Wednesday, May 07, 2008

REQUEST NUMBER: 08-1101

LOS ALAMOS
NATIONAL LABORATORY

ATTN: Lance Steere
Paragon Analytics, Inc.
225 Commerce
Fort Collins, CO 80524

These Samples are on:
LANL Request Number:08-1101
Per Agreement Number:1-800-443-1511
Project Cost Code: WEPR 1314 0300

Please analyse the enclosed samples according to the schedule indicated:

SHIP DATE: 5/7/2008
TURNAROUND/REPORT DUE: 6/6/2008
TURNAROUND REQ'D: 30 Days

RAD SCREENING: Not Required
LAB REQUEST COMMENTS: Phils Sample

LANL ER SMO CONTACT:
Signature:

PRIORITY	METHOD CODE	CNTNR	SAMPLE ID	SAMPLE MATRIX	DATE SAMPLED	SAMPLE COMMENTS	SPECIAL INSTRUCTIONS
	EPA:900	1	SFB08-08-12411	S	4/16/2008	LA Monitor-vacuum bag, location LAM-0001	
		1	SFