.66E+05X-1.71E+02
Ref. Ratio 1.095 Intensity 33560 (t= 52 us)
Laser Pulses 1000 Conc .26759 + 8.35E-03 ug/
Lifetime 240 + .493 us Dilution Factor 100 mL/mL
R2 .9998
Integrated 582618 FINAL RESULT 26.759 + .835 ug/
Record 3468 of 3481 Range: HIGH

OCT 24 1996

8019

Sample ID 96E04517
Description G969K00V,96E-0640-05
Ref. Ratio 1.083
Laser Pulses 1000
Lifetime 302 + 2.266 us
R2 .9976
Integrated 62463
Record 3469 of 3481

Date/Time 10/22/96/01:03:11
Cal Y=1.08E+07X+2312.449
Intensity 3289 (t= 52 us)
Conc 1.38E-04 + 2.94E-06 ug/
Dilution Factor 100 mL/mL

FINAL RESULT 1.38E-02 + 2.94E-04 ug/

Range: LOW

WPS

OCT 24 1996

Section 2. Instrument Performance and Calibration Data
Kinetic Phosphorescence Analysis
Inventory Checklist

- [x] Analyst Initials
- [x] Instrument ID, Manufacturer, and Model Number
- [x] Certification of Calibration Standards
- [x] Calibration Date
- [x] Background Report
- [x] Calibration Report with High and Low Calibration Curves
- [x] Results of Calibration Check

Section 2. Instrument Performance and Calibration Data
Kinetic Phosphorescence Analysis
Reviewer Checklist

X The Instrument Performance and Calibration Data Inventory Checklist above is complete.

X Specified analytical protocols are followed for particular contract requirements.

X Conditions of instrument setup are noted.

NA NCR(s) noted, and affected instruments not used.

KPA Calibration/Maintenance Log

Book Number 4071

Date	Analyst	Instrument ID	Comments
5/16/96	WPS	102875 KPA-11	Full Calibration High Range 98% Low Range 101%
5/29/96	WPS	102875 KPA-11	Full Calibration High Range 100% Low Range 99%
6/10/96	WPS	102875 KPA-11	Full Calibration High Range 101% Low Range 99%
6/26/96	WPS	102875 KPA-11	Full Calibration High Range 101% Low Range 98%
7/10/96	WPS	102875 KPA-11	Full Calibration High Range 101% Low Range 100%
8/7/96	WPS	102875 KPA-11	Full Calibration High Range 99% Low Range 100%
8/29/96	WPS	102875 KPA-11	Full Calibration Low Range 100% High Range 100%
9/10/96	WPS	102875 KPA-11	Full Calibration Low Range 101% High Range 101%
10/10/96	WPS	102875 KPA-11	Full Calibration Low Range 99% High Range 100%
10/15/96	WPS	102875 KPA-11	Full Calibration Low Range 105% High Range 97%
10/22/96	WPS	102875 KPA-11	Full Calibration Low Range 101% High Range 100%

WPS

OCT 24 1996

Reviewed By: _____
Signature & Date

[redacted]

From Page No.

8019

Intermediate Standard: ISL 2/39 (U238) Conc.: 121.23 pCi/g
Amount Used: 0.426g

$0.426g \times 121.23\ pCi/g^{(U238)} = 51.64\ pCi \times \frac{1\ ug}{0.3363\ pCi} = 153.565\ ug\ (U238)$

153.565 ug brought to 100 mL volume = 1.5356 ug/mL (U238)

Calibration standards were prepared from the 1.5356 ug/mL concentration

Calibration standards are prepared in 100 mL of 2M HNO_3

Calibration standards concentrations were calculated as follows

Volume of 1.5356 ug/mL concentration = V_1 (mL)
Volume diluted standard = V_2 = 100 mL
Concentration 1.5356 ug/mL = C_1 (ug/mL)
Concentration of final calibration standard = C_2 (ug/mL)

$$V_1 C_1 = V_2 C_2$$

Volume V_1 (mL)		Cal. Standard Concentration C_2 (ug/mL)
0.005		0.0000768
0.025		0.000384
0.1		0.00154
0.2		0.00307
0.4		0.00614
0.85		0.0131
1.7		0.0261
3.5		0.0537
7		0.107
14		0.215

Jane Reddick 3/7/96 [signature] 3/7/96

8019

RADIOCHEMISTRY LABORATORY
RADIOACTIVE MATERIAL INVENTORY
INTERMEDIATE STANDARD LOG

Intermediate Standard ID: ISL 2/39 (U238) Standard Source ID: 1843-2

Reference Date/Time*: Oct '93/0500 RMI Source Log Ref. Book/Page: 2/10

*Use Julian date and military time

DCL Balance ID No.: B 310P, 102695

Date	Inits.	Solvent	Activity (pCi)†	Final Weight	Conc. (pCi/g)†	Witness
11/16/94	DR	2 M HNO_3	12122.768	99.994 g	121.23	[illegible]

Usage:

	Date	Inits.	Aliquot	Activity (pCi)†	Balance (pCi)†	Destination
1.	11/16/94	DR	50 g	6061.5	6061.268	WSL 3/23
2.	3/5/96	[illegible]	0.4951 g	60.021	6001.247	STANDARDS Verification for KPA Cal Standards
3.	3/7/96	[illegible]	0.426 g	51.644	5949.603	New Calibration standards for KPA
4.						
5.						
6.						
7.						
8.						
9.						
10.						
11.						
12.						
13.						
14.						
15.						
16.						
17.						
18.						

† All activities are referenced to the source date/time. Decay corrections are to be made on the following page.

To Page:_____

CCW
(2)

8019

U.S. Environmental Protection Agency
Environmental Monitoring Systems Laboratory-Las Vegas
Nuclear Radiation Assessment Division

Calibration Certificate

Description

Principal radionuclide: Uranium-238 Half-life: 4.47×10^9 years

Nominal activity: 11.9 nano curies

Nominal volume: 5.0 ml in ampoule/bottle number 1843-2

Measurement Activity of principal radionuclide

Activity per gram of this solution

2.38 nanocuries of Uranium-238

October 1993

*Accompanied by 0.11 nanoCuries of Uranium-235 per gram of solution.

Activity of daughter radionuclide

The principal activity was accompanied at the quoted time by

2.38 nano curies Per gram

of the daughter nuclides Th-234, Pa-234, U-234 assuming secular equilibrium.

Total mass of this solution

Approximately 5.0 grams

Method of measurement

The solution was prepared gravimetrically by dissolving a weighed quantity of the National Bureau of Standards' SRM 950b (99.97±0.02 percent Uranium Oxide (U_3O_8)) in nitric acid and diluting to a known weight. Natural uranium was assumed to consist of 99.28 percent U-238 and 0.711 percent U-235 by weight with specific activities of 3.36×10^2 and 2.16×10^3 nanoCuries per gram respectively. The solution was compared to an earlier preparation (1843-1), which was traced to the National Institute of Standards and Technology (NIST), using liquid scintillation counting.

Useful Life

This radionuclide has decayed through [ ] half lives since it was obtained by EMSL-LV

We recommend that this solution should not be used after INDEFINITE

Purity

The manufacturer states that activities other than that of the principal nuclide and of its daughter nuclides, if any, were estimated/known to be:

(1) Radium-226	less than	0.6 %	of the principal activity
(2)	less than equal to	%	of the principal activity
(3)	less than equal to	%	of the principal activity

The activity of impurity (1) is not (2) is not (3) is not included in the quoted figures of the principal activity.

Random Errors

The precision of this standard was such that the certified value of the radioactive concentration of the principal activity had a standard error (sm) not greater than ± 0.5 %
(The 99.7% confidence limits are given by t(sm) where t is obtained from the student t factor for the degree of freedom (n-1)).

The maximum uncertainty due to the assessable systematic errors (dilution, counting, and known uncertainty of the standard) is obtained by the separate arithmetic summation of the positive and negative systematic error ($+\delta - \delta'$). These have been estimated not to exceed

+2.5 % or - 2.5 %

the overall uncertainty (often called accuracy) is an estimate of the possible divergence of the quoted result from the true value. It is a combination of random error [t(sm)] at the 99.7% confidence limits and the worst case estimate of the systematic errors ($+\delta, -\delta'$)
The overall uncertainty is therefore calculated on the basis of + [t(sm) $+\delta$], - [t(sm) $+\delta'$]
and is + 4.0 %. - 4.0 % of the quoted radioactive concentration.

Decay Schemes

This standardization is based on the following assumptions of the principle nuclide, its daughter nuclides and impurities (no allowance for error in these assumptions or the assumption of quoted half-life have been included in the statement of accuracy above).

Uranium-238 decays by alpha emission to Thorium-234 which decays by two successive beta emissions to Uranium-234. Uranium-234 is assumed to be in secular equilibrium with Uranium-238.

Chemical Composition of Solution

Carrier content per gram of solution:

Other components:
0.5M nitric acid

Preservative:

Remarks

The uranium concentration of the solution is 7.12 milligrams/gram.

Date Certificate Prepared October 27, 1993

Approval Signature Paul B. Wahn

Revised 1/84

NOTES

(1) Individual uncertainties have the significance of one standard deviation of the mean, or an approximation thereof. The combined uncertainty is the individual uncertainties shown below added in quadrature. The overall uncertainty is taken to be three times the combined uncertainty.

Source of uncertainty	Uncertainty (%)
a) liquid-scintillation measurements	0.12
b) gravimetric measurements	0.05
c) deadtime	0.05
d) background	0.10
e) original calibration of SRM 4321	0.13
f) count-rate-vs-energy extrapolation to zero energy	0.11
g) half life	0.00
h) photon-emitting impurities	0.43
Combined uncertainty	0.49
	* 3
Overall uncertainty	1.47

(2) Overall uncertainty reported by EMSL.

(3) The limit of detection for photon-emitting impurities is 0.01 $\gamma s^{-1} g^{-1}$ for energies between 90 and 1900 keV, provided that the impurity photons are separated in energy by 5 keV or more from photons emitted in the decay of uranium-235 and uranium-238 and progeny.

(4) The limit of detection for ^{226}Ra is less than 0.24 Bq g^{-1}.

(5) Proposed Recommended List of Heavy Element Radionuclide Decay Data, INDC(NDS)-149/NE; International Atomic Energy Agency, December 1983.

(6) This result demonstrates the traceability of EMSL to NBS, for this measurement, to within five percent as specified in the appendix, Traceability Studies, of the EPA-NBS interagency agreement of April 1976, as amended.

For further information call Larry Lucas at (301) 975-5546 or FTS 879-5546.

$$A = \lambda N \qquad \lambda = \frac{-\ln(0.5)}{T_{1/2}}$$

$$\frac{\text{Wt of U-238}}{\text{g soln}} = \frac{(N)\,(AW)}{Ao} = \frac{(A)\,(AW)}{(\lambda)\,(Ao)} = \frac{(A)\,(AW)\,(T_{1/2})}{-\ln(0.5)\,(Ao)}$$

$$\frac{(40.05)\,(238\ g)\,(4.468\ E09\ yr)\,(3.154E07\ sec/yr)}{(sec*g)\ (mol)\ (-\ln(0.5))\ (6.023E23/mol)} = \frac{(3.22\ E\text{-}03\ g)}{g\ soln}$$

$$= \frac{3.22\ mg\ U\text{-}238}{g\ soln} * \frac{1}{0.9928} = \frac{3.24\ mg\ U\ nat}{g\ soln}$$

A = Activity (sec^{-1})

λ = Decay constant (sec^{-1})

$T_{1/2}$ = Halflife (sec)

N = Number of atoms

AW = Atomic weight

Ao = Avogadro's number ($mols^{-1}$)

Calibration

Range: LOW
Background Measured Intensity 883

Concentration	Intercept	Uncert.	% Disc.	Intensity	Lifetime	R2
+ 7.68E-05 ug/	2002.11	44.75	-3.63E+01	1818	353.5607	.9933
+ 3.84E-04 ug/	5601.12	74.84	-1.33E+01	4054	220.0613	.9993
+ 1.54E-03 ug/	1.87E+04	136.8	-1.20E+00	15205	326.9717	.9999
+ 3.07E-03 ug/	3.56E+04	188.56	0.26	28693	290.33	.9997
+ 6.14E-03 ug/	7.26E+04	269.38	5.75	60091	323.5809	1
+ 1.31E-02 ug/	1.42E+05	376.78	-1.26E+00	116637	330.7232	1

Zero Point NOT Included. Y=1.08E+07X +2312.449

Calibration

Range: HIGH
Background Measured Intensity 6

Concentration	Intercept	Uncert.	% Disc.	Intensity	Lifetime	R2
+ 1.31E-02 ug/	2193.3	46.83	9.28	1769	315.014	.9996
+ 2.61E-02 ug/	4347.59	65.94	4.28	3575	310.1283	.9996
+ 5.37E-02 ug/	8360.9	91.44	-4.54E+00	6516	295.2348	.9996
+ .107 ug/	1.76E+04	132.5	-3.74E-01	14367	301.2404	.9998
+ .215 ug/	3.57E+04	188.9	0.28	28585	294.9246	.9999

Zero Point NOT Included. Y=1.66E+05X -1.71E+02

WPS

OCT 24 1996

Sample ID STD 1.31E-2ug
Description CALIBRATION CHECK
Ref. Ratio 1.034
Laser Pulses 1000
Lifetime 313 + .65 us
R2 .9998
Integrated 2440595
Record 3458 of 3481

Date/Time 10/22/96/00:25:05
Cal Y=1.08E+07X+2312.449
Intensity 119564 (t= 52 us)
Conc 1.32E-02 + 2.52E-04 ug/
Dilution Factor 1 mL/mL

FINAL RESULT 1.32E-02 + 2.52E-04 ug/

Range: LOW

Sample ID STD 2.15E-1ug
Description CALIBRATION CHECK
Ref. Ratio 1.046
Laser Pulses 1000
Lifetime 289 + .277 us
R2 1
Integrated 561135
Record 3459 of 3481

Date/Time 10/22/96/00:32:58
Cal Y=1.66E+05X-1.71E+02
Intensity 28616 (t= 52 us)
Conc .21596 + 6.70E-03 ug/
Dilution Factor 1 mL/mL

FINAL RESULT .216 + 6.70E-03 ug/

Range: HIGH

Background Report

Background for LOW Range
Laser Pulses 1000

First Time Gate Used (sample) 5
Date/Time 10/22/96/00:02:51

Reference	Sample
Intensity 82386	Intensity 883
Lifetime 253.9 + .14 us	
R2 1	
Intercept 1.06E+05	

Background Report

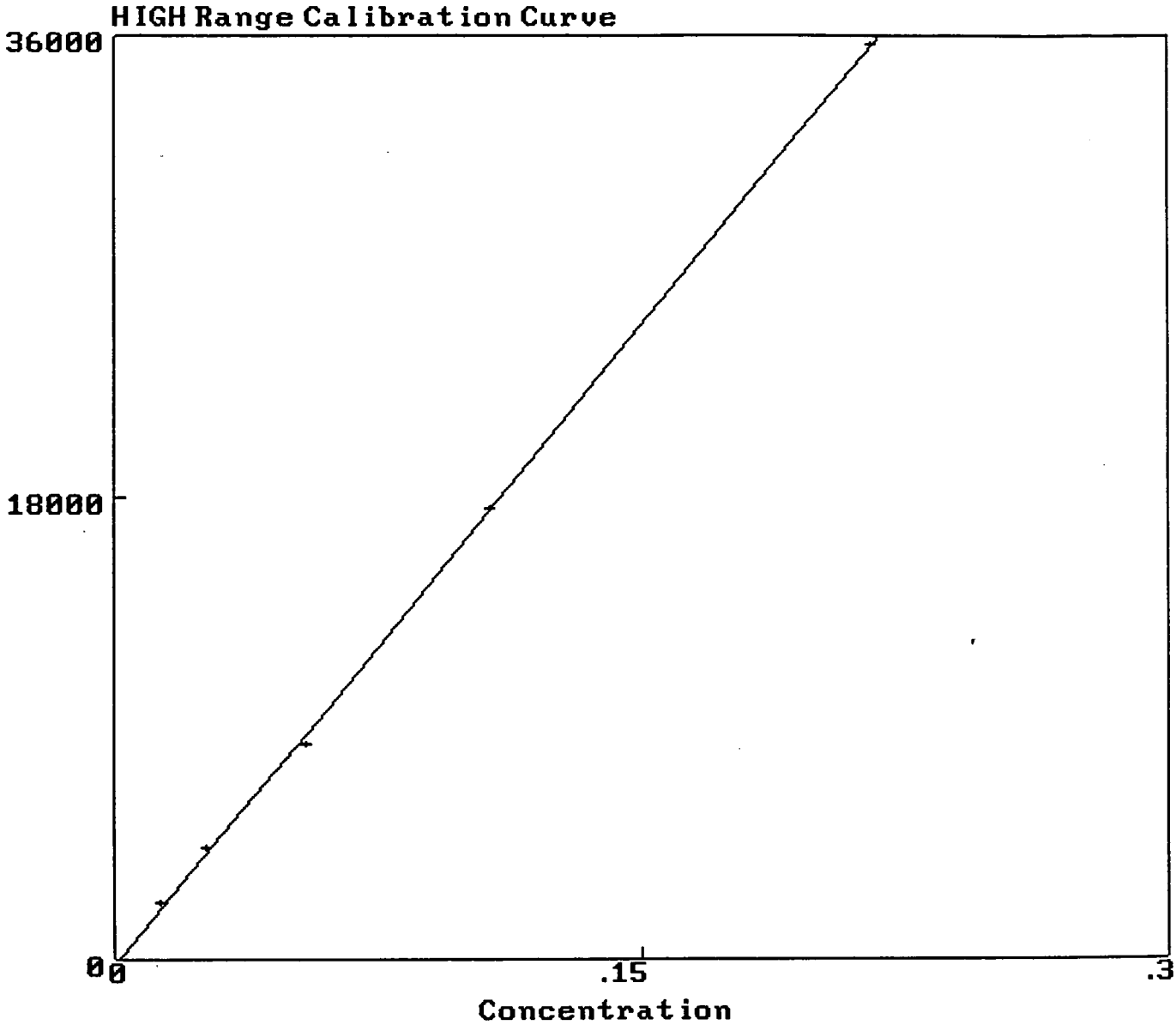
Background for HIGH Range
Laser Pulses 1000

First Time Gate Used (sample) 5
Date/Time 10/22/96/00:04:04

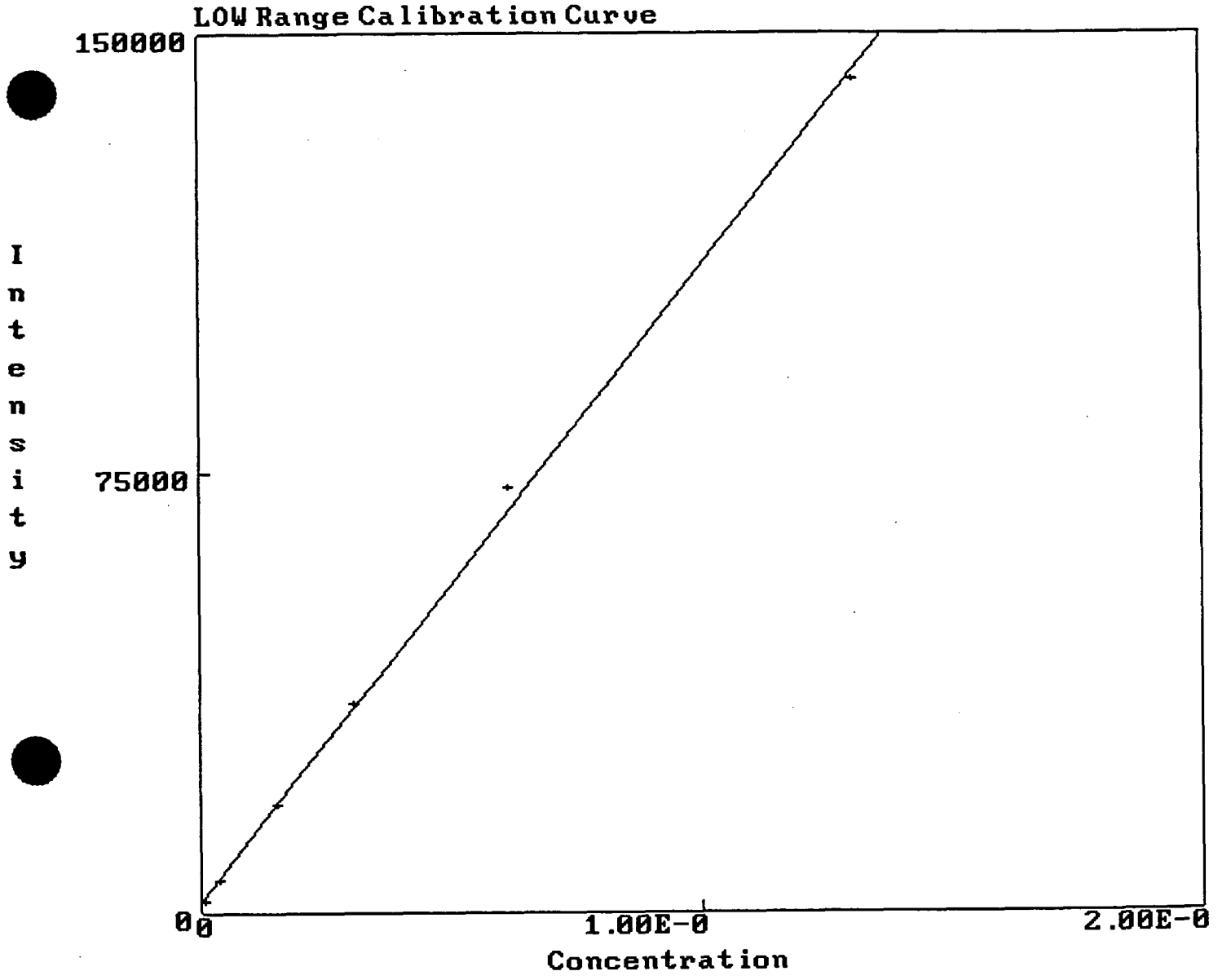
Reference	Sample
Intensity 85930	Intensity 6
Lifetime 252.76 + .44 us	
R2 .99988	
Intercept 1.10E+05	

WPS

OCT 24 1996


HIGH Range Calibration Curve
36000
18000
0
Intensity
0
.15
.3
Concentration

OCT 24 1996



WPS

OCT 24 1996

DATA CHEM LABORATORIES
A Sorenson Company

COVER FORM (TYPE I)
SINGLE METHOD ANALYSES

SUMMARY INFORMATION

Form RLIMS63M-V1.3
10219613494084
Page 1

G968S029

Date Reported.....: OCT 22 1996

Date Printed.....: 21-OCT-96 13:49
DCL Report Group..: 96E-0640-04

Client Ref Number.: Not Provided
Release Number....: Not Provided

Analysis Method(s): WR-EP-325

Hayden Environmental
Attention: Bruce Sarven
561 Congress Park Drive
Dayton, OH 45459

Client Sample Name	Laboratory Sample Name	Laboratory Sample ID	Laboratory Group Name	Laboratory Group ID
BL-123240-1	BL-123240-1	S9699072	96E-0640-04	G968S029
QC-123240-1	QC-123240-1	S9699073	96E-0640-04	G968S029
9131,39,40	96E04514	S968S06L	96E-0640-04	G968S029
9135,41,42	96E04515	S968S06M	96E-0640-04	G968S029
9136,43,44	96E04516	S968S06N	96E-0640-04	G968S029
9137,45,46	96E04517	S968S06P	96E-0640-04	G968S029
9137,45,46	96E04517MD	S9699074	96E-0640-04	G968S029

This report is 222 total pages.

Robin Lully
Analyst: Robin D. Lully

Reviewer:

Laboratory Supervisor:

960 West LeVoy Drive / Salt Lake City, Utah 84123-2547 / (801) 266-7700
FAX (801) 268-9992

DATA CHEM LABORATORIES
A Sorenson Company

FORM H (TYPE I)
SINGLE METHOD ANALYSES

SAMPLE GROUP COMMENTS

G968S029

Date Printed.....: 21-OCT-96 13:49
DCL Report Group..: 96E-0640-04

Client Name...: Hayden Environmental

Release Number....: Not Provided

General Information

The DCL QC Database maintains all numerical figures which are input from the pertinent data source. These data have not been rounded to significant figures nor have they been moisture corrected. Reports generated from the system, however, list data which have been rounded to the number of significant figures requested by the client or deemed appropriate for the method. This may create minor discrepancies between data which appear on the QC Summary Forms (Forms B-G) and those that would be calculated from rounded analytical results. Additionally, if a moisture correction is performed, differences will be observed between the QC data and the surrogate data reported on Form A (or other report forms) and corresponding data reported on QC Summary Forms. In these cases, the Form A will indicate the "Report Basis" as well as the moisture value used for making the correction.
Report generation options: 2EX

Result Symbol Definitions

ND - Not Detected above the MDL or IDL (LLD or MDC for radiochemistry).
** - No result could be reported, see sample comments for details.

Qualifier Symbol Definitions

U - Not Detected above the MDL or IDL (LLD or MDC for radiochemistry).
For radiochemistry the nuclide was not identified by the Canberra Nuclear NID program, activity values reported are calculated using the Canberra Nuclear MINACT program.
B - For organic analysis the qualifier indicates that this analyte was found in the method blank.
For inorganic analysis the qualifier signifies the value is between the IDL and PQL.
J - The qualifier indicates that the value is between the MDL and the PQL. It is also used for indicating an estimated value for tentatively identified compounds in mass spectrometry where a 1:1 response is assumed.

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S9699072

DATA CHEM LABORATORIES
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FORM A (TYPE I)
SINGLE METHOD ANALYSES

SAMPLE ANALYSIS DATA SHEET

Date Printed.....: 21-OCT-96 13:49
Client Sample Name: BL-123240-1
DCL Sample Name...: BL-123240-1

Client Name.....: Hayden Environmental
Client Ref Number....: Not Provided
Sampling Site.....: Not Applicable
Release Number.....: Not Provided

Matrix.....: AIR
Date Sampled.....: Not Applicable
Reporting Units...: pCi/sample

Date Received.....: Not Applicable
DCL Report Group.....: 96E-0640-04

DCL Preparation Group: G969901S
Date Prepared.....: 08-OCT-96 16:00
Preparation Method...: WR-DC-200
Aliquot Weight/Volume: 1.0E0 S
Net Weight/Volume....: Not Required

DCL Analysis Group: G969901S
Analysis Method...: WR-EP-325
Instrument Type...: GAMMA
Instrument ID.....: GS
Column Type.....: Not Applicable

Analytical Results

Analyte	Date Analyzed	Detection Limit	Result±Error ±TPU Error	Qual.	Dilution	CRDL
Radium-226	10-OCT-96 13:20	6.5E1	2.5E1±7.5E1 ±7.5E1		1.0E0	95
Radium-228	10-OCT-96 13:20	1.7E1	1.7E0±9.4E0 ±9.4E0	U	1.0E0	20

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S9699073

DATA CHEM LABORATORIES
A Sorenson Company

FORM A (TYPE I)
SINGLE METHOD ANALYSES

SAMPLE ANALYSIS DATA SHEET

Date Printed.....: 21-OCT-96 13:49
Client Sample Name: QC-123240-1
DCL Sample Name...: QC-123240-1

Client Name.....: Hayden Environmental
Client Ref Number....: Not Provided
Sampling Site.....: Not Applicable
Release Number.....: Not Provided

Matrix.....: AIR
Date Sampled.....: Not Applicable
Reporting Units...: pCi/g
RC
10/21/96

Date Received.....: Not Applicable
DCL Report Group.....: 96E-0640-04

DCL Preparation Group: G969901S
Date Prepared.....: 08-OCT-96 16:00
Preparation Method...: WR-DC-200
Aliquot Weight/Volume: 1.0E2g RC 10/21/96
Net Weight/Volume....: Not Required

DCL Analysis Group: G969901S
Analysis Method...: WR-EP-325
Instrument Type...: GAMMA
Instrument ID.....: GS
Column Type.....: Not Applicable

Analytical Results

Analyte	Date Analyzed	Detection Limit	Result±Error ±TPU Error	Qual.	Dilution	CRDL
Radium-226	14-OCT-96 10:56	2.0E0	5.4E1±1.7E1 ±1.9E1		1.0E0	95
Radium-228	14-OCT-96 10:56	5.3E-1	2.8E-1±3.1E-1 ±3.1E-1	U	1.0E0	20

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DATA CHEM LABORATORIES
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FORM A (TYPE I)
SINGLE METHOD ANALYSES

SAMPLE ANALYSIS DATA SHEET

S968S06L

Date Printed.....: 21-OCT-96 13:49
Client Sample Name: 9131,39,40|NORTH
DCL Sample Name...: 96E04514

Client Name.....: Hayden Environmental
Client Ref Number....: Not Provided
Sampling Site.....: Not Provided
Release Number.....: Not Provided

Matrix.....: AIR
Date Sampled.....: 19-SEP-96 08:30
Reporting Units...: pCi/S
Report Basis.....: ☒ As Received ☐ Dried

Date Received.....: 25-SEP-96 00:00
DCL Report Group.....: 96E-0640-04

DCL Preparation Group: G969901S
Date Prepared.....: 08-OCT-96 16:00
Preparation Method...: WR-DC-200
Aliquot Weight/Volume: 1.0E0 S
Net Weight/Volume....: Not Required

DCL Analysis Group: G969901S
Analysis Method...: WR-EP-325
Instrument Type...: GAMMA
Instrument ID.....: GS
Column Type.....: Not Applicable

Analytical Results

Analyte	Date Analyzed	Detection Limit	Result±Error ±TPU Error	Qual.	Dilution	CRDL
Radium-226	10-OCT-96 09:06	7.1E1	6.2E1±7.5E1 ±7.6E1		1.0E0	95
Radium-228	10-OCT-96 09:06	1.6E1	-3.4E0±9.6E0 ±9.6E0	U	1.0E0	20

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DATA CHEM LABORATORIES
A Sorenson Company

FORM A (TYPE I)
SINGLE METHOD ANALYSES

SAMPLE ANALYSIS DATA SHEET

S968S06M

Date Printed.....: 21-OCT-96 13:49
Client Sample Name: 9135,41,42|SOUTH
DCL Sample Name...: 96E04515

Client Name.....: Hayden Environmental
Client Ref Number....: Not Provided
Sampling Site.....: Not Provided
Release Number.....: Not Provided

Matrix.....: AIR
Date Sampled.....: 19-SEP-96 08:30
Reporting Units...: pCi/S
Report Basis.....: ☒ As Received ☐ Dried

Date Received.....: 25-SEP-96 00:00
DCL Report Group.....: 96E-0640-04

DCL Preparation Group: G969901S
Date Prepared.....: 08-OCT-96 16:00
Preparation Method...: WR-DC-200
Aliquot Weight/Volume: 1.0E0 S
Net Weight/Volume....: Not Required

DCL Analysis Group: G969901S
Analysis Method...: WR-EP-325
Instrument Type...: GAMMA
Instrument ID.....: GS
Column Type.....: Not Applicable

Analytical Results

Analyte	Date Analyzed	Detection Limit	Result±Error ±TPU Error	Qual.	Dilution	CRDL
Radium-226	10-OCT-96 09:07	7.7E1	4.4E1±7.9E1 ±7.9E1		1.0E0	95
Radium-228	10-OCT-96 09:07	1.8E1	5.4E0±9.7E0 ±9.7E0	U	1.0E0	20

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DATA CHEM LABORATORIES
A Sorenson Company

FORM A (TYPE I)
SINGLE METHOD ANALYSES

SAMPLE ANALYSIS DATA SHEET

Date Printed.....: 21-OCT-96 13:49
Client Sample Name: 9136,43,44|BLANK
DCL Sample Name...: 96E04516

Client Name.....: Hayden Environmental
Client Ref Number....: Not Provided
Sampling Site.....: Not Provided
Release Number.....: Not Provided

Matrix.....: AIR
Date Sampled.....: 19-SEP-96 08:30
Reporting Units...: pCi/S
Report Basis.....: ☒ As Received ☐ Dried

Date Received.....: 25-SEP-96 00:00
DCL Report Group.....: 96E-0640-04

DCL Preparation Group: G969901S
Date Prepared.....: 08-OCT-96 16:00
Preparation Method...: WR-DC-200
Aliquot Weight/Volume: 1.0E0 S
Net Weight/Volume....: Not Required

DCL Analysis Group: G969901S
Analysis Method...: WR-EP-325
Instrument Type...: GAMMA
Instrument ID.....: GS
Column Type.....: Not Applicable

Analytical Results

Analyte	Date Analyzed	Detection Limit	Result±Error ±TPU Error	Qual.	Dilution	CRDL
Radium-226	09-OCT-96 14:43	7.6E1	1.9E1±7.5E1 ±7.5E1		1.0E0	95
Radium-228	09-OCT-96 14:43	1.9E1	5.2E0±1.1E1 ±1.1E1	U	1.0E0	20

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S968S06P

DATA CHEM LABORATORIES
A Sorenson Company

FORM A (TYPE I)
SINGLE METHOD ANALYSES

SAMPLE ANALYSIS DATA SHEET

Date Printed.....: 21-OCT-96 13:49
Client Sample Name: 9137,45,46|RESP
DCL Sample Name...: 96E04517

Client Name.....: Hayden Environmental
Client Ref Number....: Not Provided
Sampling Site.....: Not Provided
Release Number.....: Not Provided

Matrix.....: AIR
Date Sampled.....: 19-SEP-96 08:30
Reporting Units...: pCi/S
Report Basis.....: ☒ As Received ☐ Dried

Date Received.....: 25-SEP-96 00:00
DCL Report Group.....: 96E-0640-04

DCL Preparation Group: G969901S
Date Prepared.....: 08-OCT-96 16:00
Preparation Method...: WR-DC-200
Aliquot Weight/Volume: 1.0E0 S
Net Weight/Volume....: Not Required

DCL Analysis Group: G969901S
Analysis Method...: WR-EP-325
Instrument Type...: GAMMA
Instrument ID.....: GS
Column Type.....: Not Applicable

Analytical Results

Analyte	Date Analyzed	Detection Limit	Result±Error ±TPU Error	Qual.	Dilution	CRDL
Radium-226	09-OCT-96 14:30	6.9e1	8.5E1±8.6E1 ±8.8E1		1.0E0	95
Radium-228	09-OCT-96 14:30	1.8E1	-1.9E0±1.1E1 ±1.1E1	U	1.0E0	20

960 West LeVoy Drive / Salt Lake City, Utah 84123-2547 / (801) 266-7700
FAX (801) 268-9992

DATA CHEM LABORATORIES
A Sorenson Company

FORM A (TYPE I)
SINGLE METHOD ANALYSES

SAMPLE ANALYSIS DATA SHEET

S9699074

Date Printed.....: 21-OCT-96 13:49
Client Sample Name: 9137,45,46|RESP
DCL Sample Name...: 96E04517MD

Client Name.....: Hayden Environmental
Client Ref Number....: Not Provided
Sampling Site.....: Not Provided
Release Number.....: Not Provided

Matrix.....: AIR
Date Sampled.....: 19-SEP-96 08:30
Reporting Units...: pCi/S
Report Basis.....: ☒ As Received ☐ Dried

Date Received.....: 25-SEP-96 00:00
DCL Report Group.....: 96E-0640-04

DCL Preparation Group: G969901S
Date Prepared.....: 08-OCT-96 16:00
Preparation Method...: WR-DC-200
Aliquot Weight/Volume: 1.0E0 S
Net Weight/Volume....: Not Required

DCL Analysis Group: G969901S
Analysis Method...: WR-EP-325
Instrument Type...: GAMMA
Instrument ID.....: GS
Column Type.....: Not Applicable

Analytical Results

Analyte	Date Analyzed	Detection Limit	Result±Error ±TPU Error	Qual.	Dilution	CRDL
Radium-226	10-OCT-96 13:23	7.8E1	5.6E0±7.3E1 ±7.3E1		1.0E0	95
Radium-228	10-OCT-96 13:23	1.7E1	-1.4E0±1.0E1 ±1.0E1	U	1.0E0	20

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S9699073

DATA CHEM LABORATORIES
A Sorenson Company

FORM B (TYPE I)
SINGLE METHOD ANALYSES

QUALITY CONTROL DATA SHEET
LABORATORY CONTROL SAMPLE (LCS)

Client Name.....: Hayden Environmental
Release Number.....: Not Provided

Matrix.....: SOIL
Reporting Units.....: pCi

Date Printed.....: 21-OCT-96 13:49
DCL Sample Name...: QC-123240-1

DCL Analysis Group: G969901S
Analysis Method...: WR-EP-325
Instrument Type...: GAMMA
Instrument ID.....: GS
Column Type.....: Not Applicable

DCL Preparation Group: G969901S
Date Prepared.....: 08-OCT-96 16:00
Preparation Method...: WR-DC-200

QC Limit Type.....: Method

Analytical Results

Analyte	Date Analyzed	Target	Result	Percent Recovery	QC Limits	QC Flag
Radium-226	14-OCT-96 10:56	5.0E1	5.4E1	108.	75.0/125.	

R. Jolly
10/21/96

000189

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S9699072

DATA CHEM LABORATORIES
A Sorenson Company

FORM C (TYPE I)
SINGLE METHOD ANALYSES

QUALITY CONTROL DATA SHEET
BLANK SAMPLE

Client Name.....: Hayden Environmental
Release Number.....: Not Provided

Matrix.....: FILTER
Reporting Units.....: pCi/sample

DCL Preparation Group: G969901S
Date Prepared.....: 08-OCT-96 16:00
Preparation Method...: WR-DC-200

Date Printed.....: 21-OCT-96 13:49
DCL Sample Name...: BL-123240-1

DCL Analysis Group: G969901S
Analysis Method...: WR-EP-325
Instrument Type...: GAMMA
Instrument ID.....: GS
Column Type.....: Not Applicable

QC Limit Type.....: Method

Analytical Results

Analyte	Date Analyzed	Result	CRDL
Radium-226	10-OCT-96 13:20	25.	95
Radium-228	10-OCT-96 13:20	1.7	20

R. Jolly
10/21/96

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DATA CHEM LABORATORIES
A Sorenson Company

FORM E (TYPE I)
SINGLE METHOD ANALYSES

Form RLIMS63E-V1.3
10219613494084
Page 13

S9699074

QUALITY CONTROL DATA SHEET
MATRIX DUPLICATE SAMPLE

Client Name.....: Hayden Environmental
Release Number.....: Not Provided

Matrix.....: FILTER
Reporting Units.....: pCi

DCL Preparation Group: G969901S
Date Prepared.....: 08-OCT-96 16:00
Preparation Method...: WR-DC-200

Date Printed.....: 21-OCT-96 13:49
DCL Sample Name...: 96E04517MD

DCL Analysis Group: G969901S
Analysis Method...: WR-EP-325
Instrument Type...: GAMMA
Instrument ID.....: GS
Column Type.....: Not Applicable

QC Limit Type.....: Method

Analytical Results

Analyte	Date Analyzed	Sample Result	Duplicate Result	Mean	Range	RER	QC Limits	QC Flag
Radium-226	10-OCT-96 13:23	8.5E1	5.6E0	46.	80.	1.4	0.00/2.00	
Radium-228	10-OCT-96 13:23	-1.9E0	-1.4E0	-1.7	0.54	0.07	0.00/2.00	

R. Jolly
10/21/96

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DATA CHEM LABORATORIES
A SCHERSON COMPANY

Datapackage Table of Contents

8019

Information pertaining to this datapackage is divided into the four categories listed below (see colored divider sheets for an inventory list of each category). If an item on the inventory is not applicable, an "NA" is placed in the corresponding check box. A Case Narrative immediately precedes this Table of Contents and contains pertinent information about this datapackage.

Analytical Forms ..... Yellow
Sample Tracking Documentation ..... Pink
Analytical Documentation ..... Blue
Raw Data ..... Green

♦ ♦ ♦ ♦ ♦ ♦ ♦ ♦ ♦ ♦

Analytical Forms
Inventory Checklist

[NA] Case Narrative

[NA] IRDMIS	[NA] Commercial Forms
[ ] Data Review and Approval Form	[ ] Analytical or Environmental Report Form
[ ] IRDMIS Reports	[ ] Set Comments
[ ] GC/MS TICs	[ ] Applicable QC Sheets

[X] RLIMS Forms	
[X] Cover Form	[NA] Matrix Spike/Matrix Spike Duplicate Sample (Form F)
[X] Sample Group Comments (Form H)	[NA] Surrogate Summary (Form G)
[X] Sample Analysis Data Sheet (Form A)	[NA] Initial Calibration Form
[X] Laboratory Control Sample (Form B)	[NA] Initial Calibration Verification (ICV) Form
[X] Blank Sample (Form C)	[NA] Continuing Calibration Form
[NA] Matrix Spike Sample (Form D)	[NA] Serial Dilution Form
[X] Matrix Duplicate Sample (Form E)	[NA] Endrin Breakdown or BFB/DFTPP GC/MS Tuning Form

Analytical Forms
Reviewer Checklist

X The Analytical Forms Inventory Checklist above is complete.

X The Case Narrative was completed in accordance with procedures in DCL SOP XX-DC-020, "Datapackage Preparation and Validation."

X Only the correct report forms are used (IRDMIS or Commercial Forms or RLIMS Forms).

X All fields on the report forms are complete with the correct information, including signatures.

X Results for all samples are reported per client request.

X Units, methods, and dates are correct.

X Sample and/or set comments are complete.

Assembled by: Robin Tully (Signature) 10/21/96 (Date) Reviewed by: [signature] (Signature) 10/21/96 (Date)

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Rev. 6/95

013

DATA CHEM LABORATORIES
A SORENSON COMPANY

Sample Tracking Documentation
Inventory Checklist

- [X] LIMS Grouping Reports
- [X] DataChem Laboratories (DCL) Chain-of-Custody Record
- [X] DCL Sample Work Order
- [NA] Copy of numbered Nonconformance/Corrective Action Report (NC/CAR)
- [NA] Copy of Client-Related Problem Report (CPR)

Sample Tracking Documentation
Reviewer Checklist

X The Sample Tracking Documentation Inventory Checklist above is complete.

X DCL Chain-of-Custody Record provides signatures for the sample portion reported in this data package.

X DCL Chain-of-Custody Record was completed in accordance with procedures in DCL SOP XX-DC-006 "Chain-of-Custody and Laboratory Tracking."

X Methods specified on the Sample Work Order were performed or an explanation for deviations is provided.

X Special instructions on the Sample Work Order were followed.

X Project Management instructions on the Project Protocol Worksheet were followed.

X Client's requests were met or an explanation is provided in the Case Narrative.

NA NC/CAR and/or CPR were completed in accordance with procedures in DCL SOP QC-DC-006 "Nonconformance/Corrective Action Report (NC/CAR) Procedures."

Assembled by: Robin Tully 10/21/96 (Signature, Date) Reviewed by: [signature] 10/21/96 (Signature, Date)

Rev. 6/95

DataChem Laboratories
LIMS - Sample Master System
Preparation Group Report

Date: 10-OCT-1996 13:28
User: LULLY

RLIMS15-V1.2

Preparation Run Name: G969901S

Group ID: G969901S

Samples: 7

Pos	Laboratory Sample Name	Field Sample Name 1	Field Sample Name 2	Laboratory Sample ID	Laboratory Group Name	Accnt. Number
1	BL-123240-1	BL-123240-1		S9699072	96E-0640-04	03025
2	QC-123240-1	QC-123240-1		S9699073	96E-0640-04	03025
3	96E04514	9131,39,40	NORTH	S968S06L	96E-0640-04	03025
4	96E04515	9135,41,42	SOUTH	S968S06M	96E-0640-04	03025
5	96E04516	9136,43,44	BLANK	S968S06N	96E-0640-04	03025
6	96E04517	9137,45,46	RESP	S968S06P	96E-0640-04	03025
7	96E04517MD	9137,45,46	RESP	S9699074	96E-0640-04	03025

----- END OF LISTING -----

R Lully
10/10/96

Earliest Sampling Date: 19-Sep-1996

DataChem Laboratories
CHAIN-OF-CUSTODY

Results due by: 25-Oct-1996

Project/Job/Task: COMM-ENV | Split: | Root Set ID: 96E-0640 * | Reporting Group

Client: Hayden Environmental | Account: 03025

Comments:

Verified: KM 9-25-96

Date Sampled	Field ID Number	DCL Sample Name	DCL Sample ID	QC	Matrix	Customer ID 2					01 Method 5 Particulate	02 Isotopic Uranium	03 ISOTOPIC THORIUM	04 Radium 226/228 by gamma spec	05 Total Uranium by kPA					# Bottles
19-Sep-1996	9131,39,40	96E04514			AIR	NORTH					X	X	X	X	X					3
19-Sep-1996	9135,41,42	96E04515			AIR	SOUTH					X	X	X	X	X					3
19-Sep-1996	9136,43,44	96E04516			AIR	BLANK					X	X	X	X	X					3
19-Sep-1996	9137,45,46	96E04517			AIR	RESP					X	X	X	X	X					3

ORIGINAL FIELD SAMPLE CHAIN-OF-CUSTODY

Relinquished By: (Signature)	Date/Time	Received By: (Signature)	Reason for Transfer/ Storage Location
Walk-in/Room/Shelf/Fridge R-23-1 TV	9/25/96 1450	Kamyn Vigil	Labeling/Shelving
Kamyn Vigil	9/25/96 1455	Walk-in/Room/Shelf/Fridge R-23-1 TV	Storage: CW-2
R-23-1 QC	9/30/96 1000	[illegible]	sample prep
[illegible]	10/06/96 12:15	Rm 311 QC	storage
Rm 311 T.P.	10/8/96 16:00	Ty E. Peterson	sample digestion
Ty E. Peterson	10/9/96 8:00	Robin Jolly	γ spec

SAMPLE PREPARATION / ANALYSIS CHAIN-OF-CUSTODY

Sample Prep/Analysis for: _____ Lab Notebook No.: _____

Prepared/Analyzed by: _____ Date/Time: _____

Relinquished By: (Signature)	Date/Time	Received By: (Signature)	Reason for Transfer/ Storage Location

☐ Check box if there is a continuation page ☐

Printed 9/25/1996 14:49

Form: COFC1.01-SWV2.30

0001175

8019

Sample Work Order

8019

QC Clearance: _____

Project Manager: Robert P. Di Rienzo

Client: Hayden Environmental

Account: 03025

Project/Task: COMM-ENV

Date Received: 25-Sep-1996

Date for Mailing Report: 25-Oct-1996

DCL Root Set ID: 96E-0640*

DCL Lab. Name: 96E04514-96E04517

Total # Samples: 4

Sample Entry: Karyn L. Boyack

Section: WA

Earliest Sampling Date: 19-Sep-1996

Preparation Type:

Rep. Group	Radiochemistry Analytes Requested	Latest Prep. Date	Latest Anal. Date	No. of Samp.	Storage Location	Analysis/Prep. Method	Inst.	Matrix
01	Method 5 Particulate		18-Mar-1997[c]	4		Method 5	GRAV	AIR
02	Isotopic Uranium	1-Oct-1996[c]	18-Mar-1997[c]	4		WR-DC-341 WR-DC-200	AS	AIR
03	ISOTOPIC THORIUM	1-Oct-1996[c]	18-Mar-1997[c]	4		WR-DC-341	AS	AIR
04	Radium 226/228 by gamma spec		18-Mar-1997[c]	4		WR-EP-325 WR-DC-200	GS	AIR
05	Total Uranium by kPA		18-Mar-1997[c]	4		WR-DC-342	kPA	AIR

[c]Based on date of collection

Special Instructions: _____

Section Manager: Charlie C. Walker

Other Sections Receiving Sample Portions: None

SAMPLE LOG-IN SHEET

Group Name: 96E-0640 8019

Lab Name: DataChem Laboratories	Page 1 of 1
Received By (Print Name): Sample Rec. Group	Log-In Date: 9-25-96
Received By (Signature): Tanya Vigil	
Case Number: —	Sample Delivery Group No.: — / SAS Number: NA

Remarks:

		Client ID #1 (EPA Sample #)	Corresponding: Client ID #2 (Sample Tag #)	Corresponding: Assigned Lab #	Matrix	Fraction	Remarks: Condition of Sample Shipment, etc.
1. Custody Seal(s)	Present/Absent*	200259131	North	96E04514	Water	R/A	each client
	Intact/Broken*	39	↓	↓	Water	↓	ID 1 bottle
2. Custody Seal Nos.	N/A	40	↓	↓	Water	↓	needs to be
		200259135	South	96E04515	Water	↓	combined
3. Chain-of-Custody Records	Present/Absent*	41	↓	↓	Water	↓	to create
4. Traffic Reports or Packing Lists	Present/Absent*	42	↓	↓	Water	↓	a single
5. Airbill	Airbill/Sticker Present/Absent*	200259136	Blank	96E04516	Water	↓	client ID
		43	↓	↓	Water	↓	2 (see PPQ)
6. Airbill No.	9690684221	44	↓	↓	Water	↓	↓
		200259137	Resp	96E04517	Water	↓	↓
7. Sample Tags	Present/Absent*	45	↓	↓	Water	↓	↓
Sample Tag Numbers	Listed/Not Listed on Chain-of-Custody	46	↓	↓	Water	↓	↓
8. Sample Condition	Intact/Broken*/Leaking						
9. Does information on custody records, traffic reports, and sample tags agree?	Yes/No*						
10. Date Received at Lab	9/25/96						
11. Time Received	1000						

Tanya Vigil 9/25/96

Sample Transfer	
Fraction: All	Fraction:
Area #: R-23-1	Area #:
By: TV	By:
On: 9/25/96	On:

* Contact SMO and attach record of resolution.

Reviewed By	Logbook No.
Date	Logbook Page No.

FRACTIONS:
C - Cyanide
D - Dissolved Metals
T - Total Metals
F - Full TCL Organics
P - Pesticides
S - Semivolatiles
V - Volatiles
R - Rad Chem
A - Particulates

FORM DC-1

Note: only highlighted portion of client ID #1s entered into DCL computer system

018

000177

FERMCO

P.O. BOX 538704
CINCINNATI, OH 45253-8704

CHAIN OF CUSTODY / REQUEST FOR ANALYSIS RECORD

REFERENCE DOCUMENT NO.: SPL-96-2875

ORIGINAL MEF NO.: _____ CORRESPONDING REFERENCE DOCUMENT NO.: _____

PAGE 1 OF 2

0001178019

RELEASE NO.: 1000012382	PROJECT NO.: N/A	FOR SAMPLE RELATED PROBLEMS, ACS CONTACT / PHONE: Tim Miller X4198	CONTRACT PURCHASE ORDER / TASK ORDER NO.: N/A
PROJECT NAME: NESHAP STACK SAMPLING		REQUIRED REPORT DATE / LAB TAT: PARTICULATE (10 DAY) RAD (30 DAY)	SAMPLE SHIPMENT DATE: 9-24-96
PROJECT CONTACT / PHONE: Tim Miller / 4198		RECEIVING LAB NAME: DATACHEM	SAMPLE SHIPPER (Print): G Bell
CHARGE NO.: 7ECG2	LOT MARKING NO.: N/A	RECEIVING LAB ADDRESS: SALT LAKE CITY	OFF-SITE LAB CONTACT: Robert DiRenzo

SAMPLING TEAM (Print) & GROUP NAME / PHONE: BRUCE SARVEN HAYDEN ENVIRONMENTAL 513-438-3010 Geoff Schoenberger 7-20-96 HAYDEN

SAMPLING TEAM (Signature & Badge No.): Bruce Sarven 283-74-1662 Geoff D. Schoenberger 267-82-4754

ITEM NO.	SAMPLE NUMBER: FACTS ID	SAMPLE NUMBER: CUSTOMER ID / SAMPLE POINT	SAMPLE MATRIX		COMP	GRAB	FILTERED	COLLECTION DATE	COLLECTION TIME	CONTAINER TYPE	CONTAINER VOL.	NO. CONTRS	PRESERVATION	A S L	ANALYSES REQUESTED (If more space is required, use the SPECIAL INSTRUCTIONS block.)	SAMPLE OKAY? (Y/N)* FERMCO	SAMPLE OKAY? (Y/N)* OFF-SITE
1	200259131	NORTH FILTER	AF	AIR FILTER	✓		N/A	9-19-96	0830	F	146 cm	1	NONE	B	Particulate & Rad *	Y	
2	200259139	NORTH FRONT 1/2	L1	ACETONE	✓		N/A	9-19-96	0830	P	1 L	1	NONE	B	Particulate & Rad *	Y	
3	200259140	NORTH BACK 1/2	L2	WATER	✓		N/A	9-19-96	0830	P	1 L	1	NONE	B	Particulate & Rad *	Y	
4	200259135	South Filter	AF	AIR FILTER	✓		N/A	9-19-96	0830	F	130 cm	1	NONE	B	Particulate & Rad *	Y	
5	200259141	South Front 1/2	L1	ACETONE	✓		N/A	9-19-96	0830	P	1 L	1	NONE	B	Particulate & Rad *	Y	
6	200259142	South BACK 1/2	L2	WATER	✓		N/A	9-19-96	0830	P	1 L	1	NONE	B	Particulate & Rad *	Y	
7	200259136	Filter BLANK	AF	AIR FILTER	✓		N/A	9-19-96	0830	F	N/A	1	NONE	B	Particulate & Rad *	Y	
8	200259143	D.I. BLANK	L2	WATER	✓		N/A	9-19-96	0830	P	1 L	1	NONE	B	Particulate & Rad *	Y	
9	200259144	ACETONE BLANK	L1	ACETONE	✓		N/A	9-19-96	0830	P	1 L	1	NONE	B	Particulate & Rad *	Y	
10	200259137	Resp. Filter	AF	AIR FILTER	✓		N/A	9-19-96	0830	F	243 cm	1	NONE	B	Particulate & Rad *	Y	

SPECIAL INSTRUCTIONS: * Samples to be shipped off-site to DATA-CHEM / UTAH, contact Robert DiRenzo
Analysis to be performed are particulate, U-238, U-234, U-235, U-236, Th-228, Th-230, Th-232
Ra-226, Ra-228 and Total Uranium by Lazer Phosphorometry

RELINQUISHED: ITEM / REASON	RELINQUISHED BY (Signature) / AFFILIATION	BADGE NO.	DATE	TIME	RECEIVED: RECEIVED BY (Signature) / AFFILIATION	BADGE NO.	DATE	TIME
1-12 Rad Analysis	Bruce Sarven / HAYDEN ENV.	1 283-74-1662	9/20/96	1630	Neil Vaughn / SPL	1 75148	9/20/96	1630
1-12 Ship	Neil Vaughn / SPL	2 75148	9-23-96	0800	G Bell / SPL	2 630	9-23-96	0800
1-17 Ship	G Bell SPL	3 630	9-24-96	1300	Sample Rec. Group R-23-1 / DCL	3 58552	9-25-96	1002
		4				4		
		5				5		

DISTRIBUTION OF COPIES: WHITE ON-SITE - RELEASE FILE / OFF-SITE ANALYTICAL LAB - RETURN TO FEMP | YELLOW - DISTRIBUTE AS NEEDED / OFF-SITE ANALYTICAL LAB - RETURN TO FEMP | BLUE SAMPLING TEAM - PROJECT FILE

FS-F-3361 (09-21-95)

SHADED AREAS ARE TO BE COMPLETED BY THE SAMPLE RECEIVING GROUP.

* IF "N", THEN COMPLETE APPLICABLE NON-CONFORMANCE PROCEDURE.

FERMCO

CHAIN OF CUSTODY / REQUEST FOR ANALYSIS RECORD (CONTINUED)

PROJECT NO.: N/A

PROJECT NAME: NESHAP STACK SAMPLING

REFERENCE DOCUMENT NO.: SPL-96-2875 1000012382

CORRESPONDING REFERENCE DOCUMENT NO.:

PAGE 2 OF 2

ITEM NO.	SAMPLE NUMBER: FACTS ID	SAMPLE NUMBER: CUSTOMER ID / SAMPLE POINT	SAMPLE MATRIX		COMP	GRAB	FILTERED	COLLECTION: DATE	COLLECTION: TIME	CONTAINER: TYPE	CONTAINER: VOL.	NO. CONTRS	PRESERVATION	A S L	ANALYSES REQUESTED (If more space is required, use the SPECIAL INSTRUCTIONS block.)	SAMPLE OKAY? (Y/N)* FERMCO	SAMPLE OKAY? (Y/N)* OFF-SITE
11	200259145	Resp. Front 1/2	L1	ACETONE	✓		N/A	9-20-96	0845	P	1L	1	NONE	B	Particulate & Rad	Y	
12	200259146	Resp. Back 1/2	L2	~~ACETONE~~ WATER	✓		N/A	9-20-96	0845	P	1L	1	NONE	B	Particulate & Rad	Y	
		NOTHING FOLLOWS															

SPECIAL INSTRUCTIONS: AF - Air Filter
L1 - Acetone
L2 - D.I. WATER

DISTRIBUTION OF COPIES: WHITE - ON-SITE - RELEASE FILE / OFF-SITE ANALYTICAL LAB - RETURN TO FEMP | YELLOW - DISTRIBUTE AS NEEDED / OFF-SITE ANALYTICAL LAB - RETURN TO FEMP | BLUE - SAMPLING TEAM - PROJECT FILE

SHADED AREAS ARE TO BE COMPLETED BY THE SAMPLE RECEIVING GROUP.

* IF "N", THEN COMPLETE APPLICABLE NON-CONFORMANCE PROCEDURE.

FB-F-3361-1 (09-21-95)

020

000179

TALLY SHEET

8019

RELEASE #: 1000012382 (CAN 1 OF 1)
PO #: NA
DATE SHIPPED: 23-SEP-96
MATERIAL: NESHAP STACK SAMPLING - AIR FILTERS, ACETONE , AND WATER

ANALYSIS: PARTICULATE AND RAD

Composite Sample Number	Lot Number	Sample Container Size	AnaLis/ FACTS Number	Gross Weight lbs.	Tare Weight lbs.	Net Weight lbs.
NORTH FILTER	W050-730-P047-0417	AIR FILTER	200259131	0.101	0.097	0.004
NORTH FRONT 1/2	W050-730-P047-0417	1 L PLS	200259139	0.300	0.220	0.080
NORTH BACK 1/2	W050-730-P047-0417	1 L PLS	200259140	0.300	0.220	0.080
SOUTH FILTER	W050-730-P047-0417	AIR FILTER	200259135	0.101	0.097	0.004
SOUTH FRONT 1/2	W050-730-P047-0417	1 L PLS	200259141	0.300	0.220	0.080
SOUTH BACK 1/2	W050-730-P047-0417	1 L PLS	200259142	0.300	0.220	0.080
FILTER BLANK	W050-730-P047-0417	AIR FILTER	200259136	0.101	0.097	0.004
DI BLANK	W050-730-P047-0417	1 L PLS	200259143	1.251	0.220	1.031
ACETONE BLANK	W050-730-P047-0417	1 L PLS	200259144	0.300	0.220	0.080
RESP. FILTER	W050-730-P047-0417	AIR FILTER	200259137	0.101	0.097	0.004
RESP. FRONT 1/2	W050-730-P047-0417	1 L PLS	200259145	0.300	0.220	0.080
RESP. BACK 1/2	W050-730-P047-0417	1 L PLS	200259146	0.300	0.220	0.080
				3.755	2.148	1.607

32350

FEMP

COVER SHEET

8019

DOCUMENT TYPE ● RSR ○ RWP

SURVEY FOR RWP? ○ YES ● NO

NAME [redacted]

PAGE 1 OF 4

SIG[redacted]

LOCATION Lab WZ6

LOCATION CODE

BADGE #	DATE	TIME	BLDG/GRID#	FLR
7323	09/24/96	09:26	15A	1

SURVEY NUMBER 96-09-11-0165

RWP NUMBER -

COMMENTS Sampleshipment Res. Filters + Acetone Rel# 12352

NA

REVIEWER R Peterson

BADGE 7395

SIGNATURE

FS-F-4617 (4/22/96)

0001810 22

FEMP
RADIOLOGICAL SURVEY REPORT

SURVEY NUMBER: 96- 9 -11- 165

DATE: 9-24-96	RCT NAME: [redacted]	RCT BADGE #: 74323	PAGE:
REVIEWED BY: [redacted]		REVIEWER BADGE NO: 7395	2 OF 4

MODEL	SERIAL NUMBER	TYPE (α, β, γ)	CALIBRATION-DUE DATE	BKGD. (cpm)	EFF./CF	COUNT TIME (min)	MDA (dpm)	INSP./PERFORMANCE TEST DATE YES	NO
LB 5100		LB β	10-96	.26/1.42	.212/.431	2.0	2/A 3	✓	
M3		Bβ	2-97	60	30	NA	3000	✓	
2221	75947	α	9-96	1.2	.16	1	16.2	✓	
					A				
				N					

ITEM NUMBER	LOCATION AND/OR DESCRIPTION	HEIGHT (FT.)	DPM/100cm² ALPHA REMOVABLE (1)	DPM/100cm² ALPHA FIXED PLUS REMOVABLE	DPM/100cm² BETA-GAMMA REMOVABLE (1)	DPM/100cm² BETA-GAMMA FIXED PLUS REMOVABLE	CORRECTED DOSE RATE (MREM/HR) γ CONTACT	β CONTACT	γ AT FT.	β AT FT.
1	200259131	NA	-0 *	-7 *	3	<MDCR				
2	200259136		2	-7.5 *	-2 *					
3	200259135		0 *	-7 *	2 *					
4	200259137		-0 *	5 *	5					
5	200259139		5	NA	4					
6	200259141		2		10					
7	200259145		0 *		5			NA		
8	200259140		0 *		0 *					
9	200259144		-0 *		0 *					
10	200259143		-0 *		0 *					
11	200259142		0 *		1 *					
12	200259146		2		5					
13	I/S can	↓	-0 *	↓	0 *	↓				
14	O/S can	NA	0 *	NA	3	<MDCR				
				NA						

Note (1): Values identified by an asterisk (*) indicate results are less than the calculated MDA (RC-RDA-010)

FS-F-1993-1 (REV. 04/18/95)

TUE SEP 24, 1996
GROUP A SMEARS FOR FREE RELEASE (2 MIN)

SAMPLE NUMBER	GROSS ALPHA	GROSS BETA	DPM ALPHA	DPM BETA	TIME OF COUNT
51	0	6	-0	5	08:03:16
[illegible]	2	[illegible]	2	-2	08:05:01
53	1	5	0	2	08:07:46
54	0	3	-0	3	08:10:01
55	4	7	5	4	08:12:16
56	2	12	1	10	08:14:01
57	1	8	0	5	08:16:46
58	1	2	0	0	08:19:01
59	0	1	-0	0	08:21:16
60	0		-0	0	08:23:01
61	1	4	0	1	08:25:46
62	2	8	1	5	08:28:01
63	0	5	-0	0	08:30:16
64	1	5	0	3	08:32:50

OPERATION COMPLETE

OPERATION COMPLETE

FEMP RADIOLOGICAL SURVEY REPORT pg 3 of 4
SURVEY # 96-8-11-164 DATED 9/24/96

	(name)	(signature)
RCT:	William Chustern	[illegible]
REVIEWER:	R. Pitson	[illegible]

MATERIAL RESTRICTED RELEASE FORM

ITEM NUMBER	ITEM DESCRIPTION	RCT	MATERIAL RELEASE EVALUATOR PRINT/SIGNATURE [1&3]	MATERIAL OWNER/SURVEY REQUESTOR PRINT/SIGNATURE [2&3]
1-4	Filters	N/A	R Peterson	GORDON BELL
5-12	Acetone	N/A	R Peterson	GORDON BELL
			NA	

Additional Comments: Samples to DCL-SLC Lic # UT1800237 EXP 11-31-97

[1] Signature by Material Release Evaluator indicates the material may be released for restricted use in the uncontrolled area of the FEMP site only. This material is not being released for unrestricted use.

[2] Signature by the Material Owner/Survey Requestor indicates acceptance of responsibility for the material while in the uncontrolled area and the material will be returned to the controlled area following use.

[3] Additional approval by the Manager of Radiological Compliance is required prior to allowing the material to exit beyond the FEMP property boundary. This allowance may be annotated in the additional comments section of the form.

FS-F-3916 (06/24/94)

025

FEMP RADIOLOGICAL SURVEY REPORT pg 1 of 1
SURVEY # 96-9-11-164 DATED 9-29-96
(name) (signature)
RCT: William Thaston

000184

PROJECT PROTOCOL WORKSHEET

8019

Project: Fernald Emission Testing
Client: Hayden Environmental
Account: 3025
Proj. Mngr: Bob Di Rienzo

Date: 09/20/96
Revision: 1.0

Client Contacts:

Reports:

Bruce Sarven
Hayden Environmental
561 Congress Park Drive
Dayton, OH 45459

Phone: (513) 438-3010
FAX: (513) 438-3020

Invoices:

Same with COC

Schedule: Starts 09/20/96

TAT: 30 Calendar Days

Sample Receipt: Use the 96E sample stream. *Notify Project Manager when samples are received.*

Analyses: **Particulates and Radiochemistry**

QA/QC: Overall QA/QC requirements will be based on the DCL Procedures.

EDL: None.

MS/MSD or MD: As per method

Deliverables: RLIMS63 Report, Raw Data, and COC
Paginate entire package

Penalties: None

Questions: If you have any questions, please contact the project manager either directly or by voice-mail at extension 331, or via e-mail on node tigger.

Special Instructions: **See attached Flow Chart and Instructions**
Particulate mesurement is completed first.
Rinsate and Filter Particulate are used for radiochemistry procedures.

PRICE CODES AND ANALYTE GROUPS:

8010

ANALYTE	MATRIX	EST SAMPLE	METHOD	SECT	HOLD CODE	PRICE CODE	ANALYTE GROUP
Particulate	Air	4	Method 5	WA	NA	3025A01NMET5	3025A1MET5
Iso U	Air	4	AS	WA	NA	3025A01NUISO	3025A1UISO
Iso Th	Air	4	AS	WA	NA	3025A01NTISO	3025A1TISO
Radium 226/228	Air	4	GS	WA	NA	3025A01NGS	3025A1GS
Total Uranium	Air	4	kPA	WA	NA	3025A01NTOTU	3025A1TOTU

DATACHEM LABORATORIES CLIENT-RELATED INFORMATION REPORT (CRIR)

CRIR NO. _____

COOLER INFORMATION CHECKLIST
(Fill In or Circle)

Client Name: Fermco

Project/Task/Site:

Date/Time of Receipt: 9/25/96 1000

Number of Coolers Received: 1

Condition of Coolers: Acceptable/Unacceptable

Temperature Control: Present/Not Included

Custody Seals: Present/Absent

Location Temperature Taken: Control/Between Samples

Intact/Broken

Are all temperatures within project specific guidelines? Yes/No

Tamper Evident: Yes/No

Ice Present: Yes/No

Are all applicable pHs within specific guidelines? Yes/No/NA

Frozen/Melted/NA

Cooler Received	DCL Cooler No.	Temp.	Cooler Received	DCL Cooler No.	Temp.	Cooler Received	DCL Cooler No.	Temp.
* 1	MC96 0437	19 °C	4	MC96	°C	7	MC96	°C
2	MC96	°C	5	MC96	°C	8	MC96	°C
3	MC96	°C	6	MC96	°C	9	MC96	°C

Taken By: Karyn Vigil (Signature) Karyn Vigil (Printed Name) 9/25/96 (Date)

* Rad Chem. Analysis: no temp preservation required

CLIENT-RELATED INFORMATION

- ☐ Missing Cooler
- ☐ Cooler Conditions
- ☐ Missing Paperwork
- ☐ Missing/Incorrect Bottle Labels
- ☐ Missing Samples/Bottles
- ☐ Broken/Leaking Samples
- ☐ Incorrect Bottle Type
- ☐ Cooler Temperatures Out Of Range
- ☐ Incorrect Preservation
- ☐ pH Criteria Not Met
- ☐ Head Space in Bottles
- ☐ Insufficient Sample Volume
- ☐ Chain Of Custody Problems
- ☐ Other:

BRIEFLY DESCRIBE THE PROBLEM AND THE ACTION TAKEN:

Faxed to Client? Yes ☐ No ☐ (If yes, attach Fax Cover Sheet)

❖ Response Required Within 24 Hours ❖

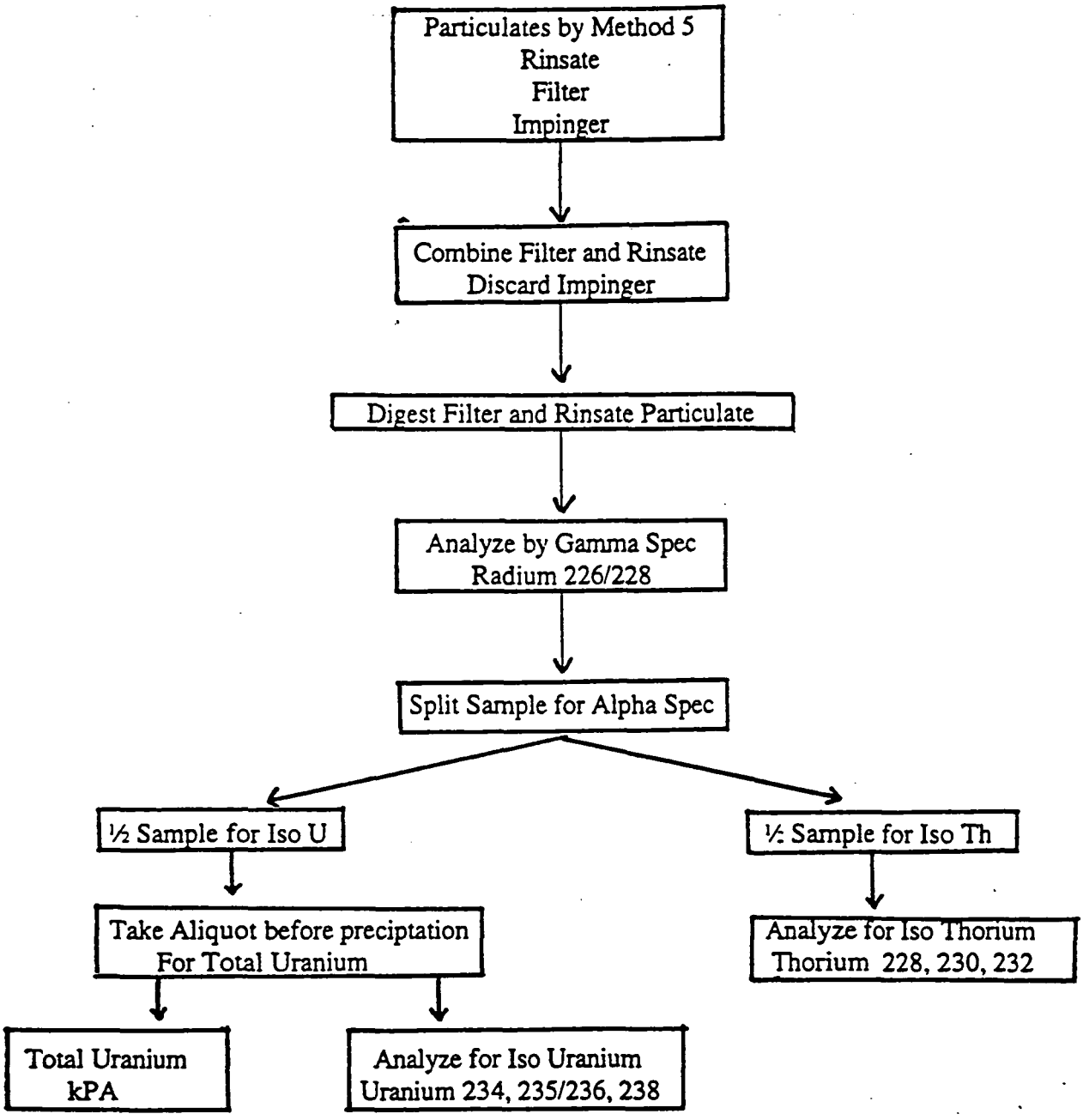
PROJECT MANAGEMENT

PROJECT MANAGER COMMENTS:

Project Manager: _____ (Printed Name) Returned to Sample Receipt by: _____ (Signature) Date: _____

Analytical Scheme
Hayden Environmental - Fernault Emission Testing

3 Samples and Field Blank



DATACHEM LABORATORIES Filter Weight Book No. FWT 06 Page No. 019

8019

Filter Lot #: ? Temp.: 74 R.H.: 55%

Filter: GF 96-20 (740)
Tare Analyst: JK Date: 9/16/96
Total Weight: ____ mg
Total Weight: ____ mg
Avg. Total Weight: ____ mg
Tare Weight: ~~453.2~~ 447.6 mg
Tare Weight: ~~453.2~~ 447.6 mg 447.6
Avg. Tare Weight: ~~453.2~~ mg
SAMPLE No.: ____ SAMPLE WT.: ____ mg
Total Wt. Anal.: ____ Date: ____
Check Analyst: ____ Date: ____

Filter: GF 96-21 (756)
Tare Analyst: JK Date: ____
Total Weight: ____ mg
Total Weight: ____ mg
Avg. Total Weight: ____ mg
Tare Weight: 453.2 mg
Tare Weight: 453.2 mg
Avg. Tare Weight: 453.2 mg
SAMPLE No.: ____ SAMPLE WT.: ____ mg
Total Wt. Anal.: ____ Date: ____
Check Analyst: ____ Date: ____

Filter: GF 96-22 (752)
Tare Analyst: JK Date: ____
Total Weight: ____ mg
Total Weight: ____ mg
Avg. Total Weight: ____ mg
Tare Weight: 448.9 mg
Tare Weight: 448.8 mg
Avg. Tare Weight: 448.9 mg
SAMPLE No.: ____ SAMPLE WT.: ____ mg
Total Wt. Anal.: ____ Date: ____
Check Analyst: ____ Date: ____

Filter: GF 96-23 (753)?
Tare Analyst: JK Date: ____
Total Weight: ____ mg
Total Weight: ____ mg
Avg. Total Weight: ____ mg
Tare Weight: 446.2 mg
Tare Weight: 446.0 mg
Avg. Tare Weight: 446.1 mg
SAMPLE No.: ____ SAMPLE WT.: ____ mg
Total Wt. Anal.: ____ Date: ____
Check Analyst: ____ Date: ____

Filter: GF 96-24 (753)?
Tare Analyst: JK Date: ____
Total Weight: ____ mg
Total Weight: ____ mg
Avg. Total Weight: ____ mg
Tare Weight: 456.6 mg
Tare Weight: 456.3 mg
Avg. Tare Weight: 456.5 mg
SAMPLE No.: ____ SAMPLE WT.: ____ mg
Total Wt. Anal.: ____ Date: ____
Check Analyst: ____ Date: ____

Pure Testing was supplied filters from GFF

Tared on a Sartorius Research (Red Cover) DLL#102683 on 9/16/96 JK

Filter: GF 96 25 (754)
Tare Analyst: JK Date: ____
Total Weight: ____ mg
Total Weight: ____ mg
Avg. Total Weight: ____ mg
Tare Weight: 447.5 mg
Tare Weight: 447.4 mg
Avg. Tare Weight: 447.5 mg
SAMPLE No.: ____ SAMPLE WT.: ____ mg
Total Wt. Anal.: ____ Date: ____
Check Analyst: ____ Date: ____

Filter: GF 96-26 (760?)
Tare Analyst: JK Date: ____
Total Weight: ____ mg
Total Weight: ____ mg
Avg. Total Weight: ____ mg
Tare Weight: 451.2 mg
Tare Weight: 450.9 mg
Avg. Tare Weight: 451.1 mg
SAMPLE No.: ____ SAMPLE WT.: ____ mg
Total Wt. Anal.: ____ Date: ____
Check Analyst: ____ Date: ____

Filter: GF 96-27 (761)
Tare Analyst: JK Date: ____
Total Weight: ____ mg
Total Weight: ____ mg
Avg. Total Weight: ____ mg
Tare Weight: 449.3 mg
Tare Weight: 449.2 mg
Avg. Tare Weight: 449.3 mg
SAMPLE No.: ____ SAMPLE WT.: ____ mg
Total Wt. Anal.: ____ Date: ____
Check Analyst: ____ Date: ____

Filter: GF 96-28 (763)
Tare Analyst: JK Date: 9/16/96
Total Weight: ____ mg
Total Weight: ____ mg
Avg. Total Weight: ____ mg
Tare Weight: 450.9 mg
Tare Weight: 450.7 mg
Avg. Tare Weight: 450.8 mg
SAMPLE No.: ____ SAMPLE WT.: ____ mg
Total Wt. Anal.: ____ Date: ____
Check Analyst: ____ Date: ____

Filter: ____
Tare Analyst: ____ Date: ____
Total Weight: ____ mg
Total Weight: ____ mg
Avg. Total Weight: ____ mg
Tare Weight: ____ mg
Tare Weight: ____ mg
Avg. Tare Weight: ____ mg
SAMPLE No.: ____ SAMPLE WT.: ____ mg
Total Wt. Anal.: ____ Date: ____
Check Analyst: ____ Date: ____

DATACHEM LABORATORIES
ANALYTE GROUP LIST
SEARCH STRING: 3025A1MET5

ANALYTE GROUP: 3025A1MET5 ACCOUNT: 03025 DESCRIPTION: Method 5 Particulate

Analyte	Instrument Class	Method	Sub Method	Report Units	Threshold	Lod	Loq
Particulate	GRAV	Method 5		mg/Rinsate			0.1
Particulate	GRAV	Method 5		mg/Filter			0.1
Particulate	GRAV	Method 5		mg/Impinger			0.1
Particulate	GRAV	Method 5		Total mg			0.1

--- END OF LISTING ---

8019
000190
031

DATACHEM LABORATORIES
ANALYTE GROUP LIST
SEARCH STRING: 3025A1UISO

ANALYTE GROUP: 3025A1UISO ACCOUNT: 03025 DESCRIPTION: Isotopic Uranium

Analyte	Instrument Class	Method	Sub Method	Report Units	Threshold	Lod	Loq
Uranium-233/234	AS	WR-DC-341	WR-DC-200	pCi/Sample			1.0
Uranium-235	AS	WR-DC-341	WR-DC-200	pCi/Sample			1.0
Uranium-238	AS	WR-DC-341	WR-DC-200	pCi/Sample			1.0

--- END OF LISTING ---

00019432

80019

DATACHEM LABORATORIES
ANALYTE GROUP LIST
SEARCH STRING: 3025A1TISO

ANALYTE GROUP: 3025A1TISO ACCOUNT: 03025 DESCRIPTION: ISOTOPIC THORIUM

Analyte	Instrument Class	Method	Sub Method	Report Units	Threshold	Lod	Loq
Thorium-228	AS	WR-DC-341		pCi/Sample			1.0
Thorium-230	AS	WR-DC-341		pCi/Sample			1.0
Thorium-232	AS	WR-DC-341		pCi/Sample			1.0

--- END OF LISTING ---

DATACHEM LABORATORIES
ANALYTE GROUP LIST
SEARCH STRING: 3025A1GS

ANALYTE GROUP: 3025A1GS ACCOUNT: 03025 DESCRIPTION: Radium 226/228 by ga

Analyte	Instrument Class	Method	Sub Method	Report Units	Threshold	Lod	Loq
Radium-226	GS	WR-EP-325	WR-DC-200	pCi/Sample			95
Radium-228	GS	WR-EP-325	WR-DC-200	pCi/Sample			20

--- END OF LISTING ---

00019934

8019

DATACHEM LABORATORIES
ANALYTE GROUP LIST
SEARCH STRING: 3025A1TOTU

ANALYTE GROUP: 3025A1TOTU ACCOUNT: 03025 DESCRIPTION: Total Uranium by kPA

Analyte	Instrument Class	Method	Sub Method	Report Units	Threshold	Lod	Loq
Total Uranium	kPA	WR-DC-342		ug/Sample			0.8

--- END OF LISTING ---

8019

000194 035

August 6, 1996
Refer to: BD0021

Bruce Sarven
Hayden Environmental
561 Congress Park Drive
Dayton, OH 45459

Phone: (513) 438-3010
FAX: (513) 438-3020

Re: REVISED FAX Quote BD0021

Dear Mr. Sarven:

DataChem Laboratories, Inc.(DCL) appreciates the opportunity to provide you with cost estimates for your project. As I understand your needs, you will be taking three 6 hour stack samples and a blank by Method 5 for particulates and radionulclides analysis. Tared glass fiber filters and sample bottles will be provided for these determinations. The acetone rinse and glass fiber filter will be combined for the analysis of radionuclides.

Uranium 234, Uranium 235/236, Uranium 238, Thorium 228, Thorium 230, and Thorium 232 will be analyzed by alpha spectrometry(AS). Radium 226 and Radium 228 will be analyzed by gamma spectrometry(GS). Total Uranium will be analyzed by kinetic phosphorescence(KPA). According to method 114 these radionuclides will be part of the particulate loading and analysis on the impinger solutions is not required. Combined particulate from the acetone rinse and filter will be analyzed according to DCL standard operating procedures(SOP).

The standard turnaround time for these analysis is 30 calendar days. The requested turnaround time of 10 working days can be accomplished for an additional 25%. The requested detection limits for isotopic analysis can not be met. Minimun Detectable Activity (MDA) is listed on the attached table.

Attached is a Pricing Quotation for these analyses. If you have any question concerning the attached quotation please call me.

Sincerely,

Robert P. Di Rienzo
Project Manager

Revised Pricing Quotation
Project Reference Number: BD-0021

Parameter Analysis	Method	MDA pCi/Sample	Method	Fractions	Price per Sample
Particulate	Method 5		Grav	Acetone Rinse Filter Impinger	$100.00
Uranium 234 Uranium 235/236 Uranium 238	DCL SOP	1 1 1	AS	Particulate*	$312.50
Thorium 228 Thorium 230 Thorium 232	DCL SOP	1 1 1	AS	Particulate*	$312.50
Radium 226 Radium 228	DCL SOP	95 20	GS	Particulate*	$250.00
Total Uranium	DCL SOP	0.8 ug/ Sample	KPA	Particulate*	$187.50

* = Particulate samples are combined acetone rinse and glass fiber filter.

EMISSION MEASUREMENT TECHNICAL INFORMATION CENTER TEST METHOD

Method 5 - Determination of Particulate Emissions from Stationary Sources

1. PRINCIPLE AND APPLICABILITY

1.1 Principle. Particulate matter (PM) is withdrawn isokinetically from the source and collected on a glass fiber filter maintained at a temperature in the range of 120 ± 14°C (248 ± 25°F) or such other temperature as specified by an applicable subpart of the standards or approved by the Administrator, U.S. Environmental Protection Agency, for a particular application. The PM mass, which includes any material that condenses at or above the filtration temperature, is determined gravimetrically after removal of uncombined water.

1.2 Applicability. This method is applicable for the determination of PM emissions from stationary sources.

2. APPARATUS

2.1 Sampling Train. A schematic of the sampling train used in this method is shown in Figure 5-1. Complete construction details are given in APTD-0581 (Citation 2 in the Bibliography); commercial models of this train are also available. For changes from APTD-0581 and for allowable modifications of the train shown in Figure 5-1, see the following subsections.

The operating and maintenance procedures for the sampling train are described in APTD-0576 (Citation 3 in the Bibliography). Since correct usage is important in obtaining valid results, all users should read APTD-0576 and adopt the operating and maintenance procedures outlined in it, unless otherwise specified herein. The sampling train consists of the following components:

2.1.1 Probe Nozzle. Stainless steel (316) or glass with sharp, tapered leading edge. The angle of taper shall be ≤30°, and the taper shall be on the outside to preserve a constant internal diameter. The probe nozzle shall be of the button-hook or elbow design, unless otherwise specified by the Administrator. If made of stainless steel, the nozzle shall be constructed from seamless tubing; other materials of construction may be used, subject to the approval of the Administrator.

A range of nozzle sizes suitable for isokinetic sampling should be available, e.g., 0.32 to 1.27 cm (1/8 to 1/2 in.)—or larger if higher volume sampling trains are used—inside diameter (ID) nozzles in increments of 0.16 cm (1/16 in.). Each nozzle shall be calibrated according to the procedures outlined in Section 5.

directly from the wash bottle being used, and place it in a glass sample container labeled "acetone blank."

Inspect the train prior to and during disassembly, and note any abnormal conditions. Treat the samples as follows:

Container No. 1. Carefully remove the filter from the filter holder, and place it in its identified petri dish container. Use a pair of tweezers and/or clean disposable surgical gloves to handle the filter. If it is necessary to fold the filter, do so such that the PM cake is inside the fold. Carefully transfer to the petri dish any PM and/or filter fibers that adhere to the filter holder gasket, by using a dry Nylon bristle brush and/or a sharp-edged blade. Seal the container.

Container No. 2. Taking care to see that dust on the outside of the probe or other exterior surfaces does not get into the sample, quantitatively recover PM or any condensate from the probe nozzle, probe fitting, probe liner, and front half of the filter holder by washing these components with acetone and placing the wash in a glass container. Deionized distilled water may be used instead of acetone when approved by the Administrator and shall be used when specified by the Administrator; in these cases, save a water blank, and follow the Administrator's directions on analysis. Perform the acetone rinse as follows:

Carefully remove the probe nozzle, and clean the inside surface by rinsing with acetone from a wash bottle and brushing with a Nylon bristle brush. Brush until the acetone rinse shows no visible particles, after which make a final rinse of the inside surface with acetone.

Brush and rinse the inside parts of the Swagelok fitting with acetone in a similar way until no visible particles remain.

Rinse the probe liner with acetone by tilting and rotating the probe while squirting acetone into its upper end so that all inside surfaces will be wetted with acetone. Let the acetone drain from the lower end into the sample container. A funnel (glass or polyethylene) may be used to aid in transferring liquid washes to the container. Follow the acetone rinse with a probe brush. Hold the probe in an inclined position, squirt acetone into the upper end as the probe brush is being pushed with a twisting action through the probe; hold a sample container underneath the lower end of the probe, and catch any acetone and particulate matter that is brushed from the probe. Run the brush through the probe three times or more until no visible PM is carried out with the acetone or until none remains in the probe liner on visual inspection. With stainless steel or other metal probes, run the brush through in the above prescribed manner at least six times since metal probes have small crevices in which particulate matter can be entrapped.

Rinse the brush with acetone, and
quantitatively collect these washings in the sample container. After the brushing, make a final acetone rinse of the probe as described above.

It is recommended that two people clean the probe to minimize sample losses. Between sampling runs, keep brushes clean and protected from contamination.

After ensuring that all joints have been wiped clean of silicone grease, clean the inside of the front half of the filter holder by rubbing the surfaces with a Nylon bristle brush and rinsing with acetone. Rinse each surface three times or more if needed to remove visible particulate. Make a final rinse of the brush and filter holder. Carefully rinse out the glass cyclone, also (if applicable). After all acetone washings and particulate matter have been collected in the sample container, tighten the lid on the sample container so that acetone will not leak out when it is shipped to the laboratory. Mark the height of the fluid level to determine whether leakage occurred during transport. Label the container to identify clearly its contents.

Container No. 3. Note the color of the indicating silica gel to determine whether it has been completely spent, and make a notation of its condition. Transfer the silica gel from the fourth impinger to its original container, and seal. A funnel may make it easier to pour the silica gel without spilling. A rubber policeman may be used as an aid in removing the silica gel from the impinger. It is not necessary to remove the small amount of dust particles that may adhere to the impinger wall and are difficult to remove. Since the gain in weight is to be used for moisture calculations, do not use any water or other liquids to transfer the silica gel. If a balance is available in the field, follow the procedure for Container No. 3 in Section 4.3.

Impinger Water. Treat the impingers as follows: Make a notation of any color or film in the liquid catch. Measure the liquid that is in the first three impingers to within I ml by using a graduated cylinder or by weighing it to within 0.5 g by using a balance (if one is available). Record the volume or weight of liquid present. This information is required to calculate the moisture content of the effluent gas.

Discard the liquid after measuring and recording the volume or weight, unless analysis of the impinger catch is required (see **NOTE**, Section 2.I.7).

If a different type of condenser is used, measure the amount of moisture condensed either volumetrically or gravimetrically.

Whenever possible, containers should be shipped in such a way that they remain upright at all times.

4.3 Analysis. Record the data required on a sheet such as the one shown in Figure 5-3. Handle each sample container as follows:

Container No. 1. Leave the contents in the shipping container or transfer the filter and any loose PM from the sample container to a tared glass weighing dish. Desiccate for 24 hours in a desiccator containing anhydrous calcium sulfate. Weigh to a constant weight, and report the results to the nearest
0.1 mg. For purposes of this Section, 4.3, the term "constant weight" means a difference of no more than 0.5 mg or 1 percent of total weight less tare weight, whichever is greater, between two consecutive weighings, with no less than 6 hours of desiccation time between weighings.

Alternatively, the sample may be oven dried at 105°C (220°F) for 2 to 3 hours, cooled in the desiccator, and weighed to a constant weight, unless otherwise specified by the Administrator. The tester may also opt to oven dry the sample at 105°C (220°F) for 2 to 3 hours, weigh the sample, and use this weight as a final weight.

Container No. 2. Note the level of liquid in the container, and confirm on the analysis sheet whether leakage occurred during transport. If a noticeable amount of leakage has occurred, either void the sample or use methods, subject to the approval of the Administrator, to correct the final results. Measure the liquid in this container either volumetrically to ±1 ml or gravimetrically to ±0.5 g. Transfer the contents to a tared 250-ml beaker, and evaporate to dryness at ambient temperature and pressure. Desiccate for 24 hours, and weigh to a constant weight. Report the results to the nearest 0.1 mg.

Container No. 3. Weigh the spent silica gel (or silica gel plus impinger) to the nearest 0.5 g using a balance. This step may be conducted in the field.

"Acetone Blank" Container. Measure the acetone in this container either volumetrically or gravimetrically. Transfer the acetone to a tared 250-ml beaker, and evaporate to dryness at ambient temperature and pressure. Desiccate for 24 hours, and weigh to a constant weight. Report the results to the nearest 0.1 mg.

NOTE: At the option of the tester, the contents of Container No. 2 as well as the acetone blank container may be evaporated at temperatures higher than ambient. If evaporation is done at an elevated temperature, the temperature must be below the boiling point of the solvent; also, to prevent "bumping," the evaporation process must be closely supervised, and the contents of the beaker must be swirled occasionally to maintain an even temperature. Use extreme care, as acetone is highly flammable and has a low flash point.

4.4 Quality Control Procedures. The following quality control procedures are

suggested to check the volume metering system calibration values at the field test site prior to sample collection. These procedures are optional for the tester.

4.4.1 Meter Orifice Check. Using the calibration data obtained during the calibration procedure described in Section 5.3, determine the $\Delta H_@$ for the metering system orifice. The $\Delta H_@$ is the orifice pressure differential in units of in. H_20 that correlates to 0.75 cfm of air at 528°R and 29.92 in. Hg. The
$\Delta H_@$ is calculated as follows:

$$\Delta H_@ = 0.0319\, \Delta H \frac{T_m\, \theta^2}{P_{bar}\, Y^2\, V_m^2}$$

where:

ΔH = Average pressure differential across the orifice meter, in. H_20.

T_m = Absolute average DGM temperature, °R.

P_{bar} = Barometric pressure, in. Hg.

θ = Total sampling time, min.

Y = DGM calibration factor, dimensionless.

V_m = Volume of gas sample as measured by DGM, dcf.

$0.0319 = (0.0567 \text{ in. Hg/°R})(0.75 \text{ cfm})^2$

Before beginning the field test (a set of three runs usually constitutes a field test), operate the metering system (i.e., pump, volume meter, and orifice) at the $\Delta H_@$ pressure differential for 10 minutes. Record the volume collected, the DGM temperature, and the barometric pressure. Calculate a DGM calibration check value, Y_c, as follows:

$$Y_c = \frac{10\,[0.0319\, T_m]^{1/2}}{V_m \left[\frac{}{P_{bar}}\right]}$$

where:

Y_c = DGM calibration check value, dimensionless.

DATA CHEM LABORATORIES
A SORENSON COMPANY

Analytical Documentation
Inventory Checklist

- [NA] This is a "dummy datapackage". Data for inventory checklist found with set _____
- [NA] Copy of TCLP Preparation Logbook Pages
- [X] Copy of Sample Preparation Notebook/Logbook Pages
- [X] Copy of Analyst's Notebook/Method Logbook Pages
- [X] Copy of Instrument Injection Logbook/Instrument Logbook/Run Log Pages
- [NA] Copy of Reagent Logbook Pages
- [NA] Copy of Working Standard Preparation Logbook Pages
- [NA] Copy of Secondary or Intermediate Standard Preparation Logbook Pages
- [NA] Copy of Primary Standard or Concentrated Stock Standard Preparation Logbook Pages
- [X] Certificates of Analysis for Standards
- [NA] Copy of Standard Verification Logbook Pages (including documentation for spiking solutions and/or calibration standards)
- [NA] Copy of Preparation Logbooks for solutions prepared by QC

All other miscellaneous documentation associated with this set (describe)

- [NA] _____

Analytical Documentation
Reviewer Checklist

- X The Analytical Documentation Inventory Checklist above is complete.
- X Basic documentation procedures were followed in accordance with DCL SOP XX-DC-004 "Analytical Data Record Keeping."
- X All notebook and logbook pages contain page number, book number, title, and available space for pagination (if required).
- X All notebook and logbook pages were signed and dated by the analyst and reviewer before copying.
- X All copies are legible.
- X Standard preparation is documented in accordance with DCL SOP XX-DC-019 "Standards Purity, Preparation, Traceability and Verification" or by WR-DC-001 "The Acquisition, Preparation, and use of Radioactive Standard Reference Materials."
- X Documentation is provided to verify that standard calibration solutions and spiking solutions are traceable to a vendor certificate.

Assembled by: Robert Tully 10/21/96 (Signature / Date) Reviewed by: [signature] 10/21/96 (Signature / Date)

Rev. 6/95

DATACHEM LABORATORIES Filter Weight Book No. FWT 00 Page No. 019

Filter Lot #: 7 Temp.: 74 R.H.: 55% 8019

Fore Testing was supplied filters Gemdia GFF

Tared on a Sartorius Research (Rad Chem) DLL #102683 on 9/16/96 JG

Filter: GF 96-20 (740)
Tare Analyst JG Date 9/16/96
Total Weight ____ mg
Total Weight ____ mg
Avg. Total Weight ____ mg
Tare Weight ~~453.2~~ 447.6 mg
Tare Weight ~~453.2~~ 447.6 mg
Avg. Tare Weight ~~453.2~~ 447.6 mg
SAMPLE No. ____ SAMPLE WT. ____ mg
Total Wt. Anal. ____ Date ____
Check Analyst ____ Date ____

Filter: GF 96-21 (756)
Tare Analyst JG Date ____
Total Weight ____ mg
Total Weight ____ mg
Avg. Total Weight ____ mg
Tare Weight 453.2 mg
Tare Weight 453.2 mg
Avg. Tare Weight 453.2 mg
SAMPLE No. ____ SAMPLE WT. ____ mg
Total Wt. Anal. ____ Date ____
Check Analyst ____ Date ____

Filter: GF 96-22 (752)
Tare Analyst JG Date ____
Total Weight ____ mg
Total Weight ____ mg
Avg. Total Weight ____ mg
Tare Weight 448.9 mg
Tare Weight 448.8 mg
Avg. Tare Weight 448.9 mg
SAMPLE No. ____ SAMPLE WT. ____ mg
Total Wt. Anal. ____ Date ____
Check Analyst ____ Date ____

Filter: GF 96-23 (753)?
Tare Analyst JG Date ____
Total Weight ____ mg
Total Weight ____ mg
Avg. Total Weight ____ mg
Tare Weight 446.2 mg
Tare Weight 446.0 mg
Avg. Tare Weight 446.1 mg
SAMPLE No. ____ SAMPLE WT. ____ mg
Total Wt. Anal. ____ Date ____
Check Analyst ____ Date ____

Filter: GF 96-24 (753)?
Tare Analyst JG Date ____
Total Weight ____ mg
Total Weight ____ mg
Avg. Total Weight ____ mg
Tare Weight 456.6 mg
Tare Weight 456.3 mg
Avg. Tare Weight 456.5 mg
SAMPLE No. ____ SAMPLE WT. ____ mg
Total Wt. Anal. ____ Date ____
Check Analyst ____ Date ____

Filter: GF 96-25 (754)
Tare Analyst JG Date ____
Total Weight ____ mg
Total Weight ____ mg
Avg. Total Weight ____ mg
Tare Weight 447.5 mg
Tare Weight 447.4 mg
Avg. Tare Weight 447.5 mg
SAMPLE No. ____ SAMPLE WT. ____ mg
Total Wt. Anal. ____ Date ____
Check Analyst ____ Date ____

Filter: GF 96-26 (760?)
Tare Analyst JG Date ____
Total Weight ____ mg
Total Weight ____ mg
Avg. Total Weight ____ mg
Tare Weight 451.2 mg
Tare Weight 450.9 mg
Avg. Tare Weight 451.1 mg
SAMPLE No. ____ SAMPLE WT. ____ mg
Total Wt. Anal. ____ Date ____
Check Analyst ____ Date ____

Filter: GF 96-27 (761)
Tare Analyst JG Date ____
Total Weight ____ mg
Total Weight ____ mg
Avg. Total Weight ____ mg
Tare Weight 449.3 mg
Tare Weight 449.2 mg
Avg. Tare Weight 449.3 mg
SAMPLE No. ____ SAMPLE WT. ____ mg
Total Wt. Anal. ____ Date ____
Check Analyst ____ Date ____

Filter: GF 96-28 (763)
Tare Analyst JG Date 9/16/96
Total Weight ____ mg
Total Weight ____ mg
Avg. Total Weight ____ mg
Tare Weight 450.9 mg
Tare Weight 450.7 mg
Avg. Tare Weight 450.8 mg
SAMPLE No. ____ SAMPLE WT. ____ mg
Total Wt. Anal. ____ Date ____
Check Analyst ____ Date ____

Filter: ____
Tare Analyst ____ Date ____
Total Weight ____ mg
Total Weight ____ mg
Avg. Total Weight ____ mg
Tare Weight ____ mg
Tare Weight ____ mg
Avg. Tare Weight ____ mg
SAMPLE No. ____ SAMPLE WT. ____ mg
Total Wt. Anal. ____ Date ____
Check Analyst ____ Date ____

TITLE Hayden Environmental Sample Dilution Book No. 3086

8019 12

From Page No.

Client	Account No.	Set No.	Sample Nos.	Matrix	Balance ID
Hayden Enviro.	3025	96E-0640 *	96E04514-4517	AIR/FILTER	102695

Filters and acetone rinse were combined after acetone rinse was dryed. Samples were placed in metal based teflon beakers and dissolved in 6 mL of HF (hydrofluoric acid) and then taken to near dryness to expell all of the HF. The samples were then transferred to tared P.M.P. jars and brought up to approximately 100.0 g, using 1 M HNO_3 (nitric acid).

Sample Number	Final Mass in Tared PMP.
96E04514	100.0 g
96E04515	106.4 g
96E04516	100.1 g
96E04517	100.1 g

T.P. 10-8-96

To Page No.

Witnessed & Understood by me,	Date	Invented by	Date
Bradley J. Richardson	10-21-96	Recorded by Ty E. Peterson	10/8/96

[redacted]

Gamma Spectrometry

Client: Hayden Environmental Account No.: 3025 Set No.: 96E-0640-04

Sample Matrix: Air Prep Group ID: G9699018 Date of Last Calibration: NA

Calibration Standard ID: IPL 479-114-3 Daily Source Check ID: CZ-588

Spiking Solution ID: — Concentration(pCi/mL): — Aliquot: —

Pipet Used: NA Counting Geometry: PMP

SAMPLE#	ALIQUOT	DETECTOR	FILE NAME
BL-123240-1	100.0	γ5 Smp.	BL123240L_GAMMA5_PMP 9190
QC-123240-1	100.4g	γ6 Smp.	QC1232401_GAMMA6_PMP_ ~~9192~~ 9220 RL 10/14/96
96E04514	1 Filter	γ5 Smp.	96E04514_GAMMA5_PMP 9186
4515	↓	γ6 Smp.	96E04515_GAMMA6_PMP 9187
4516	↓	γ5 Smp.	96E04516_GAMMA5_PMP_ RL 10/11/96 9183
4517	↓	γ6 Smp.	96E04517_GAMMA6_PMP_ 9182
4517MD	1 Filter	γ6 Smp.	96E04517MD_GAMMA6_PMP_9191

R. Jolly 10/21/96

*N/A=Not Applicable

Comments:

Recorded by: Robin Jolly Date: 10/21/96 Reviewed by: [illegible] Date: 10-21-96

Gamma Spectroscopy Run Log

Book Number 4076

Date	Det. ID	Analyst	Filename	Minutes
10-8-96	6	MAB	SMP_96M04436_Gamma6_TRMIS3_9163	60
10-8-96	NaI	MAB	SMP_96E04627_NaI_Canister_9164	10
	NaI		SMP_96E04627MD_NaI_Canister_9165	10
	NaI		SMP_96E04628_NaI_Canister_9166	10
	NaI		SMP_QC1238841_NaI_Canister_9167	10
	5		SMP_96M04435MD_Gamma5_TRMIS3_9168	60
10-8-96	6	MAB	SMP_96M04437_Gamma6_TRMIS3_9169	60
10-8-96	2	MAB	SMP_L+250_Gamma2_IPLIL_9170	500
MAB 10-8-96	~~2~~	~~MAB~~	~~SMP_L+250MD_Gamma2_IPLIL_~~	~~500~~
	~~2~~	~~MAB~~	~~SMP_L+250RMD_Gamma2_IPLIL_~~	~~500~~
10-8-96	NaI	MAB	SMP_BCKGND_Gamma2_Canister_9171	10
10-9-96	1	MAB	QCC_Gamma1_CZ588-1	15
	2		2	
	3		3	
	4		4	
	5		5	
10-9-96	6	MAB	QCC_Gamma6_CZ588-1	15
10-9-96	2	MAB	SMP_96M04410_Gamma2_TRMIS3_9173	100
	5	RL	Smp_96E04514_GAMMA5_PMP_9172	240
	6	RL	Smp_96E04515_GAMMA6_PMP_9174	240
10/9/96	1	MT	SMP_BL1234502_GAMMA1_IPLIL_9175	240
10/9/96	3	MT	SMP_QC1234502_GAMMA3_IPLIL_9176	240
10/9/96	2	MT	SMP_96C05433_GAMMA2_IPLIL_9177	1000
10/9/96	4	MT	SMP_96C05434_GAMMA4_IPLIL_9178	1000
	5	RL	Smp_96E04516_GAMMA5_PMP_9179	240 (4)
	6	RL	Smp_96E04517_GAMMA6_PMP_9180	240 (4)
10/9/96	1	MT	SMP_BL1234501_Gamma1_IPLIL_9184	240
10/9/96	3	MT	SMP_QC1234501_Gamma3_IPLIL_9185	240
	5	RL	Smp_96E04516_GAMMA5_PMP_9181	240 (4)
	6		Smp_96E04517_GAMMA6_PMP_9182	240
	5	RL	Smp_96E04516_GAMMA5_PMP_9183	240
10/10/96	1	MT	QCC_Gamma1_CZ588-1	15

Reviewed By: M. [illegible] 10/10/96
Signature & Date

Gamma Spectroscopy Run Log

Book Number 4076

Date	Det. ID	Analyst	Filename	Minutes
10/10/96	2	MT	QCC_GammG2_CZ588-1	15
	3		3-	
	4		4-	
	5		5-	
	6		6-	
10/10/96	5	RL	Smp_96E04514_GAMMA5_PMP_9186	240
10/10/96	6	RL	Smp_96E04515_GAMMA6_PMP_9187	240
~~10/9/96~~	~~6~~	~~RL~~	~~Smp_96E04517MD_GAMMA6_PMP~~ RLwley 10/10/96	~~240~~
10/10/96	2	MT	SMP_BL1227641_Gamma2_1PL1L_9188	1000
10/10/96	4	MT	SMP_QC1227641_Gamma4_1PL1L_9189	1000
	5	RL	Smp_BL1232401_GAMMA5_PMP_9190 RL	240
	6	RL	Smp_96E04517MD_GAMMA6_PMP_9191 10/10/96	240
10/10/96	5	RL	Smp_QC1232401_GAMMA5_PMP_9192	240
10/10/96	6	MT	SMP_96C05434MD_Gamma6_1PL1L_9193	1000
10/10/96	1	MT	SMP_96E04551_Gamma1_1PL1L_9194	240
10/10/96	3	MT	SMP_96E04560_Gamma3_1PL1L_9195	240

Reviewed By: _____
Signature & Date

Gamma Spectroscopy
Calibration/Maintenance Log

Book Number 4075

Date	Det. ID	Analyst	Comments
9/21/96	1→6	MAB	LN_2 Refill, Calibrations, BKGND
9/24/96	1→6	MT	QCC
9/25/96	1→6	MT	QCC
9/26/96	1→6	MT	QCC
9/27/96	1→6	MT	QCC
9/27/96	1→6	MT	LN_2 Refill
9/27/96	1→6	MT	Backgrounds.
9/30/96	1→6	MT	CAL & QCC
10/1/96	1→6	MT	QCC
10/2/96	1→6	MT	QCC
10/4/96	1→6	MAB	LN_2 Refill, Background
10-7-96	1-6	MAB	Calibration & QCC

Reviewed By: _____
Signature & Date

ALLIED Bendix Aerospace

Bendix Field Engineering Corporation
P.O. Box 1569
Grand Junction, CO 81502-1569
Telephone (303) 242-8621
Telex 454-338

January 9, 1986

Dear Reader and Custodian of TMC Radium-226 Reference Material:

A number of you have inquired about the values for lead-210 in the radium-226 reference material sets we prepared and distributed. Attached is a brief note describing the results of our analysis of the reference material for lead-210 and for one of its daughters, polonium-210. The results, and their associated uncertainties at one standard deviation, are summarized below:

Nominal Radium-226 (pCi/g)	Lead-210 (pCi/g)
5	5.2 ± 0.2
15	15.7 ± 0.6
50	51.5 ± 1.7

We hope you find these data useful.

Happy counting!

Sincerely yours,

John R. Duray

John R. Duray
Project Manager
Technical Measurements Center

Attachment

Addendum to Technical Measurements Center Report GJ/TMC-10

DEVELOPMENT OF SOLID RADIUM-226 REFERENCE MATERIALS[1]

INTRODUCTION

Many users of the Technical Measurements Center (TMC) radium-226 reference materials have suggested that the materials would be more useful if the values for lead-210 were known. Accordingly, the Analytical Chemistry Laboratory of Bendix Field Engineering Corporation/Grand Junction Operations (Bendix) has analyzed the reference materials for lead-210 by means of liquid scintillation counting following acid digestion of the materials and anion-exchange separation of lead-210.[2] In addition, alpha spectrometry was used to measure polonium-210, a daughter of lead-210, after equilibrium had been achieved.[3] Certified lead-210 and polonium-208 standards, traceable to the National Bureau of Standards, were used for calibration purposes.

RESULTS

The lead-210 and polonium-210 results for each of the three sets of reference material (5, 15, and 50 pCi/g) are presented in Tables 1, 2, and 3, respectively. Examination of these results for extreme values, as described by Dixon and Massey,[4] revealed one outlier in the polonium-210 results for the 15-pCi/g data set. This value was excluded from the data set when calculating the mean value.

---

[1] R. B. Chessmore and P. R. Engelder, 1983. Development of Solid Radium-226 Reference Materials, GJ/TMC-10, U.S. Department of Energy, Technical Measurements Center, Grand Junction, Colorado.

[2] W. D. Fairman and J. Sedlet, 1968. 'Direct Determination of Lead-210 by Liquid Scintillation Counting,' Analytical Chemistry, Vol. 40, No. 13, pp. 2004-2008.

[3] A. B. MacKenzie and R. D. Scott, 1979. 'Separation of Bismuth-214 and Polonium-210 from Aqueous Solutions by Spontaneous Adsorption on Copper Foils,' Analyst, Vol. 104, pp. 1151-1158.

[4] W. J. Dixon and F. J. Massey, Jr., 1969. Introduction to Statistical Analysis: Third Edition, McGraw-Hill Book Co., Inc., New York, New York.

DISCUSSION

The mean values of the results obtained for lead-210 and polonium-210 are presented in Tables 1, 2, and 3. Also cited are the experimental standard deviations in order to provide an indication of the precision of the measurements. The suggested value for lead-210 in the reference materials, given at the bottom of each table, is the average of all the determinations obtained using both methods, excluding outliers. The uncertainties cited are associated with the experimental standard deviations only and do not include systematic errors. Since these results have not been validated by other workers, they should be considered as 'for information only' values.

Table 1. Results of Bendix Analysis for Pb-210 and Po-210: 5-pCi/g Ra-226 Reference Material

Bottle Number	Lead-210 (pCi/g)	Polonium-210 (pCi/g)
117	5.5	5.0
116	5.2	5.4
101	5.5	5.0
114	5.2	5.1
108	5.3	4.9
110	5.4	5.0
104	5.2	5.2
112	5.3	4.9
120	5.4	5.2
Mean	5.3	5.1
Experimental Standard Deviation	±0.1	±0.2
Suggested Value for Lead-210:	5.2 ± 0.2 pCi/g	

Table 2. Results of Bendix Analysis for Pb-210 and Po-210: 15-pCi/g Ra-226 Reference Material

Bottle Number	Lead-210 (pCi/g)	Polonium-210 (pCi/g)
106	15.1	15.7
124	15.3	13.9[a]
103	15.9	16.2
112	15.0	15.8
109	15.2	15.7
105	15.3	16.1
101	15.6	15.8
119	14.8	16.9
114	15.3	16.5
Mean	15.3	16.1
Experimental Standard Deviation	±0.3	±0.4

Suggested Value for Lead-210: 15.7 ± 0.6 pCi/g

[a]Outlier.

Table 3. Results of Bendix Analysis for Pb-210 and Po-210: 50-pCi/g Ra-226 Reference Material

Bottle Number	Lead-210 (pCi/g)	Polonium-210 (pCi/g)
107	53.5	51.4
122	49.3	51.9
105	52.6	49.5
110	49.6	51.6
120	51.6	53.7
101	51.6	54.5
116	49.9	50.6
119	51.0	49.0
108	51.2	53.9
Mean	51.1	51.8
Experimental Standard Deviation	±1.4	±1.9

Suggested Value for Lead-210: 51.5 ± 1.7 pCi/g

UNC Geotech

UNC Geotech
2597 B 3/4 Road
P.O. Box 14000
Grand Junction, Colorado 81502-5504
303/242-8621

October 1987

Dear Reader:

The DOE Technical Measurements Center report entitled *Uranium Reference Materials*, UNC/GJ--36(TMC) published in July 1987, incorrectly identified uranium mill tailings reference material TRM-3 as having a recommended U-238 concentration of 29.6 pCi/g (Table 7, page 6). The correct recommended concentration for TRM-3 is 19.6 pCi/g. Attached is the corrected table, which can be easily inserted into the report by peeling the paper off of the gummed back and pasting it over the current Table 7.

We regret any inconvenience that this typographical error may have caused. If you have any further questions, please do not hesitate to contact me at 303-242-8621 or FTS 322-9543.

Sincerely,

John R. Duray

John R. Duray
Project Manager
Technical Measurements Center

Distribution:
UC-70A
S-70A
Reference Material Holders
of Record

UNC/GJ-36(TMC)
Distribution Category: UC-70A

Uranium Reference Materials

Stephen Donivan
Ronald Chessmore

Published July 1987

UNC Geotech
Technical Measurements Center
Grand Junction, Colorado 81502-5504

Prepared for the
U.S. Department of Energy
Grand Junction Projects Office
Under Contract No. DE-AC07-86ID12584

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Summary

The Technical Measurements Center (TMC), located at the U.S. Department of Energy (DOE) Grand Junction Projects Office (GJPO), has been tasked by the DOE Office of Remedial Action and Waste Technology to support ongoing remedial action programs by providing both technical guidance and assistance in making the various measurements required in all phases of remedial action work. Pursuant to this task, the Technical Measurements Center has prepared uranium mill tailings reference materials for use by remedial action contractors and cognizant federal and state agencies. Four materials were prepared with varying concentrations of radionuclides, using three tailings materials and a river-bottom soil diluent. All materials were ground, dried, and blended thoroughly to ensure homogeneity. The analyses on which the recommended values for nuclides in the reference materials are based were performed, using independent methods, by the UNC Geotech (UNC) Chemistry Laboratory, Grand Junction, Colorado, and by C. W. Sill (Sill), Idaho National Engineering Laboratory, Idaho Falls, Idaho.

Several statistical tests were performed on the analytical data to characterize the reference materials. Results of these tests reveal that the four reference materials are homogeneous and that no large systematic bias exists between the analytical methods used by Sill and those used by TMC. The average values for radionuclides of the two data sets, representing an unbiased estimate, were used as the recommended values for concentrations of nuclides in the reference materials. The recommended concentrations of radionuclides in the four reference materials are listed in Table 7. Use of these reference materials will aid in providing uniform standardization among measurements made by remedial action contractors. The reference materials are available free of charge to remedial action contractors and to Federal and State agencies involved in DOE Remedial Action Programs. Individuals interested in obtaining these reference materials are encouraged to contact the Technical Measurements Center by calling FTS 322-9543 (303/242-8621, Ext. 543).

Companion sets of Ra-226[1] and Th-232[2] reference materials have previously been prepared and are also available from the Technical Measurements Center. Gamma spectroscopic measurement results for Th-228 and K-40, determined during the Ra-226 analysis performed by the UNC Chemistry Laboratory, are presented in Appendix A.

URANIUM REFERENCE MATERIALS

Introduction

Uranium mill tailings reference materials are necessary for ensuring uniform standardization among radionuclide measurements performed by remedial action contractors. The Technical Measurements Center undertook the task of preparing approximately 200 pounds each of four different uranium mill tailings reference materials. The materials were prepared with varying radionuclide concentrations from three different tailings materials and a soil diluent. Uranium-238 concentrations of approximately 5, 20, 50, and 100 picocuries per gram (pCi/g) were used as target values.

Concentrations of U-238, U-234, Th-230, Ra-226, and Pb-210 in each of the reference materials were measured by C. W. Sill of Idaho National Engineering Laboratory, and by the UNC Geotech Chemistry Laboratory, Grand Junction, Colorado, using independent methods.

Preparation and Analysis

Uranium Mill Tailings

Tailings from two sites, the East Tailings Area and the Vanadium Tailings Area of the Monticello millsite, Monticello, Utah,[3] were used for this project. The third material used was a uranium ore from the Climax Mill in Grand Junction, Colorado. The materials were ground to -325 mesh and dried at 110 °C for 24 hours. The materials were blended in a cross-flow blender for 72 hours, then placed in 55-gallon drums. The amount of material prepared resulted in approximately 120 sets of reference materials.

Sampling

The minimum number of samples needed to estimate the mean concentrations of radionuclides in the starting materials was calculated from the equation (modified from Natrella[4]).

$$CV = D/S \qquad (1)$$

where

CV = critical value (parameter needed to estimate minimum sample size)

D = maximum allowable deviation

S = estimated allowable deviation gained through previous experience

In this case, S = 1%, D = 2%, and CV = 2.

Using Table A-8 given in Natrella, the minimum sample size for estimating the means within 2 percent with 95 percent confidence is six. For this project, the number of samples was increased to 10 in order to acquire a better estimate of the mean. Ten 800-gram samples from each of the four starting materials were randomly collected from the blender as the material was transferred to the 55-gallon drums.

Analysis

In order to minimize the errors in the recommended values, radionuclide analyses were performed on the starting materials rather than on the final reference materials. This approach allows the calculation of concentrations in the reference materials with a higher degree of accuracy than would be possible by direct analysis. Sill determined U-238, U-234, Th-230, and Ra-226 by alpha spectrometry,[5,1] and Pb-210 by beta counting.[6] The UNC Chemistry Laboratory determined U-238, U-234, Th-230, and Pb-210 by alpha spectrometry,[7,8] and Ra-226 by gamma spectroscopy.[9] U.S. National Bureau of Standards traceable standards were used when possible for all analyses.

Reference Materials

TRM-1—Tailings reference material TRM-1 is the undiluted Monticello Vanadium Tailings Area material previously described. The material was transferred to 1-quart glass jars with no further preparation.

TRM-2—Tailings reference material TRM-2 is a 1:20 dilution of TRM-1. The material contains 4,536 grams of TRM-1 and 85,277 grams of soil. Aerosil 200, a surfactant, was also added (907 grams) to assist in blending. To prepare the material, all of the TRM-1 and Aerosil 200 and one-quarter of the soil were placed in a 10-cubic-foot blender and mixed overnight. The blender was stopped, another portion of diluent was added, and the mixture was blended for another 24 hours. This process was repeated four times. After all the diluent had been added and blending completed, the material was transferred into

1-quart glass jars. Ten random samples were collected during the transfer to check homogeneity.

TRM-3—Tailings reference material TRM-3 is a 1:10 dilution of the East Tailings Area material. The material contains 80,741 grams soil, 907 grams Aerosil 200, and 9,072 grams tailings material. The material was blended, sampled, and transferred into jars in the same manner as described previously.

TRM-4—Tailings reference material TRM-4 is a 1:20 dilution of the Climax Ore material. The material contains 85,277 grams soil, 907 grams Aerosil 200, and 4,536 grams Climax Ore. The material was blended, sampled, and transferred into jars in the same manner as described previously.

Homogeneity Analysis

The samples collected after final blending of reference materials TRM-2, TRM-3, and TRM-4 were analyzed for Th-230 by Sill of Idaho National Engineering Laboratory and for Ra-226 by UNC Chemistry Laboratory to check homogeneity. Analytical methods used were those described previously.

Results

Tables 1 through 4 present the results obtained by the two laboratories for the radionuclide determinations performed on the uranium mill tailings and soil diluent materials. All results are reported in pCi/g. A procedure for detecting outliers, as described by Dixon and Massey,[10] reveals four outliers in the data sets. These values were deleted prior to any further calculations. The means of the data sets and the experimental standard deviations at 2σ (95 percent confidence interval) are also presented at the bottom of each table.

The results for each nuclide obtained by Sill and the results for the nuclides obtained at UNC were compared, using the test for equality of means described by Dunn and Clark.[11] This test compares the means of the results of the two laboratories to determine if there is any measurable difference. Results of these tests (Table 5) demonstrate that the absolute value of the calculated t-statistic (t) is greater than the critical value (M) in most instances. These findings indicate that statistically significant differences exist between the results of the two laboratories. These differences may be accounted for by systematic bias inherent in any measurement system and are to be expected when using independent laboratories, operators, and methods. The difference between the two data sets was at most 4 percent, which is within the TMC standards defined for this and similar projects.

Since the differences between the results obtained by the two laboratories are of acceptable magnitude, the reported concentration for each radionuclide in each tailings material is the average of the results from both laboratories. Statistically, the best estimate of any true value is an average of two or more means, frequently referred to as the "mean of means." Therefore, for the purposes of this project, the estimated concentrations are derived from averaging the means of the results from the two laboratories. The associated uncertainty for these values is the sum of the uncertainties (standard deviations) of the individual means. These concentrations and uncertainties are presented in Table 6.

Recommended Concentrations

The concentrations of radionuclides in the final reference materials were calculated using the values presented in Table 6 and the weights given above (*Reference Materials*, page 1). The uncertainties in Table 6 were propagated through the calculations to arrive at the total uncertainties in the recommended values at the 95 percent confidence level. Errors associated with weighing were negligible and are not included in the table. Table 7 presents the recommended concentrations and total uncertainties. It should be noted that equilibrium between Ra-226 and Pb-210 does not exist in these materials. Since Pb-210 has a relatively short half-life (21 years), the Pb-210 concentration may change slightly over time.

Homogeneity

The results of the Th-230 analyses and the Ra-226 analyses performed on the final materials to check homogeneity are presented in Table 8. At the bottom of the table the means and experimental standard deviations at 1σ are presented. The standard deviation, σ_o, is the 2 percent variation set prior to the preparation of the materials as the acceptable limit. This limit

was also used to determine the number of required samples (see *Sampling*, page 1). The one-sided confidence limit, S_1, is calculated as in Natrella at the 95 percent confidence level. If S_1 exceeds σ_o, then the material is considered non-homogeneous. Since S_1 did not exceed σ_o in any of the materials, the reference materials are considered homogeneous at the 95 percent level within 2 percent for a 1-gram sample size. The homogeneity of the starting tailings materials was checked in the same fashion. All of the materials are considered homogeneous within 2 percent at the 95 percent confidence level.

Table 1. Laboratory Analysis of the East Tailings Area Material

	Concentration (pCi/g)									
	U-238		U-234		Th-230		Ra-226		Pb-210	
	SIII	UNC	SIII	UNC	SIII	UNC	SIII	UNC	SIII	UNC
	186	178	187	182	599	557	586	607	555	565
	183	183	184	190	572	562	591	594	553	558
	185	184	184	183	582	569	578	603	537	551
	186	202[a]	188	207[a]	582	567	751[a]	600	551	553
	189	179	190	175	591	570	580	572	557	547
	186	179	186	182	592	568	592	607	559	567
	184	188	185	189	588	563	590	600	543	553
	189	187	191	182	595	559	594	604	543	552
	184	190	188	183	582	565	592	605	546	554
	185	187	183	182	578	581	596	601	532	553
Mean	186	184	187	183	586	566	589	599	548	555
SD[b]	4	8	6	8	16	14	12	20	18	12

[a]Outlier.
[b]SD = Experimental standard deviation.

Table 2. Laboratory Analysis of the Vanadium Tailings Area Material

	Concentration (pCi/g)									
	U-238		U-234		Th-230		Ra-226		Pb-210	
	SIII	UNC	SIII	UNC	SIII	UNC	SIII	UNC	SIII	UNC
	100	97	108	98	471	463	491	498	411	428
	100	100	107	102	468	465	486	493	430	440
	100	99	109	104	475	467	484	493	423	430
	100	96	108	105	475	469	476	494	426	431
	98	101	107	101	480	463	480	500	411	436
	100	101	108	104	477	476	487	490	426	430
	97	100	106	103	472	465	487	483	421	415
	96	102	109	105	471	464	475	499	427	424
	397	100	105	101	480	468	490	485	413	444
	96	102	105	103	479	461	493	493	414	414
Mean	98	100	107	103	475	466	485	493	420	429
SD[a]	4	4	4	4	8	8	12	12	14	20

[a]SD = Experimental standard deviation.

Table 3. Laboratory Analysis of the Climax Ore

	Concentration (pCi/g)									
	U-238		U-234		Th-230		Ra-226		Pb-210	
	SIII	UNC	SIII	UNC	SIII	UNC	SIII	UNC	SIII	UNC
	884	891	868	874	851	875	845	846	750	771
	882	867	871	906[a]	847	884	837	846	761	790
	889	883	890	886	870	888	840	828	766	767
	863	877[a]	871	863	845	869	833[a]	844	766	770
	887	873	876	859	852	870	854	839	769	760
	881	897	870	868	851	866	831	826	715	784
	884	865	877	884	877	856	848	838	768	764
	876	868	868	876	855	863	839	833	743	773
	872	849	860	874	856	850	828	837	751	749
	872	885	869	878	853	858	824	848	751	760
Mean	879	876	872	874	856	868	838	839	754	769
SD[b]	16	27	16	18	20	24	18	16	31	24

[a]Outlier.
[b]SD = Experimental standard deviation.

Table 4. Laboratory Analysis of the Soil Diluent

	Concentration (pCi/g)									
	U-238		U-234		Th-230		Ra-226		Pb-210	
	SIII	UNC	SIII	UNC	SIII	UNC	SIII	UNC	SIII	UNC
	1.0	0.9	1.0	1.0	1.0	1.0	1.0	0.9	0.9	1.0
	1.0	0.9	1.0	1.0	1.0	1.1	1.0	0.9	0.7	0.9
	0.9	0.9	1.0	0.9	1.1	1.1	0.9	0.9	1.0	0.8
	0.9	1.0	1.0	1.0	1.0	0.9	1.0	1.0	0.9	0.8
	1.0	0.9	1.1	1.0	1.0	0.9	1.0	1.1	1.2	0.8
	1.0	1.1	1.0	1.0	1.0	0.9	0.9	0.8	1.0	0.7
	1.2	1.1	1.1	1.1	1.0	1.0	0.9	1.0	1.0	0.7
	1.2	1.1	1.0	1.0	1.0	1.0	1.0	1.2	1.0	0.7
	1.2	0.9	1.0	0.9	1.0	0.9	1.0	1.1	1.2	0.9
	1.1	1.0	1.1	0.9	1.0	0.9	0.9	0.9	1.1	0.8
Mean	1.1	1.0	1.0	1.0	1.0	1.0	1.0	1.0	1.0	0.8
SD[a]	0.2	0.2	0.1	0.1	0.1	0.2	0.1	0.2	0.2	0.2

[a]SD = Experimental standard deviation.

Table 5. Tests for Equality of Means

Analyte	Calculated t-Statistic (t)	Critical Value (M)[a]	Finding
East Tailings Area Material			
U–238	1.170	1.734	t<M
U–234	2.124	1.740	t>M
Th–230	5.901	1.734	t>M
Ra–226	–2.648	1.740	t>M
Pb–210	–2.235	1.734	t>M
Vanadium Tailings Area Material			
U–238	–1.879	1.734	t>M
U–234	5.542	1.734	t>M
Th–230	4.596	1.734	t>M
Ra–226	–2.999	1.734	t>M
Pb–210	–2.345	1.734	t>M
Climax Ore			
U–238	0.679	1.734	t<M
U–234	–0.403	1.740	t<M
Th–230	–2.456	1.734	t>M
Ra–226	–0.335	1.734	t<M
Pb–210	–2.305	1.734	t>M
Soil Diluent			
U–238	1.481	1.734	t<M
U–234	1.987	1.734	t>M
Th–230	1.434	1.734	t<M
Ra–226	–0.474	1.734	t<M
Pb–210	3.353	1.734	t>M

[a]Critical values are at the 95 percent confidence level.

Table 6. Average Concentrations of Tailings Reference Materials (pCi/g)

	U–238	U–234	Th–230	Ra–226	Pb–210
East Tailings Area Material	185 ± 9	185 ± 10	576 ± 21	594 ± 23	552 ± 21
Vanadium Tailings Area Material	99 ± 6	105 ± 6	471 ± 11	489 ± 17	425 ± 24
Climax Ore Material	878 ± 32	873 ± 24	862 ± 31	839 ± 24	762 ± 39
Soil Diluent	1.1 ± 0.3	1.0 ± 0.2	1.0 ± 0.2	1.0 ± 0.2	0.9 ± 0.3

Appendix A

Thorium and Potassium Results

The gamma spectroscopy measurements performed by the UNC Chemistry Laboratory for the determination of Ra–226 also allowed the determination of Th–228 and K–40. Data for these nuclides may be useful to anyone performing measurements by gamma spectroscopy. Since the data for these nuclides are from one laboratory only, they are presented here solely for information purposes.

Material	Concentration (pCi/g)	
	Th-228	K-40
TRM–1	<2	<10
TRM–2	<1	19 ± 4[a]
TRM–3	<1	17 ± 7[a]
TRM–4	<1	19 ± 5[a]

[a]Uncertainties are the experimental standard deviations at 2σ.

Table 7. Recommended Concentrations of Tailings Reference Materials (pCi/g)

	TRM-1	TRM-2	TRM-3	TRM-4
U-238	99 ± 6	6.0 ± 4.0	29.6 ± 1.4	44.9 ± 1.6
U-234	105 ± 6	6.2 ± 4.0	19.6 ± 1.9	44.6 ± 1.2
Th-230	471 ± 11	24.5 ± 0.6	58.5 ± 2.1	44.0 ± 1.6
Ra-226	489 ± 17	25.4 ± 0.9	60.3 ± 2.3	42.9 ± 1.2
Pb-210	425 ± 24	22.1 ± 1.2	56.0 ± 2.1	38.9 ± 2.0

Table 8. Homogeneity Check

Statistical Analysis[a]	Concentration (pCi/g)					
	TRM-2		TRM-3		TRM-4	
	Th-230[b]	Ra-226	Th-230[b]	Ra-226	Th-230[b]	Ra-226
	24.9	25.2	61.1	60.5	44.9	43.0
	24.2	25.4	58.3	61.9	44.5	41.6
	25.2	25.4	59.3	62.5	45.5	41.8
	24.9	25.1	59.9	60.9	44.8	42.3
	23.0	25.1	59.4	59.3	44.3	42.1
	24.4	24.8	57.3	61.2	44.6	41.0
	25.3	25.4	59.0	58.8	44.5	42.4
	24.8	23.9	60.9	59.6	45.8	40.7
	24.6	25.2	59.6	61.3	44.3	43.8
	25.0	26.2	57.4	59.7	45.7	42.5
$\bar{x}$	24.6	25.2	59.2	60.6	44.9	42.1
S	0.7	0.6	1.3	1.2	0.6	0.9
σ_o	0.5	0.5	1.2	1.2	0.9	0.8
S_1	0.5	0.4	0.9	0.9	0.4	0.7

[a]Where $\bar{x}$ = mean of the results; S = experimental standard deviation at 1σ; σ_o = acceptable standard deviation; and S_1 = one-sided confidence limit for σ.
[b]Sample size = 1 gram.

References

1. R. B. Chessmore and P. R. Engelder, *Development of Solid Radium-226 Reference Materials*, U.S. Department of Energy, Grand Junction Area Office, Technical Measurements Center, Report GJ/TMC-10, 1983 (Appendix A, C. W. Sill).
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11. O. J. Dunn and V. A. Clark, *Applied Statistics Analysis of Variance and Regression*. New York: John Wiley and Sons, Inc., 1974.

CERTIFICATE OF CALIBRATION
MULTINUCLIDE STANDARD SOURCE

8019

Customer:	DATA CHEM LABORATORIES	P.O.No.:	14346	
Catalog No.:	EG-MLAM-032-5U	Reference Date:	May 1 1995	
Source No.:	479-114-3	Total Radioactivity:	5.17	μCi.
		Total Radioactivity:	191.3	kBq.

Description of Source

a. Capsule type: Customer supplied 4 oz. jar
b. Nature of active deposit: Multinuclide and AmCl3 dispersed in an epoxy matrix
c. Active diameter/volume: Approximately 125 ml (Mass of epoxy = 132.15 g)
d. Backing: Plastic
e. Cover: Plastic

Nuclide	Activity. (μCi)	Gamma-Ray Energy(MeV)	Branching Ratio %	Systematic Uncert.	Random Uncert.	Overall Uncert.
Am-241	0.0307	0.0595	36.0	1.5%	0.3%	1.5%
Cd-109	1.659	0.088	3.63	2.0%	0.6%	2.1%
Co-57	0.0554	0.122, 0.136	85.6, 10.68	2.0%	0.7%	2.1%
Te-123m	0.0658	0.159	84.0	2.0%	0.8%	2.2%
Cr-51	1.695	0.320	9.86	2.0%	0.3%	2.0%
Sn-113	0.243	0.392	64.89	2.0%	0.3%	2.0%
Sr-85	0.327	0.514	98.4	2.0%	0.3%	2.0%
Cs-137	0.245	0.662	85.1	2.0%	0.7%	2.1%
Co-60	0.261	1.173, 1.333	99.86, 99.98	2.0%	0.5%	2.1%
Y-88	0.590	0.898, 1.836	94.0, 99.36	2.0%	0.4%	2.0%

Method of Calibration

This source was prepared from a weighed aliquot of solution whose concentration, in μCi/g, was determined by gamma spectrometry.

NIST Traceability

This calibration is implicitly traceable to the National Institute of Standards and Technology.

Leak Test(s)

See reverse side for Leak Test(s) applied to this source.

Notes

1. Nuclear data was taken from "Table of Radioactive Isotopes", edited by Virginia S. Shirley, 1986.
2. IPL participates in an NIST measurement assurance program to establish and maintain implicit traceability for a number of nuclides, based on the blind assay (and later NIST certification) of Standard Reference Materials (As in NRC Regulatory Guide 4.15).
3. Overall uncertainty is calculated at the 99% confidence level.
4. Reference Half lives:

Am-241	432.2 ± 0.65 years	Te-123m	119.7 ± 0.1 days	Sr-85	64.84 ± 0.004 days
Cd-109	1.2665 ± 0.0019 years	Cr-51	27.706 ± 0.007 days	Cs-137	30.1 ± 0.2 years
Co-57	271.79 ± 0.09 days	Sn-113	115.09 ± 0.04 days	Co-60	5.271 ± 0.001 years
Y-88	106.63 ± 0.025 days				

Ana U Uhen

QUALITY CONTROL

25 Apr. 1995

Date Signed

ISOTOPE PRODUCTS LABORATORIES
3017 N. SAN FERNANDO BLVD.
BURBANK, CALIFORNIA 91504
818·843·7000 FAX 818·843·6168

IPL Ref No. 479-114-3

DATA CHEM LABORATORIES
A SORENSON COMPANY

8019

Raw Data
Radiochemistry/Mixed-Waste Department
γ Spectrometry
Inventory Checklist

- [X] Section 1. Sample and QC Data
- [X] Section 2. Instrument Performance and Calibration Data

The following signatures verify that the raw data and all inventory and reviewer checklists in each raw data section (all green sheets) are complete and accurate.

Assembled by: Robin Tully 10/21/96 (Signature / Date) Reviewed by: [signature] 10/21/96 (Signature / Date)

Rev. 3/95

068

000227

Section 1. Sample and QC Data
γ Spectrometry
Inventory Checklist

- [X] Laboratory Control Sample (LCS) Instrument Print-Out
  - LCS Spectral Plot
  - LCS Peak Search Report
  - LCS Activity Report
- [X] Blank Instrument Print-Out
  - Blank Spectral Plot
  - Blank Peak Search Report
  - Blank Activity Report
- [X] Precision Sample (MD) Instrument Print-Out
  - MD Spectral Plot
  - MD Peak Search Report
  - MD Acivity Report
- [X] Field Sample Instrument Print-outs
  - Sample Spectral Plot
  - Sample Peak Search Report
  - Sample Activity Report
- [X] Computer/Manual Calculation Sheets summarizing all calculational inputs and results

Section 1. Sample and QC Data
γ Spectrometry
Reviewer Checklist

X The Sample and QC Data Inventory Checklist above is complete.

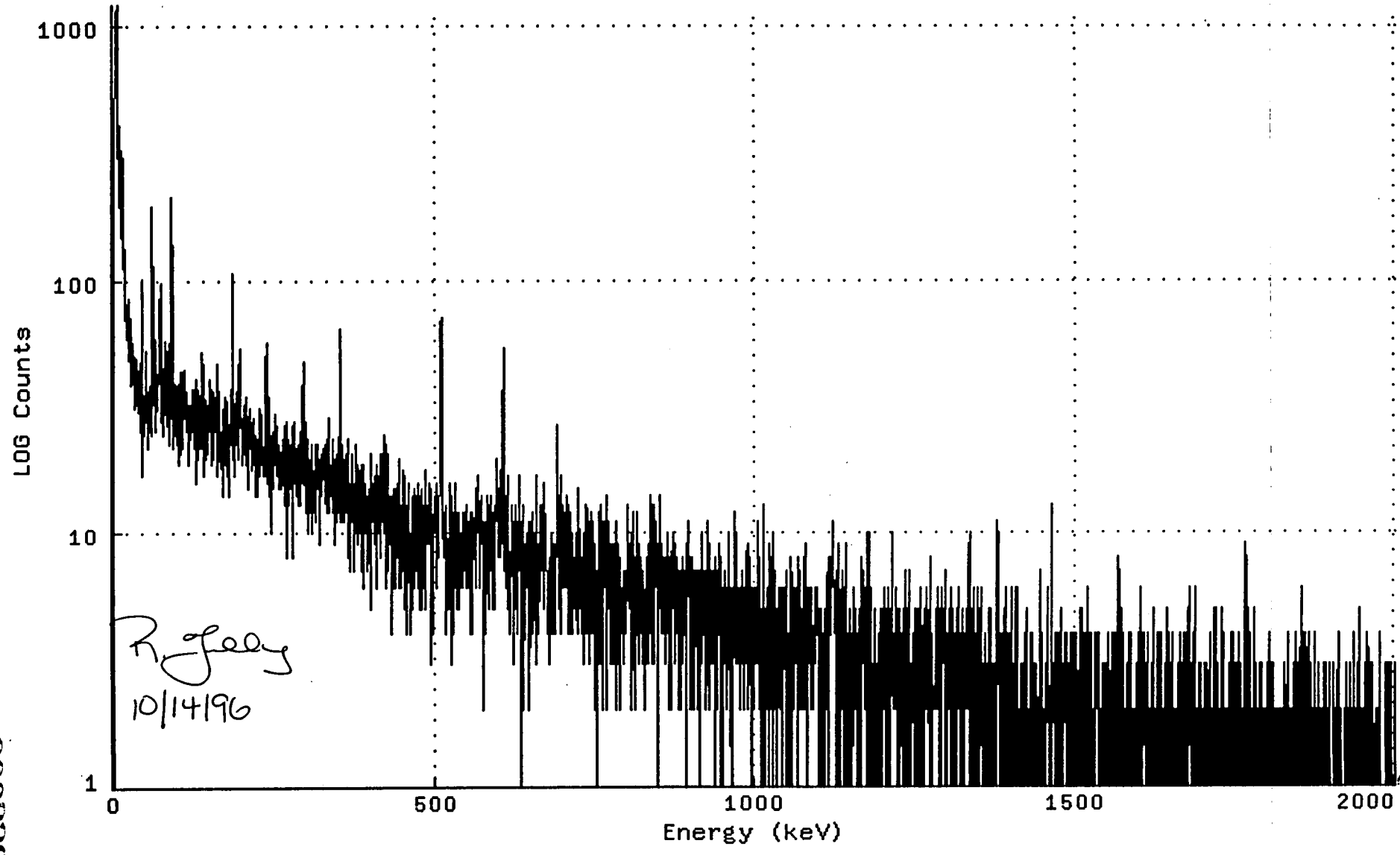
X All appropriate QC for the project was performed.

X All appropriate QC data met acceptance criteria. Unacceptable QC data were documented, and justifications were provided for data used.

X Print-outs are initialed and dated.

Spectrum : DISK:[RADCHEM.SCUSR.ARCHIVE]SMP_BL1232401_GAMMA5_PMP_9190.CNF;2
Title : 96E-0640-04
Sample Title: G969901S

Start Time: 10-OCT-1996 13:20	Sample Time: 19-SEP-1996 12:00	Energy Offset: -5.65841E-01
Real Time : 0 04:00:05.40	Sample ID : BL-123240-1	Energy Slope : 4.88823E-01
Live Time : 0 04:00:00.00	Sample Type: FILTER	Energy Quad : -8.49185E-08



0022229

8019

Gamma Spectroscopy Report generated 11-OCT-1996 11:59 **8019**

Configuration: DISK:[RADCHEM.SCUSR.ARCHIVE]SMP_BL1232401_GAMMA5_PMP_9190.CNF;2
Analyses by : PEAK V16.5 PEAKEFF V2.2

---- Sample Information ----

Sample Title : G969901S
Sample ID : BL-123240-1 Sample Quantity : 1.00000E+00 SAMPLE
Sample Type : FILTER Sample Geometry : PMP

---- Sample Decay/Count Information ----

Sample Date : 19-SEP-1996 12:00 Acquisition date : 10-OCT-1996 13:20
Elapsed live time: 0 04:00 Elapsed real time: 0 04:00 0.0%
Decay time : 21 01:20

---- Detector Parameters ----

Energy cal. time : 8-OCT-1996 12:40:
Detector name : GAMMA5 Counting geometry: PMP
Effic. cal. time : 19-SEP-1996 14:21

---- Processing Parameters ----

Cali. Slope	: 4.88823E-01	Cali. Offset	: -5.65841E-01
Cali. Quadratic	: -8.49185E-08	FWHM Offset	: 4.15386E-01
FWHM Slope	: 4.45150E-02	MDA Width (FWHM)	: 3.0
Start channel	: 1	End channel	: 4096
Sensitivity	: 5.0	Gaussian Sens.	: 10.0
Energy tolerance	: 2.0	Half life ratio	: 8.0
Abundance limit	: 75.0	WTM error limit	: 3.0
Activity Units	: PCI	Act. Conversion	: 1.00000E+06
MDA Confid Level	: 5.0	Sigma Number	: 2
Errors propagated	: Yes	Systematic Error	: 0.0%

	It	Energy	Area	Bkgnd	FWHM	Channel	%Eff	Cts/Sec	%Err	Fit
1	0	7.73	1727	3223	1.32	16.97	8.95E+00	1.20E-01	5.8	
2	0	12.98	348	904	0.81	27.71	9.66E+00	2.41E-02	14.1	
3	0	16.12	489	962	1.13	34.13	9.78E+00	3.39E-02	11.5	
4	0	46.34	211	210	1.17	95.97	8.79E+00	1.47E-02	13.7	
5	0	63.28	305	233	0.94	130.61	8.08E+00	2.12E-02	10.0	
6	1	74.74	90	175	0.88	154.06	7.65E+00	6.27E-03	24.5	1.96E+00
7	1	77.15	124	158	0.87	158.99	7.57E+00	8.58E-03	18.0	
8	3	87.25	71	143	1.10	179.66	7.23E+00	4.90E-03	27.6	1.99E+00
9	3	92.60	465	159	1.02	190.61	7.06E+00	3.23E-02	6.3	
10	0	185.78	183	235	1.02	381.23	5.03E+00	1.27E-02	17.3	
11	0	238.41	83	168	0.98	488.92	4.32E+00	5.74E-03	28.8	
12	0	294.95	107	228	1.44	604.61	3.75E+00	7.43E-03	31.5	
13	0	351.78	138	165	1.02	720.89	3.31E+00	9.60E-03	19.9	
14	0	511.10	397	145	2.94	1046.93	2.48E+00	2.76E-02	8.6	
15	0	609.64	112	87	1.21	1248.58	2.13E+00	7.76E-03	17.8	
16	0	693.45	56	66	0.65	1420.12	1.90E+00	3.90E-03	31.0	
17	0	1461.07	27	22	1.48	2991.66	9.09E-01	1.87E-03	38.9	
18	0	1765.79	33	14	3.77	3615.76	7.37E-01	2.30E-03	31.4	

Gamma Spectroscopy Report generated 11-OCT-1996 11:59

8019

Configuration: DISK:[RADCHEM.SCUSR.ARCHIVE]BKG_BCKGND_GAMMA5__9143.CNF;1
Analyses by : PEAK V16.5 PEAKEFF V2.2

---- Sample Information ----

Sample Title :
Sample ID : BCKGND
Sample Type :
Sample Quantity : 1.00000E+00 G
Sample Geometry :

---- Sample Decay/Count Information ----

Sample Date : 4-OCT-1996 00:00:
Elapsed live time: 2 02:00
Decay time : 0 18:20
Acquisition date : 4-OCT-1996 18:20:
Elapsed real time: 2 02:01 0.0%

---- Detector Parameters ----

Energy cal. time : 30-SEP-1996 09:01
Detector name : GAMMA5
Counting geometry: TRM1-S3
Effic. cal. time : 19-SEP-1996 11:45

---- Processing Parameters ----

Cali. Slope	: 4.88756E-01	Cali. Offset	: -5.37244E-01
Cali. Quadratic	: -7.07146E-08	FWHM Offset	: 5.94642E-01
FWHM Slope	: 3.39310E-02	MDA Width (FWHM)	: 3.0
Start channel	: 1	End channel	: 4096
Sensitivity	: 5.0	Gaussian Sens.	: 10.0
Energy tolerance	: 2.0	Half life ratio	: 8.0
Abundance limit	: 75.0	WTM error limit	: 3.0
Activity Units	: pCi	Act. Conversion	: 1.00000E+06
MDA Confid Level	: 5.0	Sigma Number	: 1
Errors propagated	: Yes	Systematic Error	: 9.0%

	It	Energy	Area	Bkgnd	FWHM	Channel	%Eff	Cts/Sec	%Err	Fit
1	0	7.76	24064	42790	1.54	16.98	6.55E+06	1.34E-01	1.5	
2	0	10.38	4115	15170	0.84	22.34	1.32E+04	2.29E-02	4.8	
3	0	13.03	4183	13266	0.86	27.77	5.13E+02	2.32E-02	4.7	
4	0	16.22	6461	11688	1.08	34.29	6.28E+01	3.59E-02	3.1	
5	0	19.25	1233	6158	0.89	40.48	2.09E+01	6.85E-03	10.0	
6	0	23.34	285	5186	1.44	48.85	9.40E+00	1.58E-03	40.4	
7	0	26.04	437	4406	1.08	54.38	7.03E+00	2.43E-03	24.7	
8	0	46.55	1927	3150	0.94	96.35	4.94E+00	1.07E-02	5.5	
9	0	53.64	405	3070	0.98	110.85	5.29E+00	2.25E-03	24.2	
10	4	63.34	3752	1877	0.81	130.70	5.86E+00	2.08E-02	2.4	1.10E+00
11	4	66.28	535	2846	1.28	136.72	6.02E+00	2.97E-03	18.1	
12	0	69.74	385	3435	1.87	143.79	6.21E+00	2.14E-03	26.7	
13	0	74.19	134	3061	0.84	152.90	6.44E+00	7.44E-04	65.8	
14	0	77.07	495	2625	0.94	158.79	6.57E+00	2.75E-03	17.0	
15	0	84.43	698	3059	1.37	173.85	6.87E+00	3.88E-03	14.2	
16	0	87.20	283	2253	0.85	179.52	6.97E+00	1.57E-03	27.2	
17	0	92.67	4997	3152	1.09	190.71	7.12E+00	2.78E-02	2.4	
18	0	98.25	195	2385	0.93	202.14	7.25E+00	1.09E-03	42.0	
19	0	109.75	354	2985	0.75	225.66	7.39E+00	1.97E-03	27.2	
20	0	112.82	230	1804	0.95	231.93	7.40E+00	1.28E-03	28.5	
21	0	139.81	682	3118	1.12	287.16	7.22E+00	3.79E-03	15.8	
22	0	143.66	424	2282	1.06	295.05	7.16E+00	2.35E-03	19.3	
23	0	185.85	2020	3123	1.02	381.36	6.27E+00	1.12E-02	5.6	
24	4	197.16	456	1487	0.89	404.51	6.00E+00	2.53E-03	13.8	4.49E-01

000231072

Sample ID : BCKGND Acquisition date : 4-OCT-1996 18:20:18

8019

Pk	It	Energy	Area	Bkgnd	FWHM	Channel	%Eff	Cts/Sec	%Err	Unit
[illegible]	4	198.38	665	1790	1.04	407.00	5.98E+00	3.69E-03	11.2	
[illegible]	0	205.33	188	1689	0.96	421.24	5.81E+00	1.04E-03	35.4	
27	0	238.76	908	2089	1.08	489.64	5.07E+00	5.05E-03	9.3	
28	0	295.36	179	1472	1.03	605.47	4.05E+00	9.94E-04	36.3	
29	0	352.05	298	1202	1.06	721.47	3.31E+00	1.65E-03	20.2	
30	0	511.06	4724	2215	2.53	1046.88	2.15E+00	2.62E-02	2.7	
31	0	569.99	434	1409	1.55	1167.50	1.91E+00	2.41E-03	18.5	
32	0	583.39	294	1218	1.25	1194.92	1.87E+00	1.64E-03	23.7	
33	0	609.48	299	1186	1.30	1248.33	1.79E+00	1.66E-03	21.5	
34	0	669.54	124	741	1.38	1371.25	1.64E+00	6.91E-04	40.4	
35	4	693.56	349	1136	2.18	1420.41	1.58E+00	1.94E-03	21.4	3.27E+00
36	4	696.97	189	993	1.80	1427.39	1.58E+00	1.05E-03	34.4	
37	4	702.45	192	1226	2.19	1438.62	1.57E+00	1.07E-03	38.5	
38	0	803.05	377	759	1.66	1644.53	1.41E+00	2.09E-03	15.0	
39	0	962.14	241	859	2.17	1970.22	1.25E+00	1.34E-03	28.6	
40	0	1120.02	105	385	1.77	2293.42	1.15E+00	5.83E-04	35.1	
41	0	1331.87	136	353	2.38	2727.21	1.06E+00	7.54E-04	28.1	
42	0	1460.47	320	376	1.75	2990.52	1.02E+00	1.78E-03	14.0	
43	0	1764.72	128	183	2.41	3613.62	9.27E-01	7.11E-04	23.0	

Gamma Spectroscopy Report generated 11-OCT-1996 11:59 **8019**

Configuration: DISK:[RADCHEM.SCUSR.ARCHIVE]SMP_BL1232401_GAMMA5_PMP_9190.CNF;2
Analyses by : PEAK V16.5 ENBACK V1.5

---- Sample Information ----

Sample Title : G969901S
Sample ID : BL-123240-1 Sample Quantity : 1.00000E+00 SAMPLE
Sample Type : FILTER Sample Geometry : PMP

---- Sample Decay/Count Information ----

Sample Date : 19-SEP-1996 12:00 Acquisition date : 10-OCT-1996 13:20
Elapsed live time: 0 04:00 Elapsed real time: 0 04:00 0.0%
Decay time : 21 01:20

---- Detector Parameters ----

Energy cal. time : 8-OCT-1996 12:40:
Detector name : GAMMA5 Counting geometry: PMP
Effic. cal. time : 19-SEP-1996 14:21

---- Processing Parameters ----

Cali. Slope	: 4.88823E-01	Cali. Offset	: -5.65841E-01
Cali. Quadratic	: -8.49185E-08	FWHM Offset	: 4.15386E-01
FWHM Slope	: 4.45150E-02	MDA Width (FWHM)	: 3.0
Start channel	: 1	End channel	: 4096
Sensitivity	: 5.0	Gaussian Sens.	: 10.0
Energy tolerance	: 2.0	Half life ratio	: 8.0
Abundance limit	: 75.0	WTM error limit	: 3.0
Activity Units	: PCI	Act. Conversion	: 1.00000E+06
MDA Confid Level	: 5.0	Sigma Number	: 2
Errors propagated:	Yes	Systematic Error	: 0.0%

	It	Energy	Area	Bkgnd	FWHM	Channel	Left	Pw	Cts/Sec	%Err	Fit
1	0	12.98*	13	904	0.81	27.71	26	5	9.09E-04	394.2	
2	0	46.34*	57	210	1.17	95.97	92	8	3.96E-03	53.0	
3	0	63.28*	5	233	0.94	130.61	128	7	3.16E-04	689.0	
4	1	74.74*	80	175	0.88	154.06	148	14	5.53E-03	29.2	1.96E+00
5	1	77.15*	84	158	0.87	158.99	148	14	5.83E-03	27.7	
6	3	87.25*	48	143	1.10	179.66	177	19	3.32E-03	42.6	1.99E+00
7	3	92.60*	65	159	1.02	190.61	177	19	4.51E-03	47.7	
8	0	185.78*	22	235	1.02	381.23	376	10	1.52E-03	151.2	
9	0	238.41*	10	168	0.98	488.92	485	8	6.93E-04	248.0	
10	0	294.95*	93	228	1.44	604.61	598	14	6.43E-03	36.8	
11	0	351.78*	114	165	1.02	720.89	715	11	7.95E-03	24.4	
12	0	511.10*	19	145	2.94	1046.93	1038	17	1.35E-03	182.1	
13	0	609.64*	88	87	1.21	1248.58	1244	9	6.10E-03	23.4	
14	0	693.45*	28	66	0.65	1420.12	1414	11	1.96E-03	65.3	
15	0	1461.07*	1	22	1.48	2991.66	2986	11	8.95E-05	858.7	
16	0	1765.79*	23	14	3.77	3615.76	3604	18	1.59E-03	46.6	

Flag: "*" = Peak area was modified by background subtraction

Gamma Spectroscopy Report generated 11-OCT-1996 11:59 **8019**

Configuration: DISK:[RADCHEM.SCUSR.ARCHIVE]SMP_BL1232401_GAMMA5_PMP_9190.CNF;2
Analyses by : PEAK V16.5 ENBACK V1.5 PEAKEFF V2.2 NID V3.1

---- Sample Information ----

Sample Title : G969901S
Sample ID : BL-123240-1 Sample Quantity : 1.00000E+00 SAMPLE
Sample Type : FILTER Sample Geometry : PMP

---- Sample Decay/Count Information ----

Sample Date : 19-SEP-1996 12:00 Acquisition date : 10-OCT-1996 13:20
Elapsed live time: 0 04:00 Elapsed real time: 0 04:00 0.0%
Decay time : 21 01:20

---- Detector Parameters ----

Energy cal. time : 8-OCT-1996 12:40:
Detector name : GAMMA5 Counting geometry: PMP
Effic. cal. time : 19-SEP-1996 14:21

---- Processing Parameters ----

Cali. Slope	: 4.88823E-01	Cali. Offset	: -5.65841E-01
Cali. Quadratic	: -8.49185E-08	FWHM Offset	: 4.15386E-01
FWHM Slope	: 4.45150E-02	MDA Width (FWHM)	: 3.0
Start channel	: 1	End channel	: 4096
Sensitivity	: 5.0	Gaussian Sens.	: 10.0
Energy tolerance	: 2.0	Half life ratio	: 8.0
Abundance limit	: 75.0	WTM error limit	: 3.0
Activity Units	: PCI	Act. Conversion	: 1.00000E+06
MDA Confid Level	: 5.0	Sigma Number	: 2
Errors propagated	: Yes	Systematic Error	: 0.0%

Post-NID Peak Search Report

It	Energy	Area	Bkgnd	FWHM	Channel	Left	Pw %Err	Fit	Nuclides
0	12.98*	13	904	0.81	27.71	26	5788.4		
0	46.34*	57	210	1.17	95.97	92	8106.1		
0	63.28*	5	233	0.94	130.61	128	7*****		
1	74.74*	80	175	0.88	154.06	148	14 58.4	1.96E+00	
1	77.15*	84	158	0.87	158.99	148	14 55.3		
3	87.25*	48	143	1.10	179.66	177	19 85.2	1.99E+00	
3	92.60*	65	159	1.02	190.61	177	19 95.4		
0	185.78*	22	235	1.02	381.23	376	10302.4		RA-226
0	238.41*	10	168	0.98	488.92	485	8496.0		
0	294.95*	93	228	1.44	604.61	598	14 73.5		
0	351.78*	114	165	1.02	720.89	715	11 48.8		
0	511.10*	19	145	2.94	1046.93	1038	17364.3		
0	609.64*	88	87	1.21	1248.58	1244	9 46.9		
0	693.45*	28	66	0.65	1420.12	1414	11130.5		
0	1461.07*	1	22	1.48	2991.66	2986	11*****		
0	1765.79*	23	14	3.77	3615.76	3604	18 93.2		

Gamma Spectroscopy Report generated 11-OCT-1996 11:59 **8019**

Configuration: DISK:[RADCHEM.SCUSR.ARCHIVE]SMP_BL1232401_GAMMA5_PMP_9190.CNF;2
Analyses by : PEAK V16.5 ENBACK V1.5 PEAKEFF V2.2 NID V3.1

---- Sample Information ----

Sample Title	: G969901S		
Sample ID	: BL-123240-1	Sample Quantity	: 1.00000E+00 SAMPLE
Sample Type	: FILTER	Sample Geometry	: PMP

---- Sample Decay/Count Information ----

Sample Date	: 19-SEP-1996 12:00	Acquisition date	: 10-OCT-1996 13:20
Elapsed live time	: 0 04:00	Elapsed real time	: 0 04:00 0.0%
Decay time	: 21 01:20		

---- Detector Parameters ----

Energy cal. time	: 8-OCT-1996 12:40:		
Detector name	: GAMMA5	Counting geometry	: PMP
Effic. cal. time	: 19-SEP-1996 14:21		

---- Processing Parameters ----

Cali. Slope	: 4.88823E-01	Cali. Offset	: -5.65841E-01
Cali. Quadratic	: -8.49185E-08	FWHM Offset	: 4.15386E-01
FWHM Slope	: 4.45150E-02	MDA Width (FWHM)	: 3.0
Start channel	: 1	End channel	: 4096
Sensitivity	: 5.0	Gaussian Sens.	: 10.0
Energy tolerance	: 2.0	Half life ratio	: 8.0
Abundance limit	: 75.0	WTM error limit	: 3.0
Activity Units	: PCI	Act. Conversion	: 1.00000E+06
MDA Confid Level	: 5.0	Sigma Number	: 2
Errors propagated	: Yes	Systematic Error	: 0.0%

Interference Report

No interference correction performed

Sample ID : BL-123240-1 Acquisition date : 10-OCT-1996 13:20:54

8019

Nuclide	Half-life	Half-Life Ratio	Energy	%Abund	Activity	2-Sigma %Error	Rejected by
PA-231	3.28E+04Y	0.00	50.10	31.70	--- Not Found ---		Abun.
			100.00	1.11	--- Not Found ---		
			122.31	1.19	--- Not Found ---		
			144.24	3.24	--- Not Found ---		
			154.21	5.58	--- Not Found ---		
			205.00	1.08	--- Not Found ---		
			210.60	1.26	--- Not Found ---		
			234.90	2.80	--- Not Found ---		
			236.00	11.50	--- Not Found ---		
			256.20	6.30	--- Not Found ---		
			269.46	13.60	--- Not Found ---		
			271.23	10.60	--- Not Found ---		
			283.67	1.60	--- Not Found ---		
			286.10	1.60	--- Not Found ---		
			300.08	2.30	--- Not Found ---		
			304.40	1.35	--- Not Found ---		
			323.87	3.88	--- Not Found ---		
			330.00	1.30	--- Not Found ---		
			334.20	1.15	--- Not Found ---		
			338.28	2.73	--- Not Found ---		
			351.07*	12.94	5.010E-05	51.49	
			401.81	6.50	--- Not Found ---		
			404.84	2.90	--- Not Found ---		
			427.08	1.30	--- Not Found ---		
			445.03	1.18	--- Not Found ---		
			569.67	0.54	--- Not Found ---		
			831.96	2.90	--- Not Found ---		
			897.83	0.24	--- Not Found ---		
			897.83	0.52	--- Not Found ---		
		% Abundances Found =		9.59			
U-235	7.04E+08Y	0.00	143.76	10.50	--- Not Found ---		Abun.
			163.35	4.70	--- Not Found ---		
			185.71*	54.00	1.509E-06	302.96	
			205.31	4.70	--- Not Found ---		
		% Abundances Found =		73.07			

Flag: "*" = Keyline

8019

Nuclide Type: Natural

Nuclide	Energy	Area	%Abn	%Eff	Uncorrected PCI/SAMPLE	Decay Corr PCI/SAMPLE	2-Sigma %Error
RA-226	186.21	22	3.28*	5.027E+00	2.484E+01	2.484E+01	302.94

Flag: "*" = Keyline

Gamma Spectroscopy Report generated 11-OCT-1996 12:00 **8019**

Configuration: DISK:[RADCHEM.SCUSR.ARCHIVE]SMP_BL1232401_GAMMA5_PMP_9190.CNF;2
Analyses by : PEAK V16.5 ENBACK V1.5 PEAKEFF V2.2 NID V3.1 MINACT V2.5

---- Sample Information ----

Sample Title	: G969901S		
Sample ID	: BL-123240-1	Sample Quantity	: 1.00000E+00 SAMPLE
Sample Type	: FILTER	Sample Geometry	: PMP

---- Sample Decay/Count Information ----

Sample Date	: 19-SEP-1996 12:00	Acquisition date	: 10-OCT-1996 13:20
Elapsed live time	: 0 04:00	Elapsed real time	: 0 04:00 0.0%
Decay time	: 21 01:20		

---- Detector Parameters ----

Energy cal. time	: 8-OCT-1996 12:40:		
Detector name	: GAMMA5	Counting geometry	: PMP
Effic. cal. time	: 19-SEP-1996 14:21		

---- Processing Parameters ----

Cali. Slope	: 4.88823E-01	Cali. Offset	: -5.65841E-01
Cali. Quadratic	: -8.49185E-08	FWHM Offset	: 4.15386E-01
FWHM Slope	: 4.45150E-02	MDA Width (FWHM)	: 3.0
Start channel	: 1	End channel	: 4096
Sensitivity	: 5.0	Gaussian Sens.	: 10.0
Energy tolerance	: 2.0	Half life ratio	: 8.0
Abundance limit	: 75.0	WTM error limit	: 3.0
Activity Units	: PCI	Act. Conversion	: 1.00000E+06
MDA Confid Level	: 5.0	Sigma Number	: 2
Errors propagated	: Yes	Systematic Error	: 0.0%

Combined Activity-MDA Report

---- Identified Nuclides ----

Nuclide	Activity (PCI/SAMPLE)	Act error	MDA (PCI/SAMPLE)	MDA error	Act/MDA
RA-226	2.484E+01	7.526E+01	6.466E+01	1.196E+01	0.384

---- Non-Identified Nuclides ----

Nuclide	Key-Line Activity (PCI/SAMPLE)	K.L. Ided	Act error	MDA (PCI/SAMPLE)	MDA error	Act/MDA
RA-228	1.687E+00		9.404E+00	1.668E+01	3.425E+00	0.101
PA-231	5.010E+01	+	2.580E+01	3.302E+01	5.424E+00	1.517
U-235	1.509E+00	+	4.572E+00	6.010E+00	1.128E+00	0.251

Gamma Spectroscopy Report generated 11-OCT-1996 12:00

8019

Configuration: DISK:[RADCHEM.SCUSR.ARCHIVE]SMP_BL1232401_GAMMA5_PMP_9190.CNF;2
Analyses by : PEAK V16.5 ENBACK V1.5 PEAKEFF V2.2 NID V3.1 MINACT V2.5

---- Sample Information ----

Sample Title	: G969901S		
Sample ID	: BL-123240-1	Sample Quantity	: 1.00000E+00 SAMPLE
Sample Type	: FILTER	Sample Geometry	: PMP

---- Sample Decay/Count Information ----

Sample Date	: 19-SEP-1996 12:00	Acquisition date	: 10-OCT-1996 13:20
Elapsed live time	: 0 04:00	Elapsed real time	: 0 04:00 0.0%
Decay time	: 21 01:20		

---- Detector Parameters ----

Energy cal. time	: 8-OCT-1996 12:40:		
Detector name	: GAMMA5	Counting geometry	: PMP
Effic. cal. time	: 19-SEP-1996 14:21		

---- Processing Parameters ----

Cali. Slope	: 4.88823E-01	Cali. Offset	: -5.65841E-01
Cali. Quadratic	: -8.49185E-08	FWHM Offset	: 4.15386E-01
FWHM Slope	: 4.45150E-02	MDA Width (FWHM)	: 3.0
Start channel	: 1	End channel	: 4096
Sensitivity	: 5.0	Gaussian Sens.	: 10.0
Energy tolerance	: 2.0	Half life ratio	: 8.0
Abundance limit	: 75.0	WTM error limit	: 3.0
Activity Units	: PCI	Act. Conversion	: 1.00000E+06
MDA Confid Level	: 5.0	Sigma Number	: 2
Errors propagated	: Yes	Systematic Error	: 9.0%

Combined Activity-MDA Report

---- Identified Nuclides ----

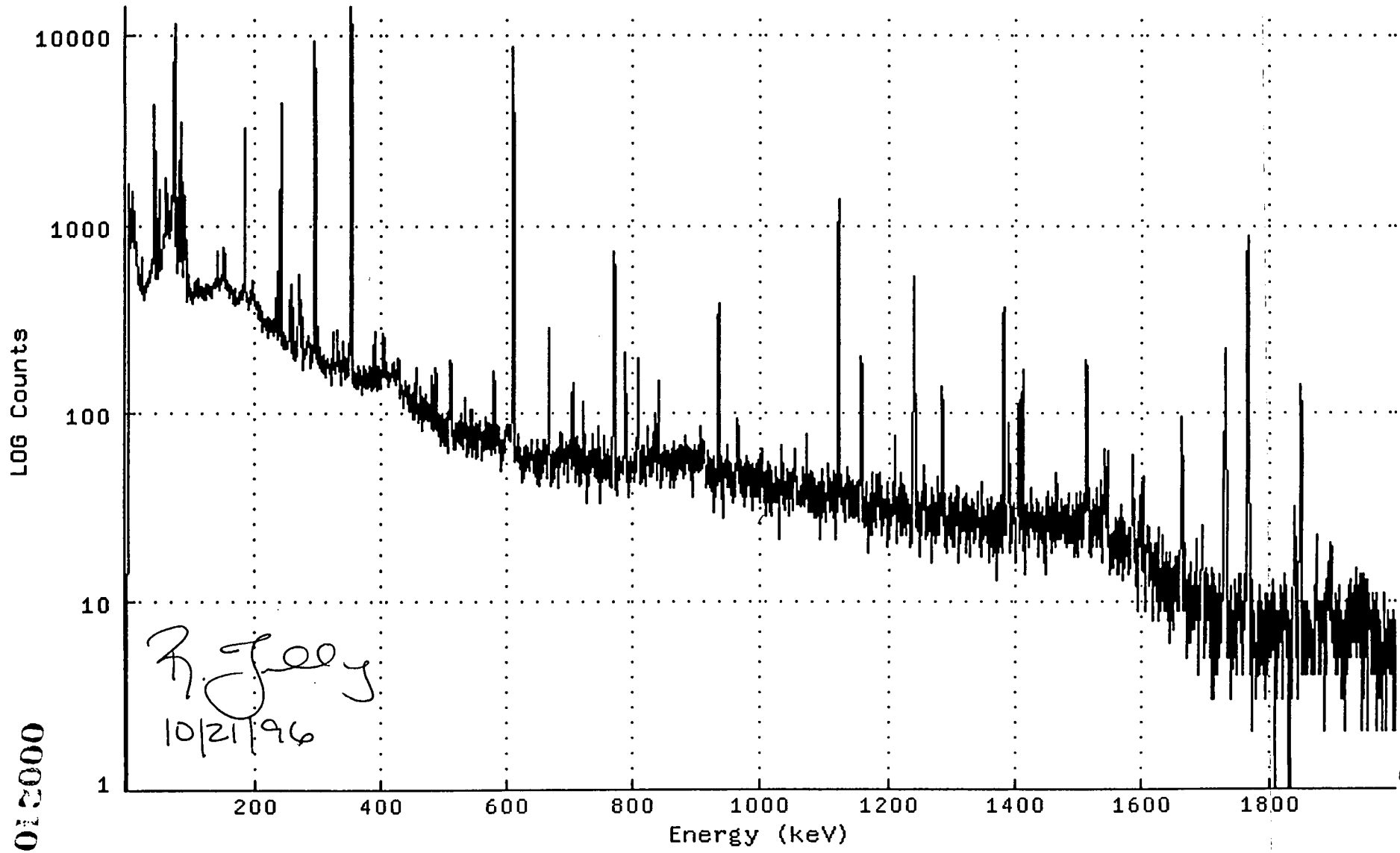
Nuclide	Activity (PCI/SAMPLE)	Act error	MDA (PCI/SAMPLE)	MDA error	Act/MDA
RA-226	2.484E+01	7.540E+01	6.466E+01	1.196E+01	0.384

---- Non-Identified Nuclides ----

Nuclide	Key-Line Activity (PCI/SAMPLE)	K.L. Ided	Act error	MDA (PCI/SAMPLE)	MDA error	Act/MDA
RA-228	1.687E+00		9.409E+00	1.668E+01	3.425E+00	0.101
PA-231	5.010E+01	+	2.733E+01	3.302E+01	5.424E+00	1.517
U-235	1.509E+00	+	4.580E+00	6.010E+00	1.128E+00	0.251

R. Jolly
10/14/96

Spectrum : DISK:[RADCHEM.SCUSR.ARCHIVE]SMP_QC1232401_GAMMA6_PMP_9220.CNF;5
Title : 96E-0640-04
Sample Title: G969901S
Start Time: 14-OCT-1996 10:56 Sample Time: 15-FEB-1983 12:00 Energy Offset: -1.75400E-01
Real Time : 0 04:00:14.76 Sample ID : QC-123240-1 Energy Slope : 4.88511E-01
Live Time : 0 04:00:00.00 Sample Type: SOIL Energy Quad : -9.43914E-08



R. Foley
10/21/96

Gamma Spectroscopy Report generated 21-OCT-1996 12:51 **8019**

Configuration: DISK:[RADCHEM.SCUSR.ARCHIVE]SMP_QC1232401_GAMMA6_PMP_9220.CNF;5
Analyses by : PEAK V16.5 PEAKEFF V2.2

---- Sample Information ----

Sample Title : G969901S
Sample ID : QC-123240-1 Sample Quantity : 1.00400E+02 G
Sample Type : SOIL Sample Geometry : TRM1S2

---- Sample Decay/Count Information ----

Sample Date : 15-FEB-1983 12:00 Acquisition date : 14-OCT-1996 10:56
Elapsed live time: 0 04:00 Elapsed real time: 0 04:00 0.1%
Decay time : 4989 22:56

---- Detector Parameters ----

Energy cal. time : 14-OCT-1996 09:29
Detector name : GAMMA6 Counting geometry: TRM1-S2
Effic. cal. time : 19-SEP-1996 15:59

---- Processing Parameters ----

Cali. Slope : 4.88511E-01 Cali. Offset : -1.75400E-01
Cali. Quadratic : -9.43914E-08 FWHM Offset : 7.57862E-01
FWHM Slope : 2.62786E-02 MDA Width (FWHM) : 3.0
Start channel : 1 End channel : 4096
Sensitivity : 5.0 Gaussian Sens. : 10.0
Energy tolerance : 2.0 Half life ratio : 8.0
Abundance limit : 75.0 WTM error limit : 3.0
Activity Units : PCI Act. Conversion : 1.00000E+06
MDA Confid Level : 5.0 Sigma Number : 2
Errors propagated: Yes Systematic Error : 0.0%

	It	Energy	Area	Bkgnd	FWHM	Channel	%Eff	Cts/Sec	%Err	Fit
1	6	10.68	1026	4588	1.03	22.22	3.79E+07	7.12E-02	10.7	1.09E+00
2	6	12.97	1667	4395	1.01	26.91	2.33E+05	1.16E-01	6.8	
3	6	15.59	1676	6280	1.46	32.27	6.54E+03	1.16E-01	9.1	
4	2	25.57	200	1806	0.91	52.70	3.32E+01	1.39E-02	30.7	1.76E+00
5	2	27.37	604	3054	1.08	56.38	2.30E+01	4.20E-02	15.8	
6	0	46.53	8088	6385	0.99	95.60	6.73E+00	5.62E-01	2.2	
7	0	50.00	744	3298	0.92	102.72	6.58E+00	5.17E-02	12.7	
8	0	53.28	2153	4484	1.01	109.43	6.55E+00	1.50E-01	5.8	
9	1	63.28	1676	4335	0.87	129.91	6.81E+00	1.16E-01	6.4	4.25E+00
10	1	67.63	1085	4410	0.88	138.80	7.00E+00	7.53E-02	9.6	
11	4	74.83	12375	5951	0.94	153.55	7.34E+00	8.59E-01	1.3	1.58E+01
12	4	77.11	21526	6168	0.92	158.22	7.45E+00	1.49E+00	0.9	
13	0	83.81	3059	3862	0.95	171.93	7.75E+00	2.12E-01	3.7	
14	0	87.18	6402	5255	1.18	178.82	7.89E+00	4.45E-01	2.2	
15	0	89.99	2081	3995	1.02	184.59	7.99E+00	1.45E-01	5.3	
16	0	92.47	1308	3434	0.95	189.65	8.08E+00	9.09E-02	7.1	
17	0	94.83	760	3027	1.12	194.49	8.15E+00	5.28E-02	12.3	
18	0	97.97	377	2576	1.46	200.92	8.24E+00	2.62E-02	21.9	
19	0	144.07	634	4292	1.16	295.29	8.38E+00	4.40E-02	19.1	
20	0	154.22	657	4492	1.06	316.08	8.19E+00	4.56E-02	18.8	
21	0	186.19	7259	4188	1.15	381.52	7.39E+00	5.04E-01	2.0	
22	0	236.02	634	2309	1.09	483.55	6.00E+00	4.41E-02	13.7	
23	0	242.07	9730	2271	1.14	495.93	5.85E+00	6.76E-01	1.3	
24	0	255.63	350	2631	0.98	523.69	5.51E+00	2.43E-02	28.9	

Sample ID : QC-123240-1 Acquisition date : 14-OCT-1996 10:56:36

80.19

Pk	It	Energy	Area	Bkgnd	FWHM	Channel	%Eff	Cts/Sec	%Err	Fit
25	0	259.00	620	1607	1.07	530.60	5.43E+00	4.30E-02	11.4	
[illegible]	3	269.60	766	1902	1.27	552.30	5.19E+00	5.32E-02	10.6	3.59E+00
27	3	271.40	589	1415	0.93	555.98	5.15E+00	4.09E-02	11.2	
28	0	274.66	406	1471	1.68	562.66	5.08E+00	2.82E-02	16.5	
29	0	295.29	21390	2505	1.15	604.91	4.66E+00	1.49E+00	0.8	
30	0	299.78	216	1581	1.21	614.10	4.57E+00	1.50E-02	32.6	
31	0	323.83	288	1801	1.12	663.34	4.15E+00	2.00E-02	29.1	
32	0	329.91	192	1413	0.71	675.79	4.06E+00	1.33E-02	34.7	
33	0	338.64	115	1202	0.76	693.66	3.92E+00	8.02E-03	50.7	
34	0	351.98	35994	2297	1.22	720.98	3.73E+00	2.50E+00	0.6	
35	0	389.24	292	1226	1.04	797.28	3.28E+00	2.03E-02	21.7	
36	0	402.02	255	1321	1.34	823.43	3.15E+00	1.77E-02	25.5	
37	0	405.43	235	1167	1.59	830.43	3.11E+00	1.63E-02	24.9	
38	0	454.49	386	1223	1.30	930.88	2.70E+00	2.68E-02	19.4	
39	0	480.76	229	726	1.49	984.68	2.52E+00	1.59E-02	21.5	
40	0	487.03	264	796	1.53	997.52	2.48E+00	1.83E-02	20.2	
41	0	511.24	663	1137	3.15	1047.10	2.34E+00	4.60E-02	11.6	
42	0	533.41	163	650	1.59	1092.50	2.23E+00	1.13E-02	29.2	
43	0	580.09	251	519	1.08	1188.09	2.04E+00	1.74E-02	17.0	
44	0	609.39	25069	903	1.39	1248.09	1.94E+00	1.74E+00	0.7	
45	0	665.64	758	437	1.44	1363.31	1.78E+00	5.27E-02	6.3	
46	0	703.13	254	634	1.19	1440.08	1.70E+00	1.77E-02	20.1	
47	0	720.09	120	573	1.01	1474.82	1.67E+00	8.35E-03	38.3	
48	0	742.51	146	462	1.48	1520.74	1.63E+00	1.02E-02	28.6	
49	0	768.39	2353	854	1.57	1573.75	1.58E+00	1.63E-01	3.5	
50	0	785.98	676	784	1.73	1609.78	1.56E+00	4.69E-02	10.3	
51	0	806.44	528	747	1.56	1651.70	1.53E+00	3.67E-02	12.2	
[illegible]	1	832.13	171	483	1.67	1704.31	1.50E+00	1.19E-02	25.3	1.29E+00
[illegible]	1	838.96	331	490	1.67	1718.31	1.49E+00	2.30E-02	13.7	
54	0	934.00	1211	506	1.63	1912.99	1.40E+00	8.41E-02	4.6	
55	0	964.15	160	531	1.66	1974.76	1.38E+00	1.11E-02	29.0	
56	0	1070.25	132	282	1.24	2192.12	1.31E+00	9.17E-03	24.6	
57	0	1120.19	5134	463	1.71	2294.45	1.29E+00	3.57E-01	1.7	
58	0	1155.09	666	422	1.69	2365.95	1.28E+00	4.62E-02	7.6	
59	0	1207.91	189	348	1.60	2474.18	1.26E+00	1.31E-02	21.9	
60	0	1237.92	1869	373	1.60	2535.67	1.24E+00	1.30E-01	3.2	
61	0	1280.87	380	401	1.58	2623.68	1.23E+00	2.64E-02	12.3	
62	2	1377.47	1408	250	1.92	2821.63	1.20E+00	9.78E-02	3.5	8.41E-01
63	2	1385.22	259	293	2.10	2837.50	1.20E+00	1.80E-02	14.7	
64	0	1401.01	399	347	1.60	2869.86	1.19E+00	2.77E-02	11.6	
65	0	1407.75	672	282	2.04	2883.68	1.19E+00	4.66E-02	6.4	
66	0	1509.15	707	364	1.66	3091.48	1.16E+00	4.91E-02	7.1	
67	4	1538.32	207	265	2.62	3151.28	1.15E+00	1.44E-02	18.0	1.42E+00
68	4	1542.84	190	253	2.62	3160.53	1.15E+00	1.32E-02	19.7	
69	0	1583.07	216	217	2.05	3243.00	1.14E+00	1.50E-02	15.6	
70	0	1599.03	71	182	0.99	3275.70	1.13E+00	4.94E-03	37.6	
71	0	1661.05	291	189	1.63	3402.82	1.11E+00	2.02E-02	11.8	
72	0	1729.54	941	138	2.04	3543.22	1.08E+00	6.53E-02	4.4	
73	0	1764.41	4244	138	2.25	3614.69	1.07E+00	2.95E-01	1.7	
74	1	1838.05	92	56	2.07	3765.66	1.04E+00	6.36E-03	22.4	1.74E+00
75	1	1847.30	579	76	2.08	3784.61	1.04E+00	4.02E-02	5.2	

Gamma Spectroscopy Report generated 21-OCT-1996 12:51

Configuration: DISK:[RADCHEM.SCUSR.ARCHIVE]BKG_BCKGND_GAMMA6__9207.CNF 8019
Analyses by : PEAK V16.5 PEAKEFF V2.2

---- Sample Information ----

Sample Title :
Sample ID : BCKGND
Sample Type :
Sample Quantity : 1.00000E+00 L
Sample Geometry :

---- Sample Decay/Count Information ----

Sample Date : 1-JAN-1900 00:00:
Elapsed live time: 0 16:40
Decay time :
Acquisition date : 11-OCT-1996 22:02
Elapsed real time: 0 16:40 0.0%

---- Detector Parameters ----

Energy cal. time : 8-OCT-1996 12:40:
Detector name : GAMMA6
Effic. cal. time : 19-SEP-1996 11:47
Counting geometry: IPL-1L

---- Processing Parameters ----

Cali. Slope	: 4.88802E-01	Cali. Offset	: -1.98761E-01
Cali. Quadratic	: -1.24008E-07	FWHM Offset	: 6.37077E-01
FWHM Slope	: 3.32083E-02	MDA Width (FWHM)	: 3.0
Start channel	: 1	End channel	: 4096
Sensitivity	: 5.0	Gaussian Sens.	: 10.0
Energy tolerance	: 2.0	Half life ratio	: 8.0
Abundance limit	: 75.0	WTM error limit	: 3.0
Activity Units	: pCi	Act. Conversion	: 1.00000E+06
MDA Confid Level	: 5.0	Sigma Number	: 1
Errors propagated	: Yes	Systematic Error	: 9.0%

	It	Energy	Area	Bkgnd	FWHM	Channel	%Eff	Cts/Sec	%Err	Fit
1	0	10.30	1435	8131	0.94	21.49	4.88E+00	2.39E-02	10.3	
2	0	13.11	1598	5408	1.08	27.23	5.24E+00	2.66E-02	7.8	
3	0	16.16	1877	4550	1.14	33.48	5.50E+00	3.13E-02	6.5	
4	0	19.32	489	2825	1.12	39.93	5.68E+00	8.16E-03	17.9	
5	0	46.47	1092	1757	1.00	95.48	5.87E+00	1.82E-02	8.1	
6	0	53.49	318	1255	0.95	109.84	5.79E+00	5.30E-03	20.1	
7	0	63.24	1969	1712	0.88	129.79	5.65E+00	3.28E-02	4.4	
8	0	66.38	251	976	1.39	136.22	5.61E+00	4.19E-03	20.7	
9	0	74.61	125	1302	0.63	153.05	5.48E+00	2.08E-03	46.4	
10	0	77.06	243	1345	0.84	158.06	5.44E+00	4.06E-03	25.9	
11	0	83.91	246	1375	0.77	172.09	5.34E+00	4.10E-03	26.9	
12	0	92.78	2705	1751	1.03	190.24	5.21E+00	4.51E-02	3.5	
13	0	110.06	123	1181	0.96	225.57	4.96E+00	2.05E-03	47.1	
14	0	139.64	327	1326	1.16	286.11	4.57E+00	5.45E-03	21.6	
15	0	143.65	214	1132	1.14	294.31	4.52E+00	3.56E-03	28.1	
16	0	163.35	219	1122	0.98	334.62	4.29E+00	3.64E-03	28.4	
17	0	185.87	1288	1399	1.06	380.70	4.06E+00	2.15E-02	6.3	
18	0	198.28	600	1223	1.98	406.10	3.94E+00	1.00E-02	12.0	
19	0	238.78	423	1033	1.02	488.98	3.59E+00	7.04E-03	14.5	
20	0	352.10	159	596	0.93	720.86	2.88E+00	2.66E-03	28.8	
21	0	511.22	1963	898	2.64	1046.54	2.24E+00	3.27E-02	4.1	
22	0	583.67	178	385	1.64	1194.85	2.03E+00	2.97E-03	22.1	
23	0	803.54	130	310	1.08	1644.99	1.57E+00	2.17E-03	26.8	
24	0	1002.71	19	311	1.88	2052.83	1.29E+00	3.21E-04	184.6	

Sample ID : BCKGND Acquisition date : 11-OCT-1996 22:02:41

8019

Pk	It	Energy	Area	Bkgnd	FWHM	Channel	%Eff	Cts/Sec	%Err	Fit
0		1461.46	98	143	1.20	2992.55	9.02E-01	1.63E-03	27.1	

Gamma Spectroscopy Report generated 21-OCT-1996 12:51

8019

Configuration: DISK:[RADCHEM.SCUSR.ARCHIVE]SMP_QC1232401_GAMMA6_PMP_9220.CNF;5
Analyses by : PEAK V16.5 ENBACK V1.5

---- Sample Information ----

Sample Title : G969901S
Sample ID : QC-123240-1 Sample Quantity : 1.00400E+02 G
Sample Type : SOIL Sample Geometry : TRM1S2

---- Sample Decay/Count Information ----

Sample Date : 15-FEB-1983 12:00 Acquisition date : 14-OCT-1996 10:56
Elapsed live time: 0 04:00 Elapsed real time: 0 04:00 0.1%
Decay time : 4989 22:56

---- Detector Parameters ----

Energy cal. time : 14-OCT-1996 09:29
Detector name : GAMMA6 Counting geometry: TRM1-S2
Effic. cal. time : 19-SEP-1996 15:59

---- Processing Parameters ----

Cali. Slope	: 4.88511E-01	Cali. Offset	: -1.75400E-01
Cali. Quadratic	: -9.43914E-08	FWHM Offset	: 7.57862E-01
FWHM Slope	: 2.62786E-02	MDA Width (FWHM)	: 3.0
Start channel	: 1	End channel	: 4096
Sensitivity	: 5.0	Gaussian Sens.	: 10.0
Energy tolerance	: 2.0	Half life ratio	: 8.0
Abundance limit	: 75.0	WTM error limit	: 3.0
Activity Units	: PCI	Act. Conversion	: 1.00000E+06
MDA Confid Level	: 5.0	Sigma Number	: 2
Errors propagated:	Yes	Systematic Error	: 0.0%

	It	Energy	Area	Bkgnd	FWHM	Channel	Left	Pw	Cts/Sec	%Err	Fit
1	6	10.68*	682	4588	1.03	22.22	19	18	4.73E-02	17.0	1.09E+00
2	6	12.97*	1284	4395	1.01	26.91	19	18	8.92E-02	9.1	
3	6	15.59*	1226	6280	1.46	32.27	19	18	8.51E-02	12.6	
4	2	25.57	200	1806	0.91	52.70	51	10	1.39E-02	30.7	1.76E+00
5	2	27.37	604	3054	1.08	56.38	51	10	4.20E-02	15.8	
6	0	46.53*	7826	6385	0.99	95.60	90	11	5.43E-01	2.3	
7	0	50.00	744	3298	0.92	102.72	101	6	5.17E-02	12.7	
8	0	53.28*	2077	4484	1.01	109.43	106	8	1.44E-01	6.1	
9	1	63.28*	1203	4335	0.87	129.91	126	16	8.36E-02	9.0	4.25E+00
10	1	67.63*	1024	4410	0.88	138.80	126	16	7.11E-02	10.3	
11	4	74.83*	12345	5951	0.94	153.55	147	15	8.57E-01	1.4	1.58E+01
12	4	77.11*	21468	6168	0.92	158.22	147	15	1.49E+00	0.9	
13	0	83.81*	3000	3862	0.95	171.93	170	6	2.08E-01	3.8	
14	0	87.18	6402	5255	1.18	178.82	176	7	4.45E-01	2.2	
15	0	89.99	2081	3995	1.02	184.59	182	6	1.45E-01	5.3	
16	0	92.47*	659	3434	0.95	189.65	188	5	4.58E-02	14.5	
17	0	94.83	760	3027	1.12	194.49	193	6	5.28E-02	12.3	
18	0	97.97	377	2576	1.46	200.92	199	6	2.62E-02	21.9	
19	0	144.07*	582	4292	1.16	295.29	291	9	4.05E-02	20.9	
20	0	154.22	657	4492	1.06	316.08	312	9	4.56E-02	18.8	
21	0	186.19*	6950	4188	1.15	381.52	377	10	4.83E-01	2.1	
22	0	236.02	634	2309	1.09	483.55	480	8	4.41E-02	13.7	
23	0	242.07	9730	2271	1.14	495.93	492	9	6.76E-01	1.3	
24	0	255.63	350	2631	0.98	523.69	518	11	2.43E-02	28.9	

Sample ID : QC-123240-1 Acquisition date : 14-OCT-1996 10:56:36

8019

Pk	It	Energy	Area	Bkgnd	FWHM	Channel	Left	Pw	Cts/Sec	%Err	Fit
25	0	259.00	620	1607	1.07	530.60	528	7	4.30E-02	11.4	
	3	269.60	766	1902	1.27	552.30	548	12	5.32E-02	10.6	3.59E+00
27	3	271.40	589	1415	0.93	555.98	548	12	4.09E-02	11.2	
28	0	274.66	406	1471	1.68	562.66	560	7	2.82E-02	16.5	
29	0	295.29	21390	2505	1.15	604.91	600	12	1.49E+00	0.8	
30	0	299.78	216	1581	1.21	614.10	611	8	1.50E-02	32.6	
31	0	323.83	288	1801	1.12	663.34	657	11	2.00E-02	29.1	
32	0	329.91	192	1413	0.71	675.79	672	8	1.33E-02	34.7	
33	0	338.64	115	1202	0.76	693.66	690	7	8.02E-03	50.7	
34	0	351.98*	35956	2297	1.22	720.98	714	14	2.50E+00	0.6	
35	0	389.24	292	1226	1.04	797.28	794	8	2.03E-02	21.7	
36	0	402.02	255	1321	1.34	823.43	820	8	1.77E-02	25.5	
37	0	405.43	235	1167	1.59	830.43	827	7	1.63E-02	24.9	
38	0	454.49	386	1223	1.30	930.88	925	13	2.68E-02	19.4	
39	0	480.76	229	726	1.49	984.68	981	8	1.59E-02	21.5	
40	0	487.03	264	796	1.53	997.52	994	9	1.83E-02	20.2	
41	0	511.24*	192	1137	3.15	1047.10	1041	14	1.33E-02	41.2	
42	0	533.41	163	650	1.59	1092.50	1089	9	1.13E-02	29.2	
43	0	580.09	251	519	1.08	1188.09	1184	8	1.74E-02	17.0	
44	0	609.39	25069	903	1.39	1248.09	1241	13	1.74E+00	0.7	
45	0	665.64	758	437	1.44	1363.31	1359	10	5.27E-02	6.3	
46	0	703.13	254	634	1.19	1440.08	1436	11	1.77E-02	20.1	
47	0	720.09	120	573	1.01	1474.82	1469	10	8.35E-03	38.3	
48	0	742.51	146	462	1.48	1520.74	1516	10	1.02E-02	28.6	
49	0	768.39	2353	854	1.57	1573.75	1566	17	1.63E-01	3.5	
50	0	785.98	676	784	1.73	1609.78	1601	17	4.69E-02	10.3	
51	0	806.44	528	747	1.56	1651.70	1645	15	3.67E-02	12.2	
	1	832.13	171	483	1.67	1704.31	1697	31	1.19E-02	25.3	1.29E+00
	1	838.96	331	490	1.67	1718.31	1697	31	2.30E-02	13.7	
54	0	934.00	1211	506	1.63	1912.99	1907	11	8.41E-02	4.6	
55	0	964.15	160	531	1.66	1974.76	1969	11	1.11E-02	29.0	
56	0	1070.25	132	282	1.24	2192.12	2188	9	9.17E-03	24.6	
57	0	1120.19	5134	463	1.71	2294.45	2287	14	3.57E-01	1.7	
58	0	1155.09	666	422	1.69	2365.95	2359	14	4.62E-02	7.6	
59	0	1207.91	189	348	1.60	2474.18	2469	13	1.31E-02	21.9	
60	0	1237.92	1869	373	1.60	2535.67	2529	14	1.30E-01	3.2	
61	0	1280.87	380	401	1.58	2623.68	2618	14	2.64E-02	12.3	
62	2	1377.47	1408	250	1.92	2821.63	2816	29	9.78E-02	3.5	8.41E-01
63	2	1385.22	259	293	2.10	2837.50	2816	29	1.80E-02	14.7	
64	0	1401.01	399	347	1.60	2869.86	2861	16	2.77E-02	11.6	
65	0	1407.75	672	282	2.04	2883.68	2877	13	4.66E-02	6.4	
66	0	1509.15	707	364	1.66	3091.48	3084	16	4.91E-02	7.1	
67	4	1538.32	207	265	2.62	3151.28	3144	23	1.44E-02	18.0	1.42E+00
68	4	1542.84	190	253	2.62	3160.53	3144	23	1.32E-02	19.7	
69	0	1583.07	216	217	2.05	3243.00	3237	13	1.50E-02	15.6	
70	0	1599.03	71	182	0.99	3275.70	3271	10	4.94E-03	37.6	
71	0	1661.05	291	189	1.63	3402.82	3397	15	2.02E-02	11.8	
72	0	1729.54	941	138	2.04	3543.22	3535	17	6.53E-02	4.4	
73	0	1764.41	4244	138	2.25	3614.69	3606	19	2.95E-01	1.7	
74	1	1838.05	92	56	2.07	3765.66	3758	34	6.36E-03	22.4	1.74E+00
75	1	1847.30	579	76	2.08	3784.61	3758	34	4.02E-02	5.2	

Flag: "*" = Peak area was modified by background subtraction

Gamma Spectroscopy Report generated 21-OCT-1996 12:51 **8019**

Configuration: DISK:[RADCHEM.SCUSR.ARCHIVE]SMP_QC1232401_GAMMA6_PMP_9220.CNF;5
Analyses by : PEAK V16.5 ENBACK V1.5 PEAKEFF V2.2 NID V3.1

---- Sample Information ----

Sample Title : G969901S
Sample ID : QC-123240-1 Sample Quantity : 1.00400E+02 G
Sample Type : SOIL Sample Geometry : TRM1S2

---- Sample Decay/Count Information ----

Sample Date : 15-FEB-1983 12:00 Acquisition date : 14-OCT-1996 10:56
Elapsed live time: 0 04:00 Elapsed real time: 0 04:00 0.1%
Decay time : 4989 22:56

---- Detector Parameters ----

Energy cal. time : 14-OCT-1996 09:29
Detector name : GAMMA6 Counting geometry: TRM1-S2
Effic. cal. time : 19-SEP-1996 15:59

---- Processing Parameters ----

Cali. Slope	: 4.88511E-01	Cali. Offset	: -1.75400E-01
Cali. Quadratic	: -9.43914E-08	FWHM Offset	: 7.57862E-01
FWHM Slope	: 2.62786E-02	MDA Width (FWHM)	: 3.0
Start channel	: 1	End channel	: 4096
Sensitivity	: 5.0	Gaussian Sens.	: 10.0
Energy tolerance	: 2.0	Half life ratio	: 8.0
Abundance limit	: 75.0	WTM error limit	: 3.0
Activity Units	: PCI	Act. Conversion	: 1.00000E+06
MDA Confid Level	: 5.0	Sigma Number	: 2
Errors propagated	: Yes	Systematic Error	: 0.0%

Post-NID Peak Search Report

It	Energy	Area	Bkgnd	FWHM	Channel	Left	Pw	%Err	Fit	Nuclides
6	10.68*	682	4588	1.03	22.22	19	18	34.0	1.09E+00	
6	12.97*	1284	4395	1.01	26.91	19	18	18.2		
6	15.59*	1226	6280	1.46	32.27	19	18	25.3		
2	25.57	200	1806	0.91	52.70	51	10	61.4	1.76E+00	
2	27.37	604	3054	1.08	56.38	51	10	31.7		
0	46.53*	7826	6385	0.99	95.60	90	11	4.6		
0	50.00	744	3298	0.92	102.72	101	6	25.4		PA-231
0	53.28*	2077	4484	1.01	109.43	106	8	12.1		
1	63.28*	1203	4335	0.87	129.91	126	16	18.1	4.25E+00	
1	67.63*	1024	4410	0.88	138.80	126	16	20.6		
4	74.83*	12345	5951	0.94	153.55	147	15	2.7	1.58E+01	
4	77.11*	21468	6168	0.92	158.22	147	15	1.8		
0	83.81*	3000	3862	0.95	171.93	170	6	7.6		
0	87.18	6402	5255	1.18	178.82	176	7	4.5		
0	89.99	2081	3995	1.02	184.59	182	6	10.7		
0	92.47*	659	3434	0.95	189.65	188	5	28.9		
0	94.83	760	3027	1.12	194.49	193	6	24.5		
0	97.97	377	2576	1.46	200.92	199	6	43.7		
0	144.07*	582	4292	1.16	295.29	291	9	41.8		U-235 PA-231
0	154.22	657	4492	1.06	316.08	312	9	37.7		PA-231

Sample ID : QC-123240-1 Acquisition date : 14-OCT-1996 10:56:36

8019

It	Energy	Area	Bkgnd	FWHM	Channel	Left	Pw	%Err	Fit	Nuclides
	186.19*	6950	4188	1.15	381.52	377	10	4.3		U-235
										RA-226
0	236.02	634	2309	1.09	483.55	480	8	27.5		PA-231
										PA-231
0	242.07	9730	2271	1.14	495.93	492	9	2.7		
0	255.63	350	2631	0.98	523.69	518	11	57.7		PA-231
0	259.00	620	1607	1.07	530.60	528	7	22.9		
3	269.60	766	1902	1.27	552.30	548	12	21.2	3.59E+00	PA-231
3	271.40	589	1415	0.93	555.98	548	12	22.5		PA-231
0	274.66	406	1471	1.68	562.66	560	7	33.0		
0	295.29	21390	2505	1.15	604.91	600	12	1.7		
0	299.78	216	1581	1.21	614.10	611	8	65.3		PA-231
0	323.83	288	1801	1.12	663.34	657	11	58.3		PA-231
0	329.91	192	1413	0.71	675.79	672	8	69.4		PA-231
0	338.64	115	1202	0.76	693.66	690	7	101.3		PA-231
0	351.98*	35956	2297	1.22	720.98	714	14	1.2		PA-231
0	389.24	292	1226	1.04	797.28	794	8	43.5		
0	402.02	255	1321	1.34	823.43	820	8	50.9		PA-231
0	405.43	235	1167	1.59	830.43	827	7	49.9		PA-231
0	454.49	386	1223	1.30	930.88	925	13	38.8		
0	480.76	229	726	1.49	984.68	981	8	43.0		
0	487.03	264	796	1.53	997.52	994	9	40.4		
0	511.24*	192	1137	3.15	1047.10	1041	14	82.4		
0	533.41	163	650	1.59	1092.50	1089	9	58.5		
0	580.09	251	519	1.08	1188.09	1184	8	33.9		
0	609.39	25069	903	1.39	1248.09	1241	13	1.4		
0	665.64	758	437	1.44	1363.31	1359	10	12.7		
	703.13	254	634	1.19	1440.08	1436	11	40.2		
0	720.09	120	573	1.01	1474.82	1469	10	76.7		
0	742.51	146	462	1.48	1520.74	1516	10	57.3		
0	768.39	2353	854	1.57	1573.75	1566	17	7.0		
0	785.98	676	784	1.73	1609.78	1601	17	20.5		
0	806.44	528	747	1.56	1651.70	1645	15	24.4		
1	832.13	171	483	1.67	1704.31	1697	31	50.6	1.29E+00	PA-231
1	838.96	331	490	1.67	1718.31	1697	31	27.4		
0	934.00	1211	506	1.63	1912.99	1907	11	9.2		
0	964.15	160	531	1.66	1974.76	1969	11	58.1		
0	1070.25	132	282	1.24	2192.12	2188	9	49.1		
0	1120.19	5134	463	1.71	2294.45	2287	14	3.3		
0	1155.09	666	422	1.69	2365.95	2359	14	15.2		
0	1207.91	189	348	1.60	2474.18	2469	13	43.7		
0	1237.92	1869	373	1.60	2535.67	2529	14	6.4		
0	1280.87	380	401	1.58	2623.68	2618	14	24.6		
2	1377.47	1408	250	1.92	2821.63	2816	29	7.0	8.41E-01	
2	1385.22	259	293	2.10	2837.50	2816	29	29.5		
0	1401.01	399	347	1.60	2869.86	2861	16	23.2		
0	1407.75	672	282	2.04	2883.68	2877	13	12.9		
0	1509.15	707	364	1.66	3091.48	3084	16	14.2		
4	1538.32	207	265	2.62	3151.28	3144	23	36.0	1.42E+00	
4	1542.84	190	253	2.62	3160.53	3144	23	39.5		
0	1583.07	216	217	2.05	3243.00	3237	13	31.3		

Sample ID : QC-123240-1 Acquisition date : 14-OCT-1996 10:56:36

8019

It	Energy	Area	Bkgnd	FWHM	Channel	Left	Pw	%Err	Fit	Nuclides
	1599.03	71	182	0.99	3275.70	3271	10	75.2		
	1661.05	291	189	1.63	3402.82	3397	15	23.6		
0	1729.54	941	138	2.04	3543.22	3535	17	8.7		
0	1764.41	4244	138	2.25	3614.69	3606	19	3.4		
1	1838.05	92	56	2.07	3765.66	3758	34	44.8	1.74E+00	
1	1847.30	579	76	2.08	3784.61	3758	34	10.4		

Gamma Spectroscopy Report generated 21-OCT-1996 12:52

8019

Configuration: DISK:[RADCHEM.SCUSR.ARCHIVE]SMP_QC1232401_GAMMA6_PMP_9220.CNF;5
Analyses by : PEAK V16.5 ENBACK V1.5 PEAKEFF V2.2 NID V3.1

---- Sample Information ----

Sample Title	: G969901S		
Sample ID	: QC-123240-1	Sample Quantity	: 1.00400E+02 G
Sample Type	: SOIL	Sample Geometry	: TRM1S2

---- Sample Decay/Count Information ----

Sample Date	: 15-FEB-1983 12:00	Acquisition date	: 14-OCT-1996 10:56
Elapsed live time	: 0 04:00	Elapsed real time	: 0 04:00 0.1%
Decay time	: 4989 22:56		

---- Detector Parameters ----

Energy cal. time	: 14-OCT-1996 09:29		
Detector name	: GAMMA6	Counting geometry	: TRM1-S2
Effic. cal. time	: 19-SEP-1996 15:59		

---- Processing Parameters ----

Cali. Slope	: 4.88511E-01	Cali. Offset	: -1.75400E-01
Cali. Quadratic	: -9.43914E-08	FWHM Offset	: 7.57862E-01
FWHM Slope	: 2.62786E-02	MDA Width (FWHM)	: 3.0
Start channel	: 1	End channel	: 4096
Sensitivity	: 5.0	Gaussian Sens.	: 10.0
Energy tolerance	: 2.0	Half life ratio	: 8.0
Abundance limit	: 75.0	WTM error limit	: 3.0
Activity Units	: PCI	Act. Conversion	: 1.00000E+06
MDA Confid Level	: 5.0	Sigma Number	: 2
Errors propagated	: Yes	Systematic Error	: 0.0%

Interference Report

No interference correction performed

Sample ID : QC-123240-1 Acquisition date : 14-OCT-1996 10:56:36

8019

Nuclide	Half-life	Half-Life Ratio	Energy	%Abund	Activity	2-Sigma %Error	Rejected by
RA-228	1.41E+10Y	0.00	209.28	4.40	--- Not Found ---		Abun.
			270.23	3.60	7.664E-06	55.89	
			327.64	3.20	--- Not Found ---		
			338.32	11.40	4.825E-07	110.13	
			463.00	4.40	--- Not Found ---		
			794.70	4.60	--- Not Found ---		
			911.07*	27.70	--- Not Found ---		
			964.60	5.20	4.176E-06	65.26	
			969.11	16.60	--- Not Found ---		
		% Abundances Found =		24.91			

Flag: "*" = Keyline

8019

Nuclide Type: Natural

Nuclide	Energy	Area	%Abn	%Eff	Uncorrected PCI/G	Decay Corr PCI/G	2-Sigma %Error
RA-226	186.21	6950	3.28*	7.388E+00	5.362E+01	5.394E+01	30.81
PA-231	50.10	744	31.70	6.579E+00	6.673E-01	6.675E-01	27.88
	100.00	------	1.11	8.297E+00	------	Line Not Found	------
	122.31	------	1.19	8.566E+00	------	Line Not Found	------
	144.24	582	3.24	8.382E+00	4.010E+00	4.011E+00	46.63
	154.21	657	5.58	8.195E+00	2.686E+00	2.686E+00	43.99
	205.00	------	1.08	6.856E+00	------	Line Not Found	------
	210.60	------	1.26	6.698E+00	------	Line Not Found	------
	234.90	634	2.80	6.005E+00	7.053E+00	7.055E+00	45.18
	236.00	634	11.50	6.005E+00	1.717E+00	1.718E+00	40.71
	256.20	350	6.30	5.514E+00	1.883E+00	1.883E+00	65.21
	269.46	766	13.60	5.191E+00	2.029E+00	2.029E+00	34.18
	271.23	589	10.60	5.151E+00	2.018E+00	2.018E+00	35.42
	283.67	------	1.60	4.889E+00	------	Line Not Found	------
	286.10	------	1.60	4.839E+00	------	Line Not Found	------
	300.08	216	2.30	4.572E+00	3.837E+00	3.838E+00	69.74
	304.40	------	1.35	4.487E+00	------	Line Not Found	------
	323.87	288	3.88	4.152E+00	3.340E+00	3.341E+00	61.46
	330.00	192	1.30	4.056E+00	6.805E+00	6.807E+00	77.85
	334.20	------	1.15	3.990E+00	------	Line Not Found	------
	338.28	115	2.73	3.923E+00	2.015E+00	2.015E+00	102.85
	351.07	35956	12.94*	3.734E+00	1.391E+02	1.392E+02	12.12
	401.81	255	6.50	3.148E+00	2.328E+00	2.329E+00	53.33
	404.84	235	2.90	3.114E+00	4.869E+00	4.871E+00	51.91
	427.08	------	1.30	2.915E+00	------	Line Not Found	------
	445.03	------	1.18	2.769E+00	------	Line Not Found	------
	569.67	------	0.54	2.078E+00	------	Line Not Found	------
	831.96	171	2.90	1.498E+00	7.376E+00	7.378E+00	83.52
	897.83	------	0.24	1.431E+00	------	Line Not Found	------
	897.83	------	0.52	1.431E+00	------	Line Not Found	------
U-235	143.76	582	10.50	8.382E+00	1.237E+00	1.237E+00	48.87
	163.35	------	4.70	7.990E+00	------	Line Not Found	------
	185.71	6950	54.00*	7.388E+00	3.257E+00	3.257E+00	30.98
	205.31	------	4.70	6.847E+00	------	Line Not Found	------

Flag: "*" = Keyline

Gamma Spectroscopy Report generated 21-OCT-1996 12:52

8019

Configuration: DISK:[RADCHEM.SCUSR.ARCHIVE]SMP_QC1232401_GAMMA6_PMP_9220.CNF;5
Analyses by : PEAK V16.5 ENBACK V1.5 PEAKEFF V2.2 NID V3.1 MINACT V2.5

---- Sample Information ----

Sample Title : G969901S
Sample ID : QC-123240-1 Sample Quantity : 1.00400E+02 G
Sample Type : SOIL Sample Geometry : TRM1S2

---- Sample Decay/Count Information ----

Sample Date : 15-FEB-1983 12:00 Acquisition date : 14-OCT-1996 10:56
Elapsed live time: 0 04:00 Elapsed real time: 0 04:00 0.1%
Decay time : 4989 22:56

---- Detector Parameters ----

Energy cal. time : 14-OCT-1996 09:29
Detector name : GAMMA6 Counting geometry: TRM1-S2
Effic. cal. time : 19-SEP-1996 15:59

---- Processing Parameters ----

Cali. Slope	: 4.88511E-01	Cali. Offset	: -1.75400E-01
Cali. Quadratic	: -9.43914E-08	FWHM Offset	: 7.57862E-01
FWHM Slope	: 2.62786E-02	MDA Width (FWHM)	: 3.0
Start channel	: 1	End channel	: 4096
Sensitivity	: 5.0	Gaussian Sens.	: 10.0
Energy tolerance	: 2.0	Half life ratio	: 8.0
Abundance limit	: 75.0	WTM error limit	: 3.0
Activity Units	: PCI	Act. Conversion	: 1.00000E+06
MDA Confid Level	: 5.0	Sigma Number	: 2
Errors propagated	: Yes	Systematic Error	: 0.0%

Combined Activity-MDA Report

---- Identified Nuclides ----

Nuclide	Activity (PCI/G)	Act error	MDA (PCI/G)	MDA error	Act/MDA
RA-226	5.394E+01	1.662E+01	1.981E+00	6.045E-01	27.223
PA-231	1.392E+02	1.687E+01	6.411E-01	7.878E-02	217.075
U-235	3.257E+00	1.009E+00	1.205E-01	3.680E-02	27.027

---- Non-Identified Nuclides ----

Nuclide	Key-Line Activity (PCI/G)	K.L. Ided	Act error	MDA (PCI/G)	MDA error	Act/MDA
RA-228	2.757E-01		3.068E-01	5.268E-01	1.171E-01	0.523

Gamma Spectroscopy Report generated 21-OCT-1996 12:52

8019

Configuration: DISK:[RADCHEM.SCUSR.ARCHIVE]SMP_QC1232401_GAMMA6_PMP_9220.CNF;5
Analyses by : PEAK V16.5 ENBACK V1.5 PEAKEFF V2.2 NID V3.1 MINACT V2.5

---- Sample Information ----

Sample Title : G969901S
Sample ID : QC-123240-1 Sample Quantity : 1.00400E+02 G
Sample Type : SOIL Sample Geometry : TRM1S2

---- Sample Decay/Count Information ----

Sample Date : 15-FEB-1983 12:00 Acquisition date : 14-OCT-1996 10:56
Elapsed live time: 0 04:00 Elapsed real time: 0 04:00 0.1%
Decay time : 4989 22:56

---- Detector Parameters ----

Energy cal. time : 14-OCT-1996 09:29
Detector name : GAMMA6 Counting geometry: TRM1-S2
Effic. cal. time : 19-SEP-1996 15:59

---- Processing Parameters ----

Cali. Slope	: 4.88511E-01	Cali. Offset	: -1.75400E-01
Cali. Quadratic	: -9.43914E-08	FWHM Offset	: 7.57862E-01
FWHM Slope	: 2.62786E-02	MDA Width (FWHM)	: 3.0
Start channel	: 1	End channel	: 4096
Sensitivity	: 5.0	Gaussian Sens.	: 10.0
Energy tolerance	: 2.0	Half life ratio	: 8.0
Abundance limit	: 75.0	WTM error limit	: 3.0
Activity Units	: PCI	Act. Conversion	: 1.00000E+06
MDA Confid Level	: 5.0	Sigma Number	: 2
Errors propagated:	Yes	Systematic Error	: 9.0%

Combined Activity-MDA Report

---- Identified Nuclides ----

Nuclide	Activity (PCI/G)	Act error	MDA (PCI/G)	MDA error	Act/MDA
RA-226	5.394E+01	1.924E+01	1.981E+00	6.045E-01	27.223
PA-231	1.392E+02	3.020E+01	6.411E-01	7.878E-02	217.075
U-235	3.257E+00	1.167E+00	1.205E-01	3.680E-02	27.027

---- Non-Identified Nuclides ----

Nuclide	Key-Line Activity (PCI/G)	K.L. Ided	Act error	MDA (PCI/G)	MDA error	Act/MDA
RA-228	2.757E-01		3.108E-01	5.268E-01	1.171E-01	0.523

R. Jelly
10/21/96

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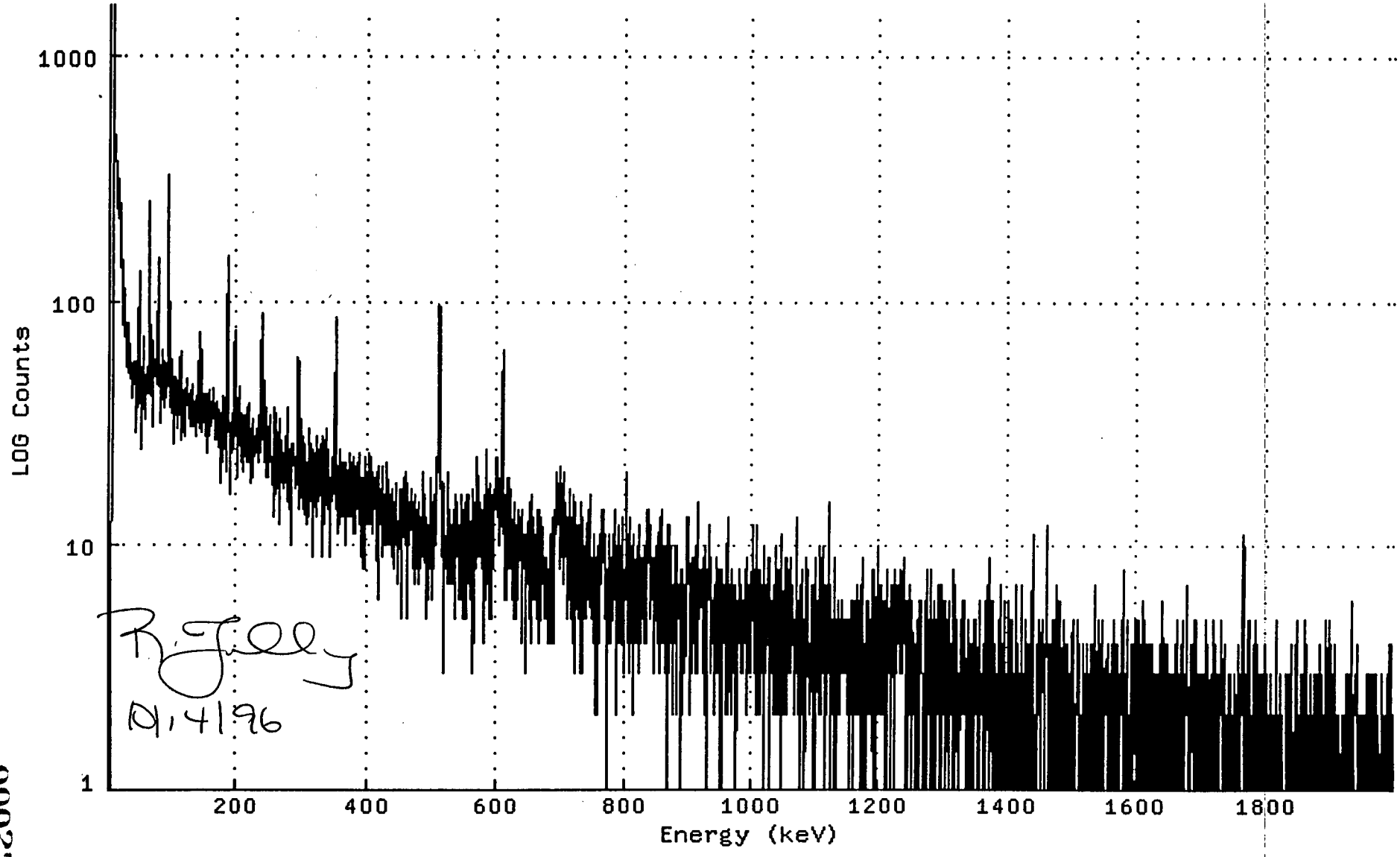
Spectrum : DISK:[RADCHEM.SCUSR.ARCHIVE]SMP_96E04517_GAMMA6_PMP_9182.CNF;2
Title : 96E-0640-04
Sample Title: G969901S
Start Time: 9-OCT-1996 14:30: Sample Time: 19-SEP-1996 12:00 Energy Offset: -1.98761E-01
Real Time : 0 04:00:02.44 Sample ID : 96E04517 Energy Slope : 4.88802E-01
Live Time : 0 04:00:00.00 Sample Type: FILTER Energy Quad : -1.24008E-07



R. Gilly
10/4/96

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Gamma Spectroscopy Report generated 11-OCT-1996 14:03

8019

Configuration: DISK:[RADCHEM.SCUSR.ARCHIVE]SMP_96E04517_GAMMA6_PMP_9182.CNF;2
Analyses by : PEAK V16.5 PEAKEFF V2.2

---- Sample Information ----

Sample Title : G969901S
Sample ID : 96E04517 Sample Quantity : 1.00000E+00 SAMPLE
Sample Type : FILTER Sample Geometry : PMP

---- Sample Decay/Count Information ----

Sample Date : 19-SEP-1996 12:00 Acquisition date : 9-OCT-1996 14:30:
Elapsed live time: 0 04:00 Elapsed real time: 0 04:00 0.0%
Decay time : 20 02:30

---- Detector Parameters ----

Energy cal. time : 8-OCT-1996 12:40:
Detector name : GAMMA6 Counting geometry: PMP
Effic. cal. time : 19-SEP-1996 15:11

---- Processing Parameters ----

Cali. Slope	: 4.88802E-01	Cali. Offset	: -1.98761E-01
Cali. Quadratic	: -1.24008E-07	FWHM Offset	: 6.37077E-01
FWHM Slope	: 3.32083E-02	MDA Width (FWHM)	: 3.0
Start channel	: 1	End channel	: 4096
Sensitivity	: 5.0	Gaussian Sens.	: 10.0
Energy tolerance	: 2.0	Half life ratio	: 8.0
Abundance limit	: 75.0	WTM error limit	: 3.0
Activity Units	: PCI	Act. Conversion	: 1.00000E+06
MDA Confid Level	: 5.0	Sigma Number	: 2
Errors propagated	: Yes	Systematic Error	: 0.0%

	It	Energy	Area	Bkgnd	FWHM	Channel	%Eff	Cts/Sec	%Err	Fit
1	0	10.21	400	1823	1.07	21.30	9.13E-01	2.78E-02	17.8	
2	0	12.85	264	1409	1.05	26.70	1.52E+00	1.84E-02	23.4	
3	0	16.08	439	1258	1.20	33.30	2.30E+00	3.05E-02	14.4	
4	0	46.50	192	304	1.02	95.53	6.84E+00	1.34E-02	16.8	
5	0	53.60	126	263	1.34	110.06	7.18E+00	8.73E-03	24.0	
6	0	63.26	438	364	1.00	129.82	7.43E+00	3.04E-02	8.9	
7	0	77.42	131	387	0.68	158.81	7.49E+00	9.07E-03	26.7	
8	0	92.66	709	473	1.15	189.97	7.34E+00	4.92E-02	7.1	
9	0	112.54	75	219	1.51	230.65	6.98E+00	5.22E-03	33.4	
10	0	144.03	92	288	0.86	295.09	6.33E+00	6.37E-03	35.1	
11	0	185.64	383	305	1.23	380.23	5.52E+00	2.66E-02	10.4	
12	0	198.07	200	348	1.88	405.67	5.31E+00	1.39E-02	20.6	
13	0	259.03	56	109	1.55	530.42	4.41E+00	3.90E-03	33.5	
14	0	295.07	141	194	1.24	604.15	4.00E+00	9.81E-03	21.5	
15	0	351.98	163	184	1.06	720.62	3.47E+00	1.13E-02	17.5	
16	0	511.31	435	200	2.13	1046.73	2.52E+00	3.02E-02	8.7	
17	0	609.32	201	201	1.48	1247.36	2.16E+00	1.39E-02	17.6	
18	0	807.00	70	149	7.01	1652.07	1.69E+00	4.83E-03	50.3	
19	0	1764.84	46	12	2.49	3614.26	9.07E-01	3.22E-03	21.1	

Gamma Spectroscopy Report generated 11-OCT-1996 14:03 **8019**

Configuration: DISK:[RADCHEM.SCUSR.ARCHIVE]BKG_BCKGND_GAMMA6__9144.CNF;1
Analyses by : PEAK V16.5 PEAKEFF V2.2

---- Sample Information ----

Sample Title :
Sample ID : BCKGND
Sample Type :
Sample Quantity : 1.00000E+00 G
Sample Geometry :

---- Sample Decay/Count Information ----

Sample Date : 4-OCT-1996 00:00:
Elapsed live time: 2 02:00
Decay time : 0 18:21
Acquisition date : 4-OCT-1996 18:21:
Elapsed real time: 2 02:00 0.0%

---- Detector Parameters ----

Energy cal. time : 30-SEP-1996 09:02
Detector name : GAMMA6
Effic. cal. time : 19-SEP-1996 13:34
Counting geometry: TRM1-S3

---- Processing Parameters ----

Cali. Slope	: 4.88539E-01	Cali. Offset	: -1.23202E-01
Cali. Quadratic	: -8.96482E-08	FWHM Offset	: 6.63864E-01
FWHM Slope	: 3.08694E-02	MDA Width (FWHM)	: 3.0
Start channel	: 1	End channel	: 4096
Sensitivity	: 5.0	Gaussian Sens.	: 10.0
Energy tolerance	: 2.0	Half life ratio	: 8.0
Abundance limit	: 75.0	WTM error limit	: 3.0
Activity Units	: pCi	Act. Conversion	: 1.00000E+06
MDA Confid Level	: 5.0	Sigma Number	: 1
Errors propagated	: Yes	Systematic Error	: 9.0%

	It	Energy	Area	Bkgnd	FWHM	Channel	%Eff	Cts/Sec	%Err	Fit
1	0	10.31	4650	23581	0.99	21.37	1.07E+05	2.58E-02	5.4	
2	4	13.10	3782	8752	0.88	27.07	1.83E+03	2.10E-02	3.5	6.65E-01
3	4	16.24	5522	14567	1.15	33.50	1.52E+02	3.07E-02	4.1	
4	0	19.50	1635	8409	1.62	40.16	3.62E+01	9.08E-03	9.3	
5	0	25.54	312	5600	0.86	52.53	1.02E+01	1.73E-03	38.6	
6	0	46.59	2743	4367	1.01	95.62	5.24E+00	1.52E-02	4.7	
7	0	53.57	608	4119	1.10	109.90	5.52E+00	3.38E-03	18.7	
8	0	63.33	5851	4242	0.89	129.88	6.06E+00	3.25E-02	2.3	
9	0	66.27	434	3647	1.07	135.89	6.23E+00	2.41E-03	23.6	
10	0	74.71	387	3737	0.90	153.19	6.70E+00	2.15E-03	25.5	
11	0	77.10	716	3235	0.91	158.08	6.82E+00	3.98E-03	13.2	
12	0	84.07	939	4528	1.17	172.34	7.15E+00	5.22E-03	13.3	
13	0	87.11	255	3002	1.06	178.56	7.28E+00	1.42E-03	34.5	
14	0	92.68	8662	4490	1.15	189.96	7.48E+00	4.81E-02	1.8	
15	0	98.45	403	3128	0.67	201.79	7.65E+00	2.24E-03	23.5	
16	7	110.09	994	5123	1.93	225.60	7.87E+00	5.52E-03	14.9	2.35E+00
17	7	112.93	511	3026	1.14	231.42	7.90E+00	2.84E-03	18.5	
18	0	139.98	660	3279	1.12	286.79	7.85E+00	3.67E-03	15.5	
19	0	143.85	766	3282	0.98	294.73	7.80E+00	4.26E-03	13.4	
20	0	163.53	543	3010	1.01	335.01	7.47E+00	3.01E-03	18.1	
21	0	185.82	3757	3802	1.11	380.64	6.98E+00	2.09E-02	3.5	
22	0	197.88	1519	4349	2.03	405.32	6.69E+00	8.44E-03	9.1	
23	0	205.27	364	2837	1.41	420.45	6.51E+00	2.02E-03	25.9	
24	0	238.51	1425	3059	1.17	488.51	5.74E+00	7.92E-03	7.4	

Sample ID : BCKGND Acquisition date : 4-OCT-1996 18:21:18

8019

Pk	It	Energy	Area	Bkgnd	FWHM	Channel	%Eff	Cts/Sec	%Err	Fit
[illegible]	0	295.60	150	1965	1.35	605.39	4.61E+00	8.34E-04	51.9	
[illegible]	0	351.85	396	1610	1.25	720.55	3.78E+00	2.20E-03	18.2	
27	0	510.92	5903	2795	2.42	1046.27	2.47E+00	3.28E-02	2.5	
28	0	569.76	296	1426	1.68	1166.76	2.20E+00	1.65E-03	25.4	
29	0	583.21	431	1428	1.46	1194.29	2.15E+00	2.39E-03	17.7	
30	0	609.11	415	1634	1.39	1247.34	2.06E+00	2.31E-03	18.9	
31	0	669.74	157	876	1.62	1371.50	1.88E+00	8.74E-04	34.9	
32	10	694.29	708	1889	3.83	1421.77	1.83E+00	3.93E-03	15.0	3.99E+00
33	10	701.21	457	2536	3.84	1435.95	1.81E+00	2.54E-03	29.9	
34	0	802.85	425	888	1.34	1644.13	1.63E+00	2.36E-03	14.4	
35	0	1000.76	326	643	1.90	2049.50	1.42E+00	1.81E-03	16.1	
36	0	1063.81	136	560	1.77	2178.65	1.38E+00	7.53E-04	33.9	
37	0	1460.33	407	435	1.84	2991.07	1.22E+00	2.26E-03	12.2	
38	0	1764.08	137	242	1.92	3613.58	1.14E+00	7.60E-04	24.3	

Gamma Spectroscopy Report generated 11-OCT-1996 14:03 **8019**

Configuration: DISK:[RADCHEM.SCUSR.ARCHIVE]SMP_96E04517_GAMMA6_PMP_9182.CNF;2
Analyses by : PEAK V16.5 ENBACK V1.5

---- Sample Information ----

Sample Title : G969901S
Sample ID : 96E04517 Sample Quantity : 1.00000E+00 SAMPLE
Sample Type : FILTER Sample Geometry : PMP

---- Sample Decay/Count Information ----

Sample Date : 19-SEP-1996 12:00 Acquisition date : 9-OCT-1996 14:30:
Elapsed live time: 0 04:00 Elapsed real time: 0 04:00 0.0%
Decay time : 20 02:30

---- Detector Parameters ----

Energy cal. time : 8-OCT-1996 12:40:
Detector name : GAMMA6 Counting geometry: PMP
Effic. cal. time : 19-SEP-1996 15:11

---- Processing Parameters ----

Cali. Slope	: 4.88802E-01	Cali. Offset	: -1.98761E-01
Cali. Quadratic	: -1.24008E-07	FWHM Offset	: 6.37077E-01
FWHM Slope	: 3.32083E-02	MDA Width (FWHM)	: 3.0
Start channel	: 1	End channel	: 4096
Sensitivity	: 5.0	Gaussian Sens.	: 10.0
Energy tolerance	: 2.0	Half life ratio	: 8.0
Abundance limit	: 75.0	WTM error limit	: 3.0
Activity Units	: PCI	Act. Conversion	: 1.00000E+06
MDA Confid Level	: 5.0	Sigma Number	: 2
Errors propagated	: Yes	Systematic Error	: 0.0%

	It	Energy	Area	Bkgnd	FWHM	Channel	Left	Pw	Cts/Sec	%Err	Fit
1	0	10.21*	28	1823	1.07	21.30	19	6	1.96E-03	262.6	
2	0	53.60*	77	263	1.34	110.06	107	8	5.35E-03	40.9	
3	0	77.42*	73	387	0.68	158.81	155	7	5.09E-03	48.8	
4	0	92.66*	16	473	1.15	189.97	186	11	1.10E-03	324.4	
5	0	112.54*	34	219	1.51	230.65	228	6	2.38E-03	76.4	
6	0	144.03*	30	288	0.86	295.09	291	9	2.12E-03	109.2	
7	0	185.64*	82	305	1.23	380.23	375	12	5.72E-03	50.1	
8	0	198.07*	78	348	1.88	405.67	399	13	5.42E-03	54.5	
9	0	259.03	56	109	1.55	530.42	527	7	3.90E-03	33.5	
10	0	295.07*	129	194	1.24	604.15	598	12	8.98E-03	23.9	
11	0	351.98*	131	184	1.06	720.62	716	10	9.12E-03	22.1	
12	0	609.32*	167	201	1.48	1247.36	1240	17	1.16E-02	21.5	
13	0	807.00	70	149	7.01	1652.07	1640	27	4.83E-03	50.3	
14	0	1764.84*	35	12	2.49	3614.26	3609	11	2.46E-03	28.7	

Flag: "*" = Peak area was modified by background subtraction

Gamma Spectroscopy Report generated 11-OCT-1996 14:04 **8019**

Configuration: DISK:[RADCHEM.SCUSR.ARCHIVE]SMP_96E04517_GAMMA6_PMP_9182.CNF;2
Analyses by : PEAK V16.5 ENBACK V1.5 PEAKEFF V2.2 NID V3.1

---- Sample Information ----

Sample Title : G969901S
Sample ID : 96E04517 Sample Quantity : 1.00000E+00 SAMPLE
Sample Type : FILTER Sample Geometry : PMP

---- Sample Decay/Count Information ----

Sample Date : 19-SEP-1996 12:00 Acquisition date : 9-OCT-1996 14:30:
Elapsed live time: 0 04:00 Elapsed real time: 0 04:00 0.0%
Decay time : 20 02:30

---- Detector Parameters ----

Energy cal. time : 8-OCT-1996 12:40:
Detector name : GAMMA6 Counting geometry: PMP
Effic. cal. time : 19-SEP-1996 15:11

---- Processing Parameters ----

Cali. Slope	: 4.88802E-01	Cali. Offset	: -1.98761E-01
Cali. Quadratic	: -1.24008E-07	FWHM Offset	: 6.37077E-01
FWHM Slope	: 3.32083E-02	MDA Width (FWHM)	: 3.0
Start channel	: 1	End channel	: 4096
Sensitivity	: 5.0	Gaussian Sens.	: 10.0
Energy tolerance	: 2.0	Half life ratio	: 8.0
Abundance limit	: 75.0	WTM error limit	: 3.0
Activity Units	: PCI	Act. Conversion	: 1.00000E+06
MDA Confid Level	: 5.0	Sigma Number	: 2
Errors propagated	: Yes	Systematic Error	: 0.0%

Post-NID Peak Search Report

It	Energy	Area	Bkgnd	FWHM	Channel	Left	Pw %Err	Fit	Nuclides
0	10.21*	28	1823	1.07	21.30	19	6525.2		
0	53.60*	77	263	1.34	110.06	107	8 81.8		
0	77.42*	73	387	0.68	158.81	155	7 97.5		
0	92.66*	16	473	1.15	189.97	186	11648.7		
0	112.54*	34	219	1.51	230.65	228	6152.7		
0	144.03*	30	288	0.86	295.09	291	9218.3		U-235
0	185.64*	82	305	1.23	380.23	375	12100.2		U-235 RA-226
0	198.07*	78	348	1.88	405.67	399	13109.0		
0	259.03	56	109	1.55	530.42	527	7 67.1		
0	295.07*	129	194	1.24	604.15	598	12 47.9		
0	351.98*	131	184	1.06	720.62	716	10 44.2		
0	609.32*	167	201	1.48	1247.36	1240	17 42.9		
0	807.00	70	149	7.01	1652.07	1640	27100.5		
0	1764.84*	35	12	2.49	3614.26	3609	11 57.4		

Gamma Spectroscopy Report generated 15-OCT-1996 11:08

8019

Configuration: DISK:[RADCHEM.SCUSR.ARCHIVE]SMP_96E04517_GAMMA6_PMP_9182.CNF;2
Analyses by : PEAK V16.5 ENBACK V1.5 PEAKEFF V2.2 NID V3.1 MINACT V2.5

---- Sample Information ----

Sample Title	: G969901S		
Sample ID	: 96E04517	Sample Quantity	: 1.00000E+00 SAMPLE
Sample Type	: FILTER	Sample Geometry	: PMP

---- Sample Decay/Count Information ----

Sample Date	: 19-SEP-1996 12:00	Acquisition date	: 9-OCT-1996 14:30:
Elapsed live time	: 0 04:00	Elapsed real time	: 0 04:00 0.0%
Decay time	: 20 02:30		

---- Detector Parameters ----

Energy cal. time	: 8-OCT-1996 12:40:		
Detector name	: GAMMA6	Counting geometry	: PMP
Effic. cal. time	: 19-SEP-1996 15:11		

---- Processing Parameters ----

Cali. Slope	: 4.88802E-01	Cali. Offset	: -1.98761E-01
Cali. Quadratic	: -1.24008E-07	FWHM Offset	: 6.37077E-01
FWHM Slope	: 3.32083E-02	MDA Width (FWHM)	: 3.0
Start channel	: 1	End channel	: 4096
Sensitivity	: 5.0	Gaussian Sens.	: 10.0
Energy tolerance	: 2.0	Half life ratio	: 8.0
Abundance limit	: 75.0	WTM error limit	: 3.0
Activity Units	: PCI	Act. Conversion	: 1.00000E+06
MDA Confid Level	: 5.0	Sigma Number	: 2
Errors propagated	: Yes	Systematic Error	: 0.0%

Combined Activity-MDA Report

---- Identified Nuclides ----

Nuclide	Activity (PCI/SAMPLE)	Act error	MDA (PCI/SAMPLE)	MDA error	Act/MDA
RA-226	8.540E+01	8.621E+01	6.926E+01	8.309E+00	1.233
U-235	8.600E+00	1.887E+01	4.199E+00	5.213E-01	2.048

---- Non-Identified Nuclides ----

Nuclide	Key-Line Activity (PCI/SAMPLE)	K.L. Ided	Act error	MDA (PCI/SAMPLE)	MDA error	Act/MDA
RA-228	-1.947E+00		1.052E+01	1.819E+01	2.423E+00	-0.107
PA-231	5.485E+01	+	2.522E+01	3.496E+01	4.401E+00	1.569

Gamma Spectroscopy Report generated 15-OCT-1996 11:08

8019

Configuration: DISK:[RADCHEM.SCUSR.ARCHIVE]SMP_96E04517_GAMMA6_PMP_9182.CNF;2
Analyses by : PEAK V16.5 ENBACK V1.5 PEAKEFF V2.2 NID V3.1 MINACT V2.5

---- Sample Information ----

Sample Title	: G969901S		
Sample ID	: 96E04517	Sample Quantity	: 1.00000E+00 SAMPLE
Sample Type	: FILTER	Sample Geometry	: PMP

---- Sample Decay/Count Information ----

Sample Date	: 19-SEP-1996 12:00	Acquisition date	: 9-OCT-1996 14:30:
Elapsed live time	: 0 04:00	Elapsed real time	: 0 04:00 0.0%
Decay time	: 20 02:30		

---- Detector Parameters ----

Energy cal. time	: 8-OCT-1996 12:40:		
Detector name	: GAMMA6	Counting geometry	: PMP
Effic. cal. time	: 19-SEP-1996 15:11		

---- Processing Parameters ----

Cali. Slope	: 4.88802E-01	Cali. Offset	: -1.98761E-01
Cali. Quadratic	: -1.24008E-07	FWHM Offset	: 6.37077E-01
FWHM Slope	: 3.32083E-02	MDA Width (FWHM)	: 3.0
Start channel	: 1	End channel	: 4096
Sensitivity	: 5.0	Gaussian Sens.	: 10.0
Energy tolerance	: 2.0	Half life ratio	: 8.0
Abundance limit	: 75.0	WTM error limit	: 3.0
Activity Units	: PCI	Act. Conversion	: 1.00000E+06
MDA Confid Level	: 5.0	Sigma Number	: 2
Errors propagated	: Yes	Systematic Error	: 9.0%

Combined Activity-MDA Report

---- Identified Nuclides ----

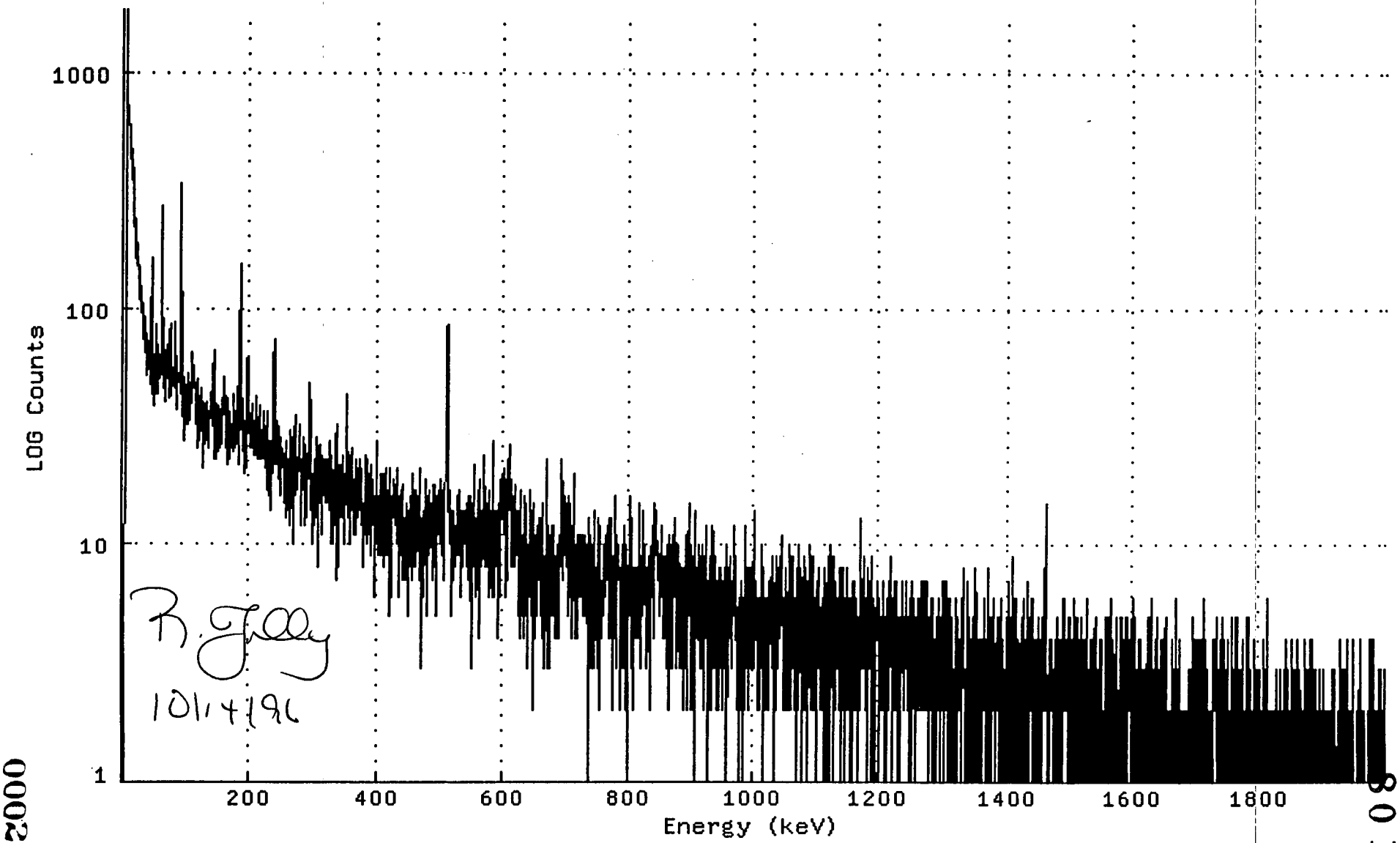
Nuclide	Activity (PCI/SAMPLE)	Act error	MDA (PCI/SAMPLE)	MDA error	Act/MDA
RA-226	8.540E+01	8.757E+01	6.926E+01	8.309E+00	1.233
U-235	8.600E+00	1.893E+01	4.199E+00	5.213E-01	2.048

---- Non-Identified Nuclides ----

Nuclide	Key-Line Activity (PCI/SAMPLE)	K.L. Ided	Act error	MDA (PCI/SAMPLE)	MDA error	Act/MDA
RA-228	-1.947E+00		1.053E+01	1.819E+01	2.423E+00	-0.107
PA-231	5.485E+01	+	2.709E+01	3.496E+01	4.401E+00	1.569

Spectrum : DISK:[RADCHEM.SCUSR.ARCHIVE]SMP_96E04517MD_GAMMA6_PMP_9191.CNF;2
Title : 96E-0640-04
Sample Title: G9699015

Start Time: 10-OCT-1996 13:23	Sample Time: 19-SEP-1996 12:00	Energy Offset: -1.98761E-01
Real Time : 0 04:00:03.26	Sample ID : 96E04517MD	Energy Slope : 4.88802E-01
Live Time : 0 04:00:00.00	Sample Type: FILTER	Energy Quad : -1.24008E-07



Gamma Spectroscopy Report generated 11-OCT-1996 14:05

8019

Configuration: DISK:[RADCHEM.SCUSR.ARCHIVE]SMP_96E04517MD_GAMMA6_PMP_9191.CNF;2
Analyses by : PEAK V16.5 PEAKEFF V2.2

---- Sample Information ----

Sample Title : G969901S
Sample ID : 96E04517MD
Sample Type : FILTER
Sample Quantity : 1.00000E+00 SAMPLE
Sample Geometry : PMP

---- Sample Decay/Count Information ----

Sample Date : 19-SEP-1996 12:00
Elapsed live time: 0 04:00
Decay time : 21 01:23
Acquisition date : 10-OCT-1996 13:23
Elapsed real time: 0 04:00 0.0%

---- Detector Parameters ----

Energy cal. time : 8-OCT-1996 12:40:
Detector name : GAMMA6
Effic. cal. time : 19-SEP-1996 15:11
Counting geometry: PMP

---- Processing Parameters ----

Cali. Slope	: 4.88802E-01	Cali. Offset	: -1.98761E-01
Cali. Quadratic	: -1.24008E-07	FWHM Offset	: 6.37077E-01
FWHM Slope	: 3.32083E-02	MDA Width (FWHM)	: 3.0
Start channel	: 1	End channel	: 4096
Sensitivity	: 5.0	Gaussian Sens.	: 10.0
Energy tolerance	: 2.0	Half life ratio	: 8.0
Abundance limit	: 75.0	WTM error limit	: 3.0
Activity Units	: PCI	Act. Conversion	: 1.00000E+06
MDA Confid Level	: 5.0	Sigma Number	: 2
Errors propagated	: Yes	Systematic Error	: 0.0%

	It	Energy	Area	Bkgnd	FWHM	Channel	%Eff	Cts/Sec	%Err	Fit
1	0	10.49	341	2652	1.04	21.86	9.72E-01	2.37E-02	23.5	
2	0	12.92	332	2433	1.12	26.83	1.53E+00	2.31E-02	24.3	
3	0	16.16	565	2112	1.28	33.46	2.32E+00	3.92E-02	14.3	
4	0	46.06	294	583	1.01	94.65	6.81E+00	2.04E-02	17.0	
5	0	63.11	434	620	1.07	129.52	7.43E+00	3.02E-02	12.1	
6	0	76.79	83	285	1.17	157.51	7.49E+00	5.77E-03	33.8	
7	0	84.11	88	319	0.79	172.49	7.44E+00	6.10E-03	35.4	
8	0	92.59	665	467	1.00	189.85	7.34E+00	4.62E-02	7.2	
9	0	143.81	59	302	0.82	294.64	6.34E+00	4.13E-03	54.5	
10	0	185.71	306	258	1.07	380.36	5.52E+00	2.12E-02	11.0	
11	0	197.96	94	311	1.63	405.45	5.31E+00	6.54E-03	36.5	
12	0	238.57	134	203	1.18	488.54	4.68E+00	9.27E-03	21.1	
13	0	295.17	50	149	1.28	604.36	4.00E+00	3.45E-03	43.1	
14	0	352.46	55	162	0.71	721.62	3.47E+00	3.81E-03	47.0	
15	0	511.02	466	172	2.79	1046.14	2.52E+00	3.24E-02	7.8	
16	0	582.66	63	94	0.93	1192.77	2.25E+00	4.38E-03	33.1	
17	0	1460.23	70	16	1.58	2990.04	1.04E+00	4.84E-03	17.6	

Gamma Spectroscopy Report generated 11-OCT-1996 14:05

8019

Configuration: DISK:[RADCHEM.SCUSR.ARCHIVE]BKG_BCKGND_GAMMA6__9144.CNF;1
Analyses by : PEAK V16.5 PEAKEFF V2.2

---- Sample Information ----

Sample Title :
Sample ID : BCKGND
Sample Type :
Sample Quantity : 1.00000E+00 G
Sample Geometry :

---- Sample Decay/Count Information ----

Sample Date : 4-OCT-1996 00:00:
Elapsed live time: 2 02:00
Decay time : 0 18:21
Acquisition date : 4-OCT-1996 18:21:
Elapsed real time: 2 02:00 0.0%

---- Detector Parameters ----

Energy cal. time : 30-SEP-1996 09:02
Detector name : GAMMA6
Effic. cal. time : 19-SEP-1996 13:34
Counting geometry: TRM1-S3

---- Processing Parameters ----

Cali. Slope	: 4.88539E-01	Cali. Offset	: -1.23202E-01
Cali. Quadratic	: -8.96482E-08	FWHM Offset	: 6.63864E-01
FWHM Slope	: 3.08694E-02	MDA Width (FWHM)	: 3.0
Start channel	: 1	End channel	: 4096
Sensitivity	: 5.0	Gaussian Sens.	: 10.0
Energy tolerance	: 2.0	Half life ratio	: 8.0
Abundance limit	: 75.0	WTM error limit	: 3.0
Activity Units	: pCi	Act. Conversion	: 1.00000E+06
MDA Confid Level	: 5.0	Sigma Number	: 1
Errors propagated	: Yes	Systematic Error	: 9.0%

	It	Energy	Area	Bkgnd	FWHM	Channel	%Eff	Cts/Sec	%Err	Fit
1	0	10.31	4650	23581	0.99	21.37	1.07E+05	2.58E-02	5.4	
2	4	13.10	3782	8752	0.88	27.07	1.83E+03	2.10E-02	3.5	6.65E-01
3	4	16.24	5522	14567	1.15	33.50	1.52E+02	3.07E-02	4.1	
4	0	19.50	1635	8409	1.62	40.16	3.62E+01	9.08E-03	9.3	
5	0	25.54	312	5600	0.86	52.53	1.02E+01	1.73E-03	38.6	
6	0	46.59	2743	4367	1.01	95.62	5.24E+00	1.52E-02	4.7	
7	0	53.57	608	4119	1.10	109.90	5.52E+00	3.38E-03	18.7	
8	0	63.33	5851	4242	0.89	129.88	6.06E+00	3.25E-02	2.3	
9	0	66.27	434	3647	1.07	135.89	6.23E+00	2.41E-03	23.6	
10	0	74.71	387	3737	0.90	153.19	6.70E+00	2.15E-03	25.5	
11	0	77.10	716	3235	0.91	158.08	6.82E+00	3.98E-03	13.2	
12	0	84.07	939	4528	1.17	172.34	7.15E+00	5.22E-03	13.3	
13	0	87.11	255	3002	1.06	178.56	7.28E+00	1.42E-03	34.5	
14	0	92.68	8662	4490	1.15	189.96	7.48E+00	4.81E-02	1.8	
15	0	98.45	403	3128	0.67	201.79	7.65E+00	2.24E-03	23.5	
16	7	110.09	994	5123	1.93	225.60	7.87E+00	5.52E-03	14.9	2.35E+00
17	7	112.93	511	3026	1.14	231.42	7.90E+00	2.84E-03	18.5	
18	0	139.98	660	3279	1.12	286.79	7.85E+00	3.67E-03	15.5	
19	0	143.85	766	3282	0.98	294.73	7.80E+00	4.26E-03	13.4	
20	0	163.53	543	3010	1.01	335.01	7.47E+00	3.01E-03	18.1	
21	0	185.82	3757	3802	1.11	380.64	6.98E+00	2.09E-02	3.5	
22	0	197.88	1519	4349	2.03	405.32	6.69E+00	8.44E-03	9.1	
23	0	205.27	364	2837	1.41	420.45	6.51E+00	2.02E-03	25.9	
24	0	238.51	1425	3059	1.17	488.51	5.74E+00	7.92E-03	7.4	

Sample ID : BCKGND Acquisition date : 4-OCT-1996 18:21:18

8019

Pk	It	Energy	Area	Bkgnd	FWHM	Channel	%Eff	Cts/Sec	%Err	Fit
[illegible]	0	295.60	150	1965	1.35	605.39	4.61E+00	8.34E-04	51.9	
[illegible]	0	351.85	396	1610	1.25	720.55	3.78E+00	2.20E-03	18.2	
27	0	510.92	5903	2795	2.42	1046.27	2.47E+00	3.28E-02	2.5	
28	0	569.76	296	1426	1.68	1166.76	2.20E+00	1.65E-03	25.4	
29	0	583.21	431	1428	1.46	1194.29	2.15E+00	2.39E-03	17.7	
30	0	609.11	415	1634	1.39	1247.34	2.06E+00	2.31E-03	18.9	
31	0	669.74	157	876	1.62	1371.50	1.88E+00	8.74E-04	34.9	
32	10	694.29	708	1889	3.83	1421.77	1.83E+00	3.93E-03	15.0	3.99E+00
33	10	701.21	457	2536	3.84	1435.95	1.81E+00	2.54E-03	29.9	
34	0	802.85	425	888	1.34	1644.13	1.63E+00	2.36E-03	14.4	
35	0	1000.76	326	643	1.90	2049.50	1.42E+00	1.81E-03	16.1	
36	0	1063.81	136	560	1.77	2178.65	1.38E+00	7.53E-04	33.9	
37	0	1460.33	407	435	1.84	2991.07	1.22E+00	2.26E-03	12.2	
38	0	1764.08	137	242	1.92	3613.58	1.14E+00	7.60E-04	24.3	

Gamma Spectroscopy Report generated 11-OCT-1996 14:05

8019

Configuration: DISK:[RADCHEM.SCUSR.ARCHIVE]SMP_96E04517MD_GAMMA6_PMP_9191.CNF;2
Analyses by : PEAK V16.5 ENBACK V1.5

---- Sample Information ----

Sample Title : G969901S
Sample ID : 96E04517MD Sample Quantity : 1.00000E+00 SAMPLE
Sample Type : FILTER Sample Geometry : PMP

---- Sample Decay/Count Information ----

Sample Date : 19-SEP-1996 12:00 Acquisition date : 10-OCT-1996 13:23
Elapsed live time: 0 04:00 Elapsed real time: 0 04:00 0.0%
Decay time : 21 01:23

---- Detector Parameters ----

Energy cal. time : 8-OCT-1996 12:40:
Detector name : GAMMA6 Counting geometry: PMP
Effic. cal. time : 19-SEP-1996 15:11

---- Processing Parameters ----

Cali. Slope	: 4.88802E-01	Cali. Offset	: -1.98761E-01
Cali. Quadratic	: -1.24008E-07	FWHM Offset	: 6.37077E-01
FWHM Slope	: 3.32083E-02	MDA Width (FWHM)	: 3.0
Start channel	: 1	End channel	: 4096
Sensitivity	: 5.0	Gaussian Sens.	: 10.0
Energy tolerance	: 2.0	Half life ratio	: 8.0
Abundance limit	: 75.0	WTM error limit	: 3.0
Activity Units	: PCI	Act. Conversion	: 1.00000E+06
MDA Confid Level	: 5.0	Sigma Number	: 2
Errors propagated	: Yes	Systematic Error	: 0.0%

	It	Energy	Area	Bkgnd	FWHM	Channel	Left	Pw	Cts/Sec	%Err	Fit
1	0	12.92*	30	2433	1.12	26.83	25	6	2.07E-03	273.5	
2	0	16.16*	123	2112	1.28	33.46	30	7	8.54E-03	67.1	
3	0	46.06*	74	583	1.01	94.65	90	11	5.15E-03	68.7	
4	0	76.79*	26	285	1.17	157.51	156	6	1.80E-03	112.5	
5	0	84.11*	13	319	0.79	172.49	169	7	8.80E-04	258.0	
6	0	185.71*	5	258	1.07	380.36	376	9	3.76E-04	653.9	
7	0	238.57*	19	203	1.18	488.54	484	9	1.35E-03	150.8	
8	0	295.17*	38	149	1.28	604.36	601	7	2.62E-03	59.2	
9	0	352.46*	23	162	0.71	721.62	715	11	1.60E-03	114.3	
10	0	582.66*	29	94	0.93	1192.77	1187	12	1.98E-03	76.1	
11	0	1460.23*	37	16	1.58	2990.04	2981	16	2.57E-03	34.7	

Flag: "*" = Peak area was modified by background subtraction

Gamma Spectroscopy Report generated 11-OCT-1996 14:05

8019

Configuration: DISK:[RADCHEM.SCUSR.ARCHIVE]SMP_96E04517MD_GAMMA6_PMP_9191.CNF;2
Analyses by : PEAK V16.5 ENBACK V1.5 PEAKEFF V2.2 NID V3.1

---- Sample Information ----

Sample Title	: G969901S		
Sample ID	: 96E04517MD	Sample Quantity	: 1.00000E+00 SAMPLE
Sample Type	: FILTER	Sample Geometry	: PMP

---- Sample Decay/Count Information ----

Sample Date	: 19-SEP-1996 12:00	Acquisition date	: 10-OCT-1996 13:23
Elapsed live time	: 0 04:00	Elapsed real time	: 0 04:00 0.0%
Decay time	: 21 01:23		

---- Detector Parameters ----

Energy cal. time	: 8-OCT-1996 12:40:		
Detector name	: GAMMA6	Counting geometry	: PMP
Effic. cal. time	: 19-SEP-1996 15:11		

---- Processing Parameters ----

Cali. Slope	: 4.88802E-01	Cali. Offset	: -1.98761E-01
Cali. Quadratic	: -1.24008E-07	FWHM Offset	: 6.37077E-01
FWHM Slope	: 3.32083E-02	MDA Width (FWHM)	: 3.0
Start channel	: 1	End channel	: 4096
Sensitivity	: 5.0	Gaussian Sens.	: 10.0
Energy tolerance	: 2.0	Half life ratio	: 8.0
Abundance limit	: 75.0	WTM error limit	: 3.0
Activity Units	: PCI	Act. Conversion	: 1.00000E+06
MDA Confid Level	: 5.0	Sigma Number	: 2
Errors propagated	: Yes	Systematic Error	: 0.0%

Post-NID Peak Search Report

It	Energy	Area	Bkgnd	FWHM	Channel	Left	Pw %Err	Fit	Nuclides
0	12.92*	30	2433	1.12	26.83	25	6547.0		
0	16.16*	123	2112	1.28	33.46	30	7134.2		
0	46.06*	74	583	1.01	94.65	90	11137.5		
0	76.79*	26	285	1.17	157.51	156	6224.9		
0	84.11*	13	319	0.79	172.49	169	7515.9		
0	185.71*	5	258	1.07	380.36	376	9*****		RA-226
0	238.57*	19	203	1.18	488.54	484	9301.6		
0	295.17*	38	149	1.28	604.36	601	7118.5		
0	352.46*	23	162	0.71	721.62	715	11228.6		
0	582.66*	29	94	0.93	1192.77	1187	12152.3		
0	1460.23*	37	16	1.58	2990.04	2981	16 69.5		

Gamma Spectroscopy Report generated 11-OCT-1996 14:05 **8019**

Configuration: DISK:[RADCHEM.SCUSR.ARCHIVE]SMP_96E04517MD_GAMMA6_PMP_9191.CNF;2
Analyses by : PEAK V16.5 ENBACK V1.5 PEAKEFF V2.2 NID V3.1

---- Sample Information ----

Sample Title	: G969901S		
Sample ID	: 96E04517MD	Sample Quantity	: 1.00000E+00 SAMPLE
Sample Type	: FILTER	Sample Geometry	: PMP

---- Sample Decay/Count Information ----

Sample Date	: 19-SEP-1996 12:00	Acquisition date	: 10-OCT-1996 13:23
Elapsed live time	: 0 04:00	Elapsed real time	: 0 04:00 0.0%
Decay time	: 21 01:23		

---- Detector Parameters ----

Energy cal. time	: 8-OCT-1996 12:40:		
Detector name	: GAMMA6	Counting geometry	: PMP
Effic. cal. time	: 19-SEP-1996 15:11		

---- Processing Parameters ----

Cali. Slope	: 4.88802E-01	Cali. Offset	: -1.98761E-01
Cali. Quadratic	: -1.24008E-07	FWHM Offset	: 6.37077E-01
FWHM Slope	: 3.32083E-02	MDA Width (FWHM)	: 3.0
Start channel	: 1	End channel	: 4096
Sensitivity	: 5.0	Gaussian Sens.	: 10.0
Energy tolerance	: 2.0	Half life ratio	: 8.0
Abundance limit	: 75.0	WTM error limit	: 3.0
Activity Units	: PCI	Act. Conversion	: 1.00000E+06
MDA Confid Level	: 5.0	Sigma Number	: 2
Errors propagated	: Yes	Systematic Error	: 0.0%

Interference Report

No interference correction performed

Sample ID : 96E04517MD Acquisition date : 10-OCT-1996 13:23:48

8019

Nuclide	Half-life	Half-Life Ratio	Energy	%Abund	Activity	2-Sigma %Error	Rejected by
PA-231	3.28E+04Y	0.00	50.10	31.70	--- Not Found ---		Abun.
			100.00	1.11	--- Not Found ---		
			122.31	1.19	--- Not Found ---		
			144.24	3.24	--- Not Found ---		
			154.21	5.58	--- Not Found ---		
			205.00	1.08	--- Not Found ---		
			210.60	1.26	--- Not Found ---		
			234.90	2.80	--- Not Found ---		
			236.00	11.50	--- Not Found ---		
			256.20	6.30	--- Not Found ---		
			269.46	13.60	--- Not Found ---		
			271.23	10.60	--- Not Found ---		
			283.67	1.60	--- Not Found ---		
			286.10	1.60	--- Not Found ---		
			300.08	2.30	--- Not Found ---		
			304.40	1.35	--- Not Found ---		
			323.87	3.88	--- Not Found ---		
			330.00	1.30	--- Not Found ---		
			334.20	1.15	--- Not Found ---		
			338.28	2.73	--- Not Found ---		
			351.07*	12.94	9.658E-06	228.95	
			401.81	6.50	--- Not Found ---		
			404.84	2.90	--- Not Found ---		
			427.08	1.30	--- Not Found ---		
			445.03	1.18	--- Not Found ---		
			569.67	0.54	--- Not Found ---		
			831.96	2.90	--- Not Found ---		
			897.83	0.24	--- Not Found ---		
			897.83	0.52	--- Not Found ---		
		% Abundances Found =		9.59			
U-235	7.04E+08Y	0.00	143.76	10.50	--- Not Found ---		Abun.
			163.35	4.70	--- Not Found ---		
			185.71*	54.00	3.404E-07	1307.78	
			205.31	4.70	--- Not Found ---		
		% Abundances Found =		73.07			

Flag: "*" = Keyline

000270

Sample ID : 96E04517MD
Acquisition date : 10-OCT-1996 13:23:48

8019

Nuclide Type: Natural

Nuclide	Energy	Area	%Abn	%Eff	Uncorrected PCI/SAMPLE	Decay Corr PCI/SAMPLE	2-Sigma %Error
RA-226	186.21	5	3.28*	5.522E+00	5.605E+00	5.605E+00	1307.77

Flag: "*" = Keyline

Gamma Spectroscopy Report generated 11-OCT-1996 14:05

Configuration: DISK:[RADCHEM.SCUSR.ARCHIVE]SMP_96E04517MD_GAMMA6_PMP_9191.CNF;2
Analyses by : PEAK V16.5 ENBACK V1.5 PEAKEFF V2.2 NID V3.1 MINACT V2.5

8019

---- Sample Information ----

Sample Title : G969901S
Sample ID : 96E04517MD
Sample Type : FILTER
Sample Quantity : 1.00000E+00 SAMPLE
Sample Geometry : PMP

---- Sample Decay/Count Information ----

Sample Date : 19-SEP-1996 12:00
Acquisition date : 10-OCT-1996 13:23
Elapsed live time: 0 04:00
Elapsed real time: 0 04:00 0.0%
Decay time : 21 01:23

---- Detector Parameters ----

Energy cal. time : 8-OCT-1996 12:40:
Detector name : GAMMA6
Counting geometry: PMP
Effic. cal. time : 19-SEP-1996 15:11

---- Processing Parameters ----

Cali. Slope	: 4.88802E-01	Cali. Offset	: -1.98761E-01
Cali. Quadratic	: -1.24008E-07	FWHM Offset	: 6.37077E-01
FWHM Slope	: 3.32083E-02	MDA Width (FWHM)	: 3.0
Start channel	: 1	End channel	: 4096
Sensitivity	: 5.0	Gaussian Sens.	: 10.0
Energy tolerance	: 2.0	Half life ratio	: 8.0
Abundance limit	: 75.0	WTM error limit	: 3.0
Activity Units	: PCI	Act. Conversion	: 1.00000E+06
MDA Confid Level	: 5.0	Sigma Number	: 2
Errors propagated	: Yes	Systematic Error	: 0.0%

Combined Activity-MDA Report

---- Identified Nuclides ----

Nuclide	Activity (PCI/SAMPLE)	Act error	MDA (PCI/SAMPLE)	MDA error	Act/MDA
RA-226	5.605E+00	7.330E+01	7.798E+01	9.354E+00	0.072

---- Non-Identified Nuclides ----

Nuclide	Key-Line Activity (PCI/SAMPLE)	K.L. Ided	Act error	MDA (PCI/SAMPLE)	MDA error	Act/MDA
RA-228	-1.405E+00		1.002E+01	1.744E+01	2.323E+00	-0.081
PA-231	9.658E+00	+	2.211E+01	2.553E+01	3.214E+00	0.378
U-235	3.404E-01	+	4.452E+00	6.714E+00	8.335E-01	0.051

Gamma Spectroscopy Report generated 11-OCT-1996 14:06

8019

Configuration: DISK:[RADCHEM.SCUSR.ARCHIVE]SMP_96E04517MD_GAMMA6_PMP_9191.CNF;2
Analyses by : PEAK V16.5 ENBACK V1.5 PEAKEFF V2.2 NID V3.1 MINACT V2.5

---- Sample Information ----

Sample Title	: G969901S		
Sample ID	: 96E04517MD	Sample Quantity	: 1.00000E+00 SAMPLE
Sample Type	: FILTER	Sample Geometry	: PMP

---- Sample Decay/Count Information ----

Sample Date	: 19-SEP-1996 12:00	Acquisition date	: 10-OCT-1996 13:23
Elapsed live time	: 0 04:00	Elapsed real time	: 0 04:00 0.0%
Decay time	: 21 01:23		

---- Detector Parameters ----

Energy cal. time	: 8-OCT-1996 12:40:		
Detector name	: GAMMA6	Counting geometry	: PMP
Effic. cal. time	: 19-SEP-1996 15:11		

---- Processing Parameters ----

Cali. Slope	: 4.88802E-01	Cali. Offset	: -1.98761E-01
Cali. Quadratic	: -1.24008E-07	FWHM Offset	: 6.37077E-01
FWHM Slope	: 3.32083E-02	MDA Width (FWHM)	: 3.0
Start channel	: 1	End channel	: 4096
Sensitivity	: 5.0	Gaussian Sens.	: 10.0
Energy tolerance	: 2.0	Half life ratio	: 8.0
Abundance limit	: 75.0	WTM error limit	: 3.0
Activity Units	: PCI	Act. Conversion	: 1.00000E+06
MDA Confid Level	: 5.0	Sigma Number	: 2
Errors propagated	: Yes	Systematic Error	: 9.0%

Combined Activity-MDA Report

---- Identified Nuclides ----

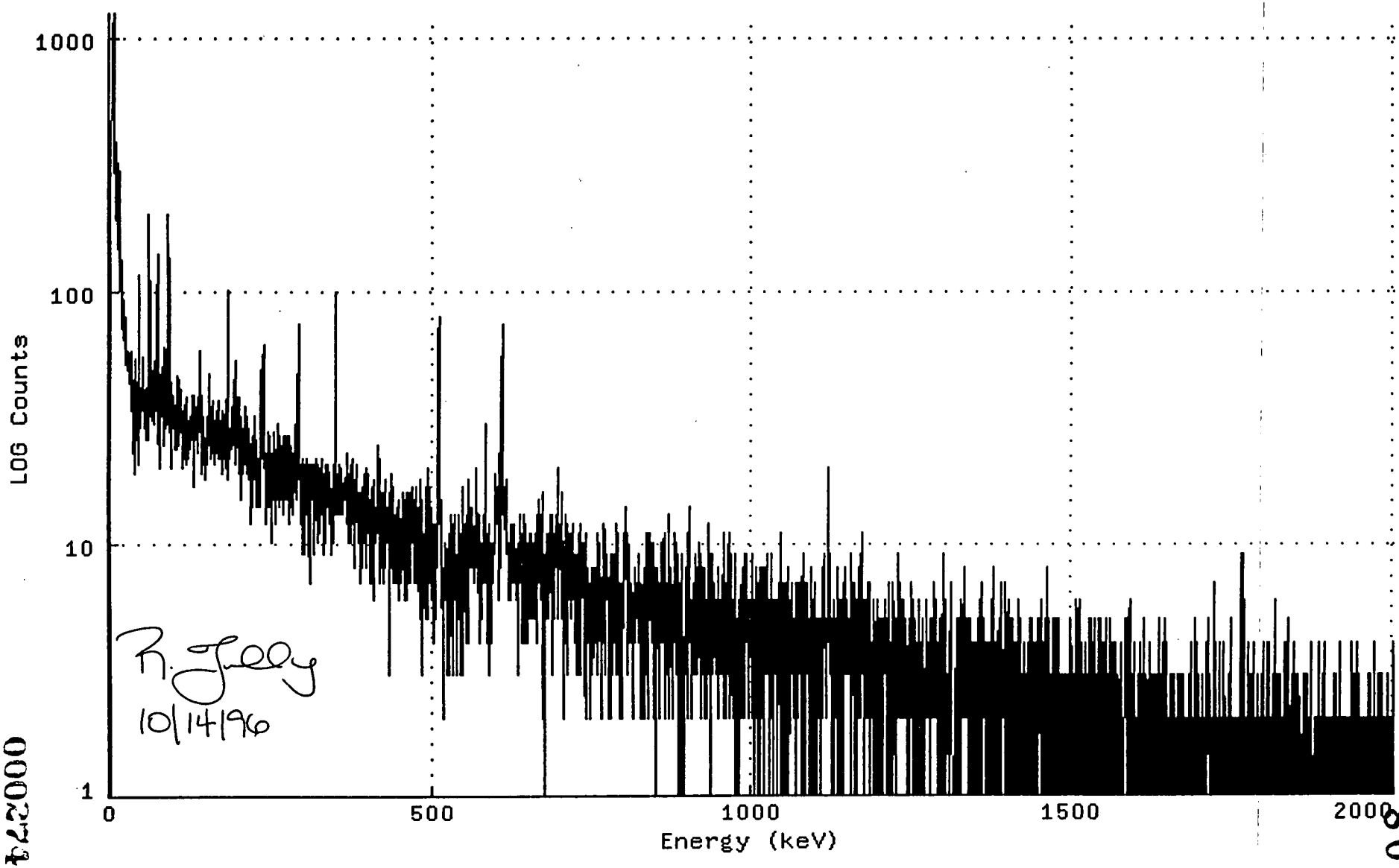
Nuclide	Activity (PCI/SAMPLE)	Act error	MDA (PCI/SAMPLE)	MDA error	Act/MDA
RA-226	5.605E+00	7.330E+01	7.798E+01	9.354E+00	0.072

---- Non-Identified Nuclides ----

Nuclide	Key-Line Activity (PCI/SAMPLE)	K.L. Ided	Act error	MDA (PCI/SAMPLE)	MDA error	Act/MDA
RA-228	-1.405E+00		1.002E+01	1.744E+01	2.323E+00	-0.081
PA-231	9.658E+00	+	2.218E+01	2.553E+01	3.214E+00	0.378
U-235	3.404E-01	+	4.452E+00	6.714E+00	8.335E-01	0.051

R. Jolly
10/14/96

Spectrum : DISK:[RADCHEM.SCUSR.ARCHIVE]SMP_96E04514_GAMMA5_PMP_9186.CNF;2
Title : 96E-0640-04
Sample Title: G969901S
Start Time: 10-OCT-1996 09:06 Sample Time: 19-SEP-1996 12:00 Energy Offset: -5.65841E-01
Real Time : 0 04:00:05.51 Sample ID : 96E04514 Energy Slope : 4.88823E-01
Live Time : 0 04:00:00.00 Sample Type: FILTER Energy Quad : -8.49185E-08



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80 19

115

Gamma Spectroscopy Report generated 11-OCT-1996 13:40

8019

Configuration: DISK:[RADCHEM.SCUSR.ARCHIVE]SMP_96E04514_GAMMA5_PMP_9186.CNF;2
Analyses by : PEAK V16.5 PEAKEFF V2.2

---- Sample Information ----

Sample Title : G969901S
Sample ID : 96E04514 Sample Quantity : 1.00000E+00 SAMPLE
Sample Type : FILTER Sample Geometry : PMP

---- Sample Decay/Count Information ----

Sample Date : 19-SEP-1996 12:00 Acquisition date : 10-OCT-1996 09:06
Elapsed live time: 0 04:00 Elapsed real time: 0 04:00 0.0%
Decay time : 20 21:06

---- Detector Parameters ----

Energy cal. time : 8-OCT-1996 12:40:
Detector name : GAMMA5 Counting geometry: PMP
Effic. cal. time : 19-SEP-1996 14:21

---- Processing Parameters ----

Cali. Slope : 4.88823E-01 Cali. Offset : -5.65841E-01
Cali. Quadratic : -8.49185E-08 FWHM Offset : 4.15386E-01
FWHM Slope : 4.45150E-02 MDA Width (FWHM) : 3.0
Start channel : 1 End channel : 4096
Sensitivity : 5.0 Gaussian Sens. : 10.0
Energy tolerance : 2.0 Half life ratio : 8.0
Abundance limit : 75.0 WTM error limit : 3.0
Activity Units : PCI Act. Conversion : 1.00000E+06
MDA Confid Level : 5.0 Sigma Number : 2
Errors propagated: Yes Systematic Error : 0.0%

	It	Energy	Area	Bkgnd	FWHM	Channel	%Eff	Cts/Sec	%Err	Fit
1	0	7.86	2074	2952	1.28	17.25	8.98E+00	1.44E-01	4.9	
2	0	13.14	319	1071	0.90	28.03	9.67E+00	2.21E-02	17.3	
3	0	16.28	481	960	1.24	34.46	9.78E+00	3.34E-02	11.7	
4	0	46.35	219	203	1.01	95.98	8.79E+00	1.52E-02	13.2	
5	0	63.29	301	228	0.88	130.64	8.08E+00	2.09E-02	10.1	
6	1	74.75	139	166	0.88	154.09	7.65E+00	9.68E-03	16.3	3.13E+00
7	1	77.16	208	143	0.84	159.02	7.57E+00	1.44E-02	11.3	
8	0	92.78	370	340	1.02	190.96	7.06E+00	2.57E-02	10.7	
9	0	185.76	216	220	1.08	381.19	5.03E+00	1.50E-02	14.6	
10	0	199.09	93	469	1.75	408.47	4.83E+00	6.47E-03	54.2	
11	4	238.47	97	189	1.61	489.05	4.32E+00	6.74E-03	28.4	2.21E+00
12	4	242.18	128	181	1.62	496.63	4.28E+00	8.87E-03	21.7	
13	0	295.12	144	220	0.98	604.95	3.75E+00	1.00E-02	22.1	
14	0	352.17	192	172	1.04	721.70	3.31E+00	1.34E-02	15.4	
15	0	511.60	445	152	2.71	1047.95	2.47E+00	3.09E-02	9.0	
16	0	583.70	73	93	0.87	1195.51	2.21E+00	5.10E-03	30.4	
17	0	609.47	190	152	1.35	1248.25	2.13E+00	1.32E-02	14.8	
18	0	1120.46	53	37	1.03	2294.23	1.20E+00	3.69E-03	26.5	
19	0	1764.83	31	20	2.23	3613.79	7.37E-01	2.12E-03	34.9	

Gamma Spectroscopy Report generated 11-OCT-1996 13:40 **8019**

Configuration: DISK:[RADCHEM.SCUSR.ARCHIVE]BKG_BCKGND_GAMMA5__9143.CNF;1
Analyses by : PEAK V16.5 PEAKEFF V2.2

---- Sample Information ----

Sample Title :
Sample ID : BCKGND
Sample Type :
Sample Quantity : 1.00000E+00 G
Sample Geometry :

---- Sample Decay/Count Information ----

Sample Date : 4-OCT-1996 00:00:
Elapsed live time: 2 02:00
Decay time : 0 18:20
Acquisition date : 4-OCT-1996 18:20:
Elapsed real time: 2 02:01 0.0%

---- Detector Parameters ----

Energy cal. time : 30-SEP-1996 09:01
Detector name : GAMMA5
Effic. cal. time : 19-SEP-1996 11:45
Counting geometry: TRM1-S3

---- Processing Parameters ----

Cali. Slope	: 4.88756E-01	Cali. Offset	: -5.37244E-01
Cali. Quadratic	: -7.07146E-08	FWHM Offset	: 5.94642E-01
FWHM Slope	: 3.39310E-02	MDA Width (FWHM)	: 3.0
Start channel	: 1	End channel	: 4096
Sensitivity	: 5.0	Gaussian Sens.	: 10.0
Energy tolerance	: 2.0	Half life ratio	: 8.0
Abundance limit	: 75.0	WTM error limit	: 3.0
Activity Units	: pCi	Act. Conversion	: 1.00000E+06
MDA Confid Level	: 5.0	Sigma Number	: 1
Errors propagated	: Yes	Systematic Error	: 9.0%

	It	Energy	Area	Bkgnd	FWHM	Channel	%Eff	Cts/Sec	%Err	Fit
1	0	7.76	24064	42790	1.54	16.98	6.55E+06	1.34E-01	1.5	
2	0	10.38	4115	15170	0.84	22.34	1.32E+04	2.29E-02	4.8	
3	0	13.03	4183	13266	0.86	27.77	5.13E+02	2.32E-02	4.7	
4	0	16.22	6461	11688	1.08	34.29	6.28E+01	3.59E-02	3.1	
5	0	19.25	1233	6158	0.89	40.48	2.09E+01	6.85E-03	10.0	
6	0	23.34	285	5186	1.44	48.85	9.40E+00	1.58E-03	40.4	
7	0	26.04	437	4406	1.08	54.38	7.03E+00	2.43E-03	24.7	
8	0	46.55	1927	3150	0.94	96.35	4.94E+00	1.07E-02	5.5	
9	0	53.64	405	3070	0.98	110.85	5.29E+00	2.25E-03	24.2	
10	4	63.34	3752	1877	0.81	130.70	5.86E+00	2.08E-02	2.4	1.10E+00
11	4	66.28	535	2846	1.28	136.72	6.02E+00	2.97E-03	18.1	
12	0	69.74	385	3435	1.87	143.79	6.21E+00	2.14E-03	26.7	
13	0	74.19	134	3061	0.84	152.90	6.44E+00	7.44E-04	65.8	
14	0	77.07	495	2625	0.94	158.79	6.57E+00	2.75E-03	17.0	
15	0	84.43	698	3059	1.37	173.85	6.87E+00	3.88E-03	14.2	
16	0	87.20	283	2253	0.85	179.52	6.97E+00	1.57E-03	27.2	
17	0	92.67	4997	3152	1.09	190.71	7.12E+00	2.78E-02	2.4	
18	0	98.25	195	2385	0.93	202.14	7.25E+00	1.09E-03	42.0	
19	0	109.75	354	2985	0.75	225.66	7.39E+00	1.97E-03	27.2	
20	0	112.82	230	1804	0.95	231.93	7.40E+00	1.28E-03	28.5	
21	0	139.81	682	3118	1.12	287.16	7.22E+00	3.79E-03	15.8	
22	0	143.66	424	2282	1.06	295.05	7.16E+00	2.35E-03	19.3	
23	0	185.85	2020	3123	1.02	381.36	6.27E+00	1.12E-02	5.6	
24	4	197.16	456	1487	0.89	404.51	6.00E+00	2.53E-03	13.8	4.49E-01

Sample ID : BCKGND Acquisition date : 4-OCT-1996 18:20:18

8019

Pk	It	Energy	Area	Bkgnd	FWHM	Channel	%Eff	Cts/Sec	%Err	Fit
[illegible]	4	198.38	665	1790	1.04	407.00	5.98E+00	3.69E-03	11.2	
[illegible]	0	205.33	188	1689	0.96	421.24	5.81E+00	1.04E-03	35.4	
27	0	238.76	908	2089	1.08	489.64	5.07E+00	5.05E-03	9.3	
28	0	295.36	179	1472	1.03	605.47	4.05E+00	9.94E-04	36.3	
29	0	352.05	298	1202	1.06	721.47	3.31E+00	1.65E-03	20.2	
30	0	511.06	4724	2215	2.53	1046.88	2.15E+00	2.62E-02	2.7	
31	0	569.99	434	1409	1.55	1167.50	1.91E+00	2.41E-03	18.5	
32	0	583.39	294	1218	1.25	1194.92	1.87E+00	1.64E-03	23.7	
33	0	609.48	299	1186	1.30	1248.33	1.79E+00	1.66E-03	21.5	
34	0	669.54	124	741	1.38	1371.25	1.64E+00	6.91E-04	40.4	
35	4	693.56	349	1136	2.18	1420.41	1.58E+00	1.94E-03	21.4	3.27E+00
36	4	696.97	189	993	1.80	1427.39	1.58E+00	1.05E-03	34.4	
37	4	702.45	192	1226	2.19	1438.62	1.57E+00	1.07E-03	38.5	
38	0	803.05	377	759	1.66	1644.53	1.41E+00	2.09E-03	15.0	
39	0	962.14	241	859	2.17	1970.22	1.25E+00	1.34E-03	28.6	
40	0	1120.02	105	385	1.77	2293.42	1.15E+00	5.83E-04	35.1	
41	0	1331.87	136	353	2.38	2727.21	1.06E+00	7.54E-04	28.1	
42	0	1460.47	320	376	1.75	2990.52	1.02E+00	1.78E-03	14.0	
43	0	1764.72	128	183	2.41	3613.62	9.27E-01	7.11E-04	23.0	

Gamma Spectroscopy Report generated 11-OCT-1996 13:40 **8019**

Configuration: DISK:[RADCHEM.SCUSR.ARCHIVE]SMP_96E04514_GAMMA5_PMP_9186.CNF;2
Analyses by : PEAK V16.5 ENBACK V1.5

---- Sample Information ----

Sample Title : G969901S
Sample ID : 96E04514 Sample Quantity : 1.00000E+00 SAMPLE
Sample Type : FILTER Sample Geometry : PMP

---- Sample Decay/Count Information ----

Sample Date : 19-SEP-1996 12:00 Acquisition date : 10-OCT-1996 09:06
Elapsed live time: 0 04:00 Elapsed real time: 0 04:00 0.0%
Decay time : 20 21:06

---- Detector Parameters ----

Energy cal. time : 8-OCT-1996 12:40:
Detector name : GAMMA5 Counting geometry: PMP
Effic. cal. time : 19-SEP-1996 14:21

---- Processing Parameters ----

Cali. Slope	: 4.88823E-01	Cali. Offset	: -5.65841E-01
Cali. Quadratic	: -8.49185E-08	FWHM Offset	: 4.15386E-01
FWHM Slope	: 4.45150E-02	MDA Width (FWHM)	: 3.0
Start channel	: 1	End channel	: 4096
Sensitivity	: 5.0	Gaussian Sens.	: 10.0
Energy tolerance	: 2.0	Half life ratio	: 8.0
Abundance limit	: 75.0	WTM error limit	: 3.0
Activity Units	: PCI	Act. Conversion	: 1.00000E+06
MDA Confid Level	: 5.0	Sigma Number	: 2
Errors propagated	: Yes	Systematic Error	: 0.0%

	It	Energy	Area	Bkgnd	FWHM	Channel	Left	Pw	Cts/Sec	%Err	Fit
1	0	7.86*	149	2952	1.28	17.25	15	6	1.03E-02	70.7	
2	0	46.35*	65	203	1.01	95.98	92	8	4.50E-03	46.4	
3	0	63.29*	1	228	0.88	130.64	127	7	6.67E-05	*****	
4	1	74.75*	129	166	0.88	154.09	149	14	8.94E-03	18.5	3.13E+00
5	1	77.16*	168	143	0.84	159.02	149	14	1.17E-02	14.5	
6	0	185.76*	54	220	1.08	381.19	376	10	3.76E-03	60.4	
7	0	199.09*	40	469	1.75	408.47	401	17	2.77E-03	127.3	
8	4	238.47*	24	189	1.61	489.05	483	21	1.70E-03	116.2	2.21E+00
9	4	242.18	128	181	1.62	496.63	483	21	8.87E-03	21.7	
10	0	295.12*	130	220	0.98	604.95	599	12	9.03E-03	24.9	
11	0	352.17*	168	172	1.04	721.70	716	12	1.17E-02	17.8	
12	0	511.60*	67	152	2.71	1047.95	1040	23	4.65E-03	61.5	
13	0	583.70*	50	93	0.87	1195.51	1188	14	3.46E-03	46.1	
14	0	609.47*	166	152	1.35	1248.25	1244	12	1.15E-02	17.2	
15	0	1120.46*	45	37	1.03	2294.23	2289	12	3.11E-03	32.1	
16	0	1764.83*	20	20	2.23	3613.79	3605	13	1.41E-03	53.8	

Flag: "*" = Peak area was modified by background subtraction

Gamma Spectroscopy Report generated 11-OCT-1996 13:40 **8019**

Configuration: DISK:[RADCHEM.SCUSR.ARCHIVE]SMP_96E04514_GAMMA5_PMP_9186.CNF;2
Analyses by : PEAK V16.5 ENBACK V1.5 PEAKEFF V2.2 NID V3.1

---- Sample Information ----

Sample Title : G969901S
Sample ID : 96E04514 Sample Quantity : 1.00000E+00 SAMPLE
Sample Type : FILTER Sample Geometry : PMP

---- Sample Decay/Count Information ----

Sample Date : 19-SEP-1996 12:00 Acquisition date : 10-OCT-1996 09:06
Elapsed live time: 0 04:00 Elapsed real time: 0 04:00 0.0%
Decay time : 20 21:06

---- Detector Parameters ----

Energy cal. time : 8-OCT-1996 12:40:
Detector name : GAMMA5 Counting geometry: PMP
Effic. cal. time : 19-SEP-1996 14:21

---- Processing Parameters ----

Cali. Slope	: 4.88823E-01	Cali. Offset	: -5.65841E-01
Cali. Quadratic	: -8.49185E-08	FWHM Offset	: 4.15386E-01
FWHM Slope	: 4.45150E-02	MDA Width (FWHM)	: 3.0
Start channel	: 1	End channel	: 4096
Sensitivity	: 5.0	Gaussian Sens.	: 10.0
Energy tolerance	: 2.0	Half life ratio	: 8.0
Abundance limit	: 75.0	WTM error limit	: 3.0
Activity Units	: PCI	Act. Conversion	: 1.00000E+06
MDA Confid Level	: 5.0	Sigma Number	: 2
Errors propagated:	Yes	Systematic Error	: 0.0%

P[illegible]-NID Peak Search Report

It	Energy	Area	Bkgnd	FWHM	Channel	Left	Pw %Err	Fit	Nuclides
0	7.86*	149	2952	1.28	17.25	15	6141.5		
0	46.35*	65	203	1.01	95.98	92	8 92.8		
0	63.29*	1	228	0.88	130.64	127	7*****		
1	74.75*	129	166	0.88	154.09	149	14 37.0	3.13E+00	
1	77.16*	168	143	0.84	159.02	149	14 29.0		
0	185.76*	54	220	1.08	381.19	376	10120.9		RA-226
0	199.09*	40	469	1.75	408.47	401	17254.6		
4	238.47*	24	189	1.61	489.05	483	21232.4	2.21E+00	
4	242.18	128	181	1.62	496.63	483	21 43.4		
0	295.12*	130	220	0.98	604.95	599	12 49.8		
0	352.17*	168	172	1.04	721.70	716	12 35.6		
0	511.60*	67	152	2.71	1047.95	1040	23123.0		
0	583.70*	50	93	0.87	1195.51	1188	14 92.2		
0	609.47*	166	152	1.35	1248.25	1244	12 34.3		
0	1120.46*	45	37	1.03	2294.23	2289	12 64.3		
0	1764.83*	20	20	2.23	3613.79	3605	13107.6		

Gamma Spectroscopy Report generated 11-OCT-1996 13:40 8019

Configuration: DISK:[RADCHEM.SCUSR.ARCHIVE]SMP_96E04514_GAMMA5_PMP_9186.CNF;2
Analyses by : PEAK V16.5 ENBACK V1.5 PEAKEFF V2.2 NID V3.1

---- Sample Information ----

Sample Title	: G969901S		
Sample ID	: 96E04514	Sample Quantity	: 1.00000E+00 SAMPLE
Sample Type	: FILTER	Sample Geometry	: PMP

---- Sample Decay/Count Information ----

Sample Date	: 19-SEP-1996 12:00	Acquisition date	: 10-OCT-1996 09:06
Elapsed live time	: 0 04:00	Elapsed real time	: 0 04:00 0.0%
Decay time	: 20 21:06		

---- Detector Parameters ----

Energy cal. time	: 8-OCT-1996 12:40:		
Detector name	: GAMMA5	Counting geometry	: PMP
Effic. cal. time	: 19-SEP-1996 14:21		

---- Processing Parameters ----

Cali. Slope	: 4.88823E-01	Cali. Offset	: -5.65841E-01
Cali. Quadratic	: -8.49185E-08	FWHM Offset	: 4.15386E-01
FWHM Slope	: 4.45150E-02	MDA Width (FWHM)	: 3.0
Start channel	: 1	End channel	: 4096
Sensitivity	: 5.0	Gaussian Sens.	: 10.0
Energy tolerance	: 2.0	Half life ratio	: 8.0
Abundance limit	: 75.0	WTM error limit	: 3.0
Activity Units	: PCI	Act. Conversion	: 1.00000E+06
MDA Confid Level	: 5.0	Sigma Number	: 2
Errors propagated	: Yes	Systematic Error	: 0.0%

Interference Report

No interference correction performed

Sample ID : 96E04514
Acquisition date : 10-OCT-1996 09:06:11

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Nuclide	Half-life	Half-Life Ratio	Energy	%Abund	Activity	2-Sigma %Error	Rejected by
PA-231	3.28E+04Y	0.00	50.10	31.70	--- Not Found ---		Abun.
			100.00	1.11	--- Not Found ---		
			122.31	1.19	--- Not Found ---		
			144.24	3.24	--- Not Found ---		
			154.21	5.58	--- Not Found ---		
			205.00	1.08	--- Not Found ---		
			210.60	1.26	--- Not Found ---		
			234.90	2.80	--- Not Found ---		
			236.00	11.50	--- Not Found ---		
			256.20	6.30	--- Not Found ---		
			269.46	13.60	--- Not Found ---		
			271.23	10.60	--- Not Found ---		
			283.67	1.60	--- Not Found ---		
			286.10	1.60	--- Not Found ---		
			300.08	2.30	--- Not Found ---		
			304.40	1.35	--- Not Found ---		
			323.87	3.88	--- Not Found ---		
			330.00	1.30	--- Not Found ---		
			334.20	1.15	--- Not Found ---		
			338.28	2.73	--- Not Found ---		
			351.07*	12.94	7.382E-05	39.21	
			401.81	6.50	--- Not Found ---		
			404.84	2.90	--- Not Found ---		
			427.08	1.30	--- Not Found ---		
			445.03	1.18	--- Not Found ---		
			569.67	0.54	--- Not Found ---		
			831.96	2.90	--- Not Found ---		
			897.83	0.24	--- Not Found ---		
			897.83	0.52	--- Not Found ---		
		% Abundances Found =		9.59			
U-235	7.04E+08Y	0.00	143.76	10.50	--- Not Found ---		Abun.
			163.35	4.70	--- Not Found ---		
			185.71*	54.00	3.741E-06	122.31	
			205.31	4.70	--- Not Found ---		
		% Abundances Found =		73.07			

Flag: "*" = Keyline

8019

Nuclide Type: Natural

Nuclide	Energy	Area	%Abn	%Eff	Uncorrected PCI/SAMPLE	Decay Corr PCI/SAMPLE	2-Sigma %Error
RA-226	186.21	54	3.28*	5.027E+00	6.159E+01	6.159E+01	122.27

Flag: "*" = Keyline

Gamma Spectroscopy Report generated 11-OCT-1996 13:40 **8019**

Configuration: DISK:[RADCHEM.SCUSR.ARCHIVE]SMP_96E04514_GAMMA5_PMP_9186.CNF;2
Analyses by : PEAK V16.5 ENBACK V1.5 PEAKEFF V2.2 NID V3.1 MINACT V2.5

---- Sample Information ----

Sample Title	: G969901S		
Sample ID	: 96E04514	Sample Quantity	: 1.00000E+00 SAMPLE
Sample Type	: FILTER	Sample Geometry	: PMP

---- Sample Decay/Count Information ----

Sample Date	: 19-SEP-1996 12:00	Acquisition date	: 10-OCT-1996 09:06
Elapsed live time	: 0 04:00	Elapsed real time	: 0 04:00 0.0%
Decay time	: 20 21:06		

---- Detector Parameters ----

Energy cal. time	: 8-OCT-1996 12:40:		
Detector name	: GAMMA5	Counting geometry	: PMP
Effic. cal. time	: 19-SEP-1996 14:21		

---- Processing Parameters ----

Cali. Slope	: 4.88823E-01	Cali. Offset	: -5.65841E-01
Cali. Quadratic	: -8.49185E-08	FWHM Offset	: 4.15386E-01
FWHM Slope	: 4.45150E-02	MDA Width (FWHM)	: 3.0
Start channel	: 1	End channel	: 4096
Sensitivity	: 5.0	Gaussian Sens.	: 10.0
Energy tolerance	: 2.0	Half life ratio	: 8.0
Abundance limit	: 75.0	WTM error limit	: 3.0
Activity Units	: PCI	Act. Conversion	: 1.00000E+06
MDA Confid Level	: 5.0	Sigma Number	: 2
Errors propagated	: Yes	Systematic Error	: 0.0%

Combined Activity-MDA Report

---- Identified Nuclides ----

Nuclide	Activity (PCI/SAMPLE)	Act error	MDA (PCI/SAMPLE)	MDA error	Act/MDA
RA-226	6.159E+01	7.531E+01	7.112E+01	1.316E+01	0.866

---- Non-Identified Nuclides ----

Nuclide	Key-Line Activity (PCI/SAMPLE)	K.L. Ided	Act error	MDA (PCI/SAMPLE)	MDA error	Act/MDA
RA-228	-3.410E+00		9.628E+00	1.614E+01	3.316E+00	-0.211
PA-231	7.382E+01	+	2.895E+01	3.574E+01	5.872E+00	2.065
U-235	3.741E+00	+	4.576E+00	6.210E+00	1.166E+00	0.602

Gamma Spectroscopy Report generated 11-OCT-1996 13:40 **8019**

Configuration: DISK:[RADCHEM.SCUSR.ARCHIVE]SMP_96E04514_GAMMA5_PMP_9186.CNF;2
Analyses by : PEAK V16.5 ENBACK V1.5 PEAKEFF V2.2 NID V3.1 MINACT V2.5

---- Sample Information ----

Sample Title	: G969901S		
Sample ID	: 96E04514	Sample Quantity	: 1.00000E+00 SAMPLE
Sample Type	: FILTER	Sample Geometry	: PMP

---- Sample Decay/Count Information ----

Sample Date	: 19-SEP-1996 12:00	Acquisition date	: 10-OCT-1996 09:06
Elapsed live time	: 0 04:00	Elapsed real time	: 0 04:00 0.0%
Decay time	: 20 21:06		

---- Detector Parameters ----

Energy cal. time	: 8-OCT-1996 12:40:		
Detector name	: GAMMA5	Counting geometry	: PMP
Effic. cal. time	: 19-SEP-1996 14:21		

---- Processing Parameters ----

Cali. Slope	: 4.88823E-01	Cali. Offset	: -5.65841E-01
Cali. Quadratic	: -8.49185E-08	FWHM Offset	: 4.15386E-01
FWHM Slope	: 4.45150E-02	MDA Width (FWHM)	: 3.0
Start channel	: 1	End channel	: 4096
Sensitivity	: 5.0	Gaussian Sens.	: 10.0
Energy tolerance	: 2.0	Half life ratio	: 8.0
Abundance limit	: 75.0	WTM error limit	: 3.0
Activity Units	: PCI	Act. Conversion	: 1.00000E+06
MDA Confid Level	: 5.0	Sigma Number	: 2
Errors propagated	: Yes	Systematic Error	: 9.0%

Combined Activity-MDA Report

---- Identified Nuclides ----

Nuclide	Activity (PCI/SAMPLE)	Act error	MDA (PCI/SAMPLE)	MDA error	Act/MDA
RA-226	6.159E+01	7.612E+01	7.112E+01	1.316E+01	0.866

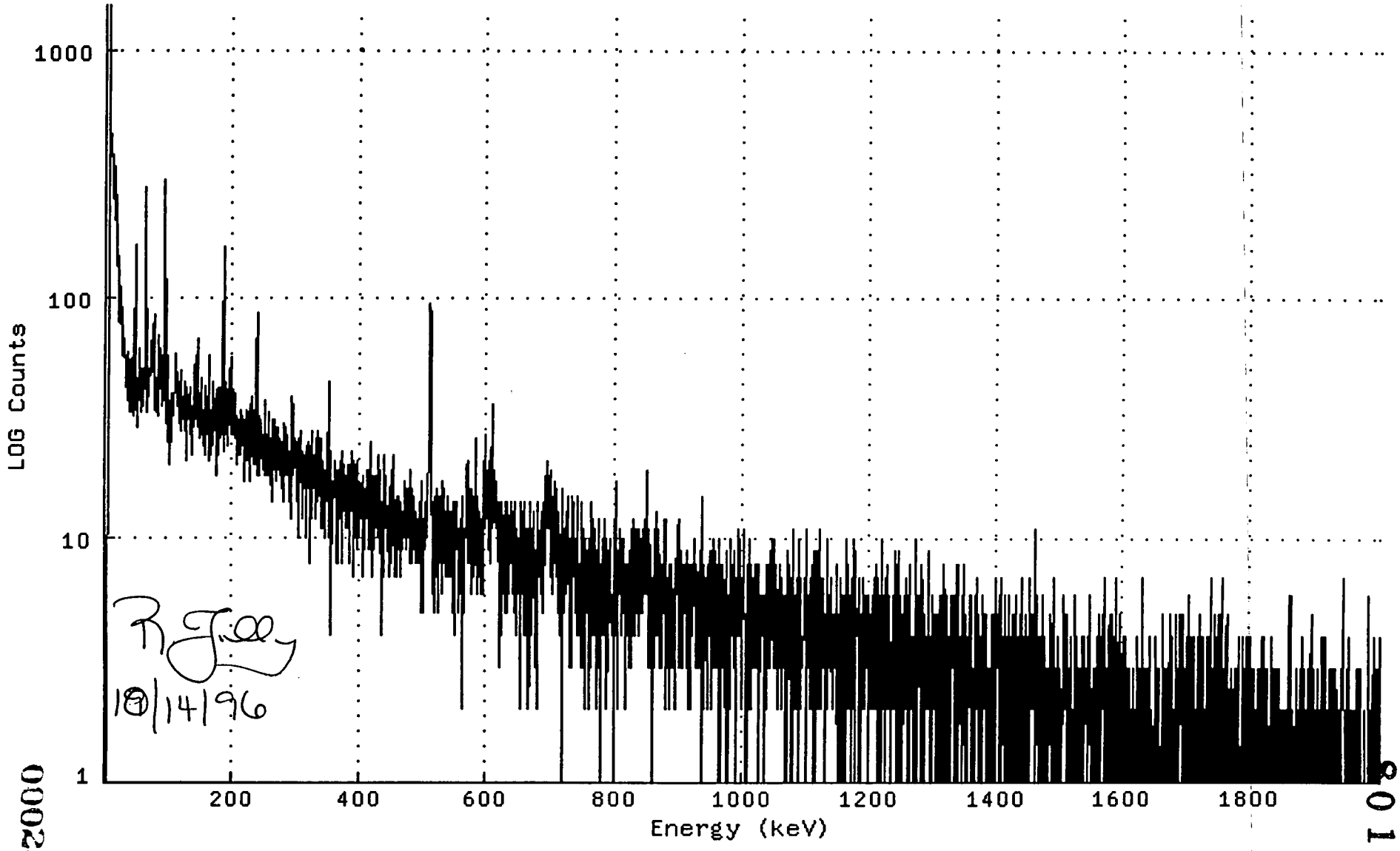
---- Non-Identified Nuclides ----

Nuclide	Key-Line Activity (PCI/SAMPLE)	K.L. Ided	Act error	MDA (PCI/SAMPLE)	MDA error	Act/MDA
RA-228	-3.410E+00		9.647E+00	1.614E+01	3.316E+00	-0.211
PA-231	7.382E+01	+	3.185E+01	3.574E+01	5.872E+00	2.065
U-235	3.741E+00	+	4.625E+00	6.210E+00	1.166E+00	0.602

R. Jolly
10/14/96

000284

Spectrum : DISK:[RADCHEM.SCUSR.ARCHIVE]SMP_96E04515_GAMMA6_PMP_9187.CNF;2
Title : 96E-0640-04
Sample Title: G969901S
Start Time: 10-OCT-1996 09:07 Sample Time: 19-JUL-1996 12:00 Energy Offset: -1.98761E-01
Real Time : 0 04:00:02.31 Sample ID : 96E04515 Energy Slope : 4.88802E-01
Live Time : 0 04:00:00.00 Sample Type: FILTER Energy Quad : -1.24008E-07



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000285

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Gamma Spectroscopy Report generated 11-OCT-1996 14:25

Configuration: DISK:[RADCHEM.SCUSR.ARCHIVE]SMP_96E04515_GAMMA6_PMP_9187.CNF;2
Analyses by : PEAK V16.5 PEAKEFF V2.2

---- Sample Information ----

Sample Title : G969901S
Sample ID : 96E04515 Sample Quantity : 1.00000E+00 SAMPLE
Sample Type : FILTER Sample Geometry : PMP

---- Sample Decay/Count Information ----

Sample Date : 19-JUL-1996 12:00 Acquisition date : 10-OCT-1996 09:07
Elapsed live time: 0 04:00 Elapsed real time: 0 04:00 0.0%
Decay time : 82 21:07

---- Detector Parameters ----

Energy cal. time : 8-OCT-1996 12:40:
Detector name : GAMMA6 Counting geometry: PMP
Effic. cal. time : 19-SEP-1996 15:11

---- Processing Parameters ----

Cali. Slope	: 4.88802E-01	Cali. Offset	: -1.98761E-01
Cali. Quadratic	: -1.24008E-07	FWHM Offset	: 6.37077E-01
FWHM Slope	: 3.32083E-02	MDA Width (FWHM)	: 3.0
Start channel	: 1	End channel	: 4096
Sensitivity	: 5.0	Gaussian Sens.	: 10.0
Energy tolerance	: 2.0	Half life ratio	: 8.0
Abundance limit	: 75.0	WTM error limit	: 3.0
Activity Units	: PCI	Act. Conversion	: 1.00000E+06
MDA Confid Level	: 5.0	Sigma Number	: 2
Errors propagated	: Yes	Systematic Error	: 0.0%

	It	Energy	Area	Bkgnd	FWHM	Channel	%Eff	Cts/Sec	%Err	Fit
1	3	10.31	367	1910	0.98	21.50	9.34E-01	2.55E-02	19.0	1.30E+00
2	3	13.03	217	1250	0.76	27.07	1.56E+00	1.50E-02	26.4	
3	0	15.87	304	1416	0.99	32.87	2.25E+00	2.11E-02	22.5	
4	0	46.56	205	414	0.93	95.66	6.84E+00	1.43E-02	19.3	
5	0	63.31	500	338	0.99	129.93	7.43E+00	3.47E-02	7.8	
6	0	92.80	717	423	1.25	190.26	7.33E+00	4.98E-02	6.7	
7	0	163.33	68	184	0.92	334.58	5.94E+00	4.73E-03	35.4	
8	0	185.65	343	285	1.10	380.25	5.52E+00	2.38E-02	10.7	
9	0	238.94	134	269	0.95	489.31	4.68E+00	9.27E-03	24.7	
10	0	352.53	114	150	1.39	721.74	3.47E+00	7.90E-03	23.8	
11	0	511.11	499	145	2.84	1046.33	2.52E+00	3.47E-02	7.3	
12	0	608.94	73	99	1.09	1246.57	2.16E+00	5.04E-03	27.4	
13	0	803.48	36	39	1.38	1644.86	1.69E+00	2.51E-03	33.9	
14	0	1863.52	22	18	4.58	3816.53	8.75E-01	1.51E-03	52.4	
15	0	1943.46	17	6	1.40	3980.39	8.52E-01	1.17E-03	36.6	

Gamma Spectroscopy Report generated 11-OCT-1996 14:25

8019

Configuration: DISK:[RADCHEM.SCUSR.ARCHIVE]BKG_BCKGND_GAMMA6__9144.CNF;1
Analyses by : PEAK V16.5 PEAKEFF V2.2

---- Sample Information ----

Sample Title :
Sample ID : BCKGND
Sample Type :
Sample Quantity : 1.00000E+00 G
Sample Geometry :

---- Sample Decay/Count Information ----

Sample Date : 4-OCT-1996 00:00:
Elapsed live time: 2 02:00
Decay time : 0 18:21
Acquisition date : 4-OCT-1996 18:21:
Elapsed real time: 2 02:00 0.0%

---- Detector Parameters ----

Energy cal. time : 30-SEP-1996 09:02
Detector name : GAMMA6
Effic. cal. time : 19-SEP-1996 13:34
Counting geometry: TRM1-S3

---- Processing Parameters ----

Cali. Slope	: 4.88539E-01	Cali. Offset	: -1.23202E-01
Cali. Quadratic	: -8.96482E-08	FWHM Offset	: 6.63864E-01
FWHM Slope	: 3.08694E-02	MDA Width (FWHM)	: 3.0
Start channel	: 1	End channel	: 4096
Sensitivity	: 5.0	Gaussian Sens.	: 10.0
Energy tolerance	: 2.0	Half life ratio	: 8.0
Abundance limit	: 75.0	WTM error limit	: 3.0
Activity Units	: pCi	Act. Conversion	: 1.00000E+06
MDA Confid Level	: 5.0	Sigma Number	: 1
Errors propagated	: Yes	Systematic Error	: 9.0%

	It	Energy	Area	Bkgnd	FWHM	Channel	%Eff	Cts/Sec	%Err	Fit
1	0	10.31	4650	23581	0.99	21.37	1.07E+05	2.58E-02	5.4	
2	4	13.10	3782	8752	0.88	27.07	1.83E+03	2.10E-02	3.5	6.65E-01
3	4	16.24	5522	14567	1.15	33.50	1.52E+02	3.07E-02	4.1	
4	0	19.50	1635	8409	1.62	40.16	3.62E+01	9.08E-03	9.3	
5	0	25.54	312	5600	0.86	52.53	1.02E+01	1.73E-03	38.6	
6	0	46.59	2743	4367	1.01	95.62	5.24E+00	1.52E-02	4.7	
7	0	53.57	608	4119	1.10	109.90	5.52E+00	3.38E-03	18.7	
8	0	63.33	5851	4242	0.89	129.88	6.06E+00	3.25E-02	2.3	
9	0	66.27	434	3647	1.07	135.89	6.23E+00	2.41E-03	23.6	
10	0	74.71	387	3737	0.90	153.19	6.70E+00	2.15E-03	25.5	
11	0	77.10	716	3235	0.91	158.08	6.82E+00	3.98E-03	13.2	
12	0	84.07	939	4528	1.17	172.34	7.15E+00	5.22E-03	13.3	
13	0	87.11	255	3002	1.06	178.56	7.28E+00	1.42E-03	34.5	
14	0	92.68	8662	4490	1.15	189.96	7.48E+00	4.81E-02	1.8	
15	0	98.45	403	3128	0.67	201.79	7.65E+00	2.24E-03	23.5	
16	7	110.09	994	5123	1.93	225.60	7.87E+00	5.52E-03	14.9	2.35E+00
17	7	112.93	511	3026	1.14	231.42	7.90E+00	2.84E-03	18.5	
18	0	139.98	660	3279	1.12	286.79	7.85E+00	3.67E-03	15.5	
19	0	143.85	766	3282	0.98	294.73	7.80E+00	4.26E-03	13.4	
20	0	163.53	543	3010	1.01	335.01	7.47E+00	3.01E-03	18.1	
21	0	185.82	3757	3802	1.11	380.64	6.98E+00	2.09E-02	3.5	
22	0	197.88	1519	4349	2.03	405.32	6.69E+00	8.44E-03	9.1	
23	0	205.27	364	2837	1.41	420.45	6.51E+00	2.02E-03	25.9	
24	0	238.51	1425	3059	1.17	488.51	5.74E+00	7.92E-03	7.4	

Sample ID : BCKGND Acquisition date : 4-OCT-1996 18:21:18

8019

Pk	It	Energy	Area	Bkgnd	FWHM	Channel	%Eff	Cts/Sec	%Err	Fit
[illegible]	0	295.60	150	1965	1.35	605.39	4.61E+00	8.34E-04	51.9	
[illegible]	0	351.85	396	1610	1.25	720.55	3.78E+00	2.20E-03	18.2	
27	0	510.92	5903	2795	2.42	1046.27	2.47E+00	3.28E-02	-2.5	
28	0	569.76	296	1426	1.68	1166.76	2.20E+00	1.65E-03	25.4	
29	0	583.21	431	1428	1.46	1194.29	2.15E+00	2.39E-03	17.7	
30	0	609.11	415	1634	1.39	1247.34	2.06E+00	2.31E-03	18.9	
31	0	669.74	157	876	1.62	1371.50	1.88E+00	8.74E-04	34.9	
32	10	694.29	708	1889	3.83	1421.77	1.83E+00	3.93E-03	15.0	3.99E+00
33	10	701.21	457	2536	3.84	1435.95	1.81E+00	2.54E-03	29.9	
34	0	802.85	425	888	1.34	1644.13	1.63E+00	2.36E-03	14.4	
35	0	1000.76	326	643	1.90	2049.50	1.42E+00	1.81E-03	16.1	
36	0	1063.81	136	560	1.77	2178.65	1.38E+00	7.53E-04	33.9	
37	0	1460.33	407	435	1.84	2991.07	1.22E+00	2.26E-03	12.2	
38	0	1764.08	137	242	1.92	3613.58	1.14E+00	7.60E-04	24.3	

Gamma Spectroscopy Report generated 11-OCT-1996 14:25

8019

Configuration: DISK:[RADCHEM.SCUSR.ARCHIVE]SMP_96E04515_GAMMA6_PMP_9187.CNF;2
Analyses by : PEAK V16.5 ENBACK V1.5

---- Sample Information ----

Sample Title : G969901S
Sample ID : 96E04515 Sample Quantity : 1.00000E+00 SAMPLE
Sample Type : FILTER Sample Geometry : PMP

---- Sample Decay/Count Information ----

Sample Date : 19-JUL-1996 12:00 Acquisition date : 10-OCT-1996 09:07
Elapsed live time: 0 04:00 Elapsed real time: 0 04:00 0.0%
Decay time : 82 21:07

---- Detector Parameters ----

Energy cal. time : 8-OCT-1996 12:40:
Detector name : GAMMA6 Counting geometry: PMP
Effic. cal. time : 19-SEP-1996 15:11

---- Processing Parameters ----

Cali. Slope	: 4.88802E-01	Cali. Offset	: -1.98761E-01
Cali. Quadratic	: -1.24008E-07	FWHM Offset	: 6.37077E-01
FWHM Slope	: 3.32083E-02	MDA Width (FWHM)	: 3.0
Start channel	: 1	End channel	: 4096
Sensitivity	: 5.0	Gaussian Sens.	: 10.0
Energy tolerance	: 2.0	Half life ratio	: 8.0
Abundance limit	: 75.0	WTM error limit	: 3.0
Activity Units	: PCI	Act. Conversion	: 1.00000E+06
MDA Confid Level	: 5.0	Sigma Number	: 2
Errors propagated	: Yes	Systematic Error	: 0.0%

	It	Energy	Area	Bkgnd	FWHM	Channel	Left	Pw	Cts/Sec	%Err	Fit
1	0	63.31*	32	338	0.99	129.93	126	8	2.20E-03	127.8	1.30E+00
2	0	92.80*	24	423	1.25	190.26	186	11	1.68E-03	205.2	
3	0	163.33*	25	184	0.92	334.58	331	7	1.72E-03	102.5	
4	0	185.65*	42	285	1.10	380.25	375	10	2.95E-03	89.7	
5	0	238.94*	20	269	0.95	489.31	485	10	1.35E-03	174.4	
6	0	352.53*	82	150	1.39	721.74	716	12	5.70E-03	33.7	
7	0	511.11*	27	145	2.84	1046.33	1038	18	1.89E-03	140.6	
8	0	608.94*	39	99	1.09	1246.57	1242	9	2.74E-03	52.9	
9	0	803.48*	2	39	1.38	1644.86	1641	8	1.54E-04	595.1	
10	0	1863.52	22	18	4.58	3816.53	3805	19	1.51E-03	52.4	
11	0	1943.46	17	6	1.40	3980.39	3977	9	1.17E-03	36.6	

Flag: "*" = Peak area was modified by background subtraction

Gamma Spectroscopy Report generated 11-OCT-1996 14:25

Configuration: DISK:[RADCHEM.SCUSR.ARCHIVE]SMP_96E04515_GAMMA6_PMP_9187.CNF;2
Analyses by : PEAK V16.5 ENBACK V1.5 PEAKEFF V2.2 NID V3.1

---- Sample Information ----

Sample Title : G969901S
Sample ID : 96E04515 Sample Quantity : 1.00000E+00 SAMPLE
Sample Type : FILTER Sample Geometry : PMP

---- Sample Decay/Count Information ----

Sample Date : 19-JUL-1996 12:00 Acquisition date : 10-OCT-1996 09:07
Elapsed live time: 0 04:00 Elapsed real time: 0 04:00 0.0%
Decay time : 82 21:07

---- Detector Parameters ----

Energy cal. time : 8-OCT-1996 12:40:
Detector name : GAMMA6 Counting geometry: PMP
Effic. cal. time : 19-SEP-1996 15:11

---- Processing Parameters ----

Cali. Slope	: 4.88802E-01	Cali. Offset	: -1.98761E-01
Cali. Quadratic	: -1.24008E-07	FWHM Offset	: 6.37077E-01
FWHM Slope	: 3.32083E-02	MDA Width (FWHM)	: 3.0
Start channel	: 1	End channel	: 4096
Sensitivity	: 5.0	Gaussian Sens.	: 10.0
Energy tolerance	: 2.0	Half life ratio	: 8.0
Abundance limit	: 75.0	WTM error limit	: 3.0
Activity Units	: PCI	Act. Conversion	: 1.00000E+06
MDA Confid Level	: 5.0	Sigma Number	: 2
Errors propagated	: Yes	Systematic Error	: 0.0%

Post-NID Peak Search Report

It	Energy	Area	Bkgnd	FWHM	Channel	Left	Pw %Err	Fit	Nuclides
0	63.31*	32	338	0.99	129.93	126	8255.5	1.30E+00	
0	92.80*	24	423	1.25	190.26	186	11410.5		
0	163.33*	25	184	0.92	334.58	331	7205.1		U-235
0	185.65*	42	285	1.10	380.25	375	10179.4		U-235 RA-226
0	238.94*	20	269	0.95	489.31	485	10348.7		
0	352.53*	82	150	1.39	721.74	716	12 67.5		
0	511.11*	27	145	2.84	1046.33	1038	18281.2		
0	608.94*	39	99	1.09	1246.57	1242	9105.8		
0	803.48*	2	39	1.38	1644.86	1641	8*****		
0	1863.52	22	18	4.58	3816.53	3805	19104.7		
0	1943.46	17	6	1.40	3980.39	3977	9 73.2		

Gamma Spectroscopy Report generated 15-OCT-1996 11:11

8019

Configuration: DISK:[RADCHEM.SCUSR.ARCHIVE]SMP_96E04515_GAMMA6_PMP_9187.CNF;2
Analyses by : PEAK V16.5 ENBACK V1.5 PEAKEFF V2.2 NID V3.1 MINACT V2.5

---- Sample Information ----

Sample Title	: G969901S		
Sample ID	: 96E04515	Sample Quantity	: 1.00000E+00 SAMPLE
Sample Type	: FILTER	Sample Geometry	: PMP

---- Sample Decay/Count Information ----

Sample Date	: 19-JUL-1996 12:00	Acquisition date	: 10-OCT-1996 09:07
Elapsed live time	: 0 04:00	Elapsed real time	: 0 04:00 0.0%
Decay time	: 82 21:07		

---- Detector Parameters ----

Energy cal. time	: 8-OCT-1996 12:40:		
Detector name	: GAMMA6	Counting geometry	: PMP
Effic. cal. time	: 19-SEP-1996 15:11		

---- Processing Parameters ----

Cali. Slope	: 4.88802E-01	Cali. Offset	: -1.98761E-01
Cali. Quadratic	: -1.24008E-07	FWHM Offset	: 6.37077E-01
FWHM Slope	: 3.32083E-02	MDA Width (FWHM)	: 3.0
Start channel	: 1	End channel	: 4096
Sensitivity	: 5.0	Gaussian Sens.	: 10.0
Energy tolerance	: 2.0	Half life ratio	: 8.0
Abundance limit	: 75.0	WTM error limit	: 3.0
Activity Units	: PCI	Act. Conversion	: 1.00000E+06
MDA Confid Level	: 5.0	Sigma Number	: 2
Errors propagated	: Yes	Systematic Error	: 0.0%

bined Activity-MDA Report

---- Identified Nuclides ----

Nuclide	Activity (PCI/SAMPLE)	Act error	MDA (PCI/SAMPLE)	MDA error	Act/MDA
RA-226	4.399E+01	7.909E+01	7.746E+01	9.293E+00	0.568
U-235	1.664E+01	3.428E+01	4.535E+00	5.630E-01	3.668

---- Non-Identified Nuclides ----

Nuclide	Key-Line Activity (PCI/SAMPLE)	K.L. Ided	Act error	MDA (PCI/SAMPLE)	MDA error	Act/MDA
RA-228	5.423E+00		9.682E+00	1.786E+01	2.379E+00	0.304
PA-231	3.431E+01	+	2.355E+01	2.913E+01	3.667E+00	1.178

Gamma Spectroscopy Report generated 15-OCT-1996 11:12

Configuration: DISK:[RADCHEM.SCUSR.ARCHIVE]SMP_96E04515_GAMMA6_PMP_9187.CNF;2
Analyses by : PEAK V16.5 ENBACK V1.5 PEAKEFF V2.2 NID V3.1 MINACT V2.5

---- Sample Information ----

Sample Title : G969901S
Sample ID : 96E04515 Sample Quantity : 1.00000E+00 SAMPLE
Sample Type : FILTER Sample Geometry : PMP

---- Sample Decay/Count Information ----

Sample Date : 19-JUL-1996 12:00 Acquisition date : 10-OCT-1996 09:07
Elapsed live time: 0 04:00 Elapsed real time: 0 04:00 0.0%
Decay time : 82 21:07

---- Detector Parameters ----

Energy cal. time : 8-OCT-1996 12:40:
Detector name : GAMMA6 Counting geometry: PMP
Effic. cal. time : 19-SEP-1996 15:11

---- Processing Parameters ----

Cali. Slope	: 4.88802E-01	Cali. Offset	: -1.98761E-01
Cali. Quadratic	: -1.24008E-07	FWHM Offset	: 6.37077E-01
FWHM Slope	: 3.32083E-02	MDA Width (FWHM)	: 3.0
Start channel	: 1	End channel	: 4096
Sensitivity	: 5.0	Gaussian Sens.	: 10.0
Energy tolerance	: 2.0	Half life ratio	: 8.0
Abundance limit	: 75.0	WTM error limit	: 3.0
Activity Units	: PCI	Act. Conversion	: 1.00000E+06
MDA Confid Level	: 5.0	Sigma Number	: 2
Errors propagated	: Yes	Systematic Error	: 9.0%

bined Activity-MDA Report

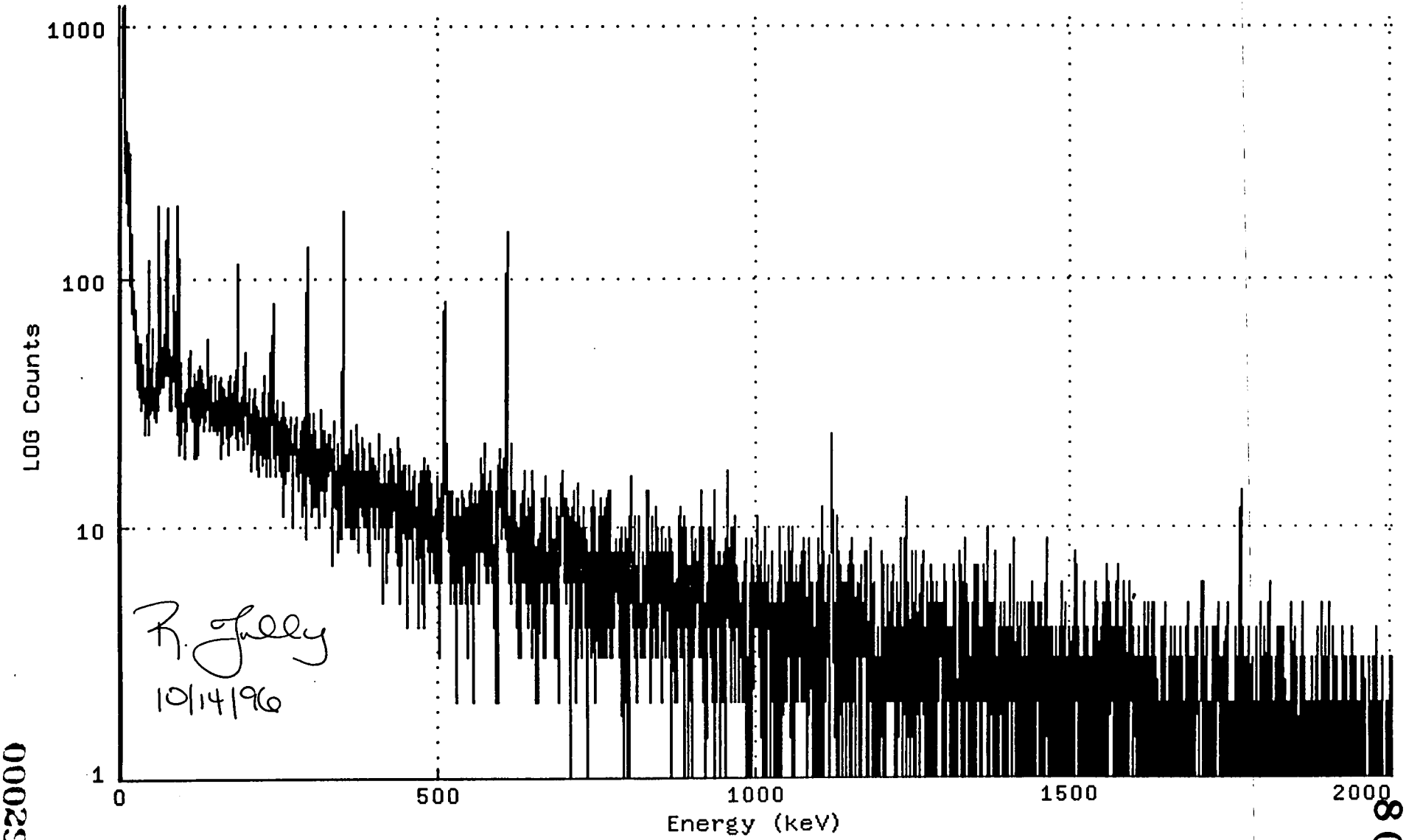
---- Identified Nuclides ----

Nuclide	Activity (PCI/SAMPLE)	Act error	MDA (PCI/SAMPLE)	MDA error	Act/MDA
RA-226	4.399E+01	7.948E+01	7.746E+01	9.293E+00	0.568
U-235	1.664E+01	3.441E+01	4.535E+00	5.630E-01	3.668

---- Non-Identified Nuclides ----

Nuclide	Key-Line Activity (PCI/SAMPLE)	K.L. Ided	Act error	MDA (PCI/SAMPLE)	MDA error	Act/MDA
RA-228	5.423E+00		9.731E+00	1.786E+01	2.379E+00	0.304
PA-231	3.431E+01	+	2.434E+01	2.913E+01	3.667E+00	1.178

Spectrum : DISK:[RADCHEM.SCUSR.ARCHIVE]SMP_96E04516_GAMMA5_PMP_9183.CNF;2
Title : 96E-0640-04
Sample Title: G969901S
Start Time: 9-OCT-1996 14:43: Sample Time: 19-SEP-1996 12:00 Energy Offset: -5.65841E-01
Real Time : 0 04:00:05.50 Sample ID : 96E04516 Energy Slope : 4.88823E-01
Live Time : 0 04:00:00.00 Sample Type: FILTER Energy Quad : -8.49185E-08



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80019

Gamma Spectroscopy Report generated 11-OCT-1996 13:41 **8019**

Configuration: DISK:[RADCHEM.SCUSR.ARCHIVE]SMP_96E04516_GAMMA5_PMP_9183.CNF;2
Analyses by : PEAK V16.5 PEAKEFF V2.2

---- Sample Information ----

Sample Title : G969901S
Sample ID : 96E04516 Sample Quantity : 1.00000E+00 SAMPLE
Sample Type : FILTER Sample Geometry : PMP

---- Sample Decay/Count Information ----

Sample Date : 19-SEP-1996 12:00 Acquisition date : 9-OCT-1996 14:43:
Elapsed live time: 0 04:00 Elapsed real time: 0 04:00 0.0%
Decay time : 20 02:43

---- Detector Parameters ----

Energy cal. time : 8-OCT-1996 12:40:
Detector name : GAMMA5 Counting geometry: PMP
Effic. cal. time : 19-SEP-1996 14:21

---- Processing Parameters ----

Cali. Slope : 4.88823E-01 Cali. Offset : -5.65841E-01
Cali. Quadratic : -8.49185E-08 FWHM Offset : 4.15386E-01
FWHM Slope : 4.45150E-02 MDA Width (FWHM) : 3.0
Start channel : 1 End channel : 4096
Sensitivity : 5.0 Gaussian Sens. : 10.0
Energy tolerance : 2.0 Half life ratio : 8.0
Abundance limit : 75.0 WTM error limit : 3.0
Activity Units : PCI Act. Conversion : 1.00000E+06
MDA Confid Level : 5.0 Sigma Number : 2
Errors propagated: Yes Systematic Error : 0.0%

	It	Energy	Area	Bkgnd	FWHM	Channel	%Eff	Cts/Sec	%Err	Fit
1	0	7.64	1803	3626	1.48	16.78	8.92E+00	1.25E-01	6.3	
2	0	13.04	308	924	0.91	27.84	9.66E+00	2.14E-02	15.9	
3	0	16.17	577	910	1.12	34.24	9.78E+00	4.00E-02	9.7	
4	0	18.87	131	722	1.25	39.76	9.79E+00	9.09E-03	37.0	
5	0	46.29	181	331	0.99	95.86	8.80E+00	1.25E-02	20.3	
6	0	53.10	104	307	1.13	109.79	8.50E+00	7.20E-03	33.1	
7	0	63.13	321	289	0.93	130.31	8.09E+00	2.23E-02	10.7	
8	2	74.73	200	239	0.97	154.05	7.65E+00	1.39E-02	14.1	1.74E+00
9	2	77.08	313	222	0.95	158.85	7.57E+00	2.18E-02	9.5	
10	0	87.23	66	285	0.81	179.62	7.23E+00	4.55E-03	44.8	
11	0	92.87	405	325	1.07	191.15	7.05E+00	2.81E-02	9.9	
12	0	185.92	178	255	1.00	381.52	5.02E+00	1.24E-02	17.8	
13	2	238.97	96	180	1.34	490.06	4.32E+00	6.67E-03	26.1	1.80E+00
14	2	242.16	152	180	1.23	496.59	4.28E+00	1.06E-02	17.2	
15	0	295.17	301	193	1.08	605.06	3.75E+00	2.09E-02	10.8	
16	0	352.05	451	156	1.15	721.45	3.31E+00	3.13E-02	7.1	
17	0	511.54	367	211	2.17	1047.83	2.47E+00	2.55E-02	10.9	
18	0	609.53	387	136	1.17	1248.36	2.13E+00	2.69E-02	8.0	
19	0	803.44	23	66	2.18	1645.26	1.66E+00	1.60E-03	71.6	
20	0	1120.65	80	55	1.51	2294.63	1.20E+00	5.58E-03	23.6	
21	0	1237.80	44	26	4.13	2534.49	1.08E+00	3.05E-03	28.3	
22	0	1377.90	37	17	3.20	2821.35	9.68E-01	2.57E-03	30.4	
23	0	1765.27	75	11	2.64	3614.70	7.37E-01	5.22E-03	16.1	

Gamma Spectroscopy Report generated 11-OCT-1996 13:41

8019

Configuration: DISK:[RADCHEM.SCUSR.ARCHIVE]BKG_BCKGND_GAMMA5__9143.CNF;1
Analyses by : PEAK V16.5 PEAKEFF V2.2

---- Sample Information ----

Sample Title :
Sample ID : BCKGND
Sample Type :
Sample Quantity : 1.00000E+00 G
Sample Geometry :

---- Sample Decay/Count Information ----

Sample Date : 4-OCT-1996 00:00:
Elapsed live time: 2 02:00
Decay time : 0 18:20
Acquisition date : 4-OCT-1996 18:20:
Elapsed real time: 2 02:01 0.0%

---- Detector Parameters ----

Energy cal. time : 30-SEP-1996 09:01
Detector name : GAMMA5
Effic. cal. time : 19-SEP-1996 11:45
Counting geometry: TRM1-S3

---- Processing Parameters ----

Cali. Slope	: 4.88756E-01	Cali. Offset	: -5.37244E-01
Cali. Quadratic	: -7.07146E-08	FWHM Offset	: 5.94642E-01
FWHM Slope	: 3.39310E-02	MDA Width (FWHM)	: 3.0
Start channel	: 1	End channel	: 4096
Sensitivity	: 5.0	Gaussian Sens.	: 10.0
Energy tolerance	: 2.0	Half life ratio	: 8.0
Abundance limit	: 75.0	WTM error limit	: 3.0
Activity Units	: pCi	Act. Conversion	: 1.00000E+06
MDA Confid Level	: 5.0	Sigma Number	: 1
Errors propagated	: Yes	Systematic Error	: 9.0%

	It	Energy	Area	Bkgnd	FWHM	Channel	%Eff	Cts/Sec	%Err	Fit
1	0	7.76	24064	42790	1.54	16.98	6.55E+06	1.34E-01	1.5	
2	0	10.38	4115	15170	0.84	22.34	1.32E+04	2.29E-02	4.8	
3	0	13.03	4183	13266	0.86	27.77	5.13E+02	2.32E-02	4.7	
4	0	16.22	6461	11688	1.08	34.29	6.28E+01	3.59E-02	3.1	
5	0	19.25	1233	6158	0.89	40.48	2.09E+01	6.85E-03	10.0	
6	0	23.34	285	5186	1.44	48.85	9.40E+00	1.58E-03	40.4	
7	0	26.04	437	4406	1.08	54.38	7.03E+00	2.43E-03	24.7	
8	0	46.55	1927	3150	0.94	96.35	4.94E+00	1.07E-02	5.5	
9	0	53.64	405	3070	0.98	110.85	5.29E+00	2.25E-03	24.2	
10	4	63.34	3752	1877	0.81	130.70	5.86E+00	2.08E-02	2.4	1.10E+00
11	4	66.28	535	2846	1.28	136.72	6.02E+00	2.97E-03	18.1	
12	0	69.74	385	3435	1.87	143.79	6.21E+00	2.14E-03	26.7	
13	0	74.19	134	3061	0.84	152.90	6.44E+00	7.44E-04	65.8	
14	0	77.07	495	2625	0.94	158.79	6.57E+00	2.75E-03	17.0	
15	0	84.43	698	3059	1.37	173.85	6.87E+00	3.88E-03	14.2	
16	0	87.20	283	2253	0.85	179.52	6.97E+00	1.57E-03	27.2	
17	0	92.67	4997	3152	1.09	190.71	7.12E+00	2.78E-02	2.4	
18	0	98.25	195	2385	0.93	202.14	7.25E+00	1.09E-03	42.0	
19	0	109.75	354	2985	0.75	225.66	7.39E+00	1.97E-03	27.2	
20	0	112.82	230	1804	0.95	231.93	7.40E+00	1.28E-03	28.5	
21	0	139.81	682	3118	1.12	287.16	7.22E+00	3.79E-03	15.8	
22	0	143.66	424	2282	1.06	295.05	7.16E+00	2.35E-03	19.3	
23	0	185.85	2020	3123	1.02	381.36	6.27E+00	1.12E-02	5.6	
24	4	197.16	456	1487	0.89	404.51	6.00E+00	2.53E-03	13.8	4.49E-01

Sample ID : BCKGND Acquisition date : 4-OCT-1996 18:20:18

8019

Pk	It	Energy	Area	Bkgnd	FWHM	Channel	%Eff	Cts/Sec	%Err	Fn
[illegible]	4	198.38	665	1790	1.04	407.00	5.98E+00	3.69E-03	11.2	
26	0	205.33	188	1689	0.96	421.24	5.81E+00	1.04E-03	35.4	
27	0	238.76	908	2089	1.08	489.64	5.07E+00	5.05E-03	9.3	
28	0	295.36	179	1472	1.03	605.47	4.05E+00	9.94E-04	36.3	
29	0	352.05	298	1202	1.06	721.47	3.31E+00	1.65E-03	20.2	
30	0	511.06	4724	2215	2.53	1046.88	2.15E+00	2.62E-02	2.7	
31	0	569.99	434	1409	1.55	1167.50	1.91E+00	2.41E-03	18.5	
32	0	583.39	294	1218	1.25	1194.92	1.87E+00	1.64E-03	23.7	
33	0	609.48	299	1186	1.30	1248.33	1.79E+00	1.66E-03	21.5	
34	0	669.54	124	741	1.38	1371.25	1.64E+00	6.91E-04	40.4	
35	4	693.56	349	1136	2.18	1420.41	1.58E+00	1.94E-03	21.4	3.27E+00
36	4	696.97	189	993	1.80	1427.39	1.58E+00	1.05E-03	34.4	
37	4	702.45	192	1226	2.19	1438.62	1.57E+00	1.07E-03	38.5	
38	0	803.05	377	759	1.66	1644.53	1.41E+00	2.09E-03	15.0	
39	0	962.14	241	859	2.17	1970.22	1.25E+00	1.34E-03	28.6	
40	0	1120.02	105	385	1.77	2293.42	1.15E+00	5.83E-04	35.1	
41	0	1331.87	136	353	2.38	2727.21	1.06E+00	7.54E-04	28.1	
42	0	1460.47	320	376	1.75	2990.52	1.02E+00	1.78E-03	14.0	
43	0	1764.72	128	183	2.41	3613.62	9.27E-01	7.11E-04	23.0	

Gamma Spectroscopy Report generated 11-OCT-1996 13:41

8019

Configuration: DISK:[RADCHEM.SCUSR.ARCHIVE]SMP_96E04516_GAMMA5_PMP_9183.CNF;2
Analyses by : PEAK V16.5 ENBACK V1.5

---- Sample Information ----

Sample Title : G969901S
Sample ID : 96E04516 Sample Quantity : 1.00000E+00 SAMPLE
Sample Type : FILTER Sample Geometry : PMP

---- Sample Decay/Count Information ----

Sample Date : 19-SEP-1996 12:00 Acquisition date : 9-OCT-1996 14:43:
Elapsed live time: 0 04:00 Elapsed real time: 0 04:00 0.0%
Decay time : 20 02:43

---- Detector Parameters ----

Energy cal. time : 8-OCT-1996 12:40:
Detector name : GAMMA5 Counting geometry: PMP
Effic. cal. time : 19-SEP-1996 14:21

---- Processing Parameters ----

Cali. Slope	: 4.88823E-01	Cali. Offset	: -5.65841E-01
Cali. Quadratic	: -8.49185E-08	FWHM Offset	: 4.15386E-01
FWHM Slope	: 4.45150E-02	MDA Width (FWHM)	: 3.0
Start channel	: 1	End channel	: 4096
Sensitivity	: 5.0	Gaussian Sens.	: 10.0
Energy tolerance	: 2.0	Half life ratio	: 8.0
Abundance limit	: 75.0	WTM error limit	: 3.0
Activity Units	: PCI	Act. Conversion	: 1.00000E+06
MDA Confid Level	: 5.0	Sigma Number	: 2
Errors propagated	: Yes	Systematic Error	: 0.0%

Pk	Fit	Energy	Area	Bkgnd	FWHM	Channel	Left	Pw	Cts/Sec	%Err	Fit
1	0	16.17*	60	910	1.12	34.24	31	7	4.15E-03	97.6	
2	0	18.87*	32	722	1.25	39.76	39	8	2.24E-03	152.9	
3	0	46.29*	26	331	0.99	95.86	92	10	1.84E-03	142.0	
4	0	53.10*	71	307	1.13	109.79	105	10	4.95E-03	49.4	
5	0	63.13*	21	289	0.93	130.31	127	8	1.48E-03	164.3	
6	2	74.73*	189	239	0.97	154.05	149	19	1.31E-02	15.4	1.74E+00
7	2	77.08*	274	222	0.95	158.85	149	19	1.90E-02	11.2	
8	0	87.23*	43	285	0.81	179.62	176	7	2.98E-03	70.0	
9	0	92.87*	5	325	1.07	191.15	187	10	3.53E-04	809.5	
10	0	185.92*	17	255	1.00	381.52	377	9	1.16E-03	197.3	
11	2	238.97*	23	180	1.34	490.06	484	17	1.63E-03	110.8	1.80E+00
12	2	242.16	152	180	1.23	496.59	484	17	1.06E-02	17.2	
13	0	295.17*	287	193	1.08	605.06	600	12	1.99E-02	11.5	
14	0	352.05*	427	156	1.15	721.45	717	11	2.96E-02	7.6	
15	0	609.53*	363	136	1.17	1248.36	1242	13	2.52E-02	8.7	
16	0	1120.65*	72	55	1.51	2294.63	2288	16	5.00E-03	26.7	
17	0	1237.80	44	26	4.13	2534.49	2527	13	3.05E-03	28.3	
18	0	1377.90	37	17	3.20	2821.35	2814	17	2.57E-03	30.4	
19	0	1765.27*	65	11	2.64	3614.70	3607	18	4.51E-03	19.0	

Flag: "*" = Peak area was modified by background subtraction

Gamma Spectroscopy Report generated 11-OCT-1996 13:41 **8019**

Configuration: DISK:[RADCHEM.SCUSR.ARCHIVE]SMP_96E04516_GAMMA5_PMP_9183.CNF;2
Analyses by : PEAK V16.5 ENBACK V1.5 PEAKEFF V2.2 NID V3.1

---- Sample Information ----

Sample Title : G969901S
Sample ID : 96E04516 Sample Quantity : 1.00000E+00 SAMPLE
Sample Type : FILTER Sample Geometry : PMP

---- Sample Decay/Count Information ----

Sample Date : 19-SEP-1996 12:00 Acquisition date : 9-OCT-1996 14:43:
Elapsed live time: 0 04:00 Elapsed real time: 0 04:00 0.0%
Decay time : 20 02:43

---- Detector Parameters ----

Energy cal. time : 8-OCT-1996 12:40:
Detector name : GAMMA5 Counting geometry: PMP
Effic. cal. time : 19-SEP-1996 14:21

---- Processing Parameters ----

Cali. Slope	: 4.88823E-01	Cali. Offset	: -5.65841E-01
Cali. Quadratic	: -8.49185E-08	FWHM Offset	: 4.15386E-01
FWHM Slope	: 4.45150E-02	MDA Width (FWHM)	: 3.0
Start channel	: 1	End channel	: 4096
Sensitivity	: 5.0	Gaussian Sens.	: 10.0
Energy tolerance	: 2.0	Half life ratio	: 8.0
Abundance limit	: 75.0	WTM error limit	: 3.0
Activity Units	: PCI	Act. Conversion	: 1.00000E+06
MDA Confid Level	: 5.0	Sigma Number	: 2
Errors propagated	: Yes	Systematic Error	: 0.0%

P[illegible]-NID Peak Search Report

It	Energy	Area	Bkgnd	FWHM	Channel	Left	Pw %Err	Fit	Nuclides
0	16.17*	60	910	1.12	34.24	31	7195.1		
0	18.87*	32	722	1.25	39.76	39	8305.8		
0	46.29*	26	331	0.99	95.86	92	10284.1		
0	53.10*	71	307	1.13	109.79	105	10 98.8		
0	63.13*	21	289	0.93	130.31	127	8328.6		
2	74.73*	189	239	0.97	154.05	149	19 30.8	1.74E+00	
2	77.08*	274	222	0.95	158.85	149	19 22.3		
0	87.23*	43	285	0.81	179.62	176	7139.9		
0	92.87*	5	325	1.07	191.15	187	10*****		
0	185.92*	17	255	1.00	381.52	377	9394.6		RA-226
2	238.97*	23	180	1.34	490.06	484	17221.5	1.80E+00	
2	242.16	152	180	1.23	496.59	484	17 34.4		
0	295.17*	287	193	1.08	605.06	600	12 23.0		
0	352.05*	427	156	1.15	721.45	717	11 15.3		
0	609.53*	363	136	1.17	1248.36	1242	13 17.4		
0	1120.65*	72	55	1.51	2294.63	2288	16 53.3		
0	1237.80	44	26	4.13	2534.49	2527	13 56.6		
0	1377.90	37	17	3.20	2821.35	2814	17 60.7		
0	1765.27*	65	11	2.64	3614.70	3607	18 38.0		

Gamma Spectroscopy Report generated 11-OCT-1996 13:41 **8019**

Configuration: DISK:[RADCHEM.SCUSR.ARCHIVE]SMP_96E04516_GAMMA5_PMP_9183.CNF;2
Analyses by : PEAK V16.5 ENBACK V1.5 PEAKEFF V2.2 NID V3.1

---- Sample Information ----

Sample Title	: G969901S		
Sample ID	: 96E04516	Sample Quantity	: 1.00000E+00 SAMPLE
Sample Type	: FILTER	Sample Geometry	: PMP

---- Sample Decay/Count Information ----

Sample Date	: 19-SEP-1996 12:00	Acquisition date	: 9-OCT-1996 14:43:
Elapsed live time	: 0 04:00	Elapsed real time	: 0 04:00 0.0%
Decay time	: 20 02:43		

---- Detector Parameters ----

Energy cal. time	: 8-OCT-1996 12:40:		
Detector name	: GAMMA5	Counting geometry	: PMP
Effic. cal. time	: 19-SEP-1996 14:21		

---- Processing Parameters ----

Cali. Slope	: 4.88823E-01	Cali. Offset	: -5.65841E-01
Cali. Quadratic	: -8.49185E-08	FWHM Offset	: 4.15386E-01
FWHM Slope	: 4.45150E-02	MDA Width (FWHM)	: 3.0
Start channel	: 1	End channel	: 4096
Sensitivity	: 5.0	Gaussian Sens.	: 10.0
Energy tolerance	: 2.0	Half life ratio	: 8.0
Abundance limit	: 75.0	WTM error limit	: 3.0
Activity Units	: PCI	Act. Conversion	: 1.00000E+06
MDA Confid Level	: 5.0	Sigma Number	: 2
Errors propagated	: Yes	Systematic Error	: 0.0%

Interference Report

No interference correction performed

Sample ID : 96E04516 Acquisition date : 9-OCT-1996 14:43:50

8019

Nuclide	Half-life	Half-Life Ratio	Energy	%Abund	Activity	2-Sigma %Error	Rejected by
P[illegible]231	3.28E+04Y	0.00	50.10	31.70	--- Not Found ---		Abun.
			100.00	1.11	--- Not Found ---		
			122.31	1.19	--- Not Found ---		
			144.24	3.24	--- Not Found ---		
			154.21	5.58	--- Not Found ---		
			205.00	1.08	--- Not Found ---		
			210.60	1.26	--- Not Found ---		
			234.90	2.80	--- Not Found ---		
			236.00	11.50	--- Not Found ---		
			256.20	6.30	--- Not Found ---		
			269.46	13.60	--- Not Found ---		
			271.23	10.60	--- Not Found ---		
			283.67	1.60	--- Not Found ---		
			286.10	1.60	--- Not Found ---		
			300.08	2.30	--- Not Found ---		
			304.40	1.35	--- Not Found ---		
			323.87	3.88	--- Not Found ---		
			330.00	1.30	--- Not Found ---		
			334.20	1.15	--- Not Found ---		
			338.28	2.73	--- Not Found ---		
			351.07*	12.94	1.870E-04	22.40	
			401.81	6.50	--- Not Found ---		
			404.84	2.90	--- Not Found ---		
			427.08	1.30	--- Not Found ---		
			445.03	1.18	--- Not Found ---		
			569.67	0.54	--- Not Found ---		
			831.96	2.90	--- Not Found ---		
			897.83	0.24	--- Not Found ---		
			897.83	0.52	--- Not Found ---		
		% Abundances Found =		9.59			
U-235	7.04E+08Y	0.00	143.76	10.50	--- Not Found ---		Abun.
			163.35	4.70	--- Not Found ---		
			185.71*	54.00	1.159E-06	395.08	
			205.31	4.70	--- Not Found ---		
		% Abundances Found =		73.07			

Flag: "*" = Keyline

Sample ID : 96E04516
Acquisition date : 9-OCT-1996 14:43:50

8019

Nuclide Type: Natural

Nuclide	Energy	Area	%Abn	%Eff	Uncorrected PCI/SAMPLE	Decay Corr PCI/SAMPLE	2-Sigma %Error
RA-226	186.21	17	3.28*	5.024E+00	1.908E+01	1.909E+01	395.07

Flag: "*" = Keyline

Gamma Spectroscopy Report generated 11-OCT-1996 13:41 **8019**

Configuration: DISK:[RADCHEM.SCUSR.ARCHIVE]SMP_96E04516_GAMMA5_PMP_9183.CNF;2
Analyses by : PEAK V16.5 ENBACK V1.5 PEAKEFF V2.2 NID V3.1 MINACT V2.5

---- Sample Information ----

Sample Title	: G969901S		
Sample ID	: 96E04516	Sample Quantity	: 1.00000E+00 SAMPLE
Sample Type	: FILTER	Sample Geometry	: PMP

---- Sample Decay/Count Information ----

Sample Date	: 19-SEP-1996 12:00	Acquisition date	: 9-OCT-1996 14:43:
Elapsed live time	: 0 04:00	Elapsed real time	: 0 04:00 0.0%
Decay time	: 20 02:43		

---- Detector Parameters ----

Energy cal. time	: 8-OCT-1996 12:40:		
Detector name	: GAMMA5	Counting geometry	: PMP
Effic. cal. time	: 19-SEP-1996 14:21		

---- Processing Parameters ----

Cali. Slope	: 4.88823E-01	Cali. Offset	: -5.65841E-01
Cali. Quadratic	: -8.49185E-08	FWHM Offset	: 4.15386E-01
FWHM Slope	: 4.45150E-02	MDA Width (FWHM)	: 3.0
Start channel	: 1	End channel	: 4096
Sensitivity	: 5.0	Gaussian Sens.	: 10.0
Energy tolerance	: 2.0	Half life ratio	: 8.0
Abundance limit	: 75.0	WTM error limit	: 3.0
Activity Units	: PCI	Act. Conversion	: 1.00000E+06
MDA Confid Level	: 5.0	Sigma Number	: 2
Errors propagated	: Yes	Systematic Error	: 0.0%

Combined Activity-MDA Report

---- Identified Nuclides ----

Nuclide	Activity (PCI/SAMPLE)	Act error	MDA (PCI/SAMPLE)	MDA error	Act/MDA
RA-226	1.909E+01	7.540E+01	7.552E+01	1.397E+01	0.253

---- Non-Identified Nuclides ----

Nuclide	Key-Line Activity (PCI/SAMPLE)	K.L. Ided	Act error	MDA (PCI/SAMPLE)	MDA error	Act/MDA
RA-228	5.205E+00		1.072E+01	1.920E+01	3.942E+00	0.271
PA-231	1.870E+02	+	4.189E+01	4.886E+01	8.026E+00	3.828
U-235	1.159E+00	+	4.580E+00	6.361E+00	1.194E+00	0.182

Gamma Spectroscopy Report generated 11-OCT-1996 13:42 **8019**

Configuration: DISK:[RADCHEM.SCUSR.ARCHIVE]SMP_96E04516_GAMMA5_PMP_9183.CNF;2
Analyses by : PEAK V16.5 ENBACK V1.5 PEAKEFF V2.2 NID V3.1 MINACT V2.5

---- Sample Information ----

Sample Title	: G969901S		
Sample ID	: 96E04516	Sample Quantity	: 1.00000E+00 SAMPLE
Sample Type	: FILTER	Sample Geometry	: PMP

---- Sample Decay/Count Information ----

Sample Date	: 19-SEP-1996 12:00	Acquisition date	: 9-OCT-1996 14:43:
Elapsed live time	: 0 04:00	Elapsed real time	: 0 04:00 0.0%
Decay time	: 20 02:43		

---- Detector Parameters ----

Energy cal. time	: 8-OCT-1996 12:40:		
Detector name	: GAMMA5	Counting geometry	: PMP
Effic. cal. time	: 19-SEP-1996 14:21		

---- Processing Parameters ----

Cali. Slope	: 4.88823E-01	Cali. Offset	: -5.65841E-01
Cali. Quadratic	: -8.49185E-08	FWHM Offset	: 4.15386E-01
FWHM Slope	: 4.45150E-02	MDA Width (FWHM)	: 3.0
Start channel	: 1	End channel	: 4096
Sensitivity	: 5.0	Gaussian Sens.	: 10.0
Energy tolerance	: 2.0	Half life ratio	: 8.0
Abundance limit	: 75.0	WTM error limit	: 3.0
Activity Units	: PCI	Act. Conversion	: 1.00000E+06
MDA Confid Level	: 5.0	Sigma Number	: 2
Errors propagated	: Yes	Systematic Error	: 9.0%

Combined Activity-MDA Report

---- Identified Nuclides ----

Nuclide	Activity (PCI/SAMPLE)	Act error	MDA (PCI/SAMPLE)	MDA error	Act/MDA
RA-226	1.909E+01	7.548E+01	7.552E+01	1.397E+01	0.253

---- Non-Identified Nuclides ----

Nuclide	Key-Line Activity (PCI/SAMPLE)	K.L. Ided	Act error	MDA (PCI/SAMPLE)	MDA error	Act/MDA
RA-228	5.205E+00		1.076E+01	1.920E+01	3.942E+00	0.271
PA-231	1.870E+02	+	5.374E+01	4.886E+01	8.026E+00	3.828
U-235	1.159E+00	+	4.585E+00	6.361E+00	1.194E+00	0.182

R. Jolly
10/14/96

Section 2. Instrument Performance and Calibration Data
γ Spectrometry
Inventory Checklist

- [x] Efficiency Calibration
  - Calibration Spectral Plot
  - Peak Search Report
  - Calibration Reports
    - Energy
    - FWHM
    - Efficiency
  - Calibration Plots
    - Energy
    - FWHM
    - Efficiency
- [x] Energy Calibration
  - Calibration Spectal Plot
  - Peak Search Report
  - Calibration Reports
    - Energy
    - FWHM
  - Calibration Plots
    - Energy
    - FWHM
- [x] Background
  - Background Spectral Plot
  - Peak Source Report(s)
- [x] QC Reports
  - Daily Source Check
  - Weekly Background

Section 2. Instrument Performance and Calibration Data
γ Spectrometry
Reviewer Checklist

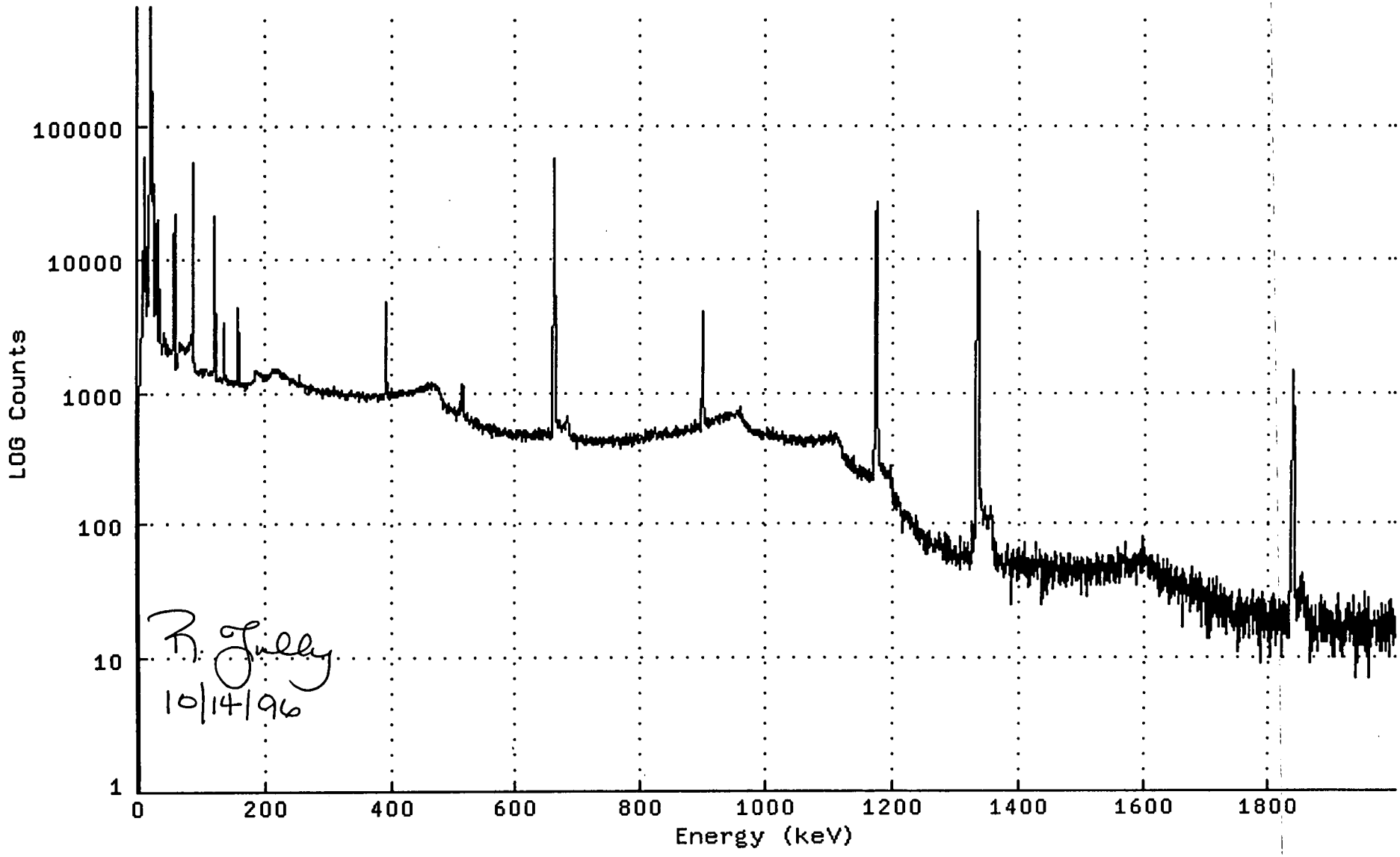
X The Instrument Performance and Calibration Data Inventory Checklist above is complete.

X Specified analytical protocols are followed for particular contract requirements.

X Conditions of instrument setup are noted.

NA NCR(s) noted, and affected instruments not used.

Spectrum : DISK:[RADCHEM.SCUSR.ARCHIVE]CAL_GAMMA5_PMP_8947.CNF;1
Title :
Sample Title:
Start Time: 19-SEP-1996 13:46 Sample Time: 1-MAY-1995 12:00: Energy Offset: -4.97085E-01
Real Time : 0 00:21:43.34 Sample ID : PMP Energy Slope : 4.88468E-01
Live Time : 0 00:20:00.00 Sample Type: Energy Quad : -4.45141E-08



R. Tully
10/14/96

VMS Peak Search Report V1.9 Generated 11-OCT-1996 11:52:01 **8019**

Configuration : DISK:[RADCHEM.SCUSR.ARCHIVE]CAL_GAMMA5_PMP_8947.CNF;1
Analyses by : PEAK V16.5,PEAKEFF V2.2
Sample date : 1-MAY-1995 12:00:00 Acquisition date : 19-SEP-1996 13:46:10
Sample ID : PMP Sample quantity : 1.0000 L
Detector name : GAMMA5 Detector geometry: PMP
Elapsed live time: 0 00:20:00.00 Elapsed real time: 0 00:21:43.34 7.9%
Start energy : -0.01 keV End energy : 1999.52 keV
Sensitivity : 5.00 Gaussian : 10.00
Critical level : No

Pk	It	Energy	Area	Bkgnd	FWHM	Channel	%Eff	Cts/Sec	%Err	Fit
1	0	5.29	2273	7754	1.50	11.84	8.11E+00	1.89E+00	6.4	
2	10	11.13	38098	32452	1.24	23.79	9.51E+00	3.17E+01	1.2	2.67E+02
3	10	12.14	84036	32416	0.77	25.88	9.60E+00	7.00E+01	0.5	
4	0	14.82	12412	31483	0.85	31.36	9.75E+00	1.03E+01	2.4	
5	7	21.14	205382	91270	1.29	44.29	9.77E+00	1.71E+02	0.6	1.05E+04
6	7	22.06	1354357	72775	0.92	46.17	9.75E+00	1.13E+03	0.1	
7	7	24.86	404702	51039	1.33	51.91	9.68E+00	3.37E+02	0.2	
8	0	31.97	38944	28359	1.03	66.47	9.42E+00	3.25E+01	0.9	
9	0	36.46	9244	19820	1.09	75.67	9.23E+00	7.70E+00	3.0	
10	0	42.98	3097	24654	2.11	89.00	8.94E+00	2.58E+00	10.3	
11	0	49.56	947	13643	1.15	102.49	8.65E+00	7.89E-01	20.7	
12	0	59.51	35789	18234	0.82	122.85	8.24E+00	2.98E+01	0.9	
13	10	67.16	2522	22915	2.10	138.51	7.93E+00	2.10E+00	12.9	1.28E+01
14	10	70.97	1437	25393	2.14	146.31	7.79E+00	1.20E+00	22.7	
15	0	88.02	96976	23270	0.89	181.22	7.21E+00	8.08E+01	0.4	
16	1	120.24	409	5340	1.02	247.19	6.30E+00	3.41E-01	25.5	8.37E-01
17	1	122.05	38585	7775	0.90	250.89	6.26E+00	3.22E+01	0.6	
[illegible]	0	136.45	4542	12499	1.01	280.36	5.93E+00	3.78E+00	4.8	
[illegible]	0	158.99	7621	10440	1.05	326.51	5.48E+00	6.35E+00	2.7	
20	0	254.85	354	6858	0.77	522.78	4.14E+00	2.95E-01	37.4	
21	0	391.70	9598	9555	1.23	802.97	3.06E+00	8.00E+00	2.2	
22	0	514.17	1382	6881	1.28	1053.74	2.46E+00	1.15E+00	11.6	
23	0	661.66	173017	8620	1.45	1355.74	1.99E+00	1.44E+02	0.3	
24	0	898.01	12394	7919	1.65	1839.75	1.50E+00	1.03E+01	1.8	
25	0	1173.15	109576	5372	1.87	2403.25	1.15E+00	9.13E+01	0.3	
26	0	1332.40	98724	2152	1.98	2729.40	1.00E+00	8.23E+01	0.3	
27	0	1836.07	7295	623	2.30	3761.14	7.05E-01	6.08E+00	1.5	

VMS Calibration Report V1.5 Generated 11-OCT-1996 11:52:03

Configuration : DISK:[RADCHEM.SCUSR.ARCHIVE]CAL_GAMMA5_PMP_8947.CNF;1
Analyses by : SCRCAL V1.1,PEAK V16.5,PEAKEFF V2.2
Detector Name : GAMMA5 Energy Calib Time: 19-SEP-1996 14:21:40
Efficiency type : Empirical Effncy Calib Time: 19-SEP-1996 14:21:40
Detector Geometry: PMP Shelf :

Energy Calibration Report

Energy = -0.4971 + 0.4885*Channel + -4.4514E-08*(Channel**2)

Nbr	Centroid Channel	True Energy	Computed Energy	Difference
1	122.85	59.54	59.51	0.028
2	181.22	88.03	88.02	0.012
3	250.89	122.06	122.05	0.013
4	280.36	136.48	136.45	0.030
5	326.51	159.00	158.99	0.014
6	802.97	391.69	391.70	-0.012
7	1053.74	513.99	514.17	-0.181
8	1355.74	661.65	661.66	-0.006
9	1839.75	898.02	898.01	0.008
10	2403.25	1173.22	1173.15	0.062
11	2729.40	1332.49	1332.40	0.091
12	3761.14	1836.01	1836.07	-0.060

FWHM Calibration Report

FWHM = 0.4790 + 4.0482E-02*(Energy**1/2)

Nbr	Energy	True FWHM	Computed FWHM	Difference
1	59.54	0.82	0.79	0.026
2	88.03	0.89	0.86	0.035
3	122.06	0.90	0.93	-0.024
4	136.48	1.01	0.95	0.061
5	159.00	1.05	0.99	0.065
6	391.69	1.23	1.28	-0.055
7	513.99	1.28	1.40	-0.119
8	661.65	1.45	1.52	-0.072
9	898.02	1.65	1.69	-0.039
10	1173.22	1.87	1.87	0.006
11	1332.49	1.98	1.96	0.024
12	1836.01	2.31	2.21	0.092

Efficiency Calibration Report

Eff = exp(a2 + a3*x + a4*x**2 + a5*x**3 + a6*x**4 + a7*x**5), x=ln(a1/energy)

a1	a2	a3	a4	a5	a6	a7
947.8	-4.255	0.9772	-0.1236	0.0000E+00	0.0000E+00	0.0000E+00

Average Deviation = 6.53 % Reduced Chi-Square = 1.96

Nbr	Energy (keV)	Measured Efficiency	Efficiency Error	Computed Efficiency	Diff/ /Error	% Diff
1	59.54	7.33E-02	3.72E-03	8.23E-02	-2.43	-12.34

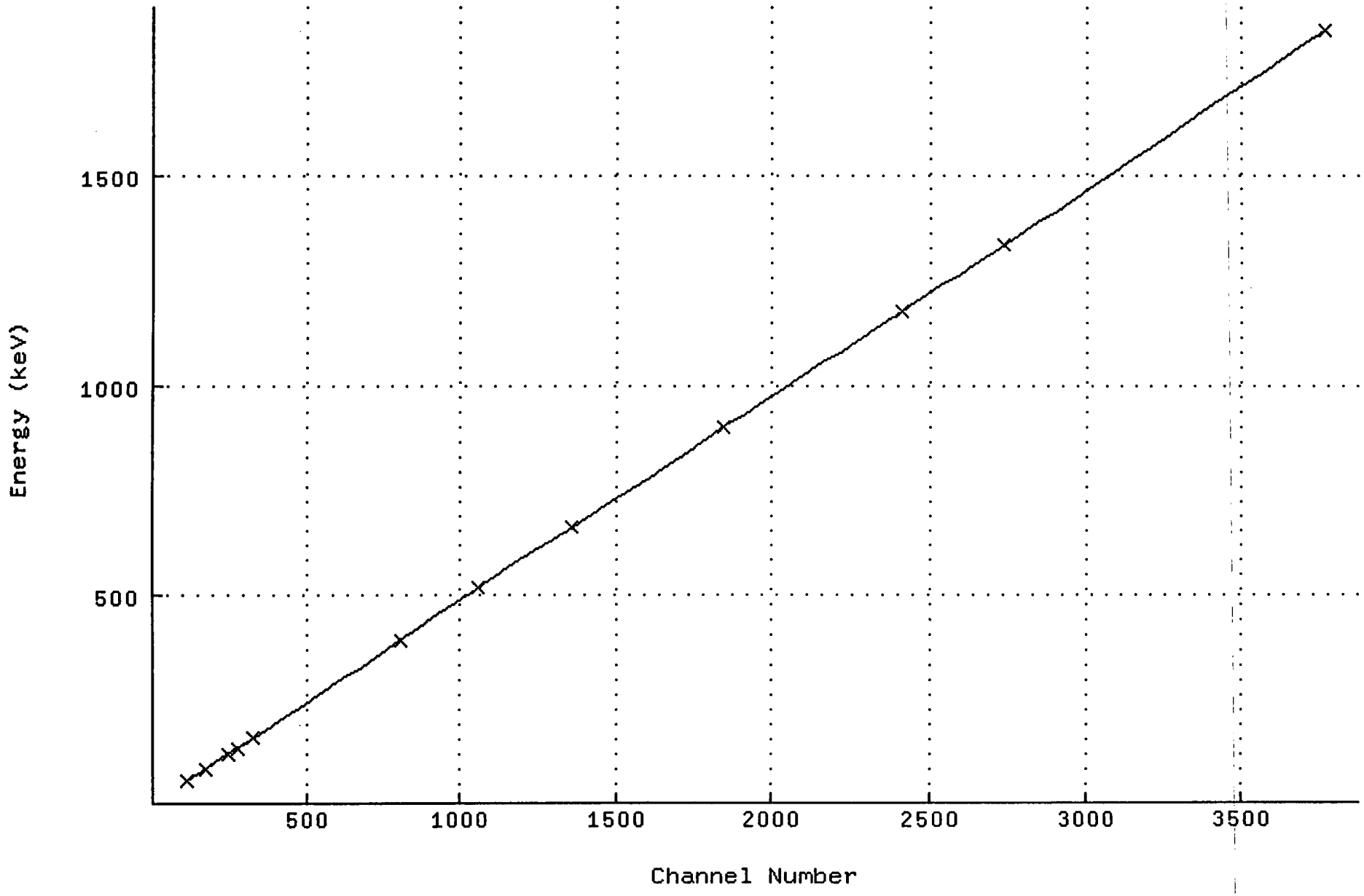
Sample ID : PMP Acquisition date : 19-SEP-1996 13:46:10

8019

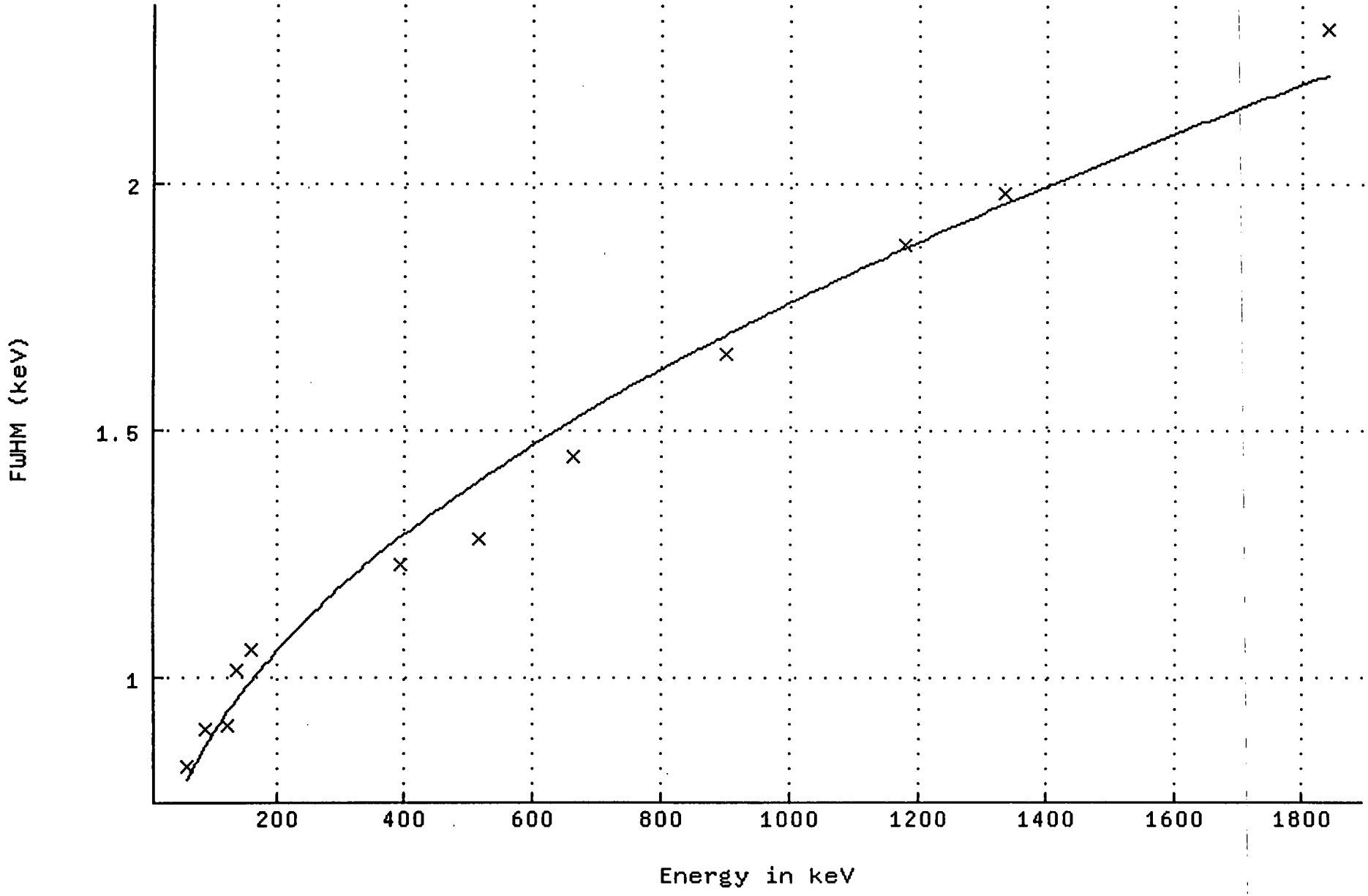
Nbr	Energy (keV)	Measured Efficiency	Efficiency Error	Computed Efficiency	Diff/ /Error	% Diff
2	88.03	7.59E-02	3.81E-03	7.21E-02	1.01	5.07
3	122.06	6.71E-02	3.39E-03	6.26E-02	1.33	6.72
4	136.48	6.38E-02	4.44E-03	5.93E-02	1.00	6.98
5	159.00	5.85E-02	3.32E-03	5.48E-02	1.10	6.26
6	391.69	2.91E-02	1.60E-03	3.06E-02	-0.95	-5.24
7	513.99	2.17E-02	2.73E-03	2.47E-02	-1.09	-13.77
8	661.65	1.93E-02	9.66E-04	1.99E-02	-0.58	-2.89
9	898.02	1.37E-02	7.26E-04	1.50E-02	-1.74	-9.25
10	1173.22	1.13E-02	5.69E-04	1.15E-02	-0.20	-0.99
11	1332.49	1.02E-02	5.12E-04	1.00E-02	0.37	1.88
12	1836.01	7.57E-03	3.95E-04	7.05E-03	1.33	6.93

Approved by: _____ Approval Date: __ / __ / ____

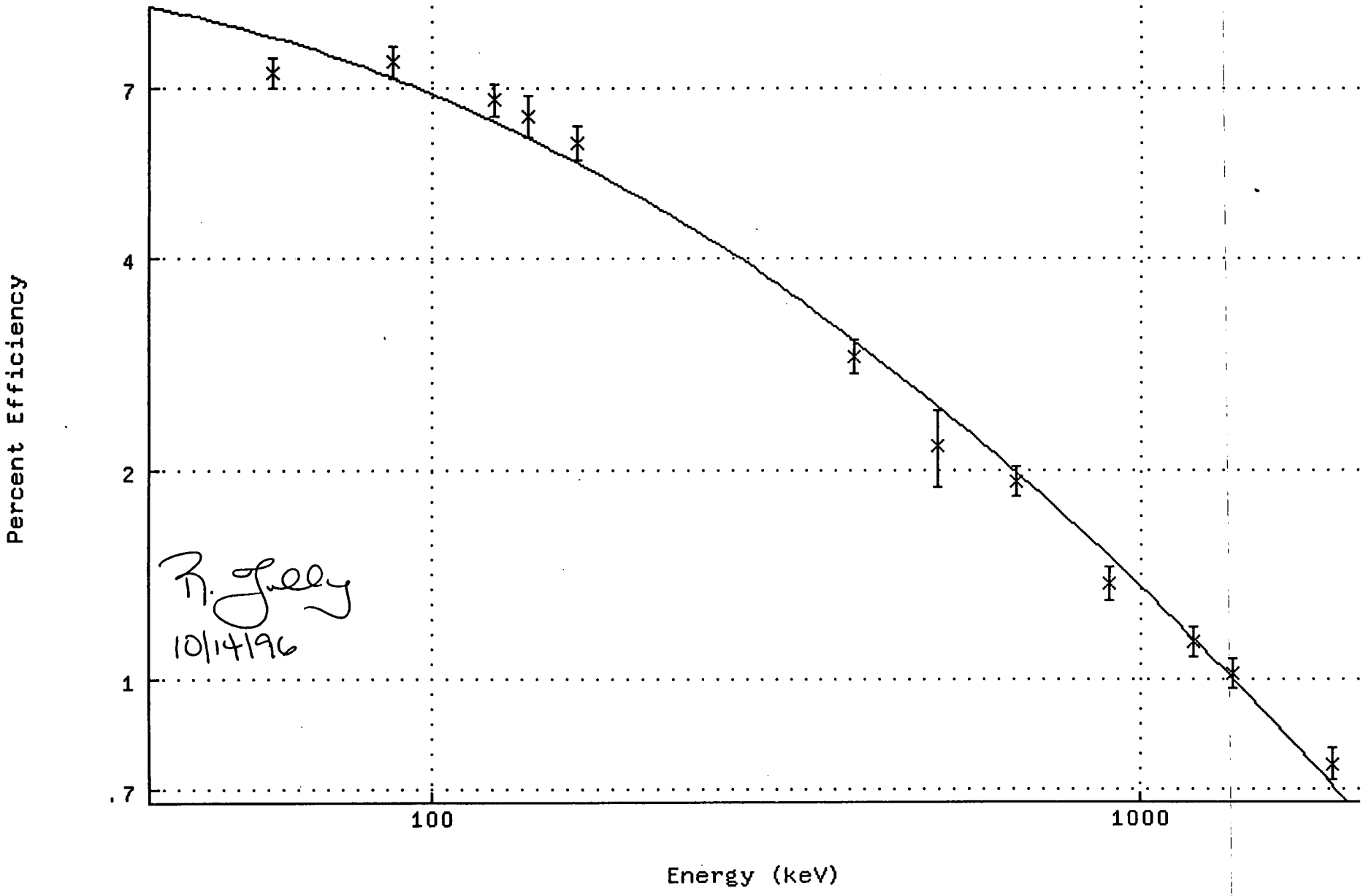
Spectrum : DISK:[RADCHEM.SCUSR.ARCHIVE]CAL_GAMMA5_PMP_8947.CNF;1
Calib Date: 19-SEP-1996 14:21
Detector : GAMMA5 Geometry: PMP
Energy = -0.497 + 0.4885 * ch + -4.4514E-08 * ch**2



Spectrum : DISK:[RADCHEM.SCUSR.ARCHIVE]CAL_GAMMA5_PMP_8947.CNF;1
Calib Date: 19-SEP-1996 14:21
Detector : GAMMA5 Geometry: PMP
FWHM = 0.479 + 0.04048 * SQRT(Energy)

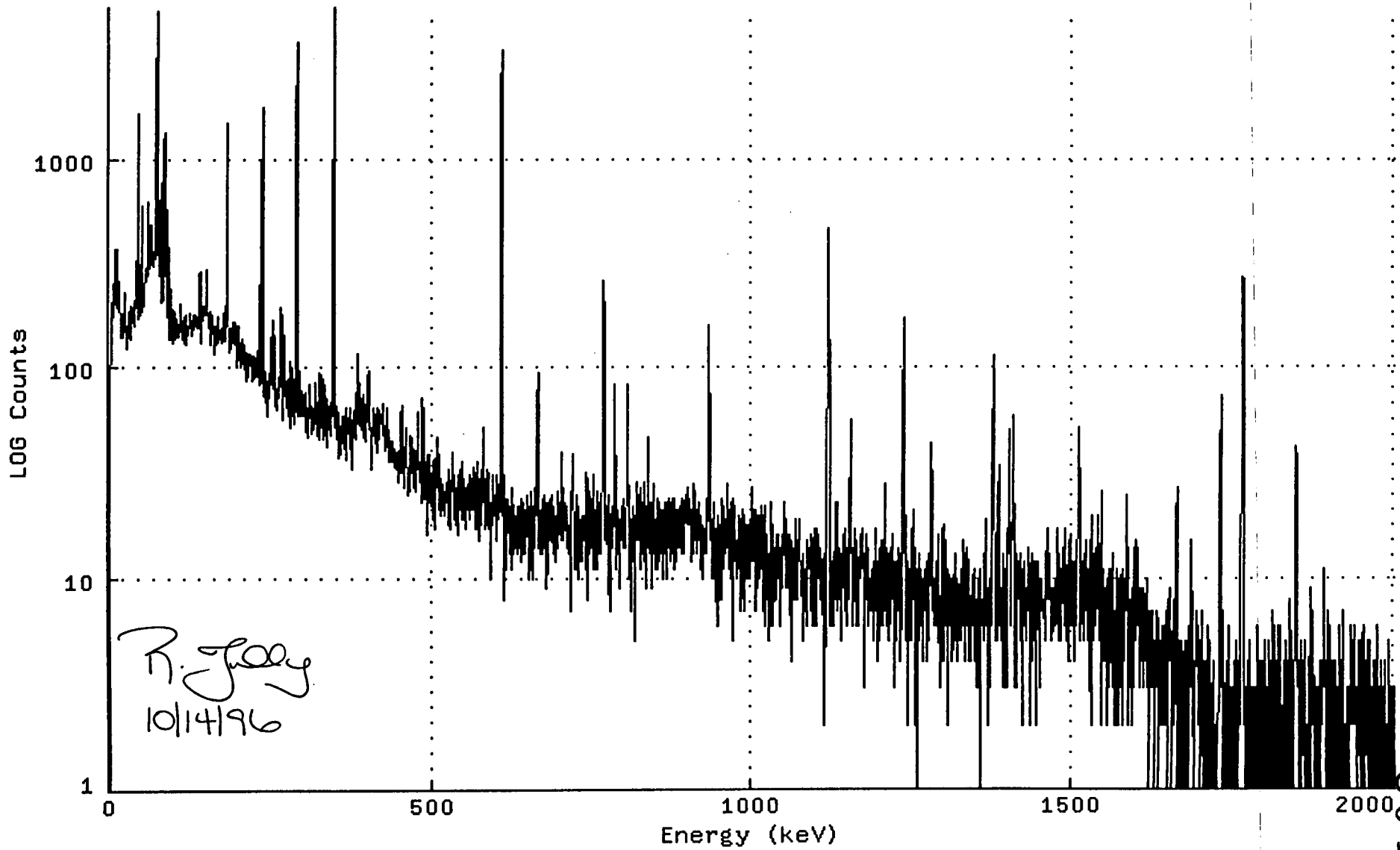


Spectrum : DISK:[RADCHEM.SCUSR.ARCHIVE]CAL_GAMMA5_PMP_8947.CNF;1
Calib Date: 19-SEP-1996 14:21
Detector : GAMMA5 Geometry : PMP
Fit type : 2 Deg. Empirical



R. Gilly
10/14/96

Spectrum : DISK:[RADCHEM.SCUSR.ARCHIVE]CAL_GAMMA5_9156.CNF;1
Title :
Sample Title:
Start Time: 8-OCT-1996 12:27: Sample Time: 4-OCT-1996 00:00: Energy Offset: -5.65841E-01
Real Time : 0 00:10:05.08 Sample ID : BCKGND Energy Slope : 4.88823E-01
Live Time : 0 00:10:00.00 Sample Type: Energy Quad : -8.49185E-08



R. Gray
10/14/96

80019

0003121153

VMS Peak Search Report V1.9 Generated 11-OCT-1996 11:52:23

8019

Configuration : DISK:[RADCHEM.SCUSR.ARCHIVE]CAL_GAMMA5_9156.CNF;1
Analyses by : PEAK V16.5,PEAKEFF V2.2
Sample date : 4-OCT-1996 00:00:00 Acquisition date : 8-OCT-1996 12:27:57
Sample ID : BCKGND Sample quantity : 1.0000 G
Detector name : GAMMA5 Detector geometry: TRM1-S3
Elapsed live time: 0 00:10:00.00 Elapsed real time: 0 00:10:05.08 0.8%
Start energy : -0.08 keV End energy : 2000.23 keV
Sensitivity : 5.00 Gaussian : 10.00
Critical level : No

Pk	It	Energy	Area	Bkgnd	FWHM	Channel	%Eff	Cts/Sec	%Err	Fit
1	0	12.85	318	817	0.90	27.45	6.05E+02	5.30E-01	13.9	
2	0	15.55	470	1371	1.11	32.96	8.83E+01	7.84E-01	13.9	
3	0	27.17	163	860	0.74	56.75	6.45E+00	2.72E-01	29.7	
4	0	46.47	2711	1515	0.89	96.22	4.93E+00	4.52E+00	3.1	
5	0	50.05	307	1130	1.22	103.56	5.10E+00	5.12E-01	18.2	
6	0	53.27	708	1591	0.83	110.14	5.27E+00	1.18E+00	10.5	
7	0	63.21	617	2181	0.96	130.47	5.85E+00	1.03E+00	13.2	
8	0	67.58	401	2553	1.01	139.41	6.10E+00	6.68E-01	22.4	
9	3	74.77	4811	1597	0.87	154.13	6.47E+00	8.02E+00	1.9	5.95E+00
10	3	77.05	8300	1619	0.86	158.80	6.57E+00	1.38E+01	1.3	
11	3	79.27	514	1308	0.68	163.32	6.67E+00	8.57E-01	10.9	
12	0	81.32	284	1576	0.60	167.52	6.75E+00	4.74E-01	21.6	
13	3	83.77	1270	1070	0.89	172.54	6.85E+00	2.12E+00	4.8	3.75E+00
14	3	87.19	2807	1506	1.11	179.53	6.97E+00	4.68E+00	3.0	
15	3	89.79	1067	1512	1.11	184.85	7.05E+00	1.78E+00	7.0	
16	5	92.55	874	1098	0.95	190.50	7.12E+00	1.46E+00	6.9	3.22E+00
17	5	94.59	455	1010	1.25	194.67	7.17E+00	7.58E-01	12.4	
[illegible]	0	97.81	178	1089	0.98	201.26	7.24E+00	2.97E-01	31.5	
[illegible]	0	143.92	313	1479	1.19	295.59	7.16E+00	5.21E-01	22.9	
20	0	154.22	256	1450	1.02	316.67	6.97E+00	4.26E-01	26.6	
21	0	186.22	2895	1730	1.01	382.14	6.26E+00	4.83E+00	3.4	
22	0	236.18	273	977	0.94	484.36	5.13E+00	4.54E-01	22.3	
23	0	242.04	3703	904	1.02	496.35	5.01E+00	6.17E+00	2.3	
24	2	256.32	157	481	1.03	525.56	4.72E+00	2.62E-01	23.5	2.13E+00
25	2	259.10	256	616	1.37	531.25	4.67E+00	4.27E-01	18.0	
26	1	269.62	313	574	1.26	552.77	4.48E+00	5.22E-01	14.9	3.76E+00
27	1	271.27	238	423	1.05	556.15	4.45E+00	3.97E-01	16.0	
28	0	274.58	210	577	1.07	562.92	4.39E+00	3.50E-01	20.9	
29	0	295.27	8149	599	1.11	605.27	4.05E+00	1.36E+01	1.2	
30	0	333.74	83	403	1.70	683.98	3.52E+00	1.38E-01	41.8	
31	0	351.97	13102	786	1.17	721.28	3.31E+00	2.18E+01	1.0	
32	0	388.19	202	680	2.79	795.40	2.95E+00	3.37E-01	26.6	
33	2	402.11	145	436	1.58	823.89	2.83E+00	2.41E-01	28.5	1.58E+00
34	2	404.93	163	421	1.59	829.66	2.80E+00	2.72E-01	25.7	
35	0	455.31	104	326	1.28	932.74	2.44E+00	1.73E-01	34.1	
36	0	480.54	82	289	1.30	984.37	2.30E+00	1.36E-01	39.3	
37	0	487.32	103	314	1.24	998.25	2.26E+00	1.72E-01	34.8	
38	0	580.33	90	233	1.14	1188.60	1.88E+00	1.50E-01	33.3	
39	0	609.41	9179	252	1.37	1248.11	1.79E+00	1.53E+01	1.1	
40	0	665.35	284	220	1.51	1362.61	1.64E+00	4.73E-01	12.6	
41	0	703.14	74	193	1.30	1439.96	1.57E+00	1.23E-01	38.4	
42	0	768.36	821	305	1.53	1573.45	1.46E+00	1.37E+00	5.9	
43	0	785.96	206	176	1.32	1609.48	1.43E+00	3.43E-01	14.3	
44	0	806.39	242	196	1.49	1651.29	1.40E+00	4.04E-01	13.9	

Sample ID : BCKGND Acquisition date : 8-OCT-1996 12:27:57

8019

Pk	It	Energy	Area	Bkgnd	FWHM	Channel	%Eff	Cts/Sec	%Err	Fit
[illegible]	0	839.50	94	212	1.67	1719.05	1.36E+00	1.56E-01	33.6	
46	0	934.21	419	247	1.43	1912.94	1.27E+00	6.98E-01	9.2	
47	0	1120.31	1885	142	1.85	2293.93	1.15E+00	3.14E+00	2.7	
48	0	1155.39	249	162	2.15	2365.75	1.13E+00	4.14E-01	13.8	
49	0	1238.16	687	116	1.92	2535.21	1.09E+00	1.14E+00	5.2	
50	0	1280.87	163	120	2.16	2622.67	1.08E+00	2.72E-01	16.6	
51	0	1377.53	499	129	2.22	2820.59	1.04E+00	8.32E-01	7.0	
52	0	1385.41	121	107	2.09	2836.73	1.04E+00	2.02E-01	21.5	
53	1	1401.55	200	87	2.29	2869.79	1.04E+00	3.33E-01	12.1	1.66E+00
54	1	1407.81	233	87	2.12	2882.60	1.03E+00	3.88E-01	10.4	
55	0	1508.94	239	106	2.53	3089.71	1.00E+00	3.98E-01	11.8	
56	4	1537.68	55	133	3.16	3148.55	9.94E-01	9.12E-02	51.6	1.69E+00
57	4	1543.51	70	57	1.71	3160.49	9.92E-01	1.16E-01	23.2	
58	0	1583.83	73	100	0.82	3243.08	9.80E-01	1.22E-01	35.5	
59	0	1661.16	112	38	1.65	3401.45	9.58E-01	1.86E-01	15.1	
60	0	1729.61	335	49	2.40	3541.66	9.37E-01	5.58E-01	7.6	
61	0	1764.47	1413	52	2.31	3613.05	9.27E-01	2.36E+00	2.9	
62	0	1847.57	218	32	2.46	3783.28	9.02E-01	3.63E-01	9.3	

VMS Calibration Report V1.5 Generated 11-OCT-1996 11:52:25

8019

Configuration : DISK:[RADCHEM.SCUSR.ARCHIVE]CAL_GAMMA5_9156.CNF;1
Analyses by : CALIBRATE V1.7,PEAK V16.5,PEAKEFF V2.2
Detector Name : Energy Calib Time: 8-OCT-1996 12:40:10
Efficiency type : Empirical Effncy Calib Time: 19-SEP-1996 11:45:10
Detector Geometry: TRM1-S3 Shelf :

Energy Calibration Report

Energy = -0.5658 + 0.4888*Channel + -8.4919E-08*(Channel**2)

Nbr	Centroid Channel	True Energy	Computed Energy	Difference
1	96.22	46.50	46.47	0.034
2	154.13	74.81	74.77	0.041
3	158.80	77.11	77.05	0.053
4	382.14	186.21	186.22	-0.009
5	605.27	295.21	295.27	-0.059
6	721.28	351.92	351.97	-0.049
7	1248.11	609.31	609.41	-0.094
8	1362.61	665.45	665.35	0.100
9	1573.45	768.36	768.36	-0.004
10	1912.94	934.06	934.21	-0.151
11	2293.87	1120.29	1120.28	0.002
12	2365.75	1155.19	1155.39	-0.204
13	2535.21	1238.11	1238.16	-0.045
14	2622.67	1280.96	1280.87	0.088
15	2820.59	1377.67	1377.53	0.142
16	2882.60	1407.98	1407.81	0.171
17	3089.71	1509.23	1508.94	0.286
[illegible]	3401.45	1661.00	1661.16	-0.160
19	3541.66	1729.59	1729.61	-0.016
20	3613.05	1764.49	1764.47	0.026
21	3783.28	1847.42	1847.57	-0.153

FWHM Calibration Report

FWHM = 0.4154 + 4.4515E-02*(Energy**1/2)

Nbr	Energy	True FWHM	Computed FWHM	Difference
1	46.50	0.89	0.72	0.167
2	74.81	0.87	0.80	0.068
3	77.11	0.86	0.81	0.052
4	186.21	1.01	1.02	-0.008
5	295.21	1.11	1.18	-0.073
6	351.92	1.17	1.25	-0.079
7	609.31	1.37	1.51	-0.148
8	665.45	1.51	1.56	-0.057
9	768.36	1.53	1.65	-0.121
10	934.06	1.43	1.78	-0.343
11	1120.29	1.85	1.91	-0.056
12	1155.19	2.15	1.93	0.220

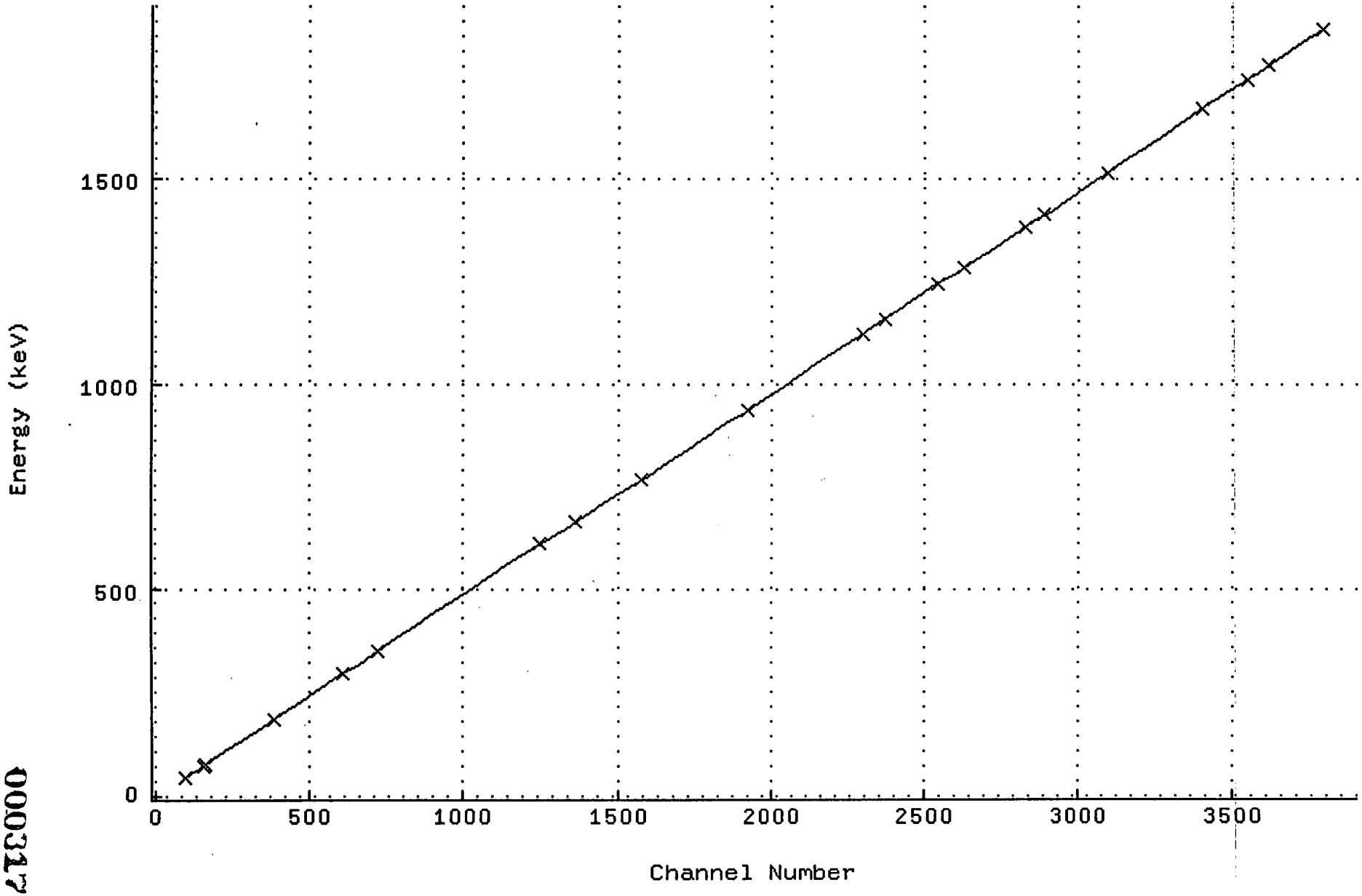
Sample ID : BCKGND Acquisition date : 8-OCT-1996 12:27:57

8019

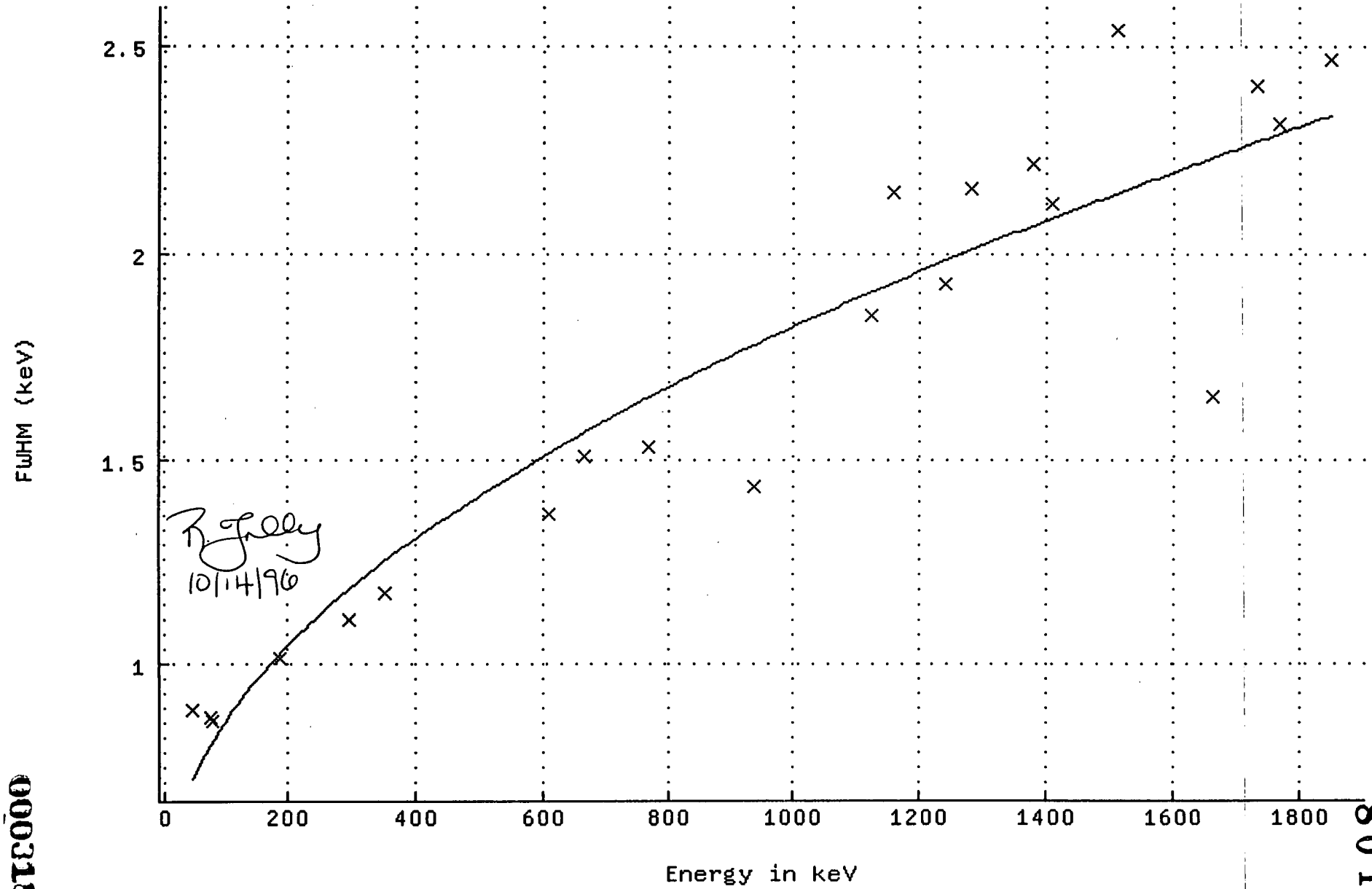
Nbr	Energy	True FWHM	Computed FWHM	Difference
[illegible]	1238.11	1.92	1.98	-0.057
14	1280.96	2.16	2.01	0.147
15	1377.67	2.22	2.07	0.148
16	1407.98	2.12	2.09	0.035
17	1509.23	2.53	2.14	0.389
18	1661.00	1.65	2.23	-0.580
19	1729.59	2.40	2.27	0.135
20	1764.49	2.31	2.29	0.025
21	1847.42	2.46	2.33	0.134

Approved by: _____ Approval Date: __ / __ / ____

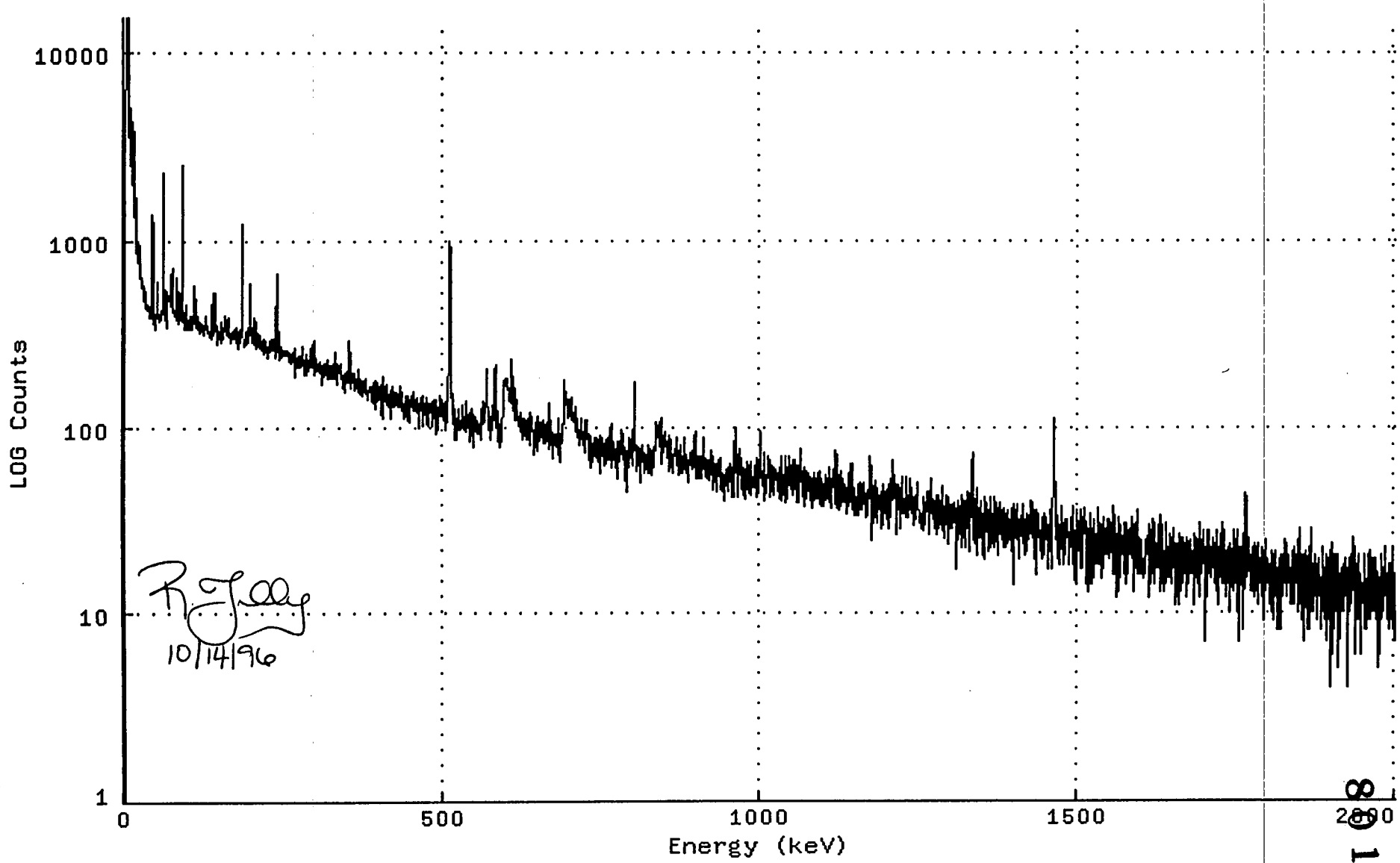
Spectrum : DISK:[RADCHEM.SCUSR.ARCHIVE]CAL_GAMMA5_9156.CNF;1
Calib Date: 8-OCT-1996 12:40:
Detector : GAMMA5 Geometry: TRM1-S3
Energy = -0.566 + 0.4888 * ch + -8.4919E-08 * ch**2



Spectrum : DISK:[RADCHEM.SCUSR.ARCHIVE]CAL_GAMMA5_9156.CNF;1
Calib Date: 8-OCT-1996 12:40:
Detector : GAMMA5 Geometry: TRM1-S3
FWHM = 0.415 + 0.04452 * SQRT(Energy)



Spectrum : DISK:[RADCHEM.SCUSR.ARCHIVE]BKG_BCKGND_GAMMA5__9143.CNF;1
Title :
Sample Title:
Start Time: 4-OCT-1996 18:20: Sample Time: 4-OCT-1996 00:00: Energy Offset: -5.37244E-01
Real Time : 2 02:01:07.08 Sample ID : BCKGND Energy Slope : 4.88756E-01
Live Time : 2 02:00:00.00 Sample Type: Energy Quad : -7.07146E-08



R J Lay
10/14/96

VMS Peak Search Report V1.9 Generated 11-OCT-1996 11:53:08

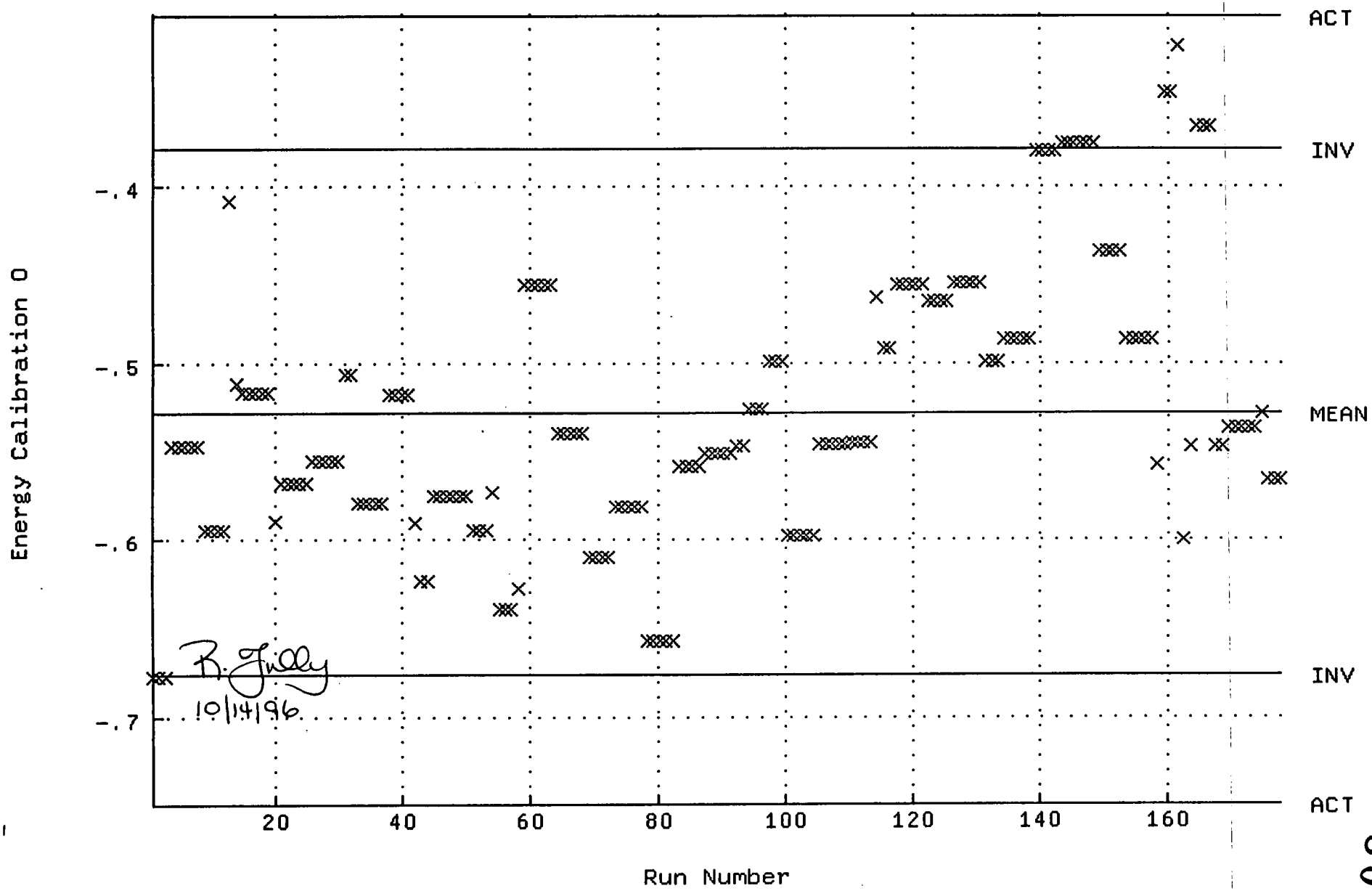
8019

Configuration : DISK:[RADCHEM.SCUSR.ARCHIVE]BKG_BCKGND_GAMMA5__9143.CNF;1
Analyses by : PEAK V16.5,PEAKEFF V2.2
Sample date : 4-OCT-1996 00:00:00 Acquisition date : 4-OCT-1996 18:20:18
Sample ID : BCKGND Sample quantity : 1.0000 G
Detector name : GAMMA5 Detector geometry: TRM1-S3
Elapsed live time: 2 02:00:00.00 Elapsed real time: 2 02:01:07.08 0.0%
Start energy : -0.05 keV End energy : 2000.22 keV
Sensitivity : 5.00 Gaussian : 10.00
Critical level : No

Pk	It	Energy	Area	Bkgnd	FWHM	Channel	%Eff	Cts/Sec	%Err	Fit
1	0	7.76	24064	42790	1.54	16.98	6.55E+06	1.34E-01	1.5	
2	0	10.38	4115	15170	0.84	22.34	1.32E+04	2.29E-02	4.8	
3	0	13.03	4183	13266	0.86	27.77	5.13E+02	2.32E-02	4.7	
4	0	16.22	6461	11688	1.08	34.29	6.28E+01	3.59E-02	3.1	
5	0	19.25	1233	6158	0.89	40.48	2.09E+01	6.85E-03	10.0	
6	0	23.34	285	5186	1.44	48.85	9.40E+00	1.58E-03	40.4	
7	0	26.04	437	4406	1.08	54.38	7.03E+00	2.43E-03	24.7	
8	0	46.55	1927	3150	0.94	96.35	4.94E+00	1.07E-02	5.5	
9	0	53.64	405	3070	0.98	110.85	5.29E+00	2.25E-03	24.2	
10	4	63.34	3752	1877	0.81	130.70	5.86E+00	2.08E-02	2.4	1.10E+00
11	4	66.28	535	2846	1.28	136.72	6.02E+00	2.97E-03	18.1	
12	0	69.74	385	3435	1.87	143.79	6.21E+00	2.14E-03	26.7	
13	0	74.19	134	3061	0.84	152.90	6.44E+00	7.44E-04	65.8	
14	0	77.07	495	2625	0.94	158.79	6.57E+00	2.75E-03	17.0	
15	0	84.43	698	3059	1.37	173.85	6.87E+00	3.88E-03	14.2	
16	0	87.20	283	2253	0.85	179.52	6.97E+00	1.57E-03	27.2	
17	0	92.67	4997	3152	1.09	190.71	7.12E+00	2.78E-02	2.4	
18	0	98.25	195	2385	0.93	202.14	7.25E+00	1.09E-03	42.0	
19	0	109.75	354	2985	0.75	225.66	7.39E+00	1.97E-03	27.2	
20	0	112.82	230	1804	0.95	231.93	7.40E+00	1.28E-03	28.5	
21	0	139.81	682	3118	1.12	287.16	7.22E+00	3.79E-03	15.8	
22	0	143.66	424	2282	1.06	295.05	7.16E+00	2.35E-03	19.3	
23	0	185.85	2020	3123	1.02	381.36	6.27E+00	1.12E-02	5.6	
24	4	197.16	456	1487	0.89	404.51	6.00E+00	2.53E-03	13.8	4.49E-01
25	4	198.38	665	1790	1.04	407.00	5.98E+00	3.69E-03	11.2	
26	0	205.33	188	1689	0.96	421.24	5.81E+00	1.04E-03	35.4	
27	0	238.76	908	2089	1.08	489.64	5.07E+00	5.05E-03	9.3	
28	0	295.36	179	1472	1.03	605.47	4.05E+00	9.94E-04	36.3	
29	0	352.05	298	1202	1.06	721.47	3.31E+00	1.65E-03	20.2	
30	0	511.06	4724	2215	2.53	1046.88	2.15E+00	2.62E-02	2.7	
31	0	569.99	434	1409	1.55	1167.50	1.91E+00	2.41E-03	18.5	
32	0	583.39	294	1218	1.25	1194.92	1.87E+00	1.64E-03	23.7	
33	0	609.48	299	1186	1.30	1248.33	1.79E+00	1.66E-03	21.5	
34	0	669.54	124	741	1.38	1371.25	1.64E+00	6.91E-04	40.4	
35	4	693.56	349	1136	2.18	1420.41	1.58E+00	1.94E-03	21.4	3.27E+00
36	4	696.97	189	993	1.80	1427.39	1.58E+00	1.05E-03	34.4	
37	4	702.45	192	1226	2.19	1438.62	1.57E+00	1.07E-03	38.5	
38	0	803.05	377	759	1.66	1644.53	1.41E+00	2.09E-03	15.0	
39	0	962.14	241	859	2.17	1970.22	1.25E+00	1.34E-03	28.6	
40	0	1120.02	105	385	1.77	2293.42	1.15E+00	5.83E-04	35.1	
41	0	1331.87	136	353	2.38	2727.21	1.06E+00	7.54E-04	28.1	
42	0	1460.47	320	376	1.75	2990.52	1.02E+00	1.78E-03	14.0	
43	0	1764.72	128	183	2.41	3613.62	9.27E-01	7.11E-04	23.0	

R. Jeffy
10/14/96

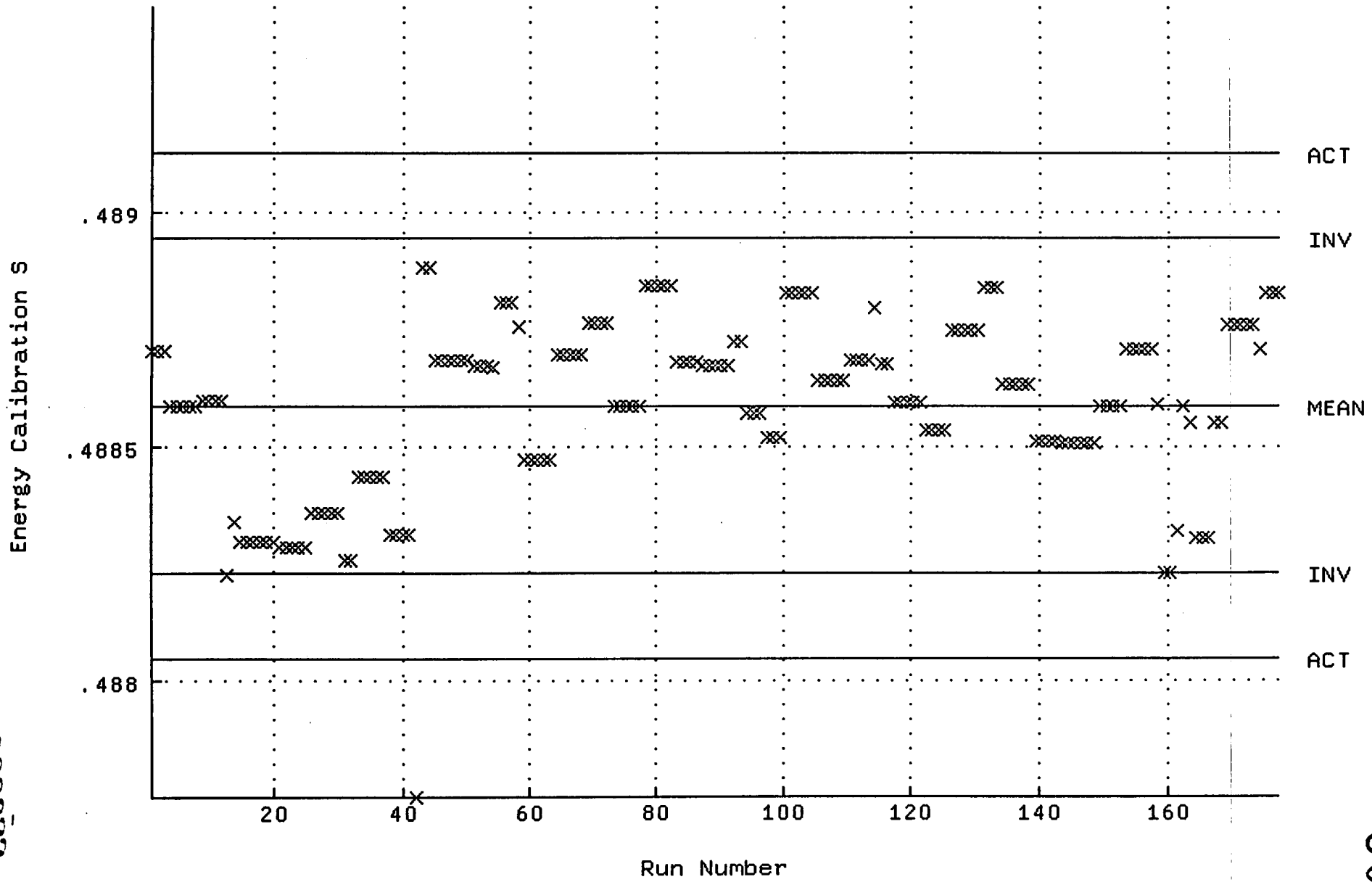
QA filename : DISK:[RADCHEM.SCUSR.QA]QCC_GAMMA5_CZ588.QAF;2
Parameter Name : ECOFFSET (Energy Calibration Offset)
Start/End Dates : 2-JAN-1996 08:23:01 through 10-OCT-1996 08:30:47
Mean +- Std Dev : -0.527460 +- 7.406983E-02 (-14.04 %)



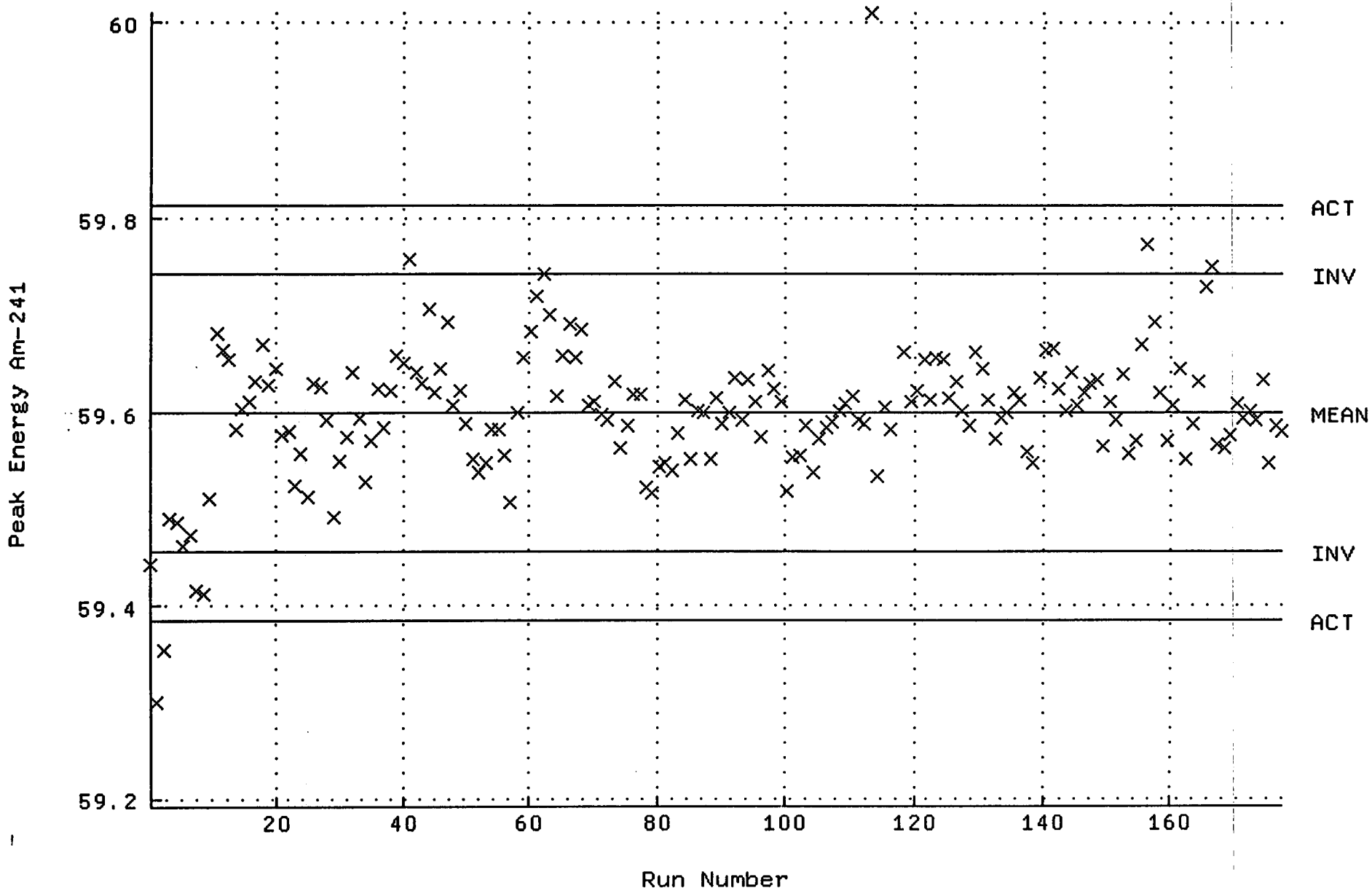
000321 162

80 19

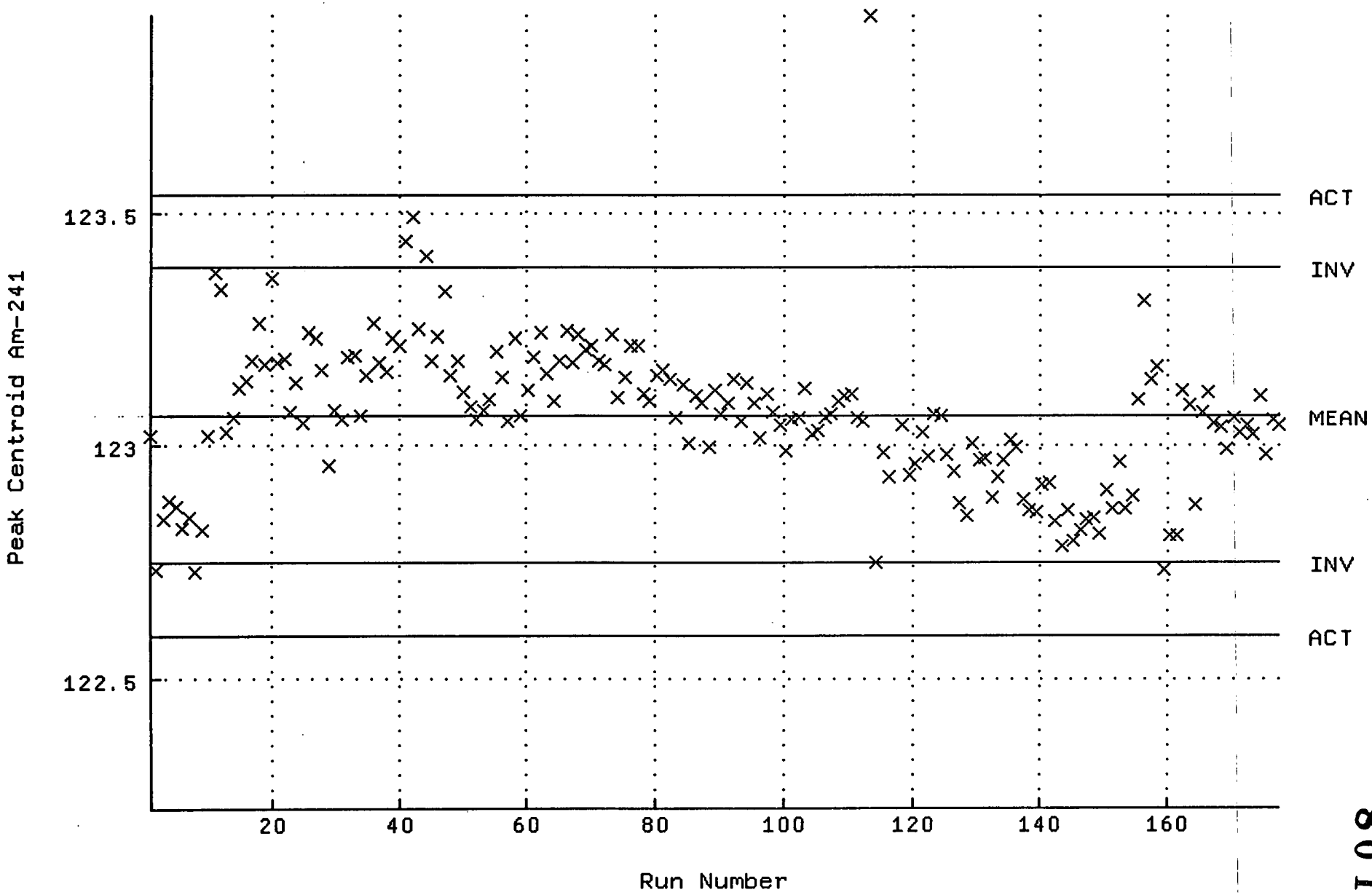
QA filename : DISK:[RADCHEM.SCUSR.QA]QCC_GAMMA5_CZ588.QAF;2
Parameter Name : ECSLOPE (Energy Calibration Slope)
Start/End Dates : 2-JAN-1996 08:23:01 through 10-OCT-1996 08:30:47
Mean +- Std Dev : 0.488588 +- 1.800091E-04 (0.04 %)



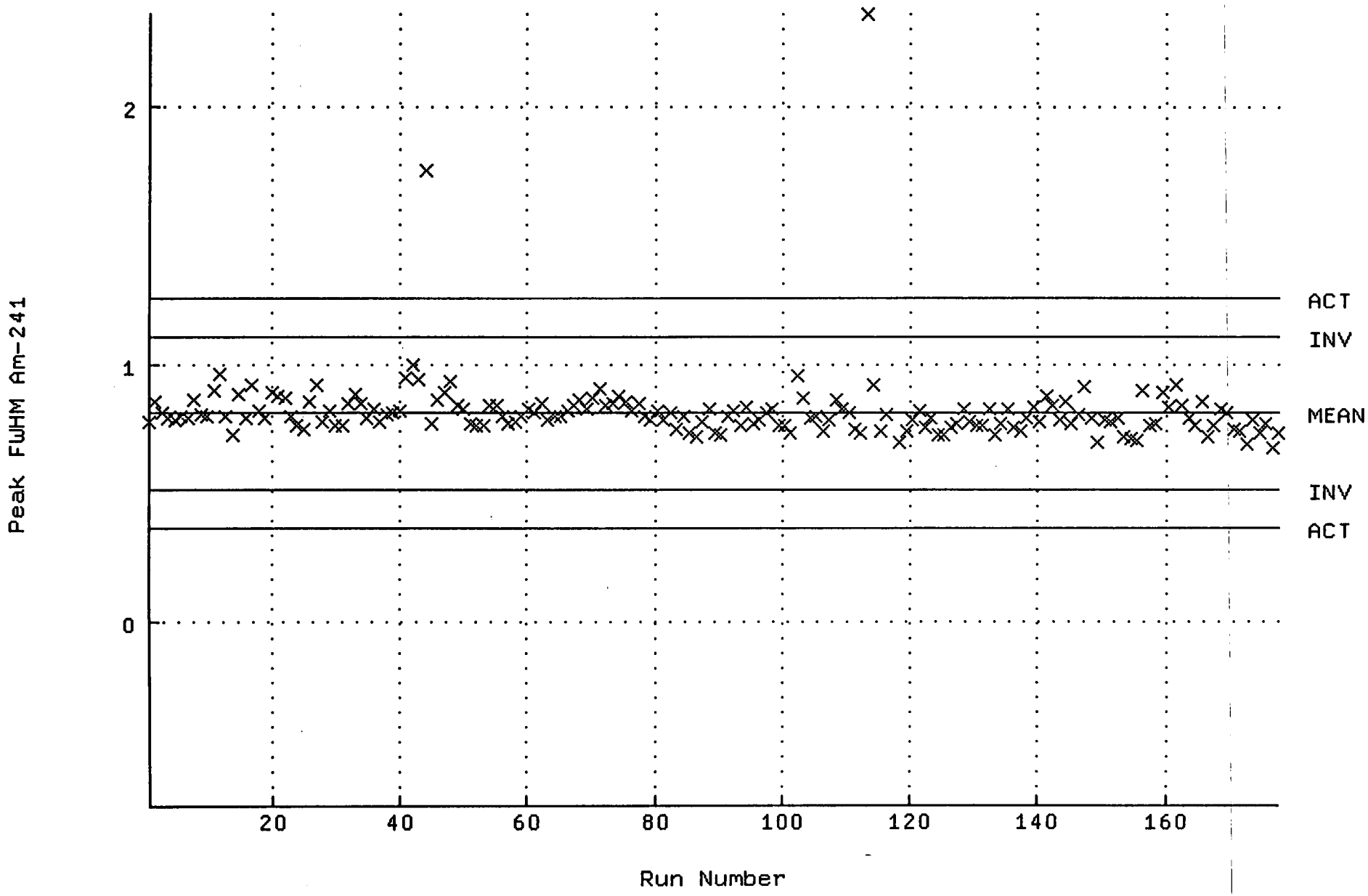
QA filename : DISK:[RADCHEM.SCUSR.QA]QCC_GAMMA5_CZ588.QAF;2
Parameter Name : PSENERGY-59 (Peak Energy Am-241)
Start/End Dates : 2-JAN-1996 08:23:01 through 10-OCT-1996 08:30:47
Mean +- Std Dev : 59.6003 +- 7.178374E-02 (0.12 %)



QA filename : DISK:[RADCHEM.SCUSR.QA]QCC_GAMMA5_CZ588.QAF;2
Parameter Name : PSCENTRD-59 (Peak Centroid Am-241)
Start/End Dates : 2-JAN-1996 08:23:01 through 10-OCT-1996 08:30:47
Mean +- Std Dev : 123.067 +- 0.158395 (0.13 %)



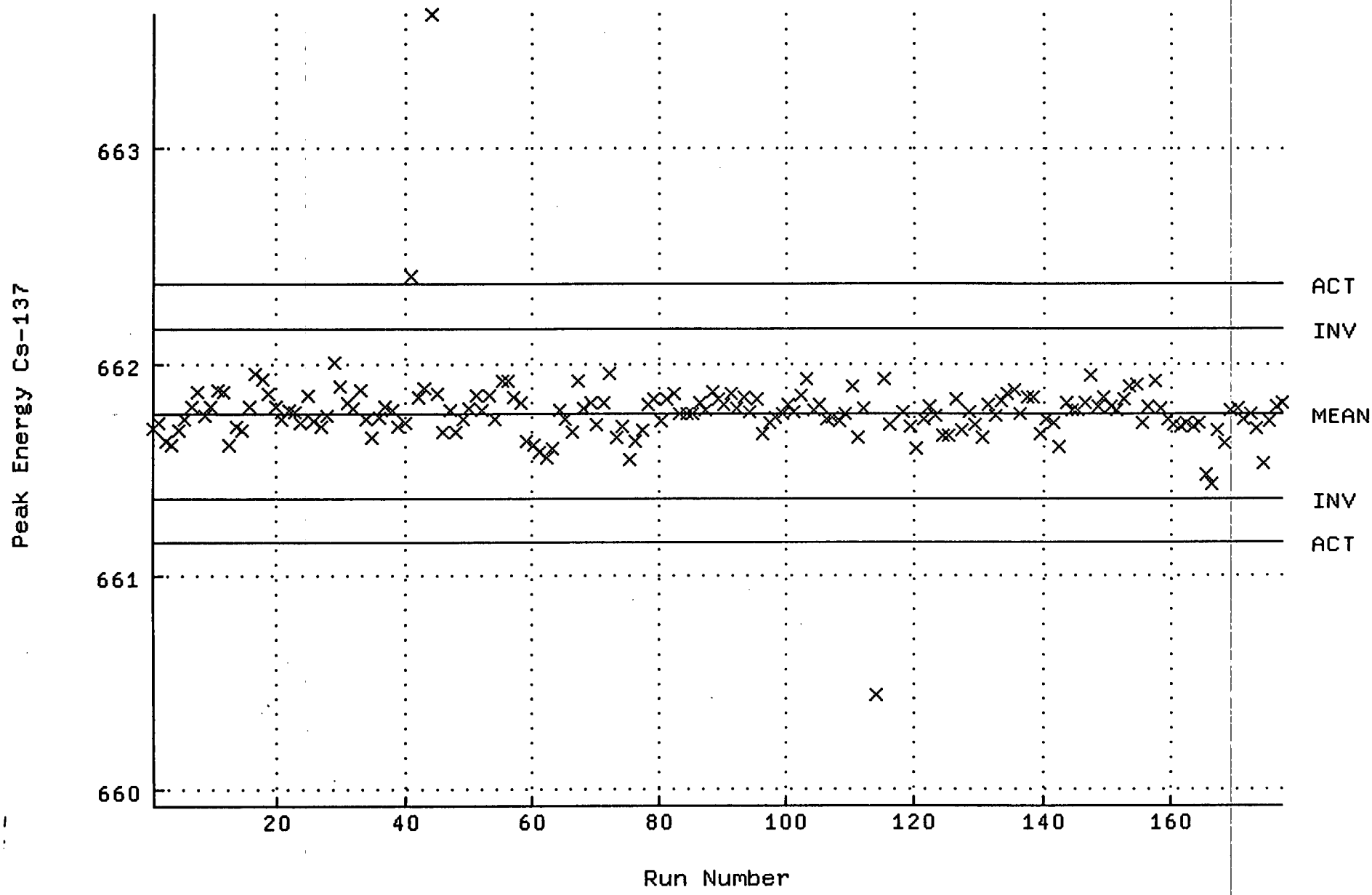
QA filename : DISK:[RADCHEM.SCUSR.QA]QCC_GAMMA5_CZ588.QAF;2
Parameter Name : PSFWHM-59 (Peak FWHM Am-241)
Start/End Dates : 2-JAN-1996 08:23:01 through 10-OCT-1996 08:30:47
Mean +- Std Dev : 0.819117 +- 0.148655 (18.15 %)



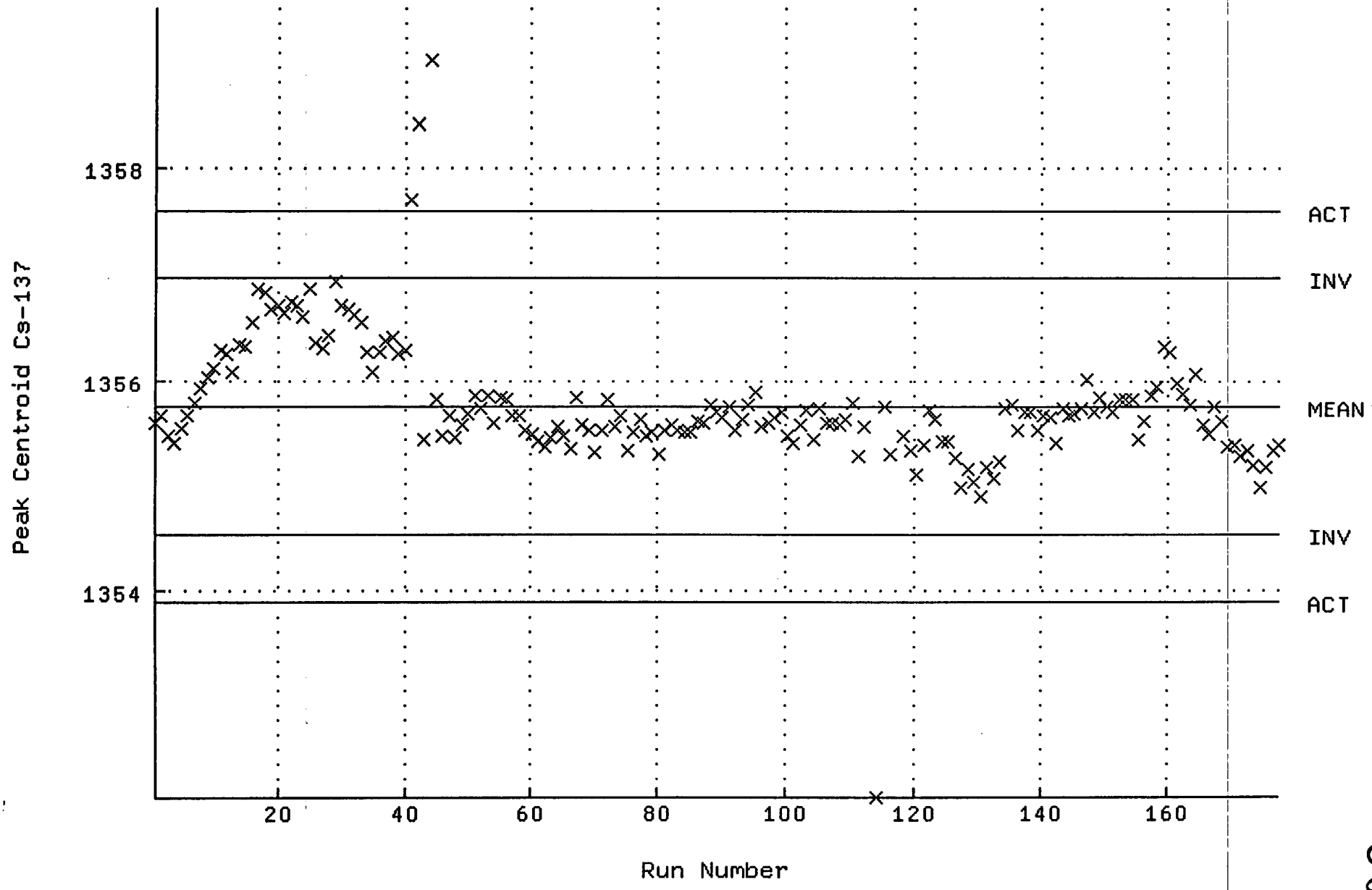
0003256

80019

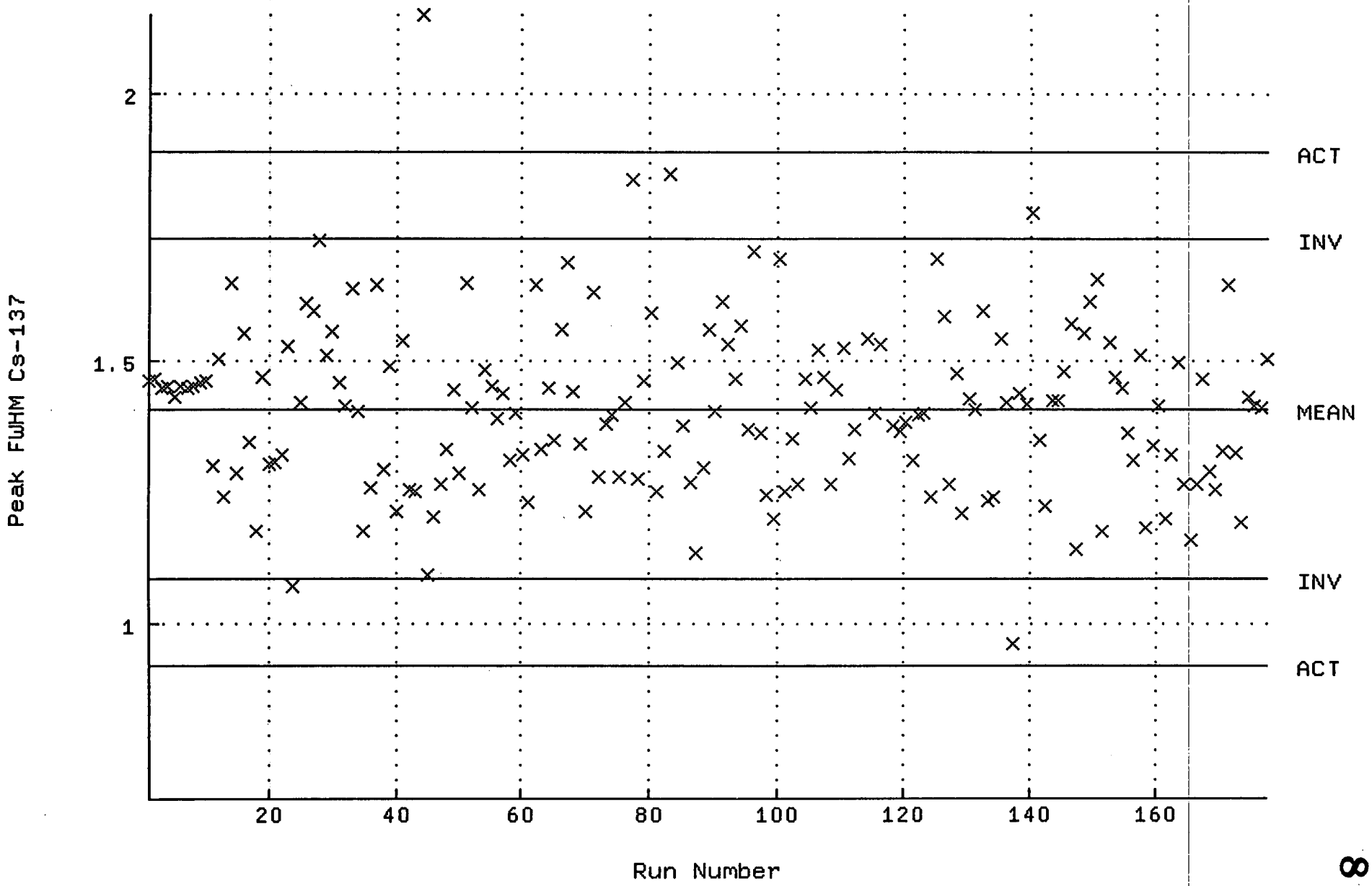
QA filename : DISK:[RADCHEM.SCUSR.QA]QCC_GAMMA5_CZ588.QAF;2
Parameter Name : PSENERGY-661 (Peak Energy Cs-137)
Start/End Dates : 2-JAN-1996 08:23:01 through 10-OCT-1996 08:30:47
Mean +- Std Dev : 661.765 +- 0.202026 (0.03 %)



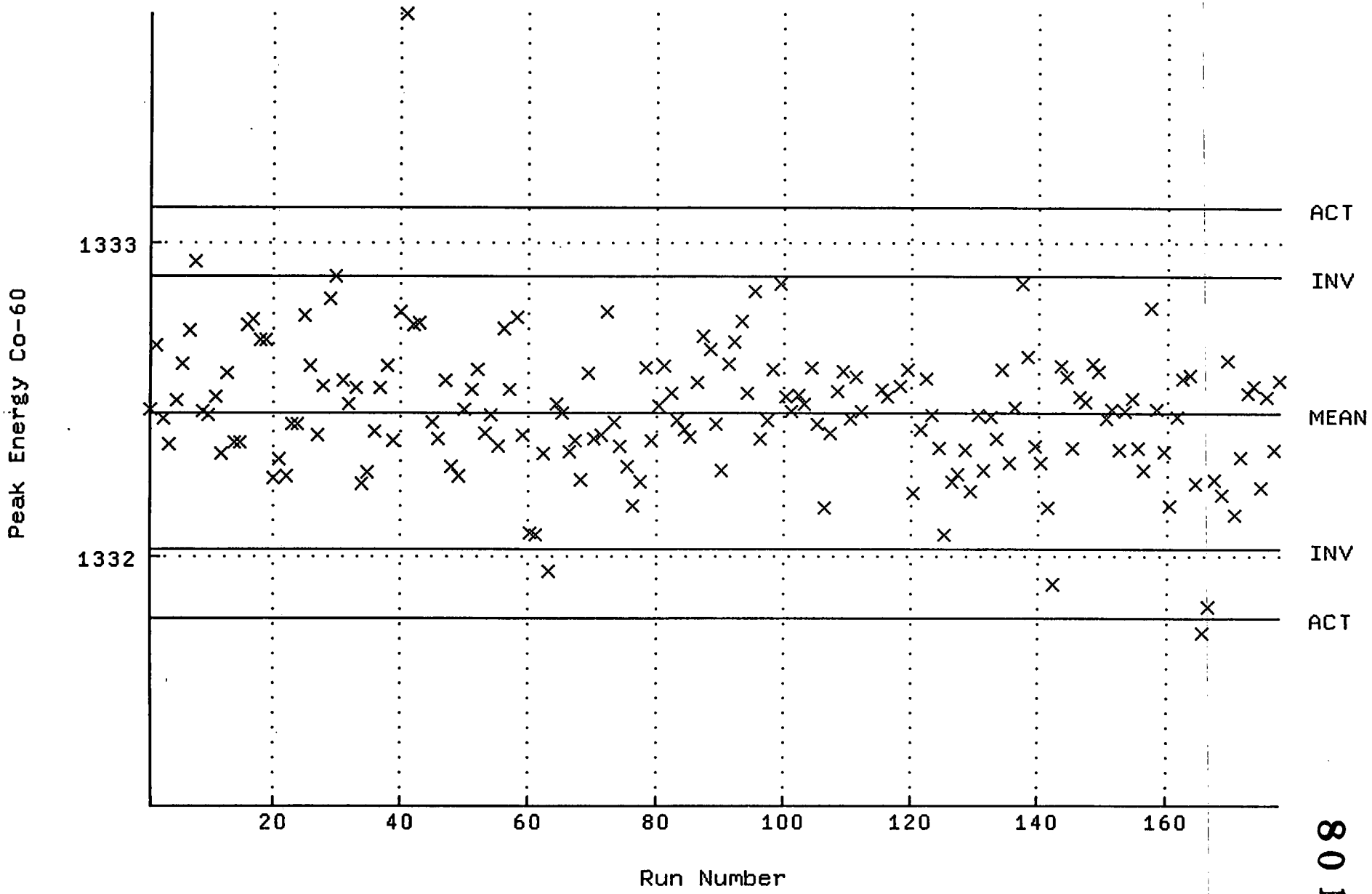
QA filename : DISK:[RADCHEM.SCUSR.QA]QCC_GAMMA5_CZ588.QAF;2
Parameter Name : PSCENTRD-661 (Peak Centroid Cs-137)
Start/End Dates : 2-JAN-1996 08:23:01 through 10-OCT-1996 08:30:47
Mean +- Std Dev : 1355.76 +- 0.613679 (0.05 %)



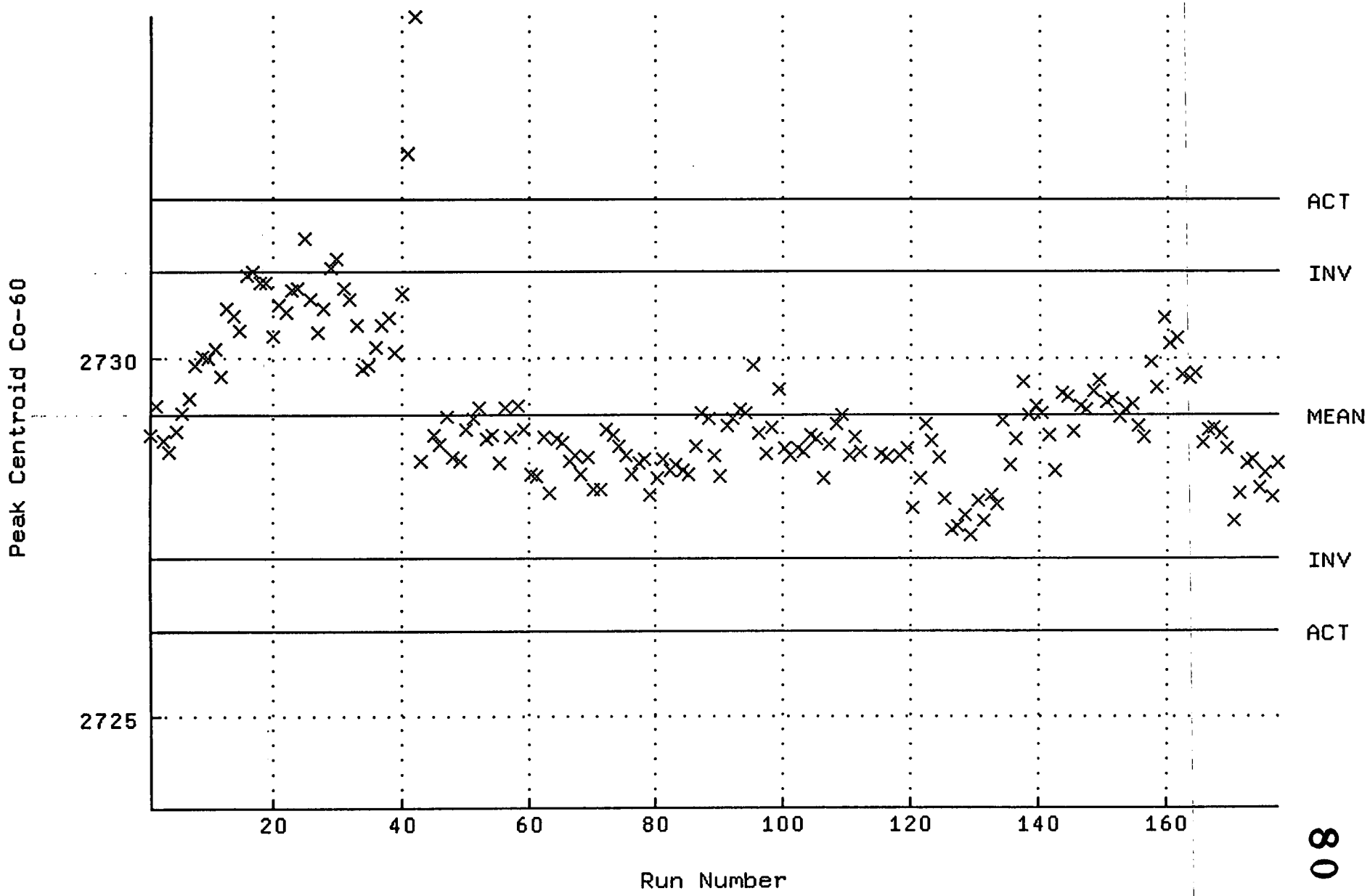
QA filename : DISK:[RADCHEM.SCUSR.QA]QCC_GAMMA5_CZ588.QAF;2
Parameter Name : PSFWHM-661 (Peak FWHM Cs-137)
Start/End Dates : 2-JAN-1996 08:23:01 through 10-OCT-1996 08:30:47
Mean +- Std Dev : 1.40811 +- 0.161421 (11.46 %)



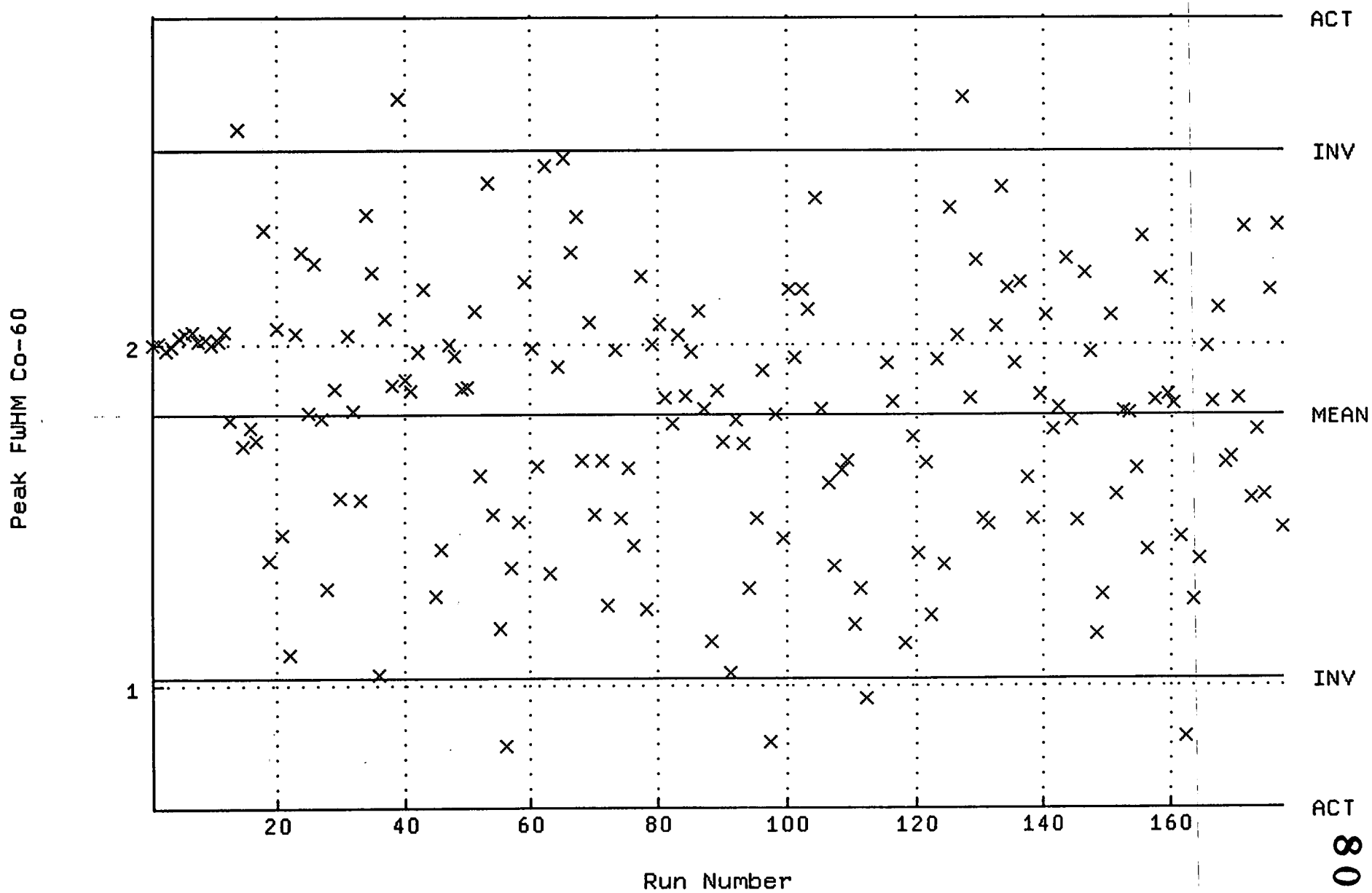
QA filename : DISK:[RADCHEM.SCUSR.QA]QCC_GAMMA5_CZ588.QAF;2
Parameter Name : PSENERGY-1332 (Peak Energy Co-60)
Start/End Dates : 2-JAN-1996 08:23:01 through 10-OCT-1996 08:30:47
Mean +- Std Dev : 1332.46 +- 0.218363 (0.02 %)



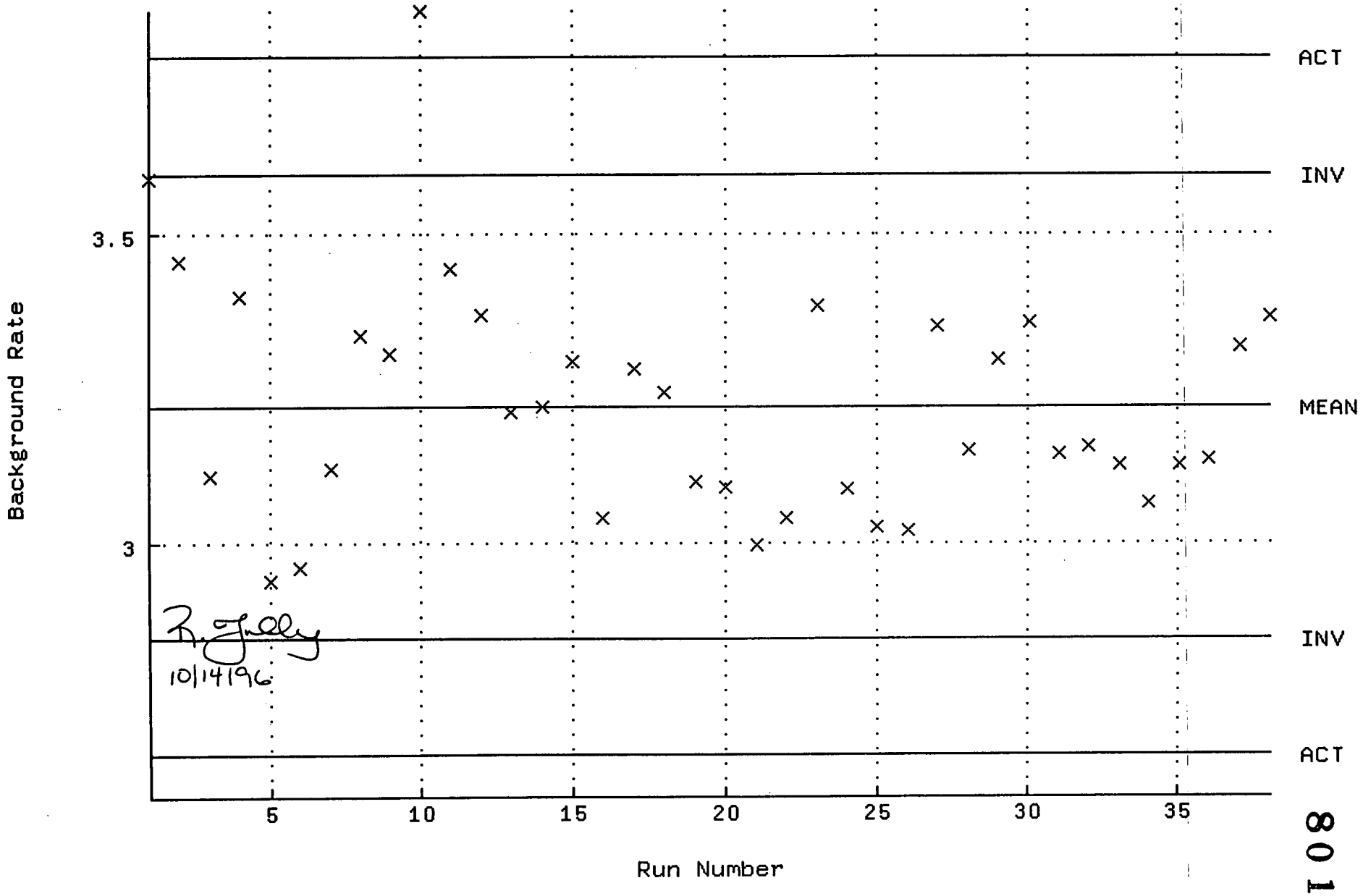
QA filename : DISK:[RADCHEM.SCUSR.QA]QCC_GAMMA5_CZ588.QAF;2
Parameter Name : PSCENTRD-1332 (Peak Centroid Co-60)
Start/End Dates : 2-JAN-1996 08:23:01 through 10-OCT-1996 08:30:47
Mean +- Std Dev : 2729.21 +- 1.00620 (0.04 %)



QA filename : DISK:[RADCHEM.SCUSR.QA]QCC_GAMMA5_CZ588.QAF;2
Parameter Name : PSFWHM-1332 (Peak FWHM Co-60)
Start/End Dates : 2-JAN-1996 08:23:01 through 10-OCT-1996 08:30:47
Mean +- Std Dev : 1.79432 +- 0.384175 (21.41 %)



QA filename : DISK:[RADCHEM.SCUSR.QA]QCB_GAMMA5_EMPTY.QAF;2
Parameter Name : BACKRATE (Background Rate)
Start/End Dates : 29-DEC-1995 14:37:29 through 4-OCT-1996 18:20:18
Mean +- Std Dev : 3.22352 +- 0.186083 (5.77 %)



R. Jolly
10/14/96

Library Title :
Library file name : DISK:[RADCHEM.SCUSR.LIB]HAYDEN.NLB;1
Date printed : 11-OCT-1996 11:56:07.71
Number of nuclides : 4
Number of lines : 43

8019

Nuclide Name	Half-Life	Nuclide Type	Key Line	Energy		Abundance
RA-226	1600.00Y	Natural	*	186.21	keV	3.28 %
RA-228	1.41E+10Y	Natural		209.28	keV	4.40 %
				270.23	keV	3.60 %
				327.64	keV	3.20 %
				338.32	keV	11.40 %
				463.00	keV	4.40 %
				794.70	keV	4.60 %
			*	911.07	keV	27.70 %
				964.60	keV	5.20 %
				969.11	keV	16.60 %
PA-231	3.28E+04Y	Natural		50.10	keV	31.70 %
				100.00	keV	1.11 %
				122.31	keV	1.19 %
				144.24	keV	3.24 %
				154.21	keV	5.58 %
				205.00	keV	1.08 %
				210.60	keV	1.26 %
				234.90	keV	2.80 %
				236.00	keV	11.50 %
				256.20	keV	6.30 %
				269.46	keV	13.60 %
				271.23	keV	10.60 %
				283.67	keV	1.60 %
				286.10	keV	1.60 %
				300.08	keV	2.30 %
				304.40	keV	1.35 %
				323.87	keV	3.88 %
				330.00	keV	1.30 %
				334.20	keV	1.15 %
				338.28	keV	2.73 %
			*	351.07	keV	12.94 %
				401.81	keV	6.50 %
				404.84	keV	2.90 %
				427.08	keV	1.30 %
				445.03	keV	1.18 %
				569.67	keV	0.54 %
				831.96	keV	2.90 %
				897.83	keV	0.24 %
				897.83	keV	0.52 %
U-235	7.04E+08Y	Natural		143.76	keV	10.50 %
				163.35	keV	4.70 %
			*	185.71	keV	54.00 %
				205.31	keV	4.70 %

R. Jolly
10/14/96

Print Time : 11-OCT-1996 11:56:09.18
Library file name : DISK:[RADCHEM.SCUSR.LIB]HAYDEN.NLB;1
Library title :

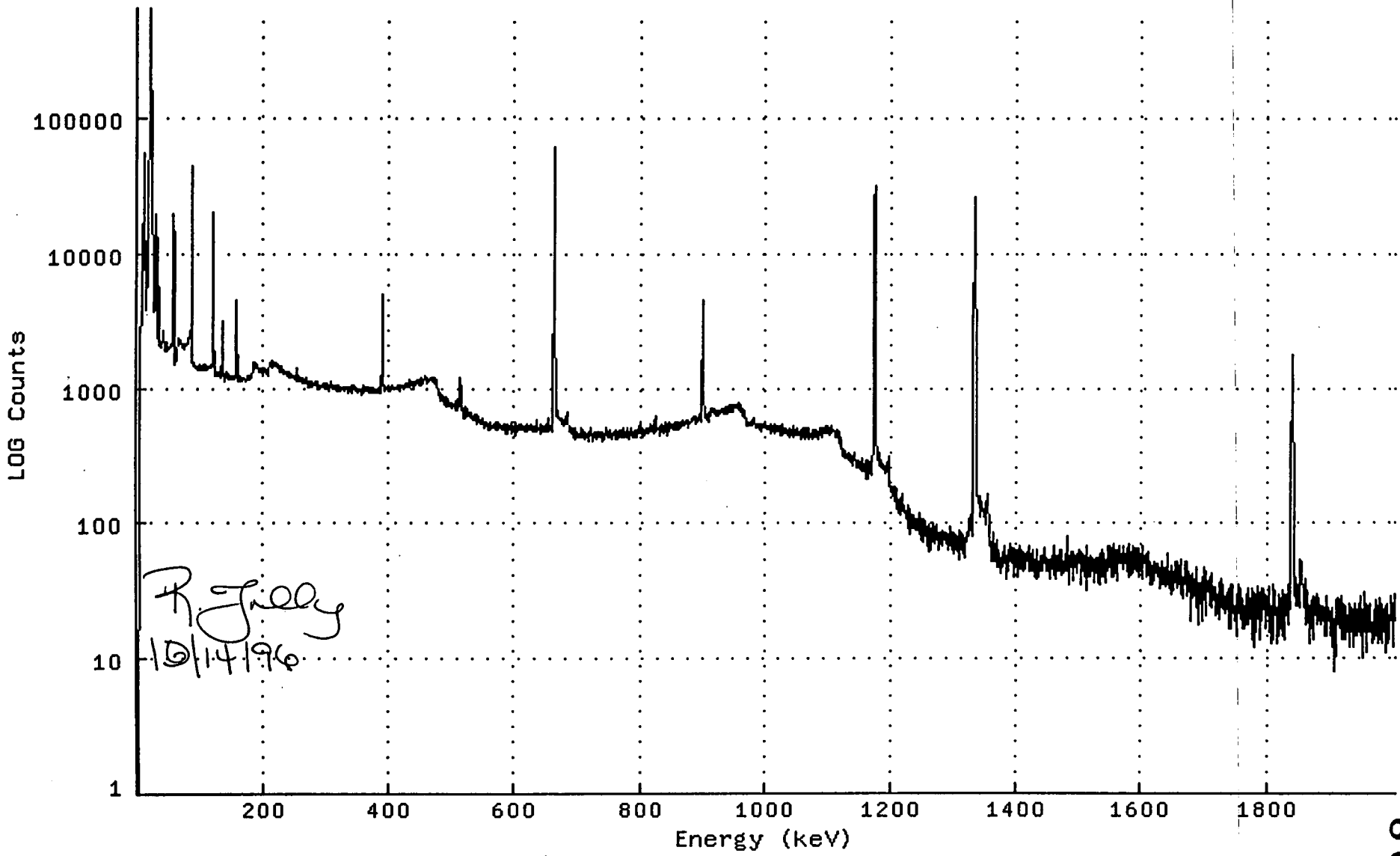
8019

Record	Interfering nuclide	Interfered nuclide
1	U-235	Ra-226
2	RA-228	Pa-231

R. Foley
10/14/96

00033475

Spectrum : DISK:[RADCHEM.SCUSR.ARCHIVE]CAL_GAMMA6_PMP_8957.CNF;1
Title :
Sample Title:
Start Time: 19-SEP-1996 14:37 Sample Time: 1-MAY-1995 12:00: Energy Offset: -1.51767E-01
Real Time : 0 00:21:38.69 Sample ID : PMP Energy Slope : 4.88648E-01
Live Time : 0 00:20:00.00 Sample Type: Energy Quad : -8.52076E-08



VMS Peak Search Report V1.9 Generated 11-OCT-1996 13:57:12

8019

Configuration : DISK:[RADCHEM.SCUSR.ARCHIVE]CAL_GAMMA6_PMP_8957.CNF;1
Analyses by : PEAK V16.5,PEAKEFF V2.2
Sample date : 1-MAY-1995 12:00:00 Acquisition date : 19-SEP-1996 14:37:15
Sample ID : PMP Sample quantity : 1.0000 L
Detector name : GAMMA6 Detector geometry: PMP
Elapsed live time: 0 00:20:00.00 Elapsed real time: 0 00:21:38.69 7.6%
Start energy : 0.34 keV End energy : 1999.92 keV
Sensitivity : 5.00 Gaussian : 10.00
Critical level : No

Pk	It	Energy	Area	Bkgnd	FWHM	Channel	%Eff	Cts/Sec	%Err	Fit
1	9	11.10	45673	28937	1.59	23.02	1.11E+00	3.81E+01	1.0	1.93E+02
2	9	12.14	89072	22647	0.91	25.16	1.35E+00	7.42E+01	0.5	
3	9	14.61	30574	37010	1.79	30.21	1.94E+00	2.55E+01	1.4	
4	3	21.96	1390494	71498	1.05	45.24	3.66E+00	1.16E+03	0.1	1.06E+04
5	3	24.83	329332	47780	1.07	51.12	4.25E+00	2.74E+02	0.2	
6	0	31.91	39636	33637	1.05	65.62	5.42E+00	3.30E+01	1.0	
7	0	36.47	9085	17730	1.13	74.95	5.99E+00	7.57E+00	2.8	
8	4	42.20	958	16197	1.24	86.67	6.54E+00	7.99E-01	23.5	5.15E+00
9	4	43.73	2172	15632	1.25	89.81	6.65E+00	1.81E+00	10.4	
10	0	49.59	926	13152	1.36	101.81	7.01E+00	7.71E-01	20.8	
11	0	59.49	35590	19446	0.92	122.05	7.36E+00	2.97E+01	0.9	
12	0	88.01	95561	16659	1.03	180.43	7.40E+00	7.96E+01	0.4	
13	0	122.06	38513	14923	0.95	250.11	6.79E+00	3.21E+01	0.8	
14	0	136.48	4850	11985	1.09	279.63	6.49E+00	4.04E+00	4.5	
15	0	158.99	7823	11544	1.05	325.70	6.03E+00	6.52E+00	2.8	
16	0	255.11	523	6860	0.92	522.42	4.46E+00	4.36E-01	25.4	
17	0	391.73	10236	9525	1.18	802.09	3.18E+00	8.53E+00	2.0	
18	0	514.03	1431	6468	1.35	1052.46	2.51E+00	1.19E+00	10.5	
19	0	661.72	185292	9266	1.44	1354.82	2.01E+00	1.54E+02	0.3	
[illegible]	0	683.49	324	4350	1.41	1399.39	1.95E+00	2.70E-01	35.9	
[illegible]	0	821.03	335	4373	0.96	1681.02	1.66E+00	2.79E-01	36.0	
22	0	898.04	13617	8350	1.62	1838.71	1.54E+00	1.13E+01	1.7	
23	0	1173.15	121168	5467	1.77	2402.12	1.23E+00	1.01E+02	0.3	
24	0	1332.38	109703	2365	1.90	2728.29	1.11E+00	9.14E+01	0.3	
25	0	1836.07	8326	544	2.10	3760.23	8.84E-01	6.94E+00	1.3	

VMS Calibration Report V1.5 Generated 11-OCT-1996 13:57:14

8019

Configuration : DISK:[RADCHEM.SCUSR.ARCHIVE]CAL_GAMMA6_PMP_8957.CNF;1
Analyses by : SCRCAL V1.1,PEAK V16.5,PEAKEFF V2.2
Detector Name : GAMMA6 Energy Calib Time: 19-SEP-1996 15:11:19
Efficiency type : Empirical Effncy Calib Time: 19-SEP-1996 15:11:19
Detector Geometry: PMP Shelf :

Energy Calibration Report

Energy = -0.1518 + 0.4886*Channel + -8.5208E-08*(Channel**2)

Nbr	Centroid Channel	True Energy	Computed Energy	Difference
1	122.05	59.54	59.49	0.049
2	180.43	88.03	88.01	0.022
3	250.11	122.06	122.06	0.003
4	279.63	136.48	136.48	-0.007
5	325.70	159.00	158.99	0.009
6	802.09	391.69	391.73	-0.046
7	1052.46	513.99	514.03	-0.045
8	1354.82	661.65	661.72	-0.072
9	1838.71	898.02	898.04	-0.022
10	2402.12	1173.22	1173.15	0.068
11	2728.29	1332.49	1332.38	0.102
12	3760.23	1836.01	1836.07	-0.061

FWHM Calibration Report

FWHM = 0.6350 + 3.3206E-02*(Energy**1/2)

Nbr	Energy	True FWHM	Computed FWHM	Difference
1	59.54	0.92	0.89	0.025
2	88.03	1.03	0.95	0.087
3	122.06	0.95	1.00	-0.052
4	136.48	1.09	1.02	0.065
5	159.00	1.05	1.05	-0.004
6	391.69	1.18	1.29	-0.114
7	513.99	1.35	1.39	-0.036
8	661.65	1.44	1.49	-0.052
9	898.02	1.62	1.63	-0.007
10	1173.22	1.77	1.77	0.002
11	1332.49	1.90	1.85	0.048
12	1836.01	2.10	2.06	0.038

Efficiency Calibration Report

Eff = exp(a2 + a3*x + a4*x**2 + a5*x**3 + a6*x**4 + a7*x**5), x=ln(a1/energy)

a1	a2	a3	a4	a5	a6	a7
947.8	-4.221	0.8506	8.2025E-02	-6.4659E-02	0.0000E+00	0.0000E+00

Average Deviation = 2.84 % Reduced Chi-Square = 0.349

Nbr	Energy (keV)	Measured Efficiency	Efficiency Error	Computed Efficiency	Diff/ /Error	% Diff
1	59.54	7.29E-02	3.71E-03	7.36E-02	-0.19	-0.98

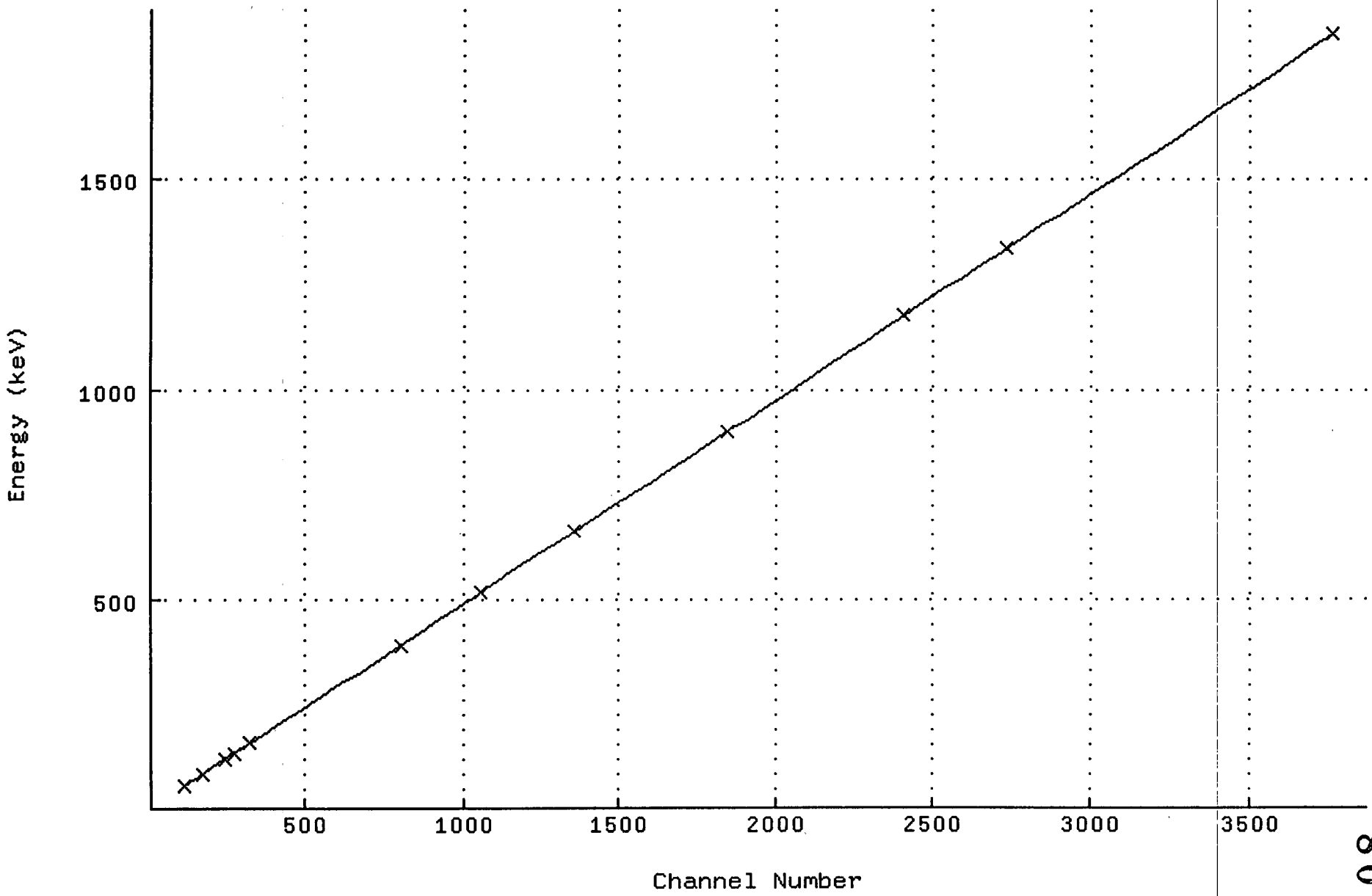
Sample ID : PMP Acquisition date : 19-SEP-1996 14:37:15

8019

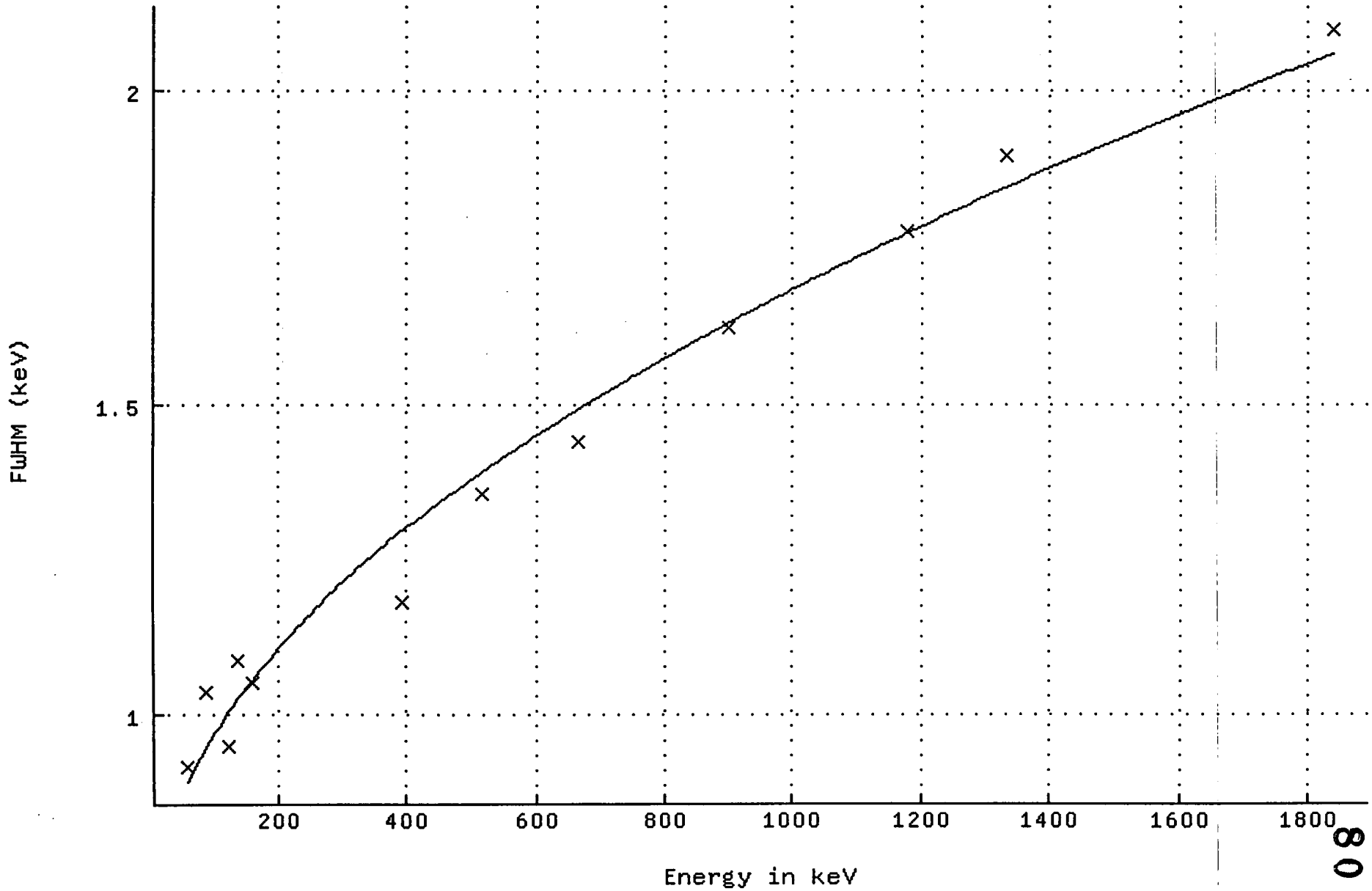
Nbr	Energy (keV)	Measured Efficiency	Efficiency Error	Computed Efficiency	Diff/ /Error	% Diff
2	88.03	7.48E-02	3.75E-03	7.40E-02	0.22	1.08
3	122.06	6.70E-02	3.40E-03	6.79E-02	-0.26	-1.31
4	136.48	6.81E-02	4.57E-03	6.49E-02	0.70	4.69
5	159.00	6.00E-02	3.45E-03	6.03E-02	-0.07	-0.43
6	391.69	3.10E-02	1.69E-03	3.18E-02	-0.45	-2.47
7	513.99	2.25E-02	2.61E-03	2.51E-02	-1.02	-11.86
8	661.65	2.07E-02	1.03E-03	2.01E-02	0.56	2.78
9	898.02	1.51E-02	7.93E-04	1.54E-02	-0.42	-2.19
10	1173.22	1.26E-02	6.29E-04	1.23E-02	0.39	1.97
11	1332.49	1.14E-02	5.69E-04	1.11E-02	0.42	2.09
12	1836.01	8.65E-03	4.47E-04	8.84E-03	-0.43	-2.21

Approved by: _____ Approval Date: __ / __ / ____

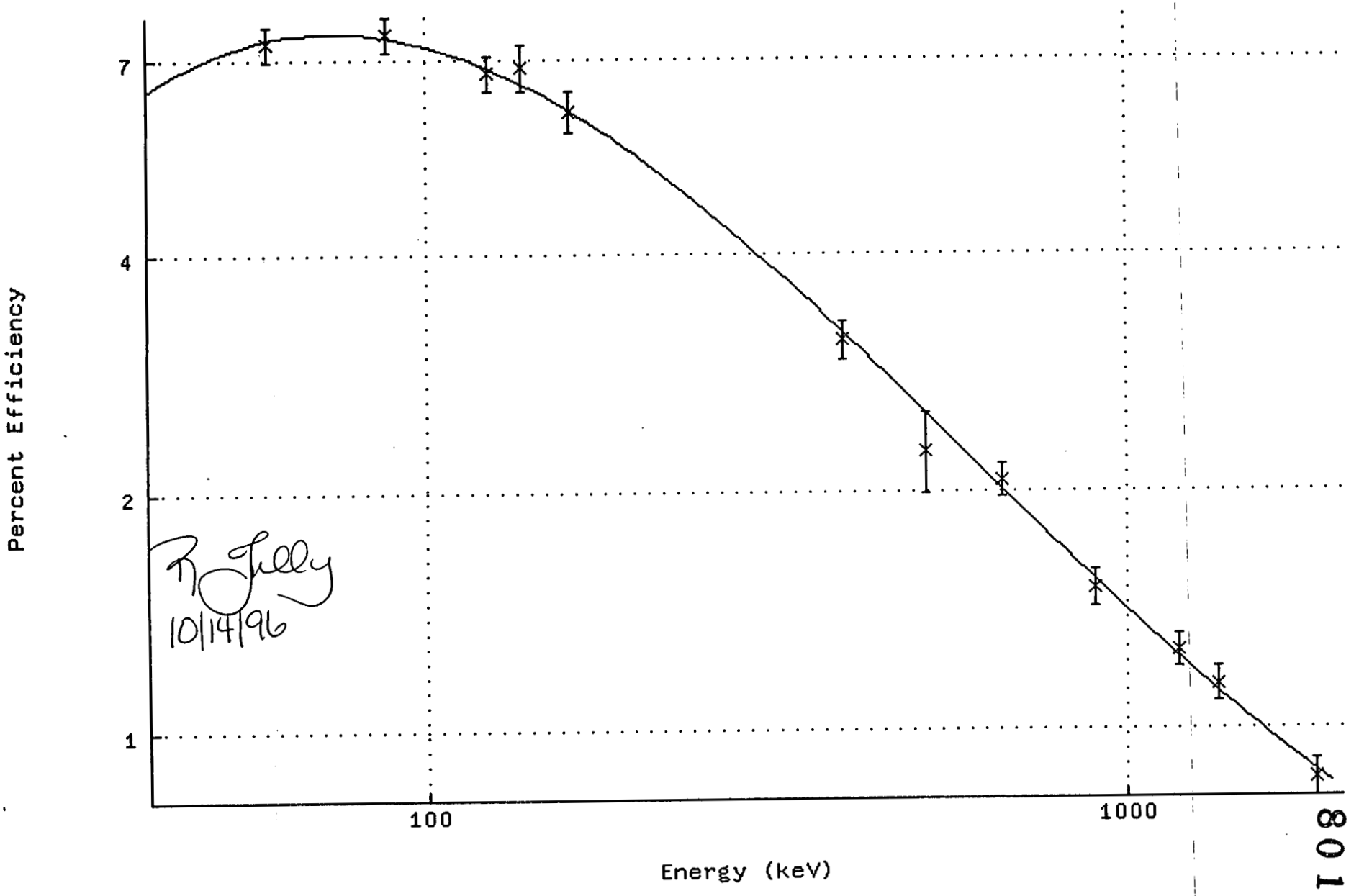
Spectrum : DISK:[RADCHEM.SCUSR.ARCHIVE]CAL_GAMMA6_PMP_8957.CNF;1
Calib Date: 19-SEP-1996 15:11
Detector : GAMMA6 Geometry: PMP
Energy = -0.152 + 0.4886 * ch + -8.5208E-08 * ch**2



Spectrum : DISK:[RADCHEM.SCUSR.ARCHIVE]CAL_GAMMA6_PMP_8957.CNF;1
Calib Date: 19-SEP-1996 15:11
Detector : GAMMA6 Geometry: PMP
FWHM = 0.635 + 0.03321 * SQRT(Energy)

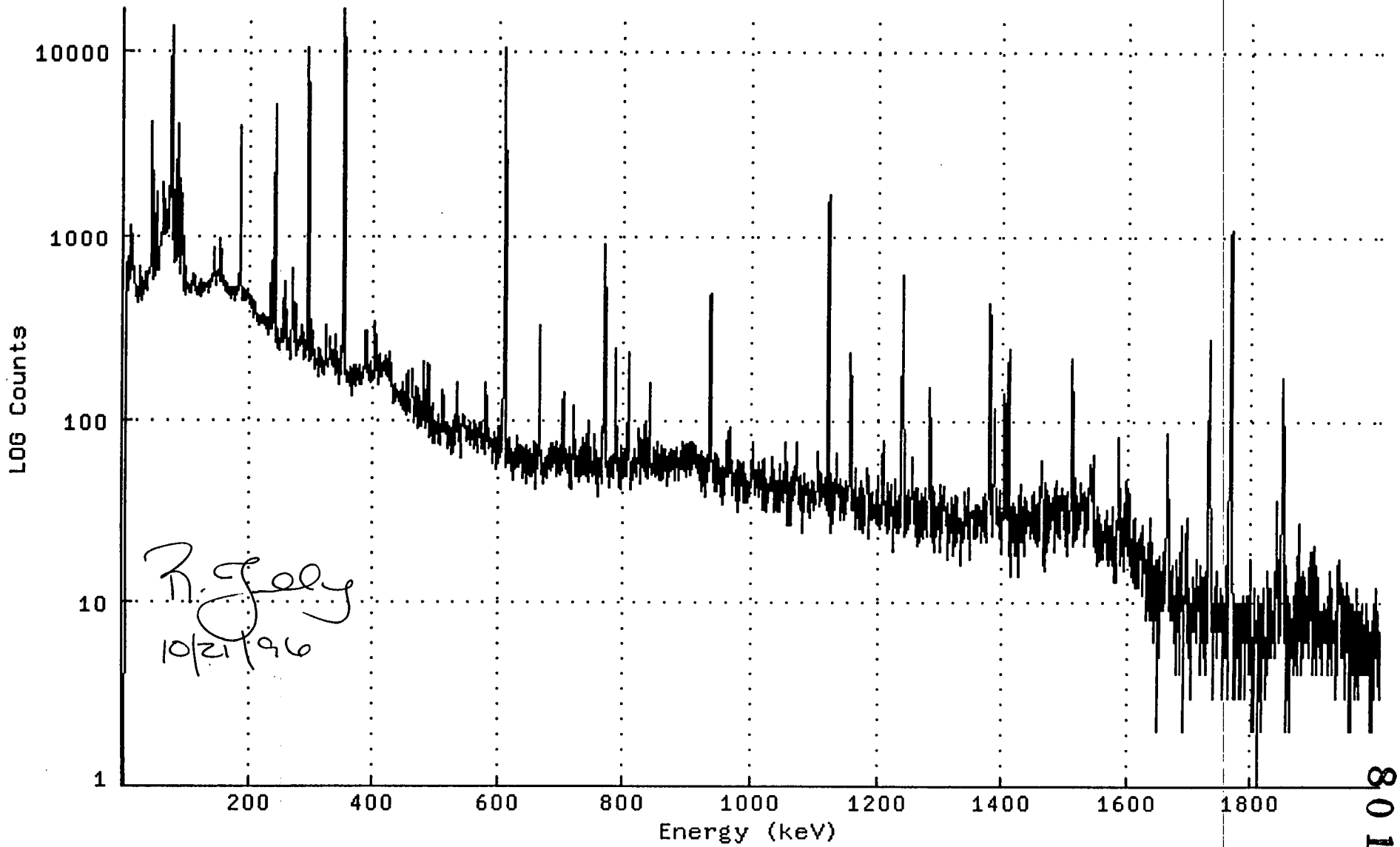


Spectrum : DISK:[RADCHEM.SCUSR.ARCHIVE]CAL_GAMMA6_PMP_8957.CNF;1
Calib Date: 19-SEP-1996 15:11
Detector : GAMMA6 Geometry : PMP
Fit type : 3 Deg. Empirical



R Jelly
10/14/96

Spectrum : DISK:[RADCHEM.SCUSR.ARCHIVE]CAL_GAMMA6_TRM1S2_8965.CNF;1
Title :
Sample Title:
Start Time: 19-SEP-1996 15:27 Sample Time: 19-SEP-1996 12:00 Energy Offset: -2.17378E-01
Real Time : 0 00:30:15.47 Sample ID : TRM1-S2 Energy Slope : 4.88771E-01
Live Time : 0 00:30:00.00 Sample Type: Energy Quad : -1.22302E-07



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VMS Peak Search Report V1.9 Generated 15-OCT-1996 11:34:11

8019

Configuration : DISK:[RADCHEM.SCUSR.ARCHIVE]CAL_GAMMA6_TRM1S2_8965.CNF;1
Analyses by : PEAK V16.5,PEAKEFF V2.2
Sample date : 19-SEP-1996 12:00:00 Acquisition date : 19-SEP-1996 15:27:38
Sample ID : TRM1-S2 Sample quantity : 1.0000 L
Detector name : GAMMA6 Detector geometry: TRM1-S2
Elapsed live time: 0 00:30:00.00 Elapsed real time: 0 00:30:15.47 0.9%
Start energy : 0.27 keV End energy : 1999.74 keV
Sensitivity : 5.00 Gaussian : 10.00
Critical level : No

Pk	It	Energy	Area	Bkgnd	FWHM	Channel	%Eff	Cts/Sec	%Err	Fit
1	6	10.76	526	2632	0.86	22.45	3.06E+07	2.92E-01	15.3	2.57E+00
2	6	12.88	1616	4255	1.26	26.80	2.72E+05	8.98E-01	7.5	
3	6	15.37	1534	4851	1.40	31.89	8.30E+03	8.52E-01	8.7	
4	6	17.25	367	4883	1.42	35.73	1.41E+03	2.04E-01	36.0	
5	0	27.26	319	3860	0.86	56.23	2.34E+01	1.77E-01	34.2	
6	0	31.98	313	3724	1.37	65.87	1.23E+01	1.74E-01	34.2	
7	0	46.46	8103	5641	1.01	95.50	6.73E+00	4.50E+00	2.0	
8	0	49.91	866	4285	0.85	102.55	6.58E+00	4.81E-01	13.0	
9	0	53.14	2188	5155	0.93	109.17	6.55E+00	1.22E+00	6.1	
10	0	63.25	1983	9151	0.91	129.85	6.81E+00	1.10E+00	9.0	
11	0	67.55	1165	8245	1.01	138.65	7.00E+00	6.47E-01	13.8	
12	4	74.78	14606	6929	0.95	153.45	7.34E+00	8.11E+00	1.2	1.85E+01
13	4	77.05	24775	7101	0.93	158.09	7.45E+00	1.38E+01	0.8	
14	3	83.78	4004	4203	0.97	171.86	7.75E+00	2.22E+00	2.9	3.40E+00
15	3	87.18	9197	4491	1.21	178.82	7.89E+00	5.11E+00	1.6	
16	3	89.81	3642	4075	1.18	184.20	7.98E+00	2.02E+00	3.4	
17	3	92.53	2824	3848	1.08	189.77	8.08E+00	1.57E+00	4.3	
18	3	94.64	1374	3651	1.09	194.08	8.15E+00	7.63E-01	8.4	
19	0	97.69	477	3648	1.62	200.32	8.24E+00	2.65E-01	21.5	
20	0	144.09	809	5036	1.04	295.28	8.38E+00	4.49E-01	16.2	
21	0	154.15	761	4634	0.86	315.86	8.20E+00	4.23E-01	15.9	
22	0	186.16	9014	5382	1.13	381.36	7.39E+00	5.01E+00	1.9	
23	0	236.01	866	2323	1.03	483.36	6.01E+00	4.81E-01	9.8	
24	0	242.05	11573	3131	1.11	495.73	5.85E+00	6.43E+00	1.3	
25	1	256.24	532	1842	1.18	524.78	5.50E+00	2.95E-01	14.1	1.60E+00
26	1	258.91	849	2027	1.25	530.24	5.44E+00	4.72E-01	9.9	
27	1	269.45	1073	1790	1.31	551.79	5.19E+00	5.96E-01	7.8	1.89E+01
28	1	271.13	848	1814	1.31	555.24	5.16E+00	4.71E-01	10.1	
29	0	285.86	172	1458	1.18	585.39	4.84E+00	9.57E-02	35.9	
30	0	295.27	25843	2718	1.15	604.65	4.66E+00	1.44E+01	0.7	
31	0	300.10	234	1345	0.96	614.53	4.57E+00	1.30E-01	25.6	
32	0	324.06	319	1751	1.12	663.57	4.15E+00	1.77E-01	24.3	
33	0	329.89	288	1781	1.60	675.49	4.06E+00	1.60E-01	27.0	
34	0	338.53	236	1490	1.20	693.19	3.92E+00	1.31E-01	29.2	
35	0	352.00	43599	2394	1.19	720.74	3.73E+00	2.42E+01	0.5	
36	4	386.88	281	1268	1.15	792.15	3.31E+00	1.56E-01	22.1	4.32E-01
37	4	388.91	344	1476	1.36	796.29	3.28E+00	1.91E-01	20.4	
38	4	401.90	456	1323	1.26	822.88	3.15E+00	2.53E-01	14.6	1.46E+00
39	4	405.54	457	2005	1.91	830.33	3.11E+00	2.54E-01	20.4	
40	0	454.49	294	1365	1.68	930.53	2.70E+00	1.63E-01	25.8	
41	0	461.83	307	1191	1.65	945.55	2.65E+00	1.71E-01	22.5	
42	0	469.48	152	933	1.73	961.21	2.59E+00	8.42E-02	37.2	
43	0	480.45	296	900	1.37	983.67	2.52E+00	1.64E-01	19.2	
44	0	487.02	309	1095	1.20	997.11	2.48E+00	1.71E-01	21.5	

Sample ID : TRM1-S2 Acquisition date : 19-SEP-1996 15:27:38

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Pk	It	Energy	Area	Bkgnd	FWHM	Channel	%Eff	Cts/Sec	%Err	Fit
45	0	533.85	222	845	1.18	1092.97	2.23E+00	1.23E-01	25.4	
46	0	580.47	203	1037	1.47	1188.41	2.04E+00	1.13E-01	33.4	
[illegible]	0	609.43	30467	927	1.38	1247.69	1.94E+00	1.69E+01	0.6	
48	0	665.58	845	663	1.52	1362.66	1.78E+00	4.70E-01	6.8	
49	0	703.42	234	682	1.32	1440.12	1.70E+00	1.30E-01	22.6	
50	0	720.37	352	764	1.44	1474.83	1.66E+00	1.95E-01	18.4	
51	0	768.31	2851	899	1.50	1572.98	1.58E+00	1.58E+00	3.1	
52	0	785.95	653	753	1.53	1609.10	1.56E+00	3.63E-01	9.7	
53	0	806.34	628	617	1.56	1650.85	1.53E+00	3.49E-01	8.9	
54	0	832.06	157	533	1.65	1703.52	1.50E+00	8.71E-02	28.7	
55	0	839.10	385	647	1.72	1717.95	1.49E+00	2.14E-01	14.2	
56	0	934.16	1558	676	1.54	1912.60	1.40E+00	8.66E-01	4.3	
57	0	964.49	248	558	1.95	1974.71	1.38E+00	1.38E-01	20.7	
58	0	1052.13	70	445	1.10	2154.20	1.32E+00	3.91E-02	57.3	
59	0	1069.65	205	586	1.42	2190.10	1.31E+00	1.14E-01	27.3	
60	0	1120.24	6182	505	1.72	2293.72	1.29E+00	3.43E+00	1.5	
61	0	1155.15	760	501	1.77	2365.22	1.28E+00	4.22E-01	7.2	
62	0	1207.82	122	435	1.51	2473.11	1.26E+00	6.78E-02	36.7	
63	0	1238.05	2251	454	1.75	2535.03	1.24E+00	1.25E+00	3.0	
64	0	1280.85	566	338	1.96	2622.72	1.23E+00	3.14E-01	7.9	
65	0	1377.64	1589	509	1.82	2821.02	1.20E+00	8.83E-01	4.2	
66	0	1385.28	317	411	1.45	2836.67	1.20E+00	1.76E-01	15.0	
67	0	1401.32	517	405	2.02	2869.52	1.19E+00	2.87E-01	9.6	
68	0	1407.92	834	310	1.74	2883.05	1.19E+00	4.63E-01	5.6	
69	0	1509.04	814	392	1.85	3090.25	1.16E+00	4.52E-01	6.6	
70	0	1543.07	156	348	1.88	3159.98	1.15E+00	8.68E-02	25.5	
71	0	1583.38	242	300	1.84	3242.58	1.14E+00	1.34E-01	16.5	
72	0	1661.27	363	175	1.92	3402.20	1.11E+00	2.01E-01	9.7	
[illegible]	0	1729.62	1283	130	2.08	3542.29	1.08E+00	7.13E-01	3.5	
[illegible]	0	1764.41	5123	113	2.17	3613.59	1.07E+00	2.85E+00	1.5	
75	0	1838.48	102	86	1.34	3765.43	1.04E+00	5.67E-02	20.3	
76	0	1847.50	718	145	1.96	3783.92	1.04E+00	3.99E-01	5.5	
77	0	1873.47	90	88	2.62	3837.15	1.03E+00	4.98E-02	24.0	

VMS Calibration Report V1.5 Generated 15-OCT-1996 11:34:13

Configuration : DISK:[RADCHEM.SCUSR.ARCHIVE]CAL_GAMMA6_TRM1S2_8965.CNF;1
Analyses by : SCRCAL V1.1,PEAK V16.5,PEAKEFF V2.2
Detector Name : GAMMA6 Energy Calib Time: 19-SEP-1996 15:59:51
Efficiency type : Empirical Effncy Calib Time: 19-SEP-1996 15:59:51
Detector Geometry: TRM1-S2 Shelf :

Energy Calibration Report

Energy = -0.2174 + 0.4888*Channel + -1.2230E-07*(Channel**2)

Nbr	Centroid Channel	True Energy	Computed Energy	Difference
1	95.50	46.50	46.46	0.045
2	153.45	74.81	74.78	0.031
3	158.09	77.11	77.05	0.060
4	381.36	186.21	186.16	0.050
5	604.65	295.21	295.27	-0.061
6	720.74	351.92	352.00	-0.075
7	1247.69	609.31	609.43	-0.117
8	1362.66	665.45	665.58	-0.132
9	1572.98	768.36	768.31	0.050
10	1912.60	934.06	934.16	-0.098
11	2293.72	1120.29	1120.24	0.043
12	2365.22	1155.19	1155.15	0.041
13	2535.03	1238.11	1238.05	0.064
14	2622.72	1280.96	1280.85	0.107
15	2821.02	1377.67	1377.64	0.025
16	2883.05	1407.98	1407.92	0.061
17	3090.25	1509.23	1509.04	0.189
18	3402.20	1661.00	1661.27	-0.266
[illegible]	3542.29	1729.59	1729.62	-0.024
[illegible]	3613.59	1764.49	1764.41	0.088
21	3783.92	1847.42	1847.50	-0.082

FWHM Calibration Report

FWHM = 0.6692 + 3.1552E-02*(Energy**1/2)

Nbr	Energy	True FWHM	Computed FWHM	Difference
1	46.50	1.01	0.88	0.125
2	74.81	0.95	0.94	0.012
3	77.11	0.93	0.95	-0.020
4	186.21	1.13	1.10	0.032
5	295.21	1.15	1.21	-0.057
6	351.92	1.19	1.26	-0.069
7	609.31	1.38	1.45	-0.067
8	665.45	1.52	1.48	0.035
9	768.36	1.50	1.54	-0.039
10	934.06	1.54	1.63	-0.098
11	1120.29	1.72	1.73	-0.008
12	1155.19	1.77	1.74	0.027

Sample ID : TRM1-S2 Acquisition date : 19-SEP-1996 15:27:38

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Nbr	Energy	True FWHM	Computed FWHM	Difference
13	1238.11	1.75	1.78	-0.032
14	1280.96	1.96	1.80	0.163
15	1377.67	1.82	1.84	-0.025
16	1407.98	1.74	1.85	-0.116
17	1509.23	1.85	1.89	-0.043
18	1661.00	1.92	1.96	-0.033
19	1729.59	2.08	1.98	0.099
20	1764.49	2.17	1.99	0.178
21	1847.42	1.96	2.03	-0.065

Efficiency Calibration Report

Eff = exp(a2 + a3*x + a4*x**2 + a5*x**3 + a6*x**4 + a7*x**5), x=ln(a1/energy)

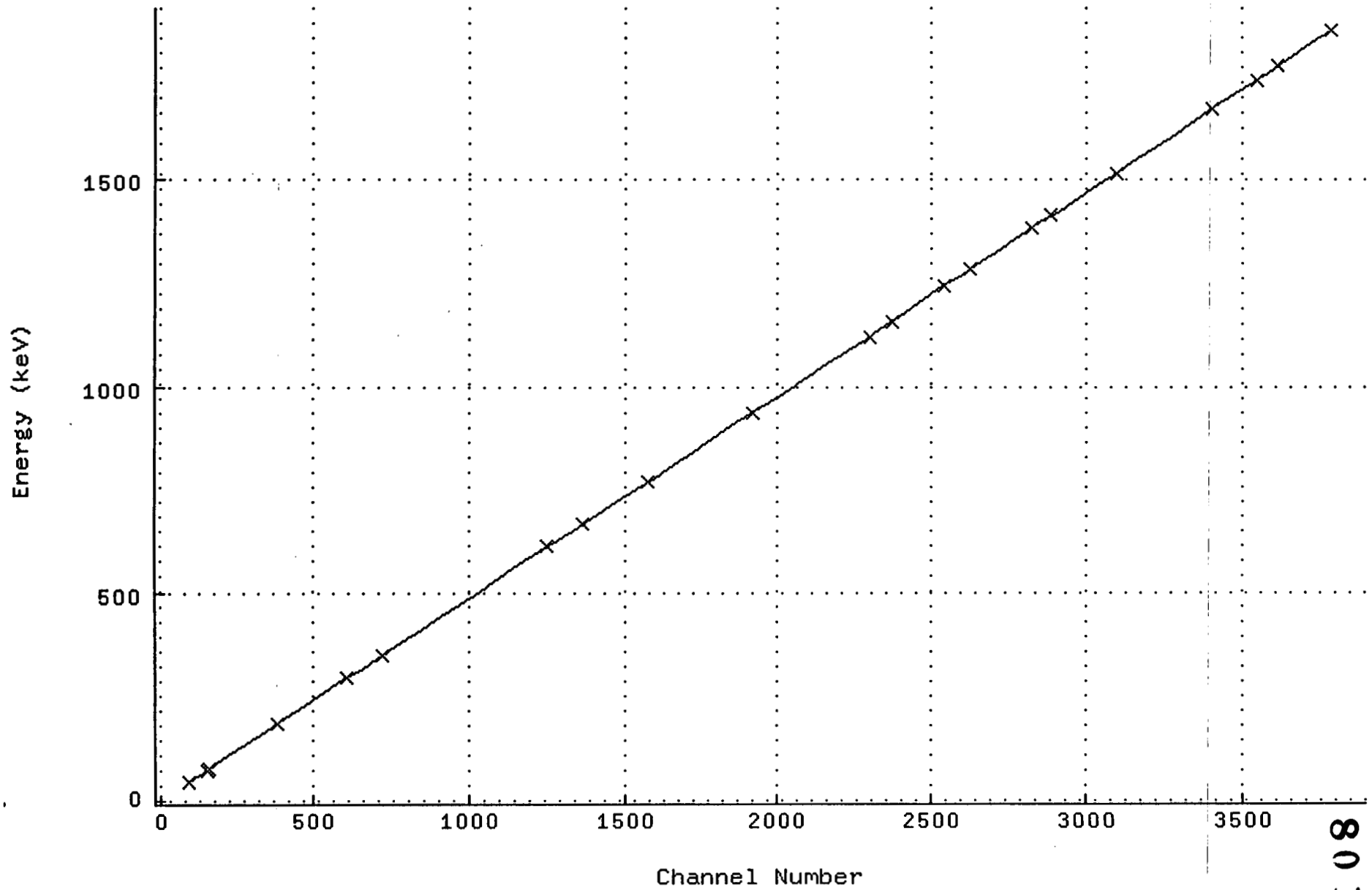
a1	a2	a3	a4	a5	a6	a7
947.0	-4.276	0.5137	0.4804	0.2874	-0.3457	6.5634E-02

Average Deviation = 6.56 % Reduced Chi-Square = 2.46

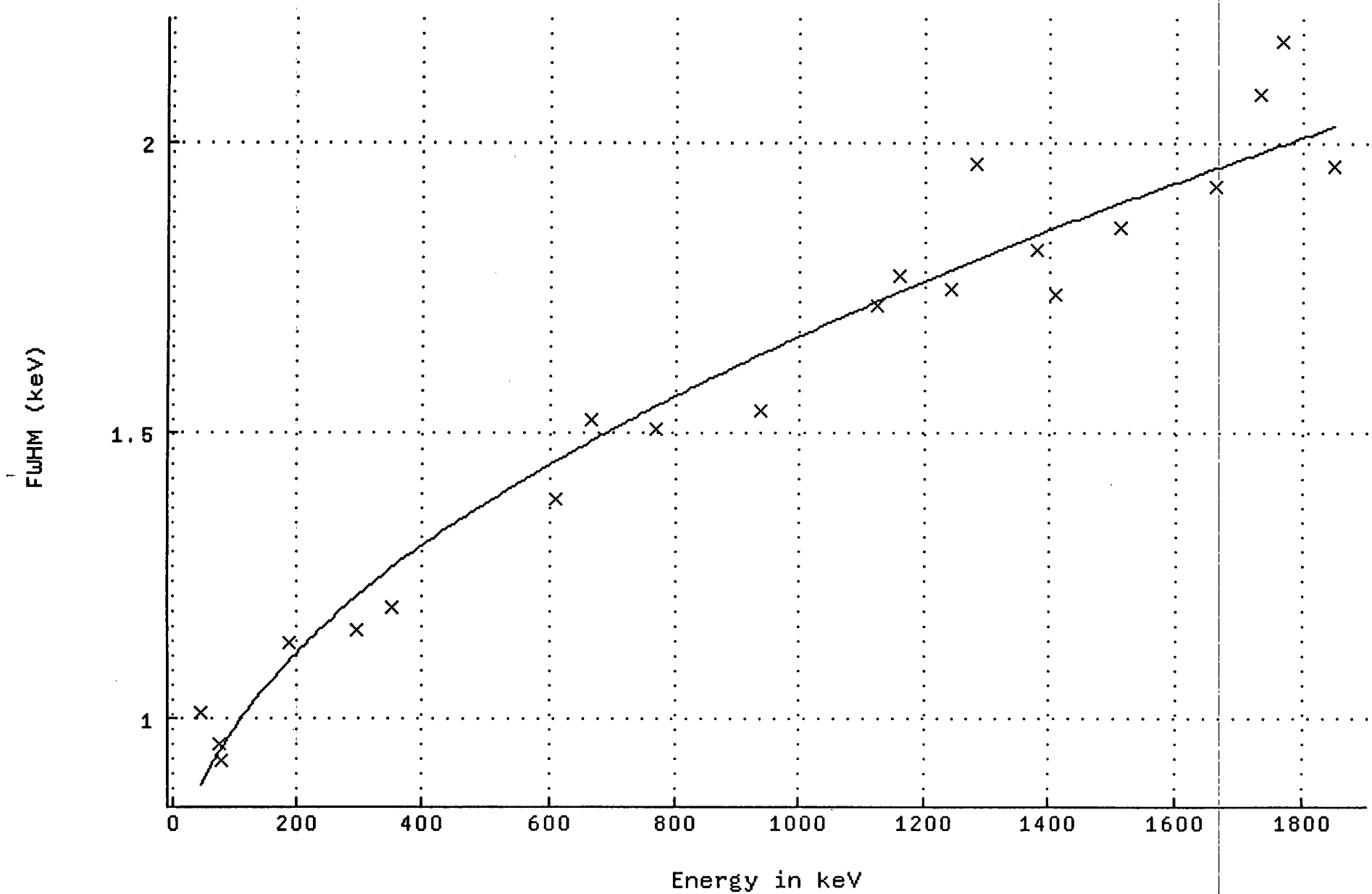
Nbr	Energy (keV)	Measured Efficiency	Efficiency Error	Computed Efficiency	Diff/ /Error	% Diff
1	46.50	6.81E-02	3.67E-03	6.73E-02	0.21	1.12
2	74.81	7.26E-02	3.74E-03	7.34E-02	-0.21	-1.09
3	77.11	7.27E-02	3.69E-03	7.45E-02	-0.49	-2.48
4	186.21	8.42E-02	4.50E-03	7.39E-02	2.29	12.25
5	295.21	4.15E-02	2.10E-03	4.66E-02	-2.44	-12.32
6	351.92	3.61E-02	1.82E-03	3.73E-02	-0.68	-3.40
7	609.31	2.03E-02	1.02E-03	1.94E-02	0.88	4.41
8	665.45	1.63E-02	1.38E-03	1.78E-02	-1.12	-9.44
9	768.36	1.76E-02	1.03E-03	1.58E-02	1.69	9.87
10	934.06	1.50E-02	9.87E-04	1.40E-02	1.02	6.69
11	1120.29	1.26E-02	6.58E-04	1.29E-02	-0.44	-2.27
12	1155.19	1.38E-02	1.21E-03	1.28E-02	0.84	7.40
13	1238.11	1.18E-02	6.85E-04	1.24E-02	-1.01	-5.86
14	1280.96	1.16E-02	1.09E-03	1.23E-02	-0.62	-5.76
15	1377.67	1.19E-02	7.82E-04	1.20E-02	-0.06	-0.41
16	1407.98	1.03E-02	7.72E-04	1.19E-02	-2.10	-15.74
17	1509.23	1.14E-02	9.42E-04	1.16E-02	-0.19	-1.60
18	1661.00	1.02E-02	1.11E-03	1.11E-02	-0.84	-9.16
19	1729.59	1.32E-02	8.07E-04	1.08E-02	2.90	17.75
20	1764.49	9.99E-03	5.21E-04	1.07E-02	-1.38	-7.17
21	1847.42	1.05E-02	7.82E-04	1.04E-02	0.20	1.48

Approved by: _____ Approval Date: __ / __ / ____

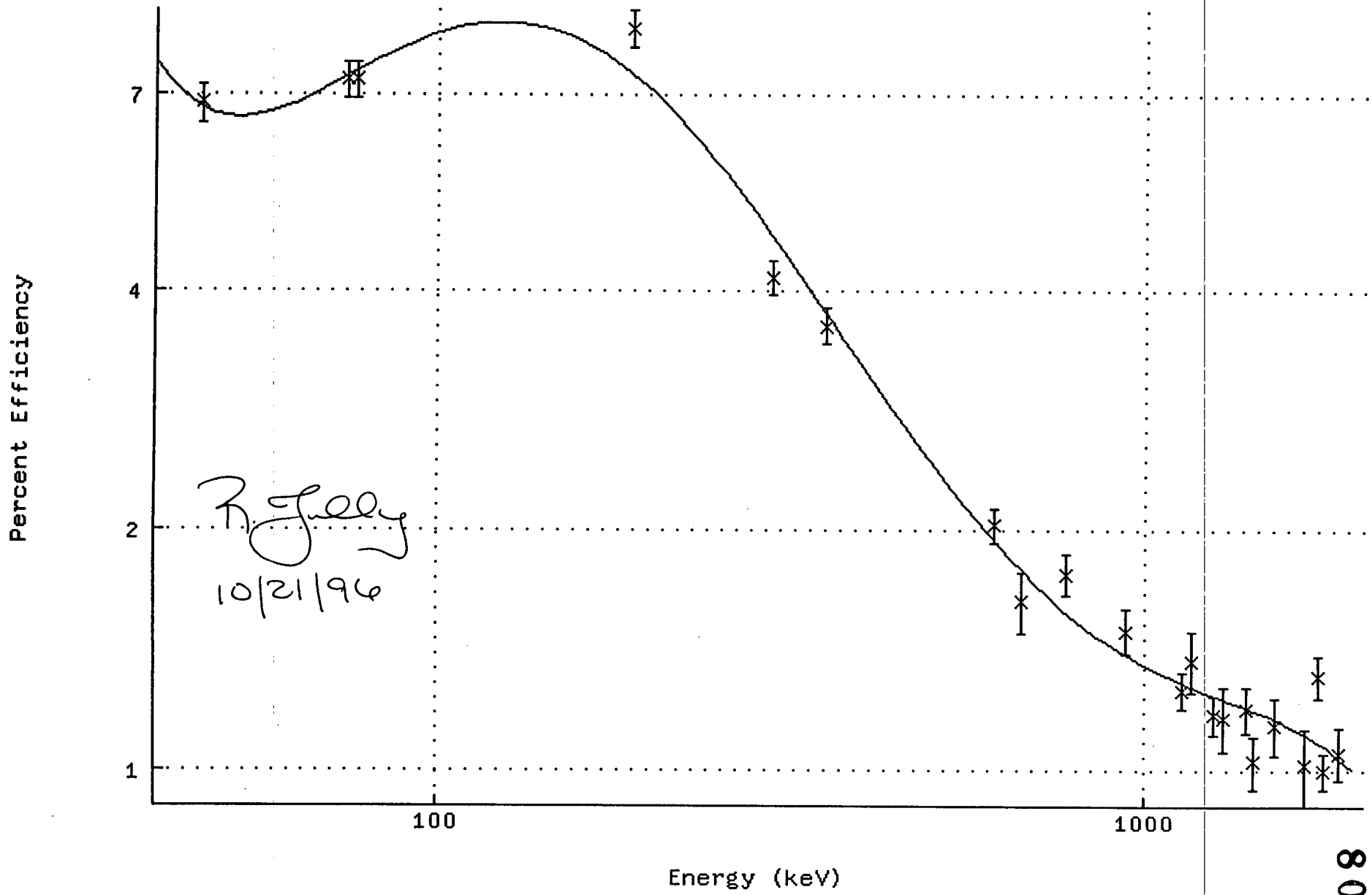
Spectrum : DISK:[RADCHEM.SCUSR.ARCHIVE]CAL_GAMMA6_TRM1S2_8965.CNF;1
Calib Date: 19-SEP-1996 15:59
Detector : GAMMA6 Geometry: TRM1-S2
Energy = -0.217 + 0.4888 * ch + -1.2230E-07 * ch**2



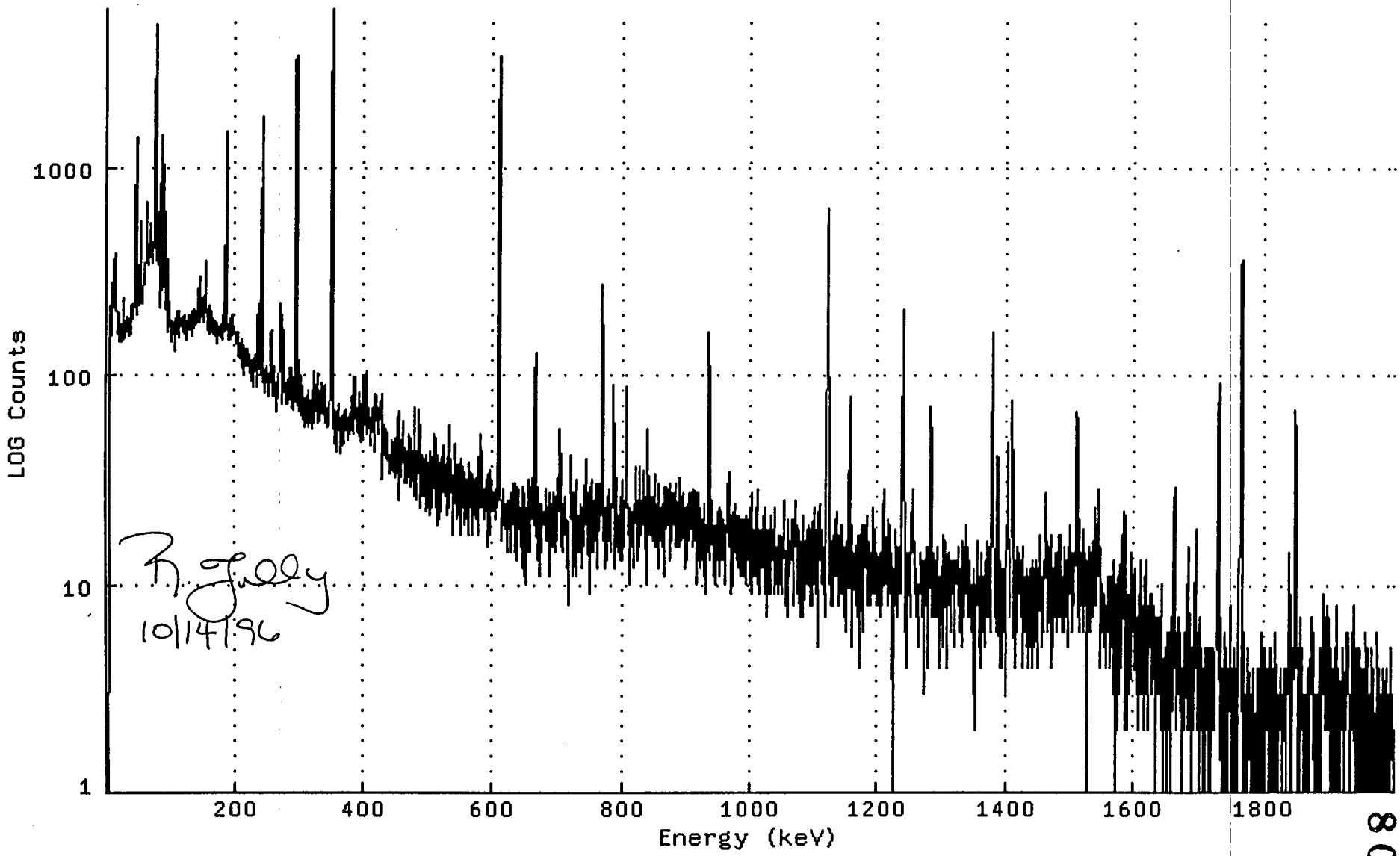
Spectrum : DISK:[RADCHEM.SCUSR.ARCHIVE]CAL_GAMMA6_TRM1S2_8965.CNF;1
Calib Date: 19-SEP-1996 15:59
Detector : GAMMA6 Geometry: TRM1-S2
FWHM = 0.669 + 0.03155 * SQRT(Energy)



Spectrum : DISK:[RADCHEM.SCUSR.ARCHIVE]CAL_GAMMA6_TRM1S2_8965.CNF;1
Calib Date: 19-SEP-1996 15:59
Detector : GAMMA6 Geometry : TRM1-S2
Fit type : 5 Deg. Empirical



Spectrum : DISK:[RADCHEM.SCUSR.ARCHIVE]CAL_GAMMA6_9157.CNF;1
Title :
Sample Title:
Start Time: 8-OCT-1996 12:27: Sample Time: 4-OCT-1996 00:00: Energy Offset: -1.98761E-01
Real Time : 0 00:10:05.24 Sample ID : BCKGND Energy Slope : 4.88802E-01
Live Time : 0 00:10:00.00 Sample Type: Energy Quad : -1.24008E-07



R. Jolly
10/14/96

VMS Peak Search Report V1.9 Generated 11-OCT-1996 13:57:32

8019

Configuration : DISK:[RADCHEM.SCUSR.ARCHIVE]CAL_GAMMA6_9157.CNF;1
Analyses by : PEAK V16.5,PEAKEFF V2.2
Sample date : 4-OCT-1996 00:00:00 Acquisition date : 8-OCT-1996 12:27:57
Sample ID : BCKGND Sample quantity : 1.0000 G
Detector name : GAMMA6 Detector geometry: TRM1-S3
Elapsed live time: 0 00:10:00.00 Elapsed real time: 0 00:10:05.24 0.9%
Start energy : 0.29 keV End energy : 1999.85 keV
Sensitivity : 5.00 Gaussian : 10.00
Critical level : No

Pk	It	Energy	Area	Bkgnd	FWHM	Channel	%Eff	Cts/Sec	%Err	Fit
1	0	12.89	313	1081	1.06	26.78	2.30E+03	5.22E-01	16.8	
2	0	15.48	468	1144	1.12	32.08	2.44E+02	7.79E-01	12.4	
3	0	26.64	73	1155	0.81	54.91	9.03E+00	1.21E-01	78.3	
4	0	46.45	2618	1773	1.02	95.45	5.24E+00	4.36E+00	3.4	
5	0	49.96	294	1471	1.11	102.63	5.35E+00	4.90E-01	22.4	
6	0	53.19	694	1778	1.03	109.22	5.50E+00	1.16E+00	11.2	
7	0	63.29	628	3113	0.86	129.88	6.06E+00	1.05E+00	16.5	
8	0	67.25	217	3378	0.91	137.99	6.29E+00	3.61E-01	48.8	
9	3	74.75	4955	2324	0.97	153.34	6.70E+00	8.26E+00	2.1	1.21E+01
10	3	77.04	8389	2598	0.92	158.02	6.82E+00	1.40E+01	1.5	
11	4	83.76	1375	1316	1.01	171.77	7.14E+00	2.29E+00	4.9	1.75E+00
12	4	87.17	3119	1638	1.23	178.75	7.28E+00	5.20E+00	2.9	
13	4	89.81	1258	1358	1.21	184.16	7.38E+00	2.10E+00	6.0	
14	4	92.57	981	1295	1.08	189.79	7.47E+00	1.63E+00	7.1	
15	4	94.70	428	1075	1.03	194.15	7.54E+00	7.14E-01	13.8	
16	0	144.04	199	1553	1.01	295.11	7.80E+00	3.31E-01	35.1	
17	0	154.20	459	1862	0.97	315.90	7.65E+00	7.66E-01	18.2	
18	0	186.15	3217	1773	1.11	381.28	6.97E+00	5.36E+00	3.1	
19	0	235.89	316	886	1.40	483.06	5.79E+00	5.27E-01	17.2	
[illegible]	0	242.03	3882	1130	1.07	495.62	5.66E+00	6.47E+00	2.3	
[illegible]	0	256.26	100	677	0.96	524.73	5.35E+00	1.67E-01	44.4	
22	0	259.12	180	678	1.02	530.60	5.29E+00	3.00E-01	26.1	
23	2	269.50	379	647	1.29	551.82	5.09E+00	6.32E-01	13.1	1.09E+00
24	2	271.31	266	508	0.96	555.54	5.05E+00	4.43E-01	15.0	
25	0	274.51	199	706	1.00	562.09	4.99E+00	3.32E-01	24.1	
26	0	295.27	8815	908	1.19	604.57	4.61E+00	1.47E+01	1.3	
27	0	351.98	14802	920	1.19	720.63	3.78E+00	2.47E+01	0.9	
28	0	404.69	179	1055	4.47	828.51	3.21E+00	2.98E-01	42.4	
29	0	455.10	99	265	1.23	931.69	2.81E+00	1.65E-01	30.5	
30	0	480.68	129	302	1.26	984.04	2.64E+00	2.15E-01	26.7	
31	0	487.62	141	328	1.73	998.25	2.60E+00	2.35E-01	26.5	
32	0	579.79	101	239	1.65	1186.91	2.16E+00	1.68E-01	30.2	
33	0	609.43	10399	346	1.41	1247.58	2.06E+00	1.73E+01	1.1	
34	0	665.73	332	225	1.39	1362.84	1.89E+00	5.53E-01	10.7	
35	0	702.92	98	243	1.05	1438.97	1.81E+00	1.63E-01	33.5	
36	0	719.49	61	187	1.28	1472.91	1.77E+00	1.01E-01	43.8	
37	0	768.44	893	305	1.62	1573.13	1.68E+00	1.49E+00	5.5	
38	0	785.82	275	235	1.67	1608.71	1.65E+00	4.59E-01	13.2	
39	0	806.67	269	270	1.66	1651.40	1.62E+00	4.49E-01	15.0	
40	0	839.11	101	220	1.40	1717.82	1.58E+00	1.68E-01	30.1	
41	0	934.08	527	192	1.40	1912.29	1.48E+00	8.78E-01	7.1	
42	0	1120.26	2208	221	1.67	2293.58	1.35E+00	3.68E+00	2.6	
43	0	1154.97	279	111	1.71	2364.69	1.33E+00	4.64E-01	9.7	
44	0	1237.96	781	120	1.80	2534.68	1.30E+00	1.30E+00	4.6	

Sample ID : BCKGND Acquisition date : 8-OCT-1996 12:27:57

8019

Pk	It	Energy	Area	Bkgnd	FWHM	Channel	%Eff	Cts/Sec	%Err	Fit
45	0	1280.97	209	110	1.35	2622.78	1.28E+00	3.49E-01	12.9	
46	0	1377.49	638	113	1.96	2820.52	1.25E+00	1.06E+00	5.4	
[illegible]	0	1385.68	119	121	1.55	2837.30	1.25E+00	1.98E-01	21.8	
48	0	1401.23	173	108	2.01	2869.16	1.24E+00	2.88E-01	14.9	
49	0	1407.87	337	102	2.11	2882.77	1.24E+00	5.61E-01	8.6	
50	0	1509.30	317	127	2.38	3090.58	1.21E+00	5.29E-01	9.9	
51	0	1542.20	117	203	5.73	3158.00	1.20E+00	1.96E-01	31.8	
52	0	1583.14	108	44	2.60	3241.90	1.19E+00	1.80E-01	15.7	
53	0	1661.23	106	90	2.11	3401.91	1.17E+00	1.77E-01	23.4	
54	0	1729.49	430	41	2.02	3541.80	1.15E+00	7.16E-01	6.1	
55	0	1764.42	1772	14	2.22	3613.39	1.14E+00	2.95E+00	2.4	
56	0	1847.60	275	19	1.82	3783.89	1.12E+00	4.58E-01	7.2	

VMS Calibration Report V1.5 Generated 11-OCT-1996 13:57:33

8019

Configuration : DISK:[RADCHEM.SCUSR.ARCHIVE]CAL_GAMMA6_9157.CNF;1
Analyses by : CALIBRATE V1.7,PEAK V16.5,PEAKEFF V2.2
Detector Name : Energy Calib Time: 8-OCT-1996 12:40:20
Efficiency type : Empirical Effncy Calib Time: 19-SEP-1996 13:34:28
Detector Geometry: TRM1-S3 Shelf :

Energy Calibration Report

Energy = -0.1988 + 0.4888*Channel + -1.2401E-07*(Channel**2)

Nbr	Centroid Channel	True Energy	Computed Energy	Difference
1	95.45	46.50	46.45	0.049
2	153.34	74.81	74.75	0.066
3	158.02	77.11	77.04	0.067
4	381.28	186.21	186.15	0.059
5	604.57	295.21	295.27	-0.059
6	720.63	351.92	351.98	-0.062
7	1247.58	609.31	609.43	-0.114
8	1362.84	665.45	665.73	-0.277
9	1573.13	768.36	768.44	-0.085
10	1912.29	934.06	934.08	-0.017
11	2293.58	1120.29	1120.26	0.031
12	2364.69	1155.19	1154.97	0.216
13	2534.68	1238.11	1237.96	0.149
14	2622.78	1280.96	1280.97	-0.011
15	2820.52	1377.67	1377.49	0.177
16	2882.77	1407.98	1407.87	0.107
17	3090.58	1509.23	1509.30	-0.072
18	3401.91	1661.00	1661.23	-0.228
[illegible]	3541.80	1729.59	1729.49	0.108
[illegible]	3613.39	1764.49	1764.42	0.077
21	3783.89	1847.42	1847.60	-0.180

FWHM Calibration Report

FWHM = 0.6371 + 3.3208E-02*(Energy**1/2)

Nbr	Energy	True FWHM	Computed FWHM	Difference
1	46.50	1.02	0.86	0.159
2	74.81	0.97	0.92	0.042
3	77.11	0.92	0.93	-0.006
4	186.21	1.11	1.09	0.024
5	295.21	1.19	1.21	-0.017
6	351.92	1.19	1.26	-0.067
7	609.31	1.41	1.46	-0.051
8	665.45	1.39	1.49	-0.108
9	768.36	1.62	1.56	0.062
10	934.06	1.40	1.65	-0.249
11	1120.29	1.67	1.75	-0.082
12	1155.19	1.71	1.77	-0.056

Sample ID : BCKGND Acquisition date : 8-OCT-1996 12:27:57

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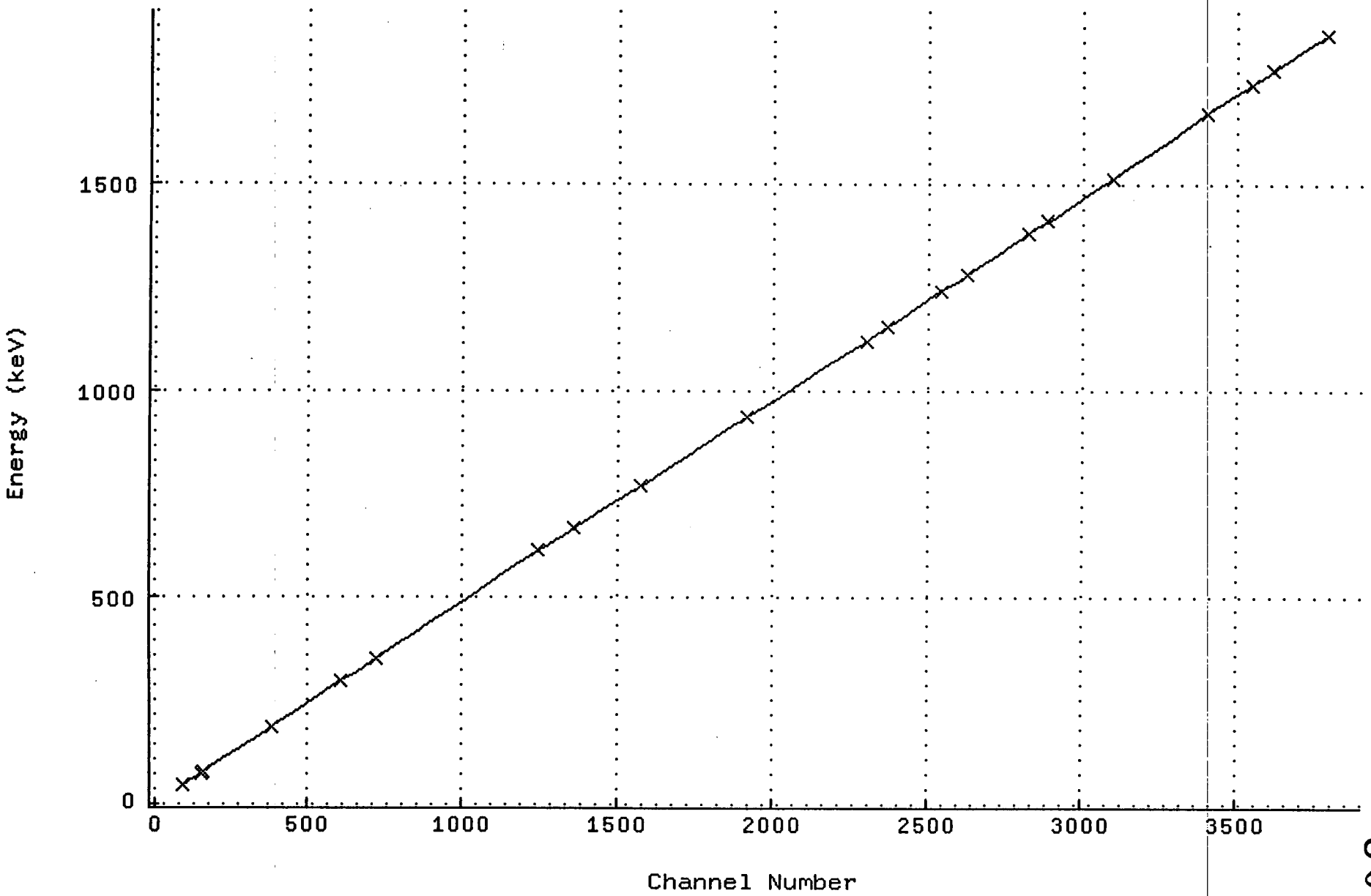
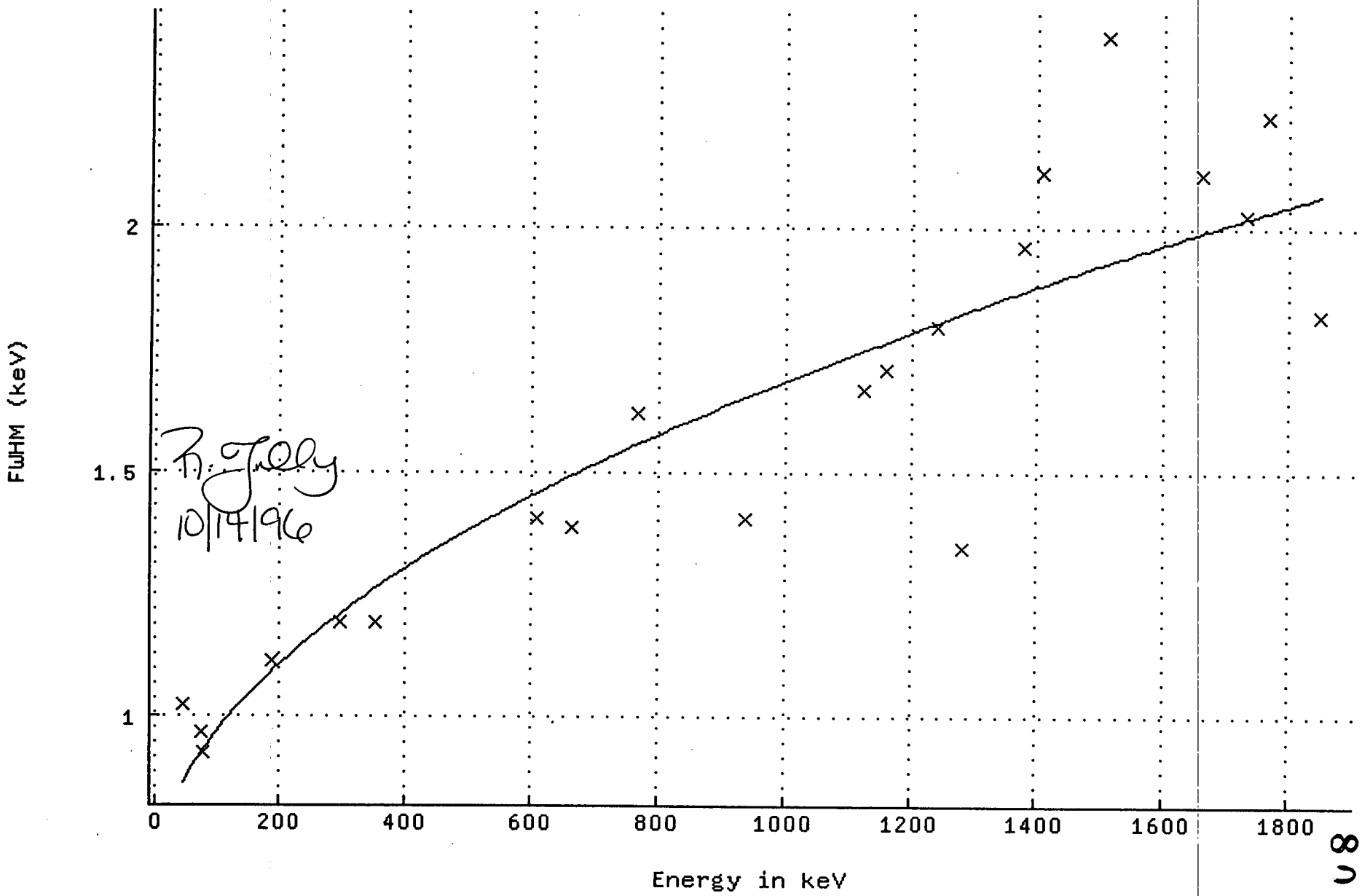
Nbr	Energy	True FWHM	Computed FWHM	Difference
13	1238.11	1.80	1.81	-0.006
14	1280.96	1.34	1.83	-0.481
15	1377.67	1.96	1.87	0.090
16	1407.98	2.11	1.88	0.226
17	1509.23	2.38	1.93	0.455
18	1661.00	2.11	1.99	0.116
19	1729.59	2.02	2.02	0.005
20	1764.49	2.22	2.03	0.188
21	1847.42	1.82	2.06	-0.245

Approved by: _____ Approval Date: __ / __ / ____

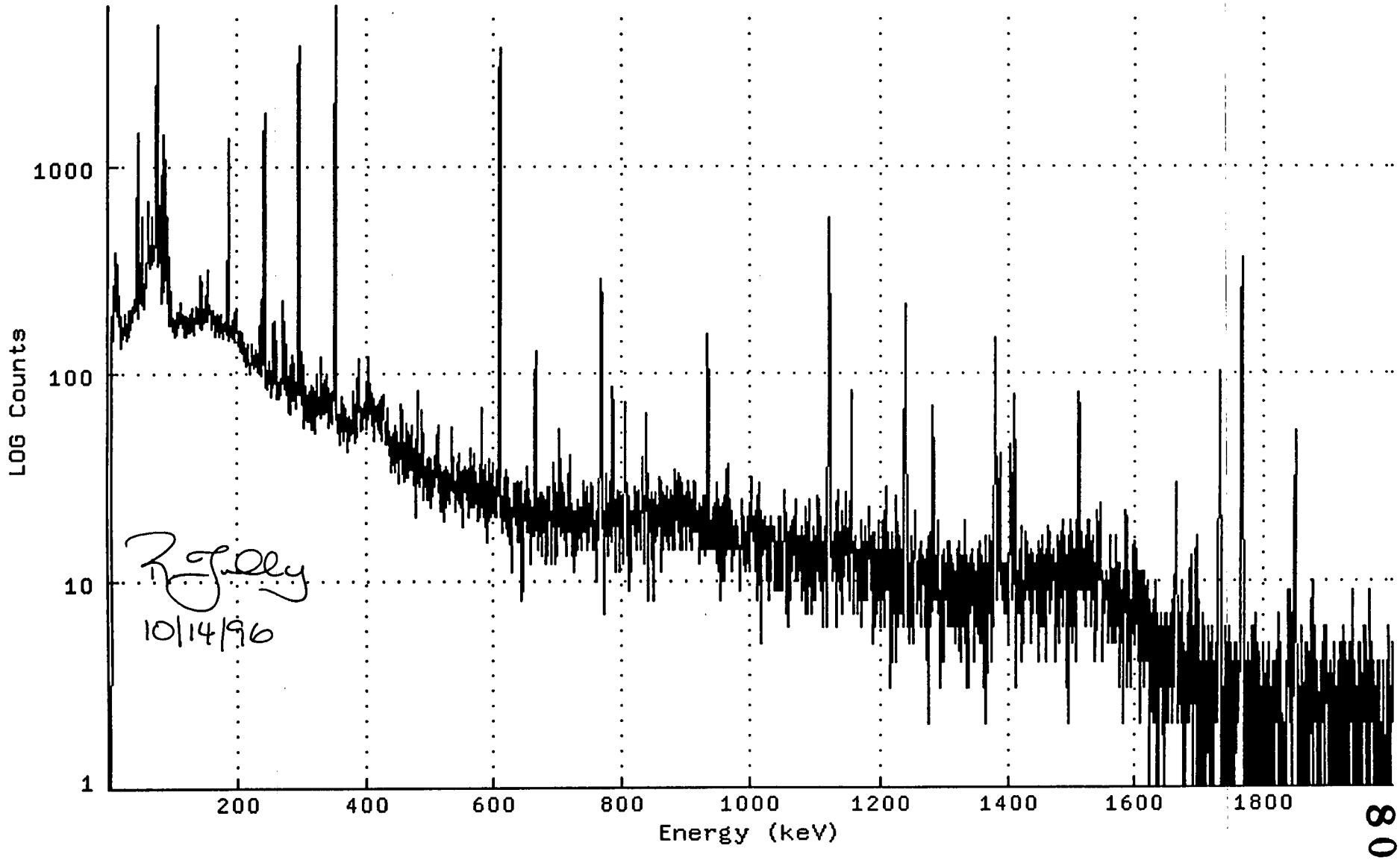
Spectrum : DISK:[RADCHEM.SCUSR.ARCHIVE]CAL_GAMMA6_9157.CNF;1
Calib Date: 8-OCT-1996 12:40:
Detector : GAMMA6 Geometry: TRM1-S3
Energy = -0.199 + 0.4888 * ch + -1.2401E-07 * ch**2



Spectrum : DISK:[RADCHEM.SCUSR.ARCHIVE]CAL_GAMMA6_9157.CNF;1
Calib Date: 8-OCT-1996 12:40:
Detector : GAMMA6 Geometry: TRM1-S3
FWHM = 0.637 + 0.03321 * SQRT(Energy)



Spectrum : DISK:[RADCHEM.SCUSR.ARCHIVE]CAL_GAMMA6_9219.CNF;1
Title :
Sample Title:
Start Time: 14-OCT-1996 09:16 Sample Time: 1-JAN-1900 00:00: Energy Offset: -1.75400E-01
Real Time : 0 00:10:05.27 Sample ID : 96E04566 Energy Slope : 4.88511E-01
Live Time : 0 00:10:00.00 Sample Type: Energy Quad : -9.43914E-08



000357

80019

VMS Peak Search Report V1.9 Generated 14-OCT-1996 16:11:19

8019

Configuration : DISK:[RADCHEM.SCUSR.ARCHIVE]CAL_GAMMA6_9219.CNF;1
Analyses by : PEAK V16.5,PEAKEFF V2.2
Sample date : 1-JAN-1900 00:00:00 Acquisition date : 14-OCT-1996 09:16:58
Sample ID : 96E04566 Sample quantity : 1.0000 L
Detector name : GAMMA6 Detector geometry: IPL-1L
Elapsed live time: 0 00:10:00.00 Elapsed real time: 0 00:10:05.27 0.9%
Start energy : 0.31 keV End energy : 1999.18 keV
Sensitivity : 5.00 Gaussian : 10.00
Critical level : No

Pk	It	Energy	Area	Bkgnd	FWHM	Channel	%Eff	Cts/Sec	%Err	Fit
1	0	13.06	231	1337	0.79	27.10	5.23E+00	3.85E-01	26.0	
2	0	15.51	396	1234	1.54	32.10	5.45E+00	6.61E-01	14.9	
3	0	46.50	2788	1832	1.02	95.54	5.87E+00	4.65E+00	3.4	
4	4	50.07	404	1193	1.38	102.85	5.83E+00	6.74E-01	14.6	8.22E-01
5	4	53.17	689	1062	0.90	109.20	5.79E+00	1.15E+00	8.0	
6	0	63.18	778	3343	0.89	129.69	5.65E+00	1.30E+00	14.4	
7	0	67.45	458	2707	0.70	138.43	5.59E+00	7.63E-01	20.2	
8	3	74.79	4903	2335	0.95	153.46	5.48E+00	8.17E+00	2.1	6.99E+00
9	3	77.07	8363	2510	0.92	158.12	5.44E+00	1.39E+01	1.5	
10	0	81.09	228	2628	2.62	166.36	5.38E+00	3.80E-01	39.3	
11	0	83.78	1212	1558	0.89	171.86	5.34E+00	2.02E+00	5.9	
12	0	87.10	2454	2169	1.13	178.67	5.29E+00	4.09E+00	3.7	
13	0	89.86	845	1572	0.99	184.32	5.25E+00	1.41E+00	8.2	
14	0	92.39	511	1449	1.00	189.50	5.21E+00	8.51E-01	11.7	
15	0	94.78	347	1072	1.13	194.38	5.18E+00	5.78E-01	15.5	
16	0	97.83	229	1206	1.43	200.63	5.13E+00	3.81E-01	26.1	
17	0	144.19	372	1579	1.19	295.55	4.51E+00	6.19E-01	20.0	
18	0	154.35	243	1554	0.83	316.34	4.39E+00	4.05E-01	28.8	
19	0	186.14	3128	1762	1.13	381.42	4.05E+00	5.21E+00	3.2	
[illegible]	0	235.91	290	989	1.07	483.32	3.61E+00	4.83E-01	20.5	
[illegible]	0	242.05	4009	1238	1.16	495.90	3.57E+00	6.68E+00	2.4	
22	1	256.15	208	716	1.22	524.76	3.46E+00	3.47E-01	23.1	1.74E+00
23	1	259.08	241	612	1.19	530.76	3.44E+00	4.02E-01	18.2	
24	2	269.53	325	625	1.08	552.15	3.37E+00	5.42E-01	14.1	5.45E+00
25	2	271.35	234	704	1.26	555.88	3.35E+00	3.90E-01	21.8	
26	0	295.27	8787	1018	1.15	604.86	3.20E+00	1.46E+01	1.3	
27	0	299.95	145	404	1.20	614.44	3.17E+00	2.42E-01	23.4	
28	0	330.06	81	536	0.53	676.10	2.99E+00	1.34E-01	51.1	
29	0	351.96	14977	926	1.26	720.94	2.88E+00	2.50E+01	0.9	
30	0	401.81	122	359	0.89	823.01	2.64E+00	2.04E-01	26.1	
31	0	454.74	72	321	1.26	931.40	2.43E+00	1.20E-01	44.6	
32	0	480.75	113	267	1.02	984.65	2.34E+00	1.88E-01	26.8	
33	0	486.82	135	299	1.26	997.08	2.32E+00	2.24E-01	25.6	
34	0	510.61	64	279	1.44	1045.82	2.24E+00	1.06E-01	48.9	
35	0	580.38	97	230	1.21	1188.69	2.04E+00	1.62E-01	30.0	
36	0	609.38	10348	355	1.39	1248.09	1.96E+00	1.72E+01	1.1	
37	0	665.52	337	233	1.34	1363.07	1.83E+00	5.61E-01	11.1	
38	0	703.40	150	232	1.78	1440.65	1.75E+00	2.50E-01	22.5	
39	0	719.72	60	201	2.68	1474.06	1.72E+00	1.01E-01	45.6	
40	0	768.38	960	276	1.53	1573.74	1.63E+00	1.60E+00	5.1	
41	0	786.21	235	236	1.50	1610.27	1.60E+00	3.92E-01	15.3	
42	0	805.93	201	214	1.49	1650.65	1.57E+00	3.35E-01	16.6	
43	0	839.12	187	173	1.34	1718.64	1.51E+00	3.12E-01	15.9	
44	0	934.11	530	234	1.72	1913.22	1.38E+00	8.83E-01	7.5	

Sample ID : 96E04566 Acquisition date : 14-OCT-1996 09:16:58

8019

Pk	It	Energy	Area	Bkgnd	FWHM	Channel	%Eff	Cts/Sec	%Err	Fit
45	0	1120.20	2199	185	1.80	2294.47	1.17E+00	3.66E+00	2.5	
46	0	1133.34	65	95	1.76	2321.39	1.15E+00	1.08E-01	30.7	
[illegible]	0	1155.21	247	138	1.71	2366.19	1.13E+00	4.11E-01	11.3	
48	0	1208.09	92	114	1.39	2474.54	1.09E+00	1.53E-01	26.6	
49	0	1224.85	31	54	0.72	2508.89	1.07E+00	5.21E-02	42.6	
50	0	1238.16	831	180	1.78	2536.17	1.06E+00	1.39E+00	5.3	
51	0	1280.97	214	121	1.31	2623.88	1.03E+00	3.57E-01	12.6	
52	0	1377.54	555	147	1.83	2821.77	9.57E-01	9.25E-01	6.3	
53	0	1385.31	114	116	1.65	2837.69	9.51E-01	1.91E-01	21.1	
54	2	1401.42	172	111	2.11	2870.71	9.41E-01	2.87E-01	14.5	9.82E-01
55	2	1407.86	283	99	2.11	2883.91	9.36E-01	4.72E-01	9.6	
56	0	1508.90	270	147	1.41	3090.97	8.73E-01	4.50E-01	11.6	
57	0	1661.38	113	49	1.76	3403.51	7.91E-01	1.88E-01	16.2	
58	0	1729.75	377	57	1.66	3543.64	7.58E-01	6.28E-01	6.9	
59	0	1764.45	1701	56	2.19	3614.77	7.43E-01	2.83E+00	2.7	
60	0	1847.30	265	17	1.80	3784.60	7.07E-01	4.42E-01	7.1	
61	0	1874.82	74	7	6.76	3841.03	6.96E-01	1.24E-01	14.8	

VMS Calibration Report V1.5 Generated 14-OCT-1996 16:11:20

8019

Configuration : DISK:[RADCHEM.SCUSR.ARCHIVE]CAL_GAMMA6_9219.CNF;1
Analyses by : CALIBRATE V1.7,PEAK V16.5,PEAKEFF V2.2
Detector Name : GAMMA6 Energy Calib Time: 14-OCT-1996 09:29:23
Efficiency type : Empirical Effncy Calib Time: 19-SEP-1996 11:47:06
Detector Geometry: IPL-1L Shelf :

Energy Calibration Report

Energy = -0.1754 + 0.4885*Channel + -9.4391E-08*(Channel**2)

Nbr	Centroid Channel	True Energy	Computed Energy	Difference
1	95.54	46.50	46.50	0.007
2	153.47	74.81	74.79	0.022
3	158.12	77.11	77.07	0.041
4	381.42	186.21	186.14	0.073
5	604.86	295.21	295.27	-0.059
6	720.94	351.92	351.96	-0.042
7	1248.09	609.31	609.38	-0.070
8	1363.07	665.45	665.52	-0.071
9	1573.74	768.36	768.38	-0.023
10	1913.22	934.06	934.11	-0.048
11	2294.47	1120.29	1120.20	0.084
12	2366.19	1155.19	1155.21	-0.016
13	2536.17	1238.11	1238.16	-0.054
14	2623.88	1280.96	1280.97	-0.011
15	2821.77	1377.67	1377.54	0.131
16	2883.91	1407.98	1407.86	0.119
17	3090.97	1509.23	1508.90	0.333
18	3403.51	1661.00	1661.38	-0.383
[illegible]	3543.70	1729.59	1729.78	-0.184
[illegible]	3614.78	1764.49	1764.45	0.043
21	3784.64	1847.42	1847.31	0.108

FWHM Calibration Report

FWHM = 0.7579 + 2.6279E-02*(Energy**1/2)

Nbr	Energy	True FWHM	Computed FWHM	Difference
1	46.50	1.02	0.94	0.083
2	74.81	0.95	0.99	-0.037
3	77.11	0.92	0.99	-0.068
4	186.21	1.13	1.12	0.016
5	295.21	1.15	1.21	-0.060
6	351.92	1.27	1.25	0.014
7	609.31	1.39	1.41	-0.019
8	665.45	1.34	1.44	-0.098
9	768.36	1.53	1.49	0.040
10	934.06	1.72	1.56	0.157
11	1120.29	1.80	1.64	0.163
12	1155.19	1.71	1.65	0.061

Sample ID : 96E04566 Acquisition date : 14-OCT-1996 09:16:58

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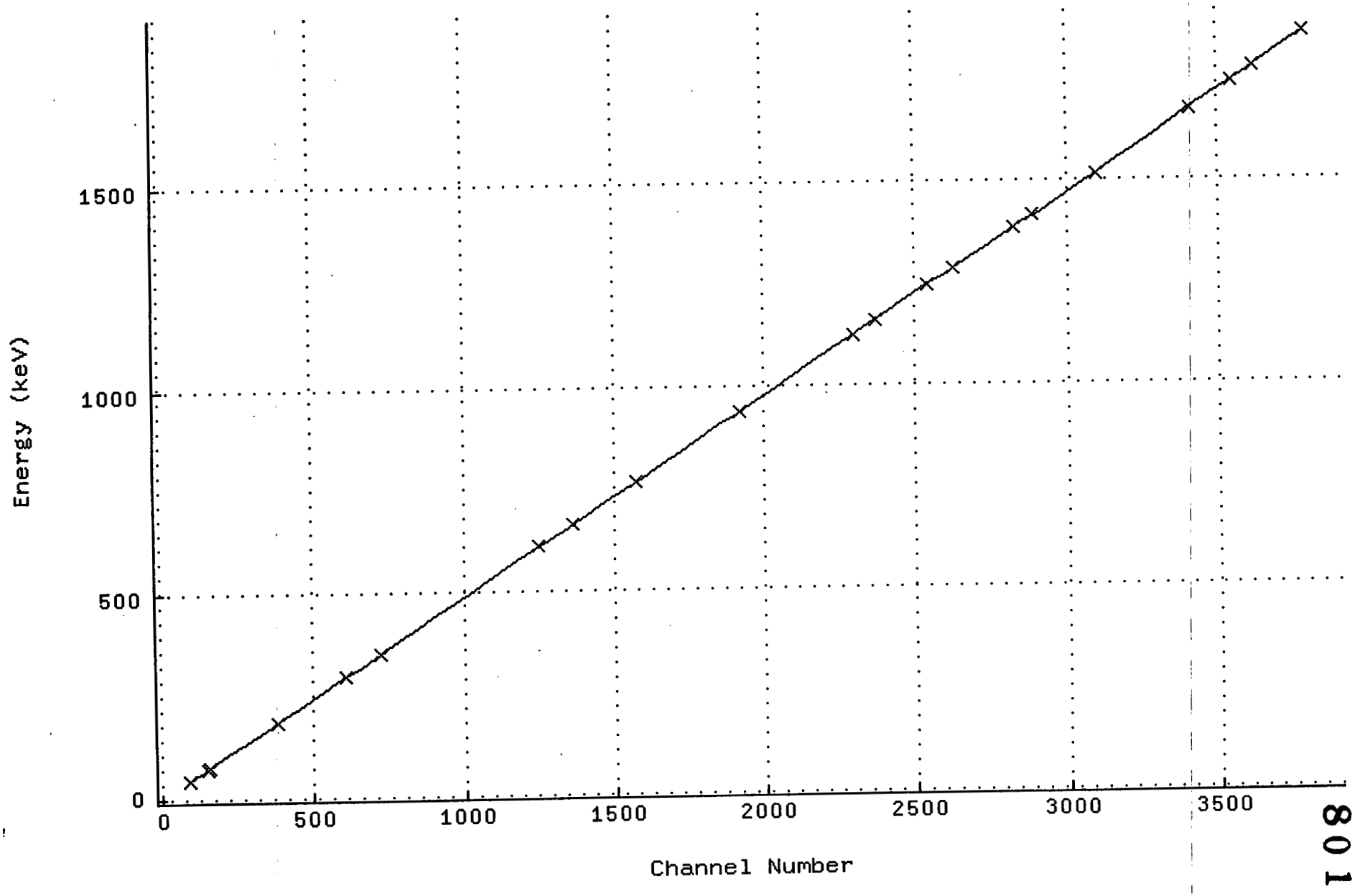
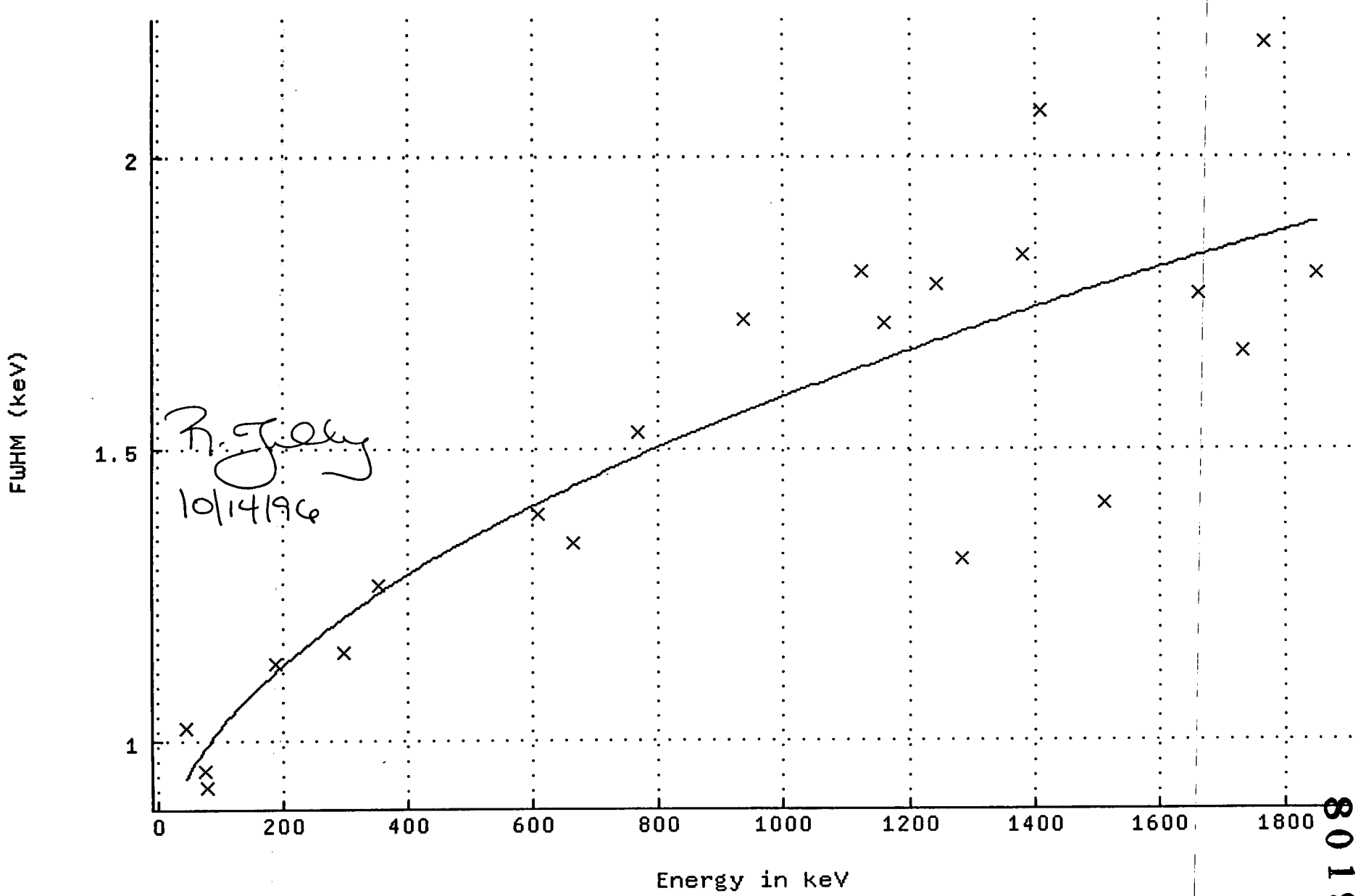
Nbr	Energy	True FWHM	Computed FWHM	Difference
13	1238.11	1.78	1.68	0.097
14	1280.96	1.31	1.70	-0.391
[illegible]	1377.67	1.83	1.73	0.097
16	1407.98	2.07	1.74	0.328
17	1509.23	1.41	1.78	-0.372
18	1661.00	1.76	1.83	-0.064
19	1729.59	1.66	1.85	-0.187
20	1764.49	2.19	1.86	0.327
21	1847.42	1.80	1.89	-0.088

Approved by: _____ Approval Date: __ / __ / ____

Spectrum : DISK:[RADCHEM.SCUSR.ARCHIVE]CAL_GAMMA6_9219.CNF;1
Calib Date: 14-OCT-1996 09:29
Detector : GAMMA6 Geometry: IPL-1L
Energy = -0.175 + 0.4885 * ch + -9.4391E-08 * ch**2



Spectrum : DISK:[RADCHEM.SCUSR.ARCHIVE]CAL_GAMMA6_9219.CNF;1
Calib Date: 14-OCT-1996 09:29
Detector : GAMMA6 Geometry: IPL-1L
FWHM = 0.758 + 0.02628 * SQRT(Energy)



R. Jiby
10/14/96

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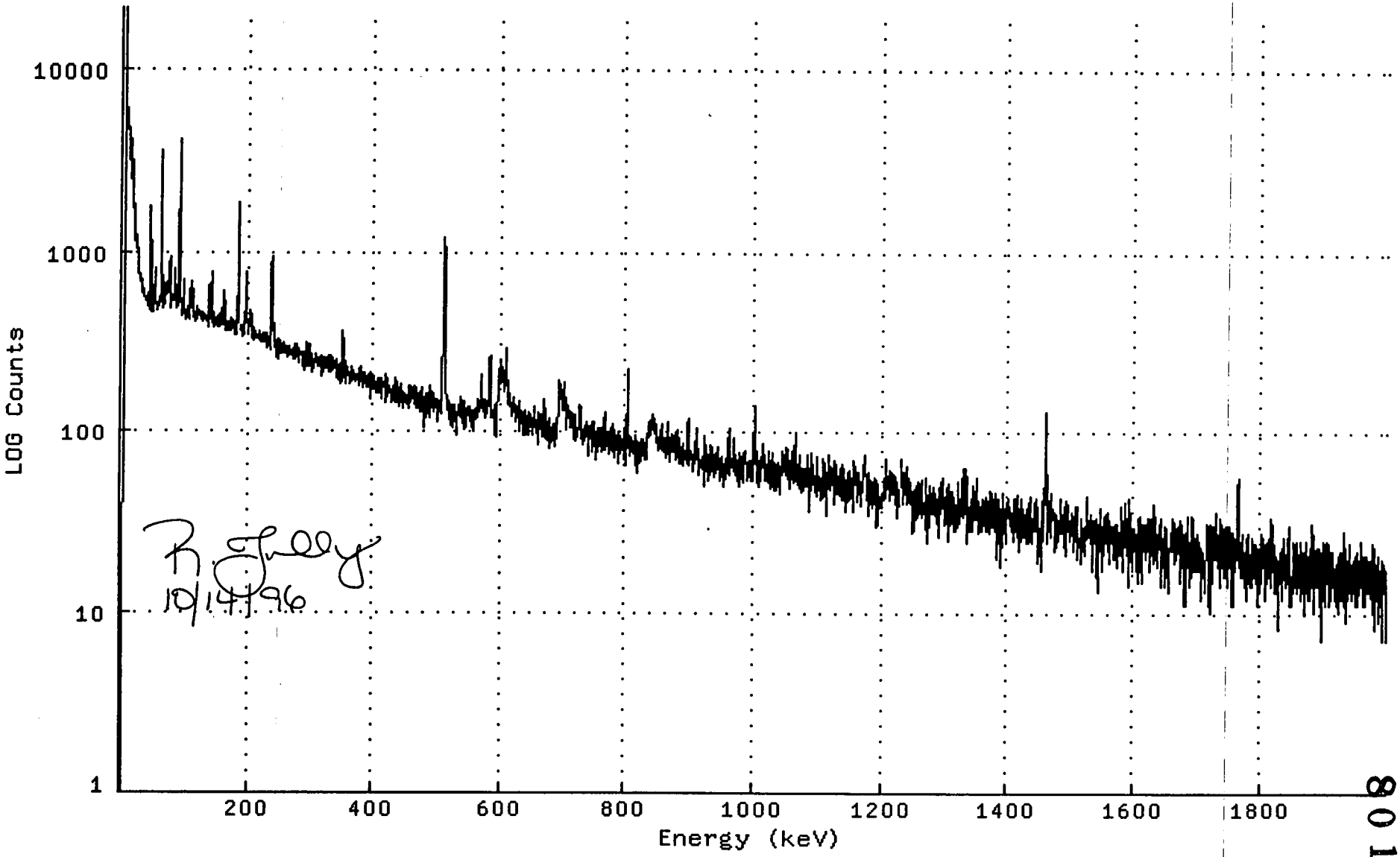
Spectrum : DISK:[RADCHEM.SCUSR.ARCHIVE]BKG_BCKGND_GAMMA6__9144.CNF;1
Title :
Sample Title:
Start Time: 4-OCT-1996 18:21: Sample Time: 4-OCT-1996 00:00: Energy Offset: -1.23202E-01
Real Time : 2 02:00:29.45 Sample ID : BCKGND Energy Slope : 4.88539E-01
Live Time : 2 02:00:00.00 Sample Type: Energy Quad : -8.96482E-08



VMS Peak Search Report V1.9 Generated 11-OCT-1996 13:58:11

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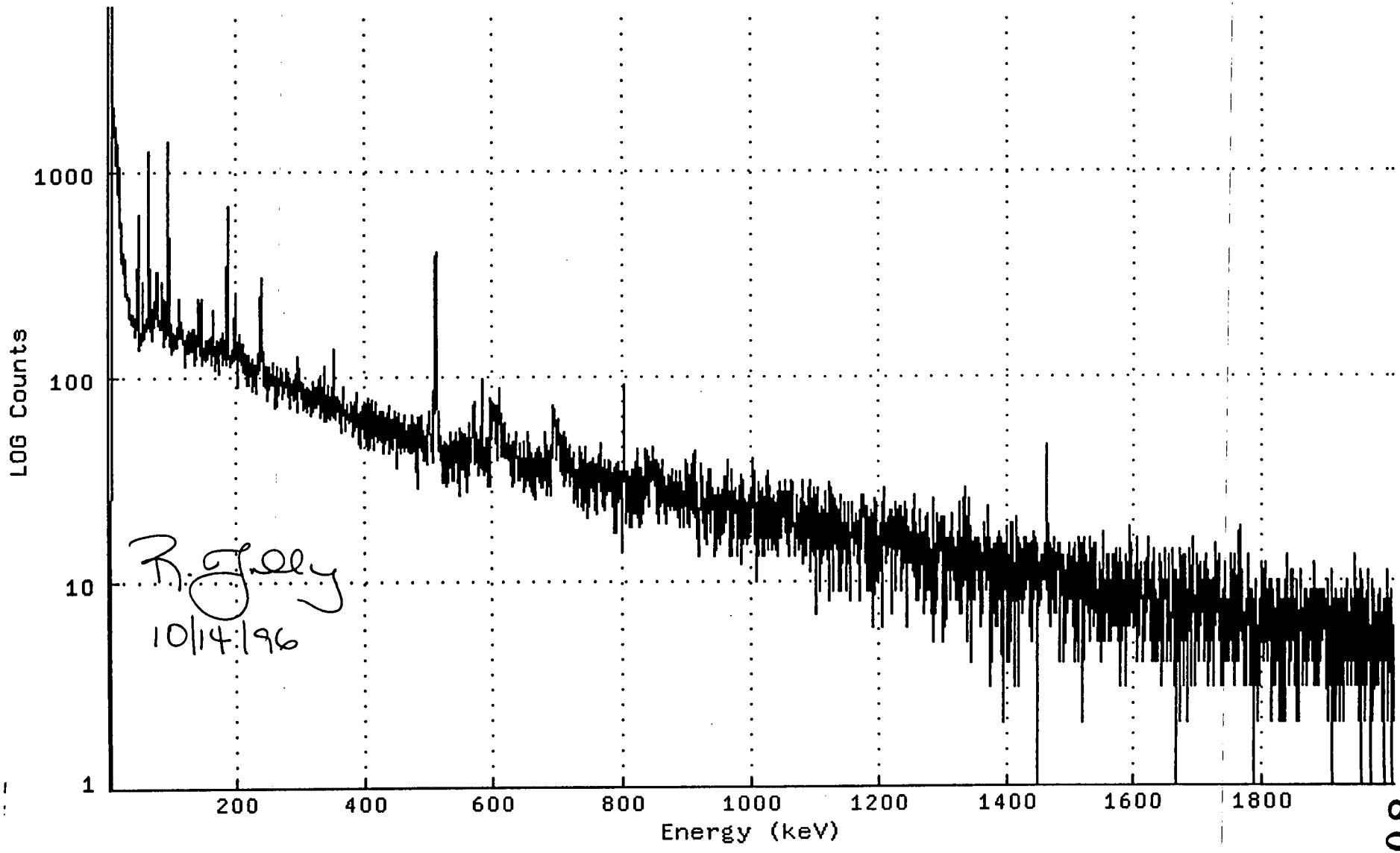
Configuration : DISK:[RADCHEM.SCUSR.ARCHIVE]BKG_BCKGND_GAMMA6__9144.CNF
Analyses by : PEAK V16.5,PEAKEFF V2.2
Sample date : 4-OCT-1996 00:00:00 Acquisition date : 4-OCT-1996 18:21:18
Sample ID : BCKGND Sample quantity : 1.0000 G
Detector name : GAMMA6 Detector geometry: TRM1-S3
Elapsed live time: 2 02:00:00.00 Elapsed real time: 2 02:00:29.45 0.0%
Start energy : 0.37 keV End energy : 1999.43 keV
Sensitivity : 5.00 Gaussian : 10.00
Critical level : No

Pk	It	Energy	Area	Bkgnd	FWHM	Channel	%Eff	Cts/Sec	%Err	Fit
1	0	10.31	4650	23581	0.99	21.37	1.07E+05	2.58E-02	5.4	
2	4	13.10	3782	8752	0.88	27.07	1.83E+03	2.10E-02	3.5	6.65E-01
3	4	16.24	5522	14567	1.15	33.50	1.52E+02	3.07E-02	4.1	
4	0	19.50	1635	8409	1.62	40.16	3.62E+01	9.08E-03	9.3	
5	0	25.54	312	5600	0.86	52.53	1.02E+01	1.73E-03	38.6	
6	0	46.59	2743	4367	1.01	95.62	5.24E+00	1.52E-02	4.7	
7	0	53.57	608	4119	1.10	109.90	5.52E+00	3.38E-03	18.7	
8	0	63.33	5851	4242	0.89	129.88	6.06E+00	3.25E-02	2.3	
9	0	66.27	434	3647	1.07	135.89	6.23E+00	2.41E-03	23.6	
10	0	74.71	387	3737	0.90	153.19	6.70E+00	2.15E-03	25.5	
11	0	77.10	716	3235	0.91	158.08	6.82E+00	3.98E-03	13.2	
12	0	84.07	939	4528	1.17	172.34	7.15E+00	5.22E-03	13.3	
13	0	87.11	255	3002	1.06	178.56	7.28E+00	1.42E-03	34.5	
14	0	92.68	8662	4490	1.15	189.96	7.48E+00	4.81E-02	1.8	
15	0	98.45	403	3128	0.67	201.79	7.65E+00	2.24E-03	23.5	
16	7	110.09	994	5123	1.93	225.60	7.87E+00	5.52E-03	14.9	2.35E+00
17	7	112.93	511	3026	1.14	231.42	7.90E+00	2.84E-03	18.5	
18	0	139.98	660	3279	1.12	286.79	7.85E+00	3.67E-03	15.5	
19	0	143.85	766	3282	0.98	294.73	7.80E+00	4.26E-03	13.4	
20	0	163.53	543	3010	1.01	335.01	7.47E+00	3.01E-03	18.1	
21	0	185.82	3757	3802	1.11	380.64	6.98E+00	2.09E-02	3.5	
22	0	197.88	1519	4349	2.03	405.32	6.69E+00	8.44E-03	9.1	
23	0	205.27	364	2837	1.41	420.45	6.51E+00	2.02E-03	25.9	
24	0	238.51	1425	3059	1.17	488.51	5.74E+00	7.92E-03	7.4	
25	0	295.60	150	1965	1.35	605.39	4.61E+00	8.34E-04	51.9	
26	0	351.85	396	1610	1.25	720.55	3.78E+00	2.20E-03	18.2	
27	0	510.92	5903	2795	2.42	1046.27	2.47E+00	3.28E-02	2.5	
28	0	569.76	296	1426	1.68	1166.76	2.20E+00	1.65E-03	25.4	
29	0	583.21	431	1428	1.46	1194.29	2.15E+00	2.39E-03	17.7	
30	0	609.11	415	1634	1.39	1247.34	2.06E+00	2.31E-03	18.9	
31	0	669.74	157	876	1.62	1371.50	1.88E+00	8.74E-04	34.9	
32	10	694.29	708	1889	3.83	1421.77	1.83E+00	3.93E-03	15.0	3.99E+00
33	10	701.21	457	2536	3.84	1435.95	1.81E+00	2.54E-03	29.9	
34	0	802.85	425	888	1.34	1644.13	1.63E+00	2.36E-03	14.4	
35	0	1000.76	326	643	1.90	2049.50	1.42E+00	1.81E-03	16.1	
36	0	1063.81	136	560	1.77	2178.65	1.38E+00	7.53E-04	33.9	
37	0	1460.33	407	435	1.84	2991.07	1.22E+00	2.26E-03	12.2	
38	0	1764.08	137	242	1.92	3613.58	1.14E+00	7.60E-04	24.3	

R. Jolly
10/14/96

Spectrum : DISK:[RADCHEM.SCUSR.ARCHIVE]BKG_BCKGND_GAMMA6__9207.CNF;1
Title :
Sample Title:
Start Time: 11-OCT-1996 22:02 Sample Time: 1-JAN-1900 00:00: Energy Offset: -1.98761E-01
Real Time : 0 16:40:09.77 Sample ID : BCKGND Energy Slope : 4.88802E-01
Live Time : 0 16:40:00.00 Sample Type: Energy Quad : -1.24008E-07



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VMS Peak Search Report V1.9 Generated 14-OCT-1996 16:12:09

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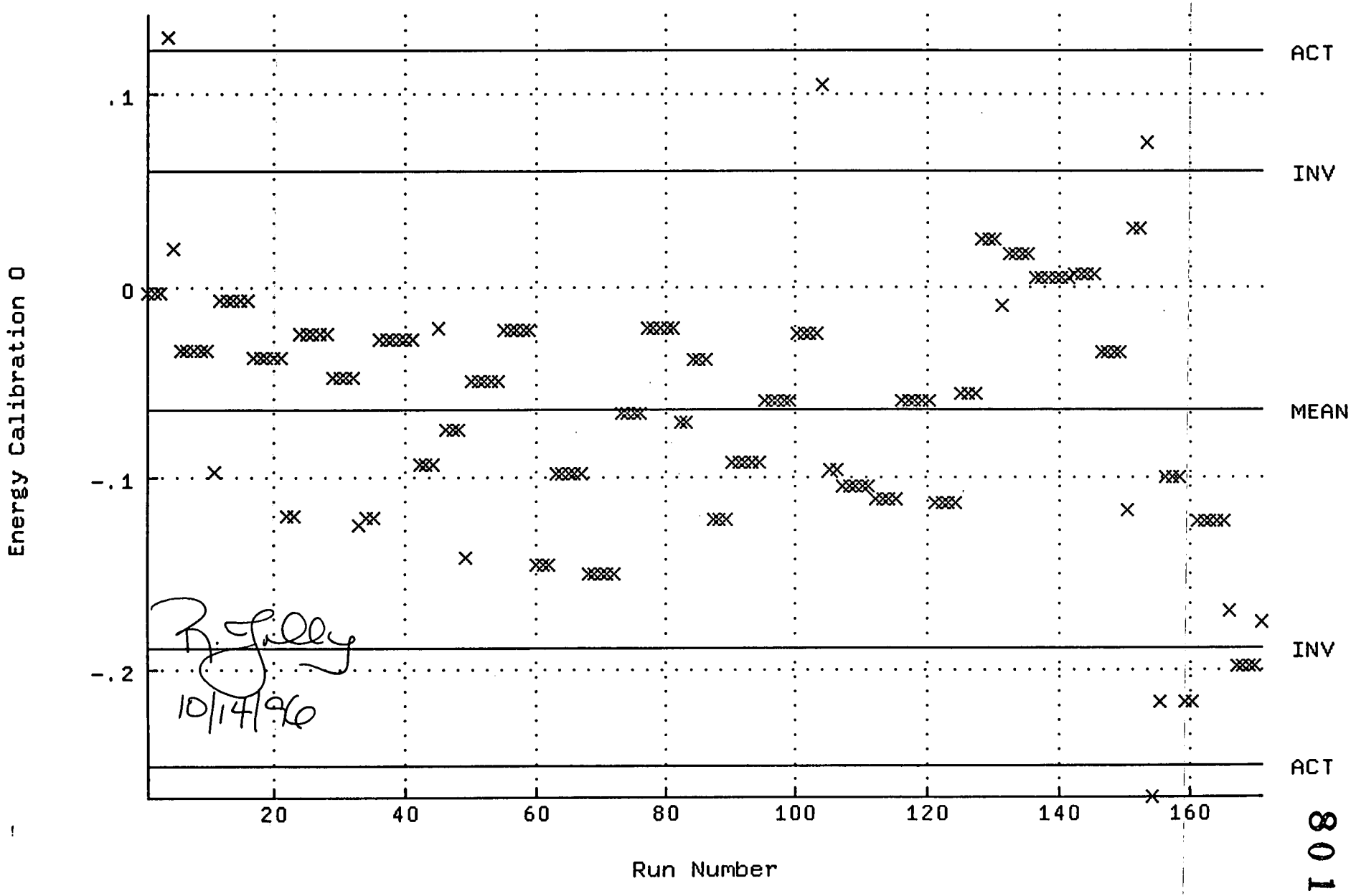
Configuration : DISK:[RADCHEM.SCUSR.ARCHIVE]BKG_BCKGND_GAMMA6__9207.CNF;1
Analyses by : PEAK V16.5,PEAKEFF V2.2
Sample date : 1-JAN-1900 00:00:00 Acquisition date : 11-OCT-1996 22:02:41
Sample ID : BCKGND Sample quantity : 1.0000 L
Detector name : GAMMA6 Detector geometry: IPL-1L
Elapsed live time: 0 16:40:00.00 Elapsed real time: 0 16:40:09.77 0.0%
Start energy : 0.29 keV End energy : 1999.85 keV
Sensitivity : 5.00 Gaussian : 10.00
Critical level : No

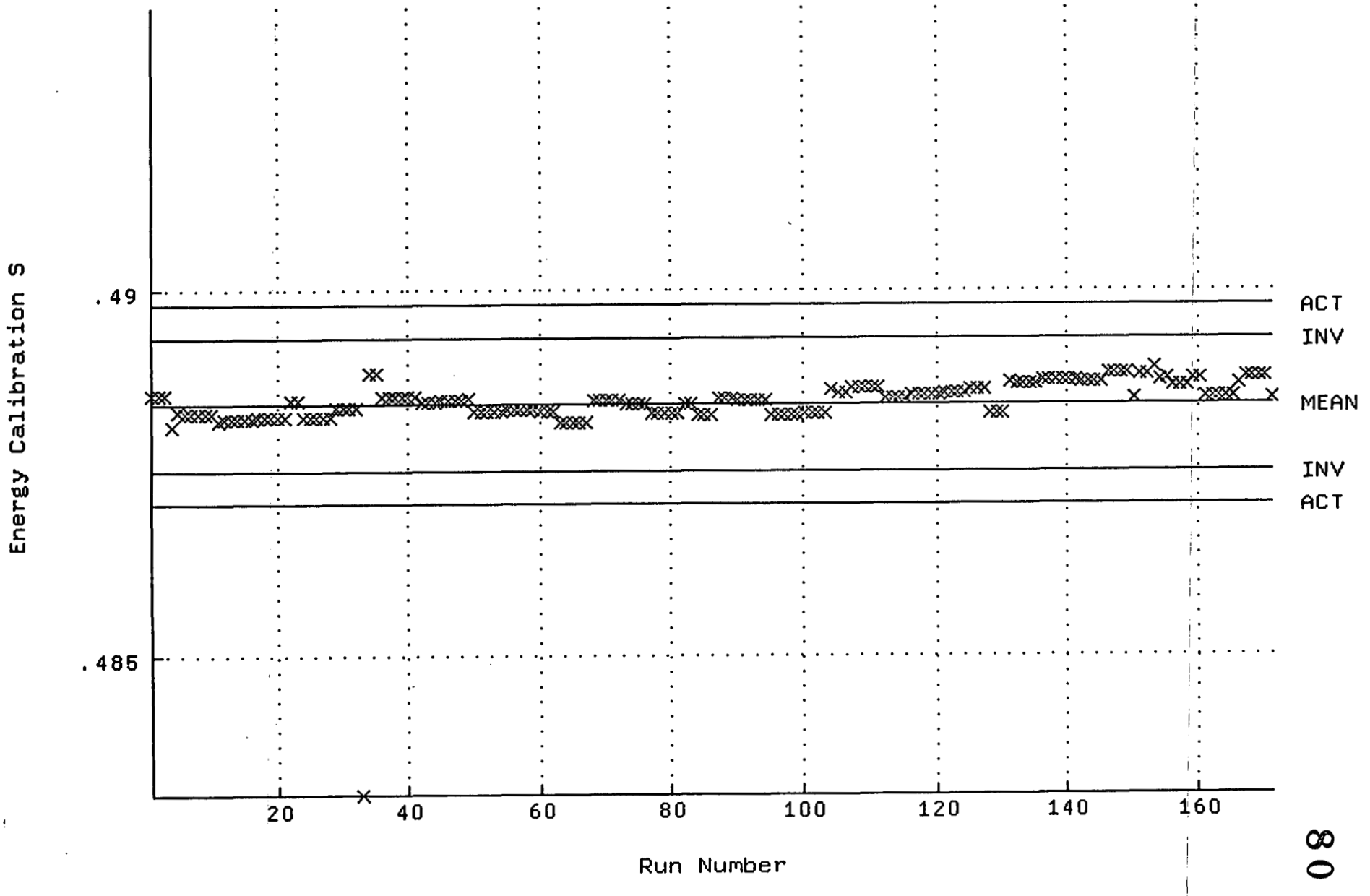
Pk	It	Energy	Area	Bkgnd	FWHM	Channel	%Eff	Cts/Sec	%Err	Fit
1	0	10.30	1435	8131	0.94	21.49	4.88E+00	2.39E-02	10.3	
2	0	13.11	1598	5408	1.08	27.23	5.24E+00	2.66E-02	7.8	
3	0	16.16	1877	4550	1.14	33.48	5.50E+00	3.13E-02	6.5	
4	0	19.32	489	2825	1.12	39.93	5.68E+00	8.16E-03	17.9	
5	0	46.47	1092	1757	1.00	95.48	5.87E+00	1.82E-02	8.1	
6	0	53.49	318	1255	0.95	109.84	5.79E+00	5.30E-03	20.1	
7	0	63.24	1969	1712	0.88	129.79	5.65E+00	3.28E-02	4.4	
8	0	66.38	251	976	1.39	136.22	5.61E+00	4.19E-03	20.7	
9	0	74.61	125	1302	0.63	153.05	5.48E+00	2.08E-03	46.4	
10	0	77.06	243	1345	0.84	158.06	5.44E+00	4.06E-03	25.9	
11	0	83.91	246	1375	0.77	172.09	5.34E+00	4.10E-03	26.9	
12	0	92.78	2705	1751	1.03	190.24	5.21E+00	4.51E-02	3.5	
13	0	110.06	123	1181	0.96	225.57	4.96E+00	2.05E-03	47.1	
14	0	139.64	327	1326	1.16	286.11	4.57E+00	5.45E-03	21.6	
15	0	143.65	214	1132	1.14	294.31	4.52E+00	3.56E-03	28.1	
16	0	163.35	219	1122	0.98	334.62	4.29E+00	3.64E-03	28.4	
17	0	185.87	1288	1399	1.06	380.70	4.06E+00	2.15E-02	6.3	
18	0	198.28	600	1223	1.98	406.10	3.94E+00	1.00E-02	12.0	
19	0	238.78	423	1033	1.02	488.98	3.59E+00	7.04E-03	14.5	
20	0	352.10	159	596	0.93	720.86	2.88E+00	2.66E-03	28.8	
[illegible]	0	511.22	1963	898	2.64	1046.54	2.24E+00	3.27E-02	4.1	
22	0	583.67	178	385	1.64	1194.85	2.03E+00	2.97E-03	22.1	
23	0	803.54	130	310	1.08	1644.99	1.57E+00	2.17E-03	26.8	
24	0	1002.71	19	311	1.88	2052.83	1.29E+00	3.21E-04	184.6	
25	0	1461.46	98	143	1.20	2992.55	9.02E-01	1.63E-03	27.1	

R. Jolly
10/14/96

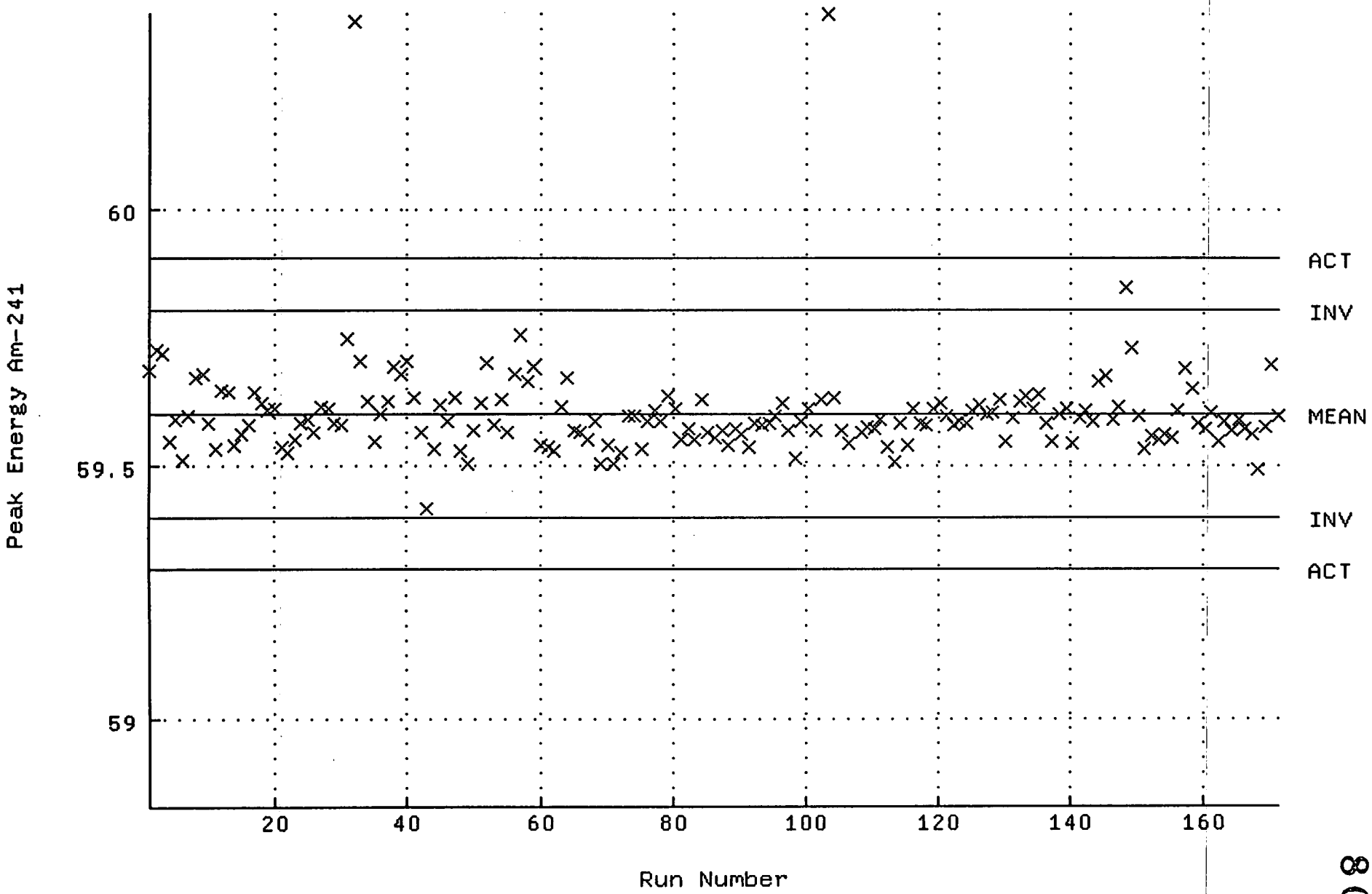
QA Filename : DISK:[RADCHEM.SCUSR.QA]QCC_GAMMA6_CZ588.QAF;1
Parameter Name : ECOFFSET (Energy Calibration Offset)
Start/End Dates : 16-JAN-1996 08:28:41 through 14-OCT-1996 10:25:14
Mean +- Std Dev : -6.367166E-02 +- 6.243657E-02 (-98.06 %)



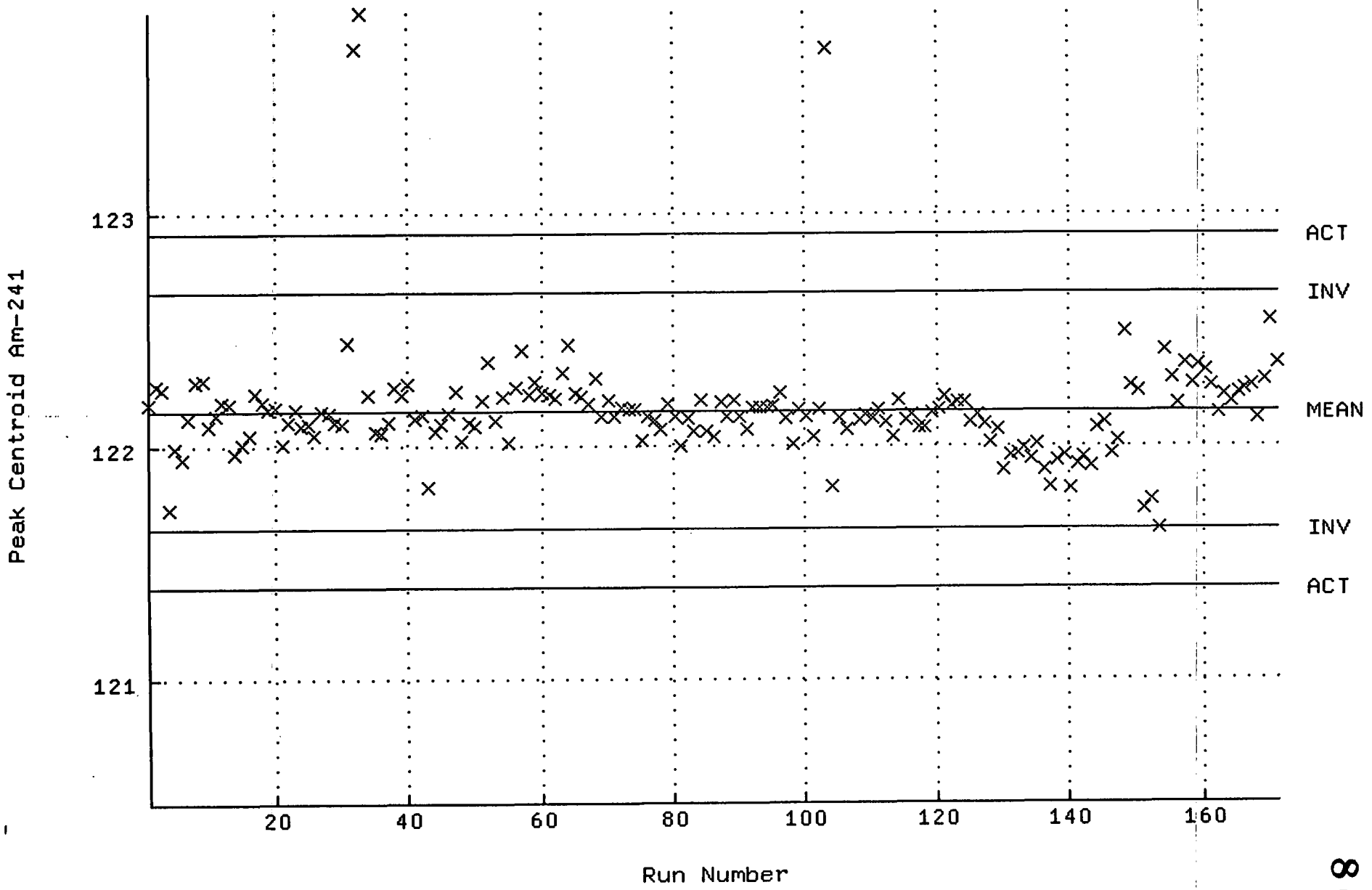
QA filename : DISK:[RADCHEM.SCUSR.QA]QCC_GAMMA6_CZ588.QAF;1
Parameter Name : ECSLOPE (Energy Calibration Slope)
Start/End Dates : 16-JAN-1996 08:28:41 through 14-OCT-1996 10:25:14
Mean +- Std Dev : 0.488452 +- 4.526013E-04 (0.09 %)



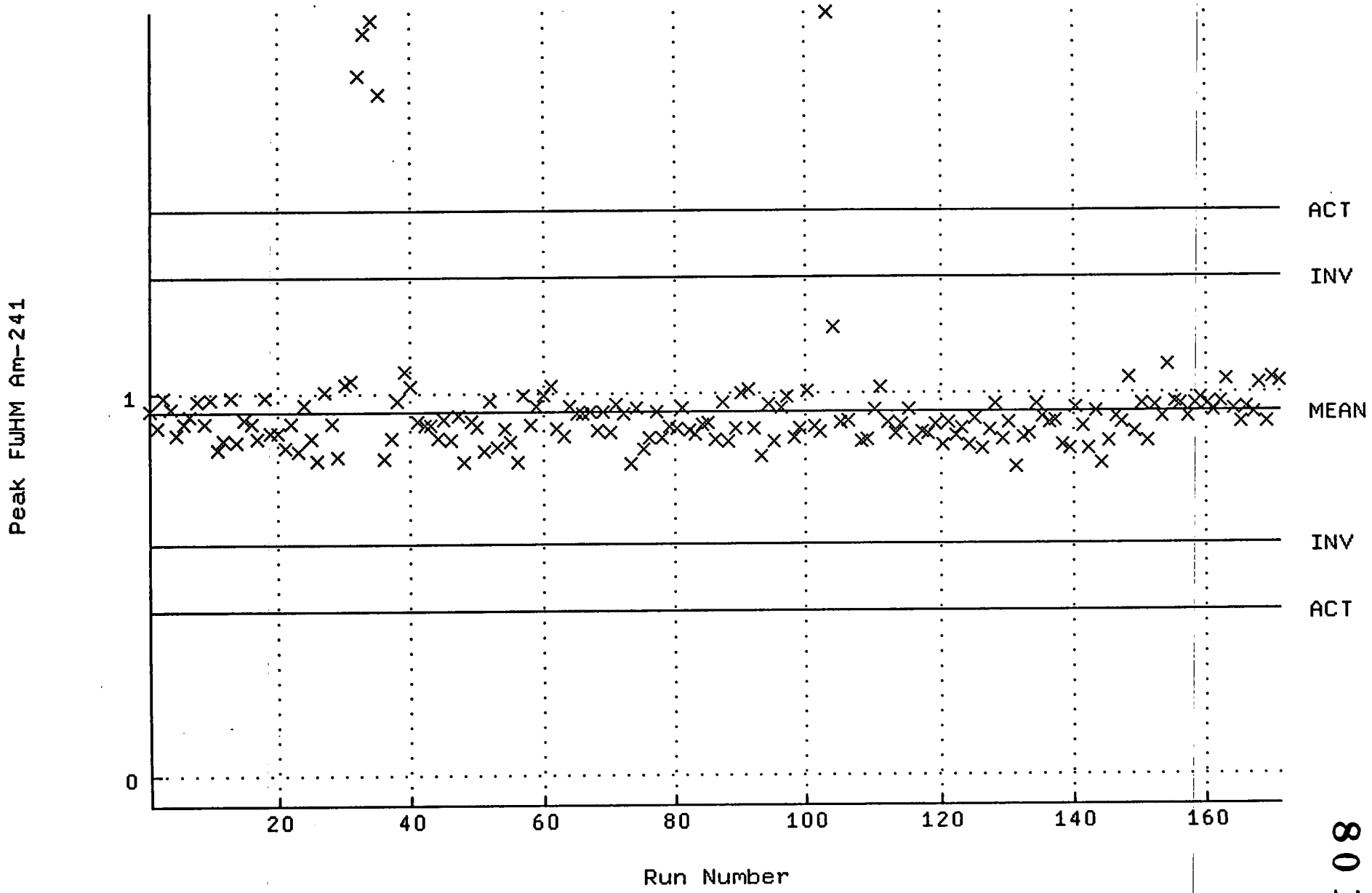
QA Filename : DISK:[RADCHEM.SCUSR.QA]QCC_GAMMA6_CZ588.QAF;1
Parameter Name : PSENERGY-59 (Peak Energy Am-241)
Start/End Dates : 16-JAN-1996 08:28:41 through 14-OCT-1996 10:25:14
Mean +- Std Dev : 59.6025 +- 0.101261 (0.17 %)



QA filename : DISK:[RADCHEM.SCUSR.QA]QCC_GAMMA6_CZ588.QAF;1
Parameter Name : PSCENTRD-59 (Peak Centroid Am-241)
Start/End Dates : 16-JAN-1996 08:28:41 through 14-OCT-1996 10:25:14
Mean +- Std Dev : 122.157 +- 0.254631 (0.21 %)



QA filename : DISK:[RADCHEM.SCUSR.QA]QCC_GAMMA6_CZ588.QAF;1
Parameter Name : PSFWHM-59 (Peak FWHM Am-241)
Start/End Dates : 16-JAN-1996 08:28:41 through 14-OCT-1996 10:25:14
Mean +- Std Dev : 0.952280 +- 0.174081 (18.28 %)



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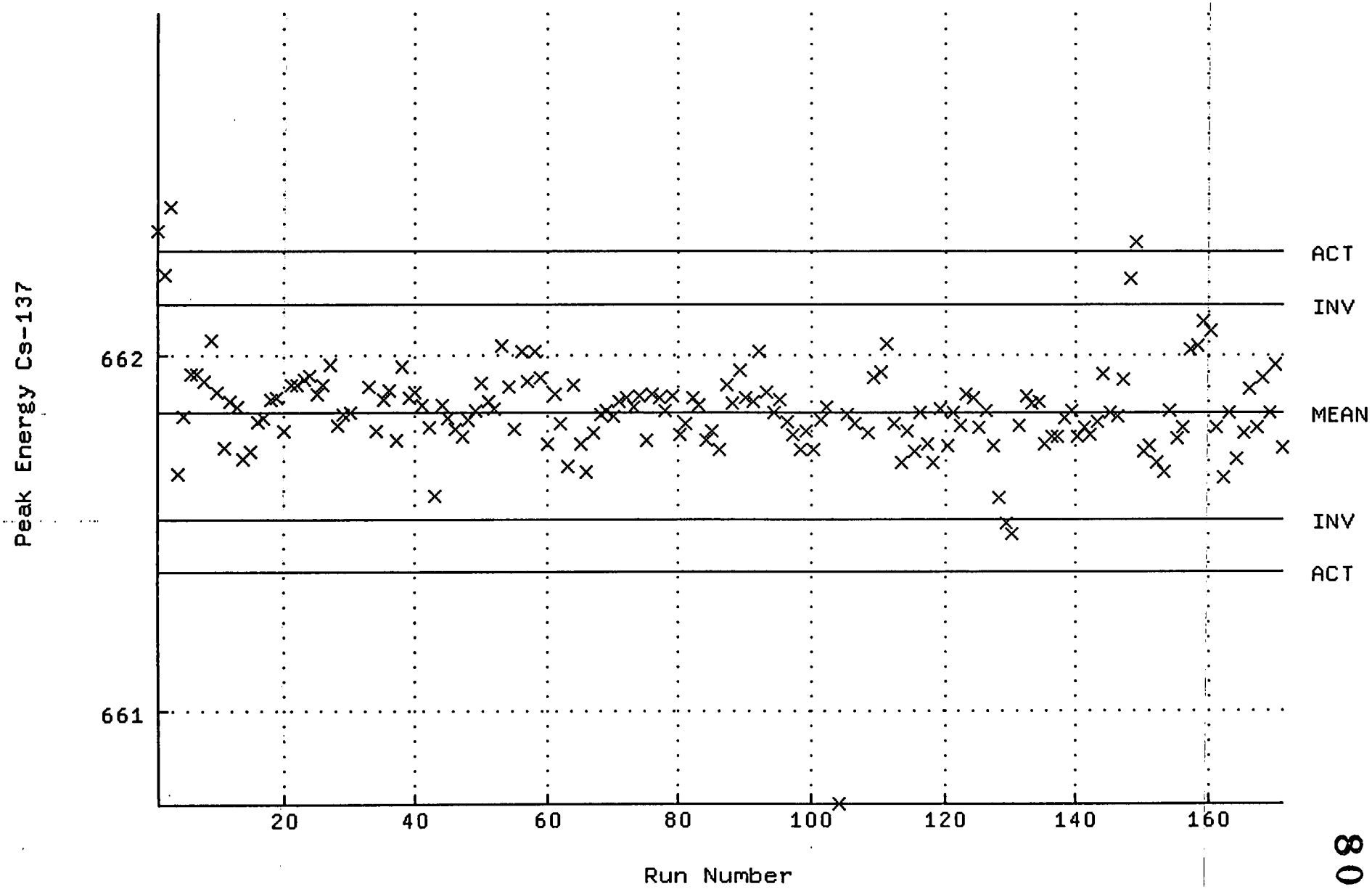
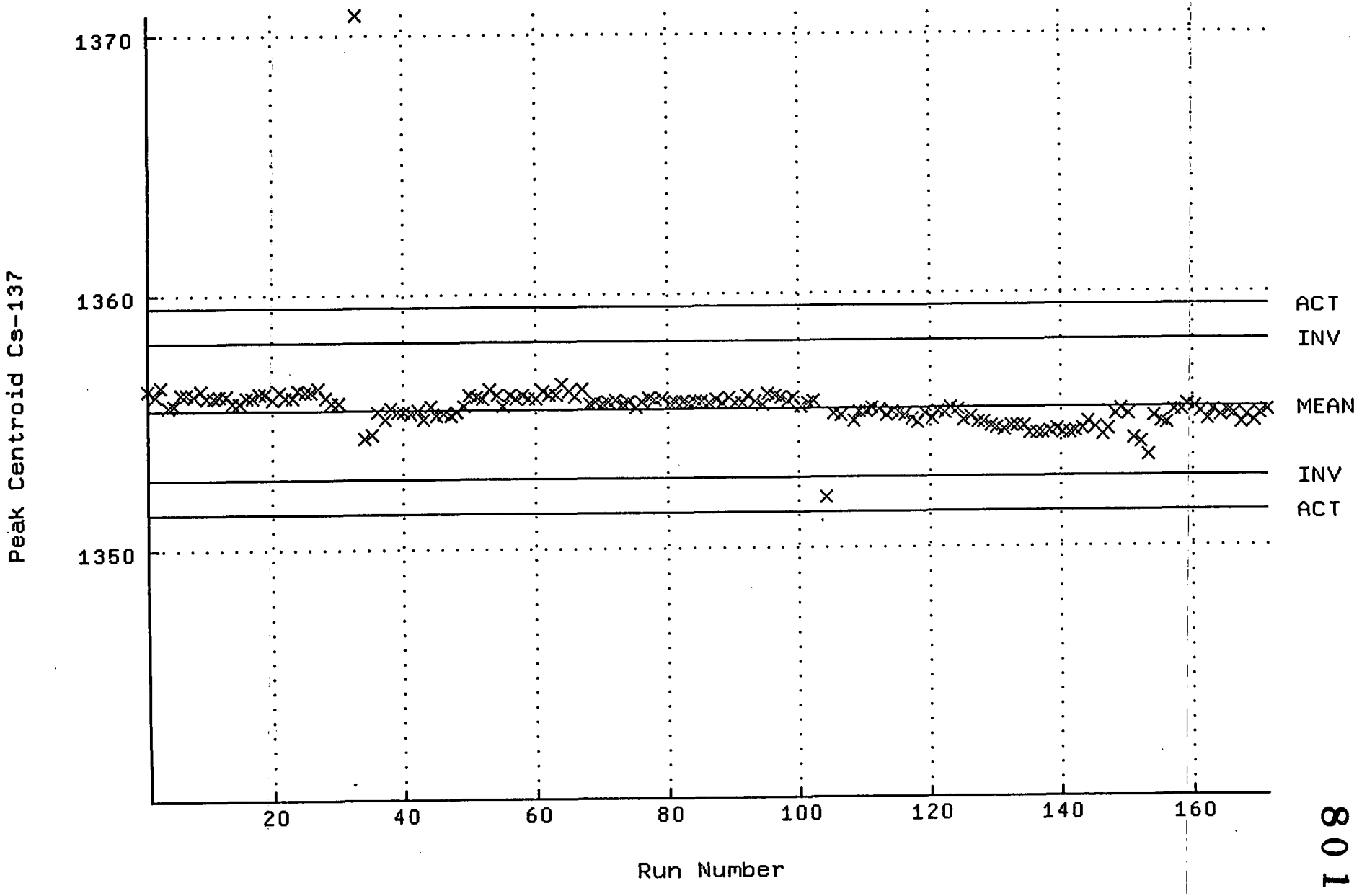
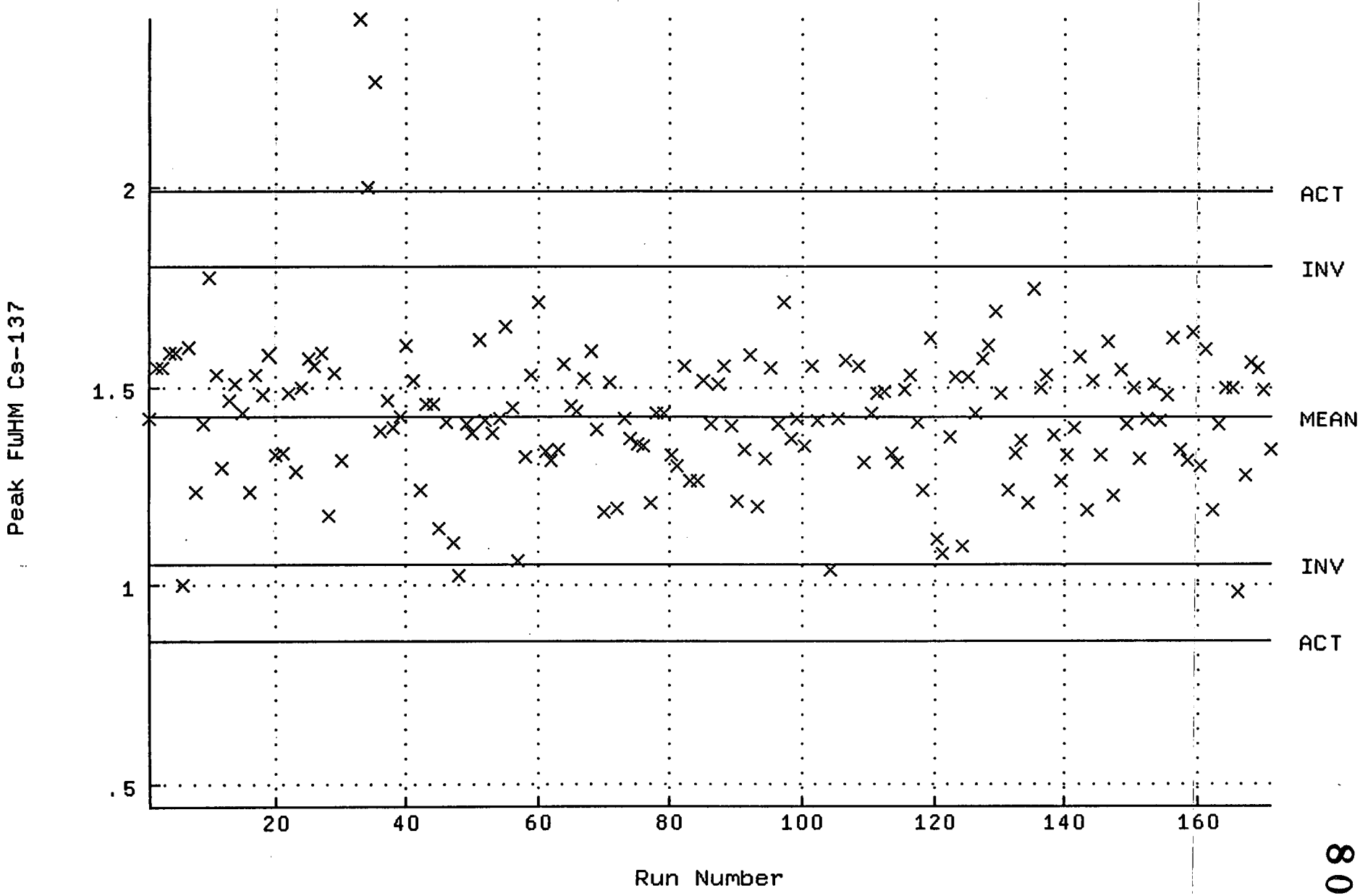
QA Filename : DISK:[RADCHEM.SCUSR.QA]QCC_GAMMA6_CZ588.QAF;1
Parameter Name : PSENERGY-661 (Peak Energy Cs-137)
Start/End Dates : 16-JAN-1996 08:28:41 through 14-OCT-1996 10:25:14
Mean +- Std Dev : 661.840 +- 0.150251 (0.02 %)



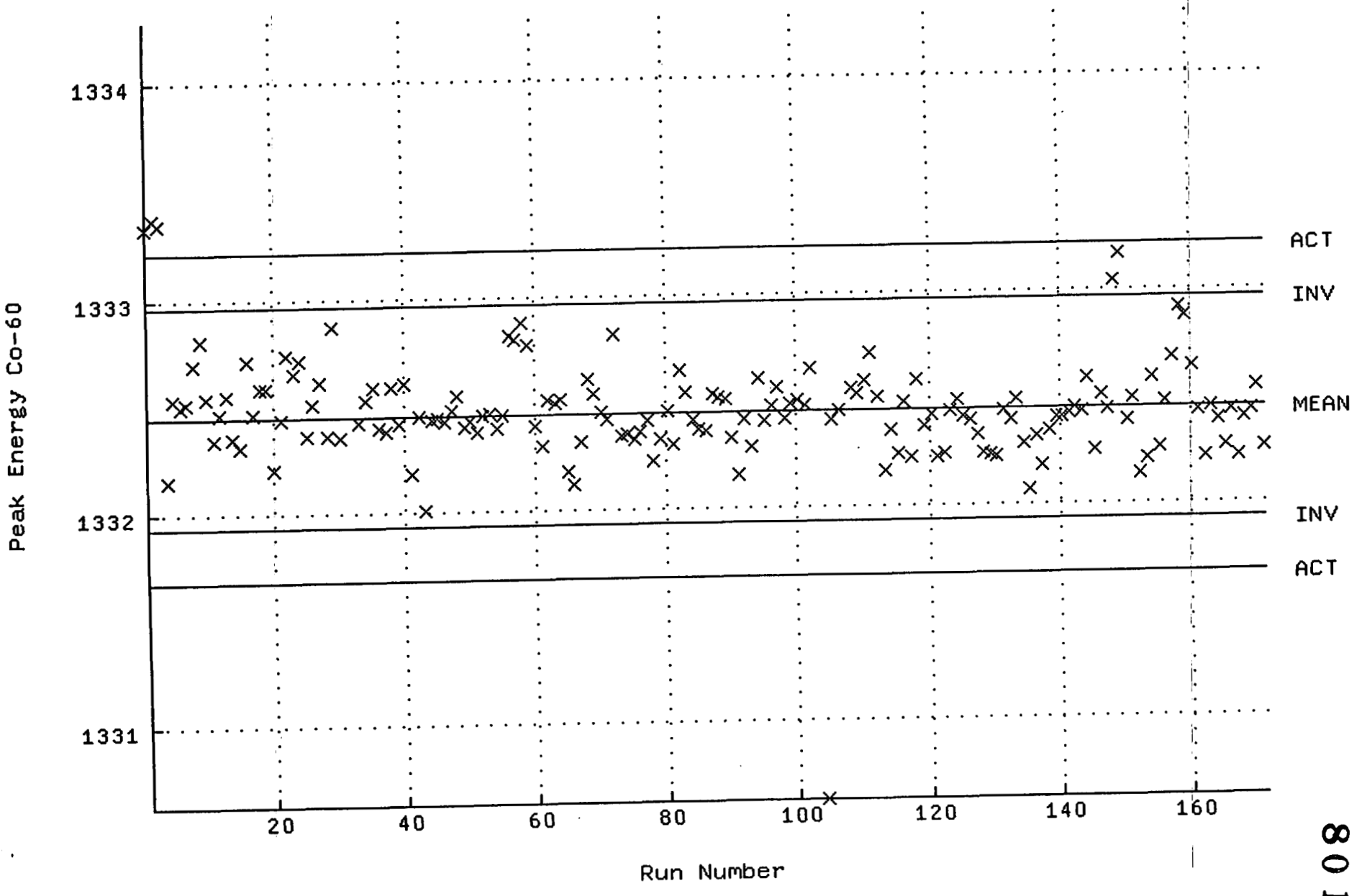
QA filename : DISK:[RADCHEM.SCUSR.QA]QCC_GAMMA6_CZ588.QAF;1
Parameter Name : PSCENTRD-661 (Peak Centroid Cs-137)
Start/End Dates : 16-JAN-1996 08:28:41 through 14-OCT-1996 10:25:14
Mean +- Std Dev : 1355.50 +- 1.33016 (0.10 %)



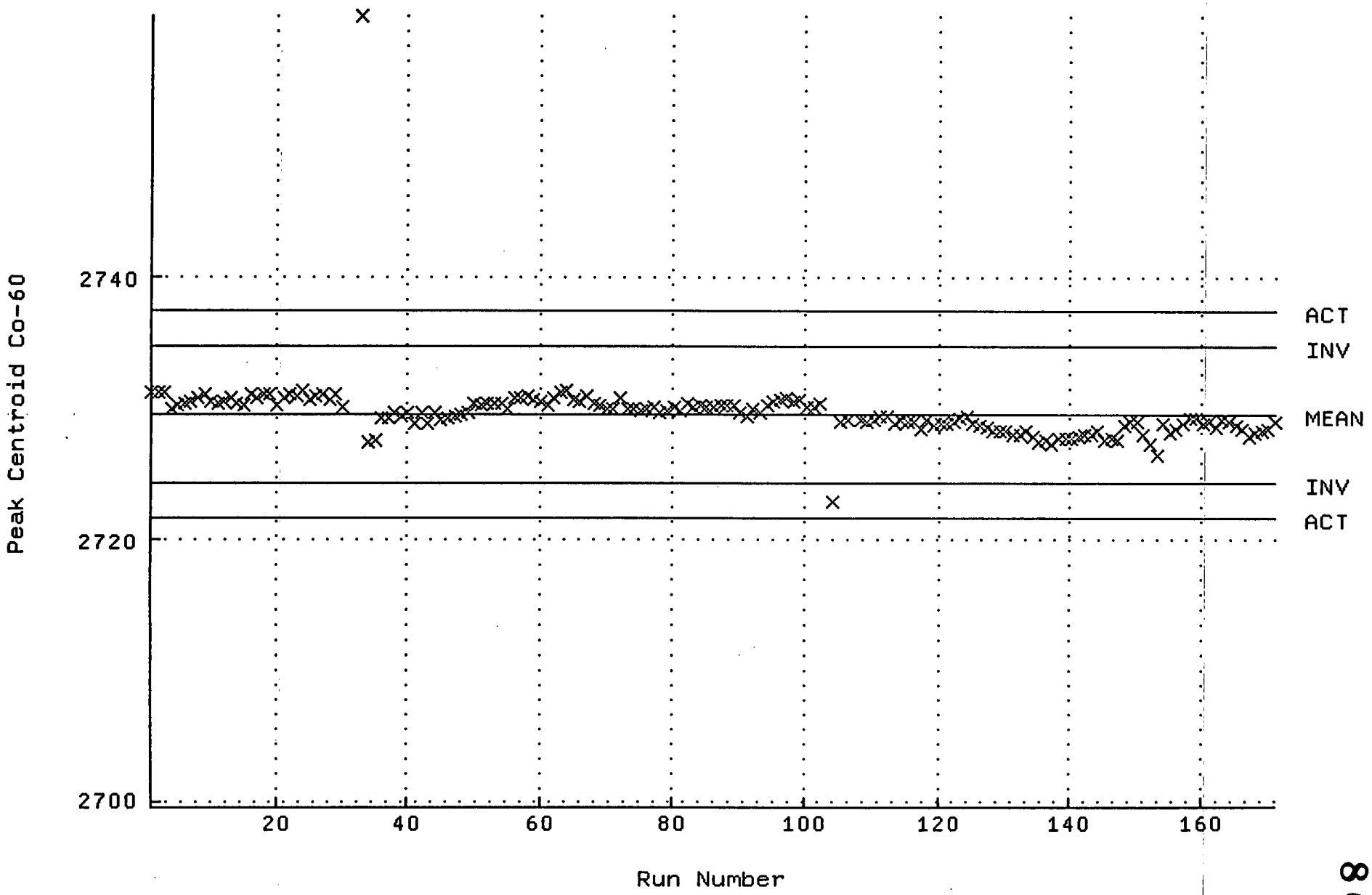
QA filename : DISK:[RADCHEM.SCUSR.QA]QCC_GAMMA6_CZ588.QAF;1
Parameter Name : PSFWHM-661 (Peak FWHM Cs-137)
Start/End Dates : 16-JAN-1996 08:28:41 through 14-OCT-1996 10:25:14
Mean +- Std Dev : 1.42995 +- 0.188369 (13.17 %)



QA filename : DISK:[RADCHEM.SCUSR.QA]QCC_GAMMA6_CZ588.QAF;1
Parameter Name : PSENERGY-1332 (Peak Energy Co-60)
Start/End Dates : 16-JAN-1996 08:28:41 through 14-OCT-1996 10:25:14
Mean +- Std Dev : 1332.45 +- 0.258320 (0.02 %)



QA Filename : DISK:[RADCHEM.SCUSR.QA]QCC_GAMMA6_CZ588.QAF;1
Parameter Name : PSCENTRD-1332 (Peak Centroid Co-60)
Start/End Dates : 16-JAN-1996 08:28:41 through 14-OCT-1996 10:25:14
Mean +- Std Dev : 2729.65 +- 2.63966 (0.10 %)



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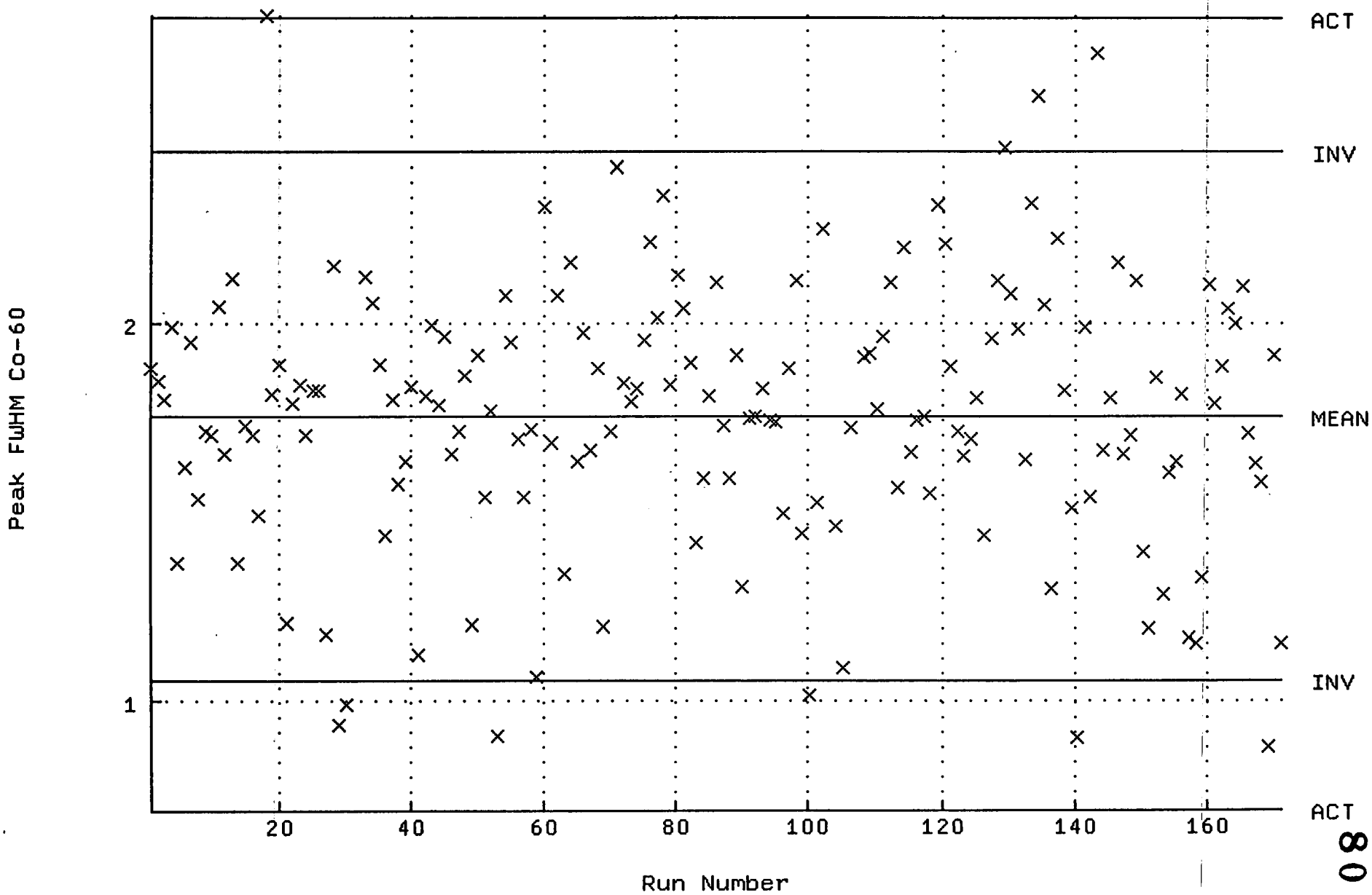
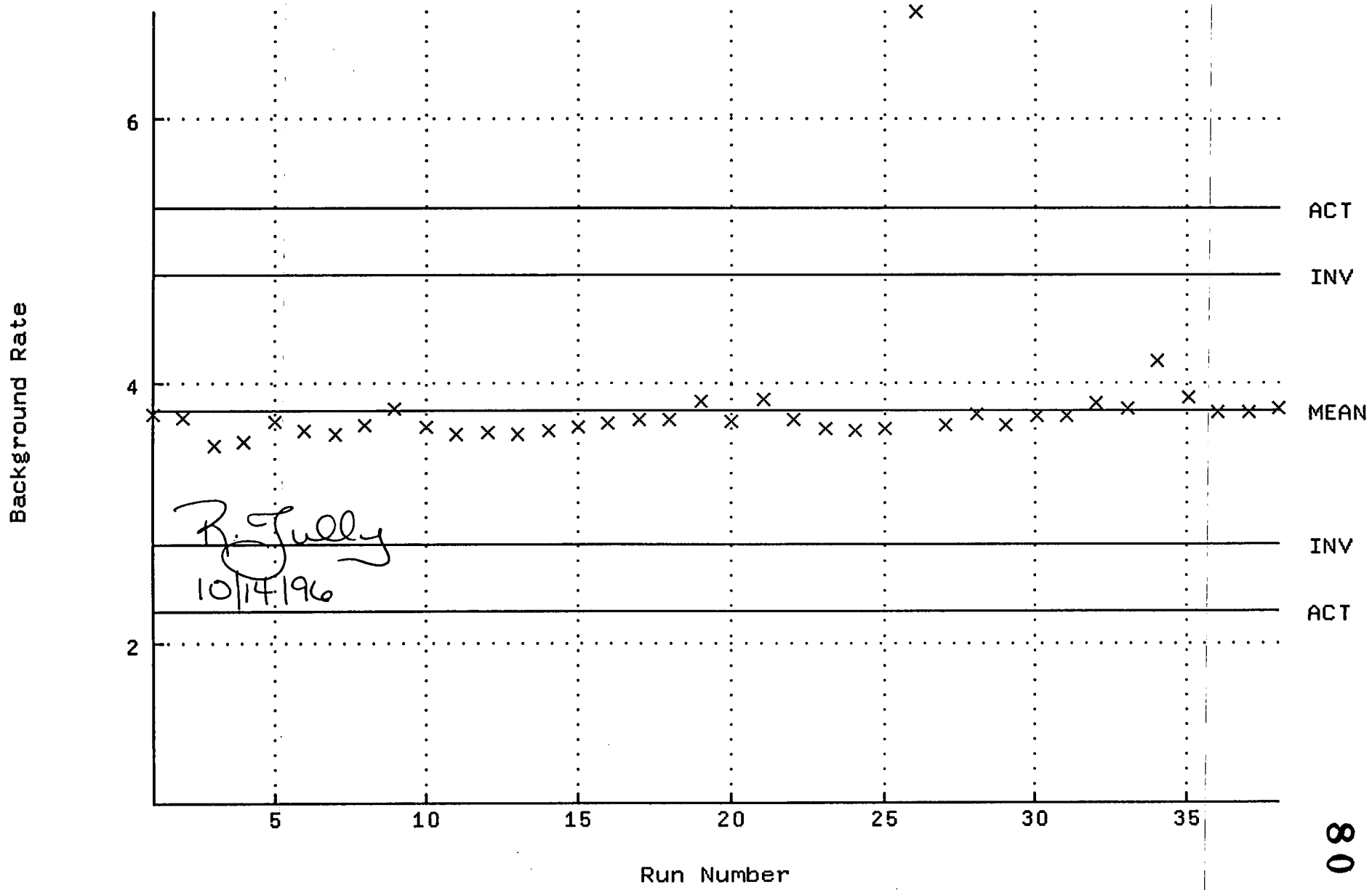
QA filename : DISK:[RADCHEM.SCUSR.QA]QCC_GAMMA6_CZ588.QAF;1
Parameter Name : PSFWHM-1332 (Peak FWHM Co-60)
Start/End Dates : 16-JAN-1996 08:28:41 through 14-OCT-1996 10:25:14
Mean +- Std Dev : 1.75623 +- 0.350073 (19.93 %)



QA Filename : DISK:[RADCHEM.SCUSR.QA]QCB_GAMMA6_EMPTY.QAF;1
Parameter Name : BACKRATE (Background Rate)
Start/End Dates : 15-JAN-1996 11:37:37 through 11-OCT-1996 22:02:41
Mean +- Std Dev : 3.79201 +- 0.514863 (13.58 %)



R. Tully
10/14/96

8019

000379

Library Title :
Library file name : DISK:[RADCHEM.SCUSR.LIB]HAYDEN.NLB;1
Date printed : 14-OCT-1996 16:14:30.70
Number of nuclides : 4
Number of lines : 43

8019

Nuclide Name	Half-Life	Nuclide Type	Key Line	Energy		Abundance
RA-226	1600.00Y	Natural	*	186.21	keV	3.28 %
RA-228	1.41E+10Y	Natural		209.28	keV	4.40 %
				270.23	keV	3.60 %
				327.64	keV	3.20 %
				338.32	keV	11.40 %
				463.00	keV	4.40 %
				794.70	keV	4.60 %
			*	911.07	keV	27.70 %
				964.60	keV	5.20 %
				969.11	keV	16.60 %
PA-231	3.28E+04Y	Natural		50.10	keV	31.70 %
				100.00	keV	1.11 %
				122.31	keV	1.19 %
				144.24	keV	3.24 %
				154.21	keV	5.58 %
				205.00	keV	1.08 %
				210.60	keV	1.26 %
				234.90	keV	2.80 %
				236.00	keV	11.50 %
				256.20	keV	6.30 %
				269.46	keV	13.60 %
				271.23	keV	10.60 %
				283.67	keV	1.60 %
				286.10	keV	1.60 %
				300.08	keV	2.30 %
				304.40	keV	1.35 %
				323.87	keV	3.88 %
				330.00	keV	1.30 %
				334.20	keV	1.15 %
				338.28	keV	2.73 %
			*	351.07	keV	12.94 %
				401.81	keV	6.50 %
				404.84	keV	2.90 %
				427.08	keV	1.30 %
				445.03	keV	1.18 %
				569.67	keV	0.54 %
				831.96	keV	2.90 %
				897.83	keV	0.24 %
				897.83	keV	0.52 %
U-235	7.04E+08Y	Natural		143.76	keV	10.50 %
				163.35	keV	4.70 %
			*	185.71	keV	54.00 %
				205.31	keV	4.70 %

R. Jolly
10/14/96

Print Time : 14-OCT-1996 16:14:32.48
Library file name : DISK:[RADCHEM.SCUSR.LIB]HAYDEN.NLB;1
Library title :

8019

Record	Interfering nuclide	Interfered nuclide
1	U-235	Ra-226
2	RA-228	Pa-231

R. Jolly
10/14/96

DATA CHEM
LABORATORIES
A SORENSON COMPANY

Case Narrative

Analysis:	Alpha - Spectrometry	**Client:**	Hayden Environmental
Preparation SOP #:	WR-DC-200	**Account:**	3025
Analysis SOP#:	WR-DC-341	**Matrix:**	Filter
Lot/Release/SDG #:	None		
DCL Set ID:	96E-0640-02, 03		

General Set Information: These sets consisted of 4 field samples. They were received in the radiochemistry laboratory in good condition on September 30, 1996.

Method Summary: The actinides were separated using ion-exchange chromatography as prescribed in the above listed procedure (WR-DC-341). No exceptions were noted.

Sample Preparation: The filters were dissolved in concentrated HF and evaporated to dryness. After drying, a perchloric/nitric acid ashing was performed. The residue was dissolved in concentrated HNO_3 and transferred to a tared vessel. The acetone wash was digested, residue dissolved and combined to filter digestate. The samples were then diluted to 100 g. Aliquots were taken and were prepared as prescribed in the above procedure. No other exceptions were noted.

Holding Times: Not applicable.

Dilutions: 50% wt.-wt. dilution were performed on the field samples as per client.

Quality Control Data

Laboratory Control Sample: One LCS was run with each preparation group in which these sets were contained. The recoveries were within QC performance limits.

Blank: One blank was run with each preparation group in which these sets were contained. The blanks were within QC performance limits.

Matrix Spike: An MS was not required.

Matrix Duplicate: An MD was not required

This report is 246 total pages.

Tracers/Surrogates: All the tracer recoveries were within QC limits

Instrument QC:

Primary Calibration: Annually, NIST traceable alpha sources were used to calibrate the spectrometers used for this analysis to determine average efficiencies.

Secondary Calibration: A weekly energy calibration was performed using sources developed with NIST traceable materials.

Pulser Check: A daily or prior-to-counting check was performed on the detectors using an electronic pulsing system .

NC/CAR: No NC/CARs were required for this lot.

Miscellaneous Comments: None.

Peter Kligmann 11/5/96

Analyst Name **Date**

DATA CHEM LABORATORIES
A Sorenson Company

COVER FORM (TYPE I)
SINGLE METHOD ANALYSES

SUMMARY INFORMATION

Form RLIMS63M-V1.3
11049616095527
Page 1

G968S026

Date Reported.....: NOV 05 1996
Date Printed.....: 04-NOV-96 16:09
DCL Report Group..: 96E-0640-02

Client Ref Number.: Not Provided
Release Number....: Not Provided

Analysis Method(s): WR-DC-341

Hayden Environmental
Attention: Bruce Sarven
561 Congress Park Drive
Dayton, OH 45459

Client Sample Name	Laboratory Sample Name	Laboratory Sample ID	Laboratory Group Name	Laboratory Group ID
BL-123238-1	BL-123238-1	S96970CC	96E-0640-02	G968S026
QC-123238-1	QC-123238-1	S96970CD	96E-0640-02	G968S026
9131,39,40	96E04514	S968S06B	96E-0640-02	G968S026
9135,41,42	96E04515	S968S06C	96E-0640-02	G968S026
9136,43,44	96E04516	S968S06D	96E-0640-02	G968S026
9137,45,46	96E04517	S968S06F	96E-0640-02	G968S026

Analyst: Peter M. Kligmann

Reviewer:

Laboratory Supervisor:

960 West LeVoy Drive / Salt Lake City, Utah 84123-2547 / (801) 266-7700
FAX (801) 268-9992

DATA CHEM LABORATORIES
A Sorenson Company

FORM H (TYPE I)
SINGLE METHOD ANALYSES

SAMPLE GROUP COMMENTS

Date Printed.....: 04-NOV-96 16:09
DCL Report Group..: 96E-0640-02

Client Name...: Hayden Environmental

Release Number....: Not Provided

General Information

The DCL QC Database maintains all numerical figures which are input from the pertinent data source. These data have not been rounded to significant figures nor have they been moisture corrected. Reports generated from the system, however, list data which have been rounded to the number of significant figures requested by the client or deemed appropriate for the method. This may create minor discrepancies between data which appear on the QC Summary Forms (Forms B-G) and those that would be calculated from rounded analytical results. Additionally, if a moisture correction is performed, differences will be observed between the QC data and the surrogate data reported on Form A (or other report forms) and corresponding data reported on QC Summary Forms. In these cases, the Form A will indicate the "Report Basis" as well as the moisture value used for making the correction.
Report generation options: E2X

Result Symbol Definitions

ND - Not Detected above the MDL or IDL (LLD or MDC for radiochemistry).
** - No result could be reported, see sample comments for details.

Qualifier Symbol Definitions

U - Not Detected above the MDL or IDL (LLD or MDC for radiochemistry).
For radiochemistry the nuclide was not identified by the Canberra Nuclear NID program, activity values reported are calculated using the Canberra Nuclear MINACT program.
B - For organic analysis the qualifier indicates that this analyte was found in the method blank.
For inorganic analysis the qualifier signifies the value is between the IDL and PQL.
J - The qualifier indicates that the value is between the MDL and the PQL. It is also used for indicating an estimated value for tentatively identified compounds in mass spectrometry where a 1:1 response is assumed.

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DATA CHEM LABORATORIES
A Sorenson Company

FORM A (TYPE I)
SINGLE METHOD ANALYSES

SAMPLE ANALYSIS DATA SHEET

S96970CC

Date Printed.....: 04-NOV-96 16:09
Client Sample Name: BL-123238-1
DCL Sample Name...: BL-123238-1

Client Name.....: Hayden Environmental
Client Ref Number....: Not Provided
Sampling Site.....: Not Applicable
Release Number.....: Not Provided

Matrix.....: AIR
Date Sampled.....: Not Applicable
Reporting Units...: pCi/sample

Date Received.....: Not Applicable
DCL Report Group.....: 96E-0640-02

DCL Preparation Group: G969703P
Date Prepared.....: 18-OCT-96 00:00
Preparation Method...: WR-DC-200
Aliquot Weight/Volume: 1.00E+00
Net Weight/Volume....: Not Required

DCL Analysis Group: G969703P
Analysis Method...: WR-DC-341
Instrument Type...: AS
Instrument ID.....: GAR0
Column Type.....: Not Applicable

Analytical Results

Analyte	Date Analyzed	Detection Limit	Result±Error ±TPU Error	Qual.	Dilution	CRDL
Uranium-233/234	24-OCT-96 09:45	5.03E-02	5.34E-03±2.67E-02 ±2.67E-02		1.00E+00	1.0
Uranium-235	24-OCT-96 09:45	3.55E-02	-3.30E-3±1.45E-02 ±1.45E-02		1.00E+00	1.0
Uranium-238	24-OCT-96 09:45	4.66E-02	-1.07E-2±2.10E-02 ±2.10E-02		1.00E+00	1.0
Uranium-232	24-OCT-96 09:45		TBA			NR

Surrogate Recoveries

Analyte	Result	Spiked Amount	Percent Recovery
Uranium-232	9.8E0	11.	88.

DATA CHEM LABORATORIES
A Sorenson Company

FORM A (TYPE I)
SINGLE METHOD ANALYSES

SAMPLE ANALYSIS DATA SHEET

Date Printed.....: 04-NOV-96 16:09
Client Sample Name: QC-123238-1
DCL Sample Name...: QC-123238-1

Client Name.....: Hayden Environmental
Client Ref Number....: Not Provided
Sampling Site.....: Not Applicable
Release Number.....: Not Provided

Matrix.....: AIR
Date Sampled.....: Not Applicable
Reporting Units...: pCi/Sample

Date Received.....: Not Applicable
DCL Report Group.....: 96E-0640-02

DCL Preparation Group: G969703P
Date Prepared.....: 18-OCT-96 00:00
Preparation Method...: WR-DC-200
Aliquot Weight/Volume: 1.00E+00
Net Weight/Volume....: Not Required

DCL Analysis Group: G969703P
Analysis Method...: WR-DC-341
Instrument Type...: AS
Instrument ID.....: GAR0
Column Type.....: Not Applicable

Analytical Results

Analyte	Date Analyzed	Detection Limit	Result±Error ±TPU Error	Qual.	Dilution	CRDL
Uranium-233/234	24-OCT-96 09:45	2.99E-02	6.15E+00±2.43E-01 ±7.85E-01		1.00E+00	1.0
Uranium-235	24-OCT-96 09:45	2.86E-02	3.26E-01±6.32E-02 ±7.45E-02		1.00E+00	1.0
Uranium-238	24-OCT-96 09:45	3.27E-02	6.32E+00±2.46E-01 ±8.06E-01		1.00E+00	1.0
Uranium-232	24-OCT-96 09:45		TBA			NR

Surrogate Recoveries

Analyte	Result	Spiked Amount	Percent Recovery
Uranium-232	1.1E1	11.	97.

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DATA CHEM LABORATORIES
A Sorenson Company

FORM A (TYPE I)
SINGLE METHOD ANALYSES

SAMPLE ANALYSIS DATA SHEET

Client Name.....: Hayden Environmental
Client Ref Number....: Not Provided
Sampling Site.....: Not Provided
Release Number.....: Not Provided

Date Received.....: 25-SEP-96 00:00
DCL Report Group.....: 96E-0640-02

DCL Preparation Group: G969703P
Date Prepared.....: 18-OCT-96 00:00
Preparation Method...: WR-DC-200
Aliquot Weight/Volume: 1.00E+00
Net Weight/Volume....: Not Required

Date Printed.....: 04-NOV-96 16:09
Client Sample Name: 9131,39,40|NORTH
DCL Sample Name...: 96E04514

Matrix.....: AIR
Date Sampled.....: 19-SEP-96 08:30
Reporting Units...: pCi/Sample
Report Basis.....: ☒ As Received ☐ Dried

DCL Analysis Group: G969703P
Analysis Method...: WR-DC-341
Instrument Type...: AS
Instrument ID.....: GAR0
Column Type.....: Not Applicable

Analytical Results

Analyte	Date Analyzed	Detection Limit	Result±Error ±TPU Error	Qual.	Dilution	CRDL
Uranium-233/234	24-OCT-96 09:45	6.93E-02	4.31E-01±1.08E-01 ±1.20E-01		4.33E-01	1.0
Uranium-235	24-OCT-96 09:45	8.57E-02	4.77E-02±5.40E-02 ±5.43E-02		4.33E-01	1.0
Uranium-238	24-OCT-96 09:45	9.10E-02	2.00E-01±8.29E-02 ±8.65E-02		4.33E-01	1.0
Uranium-232	24-OCT-96 09:45		TBA			NR

Surrogate Recoveries

Analyte	Result	Spiked Amount	Percent Recovery
Uranium-232	9.8E0	11.	88.

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S968S06C

DATA CHEM LABORATORIES
A Sorenson Company

FORM A (TYPE I)
SINGLE METHOD ANALYSES

SAMPLE ANALYSIS DATA SHEET

Date Printed.....: 04-NOV-96 16:09
Client Sample Name: 9135,41,42|SOUTH
DCL Sample Name...: 96E04515

Client Name.....: Hayden Environmental
Client Ref Number....: Not Provided
Sampling Site.....: Not Provided
Release Number.....: Not Provided

Matrix.....: AIR
Date Sampled.....: 19-SEP-96 08:30
Reporting Units...: pCi/Sample
Report Basis.....: ☒ As Received ☐ Dried

Date Received.....: 25-SEP-96 00:00
DCL Report Group.....: 96E-0640-02

DCL Preparation Group: G969703P
Date Prepared.....: 18-OCT-96 00:00
Preparation Method...: WR-DC-200
Aliquot Weight/Volume: 1.00E+00
Net Weight/Volume....: Not Required

DCL Analysis Group: G969703P
Analysis Method...: WR-DC-341
Instrument Type...: AS
Instrument ID.....: GAR0
Column Type.....: Not Applicable

Analytical Results

Analyte	Date Analyzed	Detection Limit	Result±Error ±TPU Error	Qual.	Dilution	CRDL
Uranium-233/234	24-OCT-96 09:45	7.39E-02	1.41E-01±6.41E-02 ±6.62E-02		4.79E-01	1.0
Uranium-235	24-OCT-96 09:45	6.97E-02	1.94E-02±3.81E-02 ±3.81E-02		4.79E-01	1.0
Uranium-238	24-OCT-96 09:45	5.65E-02	9.97E-02±5.14E-02 ±5.27E-02		4.79E-01	1.0
Uranium-232	24-OCT-96 09:45		TBA			NR

Surrogate Recoveries

Analyte	Result	Spiked Amount	Percent Recovery
Uranium-232	1.0E1	11.	91.

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DATA CHEM LABORATORIES
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FORM A (TYPE I)
SINGLE METHOD ANALYSES

SAMPLE ANALYSIS DATA SHEET

Date Printed.....: 04-NOV-96 16:09
Client Sample Name: 9136,43,44|BLANK
DCL Sample Name...: 96E04516

Client Name.....: Hayden Environmental
Client Ref Number....: Not Provided
Sampling Site.....: Not Provided
Release Number.....: Not Provided

Matrix.....: AIR
Date Sampled.....: 19-SEP-96 08:30
Reporting Units...: pCi/Sample
Report Basis.....: ☒ As Received ☐ Dried

Date Received.....: 25-SEP-96 00:00
DCL Report Group.....: 96E-0640-02

DCL Preparation Group: G969703P
Date Prepared.....: 18-OCT-96 00:00
Preparation Method...: WR-DC-200
Aliquot Weight/Volume: 1.00E+00
Net Weight/Volume....: Not Required

DCL Analysis Group: G969703P
Analysis Method...: WR-DC-341
Instrument Type...: AS
Instrument ID.....: GAR0
Column Type.....: Not Applicable

Analytical Results

Analyte	Date Analyzed	Detection Limit	Result±Error ±TPU Error	Qual.	Dilution	CRDL
Uranium-233/234	24-OCT-96 09:45	8.77E-02	1.55E-01±7.41E-02 ±7.65E-02		4.45E-01	1.0
Uranium-235	24-OCT-96 09:45	7.14E-02	1.54E-02±3.69E-02 ±3.69E-02		4.45E-01	1.0
Uranium-238	24-OCT-96 09:45	8.17E-02	6.23E-02±5.46E-02 ±5.51E-02		4.45E-01	1.0
[illegible]nium-232	24-OCT-96 09:45		TBA			NR

Surrogate Recoveries

Analyte	Result	Spiked Amount	Percent Recovery
Uranium-232	9.8E0	11.	88.

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DATA CHEM LABORATORIES
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FORM A (TYPE I)
SINGLE METHOD ANALYSES

SAMPLE ANALYSIS DATA SHEET

S968S06F

Date Printed.....: 04-NOV-96 16:09
Client Sample Name: 9137,45,46|RESP
DCL Sample Name...: 96E04517

Client Name.....: Hayden Environmental
Client Ref Number....: Not Provided
Sampling Site.....: Not Provided
Release Number.....: Not Provided

Matrix.....: AIR
Date Sampled.....: 19-SEP-96 08:30
Reporting Units...: pCi/Sample
Report Basis.....: ☒ As Received ☐ Dried

Date Received.....: 25-SEP-96 00:00
DCL Report Group.....: 96E-0640-02

DCL Preparation Group: G969703P
Date Prepared.....: 18-OCT-96 00:00
Preparation Method...: WR-DC-200
Aliquot Weight/Volume: 1.00E+00
Net Weight/Volume....: Not Required

DCL Analysis Group: G969703P
Analysis Method...: WR-DC-341
Instrument Type...: AS
Instrument ID.....: GAR0
Column Type.....: Not Applicable

Analytical Results

Analyte	Date Analyzed	Detection Limit	Result±Error ±TPU Error	Qual.	Dilution	CRDL
Uranium-233/234	24-OCT-96 09:45	1.21E-01	2.48E-01±9.88E-02 ±1.03E-01		4.45E-01	1.0
Uranium-235	24-OCT-96 09:45	5.65E-02	6.90E-02±4.98E-02 ±5.06E-02		4.45E-01	1.0
Uranium-238	24-OCT-96 09:45	8.15E-02	1.37E-01±6.89E-02 ±7.10E-02		4.45E-01	1.0
Uranium-232	24-OCT-96 09:45		TBA			NR

Surrogate Recoveries

Analyte	Result	Spiked Amount	Percent Recovery
Uranium-232	9.9E0	11.	89.

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DATA CHEM LABORATORIES
A Sorenson Company

FORM B (TYPE I)
SINGLE METHOD ANALYSES

Form RLIMS63B-V1.3
11049616095527
Page 9

S96970CD

QUALITY CONTROL DATA SHEET
LABORATORY CONTROL SAMPLE (LCS)

Client Name.....: Hayden Environmental
Release Number.....: Not Provided

Matrix.....: FILTER
Reporting Units.....: pCi/Sample

DCL Preparation Group: G969703P
Date Prepared.....: 18-OCT-96 00:00
Preparation Method...: WR-DC-200

Date Printed.....: 04-NOV-96 16:09
DCL Sample Name...: QC-123238-1

DCL Analysis Group: G969703P
Analysis Method...: WR-DC-341
Instrument Type...: AS
Instrument ID.....: GAR0
Column Type.....: Not Applicable

QC Limit Type.....: Method

Analytical Results

Analyte	Date Analyzed	Target	Result	Percent Recovery	QC Limits	QC Flag
Uranium-238	24-OCT-96 09:45	6.4E0	6.3E0	98.9	75.0/125.	

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S96970CC

DATA CHEM LABORATORIES
A Sorenson Company

FORM C (TYPE I)
SINGLE METHOD ANALYSES

QUALITY CONTROL DATA SHEET
BLANK SAMPLE

Client Name.....: Hayden Environmental
Release Number.....: Not Provided

Matrix.....: FILTER
Reporting Units.....: pCi/sample

DCL Preparation Group: G969703P
Date Prepared.....: 18-OCT-96 00:00
Preparation Method...: WR-DC-200

Date Printed.....: 04-NOV-96 16:09
DCL Sample Name...: BL-123238-1

DCL Analysis Group: G969703P
Analysis Method...: WR-DC-341
Instrument Type...: AS
Instrument ID.....: GAR0
Column Type.....: Not Applicable

QC Limit Type.....: Method

Analytical Results

Analyte	Date Analyzed	Result	CRDL
Uranium-234	24-OCT-96 09:45	0.0053	1.0
Uranium-235/236	24-OCT-96 09:45	-0.0033	1.0
Uranium-238	24-OCT-96 09:45	-0.011	1.0

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DATA CHEM LABORATORIES
A Sorenson Company

FORM G (TYPE I)
SINGLE METHOD ANALYSES

QUALITY CONTROL DATA SHEET
SURROGATE SUMMARY

G969703P

Client Name.....: Hayden Environmental
Release Number.....: Not Provided

Matrix.....: FILTER
Reporting Units.....: pCi

Date Printed.....: 04-NOV-96 16:09

DCL Analysis Group: G969703P
Analysis Method...: WR-DC-341

DCL Prep Group....: G969703P
Preparation Method: WR-DC-200

QC Limit Type.....: Method

Surrogate Recoveries

Surr. ID	Uranium-232											
QC Limits	45.0/100.											
DCL Sample Number	Analyte Result	Spiked Amount	% Rec.	Q	Analyte Result	Spiked Amount	% Rec.	Q	Analyte Result	Spiked Amount	% Rec.	Q
96E04514	9.82E0	11.2	87.7									
96E04515	1.02E1	11.2	91.2									
96E04516	9.84E0	11.2	87.9									
96E04517	9.93E0	11.2	88.7									
BL-123238-1	9.83E0	11.2	87.8									
QC-123238-1	1.09E1	11.2	97.0									

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DATA CHEM LABORATORIES
A Sorenson Company

COVER FORM (TYPE I)
SINGLE METHOD ANALYSES

SUMMARY INFORMATION

Form RLIMS63M-V1.3
11049616100383
Page 1

G968S028

Date Reported.....: NOV 05 1996
Date Printed.....: 04-NOV-96 16:10
DCL Report Group..: 96E-0640-03

Client Ref Number.: Not Provided
Release Number....: Not Provided

Analysis Method(s): WR-DC-341

Hayden Environmental
Attention: Bruce Sarven
561 Congress Park Drive
Dayton, OH 45459

Client Sample Name	Laboratory Sample Name	Laboratory Sample ID	Laboratory Group Name	Laboratory Group ID
BL-123239-1	BL-123239-1	S96970CF	96E-0640-03	G968S028
QC-123239-1	QC-123239-1	S96970CG	96E-0640-03	G968S028
9131,39,40	96E04514	S968S06G	96E-0640-03	G968S028
9135,41,42	96E04515	S968S06H	96E-0640-03	G968S028
9136,43,44	96E04516	S968S06J	96E-0640-03	G968S028
9137,45,46	96E04517	S968S06K	96E-0640-03	G968S028

Analyst: Peter M. Kligmann

Reviewer:

Laboratory Supervisor:

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DATA CHEM LABORATORIES
A Sorenson Company

FORM H (TYPE I)
SINGLE METHOD ANALYSES

SAMPLE GROUP COMMENTS

Date Printed.....: 04-NOV-96 16:10
DCL Report Group..: 96E-0640-03

Client Name...: Hayden Environmental

Release Number....: Not Provided

General Information

The DCL QC Database maintains all numerical figures which are input from the pertinent data source. These data have not been rounded to significant figures nor have they been moisture corrected. Reports generated from the system, however, list data which have been rounded to the number of significant figures requested by the client or deemed appropriate for the method. This may create minor discrepancies between data which appear on the QC Summary Forms (Forms B-G) and those that would be calculated from rounded analytical results. Additionally, if a moisture correction is performed, differences will be observed between the QC data and the surrogate data reported on Form A (or other report forms) and corresponding data reported on QC Summary Forms. In these cases, the Form A will indicate the "Report Basis" as well as the moisture value used for making the correction.
Report generation options: E2X

Result Symbol Definitions

ND - Not Detected above the MDL or IDL (LLD or MDC for radiochemistry).
** - No result could be reported, see sample comments for details.

Qualifier Symbol Definitions

U - Not Detected above the MDL or IDL (LLD or MDC for radiochemistry).
For radiochemistry the nuclide was not identified by the Canberra Nuclear NID program, activity values reported are calculated using the Canberra Nuclear MINACT program.
B - For organic analysis the qualifier indicates that this analyte was found in the method blank.
For inorganic analysis the qualifier signifies the value is between the IDL and PQL.
J - The qualifier indicates that the value is between the MDL and the PQL. It is also used for indicating an estimated value for tentatively identified compounds in mass spectrometry where a 1:1 response is assumed.

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DATA CHEM LABORATORIES
A Sorenson Company

FORM A (TYPE I)
SINGLE METHOD ANALYSES

SAMPLE ANALYSIS DATA SHEET

Form RLIMS63A-V1.3
11049616100383
Page 3

S96970CF

Date Printed.....: 04-NOV-96 16:10
Client Sample Name: BL-123239-1
DCL Sample Name...: BL-123239-1

Client Name.....: Hayden Environmental
Client Ref Number....: Not Provided
Sampling Site.....: Not Applicable
Release Number.....: Not Provided

Matrix.....: AIR
Date Sampled.....: Not Applicable
Reporting Units...: pCi/sample

Date Received.....: Not Applicable
DCL Report Group.....: 96E-0640-03

DCL Preparation Group: G969703Q
Date Prepared.....: 18-OCT-96 00:00
Preparation Method...: WR-DC-200
Aliquot Weight/Volume: 1.00E+00
Net Weight/Volume....: Not Required

DCL Analysis Group: G969703Q
Analysis Method...: WR-DC-341
Instrument Type...: AS
Instrument ID.....: GAR0
Column Type.....: Not Applicable

Analytical Results

Analyte	Date Analyzed	Detection Limit	Result±Error ±TPU Error	Qual.	Dilution	CRDL
Thorium-228	25-OCT-96 12:19	4.73E-02	3.12E-02±2.99E-02 ±3.02E-02		1.00E+00	1.0
Thorium-230	25-OCT-96 12:19	3.04E-02	7.05E-02±3.08E-02 ±3.19E-02		1.00E+00	1.0
Thorium-232	25-OCT-96 12:19	2.62E-02	2.82E-03±1.23E-02 ±1.23E-02		1.00E+00	1.0
Thorium-229	25-OCT-96 12:19		TBA			NR

Surrogate Recoveries

Analyte	Result	Spiked Amount	Percent Recovery
Thorium-229	9.2E0	11.	86.

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DATA CHEM LABORATORIES
A Sorenson Company

FORM A (TYPE I)
SINGLE METHOD ANALYSES

SAMPLE ANALYSIS DATA SHEET

Form RLIMS63A-V1.3
11049616100383
Page 4

S96970CG

Date Printed.....: 04-NOV-96 16:10
Client Sample Name: QC-123239-1
DCL Sample Name...: QC-123239-1

Client Name.....: Hayden Environmental
Client Ref Number....: Not Provided
Sampling Site.....: Not Applicable
Release Number.....: Not Provided

Matrix.....: AIR
Date Sampled.....: Not Applicable
Reporting Units...: pCi/Sample

Date Received.....: Not Applicable
DCL Report Group.....: 96E-0640-03

DCL Preparation Group: G969703Q
Date Prepared.....: 18-OCT-96 00:00
Preparation Method...: WR-DC-200
Aliquot Weight/Volume: 1.00E+00
Net Weight/Volume....: Not Required

DCL Analysis Group: G969703Q
Analysis Method...: WR-DC-341
Instrument Type...: AS
Instrument ID.....: GAR0
Column Type.....: Not Applicable

Analytical Results

Analyte	Date Analyzed	Detection Limit	Result±Error ±TPU Error	Qual.	Dilution	CRDL
Thorium-228	25-OCT-96 12:19	4.57E-02	1.01E-02±2.52E-02 ±2.52E-02		1.00E+00	1.0
Thorium-230	25-OCT-96 12:19	3.76E-02	4.85E+00±2.17E-01 ±5.89E-01		1.00E+00	1.0
Thorium-232	25-OCT-96 12:19	2.69E-02	2.50E-03±1.30E-02 ±1.30E-02		1.00E+00	1.0
Thorium-229	25-OCT-96 12:19		TBA			NR

Surrogate Recoveries

Analyte	Result	Spiked Amount	Percent Recovery
Thorium-229	9.8E0	11.	92.

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DATA CHEM LABORATORIES
A Sorenson Company

FORM A (TYPE I)
SINGLE METHOD ANALYSES

SAMPLE ANALYSIS DATA SHEET

Client Name.....: Hayden Environmental
Client Ref Number....: Not Provided
Sampling Site.....: Not Provided
Release Number.....: Not Provided

Date Received.....: 25-SEP-96 00:00
DCL Report Group.....: 96E-0640-03

DCL Preparation Group: G969703Q
Date Prepared.....: 18-OCT-96 00:00
Preparation Method...: WR-DC-200
Aliquot Weight/Volume: 1.00E+00
Net Weight/Volume....: Not Required

Date Printed.....: 04-NOV-96 16:10
Client Sample Name: 9131,39,40|NORTH
DCL Sample Name...: 96E04514

Matrix.....: AIR
Date Sampled.....: 19-SEP-96 08:30
Reporting Units...: pCi/Sample
Report Basis.....: ☒ As Received ☐ Dried

DCL Analysis Group: G969703Q
Analysis Method...: WR-DC-341
Instrument Type...: AS
Instrument ID.....: GAR0
Column Type.....: Not Applicable

Analytical Results

Analyte	Date Analyzed	Detection Limit	Result±Error ±TPU Error	Qual.	Dilution	CRDL
Thorium-228	25-OCT-96 12:19	7.79E-02	1.84E-01±7.45E-02 ±7.75E-02		5.01E-01	1.0
Thorium-230	25-OCT-96 12:19	8.04E-02	4.73E-01±1.09E-01 ±1.22E-01		5.01E-01	1.0
Thorium-232	25-OCT-96 12:19	6.83E-02	3.98E-02±4.32E-02 ±4.34E-02		5.01E-01	1.0
Thorium-229	25-OCT-96 12:19		TBA			NR

Surrogate Recoveries

Analyte	Result	Spiked Amount	Percent Recovery
Thorium-229	1.9E1	22.	86.

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DATA CHEM LABORATORIES
A Sorenson Company

FORM A (TYPE I)
SINGLE METHOD ANALYSES

SAMPLE ANALYSIS DATA SHEET

S968S06H

Date Printed.....: 04-NOV-96 16:10
Client Sample Name: 9135,41,42|SOUTH
DCL Sample Name...: 96E04515

Client Name.....: Hayden Environmental
Client Ref Number....: Not Provided
Sampling Site.....: Not Provided
Release Number.....: Not Provided

Matrix.....: AIR
Date Sampled.....: 19-SEP-96 08:30
Reporting Units...: pCi/Sample
Report Basis.....: ☒ As Received ☐ Dried

Date Received.....: 25-SEP-96 00:00
DCL Report Group.....: 96E-0640-03

DCL Preparation Group: G969703Q
Date Prepared.....: 18-OCT-96 00:00
Preparation Method...: WR-DC-200
Aliquot Weight/Volume: 1.00E+00
Net Weight/Volume....: Not Required

DCL Analysis Group: G969703Q
Analysis Method...: WR-DC-341
Instrument Type...: AS
Instrument ID.....: GAR0
Column Type.....: Not Applicable

Analytical Results

Analyte	Date Analyzed	Detection Limit	Result±Error ±TPU Error	Qual.	Dilution	CRDL
Thorium-228	25-OCT-96 12:19	9.23E-02	9.31E-02±6.45E-02 ±6.54E-02		4.71E-01	1.0
Thorium-230	25-OCT-96 12:19	7.32E-02	3.46E-01±9.28E-02 ±1.01E-01		4.71E-01	1.0
Thorium-232	25-OCT-96 12:19	5.17E-02	2.79E-02±3.28E-02 ±3.29E-02		4.71E-01	1.0
Thorium-229	25-OCT-96 12:19		TBA			NR

Surrogate Recoveries

Analyte	Result	Spiked Amount	Percent Recovery
Thorium-229	9.9E0	11.	92.

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DATA CHEM LABORATORIES
A Sorenson Company

FORM A (TYPE I)
SINGLE METHOD ANALYSES

SAMPLE ANALYSIS DATA SHEET

Date Printed.....: 04-NOV-96 16:10
Client Sample Name: 9136,43,44|BLANK
DCL Sample Name...: 96E04516

Client Name.....: Hayden Environmental
Client Ref Number....: Not Provided
Sampling Site.....: Not Provided
Release Number.....: Not Provided

Matrix.....: AIR
Date Sampled.....: 19-SEP-96 08:30
Reporting Units...: pCi/Sample
Report Basis.....: ☒ As Received ☐ Dried

Date Received.....: 25-SEP-96 00:00
DCL Report Group.....: 96E-0640-03

DCL Preparation Group: G969703Q
Date Prepared.....: 18-OCT-96 00:00
Preparation Method...: WR-DC-200
Aliquot Weight/Volume: 1.00E+00
Net Weight/Volume....: Not Required

DCL Analysis Group: G969703Q
Analysis Method...: WR-DC-341
Instrument Type...: AS
Instrument ID.....: GAR0
Column Type.....: Not Applicable

Analytical Results

Analyte	Date Analyzed	Detection Limit	Result±Error ±TPU Error	Qual.	Dilution	CRDL
Thorium-228	25-OCT-96 12:19	6.48E-02	7.83E-02±5.14E-02 ±5.22E-02		5.00E-01	1.0
Thorium-230	25-OCT-96 12:19	6.22E-02	3.35E-01±9.06E-02 ±9.86E-02		5.00E-01	1.0
Thorium-232	25-OCT-96 12:19	6.93E-02	1.73E-02±3.75E-02 ±3.75E-02		5.00E-01	1.0
Thorium-229	25-OCT-96 12:19		TBA			NR

Surrogate Recoveries

Analyte	Result	Spiked Amount	Percent Recovery
Thorium-229	8.7E0	11.	81.

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DATA CHEM LABORATORIES
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FORM A (TYPE I)
SINGLE METHOD ANALYSES

SAMPLE ANALYSIS DATA SHEET

S968S06K

Date Printed.....: 04-NOV-96 16:10
Client Sample Name: 9137,45,46|RESP
DCL Sample Name...: 96E04517

Client Name.....: Hayden Environmental
Client Ref Number....: Not Provided
Sampling Site.....: Not Provided
Release Number.....: Not Provided

Matrix.....: AIR
Date Sampled.....: 19-SEP-96 08:30
Reporting Units...: pCi/Sample
Report Basis.....: ☒ As Received ☐ Dried

Date Received.....: 25-SEP-96 00:00
DCL Report Group.....: 96E-0640-03

DCL Preparation Group: G969703Q
Date Prepared.....: 18-OCT-96 00:00
Preparation Method...: WR-DC-200
Aliquot Weight/Volume: 1.00E+00
Net Weight/Volume....: Not Required

DCL Analysis Group: G969703Q
Analysis Method...: WR-DC-341
Instrument Type...: AS
Instrument ID.....: GAR0
Column Type.....: Not Applicable

Analytical Results

Analyte	Date Analyzed	Detection Limit	Result±Error ±TPU Error	Qual.	Dilution	CRDL
Thorium-228	25-OCT-96 12:19	5.21E-02	6.73E-02±4.40E-02 ±4.47E-02		4.99E-01	1.0
Thorium-230	25-OCT-96 12:19	3.96E-02	3.01E-01±8.03E-02 ±8.77E-02		4.99E-01	1.0
Thorium-232	25-OCT-96 12:19	3.95E-02	0.00E+00±1.49E-02 ±1.49E-02		4.99E-01	1.0
Thorium-229	25-OCT-96 12:19		TBA			NR

Surrogate Recoveries

Analyte	Result	Spiked Amount	Percent Recovery
Thorium-229	9.4E0	11.	88.

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DATA CHEM LABORATORIES
A Sorenson Company

FORM B (TYPE I)
SINGLE METHOD ANALYSES

QUALITY CONTROL DATA SHEET
LABORATORY CONTROL SAMPLE (LCS)

Client Name.....: Hayden Environmental
Release Number.....: Not Provided

Matrix.....: FILTER
Reporting Units.....: pCi/Sample

DCL Preparation Group: G969703Q
Date Prepared.....: 18-OCT-96 00:00
Preparation Method...: WR-DC-200

Date Printed.....: 04-NOV-96 16:10
DCL Sample Name...: QC-123239-1

DCL Analysis Group: G969703Q
Analysis Method...: WR-DC-341
Instrument Type...: AS
Instrument ID.....: GAR0
Column Type.....: Not Applicable

QC Limit Type.....: Method

Analytical Results

Analyte	Date Analyzed	Target	Result	Percent Recovery	QC Limits	QC Flag
Thorium-230	25-OCT-96 12:19	5.0E0	4.9E0	97.4	75.0/125.	

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DATA CHEM LABORATORIES
A Sorenson Company

FORM C (TYPE I)
SINGLE METHOD ANALYSES

QUALITY CONTROL DATA SHEET
BLANK SAMPLE

Client Name.....: Hayden Environmental
Release Number.....: Not Provided

Matrix.....: FILTER
Reporting Units.....: pCi/sample

DCL Preparation Group: G969703Q
Date Prepared.....: 18-OCT-96 00:00
Preparation Method...: WR-DC-200

Date Printed.....: 04-NOV-96 16:10
DCL Sample Name...: BL-123239-1

DCL Analysis Group: G969703Q
Analysis Method...: WR-DC-341
Instrument Type...: AS
Instrument ID.....: GAR0
Column Type.....: Not Applicable

QC Limit Type.....: Method

Analytical Results

Analyte	Date Analyzed	Result	CRDL
Thorium-228	25-OCT-96 12:19	0.031	1.0
Thorium-230	25-OCT-96 12:19	0.071	1.0
Thorium-232	25-OCT-96 12:19	0.0028	1.0

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DATA CHEM LABORATORIES
A Sorenson Company

FORM G (TYPE I)
SINGLE METHOD ANALYSES

QUALITY CONTROL DATA SHEET
SURROGATE SUMMARY

Date Printed.....: 04-NOV-96 16:10

Client Name.....: Hayden Environmental
Release Number.....: Not Provided

DCL Analysis Group: G969703Q
Analysis Method...: WR-DC-341

Matrix.....: FILTER
Reporting Units.....: pCi

DCL Prep Group....: G969703Q
Preparation Method: WR-DC-200

QC Limit Type.....: Method

Surrogate Recoveries

Surr. ID	Thorium-229											
QC Limits	45.0/100.											
DCL Sample Number	Analyte Result	Spiked Amount	% Rec.	Q	Analyte Result	Spiked Amount	% Rec.	Q	Analyte Result	Spiked Amount	% Rec.	Q
96E04514	1.86E1	21.6	85.9									
96E04515	9.87E0	10.7	92.2									
96E04516	8.67E0	10.7	81.0									
96E04517	9.43E0	10.7	88.1									
BL-123239-1	9.24E0	10.7	86.4									
QC-123239-1	9.79E0	10.7	91.5									

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DATA CHEM LABORATORIES
A SORENSON COMPANY

Datapackage Table of Contents 8019

Information pertaining to this datapackage is divided into the four categories listed below (see colored divider sheets for an inventory list of each category). If an item on the inventory is not applicable, an "NA" is placed in the corresponding check box. A Case Narrative immediately precedes this Table of Contents and contains pertinent information about this datapackage.

Analytical Forms ..... Yellow
Sample Tracking Documentation ..... Pink
Analytical Documentation ..... Blue
Raw Data ..... Green

♦ ♦ ♦ ♦ ♦ ♦ ♦ ♦ ♦ ♦

Analytical Forms
Inventory Checklist

- [x] Case Narrative

IRDMIS
- [ ] Data Review and Approval Form
- [ ] IRDMIS Reports
- [ ] GC/MS TICs

Commercial Forms
- [ ] Analytical or Environmental Report Form
- [ ] Set Comments
- [ ] Applicable QC Sheets

RLIMS Forms
- [x] Cover Form
- [x] Sample Group Comments (Form H)
- [x] Sample Analysis Data Sheet (Form A)
- [x] Laboratory Control Sample (Form B)
- [x] Blank Sample (Form C)
- [ ] Matrix Spike Sample (Form D)
- [x] Matrix Duplicate Sample (Form E)
- [ ] Matrix Spike/Matrix Spike Duplicate Sample (Form F)
- [x] Surrogate Summary (Form G)
- [ ] Initial Calibration Form
- [ ] Initial Calibration Verification (ICV) Form
- [ ] Continuing Calibration Form
- [ ] Serial Dilution Form
- [ ] Endrin Breakdown or BFB/DFTPP GC/MS Tuning Form

Analytical Forms
Reviewer Checklist

- X The Analytical Forms Inventory Checklist above is complete.
- X The Case Narrative was completed in accordance with procedures in DCL SOP XX-DC-020, "Datapackage Preparation and Validation."
- X Only the correct report forms are used (IRDMIS or Commercial Forms or RLIMS Forms).
- X All fields on the report forms are complete with the correct information, including signatures.
- X Results for all samples are reported per client request.
- X Units, methods, and dates are correct.
- X Sample and/or set comments are complete.

Assembled by: [signature] 11/5/96 (Signature, Date) Reviewed by: [signature] 11/5/96 (Signature, Date)

Rev. 6/95

DATA CHEM LABORATORIES
A SORENSON COMPANY

8019

Sample Tracking Documentation
Inventory Checklist

- [X] LIMS Grouping Reports
- [X] DataChem Laboratories (DCL) Chain-of-Custody Record
- [X] DCL Sample Work Order
- [N/A] Copy of numbered Nonconformance/Corrective Action Report (NC/CAR)
- [N/A] Copy of Client-Related Problem Report (CPR)

Sample Tracking Documentation
Reviewer Checklist

X The Sample Tracking Documentation Inventory Checklist above is complete.

X DCL Chain-of-Custody Record provides signatures for the sample portion reported in this data package.

X DCL Chain-of-Custody Record was completed in accordance with procedures in DCL SOP XX-DC-006 "Chain-of-Custody and Laboratory Tracking."

X Methods specified on the Sample Work Order were performed or an explanation for deviations is provided.

X Special instructions on the Sample Work Order were followed.

X Project Management instructions on the Project Protocol Worksheet were followed.

X Client's requests were met or an explanation is provided in the Case Narrative.

NA NC/CAR and/or CPR were completed in accordance with procedures in DCL SOP QC-DC-006 "Nonconformance/Corrective Action Report (NC/CAR) Procedures."

Assembled by: _____ Signature _____ Date

Reviewed by: _____ Signature _____ Date 11/5/96

Rev. 6/95

DataChem Laboratories
LIMS - Sample Master System
Preparation Group Report

Date: 8-OCT-1996 16:42 Page: 1
User: PETERSON RLIMS15-V1.2

Preparation Run Name: G969703P Group ID: G969703P

Samples: 6

Pos	Laboratory Sample Name	Field Sample Name 1	Field Sample Name 2	Laboratory Sample ID	Laboratory Group Name	Accnt. Number
1	BL-123238-1	BL-123238-1		S96970CC	96E-0640-02	03025
2	QC-123238-1	QC-123238-1		S96970CD	96E-0640-02	03025
3	96E04514	9131,39,40	NORTH	S968S06B	96E-0640-02	03025
4	96E04515	9135,41,42	SOUTH	S968S06C	96E-0640-02	03025
5	96E04516	9136,43,44	BLANK	S968S06D	96E-0640-02	03025
6	96E04517	9137,45,46	RESP	S968S06F	96E-0640-02	03025

----- END OF LISTING -----

PMK

NOV 05 1996

DataChem Laboratories
LIMS - Sample Master System
Preparation Group Report

Date: 8-OCT-1996 16:42
User: PETERSON

Page: 1
RLIMS15-V1.2

Preparation Run Name: G969703Q

Group ID: G969703Q

Samples: 6

Pos	Laboratory Sample Name	Field Sample Name 1	Field Sample Name 2	Laboratory Sample ID	Laboratory Group Name	Accnt. Number
1	BL-123239-1	BL-123239-1		S96970CF	96E-0640-03	03025
2	QC-123239-1	QC-123239-1		S96970CG	96E-0640-03	03025
3	96E04514	9131,39,40	NORTH	S968S06G	96E-0640-03	03025
4	96E04515	9135,41,42	SOUTH	S968S06H	96E-0640-03	03025
5	96E04516	9136,43,44	BLANK	S968S06J	96E-0640-03	03025
6	96E04517	9137,45,46	RESP	S968S06K	96E-0640-03	03025

----- END OF LISTING -----

PMK

NOV 05 1996

Earliest Sampling Date: 19-Sep-1996

DataChem Laboratories
CHAIN-OF-CUSTODY

Results due by: 25-Oct-1996

Project/Job/Task: COMM-ENV | Split: | Root Set ID: 96E-0640 * | Reporting Group

Client: Hayden Environmental | Account: 03025

Comments:

Verified: TM 9-25-96

Date Sampled	Field ID Number	DCL Sample Name	DCL Sample ID	QC	Matrix	Customer ID 2	01 Method 5 Particulate	02 Isotopic Uranium	03 ISOTOPIC THORIUM	04 Radium 226/228 by gamma spec	05 Total Uranium by kPA	# es
19-Sep-1996	9131,39,40	96E04514			AIR	NORTH	X	X	X	X	X	3
19-Sep-1996	9135,41,42	96E04515			AIR	SOUTH	X	X	X	X	X	3
19-Sep-1996	9136,43,44	96E04516			AIR	BLANK	X	X	X	X	X	3
19-Sep-1996	9137,45,46	96E04517			AIR	RESP	X	X	X	X	X	3

ORIGINAL FIELD SAMPLE CHAIN-OF-CUSTODY

Relinquished By: (Signature)	Date/Time	Received By: (Signature)	Reason for Transfer/ Storage Location
Walk-in/Room/Shelf/Fridge R-23-1 FV	9/25/96 1450	Kamyn Vigil	Labeling/Shelving
Kamyn Vigil	9/25/96 1455	Walk-in/Room/Shelf/Fridge R-23-1 FV	Storage: CW-2
R-23-1 QC	9/30/96 10:00	Cliff L. Clay	sample prep
Cliff L. Clay	10/06/96 12:15	Rm 311 QC	storage
Rm 311 T.P.	10/8/96 16:00	Ty E. Peterson	sample digestion
Ty E. Peterson	10/9/96 8:00	Robert Tilley	γ spec
Robert Tilley	10/11/96 1115	Rm 311 BR	storage
Rm 311 BR	10-18-96 10:00	Bradley Richardson	Sample Prep
Bradley Richardson	10-18-96 12:00	Rm 311 BR	Storage

SAMPLE PREPARATION / ANALYSIS CHAIN-OF-CUSTODY

Sample Prep/Analysis for: 130 uranium | Lab Notebook No.: 4035

Prepared/Analyzed by: B Richardson | Date/Time: 10-18-96/12:00

Relinquished By: (Signature)	Date/Time	Received By: (Signature)	Reason for Transfer/ Storage Location
Bradley Richardson	10-18-96 16:00	Emil G. Rupp	Column Sep.
Emil G. Rupp	10-22-96 1500	Max A. Barnett	α-spec. (4U)
Max A. Barnett	10-25-96 11:00	R-403-1 MAB	storage

Check box if there is a continuation page ☐

Printed 9/25/1996 14:49

Form: COFC1.01-SWV2.30

Earliest Sampling Date: 19-Sep-1996

DataChem Laboratories
CHAIN-OF-CUSTODY

Results due by: 25-Oct-1996

Project/Job/Task: COMM-ENV | Split: | Root Set ID: 96E-0640 * | Reporting Group

Client: Hayden Environmental | Account: 03025

Comments:

Verified: KM 9-25-96

Date Sampled	Field ID Number	DCL Sample Name	DCL Sample ID	QC	Matrix	Customer ID 2					01 Method 5 Particulate	02 Isotopic Uranium	03 ISOTOPIC THORIUM	04 Radium 226/228 by gamma spec	05 Total Uranium by kPA					# Bottles
19-Sep-1996	9131,39,40	96E04514			AIR	NORTH					X	X	X	X	X					3
19-Sep-1996	9135,41,42	96E04515			AIR	SOUTH					X	X	X	X	X					3
19-Sep-1996	9136,43,44	96E04516			AIR	BLANK					X	X	X	X	X					3
19-Sep-1996	9137,45,46	96E04517			AIR	RESP					X	X	X	X	X					3

ORIGINAL FIELD SAMPLE CHAIN-OF-CUSTODY

Relinquished By: (Signature)	Date/Time	Received By: (Signature)	Reason for Transfer/ Storage Location
Walk-in/ Room/ Shelf/ Fridge R-23-1 TV	9/25/96 1450	Kamyn Vigil	Labeling/Shelving
Kamyn Vigil	9/25/96 1455	Walk-in/ Room/ Shelf/ Fridge R-23-1 TV	Storage: CW-2
R-23-1 QC	9/30/96 10:00	[illegible]	sample prep
[illegible]	10/06/96 12:15	Rm 311 QC	storage
Rm 311 T.P.	10/8/96 16:00	Ty E. Peterson	sample digestion
Ty E. Peterson	10/9/96 8:00	Robin Jolly	γ spec
Robin Jolly	10/11/96 11:15	Rm 311-1 RC	Storage
Rm 311 BR	10-18-96 10:00	Bradley Richardson	Sample Prep
Bradley Richardson	10-18-96 12:00	Rm 311 BR	Storage

SAMPLE PREPARATION / ANALYSIS CHAIN-OF-CUSTODY

Sample Prep/Analysis for: Thorium | Lab Notebook No.: 4035

Prepared/Analyzed by: B Richardson | Date/Time: 10-18-96/12:00

Relinquished By: (Signature)	Date/Time	Received By: (Signature)	Reason for Transfer/ Storage Location
Bradley Richardson	10-18-96 16:00	W Upham	Column sep.
W Upham	10-24-96 11:00	Mark A. Barnett	α-spec
Mark A. Barnett	11-4-96 12:00	R-403-1 MB	storage

Check box if there is a continuation page ☐

Form: COFC1.01 SWV2.30

Printed 9/25/1996 14:49

Sample Work Order

QC Clearance: _____
Project Manager: Robert P. Di Rienzo
Client: Hayden Environmental
Account: 03025
Project/Task: COMM-ENV
Date Received: 25-Sep-1996
Date for Mailing Report: 25-Oct-1996

DCL Root Set ID: 96E-0640 *
DCL Lab. Name: 96E04514-96E04517
Total # Samples: 4
Sample Entry: Karyn L. Boyack
Section: WA
Earliest Sampling Date: 19-Sep-1996
Preparation Type:

Rep. Group	Radiochemistry Analytes Requested	Latest Prep. Date	Latest Anal. Date	No. of Samp.	Storage Location	Analysis/Prep. Method	Inst.	Matrix
01	Method 5 Particulate		18-Mar-1997[c]	4		Method 5	GRAV	AIR
02	Isotopic Uranium	1-Oct-1996[c]	18-Mar-1997[c]	4		WR-DC-341 WR-DC-200	AS	AIR
03	ISOTOPIC THORIUM	1-Oct-1996[c]	18-Mar-1997[c]	4		WR-DC-341	AS	AIR
04	Radium 226/228 by gamma spec		18-Mar-1997[c]	4		WR-EP-325 WR-DC-200	GS	AIR
05	Total Uranium by kPA		18-Mar-1997[c]	4		WR-DC-342	kPA	AIR

[c]Based on date of collection

Special Instructions: _____

Section Manager: Charlie C. Walker

Other Sections Receiving Sample Portions: None

SAMPLE LOG-IN SHEET

Group Name: 96E-0840 19

Lab Name: DataChem Laboratories	Page 1 of 1
Received By (Print Name): Sample Rec. Group	Log-In Date: 9-25-96
Received By (Signature): Tanya Vigil	
Case Number: —	Sample Delivery Group No.: — / SAS Number: NA

Remarks:		Client ID #1 EPA Sample #	Corresponding Client ID #2 Sample Tag #	Corresponding Assigned Lab #	Matrix	Fraction	Remarks: Condition of Sample Shipment, etc.
1. Custody Seal(s)	Present/Absent*	200259131	North	96E04514	Water	R/A	each client
	Intact/Broken*	39	↓	↓	Water		ID 1 bottle
2. Custody Seal Nos.	N/A	40	↓	↓	Water		needs to be
		200259135	South	96E04515	Water		combined
3. Chain-of-Custody Records	Present/Absent*	41	↓	↓	Water		to create
4. Traffic Reports or Packing Lists	Present/Absent*	42	↓	↓	Water		a single
5. Airbill	Airbill/Sticker	200259136	Blank	96E04516	Water		client ID
	Present/Absent*	43	↓	↓	Water		2 (see PPL)
6. Airbill No.	9690684221	44	↓	↓	Water		↓
		200259137	Resp	96E04517	Water		
7. Sample Tags	Present/Absent*	45	↓	↓	Water		
Sample Tag Numbers	Listed/Not Listed on Chain-of-Custody	46	↓	↓	Water	↓	↓
8. Sample Condition	Intact/Broken*/Leaking						
9. Does information on custody records, traffic reports, and sample tags agree?	Yes/No*						
10. Date Received at Lab	9/25/96						
11. Time Received	1000						

Tanya Vigil 9/25/96

Sample Transfer	
Fraction: All	Fraction:
Area #: R-23-1	Area #:
By: TV	By:
On: 9/25/96	On:

* Contact SMO and attach record of resolution.

Reviewed By	Logbook No.
Date	Logbook Page No.

FRACTIONS:
C - Cyanide
D - Dissolved Metals
T - Total Metals
F - Full TCL Organics
P - Pesticides
S - Semivolatiles
V - Volatiles

FORM DC-1

R - Rad Chem
A - Particulates

Note: only highlighted portion of client ID #1's entered into DCL computer system

FERMCO

P.O. BOX 538704
CINCINNATI, OH 45253-8704

CHAIN OF CUSTODY / REQUEST FOR ANALYSIS RECORD

REFERENCE DOCUMENT NO.: SPL-96-2875

ORIGINAL MEF NO.: _____ CORRESPONDING REFERENCE DOCUMENT NO.: _____

PAGE 1 OF 2

RELEASE NO.: 1000012382	PROJECT NO.: N/A	FOR SAMPLE RELATED PROBLEMS, ACS CONTACT / PHONE: [redacted] x4198	CONTRACT PURCHASE ORDER / TASK ORDER NO.: N/A
PROJECT NAME: NESHAP STACK SAMPLING		REQUIRED REPORT DATE / LAB TAT: PARTICULATE (10 DAY) RAD (30 DAY)	SAMPLE SHIPMENT DATE: 9-24-96
PROJECT CONTACT / PHONE: Tim Miller / 4198		RECEIVING LAB NAME: DATACHEM	SAMPLE SHIPPER (Print): G Bell
CHARGE NO.: 7ECG2	LOT MARKING NO.: N/A	RECEIVING LAB ADDRESS: SALT LAKE CITY	OFF-SITE LAB CONTACT: Robert DiRenzo

SAMPLING TEAM (Print) & GROUP NAME / PHONE: BRUCE SARVEN HAYDEN ENVIRONMENTAL 513-438-3010 Geoff Schoenberger 9-20-96 HAYDEN

SAMPLING TEAM (Signature & Badge No.): Bruce Sarven 283-74-1662 Geoff D. Schoenberger 267-82-4754

ITEM NO.	SAMPLE NUMBER: FACTS ID	SAMPLE NUMBER: CUSTOMER ID / SAMPLE POINT	SAMPLE MATRIX		COMP	GRAB	FILTERED	COLLECTION DATE	COLLECTION TIME	CONTAINER TYPE	CONTAINER VOL.	NO. CONTRS	PRESERVATION	ABL	ANALYSES REQUESTED (If more space is required, use the SPECIAL INSTRUCTIONS block.)	SAMPLE OKAY? (Y/N)* FERMCO	SAMPLE OKAY? (Y/N)* OFF-SITE
1	200259131	NORTH FILTER	AF	AIR FILTER	✓		N/A	9-19-96	0830	F	1146 cfm	1	NONE	B	Particulate & Rad *	Y	
2	200259139	NORTH FRONT 1/2	L1	ACETONE	✓		N/A	9-19-96	0830	P	1 L	1	NONE	B	Particulate & Rad *	Y	
3	200259140	NORTH BACK 1/2	L2	~~ACETONE~~ WATER	✓		N/A	9-19-96	0830	P	1 L	1	NONE	B	Particulate & Rad *	Y	
4	200259135	SOUTH Filter	AF	AIR FILTER	✓		N/A	9-19-96	0830	F	1360 cfm	1	NONE	B	Particulate & Rad *	Y	
5	200259141	South Front 1/2	L1	ACETONE	✓		N/A	9-19-96	0830	P	1 L	1	NONE	B	Particulate & Rad *	Y	
6	200259142	South BACK 1/2	L2	~~ACETONE~~ WATER	✓		N/A	9-19-96	0830	P	1 L	1	NONE	B	Particulate & Rad *	Y	
7	200259136	Filter BLANK	AF	AIR FILTER	✓		N/A	9-19-96	0830	F	N/A	1	NONE	B	Particulate & Rad *	Y	
8	200259143	D.I. BLANK	L2	WATER	✓		N/A	9-19-96	0830	P	1 L	1	NONE	B	Particulate & Rad *	Y	
9	200259144	ACETONE BLANK	L1	ACETONE	✓		N/A	9-19-96	0830	P	1 L	1	NONE	B	Particulate & Rad *	Y	
10	200259137	Resp. filter	AF	AIR FILTER	✓		N/A	9-19-96	0830	F	293 cfm	1	NONE	B	Particulate & Rad *	Y	

SPECIAL INSTRUCTIONS: * Samples to be shipped off-site to DATA-CHEM / UTAH, Contact Robert DiRenzo
Analysis to be performed are particulate, U-238, U-234, U-235, U-236, Th-228, Th-230, Th-232
Ra-226, Ra-228 and Total Uranium by Lazer Phosphorometry

RELINQUISHED: ITEM / REASON	RELINQUISHED BY (Signature) / AFFILIATION	BADGE NO.	DATE	TIME	RECEIVED: RECEIVED BY (Signature) / AFFILIATION	BADGE NO.	DATE	TIME
1-12 Rad Analysis	Bruce Sarven / HAYDEN ENV.	1 283-74-1662	9/20/96	1630	[redacted]	1 75148	9/20/96	1630
1-12 Ship	Neil Nauling / SPL	2 75148	9-23-96	0800		2 630	9-23-96	0800
1-17 Ship	G Bell SPL	3 630	9-24-96	1300		3 5852	9.25.96	1002
		4				4		
		5				5		

DISTRIBUTION OF C[redacted] WHITE ON-SITE - RELEASE FILE / OFF-SITE ANALYTICAL LAB - RETURN TO FEMP YELLOW [redacted]SITE - DISTRIBUTE AS NEEDED / OFF-SITE ANALYTICAL LAB - RETURN TO FEMP BLUE SAMPLI[redacted]H / PROJECT FILE

FS-F-3361 (09-21-[redacted]

SHADED AREAS ARE TO BE COMPLETED BY [redacted] SAMPLE RECEIVING GROUP.

* IF "N", THEN COMPLETE APPLICABLE NON-CONFORMANCE PROCEDURE.

8019 1-43013 1-43016 033 000417

FERMCO

CHAIN OF CUSTODY / REQUEST FOR ANALYSIS RECORD (CONTINUED)

PROJECT NO.: N/A

PROJECT NAME: NESHAP STACK SAMPLING

REFERENCE DOCUMENT NO.: SPL-96-2875 1000012382

CORRESPONDING REFERENCE DOCUMENT NO.:

PAGE 2 OF 2

ITEM NO.	SAMPLE NUMBER: FACTS ID	SAMPLE NUMBER: CUSTOMER ID / SAMPLE POINT	SAMPLE MATRIX		COMP	GRAB	FILTERED	COLLECTION: DATE	COLLECTION: TIME	CONTAINER: TYPE	CONTAINER: VOL	NO. CONTRS	PRESERVATION	A S L	ANALYSES REQUESTED (If more space is required, use the SPECIAL INSTRUCTIONS block.)	SAMPLE OKAY? (Y/N)* FERMCO	SAMPLE OKAY? (Y/N)* OFF-SITE
11	200259145	Resp. Front 1/2	L1	ACETONE	✓		N/A	9-20-96	0845	P	1L	1	NONE	B	Particulate & Rad	Y	
12	200259146	Resp. Back 1/2	L2	~~ACETONE~~ D.I. WATER	✓		N/A	9-20-96	0845	P	1L	1	NONE	B	Particulate & Rad	Y	
		NOTHING FOLLOWS															

SPECIAL INSTRUCTIONS: AF - Air Filter
L1 - Acetone
L2 - D.I. WATER

DISTRIBUTION OF C[illegible] WHITE ON-SITE - RELEASE FILE / OFF-SITE ANALYTICAL LAB - RETURN TO FEMP YELLOW [illegible] SITE - DISTRIBUTE AS NEEDED / OFF-SITE ANALYTICAL LAB - RETURN TO FEMP BLUE SAMPLIN[illegible]H / PROJECT FILE

FS-F-3361-1 (09-21-[illegible])

SHADED AREAS ARE TO BE COMPLET[illegible] THE SAMPLE RECEIVING GROUP.

* IF "N", THEN COMPLETE APPLICABLE NON-CONFO[illegible]CE PROCEDURE.

000815 034

TALLY SHEET

8019

RELEASE #: 1000012382 (CAN 1 OF 1)
PO #: NA
DATE SHIPPED: 23-SEP-96
MATERIAL: NESHAP STACK SAMPLING - AIR FILTERS, ACETONE , AND WATER

ANALYSIS: PARTICULATE AND RAD

Composite Sample Number	Lot Number	Sample Container Size	AnaLis/ FACTS Number	Gross Weight lbs.	Tare Weight lbs.	Net Weight lbs.
NORTH FILTER	W050-730-P047-0417	AIR FILTER	200259131	0.101	0.097	0.004
NORTH FRONT 1/2	W050-730-P047-0417	1 L PLS	200259139	0.300	0.220	0.080
NORTH BACK 1/2	W050-730-P047-0417	1 L PLS	200259140	0.300	0.220	0.080
SOUTH FILTER	W050-730-P047-0417	AIR FILTER	200259135	0.101	0.097	0.004
SOUTH FRONT 1/2	W050-730-P047-0417	1 L PLS	200259141	0.300	0.220	0.080
SOUTH BACK 1/2	W050-730-P047-0417	1 L PLS	200259142	0.300	0.220	0.080
FILTER BLANK	W050-730-P047-0417	AIR FILTER	200259136	0.101	0.097	0.004
DI BLANK	W050-730-P047-0417	1 L PLS	200259143	1.251	0.220	1.031
ACETONE BLANK	W050-730-P047-0417	1 L PLS	200259144	0.300	0.220	0.080
RESP. FILTER	W050-730-P047-0417	AIR FILTER	200259137	0.101	0.097	0.004
RESP. FRONT 1/2	W050-730-P047-0417	1 L PLS	200259145	0.300	0.220	0.080
RESP. BACK 1/2	W050-730-P047-0417	1 L PLS	200259146	0.300	0.220	0.080
				3.755	2.148	1.607

32350

8019

FEMP

COVER SHEET

DOCUMENT TYPE ● RSR ○ RWP

SURVEY FOR RWP? ○ YES ● NO

NAME [redacted]

PAGE 1 OF 4

SIGNED [redacted]

LOCATION Lab WZ6

LOCATION CODE

BADGE #	DATE	TIME	BLDG/GRID#	FLR
7323	09/24/96	09:26	15A	1

SURVEY NUMBER 96-09-11-0165

RWP NUMBER -

COMMENTS Sampleshipment Res. Filters + Acetone Rel# 12352

NA

REVIEWER R Peterson

BADGE 7395

SIGNATURE

FS-F-4617 (4/22/96)

FEMP
RADIOLOGICAL SURVEY REPORT

SURVEY NUMBER: 96- 9 -11- 165

DATE: 9-24-96	RCT NAME [redacted]	RCT BADGE #: 74323	PAGE:
REVIEWED BY: [redacted]		REVIEWER BADGE NO: 7395	2 OF 4

MODEL	SERIAL NUMBER	TYPE (α, β, γ)	CALIBRATION-DUE DATE	BKGD. (cpm)	EFF/CF	COUNT TIME (min)	MDA (dpm)	INSPJ PERFORMANCE TEST DATE YES	NO
LB 5100		LB β	10-96	.26/1.42	.212/.431	2.0	2/A 3	✓	
M3		BX	2-97	60	30	NA	3000	✓	
2221	75947	α	9-96	1.2	.16	1	16.2	✓	
					A				
				N					

ITEM NUMBER	LOCATION AND/OR DESCRIPTION	HEIGHT (FT.)	DPM/100cm² ALPHA REMOVABLE (1)	DPM/100cm² ALPHA FIXED PLUS REMOVABLE	DPM/100cm² BETA-GAMMA REMOVABLE (1)	DPM/100cm² BETA-GAMMA FIXED PLUS REMOVABLE	CORRECTED DOSE RATE (MREM/HR) γ CONTACT	β CONTACT	γ AT FT.	β AT FT.
1	200259131	NA	-0 *	-7 *	3	<MDCR				
2	200259136		2	-7.5 *	-2 *					
3	200259135		0 *	-7 *	2 *					
4	200259137		-0 *	5 *	5					
5	200259139		5	NA	4					
6	200259141		2		10					
7	200259145		0 *		5			NA		
8	200259140		0 *		0 *					
9	200259144		-0 *		0 *					
10	200259143		-0 *		0 *					
11	200259142		0 *		1 *					
12	200259146		2		5					
13	I/S can	✓	-0 *	✓	0 *	✓				
14	O/S can	NA	0 *	NA	3	<MDCR				
				NA						

Note (1): Values identified by an asterisk (*) indicate results are less than the calculated MDA (RC-RDA-010)

FS-F-1993-1 (REV. 04/18/95)

TUE SEP 24, 1996
GROUP A SMEARS FOR FREE RELEASE (2 MIN)

SAMPLE NUMBER	GROSS ALPHA	GROSS BETA	DPM ALPHA	DPM BETA	TIME OF COUNT
51	0	2	-0	3	08:03:16
[illegible]	2	[illegible]	2	-2	08:05:31
53	1	5	0	7	08:07:46
54	0	2	-0	3	08:10:01
55	4	7	5	4	08:12:16
56	2	17	2	10	08:14:31
57	1	2	0	3	08:16:46
58	1	0	0	0	08:19:01
59	0	0	-0	0	08:21:16
60	0	[illegible]	-0	0	08:23:31
61	1	4	0	1	08:25:46
62	2	4	2	3	08:28:01
63	0	3	-0	0	08:30:16
64	1	0	0	3	08:32:30

OPERATION COMPLETE

OPERATION COMPLETE

FEMP RADIOLOGICAL SURVEY REPORT pg 3 of 4
SURVEY # 96-4-11-164 DATED 9/24/96

	(name)	(signature)
RCT:	William Chusteen	[illegible]
REVIEWER:	[illegible]	[illegible]

MATERIAL RESTRICTED RELEASE FORM

ITEM NUMBER	ITEM DESCRIPTION	RCT	MATERIAL RELEASE EVALUATOR PRINT/SIGNATURE [1&3]	MATERIAL OWNER/SURVEY REQUESTOR PRINT/SIGNATURE [2&3]
1-4	Filters	N/A	R Watson	GORDON BELL
5-12	Acetone	N/A	R Watson	GORDON BELL
			NA	

Additional Comments: Sales to DCL-SLC Lic # UT1800237 EXP 11-31-97

[1] Signature by Material Release Evaluator indicates the material may be released for restricted use in the uncontrolled area of the FEMP site only. This material is not being released for unrestricted use.

[2] Signature by the Material Owner/Survey Requestor indicates acceptance of responsibility for the material while in the uncontrolled area and the material will be returned to the controlled area following use.

[3] Additional approval by the Manager of Radiological Compliance is required prior to allowing the material to exit beyond the FEMP property boundary. This allowance may be annotated in the additional comments section of the form.

FS-F-3916 (06/24/94)

FEMP RADIOLOGICAL SURVEY REPORT pg 1 of 1
SURVEY # 96-9-11-164 DATED 9-29-96

	(name)	(signature)
RCT:	William Thaston	
REVIEWED:	R Watson	

039

PROJECT PROTOCOL WORKSHEET

Project:	Fernald Emission Testing	Date: 09/20/96
Client:	Hayden Environmental	Revision: 1.0
Account:	3025	
Proj. Mngr:	Bob Di Rienzo	

Client Contacts:

Reports:

Bruce Sarven
Hayden Environmental
561 Congress Park Drive
Dayton, OH 45459

Phone: (513) 438-3010
FAX: (513) 438-3020

Invoices:

Same with COC

Schedule: Starts 09/20/96

TAT: 30 Calendar Days

Sample Receipt: Use the 96E sample stream. *Notify Project Manager when samples are received.*

Analyses: **Particulates and Radiochemistry**

QA/QC: Overall QA/QC requirements will be based on the DCL Procedures.

MDL: None.

MS/MSD or MD: As per method

Deliverables: RLIMS63 Report, Raw Data, and COC
Paginate entire package

Penalties: None

Questions: If you have any questions, please contact the project manager either directly or by voice-mail at extension 331, or via e-mail on node tigger.

Special Instructions: **See attached Flow Chart and Instructions**
Particulate mesurement is completed first.
Rinsate and Filter Particulate are used for radiochemistry procedures.

PRICE CODES AND ANALYTE GROUPS:

ANALYTE	MATRIX	EST SAMPLE	METHOD	SECT	HOLD CODE	PRICE CODE	ANALYTE GROUP
Particulate	Air	4	Method 5	WA	NA	3025A01NMET5	3025A1MET5
Iso U	Air	4	AS	WA	NA	3025A01NUISO	3025A1UISO
Iso Th	Air	4	AS	WA	NA	3025A01NTISO	3025A1TISO
Radium 226/228	Air	4	GS	WA	NA	3025A01NGS	3025A1GS
Total Uranium	Air	4	kPA	WA	NA	3025A01NTOTU	3025A1TOTU

DATACHEM LABORATORIES CLIENT-RELATED INFORMATION REPORT (CRIR)

CRIR NO. _____

COOLER INFORMATION CHECKLIST
(Fill In or Circle)

Client Name: Fermco

Project/Task/Site:

Date/Time of Receipt: 9/25/96 1000

Number of Coolers Received: 1

Condition of Coolers: Acceptable/Unacceptable

Temperature Control: Present/Not Included

Custody Seals: Present/Absent

Intact/Broken

Location Temperature Taken: Control/Between Samples

Tamper Evident: Yes/No

Are all temperatures within project specific guidelines? Yes/No

Ice Present: Yes/No

Frozen/Melted/NA

Are all applicable pHs within specific guidelines? Yes/No/NA

Cooler Received	DCL Cooler No.	Temp.	Cooler Received	DCL Cooler No.	Temp.	Cooler Received	DCL Cooler No.	Temp.
* 1	MC96 0437	19 °C	4	MC96	°C	7	MC96	°C
2	MC96	°C	5	MC96	°C	8	MC96	°C
3	MC96	°C	6	MC96	°C	9	MC96	°C

Taken By: Karyn Vigil (Signature) Karyn Vigil (Printed Name) 9/25/96 (Date)

* Rad Chem. Analysis: no temp preservation required

CLIENT-RELATED INFORMATION

- ☐ Missing Cooler
- ☐ Cooler Conditions
- ☐ Missing Paperwork
- ☐ Missing/Incorrect Bottle Labels
- ☐ Missing Samples/Bottles
- ☐ Broken/Leaking Samples
- ☐ Incorrect Bottle Type
- ☐ Cooler Temperatures Out Of Range
- ☐ Incorrect Preservation
- ☐ pH Criteria Not Met
- ☐ Head Space in Bottles
- ☐ Insufficient Sample Volume
- ☐ Chain Of Custody Problems
- ☐ Other:

BRIEFLY DESCRIBE THE PROBLEM AND THE ACTION TAKEN:

Faxed to Client? Yes ☐ No ☐ (If yes, attach Fax Cover Sheet)

❖ Response Required Within 24 Hours ❖

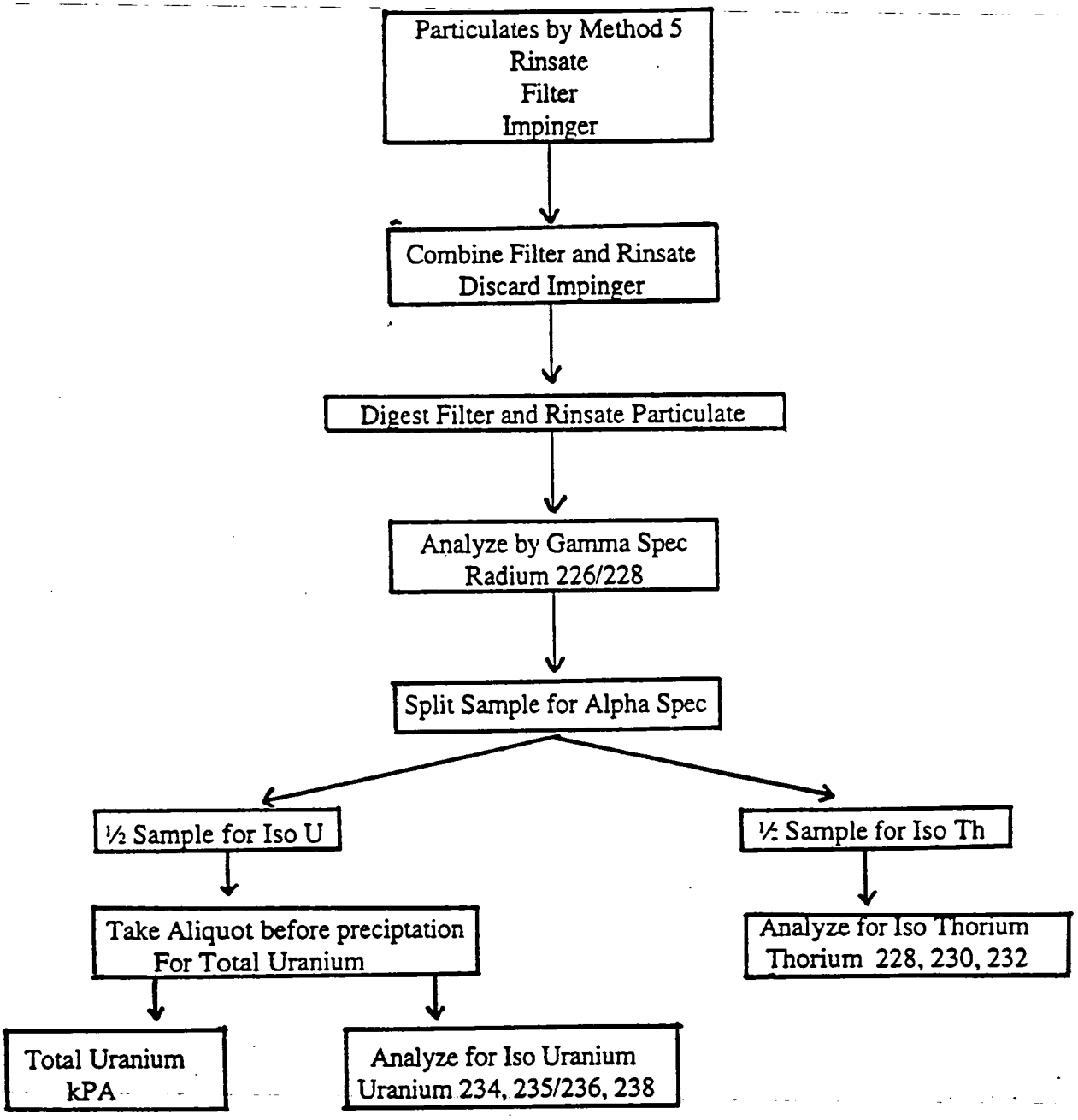
PROJECT MANAGEMENT

PROJECT MANAGER COMMENTS:

Project Manager: _____ (Printed Name) Returned to Sample Receipt by: _____ (Signature) Date: _____

Analytical Scheme
Hayden Environmental - Fernault Emission Testing

3 Samples and Field Blank



Filter Lot #: ? Temp.: 74 R.H.: 55% 8019

Pure Testing was supplied filters Gemdia GFF Glass Fiber Filters Tared on a Sartorius Research (Red Chem) DLL#102683 on 9/16/96 PG

Filter: GF 96-20 (740)
Tare Analyst PG Date 9/16/96
Total Weight ____ mg
Total Weight ____ mg
Avg. Total Weight ____ mg
Tare Weight ~~453.2~~ 447.6 mg
Tare Weight ~~453.2~~ 447.6 mg 447.6
Avg. Tare Weight ~~453.2~~ mg
SAMPLE No. ____ SAMPLE WT. ____ mg
Total Wt. Anal. ____ Date ____
Check Analyst ____ Date ____

Filter: GF 96-21 (756)
Tare Analyst PG Date ____
Total Weight ____ mg
Total Weight ____ mg
Avg. Total Weight ____ mg
Tare Weight 453.2 mg
Tare Weight 453.2 mg
Avg. Tare Weight 453.2 mg
SAMPLE No. ____ SAMPLE WT. ____ mg
Total Wt. Anal. ____ Date ____
Check Analyst ____ Date ____

Filter: GF 96-22 (752)
Tare Analyst PG Date ____
Total Weight ____ mg
Total Weight ____ mg
Avg. Total Weight ____ mg
Tare Weight 448.9 mg
Tare Weight 448.8 mg
Avg. Tare Weight 448.9 mg
SAMPLE No. ____ SAMPLE WT. ____ mg
Total Wt. Anal. ____ Date ____
Check Analyst ____ Date ____

Filter: GF 96-23 (752)?
Tare Analyst PG Date ____
Total Weight ____ mg
Total Weight ____ mg
Avg. Total Weight ____ mg
Tare Weight 446.2 mg
Tare Weight 446.0 mg
Avg. Tare Weight 446.1 mg
SAMPLE No. ____ SAMPLE WT. ____ mg
Total Wt. Anal. ____ Date ____
Check Analyst ____ Date ____

Filter: GF 96-24 (753)?
Tare Analyst PG Date ____
Total Weight ____ mg
Total Weight ____ mg
Avg. Total Weight ____ mg
Tare Weight 456.6 mg
Tare Weight 456.3 mg
Avg. Tare Weight 456.5 mg
SAMPLE No. ____ SAMPLE WT. ____ mg
Total Wt. Anal. ____ Date ____
Check Analyst ____ Date ____

Filter: GF 96-25 (754)
Tare Analyst PG Date ____
Total Weight ____ mg
Total Weight ____ mg
Avg. Total Weight ____ mg
Tare Weight 447.5 mg
Tare Weight 447.4 mg
Avg. Tare Weight 447.5 mg
SAMPLE No. ____ SAMPLE WT. ____ mg
Total Wt. Anal. ____ Date ____
Check Analyst ____ Date ____

Filter: GF 96-26 (760?)
Tare Analyst PG Date ____
Total Weight ____ mg
Total Weight ____ mg
Avg. Total Weight ____ mg
Tare Weight 451.2 mg
Tare Weight 450.9 mg
Avg. Tare Weight 451.1 mg
SAMPLE No. ____ SAMPLE WT. ____ mg
Total Wt. Anal. ____ Date ____
Check Analyst ____ Date ____

Filter: GF 96-27 (761)
Tare Analyst PG Date ____
Total Weight ____ mg
Total Weight ____ mg
Avg. Total Weight ____ mg
Tare Weight 449.3 mg
Tare Weight 449.2 mg
Avg. Tare Weight 449.3 mg
SAMPLE No. ____ SAMPLE WT. ____ mg
Total Wt. Anal. ____ Date ____
Check Analyst ____ Date ____

Filter: GF 96-28 (763)
Tare Analyst PG Date 9/16/96
Total Weight ____ mg
Total Weight ____ mg
Avg. Total Weight ____ mg
Tare Weight 450.9 mg
Tare Weight 450.7 mg
Avg. Tare Weight 450.8 mg
SAMPLE No. ____ SAMPLE WT. ____ mg
Total Wt. Anal. ____ Date ____
Check Analyst ____ Date ____

Filter: ____
Tare Analyst ____ Date ____
Total Weight ____ mg
Total Weight ____ mg
Avg. Total Weight ____ mg
Tare Weight ____ mg
Tare Weight ____ mg
Avg. Tare Weight ____ mg
SAMPLE No. ____ SAMPLE WT. ____ mg
Total Wt. Anal. ____ Date ____
Check Analyst ____ Date ____

DATACHEM LABORATORIES
ANALYTE GROUP LIST
SEARCH STRING: 3025A1MET5
ANALYTE GROUP: 3025A1MET5 ACCOUNT: 03025 DESCRIPTION: Method 5 Particulate

Analyte	Instrument Class	Method	Sub Method	Report Units	Threshold	Lod	Loq
Particulate	GRAV	Method 5		mg/Rinsate			0.1
Particulate	GRAV	Method 5		mg/Filter			0.1
Particulate	GRAV	Method 5		mg/Impinger			0.1
Particulate	GRAV	Method 5		Total mg			0.1

--- END OF LISTING ---

8019
0004260 45

DATACHEM LABORATORIES
ANALYTE GROUP LIST
SEARCH STRING: 3025A1UISO

ANALYTE GROUP: 3025A1UISO ACCOUNT: 03025 DESCRIPTION: Isotopic Uranium

Analyte	Instrument Class	Method	Sub Method	Report Units	Threshold	Lod	Log
Uranium-233/234	AS	WR-DC-341	WR-DC-200	pCi/Sample			1.0
Uranium-235	AS	WR-DC-341	WR-DC-200	pCi/Sample			1.0
Uranium-238	AS	WR-DC-341	WR-DC-200	pCi/Sample			1.0

--- END OF LISTING ---

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000127
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DATACHEM LABORATORIES
ANALYTE GROUP LIST
SEARCH STRING: 3025A1TISO

ANALYTE GROUP: 3025A1TISO ACCOUNT: 03025 DESCRIPTION: ISOTOPIC THORIUM

Analyte	Instrument Class	Method	Sub Method	Report Units	Threshold	Lod	Loq
Thorium-228	AS	WR-DC-341		pCi/Sample			1.0
Thorium-230	AS	WR-DC-341		pCi/Sample			1.0
Thorium-232	AS	WR-DC-341		pCi/Sample			1.0

--- END OF LISTING ---

8019
000128

DATACHEM LABORATORIES
ANALYTE GROUP LIST
SEARCH STRING: 3025A1GS

ANALYTE GROUP: 3025A1GS ACCOUNT: 03025 DESCRIPTION: Radium 226/228 by ga

Analyte	Instrument Class	Method	Sub Method	Report Units	Threshold	Lod	Loq
Radium-226	GS	WR-EP-325	WR-DC-200	pCi/Sample			95
Radium-228	GS	WR-EP-325	WR-DC-200	pCi/Sample			20

--- END OF LISTING ---

8019

000429

DATACHEM LABORATORIES
ANALYTE GROUP LIST
SEARCH STRING: 3025A1TOTU

ANALYTE GROUP: 3025A1TOTU ACCOUNT: 03025 DESCRIPTION: Total Uranium by kPA

Analyte	Instrument Class	Method	Sub Method	Report Units	Threshold	Lod	Loq
Total Uranium	kPA	WR-DC-342		ug/Sample			0.8

--- END OF LISTING ---

8019
049
000430

August 6, 1996
Refer to: BD0021

Bruce Sarven
Hayden Environmental
561 Congress Park Drive
Dayton, OH 45459

Phone: (513) 438-3010
FAX: (513) 438-3020

Re: REVISED FAX Quote BD0021

Dear Mr. Sarven:

DataChem Laboratories, Inc.(DCL) appreciates the opportunity to provide you with cost estimates for your project. As I understand your needs, you will be taking three 6 hour stack samples and a blank by Method 5 for particulates and radionulclides analysis. Tared glass fiber filters and sample bottles will be provided for these determinations. The acetone rinse and glass fiber filter will be combined for the analysis of radionuclides.

Uranium 234, Uranium 235/236, Uranium 238, Thorium 228, Thorium 230, and Thorium 232 will be analyzed by alpha spectrometry(AS). Radium 226 and Radium 228 will be analyzed by gamma spectrometry(GS). Total Uranium will be analyzed by kinetic phosphorescence(KPA). According to method 114 these radionuclides will be part of the particulate loading and analysis on the impinger solutions is not required. Combined particulate from the acetone rinse and filter will be analyzed according to DCL standard operating procedures(SOP).

The standard turnaround time for these analysis is 30 calendar days. The requested turnaround time of 10 working days can be accomplished for an additional 25%. The requested detection limits for isotopic analysis can not be met. Minimun Detectable Activity (MDA) is listed on the attached table.

Attached is a Pricing Quotation for these analyses. If you have any question concerning the attached quotation please call me.

Sincerely,

Robert P. Di Rienzo
Project Manager

Revised Pricing Quotation
Project Reference Number: BD-0021

Parameter Analysis	Method	MDA pCi/Sample	Method	Fractions	Price per Sample
Particulate	Method 5		Grav	Acetone Rinse Filter Impinger	$100.00
Uranium 234 Uranium 235/236 Uranium 238	DCL SOP	1 1 1	AS	Particulate*	$312.50
Thorium 228 Thorium 230 Thorium 232	DCL SOP	1 1 1	AS	Particulate*	$312.50
Radium 226 Radium 228	DCL SOP	95 20	GS	Particulate*	$250.00
Total Uranium	DCL SOP	0.8 ug/ Sample	KPA	Particulate*	$187.50

* = Particulate samples are combined acetone rinse and glass fiber filter.

EMISSION MEASUREMENT TECHNICAL INFORMATION CENTER TEST METHOD

Method 5 - Determination of Particulate Emissions from Stationary Sources

1. PRINCIPLE AND APPLICABILITY

1.1 Principle. Particulate matter (PM) is withdrawn isokinetically from the source and collected on a glass fiber filter maintained at a temperature in the range of 120 ± 14°C (248 ± 25°F) or such other temperature as specified by an applicable subpart of the standards or approved by the Administrator, U.S. Environmental Protection Agency, for a particular application. The PM mass, which includes any material that condenses at or above the filtration temperature, is determined gravimetrically after removal of uncombined water.

1.2 Applicability. This method is applicable for the determination of PM emissions from stationary sources.

2. APPARATUS

2.1 Sampling Train. A schematic of the sampling train used in this method is shown in Figure 5-1. Complete construction details are given in APTD-0581 (Citation 2 in the Bibliography); commercial models of this train are also available. For changes from APTD-0581 and for allowable modifications of the train shown in Figure 5-1, see the following subsections.

The operating and maintenance procedures for the sampling train are described in APTD-0576 (Citation 3 in the Bibliography). Since correct usage is important in obtaining valid results, all users should read APTD-0576 and adopt the operating and maintenance procedures outlined in it, unless otherwise specified herein. The sampling train consists of the following components:

2.1.1 Probe Nozzle. Stainless steel (316) or glass with sharp, tapered leading edge. The angle of taper shall be ≤30°, and the taper shall be on the outside to preserve a constant internal diameter. The probe nozzle shall be of the button-hook or elbow design, unless otherwise specified by the Administrator. If made of stainless steel, the nozzle shall be constructed from seamless tubing; other materials of construction may be used, subject to the approval of the Administrator.

A range of nozzle sizes suitable for isokinetic sampling should be available, e.g., 0.32 to 1.27 cm (1/8 to 1/2 in.)—or larger if higher volume sampling trains are used—inside diameter (ID) nozzles in increments of 0.16 cm (1/16 in.). Each nozzle shall be calibrated according to the procedures outlined in Section 5.

directly from the wash bottle being used, and place it in a glass sample container labeled "acetone blank."

Inspect the train prior to and during disassembly, and note any abnormal conditions. Treat the samples as follows:

Container No. 1. Carefully remove the filter from the filter holder, and place it in its identified petri dish container. Use a pair of tweezers and/or clean disposable surgical gloves to handle the filter. If it is necessary to fold the filter, do so such that the PM cake is inside the fold. Carefully transfer to the petri dish any PM and/or filter fibers that adhere to the filter holder gasket, by using a dry Nylon bristle brush and/or a sharp-edged blade. Seal the container.

Container No. 2. Taking care to see that dust on the outside of the probe or other exterior surfaces does not get into the sample, quantitatively recover PM or any condensate from the probe nozzle, probe fitting, probe liner, and front half of the filter holder by washing these components with acetone and placing the wash in a glass container. Deionized distilled water may be used instead of acetone when approved by the Administrator and shall be used when specified by the Administrator; in these cases, save a water blank, and follow the Administrator's directions on analysis. Perform the acetone rinse as follows:

Carefully remove the probe nozzle, and clean the inside surface by rinsing with acetone from a wash bottle and brushing with a Nylon bristle brush. Brush until the acetone rinse shows no visible particles, after which make a final rinse of the inside surface with acetone.

Brush and rinse the inside parts of the Swagelok fitting with acetone in a similar way until no visible particles remain.

Rinse the probe liner with acetone by tilting and rotating the probe while squirting acetone into its upper end so that all inside surfaces will be wetted with acetone. Let the acetone drain from the lower end into the sample container. A funnel (glass or polyethylene) may be used to aid in transferring liquid washes to the container. Follow the acetone rinse with a probe brush. Hold the probe in an inclined position, squirt acetone into the upper end as the probe brush is being pushed with a twisting action through the probe; hold a sample container underneath the lower end of the probe, and catch any acetone and particulate matter that is brushed from the probe. Run the brush through the probe three times or more until no visible PM is carried out with the acetone or until none remains in the probe liner on visual inspection. With stainless steel or other metal probes, run the brush through in the above prescribed manner at least six times since metal probes have small crevices in which particulate matter can be entrapped.

Rinse the brush with acetone, and quantitatively collect these washings in the sample container. After the brushing, make a final acetone rinse of the probe as described above.

It is recommended that two people clean the probe to minimize sample losses. Between sampling runs, keep brushes clean and protected from contamination.

After ensuring that all joints have been wiped clean of silicone grease, clean the inside of the front half of the filter holder by rubbing the surfaces with a Nylon bristle brush and rinsing with acetone. Rinse each surface three times or more if needed to remove visible particulate. Make a final rinse of the brush and filter holder. Carefully rinse out the glass cyclone, also (if applicable). After all acetone washings and particulate matter have been collected in the sample container, tighten the lid on the sample container so that acetone will not leak out when it is shipped to the laboratory. Mark the height of the fluid level to determine whether leakage occurred during transport. Label the container to identify clearly its contents.

Container No. 3. Note the color of the indicating silica gel to determine whether it has been completely spent, and make a notation of its condition. Transfer the silica gel from the fourth impinger to its original container, and seal. A funnel may make it easier to pour the silica gel without spilling. A rubber policeman may be used as an aid in removing the silica gel from the impinger. It is not necessary to remove the small amount of dust particles that may adhere to the impinger wall and are difficult to remove. Since the gain in weight is to be used for moisture calculations, do not use any water or other liquids to transfer the silica gel. If a balance is available in the field, follow the procedure for Container No. 3 in Section 4.3.

Impinger Water. Treat the impingers as follows: Make a notation of any color or film in the liquid catch. Measure the liquid that is in the first three impingers to within 1 ml by using a graduated cylinder or by weighing it to within 0.5 g by using a balance (if one is available). Record the volume or weight of liquid present. This information is required to calculate the moisture content of the effluent gas.

Discard the liquid after measuring and recording the volume or weight, unless analysis of the impinger catch is required (see **NOTE**, Section 2.1.7).

If a different type of condenser is used, measure the amount of moisture condensed either volumetrically or gravimetrically.

Whenever possible, containers should be shipped in such a way that they remain upright at all times.

4.3 **Analysis.** Record the data required on a sheet such as the one shown in Figure 5-3. Handle each sample container as follows:

Container No. 1. Leave the contents in the shipping container or transfer the filter and any loose PM from the sample container to a tared glass weighing dish. Desiccate for 24 hours in a desiccator containing anhydrous calcium sulfate. Weigh to a constant weight, and report the results to the nearest
0.1 mg. For purposes of this Section, 4.3, the term "constant weight" means a difference of no more than 0.5 mg or 1 percent of total weight less tare weight, whichever is greater, between two consecutive weighings, with no less than 6 hours of desiccation time between weighings.

Alternatively, the sample may be oven dried at 105°C (220°F) for 2 to 3 hours, cooled in the desiccator, and weighed to a constant weight, unless otherwise specified by the Administrator. The tester may also opt to oven dry the sample at 105°C (220°F) for 2 to 3 hours, weigh the sample, and use this weight as a final weight.

Container No. 2. Note the level of liquid in the container, and confirm on the analysis sheet whether leakage occurred during transport. If a noticeable amount of leakage has occurred, either void the sample or use methods, subject to the approval of the Administrator, to correct the final results. Measure the liquid in this container either volumetrically to ±1 ml or gravimetrically to ±0.5 g. Transfer the contents to a tared 250-ml beaker, and evaporate to dryness at ambient temperature and pressure. Desiccate for 24 hours, and weigh to a constant weight. Report the results to the nearest 0.1 mg.

Container No. 3. Weigh the spent silica gel (or silica gel plus impinger) to the nearest 0.5 g using a balance. This step may be conducted in the field.

"Acetone Blank" Container. Measure the acetone in this container either volumetrically or gravimetrically. Transfer the acetone to a tared 250-ml beaker, and evaporate to dryness at ambient temperature and pressure. Desiccate for 24 hours, and weigh to a constant weight. Report the results to the nearest 0.1 mg.

NOTE: At the option of the tester, the contents of Container No. 2 as well as the acetone blank container may be evaporated at temperatures higher than ambient. If evaporation is done at an elevated temperature, the temperature must be below the boiling point of the solvent; also, to prevent "bumping," the evaporation process must be closely supervised, and the contents of the beaker must be swirled occasionally to maintain an even temperature. Use extreme care, as acetone is highly flammable and has a low flash point.

4.4 Quality Control Procedures. The following quality control procedures are

suggested to check the volume metering system calibration values at the field test site prior to sample collection. These procedures are optional for the tester.

4.4.1 Meter Orifice Check. Using the calibration data obtained during the calibration procedure described in Section 5.3, determine the $\Delta H_@$ for the metering system orifice. The $\Delta H_@$ is the orifice pressure differential in units of in. H_2O that correlates to 0.75 cfm of air at 528°R and 29.92 in. Hg. The
$\Delta H_@$ is calculated as follows:

$$\Delta H_@ = 0.0319\, \Delta H \frac{T_m\, \theta^2}{P_{bar}\, Y^2\, V_m^2}$$

where:

ΔH = Average pressure differential across the orifice meter, in. H_2O.

T_m = Absolute average DGM temperature, °R.

P_{bar} = Barometric pressure, in. Hg.

θ = Total sampling time, min.

Y = DGM calibration factor, dimensionless.

V_m = Volume of gas sample as measured by DGM, dcf.

0.0319 = (0.0567 in. Hg/°R)(0.75 cfm)^2

Before beginning the field test (a set of three runs usually constitutes a field test), operate the metering system (i.e., pump, volume meter, and orifice) at the $\Delta H_@$ pressure differential for 10 minutes. Record the volume collected, the DGM temperature, and the barometric pressure. Calculate a DGM calibration check value, Y_c, as follows:

$$Y_c = \frac{10\, V_m \left[0.0319\, T_m \right]^{1/2}}{P_{bar}}$$

where:

Y_c = DGM calibration check value, dimensionless.

Sample Work Order

8019

QC Clearance: _____

Project Manager: Robert P. Di Rienzo

Client: Hayden Environmental

Account: 03025

Project/Task: COMM-ENV

Date Received: 25-Sep-1996

Date for Mailing Report: 25-Oct-1996

DCL Root Set ID: 96E-0640 *

DCL Lab. Name: 96E04514-96E04517

Total # Samples: 4

Sample Entry: Karyn L. Boyack

Section: WA

Earliest Sampling Date: 19-Sep-1996

Preparation Type:

Rep. Group	Radiochemistry Analytes Requested	Latest Prep. Date	Latest Anal. Date	No. of Samp.	Storage Location	Analysis/Prep. Method	Inst.	Matrix
01	Method 5 Particulate		18-Mar-1997[c]	4		Method 5	GRAV	AIR
02	Isotopic Uranium	1-Oct-1996[c]	18-Mar-1997[c]	4		WR-DC-341 WR-DC-200	AS	AIR
03	ISOTOPIC THORIUM	1-Oct-1996[c]	18-Mar-1997[c]	4		WR-DC-341	AS	AIR
04	Radium 226/228 by gamma spec		18-Mar-1997[c]	4		WR-EP-325 WR-DC-200	GS	AIR
05	Total Uranium by kPA		18-Mar-1997[c]	4		WR-DC-342	kPA	AIR

[c]Based on date of collection

Special Instructions: _____

Section Manager: Charlie C. Walker

Other Sections Receiving Sample Portions: None

SAMPLE LOG-IN SHEET

Group Name: 96E-8019

Lab Name: DataChem Laboratories	Page 1 of 1
Received By (Print Name): Sample Rec. Group	Log-In Date: 9-25-96
Received By (Signature): Tanya Vigil	
Case Number: —	Sample Delivery Group No.: — / SAS Number: NA

Remarks:		Client ID #1 (EPA Sample #)	Corresponding Client ID #2 (Sample Tag #)	Corresponding Assigned Lab #	Matrix	Fraction	Remarks: Condition of Sample Shipment, etc.
1. Custody Seal(s)	Present/Absent*	200259131	North	96E04514	Water	R/A	each client
	Intact/Broken*	39	↓	↓	Water	↓	ID 1 bottle
2. Custody Seal Nos.	N/A	40	↓	↓	Water	↓	needs to be
		200259135	South	96E04515	Water	↓	combined
3. Chain-of-Custody Records	Present/Absent*	41	↓	↓	Water	↓	to create
4. Traffic Reports or Packing Lists	Present/Absent*	42	↓	↓	Water	↓	a single
5. Airbill	Airbill/Sticker	200259136	Blank	96E04516	Water	↓	client ID
	Present/Absent*	43	↓	↓	Water	↓	2 (see PPL)
6. Airbill No.	9690684221	44	↓	↓	Water	↓	↓
		200259137	Resp	96E04517	Water	↓	↓
7. Sample Tags	Present/Absent*	45	↓	↓	Water	↓	↓
Sample Tag Numbers	Listed/Not Listed on Chain-of-Custody	46	↓	↓	Water	↓	↓
8. Sample Condition	Intact/Broken*/Leaking						
9. Does information on custody records, traffic reports, and sample tags agree?	Yes/No*						
10. Date Received at Lab	9/25/96						
11. Time Received	1000						

Tanya Vigil 9/25/96

Sample Transfer	
Fraction: All	Fraction:
Area #: R-23-1	Area #:
By: TV	By:
On: 9/25/96	On:

* Contact SMO and attach record of resolution.

Reviewed By:	Logbook No.:
Date:	Logbook Page No.:

FRACTIONS:
C - Cyanide
D - Dissolved Metals
T - Total Metals
F - Full TCL Organics
P - Pesticides
S - Semivolatiles
V - Volatiles
R - Rad Chem
A - Particulates

FORM DC-1

Note: only highlighted portion of client ID #1's entered into DCL computer system 9/26

FERMCO

P.O. BOX 538704
CINCINNATI, OH 45253-8704

CHAIN OF CUSTODY / REQUEST FOR ANALYSIS RECORD

REFERENCE DOCUMENT NO.: SPL-96-2875

ORIGINAL MEF NO.: _____ CORRESPONDING REFERENCE DOCUMENT NO.: _____

000441

RELEASE NO.: 1000012382	PROJECT NO.: N/A	FOR SAMPLE RELATED PROBL[redacted] ACS CONTACT / PHONE: [redacted] X4198	CONTRACT PURCHASE ORDER / TASK ORDER NO.: N/A
PROJECT NAME: NESHAP STACK SAMPLING		REQUIRED REPORT DATE / LAB[redacted] PARTICULATE (10 DAY) RAD (30 DAY)	SAMPLE SHIPMENT DATE: 9-24-96
PROJECT CONTACT / PHONE [redacted] /4198		RECEIVING LAB NAME: DATACHEM	SAMPLE SHIPPER (Print): G Bell
CHARGE NO.: 7ECG2	N/A	RECEIVING LAB ADDRESS: SALT LAKE CITY	OFF-SITE LAB CONTACT: Robert DiRenzo

SAMPLING TEAM (Print) & GROUP NAME / PHONE: BRUCE SAWYER HAYDEN ENVIRONMENTAL 513-438-3010 Geoff Schoenberger T-20 HAYDEN

SAMPLING TEAM (Signature & Badge No.): Bruce Sawyer 283-74-1868 G D. Schoenberger 267-82-4754

ITEM NO.	SAMPLE NUMBER: FACTS ID	SAMPLE NUMBER: CUSTOMER ID / SAMPLE POINT	SAMPLE MATRIX		COMP	GRAB	FILTERED	COLLECTION DATE	COLLECTION TIME	CONTAINER TYPE	CONTAINER VOL.	NO. CONTRS	PRESERVATION	ASL	ANALYSES REQUESTED (If more space is required, use the SPECIAL INSTRUCTIONS block.)	SAMPLE OKAY? (Y/N)* FERMCO	SAMPLE OKAY? (Y/N)* OFF-SITE
1	200259131	NORTH FILTER	AF	AIR FILTER	✓		N/A	9-19-96	0830	F	1460 CFM	1	NONE	B	Particulate & Rad *	Y	
2	200259139	NORTH FRONT 1/2	L1	ACETONE	✓		N/A	9-19-96	0830	P	1L	1	NONE	B	Particulate & Rad *	Y	
3	200259140	NORTH BACK 1/2	L2	~~ACETONE~~ WATER	✓		N/A	9-19-96	0830	P	1L	1	NONE	B	Particulate & Rad *	Y	
4	200259135	South Filter	AF	AIR FILTER	✓		N/A	9-19-96	0830	F	1360 CFM	1	NONE	B	Particulate & Rad *	Y	
5	200259141	South Front 1/2	~~L2~~ L1	ACETONE	✓		N/A	9-19-96	0830	P	1L	1	NONE	B	Particulate & Rad *	Y	
6	200259142	South Back 1/2	L2	~~ACETONE~~ WATER	✓		N/A	9-19-96	0830	P	1L	1	NONE	B	Particulate & Rad *	Y	
7	200259136	Filter Blank	AF	AIR FILTER	✓		N/A	9-19-96	0830	F	N/A	1	NONE	B	Particulate & Rad *	Y	
8	200259143	D.I. Blank	L2	WATER	✓		N/A	9-19-96	0830	P	1L	1	NONE	B	Particulate & Rad *	Y	
9	200259144	ACETONE BLANK	L1	ACETONE	✓		N/A	9-19-96	0830	P	1L	1	NONE	B	Particulate & Rad *	Y	
10	200259137	Resp. Filter	AF	AIR FILTER	✓		N/A	9-19-96	0830	F	293 CFM	1	NONE	B	Particulate & Rad *	Y	

SPECIAL INSTRUCTIONS: * Samples to be shipped off-site to DATA-CHEM / UTAH, contact Robert DiRenzo
Analysis to be performed are particulate, U-238, U-234, U-235, U-236, Th-228, Th-230, Th-232
Ra-226, Ra-228 and Total Uranium by Lazer Phosphorometry

RELINQUISHED: ITEM / REASON	RELINQUISHED BY (Signature) / AFFILIATION	BADGE NO.	DATE	TIME	RECEIVED: RECEIVED BY (Signature) / AFFILIATION	BADGE NO.	DATE	TIME
1-12 Rad Analysis	[redacted]	1 283-74-1868	9/20/96	1630	[redacted]	1 75148	9/20/96	1630
1-12 Ship		2 75148	9-23-96	0800		2 630	9-23-96	0800
1-17 Ship		3 630	9-24-96	1300		3 5852	9-25-96	1002
		4				4		
		5				5		

DISTRIBUTION OF COPIES: WHITE - ON-SITE - RELEASE FILE / OFF-SITE ANALYTICAL LAB - RETURN TO FEMP | YELLOW - ON-SITE - DISTRIBUTE AS NEEDED / OFF-SITE ANALYTICAL LAB - RETURN TO FEMP | BLUE - SAMPLING TEAM - PROJECT FILE

FS-F-3361 (09-21-95)

SHADED AREAS ARE TO BE COMPLETED BY THE SAMPLE RECEIVING GROUP.

* IF "N", THEN COMPLETE APPLICABLE NON-CONFORMANCE PROCEDURE.

FERMCO

CHAIN OF CUSTODY / REQUEST FOR ANALYSIS RECORD (CONTINUED)

PROJECT NO.: N/A

PROJECT NAME: NESHAP STACK SAMPLING

REFERENCE DOCUMENT NO.: SPL-96-2875 1000012382

CORRESPONDING REFERENCE DOCUMENT NO.:

PAGE 2 OF 2

ITEM NO.	SAMPLE NUMBER: FACTS ID	SAMPLE NUMBER: CUSTOMER ID / SAMPLE POINT	SAMPLE MATRIX		COMP	GRAB	FILTERED	COLLECTION: DATE	COLLECTION: TIME	CONTAINER: TYPE	CONTAINER: VOL.	NO. CONTRS	PRESERVATION	ASL	ANALYSES REQUESTED (If more space is required, use the SPECIAL INSTRUCTIONS block.)	SAMPLE OKAY? (Y/N)* FERMCO	SAMPLE OKAY? (Y/N)* OFF-SITE
11	200259145	Resp. Front 1/2	L1	ACETONE	✓		N/A	9-20-96	0845	P	1L	1	NONE	B	Particulate & Rad	Y	
12	200259146	Resp. Back 1/2	L2	~~ACETONE~~ WATER	✓		N/A	9-20-96	0845	P	1L	1	NONE	B	Particulate & Rad	Y	
		NOTHING FOLLOWS															

SPECIAL INSTRUCTIONS: AF - Air Filter
L1 - Acetone
L2 - D.I. WATER

DISTRIBUTION OF COPIES: WHITE - ON-SITE - RELEASE FILE / OFF-SITE ANALYTICAL LAB - RETURN TO FEMP; YELLOW - ON-SITE - DISTRIBUTE AS NEEDED / OFF-SITE ANALYTICAL LAB - RETURN TO FEMP; BLUE - SAMPLING PROJECT FILE

FS-F-3361-1 (09-21-95)

SHADED AREAS ARE TO BE COMPLETED BY THE SAMPLE RECEIVING GROUP.

* IF "N", THEN COMPLETE APPLICABLE NON-CONFORMANCE PROCEDURE.

0004420061

TALLY SHEET

8019

RELEASE #: 1000012382 (CAN 1 OF 1)
PO #: NA
DATE SHIPPED: 23-SEP-96
MATERIAL: NESHAP STACK SAMPLING - AIR FILTERS, ACETONE , AND WATER

ANALYSIS: PARTICULATE AND RAD

Composite Sample Number	Lot Number	Sample Container Size	AnaLis/ FACTS Number	Gross Weight lbs.	Tare Weight lbs.	Net Weight lbs.
NORTH FILTER	W050-730-P047-0417	AIR FILTER	200259131	0.101	0.097	0.004
NORTH FRONT 1/2	W050-730-P047-0417	1 L PLS	200259139	0.300	0.220	0.080
NORTH BACK 1/2	W050-730-P047-0417	1 L PLS	200259140	0.300	0.220	0.080
SOUTH FILTER	W050-730-P047-0417	AIR FILTER	200259135	0.101	0.097	0.004
SOUTH FRONT 1/2	W050-730-P047-0417	1 L PLS	200259141	0.300	0.220	0.080
SOUTH BACK 1/2	W050-730-P047-0417	1 L PLS	200259142	0.300	0.220	0.080
FILTER BLANK	W050-730-P047-0417	AIR FILTER	200259136	0.101	0.097	0.004
DI BLANK	W050-730-P047-0417	1 L PLS	200259143	1.251	0.220	1.031
ACETONE BLANK	W050-730-P047-0417	1 L PLS	200259144	0.300	0.220	0.080
RESP. FILTER	W050-730-P047-0417	AIR FILTER	200259137	0.101	0.097	0.004
RESP. FRONT 1/2	W050-730-P047-0417	1 L PLS	200259145	0.300	0.220	0.080
RESP. BACK 1/2	W050-730-P047-0417	1 L PLS	200259146	0.300	0.220	0.080
				3.755	2.148	1.607

32350

FEMP

COVER SHEET

8019

DOCUMENT TYPE ● RSR ○ RWP

SURVEY FOR RWP? ○ YES ● NO

NAME [redacted]

PAGE 1 OF 4

SIGNE [redacted]

LOCATION Lab 1126

LOCATION CODE

BADGE #	DATE	TIME	BLDG/GRID#	FLR
7323	09/24/96	09:26	15A	1

SURVEY NUMBER 96-09-11-0165

RWP NUMBER -

COMMENTS Sampleshipment Res. Filters + Acetone Rel# 12352

NA

REVIEWER [redacted] BADGE 7395

SIGN [redacted]

FS-F-4617 (4/22/96)

00044463

FEMP
RADIOLOGICAL SURVEY REPORT

SURVEY NUMBER: 96- 9 -11- 165

DATE: 9-24-96	RCT NAME: [redacted]	RCT BADGE #: 74323	PAGE:
REVIEWED BY: [redacted]		REVIEWER BADGE NO: 7395	2 OF 4

MODEL	SERIAL NUMBER	TYPE (α, β, γ)	CALIBRATION-DUE DATE	BKGD. (cpm)	EFF./CF	COUNT TIME (min)	MDA (dpm)	INSP. PERFORMANCE TEST DATE YES	NO
LB 5100		αβγ	10-96	.26/1.42	.272/.431	2.0	2/A 3	✓	
M3		βγ	2-97	60	30	NA	3000	✓	
2221	75447	α	9-96	1.2	.16	1	16.2	✓	
					A				
				N					

ITEM NUMBER	LOCATION AND/OR DESCRIPTION	HEIGHT (FT.)	DPM/100cm² ALPHA REMOVABLE (1)	DPM/100cm² ALPHA FIXED PLUS REMOVABLE	DPM/100cm² BETA-GAMMA REMOVABLE (1)	DPM/100cm² BETA-GAMMA FIXED PLUS REMOVABLE	CORRECTED DOSE RATE (MREM/HR) γ CONTACT	β CONTACT	γ AT FT.	β AT FT.
1	200259131	NA	-0 *	-7 *	3	<MDCR				
2	200259136		2	-7.5 *	-2 *					
3	200259135		0 *	-7 *	2 *					
4	200259137		-0 *	5 *	5					
5	200259139		5	NA	4					
6	200259141		2		10					
7	200259145		0 *		5			NA		
8	200259140		0 *		0 *					
9	200259144		-0 *		0 *					
10	200259143		-0 *		0 *					
11	200259142		0 *		1 *					
12	200259146		2		5					
13	I/S can	✓	-0 *	✓	0 *	✓				
14	O/S can	NA	0 *	NA	3	<MDCR				
				NA						

Note (1): Values identified by an asterisk (*) indicate results are less than the calculated MDA (RC-RDA-010)

FS-F-1993-1 (REV. 04/18/95)

TUE SEP 24, 1996
GROUP A SMEARS FOR FREE RELEASE (2 MIN)

8019

SAMPLE NUMBER	GROSS ALPHA	GROSS BETA	DPM ALPHA	DPM BETA	TIME OF COUNT
51	0	0	-0	0	08:03:16
[illegible]	4	[illegible]	2	[illegible]	08:05:01
53	1	5	0	2	08:07:46
54	0	0	-0	3	08:10:01
55	4	3	5	4	08:12:16
56	2	12	1	10	08:14:31
57	1	2	0	5	08:16:46
58	1	0	0	0	08:19:01
59	0	[illegible]	-0	0	08:21:16
60	0		-0	0	08:23:31
61	1	4	0	1	08:25:46
62	2	8	2	5	08:28:01
63	0	5	-0	0	08:30:16
64	1	0	0	3	08:32:30

OPERATION COMPLETE

OPERATION COMPLETE

FEMP RADIOLOGICAL SURVEY REPORT pg 3 of 4		
SURVEY # 96-4-11-164	DATED 9/24/96	
	(name)	(signature)
RCT:	William Chustern	[illegible]
REVIEWER:	[illegible]	[illegible]

MATERIAL RESTRICTED RELEASE FORM

ITEM NUMBER	ITEM DESCRIPTION	RCT	MATERIAL RELEASE EVALUATOR PRINT/SIGNATURE [1&3]	MATERIAL OWNER/SURVEY REQUESTOR PRINT/SIGNATURE [2&3]
1-4	Filters	N/A	R Hasson	GORDON BELL
5-12	Acetone	N/A	R Hasson	GORDON BELL
			NA	

Additional Comments Samples to DCL-SLC Lic # UT1R00237 EXP 11-31-97

[1] Signature by Material Release Evaluator indicates the material may be released for restricted use in the uncontrolled area of the FEMP site only. This material is not being released for unrestricted use.

[2] Signature by the Material Owner/Survey Requestor indicates acceptance of responsibility for the material while in the uncontrolled area and the material will be returned to the controlled area following use.

[3] Additional approval by the Manager of Radiological Compliance is required prior to allowing the material to exit beyond the FEMP property boundary. This allowance may be annotated in the additional comments section of the form.

FS-F-3916 (06/24/94)

066

FEMP RADIOLOGICAL SURVEY REPORT pg 4 of 4
SURVEY # 96-9-11-164 DATED 9-29-96
(name) (signature)
RCT: [illegible]

PROJECT PROTOCOL WORKSHEET

8019

Project:	Fernald Emission Testing	Date: 09/20/96	
Client:	Hayden Environmental	Revision: 1.0	
Account:	3025		
Proj. Mngr:	Bob Di Rienzo		

Client Contacts:

Reports:

Bruce Sarven
Hayden Environmental
561 Congress Park Drive
Dayton, OH 45459

Phone: (513) 438-3010
FAX: (513) 438-3020

Invoices:

Same with COC

Schedule: Starts 09/20/96

TAT: 30 Calendar Days

Sample Receipt: Use the 96E sample stream. *Notify Project Manager when samples are received.*

Analyses: **Particulates and Radiochemistry**

QA/QC: Overall QA/QC requirements will be based on the DCL Procedures.

EDL: None.

MS/MSD or MD: As per method

Deliverables: RLIMS63 Report, Raw Data, and COC
Paginate entire package

Penalties: None

Questions: If you have any questions, please contact the project manager either directly or by voice-mail at extension 331, or via e-mail on node tigger.

Special Instructions: **See attached Flow Chart and Instructions**
Particulate mesurement is completed first.
Rinsate and Filter Particulate are used for radiochemistry procedures.

PRICE CODES AND ANALYTE GROUPS:

8019

ANALYTE	MATRIX	EST SAMPLE	METHOD	SECT	HOLD CODE	PRICE CODE	ANALYTE GROUP
Particulate	Air	4	Method 5	WA	NA	3025A01NMET5	3025A1MET5
Iso U	Air	4	AS	WA	NA	3025A01NUISO	3025A1UISO
Iso Th	Air	4	AS	WA	NA	3025A01NTISO	3025A1TISO
Radium 226/228	Air	4	GS	WA	NA	3025A01NGS	3025A1GS
Total Uranium	Air	4	kPA	WA	NA	3025A01NTOTU	3025A1TOTU

DATACHEM LABORATORIES CLIENT-RELATED INFORMATION REPORT (CRIR)

8019

CRIR NO. _____

COOLER INFORMATION CHECKLIST
(Fill In or Circle)

Client Name: Fermco

Project/Task/Site:

Date/Time of Receipt: 9/25/96 1000

Number of Coolers Received: 1

Condition of Coolers: Acceptable/Unacceptable

Temperature Control: Present/Not Included

Custody Seals: Present/Absent

Intact/Broken

Location Temperature Taken: Control/Between Samples

Tamper Evident: Yes/No

Are all temperatures within project specific guidelines? Yes/No

Ice Present: Yes/No

Frozen/Melted/N/A

Are all applicable pHs within specific guidelines? Yes/No/N/A

Cooler Received	DCL Cooler No.	Temp.	Cooler Received	DCL Cooler No.	Temp.	Cooler Received	DCL Cooler No.	Temp.
* 1	MC96 0437	19 °C	4	MC96	°C	7	MC96	°C
2	MC96	°C	5	MC96	°C	8	MC96	°C
3	MC96	°C	6	MC96	°C	9	MC96	°C

Taken By: Karyn Vigil (Signature) Karyn Vigil (Printed Name) 9/25/96 (Date)

* Rad Chem. Analysis: no temp preservation required

CLIENT-RELATED INFORMATION

- ☐ Missing Cooler
- ☐ Cooler Conditions
- ☐ Missing Paperwork
- ☐ Missing/Incorrect Bottle Labels
- ☐ Missing Samples/Bottles
- ☐ Broken/Leaking Samples
- ☐ Incorrect Bottle Type
- ☐ Cooler Temperatures Out Of Range
- ☐ Incorrect Preservation
- ☐ pH Criteria Not Met
- ☐ Head Space in Bottles
- ☐ Insufficient Sample Volume
- ☐ Chain Of Custody Problems
- ☐ Other:

BRIEFLY DESCRIBE THE PROBLEM AND THE ACTION TAKEN:

Faxed to Client? Yes ☐ No ☐ (If yes, attach Fax Cover Sheet)

❖ Response Required Within 24 Hours ❖

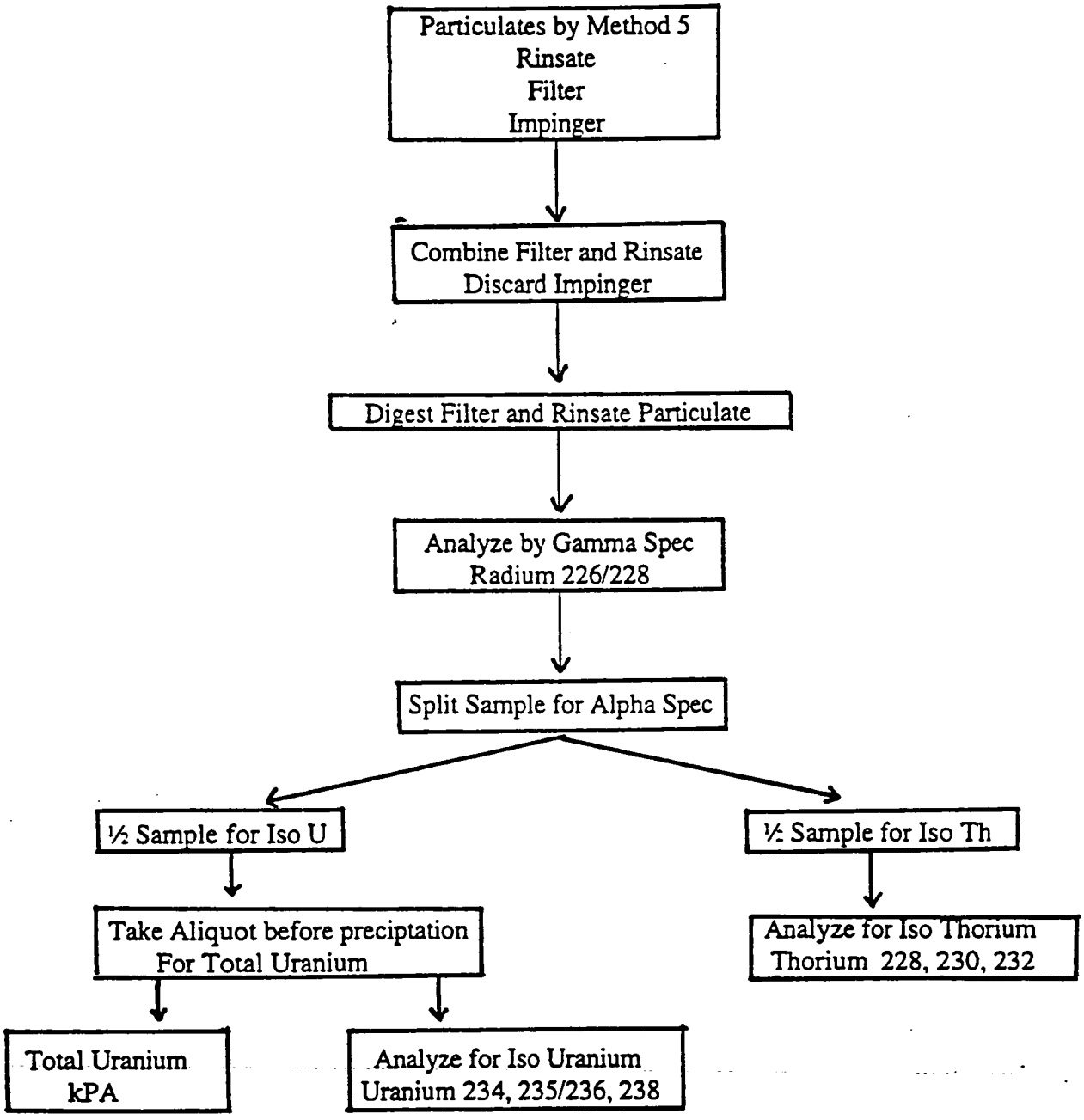
PROJECT MANAGEMENT

PROJECT MANAGER COMMENTS:

Project Manager: _____ (Printed Name) Returned to Sample Receipt by: _____ (Signature) Date: _____

Analytical Scheme
Hayden Environmental - Fernault Emission Testing

3 Samples and Field Blank



8019

Filter Lot #: 7 Temp.: 74 R.H.: 55%

Filter: GF 96-20 (740)
Tare Analyst JK Date 9/16/96
Total Weight ____ mg
Total Weight ____ mg
Avg. Total Weight ____ mg
Tare Weight ~~453.2~~ 447.6 mg
Tare Weight ~~453.2~~ 447.6 mg
Avg. Tare Weight ~~453.2~~ 447.6 mg
SAMPLE No. ____ SAMPLE WT. ____ mg
Total Wt. Anal. ____ Date ____
Check Analyst ____ Date ____

Filter: GF 96-21 (756)
Tare Analyst JK Date ____
Total Weight ____ mg
Total Weight ____ mg
Avg. Total Weight ____ mg
Tare Weight 453.2 mg
Tare Weight 453.2 mg
Avg. Tare Weight 453.2 mg
SAMPLE No. ____ SAMPLE WT. ____ mg
Total Wt. Anal. ____ Date ____
Check Analyst ____ Date ____

Filter: GF 96-22 (752)
Tare Analyst JK Date ____
Total Weight ____ mg
Total Weight ____ mg
Avg. Total Weight ____ mg
Tare Weight 448.9 mg
Tare Weight 448.8 mg
Avg. Tare Weight 448.9 mg
SAMPLE No. ____ SAMPLE WT. ____ mg
Total Wt. Anal. ____ Date ____
Check Analyst ____ Date ____

Filter: GF 96-23 (752)?
Tare Analyst JK Date ____
Total Weight ____ mg
Total Weight ____ mg
Avg. Total Weight ____ mg
Tare Weight 446.2 mg
Tare Weight 446.0 mg
Avg. Tare Weight 446.1 mg
SAMPLE No. ____ SAMPLE WT. ____ mg
Total Wt. Anal. ____ Date ____
Check Analyst ____ Date ____

Filter: GF 96-24 (753)?
Tare Analyst JK Date ____
Total Weight ____ mg
Total Weight ____ mg
Avg. Total Weight ____ mg
Tare Weight 456.6 mg
Tare Weight 456.3 mg
Avg. Tare Weight 456.5 mg
SAMPLE No. ____ SAMPLE WT. ____ mg
Total Wt. Anal. ____ Date ____
Check Analyst ____ Date ____

Fore Testing was supplied filters from GFF

Tared on a Sartorius Research (Radcum) DLL #102683 on 9/16/96 JK

Filter: GF 96 25 (754)
Tare Analyst JK Date ____
Total Weight ____ mg
Total Weight ____ mg
Avg. Total Weight ____ mg
Tare Weight 447.5 mg
Tare Weight 447.4 mg
Avg. Tare Weight 447.5 mg
SAMPLE No. ____ SAMPLE WT. ____ mg
Total Wt. Anal. ____ Date ____
Check Analyst ____ Date ____

Filter: GF 96-26 (760?)
Tare Analyst JK Date ____
Total Weight ____ mg
Total Weight ____ mg
Avg. Total Weight ____ mg
Tare Weight 451.2 mg
Tare Weight 450.9 mg
Avg. Tare Weight 451.1 mg
SAMPLE No. ____ SAMPLE WT. ____ mg
Total Wt. Anal. ____ Date ____
Check Analyst ____ Date ____

Filter: GF 96-27 (761)
Tare Analyst JK Date ____
Total Weight ____ mg
Total Weight ____ mg
Avg. Total Weight ____ mg
Tare Weight 449.3 mg
Tare Weight 449.2 mg
Avg. Tare Weight 449.3 mg
SAMPLE No. ____ SAMPLE WT. ____ mg
Total Wt. Anal. ____ Date ____
Check Analyst ____ Date ____

Filter: GF 96-28 (763)
Tare Analyst JK Date 9/16/96
Total Weight ____ mg
Total Weight ____ mg
Avg. Total Weight ____ mg
Tare Weight 450.9 mg
Tare Weight 450.7 mg
Avg. Tare Weight 450.8 mg
SAMPLE No. ____ SAMPLE WT. ____ mg
Total Wt. Anal. ____ Date ____
Check Analyst ____ Date ____

Filter: ____
Tare Analyst ____ Date ____
Total Weight ____ mg
Total Weight ____ mg
Avg. Total Weight ____ mg
Tare Weight ____ mg
Tare Weight ____ mg
Avg. Tare Weight ____ mg
SAMPLE No. ____ SAMPLE WT. ____ mg
Total Wt. Anal. ____ Date ____
Check Analyst ____ Date ____

DATACHEM LABORATORIES
ANALYTE GROUP LIST
SEARCH STRING: 3025A1MET5
ANALYTE GROUP: 3025A1MET5 ACCOUNT: 03025 DESCRIPTION: Method 5 Particulate

Analyte	Instrument Class	Method	Sub Method	Report Units	Threshold	Lod	Loq
Particulate	GRAV	Method 5		mg/Rinsate			0.1
Particulate	GRAV	Method 5		mg/Filter			0.1
Particulate	GRAV	Method 5		mg/Impinger			0.1
Particulate	GRAV	Method 5		Total mg			0.1

--- END OF LISTING ---

8019
000453 072

DATACHEM LABORATORIES
ANALYTE GROUP LIST
SEARCH STRING: 3025A1UISO

ANALYTE GROUP: 3025A1UISO ACCOUNT: 03025 DESCRIPTION: Isotopic Uranium

Analyte	Instrument Class	Method	Sub Method	Report Units	Threshold	Lod	Loq
Uranium-233/234	AS	WR-DC-341	WR-DC-200	pCi/Sample			1.0
Uranium-235	AS	WR-DC-341	WR-DC-200	pCi/Sample			1.0
Uranium-238	AS	WR-DC-341	WR-DC-200	pCi/Sample			1.0

--- END OF LISTING ---

8019

000454 073

DATACHEM LABORATORIES
ANALYTE GROUP LIST
SEARCH STRING: 3025A1TISO

ANALYTE GROUP: 3025A1TISO ACCOUNT: 03025 DESCRIPTION: ISOTOPIC THORIUM

Analyte	Instrument Class	Method	Sub Method	Report Units	Threshold	Lod	Loq
Thorium-228	AS	WR-DC-341		pCi/Sample			1.0
Thorium-230	AS	WR-DC-341		pCi/Sample			1.0
Thorium-232	AS	WR-DC-341		pCi/Sample			1.0

--- END OF LISTING ---

DATACHEM LABORATORIES
ANALYTE GROUP LIST
SEARCH STRING: 3025A1GS

ANALYTE GROUP: 3025A1GS ACCOUNT: 03025 DESCRIPTION: Radium 226/228 by ga

Analyte	Instrument Class	Method	Sub Method	Report Units	Threshold	Lod	Loq
Radium-226	GS	WR-EP-325	WR-DC-200	pCi/Sample			95
Radium-228	GS	WR-EP-325	WR-DC-200	pCi/Sample			20

--- END OF LISTING ---

8019

00045607 3

DATACHEM LABORATORIES
ANALYTE GROUP LIST
SEARCH STRING: 3025A1TOTU

ANALYTE GROUP: 3025A1TOTU ACCOUNT: 03025 DESCRIPTION: Total Uranium by kPA

Analyte	Instrument Class	Method	Sub Method	Report Units	Threshold	Lod	Loq
Total Uranium	kPA	WR-DC-342		ug/Sample			0.8

--- END OF LISTING ---

80 19
000457 076

August 6, 1996
Refer to: BD0021

Bruce Sarven
Hayden Environmental
561 Congress Park Drive
Dayton, OH 45459

Phone: (513) 438-3010
FAX: (513) 438-3020

Re: REVISED FAX Quote BD0021

Dear Mr. Sarven:

DataChem Laboratories, Inc.(DCL) appreciates the opportunity to provide you with cost estimates for your project. As I understand your needs, you will be taking three 6 hour stack samples and a blank by Method 5 for particulates and radionulclides analysis. Tared glass fiber filters and sample bottles will be provided for these determinations. The acetone rinse and glass fiber filter will be combined for the analysis of radionuclides.

Uranium 234, Uranium 235/236, Uranium 238, Thorium 228, Thorium 230, and Thorium 232 will be analyzed by alpha spectrometry(AS). Radium 226 and Radium 228 will be analyzed by gamma spectrometry(GS). Total Uranium will be analyzed by kinetic phosphorescence(KPA). According to method 114 these radionuclides will be part of the particulate loading and analysis on the impinger solutions is not required. Combined particulate from the acetone rinse and filter will be analyzed according to DCL standard operating procedures(SOP).

The standard turnaround time for these analysis is 30 calendar days. The requested turnaround time of 10 working days can be accomplished for an additional 25%. The requested detection limits for isotopic analysis can not be met. Minimun Detectable Activity (MDA) is listed on the attached table.

Attached is a Pricing Quotation for these analyses. If you have any question concerning the attached quotation please call me.

Sincerely,

Robert P. Di Rienzo
Project Manager

Revised Pricing Quotation
Project Reference Number: BD-0021

Parameter Analysis	Method	MDA pCi/Sample	Method	Fractions	Price per Sample
Particulate	Method 5		Grav	Acetone Rinse Filter Impinger	$100.00
Uranium 234 Uranium 235/236 Uranium 238	DCL SOP	1 1 1	AS	Particulate*	$312.50
Thorium 228 Thorium 230 Thorium 232	DCL SOP	1 1 1	AS	Particulate*	$312.50
Radium 226 Radium 228	DCL SOP	95 20	GS	Particulate*	$250.00
Total Uranium	DCL SOP	0.8 ug/ Sample	KPA	Particulate*	$187.50

* = Particulate samples are combined acetone rinse and glass fiber filter.

EMISSION MEASUREMENT TECHNICAL INFORMATION CENTER TEST METHOD

Method 5 - Determination of Particulate Emissions from Stationary Sources

1. PRINCIPLE AND APPLICABILITY

1.1 Principle. Particulate matter (PM) is withdrawn isokinetically from the source and collected on a glass fiber filter maintained at a temperature in the range of 120 ± 14°C (248 ± 25°F) or such other temperature as specified by an applicable subpart of the standards or approved by the Administrator, U.S. Environmental Protection Agency, for a particular application. The PM mass, which includes any material that condenses at or above the filtration temperature, is determined gravimetrically after removal of uncombined water.

1.2 Applicability. This method is applicable for the determination of PM emissions from stationary sources.

2. APPARATUS

2.1 Sampling Train. A schematic of the sampling train used in this method is shown in Figure 5-1. Complete construction details are given in APTD-0581 (Citation 2 in the Bibliography); commercial models of this train are also available. For changes from APTD-0581 and for allowable modifications of the train shown in Figure 5-1, see the following subsections.

The operating and maintenance procedures for the sampling train are described in APTD-0576 (Citation 3 in the Bibliography). Since correct usage is important in obtaining valid results, all users should read APTD-0576 and adopt the operating and maintenance procedures outlined in it, unless otherwise specified herein. The sampling train consists of the following components:

2.1.1 Probe Nozzle. Stainless steel (316) or glass with sharp, tapered leading edge. The angle of taper shall be ≤30°, and the taper shall be on the outside to preserve a constant internal diameter. The probe nozzle shall be of the button-hook or elbow design, unless otherwise specified by the Administrator. If made of stainless steel, the nozzle shall be constructed from seamless tubing; other materials of construction may be used, subject to the approval of the Administrator.

A range of nozzle sizes suitable for isokinetic sampling should be available, e.g., 0.32 to 1.27 cm (1/8 to 1/2 in.)—or larger if higher volume sampling trains are used—inside diameter (ID) nozzles in increments of 0.16 cm (1/16 in.). Each nozzle shall be calibrated according to the procedures outlined in Section 5.

directly from the wash bottle being used, and place it in a glass sample container labeled "acetone blank."

Inspect the train prior to and during disassembly, and note any abnormal conditions. Treat the samples as follows:

Container No. 1. Carefully remove the filter from the filter holder, and place it in its identified petri dish container. Use a pair of tweezers and/or clean disposable surgical gloves to handle the filter. If it is necessary to fold the filter, do so such that the PM cake is inside the fold. Carefully transfer to the petri dish any PM and/or filter fibers that adhere to the filter holder gasket, by using a dry Nylon bristle brush and/or a sharp-edged blade. Seal the container.

Container No. 2. Taking care to see that dust on the outside of the probe or other exterior surfaces does not get into the sample, quantitatively recover PM or any condensate from the probe nozzle, probe fitting, probe liner, and front half of the filter holder by washing these components with acetone and placing the wash in a glass container. Deionized distilled water may be used instead of acetone when approved by the Administrator and shall be used when specified by the Administrator; in these cases, save a water blank, and follow the Administrator's directions on analysis. Perform the acetone rinse as follows:

Carefully remove the probe nozzle, and clean the inside surface by rinsing with acetone from a wash bottle and brushing with a Nylon bristle brush. Brush until the acetone rinse shows no visible particles, after which make a final rinse of the inside surface with acetone.

Brush and rinse the inside parts of the Swagelok fitting with acetone in a similar way until no visible particles remain.

Rinse the probe liner with acetone by tilting and rotating the probe while squirting acetone into its upper end so that all inside surfaces will be wetted with acetone. Let the acetone drain from the lower end into the sample container. A funnel (glass or polyethylene) may be used to aid in transferring liquid washes to the container. Follow the acetone rinse with a probe brush. Hold the probe in an inclined position, squirt acetone into the upper end as the probe brush is being pushed with a twisting action through the probe; hold a sample container underneath the lower end of the probe, and catch any acetone and particulate matter that is brushed from the probe. Run the brush through the probe three times or more until no visible PM is carried out with the acetone or until none remains in the probe liner on visual inspection. With stainless steel or other metal probes, run the brush through in the above prescribed manner at least six times since metal probes have small crevices in which particulate matter can be entrapped.

Rinse the brush with acetone, and quantitatively collect these washings in the sample container. After the brushing, make a final acetone rinse of the probe as described above.

It is recommended that two people clean the probe to minimize sample losses. Between sampling runs, keep brushes clean and protected from contamination.

After ensuring that all joints have been wiped clean of silicone grease, clean the inside of the front half of the filter holder by rubbing the surfaces with a Nylon bristle brush and rinsing with acetone. Rinse each surface three times or more if needed to remove visible particulate. Make a final rinse of the brush and filter holder. Carefully rinse out the glass cyclone, also (if applicable). After all acetone washings and particulate matter have been collected in the sample container, tighten the lid on the sample container so that acetone will not leak out when it is shipped to the laboratory. Mark the height of the fluid level to determine whether leakage occurred during transport. Label the container to identify clearly its contents.

Container No. 3. Note the color of the indicating silica gel to determine whether it has been completely spent, and make a notation of its condition. Transfer the silica gel from the fourth impinger to its original container, and seal. A funnel may make it easier to pour the silica gel without spilling. A rubber policeman may be used as an aid in removing the silica gel from the impinger. It is not necessary to remove the small amount of dust particles that may adhere to the impinger wall and are difficult to remove. Since the gain in weight is to be used for moisture calculations, do not use any water or other liquids to transfer the silica gel. If a balance is available in the field, follow the procedure for Container No. 3 in Section 4.3.

Impinger Water. Treat the impingers as follows: Make a notation of any color or film in the liquid catch. Measure the liquid that is in the first three impingers to within I ml by using a graduated cylinder or by weighing it to within 0.5 g by using a balance (if one is available). Record the volume or weight of liquid present. This information is required to calculate the moisture content of the effluent gas.

Discard the liquid after measuring and recording the volume or weight, unless analysis of the impinger catch is required (see **NOTE**, Section 2.I.7).

If a different type of condenser is used, measure the amount of moisture condensed either volumetrically or gravimetrically.

Whenever possible, containers should be shipped in such a way that they remain upright at all times.

4.3 **Analysis.** Record the data required on a sheet such as the one shown in Figure 5-3. Handle each sample container as follows:

Container No. 1. Leave the contents in the shipping container or transfer the filter and any loose PM from the sample container to a tared glass weighing dish. Desiccate for 24 hours in a desiccator containing anhydrous calcium sulfate. Weigh to a constant weight, and report the results to the nearest
0.1 mg. For purposes of this Section, 4.3, the term "constant weight" means a difference of no more than 0.5 mg or 1 percent of total weight less tare weight, whichever is greater, between two consecutive weighings, with no less than 6 hours of desiccation time between weighings.

Alternatively, the sample may be oven dried at 105°C (220°F) for 2 to 3 hours, cooled in the desiccator, and weighed to a constant weight, unless otherwise specified by the Administrator. The tester may also opt to oven dry the sample at 105°C (220°F) for 2 to 3 hours, weigh the sample, and use this weight as a final weight.

Container No. 2. Note the level of liquid in the container, and confirm on the analysis sheet whether leakage occurred during transport. If a noticeable amount of leakage has occurred, either void the sample or use methods, subject to the approval of the Administrator, to correct the final results. Measure the liquid in this container either volumetrically to ±1 ml or gravimetrically to ±0.5 g. Transfer the contents to a tared 250-ml beaker, and evaporate to dryness at ambient temperature and pressure. Desiccate for 24 hours, and weigh to a constant weight. Report the results to the nearest 0.1 mg.

Container No. 3. Weigh the spent silica gel (or silica gel plus impinger) to the nearest 0.5 g using a balance. This step may be conducted in the field.

"Acetone Blank" Container. Measure the acetone in this container either volumetrically or gravimetrically. Transfer the acetone to a tared 250-ml beaker, and evaporate to dryness at ambient temperature and pressure. Desiccate for 24 hours, and weigh to a constant weight. Report the results to the nearest 0.1 mg.

NOTE: At the option of the tester, the contents of Container No. 2 as well as the acetone blank container may be evaporated at temperatures higher than ambient. If evaporation is done at an elevated temperature, the temperature must be below the boiling point of the solvent; also, to prevent "bumping," the evaporation process must be closely supervised, and the contents of the beaker must be swirled occasionally to maintain an even temperature. Use extreme care, as acetone is highly flammable and has a low flash point.

4.4 **Quality Control Procedures.** The following quality control procedures are

suggested to check the volume metering system calibration values at the field test site prior to sample collection. These procedures are optional for the tester.

4.4.1 Meter Orifice Check. Using the calibration data obtained during the calibration procedure described in Section 5.3, determine the $\Delta H_@$ for the metering system orifice. The $\Delta H_@$ is the orifice pressure differential in units of in. H_2O that correlates to 0.75 cfm of air at 528°R and 29.92 in. Hg. The
$\Delta H_@$ is calculated as follows:

$$\Delta H_@ = 0.0319\, \Delta H \frac{T_m\, \theta^2}{P_{bar}\, Y^2\, V_m^2}$$

where:

ΔH = Average pressure differential across the orifice meter, in. H_2O.

T_m = Absolute average DGM temperature, °R.

P_{bar} = Barometric pressure, in. Hg.

θ = Total sampling time, min.

Y = DGM calibration factor, dimensionless.

V_m = Volume of gas sample as measured by DGM, dcf.

0.0319 = (0.0567 in. Hg/°R)(0.75 cfm)^2

Before beginning the field test (a set of three runs usually constitutes a field test), operate the metering system (i.e., pump, volume meter, and orifice) at the $\Delta H_@$ pressure differential for 10 minutes. Record the volume collected, the DGM temperature, and the barometric pressure. Calculate a DGM calibration check value, Y_c, as follows:

$$Y_c = \frac{10\,\theta\, [\,0.0319\, T_m\,]^{1/2}}{V_m\, P_{bar}\, \theta}$$

where:

Y_c = DGM calibration check value, dimensionless.

DATA CHEM LABORATORIES
A SORENSON COMPANY

8019

Analytical Documentation
Inventory Checklist

- [N/A] This is a "dummy datapackage". Data for inventory checklist found with set _____
- [N/A] Copy of TCLP Preparation Logbook Pages
- [X] Copy of Sample Preparation Notebook/Logbook Pages
- [X] Copy of Analyst's Notebook/Method Logbook Pages
- [X] Copy of Instrument Injection Logbook/Instrument Logbook/Run Log Pages
- [N/A] Copy of Reagent Logbook Pages
- [X] Copy of Working Standard Preparation Logbook Pages
- [X] Copy of Secondary or Intermediate Standard Preparation Logbook Pages
- [X] Copy of Primary Standard or Concentrated Stock Standard Preparation Logbook Pages
- [X] Certificates of Analysis for Standards
- [N/A] Copy of Standard Verification Logbook Pages (including documentation for spiking solutions and/or calibration standards)
- [N/A] Copy of Preparation Logbooks for solutions prepared by QC

All other miscellaneous documentation associated with this set (describe)

- [X] Pipet Calibration Log

Analytical Documentation
Reviewer Checklist

- [X] The Analytical Documentation Inventory Checklist above is complete.
- [X] Basic documentation procedures were followed in accordance with DCL SOP XX-DC-004 "Analytical Data Record Keeping."
- [X] All notebook and logbook pages contain page number, book number, title, and available space for pagination (if required).
- [X] All notebook and logbook pages were signed and dated by the analyst and reviewer before copying.
- [X] All copies are legible.
- [X] Standard preparation is documented in accordance with DCL SOP XX-DC-019 "Standards Purity, Preparation, Traceability and Verification" or by WR-DC-001 "The Acquisition, Preparation, and use of Radioactive Standard Reference Materials."
- [X] Documentation is provided to verify that standard calibration solutions and spiking solutions are traceable to a vendor certificate.

Assembled by: _____ 11/5/96 Reviewed by: _____ 11/5/96
Signature Date Signature Date

Rev. 6/95

085

000466

TITLE Hayden Environmental Sample Dilution BOOK NO. 3100 8019

From Page No.

Client	Account No.	Set No.	Sample Nos.	Matrix	Balance ID
Hayden Enviro.	3025	96E-0640*	96E04514-4517	AIR/FILTER	102695

Filters and acetone rinse were combined after aceton was dryed. Samples were placed in metal based teflon beakers and dissolved i 6 mL of HF (hydrofluoric acid) and then taken to near dryness to expell all of the HF. The samples were then transferred t tared P.M.P. jars and brought up to approximately 100.0 g, using 1 M HNO_3 (nitric acid).

Sample Number	Final Mass in Tared PMP.
96E04514	100.0 g
96E04515	106.4 g
96E04516	100.1 g
96E04517	100.1 g

T.P. 10-8-96

To Page N

Witnessed & Understood by me,	Date	Invented by	Date
Bradley J Richardson	10-21-96		10/8/96
		Recorded by Ty E. Peterson	

Determination of Selected Actinides by Ion Exchange

Client _____ Acct No. 3025 Set No. 96E-0640-02 Matrix Air (filter)

Requested Analysis: Am__ Cf__ Cm__ Np__ Pu__ Th__ U X

LCS ID: QC-123238-1 Pipet ID: Eppe 10

Prep Group ID: G969703P Balance ID 102695

*Activity(pCi) = Conc(pCi/g) * Mass(g)*
or
*Activity(pCi) = Conc(pCi/mL) * Volume(mL)*

Standard Control ID	Conc. (pCi/g or ml)	Aliquot (g or ml)	Activity (pCi)
WSL 3/23 (U238)	60.62 pCi/g	0.1 ml = .09735 g	5.90136
		BR 10-18-96	

Tracer ID	Conc. (pCi/g or ml)	Aliquot (g or ml)	Activity (pCi)
WSL 3/55 (U232)	50.49 pCi/ml	0.1 ml = .09764 ml	4.9298
		BR 10-18-96	

VESSEL#	SAMPLE#	WEIGHT (g)	VESSEL#	SAMPLE#	WEIGHT (g)
1	BL-123238-1	Reagent	13		
2	QC-123238-1	Reagent	14		
3	96E04514	43.307 g	15		
4	96E04515	50.750 g	16		
5	96E04516	44.581 g	17		
6	96E04517	44.522 g	18		BR 10-18-96
7			19		
8			20		
9		BR 10-18-96	21		
10			22		
11			23		
12			24		

Comments:

*N/A = Not Apl

00046887

Recorded by: [illegible] Date: 10-18-96 | Reviewed by: [illegible] Date: 11/8/96

Determination of Selected Actinides by Ion Exchange

Client NA Acct No. 3025 Set No. 96E-0640-03 Matrix Air (Filter)

Requested Analysis: Am__ Cf__ Cm__ Np__ Pu__ Th X U__

8019

LCS ID: QC-123239-1 Pipet ID: Eppe 10

Prep Group ID: G969703Q Balance ID 102695

*Activity(pCi) = Conc(pCi/g) * Mass(g)*
or
*Activity(pCi) = Conc(pCi/mL) * Volume(mL)*

Standard Control ID	Conc. (pCi/g or ml)	Aliquot (g or ml)	Activity (pCi)
Th 230-003 WS	50.4 pCi/ml	0.1 ml = .09764 ml	4.9211
		BR 10-18-96	

Tracer ID	Conc. (pCi/g or ml)	Aliquot (g or ml)	Activity (pCi)
Th 229 WSL 3/67	45.34 pCi/g	0.1 ml = .09735 g	4.4138
		BR 10-18-96	

VESSEL#	SAMPLE#	WEIGHT (g)	VESSEL#	SAMPLE#	WEIGHT (g)
1	BL-123239-1	Reagent	13		
2	QC-123239-1	Reagent	14		
3	96E 04514	50.056 g	15		
4	96E 04515	50.070 g	16		
5	96E 04516	50.028 g	17		
6	96E 04517	49.997 g	18		
7			19		BR 10-18-96
8			20		
9		BR 10-18-96	21		
10			22		
11			23		
12			24		

Comments:

*N/A = Not Applic

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Recorded by: [signature] Date: 10-18-96 | Reviewed by: [signature] Date: 10/18/96

Alpha Spectroscopy Run Log

Book Number 4077

Date	Det. ID	Analyst	Code	Comments
10-21-96	43 → 47	MAB	S	96C-0439-02 (uu)
10-21-96	48	MAB	S	96C-0443-02 (uu)
10-22-96	1 → 48	MAB	D	Pulser
10-22-96	1 → 2	MAB	S	96C-0501-02 (uu)
	3 → 8			96C-0433-04 (Pu)
	9 → 15			96C-0439-04 (Pu)
	16 → 20			96C-0433-04 (Pu)
	21 → 25			96C-0439-04 (Pu)
	26 →			96C-0443-04 (Pu)
	27 → 28			96C-0501-04 (Pu)
	29 → 41			96C-0439-13 (Th)
10-22-96	42 → 45	MAB	S	96C-0443-13 (Th)
10-23-96	1 → 48	MAB	D	Pulser
	1 → 6		S	96C-0433-05 (Am)
	7 → 13			96C-0439-05 (Am)
	14 → 17			96C-0433-05 (Am)
	18 → 22			96C-0439-05 (Am)
	23 →			96C-0443-05 (Am)
	24 → 25			96C-0501-05 (Am)
	26 → 30			96M-0250-01 (uu)
	31 → 35			96M-0323-05 (uu)
10-23-96	36 → 48	MAB	S	96E-0654-02 (uu)
10-24-96	1 → 48	MAB	D	Pulser
	1 → 7		S	96E-0654-02 (uu)
	8 → 13			96E-0640-02 (uu)
	14 → 26			96C-0439-12 (uu)
	27 → 30			96C-0443-12 (uu)
	31 → 43			96C-0439-16 (Pu)
	44 → 47		S	96C-0443-16 (Pu)
10-24-96		MAB		MAB 10-24-96

Reviewed By: Max A. Barnett 10-24-96
Signature & Date

Alpha Spectroscopy Run Log

Book Number 4077

Date	Det. ID	Analyst	Code	Comments -
10-25-96	1→48	MAB	D	Pulser
	1→5		S	96M-0250-04 (Pu)
	6→10			96M-0323-01 (Pu)
	11→15			96E-0640-03 (Th)
	16→21			96M-0250-02 (Th)
	22→26			96M-0323-04 (Th)
10-25-96	27→34	MAB	S	96M-0320-09 (Th)
10-28-96	1→48	RL	Sec	secondary calibrations
10-28-96	1→48	MAB	B	Backgrounds
10-29-96	1→48	MAB	D	Pulser
10-29-96	1→8	RL	S	96M-0320-08 (uu)
	9→13			96M-0250-04 (Am)
	14→18			96M-0323-01 (Am)
	19→28			96C-0439-15 (Am)
	29→32			96C-0443-15 (Am)
	33→35			96C-0439-15 (Am)
	36→43			96M-0320-12 (Pu)
10-29-96	44→48	RL	S	96M-0306-03 (uu)
10-30-96	1→48	RL	D	Pulser x 2 RL 10/30/96
	1→3		S	96M-~~0320-11~~ 0306-03 RL 10/30/96 ~~(Am)~~ (uu)
	4→11			96M-0320-11 (Am
	12→15			96M-0292-13 (uu)
	16→19			96M-0319-29 (Th)
	20→22			96M-0318-08 (uu)
10-30-96	23→24	RL	S	96M-0319-28 (uu)
	~~25→46~~ 26 RL 10/30/96		S	96M-0319-28 (uu)
	27→~~29~~ 31		S	96M-0319-30 (Pu)
	32→38		S	96M-0319-12 (Pu)
	39→41		S	96M-0318-09 (Pu)
10-30-96	42→45	RL	S	96M-0292-11 (Pu)

-24-96

Reviewed By: Robin Tilly 10/30/96
Signature & Date

Alpha Spectroscopy
Calibration/Maintenance Log

Book Number 4078

Date	Det. ID	Analyst	Comments
10/11/96	1→48	MT	pulser check
10/13/96	1→48	MT	Backgrounds
10/14/96	1→48	MT	pulser check
10-18-96	1→48	MAB	Background
10-21-96	1→48	MAB	secondary calibration & Pulsers
10-22-96	1→48	MAB	Pulsers
10-23-96	1→48	MAB	Pulsers
10-24-96	1→48	MAB	Pulsers
10-28-96	1→48	RL	Secondary calibrations
10-25-96	1→48	MAB	Pulsers
10-28-96	1→48	MAB	Secondary & Background
10-29-96	1→48	MAB	Pulsers - A problem was noted
			with Det #30. The pulser FWHM
			has increased, while the CPS has
			decreased and the KeV has increased.
			The secondary calibration however
			indicates a steady and flat set
			of data points for several parameters.
			The problem with the #30 pulser
			is isolated to only the one detector.
			This detector will be allowed to
			count samples MAB 10-29-96
10-30-96	1→48	RL	Pulser x2
10-30-96	1→4	MAB	A problem was noted that some
			of the detectors' pulsers were not
			within bounds for peak centroid.
			This condition appears to be an
			odd event without correlation. The
			Pulsers QA will be observed. MAB 10-30-96

Reviewed By: Mark A. Burnett 10-30-96
Signature & Date

CERTIFICATE OF CALIBRATION
ALPHA STANDARD SOLUTION

Radionuclide	Th-230	Customer:	DATACHEM LABORATORIES
Half Life:	(7.54 ± 0.03) x 10^4 years	P.O.No.:	8837
Catalog No.:	7230	Reference Date:	April 15 1992 12:00 PST.
Source No.:	400-55	Contained Radioactivity:	0.1013 µCi.
		Contained Radioactivity:	3.75 kBq

Description of Solution

a. Mass of solution: 5.0114 grams.

b. Chemical form: $Th(NO_3)_4$ in 0.1N HNO_3

c. Carrier content: N/A

d. Density: 1.0016 gram/ml @ 20°C.

Radioimpurities Th-228 0.11% as of September 1 1992

Radioactive Daughters

None detected

Radionuclide Concentration

0.0202 µCi/gram.

Method of Calibration

Weighed aliquots of the solution were assayed using a liquid scintillation counter.

Uncertainty of Measurement

a. Systematic uncertainty in instrument calibration:	±2.0%
b. Random uncertainty in assay:	±1.0%
c. Random uncertainty in weighing(s):	±0.0%
d. Total uncertainty at the 99% confidence level:	±3.0%

NIST Traceability

This calibration is implicitly traceable to the National Institute of Standards and Technology.

Notes

1. Nuclear data were taken from "Table of Isotopes", Seventh Edition, edited by Virginia S. Shirley.
2. IPL participates in an NIST measurement assurance program to establish and maintain implicit traceability for a number of nuclides, based on the blind assay(and later NIST certification) of Standard Reference Materials. (As in NRC Regulatory Guide 4.15)

Asma U. Khan

QUALITY CONTROL

ISOTOPE PRODUCTS LABORATORIES
1800 No. Keystone Street.,
Burbank, California 91504
(818) 843 - 7000

000474

093

FROM P. 2

RADIOCHEMISTRY LABORATORY

RADIOACTIVE MATERIAL INVENTORY SOURCE LOG

Vendor I.D.: Isotopes Products Laboratory
Date Received: _____
RCL I.D.: 400-55

Note: This page was recentered by Peter Kligmann PMK 2-9-95

Isotopes/Form	Activity (µCi)	Mass	Date
Th-230 / solution	0.1008	4.9857 g	5-8-92 PMK

Usage:

Date PMK	Amount	Activity (µCi)	Running Total (µCi)	I.D.
5-8-92	4.9857 g	0.1008	Ø	Th-230-001-IS

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(45)

8019

RADIOCHEMISTRY LABORATORY

RADIOACTIVE MATERIAL INVENTORY
INTERMEDIATE STANDARD LOG

I.S. ID: Th-230-001-IS
Solvent: 2 N HNO_3
Concentration: 1008 pCi/mL

Date: 5-8-92
Final Volume: 100 mL
Source I.D.: 400-55

Usage: Note: The entries on this page up to and including 12-8-94 were reentered by Peter Kirchmann. PMK 2-9-95

Date	Amount	Activity (µCi)	Running Total (µCi)	I.D.
5-8-92	1 mL	1.01E-3	0.09979	Th-230-001-WS
8-16-93	0.29970	3.02E-4	0.09949	
8-16-93	0.29970	3.02E-4	0.09919	
8-16-93	0.29970	3.02E-4	0.09888	
2-1-93	0.31274	3.15E-4	0.09857	
2-24-94	0.3068	3.09E-4	0.09826	
5-31-94	1.046	1.05E-3	0.09721	Th-230-001WS
8-19-94	0.111	1.12E-4	0.09710	
12-[illegible]-94	0.3159	3.18E-4	0.09678	Th-230 µB Audit
2/21/95	0.314 g	3.17E-4	0.09646	EPA Audit µB S95-0060

0.9.4

From Page 61

RADIOCHEMISTRY LABORATORY

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RADIOACTIVE MATERIAL INVENTORY
WORKING STANDARD LOG

W.S. ID: Th-230-003-WS
Date: 9/3/96
Solvent: 2m HNO_3
Final Volume: 1000 ml
Concentration: 50.4 pci/ml
Source I.D.: Th-230-001-IS

Usage:

Date	Amount	Activity (µCi)	Running Total (µCi)	Dispensation
9/3/96	.293	14.798	3466.719	96M-0242-09 LCS, ms, msD
7-5-96	.2108 g	10.6243	3456.0947	96M-0248-03 LCS, MS
9-5-96	.2108 g	10.6243	3445.4704	96M-0248-04 LCS, MS
9-5-96	.1054 g	5.3122	3440.1582	G968201C LCS
~~9-6-96~~	~~.1054 g~~	~~5.3122~~	~~3434.8460~~	96M-0230-07 96M-0232-03 96M-0234-04 LCS
9-6-96	.09875 mL	4.977	3435.1812	96M-0270-07 96M-0272-03 96M-0284-04 LCS
9-12-96	.09875 mL	4.977	3430.2042	G968800B LCS
9-17-96	.09875 mL	4.977	3425.2272	G968D007 LCS
9/16/96	0.09875 mL	4.977	3420.250	96M-0213-26 LCS
9/19/96	.09875 mL	4.977	3415.273	G968800X LCS
9/24/96	.1975 mL	9.954	3405.3190	~~G96~~ T.P. 96M-0298-02 LCS-MS
9/24/96	.09875 mL	4.977	3400.3420	96M-0272-11 96M-0273-06 96M-0282-06 LCS
9/25/96 BR	0.1953 mL	9.84	3390.499	96C-0404-03 LCS, MS
10-1-96	0.1975 mL	9.954	3380.545	96M-0298-04 LCS, MS
10-3-96	.09875 mL	4.977	3375.568	96M-0271-29 96M-0279-(16)(25) LCS
10-7-96 T.R	.09875 mL	4.977	3370.591	96M-0286-15 96M-0301-09 96M-0290-09 96M-0297-15 LCS
10-9-96 BR	.09764 ml	4.9211	3365.670	96M-0303-09 96M-0304-09 LCS
10-9-96	.1975 mL	9.954	3355.716	G969703L QC-1 G969703M QC-2
10-14-96 BR	.1947 ml	9.8130	3345.903	96C-0439-13 → QC-1 96C-0443-13 → QC-1
10-17-96 BR	.09764 ml	4.9211	3340.9819	96M-0250-02 96M-0323-04 LCS
10-18-96 BR	.09764 ml	4.9211	3336.0608	96E-0640-03 LCS

C. Wal

8019

U.S. Environmental Protection Agency
Environmental Monitoring Systems Laboratory-Las Vegas
Nuclear Radiation Assessment Division

Calibration Certificate

Description

Principal radionuclide: Uranium-238 Half-life: 4.47×10^9 years

Nominal activity: 11.9 nano curies

Nominal volume: 5.0 ml in ampoule/bottle number 1843-2

Measurement Activity of principal radionuclide

Activity per gram of this solution

2.38 nano curies of Uranium-238

October 1993

*Accompanied by 0.11 nanoCuries of Uranium-235 per gram of solution.

Activity of daughter radionuclide

The principal activity was accompanied at the quoted time by

2.38 nano curies Per gram

of the daughter nuclides Th-234, Pa-234, U-234 assuming secular equilibrium.

Total mass of this solution

Approximately 5.0 grams

Method of measurement

The solution was prepared gravimetrically by dissolving a weighed quantity of the National Bureau of Standards' SRM 950b (99.97±0.02 percent Uranium Oxide (U_3O_8)) in nitric acid and diluting to a known weight. Natural uranium was assumed to consist of 99.28 percent U-238 and 0.711 percent U-235 by weight with specific activities of 3.36×10^2 and 2.16×10^3 nanoCuries per gram respectively. The solution was compared to an earlier preparation (1843-1), which was traced to the National Institute of Standards and Technology (NIST), using liquid scintillation counting.

Useful Life

This radionuclide has decayed through [ ] half lives since it was obtained by EMSL-LV

We recommend that this solution should not be used after INDEFINITE

Purity

The manufacturer states that activities other than that of the principal nuclide and of its daughter nuclides, if any, were estimated/known to be:

(1) Radium-226	less than	0.6 %	of the principal activity
(2)	less than equal to	%	of the principal activity
(3)	less than equal to	%	of the principal activity

The activity of impurity (1) is not (2) is not (3) is not included in the quoted figures of the principal activity.

Random Errors

The precision of this standard was such that the certified value of the radioactive concentration of the principal activity had a standard error (sm) not greater than ± 0.5 %
(The 99.7% confidence limits are given by t(sm) where t is obtained from the student t factor for the degree of freedom (n-1)).

The maximum uncertainty due to the assessable systematic errors (dilution, counting, and known uncertainty of the standard) is obtained by the separate arithmetic summation of the positive and negative systematic error ($+\delta - \delta'$). These have been estimated not to exceed

+2.5 % or - 2.5 %

the overall uncertainty (often called accuracy) is an estimate of the possible divergence of the quoted result from the true value. It is a combination of random error [t(sm)] at the 99.7% confidence limits and the worst case estimate of the systematic errors ($+\delta$, $-\delta'$)
The overall uncertainty is therefore calculated on the basis of + [t(sm) $+\delta$] , - [t(sm) $+\delta'$]
and is + 4.0 % , - 4.0 % of the quoted radioactive concentration.

Decay Schemes

This standardization is based on the following assumptions of the principle nuclide, its daughter nuclides and impurities (no allowance for error in these assumptions or the assumption of quoted half-life have been included in the statement of accuracy above).

Uranium-238 decays by alpha emission to Thorium-234 which decays by two successive beta emissions to Uranium-234. Uranium-234 is assumed to be in secular equilibrium with Uranium-238.

Chemical Composition of Solution

Carrier content per gram of solution:

Other components:
0.5M nitric acid

Preservative:

Remarks

The uranium concentration of the solution is 7.12 milligrams/gram.

Date Certificate Prepared October 27, 1993

Approval Signature Paul B. Hahn

Revised 1/84

8019

RADIOCHEMISTRY LABORATORY
RADIOACTIVE MATERIAL INVENTORY
STANDARD SOURCE LOG

Vendor: US EPA Vendor Source ID: 1843-2

Date Received: 11-22-93 Received By: CC WALKER

CAUTION
RADIOACTIVE MATERIAL
SOL# 1843-2 WT. 5.0g
AMT. 2380 pCi/g
ISOTOPE U-238
DATE Oct. 93 0400PST
ENVIRONMENTAL MONITORING SYSTEMS LABORATORY—LAS VEGAS

Place Source Label Above

Source Reference Date/Time*: OCT. '93/0500 Solvent: 0.5M HNO3

ISOTOPE(S)	CONC. (pCi/g)	ISOTOPE(S)	CONC. (pCi/g)
U-238	2380		

*Use Julian date and military time

Usage:

DCL Balance ID No.: DCL #102683

Date	Inits.	Aliquot	Activity (pCi)	Balance (pCi)	Destination	Witness
~~7.5.94~~	~~CCW~~	~~5.0936 g.~~				
11/16/94	OR	5.0936 g.	12122.768	Ø	ISL 2/39	CW

8019

RADIOCHEMISTRY LABORATORY
RADIOACTIVE MATERIAL INVENTORY
INTERMEDIATE STANDARD LOG

Intermediate Standard ID: ISL 2/39 (U238) Standard Source ID: 1848-2

Reference Date/Time*: Oct '93/0500 RMI Source Log Ref. Book/Page: 2/10

*Use Julian date and military time

DCL Balance ID No.: B 310P, 102695

Date	Inits.	Solvent	Activity (pCi)†	Final Weight	Conc. (pCi/g)†	Witness
11/16/94	DR	2 M HNO_3	12122.768	99.994 g	121.23	[illegible]

Usage:

	Date	Inits.	Aliquot	Activity (pCi)†	Balance (pCi)†	Destination
1.	11/16/94	DR	50 g	6061.5	6061.268	WSL 3/23
2.						
3.						
4.						
5.						
6.						
7.						
8.						
9.						
10.						
11.						
12.						
13.						
14.						
15.						
16.						
17.						
18.						

† activities are referenced to the source date/time. Decay corrections are to be made on the following page.

To Page:_____

From Page # 95

Book No._____ Page 111

RADIOCHEMISTRY LABORATORY
RADIOACTIVE MATERIAL INVENTORY
WORKING STANDARD LOG

8019

Working Standard ID: WSL 3/23 U 238 Intermediate Standard ID: ISL 2/39

Reference Date/Time*: Oct 1993 0500 RMI Source Log Ref. Book/Page: 2/10

*Use Julian date and military time

DCL Balance ID No.:_____

Date	Inits.	Solvent	Activity (pCi)†	Final Volume	Conc. (pCi/g)†	Witness
11-16-94	T.P. for D.R.	2M HNO_3	6061.5	100.008 g	60.615 pCi/g	T.P. for R.L.

Usage:

	Date	Inits.	Aliquot	Activity (pCi)†	Balance (pCi)†	Destination
1.	10-7-96	T.P.	.1054 g	6.3888	2647.3088	96M-0286-14 96M-0290-08 96M-0297-14 LCS
2.	10-9-96	BR	BR 10-9-96 ~~.1054~~ g .09764 ml	5.9009	2641.4079	96M-0303-08 96M-0304-08 LCS
3.	10-10-96	WM	0.01485 ~~0.00495~~	0.9001 ~~0.3000~~	2640.5078 ~~2641.1079~~ WM 10/10/96	QCMS 96M-0298-01, 96M-0306-02
4.	10-9-96	T.P.	.2108 g	12.7776	2627.7302 T.P.	G9697-03J G9697-03H 10-10-96 T.P. ~~T.P.~~ LCS (1)(2)
5.	~~10-11-96~~	~~BR~~	BR 10-11-96			
6.	10-15-96	BR	.1947 g	11.8027	2615.9275	96C-0439-12 96C-0443-12 LCS
7.	10-16-96	BR	.09735 g	5.9014	2610.0261	96E-0654-02 LCS
8.	10-17-96	BR	.09735 g	5.9014	2604.1247	96M-0250-01 96M-0323-05 LCS
9.	10-18-96	BR	.09735 g	5.9014	2598.2233	96E-0640-02 LCS
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† All activities are referenced to the source date/time. Decay corrections are to be made on the following page.

To Page:_____

National Institute of Standards & Technology

8019

Certificate

Standard Reference Material 4328A
Thorium-229 Radioactivity Standard

This Standard Reference Material (SRM) consists of radioactive thorium-229 nitrate and nitric acid dissolved in 5 mL of distilled water. The solution is contained in a flame-sealed NIST borosilicate-glass ampoule. The SRM is intended for the calibration of alpha-particle counting instruments and for the monitoring of radiochemical procedures.

Radiological Hazard

The SRM ampoule contains thorium-229 with a total activity of approximately 170 Bq. Thorium-229 decays by alpha-particle emission. The progeny of thorium-229 have a total activity of approximately 1200 Bq and decay by alpha- and beta-particle emission. None of the alpha or beta particles escape from the SRM ampoule. During the decay process X-rays and gamma rays with energies from 10 keV to 2 MeV are also emitted. Most of these photons escape from the SRM ampoule but their intensities are so small that they do not represent a radiation hazard. Approximate unshielded dose rates at several distances (as of the reference time) are given in note [a]*. The SRM should be used only by persons qualified to handle radioactive material.

Chemical Hazard

The SRM ampoule contains nitric acid (HNO_3) with a concentration of 1 mole per liter of water. The solution is corrosive and represents a health hazard if it comes in contact with eyes or skin. If the ampoule is to be opened to transfer the solution, the recommended procedure is given on page 2. The ampoule should be opened only by persons qualified to handle both radioactive material and strong acid solution.

Storage and Handling

The SRM should be stored and used at a temperature between 5 and 65 °C. The solution in an unopened ampoule should remain stable and homogeneous until at least January 2004.

The ampoule (or any subsequent container) should always be clearly marked as containing radioactive material. If the ampoule is transported it should be packed, marked, labeled, and shipped in accordance with the applicable national, international, and carrier regulations. The solution in the ampoule is a dangerous good (hazardous material) both because of the radioactivity and because of the strong acid.

Preparation

This Standard Reference Material was prepared in the Physics Laboratory, Ionizing Radiation Division, Radioactivity Group, J.M.R. Hutchinson, Group Leader. The overall technical direction and physical measurements leading to certification were provided by L.L. Lucas of the Radioactivity Group.

The support aspects involved in the preparation, certification, and issuance of this SRM were coordinated through the Standard Reference Materials Program by N.M. Trahey.

Gaithersburg, Maryland 20899
February 1995

Thomas E. Gills, Chief
Standard Reference Materials Program

*Notes and references are on pages 5 and 6.

000482101

NOTES

[a] The Sievert is the SI unit for dose equivalent. See reference [1]. One μSv is equal to 0.1 mrem.

Distance from Ampoule (cm):	1	30	100
Approximate Dose Rate (μSv/h):	<0.1	-	-

[b] The stated uncertainty is two times the standard uncertainty.

[c] Massic activity is the preferred name for the quantity activity per unit mass. See reference [1].

[d] The reported value, y, of massic activity (activity per unit mass) at the reference time was not measured directly but was derived from measurements and calculations of other quantities. This can be expressed as $y = f(x_1, x_2, x_3, \ldots x_n)$, where f is a mathematical function derived from the assumed model of the measurement process.

The value, x_i, used for each input quantity i has a standard uncertainty, $u(x_i)$, that generates a corresponding uncertainty in y, $u_i(y) \equiv |\partial y/\partial x_i| \cdot u(x_i)$, called a component of combined standard uncertainty of y.

The combined standard uncertainty of y, $u_c(y)$, is the positive square root of the sum of the squares of the components of combined standard uncertainty.

The combined standard uncertainty is multiplied by a coverage factor of $k = 2$ to obtain U, the expanded uncertainty of y.

Since it can be assumed that the possible estimated values of the massic activity are approximately normally distributed with approximate standard deviation $u_c(y)$, the unknown value of the massic activity is believed to lie in the interval $y \pm U$ with a level of confidence of approximately 95 percent.

For further information on the expression of uncertainties, see references [2] and [3].

[e] Estimated limits of detection for alpha-particle-emitting impurities are:
0.03 $\alpha \cdot s^{-1} \cdot g^{-1}$ for energies less than 3.5 MeV,
0.3 $\alpha \cdot s^{-1} \cdot g^{-1}$ for energies between 3.5 and 4.5 MeV, and
0.03 $\alpha \cdot s^{-1} \cdot g^{-1}$ for energies greater than 5.1 MeV.

Thorium-228 was detected in measurements made on the thorium-229 master solution in 1975 and 1979. As of the reference time, the massic activity of thorium-228 is well below the detection limits and is calculated to be approximately 0.001 $Bq \cdot g^{-1}$.

The thorium-229 master solution was chemically purified on 7 May 1984.

[f] Estimated limits of detection for photon-emitting impurities are:
0.003 $\gamma \cdot s^{-1} \cdot g^{-1}$ for energies between 90 and 506 keV and
0.0003 $\gamma \cdot s^{-1} \cdot g^{-1}$ for energies between 516 and 1900 keV,
provided that the photons are separated in energy by 4 keV or more from photons emitted in the decay of thorium-229 and progeny.

[g] Evaluated Nuclear Structure Data File (ENSDF), January 1995. The stated uncertainty is the standard uncertainty.

[h] Relative standard uncertainty of the input quantity x_i.

PROPERTIES OF SRM 4328A
(Certified values are shown in bold type)

Source identification number	NIST SRM 4328A		
Physical Properties:			
•Source description	Liquid in flame-sealed NIST borosilicate-glass ampoule		
Ampoule specifications	Body outside diameter Wall Thickness Barium content Lead-oxide content Other heavy elements	(16.5 ± 0.5) mm (0.60 ± 0.04) mm Less than 2.5% Less than 0.02% Trace quantities	
Solution density	**(1.032 ± 0.002) g•mL^{-1} at 22.6 °C [b]***		
Solution mass	Approximately 5 g		
Chemical Properties:			
Solution composition	Chemical Formula	Concentration (mol•L^{-1})	Mass Fraction (g•g^{-1})
	H_2O HNO_3 $Th(NO_3)4$	54 1.0 2×10^{-8}	0.94 0.06 9×10^{-9}
Radiological Properties:			
Radionuclide	**Thorium-229**		
Reference time	**1200 EST, 28 January 1994**		
Massic activity of the solution [c]	**32.83 Bq•g^{-1}**		
Relative expanded uncertainty (k=2)	**0.72% [d]**		
Alpha-particle-emitting impurities	None detected [e]		
Photon-emitting impurities	None detected [f]		
Half lives used	Thorium-229: (7340 ± 160) a [g]		
Measuring instruments	NIST "0.8π"α defined-solid-angle counter with scintillation detector plus silicon surface-barrier alpha-spectrometer system and two 4π(α+β) liquid-scintillation counting systems		

*Notes and references are on pages 5 and 6.

RADIOCHEMISTRY LABORATORY
RADIOACTIVE MATERIAL INVENTORY
STANDARD SOURCE LOG

Vendor: NIST Vendor Source ID: 4328 A

Date Received: 3/20/95 Received By: C. Walker

U.S. Department of Commerce
National Institute of Standards
and Technology
SRM 4328A
Thorium-229
<200 Bq in 6% nitric acid
CAUTION
RADIOACTIVE

Place Source Label Above

Source Reference Date/Time*: 028/1994 12:00 EST Solvent: 1M HNO_3

ISOTOPE(S)	CONC. (pCi/g)	ISOTOPE(S)	CONC. (pCi/g)
Th-229	887.30		

*Use Julian date and military time

Usage:

DCL Balance ID No.: 102695

Date	Inits.	Aliquot	Activity (pCi)	Balance (pCi)	Destination	Witness
9/5/95	PMK	5.125 g	4,547.41	Ø	FSL-2/73	BR

RADIOCHEMISTRY LABORATORY
RADIOACTIVE MATERIAL INVENTORY
INTERMEDIATE STANDARD LOG

Intermediate Standard ID: ISL-2/73 (Th-229) Standard Source ID: 4328A

Reference Date/Time*: 028, 1994 14:10MST RMI Source Log Ref. Book/Page: 02/30

*Use Julian date and military time

DCL Balance ID No.: 1002695

Date	Inits.	Solvent	Activity (pCi)†	Final Weight	Conc. (pCi/g)†	Witness
9/5/95	PMK	2M HNO_3	4,547.41	100.288g	45.34	DR

Usage:

	Date	Inits.	Aliquot	Activity (pCi)†	Balance (pCi)†	Destination
1.	9-6-95		9-6-95 ~~1.2 mt~~ 1.284g	58.217	4489.193	MX-0333-GQ tracers
2.	10/9/95	PMK	2.027g	91.918	4397.275	RX-0079-BF TRACERS
3.	10-10-95		1.177 g	53.365	4343.91	RX-0071-GJ tracers
4.	10/25/95	PMK	1.484g	67.285	4276.63	RX-0080-CF TRACERS
5.	11/21/96	PMK	~~2.472g~~ 3.708 g	~~112.080~~ 168.121	~~4164.55~~ 4108.51	RX-0082-CD TRACERS
6.	4/2/96	PMK	90.326g	4095.381	Ø	WSL-3/67
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† All activities are referenced to the source date/time. Decay corrections are to be made on the following page.

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From Page 93

RADIOCHEMISTRY LABORATORY
RADIOACTIVE MATERIAL INVENTORY
WORKING STANDARD LOG

8019

Working Standard ID: WSL 3/67 (Th 229) Intermediate Standard ID: ISL 2/73

Reference Date/Time*: 028, 1994/14:00 MST RMI Source Log Ref. Book/Page: 02/30

*Use Julian date and military time

DCL Balance ID No.:_____

Date	Inits.	Solvent	Activity (pCi)†	Final Volume	Conc. (pCi/g)†	Witness
4/2/96	T.P. for P.M.K.	2 M HNO_3	4,095.381	90.326g	45.34	T.P for RK.

Usage:

	Date	Inits.	Aliquot	Activity (pCi)†	Balance (pCi)†	Destination
1.	10-7-96	T.P.	1.581g	71.6825	1722.0061	96M-0286-15/96M-030. 09 96M-0290-09 96M-0297-15 TRACERS
2.	10-9-96	BR	1.655g	75.0377	1646.9684	96M-0303-09 96M-0304-09 Tracers
3.	10-9-96	T.P.	2.6350g	119.4709	1527.4975	G9697037 G969703M TRACERS
4.	10-14-96	BR	1.6550g	75.0377 BR	1452.4598	96C-0438-13 96C-0443-13 Tracers
5.	10-17-96	BR	.9735g	44.13849	1408.3214	96M-0250-02 96M-0323-04 Tracer
6.	10-18-96	BR	.5841g	26.4831	1381.8383	96E-0640-03 Tracers
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† All activities are referenced to the source date/time. Decay corrections are to be made on the following page.

To Page:_____

CERTIFICATE OF CALIBRATION
ALPHA STANDARD SOLUTION

8019

Radionuclide	U-232	Customer:	DATA CHEM LABORATORIES
Half Life:	68.9 ± 1.0 years	P.O.No.:	8072
Catalog No.:	7232	Reference Date:	December 15 1991 12:00 PST.
Source No.:	393-77	Contained Radioactivity:	0.1036 µCi.

Description of Solution

a. Mass of solution: 5.1639 grams.
b. Chemical form: UO2Cl2 in 2N HCl
c. Carrier content: None added
d. Density: 1.0330 gram/ml @ 20°C.

Radioimpurities

None detected (other than daughters)

Radioactive Daughters

Th-228 0.2% as of November 24 1991 (daughters separated on November 22 1991)

Radionuclide Concentration

0.0201 µCi/gram.

Method of Calibration

Weighed aliquots of the solution were assayed using a windowless internal gas flow proportional counter.

Uncertainty of Measurement

a. Systematic uncertainty in instrument calibration: ±1.3%
b. Random uncertainty in assay: ±2.3%
c. Random uncertainty in weighing(s): ±0.2%
d. Total uncertainty at the 99% confidence level: ±3.8%

NIST Traceability

This calibration is implicitly traceable to the National Institute of Standards and Technology.

Notes

1. Nuclear data were taken from "Table of Isotopes", Seventh Edition, edited by Virginia S. Shirley.
2. IPL participates in an NIST measurement assurance program to establish and maintain implicit traceability for a number of nuclides, based on the blind assay(and later NIST certification) of Standard Reference Materials. (As in NRC Regulatory Guide 4.15)

QUALITY CONTROL

ISOTOPE PRODUCTS LABORATORIES
1800 No. Keystone Street.,
Burbank, California 91504
(818) 843 - 7000

RADIOCHEMISTRY LABORATORY
RADIOACTIVE MATERIAL INVENTORY
STANDARD SOURCE LOG

8019

Transferred from RMI Source logbook 1A [illegible] 2/28/96

Vendor: IPL **Vendor Source ID:** SRM-393-77

Date Received: _____ **Received By:** C. Walker

ISOTOPE PRODUCTS LABORATORIES
Radioactivity Std. U-232
Amount 0.1036 μCi
Mass 5.16396 grams
Date Dec 15, 1991
Source No. 393-77
CAUTION RADIOACTIVE MATERIAL
NOT FOR DRUG USE

Place Source Label Above

Source Reference Date/Time*: 349, 1991 / 13:00 MST Solvent: 2N HCl

ISOTOPE(S)	CONC. (pCi/g)	ISOTOPE(S)	CONC. (pCi/g)
U-232	20,062.36		

*Use Julian date and military time

Usage:

DCL ~~Balance ID~~ No.: NA

Date	Inits.	Aliquot	Activity (pCi)	Balance (pCi)	Destination	Witness
2/13/96	PAK	5.0940g	1028 ~~[illegible]~~ 197.66	Ø	JSL-2199	PAK R.S.

RADIOCHEMISTRY LABORATORY
RADIOACTIVE MATERIAL INVENTORY
INTERMEDIATE STANDARD LOG

8019

Intermediate Standard ID: ISL-2/99 (U-232) Standard Source ID: SRM-393-77

Reference Date/Time*: 349, 1991 RMI Source Log Ref. Book/Page: 2/37

*Use Julian date and military time.

DCL Balance ID No.: NA

Date	Inits.	Solvent	Activity (pCi)†	Final Weight	Conc. (pCi/g)†	Witness
4/13/92	PMK	2M HNO3	102,197.66	100 mL	1,022	R.S.

Usage:

	Date	Inits.	Aliquot	Activity (pCi)†	Balance (pCi)†	Destination
1.	10-5-92	R.S.	5.04 mL	5,140.8	~~0.096859~~ 95,970,56.86	U-232-002-WS
2.	2/26/94		1.5 mL	1,530	95,526.860	TRACERS SX-0523-AN
3.	6/27/94		10.009g = 9.38 mL	9,586.88	85,939.98	U-232-003-WS
4.	6/8/95	PMK	5.0 mL	5,100	80,839.98	U-232-004-WS
5.	6/13/95	PMK	0.005 mL	5.11	80,834.87	TEST for WK STD
6.	2/28/96	PMK	4.94 mL	5,048.68	~~75~~,786.19	WSL-3/55
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† All activities are referenced to the source date/time. Decay corrections are to be made on the following page.

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RADIOCHEMISTRY LABORATORY
RADIOACTIVE MATERIAL INVENTORY
WORKING STANDARD LOG

Working Standard ID: WSL-3/55 (U-232) Intermediate Standard ID: ISL-2/99

Reference Date/Time*: 346, 1991/13:00HST RMI Source Log Ref. Book/Page: 2/57

*Use Julian date and military time

DCL Balance ID No.: NA

Date	Inits.	Solvent	Activity (pCi)†	Final Volume	Conc. (pCi/g)† pCi/mL	Witness
2/28/96	TMK	2M HNO3	5,048.68	100 mL	50.49	R.L.

Usage:

	Date	Inits.	Aliquot	Activity (pCi)†	Balance (pCi)†	Destination
1.	9/25/96	TMK	1.08625 mL	54.84	680.05	96C-0404-02 TRACERS
2.	10-3-96	T.P.	1.08625 mL	54.84	625.2100	96M-0271-28 TRACERS 96M-0279-19
3.	10-7-96	T.P.	1.4813 mL	74.7908	550.4192	96M-0286-14 96M-0288-08 96M-0290-08 96M-0297-14 TRACERS
4.	10-9-96	BR	1.6599 ml	83.8073	466.6119	96M-0303-08 96M-0304-08 Tracers
5.	10-9-96	T.P.	2.4688 mL	124.6497	341.9622	G969703J G969703H TRACERS
6.	10-15-96	BR	1.6550 ml	83.5610	258.4012	96C-0439-12 96C-0443-12 Tracers
7.	10-16-96	BR	1.9528 ml	98.5969	159.8043	96E-0654-02 Tracer
8.	10-17-96	BR	.9764 ml	49.2984	110.5059	96M-0250-01 96M-0323-05 Tracer
9.	10-18-96	BR	.5858 ml	29.5770	80.9289	96E-0640-02 Tracers
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† All activities are referenced to the source date/time. Decay corrections are to be made on the following page.

To Page:_____

7400-SRC-0043

Certification Date: Apr. 8, 1993

Nuclide	U-238	U-234	Pu-239	Am-241	Total Alpha
Energy (MeV)	4.20	4.77	5.15	5.49	3 - 8 MeV
Counting time (sec)	92659				
Background count time (sec)	264043				
Detector Efficiency (%) *	20.4 ± 0.42				
Gross counts	30912 ± 176	30510 ± 175	31664 ± 178	32416 ± 180	126128 ± 355
Gross count rate (cpm)	20.02 ± 0.11	19.76 ± 0.11	20.50 ± 0.12	20.99 ± 0.12	81.67 ± 0.23
Background count rate (cpm)	0.001 ± 0.0001	0.002 ± 0.0002	0.001 ± 0.0001	0.001 ± 0.0001	0.0072 ± 0.001
Net std count rate	20.02 ± 0.2231	19.75 ± 0.2217	20.50 ± 0.2258	20.99 ± 0.2285	81.67 ± 0.4507
Standard activity (dpm)	98.1 ± 2.3	96.8 ± 2.3	100.5 ± 2.3	102.9 ± 2.4	400.3 ± 8.5
Uncertainty at 95% level (%)	2.3%	2.3%	2.3%	2.3%	2.1%

*Traceable to NIST via attached calibration certificate
{Source identification "FSU" on NIST test report refers to primary standard used to calibrate detector}

000492 11

80 19

7400-SRC-0048

Certification Date: Apr. 8, 1993

Nuclide	U-238	U-234	Pu-239	Am-241	Total Alpha
Energy (MeV)	4.20	4.77	5.15	5.49	3 - 8 MeV
Counting time (sec)	97462				
Background count time (sec)	264043				
Detector Efficiency (%) *	20.4 ± 0.42				
Gross counts	31979 ± 179	31379 ± 177	34622 ± 186	34445 ± 186	133976 ± 366
Gross count rate (cpm)	19.69 ± 0.11	19.32 ± 0.11	21.31 ± 0.11	21.21 ± 0.11	82.48 ± 0.23
Background count rate (cpm)	0.001 ± 0.0001	0.002 ± 0.0002	0.001 ± 0.0001	0.001 ± 0.0001	0.0072 ± 0.001
Net std count rate	19.69 ± 0.2158	19.32 ± 0.2137	21.31 ± 0.2245	21.20 ± 0.2239	82.47 ± 0.4417
Standard activity (dpm)	96.5 ± 2.3	94.7 ± 2.2	104.5 ± 2.4	103.9 ± 2.4	404.3 ± 8.6
Uncertainty at 95% level (%)	2.3%	2.3%	2.3%	2.3%	2.1%

*Traceable to NIST via attached calibration certificate
{Source identification "FSU" on NIST test report refers to primary standard used to calibrate detector}

7400-SRC-0056

Certification Date: Apr. 8, 1993

Nuclide	U-238	U-234	Pu-239	Am-241	Total Alpha
Energy (MeV)	4.20	4.77	5.15	5.49	3 - 8 MeV
Counting time (sec)	153435				
Background count time (sec)	264043				
Detector Efficiency (%) *	20.4 ± 0.42				
Gross counts	49670 ± 223	48902 ± 221	52032 ± 228	53030 ± 230	206066 ± 454
Gross count rate (cpm)	19.42 ± 0.09	19.12 ± 0.09	20.35 ± 0.09	20.74 ± 0.09	80.58 ± 0.18
Background count rate (cpm)	0.001 ± 0.0001	0.002 ± 0.0002	0.001 ± 0.0001	0.001 ± 0.0001	0.0072 ± 0.001
Net std count rate	19.42 ± 0.1708	19.12 ± 0.1695	20.35 ± 0.1748	20.74 ± 0.1765	80.57 ± 0.3479
Standard activity (dpm)	95.2 ± 2.1	93.7 ± 2.1	99.7 ± 2.2	101.6 ± 2.3	395.0 ± 8.3
Uncertainty at 95% level (%)	2.2%	2.2%	2.2%	2.2%	2.1%

*Traceable to NIST via attached calibration certificate
(Source identification "FSU" on NIST test report refers to primary standard used to calibrate detector)

7400-SRC-0095

Certification Date: Apr. 17, 1993

Nuclide	U-238	U-234	Pu-239	Am-241	Total Alpha
Energy (MeV)	4.20	4.77	5.15	5.49	3 - 8 MeV
Counting time (sec)	110906				
Background count time (sec)	264043				
Detector Efficiency (%) *	20.4 ± 0.42				
Gross counts	37017 ± 192	36542 ± 191	34615 ± 186	37320 ± 193	147301 ± 384
Gross count rate (cpm)	20.03 ± 0.10	19.77 ± 0.10	18.73 ± 0.10	20.19 ± 0.10	79.69 ± 0.21
Background count rate (cpm)	0.001 ± 0.0001	0.002 ± 0.0002	0.001 ± 0.0001	0.001 ± 0.0001	0.0072 ± 0.001
Net std count rate	20.03 ± 0.2040	19.77 ± 0.2027	18.73 ± 0.1973	20.19 ± 0.2048	79.68 ± 0.4070
Standard activity (dpm)	98.2 ± 2.3	96.9 ± 2.2	91.8 ± 2.1	99.0 ± 2.3	390.6 ± 8.3
Uncertainty at 95% level (%)	2.3%	2.3%	2.3%	2.3%	2.1%

*Traceable to NIST via attached calibration certificate
{Source identification "FSU" on NIST test report refers to primary standard used to calibrate detector}

8019

U.S. DEPARTMENT OF COMMERCE
National Institute of Standards & Technology
Gaithersburg, MD 20899

REPORT OF TEST

for

Florida State University
Tallahassie, Florida

Radionuclide	^{210}Po, ^{234}U, ^{235}U, ^{238}U, ^{239}Pu and ^{241}Am
Source identification	FSU
2π alpha-particle counting rate	3.369 s^{-1} (1)*
Overall uncertainty	1.8 percent (2)
Relative activity	
^{210}Po	0.005 (± 26 percent)
^{234}U	0.949 (± 1.6 percent)
^{235}U	0.037 (± 4.6 percent)
^{238}U	0.954 (± 1.6 percent)
^{239}Pu	0.961 (± 1.6 percent)
^{241}Am	1.000 percent (3),(4)
Reference time	March 3, 1993
Measuring instruments	NIST $2\pi\alpha$ proportional counter and Si surface-barrier detector

For the Director,

Gaithersburg, MD 20899
March, 1993

J.M.R. Hutchinson, Acting Group Leader
Radioactivity Group
Physics Laboratory

*Notes on back

00049615

NOTES

(1) The total number of alpha particles counted per second emitted into a 2π-steradian geometry (including those scattered).

(2) The overall uncertainty is two times the value found from combining quadratically the standard deviations of the mean, or approximation thereof, of the following:

a) one standard deviation of the mean of five measurements	0.18 percent
b) pulse-height extrapolation	0.70 percent
c) system live time	0.05 percent
d) backscattering correction	0.50 percent

(3) The uncertainties in the relative activity are computed from two times the estimated standard deviation of the mean plus the uncertainty from subtraction of the estimated tail of the upper peak.

(4) Assuming the source material is thin and is deposited on stainless steel the uncertified values in Bq for the activities are as follows:

^{210}Po	0.008
^{234}U	1.623
^{235}U	0.063
^{238}U	1.631
^{239}Pu	1.643
^{241}Am	1.710

For further information, contact Dr. J.M.R. Hutchinson at (301) 975-5543, or Pamela Hodge at (301) 975-5544.

Tag no.= 11080212 FSU0056 CALIB. 2-27-93 Live = 153435 s True = 226534.1 s Readout: 08:12 1-Mar-93 Page 1

User 1 Group 1.0 Unit 1 Collected at: 14:15:10.5 28-Feb-93

X-cal = + 5.7824-03 * Ch + 2.6729+00 MeV

PEAK: Statistics = 1.00 Min width = 8 AREA: Background = 2 % Error = 1.00

Iso ID: Window= 2.0 keV Library: RESIDENT

ROI#	Start MeV	Stop MeV	Integral	Area	ICPS	%Err	Peak MeV	FWHM MeV
1	2.684	8.588	206066	205300	1.3	0.31	5.149	0.0394
2	3.806	4.246	49670	49208	0.3	0.49	4.197	0.0434
3	4.280	4.471	2013	1664	0.0	3.93	4.394	0.0486
4	4.517	4.824	48902	48470	0.3	0.48	4.769	0.0415
5	4.888	5.206	52032	51906	0.3	0.45	5.149	0.0394
6	5.206	5.599	53030	52978	0.3	0.44	5.484	0.0407

U.S. DEPARTMENT OF COMMERCE
National Institute of Standards & Technology
Gaithersburg, MD 20899

REPORT OF TEST

for

Florida State University
Tallahassie, Florida

Radionuclide	^{210}Po, ^{234}U, ^{235}U, ^{238}U, ^{239}Pu and ^{241}Am
Source identification	FSU
2π alpha-particle counting rate	3.369 s^{-1} (1)*
Overall uncertainty	1.8 percent (2)
Relative activity	
^{210}Po	0.005 (± 26 percent)
^{234}U	0.949 (± 1.6 percent)
^{235}U	0.037 (± 4.6 percent)
^{238}U	0.954 (± 1.6 percent)
^{239}Pu	0.961 (± 1.6 percent)
^{241}Am	1.000 percent (3),(4)
Reference time	March 3, 1993
Measuring instruments	NIST $2\pi\alpha$ proportional counter and Si surface-barrier detector

For the Director,

J.M.R. Hutchinson, Acting Group Leader
Radioactivity Group
Physics Laboratory

Gaithersburg, MD 20899
March, 1993

*Notes on back

NOTES

(1) The total number of alpha particles counted per second emitted into a 2π-steradian geometry (including those scattered).

(2) The overall uncertainty is two times the value found from combining quadratically the standard deviations of the mean, or approximation thereof, of the following:

a) one standard deviation of the mean of five measurements	0.18 percent
b) pulse-height extrapolation	0.70 percent
c) system live time	0.05 percent
d) backscattering correction	0.50 percent

(3) The uncertainties in the relative activity are computed from two times the estimated standard deviation of the mean plus the uncertainty from subtraction of the estimated tail of the upper peak.

(4) Assuming the source material is thin and is deposited on stainless steel the uncertified values in Bq for the activities are as follows:

^{210}Po	0.008
^{234}U	1.623
^{235}U	0.063
^{238}U	1.631
^{239}Pu	1.643
^{241}Am	1.710

For further information, contact Dr. J.M.R. Hutchinson at (301) 975-5543, or Pamela Hodge at (301) 975-5544.

NOTES

(1) The total number of alpha particles counted per second emitted into a 2π-steradian geometry (including those scattered).

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b) pulse-height extrapolation	0.70 percent
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^{234}U	1.623
^{235}U	0.063
^{238}U	1.631
^{239}Pu	1.643
^{241}Am	1.710

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8019

121

000502

Tag no.= 11080449 FSU0095 CALIB. 4-16-93 Live = 110906 s True = 372090.5 s Readout: 23:36 17-Apr-93 Page 1

User 1 Group 1.8 Unit 1 Collected at: 16:46:36.3 16-Apr-93

X-cal = + 5.7694-03 * Ch + 2.6763+00 MeV

PEAK: Statistics = 1.00 Min width = 8 AREA: Background = 2 % Error = 1.00

Iso ID: Window= 2.0 keV Library: RESIDENT

ROI#	Start MeV	Stop MeV	Integral	Area	ICPS	%Err	Peak MeV	FWHM MeV
1	2.728	8.578	147301	147301	1.3	0.26	5.154	0.0363
2	3.865	4.263	37017	36772	0.3	0.55	4.201	0.0384
3	4.263	4.523	1597	1332	0.0	4.81	4.396	0.0479
4	4.528	4.823	36542	36243	0.3	0.55	4.774	0.0373
5	4.903	5.215	34615	34464	0.3	0.55	5.154	0.0363
6	5.232	5.601	37320	37222	0.3	0.53	5.486	0.0384
7	5.619	5.734	6	6	0.0	40.82	5.681	0.0144
8	5.994	6.109	4	4	0.0	50.00	6.069	0.0000
9	6.201	6.317	11	6	0.0	92.13	6.285	0.0134
10	6.703	6.819	9	9	0.0	33.33	6.785	0.0173

Prop. Cal:

154. 40± 4.53

FSU104 FSU0104 CALIB. 4-18-93

8019

Spec no.= 11080118 FSU CALIB. 0048 2-12-93 Live = 97462 s True = 81731.1 s Readout: 17:29 13-Feb-93 Page 1

User 1 Group 1.8 Unit 1 Collected at: 15:58:20.2 13-Feb-93

X-cal = + 5.7591-03 * Ch + 2.6813+00 MeV

PEAK: Statistics = 1.00 Min width = 8 AREA: Background = 2 % Error = 1.00

Iso ID: Window= 2.0 keV Library: RESIDENT

ROI#	Start MeV	Stop MeV	Integral	Area	ICPS	%Err	Peak MeV	FWHM MeV
1	2.693	8.573	133976	133976	1.4	0.27	5.151	0.0375
2	3.920	4.248	31979	31660	0.3	0.60	4.202	0.0374
3	4.305	4.461	1250	1061	0.0	4.42	4.396	0.0447
4	4.518	4.835	31379	31099	0.3	0.60	4.772	0.0371
5	4.916	5.210	34622	34544	0.4	0.55	5.151	0.0374
6	5.210	5.590	34445	34378	0.4	0.55	5.484	0.0377

U.S. DEPARTMENT OF COMMERCE
National Institute of Standards & Technology
Gaithersburg, MD 20899

REPORT OF TEST

for

Florida State University
Tallahassie, Florida

Radionuclide	^{210}Po, ^{234}U, ^{235}U, ^{238}U, ^{239}Pu and ^{241}Am
Source identification	FSU
2π alpha-particle counting rate	3.369 s^{-1} (1)*
Overall uncertainty	1.8 percent (2)
Relative activity	
^{210}Po	0.005 (± 26 percent)
^{234}U	0.949 (± 1.6 percent)
^{235}U	0.037 (± 4.6 percent)
^{238}U	0.954 (± 1.6 percent)
^{239}Pu	0.961 (± 1.6 percent)
^{241}Am	1.000 percent (3),(4)
Reference time	March 3, 1993
Measuring instruments	NIST $2\pi\alpha$ proportional counter and Si surface-barrier detector

For the Director,

J.M.R. Hutchinson, Acting Group Leader
Radioactivity Group
Physics Laboratory

Gaithersburg, MD 20899
March, 1993

*Notes on back

NOTES

(1) The total number of alpha particles counted per second emitted into a 2π-steradian geometry (including those scattered).

(2) The overall uncertainty is two times the value found from combining quadratically the standard deviations of the mean, or approximation thereof, of the following:

a) one standard deviation of the mean of five measurements	0.18 percent
b) pulse-height extrapolation	0.70 percent
c) system live time	0.05 percent
d) backscattering correction	0.50 percent

(3) The uncertainties in the relative activity are computed from two times the estimated standard deviation of the mean plus the uncertainty from subtraction of the estimated tail of the upper peak.

(4) Assuming the source material is thin and is deposited on stainless steel the uncertified values in Bq for the activities are as follows:

^{210}Po	0.008
^{234}U	1.623
^{235}U	0.063
^{238}U	1.631
^{239}Pu	1.643
^{241}Am	1.710

For further information, contact Dr. J.M.R. Hutchinson at (301) 975-5543, or Pamela Hodge at (301) 975-5544.

8019

000506 125

Tag no.= 11080088 FSU CALIB. 0043 Live = 92659 s True = 92678.2 s Readout: 20:35 4-Feb-93 Page 1

User 1 Group 1.8 Unit 1 Collected at: 14:47:20.3 4-Feb-93

X-cal = + 5.7720-03 * Ch + 2.6727+00 MeV

PEAK: Statistics = 1.00 Min width = 8 AREA: Background = 2 % Error = 1.00

Iso ID: Window= 2.0 keV Library: RESIDENT

ROI#	Start MeV	Stop MeV	Integral	Area	ICPS	%Err	Peak MeV	FWHM MeV
1	3.810	4.272	31013	30912	0.3	0.59	4.200	0.0376
2	4.295	4.468	1266	1088	0.0	4.40	4.393	0.0509
3	4.526	4.831	30686	30510	0.3	0.59	4.771	0.0350
4	4.849	5.207	31790	31664	0.3	0.58	5.151	0.0358
5	5.230	5.593	32432	32416	0.4	0.56	5.484	0.0368

FSU CALIB. 0044

U.S. DEPARTMENT OF COMMERCE
National Institute of Standards & Technology
Gaithersburg, MD 20899

REPORT OF TEST

for

Florida State University
Tallahassie, Florida

Radionuclide	^{210}Po, ^{234}U, ^{235}U, ^{238}U, ^{239}Pu and ^{241}Am
Source identification	FSU
2π alpha-particle counting rate	3.369 s^{-1} (1)*
Overall uncertainty	1.8 percent (2)
Relative activity	
^{210}Po	0.005 (± 26 percent)
^{234}U	0.949 (± 1.6 percent)
^{235}U	0.037 (± 4.6 percent)
^{238}U	0.954 (± 1.6 percent)
^{239}Pu	0.961 (± 1.6 percent)
^{241}Am	1.000 percent (3),(4)
Reference time	March 3, 1993
Measuring instruments	NIST $2\pi\alpha$ proportional counter and Si surface-barrier detector

For the Director,

J.M.R. Hutchinson, Acting Group Leader
Radioactivity Group
Physics Laboratory

Gaithersburg, MD 20899
March, 1993

*Notes on back

PIPETTE CALIBRATION CHECK

Equipment Number: EPPE 13

Equipment Name: Eppendorf

Date: 6/17/96 Date Last Calibrated: 12/95

Calibration Period: 12/96

Pipette Volume 0.1mL 0.5mL (5mL Tip)

Water Temperature 22°C

Water Density 0.99823

Balance Used 102683

Measured Weights (g)

1	2	3	4	5	6	7
0.09759 0.49721	0.09937 0.49780	0.09860 0.49814	0.09887 0.49755	0.09836 0.49651	0.09864 0.49639	0.09863 0.49701

	Mean	σ
Weight (g)	0.09858 0.49723	0.00054 0.00065
Volume (mL)	0.09875 0.49811	0.00054 0.00065

Performed By: Christopher Weldrum

PIPETTE CALIBRATION CHECK

8019

Equipment Number: EPPE 10

Equipment Name: Eppendorf

Date: 6/14/96 Date Last Calibrated: 12/95

Calibration Period: 12/96

Pipette Volume 100 uL 200 uL 250 uL

Water Temperature ~~22°C~~ 23°C cmk 6/14/96

Water Density ~~0.99823~~ 0.99707

Balance Used 102683

Measured Weights (g)

1	2	3	4	5	6	7
0.09782 0.19721 0.24068	0.09804 0.19467 0.24269	0.09734 0.19295 0.24357	0.09792 0.19321 0.24202	0.09684 0.19346 0.24216	0.09692 0.19267 0.24293	0.09660 0.19330 0.24198

	Mean	σ
Weight (g)	0.09735 0.19392 0.24229	0.00058 0.00158 0.00091
Volume (mL)	0.09764 0.19449 0.24300	0.00058 0.00159 0.00091

Performed By: Christopher Melbourne

DATA CHEM LABORATORIES
A SORENSON COMPANY

8019

Raw Data
Radiochemistry/Mixed-Waste Department
α Spectrometry
Inventory Checklist

- [x] Section 1. Sample and QC Data
- [x] Section 2. Instrument Performance and Calibration Data

The following signatures verify that the raw data and all inventory and reviewer checklists in each raw data section (all green sheets) are complete and accurate.

Assembled by: _____ 11/5/96 Reviewed by: _____ 11/5/96
Signature Date Signature Date

Rev. 3/95

Section 1. Sample and QC Data
α Spectrometry
Inventory Checklist

- [X] Laboratory Control Sample (LCS) print-out
  - LCS Spectral Plot
  - LCS ROI Peak Search Report
  - LCS Activity Report
  - MDA Report
- [X] Reagent Blank with Tracer(s)
  - Reagent Blank Spectral Plot
  - Reagent Blank ROI Peak Search Report
  - Reagent Blank Activity Report
  - MDA Report
- [X] Accuracy Sample (MS)
  - MS Spectral Plot
  - MS ROI Peak Search Report
  - MS Relative Activity Report
  - MDA Report
- [X] Precision Sample (MD/MSD)
  - MD/MSD Spectral Plot
  - MD/MSD ROI Peak Search Report
  - MD/MSD Relative Activity Report
  - MDA Report
- [X] Field Sample Instrument Print-outs
  - Sample Spectral Plot
  - Sample ROI Peak Search Report
  - Sample Activity Report
  - Sample MDA Report
- [X] Computer/Manual Calculation Sheets summarizing all calculational inputs and results

Section 1. Sample and QC Data
α Spectrometry
Reviewer Checklist

X The Sample and QC Data Inventory Checklist above is complete.

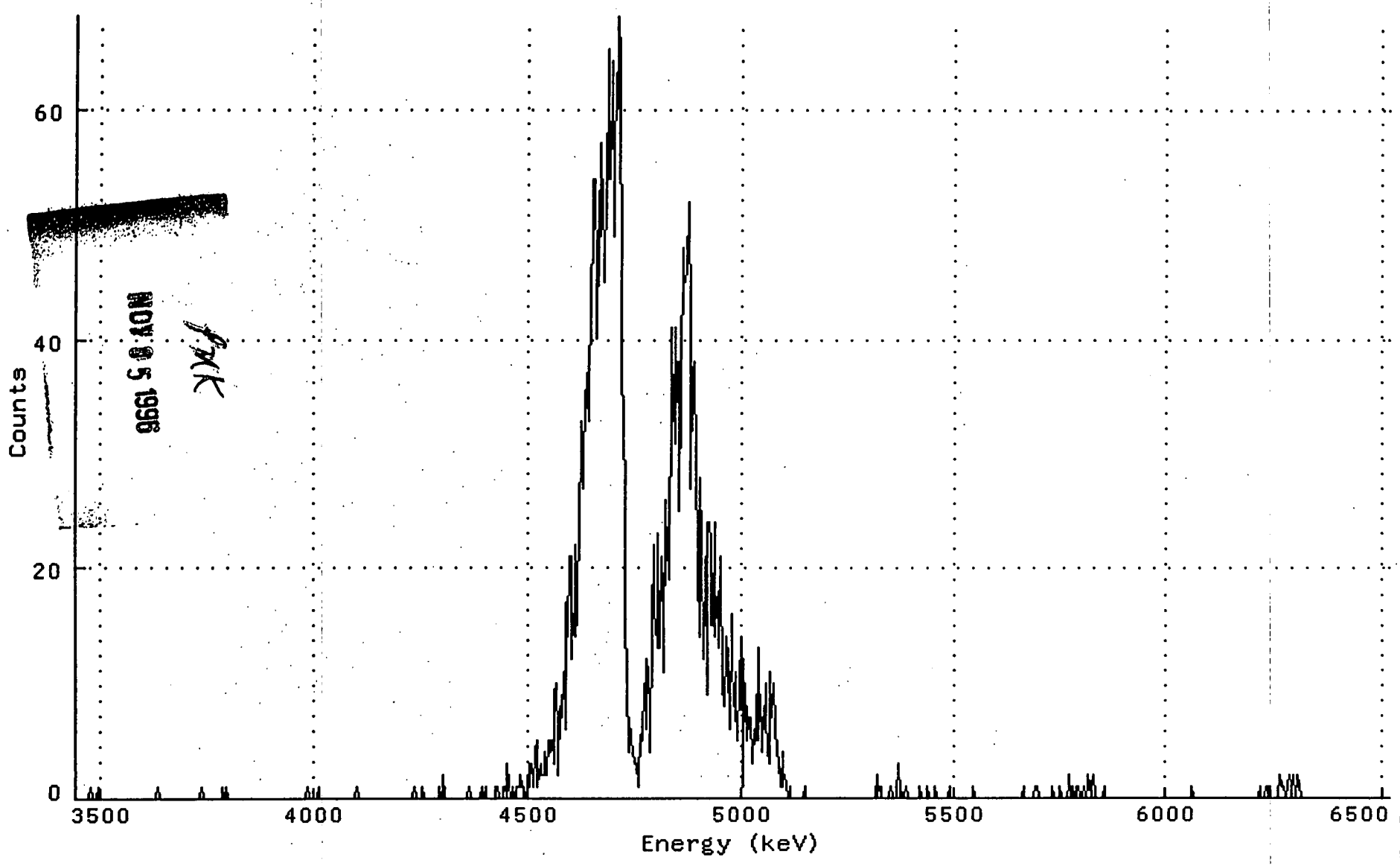
X All appropriate QC for the project was performed.

X All appropriate QC data met acceptance criteria. Unacceptable QC data were documented, and justifications were provided for data used.

X Print-outs are initialed and dated.

Th-iso

Spectrum : DKA0:[ALPHA.ALUSR.ARCHIVE.C]C_QC-123239-1_TH.CNF;2
Title : GAR011
Sample Title: 96E-0640-03
Start Time: 25-OCT-1996 12:19 Sample Time: 24-OCT-1996 12:00 Energy Offset: 3.43907E+03
Real Time : 0 16:38:37.99 Sample ID : QC-123239-1 Energy Slope : 3.20444E+00
Live Time : 0 16:38:34.00 Sample Type: TH Energy Quad : -1.95857E-04



NOV 05 1996

VMS Peak Search Report V1.9 Generated 4-NOV-1996 15:22:20

Configuration : MCA0:[ALPHA]ALPHA0$1
Analyses by : ROIPEAK V1.2
Sample title : 96E-0640-03
Sample date : 24-OCT-1996 12:00:00 Acquisition date : 25-OCT-1996 12:19:50
Sample ID : QC-123239-1 Sample quantity : 1.0000 S
Sample type : TH Sample geometry :
Elapsed live time: 0 16:38:34.00 Elapsed real time: 0 16:38:37.99 0.0%
Start energy : 3442.27 keV End energy : 6515.04 keV
Gross/Net areas : Gross Background type :
Num avg bkg chans: 2 Critical level : No

Pk	It	Energy	Area	Bkgnd	FWHM	Channel	Left	Pw	Cts/Sec	%Err	Fit
1	0	3894.09	4	0	230.72	143.25	98	96	6.68E-05	50.0	
2	0	4661.83	1944	0	92.71	390.92	306	107	3.24E-02	2.3	
3	0	4887.22	1927	0	76.66	465.14	412	128	3.22E-02	2.3	
4	0	5338.29	15	0	56.88	615.87	539	119	2.50E-04	25.8	
5	0	6058.63	1	0	3.20	863.00	792	97	1.67E-05	100.0	

VMS Peak Search Report V1.9 Generated 4-NOV-1996 15:22:45

Configuration : DKA0:[ALPHA.ALUSR.ARCHIVE.B]B_011_NONE.CNF;383
Analyses by : ROIPEAK V1.2
Sample title : 96M-0303-10
Sample date : 18-OCT-1996 14:52:02 Acquisition date : 18-OCT-1996 14:52:25
Sample ID : 011 Sample quantity : 1.0000 SAMPLE
Sample type : NONE Sample geometry :
Elapsed live time: 0 16:38:39.99 Elapsed real time: 0 16:38:30.00 0.0%
Start energy : 3447.77 keV End energy : 6526.39 keV
Gross/Net areas : Gross Background type :
Num avg bkg chans: 2 Critical level : No

Pk	It	Energy	Area	Bkgnd	FWHM	Channel	Left	Pw	Cts/Sec	%Err	Fit
1	0	3903.96	3	0	232.26	145.50	98	96	5.01E-05	57.7	
2	0	4565.14	7	0	283.17	359.00	306	107	1.17E-04	37.8	
3	0	4919.47	2	0	5.97	475.50	412	128	3.34E-05	70.7	
4	0	5287.12	11	0	3.18	598.00	539	119	1.84E-04	30.2	
5	0	5998.60	1	0	3.18	840.00	792	97	1.67E-05	100.0	

VMS Nuclide Identification Report V2.9 Generated 4-NOV-1996 15:23:27

Configuration : MCA0:[ALPHA]ALPHA0$1
Analyses by : ROIPEAK V1.2,PEAKEFF V2.2,ENBACK V1.5,NID V3.1,WTMEAN V1.8
Sample title : 96E-0640-03
Sample date : 24-OCT-1996 12:00:00 Acquisition date : 25-OCT-1996 12:19:50
Sample ID : QC-123239-1 Sample quantity : 1.0000 S
Sample type : TH Sample geometry :
Elapsed live time: 0 16:38:34.00 Elapsed real time: 0 16:38:37.99 0.0%
Energy tolerance : 100.00 keV Half life ratio : 8.00
Errors propagated: Yes Systematic Error : 0.00 %
Efficiency type : Average value Efficiencies at : Peak Energy
Abundance limit : 75.00

Summary of Nuclide Activity

Total number of lines in spectrum 5
Number of unidentified lines 0
Number of lines tentatively identified by NID 5 100.00%

Nuclide Type : Alpha

Nuclide	Hlife	Decay	Wtd Mean Uncorrected (pCi)	Wtd Mean Decay Corr (pCi)	Decay Corr 2-Sigma Error	2-Sigma %Error	Flags
TH-227	18.72D	1.05	4.256E-07	4.475E-07	**********		
Total Activity :			4.256E-07	4.475E-07			

Nuclide Type : ALPHA

Nuclide	Hlife	Decay	Wtd Mean Uncorrected (pCi)	Wtd Mean Decay Corr (pCi)	Decay Corr 2-Sigma Error	2-Sigma %Error	Flags
TH-228	1.91Y	1.00	9.159E-03	9.171E-03	23.38E-03	254.89	
TH229	7340.00Y	1.00	4.425E+00	4.425E+00	0.248E+00	5.60	
TH-230	7.70E+04Y	1.00	4.439E+00	4.439E+00	0.248E+00	5.60	
TH-232	1.41E+10Y	1.00	2.288E-03	2.288E-03	12.11E-03	528.98	
Total Activity :			8.876E+00	8.876E+00			

Grand Total Activity : 8.876E+00 8.876E+00

Flags: "K" = Keyline not found "M" = Manually accepted
"E" = Manually edited "A" = Nuclide specific abn. limit

DATACHEM
ALPHA SPECTROSCOPY REPORT

8019

****

SAMPLE TITLE: 96E-0640-03
SAMPLE DATE: 24-OCT-1996 12:00:00
ELAPSED LIVE TIME: 59914.
AVERAGE %EFFICIENCY: 19.7179
TRACER DPM: 10.7293

SAMPLE ID: QC-123239-1
SAMPLE QUANT: 1.0000 S
DETECTOR #: 011
YIELD: 91.5614

****

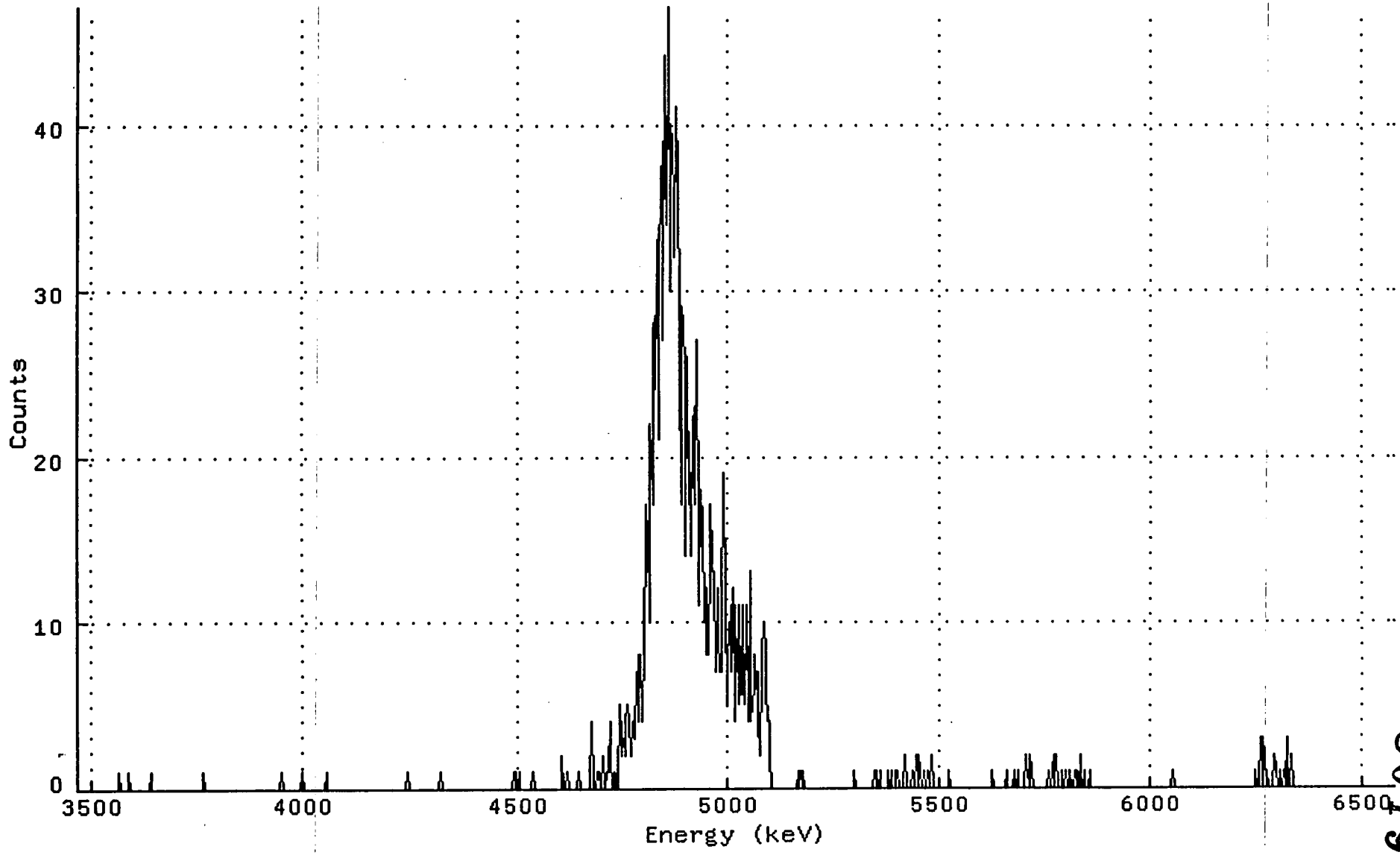
NUCLIDE ACTIVITY SUMMARY

NUCLIDE	ENERGY	NET AREA	BKG	%ABN	ACTIVITY pCi/S	ERROR 2-SIGMA	MDA pCi/S
TH-227	6006.	0.000	1.000	53.80	4.888E-07	1.381E-02	3.553E-02
TH-228	5400.	4.001	10.999	99.94	1.002E-02	2.554E-02	4.606E-02
TH229	4872.	1925.000	2.000	99.52	4.833E+00	2.705E-01	2.404E-02
TH-230	4672.	1937.001	6.999	99.82	4.849E+00	3.837E-01	3.830E-02
TH-232	3997.	1.000	3.000	100.00	2.499E-03	1.322E-02	2.762E-02

****

REVIEWED BY: DATE:

Spectrum : DKA0:[ALPHA.ALUSR.ARCHIVE.R]R_BL-123239-1_TH.CNF;2
Title : GAR012
Sample Title: 96E-0640-03
Start Time: 25-OCT-1996 12:19 Sample Time: 24-OCT-1996 12:00 Energy Offset: 3.46456E+03
Real Time : 0 16:38:37.99 Sample ID : BL-123239-1 Energy Slope : 3.20166E+00
Live Time : 0 16:38:27.00 Sample Type: TH Energy Quad : -1.64084E-04



VMS Peak Search Report V1.9 Generated 4-NOV-1996 15:20:40

8019

Configuration : MCA0:[ALPHA]ALPHA0$1
Analyses by : ROIPEAK V1.2
Sample title : 96E-0640-03
Sample date : 24-OCT-1996 12:00:00 Acquisition date : 25-OCT-1996 12:19:50
Sample ID : BL-123239-1 Sample quantity : 1.0000 S
Sample type : TH Sample geometry :
Elapsed live time: 0 16:38:27.00 Elapsed real time: 0 16:38:37.99 0.0%
Start energy : 3467.76 keV End energy : 6571.00 keV
Gross/Net areas : Gross Background type :
Num avg bkg chans: 2 Critical level : No

Pk	It	Energy	Area	Bkgnd	FWHM	Channel	Left	Pw	Cts/Sec	%Err	Fit
1	0	3902.21	3	0	243.33	137.67	90	96	5.01E-05	57.7	
2	0	4662.44	28	0	49.63	381.61	297	106	4.67E-04	18.9	
3	0	4901.57	1713	0	107.88	459.66	402	127	2.86E-02	2.4	
4	0	5369.12	20	0	40.02	614.20	528	118	3.34E-04	22.4	
5	0	5953.18	2	0	0.00	811.00	778	94	3.34E-05	70.7	

VMS Peak Search Report V1.9 Generated 4-NOV-1996 15:21:01

8019

Configuration : DKA0:[ALPHA.ALUSR.ARCHIVE.B]B_012_NONE.CNF;385
Analyses by : ROIPEAK V1.2
Sample title : 96M-0303-10
Sample date : 18-OCT-1996 14:52:03 Acquisition date : 18-OCT-1996 14:52:25
Sample ID : 012 Sample quantity : 1.0000 SAMPLE
Sample type : NONE Sample geometry :
Elapsed live time: 0 16:38:29.00 Elapsed real time: 0 16:38:30.99 0.0%
Start energy : 3451.12 keV End energy : 6552.80 keV
Gross/Net areas : Gross Background type :
Num avg bkg chans: 2 Critical level : No

Pk	It	Energy	Area	Bkgnd	FWHM	Channel	Left	Pw	Cts/Sec	%Err	Fit
1	0	3894.68	2	0	9.85	137.50	90	96	3.34E-05	70.7	
2	0	4565.44	3	0	206.86	349.50	297	106	5.01E-05	57.7	
3	0	4921.60	5	0	341.49	465.00	402	127	8.35E-05	44.7	
4	0	5289.19	9	0	334.92	586.50	528	118	1.50E-04	33.3	
5	0	5988.25	1	0	3.28	824.50	778	94	1.67E-05	100.0	

VMS Nuclide Identification Report V2.9 Generated 4-NOV-1996 15:21:27 **8019**

Configuration : MCA0:[ALPHA]ALPHA0$1
Analyses by : ROIPEAK V1.2,PEAKEFF V2.2,ENBACK V1.5,NID V3.1,WTMEAN V1.8
Sample title : 96E-0640-03
Sample date : 24-OCT-1996 12:00:00 Acquisition date : 25-OCT-1996 12:19:50
Sample ID : BL-123239-1 Sample quantity : 1.0000 S
Sample type : TH Sample geometry :
Elapsed live time: 0 16:38:27.00 Elapsed real time: 0 16:38:37.99 0.0%
Energy tolerance : 100.00 keV Half life ratio : 8.00
Errors propagated: Yes Systematic Error : 0.00 %
Efficiency type : Average value Efficiencies at : Peak Energy
Abundance limit : 75.00

Summary of Nuclide Activity

Total number of lines in spectrum 5
Number of unidentified lines 0
Number of lines tentatively identified by NID 5 100.00%

Nuclide Type : Alpha

Nuclide	Hlife	Decay	Wtd Mean Uncorrected (pCi)	Wtd Mean Decay Corr (pCi)	Decay Corr 2-Sigma Error	2-Sigma %Error	Flags
TH-227	18.72D	1.05	4.525E-09	4.758E-09	16.48E-09	346.41	
		Total Activity :	4.525E-09	4.758E-09			

Nuclide Type : ALPHA

Nuclide	Hlife	Decay	Wtd Mean Uncorrected (pCi)	Wtd Mean Decay Corr (pCi)	Decay Corr 2-Sigma Error	2-Sigma %Error	Flags
TH228	1.91Y	1.00	2.679E-08	2.683E-08	2.628E-08	97.96	
TH229	7340.00Y	1.00	4.178E-06	4.178E-06	0.245E-06	5.87	
TH-230	7.70E+04Y	1.00	6.096E-08	6.096E-08	2.723E-08	44.66	
TH-232	1.41E+10Y	1.00	2.434E-09	2.434E-09	10.89E-09	447.19	
		Total Activity :	4.268E-06	4.268E-06			

Grand Total Activity : 4.272E-06 4.273E-06

Flags: "K" = Keyline not found "M" = Manually accepted
"E" = Manually edited "A" = Nuclide specific abn. limit

DATACHEM
ALPHA SPECTROSCOPY REPORT

8019

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SAMPLE TITLE: 96E-0640-03
SAMPLE DATE: 24-OCT-1996 12:00:00
ELAPSED LIVE TIME: 59907.
AVERAGE %EFFICIENCY: 18.5340
TRACER DPM: 10.7293

SAMPLE ID: BL-123239-1
SAMPLE QUANT: 1.0000 S
DETECTOR #: 012
YIELD: 86.4395

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NUCLIDE ACTIVITY SUMMARY

NUCLIDE	ENERGY	NET AREA	BKG	%ABN	ACTIVITY pCi/S	ERROR 2-SIGMA	MDA pCi/S
TH-227	6006.	1.000	1.000	53.80	5.505E-09	1.907E-08	4.004E-08
TH-228	5400.	11.000	9.000	99.94	3.104E-08	3.046E-08	4.776E-08
TH229	4872.	1708.000	5.000	99.52	4.833E-06	2.837E-07	3.791E-08
TH-230	4672.	25.000	3.000	99.82	7.053E-08	3.177E-08	3.118E-08
TH-232	3997.	1.000	2.000	100.00	2.816E-09	1.260E-08	2.697E-08

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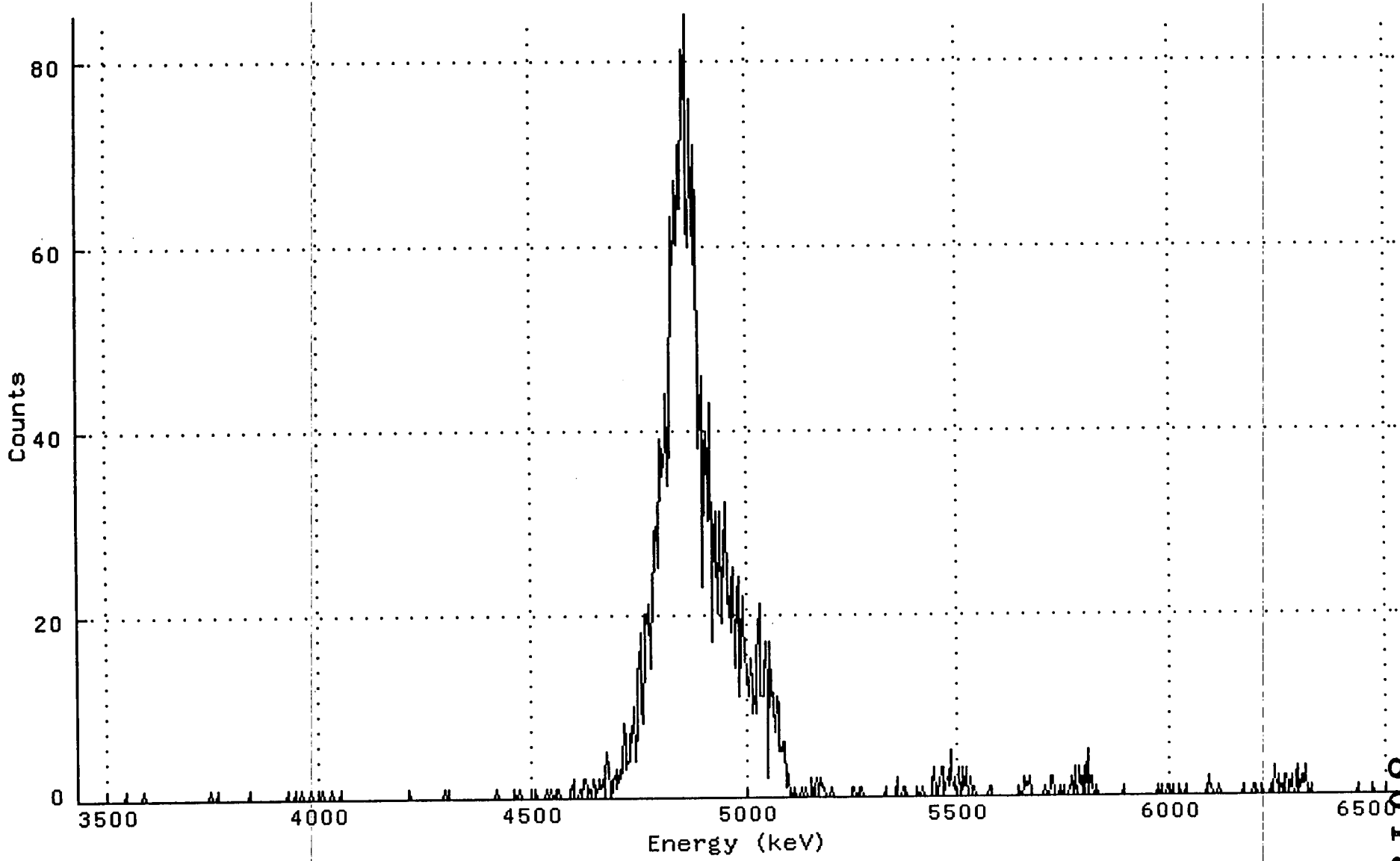
REVIEWED BY: DATE:

Spectrum : DKA0:[ALPHA.ALUSR.ARCHIVE.S]S_96E04514_TH.CNF;1
Title : GAR013
Sample Title: 96E-0640-03
Start Time: 25-OCT-1996 12:19 Sample Time: 24-OCT-1996 12:00 Energy Offset: 3.43099E+03
Real Time : 0 16:38:37.99 Sample ID : 96E04514 Energy Slope : 3.23329E+00
Live Time : 0 16:38:34.99 Sample Type: TH Energy Quad : -2.07240E-04



VMS Peak Search Report V1.9 Generated 28-OCT-1996 11:31:06

Configuration : MCA0:[ALPHA]ALPHA0$1
Analyses by : ROIPEAK V1.2
Sample title : 96E-0640-03
Sample date : 24-OCT-1996 12:00:00 Acquisition date : 25-OCT-1996 12:19:50
Sample ID : 96E04514 Sample quantity : 0.50060 S
Sample type : TH Sample geometry :
Elapsed live time: 0 16:38:34.99 Elapsed real time: 0 16:38:37.99 0.0%
Start energy : 3434.22 keV End energy : 6524.56 keV
Gross/Net areas : Gross Background type :
Num avg bkg chans: 2 Critical level : No

Pk	It	Energy	Area	Bkgnd	FWHM	Channel	Left	Pw	Cts/Sec	%Err	Fit
1	0	3947.32	11	0	0.00	161.36	99	96	1.84E-04	30.2	
2	0	4663.21	89	0	48.33	390.90	306	106	1.49E-03	10.6	
3	0	4881.90	3407	0	107.44	462.45	411	128	5.69E-02	1.7	
4	0	5294.61	36	0	0.00	599.42	538	118	6.01E-04	16.7	
5	0	6034.87	13	0	4.75	851.85	790	96	2.17E-04	27.7	

VMS Peak Search Report V1.9 Generated 28-OCT-1996 11:31:18

Configuration : DKA0:[ALPHA.ALUSR.ARCHIVE.B]B_013_NONE.CNF;372
Analyses by : ROIPEAK V1.2
Sample title : 96M-0304-10
Sample date : 18-OCT-1996 14:52:04 Acquisition date : 18-OCT-1996 14:52:25
Sample ID : 013 Sample quantity : 1.0000 SAMPLE
Sample type : NONE Sample geometry :
Elapsed live time: 0 16:38:41.00 Elapsed real time: 0 16:38:30.99 0.0%
Start energy : 3434.81 keV End energy : 6525.40 keV
Gross/Net areas : Gross Background type :
Num avg bkg chans: 2 Critical level : No

Pk	It	Energy	Area	Bkgnd	FWHM	Channel	Left	Pw	Cts/Sec	%Err	Fit
1	0	3900.97	4	0265.23		146.50	99	96	6.68E-05	50.0	
2	0	4564.40	6	0190.84		358.50	306	106	1.00E-04	40.8	
3	0	4919.48	8	0359.04		474.50	411	128	1.34E-04	35.4	
4	0	5286.89	5	0164.96		596.50	538	118	8.34E-05	44.7	
5	0	5994.45	2	0 90.57		837.50	790	96	3.34E-05	70.7	

VMS Nuclide Identification Report V2.9 Generated 28-OCT-1996 11:31:34 **8019**

Configuration : MCA0:[ALPHA]ALPHA0$1
Analyses by : ROIPEAK V1.2,PEAKEFF V2.2,ENBACK V1.5,NID V3.1,WTMEAN V1.8
Sample title : 96E-0640-03
Sample date : 24-OCT-1996 12:00:00 Acquisition date : 25-OCT-1996 12:19:50
Sample ID : 96E04514 Sample quantity : 0.50060 S
Sample type : TH Sample geometry :
Elapsed live time: 0 16:38:34.99 Elapsed real time: 0 16:38:37.99 0.0%
Energy tolerance : 100.00 keV Half life ratio : 8.00
Errors propagated: Yes Systematic Error : 0.00 %
Efficiency type : Average value Efficiencies at : Peak Energy
Abundance limit : 75.00

Summary of Nuclide Activity

Total number of lines in spectrum 5
Number of unidentified lines 0
Number of lines tentatively identified by NID 5 100.00%

Nuclide Type : Alpha

Nuclide	Hlife	Decay	Wtd Mean Uncorrected (pCi)	Wtd Mean Decay Corr (pCi)	Decay Corr 2-Sigma Error	2-Sigma %Error	Flags
TH-227	18.72D	1.05	9.996E-02	1.051E-01	0.741E-01	70.49	
Total Activity :			9.996E-02	1.051E-01			

Nuclide Type : ALPHA

Nuclide	Hlife	Decay	Wtd Mean Uncorrected (pCi)	Wtd Mean Decay Corr (pCi)	Decay Corr 2-Sigma Error	2-Sigma %Error	Flags
TH-228	1.91Y	1.00	1.516E-01	1.518E-01	0.629E-01	41.44	
TH-229	7340.00Y	1.00	1.670E+01	1.670E+01	0.079E+01	4.75	
TH-230	7.70E+04Y	1.00	4.065E-01	4.065E-01	0.964E-01	23.71	
TH-232	1.41E+10Y	1.00	3.422E-02	3.422E-02	3.788E-02	110.70	
Total Activity :			1.729E+01	1.729E+01			

Grand Total Activity : 1.739E+01 1.739E+01

Flags: "K" = Keyline not found "M" = Manually accepted
"E" = Manually edited "A" = Nuclide specific abn. limit

DATACHEM
ALPHA SPECTROSCOPY REPORT

8019

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SAMPLE TITLE: 96E-0640-03
SAMPLE DATE: 24-OCT-1996 12:00:00
ELAPSED LIVE TIME: 59915.
AVERAGE %EFFICIENCY: 18.4321
TRACER DPM: 10.7293

SAMPLE ID: 96E04514
SAMPLE QUANT: 0.5006 S
DETECTOR #: 013
YIELD: 172.9465

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NUCLIDE ACTIVITY SUMMARY

NUCLIDE	ENERGY	NET AREA	BKG	%ABN	ACTIVITY pCi/S	ERROR 2-SIGMA	MDA pCi/S
TH-227	6006.	11.000	2.000	53.80	6.078E-02	4.294E-02	5.031E-02
TH-228	5400.	31.001	4.999	99.94	8.780E-02	3.662E-02	3.789E-02
TH229	4872.	3399.001	7.999	99.52	9.654E+00	4.588E-01	4.588E-02
TH-230	4672.	83.001	5.999	99.82	2.350E-01	5.685E-02	4.075E-02
TH-232	3997.	7.000	4.000	100.00	1.979E-02	2.192E-02	3.477E-02

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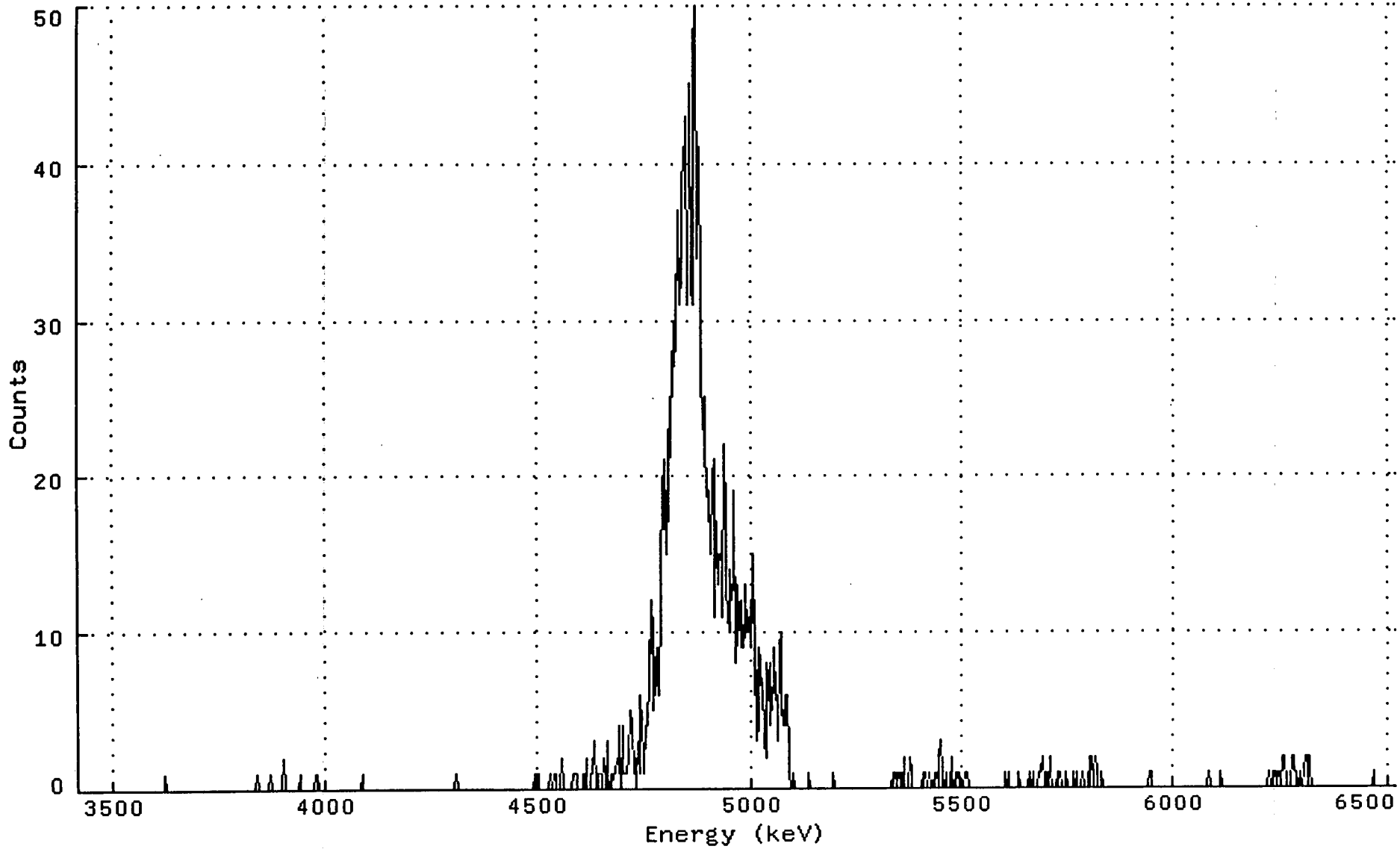
REVIEWED BY: DATE:

Spectrum : DKA0:[ALPHA.ALUSR.ARCHIVE.S]S_96E04515_TH.CNF;1
Title : GAR014
Sample Title: 96E-0640-03
Start Time: 25-OCT-1996 12:19 Sample Time: 24-OCT-1996 12:00 Energy Offset: 3.41583E+03
Real Time : 0 16:38:37.99 Sample ID : 96E04515 Energy Slope : 3.23575E+00
Live Time : 0 16:38:30.00 Sample Type: TH Energy Quad : -2.06395E-04



VMS Peak Search Report V1.9 Generated 28-OCT-1996 11:31:58

8019

Configuration : MCA0:[ALPHA]ALPHA0$1
Analyses by : ROIPEAK V1.2
Sample title : 96E-0640-03
Sample date : 24-OCT-1996 12:00:00 Acquisition date : 25-OCT-1996 12:19:50
Sample ID : 96E04515 Sample quantity : 0.47060 S
Sample type : TH Sample geometry :
Elapsed live time: 0 16:38:30.00 Elapsed real time: 0 16:38:37.99 0.0%
Start energy : 3419.06 keV End energy : 6512.81 keV
Gross/Net areas : Gross Background type :
Num avg bkg chans: 2 Critical level : No

Pk	It	Energy	Area	Bkgnd	FWHM	Channel	Left	Pw	Cts/Sec	%Err	Fit
1	0	3917.39	7	0	3.24	156.57	104	96	1.17E-04	37.8	
2	0	4657.71	67	0	99.33	393.69	310	107	1.12E-03	12.2	
3	0	4886.67	1838	0	74.99	468.56	416	127	3.07E-02	2.3	
4	0	5380.98	24	0	97.00	632.88	542	118	4.01E-04	20.4	
5	0	6022.14	4	0	190.50	851.75	794	96	6.68E-05	50.0	

VMS Peak Search Report V1.9 Generated 28-OCT-1996 11:32:07

8019

Configuration : DKA0:[ALPHA.ALUSR.ARCHIVE.B]B_014_NONE.CNF;371
Analyses by : ROIPEAK V1.2
Sample title : 96M-0304-10
Sample date : 18-OCT-1996 14:52:05 Acquisition date : 18-OCT-1996 14:52:25
Sample ID : 014 Sample quantity : 1.0000 SAMPLE
Sample type : NONE Sample geometry :
Elapsed live time: 0 16:38:42.00 Elapsed real time: 0 16:38:30.99 0.0%
Start energy : 3427.61 keV End energy : 6511.12 keV
Gross/Net areas : Gross Background type :
Num avg bkg chans: 2 Critical level : No

Pk	It	Energy	Area	Bkgnd	FWHM	Channel	Left	Pw	Cts/Sec	%Err	Fit
1	0	3908.12	2	0	199.89	151.50	104	96	3.34E-05	70.7	
2	0	4567.72	5	0	0.00	363.00	310	107	8.34E-05	44.7	
3	0	4921.71	3	0	0.00	479.00	416	127	5.01E-05	57.7	
4	0	5286.58	8	0	3.22	600.50	542	118	1.34E-04	35.4	
5	0	5992.43	3	0	199.89	841.50	794	96	5.01E-05	57.7	

VMS Nuclide Identification Report V2.9 Generated 28-OCT-1996 11:32:23 **8019**

Configuration : MCA0:[ALPHA]ALPHA0$1
Analyses by : ROIPEAK V1.2,PEAKEFF V2.2,ENBACK V1.5,NID V3.1,WTMEAN V1.8
Sample title : 96E-0640-03
Sample date : 24-OCT-1996 12:00:00 Acquisition date : 25-OCT-1996 12:19:50
Sample ID : 96E04515 Sample quantity : 0.47060 S
Sample type : TH Sample geometry :
Elapsed live time: 0 16:38:30.00 Elapsed real time: 0 16:38:37.99 0.0%
Energy tolerance : 100.00 keV Half life ratio : 8.00
Errors propagated: Yes Systematic Error : 0.00 %
Efficiency type : Average value Efficiencies at : Peak Energy
Abundance limit : 75.00

Summary of Nuclide Activity

Total number of lines in spectrum 5
Number of unidentified lines 0
Number of lines tentatively identified by NID 5 100.00%

Nuclide Type : Alpha

Nuclide	Hlife	Decay	Wtd Mean Uncorrected (pCi)	Wtd Mean Decay Corr (pCi)	Decay Corr 2-Sigma Error	2-Sigma %Error	Flags
TH-227	18.72D	1.05	9.552E-03	1.005E-02	5.312E-02	528.80	
Total Activity :			9.552E-03	1.005E-02			

Nuclide Type : ALPHA

Nuclide	Hlife	Decay	Wtd Mean Uncorrected (pCi)	Wtd Mean Decay Corr (pCi)	Decay Corr 2-Sigma Error	2-Sigma %Error	Flags
TH228	1.91Y	1.00	8.223E-02	8.234E-02	5.828E-02	70.78	
TH229	7340.00Y	1.00	9.470E+00	9.470E+00	0.540E+00	5.70	
TH-230	7.70E+04Y	1.00	3.190E-01	3.190E-01	0.879E-01	27.57	
TH-232	1.41E+10Y	1.00	2.568E-02	2.568E-02	3.082E-02	120.03	
Total Activity :			9.897E+00	9.897E+00			

Grand Total Activity : 9.906E+00 9.907E+00

Flags: "K" = Keyline not found "M" = Manually accepted
"E" = Manually edited "A" = Nuclide specific abn. limit

DATACHEM
ALPHA SPECTROSCOPY REPORT

8019

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SAMPLE TITLE: 96E-0640-03
SAMPLE DATE: 24-OCT-1996 12:00:00
ELAPSED LIVE TIME: 59910.
AVERAGE %EFFICIENCY: 18.6656
TRACER DPM: 10.7293

SAMPLE ID: 96E04515
SAMPLE QUANT: 0.4706 S
DETECTOR #: 014
YIELD: 92.2076

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NUCLIDE ACTIVITY SUMMARY

NUCLIDE	ENERGY	NET AREA	BKG	%ABN	ACTIVITY pCi/S	ERROR 2-SIGMA	MDA pCi/S
TH-227	6006.	1.001	2.999	53.80	1.089E-02	5.761E-02	1.144E-01
TH-228	5400.	16.002	7.998	99.94	8.930E-02	6.341E-02	9.001E-02
TH229	4872.	1835.001	2.999	99.52	1.027E+01	5.858E-01	6.186E-02
TH-230	4672.	62.001	4.999	99.82	3.460E-01	9.738E-02	7.475E-02
TH-232	3997.	5.000	2.000	100.00	2.785E-02	3.347E-02	5.333E-02

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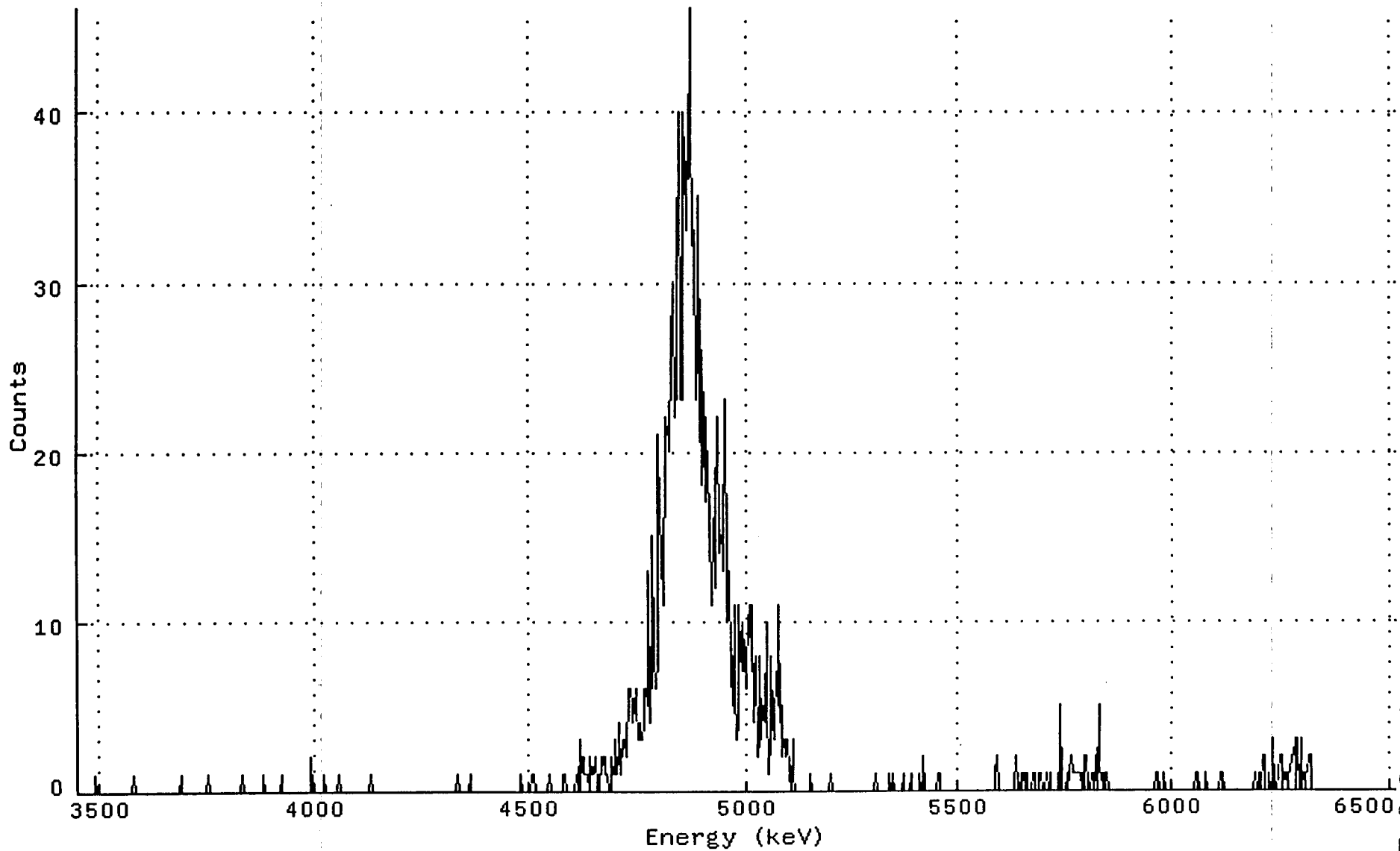
REVIEWED BY: DATE:

Spectrum : DKA0:[ALPHA.ALUSR.ARCHIVE.S]S_96E04516_TH.CNF;1
Title : GAR015
Sample Title: 96E-0640-03
Start Time: 25-OCT-1996 12:19 Sample Time: 24-OCT-1996 12:00 Energy Offset: 3.44748E+03
Real Time : 0 16:38:37.99 Sample ID : 96E04516 Energy Slope : 3.22269E+00
Live Time : 0 16:38:52.99 Sample Type: TH Energy Quad : -2.27141E-04



VMS Peak Search Report V1.9 Generated 28-OCT-1996 11:32:47

8019

Configuration : MCA0:[ALPHA]ALPHA0$1
Analyses by : ROIPEAK V1.2
Sample title : 96E-0640-03
Sample date : 24-OCT-1996 12:00:00 Acquisition date : 25-OCT-1996 12:19:50
Sample ID : 96E04516 Sample quantity : 0.49980 S
Sample type : TH Sample geometry :
Elapsed live time: 0 16:38:52.99 Elapsed real time: 0 16:38:37.99 0.0%
Start energy : 3450.70 keV End energy : 6509.34 keV
Gross/Net areas : Gross Background type :
Num avg bkg chans: 2 Critical level : No

Pk	It	Energy	Area	Bkgnd	FWHM	Channel	Left	Pw	Cts/Sec	%Err	Fit
1	0	3913.60	7	0	3.22	146.14	95	95	1.17E-04	37.8	
2	0	4657.34	61	0	113.81	385.92	302	107	1.02E-03	12.8	
3	0	4888.88	1672	0	80.87	462.33	408	129	2.79E-02	2.4	
4	0	5293.42	16	0	0.00	598.00	536	120	2.67E-04	25.0	
5	0	6040.37	8	0	180.47	856.25	791	98	1.33E-04	35.4	

VMS Peak Search Report V1.9 Generated 28-OCT-1996 11:32:57

8019

Configuration : DKA0:[ALPHA.ALUSR.ARCHIVE.B]B_015_NONE.CNF;371
Analyses by : ROIPEAK V1.2
Sample title : 96M-0304-10
Sample date : 18-OCT-1996 14:52:06 Acquisition date : 18-OCT-1996 14:52:25
Sample ID : 015 Sample quantity : 1.0000 SAMPLE
Sample type : NONE Sample geometry :
Elapsed live time: 0 16:38:34.99 Elapsed real time: 0 16:38:30.99 0.0%
Start energy : 3462.14 keV End energy : 6537.73 keV
Gross/Net areas : Gross Background type :
Num avg bkg chans: 2 Critical level : No

Pk	It	Energy	Area	Bkgnd	FWHM	Channel	Left	Pw	Cts/Sec	%Err	Fit
1	0	3905.77	4	0	268.97	142.00	95	95	6.68E-05	50.0	
2	0	4563.97	3	0	38.03	355.00	302	107	5.01E-05	57.7	
3	0	4919.40	3	0	320.07	472.00	408	129	5.01E-05	57.7	
4	0	5289.87	3	0	218.66	595.50	536	120	5.01E-05	57.7	
5	0	6007.57	0	0	0.00	839.50	791	98	0.00E+00	0.0	

VMS Nuclide Identification Report V2.9 Generated 28-OCT-1996 11:33:11 8019

Configuration : MCA0:[ALPHA]ALPHA0$1
Analyses by : ROIPEAK V1.2,PEAKEFF V2.2,ENBACK V1.5,NID V3.1,WTMEAN V1.8
Sample title : 96E-0640-03
Sample date : 24-OCT-1996 12:00:00 Acquisition date : 25-OCT-1996 12:19:50
Sample ID : 96E04516 Sample quantity : 0.49980 S
Sample type : TH Sample geometry :
Elapsed live time: 0 16:38:52.99 Elapsed real time: 0 16:38:37.99 0.0%
Energy tolerance : 100.00 keV Half life ratio : 8.00
Errors propagated: Yes Systematic Error : 0.00 %
Efficiency type : Average value Efficiencies at : Peak Energy
Abundance limit : 75.00

Summary of Nuclide Activity

Total number of lines in spectrum 5
Number of unidentified lines 0
Number of lines tentatively identified by NID 5 100.00%

Nuclide Type : Alpha

Nuclide	Hlife	Decay	Wtd Mean Uncorrected (pCi)	Wtd Mean Decay Corr (pCi)	Decay Corr 2-Sigma Error	2-Sigma %Error	Flags
TH-227	18.72D	1.05	6.950E-02	7.309E-02	5.173E-02	70.79	
Total Activity :			6.950E-02	7.309E-02			

Nuclide Type : ALPHA

Nuclide	Hlife	Decay	Wtd Mean Uncorrected (pCi)	Wtd Mean Decay Corr (pCi)	Decay Corr 2-Sigma Error	2-Sigma %Error	Flags
TH228	1.91Y	1.00	6.079E-02	6.087E-02	4.087E-02	67.15	
TH229	7340.00Y	1.00	7.838E+00	7.838E+00	0.461E+00	5.89	
TH-230	7.70E+04Y	1.00	2.716E-01	2.716E-01	0.754E-01	27.78	
TH-232	1.41E+10Y	1.00	1.402E-02	1.402E-02	3.101E-02	221.25	
Total Activity :			8.184E+00	8.184E+00			

Grand Total Activity : 8.254E+00 8.257E+00

Flags: "K" = Keyline not found "M" = Manually accepted
"E" = Manually edited "A" = Nuclide specific abn. limit

DATACHEM
ALPHA SPECTROSCOPY REPORT

8019

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SAMPLE TITLE: 96E-0640-03
SAMPLE DATE: 24-OCT-1996 12:00:00
ELAPSED LIVE TIME: 59933.
AVERAGE %EFFICIENCY: 19.3055
TRACER DPM: 10.7293

SAMPLE ID: 96E04516
SAMPLE QUANT: 0.4998 S
DETECTOR #: 015
YIELD: 81.0549

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NUCLIDE ACTIVITY SUMMARY

NUCLIDE	ENERGY	NET AREA	BKG	%ABN	ACTIVITY pCi/S	ERROR 2-SIGMA	MDA pCi/S
TH-227	6006.	8.000	0.000	53.80	9.017E-02	6.405E-02	3.215E-02
TH-228	5400.	12.999	3.001	99.94	7.510E-02	5.062E-02	6.378E-02
TH229	4872.	1668.999	3.001	99.52	9.670E+00	5.694E-01	6.405E-02
TH-230	4672.	57.999	3.001	99.82	3.350E-01	9.513E-02	6.386E-02
TH-232	3997.	2.999	4.001	100.00	1.729E-02	3.827E-02	7.093E-02

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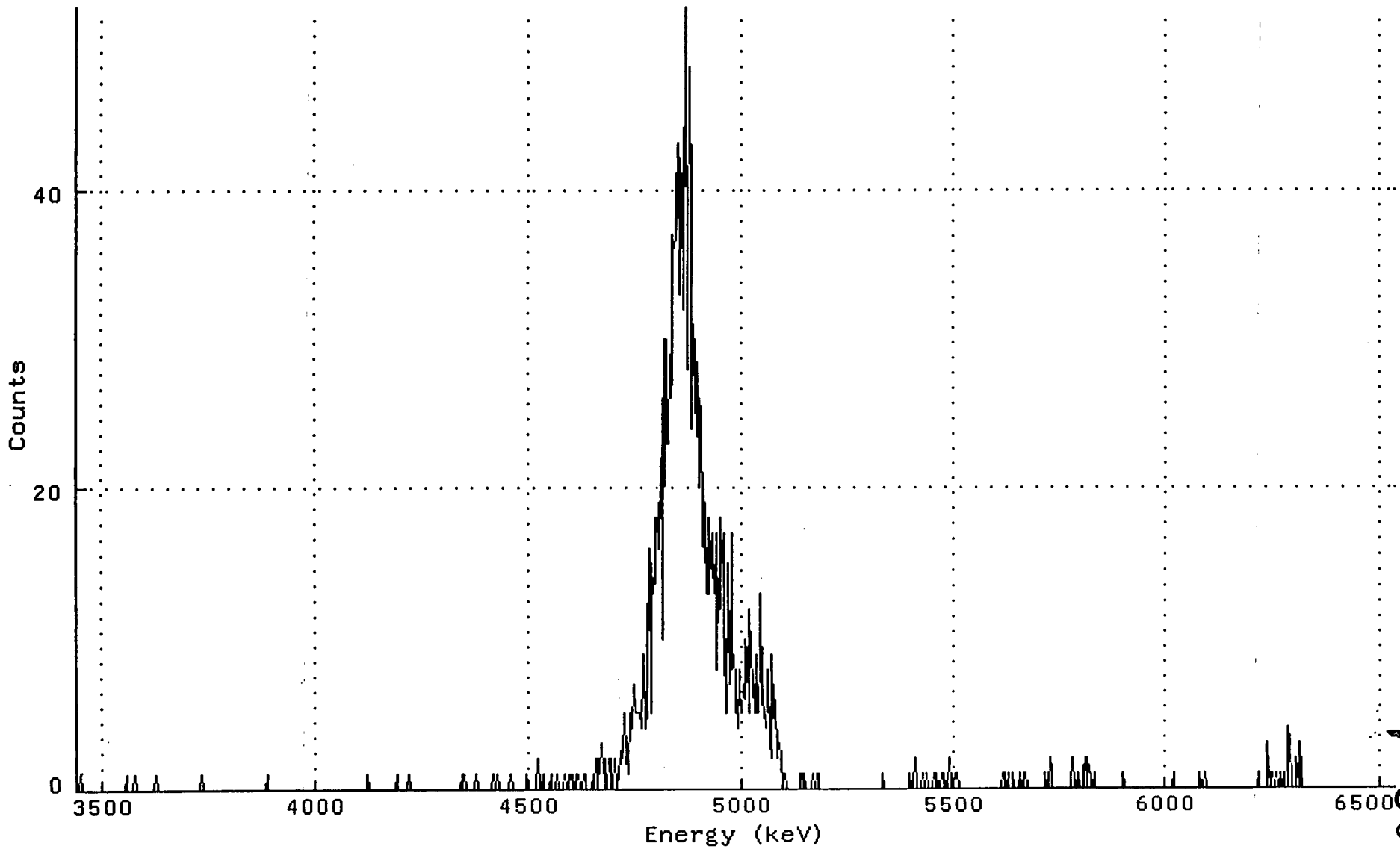
REVIEWED BY: DATE:

Spectrum : DKA0:[ALPHA.ALUSR.ARCHIVE.S]S_96E04517_TH.CNF;1
Title : GAR016
Sample Title: 96E-0640-03
Start Time: 25-OCT-1996 12:19 Sample Time: 24-OCT-1996 12:00 Energy Offset: 3.43681E+03
Real Time : 0 16:38:37.99 Sample ID : 96E04517 Energy Slope : 3.17957E+00
Live Time : 0 16:38:27.99 Sample Type: TH Energy Quad : -1.55009E-04



VMS Peak Search Report V1.9 Generated 28-OCT-1996 11:33:41

8019

Configuration : MCA0:[ALPHA]ALPHA0$1
Analyses by : ROIPEAK V1.2
Sample title : 96E-0640-03
Sample date : 24-OCT-1996 12:00:00 Acquisition date : 25-OCT-1996 12:19:50
Sample ID : 96E04517 Sample quantity : 0.49950 S
Sample type : TH Sample geometry :
Elapsed live time: 0 16:38:27.99 Elapsed real time: 0 16:38:37.99 0.0%
Start energy : 3439.99 keV End energy : 6530.16 keV
Gross/Net areas : Gross Background type :
Num avg bkg chans: 2 Critical level : No

Pk	It	Energy	Area	Bkgnd	FWHM	Channel	Left	Pw	Cts/Sec	%Err	Fit
1	0	3885.19	1	0	3.18	142.00	99	97	1.67E-05	100.0	
2	0	4641.09	57	0	0.00	386.02	308	106	9.51E-04	13.2	
3	0	4884.62	1795	0	80.52	465.93	413	128	3.00E-02	2.4	
4	0	5304.36	14	0	3.18	605.21	540	118	2.34E-04	26.7	
5	0	6023.08	4	0	209.85	848.50	791	95	6.68E-05	50.0	

VMS Peak Search Report V1.9 Generated 28-OCT-1996 11:33:51

8019

Configuration : DKA0:[ALPHA.ALUSR.ARCHIVE.B]B_016_NONE.CNF;370
Analyses by : ROIPEAK V1.2
Sample title : 96M-0304-10
Sample date : 18-OCT-1996 14:52:07 Acquisition date : 18-OCT-1996 14:52:25
Sample ID : 016 Sample quantity : 1.0000 SAMPLE
Sample type : NONE Sample geometry :
Elapsed live time: 0 16:38:39.99 Elapsed real time: 0 16:38:32.00 0.0%
Start energy : 3428.45 keV End energy : 6521.52 keV
Gross/Net areas : Gross Background type :
Num avg bkg chans: 2 Critical level : No

Pk	It	Energy	Area	Bkgnd	FWHM	Channel	Left	Pw	Cts/Sec	%Err	Fit
1	0	3895.02	1	0	3.22	147.00	99	97	1.67E-05	100.0	
2	0	4562.22	1	0	3.22	360.50	308	106	1.67E-05	100.0	
3	0	4917.23	2	0	90.29	476.50	413	128	3.34E-05	70.7	
4	0	5284.90	2	0	222.50	598.50	540	118	3.34E-05	70.7	
5	0	5989.69	1	0	3.22	838.00	791	95	1.67E-05	100.0	

VMS Nuclide Identification Report V2.9 Generated 28-OCT-1996 11:34:06

8019

Configuration : MCA0:[ALPHA]ALPHA0$1
Analyses by : ROIPEAK V1.2,PEAKEFF V2.2,ENBACK V1.5,NID V3.1,WTMEAN V1.8
Sample title : 96E-0640-03
Sample date : 24-OCT-1996 12:00:00 Acquisition date : 25-OCT-1996 12:19:50
Sample ID : 96E04517 Sample quantity : 0.49950 S
Sample type : TH Sample geometry :
Elapsed live time: 0 16:38:27.99 Elapsed real time: 0 16:38:37.99 0.0%
Energy tolerance : 100.00 keV Half life ratio : 8.00
Errors propagated: Yes Systematic Error : 0.00 %
Efficiency type : Average value Efficiencies at : Peak Energy
Abundance limit : 75.00

Summary of Nuclide Activity

Total number of lines in spectrum 5
Number of unidentified lines 0
Number of lines tentatively identified by NID 5 100.00%

Nuclide Type : Alpha

Nuclide	Hlife	Decay	Wtd Mean Uncorrected (pCi)	Wtd Mean Decay Corr (pCi)	Decay Corr 2-Sigma Error	2-Sigma %Error	Flags
TH-227	18.72D	1.05	2.641E-02	2.777E-02	4.141E-02	149.09	
Total Activity :			2.641E-02	2.777E-02			

Nuclide Type : ALPHA

Nuclide	Hlife	Decay	Wtd Mean Uncorrected (pCi)	Wtd Mean Decay Corr (pCi)	Decay Corr 2-Sigma Error	2-Sigma %Error	Flags
TH-228	1.91Y	1.00	5.686E-02	5.694E-02	3.800E-02	66.74	
TH-229	7340.00Y	1.00	8.532E+00	8.532E+00	0.491E+00	5.75	
TH-230	7.70E+04Y	1.00	2.657E-01	2.657E-01	0.728E-01	27.40	
TH-232	1.41E+10Y	1.00	9.484E-07	9.484E-07	**********		
Total Activity :			8.855E+00	8.855E+00			

Grand Total Activity : 8.881E+00 8.882E+00

Flags: "K" = Keyline not found "M" = Manually accepted
"E" = Manually edited "A" = Nuclide specific abn. limit

DATACHEM
ALPHA SPECTROSCOPY REPORT

8019

SAMPLE TITLE: 96E-0640-03
SAMPLE DATE: 24-OCT-1996 12:00:00
ELAPSED LIVE TIME: 59908.
AVERAGE %EFFICIENCY: 19.0720
TRACER DPM: 10.7293

SAMPLE ID: 96E04517
SAMPLE QUANT: 0.4995 S
DETECTOR #: 016
YIELD: 88.1799

NUCLIDE ACTIVITY SUMMARY

NUCLIDE	ENERGY	NET AREA	BKG	%ABN	ACTIVITY pCi/S	ERROR 2-SIGMA	MDA pCi/S
TH-227	6006.	3.000	1.000	53.80	3.150E-02	4.699E-02	7.636E-02
TH-228	5400.	12.000	2.000	99.94	6.457E-02	4.326E-02	5.146E-02
TH229	4872.	1793.000	2.000	99.52	9.676E+00	5.567E-01	5.167E-02
TH-230	4672.	56.000	1.000	99.82	3.013E-01	8.434E-02	4.116E-02
TH-232	3997.	0.000	1.000	100.00	1.076E-06	1.519E-02	4.108E-02

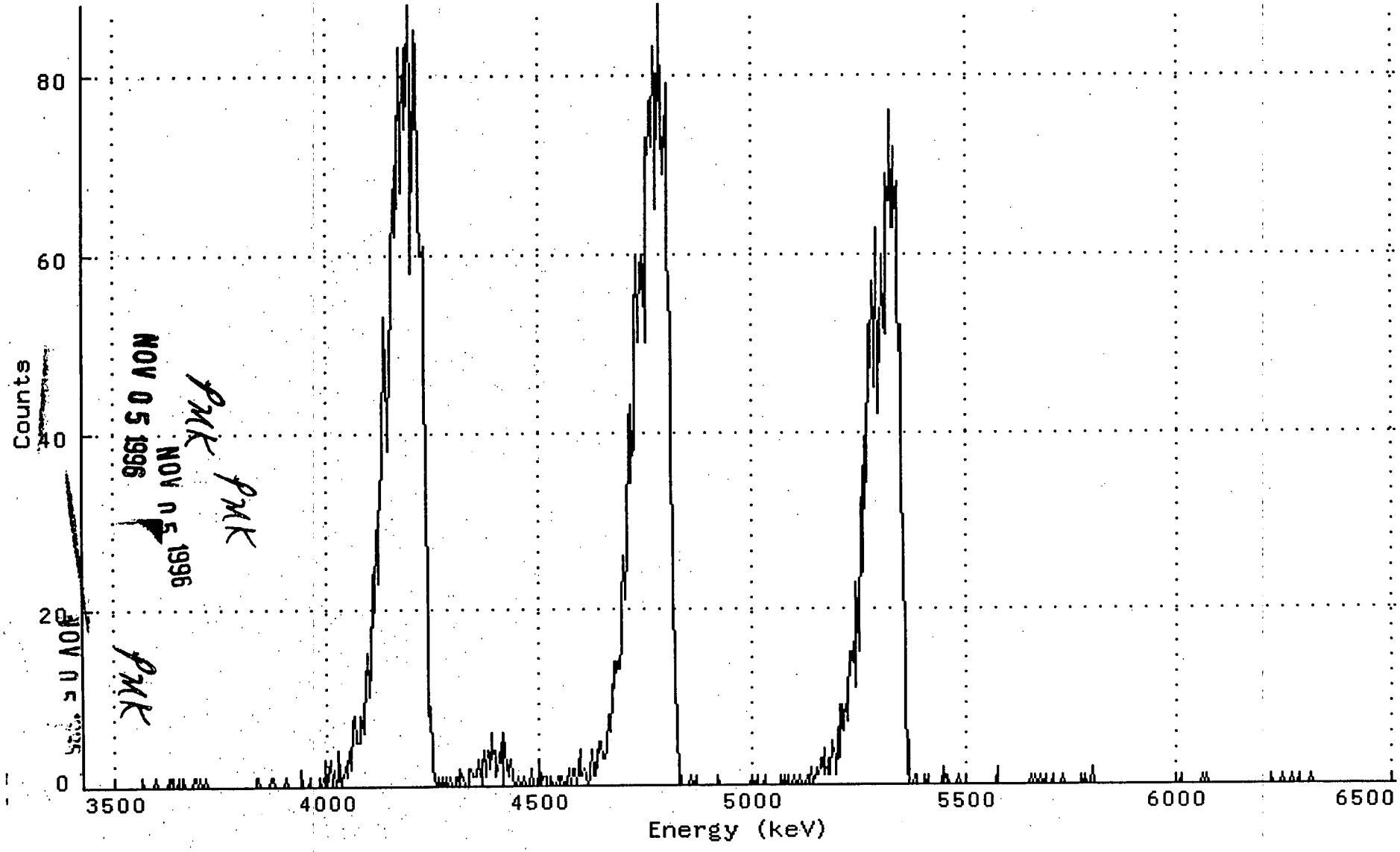
REVIEWED BY: DATE:

PMK

NOV 05 1996

U-iso

Spectrum : DKA0:[ALPHA.ALUSR.ARCHIVE.C]C_QC-123238-1_UU.CNF;1
Title : GAR009
Sample Title: 96E-0640-02
Start Time: 24-OCT-1996 09:45 Sample Time: 24-OCT-1996 12:00 Energy Offset: 3.42724E+03
Real Time : 0 16:38:42.99 Sample ID : QC-123238-1 Energy Slope : 3.24168E+00
Live Time : 0 16:38:30.99 Sample Type: UU Energy Quad : -2.29423E-04



NOV 05 1996
NOV 05 1996
NOV 05 1996
PNK
PNK
PNK

VMS Peak Search Report V1.9 Generated 25-OCT-1996 09:21:39

8019

Configuration : MCA0:[ALPHA]ALPHA0$1
Analyses by : ROIPEAK V1.2
Sample title : 96E-0640-02
Sample date : 24-OCT-1996 12:00:00 Acquisition date : 24-OCT-1996 09:45:25
Sample ID : QC-123238-1 Sample quantity : 1.0000 L
Sample type : UU Sample geometry :
Elapsed live time: 0 16:38:30.99 Elapsed real time: 0 16:38:42.99 0.0%
Start energy : 3430.48 keV End energy : 6506.15 keV
Gross/Net areas : Gross Background type :
Num avg bkg chans: 2 Critical level : No

Pk	It	Energy	Area	Bkgnd	FWHM	Channel	Left	Pw	Cts/Sec	%Err	Fit
1	0	4175.50	2542	0	99.96	234.73	141	120	4.24E-02	2.0	
2	0	4397.19	108	0	55.08	305.83	260	96	1.80E-03	9.6	
3	0	4756.90	2478	0	92.62	422.83	355	182	4.14E-02	2.0	
4	0	5293.62	2036	0	93.57	601.34	536	89	3.40E-02	2.2	

VMS Peak Search Report V1.9 Generated 25-OCT-1996 09:21:47

8019

Configuration : DKA0:[ALPHA.ALUSR.ARCHIVE.B]B_009_NONE.CNF;377
Analyses by : ROIPEAK V1.2
Sample title : 96M-0303-10
Sample date : 18-OCT-1996 14:52:00 Acquisition date : 18-OCT-1996 14:52:25
Sample ID : 009 Sample quantity : 1.0000 SAMPLE
Sample type : NONE Sample geometry :
Elapsed live time: 0 16:38:37.99 Elapsed real time: 0 16:38:29.00 0.0%
Start energy : 3442.87 keV End energy : 6518.62 keV
Gross/Net areas : Gross Background type :
Num avg bkg chans: 2 Critical level : No

Pk	It	Energy	Area	Bkgnd	FWHM	Channel	Left	Pw	Cts/Sec	%Err	Fit
1	0	4072.61	5	0	293.79	200.50	141	120	8.34E-05	44.7	
2	0	4404.40	2	0	182.02	307.50	260	96	3.34E-05	70.7	
3	0	4826.15	4	0	0.00	445.50	355	182	6.68E-05	50.0	
4	0	5230.52	7	0	3.19	580.00	536	89	1.17E-04	37.8	

VMS Nuclide Identification Report V2.9 Generated 25-OCT-1996 09:21:59

8019

Configuration : MCA0:[ALPHA]ALPHA0$1
Analyses by : ROIPEAK V1.2,PEAKEFF V2.2,ENBACK V1.5,NID V3.1,WTMEAN V1.8
Sample title : 96E-0640-02
Sample date : 24-OCT-1996 12:00:00 Acquisition date : 24-OCT-1996 09:45:25
Sample ID : QC-123238-1 Sample quantity : 1.0000 L
Sample type : UU Sample geometry :
Elapsed live time: 0 16:38:30.99 Elapsed real time: 0 16:38:42.99 0.0%
Energy tolerance : 100.00 keV Half life ratio : 8.00
Errors propagated: Yes Systematic Error : 0.00 %
Efficiency type : Average value Efficiencies at : Peak Energy
Abundance limit : 75.00

Summary of Nuclide Activity

Total number of lines in spectrum	4	
Number of unidentified lines	0	
Number of lines tentatively identified by NID	4	100.00%

Nuclide Type : ALPHA

Nuclide	Hlife	Decay	Wtd Mean Uncorrected pCi/L	Wtd Mean Decay Corr pCi/L	Decay Corr 2-Sigma Error	2-Sigma %Error	Flags
U-232	72.00Y	1.00	4.895E+00	4.895E+00	0.270E+00	5.53	
U-234	2.45E+05Y	1.00	5.969E+00	5.969E+00	0.310E+00	5.19	
U-235	7.04E+08Y	1.00	3.161E-01	3.161E-01	0.634E-01	20.06	
U-238	4.47E+09Y	1.00	6.133E+00	6.133E+00	0.316E+00	5.15	
	Total Activity :		1.731E+01	1.731E+01			
	Grand Total Activity :		1.731E+01	1.731E+01			

Flags: "K" = Keyline not found "M" = Manually accepted
"E" = Manually edited "A" = Nuclide specific abn. limit

DATACHEM
ALPHA SPECTROSCOPY REPORT

8019

****

SAMPLE TITLE: 96E-0640-02
SAMPLE DATE: 24-OCT-1996 12:00:00
ELAPSED LIVE TIME: 59911.
AVERAGE %EFFICIENCY: 18.6982
TRACER DPM: 11.1955

SAMPLE ID: QC-123238-1
SAMPLE QUANT: 1.0000 L
DETECTOR #: 009
YIELD: 97.0706

****

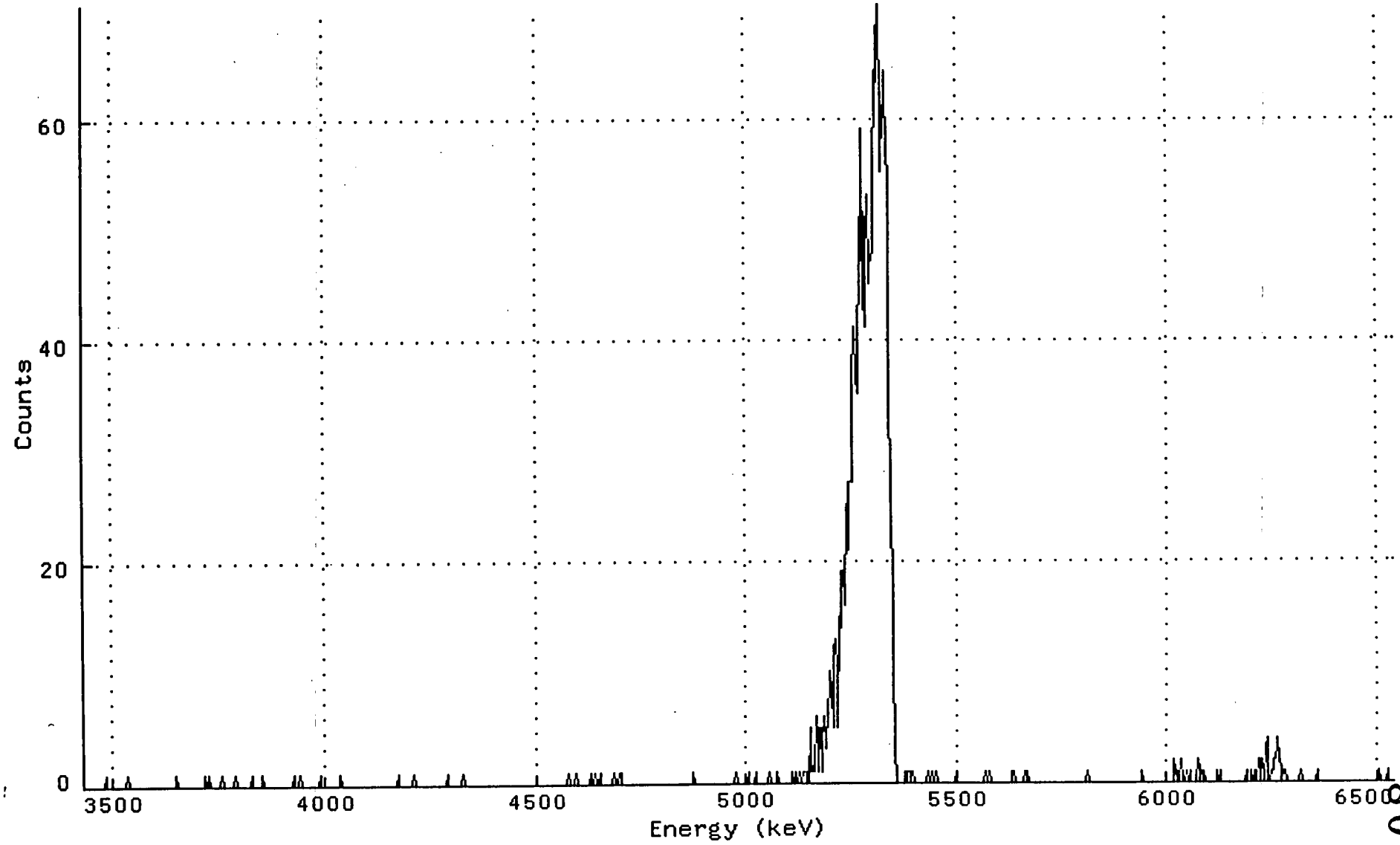
NUCLIDE ACTIVITY SUMMARY

NUCLIDE	ENERGY	NET AREA	BKG	%ABN	ACTIVITY pCi/L	ERROR 2-SIGMA	MDA pCi/L
U232	5306.	2029.001	6.999	100.00	5.043E+00	2.786E-01	3.803E-02
U-234	4762.	2474.000	4.000	100.00	6.149E+00	4.660E-01	3.057E-02
U-235	4386.	106.000	2.000	80.90	3.257E-01	6.775E-02	2.942E-02
U-238	4185.	2537.000	4.999	99.80	6.318E+00	4.772E-01	3.336E-02

****

REVIEWED BY: DATE:

Spectrum : DKA0:[ALPHA.ALUSR.ARCHIVE.R]R_BL-123238-1_UU.CNF;1
Title : GAR008
Sample Title: 96E-0640-02
Start Time: 24-OCT-1996 09:45 Sample Time: 24-OCT-1996 12:00 Energy Offset: 3.42930E+03
Real Time : 0 16:38:39.99 Sample ID : BL-123238-1 Energy Slope : 3.24723E+00
Live Time : 0 16:38:37.99 Sample Type: UU Energy Quad : -2.10494E-04



VMS Peak Search Report V1.9 Generated 25-OCT-1996 09:20:55

8019

Configuration : MCA0:[ALPHA]ALPHA0$1
Analyses by : ROIPEAK V1.2
Sample title : 96E-0640-02
Sample date : 24-OCT-1996 12:00:00 Acquisition date : 24-OCT-1996 09:45:25
Sample ID : BL-123238-1 Sample quantity : 1.0000 L
Sample type : UU Sample geometry :
Elapsed live time: 0 16:38:37.99 Elapsed real time: 0 16:38:39.99 0.0%
Start energy : 3432.54 keV End energy : 6533.74 keV
Gross/Net areas : Gross Background type :
Num avg bkg chans: 2 Critical level : No

Pk	It	Energy	Area	Bkgnd	FWHM	Channel	Left	Pw	Cts/Sec	%Err	Fit
1	0	4045.00	6		0295.50	192.00	140	120	1.00E-04	40.8	
2	0	4306.37	2		0 42.21	275.00	259	95	3.34E-05	70.7	
3	0	4800.26	14		0532.55	434.43	353	181	2.34E-04	26.7	
4	0	5288.48	1893		0 91.50	595.54	533	87	3.16E-02	2.3	

VMS Peak Search Report V1.9 Generated 25-OCT-1996 09:21:04

8019

Configuration : DKA0:[ALPHA.ALUSR.ARCHIVE.B]B_008_NONE.CNF;374
Analyses by : ROIPEAK V1.2
Sample title : 96M-0303-10
Sample date : 18-OCT-1996 14:52:00 Acquisition date : 18-OCT-1996 14:52:25
Sample ID : 008 Sample quantity : 1.0000 G
Sample type : NONE Sample geometry :
Elapsed live time: 0 16:38:34.00 Elapsed real time: 0 16:38:30.99 0.0%
Start energy : 3435.32 keV End energy : 6532.03 keV
Gross/Net areas : Gross Background type :
Num avg bkg chans: 2 Critical level : No

Pk	It	Energy	Area	Bkgnd	FWHM	Channel	Left	Pw	Cts/Sec	%Err	Fit
1	0	4071.10	10		0275.88	199.50	140	120	1.67E-04	31.6	
2	0	4405.28	3		0 74.65	306.00	259	95	5.01E-05	57.7	
3	0	4828.05	12		0509.57	443.00	353	181	2.00E-04	28.9	
4	0	5230.83	4		0100.62	576.00	533	87	6.68E-05	50.0	

VMS Nuclide Identification Report V2.9 Generated 25-OCT-1996 09:21:16 **8019**

Configuration : MCA0:[ALPHA]ALPHA0$1
Analyses by : ROIPEAK V1.2,PEAKEFF V2.2,ENBACK V1.5,NID V3.1,WTMEAN V1.8
Sample title : 96E-0640-02
Sample date : 24-OCT-1996 12:00:00 Acquisition date : 24-OCT-1996 09:45:25
Sample ID : BL-123238-1 Sample quantity : 1.0000 L
Sample type : UU Sample geometry :
Elapsed live time: 0 16:38:37.99 Elapsed real time: 0 16:38:39.99 0.0%
Energy tolerance : 100.00 keV Half life ratio : 8.00
Errors propagated: Yes Systematic Error : 0.00 %
Efficiency type : Average value Efficiencies at : Peak Energy
Abundance limit : 75.00

Summary of Nuclide Activity

Total number of lines in spectrum 4
Number of unidentified lines 0
Number of lines tentatively identified by NID 4 100.00%

Nuclide Type : ALPHA

Nuclide	Hlife	Decay	Wtd Mean Uncorrected pCi/L	Wtd Mean Decay Corr pCi/L	Decay Corr 2-Sigma Error	2-Sigma %Error	Flags
U-232	72.00Y	1.00	4.430E+00	4.430E+00	0.250E+00	5.65	
U-234	2.45E+05Y	1.00	4.688E-03	4.688E-03	23.92E-03	510.13	
U-235	7.04E+08Y	1.00	-2.899E-03	-2.899E-03	12.96E-03	-447.15	
U-238	4.47E+09Y	1.00	-9.400E-03	-9.400E-03	18.80E-03	-200.00	
			---	---			
	Total Activity :		4.422E+00	4.422E+00			
	Grand Total Activity :		4.422E+00	4.422E+00			

Flags: "K" = Keyline not found "M" = Manually accepted
"E" = Manually edited "A" = Nuclide specific abn. limit

DATACHEM
ALPHA SPECTROSCOPY REPORT

8019

SAMPLE TITLE: 96E-0640-02
SAMPLE DATE: 24-OCT-1996 12:00:00
ELAPSED LIVE TIME: 59918.
AVERAGE %EFFICIENCY: 19.2353
TRACER DPM: 11.1955

SAMPLE ID: BL-123238-1
SAMPLE QUANT: 1.0000 L
DETECTOR #: 008
YIELD: 87.8391

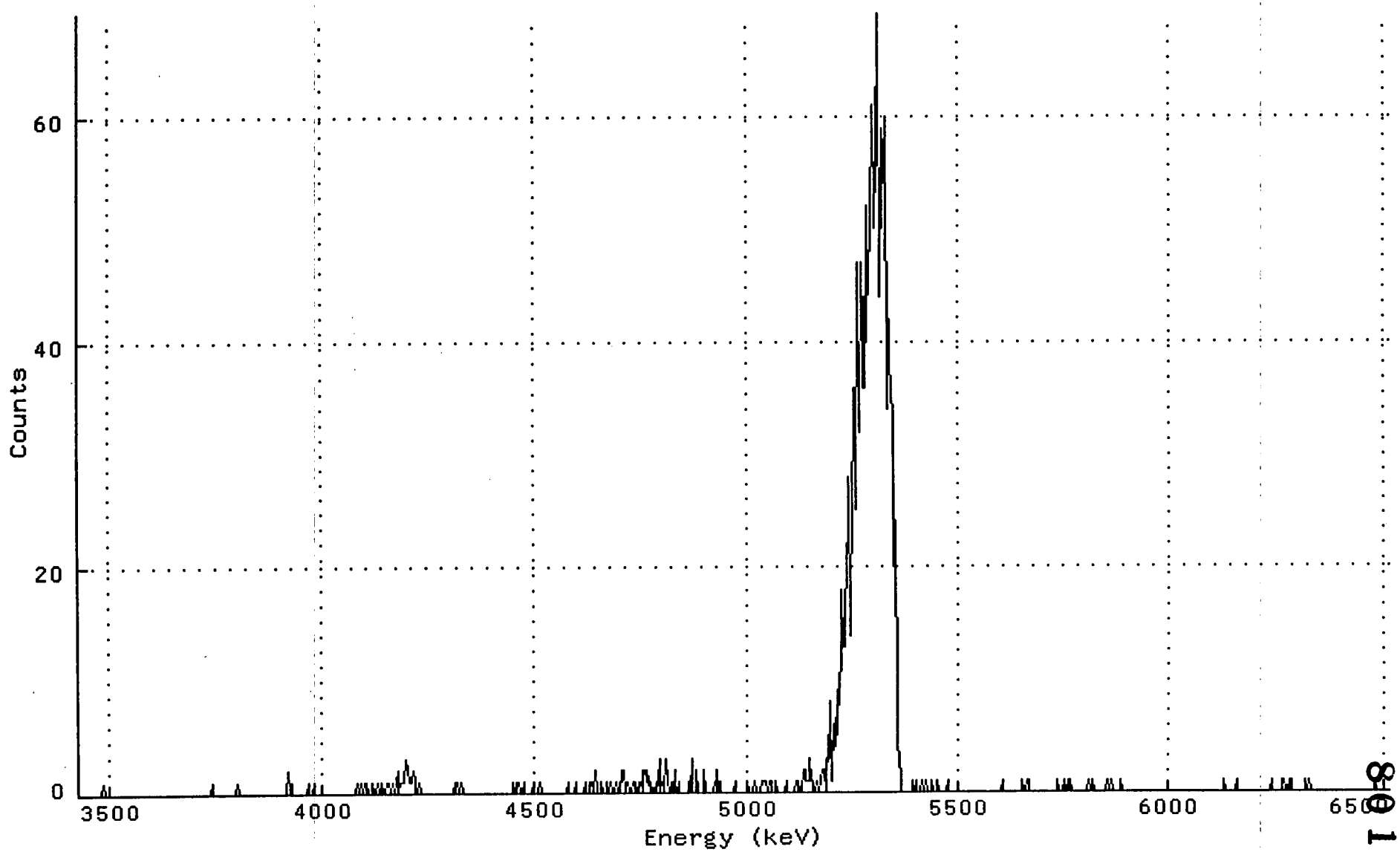
NUCLIDE ACTIVITY SUMMARY

NUCLIDE	ENERGY	NET AREA	BKG	%ABN	ACTIVITY pCi/L	ERROR 2-SIGMA	MDA pCi/L
U232	5306.	1889.000	4.000	100.00	5.043E+00	2.851E-01	3.284E-02
U-234	4762.	1.999	12.001	100.00	5.337E-03	2.723E-02	5.101E-02
U-235	4386.	1.000	3.000	80.90	-3.301E-03	1.476E-02	3.648E-02
U-238	4185.	4.001	10.001	99.80	-1.070E-02	2.141E-02	4.736E-02

REVIEWED BY:

DATE:

Spectrum : DKA0:[ALPHA.ALUSR.ARCHIVE.S]S_96E04514_UU.CNF;1
Title : GAR010
Sample Title: 96E-0640-02
Start Time: 24-OCT-1996 09:45 Sample Time: 24-OCT-1996 12:00 Energy Offset: 3.42642E+03
Real Time : 0 16:38:42.99 Sample ID : 96E04514 Energy Slope : 3.21921E+00
Live Time : 0 16:38:30.99 Sample Type: UU Energy Quad : -2.04592E-04



VMS Peak Search Report V1.9 Generated 25-OCT-1996 09:22:38

8019

Configuration : MCA0:[ALPHA]ALPHA0$1
Analyses by : ROIPEAK V1.2
Sample title : 96E-0640-02
Sample date : 24-OCT-1996 12:00:00 Acquisition date : 24-OCT-1996 09:45:25
Sample ID : 96E04514 Sample quantity : 0.20000 L
Sample type : UU Sample geometry :
Elapsed live time: 0 16:38:30.99 Elapsed real time: 0 16:38:42.99 0.0%
Start energy : 3429.64 keV End energy : 6508.37 keV
Gross/Net areas : Gross Background type :
Num avg bkg chans: 2 Critical level : No

Pk	It	Energy	Area	Bkgnd	FWHM	Channel	Left	Pw	Cts/Sec	%Err	Fit
1	0	4146.14	37	0308.14		226.84	142	121	6.18E-04	16.4	
2	0	4425.33	9	0209.25		316.67	262	96	1.50E-04	33.3	
3	0	4811.43	70	0304.18		442.69	357	182	1.17E-03	12.0	
4	0	5289.09	1813	0 97.89		601.61	538	89	3.03E-02	2.3	

VMS Peak Search Report V1.9 Generated 25-OCT-1996 09:22:47

8019

Configuration : DKA0:[ALPHA.ALUSR.ARCHIVE.B]B_010_NONE.CNF;377
Analyses by : ROIPEAK V1.2
Sample title : 96M-0303-10
Sample date : 18-OCT-1996 14:52:01 Acquisition date : 18-OCT-1996 14:52:25
Sample ID : 010 Sample quantity : 1.0000 SAMPLE
Sample type : NONE Sample geometry :
Elapsed live time: 0 16:38:37.00 Elapsed real time: 0 16:38:30.00 0.0%
Start energy : 3427.76 keV End energy : 6511.45 keV
Gross/Net areas : Gross Background type :
Num avg bkg chans: 2 Critical level : No

Pk	It	Energy	Area	Bkgnd	FWHM	Channel	Left	Pw	Cts/Sec	%Err	Fit
1	0	4068.85	6	0	235.99	202.00	142	121	1.00E-04	40.8	
2	0	4404.65	3	0	29.09	309.50	262	96	5.01E-05	57.7	
3	0	4828.52	3	0	232.76	447.50	357	182	5.01E-05	57.7	
4	0	5233.82	4	0	113.15	582.00	538	89	6.68E-05	50.0	

VMS Nuclide Identification Report V2.9 Generated 25-OCT-1996 09:23:01

8019

Configuration : MCA0:[ALPHA]ALPHA0$1
Analyses by : ROIPEAK V1.2,PEAKEFF V2.2,ENBACK V1.5,NID V3.1,WTMEAN V1.8
Sample title : 96E-0640-02
Sample date : 24-OCT-1996 12:00:00 Acquisition date : 24-OCT-1996 09:45:25
Sample ID : 96E04514 Sample quantity : 0.20000 L
Sample type : UU Sample geometry :
Elapsed live time: 0 16:38:30.99 Elapsed real time: 0 16:38:42.99 0.0%
Energy tolerance : 100.00 keV Half life ratio : 8.00
Errors propagated: Yes Systematic Error : 0.00 %
Efficiency type : Average value Efficiencies at : Peak Energy
Abundance limit : 75.00

Summary of Nuclide Activity

Total number of lines in spectrum 4
Number of unidentified lines 0
Number of lines tentatively identified by NID 4 100.00%

Nuclide Type : ALPHA

Nuclide	Hlife	Decay	Wtd Mean Uncorrected pCi/L	Wtd Mean Decay Corr pCi/L	Decay Corr 2-Sigma Error	2-Sigma %Error	Flags
U-232	72.00Y	1.00	2.212E+01	2.212E+01	0.127E+01	5.74	
U-234	2.45E+05Y	1.00	8.194E-01	8.194E-01	2.107E-01	25.71	
U-235	7.04E+08Y	1.00	9.070E-02	9.070E-02	10.48E-02	115.51	
U-238	4.47E+09Y	1.00	3.799E-01	3.799E-01	1.612E-01	42.43	
	Total Activity :		2.341E+01	2.341E+01			
	Grand Total Activity :		2.341E+01	2.341E+01			

Flags: "K" = Keyline not found "M" = Manually accepted
"E" = Manually edited "A" = Nuclide specific abn. limit

DATACHEM
ALPHA SPECTROSCOPY REPORT

8019

****

SAMPLE TITLE: 96E-0640-02
SAMPLE DATE: 24-OCT-1996 12:00:00
ELAPSED LIVE TIME: 59911.
AVERAGE %EFFICIENCY: 18.4442
TRACER DPM: 11.1955

SAMPLE ID: 96E04514
SAMPLE QUANT: 0.2000 L
DETECTOR #: 010
YIELD: 87.7371

****

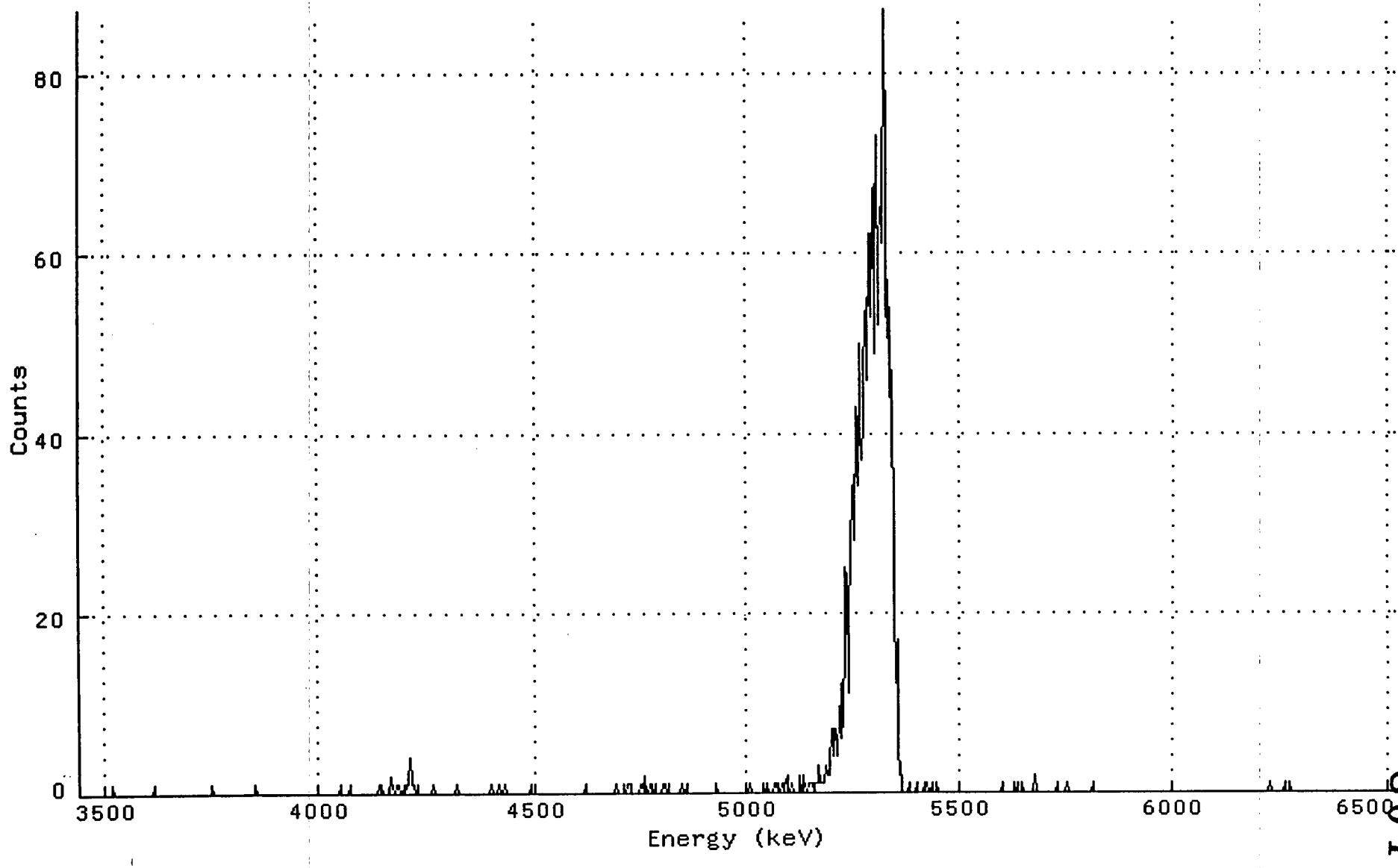
NUCLIDE ACTIVITY SUMMARY

NUCLIDE	ENERGY	NET AREA	BKG	%ABN	ACTIVITY pCi/L	ERROR 2-SIGMA	MDA pCi/L
U232	5306.	1809.000	4.000	100.00	2.522E+01	1.447E+00	1.714E-01
U-234	4762.	67.000	3.000	100.00	9.339E-01	2.461E-01	1.541E-01
U-235	4386.	6.000	3.000	80.90	1.034E-01	1.196E-01	1.904E-01
U-238	4185.	31.001	5.999	99.80	4.330E-01	1.854E-01	2.010E-01

****

REVIEWED BY: DATE:

Spectrum : DKA0:[ALPHA.ALUSR.ARCHIVE.S]S_96E04515_UU.CNF;1
Title : GAR011
Sample Title: 96E-0640-02
Start Time: 24-OCT-1996 09:45 Sample Time: 24-OCT-1996 12:00 Energy Offset: 3.43907E+03
Real Time : 0 16:38:42.99 Sample ID : 96E04515 Energy Slope : 3.20444E+00
Live Time : 0 16:38:47.00 Sample Type: UU Energy Quad : -1.95857E-04



VMS Peak Search Report V1.9 Generated 25-OCT-1996 09:23:22

8019

Configuration : MCA0:[ALPHA]ALPHA0$1
Analyses by : ROIPEAK V1.2
Sample title : 96E-0640-02
Sample date : 24-OCT-1996 12:00:00 Acquisition date : 24-OCT-1996 09:45:25
Sample ID : 96E04515 Sample quantity : 0.20000 L
Sample type : UU Sample geometry :
Elapsed live time: 0 16:38:47.00 Elapsed real time: 0 16:38:42.99 0.0%
Start energy : 3442.27 keV End energy : 6515.04 keV
Gross/Net areas : Gross Background type :
Num avg bkg chans: 2 Critical level : No

Pk	It	Energy	Area	Bkgnd	FWHM	Channel	Left	Pw	Cts/Sec	%Err	Fit
1	0	4181.72	22	0	4.27	235.14	139	121	3.67E-04	21.3	
2	0	4386.38	6	0	237.13	301.17	259	96	1.00E-04	40.8	
3	0	4877.90	33	0	358.90	462.06	354	183	5.51E-04	17.4	
4	0	5291.92	2019	0	83.78	600.23	536	88	3.37E-02	2.2	

VMS Peak Search Report V1.9 Generated 25-OCT-1996 09:23:31

8019

Configuration : DKA0:[ALPHA.ALUSR.ARCHIVE.B]B_011_NONE.CNF;377
Analyses by : ROIPEAK V1.2
Sample title : 96M-0303-10
Sample date : 18-OCT-1996 14:52:02 Acquisition date : 18-OCT-1996 14:52:25
Sample ID : 011 Sample quantity : 1.0000 SAMPLE
Sample type : NONE Sample geometry :
Elapsed live time: 0 16:38:39.99 Elapsed real time: 0 16:38:30.00 0.0%
Start energy : 3447.77 keV End energy : 6526.39 keV
Gross/Net areas : Gross Background type :
Num avg bkg chans: 2 Critical level : No

Pk	It	Energy	Area	Bkgnd	FWHM	Channel	Left	Pw	Cts/Sec	%Err	Fit
1	0	4071.08	3	0127.27		199.00	139	121	5.01E-05	57.7	
2	0	4403.98	3	0108.18		306.50	259	96	5.01E-05	57.7	
3	0	4827.14	6	0340.44		445.00	354	183	1.00E-04	40.8	
4	0	5231.92	7	0209.99		579.50	536	88	1.17E-04	37.8	

VMS Nuclide Identification Report V2.9 Generated 25-OCT-1996 09:23:42

8019

Configuration : MCA0:[ALPHA]ALPHA0$1
Analyses by : ROIPEAK V1.2,PEAKEFF V2.2,ENBACK V1.5,NID V3.1,WTMEAN V1.8
Sample title : 96E-0640-02
Sample date : 24-OCT-1996 12:00:00 Acquisition date : 24-OCT-1996 09:45:25
Sample ID : 96E04515 Sample quantity : 0.20000 L
Sample type : UU Sample geometry :
Elapsed live time: 0 16:38:47.00 Elapsed real time: 0 16:38:42.99 0.0%
Energy tolerance : 100.00 keV Half life ratio : 8.00
Errors propagated: Yes Systematic Error : 0.00 %
Efficiency type : Average value Efficiencies at : Peak Energy
Abundance limit : 75.00

Summary of Nuclide Activity

Total number of lines in spectrum	4	
Number of unidentified lines	0	
Number of lines tentatively identified by NID	4	100.00%

Nuclide Type : ALPHA

Nuclide	Hlife	Decay	Wtd Mean Uncorrected pCi/L	Wtd Mean Decay Corr pCi/L	Decay Corr 2-Sigma Error	2-Sigma %Error	Flags
U-232	72.00Y	1.00	2.301E+01	2.301E+01	0.127E+01	5.53	
U-234	2.45E+05Y	1.00	3.088E-01	3.088E-01	1.432E-01	46.37	
U-235	7.04E+08Y	1.00	4.240E-02	4.240E-02	8.483E-02	200.06	
U-238	4.47E+09Y	1.00	2.177E-01	2.177E-01	1.148E-01	52.73	
	Total Activity :		2.358E+01	2.358E+01			
	Grand Total Activity :		2.358E+01	2.358E+01			

Flags: "K" = Keyline not found "M" = Manually accepted
"E" = Manually edited "A" = Nuclide specific abn. limit

DATACHEM
ALPHA SPECTROSCOPY REPORT

8019

****

SAMPLE TITLE: 96E-0640-02
SAMPLE DATE: 24-OCT-1996 12:00:00
ELAPSED LIVE TIME: 59927.
AVERAGE %EFFICIENCY: 19.7179
TRACER DPM: 11.1955

SAMPLE ID: 96E04515
SAMPLE QUANT: 0.2000 L
DETECTOR #: 011
YIELD: 91.2549

****

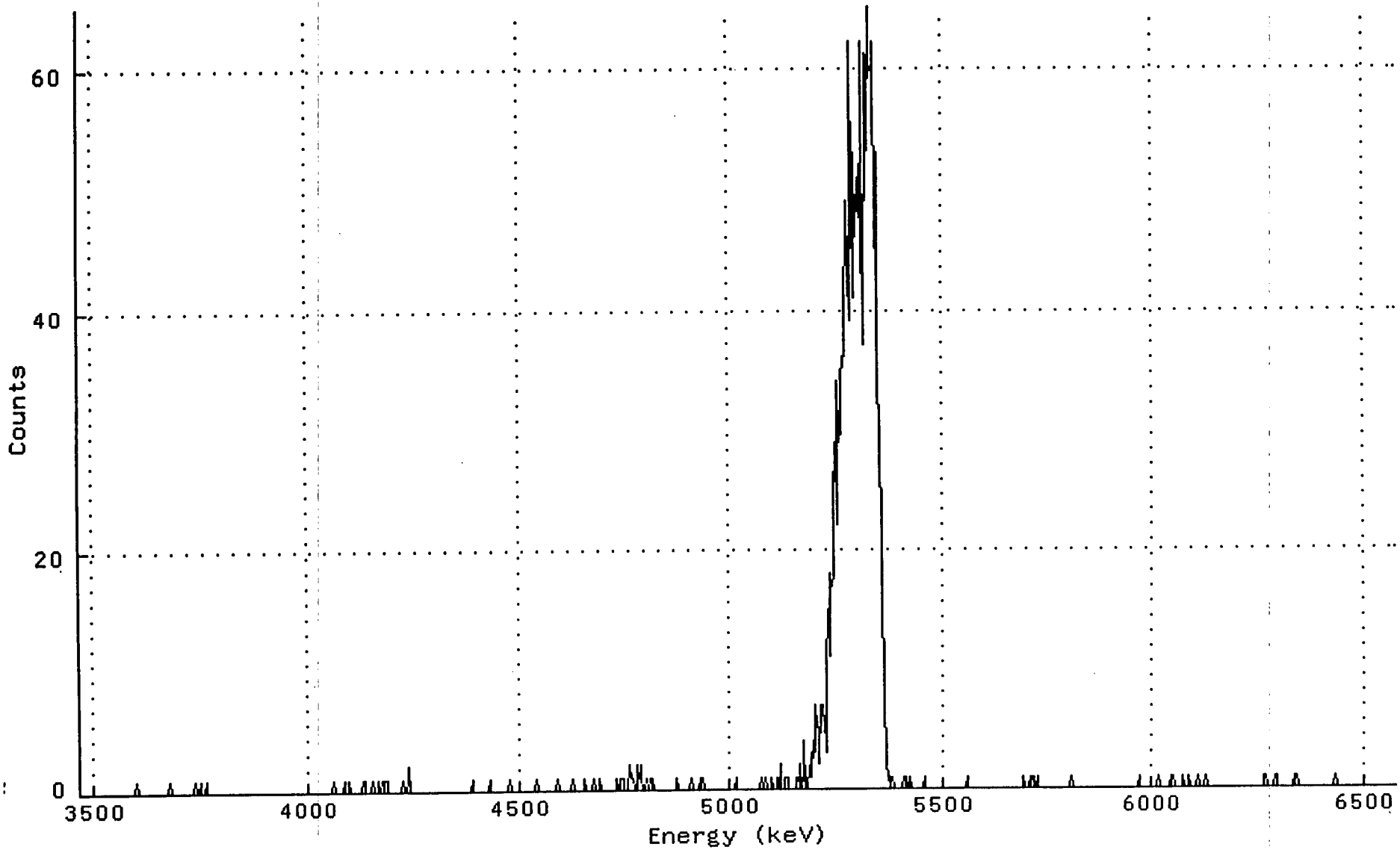
NUCLIDE ACTIVITY SUMMARY

NUCLIDE	ENERGY	NET AREA	BKG	%ABN	ACTIVITY pCi/L	ERROR 2-SIGMA	MDA pCi/L
U232	5306.	2011.999	7.001	100.00	2.522E+01	1.393E+00	1.918E-01
U-234	4762.	26.999	6.001	100.00	3.384E-01	1.580E-01	1.803E-01
U-235	4386.	3.000	3.000	80.90	4.647E-02	9.300E-02	1.712E-01
U-238	4185.	19.000	3.000	99.80	2.386E-01	1.265E-01	1.388E-01

****

REVIEWED BY: DATE:

Spectrum : DKA0:[ALPHA.ALUSR.ARCHIVE.S]S_96E04516_UU.CNF;1
Title : GAR012
Sample Title: 96E-0640-02
Start Time: 24-OCT-1996 09:46 Sample Time: 24-OCT-1996 12:00 Energy Offset: 3.46456E+03
Real Time : 0 16:38:42.99 Sample ID : 96E04516 Energy Slope : 3.20166E+00
Live Time : 0 16:38:44.99 Sample Type: UU Energy Quad : -1.64084E-04



VMS Peak Search Report V1.9 Generated 25-OCT-1996 09:24:04

8019

Configuration : MCA0:[ALPHA]ALPHA0$1
Analyses by : ROIPEAK V1.2
Sample title : 96E-0640-02
Sample date : 24-OCT-1996 12:00:00 Acquisition date : 24-OCT-1996 09:45:25
Sample ID : 96E04516 Sample quantity : 0.20000 L
Sample type : UU Sample geometry :
Elapsed live time: 0 16:38:44.99 Elapsed real time: 0 16:38:42.99 0.0%
Start energy : 3467.76 keV End energy : 6571.00 keV
Gross/Net areas : Gross Background type :
Num avg bkg chans: 2 Critical level : No

Pk	It	Energy	Area	Bkgnd	FWHM	Channel	Left	Pw	Cts/Sec	%Err	Fit
1	0	4168.28	15	0	4.70	222.33	131	120	2.50E-04	25.8	
2	0	4460.67	4	0	156.88	316.25	250	96	6.68E-05	50.0	
3	0	4809.65	31	0	30.32	429.58	345	181	5.17E-04	18.0	
4	0	5299.23	1826	0	100.83	590.94	525	87	3.05E-02	2.3	

VMS Peak Search Report V1.9 Generated 25-OCT-1996 09:24:12

8019

Configuration : DKA0:[ALPHA.ALUSR.ARCHIVE.B]B_012_NONE.CNF;379
Analyses by : ROIPEAK V1.2
Sample title : 96M-0303-10
Sample date : 18-OCT-1996 14:52:03 Acquisition date : 18-OCT-1996 14:52:25
Sample ID : 012 Sample quantity : 1.0000 SAMPLE
Sample type : NONE Sample geometry :
Elapsed live time: 0 16:38:29.00 Elapsed real time: 0 16:38:30.99 0.0%
Start energy : 3451.12 keV End energy : 6552.80 keV
Gross/Net areas : Gross Background type :
Num avg bkg chans: 2 Critical level : No

Pk	It	Energy	Area	Bkgnd	FWHM	Channel	Left	Pw	Cts/Sec	%Err	Fit
1	0	4064.44	5	0	226.56	190.50	131	120	8.35E-05	44.7	
2	0	4402.96	2	0	9.85	297.50	250	96	3.34E-05	70.7	
3	0	4829.72	6	0	420.29	435.00	345	181	1.00E-04	40.8	
4	0	5233.69	4	0	180.59	568.00	525	87	6.68E-05	50.0	

VMS Nuclide Identification Report V2.9 Generated 25-OCT-1996 09:24:24

8019

Configuration : MCA0:[ALPHA]ALPHA0$1
Analyses by : ROIPEAK V1.2,PEAKEFF V2.2,ENBACK V1.5,NID V3.1,WTMEAN V1.8
Sample title : 96E-0640-02
Sample date : 24-OCT-1996 12:00:00 Acquisition date : 24-OCT-1996 09:45:25
Sample ID : 96E04516 Sample quantity : 0.20000 L
Sample type : UU Sample geometry :
Elapsed live time: 0 16:38:44.99 Elapsed real time: 0 16:38:42.99 0.0%
Energy tolerance : 100.00 keV Half life ratio : 8.00
Errors propagated: Yes Systematic Error : 0.00 %
Efficiency type : Average value Efficiencies at : Peak Energy
Abundance limit : 75.00

Summary of Nuclide Activity

Total number of lines in spectrum 4
Number of unidentified lines 0
Number of lines tentatively identified by NID 4 100.00%

Nuclide Type : ALPHA

Nuclide	Hlife	Decay	Wtd Mean Uncorrected pCi/L	Wtd Mean Decay Corr pCi/L	Decay Corr 2-Sigma Error	2-Sigma %Error	Flags
U-232	72.00Y	1.00	2.217E+01	2.217E+01	0.127E+01	5.74	
U-234	2.45E+05Y	1.00	3.042E-01	3.042E-01	1.484E-01	48.78	
U-235	7.04E+08Y	1.00	3.007E-02	3.007E-02	7.369E-02	245.06	
U-238	4.47E+09Y	1.00	1.219E-01	1.219E-01	1.091E-01	89.52	
	Total Activity :		2.262E+01	2.262E+01			

Grand Total Activity : 2.262E+01 2.262E+01

Flags: "K" = Keyline not found "M" = Manually accepted
"E" = Manually edited "A" = Nuclide specific abn. limit

DATACHEM
ALPHA SPECTROSCOPY REPORT

8019

****

SAMPLE TITLE: 96E-0640-02
SAMPLE DATE: 24-OCT-1996 12:00:00
ELAPSED LIVE TIME: 59925.
AVERAGE %EFFICIENCY: 18.5340
TRACER DPM: 11.1955

SAMPLE ID: 96E04516
SAMPLE QUANT: 0.2000 L
DETECTOR #: 012
YIELD: 87.9191

****

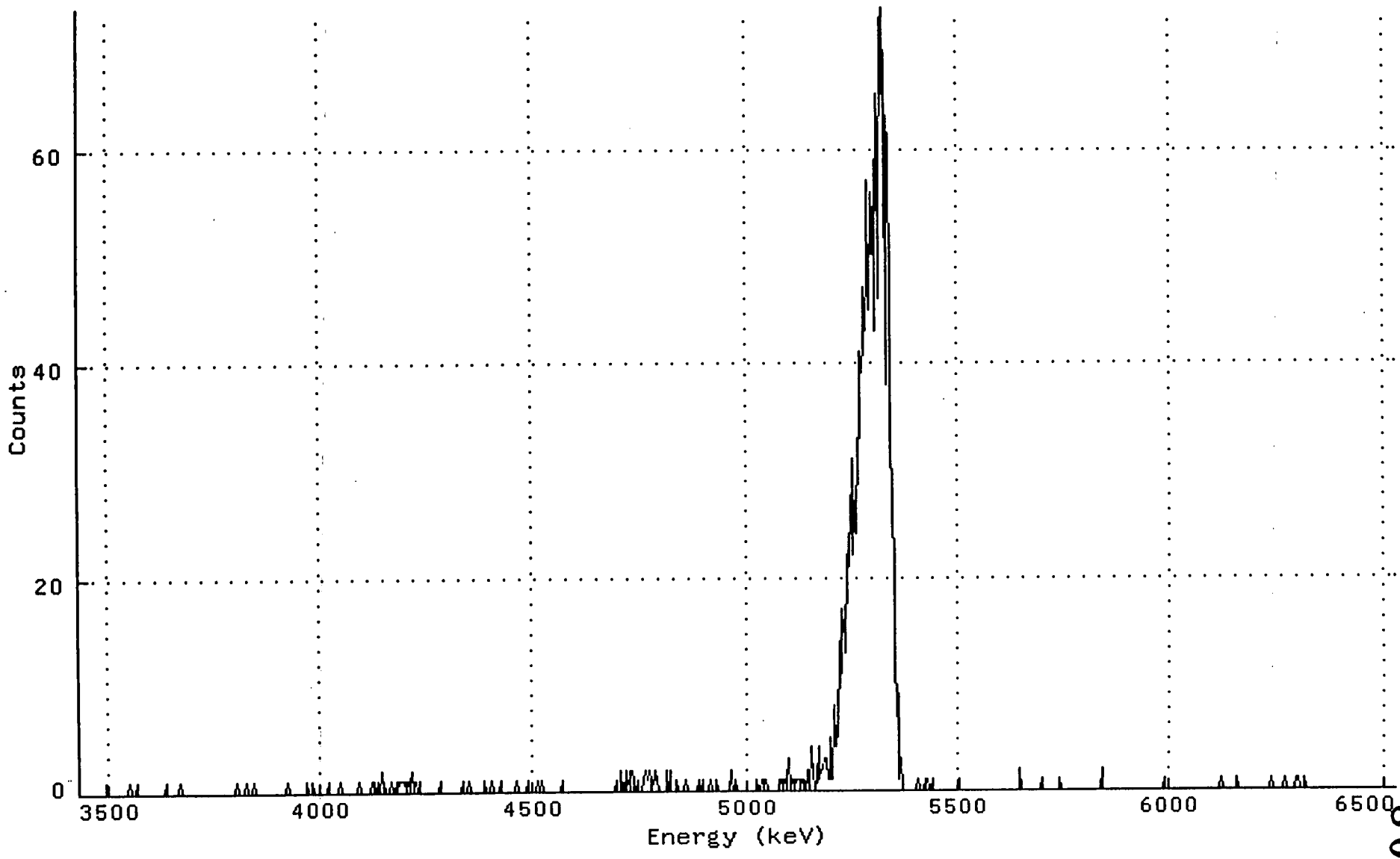
NUCLIDE ACTIVITY SUMMARY

NUCLIDE	ENERGY	NET AREA	BKG	%ABN	ACTIVITY pCi/L	ERROR 2-SIGMA	MDA pCi/L
U232	5306.	1821.999	4.001	100.00	2.522E+01	1.447E+00	1.702E-01
U-234	4762.	24.998	6.002	100.00	3.460E-01	1.699E-01	1.992E-01
U-235	4386.	1.999	2.001	80.90	3.420E-02	8.384E-02	1.638E-01
U-238	4185.	9.999	5.001	99.80	1.386E-01	1.244E-01	1.858E-01

****

REVIEWED BY: DATE:

Spectrum : DKA0:[ALPHA.ALUSR.ARCHIVE.S]S_96E04517_UU.CNF;1
Title : GAR013
Sample Title: 96E-0640-02
Start Time: 24-OCT-1996 09:45 Sample Time: 24-OCT-1996 12:00 Energy Offset: 3.43099E+03
Real Time : 0 16:38:42.99 Sample ID : 96E04517 Energy Slope : 3.23329E+00
Live Time : 0 16:38:39.99 Sample Type: UU Energy Quad : -2.07240E-04



VMS Peak Search Report V1.9 Generated 25-OCT-1996 09:24:45

8019

Configuration : MCA0:[ALPHA]ALPHA0$1
Analyses by : ROIPEAK V1.2
Sample title : 96E-0640-02
Sample date : 24-OCT-1996 12:00:00 Acquisition date : 24-OCT-1996 09:45:25
Sample ID : 96E04517 Sample quantity : 0.20000 L
Sample type : UU Sample geometry :
Elapsed live time: 0 16:38:39.99 Elapsed real time: 0 16:38:42.99 0.0%
Start energy : 3434.22 keV End energy : 6524.56 keV
Gross/Net areas : Gross Background type :
Num avg bkg chans: 2 Critical level : No

Pk	It	Energy	Area	Bkgnd	FWHM	Channel	Left	Pw	Cts/Sec	%Err	Fit
1	0	4144.61	27	0	77.60	223.93	140	120	4.51E-04	19.2	
2	0	4417.42	10	0	252.20	311.30	259	96	1.67E-04	31.6	
3	0	4856.18	53	0	419.49	454.00	354	182	8.85E-04	13.7	
4	0	5290.89	1830	0	78.38	598.17	535	87	3.05E-02	2.3	

VMS Peak Search Report V1.9 Generated 25-OCT-1996 09:24:55

8019

Configuration : DKA0:[ALPHA.ALUSR.ARCHIVE.B]B_013_NONE.CNF;372
Analyses by : ROIPEAK V1.2
Sample title : 96M-0304-10
Sample date : 18-OCT-1996 14:52:04 Acquisition date : 18-OCT-1996 14:52:25
Sample ID : 013 Sample quantity : 1.0000 SAMPLE
Sample type : NONE Sample geometry :
Elapsed live time: 0 16:38:41.00 Elapsed real time: 0 16:38:30.99 0.0%
Start energy : 3434.81 keV End energy : 6525.40 keV
Gross/Net areas : Gross Background type :
Num avg bkg chans: 2 Critical level : No

Pk	It	Energy	Area	Bkgnd	FWHM	Channel	Left	Pw	Cts/Sec	%Err	Fit
1	0	4068.58	5	0	281.41	199.50	140	120	8.34E-05	44.7	
2	0	4403.40	1	0	3.23	306.50	259	96	1.67E-05	100.0	
3	0	4828.19	13	0	517.53	444.50	354	182	2.17E-04	27.7	
4	0	5231.58	2	0	51.75	578.00	535	87	3.34E-05	70.7	

VMS Nuclide Identification Report V2.9 Generated 25-OCT-1996 09:25:07 **8019**

Configuration : MCA0:[ALPHA]ALPHA0$1
Analyses by : ROIPEAK V1.2,PEAKEFF V2.2,ENBACK V1.5,NID V3.1,WTMEAN V1.8
Sample title : 96E-0640-02
Sample date : 24-OCT-1996 12:00:00 Acquisition date : 24-OCT-1996 09:45:25
Sample ID : 96E04517 Sample quantity : 0.20000 L
Sample type : UU Sample geometry :
Elapsed live time: 0 16:38:39.99 Elapsed real time: 0 16:38:42.99 0.0%
Energy tolerance : 100.00 keV Half life ratio : 8.00
Errors propagated: Yes Systematic Error : 0.00 %
Efficiency type : Average value Efficiencies at : Peak Energy
Abundance limit : 75.00

Summary of Nuclide Activity

Total number of lines in spectrum 4
Number of unidentified lines 0
Number of lines tentatively identified by NID 4 100.00%

Nuclide Type : ALPHA

Nuclide	Hlife	Decay	Wtd Mean Uncorrected pCi/L	Wtd Mean Decay Corr pCi/L	Decay Corr 2-Sigma Error	2-Sigma %Error	Flags
U-232	72.00Y	1.00	2.237E+01	2.237E+01	0.128E+01	5.72	
U-234	2.45E+05Y	1.00	4.894E-01	4.894E-01	1.994E-01	40.75	
U-235	7.04E+08Y	1.00	1.361E-01	1.361E-01	1.004E-01	73.78	
U-238	4.47E+09Y	1.00	2.697E-01	2.697E-01	1.390E-01	51.53	
	Total Activity :		2.326E+01	2.326E+01			
	Grand Total Activity :		2.326E+01	2.326E+01			

Flags: "K" = Keyline not found "M" = Manually accepted
"E" = Manually edited "A" = Nuclide specific abn. limit

DATACHEM
ALPHA SPECTROSCOPY REPORT

8019

****

SAMPLE TITLE: 96E-0640-02
SAMPLE DATE: 24-OCT-1996 12:00:00
ELAPSED LIVE TIME: 59920.
AVERAGE %EFFICIENCY: 18.4321
TRACER DPM: 11.1955

SAMPLE ID: 96E04517
SAMPLE QUANT: 0.2000 L
DETECTOR #: 013
YIELD: 88.7035

****

NUCLIDE ACTIVITY SUMMARY

NUCLIDE	ENERGY	NET AREA	BKG	%ABN	ACTIVITY pCi/L	ERROR 2-SIGMA	MDA pCi/L
U232	5306.	1828.000	2.000	100.00	2.522E+01	1.442E+00	1.321E-01
U-234	4762.	40.000	13.000	100.00	5.517E-01	2.271E-01	2.726E-01
U-235	4386.	9.000	1.000	80.90	1.535E-01	1.135E-01	1.304E-01
U-238	4185.	22.000	5.000	99.80	3.041E-01	1.576E-01	1.852E-01

****

REVIEWED BY: DATE:

PMK

NOV 05 1996

PMK

SPREADSHEETS

61080

0005575 194

A	A	B	C	D	E	F	G	H	I	J	K
1		Client:	Hayden			QC Method:	WR-DC-341				
2		Set ID:	96E-0640-02			QC Matrix:	FILTER				
3		Group ID:	G969703P			Prep Date:	18-OCT-1996 00:00				
4		Analyte:	Uranium-233/234			Release #:	NONE				
5		Units:	pCi/Sample			File Name:	69703PU4.txt				
6					sample	tracer					tracer
7	S TYPE	FIELD NAME	SAMPLE NAME	SAMPLE ID	ABNs	ABNt	CF	T1/2 years	sEFF	sSTSt	STSt dpm
8	B	BL-123238-1	BL-123238-1	S96970CC	1.00E+00	1.00E+00	1.00E+00	2.45E+05	7.20E-03	8.49E+02	4.45E+04
9	Q	QC-123238-1	QC-123238-1	S96970CD	1.00E+00	1.00E+00	1.00E+00	2.45E+05	7.20E-03	8.49E+02	4.45E+04
10	O	9131,39,40	96E04514	S968S06B	1.00E+00	1.00E+00	1.00E+00	2.45E+05	7.20E-03	8.49E+02	4.45E+04
11	O	9135,41,42	96E04515	S968S06C	1.00E+00	1.00E+00	1.00E+00	2.45E+05	7.20E-03	8.49E+02	4.45E+04
12	O	9136,43,44	96E04516	S968S06D	1.00E+00	1.00E+00	1.00E+00	2.45E+05	7.20E-03	8.49E+02	4.45E+04
13	O	9137,45,46	96E04517	S968S06F	1.00E+00	1.00E+00	1.00E+00	2.45E+05	7.20E-03	8.49E+02	4.45E+04

PMK

NOV 05 1996

8019

000576 195

A	L	M	N	O	P	Q	R	S	T	U	V
1											
2											
3											
4											
5											
6		tracer						aliquot tracer	tracer	tracer	sample ct
7	sMASSt	MASSt g	sVOLt	sDILt	sDILs	sALIt	sALIs	ALIt mL,g	DILt	VOLt mL,g	T in min
8	6.70E-04	5.09E+00	9.00E-04	2.55E-02	1.00E-03	5.70E-04	1.00E-03	5.09E+00	5.00E+03	2.50E-01	9.99E+02
9	6.70E-04	5.09E+00	9.00E-04	2.55E-02	1.00E-03	5.70E-04	1.00E-03	5.09E+00	5.00E+03	2.50E-01	9.99E+02
10	6.70E-04	5.09E+00	9.00E-04	2.55E-02	1.00E-03	5.70E-04	1.00E-03	5.09E+00	5.00E+03	2.50E-01	9.99E+02
11	6.70E-04	5.09E+00	9.00E-04	2.55E-02	1.00E-03	5.70E-04	1.00E-03	5.09E+00	5.00E+03	2.50E-01	9.99E+02
12	6.70E-04	5.09E+00	9.00E-04	2.55E-02	1.00E-03	5.70E-04	1.00E-03	5.09E+00	5.00E+03	2.50E-01	9.99E+02
13	6.70E-04	5.09E+00	9.00E-04	2.55E-02	1.00E-03	5.70E-04	1.00E-03	5.09E+00	5.00E+03	2.50E-01	9.99E+02

A	W	X	Y	Z	AA	AB	AC	AD	AE	AF	AG
1											
2											
3											
4											
5											
6	sample bkg	act tracer	sample ct	sample bkg	sample	tracer ct	tracer bkg	aliquot sam	delta time	sample	sam bkg ct r
7	Tb in min	AMTt dpm	Cgs	Csb	DILs dec	Cgt	Ctb	ALls L,g	Dt in days	EFF c/d	Bsd
8	9.99E+02	1.12E+01	1.40E+01	1.20E+01	1.00E+00	1.89E+03	4.00E+00	1.00E+00	6.00E+00	1.92E-01	1.20E-02
9	9.98E+02	1.12E+01	2.48E+03	4.00E+00	1.00E+00	2.04E+03	7.00E+00	1.00E+00	6.00E+00	1.87E-01	4.01E-03
10	9.99E+02	1.12E+01	7.00E+01	3.00E+00	4.33E-01	1.81E+03	4.00E+00	1.00E+00	4.20E+01	1.84E-01	3.00E-03
11	9.99E+02	1.12E+01	3.30E+01	6.00E+00	4.79E-01	2.02E+03	7.00E+00	1.00E+00	4.20E+01	1.97E-01	6.01E-03
12	9.99E+02	1.12E+01	3.10E+01	6.00E+00	4.45E-01	1.83E+03	4.00E+00	1.00E+00	4.20E+01	1.85E-01	6.01E-03
13	9.99E+02	1.12E+01	5.30E+01	1.30E+01	4.45E-01	1.83E+03	2.00E+00	1.00E+00	4.20E+01	1.84E-01	1.30E-02

8019

A	AH	AI	AJ	AK	AL	AM	AN	AO	AP	AQ
1	8									
2										
3										
4										
5										
6						sample	sample	sample	sample	
7	REeff	REall	REdll	REr	R	ACTb	NBCRs	sNBCRs	IDLC	K
8	3.74E-02	1.00E-03	1.00E-03	4.81E-02	8.78E-01	5.34E-03	2.00E-03	5.10E-03	5.03E-02	3.75E-01
9	3.85E-02	1.00E-03	1.00E-03	4.85E-02	9.70E-01	6.15E+00	2.48E+00	4.99E-02	2.99E-02	4.03E-01
10	3.90E-02	1.00E-03	2.31E-03	4.96E-02	8.77E-01	4.31E-01	6.71E-02	8.55E-03	6.93E-02	1.56E-01
11	3.65E-02	1.00E-03	2.09E-03	4.70E-02	9.12E-01	1.41E-01	2.70E-02	6.25E-03	7.39E-02	1.91E-01
12	3.88E-02	1.00E-03	2.25E-03	4.94E-02	8.79E-01	1.55E-01	2.50E-02	6.09E-03	8.77E-02	1.61E-01
13	3.91E-02	1.00E-03	2.25E-03	4.95E-02	8.87E-01	2.48E-01	4.00E-02	8.13E-03	1.21E-01	1.61E-01

197 000578

8019

198
000579

A	AR	AS	AT	AU	AV
1					
2					
3					
4					
5					
6	tracer	sample	sample	sample	sample
7	NCRt	Sbkg	CUb2s	TPUb1S	TPUb2s
8	1.89E+00	4.90E-03	2.67E-02	1.36E-02	2.67E-02
9	2.03E+00	2.83E-03	2.43E-01	4.01E-01	7.85E-01
10	1.81E+00	2.45E-03	1.08E-01	6.14E-02	1.20E-01
11	2.01E+00	3.47E-03	6.41E-02	3.38E-02	6.62E-02
12	1.82E+00	3.47E-03	7.41E-02	3.90E-02	7.65E-02
13	1.83E+00	5.10E-03	9.88E-02	5.28E-02	1.03E-01

A	B	C	D	E	F	G	H	I	J	K
1	Client:	Hayden			QC Method:	WR-DC-341				
2	Set ID:	96E-0640-02			QC Matrix:	FILTER				
3	Group ID:	G969703P			Prep Date:	18-OCT-1996 00:00				
4	Analyte:	Uranium-235			Release #:	NONE				
5	Units:	pCi/Sample			File Name:	69703PU5.txt				
6				sample	tracer					tracer
7	S TYPE	FIELD NAME	SAMPLE NAME	SAMPLE ID	ABNs	ABNt	CF	T1/2 years	sEFF	sSTSt	STSt dpm
8	B	BL-123238-1	BL-123238-1	S96970CC	8.09E-01	1.00E+00	1.00E+00	7.04E+08	7.20E-03	8.49E+02	4.45E+04
9	Q	QC-123238-1	QC-123238-1	S96970CD	8.09E-01	1.00E+00	1.00E+00	7.04E+08	7.20E-03	8.49E+02	4.45E+04
10	O	9131,39,40	96E04514	S968S06B	8.09E-01	1.00E+00	1.00E+00	7.04E+08	7.20E-03	8.49E+02	4.45E+04
11	O	9135,41,42	96E04515	S968S06C	8.09E-01	1.00E+00	1.00E+00	7.04E+08	7.20E-03	8.49E+02	4.45E+04
12	O	9136,43,44	96E04516	S968S06D	8.09E-01	1.00E+00	1.00E+00	7.04E+08	7.20E-03	8.49E+02	4.45E+04
13	O	9137,45,46	96E04517	S968S06F	8.09E-01	1.00E+00	1.00E+00	7.04E+08	7.20E-03	8.49E+02	4.45E+04

6108 19

200

000581

A	L	M	N	O	P	Q	R	S	T	U	V
1	8										
2											
3											
4											
5											
6		tracer						aliquot tracer	tracer	tracer	sample ct
7	sMASSt	MASSt g	sVOLt	sDILt	sDILs	sALIt	sALIs	ALIt mL,g	DILt	VOLt mL,g	T in min
8	6.70E-04	5.09E+00	9.00E-04	2.55E-02	1.00E-03	5.70E-04	1.00E-03	5.09E+00	5.00E+03	2.50E-01	9.99E+02
9	6.70E-04	5.09E+00	9.00E-04	2.55E-02	1.00E-03	5.70E-04	1.00E-03	5.09E+00	5.00E+03	2.50E-01	9.99E+02
10	6.70E-04	5.09E+00	9.00E-04	2.55E-02	1.00E-03	5.70E-04	1.00E-03	5.09E+00	5.00E+03	2.50E-01	9.99E+02
11	6.70E-04	5.09E+00	9.00E-04	2.55E-02	1.00E-03	5.70E-04	1.00E-03	5.09E+00	5.00E+03	2.50E-01	9.99E+02
12	6.70E-04	5.09E+00	9.00E-04	2.55E-02	1.00E-03	5.70E-04	1.00E-03	5.09E+00	5.00E+03	2.50E-01	9.99E+02
13	6.70E-04	5.09E+00	9.00E-04	2.55E-02	1.00E-03	5.70E-04	1.00E-03	5.09E+00	5.00E+03	2.50E-01	9.99E+02

80019

201

000582

A	W	X	Y	Z	AA	AB	AC	AD	AE	AF	AG
1											
2											
3											
4											
5											
6	sample bkg	act tracer	sample ct	sample bkg	sample	tracer ct	tracer bkg	aliquot sam	delta time	sample	sam bkg ct r
7	Tb in min	AMTt dpm	Cgs	Csb	DILs dec	Cgt	Ctb	ALIs L,g	Dt in days	EFF c/d	Bsd
8	9.99E+02	1.12E+01	2.00E+00	3.00E+00	1.00E+00	1.89E+03	4.00E+00	1.00E+00	6.00E+00	1.92E-01	3.00E-03
9	9.98E+02	1.12E+01	1.08E+02	2.00E+00	1.00E+00	2.04E+03	7.00E+00	1.00E+00	6.00E+00	1.87E-01	2.00E-03
10	9.99E+02	1.12E+01	9.00E+00	3.00E+00	4.33E-01	1.81E+03	4.00E+00	1.00E+00	4.20E+01	1.84E-01	3.00E-03
11	9.99E+02	1.12E+01	6.00E+00	3.00E+00	4.79E-01	2.02E+03	7.00E+00	1.00E+00	4.20E+01	1.97E-01	3.00E-03
12	9.99E+02	1.12E+01	4.00E+00	2.00E+00	4.45E-01	1.83E+03	4.00E+00	1.00E+00	4.20E+01	1.85E-01	2.00E-03
13	9.99E+02	1.12E+01	1.00E+01	1.00E+00	4.45E-01	1.83E+03	2.00E+00	1.00E+00	4.20E+01	1.84E-01	1.00E-03

6108019

202

000583

A	AH	AI	AJ	AK	AL	AM	AN	AO	AP	AQ
1										
2										
3										
4										
5										
6						sample	sample	sample	sample	
7	REeff	REall	REdil	REr	R	ACTb	NBCRs	sNBCRs	IDLC	K
8	3.74E-02	1.00E-03	1.00E-03	4.81E-02	8.78E-01	-3.30E-03	-1.00E-03	2.24E-03	3.55E-02	3.03E-01
9	3.85E-02	1.00E-03	1.00E-03	4.85E-02	9.70E-01	3.26E-01	1.06E-01	1.05E-02	2.86E-02	3.26E-01
10	3.90E-02	1.00E-03	2.31E-03	4.96E-02	8.77E-01	4.77E-02	6.01E-03	3.47E-03	8.57E-02	1.26E-01
11	3.65E-02	1.00E-03	2.09E-03	4.70E-02	9.12E-01	1.94E-02	3.00E-03	3.00E-03	6.97E-02	1.55E-01
12	3.88E-02	1.00E-03	2.25E-03	4.94E-02	8.79E-01	1.54E-02	2.00E-03	2.45E-03	7.14E-02	1.30E-01
13	3.91E-02	1.00E-03	2.25E-03	4.95E-02	8.87E-01	6.90E-02	9.01E-03	3.32E-03	5.65E-02	1.31E-01

80019

203

000584

A	AR	AS	AT	AU	AV
1					
2					
3					
4					
5					
6	tracer	sample	sample	sample	sample
7	NCRt	Sbkg	CUb2s	TPUb1S	TPUb2s
8	1.89E+00	2.45E-03	1.45E-02	7.38E-03	1.45E-02
9	2.03E+00	2.00E-03	6.32E-02	3.80E-02	7.45E-02
10	1.81E+00	2.45E-03	5.40E-02	2.77E-02	5.43E-02
11	2.01E+00	2.45E-03	3.81E-02	1.94E-02	3.81E-02
12	1.82E+00	2.00E-03	3.69E-02	1.88E-02	3.69E-02
13	1.83E+00	1.42E-03	4.98E-02	2.58E-02	5.06E-02

6108 19

204

000585

A	A	B	C	D	E	F	G	H	I	J	K
1	8	Client:	Hayden			QC Method:	WR-DC-341				
2		Set ID:	96E-0640-02			QC Matrix:	FILTER				
3		Group ID:	G969703P			Prep Date:	18-OCT-1996 00:00				
4		Analyte:	Uranium-238			Release #:	NONE				
5		Units:	pCi/Sample			File Name:	69703PU8.txt				
6					sample	tracer					tracer
7	S TYPE	FIELD NAME	SAMPLE NAME	SAMPLE ID	ABNs	ABNt	CF	T1/2 years	sEFF	sSTSt	STSt dpm
8	B	BL-123238-1	BL-123238-1	S96970CC	9.98E-01	1.00E+00	1.00E+00	4.47E+09	7.20E-03	8.49E+02	4.45E+04
9	Q	QC-123238-1	QC-123238-1	S96970CD	9.98E-01	1.00E+00	1.00E+00	4.47E+09	7.20E-03	8.49E+02	4.45E+04
10	O	9131,39,40	96E04514	S968S06B	9.98E-01	1.00E+00	1.00E+00	4.47E+09	7.20E-03	8.49E+02	4.45E+04
11	O	9135,41,42	96E04515	S968S06C	9.98E-01	1.00E+00	1.00E+00	4.47E+09	7.20E-03	8.49E+02	4.45E+04
12	O	9136,43,44	96E04516	S968S06D	9.98E-01	1.00E+00	1.00E+00	4.47E+09	7.20E-03	8.49E+02	4.45E+04
13	O	9137,45,46	96E04517	S968S06F	9.98E-01	1.00E+00	1.00E+00	4.47E+09	7.20E-03	8.49E+02	4.45E+04

80019

205

000586

A	L	M	N	O	P	Q	R	S	T	U	V
1											
2											
3											
4											
5											
6		tracer						aliquot tracer	tracer	tracer	sample ct
7	sMASSt	MASSt g	sVOLt	sDILt	sDILs	sALIt	sALIs	ALIt mL,g	DILt	VOLt mL,g	T in min
8	6.70E-04	5.09E+00	9.00E-04	2.55E-02	1.00E-03	5.70E-04	1.00E-03	5.09E+00	5.00E+03	2.50E-01	9.99E+02
9	6.70E-04	5.09E+00	9.00E-04	2.55E-02	1.00E-03	5.70E-04	1.00E-03	5.09E+00	5.00E+03	2.50E-01	9.99E+02
10	6.70E-04	5.09E+00	9.00E-04	2.55E-02	1.00E-03	5.70E-04	1.00E-03	5.09E+00	5.00E+03	2.50E-01	9.99E+02
11	6.70E-04	5.09E+00	9.00E-04	2.55E-02	1.00E-03	5.70E-04	1.00E-03	5.09E+00	5.00E+03	2.50E-01	9.99E+02
12	6.70E-04	5.09E+00	9.00E-04	2.55E-02	1.00E-03	5.70E-04	1.00E-03	5.09E+00	5.00E+03	2.50E-01	9.99E+02
13	6.70E-04	5.09E+00	9.00E-04	2.55E-02	1.00E-03	5.70E-04	1.00E-03	5.09E+00	5.00E+03	2.50E-01	9.99E+02

000587 206

A	W	X	Y	Z	AA	AB	AC	AD	AE	AF	AG
1											
2											
3											
4											
5											
6	sample bkg	act tracer	sample ct	sample bkg	sample	tracer ct	tracer bkg	aliquot sam	delta time	sample	sam bkg ct r
7	Tb in min	AMTt dpm	Cgs	Csb	DILs dec	Cgt	Ctb	ALIs L,g	Dt in days	EFF c/d	Bsd
8	9.99E+02	1.12E+01	6.00E+00	1.00E+01	1.00E+00	1.89E+03	4.00E+00	1.00E+00	6.00E+00	1.92E-01	1.00E-02
9	9.98E+02	1.12E+01	2.54E+03	5.00E+00	1.00E+00	2.04E+03	7.00E+00	1.00E+00	6.00E+00	1.87E-01	5.01E-03
10	9.99E+02	1.12E+01	3.70E+01	6.00E+00	4.33E-01	1.81E+03	4.00E+00	1.00E+00	4.20E+01	1.84E-01	6.01E-03
11	9.99E+02	1.12E+01	2.20E+01	3.00E+00	4.79E-01	2.02E+03	7.00E+00	1.00E+00	4.20E+01	1.97E-01	3.00E-03
12	9.99E+02	1.12E+01	1.50E+01	5.00E+00	4.45E-01	1.83E+03	4.00E+00	1.00E+00	4.20E+01	1.85E-01	5.01E-03
13	9.99E+02	1.12E+01	2.70E+01	5.00E+00	4.45E-01	1.83E+03	2.00E+00	1.00E+00	4.20E+01	1.84E-01	5.01E-03

80019

207

000588

A	AH	AI	AJ	AK	AL	AM	AN	AO	AP	AQ
1										
2										
3										
4										
5										
6						sample	sample	sample	sample	
7	REeff	REall	REdil	REr	R	ACTb	NBCRs	sNBCRs	IDLC	K
8	3.74E-02	1.00E-03	1.00E-03	4.81E-02	8.78E-01	-1.07E-02	-4.00E-03	4.00E-03	4.66E-02	3.74E-01
9	3.85E-02	1.00E-03	1.00E-03	4.85E-02	9.70E-01	6.32E+00	2.54E+00	5.05E-02	3.27E-02	4.02E-01
10	3.90E-02	1.00E-03	2.31E-03	4.96E-02	8.77E-01	2.00E-01	3.10E-02	6.56E-03	9.10E-02	1.55E-01
11	3.65E-02	1.00E-03	2.09E-03	4.70E-02	9.12E-01	9.97E-02	1.90E-02	5.01E-03	5.65E-02	1.91E-01
12	3.88E-02	1.00E-03	2.25E-03	4.94E-02	8.79E-01	6.23E-02	1.00E-02	4.48E-03	8.17E-02	1.61E-01
13	3.91E-02	1.00E-03	2.25E-03	4.95E-02	8.87E-01	1.37E-01	2.20E-02	5.66E-03	8.15E-02	1.61E-01

61080

208

000589

A	AR	AS	AT	AU	AV
1					
2					
3					
4					
5					
6	tracer	sample	sample	sample	sample
7	NCRt	Sbkg	CUb2s	TPUb1S	TPUb2s
8	1.89E+00	4.48E-03	2.10E-02	1.07E-02	2.10E-02
9	2.03E+00	3.17E-03	2.46E-01	4.11E-01	8.06E-01
10	1.81E+00	3.47E-03	8.29E-02	4.41E-02	8.65E-02
11	2.01E+00	2.45E-03	5.14E-02	2.69E-02	5.27E-02
12	1.82E+00	3.17E-03	5.46E-02	2.81E-02	5.51E-02
13	1.83E+00	3.17E-03	6.89E-02	3.62E-02	7.10E-02

6108

6209

000590

A	A	B	C	D	E	F	G	H	I	J	K
1		Client:	Hayden			QC Method:	WR-DC-341				
2		Set ID:	96E-0640-03			QC Matrix:	FILTER				
3		Group ID:	G969703Q			Prep Date:	18-OCT-1996 00:00				
4		Analyte:	Thorium-228			Release #:	NONE				
5		Units:	pCi/Sample			File Name:	69703QT8.txt				
6					sample	tracer					tracer
7	S TYPE	FIELD NAME	SAMPLE NAME	SAMPLE ID	ABNs	ABNt	CF	T1/2 years	sEFF	sSTSt	STSt dpm
8	B	BL-123239-1	BL-123239-1	S96970CF	9.99E-01	9.95E-01	1.00E+00	1.91E+00	7.20E-03	4.00E+02	5.30E+04
9	Q	QC-123239-1	QC-123239-1	S96970CG	9.99E-01	9.95E-01	1.00E+00	1.91E+00	7.20E-03	4.00E+02	5.30E+04
10	O	9131,39,40	96E04514	S968S06G	9.99E-01	9.95E-01	1.00E+00	1.91E+00	7.20E-03	4.00E+02	5.30E+04
11	O	9135,41,42	96E04515	S968S06H	9.99E-01	9.95E-01	1.00E+00	1.91E+00	7.20E-03	4.00E+02	5.30E+04
12	O	9136,43,44	96E04516	S968S06J	9.99E-01	9.95E-01	1.00E+00	1.91E+00	7.20E-03	4.00E+02	5.30E+04
13	O	9137,45,46	96E04517	S968S06K	9.99E-01	9.95E-01	1.00E+00	1.91E+00	7.20E-03	4.00E+02	5.30E+04

8019

210 - 000591

A	L	M	N	O	P	Q	R	S	T	U	V
1											
2											
3											
4											
5											
6		tracer						aliquot tracer	tracer	tracer	sample ct
7	sMASSt	MASSt g	sVOLt	sDILt	sDILs	sALIt	sALIs	ALIt mL,g	DILt	VOLt mL,g	T in min
8	6.70E-04	1.97E+00	9.00E-04	7.98E-03	1.00E-03	5.00E-04	1.00E-03	1.97E+00	1.13E+03	1.00E-01	9.99E+02
9	6.70E-04	1.97E+00	9.00E-04	7.98E-03	1.00E-03	5.00E-04	1.00E-03	1.97E+00	1.13E+03	1.00E-01	9.99E+02
10	6.70E-04	1.97E+00	9.00E-04	7.98E-03	1.00E-03	5.00E-04	1.00E-03	1.97E+00	1.13E+03	1.00E-01	9.99E+02
11	6.70E-04	1.97E+00	9.00E-04	7.98E-03	1.00E-03	5.00E-04	1.00E-03	1.97E+00	1.13E+03	1.00E-01	9.99E+02
12	6.70E-04	1.97E+00	9.00E-04	7.98E-03	1.00E-03	5.00E-04	1.00E-03	1.97E+00	1.13E+03	1.00E-01	9.99E+02
13	6.70E-04	1.97E+00	9.00E-04	7.98E-03	1.00E-03	5.00E-04	1.00E-03	1.97E+00	1.13E+03	1.00E-01	9.99E+02

A	W	X	Y	Z	AA	AB	AC	AD	AE	AF	AG
1											
2											
3											
4											
5											
6	sample bkg	act tracer	sample ct	sample bkg	sample	tracer ct	tracer bkg	aliquot sam	delta time	sample	sam bkg ct r
7	Tb in min	AMTt dpm	Cgs	Csb	DILs dec	Cgt	Ctb	ALls L,g	Dt in days	EFF c/d	Bsd
8	9.99E+02	1.07E+01	2.00E+01	9.00E+00	1.00E+00	1.71E+03	5.00E+00	1.00E+00	7.00E+00	1.85E-01	9.01E-03
9	9.99E+02	1.07E+01	1.50E+01	1.10E+01	1.00E+00	1.93E+03	2.00E+00	1.00E+00	7.00E+00	1.97E-01	1.10E-02
10	9.99E+02	2.16E+01	3.60E+01	5.00E+00	5.01E-01	3.41E+03	8.00E+00	1.00E+00	4.30E+01	1.84E-01	5.01E-03
11	9.99E+02	1.07E+01	2.40E+01	8.00E+00	4.71E-01	1.84E+03	3.00E+00	1.00E+00	4.30E+01	1.87E-01	8.01E-03
12	9.99E+02	1.07E+01	1.60E+01	3.00E+00	5.00E-01	1.67E+03	3.00E+00	1.00E+00	4.30E+01	1.93E-01	3.00E-03
13	9.99E+02	1.07E+01	1.40E+01	2.00E+00	4.99E-01	1.80E+03	2.00E+00	1.00E+00	4.30E+01	1.91E-01	2.00E-03

80019

212 - 000593

A	AH	AI	AJ	AK	AL	AM	AN	AO	AP	AQ
1	8									
2										
3										
4										
5										
6						sample	sample	sample	sample	
7	REeff	REali	REdil	REr	R	ACTb	NBCRs	sNBCRs	IDLC	K
8	3.88E-02	1.00E-03	1.00E-03	4.73E-02	8.64E-01	3.12E-02	1.10E-02	5.39E-03	4.73E-02	3.53E-01
9	3.65E-02	1.00E-03	1.00E-03	4.46E-02	9.15E-01	1.01E-02	4.00E-03	5.10E-03	4.57E-02	3.98E-01
10	3.91E-02	1.00E-03	2.00E-03	4.43E-02	8.59E-01	1.84E-01	3.10E-02	6.41E-03	7.79E-02	1.69E-01
11	3.86E-02	1.00E-03	2.13E-03	4.66E-02	9.22E-01	9.31E-02	1.60E-02	5.66E-03	9.23E-02	1.72E-01
12	3.73E-02	1.00E-03	2.00E-03	4.62E-02	8.10E-01	7.83E-02	1.30E-02	4.36E-03	6.48E-02	1.66E-01
13	3.78E-02	1.00E-03	2.00E-03	4.61E-02	8.81E-01	6.73E-02	1.20E-02	4.00E-03	5.21E-02	1.78E-01

	AR	AS	AT	AU	AV
1					
2					
3					
4					
5					
6	tracer	sample	sample	sample	sample
7	NCRt	Sbkg	CUb2s	TPUb1S	TPUb2s
8	1.71E+00	4.25E-03	2.99E-02	1.54E-02	3.02E-02
9	1.93E+00	4.70E-03	2.52E-02	1.29E-02	2.52E-02
10	3.40E+00	3.17E-03	7.45E-02	3.96E-02	7.75E-02
11	1.84E+00	4.00E-03	6.45E-02	3.34E-02	6.54E-02
12	1.67E+00	2.45E-03	5.14E-02	2.67E-02	5.22E-02
13	1.79E+00	2.00E-03	4.40E-02	2.28E-02	4.47E-02

8019 214 000595

A	A	B	C	D	E	F	G	H	I	J	K
1		Client:	Hayden			QC Method:	WR-DC-341				
2		Set ID:	96E-0640-03			QC Matrix:	FILTER				
3		Group ID:	G969703Q			Prep Date:	18-OCT-1996 00:00				
4		Analyte:	Thorium-230			Release #:	NONE				
5		Units:	pCi/Sample			File Name:	69703QT0.txt				
6					sample	tracer					tracer
7	S TYPE	FIELD NAME	SAMPLE NAME	SAMPLE ID	ABNs	ABNt	CF	T1/2 years	sEFF	sSTSt	STSt dpm
8	B	BL-123239-1	BL-123239-1	S96970CF	9.98E-01	9.95E-01	1.00E+00	7.70E+04	7.20E-03	4.00E+02	5.30E+04
9	Q	QC-123239-1	QC-123239-1	S96970CG	9.98E-01	9.95E-01	1.00E+00	7.70E+04	7.20E-03	4.00E+02	5.30E+04
10	O	9131,39,40	96E04514	S968S06G	9.98E-01	9.95E-01	1.00E+00	7.70E+04	7.20E-03	4.00E+02	5.30E+04
11	O	9135,41,42	96E04515	S968S06H	9.98E-01	9.95E-01	1.00E+00	7.70E+04	7.20E-03	4.00E+02	5.30E+04
12	O	9136,43,44	96E04516	S968S06J	9.98E-01	9.95E-01	1.00E+00	7.70E+04	7.20E-03	4.00E+02	5.30E+04
13	O	9137,45,46	96E04517	S968S06K	9.98E-01	9.95E-01	1.00E+00	7.70E+04	7.20E-03	4.00E+02	5.30E+04

000596 215

	L	M	N	O	P	Q	R	S	T	U	V
1											
2											
3											
4											
5											
6		tracer						aliquot tracer	tracer	tracer	sample ct
7	sMASSt	MASSt g	sVOLt	sDILt	sDILs	sALIt	sALIs	ALIt mL,g	DILt	VOLt mL,g	T in min
8	6.70E-04	1.97E+00	9.00E-04	7.98E-03	1.00E-03	5.00E-04	1.00E-03	1.97E+00	1.13E+03	1.00E-01	9.99E+02
9	6.70E-04	1.97E+00	9.00E-04	7.98E-03	1.00E-03	5.00E-04	1.00E-03	1.97E+00	1.13E+03	1.00E-01	9.99E+02
10	6.70E-04	1.97E+00	9.00E-04	7.98E-03	1.00E-03	5.00E-04	1.00E-03	1.97E+00	1.13E+03	1.00E-01	9.99E+02
11	6.70E-04	1.97E+00	9.00E-04	7.98E-03	1.00E-03	5.00E-04	1.00E-03	1.97E+00	1.13E+03	1.00E-01	9.99E+02
12	6.70E-04	1.97E+00	9.00E-04	7.98E-03	1.00E-03	5.00E-04	1.00E-03	1.97E+00	1.13E+03	1.00E-01	9.99E+02
13	6.70E-04	1.97E+00	9.00E-04	7.98E-03	1.00E-03	5.00E-04	1.00E-03	1.97E+00	1.13E+03	1.00E-01	9.99E+02

8019

000597 216

A	W	X	Y	Z	AA	AB	AC	AD	AE	AF	AG
1											
2											
3											
4											
5											
6	sample bkg	act tracer	sample ct	sample bkg	sample	tracer ct	tracer bkg	aliquot sam	delta time	sample	sam bkg ct r
7	Tb in min	AMTt dpm	Cgs	Csb	DILs dec	Cgt	Ctb	ALIs L,g	Dt in days	EFF c/d	Bsd
8	9.99E+02	1.07E+01	2.80E+01	3.00E+00	1.00E+00	1.71E+03	5.00E+00	1.00E+00	7.00E+00	1.85E-01	3.00E-03
9	9.99E+02	1.07E+01	1.94E+03	7.00E+00	1.00E+00	1.93E+03	2.00E+00	1.00E+00	7.00E+00	1.97E-01	7.01E-03
10	9.99E+02	2.16E+01	8.90E+01	6.00E+00	5.01E-01	3.41E+03	8.00E+00	1.00E+00	4.30E+01	1.84E-01	6.01E-03
11	9.99E+02	1.07E+01	6.70E+01	5.00E+00	4.71E-01	1.84E+03	3.00E+00	1.00E+00	4.30E+01	1.87E-01	5.01E-03
12	9.99E+02	1.07E+01	6.10E+01	3.00E+00	5.00E-01	1.67E+03	3.00E+00	1.00E+00	4.30E+01	1.93E-01	3.00E-03
13	9.99E+02	1.07E+01	5.70E+01	1.00E+00	4.99E-01	1.80E+03	2.00E+00	1.00E+00	4.30E+01	1.91E-01	1.00E-03

6108

217 - 000598

A	AH	AI	AJ	AK	AL	AM	AN	AO	AP	AQ
1										
2										
3										
4										
5										
6						sample	sample	sample	sample	
7	REeff	REall	REdil	REr	R	ACTb	NBCRs	sNBCRs	IDLC	K
8	3.88E-02	1.00E-03	1.00E-03	4.73E-02	8.64E-01	7.05E-02	2.50E-02	5.57E-03	3.04E-02	3.55E-01
9	3.65E-02	1.00E-03	1.00E-03	4.46E-02	9.15E-01	4.85E+00	1.94E+00	4.42E-02	3.76E-02	4.00E-01
10	3.91E-02	1.00E-03	2.00E-03	4.43E-02	8.59E-01	4.73E-01	8.31E-02	9.76E-03	8.04E-02	1.76E-01
11	3.86E-02	1.00E-03	2.13E-03	4.66E-02	9.22E-01	3.46E-01	6.21E-02	8.49E-03	7.32E-02	1.79E-01
12	3.73E-02	1.00E-03	2.00E-03	4.62E-02	8.10E-01	3.35E-01	5.81E-02	8.01E-03	6.22E-02	1.73E-01
13	3.78E-02	1.00E-03	2.00E-03	4.61E-02	8.81E-01	3.01E-01	5.61E-02	7:62E-03	3.96E-02	1.86E-01

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A	AR	AS	AT	AU	AV
1					
2					
3					
4					
5					
6	tracer	sample	sample	sample	sample
7	NCRt	Sbkg	CUb2s	TPUb1S	TPUb2s
8	1.71E+00	2.45E-03	3.08E-02	1.63E-02	3.19E-02
9	1.93E+00	3.75E-03	2.17E-01	3.01E-01	5.89E-01
10	3.40E+00	3.47E-03	1.09E-01	6.22E-02	1.22E-01
11	1.84E+00	3.17E-03	9.28E-02	5.18E-02	1.01E-01
12	1.67E+00	2.45E-03	9.06E-02	5.03E-02	9.86E-02
13	1.79E+00	1.42E-03	8.03E-02	4.47E-02	8.77E-02

A	A	B	C	D	E	F	G	H	I	J	K
1		Client:	Hayden			QC Method:	WR-DC-341				
2		Set ID:	96E-0640-03			QC Matrix:	FILTER				
3		Group ID:	G969703Q			Prep Date:	18-OCT-1996 00:00				
4		Analyte:	Thorium-232			Release #:	NONE				
5		Units:	pCi/Sample			File Name:	69703QT2.txt				
6					sample	tracer					tracer
7	S TYPE	FIELD NAME	SAMPLE NAME	SAMPLE ID	ABNs	ABNt	CF	T1/2 years	sEFF	sSTSt	STSt dpm
8	B	BL-123239-1	BL-123239-1	S96970CF	1.00E+00	9.95E-01	1.00E+00	1.41E+10	7.20E-03	4.00E+02	5.30E+04
9	Q	QC-123239-1	QC-123239-1	S96970CG	1.00E+00	9.95E-01	1.00E+00	1.41E+10	7.20E-03	4.00E+02	5.30E+04
10	O	9131,39,40	96E04514	S968S06G	1.00E+00	9.95E-01	1.00E+00	1.41E+10	7.20E-03	4.00E+02	5.30E+04
11	O	9135,41,42	96E04515	S968S06H	1.00E+00	9.95E-01	1.00E+00	1.41E+10	7.20E-03	4.00E+02	5.30E+04
12	O	9136,43,44	96E04516	S968S06J	1.00E+00	9.95E-01	1.00E+00	1.41E+10	7.20E-03	4.00E+02	5.30E+04
13	O	9137,45,46	96E04517	S968S06K	1.00E+00	9.95E-01	1.00E+00	1.41E+10	7.20E-03	4.00E+02	5.30E+04

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000601

A	L	M	N	O	P	Q	R	S	T	U	V
1											
2											
3											
4											
5											
6		tracer						aliquot tracer	tracer	tracer	sample ct
7	sMASSt	MASSt g	sVOLt	sDILt	sDILs	sALIt	sALIs	ALIt mL,g	DILt	VOLt mL,g	T in min
8	6.70E-04	1.97E+00	9.00E-04	7.98E-03	1.00E-03	5.00E-04	1.00E-03	1.97E+00	1.13E+03	1.00E-01	9.99E+02
9	6.70E-04	1.97E+00	9.00E-04	7.98E-03	1.00E-03	5.00E-04	1.00E-03	1.97E+00	1.13E+03	1.00E-01	9.99E+02
10	6.70E-04	1.97E+00	9.00E-04	7.98E-03	1.00E-03	5.00E-04	1.00E-03	1.97E+00	1.13E+03	1.00E-01	9.99E+02
11	6.70E-04	1.97E+00	9.00E-04	7.98E-03	1.00E-03	5.00E-04	1.00E-03	1.97E+00	1.13E+03	1.00E-01	9.99E+02
12	6.70E-04	1.97E+00	9.00E-04	7.98E-03	1.00E-03	5.00E-04	1.00E-03	1.97E+00	1.13E+03	1.00E-01	9.99E+02
13	6.70E-04	1.97E+00	9.00E-04	7.98E-03	1.00E-03	5.00E-04	1.00E-03	1.97E+00	1.13E+03	1.00E-01	9.99E+02

000602 221

A	W	X	Y	Z	AA	AB	AC	AD	AE	AF	AG
1											
2											
3											
4											
5											
6	sample bkg	act tracer	sample ct	sample bkg	sample	tracer ct	tracer bkg	aliquot sam	delta time	sample	sam bkg ct r
7	Tb in min	AMTt dpm	Cgs	Csb	DILs dec	Cgt	Ctb	ALIs L,g	Dt in days	EFF c/d	Bsd
8	9.99E+02	1.07E+01	3.00E+00	2.00E+00	1.00E+00	1.71E+03	5.00E+00	1.00E+00	7.00E+00	1.85E-01	2.00E-03
9	9.99E+02	1.07E+01	4.00E+00	3.00E+00	1.00E+00	1.93E+03	2.00E+00	1.00E+00	7.00E+00	1.97E-01	3.00E-03
10	9.99E+02	2.16E+01	1.10E+01	4.00E+00	5.01E-01	3.41E+03	8.00E+00	1.00E+00	4.30E+01	1.84E-01	4.00E-03
11	9.99E+02	1.07E+01	7.00E+00	2.00E+00	4.71E-01	1.84E+03	3.00E+00	1.00E+00	4.30E+01	1.87E-01	2.00E-03
12	9.99E+02	1.07E+01	7.00E+00	4.00E+00	5.00E-01	1.67E+03	3.00E+00	1.00E+00	4.30E+01	1.93E-01	4.00E-03
13	9.99E+02	1.07E+01	1.00E+00	1.00E+00	4.99E-01	1.80E+03	2.00E+00	1.00E+00	4.30E+01	1.91E-01	1.00E-03

	AH	AI	AJ	AK	AL	AM	AN	AO	AP	AQ
1										
2										
3										
4										
5										
6						sample	sample	sample	sample	
7	REeff	REali	REdil	REr	R	ACTb	NBCRs	sNBCRs	IDLC	K
8	3.88E-02	1.00E-03	1.00E-03	4.73E-02	8.64E-01	2.82E-03	1.00E-03	2.24E-03	2.62E-02	3.55E-01
9	3.65E-02	1.00E-03	1.00E-03	4.46E-02	9.15E-01	2.50E-03	1.00E-03	2.65E-03	2.69E-02	4.01E-01
10	3.91E-02	1.00E-03	2.00E-03	4.43E-02	8.59E-01	3.98E-02	7.01E-03	3.88E-03	6.83E-02	1.76E-01
11	3.86E-02	1.00E-03	2.13E-03	4.66E-02	9.22E-01	2.79E-02	5.01E-03	3.00E-03	5.17E-02	1.80E-01
12	3.73E-02	1.00E-03	2.00E-03	4.62E-02	8.10E-01	1.73E-02	3.00E-03	3.32E-03	6.93E-02	1.74E-01
13	3.78E-02	1.00E-03	2.00E-03	4.61E-02	8.81E-01	0.00E+00	0.00E+00	1.42E-03	3.95E-02	1.86E-01

000603 222

000604223

A	AR	AS	AT	AU	AV
1					
2					
3					
4					
5					
6	tracer	sample	sample	sample	sample
7	NCRt	Sbkg	CUb2s	TPUb1S	TPUb2s
8	1.71E+00	2.00E-03	1.23E-02	6.30E-03	1.23E-02
9	1.93E+00	2.45E-03	1.30E-02	6.61E-03	1.30E-02
10	3.40E+00	2.83E-03	4.32E-02	2.22E-02	4.34E-02
11	1.84E+00	2.00E-03	3.28E-02	1.68E-02	3.29E-02
12	1.67E+00	2.83E-03	3.75E-02	1.92E-02	3.75E-02
13	1.79E+00	1.42E-03	1.49E-02	7.60E-03	1.49E-02

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NOV 05 1996

Section 2. Instrument Performance and Calibration Data
α Spectrometry
Inventory Checklist

Alpha Spectrometry System, Batch QC Charts

☒ Primary Calibration
- ECSLOPE (Energy Calibration Slope)
- ECOFFSET (Energy Calibration Offset)
- FWHMCONSTANT (Constant FWHM)
- AVRGEFF (Average Efficiency)
- PSENERGY-PU239 (Peak Energy Pu-239)
- PSFWHM-PU239 (Peak FWHM Pu-239)
- NLACTVTY-PU239 (Decay Corrected Activity Pu-239)

☒ Secondary Calibration
- ECSLOPE (Energy Calibration Slope)
- ECOFFSET (Energy Calibration Offset)
- FWHMCONSTANT (Constant FWHM)
- PSENERGY-PU239 (Peak Energy Pu-239)
- PSFWHM-PU239 (Peak FWHM Pu-239)
- NLACTVTY-PU239 (Decay Corrected Activity Pu-239)

☒ Daily Pulsar Calibration
- PSENERGY-5000 (Peak Energy 5000 keV)
- PSCENTRD-5000 (Peak Centroid 5000 keV)
- PSFWHM-5000 (Peak FWHM 5000 keV)
- PSCTSS-5000 (Counts/Second 5000 keV)

☒ Weekly Background of Chamber
- BACKRATE (Background Rate)

Section 2. Instrument Performance and Calibration Data
α Spectrometry
Reviewer Checklist

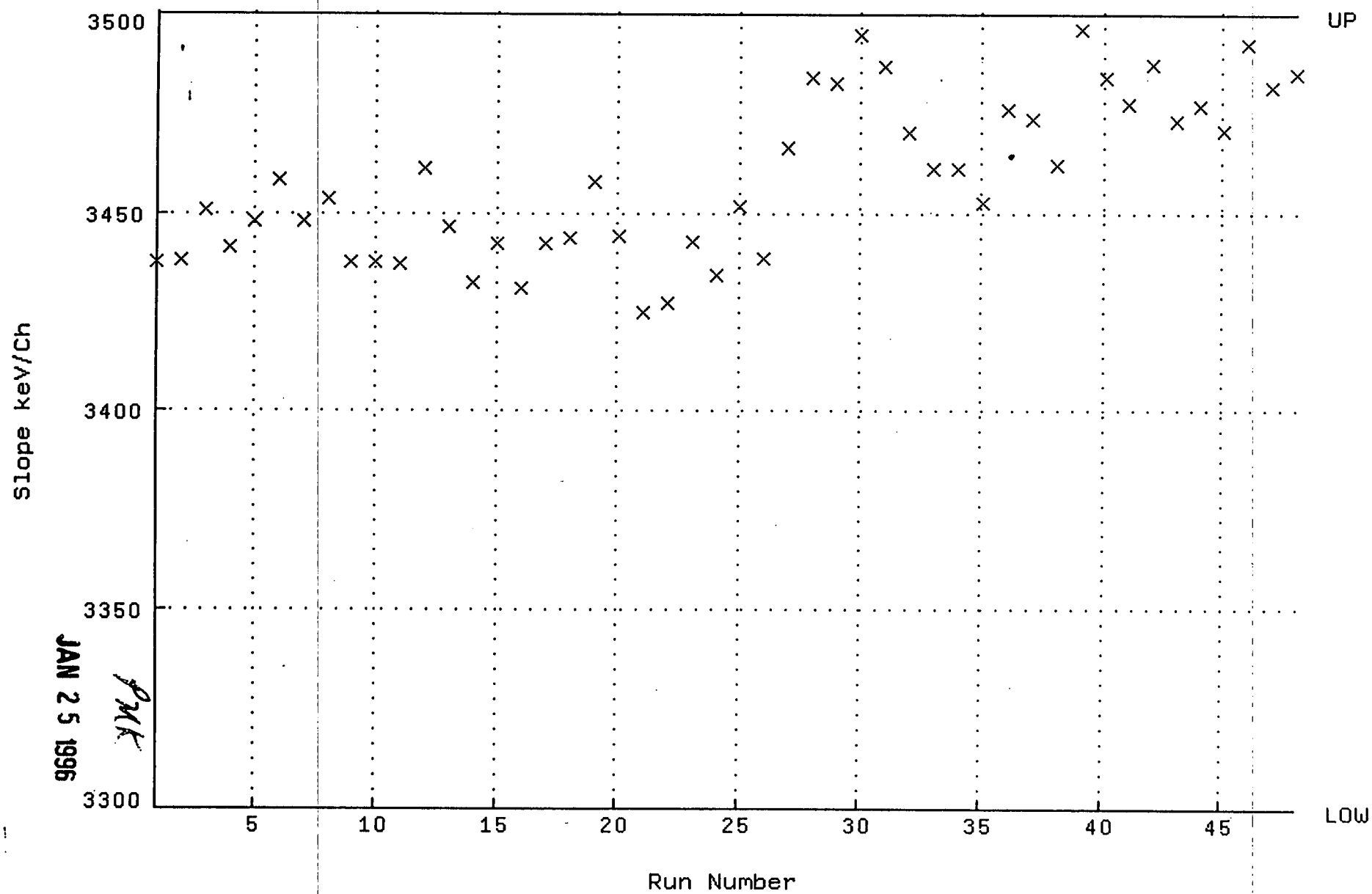
X The Instrument Performance and Calibration Data Inventory Checklist above is complete.

X Specified analytical protocols are followed for particular contract requirements.

X Conditions of instrument setup are noted.

NA NCR(s) noted, and affected instruments not used.

QA filename : DKA0:[ALPHA.ALUSR.QA.PRIME]BATCH_PRIME.QAF;47
Parameter Name : ECOFFSET (Slope keV/Ch)
Start/End Dates : 22-JAN-1996 09:02:47 through 24-JAN-1996 07:29:22
Lower/Upper Lmts: 3300.00 through 3500.00



JAN 25 1996

PMK

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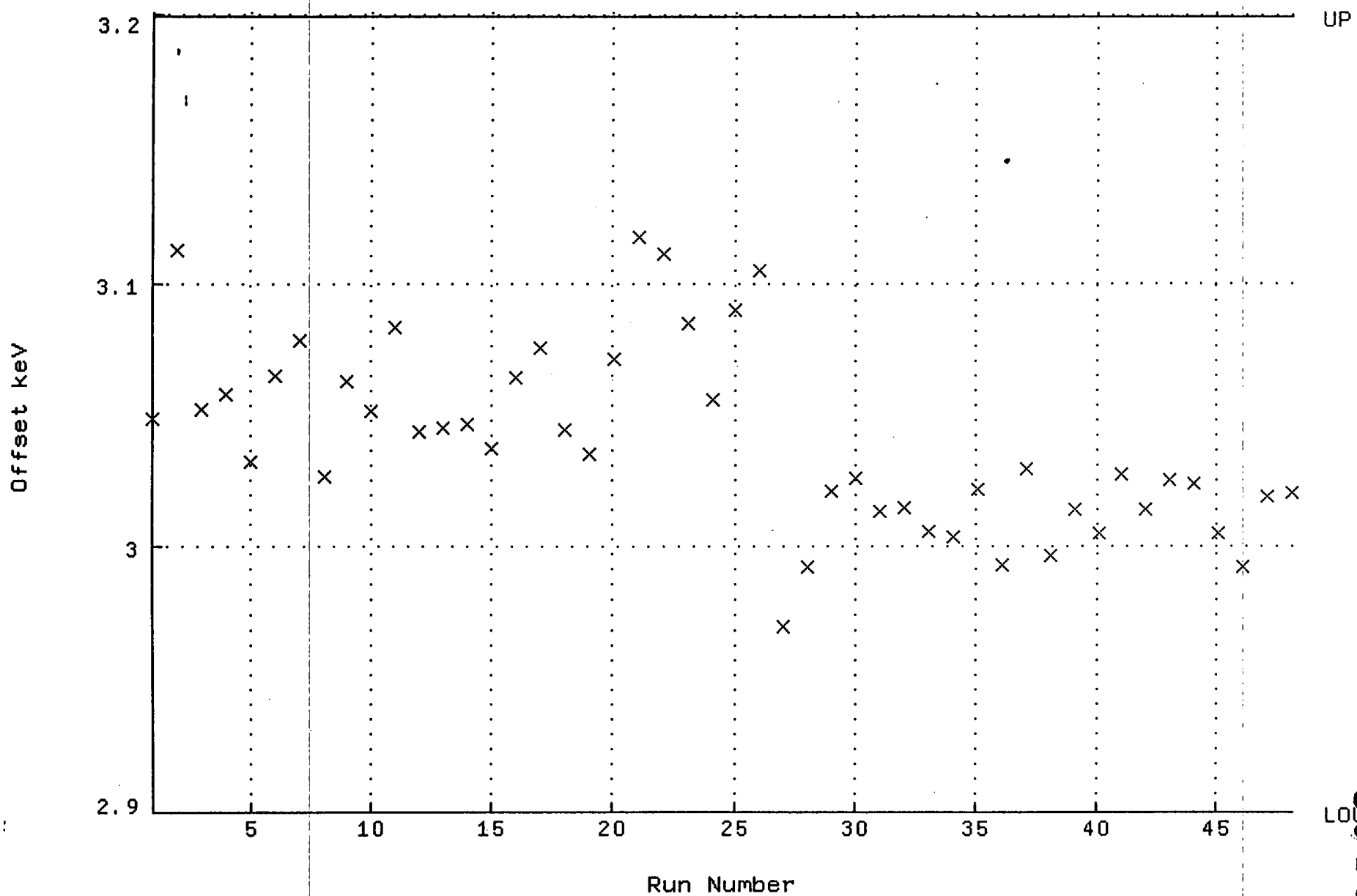
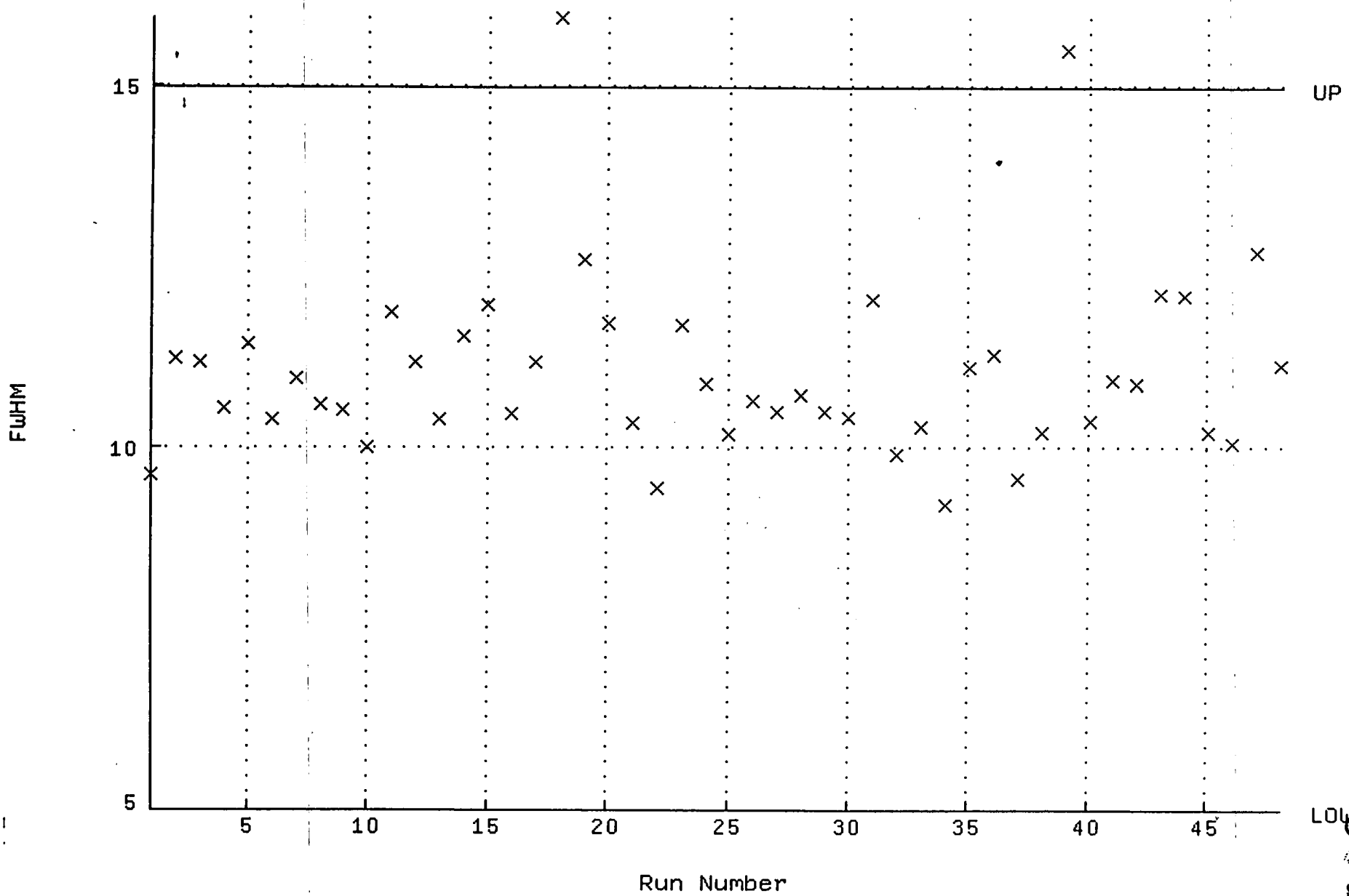
QA filename : DKA0:[ALPHA.ALUSR.QA.PRIME]BATCH_PRIME.QAF;47
Parameter Name : ECSLOPE (Offset keV)
Start/End Dates : 22-JAN-1996 09:02:47 through 24-JAN-1996 07:29:22
Lower/Upper Lmts: 2.90000 through 3.20000



QA filename : DKA0:[ALPHA.ALUSR.QA.PRIME]BATCH_PRIME.QAF;47
Parameter Name : FWHMCONST (FWHM)
Start/End Dates : 22-JAN-1996 09:02:47 through 24-JAN-1996 07:29:22
Lower/Upper Lmts: 5.00000 through 15.0000



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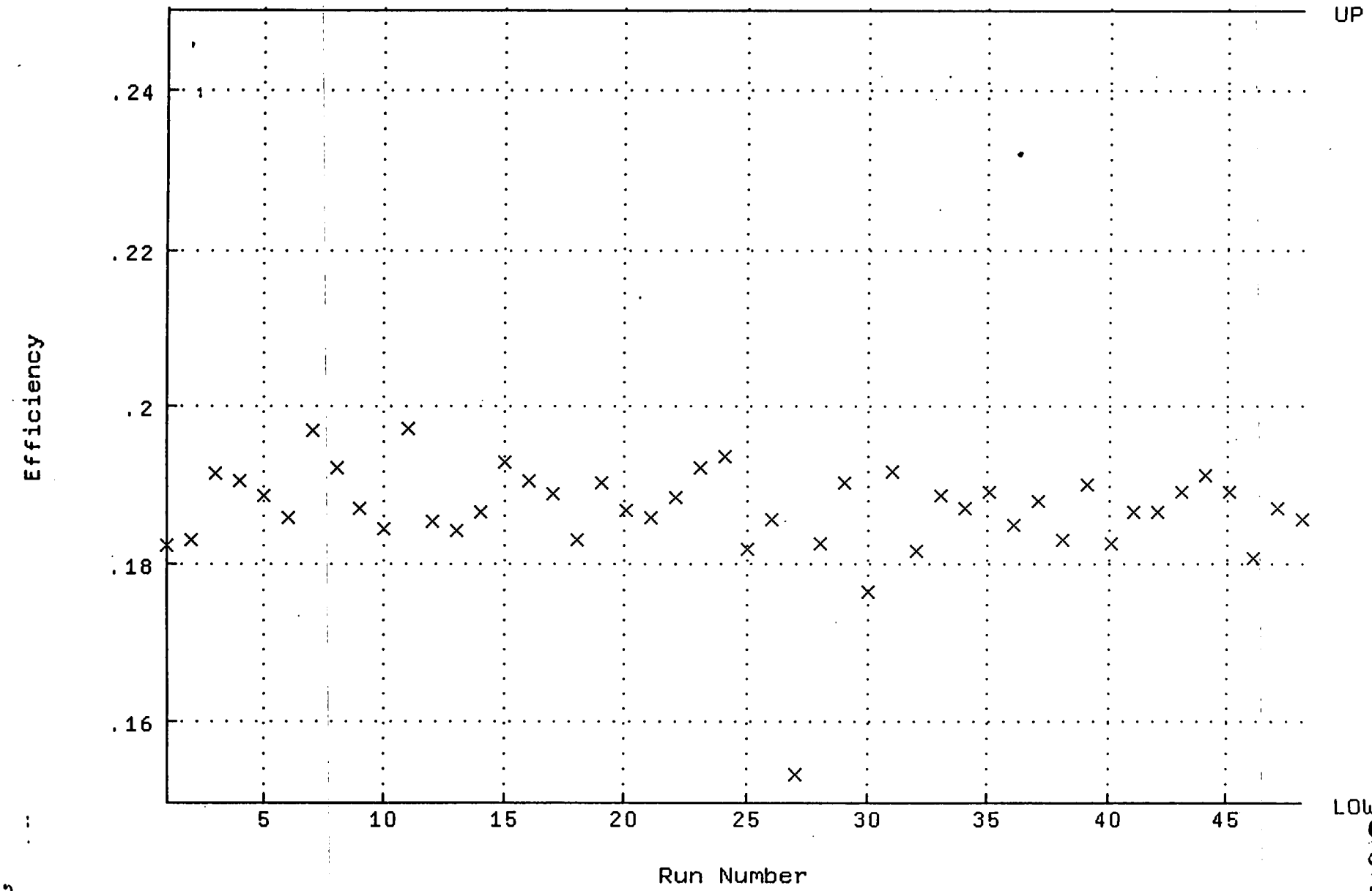
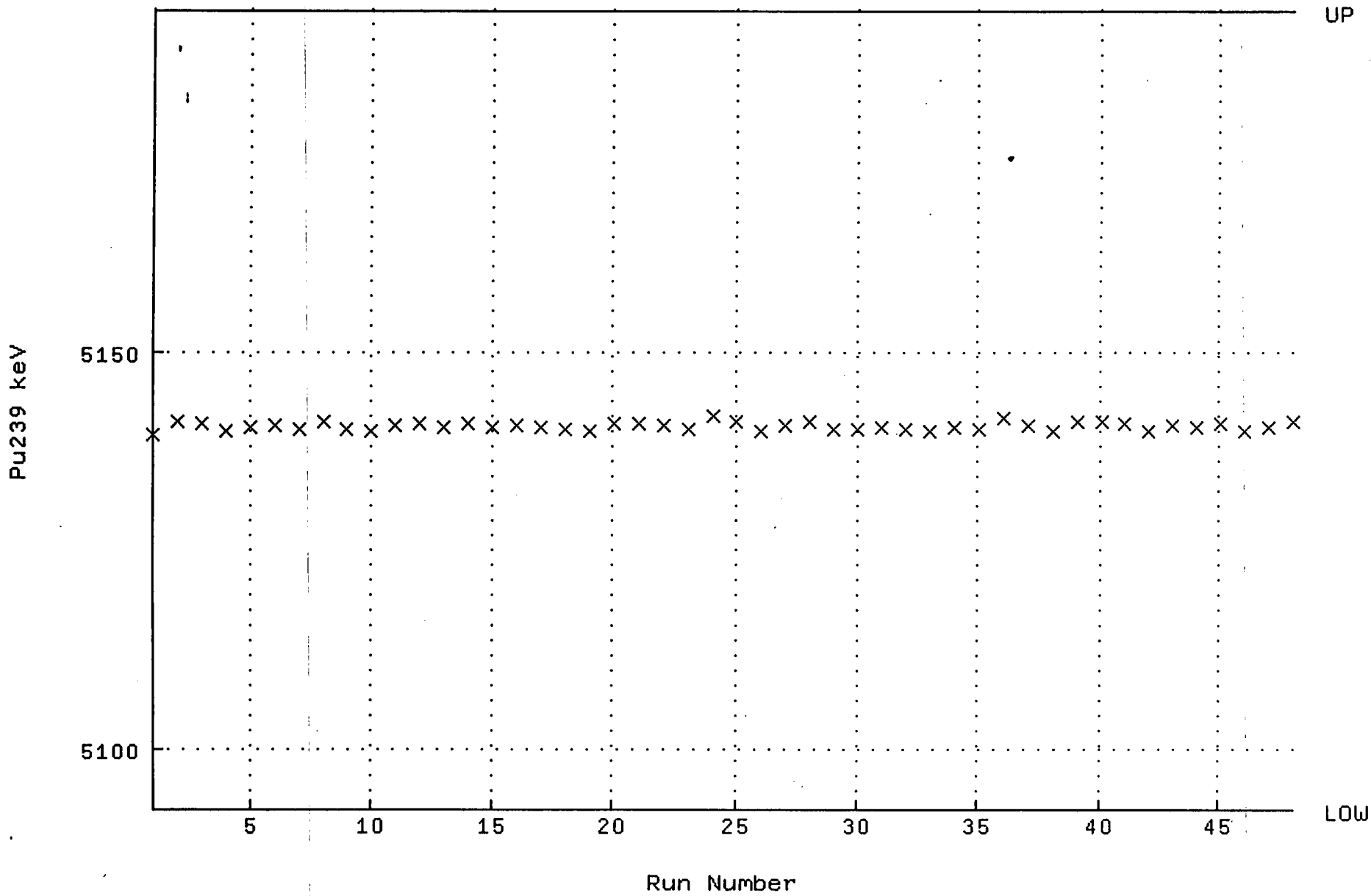
8019

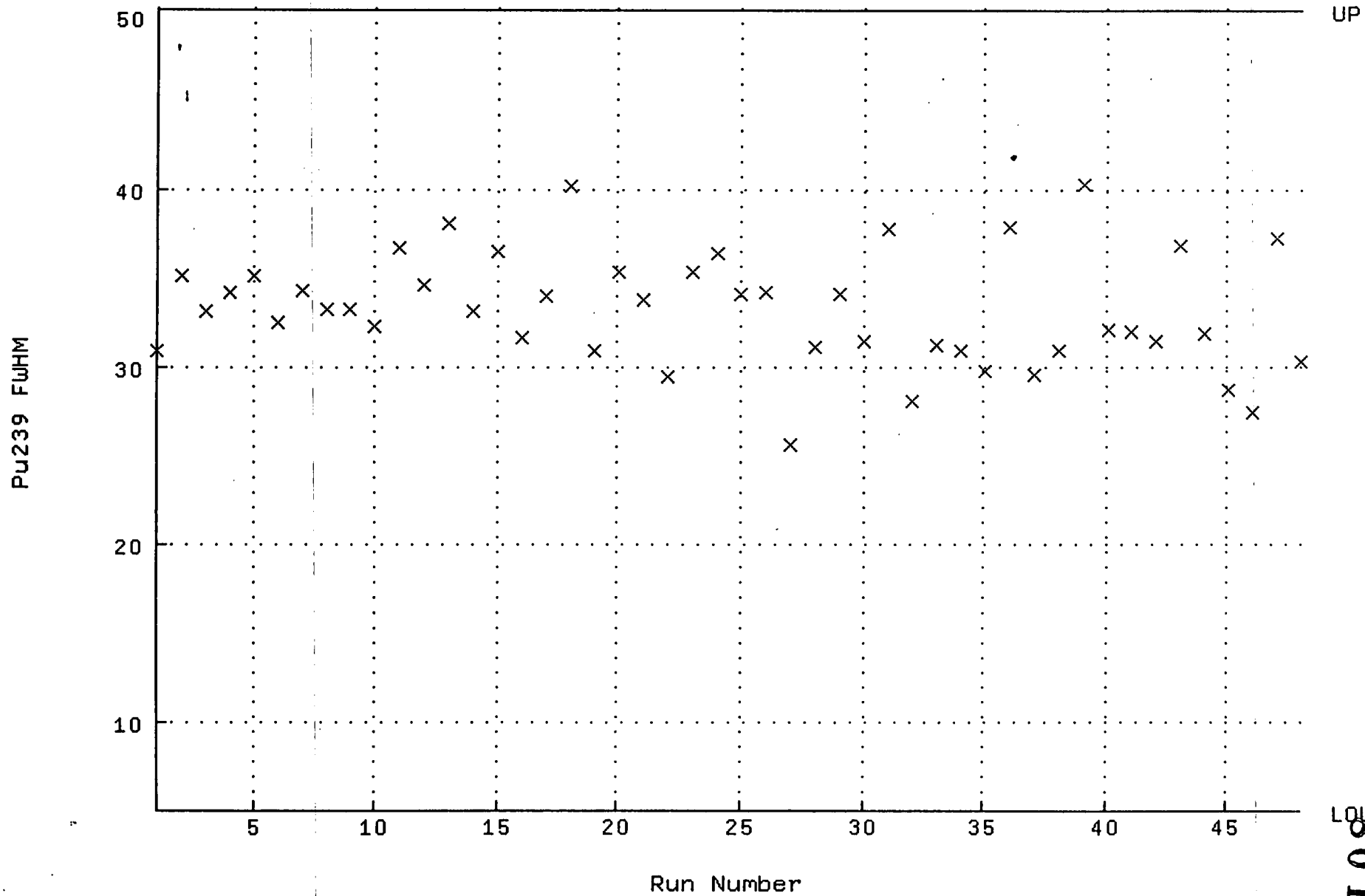
QA filename : DKA0:[ALPHA.ALUSR.QA.PRIME]BATCH_PRIME.QAF;47
Parameter Name : AVRGEFF (Efficiency)
Start/End Dates : 22-JAN-1996 09:02:47 through 24-JAN-1996 07:29:22
Lower/Upper Lmts: 0.150000 through 0.250000



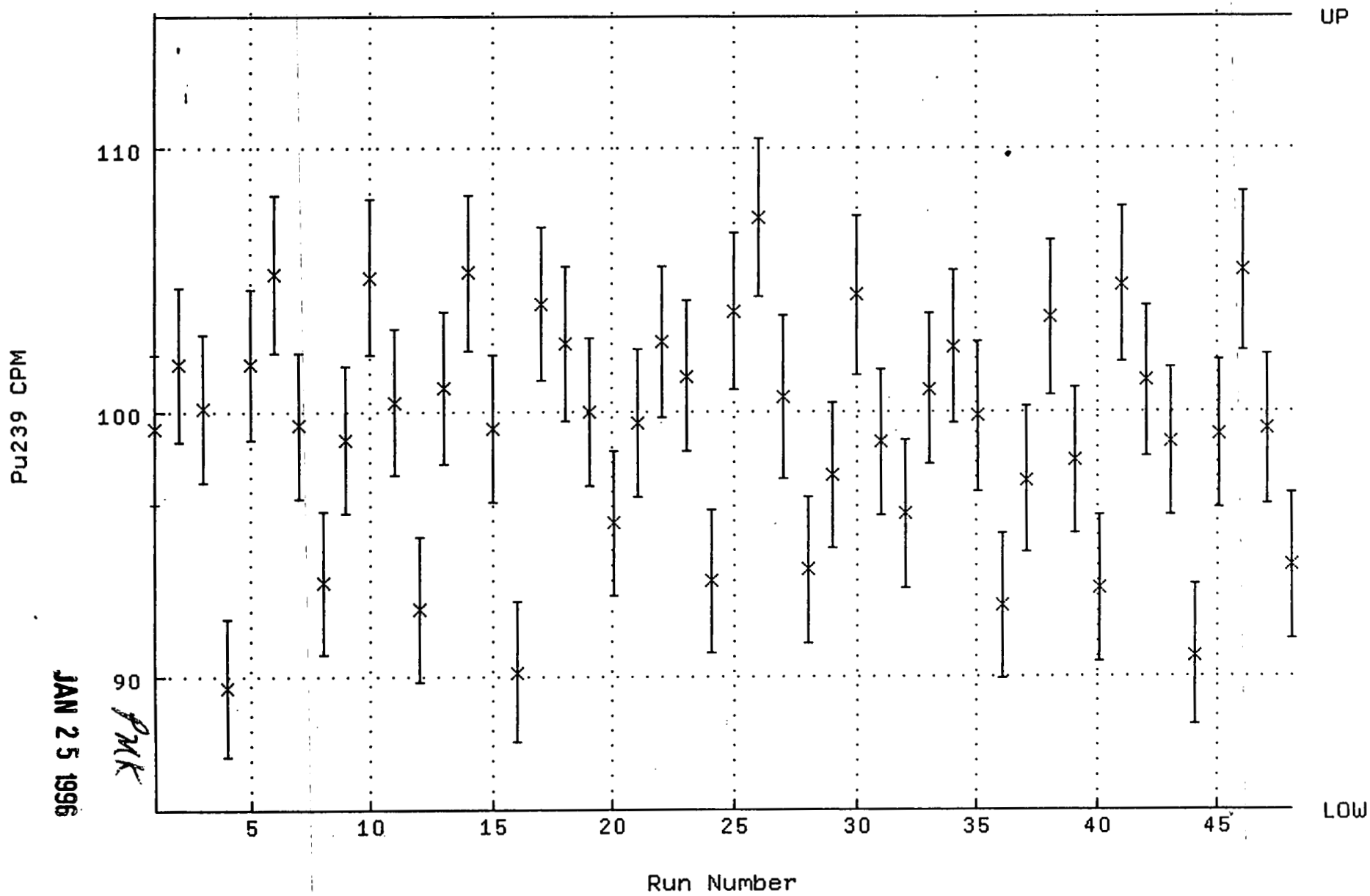
QA filename : DKA0:[ALPHA.ALUSR.QA.PRIME]BATCH_PRIME.QAF;47
Parameter Name : PSENERGY-PU239 (Pu239 keV)
Start/End Dates : 22-JAN-1996 09:02:47 through 24-JAN-1996 07:29:22
Lower/Upper Lmts: 5092.50 through 5192.50



QA filename : DKA0:[ALPHA.ALUSR.QA.PRIME]BATCH_PRIME.QAF;47
Parameter Name : PSFWHM-PU239 (Pu239 FWHM)
Start/End Dates : 22-JAN-1996 09:02:47 through 24-JAN-1996 07:29:22
Lower/Upper Lmts: 5.00000 through 50.0000



QA filename : DKA0:[ALPHA.ALUSR.QA.PRIME]BATCH_PRIME.QAF;47
Parameter Name : NLACTVTY-PU239 (Pu239 CPM)
Start/End Dates : 22-JAN-1996 09:02:47 through 24-JAN-1996 07:29:22
Lower/Upper Lmts: 85.0000 through 115.000



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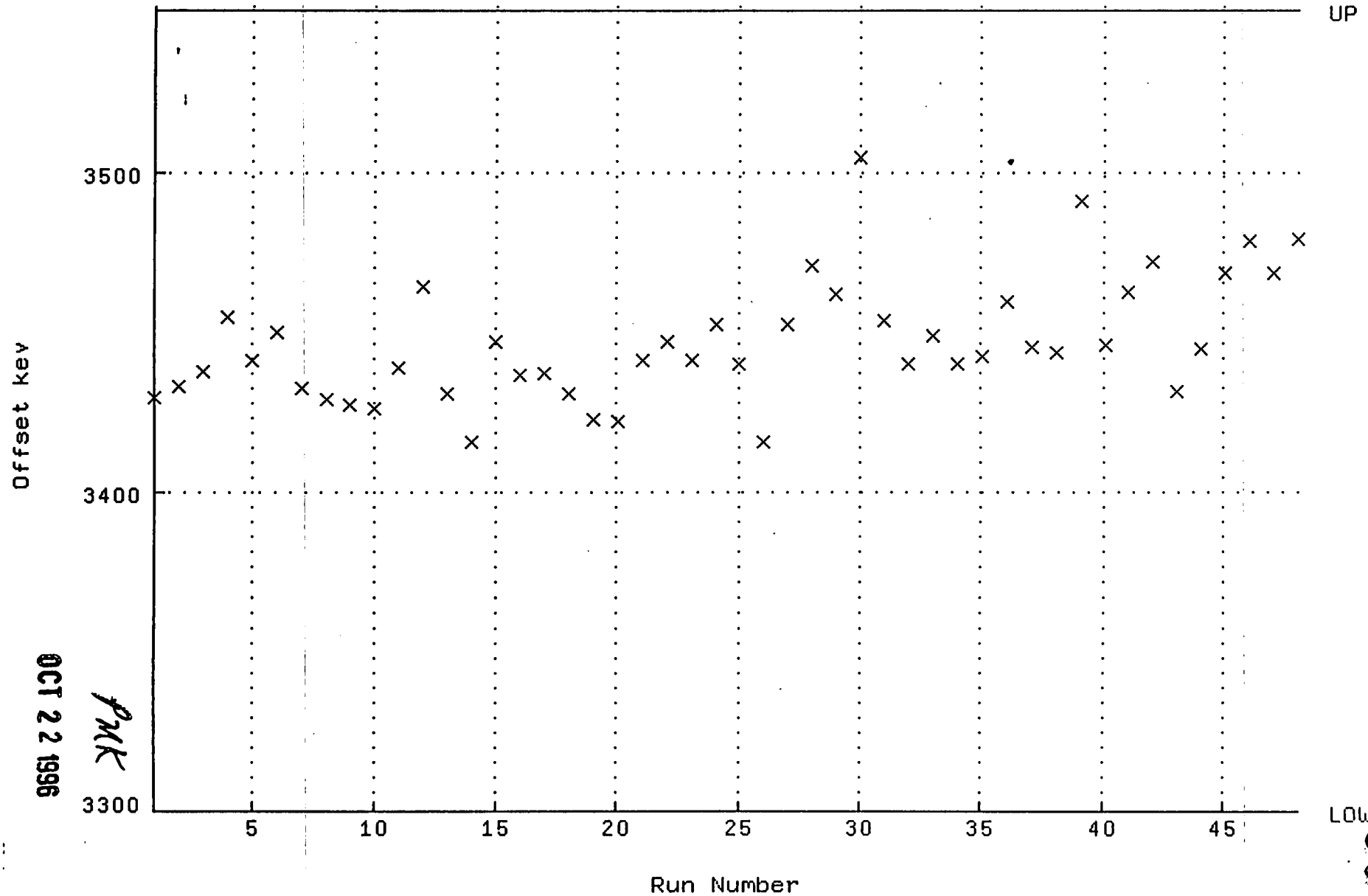
QA filename : DKA0:[ALPHA.ALUSR.QA.SECOND]BATCH_SECOND.QAF;242
Parameter Name : ECOFFSET (Offset kev)
Start/End Dates : 21-OCT-1996 10:05:04 through 21-OCT-1996 12:31:45
Lower/Upper Lmts: 3300.00 through 3550.00



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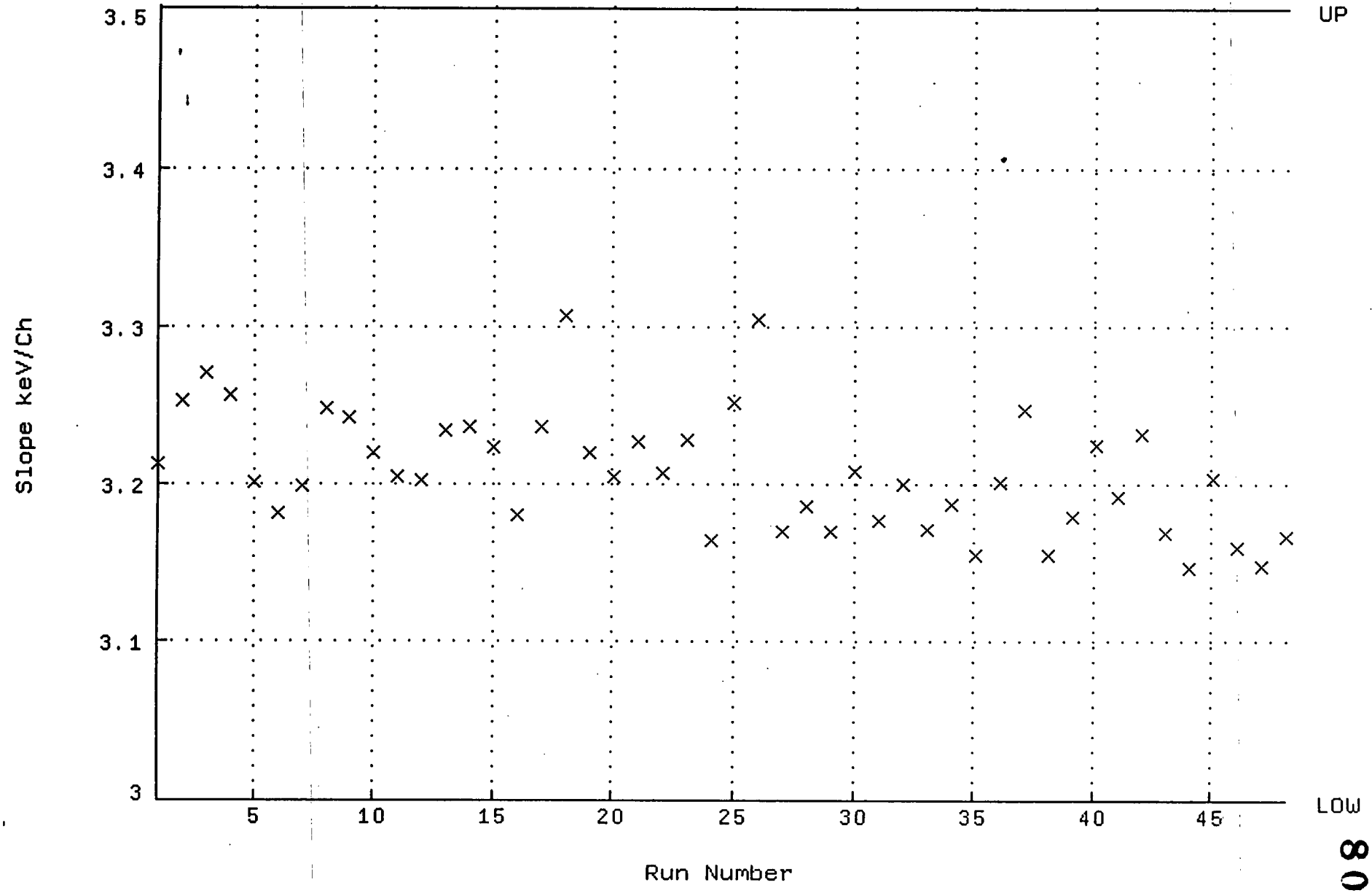
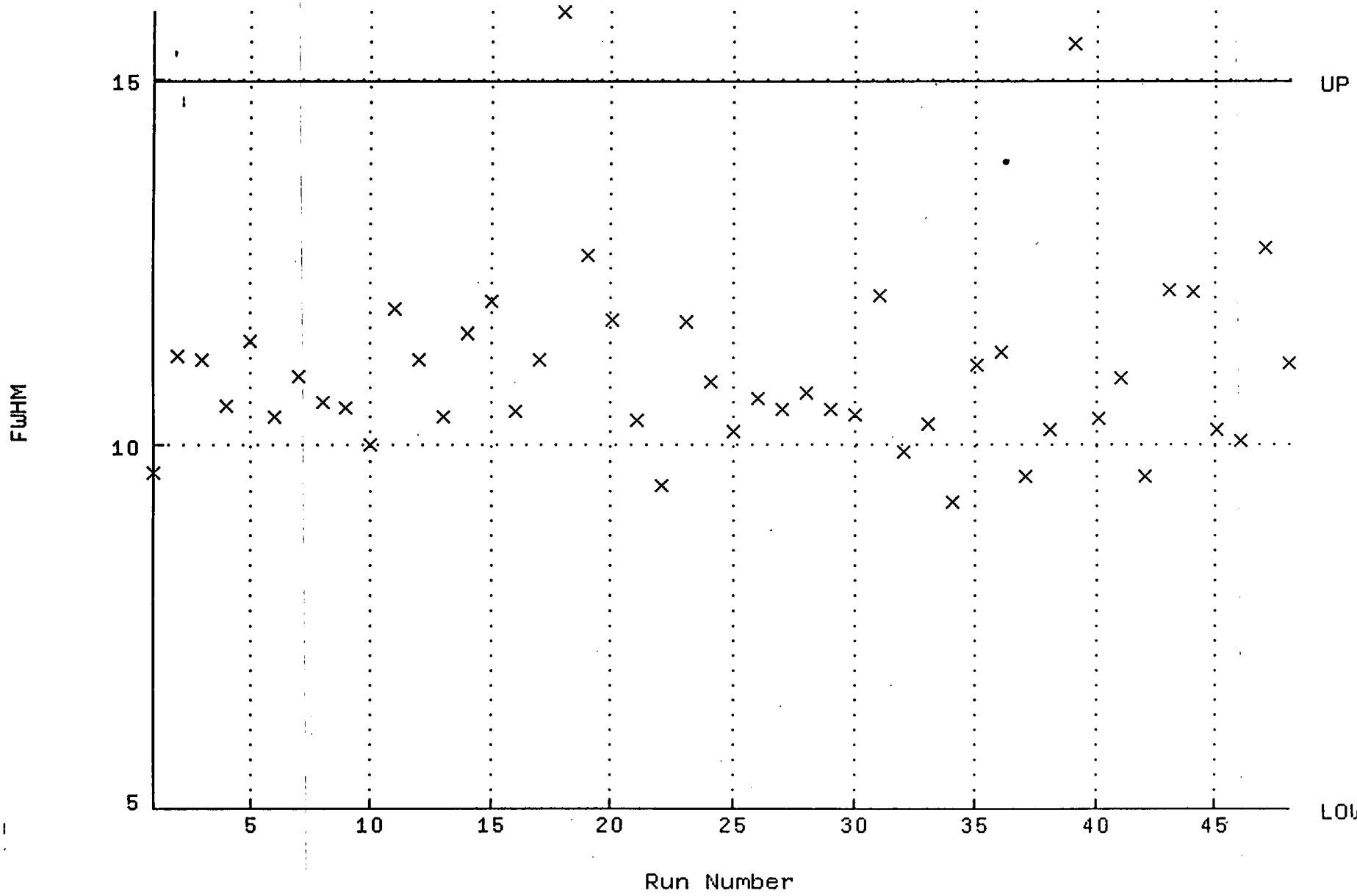
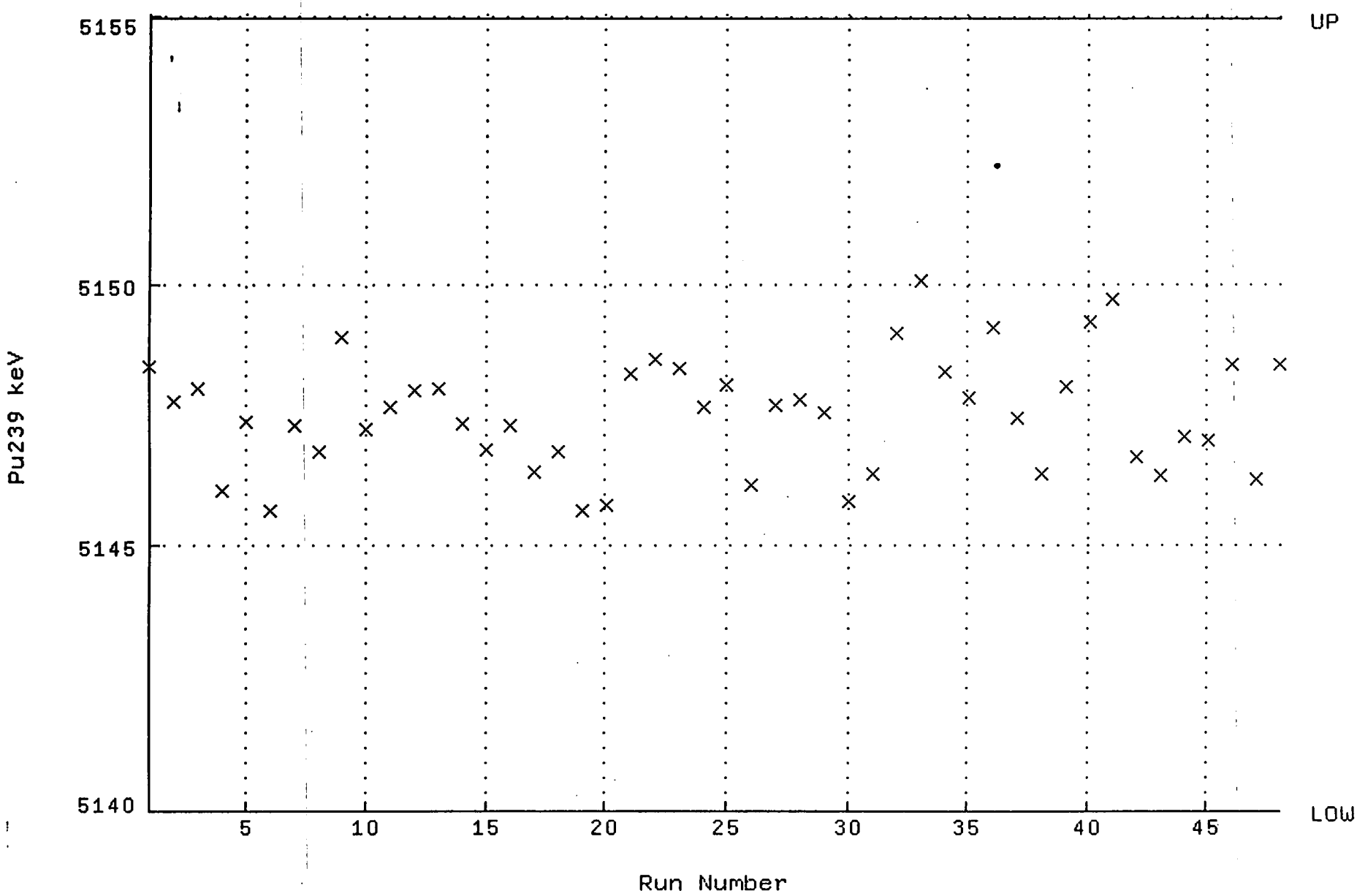
QA filename : DKA0:[ALPHA.ALUSR.QA.SECOND]BATCH_SECOND.QAF;242
Parameter Name : ECSLOPE (Slope keV/Ch)
Start/End Dates : 21-OCT-1996 10:05:04 through 21-OCT-1996 12:31:45
Lower/Upper Lmts: 3.00000 through 3.50000



QA filename : DKA0:[ALPHA.ALUSR.QA.SECOND]BATCH_SECOND.QAF;242
Parameter Name : FWHMCONST (FWHM)
Start/End Dates : 21-OCT-1996 10:05:04 through 21-OCT-1996 12:31:45
Lower/Upper Lmts: 5.00000 through 15.0000



QA filename : DKA0:[ALPHA.ALUSR.QA.SECOND]BATCH_SECOND.QAF;242
Parameter Name : PSENERGY-PU239 (Pu239 keV)
Start/End Dates : 21-OCT-1996 10:05:04 through 21-OCT-1996 12:31:45
Lower/Upper Lmts: 5140.00 through 5155.00



QA filename : DKA0:[ALPHA.ALUSR.QA.SECOND]BATCH_SECOND.QAF;242
Parameter Name : PSFWHM-PU239 (Pu239 FWHM)
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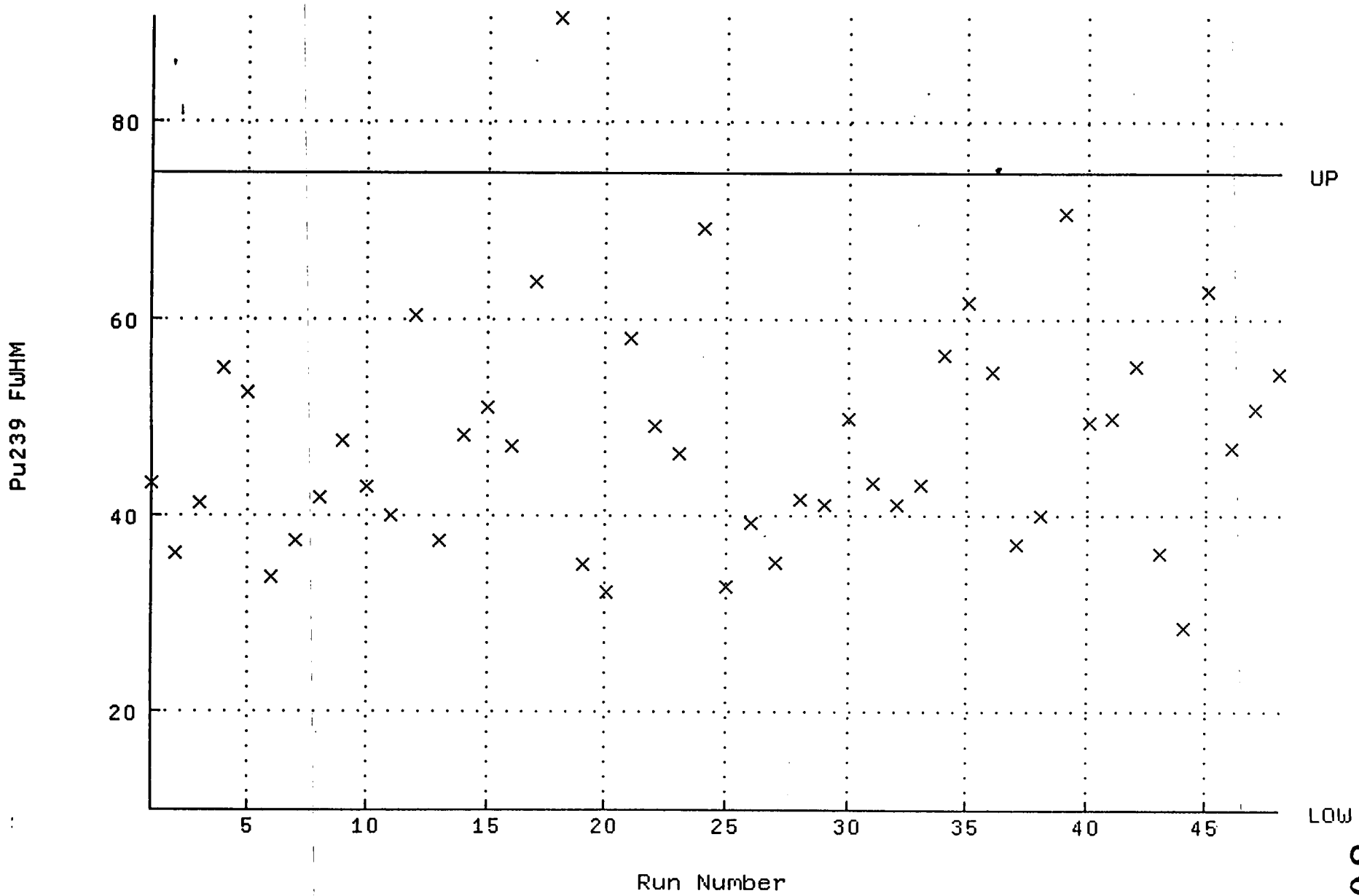
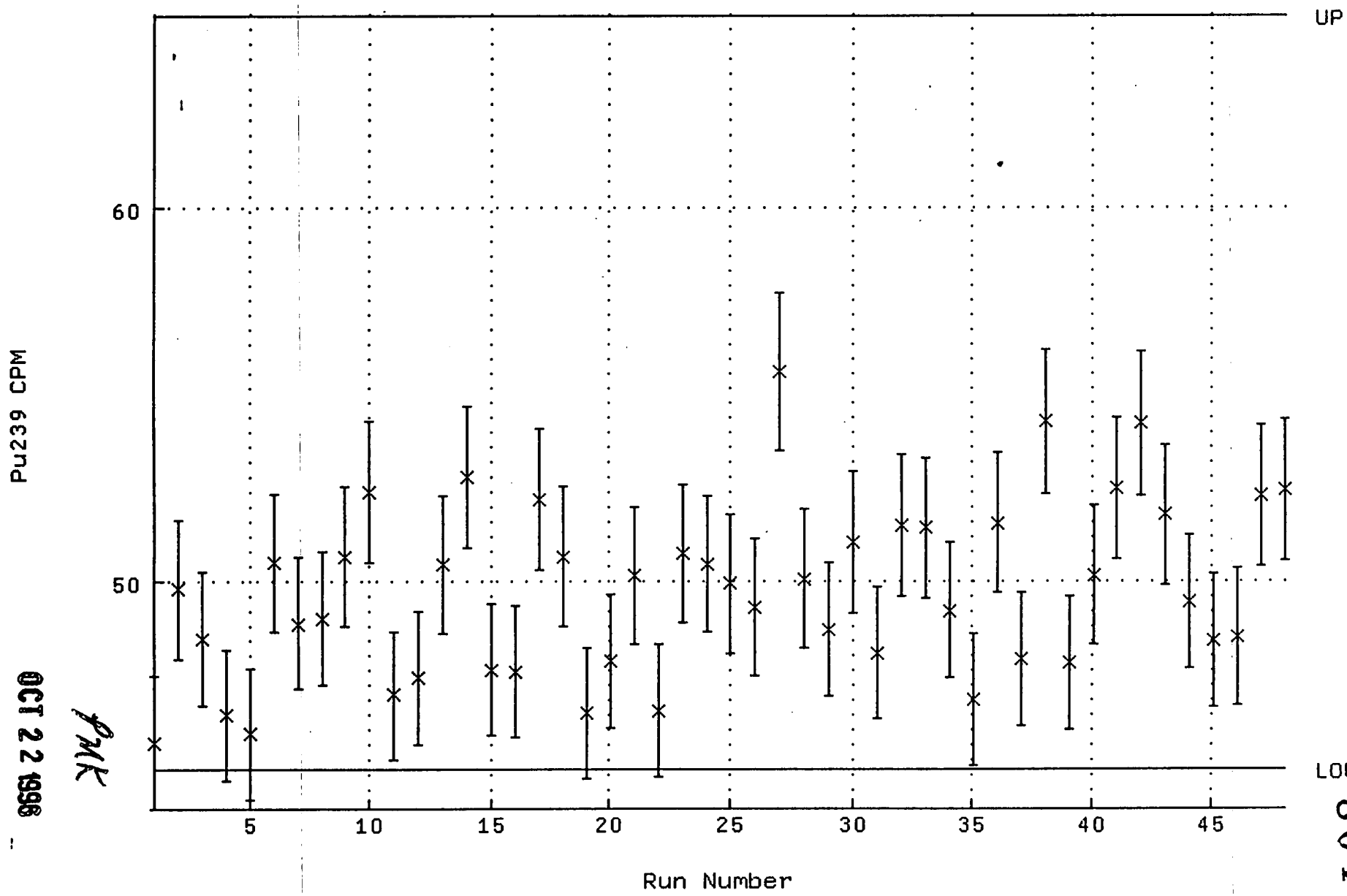
Lower/Upper Lmts: 10.0000 through 75.0000



QA filename : DKA0:[ALPHA.ALUSR.QA.SECOND]BATCH_SECOND.QAF;242
Parameter Name : NLACTVTY-PU239 (Pu239 CPM)
Start/End Dates : 21-OCT-1996 10:05:04 through 21-OCT-1996 12:31:45
Lower/Upper Lmts: 45.0000 through 65.0000



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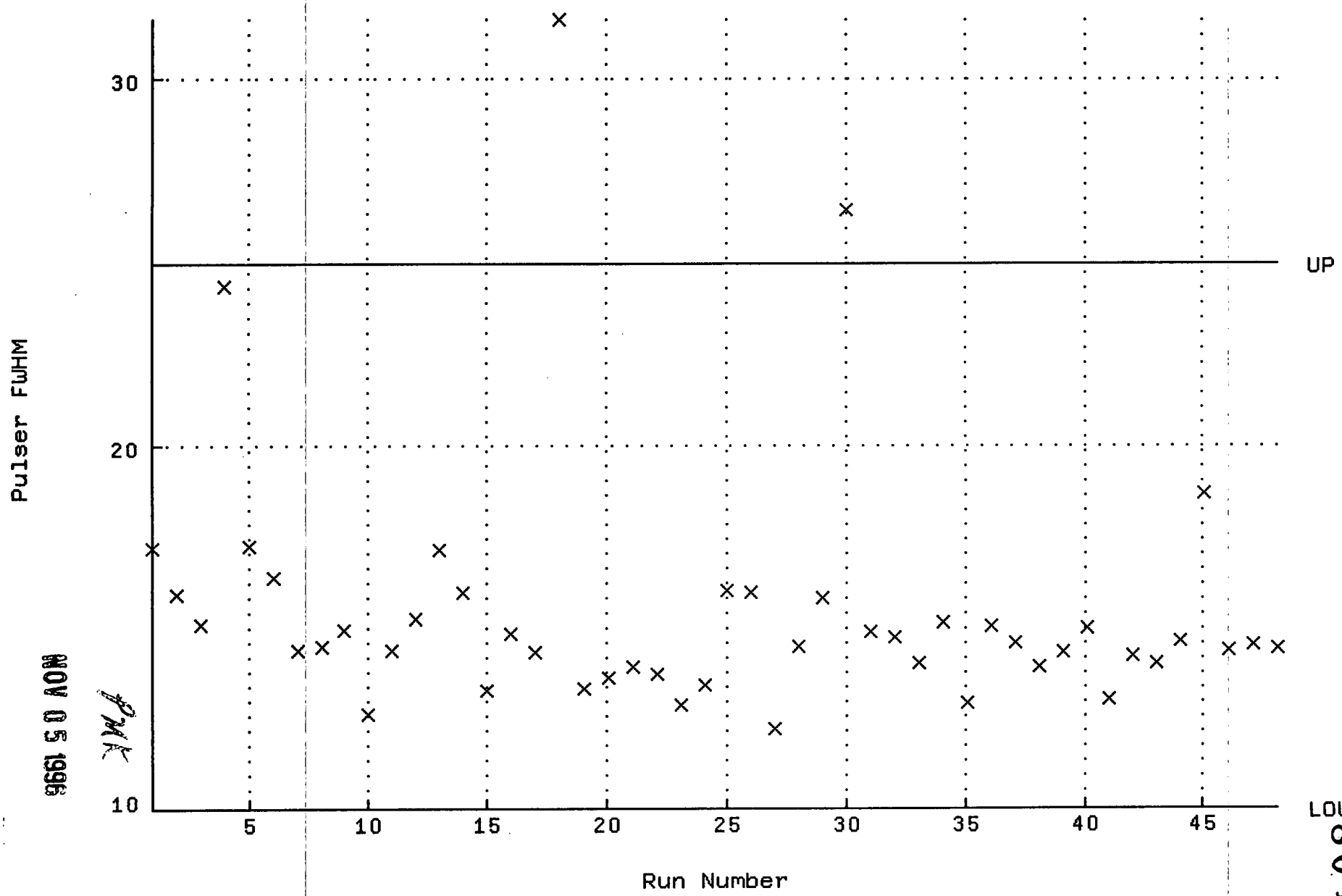
QA filename : DKA0:[ALPHA.ALUSR.QA.D]BATCH_D.QAF;677
Parameter Name : PSFWHM-5000 (Pulser FWHM)
Start/End Dates : 24-OCT-1996 08:27:45 through 24-OCT-1996 08:28:16
Lower/Upper Lmts: 10.0000 through 25.0000



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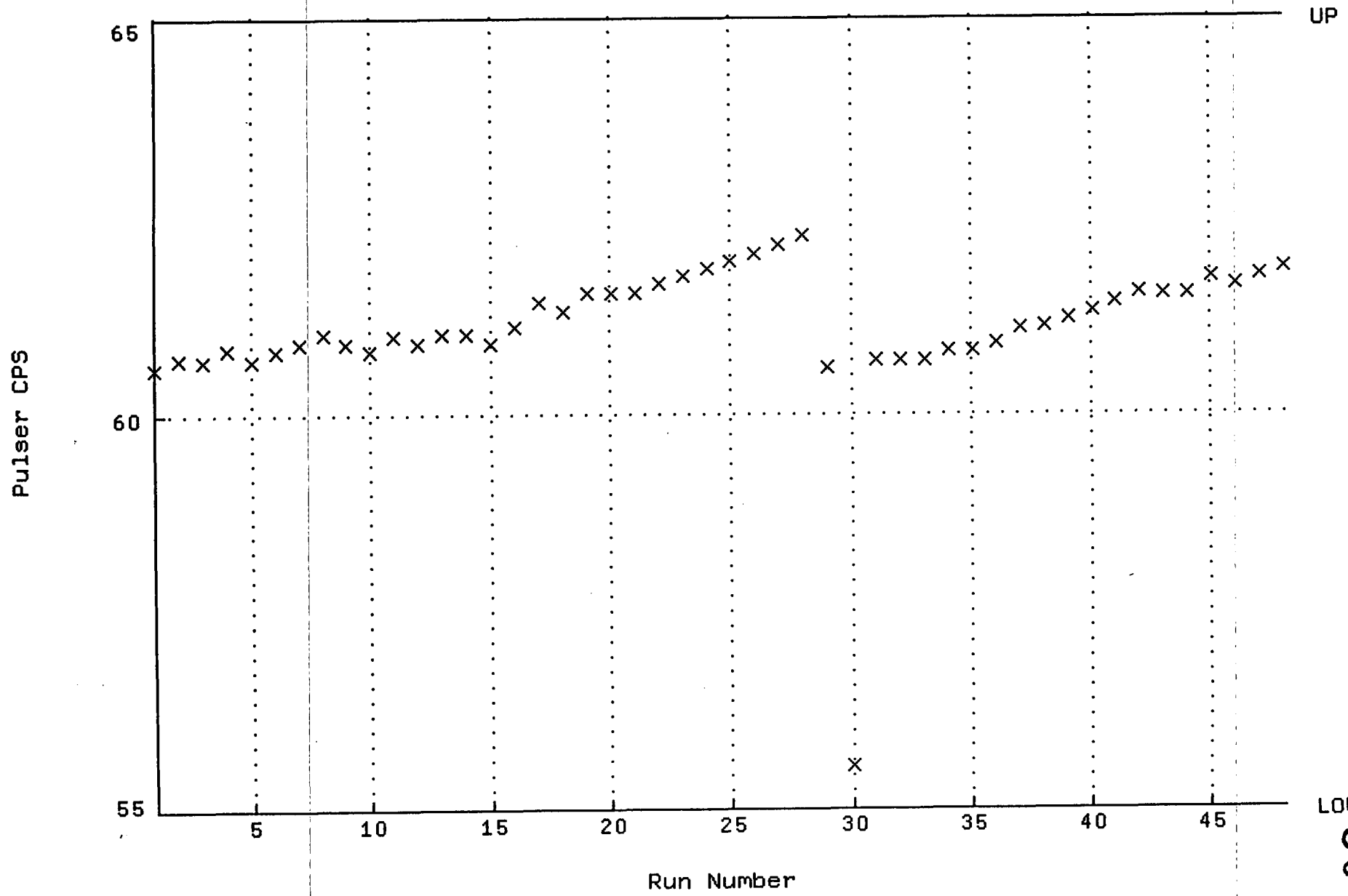
QA filename : DKA0:[ALPHA.ALUSR.QA.D]BATCH_D.QAF;677
Parameter Name : PSCTSS-6000 (Pulser CPS)
Start/End Dates : 24-OCT-1996 08:27:45 through 24-OCT-1996 08:28:16
Lower/Upper Lmts: 55.0000 through 65.0000



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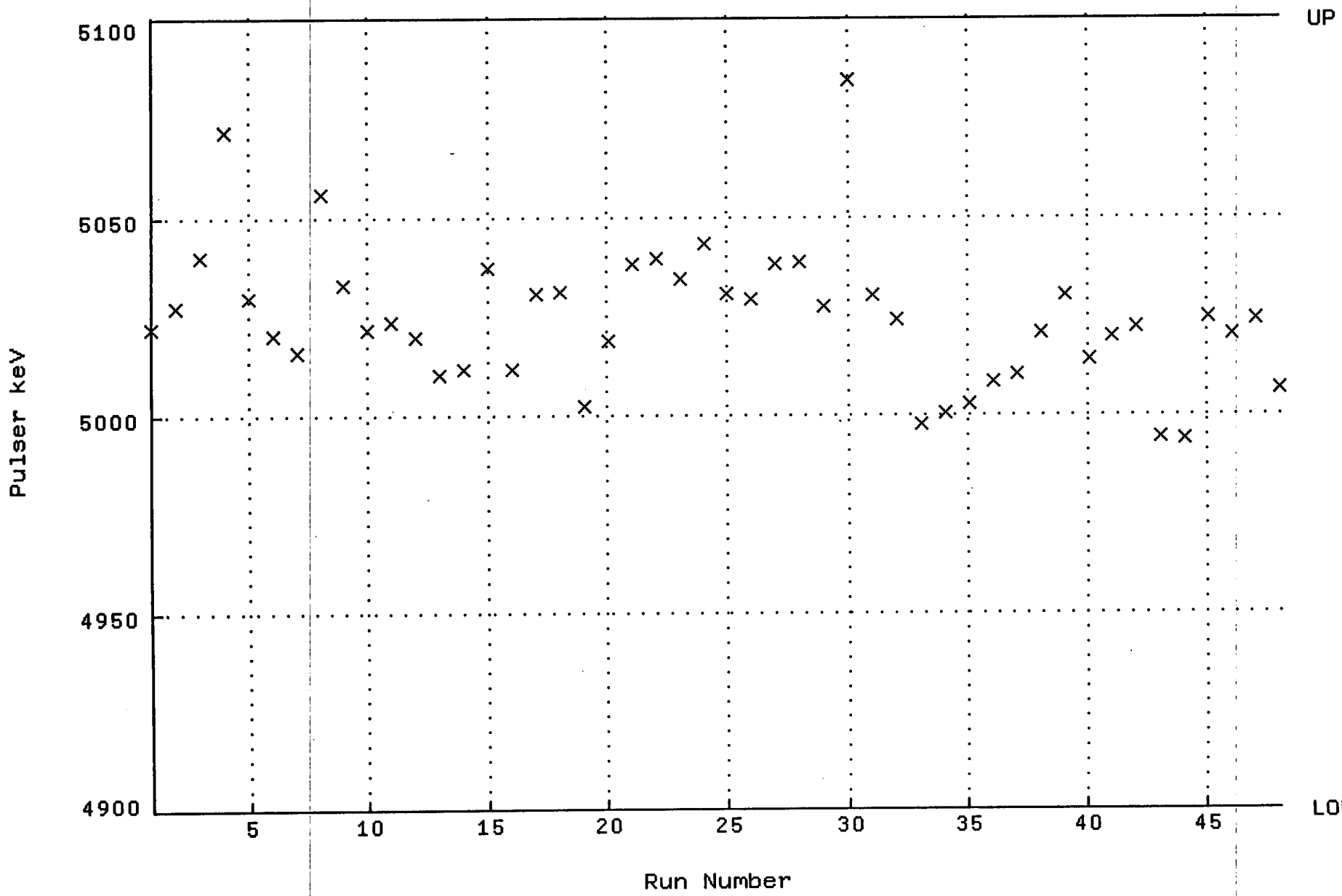
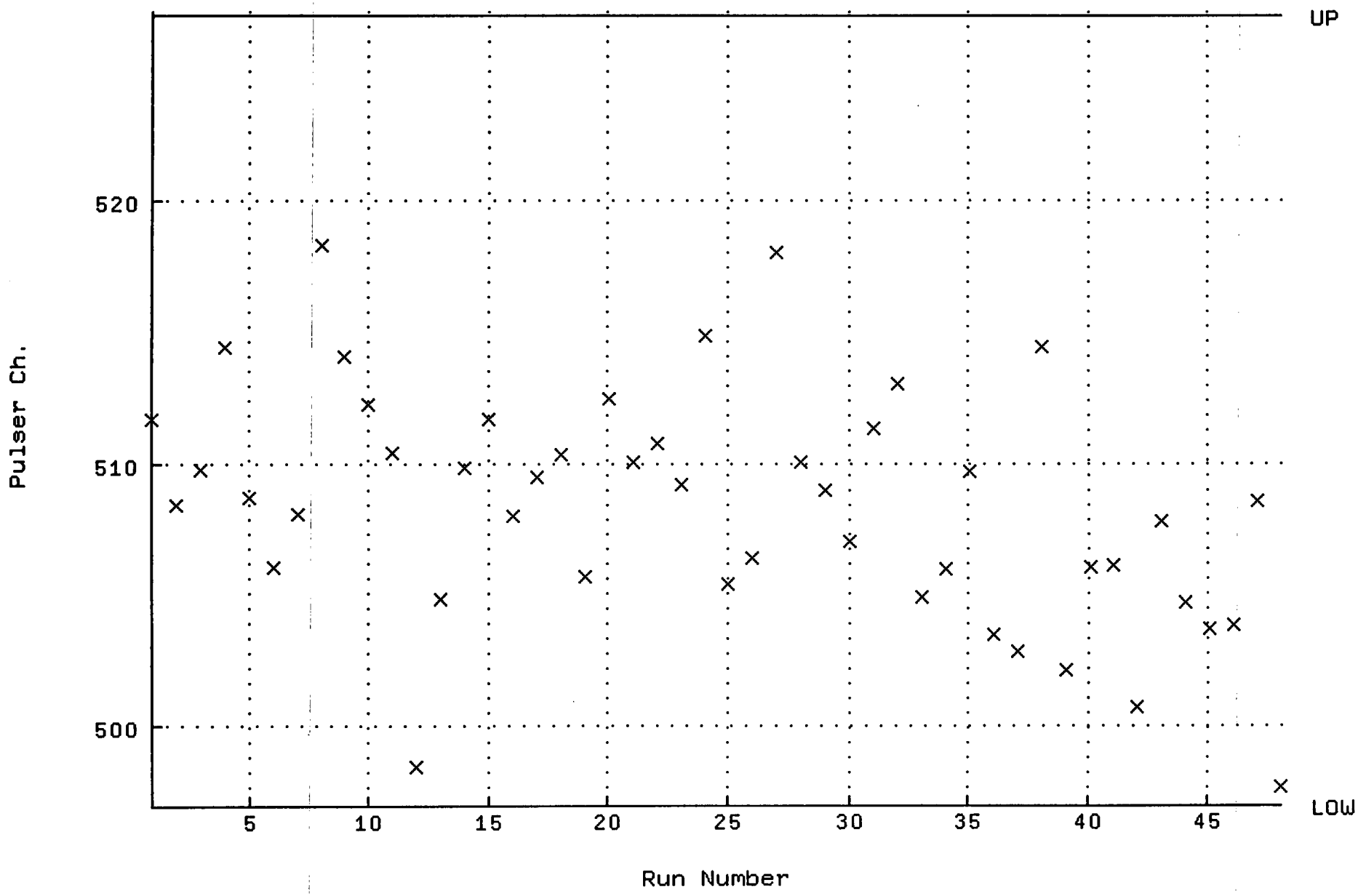
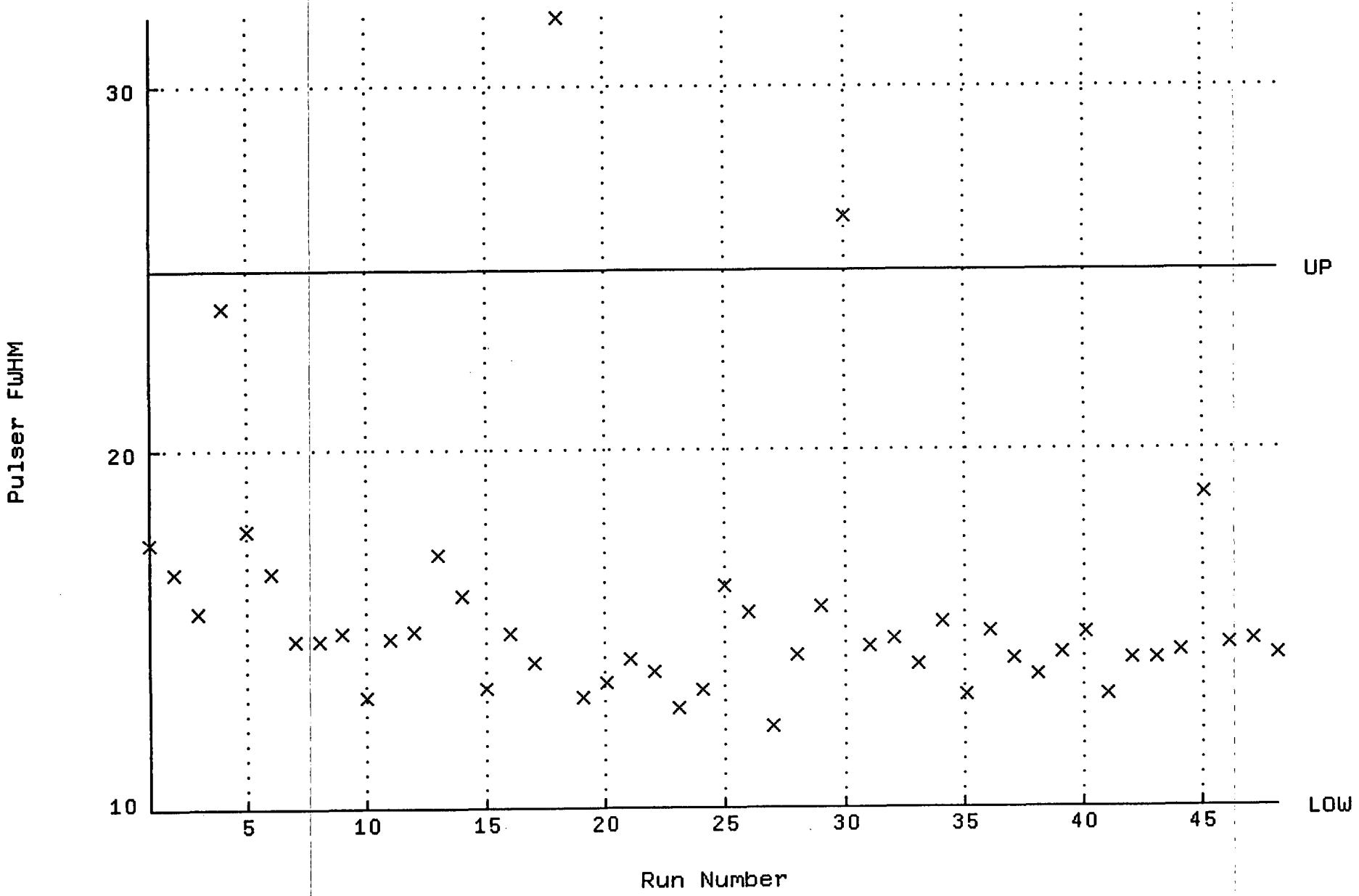
QA filename : DKA0:[ALPHA.ALUSR.QA.D]BATCH_D.QAF;677
Parameter Name : PSENERGY-5000 (Pulser keV)
Start/End Dates : 24-OCT-1996 08:27:45 through 24-OCT-1996 08:28:16
Lower/Upper Lmts: 4900.00 through 5100.00



QA filename : DKA0:[ALPHA.ALUSR.QA.D]BATCH_D.QAF;677
Parameter Name : PSCENTRD-5000 (Pulser Ch.)
Start/End Dates : 24-OCT-1996 08:27:45 through 24-OCT-1996 08:28:16
Lower/Upper Lmts: 497.000 through 527.000



QA filename : DKA0:[ALPHA.ALUSR.QA.D]BATCH_D.QAF;678
Parameter Name : PSFWHM-5000 (Pulser FWHM)
Start/End Dates : 25-OCT-1996 10:18:59 through 25-OCT-1996 10:19:26
Lower/Upper Lmts: 10.0000 through 25.0000



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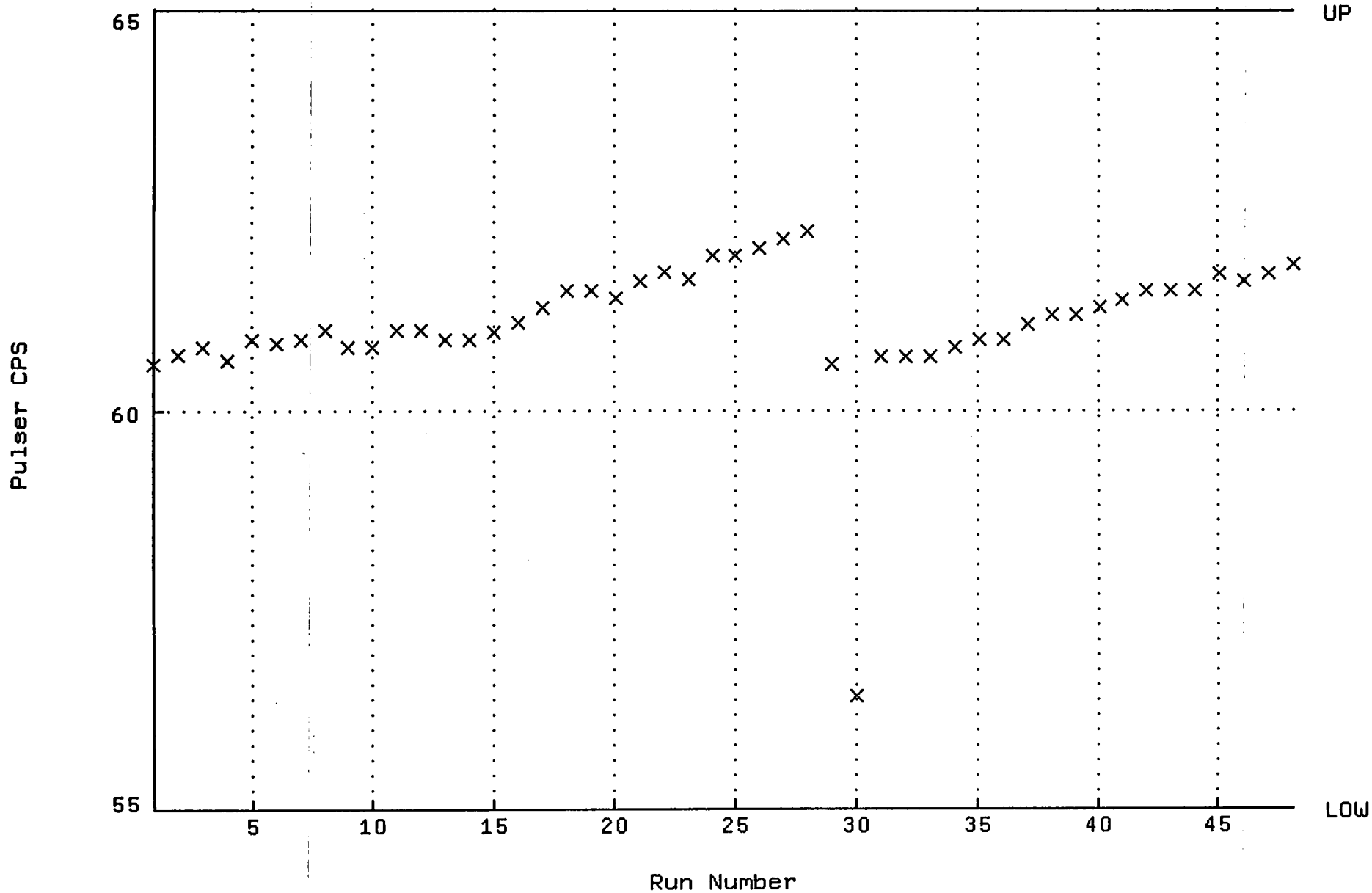
Lower/Upper Lmts: 55.0000 through 65.0000



QA filename : DKA0:[ALPHA.ALUSR.QA.D]BATCH_D.QAF;678
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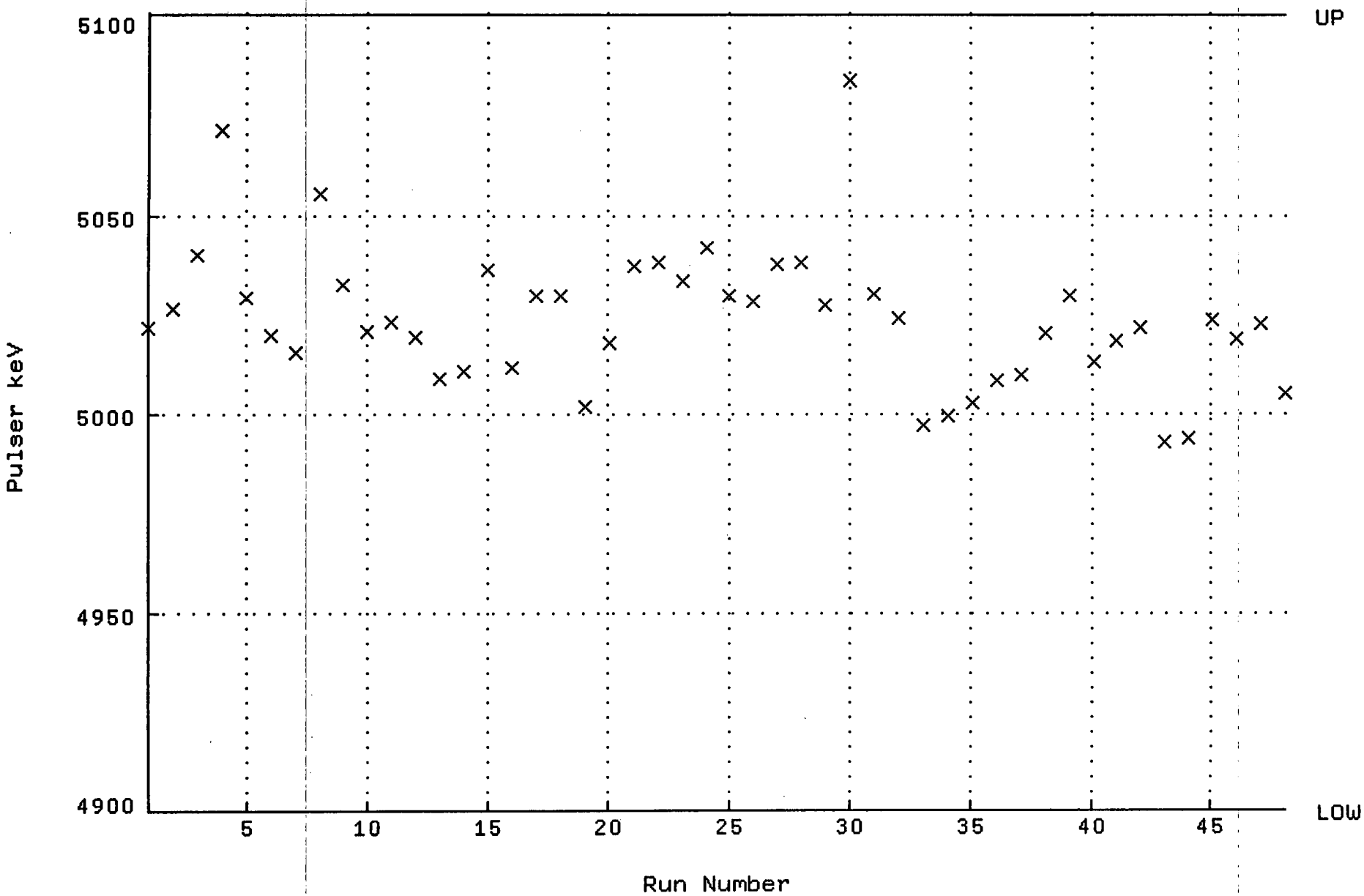
Start/End Dates : 25-OCT-1996 10:18:59 through 25-OCT-1996 10:19:26
Lower/Upper Lmts: 4900.00 through 5100.00



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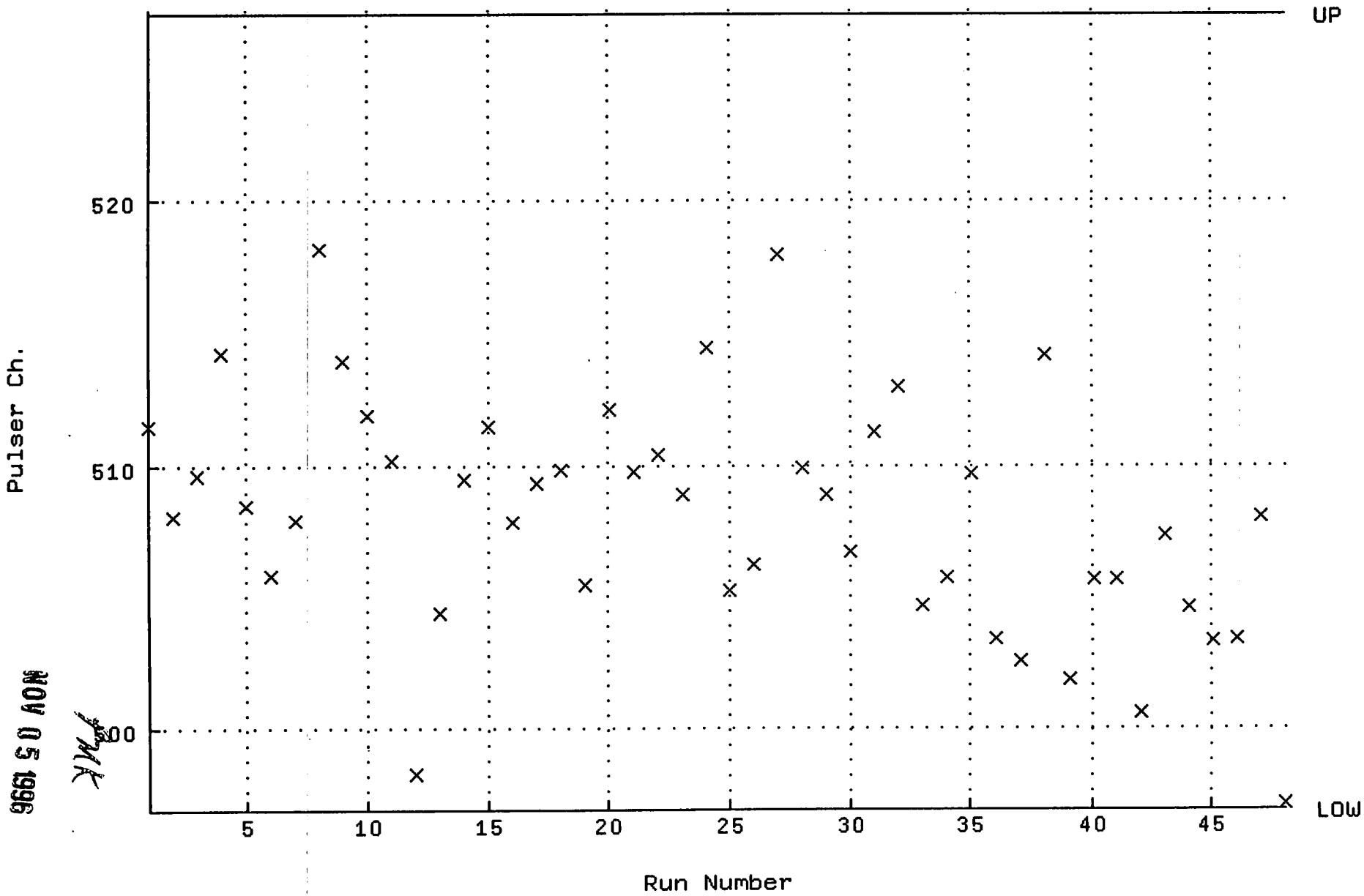
Lower/Upper Lmts: 497.000 through 527.000



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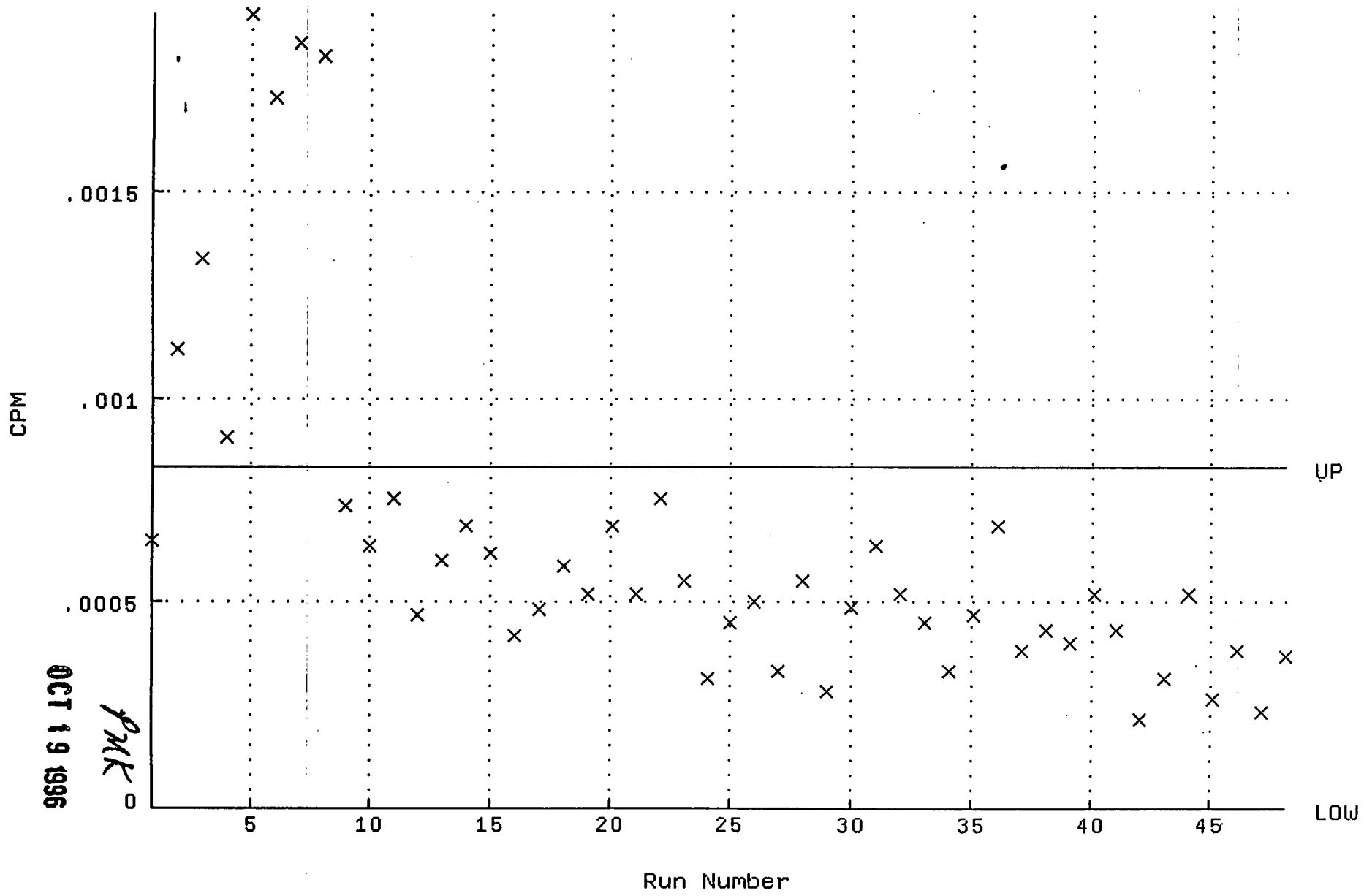
QA filename : DKA0:[ALPHA.ALUSR.QA.B]BATCH_B.QAF;209
Parameter Name : BACKRATE (CPM)
Start/End Dates : 18-OCT-1996 14:52:25 through 18-OCT-1996 14:53:49
Lower/Upper Lmts: -1.000000E-07 through 8.333000E-04



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COMPLIANCE TEST REPORT
DETERMINATION OF PARTICULATE; URANIUM - 233/234 235/236, AND 238; THORIUM - 228, 229, 230, AND 232; RADIUM - 226 AND 228; AND TOTAL URANIUM EMISSIONS FROM THE RESPIRATOR WASHING FACILITY (EPA SOURCE #EP-P284-01)

FERNALD ENVIRONMENTAL MANAGEMENT CORPORATION
CINCINNATI, OHIO

Prepared for

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Prepared by:

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P.N. A96043

November 20, 1996

HAYDEN
ENVIRONMENTAL

COMPLIANCE TEST REPORT
DETERMINATION OF PARTICULATE; URANIUM - 233/234, 235/236, AND 238; THORIUM - 228, 229, 230, AND 232; RADIUM - 226 AND 228; AND TOTAL URANIUM EMISSIONS FROM THE RESPIRATOR WASHING FACILITY (EPA SOURCE # EP-P284-01) FERNALD ENVIRONMENTAL MANAGEMENT CORPORATION CINCINNATI, OHIO

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Emissions Measurements Division

P.N. A96043
November 20, 1996

HAYDEN

Executive Summary

Hayden Environmental Group, Inc. was retained by Fernald Environmental Management Corporation (FERMCO) to determine the particulate; uranium - 233/234, 235/236, and 238; thorium - 228, 230, and 232; radium - 226 and 228; and total uranium emissions from the Respirator Washing Facility (EPA Source # EP-284-01) at their Fernald, Ohio project site. The evaluation was performed to demonstrate periodic conformity measurements as required by NESHAP Subpart H regulations Emission samples were collected and analyzed using USEPA Reference Methods for stationary source sampling. The tests were conducted on September 20, 1996. The results of the tests are summarized below:

Summary of Emission Rates

Analyte	Emission Rate	Standard Deviation	Units
Total Particulate	BPQL	NA	lb/hr
Uranium-233/234	93.7	36.5	pci/hr
Uranium-235/236	26.1	18.8	pci/hr
Uranium-238	51.8	26.0	pci/hr
Thorium-228	25.4	16.6	pci/hr
Thorium-230	113.8	30.3	pci/hr
Thorium-232	BPQL	BPQL	pci/hr
Radium-226	32,125	32,503	pci/hr
Radium-228	ND	ND	pci/hr
Total Uranium	BPQL	BPQL	lb/hr

NA: not applicable

BPQL: value was measured at a level below the practical quantification limits (However the measured value is recorded in the emission tables located in appendix A)

ND: activity was not detected

lb/hr: pounds per hour

pci/hr: picocurie per hour

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APPENDIX E Calculations

APPENDIX F Quality Assurance Procedures and Protocols

1.0 Introduction

Hayden Environmental Group, Inc. (Hayden) was retained by Fernald Environmental Management Corporation (FERMCO) to perform a particulate; uranium - 233/234, 235/236, and 238; thorium - 228, 230, and 232; radium - 226 and 228; and total uranium emissions to demonstrate periodic conformity measurements as required by NESHAP Subpart H regulations on the Respirator Wash Facility at their Fernald, Ohio project. The evaluation was performed on September 20, 1996. A single test run was conducted using USEPA Reference Methods 1, 2, 3, 4, 5, and 114. Mr. Tim Miller of FERMCO. coordinated the test schedules with plant operations. Ms. Dawn Wiburs of Hamilton County Department of Environmental Services (HCDES) was on-site to verify process operating conditions and witness testing procedures. The emission tests were performed by the Hayden test team of Mr. Bruce Sarven and Mr. Geoffrey Schoenberger. The emission samples were analyzed by Data Chem Laboratories, Inc. located in Salt Lake City, Utah.

2.0 Process Description

Respirators donned during the Fernald Environmental Management Project are cleaned within the respirator wash facility (EPA Source #EP-P284-01). The respirators are scrubbed and sanitized using a soap cleaner and a chlorine bleach solution. Ventilation hoods or pick up points are located over the sink and automatic washer and dryer table areas. The hoods are vented to a 2,000 cubic feet per minute (cfm) high efficiency particulate air (HEPA) filtration unit before venting to the atmosphere.

The respirator washing facility can clean a maximum of 125 respirators per hour. The facility can typically clean an average of 83 respirators per hour.

The process data is included in Appendix B.

3.0 Sampling Site Description

The emissions from EP-P284-01 HEPA filter are vented through a 12 inch diameter stack.. The sampling ports are located 48 inches or 4.0 diameters downstream from the last flow disturbance (elbow) and 24 inches or 2.0 diameters upstream from the next flow disturbance (top of stack). A drawing of the sampling site is provided in Figure 3.1.

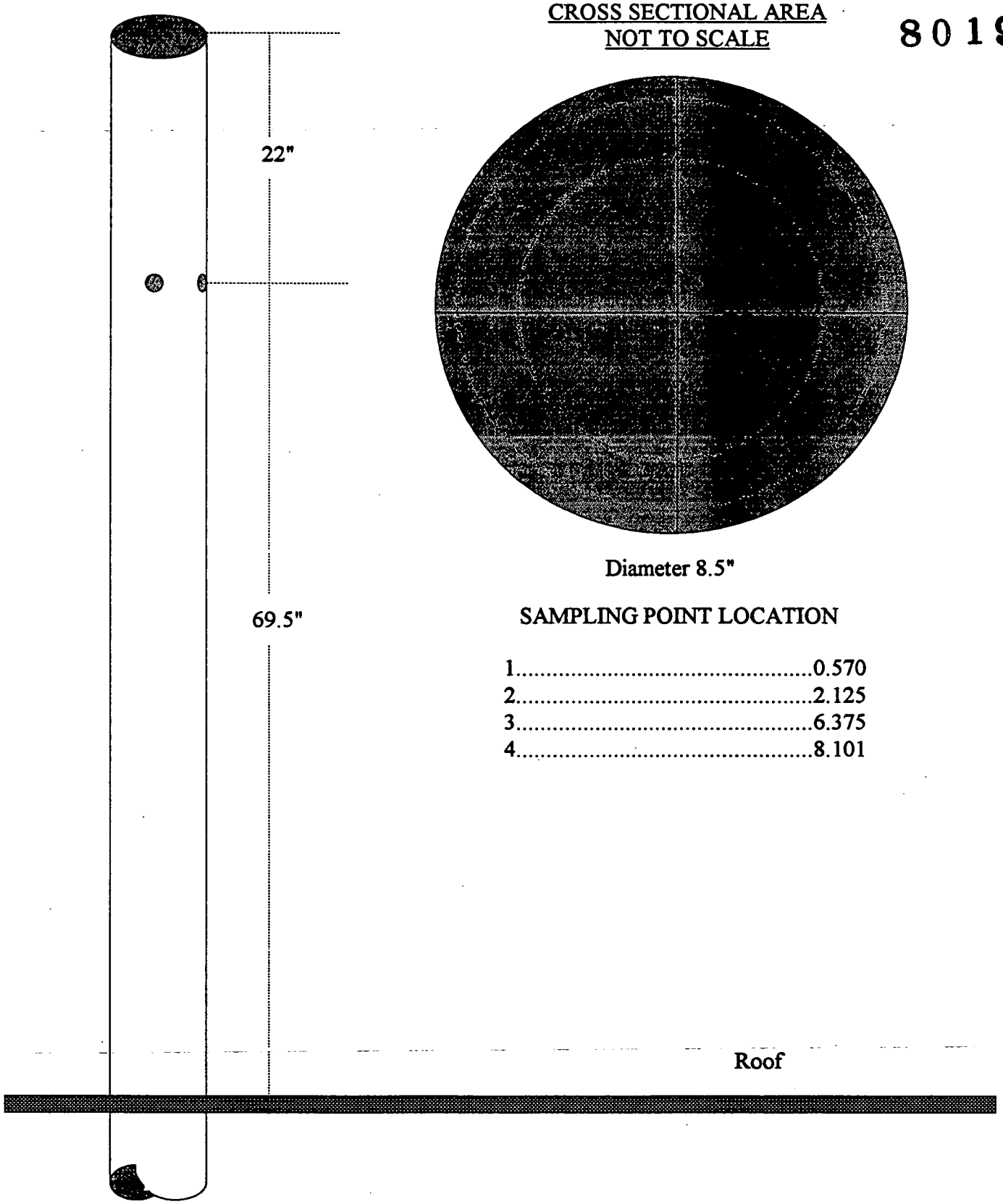

Figure 3.1 Respirator Wash Facility Sample Site Detail

4.0 Sampling and Analytical Procedures

The sampling and analytical procedures conformed to the most recent revisions of USEPA Reference Methods for stationary sources. Specifically, USEPA Reference Methods 1A, 2C, 3, 4, 5C, and 114 were used. A brief description of each procedure is included below:

4.1 Measurement Sites (USEPA Method 1A)

The location of measurement sites and the number of traverse points were determined using USEPA Reference Method 1A, "Sample and Velocity Traverses for Stationary Sources with Small Stacks or Ducts.

4.2 Velocities and Volumetric Flow Rates (USEPA Method 2C)

The stack gas velocity and volumetric flow rates were determined using USEPA Reference Method 2C, "Determination of Stack Gas Velocity and Volumetric Flow Rate in Small Stacks or Ducts." The stack gas velocity were measured before and after each test run with an inclined oil filled manometer using a standard pitot tube. The stack gas temperature were measured with a calibrated type "K" thermocouple and Omega digital temperature readout. A schematic of the velocity measurement apparatus is included in Figure 4.1.

4.3 Dry Molecular Weight (USEPA Method 3)

The stack gas dry molecular weight was determined using USEPA Reference Method 3, "Gas Analysis for Carbon Dioxide, Oxygen, Excess Air, and Dry Molecular Weight." Several grab samples were collected and analyzed during each test with Fyrite combustion gas analyzers which directly measure concentrations of O_2 and CO_2.

4.4. Moisture (USEPA Method 4)

The stack gas moisture content was determined using USEPA Reference Method 4, "Determination of Moisture Content in Stack Gases". Moisture samples were collected in a series of chilled impingers. The moisture collected within the impingers was analyzed by gravimetric analysis.

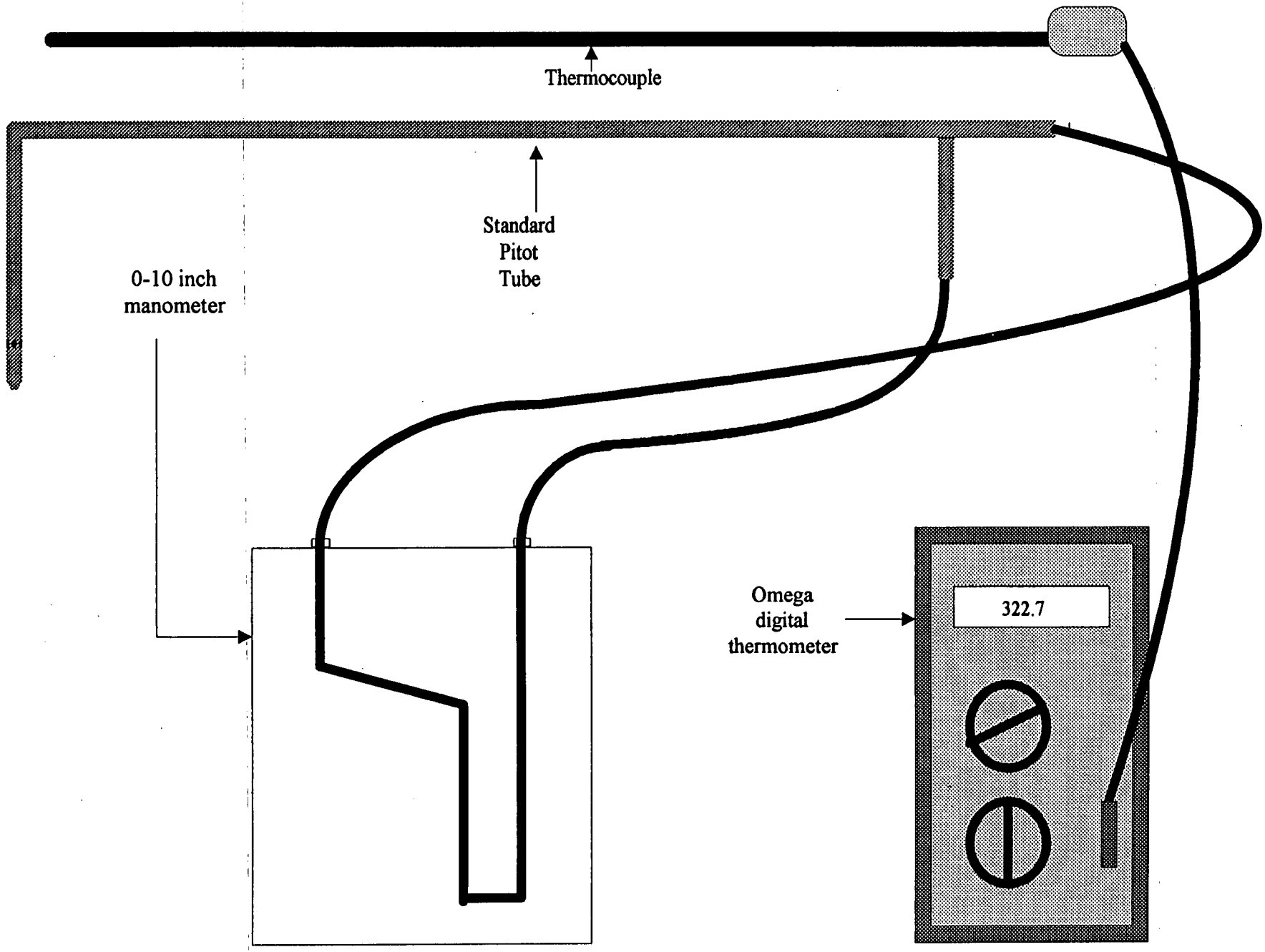

Figure 4.1 Velocity Measurement Apparatus

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4.5 **Particulate Matter (USEPA Method 5C)**

The total particulate emissions were determined using USEPA Reference Method 5C, "Determination of Particulate Emissions from Stationary Sources with Small Stacks or Ducts." The stack gas samples were collected from a single representative point isokinetically through a heated glass lined probe, a heated (248°+/-25°) tared glass fiber filter, and a series of cooled impingers (to condense the moisture). The nozzle, probe, and glassware prior to the filter was rinsed with acetone into a beaker that had been tare-weighed. The impingers and glassware after the filter was rinsed with DI water into a separate beaker that had been tare-weighed. The acetone and DI water were evaporated at temperatures below their boiling points. The acetone particulate residue within the tare-weighed beaker and the filter were analyzed by gravimetric analysis to determine the filterable particulate mass collected. The DI water particulate residue within the tare-weighed beaker was analyzed by gravimetric analysis to determine the condensible particulate mass collected. The filterable and condensible particulate mass were added together to determine the total particulate mass collected. A schematic of the particulate sampling train is provided in Figure 4.2

4.6 **Radiological Analyses (EPA Method 114 + Laser Phosphorimetry (U only))**

The particulate sample residues (filter and probe rinse residue) were recovered, composited for each sample run, and analyzed for uranium - 234, 235, 236, and 238; thorium - 228, 230, and 232; and radium - 226 and 228 by the procedures established in USEPA Method 114. Additionally, the samples were analyzed for total uranium by laser phosphorimetry.

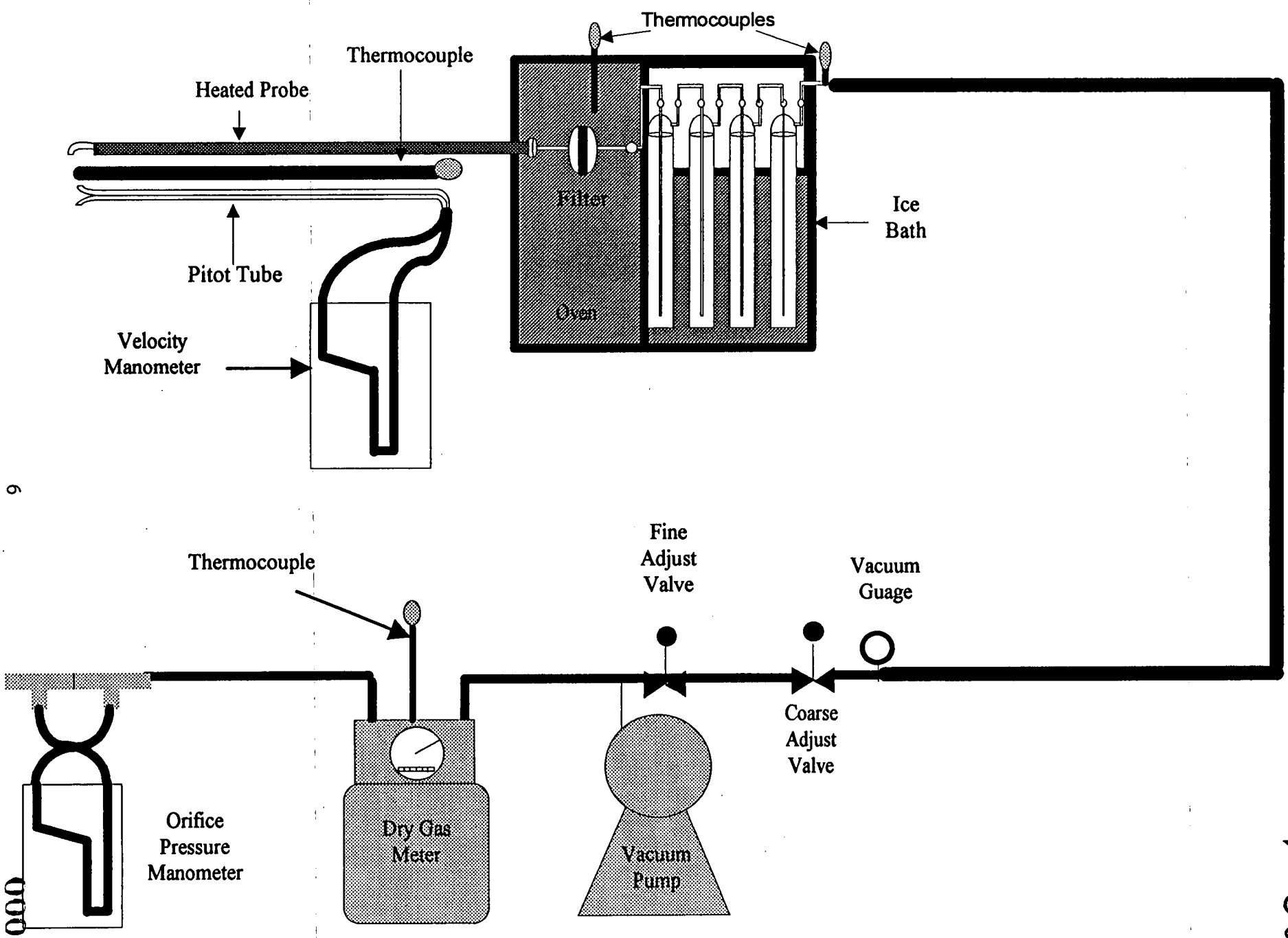

Figure 4.2 Particulate and Radionuclide Sampling Train

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5.0 Discussion and Interpretation

A negative weight gain was detected on the sample filter after the test run. A weight loss is common on a filter with very lite grain loading. The filter has a tendency to adhere to the gasket material on the filter bell during sample recovery. The filter material is than recovered into the acetone rinse. If this situation occurs a negative weight gain may be observed on the filter. However a net positive weight gain should be observed on the filter and acetone rinse combined. The negative filter weight gain observed on during the test run can be explained by adherence to the gasket material.

The total uranium mass collected was measured below the practical quantification limit. The measured mass was used to estimate the stack gas concentrations and emission rates.

Radium-228 was not detected.

APPENDIX A

TEST RESULTS

FERMCO, PN. A96043

TABLE A.1 SUMMARY OF STACK GAS CONDITIONS

Respirator Wahing Facility HEPA Exhaust

Run No.	Date/Time	Velocity (fps)	Volumetric Flow Rate (acfm)	Volumetric Flow Rate (dscfm)	Temperature (F)	Moisture (%)	O2 (%)	CO2 (%)
RW-1	9/20/96 0845-1445	76.8	1,817	1,731	76	1.3	21.0	0.0

fps: feet per second

acfm: actual cubic feet per minute

dscfm: dry standard cubic feet per minute

FERMCO, PN. A96043

TABLE A.2 SUMMARY OF PARTICULATE EMISSIONS

Respirator Wahing Facility HEPA Exhaust

Run No.	Date/Time	Concentration		Emission Rate	NOTES
		(gr/dscf)	(lb/dscf)	(lb/hr)	
RW-1	9/20/96 0845-1445	-1.12E-05	-1.60E-09	-1.66E-04	BPQL

BPQL: mass was below the practical quantification limit

gr/dscf: grains per dry standard cubic foot

lb/dscf: pounds per dry standard cubic foot

lb/hr: pounds per hour

FERMCO, PN. A96043

TABLE A.3 SUMMARY OF TOTAL URANIUM EMISSIONS EMISSIONS

Respirator Wahing Facility HEPA Exhaust

Run No.	Date/Time	Concentration		Emission Rate		NOTES
		Measured (µg/dscf)	Std. Dev (µg/dscf)	Measured (lb/hr)	Std. Dev (lb/hr)	
RW-1	9/20/96 0845-1445	1.02E-03	1.02E-04	2.33E-07	2.33E-08	BPQL

BPQL: mass was below the practical quantification limit

µg/dscf: micrograms per dry standard cubic foot

lb/hr: pounds per hour

FERMCO, PN. A96043

TABLE A.4 SUMMARY OF RADIOACTIVE METAL EMISSIONS

Respirator Wahing Facility HEPA Exhaust

Compound	Date/Time	Concentration		Emission Rate		NOTES
		Measured (ρci/dscf)	Std. Dev (ρci/dscf)	Measured (ρci/hr)	Std. Dev (ρci/hr)	
Uranium-233/234	9/20/96 0845-1445	9.02E-04	3.59E-04	93.7	37.3	
Uranium-235/236	9/20/96 0845-1445	2.51E-04	1.81E-04	26.1	18.8	
Uranium-238	9/20/96 0845-1445	4.98E-04	2.51E-04	51.8	26.0	
Radium-226	9/20/96 0845-1445	3.09E-01	3.13E-01	32,125	32,503	
Radium-228	9/20/96 0845-1445	-6.91E-03	4.00E-02	(718)	4,157	ND
Thorium-228	9/20/96 0845-1445	2.45E-04	1.60E-04	25.4	16.6	
Thorium-230	9/20/96 0845-1445	1.10E-03	2.92E-04	113.8	30.3	
Thorium-232	9/20/96 0845-1445	0.00E+00	5.42E-05	0.0	5.6	BPQL

BPQL: activity was below the practical quantification limit

ND: activity was not detected

ρci/dscf: picocuries per dry standard cubic foot

ρci/hr: picocuries per hour

APPENDIX B

PROCESS DATA

HAYDEN

EMISSION TEST AT THE RESPIRATORY WASH FACILITY
SEPT. 20, 1996

The rated capacity for the Respirator Wash Facility equipment, according to the August 1996 Ohio EPA PTI No. 1431110128 P284 is:

average: 83/hr	max: 125/hr
per 6 hr = 498	per 6 hr = 750

also listed as:

<u>rated capacity:</u>		
2000 per 24 hr day;	498 per 6 hr day;	304 per 8 hr day;
<u>maximum capacity:</u>		
3000 per 24 hr day;	750 per 6 hr day;	1000 per 8 hr day;

Number of respirators washed for the 6 hr emission test on Friday 9/20/96, from 8:45 am till 2:45 pm was 198 or 40% of the rated ave. capacity.

Operators stated that actual daily operations were "6 loads" which consist of 36 respirators per load or 216 resp. per 8 hr shift. This would yield 92%. Daily log records are available from the Resp. Wash Facility Supervisor to confirm actual daily process rate.

Tim Miller

APPENDIX C

FIELD DATA SHEETS

METHOD 1 TRAVERSE POINT LOCATION FOR CIRCULAR DUCTS

Client: FEMCO PN: A96043 Date: 9/20/96
Source: RESPIRATOR WASH Site: EXHAUST

INSIDE OF FAR WALL TO OUTSIDE OF NIPPLE: _____

INSIDE OF NEAR WALL TO OUTSIDE OF NIPPLE: _____

STACK I.D.: 8.5

NEAREST UPSTREAM DISTURBANCE: 22 (2.6)

NEAREST DOWNSTREAM DISTURBANCE: 69.5 (8.2)

TRAVERSE POINT NUMBER	FRACTION OF STACK I.D. (Y)	STACK DIAMETER (D)	(Y) x (D)	NIPPLE DEPTH	TRAVERSE POINT LOCATION
1	0.067	8.5	0.570	NA	9/16
2	0.250	↓	2.125	↓	2 1/8
3	0.750	↓	6.375	↓	6 3/8
4	0.953	↓	8.101	↓	8 1/8

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METHOD 2 VELOCITY FIELD DATA

Client: FEMCO
Project Number: A96043
Date: 9/20/96
Source: RESPIRATOR WASH FACILITY
Site: HEPA EXHAUST
Run: RW-1
Operators: BS DS
Barometric Pressure: 29.35
Static Pressure: 1. -0.14 2. -0.14

Pilot Tube I.D.: Stratos
Thermocouple I.D.:
Pre-Test Leak Check:
Post-Test Leak Check:
Stack I.D.:
METHOD 4 DATA
Wet Bulb Thermocouple I.D.:
Dry Bulb Thermocouple I.D.:
Temperatures (°F); Wet: Dry:

Traverse Point #	Δ P ("H_2O)	Stack Temp. (°F)	Traverse Point #	Δ P ("H_2O)	Stack Temp. (°F)
1	1.1	71°F	1	1.4	71°F
2	1.1	↓	2	1.4	↓
3	1.3	↓	3	1.4	↓
4	1.4	↓	4	1.1	↓
5					
[redacted]					
1	1.3	81	1	1.4	81
2	1.35	↓	2	1.3	↓
3	1.3	↓	3	1.3	↓
4	1.3	↓	4	1.3	↓

O_2:
CO_2:
Bws:
Δ P:
✓ Δ P: ① 1.1074 ② 1.1483
Ts: 1.BA ✓BA
Vs:
Qa:
Qstd:

SKETCH

HAYDEN ENVIRONMENTAL GROUP INC.

000648

8019

EMISSION TESTING FIELD DATA

Client: FEAMCO
PN: A96043
Date: 9/20/96
Source: RESPIRATOR WASH
Site: HEPA EXHAUST
Sample Type: PART
Run: RW-1
Operators: BS, DJ
Barometric Pressure (Pb): 29.35
Static Pressure (Pg): -0.14

Meter Box: N-3
Sample Box #: 2
Filter #:
Probe Length/Type 3' Glass
Stack Thermocouple #: NA
Oven Thermocouple #: OV-2
Impinger Thermocouple #: I-2
Pilot Tube #: NA
Stack I.D.: 8.5
Record Data Every 10 Minutes

Meter ΔH@: 1.903
Meter Y Factor: 0.9898
C Factor: 1.10
Reference ΔP: 1.35
Nozzle I.D.: Avg. 0.183
Pre-test Leak Rate: 0.014 cfm@ 10 "Hg
Post-test Leak Rate: 0.004 cfm@ 3 "Hg
Pilot Tube Leak Check: Pre: Post:
Orsat Train Leak Check: Pre: Post:
Page of

Traverse Point Number	Sampling Time (min)	Clock Time (hr)	Meter Reading (cu ft.)	Velocity Pressure ΔP ("H2O)	Desired	Actual	Train Vacuum ("Hg)	Stack	Filter	Probe	IMP	Meter
					~~2.0~~	~~2.0~~						
C	0	0845	744.229									
E	10	0855	751.230	NA	2.0	2.0	3.0	NA	253	NA	56	58/54
N	20	0905	759.315				3.0		255		52	62/55
T	30	0915	766.850				3.0		252		55	66/56
E	40	0925	774.440				3.0		253		60	76/62
A	50	0935	782.070				3.0		254		57	77/63
	60	0945	789.760				3.0		251		56	81/67
	70	0955	797.430				3.0		248		54	83/71
	80	1005	805.240				3.0		250		52	85/75
	90	1015	812.910				3.0		252		54	88/77
	100	1025	820.665				3.0		250		54	90/80
	110	1035	828.580				3.0		251		54	90/81
	120	1045	836.695				3.0		248		56	92/83

HAYDEN ENVIRONMENTAL GROUP, INC.

EMISSION TESTING FIELD DATA

Client: FERMCO Run #: RW-1 Date: 9/20/96 Page 2 of 2

Traverse Point Number	Sampling Time (min)	Clock Time (hr)	Meter Reading (cu ft.)	Velocity Pressure ΔP ("H2O)	Orifice Pressure ΔH@ ("H2O) Desired	Orifice Pressure ΔH@ ("H2O) Actual	Train Vacuum ("Hg)	Temperatures (°F) Stack	Filter	Probe	IMP	Meter	
	120	1045	836.695										
~~130~~ C	130	1055	844.835	NA	2.0	2.0	3.0	NA	251	NA	56	98	83
C	140	1105	852.985				3.0		248		58	99	87
N	150	1115	861.155				3.0		243		58	96	87
T	160	1125	869.350				3.0		245		61	98	90
C	170	1135	877.610				3.0		243		63	99	91
	180	1145	885.880				3.0		247		66	101	93
	200	1205	902.455				3.0		247		68	101	93
	210	1215	910.780				3.0		253		59	103	95
	220	1225	918.905				3.0		251		60	102	95
	230	1235	927.395				3.0		250		64	101	95
	240	1245	935.700				3.0		253		61	103	95
	250	1255	944.150				3.0		250		61	101	95
	270	1305	960.050				3.0		247		62	106	97
	280	1325	969.550				3.0		251		66	105	97
	300	1345	986.560				3.0		250		66	105	99
	310	1355	995.080				3.0		250		62	109	101
	320	1405	1003.580				3.0		248		62	109	101
	330	1415	1012.110				3.0		252		63	108	101
	340	1425	1020.640				3.0		250		64	110	102
	350	1435	1029.170				3.0		251		65	110	103
	360	1445	1037.708				3.0		253		65	114	105

293.479 VBH

90.1 ✓ BH

HAYDEN ENVIRONMENTAL GROUP, INC.

SAMPLE RECOVERY DATA

Client: Fermco PN: A96043 Date: 9/20/96
Source: HEPA Filter Site: Outlet Run #: RESPR.
Sample Date: 9/20/96 Recovery Date: 9/20/96

Filter No: _____ Glassware Set No: 2 Sample Box #: 2

IMPINGER DATA

Gravimetric: ✓ Volumetric: _____

	#1	#2	#3	#4	#5	Total
Contents	100ml DI	100ml DI	DRY	Silica GEL		
Final	594.2	676.1	462.3	774.8		
Initial	585.8	~~[illegible]~~ 665.1	458.8	718.6		
Net	8.4	11.0	3.5	56.2		79.1 ✓

RECOVERED SAMPLE

Description of Particulate on Filter: No visible part

Color of Silica Gel: 3/4 spent

Recovered By: [signature]

HAYDEN ENVIRONMENTAL GROUP, INC.

APPENDIX D

LABORATORY DATA

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APPENDIX E

CALCULATIONS

NOMENCLATURE

A_n = Area of sampling nozzle, ft^2

A_s = Cross-sectional area of stack at sampling site, ft^2

B_{ws} = Proportion water vapor in stack gas by volume

CO = Percent carbon monoxide in stack gas by volume,dry basis, %

CO_2 = Percent carbon dioxide in stack gas by volume, dry basis, %

C_p = Pitot tube coefficient

C_1 = Concentration of particulate in stack gas, grains/dscf

C_2 = Concentration of particulate in stack gas, lb/dscf

$C_{Ra\text{-}226}$ = Concentration of Radium-226 in stack gas, ρci/dscf

$C_{Ra\text{-}228}$ = Concentration of Radium-228 in stack gas, ρci/dscf

$C_{Th\text{-}228}$ = Concentration of Thorium-228 in stack gas, ρci/dscf

$C_{Th\text{-}230}$ = Concentration of Thorium-230 in stack gas, ρci/dscf

$C_{Th\text{-}232}$ = Concentration of Thorium-232 in stack gas, ρci/dscf

$C_{total\ U}$ = Concentration of total uranium in stack gas, μg/dscm

$C_{total\ U\ 2}$ = Concentration of total uranium in stack gas, μg/dscf

$C_{U\text{-}233/234}$ = Concentration of uranium-233/234 in stack gas, ρci/dscf

$C_{U\text{-}235}$ = Concentration of uranium-235 in stack gas, ρci/dscf

$C_{U\text{-}238}$ = Concentration of uranium-238 in stack gas, ρci/dscf

ER = particulate emission rate, lb/hr

$ER_{Ra\text{-}226}$ = Radium-226 emission rate, ρci/hr

$ER_{Ra\text{-}228}$ = Radium-228 emission rate, ρci/hr

$ER_{Th\text{-}228}$ = Thorium-228 emission rate, ρci/hr

$ER_{Th\text{-}230}$ = Thorium-230 emission rate, ρci/hr

$ER_{Th\text{-}232}$ = Thorium-232 emission rate, ρci/hr

$ER_{Total\ U}$ = total uranium emission rate, lb/hr

$ER_{U\text{-}233/234}$ = Uranium-233/234 emission rate, ρci/hr

$ER_{U\text{-}235}$ = Uranium-235 emission rate, ρci/hr

$ER_{U\text{-}238}$ = Uranium-238 emission rate, ρci/hr

ΔH = Average pressure drop across orifice

%I = Percent isokinetic sampling rate, %

M_d = Molecular weight of stack gas, dry conditions, lb/lb-mole

M_s = Molecular weight of stack gas, stack conditions, lb/lb-mole

Mn_{part} = Particulate catch, mg

$Mn_{Ra\text{-}226}$ = Radium-226 activity, ρci

$Mn_{Ra\text{-}228}$ = Radium-228 activity, ρci

$Mn_{Th\text{-}228}$ = Thorium-228 activity, ρci

$Mn_{Th\text{-}230}$ = Thorium-230 activity, ρci

$Mn_{Th\text{-}232}$ = Thorium-232 activity, ρci

$Mn_{Total\ U}$ = Uranium catch, μg

$Mn_{U\text{-}233/234}$ = Uranium-233/234 activity, ρci

$Mn_{U\text{-}235}$ = Uranium-235 activity, ρci

$Mn_{U\text{-}238}$ = Uranium-238 activity, ρci

N_2 = Percent nitrogen in stack gas by volume, dry basis, %

O_2 = Percent oxygen in stack gas by volume, dry basis, %

Δp = Average velocity head of stack gas, inches H_2O

$\sqrt{\Delta p}$ = Average square root of velocity head pressure, inches H_2O

P_b = Barometric pressure, inches Hg

P_g = Static pressure of stack gas, inches H_2O

P_s = Absolute stack gas pressure, inches Hg

Q_a = Volumetric stack gas flow rate, stack conditions, acfm

Q_{std} = Volumetric stack gas flow rate, dry standard conditions, dscfm

Θ = Elapsed time of test, minutes

T_m = Average dry gas meter temperature, °F

T_s = Average stack gas temperature, °F

V_{lc} = Mass of water collected, g

V_m = Volume of gas measured by dry gas meter, ft^3

V_{mc} = Volume of dry gas meter corrected for leak rate, ft^3

V_{mstd} = Volume of dry gas meter corrected to standard conditions, ft^3

V_{wstd} = Volume of water collected, standard conditions, ft^3

Vs = Stack gas velocity, fps

γ = dry gas meter calibration factor, dimensionless

Note: Standard conditions = 68°F and 29.92 inches Hg.

EXAMPLE CALCULATION
RESPIRATOR WASH FACILITY EXHAUST STACK
TEST RUN # 2

1. Volume Metered, Standard Conditions (68°F, 29.92 In Hg)

$$V_{mstd} = (17.647)x(V_m)x(Y)x\frac{(P_b) + \frac{(\Delta H)}{(13.6)}}{(T_m + 460)}$$

$$V_{mstd} = (17.647)x(293.479)x(0.9898)x\frac{(29.35) + \frac{(2.000)}{(13.6)}}{(90.1 + 460)} = 274.873$$

2. Volume Water Vapor Collected, Standard Conditions

$$V_{wstd} = (0.04707)x(V_{lc})$$
$$V_{wstd} = (0.04707)x(79.1) = 3.723$$

3. Proportion Water Vapor, By Volume

$$B_{ws} = \frac{(V_{wstd})}{(V_{wstd} + V_{mstd})}$$
$$B_{ws} = \frac{(3.723)}{(3.723 + 274.873)} = 0.013$$

4. Molecular Weight of Stack Gas, Dry Conditions

$$M_d = (0.44x\,CO_2) + (0.32x\,O_2) + (0.28x(N_2 + CO))$$
$$M_d = (0.44x0.0) + (0.32x21.0) + (0.28x79.0) = 28.84$$

5. Molecular Weight of Stack Gas, Stack Conditions

$$M_s = [M_d\,x(1 - B_{ws})] + (18x\,B_{ws})$$
$$M_s = [28.84x(1 - 0.013)] + (18x0.013) = 28.70$$

EXAMPLE CALCULATION
MIXED WASTE CHEMICAL TREATMENT PROJECT NORTH EXHAUST STACK
TEST RUN # 1 (Cont.)

6. Static Pressure, inches H_20

$$Ps = (Pb) + \frac{(Pg)}{(13.6)}$$

$$Ps = (29.35) + \frac{(-0.14)}{(13.6)} = 29.34$$

7. Stack Gas Velocity, fps

$$V_s = (85.49)x(c_p)x(\sqrt{\Delta p})x\sqrt{\frac{(T_s + 460)}{(P_s)x(M_s)}}$$

$$V_s = (85.49)x(0.99)x(1.1379)x\sqrt{\frac{(76.0 + 460)}{(29.34)x(28.70)}} = 76.8$$

8. Stack Gas Flow Rate, acfm

$$Q_a = (60)x(V_s)x(5.454E - 03)x(Dia)^2$$

$$Q_a = (60)x(76.8)x(5.454E - 03)x(8.5)^2 = 1{,}816.7$$

9. Stack Gas Flow Rate, dscf

$$Q_{std} = (17.647)x(Q_a)x(1 - B_{ws})x\frac{(P_s)}{(T_s + 460)}$$

$$Q_{std} = (17.647)x(1{,}816.7)x(1 - 0.013)x\frac{(29.34)}{(76.0 + 460)} = 1{,}731.4$$

10. Isonkinetic Variation, %

$$\%I = (0.0944)x\frac{(T_s + 460)x(V_{mstd})}{(P_s)x(V_s)x(An)x(\Theta)x(1 - B_{ws})}$$

$$\%I = (0.0944)x\frac{(76.0 + 460)x(274.873)}{(29.34)x(76.8)x(1.83E - 04)x(360)x(1 - 0.013)} = 95.1$$

EXAMPLE CALCULATION
MIXED WASTE CHEMICAL TREATMENT PROJECT NORTH EXHAUST STACK
TEST RUN # 1 (Cont.)

11. Particulate Concentration, gr/dscf

$$C_1 = \frac{(0.0154)x(Mn)}{(V_{mstd})}$$

$$C_1 = \frac{(0.0154)x(-0.2)}{(274.873)} = (-1.12E-05)$$

12. Particulate Concentration, lb,dscf

$$C_2 = (1.429E-04)x(C_1)$$

$$C_2 = (1.429E-04)x(-1.12E-05) = (-1.60E-09)$$

13. Particulate Emission Rate, lb/hr

$$ER = (C_2)x(Q_{std})x(60)$$

$$ER = (-1.60E-09)x(1,731.4)x(60) = (-1.66E-04)$$

14. Total Uranium Concentration, µg/dscm

$$C_{Total\,U} = \frac{(Mn_{Total\,U})}{(V_{mstd})}$$

$$C_{Total\,U} = \frac{(0.28)x(35.341)}{(274.873)} = 3.60E-02$$

15. Total Uranium Standard Deviation Concentration, µg/dscm

$$C_{Total\,U\,stdv} = \frac{(Mn_{Total\,U\,stdv})}{(V_{mstd})}$$

$$C_{Total\,U} = \frac{(0.028)x(35.341)}{(2.74.873)} = 3.60E-03$$

EXAMPLE CALCULATION
MIXED WASTE CHEMICAL TREATMENT PROJECT NORTH EXHAUST STACK
TEST RUN # 1 (Cont.)

16. Total Uranium Concentration, µg/dscf

$$C_{Total\,U_2} = \frac{(Mn_{Total\,U})}{(V_{mstd})}$$

$$C_{Total\,U_2} = \frac{(0.28)}{(274.873)} = 1.02E-03$$

17. Total Uranium Standard Deviation Concentration, µg/dscf

$$C_{Total\,U_2\,stdv} = \frac{(Mn_{Total\,U\,stdv})}{(V_{mstd})}$$

$$C_{Total\,U_2\,stdv} = \frac{(0.028)}{(274.873)} = 1.02E-04$$

18. Total Uranium Emission Rate, lb/hr

$$ER_{Total\,U} = \frac{(C_{Total\,U_2})x(Q_{std})x(60)}{(1{,}000{,}000)x(453.59)}$$

$$ER_{total\,U} = \frac{(1.02E-03)x(1{,}731.4)x(60)}{(1{,}000{,}000)x(453.59)} = 2.33E-07$$

19. Total Uranium Standard Deviation Emission Rate, lb/hr

$$ER_{Total\,U\,stdv} = \frac{(C_{Total\,U_2})x(Q_{std})x(60)}{(1{,}000{,}000)x(453.59)}$$

$$ER_{Total\,U\,stdv} = \frac{(1.02E-04)x(1{,}731.4)x(60)}{(1{,}000{,}000)x(453.59)} = 2.33E-08$$

20. Radionuclide (Uranium-233/234) Concentration, pci/dscf

$$C_{U-233/234} = \frac{(Mn_{U-233/234})}{(V_{mstd})}$$

$$C_{U-233/234} = \frac{(0.248)}{(274.873)} = 9.02E-04$$

HAYDEN

EXAMPLE CALCULATION
MIXED WASTE CHEMICAL TREATMENT PROJECT NORTH EXHAUST STACK
TEST RUN # 1 (Cont.)

21. Radionuclide (Uranium-233/234) Standard Deviation Concentration, ρci/dscf

$$C_{U-233/234\,stdv} = \frac{(Mn_{U-233/234\,stdv})}{(V_{mstd})}$$

$$C_{U-233/234\,stdv} = \frac{(0.0988)}{(274.873)} = 3.59E-04$$

22. Radionuclide Emission Rate, ρci/hr

$$ER_{U-233/234} = (C_{U-233/234})x(Q_{std})x(60)$$

$$ER_{U-233/234} = (9.02E-04)x(1{,}731.4)x(60) = 93.7$$

23. Radionuclide (Uranium-233/234) Standard Deviation Emission Rate, ρci/hr

$$ER_{U-233/234\,stdv} = (C_{U-233/234\,stdv})x(Q_{std})x(60)$$

$$ER_{U-233/234\,stdv} = (3.59E-04)x(1{,}731.4)x(60) = 37.3$$

Respirator Wash Facility

CLIENT/PROJECT #:	FERMCO, PN. A96043
SAMPLE LOCATION:	Respirator Wahing Facility HEPA Exhaust
DATE/TIME:	9/20/96 0845-1445
RUN #:	RW-1

STATIC PRESSURE ("H2O):	-0.14
BAROMETRIC ("Hg):	29.35
Cp PITOT:	0.99
METER BOX Y:	0.9898
NOZZLE DIAMETER (inches):	0.183
LENGTH OF TEST (min):	360.0
VOLUME METERED (CF):	293.479
SQUARE ROOT DELTA P ("H2O):	1.1379
DELTA H (" H2O):	2.000
STACK TEMPERATURE (F):	76.0
METER TEMPERATURE (F)	90.1
STACK DIAMETER (Inches):	8.5
STACK GAS O2 CONCENTRATION (%):	21.0
STACK GAS CO2 CONCENTRATION (%):	0.0
VOLUME LIQUID COLLECTED(ml):	79.1

PARTICULATE MASS LOADING

PARTICULATE MASS ON FILTER (mg):	3.5
PARTICULATE MASS IN ACETONE RINSE (mg):	-3.7

ANALYTE #1		Total Uranium	
	Mass (ug):	0.28	BPQL
	Mass Std. Dev.(ug):	0.028	
ANALYTE #2		Uranium-233/234	
	Activity (pci):	0.248	
	Activity Std. Deviation (pci):	0.0988	
ANALYTE #3		Uranium-235/236	
	Activity (pci):	0.0690	
	Activity Std. Deviation (pci):	0.0498	
ANALYTE #4		Uranium-238	
	Activity (pci):	0.137	
	Activity Std. Deviation (pci):	0.0689	
ANALYTE #5		Radium-226	
	Activity (pci):	85	
	Activity Std. Deviation (pci):	86	
ANALYTE #6		Radium-228	
	Activity (pci):	-1.9	ND
	Activity Std. Deviation (pci):	11.0	
ANALYTE #7		Thorium-228	
	Activity (pci):	0.0673	

Activity Std. Deviation (pci):	0.0440	

ANALYTE #8 Thorium-230

Activity (pci):	0.301	
Activity Std. Deviation (pci):	0.0803	

ANALYTE #9 Thorium-232

Activity (pci):	0.0000	BPQL
Activity Std. Deviation (pci):	0.0149	

********** CALCULATIONS **********

VOLUME METERED STD. CONDITIONS (dscf):	274.873
OLUME H2O VAPOR COLLECTED STD. CONDITIONS (dscf):	3.723
STACK GAS MOISTURE (%):	1.3
STACK GAS MOLECULAR WEIGHT, DRY CONDITIONS:	28.84
STACK GAS MOLECULAR WEIGHT, STACK CONDITIONS:	28.70
STACK GAS STATIC PRESSURE ("H2O)	29.34
STACK GAS VELOCITY (fps):	76.8
STACK GAS AIR FLOW, STACK CONDITIONS (acfm):	1816.7
STACK GAS AIR FLOW, STD. CONDITIONS (dscfm):	1731.4
STACK GAS TEMPERATURE (F):	76.0
STACK GAS MOISTURE (%):	1.3
STACK GAS O2 CONCENTRATION (%):	21.0
STACK GAS CO2 CONCENTRATION(%):	0.0
ISOKINETIC VARIATION (%):	95.1

PARTICULATE RESULTS

CONCENTRATION (gr/dscf):	-1.12E-05
CONCENTRATION (lb/dscf):	-1.60E-09
EMISSION RATE (lb/hr):	0.000

ANALYTE #1 RESULTS **Total Uranium**

CONCENTRATION (ug/dscf):	1.02E-03
CONCENTRATION STANDARD DEVIATION (ug/dscf):	1.02E-04
EMISSION RATE (lb/hr):	2.33E-07
EMISSION RATE STANDARD DEVIATION (lb/hr):	2.33E-08

ANALYTE #2 RESULTS **Uranium-233/234**

CONCENTRATION (pci/dscf):	9.02E-04
CONCENTRATION STANDARD DEVIATION (pci/dscf):	3.59E-04
EMISSION RATE (pci/hr):	9.37E+01
EMISSION RATE STANDARD DEVIATION (pci/hr):	3.73E+01

ANALYTE #3 RESULTS **Uranium-235/236**

CONCENTRATION (pci/dscf):	2.51E-04
CONCENTRATION STANDARD DEVIATION (pci/dscf):	1.81E-04
EMISSION RATE (pci/hr):	2.61E+01
EMISSION RATE STANDARD DEVIATION (pci/hr):	1.88E+01

ANALYTE #4 RESULTS	**Uranium-238**
CONCENTRATION (pci/dscf):	4.98E-04
CONCENTRATION STANDARD DEVIATION (pci/dscf):	2.51E-04
EMISSION RATE (pci/hr):	5.18E+01
EMISSION RATE STANDARD DEVIATION (pci/hr):	2.60E+01
ANALYTE #5 RESULTS	**Radium-226**
CONCENTRATION (pci/dscf):	3.09E-01
CONCENTRATION STANDARD DEVIATION (pci/dscf):	3.13E-01
EMISSION RATE (pci/hr):	3.21E+04
EMISSION RATE STANDARD DEVIATION (pci/hr):	3.25E+04
ANALYTE #6 RESULTS	**Radium-228**
CONCENTRATION (pci/dscf):	-6.91E-03
CONCENTRATION STANDARD DEVIATION (pci/dscf):	4.00E-02
EMISSION RATE (pci/hr):	-7.18E+02
EMISSION RATE STANDARD DEVIATION (pci/hr):	4.16E+03
ANALYTE #7 RESULTS	**Thorium-228**
CONCENTRATION (pci/dscf):	2.45E-04
CONCENTRATION STANDARD DEVIATION (pci/dscf):	1.60E-04
EMISSION RATE (pci/hr):	2.54E+01
EMISSION RATE STANDARD DEVIATION (pci/hr):	1.66E+01
ANALYTE #8 RESULTS	**Thorium-230**
CONCENTRATION (pci/dscf):	1.10E-03
CONCENTRATION STANDARD DEVIATION (pci/dscf):	2.92E-04
EMISSION RATE (pci/hr):	1.14E+02
EMISSION RATE STANDARD DEVIATION (pci/hr):	3.03E+01
ANALYTE #9 RESULTS	**Thorium-232**
CONCENTRATION (pci/dscf):	0.00E+00
CONCENTRATION STANDARD DEVIATION (pci/dscf):	5.42E-05
EMISSION RATE (pci/hr):	0.00E+00
EMISSION RATE STANDARD DEVIATION (pci/hr):	5.63E+00

COMMENTS:

APPENDIX F

QUALITY ASSURANCE PROCEDURES AND RESULTS

QUALITY ASSURANCE PROCEDURES AND RESULTS

The sampling equipment used in this test series has been calibrated in accordance with procedures outlined in the USEPA Reference Methods for stationary source sampling and also in the Quality Assurance Handbook for Air Pollution Measurement Systems. All pertinent calibration data for the equipment used in this test series are included in this appendix. The following calibration procedures are employed.

a. **Probe-tips (Nozzles)**
Probe-tips are inspected before use to detect damage or irregularities. If the nozzle shows signs of damage, it is repaired and measured before use. The nozzle diameter is determined in the field by measuring three diameters with a precision micrometer. The average of the three measurements is the nozzle diameter.

b. **Pitot Tubes**
The S-type pitot tubes are built to the design specifications cited in Reference Method 2 and are calibrated annually in a wind tunnel. Standard pitot tubes are supplied from the manufacturer with a coefficient of 0.99. The pitot tubes, connecting lines, and manometers are leak-checked in the field before and after each test run.

c. **Thermocouples**
Thermocouples are calibrated upon receipt and annually thereafter. The thermocouples are calibrated at 32°F, ambient temperature, 212°F, and approximately 450°F.

d. **Fyrite Analyzers**
The fyrite analyzers are leak-checked on-site and the reagents are replenished as needed.

e. **Method 5 Control Consoles**
The dry gas meter and the orifice in the Method 5 control consoles are calibrated at six (6) points from 0 to 4 inches of mercury. The dry gas meter coefficient (y-factor) and the orifice constant (Delta H) are established from this calibration. The dry gas meter is calibrated after each test series to confirm the y-factors is used in all sample volume calculations. Hayden Environmental participates in the USEPA Method 5 Dry Gas Meter Inter-Laboratory Performance Audit.

f. **Barometers**
The aneroid field barometers are calibrated with a stationary mercury column barometer prior to each use. The reference barometer is permanently mounted in the Hayden Environmental Laboratory.

REFERENCE METER CALIBRATION
ENGLISH REFERENCE METER UNITS

DGM Serial # 1334637
Date 2/8/96

Filename: F:\DATAFILE\CALIBRAT\CAL_MENU.DSK\DGM_REF.
Revised: 06/08/95

Barometric Pressure 29.82
Meter Yw 1.00000
K (deg R/inches Hg) 17.64

Time (min)	Pressure (in. H20)	Dry Gas Meter (DGM) Meter Readings Initial	Final	Volume (cubic feet)	Temperature Initial (deg F)	Final (deg F)	Wet Test Meter (WTM) Meter Readings Initial	Final	Volume (cubic feet)	Temp (deg F)	DGM Coefficient Yds	Coefficient Variation Yds-(Avg.Yds)	Flow Rate (CFM)
5.00	-6.40	441.38	447.50	6.12	73.0	75.0	670.495	676.641	6.146	77.0	1.015	-0.002	1.204
5.00	-6.40	447.50	453.63	6.13	75.0	75.0	676.641	682.803	6.162	77.0	1.017	0.001	1.207
5.50	-6.40	453.63	460.39	6.77	75.0	76.0	682.803	689.599	6.796	77.0	1.017	0.001	1.210
									Max Yds - Min Yds =0.002571603 Must be no greater than 0.030				
									Average Yds =1.016523907 Must be between 0.95 to 1.05				
11.00	-4.30	460.39	470.81	10.41	76.0	78.0	689.599	700.105	10.506	77.0	1.020	-0.001	0.936
6.00	-4.30	470.81	476.47	5.66	78.0	78.0	700.105	705.815	5.710	77.0	1.021	0.001	0.932
6.50	-4.30	476.47	482.59	6.12	78.0	78.0	705.815	711.989	6.174	77.0	1.021	0.000	0.930
									Max Yds - Min Yds =0.001620064 Must be no greater than 0.030				
									Average Yds =1.020657586 Must be between 0.95 to 1.05				
14.50	-3.00	482.59	493.83	11.23	78.0	80.0	711.989	723.300	11.311	77.0	1.018	0.002	0.764
7.00	-3.00	493.83	499.27	5.44	80.0	80.0	723.300	728.761	5.461	77.0	1.016	0.000	0.764
7.50	-3.00	499.27	505.12	5.85	80.0	81.0	728.761	734.610	5.849	77.0	1.014	-0.002	0.764
									Max Yds - Min Yds =0.004034120 Must be no greater than 0.030				
									Average Yds =1.016220858 Must be between 0.95 to 1.05				
10.00	-1.80	505.12	510.63	5.52	81.0	81.0	734.610	740.145	5.535	77.0	1.015	0.002	0.542
10.00	-1.80	510.63	516.17	5.54	81.0	81.0	740.145	745.680	5.535	77.0	1.011	-0.002	0.542
10.00	-1.80	516.17	521.69	5.51	81.0	82.0	745.680	751.190	5.510	77.0	1.012	-0.001	0.540
									Max Yds - Min Yds =0.004214902 Must be no greater than 0.030				
									Average Yds =1.012741931 Must be between 0.95 to 1.05				
13.00	-1.20	521.69	526.81	5.13	82.0	82.0	751.190	756.315	5.125	77.0	1.012	-0.001	0.386
13.00	-1.20	526.81	531.91	5.10	82.0	83.0	756.315	761.415	5.100	77.0	1.014	0.001	0.384
35.50	-1.20	531.91	545.89	13.97	82.0	84.0	761.415	775.369	13.954	77.0	1.013	0.000	0.385
									Max Yds - Min Yds =0.001331366 Must be no greater than 0.030				
									Average Yds = 1.0128647 Must be between 0.95 to 1.05				

Overall Average Yds =1.015801796

I certify that the above Dry Gas Meter was calibrated in accordance with E.P.A. Method 5 , paragraph 7.1 ;CFR 40 Part 60, using the Precision Wet Test Meter # 11AE6, which in turn was calibrated using the American Bell Prover # 3785, certificate # F107, which is traceable to the National Bureau of Standards (N.I.S.T.).

Signature [signature] Date 2-8-96

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HAYDEN ENVIRONMENTAL GROUP METER POST TEST CALIBRATION

Barometric: 29.35 Date: 2-Oct-96 Calibration Met 1334637 Reference Y: 1.016

Project # A96043 pproved By BS Meter Box I N-3 Pretest Y: 0.9898

	Orifice Reading (H) in H20	Calibration Meter Gas Volume (Vds) ft3	Meter Box Meter Gas Volume (Vd) ft3	Temperature Calibration Meter Average (tds) F	Temperature Meter Box Meter Average (td) F	Time (O) min	Orfice Pressure Differential (H@)	Meter Box Meter Coefficient (Y)
Stop	2.00	389.180	371.955	72.0	83.5			
Start	2.00	381.593	364.174	72.0	81.0	10	1.929	1.005
Average:	2.00	7.587	7.781	72.0	82.3			
Stop	2.00	396.747	379.771	72.0	86.0			
Start	2.00	389.180	371.955	73.0	83.5	10	1.934	1.001
Average:	2.00	7.567	7.816	72.5	84.8			
Stop	2.00	404.364	387.573	73.0	88.0			
Start	2.00	396.747	379.771	74.0	86.0	10	1.908	1.012
Average:	2.00	7.617	7.802	73.5	87.0			
						Average:	1.923	1.006

The meter coefficient (Y) must be within +/- 5% of the pretest Y. Calibrated By: _____

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DGM/ORIFICE CALIBRATION

DATE 9/22/96

BAROMETRIC PRESSURE 29.10 in. Hg

CALIBRATOR DS.

METER BOX NO. N-3

REFERENCE METER NO. 1334637

Reference Meter Gamma 1.016

ORIFICE SETTING in. H_2O	REFERENCE METER		DRY GAS METER			TIME θ min.	VACUUM
	GAS VOLUME V_R ft^3	TEMP. T_R °F	GAS VOLUME V_D ft^3	IN TEMP T_i °F	OUT TEMP T_o °F		
0.5	136.278	68	067.175	81	72	13.0	5
	141.374	69	072.413	82	75		
	5.096	68.5	5.238	81.5 / 73.5 / 77.5			
1.0	141.864	69	072.909	81	75	10.0	5
	147.379	69	078.584	87	79		
	5.515	69	5.675	84 / 77 / 80.5			
1.5	147.833	69	079.044	84	77	10.0	5
	154.369	69	085.797	88	79		
	6.536	69	6.753	86 / 78 / 82			
2.0	154.715	69	086.157	86	79	11.0	5
	163.109	70	094.835	90	81		
	8.394	69.5	8.678	88 / 80 / 84			
3.0	163.478	70	095.217	89	81	12.0	5
	174.730	70	106.868	93	83		
	11.252	70	11.651	91 / 82 / 86.5			
4.0	175.174	70	107.329	91	83	12.0	5
	188.213	70	120.802	96	85		
	13.039	70	13.482	93.5 / 84 / 88.75			

HAYDEN ENVIRONMENTAL GROUP, INC.

PRE-TEST METER BOX CALIBRATIONS

Meter Box #	N-3	N-3	N-3	N-3	N-3	N-3
Date	9/22/96	9/22/96	9/22/96	9/22/96	9/22/96	9/22/96
Reference Meter #	1334637	1334637	1334637	1334637	1334637	1334637
Y Reference Meter	1.016	1.016	1.016	1.016	1.016	1.016
Barometric Pressure ("Hg)	29.10	29.10	29.10	29.10	29.10	29.10
Orrifice Setting Delta H ("H2O)	0.50	1.00	1.50	2.00	3.00	4.00
Total Gas Volume Reference Meter (cubic feet)	5.096	5.515	6.536	8.394	11.252	13.039
Temperature Reference Meter (degrees F)	68.5	69.0	69.0	69.5	70.0	70.0
Total Gas Volume Dry Gas Meter (Cubic Feet)	5.238	5.675	6.753	8.678	11.651	13.482
Inlet Temperature Dry Gas Meter (degrees F)	81.5	84.0	86.0	88.0	91.0	93.5
Outlet Temperature Dry Gas Meter (degrees F)	73.5	77.0	78.0	80.0	82.0	84.0
Average Temperature Dry Gas Meter (Degrees F)	77.5	80.5	82.0	84.0	86.5	88.8
Time (min)	13.0	10.0	10.0	11.0	12.0	12.0
Vacuum (psi)	5.0	5.0	5.0	5.0	5.0	5.0
********** Calculations **********						
Meter Box Y	0.9882	0.9904	0.9879	0.9888	0.9883	0.9913
Meter Box Delta H ("H2O)	1.856	1.866	1.990	1.943	1.926	1.906
Average Meter Box Y	0.9892					
Average Meter Box Delta H ("H2O)	1.914					

025000

80 1 9

Meter Box Field Check

Meter Box #: N-3 Date: 9/22/96 Barometric: 29.1

Y: 0.9892 Calibrator: DS

delta H: 1.914 Leak Check: ✓

Run No.	Initial Volume	Final Volume	Net Volume	Initial Temp.	Final Temp.	Avg. Temp.	Y_c Comparison
1	125.031	132.776	7.745	79/78	86/79	80.5	0.99386
2	132.776	140.525	7.749	86/79	90/81	84	0.99656
3	146.525	148.273	7.748	90/81	93/83	86.75	0.99920

$$y_c = \frac{10}{Vm} \times \sqrt{\frac{(0.0319) \times (Tm)}{(Pb)}}$$

Compare with Y_c

$0.97 * Y < Y_c < 1.03 * Y$

$0.97 * Y =$ 0.9595

$1.03 * Y =$ 1.0188

THERMOCOUPLE CALIBRATION

THERMOCOUPLE I.D.: 41-B LENGTH: 47" DATE: 7/16/96

CALIBRATED BY: Dutch Schoenberger

REFERENCE THERMOMETER: 402947452

Source	Reference Thermometer Temperature °F	Test Thermocouple Temperature °F	Temperature Difference °F	Thermocouple Simulator Display	Thermocouple Simulator Setting
Ambient Air	74.6	75.0	+0.4	95.5	100
Boiling Water	209.4	207.3	-2.1	202.8	200
Boiling Oil	303.0	307.2	+4.2	301.9	300
Ice Bath	34.5	35.0	+0.5	95.9	100

F030164.94

THERMOCOUPLE CALIBRATION

THERMOCOUPLE I.D.: OV-2 LENGTH: 6" DATE: 7/16/96

CALIBRATED BY: Dutch Schulze

REFERENCE THERMOMETER: 1402247452

Source	Reference Thermometer Temperature °F	Test Thermocouple Temperature °F	Temperature Difference °F	Thermocouple Simulator Display	Thermocouple Simulator Setting
Boiling H_2O	208.2	209.0	-0.8	204.5	200
Ambient Air	75.4	76.0	-0.4	96.0	100

F030164.94

THERMOCOUPLE CALIBRATION

THERMOCOUPLE I.D.: I-2 LENGTH: 6" DATE: 7/16/96

CALIBRATED BY: Dutch Schoenberger

REFERENCE THERMOMETER: 402947452

Source	Reference Thermometer Temperature °F	Test Thermocouple Temperature °F	Temperature Difference °F	Thermocouple Simulator *Display*	Thermocouple Simulator *Setting*
Air	74.8	74.4	-0.4	96.0	100
Ice Bath	34.0	34.2	+0.2	96.0	100

F030164.94

8019

DATA CHEM LABORATORIES, INC.
A SORENSON COMPANY

November 19, 1996

Mr. Bruce Sarven
Hayden Environmental
561 Congress Park Drive
Dayton, OH 45459

Phone: (513) 438-3010
FAX: (513) 438-3020

Re.: Isotopic Uranium Analysis

Dear Mr. Sarven:

As per your conversation with Mr. Keith Nicholson in this office on Tuesday, November 19, 1996 the following addresses your issue. As I understand it you would like to have a written response concerning your request for Uranium 235 and the DCL report which has Uranium 235/236 as a result.

As I mentioned when we spoke about this work in July, Table 2 in the bidding information requested U-234, U-235, Th-236, U-238 and this was incorrect. Table 2 should have read U-234, U-235/236, U-238. Uranium-235/236 cannot be separated by existing analytical methods. Uranium-235/236 use the same spectral region of interest by alpha spectrometry and since chemical separation cannot separate these two radionuclides it is impossible to give individual measurements. It is standard to report isotopic uranium as U-234, U-235/236, and U-238 by alpha spectrometry.

If you have any further questions please contact me directly at 1-801-266-7700 x331.

Sincerely,

Robert P. Di rienzo
Project Manager

000675

CINCINNATI LABORATORY
4388 Glendale-Milford Road
Cincinnati, Ohio 45242-3706
513-733-5336, FAX 513-733-5347

NOVATO OFFICE
11 Santa Yorma Court
Novato, California 94945
415 897-9471, FAX 415-893 9469

CORPORATE OFFICE
SALT LAKE CITY LABORATORY
960 West LeVoy Drive
Salt Lake City, Utah 84123-2547
801-266-7700, FAX 801-268-9592

BALTIMORE OFFICE
10 Juliet Lane #203
Baltimore, Maryland 21236-1220
410-529-5675, FAX 410-529-5367

RICHLAND OFFICE
313 Wellsian Way
Richland, Washington 99352-4116
509-943-5858, FAX 509-943-5651

DATA CHEM LABORATORIES
A Sorenson Company

ANALYTICAL REPORT

Form ARF-AL 8019
Page 1 of 1
Part 1 of 1
10039611311638

Date 10/3/96
Laboratory Group Name 96E-0640-01
Account No. 03025

Hayden Environmental
Attention: Bruce Sarven
561 Congress Park Drive
Dayton, OH 45459

FAX (513) 548-3020
Telephone (513) 438-3010

Sampling Collection and Shipment

Sampling Site HAYDEN ENVIRONMENTAL Date of Collection September 19, 1996

Date Samples Received at Laboratory September 25, 1996

Analysis

Method of Analysis Method 5 / PARTICULATE WEIGHT

Date(s) of Analysis 10/2/96

Analytical Results

Field Sample Number	Laboratory Number	Sample Type	Particulate mg/Rinsate	Particulate mg/Filter	Particulate mg/Impinger	Particulate Total mg				
9131,39,40	96E04514	AIR	2.3	-2.3	0.0	0.0				
9135,41,42	96E04515	AIR	2.8	-19.8	0.0	-17.0				
9136,43,44	96E04516	AIR	2.0	-0.7	0.0	1.3				
9137,45,46	96E04517	AIR	3.5	-3.7	0.0	-0.2				
Limit of Detection										
Limit of Quantitation			0.1	0.1	0.1	0.1				

† See comment on last page.
ND Parameter not detected above LOD.
NR Parameter not requested.

** See comment on last page.
( ) Parameter between LOD and LOQ.

Analyst: Jennifer L. Clary

Reviewer:

Laboratory Supervisor:

090576

960 West LeVoy Drive / Salt Lake City, Utah 84123-2547 / (801) 266-7700
FAX (801) 268-9992

DATACHEM LABORATORIES Filter Weight Book No. FWT 06 Page No. 019

8019

Filter Lot #: 7 Temp.: 74 R.H.: 55%

Pre Testing has supplied filters Gemdia GFF GF-96-20 to 28 Tared on a Sartorius Research (Rad Chem) DCL #102683 on 9/16/96 JK

Filter: GF 96-20 (740)
Tare Analyst JK Date 9/16/96
Total Weight ____ mg
Total Weight ____ mg
Avg. Total Weight ____ mg
Tare Weight ~~453.2~~ 447.6 mg
Tare Weight ~~453.2~~ 447.6 mg
Avg. Tare Weight ~~453.2~~ 447.6 mg
SAMPLE No. ____ SAMPLE WT. ____ mg
Total Wt. Anal. ____ Date ____
Check Analyst ____ Date ____

Filter: GF 96-21 (756)
Tare Analyst JK Date ____
Total Weight ____ mg
Total Weight ____ mg
Avg. Total Weight ____ mg
Tare Weight 453.2 mg
Tare Weight 453.2 mg
Avg. Tare Weight 453.2 mg
SAMPLE No. ____ SAMPLE WT. ____ mg
Total Wt. Anal. ____ Date ____
Check Analyst ____ Date ____

Filter: GF 96-22 (752)
Tare Analyst JK Date ____
Total Weight 448.1 mg
Total Weight 448.2 mg
Avg. Total Weight 448.2 mg
Tare Weight 448.9 mg
Tare Weight 448.8 mg
Avg. Tare Weight 448.9 mg
SAMPLE No. 96E04511e SAMPLE WT. -0.7 mg
Total Wt. Anal. Jennifer L. Clay Date 9/30/96
Check Analyst JK Date 9/30/96

Filter: GF 96-23 (753)
Tare Analyst JK Date ____
Total Weight 443.8 mg
Total Weight 443.8 mg
Avg. Total Weight 443.8 mg
Tare Weight 446.2 mg
Tare Weight 446.0 mg
Avg. Tare Weight 446.1 mg
SAMPLE No. 96E04514 SAMPLE WT. -2.3 mg
Total Wt. Anal. Jennifer L. Clay Date 9/30/96
Check Analyst JK Date 9/30/96

Filter: GF 96-24 (753)
Tare Analyst JK Date ____
Total Weight 452.7 mg
Total Weight 452.8 mg
Avg. Total Weight 452.8 mg
Tare Weight 456.6 mg
Tare Weight 456.3 mg
Avg. Tare Weight 456.5 mg
SAMPLE No. 96E04517 SAMPLE WT. -3.7 mg
Total Wt. Anal. Jennifer L. Clay Date 9/30/96
Check Analyst JK Date 9/30/96

Filter: GF 96-25 (754)
Tare Analyst JK Date ____
Total Weight ____ mg
Total Weight ____ mg
Avg. Total Weight ____ mg
Tare Weight 447.5 mg
Tare Weight 447.4 mg
Avg. Tare Weight 447.5 mg
SAMPLE No. ____ SAMPLE WT. ____ mg
Total Wt. Anal. ____ Date ____
Check Analyst ____ Date ____

Filter: GF 96-26 (760?)
Tare Analyst JK Date ____
Total Weight ____ mg
Total Weight ____ mg
Avg. Total Weight ____ mg
Tare Weight 451.2 mg
Tare Weight 450.9 mg
Avg. Tare Weight 451.1 mg
SAMPLE No. ____ SAMPLE WT. ____ mg
Total Wt. Anal. ____ Date ____
Check Analyst ____ Date ____

Filter: GF 96-27 (761)
Tare Analyst JK Date ____
Total Weight 429.5 mg
Total Weight 429.5 mg
Avg. Total Weight 429.5 mg
Tare Weight 449.3 mg
Tare Weight 449.2 mg
Avg. Tare Weight 449.3 mg
SAMPLE No. 96E04515 SAMPLE WT. -19.8 mg
Total Wt. Anal. Jennifer L. Clay Date 9/30/96
Check Analyst JK Date 9/30/96

Filter: GF 96-28 (763)
Tare Analyst JK Date 9/16/96
Total Weight ____ mg
Total Weight ____ mg
Avg. Total Weight ____ mg
Tare Weight 450.9 mg
Tare Weight 450.7 mg
Avg. Tare Weight 450.8 mg
SAMPLE No. ____ SAMPLE WT. ____ mg
Total Wt. Anal. ____ Date ____
Check Analyst ____ Date ____

Filter: ____
Tare Analyst ____ Date ____
Total Weight ____ mg
Total Weight ____ mg
Avg. Total Weight ____ mg
Tare Weight ____ mg
Tare Weight ____ mg
Avg. Tare Weight ____ mg
SAMPLE No. ____ SAMPLE WT. ____ mg
Total Wt. Anal. ____ Date ____
Check Analyst ____ Date ____

TITLE METHOD 5

Project No.
Book No. 3143

DATA CHEM 1.

From Page No.

8019

ACETONE RINSE			IMPINGER	
SAMPLE	BEAKER WT.(g)	BEAKER + RESIDUE(g)	BEAKER WT.(g)	BEAKER + RESIDUE WT.(g)
96E04514	106.7277	106.7300	236.300	236.300
96E04515	106.4482	106.4510	177.985	177.985
96E04516	108.6621	108.6641	239.510	239.510
96E04517	106.2247	106.2282	237.355	237.355

SAMPLE	ACETONE RINSE WT (mg)	IMPINGER WT. (mg)
96E04514	2.3	0.0
96E04515	2.8	0.0
96E04516	2.0	0.0
96E04517	3.5	0.0

To Page No.

Witnessed & Understood by me	Date	Invented by NOT APPLICABLE	Date
[signature]	10-3-96	Recorded by [signature]	10/3/96

Sample Work Order

8019

QC Clearance: _____

Project Manager: Robert P. Di Rienzo

Client: Hayden Environmental

Account: 03025

Project/Task: COMM-ENV

Date Received: 25-Sep-1996

Date for Mailing Report: 25-Oct-1996

DCL Root Set ID: 96E-0640 *

DCL Lab. Name: 96E04514–96E04517

Total # Samples: 4

Sample Entry: Karyn L. Boyack

Section: WA

Earliest Sampling Date: 19-Sep-1996

Preparation Type:

Rep. Group	Radiochemistry Analytes Requested	Latest Prep. Date	Latest Anal. Date	No. of Samp.	Storage Location	Analysis/Prep. Method	Inst.	Matrix
01	Method 5 Particulate		18-Mar-1997[c]	4		Method 5	GRAV	AIR
02	Isotopic Uranium	1-Oct-1996[c]	18-Mar-1997[c]	4		WR-DC-341 WR-DC-200	AS	AIR
03	ISOTOPIC THORIUM	1-Oct-1996[c]	18-Mar-1997[c]	4		WR-DC-341	AS	AIR
04	Radium 226/228 by gamma spec		18-Mar-1997[c]	4		WR-EP-325 WR-DC-200	GS	AIR
05	Total Uranium by kPA		18-Mar-1997[c]	4		WR-DC-342	kPA	AIR

[c]Based on date of collection

Special Instructions: _____

Section Manager: Charlie C. Walker

Other Sections Receiving Sample Portions: None

000679

SAMPLE LOG-IN SHEET

Group Name: 96E-8640 8019

Lab Name: DataChem Laboratories	Page 1 of 1
Received By (Print Name): Sample Rec. Group	Log-In Date: 9-25-96
Received By (Signature): Tanya Vigil	
Case Number: 1	Sample Delivery Group No.: —
	SAS Number: NA

Remarks:

		Client ID #1 ~~EPA Sample #~~	Corresponding Client ID #2 ~~Sample Tag #~~	Corresponding Assigned Lab #	Matrix	Fraction	Remarks: Condition of Sample Shipment, etc.
1. Custody Seal(s)	Present/Absent*	200259131	North	96E04514	filter	R/A	each client
	Intact/Broken*	39	↓	↓	acetone		ID 1 bottle
2. Custody Seal Nos.	R/A	40	↓	↓	water		needs to be
		200259135	South	96E04515	filter		combined
3. Chain-of-Custody Records	Present/Absent*	41	↓	↓	acetone		to create
4. Traffic Reports or Packing Lists	Present/Absent*	42	↓	↓	water		a single
5. Airbill	Airbill/Sticker	200259136	Blank	96E04516	filter		client ID
	Present/Absent*	43	↓	↓	acetone		2 (see PPO)
6. Airbill No.	9690684721	44	↓	↓	water		↓
		200259137	Resp	96E04517	filter		
7. Sample Tags	Present/Absent*	45	↓	↓	acetone		
Sample Tag Numbers	Listed/Not Listed on Chain-of-Custody	46	↓	↓	water	↓	↓
8. Sample Condition	Intact/Broken*/Leaking						
9. Does information on custody records, traffic reports, and sample tags agree?	Yes/No*						
10. Date Received at Lab	9/25/96						
11. Time Received	1000						

Tanya Vigil 9/25/96

Sample Transfer	
Fraction: All	Fraction
Area #: R-23-1	Area #
By: TV	By
On: 9/25/96	On

* Contact SMO and attach record of resolution.

Reviewed By	Logbook No.
Date	Logbook Page No. 000680

FRACTIONS:
C - Cyanide
D - Dissolved Metals
T - Total Metals
F - Full TCL Organics
P - Pesticides
S - Semivolatiles
V - Volatiles

FORM DC-1

R - Rad Chem
A - Particulates

Note: only highlighted portion of client ID #1s entered into DCL computer system 9/25

ID:

FERMCO

P.O. BOX 538704
CINCINNATI, OH 45253-8704

CHAIN OF CUSTODY / REQUEST FOR ANALYSIS RECORD

REFERENCE DOCUMENT NO.: SPL-96-2875

ORIGINAL MEF NO.: _____ CORRESPONDING REFERENCE DOCUMENT NO.: _____

PAGE 1 OF 2

RELEASE NO.: 00 1000012382	PROJECT NO.: N/A	FOR SAMPLE RELATED PROBLEMS, ACS CONTACT / PHONE: Tim Miller X4198	CONTRACT PURCHASE ORDER / TASK ORDER NO.: N/A
PROJECT NAME: NESHAP STACK SAMPLING		REQUIRED REPORT DATE / LAB TAT: PARTICULATE (10 DAY) RAD (30 DAY)	SAMPLE SHIPMENT DATE: 9-24-96
PROJECT CONTACT / PHONE: Tim Miller / 4198		RECEIVING LAB NAME: DATACHEM	SAMPLE SHIPPER (Print): G Bell
CHARGE NO.: 7ECG-2	LOT MARKING NO.: N/A	RECEIVING LAB ADDRESS: SALT LAKE CITY	OFF-SITE LAB CONTACT: Robert DiRenzo

SAMPLING TEAM (Print) & GROUP NAME / PHONE: Bruce Sauven HAYDEN ENVIRONMENTAL 513-433-3010 Geoff Schoenberger 9-20-96 HAYDEN

SAMPLING TEAM (Signature & Badge No.): Bruce Sauven 283-74-1262 G/G D. Schoenberger 269-82-4154

ITEM NO.	FACTS ID	CUSTOMER ID / SAMPLE POINT	SAMPLE MATRIX	COMP	GRAB	FILTERED	COLLECTION DATE	COLLECTION TIME	CONTAINER TYPE	CONTAINER VOL.	NO. CONTRS	PRESERVATION	ASL	ANALYSES REQUESTED (If more space is required, use the SPECIAL INSTRUCTIONS block.)	SAMPLE OKAY? (Y/N)* FERMCO	SAMPLE OKAY? (Y/N)* OFF-SITE
1	200259131	NORTH FILTER	AF AIR FILTER	✓		N/A	9-19-96	0830	F	146 cm	1	NONE	B	Particulate & Rad *	Y	
2	200259139	NORTH FRONT 1/2	L1 ACETONE	✓		N/A	9-19-96	0830	P	1 L	1	NONE	B	Particulate & Rad *	Y	
3	200259140	NORTH BACK 1/2	L2 ~~ACETONE~~ WATER	✓		N/A	9-19-96	0830	P	1 L	1	NONE	B	Particulate & Rad *	Y	
4	200259135	South Filter	AF AIR FILTER	✓		N/A	9-19-96	0830	F	136 cm	1	NONE	B	Particulate & Rad *	Y	
5	200259141	South Front 1/2	~~L2~~ L1 ACETONE	✓		N/A	9-19-96	0830	P	1 L	1	NONE	B	Particulate & Rad *	Y	
6	200259142	South BACK 1/2	L2 ~~ACETONE~~ WATER	✓		N/A	9-19-96	0830	P	1 L	1	NONE	B	Particulate & Rad *	Y	
7	200259136	Filter BLANK	AF AIR FILTER	✓		N/A	9-19-96	0830	F	N/A	1	NONE	B	Particulate & Rad *	Y	
8	200259143	D.I. BLANK	L2 WATER	✓		N/A	9-19-96	0830	P	1 L	1	NONE	B	Particulate & Rad *	Y	
9	200259144	ACETONE BLANK	L1 ACETONE	✓		N/A	9-19-96	0830	P	1 L	1	NONE	B	Particulate & Rad *	Y	
10	200259137	Resp. filter	AF AIR FILTER	✓		N/A	9-19-96	0830	F	283 cm	1	NONE	B	Particulate & Rad *	Y	

SPECIAL INSTRUCTIONS: * Samples to be shipped off-site to DATA-CHEM / UTAH, Contact Robert DiRenzo
Analysis to be performed are particulate, U-238, U-234, U-235, U-236, Th-228, Th-230, Th-232
Ra-226, Ra-228 and Total Uranium by Lazer Phosphorometry

RELINQUISHED ITEM / REASON	RELINQUISHED BY (Signature) / AFFILIATION	BADGE NO.	DATE	TIME	RECEIVED BY (Signature) / AFFILIATION	BADGE NO.	DATE	TIME
1-12 Rad Analysis	[redacted]	1 283-74-1262	9/20/96	1630	[redacted]	1 75148	9/20/96	1630
1-12 Ship		2 75148	9-23-96	0800		2 630	9-23-96	0800
1-17 Ship		3 630	9-24-96	1300		3 58852	9-25-96	1002
		4				4		
		5				5		

DISTRIBUTION OF C[illegible] WHITE ON-SITE - RELEASE FILE / OFF-SITE ANALYTICAL LAB - RETURN TO FEMP YELLOW [illegible]SITE - DISTRIBUTE AS NEEDED / OFF-SITE ANALYTICAL LAB - RETURN TO FEMP BLUE SAMPLIN[illegible] / PROJECT FILE

FS-F-3361 (09-21-9[illegible]) SHADED AREAS ARE TO BE COMPLETED BY [illegible]MPLE RECEIVING GROUP.

* IF "N", THEN COMPLETE APPLICABLE NON-CONFORMANCE PROCEDURE.

1-43013 1-43016

000081

FERMCO

CHAIN OF CUSTODY / REQUEST FOR ANALYSIS RECORD (CONTINUED)

PROJECT NO.: N/A

PROJECT NAME: NESHAP STACK SAMPLING

REFERENCE DOCUMENT NO.: SPL-96-2875 1000012382

CORRESPONDING REFERENCE DOCUMENT NO.:

000682

ITEM NO.	SAMPLE NUMBER: FACTS ID	SAMPLE NUMBER: CUSTOMER ID / SAMPLE POINT	SAMPLE MATRIX		COMP	GRAB	FILTERED	COLLECTION: DATE	COLLECTION: TIME	CONTAINER: TYPE	CONTAINER: VOL.	NO. CONTRS	PRESERVATION	ASL	ANALYSES REQUESTED (If more space is required, use the SPECIAL INSTRUCTIONS block.)	SAMPLE OKAY? (Y/N)* FERMCO	SAMPLE OKAY? (Y/N)* OFF-SITE
11	2000259145	Resp. Front 1/2	L1	ACETONE	✓		N/A	9-20-96	0845	P	1L	1	NONE	B	Particulate & Rad	Y	
12	2000259146	Resp. Back 1/2	L2	~~ACETONE~~ D.I. WATER	✓		N/A	9-20-96	0845	P	1L	1	NONE	B	Particulate & Rad	Y	
		NOTHING FOLLOWS															

SPECIAL INSTRUCTIONS: AF - Air Filter
L1 - Acetone
L2 - D.I. WATER

DISTRIBUTION OF C[illegible]: WHITE ON-SITE - RELEASE FILE / OFF-SITE ANALYTICAL LAB - RETURN TO FEMP; YELLOW [illegible]N-SITE - DISTRIBUTE AS NEEDED / OFF-SITE ANALYTICAL LAB - RETURN TO FEMP; BLUE SAMPLIN[illegible]CH / PROJECT FILE

SHADED AREAS ARE TO BE COMPL[illegible] BY THE SAMPLE RECEIVING GROUP.

* IF "N", THEN COMPLETE APPLICABLE NON-CON[illegible]CE PROCEDURE.

FS-F-3361-1 (09-2[illegible])

TALLY SHEET

8019

RELEASE #: 1000012382 (CAN 1 OF 1)
PO #: NA
DATE SHIPPED: 23-SEP-96
MATERIAL: NESHAP STACK SAMPLING - AIR FILTERS, ACETONE , AND WATER

ANALYSIS: PARTICULATE AND RAD

Composite Sample Number	Lot Number	Sample Container Size	AnaLis/ FACTS Number	Gross Weight lbs.	Tare Weight lbs.	Net Weight lbs.
NORTH FILTER	W050-730-P047-0417	AIR FILTER	200259131	0.101	0.097	0.004
NORTH FRONT 1/2	W050-730-P047-0417	1 L PLS	200259139	0.300	0.220	0.080
NORTH BACK 1/2	W050-730-P047-0417	1 L PLS	200259140	0.300	0.220	0.080
SOUTH FILTER	W050-730-P047-0417	AIR FILTER	200259135	0.101	0.097	0.004
SOUTH FRONT 1/2	W050-730-P047-0417	1 L PLS	200259141	0.300	0.220	0.080
SOUTH BACK 1/2	W050-730-P047-0417	1 L PLS	200259142	0.300	0.220	0.080
FILTER BLANK	W050-730-P047-0417	AIR FILTER	200259136	0.101	0.097	0.004
DI BLANK	W050-730-P047-0417	1 L PLS	200259143	1.251	0.220	1.031
ACETONE BLANK	W050-730-P047-0417	1 L PLS	200259144	0.300	0.220	0.080
RESP. FILTER	W050-730-P047-0417	AIR FILTER	200259137	0.101	0.097	0.004
RESP. FRONT 1/2	W050-730-P047-0417	1 L PLS	200259145	0.300	0.220	0.080
RESP. BACK 1/2	W050-730-P047-0417	1 L PLS	200259146	0.300	0.220	0.080
				3.755	2.148	1.607

8019

32350

FEMP

COVER SHEET

DOCUMENT TYPE ● RSR ○ RWP

SURVEY FOR RWP? ○ YES ● NO

NAME [redacted]

PAGE 1 OF 4

SIGNED [redacted]

LOCATION Lab WZ6

LOCATION CODE

BADGE #	DATE	TIME	BLDG/GRID#	FLR
7323	09/24/96	09:26	15A	1

SURVEY NUMBER 96-09-11-0165

RWP NUMBER -

COMMENTS Sampleshipment Res. Filters + Acetone Rel# 12352

NA

REVIEWER [redacted] BADGE 7395

SIGN [redacted]

FS-F-4617 (4/22/96)

000681

FEMP
RADIOLOGICAL SURVEY REPORT

SURVEY NUMBER: 96- 9 -11- 165

DATE: 9-24-96	RCT NAME: [redacted]	RCT BADGE #: 74323	PAGE:
REVIEWED BY: [redacted]		REVIEWER BADGE NO: 7395	2 OF 4

MODEL	SERIAL NUMBER	TYPE (α, β, γ)	CALIBRATION-DUE DATE	BKGD. (cpm)	EFF./CF	COUNT TIME (min)	MDA (dpm)	INSP./ PERFORMANCE TEST DATE YES	NO
LB 5100		αβγ	10-96	.26/1.42	.212/.431	2.0	2/A 3	✓	
M3		βγ	2-97	60	30	NA	3000	✓	
2221	75447	α	9-96	1.2	.16	1	16.2	✓	
					A				
				N					

ITEM NUMBER	LOCATION AND/OR DESCRIPTION	HEIGHT (FT.)	DPM/100cm² ALPHA REMOVABLE (1)	DPM/100cm² ALPHA FIXED PLUS REMOVABLE	DPM/100cm² BETA-GAMMA REMOVABLE (1)	DPM/100cm² BETA-GAMMA FIXED PLUS REMOVABLE	CORRECTED DOSE RATE (MREM/HR) γ CONTACT	β CONTACT	γ AT FT.	β AT FT.
1	200259131	NA	-0 *	-7 *	3	<MDCR				
2	200259136		2	-7.5 *	-2 *					
3	200259135		0 *	-7 *	2 *					
4	200259137		-0 *	5 *	5					
5	200259139		5	NA	4					
6	200259141		2		10					
7	200259145		0 *		5			NA		
8	200259140		0 *		0 *					
9	200259144		-0 *		0 *					
10	200259143		-0 *		0 *					
11	200259142		0 *		1 *					
12	200259146		2		5					
13	I/S can	✓	-0 *	✓	0 *	✓				
14	O/S can	NA	0 *	NA	3	<MDCR				
				NA						

Note (1): Values identified by an asterisk (*) indicate results are less than the calculated MDA (RC-RDA-010).

FS-F-1993-1 (REV. 04/18/95)

TUE SEP 24, 1996
GROUP A SMEARS FOR FREE RELEASE (2 MIN)

8019

SAMPLE NUMBER	GROSS ALPHA	GROSS BETA	DPM ALPHA	DPM BETA	TIME OF COUNT
51	0	6	-0	3	08:03:16
52	2	[illegible]	2	[illegible]	08:07:31
53	1	5	0	2	08:07:46
54	0	[illegible]	-0	3	08:10:01
55	4	7	5	4	08:10:16
56	2	12	3	10	08:14:31
57	1	8	0	5	08:16:46
58	1	[illegible]	0	0	08:19:01
59	0	5	-0	0	08:21:16
60	0		-0	0	08:23:31
61	1	4	0	1	08:25:16
62	2	8	3	5	08:28:01
63	0	5	-0	0	08:30:16
64	1	[illegible]	0	3	08:32:30

OPERATION COMPLETE

OPERATION COMPLETE

FEMP RADIOLOGICAL SURVEY REPORT pg 3 of 4
SURVEY # 96-4-11-165 DATED 9/24/96

	(name)	(signature)
RCT:	William Chastern	[signature]
REVIEWER:	[signature]	[signature]

MATERIAL RESTRICTED RELEASE FORM

ITEM NUMBER	ITEM DESCRIPTION	RCT	MATERIAL RELEASE EVALUATOR PRINT/SIGNATURE [1&3]	MATERIAL OWNER/SURVEY REQUESTOR PRINT/SIGNATURE [2&3]
1-4	Filters	N/A	R Atkinson	GORDON BELL
5-12	Acetone	N/A	R Atkinson	GORDON BELL
			NA	

Additional Comments: Sagles to DCL-SLC Lic # UT 1800237 EXP 11-31-97

[1] Signature by Material Release Evaluator indicates the material may be released for restricted use in the uncontrolled area of the FEMP site only. This material is not being released for unrestricted use.

[2] Signature by the Material Owner/Survey Requestor indicates acceptance of responsibility for the material while in the uncontrolled area and the material will be returned to the controlled area following use.

[3] Additional approval by the Manager of Radiological Compliance is required prior to allowing the material to exit beyond the FEMP property boundary. This allowance may be annotated in the additional comments section of the form.

000082

FS-F-3916 (06/24/94)

FEMP RADIOLOGICAL SURVEY REPORT pg 4 of 4
SURVEY # 96-9-11-164 DATED 9-29-96
(name) (signature)
RCT: William Thaston

PROJECT PROTOCOL WORKSHEET

8019

Project:	Fernald Emission Testing	Date: 09/20/96
Client:	Hayden Environmental	Revision: 1.0
Account:	3025	
Proj. Mngr:	Bob Di Rienzo	

Client Contacts:

Reports:

Bruce Sarven
Hayden Environmental
561 Congress Park Drive
Dayton, OH 45459

Phone: (513) 438-3010
FAX: (513) 438-3020

Invoices:

Same with COC

Schedule: Starts 09/20/96

TAT: 30 Calendar Days

Sample Receipt: Use the 96E sample stream. *Notify Project Manager when samples are received.*

Analyses: **Particulates and Radiochemistry**

QA/QC: Overall QA/QC requirements will be based on the DCL Procedures.

EDL: None.

MS/MSD or MD: As per method

Deliverables: RLIMS63 Report, Raw Data, and COC
Paginate entire package

Penalties: None

Questions: If you have any questions, please contact the project manager either directly or by voice-mail at extension 331, or via e-mail on node tigger.

Special Instructions: **See attached Flow Chart and Instructions**
Particulate mesurement is completed first.
Rinsate and Filter Particulate are used for radiochemistry procedures.

PRICE CODES AND ANALYTE GROUPS:

ANALYTE	MATRIX	EST SAMPLE	METHOD	SECT	HOLD CODE	PRICE CODE	ANALYTE GROUP
Particulate	Air	4	Method 5	WA	NA	3025A01NMET5	3025A1MET5
Iso U	Air	4	AS	WA	NA	3025A01NUISO	3025A1UISO
Iso Th	Air	4	AS	WA	NA	3025A01NTISO	3025A1TISO
Radium 226/228	Air	4	GS	WA	NA	3025A01NGS	3025A1GS
Total Uranium	Air	4	kPA	WA	NA	3025A01NTOTU	3025A1TOTU

DATACHEM LABORATORIES CLIENT-RELATED INFORMATION REPORT (CRIR)

CRIR NO. _____ 8019

COOLER INFORMATION CHECKLIST
(Fill In or Circle)

Client Name: Fermco

Project/Task/Site:

Date/Time of Receipt: 9/25/96 1000

Number of Coolers Received: 1

Condition of Coolers: Acceptable/Unacceptable

Temperature Control: Present/Not Included

Custody Seals: Present/Absent

Intact/Broken

Location Temperature Taken: Control/Between Samples

Tamper Evident: Yes/No

Are all temperatures within project specific guidelines? Yes/No

Ice Present: Yes/No

Frozen/Melted/NA

Are all applicable pHs within specific guidelines? Yes/No/NA

Cooler Received	DCL Cooler No.	Temp.	Cooler Received	DCL Cooler No.	Temp.	Cooler Received	DCL Cooler No.	Temp.
* 1	MC96 0437	19 °C	4	MC96	°C	7	MC96	°C
2	MC96	°C	5	MC96	°C	8	MC96	°C
3	MC96	°C	6	MC96	°C	9	MC96	°C

Taken By: Karyn Vigil (Signature) Karyn Vigil (Printed Name) 9/25/96 (Date)

* Rad Chem. Analyses: no temp preservation required

CLIENT-RELATED INFORMATION

- ☐ Missing Cooler
- ☐ Cooler Conditions
- ☐ Missing Paperwork
- ☐ Missing/Incorrect Bottle Labels
- ☐ Missing Samples/Bottles
- ☐ Broken/Leaking Samples
- ☐ Incorrect Bottle Type
- ☐ Cooler Temperatures Out Of Range
- ☐ Incorrect Preservation
- ☐ pH Criteria Not Met
- ☐ Head Space in Bottles
- ☐ Insufficient Sample Volume
- ☐ Chain Of Custody Problems
- ☐ Other:

BRIEFLY DESCRIBE THE PROBLEM AND THE ACTION TAKEN:

Faxed to Client? Yes ☐ No ☐ (If yes, attach Fax Cover Sheet)

❖ **Response Required Within 24 Hours** ❖

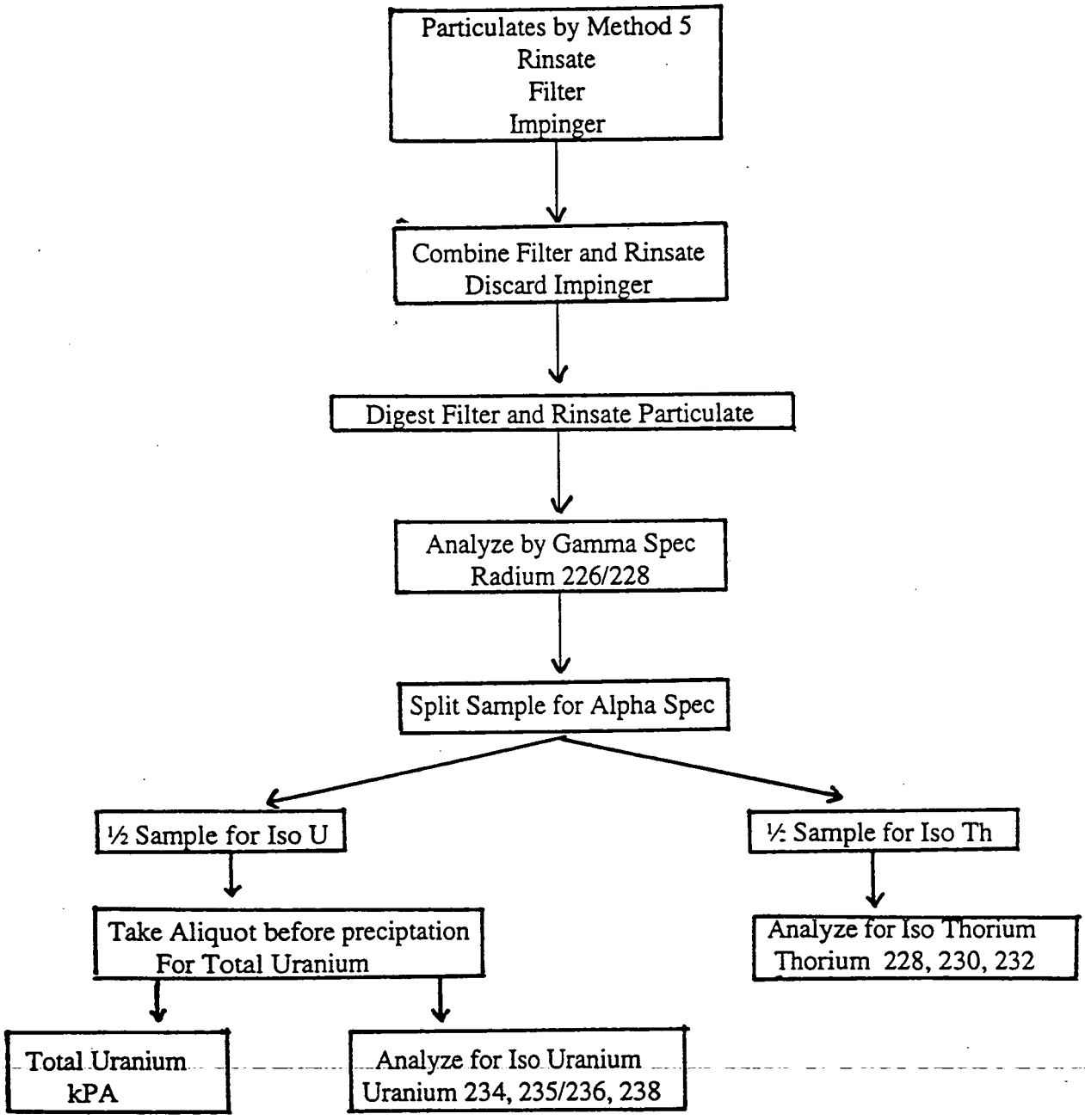
PROJECT MANAGEMENT

PROJECT MANAGER COMMENTS:

DCL Project Manager: _____ (Printed Name) Returned to Sample Receipt by: _____ (Signature) Date: _____

Analytical Scheme
Hayden Environmental - Fernault Emission Testing

3 Samples and Field Blank



DATACHEM LABORATORIES Filter Weight Book No. FWT Ub Page No. 019

Filter Lot #: 7 Temp.: 74 R.H.: 55% 8019

Pure Testing was supplied filters Gemidia GFF

Tared on a Sartorius Research (Rad Chem) DLL #102683 on 9/16/96 PG

Filter: GF 96-20 (740)
Tare Analyst PG Date 9/16/96
Total Weight ____ mg
Total Weight ____ mg
Avg. Total Weight ____ mg
Tare Weight ~~453.2~~ 447.6 mg
Tare Weight ~~453.2~~ 447.6 mg 447.6
Avg. Tare Weight ~~453.2~~ mg
SAMPLE No. ____ SAMPLE WT. ____ mg
Total Wt. Anal. ____ Date ____
Check Analyst ____ Date ____

Filter: GF 96-21 (756)
Tare Analyst PG Date ____
Total Weight ____ mg
Total Weight ____ mg
Avg. Total Weight ____ mg
Tare Weight 453.2 mg
Tare Weight 453.2 mg
Avg. Tare Weight 453.2 mg
SAMPLE No. ____ SAMPLE WT. ____ mg
Total Wt. Anal. ____ Date ____
Check Analyst ____ Date ____

Filter: GF 96-22 (752)
Tare Analyst PG Date ____
Total Weight ____ mg
Total Weight ____ mg
Avg. Total Weight ____ mg
Tare Weight 448.9 mg
Tare Weight 448.8 mg
Avg. Tare Weight 448.9 mg
SAMPLE No. ____ SAMPLE WT. ____ mg
Total Wt. Anal. ____ Date ____
Check Analyst ____ Date ____

Filter: GF 96-23 (753)?
Tare Analyst PG Date ____
Total Weight ____ mg
Total Weight ____ mg
Avg. Total Weight ____ mg
Tare Weight 446.2 mg
Tare Weight 446.0 mg
Avg. Tare Weight 446.1 mg
SAMPLE No. ____ SAMPLE WT. ____ mg
Total Wt. Anal. ____ Date ____
Check Analyst ____ Date ____

Filter: GF 96-24 (753)?
Tare Analyst PG Date ____
Total Weight ____ mg
Total Weight ____ mg
Avg. Total Weight ____ mg
Tare Weight 456.6 mg
Tare Weight 456.3 mg
Avg. Tare Weight 456.5 mg
SAMPLE No. ____ SAMPLE WT. ____ mg
Total Wt. Anal. ____ Date ____
Check Analyst ____ Date ____

Filter: GF 96 25 (754)
Tare Analyst PG Date ____
Total Weight ____ mg
Total Weight ____ mg
Avg. Total Weight ____ mg
Tare Weight 447.5 mg
Tare Weight 447.4 mg
Avg. Tare Weight 447.5 mg
SAMPLE No. ____ SAMPLE WT. ____ mg
Total Wt. Anal. ____ Date ____
Check Analyst ____ Date ____

Filter: GF 96-26 (760?)
Tare Analyst PG Date ____
Total Weight ____ mg
Total Weight ____ mg
Avg. Total Weight ____ mg
Tare Weight 451.2 mg
Tare Weight 450.9 mg
Avg. Tare Weight 451.1 mg
SAMPLE No. ____ SAMPLE WT. ____ mg
Total Wt. Anal. ____ Date ____
Check Analyst ____ Date ____

Filter: GF 96-27 (761)
Tare Analyst PG Date ____
Total Weight ____ mg
Total Weight ____ mg
Avg. Total Weight ____ mg
Tare Weight 449.3 mg
Tare Weight 449.2 mg
Avg. Tare Weight 449.3 mg
SAMPLE No. ____ SAMPLE WT. ____ mg
Total Wt. Anal. ____ Date ____
Check Analyst ____ Date ____

Filter: GF 96-28 (763)
Tare Analyst PG Date 9/16/96
Total Weight ____ mg
Total Weight ____ mg
Avg. Total Weight ____ mg
Tare Weight 450.9 mg
Tare Weight 450.7 mg
Avg. Tare Weight 450.8 mg
SAMPLE No. ____ SAMPLE WT. ____ mg
Total Wt. Anal. ____ Date ____
Check Analyst ____ Date ____

Filter: ____
Tare Analyst ____ Date ____
Total Weight ____ mg
Total Weight ____ mg
Avg. Total Weight ____ mg
Tare Weight ____ mg
Tare Weight ____ mg
Avg. Tare Weight ____ mg
SAMPLE No. ____ SAMPLE WT. ____ mg
Total Wt. Anal. ____ Date ____
Check Analyst ____ Date ____

DATACHEM LABORATORIES
ANALYTE GROUP LIST
SEARCH STRING: 3025A1MET5

ANALYTE GROUP: 3025A1MET5 ACCOUNT: 03025 DESCRIPTION: Method 5 Particulate

Analyte	Instrument Class	Method	Sub Method	Report Units	Threshold	Lod	Loq
Particulate	GRAV	Method 5		mg/Rinsate			0.1
Particulate	GRAV	Method 5		mg/Filter			0.1
Particulate	GRAV	Method 5		mg/Impinger			0.1
Particulate	GRAV	Method 5		Total mg			0.1

--- END OF LISTING ---

000693

80 19

DATACHEM LABORATORIES
ANALYTE GROUP LIST
SEARCH STRING: 3025A1UISO

ANALYTE GROUP: 3025A1UISO ACCOUNT: 03025 DESCRIPTION: Isotopic Uranium

Analyte	Instrument Class	Method	Sub Method	Report Units	Threshold	Lod	Loq
Uranium-233/234	AS	WR-DC-341	WR-DC-200	pCi/Sample			1.0
Uranium-235	AS	WR-DC-341	WR-DC-200	pCi/Sample			1.0
Uranium-238	AS	WR-DC-341	WR-DC-200	pCi/Sample			1.0

--- END OF LISTING ---

000694

8019

DATACHEM LABORATORIES
ANALYTE GROUP LIST
SEARCH STRING: 3025A1TISO

ANALYTE GROUP: 3025A1TISO ACCOUNT: 03025 DESCRIPTION: ISOTOPIC THORIUM

Analyte	Instrument Class	Method	Sub Method	Report Units	Threshold	Lod	Loq
Thorium-228	AS	WR-DC-341		pCi/Sample			1.0
Thorium-230	AS	WR-DC-341		pCi/Sample			1.0
Thorium-232	AS	WR-DC-341		pCi/Sample			1.0

--- END OF LISTING ---

000695

8019

DATACHEM LABORATORIES
ANALYTE GROUP LIST
SEARCH STRING: 3025A1GS

ANALYTE GROUP: 3025A1GS ACCOUNT: 03025 DESCRIPTION: Radium 226/228 by ga

Analyte	Instrument Class	Method	Sub Method	Report Units	Threshold	Lod	Loq
Radium-226	GS	WR-EP-325	WR-DC-200	pCi/Sample			95
Radium-228	GS	WR-EP-325	WR-DC-200	pCi/Sample			20

--- END OF LISTING ---

000596

8019

DATACHEM LABORATORIES
ANALYTE GROUP LIST
SEARCH STRING: 3025A1TOTU

ANALYTE GROUP: 3025A1TOTU ACCOUNT: 03025 DESCRIPTION: Total Uranium by kPA

Analyte	Instrument Class	Method	Sub Method	Report Units	Threshold	Lod	Loq
Total Uranium	kPA	WR-DC-342		ug/Sample			0.8

--- END OF LISTING ---

000697

8019

August 6, 1996
Refer to: BD0021

Bruce Sarven
Hayden Environmental
561 Congress Park Drive
Dayton, OH 45459

Phone: (513) 438-3010
FAX: (513) 438-3020

Re: REVISED FAX Quote BD0021

Dear Mr. Sarven:

DataChem Laboratories, Inc.(DCL) appreciates the opportunity to provide you with cost estimates for your project. As I understand your needs, you will be taking three 6 hour stack samples and a blank by Method 5 for particulates and radionulclides analysis. Tared glass fiber filters and sample bottles will be provided for these determinations. The acetone rinse and glass fiber filter will be combined for the analysis of radionuclides.

Uranium 234, Uranium 235/236, Uranium 238, Thorium 228, Thorium 230, and Thorium 232 will be analyzed by alpha spectrometry(AS). Radium 226 and Radium 228 will be analyzed by gamma spectrometry(GS). Total Uranium will be analyzed by kinetic phosphorescence(KPA). According to method 114 these radionuclides will be part of the particulate loading and analysis on the impinger solutions is not required. Combined particulate from the acetone rinse and filter will be analyzed according to DCL standard operating procedures(SOP).

The standard turnaround time for these analysis is 30 calendar days. The requested turnaround time of 10 working days can be accomplished for an additional 25%. The requested detection limits for isotopic analysis can not be met. Minimun Detectable Activity (MDA) is listed on the attached table.

Attached is a Pricing Quotation for these analyses. If you have any question concerning the attached quotation please call me.

Sincerely,

Robert P. Di Rienzo
Project Manager

Revised Pricing Quotation
Project Reference Number: BD-0021

Parameter Analysis	Method	MDA pCi/Sample	Method	Fractions	Price per Sample
Particulate	Method 5		Grav	Acetone Rinse Filter Impinger	$100.00
Uranium 234 Uranium 235/236 Uranium 238	DCL SOP	1 1 1	AS	Particulate*	$312.50
Thorium 228 Thorium 230 Thorium 232	DCL SOP	1 1 1	AS	Particulate*	$312.50
Radium 226 Radium 228	DCL SOP	95 20	GS	Particulate*	$250.00
Total Uranium	DCL SOP	0.8 ug/ Sample	KPA	Particulate*	$187.50

* = Particulate samples are combined acetone rinse and glass fiber filter.

EMISSION MEASUREMENT TECHNICAL INFORMATION CENTER TEST METHOD

Method 5 - Determination of Particulate Emissions from Stationary Sources

1. PRINCIPLE AND APPLICABILITY

1.1 Principle. Particulate matter (PM) is withdrawn isokinetically from the source and collected on a glass fiber filter maintained at a temperature in the range of 120 ± 14°C (248 ± 25°F) or such other temperature as specified by an applicable subpart of the standards or approved by the Administrator, U.S. Environmental Protection Agency, for a particular application. The PM mass, which includes any material that condenses at or above the filtration temperature, is determined gravimetrically after removal of uncombined water.

1.2 Applicability. This method is applicable for the determination of PM emissions from stationary sources.

2. APPARATUS

2.1 Sampling Train. A schematic of the sampling train used in this method is shown in Figure 5-1. Complete construction details are given in APTD-0581 (Citation 2 in the Bibliography); commercial models of this train are also available. For changes from APTD-0581 and for allowable modifications of the train shown in Figure 5-1, see the following subsections.

The operating and maintenance procedures for the sampling train are described in APTD-0576 (Citation 3 in the Bibliography). Since correct usage is important in obtaining valid results, all users should read APTD-0576 and adopt the operating and maintenance procedures outlined in it, unless otherwise specified herein. The sampling train consists of the following components:

2.1.1 Probe Nozzle. Stainless steel (316) or glass with sharp, tapered leading edge. The angle of taper shall be ≤30°, and the taper shall be on the outside to preserve a constant internal diameter. The probe nozzle shall be of the button-hook or elbow design, unless otherwise specified by the Administrator. If made of stainless steel, the nozzle shall be constructed from seamless tubing; other materials of construction may be used, subject to the approval of the Administrator.

A range of nozzle sizes suitable for isokinetic sampling should be available, e.g., 0.32 to 1.27 cm (1/8 to 1/2 in.)—or larger if higher volume sampling trains are used—inside diameter (ID) nozzles in increments of 0.16 cm (1/16 in.). Each nozzle shall be calibrated according to the procedures outlined in Section 5.

directly from the wash bottle being used, and place it in a glass sample container labeled "acetone blank."

Inspect the train prior to and during disassembly, and note any abnormal conditions. Treat the samples as follows:

Container No. 1. Carefully remove the filter from the filter holder, and place it in its identified petri dish container. Use a pair of tweezers and/or clean disposable surgical gloves to handle the filter. If it is necessary to fold the filter, do so such that the PM cake is inside the fold. Carefully transfer to the petri dish any PM and/or filter fibers that adhere to the filter holder gasket, by using a dry Nylon bristle brush and/or a sharp-edged blade. Seal the container.

Container No. 2. Taking care to see that dust on the outside of the probe or other exterior surfaces does not get into the sample, quantitatively recover PM or any condensate from the probe nozzle, probe fitting, probe liner, and front half of the filter holder by washing these components with acetone and placing the wash in a glass container. Deionized distilled water may be used instead of acetone when approved by the Administrator and shall be used when specified by the Administrator; in these cases, save a water blank, and follow the Administrator's directions on analysis. Perform the acetone rinse as follows:

Carefully remove the probe nozzle, and clean the inside surface by rinsing with acetone from a wash bottle and brushing with a Nylon bristle brush. Brush until the acetone rinse shows no visible particles, after which make a final rinse of the inside surface with acetone.

Brush and rinse the inside parts of the Swagelok fitting with acetone in a similar way until no visible particles remain.

Rinse the probe liner with acetone by tilting and rotating the probe while squirting acetone into its upper end so that all inside surfaces will be wetted with acetone. Let the acetone drain from the lower end into the sample container. A funnel (glass or polyethylene) may be used to aid in transferring liquid washes to the container. Follow the acetone rinse with a probe brush. Hold the probe in an inclined position, squirt acetone into the upper end as the probe brush is being pushed with a twisting action through the probe; hold a sample container underneath the lower end of the probe, and catch any acetone and particulate matter that is brushed from the probe. Run the brush through the probe three times or more until no visible PM is carried out with the acetone or until none remains in the probe liner on visual inspection. With stainless steel or other metal probes, run the brush through in the above prescribed manner at least six times since metal probes have small crevices in which particulate matter can be entrapped.

Rinse the brush with acetone, and
quantitatively collect these washings in the sample container. After the brushing, make a final acetone rinse of the probe as described above.

It is recommended that two people clean the probe to minimize sample losses. Between sampling runs, keep brushes clean and protected from contamination.

After ensuring that all joints have been wiped clean of silicone grease, clean the inside of the front half of the filter holder by rubbing the surfaces with a Nylon bristle brush and rinsing with acetone. Rinse each surface three times or more if needed to remove visible particulate. Make a final rinse of the brush and filter holder. Carefully rinse out the glass cyclone, also (if applicable). After all acetone washings and particulate matter have been collected in the sample container, tighten the lid on the sample container so that acetone will not leak out when it is shipped to the laboratory. Mark the height of the fluid level to determine whether leakage occurred during transport. Label the container to identify clearly its contents.

Container No. 3. Note the color of the indicating silica gel to determine whether it has been completely spent, and make a notation of its condition. Transfer the silica gel from the fourth impinger to its original container, and seal. A funnel may make it easier to pour the silica gel without spilling. A rubber policeman may be used as an aid in removing the silica gel from the impinger. It is not necessary to remove the small amount of dust particles that may adhere to the impinger wall and are difficult to remove. Since the gain in weight is to be used for moisture calculations, do not use any water or other liquids to transfer the silica gel. If a balance is available in the field, follow the procedure for Container No. 3 in Section 4.3.

Impinger Water. Treat the impingers as follows: Make a notation of any color or film in the liquid catch. Measure the liquid that is in the first three impingers to within I ml by using a graduated cylinder or by weighing it to within 0.5 g by using a balance (if one is available). Record the volume or weight of liquid present. This information is required to calculate the moisture content of the effluent gas.

Discard the liquid after measuring and recording the volume or weight, unless analysis of the impinger catch is required (see **NOTE**, Section 2.I.7).

If a different type of condenser is used, measure the amount of moisture condensed either volumetrically or gravimetrically.

Whenever possible, containers should be shipped in such a way that they remain upright at all times.

4.3 Analysis. Record the data required on a sheet such as the one shown in Figure 5-3. Handle each sample container as follows:

Container No. 1. Leave the contents in the shipping container or transfer the filter and any loose PM from the sample container to a tared glass weighing dish. Desiccate for 24 hours in a desiccator containing anhydrous calcium sulfate. Weigh to a constant weight, and report the results to the nearest
0.1 mg. For purposes of this Section, 4.3, the term "constant weight" means a difference of no more than 0.5 mg or 1 percent of total weight less tare weight, whichever is greater, between two consecutive weighings, with no less than 6 hours of desiccation time between weighings.

Alternatively, the sample may be oven dried at 105°C (220°F) for 2 to 3 hours, cooled in the desiccator, and weighed to a constant weight, unless otherwise specified by the Administrator. The tester may also opt to oven dry the sample at 105°C (220°F) for 2 to 3 hours, weigh the sample, and use this weight as a final weight.

Container No. 2. Note the level of liquid in the container, and confirm on the analysis sheet whether leakage occurred during transport. If a noticeable amount of leakage has occurred, either void the sample or use methods, subject to the approval of the Administrator, to correct the final results. Measure the liquid in this container either volumetrically to ±1 ml or gravimetrically to ±0.5 g. Transfer the contents to a tared 250-ml beaker, and evaporate to dryness at ambient temperature and pressure. Desiccate for 24 hours, and weigh to a constant weight. Report the results to the nearest 0.1 mg.

Container No. 3. Weigh the spent silica gel (or silica gel plus impinger) to the nearest 0.5 g using a balance. This step may be conducted in the field.

"Acetone Blank" Container. Measure the acetone in this container either volumetrically or gravimetrically. Transfer the acetone to a tared 250-ml beaker, and evaporate to dryness at ambient temperature and pressure. Desiccate for 24 hours, and weigh to a constant weight. Report the results to the nearest 0.1 mg.

NOTE: At the option of the tester, the contents of Container No. 2 as well as the acetone blank container may be evaporated at temperatures higher than ambient. If evaporation is done at an elevated temperature, the temperature must be below the boiling point of the solvent; also, to prevent "bumping," the evaporation process must be closely supervised, and the contents of the beaker must be swirled occasionally to maintain an even temperature. Use extreme care, as acetone is highly flammable and has a low flash point.

4.4 Quality Control Procedures. The following quality control procedures are

suggested to check the volume metering system calibration values at the field test site prior to sample collection. These procedures are optional for the tester.

4.4.1 Meter Orifice Check. Using the calibration data obtained during the calibration procedure described in Section 5.3, determine the $\Delta H_@$ for the metering system orifice. The $\Delta H_@$ is the orifice pressure differential in units of in. H_20 that correlates to 0.75 cfm of air at 528°R and 29.92 in. Hg. The
$\Delta H_@$ is calculated as follows:

$$\Delta H_@ = 0.0319\, \Delta H \frac{T_m\, \theta^2}{P_{bar}\, Y^2\, V_m^{\,2}}$$

where:

ΔH = Average pressure differential across the orifice meter, in. H_20.

T_m = Absolute average DGM temperature, °R.

P_{bar} = Barometric pressure, in. Hg.

θ = Total sampling time, min.

Y = DGM calibration factor, dimensionless.

V_m = Volume of gas sample as measured by DGM, dcf.

0.0319 = (0.0567 in. Hg/°R)(0.75 cfm)^2

Before beginning the field test (a set of three runs usually constitutes a field test), operate the metering system (i.e., pump, volume meter, and orifice) at the $\Delta H_@$ pressure differential for 10 minutes. Record the volume collected, the DGM temperature, and the barometric pressure. Calculate a DGM calibration check value, Y_c, as follows:

$$Y_c = \frac{10\left[0.0319\, T_m\right]^{1/2}}{V_m\left[P_{bar}\right]}$$

where:

Y_c = DGM calibration check value, dimensionless.

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9690684721

8019

RECIPIENT'S COPY

1 Date 09-24-96

From (Your Name) Please Print: Linda Sue Murray, Traffic
Your Phone Number (Very Important): (513)548-4444
Company:
Department/Floor No.:
Street Address: 7400 MILLER ROAD
City: FERNALD State: OH ZIP Required: 45030

2 To (Recipient's Name) Please Print: Jim Johnston
Recipient's Phone Number (Very Important): (801)266 7700
Company: DataChem
Department/Floor No.:
Exact Street Address (We Cannot Deliver to P.O. Boxes or P.O. Zip Codes.): 960 W. Levoy Drive
City: Salt Lake City, Utah State: ZIP Required: 84123

YOUR INTERNAL BILLING REFERENCE INFORMATION (optional) (First 24 characters will appear on invoice.): HNSO # 1890 Charge 7ECG2

H IF HOLD AT FEDEX LOCATION, Print FEDEX Address Here (Not available at all locations)
Street Address:
City: State: ZIP Required:

3 PAYMENT 1 [X] Bill Sender 2 [ ] Bill Recipient's FedEx Acct. No. 3 [ ] Bill 3rd Party FedEx Acct. No. 4 [ ] Bill Credit Card 5 [ ] Cash/Check

4 SERVICES (Check only one box)

Priority Overnight (Delivery by next business morning†) 11 [ ]
Standard Overnight (Delivery by next business afternoon No Saturday Delivery†) 51 [ ]
Economy Two-Day (Delivery by second business day†) 30 [ ]
Government Overnight (Restricted for authorized users only) 41 [X]

Freight Service (for packages over 150 lbs.)
70 [ ] OVERNIGHT FREIGHT** (Confirmed reservation required)
80 [ ] TWO-DAY FREIGHT**
† Delivery commitment may be later in some areas. **Call for delivery schedule.

INSTRUCTIONS (Mark appropriate boxes)
- Dangerous Goods as per attached Shipper's Declaration [X]
- Dangerous Goods Shipper's Declaration not required [ ]
- Cargo Aircraft only [ ]

5 DELIVERY AND SPECIAL HANDLING (Check services required)

Weekday Service
1 [ ] HOLD AT FEDEX LOCATION WEEKDAY (Fill in Section H)
2 [X] DELIVER WEEKDAY

Saturday Service
31 [ ] HOLD AT FEDEX LOCATION SATURDAY (Fill in Section H)
3 [ ] DELIVER SATURDAY (Extra charge) (Not available to all locations)
9 [ ] SATURDAY PICK-UP (Extra charge)

Special Handling
4 [X] DANGEROUS GOODS (Extra charge)
6 [ ] DRY ICE Dangerous Goods Shipper's Declaration not required
Dry ice 9 UN 1845 III ____ X ____ kg. 904
[ ]
12 [ ] HOLIDAY DELIVERY (If offered) (Extra charge)

6

PACKAGES	WEIGHT In Pounds Only	YOUR DECLARED VALUE (See right)
1	21	
Total	Total	Total
1	21	

DIM SHIPMENT (Chargeable Weight) [ ] ____ lbs.
L ____ x W ____ x H ____

Received At:
1 [ ] Regular Stop 3 [ ] Drop Box
4 [ ] B.S.C.
2 [ ] On-Call Stop 5 [ ] Station

Emp. No. Date
[ ] Cash Received
[ ] Return Shipment
[ ] Third Party [ ] Chg. To Del. [ ] Chg. To Hold
Street Address
City State Zip
Received By: X
Date/Time Received FedEx Employee Number

SIGNATURE RELEASE UNAVAILABLE

Federal Express Use
Base Charges
Declared Value Charge
Other 1
Other 2
Total Charges

REVISION DATE 11/94
Part # 146187/146188
FORMAT #219 GBFE
219

9690684721 Page 1 of 1 Pages

Two completed and signed copies of this Declaration must be handed to the operator.

WARNING

Failure to comply in all respects with the applicable Dangerous Goods Regulations may be in breach of the applicable law, subject to legal penalties. This Declaration must not, in any circumstances, be completed and/or signed by a consolidator, a forwarder or an IATA cargo agent.

TRANSPORT DETAILS

This shipment is within the limitations prescribed for: (delete non applicable)
PASSENGER AND CARGO AIRCRAFT / ~~CARGO AIRCRAFT ONLY~~

Airport of Departure:

Airport of Destination:

Shipment type: (delete non-applicable)
NON-RADIOACTIVE / ~~RADIOACTIVE~~

NATURE AND QUANTITY OF DANGEROUS GOODS

Dangerous Goods Identification							
Proper Shipping Name	Class or Division	UN or ID No.	Packing Group	Subsidiary Risk	Quantity and type of packing	Packing Inst.	Authorization
Flammable Liquids, n.o.s (Acetone)	3	UN1993	II		(1) Steel Drum x .56 L	Y 305	LTD. QTY.

Additional Handling Information
Call Collect Night or Day - 24 Hour Line 1-513-648-4444
Emergency Response Guide # 127 Applies/Attached

I hereby declare that the contents of this consignment are fully and accurately described above by the proper shipping name and are classified, packaged, marked, and labeled, and are in all respects in the proper condition for transport by air according to the applicable International and National Governmental Regulations.

Name/Title of Signatory: Linda Sue Murray, Traffic
Place and Date: Fernald, Ohio 45030 09-24-96
Signature (see warning above):

000706

Emergency Telephone Number (Required for US Origin or Destination Shipments): 1-513-648-4444 Call Collect Night or Day - 24 Hr. Line

IF ACCEPTABLE FOR PASSENGER AIRCRAFT, THIS SHIPMENT CONTAINS RADIOACTIVE MATERIAL INTENDED FOR USE IN, OR INCIDENT TO, RESEARCH, MEDICAL DIAGNOSIS, OR TREATMENT.

DATA CHEM
LABORATORIES
A SORENSON COMPANY

Case Narrative

Analysis:	Total Uranium	**Client:**	Hayden Env.
Preparation SOP #:	WR-DC-200	**Account:**	03025
Analysis SOP#:	WR-DC-342	**Matrix:**	Filter
Lot/Release/SDG #:	N/A		
DCL Set ID:	96E-0640-05		

General Set Information: This lot consisted of four field and two QC samples.
Method Summary: Samples were analyzed using a laser phosphorimeter to determine total uranium in the samples according to WR-DC-342.
Sample Preparation: Sample preparation was performed according to WR-DC-200.
Holding Times: Holding times were not applicable to this project.
Dilutions: Dilutions were performed to place sample concentrations within the range of the calibration curve. The dilutions that were made are recorded on the form A's for each particular sample.
Method and Sample QC Data:
Laboratory Control Sample: The laboratory control sample (LCS) was within the method acceptance criteria for recovery.
Blank: The blank consisted of acidified DI water and was within QC limits.
Instrument QC: Instrument initial and continuing calibrations were performed in accordance with published procedures.
Nonconformance/Corrective Action Reports (NCR/CAR): No NCR/CARs were required.
Miscellaneous Comments: N/A

Walter R. Spanton 10/24/96
Walter R. Spanton **Date**

DATA CHEM LABORATORIES
A Sorenson Company

COVER FORM (TYPE I)
SINGLE METHOD ANALYSES

SUMMARY INFORMATION

G968S02B

Date Reported.....: OCT 25 1996

Date Printed.....: 24-OCT-96 10:42
DCL Report Group..: 96E-0640-05

Client Ref Number.: Not Provided
Release Number....: Not Provided

Analysis Method(s): WR-DC-342

Hayden Environmental
Attention: Bruce Sarven
561 Congress Park Drive
Dayton, OH 45459

Client Sample Name	Laboratory Sample Name	Laboratory Sample ID	Laboratory Group Name	Laboratory Group ID
BL-123241-1	BL-123241-1	S969K018	96E-0640-05	G968S02B
QC-123241-1	QC-123241-1	S969K019	96E-0640-05	G968S02B
9131,39,40	96E04514	S968S06Q	96E-0640-05	G968S02B
9135,41,42	96E04515	S968S06R	96E-0640-05	G968S02B
9136,43,44	96E04516	S968S06S	96E-0640-05	G968S02B
9137,45,46	96E04517	S968S06T	96E-0640-05	G968S02B

Analyst: Walter R. Spanton

Reviewers:

Laboratory Supervisor:

960 West LeVoy Drive / Salt Lake City, Utah 84123-2547 / (801) 266-7700
FAX (801) 268-9992

DATA CHEM LABORATORIES
A Sorenson Company

FORM H (TYPE I)
SINGLE METHOD ANALYSES

SAMPLE GROUP COMMENTS

G968S02B

Date Printed.....: 24-OCT-96 10:42
DCL Report Group..: 96E-0640-05

Client Name...: Hayden Environmental

Release Number....: Not Provided

General Information

The DCL QC Database maintains all numerical figures which are input from the pertinent data source. These data have not been rounded to significant figures nor have they been moisture corrected. Reports generated from the system, however, list data which have been rounded to the number of significant figures requested by the client or deemed appropriate for the method. This may create minor discrepancies between data which appear on the QC Summary Forms (Forms B-G) and those that would be calculated from rounded analytical results. Additionally, if a moisture correction is performed, differences will be observed between the QC data and the surrogate data reported on Form A (or other report forms) and corresponding data reported on QC Summary Forms. In these cases, the Form A will indicate the "Report Basis" as well as the moisture value used for making the correction.
Report generation options: E2X

Result Symbol Definitions

ND - Not Detected above the MDL or IDL (LLD or MDC for radiochemistry).
** - No result could be reported, see sample comments for details.

Qualifier Symbol Definitions

U - Not Detected above the MDL or IDL (LLD or MDC for radiochemistry).
For radiochemistry the nuclide was not identified by the Canberra Nuclear NID program, activity values reported are calculated using the Canberra Nuclear MINACT program.
B - For organic analysis the qualifier indicates that this analyte was found in the method blank.
For inorganic analysis the qualifier signifies the value is between the IDL and PQL.
J - The qualifier indicates that the value is between the MDL and the PQL. It is also used for indicating an estimated value for tentatively identified compounds in mass spectrometry where a 1:1 response is assumed.

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DATA CHEM LABORATORIES
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FORM A (TYPE I)
SINGLE METHOD ANALYSES

SAMPLE ANALYSIS DATA SHEET

S969K018

Date Printed.....: 24-OCT-96 14:17
Client Sample Name: BL-123241-1
DCL Sample Name...: BL-123241-1

Client Name.....: Hayden Environmental
Client Ref Number....: Not Provided
Sampling Site.....: Not Applicable
Release Number.....: Not Provided

Matrix.....: AIR
Date Sampled.....: Not Applicable
Reporting Units...: ug/sample

Date Received.....: Not Applicable
DCL Report Group.....: 96E-0640-05

DCL Preparation Group: G969K00V
Date Prepared.....: 21-OCT-96 12:00
Preparation Method...: WR-DC-342
Aliquot Weight/Volume: 1
Net Weight/Volume....: Not Required

DCL Analysis Group: G969K00V
Analysis Method...: WR-DC-342
Instrument Type...: LP
Instrument ID.....: KPA-11
Column Type.....: Not Applicable

Analytical Results

Analyte	Date Analyzed	Detection Limit	Result±Error	Qual.	Dilution	CRDL
Total Uranium	22-OCT-96 12:00	7.0E-1	4.7E-3±4.7E-4		100	8.0E-1

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DATA CHEM LABORATORIES
A Sorenson Company

FORM A (TYPE I)
SINGLE METHOD ANALYSES

SAMPLE ANALYSIS DATA SHEET

S969K019

Date Printed.....: 24-OCT-96 14:17
Client Sample Name: QC-123241-1
DCL Sample Name...: QC-123241-1

Client Name.....: Hayden Environmental
Client Ref Number....: Not Provided
Sampling Site.....: Not Applicable
Release Number.....: Not Provided

Matrix.....: AIR
Date Sampled.....: Not Applicable
Reporting Units...: ug/Sample

Date Received.....: Not Applicable
DCL Report Group.....: 96E-0640-05

DCL Preparation Group: G969K00V
Date Prepared.....: 21-OCT-96 12:00
Preparation Method...: WR-DC-342
Aliquot Weight/Volume: 1
Net Weight/Volume....: Not Required

DCL Analysis Group: G969K00V
Analysis Method...: WR-DC-342
Instrument Type...: LP
Instrument ID.....: KPA-11
Column Type.....: Not Applicable

Analytical Results

Analyte	Date Analyzed	Detection Limit	Result±Error	Qual.	Dilution	CRDL
Total Uranium	22-OCT-96 12:00	7.0E-1	1.7E1±1.7E0		100	8.0E-1

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DATA CHEM LABORATORIES
A Sorenson Company

FORM A (TYPE I)
SINGLE METHOD ANALYSES

SAMPLE ANALYSIS DATA SHEET

S968S06Q

Date Printed.....: 24-OCT-96 14:17
Client Sample Name: 9131,39,40|NORTH
DCL Sample Name...: 96E04514

Client Name.....: Hayden Environmental
Client Ref Number....: Not Provided
Sampling Site.....: Not Provided
Release Number.....: Not Provided

Matrix.....: AIR
Date Sampled.....: 19-SEP-96 08:30
Reporting Units...: ug/Sample
Report Basis.....: ☒ As Received ☐ Dried

Date Received.....: 25-SEP-96 00:00
DCL Report Group.....: 96E-0640-05

DCL Preparation Group: G969K00V
Date Prepared.....: 21-OCT-96 12:00
Preparation Method...: WR-DC-342
Aliquot Weight/Volume: 5.2E2
Net Weight/Volume....: Not Required

DCL Analysis Group: G969K00V
Analysis Method...: WR-DC-342
Instrument Type...: LP
Instrument ID.....: KPA-11
Column Type.....: Not Applicable

Analytical Results

Analyte	Date Analyzed	Detection Limit	Result±Error	Qual.	Dilution	CRDL
Total Uranium	22-OCT-96 12:00	7.0E-1	2.1E0±2.1E-1		100	8.0E-1

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DATA CHEM LABORATORIES
A Sorenson Company

FORM A (TYPE I)
SINGLE METHOD ANALYSES

SAMPLE ANALYSIS DATA SHEET

S968S06R

Date Printed.....: 24-OCT-96 14:17
Client Sample Name: 9135,41,42|SOUTH
DCL Sample Name...: 96E04515

Client Name.....: Hayden Environmental
Client Ref Number....: Not Provided
Sampling Site.....: Not Provided
Release Number.....: Not Provided

Matrix.....: AIR
Date Sampled.....: 19-SEP-96 08:30
Reporting Units...: ug/Sample
Report Basis.....: ☒ As Received ☐ Dried

Date Received.....: 25-SEP-96 00:00
DCL Report Group.....: 96E-0640-05

DCL Preparation Group: G969K00V
Date Prepared.....: 21-OCT-96 12:00
Preparation Method...: WR-DC-342
Aliquot Weight/Volume: 4.8E-2
Net Weight/Volume....: Not Required

DCL Analysis Group: G969K00V
Analysis Method...: WR-DC-342
Instrument Type...: LP
Instrument ID.....: KPA-11
Column Type.....: Not Applicable

Analytical Results

Analyte	Date Analyzed	Detection Limit	Result±Error	Qual.	Dilution	CRDL
Total Uranium	22-OCT-96 12:00	7.0E-1	3.4E0±3.4E-1		100	8.0E-1

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DATA CHEM LABORATORIES
A Sorenson Company

FORM A (TYPE I)
SINGLE METHOD ANALYSES

SAMPLE ANALYSIS DATA SHEET

S968S06S

Date Printed.....: 24-OCT-96 14:17
Client Sample Name: 9136,43,44|BLANK
DCL Sample Name...: 96E04516

Client Name.....: Hayden Environmental
Client Ref Number....: Not Provided
Sampling Site.....: Not Provided
Release Number.....: Not Provided

Matrix.....: AIR
Date Sampled.....: 19-SEP-96 08:30
Reporting Units...: ug/Sample
Report Basis.....: ☒ As Received ☐ Dried

Date Received.....: 25-SEP-96 00:00
DCL Report Group.....: 96E-0640-05

DCL Preparation Group: G969K00V
Date Prepared.....: 21-OCT-96 12:00
Preparation Method...: WR-DC-342
Aliquot Weight/Volume: 5.0E-2
Net Weight/Volume....: Not Required

DCL Analysis Group: G969K00V
Analysis Method...: WR-DC-342
Instrument Type...: LP
Instrument ID.....: KPA-11
Column Type.....: Not Applicable

Analytical Results

Analyte	Date Analyzed	Detection Limit	Result±Error	Qual.	Dilution	CRDL
Total Uranium	22-OCT-96 12:00	7.0E-1	5.4E2±5.4E1		100	8.0E-1

960 West LeVoy Drive / Salt Lake City, Utah 84123-2547 / (801) 266-7700
FAX (801) 268-9992

DATA CHEM LABORATORIES
A Sorenson Company

FORM A (TYPE I)
SINGLE METHOD ANALYSES

SAMPLE ANALYSIS DATA SHEET

S968S06T

Date Printed.....: 24-OCT-96 14:17
Client Sample Name: 9137,45,46|RESP
DCL Sample Name...: 96E04517

Client Name.....: Hayden Environmental
Client Ref Number....: Not Provided
Sampling Site.....: Not Provided
Release Number.....: Not Provided

Matrix.....: AIR
Date Sampled.....: 19-SEP-96 08:30
Reporting Units...: ug/Sample
Report Basis.....: ☒ As Received ☐ Dried

Date Received.....: 25-SEP-96 00:00
DCL Report Group.....: 96E-0640-05

DCL Preparation Group: G969K00V
Date Prepared.....: 21-OCT-96 12:00
Preparation Method...: WR-DC-342
Aliquot Weight/Volume: 5.0E-2
Net Weight/Volume....: Not Required

DCL Analysis Group: G969K00V
Analysis Method...: WR-DC-342
Instrument Type...: LP
Instrument ID.....: KPA-11
Column Type.....: Not Applicable

Analytical Results

Analyte	Date Analyzed	Detection Limit	Result±Error	Qual.	Dilution	CRDL
Total Uranium	22-OCT-96 12:00	7.0E-1	2.8E-1±2.8E-2		100	8.0E-1

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FAX (801) 268-9992

S969K019

DATA CHEM LABORATORIES
A Sorenson Company

FORM B (TYPE I)
SINGLE METHOD ANALYSES

QUALITY CONTROL DATA SHEET
LABORATORY CONTROL SAMPLE (LCS)

Client Name.....: Hayden Environmental
Release Number.....: Not Provided

Matrix.....: FILTER
Reporting Units.....: µg/filter

DCL Preparation Group: G969K00V
Date Prepared.....: 21-OCT-96 12:00
Preparation Method...: WR-DC-342

Date Printed.....: 24-OCT-96 10:42
DCL Sample Name...: QC-123241-1

DCL Analysis Group: G969K00V
Analysis Method...: WR-DC-342
Instrument Type...: LP
Instrument ID.....: KPA-11
Column Type.....: Not Applicable

QC Limit Type.....: Method

Analytical Results

Analyte	Date Analyzed	Target	Result	Percent Recovery	QC Limits	QC Flag
Total uranium	22-OCT-96 12:00	1.8E1	1.7E1	97.6	75.0/125.	

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FAX (801) 268-9992

DATA CHEM LABORATORIES
A Sorenson Company

FORM C (TYPE I)
SINGLE METHOD ANALYSES

S969K018

QUALITY CONTROL DATA SHEET
BLANK SAMPLE

Client Name.....: Hayden Environmental
Release Number.....: Not Provided

Matrix.....: FILTER
Reporting Units.....: µg/sample

DCL Preparation Group: G969K00V
Date Prepared.....: 21-OCT-96 12:00
Preparation Method...: WR-DC-342

Date Printed.....: 24-OCT-96 10:42
DCL Sample Name...: BL-123241-1

DCL Analysis Group: G969K00V
Analysis Method...: WR-DC-342
Instrument Type...: LP
Instrument ID.....: KPA-11
Column Type.....: Not Applicable

QC Limit Type.....: Method

Analytical Results

Analyte	Date Analyzed	Result	CRDL
Total uranium	22-OCT-96 12:00	0.0047	0.8

960 West LeVoy Drive / Salt Lake City, Utah 84123-2547 / (801) 266-7700
FAX (801) 268-9992

DATA CHEM LABORATORIES
A SORENSON COMPANY

Datapackage Table of Contents

Information pertaining to this datapackage is divided into the four categories listed below (see colored divider sheets for an inventory list of each category). If an item on the inventory is not applicable, an "NA" is placed in the corresponding check box. A Case Narrative immediately precedes this Table of Contents and contains pertinent information about this datapackage.

Analytical Forms ..... Yellow
Sample Tracking Documentation ..... Pink
Analytical Documentation ..... Blue
Raw Data ..... Green

♦ ♦ ♦ ♦ ♦ ♦ ♦ ♦ ♦ ♦

Analytical Forms
Inventory Checklist

[X] Case Narrative

[N/A] IRDMIS	[N/A] Commercial Forms
[ ] Data Review and Approval Form	[ ] Analytical or Environmental Report Form
[ ] IRDMIS Reports	[ ] Set Comments
[ ] GC/MS TICs	[ ] Applicable QC Sheets

[X] RLIMS Forms	
[X] Cover Form	[N/A] Matrix Spike/Matrix Spike Duplicate Sample (Form F)
[X] Sample Group Comments (Form H)	[N/A] Surrogate Summary (Form G)
[X] Sample Analysis Data Sheet (Form A)	[N/A] Initial Calibration Form
[X] Laboratory Control Sample (Form B)	[N/A] Initial Calibration Verification (ICV) Form
[X] Blank Sample (Form C)	[N/A] Continuing Calibration Form
[N/A] Matrix Spike Sample (Form D)	[N/A] Serial Dilution Form
[N/A] Matrix Duplicate Sample (Form E)	[N/A] Endrin Breakdown or BFB/DFTPP GC/MS Tuning Form

Analytical Forms
Reviewer Checklist

X The Analytical Forms Inventory Checklist above is complete.

X The Case Narrative was completed in accordance with procedures in DCL SOP XX-DC-020, "Datapackage Preparation and Validation."

X Only the correct report forms are used (IRDMIS or Commercial Forms or RLIMS Forms).

X All fields on the report forms are complete with the correct information, including signatures.

X Results for all samples are reported per client request.

X Units, methods, and dates are correct.

X Sample and/or set comments are complete.

Assembled by: [signature] 10/24/96 (Signature, Date) Reviewed by: [signature] 10/24/96 (Signature, Date)

Rev. 6/95

DATA CHEM LABORATORIES
A SORENSON COMPANY

Sample Tracking Documentation
Inventory Checklist

- [x] LIMS Grouping Reports
- [x] DataChem Laboratories (DCL) Chain-of-Custody Record
- [x] DCL Sample Work Order
- [N/A] Copy of numbered Nonconformance/Corrective Action Report (NC/CAR)
- [N/A] Copy of Client-Related Problem Report (CPR)

Sample Tracking Documentation
Reviewer Checklist

X The Sample Tracking Documentation Inventory Checklist above is complete.

X DCL Chain-of-Custody Record provides signatures for the sample portion reported in this data package.

X DCL Chain-of-Custody Record was completed in accordance with procedures in DCL SOP XX-DC-006 "Chain-of-Custody and Laboratory Tracking."

X Methods specified on the Sample Work Order were performed or an explanation for deviations is provided.

X Special instructions on the Sample Work Order were followed.

X Project Management instructions on the Project Protocol Worksheet were followed.

X Client's requests were met or an explanation is provided in the Case Narrative.

NA NC/CAR and/or CPR were completed in accordance with procedures in DCL SOP QC-DC-006 "Nonconformance/Corrective Action Report (NC/CAR) Procedures."

Assembled by: Walter Rowlands 10/24/96 (Signature / Date) Reviewed by: [signature] 10/24/96 (Signature / Date)

Rev. 6/95

DataChem Laboratories
LIMS - Sample Master System
Preparation Group Report

Date: 18-OCT-1996 12:16
User: RICHARDSON

RLIMS15-V1.2

Preparation Run Name: G969K00V

Group ID: G969K00V

Samples: 6

Pos	Laboratory Sample Name	Field Sample Name 1	Field Sample Name 2	Laboratory Sample ID	Laboratory Group Name	Accnt. Number
1	BL-123241-1	BL-123241-1		S969K018	96E-0640-05	03025
2	QC-123241-1	QC-123241-1		S969K019	96E-0640-05	03025
3	96E04514	9131,39,40	NORTH	S968S06Q	96E-0640-05	03025
4	96E04515	9135,41,42	SOUTH	S968S06R	96E-0640-05	03025
5	96E04516	9136,43,44	BLANK	S968S06S	96E-0640-05	03025
6	96E04517	9137,45,46	RESP	S968S06T	96E-0640-05	03025

----- END OF LISTING -----

WPS
OCT 24 1996

Earliest Sampling Date: 19-Sep-1996

DataChem Laboratories
CHAIN-OF-CUSTODY

Results due by: 25-Oct-1996

Project/Job/Task: COMM-ENV | Split: | Root Set ID: 96E-0640 * | Reporting Group

Client: Hayden Environmental | Account: 03025

Comments:

Verified: KM 9-25-96

Date Sampled	Field ID Number	DCL Sample Name	DCL Sample ID	QC	Matrix	Customer ID 2					01 Method 5 Particulate	02 Isotopic Uranium	03 ISOTOPIC THORIUM	04 Radium 226/228 by gamma spec	05 Total Uranium by kPA					# Bottles
19-Sep-1996	9131,39,40	96E04514			AIR	NORTH					X	X	X	X	X					3
19-Sep-1996	9135,41,42	96E04515			AIR	SOUTH					X	X	X	X	X					3
19-Sep-1996	9136,43,44	96E04516			AIR	BLANK					X	X	X	X	X					3
19-Sep-1996	9137,45,46	96E04517			AIR	RESP					X	X	X	X	X					3

ORIGINAL FIELD SAMPLE CHAIN-OF-CUSTODY

Relinquished By: (Signature)	Date/Time	Received By: (Signature)	Reason for Transfer/ Storage Location
Walk-in/ Room/ Shelf/ Fridge R-23-1 TV	9/25/96 1450	Kamyn Vigil	Labeling/Shelving
Kamyn Vigil	9/25/96 1455	Walk-in/ Room/ Shelf/ Fridge R-23-1 TV	Storage: CW-2
R-23-1 QC	9/30/96 1900	[illegible]	sample prep
[illegible]	10/06/96 12:15	Rm 311 QC	storage
Rm 311 T.P.	10/8/96 16:00	Ty E. Peterson	sample digestion
Ty E. Peterson	10/9/96 8:00	Robin Jolly	Y spec
Robin Jolly	10/11/96 1115	Rm 311 BR	storage
Rm 311 BR	10-18-96 10:00	Bradley Richardson	Sample Prep
Bradley Richardson	10-18-96 12:00	Rm 311 BR	Storage

SAMPLE PREPARATION / ANALYSIS CHAIN-OF-CUSTODY

Sample Prep/Analysis for: Total Uranium | Lab Notebook No.: 4035

Prepared/Analyzed by: B. Richardson | Date/Time:

Relinquished By: (Signature)	Date/Time	Received By: (Signature)	Reason for Transfer/ Storage Location
Bradley Richardson	10-18-96 16:00	Emil O. Knopf	Column Sep.
Emil O. Knopf	10-22-96 1300	W. [illegible]	Total U

Check box if there is a continuation page ☐

Form: COFC1.01-SWV2.30

Printed 9/25/1996 14:49

Sample Work Order

8019

QC Clearance: _____

Project Manager: Robert P. Di Rienzo

Client: Hayden Environmental

Account: 03025

Project/Task: COMM-ENV

Date Received: 25-Sep-1996

Date for Mailing Report: 25-Oct-1996

DCL Root Set ID: 96E-0640

DCL Lab. Name: 96E04514-96E04517

Total # Samples: 4

Sample Entry: Karyn L. Boyack

Section: WA

Earliest Sampling Date: 19-Sep-1996

Preparation Type:

Rep. Group	Radiochemistry Analytes Requested	Latest Prep. Date	Latest Anal. Date	No. of Samp.	Storage Location	Analysis/Prep. Method	Inst.	Matrix
01	Method 5 Particulate		18-Mar-1997[c]	4		Method 5	GRAV	AIR
02	Isotopic Uranium	1-Oct-1996[c]	18-Mar-1997[c]	4		WR-DC-341 WR-DC-200	AS	AIR
03	ISOTOPIC THORIUM	1-Oct-1996[c]	18-Mar-1997[c]	4		WR-DC-341	AS	AIR
04	Radium 226/228 by gamma spec		18-Mar-1997[c]	4		WR-EP-325 WR-DC-200	GS	AIR
05	Total Uranium by kPA		18-Mar-1997[c]	4		WR-DC-342	kPA	AIR

[c]Based on date of collection

Special Instructions: _____

Section Manager: Charlie C. Walker

Other Sections Receiving Sample Portions: None

SAMPLE LOG-IN SHEET

8019

Group Name: 96E-0640

Lab Name: DataChem Laboratories	Page 1 of 1
Received By (Print Name): Sample Rec. Group	Log-In Date: 9-25-96
Received By (Signature): Zenaida Virgil	
Case Number: —	Sample Delivery Group No.: — / SAS Number: NA

Remarks:

		Client ID #1 (EPA Sample #)	Corresponding: Client ID #2 (Sample Tag #)	Corresponding: Assigned Lab #	Matrix	Fraction	Remarks: Condition of Sample Shipment, etc.
1. Custody Seal(s)	Present/Absent*	200259131	North	96E04514	Filter	R/A	each client
	Intact/Broken*	39	↓	↓	Bicarbonate	↓	ID 1 bottle
2. Custody Seal Nos.	N/A	40	↓	↓	Water	↓	needs to be
		200259135	South	96E04515	Filter	↓	combined
3. Chain-of-Custody Records	Present/Absent*	41	↓	↓	Bicarbonate	↓	to create
4. Traffic Reports or Packing Lists	Present/Absent*	42	↓	↓	Water	↓	a single
5. Airbill	Airbill/Sticker	200259136	Blank	96E04516	Filter	↓	client ID
	Present/Absent*	43	↓	↓	Bicarbonate	↓	2 (see PPL)
6. Airbill No.	9690684221	44	↓	↓	Water	↓	↓
		200259137	Resp	96E04517	Filter	↓	↓
7. Sample Tags	Present/Absent*	45	↓	↓	Bicarbonate	↓	↓
Sample Tag Numbers	Listed/Not Listed on Chain-of-Custody	46	↓	↓	Water	↓	↓
8. Sample Condition	Intact/Broken*/Leaking						
9. Does information on custody records, traffic reports, and sample tags agree?	Yes/No*						
10. Date Received at Lab	9/25/96						
11. Time Received	1000						

Zenaida Virgil 9/25/96

Sample Transfer	
Fraction: FII	Fraction:
Area #: R-23-1	Area #:
By: ZV	By:
On: 9/25/96	On:

* Contact SMO and attach record of resolution.

Reviewed By	Logbook No.
Date	Logbook Page No.

FRACTIONS:
C - Cyanide
D - Dissolved Metals
T - Total Metals
F - Full TCL Organics
P - Pesticides
S - Semivolatiles
V - Volatiles
R - Rad Chem
A - Particulates

FORM DC-1

Note: only highlighted portion of client ID #1s entered into DCL computer system

FERMCO

P.O. BOX 538704
CINCINNATI, OH 45253-8704

CHAIN OF CUSTODY / REQUEST FOR ANALYSIS RECORD

REFERENCE DOCUMENT NO.: SPL-96-2875

ORIGINAL MEF NO.: _____ CORRESPONDING REFERENCE DOCUMENT NO.: _____

RELEASE NO.: 1000012382	PROJECT NO.: N/A	FOR SAMPLE RELATED PROBLEMS ACS CONTACT / PHONE: [redacted] x4198	CONTRACT PURCHASE ORDER / TASK ORDER NO.: N/A
PROJECT NAME: NESHAP STACK SAMPLING		REQUIRED REPORT DATE / LAB TAT: PARTICULATE (10 DAY) RAD (30 DAY)	SAMPLE SHIPMENT DATE: 9-24-96
PROJECT CONTACT / PH: [redacted] /4198		RECEIVING LAB NAME: DATACHEM	SAMPLE SHIPPER (Print): G Bell
CHARGE NO.: 7ECG-2	N/A	RECEIVING LAB ADDRESS: SALT LAKE CITY	OFF-SITE LAB CONTACT: Robert DiRenzo

SAMPLING TEAM (Print) & GROUP NAME / PHONE: BRUCE SARVEN HAYDEN ENVIRONMENTAL 513-438-3010 Geoff Schoenberger HAYDEN

SAMPLING TEAM (Signature & Badge No.): Bruce Sarven 283-74-1262 Geoff D. Schoenberger 267-82-4754

ITEM NO.	SAMPLE NUMBER: FACTS ID	SAMPLE NUMBER: CUSTOMER ID / SAMPLE POINT	SAMPLE MATRIX		COMP	GRAB	FILTERED	COLLECTION: DATE	COLLECTION: TIME	CONTAINER: TYPE	CONTAINER: VOL.	NO. CONTRS	PRESERVATION	A S L	ANALYSES REQUESTED (If more space is required, use the SPECIAL INSTRUCTIONS block.)	SAMPLE OKAY? (Y/N)* FERMCO	SAMPLE OKAY? (Y/N)* OFF-SITE
1	200259131	NORTH FILTER	AF	AIR FILTER	✓		N/A	9-19-96	0830	F	1460 cfm	1	NONE	B	Particulate & Rad *	Y	
2	200259139	NORTH FRONT 1/2	L1	ACETONE	✓		N/A	9-19-96	0830	P	1L	1	NONE	B	Particulate & Rad *	Y	
3	200259140	NORTH BACK 1/2	L2	~~ACETONE~~ WATER	✓		N/A	9-19-96	0830	P	1L	1	NONE	B	Particulate & Rad *	Y	
4	200259135	South Filter	AF	AIR FILTER	✓		N/A	9-19-96	0830	F	1360 cfm	1	NONE	B	Particulate & Rad *	Y	
5	200259141	South Front 1/2	~~L2~~ L1	ACETONE	✓		N/A	9-19-96	0830	P	1L	1	NONE	B	Particulate & Rad *	Y	
6	200259142	South BACK 1/2	L2	~~ACETONE~~ WATER	✓		N/A	9-19-96	0830	P	1L	1	NONE	B	Particulate & Rad *	Y	
7	200259136	Filter BLANK	AF	AIR FILTER	✓		N/A	9-19-96	0830	F	N/A	1	NONE	B	Particulate & Rad *	Y	
8	200259143	D.I. BLANK	L2	WATER	✓		N/A	9-19-96	0830	P	1L	1	NONE	B	Particulate & Rad *	Y	
9	200259144	ACETONE BLANK	L1	ACETONE	✓		N/A	9-19-96	0830	P	1L	1	NONE	B	Particulate & Rad *	Y	
10	200259137	Resp. filter	AF	AIR FILTER	✓		N/A	9-19-96	0830	F	293 cfm	1	NONE	B	Particulate & Rad *	Y	

SPECIAL INSTRUCTIONS: * Samples to be shipped off-site to DATA-CHEM / UTAH, Contact Robert DiRenzo
Analysis to be performed are particulate, U-238, U-234, U-235, U-236, Th-228, Th-230, Th-232
Ra-226, Ra-228 and Total Uranium by Lazer Phosphorometry

RELINQUISHED: ITEM / REASON	RELINQUISHED BY (Signature) / AFFILIATION	BADGE NO.	DATE	TIME	RECEIVED: RECEIVED BY (Signature) / AFFILIATION	BADGE NO.	DATE	TIME
1-12 Rad Analysis	[redacted]	1 283-74-1262	9/20/96	1630	[redacted]	1 75148	9/20/96	1630
1-12 Ship		2 75148	9-23-96	0800		2 630	9-23-96	0800
1-17 Ship		3 630	9-24-96	1300		3 5852	9-25-96	1000
		4				4		
		5				5		

DISTRIBUTION OF [redacted]: WHITE ON-SITE - RELEASE FILE / OFF-SITE ANALYTICAL LAB - RETURN TO FEMP; YELLOW [redacted]-SITE - DISTRIBUTE AS NEEDED / OFF-SITE ANALYTICAL LAB - RETURN TO FEMP; BLUE SAMP[redacted]CH / PROJECT FILE

FS-F-3361 (09-2[redacted]

SHADED AREAS ARE TO BE COMPLETED [redacted] SAMPLE RECEIVING GROUP

* IF "N", THEN COMPLETE APPLICABLE NON-CONF[redacted]NCE PROCEDURE.

1-48013 01-43016

000073

FERMCO

CHAIN OF CUSTODY / REQUEST FOR ANALYSIS RECORD (CONTINUED)

PROJECT NO.: N/A

PROJECT NAME: NESHAP STACK SAMPLING

REFERENCE DOCUMENT NO.: SPL-96-2875 1000012382

CORRESPONDING REFERENCE DOCUMENT NO.:

ITEM NO.	SAMPLE NUMBER: FACTS ID	SAMPLE NUMBER: CUSTOMER ID / SAMPLE POINT	SAMPLE MATRIX		COMP	GRAB	FILTERED	COLLECTION: DATE	COLLECTION: TIME	CONTAINER: TYPE	CONTAINER: VOL.	NO. CONTRS	PRESERVATION	ASL	ANALYSES REQUESTED (If more space is required, use the SPECIAL INSTRUCTIONS block.)	SAMPLE OKAY? (Y/N)* FERMCO	SAMPLE OKAY? (Y/N)* OFF-SITE
11	200259145	Resp. Front 1/2	L1	ACETONE	✓		N/A	9-20-96	0845	P	1L	1	NONE	B	Particulate & Rad	Y	
12	200259146	Resp. Back 1/2	L2	~~ACETONE~~ D.I. WATER	✓		N/A	9-20-96	0845	P	1L	1	NONE	B	Particulate & Rad	Y	
		NOTHING FOLLOWS															

SPECIAL INSTRUCTIONS: AF - Air Filter
L1 - Acetone
L2 - D.I. WATER

DISTRIBUTION OF CO[illegible] | WHITE ON-SITE - RELEASE FILE / OFF-SITE ANALYTICAL LAB - RETURN TO FEMP | YELLOW [illegible]SITE - DISTRIBUTE AS NEEDED / OFF-SITE ANALYTICAL LAB - RETURN TO FEMP | BLUE SAMPLIN[illegible] / PROJECT FILE

FB-F-3361-1 (09-21-[illegible])

SHADED AREAS ARE TO BE COMPLET[illegible] THE SAMPLE RECEIVING GROUP.

* IF "N", THEN COMPLETE APPLICABLE NON-CONFO[illegible]CE PROCEDURE.

TALLY SHEET

8019

RELEASE #: 1000012382 (CAN 1 OF 1)
PO #: NA
DATE SHIPPED: 23-SEP-96
MATERIAL: NESHAP STACK SAMPLING - AIR FILTERS, ACETONE , AND WATER

ANALYSIS: PARTICULATE AND RAD

Composite Sample Number	Lot Number	Sample Container Size	AnaLis/ FACTS Number	Gross Weight lbs.	Tare Weight lbs.	Net Weight lbs.
NORTH FILTER	W050-730-P047-0417	AIR FILTER	200259131	0.101	0.097	0.004
NORTH FRONT 1/2	W050-730-P047-0417	1 L PLS	200259139	0.300	0.220	0.080
NORTH BACK 1/2	W050-730-P047-0417	1 L PLS	200259140	0.300	0.220	0.080
SOUTH FILTER	W050-730-P047-0417	AIR FILTER	200259135	0.101	0.097	0.004
SOUTH FRONT 1/2	W050-730-P047-0417	1 L PLS	200259141	0.300	0.220	0.080
SOUTH BACK 1/2	W050-730-P047-0417	1 L PLS	200259142	0.300	0.220	0.080
FILTER BLANK	W050-730-P047-0417	AIR FILTER	200259136	0.101	0.097	0.004
DI BLANK	W050-730-P047-0417	1 L PLS	200259143	1.251	0.220	1.031
ACETONE BLANK	W050-730-P047-0417	1 L PLS	200259144	0.300	0.220	0.080
RESP. FILTER	W050-730-P047-0417	AIR FILTER	200259137	0.101	0.097	0.004
RESP. FRONT 1/2	W050-730-P047-0417	1 L PLS	200259145	0.300	0.220	0.080
RESP. BACK 1/2	W050-730-P047-0417	1 L PLS	200259146	0.300	0.220	0.080
				3.755	2.148	1.607

32350

FEMP

COVER SHEET

8019

DOCUMENT TYPE ● RSR ○ RWP

SURVEY FOR RWP? ○ YES ● NO

NAME [redacted]

PAGE 1 OF 4

SIGNED [redacted]

LOCATION Lab WZ6

LOCATION CODE

BADGE #	DATE	TIME	BLDG/GRID#	FLR
74323	09/24/96	09:26	15A	1

SURVEY NUMBER 96-09-11-0165

RWP NUMBER -

COMMENTS Sampleshipment Res. Filters + Acetone Rel# 12352

NA

REVIEWER [redacted] BADGE 7395

SIGN [redacted]

FS-F-4617 (4/22/96)

000727

FEMP
RADIOLOGICAL SURVEY REPORT

SURVEY NUMBER: 96- 9 -11- 165

DATE: 9-24-96	RCT NAME: [redacted]	RCT BADGE #: 74323	PAGE:
REVIEWED BY: [redacted]		REVIEWER BADGE NO: 7395	2 OF 4

MODEL	SERIAL NUMBER	TYPE (α, β, γ)	CALIBRATION-DUE DATE	BKGD. (cpm)	EFF/CF	COUNT TIME (min)	MDA (dpm)	INSP/PERFORMANCE TEST DATE YES	NO
LB 5100		αβγ	10-96	.26/1.42	.212/.431	2.0	2/A 3	✓	
M3		βγ	2-97	60	30	NA	3000	✓	
2221	75947	α	9-96	1.2	.16	1	16.2	✓	
					A				
				N					

ITEM NUMBER	LOCATION AND/OR DESCRIPTION	HEIGHT (FT.)	DPM/100cm² ALPHA REMOVABLE (1)	DPM/100cm² ALPHA FIXED PLUS REMOVABLE	DPM/100cm² BETA-GAMMA REMOVABLE (1)	DPM/100cm² BETA-GAMMA FIXED PLUS REMOVABLE	CORRECTED DOSE RATE (MREM/HR) γ CONTACT	β CONTACT	γ AT FT.	β AT FT.
1	200259131	NA	-0 *	-7 *	3	<MDCR				
2	200259136		2	-7.5 *	-2 *					
3	200259135		0 *	-7 *	2 *					
4	200259137		-0 *	5 *	5					
5	200259139		5	NA	4					
6	200259141		2		10					
7	200259145		0 *		5			NA		
8	200259140		0 *		0 *					
9	200259144		-0 *		0 *					
10	200259143		-0 *		0 *					
11	200259142		0 *		1 *					
12	200259146		2		5					
13	I/S can	↓	-0 *	↓	0 *	↓				
14	O/S can	NA	0 *	NA	3	<MDCR				
				NA						

Note (1): Values identified by an asterisk (*) indicate results are less than the calculated MDA (RC-RDA-010)

FS-F-1993-1 (REV. 04/18/95)

TUE SEP 24, 1996
GROUP A SMEARS FOR FREE RELEASE (2 MIN)

8019

SAMPLE NUMBER	GROSS ALPHA	GROSS BETA	DPM ALPHA	DPM BETA	TIME OF COUNT
51	0	0	-0	0	08:03:16
[illegible]	2	[illegible]	2	[illegible]	08:05:31
53	1	5	0	7	08:07:46
54	0	3	-0	3	08:10:01
55	4	7	5	4	08:12:16
56	2	[illegible]	1	10	08:14:31
57	1	8	0	5	08:16:46
58	1	[illegible]	0	0	08:19:01
59	0	[illegible]	0	0	08:21:16
60	0	[illegible]	-0	0	08:23:31
61	1	4	0	1	08:25:46
62	2	8	2	5	08:28:01
63	0	5	-0	0	08:30:16
64	1	[illegible]	0	3	08:32:30

OPERATION COMPLETE

OPERATION COMPLETE

FEMP RADIOLOGICAL SURVEY REPORT pg 3 of 4		
SURVEY # 96-9-11-165	DATED 9/24/96	
	(name)	(signature)
RCT:	William Chustern	[illegible]
REVIEWER:	[illegible]	[illegible]

MATERIAL RESTRICTED RELEASE FORM

ITEM NUMBER	ITEM DESCRIPTION	RCT	MATERIAL RELEASE EVALUATOR PRINT/SIGNATURE [1&3]	MATERIAL OWNER/SURVEY REQUESTOR PRINT/SIGNATURE [2&3]
1-4	Filters	N/A	R Hudson	GORDON BELL
5-12	Acetone	N/A	R Hudson	GORDON BELL
			NA	

Additional Comments: Sgles to DCL-SLC Lic # UT 1800237 EXP 11-31-97

[1] Signature by Material Release Evaluator indicates the material may be released for restricted use in the uncontrolled area of the FEMP site only. This material is not being released for unrestricted use.

[2] Signature by the Material Owner/Survey Requestor indicates acceptance of responsibility for the material while in the uncontrolled area and the material will be returned to the controlled area following use.

[3] Additional approval by the Manager of Radiological Compliance is required prior to allowing the material to exit beyond the FEMP property boundary. This allowance may be annotated in the additional comments section of the form.

FS-F-3916 (06/24/94)

FEMP RADIOLOGICAL SURVEY REPORT pg 4 of 4
SURVEY # 96-9-11-164 DATED 9-29-96
(name) (signature)
RCT: William Chastean

PROJECT PROTOCOL WORKSHEET

8019

Project:	Fernald Emission Testing	Date: 09/20/96
Client:	Hayden Environmental	Revision: 1.0
Account:	3025	
Proj. Mngr:	Bob Di Rienzo	

Client Contacts:

Reports:

Bruce Sarven
Hayden Environmental
561 Congress Park Drive
Dayton, OH 45459

Phone: (513) 438-3010
FAX: (513) 438-3020

Invoices:

Same with COC

Schedule: Starts 09/20/96

TAT: 30 Calendar Days

Sample Receipt: Use the 96E sample stream. *Notify Project Manager when samples are received.*

Analyses: **Particulates and Radiochemistry**

QA/QC: Overall QA/QC requirements will be based on the DCL Procedures.

EDL: None.

MS/MSD or MD: As per method

Deliverables: RLIMS63 Report, Raw Data, and COC
Paginate entire package

Penalties: None

Questions: If you have any questions, please contact the project manager either directly or by voice-mail at extension 331, or via e-mail on node tigger.

Special Instructions: **See attached Flow Chart and Instructions**
Particulate mesurement is completed first.
Rinsate and Filter Particulate are used for radiochemistry procedures.

PRICE CODES AND ANALYTE GROUPS:

ANALYTE	MATRIX	EST SAMPLE	METHOD	SECT	HOLD CODE	PRICE CODE	ANALYTE GROUP
Particulate	Air	4	Method 5	WA	NA	3025A01NMET5	3025A1MET5
Iso U	Air	4	AS	WA	NA	3025A01NUISO	3025A1UISO
Iso Th	Air	4	AS	WA	NA	3025A01NTISO	3025A1TISO
Radium 226/228	Air	4	GS	WA	NA	3025A01NGS	3025A1GS
Total Uranium	Air	4	kPA	WA	NA	3025A01NTOTU	3025A1TOTU

DATACHEM LABORATORIES CLIENT-RELATED INFORMATION REPORT (CRIR) 80 19

CRIR NO. _____

COOLER INFORMATION CHECKLIST
(Fill In or Circle)

Client Name: FerrmcO

Project/Task/Site:

Date/Time of Receipt: 9/25/96 1000

Number of Coolers Received: 1

Condition of Coolers: Acceptable/Unacceptable

Temperature Control: Present/Not Included

Custody Seals: Present/Absent

Location Temperature Taken: Control/Between Samples

Intact/Broken

Are all temperatures within project specific guidelines? Yes/No

Tamper Evident: Yes/No

Ice Present: Yes/No

Frozen/Melted/N/A

Are all applicable pHs within specific guidelines? Yes/No/N/A

Cooler Received	DCL Cooler No.	Temp.	Cooler Received	DCL Cooler No.	Temp.	Cooler Received	DCL Cooler No.	Temp.
* 1	MC96 0437	19 °C	4	MC96	°C	7	MC96	°C
2	MC96	°C	5	MC96	°C	8	MC96	°C
3	MC96	°C	6	MC96	°C	9	MC96	°C

Taken By: Karyn Vigil (Signature) Karyn Vigil (Printed Name) 9/25/96 (Date)

* Rad Chem. Analyses: no temp preservation required

CLIENT-RELATED INFORMATION

- ☐ Missing Cooler
- ☐ Cooler Conditions
- ☐ Missing Paperwork
- ☐ Missing/Incorrect Bottle Labels
- ☐ Missing Samples/Bottles
- ☐ Broken/Leaking Samples
- ☐ Incorrect Bottle Type
- ☐ Cooler Temperatures Out Of Range
- ☐ Incorrect Preservation
- ☐ pH Criteria Not Met
- ☐ Head Space in Bottles
- ☐ Insufficient Sample Volume
- ☐ Chain Of Custody Problems
- ☐ Other:

BRIEFLY DESCRIBE THE PROBLEM AND THE ACTION TAKEN:

Faxed to Client? Yes ☐ No ☐ (If yes, attach Fax Cover Sheet)

❖ **Response Required Within 24 Hours** ❖

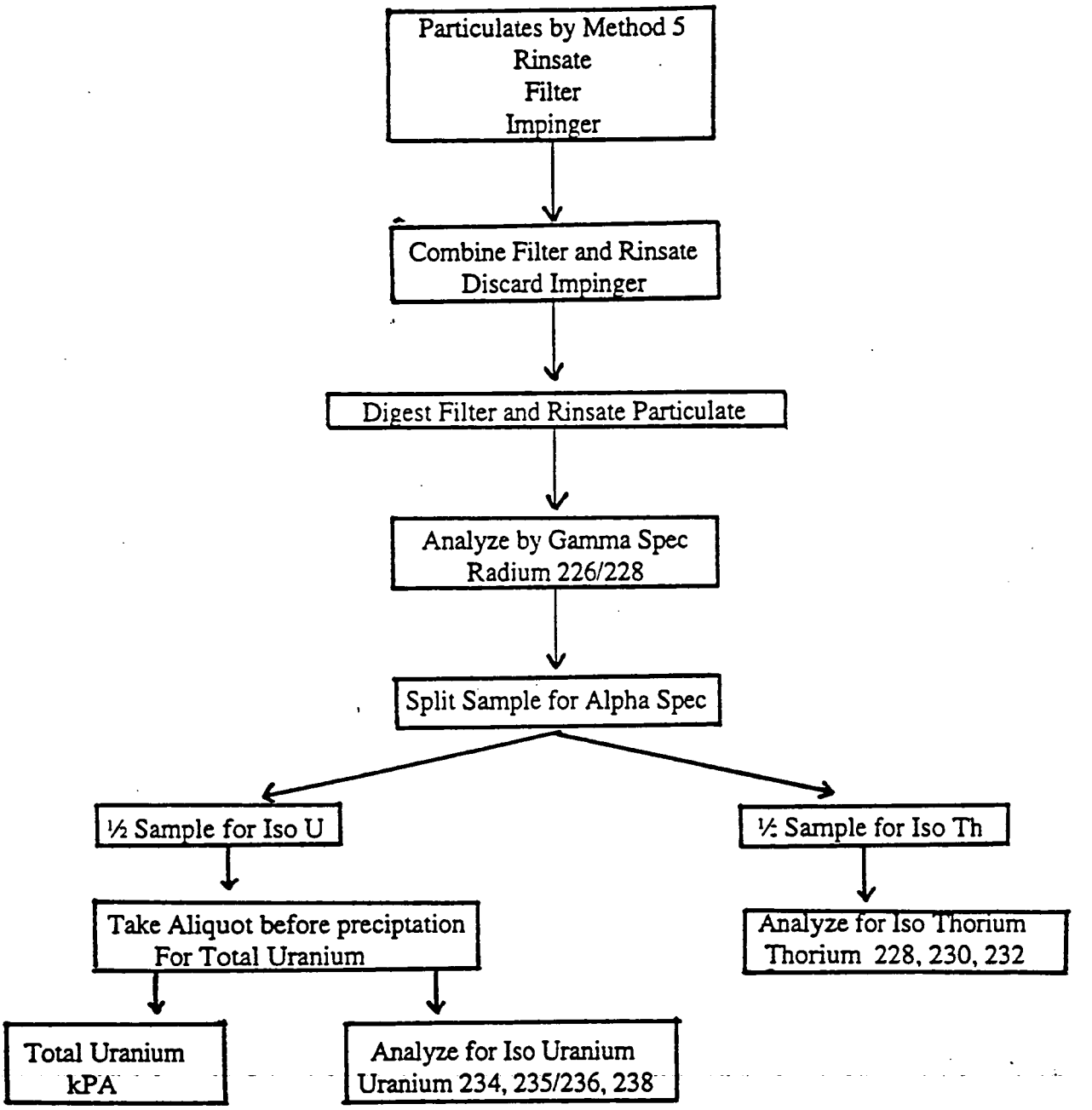
PROJECT MANAGEMENT

PROJECT MANAGER COMMENTS:

DCL Project Manager: _____ (Printed Name) Returned to Sample Receipt by: _____ (Signature) Date: _____

Analytical Scheme
Hayden Environmental - Fernault Emission Testing

3 Samples and Field Blank



DATACHEM LABORATORIES Filter Weight Book No. FWT 06 Page No. 019

Filter Lot #: ? Temp.: 74 R.H.: 55% 8019

Filter: GF 96-20 (740)
Tare Analyst [illegible] Date 9/16/96
Total Weight _____ mg
Total Weight _____ mg

Avg. Total Weight _____ mg
Tare Weight ~~453.2~~ 447.6 mg
Tare Weight ~~453.2~~ 447.6 mg 447.6
Avg. Tare Weight ~~453.2~~ mg
SAMPLE No. _____ SAMPLE WT. _____ mg
Total Wt. Anal. _____ Date _____
Check Analyst _____ Date _____

Filter: GF 96-21 (756)
Tare Analyst [illegible] Date _____
Total Weight _____ mg
Total Weight _____ mg

Avg. Total Weight _____ mg
Tare Weight 453.2 mg
Tare Weight 453.2 mg
Avg. Tare Weight 453.2 mg
SAMPLE No. _____ SAMPLE WT. _____ mg
Total Wt. Anal. _____ Date _____
Check Analyst _____ Date _____

Filter: GF 96-22 (752)
Tare Analyst [illegible] Date _____
Total Weight _____ mg
Total Weight _____ mg

Avg. Total Weight _____ mg
Tare Weight 448.9 mg
Tare Weight 448.8 mg
Avg. Tare Weight 448.9 mg
SAMPLE No. _____ SAMPLE WT. _____ mg
Total Wt. Anal. _____ Date _____
Check Analyst _____ Date _____

Filter: GF 96-23 (753)?
Tare Analyst [illegible] Date _____
Total Weight _____ mg
Total Weight _____ mg

Avg. Total Weight _____ mg
Tare Weight 446.2 mg
Tare Weight 446.0 mg
Avg. Tare Weight 446.1 mg
SAMPLE No. _____ SAMPLE WT. _____ mg
Total Wt. Anal. _____ Date _____
Check Analyst _____ Date _____

Filter: GF 96-24 (753)?
Tare Analyst [illegible] Date _____
Total Weight _____ mg
Total Weight _____ mg

Avg. Total Weight _____ mg
Tare Weight 456.6 mg
Tare Weight 456.3 mg
Avg. Tare Weight 456.5 mg
SAMPLE No. _____ SAMPLE WT. _____ mg
Total Wt. Anal. _____ Date _____
Check Analyst _____ Date _____

Fore Testing was supplied filters Gemidia GFF

Tared on a Sartorius Research (Red Cross) DLL #102683 on 9/16/96 [illegible]

Filter: GF 96-25 (754)
Tare Analyst [illegible] Date _____
Total Weight _____ mg
Total Weight _____ mg

Avg. Total Weight _____ mg
Tare Weight 447.5 mg
Tare Weight 447.4 mg
Avg. Tare Weight 447.5 mg
SAMPLE No. _____ SAMPLE WT. _____ mg
Total Wt. Anal. _____ Date _____
Check Analyst _____ Date _____

Filter: GF 96-26 (760?)
Tare Analyst [illegible] Date _____
Total Weight _____ mg
Total Weight _____ mg

Avg. Total Weight _____ mg
Tare Weight 451.2 mg
Tare Weight 450.9 mg
Avg. Tare Weight 451.1 mg
SAMPLE No. _____ SAMPLE WT. _____ mg
Total Wt. Anal. _____ Date _____
Check Analyst _____ Date _____

Filter: GF 96-27 (761)
Tare Analyst [illegible] Date _____
Total Weight _____ mg
Total Weight _____ mg

Avg. Total Weight _____ mg
Tare Weight 449.3 mg
Tare Weight 449.2 mg
Avg. Tare Weight 449.3 mg
SAMPLE No. _____ SAMPLE WT. _____ mg
Total Wt. Anal. _____ Date _____
Check Analyst _____ Date _____

Filter: GF 96-28 (763)
Tare Analyst [illegible] Date 9/16/96
Total Weight _____ mg
Total Weight _____ mg

Avg. Total Weight _____ mg
Tare Weight 450.9 mg
Tare Weight 450.7 mg
Avg. Tare Weight 450.8 mg
SAMPLE No. _____ SAMPLE WT. _____ mg
Total Wt. Anal. _____ Date _____
Check Analyst _____ Date _____

Filter: _____
Tare Analyst _____ Date _____
Total Weight _____ mg
Total Weight _____ mg

Avg. Total Weight _____ mg
Tare Weight _____ mg
Tare Weight _____ mg
Avg. Tare Weight _____ mg
SAMPLE No. _____ SAMPLE WT. _____ mg
Total Wt. Anal. _____ Date _____
Check Analyst _____ Date _____

DATACHEM LABORATORIES
ANALYTE GROUP LIST
SEARCH STRING: 3025A1MET5

ANALYTE GROUP: 3025A1MET5 ACCOUNT: 03025 DESCRIPTION: Method 5 Particulate

Analyte	Instrument Class	Method	Sub Method	Report Units	Threshold	Lod	Loq
Particulate	GRAV	Method 5		mg/Rinsate			0.1
Particulate	GRAV	Method 5		mg/Filter			0.1
Particulate	GRAV	Method 5		mg/Impinger			0.1
Particulate	GRAV	Method 5		Total mg			0.1

--- END OF LISTING ---

8019

000236

DATACHEM LABORATORIES
ANALYTE GROUP LIST
SEARCH STRING: 3025A1UISO

ANALYTE GROUP: 3025A1UISO ACCOUNT: 03025 DESCRIPTION: Isotopic Uranium

Analyte	Instrument Class	Method	Sub Method	Report Units	Threshold	Lod	Loq
Uranium-233/234	AS	WR-DC-341	WR-DC-200	pCi/Sample			1.0
Uranium-235	AS	WR-DC-341	WR-DC-200	pCi/Sample			1.0
Uranium-238	AS	WR-DC-341	WR-DC-200	pCi/Sample			1.0

--- END OF LISTING ---

000137

DATACHEM LABORATORIES
ANALYTE GROUP LIST
SEARCH STRING: 3025A1TISO

ANALYTE GROUP: 3025A1TISO ACCOUNT: 03025 DESCRIPTION: ISOTOPIC THORIUM

Analyte	Instrument Class	Method	Sub Method	Report Units	Threshold	Lod	Loq
Thorium-228	AS	WR-DC-341		pCi/Sample			1.0
Thorium-230	AS	WR-DC-341		pCi/Sample			1.0
Thorium-232	AS	WR-DC-341		pCi/Sample			1.0

--- END OF LISTING ---

000738

8019

DATACHEM LABORATORIES
ANALYTE GROUP LIST
SEARCH STRING: 3025A1GS

ANALYTE GROUP: 3025A1GS ACCOUNT: 03025 DESCRIPTION: Radium 226/228 by ga

Analyte	Instrument Class	Method	Sub Method	Report Units	Threshold	Lod	Loq
Radium-226	GS	WR-EP-325	WR-DC-200	pCi/Sample			95
Radium-228	GS	WR-EP-325	WR-DC-200	pCi/Sample			20

--- END OF LISTING ---

0007339

8019

DATACHEM LABORATORIES
ANALYTE GROUP LIST
SEARCH STRING: 3025A1TOTU

ANALYTE GROUP: 3025A1TOTU ACCOUNT: 03025 DESCRIPTION: Total Uranium by kPA

Analyte	Instrument Class	Method	Sub Method	Report Units	Threshold	Lod	Loq
Total Uranium	kPA	WR-DC-342		ug/Sample			0.8

--- END OF LISTING ---

00019

0007740

August 6, 1996
Refer to: BD0021

Bruce Sarven
Hayden Environmental
561 Congress Park Drive
Dayton, OH 45459

Phone: (513) 438-3010
FAX: (513) 438-3020

Re: REVISED FAX Quote BD0021

Dear Mr. Sarven:

DataChem Laboratories, Inc.(DCL) appreciates the opportunity to provide you with cost estimates for your project. As I understand your needs, you will be taking three 6 hour stack samples and a blank by Method 5 for particulates and radionulclides analysis. Tared glass fiber filters and sample bottles will be provided for these determinations. The acetone rinse and glass fiber filter will be combined for the analysis of radionuclides.

Uranium 234, Uranium 235/236, Uranium 238, Thorium 228, Thorium 230, and Thorium 232 will be analyzed by alpha spectrometry(AS). Radium 226 and Radium 228 will be analyzed by gamma spectrometry(GS). Total Uranium will be analyzed by kinetic phosphorescence(KPA). According to method 114 these radionuclides will be part of the particulate loading and analysis on the impinger solutions is not required. Combined particulate from the acetone rinse and filter will be analyzed according to DCL standard operating procedures(SOP).

The standard turnaround time for these analysis is 30 calendar days. The requested turnaround time of 10 working days can be accomplished for an additional 25%. The requested detection limits for isotopic analysis can not be met. Minimun Detectable Activity (MDA) is listed on the attached table.

Attached is a Pricing Quotation for these analyses. If you have any question concerning the attached quotation please call me.

Sincerely,

Robert P. Di Rienzo
Project Manager

Revised Pricing Quotation
Project Reference Number: BD-0021

Parameter Analysis	Method	MDA pCi/Sample	Method	Fractions	Price per Sample
Particulate	Method 5		Grav	Acetone Rinse Filter Impinger	$100.00
Uranium 234 Uranium 235/236 Uranium 238	DCL SOP	1 1 1	AS	Particulate*	$312.50
Thorium 228 Thorium 230 Thorium 232	DCL SOP	1 1 1	AS	Particulate*	$312.50
Radium 226 Radium 228	DCL SOP	95 20	GS	Particulate*	$250.00
Total Uranium	DCL SOP	0.8 ug/ Sample	KPA	Particulate*	$187.50

* = Particulate samples are combined acetone rinse and glass fiber filter.

EMISSION MEASUREMENT TECHNICAL INFORMATION CENTER TEST METHOD

Method 5 - Determination of Particulate Emissions from Stationary Sources

1. PRINCIPLE AND APPLICABILITY

1.1 Principle. Particulate matter (PM) is withdrawn isokinetically from the source and collected on a glass fiber filter maintained at a temperature in the range of 120 ± 14°C (248 ± 25°F) or such other temperature as specified by an applicable subpart of the standards or approved by the Administrator, U.S. Environmental Protection Agency, for a particular application. The PM mass, which includes any material that condenses at or above the filtration temperature, is determined gravimetrically after removal of uncombined water.

1.2 Applicability. This method is applicable for the determination of PM emissions from stationary sources.

2. APPARATUS

2.1 Sampling Train. A schematic of the sampling train used in this method is shown in Figure 5-1. Complete construction details are given in APTD-0581 (Citation 2 in the Bibliography); commercial models of this train are also available. For changes from APTD-0581 and for allowable modifications of the train shown in Figure 5-1, see the following subsections.

The operating and maintenance procedures for the sampling train are described in APTD-0576 (Citation 3 in the Bibliography). Since correct usage is important in obtaining valid results, all users should read APTD-0576 and adopt the operating and maintenance procedures outlined in it, unless otherwise specified herein. The sampling train consists of the following components:

2.1.1 Probe Nozzle. Stainless steel (316) or glass with sharp, tapered leading edge. The angle of taper shall be ≤30°, and the taper shall be on the outside to preserve a constant internal diameter. The probe nozzle shall be of the button-hook or elbow design, unless otherwise specified by the Administrator. If made of stainless steel, the nozzle shall be constructed from seamless tubing; other materials of construction may be used, subject to the approval of the Administrator.

A range of nozzle sizes suitable for isokinetic sampling should be available, e.g., 0.32 to 1.27 cm (1/8 to 1/2 in.)—or larger if higher volume sampling trains are used—inside diameter (ID) nozzles in increments of 0.16 cm (1/16 in.). Each nozzle shall be calibrated according to the procedures outlined in Section 5.

directly from the wash bottle being used, and place it in a glass sample container labeled "acetone blank."

Inspect the train prior to and during disassembly, and note any abnormal conditions. Treat the samples as follows:

Container No. 1. Carefully remove the filter from the filter holder, and place it in its identified petri dish container. Use a pair of tweezers and/or clean disposable surgical gloves to handle the filter. If it is necessary to fold the filter, do so such that the PM cake is inside the fold. Carefully transfer to the petri dish any PM and/or filter fibers that adhere to the filter holder gasket, by using a dry Nylon bristle brush and/or a sharp-edged blade. Seal the container.

Container No. 2. Taking care to see that dust on the outside of the probe or other exterior surfaces does not get into the sample, quantitatively recover PM or any condensate from the probe nozzle, probe fitting, probe liner, and front half of the filter holder by washing these components with acetone and placing the wash in a glass container. Deionized distilled water may be used instead of acetone when approved by the Administrator and shall be used when specified by the Administrator; in these cases, save a water blank, and follow the Administrator's directions on analysis. Perform the acetone rinse as follows:

Carefully remove the probe nozzle, and clean the inside surface by rinsing with acetone from a wash bottle and brushing with a Nylon bristle brush. Brush until the acetone rinse shows no visible particles, after which make a final rinse of the inside surface with acetone.

Brush and rinse the inside parts of the Swagelok fitting with acetone in a similar way until no visible particles remain.

Rinse the probe liner with acetone by tilting and rotating the probe while squirting acetone into its upper end so that all inside surfaces will be wetted with acetone. Let the acetone drain from the lower end into the sample container. A funnel (glass or polyethylene) may be used to aid in transferring liquid washes to the container. Follow the acetone rinse with a probe brush. Hold the probe in an inclined position, squirt acetone into the upper end as the probe brush is being pushed with a twisting action through the probe; hold a sample container underneath the lower end of the probe, and catch any acetone and particulate matter that is brushed from the probe. Run the brush through the probe three times or more until no visible PM is carried out with the acetone or until none remains in the probe liner on visual inspection. With stainless steel or other metal probes, run the brush through in the above prescribed manner at least six times since metal probes have small crevices in which particulate matter can be entrapped.

Rinse the brush with acetone, and
quantitatively collect these washings in the sample container. After the brushing, make a final acetone rinse of the probe as described above.

It is recommended that two people clean the probe to minimize sample losses. Between sampling runs, keep brushes clean and protected from contamination.

After ensuring that all joints have been wiped clean of silicone grease, clean the inside of the front half of the filter holder by rubbing the surfaces with a Nylon bristle brush and rinsing with acetone. Rinse each surface three times or more if needed to remove visible particulate. Make a final rinse of the brush and filter holder. Carefully rinse out the glass cyclone, also (if applicable). After all acetone washings and particulate matter have been collected in the sample container, tighten the lid on the sample container so that acetone will not leak out when it is shipped to the laboratory. Mark the height of the fluid level to determine whether leakage occurred during transport. Label the container to identify clearly its contents.

Container No. 3. Note the color of the indicating silica gel to determine whether it has been completely spent, and make a notation of its condition. Transfer the silica gel from the fourth impinger to its original container, and seal. A funnel may make it easier to pour the silica gel without spilling. A rubber policeman may be used as an aid in removing the silica gel from the impinger. It is not necessary to remove the small amount of dust particles that may adhere to the impinger wall and are difficult to remove. Since the gain in weight is to be used for moisture calculations, do not use any water or other liquids to transfer the silica gel. If a balance is available in the field, follow the procedure for Container No. 3 in Section 4.3.

Impinger Water. Treat the impingers as follows: Make a notation of any color or film in the liquid catch. Measure the liquid that is in the first three impingers to within I ml by using a graduated cylinder or by weighing it to within 0.5 g by using a balance (if one is available). Record the volume or weight of liquid present. This information is required to calculate the moisture content of the effluent gas.

Discard the liquid after measuring and recording the volume or weight, unless analysis of the impinger catch is required (see **NOTE**, Section 2.1.7).

If a different type of condenser is used, measure the amount of moisture condensed either volumetrically or gravimetrically.

Whenever possible, containers should be shipped in such a way that they remain upright at all times.

4.3 Analysis. Record the data required on a sheet such as the one shown in Figure 5-3. Handle each sample container as follows:

Container No. I. Leave the contents in the shipping container or transfer the filter and any loose PM from the sample container to a tared glass weighing dish. Desiccate for 24 hours in a desiccator containing anhydrous calcium sulfate. Weigh to a constant weight, and report the results to the nearest
0.I mg. For purposes of this Section, 4.3, the term "constant weight" means a difference of no more than 0.5 mg or I percent of total weight less tare weight, whichever is greater, between two consecutive weighings, with no less than 6 hours of desiccation time between weighings.

Alternatively, the sample may be oven dried at I05°C (220°F) for 2 to 3 hours, cooled in the desiccator, and weighed to a constant weight, unless otherwise specified by the Administrator. The tester may also opt to oven dry the sample at I05°C (220°F) for 2 to 3 hours, weigh the sample, and use this weight as a final weight.

Container No. 2. Note the level of liquid in the container, and confirm on the analysis sheet whether leakage occurred during transport. If a noticeable amount of leakage has occurred, either void the sample or use methods, subject to the approval of the Administrator, to correct the final results. Measure the liquid in this container either volumetrically to ±I ml or gravimetrically to ±0.5 g. Transfer the contents to a tared 250-ml beaker, and evaporate to dryness at ambient temperature and pressure. Desiccate for 24 hours, and weigh to a constant weight. Report the results to the nearest 0.I mg.

Container No. 3. Weigh the spent silica gel (or silica gel plus impinger) to the nearest 0.5 g using a balance. This step may be conducted in the field.

"Acetone Blank" Container. Measure the acetone in this container either volumetrically or gravimetrically. Transfer the acetone to a tared 250-ml beaker, and evaporate to dryness at ambient temperature and pressure. Desiccate for 24 hours, and weigh to a constant weight. Report the results to the nearest 0.I mg.

NOTE: At the option of the tester, the contents of Container No. 2 as well as the acetone blank container may be evaporated at temperatures higher than ambient. If evaporation is done at an elevated temperature, the temperature must be below the boiling point of the solvent; also, to prevent "bumping," the evaporation process must be closely supervised, and the contents of the beaker must be swirled occasionally to maintain an even temperature. Use extreme care, as acetone is highly flammable and has a low flash point.

4.4 Quality Control Procedures. The following quality control procedures are

suggested to check the volume metering system calibration values at the field test site prior to sample collection. These procedures are optional for the tester.

4.4.1 Meter Orifice Check. Using the calibration data obtained during the calibration procedure described in Section 5.3, determine the $\Delta H_@$ for the metering system orifice. The $\Delta H_@$ is the orifice pressure differential in units of in. H_2O that correlates to 0.75 cfm of air at 528°R and 29.92 in. Hg. The
$\Delta H_@$ is calculated as follows:

$$\Delta H_@ = 0.0319\, \Delta H \frac{T_m\, \theta^2}{P_{bar}\, Y^2\, V_m^2}$$

where:

ΔH = Average pressure differential across the orifice meter, in. H_2O.

T_m = Absolute average DGM temperature, °R.

P_{bar} = Barometric pressure, in. Hg.

θ = Total sampling time, min.

Y = DGM calibration factor, dimensionless.

V_m = Volume of gas sample as measured by DGM, dcf.

0.0319 = (0.0567 in. Hg/°R)(0.75 cfm)^2

Before beginning the field test (a set of three runs usually constitutes a field test), operate the metering system (i.e., pump, volume meter, and orifice) at the $\Delta H_@$ pressure differential for 10 minutes. Record the volume collected, the DGM temperature, and the barometric pressure. Calculate a DGM calibration check value, Y_c, as follows:

$$Y_c = \frac{10\,[0.0319\, T_m]^{1/2}}{V_m \left[\frac{}{P_{bar}}\right]}$$

where:

Y_c = DGM calibration check value, dimensionless.

DATA CHEM LABORATORIES
A SORENSON COMPANY

Analytical Documentation
Inventory Checklist

- [N/A] This is a "dummy datapackage". Data for inventory checklist found with set _____
- [N/A] Copy of TCLP Preparation Logbook Pages
- [X] Copy of Sample Preparation Notebook/Logbook Pages
- [X] Copy of Analyst's Notebook/Method Logbook Pages
- [X] Copy of Instrument Injection Logbook/Instrument Logbook/Run Log Pages
- [N/A] Copy of Reagent Logbook Pages
- [X] Copy of Working Standard Preparation Logbook Pages
- [X] Copy of Secondary or Intermediate Standard Preparation Logbook Pages
- [X] Copy of Primary Standard or Concentrated Stock Standard Preparation Logbook Pages
- [X] Certificates of Analysis for Standards
- [X] Copy of Standard Verification Logbook Pages (including documentation for spiking solutions and/or calibration standards)
- [N/A] Copy of Preparation Logbooks for solutions prepared by QC

All other miscellaneous documentation associated with this set (describe)

- [N/A] _____

Analytical Documentation
Reviewer Checklist

- X The Analytical Documentation Inventory Checklist above is complete.
- X Basic documentation procedures were followed in accordance with DCL SOP XX-DC-004 "Analytical Data Record Keeping."
- X All notebook and logbook pages contain page number, book number, title, and available space for pagination (if required).
- X All notebook and logbook pages were signed and dated by the analyst and reviewer before copying.
- X All copies are legible.
- X Standard preparation is documented in accordance with DCL SOP XX-DC-019 "Standards Purity, Preparation, Traceability and Verification" or by WR-DC-001 "The Acquisition, Preparation, and use of Radioactive Standard Reference Materials."
- X Documentation is provided to verify that standard calibration solutions and spiking solutions are traceable to a vendor certificate.

Assembled by: _____ Signature 10/24/96 Date Reviewed by: _____ Signature 10/24/96 Date

Rev. 6/95

TITLE Hayden Environmental Sample Filtration BOOK NO. 5000

From Page No.

8019

Client	Account No.	Set No.	Sample Nos.	Matrix	Balance ID
Hayden Enviro.	3025	96E-0640 *	96E04514-4517	AIR/FILTER	102695

Filters and acetone rinse were combined after aceton was dryed. Samples were placed in metal based teflon beakers and dissolved i 6 mL of HF (hydrofluoric acid) and then taken to near dryness to expell all of the HF. The samples were then transferred t tared P.M.P. jars and brought up to approximately 100.0 g, using 1 M HNO_3 (nitric acid).

Sample Number	Final Mass in Tared PMP.
96E04514	100.0 g
96E04515	106.4 g
96E04516	100.1 g
96E04517	100.1 g

T.P. 10-8-96

To Page N

Witnessed & Understood by me,	Date	Invented by	Date
Bradley J. Richardson	10-21-96	Recorded by Ty E. Peterson	10/8/96

000750

8019

Determination of Selected Actinides by Ion Exchange

Client NA Acct No. 3025 Set No. 96E-0640-05 Matrix Air (Filter)

Requested Analysis: Am__ Cf__ Cm__ Np__ Pu__ Th__ U ✓ Total

LCS ID: QC-123241-1 Pipet ID: Eppe 10

Prep Group ID: G969K00V Balance ID 102695

*Activity(pCi) = Conc(pCi/g) * Mass(g)*
or
*Activity(pCi) = Conc(pCi/mL) * Volume(mL)*

Standard Control ID	Conc. (pCi/g or ml)	Aliquot (g or ml)	Activity (pCi)
WSL 3/23 (U238)	60.62 pCi/g	0.1 ml = .09735 g	5.90136
	BR 10-18-96		

Tracer ID	Conc. (pCi/g or ml)	Aliquot (g or ml)	Activity (pCi)
~~WSL 3/55 (U232~~ BR 10-18-96			
		BR 10-18-96	

VESSEL#	SAMPLE#	WEIGHT (g)	VESSEL#	SAMPLE#	WEIGHT (g)
1	BL-123241-1	Reagent	13		
2	QC-123241-1	Reagent	14		
3	96E04514	5.229 g	15		
4	96E04515	5.059 g	16		
5	96E04516	5.032 g	17		
6	96E04517	5.024 g	18		
7			19		BR 10-18-96
8			20		
9		BR 10-18-96	21		
10			22		
11			23		
12			24		

Comments:

*N/A = Not Applical

000751

Recorded by: [signature] Date: 10-18-96 Reviewed by: [signature] Date: 10/22/96

Book No. 4037 Page No. 151

Total Uranium by Kinetic Pulsed Laser Phosphorimetry

Client N/A Acct No. 3025 Instrument 102875

Sample Matrix Filter Set No. 96E-0640-05 Prep. Group ID G969K00V

Date of Last Calibration 10/22/96 Calibration Standard ID ~~WS 10/22/96~~ ISL 2/39

Balance ID N/A Blank No(s). BL-123241-1

LCS No(s). QC-123241-1 MD No(s). 96E04514MD

MS No(s). N/A MSD No(s). N/A

LCS Solution ID WSL 3/23 Amount 0.09735 Pipet Used: EPPE10

Spiking Solution ID N/A Amount N/A Pipet Used: N/A

*N/A=Not Applicable

SAMPLE#	FINAL RESULT	Dilutions	SAMPLE#	FINAL RESULT
BL-123241-1	4.7 E-3	100		
QC-123241-1	1.7E1			
96E04514	2.1E0			
~~96E04514MD~~ WS 10/22/96	N/A			
96E04515	3.4E0			
96E04516	5.4E2			
96E04517	2.8E-1			

10/22/96

Comments: N/A

Recorded by: [signature] Date: 10/22/96 Reviewed by: [signature] Date: 10/24/96

KPA Run Log

Book Number 4072

Instrument ID KPA-11

Date	Analyst	Mode	Sample ID
5/16/96	wpg	Manual	*Calibrated 96C-0065-04, 96C-0066-04, 96C-0067-04
5/29/96	wpg	Manual	*Calibrated 96C-0205-04
6/10/96	wpg	Manual	*Calibrated 96M-0158-04, 96C-0144-04, 96M-0158-02
6/26/96	wpg	Manual	*Calibrated 96M-0175-05
7/10/96	wpg	Manual	*Calibrated 96M-0191-01, 96M-0191-03
8/7/96	wpg	Manual	*Calibrated 96C-0355-01, 96M-0211-01, 96M-0211-01
8/29/96	wpg	Manual	*Calibrated 96M-0213-28
9/10/96	wpg	Manual	*Calibrated 96M-0248-01, 96M-0248-02
10/10/96	wpg	Manual	*Calibrated 96M-0298-01, 96M-0298-03, 96C-0485-06
10/15/96	wpg	Manual	*Calibrated 96M-0306-02
10/22/96	wpg	Manual	*Calibrated 96C-0517-01, 96E-0640-05

wpg

OCT 24 1996

Reviewed By: _____
Signature & Date

From Page # 95

RADIOCHEMISTRY LABORATORY
RADIOACTIVE MATERIAL INVENTORY
WORKING STANDARD LOG

8019

Working Standard ID: WSL 3/23 U 238 Intermediate Standard ID: 13L 2/39

Reference Date/Time*: Oct 1993 0500 RMI Source Log Ref. Book/Page: 2/10

*Use Julian date and military time

DCL Balance ID No.:_____

Date	Inits.	Solvent	Activity (pCi)†	Final Volume	Conc. (pCi/g)†	Witness
11-16-94	T.P. for D.R.	2M HNO_3	6061.5	100.008g	60.615 pCi/g	T.P. for R.L.

Usage:

	Date	Inits.	Aliquot	Activity (pCi)†	Balance (pCi)†	Destination
1.	10-7-96	T.P.	.1054g	6.3888	2647.3088	96M-0286-14 96M-0300-08 96M-0290-08 96M-0297-14 LCS
2.	10-9-96	BR	BR 10-9-96 ~~.1054g~~ .09764ml	5.9009	2641.4079	96M-0303-08 96M-0304-08 LCS
3.	10-10-96	MS	0.01485 ~~0.00495~~	0.9001 ~~0.3000~~	2640.5078 ~~2641.1079~~ MS 10/10/96	QCMS 96M-0298-01, 96M-0306-02
4.	10-9-96	T.P.	.2108g	12.7776	2627.7302 T.P.	G9697 03J G9697 034 10-10-96 T.P. ~~TRACER~~ LCS (1)(2)
5.	~~10-11-96~~	~~BR~~	BR 10-11-96			
6.	10-15-96	BR	.1947g	11.8027	2615.9275	96C-0439-12 96C-0443-12 LCS
7.	10-16-96	BR	.09735g	5.9014	2610.0261	96E-0654-02 LCS
8.	10-17-96	BR	.09735g	5.9014	2604.1247	96M-0250-01 96M-0323-05 LCS
9.	10-18-96	BR	.09735g	5.9014	2598.2233	96E-0640-02 LCS
10.	10-18-96	BR	.09735g	5.9014	2592.3219	96E-0640-05 LCS
11.						
12.						
13.						
14.						
15.						
16.						
17.						
18.						

† All activities are referenced to the source date/time. Decay corrections are to be made on the following page.

To Page:_____

8019

RADIOCHEMISTRY LABORATORY
RADIOACTIVE MATERIAL INVENTORY
INTERMEDIATE STANDARD LOG

Intermediate Standard ID: ISL 2/39 (U238) Standard Source ID: 1848-2

Reference Date/Time*: Oct '93/0500 RMI Source Log Ref. Book/Page: 2/10

*Use Julian date and military time

DCL Balance ID No.: B 310P, 102695

Date	Inits.	Solvent	Activity (pCi)†	Final Weight	Conc. (pCi/g)†	Witness
11/16/94	DR	2 M HNO_3	12122.768	99.994 g	121.23	[illegible]

Usage:

	Date	Inits.	Aliquot	Activity (pCi)†	Balance (pCi)†	Destination
1.	11/16/94	DR	50 g	6061.5	6061.268	WSL 3/23
2.						
3.						
4.						
5.						
6.						
7.						
8.						
9.						
10.						
11.						
12.						
13.						
14.						
15.						
16.						
17.						
18.						

† All activities are referenced to the source date/time. Decay corrections are to be made on the following page.

To Page:

Book No. 2 Page 10

8019

RADIOCHEMISTRY LABORATORY
RADIOACTIVE MATERIAL INVENTORY
STANDARD SOURCE LOG

Vendor: US EPA Vendor Source ID: 1843-2

Date Received: 11-22-93 Received By: CC WALKER

CAUTION
RADIOACTIVE MATERIAL
SOL# 1843-2 WT. 5.0g
AMT. 2380 nanoCi/g
ISOTOPE U-238
DATE Oct. 93 0400PST
ENVIRONMENTAL MONITORING SYSTEMS LABORATORY—LAS VEGAS

Place Source Label Above

Source Reference Date/Time*: OCT. '93/0500 Solvent: 0.5M HNO3

ISOTOPE(S)	CONC. (pCi/g)	ISOTOPE(S)	CONC. (pCi/g)
U-238	2380		

*Use Julian date and military time

Usage:

DCL Balance ID No.: DCL #102683

Date	Inits.	Aliquot	Activity (pCi)	Balance (pCi)	Destination	Witness
~~7.5g~~	~~CC 11-16-94~~	~~5.0936 g~~				
11/16/94	OR	5.0936 g	12122.768	Ø	ISL 2/39	CW

000756

Lec. 11 GEW

8019

U.S. Environmental Protection Agency
Environmental Monitoring Systems Laboratory-Las Vegas
Nuclear Radiation Assessment Division

Calibration Certificate

Description

Principal radionuclide: Uranium-238 Half-life: 4.47×10^9 years

Nominal activity: 11.9 nanocuries

Nominal volume: 5.0 ml in ampoule/bottle number 1843-2

Measurement Activity of principal radionuclide

Activity per gram of this solution

2.38 nanocuries of Uranium-238

October 1993

*Accompanied by 0.11 nanoCuries of Uranium-235 per gram of solution.

Activity of daughter radionuclide

The principal activity was accompanied at the quoted time by

2.38 nanocuries Per gram

of the daughter nuclides Th-234, Pa-234, U-234 assuming secular equilibrium.

Total mass of this solution

Approximately 5.0 grams

Method of measurement

The solution was prepared gravimetrically by dissolving a weighed quantity of the National Bureau of Standards' SRM 950b (99.97±0.02 percent Uranium Oxide (U_3O_8)) in nitric acid and diluting to a known weight. Natural uranium was assumed to consist of 99.28 percent U-238 and 0.711 percent U-235 by weight with specific activities of 3.36×10^2 and 2.16×10^3 nanoCuries per gram respectively. The solution was compared to an earlier preparation (1843-1), which was traced to the National Institute of Standards and Technology (NIST), using liquid scintillation counting.

Useful Life

This radionuclide has decayed through [ ] half lives since it was obtained by EMSL-LV

We recommend that this solution should not be used after INDEFINITE

000757

Purity

The manufacturer states that activities other than that of the principal nuclide and of its daughter nuclides, if any, were estimated/known to be:

(1) Radium-226	less than	0.6 %	of the principal activity
(2)	less than equal to	%	of the principal activity
(3)	less than equal to	%	of the principal activity

The activity of impurity (1) is not (2) is not (3) is not included in the quoted figures of the principal activity.

Random Errors

The precision of this standard was such that the certified value of the radioactive concentration of the principal activity had a standard error (sm) not greater than ± 0.5 %
(The 99.7% confidence limits are given by t(sm) where t is obtained from the student t factor for the degree of freedom (n-1)).

The maximum uncertainty due to the assessable systematic errors (dilution, counting, and known uncertainty of the standard) is obtained by the separate arithmetic summation of the positive and negative systematic error ($+\delta - \delta'$). These have been estimated not to exceed

+2.5 % or - 2.5 %

the overall uncertainty (often called accuracy) is an estimate of the possible divergence of the quoted result from the true value. It is a combination of random error [t(sm)] at the 99.7% confidence limits and the worst case estimate of the systematic errors ($+\delta - \delta'$)
The overall uncertainty is therefore calculated on the basis of + [t(sm) $+\delta$], - [t(sm) $+\delta'$]
and is + 4.0 %, - 4.0 % of the quoted radioactive concentration.

Decay Schemes

This standardization is based on the following assumptions of the principle nuclide, its daughter nuclides and impurities (no allowance for error in these assumptions or the assumption of quoted half-life have been included in the statement of accuracy above).

Uranium-238 decays by alpha emission to Thorium-234 which decays by two successive beta emissions to Uranium-234. Uranium-234 is assumed to be in secular equilibrium with Uranium-238.

Chemical Composition of Solution

Carrier content per gram of solution:

Other components:
0.5M nitric acid

Preservative:

Remarks

The uranium concentration of the solution is 7.12 milligrams/gram.

Date Certificate Prepared October 27, 1993

Approval Signature Paul B. Hahn

Revised 1/84

DATA CHEM LABORATORIES
A SORENSON COMPANY

8019

Raw Data
Radiochemistry/Mixed-Waste Department
Kinetic Phosphorescence Analysis
Inventory Checklist

- [x] Section 1. Sample and QC Data
- [x] Section 2. Instrument Performance and Calibration Data

The following signatures verify that the raw data and all inventory and reviewer checklists in each raw data section (all green sheets) are complete and accurate.

Assembled by: Signature 10/24/96 Date Reviewed by: Signature 10/24/96 Date

Rev. 3/95

Section 1. Sample and QC Data
Kinetic Phosphorescence Analysis
Inventory Checklist

- [x] Laboratory Control Sample (LCS) Instrument Print-Out
- [x] Blank Instrument Print-Out
- [x] Accuracy Sample (MS) Instrument Print-Out
- [x] Precision Sample (MSD/MD) Instrument Print-Out
- [x] Field Sample Instrument Print-Outs
- [x] Computer/Manual Calculation Sheets summarizing all calculational inputs and results

Section 1. Sample and QC Data
Kinetic Phosphorescence Analysis
Reviewer Checklist

X The Sample and QC Data Inventory Checklist above is complete.

X All appropriate QC for the project was performed.

X All appropriate QC data met acceptance criteria. Unacceptable QC data were documented, and justifications were provided for data used.

X Print-outs are initialed and dated.

8019

Sample ID BL-123241-1 Date/Time 10/22/96/00:41:45
Description G969K00V,96E-0640-05 Cal Y=1.08E+07X+2312.449
Ref. Ratio 1.068 Intensity 2067 (t= 52 us)
Laser Pulses 1000 Conc 4.74E-05 + 9.66E-07 ug/
Lifetime 224 + .979 us Dilution Factor 100 mL/mL
R2 .9992
Integrated 34465 FINAL RESULT 4.74E-03 + 9.66E-05 ug/
Record 3460 of 3481 Range: LOW

Sample ID QC-123241-1 Date/Time 10/22/96/00:45:07
Description G969K00V,96E-0640-05 Cal Y=1.66E+05X-1.71E+02
Ref. Ratio 1.034 Intensity 21740 (t= 52 us)
Laser Pulses 1000 Conc .17126 + 5.33E-03 ug/
Lifetime 248 + .399 us Dilution Factor 100 mL/mL
R2 .9999
Integrated 384444 FINAL RESULT 17.126 + .533 ug/
Record 3461 of 3481 Range: HIGH

Sample ID 96E04514 Date/Time 10/22/96/00:49:18
Description G969K00V,96E-0640-05 Cal Y=1.08E+07X+2312.449
Ref. Ratio 1.062 Intensity 11118 (t= 52 us)
Laser Pulses 1000 Conc 1.11E-03 + 2.14E-05 ug/
Lifetime 243 + .594 us Dilution Factor 100 mL/mL
R2 .9998
Integrated 189712 FINAL RESULT .111 + 2.14E-03 ug/
Record 3462 of 3481 Range: LOW

Sample ID 96E04514MD Date/Time 10/22/96/00:52:01
Description G969K00V,96E-0640-05 Cal Y=1.08E+07X+2312.449
Ref. Ratio 1.085 Intensity 10851 (t= 52 us)
Laser Pulses 1000 Conc 1.10E-03 + 2.11E-05 ug/
Lifetime 239 + .474 us Dilution Factor 100 mL/mL
R2 .9998
Integrated 185991 FINAL RESULT .11 + 2.11E-03 ug/
Record 3463 of 3481 Range: LOW

WPS 10/24/96

Sample ID 96E04515 Date/Time 10/22/96/00:57:22
Description G969K00V,96E-0640-05 Cal Y=1.08E+07X+2312.449
Ref. Ratio 1.138 Intensity 14917 (t= 52 us)
Laser Pulses 1000 Conc 1.57E-03 + 3.06E-05 ug/
Lifetime 236 + .65 us Dilution Factor 100 mL/mL
R2 .9997
Integrated 249946 FINAL RESULT .157 + 3.06E-03 ug/
Record 3466 of 3481 Range: LOW

Sample ID 96E04516 Date/Time 10/22/96/01:00:47
Description G969K00V,96E-0640-05 Cal Y=1.66E+05X-1.71E+02
Ref. Ratio 1.095 Intensity 33560 (t= 52 us)
Laser Pulses 1000 Conc .26759 + 8.35E-03 ug/
Lifetime 240 + .493 us Dilution Factor 100 mL/mL
R2 .9998
Integrated 582618 FINAL RESULT 26.759 + .835 ug/
Record 3468 of 3481 Range: HIGH

WPS

OCT 24 1996

Sample ID 96E04517
Description G969K00V,96E-0640-05
Ref. Ratio 1.083
Laser Pulses 1000
[illegible]etime 302 + 2.266 us
[illegible].9976
Integrated 62463
Record 3469 of 3481

Date/Time 10/22/96/01:03:11
Cal Y=1.08E+07X+2312.449
Intensity 3289 (t= 52 us)
Conc 1.38E-04 + 2.94E-06 ug/
Dilution Factor 100 mL/mL

FINAL RESULT 1.38E-02 + 2.94E-04 ug/

Range: LOW

WPS

OCT 24 1996

Section 2. Instrument Performance and Calibration Data
Kinetic Phosphorescence Analysis
Inventory Checklist

- [X] Analyst Initials
- [X] Instrument ID, Manufacturer, and Model Number
- [X] Certification of Calibration Standards
- [X] Calibration Date
- [X] Background Report
- [X] Calibration Report with High and Low Calibration Curves
- [X] Results of Calibration Check

Section 2. Instrument Performance and Calibration Data
Kinetic Phosphorescence Analysis
Reviewer Checklist

X The Instrument Performance and Calibration Data Inventory Checklist above is complete.

X Specified analytical protocols are followed for particular contract requirements.

X Conditions of instrument setup are noted.

NA NCR(s) noted, and affected instruments not used.

KPA Calibration/Maintenance Log

Book Number 4071

Date	Analyst	Instrument ID	Comments
5/16/96	WPS	102875 KPA-11	Full Calibration High Range 98% Low Range 101%
5/29/96	WPS	102875 KPA-11	Full Calibration High Range 100% Low Range 99%
6/10/96	WPS	102875 KPA-11	Full Calibration High Range 101% Low Range 99%
6/26/96	WPS	102875 KPA-11	Full Calibration High Range 101% Low Range 98%
7/10/96	WPS	102875 KPA-11	Full Calibration High Range 101% Low Range 100%
8/7/96	WPS	102875 KPA-11	Full Calibration High Range 99% Low Range 100%
8/29/96	WPS	102875 KPA-11	Full Calibration Low Range 100% High Range 100%
9/10/96	WPS	102875 KPA-11	Full Calibration Low Range 101% High Range 101%
10/10/96	WPS	102875 KPA-11	Full Calibration Low Range 99% High Range 100%
10/15/96	WPS	102875 KPA-11	Full Calibration Low Range 105% High Range 97%
10/22/96	WPS	102875 KPA-11	Full Calibration Low Range 101% High Range 100%

WPS

OCT 24 1996

Reviewed By: _____
Signature & Date

[redacted]

From Page No.__

Intermediate Standard: ISL 2/39 (U238) Conc.: 121.23 pCi/g
Amount Used: 0.426g

$0.426g \times 121.23 pCi/g^{(U238)} = 51.64 pCi \times \frac{1 ug}{0.3363 pCi} = 153.565 ug (U238)$

153.565 ug brought to 100 mL volume = 1.5356 ug/mL (U238)

Calibration standards were prepared from the 1.5356 ug/mL concentration

Calibration standards are prepared in 100 mL of 2M HNO_3

Calibration standards concentrations were calculated as follows

Volume of 1.5356 ug/mL concentration = V_1 (mL)
Volume diluted standard = V_2 = 100 mL
Concentration 1.5356 ug/mL = C_1 (ug/mL)
Concentration of final calibration standard = C_2 (ug/mL)

$$V_1 C_1 = V_2 C_2$$

Volume V_1 (mL)		Cal. Standard Concentration C_2 (ug/mL)
0.005		0.0000768
0.025		0.000384
0.1		0.00154
0.2		0.00307
0.4		0.00614
0.85		0.0131
1.7		0.0261
3.5		0.0537
7		0.107
14		0.215

Jane Reddick 3/7/96 [signature] 3/7/96

8019

RADIOCHEMISTRY LABORATORY
RADIOACTIVE MATERIAL INVENTORY
INTERMEDIATE STANDARD LOG

Intermediate Standard ID: ISL 2/39 (U238) Standard Source ID: 1843-2

Reference Date/Time*: Oct '93/0500 RMI Source Log Ref. Book/Page: 2/10

*Use Julian date and military time

DCL Balance ID No.: B 310P, 102695

Date	Inits.	Solvent	Activity (pCi)†	Final Weight	Conc. (pCi/g)†	Witness
11/16/94	DR	2 M HNO_3	12122.768	99.994 g	121.23	[illegible]

Usage:

	Date	Inits.	Aliquot	Activity (pCi)†	Balance (pCi)†	Destination
1.	11/16/94	DR	50 g	6061.5	6061.268	WSL 3/23
2.	3/5/96	[illegible]	0.4951 g	60.021	6001.247	STANDARDS Verification for KPA Cal Standards
3.	3/7/96	[illegible]	0.426 g	51.644	5949.603	New Calibration standards for KPA
4.						
6.						
7.						
8.						
9.						
10.						
11.						
12.						
13.						
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15.						
16.						
17.						
18.						

† All activities are referenced to the source date/time. Decay corrections are to be made on the following page.

To Page:_____

CCW
(2) 8019

U.S. Environmental Protection Agency
Environmental Monitoring Systems Laboratory-Las Vegas
Nuclear Radiation Assessment Division

Calibration Certificate

Description

Principal radionuclide: Uranium-238 Half-life: 4.47×10^9 years

Nominal activity: 11.9 nano curies

Nominal volume: 5.0 ml in ampoule/bottle number 1843-2

Measurement Activity of principal radionuclide

Activity per gram of this solution

2.38 nanocuries of Uranium-238

October 1993

*Accompanied by 0.11 nanoCuries of Uranium-235 per gram of solution.

Activity of daughter radionuclide

The principal activity was accompanied at the quoted time by

2.38 nano curies Per gram

of the daughter nuclides Th-234, Pa-234, U-234 assuming secular equilibrium.

Total mass of this solution

Approximately 5.0 grams

Method of measurement

The solution was prepared gravimetrically by dissolving a weighed quantity of the National Bureau of Standards' SRM 950b (99.97±0.02 percent Uranium Oxide (U_3O_8)) in nitric acid and diluting to a known weight. Natural uranium was assumed to consist of 99.28 percent U-238 and 0.711 percent U-235 by weight with specific activities of 3.36×10^2 and 2.16×10^3 nanoCuries per gram respectively. The solution was compared to an earlier preparation (1843-1), which was traced to the National Institute of Standards and Technology (NIST), using liquid scintillation counting.

Useful Life

This radionuclide has decayed through [ ] half lives since it was obtained by EMSL-LV

We recommend that this solution should not be used after INDEFINITE

Purity

The manufacturer states that activities other than that of the principal nuclide and of its daughter nuclides, if any, were estimated/known to be:

(1) Radium-226	less than	0.6 %	of the principal activity
(2)	less than equal to	%	of the principal activity
(3)	less than equal to	%	of the principal activity

The activity of impurity (1) is not (2) is not (3) is not included in the quoted figures of the principal activity.

Random Errors

The precision of this standard was such that the certified value of the radioactive concentration of the principal activity had a standard error (sm) not greater than ± 0.5 %
(The 99.7% confidence limits are given by t(sm) where t is obtained from the student t factor for the degree of freedom (n-1)).

The maximum uncertainty due to the assessable systematic errors (dilution, counting, and known uncertainty of the standard) is obtained by the separate arithmetic summation of the positive and negative systematic error ($+\delta - \delta'$). These have been estimated not to exceed

+2.5 % or - 2.5 %

the overall uncertainty (often called accuracy) is an estimate of the possible divergence of the quoted result from the true value. It is a combination of random error [t(sm)] at the 99.7% confidence limits and the worst case estimate of the systematic errors ($+\delta, -\delta'$)
The overall uncertainty is therefore calculated on the basis of + [t(sm) $+\delta$], - [t(sm) $+\delta'$]
and is + 4.0 %, - 4.0 % of the quoted radioactive concentration.

Decay Schemes

This standardization is based on the following assumptions of the principle nuclide, its daughter nuclides and impurities (no allowance for error in these assumptions or the assumption of quoted half-life have been included in the statement of accuracy above).

Uranium-238 decays by alpha emission to Thorium-234 which decays by two successive beta emissions to Uranium-234. Uranium-234 is assumed to be in secular equilibrium with Uranium-238.

Chemical Composition of Solution

Carrier content per gram of solution:

Other components:
0.5M nitric acid

Preservative:

Remarks

The uranium concentration of the solution is 7.12 milligrams/gram.

Date Certificate Prepared October 27, 1993

Approval Signature Paul B. Wahn

Revised 1/84

NOTES

(1) Individual uncertainties have the significance of one standard deviation of the mean, or an approximation thereof. The combined uncertainty is the individual uncertainties shown below added in quadrature. The overall uncertainty is taken to be three times the combined uncertainty.

Source of uncertainty	Uncertainty (%)
a) liquid-scintillation measurements	0.12
b) gravimetric measurements	0.05
c) deadtime	0.05
d) background	0.10
e) original calibration of SRM 4321	0.13
f) count-rate-vs-energy extrapolation to zero energy	0.11
g) half life	0.00
h) photon-emitting impurities	0.43
Combined uncertainty	0.49
	* 3
Overall uncertainty	1.47

(2) Overall uncertainty reported by EMSL.

(3) The limit of detection for photon-emitting impurities is $0.01\ \gamma s^{-1} g^{-1}$ for energies between 90 and 1900 keV, provided that the impurity photons are separated in energy by 5 keV or more from photons emitted in the decay of uranium-235 and uranium-238 and progeny.

(4) The limit of detection for ^{226}Ra is less than 0.24 Bq g^{-1}.

(5) Proposed Recommended List of Heavy Element Radionuclide Decay Data, INDC(NDS)-149/NE, International Atomic Energy Agency, December 1983.

(6) This result demonstrates the traceability of EMSL to NBS, for this measurement, to within five percent as specified in the appendix, Traceability Studies, of the EPA-NBS interagency agreement of April 1976, as amended.

For further information call Larry Lucas at (301) 975-5546 or FTS 879-5546.

$$A = \lambda N \qquad \lambda = \frac{-\ln(0.5)}{T\frac{1}{2}}$$

$$\frac{\text{Wt of U-238}}{\text{g soln}} = \frac{(N)\,(AW)}{Ao} = \frac{(A)\,(AW)}{(\lambda)\,(Ao)} = \frac{(A)\,(AW)\,(T\frac{1}{2})}{-\ln(0.5)\,(Ao)}$$

$$\frac{(40.05)}{(\text{sec*g})}\,\frac{(238\ \text{g})}{(\text{mol})}\,\frac{(4.468\ \text{E09 yr})}{(-\ln(0.5))}\,\frac{(3.154\text{E07 sec/yr})}{(6.023\text{E23/mol})} = \frac{(3.22\ \text{E-03 g})}{\text{g soln}}$$

$$= \frac{3.22\ \text{mg U-238}}{\text{g soln}} * \frac{1}{0.9928} = \frac{3.24\ \text{mg U nat}}{\text{g soln}}$$

A = Activity (sec^{-1})

λ = Decay constant (sec^{-1})

$T\frac{1}{2}$ = Halflife (sec)

N = Number of atoms

AW = Atomic weight

Ao = Avogadro's number ($mols^{-1}$)

8019

Calibration

Range: LOW
Background Measured Intensity 883

Concentration	Intercept	Uncert.	% Disc.	Intensity	Lifetime	R2
+ 7.68E-05 ug/	2002.11	44.75	-3.63E+01	1818	353.5607	.9933
+ 3.84E-04 ug/	5601.12	74.84	-1.33E+01	4054	220.0613	.9993
+ 1.54E-03 ug/	1.87E+04	136.8	-1.20E+00	15205	326.9717	.9999
+ 3.07E-03 ug/	3.56E+04	188.56	0.26	28693	290.33	.9997
+ 6.14E-03 ug/	7.26E+04	269.38	5.75	60091	323.5809	1
+ 1.31E-02 ug/	1.42E+05	376.78	-1.26E+00	116637	330.7232	1

Zero Point NOT Included. Y=1.08E+07X +2312.449

Calibration

Range: HIGH
Background Measured Intensity 6

Concentration	Intercept	Uncert.	% Disc.	Intensity	Lifetime	R2
+ 1.31E-02 ug/	2193.3	46.83	9.28	1769	315.014	.9996
+ 2.61E-02 ug/	4347.59	65.94	4.28	3575	310.1283	.9996
+ 5.37E-02 ug/	8360.9	91.44	-4.54E+00	6516	295.2348	.9996
+ .107 ug/	1.76E+04	132.5	-3.74E-01	14367	301.2404	.9998
+ .215 ug/	3.57E+04	188.9	0.28	28585	294.9246	.9999

Zero Point NOT Included. Y=1.66E+05X -1.71E+02

aPS

OCT 24 1996

8019

Sample ID STD 1.31E-2ug
Description CALIBRATION CHECK
Ref. Ratio 1.034
Laser Pulses 1000
Lifetime 313 + .65 us
R2 .9998
Integrated 2440595
Record 3458 of 3481

Date/Time 10/22/96/00:25:05
Cal Y=1.08E+07X+2312.449
Intensity 119564 (t= 52 us)
Conc 1.32E-02 + 2.52E-04 ug/
Dilution Factor 1 mL/mL

FINAL RESULT 1.32E-02 + 2.52E-04 ug/

Range: LOW

Sample ID STD 2.15E-1ug
Description CALIBRATION CHECK
Ref. Ratio 1.046
Laser Pulses 1000
Lifetime 289 + .277 us
R2 1
Integrated 561135
Record 3459 of 3481

Date/Time 10/22/96/00:32:58
Cal Y=1.66E+05X-1.71E+02
Intensity 28616 (t= 52 us)
Conc .21596 + 6.70E-03 ug/
Dilution Factor 1 mL/mL

FINAL RESULT .216 + 6.70E-03 ug/

Range: HIGH

Background Report

Background for LOW Range
Laser Pulses 1000

First Time Gate Used (sample) 5
Date/Time 10/22/96/00:02:51

Reference	Sample
Intensity 82386	Intensity 883
Lifetime 253.9 + .14 us	
R2 1	
Intercept 1.06E+05	

Background Report

Background for HIGH Range
Laser Pulses 1000

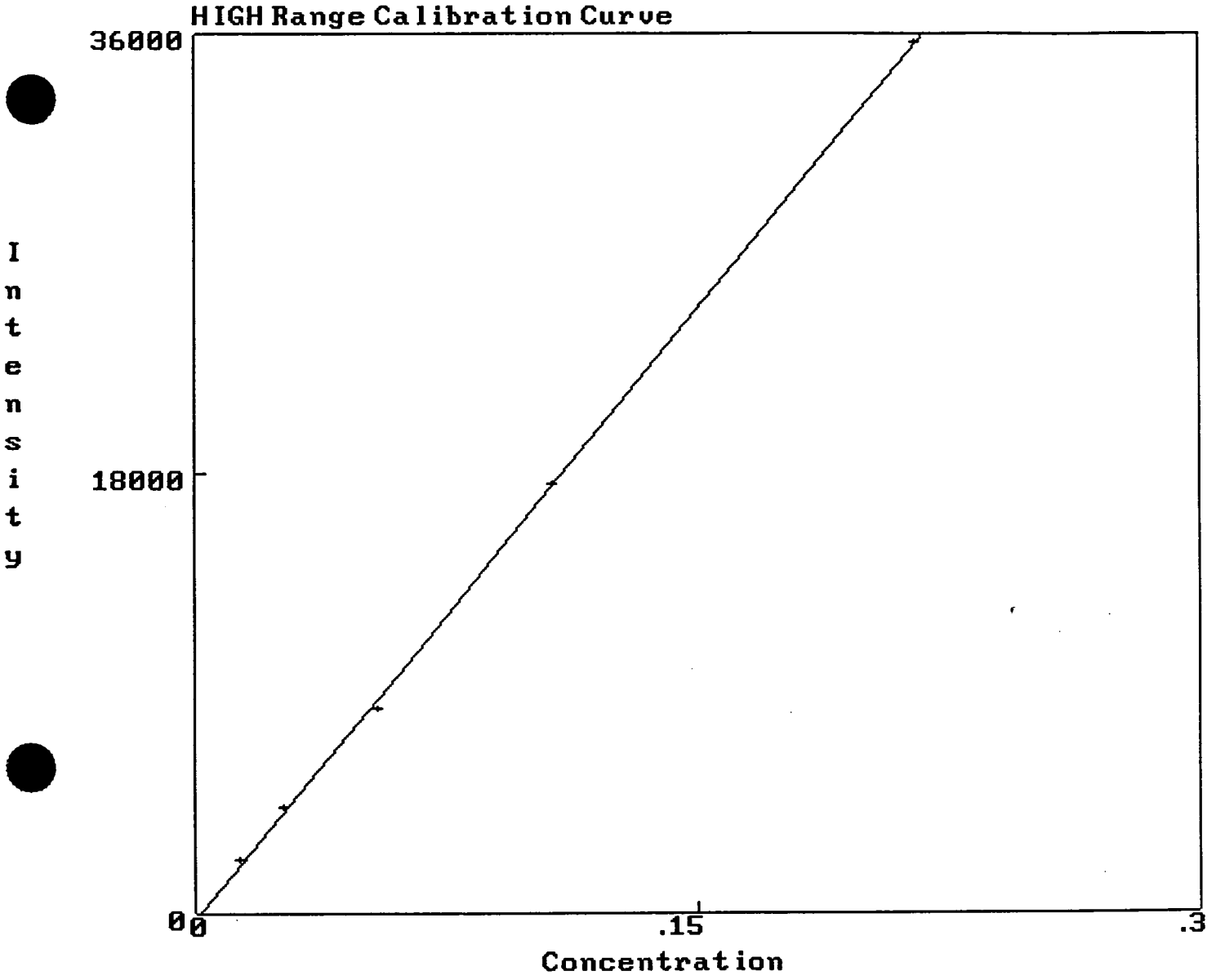
First Time Gate Used (sample) 5
Date/Time 10/22/96/00:04:04

Reference	Sample
Intensity 85930	Intensity 6
Lifetime 252.76 + .44 us	
R2 .99988	
Intercept 1.10E+05	

WPS

OCT 24 1996

8019



OCT 24 1996

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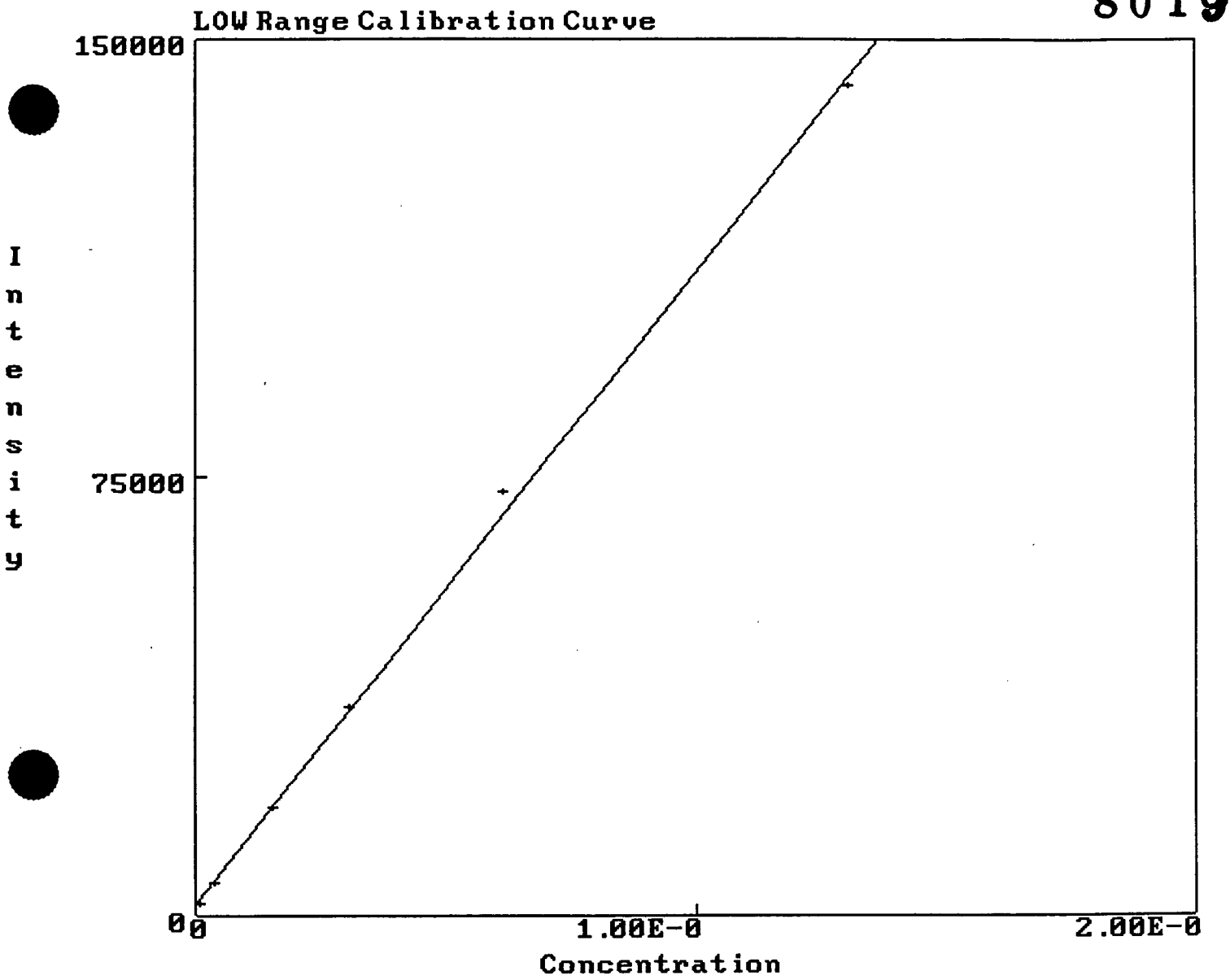

WPS

OCT 24 1996

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DATA CHEM LABORATORIES
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COVER FORM (TYPE I)
SINGLE METHOD ANALYSES

SUMMARY INFORMATION

Form RLIMS63M-V1.3
10219613494084
Page 1

G968S029

Date Reported.....: OCT 22 1996

Date Printed.....: 21-OCT-96 13:49
DCL Report Group..: 96E-0640-04

Client Ref Number.: Not Provided
Release Number....: Not Provided

Analysis Method(s): WR-EP-325

Hayden Environmental
Attention: Bruce Sarven
561 Congress Park Drive
Dayton, OH 45459

Client Sample Name	Laboratory Sample Name	Laboratory Sample ID	Laboratory Group Name	Laboratory Group ID
BL-123240-1	BL-123240-1	S9699072	96E-0640-04	G968S029
QC-123240-1	QC-123240-1	S9699073	96E-0640-04	G968S029
9131,39,40	96E04514	S968S06L	96E-0640-04	G968S029
9135,41,42	96E04515	S968S06M	96E-0640-04	G968S029
9136,43,44	96E04516	S968S06N	96E-0640-04	G968S029
9137,45,46	96E04517	S968S06P	96E-0640-04	G968S029
9137,45,46	96E04517MD	S9699074	96E-0640-04	G968S029

This report is 222 total pages.

Analyst: Robin D. Lully

Reviewer:

Laboratory Supervisor:

000775

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G968S029

DATA CHEM LABORATORIES
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FORM H (TYPE I)
SINGLE METHOD ANALYSES

SAMPLE GROUP COMMENTS

Date Printed.....: 21-OCT-96 13:49
DCL Report Group..: 96E-0640-04

Client Name...: Hayden Environmental

Release Number....: Not Provided

General Information

The DCL QC Database maintains all numerical figures which are input from the pertinent data source. These data have not been rounded to significant figures nor have they been moisture corrected. Reports generated from the system, however, list data which have been rounded to the number of significant figures requested by the client or deemed appropriate for the method. This may create minor discrepancies between data which appear on the QC Summary Forms (Forms B-G) and those that would be calculated from rounded analytical results. Additionally, if a moisture correction is performed, differences will be observed between the QC data and the surrogate data reported on Form A (or other report forms) and corresponding data reported on QC Summary Forms. In these cases, the Form A will indicate the "Report Basis" as well as the moisture value used for making the correction.
Report generation options: 2EX

Result Symbol Definitions

ND - Not Detected above the MDL or IDL (LLD or MDC for radiochemistry).
** - No result could be reported, see sample comments for details.

Qualifier Symbol Definitions

U - Not Detected above the MDL or IDL (LLD or MDC for radiochemistry).
For radiochemistry the nuclide was not identified by the Canberra Nuclear NID program, activity values reported are calculated using the Canberra Nuclear MINACT program.
B - For organic analysis the qualifier indicates that this analyte was found in the method blank.
For inorganic analysis the qualifier signifies the value is between the IDL and PQL.
J - The qualifier indicates that the value is between the MDL and the PQL. It is also used for indicating an estimated value for tentatively identified compounds in mass spectrometry where a 1:1 response is assumed.

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FORM A (TYPE I)
SINGLE METHOD ANALYSES

SAMPLE ANALYSIS DATA SHEET

Form RLIMS63A-V1.3
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Page 3

S9699072

Date Printed.....: 21-OCT-96 13:49
Client Sample Name: BL-123240-1
DCL Sample Name...: BL-123240-1

Client Name.....: Hayden Environmental
Client Ref Number....: Not Provided
Sampling Site.....: Not Applicable
Release Number.....: Not Provided

Matrix.....: AIR
Date Sampled.....: Not Applicable
Reporting Units...: pCi/sample

Date Received.....: Not Applicable
DCL Report Group.....: 96E-0640-04

DCL Preparation Group: G969901S
Date Prepared.....: 08-OCT-96 16:00
Preparation Method...: WR-DC-200
Aliquot Weight/Volume: 1.0E0 S
Net Weight/Volume....: Not Required

DCL Analysis Group: G969901S
Analysis Method...: WR-EP-325
Instrument Type...: GAMMA
Instrument ID.....: GS
Column Type.....: Not Applicable

Analytical Results

Analyte	Date Analyzed	Detection Limit	Result±Error ±TPU Error	Qual.	Dilution	CRDL
Radium-226	10-OCT-96 13:20	6.5E1	2.5E1±7.5E1 ±7.5E1		1.0E0	95
Radium-228	10-OCT-96 13:20	1.7E1	1.7E0±9.4E0 ±9.4E0	U	1.0E0	20

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S9699073

DATA CHEM LABORATORIES
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FORM A (TYPE I)
SINGLE METHOD ANALYSES

SAMPLE ANALYSIS DATA SHEET

Date Printed.....: 21-OCT-96 13:49
Client Sample Name: QC-123240-1
DCL Sample Name...: QC-123240-1

Client Name.....: Hayden Environmental
Client Ref Number....: Not Provided
Sampling Site.....: Not Applicable
Release Number.....: Not Provided

Matrix.....: AIR
Date Sampled.....: Not Applicable
Reporting Units...: pCi/g
RL
10/21/96

Date Received.....: Not Applicable
DCL Report Group.....: 96E-0640-04

DCL Preparation Group: G969901S
Date Prepared.....: 08-OCT-96 16:00
Preparation Method...: WR-DC-200
Aliquot Weight/Volume: 1.0E2g 8 RL 10/21/96
Net Weight/Volume....: Not Required

DCL Analysis Group: G969901S
Analysis Method...: WR-EP-325
Instrument Type...: GAMMA
Instrument ID.....: GS
Column Type.....: Not Applicable

Analytical Results

Analyte	Date Analyzed	Detection Limit	Result±Error ±TPU Error	Qual.	Dilution	CRDL
Radium-226	14-OCT-96 10:56	2.0E0	5.4E1±1.7E1 ±1.9E1		1.0E0	95
Radium-228	14-OCT-96 10:56	5.3E-1	2.8E-1±3.1E-1 ±3.1E-1	U	1.0E0	20

000778

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DATA CHEM LABORATORIES
A Sorenson Company

FORM A (TYPE I)
SINGLE METHOD ANALYSES

SAMPLE ANALYSIS DATA SHEET

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Page 5

S968S06L

Date Printed.....: 21-OCT-96 13:49
Client Sample Name: 9131,39,40|NORTH
DCL Sample Name...: 96E04514

Client Name.....: Hayden Environmental
Client Ref Number....: Not Provided
Sampling Site.....: Not Provided
Release Number.....: Not Provided

Matrix.....: AIR
Date Sampled.....: 19-SEP-96 08:30
Reporting Units...: pCi/S
Report Basis.....: ☒ As Received ☐ Dried

Date Received.....: 25-SEP-96 00:00
DCL Report Group.....: 96E-0640-04

DCL Preparation Group: G969901S
Date Prepared.....: 08-OCT-96 16:00
Preparation Method...: WR-DC-200
Aliquot Weight/Volume: 1.0E0 S
Net Weight/Volume....: Not Required

DCL Analysis Group: G969901S
Analysis Method...: WR-EP-325
Instrument Type...: GAMMA
Instrument ID.....: GS
Column Type.....: Not Applicable

Analytical Results

Analyte	Date Analyzed	Detection Limit	Result±Error ±TPU Error	Qual.	Dilution	CRDL
Radium-226	10-OCT-96 09:06	7.1E1	6.2E1±7.5E1 ±7.6E1		1.0E0	95
Radium-228	10-OCT-96 09:06	1.6E1	-3.4E0±9.6E0 ±9.6E0	U	1.0E0	20

000779

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S968S06M

DATA CHEM LABORATORIES
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FORM A (TYPE I)
SINGLE METHOD ANALYSES

SAMPLE ANALYSIS DATA SHEET

Date Printed.....: 21-OCT-96 13:49
Client Sample Name: 9135,41,42|SOUTH
DCL Sample Name...: 96E04515

Client Name.....: Hayden Environmental
Client Ref Number....: Not Provided
Sampling Site.....: Not Provided
Release Number.....: Not Provided

Matrix.....: AIR
Date Sampled.....: 19-SEP-96 08:30
Reporting Units...: pCi/S
Report Basis.....: ☒ As Received ☐ Dried

Date Received.....: 25-SEP-96 00:00
DCL Report Group.....: 96E-0640-04

DCL Preparation Group: G969901S
Date Prepared.....: 08-OCT-96 16:00
Preparation Method...: WR-DC-200
Aliquot Weight/Volume: 1.0E0 S
Net Weight/Volume....: Not Required

DCL Analysis Group: G969901S
Analysis Method...: WR-EP-325
Instrument Type...: GAMMA
Instrument ID.....: GS
Column Type.....: Not Applicable

Analytical Results

Analyte	Date Analyzed	Detection Limit	Result±Error ±TPU Error	Qual.	Dilution	CRDL
Radium-226	10-OCT-96 09:07	7.7E1	4.4E1±7.9E1 ±7.9E1		1.0E0	95
Radium-228	10-OCT-96 09:07	1.8E1	5.4E0±9.7E0 ±9.7E0	U	1.0E0	20

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DATA CHEM LABORATORIES
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FORM A (TYPE I)
SINGLE METHOD ANALYSES

SAMPLE ANALYSIS DATA SHEET

Form RLIMS63A-V1.3
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S968S06N

Date Printed.....: 21-OCT-96 13:49
Client Sample Name: 9136,43,44|BLANK
DCL Sample Name...: 96E04516

Client Name.....: Hayden Environmental
Client Ref Number....: Not Provided
Sampling Site.....: Not Provided
Release Number.....: Not Provided

Matrix.....: AIR
Date Sampled.....: 19-SEP-96 08:30
Reporting Units...: pCi/S
Report Basis.....: ☒ As Received ☐ Dried

Date Received.....: 25-SEP-96 00:00
DCL Report Group.....: 96E-0640-04

DCL Preparation Group: G969901S
Date Prepared.....: 08-OCT-96 16:00
Preparation Method...: WR-DC-200
Aliquot Weight/Volume: 1.0E0 S
Net Weight/Volume....: Not Required

DCL Analysis Group: G969901S
Analysis Method...: WR-EP-325
Instrument Type...: GAMMA
Instrument ID.....: GS
Column Type.....: Not Applicable

Analytical Results

Analyte	Date Analyzed	Detection Limit	Result±Error ±TPU Error	Qual.	Dilution	CRDL
Radium-226	09-OCT-96 14:43	7.6E1	1.9E1±7.5E1 ±7.5E1		1.0E0	95
Radium-228	09-OCT-96 14:43	1.9E1	5.2E0±1.1E1 ±1.1E1	U	1.0E0	20

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FORM A (TYPE I)
SINGLE METHOD ANALYSES

SAMPLE ANALYSIS DATA SHEET

Date Printed.....: 21-OCT-96 13:49
Client Sample Name: 9137,45,46|RESP
DCL Sample Name...: 96E04517

Client Name.....: Hayden Environmental
Client Ref Number....: Not Provided
Sampling Site.....: Not Provided
Release Number.....: Not Provided

Matrix.....: AIR
Date Sampled.....: 19-SEP-96 08:30
Reporting Units...: pCi/S
Report Basis.....: ☒ As Received ☐ Dried

Date Received.....: 25-SEP-96 00:00
DCL Report Group.....: 96E-0640-04

DCL Preparation Group: G969901S
Date Prepared.....: 08-OCT-96 16:00
Preparation Method...: WR-DC-200
Aliquot Weight/Volume: 1.0E0 S
Net Weight/Volume....: Not Required

DCL Analysis Group: G969901S
Analysis Method...: WR-EP-325
Instrument Type...: GAMMA
Instrument ID.....: GS
Column Type.....: Not Applicable

Analytical Results

Analyte	Date Analyzed	Detection Limit	Result±Error ±TPU Error	Qual.	Dilution	CRDL
Radium-226	09-OCT-96 14:30	6.9e1	8.5E1±8.6E1 ±8.8E1		1.0E0	95
Radium-228	09-OCT-96 14:30	1.8E1	-1.9E0±1.1E1 ±1.1E1	U	1.0E0	20

000782

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FORM A (TYPE I)
SINGLE METHOD ANALYSES

SAMPLE ANALYSIS DATA SHEET

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S9699074

Date Printed.....: 21-OCT-96 13:49
Client Sample Name: 9137,45,46|RESP
DCL Sample Name...: 96E04517MD

Client Name.....: Hayden Environmental
Client Ref Number....: Not Provided
Sampling Site.....: Not Provided
Release Number.....: Not Provided

Matrix.....: AIR
Date Sampled.....: 19-SEP-96 08:30
Reporting Units...: pCi/S
Report Basis.....: ☒ As Received ☐ Dried

Date Received.....: 25-SEP-96 00:00
DCL Report Group.....: 96E-0640-04

DCL Preparation Group: G969901S
Date Prepared.....: 08-OCT-96 16:00
Preparation Method...: WR-DC-200
Aliquot Weight/Volume: 1.0E0 S
Net Weight/Volume....: Not Required

DCL Analysis Group: G969901S
Analysis Method...: WR-EP-325
Instrument Type...: GAMMA
Instrument ID.....: GS
Column Type.....: Not Applicable

Analytical Results

Analyte	Date Analyzed	Detection Limit	Result±Error ±TPU Error	Qual.	Dilution	CRDL
Radium-226	10-OCT-96 13:23	7.8E1	5.6E0±7.3E1 ±7.3E1		1.0E0	95
Radium-228	10-OCT-96 13:23	1.7E1	-1.4E0±1.0E1 ±1.0E1	U	1.0E0	20

000783

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DATA CHEM LABORATORIES
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FORM B (TYPE I)
SINGLE METHOD ANALYSES

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Form RLIMS63B-V1.3
10219613494084
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S9699073

QUALITY CONTROL DATA SHEET
LABORATORY CONTROL SAMPLE (LCS)

Client Name.....: Hayden Environmental
Release Number.....: Not Provided

Matrix.....: SOIL
Reporting Units.....: pCi

Date Printed.....: 21-OCT-96 13:49
DCL Sample Name...: QC-123240-1

DCL Analysis Group: G969901S
Analysis Method...: WR-EP-325
Instrument Type...: GAMMA
Instrument ID.....: GS
Column Type.....: Not Applicable

DCL Preparation Group: G969901S
Date Prepared.....: 08-OCT-96 16:00
Preparation Method...: WR-DC-200

QC Limit Type.....: Method

Analytical Results

Analyte	Date Analyzed	Target	Result	Percent Recovery	QC Limits	QC Flag
Radium-226	14-OCT-96 10:56	5.0E1	5.4E1	108.	75.0/125.	

R. Jolly
10/21/96

000781

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DATA CHEM LABORATORIES
A Sorenson Company

FORM C (TYPE I)
SINGLE METHOD ANALYSES

Form RLIMS63C-V1.3
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QUALITY CONTROL DATA SHEET
BLANK SAMPLE

Client Name.....: Hayden Environmental
Release Number.....: Not Provided

Matrix.....: FILTER
Reporting Units.....: pCi/sample

DCL Preparation Group: G969901S
Date Prepared.....: 08-OCT-96 16:00
Preparation Method...: WR-DC-200

Date Printed.....: 21-OCT-96 13:49
DCL Sample Name...: BL-123240-1

DCL Analysis Group: G969901S
Analysis Method...: WR-EP-325
Instrument Type...: GAMMA
Instrument ID.....: GS
Column Type.....: Not Applicable

QC Limit Type.....: Method

Analytical Results

Analyte	Date Analyzed	Result	CRDL
Radium-226	10-OCT-96 13:20	25.	95
Radium-228	10-OCT-96 13:20	1.7	20

R. Jolly
10/21/96

000785

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S9699074

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FORM E (TYPE I)
SINGLE METHOD ANALYSES

QUALITY CONTROL DATA SHEET
MATRIX DUPLICATE SAMPLE

Client Name.....: Hayden Environmental
Release Number.....: Not Provided

Matrix.....: FILTER
Reporting Units.....: pCi

DCL Preparation Group: G969901S
Date Prepared.....: 08-OCT-96 16:00
Preparation Method...: WR-DC-200

Date Printed.....: 21-OCT-96 13:49
DCL Sample Name...: 96E04517MD

DCL Analysis Group: G969901S
Analysis Method...: WR-EP-325
Instrument Type...: GAMMA
Instrument ID.....: GS
Column Type.....: Not Applicable

QC Limit Type.....: Method

Analytical Results

Analyte	Date Analyzed	Sample Result	Duplicate Result	Mean	Range	RER	QC Limits	QC Flag
Radium-226	10-OCT-96 13:23	8.5E1	5.6E0	46.	80.	1.4	0.00/2.00	
Radium-228	10-OCT-96 13:23	-1.9E0	-1.4E0	-1.7	0.54	0.07	0.00/2.00	

R. Jolly
10/21/96

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DATA CHEM LABORATORIES
A SORENSON COMPANY

8019

Datapackage Table of Contents

Information pertaining to this datapackage is divided into the four categories listed below (see colored divider sheets for an inventory list of each category). If an item on the inventory is not applicable, an "NA" is placed in the corresponding check box. A Case Narrative immediately precedes this Table of Contents and contains pertinent information about this datapackage.

Analytical Forms ..... Yellow
Sample Tracking Documentation ..... Pink
Analytical Documentation ..... Blue
Raw Data ..... Green

♦ ♦ ♦ ♦ ♦ ♦ ♦ ♦ ♦ ♦

Analytical Forms
Inventory Checklist

[NA] Case Narrative

[NA] IRDMIS

- [ ] Data Review and Approval Form
- [ ] IRDMIS Reports
- [ ] GC/MS TICs

[NA] Commercial Forms

- [ ] Analytical or Environmental Report Form
- [ ] Set Comments
- [ ] Applicable QC Sheets

[X] RLIMS Forms

- [X] Cover Form
- [X] Sample Group Comments (Form H)
- [X] Sample Analysis Data Sheet (Form A)
- [X] Laboratory Control Sample (Form B)
- [X] Blank Sample (Form C)
- [NA] Matrix Spike Sample (Form D)
- [X] Matrix Duplicate Sample (Form E)
- [NA] Matrix Spike/Matrix Spike Duplicate Sample (Form F)
- [NA] Surrogate Summary (Form G)
- [NA] Initial Calibration Form
- [NA] Initial Calibration Verification (ICV) Form
- [NA] Continuing Calibration Form
- [NA] Serial Dilution Form
- [NA] Endrin Breakdown or BFB/DFTPP GC/MS Tuning Form

Analytical Forms
Reviewer Checklist

X The Analytical Forms Inventory Checklist above is complete.

X The Case Narrative was completed in accordance with procedures in DCL SOP XX-DC-020, "Datapackage Preparation and Validation."

X Only the correct report forms are used (IRDMIS or Commercial Forms or RLIMS Forms).

X All fields on the report forms are complete with the correct information, including signatures.

X Results for all samples are reported per client request.

X Units, methods, and dates are correct.

X Sample and/or set comments are complete.

000787

Assembled by: Robert Tully (Signature) 10/21/96 (Date) Reviewed by: [signature] (Signature) 10/21/96 (Date)

013

Rev. 6/95

DATA CHEM LABORATORIES
A SORENSON COMPANY

Sample Tracking Documentation
Inventory Checklist

- [x] LIMS Grouping Reports
- [x] DataChem Laboratories (DCL) Chain-of-Custody Record
- [x] DCL Sample Work Order
- [NA] Copy of numbered Nonconformance/Corrective Action Report (NC/CAR)
- [NA] Copy of Client-Related Problem Report (CPR)

Sample Tracking Documentation
Reviewer Checklist

X The Sample Tracking Documentation Inventory Checklist above is complete.

X DCL Chain-of-Custody Record provides signatures for the sample portion reported in this data package.

X DCL Chain-of-Custody Record was completed in accordance with procedures in DCL SOP XX-DC-006 "Chain-of-Custody and Laboratory Tracking."

X Methods specified on the Sample Work Order were performed or an explanation for deviations is provided.

X Special instructions on the Sample Work Order were followed.

X Project Management instructions on the Project Protocol Worksheet were followed.

X Client's requests were met or an explanation is provided in the Case Narrative.

NA NC/CAR and/or CPR were completed in accordance with procedures in DCL SOP QC-DC-006 "Nonconformance/Corrective Action Report (NC/CAR) Procedures."

000788

Assembled by: Robin Tully 10/21/96 (Signature / Date) Reviewed by: [signature] 10/21/96 (Signature / Date)

DataChem Laboratories
LIMS - Sample Master System
Preparation Group Report

te: 10-OCT-1996 13:28
er: LULLY

RLIMS15-V1.2

Preparation Run Name: G969901S

Group ID: G969901S

Samples: 7

Pos	Laboratory Sample Name	Field Sample Name 1	Field Sample Name 2	Laboratory Sample ID	Laboratory Group Name	Accnt. Number
1	BL-123240-1	BL-123240-1		S9699072	96E-0640-04	03025
2	QC-123240-1	QC-123240-1		S9699073	96E-0640-04	03025
3	96E04514	9131,39,40	NORTH	S968S06L	96E-0640-04	03025
4	96E04515	9135,41,42	SOUTH	S968S06M	96E-0640-04	03025
5	96E04516	9136,43,44	BLANK	S968S06N	96E-0640-04	03025
6	96E04517	9137,45,46	RESP	S968S06P	96E-0640-04	03025
7	96E04517MD	9137,45,46	RESP	S9699074	96E-0640-04	03025

----- END OF LISTING -----

R Lully
10/10/96

Earliest Sampling Date: 19-Sep-1996

DataChem Laboratories
CHAIN-OF-CUSTODY

Results due by: 25-Oct-1996

Project/Job/Task: COMM-ENV | Split: | Root Set ID: 96E-0640 * | Reporting Group

Client: Hayden Environmental | Account: 03025

Comments:

Verified: KM 9-25-96

Date Sampled	Field ID Number	DCL Sample Name	DCL Sample ID	QC	Matrix	Customer ID 2			Analysis		01 Method 5 Particulate	02 Isotopic Uranium	03 ISOTOPIC THORIUM	04 Radium 226/228 by gamma spec	05 Total Uranium by kPA					# Bottles
19-Sep-1996	9131,39,40	96E04514			AIR	NORTH					X	X	X	X	X					3
19-Sep-1996	9135,41,42	96E04515			AIR	SOUTH					X	X	X	X	X					3
19-Sep-1996	9136,43,44	96E04516			AIR	BLANK					X	X	X	X	X					3
19-Sep-1996	9137,45,46	96E04517			AIR	RESP					X	X	X	X	X					3

ORIGINAL FIELD SAMPLE CHAIN-OF-CUSTODY

Relinquished By: (Signature)	Date/Time	Received By: (Signature)	Reason for Transfer/ Storage Location
Walk-in/Room/Shelf/Fridge R-23-1 FV	9/25/96 1450	Karen Vigil	Labeling/Shelving
Karen Vigil	9/25/96 1455	Walk-in/Room/Shelf/Fridge R-23-1 FV	Storage: CW-2
R-23-1 QC	9/30/96 1900	[illegible]	sample prep
[illegible]	10/06/96 12:15	Rm 311 QC	storage
Rm 311 T.P.	10/8/96 16:00	Ty E. Peterson	sample digestion
Ty E. Peterson	10/9/96 8:00	Robin Jelly	γ spec

SAMPLE PREPARATION / ANALYSIS CHAIN-OF-CUSTODY

Sample Prep/Analysis for: _____ Lab Notebook No.: _____

Prepared/Analyzed by: _____ Date/Time: _____

Relinquished By: (Signature)	Date/Time	Received By: (Signature)	Reason for Transfer/ Storage Location

Check box if there is a continuation page ☐

Printed 9/25/1996 14:49

Form: COFC1.01-SWV2.30

000290

6

8019

Sample Work Order

8019

QC Clearance: _____

Project Manager: Robert P. Di Rienzo

Client: Hayden Environmental

Account: 03025

Project/Task: COMM-ENV

Date Received: 25-Sep-1996

Date for Mailing Report: 25-Oct-1996

DCL Root Set ID: 96E-0640 *

DCL Lab. Name: 96E04514-96E04517

Total # Samples: 4

Sample Entry: Karyn L. Boyack

Section: WA

Earliest Sampling Date: 19-Sep-1996

Preparation Type:

Rep. Group	Radiochemistry Analytes Requested	Latest Prep. Date	Latest Anal. Date	No. of Samp.	Storage Location	Analysis/Prep. Method	Inst.	Matrix
01	Method 5 Particulate		18-Mar-1997[c]	4		Method 5	GRAV	AIR
02	Isotopic Uranium	1-Oct-1996[c]	18-Mar-1997[c]	4		WR-DC-341 WR-DC-200	AS	AIR
03	ISOTOPIC THORIUM	1-Oct-1996[c]	18-Mar-1997[c]	4		WR-DC-341	AS	AIR
04	Radium 226/228 by gamma spec		18-Mar-1997[c]	4		WR-EP-325 WR-DC-200	GS	AIR
05	Total Uranium by kPA		18-Mar-1997[c]	4		WR-DC-342	kPA	AIR

[c]Based on date of collection

Special Instructions: _____

Section Manager: Charlie C. Walker

Other Sections Receiving Sample Portions: None

SAMPLE LOG-IN SHEET

8019

Group Name: 96E-0640

Lab Name: DataChem Laboratories	Page 1 of 1
Received By (Print Name): Sample Rec. Group	Log-In Date: 9-25-96
Received By (Signature): Tanya Vigil	
Case Number: —	Sample Delivery Group No.: — / SAS Number: NA

Remarks:

		Client ID #1 EPA Sample #	Corresponding Client ID #2 Sample Tag #	Corresponding Assigned Lab #	Matrix	Fraction	Remarks: Condition of Sample Shipment, etc.
1. Custody Seal(s)	Present/Absent*	200259131	North	96E04514	Water	R/A	each client
	Intact/Broken*	39	↓	↓	Water	↓	ID 1 bottle
2. Custody Seal Nos.	N/A	40	↓	↓	Water	↓	needs to be
		200259135	South	96E04515	Water	↓	combined
3. Chain-of-Custody Records	Present/Absent*	41	↓	↓	Water	↓	to create
4. Traffic Reports or Packing Lists	Present/Absent*	42	↓	↓	Water	↓	a single
5. Airbill	Airbill/Sticker	200259136	Blank	96E04516	Water	↓	client ID
	Present/Absent*	43	↓	↓	Water	↓	2 (see PPQ)
6. Airbill No.	9690684221	44	↓	↓	Water	↓	↓
		200259137	Resp	96E04517	Water	↓	↓
7. Sample Tags	Present/Absent*	45	↓	↓	Water	↓	↓
Sample Tag Numbers	Listed/Not Listed on Chain-of-Custody	46	↓	↓	Water	↓	↓
8. Sample Condition	Intact/Broken*/Leaking						
9. Does information on custody records, traffic reports, and sample tags agree?	Yes/No*						
10. Date Received at Lab	9/25/96						
11. Time Received	1000						

Tanya Vigil 9/25/96

Sample Transfer	
Fraction: All	Fraction:
Area #: R-23-1	Area #:
By: TV	By:
On: 9/25/96	On:

* Contact SMO and attach record of resolution.

Reviewed By	Logbook No.
Date	Logbook Page No.

FRACTIONS:
C - Cyanide
D - Dissolved Metals
T - Total Metals
F - Full TCL Organics
P - Pesticides
S - Semivolatiles
V - Volatiles
R - Rad Chem
A - Particulates

FORM DC-1

Note: only highlighted portion of client ID #1s entered into DCL computer system 9/26

018

000792

FERMCO

P.O. BOX 538704
CINCINNATI, OH 45253-8704

CHAIN OF CUSTODY / REQUEST FOR ANALYSIS RECORD

REFERENCE DOCUMENT NO.: SPL-96-2875

ORIGINAL MEF NO.: _____ CORRESPONDING REFERENCE DOCUMENT NO.: _____

PAGE 1 OF 2

RELEASE NO.: 1000012382	PROJECT NO.: N/A	FOR SAMPLE RELATED PROBLEMS ACS CONTACT / PHONE: [redacted] x4198	CONTRACT PURCHASE ORDER / TASK ORDER NO.: N/A
PROJECT NAME: NESHAP STACK SAMPLING		REQUIRED REPORT DATE / LAB TAT: PARTICULATE (10 DAY) RAD (30 DAY)	SAMPLE SHIPMENT DATE: 9-24-96
PROJECT CONTACT / P[redacted] /4198		RECEIVING LAB NAME: DATACHEM	SAMPLE SHIPPER (Print): G Bell
CHARGE NO.: 2EC0-2	N/A	RECEIVING LAB ADDRESS: SALT LAKE CITY	OFF-SITE LAB CONTACT: Robert DiRenzo

SAMPLING TEAM (Print) & GROUP NAME / PHONE: BRUCE SARVEN HAYDEN ENVIRONMENTAL 513-438-3010 Geoff Schoenberger HAYDEN

SAMPLING TEAM (Signature & Badge No.): Bruce Sarven 287-74-1868 Geoff D. Schoenberger 267-82-4754

ITEM NO.	SAMPLE NUMBER: FACTS ID	SAMPLE NUMBER: CUSTOMER ID / SAMPLE POINT	SAMPLE MATRIX		COMP	GRAB	FILTERED	COLLECTION DATE	COLLECTION TIME	CONTAINER TYPE	CONTAINER VOL.	NO. CONTRS	PRESERVATION	ASL	ANALYSES REQUESTED (If more space is required, use the SPECIAL INSTRUCTIONS block.)	SAMPLE OKAY? (Y/N)* FERMCO	SAMPLE OKAY? (Y/N)* OFF-SITE
1	200259131	NORTH FILTER	AF	AIR FILTER	✓		N/A	9-19-96	0830	F	1460 CFM	1	NONE	B	Particulate & Rad *	Y	
2	200259139	NORTH FRONT 1/2	L1	ACETONE	✓		N/A	9-19-96	0830	P	1 L	1	NONE	B	Particulate & Rad *	Y	
3	200259140	NORTH BACK 1/2	L2	~~ACETONE~~ WATER	✓		N/A	9-19-96	0830	P	1 L	1	NONE	B	Particulate & Rad *	Y	
4	200259135	South Filter	AF	AIR FILTER	✓		N/A	9-19-96	0830	F	1360 CFM	1	NONE	B	Particulate & Rad *	Y	
5	200259141	South Front 1/2	~~L2~~ L1	ACETONE	✓		N/A	9-19-96	0830	P	1 L	1	NONE	B	Particulate & Rad *	Y	
6	200259142	South Back 1/2	L2	~~ACETONE~~ WATER	✓		N/A	9-19-96	0830	P	1 L	1	NONE	B	Particulate & Rad *	Y	
7	200259136	Filter Blank	AF	AIR FILTER	✓		N/A	9-19-96	0830	F	N/A	1	NONE	B	Particulate & Rad *	Y	
8	200259143	D.I. Blank	L2	WATER	✓		N/A	9-19-96	0830	P	1 L	1	NONE	B	Particulate & Rad *	Y	
9	200259144	ACETONE BLANK	L1	ACETONE	✓		N/A	9-19-96	0830	P	1 L	1	NONE	B	Particulate & Rad *	Y	
10	200259137	Resp. Filter	AF	AIR FILTER	✓		N/A	9-19-96	0830	F	293 CFM	1	NONE	B	Particulate & Rad *	Y	

SPECIAL INSTRUCTIONS: * Samples to be shipped off-site to DATA-CHEM / UTAH, contact Robert DiRenzo
Analysis to be performed are particulate, U-238, U-234, U-235, U-236, Th-228, Th-230, Th-232
Ra-226, Ra-228 and Total Uranium by Luzer Phosphorometry

RELINQUISHED ITEM / REASON	RELINQUISHED BY (Signature) / AFFILIATION	BADGE NO.	DATE	TIME	RECEIVED BY (Signature) / AFFILIATION	BADGE NO.	DATE	TIME
1-12 Rad Analysis	[redacted]	1 287-74-1868	9/20/96	1630	[redacted]	75148	9/20/96	1630
1-12 Ship		2 75148	9-23-96	0800		630	9-23-96	0800
1-17 Ship		3 630	9-24-96	1300		58552	9-25-96	1002
		4						
		5				6		

DISTRIBUTION OF COPIES: WHITE - ON-SITE - RELEASE FILE / OFF-SITE ANALYTICAL LAB - RETURN TO FEMP; YELLOW - DISTRIBUTE AS NEEDED / OFF-SITE ANALYTICAL LAB - RETURN TO FEMP; BLUE - SAMPLING TEAM - PROJECT FILE

FS-F-3361 (09-21-95)

SHADED AREAS ARE TO BE COMPLETED BY THE RECEIVING GROUP.

* IF "N", THEN COMPLETE APPLICABLE NON-CONFORMANCE PROCEDURE.

000269319

FERMCO

108

CHAIN OF CUSTODY / REQUEST FOR ANALYSIS RECORD (CONTINUED)

PROJECT NO.: N/A

PROJECT NAME: NESHAP STACK SAMPLING

REFERENCE DOCUMENT NO.: SPL-96-2875 1000012382

CORRESPONDING REFERENCE DOCUMENT NO.:

PAGE 2 OF 2

000794020

ITEM NO.	SAMPLE NUMBER FACTS ID	SAMPLE NUMBER CUSTOMER ID / SAMPLE POINT	SAMPLE MATRIX		COMP	GRAB	FILTERED	COLLECTION DATE	COLLECTION TIME	CONTAINER TYPE	CONTAINER VOL.	NO. CONTRS	PRESERVATION	AGL	ANALYSES REQUESTED (If more space is required, use the SPECIAL INSTRUCTIONS block.)	SAMPLE OKAY? (Y/N)* FERMCO	SAMPLE OKAY? (Y/N)* OFF-SITE
11	200259145	Resp. Front 1/2	L1	ACETONE	✓		N/A	9-20-96	0845	P	1L	1	NONE	B	Particulate & Rad	Y	
12	200259146	Resp. Back 1/2	L2	~~ACETONE~~ WATER	✓		N/A	9-20-96	0845	P	1L	1	NONE	B	Particulate & Rad	Y	
		NOTHING FOLLOWS															

SPECIAL INSTRUCTIONS: AF - Air Filter
L1 - Acetone
L2 - D.I. WATER

DISTRIBUTION OF COPIES: WHITE - ON-SITE - RELEASE FILE / OFF-SITE ANALYTICAL LAB - RETURN TO FEMP | YELLOW - DISTRIBUTE AS NEEDED / OFF-SITE ANALYTICAL LAB - RETURN TO FEMP | BLUE - SAMPLING TEAM - PROJECT FILE

FB-F-3361-1 (09-21-95)

SHADED AREAS ARE TO BE COMPLETED BY THE SAMPLE RECEIVING GROUP.

* IF "N", THEN COMPLETE APPLICABLE NON-CONFORMANCE PROCEDURE.

TALLY SHEET

8019

RELEASE #: 1000012382 (CAN 1 OF 1)
PO #: NA
DATE SHIPPED: 23-SEP-96
MATERIAL: NESHAP STACK SAMPLING - AIR FILTERS, ACETONE , AND WATER

ANALYSIS: PARTICULATE AND RAD

Composite Sample Number	Lot Number	Sample Container Size	AnaLis/ FACTS Number	Gross Weight lbs.	Tare Weight lbs.	Net Weight lbs.
NORTH FILTER	W050-730-P047-0417	AIR FILTER	200259131	0.101	0.097	0.004
NORTH FRONT 1/2	W050-730-P047-0417	1 L PLS	200259139	0.300	0.220	0.080
NORTH BACK 1/2	W050-730-P047-0417	1 L PLS	200259140	0.300	0.220	0.080
SOUTH FILTER	W050-730-P047-0417	AIR FILTER	200259135	0.101	0.097	0.004
SOUTH FRONT 1/2	W050-730-P047-0417	1 L PLS	200259141	0.300	0.220	0.080
SOUTH BACK 1/2	W050-730-P047-0417	1 L PLS	200259142	0.300	0.220	0.080
FILTER BLANK	W050-730-P047-0417	AIR FILTER	200259136	0.101	0.097	0.004
DI BLANK	W050-730-P047-0417	1 L PLS	200259143	1.251	0.220	1.031
ACETONE BLANK	W050-730-P047-0417	1 L PLS	200259144	0.300	0.220	0.080
RESP. FILTER	W050-730-P047-0417	AIR FILTER	200259137	0.101	0.097	0.004
RESP. FRONT 1/2	W050-730-P047-0417	1 L PLS	200259145	0.300	0.220	0.080
RESP. BACK 1/2	W050-730-P047-0417	1 L PLS	200259146	0.300	0.220	0.080
				3.755	2.148	1.607

32350

8019

FEMP

COVER SHEET

DOCUMENT TYPE ● RSR ○ RWP

SURVEY FOR RWP? ○ YES ● NO

NAME [redacted]

PAGE 1 OF 4

SIGNE [redacted]

LOCATION Lab WZ6

LOCATION CODE

BADGE #	DATE	TIME	BLDG/GRID#	FLR
7323	09/24/96	09:26	15A	1

SURVEY NUMBER 96-09-11-0165

RWP NUMBER -

COMMENTS Sampleshipment Res. Filters + Acetone Rel# 12352

NA

REVIEWER [redacted] BADGE 7395

SIGN [redacted]

FS-F-4617 (4/22/96)

022

000796

FEMP
RADIOLOGICAL SURVEY REPORT

SURVEY NUMBER: 96- 9 -11- 165

DATE: 9-24-96	RCT NAME: [redacted]	RCT BADGE #: 74323	PAGE:
REVIEWED BY: [redacted]		REVIEWER BADGE NO: 7395	2 OF 4

MODEL	SERIAL NUMBER	TYPE (α, β, γ)	CALIBRATION-DUE DATE	BKGD. (cpm)	EFF./CF	COUNT TIME (min)	MDA (dpm)	INSP./PERFORMANCE TEST DATE YES	NO
LB 5100		LB β	10-96	.26/1.42	.242/.431	2.0	2/A 3	✓	
M3		β	2-97	60	30	NA	3000	✓	
2221	75447	α	9-96	1.2	.16	1	16.2	✓	
					A				
				N					

ITEM NUMBER	LOCATION AND/OR DESCRIPTION	HEIGHT (FT.)	DPM/100cm² ALPHA REMOVABLE (1)	DPM/100cm² ALPHA FIXED PLUS REMOVABLE	DPM/100cm² BETA-GAMMA REMOVABLE (1)	DPM/100cm² BETA-GAMMA FIXED PLUS REMOVABLE	CORRECTED DOSE RATE (MREM/HR) γ CONTACT	β CONTACT	γ AT FT.	β AT FT.
1	200259131	NA	-0 *	-7 *	3	<MDCR				
2	200259136		2	-7.5 *	-2 *					
3	200259135		0 *	-7 *	2 *					
4	200259137		-0 *	5 *	5					
5	200259139		5	NA	4					
6	200259141		2		10					
7	200259145		0 *		5			NA		
8	200259140		0 *		0 *					
9	200259144		-0 *		0 *					
10	200259143		-0 *		0 *					
11	200259142		0 *		1 *					
12	200259146		2		5					
13	2/5 can	↓	-0 *	↓	0 *	↓				
14	9/5 can	NA	0 *	NA	3	<MDCR				
				NA						

Note (1): Values identified by an asterisk (*) indicate results are less than the calculated MDA (RC-RDA-010)

FS-F-1993-1 (REV. 04/18/95)

8019

TUE SEP 24, 1996
GROUP A SMEARS FOR FREE RELEASE (2 MIN)

SAMPLE NUMBER	GROSS ALPHA	GROSS BETA	DPM ALPHA	DPM BETA	TIME OF COUNT
51	0	[illegible]	-0	5	08:03:16
[illegible]	2		[illegible]	-[illegible]	08:05:51
53	1	5	0	2	08:07:46
54	0	[illegible]	-0	3	08:10:01
55	4	7	5	4	08:12:16
56	2	1[illegible]	[illegible]	10	08:14:31
57	1	[illegible]	0	5	08:16:46
58	1	[illegible]	0	0	08:19:01
59	0	[illegible]	-0	0	08:21:16
60	0		-0	0	08:23:31
61	1	4	0	1	08:25:46
62	2	4	1	5	08:28:01
63	0	5	-0	0	08:30:16
64	1	[illegible]	0	3	08:32:30

OPERATION COMPLETE

OPERATION COMPLETE

FEMP RADIOLOGICAL SURVEY REPORT pg 3 of 4
SURVEY # 96-8-11-165 DATED 9/24/96

	(name)	(signature)
RCT:	William Chustern	[illegible]
REVIEWER:	[illegible]	[illegible]

MATERIAL RESTRICTED RELEASE FORM

ITEM NUMBER	ITEM DESCRIPTION	RCT	MATERIAL RELEASE EVALUATOR PRINT/SIGNATURE [1&3]	MATERIAL OWNER/SURVEY REQUESTOR PRINT/SIGNATURE [2&3]
1-4	Filters	N/A	R Atkinson	GORDON BELL
5-12	Acetone	N/A	R Atkinson	GORDON BELL
			NA	

Additional Comments Sgles to DCL-SLC Lic # UT1800237 EXP 11-31-97

[1] Signature by Material Release Evaluator indicates the material may be released for restricted use in the uncontrolled area of the FEMP site only. This material is not being released for unrestricted use.

[2] Signature by the Material Owner/Survey Requestor indicates acceptance of responsibility for the material while in the uncontrolled area and the material will be returned to the controlled area following use.

[3] Additional approval by the Manager of Radiological Compliance is required prior to allowing the material to exit beyond the FEMP property boundary. This allowance may be annotated in the additional comments section of the form.

000 99

FS-F-3916 (06/24/94)

025

FEMP RADIOLOGICAL SURVEY REPORT pg 4 of 4
SURVEY # 96-9-11-164 DATED 9-27-96
(name) (signature)
RCT: William Thaston

PROJECT PROTOCOL WORKSHEET

8019

Project:	Fernald Emission Testing	Date: 09/20/96
Client:	Hayden Environmental	Revision: 1.0
Account:	3025	
Proj. Mngr:	Bob Di Rienzo	

Client Contacts:

Reports:

Bruce Sarven
Hayden Environmental
561 Congress Park Drive
Dayton, OH 45459

Phone: (513) 438-3010
FAX: (513) 438-3020

Invoices:

Same with COC

Schedule: Starts 09/20/96

TAT: 30 Calendar Days

Sample Receipt: Use the 96E sample stream. *Notify Project Manager when samples are received.*

Analyses: **Particulates and Radiochemistry**

QA/QC: Overall QA/QC requirements will be based on the DCL Procedures.

EDL: None.

MS/MSD or MD: As per method

Deliverables: RLIMS63 Report, Raw Data, and COC
Paginate entire package

Penalties: None

Questions: If you have any questions, please contact the project manager either directly or by voice-mail at extension 331, or via e-mail on node tigger.

Special Instructions: **See attached Flow Chart and Instructions**
Particulate mesurement is completed first.
Rinsate and Filter Particulate are used for radiochemistry procedures.

PRICE CODES AND ANALYTE GROUPS:

ANALYTE	MATRIX	EST SAMPLE	METHOD	SECT	HOLD CODE	PRICE CODE	ANALYTE GROUP
Particulate	Air	4	Method 5	WA	NA	3025A01NMET5	3025A1MET5
Iso U	Air	4	AS	WA	NA	3025A01NUISO	3025A1UISO
Iso Th	Air	4	AS	WA	NA	3025A01NTISO	3025A1TISO
Radium 226/228	Air	4	GS	WA	NA	3025A01NGS	3025A1GS
Total Uranium	Air	4	kPA	WA	NA	3025A01NTOTU	3025A1TOTU

8019

DATACHEM LABORATORIES CLIENT-RELATED INFORMATION REPORT (CRIR)

CRIR NO. _____

COOLER INFORMATION CHECKLIST
(Fill In or Circle)

Client Name: FerMcO

Project/Task/Site:

Date/Time of Receipt: 9/25/96 1000

Number of Coolers Received: 1

Condition of Coolers: Acceptable/Unacceptable

Temperature Control: Present/Not Included

Custody Seals: Present/Absent

Intact/Broken

Location Temperature Taken: Control/Between Samples

Tamper Evident: Yes/No

Are all temperatures within project specific guidelines? Yes/No

Ice Present: Yes/No

Frozen/Melted/N/A

Are all applicable pHs within specific guidelines? Yes/No/N/A

Cooler Received	DCL Cooler No.	Temp.	Cooler Received	DCL Cooler No.	Temp.	Cooler Received	DCL Cooler No.	Temp.
* 1	MC96 0437	19 °C	4	MC96	°C	7	MC96	°C
2	MC96	°C	5	MC96	°C	8	MC96	°C
3	MC96	°C	6	MC96	°C	9	MC96	°C

Taken By: Karyn Vigil (Signature) Karyn Vigil (Printed Name) 9/25/96 (Date)

* Rad Chem. Analyses: no temp preservation required

CLIENT-RELATED INFORMATION

- ☐ Missing Cooler
- ☐ Cooler Conditions
- ☐ Missing Paperwork
- ☐ Missing/Incorrect Bottle Labels
- ☐ Missing Samples/Bottles
- ☐ Broken/Leaking Samples
- ☐ Incorrect Bottle Type
- ☐ Cooler Temperatures Out Of Range
- ☐ Incorrect Preservation
- ☐ pH Criteria Not Met
- ☐ Head Space in Bottles
- ☐ Insufficient Sample Volume
- ☐ Chain Of Custody Problems
- ☐ Other:

BRIEFLY DESCRIBE THE PROBLEM AND THE ACTION TAKEN:

Faxed to Client? Yes ☐ No ☐ (If yes, attach Fax Cover Sheet)

❖ Response Required Within 24 Hours ❖

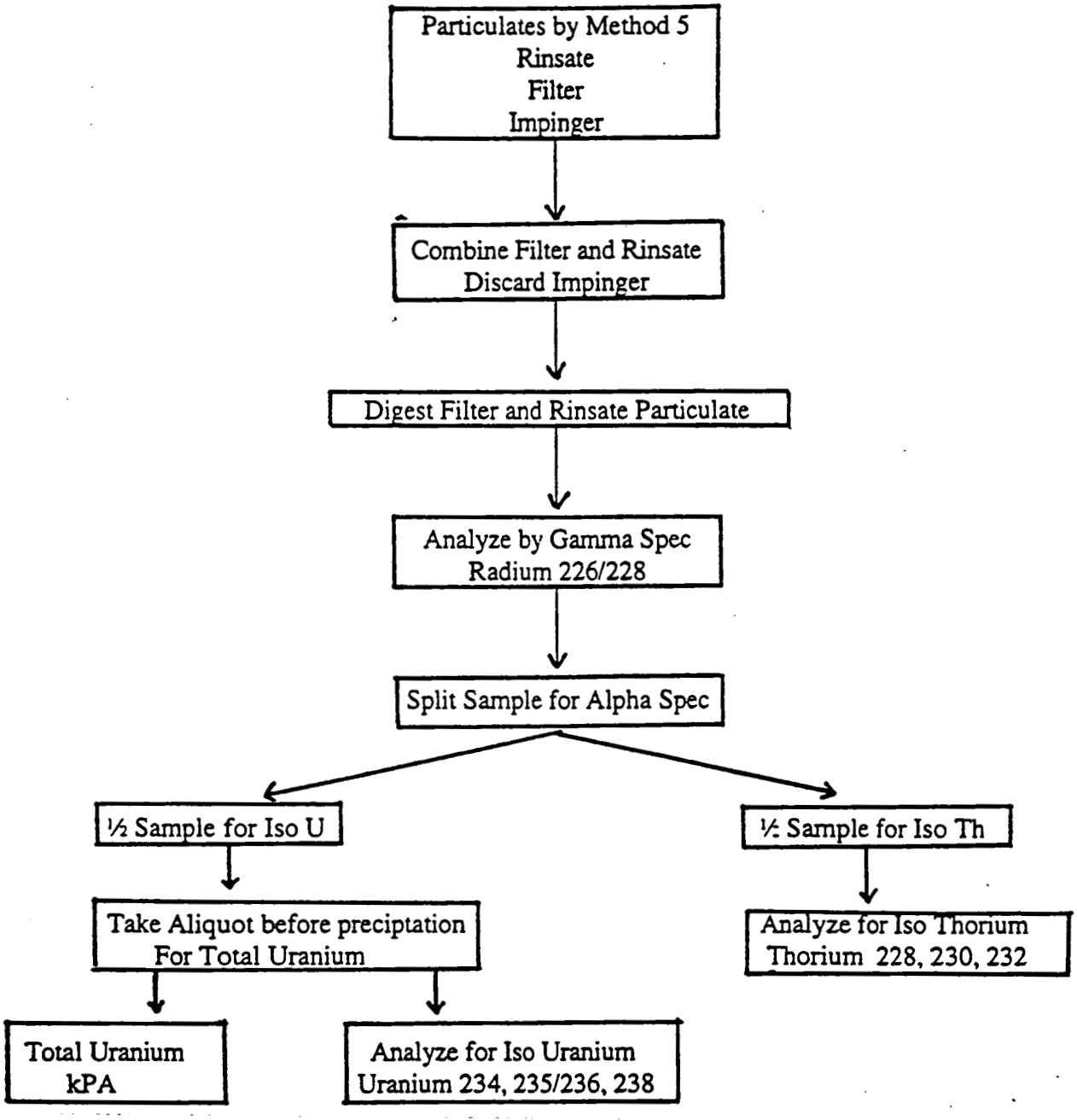
PROJECT MANAGEMENT

PROJECT MANAGER COMMENTS:

Project Manager: _____ (Printed Name) Returned to Sample Receipt by: _____ (Signature) Date: _____

Analytical Scheme
Hayden Environmental - Fernault Emission Testing

3 Samples and Field Blank



DATACHEM LABORATORIES Filter Weight Book No. FWT 06 Page No. 019

8019

Filter Lot #: 7 Temp.: 74 R.H.: 55%

Filter: GF 96-20 (740)
Tare Analyst: JK Date: 9/16/96
Total Weight: ____ mg
Total Weight: ____ mg
Avg. Total Weight: ____ mg
Tare Weight: ~~453.2~~ 447.6 mg
Tare Weight: ~~453.2~~ 447.6 mg 447.6
~~453.2~~
Avg. Tare Weight: ~~453.2~~ mg
SAMPLE No.: ____ SAMPLE WT.: ____ mg
Total Wt. Anal.: ____ Date: ____
Check Analyst: ____ Date: ____

Filter: GF 96-21 (756)
Tare Analyst: JK Date: ____
Total Weight: ____ mg
Total Weight: ____ mg
Avg. Total Weight: ____ mg
Tare Weight: 453.2 mg
Tare Weight: 453.2 mg
Avg. Tare Weight: 453.2 mg
SAMPLE No.: ____ SAMPLE WT.: ____ mg
Total Wt. Anal.: ____ Date: ____
Check Analyst: ____ Date: ____

Filter: GF 96-22 (752)
Tare Analyst: JK Date: ____
Total Weight: ____ mg
Total Weight: ____ mg
Avg. Total Weight: ____ mg
Tare Weight: 448.9 mg
Tare Weight: 448.8 mg
Avg. Tare Weight: 448.9 mg
SAMPLE No.: ____ SAMPLE WT.: ____ mg
Total Wt. Anal.: ____ Date: ____
Check Analyst: ____ Date: ____

Filter: GF 96-23 (753)?
Tare Analyst: JK Date: ____
Total Weight: ____ mg
Total Weight: ____ mg
Avg. Total Weight: ____ mg
Tare Weight: 446.2 mg
Tare Weight: 446.0 mg
Avg. Tare Weight: 446.1 mg
SAMPLE No.: ____ SAMPLE WT.: ____ mg
Total Wt. Anal.: ____ Date: ____
Check Analyst: ____ Date: ____

Filter: GF 96-24 (755)?
Tare Analyst: JK Date: ____
Total Weight: ____ mg
Total Weight: ____ mg
Avg. Total Weight: ____ mg
Tare Weight: 456.6 mg
Tare Weight: 456.3 mg
Avg. Tare Weight: 456.5 mg
SAMPLE No.: ____ SAMPLE WT.: ____ mg
Total Wt. Anal.: ____ Date: ____
Check Analyst: ____ Date: ____

Pre-Testing was supplied filters from GF

Tared on a Sartorius Research (Radcum) DLL #102683 on 9/16/96 JK

Filter: GF 96 25 (754)
Tare Analyst: JK Date: ____
Total Weight: ____ mg
Total Weight: ____ mg
Avg. Total Weight: ____ mg
Tare Weight: 447.5 mg
Tare Weight: 447.4 mg
Avg. Tare Weight: 447.5 mg
SAMPLE No.: ____ SAMPLE WT.: ____ mg
Total Wt. Anal.: ____ Date: ____
Check Analyst: ____ Date: ____

Filter: GF 96-26 (760?)
Tare Analyst: JK Date: ____
Total Weight: ____ mg
Total Weight: ____ mg
Avg. Total Weight: ____ mg
Tare Weight: 451.2 mg
Tare Weight: 450.9 mg
Avg. Tare Weight: 451.1 mg
SAMPLE No.: ____ SAMPLE WT.: ____ mg
Total Wt. Anal.: ____ Date: ____
Check Analyst: ____ Date: ____

Filter: GF 96-27 (761)
Tare Analyst: JK Date: ____
Total Weight: ____ mg
Total Weight: ____ mg
Avg. Total Weight: ____ mg
Tare Weight: 449.3 mg
Tare Weight: 449.2 mg
Avg. Tare Weight: 449.3 mg
SAMPLE No.: ____ SAMPLE WT.: ____ mg
Total Wt. Anal.: ____ Date: ____
Check Analyst: ____ Date: ____

Filter: GF 96-28 (763)
Tare Analyst: JK Date: 9/16/96
Total Weight: ____ mg
Total Weight: ____ mg
Avg. Total Weight: ____ mg
Tare Weight: 450.9 mg
Tare Weight: 450.7 mg
Avg. Tare Weight: 450.8 mg
SAMPLE No.: ____ SAMPLE WT.: ____ mg
Total Wt. Anal.: ____ Date: ____
Check Analyst: ____ Date: ____

Filter: ____
Tare Analyst: ____ Date: ____
Total Weight: ____ mg
Total Weight: ____ mg
Avg. Total Weight: ____ mg
Tare Weight: ____ mg
Tare Weight: ____ mg
Avg. Tare Weight: ____ mg
SAMPLE No.: ____ SAMPLE WT.: ____ mg
Total Wt. Anal.: ____ Date: ____
Check Analyst: ____ Date: ____

DATACHEM LABORATORIES
ANALYTE GROUP LIST
SEARCH STRING: 3025A1MET5

ANALYTE GROUP: 3025A1MET5 ACCOUNT: 03025 DESCRIPTION: Method 5 Particulate

Analyte	Instrument Class	Method	Sub Method	Report Units	Threshold	Lod	Loq
Particulate	GRAV	Method 5		mg/Rinsate			0.1
Particulate	GRAV	Method 5		mg/Filter			0.1
Particulate	GRAV	Method 5		mg/Impinger			0.1
Particulate	GRAV	Method 5		Total mg			0.1

--- END OF LISTING ---

8019
000805
031

DATACHEM LABORATORIES
ANALYTE GROUP LIST
SEARCH STRING: 3025A1UISO

ANALYTE GROUP: 3025A1UISO ACCOUNT: 03025 DESCRIPTION: Isotopic Uranium

Analyte	Instrument Class	Method	Sub Method	Report Units	Threshold	Lod	Loq
Uranium-233/234	AS	WR-DC-341	WR-DC-200	pCi/Sample			1.0
Uranium-235	AS	WR-DC-341	WR-DC-200	pCi/Sample			1.0
Uranium-238	AS	WR-DC-341	WR-DC-200	pCi/Sample			1.0

--- END OF LISTING ---

000806 032

DATACHEM LABORATORIES
ANALYTE GROUP LIST
SEARCH STRING: 3025A1TISO

ANALYTE GROUP: 3025A1TISO ACCOUNT: 03025 DESCRIPTION: ISOTOPIC THORIUM

Analyte	Instrument Class	Method	Sub Method	Report Units	Threshold	Lod	Loq
Thorium-228	AS	WR-DC-341		pCi/Sample			1.0
Thorium-230	AS	WR-DC-341		pCi/Sample			1.0
Thorium-232	AS	WR-DC-341		pCi/Sample			1.0

--- END OF LISTING ---

8019
000507
033

DATACHEM LABORATORIES
ANALYTE GROUP LIST
SEARCH STRING: 3025A1GS

ANALYTE GROUP: 3025A1GS ACCOUNT: 03025 DESCRIPTION: Radium 226/228 by ga

Analyte	Instrument Class	Method	Sub Method	Report Units	Threshold	Lod	Loq
Radium-226	GS	WR-EP-325	WR-DC-200	pCi/Sample			95
Radium-228	GS	WR-EP-325	WR-DC-200	pCi/Sample			20

--- END OF LISTING ---

808
000808
034

DATACHEM LABORATORIES
ANALYTE GROUP LIST
SEARCH STRING: 3025A1TOTU

ANALYTE GROUP: 3025A1TOTU ACCOUNT: 03025 DESCRIPTION: Total Uranium by kPA

Analyte	Instrument Class	Method	Sub Method	Report Units	Threshold	Lod	Loq
Total Uranium	kPA	WR-DC-342		ug/Sample			0.8

--- END OF LISTING ---

000809
035
8019

August 6, 1996
Refer to: BD0021

Bruce Sarven
Hayden Environmental
561 Congress Park Drive
Dayton, OH 45459

Phone: (513) 438-3010
FAX: (513) 438-3020

Re: REVISED FAX Quote BD0021

Dear Mr. Sarven:

DataChem Laboratories, Inc.(DCL) appreciates the opportunity to provide you with cost estimates for your project. As I understand your needs, you will be taking three 6 hour stack samples and a blank by Method 5 for particulates and radionulclides analysis. Tared glass fiber filters and sample bottles will be provided for these determinations. The acetone rinse and glass fiber filter will be combined for the analysis of radionuclides.

Uranium 234, Uranium 235/236, Uranium 238, Thorium 228, Thorium 230, and Thorium 232 will be analyzed by alpha spectrometry(AS). Radium 226 and Radium 228 will be analyzed by gamma spectrometry(GS). Total Uranium will be analyzed by kinetic phosphorescence(KPA). According to method 114 these radionuclides will be part of the particulate loading and analysis on the impinger solutions is not required. Combined particulate from the acetone rinse and filter will be analyzed according to DCL standard operating procedures(SOP).

The standard turnaround time for these analysis is 30 calendar days. The requested turnaround time of 10 working days can be accomplished for an additional 25%. The requested detection limits for isotopic analysis can not be met. Minimun Detectable Activity (MDA) is listed on the attached table.

Attached is a Pricing Quotation for these analyses. If you have any question concerning the attached quotation please call me.

Sincerely,

Robert P. Di Rienzo
Project Manager

Revised Pricing Quotation
Project Reference Number: BD-0021

Parameter Analysis	Method	MDA pCi/Sample	Method	Fractions	Price per Sample
Particulate	Method 5		Grav	Acetone Rinse Filter Impinger	$100.00
Uranium 234 Uranium 235/236 Uranium 238	DCL SOP	1 1 1	AS	Particulate*	$312.50
Thorium 228 Thorium 230 Thorium 232	DCL SOP	1 1 1	AS	Particulate*	$312.50
Radium 226 Radium 228	DCL SOP	95 20	GS	Particulate*	$250.00
Total Uranium	DCL SOP	0.8 ug/ Sample	KPA	Particulate*	$187.50

* = Particulate samples are combined acetone rinse and glass fiber filter.

EMISSION MEASUREMENT TECHNICAL INFORMATION CENTER TEST METHOD

Method 5 - Determination of Particulate Emissions from Stationary Sources

1. PRINCIPLE AND APPLICABILITY

1.1 Principle. Particulate matter (PM) is withdrawn isokinetically from the source and collected on a glass fiber filter maintained at a temperature in the range of 120 ± 14°C (248 ± 25°F) or such other temperature as specified by an applicable subpart of the standards or approved by the Administrator, U.S. Environmental Protection Agency, for a particular application. The PM mass, which includes any material that condenses at or above the filtration temperature, is determined gravimetrically after removal of uncombined water.

1.2 Applicability. This method is applicable for the determination of PM emissions from stationary sources.

2. APPARATUS

2.1 Sampling Train. A schematic of the sampling train used in this method is shown in Figure 5-1. Complete construction details are given in APTD-0581 (Citation 2 in the Bibliography); commercial models of this train are also available. For changes from APTD-0581 and for allowable modifications of the train shown in Figure 5-1, see the following subsections.

The operating and maintenance procedures for the sampling train are described in APTD-0576 (Citation 3 in the Bibliography). Since correct usage is important in obtaining valid results, all users should read APTD-0576 and adopt the operating and maintenance procedures outlined in it, unless otherwise specified herein. The sampling train consists of the following components:

2.1.1 Probe Nozzle. Stainless steel (316) or glass with sharp, tapered leading edge. The angle of taper shall be ≤30°, and the taper shall be on the outside to preserve a constant internal diameter. The probe nozzle shall be of the button-hook or elbow design, unless otherwise specified by the Administrator. If made of stainless steel, the nozzle shall be constructed from seamless tubing; other materials of construction may be used, subject to the approval of the Administrator.

A range of nozzle sizes suitable for isokinetic sampling should be available, e.g., 0.32 to 1.27 cm (1/8 to 1/2 in.)--or larger if higher volume sampling trains are used--inside diameter (ID) nozzles in increments of 0.16 cm (1/16 in.). Each nozzle shall be calibrated according to the procedures outlined in Section 5.

directly from the wash bottle being used, and place it in a glass sample container labeled "acetone blank."

Inspect the train prior to and during disassembly, and note any abnormal conditions. Treat the samples as follows:

Container No. 1. Carefully remove the filter from the filter holder, and place it in its identified petri dish container. Use a pair of tweezers and/or clean disposable surgical gloves to handle the filter. If it is necessary to fold the filter, do so such that the PM cake is inside the fold. Carefully transfer to the petri dish any PM and/or filter fibers that adhere to the filter holder gasket, by using a dry Nylon bristle brush and/or a sharp-edged blade. Seal the container.

Container No. 2. Taking care to see that dust on the outside of the probe or other exterior surfaces does not get into the sample, quantitatively recover PM or any condensate from the probe nozzle, probe fitting, probe liner, and front half of the filter holder by washing these components with acetone and placing the wash in a glass container. Deionized distilled water may be used instead of acetone when approved by the Administrator and shall be used when specified by the Administrator; in these cases, save a water blank, and follow the Administrator's directions on analysis. Perform the acetone rinse as follows:

Carefully remove the probe nozzle, and clean the inside surface by rinsing with acetone from a wash bottle and brushing with a Nylon bristle brush. Brush until the acetone rinse shows no visible particles, after which make a final rinse of the inside surface with acetone.

Brush and rinse the inside parts of the Swagelok fitting with acetone in a similar way until no visible particles remain.

Rinse the probe liner with acetone by tilting and rotating the probe while squirting acetone into its upper end so that all inside surfaces will be wetted with acetone. Let the acetone drain from the lower end into the sample container. A funnel (glass or polyethylene) may be used to aid in transferring liquid washes to the container. Follow the acetone rinse with a probe brush. Hold the probe in an inclined position, squirt acetone into the upper end as the probe brush is being pushed with a twisting action through the probe; hold a sample container underneath the lower end of the probe, and catch any acetone and particulate matter that is brushed from the probe. Run the brush through the probe three times or more until no visible PM is carried out with the acetone or until none remains in the probe liner on visual inspection. With stainless steel or other metal probes, run the brush through in the above prescribed manner at least six times since metal probes have small crevices in which particulate matter can be entrapped.

Rinse the brush with acetone, and
quantitatively collect these washings in the sample container. After the brushing, make a final acetone rinse of the probe as described above.

It is recommended that two people clean the probe to minimize sample losses. Between sampling runs, keep brushes clean and protected from contamination.

After ensuring that all joints have been wiped clean of silicone grease, clean the inside of the front half of the filter holder by rubbing the surfaces with a Nylon bristle brush and rinsing with acetone. Rinse each surface three times or more if needed to remove visible particulate. Make a final rinse of the brush and filter holder. Carefully rinse out the glass cyclone, also (if applicable). After all acetone washings and particulate matter have been collected in the sample container, tighten the lid on the sample container so that acetone will not leak out when it is shipped to the laboratory. Mark the height of the fluid level to determine whether leakage occurred during transport. Label the container to identify clearly its contents.

Container No. 3. Note the color of the indicating silica gel to determine whether it has been completely spent, and make a notation of its condition. Transfer the silica gel from the fourth impinger to its original container, and seal. A funnel may make it easier to pour the silica gel without spilling. A rubber policeman may be used as an aid in removing the silica gel from the impinger. It is not necessary to remove the small amount of dust particles that may adhere to the impinger wall and are difficult to remove. Since the gain in weight is to be used for moisture calculations, do not use any water or other liquids to transfer the silica gel. If a balance is available in the field, follow the procedure for Container No. 3 in Section 4.3.

Impinger Water. Treat the impingers as follows: Make a notation of any color or film in the liquid catch. Measure the liquid that is in the first three impingers to within 1 ml by using a graduated cylinder or by weighing it to within 0.5 g by using a balance (if one is available). Record the volume or weight of liquid present. This information is required to calculate the moisture content of the effluent gas.

Discard the liquid after measuring and recording the volume or weight, unless analysis of the impinger catch is required (see **NOTE**, Section 2.1.7).

If a different type of condenser is used, measure the amount of moisture condensed either volumetrically or gravimetrically.

Whenever possible, containers should be shipped in such a way that they remain upright at all times.

4.3 Analysis. Record the data required on a sheet such as the one shown in Figure 5-3. Handle each sample container as follows:

Container No. 1. Leave the contents in the shipping container or transfer the filter and any loose PM from the sample container to a tared glass weighing dish. Desiccate for 24 hours in a desiccator containing anhydrous calcium sulfate. Weigh to a constant weight, and report the results to the nearest
0.1 mg. For purposes of this Section, 4.3, the term "constant weight" means a difference of no more than 0.5 mg or 1 percent of total weight less tare weight, whichever is greater, between two consecutive weighings, with no less than 6 hours of desiccation time between weighings.

Alternatively, the sample may be oven dried at 105°C (220°F) for 2 to 3 hours, cooled in the desiccator, and weighed to a constant weight, unless otherwise specified by the Administrator. The tester may also opt to oven dry the sample at 105°C (220°F) for 2 to 3 hours, weigh the sample, and use this weight as a final weight.

Container No. 2. Note the level of liquid in the container, and confirm on the analysis sheet whether leakage occurred during transport. If a noticeable amount of leakage has occurred, either void the sample or use methods, subject to the approval of the Administrator, to correct the final results. Measure the liquid in this container either volumetrically to ±1 ml or gravimetrically to ±0.5 g. Transfer the contents to a tared 250-ml beaker, and evaporate to dryness at ambient temperature and pressure. Desiccate for 24 hours, and weigh to a constant weight. Report the results to the nearest 0.1 mg.

Container No. 3. Weigh the spent silica gel (or silica gel plus impinger) to the nearest 0.5 g using a balance. This step may be conducted in the field.

"Acetone Blank" Container. Measure the acetone in this container either volumetrically or gravimetrically. Transfer the acetone to a tared 250-ml beaker, and evaporate to dryness at ambient temperature and pressure. Desiccate for 24 hours, and weigh to a constant weight. Report the results to the nearest 0.1 mg.

NOTE: At the option of the tester, the contents of Container No. 2 as well as the acetone blank container may be evaporated at temperatures higher than ambient. If evaporation is done at an elevated temperature, the temperature must be below the boiling point of the solvent; also, to prevent "bumping," the evaporation process must be closely supervised, and the contents of the beaker must be swirled occasionally to maintain an even temperature. Use extreme care, as acetone is highly flammable and has a low flash point.

4.4 Quality Control Procedures. The following quality control procedures are

suggested to check the volume metering system calibration values at the field test site prior to sample collection. These procedures are optional for the tester.

4.4.1 Meter Orifice Check. Using the calibration data obtained during the calibration procedure described in Section 5.3, determine the $\Delta H_@$ for the metering system orifice. The $\Delta H_@$ is the orifice pressure differential in units of in. H_20 that correlates to 0.75 cfm of air at 528°R and 29.92 in. Hg. The
$\Delta H_@$ is calculated as follows:

$$\Delta H_@ = 0.0319\, \Delta H \frac{T_m\, \theta^2}{P_{bar}\, Y^2\, V_m^2}$$

where:

ΔH = Average pressure differential across the orifice meter, in. H_20.

T_m = Absolute average DGM temperature, °R.

P_{bar} = Barometric pressure, in. Hg.

θ = Total sampling time, min.

Y = DGM calibration factor, dimensionless.

V_m = Volume of gas sample as measured by DGM, dcf.

0.0319 = (0.0567 in. Hg/°R)(0.75 cfm)^2

Before beginning the field test (a set of three runs usually constitutes a field test), operate the metering system (i.e., pump, volume meter, and orifice) at the $\Delta H_@$ pressure differential for 10 minutes. Record the volume collected, the DGM temperature, and the barometric pressure. Calculate a DGM calibration check value, Y_c, as follows:

$$Y_c = \frac{10\, [0.0319\, T_m]^{1/2}}{V_m\, P_{bar}}$$

where:

Y_c = DGM calibration check value, dimensionless.

DATA CHEM LABORATORIES
A SORENSON COMPANY

8019

Analytical Documentation
Inventory Checklist

- [NA] This is a "dummy datapackage". Data for inventory checklist found with set _____
- [NA] Copy of TCLP Preparation Logbook Pages
- [X] Copy of Sample Preparation Notebook/Logbook Pages
- [X] Copy of Analyst's Notebook/Method Logbook Pages
- [X] Copy of Instrument Injection Logbook/Instrument Logbook/Run Log Pages
- [NA] Copy of Reagent Logbook Pages
- [NA] Copy of Working Standard Preparation Logbook Pages
- [NA] Copy of Secondary or Intermediate Standard Preparation Logbook Pages
- [NA] Copy of Primary Standard or Concentrated Stock Standard Preparation Logbook Pages
- [X] Certificates of Analysis for Standards
- [NA] Copy of Standard Verification Logbook Pages (including documentation for spiking solutions and/or calibration standards)
- [NA] Copy of Preparation Logbooks for solutions prepared by QC

All other miscellaneous documentation associated with this set (describe)

- [NA] _____

Analytical Documentation
Reviewer Checklist

- X The Analytical Documentation Inventory Checklist above is complete.
- X Basic documentation procedures were followed in accordance with DCL SOP XX-DC-004 "Analytical Data Record Keeping."
- X All notebook and logbook pages contain page number, book number, title, and available space for pagination (if required).
- X All notebook and logbook pages were signed and dated by the analyst and reviewer before copying.
- X All copies are legible.
- X Standard preparation is documented in accordance with DCL SOP XX-DC-019 "Standards Purity, Preparation, Traceability and Verification" or by WR-DC-001 "The Acquisition, Preparation, and use of Radioactive Standard Reference Materials."
- X Documentation is provided to verify that standard calibration solutions and spiking solutions are traceable to a vendor certificate.

Assembled by: Robert Tully 10/21/96 (Signature / Date) Reviewed by: [signature] 10/21/96 (Signature / Date)

Rev. 6/95

044

000018

DATACHEM LABORATORIES Filter Weight Book No. FWT 00 Page No. 019

Filter Lot #: 7 Temp.: 74 R.H.: 55% 8019

Filter: GF 96-20 (740)
Tare Analyst JK Date 9/16/96
Total Weight ____ mg
Total Weight ____ mg
Avg. Total Weight ____ mg
Tare Weight ~~453.2~~ 447.6 mg
Tare Weight ~~453.2~~ 447.6 mg
Avg. Tare Weight ~~453.2~~ 447.6 mg
SAMPLE No. ____ SAMPLE WT. ____ mg
Total Wt. Anal. ____ Date ____
Check Analyst ____ Date ____

Filter: GF 96-21 (756)
Tare Analyst JK Date ____
Total Weight ____ mg
Total Weight ____ mg
Avg. Total Weight ____ mg
Tare Weight 453.2 mg
Tare Weight 453.2 mg
Avg. Tare Weight 453.2 mg
SAMPLE No. ____ SAMPLE WT. ____ mg
Total Wt. Anal. ____ Date ____
Check Analyst ____ Date ____

Filter: GF 96-22 (752)
Tare Analyst JK Date ____
Total Weight ____ mg
Total Weight ____ mg
Avg. Total Weight ____ mg
Tare Weight 448.9 mg
Tare Weight 448.8 mg
Avg. Tare Weight 448.9 mg
SAMPLE No. ____ SAMPLE WT. ____ mg
Total Wt. Anal. ____ Date ____
Check Analyst ____ Date ____

Filter: GF 96-23 (753)?
Tare Analyst JK Date ____
Total Weight ____ mg
Total Weight ____ mg
Avg. Total Weight ____ mg
Tare Weight 446.2 mg
Tare Weight 446.0 mg
Avg. Tare Weight 446.1 mg
SAMPLE No. ____ SAMPLE WT. ____ mg
Total Wt. Anal. ____ Date ____
Check Analyst ____ Date ____

Filter: GF 96-24 (753)?
Tare Analyst JK Date ____
Total Weight ____ mg
Total Weight ____ mg
Avg. Total Weight ____ mg
Tare Weight 456.6 mg
Tare Weight 456.3 mg
Avg. Tare Weight 456.5 mg
SAMPLE No. ____ SAMPLE WT. ____ mg
Total Wt. Anal. ____ Date ____
Check Analyst ____ Date ____

Pre Testing w/ supplied filters from GFF

Tared on a Sartorius Research (Rad Chem) DLL #102683 on 9/16/96 JK

Filter: GF 96-25 (754)
Tare Analyst JK Date ____
Total Weight ____ mg
Total Weight ____ mg
Avg. Total Weight ____ mg
Tare Weight 447.5 mg
Tare Weight 447.4 mg
Avg. Tare Weight 447.5 mg
SAMPLE No. ____ SAMPLE WT. ____ mg
Total Wt. Anal. ____ Date ____
Check Analyst ____ Date ____

Filter: GF 96-26 (760?)
Tare Analyst JK Date ____
Total Weight ____ mg
Total Weight ____ mg
Avg. Total Weight ____ mg
Tare Weight 451.2 mg
Tare Weight 450.9 mg
Avg. Tare Weight 451.1 mg
SAMPLE No. ____ SAMPLE WT. ____ mg
Total Wt. Anal. ____ Date ____
Check Analyst ____ Date ____

Filter: GF 96-27 (761)
Tare Analyst JK Date ____
Total Weight ____ mg
Total Weight ____ mg
Avg. Total Weight ____ mg
Tare Weight 449.3 mg
Tare Weight 449.2 mg
Avg. Tare Weight 449.3 mg
SAMPLE No. ____ SAMPLE WT. ____ mg
Total Wt. Anal. ____ Date ____
Check Analyst ____ Date ____

Filter: GF 96-28 (763)
Tare Analyst JK Date 9/16/96
Total Weight ____ mg
Total Weight ____ mg
Avg. Total Weight ____ mg
Tare Weight 450.9 mg
Tare Weight 450.7 mg
Avg. Tare Weight 450.8 mg
SAMPLE No. ____ SAMPLE WT. ____ mg
Total Wt. Anal. ____ Date ____
Check Analyst ____ Date ____

Filter: ____
Tare Analyst ____ Date ____
Total Weight ____ mg
Total Weight ____ mg
Avg. Total Weight ____ mg
Tare Weight ____ mg
Tare Weight ____ mg
Avg. Tare Weight ____ mg
SAMPLE No. ____ SAMPLE WT. ____ mg
Total Wt. Anal. ____ Date ____
Check Analyst ____ Date ____

From Page No.

Client	Account No.	Set No.	Sample Nos.	Matrix	Balance ID
Hayden Enviro.	3025	96E-0640 *	96E04514-4517	AIR/FILTER	102695

Filters and acetone rinse were combined after acetone rinse was dryed. Samples were placed in metal based teflon beakers and dissolved in 6 mL of HF (hydrofluoric acid) and then taken to near dryness to expell all of the HF. The samples were then transferred to tared P.M.P. jars and brought up to approximately 100.0 g, using 1 M HNO_3 (nitric acid).

Sample Number	Final Mass in Tared PMP.
96E04514	100.0 g
96E04515	106.4 g
96E04516	100.1 g
96E04517	100.1 g

T.P. 10-8-96

To Page No.

Witnessed & Understood by me,	Date	Invented by	Date
Bradley J. Richardson	10-21-96	Recorded by Ty E. Peterson	10/8/96

Gamma Spectrometry

Client: Hayden Environmental Account No.: 3025 Set No.: 96E-0640-04

Sample Matrix: Air Prep Group ID: G9699018 Date of Last Calibration: NA

Calibration Standard ID: IPL 479-114-3 Daily Source Check ID: CZ-588

Spiking Solution ID: — Concentration(pCi/mL): — Aliquot: —

Pipet Used: NA Counting Geometry: PMP

SAMPLE#	ALIQUOT	DETECTOR	FILE NAME
BL-123240-1	100.0	γ5 Smp.	BL123240L_GAMMA5_PMP_9190
QC-123240-1	100.4g	γ6 Smp.	QC123240L_GAMMA6_PMP_~~9192~~ 9220 RL 10/14/96
96E04514	1 Filter	γ5 Smp.	96E04514_GAMMA5_PMP_9186
4515	↓	γ6 Smp.	96E04515_GAMMA6_PMP_9187
4516		γ5 Smp.	96E04516_GAMMA5_PMP_ RL 10/11/96 9183
4517	↓	γ6 Smp.	96E04517_GAMMA6_PMP_9182
4517MD	1 Filter	γ6 Smp.	96E04517MD_GAMMA6_PMP_9191

R. Foley 10/21/96

Comments:

*N/A=Not Applicable

000821

Recorded by: Robin Foley Date: 10/21/96 Reviewed by: M A Bennett Date: 10-21-96

Gamma Spectroscopy Run Log

Book Number 4076

Date	Det. ID	Analyst	Filename	Minutes
10-8-96	6	MAB	SMP_96M04436_Gamma6_TRMIS3_9163	60
10-8-96	NaI	MAB	SMP_96E04627_NaI_Canister_9164	10
	NaI		SMP_96E04627MD_NaI_Canister_9165	10
	NaI		SMP_96E04628_NaI_Canister_9166	10
	NaI		SMP_QC1238841_NaI_Canister_9167	10
	5		SMP_96M04435MD_Gamma5_TRMIS3_9168	60
10-8-96	6	MAB	SMP_96M04437_Gamma6_TRMIS3_9169	60
10-8-96	2	MAB	SMP_L4250_Gamma2_IPLIL_9170	500
MAB 10-8-96	~~2~~	~~MAB~~	~~SMP_L4250MD_Gamma2_IPLIL_~~	~~500~~
	~~2~~	~~MAB~~	~~SMP_L4250RMD_Gamma2_IPLIL_~~	~~500~~
10-8-96	NaI	MAB	SMP_BCKGND_Gamma2_Canister_9171	10
10-9-96	1	MAB	QCC_Gamma1_CZ588-1	15
	2		2	
	3		3	
	4		4	
	5		5	
10-9-96	6	MAB	QCC_Gamma6_CZ588-1	15
10-9-96	2	MAB	SMP_96M04410_Gamma2_TRMIS3_9173	100
	5	RL	Smp_96E04514_GAMMA5_PMP_9172	240
	6	RL	Smp_96E04515_GAMMA6_PMP_9174	240
10/9/96	1	MT	SMP_BL1234502_GAMMA1_IPLIL_9175	240
10/9/96	3	MT	SMP_QC1234502_GAMMA3_IPLIL_9176	240
10/9/96	2	MT	SMP_96C05433_GAMMA2_IPLIL_9177	1000
10/9/96	4	MT	SMP_96C05434_GAMMA4_IPLIL_9178	1000
	5	RL	Smp_96E04516_GAMMA5_PMP_9179	240 (4)
	6	RL	Smp_96E04517_GAMMA6_PMP_9180	240 (4)
10/9/96	1	MT	SMP_BL1234501_Gamma1_IPLIL_9184	240
10/9/96	3	MT	SMP_QC1234501_Gamma3_IPLIL_9185	240
	5	RL	Smp_96E04516_GAMMA5_PMP_9181	240 (4)
	6		Smp_96E04517_GAMMA6_PMP_9182	240
	5	RL	Smp_96E04516_GAMMA5_PMP_9183	240
10/10/96	1	MT	QCC_Gamma1_CZ588-1	15

Reviewed By: M. [illegible] 10/10/96
Signature & Date

Gamma Spectroscopy Run Log

Book Number 4076

Date	Det. ID	Analyst	Filename	Minutes
10/10/96	2	MT	QCC-Gamma2-CZ588-1	15
	3		3-	
	4		4-	
	5		5-	
	6		6-	
10/10/96	5	RL	Smp-96E04514-Gamma5-PMP-9186	240
10/10/96	6	RL	Smp-96E04515-Gamma6-PMP-9187	240
~~10/9/96~~	~~6~~	~~RL~~	~~Smp-96E04517MD-Gamma6-PMP~~ RLuely 10/10/96	~~240~~
10/10/96	2	MT	SMP-BL1227641-Gamma2-IPLIL-9188	1000
10/10/96	4	MT	SMP-QC1227641-Gamma4-IPLIL-9189	1000
	5	RL	Smp-BL1232401-Gamma5-PMP-9190 RL 10/10/96	240
	6	RL	Smp-96E04517MD-Gamma6-PMP-9191	240
10/10/96	5	RL	Smp-QC1232401-Gamma5-PMP-9192	240
10/10/96	6	MT	SMP-96C05434MD-Gamma6-IPLIL-9193	1000
10/10/96	1	MT	SMP-96E04554-Gamma1-IPLIL-9194	240
10/10/96	3	MT	SMP-96E04560-Gamma3-IPLIL-9195	240

Reviewed By: _____
Signature & Date

Gamma Spectroscopy
Calibration/Maintenance Log

Book Number 4075

Date	Det. ID	Analyst	Comments
9/20/96	1→6	MAB	LN_2 Refill, Calibrations, BKGND
9/24/96	1→6	MT	QCC
9/25/96	1→6	MT	QCC
9/26/96	1→6	MT	QCC
9/27/96	1→6	MT	QCC
9/27/96	1→6	MT	LN_2 Refill
9/27/96	1→6	MT	Backgrounds.
9/30/96	1→6	MT	CAL & QCC
10/1/96	1→6	MT	QCC
10/2/96	1→6	MT	QCC
10/4/96	1→6	MAB	LN_2 Refill, Background
10-7-96	1-6	MAB	Calibration & QCC

Reviewed By: _____
Signature & Date

ALLIED Bendix Aerospace

Bendix Field Engineering Corporation
P.O. Box 1569
Grand Junction, CO 81502-1569
Telephone (303) 242-6621
Telex 454-339

January 9, 1986

Dear Reader and Custodian of TMC Radium-226 Reference Material:

A number of you have inquired about the values for lead-210 in the radium-226 reference material sets we prepared and distributed. Attached is a brief note describing the results of our analysis of the reference material for lead-210 and for one of its daughters, polonium-210. The results, and their associated uncertainties at one standard deviation, are summarized below:

Nominal Radium-226 (pCi/g)	Lead-210 (pCi/g)
5	5.2 ± 0.2
15	15.7 ± 0.6
50	51.5 ± 1.7

We hope you find these data useful.

Happy counting!

Sincerely yours,

John R. Duray

John R. Duray
Project Manager
Technical Measurements Center

Attachment

Addendum to Technical Measurements Center Report GJ/TMC-10

DEVELOPMENT OF SOLID RADIUM-226 REFERENCE MATERIALS[1]

INTRODUCTION

Many users of the Technical Measurements Center (TMC) radium-226 reference materials have suggested that the materials would be more useful if the values for lead-210 were known. Accordingly, the Analytical Chemistry Laboratory of Bendix Field Engineering Corporation/Grand Junction Operations (Bendix) has analyzed the reference materials for lead-210 by means of liquid scintillation counting following acid digestion of the materials and anion-exchange separation of lead-210.[2] In addition, alpha spectrometry was used to measure polonium-210, a daughter of lead-210, after equilibrium had been achieved.[3] Certified lead-210 and polonium-208 standards, traceable to the National Bureau of Standards, were used for calibration purposes.

RESULTS

The lead-210 and polonium-210 results for each of the three sets of reference material (5, 15, and 50 pCi/g) are presented in Tables 1, 2, and 3, respectively. Examination of these results for extreme values, as described by Dixon and Massey,[4] revealed one outlier in the polonium-210 results for the 15-pCi/g data set. This value was excluded from the data set when calculating the mean value.

---

[1]R. B. Chessmore and P. R. Engelder, 1983. Development of Solid Radium-226 Reference Materials, GJ/TMC-10, U.S. Department of Energy, Technical Measurements Center, Grand Junction, Colorado.

[2]W. D. Fairman and J. Sedlet, 1968. 'Direct Determination of Lead-210 by Liquid Scintillation Counting,' Analytical Chemistry, Vol. 40, No. 13, pp. 2004-2008.

[3]A. B. MacKenzie and R. D. Scott, 1979. 'Separation of Bismuth-214 and Polonium-210 from Aqueous Solutions by Spontaneous Adsorption on Copper Foils,' Analyst, Vol. 104, pp. 1151-1158.

[4]W. J. Dixon and F. J. Massey, Jr., 1969. Introduction to Statistical Analysis: Third Edition, McGraw-Hill Book Co., Inc., New York, New York.

DISCUSSION

The mean values of the results obtained for lead-210 and polonium-210 are presented in Tables 1, 2, and 3. Also cited are the experimental standard deviations in order to provide an indication of the precision of the measurements. The suggested value for lead-210 in the reference materials, given at the bottom of each table, is the average of all the determinations obtained using both methods, excluding outliers. The uncertainties cited are associated with the experimental standard deviations only and do not include systematic errors. Since these results have not been validated by other workers, they should be considered as 'for information only' values.

Table 1. Results of Bendix Analysis for Pb-210 and Po-210: 5-pCi/g Ra-226 Reference Material

Bottle Number	Lead-210 (pCi/g)	Polonium-210 (pCi/g)
117	5.5	5.0
116	5.2	5.4
101	5.5	5.0
114	5.2	5.1
108	5.3	4.9
110	5.4	5.0
104	5.2	5.2
112	5.3	4.9
120	5.4	5.2
Mean	5.3	5.1
Experimental Standard Deviation	±0.1	±0.2
Suggested Value for Lead-210:	5.2 ± 0.2 pCi/g	

Table 2. Results of Bendix Analysis for Pb-210 and Po-210: 15-pCi/g Ra-226 Reference Material

Bottle Number	Lead-210 (pCi/g)	Polonium-210 (pCi/g)
106	15.1	15.7
124	15.3	13.9[a]
103	15.9	16.2
112	15.0	15.8
109	15.2	15.7
105	15.3	16.1
101	15.6	15.8
119	14.8	16.9
114	15.3	16.5
Mean	15.3	16.1
Experimental Standard Deviation	±0.3	±0.4
Suggested Value for Lead-210:	15.7 ± 0.6 pCi/g	

[a]Outlier.

Table 3. Results of Bendix Analysis for Pb-210 and Po-210: 50-pCi/g Ra-226 Reference Material

Bottle Number	Lead-210 (pCi/g)	Polonium-210 (pCi/g)
107	53.5	51.4
122	49.3	51.9
105	52.6	49.5
110	49.6	51.6
120	51.6	53.7
101	51.6	54.5
116	49.9	50.6
119	51.0	49.0
108	51.2	53.9
Mean	51.1	51.8
Experimental Standard Deviation	±1.4	±1.9
Suggested Value for Lead-210:	51.5 ± 1.7 pCi/g	

UNC Geotech

UNC Geotech
2597 B 3/4 Road
P.O. Box 14000
Grand Junction, Colorado 81502-5504
303/242-8621

October 1987

Dear Reader:

The DOE Technical Measurements Center report entitled *Uranium Reference Materials*, UNC/GJ--36(TMC) published in July 1987, incorrectly identified uranium mill tailings reference material TRM-3 as having a recommended U-238 concentration of 29.6 pCi/g (Table 7, page 6). The correct recommended concentration for TRM-3 is 19.6 pCi/g. Attached is the corrected table, which can be easily inserted into the report by peeling the paper off of the gummed back and pasting it over the current Table 7.

We regret any inconvenience that this typographical error may have caused. If you have any further questions, please do not hesitate to contact me at 303-242-8621 or FTS 322-9543.

Sincerely,

John R. Duray

John R. Duray
Project Manager
Technical Measurements Center

Distribution:
UC-70A
S-70A
Reference Material Holders
of Record

A subsidiary of UNC Incorporated

8019

UNC/GJ-36(TMC)
Distribution Category: UC-70A

Uranium Reference Materials

Stephen Donivan
Ronald Chessmore

Published July 1987

UNC Geotech
Technical Measurements Center
Grand Junction, Colorado 81502-5504

Prepared for the
U.S. Department of Energy
Grand Junction Projects Office
Under Contract No. DE-AC07-86ID12584

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Summary

The Technical Measurements Center (TMC), located at the U.S. Department of Energy (DOE) Grand Junction Projects Office (GJPO), has been tasked by the DOE Office of Remedial Action and Waste Technology to support ongoing remedial action programs by providing both technical guidance and assistance in making the various measurements required in all phases of remedial action work. Pursuant to this task, the Technical Measurements Center has prepared uranium mill tailings reference materials for use by remedial action contractors and cognizant federal and state agencies. Four materials were prepared with varying concentrations of radionuclides, using three tailings materials and a river-bottom soil diluent. All materials were ground, dried, and blended thoroughly to ensure homogeneity. The analyses on which the recommended values for nuclides in the reference materials are based were performed, using independent methods, by the UNC Geotech (UNC) Chemistry Laboratory, Grand Junction, Colorado, and by C. W. Sill (Sill), Idaho National Engineering Laboratory, Idaho Falls, Idaho.

Several statistical tests were performed on the analytical data to characterize the reference materials. Results of these tests reveal that the four reference materials are homogeneous and that no large systematic bias exists between the analytical methods used by Sill and those used by TMC. The average values for radionuclides of the two data sets, representing an unbiased estimate, were used as the recommended values for concentrations of nuclides in the reference materials. The recommended concentrations of radionuclides in the four reference materials are listed in Table 7. Use of these reference materials will aid in providing uniform standardization among measurements made by remedial action contractors. The reference materials are available free of charge to remedial action contractors and to Federal and State agencies involved in DOE Remedial Action Programs. Individuals interested in obtaining these reference materials are encouraged to contact the Technical Measurements Center by calling FTS 322-9543 (303/242-8621, Ext. 543).

Companion sets of Ra-226[1] and Th-232[2] reference materials have previously been prepared and are also available from the Technical Measurements Center. Gamma spectroscopic measurement results for Th-228 and K-40, determined during the Ra-226 analysis performed by the UNC Chemistry Laboratory, are presented in Appendix A.

URANIUM REFERENCE MATERIALS

Introduction

Uranium mill tailings reference materials are necessary for ensuring uniform standardization among radionuclide measurements performed by remedial action contractors. The Technical Measurements Center undertook the task of preparing approximately 200 pounds each of four different uranium mill tailings reference materials. The materials were prepared with varying radionuclide concentrations from three different tailings materials and a soil diluent. Uranium-238 concentrations of approximately 5, 20, 50, and 100 picocuries per gram (pCi/g) were used as target values.

Concentrations of U-238, U-234, Th-230, Ra-226, and Pb-210 in each of the reference materials were measured by C. W. Sill of Idaho National Engineering Laboratory, and by the UNC Geotech Chemistry Laboratory, Grand Junction, Colorado, using independent methods.

Preparation and Analysis

Uranium Mill Tailings

Tailings from two sites, the East Tailings Area and the Vanadium Tailings Area of the Monticello millsite, Monticello, Utah,[3] were used for this project. The third material used was a uranium ore from the Climax Mill in Grand Junction, Colorado. The materials were ground to -325 mesh and dried at 110 °C for 24 hours. The materials were blended in a cross-flow blender for 72 hours, then placed in 55-gallon drums. The amount of material prepared resulted in approximately 120 sets of reference materials.

Sampling

The minimum number of samples needed to estimate the mean concentrations of radionuclides in the starting materials was calculated from the equation (modified from Natrella[4]).

$$CV = D/S \qquad (1)$$

where

CV = critical value (parameter needed to estimate minimum sample size)

D = maximum allowable deviation

S = estimated allowable deviation gained through previous experience

In this case, S = 1%, D = 2%, and CV = 2.

Using Table A-8 given in Natrella, the minimum sample size for estimating the means within 2 percent with 95 percent confidence is six. For this project, the number of samples was increased to 10 in order to acquire a better estimate of the mean. Ten 800-gram samples from each of the four starting materials were randomly collected from the blender as the material was transferred to the 55-gallon drums.

Analysis

In order to minimize the errors in the recommended values, radionuclide analyses were performed on the starting materials rather than on the final reference materials. This approach allows the calculation of concentrations in the reference materials with a higher degree of accuracy than would be possible by direct analysis. Sill determined U-238, U-234, Th-230, and Ra-226 by alpha spectrometry,[5,1] and Pb-210 by beta counting.[6] The UNC Chemistry Laboratory determined U-238, U-234, Th-230, and Pb-210 by alpha spectrometry,[7,8] and Ra-226 by gamma spectroscopy.[9] U.S. National Bureau of Standards traceable standards were used when possible for all analyses.

Reference Materials

TRM-1—Tailings reference material TRM-1 is the undiluted Monticello Vanadium Tailings Area material previously described. The material was transferred to 1-quart glass jars with no further preparation.

TRM-2—Tailings reference material TRM-2 is a 1:20 dilution of TRM-1. The material contains 4,536 grams of TRM-1 and 85,277 grams of soil. Aerosil 200, a surfactant, was also added (907 grams) to assist in blending. To prepare the material, all of the TRM-1 and Aerosil 200 and one-quarter of the soil were placed in a 10-cubic-foot blender and mixed overnight. The blender was stopped, another portion of diluent was added, and the mixture was blended for another 24 hours. This process was repeated four times. After all the diluent had been added and blending completed, the material was transferred into

1-quart glass jars. Ten random samples were collected during the transfer to check homogeneity.

TRM-3—Tailings reference material TRM-3 is a 1:10 dilution of the East Tailings Area material. The material contains 80,741 grams soil, 907 grams Aerosil 200, and 9,072 grams tailings material. The material was blended, sampled, and transferred into jars in the same manner as described previously.

TRM-4—Tailings reference material TRM-4 is a 1:20 dilution of the Climax Ore material. The material contains 85,277 grams soil, 907 grams Aerosil 200, and 4,536 grams Climax Ore. The material was blended, sampled, and transferred into jars in the same manner as described previously.

Homogeneity Analysis

The samples collected after final blending of reference materials TRM-2, TRM-3, and TRM-4 were analyzed for Th-230 by Sill of Idaho National Engineering Laboratory and for Ra-226 by UNC Chemistry Laboratory to check homogeneity. Analytical methods used were those described previously.

Results

Tables 1 through 4 present the results obtained by the two laboratories for the radionuclide determinations performed on the uranium mill tailings and soil diluent materials. All results are reported in pCi/g. A procedure for detecting outliers, as described by Dixon and Massey,[10] reveals four outliers in the data sets. These values were deleted prior to any further calculations. The means of the data sets and the experimental standard deviations at 2σ (95 percent confidence interval) are also presented at the bottom of each table.

The results for each nuclide obtained by Sill and the results for the nuclides obtained at UNC were compared, using the test for equality of means described by Dunn and Clark.[11] This test compares the means of the results of the two laboratories to determine if there is any measurable difference. Results of these tests (Table 5) demonstrate that the absolute value of the calculated t-statistic (t) is greater than the critical value (M) in most instances. These findings indicate that statistically significant differences exist between the results of the two laboratories. These differences may be accounted for by systematic bias inherent in any measurement system and are to be expected when using independent laboratories, operators, and methods. The difference between the two data sets was at most 4 percent, which is within the TMC standards defined for this and similar projects.

Since the differences between the results obtained by the two laboratories are of acceptable magnitude, the reported concentration for each radionuclide in each tailings material is the average of the results from both laboratories. Statistically, the best estimate of any true value is an average of two or more means, frequently referred to as the "mean of means." Therefore, for the purposes of this project, the estimated concentrations are derived from averaging the means of the results from the two laboratories. The associated uncertainty for these values is the sum of the uncertainties (standard deviations) of the individual means. These concentrations and uncertainties are presented in Table 6.

Recommended Concentrations

The concentrations of radionuclides in the final reference materials were calculated using the values presented in Table 6 and the weights given above (*Reference Materials*, page 1). The uncertainties in Table 6 were propagated through the calculations to arrive at the total uncertainties in the recommended values at the 95 percent confidence level. Errors associated with weighing were negligible and are not included in the table. Table 7 presents the recommended concentrations and total uncertainties. It should be noted that equilibrium between Ra-226 and Pb-210 does not exist in these materials. Since Pb-210 has a relatively short half-life (21 years), the Pb-210 concentration may change slightly over time.

Homogeneity

The results of the Th-230 analyses and the Ra-226 analyses performed on the final materials to check homogeneity are presented in Table 8. At the bottom of the table the means and experimental standard deviations at 1σ are presented. The standard deviation, σ_o, is the 2 percent variation set prior to the preparation of the materials as the acceptable limit. This limit

was also used to determine the number of required samples (see *Sampling*, page 1). The one-sided confidence limit, S_1, is calculated as in Natrella at the 95 percent confidence level. If S_1 exceeds σ_0, then the material is considered non-homogeneous. Since S_1 did not exceed σ_0 in any of the materials, the reference materials are considered homogeneous at the 95 percent level within 2 percent for a 1-gram sample size. The homogeneity of the starting tailings materials was checked in the same fashion. All of the materials are considered homogeneous within 2 percent at the 95 percent confidence level.

Table 1. Laboratory Analysis of the East Tailings Area Material

	Concentration (pCi/g)									
	U-238		U-234		Th-230		Ra-226		Pb-210	
	SIII	UNC	SIII	UNC	SIII	UNC	SIII	UNC	SIII	UNC
	186	178	187	182	599	557	586	607	555	565
	183	183	184	190	572	562	591	594	553	558
	185	184	184	183	582	569	578	603	537	551
	186	202[a]	188	207[a]	582	567	751[a]	600	551	553
	189	179	190	175	591	570	580	572	557	547
	186	179	186	182	592	568	592	607	559	567
	184	188	185	189	588	563	590	600	543	553
	189	187	191	182	595	559	594	604	543	552
	184	190	188	183	582	565	592	605	546	554
	185	187	183	182	578	581	596	601	532	553
Mean	186	184	187	183	586	566	589	599	548	555
SD[b]	4	8	6	8	16	14	12	20	18	12

[a]Outlier.
[b]SD = Experimental standard deviation.

Table 2. Laboratory Analysis of the Vanadium Tailings Area Material

	Concentration (pCi/g)									
	U-238		U-234		Th-230		Ra-226		Pb-210	
	SIII	UNC	SIII	UNC	SIII	UNC	SIII	UNC	SIII	UNC
	100	97	108	98	471	463	491	498	411	428
	100	100	107	102	468	465	486	493	430	440
	100	99	109	104	475	467	484	493	423	430
	100	96	108	105	475	469	476	494	426	431
	98	101	107	101	480	463	480	500	411	436
	100	101	108	104	477	476	487	490	426	430
	97	100	106	103	472	465	487	483	421	415
	96	102	109	105	471	464	475	499	427	424
	397	100	105	101	480	468	490	485	413	444
	96	102	105	103	479	461	493	493	414	414
Mean	98	100	107	103	475	466	485	493	420	429
SD[a]	4	4	4	4	8	8	12	12	14	20

[a]SD = Experimental standard deviation.

Table 3. Laboratory Analysis of the Climax Ore

	Concentration (pCi/g)									
	U-238		U-234		Th-230		Ra-226		Pb-210	
	SIII	UNC	SIII	UNC	SIII	UNC	SIII	UNC	SIII	UNC
	884	891	868	874	851	875	845	846	750	771
	882	867	871	906[a]	847	884	837	846	761	790
	889	883	890	886	870	888	840	828	766	767
	863	877[a]	871	863	845	869	833[a]	844	766	770
	887	873	876	859	852	870	854	839	769	760
	881	897	870	868	851	866	831	826	715	784
	884	865	877	884	877	856	848	838	768	764
	876	868	868	876	855	863	839	833	743	773
	872	849	860	874	856	850	828	837	751	749
	872	885	869	878	853	858	824	848	751	760
Mean	879	876	872	874	856	868	838	839	754	769
SD[b]	16	27	16	18	20	24	18	16	31	24

[a]Outlier.
[b]SD = Experimental standard deviation.

Table 4. Laboratory Analysis of the Soil Diluent

	Concentration (pCi/g)									
	U-238		U-234		Th-230		Ra-226		Pb-210	
	SIII	UNC	SIII	UNC	SIII	UNC	SIII	UNC	SIII	UNC
	1.0	0.9	1.0	1.0	1.0	1.0	1.0	0.9	0.9	1.0
	1.0	0.9	1.0	1.0	1.0	1.1	1.0	0.9	0.7	0.9
	0.9	0.9	1.0	0.9	1.1	1.1	0.9	0.9	1.0	0.8
	0.9	1.0	1.0	1.0	1.0	0.9	1.0	1.0	0.9	0.8
	1.0	0.9	1.1	1.0	1.0	0.9	1.0	1.1	1.2	0.8
	1.0	1.1	1.0	1.0	1.0	0.9	0.9	0.8	1.0	0.7
	1.2	1.1	1.1	1.1	1.0	1.0	0.9	1.0	1.0	0.7
	1.2	1.1	1.0	1.0	1.0	1.0	1.0	1.2	1.0	0.7
	1.2	0.9	1.0	0.9	1.0	0.9	1.0	1.1	1.2	0.9
	1.1	1.0	1.1	0.9	1.0	0.9	0.9	0.9	1.1	0.8
Mean	1.1	1.0	1.0	1.0	1.0	1.0	1.0	1.0	1.0	0.8
SD[a]	0.2	0.2	0.1	0.1	0.1	0.2	0.1	0.2	0.2	0.2

[a]SD = Experimental standard deviation.

Table 5. Tests for Equality of Means

Analyte	Calculated t-Statistic (t)	Critical Value (M)[a]	Finding
East Tailings Area Material			
U–238	1.170	1.734	t<M
U–234	2.124	1.740	t>M
Th–230	5.901	1.734	t>M
Ra–226	–2.648	1.740	t>M
Pb–210	–2.235	1.734	t>M
Vanadium Tailings Area Material			
U–238	–1.879	1.734	t>M
U–234	5.542	1.734	t>M
Th–230	4.596	1.734	t>M
Ra–226	–2.999	1.734	t>M
Pb–210	–2.345	1.734	t>M
Climax Ore			
U–238	0.679	1.734	t<M
U–234	–0.403	1.740	t<M
Th–230	–2.456	1.734	t>M
Ra–226	–0.335	1.734	t<M
Pb–210	–2.305	1.734	t>M
Soil Diluent			
U–238	1.481	1.734	t<M
U–234	1.987	1.734	t>M
Th–230	1.434	1.734	t<M
Ra–226	–0.474	1.734	t<M
Pb–210	3.353	1.734	t>M

[a]Critical values are at the 95 percent confidence level.

Table 6. Average Concentrations of Tailings Reference Materials (pCi/g)

	U–238	U–234	Th–230	Ra–226	Pb–210
East Tailings Area Material	185 ± 9	185 ± 10	576 ± 21	594 ± 23	552 ± 21
Vanadium Tailings Area Material	99 ± 6	105 ± 6	471 ± 11	489 ± 17	425 ± 24
Climax Ore Material	878 ± 32	873 ± 24	862 ± 31	839 ± 24	762 ± 39
Soil Diluent	1.1 ± 0.3	1.0 ± 0.2	1.0 ± 0.2	1.0 ± 0.2	0.9 ± 0.3

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Appendix A

Thorium and Potassium Results

The gamma spectroscopy measurements performed by the UNC Chemistry Laboratory for the determination of Ra–226 also allowed the determination of Th–228 and K–40. Data for these nuclides may be useful to anyone performing measurements by gamma spectroscopy. Since the data for these nuclides are from one laboratory only, they are presented here solely for information purposes.

Material	Concentration (pCi/g)	
	Th-228	K-40
TRM–1	<2	<10
TRM–2	<1	19 ± 4[a]
TRM–3	<1	17 ± 7[a]
TRM–4	<1	19 ± 5[a]

[a]Uncertainties are the experimental standard deviations at 2σ.

Table 7. Recommended Concentrations of Tailings Reference Materials (pCi/g)

	TRM-1	TRM-2	TRM-3	TRM-4
U-238	99 ± 6	6.0 ± 4.0	29.6 ± 1.4	44.9 ± 1.6
U-234	105 ± 6	6.2 ± 4.0	19.6 ± 1.9	44.6 ± 1.2
Th-230	471 ± 11	24.5 ± 0.6	58.5 ± 2.1	44.0 ± 1.6
Ra-226	489 ± 17	25.4 ± 0.9	60.3 ± 2.3	42.9 ± 1.2
Pb-210	425 ± 24	22.1 ± 1.2	56.0 ± 2.1	38.9 ± 2.0

Table 8. Homogeneity Check

Statistical Analysis[a]	Concentration (pCi/g)					
	TRM-2		TRM-3		TRM-4	
	Th-230[b]	Ra-226	Th-230[b]	Ra-226	Th-230[b]	Ra-226
	24.9	25.2	61.1	60.5	44.9	43.0
	24.2	25.4	58.3	61.9	44.5	41.6
	25.2	25.4	59.3	62.5	45.5	41.8
	24.9	25.1	59.9	60.9	44.8	42.3
	23.0	25.1	59.4	59.3	44.3	42.1
	24.4	24.8	57.3	61.2	44.6	41.0
	25.3	25.4	59.0	58.8	44.5	42.4
	24.8	23.9	60.9	59.6	45.8	40.7
	24.6	25.2	59.6	61.3	44.3	43.8
	25.0	26.2	57.4	59.7	45.7	42.5
$\bar{x}$	24.6	25.2	59.2	60.6	44.9	42.1
S	0.7	0.6	1.3	1.2	0.6	0.9
σ_o	0.5	0.5	1.2	1.2	0.9	0.8
S_1	0.5	0.4	0.9	0.9	0.4	0.7

[a]Where $\bar{x}$ = mean of the results; S = experimental standard deviation at 1σ; σ_o = acceptable standard deviation; and S_1 = one-sided confidence limit for σ.
[b]Sample size = 1 gram.

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References

1. R. B. Chessmore and P. R. Engelder, *Development of Solid Radium-226 Reference Materials*, U.S. Department of Energy, Grand Junction Area Office, Technical Measurements Center, Report GJ/TMC-10, 1983 (Appendix A, C. W. Sill).
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8. A. B. Mackenzie and R. D. Scott, "Separation of Bismuth-210 and Polonium-210 from Aqueous Solutions by Spontaneous Absorption on Copper Foils," *Analyst*, 1979, Vol. 104, pp. 1151-1158.
9. G. L. Dechant and S. E. Donivan, *Calibration and Performance of a High-Resolution Gamma-Spectroscopy System*, U.S. Department of Energy, Grand Junction Area Office, Open-File Report GJBX-4(84), 1984.
10. W. J. Dixon and F. J. Massey, Jr., *Introduction to Statistical Analysis*, 3rd edition. New York: McGraw-Hill Book Co., Inc., 1969.
11. O. J. Dunn and V. A. Clark, *Applied Statistics Analysis of Variance and Regression*. New York: John Wiley and Sons, Inc., 1974.

CERTIFICATE OF CALIBRATION
MULTINUCLIDE STANDARD SOURCE

Customer:	DATA CHEM LABORATORIES	P.O.No.:	14346	
Catalog No.:	EG-MLAM-032-5U	Reference Date:	May 1 1995	
Source No.:	479-114-3	Total Radioactivity:	5.17	μCi.
		Total Radioactivity:	191.3	kBq.

Description of Source

a. Capsule type: Customer supplied 4 oz. jar
b. Nature of active deposit: Multinuclide and AmCl3 dispersed in an epoxy matrix
c. Active diameter/volume: Approximately 125 ml (Mass of epoxy = 132.15 g)
d. Backing: Plastic
e. Cover: Plastic

Nuclide	Activity. (μCi)	Gamma-Ray Energy(MeV)	Branching Ratio %	Systematic Uncert.	Random Uncert.	Overall Uncert.
Am-241	0.0307	0.0595	36.0	1.5%	0.3%	1.5%
Cd-109	1.659	0.088	3.63	2.0%	0.6%	2.1%
Co-57	0.0554	0.122, 0.136	85.6, 10.68	2.0%	0.7%	2.1%
Te-123m	0.0658	0.159	84.0	2.0%	0.8%	2.2%
Cr-51	1.695	0.320	9.86	2.0%	0.3%	2.0%
Sn-113	0.243	0.392	64.89	2.0%	0.3%	2.0%
Sr-85	0.327	0.514	98.4	2.0%	0.3%	2.0%
Cs-137	0.245	0.662	85.1	2.0%	0.7%	2.1%
Co-60	0.261	1.173, 1.333	99.86, 99.98	2.0%	0.5%	2.1%
Y-88	0.590	0.898, 1.836	94.0, 99.36	2.0%	0.4%	2.0%

Method of Calibration

This source was prepared from a weighed aliquot of solution whose concentration, in μCi/g, was determined by gamma spectrometry.

NIST Traceability

This calibration is implicitly traceable to the National Institute of Standards and Technology.

Leak Test(s)

See reverse side for Leak Test(s) applied to this source.

Notes

1. Nuclear data was taken from "Table of Radioactive Isotopes", edited by Virginia S. Shirley, 1986.
2. IPL participates in an NIST measurement assurance program to establish and maintain implicit traceability for a number of nuclides, based on the blind assay (and later NIST certification) of Standard Reference Materials (As in NRC Regulatory Guide 4.15).
3. Overall uncertainty is calculated at the 99% confidence level.
4. Reference Half lives:

Am-241	432.2 ± 0.65 years	Te-123m	119.7 ± 0.1 days	Sr-85	64.84 ± 0.004 days
Cd-109	1.2665 ± 0.0019 years	Cr-51	27.706 ± 0.007 days	Cs-137	30.1 ± 0.2 years
Co-57	271.79 ± 0.09 days	Sn-113	115.09 ± 0.04 days	Co-60	5.271 ± 0.001 years
Y-88	106.63 ± 0.025 days				

QUALITY CONTROL

25 Apr. 1995

Date Signed

ISOTOPE PRODUCTS LABORATORIES
3017 N. SAN FERNANDO BLVD.
BURBANK, CALIFORNIA 91504
818·843·7000 FAX 818·843·6168

IPL Ref No. 479-114-3

DATA CHEM LABORATORIES
A SORENSON COMPANY

8019

Raw Data
Radiochemistry/Mixed-Waste Department
γ Spectrometry
Inventory Checklist

- [X] Section 1. Sample and QC Data
- [X] Section 2. Instrument Performance and Calibration Data

The following signatures verify that the raw data and all inventory and reviewer checklists in each raw data section (all green sheets) are complete and accurate.

Assembled by: Robin Tully 10/21/96 (Signature / Date) Reviewed by: [signature] 10/21/96 (Signature / Date)

Rev. 3/95

068

000842

Section 1. Sample and QC Data
γ Spectrometry
Inventory Checklist

- [X] Laboratory Control Sample (LCS) Instrument Print-Out
  - LCS Spectral Plot
  - LCS Peak Search Report
  - LCS Activity Report
- [X] Blank Instrument Print-Out
  - Blank Spectral Plot
  - Blank Peak Search Report
  - Blank Activity Report
- [X] Precision Sample (MD) Instrument Print-Out
  - MD Spectral Plot
  - MD Peak Search Report
  - MD Acivity Report
- [X] Field Sample Instrument Print-outs
  - Sample Spectral Plot
  - Sample Peak Search Report
  - Sample Activity Report
- [X] Computer/Manual Calculation Sheets summarizing all calculational inputs and results

Section 1. Sample and QC Data
γ Spectrometry
Reviewer Checklist

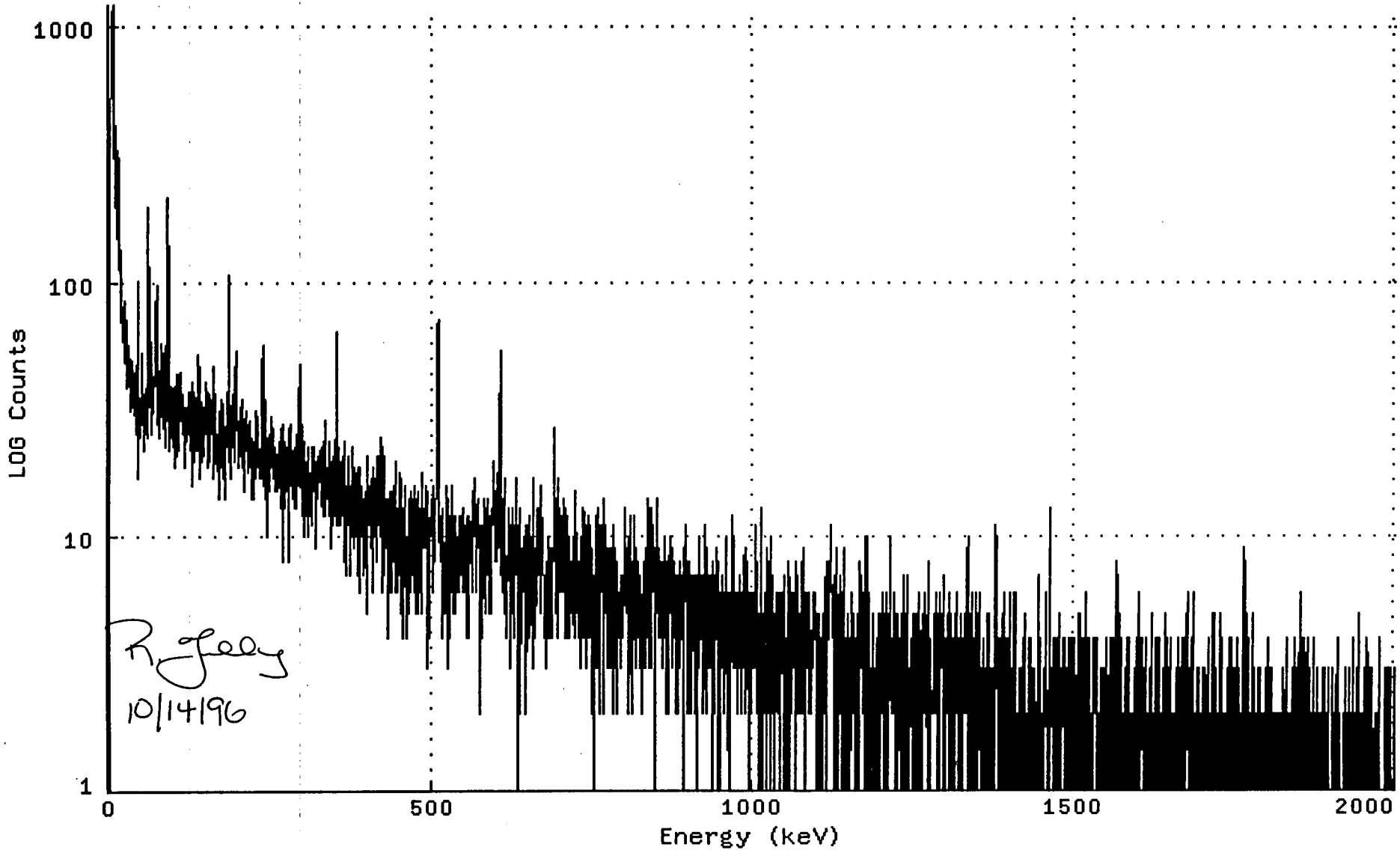
X The Sample and QC Data Inventory Checklist above is complete.

X All appropriate QC for the project was performed.

X All appropriate QC data met acceptance criteria. Unacceptable QC data were documented, and justifications were provided for data used.

X Print-outs are initialed and dated.

Spectrum : DISK:[RADCHEM.SCUSR.ARCHIVE]SMP_BL1232401_GAMMA5_PMP_9190.CNF;2
Title : 96E-0640-04
Sample Title: G969901S
Start Time: 10-OCT-1996 13:20 Sample Time: 19-SEP-1996 12:00 Energy Offset: -5.65841E-01
Real Time : 0 04:00:05.40 Sample ID : BL-123240-1 Energy Slope : 4.88823E-01
Live Time : 0 04:00:00.00 Sample Type: FILTER Energy Quad : -8.49185E-08



R Gray
10/14/96

000844

670

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Gamma Spectroscopy Report generated 11-OCT-1996 11:59 **8019**

Configuration: DISK:[RADCHEM.SCUSR.ARCHIVE]SMP_BL1232401_GAMMA5_PMP_9190.CNF;2
Analyses by : PEAK V16.5 PEAKEFF V2.2

---- Sample Information ----

Sample Title : G969901S
Sample ID : BL-123240-1 Sample Quantity : 1.00000E+00 SAMPLE
Sample Type : FILTER Sample Geometry : PMP

---- Sample Decay/Count Information ----

Sample Date : 19-SEP-1996 12:00 Acquisition date : 10-OCT-1996 13:20
Elapsed live time: 0 04:00 Elapsed real time: 0 04:00 0.0%
Decay time : 21 01:20

---- Detector Parameters ----

Energy cal. time : 8-OCT-1996 12:40:
Detector name : GAMMA5 Counting geometry: PMP
Effic. cal. time : 19-SEP-1996 14:21

---- Processing Parameters ----

Cali. Slope : 4.88823E-01 Cali. Offset : -5.65841E-01
Cali. Quadratic : -8.49185E-08 FWHM Offset : 4.15386E-01
FWHM Slope : 4.45150E-02 MDA Width (FWHM) : 3.0
Start channel : 1 End channel : 4096
Sensitivity : 5.0 Gaussian Sens. : 10.0
Energy tolerance : 2.0 Half life ratio : 8.0
Abundance limit : 75.0 WTM error limit : 3.0
Activity Units : PCI Act. Conversion : 1.00000E+06
MDA Confid Level : 5.0 Sigma Number : 2
Errors propagated: Yes Systematic Error : 0.0%

	It	Energy	Area	Bkgnd	FWHM	Channel	%Eff	Cts/Sec	%Err	Fit
1	0	7.73	1727	3223	1.32	16.97	8.95E+00	1.20E-01	5.8	
2	0	12.98	348	904	0.81	27.71	9.66E+00	2.41E-02	14.1	
3	0	16.12	489	962	1.13	34.13	9.78E+00	3.39E-02	11.5	
4	0	46.34	211	210	1.17	95.97	8.79E+00	1.47E-02	13.7	
5	0	63.28	305	233	0.94	130.61	8.08E+00	2.12E-02	10.0	
6	1	74.74	90	175	0.88	154.06	7.65E+00	6.27E-03	24.5	1.96E+00
7	1	77.15	124	158	0.87	158.99	7.57E+00	8.58E-03	18.0	
8	3	87.25	71	143	1.10	179.66	7.23E+00	4.90E-03	27.6	1.99E+00
9	3	92.60	465	159	1.02	190.61	7.06E+00	3.23E-02	6.3	
10	0	185.78	183	235	1.02	381.23	5.03E+00	1.27E-02	17.3	
11	0	238.41	83	168	0.98	488.92	4.32E+00	5.74E-03	28.8	
12	0	294.95	107	228	1.44	604.61	3.75E+00	7.43E-03	31.5	
13	0	351.78	138	165	1.02	720.89	3.31E+00	9.60E-03	19.9	
14	0	511.10	397	145	2.94	1046.93	2.48E+00	2.76E-02	8.6	
15	0	609.64	112	87	1.21	1248.58	2.13E+00	7.76E-03	17.8	
16	0	693.45	56	66	0.65	1420.12	1.90E+00	3.90E-03	31.0	
17	0	1461.07	27	22	1.48	2991.66	9.09E-01	1.87E-03	38.9	
18	0	1765.79	33	14	3.77	3615.76	7.37E-01	2.30E-03	31.4	

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Gamma Spectroscopy Report generated 11-OCT-1996 11:59

Configuration: DISK:[RADCHEM.SCUSR.ARCHIVE]BKG_BCKGND_GAMMA5__9143.CNF;1
Analyses by : PEAK V16.5 PEAKEFF V2.2

---- Sample Information ----

Sample Title :
Sample ID : BCKGND
Sample Type :
Sample Quantity : 1.00000E+00 G
Sample Geometry :

---- Sample Decay/Count Information ----

Sample Date : 4-OCT-1996 00:00:
Elapsed live time: 2 02:00
Decay time : 0 18:20
Acquisition date : 4-OCT-1996 18:20:
Elapsed real time: 2 02:01 0.0%

---- Detector Parameters ----

Energy cal. time : 30-SEP-1996 09:01
Detector name : GAMMA5
Effic. cal. time : 19-SEP-1996 11:45
Counting geometry: TRM1-S3

---- Processing Parameters ----

Cali. Slope	: 4.88756E-01	Cali. Offset	: -5.37244E-01
Cali. Quadratic	: -7.07146E-08	FWHM Offset	: 5.94642E-01
FWHM Slope	: 3.39310E-02	MDA Width (FWHM)	: 3.0
Start channel	: 1	End channel	: 4096
Sensitivity	: 5.0	Gaussian Sens.	: 10.0
Energy tolerance	: 2.0	Half life ratio	: 8.0
Abundance limit	: 75.0	WTM error limit	: 3.0
Activity Units	: pCi	Act. Conversion	: 1.00000E+06
MDA Confid Level	: 5.0	Sigma Number	: 1
Errors propagated	: Yes	Systematic Error	: 9.0%

	It	Energy	Area	Bkgnd	FWHM	Channel	%Eff	Cts/Sec	%Err	Fit
1	0	7.76	24064	42790	1.54	16.98	6.55E+06	1.34E-01	1.5	
2	0	10.38	4115	15170	0.84	22.34	1.32E+04	2.29E-02	4.8	
3	0	13.03	4183	13266	0.86	27.77	5.13E+02	2.32E-02	4.7	
4	0	16.22	6461	11688	1.08	34.29	6.28E+01	3.59E-02	3.1	
5	0	19.25	1233	6158	0.89	40.48	2.09E+01	6.85E-03	10.0	
6	0	23.34	285	5186	1.44	48.85	9.40E+00	1.58E-03	40.4	
7	0	26.04	437	4406	1.08	54.38	7.03E+00	2.43E-03	24.7	
8	0	46.55	1927	3150	0.94	96.35	4.94E+00	1.07E-02	5.5	
9	0	53.64	405	3070	0.98	110.85	5.29E+00	2.25E-03	24.2	
10	4	63.34	3752	1877	0.81	130.70	5.86E+00	2.08E-02	2.4	1.10E+00
11	4	66.28	535	2846	1.28	136.72	6.02E+00	2.97E-03	18.1	
12	0	69.74	385	3435	1.87	143.79	6.21E+00	2.14E-03	26.7	
13	0	74.19	134	3061	0.84	152.90	6.44E+00	7.44E-04	65.8	
14	0	77.07	495	2625	0.94	158.79	6.57E+00	2.75E-03	17.0	
15	0	84.43	698	3059	1.37	173.85	6.87E+00	3.88E-03	14.2	
16	0	87.20	283	2253	0.85	179.52	6.97E+00	1.57E-03	27.2	
17	0	92.67	4997	3152	1.09	190.71	7.12E+00	2.78E-02	2.4	
18	0	98.25	195	2385	0.93	202.14	7.25E+00	1.09E-03	42.0	
19	0	109.75	354	2985	0.75	225.66	7.39E+00	1.97E-03	27.2	
20	0	112.82	230	1804	0.95	231.93	7.40E+00	1.28E-03	28.5	
21	0	139.81	682	3118	1.12	287.16	7.22E+00	3.79E-03	15.8	
22	0	143.66	424	2282	1.06	295.05	7.16E+00	2.35E-03	19.3	
23	0	185.85	2020	3123	1.02	381.36	6.27E+00	1.12E-02	5.6	
24	4	197.16	456	1487	0.89	404.51	6.00E+00	2.53E-03	13.8	4.49E-01

Sample ID : BCKGND Acquisition date : 4-OCT-1996 18:20:18

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Pk	It	Energy	Area	Bkgnd	FWHM	Channel	%Eff	Cts/Sec	%Err	Fit
25	4	198.38	665	1790	1.04	407.00	5.98E+00	3.69E-03	11.2	
[illegible]	0	205.33	188	1689	0.96	421.24	5.81E+00	1.04E-03	35.4	
27	0	238.76	908	2089	1.08	489.64	5.07E+00	5.05E-03	9.3	
28	0	295.36	179	1472	1.03	605.47	4.05E+00	9.94E-04	36.3	
29	0	352.05	298	1202	1.06	721.47	3.31E+00	1.65E-03	20.2	
30	0	511.06	4724	2215	2.53	1046.88	2.15E+00	2.62E-02	2.7	
31	0	569.99	434	1409	1.55	1167.50	1.91E+00	2.41E-03	18.5	
32	0	583.39	294	1218	1.25	1194.92	1.87E+00	1.64E-03	23.7	
33	0	609.48	299	1186	1.30	1248.33	1.79E+00	1.66E-03	21.5	
34	0	669.54	124	741	1.38	1371.25	1.64E+00	6.91E-04	40.4	
35	4	693.56	349	1136	2.18	1420.41	1.58E+00	1.94E-03	21.4	3.27E+00
36	4	696.97	189	993	1.80	1427.39	1.58E+00	1.05E-03	34.4	
37	4	702.45	192	1226	2.19	1438.62	1.57E+00	1.07E-03	38.5	
38	0	803.05	377	759	1.66	1644.53	1.41E+00	2.09E-03	15.0	
39	0	962.14	241	859	2.17	1970.22	1.25E+00	1.34E-03	28.6	
40	0	1120.02	105	385	1.77	2293.42	1.15E+00	5.83E-04	35.1	
41	0	1331.87	136	353	2.38	2727.21	1.06E+00	7.54E-04	28.1	
42	0	1460.47	320	376	1.75	2990.52	1.02E+00	1.78E-03	14.0	
43	0	1764.72	128	183	2.41	3613.62	9.27E-01	7.11E-04	23.0	

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Gamma Spectroscopy Report generated 11-OCT-1996 11:59

Configuration: DISK:[RADCHEM.SCUSR.ARCHIVE]SMP_BL1232401_GAMMA5_PMP_9190.CNF;2
Analyses by : PEAK V16.5 ENBACK V1.5

---- Sample Information ----

Sample Title : G969901S
Sample ID : BL-123240-1 Sample Quantity : 1.00000E+00 SAMPLE
Sample Type : FILTER Sample Geometry : PMP

---- Sample Decay/Count Information ----

Sample Date : 19-SEP-1996 12:00 Acquisition date : 10-OCT-1996 13:20
Elapsed live time: 0 04:00 Elapsed real time: 0 04:00 0.0%
Decay time : 21 01:20

---- Detector Parameters ----

Energy cal. time : 8-OCT-1996 12:40:
Detector name : GAMMA5 Counting geometry: PMP
Effic. cal. time : 19-SEP-1996 14:21

---- Processing Parameters ----

Cali. Slope	: 4.88823E-01	Cali. Offset	: -5.65841E-01
Cali. Quadratic	: -8.49185E-08	FWHM Offset	: 4.15386E-01
FWHM Slope	: 4.45150E-02	MDA Width (FWHM)	: 3.0
Start channel	: 1	End channel	: 4096
Sensitivity	: 5.0	Gaussian Sens.	: 10.0
Energy tolerance	: 2.0	Half life ratio	: 8.0
Abundance limit	: 75.0	WTM error limit	: 3.0
Activity Units	: PCI	Act. Conversion	: 1.00000E+06
MDA Confid Level	: 5.0	Sigma Number	: 2
Errors propagated	: Yes	Systematic Error	: 0.0%

	It	Energy	Area	Bkgnd	FWHM	Channel	Left	Pw	Cts/Sec	%Err	Fit
1	0	12.98*	13	904	0.81	27.71	26	5	9.09E-04	394.2	
2	0	46.34*	57	210	1.17	95.97	92	8	3.96E-03	53.0	
3	0	63.28*	5	233	0.94	130.61	128	7	3.16E-04	689.0	
4	1	74.74*	80	175	0.88	154.06	148	14	5.53E-03	29.2	1.96E+00
5	1	77.15*	84	158	0.87	158.99	148	14	5.83E-03	27.7	
6	3	87.25*	48	143	1.10	179.66	177	19	3.32E-03	42.6	1.99E+00
7	3	92.60*	65	159	1.02	190.61	177	19	4.51E-03	47.7	
8	0	185.78*	22	235	1.02	381.23	376	10	1.52E-03	151.2	
9	0	238.41*	10	168	0.98	488.92	485	8	6.93E-04	248.0	
10	0	294.95*	93	228	1.44	604.61	598	14	6.43E-03	36.8	
11	0	351.78*	114	165	1.02	720.89	715	11	7.95E-03	24.4	
12	0	511.10*	19	145	2.94	1046.93	1038	17	1.35E-03	182.1	
13	0	609.64*	88	87	1.21	1248.58	1244	9	6.10E-03	23.4	
14	0	693.45*	28	66	0.65	1420.12	1414	11	1.96E-03	65.3	
15	0	1461.07*	1	22	1.48	2991.66	2986	11	8.95E-05	858.7	
16	0	1765.79*	23	14	3.77	3615.76	3604	18	1.59E-03	46.6	

Flag: "*" = Peak area was modified by background subtraction

Gamma Spectroscopy Report generated 11-OCT-1996 11:59 8019

Configuration: DISK:[RADCHEM.SCUSR.ARCHIVE]SMP_BL1232401_GAMMA5_PMP_9190.CNF;2
Analyses by : PEAK V16.5 ENBACK V1.5 PEAKEFF V2.2 NID V3.1

---- Sample Information ----

Sample Title : G969901S
Sample ID : BL-123240-1 Sample Quantity : 1.00000E+00 SAMPLE
Sample Type : FILTER Sample Geometry : PMP

---- Sample Decay/Count Information ----

Sample Date : 19-SEP-1996 12:00 Acquisition date : 10-OCT-1996 13:20
Elapsed live time: 0 04:00 Elapsed real time: 0 04:00 0.0%
Decay time : 21 01:20

---- Detector Parameters ----

Energy cal. time : 8-OCT-1996 12:40:
Detector name : GAMMA5 Counting geometry: PMP
Effic. cal. time : 19-SEP-1996 14:21

---- Processing Parameters ----

Cali. Slope	: 4.88823E-01	Cali. Offset	: -5.65841E-01
Cali. Quadratic	: -8.49185E-08	FWHM Offset	: 4.15386E-01
FWHM Slope	: 4.45150E-02	MDA Width (FWHM)	: 3.0
Start channel	: 1	End channel	: 4096
Sensitivity	: 5.0	Gaussian Sens.	: 10.0
Energy tolerance	: 2.0	Half life ratio	: 8.0
Abundance limit	: 75.0	WTM error limit	: 3.0
Activity Units	: PCI	Act. Conversion	: 1.00000E+06
MDA Confid Level	: 5.0	Sigma Number	: 2
Errors propagated	: Yes	Systematic Error	: 0.0%

Input-NID Peak Search Report

It	Energy	Area	Bkgnd	FWHM	Channel	Left	Pw	%Err	Fit	Nuclides
0	12.98*	13	904	0.81	27.71	26	5	788.4		
0	46.34*	57	210	1.17	95.97	92	8	106.1		
0	63.28*	5	233	0.94	130.61	128	7	*****		
1	74.74*	80	175	0.88	154.06	148	14	58.4	1.96E+00	
1	77.15*	84	158	0.87	158.99	148	14	55.3		
3	87.25*	48	143	1.10	179.66	177	19	85.2	1.99E+00	
3	92.60*	65	159	1.02	190.61	177	19	95.4		
0	185.78*	22	235	1.02	381.23	376	10	302.4		RA-226
0	238.41*	10	168	0.98	488.92	485	8	496.0		
0	294.95*	93	228	1.44	604.61	598	14	73.5		
0	351.78*	114	165	1.02	720.89	715	11	48.8		
0	511.10*	19	145	2.94	1046.93	1038	17	364.3		
0	609.64*	88	87	1.21	1248.58	1244	9	46.9		
0	693.45*	28	66	0.65	1420.12	1414	11	130.5		
0	1461.07*	1	22	1.48	2991.66	2986	11	*****		
0	1765.79*	23	14	3.77	3615.76	3604	18	93.2		

Gamma Spectroscopy Report generated 11-OCT-1996 11:59 8019

Configuration: DISK:[RADCHEM.SCUSR.ARCHIVE]SMP_BL1232401_GAMMA5_PMP_9190.CNF;2
Analyses by : PEAK V16.5 ENBACK V1.5 PEAKEFF V2.2 NID V3.1

---- Sample Information ----

Sample Title	: G969901S		
Sample ID	: BL-123240-1	Sample Quantity	: 1.00000E+00 SAMPLE
Sample Type	: FILTER	Sample Geometry	: PMP

---- Sample Decay/Count Information ----

Sample Date	: 19-SEP-1996 12:00	Acquisition date	: 10-OCT-1996 13:20
Elapsed live time	: 0 04:00	Elapsed real time	: 0 04:00 0.0%
Decay time	: 21 01:20		

---- Detector Parameters ----

Energy cal. time	: 8-OCT-1996 12:40:		
Detector name	: GAMMA5	Counting geometry	: PMP
Effic. cal. time	: 19-SEP-1996 14:21		

---- Processing Parameters ----

Cali. Slope	: 4.88823E-01	Cali. Offset	: -5.65841E-01
Cali. Quadratic	: -8.49185E-08	FWHM Offset	: 4.15386E-01
FWHM Slope	: 4.45150E-02	MDA Width (FWHM)	: 3.0
Start channel	: 1	End channel	: 4096
Sensitivity	: 5.0	Gaussian Sens.	: 10.0
Energy tolerance	: 2.0	Half life ratio	: 8.0
Abundance limit	: 75.0	WTM error limit	: 3.0
Activity Units	: PCI	Act. Conversion	: 1.00000E+06
MDA Confid Level	: 5.0	Sigma Number	: 2
Errors propagated	: Yes	Systematic Error	: 0.0%

Interference Report

No interference correction performed

Sample ID : BL-123240-1 Acquisition date : 10-OCT-1996 13:20:54

8019

Nuclide	Half-life	Half-Life Ratio	Energy	%Abund	Activity	2-Sigma %Error	Rejected by
PA-231	3.28E+04Y	0.00	50.10	31.70	--- Not Found ---		Abun.
			100.00	1.11	--- Not Found ---		
			122.31	1.19	--- Not Found ---		
			144.24	3.24	--- Not Found ---		
			154.21	5.58	--- Not Found ---		
			205.00	1.08	--- Not Found ---		
			210.60	1.26	--- Not Found ---		
			234.90	2.80	--- Not Found ---		
			236.00	11.50	--- Not Found ---		
			256.20	6.30	--- Not Found ---		
			269.46	13.60	--- Not Found ---		
			271.23	10.60	--- Not Found ---		
			283.67	1.60	--- Not Found ---		
			286.10	1.60	--- Not Found ---		
			300.08	2.30	--- Not Found ---		
			304.40	1.35	--- Not Found ---		
			323.87	3.88	--- Not Found ---		
			330.00	1.30	--- Not Found ---		
			334.20	1.15	--- Not Found ---		
			338.28	2.73	--- Not Found ---		
			351.07*	12.94	5.010E-05	51.49	
			401.81	6.50	--- Not Found ---		
			404.84	2.90	--- Not Found ---		
			427.08	1.30	--- Not Found ---		
			445.03	1.18	--- Not Found ---		
			569.67	0.54	--- Not Found ---		
			831.96	2.90	--- Not Found ---		
			897.83	0.24	--- Not Found ---		
			897.83	0.52	--- Not Found ---		
		% Abundances Found =		9.59			
U-235	7.04E+08Y	0.00	143.76	10.50	--- Not Found ---		Abun.
			163.35	4.70	--- Not Found ---		
			185.71*	54.00	1.509E-06	302.96	
			205.31	4.70	--- Not Found ---		
		% Abundances Found =		73.07			

Flag: "*" = Keyline

Sample ID : BL-123240-1
Acquisition date : 10-OCT-1996 13:20:54

8019

Nuclide Type: Natural

Nuclide	Energy	Area	%Abn	%Eff	Uncorrected PCI/SAMPLE	Decay Corr PCI/SAMPLE	2-Sigma %Error
RA-226	186.21	22	3.28*	5.027E+00	2.484E+01	2.484E+01	302.94

Flag: "*" = Keyline

Gamma Spectroscopy Report generated 11-OCT-1996 12:00 **8019**

Configuration: DISK:[RADCHEM.SCUSR.ARCHIVE]SMP_BL1232401_GAMMA5_PMP_9190.CNF;2
Analyses by : PEAK V16.5 ENBACK V1.5 PEAKEFF V2.2 NID V3.1 MINACT V2.5

---- Sample Information ----

Sample Title : G969901S
Sample ID : BL-123240-1 Sample Quantity : 1.00000E+00 SAMPLE
Sample Type : FILTER Sample Geometry : PMP

---- Sample Decay/Count Information ----

Sample Date : 19-SEP-1996 12:00 Acquisition date : 10-OCT-1996 13:20
Elapsed live time: 0 04:00 Elapsed real time: 0 04:00 0.0%
Decay time : 21 01:20

---- Detector Parameters ----

Energy cal. time : 8-OCT-1996 12:40:
Detector name : GAMMA5 Counting geometry: PMP
Effic. cal. time : 19-SEP-1996 14:21

---- Processing Parameters ----

Cali. Slope	: 4.88823E-01	Cali. Offset	: -5.65841E-01
Cali. Quadratic	: -8.49185E-08	FWHM Offset	: 4.15386E-01
FWHM Slope	: 4.45150E-02	MDA Width (FWHM)	: 3.0
Start channel	: 1	End channel	: 4096
Sensitivity	: 5.0	Gaussian Sens.	: 10.0
Energy tolerance	: 2.0	Half life ratio	: 8.0
Abundance limit	: 75.0	WTM error limit	: 3.0
Activity Units	: PCI	Act. Conversion	: 1.00000E+06
MDA Confid Level	: 5.0	Sigma Number	: 2
Errors propagated:	Yes	Systematic Error	: 0.0%

Combined Activity-MDA Report

---- Identified Nuclides ----

Nuclide	Activity (PCI/SAMPLE)	Act error	MDA (PCI/SAMPLE)	MDA error	Act/MDA
RA-226	2.484E+01	7.526E+01	6.466E+01	1.196E+01	0.384

---- Non-Identified Nuclides ----

Nuclide	Key-Line Activity (PCI/SAMPLE)	K.L. Ided	Act error	MDA (PCI/SAMPLE)	MDA error	Act/MDA
RA-228	1.687E+00		9.404E+00	1.668E+01	3.425E+00	0.101
PA-231	5.010E+01	+	2.580E+01	3.302E+01	5.424E+00	1.517
U-235	1.509E+00	+	4.572E+00	6.010E+00	1.128E+00	0.251

8019

Gamma Spectroscopy Report generated 11-OCT-1996 12:00

Configuration: DISK:[RADCHEM.SCUSR.ARCHIVE]SMP_BL1232401_GAMMA5_PMP_9190.CNF;2
Analyses by : PEAK V16.5 ENBACK V1.5 PEAKEFF V2.2 NID V3.1 MINACT V2.5

---- Sample Information ----

Sample Title : G969901S
Sample ID : BL-123240-1 Sample Quantity : 1.00000E+00 SAMPLE
Sample Type : FILTER Sample Geometry : PMP

---- Sample Decay/Count Information ----

Sample Date : 19-SEP-1996 12:00 Acquisition date : 10-OCT-1996 13:20
Elapsed live time: 0 04:00 Elapsed real time: 0 04:00 0.0%
Decay time : 21 01:20

---- Detector Parameters ----

Energy cal. time : 8-OCT-1996 12:40:
Detector name : GAMMA5 Counting geometry: PMP
Effic. cal. time : 19-SEP-1996 14:21

---- Processing Parameters ----

Cali. Slope	: 4.88823E-01	Cali. Offset	: -5.65841E-01
Cali. Quadratic	: -8.49185E-08	FWHM Offset	: 4.15386E-01
FWHM Slope	: 4.45150E-02	MDA Width (FWHM)	: 3.0
Start channel	: 1	End channel	: 4096
Sensitivity	: 5.0	Gaussian Sens.	: 10.0
Energy tolerance	: 2.0	Half life ratio	: 8.0
Abundance limit	: 75.0	WTM error limit	: 3.0
Activity Units	: PCI	Act. Conversion	: 1.00000E+06
MDA Confid Level	: 5.0	Sigma Number	: 2
Errors propagated	: Yes	Systematic Error	: 9.0%

Combined Activity-MDA Report

---- Identified Nuclides ----

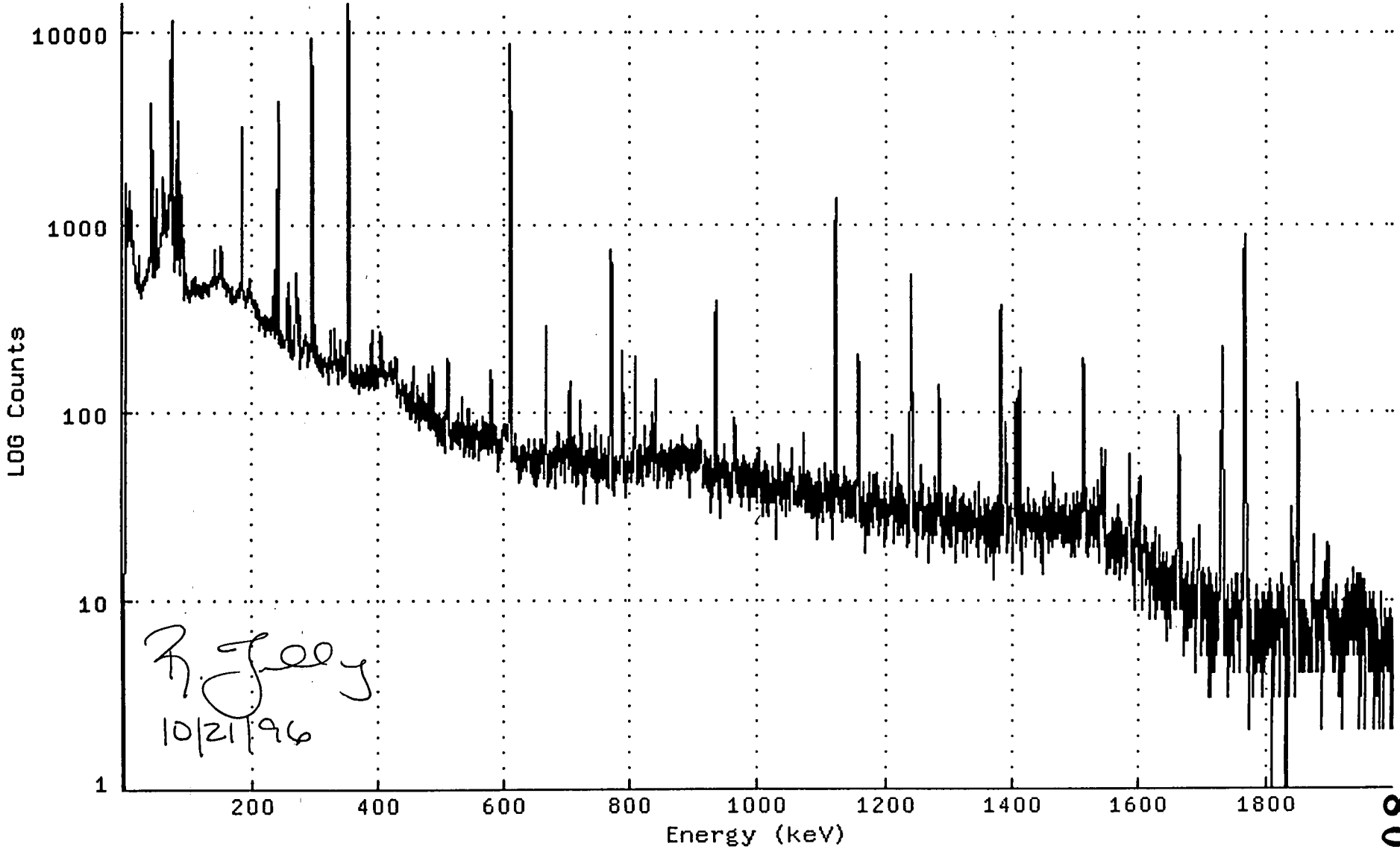
Nuclide	Activity (PCI/SAMPLE)	Act error	MDA (PCI/SAMPLE)	MDA error	Act/MDA
RA-226	2.484E+01	7.540E+01	6.466E+01	1.196E+01	0.384

---- Non-Identified Nuclides ----

Nuclide	Key-Line Activity (PCI/SAMPLE)	K.L. Ided	Act error	MDA (PCI/SAMPLE)	MDA error	Act/MDA
RA-228	1.687E+00		9.409E+00	1.668E+01	3.425E+00	0.101
PA-231	5.010E+01	+	2.733E+01	3.302E+01	5.424E+00	1.517
U-235	1.509E+00	+	4.580E+00	6.010E+00	1.128E+00	0.251

R. Jolly
10/14/96

Spectrum : DISK:[RADCHEM.SCUSR.ARCHIVE]SMP_QC1232401_GAMMA6_PMP_9220.CNF;5
Title : 96E-0640-04
Sample Title: G969901S
Start Time: 14-OCT-1996 10:56 Sample Time: 15-FEB-1983 12:00 Energy Offset: -1.75400E-01
Real Time : 0 04:00:14.76 Sample ID : QC-123240-1 Energy Slope : 4.88511E-01
Live Time : 0 04:00:00.00 Sample Type: SOIL Energy Quad : -9.43914E-08



R. Foley
10/21/96

000855

081

80019

Gamma Spectroscopy Report generated 21-OCT-1996 12:51

Configuration: DISK:[RADCHEM.SCUSR.ARCHIVE]SMP_QC1232401_GAMMA6_PMP_9220.CNF;5
Analyses by : PEAK V16.5 PEAKEFF V2.2

---- Sample Information ----

Sample Title : G969901S
Sample ID : QC-123240-1 Sample Quantity : 1.00400E+02 G
Sample Type : SOIL Sample Geometry : TRM1S2

---- Sample Decay/Count Information ----

Sample Date : 15-FEB-1983 12:00 Acquisition date : 14-OCT-1996 10:56
Elapsed live time: 0 04:00 Elapsed real time: 0 04:00 0.1%
Decay time : 4989 22:56

---- Detector Parameters ----

Energy cal. time : 14-OCT-1996 09:29
Detector name : GAMMA6 Counting geometry: TRM1-S2
Effic. cal. time : 19-SEP-1996 15:59

---- Processing Parameters ----

Cali. Slope : 4.88511E-01 Cali. Offset : -1.75400E-01
Cali. Quadratic : -9.43914E-08 FWHM Offset : 7.57862E-01
FWHM Slope : 2.62786E-02 MDA Width (FWHM) : 3.0
Start channel : 1 End channel : 4096
Sensitivity : 5.0 Gaussian Sens. : 10.0
Energy tolerance : 2.0 Half life ratio : 8.0
Abundance limit : 75.0 WTM error limit : 3.0
Activity Units : PCI Act. Conversion : 1.00000E+06
MDA Confid Level : 5.0 Sigma Number : 2
Errors propagated: Yes Systematic Error : 0.0%

	It	Energy	Area	Bkgnd	FWHM	Channel	%Eff	Cts/Sec	%Err	Fit
1	6	10.68	1026	4588	1.03	22.22	3.79E+07	7.12E-02	10.7	1.09E+00
2	6	12.97	1667	4395	1.01	26.91	2.33E+05	1.16E-01	6.8	
3	6	15.59	1676	6280	1.46	32.27	6.54E+03	1.16E-01	9.1	
4	2	25.57	200	1806	0.91	52.70	3.32E+01	1.39E-02	30.7	1.76E+00
5	2	27.37	604	3054	1.08	56.38	2.30E+01	4.20E-02	15.8	
6	0	46.53	8088	6385	0.99	95.60	6.73E+00	5.62E-01	2.2	
7	0	50.00	744	3298	0.92	102.72	6.58E+00	5.17E-02	12.7	
8	0	53.28	2153	4484	1.01	109.43	6.55E+00	1.50E-01	5.8	
9	1	63.28	1676	4335	0.87	129.91	6.81E+00	1.16E-01	6.4	4.25E+00
10	1	67.63	1085	4410	0.88	138.80	7.00E+00	7.53E-02	9.6	
11	4	74.83	12375	5951	0.94	153.55	7.34E+00	8.59E-01	1.3	1.58E+01
12	4	77.11	21526	6168	0.92	158.22	7.45E+00	1.49E+00	0.9	
13	0	83.81	3059	3862	0.95	171.93	7.75E+00	2.12E-01	3.7	
14	0	87.18	6402	5255	1.18	178.82	7.89E+00	4.45E-01	2.2	
15	0	89.99	2081	3995	1.02	184.59	7.99E+00	1.45E-01	5.3	
16	0	92.47	1308	3434	0.95	189.65	8.08E+00	9.09E-02	7.1	
17	0	94.83	760	3027	1.12	194.49	8.15E+00	5.28E-02	12.3	
18	0	97.97	377	2576	1.46	200.92	8.24E+00	2.62E-02	21.9	
19	0	144.07	634	4292	1.16	295.29	8.38E+00	4.40E-02	19.1	
20	0	154.22	657	4492	1.06	316.08	8.19E+00	4.56E-02	18.8	
21	0	186.19	7259	4188	1.15	381.52	7.39E+00	5.04E-01	2.0	
22	0	236.02	634	2309	1.09	483.55	6.00E+00	4.41E-02	13.7	
23	0	242.07	9730	2271	1.14	495.93	5.85E+00	6.76E-01	1.3	
24	0	255.63	350	2631	0.98	523.69	5.51E+00	2.43E-02	28.9	

Sample ID : QC-123240-1 Acquisition date : 14-OCT-1996 10:56:36

8019

Pk	It	Energy	Area	Bkgnd	FWHM	Channel	%Eff	Cts/Sec	%Err	Fit
25	0	259.00	620	1607	1.07	530.60	5.43E+00	4.30E-02	11.4	
[illegible]	3	269.60	766	1902	1.27	552.30	5.19E+00	5.32E-02	10.6	3.59E+00
27	3	271.40	589	1415	0.93	555.98	5.15E+00	4.09E-02	11.2	
28	0	274.66	406	1471	1.68	562.66	5.08E+00	2.82E-02	16.5	
29	0	295.29	21390	2505	1.15	604.91	4.66E+00	1.49E+00	0.8	
30	0	299.78	216	1581	1.21	614.10	4.57E+00	1.50E-02	32.6	
31	0	323.83	288	1801	1.12	663.34	4.15E+00	2.00E-02	29.1	
32	0	329.91	192	1413	0.71	675.79	4.06E+00	1.33E-02	34.7	
33	0	338.64	115	1202	0.76	693.66	3.92E+00	8.02E-03	50.7	
34	0	351.98	35994	2297	1.22	720.98	3.73E+00	2.50E+00	0.6	
35	0	389.24	292	1226	1.04	797.28	3.28E+00	2.03E-02	21.7	
36	0	402.02	255	1321	1.34	823.43	3.15E+00	1.77E-02	25.5	
37	0	405.43	235	1167	1.59	830.43	3.11E+00	1.63E-02	24.9	
38	0	454.49	386	1223	1.30	930.88	2.70E+00	2.68E-02	19.4	
39	0	480.76	229	726	1.49	984.68	2.52E+00	1.59E-02	21.5	
40	0	487.03	264	796	1.53	997.52	2.48E+00	1.83E-02	20.2	
41	0	511.24	663	1137	3.15	1047.10	2.34E+00	4.60E-02	11.6	
42	0	533.41	163	650	1.59	1092.50	2.23E+00	1.13E-02	29.2	
43	0	580.09	251	519	1.08	1188.09	2.04E+00	1.74E-02	17.0	
44	0	609.39	25069	903	1.39	1248.09	1.94E+00	1.74E+00	0.7	
45	0	665.64	758	437	1.44	1363.31	1.78E+00	5.27E-02	6.3	
46	0	703.13	254	634	1.19	1440.08	1.70E+00	1.77E-02	20.1	
47	0	720.09	120	573	1.01	1474.82	1.67E+00	8.35E-03	38.3	
48	0	742.51	146	462	1.48	1520.74	1.63E+00	1.02E-02	28.6	
49	0	768.39	2353	854	1.57	1573.75	1.58E+00	1.63E-01	3.5	
50	0	785.98	676	784	1.73	1609.78	1.56E+00	4.69E-02	10.3	
51	0	806.44	528	747	1.56	1651.70	1.53E+00	3.67E-02	12.2	
[illegible]	1	832.13	171	483	1.67	1704.31	1.50E+00	1.19E-02	25.3	1.29E+00
[illegible]	1	838.96	331	490	1.67	1718.31	1.49E+00	2.30E-02	13.7	
54	0	934.00	1211	506	1.63	1912.99	1.40E+00	8.41E-02	4.6	
55	0	964.15	160	531	1.66	1974.76	1.38E+00	1.11E-02	29.0	
56	0	1070.25	132	282	1.24	2192.12	1.31E+00	9.17E-03	24.6	
57	0	1120.19	5134	463	1.71	2294.45	1.29E+00	3.57E-01	1.7	
58	0	1155.09	666	422	1.69	2365.95	1.28E+00	4.62E-02	7.6	
59	0	1207.91	189	348	1.60	2474.18	1.26E+00	1.31E-02	21.9	
60	0	1237.92	1869	373	1.60	2535.67	1.24E+00	1.30E-01	3.2	
61	0	1280.87	380	401	1.58	2623.68	1.23E+00	2.64E-02	12.3	
62	2	1377.47	1408	250	1.92	2821.63	1.20E+00	9.78E-02	3.5	8.41E-01
63	2	1385.22	259	293	2.10	2837.50	1.20E+00	1.80E-02	14.7	
64	0	1401.01	399	347	1.60	2869.86	1.19E+00	2.77E-02	11.6	
65	0	1407.75	672	282	2.04	2883.68	1.19E+00	4.66E-02	6.4	
66	0	1509.15	707	364	1.66	3091.48	1.16E+00	4.91E-02	7.1	
67	4	1538.32	207	265	2.62	3151.28	1.15E+00	1.44E-02	18.0	1.42E+00
68	4	1542.84	190	253	2.62	3160.53	1.15E+00	1.32E-02	19.7	
69	0	1583.07	216	217	2.05	3243.00	1.14E+00	1.50E-02	15.6	
70	0	1599.03	71	182	0.99	3275.70	1.13E+00	4.94E-03	37.6	
71	0	1661.05	291	189	1.63	3402.82	1.11E+00	2.02E-02	11.8	
72	0	1729.54	941	138	2.04	3543.22	1.08E+00	6.53E-02	4.4	
73	0	1764.41	4244	138	2.25	3614.69	1.07E+00	2.95E-01	1.7	
74	1	1838.05	92	56	2.07	3765.66	1.04E+00	6.36E-03	22.4	1.74E+00
75	1	1847.30	579	76	2.08	3784.61	1.04E+00	4.02E-02	5.2	

8019

Gamma Spectroscopy Report generated 21-OCT-1996 12:51

Configuration: DISK:[RADCHEM.SCUSR.ARCHIVE]BKG_BCKGND_GAMMA6__9207.CNF;1
Analyses by : PEAK V16.5 PEAKEFF V2.2

---- Sample Information ----

Sample Title :
Sample ID : BCKGND
Sample Type :
Sample Quantity : 1.00000E+00 L
Sample Geometry :

---- Sample Decay/Count Information ----

Sample Date : 1-JAN-1900 00:00:
Elapsed live time: 0 16:40
Decay time :
Acquisition date : 11-OCT-1996 22:02
Elapsed real time: 0 16:40 0.0%

---- Detector Parameters ----

Energy cal. time : 8-OCT-1996 12:40:
Detector name : GAMMA6
Effic. cal. time : 19-SEP-1996 11:47
Counting geometry: IPL-1L

---- Processing Parameters ----

Cali. Slope	: 4.88802E-01	Cali. Offset	: -1.98761E-01
Cali. Quadratic	: -1.24008E-07	FWHM Offset	: 6.37077E-01
FWHM Slope	: 3.32083E-02	MDA Width (FWHM)	: 3.0
Start channel	: 1	End channel	: 4096
Sensitivity	: 5.0	Gaussian Sens.	: 10.0
Energy tolerance	: 2.0	Half life ratio	: 8.0
Abundance limit	: 75.0	WTM error limit	: 3.0
Activity Units	: pCi	Act. Conversion	: 1.00000E+06
MDA Confid Level	: 5.0	Sigma Number	: 1
Errors propagated	: Yes	Systematic Error	: 9.0%

	It	Energy	Area	Bkgnd	FWHM	Channel	%Eff	Cts/Sec	%Err	Fit
1	0	10.30	1435	8131	0.94	21.49	4.88E+00	2.39E-02	10.3	
2	0	13.11	1598	5408	1.08	27.23	5.24E+00	2.66E-02	7.8	
3	0	16.16	1877	4550	1.14	33.48	5.50E+00	3.13E-02	6.5	
4	0	19.32	489	2825	1.12	39.93	5.68E+00	8.16E-03	17.9	
5	0	46.47	1092	1757	1.00	95.48	5.87E+00	1.82E-02	8.1	
6	0	53.49	318	1255	0.95	109.84	5.79E+00	5.30E-03	20.1	
7	0	63.24	1969	1712	0.88	129.79	5.65E+00	3.28E-02	4.4	
8	0	66.38	251	976	1.39	136.22	5.61E+00	4.19E-03	20.7	
9	0	74.61	125	1302	0.63	153.05	5.48E+00	2.08E-03	46.4	
10	0	77.06	243	1345	0.84	158.06	5.44E+00	4.06E-03	25.9	
11	0	83.91	246	1375	0.77	172.09	5.34E+00	4.10E-03	26.9	
12	0	92.78	2705	1751	1.03	190.24	5.21E+00	4.51E-02	3.5	
13	0	110.06	123	1181	0.96	225.57	4.96E+00	2.05E-03	47.1	
14	0	139.64	327	1326	1.16	286.11	4.57E+00	5.45E-03	21.6	
15	0	143.65	214	1132	1.14	294.31	4.52E+00	3.56E-03	28.1	
16	0	163.35	219	1122	0.98	334.62	4.29E+00	3.64E-03	28.4	
17	0	185.87	1288	1399	1.06	380.70	4.06E+00	2.15E-02	6.3	
18	0	198.28	600	1223	1.98	406.10	3.94E+00	1.00E-02	12.0	
19	0	238.78	423	1033	1.02	488.98	3.59E+00	7.04E-03	14.5	
20	0	352.10	159	596	0.93	720.86	2.88E+00	2.66E-03	28.8	
21	0	511.22	1963	898	2.64	1046.54	2.24E+00	3.27E-02	4.1	
22	0	583.67	178	385	1.64	1194.85	2.03E+00	2.97E-03	22.1	
23	0	803.54	130	310	1.08	1644.99	1.57E+00	2.17E-03	26.8	
24	0	1002.71	19	311	1.88	2052.83	1.29E+00	3.21E-04	184.6	

Sample ID : BCKGND Acquisition date : 11-OCT-1996 22:02:41

8019

Pk	It	Energy	Area	Bkgnd	FWHM	Channel	%Eff	Cts/Sec	%Err	Fit
[illegible]	0	1461.46	98	143	1.20	2992.55	9.02E-01	1.63E-03	27.1	

Gamma Spectroscopy Report generated 21-OCT-1996 12:51

8019

Configuration: DISK:[RADCHEM.SCUSR.ARCHIVE]SMP_QC1232401_GAMMA6_PMP_9220.CNF;5
Analyses by : PEAK V16.5 ENBACK V1.5

---- Sample Information ----

Sample Title : G969901S
Sample ID : QC-123240-1 Sample Quantity : 1.00400E+02 G
Sample Type : SOIL Sample Geometry : TRM1S2

---- Sample Decay/Count Information ----

Sample Date : 15-FEB-1983 12:00 Acquisition date : 14-OCT-1996 10:56
Elapsed live time: 0 04:00 Elapsed real time: 0 04:00 0.1%
Decay time : 4989 22:56

---- Detector Parameters ----

Energy cal. time : 14-OCT-1996 09:29
Detector name : GAMMA6 Counting geometry: TRM1-S2
Effic. cal. time : 19-SEP-1996 15:59

---- Processing Parameters ----

Cali. Slope : 4.88511E-01 Cali. Offset : -1.75400E-01
Cali. Quadratic : -9.43914E-08 FWHM Offset : 7.57862E-01
FWHM Slope : 2.62786E-02 MDA Width (FWHM) : 3.0
Start channel : 1 End channel : 4096
Sensitivity : 5.0 Gaussian Sens. : 10.0
Energy tolerance : 2.0 Half life ratio : 8.0
Abundance limit : 75.0 WTM error limit : 3.0
Activity Units : PCI Act. Conversion : 1.00000E+06
MDA Confid Level : 5.0 Sigma Number : 2
Errors propagated: Yes Systematic Error : 0.0%

	It	Energy	Area	Bkgnd	FWHM	Channel	Left	Pw	Cts/Sec	%Err	Fit
1	6	10.68*	682	4588	1.03	22.22	19	18	4.73E-02	17.0	1.09E+00
2	6	12.97*	1284	4395	1.01	26.91	19	18	8.92E-02	9.1	
3	6	15.59*	1226	6280	1.46	32.27	19	18	8.51E-02	12.6	
4	2	25.57	200	1806	0.91	52.70	51	10	1.39E-02	30.7	1.76E+00
5	2	27.37	604	3054	1.08	56.38	51	10	4.20E-02	15.8	
6	0	46.53*	7826	6385	0.99	95.60	90	11	5.43E-01	2.3	
7	0	50.00	744	3298	0.92	102.72	101	6	5.17E-02	12.7	
8	0	53.28*	2077	4484	1.01	109.43	106	8	1.44E-01	6.1	
9	1	63.28*	1203	4335	0.87	129.91	126	16	8.36E-02	9.0	4.25E+00
10	1	67.63*	1024	4410	0.88	138.80	126	16	7.11E-02	10.3	
11	4	74.83*	12345	5951	0.94	153.55	147	15	8.57E-01	1.4	1.58E+01
12	4	77.11*	21468	6168	0.92	158.22	147	15	1.49E+00	0.9	
13	0	83.81*	3000	3862	0.95	171.93	170	6	2.08E-01	3.8	
14	0	87.18	6402	5255	1.18	178.82	176	7	4.45E-01	2.2	
15	0	89.99	2081	3995	1.02	184.59	182	6	1.45E-01	5.3	
16	0	92.47*	659	3434	0.95	189.65	188	5	4.58E-02	14.5	
17	0	94.83	760	3027	1.12	194.49	193	6	5.28E-02	12.3	
18	0	97.97	377	2576	1.46	200.92	199	6	2.62E-02	21.9	
19	0	144.07*	582	4292	1.16	295.29	291	9	4.05E-02	20.9	
20	0	154.22	657	4492	1.06	316.08	312	9	4.56E-02	18.8	
21	0	186.19*	6950	4188	1.15	381.52	377	10	4.83E-01	2.1	
22	0	236.02	634	2309	1.09	483.55	480	8	4.41E-02	13.7	
23	0	242.07	9730	2271	1.14	495.93	492	9	6.76E-01	1.3	
24	0	255.63	350	2631	0.98	523.69	518	11	2.43E-02	28.9	

Sample ID : QC-123240-1 Acquisition date : 14-OCT-1996 10:56:31

8019

Pk	It	Energy	Area	Bkgnd	FWHM	Channel	Left	Pw	Cts/Sec	%Err	Fit
[illegible]	0	259.00	620	1607	1.07	530.60	528	7	4.30E-02	11.4	
[illegible]	3	269.60	766	1902	1.27	552.30	548	12	5.32E-02	10.6	3.59E+00
27	3	271.40	589	1415	0.93	555.98	548	12	4.09E-02	11.2	
28	0	274.66	406	1471	1.68	562.66	560	7	2.82E-02	16.5	
29	0	295.29	21390	2505	1.15	604.91	600	12	1.49E+00	0.8	
30	0	299.78	216	1581	1.21	614.10	611	8	1.50E-02	32.6	
31	0	323.83	288	1801	1.12	663.34	657	11	2.00E-02	29.1	
32	0	329.91	192	1413	0.71	675.79	672	8	1.33E-02	34.7	
33	0	338.64	115	1202	0.76	693.66	690	7	8.02E-03	50.7	
34	0	351.98*	35956	2297	1.22	720.98	714	14	2.50E+00	0.6	
35	0	389.24	292	1226	1.04	797.28	794	8	2.03E-02	21.7	
36	0	402.02	255	1321	1.34	823.43	820	8	1.77E-02	25.5	
37	0	405.43	235	1167	1.59	830.43	827	7	1.63E-02	24.9	
38	0	454.49	386	1223	1.30	930.88	925	13	2.68E-02	19.4	
39	0	480.76	229	726	1.49	984.68	981	8	1.59E-02	21.5	
40	0	487.03	264	796	1.53	997.52	994	9	1.83E-02	20.2	
41	0	511.24*	192	1137	3.15	1047.10	1041	14	1.33E-02	41.2	
42	0	533.41	163	650	1.59	1092.50	1089	9	1.13E-02	29.2	
43	0	580.09	251	519	1.08	1188.09	1184	8	1.74E-02	17.0	
44	0	609.39	25069	903	1.39	1248.09	1241	13	1.74E+00	0.7	
45	0	665.64	758	437	1.44	1363.31	1359	10	5.27E-02	6.3	
46	0	703.13	254	634	1.19	1440.08	1436	11	1.77E-02	20.1	
47	0	720.09	120	573	1.01	1474.82	1469	10	8.35E-03	38.3	
48	0	742.51	146	462	1.48	1520.74	1516	10	1.02E-02	28.6	
49	0	768.39	2353	854	1.57	1573.75	1566	17	1.63E-01	3.5	
50	0	785.98	676	784	1.73	1609.78	1601	17	4.69E-02	10.3	
51	0	806.44	528	747	1.56	1651.70	1645	15	3.67E-02	12.2	
[illegible]	1	832.13	171	483	1.67	1704.31	1697	31	1.19E-02	25.3	1.29E+00
[illegible]	1	838.96	331	490	1.67	1718.31	1697	31	2.30E-02	13.7	
54	0	934.00	1211	506	1.63	1912.99	1907	11	8.41E-02	4.6	
55	0	964.15	160	531	1.66	1974.76	1969	11	1.11E-02	29.0	
56	0	1070.25	132	282	1.24	2192.12	2188	9	9.17E-03	24.6	
57	0	1120.19	5134	463	1.71	2294.45	2287	14	3.57E-01	1.7	
58	0	1155.09	666	422	1.69	2365.95	2359	14	4.62E-02	7.6	
59	0	1207.91	189	348	1.60	2474.18	2469	13	1.31E-02	21.9	
60	0	1237.92	1869	373	1.60	2535.67	2529	14	1.30E-01	3.2	
61	0	1280.87	380	401	1.58	2623.68	2618	14	2.64E-02	12.3	
62	2	1377.47	1408	250	1.92	2821.63	2816	29	9.78E-02	3.5	8.41E-01
63	2	1385.22	259	293	2.10	2837.50	2816	29	1.80E-02	14.7	
64	0	1401.01	399	347	1.60	2869.86	2861	16	2.77E-02	11.6	
65	0	1407.75	672	282	2.04	2883.68	2877	13	4.66E-02	6.4	
66	0	1509.15	707	364	1.66	3091.48	3084	16	4.91E-02	7.1	
67	4	1538.32	207	265	2.62	3151.28	3144	23	1.44E-02	18.0	1.42E+00
68	4	1542.84	190	253	2.62	3160.53	3144	23	1.32E-02	19.7	
69	0	1583.07	216	217	2.05	3243.00	3237	13	1.50E-02	15.6	
70	0	1599.03	71	182	0.99	3275.70	3271	10	4.94E-03	37.6	
71	0	1661.05	291	189	1.63	3402.82	3397	15	2.02E-02	11.8	
72	0	1729.54	941	138	2.04	3543.22	3535	17	6.53E-02	4.4	
73	0	1764.41	4244	138	2.25	3614.69	3606	19	2.95E-01	1.7	
74	1	1838.05	92	56	2.07	3765.66	3758	34	6.36E-03	22.4	1.74E+00
75	1	1847.30	579	76	2.08	3784.61	3758	34	4.02E-02	5.2	

Flag: "*" = Peak area was modified by background subtraction

[illegible]

087

000861

8019

Gamma Spectroscopy Report generated 21-OCT-1996 12:51

Configuration: DISK:[RADCHEM.SCUSR.ARCHIVE]SMP_QC1232401_GAMMA6_PMP_9220.CNF;5
Analyses by : PEAK V16.5 ENBACK V1.5 PEAKEFF V2.2 NID V3.1

---- Sample Information ----

Sample Title : G969901S
Sample ID : QC-123240-1 Sample Quantity : 1.00400E+02 G
Sample Type : SOIL Sample Geometry : TRM1S2

---- Sample Decay/Count Information ----

Sample Date : 15-FEB-1983 12:00 Acquisition date : 14-OCT-1996 10:56
Elapsed live time: 0 04:00 Elapsed real time: 0 04:00 0.1%
Decay time : 4989 22:56

---- Detector Parameters ----

Energy cal. time : 14-OCT-1996 09:29
Detector name : GAMMA6 Counting geometry: TRM1-S2
Effic. cal. time : 19-SEP-1996 15:59

---- Processing Parameters ----

Cali. Slope	: 4.88511E-01	Cali. Offset	: -1.75400E-01
Cali. Quadratic	: -9.43914E-08	FWHM Offset	: 7.57862E-01
FWHM Slope	: 2.62786E-02	MDA Width (FWHM)	: 3.0
Start channel	: 1	End channel	: 4096
Sensitivity	: 5.0	Gaussian Sens.	: 10.0
Energy tolerance	: 2.0	Half life ratio	: 8.0
Abundance limit	: 75.0	WTM error limit	: 3.0
Activity Units	: PCI	Act. Conversion	: 1.00000E+06
MDA Confid Level	: 5.0	Sigma Number	: 2
Errors propagated	: Yes	Systematic Error	: 0.0%

Post-NID Peak Search Report

It	Energy	Area	Bkgnd	FWHM	Channel	Left	Pw	%Err	Fit	Nuclides
6	10.68*	682	4588	1.03	22.22	19	18	34.0	1.09E+00	
6	12.97*	1284	4395	1.01	26.91	19	18	18.2		
6	15.59*	1226	6280	1.46	32.27	19	18	25.3		
2	25.57	200	1806	0.91	52.70	51	10	61.4	1.76E+00	
2	27.37	604	3054	1.08	56.38	51	10	31.7		
0	46.53*	7826	6385	0.99	95.60	90	11	4.6		
0	50.00	744	3298	0.92	102.72	101	6	25.4		PA-231
0	53.28*	2077	4484	1.01	109.43	106	8	12.1		
1	63.28*	1203	4335	0.87	129.91	126	16	18.1	4.25E+00	
1	67.63*	1024	4410	0.88	138.80	126	16	20.6		
4	74.83*	12345	5951	0.94	153.55	147	15	2.7	1.58E+01	
4	77.11*	21468	6168	0.92	158.22	147	15	1.8		
0	83.81*	3000	3862	0.95	171.93	170	6	7.6		
0	87.18	6402	5255	1.18	178.82	176	7	4.5		
0	89.99	2081	3995	1.02	184.59	182	6	10.7		
0	92.47*	659	3434	0.95	189.65	188	5	28.9		
0	94.83	760	3027	1.12	194.49	193	6	24.5		
0	97.97	377	2576	1.46	200.92	199	6	43.7		
0	144.07*	582	4292	1.16	295.29	291	9	41.8		U-235 PA-231
0	154.22	657	4492	1.06	316.08	312	9	37.7		PA-231

088

000862

Sample ID : QC-123240-1 Acquisition date : 14-OCT-1996 10:56:36

8019

It	Energy	Area	Bkgnd	FWHM	Channel	Left	Pw	%Err	Fit	Nuclides
0	186.19*	6950	4188	1.15	381.52	377	10	4.3		U-235 RA-226
0	236.02	634	2309	1.09	483.55	480	8	27.5		PA-231 PA-231
0	242.07	9730	2271	1.14	495.93	492	9	2.7		
0	255.63	350	2631	0.98	523.69	518	11	57.7		PA-231
0	259.00	620	1607	1.07	530.60	528	7	22.9		
3	269.60	766	1902	1.27	552.30	548	12	21.2	3.59E+00	PA-231
3	271.40	589	1415	0.93	555.98	548	12	22.5		PA-231
0	274.66	406	1471	1.68	562.66	560	7	33.0		
0	295.29	21390	2505	1.15	604.91	600	12	1.7		
0	299.78	216	1581	1.21	614.10	611	8	65.3		PA-231
0	323.83	288	1801	1.12	663.34	657	11	58.3		PA-231
0	329.91	192	1413	0.71	675.79	672	8	69.4		PA-231
0	338.64	115	1202	0.76	693.66	690	7	101.3		PA-231
0	351.98*	35956	2297	1.22	720.98	714	14	1.2		PA-231
0	389.24	292	1226	1.04	797.28	794	8	43.5		
0	402.02	255	1321	1.34	823.43	820	8	50.9		PA-231
0	405.43	235	1167	1.59	830.43	827	7	49.9		PA-231
0	454.49	386	1223	1.30	930.88	925	13	38.8		
0	480.76	229	726	1.49	984.68	981	8	43.0		
0	487.03	264	796	1.53	997.52	994	9	40.4		
0	511.24*	192	1137	3.15	1047.10	1041	14	82.4		
0	533.41	163	650	1.59	1092.50	1089	9	58.5		
0	580.09	251	519	1.08	1188.09	1184	8	33.9		
0	609.39	25069	903	1.39	1248.09	1241	13	1.4		
0	665.64	758	437	1.44	1363.31	1359	10	12.7		
	703.13	254	634	1.19	1440.08	1436	11	40.2		
	720.09	120	573	1.01	1474.82	1469	10	76.7		
0	742.51	146	462	1.48	1520.74	1516	10	57.3		
0	768.39	2353	854	1.57	1573.75	1566	17	7.0		
0	785.98	676	784	1.73	1609.78	1601	17	20.5		
0	806.44	528	747	1.56	1651.70	1645	15	24.4		
1	832.13	171	483	1.67	1704.31	1697	31	50.6	1.29E+00	PA-231
1	838.96	331	490	1.67	1718.31	1697	31	27.4		
0	934.00	1211	506	1.63	1912.99	1907	11	9.2		
0	964.15	160	531	1.66	1974.76	1969	11	58.1		
0	1070.25	132	282	1.24	2192.12	2188	9	49.1		
0	1120.19	5134	463	1.71	2294.45	2287	14	3.3		
0	1155.09	666	422	1.69	2365.95	2359	14	15.2		
0	1207.91	189	348	1.60	2474.18	2469	13	43.7		
0	1237.92	1869	373	1.60	2535.67	2529	14	6.4		
0	1280.87	380	401	1.58	2623.68	2618	14	24.6		
2	1377.47	1408	250	1.92	2821.63	2816	29	7.0	8.41E-01	
2	1385.22	259	293	2.10	2837.50	2816	29	29.5		
0	1401.01	399	347	1.60	2869.86	2861	16	23.2		
0	1407.75	672	282	2.04	2883.68	2877	13	12.9		
0	1509.15	707	364	1.66	3091.48	3084	16	14.2		
4	1538.32	207	265	2.62	3151.28	3144	23	36.0	1.42E+00	
4	1542.84	190	253	2.62	3160.53	3144	23	39.5		
0	1583.07	216	217	2.05	3243.00	3237	13	31.3		

Sample ID : QC-123240-1 Acquisition date : 14-OCT-1996 10:56:36

8019

It	Energy	Area	Bkgnd	FWHM	Channel	Left	Pw	%Err	Fit	Nuclides
	1599.03	71	182	0.99	3275.70	3271	10	75.2		
	1661.05	291	189	1.63	3402.82	3397	15	23.6		
0	1729.54	941	138	2.04	3543.22	3535	17	8.7		
0	1764.41	4244	138	2.25	3614.69	3606	19	3.4		
1	1838.05	92	56	2.07	3765.66	3758	34	44.8	1.74E+00	
1	1847.30	579	76	2.08	3784.61	3758	34	10.4		

Gamma Spectroscopy Report generated 21-OCT-1996 12:52 **8019**

Configuration: DISK:[RADCHEM.SCUSR.ARCHIVE]SMP_QC1232401_GAMMA6_PMP_9220.CNF;5
Analyses by : PEAK V16.5 ENBACK V1.5 PEAKEFF V2.2 NID V3.1

---- Sample Information ----

Sample Title	: G969901S		
Sample ID	: QC-123240-1	Sample Quantity	: 1.00400E+02 G
Sample Type	: SOIL	Sample Geometry	: TRM1S2

---- Sample Decay/Count Information ----

Sample Date	: 15-FEB-1983 12:00	Acquisition date	: 14-OCT-1996 10:56
Elapsed live time	: 0 04:00	Elapsed real time	: 0 04:00 0.1%
Decay time	: 4989 22:56		

---- Detector Parameters ----

Energy cal. time	: 14-OCT-1996 09:29		
Detector name	: GAMMA6	Counting geometry	: TRM1-S2
Effic. cal. time	: 19-SEP-1996 15:59		

---- Processing Parameters ----

Cali. Slope	: 4.88511E-01	Cali. Offset	: -1.75400E-01
Cali. Quadratic	: -9.43914E-08	FWHM Offset	: 7.57862E-01
FWHM Slope	: 2.62786E-02	MDA Width (FWHM)	: 3.0
Start channel	: 1	End channel	: 4096
Sensitivity	: 5.0	Gaussian Sens.	: 10.0
Energy tolerance	: 2.0	Half life ratio	: 8.0
Abundance limit	: 75.0	WTM error limit	: 3.0
Activity Units	: PCI	Act. Conversion	: 1.00000E+06
MDA Confid Level	: 5.0	Sigma Number	: 2
Errors propagated	: Yes	Systematic Error	: 0.0%

Interference Report

No interference correction performed

Sample ID : QC-123240-1 Acquisition date : 14-OCT-1996 10:56:36

8019

Nuclide	Half-life	Half-Life Ratio	Energy	%Abund	Activity	2-Sigma %Error	Rejected by
RA-228	1.41E+10Y	0.00	209.28	4.40	--- Not Found ---		Abun.
			270.23	3.60	7.664E-06	55.89	
			327.64	3.20	--- Not Found ---		
			338.32	11.40	4.825E-07	110.13	
			463.00	4.40	--- Not Found ---		
			794.70	4.60	--- Not Found ---		
			911.07*	27.70	--- Not Found ---		
			964.60	5.20	4.176E-06	65.26	
			969.11	16.60	--- Not Found ---		

% Abundances Found = 24.91

Flag: "*" = Keyline

8019

Nuclide Type: Natural

Nuclide	Energy	Area	%Abn	%Eff	Uncorrected PCI/G	Decay Corr PCI/G	2-Sigma %Error
RA-226	186.21	6950	3.28*	7.388E+00	5.362E+01	5.394E+01	30.81
PA-231	50.10	744	31.70	6.579E+00	6.673E-01	6.675E-01	27.88
	100.00	------	1.11	8.297E+00	------	Line Not Found	------
	122.31	------	1.19	8.566E+00	------	Line Not Found	------
	144.24	582	3.24	8.382E+00	4.010E+00	4.011E+00	46.63
	154.21	657	5.58	8.195E+00	2.686E+00	2.686E+00	43.99
	205.00	------	1.08	6.856E+00	------	Line Not Found	------
	210.60	------	1.26	6.698E+00	------	Line Not Found	------
	234.90	634	2.80	6.005E+00	7.053E+00	7.055E+00	45.18
	236.00	634	11.50	6.005E+00	1.717E+00	1.718E+00	40.71
	256.20	350	6.30	5.514E+00	1.883E+00	1.883E+00	65.21
	269.46	766	13.60	5.191E+00	2.029E+00	2.029E+00	34.18
	271.23	589	10.60	5.151E+00	2.018E+00	2.018E+00	35.42
	283.67	------	1.60	4.889E+00	------	Line Not Found	------
	286.10	------	1.60	4.839E+00	------	Line Not Found	------
	300.08	216	2.30	4.572E+00	3.837E+00	3.838E+00	69.74
	304.40	------	1.35	4.487E+00	------	Line Not Found	------
	323.87	288	3.88	4.152E+00	3.340E+00	3.341E+00	61.46
	330.00	192	1.30	4.056E+00	6.805E+00	6.807E+00	77.85
	334.20	------	1.15	3.990E+00	------	Line Not Found	------
	338.28	115	2.73	3.923E+00	2.015E+00	2.015E+00	102.85
	351.07	35956	12.94*	3.734E+00	1.391E+02	1.392E+02	12.12
	401.81	255	6.50	3.148E+00	2.328E+00	2.329E+00	53.33
	404.84	235	2.90	3.114E+00	4.869E+00	4.871E+00	51.91
	427.08	------	1.30	2.915E+00	------	Line Not Found	------
	445.03	------	1.18	2.769E+00	------	Line Not Found	------
	569.67	------	0.54	2.078E+00	------	Line Not Found	------
	831.96	171	2.90	1.498E+00	7.376E+00	7.378E+00	83.52
	897.83	------	0.24	1.431E+00	------	Line Not Found	------
	897.83	------	0.52	1.431E+00	------	Line Not Found	------
U-235	143.76	582	10.50	8.382E+00	1.237E+00	1.237E+00	48.87
	163.35	------	4.70	7.990E+00	------	Line Not Found	------
	185.71	6950	54.00*	7.388E+00	3.257E+00	3.257E+00	30.98
	205.31	------	4.70	6.847E+00	------	Line Not Found	------

Flag: "*" = Keyline

Gamma Spectroscopy Report generated 21-OCT-1996 12:52 8019

Configuration: DISK:[RADCHEM.SCUSR.ARCHIVE]SMP_QC1232401_GAMMA6_PMP_9220.CNF;5
Analyses by : PEAK V16.5 ENBACK V1.5 PEAKEFF V2.2 NID V3.1 MINACT V2.5

---- Sample Information ----

Sample Title	: G969901S		
Sample ID	: QC-123240-1	Sample Quantity	: 1.00400E+02 G
Sample Type	: SOIL	Sample Geometry	: TRM1S2

---- Sample Decay/Count Information ----

Sample Date	: 15-FEB-1983 12:00	Acquisition date	: 14-OCT-1996 10:56
Elapsed live time	: 0 04:00	Elapsed real time	: 0 04:00 0.1%
Decay time	: 4989 22:56		

---- Detector Parameters ----

Energy cal. time	: 14-OCT-1996 09:29		
Detector name	: GAMMA6	Counting geometry	: TRM1-S2
Effic. cal. time	: 19-SEP-1996 15:59		

---- Processing Parameters ----

Cali. Slope	: 4.88511E-01	Cali. Offset	: -1.75400E-01
Cali. Quadratic	: -9.43914E-08	FWHM Offset	: 7.57862E-01
FWHM Slope	: 2.62786E-02	MDA Width (FWHM)	: 3.0
Start channel	: 1	End channel	: 4096
Sensitivity	: 5.0	Gaussian Sens.	: 10.0
Energy tolerance	: 2.0	Half life ratio	: 8.0
Abundance limit	: 75.0	WTM error limit	: 3.0
Activity Units	: PCI	Act. Conversion	: 1.00000E+06
MDA Confid Level	: 5.0	Sigma Number	: 2
Errors propagated	: Yes	Systematic Error	: 0.0%

Combined Activity-MDA Report

---- Identified Nuclides ----

Nuclide	Activity (PCI/G)	Act error	MDA (PCI/G)	MDA error	Act/MDA
RA-226	5.394E+01	1.662E+01	1.981E+00	6.045E-01	27.223
PA-231	1.392E+02	1.687E+01	6.411E-01	7.878E-02	217.075
U-235	3.257E+00	1.009E+00	1.205E-01	3.680E-02	27.027

---- Non-Identified Nuclides ----

Nuclide	Key-Line Activity (PCI/G)	K.L. Ided	Act error	MDA (PCI/G)	MDA error	Act/MDA
RA-228	2.757E-01		3.068E-01	5.268E-01	1.171E-01	0.523

Gamma Spectroscopy Report generated 21-OCT-1996 12:52 **8019**

Configuration: DISK:[RADCHEM.SCUSR.ARCHIVE]SMP_QC1232401_GAMMA6_PMP_9220.CNF;5
Analyses by : PEAK V16.5 ENBACK V1.5 PEAKEFF V2.2 NID V3.1 MINACT V2.5

---- Sample Information ----

Sample Title	: G969901S		
Sample ID	: QC-123240-1	Sample Quantity	: 1.00400E+02 G
Sample Type	: SOIL	Sample Geometry	: TRM1S2

---- Sample Decay/Count Information ----

Sample Date	: 15-FEB-1983 12:00	Acquisition date	: 14-OCT-1996 10:56
Elapsed live time	: 0 04:00	Elapsed real time	: 0 04:00 0.1%
Decay time	: 4989 22:56		

---- Detector Parameters ----

Energy cal. time	: 14-OCT-1996 09:29		
Detector name	: GAMMA6	Counting geometry	: TRM1-S2
Effic. cal. time	: 19-SEP-1996 15:59		

---- Processing Parameters ----

Cali. Slope	: 4.88511E-01	Cali. Offset	: -1.75400E-01
Cali. Quadratic	: -9.43914E-08	FWHM Offset	: 7.57862E-01
FWHM Slope	: 2.62786E-02	MDA Width (FWHM)	: 3.0
Start channel	: 1	End channel	: 4096
Sensitivity	: 5.0	Gaussian Sens.	: 10.0
Energy tolerance	: 2.0	Half life ratio	: 8.0
Abundance limit	: 75.0	WTM error limit	: 3.0
Activity Units	: PCI	Act. Conversion	: 1.00000E+06
MDA Confid Level	: 5.0	Sigma Number	: 2
Errors propagated	: Yes	Systematic Error	: 9.0%

Combined Activity-MDA Report

---- Identified Nuclides ----

Nuclide	Activity (PCI/G)	Act error	MDA (PCI/G)	MDA error	Act/MDA
RA-226	5.394E+01	1.924E+01	1.981E+00	6.045E-01	27.223
PA-231	1.392E+02	3.020E+01	6.411E-01	7.878E-02	217.075
U-235	3.257E+00	1.167E+00	1.205E-01	3.680E-02	27.027

---- Non-Identified Nuclides ----

Nuclide	Key-Line Activity (PCI/G)	K.L. Ided	Act error	MDA (PCI/G)	MDA error	Act/MDA
RA-228	2.757E-01		3.108E-01	5.268E-01	1.171E-01	0.523

R. Jelly
10/21/96

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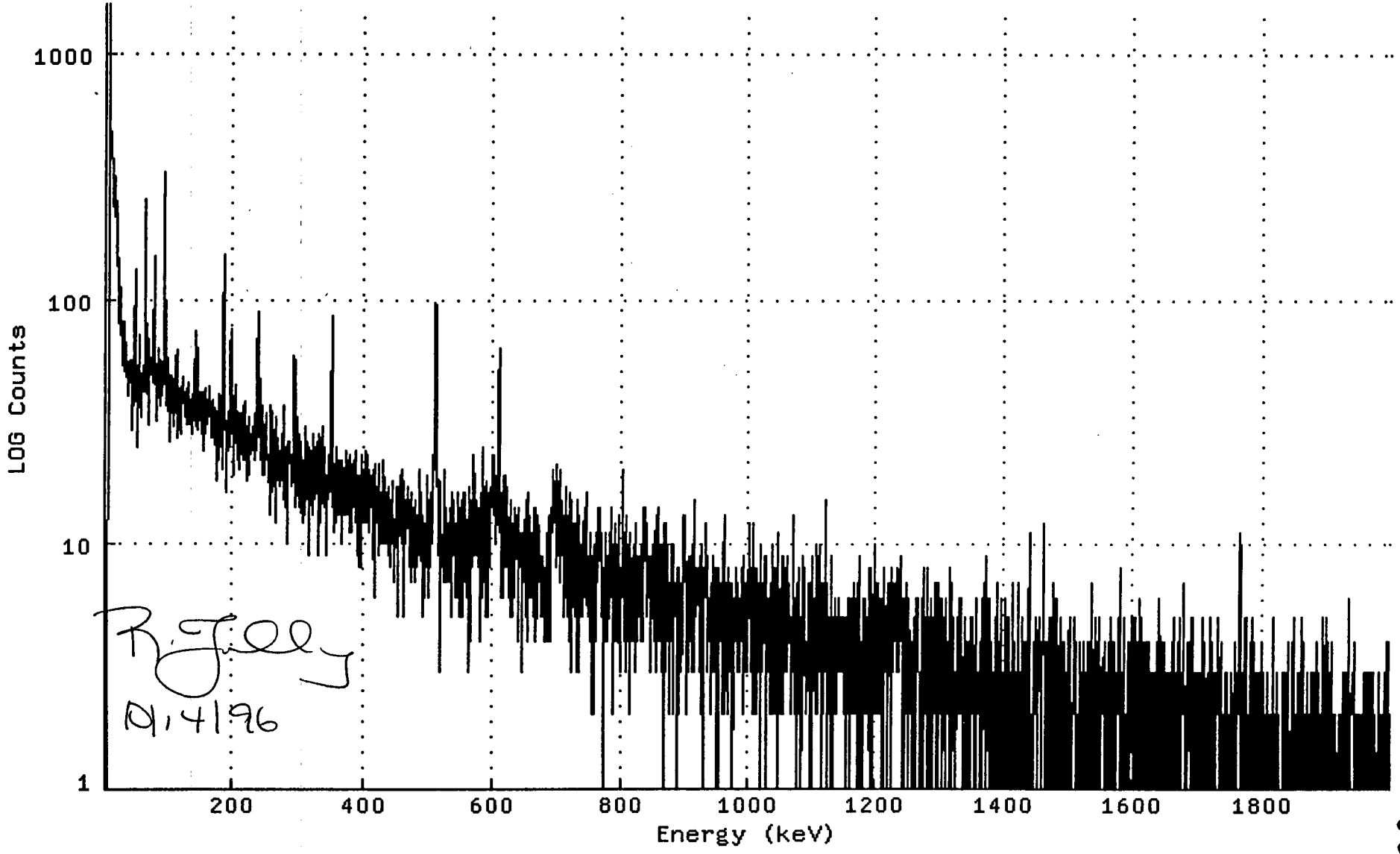
Spectrum : DISK:[RADCHEM.SCUSR.ARCHIVE]SMP_96E04517_GAMMA6_PMP_9182.CNF;2
Title : 96E-0640-04
Sample Title: G969901S
Start Time: 9-OCT-1996 14:30: Sample Time: 19-SEP-1996 12:00 Energy Offset: -1.98761E-01
Real Time : 0 04:00:02.44 Sample ID : 96E04517 Energy Slope : 4.88802E-01
Live Time : 0 04:00:00.00 Sample Type: FILTER Energy Quad : -1.24008E-07



R. Gilly
10/4/96

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Gamma Spectroscopy Report generated 11-OCT-1996 14:03 **8019**

Configuration: DISK:[RADCHEM.SCUSR.ARCHIVE]SMP_96E04517_GAMMA6_PMP_9182.CNF;2
Analyses by : PEAK V16.5 PEAKEFF V2.2

---- Sample Information ----

Sample Title : G969901S
Sample ID : 96E04517 Sample Quantity : 1.00000E+00 SAMPLE
Sample Type : FILTER Sample Geometry : PMP

---- Sample Decay/Count Information ----

Sample Date : 19-SEP-1996 12:00 Acquisition date : 9-OCT-1996 14:30:
Elapsed live time: 0 04:00 Elapsed real time: 0 04:00 0.0%
Decay time : 20 02:30

---- Detector Parameters ----

Energy cal. time : 8-OCT-1996 12:40:
Detector name : GAMMA6 Counting geometry: PMP
Effic. cal. time : 19-SEP-1996 15:11

---- Processing Parameters ----

Cali. Slope	: 4.88802E-01	Cali. Offset	: -1.98761E-01
Cali. Quadratic	: -1.24008E-07	FWHM Offset	: 6.37077E-01
FWHM Slope	: 3.32083E-02	MDA Width (FWHM)	: 3.0
Start channel	: 1	End channel	: 4096
Sensitivity	: 5.0	Gaussian Sens.	: 10.0
Energy tolerance	: 2.0	Half life ratio	: 8.0
Abundance limit	: 75.0	WTM error limit	: 3.0
Activity Units	: PCI	Act. Conversion	: 1.00000E+06
MDA Confid Level	: 5.0	Sigma Number	: 2
Errors propagated	: Yes	Systematic Error	: 0.0%

	It	Energy	Area	Bkgnd	FWHM	Channel	%Eff	Cts/Sec	%Err	Fit
1	0	10.21	400	1823	1.07	21.30	9.13E-01	2.78E-02	17.8	
2	0	12.85	264	1409	1.05	26.70	1.52E+00	1.84E-02	23.4	
3	0	16.08	439	1258	1.20	33.30	2.30E+00	3.05E-02	14.4	
4	0	46.50	192	304	1.02	95.53	6.84E+00	1.34E-02	16.8	
5	0	53.60	126	263	1.34	110.06	7.18E+00	8.73E-03	24.0	
6	0	63.26	438	364	1.00	129.82	7.43E+00	3.04E-02	8.9	
7	0	77.42	131	387	0.68	158.81	7.49E+00	9.07E-03	26.7	
8	0	92.66	709	473	1.15	189.97	7.34E+00	4.92E-02	7.1	
9	0	112.54	75	219	1.51	230.65	6.98E+00	5.22E-03	33.4	
10	0	144.03	92	288	0.86	295.09	6.33E+00	6.37E-03	35.1	
11	0	185.64	383	305	1.23	380.23	5.52E+00	2.66E-02	10.4	
12	0	198.07	200	348	1.88	405.67	5.31E+00	1.39E-02	20.6	
13	0	259.03	56	109	1.55	530.42	4.41E+00	3.90E-03	33.5	
14	0	295.07	141	194	1.24	604.15	4.00E+00	9.81E-03	21.5	
15	0	351.98	163	184	1.06	720.62	3.47E+00	1.13E-02	17.5	
16	0	511.31	435	200	2.13	1046.73	2.52E+00	3.02E-02	8.7	
17	0	609.32	201	201	1.48	1247.36	2.16E+00	1.39E-02	17.6	
18	0	807.00	70	149	7.01	1652.07	1.69E+00	4.83E-03	50.3	
19	0	1764.84	46	12	2.49	3614.26	9.07E-01	3.22E-03	21.1	

Gamma Spectroscopy Report generated 11-OCT-1996 14:03

8019

Configuration: DISK:[RADCHEM.SCUSR.ARCHIVE]BKG_BCKGND_GAMMA6__9144.CNF;1
Analyses by : PEAK V16.5 PEAKEFF V2.2

---- Sample Information ----

Sample Title :
Sample ID : BCKGND
Sample Type :
Sample Quantity : 1.00000E+00 G
Sample Geometry :

---- Sample Decay/Count Information ----

Sample Date : 4-OCT-1996 00:00:
Elapsed live time: 2 02:00
Decay time : 0 18:21
Acquisition date : 4-OCT-1996 18:21:
Elapsed real time: 2 02:00 0.0%

---- Detector Parameters ----

Energy cal. time : 30-SEP-1996 09:02
Detector name : GAMMA6
Effic. cal. time : 19-SEP-1996 13:34
Counting geometry: TRM1-S3

---- Processing Parameters ----

Cali. Slope	: 4.88539E-01	Cali. Offset	: -1.23202E-01
Cali. Quadratic	: -8.96482E-08	FWHM Offset	: 6.63864E-01
FWHM Slope	: 3.08694E-02	MDA Width (FWHM)	: 3.0
Start channel	: 1	End channel	: 4096
Sensitivity	: 5.0	Gaussian Sens.	: 10.0
Energy tolerance	: 2.0	Half life ratio	: 8.0
Abundance limit	: 75.0	WTM error limit	: 3.0
Activity Units	: pCi	Act. Conversion	: 1.00000E+06
MDA Confid Level	: 5.0	Sigma Number	: 1
Errors propagated	: Yes	Systematic Error	: 9.0%

	It	Energy	Area	Bkgnd	FWHM	Channel	%Eff	Cts/Sec	%Err	Fit
1	0	10.31	4650	23581	0.99	21.37	1.07E+05	2.58E-02	5.4	
2	4	13.10	3782	8752	0.88	27.07	1.83E+03	2.10E-02	3.5	6.65E-01
3	4	16.24	5522	14567	1.15	33.50	1.52E+02	3.07E-02	4.1	
4	0	19.50	1635	8409	1.62	40.16	3.62E+01	9.08E-03	9.3	
5	0	25.54	312	5600	0.86	52.53	1.02E+01	1.73E-03	38.6	
6	0	46.59	2743	4367	1.01	95.62	5.24E+00	1.52E-02	4.7	
7	0	53.57	608	4119	1.10	109.90	5.52E+00	3.38E-03	18.7	
8	0	63.33	5851	4242	0.89	129.88	6.06E+00	3.25E-02	2.3	
9	0	66.27	434	3647	1.07	135.89	6.23E+00	2.41E-03	23.6	
10	0	74.71	387	3737	0.90	153.19	6.70E+00	2.15E-03	25.5	
11	0	77.10	716	3235	0.91	158.08	6.82E+00	3.98E-03	13.2	
12	0	84.07	939	4528	1.17	172.34	7.15E+00	5.22E-03	13.3	
13	0	87.11	255	3002	1.06	178.56	7.28E+00	1.42E-03	34.5	
14	0	92.68	8662	4490	1.15	189.96	7.48E+00	4.81E-02	1.8	
15	0	98.45	403	3128	0.67	201.79	7.65E+00	2.24E-03	23.5	
16	7	110.09	994	5123	1.93	225.60	7.87E+00	5.52E-03	14.9	2.35E+00
17	7	112.93	511	3026	1.14	231.42	7.90E+00	2.84E-03	18.5	
18	0	139.98	660	3279	1.12	286.79	7.85E+00	3.67E-03	15.5	
19	0	143.85	766	3282	0.98	294.73	7.80E+00	4.26E-03	13.4	
20	0	163.53	543	3010	1.01	335.01	7.47E+00	3.01E-03	18.1	
21	0	185.82	3757	3802	1.11	380.64	6.98E+00	2.09E-02	3.5	
22	0	197.88	1519	4349	2.03	405.32	6.69E+00	8.44E-03	9.1	
23	0	205.27	364	2837	1.41	420.45	6.51E+00	2.02E-03	25.9	
24	0	238.51	1425	3059	1.17	488.51	5.74E+00	7.92E-03	7.4	

Sample ID : BCKGND Acquisition date : 4-OCT-1996 18:21:18

8019

Pk	It	Energy	Area	Bkgnd	FWHM	Channel	%Eff	Cts/Sec	%Err	Fit
[illegible]	0	295.60	150	1965	1.35	605.39	4.61E+00	8.34E-04	51.9	
[illegible]	0	351.85	396	1610	1.25	720.55	3.78E+00	2.20E-03	18.2	
27	0	510.92	5903	2795	2.42	1046.27	2.47E+00	3.28E-02	2.5	
28	0	569.76	296	1426	1.68	1166.76	2.20E+00	1.65E-03	25.4	
29	0	583.21	431	1428	1.46	1194.29	2.15E+00	2.39E-03	17.7	
30	0	609.11	415	1634	1.39	1247.34	2.06E+00	2.31E-03	18.9	
31	0	669.74	157	876	1.62	1371.50	1.88E+00	8.74E-04	34.9	
32	10	694.29	708	1889	3.83	1421.77	1.83E+00	3.93E-03	15.0	3.99E+00
33	10	701.21	457	2536	3.84	1435.95	1.81E+00	2.54E-03	29.9	
34	0	802.85	425	888	1.34	1644.13	1.63E+00	2.36E-03	14.4	
35	0	1000.76	326	643	1.90	2049.50	1.42E+00	1.81E-03	16.1	
36	0	1063.81	136	560	1.77	2178.65	1.38E+00	7.53E-04	33.9	
37	0	1460.33	407	435	1.84	2991.07	1.22E+00	2.26E-03	12.2	
38	0	1764.08	137	242	1.92	3613.58	1.14E+00	7.60E-04	24.3	

Gamma Spectroscopy Report generated 11-OCT-1996 14:03

8019

Configuration: DISK:[RADCHEM.SCUSR.ARCHIVE]SMP_96E04517_GAMMA6_PMP_9182.CNF;2
Analyses by : PEAK V16.5 ENBACK V1.5

---- Sample Information ----

Sample Title : G969901S
Sample ID : 96E04517
Sample Type : FILTER
Sample Quantity : 1.00000E+00 SAMPLE
Sample Geometry : PMP

---- Sample Decay/Count Information ----

Sample Date : 19-SEP-1996 12:00
Acquisition date : 9-OCT-1996 14:30:
Elapsed live time: 0 04:00
Elapsed real time: 0 04:00 0.0%
Decay time : 20 02:30

---- Detector Parameters ----

Energy cal. time : 8-OCT-1996 12:40:
Detector name : GAMMA6
Counting geometry: PMP
Effic. cal. time : 19-SEP-1996 15:11

---- Processing Parameters ----

Cali. Slope	: 4.88802E-01	Cali. Offset	: -1.98761E-01
Cali. Quadratic	: -1.24008E-07	FWHM Offset	: 6.37077E-01
FWHM Slope	: 3.32083E-02	MDA Width (FWHM)	: 3.0
Start channel	: 1	End channel	: 4096
Sensitivity	: 5.0	Gaussian Sens.	: 10.0
Energy tolerance	: 2.0	Half life ratio	: 8.0
Abundance limit	: 75.0	WTM error limit	: 3.0
Activity Units	: PCI	Act. Conversion	: 1.00000E+06
MDA Confid Level	: 5.0	Sigma Number	: 2
Errors propagated	: Yes	Systematic Error	: 0.0%

	It	Energy	Area	Bkgnd	FWHM	Channel	Left	Pw	Cts/Sec	%Err	Fit
1	0	10.21*	28	1823	1.07	21.30	19	6	1.96E-03	262.6	
2	0	53.60*	77	263	1.34	110.06	107	8	5.35E-03	40.9	
3	0	77.42*	73	387	0.68	158.81	155	7	5.09E-03	48.8	
4	0	92.66*	16	473	1.15	189.97	186	11	1.10E-03	324.4	
5	0	112.54*	34	219	1.51	230.65	228	6	2.38E-03	76.4	
6	0	144.03*	30	288	0.86	295.09	291	9	2.12E-03	109.2	
7	0	185.64*	82	305	1.23	380.23	375	12	5.72E-03	50.1	
8	0	198.07*	78	348	1.88	405.67	399	13	5.42E-03	54.5	
9	0	259.03	56	109	1.55	530.42	527	7	3.90E-03	33.5	
10	0	295.07*	129	194	1.24	604.15	598	12	8.98E-03	23.9	
11	0	351.98*	131	184	1.06	720.62	716	10	9.12E-03	22.1	
12	0	609.32*	167	201	1.48	1247.36	1240	17	1.16E-02	21.5	
13	0	807.00	70	149	7.01	1652.07	1640	27	4.83E-03	50.3	
14	0	1764.84*	35	12	2.49	3614.26	3609	11	2.46E-03	28.7	

Flag: "*" = Peak area was modified by background subtraction

Gamma Spectroscopy Report generated 11-OCT-1996 14:04 **8019**

Configuration: DISK:[RADCHEM.SCUSR.ARCHIVE]SMP_96E04517_GAMMA6_PMP_9182.CNF;2
Analyses by : PEAK V16.5 ENBACK V1.5 PEAKEFF V2.2 NID V3.1

---- Sample Information ----

Sample Title	: G969901S		
Sample ID	: 96E04517	Sample Quantity	: 1.00000E+00 SAMPLE
Sample Type	: FILTER	Sample Geometry	: PMP

---- Sample Decay/Count Information ----

Sample Date	: 19-SEP-1996 12:00	Acquisition date	: 9-OCT-1996 14:30:
Elapsed live time	: 0 04:00	Elapsed real time	: 0 04:00 0.0%
Decay time	: 20 02:30		

---- Detector Parameters ----

Energy cal. time	: 8-OCT-1996 12:40:		
Detector name	: GAMMA6	Counting geometry	: PMP
Effic. cal. time	: 19-SEP-1996 15:11		

---- Processing Parameters ----

Cali. Slope	: 4.88802E-01	Cali. Offset	: -1.98761E-01
Cali. Quadratic	: -1.24008E-07	FWHM Offset	: 6.37077E-01
FWHM Slope	: 3.32083E-02	MDA Width (FWHM)	: 3.0
Start channel	: 1	End channel	: 4096
Sensitivity	: 5.0	Gaussian Sens.	: 10.0
Energy tolerance	: 2.0	Half life ratio	: 8.0
Abundance limit	: 75.0	WTM error limit	: 3.0
Activity Units	: PCI	Act. Conversion	: 1.00000E+06
MDA Confid Level	: 5.0	Sigma Number	: 2
Errors propagated	: Yes	Systematic Error	: 0.0%

Post-NID Peak Search Report

It	Energy	Area	Bkgnd	FWHM	Channel	Left	Pw %Err	Fit	Nuclides
0	10.21*	28	1823	1.07	21.30	19	6525.2		
0	53.60*	77	263	1.34	110.06	107	8 81.8		
0	77.42*	73	387	0.68	158.81	155	7 97.5		
0	92.66*	16	473	1.15	189.97	186	11648.7		
0	112.54*	34	219	1.51	230.65	228	6152.7		
0	144.03*	30	288	0.86	295.09	291	9218.3		U-235
0	185.64*	82	305	1.23	380.23	375	12100.2		U-235 RA-226
0	198.07*	78	348	1.88	405.67	399	13109.0		
0	259.03	56	109	1.55	530.42	527	7 67.1		
0	295.07*	129	194	1.24	604.15	598	12 47.9		
0	351.98*	131	184	1.06	720.62	716	10 44.2		
0	609.32*	167	201	1.48	1247.36	1240	17 42.9		
0	807.00	70	149	7.01	1652.07	1640	27100.5		
0	1764.84*	35	12	2.49	3614.26	3609	11 57.4		

Gamma Spectroscopy Report generated 15-OCT-1996 11:08

Configuration: DISK:[RADCHEM.SCUSR.ARCHIVE]SMP_96E04517_GAMMA6_PMP_9182.CNF;2
Analyses by : PEAK V16.5 ENBACK V1.5 PEAKEFF V2.2 NID V3.1 MINACT V2.5

---- Sample Information ----

Sample Title	: G969901S		
Sample ID	: 96E04517	Sample Quantity	: 1.00000E+00 SAMPLE
Sample Type	: FILTER	Sample Geometry	: PMP

---- Sample Decay/Count Information ----

Sample Date	: 19-SEP-1996 12:00	Acquisition date	: 9-OCT-1996 14:30:
Elapsed live time	: 0 04:00	Elapsed real time	: 0 04:00 0.0%
Decay time	: 20 02:30		

---- Detector Parameters ----

Energy cal. time	: 8-OCT-1996 12:40:		
Detector name	: GAMMA6	Counting geometry	: PMP
Effic. cal. time	: 19-SEP-1996 15:11		

---- Processing Parameters ----

Cali. Slope	: 4.88802E-01	Cali. Offset	: -1.98761E-01
Cali. Quadratic	: -1.24008E-07	FWHM Offset	: 6.37077E-01
FWHM Slope	: 3.32083E-02	MDA Width (FWHM)	: 3.0
Start channel	: 1	End channel	: 4096
Sensitivity	: 5.0	Gaussian Sens.	: 10.0
Energy tolerance	: 2.0	Half life ratio	: 8.0
Abundance limit	: 75.0	WTM error limit	: 3.0
Activity Units	: PCI	Act. Conversion	: 1.00000E+06
MDA Confid Level	: 5.0	Sigma Number	: 2
Errors propagated	: Yes	Systematic Error	: 0.0%

Combined Activity-MDA Report

---- Identified Nuclides ----

Nuclide	Activity (PCI/SAMPLE)	Act error	MDA (PCI/SAMPLE)	MDA error	Act/MDA
RA-226	8.540E+01	8.621E+01	6.926E+01	8.309E+00	1.233
U-235	8.600E+00	1.887E+01	4.199E+00	5.213E-01	2.048

---- Non-Identified Nuclides ----

Nuclide	Key-Line Activity (PCI/SAMPLE)	K.L. Ided	Act error	MDA (PCI/SAMPLE)	MDA error	Act/MDA
RA-228	-1.947E+00		1.052E+01	1.819E+01	2.423E+00	-0.107
PA-231	5.485E+01	+	2.522E+01	3.496E+01	4.401E+00	1.569

Gamma Spectroscopy Report generated 15-OCT-1996 11:08 **8019**

Configuration: DISK:[RADCHEM.SCUSR.ARCHIVE]SMP_96E04517_GAMMA6_PMP_9182.CNF;2
Analyses by : PEAK V16.5 ENBACK V1.5 PEAKEFF V2.2 NID V3.1 MINACT V2.5

---- Sample Information ----

Sample Title	: G969901S		
Sample ID	: 96E04517	Sample Quantity	: 1.00000E+00 SAMPLE
Sample Type	: FILTER	Sample Geometry	: PMP

---- Sample Decay/Count Information ----

Sample Date	: 19-SEP-1996 12:00	Acquisition date	: 9-OCT-1996 14:30:
Elapsed live time	: 0 04:00	Elapsed real time	: 0 04:00 0.0%
Decay time	: 20 02:30		

---- Detector Parameters ----

Energy cal. time	: 8-OCT-1996 12:40:		
Detector name	: GAMMA6	Counting geometry	: PMP
Effic. cal. time	: 19-SEP-1996 15:11		

---- Processing Parameters ----

Cali. Slope	: 4.88802E-01	Cali. Offset	: -1.98761E-01
Cali. Quadratic	: -1.24008E-07	FWHM Offset	: 6.37077E-01
FWHM Slope	: 3.32083E-02	MDA Width (FWHM)	: 3.0
Start channel	: 1	End channel	: 4096
Sensitivity	: 5.0	Gaussian Sens.	: 10.0
Energy tolerance	: 2.0	Half life ratio	: 8.0
Abundance limit	: 75.0	WTM error limit	: 3.0
Activity Units	: PCI	Act. Conversion	: 1.00000E+06
MDA Confid Level	: 5.0	Sigma Number	: 2
Errors propagated	: Yes	Systematic Error	: 9.0%

Combined Activity-MDA Report

---- Identified Nuclides ----

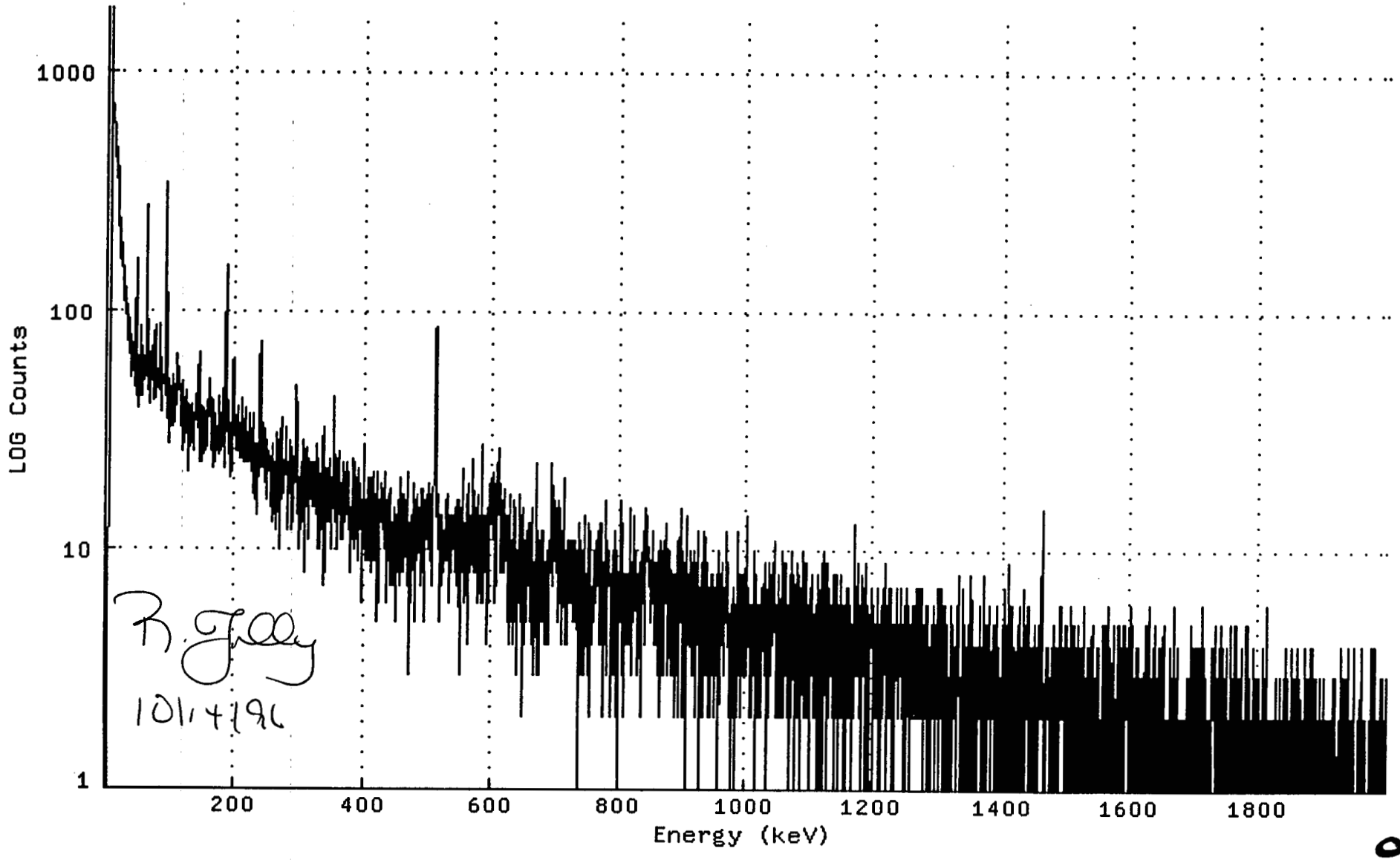
Nuclide	Activity (PCI/SAMPLE)	Act error	MDA (PCI/SAMPLE)	MDA error	Act/MDA
RA-226	8.540E+01	8.757E+01	6.926E+01	8.309E+00	1.233
U-235	8.600E+00	1.893E+01	4.199E+00	5.213E-01	2.048

---- Non-Identified Nuclides ----

Nuclide	Key-Line Activity (PCI/SAMPLE)	K.L. Ided	Act error	MDA (PCI/SAMPLE)	MDA error	Act/MDA
RA-228	-1.947E+00		1.053E+01	1.819E+01	2.423E+00	-0.107
PA-231	5.485E+01	+	2.709E+01	3.496E+01	4.401E+00	1.569

Spectrum : DISK:[RADCHEM.SCUSR.ARCHIVE]SMP_96E04517MD_GAMMA6_PMP_9191.CNF;2
Title : 96E-0640-04
Sample Title: G9699015

Start Time: 10-OCT-1996 13:23	Sample Time: 19-SEP-1996 12:00	Energy Offset: -1.98761E-01
Real Time : 0 04:00:03.26	Sample ID : 96E04517MD	Energy Slope : 4.88802E-01
Live Time : 0 04:00:00.00	Sample Type: FILTER	Energy Quad : -1.24008E-07



R. Jolly
10/14/96

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Gamma Spectroscopy Report generated 11-OCT-1996 14:05 **8019**

Configuration: DISK:[RADCHEM.SCUSR.ARCHIVE]SMP_96E04517MD_GAMMA6_PMP_9191.CNF;2
Analyses by : PEAK V16.5 PEAKEFF V2.2

---- Sample Information ----

Sample Title : G969901S
Sample ID : 96E04517MD
Sample Type : FILTER
Sample Quantity : 1.00000E+00 SAMPLE
Sample Geometry : PMP

---- Sample Decay/Count Information ----

Sample Date : 19-SEP-1996 12:00
Acquisition date : 10-OCT-1996 13:23
Elapsed live time: 0 04:00
Elapsed real time: 0 04:00 0.0%
Decay time : 21 01:23

---- Detector Parameters ----

Energy cal. time : 8-OCT-1996 12:40:
Detector name : GAMMA6
Counting geometry: PMP
Effic. cal. time : 19-SEP-1996 15:11

---- Processing Parameters ----

Cali. Slope	: 4.88802E-01	Cali. Offset	: -1.98761E-01
Cali. Quadratic	: -1.24008E-07	FWHM Offset	: 6.37077E-01
FWHM Slope	: 3.32083E-02	MDA Width (FWHM)	: 3.0
Start channel	: 1	End channel	: 4096
Sensitivity	: 5.0	Gaussian Sens.	: 10.0
Energy tolerance	: 2.0	Half life ratio	: 8.0
Abundance limit	: 75.0	WTM error limit	: 3.0
Activity Units	: PCI	Act. Conversion	: 1.00000E+06
MDA Confid Level	: 5.0	Sigma Number	: 2
Errors propagated	: Yes	Systematic Error	: 0.0%

	It	Energy	Area	Bkgnd	FWHM	Channel	%Eff	Cts/Sec	%Err	Fit
1	0	10.49	341	2652	1.04	21.86	9.72E-01	2.37E-02	23.5	
2	0	12.92	332	2433	1.12	26.83	1.53E+00	2.31E-02	24.3	
3	0	16.16	565	2112	1.28	33.46	2.32E+00	3.92E-02	14.3	
4	0	46.06	294	583	1.01	94.65	6.81E+00	2.04E-02	17.0	
5	0	63.11	434	620	1.07	129.52	7.43E+00	3.02E-02	12.1	
6	0	76.79	83	285	1.17	157.51	7.49E+00	5.77E-03	33.8	
7	0	84.11	88	319	0.79	172.49	7.44E+00	6.10E-03	35.4	
8	0	92.59	665	467	1.00	189.85	7.34E+00	4.62E-02	7.2	
9	0	143.81	59	302	0.82	294.64	6.34E+00	4.13E-03	54.5	
10	0	185.71	306	258	1.07	380.36	5.52E+00	2.12E-02	11.0	
11	0	197.96	94	311	1.63	405.45	5.31E+00	6.54E-03	36.5	
12	0	238.57	134	203	1.18	488.54	4.68E+00	9.27E-03	21.1	
13	0	295.17	50	149	1.28	604.36	4.00E+00	3.45E-03	43.1	
14	0	352.46	55	162	0.71	721.62	3.47E+00	3.81E-03	47.0	
15	0	511.02	466	172	2.79	1046.14	2.52E+00	3.24E-02	7.8	
16	0	582.66	63	94	0.93	1192.77	2.25E+00	4.38E-03	33.1	
17	0	1460.23	70	16	1.58	2990.04	1.04E+00	4.84E-03	17.6	

8019

Gamma Spectroscopy Report generated 11-OCT-1996 14:05

Configuration: DISK:[RADCHEM.SCUSR.ARCHIVE]BKG_BCKGND_GAMMA6__9144.CNF;1
Analyses by : PEAK V16.5 PEAKEFF V2.2

---- Sample Information ----

Sample Title :
Sample ID : BCKGND
Sample Type :
Sample Quantity : 1.00000E+00 G
Sample Geometry :

---- Sample Decay/Count Information ----

Sample Date : 4-OCT-1996 00:00:
Elapsed live time: 2 02:00
Decay time : 0 18:21
Acquisition date : 4-OCT-1996 18:21:
Elapsed real time: 2 02:00 0.0%

---- Detector Parameters ----

Energy cal. time : 30-SEP-1996 09:02
Detector name : GAMMA6
Effic. cal. time : 19-SEP-1996 13:34
Counting geometry: TRM1-S3

---- Processing Parameters ----

Cali. Slope	: 4.88539E-01	Cali. Offset	: -1.23202E-01
Cali. Quadratic	: -8.96482E-08	FWHM Offset	: 6.63864E-01
FWHM Slope	: 3.08694E-02	MDA Width (FWHM)	: 3.0
Start channel	: 1	End channel	: 4096
Sensitivity	: 5.0	Gaussian Sens.	: 10.0
Energy tolerance	: 2.0	Half life ratio	: 8.0
Abundance limit	: 75.0	WTM error limit	: 3.0
Activity Units	: pCi	Act. Conversion	: 1.00000E+06
MDA Confid Level	: 5.0	Sigma Number	: 1
Errors propagated	: Yes	Systematic Error	: 9.0%

	It	Energy	Area	Bkgnd	FWHM	Channel	%Eff	Cts/Sec	%Err	Fit
1	0	10.31	4650	23581	0.99	21.37	1.07E+05	2.58E-02	5.4	
2	4	13.10	3782	8752	0.88	27.07	1.83E+03	2.10E-02	3.5	6.65E-01
3	4	16.24	5522	14567	1.15	33.50	1.52E+02	3.07E-02	4.1	
4	0	19.50	1635	8409	1.62	40.16	3.62E+01	9.08E-03	9.3	
5	0	25.54	312	5600	0.86	52.53	1.02E+01	1.73E-03	38.6	
6	0	46.59	2743	4367	1.01	95.62	5.24E+00	1.52E-02	4.7	
7	0	53.57	608	4119	1.10	109.90	5.52E+00	3.38E-03	18.7	
8	0	63.33	5851	4242	0.89	129.88	6.06E+00	3.25E-02	2.3	
9	0	66.27	434	3647	1.07	135.89	6.23E+00	2.41E-03	23.6	
10	0	74.71	387	3737	0.90	153.19	6.70E+00	2.15E-03	25.5	
11	0	77.10	716	3235	0.91	158.08	6.82E+00	3.98E-03	13.2	
12	0	84.07	939	4528	1.17	172.34	7.15E+00	5.22E-03	13.3	
13	0	87.11	255	3002	1.06	178.56	7.28E+00	1.42E-03	34.5	
14	0	92.68	8662	4490	1.15	189.96	7.48E+00	4.81E-02	1.8	
15	0	98.45	403	3128	0.67	201.79	7.65E+00	2.24E-03	23.5	
16	7	110.09	994	5123	1.93	225.60	7.87E+00	5.52E-03	14.9	2.35E+00
17	7	112.93	511	3026	1.14	231.42	7.90E+00	2.84E-03	18.5	
18	0	139.98	660	3279	1.12	286.79	7.85E+00	3.67E-03	15.5	
19	0	143.85	766	3282	0.98	294.73	7.80E+00	4.26E-03	13.4	
20	0	163.53	543	3010	1.01	335.01	7.47E+00	3.01E-03	18.1	
21	0	185.82	3757	3802	1.11	380.64	6.98E+00	2.09E-02	3.5	
22	0	197.88	1519	4349	2.03	405.32	6.69E+00	8.44E-03	9.1	
23	0	205.27	364	2837	1.41	420.45	6.51E+00	2.02E-03	25.9	
24	0	238.51	1425	3059	1.17	488.51	5.74E+00	7.92E-03	7.4	

Sample ID : BCKGND Acquisition date : 4-OCT-1996 18:21:18

8019

Pk	It	Energy	Area	Bkgnd	FWHM	Channel	%Eff	Cts/Sec	%Err	Fit
[illegible]	0	295.60	150	1965	1.35	605.39	4.61E+00	8.34E-04	51.9	
[illegible]	0	351.85	396	1610	1.25	720.55	3.78E+00	2.20E-03	18.2	
27	0	510.92	5903	2795	2.42	1046.27	2.47E+00	3.28E-02	2.5	
28	0	569.76	296	1426	1.68	1166.76	2.20E+00	1.65E-03	25.4	
29	0	583.21	431	1428	1.46	1194.29	2.15E+00	2.39E-03	17.7	
30	0	609.11	415	1634	1.39	1247.34	2.06E+00	2.31E-03	18.9	
31	0	669.74	157	876	1.62	1371.50	1.88E+00	8.74E-04	34.9	
32	10	694.29	708	1889	3.83	1421.77	1.83E+00	3.93E-03	15.0	3.99E+00
33	10	701.21	457	2536	3.84	1435.95	1.81E+00	2.54E-03	29.9	
34	0	802.85	425	888	1.34	1644.13	1.63E+00	2.36E-03	14.4	
35	0	1000.76	326	643	1.90	2049.50	1.42E+00	1.81E-03	16.1	
36	0	1063.81	136	560	1.77	2178.65	1.38E+00	7.53E-04	33.9	
37	0	1460.33	407	435	1.84	2991.07	1.22E+00	2.26E-03	12.2	
38	0	1764.08	137	242	1.92	3613.58	1.14E+00	7.60E-04	24.3	

8019

Gamma Spectroscopy Report generated 11-OCT-1996 14:05

Configuration: DISK:[RADCHEM.SCUSR.ARCHIVE]SMP_96E04517MD_GAMMA6_PMP_9191.CNF;2
Analyses by : PEAK V16.5 ENBACK V1.5

---- Sample Information ----

Sample Title : G969901S
Sample ID : 96E04517MD
Sample Type : FILTER
Sample Quantity : 1.00000E+00 SAMPLE
Sample Geometry : PMP

---- Sample Decay/Count Information ----

Sample Date : 19-SEP-1996 12:00
Acquisition date : 10-OCT-1996 13:23
Elapsed live time: 0 04:00
Elapsed real time: 0 04:00 0.0%
Decay time : 21 01:23

---- Detector Parameters ----

Energy cal. time : 8-OCT-1996 12:40:
Detector name : GAMMA6
Counting geometry: PMP
Effic. cal. time : 19-SEP-1996 15:11

---- Processing Parameters ----

Cali. Slope	: 4.88802E-01	Cali. Offset	: -1.98761E-01
Cali. Quadratic	: -1.24008E-07	FWHM Offset	: 6.37077E-01
FWHM Slope	: 3.32083E-02	MDA Width (FWHM)	: 3.0
Start channel	: 1	End channel	: 4096
Sensitivity	: 5.0	Gaussian Sens.	: 10.0
Energy tolerance	: 2.0	Half life ratio	: 8.0
Abundance limit	: 75.0	WTM error limit	: 3.0
Activity Units	: PCI	Act. Conversion	: 1.00000E+06
MDA Confid Level	: 5.0	Sigma Number	: 2
Errors propagated	: Yes	Systematic Error	: 0.0%

	It	Energy	Area	Bkgnd	FWHM	Channel	Left	Pw	Cts/Sec	%Err	Fit
1	0	12.92*	30	2433	1.12	26.83	25	6	2.07E-03	273.5	
2	0	16.16*	123	2112	1.28	33.46	30	7	8.54E-03	67.1	
3	0	46.06*	74	583	1.01	94.65	90	11	5.15E-03	68.7	
4	0	76.79*	26	285	1.17	157.51	156	6	1.80E-03	112.5	
5	0	84.11*	13	319	0.79	172.49	169	7	8.80E-04	258.0	
6	0	185.71*	5	258	1.07	380.36	376	9	3.76E-04	653.9	
7	0	238.57*	19	203	1.18	488.54	484	9	1.35E-03	150.8	
8	0	295.17*	38	149	1.28	604.36	601	7	2.62E-03	59.2	
9	0	352.46*	23	162	0.71	721.62	715	11	1.60E-03	114.3	
10	0	582.66*	29	94	0.93	1192.77	1187	12	1.98E-03	76.1	
11	0	1460.23*	37	16	1.58	2990.04	2981	16	2.57E-03	34.7	

Flag: "*" = Peak area was modified by background subtraction

Gamma Spectroscopy Report generated 11-OCT-1996 14:05

8019

Configuration: DISK:[RADCHEM.SCUSR.ARCHIVE]SMP_96E04517MD_GAMMA6_PMP_9191.CNF;2
Analyses by : PEAK V16.5 ENBACK V1.5 PEAKEFF V2.2 NID V3.1

---- Sample Information ----

Sample Title : G969901S
Sample ID : 96E04517MD
Sample Type : FILTER
Sample Quantity : 1.00000E+00 SAMPLE
Sample Geometry : PMP

---- Sample Decay/Count Information ----

Sample Date : 19-SEP-1996 12:00
Acquisition date : 10-OCT-1996 13:23
Elapsed live time: 0 04:00
Elapsed real time: 0 04:00 0.0%
Decay time : 21 01:23

---- Detector Parameters ----

Energy cal. time : 8-OCT-1996 12:40:
Detector name : GAMMA6
Counting geometry: PMP
Effic. cal. time : 19-SEP-1996 15:11

---- Processing Parameters ----

Cali. Slope	: 4.88802E-01	Cali. Offset	: -1.98761E-01
Cali. Quadratic	: -1.24008E-07	FWHM Offset	: 6.37077E-01
FWHM Slope	: 3.32083E-02	MDA Width (FWHM)	: 3.0
Start channel	: 1	End channel	: 4096
Sensitivity	: 5.0	Gaussian Sens.	: 10.0
Energy tolerance	: 2.0	Half life ratio	: 8.0
Abundance limit	: 75.0	WTM error limit	: 3.0
Activity Units	: PCI	Act. Conversion	: 1.00000E+06
MDA Confid Level	: 5.0	Sigma Number	: 2
Errors propagated	: Yes	Systematic Error	: 0.0%

Post-NID Peak Search Report

It	Energy	Area	Bkgnd	FWHM	Channel	Left	Pw %Err	Fit	Nuclides
0	12.92*	30	2433	1.12	26.83	25	6547.0		
0	16.16*	123	2112	1.28	33.46	30	7134.2		
0	46.06*	74	583	1.01	94.65	90	11137.5		
0	76.79*	26	285	1.17	157.51	156	6224.9		
0	84.11*	13	319	0.79	172.49	169	7515.9		
0	185.71*	5	258	1.07	380.36	376	9*****		RA-226
0	238.57*	19	203	1.18	488.54	484	9301.6		
0	295.17*	38	149	1.28	604.36	601	7118.5		
0	352.46*	23	162	0.71	721.62	715	11228.6		
0	582.66*	29	94	0.93	1192.77	1187	12152.3		
0	1460.23*	37	16	1.58	2990.04	2981	16 69.5		

Gamma Spectroscopy Report generated 11-OCT-1996 14:05 B019

Configuration: DISK:[RADCHEM.SCUSR.ARCHIVE]SMP_96E04517MD_GAMMA6_PMP_9191.CNF;2
Analyses by : PEAK V16.5 ENBACK V1.5 PEAKEFF V2.2 NID V3.1

---- Sample Information ----

Sample Title	: G969901S		
Sample ID	: 96E04517MD	Sample Quantity	: 1.00000E+00 SAMPLE
Sample Type	: FILTER	Sample Geometry	: PMP

---- Sample Decay/Count Information ----

Sample Date	: 19-SEP-1996 12:00	Acquisition date	: 10-OCT-1996 13:23
Elapsed live time	: 0 04:00	Elapsed real time	: 0 04:00 0.0%
Decay time	: 21 01:23		

---- Detector Parameters ----

Energy cal. time	: 8-OCT-1996 12:40:		
Detector name	: GAMMA6	Counting geometry	: PMP
Effic. cal. time	: 19-SEP-1996 15:11		

---- Processing Parameters ----

Cali. Slope	: 4.88802E-01	Cali. Offset	: -1.98761E-01
Cali. Quadratic	: -1.24008E-07	FWHM Offset	: 6.37077E-01
FWHM Slope	: 3.32083E-02	MDA Width (FWHM)	: 3.0
Start channel	: 1	End channel	: 4096
Sensitivity	: 5.0	Gaussian Sens.	: 10.0
Energy tolerance	: 2.0	Half life ratio	: 8.0
Abundance limit	: 75.0	WTM error limit	: 3.0
Activity Units	: PCI	Act. Conversion	: 1.00000E+06
MDA Confid Level	: 5.0	Sigma Number	: 2
Errors propagated	: Yes	Systematic Error	: 0.0%

Interference Report

No interference correction performed

Sample ID : 96E04517MD Acquisition date : 10-OCT-1996 13:23:48

8019

Nuclide	Half-life	Half-Life Ratio	Energy	%Abund	Activity	2-Sigma %Error	Rejected by
PA-231	3.28E+04Y	0.00	50.10	31.70	--- Not Found ---		Abun.
			100.00	1.11	--- Not Found ---		
			122.31	1.19	--- Not Found ---		
			144.24	3.24	--- Not Found ---		
			154.21	5.58	--- Not Found ---		
			205.00	1.08	--- Not Found ---		
			210.60	1.26	--- Not Found ---		
			234.90	2.80	--- Not Found ---		
			236.00	11.50	--- Not Found ---		
			256.20	6.30	--- Not Found ---		
			269.46	13.60	--- Not Found ---		
			271.23	10.60	--- Not Found ---		
			283.67	1.60	--- Not Found ---		
			286.10	1.60	--- Not Found ---		
			300.08	2.30	--- Not Found ---		
			304.40	1.35	--- Not Found ---		
			323.87	3.88	--- Not Found ---		
			330.00	1.30	--- Not Found ---		
			334.20	1.15	--- Not Found ---		
			338.28	2.73	--- Not Found ---		
			351.07*	12.94	9.658E-06	228.95	
			401.81	6.50	--- Not Found ---		
			404.84	2.90	--- Not Found ---		
			427.08	1.30	--- Not Found ---		
			445.03	1.18	--- Not Found ---		
			569.67	0.54	--- Not Found ---		
			831.96	2.90	--- Not Found ---		
			897.83	0.24	--- Not Found ---		
			897.83	0.52	--- Not Found ---		
		% Abundances Found =		9.59			
U-235	7.04E+08Y	0.00	143.76	10.50	--- Not Found ---		Abun.
			163.35	4.70	--- Not Found ---		
			185.71*	54.00	3.404E-07	1307.78	
			205.31	4.70	--- Not Found ---		
		% Abundances Found =		73.07			

Flag: "*" = Keyline

Sample ID : 96E04517MD
Acquisition date : 10-OCT-1996 13:23:48

8019

Nuclide Type: Natural

Nuclide	Energy	Area	%Abn	%Eff	Uncorrected PCI/SAMPLE	Decay Corr PCI/SAMPLE	2-Sigma %Error
RA-226	186.21	5	3.28*	5.522E+00	5.605E+00	5.605E+00	1307.77

Flag: "*" = Keyline

Gamma Spectroscopy Report generated 11-OCT-1996 14:05 8019

Configuration: DISK:[RADCHEM.SCUSR.ARCHIVE]SMP_96E04517MD_GAMMA6_PMP_9191.CNF;2
Analyses by : PEAK V16.5 ENBACK V1.5 PEAKEFF V2.2 NID V3.1 MINACT V2.5

---- Sample Information ----

Sample Title	: G969901S		
Sample ID	: 96E04517MD	Sample Quantity	: 1.00000E+00 SAMPLE
Sample Type	: FILTER	Sample Geometry	: PMP

---- Sample Decay/Count Information ----

Sample Date	: 19-SEP-1996 12:00	Acquisition date	: 10-OCT-1996 13:23
Elapsed live time	: 0 04:00	Elapsed real time	: 0 04:00 0.0%
Decay time	: 21 01:23		

---- Detector Parameters ----

Energy cal. time	: 8-OCT-1996 12:40:		
Detector name	: GAMMA6	Counting geometry	: PMP
Effic. cal. time	: 19-SEP-1996 15:11		

---- Processing Parameters ----

Cali. Slope	: 4.88802E-01	Cali. Offset	: -1.98761E-01
Cali. Quadratic	: -1.24008E-07	FWHM Offset	: 6.37077E-01
FWHM Slope	: 3.32083E-02	MDA Width (FWHM)	: 3.0
Start channel	: 1	End channel	: 4096
Sensitivity	: 5.0	Gaussian Sens.	: 10.0
Energy tolerance	: 2.0	Half life ratio	: 8.0
Abundance limit	: 75.0	WTM error limit	: 3.0
Activity Units	: PCI	Act. Conversion	: 1.00000E+06
MDA Confid Level	: 5.0	Sigma Number	: 2
Errors propagated	: Yes	Systematic Error	: 0.0%

Combined Activity-MDA Report

---- Identified Nuclides ----

Nuclide	Activity (PCI/SAMPLE)	Act error	MDA (PCI/SAMPLE)	MDA error	Act/MDA
RA-226	5.605E+00	7.330E+01	7.798E+01	9.354E+00	0.072

---- Non-Identified Nuclides ----

Nuclide	Key-Line Activity (PCI/SAMPLE)	K.L. Ided	Act error	MDA (PCI/SAMPLE)	MDA error	Act/MDA
RA-228	-1.405E+00		1.002E+01	1.744E+01	2.323E+00	-0.081
PA-231	9.658E+00	+	2.211E+01	2.553E+01	3.214E+00	0.378
U-235	3.404E-01	+	4.452E+00	6.714E+00	8.335E-01	0.051

Gamma Spectroscopy Report generated 11-OCT-1996 14:06 8019

Configuration: DISK:[RADCHEM.SCUSR.ARCHIVE]SMP_96E04517MD_GAMMA6_PMP_9191.CNF;2
Analyses by : PEAK V16.5 ENBACK V1.5 PEAKEFF V2.2 NID V3.1 MINACT V2.5

---- Sample Information ----

Sample Title : G969901S
Sample ID : 96E04517MD
Sample Type : FILTER
Sample Quantity : 1.00000E+00 SAMPLE
Sample Geometry : PMP

---- Sample Decay/Count Information ----

Sample Date : 19-SEP-1996 12:00
Acquisition date : 10-OCT-1996 13:23
Elapsed live time: 0 04:00
Elapsed real time: 0 04:00 0.0%
Decay time : 21 01:23

---- Detector Parameters ----

Energy cal. time : 8-OCT-1996 12:40:
Detector name : GAMMA6
Counting geometry: PMP
Effic. cal. time : 19-SEP-1996 15:11

---- Processing Parameters ----

Cali. Slope	: 4.88802E-01	Cali. Offset	: -1.98761E-01
Cali. Quadratic	: -1.24008E-07	FWHM Offset	: 6.37077E-01
FWHM Slope	: 3.32083E-02	MDA Width (FWHM)	: 3.0
Start channel	: 1	End channel	: 4096
Sensitivity	: 5.0	Gaussian Sens.	: 10.0
Energy tolerance	: 2.0	Half life ratio	: 8.0
Abundance limit	: 75.0	WTM error limit	: 3.0
Activity Units	: PCI	Act. Conversion	: 1.00000E+06
MDA Confid Level	: 5.0	Sigma Number	: 2
Errors propagated	: Yes	Systematic Error	: 9.0%

Combined Activity-MDA Report

---- Identified Nuclides ----

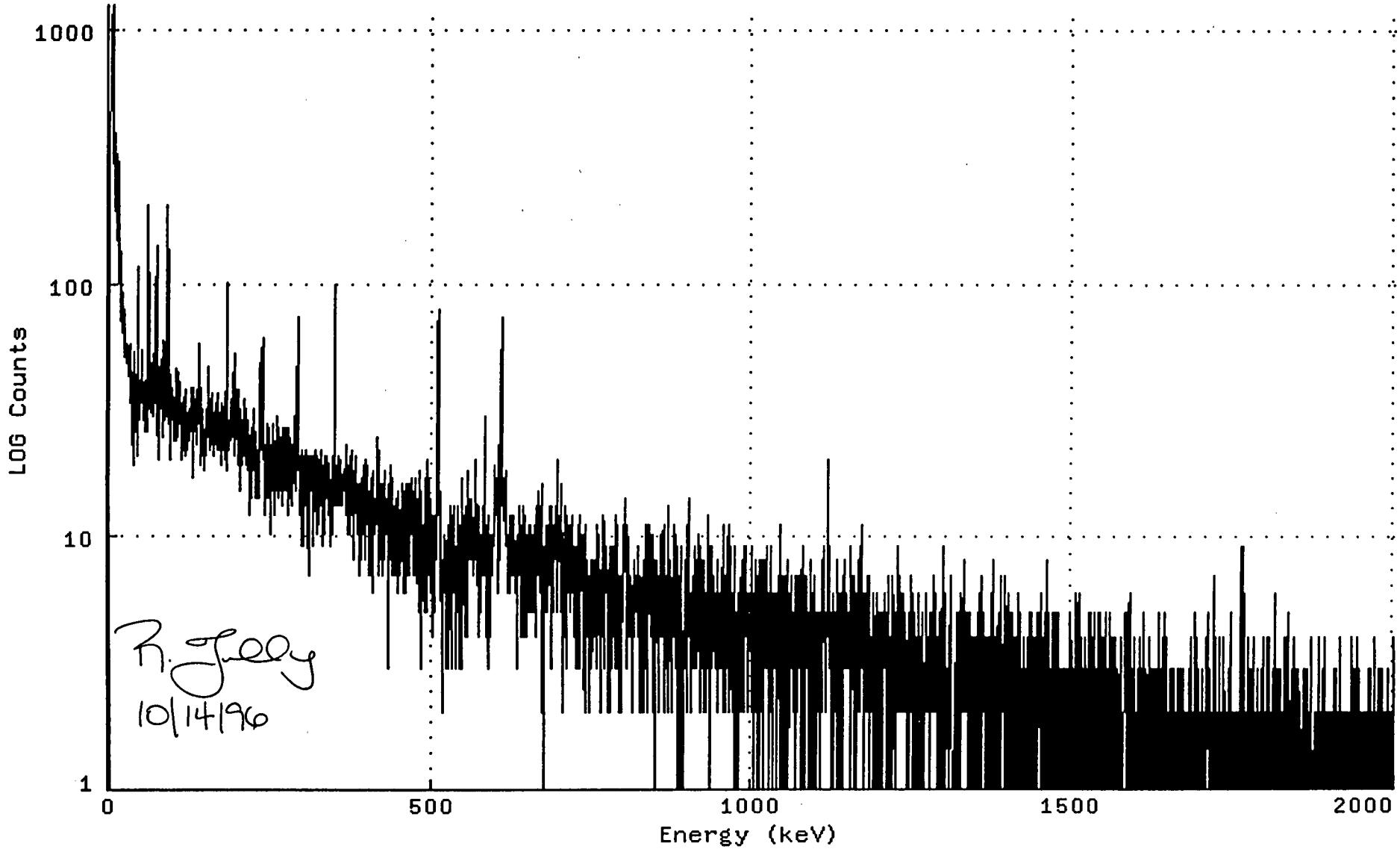
Nuclide	Activity (PCI/SAMPLE)	Act error	MDA (PCI/SAMPLE)	MDA error	Act/MDA
RA-226	5.605E+00	7.330E+01	7.798E+01	9.354E+00	0.072

---- Non-Identified Nuclides ----

Nuclide	Key-Line Activity (PCI/SAMPLE)	K.L. Ided	Act error	MDA (PCI/SAMPLE)	MDA error	Act/MDA
RA-228	-1.405E+00		1.002E+01	1.744E+01	2.323E+00	-0.081
PA-231	9.658E+00	+	2.218E+01	2.553E+01	3.214E+00	0.378
U-235	3.404E-01	+	4.452E+00	6.714E+00	8.335E-01	0.051

R. Foley
10/14/96

Spectrum : DISK:[RADCHEM.SCUSR.ARCHIVE]SMP_96E04514_GAMMA5_PMP_9186.CNF;2
Title : 96E-0640-04
Sample Title: G969901S
Start Time: 10-OCT-1996 09:06 Sample Time: 19-SEP-1996 12:00 Energy Offset: -5.65841E-01
Real Time : 0 04:00:05.51 Sample ID : 96E04514 Energy Slope : 4.88823E-01
Live Time : 0 04:00:00.00 Sample Type: FILTER Energy Quad : -8.49185E-08



Gamma Spectroscopy Report generated 11-OCT-1996 13:40 8019

Configuration: DISK:[RADCHEM.SCUSR.ARCHIVE]SMP_96E04514_GAMMA5_PMP_9186.CNF;2
Analyses by : PEAK V16.5 PEAKEFF V2.2

---- Sample Information ----

Sample Title : G969901S
Sample ID : 96E04514 Sample Quantity : 1.00000E+00 SAMPLE
Sample Type : FILTER Sample Geometry : PMP

---- Sample Decay/Count Information ----

Sample Date : 19-SEP-1996 12:00 Acquisition date : 10-OCT-1996 09:06
Elapsed live time: 0 04:00 Elapsed real time: 0 04:00 0.0%
Decay time : 20 21:06

---- Detector Parameters ----

Energy cal. time : 8-OCT-1996 12:40:
Detector name : GAMMA5 Counting geometry: PMP
Effic. cal. time : 19-SEP-1996 14:21

---- Processing Parameters ----

Cali. Slope	: 4.88823E-01	Cali. Offset	: -5.65841E-01
Cali. Quadratic	: -8.49185E-08	FWHM Offset	: 4.15386E-01
FWHM Slope	: 4.45150E-02	MDA Width (FWHM)	: 3.0
Start channel	: 1	End channel	: 4096
Sensitivity	: 5.0	Gaussian Sens.	: 10.0
Energy tolerance	: 2.0	Half life ratio	: 8.0
Abundance limit	: 75.0	WTM error limit	: 3.0
Activity Units	: PCI	Act. Conversion	: 1.00000E+06
MDA Confid Level	: 5.0	Sigma Number	: 2
Errors propagated	: Yes	Systematic Error	: 0.0%

	It	Energy	Area	Bkgnd	FWHM	Channel	%Eff	Cts/Sec	%Err	Fit
1	0	7.86	2074	2952	1.28	17.25	8.98E+00	1.44E-01	4.9	
2	0	13.14	319	1071	0.90	28.03	9.67E+00	2.21E-02	17.3	
3	0	16.28	481	960	1.24	34.46	9.78E+00	3.34E-02	11.7	
4	0	46.35	219	203	1.01	95.98	8.79E+00	1.52E-02	13.2	
5	0	63.29	301	228	0.88	130.64	8.08E+00	2.09E-02	10.1	
6	1	74.75	139	166	0.88	154.09	7.65E+00	9.68E-03	16.3	3.13E+00
7	1	77.16	208	143	0.84	159.02	7.57E+00	1.44E-02	11.3	
8	0	92.78	370	340	1.02	190.96	7.06E+00	2.57E-02	10.7	
9	0	185.76	216	220	1.08	381.19	5.03E+00	1.50E-02	14.6	
10	0	199.09	93	469	1.75	408.47	4.83E+00	6.47E-03	54.2	
11	4	238.47	97	189	1.61	489.05	4.32E+00	6.74E-03	28.4	2.21E+00
12	4	242.18	128	181	1.62	496.63	4.28E+00	8.87E-03	21.7	
13	0	295.12	144	220	0.98	604.95	3.75E+00	1.00E-02	22.1	
14	0	352.17	192	172	1.04	721.70	3.31E+00	1.34E-02	15.4	
15	0	511.60	445	152	2.71	1047.95	2.47E+00	3.09E-02	9.0	
16	0	583.70	73	93	0.87	1195.51	2.21E+00	5.10E-03	30.4	
17	0	609.47	190	152	1.35	1248.25	2.13E+00	1.32E-02	14.8	
18	0	1120.46	53	37	1.03	2294.23	1.20E+00	3.69E-03	26.5	
19	0	1764.83	31	20	2.23	3613.79	7.37E-01	2.12E-03	34.9	

Gamma Spectroscopy Report generated 11-OCT-1996 13:40

8019

Configuration: DISK:[RADCHEM.SCUSR.ARCHIVE]BKG_BCKGND_GAMMA5__9143.CNF;1
Analyses by : PEAK V16.5 PEAKEFF V2.2

---- Sample Information ----

Sample Title :
Sample ID : BCKGND
Sample Type :
Sample Quantity : 1.00000E+00 G
Sample Geometry :

---- Sample Decay/Count Information ----

Sample Date : 4-OCT-1996 00:00:
Elapsed live time: 2 02:00
Decay time : 0 18:20
Acquisition date : 4-OCT-1996 18:20:
Elapsed real time: 2 02:01 0.0%

---- Detector Parameters ----

Energy cal. time : 30-SEP-1996 09:01
Detector name : GAMMA5
Effic. cal. time : 19-SEP-1996 11:45
Counting geometry: TRM1-S3

---- Processing Parameters ----

Cali. Slope	: 4.88756E-01	Cali. Offset	: -5.37244E-01
Cali. Quadratic	: -7.07146E-08	FWHM Offset	: 5.94642E-01
FWHM Slope	: 3.39310E-02	MDA Width (FWHM)	: 3.0
Start channel	: 1	End channel	: 4096
Sensitivity	: 5.0	Gaussian Sens.	: 10.0
Energy tolerance	: 2.0	Half life ratio	: 8.0
Abundance limit	: 75.0	WTM error limit	: 3.0
Activity Units	: pCi	Act. Conversion	: 1.00000E+06
MDA Confid Level	: 5.0	Sigma Number	: 1
Errors propagated	: Yes	Systematic Error	: 9.0%

	It	Energy	Area	Bkgnd	FWHM	Channel	%Eff	Cts/Sec	%Err	Fit
1	0	7.76	24064	42790	1.54	16.98	6.55E+06	1.34E-01	1.5	
2	0	10.38	4115	15170	0.84	22.34	1.32E+04	2.29E-02	4.8	
3	0	13.03	4183	13266	0.86	27.77	5.13E+02	2.32E-02	4.7	
4	0	16.22	6461	11688	1.08	34.29	6.28E+01	3.59E-02	3.1	
5	0	19.25	1233	6158	0.89	40.48	2.09E+01	6.85E-03	10.0	
6	0	23.34	285	5186	1.44	48.85	9.40E+00	1.58E-03	40.4	
7	0	26.04	437	4406	1.08	54.38	7.03E+00	2.43E-03	24.7	
8	0	46.55	1927	3150	0.94	96.35	4.94E+00	1.07E-02	5.5	
9	0	53.64	405	3070	0.98	110.85	5.29E+00	2.25E-03	24.2	
10	4	63.34	3752	1877	0.81	130.70	5.86E+00	2.08E-02	2.4	1.10E+00
11	4	66.28	535	2846	1.28	136.72	6.02E+00	2.97E-03	18.1	
12	0	69.74	385	3435	1.87	143.79	6.21E+00	2.14E-03	26.7	
13	0	74.19	134	3061	0.84	152.90	6.44E+00	7.44E-04	65.8	
14	0	77.07	495	2625	0.94	158.79	6.57E+00	2.75E-03	17.0	
15	0	84.43	698	3059	1.37	173.85	6.87E+00	3.88E-03	14.2	
16	0	87.20	283	2253	0.85	179.52	6.97E+00	1.57E-03	27.2	
17	0	92.67	4997	3152	1.09	190.71	7.12E+00	2.78E-02	2.4	
18	0	98.25	195	2385	0.93	202.14	7.25E+00	1.09E-03	42.0	
19	0	109.75	354	2985	0.75	225.66	7.39E+00	1.97E-03	27.2	
20	0	112.82	230	1804	0.95	231.93	7.40E+00	1.28E-03	28.5	
21	0	139.81	682	3118	1.12	287.16	7.22E+00	3.79E-03	15.8	
22	0	143.66	424	2282	1.06	295.05	7.16E+00	2.35E-03	19.3	
23	0	185.85	2020	3123	1.02	381.36	6.27E+00	1.12E-02	5.6	
24	4	197.16	456	1487	0.89	404.51	6.00E+00	2.53E-03	13.8	4.49E-01

Sample ID : BCKGND Acquisition date : 4-OCT-1996 18:20:18

8019

Pk	It	Energy	Area	Bkgnd	FWHM	Channel	%Eff	Cts/Sec	%Err	Fit
[illegible]	4	198.38	665	1790	1.04	407.00	5.98E+00	3.69E-03	11.2	
[illegible]	0	205.33	188	1689	0.96	421.24	5.81E+00	1.04E-03	35.4	
27	0	238.76	908	2089	1.08	489.64	5.07E+00	5.05E-03	9.3	
28	0	295.36	179	1472	1.03	605.47	4.05E+00	9.94E-04	36.3	
29	0	352.05	298	1202	1.06	721.47	3.31E+00	1.65E-03	20.2	
30	0	511.06	4724	2215	2.53	1046.88	2.15E+00	2.62E-02	2.7	
31	0	569.99	434	1409	1.55	1167.50	1.91E+00	2.41E-03	18.5	
32	0	583.39	294	1218	1.25	1194.92	1.87E+00	1.64E-03	23.7	
33	0	609.48	299	1186	1.30	1248.33	1.79E+00	1.66E-03	21.5	
34	0	669.54	124	741	1.38	1371.25	1.64E+00	6.91E-04	40.4	
35	4	693.56	349	1136	2.18	1420.41	1.58E+00	1.94E-03	21.4	3.27E+00
36	4	696.97	189	993	1.80	1427.39	1.58E+00	1.05E-03	34.4	
37	4	702.45	192	1226	2.19	1438.62	1.57E+00	1.07E-03	38.5	
38	0	803.05	377	759	1.66	1644.53	1.41E+00	2.09E-03	15.0	
39	0	962.14	241	859	2.17	1970.22	1.25E+00	1.34E-03	28.6	
40	0	1120.02	105	385	1.77	2293.42	1.15E+00	5.83E-04	35.1	
41	0	1331.87	136	353	2.38	2727.21	1.06E+00	7.54E-04	28.1	
42	0	1460.47	320	376	1.75	2990.52	1.02E+00	1.78E-03	14.0	
43	0	1764.72	128	183	2.41	3613.62	9.27E-01	7.11E-04	23.0	

Gamma Spectroscopy Report generated 11-OCT-1996 13:40 **8019**

Configuration: DISK:[RADCHEM.SCUSR.ARCHIVE]SMP_96E04514_GAMMA5_PMP_9186.CNF;2
Analyses by : PEAK V16.5 ENBACK V1.5

---- Sample Information ----

Sample Title : G969901S
Sample ID : 96E04514 Sample Quantity : 1.00000E+00 SAMPLE
Sample Type : FILTER Sample Geometry : PMP

---- Sample Decay/Count Information ----

Sample Date : 19-SEP-1996 12:00 Acquisition date : 10-OCT-1996 09:06
Elapsed live time: 0 04:00 Elapsed real time: 0 04:00 0.0%
Decay time : 20 21:06

---- Detector Parameters ----

Energy cal. time : 8-OCT-1996 12:40:
Detector name : GAMMA5 Counting geometry: PMP
Effic. cal. time : 19-SEP-1996 14:21

---- Processing Parameters ----

Cali. Slope : 4.88823E-01 Cali. Offset : -5.65841E-01
Cali. Quadratic : -8.49185E-08 FWHM Offset : 4.15386E-01
FWHM Slope : 4.45150E-02 MDA Width (FWHM) : 3.0
Start channel : 1 End channel : 4096
Sensitivity : 5.0 Gaussian Sens. : 10.0
Energy tolerance : 2.0 Half life ratio : 8.0
Abundance limit : 75.0 WTM error limit : 3.0
Activity Units : PCI Act. Conversion : 1.00000E+06
MDA Confid Level : 5.0 Sigma Number : 2
Errors propagated: Yes Systematic Error : 0.0%

	It	Energy	Area	Bkgnd	FWHM	Channel	Left	Pw	Cts/Sec	%Err	Fit
1	0	7.86*	149	2952	1.28	17.25	15	6	1.03E-02	70.7	
2	0	46.35*	65	203	1.01	95.98	92	8	4.50E-03	46.4	
3	0	63.29*	1	228	0.88	130.64	127	7	6.67E-05	*****	
4	1	74.75*	129	166	0.88	154.09	149	14	8.94E-03	18.5	3.13E+00
5	1	77.16*	168	143	0.84	159.02	149	14	1.17E-02	14.5	
6	0	185.76*	54	220	1.08	381.19	376	10	3.76E-03	60.4	
7	0	199.09*	40	469	1.75	408.47	401	17	2.77E-03	127.3	
8	4	238.47*	24	189	1.61	489.05	483	21	1.70E-03	116.2	2.21E+00
9	4	242.18	128	181	1.62	496.63	483	21	8.87E-03	21.7	
10	0	295.12*	130	220	0.98	604.95	599	12	9.03E-03	24.9	
11	0	352.17*	168	172	1.04	721.70	716	12	1.17E-02	17.8	
12	0	511.60*	67	152	2.71	1047.95	1040	23	4.65E-03	61.5	
13	0	583.70*	50	93	0.87	1195.51	1188	14	3.46E-03	46.1	
14	0	609.47*	166	152	1.35	1248.25	1244	12	1.15E-02	17.2	
15	0	1120.46*	45	37	1.03	2294.23	2289	12	3.11E-03	32.1	
16	0	1764.83*	20	20	2.23	3613.79	3605	13	1.41E-03	53.8	

Flag: "*" = Peak area was modified by background subtraction

8019

Gamma Spectroscopy Report generated 11-OCT-1996 13:40

Configuration: DISK:[RADCHEM.SCUSR.ARCHIVE]SMP_96E04514_GAMMA5_PMP_9186.CNF;2
Analyses by : PEAK V16.5 ENBACK V1.5 PEAKEFF V2.2 NID V3.1

---- Sample Information ----

Sample Title : G969901S
Sample ID : 96E04514 Sample Quantity : 1.00000E+00 SAMPLE
Sample Type : FILTER Sample Geometry : PMP

---- Sample Decay/Count Information ----

Sample Date : 19-SEP-1996 12:00 Acquisition date : 10-OCT-1996 09:06
Elapsed live time: 0 04:00 Elapsed real time: 0 04:00 0.0%
Decay time : 20 21:06

---- Detector Parameters ----

Energy cal. time : 8-OCT-1996 12:40:
Detector name : GAMMA5 Counting geometry: PMP
Effic. cal. time : 19-SEP-1996 14:21

---- Processing Parameters ----

Cali. Slope	: 4.88823E-01	Cali. Offset	: -5.65841E-01
Cali. Quadratic	: -8.49185E-08	FWHM Offset	: 4.15386E-01
FWHM Slope	: 4.45150E-02	MDA Width (FWHM)	: 3.0
Start channel	: 1	End channel	: 4096
Sensitivity	: 5.0	Gaussian Sens.	: 10.0
Energy tolerance	: 2.0	Half life ratio	: 8.0
Abundance limit	: 75.0	WTM error limit	: 3.0
Activity Units	: PCI	Act. Conversion	: 1.00000E+06
MDA Confid Level	: 5.0	Sigma Number	: 2
Errors propagated	: Yes	Systematic Error	: 0.0%

P[illegible]-NID Peak Search Report

It	Energy	Area	Bkgnd	FWHM	Channel	Left	Pw %Err	Fit	Nuclides
0	7.86*	149	2952	1.28	17.25	15	6141.5		
0	46.35*	65	203	1.01	95.98	92	8 92.8		
0	63.29*	1	228	0.88	130.64	127	7*****		
1	74.75*	129	166	0.88	154.09	149	14 37.0	3.13E+00	
1	77.16*	168	143	0.84	159.02	149	14 29.0		
0	185.76*	54	220	1.08	381.19	376	10120.9		RA-226
0	199.09*	40	469	1.75	408.47	401	17254.6		
4	238.47*	24	189	1.61	489.05	483	21232.4	2.21E+00	
4	242.18	128	181	1.62	496.63	483	21 43.4		
0	295.12*	130	220	0.98	604.95	599	12 49.8		
0	352.17*	168	172	1.04	721.70	716	12 35.6		
0	511.60*	67	152	2.71	1047.95	1040	23123.0		
0	583.70*	50	93	0.87	1195.51	1188	14 92.2		
0	609.47*	166	152	1.35	1248.25	1244	12 34.3		
0	1120.46*	45	37	1.03	2294.23	2289	12 64.3		
0	1764.83*	20	20	2.23	3613.79	3605	13107.6		

Gamma Spectroscopy Report generated 11-OCT-1996 13:40 **8019**

Configuration: DISK:[RADCHEM.SCUSR.ARCHIVE]SMP_96E04514_GAMMA5_PMP_9186.CNF;2
Analyses by : PEAK V16.5 ENBACK V1.5 PEAKEFF V2.2 NID V3.1

---- Sample Information ----

Sample Title	: G969901S		
Sample ID	: 96E04514	Sample Quantity	: 1.00000E+00 SAMPLE
Sample Type	: FILTER	Sample Geometry	: PMP

---- Sample Decay/Count Information ----

Sample Date	: 19-SEP-1996 12:00	Acquisition date	: 10-OCT-1996 09:06
Elapsed live time	: 0 04:00	Elapsed real time	: 0 04:00 0.0%
Decay time	: 20 21:06		

---- Detector Parameters ----

Energy cal. time	: 8-OCT-1996 12:40:		
Detector name	: GAMMA5	Counting geometry	: PMP
Effic. cal. time	: 19-SEP-1996 14:21		

---- Processing Parameters ----

Cali. Slope	: 4.88823E-01	Cali. Offset	: -5.65841E-01
Cali. Quadratic	: -8.49185E-08	FWHM Offset	: 4.15386E-01
FWHM Slope	: 4.45150E-02	MDA Width (FWHM)	: 3.0
Start channel	: 1	End channel	: 4096
Sensitivity	: 5.0	Gaussian Sens.	: 10.0
Energy tolerance	: 2.0	Half life ratio	: 8.0
Abundance limit	: 75.0	WTM error limit	: 3.0
Activity Units	: PCI	Act. Conversion	: 1.00000E+06
MDA Confid Level	: 5.0	Sigma Number	: 2
Errors propagated	: Yes	Systematic Error	: 0.0%

Interference Report

No interference correction performed

Sample ID : 96E04514 Acquisition date : 10-OCT-1996 09:06:11

8019

Nuclide	Half-life	Half-Life Ratio	Energy	%Abund	Activity	2-Sigma %Error	Rejected by
PA-231	3.28E+04Y	0.00	50.10	31.70	--- Not Found ---		Abun.
			100.00	1.11	--- Not Found ---		
			122.31	1.19	--- Not Found ---		
			144.24	3.24	--- Not Found ---		
			154.21	5.58	--- Not Found ---		
			205.00	1.08	--- Not Found ---		
			210.60	1.26	--- Not Found ---		
			234.90	2.80	--- Not Found ---		
			236.00	11.50	--- Not Found ---		
			256.20	6.30	--- Not Found ---		
			269.46	13.60	--- Not Found ---		
			271.23	10.60	--- Not Found ---		
			283.67	1.60	--- Not Found ---		
			286.10	1.60	--- Not Found ---		
			300.08	2.30	--- Not Found ---		
			304.40	1.35	--- Not Found ---		
			323.87	3.88	--- Not Found ---		
			330.00	1.30	--- Not Found ---		
			334.20	1.15	--- Not Found ---		
			338.28	2.73	--- Not Found ---		
			351.07*	12.94	7.382E-05	39.21	
			401.81	6.50	--- Not Found ---		
			404.84	2.90	--- Not Found ---		
			427.08	1.30	--- Not Found ---		
			445.03	1.18	--- Not Found ---		
			569.67	0.54	--- Not Found ---		
			831.96	2.90	--- Not Found ---		
			897.83	0.24	--- Not Found ---		
			897.83	0.52	--- Not Found ---		
		% Abundances Found =		9.59			
U-235	7.04E+08Y	0.00	143.76	10.50	--- Not Found ---		Abun.
			163.35	4.70	--- Not Found ---		
			185.71*	54.00	3.741E-06	122.31	
			205.31	4.70	--- Not Found ---		
		% Abundances Found =		73.07			

Flag: "*" = Keyline

Sample ID : 96E04514
Acquisition date : 10-OCT-1996 09:06:11

8019

Nuclide Type: Natural

Nuclide	Energy	Area	%Abn	%Eff	Uncorrected PCI/SAMPLE	Decay Corr PCI/SAMPLE	2-Sigma %Error
RA-226	186.21	54	3.28*	5.027E+00	6.159E+01	6.159E+01	122.27

Flag: "*" = Keyline

8019

Gamma Spectroscopy Report generated 11-OCT-1996 13:40

Configuration: DISK:[RADCHEM.SCUSR.ARCHIVE]SMP_96E04514_GAMMA5_PMP_9186.CNF;2
Analyses by : PEAK V16.5 ENBACK V1.5 PEAKEFF V2.2 NID V3.1 MINACT V2.5

---- Sample Information ----

Sample Title : G969901S
Sample ID : 96E04514 Sample Quantity : 1.00000E+00 SAMPLE
Sample Type : FILTER Sample Geometry : PMP

---- Sample Decay/Count Information ----

Sample Date : 19-SEP-1996 12:00 Acquisition date : 10-OCT-1996 09:06
Elapsed live time: 0 04:00 Elapsed real time: 0 04:00 0.0%
Decay time : 20 21:06

---- Detector Parameters ----

Energy cal. time : 8-OCT-1996 12:40:
Detector name : GAMMA5 Counting geometry: PMP
Effic. cal. time : 19-SEP-1996 14:21

---- Processing Parameters ----

Cali. Slope	: 4.88823E-01	Cali. Offset	: -5.65841E-01
Cali. Quadratic	: -8.49185E-08	FWHM Offset	: 4.15386E-01
FWHM Slope	: 4.45150E-02	MDA Width (FWHM)	: 3.0
Start channel	: 1	End channel	: 4096
Sensitivity	: 5.0	Gaussian Sens.	: 10.0
Energy tolerance	: 2.0	Half life ratio	: 8.0
Abundance limit	: 75.0	WTM error limit	: 3.0
Activity Units	: PCI	Act. Conversion	: 1.00000E+06
MDA Confid Level	: 5.0	Sigma Number	: 2
Errors propagated	: Yes	Systematic Error	: 0.0%

Combined Activity-MDA Report

---- Identified Nuclides ----

Nuclide	Activity (PCI/SAMPLE)	Act error	MDA (PCI/SAMPLE)	MDA error	Act/MDA
RA-226	6.159E+01	7.531E+01	7.112E+01	1.316E+01	0.866

---- Non-Identified Nuclides ----

Nuclide	Key-Line Activity (PCI/SAMPLE)	K.L. Ided	Act error	MDA (PCI/SAMPLE)	MDA error	Act/MDA
RA-228	-3.410E+00		9.628E+00	1.614E+01	3.316E+00	-0.211
PA-231	7.382E+01	+	2.895E+01	3.574E+01	5.872E+00	2.065
U-235	3.741E+00	+	4.576E+00	6.210E+00	1.166E+00	0.602

Gamma Spectroscopy Report generated 11-OCT-1996 13:40 **8019**

Configuration: DISK:[RADCHEM.SCUSR.ARCHIVE]SMP_96E04514_GAMMA5_PMP_9186.CNF;2
Analyses by : PEAK V16.5 ENBACK V1.5 PEAKEFF V2.2 NID V3.1 MINACT V2.5

---- Sample Information ----

Sample Title	: G969901S		
Sample ID	: 96E04514	Sample Quantity	: 1.00000E+00 SAMPLE
Sample Type	: FILTER	Sample Geometry	: PMP

---- Sample Decay/Count Information ----

Sample Date	: 19-SEP-1996 12:00	Acquisition date	: 10-OCT-1996 09:06
Elapsed live time	: 0 04:00	Elapsed real time	: 0 04:00 0.0%
Decay time	: 20 21:06		

---- Detector Parameters ----

Energy cal. time	: 8-OCT-1996 12:40:		
Detector name	: GAMMA5	Counting geometry	: PMP
Effic. cal. time	: 19-SEP-1996 14:21		

---- Processing Parameters ----

Cali. Slope	: 4.88823E-01	Cali. Offset	: -5.65841E-01
Cali. Quadratic	: -8.49185E-08	FWHM Offset	: 4.15386E-01
FWHM Slope	: 4.45150E-02	MDA Width (FWHM)	: 3.0
Start channel	: 1	End channel	: 4096
Sensitivity	: 5.0	Gaussian Sens.	: 10.0
Energy tolerance	: 2.0	Half life ratio	: 8.0
Abundance limit	: 75.0	WTM error limit	: 3.0
Activity Units	: PCI	Act. Conversion	: 1.00000E+06
MDA Confid Level	: 5.0	Sigma Number	: 2
Errors propagated	: Yes	Systematic Error	: 9.0%

Combined Activity-MDA Report

---- Identified Nuclides ----

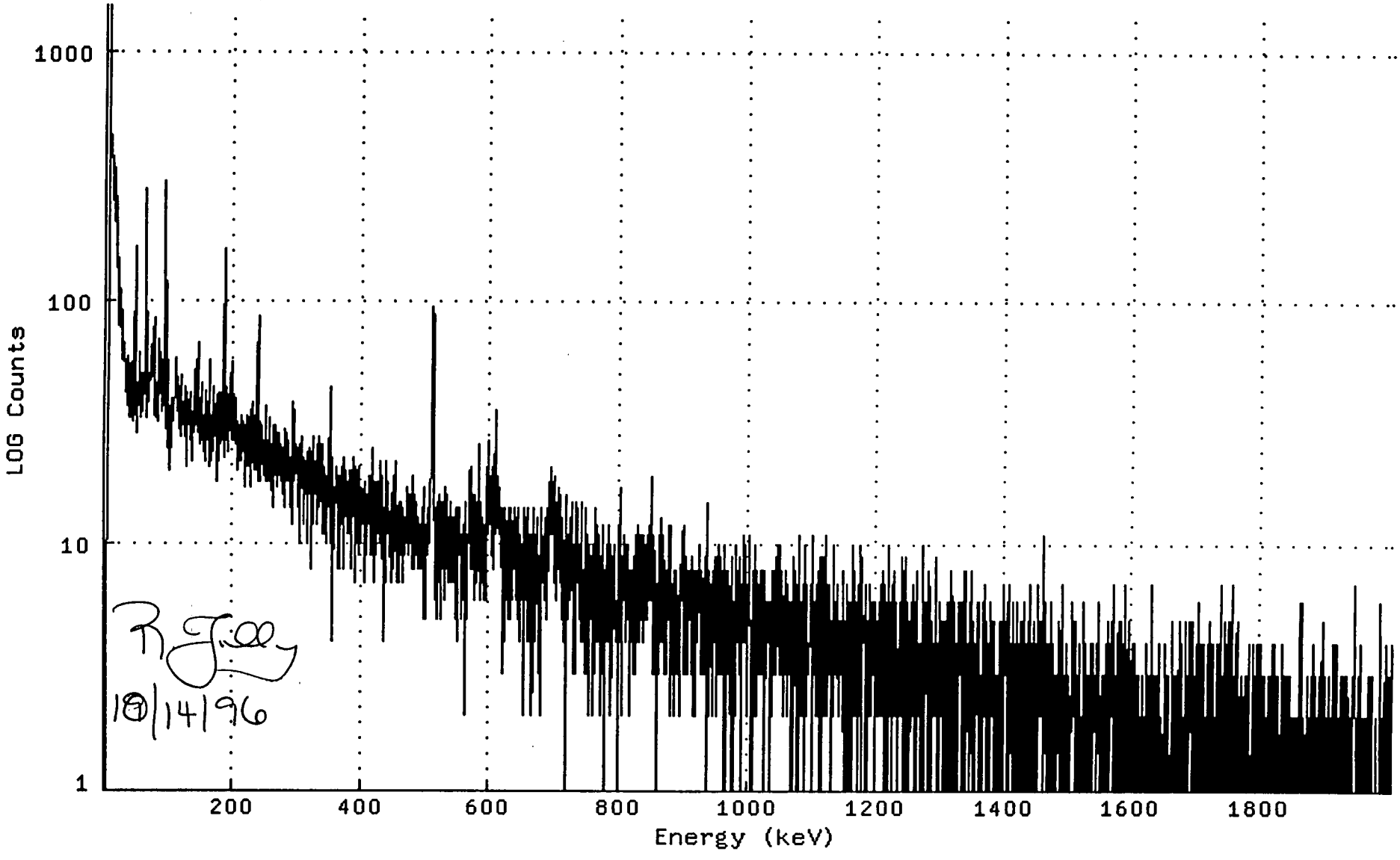
Nuclide	Activity (PCI/SAMPLE)	Act error	MDA (PCI/SAMPLE)	MDA error	Act/MDA
RA-226	6.159E+01	7.612E+01	7.112E+01	1.316E+01	0.866

---- Non-Identified Nuclides ----

Nuclide	Key-Line Activity (PCI/SAMPLE)	K.L. Ided	Act error	MDA (PCI/SAMPLE)	MDA error	Act/MDA
RA-228	-3.410E+00		9.647E+00	1.614E+01	3.316E+00	-0.211
PA-231	7.382E+01	+	3.185E+01	3.574E+01	5.872E+00	2.065
U-235	3.741E+00	+	4.625E+00	6.210E+00	1.166E+00	0.602

R. Jolly
10/14/96

Spectrum : DISK:[RADCHEM.SCUSR.ARCHIVE]SMP_96E04515_GAMMA6_PMP_9187.CNF;2
Title : 96E-0640-04
Sample Title: G969901S
Start Time: 10-OCT-1996 09:07 Sample Time: 19-JUL-1996 12:00 Energy Offset: -1.98761E-01
Real Time : 0 04:00:02.31 Sample ID : 96E04515 Energy Slope : 4.88802E-01
Live Time : 0 04:00:00.00 Sample Type: FILTER Energy Quad : -1.24008E-07



R J Gill
10/14/96

000500 126

8019

Gamma Spectroscopy Report generated 11-OCT-1996 14:25 **8019**

Configuration: DISK:[RADCHEM.SCUSR.ARCHIVE]SMP_96E04515_GAMMA6_PMP_9187.CNF;2
Analyses by : PEAK V16.5 PEAKEFF V2.2

---- Sample Information ----

Sample Title : G969901S
Sample ID : 96E04515 Sample Quantity : 1.00000E+00 SAMPLE
Sample Type : FILTER Sample Geometry : PMP

---- Sample Decay/Count Information ----

Sample Date : 19-JUL-1996 12:00 Acquisition date : 10-OCT-1996 09:07
Elapsed live time: 0 04:00 Elapsed real time: 0 04:00 0.0%
Decay time : 82 21:07

---- Detector Parameters ----

Energy cal. time : 8-OCT-1996 12:40:
Detector name : GAMMA6 Counting geometry: PMP
Effic. cal. time : 19-SEP-1996 15:11

---- Processing Parameters ----

Cali. Slope : 4.88802E-01 Cali. Offset : -1.98761E-01
Cali. Quadratic : -1.24008E-07 FWHM Offset : 6.37077E-01
FWHM Slope : 3.32083E-02 MDA Width (FWHM) : 3.0
Start channel : 1 End channel : 4096
Sensitivity : 5.0 Gaussian Sens. : 10.0
Energy tolerance : 2.0 Half life ratio : 8.0
Abundance limit : 75.0 WTM error limit : 3.0
Activity Units : PCI Act. Conversion : 1.00000E+06
MDA Confid Level : 5.0 Sigma Number : 2
Errors propagated: Yes Systematic Error : 0.0%

	It	Energy	Area	Bkgnd	FWHM	Channel	%Eff	Cts/Sec	%Err	Fit
1	3	10.31	367	1910	0.98	21.50	9.34E-01	2.55E-02	19.0	1.30E+00
2	3	13.03	217	1250	0.76	27.07	1.56E+00	1.50E-02	26.4	
3	0	15.87	304	1416	0.99	32.87	2.25E+00	2.11E-02	22.5	
4	0	46.56	205	414	0.93	95.66	6.84E+00	1.43E-02	19.3	
5	0	63.31	500	338	0.99	129.93	7.43E+00	3.47E-02	7.8	
6	0	92.80	717	423	1.25	190.26	7.33E+00	4.98E-02	6.7	
7	0	163.33	68	184	0.92	334.58	5.94E+00	4.73E-03	35.4	
8	0	185.65	343	285	1.10	380.25	5.52E+00	2.38E-02	10.7	
9	0	238.94	134	269	0.95	489.31	4.68E+00	9.27E-03	24.7	
10	0	352.53	114	150	1.39	721.74	3.47E+00	7.90E-03	23.8	
11	0	511.11	499	145	2.84	1046.33	2.52E+00	3.47E-02	7.3	
12	0	608.94	73	99	1.09	1246.57	2.16E+00	5.04E-03	27.4	
13	0	803.48	36	39	1.38	1644.86	1.69E+00	2.51E-03	33.9	
14	0	1863.52	22	18	4.58	3816.53	8.75E-01	1.51E-03	52.4	
15	0	1943.46	17	6	1.40	3980.39	8.52E-01	1.17E-03	36.6	

8019

Gamma Spectroscopy Report generated 11-OCT-1996 14:25

Configuration: DISK:[RADCHEM.SCUSR.ARCHIVE]BKG_BCKGND_GAMMA6__9144.CNF;1
Analyses by : PEAK V16.5 PEAKEFF V2.2

---- Sample Information ----

Sample Title :
Sample ID : BCKGND
Sample Type :
Sample Quantity : 1.00000E+00 G
Sample Geometry :

---- Sample Decay/Count Information ----

Sample Date : 4-OCT-1996 00:00:
Elapsed live time: 2 02:00
Decay time : 0 18:21
Acquisition date : 4-OCT-1996 18:21:
Elapsed real time: 2 02:00 0.0%

---- Detector Parameters ----

Energy cal. time : 30-SEP-1996 09:02
Detector name : GAMMA6
Effic. cal. time : 19-SEP-1996 13:34
Counting geometry: TRM1-S3

---- Processing Parameters ----

Cali. Slope	: 4.88539E-01	Cali. Offset	: -1.23202E-01
Cali. Quadratic	: -8.96482E-08	FWHM Offset	: 6.63864E-01
FWHM Slope	: 3.08694E-02	MDA Width (FWHM)	: 3.0
Start channel	: 1	End channel	: 4096
Sensitivity	: 5.0	Gaussian Sens.	: 10.0
Energy tolerance	: 2.0	Half life ratio	: 8.0
Abundance limit	: 75.0	WTM error limit	: 3.0
Activity Units	: pCi	Act. Conversion	: 1.00000E+06
MDA Confid Level	: 5.0	Sigma Number	: 1
Errors propagated	: Yes	Systematic Error	: 9.0%

	It	Energy	Area	Bkgnd	FWHM	Channel	%Eff	Cts/Sec	%Err	Fit
1	0	10.31	4650	23581	0.99	21.37	1.07E+05	2.58E-02	5.4	
2	4	13.10	3782	8752	0.88	27.07	1.83E+03	2.10E-02	3.5	6.65E-01
3	4	16.24	5522	14567	1.15	33.50	1.52E+02	3.07E-02	4.1	
4	0	19.50	1635	8409	1.62	40.16	3.62E+01	9.08E-03	9.3	
5	0	25.54	312	5600	0.86	52.53	1.02E+01	1.73E-03	38.6	
6	0	46.59	2743	4367	1.01	95.62	5.24E+00	1.52E-02	4.7	
7	0	53.57	608	4119	1.10	109.90	5.52E+00	3.38E-03	18.7	
8	0	63.33	5851	4242	0.89	129.88	6.06E+00	3.25E-02	2.3	
9	0	66.27	434	3647	1.07	135.89	6.23E+00	2.41E-03	23.6	
10	0	74.71	387	3737	0.90	153.19	6.70E+00	2.15E-03	25.5	
11	0	77.10	716	3235	0.91	158.08	6.82E+00	3.98E-03	13.2	
12	0	84.07	939	4528	1.17	172.34	7.15E+00	5.22E-03	13.3	
13	0	87.11	255	3002	1.06	178.56	7.28E+00	1.42E-03	34.5	
14	0	92.68	8662	4490	1.15	189.96	7.48E+00	4.81E-02	1.8	
15	0	98.45	403	3128	0.67	201.79	7.65E+00	2.24E-03	23.5	
16	7	110.09	994	5123	1.93	225.60	7.87E+00	5.52E-03	14.9	2.35E+00
17	7	112.93	511	3026	1.14	231.42	7.90E+00	2.84E-03	18.5	
18	0	139.98	660	3279	1.12	286.79	7.85E+00	3.67E-03	15.5	
19	0	143.85	766	3282	0.98	294.73	7.80E+00	4.26E-03	13.4	
20	0	163.53	543	3010	1.01	335.01	7.47E+00	3.01E-03	18.1	
21	0	185.82	3757	3802	1.11	380.64	6.98E+00	2.09E-02	3.5	
22	0	197.88	1519	4349	2.03	405.32	6.69E+00	8.44E-03	9.1	
23	0	205.27	364	2837	1.41	420.45	6.51E+00	2.02E-03	25.9	
24	0	238.51	1425	3059	1.17	488.51	5.74E+00	7.92E-03	7.4	

Sample ID : BCKGND Acquisition date : 4-OCT-1996 18:21:18

8019

Pk	It	Energy	Area	Bkgnd	FWHM	Channel	%Eff	Cts/Sec	%Err	Fit
[illegible]	0	295.60	150	1965	1.35	605.39	4.61E+00	8.34E-04	51.9	
[illegible]	0	351.85	396	1610	1.25	720.55	3.78E+00	2.20E-03	18.2	
27	0	510.92	5903	2795	2.42	1046.27	2.47E+00	3.28E-02	2.5	
28	0	569.76	296	1426	1.68	1166.76	2.20E+00	1.65E-03	25.4	
29	0	583.21	431	1428	1.46	1194.29	2.15E+00	2.39E-03	17.7	
30	0	609.11	415	1634	1.39	1247.34	2.06E+00	2.31E-03	18.9	
31	0	669.74	157	876	1.62	1371.50	1.88E+00	8.74E-04	34.9	
32	10	694.29	708	1889	3.83	1421.77	1.83E+00	3.93E-03	15.0	3.99E+00
33	10	701.21	457	2536	3.84	1435.95	1.81E+00	2.54E-03	29.9	
34	0	802.85	425	888	1.34	1644.13	1.63E+00	2.36E-03	14.4	
35	0	1000.76	326	643	1.90	2049.50	1.42E+00	1.81E-03	16.1	
36	0	1063.81	136	560	1.77	2178.65	1.38E+00	7.53E-04	33.9	
37	0	1460.33	407	435	1.84	2991.07	1.22E+00	2.26E-03	12.2	
38	0	1764.08	137	242	1.92	3613.58	1.14E+00	7.60E-04	24.3	

8019

Gamma Spectroscopy Report generated 11-OCT-1996 14:25

Configuration: DISK:[RADCHEM.SCUSR.ARCHIVE]SMP_96E04515_GAMMA6_PMP_9187.CNF;2
Analyses by : PEAK V16.5 ENBACK V1.5

---- Sample Information ----

Sample Title : G969901S
Sample ID : 96E04515
Sample Type : FILTER
Sample Quantity : 1.00000E+00 SAMPLE
Sample Geometry : PMP

---- Sample Decay/Count Information ----

Sample Date : 19-JUL-1996 12:00
Elapsed live time: 0 04:00
Decay time : 82 21:07
Acquisition date : 10-OCT-1996 09:07
Elapsed real time: 0 04:00 0.0%

---- Detector Parameters ----

Energy cal. time : 8-OCT-1996 12:40:
Detector name : GAMMA6
Effic. cal. time : 19-SEP-1996 15:11
Counting geometry: PMP

---- Processing Parameters ----

Cali. Slope	: 4.88802E-01	Cali. Offset	: -1.98761E-01
Cali. Quadratic	: -1.24008E-07	FWHM Offset	: 6.37077E-01
FWHM Slope	: 3.32083E-02	MDA Width (FWHM)	: 3.0
Start channel	: 1	End channel	: 4096
Sensitivity	: 5.0	Gaussian Sens.	: 10.0
Energy tolerance	: 2.0	Half life ratio	: 8.0
Abundance limit	: 75.0	WTM error limit	: 3.0
Activity Units	: PCI	Act. Conversion	: 1.00000E+06
MDA Confid Level	: 5.0	Sigma Number	: 2
Errors propagated	: Yes	Systematic Error	: 0.0%

	It	Energy	Area	Bkgnd	FWHM	Channel	Left	Pw	Cts/Sec	%Err	Fit
1	0	63.31*	32	338	0.99	129.93	126	8	2.20E-03	127.8	1.30E+00
2	0	92.80*	24	423	1.25	190.26	186	11	1.68E-03	205.2	
3	0	163.33*	25	184	0.92	334.58	331	7	1.72E-03	102.5	
4	0	185.65*	42	285	1.10	380.25	375	10	2.95E-03	89.7	
5	0	238.94*	20	269	0.95	489.31	485	10	1.35E-03	174.4	
6	0	352.53*	82	150	1.39	721.74	716	12	5.70E-03	33.7	
7	0	511.11*	27	145	2.84	1046.33	1038	18	1.89E-03	140.6	
8	0	608.94*	39	99	1.09	1246.57	1242	9	2.74E-03	52.9	
9	0	803.48*	2	39	1.38	1644.86	1641	8	1.54E-04	595.1	
10	0	1863.52	22	18	4.58	3816.53	3805	19	1.51E-03	52.4	
11	0	1943.46	17	6	1.40	3980.39	3977	9	1.17E-03	36.6	

Flag: "*" = Peak area was modified by background subtraction

Gamma Spectroscopy Report generated 11-OCT-1996 14:25 8019

Configuration: DISK:[RADCHEM.SCUSR.ARCHIVE]SMP_96E04515_GAMMA6_PMP_9187.CNF;2
Analyses by : PEAK V16.5 ENBACK V1.5 PEAKEFF V2.2 NID V3.1

---- Sample Information ----

Sample Title	: G969901S		
Sample ID	: 96E04515	Sample Quantity	: 1.00000E+00 SAMPLE
Sample Type	: FILTER	Sample Geometry	: PMP

---- Sample Decay/Count Information ----

Sample Date	: 19-JUL-1996 12:00	Acquisition date	: 10-OCT-1996 09:07
Elapsed live time	: 0 04:00	Elapsed real time	: 0 04:00 0.0%
Decay time	: 82 21:07		

---- Detector Parameters ----

Energy cal. time	: 8-OCT-1996 12:40:		
Detector name	: GAMMA6	Counting geometry	: PMP
Effic. cal. time	: 19-SEP-1996 15:11		

---- Processing Parameters ----

Cali. Slope	: 4.88802E-01	Cali. Offset	: -1.98761E-01
Cali. Quadratic	: -1.24008E-07	FWHM Offset	: 6.37077E-01
FWHM Slope	: 3.32083E-02	MDA Width (FWHM)	: 3.0
Start channel	: 1	End channel	: 4096
Sensitivity	: 5.0	Gaussian Sens.	: 10.0
Energy tolerance	: 2.0	Half life ratio	: 8.0
Abundance limit	: 75.0	WTM error limit	: 3.0
Activity Units	: PCI	Act. Conversion	: 1.00000E+06
MDA Confid Level	: 5.0	Sigma Number	: 2
Errors propagated	: Yes	Systematic Error	: 0.0%

t-NID Peak Search Report

It	Energy	Area	Bkgnd	FWHM	Channel	Left	Pw %Err	Fit	Nuclides
0	63.31*	32	338	0.99	129.93	126	8255.5	1.30E+00	
0	92.80*	24	423	1.25	190.26	186	11410.5		
0	163.33*	25	184	0.92	334.58	331	7205.1		U-235
0	185.65*	42	285	1.10	380.25	375	10179.4		U-235 RA-226
0	238.94*	20	269	0.95	489.31	485	10348.7		
0	352.53*	82	150	1.39	721.74	716	12 67.5		
0	511.11*	27	145	2.84	1046.33	1038	18281.2		
0	608.94*	39	99	1.09	1246.57	1242	9105.8		
0	803.48*	2	39	1.38	1644.86	1641	8*****		
0	1863.52	22	18	4.58	3816.53	3805	19104.7		
0	1943.46	17	6	1.40	3980.39	3977	9 73.2		

8019

Gamma Spectroscopy Report generated 15-OCT-1996 11:11

Configuration: DISK:[RADCHEM.SCUSR.ARCHIVE]SMP_96E04515_GAMMA6_PMP_9187.CNF;2
Analyses by : PEAK V16.5 ENBACK V1.5 PEAKEFF V2.2 NID V3.1 MINACT V2.5

---- Sample Information ----

Sample Title	: G969901S		
Sample ID	: 96E04515	Sample Quantity	: 1.00000E+00 SAMPLE
Sample Type	: FILTER	Sample Geometry	: PMP

---- Sample Decay/Count Information ----

Sample Date	: 19-JUL-1996 12:00	Acquisition date	: 10-OCT-1996 09:07
Elapsed live time	: 0 04:00	Elapsed real time	: 0 04:00 0.0%
Decay time	: 82 21:07		

---- Detector Parameters ----

Energy cal. time	: 8-OCT-1996 12:40:		
Detector name	: GAMMA6	Counting geometry	: PMP
Effic. cal. time	: 19-SEP-1996 15:11		

---- Processing Parameters ----

Cali. Slope	: 4.88802E-01	Cali. Offset	: -1.98761E-01
Cali. Quadratic	: -1.24008E-07	FWHM Offset	: 6.37077E-01
FWHM Slope	: 3.32083E-02	MDA Width (FWHM)	: 3.0
Start channel	: 1	End channel	: 4096
Sensitivity	: 5.0	Gaussian Sens.	: 10.0
Energy tolerance	: 2.0	Half life ratio	: 8.0
Abundance limit	: 75.0	WTM error limit	: 3.0
Activity Units	: PCI	Act. Conversion	: 1.00000E+06
MDA Confid Level	: 5.0	Sigma Number	: 2
Errors propagated	: Yes	Systematic Error	: 0.0%

Combined Activity-MDA Report

---- Identified Nuclides ----

Nuclide	Activity (PCI/SAMPLE)	Act error	MDA (PCI/SAMPLE)	MDA error	Act/MDA
RA-226	4.399E+01	7.909E+01	7.746E+01	9.293E+00	0.568
U-235	1.664E+01	3.428E+01	4.535E+00	5.630E-01	3.668

---- Non-Identified Nuclides ----

Nuclide	Key-Line Activity (PCI/SAMPLE)	K.L. Ided	Act error	MDA (PCI/SAMPLE)	MDA error	Act/MDA
RA-228	5.423E+00		9.682E+00	1.786E+01	2.379E+00	0.304
PA-231	3.431E+01	+	2.355E+01	2.913E+01	3.667E+00	1.178

Gamma Spectroscopy Report generated 15-OCT-1996 11:12 **8019**

Configuration: DISK:[RADCHEM.SCUSR.ARCHIVE]SMP_96E04515_GAMMA6_PMP_9187.CNF;2
Analyses by : PEAK V16.5 ENBACK V1.5 PEAKEFF V2.2 NID V3.1 MINACT V2.5

---- Sample Information ----

Sample Title	: G969901S		
Sample ID	: 96E04515	Sample Quantity	: 1.00000E+00 SAMPLE
Sample Type	: FILTER	Sample Geometry	: PMP

---- Sample Decay/Count Information ----

Sample Date	: 19-JUL-1996 12:00	Acquisition date	: 10-OCT-1996 09:07
Elapsed live time	: 0 04:00	Elapsed real time	: 0 04:00 0.0%
Decay time	: 82 21:07		

---- Detector Parameters ----

Energy cal. time	: 8-OCT-1996 12:40:		
Detector name	: GAMMA6	Counting geometry	: PMP
Effic. cal. time	: 19-SEP-1996 15:11		

---- Processing Parameters ----

Cali. Slope	: 4.88802E-01	Cali. Offset	: -1.98761E-01
Cali. Quadratic	: -1.24008E-07	FWHM Offset	: 6.37077E-01
FWHM Slope	: 3.32083E-02	MDA Width (FWHM)	: 3.0
Start channel	: 1	End channel	: 4096
Sensitivity	: 5.0	Gaussian Sens.	: 10.0
Energy tolerance	: 2.0	Half life ratio	: 8.0
Abundance limit	: 75.0	WTM error limit	: 3.0
Activity Units	: PCI	Act. Conversion	: 1.00000E+06
MDA Confid Level	: 5.0	Sigma Number	: 2
Errors propagated	: Yes	Systematic Error	: 9.0%

Combined Activity-MDA Report

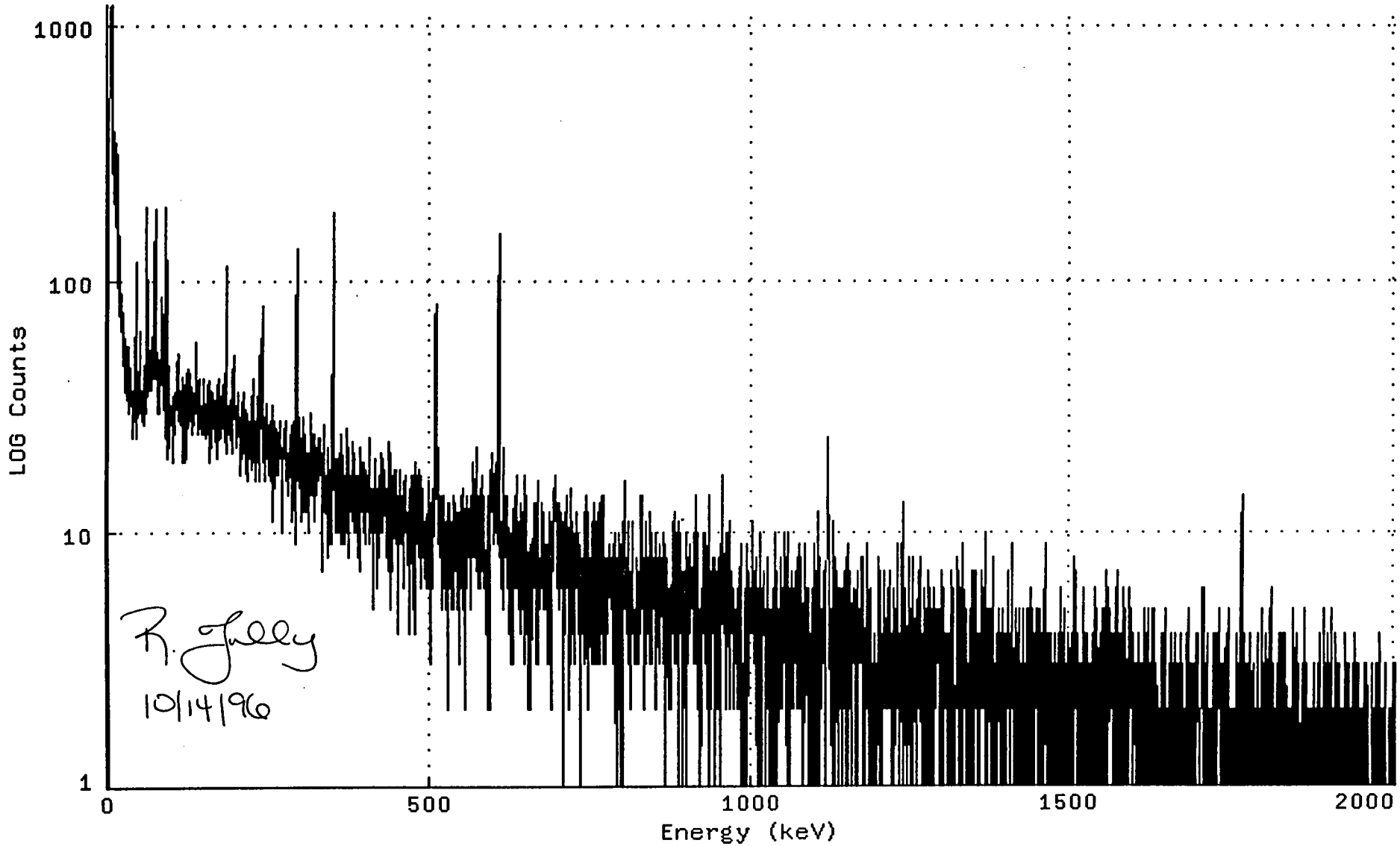
---- Identified Nuclides ----

Nuclide	Activity (PCI/SAMPLE)	Act error	MDA (PCI/SAMPLE)	MDA error	Act/MDA
RA-226	4.399E+01	7.948E+01	7.746E+01	9.293E+00	0.568
U-235	1.664E+01	3.441E+01	4.535E+00	5.630E-01	3.668

---- Non-Identified Nuclides ----

Nuclide	Key-Line Activity (PCI/SAMPLE)	K.L. Ided	Act error	MDA (PCI/SAMPLE)	MDA error	Act/MDA
RA-228	5.423E+00		9.731E+00	1.786E+01	2.379E+00	0.304
PA-231	3.431E+01	+	2.434E+01	2.913E+01	3.667E+00	1.178

Spectrum : DISK:[RADCHEM.SCUSR.ARCHIVE]SMP_96E04516_GAMMA5_PMP_9183.CNF;2
Title : 96E-0640-04
Sample Title: G969901S
Start Time: 9-OCT-1996 14:43: Sample Time: 19-SEP-1996 12:00 Energy Offset: -5.65841E-01
Real Time : 0 04:00:05.50 Sample ID : 96E04516 Energy Slope : 4.88823E-01
Live Time : 0 04:00:00.00 Sample Type: FILTER Energy Quad : -8.49185E-08



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8019

Gamma Spectroscopy Report generated 11-OCT-1996 13:41 **8019**

Configuration: DISK:[RADCHEM.SCUSR.ARCHIVE]SMP_96E04516_GAMMA5_PMP_9183.CNF;2
Analyses by : PEAK V16.5 PEAKEFF V2.2

---- Sample Information ----

Sample Title : G969901S
Sample ID : 96E04516 Sample Quantity : 1.00000E+00 SAMPLE
Sample Type : FILTER Sample Geometry : PMP

---- Sample Decay/Count Information ----

Sample Date : 19-SEP-1996 12:00 Acquisition date : 9-OCT-1996 14:43:
Elapsed live time: 0 04:00 Elapsed real time: 0 04:00 0.0%
Decay time : 20 02:43

---- Detector Parameters ----

Energy cal. time : 8-OCT-1996 12:40:
Detector name : GAMMA5 Counting geometry: PMP
Effic. cal. time : 19-SEP-1996 14:21

---- Processing Parameters ----

Cali. Slope	: 4.88823E-01	Cali. Offset	: -5.65841E-01
Cali. Quadratic	: -8.49185E-08	FWHM Offset	: 4.15386E-01
FWHM Slope	: 4.45150E-02	MDA Width (FWHM)	: 3.0
Start channel	: 1	End channel	: 4096
Sensitivity	: 5.0	Gaussian Sens.	: 10.0
Energy tolerance	: 2.0	Half life ratio	: 8.0
Abundance limit	: 75.0	WTM error limit	: 3.0
Activity Units	: PCI	Act. Conversion	: 1.00000E+06
MDA Confid Level	: 5.0	Sigma Number	: 2
Errors propagated	: Yes	Systematic Error	: 0.0%

	It	Energy	Area	Bkgnd	FWHM	Channel	%Eff	Cts/Sec	%Err	Fit
1	0	7.64	1803	3626	1.48	16.78	8.92E+00	1.25E-01	6.3	
2	0	13.04	308	924	0.91	27.84	9.66E+00	2.14E-02	15.9	
3	0	16.17	577	910	1.12	34.24	9.78E+00	4.00E-02	9.7	
4	0	18.87	131	722	1.25	39.76	9.79E+00	9.09E-03	37.0	
5	0	46.29	181	331	0.99	95.86	8.80E+00	1.25E-02	20.3	
6	0	53.10	104	307	1.13	109.79	8.50E+00	7.20E-03	33.1	
7	0	63.13	321	289	0.93	130.31	8.09E+00	2.23E-02	10.7	
8	2	74.73	200	239	0.97	154.05	7.65E+00	1.39E-02	14.1	1.74E+00
9	2	77.08	313	222	0.95	158.85	7.57E+00	2.18E-02	9.5	
10	0	87.23	66	285	0.81	179.62	7.23E+00	4.55E-03	44.8	
11	0	92.87	405	325	1.07	191.15	7.05E+00	2.81E-02	9.9	
12	0	185.92	178	255	1.00	381.52	5.02E+00	1.24E-02	17.8	
13	2	238.97	96	180	1.34	490.06	4.32E+00	6.67E-03	26.1	1.80E+00
14	2	242.16	152	180	1.23	496.59	4.28E+00	1.06E-02	17.2	
15	0	295.17	301	193	1.08	605.06	3.75E+00	2.09E-02	10.8	
16	0	352.05	451	156	1.15	721.45	3.31E+00	3.13E-02	7.1	
17	0	511.54	367	211	2.17	1047.83	2.47E+00	2.55E-02	10.9	
18	0	609.53	387	136	1.17	1248.36	2.13E+00	2.69E-02	8.0	
19	0	803.44	23	66	2.18	1645.26	1.66E+00	1.60E-03	71.6	
20	0	1120.65	80	55	1.51	2294.63	1.20E+00	5.58E-03	23.6	
21	0	1237.80	44	26	4.13	2534.49	1.08E+00	3.05E-03	28.3	
22	0	1377.90	37	17	3.20	2821.35	9.68E-01	2.57E-03	30.4	
23	0	1765.27	75	11	2.64	3614.70	7.37E-01	5.22E-03	16.1	

8019

Gamma Spectroscopy Report generated 11-OCT-1996 13:41

Configuration: DISK:[RADCHEM.SCUSR.ARCHIVE]BKG_BCKGND_GAMMA5__9143.CNF;1
Analyses by : PEAK V16.5 PEAKEFF V2.2

---- Sample Information ----

Sample Title :
Sample ID : BCKGND
Sample Type :
Sample Quantity : 1.00000E+00 G
Sample Geometry :

---- Sample Decay/Count Information ----

Sample Date : 4-OCT-1996 00:00:
Elapsed live time: 2 02:00
Decay time : 0 18:20
Acquisition date : 4-OCT-1996 18:20:
Elapsed real time: 2 02:01 0.0%

---- Detector Parameters ----

Energy cal. time : 30-SEP-1996 09:01
Detector name : GAMMA5
Effic. cal. time : 19-SEP-1996 11:45
Counting geometry: TRM1-S3

---- Processing Parameters ----

Cali. Slope	: 4.88756E-01	Cali. Offset	: -5.37244E-01
Cali. Quadratic	: -7.07146E-08	FWHM Offset	: 5.94642E-01
FWHM Slope	: 3.39310E-02	MDA Width (FWHM)	: 3.0
Start channel	: 1	End channel	: 4096
Sensitivity	: 5.0	Gaussian Sens.	: 10.0
Energy tolerance	: 2.0	Half life ratio	: 8.0
Abundance limit	: 75.0	WTM error limit	: 3.0
Activity Units	: pCi	Act. Conversion	: 1.00000E+06
MDA Confid Level	: 5.0	Sigma Number	: 1
Errors propagated	: Yes	Systematic Error	: 9.0%

	It	Energy	Area	Bkgnd	FWHM	Channel	%Eff	Cts/Sec	%Err	Fit
1	0	7.76	24064	42790	1.54	16.98	6.55E+06	1.34E-01	1.5	
2	0	10.38	4115	15170	0.84	22.34	1.32E+04	2.29E-02	4.8	
3	0	13.03	4183	13266	0.86	27.77	5.13E+02	2.32E-02	4.7	
4	0	16.22	6461	11688	1.08	34.29	6.28E+01	3.59E-02	3.1	
5	0	19.25	1233	6158	0.89	40.48	2.09E+01	6.85E-03	10.0	
6	0	23.34	285	5186	1.44	48.85	9.40E+00	1.58E-03	40.4	
7	0	26.04	437	4406	1.08	54.38	7.03E+00	2.43E-03	24.7	
8	0	46.55	1927	3150	0.94	96.35	4.94E+00	1.07E-02	5.5	
9	0	53.64	405	3070	0.98	110.85	5.29E+00	2.25E-03	24.2	
10	4	63.34	3752	1877	0.81	130.70	5.86E+00	2.08E-02	2.4	1.10E+00
11	4	66.28	535	2846	1.28	136.72	6.02E+00	2.97E-03	18.1	
12	0	69.74	385	3435	1.87	143.79	6.21E+00	2.14E-03	26.7	
13	0	74.19	134	3061	0.84	152.90	6.44E+00	7.44E-04	65.8	
14	0	77.07	495	2625	0.94	158.79	6.57E+00	2.75E-03	17.0	
15	0	84.43	698	3059	1.37	173.85	6.87E+00	3.88E-03	14.2	
16	0	87.20	283	2253	0.85	179.52	6.97E+00	1.57E-03	27.2	
17	0	92.67	4997	3152	1.09	190.71	7.12E+00	2.78E-02	2.4	
18	0	98.25	195	2385	0.93	202.14	7.25E+00	1.09E-03	42.0	
19	0	109.75	354	2985	0.75	225.66	7.39E+00	1.97E-03	27.2	
20	0	112.82	230	1804	0.95	231.93	7.40E+00	1.28E-03	28.5	
21	0	139.81	682	3118	1.12	287.16	7.22E+00	3.79E-03	15.8	
22	0	143.66	424	2282	1.06	295.05	7.16E+00	2.35E-03	19.3	
23	0	185.85	2020	3123	1.02	381.36	6.27E+00	1.12E-02	5.6	
24	4	197.16	456	1487	0.89	404.51	6.00E+00	2.53E-03	13.8	4.49E-01

Sample ID : BCKGND Acquisition date : 4-OCT-1996 18:20:18

8019

Pk	It	Energy	Area	Bkgnd	FWHM	Channel	%Eff	Cts/Sec	%Err	Fit
[illegible]	4	198.38	665	1790	1.04	407.00	5.98E+00	3.69E-03	11.2	
26	0	205.33	188	1689	0.96	421.24	5.81E+00	1.04E-03	35.4	
27	0	238.76	908	2089	1.08	489.64	5.07E+00	5.05E-03	9.3	
28	0	295.36	179	1472	1.03	605.47	4.05E+00	9.94E-04	36.3	
29	0	352.05	298	1202	1.06	721.47	3.31E+00	1.65E-03	20.2	
30	0	511.06	4724	2215	2.53	1046.88	2.15E+00	2.62E-02	2.7	
31	0	569.99	434	1409	1.55	1167.50	1.91E+00	2.41E-03	18.5	
32	0	583.39	294	1218	1.25	1194.92	1.87E+00	1.64E-03	23.7	
33	0	609.48	299	1186	1.30	1248.33	1.79E+00	1.66E-03	21.5	
34	0	669.54	124	741	1.38	1371.25	1.64E+00	6.91E-04	40.4	
35	4	693.56	349	1136	2.18	1420.41	1.58E+00	1.94E-03	21.4	3.27E+00
36	4	696.97	189	993	1.80	1427.39	1.58E+00	1.05E-03	34.4	
37	4	702.45	192	1226	2.19	1438.62	1.57E+00	1.07E-03	38.5	
38	0	803.05	377	759	1.66	1644.53	1.41E+00	2.09E-03	15.0	
39	0	962.14	241	859	2.17	1970.22	1.25E+00	1.34E-03	28.6	
40	0	1120.02	105	385	1.77	2293.42	1.15E+00	5.83E-04	35.1	
41	0	1331.87	136	353	2.38	2727.21	1.06E+00	7.54E-04	28.1	
42	0	1460.47	320	376	1.75	2990.52	1.02E+00	1.78E-03	14.0	
43	0	1764.72	128	183	2.41	3613.62	9.27E-01	7.11E-04	23.0	

8019

Gamma Spectroscopy Report generated 11-OCT-1996 13:41

Configuration: DISK:[RADCHEM.SCUSR.ARCHIVE]SMP_96E04516_GAMMA5_PMP_9183.CNF;2
Analyses by : PEAK V16.5 ENBACK V1.5

---- Sample Information ----

Sample Title : G969901S
Sample ID : 96E04516 Sample Quantity : 1.00000E+00 SAMPLE
Sample Type : FILTER Sample Geometry : PMP

---- Sample Decay/Count Information ----

Sample Date : 19-SEP-1996 12:00 Acquisition date : 9-OCT-1996 14:43:
Elapsed live time: 0 04:00 Elapsed real time: 0 04:00 0.0%
Decay time : 20 02:43

---- Detector Parameters ----

Energy cal. time : 8-OCT-1996 12:40:
Detector name : GAMMA5 Counting geometry: PMP
Effic. cal. time : 19-SEP-1996 14:21

---- Processing Parameters ----

Cali. Slope : 4.88823E-01 Cali. Offset : -5.65841E-01
Cali. Quadratic : -8.49185E-08 FWHM Offset : 4.15386E-01
FWHM Slope : 4.45150E-02 MDA Width (FWHM) : 3.0
Start channel : 1 End channel : 4096
Sensitivity : 5.0 Gaussian Sens. : 10.0
Energy tolerance : 2.0 Half life ratio : 8.0
Abundance limit : 75.0 WTM error limit : 3.0
Activity Units : PCI Act. Conversion : 1.00000E+06
MDA Confid Level : 5.0 Sigma Number : 2
Errors propagated: Yes Systematic Error : 0.0%

	It	Energy	Area	Bkgnd	FWHM	Channel	Left	Pw	Cts/Sec	%Err	Fit
1	0	16.17*	60	910	1.12	34.24	31	7	4.15E-03	97.6	
2	0	18.87*	32	722	1.25	39.76	39	8	2.24E-03	152.9	
3	0	46.29*	26	331	0.99	95.86	92	10	1.84E-03	142.0	
4	0	53.10*	71	307	1.13	109.79	105	10	4.95E-03	49.4	
5	0	63.13*	21	289	0.93	130.31	127	8	1.48E-03	164.3	
6	2	74.73*	189	239	0.97	154.05	149	19	1.31E-02	15.4	1.74E+00
7	2	77.08*	274	222	0.95	158.85	149	19	1.90E-02	11.2	
8	0	87.23*	43	285	0.81	179.62	176	7	2.98E-03	70.0	
9	0	92.87*	5	325	1.07	191.15	187	10	3.53E-04	809.5	
10	0	185.92*	17	255	1.00	381.52	377	9	1.16E-03	197.3	
11	2	238.97*	23	180	1.34	490.06	484	17	1.63E-03	110.8	1.80E+00
12	2	242.16	152	180	1.23	496.59	484	17	1.06E-02	17.2	
13	0	295.17*	287	193	1.08	605.06	600	12	1.99E-02	11.5	
14	0	352.05*	427	156	1.15	721.45	717	11	2.96E-02	7.6	
15	0	609.53*	363	136	1.17	1248.36	1242	13	2.52E-02	8.7	
16	0	1120.65*	72	55	1.51	2294.63	2288	16	5.00E-03	26.7	
17	0	1237.80	44	26	4.13	2534.49	2527	13	3.05E-03	28.3	
18	0	1377.90	37	17	3.20	2821.35	2814	17	2.57E-03	30.4	
19	0	1765.27*	65	11	2.64	3614.70	3607	18	4.51E-03	19.0	

Flag: "*" = Peak area was modified by background subtraction

Gamma Spectroscopy Report generated 11-OCT-1996 13:41 **8019**

Configuration: DISK:[RADCHEM.SCUSR.ARCHIVE]SMP_96E04516_GAMMA5_PMP_9183.CNF;2
Analyses by : PEAK V16.5 ENBACK V1.5 PEAKEFF V2.2 NID V3.1

---- Sample Information ----

Sample Title : G969901S
Sample ID : 96E04516 Sample Quantity : 1.00000E+00 SAMPLE
Sample Type : FILTER Sample Geometry : PMP

---- Sample Decay/Count Information ----

Sample Date : 19-SEP-1996 12:00 Acquisition date : 9-OCT-1996 14:43:
Elapsed live time: 0 04:00 Elapsed real time: 0 04:00 0.0%
Decay time : 20 02:43

---- Detector Parameters ----

Energy cal. time : 8-OCT-1996 12:40:
Detector name : GAMMA5 Counting geometry: PMP
Effic. cal. time : 19-SEP-1996 14:21

---- Processing Parameters ----

Cali. Slope	: 4.88823E-01	Cali. Offset	: -5.65841E-01
Cali. Quadratic	: -8.49185E-08	FWHM Offset	: 4.15386E-01
FWHM Slope	: 4.45150E-02	MDA Width (FWHM)	: 3.0
Start channel	: 1	End channel	: 4096
Sensitivity	: 5.0	Gaussian Sens.	: 10.0
Energy tolerance	: 2.0	Half life ratio	: 8.0
Abundance limit	: 75.0	WTM error limit	: 3.0
Activity Units	: PCI	Act. Conversion	: 1.00000E+06
MDA Confid Level	: 5.0	Sigma Number	: 2
Errors propagated	: Yes	Systematic Error	: 0.0%

P-NID Peak Search Report

It	Energy	Area	Bkgnd	FWHM	Channel	Left	Pw %Err	Fit	Nuclides
0	16.17*	60	910	1.12	34.24	31	7195.1		
0	18.87*	32	722	1.25	39.76	39	8305.8		
0	46.29*	26	331	0.99	95.86	92	10284.1		
0	53.10*	71	307	1.13	109.79	105	10 98.8		
0	63.13*	21	289	0.93	130.31	127	8328.6		
2	74.73*	189	239	0.97	154.05	149	19 30.8	1.74E+00	
2	77.08*	274	222	0.95	158.85	149	19 22.3		
0	87.23*	43	285	0.81	179.62	176	7139.9		
0	92.87*	5	325	1.07	191.15	187	10*****		
0	185.92*	17	255	1.00	381.52	377	9394.6		RA-226
2	238.97*	23	180	1.34	490.06	484	17221.5	1.80E+00	
2	242.16	152	180	1.23	496.59	484	17 34.4		
0	295.17*	287	193	1.08	605.06	600	12 23.0		
0	352.05*	427	156	1.15	721.45	717	11 15.3		
0	609.53*	363	136	1.17	1248.36	1242	13 17.4		
0	1120.65*	72	55	1.51	2294.63	2288	16 53.3		
0	1237.80	44	26	4.13	2534.49	2527	13 56.6		
0	1377.90	37	17	3.20	2821.35	2814	17 60.7		
0	1765.27*	65	11	2.64	3614.70	3607	18 38.0		

8019

Gamma Spectroscopy Report generated 11-OCT-1996 13:41

Configuration: DISK:[RADCHEM.SCUSR.ARCHIVE]SMP_96E04516_GAMMA5_PMP_9183.CNF;2
Analyses by : PEAK V16.5 ENBACK V1.5 PEAKEFF V2.2 NID V3.1

---- Sample Information ----

Sample Title	: G969901S		
Sample ID	: 96E04516	Sample Quantity	: 1.00000E+00 SAMPLE
Sample Type	: FILTER	Sample Geometry	: PMP

---- Sample Decay/Count Information ----

Sample Date	: 19-SEP-1996 12:00	Acquisition date	: 9-OCT-1996 14:43:
Elapsed live time	: 0 04:00	Elapsed real time	: 0 04:00 0.0%
Decay time	: 20 02:43		

---- Detector Parameters ----

Energy cal. time	: 8-OCT-1996 12:40:		
Detector name	: GAMMA5	Counting geometry	: PMP
Effic. cal. time	: 19-SEP-1996 14:21		

---- Processing Parameters ----

Cali. Slope	: 4.88823E-01	Cali. Offset	: -5.65841E-01
Cali. Quadratic	: -8.49185E-08	FWHM Offset	: 4.15386E-01
FWHM Slope	: 4.45150E-02	MDA Width (FWHM)	: 3.0
Start channel	: 1	End channel	: 4096
Sensitivity	: 5.0	Gaussian Sens.	: 10.0
Energy tolerance	: 2.0	Half life ratio	: 8.0
Abundance limit	: 75.0	WTM error limit	: 3.0
Activity Units	: PCI	Act. Conversion	: 1.00000E+06
MDA Confid Level	: 5.0	Sigma Number	: 2
Errors propagated	: Yes	Systematic Error	: 0.0%

Interference Report

No interference correction performed

Nuclide	Half-life	Half-Life Ratio	Energy	%Abund	Activity	2-Sigma %Error	Rejected by
PA-231	3.28E+04Y	0.00	50.10	31.70	--- Not Found ---		Abun.
			100.00	1.11	--- Not Found ---		
			122.31	1.19	--- Not Found ---		
			144.24	3.24	--- Not Found ---		
			154.21	5.58	--- Not Found ---		
			205.00	1.08	--- Not Found ---		
			210.60	1.26	--- Not Found ---		
			234.90	2.80	--- Not Found ---		
			236.00	11.50	--- Not Found ---		
			256.20	6.30	--- Not Found ---		
			269.46	13.60	--- Not Found ---		
			271.23	10.60	--- Not Found ---		
			283.67	1.60	--- Not Found ---		
			286.10	1.60	--- Not Found ---		
			300.08	2.30	--- Not Found ---		
			304.40	1.35	--- Not Found ---		
			323.87	3.88	--- Not Found ---		
			330.00	1.30	--- Not Found ---		
			334.20	1.15	--- Not Found ---		
			338.28	2.73	--- Not Found ---		
			351.07*	12.94	1.870E-04	22.40	
			401.81	6.50	--- Not Found ---		
			404.84	2.90	--- Not Found ---		
			427.08	1.30	--- Not Found ---		
			445.03	1.18	--- Not Found ---		
			569.67	0.54	--- Not Found ---		
			831.96	2.90	--- Not Found ---		
			897.83	0.24	--- Not Found ---		
			897.83	0.52	--- Not Found ---		
		% Abundances Found =		9.59			
U-235	7.04E+08Y	0.00	143.76	10.50	--- Not Found ---		Abun.
			163.35	4.70	--- Not Found ---		
			185.71*	54.00	1.159E-06	395.08	
			205.31	4.70	--- Not Found ---		
		% Abundances Found =		73.07			

Flag: "*" = Keyline

8019

Nuclide Type: Natural

Nuclide	Energy	Area	%Abn	%Eff	Uncorrected PCI/SAMPLE	Decay Corr PCI/SAMPLE	2-Sigma %Error
RA-226	186.21	17	3.28*	5.024E+00	1.908E+01	1.909E+01	395.07

Flag: "*" = Keyline

Gamma Spectroscopy Report generated 11-OCT-1996 13:41

Configuration: DISK:[RADCHEM.SCUSR.ARCHIVE]SMP_96E04516_GAMMA5_PMP_9183.CNF;2
Analyses by : PEAK V16.5 ENBACK V1.5 PEAKEFF V2.2 NID V3.1 MINACT V2.5

---- Sample Information ----

Sample Title	: G969901S		
Sample ID	: 96E04516	Sample Quantity	: 1.00000E+00 SAMPLE
Sample Type	: FILTER	Sample Geometry	: PMP

---- Sample Decay/Count Information ----

Sample Date	: 19-SEP-1996 12:00	Acquisition date	: 9-OCT-1996 14:43:
Elapsed live time	: 0 04:00	Elapsed real time	: 0 04:00 0.0%
Decay time	: 20 02:43		

---- Detector Parameters ----

Energy cal. time	: 8-OCT-1996 12:40:		
Detector name	: GAMMA5	Counting geometry	: PMP
Effic. cal. time	: 19-SEP-1996 14:21		

---- Processing Parameters ----

Cali. Slope	: 4.88823E-01	Cali. Offset	: -5.65841E-01
Cali. Quadratic	: -8.49185E-08	FWHM Offset	: 4.15386E-01
FWHM Slope	: 4.45150E-02	MDA Width (FWHM)	: 3.0
Start channel	: 1	End channel	: 4096
Sensitivity	: 5.0	Gaussian Sens.	: 10.0
Energy tolerance	: 2.0	Half life ratio	: 8.0
Abundance limit	: 75.0	WTM error limit	: 3.0
Activity Units	: PCI	Act. Conversion	: 1.00000E+06
MDA Confid Level	: 5.0	Sigma Number	: 2
Errors propagated	: Yes	Systematic Error	: 0.0%

Combined Activity-MDA Report

---- Identified Nuclides ----

Nuclide	Activity (PCI/SAMPLE)	Act error	MDA (PCI/SAMPLE)	MDA error	Act/MDA
RA-226	1.909E+01	7.540E+01	7.552E+01	1.397E+01	0.253

---- Non-Identified Nuclides ----

Nuclide	Key-Line Activity (PCI/SAMPLE)	K.L. Ided	Act error	MDA (PCI/SAMPLE)	MDA error	Act/MDA
RA-228	5.205E+00		1.072E+01	1.920E+01	3.942E+00	0.271
PA-231	1.870E+02	+	4.189E+01	4.886E+01	8.026E+00	3.828
U-235	1.159E+00	+	4.580E+00	6.361E+00	1.194E+00	0.182

8019

Gamma Spectroscopy Report generated 11-OCT-1996 13:42

Configuration: DISK:[RADCHEM.SCUSR.ARCHIVE]SMP_96E04516_GAMMA5_PMP_9183.CNF;2
Analyses by : PEAK V16.5 ENBACK V1.5 PEAKEFF V2.2 NID V3.1 MINACT V2.5

---- Sample Information ----

Sample Title	: G969901S		
Sample ID	: 96E04516	Sample Quantity	: 1.00000E+00 SAMPLE
Sample Type	: FILTER	Sample Geometry	: PMP

---- Sample Decay/Count Information ----

Sample Date	: 19-SEP-1996 12:00	Acquisition date	: 9-OCT-1996 14:43:
Elapsed live time	: 0 04:00	Elapsed real time	: 0 04:00 0.0%
Decay time	: 20 02:43		

---- Detector Parameters ----

Energy cal. time	: 8-OCT-1996 12:40:		
Detector name	: GAMMA5	Counting geometry	: PMP
Effic. cal. time	: 19-SEP-1996 14:21		

---- Processing Parameters ----

Cali. Slope	: 4.88823E-01	Cali. Offset	: -5.65841E-01
Cali. Quadratic	: -8.49185E-08	FWHM Offset	: 4.15386E-01
FWHM Slope	: 4.45150E-02	MDA Width (FWHM)	: 3.0
Start channel	: 1	End channel	: 4096
Sensitivity	: 5.0	Gaussian Sens.	: 10.0
Energy tolerance	: 2.0	Half life ratio	: 8.0
Abundance limit	: 75.0	WTM error limit	: 3.0
Activity Units	: PCI	Act. Conversion	: 1.00000E+06
MDA Confid Level	: 5.0	Sigma Number	: 2
Errors propagated	: Yes	Systematic Error	: 9.0%

Combined Activity-MDA Report

---- Identified Nuclides ----

Nuclide	Activity (PCI/SAMPLE)	Act error	MDA (PCI/SAMPLE)	MDA error	Act/MDA
RA-226	1.909E+01	7.548E+01	7.552E+01	1.397E+01	0.253

---- Non-Identified Nuclides ----

Nuclide	Key-Line Activity (PCI/SAMPLE)	K.L. Ided	Act error	MDA (PCI/SAMPLE)	MDA error	Act/MDA
RA-228	5.205E+00		1.076E+01	1.920E+01	3.942E+00	0.271
PA-231	1.870E+02	+	5.374E+01	4.886E+01	8.026E+00	3.828
U-235	1.159E+00	+	4.585E+00	6.361E+00	1.194E+00	0.182

R. Foley
10/14/96

Section 2. Instrument Performance and Calibration Data
γ Spectrometry
Inventory Checklist

- [x] Efficiency Calibration
  - Calibration Spectral Plot
  - Peak Search Report
  - Calibration Reports
    - Energy
    - FWHM
    - Efficiency
  - Calibration Plots
    - Energy
    - FWHM
    - Efficiency
- [x] Energy Calibration
  - Calibration Spectal Plot
  - Peak Search Report
  - Calibration Reports
    - Energy
    - FWHM
  - Calibration Plots
    - Energy
    - FWHM
- [x] Background
  - Background Spectral Plot
  - Peak Source Report(s)
- [x] QC Reports
  - Daily Source Check
  - Weekly Background

Section 2. Instrument Performance and Calibration Data
γ Spectrometry
Reviewer Checklist

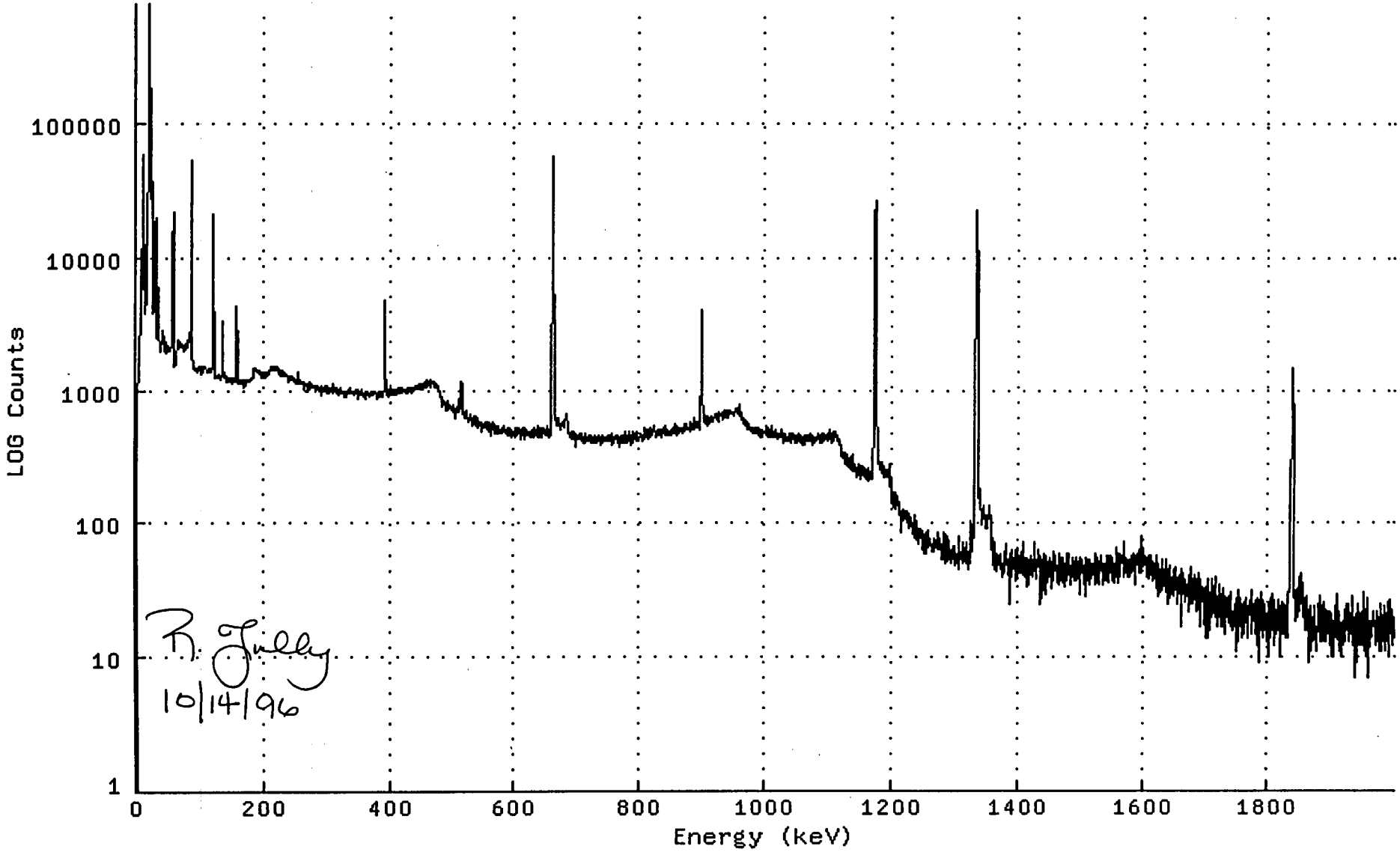
X The Instrument Performance and Calibration Data Inventory Checklist above is complete.

X Specified analytical protocols are followed for particular contract requirements.

X Conditions of instrument setup are noted.

NA NCR(s) noted, and affected instruments not used.

Spectrum : DISK:[RADCHEM.SCUSR.ARCHIVE]CAL_GAMMA5_PMP_8947.CNF;1
Title :
Sample Title:
Start Time: 19-SEP-1996 13:46 Sample Time: 1-MAY-1995 12:00: Energy Offset: -4.97085E-01
Real Time : 0 00:21:43.34 Sample ID : PMP Energy Slope : 4.88468E-01
Live Time : 0 00:20:00.00 Sample Type: Energy Quad : -4.45141E-08



R. Tully
10/14/96

000920 146

8019

VMS Peak Search Report V1.9 Generated 11-OCT-1996 11:52:01 **8019**

Configuration : DISK:[RADCHEM.SCUSR.ARCHIVE]CAL_GAMMA5_PMP_8947.CNF;1
Analyses by : PEAK V16.5,PEAKEFF V2.2
Sample date : 1-MAY-1995 12:00:00 Acquisition date : 19-SEP-1996 13:46:10
Sample ID : PMP Sample quantity : 1.0000 L
Detector name : GAMMA5 Detector geometry: PMP
Elapsed live time: 0 00:20:00.00 Elapsed real time: 0 00:21:43.34 7.9%
Start energy : -0.01 keV End energy : 1999.52 keV
Sensitivity : 5.00 Gaussian : 10.00
Critical level : No

Pk	It	Energy	Area	Bkgnd	FWHM	Channel	%Eff	Cts/Sec	%Err	Fit
1	0	5.29	2273	7754	1.50	11.84	8.11E+00	1.89E+00	6.4	
2	10	11.13	38098	32452	1.24	23.79	9.51E+00	3.17E+01	1.2	2.67E+02
3	10	12.14	84036	32416	0.77	25.88	9.60E+00	7.00E+01	0.5	
4	0	14.82	12412	31483	0.85	31.36	9.75E+00	1.03E+01	2.4	
5	7	21.14	205382	91270	1.29	44.29	9.77E+00	1.71E+02	0.6	1.05E+04
6	7	22.06	1354357	72775	0.92	46.17	9.75E+00	1.13E+03	0.1	
7	7	24.86	404702	51039	1.33	51.91	9.68E+00	3.37E+02	0.2	
8	0	31.97	38944	28359	1.03	66.47	9.42E+00	3.25E+01	0.9	
9	0	36.46	9244	19820	1.09	75.67	9.23E+00	7.70E+00	3.0	
10	0	42.98	3097	24654	2.11	89.00	8.94E+00	2.58E+00	10.3	
11	0	49.56	947	13643	1.15	102.49	8.65E+00	7.89E-01	20.7	
12	0	59.51	35789	18234	0.82	122.85	8.24E+00	2.98E+01	0.9	
13	10	67.16	2522	22915	2.10	138.51	7.93E+00	2.10E+00	12.9	1.28E+01
14	10	70.97	1437	25393	2.14	146.31	7.79E+00	1.20E+00	22.7	
15	0	88.02	96976	23270	0.89	181.22	7.21E+00	8.08E+01	0.4	
16	1	120.24	409	5340	1.02	247.19	6.30E+00	3.41E-01	25.5	8.37E-01
17	1	122.05	38585	7775	0.90	250.89	6.26E+00	3.22E+01	0.6	
18	0	136.45	4542	12499	1.01	280.36	5.93E+00	3.78E+00	4.8	
19	0	158.99	7621	10440	1.05	326.51	5.48E+00	6.35E+00	2.7	
20	0	254.85	354	6858	0.77	522.78	4.14E+00	2.95E-01	37.4	
21	0	391.70	9598	9555	1.23	802.97	3.06E+00	8.00E+00	2.2	
22	0	514.17	1382	6881	1.28	1053.74	2.46E+00	1.15E+00	11.6	
23	0	661.66	173017	8620	1.45	1355.74	1.99E+00	1.44E+02	0.3	
24	0	898.01	12394	7919	1.65	1839.75	1.50E+00	1.03E+01	1.8	
25	0	1173.15	109576	5372	1.87	2403.25	1.15E+00	9.13E+01	0.3	
26	0	1332.40	98724	2152	1.98	2729.40	1.00E+00	8.23E+01	0.3	
27	0	1836.07	7295	623	2.30	3761.14	7.05E-01	6.08E+00	1.5	

8019

VMS Calibration Report V1.5 Generated 11-OCT-1996 11:52:03

Configuration : DISK:[RADCHEM.SCUSR.ARCHIVE]CAL_GAMMA5_PMP_8947.CNF;1
Analyses by : SCRCAL V1.1,PEAK V16.5,PEAKEFF V2.2
Detector Name : GAMMA5 Energy Calib Time: 19-SEP-1996 14:21:40
Efficiency type : Empirical Effncy Calib Time: 19-SEP-1996 14:21:40
Detector Geometry: PMP Shelf :

Energy Calibration Report

Energy = -0.4971 + 0.4885*Channel + -4.4514E-08*(Channel**2)

Nbr	Centroid Channel	True Energy	Computed Energy	Difference
1	122.85	59.54	59.51	0.028
2	181.22	88.03	88.02	0.012
3	250.89	122.06	122.05	0.013
4	280.36	136.48	136.45	0.030
5	326.51	159.00	158.99	0.014
6	802.97	391.69	391.70	-0.012
7	1053.74	513.99	514.17	-0.181
8	1355.74	661.65	661.66	-0.006
9	1839.75	898.02	898.01	0.008
10	2403.25	1173.22	1173.15	0.062
11	2729.40	1332.49	1332.40	0.091
12	3761.14	1836.01	1836.07	-0.060

FWHM Calibration Report

FWHM = 0.4790 + 4.0482E-02*(Energy**1/2)

Nbr	Energy	True FWHM	Computed FWHM	Difference
1	59.54	0.82	0.79	0.026
2	88.03	0.89	0.86	0.035
3	122.06	0.90	0.93	-0.024
4	136.48	1.01	0.95	0.061
5	159.00	1.05	0.99	0.065
6	391.69	1.23	1.28	-0.055
7	513.99	1.28	1.40	-0.119
8	661.65	1.45	1.52	-0.072
9	898.02	1.65	1.69	-0.039
10	1173.22	1.87	1.87	0.006
11	1332.49	1.98	1.96	0.024
12	1836.01	2.31	2.21	0.092

Efficiency Calibration Report

Eff = exp(a2 + a3*x + a4*x**2 + a5*x**3 + a6*x**4 + a7*x**5), x=ln(a1/energy)

a1	a2	a3	a4	a5	a6	a7
947.8	-4.255	0.9772	-0.1236	0.0000E+00	0.0000E+00	0.0000E+00

Average Deviation = 6.53 % Reduced Chi-Square = 1.96

Nbr	Energy (keV)	Measured Efficiency	Efficiency Error	Computed Efficiency	Diff/ /Error	% Diff
1	59.54	7.33E-02	3.72E-03	8.23E-02	-2.43	-12.34

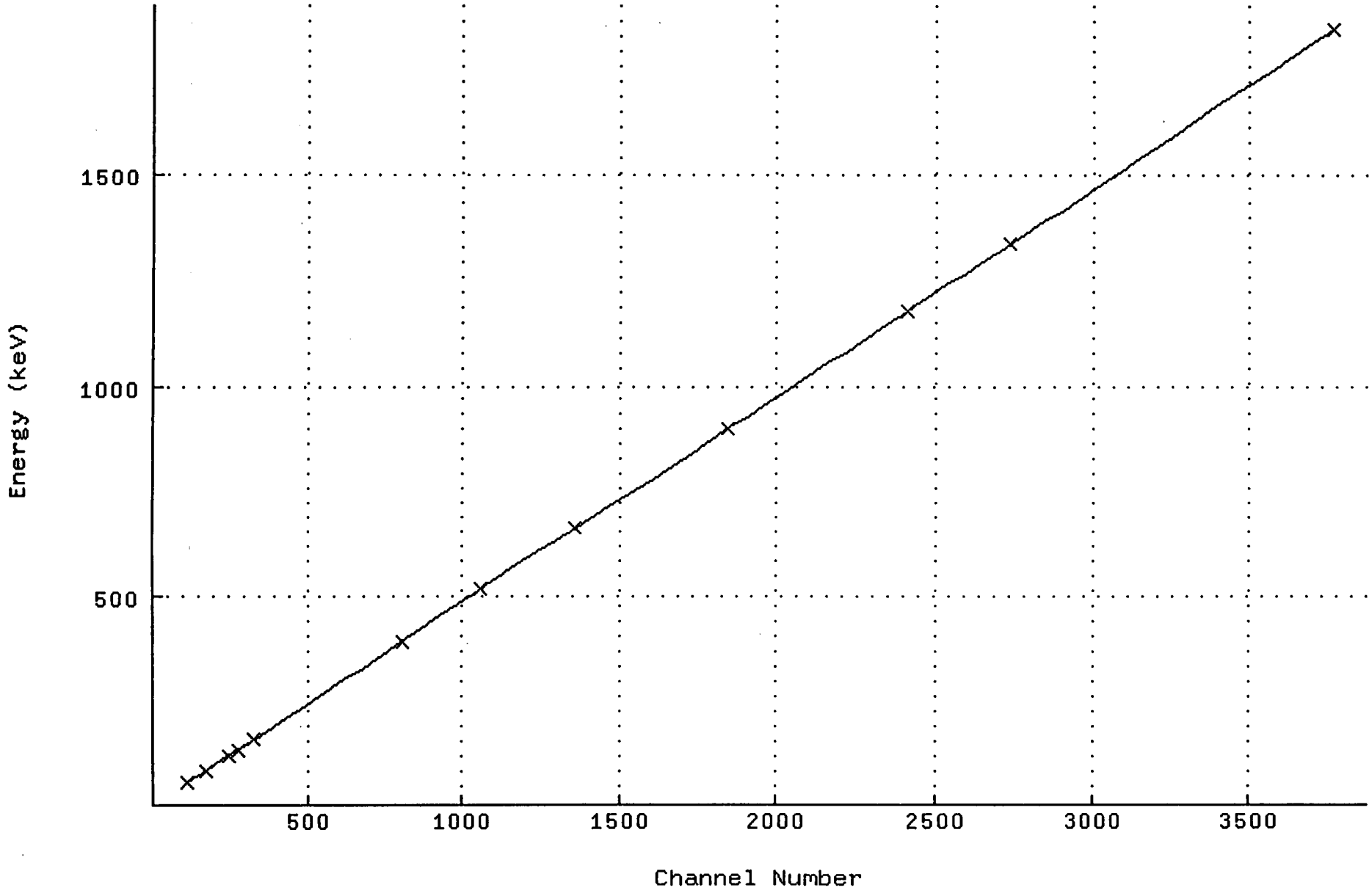
Sample ID : PMP Acquisition date : 19-SEP-1996 13:46:10

8019

Nbr	Energy (keV)	Measured Efficiency	Efficiency Error	Computed Efficiency	Diff/ /Error	% Diff
2	88.03	7.59E-02	3.81E-03	7.21E-02	1.01	5.07
3	122.06	6.71E-02	3.39E-03	6.26E-02	1.33	6.72
4	136.48	6.38E-02	4.44E-03	5.93E-02	1.00	6.98
5	159.00	5.85E-02	3.32E-03	5.48E-02	1.10	6.26
6	391.69	2.91E-02	1.60E-03	3.06E-02	-0.95	-5.24
7	513.99	2.17E-02	2.73E-03	2.47E-02	-1.09	-13.77
8	661.65	1.93E-02	9.66E-04	1.99E-02	-0.58	-2.89
9	898.02	1.37E-02	7.26E-04	1.50E-02	-1.74	-9.25
10	1173.22	1.13E-02	5.69E-04	1.15E-02	-0.20	-0.99
11	1332.49	1.02E-02	5.12E-04	1.00E-02	0.37	1.88
12	1836.01	7.57E-03	3.95E-04	7.05E-03	1.33	6.93

Approved by: _____ Approval Date: __ / __ / ____

Spectrum : DISK:[RADCHEM.SCUSR.ARCHIVE]CAL_GAMMA5_PMP_8947.CNF;1
Calib Date: 19-SEP-1996 14:21
Detector : GAMMA5 Geometry: PMP
Energy = -0.497 + 0.4885 * ch + -4.4514E-08 * ch**2



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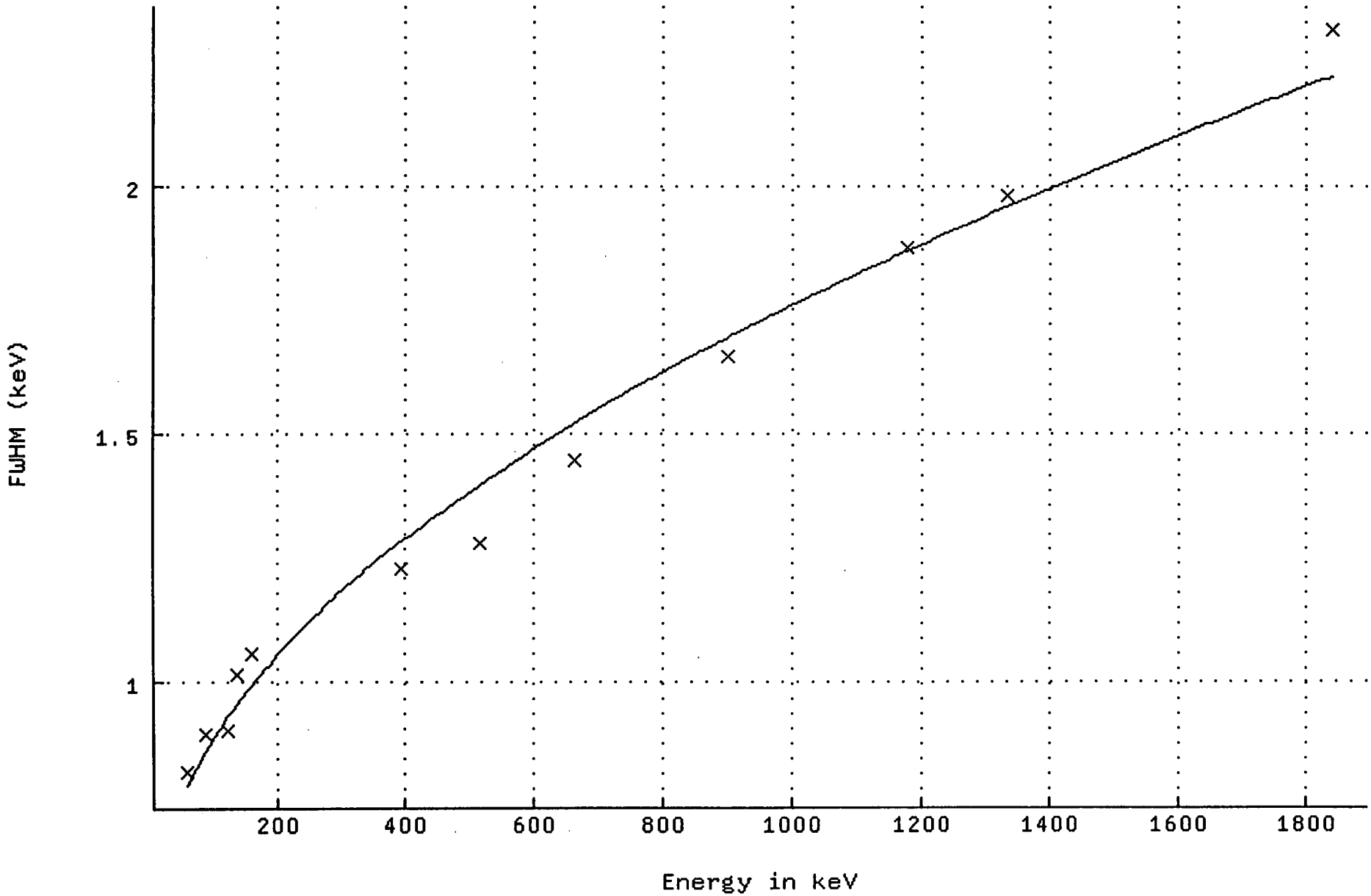
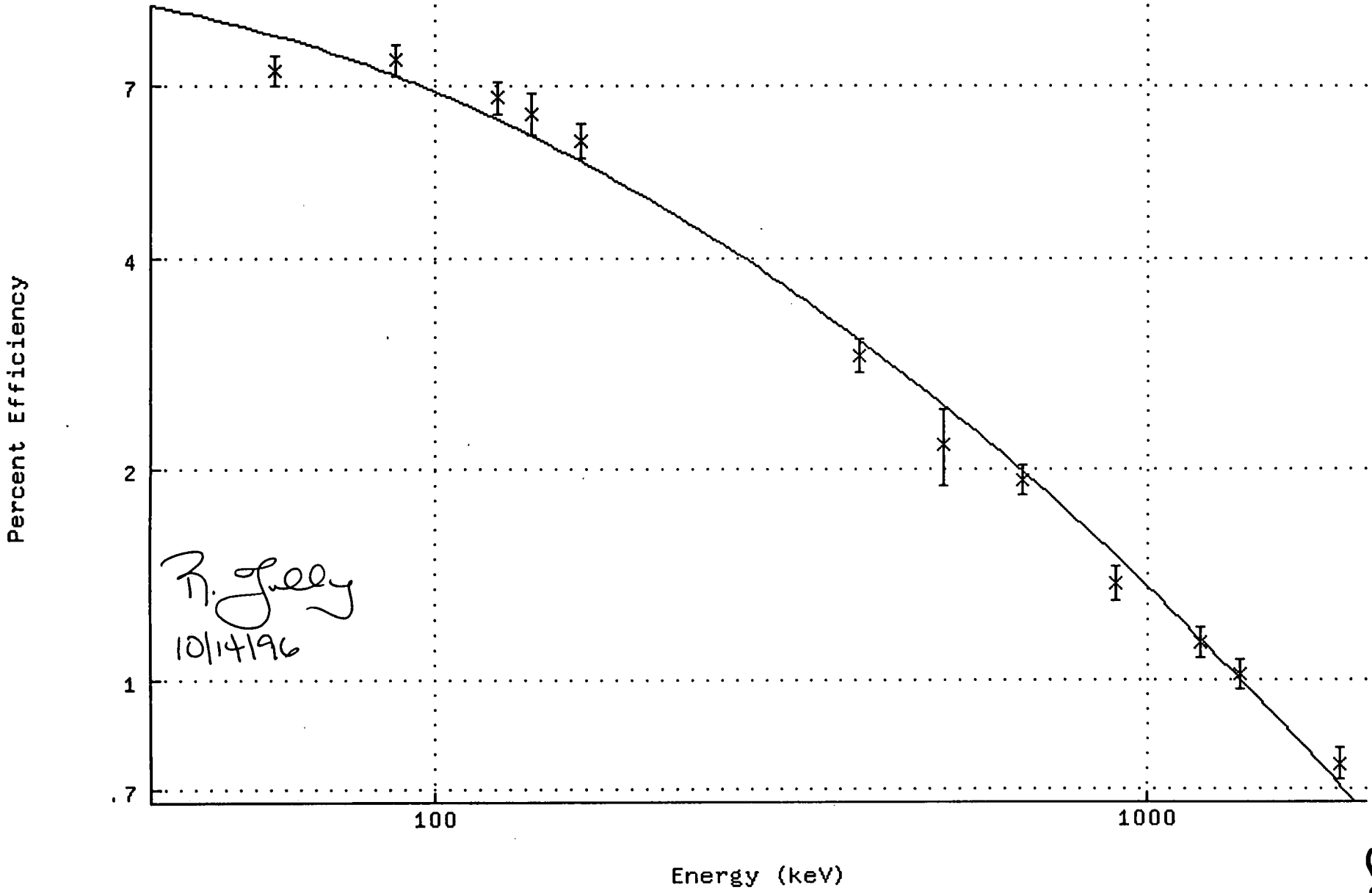
8016

Spectrum : DISK:[RADCHEM.SCUSR.ARCHIVE]CAL_GAMMA5_PMP_8947.CNF;1
Calib Date: 19-SEP-1996 14:21
Detector : GAMMA5 Geometry: PMP
FWHM = 0.479 + 0.04048 * SQRT(Energy)



Spectrum : DISK:[RADCHEM.SCUSR.ARCHIVE]CAL_GAMMA5_PMP_8947.CNF;1
Calib Date: 19-SEP-1996 14:21
Detector : GAMMA5 Geometry : PMP
Fit type : 2 Deg. Empirical



R. Gulley
10/14/96

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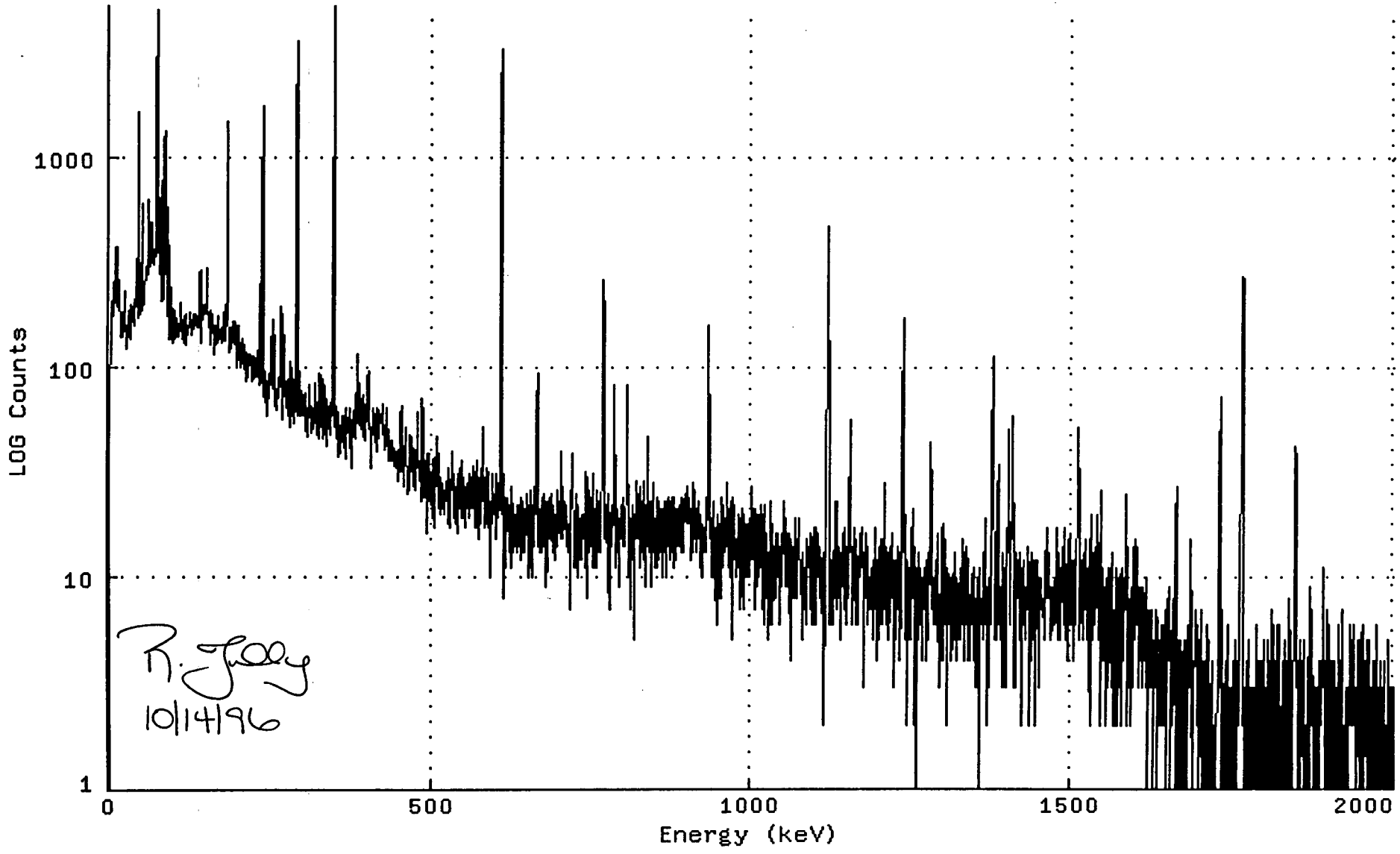
8019

Spectrum : DISK:[RADCHEM.SCUSR.ARCHIVE]CAL_GAMMA5_9156.CNF;1
Title :
Sample Title:
Start Time: 8-OCT-1996 12:27: Sample Time: 4-OCT-1996 00:00: Energy Offset: -5.65841E-01
Real Time : 0 00:10:05.08 Sample ID : BCKGND Energy Slope : 4.88823E-01
Live Time : 0 00:10:00.00 Sample Type: Energy Quad : -8.49185E-08



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OUT 9

809

VMS Peak Search Report V1.9 Generated 11-OCT-1996 11:52:23

Configuration : DISK:[RADCHEM.SCUSR.ARCHIVE]CAL_GAMMA5_9156.CNF;1
Analyses by : PEAK V16.5,PEAKEFF V2.2
Sample date : 4-OCT-1996 00:00:00 Acquisition date : 8-OCT-1996 12:27:57
Sample ID : BCKGND Sample quantity : 1.0000 G
Detector name : GAMMA5 Detector geometry: TRM1-S3
Elapsed live time: 0 00:10:00.00 Elapsed real time: 0 00:10:05.08 0.8%
Start energy : -0.08 keV End energy : 2000.23 keV
Sensitivity : 5.00 Gaussian : 10.00
Critical level : No

Pk	It	Energy	Area	Bkgnd	FWHM	Channel	%Eff	Cts/Sec	%Err	Fit
1	0	12.85	318	817	0.90	27.45	6.05E+02	5.30E-01	13.9	
2	0	15.55	470	1371	1.11	32.96	8.83E+01	7.84E-01	13.9	
3	0	27.17	163	860	0.74	56.75	6.45E+00	2.72E-01	29.7	
4	0	46.47	2711	1515	0.89	96.22	4.93E+00	4.52E+00	3.1	
5	0	50.05	307	1130	1.22	103.56	5.10E+00	5.12E-01	18.2	
6	0	53.27	708	1591	0.83	110.14	5.27E+00	1.18E+00	10.5	
7	0	63.21	617	2181	0.96	130.47	5.85E+00	1.03E+00	13.2	
8	0	67.58	401	2553	1.01	139.41	6.10E+00	6.68E-01	22.4	
9	3	74.77	4811	1597	0.87	154.13	6.47E+00	8.02E+00	1.9	5.95E+00
10	3	77.05	8300	1619	0.86	158.80	6.57E+00	1.38E+01	1.3	
11	3	79.27	514	1308	0.68	163.32	6.67E+00	8.57E-01	10.9	
12	0	81.32	284	1576	0.60	167.52	6.75E+00	4.74E-01	21.6	
13	3	83.77	1270	1070	0.89	172.54	6.85E+00	2.12E+00	4.8	3.75E+00
14	3	87.19	2807	1506	1.11	179.53	6.97E+00	4.68E+00	3.0	
15	3	89.79	1067	1512	1.11	184.85	7.05E+00	1.78E+00	7.0	
16	5	92.55	874	1098	0.95	190.50	7.12E+00	1.46E+00	6.9	3.22E+00
17	5	94.59	455	1010	1.25	194.67	7.17E+00	7.58E-01	12.4	
18	0	97.81	178	1089	0.98	201.26	7.24E+00	2.97E-01	31.5	
[illegible]	0	143.92	313	1479	1.19	295.59	7.16E+00	5.21E-01	22.9	
[illegible]	0	154.22	256	1450	1.02	316.67	6.97E+00	4.26E-01	26.6	
21	0	186.22	2895	1730	1.01	382.14	6.26E+00	4.83E+00	3.4	
22	0	236.18	273	977	0.94	484.36	5.13E+00	4.54E-01	22.3	
23	0	242.04	3703	904	1.02	496.35	5.01E+00	6.17E+00	2.3	
24	2	256.32	157	481	1.03	525.56	4.72E+00	2.62E-01	23.5	2.13E+00
25	2	259.10	256	616	1.37	531.25	4.67E+00	4.27E-01	18.0	
26	1	269.62	313	574	1.26	552.77	4.48E+00	5.22E-01	14.9	3.76E+00
27	1	271.27	238	423	1.05	556.15	4.45E+00	3.97E-01	16.0	
28	0	274.58	210	577	1.07	562.92	4.39E+00	3.50E-01	20.9	
29	0	295.27	8149	599	1.11	605.27	4.05E+00	1.36E+01	1.2	
30	0	333.74	83	403	1.70	683.98	3.52E+00	1.38E-01	41.8	
31	0	351.97	13102	786	1.17	721.28	3.31E+00	2.18E+01	1.0	
32	0	388.19	202	680	2.79	795.40	2.95E+00	3.37E-01	26.6	
33	2	402.11	145	436	1.58	823.89	2.83E+00	2.41E-01	28.5	1.58E+00
34	2	404.93	163	421	1.59	829.66	2.80E+00	2.72E-01	25.7	
35	0	455.31	104	326	1.28	932.74	2.44E+00	1.73E-01	34.1	
36	0	480.54	82	289	1.30	984.37	2.30E+00	1.36E-01	39.3	
37	0	487.32	103	314	1.24	998.25	2.26E+00	1.72E-01	34.8	
38	0	580.33	90	233	1.14	1188.60	1.88E+00	1.50E-01	33.3	
39	0	609.41	9179	252	1.37	1248.11	1.79E+00	1.53E+01	1.1	
40	0	665.35	284	220	1.51	1362.61	1.64E+00	4.73E-01	12.6	
41	0	703.14	74	193	1.30	1439.96	1.57E+00	1.23E-01	38.4	
42	0	768.36	821	305	1.53	1573.45	1.46E+00	1.37E+00	5.9	
43	0	785.96	206	176	1.32	1609.48	1.43E+00	3.43E-01	14.3	
44	0	806.39	242	196	1.49	1651.29	1.40E+00	4.04E-01	13.9	

Sample ID : BCKGND Acquisition date : 8-OCT-1996 12:27:57

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Pk	It	Energy	Area	Bkgnd	FWHM	Channel	%Eff	Cts/Sec	%Err	Fit
	0	839.50	94	212	1.67	1719.05	1.36E+00	1.56E-01	33.6	
	0	934.21	419	247	1.43	1912.94	1.27E+00	6.98E-01	9.2	
47	0	1120.31	1885	142	1.85	2293.93	1.15E+00	3.14E+00	2.7	
48	0	1155.39	249	162	2.15	2365.75	1.13E+00	4.14E-01	13.8	
49	0	1238.16	687	116	1.92	2535.21	1.09E+00	1.14E+00	5.2	
50	0	1280.87	163	120	2.16	2622.67	1.08E+00	2.72E-01	16.6	
51	0	1377.53	499	129	2.22	2820.59	1.04E+00	8.32E-01	7.0	
52	0	1385.41	121	107	2.09	2836.73	1.04E+00	2.02E-01	21.5	
53	1	1401.55	200	87	2.29	2869.79	1.04E+00	3.33E-01	12.1	1.66E+00
54	1	1407.81	233	87	2.12	2882.60	1.03E+00	3.88E-01	10.4	
55	0	1508.94	239	106	2.53	3089.71	1.00E+00	3.98E-01	11.8	
56	4	1537.68	55	133	3.16	3148.55	9.94E-01	9.12E-02	51.6	1.69E+00
57	4	1543.51	70	57	1.71	3160.49	9.92E-01	1.16E-01	23.2	
58	0	1583.83	73	100	0.82	3243.08	9.80E-01	1.22E-01	35.5	
59	0	1661.16	112	38	1.65	3401.45	9.58E-01	1.86E-01	15.1	
60	0	1729.61	335	49	2.40	3541.66	9.37E-01	5.58E-01	7.6	
61	0	1764.47	1413	52	2.31	3613.05	9.27E-01	2.36E+00	2.9	
62	0	1847.57	218	32	2.46	3783.28	9.02E-01	3.63E-01	9.3	

8019

VMS Calibration Report V1.5 Generated 11-OCT-1996 11:52:25

Configuration : DISK:[RADCHEM.SCUSR.ARCHIVE]CAL_GAMMA5_9156.CNF;1
Analyses by : CALIBRATE V1.7,PEAK V16.5,PEAKEFF V2.2
Detector Name : Energy Calib Time: 8-OCT-1996 12:40:10
Efficiency type : Empirical Effncy Calib Time: 19-SEP-1996 11:45:10
Detector Geometry: TRM1-S3 Shelf :

Energy Calibration Report

Energy = -0.5658 + 0.4888*Channel + -8.4919E-08*(Channel**2)

Nbr	Centroid Channel	True Energy	Computed Energy	Difference
1	96.22	46.50	46.47	0.034
2	154.13	74.81	74.77	0.041
3	158.80	77.11	77.05	0.053
4	382.14	186.21	186.22	-0.009
5	605.27	295.21	295.27	-0.059
6	721.28	351.92	351.97	-0.049
7	1248.11	609.31	609.41	-0.094
8	1362.61	665.45	665.35	0.100
9	1573.45	768.36	768.36	-0.004
10	1912.94	934.06	934.21	-0.151
11	2293.87	1120.29	1120.28	0.002
12	2365.75	1155.19	1155.39	-0.204
13	2535.21	1238.11	1238.16	-0.045
14	2622.67	1280.96	1280.87	0.088
15	2820.59	1377.67	1377.53	0.142
16	2882.60	1407.98	1407.81	0.171
17	3089.71	1509.23	1508.94	0.286
[illegible]	3401.45	1661.00	1661.16	-0.160
[illegible]	3541.66	1729.59	1729.61	-0.016
20	3613.05	1764.49	1764.47	0.026
21	3783.28	1847.42	1847.57	-0.153

FWHM Calibration Report

FWHM = 0.4154 + 4.4515E-02*(Energy**1/2)

Nbr	Energy	True FWHM	Computed FWHM	Difference
1	46.50	0.89	0.72	0.167
2	74.81	0.87	0.80	0.068
3	77.11	0.86	0.81	0.052
4	186.21	1.01	1.02	-0.008
5	295.21	1.11	1.18	-0.073
6	351.92	1.17	1.25	-0.079
7	609.31	1.37	1.51	-0.148
8	665.45	1.51	1.56	-0.057
9	768.36	1.53	1.65	-0.121
10	934.06	1.43	1.78	-0.343
11	1120.29	1.85	1.91	-0.056
12	1155.19	2.15	1.93	0.220

Sample ID : BCKGND Acquisition date : 8-OCT-1996 12:27:57

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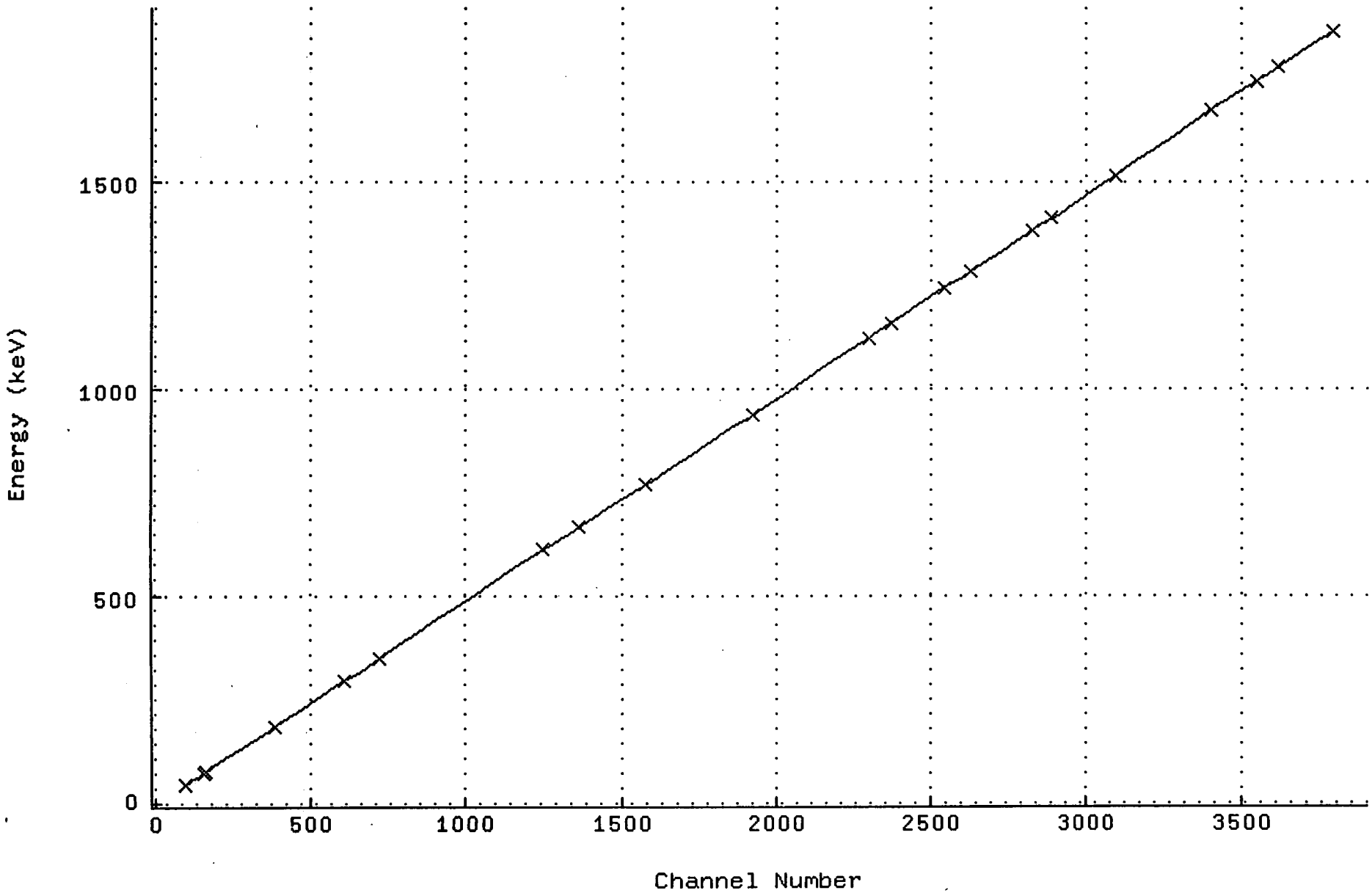
Nbr	Energy	True FWHM	Computed FWHM	Difference
[illegible]	1238.11	1.92	1.98	-0.057
[illegible]	1280.96	2.16	2.01	0.147
15	1377.67	2.22	2.07	0.148
16	1407.98	2.12	2.09	0.035
17	1509.23	2.53	2.14	0.389
18	1661.00	1.65	2.23	-0.580
19	1729.59	2.40	2.27	0.135
20	1764.49	2.31	2.29	0.025
21	1847.42	2.46	2.33	0.134

Approved by: _____ Approval Date: __ / __ / ____

Spectrum : DISK:[RADCHEM.SCUSR.ARCHIVE]CAL_GAMMA5_9156.CNF;1
Calib Date: 8-OCT-1996 12:40:
Detector : GAMMA5 Geometry: TRM1-S3
Energy = -0.566 + 0.4888 * ch + -8.4919E-08 * ch**2



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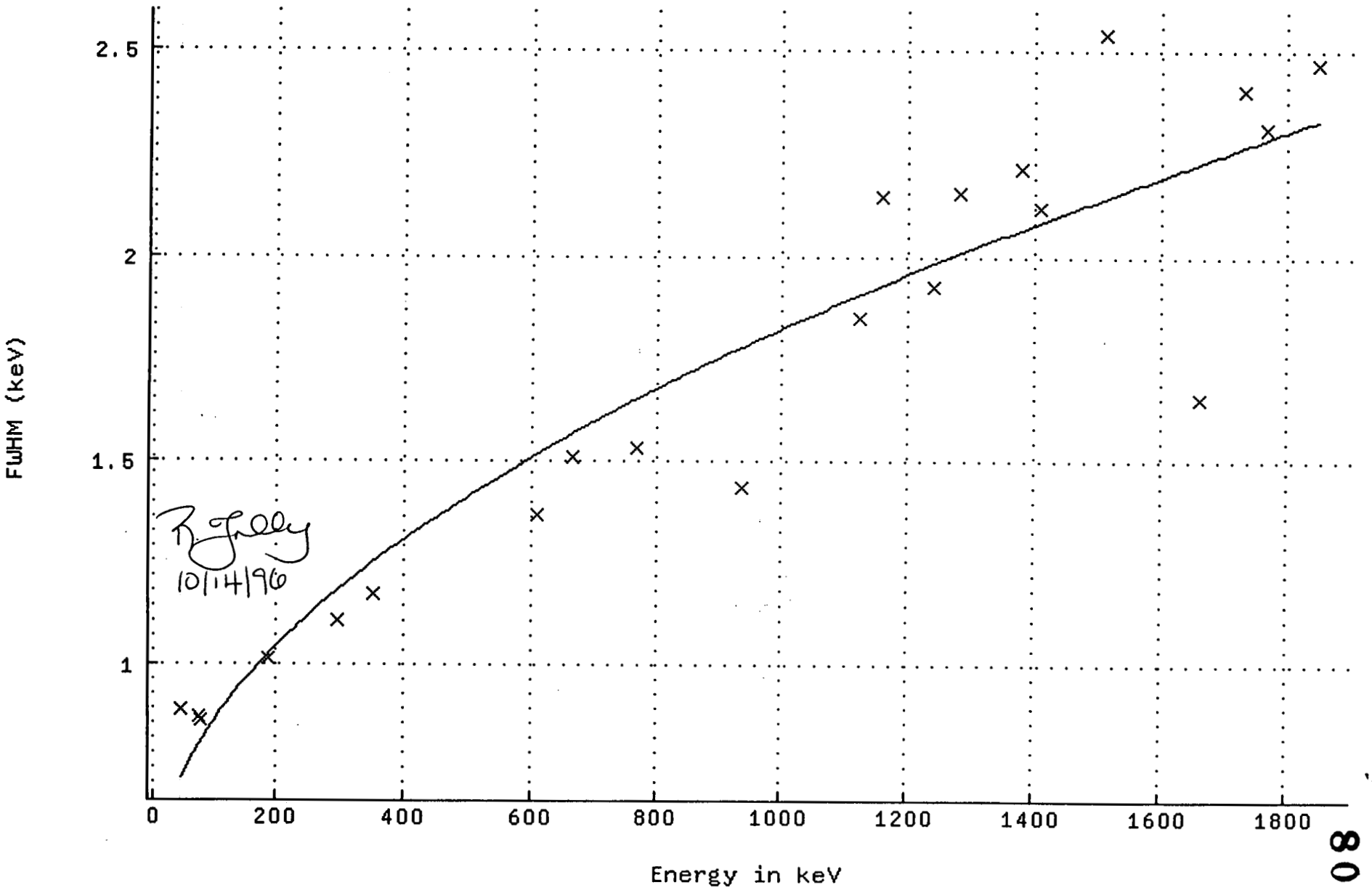
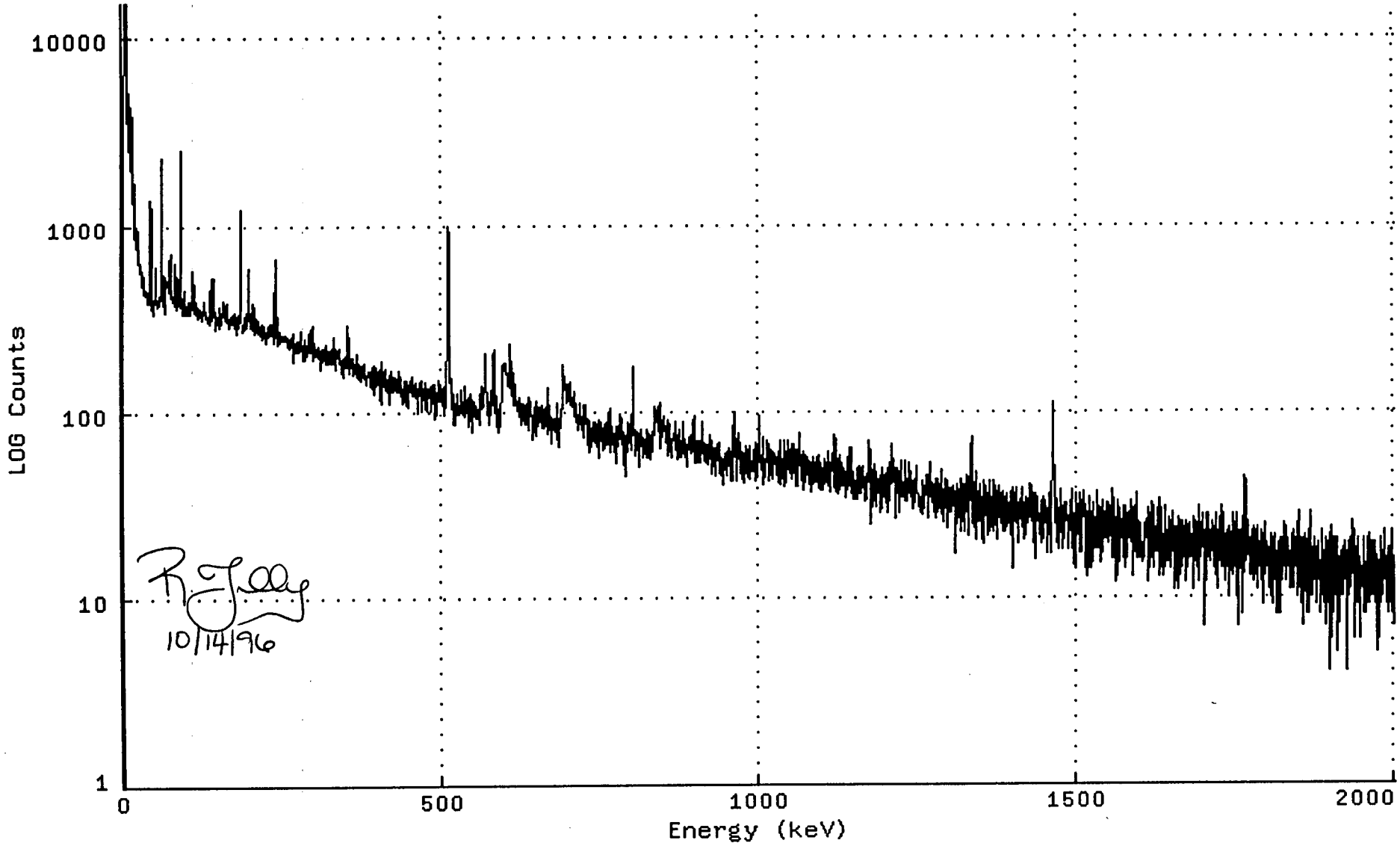
Spectrum : DISK:[RADCHEM.SCUSR.ARCHIVE]CAL_GAMMA5_9156.CNF;1
Calib Date: 8-OCT-1996 12:40:
Detector : GAMMA5 Geometry: TRM1-S3
FWHM = 0.415 + 0.04452 * SQRT(Energy)



Spectrum : DISK:[RADCHEM.SCUSR.ARCHIVE]BKG_BCKGND_GAMMA5__9143.CNF;1
Title :
Sample Title:
Start Time: 4-OCT-1996 18:20: Sample Time: 4-OCT-1996 00:00: Energy Offset: -5.37244E-01
Real Time : 2 02:01:07.08 Sample ID : BCKGND Energy Slope : 4.88756E-01
Live Time : 2 02:00:00.00 Sample Type: Energy Quad : -7.07146E-08



R. Jolly
10/14/96

000934

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8019

VMS Peak Search Report V1.9 Generated 11-OCT-1996 11:53:08 **8019**

Configuration : DISK:[RADCHEM.SCUSR.ARCHIVE]BKG_BCKGND_GAMMA5__9143.CNF;1
Analyses by : PEAK V16.5,PEAKEFF V2.2
Sample date : 4-OCT-1996 00:00:00 Acquisition date : 4-OCT-1996 18:20:18
Sample ID : BCKGND Sample quantity : 1.0000 G
Detector name : GAMMA5 Detector geometry: TRM1-S3
Elapsed live time: 2 02:00:00.00 Elapsed real time: 2 02:01:07.08 0.0%
Start energy : -0.05 keV End energy : 2000.22 keV
Sensitivity : 5.00 Gaussian : 10.00
Critical level : No

Pk	It	Energy	Area	Bkgnd	FWHM	Channel	%Eff	Cts/Sec	%Err	Fit
1	0	7.76	24064	42790	1.54	16.98	6.55E+06	1.34E-01	1.5	
2	0	10.38	4115	15170	0.84	22.34	1.32E+04	2.29E-02	4.8	
3	0	13.03	4183	13266	0.86	27.77	5.13E+02	2.32E-02	4.7	
4	0	16.22	6461	11688	1.08	34.29	6.28E+01	3.59E-02	3.1	
5	0	19.25	1233	6158	0.89	40.48	2.09E+01	6.85E-03	10.0	
6	0	23.34	285	5186	1.44	48.85	9.40E+00	1.58E-03	40.4	
7	0	26.04	437	4406	1.08	54.38	7.03E+00	2.43E-03	24.7	
8	0	46.55	1927	3150	0.94	96.35	4.94E+00	1.07E-02	5.5	
9	0	53.64	405	3070	0.98	110.85	5.29E+00	2.25E-03	24.2	
10	4	63.34	3752	1877	0.81	130.70	5.86E+00	2.08E-02	2.4	1.10E+00
11	4	66.28	535	2846	1.28	136.72	6.02E+00	2.97E-03	18.1	
12	0	69.74	385	3435	1.87	143.79	6.21E+00	2.14E-03	26.7	
13	0	74.19	134	3061	0.84	152.90	6.44E+00	7.44E-04	65.8	
14	0	77.07	495	2625	0.94	158.79	6.57E+00	2.75E-03	17.0	
15	0	84.43	698	3059	1.37	173.85	6.87E+00	3.88E-03	14.2	
16	0	87.20	283	2253	0.85	179.52	6.97E+00	1.57E-03	27.2	
17	0	92.67	4997	3152	1.09	190.71	7.12E+00	2.78E-02	2.4	
18	0	98.25	195	2385	0.93	202.14	7.25E+00	1.09E-03	42.0	
[illegible]	0	109.75	354	2985	0.75	225.66	7.39E+00	1.97E-03	27.2	
20	0	112.82	230	1804	0.95	231.93	7.40E+00	1.28E-03	28.5	
21	0	139.81	682	3118	1.12	287.16	7.22E+00	3.79E-03	15.8	
22	0	143.66	424	2282	1.06	295.05	7.16E+00	2.35E-03	19.3	
23	0	185.85	2020	3123	1.02	381.36	6.27E+00	1.12E-02	5.6	
24	4	197.16	456	1487	0.89	404.51	6.00E+00	2.53E-03	13.8	4.49E-01
25	4	198.38	665	1790	1.04	407.00	5.98E+00	3.69E-03	11.2	
26	0	205.33	188	1689	0.96	421.24	5.81E+00	1.04E-03	35.4	
27	0	238.76	908	2089	1.08	489.64	5.07E+00	5.05E-03	9.3	
28	0	295.36	179	1472	1.03	605.47	4.05E+00	9.94E-04	36.3	
29	0	352.05	298	1202	1.06	721.47	3.31E+00	1.65E-03	20.2	
30	0	511.06	4724	2215	2.53	1046.88	2.15E+00	2.62E-02	2.7	
31	0	569.99	434	1409	1.55	1167.50	1.91E+00	2.41E-03	18.5	
32	0	583.39	294	1218	1.25	1194.92	1.87E+00	1.64E-03	23.7	
33	0	609.48	299	1186	1.30	1248.33	1.79E+00	1.66E-03	21.5	
34	0	669.54	124	741	1.38	1371.25	1.64E+00	6.91E-04	40.4	
35	4	693.56	349	1136	2.18	1420.41	1.58E+00	1.94E-03	21.4	3.27E+00
36	4	696.97	189	993	1.80	1427.39	1.58E+00	1.05E-03	34.4	
37	4	702.45	192	1226	2.19	1438.62	1.57E+00	1.07E-03	38.5	
38	0	803.05	377	759	1.66	1644.53	1.41E+00	2.09E-03	15.0	
39	0	962.14	241	859	2.17	1970.22	1.25E+00	1.34E-03	28.6	
40	0	1120.02	105	385	1.77	2293.42	1.15E+00	5.83E-04	35.1	
41	0	1331.87	136	353	2.38	2727.21	1.06E+00	7.54E-04	28.1	
42	0	1460.47	320	376	1.75	2990.52	1.02E+00	1.78E-03	14.0	
43	0	1764.72	128	183	2.41	3613.62	9.27E-01	7.11E-04	23.0	

R. Jelly
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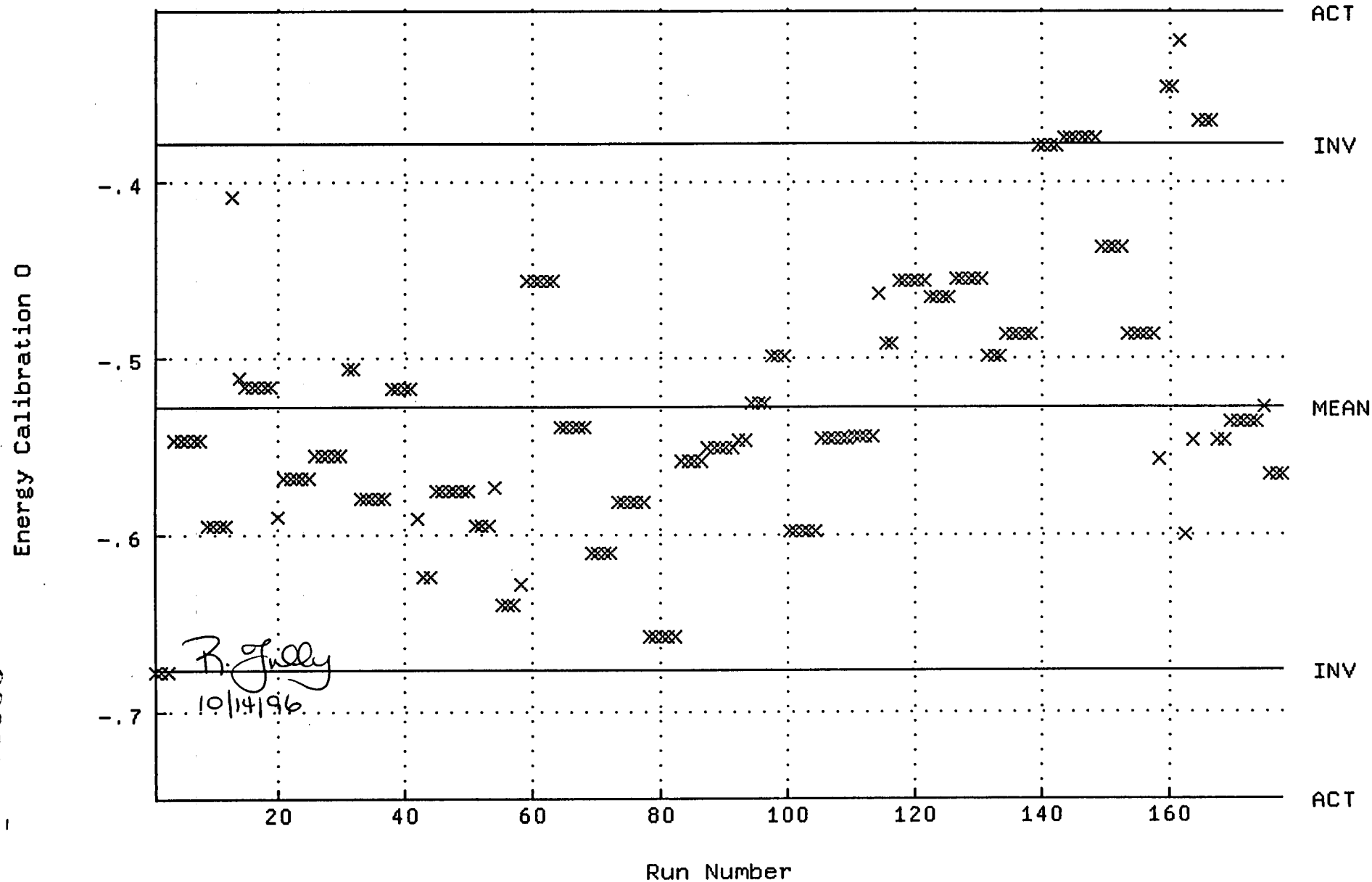
QA filename : DISK:[RADCHEM.SCUSR.QA]QCC_GAMMA5_CZ588.QAF;2
Parameter Name : ECOFFSET (Energy Calibration Offset)
Start/End Dates : 2-JAN-1996 08:23:01 through 10-OCT-1996 08:30:47
Mean +- Std Dev : -0.527460 +- 7.406983E-02 (-14.04 %)



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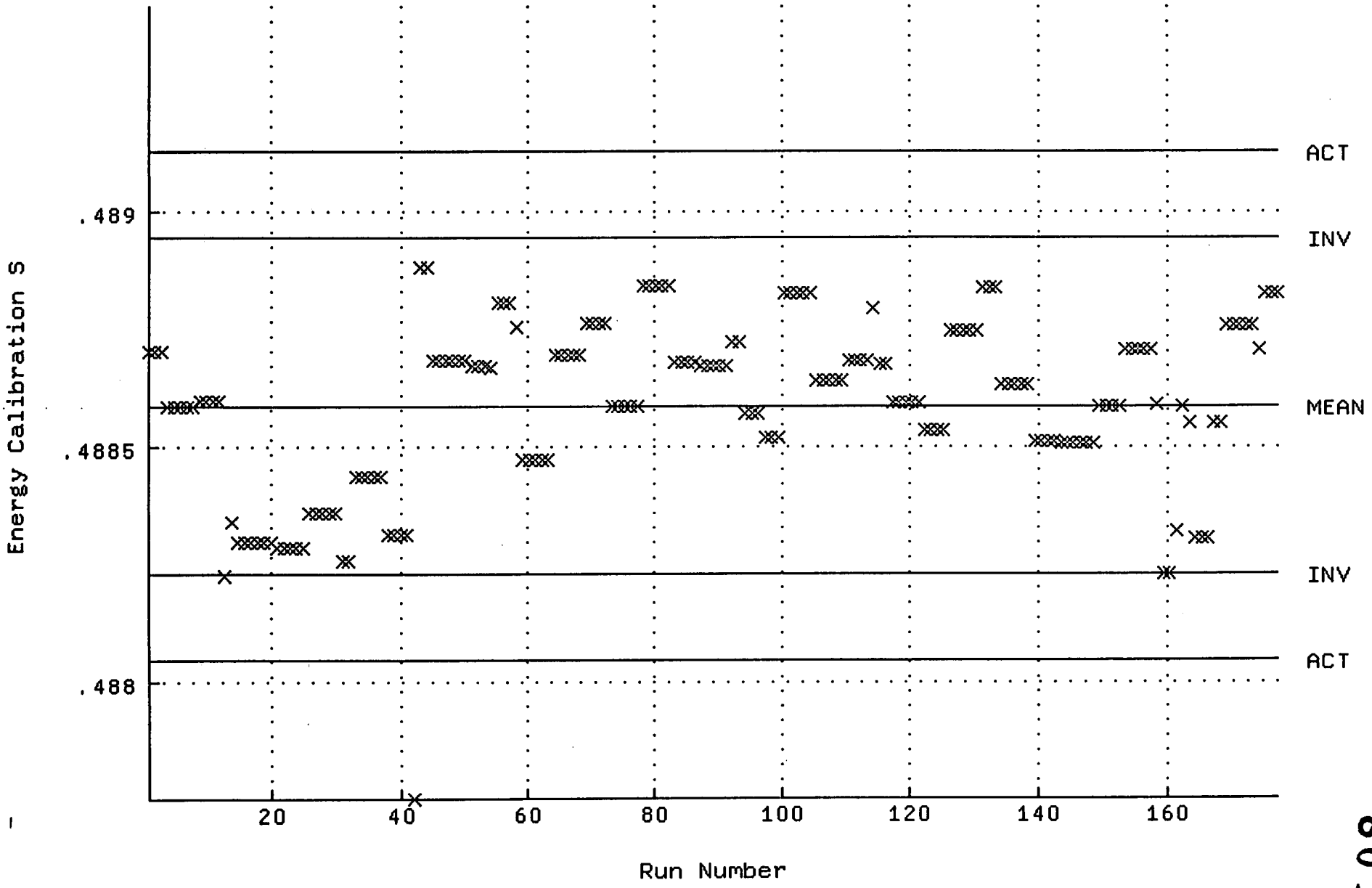
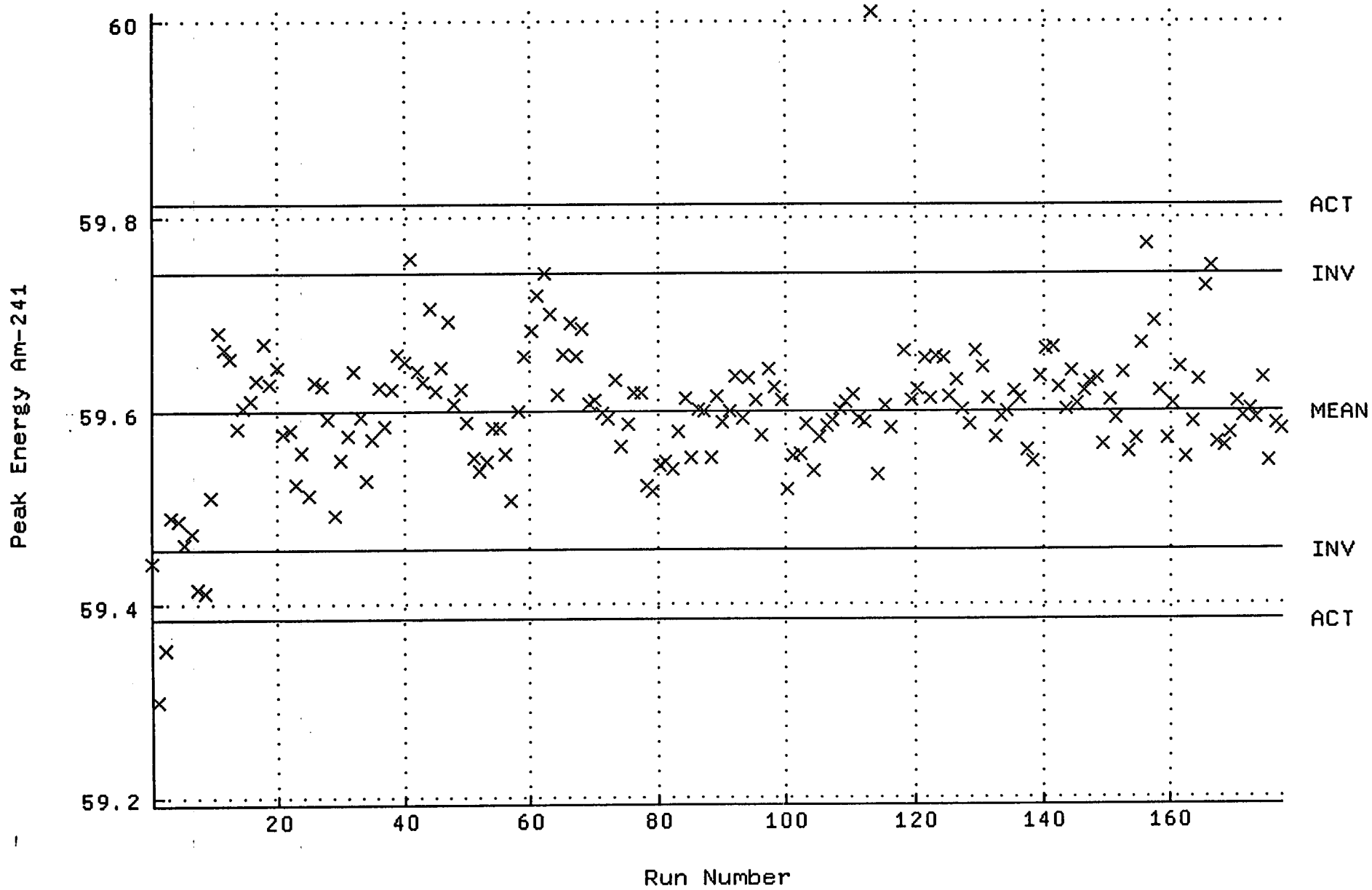
8019

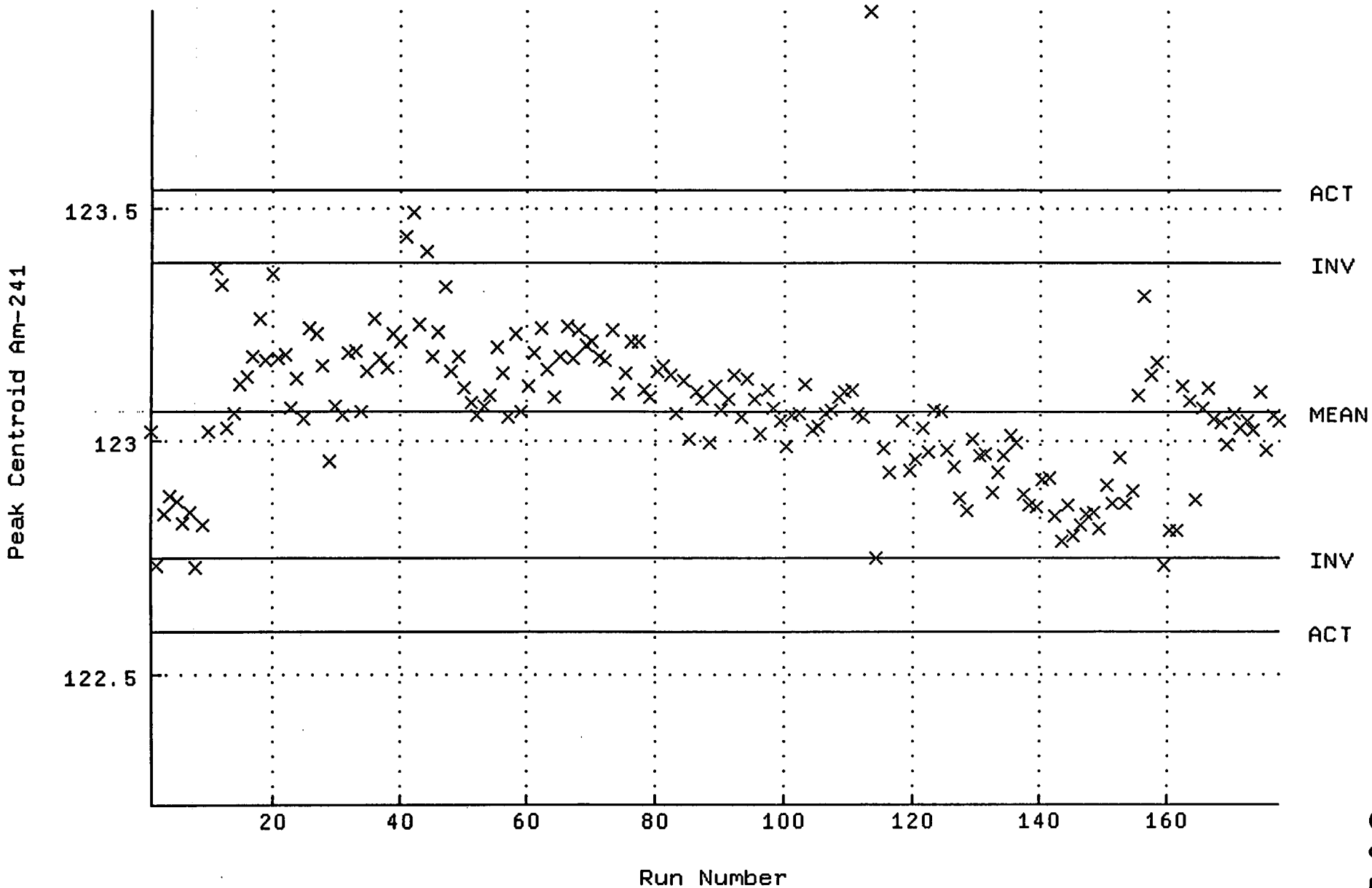
QA filename : DISK:[RADCHEM.SCUSR.QA]QCC_GAMMA5_CZ588.QAF;2
Parameter Name : ECSLOPE (Energy Calibration Slope)
Start/End Dates : 2-JAN-1996 08:23:01 through 10-OCT-1996 08:30:47
Mean +- Std Dev : 0.488588 +- 1.800091E-04 (0.04 %)



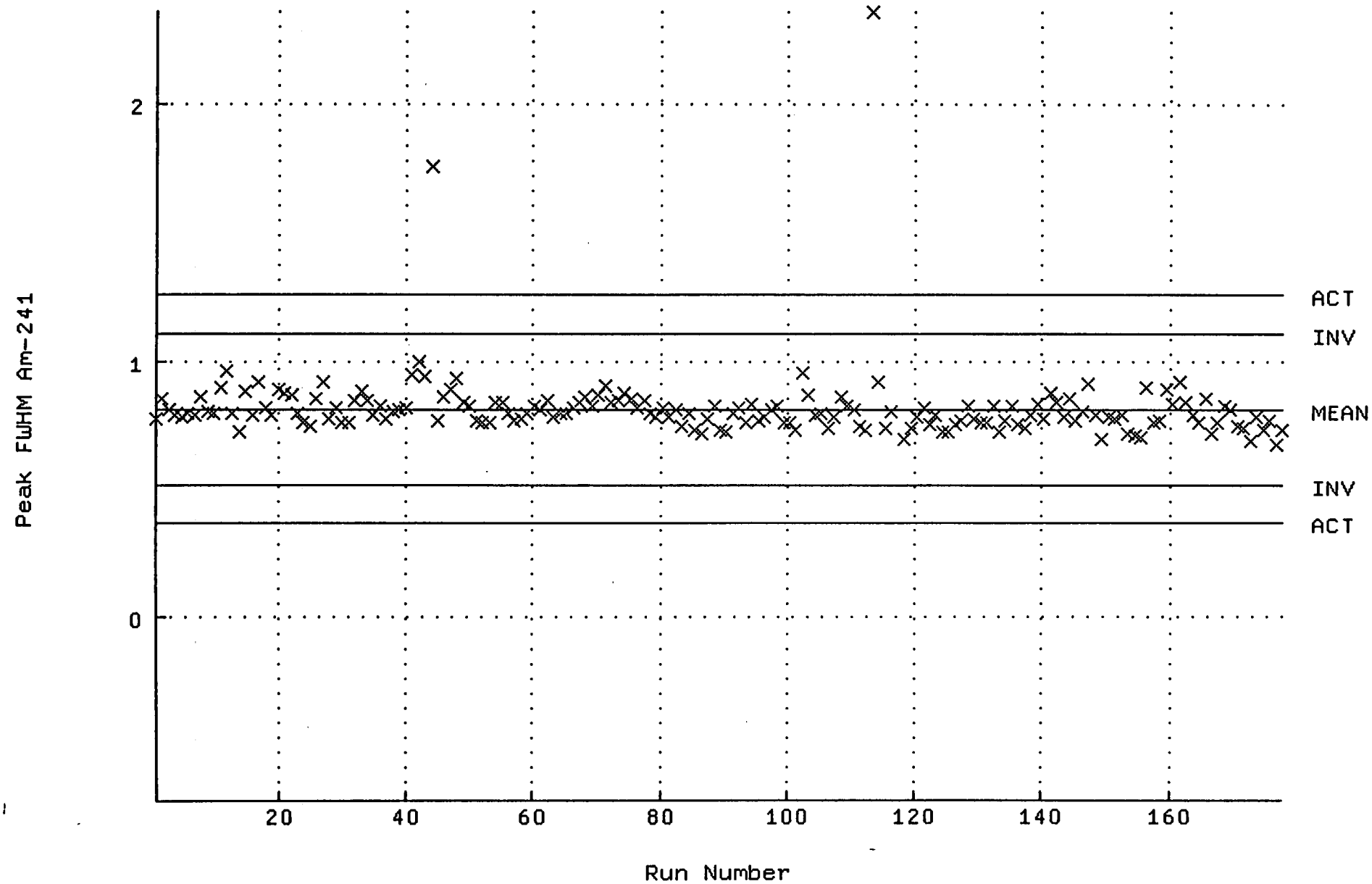
QA filename : DISK:[RADCHEM.SCUSR.QA]QCC_GAMMA5_CZ588.QAF;2
Parameter Name : PSENERGY-59 (Peak Energy Am-241)
Start/End Dates : 2-JAN-1996 08:23:01 through 10-OCT-1996 08:30:47
Mean +- Std Dev : 59.6003 +- 7.178374E-02 (0.12 %)



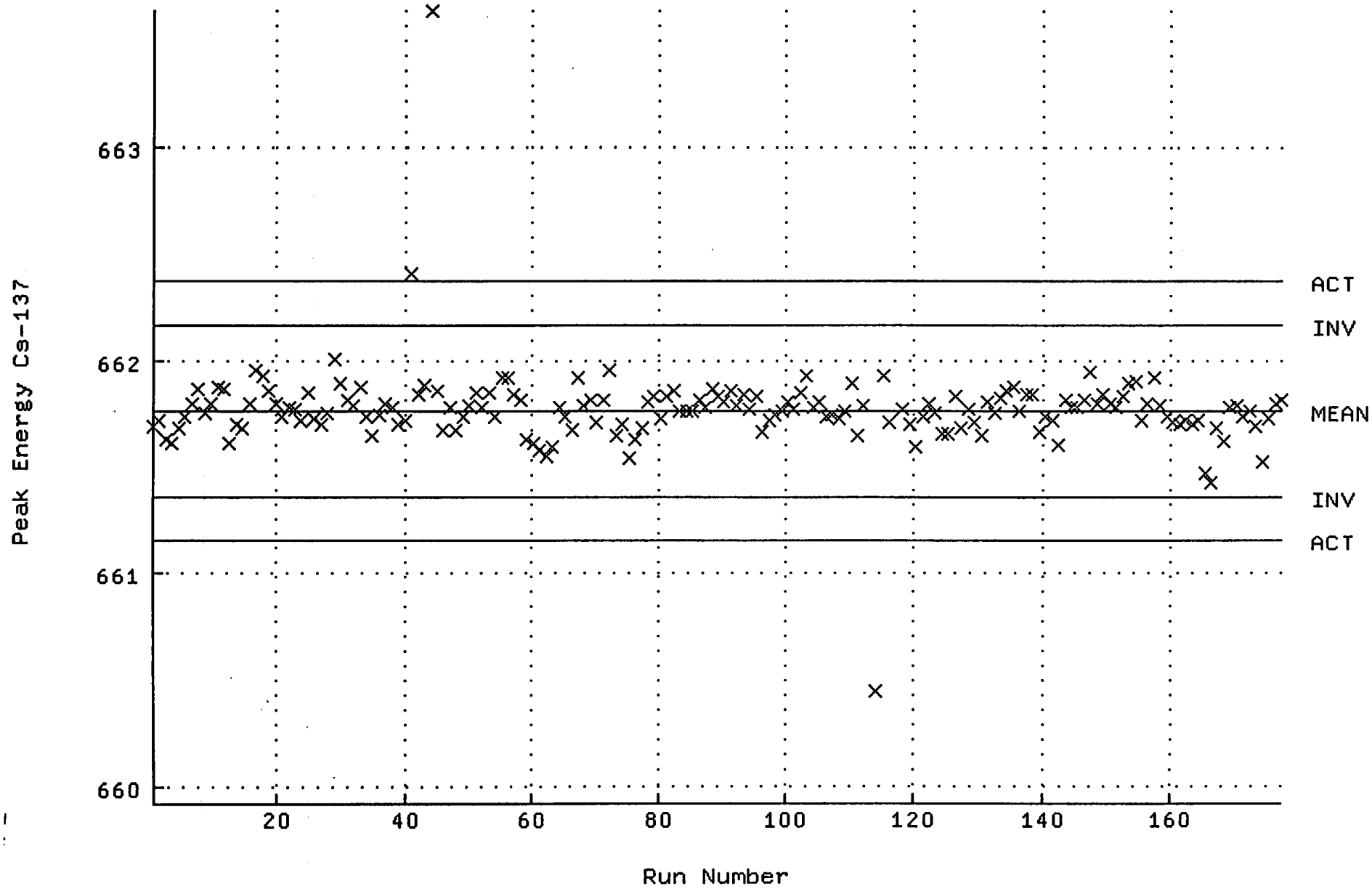
QA filename : DISK:[RADCHEM.SCUSR.QA]QCC_GAMMA5_CZ588.QAF;2
Parameter Name : PSCENTRD-59 (Peak Centroid Am-241)
Start/End Dates : 2-JAN-1996 08:23:01 through 10-OCT-1996 08:30:47
Mean +- Std Dev : 123.067 +- 0.158395 (0.13 %)



QA filename : DISK:[RADCHEM.SCUSR.QA]QCC_GAMMA5_CZ588.QAF;2
Parameter Name : PSFWHM-59 (Peak FWHM Am-241)
Start/End Dates : 2-JAN-1996 08:23:01 through 10-OCT-1996 08:30:47
Mean +- Std Dev : 0.819117 +- 0.148655 (18.15 %)



QA filename : DISK:[RADCHEM.SCUSR.QA]QCC_GAMMA5_CZ588.QAF;2
Parameter Name : PSENERGY-661 (Peak Energy Cs-137)
Start/End Dates : 2-JAN-1996 08:23:01 through 10-OCT-1996 08:30:47
Mean +- Std Dev : 661.765 +- 0.202026 (0.03 %)



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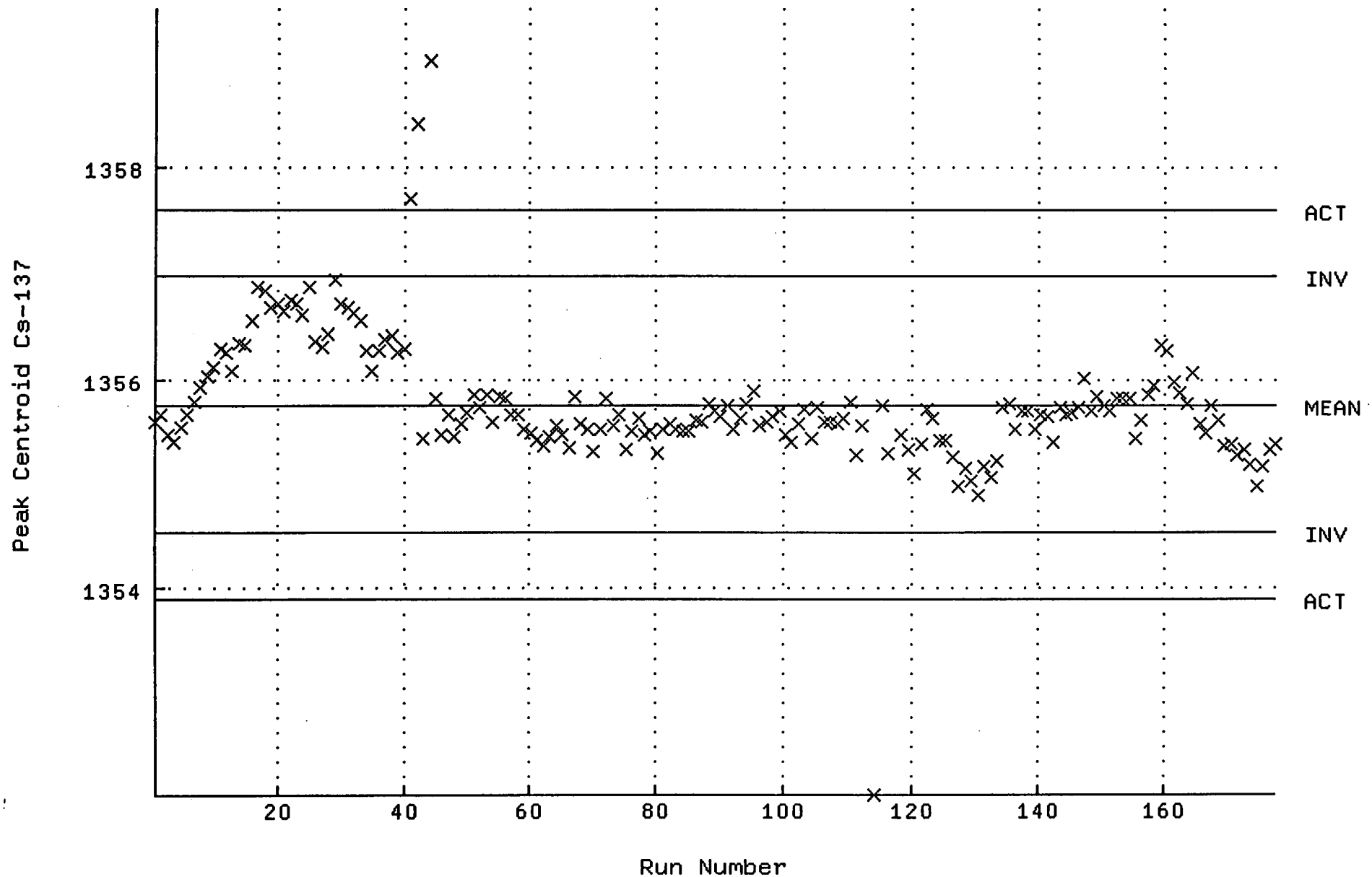
80019

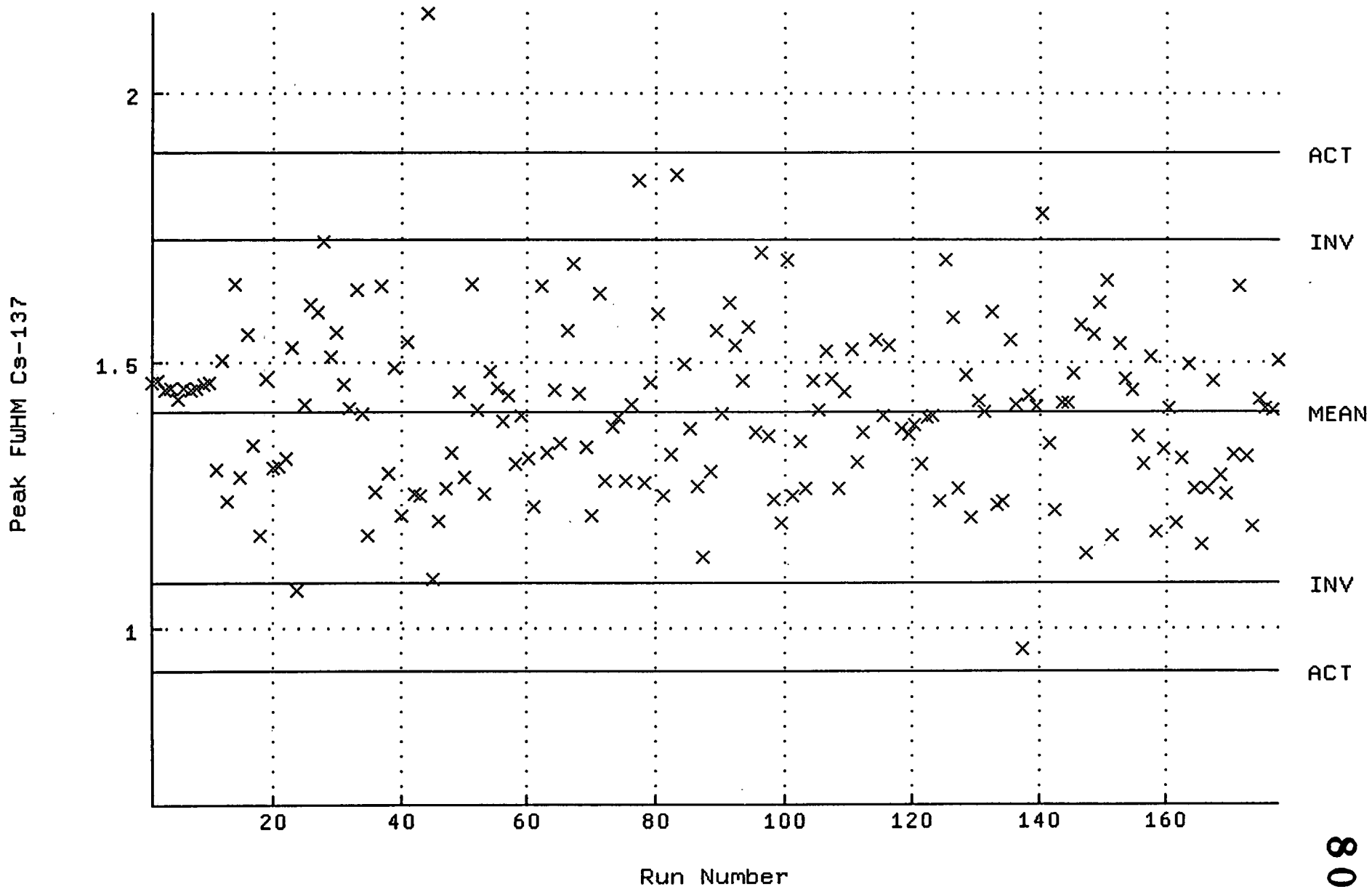
QA filename : DISK:[RADCHEM.SCUSR.QA]QCC_GAMMA5_CZ588.QAF;2
Parameter Name : PSCENTRD-661 (Peak Centroid Cs-137)
Start/End Dates : 2-JAN-1996 08:23:01 through 10-OCT-1996 08:30:47
Mean +- Std Dev : 1355.76 +- 0.613679 (0.05 %)



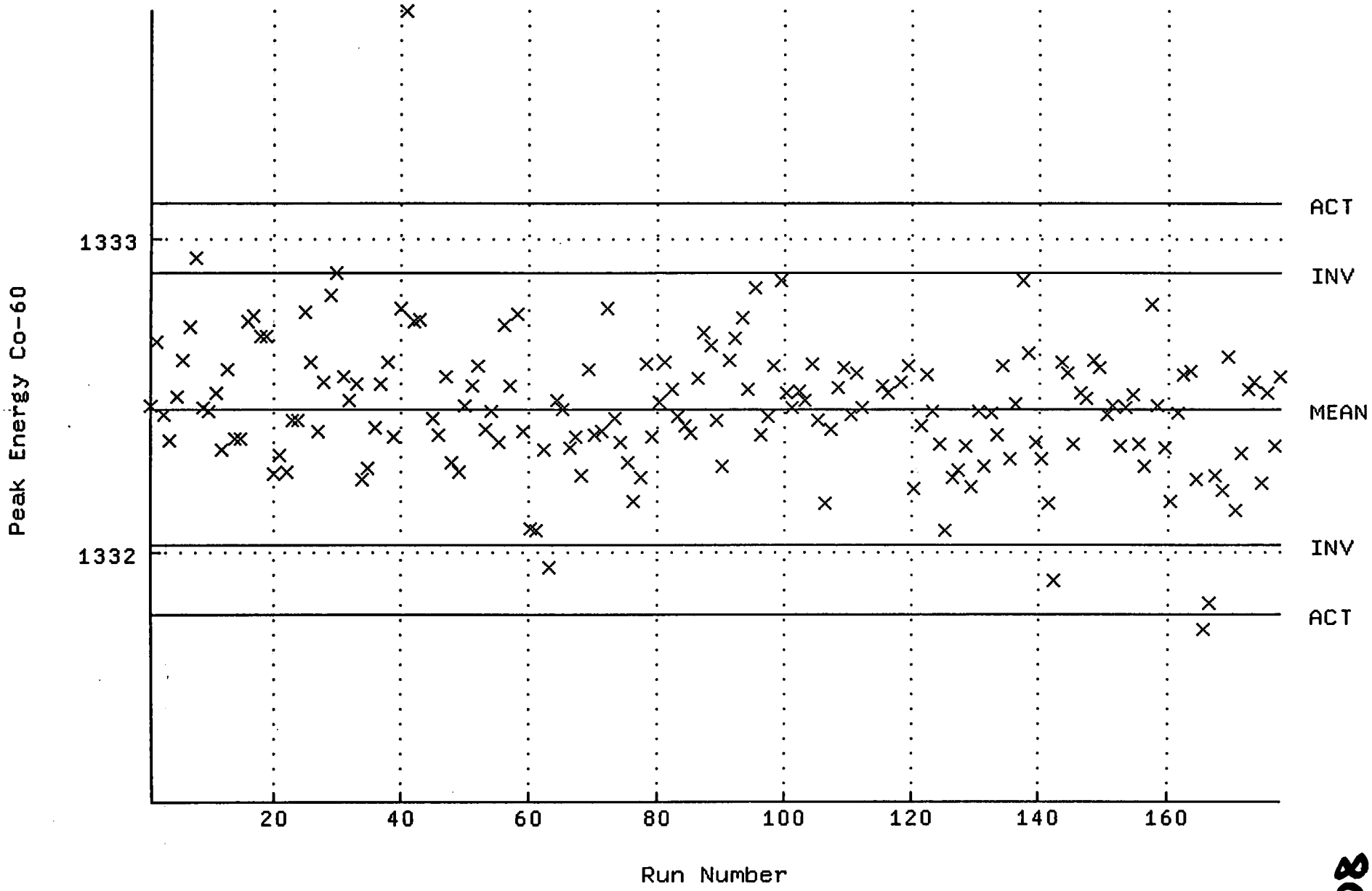
00094216 8

8019

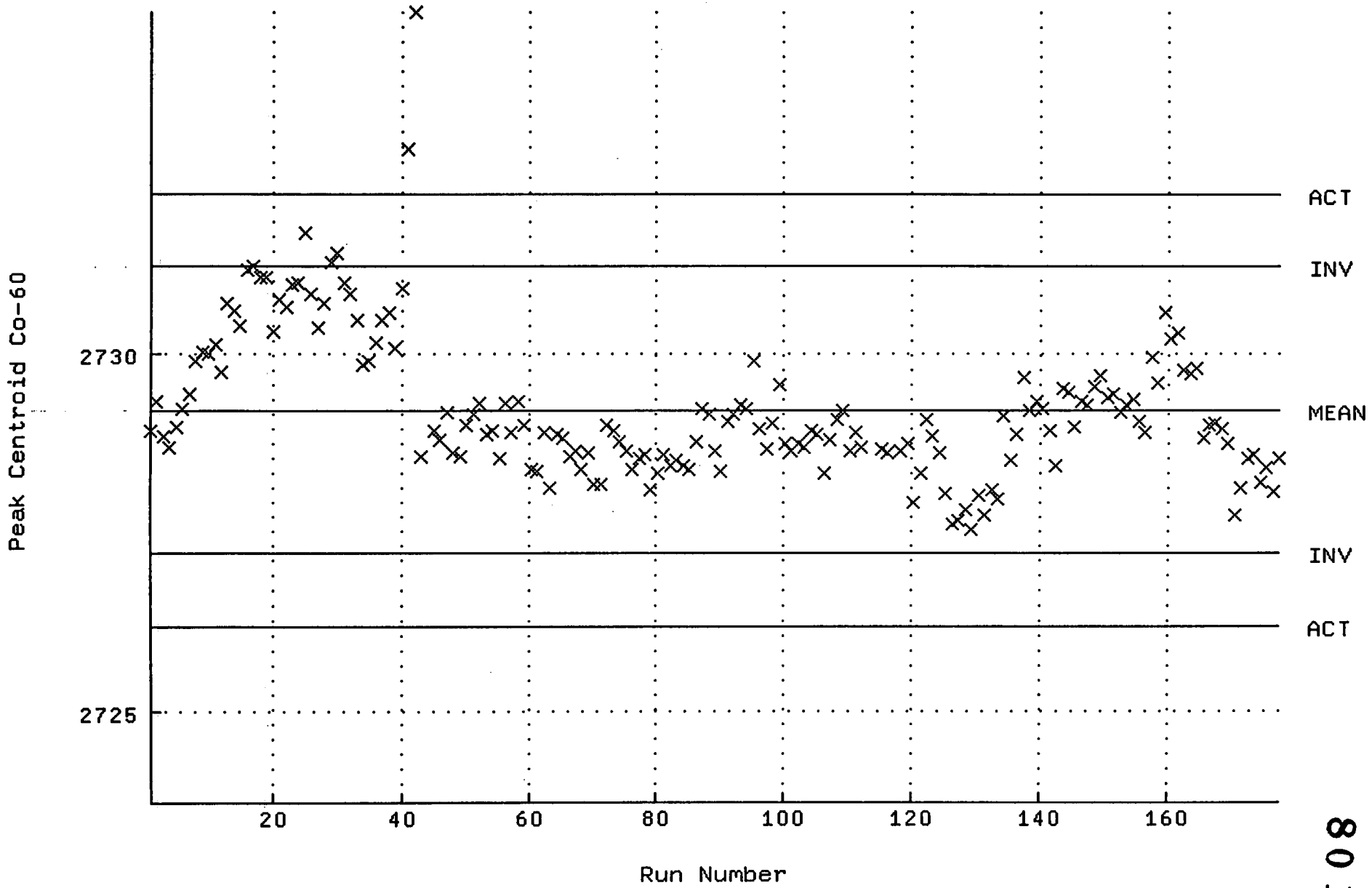
QA filename : DISK:[RADCHEM.SCUSR.QA]QCC_GAMMA5_CZ588.QAF;2
Parameter Name : PSFWHM-661 (Peak FWHM Cs-137)
Start/End Dates : 2-JAN-1996 08:23:01 through 10-OCT-1996 08:30:47
Mean +- Std Dev : 1.40811 +- 0.161421 (11.46 %)



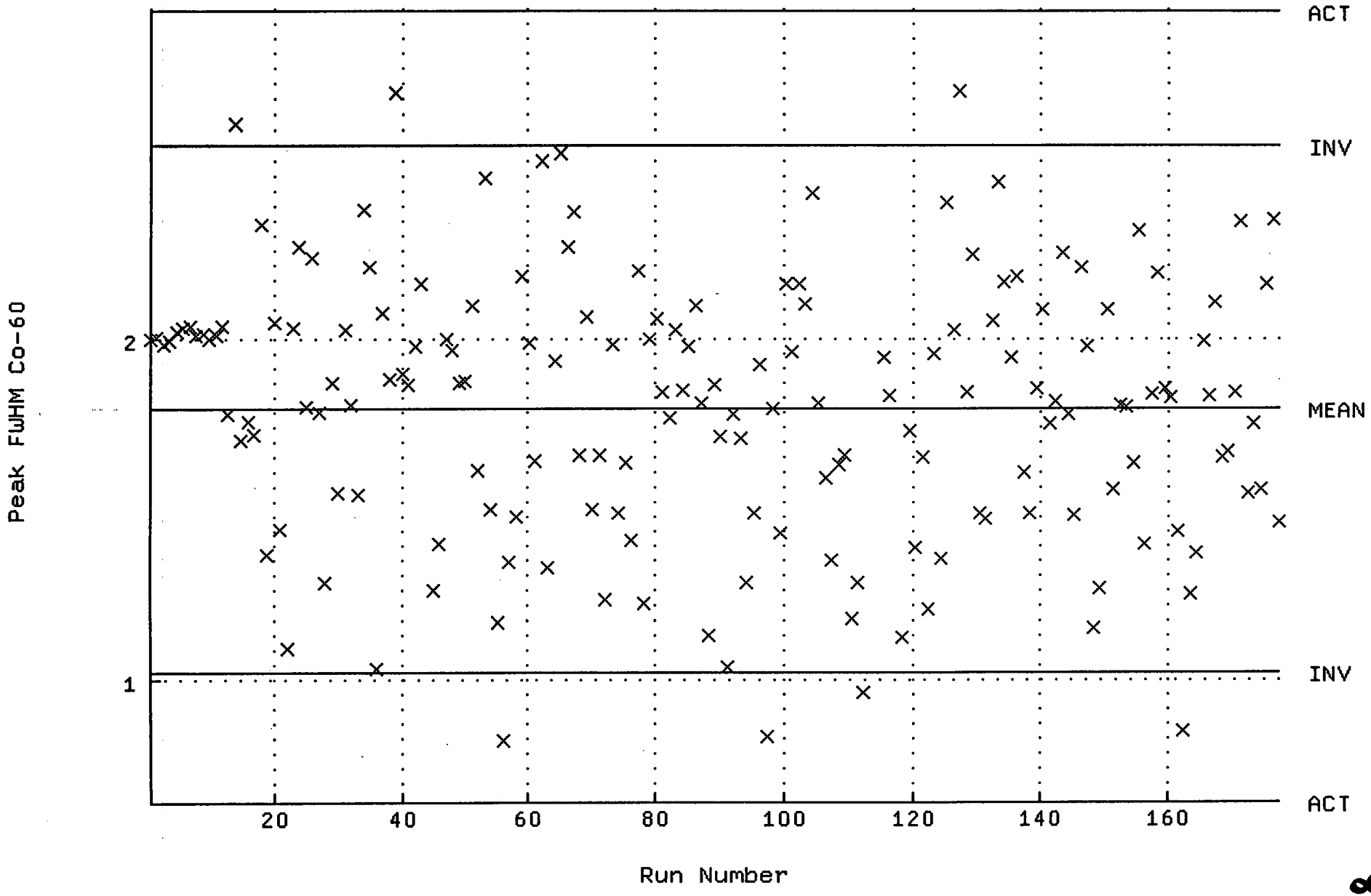
QA filename : DISK:[RADCHEM.SCUSR.QA]QCC_GAMMA5_CZ588.QAF;2
Parameter Name : PSENERGY-1332 (Peak Energy Co-60)
Start/End Dates : 2-JAN-1996 08:23:01 through 10-OCT-1996 08:30:47
Mean +- Std Dev : 1332.46 +- 0.218363 (0.02 %)



QA filename : DISK:[RADCHEM.SCUSR.QA]QCC_GAMMA5_CZ588.QAF;2
Parameter Name : PSCENTRD-1332 (Peak Centroid Co-60)
Start/End Dates : 2-JAN-1996 08:23:01 through 10-OCT-1996 08:30:47
Mean +- Std Dev : 2729.21 +- 1.00620 (0.04 %)



QA filename : DISK:[RADCHEM.SCUSR.QA]QCC_GAMMA5_CZ588.QAF;2
Parameter Name : PSFWHM-1332 (Peak FWHM Co-60)
Start/End Dates : 2-JAN-1996 08:23:01 through 10-OCT-1996 08:30:47
Mean +- Std Dev : 1.79432 +- 0.384175 (21.41 %)



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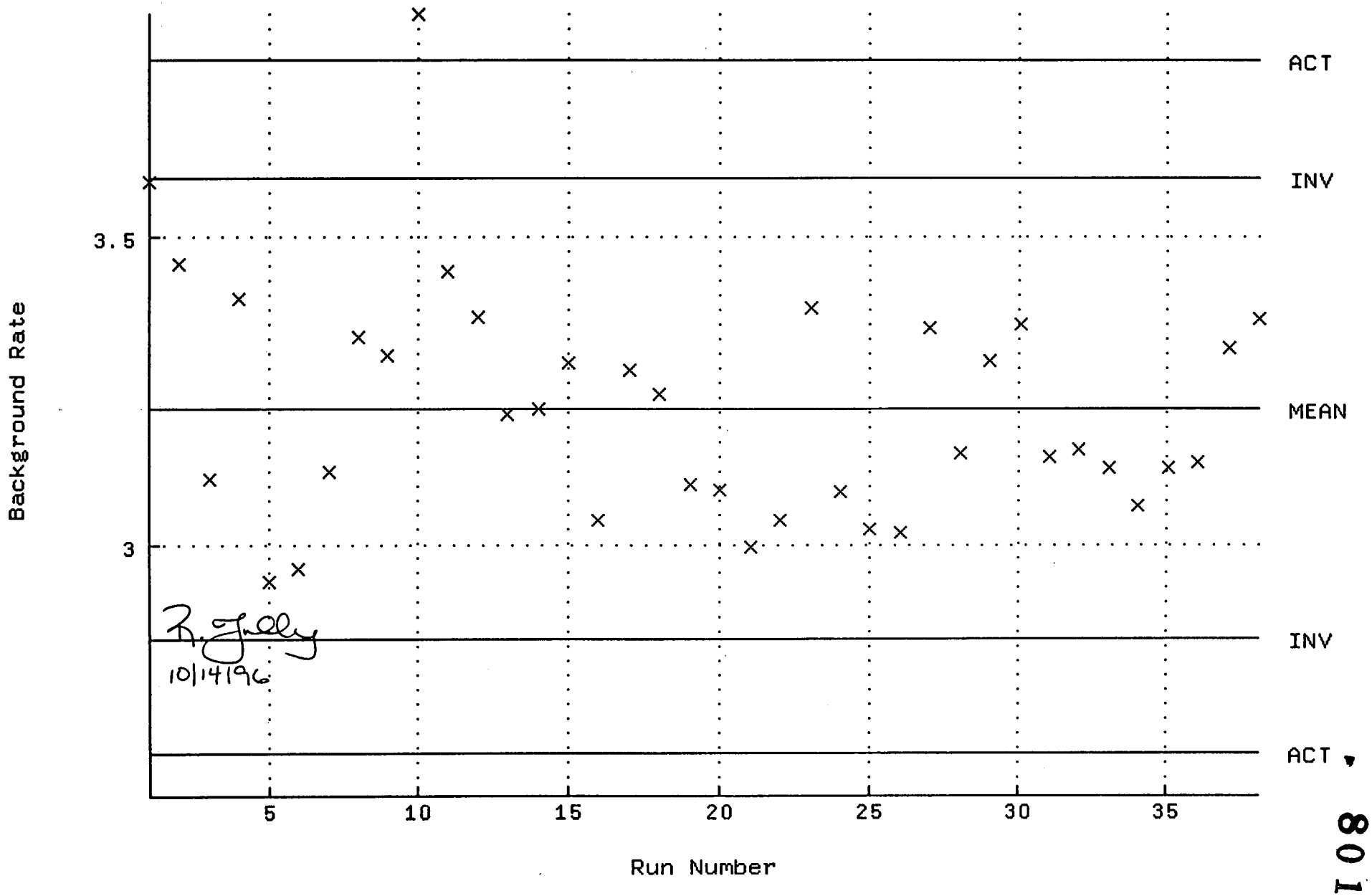
8019

QA filename : DISK:[RADCHEM.SCUSR.QA]QCB_GAMMA5_EMPTY.QAF;2
Parameter Name : BACKRATE (Background Rate)
Start/End Dates : 29-DEC-1995 14:37:29 through 4-OCT-1996 18:20:18
Mean +- Std Dev : 3.22352 +- 0.186083 (5.77 %)



Library Title :
Library file name : DISK:[RADCHEM.SCUSR.LIB]HAYDEN.NLB;1
Date printed : 11-OCT-1996 11:56:07.71
Number of nuclides : 4
Number of lines : 43

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Nuclide Name	Half-Life	Nuclide Type	Key Line	Energy		Abundance
RA-226	1600.00Y	Natural	*	186.21	keV	3.28 %
RA-228	1.41E+10Y	Natural		209.28	keV	4.40 %
				270.23	keV	3.60 %
				327.64	keV	3.20 %
				338.32	keV	11.40 %
				463.00	keV	4.40 %
				794.70	keV	4.60 %
			*	911.07	keV	27.70 %
				964.60	keV	5.20 %
				969.11	keV	16.60 %
PA-231	3.28E+04Y	Natural		50.10	keV	31.70 %
				100.00	keV	1.11 %
				122.31	keV	1.19 %
				144.24	keV	3.24 %
				154.21	keV	5.58 %
				205.00	keV	1.08 %
				210.60	keV	1.26 %
				234.90	keV	2.80 %
				236.00	keV	11.50 %
				256.20	keV	6.30 %
				269.46	keV	13.60 %
				271.23	keV	10.60 %
				283.67	keV	1.60 %
				286.10	keV	1.60 %
				300.08	keV	2.30 %
				304.40	keV	1.35 %
				323.87	keV	3.88 %
				330.00	keV	1.30 %
				334.20	keV	1.15 %
				338.28	keV	2.73 %
			*	351.07	keV	12.94 %
				401.81	keV	6.50 %
				404.84	keV	2.90 %
				427.08	keV	1.30 %
				445.03	keV	1.18 %
				569.67	keV	0.54 %
				831.96	keV	2.90 %
				897.83	keV	0.24 %
				897.83	keV	0.52 %
U-235	7.04E+08Y	Natural		143.76	keV	10.50 %
				163.35	keV	4.70 %
			*	185.71	keV	54.00 %
				205.31	keV	4.70 %

R. Jolly
10/14/96

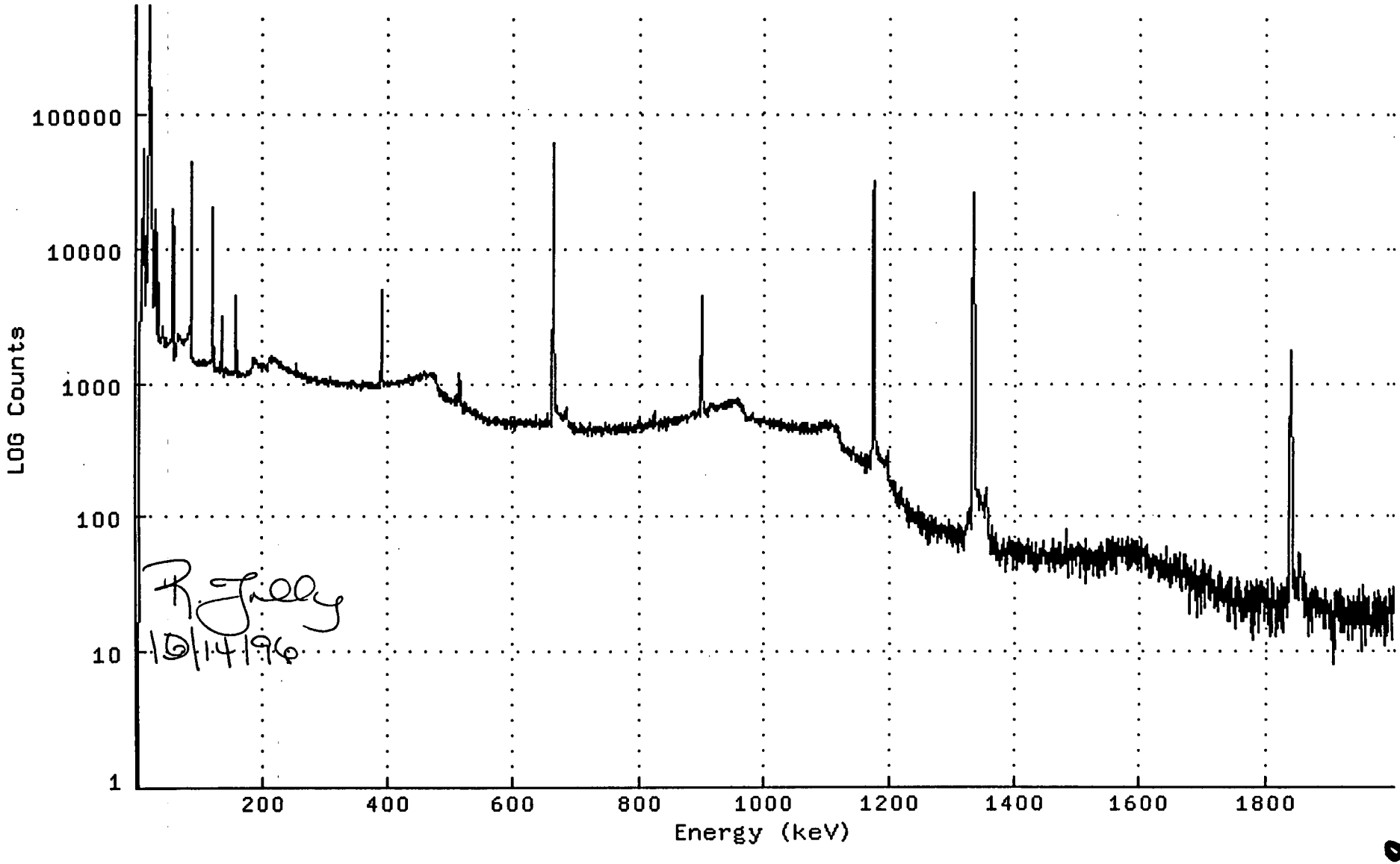
Print Time : 11-OCT-1996 11:56:09.18
Library file name : DISK:[RADCHEM.SCUSR.LIB]HAYDEN.NLB;1
Library title :

8019

Record	Interfering nuclide	Interfered nuclide
1	U-235	Ra-226
2	RA-228	Pa-231

R. Foley
10/14/96

Spectrum : DISK:[RADCHEM.SCUSR.ARCHIVE]CAL_GAMMA6_PMP_8957.CNF;1
Title :
Sample Title:
Start Time: 19-SEP-1996 14:37 Sample Time: 1-MAY-1995 12:00: Energy Offset: -1.51767E-01
Real Time : 0 00:21:38.69 Sample ID : PMP Energy Slope : 4.88648E-01
Live Time : 0 00:20:00.00 Sample Type: Energy Quad : -8.52076E-08



VMS Peak Search Report V1.9 Generated 11-OCT-1996 13:57:12

8019

Configuration : DISK:[RADCHEM.SCUSR.ARCHIVE]CAL_GAMMA6_PMP_8957.CNF;1
Analyses by : PEAK V16.5,PEAKEFF V2.2
Sample date : 1-MAY-1995 12:00:00 Acquisition date : 19-SEP-1996 14:37:15
Sample ID : PMP Sample quantity : 1.0000 L
Detector name : GAMMA6 Detector geometry: PMP
Elapsed live time: 0 00:20:00.00 Elapsed real time: 0 00:21:38.69 7.6%
Start energy : 0.34 keV End energy : 1999.92 keV
Sensitivity : 5.00 Gaussian : 10.00
Critical level : No

Pk	It	Energy	Area	Bkgnd	FWHM	Channel	%Eff	Cts/Sec	%Err	Fit
1	9	11.10	45673	28937	1.59	23.02	1.11E+00	3.81E+01	1.0	1.93E+02
2	9	12.14	89072	22647	0.91	25.16	1.35E+00	7.42E+01	0.5	
3	9	14.61	30574	37010	1.79	30.21	1.94E+00	2.55E+01	1.4	
4	3	21.96	1390494	71498	1.05	45.24	3.66E+00	1.16E+03	0.1	1.06E+04
5	3	24.83	329332	47780	1.07	51.12	4.25E+00	2.74E+02	0.2	
6	0	31.91	39636	33637	1.05	65.62	5.42E+00	3.30E+01	1.0	
7	0	36.47	9085	17730	1.13	74.95	5.99E+00	7.57E+00	2.8	
8	4	42.20	958	16197	1.24	86.67	6.54E+00	7.99E-01	23.5	5.15E+00
9	4	43.73	2172	15632	1.25	89.81	6.65E+00	1.81E+00	10.4	
10	0	49.59	926	13152	1.36	101.81	7.01E+00	7.71E-01	20.8	
11	0	59.49	35590	19446	0.92	122.05	7.36E+00	2.97E+01	0.9	
12	0	88.01	95561	16659	1.03	180.43	7.40E+00	7.96E+01	0.4	
13	0	122.06	38513	14923	0.95	250.11	6.79E+00	3.21E+01	0.8	
14	0	136.48	4850	11985	1.09	279.63	6.49E+00	4.04E+00	4.5	
15	0	158.99	7823	11544	1.05	325.70	6.03E+00	6.52E+00	2.8	
16	0	255.11	523	6860	0.92	522.42	4.46E+00	4.36E-01	25.4	
17	0	391.73	10236	9525	1.18	802.09	3.18E+00	8.53E+00	2.0	
18	0	514.03	1431	6468	1.35	1052.46	2.51E+00	1.19E+00	10.5	
19	0	661.72	185292	9266	1.44	1354.82	2.01E+00	1.54E+02	0.3	
[illegible]	0	683.49	324	4350	1.41	1399.39	1.95E+00	2.70E-01	35.9	
[illegible]	0	821.03	335	4373	0.96	1681.02	1.66E+00	2.79E-01	36.0	
22	0	898.04	13617	8350	1.62	1838.71	1.54E+00	1.13E+01	1.7	
23	0	1173.15	121168	5467	1.77	2402.12	1.23E+00	1.01E+02	0.3	
24	0	1332.38	109703	2365	1.90	2728.29	1.11E+00	9.14E+01	0.3	
25	0	1836.07	8326	544	2.10	3760.23	8.84E-01	6.94E+00	1.3	

VMS Calibration Report V1.5 Generated 11-OCT-1996 13:57:14

8019

Configuration : DISK:[RADCHEM.SCUSR.ARCHIVE]CAL_GAMMA6_PMP_8957.CNF;1
Analyses by : SCRCAL V1.1,PEAK V16.5,PEAKEFF V2.2
Detector Name : GAMMA6 Energy Calib Time: 19-SEP-1996 15:11:19
Efficiency type : Empirical Effncy Calib Time: 19-SEP-1996 15:11:19
Detector Geometry: PMP Shelf :

Energy Calibration Report

Energy = -0.1518 + 0.4886*Channel + -8.5208E-08*(Channel**2)

Nbr	Centroid Channel	True Energy	Computed Energy	Difference
1	122.05	59.54	59.49	0.049
2	180.43	88.03	88.01	0.022
3	250.11	122.06	122.06	0.003
4	279.63	136.48	136.48	-0.007
5	325.70	159.00	158.99	0.009
6	802.09	391.69	391.73	-0.046
7	1052.46	513.99	514.03	-0.045
8	1354.82	661.65	661.72	-0.072
9	1838.71	898.02	898.04	-0.022
10	2402.12	1173.22	1173.15	0.068
11	2728.29	1332.49	1332.38	0.102
12	3760.23	1836.01	1836.07	-0.061

FWHM Calibration Report

FWHM = 0.6350 + 3.3206E-02*(Energy**1/2)

Nbr	Energy	True FWHM	Computed FWHM	Difference
1	59.54	0.92	0.89	0.025
2	88.03	1.03	0.95	0.087
3	122.06	0.95	1.00	-0.052
4	136.48	1.09	1.02	0.065
5	159.00	1.05	1.05	-0.004
6	391.69	1.18	1.29	-0.114
7	513.99	1.35	1.39	-0.036
8	661.65	1.44	1.49	-0.052
9	898.02	1.62	1.63	-0.007
10	1173.22	1.77	1.77	0.002
11	1332.49	1.90	1.85	0.048
12	1836.01	2.10	2.06	0.038

Efficiency Calibration Report

Eff = exp(a2 + a3*x + a4*x**2 + a5*x**3 + a6*x**4 + a7*x**5), x=ln(a1/energy)

a1	a2	a3	a4	a5	a6	a7
947.8	-4.221	0.8506	8.2025E-02	-6.4659E-02	0.0000E+00	0.0000E+00

Average Deviation = 2.84 % Reduced Chi-Square = 0.349

Nbr	Energy (keV)	Measured Efficiency	Efficiency Error	Computed Efficiency	Diff/ /Error	% Diff
1	59.54	7.29E-02	3.71E-03	7.36E-02	-0.19	-0.98

Sample ID : PMP Acquisition date : 19-SEP-1996 14:37:15

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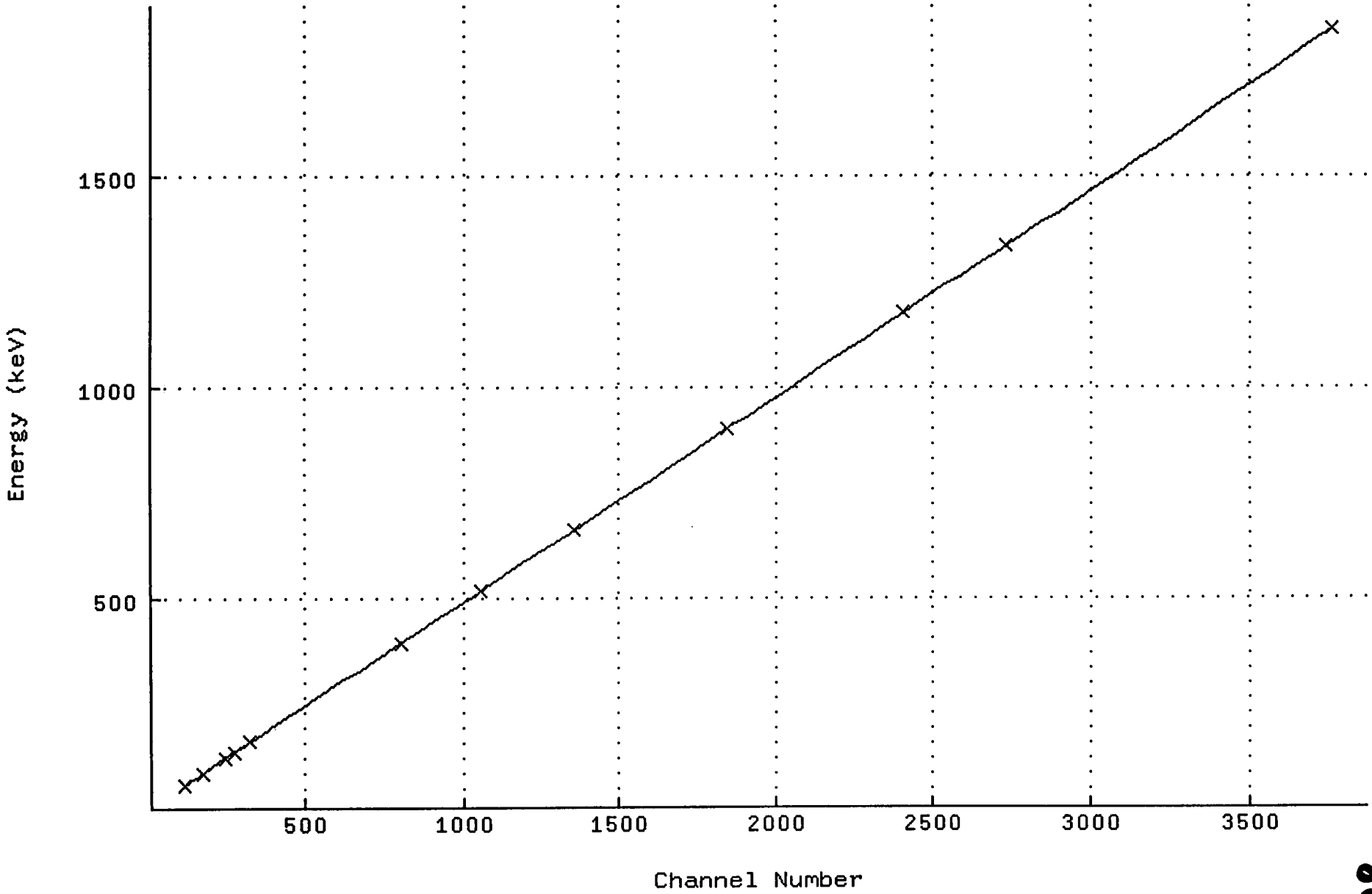
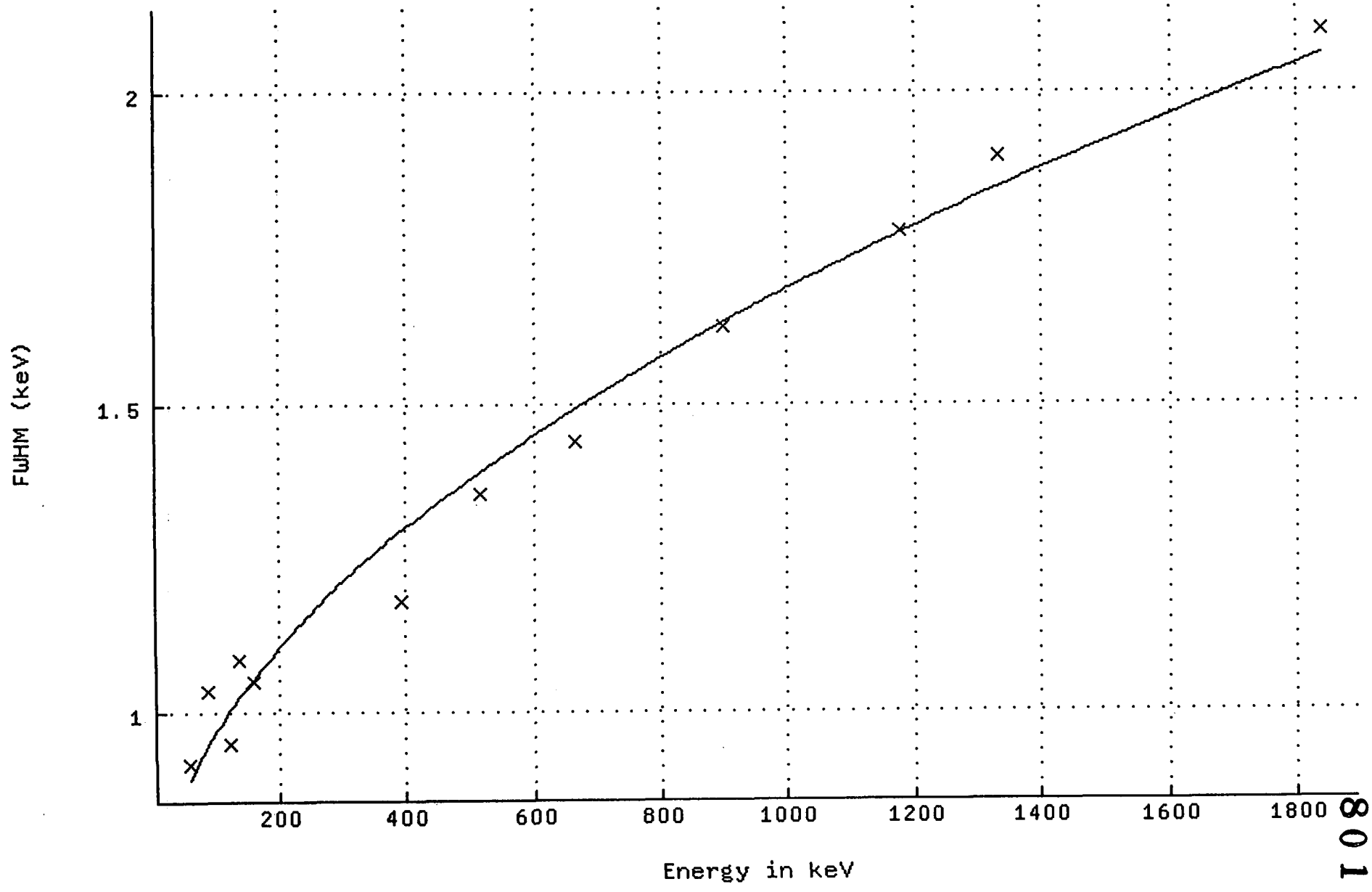
Nbr	Energy (keV)	Measured Efficiency	Efficiency Error	Computed Efficiency	Diff/ /Error	% Diff
2	88.03	7.48E-02	3.75E-03	7.40E-02	0.22	1.08
3	122.06	6.70E-02	3.40E-03	6.79E-02	-0.26	-1.31
4	136.48	6.81E-02	4.57E-03	6.49E-02	0.70	4.69
5	159.00	6.00E-02	3.45E-03	6.03E-02	-0.07	-0.43
6	391.69	3.10E-02	1.69E-03	3.18E-02	-0.45	-2.47
7	513.99	2.25E-02	2.61E-03	2.51E-02	-1.02	-11.86
8	661.65	2.07E-02	1.03E-03	2.01E-02	0.56	2.78
9	898.02	1.51E-02	7.93E-04	1.54E-02	-0.42	-2.19
10	1173.22	1.26E-02	6.29E-04	1.23E-02	0.39	1.97
11	1332.49	1.14E-02	5.69E-04	1.11E-02	0.42	2.09
12	1836.01	8.65E-03	4.47E-04	8.84E-03	-0.43	-2.21

Approved by: _____ Approval Date: __ / __ / ____

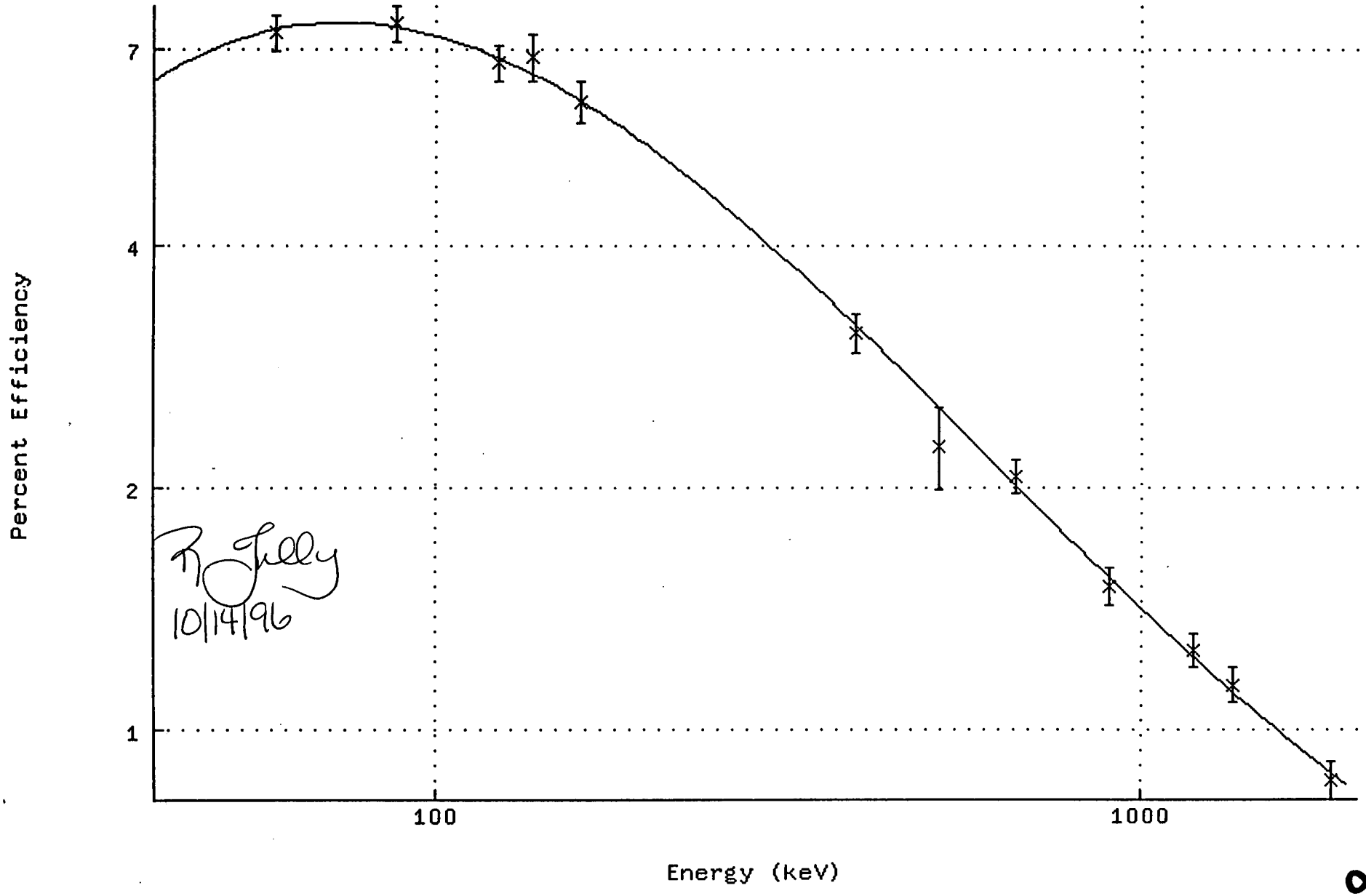
Spectrum : DISK:[RADCHEM.SCUSR.ARCHIVE]CAL_GAMMA6_PMP_8957.CNF;1
Calib Date: 19-SEP-1996 15:11
Detector : GAMMA6 Geometry: PMP
Energy = -0.152 + 0.4886 * ch + -8.5208E-08 * ch**2



Spectrum : DISK:[RADCHEM.SCUSR.ARCHIVE]CAL_GAMMA6_PMP_8957.CNF;1
Calib Date: 19-SEP-1996 15:11
Detector : GAMMA6 Geometry: PMP
FWHM = 0.635 + 0.03321 * SQRT(Energy)

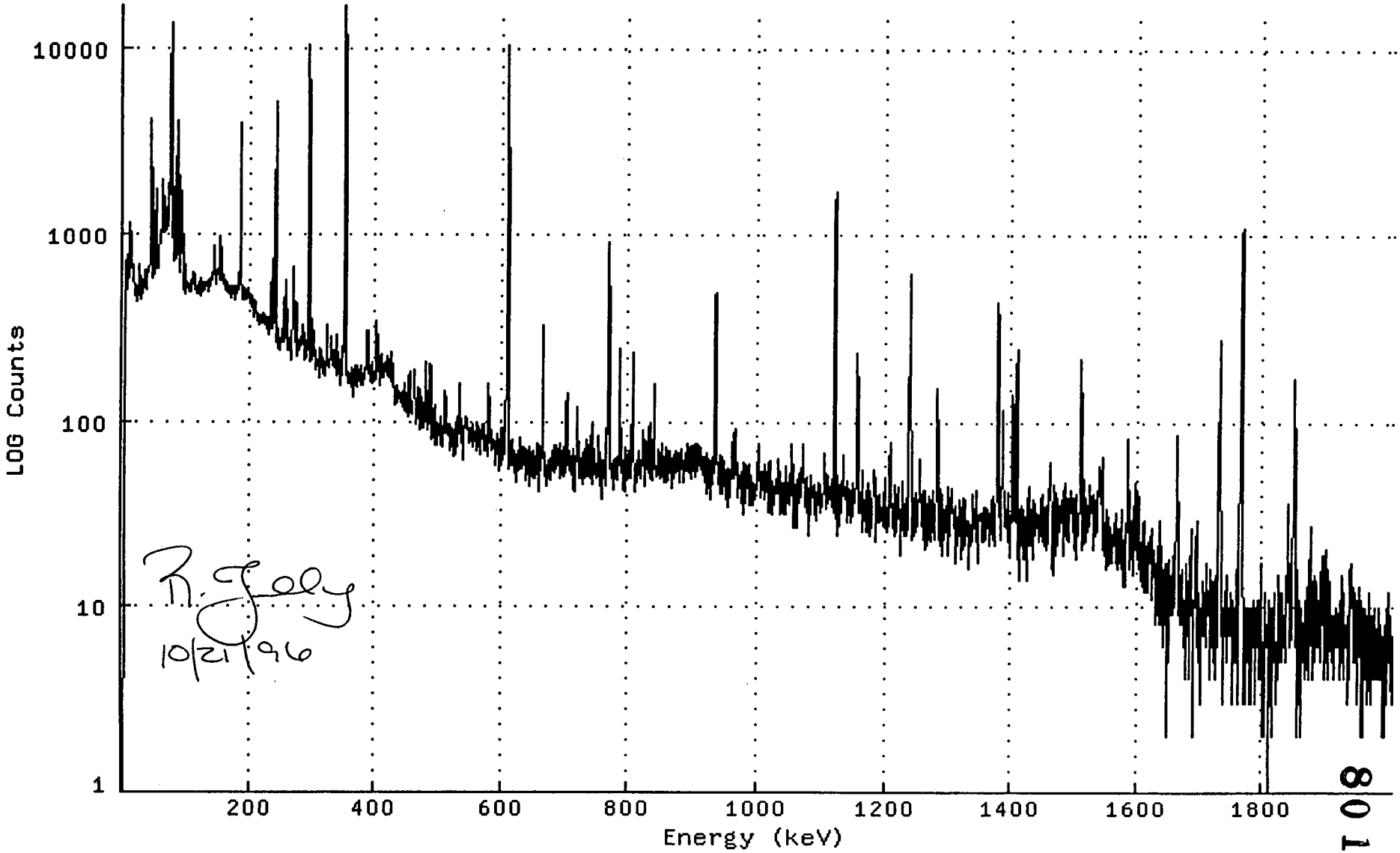


Spectrum : DISK:[RADCHEM.SCUSR.ARCHIVE]CAL_GAMMA6_PMP_8957.CNF;1
Calib Date: 19-SEP-1996 15:11
Detector : GAMMA6 Geometry : PMP
Fit type : 3 Deg. Empirical



R Tully
10/14/96

Spectrum : DISK:[RADCHEM.SCUSR.ARCHIVE]CAL_GAMMA6_TRM1S2_8965.CNF;1
Title :
Sample Title:
Start Time: 19-SEP-1996 15:27 Sample Time: 19-SEP-1996 12:00 Energy Offset: -2.17378E-01
Real Time : 0 00:30:15.47 Sample ID : TRM1-S2 Energy Slope : 4.88771E-01
Live Time : 0 00:30:00.00 Sample Type: Energy Quad : -1.22302E-07



VMS Peak Search Report V1.9 Generated 15-OCT-1996 11:34:11

8019

Configuration : DISK:[RADCHEM.SCUSR.ARCHIVE]CAL_GAMMA6_TRM1S2_8965.CNF;1
Analyses by : PEAK V16.5,PEAKEFF V2.2
Sample date : 19-SEP-1996 12:00:00 Acquisition date : 19-SEP-1996 15:27:38
Sample ID : TRM1-S2 Sample quantity : 1.0000 L
Detector name : GAMMA6 Detector geometry: TRM1-S2
Elapsed live time: 0 00:30:00.00 Elapsed real time: 0 00:30:15.47 0.9%
Start energy : 0.27 keV End energy : 1999.74 keV
Sensitivity : 5.00 Gaussian : 10.00
Critical level : No

Pk	It	Energy	Area	Bkgnd	FWHM	Channel	%Eff	Cts/Sec	%Err	Fit
1	6	10.76	526	2632	0.86	22.45	3.06E+07	2.92E-01	15.3	2.57E+00
2	6	12.88	1616	4255	1.26	26.80	2.72E+05	8.98E-01	7.5	
3	6	15.37	1534	4851	1.40	31.89	8.30E+03	8.52E-01	8.7	
4	6	17.25	367	4883	1.42	35.73	1.41E+03	2.04E-01	36.0	
5	0	27.26	319	3860	0.86	56.23	2.34E+01	1.77E-01	34.2	
6	0	31.98	313	3724	1.37	65.87	1.23E+01	1.74E-01	34.2	
7	0	46.46	8103	5641	1.01	95.50	6.73E+00	4.50E+00	2.0	
8	0	49.91	866	4285	0.85	102.55	6.58E+00	4.81E-01	13.0	
9	0	53.14	2188	5155	0.93	109.17	6.55E+00	1.22E+00	6.1	
10	0	63.25	1983	9151	0.91	129.85	6.81E+00	1.10E+00	9.0	
11	0	67.55	1165	8245	1.01	138.65	7.00E+00	6.47E-01	13.8	
12	4	74.78	14606	6929	0.95	153.45	7.34E+00	8.11E+00	1.2	1.85E+01
13	4	77.05	24775	7101	0.93	158.09	7.45E+00	1.38E+01	0.8	
14	3	83.78	4004	4203	0.97	171.86	7.75E+00	2.22E+00	2.9	3.40E+00
15	3	87.18	9197	4491	1.21	178.82	7.89E+00	5.11E+00	1.6	
16	3	89.81	3642	4075	1.18	184.20	7.98E+00	2.02E+00	3.4	
17	3	92.53	2824	3848	1.08	189.77	8.08E+00	1.57E+00	4.3	
18	3	94.64	1374	3651	1.09	194.08	8.15E+00	7.63E-01	8.4	
19	0	97.69	477	3648	1.62	200.32	8.24E+00	2.65E-01	21.5	
[illegible]	0	144.09	809	5036	1.04	295.28	8.38E+00	4.49E-01	16.2	
[illegible]	0	154.15	761	4634	0.86	315.86	8.20E+00	4.23E-01	15.9	
22	0	186.16	9014	5382	1.13	381.36	7.39E+00	5.01E+00	1.9	
23	0	236.01	866	2323	1.03	483.36	6.01E+00	4.81E-01	9.8	
24	0	242.05	11573	3131	1.11	495.73	5.85E+00	6.43E+00	1.3	
25	1	256.24	532	1842	1.18	524.78	5.50E+00	2.95E-01	14.1	1.60E+00
26	1	258.91	849	2027	1.25	530.24	5.44E+00	4.72E-01	9.9	
27	1	269.45	1073	1790	1.31	551.79	5.19E+00	5.96E-01	7.8	1.89E+01
28	1	271.13	848	1814	1.31	555.24	5.16E+00	4.71E-01	10.1	
29	0	285.86	172	1458	1.18	585.39	4.84E+00	9.57E-02	35.9	
30	0	295.27	25843	2718	1.15	604.65	4.66E+00	1.44E+01	0.7	
31	0	300.10	234	1345	0.96	614.53	4.57E+00	1.30E-01	25.6	
32	0	324.06	319	1751	1.12	663.57	4.15E+00	1.77E-01	24.3	
33	0	329.89	288	1781	1.60	675.49	4.06E+00	1.60E-01	27.0	
34	0	338.53	236	1490	1.20	693.19	3.92E+00	1.31E-01	29.2	
35	0	352.00	43599	2394	1.19	720.74	3.73E+00	2.42E+01	0.5	
36	4	386.88	281	1268	1.15	792.15	3.31E+00	1.56E-01	22.1	4.32E-01
37	4	388.91	344	1476	1.36	796.29	3.28E+00	1.91E-01	20.4	
38	4	401.90	456	1323	1.26	822.88	3.15E+00	2.53E-01	14.6	1.46E+00
39	4	405.54	457	2005	1.91	830.33	3.11E+00	2.54E-01	20.4	
40	0	454.49	294	1365	1.68	930.53	2.70E+00	1.63E-01	25.8	
41	0	461.83	307	1191	1.65	945.55	2.65E+00	1.71E-01	22.5	
42	0	469.48	152	933	1.73	961.21	2.59E+00	8.42E-02	37.2	
43	0	480.45	296	900	1.37	983.67	2.52E+00	1.64E-01	19.2	
44	0	487.02	309	1095	1.20	997.11	2.48E+00	1.71E-01	21.5	

Sample ID : TRM1-S2 Acquisition date : 19-SEP-1996 15:27:38

8019

Pk	It	Energy	Area	Bkgnd	FWHM	Channel	%Eff	Cts/Sec	%Err
45	0	533.85	222	845	1.18	1092.97	2.23E+00	1.23E-01	25.4
46	0	580.47	203	1037	1.47	1188.41	2.04E+00	1.13E-01	33.4
[illegible]	0	609.43	30467	927	1.38	1247.69	1.94E+00	1.69E+01	0.6
48	0	665.58	845	663	1.52	1362.66	1.78E+00	4.70E-01	6.8
49	0	703.42	234	682	1.32	1440.12	1.70E+00	1.30E-01	22.6
50	0	720.37	352	764	1.44	1474.83	1.66E+00	1.95E-01	18.4
51	0	768.31	2851	899	1.50	1572.98	1.58E+00	1.58E+00	3.1
52	0	785.95	653	753	1.53	1609.10	1.56E+00	3.63E-01	9.7
53	0	806.34	628	617	1.56	1650.85	1.53E+00	3.49E-01	8.9
54	0	832.06	157	533	1.65	1703.52	1.50E+00	8.71E-02	28.7
55	0	839.10	385	647	1.72	1717.95	1.49E+00	2.14E-01	14.2
56	0	934.16	1558	676	1.54	1912.60	1.40E+00	8.66E-01	4.3
57	0	964.49	248	558	1.95	1974.71	1.38E+00	1.38E-01	20.7
58	0	1052.13	70	445	1.10	2154.20	1.32E+00	3.91E-02	57.3
59	0	1069.65	205	586	1.42	2190.10	1.31E+00	1.14E-01	27.3
60	0	1120.24	6182	505	1.72	2293.72	1.29E+00	3.43E+00	1.5
61	0	1155.15	760	501	1.77	2365.22	1.28E+00	4.22E-01	7.2
62	0	1207.82	122	435	1.51	2473.11	1.26E+00	6.78E-02	36.7
63	0	1238.05	2251	454	1.75	2535.03	1.24E+00	1.25E+00	3.0
64	0	1280.85	566	338	1.96	2622.72	1.23E+00	3.14E-01	7.9
65	0	1377.64	1589	509	1.82	2821.02	1.20E+00	8.83E-01	4.2
66	0	1385.28	317	411	1.45	2836.67	1.20E+00	1.76E-01	15.0
67	0	1401.32	517	405	2.02	2869.52	1.19E+00	2.87E-01	9.6
68	0	1407.92	834	310	1.74	2883.05	1.19E+00	4.63E-01	5.6
69	0	1509.04	814	392	1.85	3090.25	1.16E+00	4.52E-01	6.6
70	0	1543.07	156	348	1.88	3159.98	1.15E+00	8.68E-02	25.5
71	0	1583.38	242	300	1.84	3242.58	1.14E+00	1.34E-01	16.5
72	0	1661.27	363	175	1.92	3402.20	1.11E+00	2.01E-01	9.7
[illegible]	0	1729.62	1283	130	2.08	3542.29	1.08E+00	7.13E-01	3.5
[illegible]	0	1764.41	5123	113	2.17	3613.59	1.07E+00	2.85E+00	1.5
75	0	1838.48	102	86	1.34	3765.43	1.04E+00	5.67E-02	20.3
76	0	1847.50	718	145	1.96	3783.92	1.04E+00	3.99E-01	5.5
77	0	1873.47	90	88	2.62	3837.15	1.03E+00	4.98E-02	24.0

VMS Calibration Report V1.5 Generated 15-OCT-1996 11:34:13

8019

Configuration : DISK:[RADCHEM.SCUSR.ARCHIVE]CAL_GAMMA6_TRM1S2_8965.CNF;1
Analyses by : SCRCAL V1.1,PEAK V16.5,PEAKEFF V2.2
Detector Name : GAMMA6 Energy Calib Time: 19-SEP-1996 15:59:51
Efficiency type : Empirical Effncy Calib Time: 19-SEP-1996 15:59:51
Detector Geometry: TRM1-S2 Shelf :

Energy Calibration Report

Energy = -0.2174 + 0.4888*Channel + -1.2230E-07*(Channel**2)

Nbr	Centroid Channel	True Energy	Computed Energy	Difference
1	95.50	46.50	46.46	0.045
2	153.45	74.81	74.78	0.031
3	158.09	77.11	77.05	0.060
4	381.36	186.21	186.16	0.050
5	604.65	295.21	295.27	-0.061
6	720.74	351.92	352.00	-0.075
7	1247.69	609.31	609.43	-0.117
8	1362.66	665.45	665.58	-0.132
9	1572.98	768.36	768.31	0.050
10	1912.60	934.06	934.16	-0.098
11	2293.72	1120.29	1120.24	0.043
12	2365.22	1155.19	1155.15	0.041
13	2535.03	1238.11	1238.05	0.064
14	2622.72	1280.96	1280.85	0.107
15	2821.02	1377.67	1377.64	0.025
16	2883.05	1407.98	1407.92	0.061
17	3090.25	1509.23	1509.04	0.189
18	3402.20	1661.00	1661.27	-0.266
[illegible]	3542.29	1729.59	1729.62	-0.024
20	3613.59	1764.49	1764.41	0.088
21	3783.92	1847.42	1847.50	-0.082

FWHM Calibration Report

FWHM = 0.6692 + 3.1552E-02*(Energy**1/2)

Nbr	Energy	True FWHM	Computed FWHM	Difference
1	46.50	1.01	0.88	0.125
2	74.81	0.95	0.94	0.012
3	77.11	0.93	0.95	-0.020
4	186.21	1.13	1.10	0.032
5	295.21	1.15	1.21	-0.057
6	351.92	1.19	1.26	-0.069
7	609.31	1.38	1.45	-0.067
8	665.45	1.52	1.48	0.035
9	768.36	1.50	1.54	-0.039
10	934.06	1.54	1.63	-0.098
11	1120.29	1.72	1.73	-0.008
12	1155.19	1.77	1.74	0.027

Sample ID : TRM1-S2 Acquisition date : 19-SEP-1996 15:27:38

8019

Nbr	Energy	True FWHM	Computed FWHM	Difference
13	1238.11	1.75	1.78	-0.032
[illegible]	1280.96	1.96	1.80	0.163
[illegible]	1377.67	1.82	1.84	-0.025
16	1407.98	1.74	1.85	-0.116
17	1509.23	1.85	1.89	-0.043
18	1661.00	1.92	1.96	-0.033
19	1729.59	2.08	1.98	0.099
20	1764.49	2.17	1.99	0.178
21	1847.42	1.96	2.03	-0.065

Efficiency Calibration Report

Eff = exp(a2 + a3*x + a4*x**2 + a5*x**3 + a6*x**4 + a7*x**5), x=ln(a1/energy)

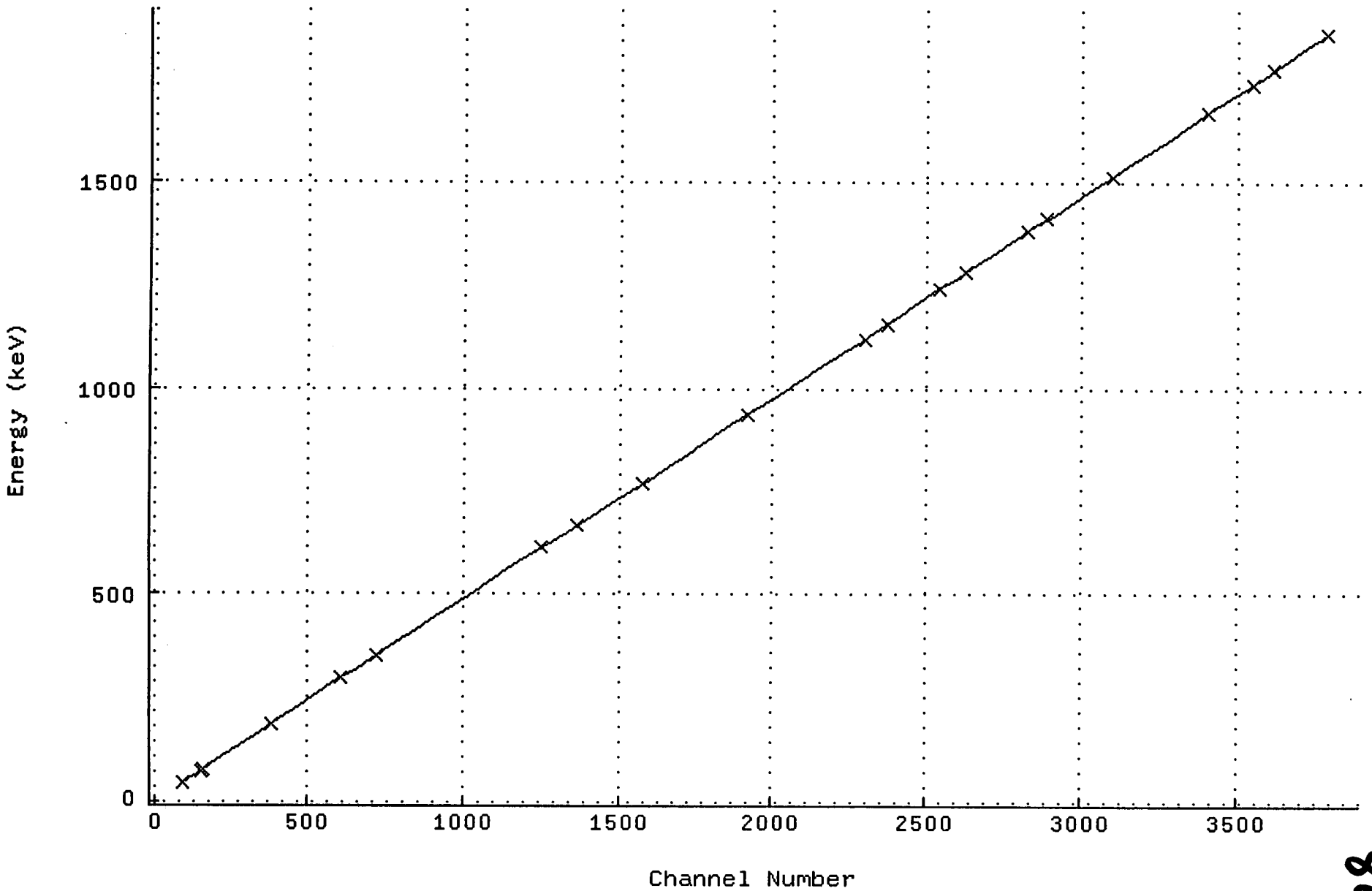
a1	a2	a3	a4	a5	a6	a7
947.0	-4.276	0.5137	0.4804	0.2874	-0.3457	6.5634E-02

Average Deviation = 6.56 % Reduced Chi-Square = 2.46

Nbr	Energy (keV)	Measured Efficiency	Efficiency Error	Computed Efficiency	Diff/ /Error	% Diff
1	46.50	6.81E-02	3.67E-03	6.73E-02	0.21	1.12
2	74.81	7.26E-02	3.74E-03	7.34E-02	-0.21	-1.09
3	77.11	7.27E-02	3.69E-03	7.45E-02	-0.49	-2.48
4	186.21	8.42E-02	4.50E-03	7.39E-02	2.29	12.25
5	295.21	4.15E-02	2.10E-03	4.66E-02	-2.44	-12.32
6	351.92	3.61E-02	1.82E-03	3.73E-02	-0.68	-3.40
7	609.31	2.03E-02	1.02E-03	1.94E-02	0.88	4.41
8	665.45	1.63E-02	1.38E-03	1.78E-02	-1.12	-9.44
9	768.36	1.76E-02	1.03E-03	1.58E-02	1.69	9.87
10	934.06	1.50E-02	9.87E-04	1.40E-02	1.02	6.69
11	1120.29	1.26E-02	6.58E-04	1.29E-02	-0.44	-2.27
12	1155.19	1.38E-02	1.21E-03	1.28E-02	0.84	7.40
13	1238.11	1.18E-02	6.85E-04	1.24E-02	-1.01	-5.86
14	1280.96	1.16E-02	1.09E-03	1.23E-02	-0.62	-5.76
15	1377.67	1.19E-02	7.82E-04	1.20E-02	-0.06	-0.41
16	1407.98	1.03E-02	7.72E-04	1.19E-02	-2.10	-15.74
17	1509.23	1.14E-02	9.42E-04	1.16E-02	-0.19	-1.60
18	1661.00	1.02E-02	1.11E-03	1.11E-02	-0.84	-9.16
19	1729.59	1.32E-02	8.07E-04	1.08E-02	2.90	17.75
20	1764.49	9.99E-03	5.21E-04	1.07E-02	-1.38	-7.17
21	1847.42	1.05E-02	7.82E-04	1.04E-02	0.20	1.48

Approved by: _____ Approval Date: __ / __ / ____

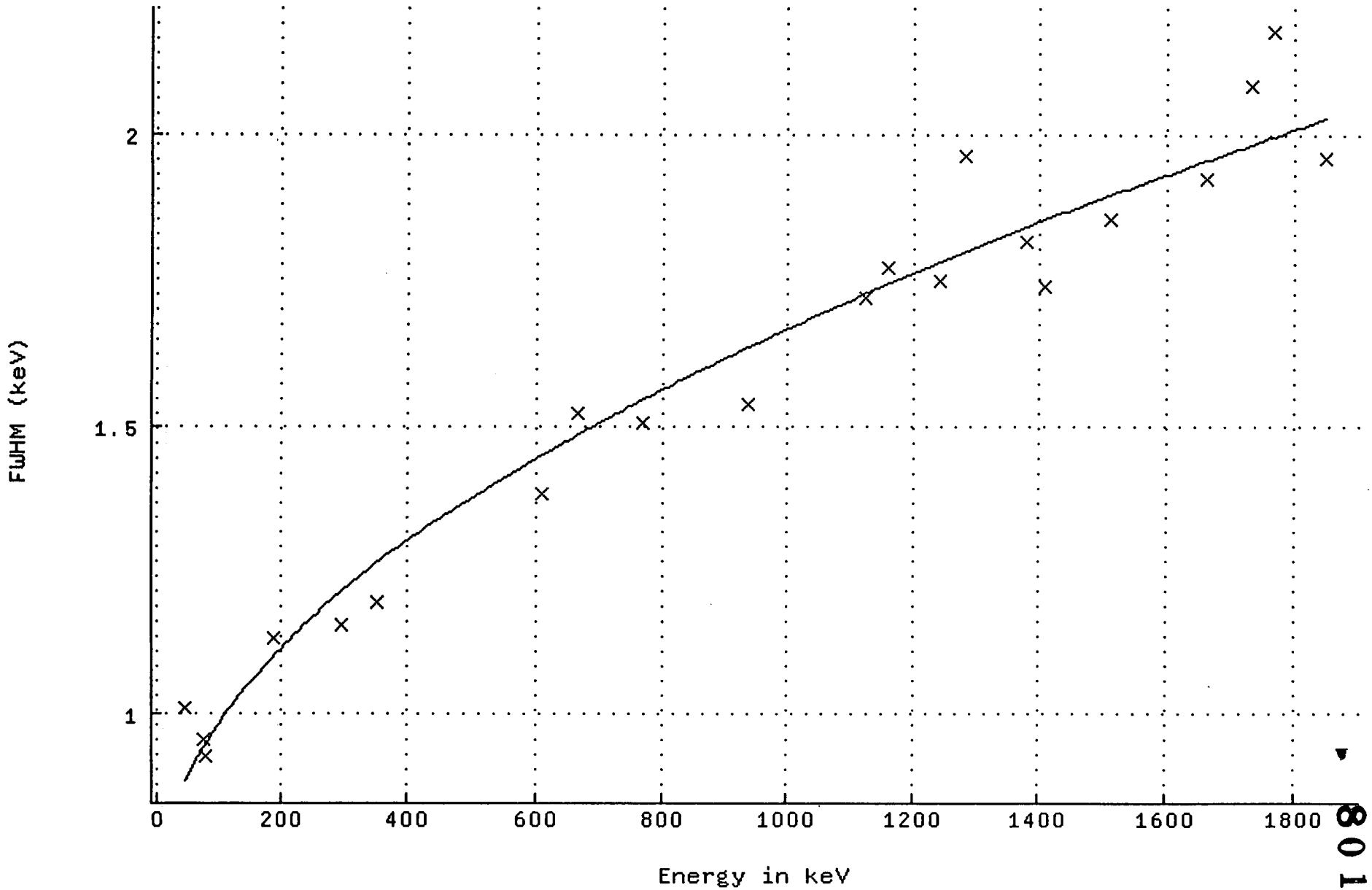
Spectrum : DISK:[RADCHEM.SCUSR.ARCHIVE]CAL_GAMMA6_TRM1S2_8965.CNF;1
Calib Date: 19-SEP-1996 15:59
Detector : GAMMA6 Geometry: TRM1-S2
Energy = -0.217 + 0.4888 * ch + -1.2230E-07 * ch**2



000964 188

8019

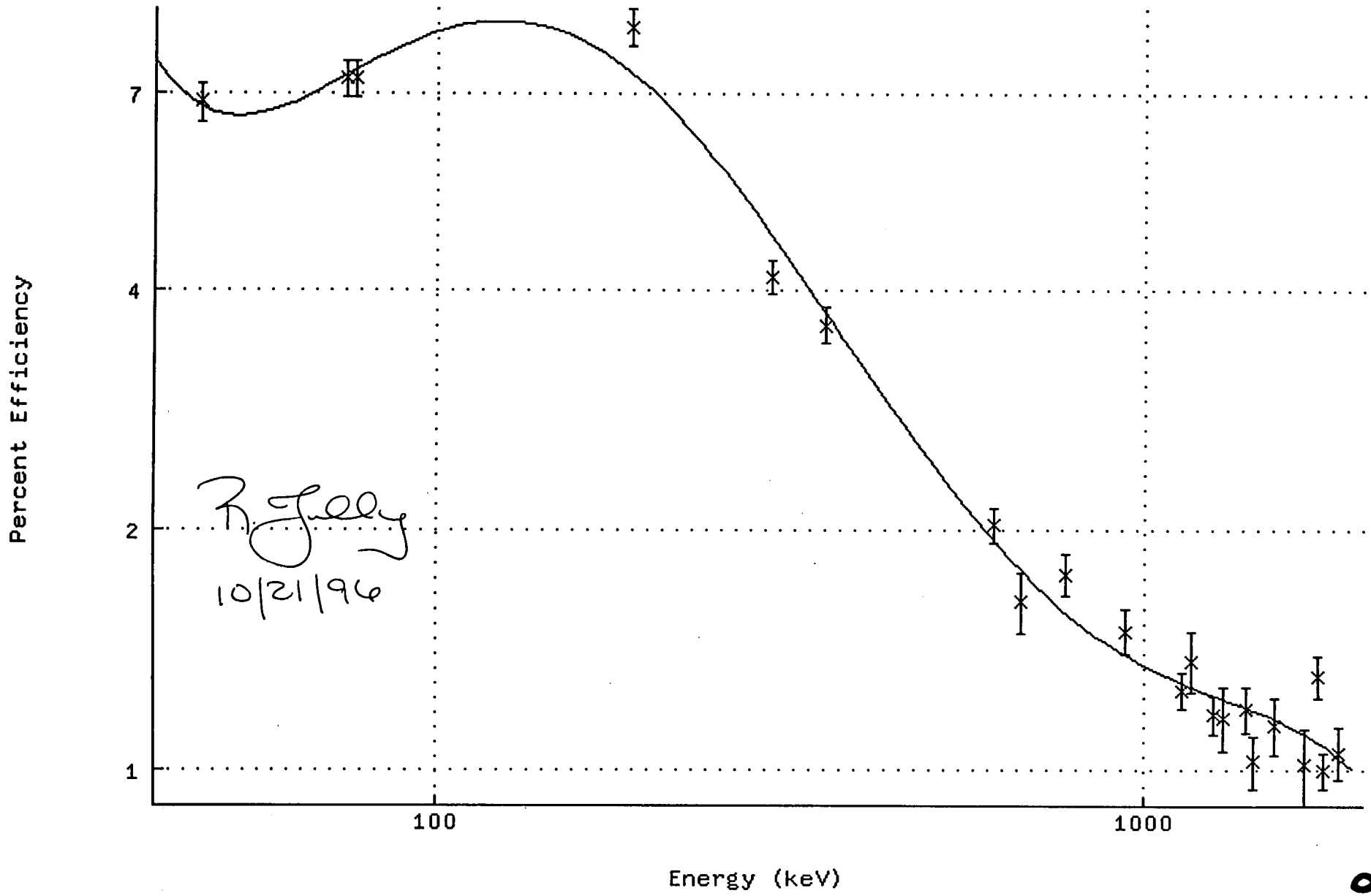
Spectrum : DISK:[RADCHEM.SCUSR.ARCHIVE]CAL_GAMMA6_TRM1S2_8965.CNF;1
Calib Date: 19-SEP-1996 15:59
Detector : GAMMA6 Geometry: TRM1-S2
FWHM = 0.669 + 0.03155 * SQRT(Energy)



00096218 9

80 19

Spectrum : DISK:[RADCHEM.SCUSR.ARCHIVE]CAL_GAMMA6_TRM1S2_8965.CNF;1
Calib Date: 19-SEP-1996 15:59
Detector : GAMMA6 Geometry : TRM1-S2
Fit type : 5 Deg. Empirical

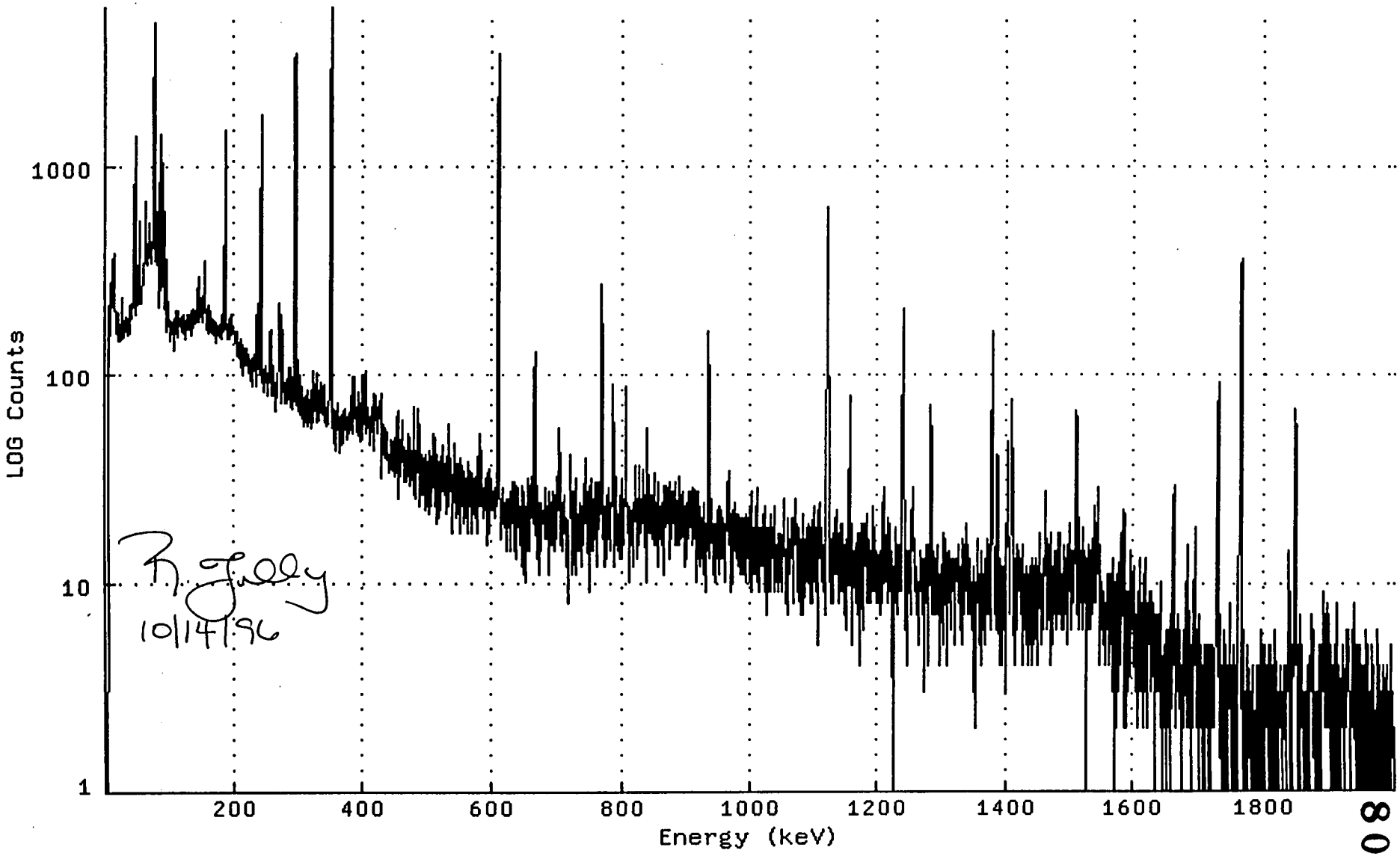


R. Jolly
10/21/96

000963 190

8019

Spectrum : DISK:[RADCHEM.SCUSR.ARCHIVE]CAL_GAMMA6_9157.CNF;1
Title :
Sample Title:
Start Time: 8-OCT-1996 12:27: Sample Time: 4-OCT-1996 00:00: Energy Offset: -1.98761E-01
Real Time : 0 00:10:05.24 Sample ID : BCKGND Energy Slope : 4.88802E-01
Live Time : 0 00:10:00.00 Sample Type: Energy Quad : -1.24008E-07



R. Jolly
10/14/96

VMS Peak Search Report V1.9 Generated 11-OCT-1996 13:57:32

8019

Configuration : DISK:[RADCHEM.SCUSR.ARCHIVE]CAL_GAMMA6_9157.CNF;1
Analyses by : PEAK V16.5,PEAKEFF V2.2
Sample date : 4-OCT-1996 00:00:00 Acquisition date : 8-OCT-1996 12:27:57
Sample ID : BCKGND Sample quantity : 1.0000 G
Detector name : GAMMA6 Detector geometry: TRM1-S3
Elapsed live time: 0 00:10:00.00 Elapsed real time: 0 00:10:05.24 0.9%
Start energy : 0.29 keV End energy : 1999.85 keV
Sensitivity : 5.00 Gaussian : 10.00
Critical level : No

Pk	It	Energy	Area	Bkgnd	FWHM	Channel	%Eff	Cts/Sec	%Err	Fit
1	0	12.89	313	1081	1.06	26.78	2.30E+03	5.22E-01	16.8	
2	0	15.48	468	1144	1.12	32.08	2.44E+02	7.79E-01	12.4	
3	0	26.64	73	1155	0.81	54.91	9.03E+00	1.21E-01	78.3	
4	0	46.45	2618	1773	1.02	95.45	5.24E+00	4.36E+00	3.4	
5	0	49.96	294	1471	1.11	102.63	5.35E+00	4.90E-01	22.4	
6	0	53.19	694	1778	1.03	109.22	5.50E+00	1.16E+00	11.2	
7	0	63.29	628	3113	0.86	129.88	6.06E+00	1.05E+00	16.5	
8	0	67.25	217	3378	0.91	137.99	6.29E+00	3.61E-01	48.8	
9	3	74.75	4955	2324	0.97	153.34	6.70E+00	8.26E+00	2.1	1.21E+01
10	3	77.04	8389	2598	0.92	158.02	6.82E+00	1.40E+01	1.5	
11	4	83.76	1375	1316	1.01	171.77	7.14E+00	2.29E+00	4.9	1.75E+00
12	4	87.17	3119	1638	1.23	178.75	7.28E+00	5.20E+00	2.9	
13	4	89.81	1258	1358	1.21	184.16	7.38E+00	2.10E+00	6.0	
14	4	92.57	981	1295	1.08	189.79	7.47E+00	1.63E+00	7.1	
15	4	94.70	428	1075	1.03	194.15	7.54E+00	7.14E-01	13.8	
16	0	144.04	199	1553	1.01	295.11	7.80E+00	3.31E-01	35.1	
17	0	154.20	459	1862	0.97	315.90	7.65E+00	7.66E-01	18.2	
18	0	186.15	3217	1773	1.11	381.28	6.97E+00	5.36E+00	3.1	
19	0	235.89	316	886	1.40	483.06	5.79E+00	5.27E-01	17.2	
[illegible]	0	242.03	3882	1130	1.07	495.62	5.66E+00	6.47E+00	2.3	
[illegible]	0	256.26	100	677	0.96	524.73	5.35E+00	1.67E-01	44.4	
22	0	259.12	180	678	1.02	530.60	5.29E+00	3.00E-01	26.1	
23	2	269.50	379	647	1.29	551.82	5.09E+00	6.32E-01	13.1	1.09E+00
24	2	271.31	266	508	0.96	555.54	5.05E+00	4.43E-01	15.0	
25	0	274.51	199	706	1.00	562.09	4.99E+00	3.32E-01	24.1	
26	0	295.27	8815	908	1.19	604.57	4.61E+00	1.47E+01	1.3	
27	0	351.98	14802	920	1.19	720.63	3.78E+00	2.47E+01	0.9	
28	0	404.69	179	1055	4.47	828.51	3.21E+00	2.98E-01	42.4	
29	0	455.10	99	265	1.23	931.69	2.81E+00	1.65E-01	30.5	
30	0	480.68	129	302	1.26	984.04	2.64E+00	2.15E-01	26.7	
31	0	487.62	141	328	1.73	998.25	2.60E+00	2.35E-01	26.5	
32	0	579.79	101	239	1.65	1186.91	2.16E+00	1.68E-01	30.2	
33	0	609.43	10399	346	1.41	1247.58	2.06E+00	1.73E+01	1.1	
34	0	665.73	332	225	1.39	1362.84	1.89E+00	5.53E-01	10.7	
35	0	702.92	98	243	1.05	1438.97	1.81E+00	1.63E-01	33.5	
36	0	719.49	61	187	1.28	1472.91	1.77E+00	1.01E-01	43.8	
37	0	768.44	893	305	1.62	1573.13	1.68E+00	1.49E+00	5.5	
38	0	785.82	275	235	1.67	1608.71	1.65E+00	4.59E-01	13.2	
39	0	806.67	269	270	1.66	1651.40	1.62E+00	4.49E-01	15.0	
40	0	839.11	101	220	1.40	1717.82	1.58E+00	1.68E-01	30.1	
41	0	934.08	527	192	1.40	1912.29	1.48E+00	8.78E-01	7.1	
42	0	1120.26	2208	221	1.67	2293.58	1.35E+00	3.68E+00	2.6	
43	0	1154.97	279	111	1.71	2364.69	1.33E+00	4.64E-01	9.7	
44	0	1237.96	781	120	1.80	2534.68	1.30E+00	1.30E+00	4.6	

Sample ID : BCKGND Acquisition date : 8-OCT-1996 12:27:57

8019

Pk	It	Energy	Area	Bkgnd	FWHM	Channel	%Eff	Cts/Sec	%Err	Fit
45	0	1280.97	209	110	1.35	2622.78	1.28E+00	3.49E-01	12.9	
46	0	1377.49	638	113	1.96	2820.52	1.25E+00	1.06E+00	5.4	
[illegible]	0	1385.68	119	121	1.55	2837.30	1.25E+00	1.98E-01	21.8	
48	0	1401.23	173	108	2.01	2869.16	1.24E+00	2.88E-01	14.9	
49	0	1407.87	337	102	2.11	2882.77	1.24E+00	5.61E-01	8.6	
50	0	1509.30	317	127	2.38	3090.58	1.21E+00	5.29E-01	9.9	
51	0	1542.20	117	203	5.73	3158.00	1.20E+00	1.96E-01	31.8	
52	0	1583.14	108	44	2.60	3241.90	1.19E+00	1.80E-01	15.7	
53	0	1661.23	106	90	2.11	3401.91	1.17E+00	1.77E-01	23.4	
54	0	1729.49	430	41	2.02	3541.80	1.15E+00	7.16E-01	6.1	
55	0	1764.42	1772	14	2.22	3613.39	1.14E+00	2.95E+00	2.4	
56	0	1847.60	275	19	1.82	3783.89	1.12E+00	4.58E-01	7.2	

VMS Calibration Report V1.5 Generated 11-OCT-1996 13:57:33

8019

Configuration : DISK:[RADCHEM.SCUSR.ARCHIVE]CAL_GAMMA6_9157.CNF;1
Analyses by : CALIBRATE V1.7,PEAK V16.5,PEAKEFF V2.2
Detector Name : Energy Calib Time: 8-OCT-1996 12:40:20
Efficiency type : Empirical Effncy Calib Time: 19-SEP-1996 13:34:28
Detector Geometry: TRM1-S3 Shelf :

Energy Calibration Report

Energy = -0.1988 + 0.4888*Channel + -1.2401E-07*(Channel**2)

Nbr	Centroid Channel	True Energy	Computed Energy	Difference
1	95.45	46.50	46.45	0.049
2	153.34	74.81	74.75	0.066
3	158.02	77.11	77.04	0.067
4	381.28	186.21	186.15	0.059
5	604.57	295.21	295.27	-0.059
6	720.63	351.92	351.98	-0.062
7	1247.58	609.31	609.43	-0.114
8	1362.84	665.45	665.73	-0.277
9	1573.13	768.36	768.44	-0.085
10	1912.29	934.06	934.08	-0.017
11	2293.58	1120.29	1120.26	0.031
12	2364.69	1155.19	1154.97	0.216
13	2534.68	1238.11	1237.96	0.149
14	2622.78	1280.96	1280.97	-0.011
15	2820.52	1377.67	1377.49	0.177
16	2882.77	1407.98	1407.87	0.107
17	3090.58	1509.23	1509.30	-0.072
18	3401.91	1661.00	1661.23	-0.228
[illegible]	3541.80	1729.59	1729.49	0.108
[illegible]	3613.39	1764.49	1764.42	0.077
21	3783.89	1847.42	1847.60	-0.180

FWHM Calibration Report

FWHM = 0.6371 + 3.3208E-02*(Energy**1/2)

Nbr	Energy	True FWHM	Computed FWHM	Difference
1	46.50	1.02	0.86	0.159
2	74.81	0.97	0.92	0.042
3	77.11	0.92	0.93	-0.006
4	186.21	1.11	1.09	0.024
5	295.21	1.19	1.21	-0.017
6	351.92	1.19	1.26	-0.067
7	609.31	1.41	1.46	-0.051
8	665.45	1.39	1.49	-0.108
9	768.36	1.62	1.56	0.062
10	934.06	1.40	1.65	-0.249
11	1120.29	1.67	1.75	-0.082
12	1155.19	1.71	1.77	-0.056

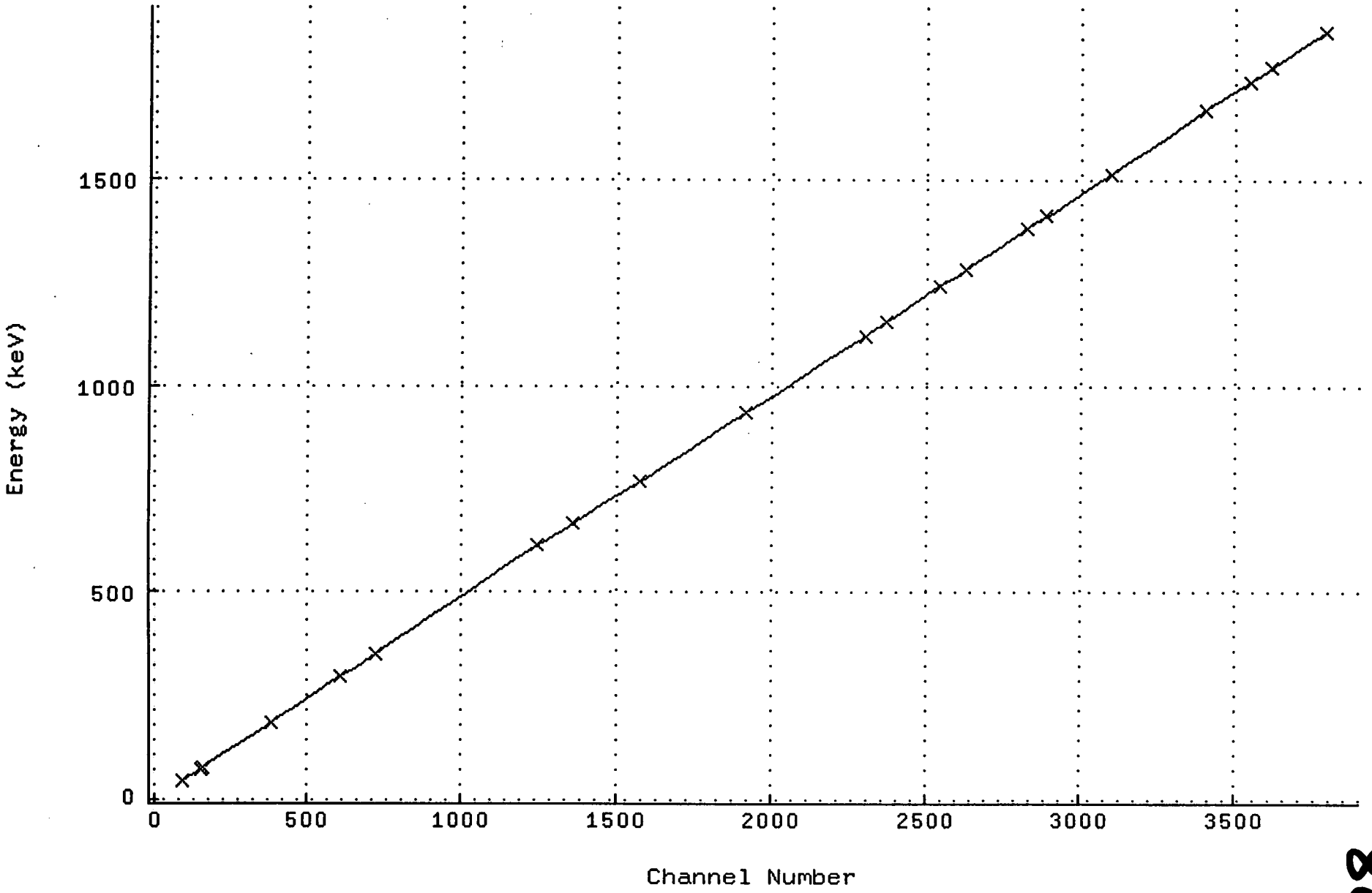
Sample ID : BCKGND Acquisition date : 8-OCT-1996 12:27:57

8019

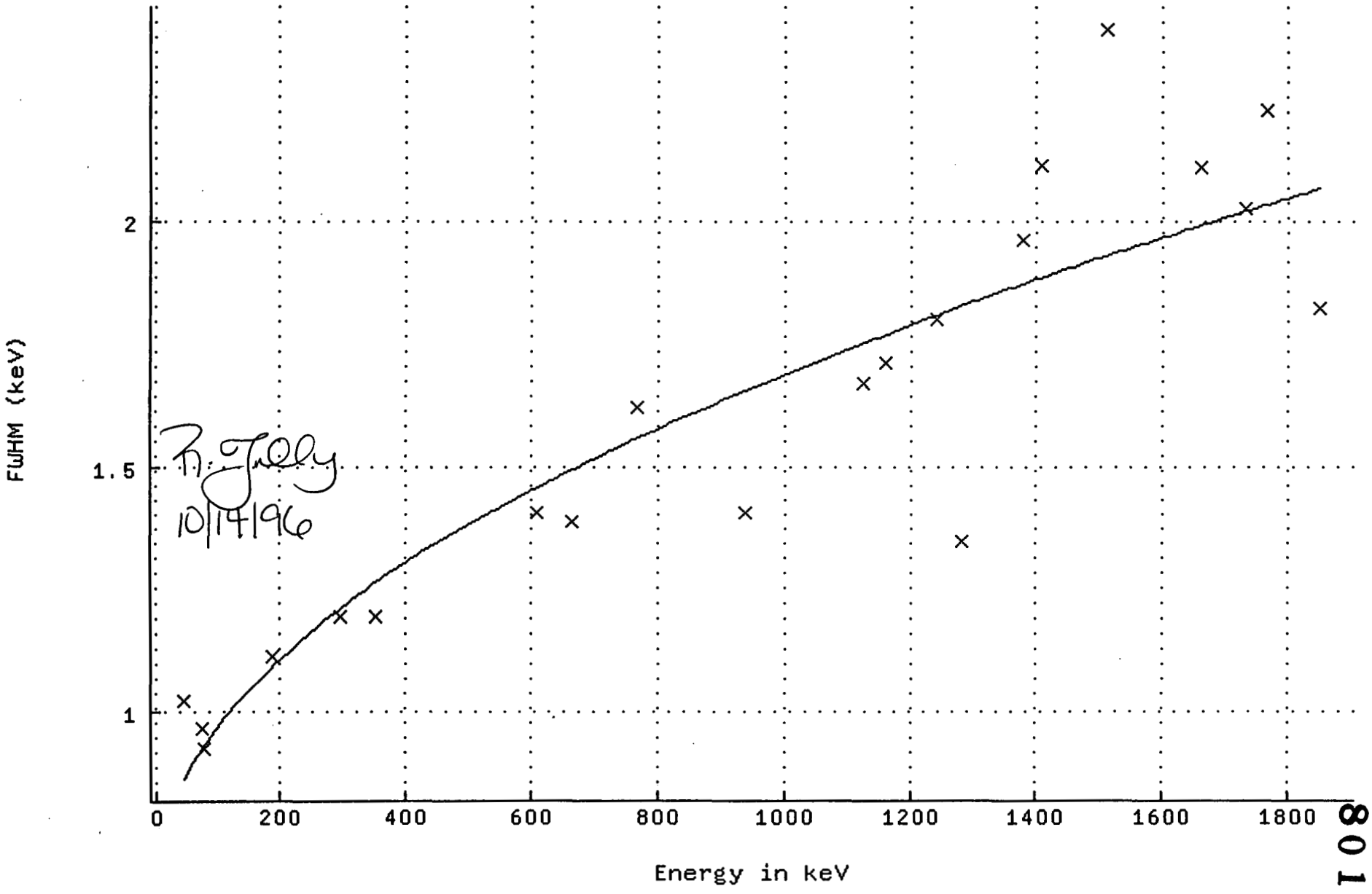
Nbr	Energy	True FWHM	Computed FWHM	Difference
13	1238.11	1.80	1.81	-0.006
	1280.96	1.34	1.83	-0.481
	1377.67	1.96	1.87	0.090
16	1407.98	2.11	1.88	0.226
17	1509.23	2.38	1.93	0.455
18	1661.00	2.11	1.99	0.116
19	1729.59	2.02	2.02	0.005
20	1764.49	2.22	2.03	0.188
21	1847.42	1.82	2.06	-0.245

Approved by: _____ Approval Date: __ / __ / ____

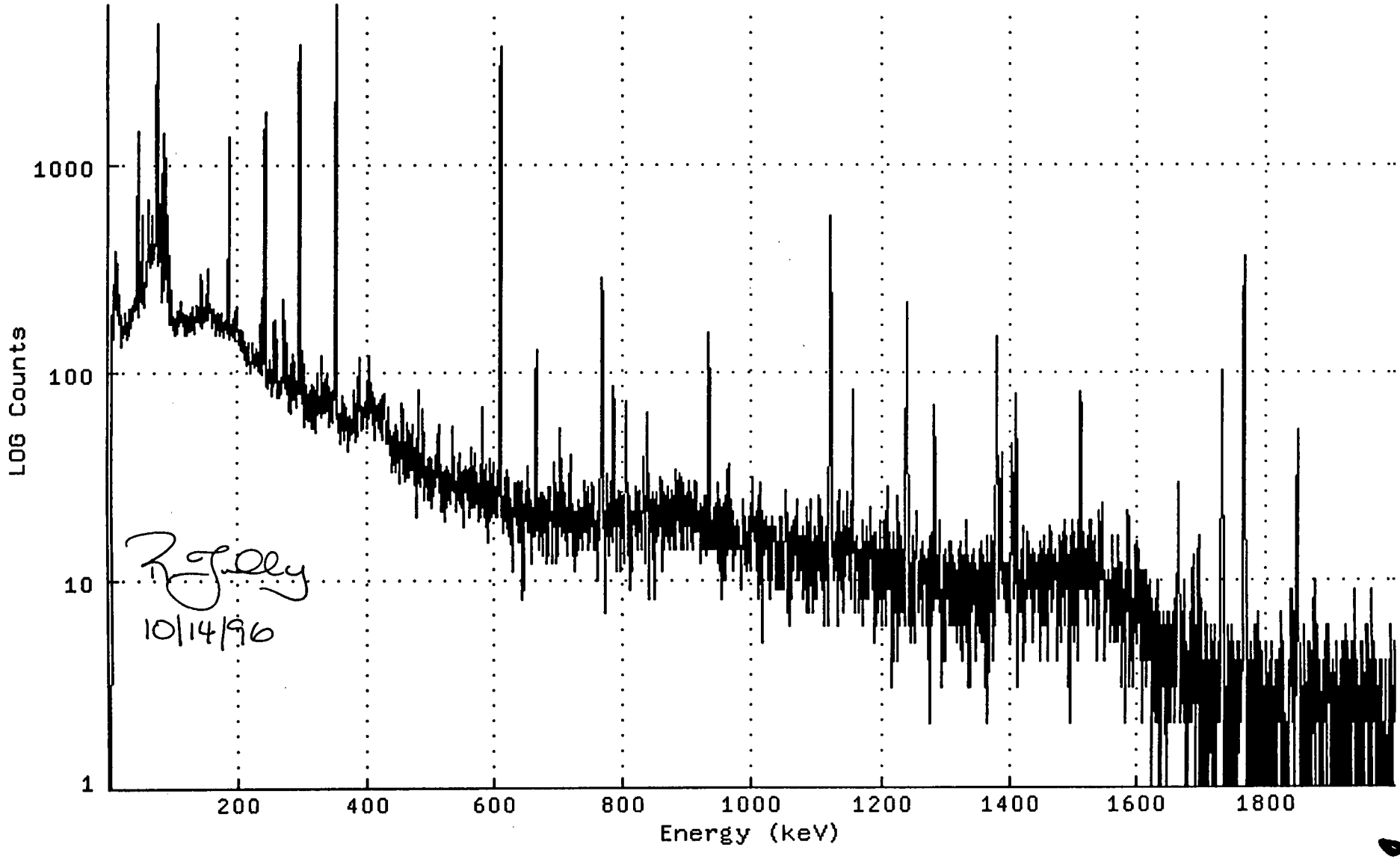
Spectrum : DISK:[RADCHEM.SCUSR.ARCHIVE]CAL_GAMMA6_9157.CNF;1
Calib Date: 8-OCT-1996 12:40:
Detector : GAMMA6 Geometry: TRM1-S3
Energy = -0.199 + 0.4888 * ch + -1.2401E-07 * ch**2



Spectrum : DISK:[RADCHEM.SCUSR.ARCHIVE]CAL_GAMMA6_9157.CNF;1
Calib Date: 8-OCT-1996 12:40:
Detector : GAMMA6 Geometry: TRM1-S3
FWHM = 0.637 + 0.03321 * SQRT(Energy)



Spectrum : DISK:[RADCHEM.SCUSR.ARCHIVE]CAL_GAMMA6_9219.CNF;1
Title :
Sample Title:
Start Time: 14-OCT-1996 09:16 Sample Time: 1-JAN-1900 00:00: Energy Offset: -1.75400E-01
Real Time : 0 00:10:05.27 Sample ID : 96E04566 Energy Slope : 4.88511E-01
Live Time : 0 00:10:00.00 Sample Type: Energy Quad : -9.43914E-08



R. Gilly
10/14/96

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VMS Peak Search Report V1.9 Generated 14-OCT-1996 16:11:19

8019

Configuration : DISK:[RADCHEM.SCUSR.ARCHIVE]CAL_GAMMA6_9219.CNF;1
Analyses by : PEAK V16.5,PEAKEFF V2.2
Sample date : 1-JAN-1900 00:00:00 Acquisition date : 14-OCT-1996 09:16:58
Sample ID : 96E04566 Sample quantity : 1.0000 L
Detector name : GAMMA6 Detector geometry: IPL-1L
Elapsed live time: 0 00:10:00.00 Elapsed real time: 0 00:10:05.27 0.9%
Start energy : 0.31 keV End energy : 1999.18 keV
Sensitivity : 5.00 Gaussian : 10.00
Critical level : No

Pk	It	Energy	Area	Bkgnd	FWHM	Channel	%Eff	Cts/Sec	%Err	Fit
1	0	13.06	231	1337	0.79	27.10	5.23E+00	3.85E-01	26.0	
2	0	15.51	396	1234	1.54	32.10	5.45E+00	6.61E-01	14.9	
3	0	46.50	2788	1832	1.02	95.54	5.87E+00	4.65E+00	3.4	
4	4	50.07	404	1193	1.38	102.85	5.83E+00	6.74E-01	14.6	8.22E-01
5	4	53.17	689	1062	0.90	109.20	5.79E+00	1.15E+00	8.0	
6	0	63.18	778	3343	0.89	129.69	5.65E+00	1.30E+00	14.4	
7	0	67.45	458	2707	0.70	138.43	5.59E+00	7.63E-01	20.2	
8	3	74.79	4903	2335	0.95	153.46	5.48E+00	8.17E+00	2.1	6.99E+00
9	3	77.07	8363	2510	0.92	158.12	5.44E+00	1.39E+01	1.5	
10	0	81.09	228	2628	2.62	166.36	5.38E+00	3.80E-01	39.3	
11	0	83.78	1212	1558	0.89	171.86	5.34E+00	2.02E+00	5.9	
12	0	87.10	2454	2169	1.13	178.67	5.29E+00	4.09E+00	3.7	
13	0	89.86	845	1572	0.99	184.32	5.25E+00	1.41E+00	8.2	
14	0	92.39	511	1449	1.00	189.50	5.21E+00	8.51E-01	11.7	
15	0	94.78	347	1072	1.13	194.38	5.18E+00	5.78E-01	15.5	
16	0	97.83	229	1206	1.43	200.63	5.13E+00	3.81E-01	26.1	
17	0	144.19	372	1579	1.19	295.55	4.51E+00	6.19E-01	20.0	
18	0	154.35	243	1554	0.83	316.34	4.39E+00	4.05E-01	28.8	
19	0	186.14	3128	1762	1.13	381.42	4.05E+00	5.21E+00	3.2	
[illegible]	0	235.91	290	989	1.07	483.32	3.61E+00	4.83E-01	20.5	
[illegible]	0	242.05	4009	1238	1.16	495.90	3.57E+00	6.68E+00	2.4	
22	1	256.15	208	716	1.22	524.76	3.46E+00	3.47E-01	23.1	1.74E+00
23	1	259.08	241	612	1.19	530.76	3.44E+00	4.02E-01	18.2	
24	2	269.53	325	625	1.08	552.15	3.37E+00	5.42E-01	14.1	5.45E+00
25	2	271.35	234	704	1.26	555.88	3.35E+00	3.90E-01	21.8	
26	0	295.27	8787	1018	1.15	604.86	3.20E+00	1.46E+01	1.3	
27	0	299.95	145	404	1.20	614.44	3.17E+00	2.42E-01	23.4	
28	0	330.06	81	536	0.53	676.10	2.99E+00	1.34E-01	51.1	
29	0	351.96	14977	926	1.26	720.94	2.88E+00	2.50E+01	0.9	
30	0	401.81	122	359	0.89	823.01	2.64E+00	2.04E-01	26.1	
31	0	454.74	72	321	1.26	931.40	2.43E+00	1.20E-01	44.6	
32	0	480.75	113	267	1.02	984.65	2.34E+00	1.88E-01	26.8	
33	0	486.82	135	299	1.26	997.08	2.32E+00	2.24E-01	25.6	
34	0	510.61	64	279	1.44	1045.82	2.24E+00	1.06E-01	48.9	
35	0	580.38	97	230	1.21	1188.69	2.04E+00	1.62E-01	30.0	
36	0	609.38	10348	355	1.39	1248.09	1.96E+00	1.72E+01	1.1	
37	0	665.52	337	233	1.34	1363.07	1.83E+00	5.61E-01	11.1	
38	0	703.40	150	232	1.78	1440.65	1.75E+00	2.50E-01	22.5	
39	0	719.72	60	201	2.68	1474.06	1.72E+00	1.01E-01	45.6	
40	0	768.38	960	276	1.53	1573.74	1.63E+00	1.60E+00	5.1	
41	0	786.21	235	236	1.50	1610.27	1.60E+00	3.92E-01	15.3	
42	0	805.93	201	214	1.49	1650.65	1.57E+00	3.35E-01	16.6	
43	0	839.12	187	173	1.34	1718.64	1.51E+00	3.12E-01	15.9	
44	0	934.11	530	234	1.72	1913.22	1.38E+00	8.83E-01	7.5	

Sample ID : 96E04566 Acquisition date : 14-OCT-1996 09:16:58

8019

Pk	It	Energy	Area	Bkgnd	FWHM	Channel	%Eff	Cts/Sec	%Err	Fit
45	0	1120.20	2199	185	1.80	2294.47	1.17E+00	3.66E+00	2.5	
46	0	1133.34	65	95	1.76	2321.39	1.15E+00	1.08E-01	30.7	
[illegible]	0	1155.21	247	138	1.71	2366.19	1.13E+00	4.11E-01	11.3	
48	0	1208.09	92	114	1.39	2474.54	1.09E+00	1.53E-01	26.6	
49	0	1224.85	31	54	0.72	2508.89	1.07E+00	5.21E-02	42.6	
50	0	1238.16	831	180	1.78	2536.17	1.06E+00	1.39E+00	5.3	
51	0	1280.97	214	121	1.31	2623.88	1.03E+00	3.57E-01	12.6	
52	0	1377.54	555	147	1.83	2821.77	9.57E-01	9.25E-01	6.3	
53	0	1385.31	114	116	1.65	2837.69	9.51E-01	1.91E-01	21.1	
54	2	1401.42	172	111	2.11	2870.71	9.41E-01	2.87E-01	14.5	9.82E-01
55	2	1407.86	283	99	2.11	2883.91	9.36E-01	4.72E-01	9.6	
56	0	1508.90	270	147	1.41	3090.97	8.73E-01	4.50E-01	11.6	
57	0	1661.38	113	49	1.76	3403.51	7.91E-01	1.88E-01	16.2	
58	0	1729.75	377	57	1.66	3543.64	7.58E-01	6.28E-01	6.9	
59	0	1764.45	1701	56	2.19	3614.77	7.43E-01	2.83E+00	2.7	
60	0	1847.30	265	17	1.80	3784.60	7.07E-01	4.42E-01	7.1	
61	0	1874.82	74	7	6.76	3841.03	6.96E-01	1.24E-01	14.8	

VMS Calibration Report V1.5 Generated 14-OCT-1996 16:11:20

8019

Configuration : DISK:[RADCHEM.SCUSR.ARCHIVE]CAL_GAMMA6_9219.CNF;1
Analyses by : CALIBRATE V1.7,PEAK V16.5,PEAKEFF V2.2
Detector Name : GAMMA6 Energy Calib Time: 14-OCT-1996 09:29:23
Efficiency type : Empirical Effncy Calib Time: 19-SEP-1996 11:47:06
Detector Geometry: IPL-1L Shelf :

Energy Calibration Report

Energy = -0.1754 + 0.4885*Channel + -9.4391E-08*(Channel**2)

Nbr	Centroid Channel	True Energy	Computed Energy	Difference
1	95.54	46.50	46.50	0.007
2	153.47	74.81	74.79	0.022
3	158.12	77.11	77.07	0.041
4	381.42	186.21	186.14	0.073
5	604.86	295.21	295.27	-0.059
6	720.94	351.92	351.96	-0.042
7	1248.09	609.31	609.38	-0.070
8	1363.07	665.45	665.52	-0.071
9	1573.74	768.36	768.38	-0.023
10	1913.22	934.06	934.11	-0.048
11	2294.47	1120.29	1120.20	0.084
12	2366.19	1155.19	1155.21	-0.016
13	2536.17	1238.11	1238.16	-0.054
14	2623.88	1280.96	1280.97	-0.011
15	2821.77	1377.67	1377.54	0.131
16	2883.91	1407.98	1407.86	0.119
17	3090.97	1509.23	1508.90	0.333
18	3403.51	1661.00	1661.38	-0.383
19	3543.70	1729.59	1729.78	-0.184
20	3614.78	1764.49	1764.45	0.043
21	3784.64	1847.42	1847.31	0.108

FWHM Calibration Report

FWHM = 0.7579 + 2.6279E-02*(Energy**1/2)

Nbr	Energy	True FWHM	Computed FWHM	Difference
1	46.50	1.02	0.94	0.083
2	74.81	0.95	0.99	-0.037
3	77.11	0.92	0.99	-0.068
4	186.21	1.13	1.12	0.016
5	295.21	1.15	1.21	-0.060
6	351.92	1.27	1.25	0.014
7	609.31	1.39	1.41	-0.019
8	665.45	1.34	1.44	-0.098
9	768.36	1.53	1.49	0.040
10	934.06	1.72	1.56	0.157
11	1120.29	1.80	1.64	0.163
12	1155.19	1.71	1.65	0.061

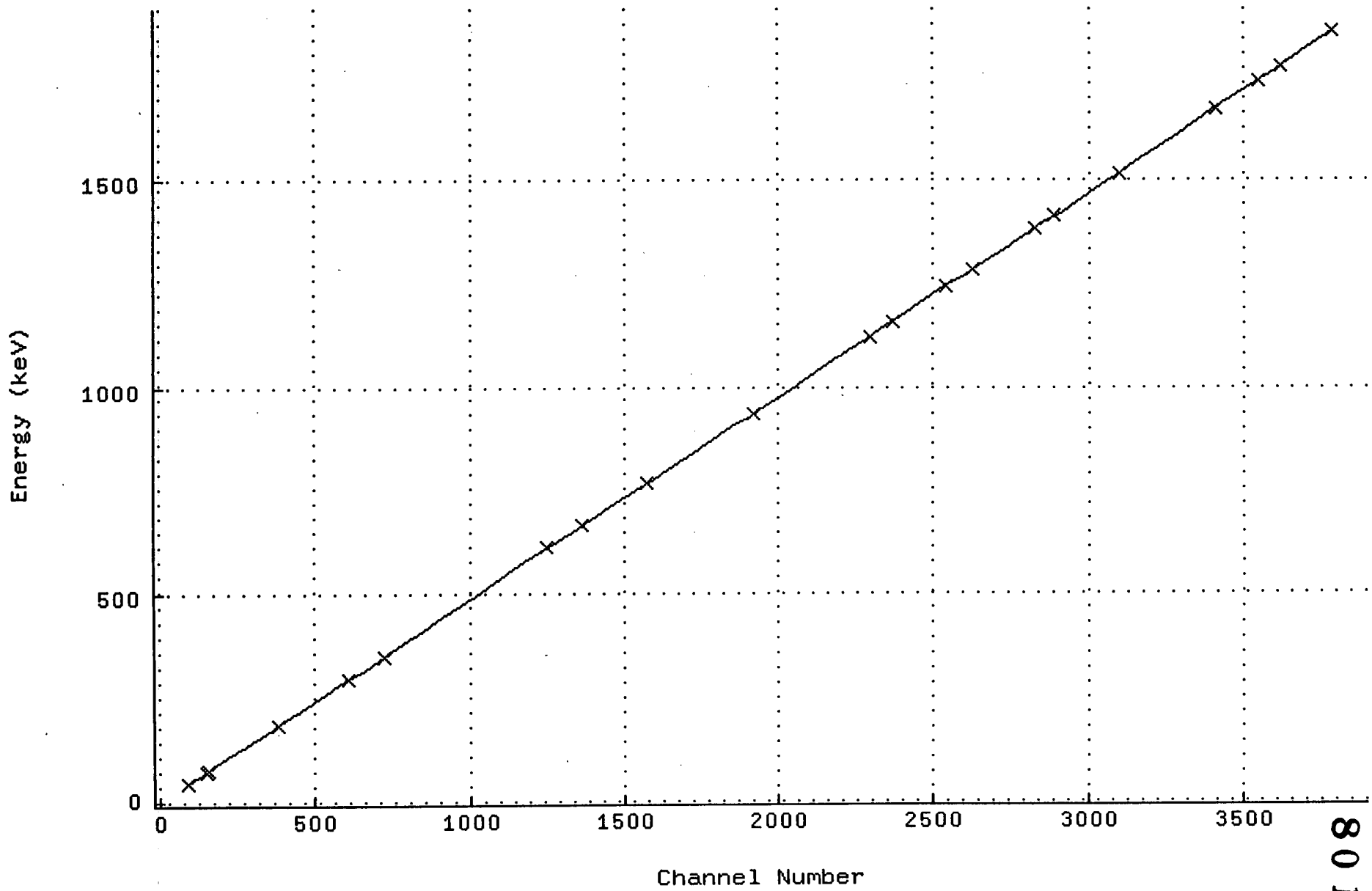
Sample ID : 96E04566 Acquisition date : 14-OCT-1996 09:16:58

8019

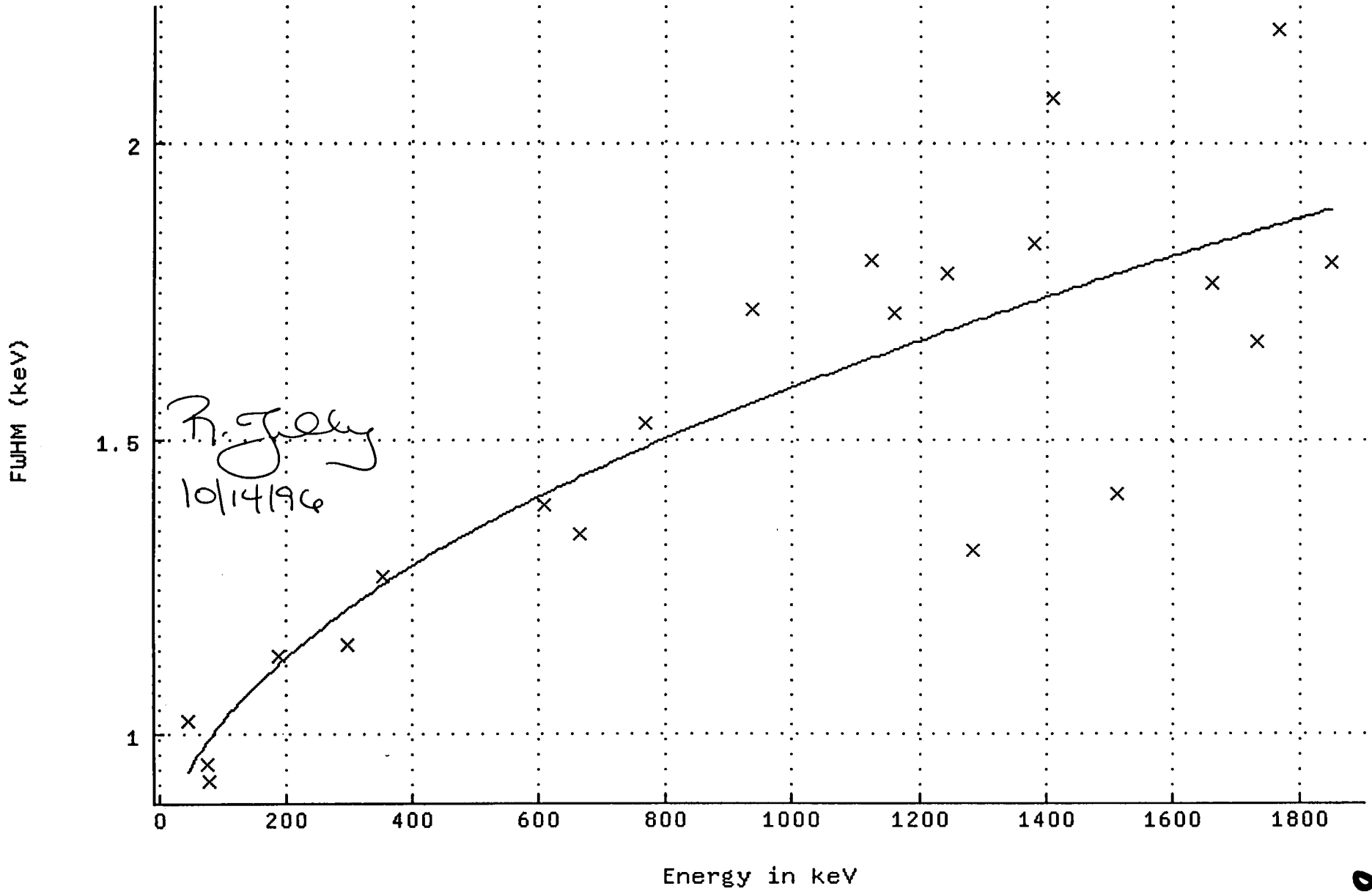
Nbr	Energy	True FWHM	Computed FWHM	Difference
13	1238.11	1.78	1.68	0.097
14	1280.96	1.31	1.70	-0.391
15	1377.67	1.83	1.73	0.097
16	1407.98	2.07	1.74	0.328
17	1509.23	1.41	1.78	-0.372
18	1661.00	1.76	1.83	-0.064
19	1729.59	1.66	1.85	-0.187
20	1764.49	2.19	1.86	0.327
21	1847.42	1.80	1.89	-0.088

Approved by: _____ Approval Date: __ / __ / ____

Spectrum : DISK:[RADCHEM.SCUSR.ARCHIVE]CAL_GAMMA6_9219.CNF;1
Calib Date: 14-OCT-1996 09:29
Detector : GAMMA6 Geometry: IPL-1L
Energy = -0.175 + 0.4885 * ch + -9.4391E-08 * ch**2



Spectrum : DISK:[RADCHEM.SCUSR.ARCHIVE]CAL_GAMMA6_9219.CNF;1
Calib Date: 14-OCT-1996 09:29
Detector : GAMMA6 Geometry: IPL-1L
FWHM = 0.758 + 0.02628 * SQRT(Energy)



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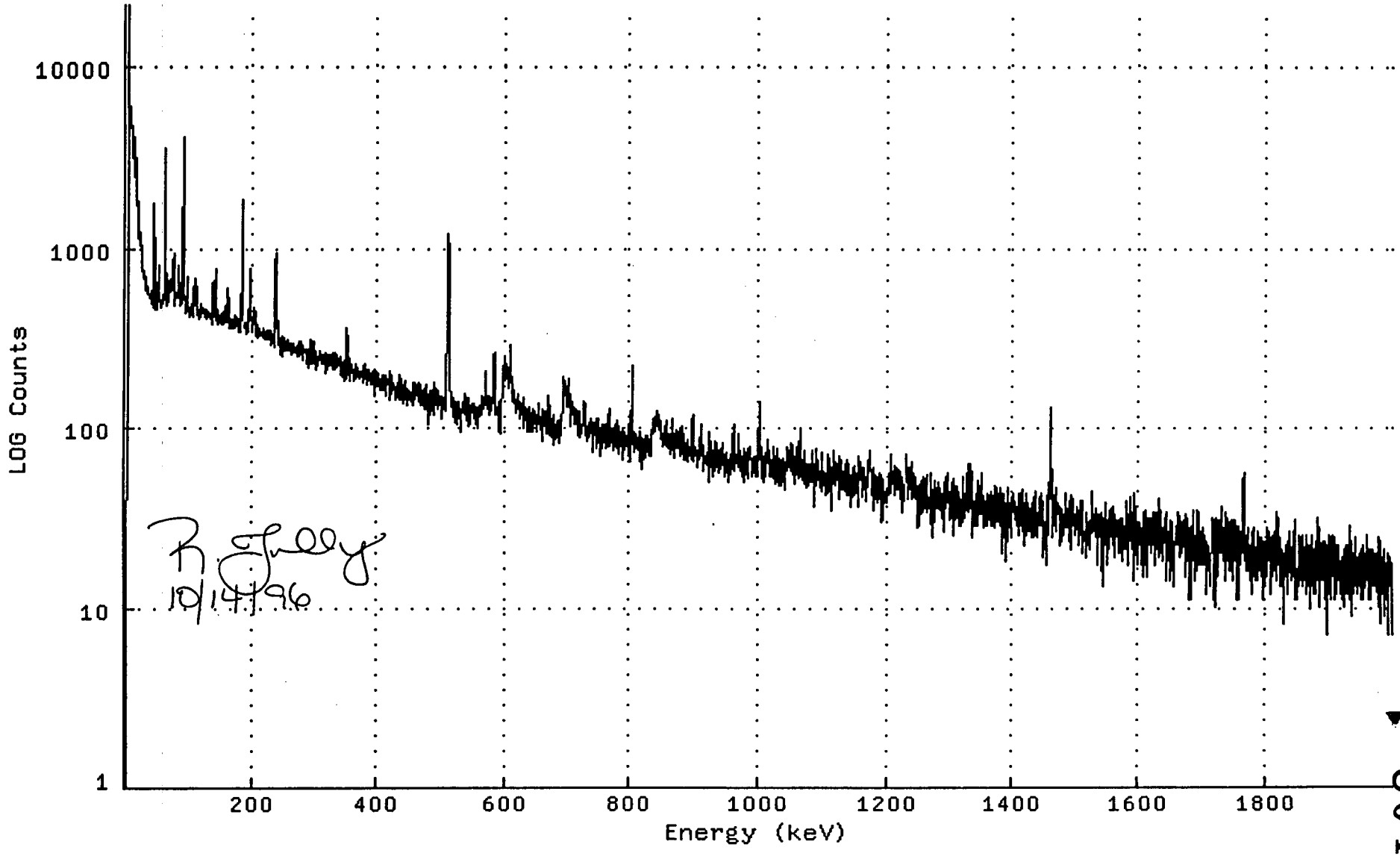
Spectrum : DISK:[RADCHEM.SCUSR.ARCHIVE]BKG_BCKGND_GAMMA6__9144.CNF;1
Title :
Sample Title:
Start Time: 4-OCT-1996 18:21: Sample Time: 4-OCT-1996 00:00: Energy Offset: -1.23202E-01
Real Time : 2 02:00:29.45 Sample ID : BCKGND Energy Slope : 4.88539E-01
Live Time : 2 02:00:00.00 Sample Type: Energy Quad : -8.96482E-08



VMS Peak Search Report V1.9 Generated 11-OCT-1996 13:58:11

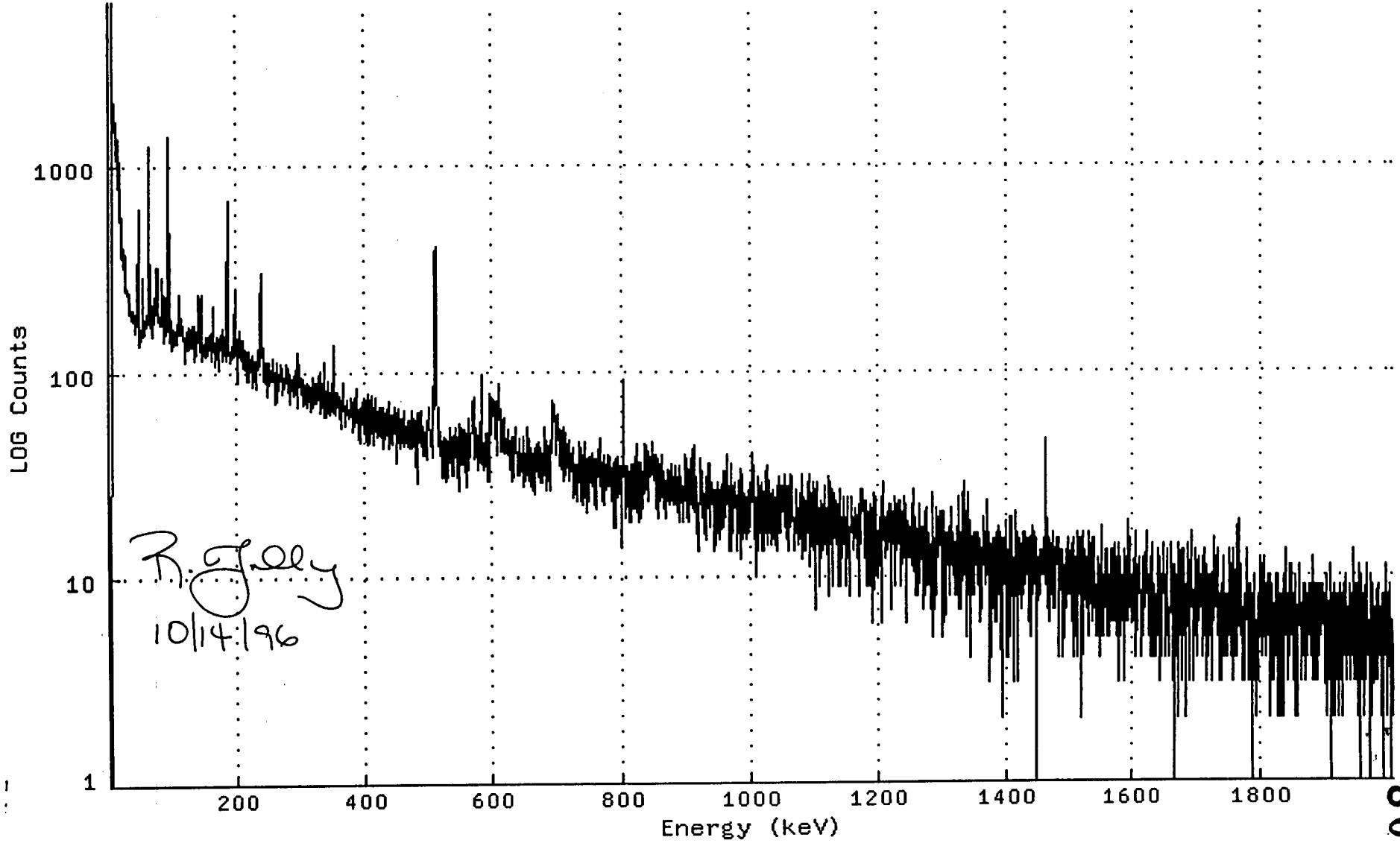
8019

Configuration : DISK:[RADCHEM.SCUSR.ARCHIVE]BKG_BCKGND_GAMMA6__9144.CNF;1
Analyses by : PEAK V16.5,PEAKEFF V2.2
Sample date : 4-OCT-1996 00:00:00 Acquisition date : 4-OCT-1996 18:21:18
Sample ID : BCKGND Sample quantity : 1.0000 G
Detector name : GAMMA6 Detector geometry: TRM1-S3
Elapsed live time: 2 02:00:00.00 Elapsed real time: 2 02:00:29.45 0.0%
Start energy : 0.37 keV End energy : 1999.43 keV
Sensitivity : 5.00 Gaussian : 10.00
Critical level : No

Pk	It	Energy	Area	Bkgnd	FWHM	Channel	%Eff	Cts/Sec	%Err	Fit
1	0	10.31	4650	23581	0.99	21.37	1.07E+05	2.58E-02	5.4	
2	4	13.10	3782	8752	0.88	27.07	1.83E+03	2.10E-02	3.5	6.65E-01
3	4	16.24	5522	14567	1.15	33.50	1.52E+02	3.07E-02	4.1	
4	0	19.50	1635	8409	1.62	40.16	3.62E+01	9.08E-03	9.3	
5	0	25.54	312	5600	0.86	52.53	1.02E+01	1.73E-03	38.6	
6	0	46.59	2743	4367	1.01	95.62	5.24E+00	1.52E-02	4.7	
7	0	53.57	608	4119	1.10	109.90	5.52E+00	3.38E-03	18.7	
8	0	63.33	5851	4242	0.89	129.88	6.06E+00	3.25E-02	2.3	
9	0	66.27	434	3647	1.07	135.89	6.23E+00	2.41E-03	23.6	
10	0	74.71	387	3737	0.90	153.19	6.70E+00	2.15E-03	25.5	
11	0	77.10	716	3235	0.91	158.08	6.82E+00	3.98E-03	13.2	
12	0	84.07	939	4528	1.17	172.34	7.15E+00	5.22E-03	13.3	
13	0	87.11	255	3002	1.06	178.56	7.28E+00	1.42E-03	34.5	
14	0	92.68	8662	4490	1.15	189.96	7.48E+00	4.81E-02	1.8	
15	0	98.45	403	3128	0.67	201.79	7.65E+00	2.24E-03	23.5	
16	7	110.09	994	5123	1.93	225.60	7.87E+00	5.52E-03	14.9	2.35E+00
17	7	112.93	511	3026	1.14	231.42	7.90E+00	2.84E-03	18.5	
18	0	139.98	660	3279	1.12	286.79	7.85E+00	3.67E-03	15.5	
19	0	143.85	766	3282	0.98	294.73	7.80E+00	4.26E-03	13.4	
[illegible]	0	163.53	543	3010	1.01	335.01	7.47E+00	3.01E-03	18.1	
[illegible]	0	185.82	3757	3802	1.11	380.64	6.98E+00	2.09E-02	3.5	
22	0	197.88	1519	4349	2.03	405.32	6.69E+00	8.44E-03	9.1	
23	0	205.27	364	2837	1.41	420.45	6.51E+00	2.02E-03	25.9	
24	0	238.51	1425	3059	1.17	488.51	5.74E+00	7.92E-03	7.4	
25	0	295.60	150	1965	1.35	605.39	4.61E+00	8.34E-04	51.9	
26	0	351.85	396	1610	1.25	720.55	3.78E+00	2.20E-03	18.2	
27	0	510.92	5903	2795	2.42	1046.27	2.47E+00	3.28E-02	2.5	
28	0	569.76	296	1426	1.68	1166.76	2.20E+00	1.65E-03	25.4	
29	0	583.21	431	1428	1.46	1194.29	2.15E+00	2.39E-03	17.7	
30	0	609.11	415	1634	1.39	1247.34	2.06E+00	2.31E-03	18.9	
31	0	669.74	157	876	1.62	1371.50	1.88E+00	8.74E-04	34.9	
32	10	694.29	708	1889	3.83	1421.77	1.83E+00	3.93E-03	15.0	3.99E+00
33	10	701.21	457	2536	3.84	1435.95	1.81E+00	2.54E-03	29.9	
34	0	802.85	425	888	1.34	1644.13	1.63E+00	2.36E-03	14.4	
35	0	1000.76	326	643	1.90	2049.50	1.42E+00	1.81E-03	16.1	
36	0	1063.81	136	560	1.77	2178.65	1.38E+00	7.53E-04	33.9	
37	0	1460.33	407	435	1.84	2991.07	1.22E+00	2.26E-03	12.2	
38	0	1764.08	137	242	1.92	3613.58	1.14E+00	7.60E-04	24.3	

R. Tully
10/14/96

Spectrum : DISK:[RADCHEM.SCUSR.ARCHIVE]BKG_BCKGND_GAMMA6__9207.CNF;1
Title :
Sample Title:
Start Time: 11-OCT-1996 22:02 Sample Time: 1-JAN-1900 00:00: Energy Offset: -1.98761E-01
Real Time : 0 16:40:09.77 Sample ID : BCKGND Energy Slope : 4.88802E-01
Live Time : 0 16:40:00.00 Sample Type: Energy Quad : -1.24008E-07



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8019

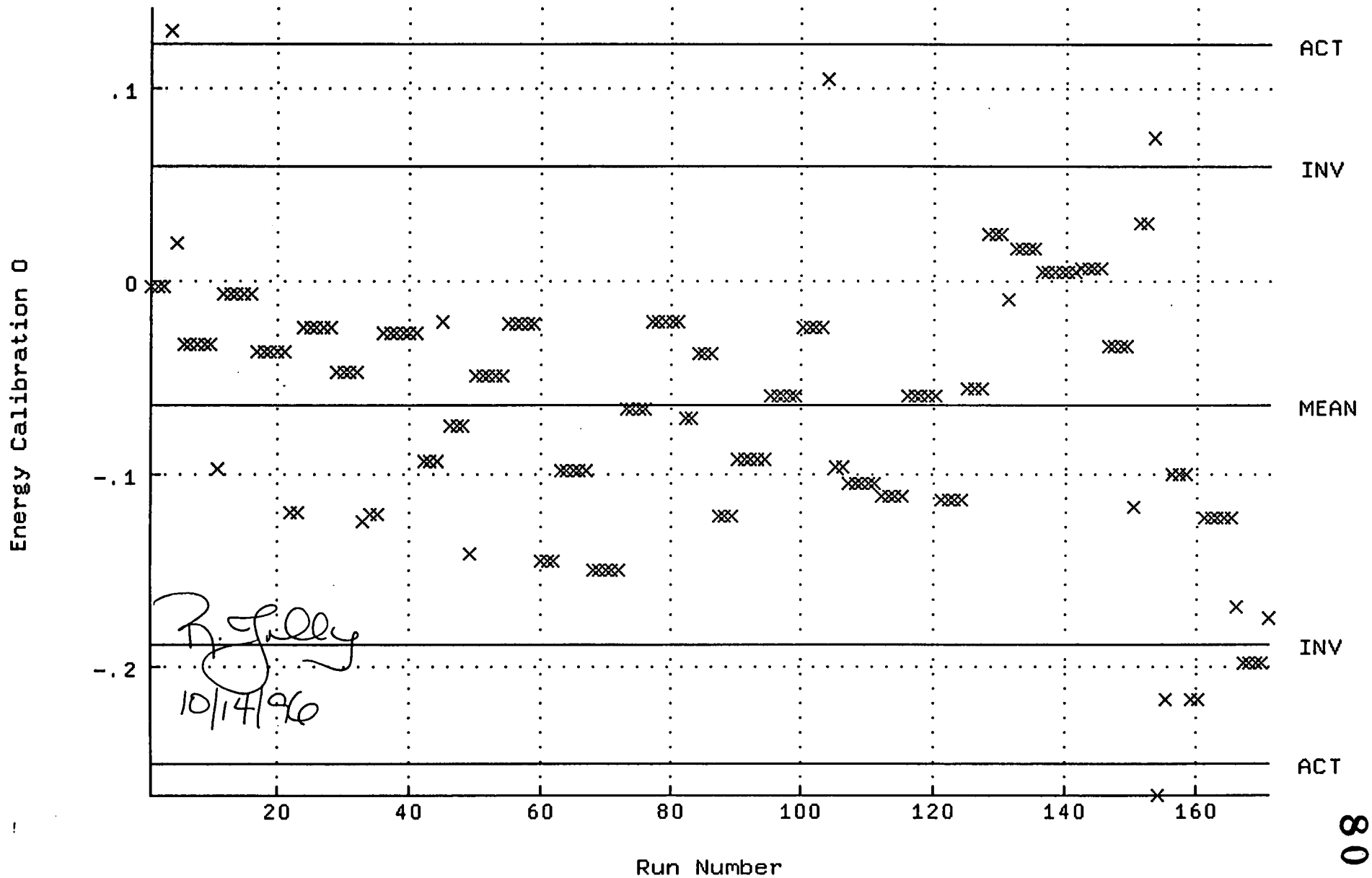
VMS Peak Search Report V1.9 Generated 14-OCT-1996 16:12:09 8019

Configuration : DISK:[RADCHEM.SCUSR.ARCHIVE]BKG_BCKGND_GAMMA6__9207.CNF;1
Analyses by : PEAK V16.5,PEAKEFF V2.2
Sample date : 1-JAN-1900 00:00:00 Acquisition date : 11-OCT-1996 22:02:41
Sample ID : BCKGND Sample quantity : 1.0000 L
Detector name : GAMMA6 Detector geometry: IPL-1L
Elapsed live time: 0 16:40:00.00 Elapsed real time: 0 16:40:09.77 0.0%
Start energy : 0.29 keV End energy : 1999.85 keV
Sensitivity : 5.00 Gaussian : 10.00
Critical level : No

Pk	It	Energy	Area	Bkgnd	FWHM	Channel	%Eff	Cts/Sec	%Err	Fit
1	0	10.30	1435	8131	0.94	21.49	4.88E+00	2.39E-02	10.3	
2	0	13.11	1598	5408	1.08	27.23	5.24E+00	2.66E-02	7.8	
3	0	16.16	1877	4550	1.14	33.48	5.50E+00	3.13E-02	6.5	
4	0	19.32	489	2825	1.12	39.93	5.68E+00	8.16E-03	17.9	
5	0	46.47	1092	1757	1.00	95.48	5.87E+00	1.82E-02	8.1	
6	0	53.49	318	1255	0.95	109.84	5.79E+00	5.30E-03	20.1	
7	0	63.24	1969	1712	0.88	129.79	5.65E+00	3.28E-02	4.4	
8	0	66.38	251	976	1.39	136.22	5.61E+00	4.19E-03	20.7	
9	0	74.61	125	1302	0.63	153.05	5.48E+00	2.08E-03	46.4	
10	0	77.06	243	1345	0.84	158.06	5.44E+00	4.06E-03	25.9	
11	0	83.91	246	1375	0.77	172.09	5.34E+00	4.10E-03	26.9	
12	0	92.78	2705	1751	1.03	190.24	5.21E+00	4.51E-02	3.5	
13	0	110.06	123	1181	0.96	225.57	4.96E+00	2.05E-03	47.1	
14	0	139.64	327	1326	1.16	286.11	4.57E+00	5.45E-03	21.6	
15	0	143.65	214	1132	1.14	294.31	4.52E+00	3.56E-03	28.1	
16	0	163.35	219	1122	0.98	334.62	4.29E+00	3.64E-03	28.4	
17	0	185.87	1288	1399	1.06	380.70	4.06E+00	2.15E-02	6.3	
18	0	198.28	600	1223	1.98	406.10	3.94E+00	1.00E-02	12.0	
19	0	238.78	423	1033	1.02	488.98	3.59E+00	7.04E-03	14.5	
[illegible]	0	352.10	159	596	0.93	720.86	2.88E+00	2.66E-03	28.8	
[illegible]	0	511.22	1963	898	2.64	1046.54	2.24E+00	3.27E-02	4.1	
22	0	583.67	178	385	1.64	1194.85	2.03E+00	2.97E-03	22.1	
23	0	803.54	130	310	1.08	1644.99	1.57E+00	2.17E-03	26.8	
24	0	1002.71	19	311	1.88	2052.83	1.29E+00	3.21E-04	184.6	
25	0	1461.46	98	143	1.20	2992.55	9.02E-01	1.63E-03	27.1	

R. Jolly
10/14/96

QA filename : DISK:[RADCHEM.SCUSR.QA]QCC_GAMMA6_CZ588.QAF;1
Parameter Name : ECOFFSET (Energy Calibration Offset)
Start/End Dates : 16-JAN-1996 08:28:41 through 14-OCT-1996 10:25:14
Mean +- Std Dev : -6.367166E-02 +- 6.243657E-02 (-98.06 %)



R. Gilly
10/14/96

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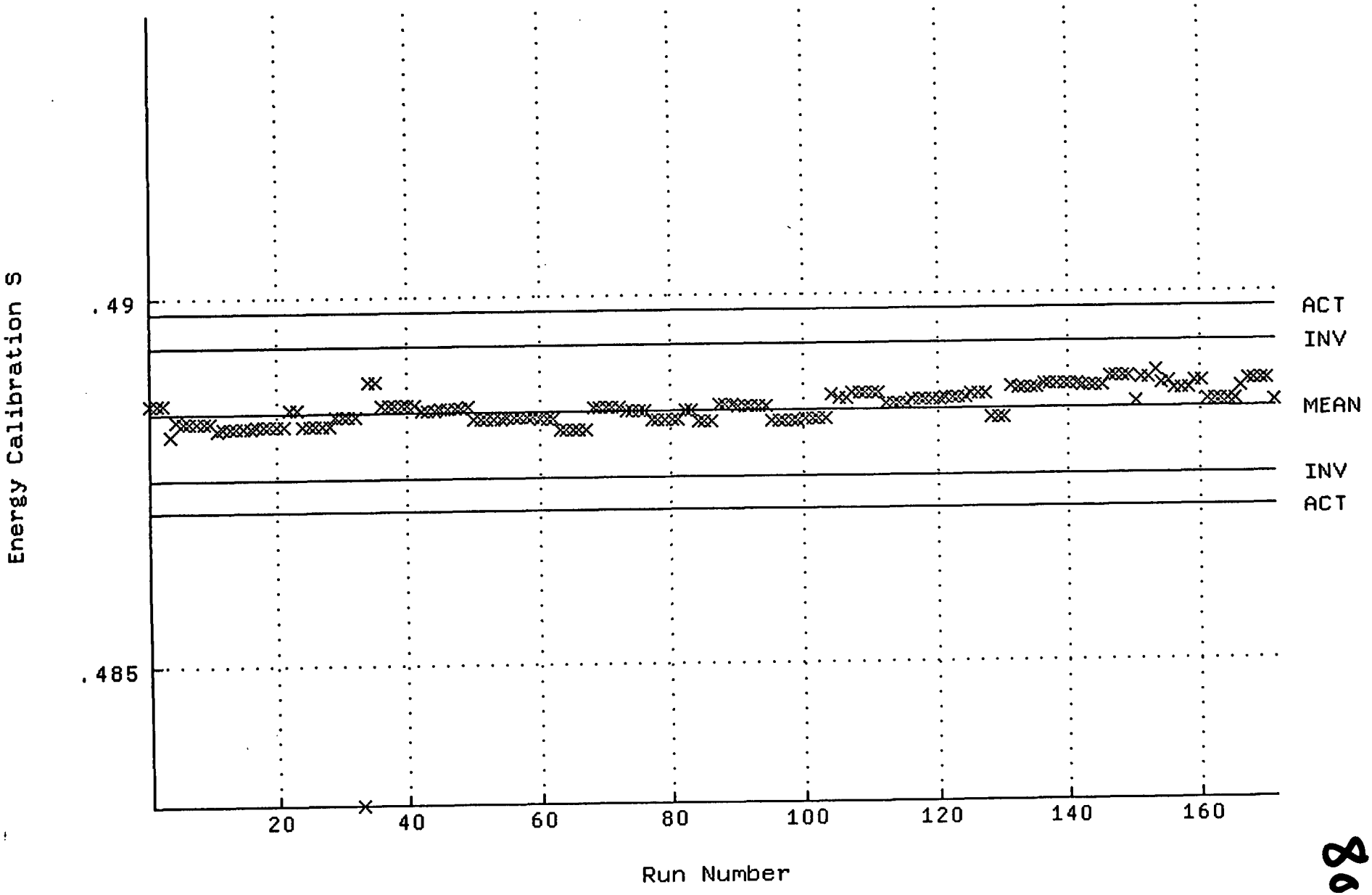
QA Filename : DISK:[RADCHEM.SCUSR.QA]QCC_GAMMA6_CZ588.QAF;1
Parameter Name : ECSLOPE (Energy Calibration Slope)
Start/End Dates : 16-JAN-1996 08:28:41 through 14-OCT-1996 10:25:14
Mean +- Std Dev : 0.488452 +- 4.526013E-04 (0.09 %)



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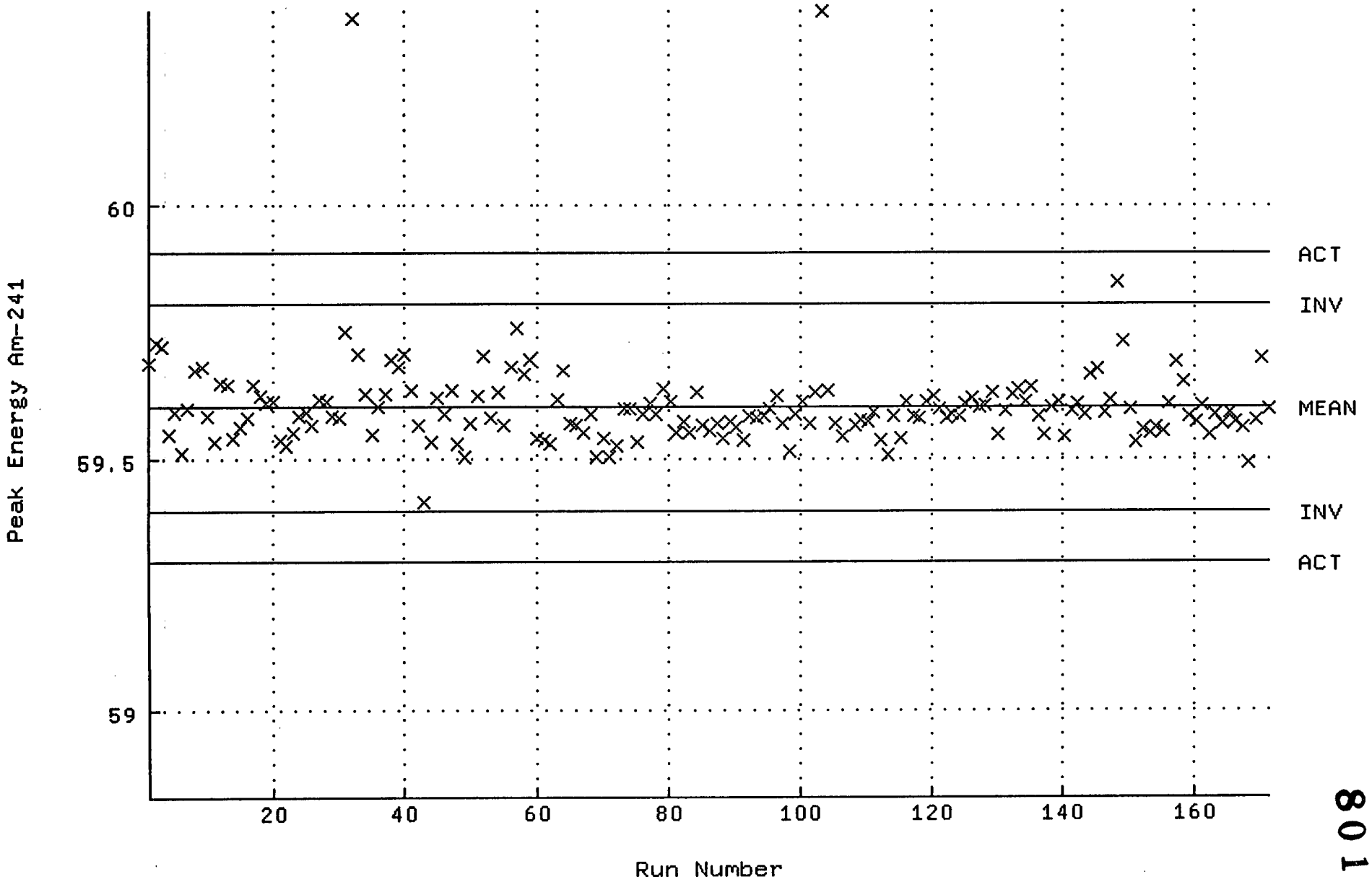
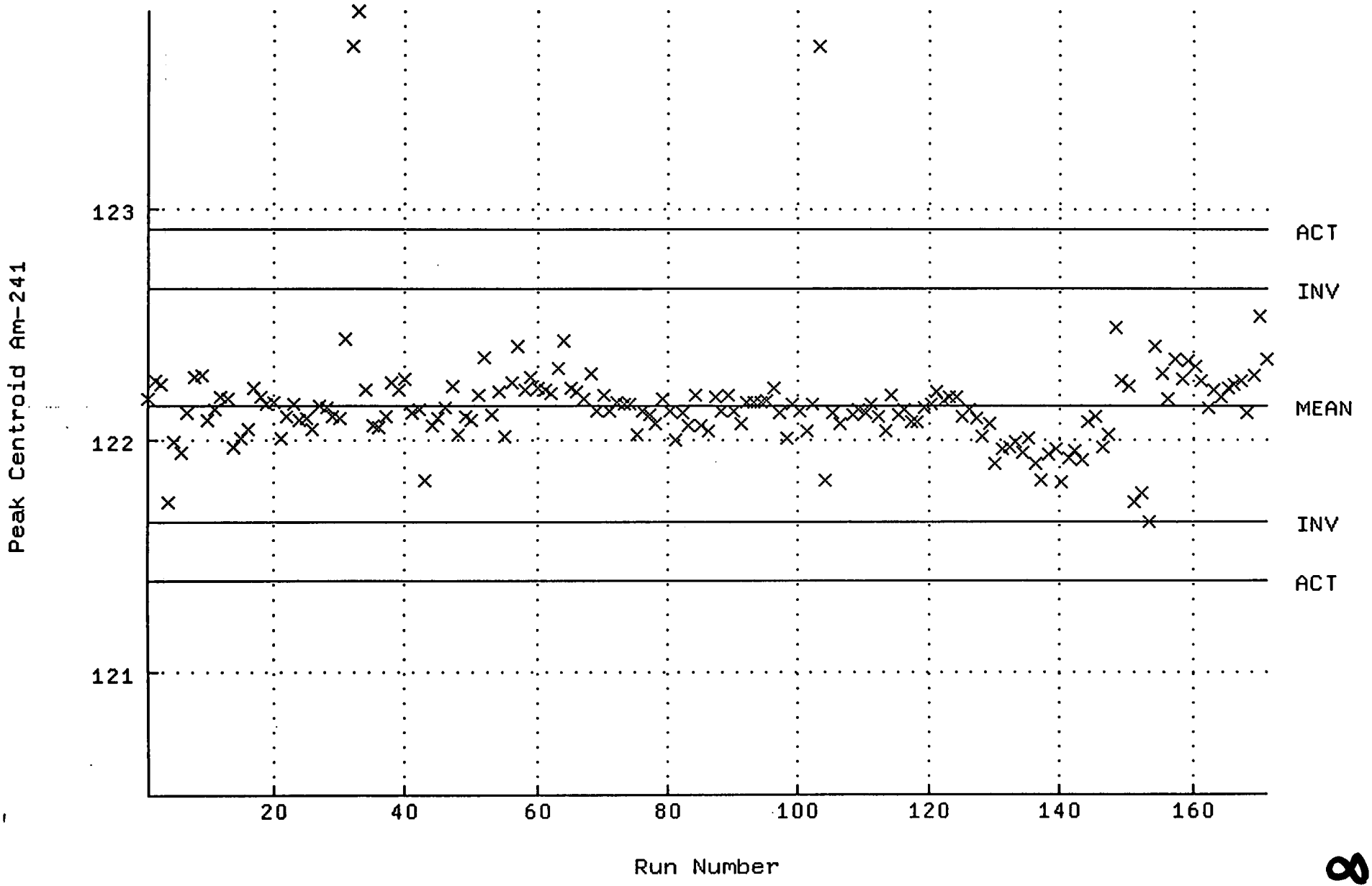
8619

QA filename : DISK:[RADCHEM.SCUSR.QA]QCC_GAMMA6_CZ588.QAF;1
Parameter Name : PSENERGY-59 (Peak Energy Am-241)
Start/End Dates : 16-JAN-1996 08:28:41 through 14-OCT-1996 10:25:14
Mean +- Std Dev : 59.6025 +- 0.101261 (0.17 %)



QA Filename : DISK:[RADCHEM.SCUSR.QA]QCC_GAMMA6_CZ588.QAF;1
Parameter Name : PSCENTRD-59 (Peak Centroid Am-241)
Start/End Dates : 16-JAN-1996 08:28:41 through 14-OCT-1996 10:25:14
Mean +- Std Dev : 122.157 +- 0.254631 (0.21 %)



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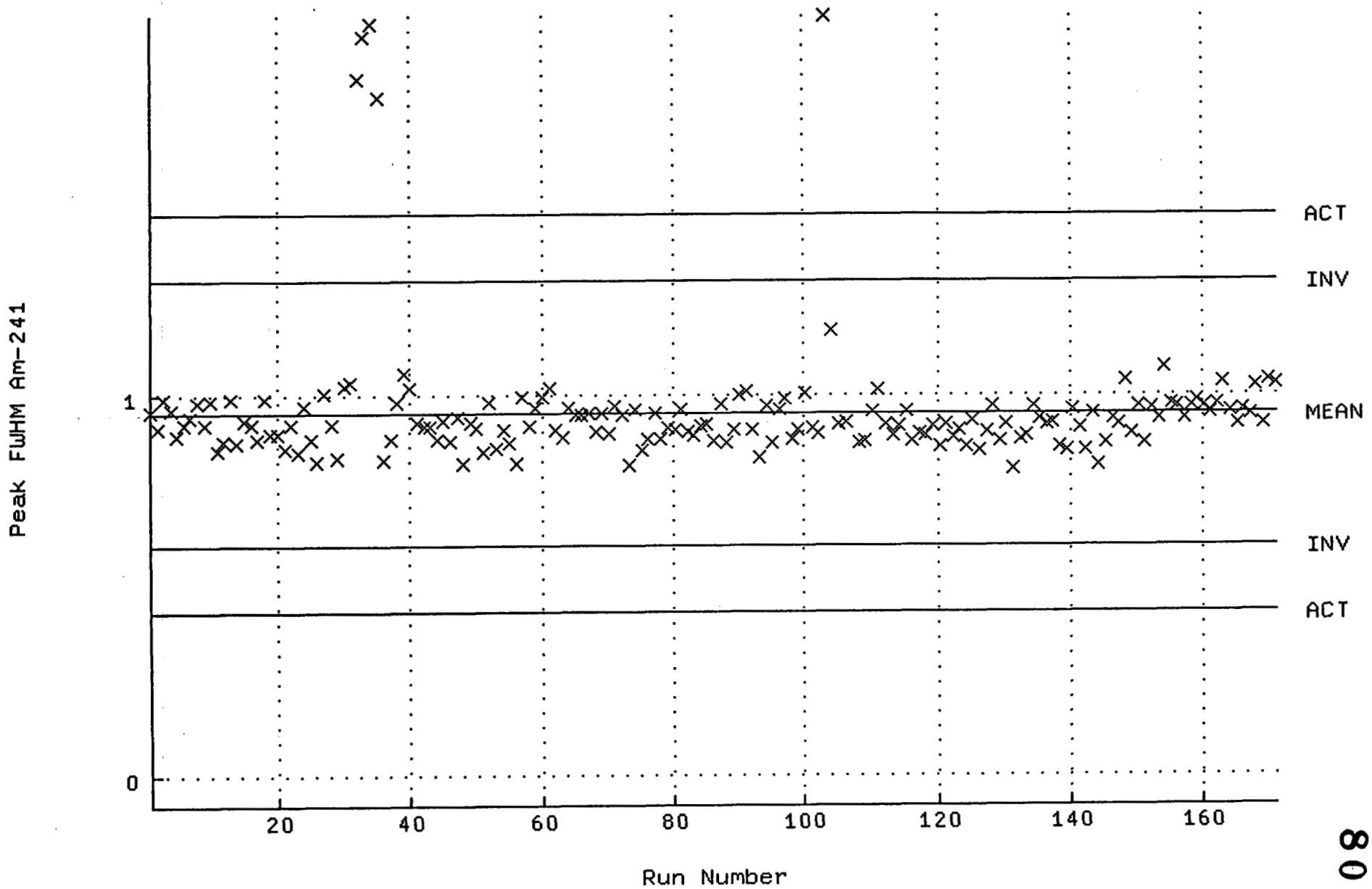
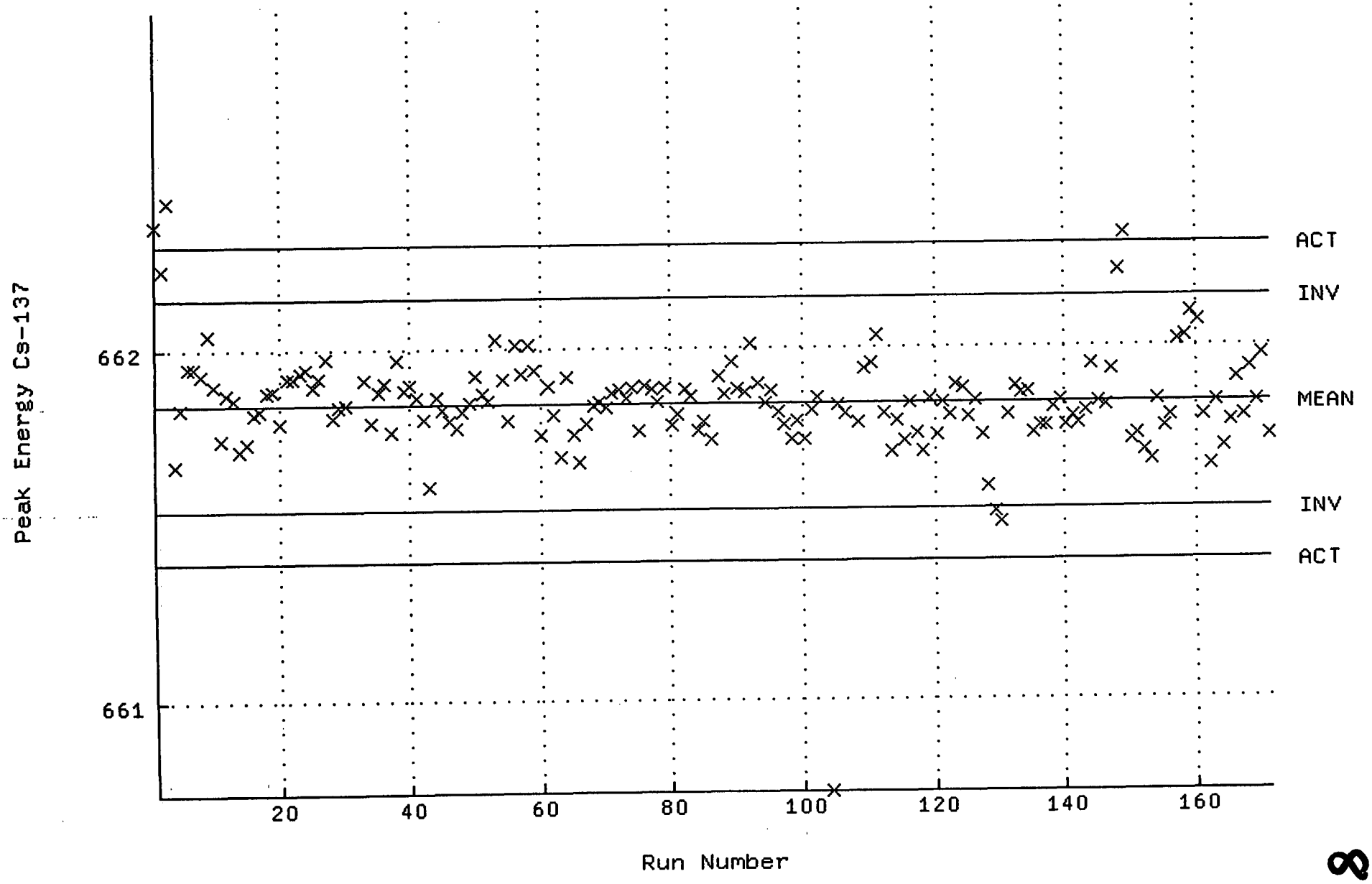
QA filename : DISK:[RADCHEM.SCUSR.QA]QCC_GAMMA6_CZ588.QAF;1
Parameter Name : PSFWHM-59 (Peak FWHM Am-241)
Start/End Dates : 16-JAN-1996 08:28:41 through 14-OCT-1996 10:25:14
Mean +- Std Dev : 0.952280 +- 0.174081 (18.28 %)



QA filename : DISK:[RADCHEM.SCUSR.QA]QCC_GAMMA6_CZ588.QAF;1
Parameter Name : PSENERGY-661 (Peak Energy Cs-137)
Start/End Dates : 16-JAN-1996 08:28:41 through 14-OCT-1996 10:25:14
Mean +- Std Dev : 661.840 +- 0.150251 (0.02 %)



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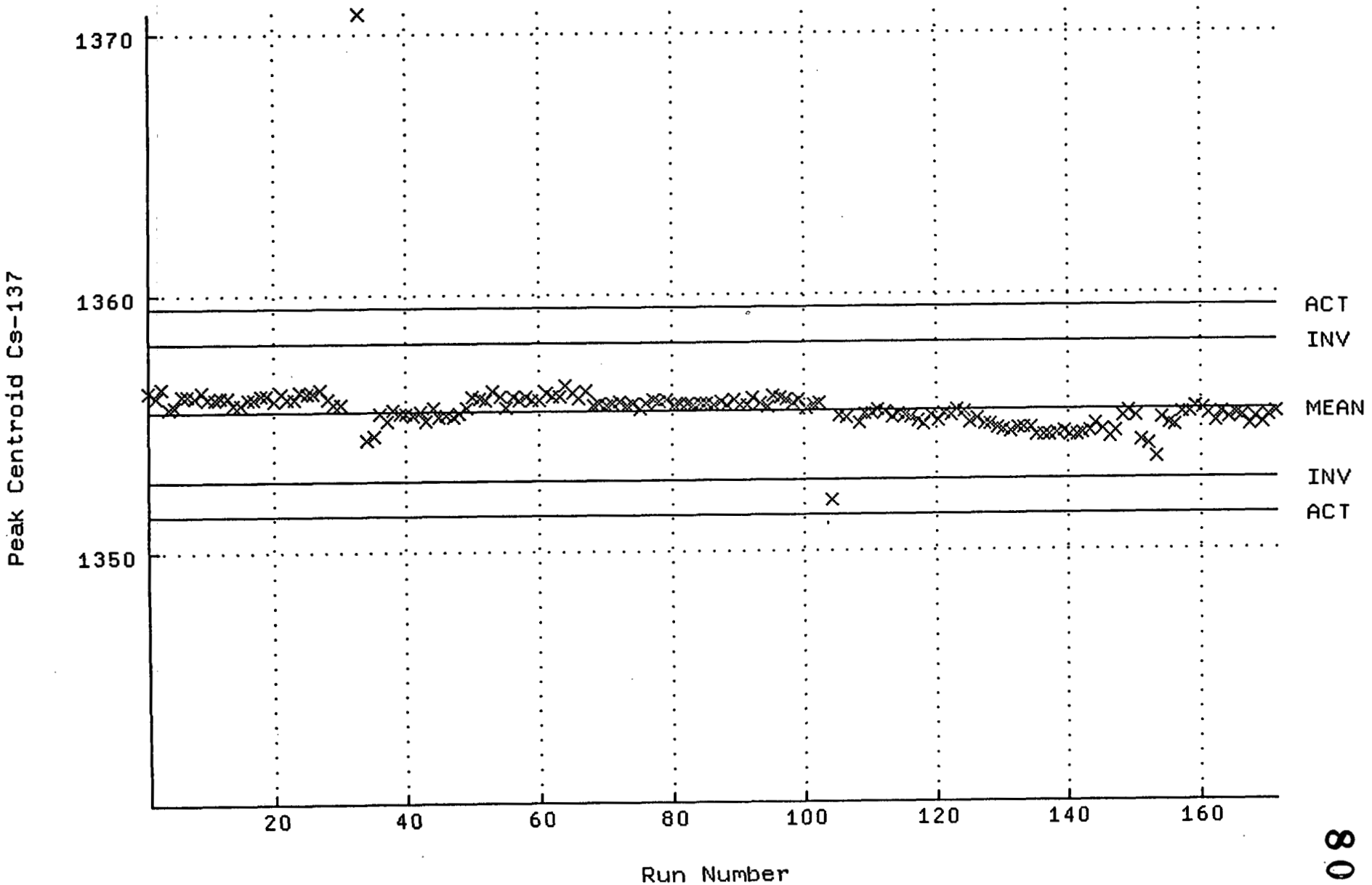
214

8019

QA filename : DISK:[RADCHEM.SCUSR.QA]QCC_GAMMA6_CZ588.QAF;1
Parameter Name : PSCENTRD-661 (Peak Centroid Cs-137)
Start/End Dates : 16-JAN-1996 08:28:41 through 14-OCT-1996 10:25:14
Mean +- Std Dev : 1355.50 +- 1.33016 (0.10 %)



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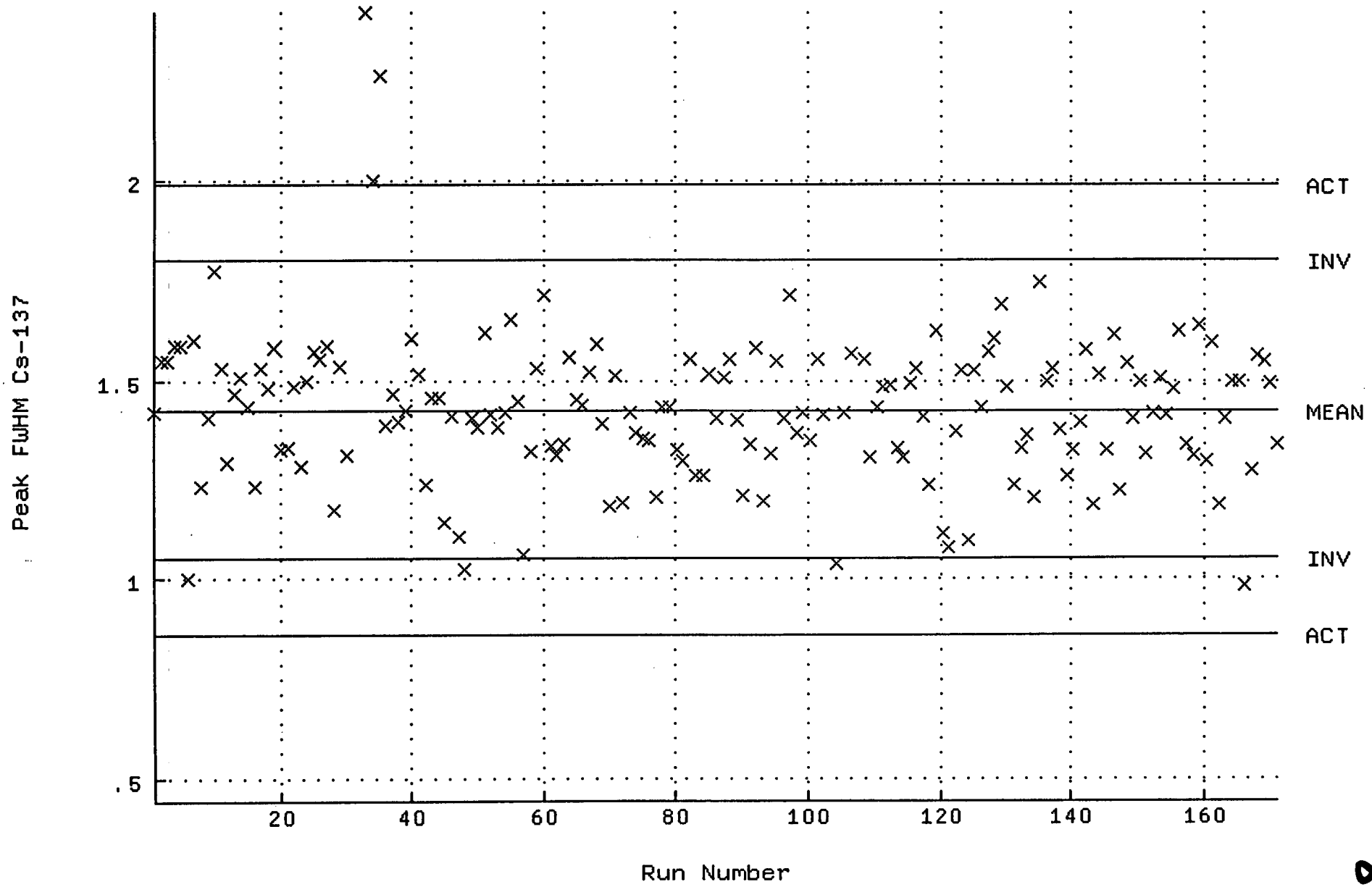
215

8019

QA Filename : DISK:[RADCHEM.SCUSR.QA]QCC_GAMMA6_CZ588.QAF;1
Parameter Name : PSFWHM-661 (Peak FWHM Cs-137)
Start/End Dates : 16-JAN-1996 08:28:41 through 14-OCT-1996 10:25:14
Mean +- Std Dev : 1.42995 +- 0.188369 (13.17 %)



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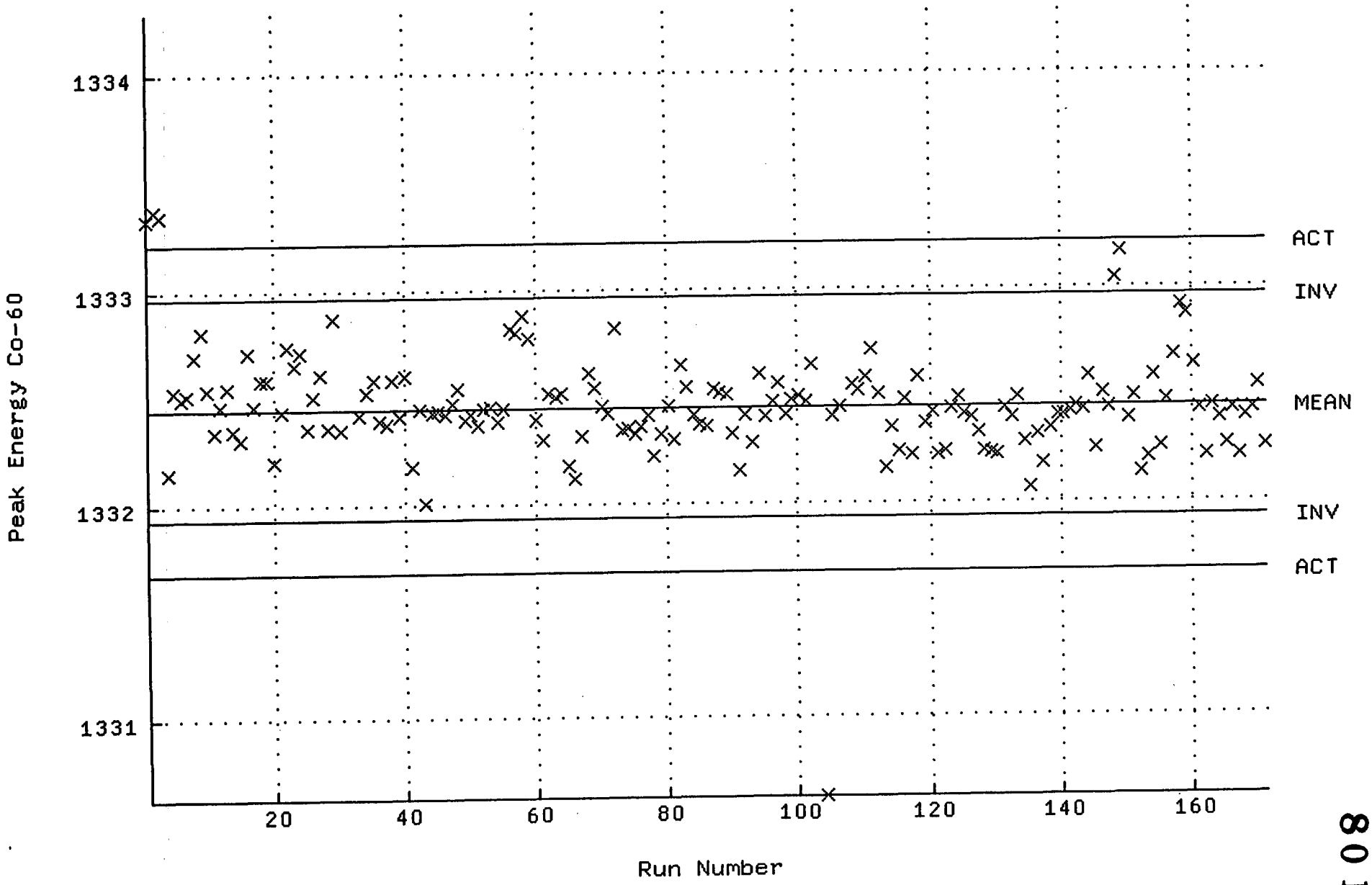
8019

QA filename : DISK:[RADCHEM.SCUSR.QA]QCC_GAMMA6_CZ588.QAF;1
Parameter Name : PSENERGY-1332 (Peak Energy Co-60)
Start/End Dates : 16-JAN-1996 08:28:41 through 14-OCT-1996 10:25:14
Mean +- Std Dev : 1332.45 +- 0.258320 (0.02 %)



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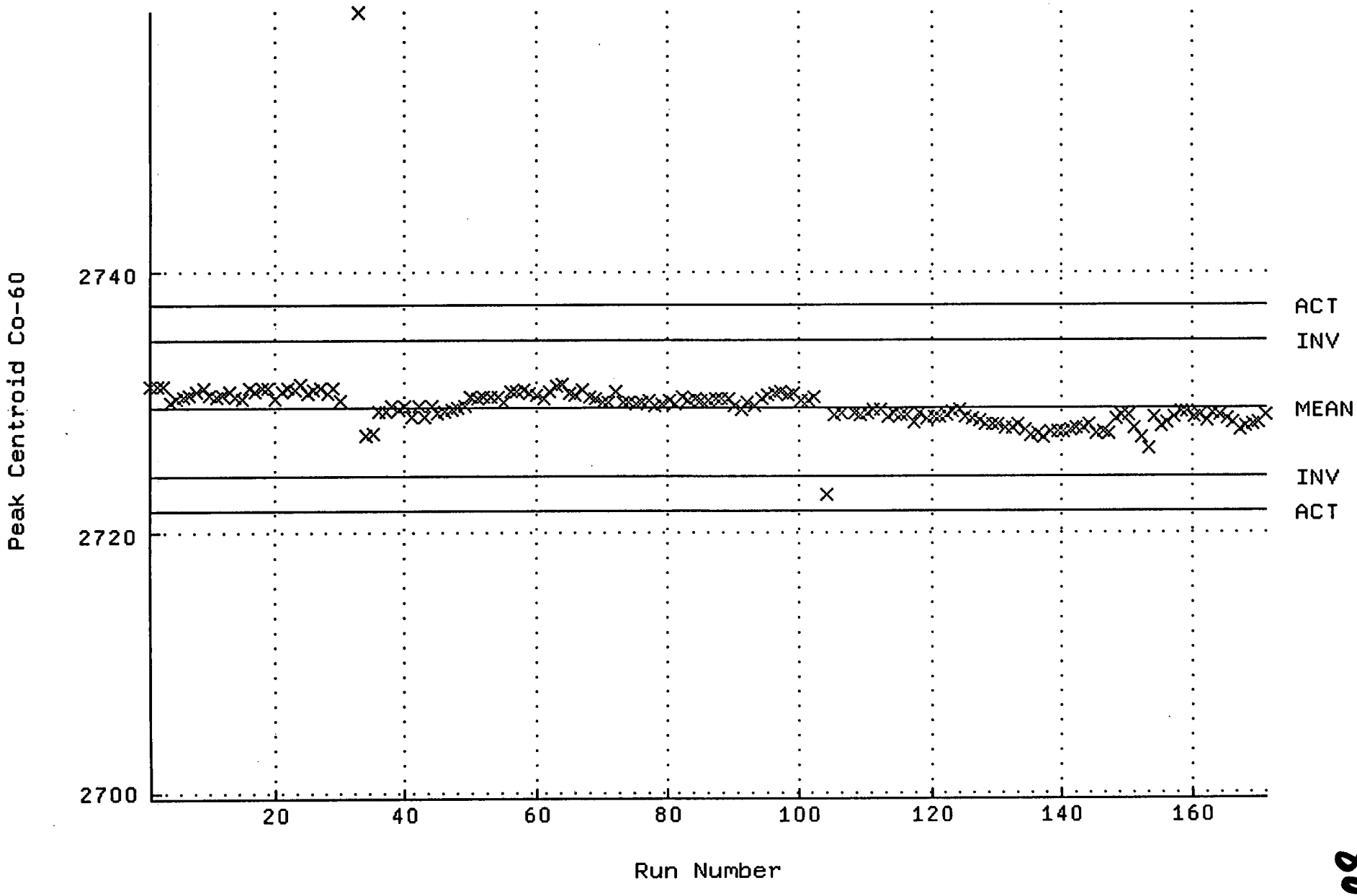
217

80019

QA Filename : DISK:[RADCHEM.SCUSR.QA]QCC_GAMMA6_CZ588.QAF;1
Parameter Name : PSCENTRD-1332 (Peak Centroid Co-60)
Start/End Dates : 16-JAN-1996 08:28:41 through 14-OCT-1996 10:25:14
Mean +- Std Dev : 2729.65 +- 2.63966 (0.10 %)



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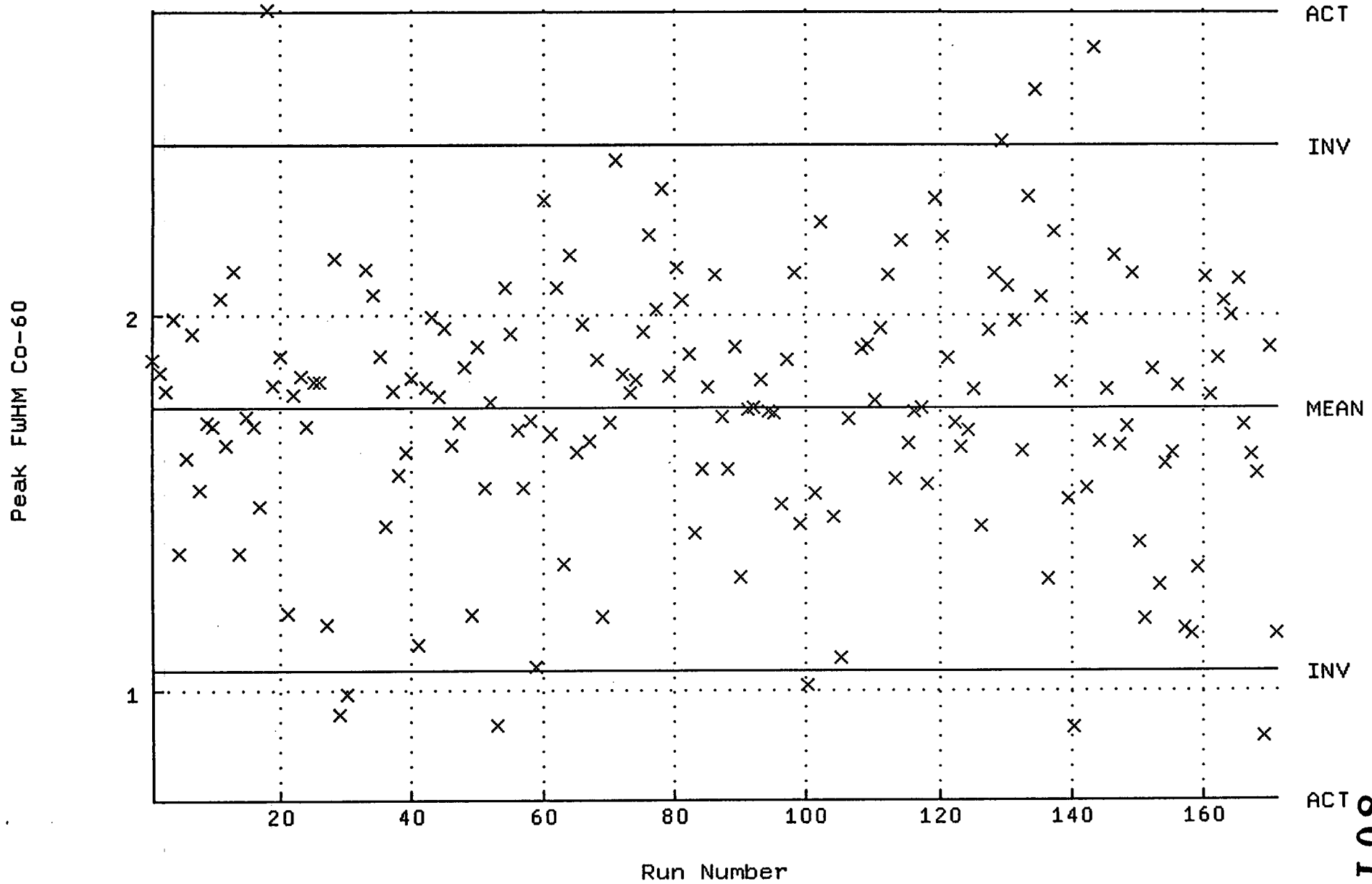
8019

QA Filename : DISK:[RADCHEM.SCUSR.QA]QCC_GAMMA6_CZ588.QAF;1
Parameter Name : PSFWHM-1332 (Peak FWHM Co-60)
Start/End Dates : 16-JAN-1996 08:28:41 through 14-OCT-1996 10:25:14
Mean +- Std Dev : 1.75623 +- 0.350073 (19.93 %)



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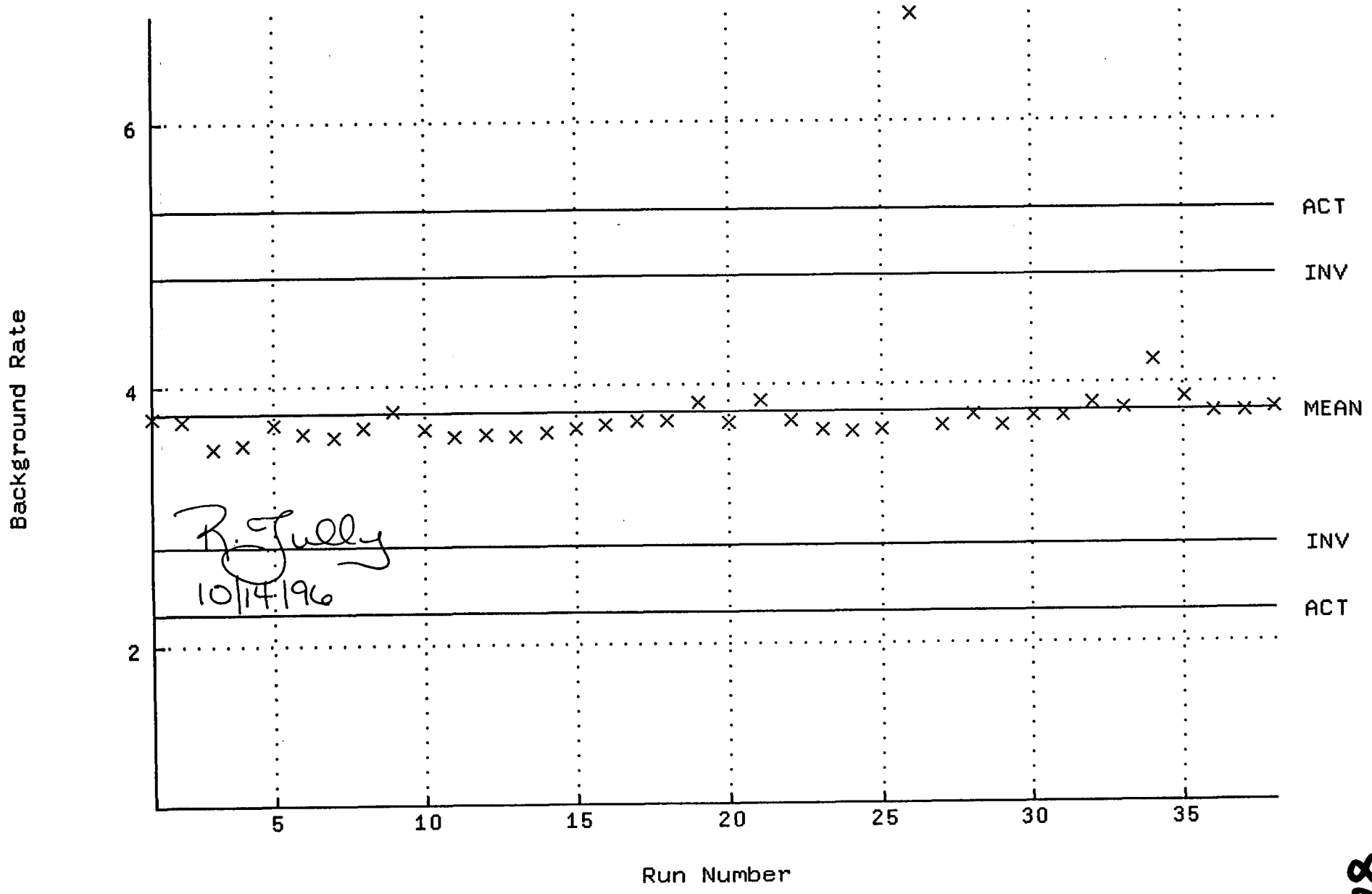
219

80019

QA filename : DISK:[RADCHEM.SCUSR.QA]QCB_GAMMA6_EMPTY.QAF;1
Parameter Name : BACKRATE (Background Rate)
Start/End Dates : 15-JAN-1996 11:37:37 through 11-OCT-1996 22:02:41
Mean +- Std Dev : 3.79201 +- 0.514863 (13.58 %)



R. Tully
10/14/96

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8019

Library Title :
Library file name : DISK:[RADCHEM.SCUSR.LIB]HAYDEN.NLB;1
Date printed : 14-OCT-1996 16:14:30.70
Number of nuclides : 4
Number of lines : 43

8019

Nuclide Name	Half-Life	Nuclide Type	Key Line	Energy		Abundance
RA-226	1600.00Y	Natural	*	186.21	keV	3.28 %
RA-228	1.41E+10Y	Natural		209.28	keV	4.40 %
				270.23	keV	3.60 %
				327.64	keV	3.20 %
				338.32	keV	11.40 %
				463.00	keV	4.40 %
				794.70	keV	4.60 %
			*	911.07	keV	27.70 %
				964.60	keV	5.20 %
				969.11	keV	16.60 %
PA-231	3.28E+04Y	Natural		50.10	keV	31.70 %
				100.00	keV	1.11 %
				122.31	keV	1.19 %
				144.24	keV	3.24 %
				154.21	keV	5.58 %
				205.00	keV	1.08 %
				210.60	keV	1.26 %
				234.90	keV	2.80 %
				236.00	keV	11.50 %
				256.20	keV	6.30 %
				269.46	keV	13.60 %
				271.23	keV	10.60 %
				283.67	keV	1.60 %
				286.10	keV	1.60 %
				300.08	keV	2.30 %
				304.40	keV	1.35 %
				323.87	keV	3.88 %
				330.00	keV	1.30 %
				334.20	keV	1.15 %
				338.28	keV	2.73 %
			*	351.07	keV	12.94 %
				401.81	keV	6.50 %
				404.84	keV	2.90 %
				427.08	keV	1.30 %
				445.03	keV	1.18 %
				569.67	keV	0.54 %
				831.96	keV	2.90 %
				897.83	keV	0.24 %
				897.83	keV	0.52 %
U-235	7.04E+08Y	Natural		143.76	keV	10.50 %
				163.35	keV	4.70 %
			*	185.71	keV	54.00 %
				205.31	keV	4.70 %

R. Jolly
10/14/96

Print Time : 14-OCT-1996 16:14:32.48
Library file name : DISK:[RADCHEM.SCUSR.LIB]HAYDEN.NLB;1
Library title :

8019

Record	Interfering nuclide	Interfered nuclide
1	U-235	Ra-226
2	RA-228	Pa-231

R. Jolly
10/14/96

DATA CHEM
LABORATORIES
A SORENSON COMPANY

Case Narrative

Analysis: Alpha - Spectrometry
Preparation SOP #: WR-DC-200
Analysis SOP#: WR-DC-341
Lot/Release/SDG #: None
DCL Set ID: 96E-0640-02, 03

Client: Hayden Environmental
Account: 3025
Matrix: Filter

General Set Information: These sets consisted of 4 field samples. They were received in the radiochemistry laboratory in good condition on September 30, 1996.

Method Summary: The actinides were separated using ion-exchange chromatography as prescribed in the above listed procedure (WR-DC-341). No exceptions were noted.

Sample Preparation: The filters were dissolved in concentrated HF and evaporated to dryness. After drying, a perchloric/nitric acid ashing was performed. The residue was dissolved in concentrated HNO_3 and transferred to a tared vessel. The acetone wash was digested, residue dissolved and combined to filter digestate. The samples were then diluted to 100 g. Aliquots were taken and were prepared as prescribed in the above procedure. No other exceptions were noted.

Holding Times: Not applicable.

Dilutions: 50% wt.-wt. dilution were performed on the field samples as per client.

Quality Control Data

Laboratory Control Sample: One LCS was run with each preparation group in which these sets were contained. The recoveries were within QC performance limits.

Blank: One blank was run with each preparation group in which these sets were contained. The blanks were within QC performance limits.

Matrix Spike: An MS was not required.

Matrix Duplicate: An MD was not required

This report is 246 total pages.

Tracers/Surrogates: All the tracer recoveries were within QC limits

Instrument QC:

Primary Calibration: Annually, NIST traceable alpha sources were used to calibrate the spectrometers used for this analysis to determine average efficiencies.

Secondary Calibration: A weekly energy calibration was performed using sources developed with NIST traceable materials.

Pulser Check: A daily or prior-to-counting check was performed on the detectors using an electronic pulsing system .

NC/CAR: No NC/CARs were required for this lot.

Miscellaneous Comments: None.

Peter Kligmann 11/5/96

Analyst Name **Date**

DATA CHEM LABORATORIES
A Sorenson Company

COVER FORM (TYPE I)
SINGLE METHOD ANALYSES

SUMMARY INFORMATION

Form RLIMS63M-V1.3
11049616095527
Page 1

G968S026

Date Reported.....: NOV 05 1996
Date Printed.....: 04-NOV-96 16:09
DCL Report Group..: 96E-0640-02

Client Ref Number.: Not Provided
Release Number....: Not Provided

Analysis Method(s): WR-DC-341

Hayden Environmental
Attention: Bruce Sarven
561 Congress Park Drive
Dayton, OH 45459

Client Sample Name	Laboratory Sample Name	Laboratory Sample ID	Laboratory Group Name	Laboratory Group ID
BL-123238-1	BL-123238-1	S96970CC	96E-0640-02	G968S026
QC-123238-1	QC-123238-1	S96970CD	96E-0640-02	G968S026
9131,39,40	96E04514	S968S06B	96E-0640-02	G968S026
9135,41,42	96E04515	S968S06C	96E-0640-02	G968S026
9136,43,44	96E04516	S968S06D	96E-0640-02	G968S026
9137,45,46	96E04517	S968S06F	96E-0640-02	G968S026

Analyst: Peter M. Kligmann

Reviewer:

Laboratory Supervisor:

960 West LeVoy Drive / Salt Lake City, Utah 84123-2547 / (801) 266-7700
FAX (801) 268-9992

DATA CHEM LABORATORIES
A Sorenson Company

FORM H (TYPE I)
SINGLE METHOD ANALYSES

SAMPLE GROUP COMMENTS

Date Printed.....: 04-NOV-96 16:09
DCL Report Group..: 96E-0640-02

Client Name...: Hayden Environmental

Release Number....: Not Provided

General Information

The DCL QC Database maintains all numerical figures which are input from the pertinent data source. These data have not been rounded to significant figures nor have they been moisture corrected. Reports generated from the system, however, list data which have been rounded to the number of significant figures requested by the client or deemed appropriate for the method. This may create minor discrepancies between data which appear on the QC Summary Forms (Forms B-G) and those that would be calculated from rounded analytical results. Additionally, if a moisture correction is performed, differences will be observed between the QC data and the surrogate data reported on Form A (or other report forms) and corresponding data reported on QC Summary Forms. In these cases, the Form A will indicate the "Report Basis" as well as the moisture value used for making the correction.
Report generation options: E2X

Result Symbol Definitions

ND - Not Detected above the MDL or IDL (LLD or MDC for radiochemistry).
** - No result could be reported, see sample comments for details.

Qualifier Symbol Definitions

U - Not Detected above the MDL or IDL (LLD or MDC for radiochemistry).
For radiochemistry the nuclide was not identified by the Canberra Nuclear NID program, activity values reported are calculated using the Canberra Nuclear MINACT program.
B - For organic analysis the qualifier indicates that this analyte was found in the method blank.
For inorganic analysis the qualifier signifies the value is between the IDL and PQL.
J - The qualifier indicates that the value is between the MDL and the PQL. It is also used for indicating an estimated value for tentatively identified compounds in mass spectrometry where a 1:1 response is assumed.

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FORM A (TYPE I)
SINGLE METHOD ANALYSES

SAMPLE ANALYSIS DATA SHEET

Form RLIMS63A-V1.3
11049616095527
Page 3

S96970CC

Date Printed.....: 04-NOV-96 16:09
Client Sample Name: BL-123238-1
DCL Sample Name...: BL-123238-1

Client Name.....: Hayden Environmental
Client Ref Number....: Not Provided
Sampling Site.....: Not Applicable
Release Number.....: Not Provided

Matrix.....: AIR
Date Sampled.....: Not Applicable
Reporting Units...: pCi/sample

Date Received.....: Not Applicable
DCL Report Group.....: 96E-0640-02

DCL Preparation Group: G969703P
Date Prepared.....: 18-OCT-96 00:00
Preparation Method...: WR-DC-200
Aliquot Weight/Volume: 1.00E+00
Net Weight/Volume....: Not Required

DCL Analysis Group: G969703P
Analysis Method...: WR-DC-341
Instrument Type...: AS
Instrument ID.....: GAR0
Column Type.....: Not Applicable

Analytical Results

Analyte	Date Analyzed	Detection Limit	Result±Error ±TPU Error	Qual.	Dilution	CRDL
Uranium-233/234	24-OCT-96 09:45	5.03E-02	5.34E-03±2.67E-02 ±2.67E-02		1.00E+00	1.0
Uranium-235	24-OCT-96 09:45	3.55E-02	-3.30E-3±1.45E-02 ±1.45E-02		1.00E+00	1.0
Uranium-238	24-OCT-96 09:45	4.66E-02	-1.07E-2±2.10E-02 ±2.10E-02		1.00E+00	1.0
Uranium-232	24-OCT-96 09:45		TBA			NR

Surrogate Recoveries

Analyte	Result	Spiked Amount	Percent Recovery
Uranium-232	9.8E0	11.	88.

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DATA CHEM LABORATORIES
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FORM A (TYPE I)
SINGLE METHOD ANALYSES

SAMPLE ANALYSIS DATA SHEET

Form RLIMS63A-V1.3
11049616095527
Page 4

S96970CD

Date Printed.....: 04-NOV-96 16:09
Client Sample Name: QC-123238-1
DCL Sample Name...: QC-123238-1

Client Name.....: Hayden Environmental
Client Ref Number....: Not Provided
Sampling Site.....: Not Applicable
Release Number.....: Not Provided

Matrix.....: AIR
Date Sampled.....: Not Applicable
Reporting Units...: pCi/Sample

Date Received.....: Not Applicable
DCL Report Group.....: 96E-0640-02

DCL Preparation Group: G969703P
Date Prepared.....: 18-OCT-96 00:00
Preparation Method...: WR-DC-200
Aliquot Weight/Volume: 1.00E+00
Net Weight/Volume....: Not Required

DCL Analysis Group: G969703P
Analysis Method...: WR-DC-341
Instrument Type...: AS
Instrument ID.....: GAR0
Column Type.....: Not Applicable

Analytical Results

Analyte	Date Analyzed	Detection Limit	Result±Error ±TPU Error	Qual.	Dilution	CRDL
Uranium-233/234	24-OCT-96 09:45	2.99E-02	6.15E+00±2.43E-01 ±7.85E-01		1.00E+00	1.0
Uranium-235	24-OCT-96 09:45	2.86E-02	3.26E-01±6.32E-02 ±7.45E-02		1.00E+00	1.0
Uranium-238	24-OCT-96 09:45	3.27E-02	6.32E+00±2.46E-01 ±8.06E-01		1.00E+00	1.0
nium-232	24-OCT-96 09:45		TBA			NR

Surrogate Recoveries

Analyte	Result	Spiked Amount	Percent Recovery
Uranium-232	1.1E1	11.	97.

001001

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S968S06B

DATA CHEM LABORATORIES
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FORM A (TYPE I)
SINGLE METHOD ANALYSES

SAMPLE ANALYSIS DATA SHEET

Date Printed.....: 04-NOV-96 16:09
Client Sample Name: 9131,39,40|NORTH
DCL Sample Name...: 96E04514

Client Name.....: Hayden Environmental
Client Ref Number....: Not Provided
Sampling Site.....: Not Provided
Release Number.....: Not Provided

Matrix.....: AIR
Date Sampled.....: 19-SEP-96 08:30
Reporting Units...: pCi/Sample
Report Basis.....: ☒ As Received ☐ Dried

Date Received.....: 25-SEP-96 00:00
DCL Report Group.....: 96E-0640-02

DCL Preparation Group: G969703P
Date Prepared.....: 18-OCT-96 00:00
Preparation Method...: WR-DC-200
Aliquot Weight/Volume: 1.00E+00
Net Weight/Volume....: Not Required

DCL Analysis Group: G969703P
Analysis Method...: WR-DC-341
Instrument Type...: AS
Instrument ID.....: GAR0
Column Type.....: Not Applicable

Analytical Results

Analyte	Date Analyzed	Detection Limit	Result±Error ±TPU Error	Qual.	Dilution	CRDL
Uranium-233/234	24-OCT-96 09:45	6.93E-02	4.31E-01±1.08E-01 ±1.20E-01		4.33E-01	1.0
Uranium-235	24-OCT-96 09:45	8.57E-02	4.77E-02±5.40E-02 ±5.43E-02		4.33E-01	1.0
Uranium-238	24-OCT-96 09:45	9.10E-02	2.00E-01±8.29E-02 ±8.65E-02		4.33E-01	1.0
Uranium-232	24-OCT-96 09:45		TBA			NR

Surrogate Recoveries

Analyte	Result	Spiked Amount	Percent Recovery
Uranium-232	9.8E0	11.	88.

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DATA CHEM LABORATORIES
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FORM A (TYPE I)
SINGLE METHOD ANALYSES

SAMPLE ANALYSIS DATA SHEET

Form RLIMS63A-V1.3
11049616095527
Page 6

S968S06C

Date Printed.....: 04-NOV-96 16:09
Client Sample Name: 9135,41,42|SOUTH
DCL Sample Name...: 96E04515

Client Name.....: Hayden Environmental
Client Ref Number....: Not Provided
Sampling Site.....: Not Provided
Release Number.....: Not Provided

Matrix.....: AIR
Date Sampled.....: 19-SEP-96 08:30
Reporting Units...: pCi/Sample
Report Basis.....: ☒ As Received ☐ Dried

Date Received.....: 25-SEP-96 00:00
DCL Report Group.....: 96E-0640-02

DCL Preparation Group: G969703P
Date Prepared.....: 18-OCT-96 00:00
Preparation Method...: WR-DC-200
Aliquot Weight/Volume: 1.00E+00
Net Weight/Volume....: Not Required

DCL Analysis Group: G969703P
Analysis Method...: WR-DC-341
Instrument Type...: AS
Instrument ID.....: GAR0
Column Type.....: Not Applicable

Analytical Results

Analyte	Date Analyzed	Detection Limit	Result±Error ±TPU Error	Qual.	Dilution	CRDL
Uranium-233/234	24-OCT-96 09:45	7.39E-02	1.41E-01±6.41E-02 ±6.62E-02		4.79E-01	1.0
Uranium-235	24-OCT-96 09:45	6.97E-02	1.94E-02±3.81E-02 ±3.81E-02		4.79E-01	1.0
Uranium-238	24-OCT-96 09:45	5.65E-02	9.97E-02±5.14E-02 ±5.27E-02		4.79E-01	1.0
Uranium-232	24-OCT-96 09:45		TBA			NR

Surrogate Recoveries

Analyte	Result	Spiked Amount	Percent Recovery
Uranium-232	1.0E1	11.	91.

001003

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FORM A (TYPE I)
SINGLE METHOD ANALYSES

SAMPLE ANALYSIS DATA SHEET

Form RLIMS63A-V1.3
11049616095527
Page 7

S968S06D

Date Printed.....: 04-NOV-96 16:09
Client Sample Name: 9136,43,44|BLANK
DCL Sample Name...: 96E04516

Client Name.....: Hayden Environmental
Client Ref Number....: Not Provided
Sampling Site.....: Not Provided
Release Number.....: Not Provided

Matrix.....: AIR
Date Sampled.....: 19-SEP-96 08:30
Reporting Units...: pCi/Sample
Report Basis.....: ☒ As Received ☐ Dried

Date Received.....: 25-SEP-96 00:00
DCL Report Group.....: 96E-0640-02

DCL Preparation Group: G969703P
Date Prepared.....: 18-OCT-96 00:00
Preparation Method...: WR-DC-200
Aliquot Weight/Volume: 1.00E+00
Net Weight/Volume....: Not Required

DCL Analysis Group: G969703P
Analysis Method...: WR-DC-341
Instrument Type...: AS
Instrument ID.....: GAR0
Column Type.....: Not Applicable

Analytical Results

Analyte	Date Analyzed	Detection Limit	Result±Error ±TPU Error	Qual.	Dilution	CRDL
Uranium-233/234	24-OCT-96 09:45	8.77E-02	1.55E-01±7.41E-02 ±7.65E-02		4.45E-01	1.0
Uranium-235	24-OCT-96 09:45	7.14E-02	1.54E-02±3.69E-02 ±3.69E-02		4.45E-01	1.0
Uranium-238	24-OCT-96 09:45	8.17E-02	6.23E-02±5.46E-02 ±5.51E-02		4.45E-01	1.0
Uranium-232	24-OCT-96 09:45		TBA			NR

Surrogate Recoveries

Analyte	Result	Spiked Amount	Percent Recovery
Uranium-232	9.8E0	11.	88.

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FORM A (TYPE I)
SINGLE METHOD ANALYSES

SAMPLE ANALYSIS DATA SHEET

Form RLIMS63A-V1.3
11049616095527
Page 8

S968S06F

Date Printed.....: 04-NOV-96 16:09
Client Sample Name: 9137,45,46|RESP
DCL Sample Name...: 96E04517

Client Name.....: Hayden Environmental
Client Ref Number....: Not Provided
Sampling Site.....: Not Provided
Release Number.....: Not Provided

Matrix.....: AIR
Date Sampled.....: 19-SEP-96 08:30
Reporting Units...: pCi/Sample
Report Basis.....: ☒ As Received ☐ Dried

Date Received.....: 25-SEP-96 00:00
DCL Report Group.....: 96E-0640-02

DCL Preparation Group: G969703P
Date Prepared.....: 18-OCT-96 00:00
Preparation Method...: WR-DC-200
Aliquot Weight/Volume: 1.00E+00
Net Weight/Volume....: Not Required

DCL Analysis Group: G969703P
Analysis Method...: WR-DC-341
Instrument Type...: AS
Instrument ID.....: GAR0
Column Type.....: Not Applicable

Analytical Results

Analyte	Date Analyzed	Detection Limit	Result±Error ±TPU Error	Qual.	Dilution	CRDL
Uranium-233/234	24-OCT-96 09:45	1.21E-01	2.48E-01±9.88E-02 ±1.03E-01		4.45E-01	1.0
Uranium-235	24-OCT-96 09:45	5.65E-02	6.90E-02±4.98E-02 ±5.06E-02		4.45E-01	1.0
Uranium-238	24-OCT-96 09:45	8.15E-02	1.37E-01±6.89E-02 ±7.10E-02		4.45E-01	1.0
Uranium-232	24-OCT-96 09:45		TBA			NR

Surrogate Recoveries

Analyte	Result	Spiked Amount	Percent Recovery
Uranium-232	9.9E0	11.	89.

001005

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010

DATA CHEM LABORATORIES
A Sorenson Company

FORM B (TYPE I)
SINGLE METHOD ANALYSES

S96970CD

QUALITY CONTROL DATA SHEET
LABORATORY CONTROL SAMPLE (LCS)

Client Name.....: Hayden Environmental
Release Number.....: Not Provided

Matrix.....: FILTER
Reporting Units.....: pCi/Sample

DCL Preparation Group: G969703P
Date Prepared.....: 18-OCT-96 00:00
Preparation Method...: WR-DC-200

Date Printed.....: 04-NOV-96 16:09
DCL Sample Name...: QC-123238-1

DCL Analysis Group: G969703P
Analysis Method...: WR-DC-341
Instrument Type...: AS
Instrument ID.....: GAR0
Column Type.....: Not Applicable

QC Limit Type.....: Method

Analytical Results

Analyte	Date Analyzed	Target	Result	Percent Recovery	QC Limits	QC Flag
Uranium-238	24-OCT-96 09:45	6.4E0	6.3E0	98.9	75.0/125.	

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DATA CHEM LABORATORIES
A Sorenson Company

FORM C (TYPE I)
SINGLE METHOD ANALYSES

Form RLIMS63C-V1.3
11049616095527
Page 10

S96970CC

QUALITY CONTROL DATA SHEET
BLANK SAMPLE

Client Name.....: Hayden Environmental
Release Number.....: Not Provided

Matrix.....: FILTER
Reporting Units.....: pCi/sample

DCL Preparation Group: G969703P
Date Prepared.....: 18-OCT-96 00:00
Preparation Method...: WR-DC-200

Date Printed.....: 04-NOV-96 16:09
DCL Sample Name...: BL-123238-1

DCL Analysis Group: G969703P
Analysis Method...: WR-DC-341
Instrument Type...: AS
Instrument ID.....: GAR0
Column Type.....: Not Applicable

QC Limit Type.....: Method

Analytical Results

Analyte	Date Analyzed	Result	CRDL
Uranium-234	24-OCT-96 09:45	0.0053	1.0
Uranium-235/236	24-OCT-96 09:45	-0.0033	1.0
Uranium-238	24-OCT-96 09:45	-0.011	1.0

001007

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DATA CHEM LABORATORIES
A Sorenson Company

FORM G (TYPE I)
SINGLE METHOD ANALYSES

QUALITY CONTROL DATA SHEET
SURROGATE SUMMARY

Date Printed.....: 04-NOV-96 16:09

Client Name.....: Hayden Environmental
Release Number.....: Not Provided

DCL Analysis Group: G969703P
Analysis Method...: WR-DC-341

Matrix.....: FILTER
Reporting Units.....: pCi

DCL Prep Group....: G969703P
Preparation Method: WR-DC-200

QC Limit Type.....: Method

Surrogate Recoveries

Surr. ID	Uranium-232											
QC Limits	45.0/100.											
DCL Sample Number	Analyte Result	Spiked Amount	% Rec.	Q	Analyte Result	Spiked Amount	% Rec.	Q	Analyte Result	Spiked Amount	% Rec.	Q
96E04514	9.82E0	11.2	87.7									
96E04515	1.02E1	11.2	91.2									
96E04516	9.84E0	11.2	87.9									
96E04517	9.93E0	11.2	88.7									
BL-123238-1	9.83E0	11.2	87.8									
QC-123238-1	1.09E1	11.2	97.0									

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DATA CHEM LABORATORIES
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COVER FORM (TYPE I)
SINGLE METHOD ANALYSES

SUMMARY INFORMATION

Form RLIMS63M-V1.3
11049616100383
Page 1

G968S028

Date Reported.....: NOV 05 1996
Date Printed.....: 04-NOV-96 16:10
DCL Report Group..: 96E-0640-03

Client Ref Number.: Not Provided
Release Number....: Not Provided

Analysis Method(s): WR-DC-341

Hayden Environmental
Attention: Bruce Sarven
561 Congress Park Drive
Dayton, OH 45459

Client Sample Name	Laboratory Sample Name	Laboratory Sample ID	Laboratory Group Name	Laboratory Group ID
BL-123239-1	BL-123239-1	S96970CF	96E-0640-03	G968S028
QC-123239-1	QC-123239-1	S96970CG	96E-0640-03	G968S028
9131,39,40	96E04514	S968S06G	96E-0640-03	G968S028
9135,41,42	96E04515	S968S06H	96E-0640-03	G968S028
9136,43,44	96E04516	S968S06J	96E-0640-03	G968S028
9137,45,46	96E04517	S968S06K	96E-0640-03	G968S028

Analyst: Peter M. Klingmann

Reviewer:

Laboratory Supervisor:

001009

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014

DATA CHEM LABORATORIES
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FORM H (TYPE I)
SINGLE METHOD ANALYSES

SAMPLE GROUP COMMENTS

G968S028

Date Printed.....: 04-NOV-96 16:10
DCL Report Group..: 96E-0640-03

Client Name...: Hayden Environmental

Release Number....: Not Provided

General Information

The DCL QC Database maintains all numerical figures which are input from the pertinent data source. These data have not been rounded to significant figures nor have they been moisture corrected. Reports generated from the system, however, list data which have been rounded to the number of significant figures requested by the client or deemed appropriate for the method. This may create minor discrepancies between data which appear on the QC Summary Forms (Forms B-G) and those that would be calculated from rounded analytical results. Additionally, if a moisture correction is performed, differences will be observed between the QC data and the surrogate data reported on Form A (or other report forms) and corresponding data reported on QC Summary Forms. In these cases, the Form A will indicate the "Report Basis" as well as the moisture value used for making the correction.
Report generation options: E2X

Result Symbol Definitions

ND - Not Detected above the MDL or IDL (LLD or MDC for radiochemistry).
** - No result could be reported, see sample comments for details.

Qualifier Symbol Definitions

U - Not Detected above the MDL or IDL (LLD or MDC for radiochemistry).
For radiochemistry the nuclide was not identified by the Canberra Nuclear NID program, activity values reported are calculated using the Canberra Nuclear MINACT program.
B - For organic analysis the qualifier indicates that this analyte was found in the method blank.
For inorganic analysis the qualifier signifies the value is between the IDL and PQL.
J - The qualifier indicates that the value is between the MDL and the PQL. It is also used for indicating an estimated value for tentatively identified compounds in mass spectrometry where a 1:1 response is assumed.

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A Sorenson Company

FORM A (TYPE I)
SINGLE METHOD ANALYSES

SAMPLE ANALYSIS DATA SHEET

Form RLIMS63A-V1.3
11049616100383
Page 3

S96970CF

Date Printed.....: 04-NOV-96 16:10
Client Sample Name: BL-123239-1
DCL Sample Name...: BL-123239-1

Client Name.....: Hayden Environmental
Client Ref Number....: Not Provided
Sampling Site.....: Not Applicable
Release Number.....: Not Provided

Matrix.....: AIR
Date Sampled.....: Not Applicable
Reporting Units...: pCi/sample

Date Received.....: Not Applicable
DCL Report Group.....: 96E-0640-03

DCL Preparation Group: G969703Q
Date Prepared.....: 18-OCT-96 00:00
Preparation Method...: WR-DC-200
Aliquot Weight/Volume: 1.00E+00
Net Weight/Volume....: Not Required

DCL Analysis Group: G969703Q
Analysis Method...: WR-DC-341
Instrument Type...: AS
Instrument ID.....: GAR0
Column Type.....: Not Applicable

Analytical Results

Analyte	Date Analyzed	Detection Limit	Result±Error ±TPU Error	Qual.	Dilution	CRDL
Thorium-228	25-OCT-96 12:19	4.73E-02	3.12E-02±2.99E-02 ±3.02E-02		1.00E+00	1.0
Thorium-230	25-OCT-96 12:19	3.04E-02	7.05E-02±3.08E-02 ±3.19E-02		1.00E+00	1.0
Thorium-232	25-OCT-96 12:19	2.62E-02	2.82E-03±1.23E-02 ±1.23E-02		1.00E+00	1.0
Thorium-229	25-OCT-96 12:19		TBA			NR

Surrogate Recoveries

Analyte	Result	Spiked Amount	Percent Recovery
Thorium-229	9.2E0	11.	86.

001011

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DATA CHEM LABORATORIES
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FORM A (TYPE I)
SINGLE METHOD ANALYSES

SAMPLE ANALYSIS DATA SHEET

S96970CG

Date Printed.....: 04-NOV-96 16:10
Client Sample Name: QC-123239-1
DCL Sample Name...: QC-123239-1

Client Name.....: Hayden Environmental
Client Ref Number....: Not Provided
Sampling Site.....: Not Applicable
Release Number.....: Not Provided

Matrix.....: AIR
Date Sampled.....: Not Applicable
Reporting Units...: pCi/Sample

Date Received.....: Not Applicable
DCL Report Group.....: 96E-0640-03

DCL Preparation Group: G969703Q
Date Prepared.....: 18-OCT-96 00:00
Preparation Method...: WR-DC-200
Aliquot Weight/Volume: 1.00E+00
Net Weight/Volume....: Not Required

DCL Analysis Group: G969703Q
Analysis Method...: WR-DC-341
Instrument Type...: AS
Instrument ID.....: GAR0
Column Type.....: Not Applicable

Analytical Results

Analyte	Date Analyzed	Detection Limit	Result±Error ±TPU Error	Qual.	Dilution	CRDL
Thorium-228	25-OCT-96 12:19	4.57E-02	1.01E-02±2.52E-02 ±2.52E-02		1.00E+00	1.0
Thorium-230	25-OCT-96 12:19	3.76E-02	4.85E+00±2.17E-01 ±5.89E-01		1.00E+00	1.0
Thorium-232	25-OCT-96 12:19	2.69E-02	2.50E-03±1.30E-02 ±1.30E-02		1.00E+00	1.0
Thorium-229	25-OCT-96 12:19		TBA			NR

Surrogate Recoveries

Analyte	Result	Spiked Amount	Percent Recovery
Thorium-229	9.8E0	11.	92.

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DATA CHEM LABORATORIES
A Sorenson Company

FORM A (TYPE I)
SINGLE METHOD ANALYSES

SAMPLE ANALYSIS DATA SHEET

S968S06G

Date Printed.....: 04-NOV-96 16:10
Client Sample Name: 9131,39,40|NORTH
DCL Sample Name...: 96E04514

Client Name.....: Hayden Environmental
Client Ref Number....: Not Provided
Sampling Site.....: Not Provided
Release Number.....: Not Provided

Matrix.....: AIR
Date Sampled.....: 19-SEP-96 08:30
Reporting Units...: pCi/Sample
Report Basis.....: ☒ As Received ☐ Dried

Date Received.....: 25-SEP-96 00:00
DCL Report Group.....: 96E-0640-03

DCL Preparation Group: G969703Q
Date Prepared.....: 18-OCT-96 00:00
Preparation Method...: WR-DC-200
Aliquot Weight/Volume: 1.00E+00
Net Weight/Volume....: Not Required

DCL Analysis Group: G969703Q
Analysis Method...: WR-DC-341
Instrument Type...: AS
Instrument ID.....: GAR0
Column Type.....: Not Applicable

Analytical Results

Analyte	Date Analyzed	Detection Limit	Result±Error ±TPU Error	Qual.	Dilution	CRDL
Thorium-228	25-OCT-96 12:19	7.79E-02	1.84E-01±7.45E-02 ±7.75E-02		5.01E-01	1.0
Thorium-230	25-OCT-96 12:19	8.04E-02	4.73E-01±1.09E-01 ±1.22E-01		5.01E-01	1.0
Thorium-232	25-OCT-96 12:19	6.83E-02	3.98E-02±4.32E-02 ±4.34E-02		5.01E-01	1.0
Thorium-229	25-OCT-96 12:19		TBA			NR

Surrogate Recoveries

Analyte	Result	Spiked Amount	Percent Recovery
Thorium-229	1.9E1	22.	86.

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DATA CHEM LABORATORIES
A Sorenson Company

FORM A (TYPE I)
SINGLE METHOD ANALYSES

SAMPLE ANALYSIS DATA SHEET

S968S06H

Date Printed.....: 04-NOV-96 16:10
Client Sample Name: 9135,41,42|SOUTH
DCL Sample Name...: 96E04515

Client Name.....: Hayden Environmental
Client Ref Number....: Not Provided
Sampling Site.....: Not Provided
Release Number.....: Not Provided

Matrix.....: AIR
Date Sampled.....: 19-SEP-96 08:30
Reporting Units...: pCi/Sample
Report Basis.....: ☒ As Received ☐ Dried

Date Received.....: 25-SEP-96 00:00
DCL Report Group.....: 96E-0640-03

DCL Preparation Group: G969703Q
Date Prepared.....: 18-OCT-96 00:00
Preparation Method...: WR-DC-200
Aliquot Weight/Volume: 1.00E+00
Net Weight/Volume....: Not Required

DCL Analysis Group: G969703Q
Analysis Method...: WR-DC-341
Instrument Type...: AS
Instrument ID.....: GAR0
Column Type.....: Not Applicable

Analytical Results

Analyte	Date Analyzed	Detection Limit	Result±Error ±TPU Error	Qual.	Dilution	CRDL
Thorium-228	25-OCT-96 12:19	9.23E-02	9.31E-02±6.45E-02 ±6.54E-02		4.71E-01	1.0
Thorium-230	25-OCT-96 12:19	7.32E-02	3.46E-01±9.28E-02 ±1.01E-01		4.71E-01	1.0
Thorium-232	25-OCT-96 12:19	5.17E-02	2.79E-02±3.28E-02 ±3.29E-02		4.71E-01	1.0
Thorium-229	25-OCT-96 12:19		TBA			NR

Surrogate Recoveries

Analyte	Result	Spiked Amount	Percent Recovery
Thorium-229	9.9E0	11.	92.

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DATA CHEM LABORATORIES
A Sorenson Company

FORM A (TYPE I)
SINGLE METHOD ANALYSES

SAMPLE ANALYSIS DATA SHEET

Form RLIMS63A-V1.3
11049616100383
Page 7

S968S06J

Date Printed.....: 04-NOV-96 16:10
Client Sample Name: 9136,43,44|BLANK
DCL Sample Name...: 96E04516

Client Name.....: Hayden Environmental
Client Ref Number....: Not Provided
Sampling Site.....: Not Provided
Release Number.....: Not Provided

Matrix.....: AIR
Date Sampled.....: 19-SEP-96 08:30
Reporting Units...: pCi/Sample
Report Basis.....: ☒ As Received ☐ Dried

Date Received.....: 25-SEP-96 00:00
DCL Report Group.....: 96E-0640-03

DCL Preparation Group: G969703Q
Date Prepared.....: 18-OCT-96 00:00
Preparation Method...: WR-DC-200
Aliquot Weight/Volume: 1.00E+00
Net Weight/Volume....: Not Required

DCL Analysis Group: G969703Q
Analysis Method...: WR-DC-341
Instrument Type...: AS
Instrument ID.....: GAR0
Column Type.....: Not Applicable

Analytical Results

Analyte	Date Analyzed	Detection Limit	Result±Error ±TPU Error	Qual.	Dilution	CRDL
Thorium-228	25-OCT-96 12:19	6.48E-02	7.83E-02±5.14E-02 ±5.22E-02		5.00E-01	1.0
Thorium-230	25-OCT-96 12:19	6.22E-02	3.35E-01±9.06E-02 ±9.86E-02		5.00E-01	1.0
Thorium-232	25-OCT-96 12:19	6.93E-02	1.73E-02±3.75E-02 ±3.75E-02		5.00E-01	1.0
Thorium-229	25-OCT-96 12:19		TBA			NR

Surrogate Recoveries

Analyte	Result	Spiked Amount	Percent Recovery
Thorium-229	8.7E0	11.	81.

001015

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020

DATA CHEM LABORATORIES
A Sorenson Company

FORM A (TYPE I)
SINGLE METHOD ANALYSES

SAMPLE ANALYSIS DATA SHEET

Date Printed.....: 04-NOV-96 16:10
Client Sample Name: 9137,45,46|RESP
DCL Sample Name...: 96E04517

Client Name.....: Hayden Environmental
Client Ref Number....: Not Provided
Sampling Site.....: Not Provided
Release Number.....: Not Provided

Matrix.....: AIR
Date Sampled.....: 19-SEP-96 08:30
Reporting Units...: pCi/Sample
Report Basis.....: ☒ As Received ☐ Dried

Date Received.....: 25-SEP-96 00:00
DCL Report Group.....: 96E-0640-03

DCL Preparation Group: G969703Q
Date Prepared.....: 18-OCT-96 00:00
Preparation Method...: WR-DC-200
Aliquot Weight/Volume: 1.00E+00
Net Weight/Volume....: Not Required

DCL Analysis Group: G969703Q
Analysis Method...: WR-DC-341
Instrument Type...: AS
Instrument ID.....: GAR0
Column Type.....: Not Applicable

Analytical Results

Analyte	Date Analyzed	Detection Limit	Result±Error ±TPU Error	Qual.	Dilution	CRDL
Thorium-228	25-OCT-96 12:19	5.21E-02	6.73E-02±4.40E-02 ±4.47E-02		4.99E-01	1.0
Thorium-230	25-OCT-96 12:19	3.96E-02	3.01E-01±8.03E-02 ±8.77E-02		4.99E-01	1.0
Thorium-232	25-OCT-96 12:19	3.95E-02	0.00E+00±1.49E-02 ±1.49E-02		4.99E-01	1.0
Thorium-229	25-OCT-96 12:19		TBA			NR

Surrogate Recoveries

Analyte	Result	Spiked Amount	Percent Recovery
Thorium-229	9.4E0	11.	88.

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DATA CHEM LABORATORIES
A Sorenson Company

FORM B (TYPE I)
SINGLE METHOD ANALYSES

Form RLIMS63B-V1.3
11049616100383
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S96970CG

QUALITY CONTROL DATA SHEET
LABORATORY CONTROL SAMPLE (LCS)

Client Name.....: Hayden Environmental
Release Number.....: Not Provided

Matrix.....: FILTER
Reporting Units.....: pCi/Sample

DCL Preparation Group: G969703Q
Date Prepared.....: 18-OCT-96 00:00
Preparation Method...: WR-DC-200

Date Printed.....: 04-NOV-96 16:10
DCL Sample Name...: QC-123239-1

DCL Analysis Group: G969703Q
Analysis Method...: WR-DC-341
Instrument Type...: AS
Instrument ID.....: GAR0
Column Type.....: Not Applicable

QC Limit Type.....: Method

Analytical Results

Analyte	Date Analyzed	Target	Result	Percent Recovery	QC Limits	QC Flag
Thorium-230	25-OCT-96 12:19	5.0E0	4.9E0	97.4	75.0/125.	

001017

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DATA CHEM LABORATORIES
A Sorenson Company

FORM C (TYPE I)
SINGLE METHOD ANALYSES

QUALITY CONTROL DATA SHEET
BLANK SAMPLE

Client Name.....: Hayden Environmental
Release Number.....: Not Provided

Matrix.....: FILTER
Reporting Units.....: pCi/sample

DCL Preparation Group: G969703Q
Date Prepared.....: 18-OCT-96 00:00
Preparation Method...: WR-DC-200

Date Printed.....: 04-NOV-96 16:10
DCL Sample Name...: BL-123239-1

DCL Analysis Group: G969703Q
Analysis Method...: WR-DC-341
Instrument Type...: AS
Instrument ID.....: GAR0
Column Type.....: Not Applicable

QC Limit Type.....: Method

Analytical Results

Analyte	Date Analyzed	Result	CRDL
Thorium-228	25-OCT-96 12:19	0.031	1.0
Thorium-230	25-OCT-96 12:19	0.071	1.0
Thorium-232	25-OCT-96 12:19	0.0028	1.0

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DATA CHEM LABORATORIES
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FORM G (TYPE I)
SINGLE METHOD ANALYSES

Form RLIMS63G-V1.3
11049616100383
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G969703Q

QUALITY CONTROL DATA SHEET
SURROGATE SUMMARY

Date Printed.....: 04-NOV-96 16:10

Client Name.....: Hayden Environmental
Release Number.....: Not Provided

DCL Analysis Group: G969703Q
Analysis Method...: WR-DC-341

Matrix.....: FILTER
Reporting Units.....: pCi

DCL Prep Group....: G969703Q
Preparation Method: WR-DC-200

QC Limit Type.....: Method

Surrogate Recoveries

Surr. ID	Thorium-229											
QC Limits	45.0/100.											
DCL Sample Number	Analyte Result	Spiked Amount	% Rec.	Q	Analyte Result	Spiked Amount	% Rec.	Q	Analyte Result	Spiked Amount	% Rec.	Q
96E04514	1.86E1	21.6	85.9									
96E04515	9.87E0	10.7	92.2									
96E04516	8.67E0	10.7	81.0									
96E04517	9.43E0	10.7	88.1									
BL-123239-1	9.24E0	10.7	86.4									
QC-123239-1	9.79E0	10.7	91.5									

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DATA CHEM LABORATORIES
A SORENSON COMPANY

Datapackage Table of Contents

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Information pertaining to this datapackage is divided into the four categories listed below (see colored divider sheets for an inventory list of each category). If an item on the inventory is not applicable, an "NA" is placed in the corresponding check box. A Case Narrative immediately precedes this Table of Contents and contains pertinent information about this datapackage.

Analytical Forms ..... Yellow
Sample Tracking Documentation ..... Pink
Analytical Documentation ..... Blue
Raw Data ..... Green

♦ ♦ ♦ ♦ ♦ ♦ ♦ ♦ ♦ ♦

Analytical Forms
Inventory Checklist

- [x] Case Narrative

IRDMIS
- [ ] Data Review and Approval Form
- [ ] IRDMIS Reports
- [ ] GC/MS TICs

Commercial Forms
- [ ] Analytical or Environmental Report Form
- [ ] Set Comments
- [ ] Applicable QC Sheets

RLIMS Forms
- [x] Cover Form
- [x] Sample Group Comments (Form H)
- [x] Sample Analysis Data Sheet (Form A)
- [x] Laboratory Control Sample (Form B)
- [x] Blank Sample (Form C)
- [ ] Matrix Spike Sample (Form D)
- [x] Matrix Duplicate Sample (Form E)
- [ ] Matrix Spike/Matrix Spike Duplicate Sample (Form F)
- [x] Surrogate Summary (Form G)
- [ ] Initial Calibration Form
- [ ] Initial Calibration Verification (ICV) Form
- [ ] Continuing Calibration Form
- [ ] Serial Dilution Form
- [ ] Endrin Breakdown or BFB/DFTPP GC/MS Tuning Form

Analytical Forms
Reviewer Checklist

- X The Analytical Forms Inventory Checklist above is complete.
- X The Case Narrative was completed in accordance with procedures in DCL SOP XX-DC-020, "Datapackage Preparation and Validation."
- X Only the correct report forms are used (IRDMIS or Commercial Forms or RLIMS Forms).
- X All fields on the report forms are complete with the correct information, including signatures.
- X Results for all samples are reported per client request.
- X Units, methods, and dates are correct.
- X Sample and/or set comments are complete.

Assembled by: [signature] 11/5/96 (Signature, Date) Reviewed by: [signature] 11/5/96 (Signature, Date)

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Rev. 6/95

DATA CHEM LABORATORIES
A SORENSON COMPANY

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Sample Tracking Documentation
Inventory Checklist

- [X] LIMS Grouping Reports
- [X] DataChem Laboratories (DCL) Chain-of-Custody Record
- [X] DCL Sample Work Order
- [NA] Copy of numbered Nonconformance/Corrective Action Report (NC/CAR)
- [NA] Copy of Client-Related Problem Report (CPR)

Sample Tracking Documentation
Reviewer Checklist

X The Sample Tracking Documentation Inventory Checklist above is complete.

X DCL Chain-of-Custody Record provides signatures for the sample portion reported in this data package.

X DCL Chain-of-Custody Record was completed in accordance with procedures in DCL SOP XX-DC-006 "Chain-of-Custody and Laboratory Tracking."

X Methods specified on the Sample Work Order were performed or an explanation for deviations is provided.

X Special instructions on the Sample Work Order were followed.

X Project Management instructions on the Project Protocol Worksheet were followed.

X Client's requests were met or an explanation is provided in the Case Narrative.

NA NC/CAR and/or CPR were completed in accordance with procedures in DCL SOP QC-DC-006 "Nonconformance/Corrective Action Report (NC/CAR) Procedures."

Assembled by: _____ Signature _____ Date _____ Reviewed by: _____ Signature _____ Date 11/5/96

Rev. 6/95

DataChem Laboratories
LIMS - Sample Master System
Preparation Group Report

Date: 8-OCT-1996 16:42
User: PETERSON

RLIMS15-V1.2

Preparation Run Name: G969703P

Group ID: G969703P

Samples: 6

Pos	Laboratory Sample Name	Field Sample Name 1	Field Sample Name 2	Laboratory Sample ID	Laboratory Group Name	Accnt. Number
1	BL-123238-1	BL-123238-1		S96970CC	96E-0640-02	03025
2	QC-123238-1	QC-123238-1		S96970CD	96E-0640-02	03025
3	96E04514	9131,39,40	NORTH	S968S06B	96E-0640-02	03025
4	96E04515	9135,41,42	SOUTH	S968S06C	96E-0640-02	03025
5	96E04516	9136,43,44	BLANK	S968S06D	96E-0640-02	03025
6	96E04517	9137,45,46	RESP	S968S06F	96E-0640-02	03025

----- END OF LISTING -----

PMK

NOV 05 1996

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DataChem Laboratories
LIMS - Sample Master System
Preparation Group Report

Date: 8-OCT-1996 16:42
User: PETERSON

Page: 1
RLIMS15-V1.2

Preparation Run Name: G969703Q

Group ID: G969703Q

Samples: 6

Pos	Laboratory Sample Name	Field Sample Name 1	Field Sample Name 2	Laboratory Sample ID	Laboratory Group Name	Accnt. Number
1	BL-123239-1	BL-123239-1		S96970CF	96E-0640-03	03025
2	QC-123239-1	QC-123239-1		S96970CG	96E-0640-03	03025
3	96E04514	9131,39,40	NORTH	S968S06G	96E-0640-03	03025
4	96E04515	9135,41,42	SOUTH	S968S06H	96E-0640-03	03025
5	96E04516	9136,43,44	BLANK	S968S06J	96E-0640-03	03025
6	96E04517	9137,45,46	RESP	S968S06K	96E-0640-03	03025

----- END OF LISTING -----

PMK

NOV 05 1996

8019

Earliest Sampling Date: 19-Sep-1996

DataChem Laboratories
CHAIN-OF-CUSTODY

Results due by: 25-Oct-1996

Project/Job/Task: COMM-ENV | Split: | Root Set ID: 96E-0640 * | Reporting Group

Client: Hayden Environmental | Account: 03025

Comments:

Verified: KM 9-25-96

Date Sampled	Field ID Number	DCL Sample Name	DCL Sample ID	QC	Matrix	Customer ID 2					01 Method 5 Particulate	02 Isotopic Uranium	03 ISOTOPIC THORIUM	04 Radium 226/228 by gamma spec	05 Total Uranium by kPA					#
19-Sep-1996	9131,39,40	96E04514			AIR	NORTH					X	X	X	X	X					3
19-Sep-1996	9135,41,42	96E04515			AIR	SOUTH					X	X	X	X	X					3
19-Sep-1996	9136,43,44	96E04516			AIR	BLANK					X	X	X	X	X					3
19-Sep-1996	9137,45,46	96E04517			AIR	RESP					X	X	X	X	X					3

ORIGINAL FIELD SAMPLE CHAIN-OF-CUSTODY

Relinquished By: (Signature)	Date/Time	Received By: (Signature)	Reason for Transfer/ Storage Location
Walk-in/ Room/ Shelf/ Fridge R-23-1 FV	9/25/96 1450	Karen Vigil	Labeling/Shelving
Karen Vigil	9/25/96 1455	Walk-in/ Room/ Shelf/ Fridge R-23-1 FV	Storage: CW-2
R-23-1 QC	9/30/96 1000	[illegible]	sample prep
[illegible]	10/06/96 12:15	Rm 311 QC	storage
Rm 311 T.P.	10/8/96 16:00	Ty E. Peterson	sample digestion
Ty E. Peterson	10/9/96 8:00	Robin Tilly	γ spec
Robin Tilly	10/11/96 1115	Rm 311 BR	storage
Rm 311 BR	10-18-96 10:00	Bradley Richardson	Sample Prep
Bradley Richardson	10-18-96 12:00	Rm 311 BR	Storage

SAMPLE PREPARATION / ANALYSIS CHAIN-OF-CUSTODY

Sample Prep/Analysis for: 150 URANIUM | Lab Notebook No.: 4035

Prepared/Analyzed by: B Richardson | Date/Time: 10-18-96/12:00

Relinquished By: (Signature)	Date/Time	Received By: (Signature)	Reason for Transfer/ Storage Location
Bradley Richardson	10-18-96 16:00	Emil G. Rupp	Column Sep.
Emil G. Rupp	10-22-96 1500	Max A. Barnett	α-spec. (44)
Max A. Barnett	10-25-96 11:00	R-403-1 MAB	storage

Check box if there is a continuation page ☐

Form: COFC1.01-SWV2.30

Printed 9/25/1996 14:49

8019

Earliest Sampling Date: 19-Sep-1996

DataChem Laboratories
CHAIN-OF-CUSTODY

Results due by: 25-Oct-1996

Project/Job/Task: COMM-ENV | Split: | Root Set ID: 96E-0640 * | Reporting Group

Client: Hayden Environmental | Account: 03025

Comments:

Verified: KM 9-25-96

Date Sampled	Field ID Number	DCL Sample Name	DCL Sample ID	QC	Matrix	Customer ID 2	01 Method 5 Particulate	02 Isotopic Uranium	03 ISOTOPIC THORIUM	04 Radium 226/228 by gamma spec	05 Total Uranium by KPA	Samples
19-Sep-1996	9131,39,40	96E04514			AIR	NORTH	X	X	X	X	X	3
19-Sep-1996	9135,41,42	96E04515			AIR	SOUTH	X	X	X	X	X	3
19-Sep-1996	9136,43,44	96E04516			AIR	BLANK	X	X	X	X	X	3
19-Sep-1996	9137,45,46	96E04517			AIR	RESP	X	X	X	X	X	3

ORIGINAL FIELD SAMPLE CHAIN-OF-CUSTODY

Relinquished By: (Signature)	Date/Time	Received By: (Signature)	Reason for Transfer/ Storage Location
Walk-in/ Room/ Shelf/ Fridge R-23-1 FV	9/25/96 1450	Kamyn Vigil	Labeling/Shelving
Kamyn Vigil	9/25/96 1455	Walk-in/ Room/ Shelf/ Fridge R-23-1 FV	Storage: CW-R
R-23-1 QC	9/30/96 1000	Cliff L. Clay	sample prep
Cliff L. Clay	10/06/96 12:15	Rm 311 QC	storage
Rm 311 T.P.	10/8/96 16:00	Ty E. Peterson	sample digestion
Ty E. Peterson	10/9/96 8:00	Robin Jolley	γ spec
Robin Jolley	10/11/96 11:15	Rm 311 RJ	storage
Rm 311 BR	10-18-96 10:00	Bradley Richardson	Sample Prep
Bradley Richardson	10-18-96 12:00	Rm 311 BR	Storage

SAMPLE PREPARATION / ANALYSIS CHAIN-OF-CUSTODY

Sample Prep/Analysis for: Thorium | Lab Notebook No.: 4035

Prepared/Analyzed by: B Richardson | Date/Time: 10-18-96/12:00

Relinquished By: (Signature)	Date/Time	Received By: (Signature)	Reason for Transfer/ Storage Location
Bradley Richardson	10-18-96 16:00	W Upham	Column sep.
W Upham	10-24-96 11:00	Mark A. Barnett	α-spec.
Mark A. Barnett	11-4-96 12:00	R-403-1 MAB	storage

Check box if there is a continuation page ☐

Form: COFC1.01 SWV2.30

Printed 9/25/1996 14:49

Sample Work Order

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QC Clearance: _____

Project Manager: Robert P. Di Rienzo

Client: Hayden Environmental

Account: 03025

Project/Task: COMM-ENV

Date Received: 25-Sep-1996

Date for Mailing Report: 25-Oct-1996

DCL Root Set ID: 96E-0640 *

DCL Lab. Name: 96E04514-96E04517

Total # Samples: 4

Sample Entry: Karyn L. Boyack

Section: WA

Earliest Sampling Date: 19-Sep-1996

Preparation Type:

Rep. Group	Radiochemistry Analytes Requested	Latest Prep. Date	Latest Anal. Date	No. of Samp.	Storage Location	Analysis/Prep. Method	Inst.	Matrix
01	Method 5 Particulate		18-Mar-1997[c]	4		Method 5	GRAV	AIR
02	Isotopic Uranium	1-Oct-1996[c]	18-Mar-1997[c]	4		WR-DC-341 WR-DC-200	AS	AIR
03	ISOTOPIC THORIUM	1-Oct-1996[c]	18-Mar-1997[c]	4		WR-DC-341	AS	AIR
04	Radium 226/228 by gamma spec		18-Mar-1997[c]	4		WR-EP-325 WR-DC-200	GS	AIR
05	Total Uranium by kPA		18-Mar-1997[c]	4		WR-DC-342	kPA	AIR

[c]Based on date of collection

Special Instructions: _____

Section Manager: Charlie C. Walker

Other Sections Receiving Sample Portions: None

SAMPLE LOG-IN SHEET

8019

Group Name: 96E-0640

Lab Name: DataChem Laboratories	Page 1 of 1
Received By (Print Name): Sample Rec. Group	Log-In Date: 9-25-96
Received By (Signature): Tanya Vigil	
Case Number: —	Sample Delivery Group No.: — / SAS Number: NA

Remarks:

		Client ID #1 EPA Sample #	Corresponding Client ID #2 Sample Tag #	Corresponding Assigned Lab #	Matrix	Fraction	Remarks: Condition of Sample Shipment, etc.
1. Custody Seal(s)	Present/Absent*	200259131	North	96E04514	Water	R/A	each client
	Intact/Broken*	39	↓	↓	Water	↓	ID 1 bottle
2. Custody Seal Nos.	N/A	40	↓	↓	Water	↓	needs to be
		200259135	South	96E04515	Water	↓	combined
3. Chain-of-Custody Records	Present/Absent*	41	↓	↓	Water	↓	to create
4. Traffic Reports or Packing Lists	Present/Absent*	42	↓	↓	Water	↓	a single
5. Airbill	Airbill/Sticker	200259136	Blank	96E04516	Water	↓	client ID
	Present/Absent*	43	↓	↓	Water	↓	2 (see PPQ)
6. Airbill No.	9690684221	44	↓	↓	Water	↓	↓
		200259137	Resp	96E04517	Water	↓	↓
7. Sample Tags	Present/Absent*	45	↓	↓	Water	↓	↓
Sample Tag Numbers	Listed/Not Listed on Chain-of-Custody	46	↓	↓	Water	↓	↓
8. Sample Condition	Intact/Broken*/Leaking						
9. Does information on custody records, traffic reports, and sample tags agree?	Yes/No*						
10. Date Received at Lab	9/25/96						
11. Time Received	1000						

Tanya Vigil 9/25/96

Sample Transfer	
Fraction: All	Fraction:
Area #: R-23-1	Area #:
By: TV	By:
On: 9/25/96	On:

* Contact SMO and attach record of resolution.

Reviewed By:	Logbook No.:
Date:	Logbook Page No.:

FRACTIONS:
C - Cyanide
D - Dissolved Metals
T - Total Metals
F - Full TCL Organics
P - Pesticides
S - Semivolatiles
V - Volatiles

FORM DC-1

R - Rad Chem
A - Particulates

Note: only highlighted portion of client ID #1s entered into DCL computer system 9/26

001027

FERMCO

P.O. BOX 538704
CINCINNATI, OH 45253-8704

CHAIN OF CUSTODY / REQUEST FOR ANALYSIS RECORD

REFERENCE DOCUMENT NO.: SPL-96-2875

ORIGINAL MEF NO.: _____ CORRESPONDING REFERENCE DOCUMENT NO.: _____

8019 033

RELEASE NO.: 1000012382 | PROJECT NO.: N/A | FOR SAMPLE RELATED PROBLEMS, ACS CONTACT / PHONE: Tim Miller X4198 | CONTRACT PURCHASE ORDER / TASK ORDER NO.: N/A

PROJECT NAME: NESHAP STACK SAMPLING | REQUIRED REPORT DATE / LAB TAT: PARTICULATE (10 DAY) RAD (30 DAY) | SAMPLE SHIPMENT DATE: 9-24-96

PROJECT CONTACT / PHONE: Tim Miller / 4198 | RECEIVING LAB NAME: DATACHEM | SAMPLE SHIPPER (Print): G Bell

CHARGE NO.: 2ECG2 | LOT MARKING NO.: N/A | RECEIVING LAB ADDRESS: SALT LAKE CITY | OFF-SITE LAB CONTACT: Robert DiRenzo

SAMPLING TEAM (Print) & GROUP NAME / PHONE: BRUCE SARVEN HAYDEN ENVIRONMENTAL 513-438-3010 Geoff Schoenberger HAYDEN

SAMPLING TEAM (Signature & Badge No.): Bruce Sarven 282-74-1262 Geoff D. Schoenberger 267-82-4754

ITEM NO.	SAMPLE NUMBER: FACTS ID	SAMPLE NUMBER: CUSTOMER ID / SAMPLE POINT	SAMPLE MATRIX		COMP	GRAB	FILTERED	COLLECTION DATE	COLLECTION TIME	CONTAINER TYPE	CONTAINER VOL.	NO. CONTRS	PRESERVATION	A B L	ANALYSES REQUESTED (If more space is required, use the SPECIAL INSTRUCTIONS block.)	SAMPLE OKAY? (Y/N)* FERMCO	SAMPLE OKAY? (Y/N)* OFF-SITE
1	200259131	NORTH FILTER	AF	AIR FILTER	✓		N/A	9-19-96	0830	F	1460 CFM	1	NONE	B	Particulate & Rad *	Y	
2	200259139	NORTH FRONT 1/2	L1	ACETONE	✓		N/A	9-19-96	0830	P	1 L	1	NONE	B	Particulate & Rad *	Y	
3	200259140	NORTH BACK 1/2	L2	~~ACETONE~~ WATER	✓		N/A	9-19-96	0830	P	1 L	1	NONE	B	Particulate & Rad *	Y	
4	200259135	South Filter	AF	AIR FILTER	✓		N/A	9-19-96	0830	F	1360 CFM	1	NONE	B	Particulate & Rad *	Y	
5	200259141	South Front 1/2	L1 ~~L2~~	ACETONE	✓		N/A	9-19-96	0830	P	1 L	1	NONE	B	Particulate & Rad *	Y	
6	200259142	South Back 1/2	L2	~~ACETONE~~ WATER	✓		N/A	9-19-96	0830	P	1 L	1	NONE	B	Particulate & Rad *	Y	
7	200259136	Filter BLANK	AF	AIR FILTER	✓		N/A	9-19-96	0830	F	N/A	1	NONE	B	Particulate & Rad *	Y	
8	200259143	D.I. BLANK	L2	WATER	✓		N/A	9-19-96	0830	P	1 L	1	NONE	B	Particulate & Rad *	Y	
9	200259144	ACETONE BLANK	L1	ACETONE	✓		N/A	9-19-96	0830	P	1 L	1	NONE	B	Particulate & Rad *	Y	
10	200259137	Resp. filter	AF	AIR FILTER	✓		N/A	9-19-96	0830	F	293 CFM	1	NONE	B	Particulate & Rad *	Y	

SPECIAL INSTRUCTIONS: * Samples to be shipped off-site to DATA-CHEM / UTAH, Contact Robert DiRenzo
Analysis to be performed are particulate, U-238, U-234, U-235, U-236, Th-228, Th-230, Th-232
Ra-226, Ra-228 and Total Uranium by Lazer Phosphorometry

1-43013 1-43016

RELINQUISHED

ITEM / REASON	RELINQUISHED BY (Signature) / AFFILIATION	BADGE NO.	DATE	TIME
1-12 Rad Analysis	[redacted]	282-74-1262	9/20/96	1630
1-12 Ship		75148	9-23-96	0800
1-17 Ship		630	9-24-96	1300
		6		

RECEIVED

RECEIVED BY (Signature) / AFFILIATION	BADGE NO.	DATE	TIME
[redacted]	1 75148	9/20/96	1630
	2 630	9-23-96	0800
	3 5852	9.25.96	1000
	4		
	5		

DISTRIBUTION OF C[redacted] WHITE ON-SITE - RELEASE FILE / OFF-SITE ANALYTICAL LAB - RETURN TO FEMP | YELLOW [redacted]SITE - DISTRIBUTE AS NEEDED / OFF-SITE ANALYTICAL LAB - RETURN TO FEMP | BLUE SAMPLI[redacted] / PROJECT FILE

FS-F-3361 (09-21-[redacted]

SHADED AREAS ARE TO BE COMPLETED BY [redacted]MPLE RECEIVING GROUP.

* IF "N", THEN COMPLETE APPLICABLE NON-CONFO[redacted]CE PROCEDURE.

FERMCO

CHAIN OF CUSTODY / REQUEST FOR ANALYSIS RECORD (CONTINUED)

PROJECT NO.: N/A

PROJECT NAME: NESHAP STACK SAMPLING

REFERENCE DOCUMENT NO.: SPL-96-2875 1000012382

CORRESPONDING REFERENCE DOCUMENT NO.:

PAGE 2 OF 29

ITEM NO.	SAMPLE NUMBER: FACTS ID	SAMPLE NUMBER: CUSTOMER ID / SAMPLE POINT	SAMPLE MATRIX		COMP	GRAB	FILTERED	COLLECTION: DATE	COLLECTION: TIME	CONTAINER: TYPE	CONTAINER: VOL.	NO. CONTRS	PRESERVATION	ABL	ANALYSES REQUESTED (If more space is required, use the SPECIAL INSTRUCTIONS block.)	SAMPLE OKAY? (Y/N): FERMCO	SAMPLE OKAY? (Y/N): OFF-SITE
11	200259145	Resp. Front 1/2	L1	ACETONE	✓		N/A	9-20-96	0845	P	1L	1	NONE	B	Particulate & Rad	Y	
12	200259146	Resp. Back 1/2	L2	~~ACETONE~~ D.I. WATER	✓		N/A	9-20-96	0845	P	1L	1	NONE	B	Particulate & Rad	Y	
		NOTHING FOLLOWS															

SPECIAL INSTRUCTIONS: AF - Air Filter
L1 - Acetone
L2 - D.I. WATER

DISTRIBUTION OF C[illegible] WHITE ON-SITE - RELEASE FILE / OFF-SITE ANALYTICAL LAB - RETURN TO FEMP YELLOW [illegible]SITE - DISTRIBUTE AS NEEDED / OFF-SITE ANALYTICAL LAB - RETURN TO FEMP BLUE SAMPL[illegible]H / PROJECT FILE

FS-F-3361-1 (09-21-95)

SHADED AREAS ARE TO BE COMPLETED BY THE SAMPLE RECEIVING GROUP.

* IF "N", THEN COMPLETE APPLICABLE NON-CONFO[illegible]NCE PROCEDURE.

TALLY SHEET

 8019

RELEASE #: 1000012382 (CAN 1 OF 1)
PO #: NA
DATE SHIPPED: 23-SEP-96
MATERIAL: NESHAP STACK SAMPLING - AIR FILTERS, ACETONE , AND WATER

ANALYSIS: PARTICULATE AND RAD

Composite Sample Number	Lot Number	Sample Container Size	AnaLis/ FACTS Number	Gross Weight lbs.	Tare Weight lbs.	Net Weight lbs.
NORTH FILTER	W050-730-P047-0417	AIR FILTER	200259131	0.101	0.097	0.004
NORTH FRONT 1/2	W050-730-P047-0417	1 L PLS	200259139	0.300	0.220	0.080
NORTH BACK 1/2	W050-730-P047-0417	1 L PLS	200259140	0.300	0.220	0.080
SOUTH FILTER	W050-730-P047-0417	AIR FILTER	200259135	0.101	0.097	0.004
SOUTH FRONT 1/2	W050-730-P047-0417	1 L PLS	200259141	0.300	0.220	0.080
SOUTH BACK 1/2	W050-730-P047-0417	1 L PLS	200259142	0.300	0.220	0.080
FILTER BLANK	W050-730-P047-0417	AIR FILTER	200259136	0.101	0.097	0.004
DI BLANK	W050-730-P047-0417	1 L PLS	200259143	1.251	0.220	1.031
ACETONE BLANK	W050-730-P047-0417	1 L PLS	200259144	0.300	0.220	0.080
RESP. FILTER	W050-730-P047-0417	AIR FILTER	200259137	0.101	0.097	0.004
RESP. FRONT 1/2	W050-730-P047-0417	1 L PLS	200259145	0.300	0.220	0.080
RESP. BACK 1/2	W050-730-P047-0417	1 L PLS	200259146	0.300	0.220	0.080
				3.755	2.148	1.607

32350

8019

FEMP

COVER SHEET

DOCUMENT TYPE ● RSR ○ RWP

SURVEY FOR RWP? ○ YES ● NO

NAME [redacted]

PAGE 1 OF 4

SIGNED [redacted]

LOCATION Lab WZ6

LOCATION CODE

BADGE #	DATE	TIME	BLDG/GRID#	FLR
7323	09/24/96	09:26	15A	1

SURVEY NUMBER 96-09-11-0164

RWP NUMBER -

COMMENTS Sampleshipment Res. Filters + Acetone Rel# 12352

NA

REVIEWER [redacted] BADGE 7395

SIGN [redacted]

FS-F-4617 (4/22/96)

FEMP
RADIOLOGICAL SURVEY REPORT

SURVEY NUMBER: 96- 9 -11- 165

DATE: 9-24-96	RCT NAME: [redacted]	RCT BADGE #: 74323	PAGE:
REVIEWED BY: [redacted]		REVIEWER BADGE NO: 7395	2 OF 4

MODEL	SERIAL NUMBER	TYPE (α, β, γ)	CALIBRATION-DUE DATE	BKGD. (cpm)	EFF/CF	COUNT TIME (min)	MDA (dpm)	INSP/PERFORMANCE TEST DATE YES	NO
LB5100		αβγ	10-96	.26/1.42	.212/.431	2.0	2/A3	✓	
M3		βγ	2-97	60	30	NA	3000	✓	
2221	75947	α	9-96	1.2	.16	1	16.2	✓	

ITEM NUMBER	LOCATION AND/OR DESCRIPTION	HEIGHT (FT.)	DPM/100cm² ALPHA REMOVABLE (1)	DPM/100cm² ALPHA FIXED PLUS REMOVABLE	DPM/100cm² BETA-GAMMA REMOVABLE (1)	DPM/100cm² BETA-GAMMA FIXED PLUS REMOVABLE	CORRECTED DOSE RATE (MREM/HR) γ CONTACT	β CONTACT	γ AT FT.	β AT FT.
1	200259131	NA	-0 *	-7 *	3	<MDCR				
2	200259136		2	-7.5 *	-2 *					
3	200259135		0 *	-7 *	2 *					
4	200259137		-0 *	5 *	5					
5	200259139		5	NA	4					
6	200259141		2		10					
7	200259145		0 *		5			NA		
8	200259140		0 *		0 *					
9	200259144		-0 *		0 *					
10	200259143		-0 *		0 *					
11	200259142		0 *		1 *					
12	200259146		2		5					
13	I/S can	✓	-0 *	✓	0 *	✓				
14	O/S can	NA	0 *	NA	3	<MDCR				
				NA						

Note (1): Values identified by an asterisk (*) indicate results are less than the calculated MDA (RC-RDA-010)

FS-F-1993-1 (REV. 04/18/95)

8019

TUE SEP 24, 1996
GROUP A SMEARS FOR FREE RELEASE (2 MIN)

SAMPLE NUMBER	GROSS ALPHA	GROSS BETA	DPM ALPHA	DPM BETA	TIME OF COUNT
51	0	[illegible]	-0	5	08:03:16
[illegible]	2	[illegible]	[illegible]	[illegible]	08:05:01
53	1	5	0	2	08:07:46
54	0	[illegible]	-0	3	08:10:01
55	4	7	5	4	08:12:16
56	2	[illegible]	[illegible]	10	08:14:01
57	1	[illegible]	[illegible]	5	08:16:46
58	1	[illegible]	[illegible]	0	08:17:01
59	0	[illegible]	-0	0	08:21:16
60	0		-0	0	08:23:01
61	1	4	0	1	08:25:46
62	2	[illegible]	[illegible]	5	08:28:01
63	0	5	-0	0	08:30:16
64	1	[illegible]	0	3	08:32:30

OPERATION COMPLETE

OPERATION COMPLETE

FEMP RADIOLOGICAL SURVEY REPORT pg 3 of 4
SURVEY # 96-9-11-164 DATED 9/24/96

	(name)	(signature)
RCT:	William Chustern	[illegible]
REVIEWER:	[illegible]	[illegible]

MATERIAL RESTRICTED RELEASE FORM

ITEM NUMBER	ITEM DESCRIPTION	RCT	MATERIAL RELEASE EVALUATOR PRINT/SIGNATURE [1&3]	MATERIAL OWNER/SURVEY REQUESTOR PRINT/SIGNATURE [2&3]
1-4	Filters	RAE	R Hutson	GORDON BELL
5-12	Acetone	RAE	R Hutson	GORDON BELL
			NA	

Additional Comments: Sample to DCL-SLC Lic # UT 1800237 EXP 11-31-97

[1] Signature by Material Release Evaluator indicates the material may be released for restricted use in the uncontrolled area of the FEMP site only. This material is not being released for unrestricted use.

[2] Signature by the Material Owner/Survey Requestor indicates acceptance of responsibility for the material while in the uncontrolled area and the material will be returned to the controlled area following use.

[3] Additional approval by the Manager of Radiological Compliance is required prior to allowing the material to exit beyond the FEMP property boundary. This allowance may be annotated in the additional comments section of the form.

FS-F-3916 (06/24/94)

FEMP RADIOLOGICAL SURVEY REPORT pg 1 of 1
SURVEY # 96-9-11-164 DATED 9-24-96
(name) (signature)
RCT: William Chaston
REVIEWED: R Hutson

039

8019

PROJECT PROTOCOL WORKSHEET

Project:	Fernald Emission Testing	Date: 09/20/96
Client:	Hayden Environmental	Revision: 1.0
Account:	3025	
Proj. Mngr:	Bob Di Rienzo	

Client Contacts:

Reports:

Bruce Sarven
Hayden Environmental
561 Congress Park Drive
Dayton, OH 45459

Phone: (513) 438-3010
FAX: (513) 438-3020

Invoices:

Same with COC

Schedule: Starts 09/20/96

TAT: 30 Calendar Days

Sample Receipt: Use the 96E sample stream. *Notify Project Manager when samples are received.*

Analyses: **Particulates and Radiochemistry**

QA/QC: Overall QA/QC requirements will be based on the DCL Procedures.

MDL: None.

MS/MSD or MD: As per method

Deliverables: RLIMS63 Report, Raw Data, and COC
Paginate entire package

Penalties: None

Questions: If you have any questions, please contact the project manager either directly or by voice-mail at extension 331, or via e-mail on node tigger.

Special Instructions: **See attached Flow Chart and Instructions**
Particulate mesurement is completed first.
Rinsate and Filter Particulate are used for radiochemistry procedures.

PRICE CODES AND ANALYTE GROUPS:

ANALYTE	MATRIX	EST SAMPLE	METHOD	SECT	HOLD CODE	PRICE CODE	ANALYTE GROUP
Particulate	Air	4	Method 5	WA	NA	3025A01NMET5	3025A1MET5
Iso U	Air	4	AS	WA	NA	3025A01NUISO	3025A1UISO
Iso Th	Air	4	AS	WA	NA	3025A01NTISO	3025A1TISO
Radium 226/228	Air	4	GS	WA	NA	3025A01NGS	3025A1GS
Total Uranium	Air	4	kPA	WA	NA	3025A01NTOTU	3025A1TOTU

8019

DATACHEM LABORATORIES CLIENT-RELATED INFORMATION REPORT (CRIR)

CRIR NO. _____

COOLER INFORMATION CHECKLIST
(Fill In or Circle)

Client Name: Fermco

Project/Task/Site:

Date/Time of Receipt: 9/25/96 1000

Number of Coolers Received: 1

Condition of Coolers: Acceptable/Unacceptable

Temperature Control: Present/Not Included

Custody Seals: Present/Absent

Location Temperature Taken: Control/Between Samples

Intact/Broken

Are all temperatures within project specific guidelines? Yes/No

Tamper Evident: Yes/No

Ice Present: Yes/No

Are all applicable pHs within specific guidelines? Yes/No/NA

Frozen/Melted/NA

Cooler Received	DCL Cooler No.	Temp.	Cooler Received	DCL Cooler No.	Temp.	Cooler Received	DCL Cooler No.	Temp.
* 1	MC96 0437	19 °C	4	MC96	°C	7	MC96	°C
2	MC96	°C	5	MC96	°C	8	MC96	°C
3	MC96	°C	6	MC96	°C	9	MC96	°C

Taken By: Karyn Vigil (Signature) Karyn Vigil (Printed Name) 9/25/96 (Date)

* Rad Chem. Analysis: no temp preservation required

CLIENT-RELATED INFORMATION

- ☐ Missing Cooler
- ☐ Cooler Conditions
- ☐ Missing Paperwork
- ☐ Missing/Incorrect Bottle Labels
- ☐ Missing Samples/Bottles
- ☐ Broken/Leaking Samples
- ☐ Incorrect Bottle Type
- ☐ Cooler Temperatures Out Of Range
- ☐ Incorrect Preservation
- ☐ pH Criteria Not Met
- ☐ Head Space in Bottles
- ☐ Insufficient Sample Volume
- ☐ Chain Of Custody Problems
- ☐ Other:

BRIEFLY DESCRIBE THE PROBLEM AND THE ACTION TAKEN:

Faxed to Client? Yes ☐ No ☐ (If yes, attach Fax Cover Sheet)

❖ Response Required Within 24 Hours ❖

PROJECT MANAGEMENT

PROJECT MANAGER COMMENTS:

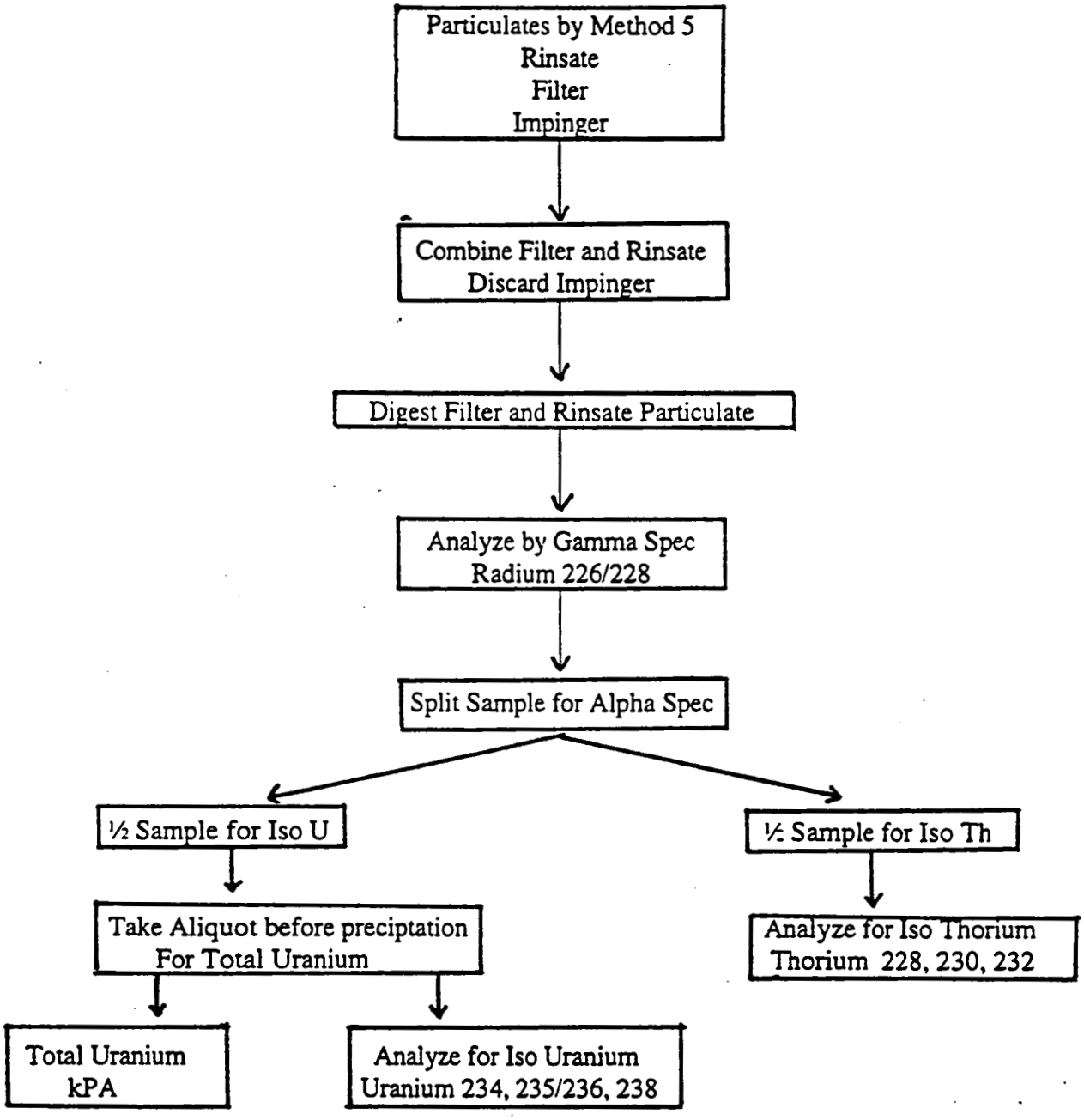
DCL Project Manager: _____ (Printed Name) Returned to Sample Receipt by: _____ (Signature) Date: _____

042

001037

Analytical Scheme
Hayden Environmental - Fernault Emission Testing

3 Samples and Field Blank



DATACHEM LABORATORIES Filter Weight Book No. FWT 00 Page No. 019

8019

Filter Lot #: ? Temp.: 74 R.H.: 55%

Filter: GF 96-20 (740)
Tare Analyst: JK Date: 9/16/96
Total Weight ____ mg
Total Weight ____ mg
Avg. Total Weight ____ mg
Tare Weight ~~453.2~~ 447.6 mg
Tare Weight ~~453.2~~ 447.6 mg
Avg. Tare Weight ~~453.2~~ 447.6 mg
SAMPLE No. ____ SAMPLE WT. ____ mg
Total Wt. Anal. ____ Date ____
Check Analyst ____ Date ____

Filter: GF 96-21 (756)
Tare Analyst: JK Date ____
Total Weight ____ mg
Total Weight ____ mg
Avg. Total Weight ____ mg
Tare Weight 453.2 mg
Tare Weight 453.2 mg
Avg. Tare Weight 453.2 mg
SAMPLE No. ____ SAMPLE WT. ____ mg
Total Wt. Anal. ____ Date ____
Check Analyst ____ Date ____

Filter: GF 96-22 (752)
Tare Analyst: JK Date ____
Total Weight ____ mg
Total Weight ____ mg
Avg. Total Weight ____ mg
Tare Weight 448.9 mg
Tare Weight 448.8 mg
Avg. Tare Weight 448.9 mg
SAMPLE No. ____ SAMPLE WT. ____ mg
Total Wt. Anal. ____ Date ____
Check Analyst ____ Date ____

Filter: GF 96-23 (753)?
Tare Analyst: JK Date ____
Total Weight ____ mg
Total Weight ____ mg
Avg. Total Weight ____ mg
Tare Weight 446.2 mg
Tare Weight 446.0 mg
Avg. Tare Weight 446.1 mg
SAMPLE No. ____ SAMPLE WT. ____ mg
Total Wt. Anal. ____ Date ____
Check Analyst ____ Date ____

Filter: GF 96-24 (755)?
Tare Analyst: JK Date ____
Total Weight ____ mg
Total Weight ____ mg
Avg. Total Weight ____ mg
Tare Weight 456.6 mg
Tare Weight 456.3 mg
Avg. Tare Weight 456.5 mg
SAMPLE No. ____ SAMPLE WT. ____ mg
Total Wt. Anal. ____ Date ____
Check Analyst ____ Date ____

Fore Testing we supplied filters Gemaire GFF Glass Fiber Filters Tared on a Sartorius Research (Rad Chem) DLL#102683 on 9/16/96 JK

Filter: GF 96-25 (754)
Tare Analyst: JK Date ____
Total Weight ____ mg
Total Weight ____ mg
Avg. Total Weight ____ mg
Tare Weight 447.5 mg
Tare Weight 447.4 mg
Avg. Tare Weight 447.5 mg
SAMPLE No. ____ SAMPLE WT. ____ mg
Total Wt. Anal. ____ Date ____
Check Analyst ____ Date ____

Filter: GF 96-26 (760?)
Tare Analyst: JK Date ____
Total Weight ____ mg
Total Weight ____ mg
Avg. Total Weight ____ mg
Tare Weight 451.2 mg
Tare Weight 450.9 mg
Avg. Tare Weight 451.1 mg
SAMPLE No. ____ SAMPLE WT. ____ mg
Total Wt. Anal. ____ Date ____
Check Analyst ____ Date ____

Filter: GF 96-27 (761)
Tare Analyst: JK Date ____
Total Weight ____ mg
Total Weight ____ mg
Avg. Total Weight ____ mg
Tare Weight 449.3 mg
Tare Weight 449.2 mg
Avg. Tare Weight 449.3 mg
SAMPLE No. ____ SAMPLE WT. ____ mg
Total Wt. Anal. ____ Date ____
Check Analyst ____ Date ____

Filter: GF 96-28 (763)
Tare Analyst: JK Date 9/16/96
Total Weight ____ mg
Total Weight ____ mg
Avg. Total Weight ____ mg
Tare Weight 450.9 mg
Tare Weight 450.7 mg
Avg. Tare Weight 450.8 mg
SAMPLE No. ____ SAMPLE WT. ____ mg
Total Wt. Anal. ____ Date ____
Check Analyst ____ Date ____

Filter: ____
Tare Analyst ____ Date ____
Total Weight ____ mg
Total Weight ____ mg
Avg. Total Weight ____ mg
Tare Weight ____ mg
Tare Weight ____ mg
Avg. Tare Weight ____ mg
SAMPLE No. ____ SAMPLE WT. ____ mg
Total Wt. Anal. ____ Date ____
Check Analyst ____ Date ____

044

DATACHEM LABORATORIES
ANALYTE GROUP LIST
SEARCH STRING: 3025A1MET5

ANALYTE GROUP: 3025A1MET5 ACCOUNT: 03025 DESCRIPTION: Method 5 Particulate

Analyte	Instrument Class	Method	Sub Method	Report Units	Threshold	Lod	Loq
Particulate	GRAV	Method 5		mg/Rinsate			0.1
Particulate	GRAV	Method 5		mg/Filter			0.1
Particulate	GRAV	Method 5		mg/Impinger			0.1
Particulate	GRAV	Method 5		Total mg			0.1

--- END OF LISTING ---

80019
045
001040

DATACHEM LABORATORIES
ANALYTE GROUP LIST
SEARCH STRING: 3025A1UISO

ANALYTE GROUP: 3025A1UISO ACCOUNT: 03025 DESCRIPTION: Isotopic Uranium

Analyte	Instrument Class	Method	Sub Method	Report Units	Threshold	Lod	Loq
Uranium-233/234	AS	WR-DC-341	WR-DC-200	pCi/Sample			1.0
Uranium-235	AS	WR-DC-341	WR-DC-200	pCi/Sample			1.0
Uranium-238	AS	WR-DC-341	WR-DC-200	pCi/Sample			1.0

--- END OF LISTING ---

8019
046
001041

DATACHEM LABORATORIES
ANALYTE GROUP LIST
SEARCH STRING: 3025A1TISO

ANALYTE GROUP: 3025A1TISO ACCOUNT: 03025 DESCRIPTION: ISOTOPIC THORIUM

Analyte	Instrument Class	Method	Sub Method	Report Units	Threshold	Lod	Loq
Thorium-228	AS	WR-DC-341		pCi/Sample			1.0
Thorium-230	AS	WR-DC-341		pCi/Sample			1.0
Thorium-232	AS	WR-DC-341		pCi/Sample			1.0

--- END OF LISTING ---

001042
047
80019

DATACHEM LABORATORIES
ANALYTE GROUP LIST
SEARCH STRING: 3025A1GS

ANALYTE GROUP: 3025A1GS ACCOUNT: 03025 DESCRIPTION: Radium 226/228 by ga

Analyte	Instrument Class	Method	Sub Method	Report Units	Threshold	Lod	Loq
Radium-226	GS	WR-EP-325	WR-DC-200	pCi/Sample			95
Radium-228	GS	WR-EP-325	WR-DC-200	pCi/Sample			20

--- END OF LISTING ---

809
001043
048

DATACHEM LABORATORIES
ANALYTE GROUP LIST
SEARCH STRING: 3025A1TOTU

ANALYTE GROUP: 3025A1TOTU ACCOUNT: 03025 DESCRIPTION: Total Uranium by kPA

Analyte	Instrument Class	Method	Sub Method	Report Units	Threshold	Lod	Loq
Total Uranium	kPA	WR-DC-342		ug/Sample			0.8

--- END OF LISTING ---

001044
049
8019

August 6, 1996
Refer to: BD0021

Bruce Sarven
Hayden Environmental
561 Congress Park Drive
Dayton, OH 45459

Phone: (513) 438-3010
FAX: (513) 438-3020

Re: REVISED FAX Quote BD0021

Dear Mr. Sarven:

DataChem Laboratories, Inc.(DCL) appreciates the opportunity to provide you with cost estimates for your project. As I understand your needs, you will be taking three 6 hour stack samples and a blank by Method 5 for particulates and radionulclides analysis. Tared glass fiber filters and sample bottles will be provided for these determinations. The acetone rinse and glass fiber filter will be combined for the analysis of radionuclides.

Uranium 234, Uranium 235/236, Uranium 238, Thorium 228, Thorium 230, and Thorium 232 will be analyzed by alpha spectrometry(AS). Radium 226 and Radium 228 will be analyzed by gamma spectrometry(GS). Total Uranium will be analyzed by kinetic phosphorescence(KPA). According to method 114 these radionuclides will be part of the particulate loading and analysis on the impinger solutions is not required. Combined particulate from the acetone rinse and filter will be analyzed according to DCL standard operating procedures(SOP).

The standard turnaround time for these analysis is 30 calendar days. The requested turnaround time of 10 working days can be accomplished for an additional 25%. The requested detection limits for isotopic analysis can not be met. Minimun Detectable Activity (MDA) is listed on the attached table.

Attached is a Pricing Quotation for these analyses. If you have any question concerning the attached quotation please call me.

Sincerely,

Robert P. Di Rienzo
Project Manager

Revised Pricing Quotation
Project Reference Number: BD-0021

Parameter Analysis	Method	MDA pCi/Sample	Method	Fractions	Price per Sample
Particulate	Method 5		Grav	Acetone Rinse Filter Impinger	$100.00
Uranium 234 Uranium 235/236 Uranium 238	DCL SOP	1 1 1	AS	Particulate*	$312.50
Thorium 228 Thorium 230 Thorium 232	DCL SOP	1 1 1	AS	Particulate*	$312.50
Radium 226 Radium 228	DCL SOP	95 20	GS	Particulate*	$250.00
Total Uranium	DCL SOP	0.8 ug/ Sample	KPA	Particulate*	$187.50

* = Particulate samples are combined acetone rinse and glass fiber filter.

EMISSION MEASUREMENT TECHNICAL INFORMATION CENTER TEST METHOD

Method 5 - Determination of Particulate Emissions from Stationary Sources

1. PRINCIPLE AND APPLICABILITY

1.1 Principle. Particulate matter (PM) is withdrawn isokinetically from the source and collected on a glass fiber filter maintained at a temperature in the range of 120 ± 14°C (248 ± 25°F) or such other temperature as specified by an applicable subpart of the standards or approved by the Administrator, U.S. Environmental Protection Agency, for a particular application. The PM mass, which includes any material that condenses at or above the filtration temperature, is determined gravimetrically after removal of uncombined water.

1.2 Applicability. This method is applicable for the determination of PM emissions from stationary sources.

2. APPARATUS

2.1 Sampling Train. A schematic of the sampling train used in this method is shown in Figure 5-1. Complete construction details are given in APTD-0581 (Citation 2 in the Bibliography); commercial models of this train are also available. For changes from APTD-0581 and for allowable modifications of the train shown in Figure 5-1, see the following subsections.

The operating and maintenance procedures for the sampling train are described in APTD-0576 (Citation 3 in the Bibliography). Since correct usage is important in obtaining valid results, all users should read APTD-0576 and adopt the operating and maintenance procedures outlined in it, unless otherwise specified herein. The sampling train consists of the following components:

2.1.1 Probe Nozzle. Stainless steel (316) or glass with sharp, tapered leading edge. The angle of taper shall be ≤30°, and the taper shall be on the outside to preserve a constant internal diameter. The probe nozzle shall be of the button-hook or elbow design, unless otherwise specified by the Administrator. If made of stainless steel, the nozzle shall be constructed from seamless tubing; other materials of construction may be used, subject to the approval of the Administrator.

A range of nozzle sizes suitable for isokinetic sampling should be available, e.g., 0.32 to 1.27 cm (1/8 to 1/2 in.)—or larger if higher volume sampling trains are used—inside diameter (ID) nozzles in increments of 0.16 cm (1/16 in.). Each nozzle shall be calibrated according to the procedures outlined in Section 5.

directly from the wash bottle being used, and place it in a glass sample container labeled "acetone blank."

Inspect the train prior to and during disassembly, and note any abnormal conditions. Treat the samples as follows:

Container No. 1. Carefully remove the filter from the filter holder, and place it in its identified petri dish container. Use a pair of tweezers and/or clean disposable surgical gloves to handle the filter. If it is necessary to fold the filter, do so such that the PM cake is inside the fold. Carefully transfer to the petri dish any PM and/or filter fibers that adhere to the filter holder gasket, by using a dry Nylon bristle brush and/or a sharp-edged blade. Seal the container.

Container No. 2. Taking care to see that dust on the outside of the probe or other exterior surfaces does not get into the sample, quantitatively recover PM or any condensate from the probe nozzle, probe fitting, probe liner, and front half of the filter holder by washing these components with acetone and placing the wash in a glass container. Deionized distilled water may be used instead of acetone when approved by the Administrator and shall be used when specified by the Administrator; in these cases, save a water blank, and follow the Administrator's directions on analysis. Perform the acetone rinse as follows:

Carefully remove the probe nozzle, and clean the inside surface by rinsing with acetone from a wash bottle and brushing with a Nylon bristle brush. Brush until the acetone rinse shows no visible particles, after which make a final rinse of the inside surface with acetone.

Brush and rinse the inside parts of the Swagelok fitting with acetone in a similar way until no visible particles remain.

Rinse the probe liner with acetone by tilting and rotating the probe while squirting acetone into its upper end so that all inside surfaces will be wetted with acetone. Let the acetone drain from the lower end into the sample container. A funnel (glass or polyethylene) may be used to aid in transferring liquid washes to the container. Follow the acetone rinse with a probe brush. Hold the probe in an inclined position, squirt acetone into the upper end as the probe brush is being pushed with a twisting action through the probe; hold a sample container underneath the lower end of the probe, and catch any acetone and particulate matter that is brushed from the probe. Run the brush through the probe three times or more until no visible PM is carried out with the acetone or until none remains in the probe liner on visual inspection. With stainless steel or other metal probes, run the brush through in the above prescribed manner at least six times since metal probes have small crevices in which particulate matter can be entrapped.

Rinse the brush with acetone, and
quantitatively collect these washings in the sample container. After the brushing, make a final acetone rinse of the probe as described above.

It is recommended that two people clean the probe to minimize sample losses. Between sampling runs, keep brushes clean and protected from contamination.

After ensuring that all joints have been wiped clean of silicone grease, clean the inside of the front half of the filter holder by rubbing the surfaces with a Nylon bristle brush and rinsing with acetone. Rinse each surface three times or more if needed to remove visible particulate. Make a final rinse of the brush and filter holder. Carefully rinse out the glass cyclone, also (if applicable). After all acetone washings and particulate matter have been collected in the sample container, tighten the lid on the sample container so that acetone will not leak out when it is shipped to the laboratory. Mark the height of the fluid level to determine whether leakage occurred during transport. Label the container to identify clearly its contents.

Container No. 3. Note the color of the indicating silica gel to determine whether it has been completely spent, and make a notation of its condition. Transfer the silica gel from the fourth impinger to its original container, and seal. A funnel may make it easier to pour the silica gel without spilling. A rubber policeman may be used as an aid in removing the silica gel from the impinger. It is not necessary to remove the small amount of dust particles that may adhere to the impinger wall and are difficult to remove. Since the gain in weight is to be used for moisture calculations, do not use any water or other liquids to transfer the silica gel. If a balance is available in the field, follow the procedure for Container No. 3 in Section 4.3.

Impinger Water. Treat the impingers as follows: Make a notation of any color or film in the liquid catch. Measure the liquid that is in the first three impingers to within 1 ml by using a graduated cylinder or by weighing it to within 0.5 g by using a balance (if one is available). Record the volume or weight of liquid present. This information is required to calculate the moisture content of the effluent gas.

Discard the liquid after measuring and recording the volume or weight, unless analysis of the impinger catch is required (see **NOTE**, Section 2.1.7).

If a different type of condenser is used, measure the amount of moisture condensed either volumetrically or gravimetrically.

Whenever possible, containers should be shipped in such a way that they remain upright at all times.

4.3 Analysis. Record the data required on a sheet such as the one shown in Figure 5-3. Handle each sample container as follows:

Container No. 1. Leave the contents in the shipping container or transfer the filter and any loose PM from the sample container to a tared glass weighing dish. Desiccate for 24 hours in a desiccator containing anhydrous calcium sulfate. Weigh to a constant weight, and report the results to the nearest
0.1 mg. For purposes of this Section, 4.3, the term "constant weight" means a difference of no more than 0.5 mg or 1 percent of total weight less tare weight, whichever is greater, between two consecutive weighings, with no less than 6 hours of desiccation time between weighings.

Alternatively, the sample may be oven dried at 105°C (220°F) for 2 to 3 hours, cooled in the desiccator, and weighed to a constant weight, unless otherwise specified by the Administrator. The tester may also opt to oven dry the sample at 105°C (220°F) for 2 to 3 hours, weigh the sample, and use this weight as a final weight.

Container No. 2. Note the level of liquid in the container, and confirm on the analysis sheet whether leakage occurred during transport. If a noticeable amount of leakage has occurred, either void the sample or use methods, subject to the approval of the Administrator, to correct the final results. Measure the liquid in this container either volumetrically to ±1 ml or gravimetrically to ±0.5 g. Transfer the contents to a tared 250-ml beaker, and evaporate to dryness at ambient temperature and pressure. Desiccate for 24 hours, and weigh to a constant weight. Report the results to the nearest 0.1 mg.

Container No. 3. Weigh the spent silica gel (or silica gel plus impinger) to the nearest 0.5 g using a balance. This step may be conducted in the field.

"Acetone Blank" Container. Measure the acetone in this container either volumetrically or gravimetrically. Transfer the acetone to a tared 250-ml beaker, and evaporate to dryness at ambient temperature and pressure. Desiccate for 24 hours, and weigh to a constant weight. Report the results to the nearest 0.1 mg.

NOTE: At the option of the tester, the contents of Container No. 2 as well as the acetone blank container may be evaporated at temperatures higher than ambient. If evaporation is done at an elevated temperature, the temperature must be below the boiling point of the solvent; also, to prevent "bumping," the evaporation process must be closely supervised, and the contents of the beaker must be swirled occasionally to maintain an even temperature. Use extreme care, as acetone is highly flammable and has a low flash point.

4.4 Quality Control Procedures. The following quality control procedures are

suggested to check the volume metering system calibration values at the field test site prior to sample collection. These procedures are optional for the tester.

4.4.1 Meter Orifice Check. Using the calibration data obtained during the calibration procedure described in Section 5.3, determine the $\Delta H_@$ for the metering system orifice. The $\Delta H_@$ is the orifice pressure differential in units of in. H_20 that correlates to 0.75 cfm of air at 528°R and 29.92 in. Hg. The
$\Delta H_@$ is calculated as follows:

$$\Delta H_@ = 0.0319\, \Delta H \frac{T_m\, \theta^2}{P_{bar}\, Y^2\, V_m^2}$$

where:

ΔH = Average pressure differential across the orifice meter, in. H_20.

T_m = Absolute average DGM temperature, °R.

P_{bar} = Barometric pressure, in. Hg.

θ = Total sampling time, min.

Y = DGM calibration factor, dimensionless.

V_m = Volume of gas sample as measured by DGM, dcf.

0.0319 = (0.0567 in. Hg/°R)(0.75 cfm)^2

Before beginning the field test (a set of three runs usually constitutes a field test), operate the metering system (i.e., pump, volume meter, and orifice) at the $\Delta H_@$ pressure differential for 10 minutes. Record the volume collected, the DGM temperature, and the barometric pressure. Calculate a DGM calibration check value, Y_c, as follows:

$$Y_c = \frac{10\,[0.0319\, T_m]^{1/2}}{V_m\, P_{bar}}$$

where:

Y_c = DGM calibration check value, dimensionless.

8019

Sample Work Order

QC Clearance: _____
Project Manager: Robert P. Di Rienzo
Client: Hayden Environmental
Account: 03025
Project/Task: COMM-ENV
Date Received: 25-Sep-1996
Date for Mailing Report: 25-Oct-1996

DCL Root Set ID: 96E-0640 *
DCL Lab. Name: 96E04514-96E04517
Total # Samples: 4
Sample Entry: Karyn L. Boyack
Section: WA
Earliest Sampling Date: 19-Sep-1996
Preparation Type:

Rep. Group	Radiochemistry Analytes Requested	Latest Prep. Date	Latest Anal. Date	No. of Samp.	Storage Location	Analysis/Prep. Method	Inst.	Matrix
✓ 01	Method 5 Particulate		18-Mar-1997[c]	4		Method 5	GRAV	AIR
✓ 02	Isotopic Uranium	1-Oct-1996[c]	18-Mar-1997[c]	4		WR-DC-341 WR-DC-200	AS	AIR
✓ 03	ISOTOPIC THORIUM	1-Oct-1996[c]	18-Mar-1997[c]	4		WR-DC-341	AS	AIR
✓ 04	Radium 226/228 by gamma spec		18-Mar-1997[c]	4		WR-EP-325 WR-DC-200	GS	AIR
✓ 05	Total Uranium by kPA		18-Mar-1997[c]	4		WR-DC-342	kPA	AIR

[c]Based on date of collection

Special Instructions: _____

Section Manager: Charlie C. Walker

Other Sections Receiving Sample Portions: None

SAMPLE LOG-IN SHEET

Group Name: 96E-8019

Lab Name: DataChem Laboratories	Page 1 of 1
Received By (Print Name): Sample Rec. Group	Log-In Date: 9-25-96
Received By (Signature): Tanya Vigil	
Case Number: —	Sample Delivery Group No.: — / SAS Number: NA

Remarks:

		Client ID #1 (EPA Sample #)	Corresponding: Client ID #2 (Sample Tag #)	Corresponding: Assigned Lab #	Matrix	Fraction	Remarks: Condition of Sample Shipment, etc.
1. Custody Seal(s)	Present/Absent*	200259131	North	96E04514	Water	R/A	each client
	Intact/Broken*	39	↓	↓	Water		ID 1 bottle
2. Custody Seal Nos.	N/A	40	↓	↓	Water		needs to be
		200259135	South	96E04515	Water		combined
3. Chain-of-Custody Records	Present/Absent*	41	↓	↓	Water		to create
4. Traffic Reports or Packing Lists	Present/Absent*	42	↓	↓	Water		a single
5. Airbill	Airbill/Sticker Present/Absent*	200259136	Blank	96E04516	Water		client ID
		43	↓	↓	Water		2 (see PPQ)
6. Airbill No.	9690684221	44	↓	↓	Water		↓
		200259137	Resp	96E04517	Water		
7. Sample Tags	Present/Absent*	45	↓	↓	Water		
Sample Tag Numbers	Listed/Not Listed on Chain-of-Custody	46	↓	↓	Water	↓	↓
8. Sample Condition	Intact/Broken*/Leaking						
9. Does information on custody records, traffic reports, and sample tags agree?	Yes/No*						
10. Date Received at Lab	9/25/96						
11. Time Received	1000						

Tanya Vigil 9/25/96

Sample Transfer	
Fraction: HII	Fraction:
Area #: K-23-1	Area #:
By: TV	By:
On: 9/25/96	On:

* Contact SMO and attach record of resolution.

Reviewed By	Logbook No.
Date	Logbook Page No.

FRACTIONS:
C - Cyanide
D - Dissolved Metals
T - Total Metals
F - Full TCL Organics
P - Pesticides
S - Semivolatiles
V - Volatiles
R - Rad Chem
A - Particulates

FORM DC-1

Note: only highlighted portion of client ID #1's entered into DCL computer system 9/26

001054 95-9

FERMCO

P.O. BOX 538704
CINCINNATI, OH 45253-8704

CHAIN OF CUSTODY / REQUEST FOR ANALYSIS RECORD

REFERENCE DOCUMENT NO.: SPL-96-2875

ORIGINAL MEF NO.: _____ CORRESPONDING REFERENCE DOCUMENT NO.: _____

PAGE 1 OF 2

RELEASE NO.: 1000012382	PROJECT NO.: N/A	FOR SAMPLE RELATED PROBLEMS, ACS CONTACT / PHONE: Tim Miller X4198	CONTRACT PURCHASE ORDER / TASK ORDER NO.: N/A
PROJECT NAME: NESHAP STACK SAMPLING		REQUIRED REPORT DATE / LAB TAT: PARTICULATE (10 DAY) RAD (30 DAY)	SAMPLE SHIPMENT DATE: 9-24-96
PROJECT CONTACT / PHONE: Tim Miller / 4198		RECEIVING LAB NAME: DATACHEM	SAMPLE SHIPPER (Print): G Bell
CHARGE NO.: 7ECG2	LOT MARKING NO.: N/A	RECEIVING LAB ADDRESS: SALT LAKE CITY	OFF-SITE LAB CONTACT: Robert DiRenzo

SAMPLING TEAM (Print) & GROUP NAME / PHONE: BRUCE SARVEN HAYDEN ENVIRONMENTAL 513-438-3010 Geoff Schoenberger 9-20-96 HAYDEN

SAMPLING TEAM (Signature & Badge No.): Bruce Sarven 282-74-1662 Geoff D. Schoenberger 267-82-4754

ITEM NO.	SAMPLE NUMBER: FACTS ID	SAMPLE NUMBER: CUSTOMER ID / SAMPLE POINT	SAMPLE MATRIX		COMP	GRAB	FILTERED	COLLECTION DATE	COLLECTION TIME	CONTAINER TYPE	CONTAINER VOL.	NO. CONTRS	PRESERVATION	BSL	ANALYSES REQUESTED (If more space is required, use the SPECIAL INSTRUCTIONS block.)	SAMPLE OKAY? (Y/N)* FERMCO	SAMPLE OKAY? (Y/N)* OFF-SITE
1	200259131	NORTH FILTER	AF	AIR FILTER	✓		N/A	9-19-96	0830	F	1460 CFM	1	NONE	B	Particulate & Rad *	Y	
2	200259139	NORTH FRONT 1/2	L1	ACETONE	✓		N/A	9-19-96	0830	P	1 L	1	NONE	B	Particulate & Rad *	Y	
3	200259140	NORTH BACK 1/2	L2	WATER	✓		N/A	9-19-96	0830	P	1 L	1	NONE	B	Particulate & Rad *	Y	
4	200259135	SOUTH Filter	AF	AIR FILTER	✓		N/A	9-19-96	0830	F	1360 CFM	1	NONE	B	Particulate & Rad *	Y	
5	200259141	South Front 1/2	L1	ACETONE	✓		N/A	9-19-96	0830	P	1 L	1	NONE	B	Particulate & Rad *	Y	
6	200259142	South BACK 1/2	L2	WATER	✓		N/A	9-19-96	0830	P	1 L	1	NONE	B	Particulate & Rad *	Y	
7	200259136	Filter BLANK	AF	AIR FILTER	✓		N/A	9-19-96	0830	F	N/A	1	NONE	B	Particulate & Rad *	Y	
8	200259143	D.I. BLANK	L2	WATER	✓		N/A	9-19-96	0830	P	1 L	1	NONE	B	Particulate & Rad *	Y	
9	200259144	ACETONE BLANK	L1	ACETONE	✓		N/A	9-19-96	0830	P	1 L	1	NONE	B	Particulate & Rad *	Y	
10	200259137	Resp. Filter	AF	AIR FILTER	✓		N/A	9-19-96	0830	F	293 CFM	1	NONE	B	Particulate & Rad *	Y	

SPECIAL INSTRUCTIONS: * Samples to be shipped off-site to DATA-CHEM / UTAH, Contact Robert DiRenzo
Analysis to be performed are particulate, U-238, U-234, U-235, U-236, Th-228, Th-230, Th-232
Ra-226, Ra-228 and Total Uranium by Luzer Phosphorometry

RELINQUISHED

ITEM / REASON	RELINQUISHED BY (Signature) / AFFILIATION	BADGE NO.	DATE	TIME
1-12 Rad Analysis	[redacted]	1 282-74-1662	9/20/96	1630
1-12 Ship		2 75148	9-23-96	0800
1-17 Ship		3 630	9-24-96	1300
		4		
		5		

RECEIVED

RECEIVED BY (Signature) / AFFILIATION	BADGE NO.	DATE	TIME
[redacted]	1 75148	9/20/96	1630
	2 630	9-23-96	0800
	3 5852	9-25-96	1002
	4		
	5		

DISTRIBUTION OF COPIES: WHITE ON-SITE - RELEASE FILE / OFF-SITE ANALYTICAL LAB - RETURN TO FEMP | YELLOW ON-SITE - DISTRIBUTE AS NEEDED / OFF-SITE ANALYTICAL LAB - RETURN TO FEMP | BLUE SAMPLING TEAM - PROJECT FILE

FS-F-3361 (09-21-95)

SHADED AREAS ARE TO BE COMPLETED BY THE RECEIVING GROUP.

* IF "N", THEN COMPLETE APPLICABLE NON-CONFORMANCE PROCEDURE.

001055

FERMCO

CHAIN OF CUSTODY / REQUEST FOR ANALYSIS RECORD (CONTINUED)

PROJECT NO.: N/A

PROJECT NAME: NESHAP STACK SAMPLING

REFERENCE DOCUMENT NO.: SPL-96-2875 1000012382

CORRESPONDING REFERENCE DOCUMENT NO.:

PAGE 2 OF 2

ITEM NO.	SAMPLE NUMBER: FACTS ID	SAMPLE NUMBER: CUSTOMER ID / SAMPLE POINT	SAMPLE MATRIX		COMP	GRAB	FILTERED	COLLECTION: DATE	COLLECTION: TIME	CONTAINER: TYPE	CONTAINER: VOL.	NO. CONTRS	PRESERVATION	ASL	ANALYSES REQUESTED (If more space is required, use the SPECIAL INSTRUCTIONS block.)	SAMPLE OKAY? (Y/N)* FERMCO	SAMPLE OKAY? (Y/N)* OFF-SITE
11	2000259145	Resp. Front 1/2	L1	ACETONE	✓		N/A	9-20-96	0845	P	1L	1	NONE	B	Particulate & Rad	Y	
12	2000259146	Resp. Back 1/2	L2	~~ACETONE~~ WATER	✓		N/A	9-20-96	0845	P	1L	1	NONE	B	Particulate & Rad	Y	
		NOTHING FOLLOWS															

SPECIAL INSTRUCTIONS: AF - Air Filter
L1 - Acetone
L2 - D.I. WATER

DISTRIBUTION OF COPIES: WHITE - ON-SITE - RELEASE FILE / OFF-SITE ANALYTICAL LAB - RETURN TO FEMP | YELLOW - ON-SITE - DISTRIBUTE AS NEEDED / OFF-SITE ANALYTICAL LAB - RETURN TO FEMP | BLUE - SAMPLING TEAM - PROJECT FILE

FS-F-3361-1 (09-21-95)

SHADED AREAS ARE TO BE COMPLETED BY THE SAMPLE RECEIVING GROUP.

* IF "N", THEN COMPLETE APPLICABLE NON-CONFORMANCE PROCEDURE.

8019

001076

061

TALLY SHEET

 8019

RELEASE #: 1000012382 (CAN 1 OF 1)
PO #: NA
DATE SHIPPED: 23-SEP-96
MATERIAL: NESHAP STACK SAMPLING - AIR FILTERS, ACETONE , AND WATER

ANALYSIS: PARTICULATE AND RAD

Composite Sample Number	Lot Number	Sample Container Size	AnaLis/ FACTS Number	Gross Weight lbs.	Tare Weight lbs.	Net Weight lbs.
NORTH FILTER	W050-730-P047-0417	AIR FILTER	200259131	0.101	0.097	0.004
NORTH FRONT 1/2	W050-730-P047-0417	1 L PLS	200259139	0.300	0.220	0.080
NORTH BACK 1/2	W050-730-P047-0417	1 L PLS	200259140	0.300	0.220	0.080
SOUTH FILTER	W050-730-P047-0417	AIR FILTER	200259135	0.101	0.097	0.004
SOUTH FRONT 1/2	W050-730-P047-0417	1 L PLS	200259141	0.300	0.220	0.080
SOUTH BACK 1/2	W050-730-P047-0417	1 L PLS	200259142	0.300	0.220	0.080
FILTER BLANK	W050-730-P047-0417	AIR FILTER	200259136	0.101	0.097	0.004
DI BLANK	W050-730-P047-0417	1 L PLS	200259143	1.251	0.220	1.031
ACETONE BLANK	W050-730-P047-0417	1 L PLS	200259144	0.300	0.220	0.080
RESP. FILTER	W050-730-P047-0417	AIR FILTER	200259137	0.101	0.097	0.004
RESP. FRONT 1/2	W050-730-P047-0417	1 L PLS	200259145	0.300	0.220	0.080
RESP. BACK 1/2	W050-730-P047-0417	1 L PLS	200259146	0.300	0.220	0.080
				3.755	2.148	1.607

32350

FEMP

COVER SHEET

8019

DOCUMENT TYPE ● RSR ○ RWP

SURVEY FOR RWP? ○ YES ● NO

NAME [redacted]

PAGE 1 OF 4

SIGNED [redacted]

LOCATION Lab WZ6

LOCATION CODE

BADGE #	DATE	TIME	BLDG/GRID#	FLR
7323	09/24/96	09:26	15A	1

SURVEY NUMBER 96-09-11-0165

RWP NUMBER -

COMMENTS Sampleshipment Res. Filters + Acetone Rel# 12352

NA

REVIEWER [redacted] BADGE 7395

S[redacted]

FS-F-4617 (4/22/96)

001058063

8019

FEMP
RADIOLOGICAL SURVEY REPORT

SURVEY NUMBER: 96- 9 -11- 165

DATE: 9-24-96	RCT NAME: [redacted]	RCT BADGE #: 74323	PAGE:
REVIEWED BY: [redacted]		REVIEWER BADGE NO: 7395	2 OF 4

MODEL	SERIAL NUMBER	TYPE (α, β, γ)	CALIBRATION-DUE DATE	BKGD. (cpm)	EFF./CF	COUNT TIME (min)	MDA (dpm)	INSP./PERFORMANCE TEST (LIT) YES	NO
LB5100		αβγ	10-96	.26/1.42	.212/.431	2.0	2/A 3	✓	
M3		βγ	2-97	60	30	NA	3000	✓	
2221	75947	α	9-96	1.2	.16	1	16.2	✓	
					A				
				N					

ITEM NUMBER	LOCATION AND/OR DESCRIPTION	HEIGHT (FT.)	DPM/100cm² ALPHA REMOVABLE (1)	DPM/100cm² ALPHA FIXED PLUS REMOVABLE	DPM/100cm² BETA-GAMMA REMOVABLE (1)	DPM/100cm² BETA-GAMMA FIXED PLUS REMOVABLE	CORRECTED DOSE RATE (MREM/HR) γ CONTACT	β CONTACT	γ AT FT.	β AT FT.
1	200259131	NA	-0 *	-7 *	3	<MDCR				
2	200259136		2	-7.5 *	-2 *					
3	200259135		0 *	-7 *	2 *					
4	200259137		-0 *	5 *	5					
5	200259139		5	NA	4					
6	200259141		2		10					
7	200259145		0 *		5			NA		
8	200259140		0 *		0 *					
9	200259144		-0 *		0 *					
10	200259143		-0 *		0 *					
11	200259142		0 *		1 *					
12	200259146		2		5					
13	I/S can	✓	-0 *	✓	0 *	✓				
14	O/S can	NA	0 *	NA	3	<MDCR				
				NA						

Note (1): Values identified by an asterisk (*) indicate results are less than the calculated MDA (RC-RDA-010)

FS-F-1993-1 (REV. 04/18/95)

0010590 64

TUE SEP 24, 1996
GROUP A SMEARS FOR FREE RELEASE (2 MIN)

SAMPLE NUMBER	GROSS ALPHA	GROSS BETA	DPM ALPHA	DPM BETA	TIME OF COUNT
51	0	2	-0	3	08:03:16
--	2		2	-2	08:05:31
53	1	5	0	2	08:07:46
54	0	3	-0	3	08:10:01
55	4	7	5	4	08:12:16
56	2	17	2	10	08:14:31
57	1	0	0	3	08:16:46
58	1	0	0	0	08:19:01
59	0	1	-0	0	08:21:16
60	0		-0	0	08:23:31
61	1	4	0	1	08:25:46
62	2	8	2	5	08:28:01
63	0	3	-0	0	08:30:16
64	1	5	0	3	08:32:30

OPERATION COMPLETE

OPERATION COMPLETE

FEMP RADIOLOGICAL SURVEY REPORT pg 3 of 4		
SURVEY # 96-9-11-164	DATED 9/24/96	
	(name)	(signature)
RCT:	William Chastern	[illegible]
REVIEWER:	[illegible]	[illegible]

8019

MATERIAL RESTRICTED RELEASE FORM

ITEM NUMBER	ITEM DESCRIPTION	RCT	MATERIAL RELEASE EVALUATOR PRINT/SIGNATURE [1&3]	MATERIAL OWNER/SURVEY REQUESTOR PRINT/SIGNATURE [2&3]
1-4	Filters	N/A	R Watson	GORDON BELL
5-12	Acetone	N/A	R Watson	GORDON BELL
			NA	

Additional Comments: Sent to DCL-SLC Lic # UT1800237 EXP 11-31-97

[1] Signature by Material Release Evaluator indicates the material may be released for restricted use in the uncontrolled area of the FEMP site only. This material is not being released for unrestricted use.

[2] Signature by the Material Owner/Survey Requestor indicates acceptance of responsibility for the material while in the uncontrolled area and the material will be returned to the controlled area following use.

[3] Additional approval by the Manager of Radiological Compliance is required prior to allowing the material to exit beyond the FEMP property boundary. This allowance may be annotated in the additional comments section of the form.

FS-F-3916 (06/24/94)

FEMP RADIOLOGICAL SURVEY REPORT pg 1 of 1
SURVEY # 96-9-11-164 DATED 9-29-96
(name) (signature)
RCT:

066

001061

PROJECT PROTOCOL WORKSHEET

8019

Project:	Fernald Emission Testing	Date: 09/20/96
Client:	Hayden Environmental	Revision: 1.0
Account:	3025	
Proj. Mngr:	Bob Di Rienzo	

Client Contacts:

Reports:

Bruce Sarven
Hayden Environmental
561 Congress Park Drive
Dayton, OH 45459

Phone: (513) 438-3010
FAX: (513) 438-3020

Invoices:

Same with COC

Schedule: Starts 09/20/96

TAT: 30 Calendar Days

Sample Receipt: Use the 96E sample stream. *Notify Project Manager when samples are received.*

Analyses: **Particulates and Radiochemistry**

QA/QC: Overall QA/QC requirements will be based on the DCL Procedures.

EDL: None.

MS/MSD or MD: As per method

Deliverables: RLIMS63 Report, Raw Data, and COC
Paginate entire package

Penalties: None

Questions: If you have any questions, please contact the project manager either directly or by voice-mail at extension 331, or via e-mail on node tigger.

Special Instructions: **See attached Flow Chart and Instructions**
Particulate mesurement is completed first.
Rinsate and Filter Particulate are used for radiochemistry procedures.

PRICE CODES AND ANALYTE GROUPS:

8019

ANALYTE	MATRIX	EST SAMPLE	METHOD	SECT	HOLD CODE	PRICE CODE	ANALYTE GROUP
Particulate	Air	4	Method 5	WA	NA	3025A01NMET5	3025A1MET5
Iso U	Air	4	AS	WA	NA	3025A01NUISO	3025A1UISO
Iso Th	Air	4	AS	WA	NA	3025A01NTISO	3025A1TISO
Radium 226/228	Air	4	GS	WA	NA	3025A01NGS	3025A1GS
Total Uranium	Air	4	kPA	WA	NA	3025A01NTOTU	3025A1TOTU

DATACHEM LABORATORIES CLIENT-RELATED INFORMATION REPORT (CRIR)

CRIR NO. _____

COOLER INFORMATION CHECKLIST
(Fill In or Circle)

Client Name: Fermco

Project/Task/Site:

Date/Time of Receipt: 9/25/96 1000

Number of Coolers Received: 1

Condition of Coolers: Acceptable/Unacceptable

Temperature Control: Present/Not Included

Custody Seals: Present/Absent

Location Temperature Taken: Control/Between Samples

Intact/Broken

Are all temperatures within project specific guidelines? Yes/No

Tamper Evident: Yes/No

Ice Present: Yes/No

Frozen/Melted/NA

Are all applicable pHs within specific guidelines? Yes/No/NA

Cooler Received	DCL Cooler No.	Temp.	Cooler Received	DCL Cooler No.	Temp.	Cooler Received	DCL Cooler No.	Temp.
* 1	MC96 0437	19 °C	4	MC96	°C	7	MC96	°C
2	MC96	°C	5	MC96	°C	8	MC96	°C
3	MC96	°C	6	MC96	°C	9	MC96	°C

Taken By: Karyn Vigil (Signature) Karyn Vigil (Printed Name) 9/25/96 (Date)

* Rad Chem. Analysis: no temp preservation required

CLIENT-RELATED INFORMATION

- ☐ Missing Cooler
- ☐ Cooler Conditions
- ☐ Missing Paperwork
- ☐ Missing/Incorrect Bottle Labels
- ☐ Missing Samples/Bottles
- ☐ Broken/Leaking Samples
- ☐ Incorrect Bottle Type
- ☐ Cooler Temperatures Out Of Range
- ☐ Incorrect Preservation
- ☐ pH Criteria Not Met
- ☐ Head Space in Bottles
- ☐ Insufficient Sample Volume
- ☐ Chain Of Custody Problems
- ☐ Other:

BRIEFLY DESCRIBE THE PROBLEM AND THE ACTION TAKEN:

Faxed to Client? Yes ☐ No ☐ (If yes, attach Fax Cover Sheet)

❖ Response Required Within 24 Hours ❖

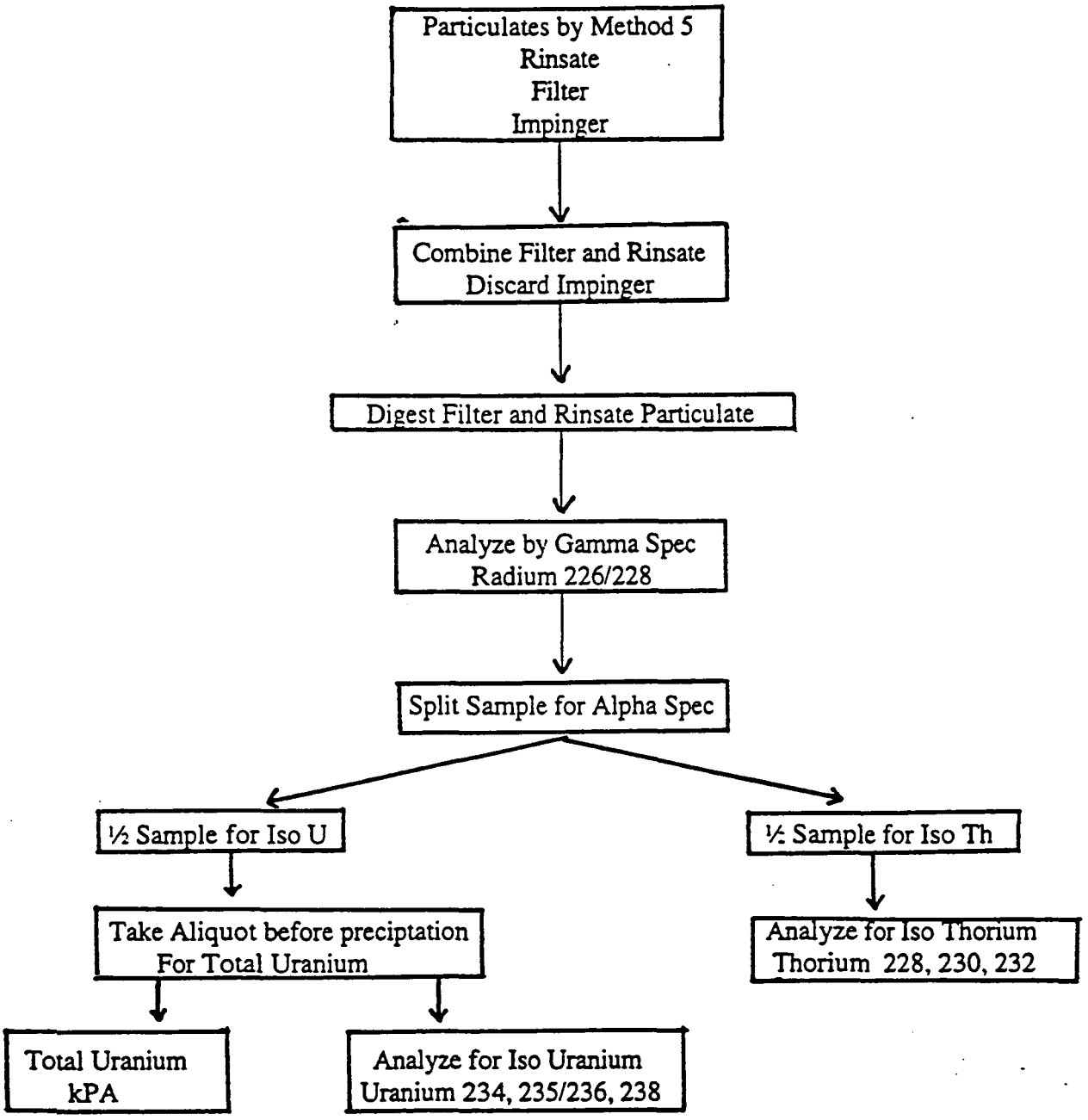
PROJECT MANAGEMENT

PROJECT MANAGER COMMENTS:

DCL Project Manager: _____ (Printed Name) Returned to Sample Receipt by: _____ (Signature) Date: _____

Analytical Scheme
Hayden Environmental - Fernault Emission Testing

3 Samples and Field Blank



DATACHEM LABORATORIES Filter Weight Book No. FWT 06 Page No. 015

8019

Filter Lot #: 7 Temp.: 74 R.H.: 55%

Filter: GF 96-20 (740)
Tare Analyst JK Date 9/16/96
Total Weight ____ mg
Total Weight ____ mg
Avg. Total Weight ____ mg
Tare Weight 453.2 447.6 mg
Tare Weight 453.2 447.6 mg 447.6
Avg. Tare Weight ~~453.2~~ mg
SAMPLE No. ____ SAMPLE WT. ____ mg
Total Wt. Anal. ____ Date ____
Check Analyst ____ Date ____

Filter: GF 96-21 (756)
Tare Analyst JK Date ____
Total Weight ____ mg
Total Weight ____ mg
Avg. Total Weight ____ mg
Tare Weight 453.2 mg
Tare Weight 453.2 mg
Avg. Tare Weight 453.2 mg
SAMPLE No. ____ SAMPLE WT. ____ mg
Total Wt. Anal. ____ Date ____
Check Analyst ____ Date ____

Filter: GF 96-22 (752)
Tare Analyst JK Date ____
Total Weight ____ mg
Total Weight ____ mg
Avg. Total Weight ____ mg
Tare Weight 448.9 mg
Tare Weight 448.8 mg
Avg. Tare Weight 448.9 mg
SAMPLE No. ____ SAMPLE WT. ____ mg
Total Wt. Anal. ____ Date ____
Check Analyst ____ Date ____

Filter: GF 96-23 (752)?
Tare Analyst JK Date ____
Total Weight ____ mg
Total Weight ____ mg
Avg. Total Weight ____ mg
Tare Weight 446.2 mg
Tare Weight 446.0 mg
Avg. Tare Weight 446.1 mg
SAMPLE No. ____ SAMPLE WT. ____ mg
Total Wt. Anal. ____ Date ____
Check Analyst ____ Date ____

Filter: GF 96-24 (753)?
Tare Analyst JK Date ____
Total Weight ____ mg
Total Weight ____ mg
Avg. Total Weight ____ mg
Tare Weight 456.6 mg
Tare Weight 456.3 mg
Avg. Tare Weight 456.5 mg
SAMPLE No. ____ SAMPLE WT. ____ mg
Total Wt. Anal. ____ Date ____
Check Analyst ____ Date ____

Fore Testing was supplied filters Gemidia GFF

Tared on a Sartorius Research (Rad Chem) DLL #102683 on 9/16/96 JK

Filter: GF 96-25 (754)
Tare Analyst JK Date ____
Total Weight ____ mg
Total Weight ____ mg
Avg. Total Weight ____ mg
Tare Weight 447.5 mg
Tare Weight 447.4 mg
Avg. Tare Weight 447.5 mg
SAMPLE No. ____ SAMPLE WT. ____ mg
Total Wt. Anal. ____ Date ____
Check Analyst ____ Date ____

Filter: GF 96-26 (760?)
Tare Analyst JK Date ____
Total Weight ____ mg
Total Weight ____ mg
Avg. Total Weight ____ mg
Tare Weight 451.2 mg
Tare Weight 450.9 mg
Avg. Tare Weight 451.1 mg
SAMPLE No. ____ SAMPLE WT. ____ mg
Total Wt. Anal. ____ Date ____
Check Analyst ____ Date ____

Filter: GF 96-27 (761)
Tare Analyst JK Date ____
Total Weight ____ mg
Total Weight ____ mg
Avg. Total Weight ____ mg
Tare Weight 449.3 mg
Tare Weight 449.2 mg
Avg. Tare Weight 449.3 mg
SAMPLE No. ____ SAMPLE WT. ____ mg
Total Wt. Anal. ____ Date ____
Check Analyst ____ Date ____

Filter: GF 96-28 (763)
Tare Analyst JK Date 9/16/96
Total Weight ____ mg
Total Weight ____ mg
Avg. Total Weight ____ mg
Tare Weight 450.9 mg
Tare Weight 450.7 mg
Avg. Tare Weight 450.8 mg
SAMPLE No. ____ SAMPLE WT. ____ mg
Total Wt. Anal. ____ Date ____
Check Analyst ____ Date ____

Filter: ____
Tare Analyst ____ Date ____
Total Weight ____ mg
Total Weight ____ mg
Avg. Total Weight ____ mg
Tare Weight ____ mg
Tare Weight ____ mg
Avg. Tare Weight ____ mg
SAMPLE No. ____ SAMPLE WT. ____ mg
Total Wt. Anal. ____ Date ____
Check Analyst ____ Date ____

DATACHEM LABORATORIES
ANALYTE GROUP LIST
SEARCH STRING: 3025A1MET5

ANALYTE GROUP: 3025A1MET5 ACCOUNT: 03025 DESCRIPTION: Method 5 Particulate

Analyte	Instrument Class	Method	Sub Method	Report Units	Threshold	Lod	Loq
Particulate	GRAV	Method 5		mg/Rinsate			0.1
Particulate	GRAV	Method 5		mg/Filter			0.1
Particulate	GRAV	Method 5		mg/Impinger			0.1
Particulate	GRAV	Method 5		Total mg			0.1

--- END OF LISTING ---

00106720 72

DATACHEM LABORATORIES
ANALYTE GROUP LIST
SEARCH STRING: 3025A1UISO
ANALYTE GROUP: 3025A1UISO ACCOUNT: 03025 DESCRIPTION: Isotopic Uranium

Analyte	Instrument Class	Method	Sub Method	Report Units	Threshold	Lod	Loq
Uranium-233/234	AS	WR-DC-341	WR-DC-200	pCi/Sample			1.0
Uranium-235	AS	WR-DC-341	WR-DC-200	pCi/Sample			1.0
Uranium-238	AS	WR-DC-341	WR-DC-200	pCi/Sample			1.0

--- END OF LISTING ---

001068 0730

80019

DATACHEM LABORATORIES
ANALYTE GROUP LIST
SEARCH STRING: 3025A1TISO

ANALYTE GROUP: 3025A1TISO ACCOUNT: 03025 DESCRIPTION: ISOTOPIC THORIUM

Analyte	Instrument Class	Method	Sub Method	Report Units	Threshold	Lod	Loq
Thorium-228	AS	WR-DC-341		pCi/Sample			1.0
Thorium-230	AS	WR-DC-341		pCi/Sample			1.0
Thorium-232	AS	WR-DC-341		pCi/Sample			1.0

--- END OF LISTING ---

808
000063 074

DATACHEM LABORATORIES
ANALYTE GROUP LIST
SEARCH STRING: 3025A1GS

ANALYTE GROUP: 3025A1GS ACCOUNT: 03025 DESCRIPTION: Radium 226/228 by ga

Analyte	Instrument Class	Method	Sub Method	Report Units	Threshold	Lod	Loq
Radium-226	GS	WR-EP-325	WR-DC-200	pCi/Sample			95
Radium-228	GS	WR-EP-325	WR-DC-200	pCi/Sample			20

--- END OF LISTING ---

80019

0010279

DATACHEM LABORATORIES
ANALYTE GROUP LIST
SEARCH STRING: 3025A1TOTU

ANALYTE GROUP: 3025A1TOTU ACCOUNT: 03025 DESCRIPTION: Total Uranium by kPA

Analyte	Instrument Class	Method	Sub Method	Report Units	Threshold	Lod	Loq
Total Uranium	kPA	WR-DC-342		ug/Sample			0.8

--- END OF LISTING ---

8019
001071 076

August 6, 1996
Refer to: BD0021

Bruce Sarven
Hayden Environmental
561 Congress Park Drive
Dayton, OH 45459

Phone: (513) 438-3010
FAX: (513) 438-3020

Re: REVISED FAX Quote BD0021

Dear Mr. Sarven:

DataChem Laboratories, Inc.(DCL) appreciates the opportunity to provide you with cost estimates for your project. As I understand your needs, you will be taking three 6 hour stack samples and a blank by Method 5 for particulates and radionulclides analysis. Tared glass fiber filters and sample bottles will be provided for these determinations. The acetone rinse and glass fiber filter will be combined for the analysis of radionuclides.

Uranium 234, Uranium 235/236, Uranium 238, Thorium 228, Thorium 230, and Thorium 232 will be analyzed by alpha spectrometry(AS). Radium 226 and Radium 228 will be analyzed by gamma spectrometry(GS). Total Uranium will be analyzed by kinetic phosphorescence(KPA). According to method 114 these radionuclides will be part of the particulate loading and analysis on the impinger solutions is not required. Combined particulate from the acetone rinse and filter will be analyzed according to DCL standard operating procedures(SOP).

The standard turnaround time for these analysis is 30 calendar days. The requested turnaround time of 10 working days can be accomplished for an additional 25%. The requested detection limits for isotopic analysis can not be met. Minimun Detectable Activity (MDA) is listed on the attached table.

Attached is a Pricing Quotation for these analyses. If you have any question concerning the attached quotation please call me.

Sincerely,

Robert P. Di Rienzo
Project Manager

Revised Pricing Quotation
Project Reference Number: BD-0021

Parameter Analysis	Method	MDA pCi/Sample	Method	Fractions	Price per Sample
Particulate	Method 5		Grav	Acetone Rinse Filter Impinger	$100.00
Uranium 234 Uranium 235/236 Uranium 238	DCL SOP	1 1 1	AS	Particulate*	$312.50
Thorium 228 Thorium 230 Thorium 232	DCL SOP	1 1 1	AS	Particulate*	$312.50
Radium 226 Radium 228	DCL SOP	95 20	GS	Particulate*	$250.00
Total Uranium	DCL SOP	0.8 ug/ Sample	KPA	Particulate*	$187.50

* = Particulate samples are combined acetone rinse and glass fiber filter.

EMISSION MEASUREMENT TECHNICAL INFORMATION CENTER TEST METHOD

Method 5 - Determination of Particulate Emissions from Stationary Sources

1. PRINCIPLE AND APPLICABILITY

1.1 Principle. Particulate matter (PM) is withdrawn isokinetically from the source and collected on a glass fiber filter maintained at a temperature in the range of 120 ± 14°C (248 ± 25°F) or such other temperature as specified by an applicable subpart of the standards or approved by the Administrator, U.S. Environmental Protection Agency, for a particular application. The PM mass, which includes any material that condenses at or above the filtration temperature, is determined gravimetrically after removal of uncombined water.

1.2 Applicability. This method is applicable for the determination of PM emissions from stationary sources.

2. APPARATUS

2.1 Sampling Train. A schematic of the sampling train used in this method is shown in Figure 5-1. Complete construction details are given in APTD-0581 (Citation 2 in the Bibliography); commercial models of this train are also available. For changes from APTD-0581 and for allowable modifications of the train shown in Figure 5-1, see the following subsections.

The operating and maintenance procedures for the sampling train are described in APTD-0576 (Citation 3 in the Bibliography). Since correct usage is important in obtaining valid results, all users should read APTD-0576 and adopt the operating and maintenance procedures outlined in it, unless otherwise specified herein. The sampling train consists of the following components:

2.1.1 Probe Nozzle. Stainless steel (316) or glass with sharp, tapered leading edge. The angle of taper shall be ≤30°, and the taper shall be on the outside to preserve a constant internal diameter. The probe nozzle shall be of the button-hook or elbow design, unless otherwise specified by the Administrator. If made of stainless steel, the nozzle shall be constructed from seamless tubing; other materials of construction may be used, subject to the approval of the Administrator.

A range of nozzle sizes suitable for isokinetic sampling should be available, e.g., 0.32 to 1.27 cm (1/8 to 1/2 in.)—or larger if higher volume sampling trains are used—inside diameter (ID) nozzles in increments of 0.16 cm (1/16 in.). Each nozzle shall be calibrated according to the procedures outlined in Section 5.

directly from the wash bottle being used, and place it in a glass sample container labeled "acetone blank."

Inspect the train prior to and during disassembly, and note any abnormal conditions. Treat the samples as follows:

Container No. 1. Carefully remove the filter from the filter holder, and place it in its identified petri dish container. Use a pair of tweezers and/or clean disposable surgical gloves to handle the filter. If it is necessary to fold the filter, do so such that the PM cake is inside the fold. Carefully transfer to the petri dish any PM and/or filter fibers that adhere to the filter holder gasket, by using a dry Nylon bristle brush and/or a sharp-edged blade. Seal the container.

Container No. 2. Taking care to see that dust on the outside of the probe or other exterior surfaces does not get into the sample, quantitatively recover PM or any condensate from the probe nozzle, probe fitting, probe liner, and front half of the filter holder by washing these components with acetone and placing the wash in a glass container. Deionized distilled water may be used instead of acetone when approved by the Administrator and shall be used when specified by the Administrator; in these cases, save a water blank, and follow the Administrator's directions on analysis. Perform the acetone rinse as follows:

Carefully remove the probe nozzle, and clean the inside surface by rinsing with acetone from a wash bottle and brushing with a Nylon bristle brush. Brush until the acetone rinse shows no visible particles, after which make a final rinse of the inside surface with acetone.

Brush and rinse the inside parts of the Swagelok fitting with acetone in a similar way until no visible particles remain.

Rinse the probe liner with acetone by tilting and rotating the probe while squirting acetone into its upper end so that all inside surfaces will be wetted with acetone. Let the acetone drain from the lower end into the sample container. A funnel (glass or polyethylene) may be used to aid in transferring liquid washes to the container. Follow the acetone rinse with a probe brush. Hold the probe in an inclined position, squirt acetone into the upper end as the probe brush is being pushed with a twisting action through the probe; hold a sample container underneath the lower end of the probe, and catch any acetone and particulate matter that is brushed from the probe. Run the brush through the probe three times or more until no visible PM is carried out with the acetone or until none remains in the probe liner on visual inspection. With stainless steel or other metal probes, run the brush through in the above prescribed manner at least six times since metal probes have small crevices in which particulate matter can be entrapped.

Rinse the brush with acetone, and
quantitatively collect these washings in the sample container. After the brushing, make a final acetone rinse of the probe as described above.

It is recommended that two people clean the probe to minimize sample losses. Between sampling runs, keep brushes clean and protected from contamination.

After ensuring that all joints have been wiped clean of silicone grease, clean the inside of the front half of the filter holder by rubbing the surfaces with a Nylon bristle brush and rinsing with acetone. Rinse each surface three times or more if needed to remove visible particulate. Make a final rinse of the brush and filter holder. Carefully rinse out the glass cyclone, also (if applicable). After all acetone washings and particulate matter have been collected in the sample container, tighten the lid on the sample container so that acetone will not leak out when it is shipped to the laboratory. Mark the height of the fluid level to determine whether leakage occurred during transport. Label the container to identify clearly its contents.

Container No. 3. Note the color of the indicating silica gel to determine whether it has been completely spent, and make a notation of its condition. Transfer the silica gel from the fourth impinger to its original container, and seal. A funnel may make it easier to pour the silica gel without spilling. A rubber policeman may be used as an aid in removing the silica gel from the impinger. It is not necessary to remove the small amount of dust particles that may adhere to the impinger wall and are difficult to remove. Since the gain in weight is to be used for moisture calculations, do not use any water or other liquids to transfer the silica gel. If a balance is available in the field, follow the procedure for Container No. 3 in Section 4.3.

Impinger Water. Treat the impingers as follows: Make a notation of any color or film in the liquid catch. Measure the liquid that is in the first three impingers to within I ml by using a graduated cylinder or by weighing it to within 0.5 g by using a balance (if one is available). Record the volume or weight of liquid present. This information is required to calculate the moisture content of the effluent gas.

Discard the liquid after measuring and recording the volume or weight, unless analysis of the impinger catch is required (see **NOTE**, Section 2.I.7).

If a different type of condenser is used, measure the amount of moisture condensed either volumetrically or gravimetrically.

Whenever possible, containers should be shipped in such a way that they remain upright at all times.

4.3 Analysis. Record the data required on a sheet such as the one shown in Figure 5-3. Handle each sample container as follows:

Container No. 1. Leave the contents in the shipping container or transfer the filter and any loose PM from the sample container to a tared glass weighing dish. Desiccate for 24 hours in a desiccator containing anhydrous calcium sulfate. Weigh to a constant weight, and report the results to the nearest
0.1 mg. For purposes of this Section, 4.3, the term "constant weight" means a difference of no more than 0.5 mg or 1 percent of total weight less tare weight, whichever is greater, between two consecutive weighings, with no less than 6 hours of desiccation time between weighings.

Alternatively, the sample may be oven dried at 105°C (220°F) for 2 to 3 hours, cooled in the desiccator, and weighed to a constant weight, unless otherwise specified by the Administrator. The tester may also opt to oven dry the sample at 105°C (220°F) for 2 to 3 hours, weigh the sample, and use this weight as a final weight.

Container No. 2. Note the level of liquid in the container, and confirm on the analysis sheet whether leakage occurred during transport. If a noticeable amount of leakage has occurred, either void the sample or use methods, subject to the approval of the Administrator, to correct the final results. Measure the liquid in this container either volumetrically to ±1 ml or gravimetrically to ±0.5 g. Transfer the contents to a tared 250-ml beaker, and evaporate to dryness at ambient temperature and pressure. Desiccate for 24 hours, and weigh to a constant weight. Report the results to the nearest 0.1 mg.

Container No. 3. Weigh the spent silica gel (or silica gel plus impinger) to the nearest 0.5 g using a balance. This step may be conducted in the field.

"Acetone Blank" Container. Measure the acetone in this container either volumetrically or gravimetrically. Transfer the acetone to a tared 250-ml beaker, and evaporate to dryness at ambient temperature and pressure. Desiccate for 24 hours, and weigh to a constant weight. Report the results to the nearest 0.1 mg.

NOTE: At the option of the tester, the contents of Container No. 2 as well as the acetone blank container may be evaporated at temperatures higher than ambient. If evaporation is done at an elevated temperature, the temperature must be below the boiling point of the solvent; also, to prevent "bumping," the evaporation process must be closely supervised, and the contents of the beaker must be swirled occasionally to maintain an even temperature. Use extreme care, as acetone is highly flammable and has a low flash point.

4.4 Quality Control Procedures. The following quality control procedures are

suggested to check the volume metering system calibration values at the field test site prior to sample collection. These procedures are optional for the tester.

4.4.1 Meter Orifice Check. Using the calibration data obtained during the calibration procedure described in Section 5.3, determine the $\Delta H_@$ for the metering system orifice. The $\Delta H_@$ is the orifice pressure differential in units of in. H_20 that correlates to 0.75 cfm of air at 528°R and 29.92 in. Hg. The
$\Delta H_@$ is calculated as follows:

$$\Delta H_@ = 0.0319\, \Delta H \frac{T_m\, \theta^2}{P_{bar}\, Y^2\, V_m^2}$$

where:

ΔH = Average pressure differential across the orifice meter, in. H_20.

T_m = Absolute average DGM temperature, °R.

P_{bar} = Barometric pressure, in. Hg.

θ = Total sampling time, min.

Y = DGM calibration factor, dimensionless.

V_m = Volume of gas sample as measured by DGM, dcf.

0.0319 = (0.0567 in. Hg/°R)(0.75 cfm)^2

Before beginning the field test (a set of three runs usually constitutes a field test), operate the metering system (i.e., pump, volume meter, and orifice) at the $\Delta H_@$ pressure differential for 10 minutes. Record the volume collected, the DGM temperature, and the barometric pressure. Calculate a DGM calibration check value, Y_c, as follows:

$$V_m \left[Y_c = \frac{10^{\omega}\, \Gamma^{\omega} 0.0319^{\omega} T_m}{P_{bar}} \right]^{\omega_1} \frac{1}{\omega_1}$$

where:

Y_c = DGM calibration check value, dimensionless.

DATA CHEM LABORATORIES
A SORENSON COMPANY

8019

Analytical Documentation
Inventory Checklist

- [X] This is a "dummy datapackage". Data for inventory checklist found with set _____
- [NA] Copy of TCLP Preparation Logbook Pages
- [X] Copy of Sample Preparation Notebook/Logbook Pages
- [X] Copy of Analyst's Notebook/Method Logbook Pages
- [X] Copy of Instrument Injection Logbook/Instrument Logbook/Run Log Pages
- [NA] Copy of Reagent Logbook Pages
- [X] Copy of Working Standard Preparation Logbook Pages
- [X] Copy of Secondary or Intermediate Standard Preparation Logbook Pages
- [X] Copy of Primary Standard or Concentrated Stock Standard Preparation Logbook Pages
- [X] Certificates of Analysis for Standards
- [X] Copy of Standard Verification Logbook Pages (including documentation for spiking solutions and/or calibration standards)
- [NA] Copy of Preparation Logbooks for solutions prepared by QC

All other miscellaneous documentation associated with this set (describe)

- [X] Pipet Calibration Log

Analytical Documentation
Reviewer Checklist

- [X] The Analytical Documentation Inventory Checklist above is complete.
- [X] Basic documentation procedures were followed in accordance with DCL SOP XX-DC-004 "Analytical Data Record Keeping."
- [X] All notebook and logbook pages contain page number, book number, title, and available space for pagination (if required).
- [X] All notebook and logbook pages were signed and dated by the analyst and reviewer before copying.
- [X] All copies are legible.
- [X] Standard preparation is documented in accordance with DCL SOP XX-DC-019 "Standards Purity, Preparation, Traceability and Verification" or by WR-DC-001 "The Acquisition, Preparation, and use of Radioactive Standard Reference Materials."
- [X] Documentation is provided to verify that standard calibration solutions and spiking solutions are traceable to a vendor certificate.

Assembled by: _____ 11/5/96 (Signature / Date) Reviewed by: _____ 11/5/96 (Signature / Date)

Rev. 6/95

TITLE Hayden Environmental Sample Dilution BOOK NO. 3000 8019

From Page No.

Client	Account No.	Set No.	Sample Nos.	Matrix	Balance ID
Hayden Enviro.	3025	96E-0640 *	96E04514-4517	AIR/FILTER	102695

Filters and acetone rinse were compined after aceton was dryed. Samples were placed in metal based teflon beakers and dissolved i 6 mL of HF (hydrofluoric acid) and then taken to near dryness to expell all of the HF. The samples were then transferred t tared P.M.P. jars and brought up to approximately 100.0 g, using 1 M HNO_3 (nitric acid).

Sample Number	Final Mass in Tared PMP.
96E04514	100.0 g
96E04515	106.4 g
96E04516	100.1 g
96E04517	100.1 g

T.P.
10-8-96

To Page N

Witnessed & Understood by me,	Date	Invented by	Date
Bradley J. Richardson	10-21-96		10/8/96
		Recorded by Ty E. Peterson	

001081 086

B019

Book No. 4035 Page No. 145

Determination of Selected Actinides by Ion Exchange

Client _____ Acct No. 3025 Set No. 96E-0640-02 Matrix Air (filter)

Requested Analysis: Am__ Cf__ Cm__ Np__ Pu__ Th__ U X

LCS ID: QC-123238-1 Pipet ID: Eppe 10

Prep Group ID: G969703P Balance ID 102695

Activity(pCi) = Conc(pCi/g) • Mass(g)
or
Activity(pCi) = Conc(pCi/mL) • Volume(mL)

Standard Control ID	Conc. (pCi/g or ml)	Aliquot (g or ml)	Activity (pCi)
WSL 3/23 (U238)	60.62 pCi/g	0.1 ml = .09735 g	5.90136
		BR 10-18-96	

Tracer ID	Conc. (pCi/g or ml)	Aliquot (g or ml)	Activity (pCi)
WSL 3/55 (U232)	50.49 pCi/ml	0.1 ml = .09764 ml	4.9298
		BR 10-18-96	

VESSEL#	SAMPLE#	WEIGHT (g)	VESSEL#	SAMPLE#	WEIGHT (g)
1	BL-123238-1	Reagent	13		
2	QC-123238-1	Reagent	14		
3	96E04514	43.307 g	15		
4	96E04515	50.750 g	16		
5	96E04516	44.581 g	17		
6	96E04517	44.522 g	18		BR 10-18-96
7			19		
8			20		
9		BR 10-18-96	21		
10			22		
11			23		
12			24		

Comments:

*N/A = Not Ap

001032 087

Recorded by: Bradley A. Richardson Date: 10-18-96 | Reviewed by [signature] Date: 10/18/9

Determination of Selected Actinides by Ion Exchange

Client NA Acct No. 3025 Set No. 96E-0640-03 Matrix Air (Filter)

Requested Analysis: Am__ Cf__ Cm__ Np__ Pu__ Th X U__

LCS ID: QC-123239-1 Pipet ID: Eppe 10

Prep Group ID: G969703Q Balance ID 102695

*Activity(pCi) = Conc(pCi/g) * Mass(g)*
or
*Activity(pCi) = Conc(pCi/mL) * Volume(mL)*

Standard Control ID	Conc. (pCi/g or ml)	Aliquot (g or ml)	Activity (pCi)
Th 230-003 WS	50.4 pCi/ml	0.1 ml = .09764 ml	4.9211
		BR 10-18-96	

Tracer ID	Conc. (pCi/g or ml)	Aliquot (g or ml)	Activity (pCi)
Th 229 WSL 3/67	45.34 pCi/g	0.1 ml = .09735 g	4.4138
		BR 10-18-96	

VESSEL#	SAMPLE#	WEIGHT (g)	VESSEL#	SAMPLE#	WEIGHT (g)
1	BL-123239-1	Reagent	13		
2	QC-123239-1	Reagent	14		
3	96E 04514	50.056 g	15		
4	96E 04515	50.070 g	16		
5	96E 04516	50.028 g	17		
6	96E 04517	49.997 g	18		
7			19		BR 10-18-96
8			20		
9		BR 10-18-96	21		
10			22		
11			23		
12			24		

Comments:

*N/A = Not Applic

001083 088

Recorded by: [signature] Date: 10-18-96 | Reviewed by: [signature] Date: 10/18/96

Alpha Spectroscopy Run Log

Book Number 4077

Date	Det. ID	Analyst	Code	Comments
10-21-96	43 → 47	MAB	S	96C-0439-02 (uu)
10-21-96	48	MAB	S	96C-0443-02 (uu)
10-22-96	1 → 48	MAB	D	Pulser
10-22-96	1 → 2	MAB	S	96C-0501-02 (uu)
	3 → 8			96C-0433-04 (Pu)
	9 → 15			96C-0439-04 (Pu)
	16 → 20			96C-0433-04 (Pu)
	21 → 25			96C-0439-04 (Pu)
	26 →			96C-0443-04 (Pu)
	27 → 28			96C-0501-04 (Pu)
	29 → 41			96C-0439-13 (Th)
10-22-96	42 → 45	MAB	S	96C-0443-13 (Th)
10-23-96	1 → 48	MAB	D	Pulser
	1 → 6		S	96C-0433-05 (Am)
	7 → 13			96C-0439-05 (Am)
	14 → 17			96C-0433-05 (Am)
	18 → 22			96C-0439-05 (Am)
	23 →			96C-0443-05 (Am)
	24 → 25			96C-0501-05 (Am)
	26 → 30			96M-0250-01 (uu)
	31 → 35			96M-0323-05 (uu)
10-23-96	36 → 48	MAB	S	96E-0654-02 (uu)
10-24-96	1 → 48	MAB	D	Pulser
	1 → 7		S	96E-0654-02 (uu)
	8 → 13			96E-0640-02 (uu)
	14 → 26			96C-0439-12 (uu)
	27 → 30			96C-0443-12 (uu)
	31 → 43			96C-0439-16 (Pu)
	44 → 47		S	96C-0443-16 (Pu)
10-24-96		MAB		MAB 10-24-96

Reviewed By: Max A. Barnett 10-24-96
Signature & Date

Alpha Spectroscopy Run Log

Book Number 4077

Date	Det. ID	Analyst	Code	Comments -
10-25-96	1→48	MAB	D	Pulser
	1→5		S	96M-0250-04 (Pu)
	6→10			96M-0323-01 (Pu)
	11→15			96E-0640-03 (Th)
	16→21			96M-0250-02 (Th)
	22→26			96M-0323-04 (Th)
10-25-96	27→34	MAB	S	96M-0320-09 (Th)
10-28-96	1→48	RL	Sec	secondary calibrations
10-28-96	1→48	MAB	B	Backgrounds
10-29-96	1→48	MAB	D	Pulser
10-29-96	1→8	RL	S	96M-0320-08 (UU)
	9→13			96M-0250-04 (Am)
	14→18			96M-0323-01 (Am)
	19→28			96C-0439-15 (Am)
	29→32			96C-0443-15 (Am)
	33→35			96C-0439-15 (Am)
	36→43			96M-0320-12 (Pu)
10-29-96	44→48	RL	S	96M-0306-03 (UU)
10-30-96	1→48	RL	D	Pulser x 2 RL10/30/96
	1→3		S	96M-~~0320-11~~ 0306-03 RL 10/30/96 ~~(Am)~~ (UU)
	4→11			96M-0320-11 (Am
	12→15			96M-0292-13 (UU)
	16→19			96M-0319-29 (Th)
	20→22			96M-0318-08 (UU)
10-30-96	23→24	RL	S	96M-0319-28 (UU)
	25→~~48~~ 26 RL 10/30/96		S	96M-0319-28 (UU)
	27→~~29~~ 31		S	96M-0319-30 (Pu)
	32→38		S	96M-0319-12 (Pu)
	39→41		S	96M-0318-09 (Pu)
10-30-96	42→45	RL	S	96M-0292-11 (Pu)

Reviewed By: Robin Tilly 10/30/96
Signature & Date

Alpha Spectroscopy
Calibration/Maintenance Log

Book Number 4078

Date	Det. ID	Analyst	Comments
10/11/96	1→48	MT	pulser check
10/13/96	1→48	MT	Backgrounds
10/14/96	1→48	MT	pulser check
10-18-96	1→48	MAB	Background
10-21-96	1→48	MAB	secondary calibration & Pulsers
10-22-96	1→48	MAB	Pulsers
10-23-96	1→48	MAB	Pulsers
10-24-96	1→48	MAB	Pulsers
10-28-96	1→48	RL	Secondary calibrations
10-25-96	1→48	MAB	Pulsers
10-28-96	1→48	MAB	Secondary & Background
10-29-96	1→48	MAB	Pulsers - A problem was noted
			with Det #30. The pulsers FWHM
			has increased, while the CPS has
			decreased and the KeV has increased.
			The secondary calibration however
			indicates a steady and flat set
			of data points for several parameters.
			The problem with the #30 pulser
			is isolated to only the one detector.
			This detector will be allowed to
			count samples MAB 10-29-96
10-30-96	1→48	RL	Pulser x2
10-30-96	1→4	MAB	A problem was noted that some
			of the detectors' pulsers were not
			within bounds for peak centroid.
			This condition appears to be an
			odd event without correlation. The
			Pulsers QA will be observed. MB 10-30-96

Reviewed By: Mark A. Burnett 10-30-96
Signature & Date

8019

CERTIFICATE OF CALIBRATION
ALPHA STANDARD SOLUTION

Radionuclide	Th-230	Customer:	DATACHEM LABORATORIES
Half Life:	(7.54 ± 0.03) x 10^4 years	P.O.No.:	8837
Catalog No.:	7230	Reference Date:	April 15 1992 12:00 PST.
Source No.:	400-55	Contained Radioactivity:	0.1013 µCi.
		Contained Radioactivity:	3.75 kBq

Description of Solution

a. Mass of solution: 5.0114 grams.

b. Chemical form: $Th(NO_3)_4$ in 0.1N HNO_3

c. Carrier content: N/A

d. Density: 1.0016 gram/ml @ 20°C.

Radioimpurities Th-228 0.11% as of September 1 1992

Radioactive Daughters

None detected

Radionuclide Concentration

0.0202 µCi/gram.

Method of Calibration

Weighed aliquots of the solution were assayed using a liquid scintillation counter.

Uncertainty of Measurement

a. Systematic uncertainty in instrument calibration: ±2.0%

b. Random uncertainty in assay: ±1.0%

c. Random uncertainty in weighing(s): ±0.0%

d. Total uncertainty at the 99% confidence level: ±3.0%

NIST Traceability

This calibration is implicitly traceable to the National Institute of Standards and Technology.

Notes

1. Nuclear data were taken from "Table of Isotopes", Seventh Edition, edited by Virginia S. Shirley.
2. IPL participates in an NIST measurement assurance program to establish and maintain implicit traceability for a number of nuclides, based on the blind assay(and later NIST certification) of Standard Reference Materials. (As in NRC Regulatory Guide 4.15)

Aman U. Khan

QUALITY CONTROL

ISOTOPE PRODUCTS LABORATORIES
1800 No. Keystone Street.,
Burbank, California 91504
(818) 843 - 7000

001088

FROM P. 25

RADIOCHEMISTRY LABORATORY

RADIOACTIVE MATERIAL INVENTORY SOURCE LOG

Vendor I.D.: Isotopes Products Laboratory
Date Received:
RCL I.D.: 400-55

Note: This page was recentered by Peter Klingmann PMK 2-9-95

Isotopes/Form	Activity (µCi)	Mass	Date
Th-230 /solution	0.1008	4.9857g	5-8-92 PMK

Usage:

Date PMK	Amount	Activity (µCi)	Running Total (µCi)	I.D.
5-8-92	4.9857g	0.1008	Ø	Th-230-001-IS

001019

Pg. 16

(45)

8019

RADIOCHEMISTRY LABORATORY

RADIOACTIVE MATERIAL INVENTORY
INTERMEDIATE STANDARD LOG

I.S. ID: Th-230-001-IS

Solvent: 2 N HNO_3

Concentration: 1008 pCi/gm

Date: 5-8-92

Final Volume: 100 mL

Source I.D.: 400-55

Usage: Note: The entries on this page up to and including 12-8-94 were reentered by Peter Kittmann. PMK 2-9-95

Date	Amount	Activity (µCi)	Running Total (µCi)	I.D.
5-8-92	1 mL	1.01E-3	0.09979	Th-230-001-WS
8-16-93	0.29970	3.02E-4	0.09949	
8-16-93	0.29970	3.02E-4	0.09919	
8-16-93	0.29970	3.02E-4	0.09888	
2-1-93	0.31274	3.15E-4	0.09857	
2-24-94	0.3068	3.09E-4	0.09826	
5-31-94	1.046	1.05E-3	0.09721	Th-230-001 WS
8-19-94	0.111	1.12E-4	0.09710	
12-[illegible]-94	0.3159	3.18E-4	0.09678	Th-230 αβ Audit
2/21/95	0.314g	3.17E-4	0.09646	EPA Audit αβ S95-0060

From Page 61

RADIOCHEMISTRY LABORATORY

8019

RADIOACTIVE MATERIAL INVENTORY
WORKING STANDARD LOG

W.S. ID: Th-230-003-WS
Solvent: 2m HNO_3
Concentration: 50.4 pci/ml

Date: 9/3/96
Final Volume: 1000 ml
Source I.D.: Th-230-001-IS

Usage:

Date	Amount	Activity (µCi)	Running Total (µCi)	Dispensation
9/3/96	.293	14.798	3466.719	96M-0242-09 LCS, ms, msD
7-5-96	.2108 g	10.6243	3456.0947	96M-0248-03 LCS, MS
9-5-96	.2108 g	10.6243	3445.4704	96M-0248-04 LCS, MS
9-5-96	.1054 g	5.3122	3440.1582	G968201C LCS
~~9-6-96~~	~~.1054 g~~	~~5.3122~~	~~3434.8460~~	~~96M-0230-07 96M-0232-03 96M-0234-04 LCS~~
9-6-96	.09875 mL	4.977	3435.1812	96M-0230-07 96M-0232-03 96M-0234-04 LCS
9-12-96	.09875 mL	4.977	3430.2042	G9688008 LCS
9-17-96	.09875 mL	4.977	3425.2272	G968D007 LCS
9/16/96	0.09875 mL	4.977	3420.250	96M-0213-26 LCS
9/19/96	.09875 mL	4.977	3415.273	G968800X LCS
9/24/96	.1975 mL	9.954	3405.3190	~~G96~~ T.P. 96M-0298-02 LCS-MS
9/24/96	.09875 mL	4.977	3400.3420	96M-0272-11 96M-0273-06 96M-0282-06 LCS
9/25/96 BMS	0.1953 mL	9.84	3390.499	96C-0404-03 LCS, MS
10-1-96	0.1975 mL	9.954	3380.545	96M-0298-04 LCS, MS
10-3-96	.09875 mL	4.977	3375.568	96M-0271-29 96M-0279-(16)(25) LCS
10-7-96 T.R	.09875 mL	4.977	3370.591	96M-0286-15 96M-0301-09 96M-0290-07 96M-0297-15 LCS
10-9-96 BR	.09764 ml	4.9211	3365.670	96M-0303-09 96M-0304-09 LCS
10-9-96	.1975 mL	9.954	3355.716	G969703L QC-1 G969703M QC-2
10-14-96 BR	.1947 ml	9.8130	3345.903	96C-0439-13 → QC-1 96C-0443-13 → QC-1
10-17-96 BR	.09764 ml	4.9211	3340.9819	96M-0250-02 96M-0323-04 LCS
10-18-96 BR	.09764 ml	4.9211	3336.0608	96E-0640-03 LCS

C. Wal 8019

U.S. Environmental Protection Agency
Environmental Monitoring Systems Laboratory-Las Vegas
Nuclear Radiation Assessment Division

Calibration Certificate

Description

Principal radionuclide: Uranium-238 Half-life: 4.47×10^9 years

Nominal activity: 11.9 nano curies

Nominal volume: 5.0 ml in ampoule/bottle number: 1843-2

Measurement Activity of principal radionuclide

Activity per gram of this solution

2.38 nanocuries of Uranium-238

October 1993

*Accompanied by 0.11 nanoCuries of Uranium-235 per gram of solution.

Activity of daughter radionuclide

The principal activity was accompanied at the quoted time by

2.38 nano curies Per gram

of the daughter nuclides Th-234, Pa-234, U-234 assuming secular equilibrium.

Total mass of this solution

Approximately 5.0 grams

Method of measurement

The solution was prepared gravimetrically by dissolving a weighed quantity of the National Bureau of Standards' SRM 950b (99.97±0.02 percent Uranium Oxide (U_3O_8)) in nitric acid and diluting to a known weight. Natural uranium was assumed to consist of 99.28 percent U-238 and 0.711 percent U-235 by weight with specific activities of 3.36×10^2 and 2.16×10^3 nanoCuries per gram respectively. The solution was compared to an earlier preparation (1843-1), which was traced to the National Institute of Standards and Technology (NIST), using liquid scintillation counting.

Useful Life

This radionuclide has decayed through [ ] half lives since it was obtained by EMSL-LV

We recommend that this solution should not be used after INDEFINITE

Purity

The manufacturer states that activities other than that of the principal nuclide and of its daughter nuclides, if any, were estimated/known to be:

(1) Radium-226	less than	0.6 %	of the principal activity
(2)	less than equal to	%	of the principal activity
(3)	less than equal to	%	of the principal activity

The activity of impurity (1) is not (2) is not (3) is not included in the quoted figures of the principal activity.

Random Errors

The precision of this standard was such that the certified value of the radioactive concentration of the principal activity had a standard error (sm) not greater than ± 0.5 %
(The 99.7% confidence limits are given by t(sm) where t is obtained from the student t factor for the degree of freedom (n-1)).

The maximum uncertainty due to the assessable systematic errors (dilution, counting, and known uncertainty of the standard) is obtained by the separate arithmetic summation of the positive and negative systematic error ($+\delta - \delta'$). These have been estimated not to exceed

+2.5 % or - 2.5 %

the overall uncertainty (often called accuracy) is an estimate of the possible divergence of the quoted result from the true value. It is a combination of random error [t(sm)] at the 99.7% confidence limits and the worst case estimate of the systematic errors ($+\delta, -\delta'$)
The overall uncertainty is therefore calculated on the basis of + [t(sm) $+\delta$], - [t(sm) $+\delta'$]
and is + 4.0 %, - 4.0 % of the quoted radioactive concentration.

Decay Schemes

This standardization is based on the following assumptions of the principle nuclide, its daughter nuclides and impurities (no allowance for error in these assumptions or the assumption of quoted half-life have been included in the statement of accuracy above).

Uranium-238 decays by alpha emission to Thorium-234 which decays by two successive beta emissions to Uranium-234. Uranium-234 is assumed to be in secular equilibrium with Uranium-238.

Chemical Composition of Solution

Carrier content per gram of solution:

Other components:
0.5M nitric acid

Preservative:

Remarks

The uranium concentration of the solution is 7.12 milligrams/gram.

Date Certificate Prepared October 27, 1993

Approval Signature Paul B. Hahn

Revised 1/84

8019

RADIOCHEMISTRY LABORATORY
RADIOACTIVE MATERIAL INVENTORY
STANDARD SOURCE LOG

Vendor: US EPA Vendor Source ID: 1843-2

Date Received: 11-22-93 Received By: CC WALKER

CAUTION
RADIOACTIVE MATERIAL
SOL# 1843-2 WT. 5.0g
AMT. 2380 pCi/g
ISOTOPE U-238
DATE Oct. 93 0400PST
ENVIRONMENTAL MONITORING SYSTEMS LABORATORY—LAS VEGAS

Place Source Label Above

Source Reference Date/Time*: OCT. '93/0500 Solvent: 0.5M HNO3

ISOTOPE(S)	CONC. (pCi/g)	ISOTOPE(S)	CONC. (pCi/g)
U-238	2380		

*Use Julian date and military time

Usage:

DCL Balance ID No.: DCL #102683

Date	Inits.	Aliquot	Activity (pCi)	Balance (pCi)	Destination	Witness
~~7.5.94~~	~~CCW~~ 11.16.94	~~5.0936 g.~~				
11/16/94	OR	5.0936 g.	12122.768	Ø	ISL 2/39	CW

8019

RADIOCHEMISTRY LABORATORY
RADIOACTIVE MATERIAL INVENTORY
INTERMEDIATE STANDARD LOG

Intermediate Standard ID: ISL 2/39 (U238) Standard Source ID: 1848-2

Reference Date/Time*: Oct '93/0500 RMI Source Log Ref. Book/Page: 2/10

*Use Julian date and military time

DCL Balance ID No.: B310P, 102695

Date	Inits.	Solvent	Activity (pCi)†	Final Weight	Conc. (pCi/g)†	Witness
11/16/94	DR	2 M HNO_3	12122.768	99.994 g	121.23	[illegible]

Usage:

	Date	Inits.	Aliquot	Activity (pCi)†	Balance (pCi)†	Destination
1.	11/16/94	DR	50 g	6061.5	6061.268	WSL 3/23
2.						
3.						
4.						
5.						
6.						
7.						
8.						
9.						
10.						
11.						
12.						
13.						
14.						
15.						
16.						
17.						
18.						

† All activities are referenced to the source date/time. Decay corrections are to be made on the following page.

To Page:_____

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From Page # 95

RADIOCHEMISTRY LABORATORY
RADIOACTIVE MATERIAL INVENTORY
WORKING STANDARD LOG

Working Standard ID: WSL 3/23 U 238 Intermediate Standard ID: ISL 2/39

Reference Date/Time*: Oct 1993 0500 RMI Source Log Ref. Book/Page: 2/10

*Use Julian date and military time

DCL Balance ID No.:_____

Date	Inits.	Solvent	Activity (pCi)†	Final Volume	Conc. (pCi/g)†	Witness
11-16-94	T.P. for D.R.	2M HNO_3	6061.5	100.008 g	60.615 pCi/g	T.P. for R.L.

Usage:

	Date	Inits.	Aliquot	Activity (pCi)†	Balance (pCi)†	Destination
1.	10-7-96	T.P.	.1054 g	6.3888	2647.3088	96M-0286-14 96M-0290-08 96M-0297-14 LCS
2.	10-9-96	BR	BR 10-9-96 ~~.1054~~ g .09764 ml	5.9009	2641.4079	96M-0307-08 96M-0304-08 LCS
3.	10-10-96	WM	0.01485 ~~0.00495~~	0.9001 ~~0.3000~~	2640.5078 ~~2641.1079~~ WM 10/10/96	QC,MS 96M-0298-01, 96M-0306-02
4.	10-9-96	T.P.	.2108 g	12.7776	2627.7302 T.P.	G9697-03J G9697-034 10-10-96 T.P. ~~TRACERS~~ LCS (1)(2)
5.	~~10-11-96~~	~~BR~~	~~BR 10-11-96~~			
6.	10-15-96	BR	.1947 g	11.8027	2615.9275	96C-0439-12 96C-0443-12 LCS
7.	10-16-96	BR	.09735 g	5.9014	2610.0261	96E-0654-02 LCS
8.	10-17-96	BR	.09735 g	5.9014	2604.1247	96M-0250-01 96M-0323-05 LCS
9.	10-18-96	BR	.09735 g	5.9014	2598.2233	96E-0640-02 LCS
10.						
11.						
12.						
13.						
14.						
15.						
16.						
17.						
18.						

† All activities are referenced to the source date/time. Decay corrections are to be made on the following page.

To Page:_____

8019

National Institute of Standards & Technology

Certificate

Standard Reference Material 4328A
Thorium-229 Radioactivity Standard

This Standard Reference Material (SRM) consists of radioactive thorium-229 nitrate and nitric acid dissolved in 5 mL of distilled water. The solution is contained in a flame-sealed NIST borosilicate-glass ampoule. The SRM is intended for the calibration of alpha-particle counting instruments and for the monitoring of radiochemical procedures.

Radiological Hazard

The SRM ampoule contains thorium-229 with a total activity of approximately 170 Bq. Thorium-229 decays by alpha-particle emission. The progeny of thorium-229 have a total activity of approximately 1200 Bq and decay by alpha- and beta-particle emission. None of the alpha or beta particles escape from the SRM ampoule. During the decay process X-rays and gamma rays with energies from 10 keV to 2 MeV are also emitted. Most of these photons escape from the SRM ampoule but their intensities are so small that they do not represent a radiation hazard. Approximate unshielded dose rates at several distances (as of the reference time) are given in note [a]*. The SRM should be used only by persons qualified to handle radioactive material.

Chemical Hazard

The SRM ampoule contains nitric acid (HNO_3) with a concentration of 1 mole per liter of water. The solution is corrosive and represents a health hazard if it comes in contact with eyes or skin. If the ampoule is to be opened to transfer the solution, the recommended procedure is given on page 2. The ampoule should be opened only by persons qualified to handle both radioactive material and strong acid solution.

Storage and Handling

The SRM should be stored and used at a temperature between 5 and 65 °C. The solution in an unopened ampoule should remain stable and homogeneous until at least January 2004.

The ampoule (or any subsequent container) should always be clearly marked as containing radioactive material. If the ampoule is transported it should be packed, marked, labeled, and shipped in accordance with the applicable national, international, and carrier regulations. The solution in the ampoule is a dangerous good (hazardous material) both because of the radioactivity and because of the strong acid.

Preparation

This Standard Reference Material was prepared in the Physics Laboratory, Ionizing Radiation Division, Radioactivity Group, J.M.R. Hutchinson, Group Leader. The overall technical direction and physical measurements leading to certification were provided by L.L. Lucas of the Radioactivity Group.

The support aspects involved in the preparation, certification, and issuance of this SRM were coordinated through the Standard Reference Materials Program by N.M. Trahey.

Gaithersburg, Maryland 20899
February 1995

Thomas E. Gills, Chief
Standard Reference Materials Program

*Notes and references are on pages 5 and 6.

NOTES

[a] The Sievert is the SI unit for dose equivalent. See reference [1]. One μSv is equal to 0.1 mrem.

Distance from Ampoule (cm):	1	30	100
Approximate Dose Rate (μSv/h):	<0.1	-	-

[b] The stated uncertainty is two times the standard uncertainty.

[c] Massic activity is the preferred name for the quantity activity per unit mass. See reference [1].

[d] The reported value, y, of massic activity (activity per unit mass) at the reference time was not measured directly but was derived from measurements and calculations of other quantities. This can be expressed as $y = f(x_1, x_2, x_3, \ldots x_n)$, where f is a mathematical function derived from the assumed model of the measurement process.

The value, x_i, used for each input quantity i has a standard uncertainty, $u(x_i)$, that generates a corresponding uncertainty in y, $u_i(y) \equiv |\partial y/\partial x_i| \cdot u(x_i)$, called a component of combined standard uncertainty of y.

The combined standard uncertainty of y, $u_c(y)$, is the positive square root of the sum of the squares of the components of combined standard uncertainty.

The combined standard uncertainty is multiplied by a coverage factor of $k = 2$ to obtain U, the expanded uncertainty of y.

Since it can be assumed that the possible estimated values of the massic activity are approximately normally distributed with approximate standard deviation $u_c(y)$, the unknown value of the massic activity is believed to lie in the interval $y \pm U$ with a level of confidence of approximately 95 percent.

For further information on the expression of uncertainties, see references [2] and [3].

[e] Estimated limits of detection for alpha-particle-emitting impurities are:
0.03 $\alpha \cdot s^{-1} \cdot g^{-1}$ for energies less than 3.5 MeV,
0.3 $\alpha \cdot s^{-1} \cdot g^{-1}$ for energies between 3.5 and 4.5 MeV, and
0.03 $\alpha \cdot s^{-1} \cdot g^{-1}$ for energies greater than 5.1 MeV.

Thorium-228 was detected in measurements made on the thorium-229 master solution in 1975 and 1979. As of the reference time, the massic activity of thorium-228 is well below the detection limits and is calculated to be approximately 0.001 $Bq \cdot g^{-1}$.

The thorium-229 master solution was chemically purified on 7 May 1984.

[f] Estimated limits of detection for photon-emitting impurities are:
0.003 $\gamma \cdot s^{-1} \cdot g^{-1}$ for energies between 90 and 506 keV and
0.0003 $\gamma \cdot s^{-1} \cdot g^{-1}$ for energies between 516 and 1900 keV,
provided that the photons are separated in energy by 4 keV or more from photons emitted in the decay of thorium-229 and progeny.

[g] Evaluated Nuclear Structure Data File (ENSDF), January 1995. The stated uncertainty is the standard uncertainty.

[h] Relative standard uncertainty of the input quantity x_i.

PROPERTIES OF SRM 4328A

(Certified values are shown in bold type)

Source identification number	NIST SRM 4328A		
Physical Properties:			
•Source description	Liquid in flame-sealed NIST borosilicate-glass ampoule		
Ampoule specifications	Body outside diameter Wall Thickness Barium content Lead-oxide content Other heavy elements	(16.5 ± 0.5) mm (0.60 ± 0.04) mm Less than 2.5% Less than 0.02% Trace quantities	
Solution density	**(1.032 ± 0.002) g•mL^{-1} at 22.6 °C [b]***		
Solution mass	Approximately 5 g		
Chemical Properties:			
Solution composition	Chemical Formula	Concentration (mol•L^{-1})	Mass Fraction (g•g^{-1})
	H_2O HNO_3 $Th(NO_3)4$	54 1.0 2×10^{-8}	0.94 0.06 9×10^{-9}
Radiological Properties:			
Radionuclide	Thorium-229		
Reference time	1200 EST, 28 January 1994		
Massic activity of the solution [c]	32.83 Bq•g^{-1}		
Relative expanded uncertainty (k=2)	0.72% [d]		
Alpha-particle-emitting impurities	None detected [e]		
Photon-emitting impurities	None detected [f]		
Half lives used	Thorium-229: (7340 ± 160) a [g]		
Measuring instruments	NIST "0.8π"α defined-solid-angle counter with scintillation detector plus silicon surface-barrier alpha-spectrometer system and two $4\pi(\alpha+\beta)$ liquid-scintillation counting systems		

*Notes and references are on pages 5 and 6.

8019

RADIOCHEMISTRY LABORATORY
RADIOACTIVE MATERIAL INVENTORY
STANDARD SOURCE LOG

Vendor: NIST Vendor Source ID: 4328 A

Date Received: 3/20/95 Received By: C. Walker

U.S. Department of Commerce
National Institute of Standards
and Technology
SRM 4328A
Thorium-229
<200 Bq in 6% nitric acid
CAUTION
RADIOACTIVE

Place Source Label Above

Source Reference Date/Time*: 028/1994 12:00 EST Solvent: 1M HNO_3

ISOTOPE(S)	CONC. (pCi/g)	ISOTOPE(S)	CONC. (pCi/g)
Th-229	887.30		

*Use Julian date and military time

Usage:

DCL Balance ID No.: 102695

Date	Inits.	Aliquot	Activity (pCi)	Balance (pCi)	Destination	Witness
9/6/95	DMK	5.125 g	4,547.41	Ø	FSL-2/73	BR

RADIOCHEMISTRY LABORATORY
RADIOACTIVE MATERIAL INVENTORY
INTERMEDIATE STANDARD LOG

Intermediate Standard ID: ISL-2/73 (Th-229) Standard Source ID: 4328A

Reference Date/Time*: 028,1994/14:10MST RMI Source Log Ref. Book/Page: 02/30

*Use Julian date and military time

DCL Balance ID No.: 1002695

Date	Inits.	Solvent	Activity (pCi)†	Final Weight	Conc. (pCi/g)†	Witness
9/5/95	PMK	2M HNO_3	4,547.41	100.288g	45.34	DR

Usage:

	Date	Inits.	Aliquot	Activity (pCi)†	Balance (pCi)†	Destination
1.	9-6-95	[illegible]	9.6.95 ~~1.2 mt~~ 1.284g	58.217	4489.193	MX-0333-GQ tracers
2.	10/9/95	PMK	2.027g	91.918	4397.275	RX-0079-BF TRACERS
3.	10-10-95	[illegible]	1.177 g	53.265	4343.91	RX-0071-GJ tracers
4.	10/25/95	PMK	1.484g	67.285	4276.63	RX-0080-CF TRACERS
5.	11/21/95	PMK	~~2.472g~~ 3.708 g	~~172.080~~ 68.126	~~4164.55~~ 4108.50	RX-0082-CD TRACERS
6.	4/2/96	PMK	90.326g	4095.381	Ø	WSL-3/67
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† All activities are referenced to the source date/time. Decay corrections are to be made on the following page.

To Page:_____

8019

From Page 93

RADIOCHEMISTRY LABORATORY
RADIOACTIVE MATERIAL INVENTORY
WORKING STANDARD LOG

Working Standard ID: WSL 3/67 (Th 229) Intermediate Standard ID: ISL 2/73

Reference Date/Time*: 028, 1994/14:00 MST RMI Source Log Ref. Book/Page: 02/30

*Use Julian date and military time

DCL Balance ID No.:_____

Date	Inits.	Solvent	Activity (pCi)†	Final Volume	Conc. (pCi/g)†	Witness
4/2/96	T.P. for P.M.K.	2 M HNO_3	4,095.381	90.326g	45.34	T.P for RK.

Usage:

	Date	Inits.	Aliquot	Activity (pCi)†	Balance (pCi)†	Destination
1.	10-7-96	T.P.	1.581g	71.6825	1722.0061	96M-0286-15/96M-030.-09 96M-0290-09 96M-0297-15 TRACERS
2.	10-9-96	BR	1.655g	75.0377	1646.9684	96M-0303-09 96M-0304-09 Tracers
3.	10-9-96	T.P.	2.6350g	119.4709	1527.4975	9969703 7 9969703M TRACERS
4.	10-14-96	BR	1.6550g	75.0346 77 BR	1452.4598	96C-0439-13 96C-0443-13 Tracers
5.	10-17-96	BR	.9735g	44.13849	1408.3214	96M-0250-02 96M-0323-04 Tracer
6.	10-18-96	BR	.5841g	26.4831	1381.8383	96E-0640-03 Tracers
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† All activities are referenced to the source date/time. Decay corrections are to be made on the following page.

To Page:_____

CERTIFICATE OF CALIBRATION
ALPHA STANDARD SOLUTION

8019

Radionuclide	U-232	Customer:	DATA CHEM LABORATORIES
Half Life:	68.9 ± 1.0 years	P.O.No.:	8072
Catalog No.:	7232	Reference Date:	December 15 1991 12:00 PST.
Source No.:	393-77	Contained Radioactivity:	0.1036 µCi.

Description of Solution

a. Mass of solution: 5.1639 grams.

b. Chemical form: UO2Cl2 in 2N HCl

c. Carrier content: None added

d. Density: 1.0330 gram/ml @ 20°C.

Radioimpurities

None detected (other than daughters)

Radioactive Daughters

Th-228 0.2% as of November 24 1991 (daughters separated on November 22 1991)

Radionuclide Concentration

0.0201 µCi/gram.

Method of Calibration

Weighed aliquots of the solution were assayed using a windowless internal gas flow proportional counter.

Uncertainty of Measurement

a. Systematic uncertainty in instrument calibration:	±1.3%
b. Random uncertainty in assay:	±2.3%
c. Random uncertainty in weighing(s):	±0.2%
d. Total uncertainty at the 99% confidence level:	±3.8%

NIST Traceability

This calibration is implicitly traceable to the National Institute of Standards and Technology.

Notes

1. Nuclear data were taken from "Table of Isotopes", Seventh Edition, edited by Virginia S. Shirley.
2. IPL participates in an NIST measurement assurance program to establish and maintain implicit traceability for a number of nuclides, based on the blind assay(and later NIST certification) of Standard Reference Materials. (As in NRC Regulatory Guide 4.15)

QUALITY CONTROL

ISOTOPE PRODUCTS LABORATORIES
1800 No. Keystone Street.,
Burbank, California 91504
(818) 843 - 7000

RADIOCHEMISTRY LABORATORY
RADIOACTIVE MATERIAL INVENTORY
STANDARD SOURCE LOG

8019

Transferred from
RMI Source logbook 1A [illegible]
2/28/96

Vendor: FPL Vendor Source ID: SRM-393-77

Date Received: Received By: C. Walker

ISOTOPE PRODUCTS LABORATORIES
Radioactivity Std. U-232
Amount 0.1036 μCi
Mass 5.1639 GRAMS
Date Dec 15, 1991
Source No. 393-77
CAUTION RADIOACTIVE MATERIAL
NOT FOR DRUG USE

Place Source Label Above

Source Reference Date/Time*: 349, 1991 / 13:00 MST Solvent: 2N HCl

ISOTOPE(S)	CONC. (pCi/g)	ISOTOPE(S)	CONC. (pCi/g)
U-232	20,062.36		

*Use Julian date and military time

DCL ~~Balance ID~~ No.: NA

Date	Inits.	Aliquot	Activity (pCi)	Balance (pCi)	Destination	Witness
2/13/96	PBK	5.0940g	102 & 197.66	Ø	FSL-2/99	PBK R.S.

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001103

RADIOCHEMISTRY LABORATORY
RADIOACTIVE MATERIAL INVENTORY
INTERMEDIATE STANDARD LOG

Intermediate Standard ID: ISL-2/99 (U-232) Standard Source ID: SRM-393-77

Reference Date/Time*: 349, 1991 RMI Source Log Ref. Book/Page: 2/37

*Use Julian date and military time.

DCL Balance ID No.: NA

Date	Inits.	Solvent	Activity (pCi)†	Final Weight	Conc. (pCi/g)†	Witness
4/13/92	PMK	2M HNO3	~~102~~ 197.66	100 mL	1,022	R.S.

Usage:

	Date	Inits.	Aliquot	Activity (pCi)†	Balance (pCi)†	Destination
1.	10-5-92	R.S.	5.04 mL	5,140.8	~~0.096859~~	U-232-002-WS
2.	2/26/94	EWB	1.5 mL	1,530	95,526.860	TRACERS SX-0503-AN
3.	6/27/94	SP.	10.009g = 9.38 mL	9,586.88	85,939.98	U-232-003-WS
4.	6/8/95	PMK	5.0 mL	5,100	80,839.98	U-232-004-WS
5.	6/13/95	PMK	0.005 mL	5.11	80,834.87	Test for UR STD
6.	2/28/96	PMK	4.94 mL	5,048.68	75,786.19	WSL-3/55
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† All activities are referenced to the source date/time. Decay corrections are to be made on the following page.

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Flow PAGE 89

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RADIOCHEMISTRY LABORATORY
RADIOACTIVE MATERIAL INVENTORY
WORKING STANDARD LOG

Working Standard ID: WSL-3/55 (U-232) Intermediate Standard ID: ISL-2/99

Reference Date/Time*: 346, 1991/13:00HST RMI Source Log Ref. Book/Page: 2/57

*Use Julian date and military time

DCL Balance ID No.: NA

Date	Inits.	Solvent	Activity (pCi)†	Final Volume	Conc. (pCi/g)†	Witness
2/28/96	PMK	2M HNO_3	5,048.68	100 mL	50.49	R.L.

Usage:

	Date	Inits.	Aliquot	Activity (pCi)†	Balance (pCi)†	Destination
1.	9/25/96	PMK	1.08625 mL	54.84	680.05	96C-0404-02 TRACERS
2.	10-3-96	T.P.	1.08625 mL	54.84	625.2100	96M-0271-28 TRACERS 96M-0279-19
3.	10-7-96	T.P.	1.4813 mL	74.7908	550.4192	96M-0286-14 96M-0288-08 96M-0290-08 96M-0297-14 TRACERS
4.	10-9-96	BR	1.6599 ml	83.8073	466.6119	96M-0303-08 96M-0304-08 Tracers
5.	10-9-96	T.P.	2.4688 mL	124.6497	341.9622	G969703J G969703H TRACERS
6.	10-15-96	BR	1.6550 ml	83.5610	258.4012	96C-0439-12 96C-0443-12 Tracers
7.	10-16-96	BR	1.9528 ml	98.5969	159.8043	96E-0654-02 Tracer
8.	10-17-96	BR	.9764 ml	49.2984	110.5059	96M-0250-01 96M-0323-05 Tracer
9.	10-18-96	BR	.5858 ml	29.5770	80.9289	96E-0640-02 Tracers
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† All activities are referenced to the source date/time. Decay corrections are to be made on the following page.

To Page:_____

7400-SRC-0043

Certification Date: Apr. 8, 1993

Nuclide	U-238	U-234	Pu-239	Am-241	Total Alpha
Energy (MeV)	4.20	4.77	5.15	5.49	3 - 8 MeV
Counting time (sec)	92659				
Background count time (sec)	264043				
Detector Efficiency (%) *	20.4 ± 0.42				
Gross counts	30912 ± 176	30510 ± 175	31664 ± 178	32416 ± 180	126128 ± 355
Gross count rate (cpm)	20.02 ± 0.11	19.76 ± 0.11	20.50 ± 0.12	20.99 ± 0.12	81.67 ± 0.23
Background count rate (cpm)	0.001 ± 0.0001	0.002 ± 0.0002	0.001 ± 0.0001	0.001 ± 0.0001	0.0072 ± 0.001
Net std count rate	20.02 ± 0.2231	19.75 ± 0.2217	20.50 ± 0.2258	20.99 ± 0.2285	81.67 ± 0.4507
Standard activity (dpm)	98.1 ± 2.3	96.8 ± 2.3	100.5 ± 2.3	102.9 ± 2.4	400.3 ± 8.5
Uncertainty at 95% level (%)	2.3%	2.3%	2.3%	2.3%	2.1%

*Traceable to NIST via attached calibration certificate
(Source identification "FSU" on NIST test report refers to primary standard used to calibrate detector)

7400-SRC-0048

Certification Date: Apr. 8, 1993

Nuclide	U-238	U-234	Pu-239	Am-241	Total Alpha
Energy (MeV)	4.20	4.77	5.15	5.49	3 - 8 MeV
Counting time (sec)	97462				
Background count time (sec)	264043				
Detector Efficiency (%) *	20.4 ± 0.42				
Gross counts	31979 ± 179	31379 ± 177	34622 ± 186	34445 ± 186	133976 ± 366
Gross count rate (cpm)	19.69 ± 0.11	19.32 ± 0.11	21.31 ± 0.11	21.21 ± 0.11	82.48 ± 0.23
Background count rate (cpm)	0.001 ± 0.0001	0.002 ± 0.0002	0.001 ± 0.0001	0.001 ± 0.0001	0.0072 ± 0.001
Net std count rate	19.69 ± 0.2158	19.32 ± 0.2137	21.31 ± 0.2245	21.20 ± 0.2239	82.47 ± 0.4417
Standard activity (dpm)	96.5 ± 2.3	94.7 ± 2.2	104.5 ± 2.4	103.9 ± 2.4	404.3 ± 8.6
Uncertainty at 95% level (%)	2.3%	2.3%	2.3%	2.3%	2.1%

*Traceable to NIST via attached calibration certificate
(Source identification "FSU" on NIST test report refers to primary standard used to calibrate detector)

001107 112

7400-SRC-0056

Certification Date: Apr. 8, 1993

Nuclide	U-238	U-234	Pu-239	Am-241	Total Alpha
Energy (MeV)	4.20	4.77	5.15	5.49	3 - 8 MeV
Counting time (sec)	153435				
Background count time (sec)	264043				
Detector Efficiency (%) *	20.4 ± 0.42				
Gross counts	49670 ± 223	48902 ± 221	52032 ± 228	53030 ± 230	206066 ± 454
Gross count rate (cpm)	19.42 ± 0.09	19.12 ± 0.09	20.35 ± 0.09	20.74 ± 0.09	80.58 ± 0.18
Background count rate (cpm)	0.001 ± 0.0001	0.002 ± 0.0002	0.001 ± 0.0001	0.001 ± 0.0001	0.0072 ± 0.001
Net std count rate	19.42 ± 0.1708	19.12 ± 0.1695	20.35 ± 0.1748	20.74 ± 0.1765	80.57 ± 0.3479
Standard activity (dpm)	95.2 ± 2.1	93.7 ± 2.1	99.7 ± 2.2	101.6 ± 2.3	395.0 ± 8.3
Uncertainty at 95% level (%)	2.2%	2.2%	2.2%	2.2%	2.1%

*Traceable to NIST via attached calibration certificate
(Source identification "FSU" on NIST test report refers to primary standard used to calibrate detector)

7400-SRC-0095

Certification Date: Apr. 17, 1993

Nuclide	U-238	U-234	Pu-239	Am-241	Total Alpha
Energy (MeV)	4.20	4.77	5.15	5.49	3 - 8 MeV
Counting time (sec)	110906				
Background count time (sec)	264043				
Detector Efficiency (%) *	20.4 ± 0.42				
Gross counts	37017 ± 192	36542 ± 191	34615 ± 186	37320 ± 193	147301 ± 384
Gross count rate (cpm)	20.03 ± 0.10	19.77 ± 0.10	18.73 ± 0.10	20.19 ± 0.10	79.69 ± 0.21
Background count rate (cpm)	0.001 ± 0.0001	0.002 ± 0.0002	0.001 ± 0.0001	0.001 ± 0.0001	0.0072 ± 0.001
Net std count rate	20.03 ± 0.2040	19.77 ± 0.2027	18.73 ± 0.1973	20.19 ± 0.2048	79.68 ± 0.4070
Standard activity (dpm)	98.2 ± 2.3	96.9 ± 2.2	91.8 ± 2.1	99.0 ± 2.3	390.6 ± 8.3
Uncertainty at 95% level (%)	2.3%	2.3%	2.3%	2.3%	2.1%

*Traceable to NIST via attached calibration certificate
(Source identification "FSU" on NIST test report refers to primary standard used to calibrate detector)

8019

U.S. DEPARTMENT OF COMMERCE
National Institute of Standards & Technology
Gaithersburg, MD 20899

REPORT OF TEST

for

Florida State University
Tallahassie, Florida

Radionuclide	^{210}Po, ^{234}U, ^{235}U, ^{238}U, ^{239}Pu and ^{241}Am
Source identification	FSU
2π alpha-particle counting rate	3.369 s^{-1} (1)*
Overall uncertainty	1.8 percent (2)
Relative activity	
^{210}Po	0.005 (± 26 percent)
^{234}U	0.949 (± 1.6 percent)
^{235}U	0.037 (± 4.6 percent)
^{238}U	0.954 (± 1.6 percent)
^{239}Pu	0.961 (± 1.6 percent)
^{241}Am	1.000 percent (3),(4)
Reference time	March 3, 1993
Measuring instruments	NIST $2\pi\alpha$ proportional counter and Si surface-barrier detector

For the Director,

J.M.R. Hutchinson, Acting Group Leader
Radioactivity Group
Physics Laboratory

Gaithersburg, MD 20899
March, 1993

*Notes on back

NOTES

(1) The total number of alpha particles counted per second emitted into a 2π-steradian geometry (including those scattered).

(2) The overall uncertainty is two times the value found from combining quadratically the standard deviations of the mean, or approximation thereof, of the following:

a) one standard deviation of the mean of five measurements	0.18 percent
b) pulse-height extrapolation	0.70 percent
c) system live time	0.05 percent
d) backscattering correction	0.50 percent

(3) The uncertainties in the relative activity are computed from two times the estimated standard deviation of the mean plus the uncertainty from subtraction of the estimated tail of the upper peak.

(4) Assuming the source material is thin and is deposited on stainless steel the uncertified values in Bq for the activities are as follows:

^{210}Po	0.008
^{234}U	1.623
^{235}U	0.063
^{238}U	1.631
^{239}Pu	1.643
^{241}Am	1.710

For further information, contact Dr. J.M.R. Hutchinson at (301) 975-5543, or Pamela Hodge at (301) 975-5544.

8019

001112117

Tas no.= 11080212 FSU0056 CALIB. 2-27-93 Live = 153435 s True = 226534.1 s Readout: 08:12 1-Mar-93 Page 1

User 1 Group 1.8 Unit 1 Collected at: 14:15:10.5 28-Feb-93

X-cal = + 5.7824-03 * Ch + 2.6729+00 MeV

PEAK: Statistics = 1.00 Min width = 8 AREA: Background = 2 % Error = 1.00

Iso ID: Window= 2.0 keV Library: RESIDENT

ROI#	Start MeV	Stop MeV	Integral	Area	ICPS	%Err	Peak MeV	FWHM MeV
1	2.684	8.588	206066	205300	1.3	0.31	5.149	0.0394
2	3.806	4.246	49670	49208	0.3	0.49	4.197	0.0434
3	4.280	4.471	2013	1664	0.0	3.93	4.394	0.0486
4	4.517	4.824	48902	48470	0.3	0.48	4.769	0.0415
5	4.888	5.206	52032	51906	0.3	0.45	5.149	0.0394
6	5.206	5.599	53030	52978	0.3	0.44	5.484	0.0407

8019

U.S. DEPARTMENT OF COMMERCE
National Institute of Standards & Technology
Gaithersburg, MD 20899

REPORT OF TEST

for

Florida State University
Tallahassie, Florida

Radionuclide	^{210}Po, ^{234}U, ^{235}U, ^{238}U, ^{239}Pu and ^{241}Am
Source identification	FSU
2π alpha-particle counting rate	3.369 s^{-1} (1)*
Overall uncertainty	1.8 percent (2)
Relative activity	
^{210}Po	0.005 (± 26 percent)
^{234}U	0.949 (± 1.6 percent)
^{235}U	0.037 (± 4.6 percent)
^{238}U	0.954 (± 1.6 percent)
^{239}Pu	0.961 (± 1.6 percent)
^{241}Am	1.000 percent (3),(4)
Reference time	March 3, 1993
Measuring instruments	NIST $2\pi\alpha$ proportional counter and Si surface-barrier detector

For the Director,

J.M.R. Hutchinson, Acting Group Leader
Radioactivity Group
Physics Laboratory

Gaithersburg, MD 20899
March, 1993

*Notes on back

NOTES

(1) The total number of alpha particles counted per second emitted into a 2π-steradian geometry (including those scattered).

(2) The overall uncertainty is two times the value found from combining quadratically the standard deviations of the mean, or approximation thereof, of the following:

a) one standard deviation of the mean of five measurements	0.18 percent
b) pulse-height extrapolation	0.70 percent
c) system live time	0.05 percent
d) backscattering correction	0.50 percent

(3) The uncertainties in the relative activity are computed from two times the estimated standard deviation of the mean plus the uncertainty from subtraction of the estimated tail of the upper peak.

(4) Assuming the source material is thin and is deposited on stainless steel the uncertified values in Bq for the activities are as follows:

^{210}Po	0.008
^{234}U	1.623
^{235}U	0.063
^{238}U	1.631
^{239}Pu	1.643
^{241}Am	1.710

For further information, contact Dr. J.M.R. Hutchinson at (301) 975-5543, or Pamela Hodge at (301) 975-5544.

NOTES

(1) The total number of alpha particles counted per second emitted into a 2π-steradian geometry (including those scattered).

(2) The overall uncertainty is two times the value found from combining quadratically the standard deviations of the mean, or approximation thereof, of the following:

a) one standard deviation of the mean of five measurements	0.18 percent
b) pulse-height extrapolation	0.70 percent
c) system live time	0.05 percent
d) backscattering correction	0.50 percent

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^{210}Po	0.008
^{234}U	1.623
^{235}U	0.063
^{238}U	1.631
^{239}Pu	1.643
^{241}Am	1.710

For further information, contact Dr. J.M.R. Hutchinson at (301) 975-5543, or Pamela Hodge at (301) 975-5544.

001116

80019

Tag no.= 11080449 FSU0095 CALIB. 4-16-93 Live = 110906 s True = 372090.5 s Readout: 23:36 17-Apr-93 Page 1

User 1 Group 1.8 Unit 1 Collected at: 16:46:36.3 16-Apr-93

X-cal = + 5.7694-03 * Ch + 2.6763+00 MeV

PEAK: Statistics = 1.00 Min width = 8 AREA: Background = 2 % Error = 1.00

Iso ID: Window= 2.0 keV Library: RESIDENT

ROI#	Start MeV	Stop MeV	Integral	Area	ICPS	%Err	Peak MeV	FWHM MeV
1	2.728	8.578	147301	147301	1.3	0.26	5.154	0.0363
2	3.865	4.263	37017	36772	0.3	0.55	4.201	0.0384
3	4.263	4.523	1597	1332	0.0	4.81	4.396	0.0479
4	4.528	4.823	36542	36243	0.3	0.55	4.774	0.0373
5	4.903	5.215	34615	34464	0.3	0.55	5.154	0.0363
6	5.232	5.601	37320	37222	0.3	0.53	5.486	0.0384
7	5.619	5.734	6	6	0.0	40.82	5.681	0.0144
8	5.994	6.109	4	4	0.0	50.00	6.069	0.0000
9	6.201	6.317	11	6	0.0	92.13	6.285	0.0134
10	6.703	6.819	9	9	0.0	33.33	6.785	0.0173

Prop. Cal:

154. 40± 4.55

FSU104 FSU0104 CALIB. 4-18-93

8019

001117 122

Tag no.= 11080118 FSU CALIB. 0048 2-12-93 Live = 97462 s True = 81731.1 s Readout: 17:29 13-Feb-93 Page 1

User 1 Group 1.8 Unit 1 Collected at: 15:58:20.2 13-Feb-93

X-cal = + 5.7591-03 * Ch + 2.6813+00 MeV

PEAK: Statistics = 1.00 Min width = 8 AREA: Background = 2 % Error = 1.00

Iso ID: Window= 2.0 keV Library: RESIDENT

ROI#	Start MeV	Stop MeV	Integral	Area	ICPS	%Err	Peak MeV	FWHM MeV
1	2.693	8.573	133976	133976	1.4	0.27	5.151	0.0375
2	3.920	4.248	31979	31660	0.3	0.60	4.202	0.0374
3	4.305	4.461	1250	1061	0.0	4.42	4.396	0.0447
4	4.518	4.835	31379	31099	0.3	0.60	4.772	0.0371
5	4.916	5.210	34622	34544	0.4	0.55	5.151	0.0374
6	5.210	5.590	34445	34378	0.4	0.55	5.484	0.0377

U.S. DEPARTMENT OF COMMERCE
National Institute of Standards & Technology
Gaithersburg, MD 20899

REPORT OF TEST

for

Florida State University
Tallahassie, Florida

Radionuclide	^{210}Po, ^{234}U, ^{235}U, ^{238}U, ^{239}Pu and ^{241}Am
Source identification	FSU
2π alpha-particle counting rate	3.369 s^{-1} (1)*
Overall uncertainty	1.8 percent (2)
Relative activity	
^{210}Po	0.005 (± 26 percent)
^{234}U	0.949 (± 1.6 percent)
^{235}U	0.037 (± 4.6 percent)
^{238}U	0.954 (± 1.6 percent)
^{239}Pu	0.961 (± 1.6 percent)
^{241}Am	1.000 percent (3),(4)
Reference time	March 3, 1993
Measuring instruments	NIST $2\pi\alpha$ proportional counter and Si surface-barrier detector

For the Director,

J.M.R. Hutchinson, Acting Group Leader
Radioactivity Group
Physics Laboratory

Gaithersburg, MD 20899
March, 1993

*Notes on back

NOTES

(1) The total number of alpha particles counted per second emitted into a 2π-steradian geometry (including those scattered).

(2) The overall uncertainty is two times the value found from combining quadratically the standard deviations of the mean, or approximation thereof, of the following:

a) one standard deviation of the mean of five measurements	0.18 percent
b) pulse-height extrapolation	0.70 percent
c) system live time	0.05 percent
d) backscattering correction	0.50 percent

(3) The uncertainties in the relative activity are computed from two times the estimated standard deviation of the mean plus the uncertainty from subtraction of the estimated tail of the upper peak.

(4) Assuming the source material is thin and is deposited on stainless steel the uncertified values in Bq for the activities are as follows:

^{210}Po	0.008
^{234}U	1.623
^{235}U	0.063
^{238}U	1.631
^{239}Pu	1.643
^{241}Am	1.710

For further information, contact Dr. J.M.R. Hutchinson at (301) 975-5543, or Pamela Hodge at (301) 975-5544.

Tag no.= 11080088 FSU CALIB. 0043 *Live = 92659 s True = 92678.2 s Readout: 20:35 4-Feb-93 Page 1

User 1 Group 1.8 Unit 1 Collected at: 14:47:20.3 4-Feb-93

X-cal = + 5.7720-03 * Ch + 2.6727+00 MeV

PEAK: Statistics = 1.00 Min width = 8 AREA: Background = 2 % Error = 1.00

Iso ID: Window= 2.0 keV Library: RESIDENT

ROI#	Start MeV	Stop MeV	Integral	Area	ICPS	%Err	Peak MeV	FWHM MeV
1	3.810	4.272	31013	30912	0.3	0.59	4.200	0.0376
2	4.295	4.468	1266	1088	0.0	4.40	4.393	0.0509
3	4.526	4.831	30686	30510	0.3	0.59	4.771	0.0350
4	4.849	5.207	31790	31664	0.3	0.58	5.151	0.0358
5	5.230	5.593	32432	32416	0.4	0.56	5.484	0.0368

8019

U.S. DEPARTMENT OF COMMERCE
National Institute of Standards & Technology
Gaithersburg, MD 20899

REPORT OF TEST

for

Florida State University
Tallahassie, Florida

Radionuclide	^{210}Po, ^{234}U, ^{235}U, ^{238}U, ^{239}Pu and ^{241}Am
Source identification	FSU
2π alpha-particle counting rate	3.369 s^{-1} (1)*
Overall uncertainty	1.8 percent (2)
Relative activity	
^{210}Po	0.005 (± 26 percent)
^{234}U	0.949 (± 1.6 percent)
^{235}U	0.037 (± 4.6 percent)
^{238}U	0.954 (± 1.6 percent)
^{239}Pu	0.961 (± 1.6 percent)
^{241}Am	1.000 percent (3),(4)
Reference time	March 3, 1993
Measuring instruments	NIST $2\pi\alpha$ proportional counter and Si surface-barrier detector

For the Director,

J.M.R. Hutchinson, Acting Group Leader
Radioactivity Group
Physics Laboratory

Gaithersburg, MD 20899
March, 1993

*Notes on back

001121 126

PIPETTE CALIBRATION CHECK

Equipment Number: EPPE 13

Equipment Name: Eppendorf

Date: 6/17/96 Date Last Calibrated: 12/95

Calibration Period: 12/96

Pipette Volume 0.1mL 0.5mL (5mL Tip)

Water Temperature 22°C

Water Density 0.99823

Balance Used 102683

Measured Weights (g)

1	2	3	4	5	6	7
0.09759 0.49721	0.09937 0.49780	0.09860 0.49814	0.09887 0.49755	0.09836 0.49651	0.09864 0.49639	0.09863 0.49701

	Mean	σ
Weight (g)	0.09858 0.49723	0.00054 0.00065
Volume (mL)	0.09875 0.49811	0.00054 0.00065

Performed By: Christopher Weldrum

PIPETTE CALIBRATION CHECK

8019

Equipment Number: EPPE 10

Equipment Name: Eppendorf

Date: 6/14/96 Date Last Calibrated: 12/95

Calibration Period: 12/96

Pipette Volume 100 uL 200 uL 250 uL

Water Temperature ~~22°C~~ 23°C cmk 6/14/96

Water Density ~~0.99823~~ 0.99707

Balance Used 102683

Measured Weights (g)

1	2	3	4	5	6	7
0.09782 0.19721 0.24068	0.09804 0.19467 0.24269	0.09734 0.19295 0.24357	0.09792 0.19321 0.24202	0.09684 0.19346 0.24216	0.09692 0.19267 0.24293	0.09660 0.19330 0.24198

	Mean	σ
Weight (g)	0.09735 0.19392 0.24229	0.00058 0.00158 0.00091
Volume (mL)	0.09764 0.19449 0.24300	0.00058 0.00159 0.00091

Performed By: Christopher Wellborn

DATA CHEM LABORATORIES
A SORENSON COMPANY

Raw Data
Radiochemistry/Mixed-Waste Department
α Spectrometry
Inventory Checklist

- [x] Section 1. Sample and QC Data
- [x] Section 2. Instrument Performance and Calibration Data

The following signatures verify that the raw data and all inventory and reviewer checklists in each raw data section (all green sheets) are complete and accurate.

Assembled by: _____ 11/5/96 Reviewed by: _____ 11/5/96
Signature Date Signature Date

Rev. 3/95

8019

Section 1. Sample and QC Data
α Spectrometry
Inventory Checklist

- [x] Laboratory Control Sample (LCS) print-out
  - LCS Spectral Plot
  - LCS ROI Peak Search Report
  - LCS Activity Report
  - MDA Report
- [x] Reagent Blank with Tracer(s)
  - Reagent Blank Spectral Plot
  - Reagent Blank ROI Peak Search Report
  - Reagent Blank Activity Report
  - MDA Report
- [/] Accuracy Sample (MS)
  - MS Spectral Plot
  - MS ROI Peak Search Report
  - MS Relative Activity Report
  - MDA Report
- [x] Precision Sample (MD/MSD)
  - MD/MSD Spectral Plot
  - MD/MSD ROI Peak Search Report
  - MD/MSD Relative Activity Report
  - MDA Report
- [x] Field Sample Instrument Print-outs
  - Sample Spectral Plot
  - Sample ROI Peak Search Report
  - Sample Activity Report
  - Sample MDA Report
- [x] Computer/Manual Calculation Sheets summarizing all calculational inputs and results

Section 1. Sample and QC Data
α Spectrometry
Reviewer Checklist

X The Sample and QC Data Inventory Checklist above is complete.

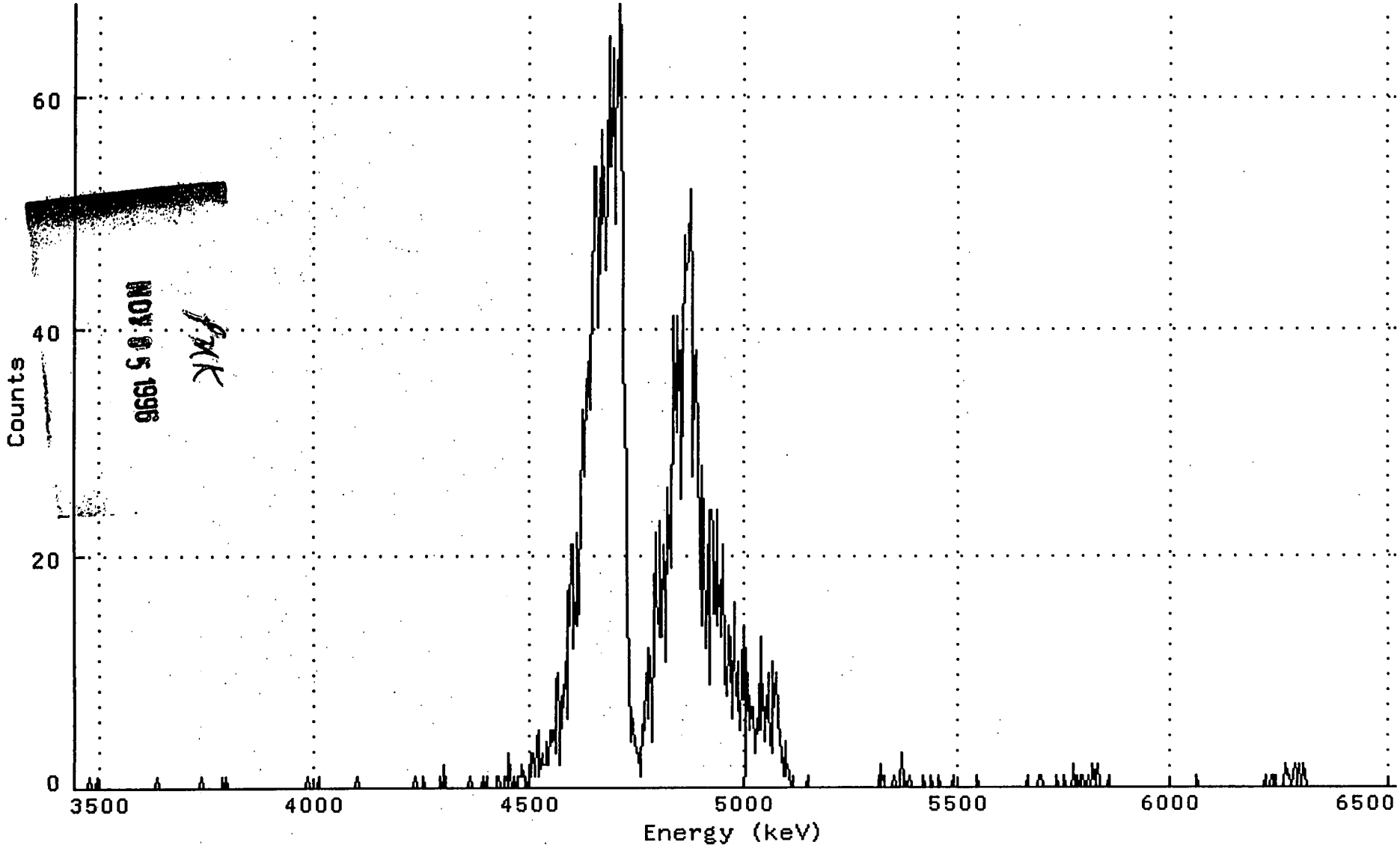
X All appropriate QC for the project was performed.

X All appropriate QC data met acceptance criteria. Unacceptable QC data were documented, and justifications were provided for data used.

X Print-outs are initialed and dated.

Th-iso

Spectrum : DKA0:[ALPHA.ALUSR.ARCHIVE.C]C_QC-123239-1_TH.CNF;2
Title : GAR011
Sample Title: 96E-0640-03
Start Time: 25-OCT-1996 12:19 Sample Time: 24-OCT-1996 12:00 Energy Offset: 3.43907E+03
Real Time : 0 16:38:37.99 Sample ID : QC-123239-1 Energy Slope : 3.20444E+00
Live Time : 0 16:38:34.00 Sample Type: TH Energy Quad : -1.95857E-04



NOV 05 1996

VMS Peak Search Report V1.9 Generated 4-NOV-1996 15:22:20

8019

Configuration : MCA0:[ALPHA]ALPHA0$1
Analyses by : ROIPEAK V1.2
Sample title : 96E-0640-03
Sample date : 24-OCT-1996 12:00:00 Acquisition date : 25-OCT-1996 12:19:50
Sample ID : QC-123239-1 Sample quantity : 1.0000 S
Sample type : TH Sample geometry :
Elapsed live time: 0 16:38:34.00 Elapsed real time: 0 16:38:37.99 0.0%
Start energy : 3442.27 keV End energy : 6515.04 keV
Gross/Net areas : Gross Background type :
Num avg bkg chans: 2 Critical level : No

Pk	It	Energy	Area	Bkgnd	FWHM	Channel	Left	Pw	Cts/Sec	%Err	Fit
1	0	3894.09	4	0	230.72	143.25	98	96	6.68E-05	50.0	
2	0	4661.83	1944	0	92.71	390.92	306	107	3.24E-02	2.3	
3	0	4887.22	1927	0	76.66	465.14	412	128	3.22E-02	2.3	
4	0	5338.29	15	0	56.88	615.87	539	119	2.50E-04	25.8	
5	0	6058.63	1	0	3.20	863.00	792	97	1.67E-05	100.0	

8019

VMS Peak Search Report V1.9 Generated 4-NOV-1996 15:22:45

Configuration : DKA0:[ALPHA.ALUSR.ARCHIVE.B]B_011_NONE.CNF;383
Analyses by : ROIPEAK V1.2
Sample title : 96M-0303-10
Sample date : 18-OCT-1996 14:52:02 Acquisition date : 18-OCT-1996 14:52:25
Sample ID : 011 Sample quantity : 1.0000 SAMPLE
Sample type : NONE Sample geometry :
Elapsed live time: 0 16:38:39.99 Elapsed real time: 0 16:38:30.00 0.0%
Start energy : 3447.77 keV End energy : 6526.39 keV
Gross/Net areas : Gross Background type :
Num avg bkg chans: 2 Critical level : No

Pk	It	Energy	Area	Bkgnd	FWHM	Channel	Left	Pw	Cts/Sec	%Err	Fit
1	0	3903.96	3	0	232.26	145.50	98	96	5.01E-05	57.7	
2	0	4565.14	7	0	283.17	359.00	306	107	1.17E-04	37.8	
3	0	4919.47	2	0	5.97	475.50	412	128	3.34E-05	70.7	
4	0	5287.12	11	0	3.18	598.00	539	119	1.84E-04	30.2	
5	0	5998.60	1	0	3.18	840.00	792	97	1.67E-05	100.0	

VMS Nuclide Identification Report V2.9 Generated 4-NOV-1996 15:23:27 8019

Configuration : MCA0:[ALPHA]ALPHA0$1
Analyses by : ROIPEAK V1.2,PEAKEFF V2.2,ENBACK V1.5,NID V3.1,WTMEAN V1.8
Sample title : 96E-0640-03
Sample date : 24-OCT-1996 12:00:00 Acquisition date : 25-OCT-1996 12:19:50
Sample ID : QC-123239-1 Sample quantity : 1.0000 S
Sample type : TH Sample geometry :
Elapsed live time: 0 16:38:34.00 Elapsed real time: 0 16:38:37.99 0.0%
Energy tolerance : 100.00 keV Half life ratio : 8.00
Errors propagated: Yes Systematic Error : 0.00 %
Efficiency type : Average value Efficiencies at : Peak Energy
Abundance limit : 75.00

Summary of Nuclide Activity

Total number of lines in spectrum 5
Number of unidentified lines 0
Number of lines tentatively identified by NID 5 100.00%

Nuclide Type : Alpha

Nuclide	Hlife	Decay	Wtd Mean Uncorrected (pCi)	Wtd Mean Decay Corr (pCi)	Decay Corr 2-Sigma Error	2-Sigma %Error	Flags
TH-227	18.72D	1.05	4.256E-07	4.475E-07	**********		
			---	---			
Total Activity :			4.256E-07	4.475E-07			

Nuclide Type : ALPHA

Nuclide	Hlife	Decay	Wtd Mean Uncorrected (pCi)	Wtd Mean Decay Corr (pCi)	Decay Corr 2-Sigma Error	2-Sigma %Error	Flags
TH-228	1.91Y	1.00	9.159E-03	9.171E-03	23.38E-03	254.89	
TH-229	7340.00Y	1.00	4.425E+00	4.425E+00	0.248E+00	5.60	
TH-230	7.70E+04Y	1.00	4.439E+00	4.439E+00	0.248E+00	5.60	
TH-232	1.41E+10Y	1.00	2.288E-03	2.288E-03	12.11E-03	528.98	
			---	---			
Total Activity :			8.876E+00	8.876E+00			

Grand Total Activity : 8.876E+00 8.876E+00

Flags: "K" = Keyline not found "M" = Manually accepted
"E" = Manually edited "A" = Nuclide specific abn. limit

8019

DATACHEM
ALPHA SPECTROSCOPY REPORT

****

SAMPLE TITLE: 96E-0640-03
SAMPLE DATE: 24-OCT-1996 12:00:00
ELAPSED LIVE TIME: 59914.
AVERAGE %EFFICIENCY: 19.7179
TRACER DPM: 10.7293

SAMPLE ID: QC-123239-1
SAMPLE QUANT: 1.0000 S
DETECTOR #: 011
YIELD: 91.5614

****

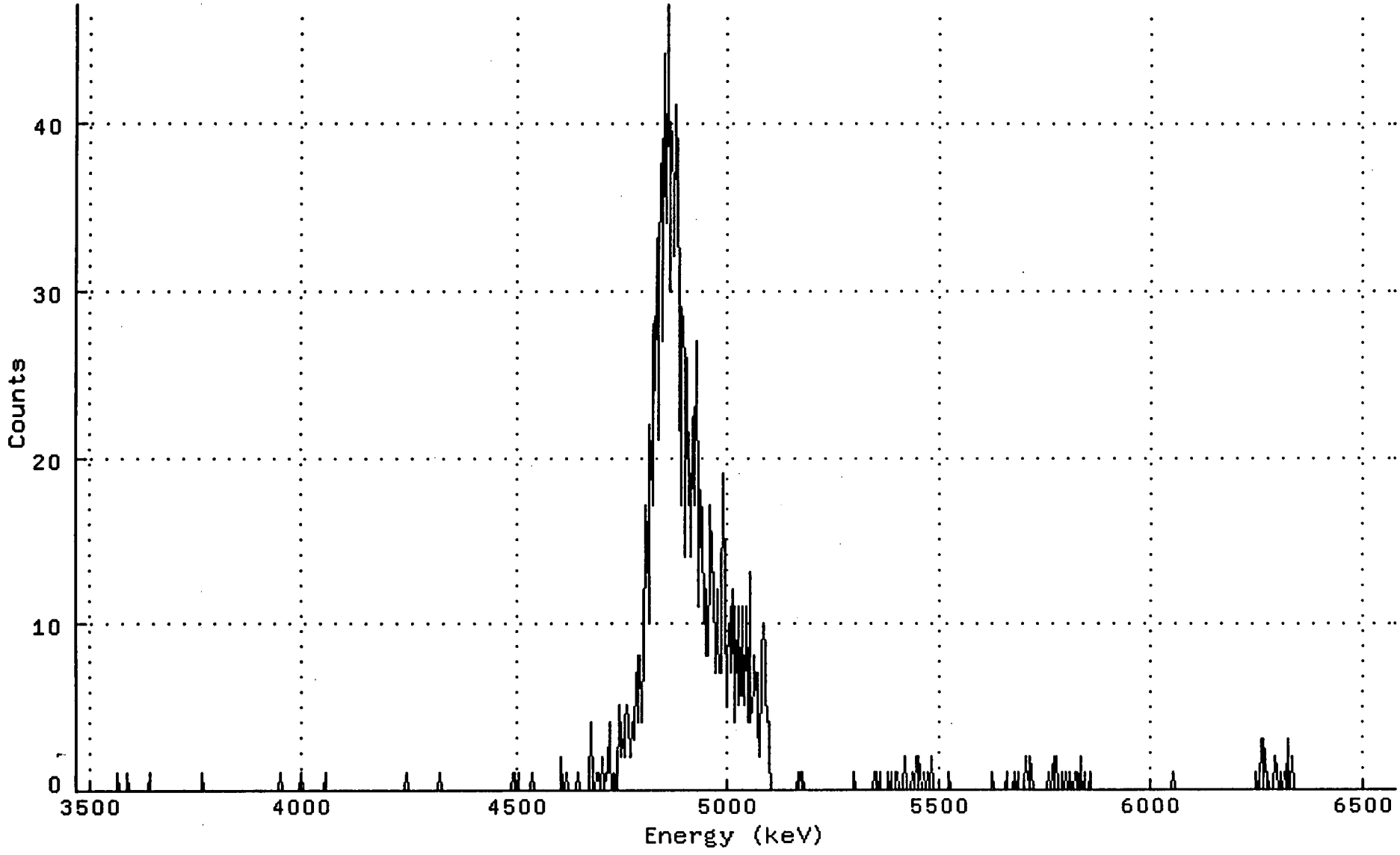
NUCLIDE ACTIVITY SUMMARY

NUCLIDE	ENERGY	NET AREA	BKG	%ABN	ACTIVITY pCi/S	ERROR 2-SIGMA	MDA pCi/S
TH-227	6006.	0.000	1.000	53.80	4.888E-07	1.381E-02	3.553E-02
TH-228	5400.	4.001	10.999	99.94	1.002E-02	2.554E-02	4.606E-02
TH229	4872.	1925.000	2.000	99.52	4.833E+00	2.705E-01	2.404E-02
TH-230	4672.	1937.001	6.999	99.82	4.849E+00	3.837E-01	3.830E-02
TH-232	3997.	1.000	3.000	100.00	2.499E-03	1.322E-02	2.762E-02

****

REVIEWED BY: DATE:

Spectrum : DKA0:[ALPHA.ALUSR.ARCHIVE.R]R_BL-123239-1_TH.CNF;2
Title : GAR012
Sample Title: 96E-0640-03
Start Time: 25-OCT-1996 12:19 Sample Time: 24-OCT-1996 12:00 Energy Offset: 3.46456E+03
Real Time : 0 16:38:37.99 Sample ID : BL-123239-1 Energy Slope : 3.20166E+00
Live Time : 0 16:38:27.00 Sample Type: TH Energy Quad : -1.64084E-04



VMS Peak Search Report V1.9 Generated 4-NOV-1996 15:20:40

8019

Configuration : MCA0:[ALPHA]ALPHA0$1
Analyses by : ROIPEAK V1.2
Sample title : 96E-0640-03
Sample date : 24-OCT-1996 12:00:00 Acquisition date : 25-OCT-1996 12:19:50
Sample ID : BL-123239-1 Sample quantity : 1.0000 S
Sample type : TH Sample geometry :
Elapsed live time: 0 16:38:27.00 Elapsed real time: 0 16:38:37.99 0.0%
Start energy : 3467.76 keV End energy : 6571.00 keV
Gross/Net areas : Gross Background type :
Num avg bkg chans: 2 Critical level : No

Pk	It	Energy	Area	Bkgnd	FWHM	Channel	Left	Pw	Cts/Sec	%Err	Fit
1	0	3902.21	3	0	243.33	137.67	90	96	5.01E-05	57.7	
2	0	4662.44	28	0	49.63	381.61	297	106	4.67E-04	18.9	
3	0	4901.57	1713	0	107.88	459.66	402	127	2.86E-02	2.4	
4	0	5369.12	20	0	40.02	614.20	528	118	3.34E-04	22.4	
5	0	5953.18	2	0	0.00	811.00	778	94	3.34E-05	70.7	

VMS Peak Search Report V1.9 Generated 4-NOV-1996 15:21:01

8019

Configuration : DKA0:[ALPHA.ALUSR.ARCHIVE.B]B_012_NONE.CNF;385
Analyses by : ROIPEAK V1.2
Sample title : 96M-0303-10
Sample date : 18-OCT-1996 14:52:03 Acquisition date : 18-OCT-1996 14:52:25
Sample ID : 012 Sample quantity : 1.0000 SAMPLE
Sample type : NONE Sample geometry :
Elapsed live time: 0 16:38:29.00 Elapsed real time: 0 16:38:30.99 0.0%
Start energy : 3451.12 keV End energy : 6552.80 keV
Gross/Net areas : Gross Background type :
Num avg bkg chans: 2 Critical level : No

Pk	It	Energy	Area	Bkgnd	FWHM	Channel	Left	Pw	Cts/Sec	%Err	Fit
1	0	3894.68	2	0	9.85	137.50	90	96	3.34E-05	70.7	
2	0	4565.44	3	0	206.86	349.50	297	106	5.01E-05	57.7	
3	0	4921.60	5	0	341.49	465.00	402	127	8.35E-05	44.7	
4	0	5289.19	9	0	334.92	586.50	528	118	1.50E-04	33.3	
5	0	5988.25	1	0	3.28	824.50	778	94	1.67E-05	100.0	

VMS Nuclide Identification Report V2.9 Generated 4-NOV-1996 15:21:27 8019

Configuration : MCA0:[ALPHA]ALPHA0$1
Analyses by : ROIPEAK V1.2,PEAKEFF V2.2,ENBACK V1.5,NID V3.1,WTMEAN V1.8
Sample title : 96E-0640-03
Sample date : 24-OCT-1996 12:00:00 Acquisition date : 25-OCT-1996 12:19:50
Sample ID : BL-123239-1 Sample quantity : 1.0000 S
Sample type : TH Sample geometry :
Elapsed live time: 0 16:38:27.00 Elapsed real time: 0 16:38:37.99 0.0%
Energy tolerance : 100.00 keV Half life ratio : 8.00
Errors propagated: Yes Systematic Error : 0.00 %
Efficiency type : Average value Efficiencies at : Peak Energy
Abundance limit : 75.00

Summary of Nuclide Activity

Total number of lines in spectrum 5
Number of unidentified lines 0
Number of lines tentatively identified by NID 5 100.00%

Nuclide Type : Alpha

Nuclide	Hlife	Decay	Wtd Mean Uncorrected (pCi)	Wtd Mean Decay Corr (pCi)	Decay Corr 2-Sigma Error	2-Sigma %Error	Flags
TH-227	18.72D	1.05	4.525E-09	4.758E-09	16.48E-09	346.41	
Total Activity :			4.525E-09	4.758E-09			

Nuclide Type : ALPHA

Nuclide	Hlife	Decay	Wtd Mean Uncorrected (pCi)	Wtd Mean Decay Corr (pCi)	Decay Corr 2-Sigma Error	2-Sigma %Error	Flags
TH-228	1.91Y	1.00	2.679E-08	2.683E-08	2.628E-08	97.96	
TH-229	7340.00Y	1.00	4.178E-06	4.178E-06	0.245E-06	5.87	
TH-230	7.70E+04Y	1.00	6.096E-08	6.096E-08	2.723E-08	44.66	
TH-232	1.41E+10Y	1.00	2.434E-09	2.434E-09	10.89E-09	447.19	
Total Activity :			4.268E-06	4.268E-06			

Grand Total Activity : 4.272E-06 4.273E-06

Flags: "K" = Keyline not found "M" = Manually accepted
"E" = Manually edited "A" = Nuclide specific abn. limit

DATACHEM
ALPHA SPECTROSCOPY REPORT

8019

****

SAMPLE TITLE: 96E-0640-03
SAMPLE DATE: 24-OCT-1996 12:00:00
ELAPSED LIVE TIME: 59907.
AVERAGE %EFFICIENCY: 18.5340
TRACER DPM: 10.7293

SAMPLE ID: BL-123239-1
SAMPLE QUANT: 1.0000 S
DETECTOR #: 012
YIELD: 86.4395

****

NUCLIDE ACTIVITY SUMMARY

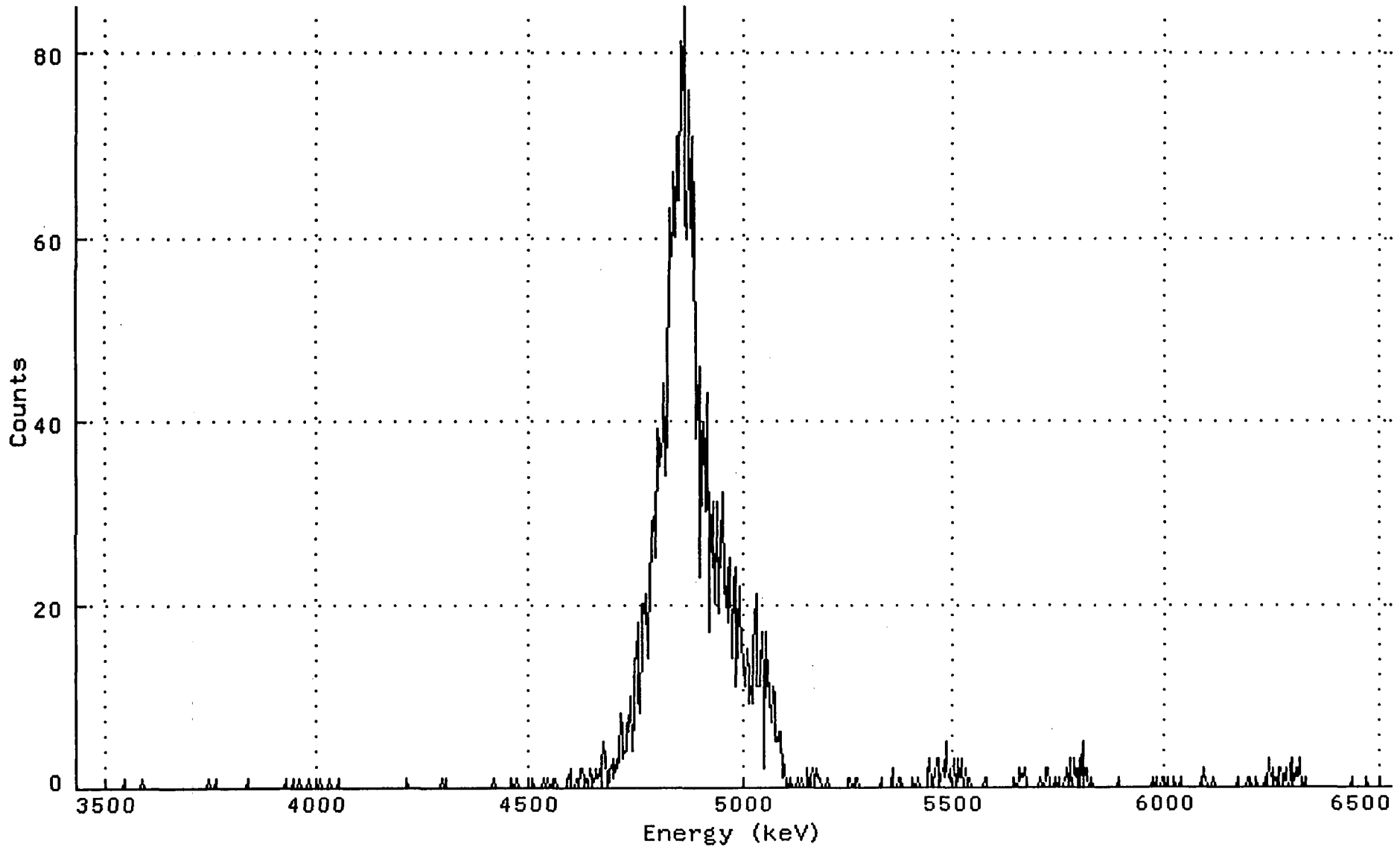
NUCLIDE	ENERGY	NET AREA	BKG	%ABN	ACTIVITY pCi/S	ERROR 2-SIGMA	MDA pCi/S
TH-227	6006.	1.000	1.000	53.80	5.505E-09	1.907E-08	4.004E-08
TH-228	5400.	11.000	9.000	99.94	3.104E-08	3.046E-08	4.776E-08
TH229	4872.	1708.000	5.000	99.52	4.833E-06	2.837E-07	3.791E-08
TH-230	4672.	25.000	3.000	99.82	7.053E-08	3.177E-08	3.118E-08
TH-232	3997.	1.000	2.000	100.00	2.816E-09	1.260E-08	2.697E-08

****

REVIEWED BY: DATE:

Spectrum : DKA0:[ALPHA.ALUSR.ARCHIVE.S]S_96E04514_TH.CNF;1
Title . : GAR013
Sample Title: 96E-0640-03

Start Time: 25-OCT-1996 12:19	Sample Time: 24-OCT-1996 12:00	Energy Offset: 3.43099E+03
Real Time : 0 16:38:37.99	Sample ID : 96E04514	Energy Slope : 3.23329E+00
Live Time : 0 16:38:34.99	Sample Type: TH	Energy Quad : -2.07240E-04



VMS Peak Search Report V1.9 Generated 28-OCT-1996 11:31:06

8019

Configuration : MCA0:[ALPHA]ALPHA0$1
Analyses by : ROIPEAK V1.2
Sample title : 96E-0640-03
Sample date : 24-OCT-1996 12:00:00 Acquisition date : 25-OCT-1996 12:19:50
Sample ID : 96E04514 Sample quantity : 0.50060 S
Sample type : TH Sample geometry :
Elapsed live time: 0 16:38:34.99 Elapsed real time: 0 16:38:37.99 0.0%
Start energy : 3434.22 keV End energy : 6524.56 keV
Gross/Net areas : Gross Background type :
Num avg bkg chans: 2 Critical level : No

Pk	It	Energy	Area	Bkgnd	FWHM	Channel	Left	Pw	Cts/Sec	%Err	Fit
1	0	3947.32	11	0	0.00	161.36	99	96	1.84E-04	30.2	
2	0	4663.21	89	0	48.33	390.90	306	106	1.49E-03	10.6	
3	0	4881.90	3407	0	107.44	462.45	411	128	5.69E-02	1.7	
4	0	5294.61	36	0	0.00	599.42	538	118	6.01E-04	16.7	
5	0	6034.87	13	0	4.75	851.85	790	96	2.17E-04	27.7	

8019

VMS Peak Search Report V1.9 Generated 28-OCT-1996 11:31:18

Configuration : DKA0:[ALPHA.ALUSR.ARCHIVE.B]B_013_NONE.CNF;372
Analyses by : ROIPEAK V1.2
Sample title : 96M-0304-10
Sample date : 18-OCT-1996 14:52:04 Acquisition date : 18-OCT-1996 14:52:25
Sample ID : 013 Sample quantity : 1.0000 SAMPLE
Sample type : NONE Sample geometry :
Elapsed live time: 0 16:38:41.00 Elapsed real time: 0 16:38:30.99 0.0%
Start energy : 3434.81 keV End energy : 6525.40 keV
Gross/Net areas : Gross Background type :
Num avg bkg chans: 2 Critical level : No

Pk	It	Energy	Area	Bkgnd	FWHM	Channel	Left	Pw	Cts/Sec	%Err	Fit
1	0	3900.97	4		0265.23	146.50	99	96	6.68E-05	50.0	
2	0	4564.40	6		0190.84	358.50	306	106	1.00E-04	40.8	
3	0	4919.48	8		0359.04	474.50	411	128	1.34E-04	35.4	
4	0	5286.89	5		0164.96	596.50	538	118	8.34E-05	44.7	
5	0	5994.45	2		0 90.57	837.50	790	96	3.34E-05	70.7	

VMS Nuclide Identification Report V2.9 Generated 28-OCT-1996 11:31:34 **8019**

Configuration : MCA0:[ALPHA]ALPHA0$1
Analyses by : ROIPEAK V1.2,PEAKEFF V2.2,ENBACK V1.5,NID V3.1,WTMEAN V1.8
Sample title : 96E-0640-03
Sample date : 24-OCT-1996 12:00:00 Acquisition date : 25-OCT-1996 12:19:50
Sample ID : 96E04514 Sample quantity : 0.50060 S
Sample type : TH Sample geometry :
Elapsed live time: 0 16:38:34.99 Elapsed real time: 0 16:38:37.99 0.0%
Energy tolerance : 100.00 keV Half life ratio : 8.00
Errors propagated: Yes Systematic Error : 0.00 %
Efficiency type : Average value Efficiencies at : Peak Energy
Abundance limit : 75.00

Summary of Nuclide Activity

Total number of lines in spectrum 5
Number of unidentified lines 0
Number of lines tentatively identified by NID 5 100.00%

Nuclide Type : Alpha

Nuclide	Hlife	Decay	Wtd Mean Uncorrected (pCi)	Wtd Mean Decay Corr (pCi)	Decay Corr 2-Sigma Error	2-Sigma %Error	Flags
TH-227	18.72D	1.05	9.996E-02	1.051E-01	0.741E-01	70.49	
		Total Activity :	9.996E-02	1.051E-01			

Nuclide Type : ALPHA

Nuclide	Hlife	Decay	Wtd Mean Uncorrected (pCi)	Wtd Mean Decay Corr (pCi)	Decay Corr 2-Sigma Error	2-Sigma %Error	Flags
TH-228	1.91Y	1.00	1.516E-01	1.518E-01	0.629E-01	41.44	
TH-229	7340.00Y	1.00	1.670E+01	1.670E+01	0.079E+01	4.75	
TH-230	7.70E+04Y	1.00	4.065E-01	4.065E-01	0.964E-01	23.71	
TH-232	1.41E+10Y	1.00	3.422E-02	3.422E-02	3.788E-02	110.70	
		Total Activity :	1.729E+01	1.729E+01			

Grand Total Activity : 1.739E+01 1.739E+01

Flags: "K" = Keyline not found "M" = Manually accepted
"E" = Manually edited "A" = Nuclide specific abn. limit

DATACHEM
ALPHA SPECTROSCOPY REPORT

8019

****

SAMPLE TITLE: 96E-0640-03
SAMPLE DATE: 24-OCT-1996 12:00:00
ELAPSED LIVE TIME: 59915.
AVERAGE %EFFICIENCY: 18.4321
TRACER DPM: 10.7293

SAMPLE ID: 96E04514
SAMPLE QUANT: 0.5006 S
DETECTOR #: 013
YIELD: 172.9465

****

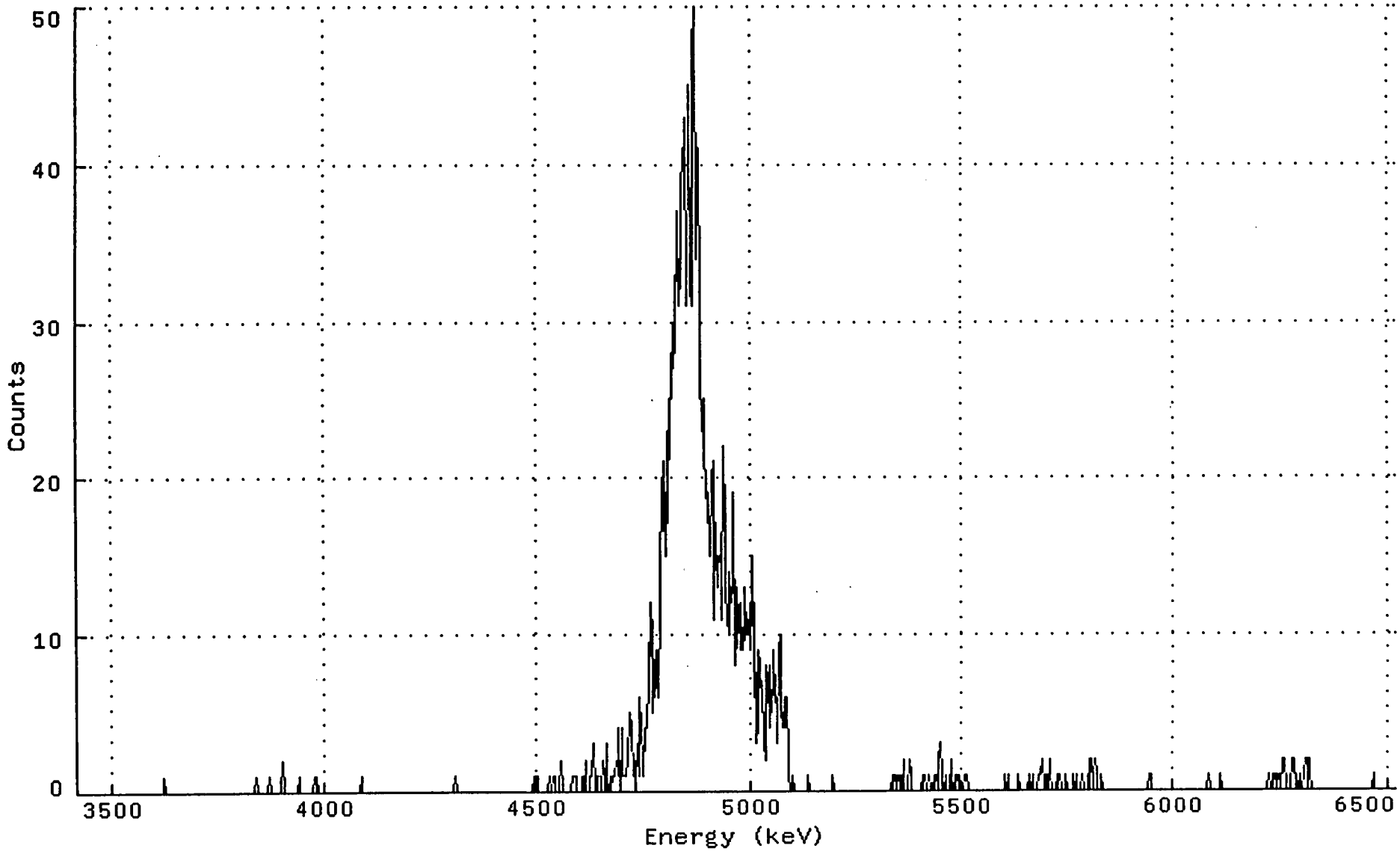
NUCLIDE ACTIVITY SUMMARY

NUCLIDE	ENERGY	NET AREA	BKG	%ABN	ACTIVITY pCi/S	ERROR 2-SIGMA	MDA pCi/S
TH-227	6006.	11.000	2.000	53.80	6.078E-02	4.294E-02	5.031E-02
TH-228	5400.	31.001	4.999	99.94	8.780E-02	3.662E-02	3.789E-02
TH229	4872.	3399.001	7.999	99.52	9.654E+00	4.588E-01	4.588E-02
TH-230	4672.	83.001	5.999	99.82	2.350E-01	5.685E-02	4.075E-02
TH-232	3997.	7.000	4.000	100.00	1.979E-02	2.192E-02	3.477E-02

****

REVIEWED BY: DATE:

Spectrum : DKA0:[ALPHA.ALUSR.ARCHIVE.S]S_96E04515_TH.CNF;1
Title : GAR014
Sample Title: 96E-0640-03
Start Time: 25-OCT-1996 12:19 Sample Time: 24-OCT-1996 12:00 Energy Offset: 3.41583E+03
Real Time : 0 16:38:37.99 Sample ID : 96E04515 Energy Slope : 3.23575E+00
Live Time : 0 16:38:30.00 Sample Type: TH Energy Quad : -2.06395E-04



8019

VMS Peak Search Report V1.9 Generated 28-OCT-1996 11:31:58

Configuration : MCA0:[ALPHA]ALPHA0$1
Analyses by : ROIPEAK V1.2
Sample title : 96E-0640-03
Sample date : 24-OCT-1996 12:00:00 Acquisition date : 25-OCT-1996 12:19:50
Sample ID : 96E04515 Sample quantity : 0.47060 S
Sample type : TH Sample geometry :
Elapsed live time: 0 16:38:30.00 Elapsed real time: 0 16:38:37.99 0.0%
Start energy : 3419.06 keV End energy : 6512.81 keV
Gross/Net areas : Gross Background type :
Num avg bkg chans: 2 Critical level : No

Pk	It	Energy	Area	Bkgnd	FWHM	Channel	Left	Pw	Cts/Sec	%Err	Fit
1	0	3917.39	7	0	3.24	156.57	104	96	1.17E-04	37.8	
2	0	4657.71	67	0	99.33	393.69	310	107	1.12E-03	12.2	
3	0	4886.67	1838	0	74.99	468.56	416	127	3.07E-02	2.3	
4	0	5380.98	24	0	97.00	632.88	542	118	4.01E-04	20.4	
5	0	6022.14	4	0	190.50	851.75	794	96	6.68E-05	50.0	

VMS Peak Search Report V1.9 Generated 28-OCT-1996 11:32:07

Configuration : DKA0:[ALPHA.ALUSR.ARCHIVE.B]B_014_NONE.CNF;371
Analyses by : ROIPEAK V1.2
Sample title : 96M-0304-10
Sample date : 18-OCT-1996 14:52:05 Acquisition date : 18-OCT-1996 14:52:25
Sample ID : 014 Sample quantity : 1.0000 SAMPLE
Sample type : NONE Sample geometry :
Elapsed live time: 0 16:38:42.00 Elapsed real time: 0 16:38:30.99 0.0%
Start energy : 3427.61 keV End energy : 6511.12 keV
Gross/Net areas : Gross Background type :
Num avg bkg chans: 2 Critical level : No

Pk	It	Energy	Area	Bkgnd	FWHM	Channel	Left	Pw	Cts/Sec	%Err	Fit
1	0	3908.12	2	0	199.89	151.50	104	96	3.34E-05	70.7	
2	0	4567.72	5	0	0.00	363.00	310	107	8.34E-05	44.7	
3	0	4921.71	3	0	0.00	479.00	416	127	5.01E-05	57.7	
4	0	5286.58	8	0	3.22	600.50	542	118	1.34E-04	35.4	
5	0	5992.43	3	0	199.89	841.50	794	96	5.01E-05	57.7	

8019

VMS Nuclide Identification Report V2.9 Generated 28-OCT-1996 11:32:23

Configuration : MCA0:[ALPHA]ALPHA0$1
Analyses by : ROIPEAK V1.2,PEAKEFF V2.2,ENBACK V1.5,NID V3.1,WTMEAN V1.8
Sample title : 96E-0640-03
Sample date : 24-OCT-1996 12:00:00 Acquisition date : 25-OCT-1996 12:19:50
Sample ID : 96E04515 Sample quantity : 0.47060 S
Sample type : TH Sample geometry :
Elapsed live time: 0 16:38:30.00 Elapsed real time: 0 16:38:37.99 0.0%
Energy tolerance : 100.00 keV Half life ratio : 8.00
Errors propagated: Yes Systematic Error : 0.00 %
Efficiency type : Average value Efficiencies at : Peak Energy
Abundance limit : 75.00

Summary of Nuclide Activity

Total number of lines in spectrum 5
Number of unidentified lines 0
Number of lines tentatively identified by NID 5 100.00%

Nuclide Type : Alpha

Nuclide	Hlife	Decay	Wtd Mean Uncorrected (pCi)	Wtd Mean Decay Corr (pCi)	Decay Corr 2-Sigma Error	2-Sigma %Error	Flags
TH-227	18.72D	1.05	9.552E-03	1.005E-02	5.312E-02	528.80	
Total Activity :			9.552E-03	1.005E-02			

Nuclide Type : ALPHA

Nuclide	Hlife	Decay	Wtd Mean Uncorrected (pCi)	Wtd Mean Decay Corr (pCi)	Decay Corr 2-Sigma Error	2-Sigma %Error	Flags
TH-228	1.91Y	1.00	8.223E-02	8.234E-02	5.828E-02	70.78	
TH229	7340.00Y	1.00	9.470E+00	9.470E+00	0.540E+00	5.70	
TH-230	7.70E+04Y	1.00	3.190E-01	3.190E-01	0.879E-01	27.57	
TH-232	1.41E+10Y	1.00	2.568E-02	2.568E-02	3.082E-02	120.03	
Total Activity :			9.897E+00	9.897E+00			

Grand Total Activity : 9.906E+00 9.907E+00

Flags: "K" = Keyline not found "M" = Manually accepted
"E" = Manually edited "A" = Nuclide specific abn. limit

DATACHEM
ALPHA SPECTROSCOPY REPORT

8019

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SAMPLE TITLE: 96E-0640-03
SAMPLE DATE: 24-OCT-1996 12:00:00
ELAPSED LIVE TIME: 59910.
AVERAGE %EFFICIENCY: 18.6656
TRACER DPM: 10.7293

SAMPLE ID: 96E04515
SAMPLE QUANT: 0.4706 S
DETECTOR #: 014
YIELD: 92.2076

****

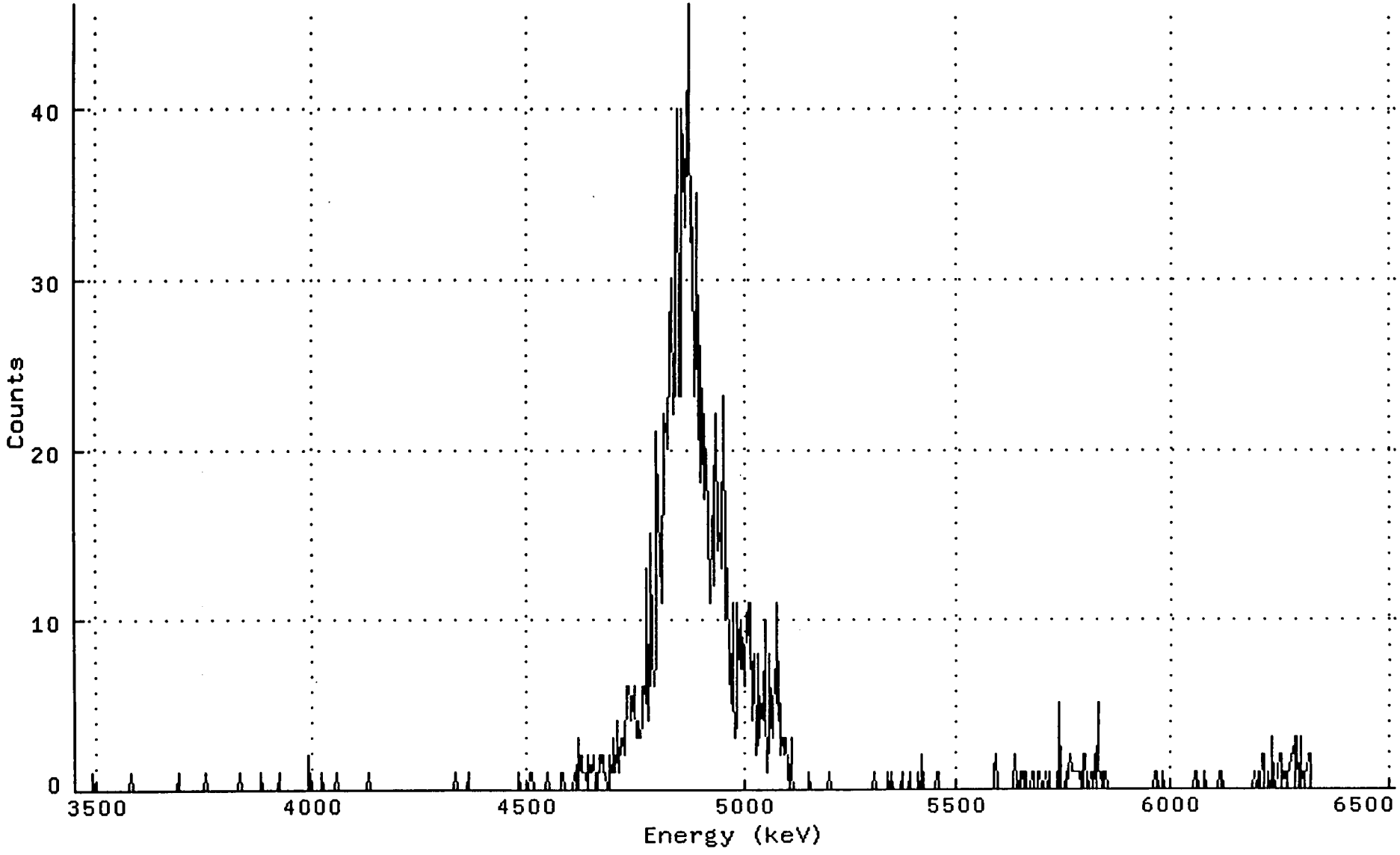
NUCLIDE ACTIVITY SUMMARY

NUCLIDE	ENERGY	NET AREA	BKG	%ABN	ACTIVITY pCi/S	ERROR 2-SIGMA	MDA pCi/S
TH-227	6006.	1.001	2.999	53.80	1.089E-02	5.761E-02	1.144E-01
TH-228	5400.	16.002	7.998	99.94	8.930E-02	6.341E-02	9.001E-02
TH229	4872.	1835.001	2.999	99.52	1.027E+01	5.858E-01	6.186E-02
TH-230	4672.	62.001	4.999	99.82	3.460E-01	9.738E-02	7.475E-02
TH-232	3997.	5.000	2.000	100.00	2.785E-02	3.347E-02	5.333E-02

****

REVIEWED BY: DATE:

Spectrum : DKA0:[ALPHA.ALUSR.ARCHIVE.S]S_96E04516_TH.CNF;1
Title : GAR015
Sample Title: 96E-0640-03
Start Time: 25-OCT-1996 12:19 Sample Time: 24-OCT-1996 12:00 Energy Offset: 3.44748E+03
Real Time : 0 16:38:37.99 Sample ID : 96E04516 Energy Slope : 3.22269E+00
Live Time : 0 16:38:52.99 Sample Type: TH Energy Quad : -2.27141E-04



VMS Peak Search Report V1.9 Generated 28-OCT-1996 11:32:47

8019

Configuration : MCA0:[ALPHA]ALPHA0$1
Analyses by : ROIPEAK V1.2
Sample title : 96E-0640-03
Sample date : 24-OCT-1996 12:00:00 Acquisition date : 25-OCT-1996 12:19:50
Sample ID : 96E04516 Sample quantity : 0.49980 S
Sample type : TH Sample geometry :
Elapsed live time: 0 16:38:52.99 Elapsed real time: 0 16:38:37.99 0.0%
Start energy : 3450.70 keV End energy : 6509.34 keV
Gross/Net areas : Gross Background type :
Num avg bkg chans: 2 Critical level : No

Pk	It	Energy	Area	Bkgnd	FWHM	Channel	Left	Pw	Cts/Sec	%Err	Fit
1	0	3913.60	7	0	3.22	146.14	95	95	1.17E-04	37.8	
2	0	4657.34	61	0	113.81	385.92	302	107	1.02E-03	12.8	
3	0	4888.88	1672	0	80.87	462.33	408	129	2.79E-02	2.4	
4	0	5293.42	16	0	0.00	598.00	536	120	2.67E-04	25.0	
5	0	6040.37	8	0	180.47	856.25	791	98	1.33E-04	35.4	

8019

VMS Peak Search Report V1.9 Generated 28-OCT-1996 11:32:57

Configuration : DKA0:[ALPHA.ALUSR.ARCHIVE.B]B_015_NONE.CNF;371
Analyses by : ROIPEAK V1.2
Sample title : 96M-0304-10
Sample date : 18-OCT-1996 14:52:06 Acquisition date : 18-OCT-1996 14:52:25
Sample ID : 015 Sample quantity : 1.0000 SAMPLE
Sample type : NONE Sample geometry :
Elapsed live time: 0 16:38:34.99 Elapsed real time: 0 16:38:30.99 0.0%
Start energy : 3462.14 keV End energy : 6537.73 keV
Gross/Net areas : Gross Background type :
Num avg bkg chans: 2 Critical level : No

Pk	It	Energy	Area	Bkgnd	FWHM	Channel	Left	Pw	Cts/Sec	%Err	Fit
1	0	3905.77	4	0	268.97	142.00	95	95	6.68E-05	50.0	
2	0	4563.97	3	0	38.03	355.00	302	107	5.01E-05	57.7	
3	0	4919.40	3	0	320.07	472.00	408	129	5.01E-05	57.7	
4	0	5289.87	3	0	218.66	595.50	536	120	5.01E-05	57.7	
5	0	6007.57	0	0	0.00	839.50	791	98	0.00E+00	0.0	

VMS Nuclide Identification Report V2.9 Generated 28-OCT-1996 11:33:11

8019

Configuration : MCA0:[ALPHA]ALPHA0$1
Analyses by : ROIPEAK V1.2,PEAKEFF V2.2,ENBACK V1.5,NID V3.1,WTMEAN V1.8
Sample title : 96E-0640-03
Sample date : 24-OCT-1996 12:00:00 Acquisition date : 25-OCT-1996 12:19:50
Sample ID : 96E04516 Sample quantity : 0.49980 S
Sample type : TH Sample geometry :
Elapsed live time: 0 16:38:52.99 Elapsed real time: 0 16:38:37.99 0.0%
Energy tolerance : 100.00 keV Half life ratio : 8.00
Errors propagated: Yes Systematic Error : 0.00 %
Efficiency type : Average value Efficiencies at : Peak Energy
Abundance limit : 75.00

Summary of Nuclide Activity

Total number of lines in spectrum	5	
Number of unidentified lines	0	
Number of lines tentatively identified by NID	5	100.00%

Nuclide Type : Alpha

Nuclide	Hlife	Decay	Wtd Mean Uncorrected (pCi)	Wtd Mean Decay Corr (pCi)	Decay Corr 2-Sigma Error	2-Sigma %Error	Flags
TH-227	18.72D	1.05	6.950E-02	7.309E-02	5.173E-02	70.79	
Total Activity :			6.950E-02	7.309E-02			

Nuclide Type : ALPHA

Nuclide	Hlife	Decay	Wtd Mean Uncorrected (pCi)	Wtd Mean Decay Corr (pCi)	Decay Corr 2-Sigma Error	2-Sigma %Error	Flags
TH228	1.91Y	1.00	6.079E-02	6.087E-02	4.087E-02	67.15	
TH229	7340.00Y	1.00	7.838E+00	7.838E+00	0.461E+00	5.89	
TH-230	7.70E+04Y	1.00	2.716E-01	2.716E-01	0.754E-01	27.78	
TH-232	1.41E+10Y	1.00	1.402E-02	1.402E-02	3.101E-02	221.25	
Total Activity :			8.184E+00	8.184E+00			

Grand Total Activity : 8.254E+00 8.257E+00

Flags: "K" = Keyline not found "M" = Manually accepted
"E" = Manually edited "A" = Nuclide specific abn. limit

DATACHEM
ALPHA SPECTROSCOPY REPORT

8019

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SAMPLE TITLE: 96E-0640-03
SAMPLE DATE: 24-OCT-1996 12:00:00
ELAPSED LIVE TIME: 59933.
AVERAGE %EFFICIENCY: 19.3055
TRACER DPM: 10.7293

SAMPLE ID: 96E04516
SAMPLE QUANT: 0.4998 S
DETECTOR #: 015
YIELD: 81.0549

****

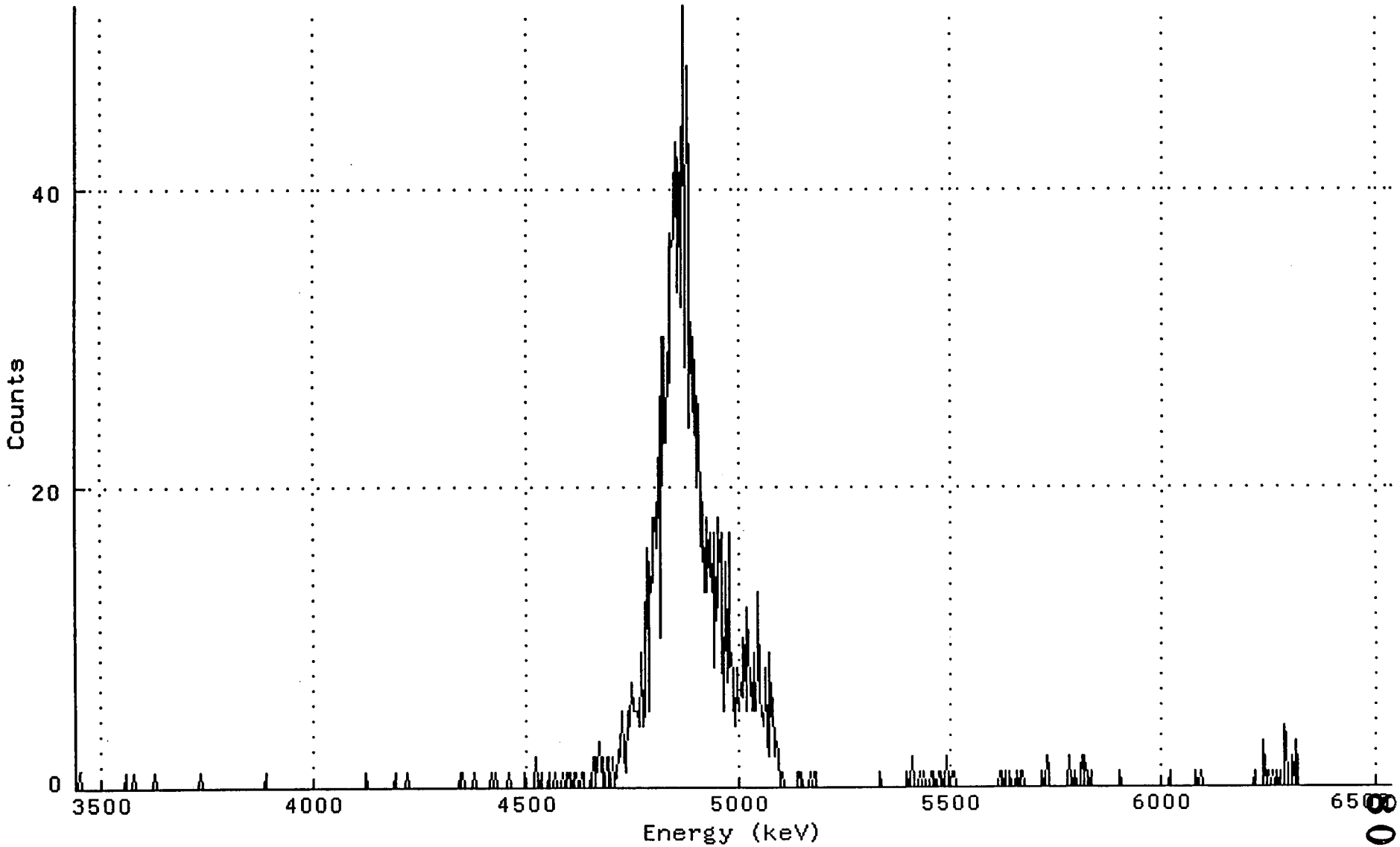
NUCLIDE ACTIVITY SUMMARY

NUCLIDE	ENERGY	NET AREA	BKG	%ABN	ACTIVITY pCi/S	ERROR 2-SIGMA	MDA pCi/S
TH-227	6006.	8.000	0.000	53.80	9.017E-02	6.405E-02	3.215E-02
TH-228	5400.	12.999	3.001	99.94	7.510E-02	5.062E-02	6.378E-02
TH229	4872.	1668.999	3.001	99.52	9.670E+00	5.694E-01	6.405E-02
TH-230	4672.	57.999	3.001	99.82	3.350E-01	9.513E-02	6.386E-02
TH-232	3997.	2.999	4.001	100.00	1.729E-02	3.827E-02	7.093E-02

****

REVIEWED BY: DATE:

Spectrum : DKA0:[ALPHA.ALUSR.ARCHIVE.S]S_96E04517_TH.CNF;1
Title : GAR016
Sample Title: 96E-0640-03
Start Time: 25-OCT-1996 12:19 Sample Time: 24-OCT-1996 12:00 Energy Offset: 3.43681E+03
Real Time : 0 16:38:37.99 Sample ID : 96E04517 Energy Slope : 3.17957E+00
Live Time : 0 16:38:27.99 Sample Type: TH Energy Quad : -1.55009E-04



VMS Peak Search Report V1.9 Generated 28-OCT-1996 11:33:41

8019

Configuration : MCA0:[ALPHA]ALPHA0$1
Analyses by : ROIPEAK V1.2
Sample title : 96E-0640-03
Sample date : 24-OCT-1996 12:00:00 Acquisition date : 25-OCT-1996 12:19:50
Sample ID : 96E04517 Sample quantity : 0.49950 S
Sample type : TH Sample geometry :
Elapsed live time: 0 16:38:27.99 Elapsed real time: 0 16:38:37.99 0.0%
Start energy : 3439.99 keV End energy : 6530.16 keV
Gross/Net areas : Gross Background type :
Num avg bkg chans: 2 Critical level : No

Pk	It	Energy	Area	Bkgnd	FWHM	Channel	Left	Pw	Cts/Sec	%Err	Fit
1	0	3885.19	1	0	3.18	142.00	99	97	1.67E-05	100.0	
2	0	4641.09	57	0	0.00	386.02	308	106	9.51E-04	13.2	
3	0	4884.62	1795	0	80.52	465.93	413	128	3.00E-02	2.4	
4	0	5304.36	14	0	3.18	605.21	540	118	2.34E-04	26.7	
5	0	6023.08	4	0	209.85	848.50	791	95	6.68E-05	50.0	

VMS Peak Search Report V1.9 Generated 28-OCT-1996 11:33:51

8019

Configuration : DKA0:[ALPHA.ALUSR.ARCHIVE.B]B_016_NONE.CNF;370
Analyses by : ROIPEAK V1.2
Sample title : 96M-0304-10
Sample date : 18-OCT-1996 14:52:07 Acquisition date : 18-OCT-1996 14:52:25
Sample ID : 016 Sample quantity : 1.0000 SAMPLE
Sample type : NONE Sample geometry :
Elapsed live time: 0 16:38:39.99 Elapsed real time: 0 16:38:32.00 0.0%
Start energy : 3428.45 keV End energy : 6521.52 keV
Gross/Net areas : Gross Background type :
Num avg bkg chans: 2 Critical level : No

Pk	It	Energy	Area	Bkgnd	FWHM	Channel	Left	Pw	Cts/Sec	%Err	Fit
1	0	3895.02	1	0	3.22	147.00	99	97	1.67E-05	100.0	
2	0	4562.22	1	0	3.22	360.50	308	106	1.67E-05	100.0	
3	0	4917.23	2	0	90.29	476.50	413	128	3.34E-05	70.7	
4	0	5284.90	2	0	222.50	598.50	540	118	3.34E-05	70.7	
5	0	5989.69	1	0	3.22	838.00	791	95	1.67E-05	100.0	

VMS Nuclide Identification Report V2.9 Generated 28-OCT-1996 11:34:06 8019

Configuration : MCA0:[ALPHA]ALPHA0$1
Analyses by : ROIPEAK V1.2,PEAKEFF V2.2,ENBACK V1.5,NID V3.1,WTMEAN V1.8
Sample title : 96E-0640-03
Sample date : 24-OCT-1996 12:00:00 Acquisition date : 25-OCT-1996 12:19:50
Sample ID : 96E04517 Sample quantity : 0.49950 S
Sample type : TH Sample geometry :
Elapsed live time: 0 16:38:27.99 Elapsed real time: 0 16:38:37.99 0.0%
Energy tolerance : 100.00 keV Half life ratio : 8.00
Errors propagated: Yes Systematic Error : 0.00 %
Efficiency type : Average value Efficiencies at : Peak Energy
Abundance limit : 75.00

Summary of Nuclide Activity

Total number of lines in spectrum 5
Number of unidentified lines 0
Number of lines tentatively identified by NID 5 100.00%

Nuclide Type : Alpha

Nuclide	Hlife	Decay	Wtd Mean Uncorrected (pCi)	Wtd Mean Decay Corr (pCi)	Decay Corr 2-Sigma Error	2-Sigma %Error	Flags
TH-227	18.72D	1.05	2.641E-02	2.777E-02	4.141E-02	149.09	
Total Activity :			2.641E-02	2.777E-02			

Nuclide Type : ALPHA

Nuclide	Hlife	Decay	Wtd Mean Uncorrected (pCi)	Wtd Mean Decay Corr (pCi)	Decay Corr 2-Sigma Error	2-Sigma %Error	Flags
TH-228	1.91Y	1.00	5.686E-02	5.694E-02	3.800E-02	66.74	
TH-229	7340.00Y	1.00	8.532E+00	8.532E+00	0.491E+00	5.75	
TH-230	7.70E+04Y	1.00	2.657E-01	2.657E-01	0.728E-01	27.40	
TH-232	1.41E+10Y	1.00	9.484E-07	9.484E-07	**********		
Total Activity :			8.855E+00	8.855E+00			

Grand Total Activity : 8.881E+00 8.882E+00

Flags: "K" = Keyline not found "M" = Manually accepted
"E" = Manually edited "A" = Nuclide specific abn. limit

DATACHEM
ALPHA SPECTROSCOPY REPORT

8019

****

SAMPLE TITLE: 96E-0640-03
SAMPLE DATE: 24-OCT-1996 12:00:00
ELAPSED LIVE TIME: 59908.
AVERAGE %EFFICIENCY: 19.0720
TRACER DPM: 10.7293

SAMPLE ID: 96E04517
SAMPLE QUANT: 0.4995 S
DETECTOR #: 016
YIELD: 88.1799

****

NUCLIDE ACTIVITY SUMMARY

NUCLIDE	ENERGY	NET AREA	BKG	%ABN	ACTIVITY pCi/S	ERROR 2-SIGMA	MDA pCi/S
TH-227	6006.	3.000	1.000	53.80	3.150E-02	4.699E-02	7.636E-02
TH-228	5400.	12.000	2.000	99.94	6.457E-02	4.326E-02	5.146E-02
TH229	4872.	1793.000	2.000	99.52	9.676E+00	5.567E-01	5.167E-02
TH-230	4672.	56.000	1.000	99.82	3.013E-01	8.434E-02	4.116E-02
TH-232	3997.	0.000	1.000	100.00	1.076E-06	1.519E-02	4.108E-02

****

REVIEWED BY: DATE:

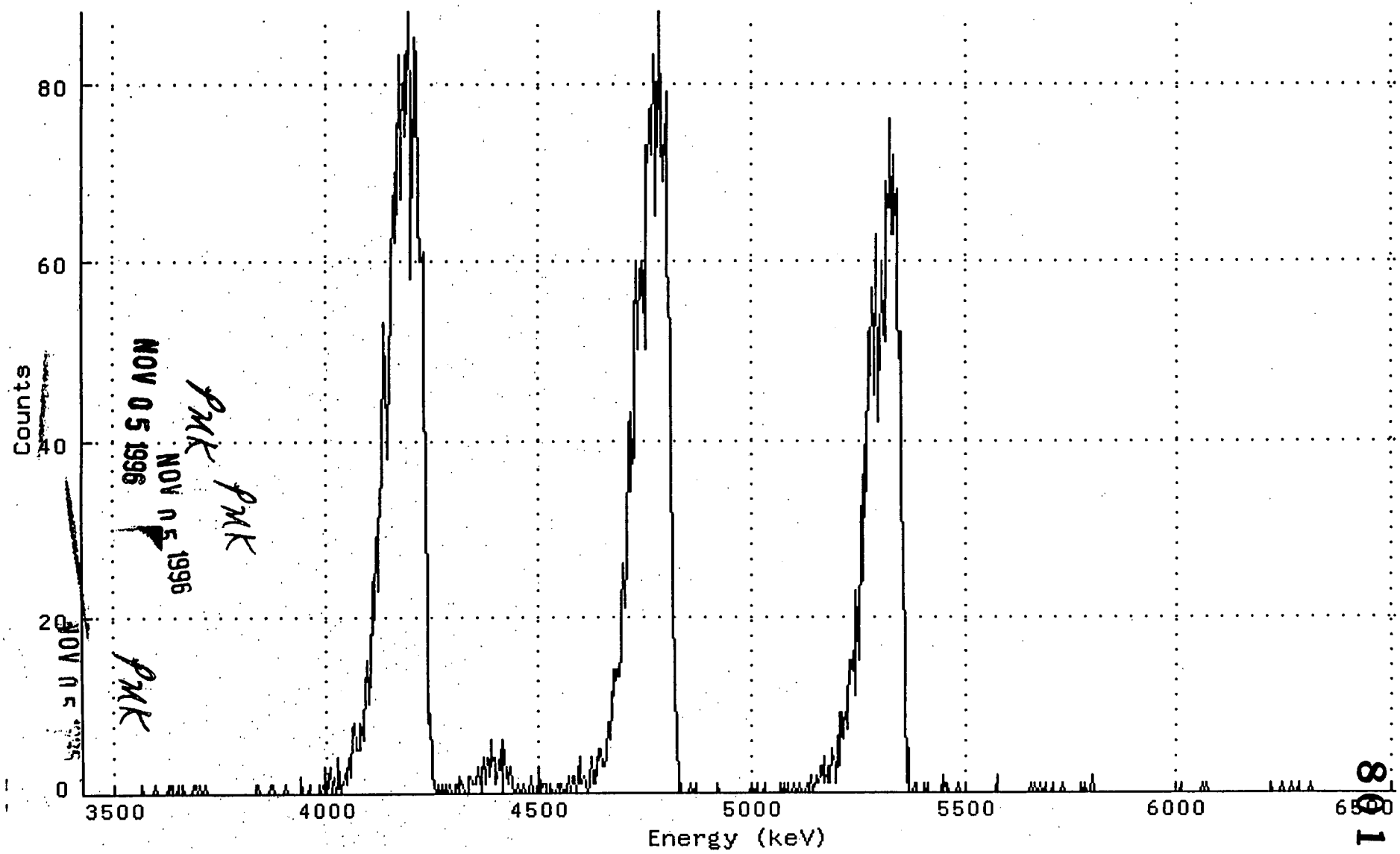
PMK

NOV 05 1996

8019

U-iso

Spectrum : DKA0:[ALPHA.ALUSR.ARCHIVE.C]C_QC-123238-1_UU.CNF;1
Title : GAR009
Sample Title: 96E-0640-02
Start Time: 24-OCT-1996 09:45 Sample Time: 24-OCT-1996 12:00 Energy Offset: 3.42724E+03
Real Time : 0 16:38:42.99 Sample ID : QC-123238-1 Energy Slope : 3.24168E+00
Live Time : 0 16:38:30.99 Sample Type: UU Energy Quad : -2.29423E-04



NOV 05 1996
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PMK

8019

001158 163

VMS Peak Search Report V1.9 Generated 25-OCT-1996 09:21:39

8019

Configuration : MCA0:[ALPHA]ALPHA0$1
Analyses by : ROIPEAK V1.2
Sample title : 96E-0640-02
Sample date : 24-OCT-1996 12:00:00 Acquisition date : 24-OCT-1996 09:45:25
Sample ID : QC-123238-1 Sample quantity : 1.0000 L
Sample type : UU Sample geometry :
Elapsed live time: 0 16:38:30.99 Elapsed real time: 0 16:38:42.99 0.0%
Start energy : 3430.48 keV End energy : 6506.15 keV
Gross/Net areas : Gross Background type :
Num avg bkg chans: 2 Critical level : No

Pk	It	Energy	Area	Bkgnd	FWHM	Channel	Left	Pw	Cts/Sec	%Err	Fit
1	0	4175.50	2542	0	99.96	234.73	141	120	4.24E-02	2.0	
2	0	4397.19	108	0	55.08	305.83	260	96	1.80E-03	9.6	
3	0	4756.90	2478	0	92.62	422.83	355	182	4.14E-02	2.0	
4	0	5293.62	2036	0	93.57	601.34	536	89	3.40E-02	2.2	

VMS Peak Search Report V1.9 Generated 25-OCT-1996 09:21:47

8019

Configuration : DKA0:[ALPHA.ALUSR.ARCHIVE.B]B_009_NONE.CNF;377
Analyses by : ROIPEAK V1.2
Sample title : 96M-0303-10
Sample date : 18-OCT-1996 14:52:00 Acquisition date : 18-OCT-1996 14:52:25
Sample ID : 009 Sample quantity : 1.0000 SAMPLE
Sample type : NONE Sample geometry :
Elapsed live time: 0 16:38:37.99 Elapsed real time: 0 16:38:29.00 0.0%
Start energy : 3442.87 keV End energy : 6518.62 keV
Gross/Net areas : Gross Background type :
Num avg bkg chans: 2 Critical level : No

Pk	It	Energy	Area	Bkgnd	FWHM	Channel	Left	Pw	Cts/Sec	%Err	Fit
1	0	4072.61	5	0	293.79	200.50	141	120	8.34E-05	44.7	
2	0	4404.40	2	0	182.02	307.50	260	96	3.34E-05	70.7	
3	0	4826.15	4	0	0.00	445.50	355	182	6.68E-05	50.0	
4	0	5230.52	7	0	3.19	580.00	536	89	1.17E-04	37.8	

8019

VMS Nuclide Identification Report V2.9 Generated 25-OCT-1996 09:21:59

Configuration : MCA0:[ALPHA]ALPHA0$1
Analyses by : ROIPEAK V1.2,PEAKEFF V2.2,ENBACK V1.5,NID V3.1,WTMEAN V1.8
Sample title : 96E-0640-02
Sample date : 24-OCT-1996 12:00:00 Acquisition date : 24-OCT-1996 09:45:25
Sample ID : QC-123238-1 Sample quantity : 1.0000 L
Sample type : UU Sample geometry :
Elapsed live time: 0 16:38:30.99 Elapsed real time: 0 16:38:42.99 0.0%
Energy tolerance : 100.00 keV Half life ratio : 8.00
Errors propagated: Yes Systematic Error : 0.00 %
Efficiency type : Average value Efficiencies at : Peak Energy
Abundance limit : 75.00

Summary of Nuclide Activity

Total number of lines in spectrum	4	
Number of unidentified lines	0	
Number of lines tentatively identified by NID	4	100.00%

Nuclide Type : ALPHA

Nuclide	Hlife	Decay	Wtd Mean Uncorrected pCi/L	Wtd Mean Decay Corr pCi/L	Decay Corr 2-Sigma Error	2-Sigma %Error	Flags
U-232	72.00Y	1.00	4.895E+00	4.895E+00	0.270E+00	5.53	
U-234	2.45E+05Y	1.00	5.969E+00	5.969E+00	0.310E+00	5.19	
U-235	7.04E+08Y	1.00	3.161E-01	3.161E-01	0.634E-01	20.06	
U-238	4.47E+09Y	1.00	6.133E+00	6.133E+00	0.316E+00	5.15	
		Total Activity :	1.731E+01	1.731E+01			

Grand Total Activity : 1.731E+01 1.731E+01

Flags: "K" = Keyline not found "M" = Manually accepted
"E" = Manually edited "A" = Nuclide specific abn. limit

DATACHEM
ALPHA SPECTROSCOPY REPORT

8019

****

SAMPLE TITLE: 96E-0640-02
SAMPLE DATE: 24-OCT-1996 12:00:00
ELAPSED LIVE TIME: 59911.
AVERAGE %EFFICIENCY: 18.6982
TRACER DPM: 11.1955

SAMPLE ID: QC-123238-1
SAMPLE QUANT: 1.0000 L
DETECTOR #: 009
YIELD: 97.0706

****

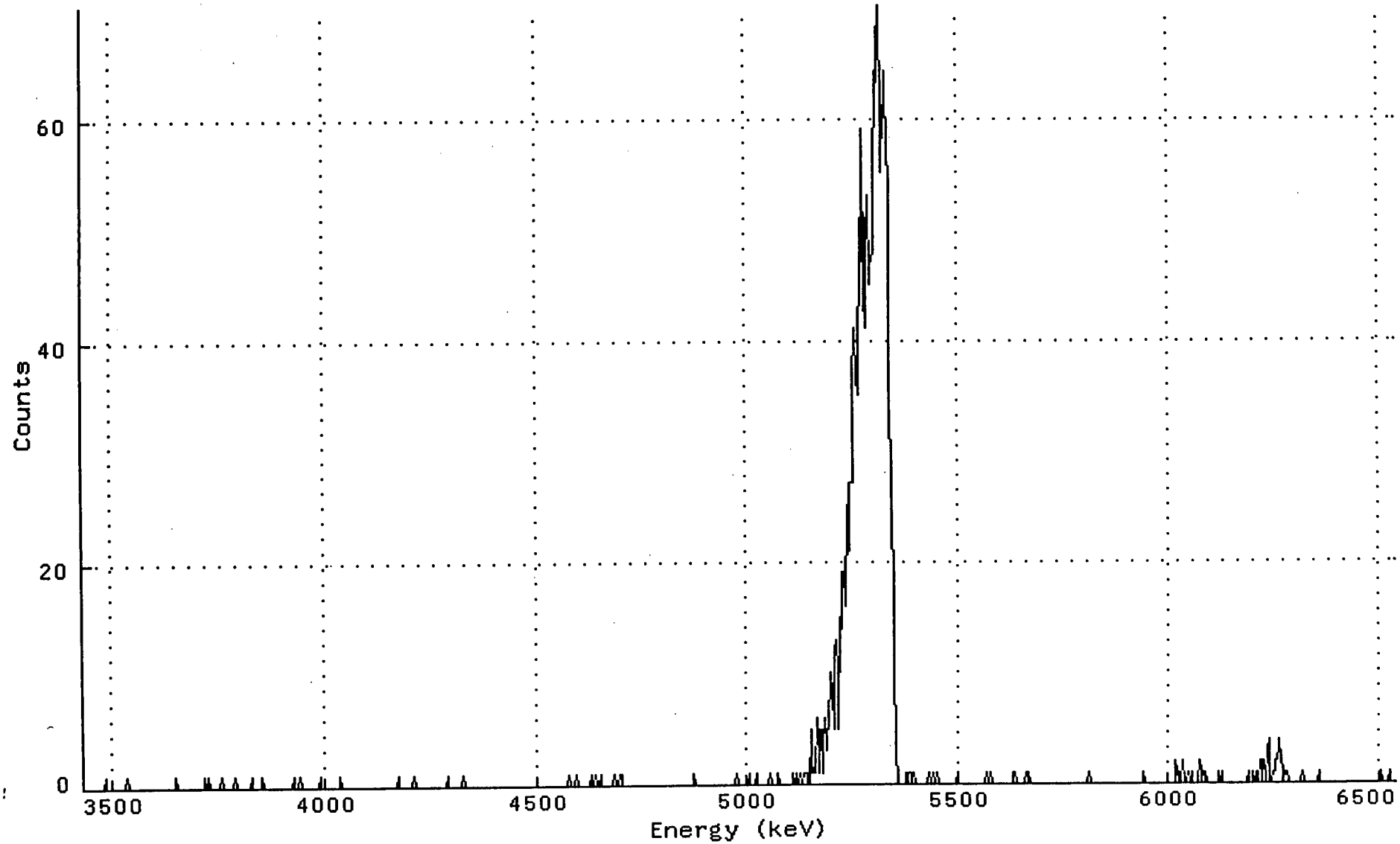
NUCLIDE ACTIVITY SUMMARY

NUCLIDE	ENERGY	NET AREA	BKG	%ABN	ACTIVITY pCi/L	ERROR 2-SIGMA	MDA pCi/L
U232	5306.	2029.001	6.999	100.00	5.043E+00	2.786E-01	3.803E-02
U-234	4762.	2474.000	4.000	100.00	6.149E+00	4.660E-01	3.057E-02
U-235	4386.	106.000	2.000	80.90	3.257E-01	6.775E-02	2.942E-02
U-238	4185.	2537.000	4.999	99.80	6.318E+00	4.772E-01	3.336E-02

****

REVIEWED BY: DATE:

Spectrum : DKA0:[ALPHA.ALUSR.ARCHIVE.R]R_BL-123238-1_UU.CNF;1
Title : GAR008
Sample Title: 96E-0640-02
Start Time: 24-OCT-1996 09:45 Sample Time: 24-OCT-1996 12:00 Energy Offset: 3.42930E+03
Real Time : 0 16:38:39.99 Sample ID : BL-123238-1 Energy Slope : 3.24723E+00
Live Time : 0 16:38:37.99 Sample Type: UU Energy Quad : -2.10494E-04



VMS Peak Search Report V1.9 Generated 25-OCT-1996 09:20:55

8019

Configuration : MCA0:[ALPHA]ALPHA0$1
Analyses by : ROIPEAK V1.2
Sample title : 96E-0640-02
Sample date : 24-OCT-1996 12:00:00 Acquisition date : 24-OCT-1996 09:45:25
Sample ID : BL-123238-1 Sample quantity : 1.0000 L
Sample type : UU Sample geometry :
Elapsed live time: 0 16:38:37.99 Elapsed real time: 0 16:38:39.99 0.0%
Start energy : 3432.54 keV End energy : 6533.74 keV
Gross/Net areas : Gross Background type :
Num avg bkg chans: 2 Critical level : No

Pk	It	Energy	Area	Bkgnd	FWHM	Channel	Left	Pw	Cts/Sec	%Err	Fit
1	0	4045.00	6	0	295.50	192.00	140	120	1.00E-04	40.8	
2	0	4306.37	2	0	42.21	275.00	259	95	3.34E-05	70.7	
3	0	4800.26	14	0	532.55	434.43	353	181	2.34E-04	26.7	
4	0	5288.48	1893	0	91.50	595.54	533	87	3.16E-02	2.3	

VMS Peak Search Report V1.9 Generated 25-OCT-1996 09:21:04

8019

Configuration : DKA0:[ALPHA.ALUSR.ARCHIVE.B]B_008_NONE.CNF;374
Analyses by : ROIPEAK V1.2
Sample title : 96M-0303-10
Sample date : 18-OCT-1996 14:52:00 Acquisition date : 18-OCT-1996 14:52:25
Sample ID : 008 Sample quantity : 1.0000 G
Sample type : NONE Sample geometry :
Elapsed live time: 0 16:38:34.00 Elapsed real time: 0 16:38:30.99 0.0%
Start energy : 3435.32 keV End energy : 6532.03 keV
Gross/Net areas : Gross Background type :
Num avg bkg chans: 2 Critical level : No

Pk	It	Energy	Area	Bkgnd	FWHM	Channel	Left	Pw	Cts/Sec	%Err	Fit
1	0	4071.10	10	0	275.88	199.50	140	120	1.67E-04	31.6	
2	0	4405.28	3	0	74.65	306.00	259	95	5.01E-05	57.7	
3	0	4828.05	12	0	509.57	443.00	353	181	2.00E-04	28.9	
4	0	5230.83	4	0	100.62	576.00	533	87	6.68E-05	50.0	

VMS Nuclide Identification Report V2.9 Generated 25-OCT-1996 09:21:16

8019

Configuration : MCA0:[ALPHA]ALPHA0$1
Analyses by : ROIPEAK V1.2,PEAKEFF V2.2,ENBACK V1.5,NID V3.1,WTMEAN V1.8
Sample title : 96E-0640-02
Sample date : 24-OCT-1996 12:00:00 Acquisition date : 24-OCT-1996 09:45:25
Sample ID : BL-123238-1 Sample quantity : 1.0000 L
Sample type : UU Sample geometry :
Elapsed live time: 0 16:38:37.99 Elapsed real time: 0 16:38:39.99 0.0%
Energy tolerance : 100.00 keV Half life ratio : 8.00
Errors propagated: Yes Systematic Error : 0.00 %
Efficiency type : Average value Efficiencies at : Peak Energy
Abundance limit : 75.00

Summary of Nuclide Activity

Total number of lines in spectrum	4	
Number of unidentified lines	0	
Number of lines tentatively identified by NID	4	100.00%

Nuclide Type : ALPHA

Nuclide	Hlife	Decay	Wtd Mean Uncorrected pCi/L	Wtd Mean Decay Corr pCi/L	Decay Corr 2-Sigma Error	2-Sigma %Error	Flags
U-232	72.00Y	1.00	4.430E+00	4.430E+00	0.250E+00	5.65	
U-234	2.45E+05Y	1.00	4.688E-03	4.688E-03	23.92E-03	510.13	
U-235	7.04E+08Y	1.00	-2.899E-03	-2.899E-03	12.96E-03	-447.15	
U-238	4.47E+09Y	1.00	-9.400E-03	-9.400E-03	18.80E-03	-200.00	
			---	---			
Total Activity :			4.422E+00	4.422E+00			
Grand Total Activity :			4.422E+00	4.422E+00			

Flags: "K" = Keyline not found "M" = Manually accepted
"E" = Manually edited "A" = Nuclide specific abn. limit

DATACHEM
ALPHA SPECTROSCOPY REPORT

8019

****

SAMPLE TITLE: 96E-0640-02
SAMPLE DATE: 24-OCT-1996 12:00:00
ELAPSED LIVE TIME: 59918.
AVERAGE %EFFICIENCY: 19.2353
TRACER DPM: 11.1955

SAMPLE ID: BL-123238-1
SAMPLE QUANT: 1.0000 L
DETECTOR #: 008
YIELD: 87.8391

****

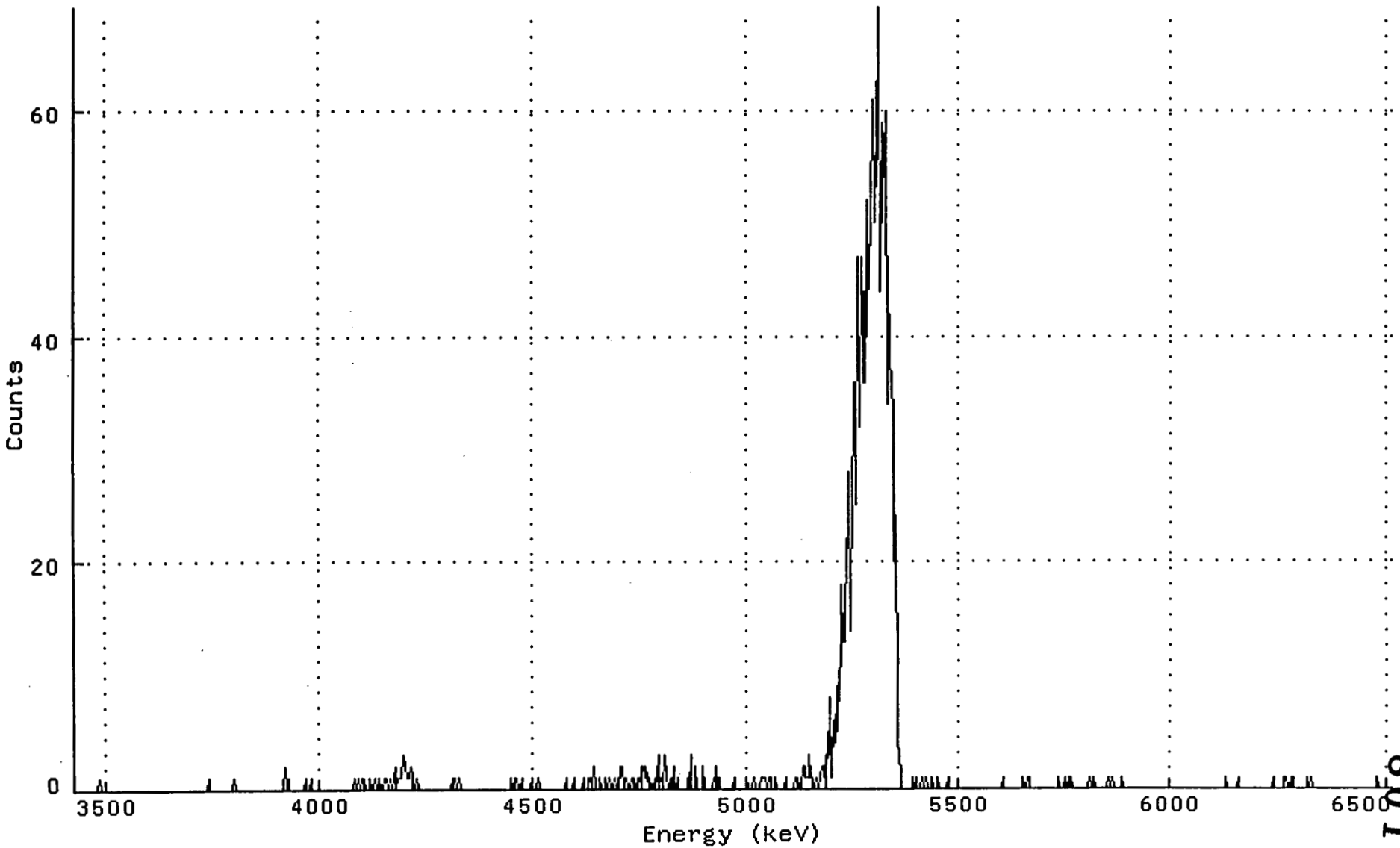
NUCLIDE ACTIVITY SUMMARY

NUCLIDE	ENERGY	NET AREA	BKG	%ABN	ACTIVITY pCi/L	ERROR 2-SIGMA	MDA pCi/L
U232	5306.	1889.000	4.000	100.00	5.043E+00	2.851E-01	3.284E-02
U-234	4762.	1.999	12.001	100.00	5.337E-03	2.723E-02	5.101E-02
U-235	4386.	1.000	3.000	80.90	-3.301E-03	1.476E-02	3.648E-02
U-238	4185.	4.001	10.001	99.80	-1.070E-02	2.141E-02	4.736E-02

****

REVIEWED BY: DATE:

Spectrum : DKA0:[ALPHA.ALUSR.ARCHIVE.S]S_96E04514_UU.CNF;1
Title : GAR010
Sample Title: 96E-0640-02
Start Time: 24-OCT-1996 09:45 Sample Time: 24-OCT-1996 12:00 Energy Offset: 3.42642E+03
Real Time : 0 16:38:42.99 Sample ID : 96E04514 Energy Slope : 3.21921E+00
Live Time : 0 16:38:30.99 Sample Type: UU Energy Quad : -2.04592E-04



VMS Peak Search Report V1.9 Generated 25-OCT-1996 09:22:38

8019

Configuration : MCA0:[ALPHA]ALPHA0$1
Analyses by : ROIPEAK V1.2
Sample title : 96E-0640-02
Sample date : 24-OCT-1996 12:00:00 Acquisition date : 24-OCT-1996 09:45:25
Sample ID : 96E04514 Sample quantity : 0.20000 L
Sample type : UU Sample geometry :
Elapsed live time: 0 16:38:30.99 Elapsed real time: 0 16:38:42.99 0.0%
Start energy : 3429.64 keV End energy : 6508.37 keV
Gross/Net areas : Gross Background type :
Num avg bkg chans: 2 Critical level : No

Pk	It	Energy	Area	Bkgnd	FWHM	Channel	Left	Pw	Cts/Sec	%Err	Fit
1	0	4146.14	37	0308.14		226.84	142	121	6.18E-04	16.4	
2	0	4425.33	9	0209.25		316.67	262	96	1.50E-04	33.3	
3	0	4811.43	70	0304.18		442.69	357	182	1.17E-03	12.0	
4	0	5289.09	1813	0 97.89		601.61	538	89	3.03E-02	2.3	

VMS Peak Search Report V1.9 Generated 25-OCT-1996 09:22:47

8019

Configuration : DKA0:[ALPHA.ALUSR.ARCHIVE.B]B_010_NONE.CNF;377
Analyses by : ROIPEAK V1.2
Sample title : 96M-0303-10
Sample date : 18-OCT-1996 14:52:01 Acquisition date : 18-OCT-1996 14:52:25
Sample ID : 010 Sample quantity : 1.0000 SAMPLE
Sample type : NONE Sample geometry :
Elapsed live time: 0 16:38:37.00 Elapsed real time: 0 16:38:30.00 0.0%
Start energy : 3427.76 keV End energy : 6511.45 keV
Gross/Net areas : Gross Background type :
Num avg bkg chans: 2 Critical level : No

Pk	It	Energy	Area	Bkgnd	FWHM	Channel	Left	Pw	Cts/Sec	%Err	Fit
1	0	4068.85	6		0235.99	202.00	142	121	1.00E-04	40.8	
2	0	4404.65	3		0 29.09	309.50	262	96	5.01E-05	57.7	
3	0	4828.52	3		0232.76	447.50	357	182	5.01E-05	57.7	
4	0	5233.82	4		0113.15	582.00	538	89	6.68E-05	50.0	

VMS Nuclide Identification Report V2.9 Generated 25-OCT-1996 09:23:01 8019

Configuration : MCA0:[ALPHA]ALPHA0$1
Analyses by : ROIPEAK V1.2,PEAKEFF V2.2,ENBACK V1.5,NID V3.1,WTMEAN V1.8
Sample title : 96E-0640-02
Sample date : 24-OCT-1996 12:00:00 Acquisition date : 24-OCT-1996 09:45:25
Sample ID : 96E04514 Sample quantity : 0.20000 L
Sample type : UU Sample geometry :
Elapsed live time: 0 16:38:30.99 Elapsed real time: 0 16:38:42.99 0.0%
Energy tolerance : 100.00 keV Half life ratio : 8.00
Errors propagated: Yes Systematic Error : 0.00 %
Efficiency type : Average value Efficiencies at : Peak Energy
Abundance limit : 75.00

Summary of Nuclide Activity

Total number of lines in spectrum 4
Number of unidentified lines 0
Number of lines tentatively identified by NID 4 100.00%

Nuclide Type : ALPHA

Nuclide	Hlife	Decay	Wtd Mean Uncorrected pCi/L	Wtd Mean Decay Corr pCi/L	Decay Corr 2-Sigma Error	2-Sigma %Error	Flags
U-232	72.00Y	1.00	2.212E+01	2.212E+01	0.127E+01	5.74	
U-234	2.45E+05Y	1.00	8.194E-01	8.194E-01	2.107E-01	25.71	
U-235	7.04E+08Y	1.00	9.070E-02	9.070E-02	10.48E-02	115.51	
U-238	4.47E+09Y	1.00	3.799E-01	3.799E-01	1.612E-01	42.43	
	Total Activity :		2.341E+01	2.341E+01			

Grand Total Activity : 2.341E+01 2.341E+01

Flags: "K" = Keyline not found "M" = Manually accepted
"E" = Manually edited "A" = Nuclide specific abn. limit

DATACHEM
ALPHA SPECTROSCOPY REPORT

8019

****

SAMPLE TITLE: 96E-0640-02
SAMPLE DATE: 24-OCT-1996 12:00:00
ELAPSED LIVE TIME: 59911.
AVERAGE %EFFICIENCY: 18.4442
TRACER DPM: 11.1955

SAMPLE ID: 96E04514
SAMPLE QUANT: 0.2000 L
DETECTOR #: 010
YIELD: 87.7371

****

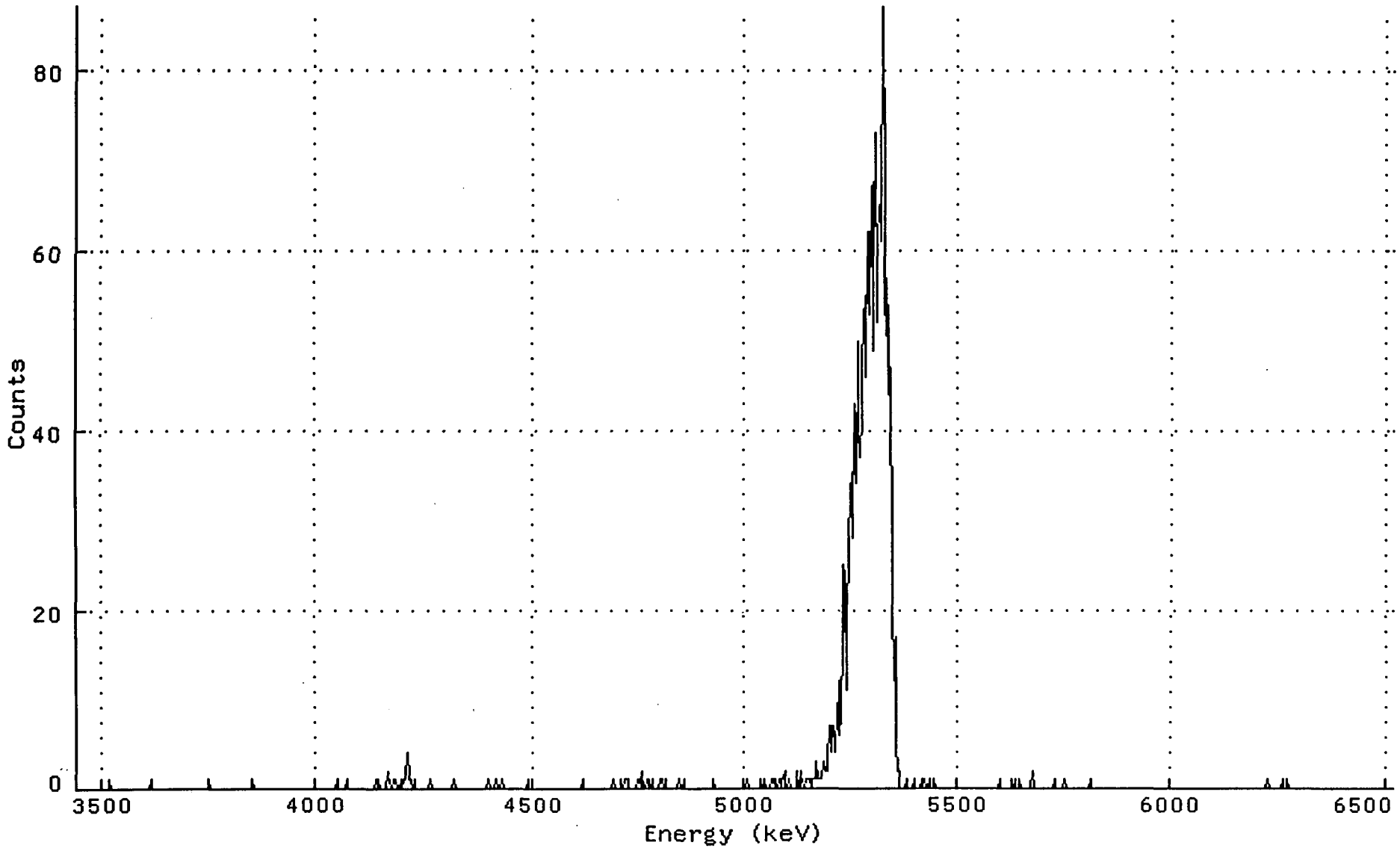
NUCLIDE ACTIVITY SUMMARY

NUCLIDE	ENERGY	NET AREA	BKG	%ABN	ACTIVITY pCi/L	ERROR 2-SIGMA	MDA pCi/L
U232	5306.	1809.000	4.000	100.00	2.522E+01	1.447E+00	1.714E-01
U-234	4762.	67.000	3.000	100.00	9.339E-01	2.461E-01	1.541E-01
U-235	4386.	6.000	3.000	80.90	1.034E-01	1.196E-01	1.904E-01
U-238	4185.	31.001	5.999	99.80	4.330E-01	1.854E-01	2.010E-01

****

REVIEWED BY: DATE:

Spectrum : DKA0:[ALPHA.ALUSR.ARCHIVE.S]S_96E04515_UU.CNF;1
Title : GAR011
Sample Title: 96E-0640-02
Start Time: 24-OCT-1996 09:45 Sample Time: 24-OCT-1996 12:00 Energy Offset: 3.43907E+03
Real Time : 0 16:38:42.99 Sample ID : 96E04515 Energy Slope : 3.20444E+00
Live Time : 0 16:38:47.00 Sample Type: UU Energy Quad : -1.95857E-04



VMS Peak Search Report V1.9 Generated 25-OCT-1996 09:23:22

8019

Configuration : MCA0:[ALPHA]ALPHA0$1
Analyses by : ROIPEAK V1.2
Sample title : 96E-0640-02
Sample date : 24-OCT-1996 12:00:00 Acquisition date : 24-OCT-1996 09:45:25
Sample ID : 96E04515 Sample quantity : 0.20000 L
Sample type : UU Sample geometry :
Elapsed live time: 0 16:38:47.00 Elapsed real time: 0 16:38:42.99 0.0%
Start energy : 3442.27 keV End energy : 6515.04 keV
Gross/Net areas : Gross Background type :
Num avg bkg chans: 2 Critical level : No

Pk	It	Energy	Area	Bkgnd	FWHM	Channel	Left	Pw	Cts/Sec	%Err	Fit
1	0	4181.72	22	0	4.27	235.14	139	121	3.67E-04	21.3	
2	0	4386.38	6	0	237.13	301.17	259	96	1.00E-04	40.8	
3	0	4877.90	33	0	358.90	462.06	354	183	5.51E-04	17.4	
4	0	5291.92	2019	0	83.78	600.23	536	88	3.37E-02	2.2	

VMS Peak Search Report V1.9 Generated 25-OCT-1996 09:23:31

8019

Configuration : DKA0:[ALPHA.ALUSR.ARCHIVE.B]B_011_NONE.CNF;377
Analyses by : ROIPEAK V1.2
Sample title : 96M-0303-10
Sample date : 18-OCT-1996 14:52:02 Acquisition date : 18-OCT-1996 14:52:25
Sample ID : 011 Sample quantity : 1.0000 SAMPLE
Sample type : NONE Sample geometry :
Elapsed live time: 0 16:38:39.99 Elapsed real time: 0 16:38:30.00 0.0%
Start energy : 3447.77 keV End energy : 6526.39 keV
Gross/Net areas : Gross Background type :
Num avg bkg chans: 2 Critical level : No

Pk	It	Energy	Area	Bkgnd	FWHM	Channel	Left	Pw	Cts/Sec	%Err	Fit
1	0	4071.08	3		0127.27	199.00	139	121	5.01E-05	57.7	
2	0	4403.98	3		0108.18	306.50	259	96	5.01E-05	57.7	
3	0	4827.14	6		0340.44	445.00	354	183	1.00E-04	40.8	
4	0	5231.92	7		0209.99	579.50	536	88	1.17E-04	37.8	

VMS Nuclide Identification Report V2.9 Generated 25-OCT-1996 09:23:42 **8019**

Configuration : MCA0:[ALPHA]ALPHA0$1
Analyses by : ROIPEAK V1.2,PEAKEFF V2.2,ENBACK V1.5,NID V3.1,WTMEAN V1.8
Sample title : 96E-0640-02
Sample date : 24-OCT-1996 12:00:00 Acquisition date : 24-OCT-1996 09:45:25
Sample ID : 96E04515 Sample quantity : 0.20000 L
Sample type : UU Sample geometry :
Elapsed live time: 0 16:38:47.00 Elapsed real time: 0 16:38:42.99 0.0%
Energy tolerance : 100.00 keV Half life ratio : 8.00
Errors propagated: Yes Systematic Error : 0.00 %
Efficiency type : Average value Efficiencies at : Peak Energy
Abundance limit : 75.00

Summary of Nuclide Activity

Total number of lines in spectrum	4	
Number of unidentified lines	0	
Number of lines tentatively identified by NID	4	100.00%

Nuclide Type : ALPHA

Nuclide	Hlife	Decay	Wtd Mean Uncorrected pCi/L	Wtd Mean Decay Corr pCi/L	Decay Corr 2-Sigma Error	2-Sigma %Error	Flags
U-232	72.00Y	1.00	2.301E+01	2.301E+01	0.127E+01	5.53	
U-234	2.45E+05Y	1.00	3.088E-01	3.088E-01	1.432E-01	46.37	
U-235	7.04E+08Y	1.00	4.240E-02	4.240E-02	8.483E-02	200.06	
U-238	4.47E+09Y	1.00	2.177E-01	2.177E-01	1.148E-01	52.73	
		Total Activity :	2.358E+01	2.358E+01			
		Grand Total Activity :	2.358E+01	2.358E+01			

Flags: "K" = Keyline not found "M" = Manually accepted
"E" = Manually edited "A" = Nuclide specific abn. limit

DATACHEM
ALPHA SPECTROSCOPY REPORT

8019

****

SAMPLE TITLE: 96E-0640-02
SAMPLE DATE: 24-OCT-1996 12:00:00
ELAPSED LIVE TIME: 59927.
AVERAGE %EFFICIENCY: 19.7179
TRACER DPM: 11.1955

SAMPLE ID: 96E04515
SAMPLE QUANT: 0.2000 L
DETECTOR #: 011
YIELD: 91.2549

****

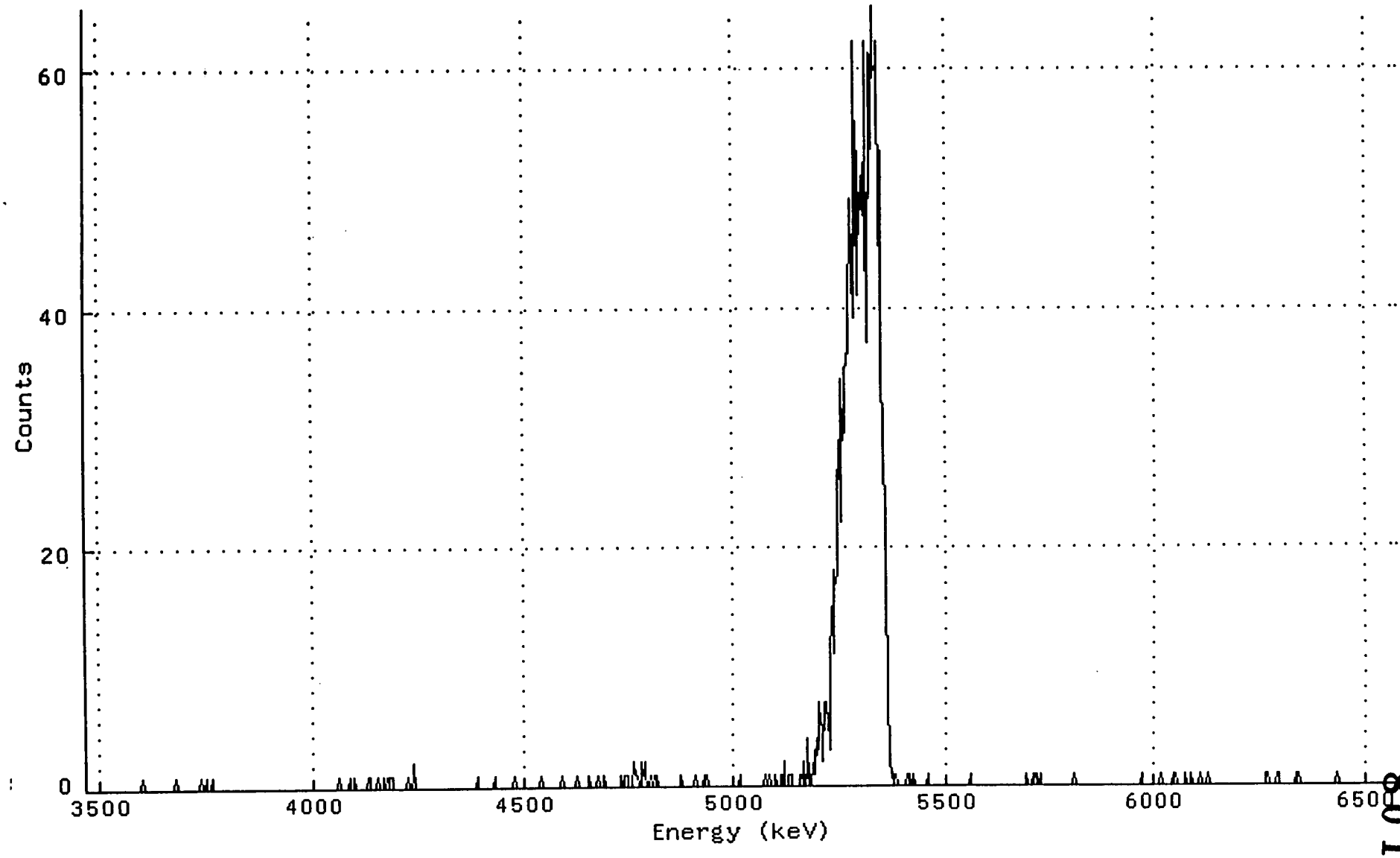
NUCLIDE ACTIVITY SUMMARY

NUCLIDE	ENERGY	NET AREA	BKG	%ABN	ACTIVITY pCi/L	ERROR 2-SIGMA	MDA pCi/L
U232	5306.	2011.999	7.001	100.00	2.522E+01	1.393E+00	1.918E-01
U-234	4762.	26.999	6.001	100.00	3.384E-01	1.580E-01	1.803E-01
U-235	4386.	3.000	3.000	80.90	4.647E-02	9.300E-02	1.712E-01
U-238	4185.	19.000	3.000	99.80	2.386E-01	1.265E-01	1.388E-01

****

REVIEWED BY: DATE:

Spectrum : DKA0:[ALPHA.ALUSR.ARCHIVE.S]S_96E04516_UU.CNF;1
Title : GAR012
Sample Title: 96E-0640-02
Start Time: 24-OCT-1996 09:45 Sample Time: 24-OCT-1996 12:00 Energy Offset: 3.46456E+03
Real Time : 0 16:38:42.99 Sample ID : 96E04516 Energy Slope : 3.20166E+00
Live Time : 0 16:38:44.99 Sample Type: UU Energy Quad : -1.64084E-04



VMS Peak Search Report V1.9 Generated 25-OCT-1996 09:24:04

8019

Configuration : MCA0:[ALPHA]ALPHA0$1
Analyses by : ROIPEAK V1.2
Sample title : 96E-0640-02
Sample date : 24-OCT-1996 12:00:00 Acquisition date : 24-OCT-1996 09:45:25
Sample ID : 96E04516 Sample quantity : 0.20000 L
Sample type : UU Sample geometry :
Elapsed live time: 0 16:38:44.99 Elapsed real time: 0 16:38:42.99 0.0%
Start energy : 3467.76 keV End energy : 6571.00 keV
Gross/Net areas : Gross Background type :
Num avg bkg chans: 2 Critical level : No

Pk	It	Energy	Area	Bkgnd	FWHM	Channel	Left	Pw	Cts/Sec	%Err	Fit
1	0	4168.28	15	0	4.70	222.33	131	120	2.50E-04	25.8	
2	0	4460.67	4	0	156.88	316.25	250	96	6.68E-05	50.0	
3	0	4809.65	31	0	30.32	429.58	345	181	5.17E-04	18.0	
4	0	5299.23	1826	0	100.83	590.94	525	87	3.05E-02	2.3	

VMS Peak Search Report V1.9 Generated 25-OCT-1996 09:24:12

8019

Configuration : DKA0:[ALPHA.ALUSR.ARCHIVE.B]B_012_NONE.CNF;379
Analyses by : ROIPEAK V1.2
Sample title : 96M-0303-10
Sample date : 18-OCT-1996 14:52:03 Acquisition date : 18-OCT-1996 14:52:25
Sample ID : 012 Sample quantity : 1.0000 SAMPLE
Sample type : NONE Sample geometry :
Elapsed live time: 0 16:38:29.00 Elapsed real time: 0 16:38:30.99 0.0%
Start energy : 3451.12 keV End energy : 6552.80 keV
Gross/Net areas : Gross Background type :
Num avg bkg chans: 2 Critical level : No

Pk	It	Energy	Area	Bkgnd	FWHM	Channel	Left	Pw	Cts/Sec	%Err	Fit
1	0	4064.44	5	0	226.56	190.50	131	120	8.35E-05	44.7	
2	0	4402.96	2	0	9.85	297.50	250	96	3.34E-05	70.7	
3	0	4829.72	6	0	420.29	435.00	345	181	1.00E-04	40.8	
4	0	5233.69	4	0	180.59	568.00	525	87	6.68E-05	50.0	

8019

VMS Nuclide Identification Report V2.9 Generated 25-OCT-1996 09:24:24

Configuration : MCA0:[ALPHA]ALPHA0$1
Analyses by : ROIPEAK V1.2,PEAKEFF V2.2,ENBACK V1.5,NID V3.1,WTMEAN V1.8
Sample title : 96E-0640-02
Sample date : 24-OCT-1996 12:00:00 Acquisition date : 24-OCT-1996 09:45:25
Sample ID : 96E04516 Sample quantity : 0.20000 L
Sample type : UU Sample geometry :
Elapsed live time: 0 16:38:44.99 Elapsed real time: 0 16:38:42.99 0.0%
Energy tolerance : 100.00 keV Half life ratio : 8.00
Errors propagated: Yes Systematic Error : 0.00 %
Efficiency type : Average value Efficiencies at : Peak Energy
Abundance limit : 75.00

Summary of Nuclide Activity

Total number of lines in spectrum	4	
Number of unidentified lines	0	
Number of lines tentatively identified by NID	4	100.00%

Nuclide Type : ALPHA

Nuclide	Hlife	Decay	Wtd Mean Uncorrected pCi/L	Wtd Mean Decay Corr pCi/L	Decay Corr 2-Sigma Error	2-Sigma %Error	Flags
U-232	72.00Y	1.00	2.217E+01	2.217E+01	0.127E+01	5.74	
U-234	2.45E+05Y	1.00	3.042E-01	3.042E-01	1.484E-01	48.78	
U-235	7.04E+08Y	1.00	3.007E-02	3.007E-02	7.369E-02	245.06	
U-238	4.47E+09Y	1.00	1.219E-01	1.219E-01	1.091E-01	89.52	
	Total Activity :		2.262E+01	2.262E+01			
	Grand Total Activity :		2.262E+01	2.262E+01			

Flags: "K" = Keyline not found "M" = Manually accepted
"E" = Manually edited "A" = Nuclide specific abn. limit

DATACHEM
ALPHA SPECTROSCOPY REPORT

8019

****

SAMPLE TITLE: 96E-0640-02
SAMPLE DATE: 24-OCT-1996 12:00:00
ELAPSED LIVE TIME: 59925.
AVERAGE %EFFICIENCY: 18.5340
TRACER DPM: 11.1955

SAMPLE ID: 96E04516
SAMPLE QUANT: 0.2000 L
DETECTOR #: 012
YIELD: 87.9191

****

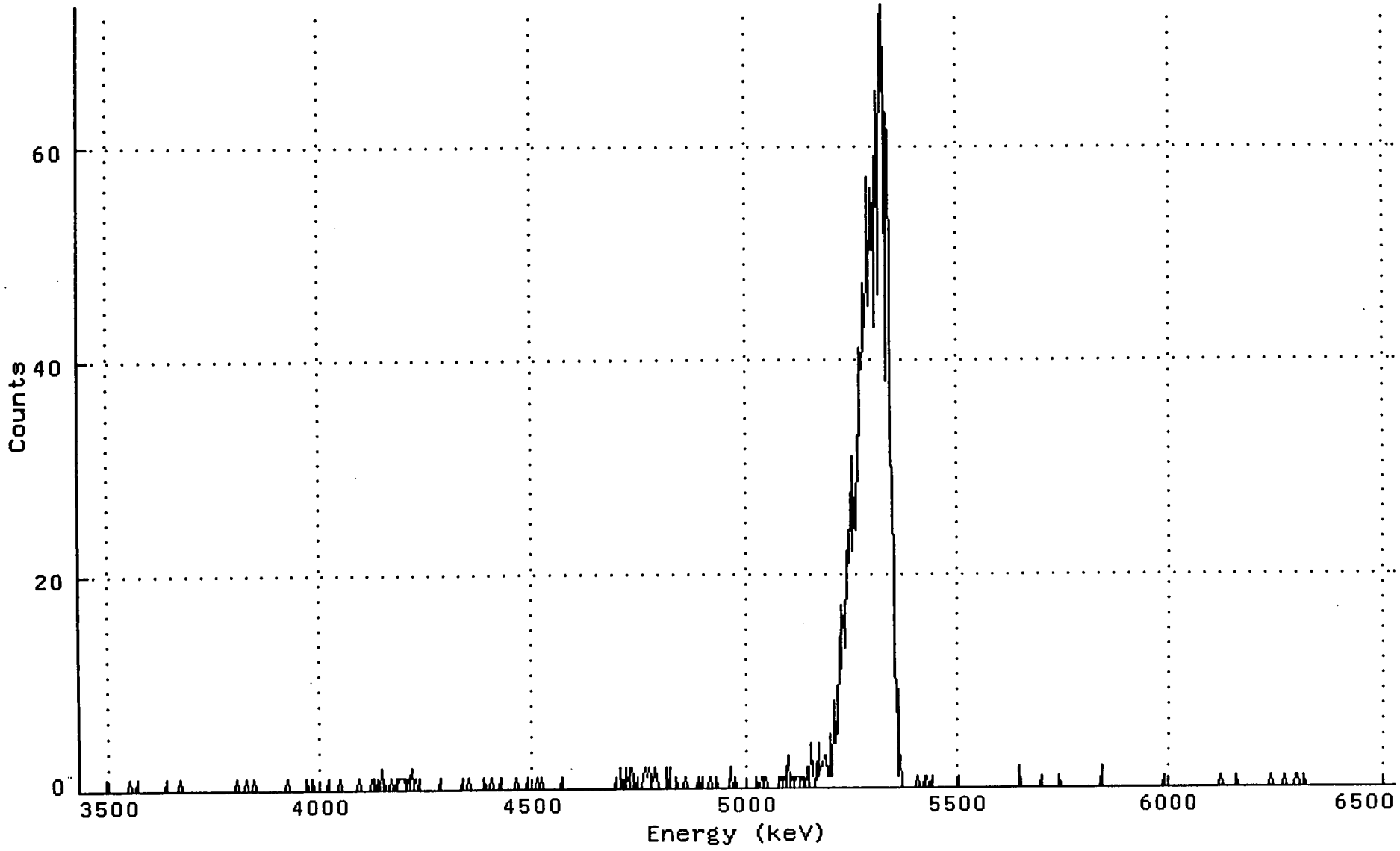
NUCLIDE ACTIVITY SUMMARY

NUCLIDE	ENERGY	NET AREA	BKG	%ABN	ACTIVITY pCi/L	ERROR 2-SIGMA	MDA pCi/L
U232	5306.	1821.999	4.001	100.00	2.522E+01	1.447E+00	1.702E-01
U-234	4762.	24.998	6.002	100.00	3.460E-01	1.699E-01	1.992E-01
U-235	4386.	1.999	2.001	80.90	3.420E-02	8.384E-02	1.638E-01
U-238	4185.	9.999	5.001	99.80	1.386E-01	1.244E-01	1.858E-01

****

REVIEWED BY: DATE:

Spectrum : DKA0:[ALPHA.ALUSR.ARCHIVE.S]S_96E04517_UU.CNF;1
Title : GAR013
Sample Title: 96E-0640-02
Start Time: 24-OCT-1996 09:45 Sample Time: 24-OCT-1996 12:00 Energy Offset: 3.43099E+03
Real Time : 0 16:38:42.99 Sample ID : 96E04517 Energy Slope : 3.23329E+00
Live Time : 0 16:38:39.99 Sample Type: UU Energy Quad : -2.07240E-04



001183

8019

188

VMS Peak Search Report V1.9 Generated 25-OCT-1996 09:24:45

8019

Configuration : MCA0:[ALPHA]ALPHA0$1
Analyses by : ROIPEAK V1.2
Sample title : 96E-0640-02
Sample date : 24-OCT-1996 12:00:00 Acquisition date : 24-OCT-1996 09:45:25
Sample ID : 96E04517 Sample quantity : 0.20000 L
Sample type : UU Sample geometry :
Elapsed live time: 0 16:38:39.99 Elapsed real time: 0 16:38:42.99 0.0%
Start energy : 3434.22 keV End energy : 6524.56 keV
Gross/Net areas : Gross Background type :
Num avg bkg chans: 2 Critical level : No

Pk	It	Energy	Area	Bkgnd	FWHM	Channel	Left	Pw	Cts/Sec	%Err	Fit
1	0	4144.61	27	0	77.60	223.93	140	120	4.51E-04	19.2	
2	0	4417.42	10	0	252.20	311.30	259	96	1.67E-04	31.6	
3	0	4856.18	53	0	419.49	454.00	354	182	8.85E-04	13.7	
4	0	5290.89	1830	0	78.38	598.17	535	87	3.05E-02	2.3	

VMS Peak Search Report V1.9 Generated 25-OCT-1996 09:24:55

8019

Configuration : DKA0:[ALPHA.ALUSR.ARCHIVE.B]B_013_NONE.CNF;372
Analyses by : ROIPEAK V1.2
Sample title : 96M-0304-10
Sample date : 18-OCT-1996 14:52:04 Acquisition date : 18-OCT-1996 14:52:25
Sample ID : 013 Sample quantity : 1.0000 SAMPLE
Sample type : NONE Sample geometry :
Elapsed live time: 0 16:38:41.00 Elapsed real time: 0 16:38:30.99 0.0%
Start energy : 3434.81 keV End energy : 6525.40 keV
Gross/Net areas : Gross Background type :
Num avg bkg chans: 2 Critical level : No

Pk	It	Energy	Area	Bkgnd	FWHM	Channel	Left	Pw	Cts/Sec	%Err	Fit
1	0	4068.58	5	0	281.41	199.50	140	120	8.34E-05	44.7	
2	0	4403.40	1	0	3.23	306.50	259	96	1.67E-05	100.0	
3	0	4828.19	13	0	517.53	444.50	354	182	2.17E-04	27.7	
4	0	5231.58	2	0	51.75	578.00	535	87	3.34E-05	70.7	

VMS Nuclide Identification Report V2.9 Generated 25-OCT-1996 09:25:07

8019

Configuration : MCA0:[ALPHA]ALPHA0$1
Analyses by : ROIPEAK V1.2,PEAKEFF V2.2,ENBACK V1.5,NID V3.1,WTMEAN V1.8
Sample title : 96E-0640-02
Sample date : 24-OCT-1996 12:00:00 Acquisition date : 24-OCT-1996 09:45:25
Sample ID : 96E04517 Sample quantity : 0.20000 L
Sample type : UU Sample geometry :
Elapsed live time: 0 16:38:39.99 Elapsed real time: 0 16:38:42.99 0.0%
Energy tolerance : 100.00 keV Half life ratio : 8.00
Errors propagated: Yes Systematic Error : 0.00 %
Efficiency type : Average value Efficiencies at : Peak Energy
Abundance limit : 75.00

Summary of Nuclide Activity

Total number of lines in spectrum	4	
Number of unidentified lines	0	
Number of lines tentatively identified by NID	4	100.00%

Nuclide Type : ALPHA

Nuclide	Hlife	Decay	Wtd Mean Uncorrected pCi/L	Wtd Mean Decay Corr pCi/L	Decay Corr 2-Sigma Error	2-Sigma %Error	Flags
U-232	72.00Y	1.00	2.237E+01	2.237E+01	0.128E+01	5.72	
U-234	2.45E+05Y	1.00	4.894E-01	4.894E-01	1.994E-01	40.75	
U-235	7.04E+08Y	1.00	1.361E-01	1.361E-01	1.004E-01	73.78	
U-238	4.47E+09Y	1.00	2.697E-01	2.697E-01	1.390E-01	51.53	
	Total Activity :		2.326E+01	2.326E+01			
	Grand Total Activity :		2.326E+01	2.326E+01			

Flags: "K" = Keyline not found "M" = Manually accepted
"E" = Manually edited "A" = Nuclide specific abn. limit

DATACHEM
ALPHA SPECTROSCOPY REPORT

8019

****

SAMPLE TITLE: 96E-0640-02
SAMPLE DATE: 24-OCT-1996 12:00:00
ELAPSED LIVE TIME: 59920.
AVERAGE %EFFICIENCY: 18.4321
TRACER DPM: 11.1955

SAMPLE ID: 96E04517
SAMPLE QUANT: 0.2000 L
DETECTOR #: 013
YIELD: 88.7035

****

NUCLIDE ACTIVITY SUMMARY

NUCLIDE	ENERGY	NET AREA	BKG	%ABN	ACTIVITY pCi/L	ERROR 2-SIGMA	MDA pCi/L
U232	5306.	1828.000	2.000	100.00	2.522E+01	1.442E+00	1.321E-01
U-234	4762.	40.000	13.000	100.00	5.517E-01	2.271E-01	2.726E-01
U-235	4386.	9.000	1.000	80.90	1.535E-01	1.135E-01	1.304E-01
U-238	4185.	22.000	5.000	99.80	3.041E-01	1.576E-01	1.852E-01

****

REVIEWED BY: DATE:

PMK

NOV 05 1996

DMK

SPREADSHEETS

8019

DataChem Laboratories

001189194

A	A	B	C	D	E	F	G	H	I	J	K
1		Client:	Hayden			QC Method:	WR-DC-341				
2		Set ID:	96E-0640-02			QC Matrix:	FILTER				
3		Group ID:	G969703P			Prep Date:	18-OCT-1996 00:00				
4		Analyte:	Uranium-233/234			Release #:	NONE				
5		Units:	pCi/Sample			File Name:	69703PU4.txt				
6					sample	tracer					tracer
7	S TYPE	FIELD NAME	SAMPLE NAME	SAMPLE ID	ABNs	ABNt	CF	T1/2 years	sEFF	sSTSt	STSt dpm
8	B	BL-123238-1	BL-123238-1	S96970CC	1.00E+00	1.00E+00	1.00E+00	2.45E+05	7.20E-03	8.49E+02	4.45E+04
9	Q	QC-123238-1	QC-123238-1	S96970CD	1.00E+00	1.00E+00	1.00E+00	2.45E+05	7.20E-03	8.49E+02	4.45E+04
10	O	9131,39,40	96E04514	S968S06B	1.00E+00	1.00E+00	1.00E+00	2.45E+05	7.20E-03	8.49E+02	4.45E+04
11	O	9135,41,42	96E04515	S968S06C	1.00E+00	1.00E+00	1.00E+00	2.45E+05	7.20E-03	8.49E+02	4.45E+04
12	O	9136,43,44	96E04516	S968S06D	1.00E+00	1.00E+00	1.00E+00	2.45E+05	7.20E-03	8.49E+02	4.45E+04
13	O	9137,45,46	96E04517	S968S06F	1.00E+00	1.00E+00	1.00E+00	2.45E+05	7.20E-03	8.49E+02	4.45E+04

PMK

NOV 05 1996

80019

001190 195

	L	M	N	O	P	Q	R	S	T	U	V
2											
3											
4											
5											
6		tracer						aliquot tracer	tracer	tracer	sample ct
7	sMASSt	MASSt g	sVOLt	sDILt	sDILs	sALIt	sALIs	ALIt mL,g	DILt	VOLt mL,g	T in min
8	6.70E-04	5.09E+00	9.00E-04	2.55E-02	1.00E-03	5.70E-04	1.00E-03	5.09E+00	5.00E+03	2.50E-01	9.99E+02
9	6.70E-04	5.09E+00	9.00E-04	2.55E-02	1.00E-03	5.70E-04	1.00E-03	5.09E+00	5.00E+03	2.50E-01	9.99E+02
10	6.70E-04	5.09E+00	9.00E-04	2.55E-02	1.00E-03	5.70E-04	1.00E-03	5.09E+00	5.00E+03	2.50E-01	9.99E+02
11	6.70E-04	5.09E+00	9.00E-04	2.55E-02	1.00E-03	5.70E-04	1.00E-03	5.09E+00	5.00E+03	2.50E-01	9.99E+02
12	6.70E-04	5.09E+00	9.00E-04	2.55E-02	1.00E-03	5.70E-04	1.00E-03	5.09E+00	5.00E+03	2.50E-01	9.99E+02
13	6.70E-04	5.09E+00	9.00E-04	2.55E-02	1.00E-03	5.70E-04	1.00E-03	5.09E+00	5.00E+03	2.50E-01	9.99E+02

A	W	X	Y	Z	AA	AB	AC	AD	AE	AF	AG
1											
2											
3											
4											
5											
6	sample bkg	act tracer	sample ct	sample bkg	sample	tracer ct	tracer bkg	aliquot sam	delta time	sample	sam bkg ct r
7	Tb in min	AMTt dpm	Cgs	Csb	DILs dec	Cgt	Ctb	ALIs L,g	Dt in days	EFF c/d	Bsd
8	9.99E+02	1.12E+01	1.40E+01	1.20E+01	1.00E+00	1.89E+03	4.00E+00	1.00E+00	6.00E+00	1.92E-01	1.20E-02
9	9.98E+02	1.12E+01	2.48E+03	4.00E+00	1.00E+00	2.04E+03	7.00E+00	1.00E+00	6.00E+00	1.87E-01	4.01E-03
10	9.99E+02	1.12E+01	7.00E+01	3.00E+00	4.33E-01	1.81E+03	4.00E+00	1.00E+00	4.20E+01	1.84E-01	3.00E-03
11	9.99E+02	1.12E+01	3.30E+01	6.00E+00	4.79E-01	2.02E+03	7.00E+00	1.00E+00	4.20E+01	1.97E-01	6.01E-03
12	9.99E+02	1.12E+01	3.10E+01	6.00E+00	4.45E-01	1.83E+03	4.00E+00	1.00E+00	4.20E+01	1.85E-01	6.01E-03
13	9.99E+02	1.12E+01	5.30E+01	1.30E+01	4.45E-01	1.83E+03	2.00E+00	1.00E+00	4.20E+01	1.84E-01	1.30E-02

8019

001192 197

A	AH	AI	AJ	AK	AL	AM	AN	AO	AP	AQ
1										
2										
3										
4										
5										
6						sample	sample	sample	sample	
7	REeff	REall	REdll	REr	R	ACTb	NBCRs	sNBCRs	IDLC	K
8	3.74E-02	1.00E-03	1.00E-03	4.81E-02	8.78E-01	5.34E-03	2.00E-03	5.10E-03	5.03E-02	3.75E-01
9	3.85E-02	1.00E-03	1.00E-03	4.85E-02	9.70E-01	6.15E+00	2.48E+00	4.99E-02	2.99E-02	4.03E-01
10	3.90E-02	1.00E-03	2.31E-03	4.96E-02	8.77E-01	4.31E-01	6.71E-02	8.55E-03	6.93E-02	1.56E-01
11	3.65E-02	1.00E-03	2.09E-03	4.70E-02	9.12E-01	1.41E-01	2.70E-02	6.25E-03	7.39E-02	1.91E-01
12	3.88E-02	1.00E-03	2.25E-03	4.94E-02	8.79E-01	1.55E-01	2.50E-02	6.09E-03	8.77E-02	1.61E-01
13	3.91E-02	1.00E-03	2.25E-03	4.95E-02	8.87E-01	2.48E-01	4.00E-02	8.13E-03	1.21E-01	1.61E-01

A	AR	AS	AT	AU	AV
1					
2					
3					
4					
5					
6	tracer	sample	sample	sample	sample
7	NCRt	Sbkg	CUb2s	TPUb1S	TPUb2s
8	1.89E+00	4.90E-03	2.67E-02	1.36E-02	2.67E-02
9	2.03E+00	2.83E-03	2.43E-01	4.01E-01	7.85E-01
10	1.81E+00	2.45E-03	1.08E-01	6.14E-02	1.20E-01
11	2.01E+00	3.47E-03	6.41E-02	3.38E-02	6.62E-02
12	1.82E+00	3.47E-03	7.41E-02	3.90E-02	7.65E-02
13	1.83E+00	5.10E-03	9.88E-02	5.28E-02	1.03E-01

199
001194
8019

A	A	B	C	D	E	F	G	H	I	J	K
1		Client:	Hayden			QC Method:	WR-DC-341				
2		Set ID:	96E-0640-02			QC Matrix:	FILTER				
3		Group ID:	G969703P			Prep Date:	18-OCT-1996 00:00				
4		Analyte:	Uranium-235			Release #:	NONE				
5		Units:	pCi/Sample			File Name:	69703PU5.txt				
6					sample	tracer					tracer
7	S TYPE	FIELD NAME	SAMPLE NAME	SAMPLE ID	ABNs	ABNt	CF	T1/2 years	sEFF	sSTSt	STSt dpm
8	B	BL-123238-1	BL-123238-1	S96970CC	8.09E-01	1.00E+00	1.00E+00	7.04E+08	7.20E-03	8.49E+02	4.45E+04
9	Q	QC-123238-1	QC-123238-1	S96970CD	8.09E-01	1.00E+00	1.00E+00	7.04E+08	7.20E-03	8.49E+02	4.45E+04
10	O	9131,39,40	96E04514	S968S06B	8.09E-01	1.00E+00	1.00E+00	7.04E+08	7.20E-03	8.49E+02	4.45E+04
11	O	9135,41,42	96E04515	S968S06C	8.09E-01	1.00E+00	1.00E+00	7.04E+08	7.20E-03	8.49E+02	4.45E+04
12	O	9136,43,44	96E04516	S968S06D	8.09E-01	1.00E+00	1.00E+00	7.04E+08	7.20E-03	8.49E+02	4.45E+04
13	O	9137,45,46	96E04517	S968S06F	8.09E-01	1.00E+00	1.00E+00	7.04E+08	7.20E-03	8.49E+02	4.45E+04

8019

001195 200

A	L	M	N	O	P	Q	R	S	T	U	V
1											
2											
3											
4											
5											
6		tracer						aliquot tracer	tracer	tracer	sample ct
7	sMASSt	MASSt g	sVOLt	sDILt	sDILs	sALIt	sALIs	ALIt mL,g	DILt	VOLt mL,g	T in min
8	6.70E-04	5.09E+00	9.00E-04	2.55E-02	1.00E-03	5.70E-04	1.00E-03	5.09E+00	5.00E+03	2.50E-01	9.99E+02
9	6.70E-04	5.09E+00	9.00E-04	2.55E-02	1.00E-03	5.70E-04	1.00E-03	5.09E+00	5.00E+03	2.50E-01	9.99E+02
10	6.70E-04	5.09E+00	9.00E-04	2.55E-02	1.00E-03	5.70E-04	1.00E-03	5.09E+00	5.00E+03	2.50E-01	9.99E+02
11	6.70E-04	5.09E+00	9.00E-04	2.55E-02	1.00E-03	5.70E-04	1.00E-03	5.09E+00	5.00E+03	2.50E-01	9.99E+02
12	6.70E-04	5.09E+00	9.00E-04	2.55E-02	1.00E-03	5.70E-04	1.00E-03	5.09E+00	5.00E+03	2.50E-01	9.99E+02
13	6.70E-04	5.09E+00	9.00E-04	2.55E-02	1.00E-03	5.70E-04	1.00E-03	5.09E+00	5.00E+03	2.50E-01	9.99E+02

001196 201

A	W	X	Y	Z	AA	AB	AC	AD	AE	AF	AG
1											
2											
3											
4											
5											
6	sample bkg	act tracer	sample ct	sample bkg	sample	tracer ct	tracer bkg	aliquot sam	delta time	sample	sam bkg ct r
7	Tb in min	AMTt dpm	Cgs	Csb	DILs dec	Cgt	Ctb	ALIs L,g	Dt in days	EFF c/d	Bsd
8	9.99E+02	1.12E+01	2.00E+00	3.00E+00	1.00E+00	1.89E+03	4.00E+00	1.00E+00	6.00E+00	1.92E-01	3.00E-03
9	9.98E+02	1.12E+01	1.08E+02	2.00E+00	1.00E+00	2.04E+03	7.00E+00	1.00E+00	6.00E+00	1.87E-01	2.00E-03
10	9.99E+02	1.12E+01	9.00E+00	3.00E+00	4.33E-01	1.81E+03	4.00E+00	1.00E+00	4.20E+01	1.84E-01	3.00E-03
11	9.99E+02	1.12E+01	6.00E+00	3.00E+00	4.79E-01	2.02E+03	7.00E+00	1.00E+00	4.20E+01	1.97E-01	3.00E-03
12	9.99E+02	1.12E+01	4.00E+00	2.00E+00	4.45E-01	1.83E+03	4.00E+00	1.00E+00	4.20E+01	1.85E-01	2.00E-03
13	9.99E+02	1.12E+01	1.00E+01	1.00E+00	4.45E-01	1.83E+03	2.00E+00	1.00E+00	4.20E+01	1.84E-01	1.00E-03

A	AH	AI	AJ	AK	AL	AM	AN	AO	AP	AQ
1										
2										
3										
4										
5										
6						sample	sample	sample	sample	
7	REeff	REall	REdil	REr	R	ACTb	NBCRs	sNBCRs	IDLC	K
8	3.74E-02	1.00E-03	1.00E-03	4.81E-02	8.78E-01	-3.30E-03	-1.00E-03	2.24E-03	3.55E-02	3.03E-01
9	3.85E-02	1.00E-03	1.00E-03	4.85E-02	9.70E-01	3.26E-01	1.06E-01	1.05E-02	2.86E-02	3.26E-01
10	3.90E-02	1.00E-03	2.31E-03	4.96E-02	8.77E-01	4.77E-02	6.01E-03	3.47E-03	8.57E-02	1.26E-01
11	3.65E-02	1.00E-03	2.09E-03	4.70E-02	9.12E-01	1.94E-02	3.00E-03	3.00E-03	6.97E-02	1.55E-01
12	3.88E-02	1.00E-03	2.25E-03	4.94E-02	8.79E-01	1.54E-02	2.00E-03	2.45E-03	7.14E-02	1.30E-01
13	3.91E-02	1.00E-03	2.25E-03	4.95E-02	8.87E-01	6.90E-02	9.01E-03	3.32E-03	5.65E-02	1.31E-01

202
001197

019
203
001198

A	AR	AS	AT	AU	AV
1	8				
2					
3					
4					
5					
6	tracer	sample	sample	sample	sample
7	NCRt	Sbkg	CUb2s	TPUb1S	TPUb2s
8	1.89E+00	2.45E-03	1.45E-02	7.38E-03	1.45E-02
9	2.03E+00	2.00E-03	6.32E-02	3.80E-02	7.45E-02
10	1.81E+00	2.45E-03	5.40E-02	2.77E-02	5.43E-02
11	2.01E+00	2.45E-03	3.81E-02	1.94E-02	3.81E-02
12	1.82E+00	2.00E-03	3.69E-02	1.88E-02	3.69E-02
13	1.83E+00	1.42E-03	4.98E-02	2.58E-02	5.06E-02

204
001199

A	A	B	C	D	E	F	G	H	I	J	K
1		Client:	Hayden			QC Method:	WR-DC-341				
2		Set ID:	96E-0640-02			QC Matrix:	FILTER				
3		Group ID:	G969703P			Prep Date:	18-OCT-1996 00:00				
4		Analyte:	Uranium-238			Release #:	NONE				
5		Units:	pCi/Sample			File Name:	69703PU8.txt				
6					sample	tracer					tracer
7	S TYPE	FIELD NAME	SAMPLE NAME	SAMPLE ID	ABNs	ABNt	CF	T1/2 years	sEFF	sSTSt	STSt dpm
8	B	BL-123238-1	BL-123238-1	S96970CC	9.98E-01	1.00E+00	1.00E+00	4.47E+09	7.20E-03	8.49E+02	4.45E+04
9	Q	QC-123238-1	QC-123238-1	S96970CD	9.98E-01	1.00E+00	1.00E+00	4.47E+09	7.20E-03	8.49E+02	4.45E+04
10	O	9131,39,40	96E04514	S968S06B	9.98E-01	1.00E+00	1.00E+00	4.47E+09	7.20E-03	8.49E+02	4.45E+04
11	O	9135,41,42	96E04515	S968S06C	9.98E-01	1.00E+00	1.00E+00	4.47E+09	7.20E-03	8.49E+02	4.45E+04
12	O	9136,43,44	96E04516	S968S06D	9.98E-01	1.00E+00	1.00E+00	4.47E+09	7.20E-03	8.49E+02	4.45E+04
13	O	9137,45,46	96E04517	S968S06F	9.98E-01	1.00E+00	1.00E+00	4.47E+09	7.20E-03	8.49E+02	4.45E+04

A	L	M	N	O	P	Q	R	S	T	U	V
1											
2											
3											
4											
5											
6		tracer						aliquot tracer	tracer	tracer	sample ct
7	sMASSt	MASSt g	sVOLt	sDILt	sDILs	sALIt	sALIs	ALIt mL,g	DILt	VOLt mL,g	T in min
8	6.70E-04	5.09E+00	9.00E-04	2.55E-02	1.00E-03	5.70E-04	1.00E-03	5.09E+00	5.00E+03	2.50E-01	9.99E+02
9	6.70E-04	5.09E+00	9.00E-04	2.55E-02	1.00E-03	5.70E-04	1.00E-03	5.09E+00	5.00E+03	2.50E-01	9.99E+02
10	6.70E-04	5.09E+00	9.00E-04	2.55E-02	1.00E-03	5.70E-04	1.00E-03	5.09E+00	5.00E+03	2.50E-01	9.99E+02
11	6.70E-04	5.09E+00	9.00E-04	2.55E-02	1.00E-03	5.70E-04	1.00E-03	5.09E+00	5.00E+03	2.50E-01	9.99E+02
12	6.70E-04	5.09E+00	9.00E-04	2.55E-02	1.00E-03	5.70E-04	1.00E-03	5.09E+00	5.00E+03	2.50E-01	9.99E+02
13	6.70E-04	5.09E+00	9.00E-04	2.55E-02	1.00E-03	5.70E-04	1.00E-03	5.09E+00	5.00E+03	2.50E-01	9.99E+02

A	W	X	Y	Z	AA	AB	AC	AD	AE	AF	AG
1											
2											
3											
4											
5											
6	sample bkg	act tracer	sample ct	sample bkg	sample	tracer ct	tracer bkg	aliquot sam	delta time	sample	sam bkg ct r
7	Tb in min	AMTt dpm	Cgs	Csb	DILs dec	Cgt	Ctb	ALIs L,g	Dt in days	EFF c/d	Bsd
8	9.99E+02	1.12E+01	6.00E+00	1.00E+01	1.00E+00	1.89E+03	4.00E+00	1.00E+00	6.00E+00	1.92E-01	1.00E-02
9	9.98E+02	1.12E+01	2.54E+03	5.00E+00	1.00E+00	2.04E+03	7.00E+00	1.00E+00	6.00E+00	1.87E-01	5.01E-03
10	9.99E+02	1.12E+01	3.70E+01	6.00E+00	4.33E-01	1.81E+03	4.00E+00	1.00E+00	4.20E+01	1.84E-01	6.01E-03
11	9.99E+02	1.12E+01	2.20E+01	3.00E+00	4.79E-01	2.02E+03	7.00E+00	1.00E+00	4.20E+01	1.97E-01	3.00E-03
12	9.99E+02	1.12E+01	1.50E+01	5.00E+00	4.45E-01	1.83E+03	4.00E+00	1.00E+00	4.20E+01	1.85E-01	5.01E-03
13	9.99E+02	1.12E+01	2.70E+01	5.00E+00	4.45E-01	1.83E+03	2.00E+00	1.00E+00	4.20E+01	1.84E-01	5.01E-03

001201 206

001202 207

A	AH	AI	AJ	AK	AL	AM	AN	AO	AP	AQ
1										
2										
3										
4										
5										
6						sample	sample	sample	sample	
7	REeff	REall	REdil	REr	R	ACTb	NBCRs	sNBCRs	IDLC	K
8	3.74E-02	1.00E-03	1.00E-03	4.81E-02	8.78E-01	-1.07E-02	-4.00E-03	4.00E-03	4.66E-02	3.74E-01
9	3.85E-02	1.00E-03	1.00E-03	4.85E-02	9.70E-01	6.32E+00	2.54E+00	5.05E-02	3.27E-02	4.02E-01
10	3.90E-02	1.00E-03	2.31E-03	4.96E-02	8.77E-01	2.00E-01	3.10E-02	6.56E-03	9.10E-02	1.55E-01
11	3.65E-02	1.00E-03	2.09E-03	4.70E-02	9.12E-01	9.97E-02	1.90E-02	5.01E-03	5.65E-02	1.91E-01
12	3.88E-02	1.00E-03	2.25E-03	4.94E-02	8.79E-01	6.23E-02	1.00E-02	4.48E-03	8.17E-02	1.61E-01
13	3.91E-02	1.00E-03	2.25E-03	4.95E-02	8.87E-01	1.37E-01	2.20E-02	5.66E-03	8.15E-02	1.61E-01

2019

001203 208

A	AR	AS	AT	AU	AV
1					
2					
3					
4					
5					
6	tracer	sample	sample	sample	sample
7	NCRt	Sbkg	CUb2s	TPUb1S	TPUb2s
8	1.89E+00	4.48E-03	2.10E-02	1.07E-02	2.10E-02
9	2.03E+00	3.17E-03	2.46E-01	4.11E-01	8.06E-01
10	1.81E+00	3.47E-03	8.29E-02	4.41E-02	8.65E-02
11	2.01E+00	2.45E-03	5.14E-02	2.69E-02	5.27E-02
12	1.82E+00	3.17E-03	5.46E-02	2.81E-02	5.51E-02
13	1.83E+00	3.17E-03	6.89E-02	3.62E-02	7.10E-02

6108019

001204 209

A	A	B	C	D	E	F	G	H	I	J	K
1		Client:	Hayden			QC Method:	WR-DC-341				
2		Set ID:	96E-0640-03			QC Matrix:	FILTER				
3		Group ID:	G969703Q			Prep Date:	18-OCT-1996 00:00				
4		Analyte:	Thorium-228			Release #:	NONE				
5		Units:	pCi/Sample			File Name:	69703QT8.txt				
6					sample	tracer					tracer
7	S TYPE	FIELD NAME	SAMPLE NAME	SAMPLE ID	ABNs	ABNt	CF	T1/2 years	sEFF	sSTSt	STSt dpm
8	B	BL-123239-1	BL-123239-1	S96970CF	9.99E-01	9.95E-01	1.00E+00	1.91E+00	7.20E-03	4.00E+02	5.30E+04
9	Q	QC-123239-1	QC-123239-1	S96970CG	9.99E-01	9.95E-01	1.00E+00	1.91E+00	7.20E-03	4.00E+02	5.30E+04
10	O	9131,39,40	96E04514	S968S06G	9.99E-01	9.95E-01	1.00E+00	1.91E+00	7.20E-03	4.00E+02	5.30E+04
11	O	9135,41,42	96E04515	S968S06H	9.99E-01	9.95E-01	1.00E+00	1.91E+00	7.20E-03	4.00E+02	5.30E+04
12	O	9136,43,44	96E04516	S968S06J	9.99E-01	9.95E-01	1.00E+00	1.91E+00	7.20E-03	4.00E+02	5.30E+04
13	O	9137,45,46	96E04517	S968S06K	9.99E-01	9.95E-01	1.00E+00	1.91E+00	7.20E-03	4.00E+02	5.30E+04

A	L	M	N	O	P	Q	R	S	T	U	V
1											
2											
3											
4											
5											
6		tracer						aliquot tracer	tracer	tracer	sample ct
7	sMASSt	MASSt g	sVOLt	sDILt	sDILs	sALIt	sALIs	ALIt mL,g	DILt	VOLt mL,g	T in min
8	6.70E-04	1.97E+00	9.00E-04	7.98E-03	1.00E-03	5.00E-04	1.00E-03	1.97E+00	1.13E+03	1.00E-01	9.99E+02
9	6.70E-04	1.97E+00	9.00E-04	7.98E-03	1.00E-03	5.00E-04	1.00E-03	1.97E+00	1.13E+03	1.00E-01	9.99E+02
10	6.70E-04	1.97E+00	9.00E-04	7.98E-03	1.00E-03	5.00E-04	1.00E-03	1.97E+00	1.13E+03	1.00E-01	9.99E+02
11	6.70E-04	1.97E+00	9.00E-04	7.98E-03	1.00E-03	5.00E-04	1.00E-03	1.97E+00	1.13E+03	1.00E-01	9.99E+02
12	6.70E-04	1.97E+00	9.00E-04	7.98E-03	1.00E-03	5.00E-04	1.00E-03	1.97E+00	1.13E+03	1.00E-01	9.99E+02
13	6.70E-04	1.97E+00	9.00E-04	7.98E-03	1.00E-03	5.00E-04	1.00E-03	1.97E+00	1.13E+03	1.00E-01	9.99E+02

A	W	X	Y	Z	AA	AB	AC	AD	AE	AF	AG
1											
2											
3											
4											
5											
6	sample bkg	act tracer	sample ct	sample bkg	sample	tracer ct	tracer bkg	aliquot sam	delta time	sample	sam bkg ct r
7	Tb in min	AMTt dpm	Cgs	Csb	DILs dec	Cgt	Ctb	ALIs L,g	Dt in days	EFF c/d	Bsd
8	9.99E+02	1.07E+01	2.00E+01	9.00E+00	1.00E+00	1.71E+03	5.00E+00	1.00E+00	7.00E+00	1.85E-01	9.01E-03
9	9.99E+02	1.07E+01	1.50E+01	1.10E+01	1.00E+00	1.93E+03	2.00E+00	1.00E+00	7.00E+00	1.97E-01	1.10E-02
10	9.99E+02	2.16E+01	3.60E+01	5.00E+00	5.01E-01	3.41E+03	8.00E+00	1.00E+00	4.30E+01	1.84E-01	5.01E-03
11	9.99E+02	1.07E+01	2.40E+01	8.00E+00	4.71E-01	1.84E+03	3.00E+00	1.00E+00	4.30E+01	1.87E-01	8.01E-03
12	9.99E+02	1.07E+01	1.60E+01	3.00E+00	5.00E-01	1.67E+03	3.00E+00	1.00E+00	4.30E+01	1.93E-01	3.00E-03
13	9.99E+02	1.07E+01	1.40E+01	2.00E+00	4.99E-01	1.80E+03	2.00E+00	1.00E+00	4.30E+01	1.91E-01	2.00E-03

A	AH	AI	AJ	AK	AL	AM	AN	AO	AP	AQ
1										
2										
3										
4										
5										
6						sample	sample	sample	sample	
7	REeff	REali	REdil	REr	R	ACTb	NBCRs	sNBCRs	IDLC	K
8	3.88E-02	1.00E-03	1.00E-03	4.73E-02	8.64E-01	3.12E-02	1.10E-02	5.39E-03	4.73E-02	3.53E-01
9	3.65E-02	1.00E-03	1.00E-03	4.46E-02	9.15E-01	1.01E-02	4.00E-03	5.10E-03	4.57E-02	3.98E-01
10	3.91E-02	1.00E-03	2.00E-03	4.43E-02	8.59E-01	1.84E-01	3.10E-02	6.41E-03	7.79E-02	1.69E-01
11	3.86E-02	1.00E-03	2.13E-03	4.66E-02	9.22E-01	9.31E-02	1.60E-02	5.66E-03	9.23E-02	1.72E-01
12	3.73E-02	1.00E-03	2.00E-03	4.62E-02	8.10E-01	7.83E-02	1.30E-02	4.36E-03	6.48E-02	1.66E-01
13	3.78E-02	1.00E-03	2.00E-03	4.61E-02	8.81E-01	6.73E-02	1.20E-02	4.00E-03	5.21E-02	1.78E-01

0019
213
001208

A	AR	AS	AT	AU	AV
1					
2					
3					
4					
5					
6	tracer	sample	sample	sample	sample
7	NCRt	Sbkg	CUb2s	TPUb1S	TPUb2s
8	1.71E+00	4.25E-03	2.99E-02	1.54E-02	3.02E-02
9	1.93E+00	4.70E-03	2.52E-02	1.29E-02	2.52E-02
10	3.40E+00	3.17E-03	7.45E-02	3.96E-02	7.75E-02
11	1.84E+00	4.00E-03	6.45E-02	3.34E-02	6.54E-02
12	1.67E+00	2.45E-03	5.14E-02	2.67E-02	5.22E-02
13	1.79E+00	2.00E-03	4.40E-02	2.28E-02	4.47E-02

DataChem Laboratories

A	A	B	C	D	E	F	G	H	I	J	K
1		Client:	Hayden			QC Method:	WR-DC-341				
2		Set ID:	96E-0640-03			QC Matrix:	FILTER				
3		Group ID:	G969703Q			Prep Date:	18-OCT-1996 00:00				
4		Analyte:	Thorium-230			Release #:	NONE				
5		Units:	pCi/Sample			File Name:	69703QT0.txt				
6					sample	tracer					tracer
7	S TYPE	FIELD NAME	SAMPLE NAME	SAMPLE ID	ABNs	ABNt	CF	T1/2 years	sEFF	sSTSt	STSt dpm
8	B	BL-123239-1	BL-123239-1	S96970CF	9.98E-01	9.95E-01	1.00E+00	7.70E+04	7.20E-03	4.00E+02	5.30E+04
9	Q	QC-123239-1	QC-123239-1	S96970CG	9.98E-01	9.95E-01	1.00E+00	7.70E+04	7.20E-03	4.00E+02	5.30E+04
10	O	9131,39,40	96E04514	S968S06G	9.98E-01	9.95E-01	1.00E+00	7.70E+04	7.20E-03	4.00E+02	5.30E+04
11	O	9135,41,42	96E04515	S968S06H	9.98E-01	9.95E-01	1.00E+00	7.70E+04	7.20E-03	4.00E+02	5.30E+04
12	O	9136,43,44	96E04516	S968S06J	9.98E-01	9.95E-01	1.00E+00	7.70E+04	7.20E-03	4.00E+02	5.30E+04
13	O	9137,45,46	96E04517	S968S06K	9.98E-01	9.95E-01	1.00E+00	7.70E+04	7.20E-03	4.00E+02	5.30E+04

0019
215
001210

A	L	M	N	O	P	Q	R	S	T	U	V
1											
2											
3											
4											
5											
6		tracer						aliquot tracer	tracer	tracer	sample ct
7	sMASSt	MASSt g	sVOLt	sDILt	sDILs	sALIt	sALIs	ALIt mL,g	DILt	VOLt mL,g	T in min
8	6.70E-04	1.97E+00	9.00E-04	7.98E-03	1.00E-03	5.00E-04	1.00E-03	1.97E+00	1.13E+03	1.00E-01	9.99E+02
9	6.70E-04	1.97E+00	9.00E-04	7.98E-03	1.00E-03	5.00E-04	1.00E-03	1.97E+00	1.13E+03	1.00E-01	9.99E+02
10	6.70E-04	1.97E+00	9.00E-04	7.98E-03	1.00E-03	5.00E-04	1.00E-03	1.97E+00	1.13E+03	1.00E-01	9.99E+02
11	6.70E-04	1.97E+00	9.00E-04	7.98E-03	1.00E-03	5.00E-04	1.00E-03	1.97E+00	1.13E+03	1.00E-01	9.99E+02
12	6.70E-04	1.97E+00	9.00E-04	7.98E-03	1.00E-03	5.00E-04	1.00E-03	1.97E+00	1.13E+03	1.00E-01	9.99E+02
13	6.70E-04	1.97E+00	9.00E-04	7.98E-03	1.00E-03	5.00E-04	1.00E-03	1.97E+00	1.13E+03	1.00E-01	9.99E+02

A	W	X	Y	Z	AA	AB	AC	AD	AE	AF	AG
1											
2											
3											
4											
5											
6	sample bkg	act tracer	sample ct	sample bkg	sample	tracer ct	tracer bkg	aliquot sam	delta time	sample	sam bkg ct r
7	Tb in min	AMTt dpm	Cgs	Csb	DILs dec	Cgt	Ctb	ALIs L,g	Dt in days	EFF c/d	Bsd
8	9.99E+02	1.07E+01	2.80E+01	3.00E+00	1.00E+00	1.71E+03	5.00E+00	1.00E+00	7.00E+00	1.85E-01	3.00E-03
9	9.99E+02	1.07E+01	1.94E+03	7.00E+00	1.00E+00	1.93E+03	2.00E+00	1.00E+00	7.00E+00	1.97E-01	7.01E-03
10	9.99E+02	2.16E+01	8.90E+01	6.00E+00	5.01E-01	3.41E+03	8.00E+00	1.00E+00	4.30E+01	1.84E-01	6.01E-03
11	9.99E+02	1.07E+01	6.70E+01	5.00E+00	4.71E-01	1.84E+03	3.00E+00	1.00E+00	4.30E+01	1.87E-01	5.01E-03
12	9.99E+02	1.07E+01	6.10E+01	3.00E+00	5.00E-01	1.67E+03	3.00E+00	1.00E+00	4.30E+01	1.93E-01	3.00E-03
13	9.99E+02	1.07E+01	5.70E+01	1.00E+00	4.99E-01	1.80E+03	2.00E+00	1.00E+00	4.30E+01	1.91E-01	1.00E-03

80019

001212 217

A	AH	AI	AJ	AK	AL	AM	AN	AO	AP	AQ
1	80									
2										
3										
4										
5										
6						sample	sample	sample	sample	
7	REeff	REali	REdil	REr	R	ACTb	NBCRs	sNBCRs	IDLC	K
8	3.88E-02	1.00E-03	1.00E-03	4.73E-02	8.64E-01	7.05E-02	2.50E-02	5.57E-03	3.04E-02	3.55E-01
9	3.65E-02	1.00E-03	1.00E-03	4.46E-02	9.15E-01	4.85E+00	1.94E+00	4.42E-02	3.76E-02	4.00E-01
10	3.91E-02	1.00E-03	2.00E-03	4.43E-02	8.59E-01	4.73E-01	8.31E-02	9.76E-03	8.04E-02	1.76E-01
11	3.86E-02	1.00E-03	2.13E-03	4.66E-02	9.22E-01	3.46E-01	6.21E-02	8.49E-03	7.32E-02	1.79E-01
12	3.73E-02	1.00E-03	2.00E-03	4.62E-02	8.10E-01	3.35E-01	5.81E-02	8.01E-03	6.22E-02	1.73E-01
13	3.78E-02	1.00E-03	2.00E-03	4.61E-02	8.81E-01	3.01E-01	5.61E-02	7:62E-03	3.96E-02	1.86E-01

A	AR	AS	AT	AU	AV
1					
2					
3					
4					
5					
6	tracer	sample	sample	sample	sample
7	NCRt	Sbkg	CUb2s	TPUb1S	TPUb2s
8	1.71E+00	2.45E-03	3.08E-02	1.63E-02	3.19E-02
9	1.93E+00	3.75E-03	2.17E-01	3.01E-01	5.89E-01
10	3.40E+00	3.47E-03	1.09E-01	6.22E-02	1.22E-01
11	1.84E+00	3.17E-03	9.28E-02	5.18E-02	1.01E-01
12	1.67E+00	2.45E-03	9.06E-02	5.03E-02	9.86E-02
13	1.79E+00	1.42E-03	8.03E-02	4.47E-02	8.77E-02

80169

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001214

A	A	B	C	D	E	F	G	H	I	J	K
1		Client:	Hayden			QC Method:	WR-DC-341				
2		Set ID:	96E-0640-03			QC Matrix:	FILTER				
3		Group ID:	G969703Q			Prep Date:	18-OCT-1996 00:00				
4		Analyte:	Thorium-232			Release #:	NONE				
5		Units:	pCi/Sample			File Name:	69703QT2.txt				
6					sample	tracer					tracer
7	S TYPE	FIELD NAME	SAMPLE NAME	SAMPLE ID	ABNs	ABNt	CF	T1/2 years	sEFF	sSTSt	STSt dpm
8	B	BL-123239-1	BL-123239-1	S96970CF	1.00E+00	9.95E-01	1.00E+00	1.41E+10	7.20E-03	4.00E+02	5.30E+04
9	Q	QC-123239-1	QC-123239-1	S96970CG	1.00E+00	9.95E-01	1.00E+00	1.41E+10	7.20E-03	4.00E+02	5.30E+04
10	O	9131,39,40	96E04514	S968S06G	1.00E+00	9.95E-01	1.00E+00	1.41E+10	7.20E-03	4.00E+02	5.30E+04
11	O	9135,41,42	96E04515	S968S06H	1.00E+00	9.95E-01	1.00E+00	1.41E+10	7.20E-03	4.00E+02	5.30E+04
12	O	9136,43,44	96E04516	S968S06J	1.00E+00	9.95E-01	1.00E+00	1.41E+10	7.20E-03	4.00E+02	5.30E+04
13	O	9137,45,46	96E04517	S968S06K	1.00E+00	9.95E-01	1.00E+00	1.41E+10	7.20E-03	4.00E+02	5.30E+04

8019

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001215

A	L	M	N	O	P	Q	R	S	T	U	V
1											
2											
3											
4											
5											
6		tracer						aliquot tracer	tracer	tracer	sample ct
7	sMASSt	MASSt g	sVOLt	sDILt	sDILs	sALIt	sALIs	ALIt mL,g	DILt	VOLt mL,g	T in min
8	6.70E-04	1.97E+00	9.00E-04	7.98E-03	1.00E-03	5.00E-04	1.00E-03	1.97E+00	1.13E+03	1.00E-01	9.99E+02
9	6.70E-04	1.97E+00	9.00E-04	7.98E-03	1.00E-03	5.00E-04	1.00E-03	1.97E+00	1.13E+03	1.00E-01	9.99E+02
10	6.70E-04	1.97E+00	9.00E-04	7.98E-03	1.00E-03	5.00E-04	1.00E-03	1.97E+00	1.13E+03	1.00E-01	9.99E+02
11	6.70E-04	1.97E+00	9.00E-04	7.98E-03	1.00E-03	5.00E-04	1.00E-03	1.97E+00	1.13E+03	1.00E-01	9.99E+02
12	6.70E-04	1.97E+00	9.00E-04	7.98E-03	1.00E-03	5.00E-04	1.00E-03	1.97E+00	1.13E+03	1.00E-01	9.99E+02
13	6.70E-04	1.97E+00	9.00E-04	7.98E-03	1.00E-03	5.00E-04	1.00E-03	1.97E+00	1.13E+03	1.00E-01	9.99E+02

80019

001216 221

A	W	X	Y	Z	AA	AB	AC	AD	AE	AF	AG
1											
2											
3											
4											
5											
6	sample bkg	act tracer	sample ct	sample bkg	sample	tracer ct	tracer bkg	aliquot sam	delta time	sample	sam bkg ct r
7	Tb in min	AMTt dpm	Cgs	Csb	DILs dec	Cgt	Ctb	ALIs L,g	Dt in days	EFF c/d	Bsd
8	9.99E+02	1.07E+01	3.00E+00	2.00E+00	1.00E+00	1.71E+03	5.00E+00	1.00E+00	7.00E+00	1.85E-01	2.00E-03
9	9.99E+02	1.07E+01	4.00E+00	3.00E+00	1.00E+00	1.93E+03	2.00E+00	1.00E+00	7.00E+00	1.97E-01	3.00E-03
10	9.99E+02	2.16E+01	1.10E+01	4.00E+00	5.01E-01	3.41E+03	8.00E+00	1.00E+00	4.30E+01	1.84E-01	4.00E-03
11	9.99E+02	1.07E+01	7.00E+00	2.00E+00	4.71E-01	1.84E+03	3.00E+00	1.00E+00	4.30E+01	1.87E-01	2.00E-03
12	9.99E+02	1.07E+01	7.00E+00	4.00E+00	5.00E-01	1.67E+03	3.00E+00	1.00E+00	4.30E+01	1.93E-01	4.00E-03
13	9.99E+02	1.07E+01	1.00E+00	1.00E+00	4.99E-01	1.80E+03	2.00E+00	1.00E+00	4.30E+01	1.91E-01	1.00E-03

8019

001217 222

A	AH	AI	AJ	AK	AL	AM	AN	AO	AP	AQ
1										
2										
3										
4										
5										
6						sample	sample	sample	sample	
7	REeff	REall	REdil	REr	R	ACTb	NBCRs	sNBCRs	IDLC	K
8	3.88E-02	1.00E-03	1.00E-03	4.73E-02	8.64E-01	2.82E-03	1.00E-03	2.24E-03	2.62E-02	3.55E-01
9	3.65E-02	1.00E-03	1.00E-03	4.46E-02	9.15E-01	2.50E-03	1.00E-03	2.65E-03	2.69E-02	4.01E-01
10	3.91E-02	1.00E-03	2.00E-03	4.43E-02	8.59E-01	3.98E-02	7.01E-03	3.88E-03	6.83E-02	1.76E-01
11	3.86E-02	1.00E-03	2.13E-03	4.66E-02	9.22E-01	2.79E-02	5.01E-03	3.00E-03	5.17E-02	1.80E-01
12	3.73E-02	1.00E-03	2.00E-03	4.62E-02	8.10E-01	1.73E-02	3.00E-03	3.32E-03	6.93E-02	1.74E-01
13	3.78E-02	1.00E-03	2.00E-03	4.61E-02	8.81E-01	0.00E+00	0.00E+00	1.42E-03	3.95E-02	1.86E-01

80119

001218 223

A	AR	AS	AT	AU	AV
1					
2					
3					
4					
5					
6	tracer	sample	sample	sample	sample
7	NCRt	Sbkg	CUb2s	TPUb1S	TPUb2s
8	1.71E+00	2.00E-03	1.23E-02	6.30E-03	1.23E-02
9	1.93E+00	2.45E-03	1.30E-02	6.61E-03	1.30E-02
10	3.40E+00	2.83E-03	4.32E-02	2.22E-02	4.34E-02
11	1.84E+00	2.00E-03	3.28E-02	1.68E-02	3.29E-02
12	1.67E+00	2.83E-03	3.75E-02	1.92E-02	3.75E-02
13	1.79E+00	1.42E-03	1.49E-02	7.60E-03	1.49E-02

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NOV 05 1996

Section 2. Instrument Performance and Calibration Data
α Spectrometry
Inventory Checklist

Alpha Spectrometry System, Batch QC Charts

☒ Primary Calibration
- ECSLOPE (Energy Calibration Slope)
- ECOFFSET (Energy Calibration Offset)
- FWHMCONSTANT (Constant FWHM)
- AVRGEFF (Average Efficiency)
- PSENERGY-PU239 (Peak Energy Pu-239)
- PSFWHM-PU239 (Peak FWHM Pu-239)
- NLACTVTY-PU239 (Decay Corrected Activity Pu-239)

☒ Secondary Calibration
- ECSLOPE (Energy Calibration Slope)
- ECOFFSET (Energy Calibration Offset)
- FWHMCONSTANT (Constant FWHM)
- PSENERGY-PU239 (Peak Energy Pu-239)
- PSFWHM-PU239 (Peak FWHM Pu-239)
- NLACTVTY-PU239 (Decay Corrected Activity Pu-239)

☒ Daily Pulsar Calibration
- PSENERGY-5000 (Peak Energy 5000 keV)
- PSCENTRD-5000 (Peak Centroid 5000 keV)
- PSFWHM-5000 (Peak FWHM 5000 keV)
- PSCTSS-5000 (Counts/Second 5000 keV)

☒ Weekly Background of Chamber
- BACKRATE (Background Rate)

Section 2. Instrument Performance and Calibration Data
α Spectrometry
Reviewer Checklist

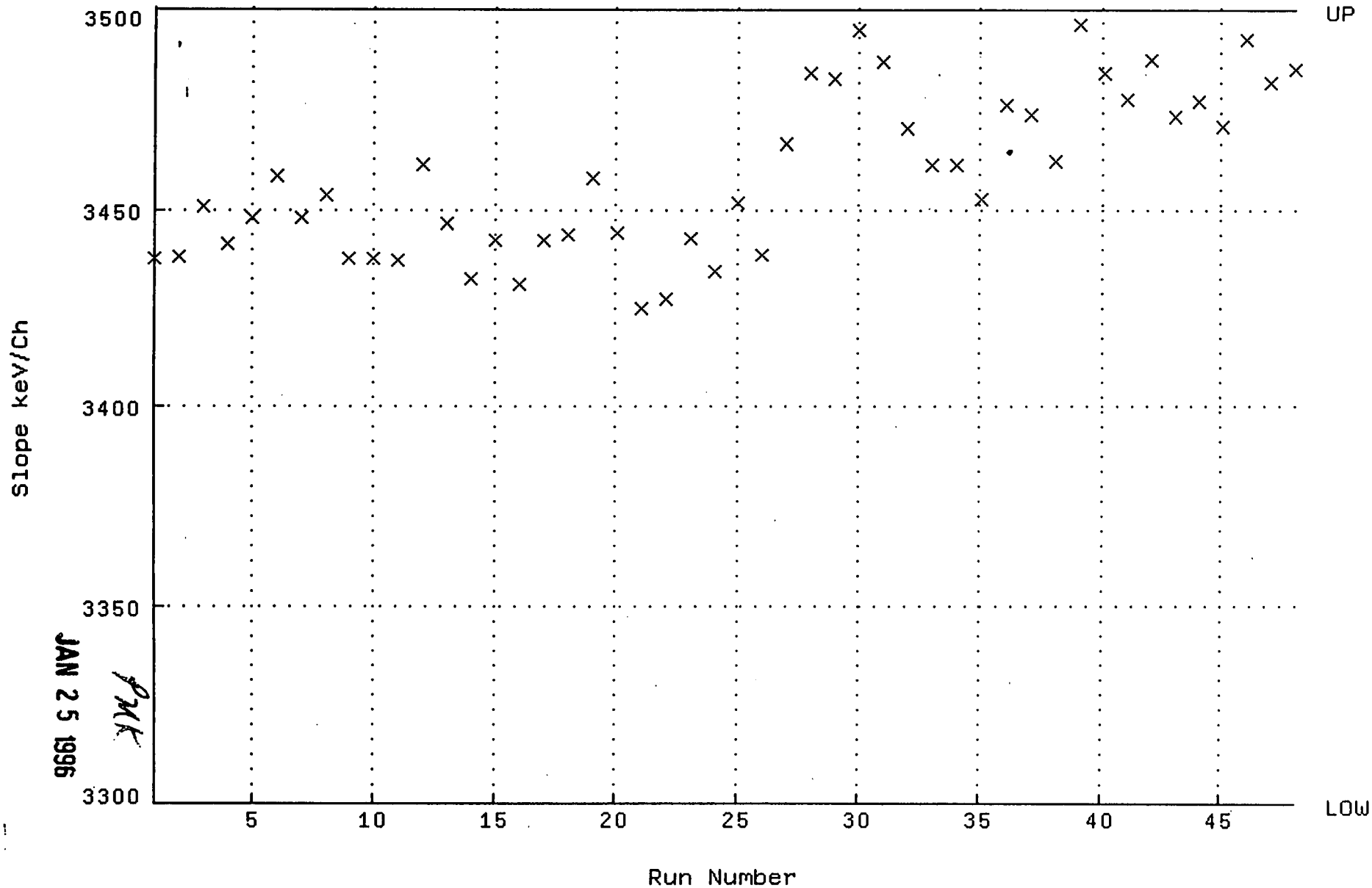
X The Instrument Performance and Calibration Data Inventory Checklist above is complete.

X Specified analytical protocols are followed for particular contract requirements.

X Conditions of instrument setup are noted.

NA NCR(s) noted, and affected instruments not used.

QA filename : DKA0:[ALPHA.ALUSR.QA.PRIME]BATCH_PRIME.QAF;47
Parameter Name : ECOFFSET (Slope keV/Ch)
Start/End Dates : 22-JAN-1996 09:02:47 through 24-JAN-1996 07:29:22
Lower/Upper Lmts: 3300.00 through 3500.00



JAN 25 1996

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001220

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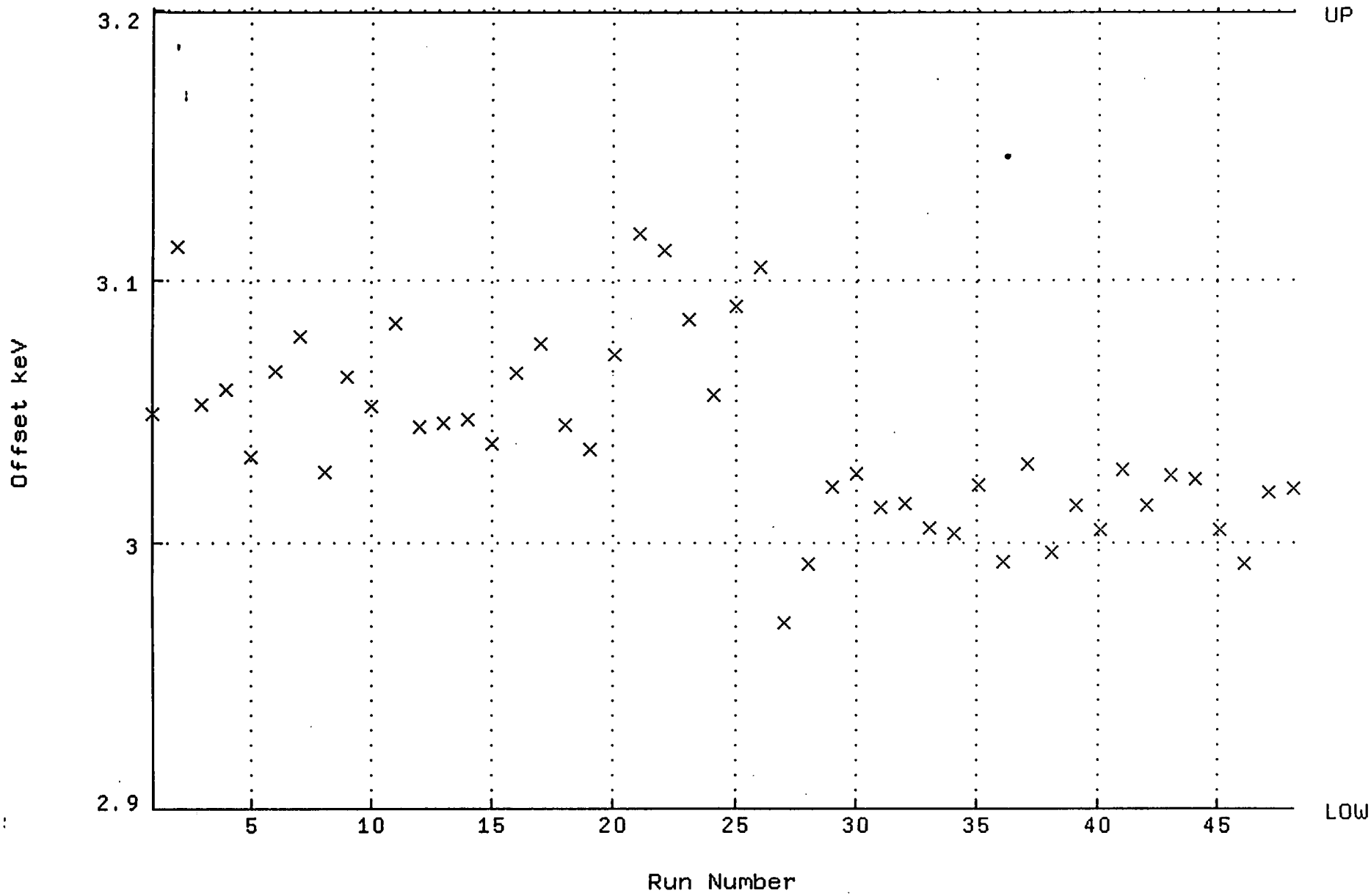
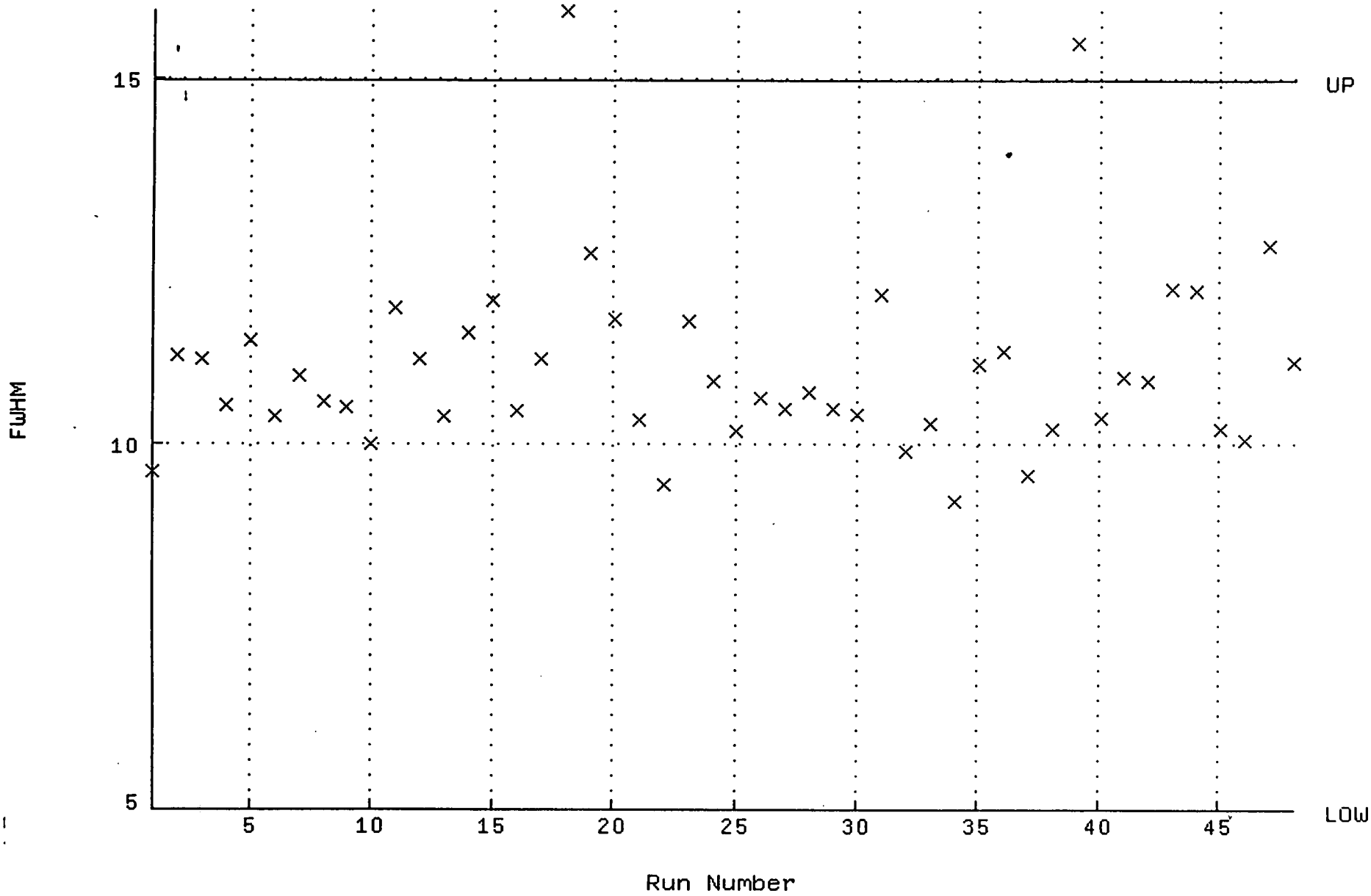
8019

QA filename : DKA0:[ALPHA.ALUSR.QA.PRIME]BATCH_PRIME.QAF;47
Parameter Name : ECSLOPE (Offset keV)
Start/End Dates : 22-JAN-1996 09:02:47 through 24-JAN-1996 07:29:22
Lower/Upper Lmts: 2.90000 through 3.20000

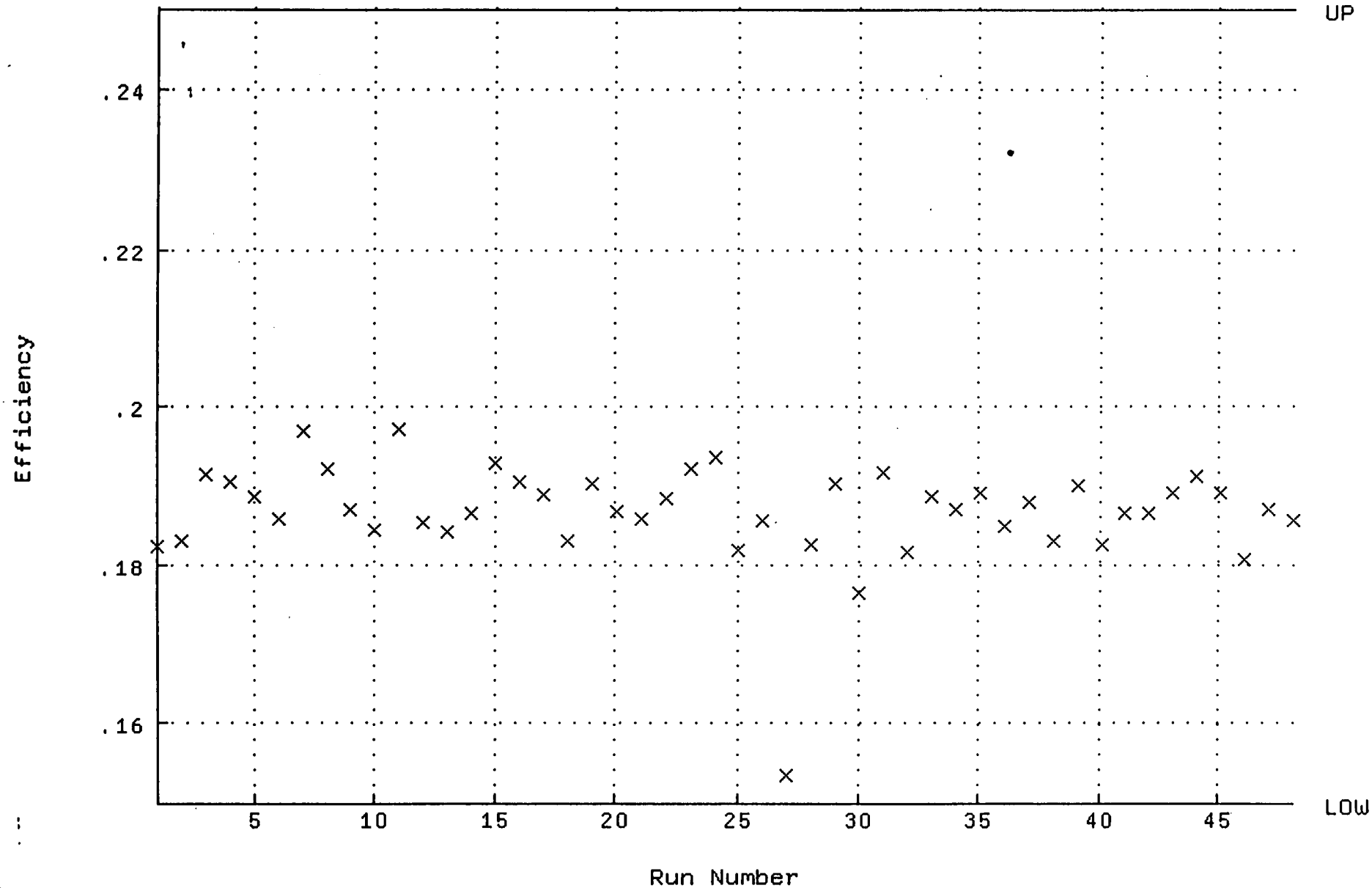


8019

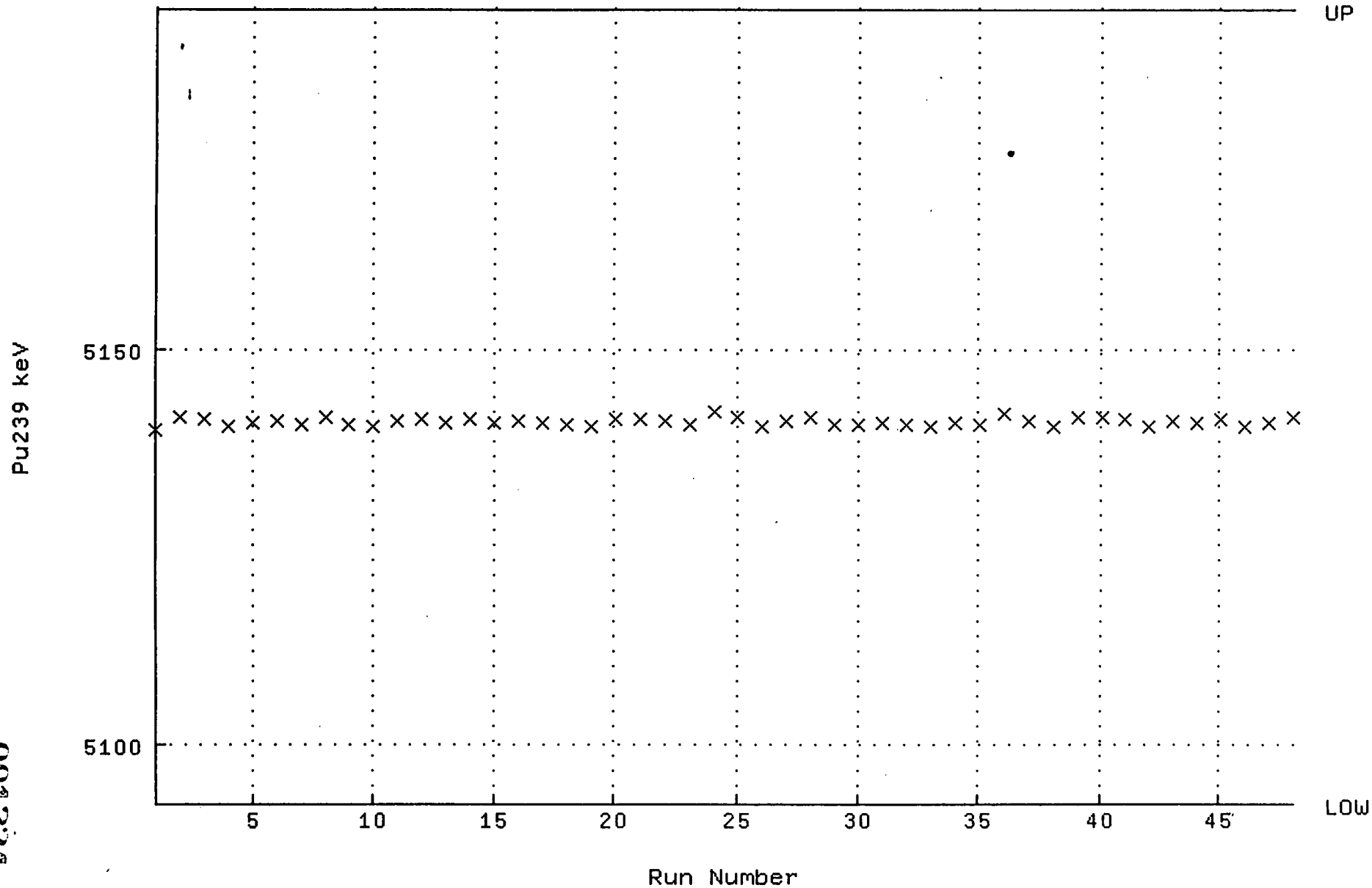
QA filename : DKA0:[ALPHA.ALUSR.QA.PRIME]BATCH_PRIME.QAF;47
Parameter Name : FWHMCONST (FWHM)
Start/End Dates : 22-JAN-1996 09:02:47 through 24-JAN-1996 07:29:22
Lower/Upper Lmts: 5.00000 through 15.0000



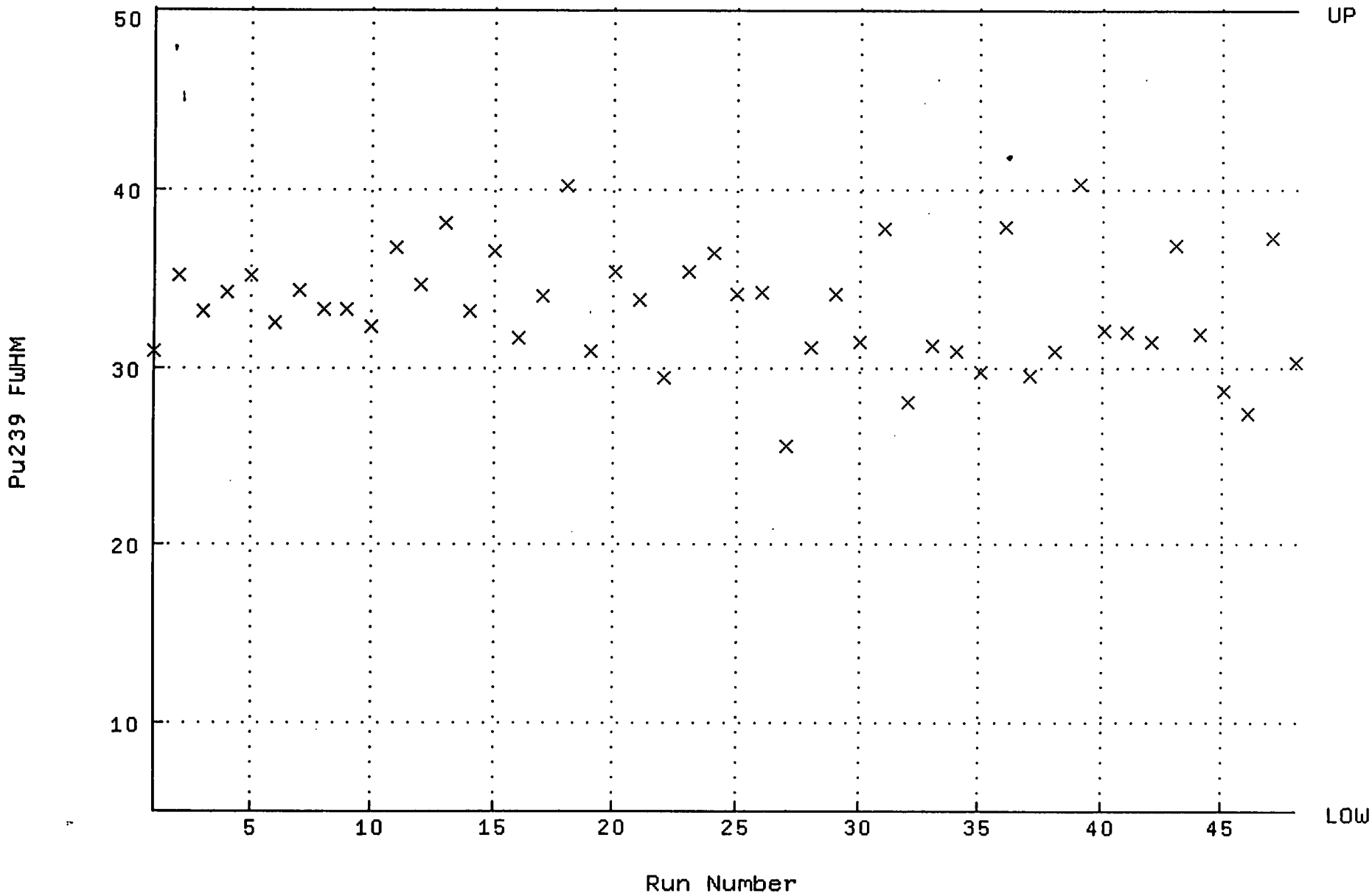
QA filename : DKA0:[ALPHA.ALUSR.QA.PRIME]BATCH_PRIME.QAF;47
Parameter Name : AVRGEFF (Efficiency)
Start/End Dates : 22-JAN-1996 09:02:47 through 24-JAN-1996 07:29:22
Lower/Upper Lmts: 0.150000 through 0.250000



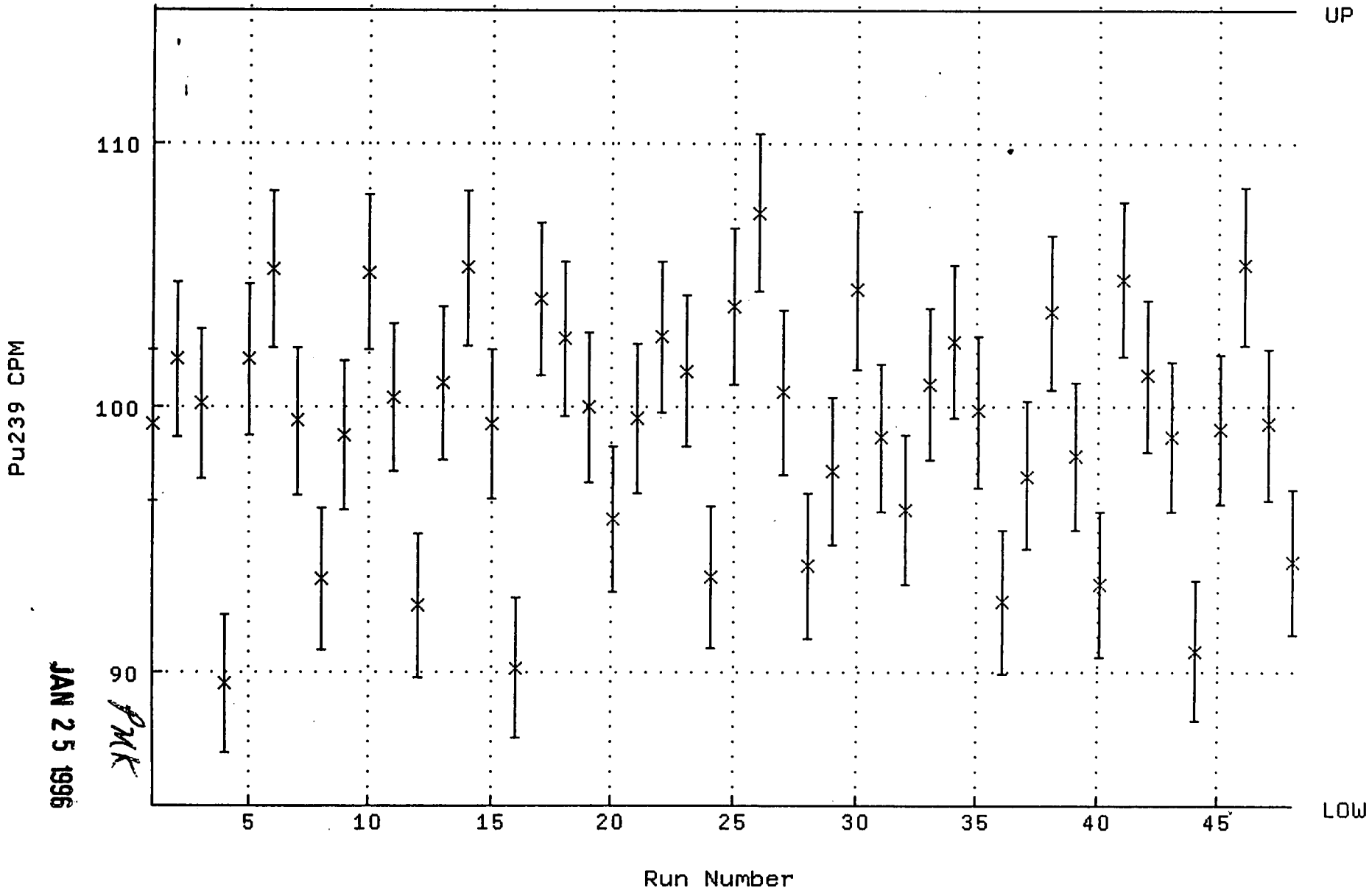
QA filename : DKA0:[ALPHA.ALUSR.QA.PRIME]BATCH_PRIME.QAF;47
Parameter Name : PSENERGY-PU239 (Pu239 keV)
Start/End Dates : 22-JAN-1996 09:02:47 through 24-JAN-1996 07:29:22
Lower/Upper Lmts: 5092.50 through 5192.50



QA filename : DKA0:[ALPHA.ALUSR.QA.PRIME]BATCH_PRIME.QAF;47
Parameter Name : PSFWHM-PU239 (Pu239 FWHM)
Start/End Dates : 22-JAN-1996 09:02:47 through 24-JAN-1996 07:29:22
Lower/Upper Lmts: 5.00000 through 50.0000



QA filename : DKA0:[ALPHA.ALUSR.QA.PRIME]BATCH_PRIME.QAF;47
Parameter Name : NLACTVTY-PU239 (Pu239 CPM)
Start/End Dates : 22-JAN-1996 09:02:47 through 24-JAN-1996 07:29:22
Lower/Upper Lmts: 85.0000 through 115.000



JAN 25 1996
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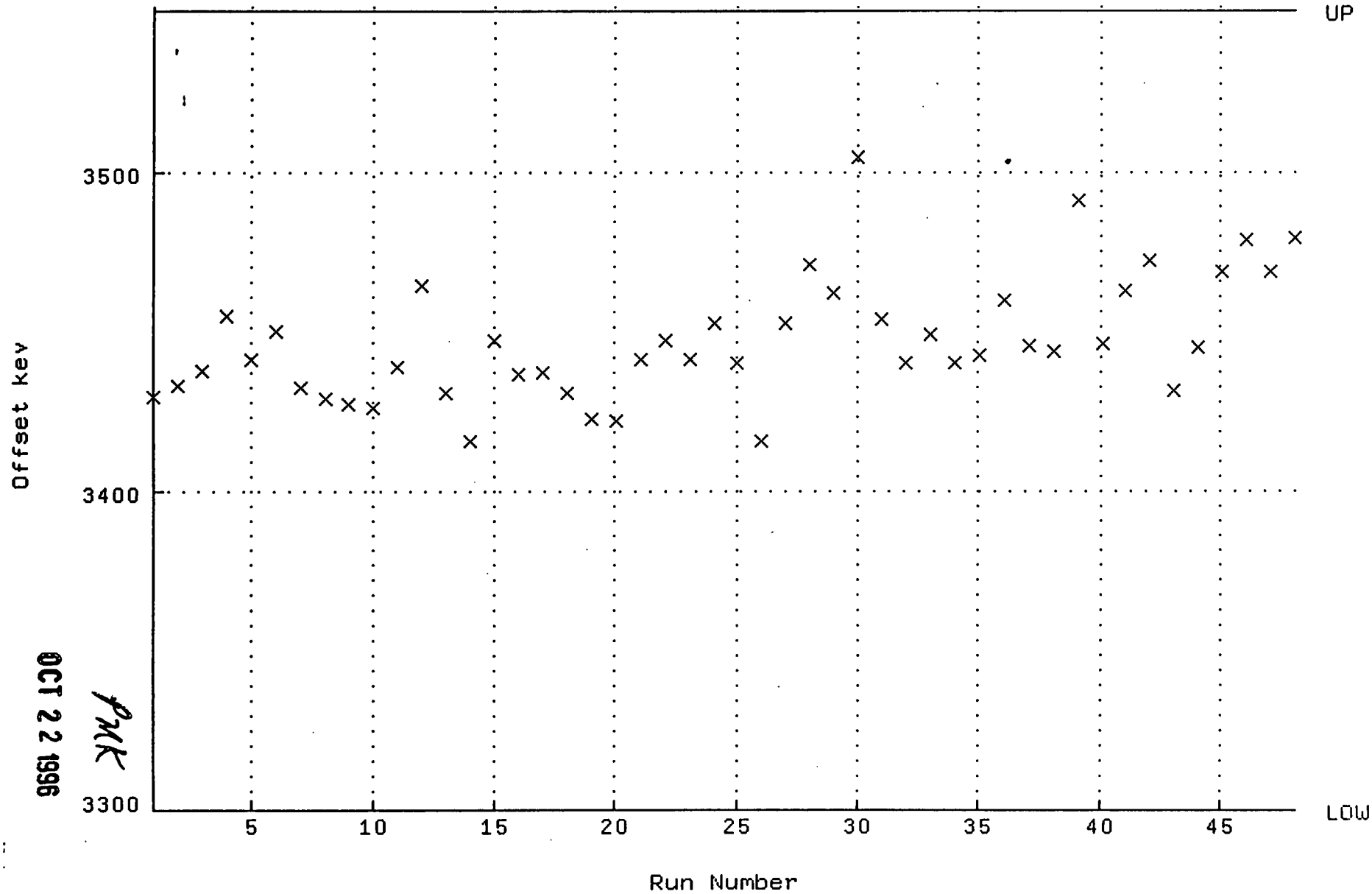
QA filename : DKA0:[ALPHA.ALUSR.QA.SECOND]BATCH_SECOND.QAF;242
Parameter Name : ECOFFSET (Offset kev)
Start/End Dates : 21-OCT-1996 10:05:04 through 21-OCT-1996 12:31:45
Lower/Upper Lmts: 3300.00 through 3550.00



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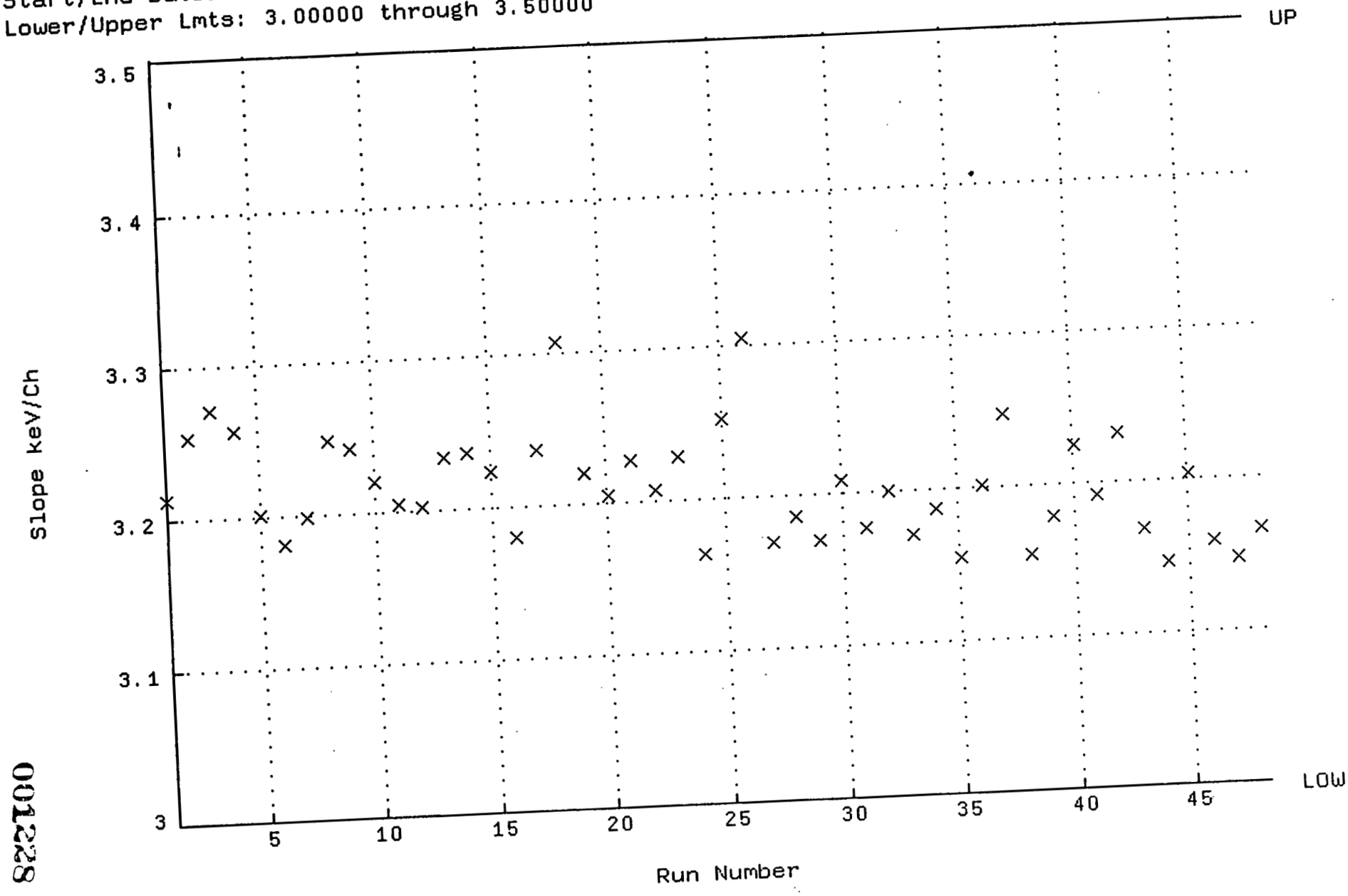
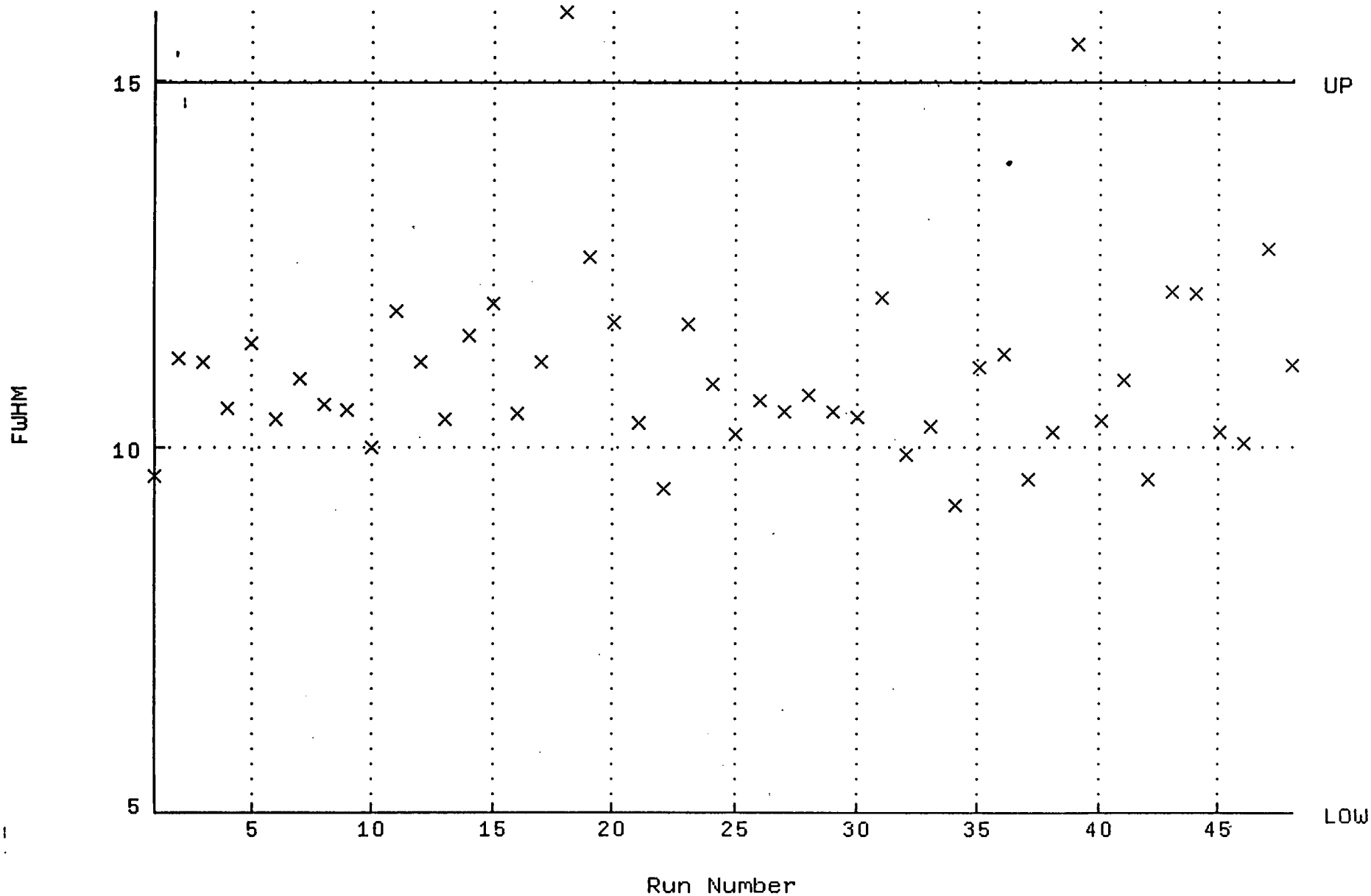
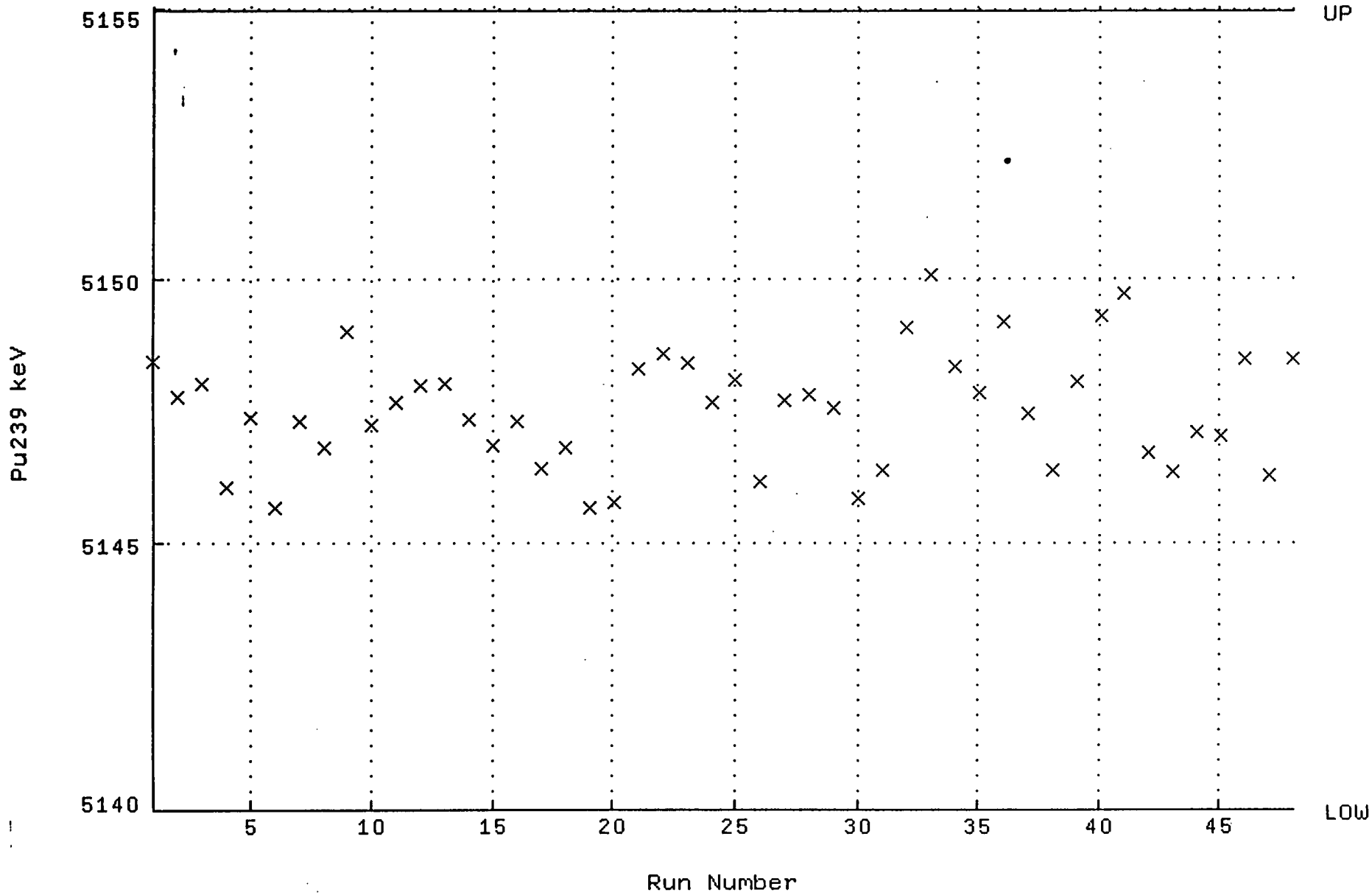
QA filename : DKA0:[ALPHA.ALUSR.QA.SECOND]BATCH_SECOND.QAF;242
Parameter Name : ECSLOPE (Slope keV/Ch)
Start/End Dates : 21-OCT-1996 10:05:04 through 21-OCT-1996 12:31:45
Lower/Upper Lmts: 3.00000 through 3.50000



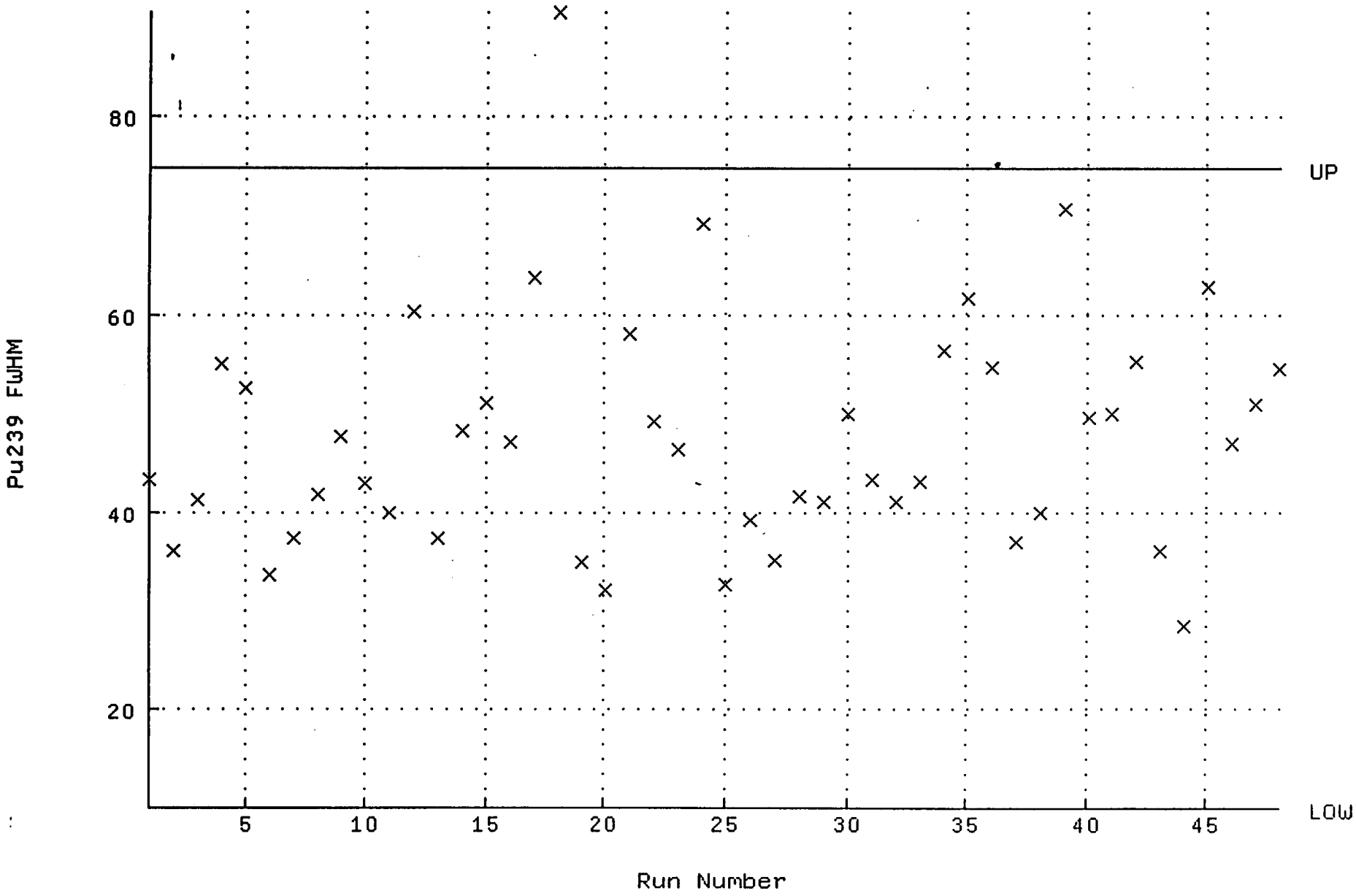
QA filename : DKA0:[ALPHA.ALUSR.QA.SECOND]BATCH_SECOND.QAF;242
Parameter Name : FWHMCONST (FWHM)
Start/End Dates : 21-OCT-1996 10:05:04 through 21-OCT-1996 12:31:45
Lower/Upper Lmts: 5.00000 through 15.0000



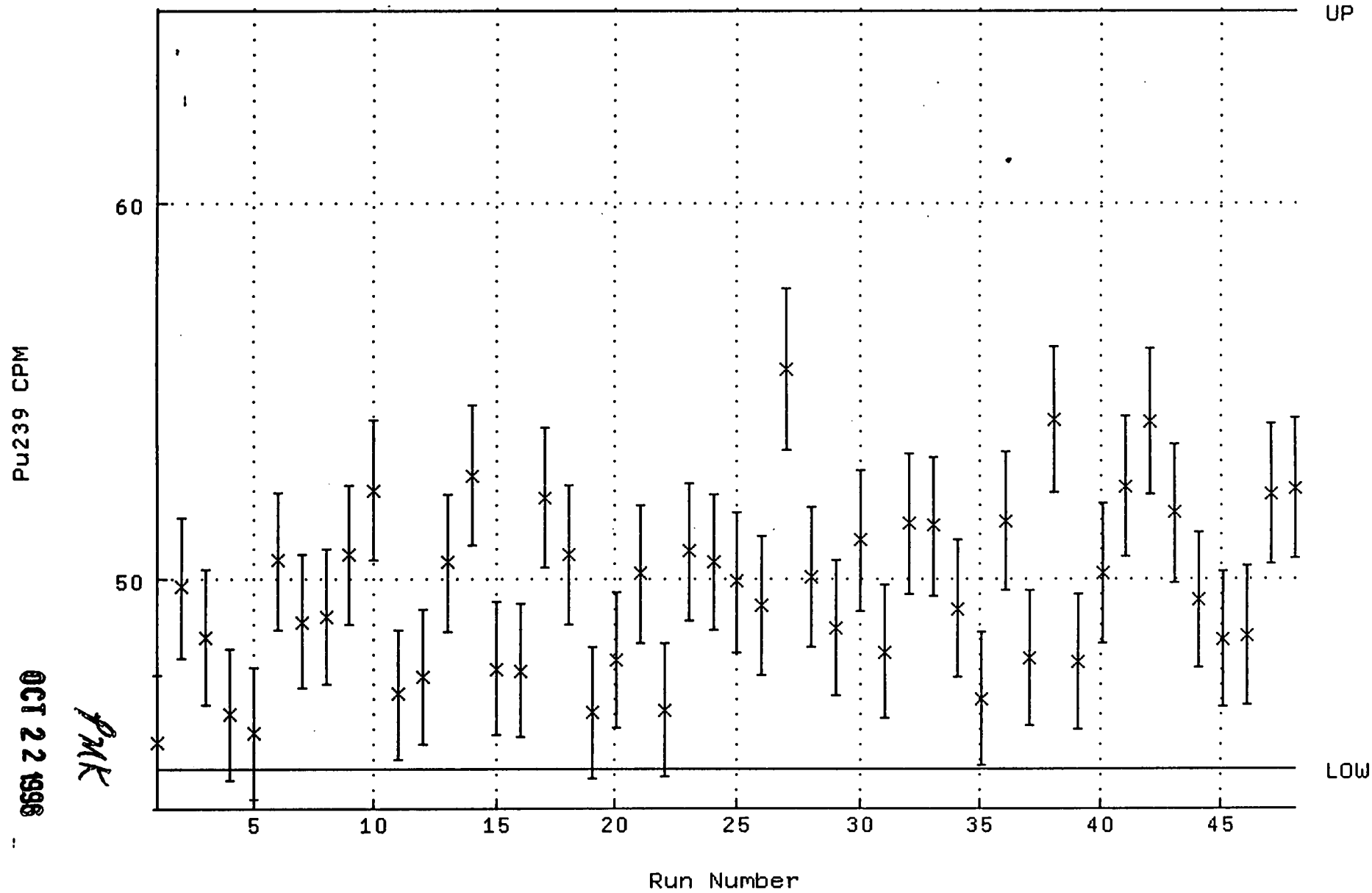
QA filename : DKA0:[ALPHA.ALUSR.QA.SECOND]BATCH_SECOND.QAF;242
Parameter Name : PSENERGY-PU239 (Pu239 keV)
Start/End Dates : 21-OCT-1996 10:05:04 through 21-OCT-1996 12:31:45
Lower/Upper Lmts: 5140.00 through 5155.00



QA filename : DKA0:[ALPHA.ALUSR.QA.SECOND]BATCH_SECOND.QAF;242
Parameter Name : PSFWHM-PU239 (Pu239 FWHM)
Start/End Dates : 21-OCT-1996 10:05:04 through 21-OCT-1996 12:31:45
Lower/Upper Lmts: 10.0000 through 75.0000



QA filename : DKA0:[ALPHA.ALUSR.QA.SECOND]BATCH_SECOND.QAF;242
Parameter Name : NLACTVTY-PU239 (Pu239 CPM)
Start/End Dates : 21-OCT-1996 10:05:04 through 21-OCT-1996 12:31:45
Lower/Upper Lmts: 45.0000 through 65.0000



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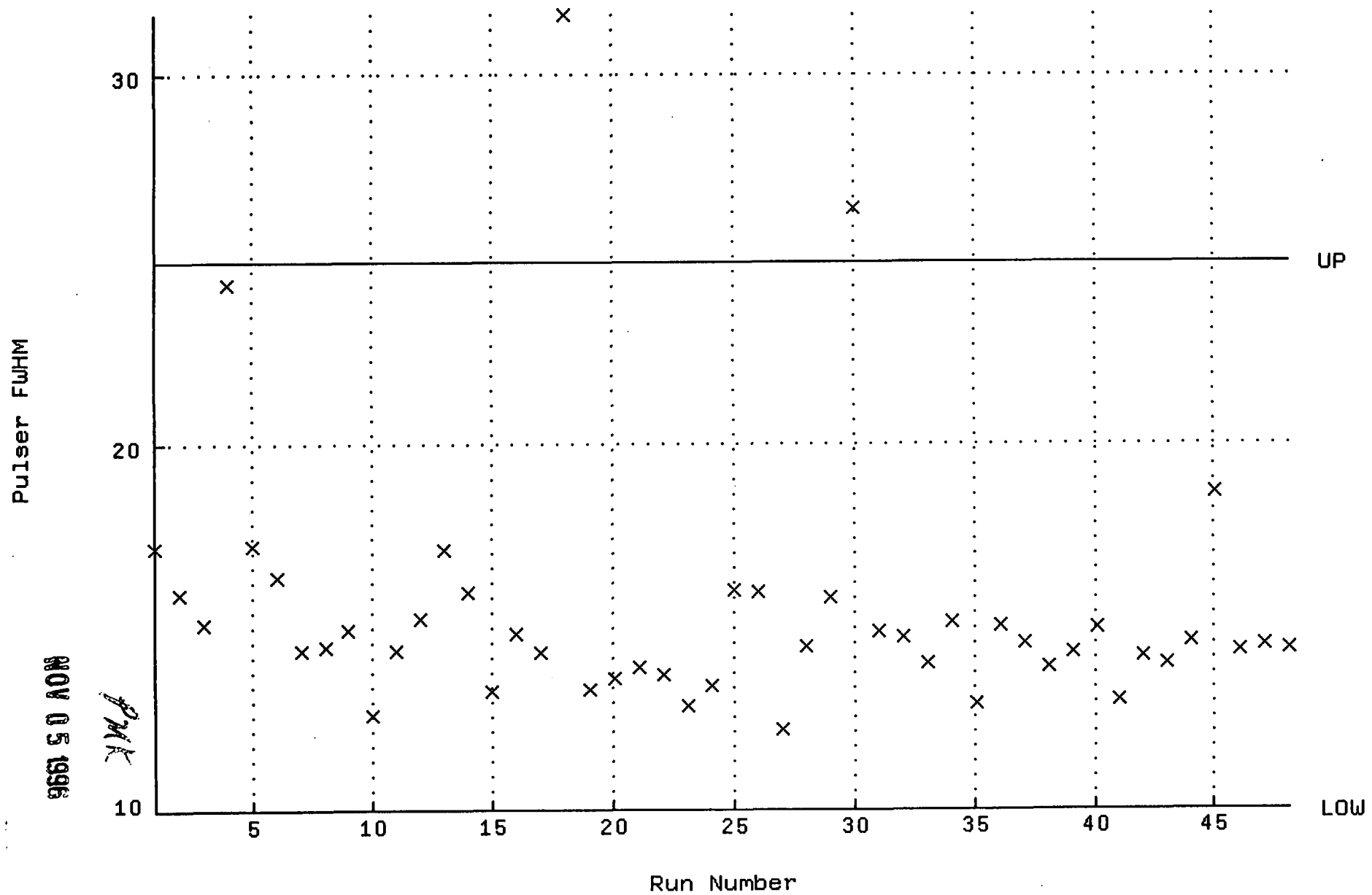
QA filename : DKA0:[ALPHA.ALUSR.QA.D]BATCH_D.QAF;677
Parameter Name : PSFWHM-5000 (Pulser FWHM)
Start/End Dates : 24-OCT-1996 08:27:45 through 24-OCT-1996 08:28:16
Lower/Upper Lmts: 10.0000 through 25.0000



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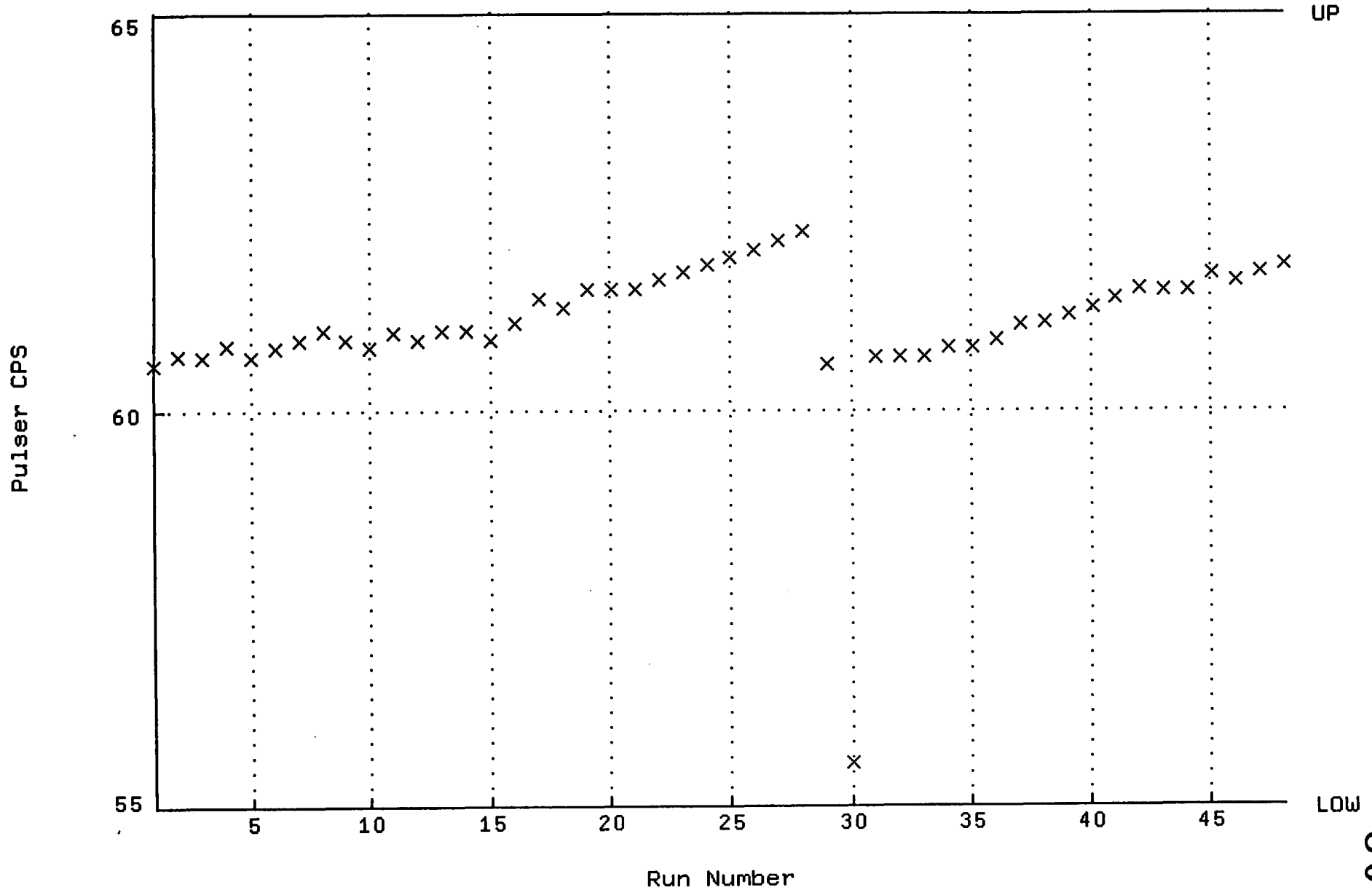
8019

QA filename : DKA0:[ALPHA.ALUSR.QA.D]BATCH_D.QAF;677
Parameter Name : PSCTSS-6000 (Pulser CPS)
Start/End Dates : 24-OCT-1996 08:27:45 through 24-OCT-1996 08:28:16
Lower/Upper Lmts: 55.0000 through 65.0000



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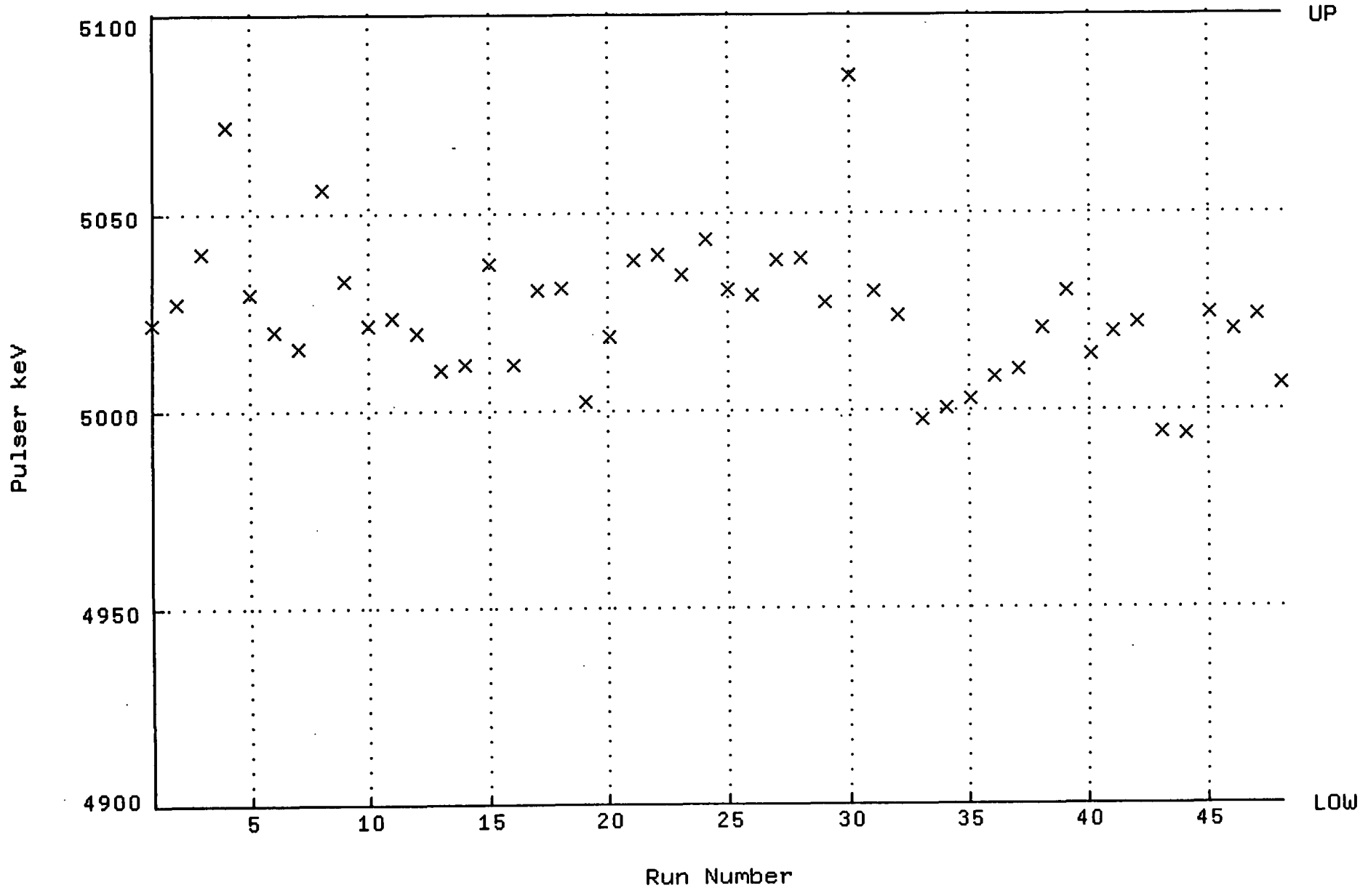
001234 ~~P3998~~

QA filename : DKA0:[ALPHA.ALUSR.QA.D]BATCH_D.QAF;677
Parameter Name : PSENERGY-5000 (Pulser keV)
Start/End Dates : 24-OCT-1996 08:27:45 through 24-OCT-1996 08:28:16
Lower/Upper Lmts: 4900.00 through 5100.00



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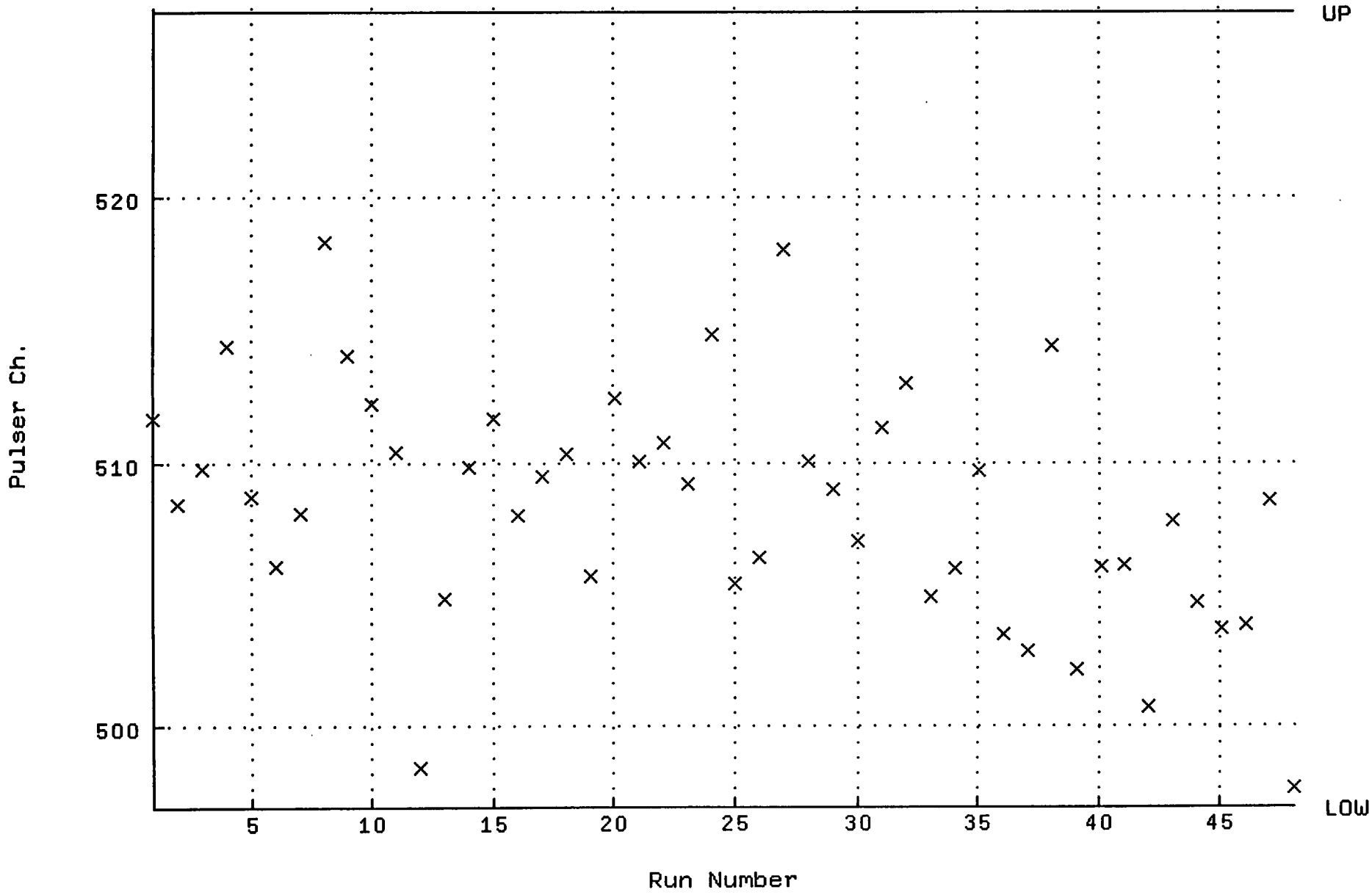
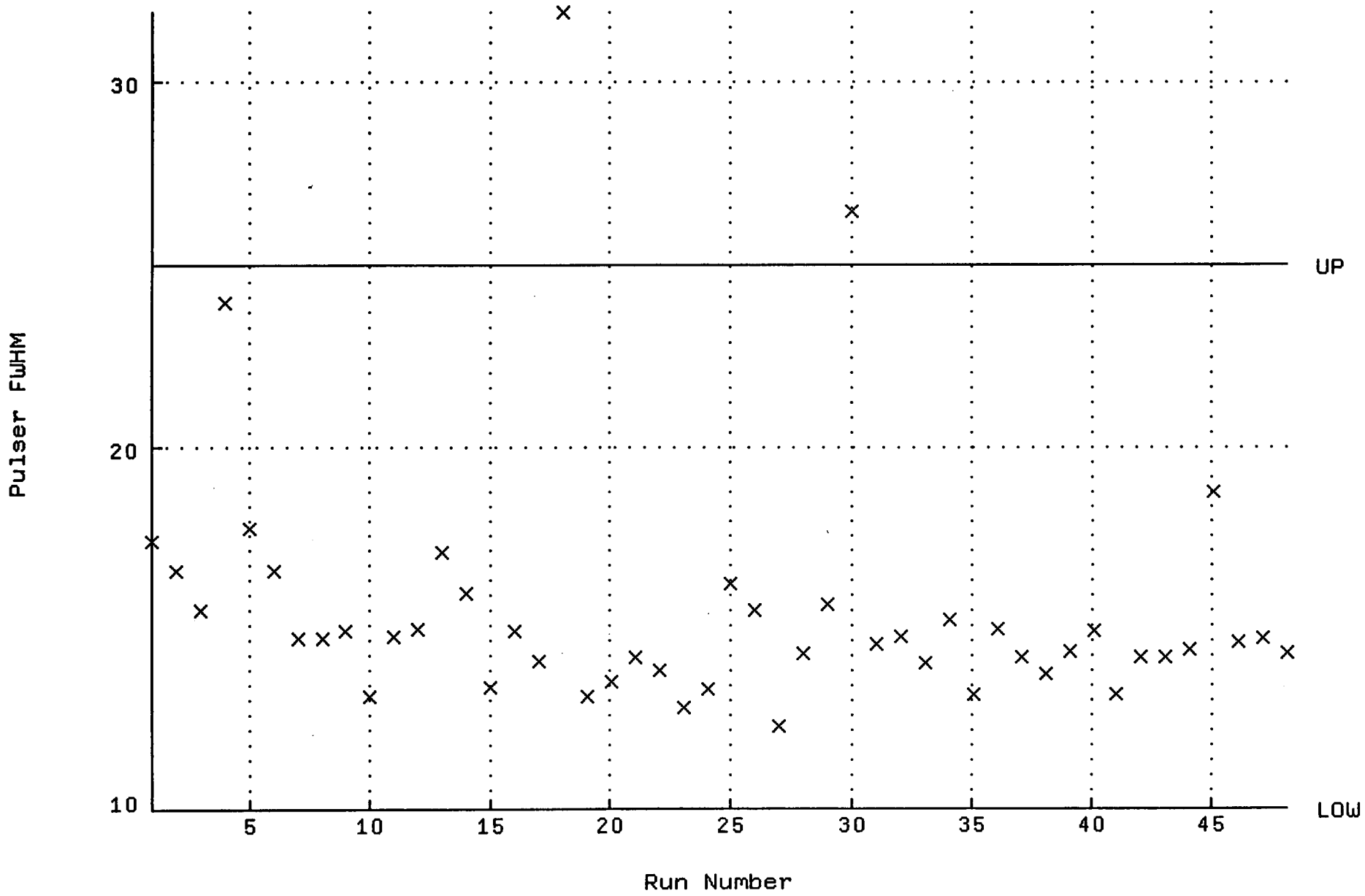
QA filename : DKA0:[ALPHA.ALUSR.QA.D]BATCH_D.QAF;677
Parameter Name : PSCENTRD-5000 (Pulser Ch.)
Start/End Dates : 24-OCT-1996 08:27:45 through 24-OCT-1996 08:28:16
Lower/Upper Lmts: 497.000 through 527.000



QA filename : DKA0:[ALPHA.ALUSR.QA.D]BATCH_D.QAF;678
Parameter Name : PSFWHM-5000 (Pulser FWHM)
Start/End Dates : 25-OCT-1996 10:18:59 through 25-OCT-1996 10:19:26
Lower/Upper Lmts: 10.0000 through 25.0000



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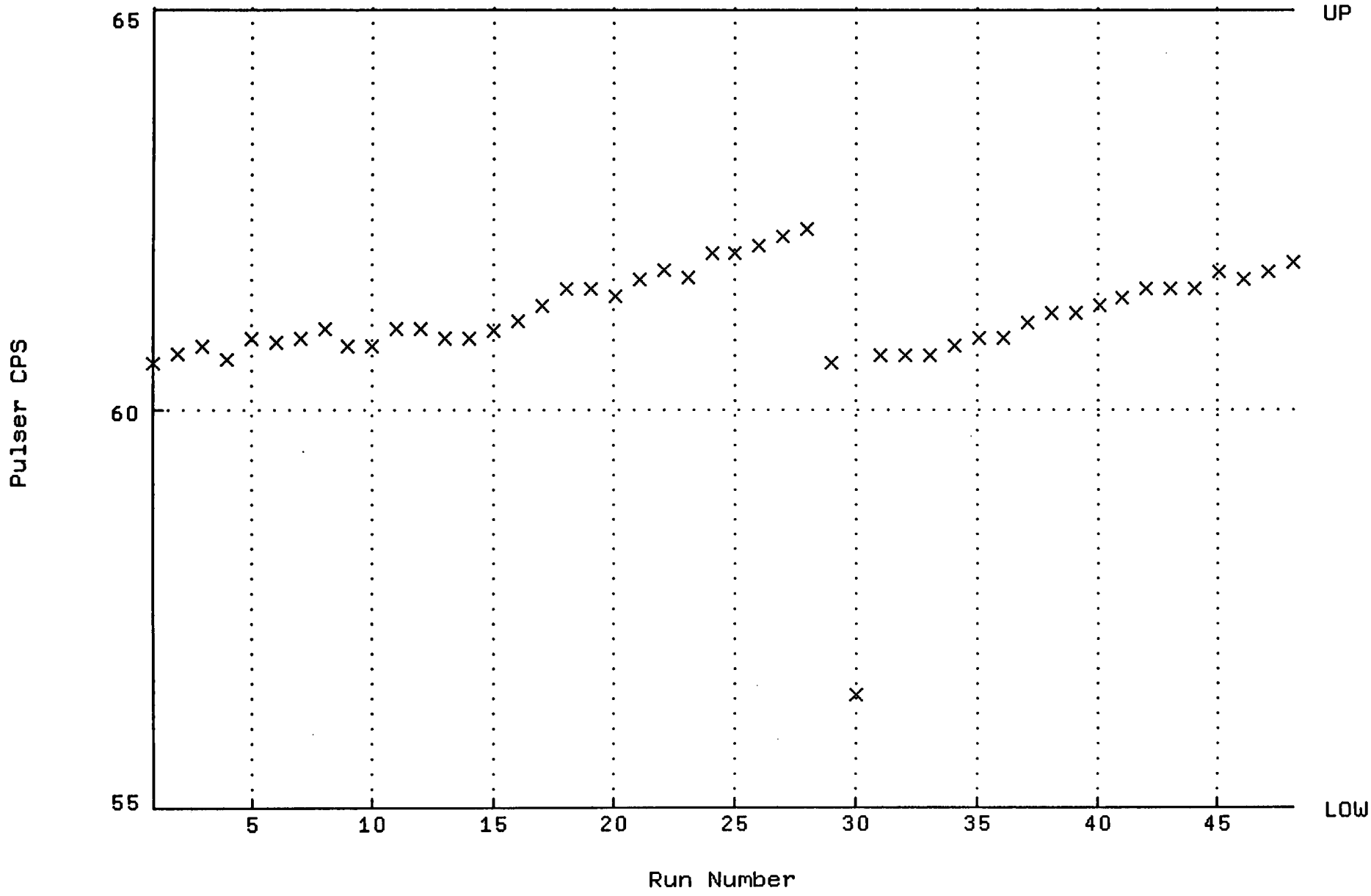
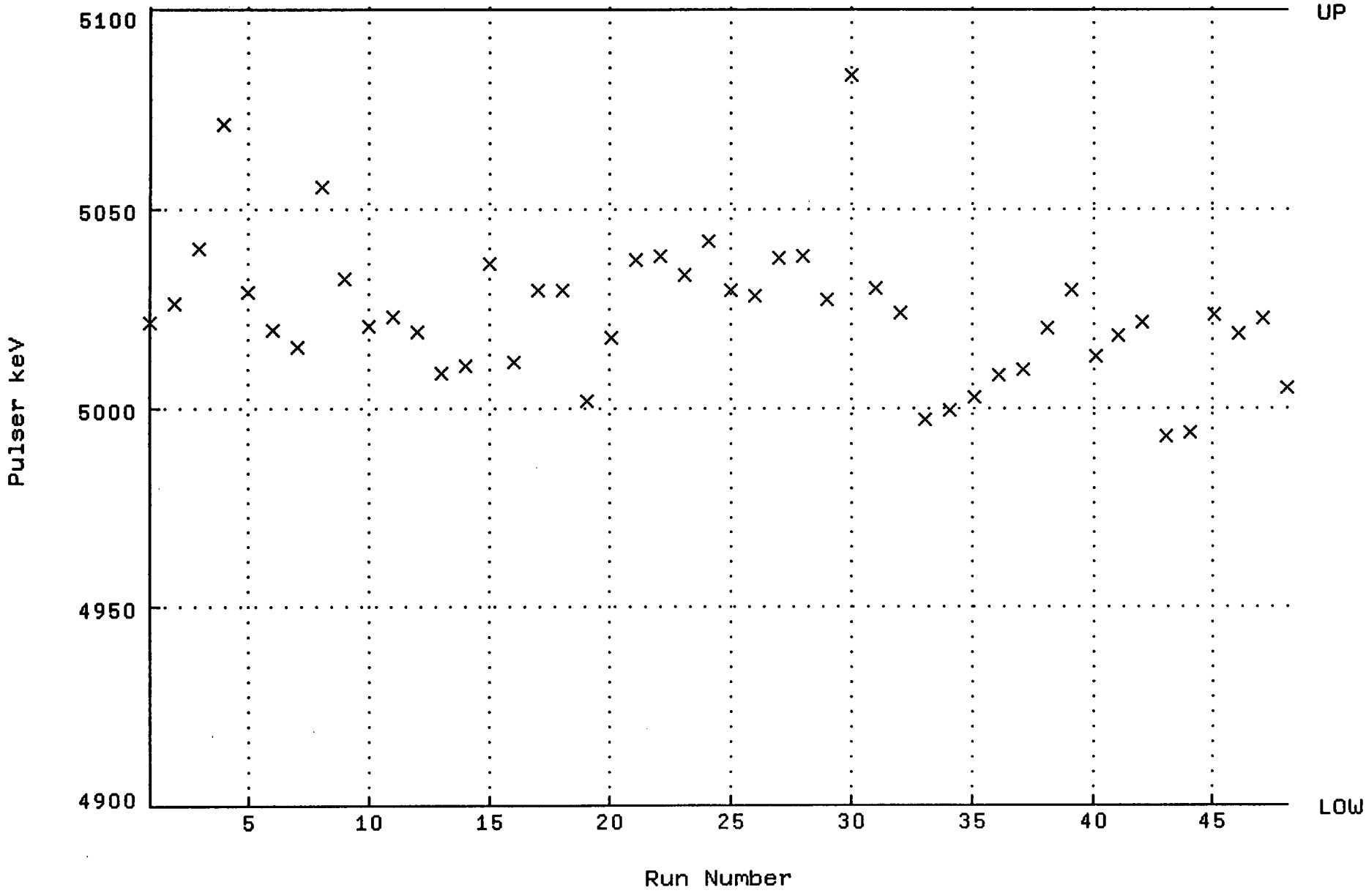
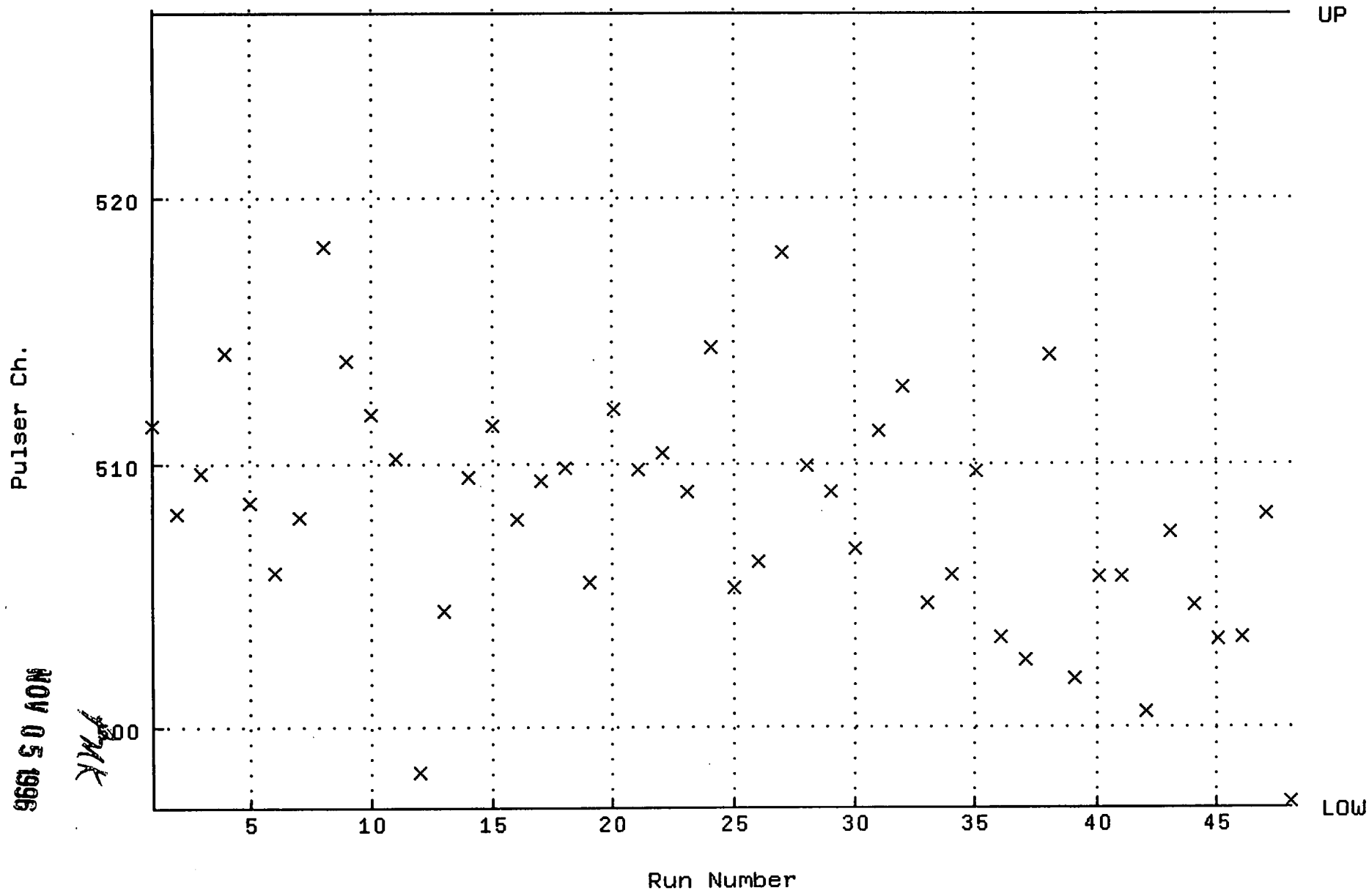
QA filename : DKA0:[ALPHA.ALUSR.QA.D]BATCH_D.QAF;678
Parameter Name : PSCTSS-5000 (Pulser CPS)
Start/End Dates : 25-OCT-1996 10:18:59 through 25-OCT-1996 10:19:26
Lower/Upper Lmts: 55.0000 through 65.0000



QA filename : DKA0:[ALPHA.ALUSR.QA.D]BATCH_D.QAF;678
Parameter Name : PSENERGY-5000 (Pulser keV)
Start/End Dates : 25-OCT-1996 10:18:59 through 25-OCT-1996 10:19:26
Lower/Upper Lmts: 4900.00 through 5100.00



QA filename : DKA0:[ALPHA.ALUSR.QA.D]BATCH_D.QAF;678
Parameter Name : PSCENTRD-5000 (Pulser Ch.)
Start/End Dates : 25-OCT-1996 10:18:59 through 25-OCT-1996 10:19:26
Lower/Upper Lmts: 497.000 through 527.000



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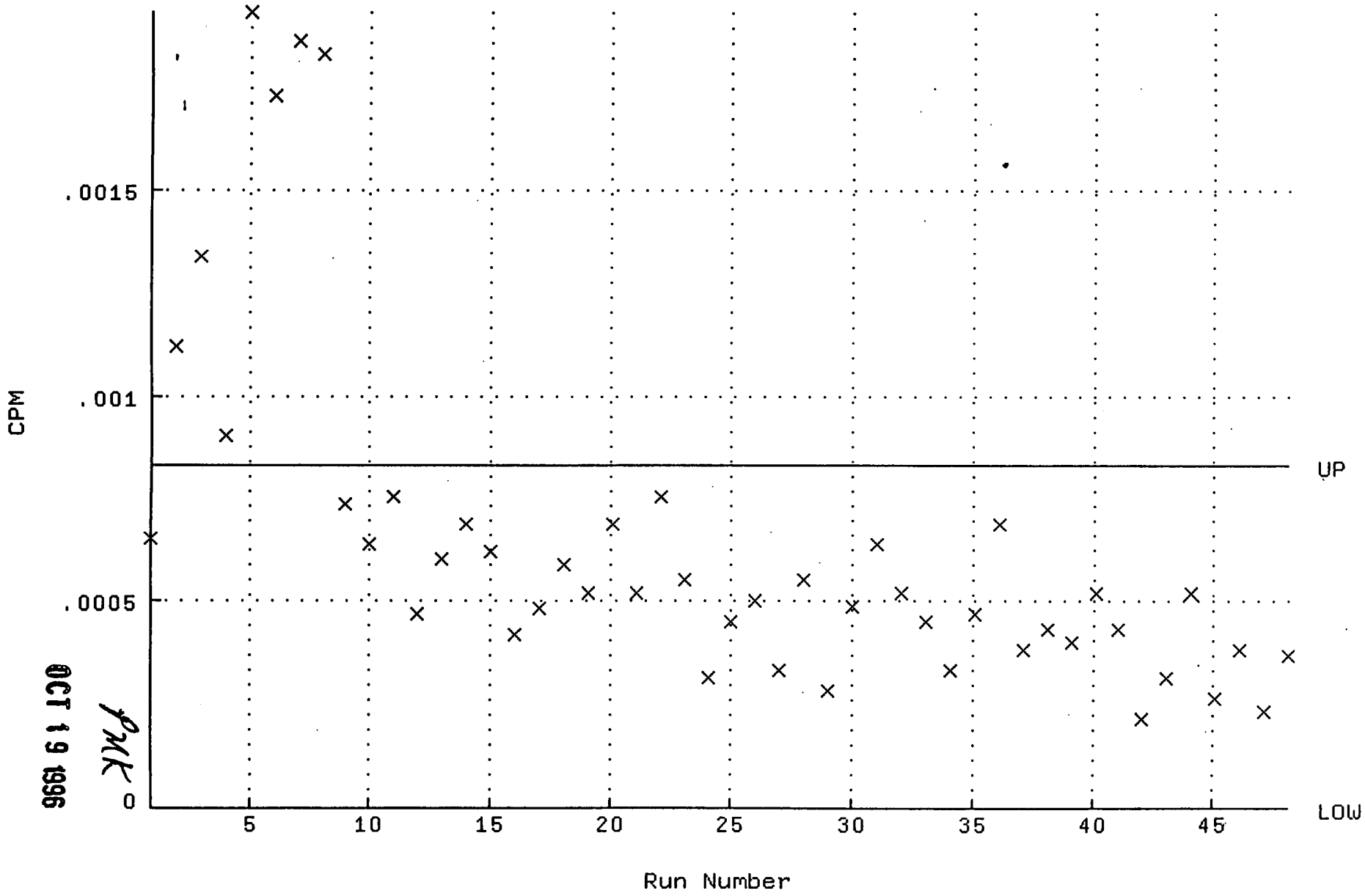
QA filename : DKA0:[ALPHA.ALUSR.QA.B]BATCH_B.QAF;209
Parameter Name : BACKRATE (CPM)
Start/End Dates : 18-OCT-1996 14:52:25 through 18-OCT-1996 14:53:49
Lower/Upper Lmts: -1.000000E-07 through 8.333000E-04



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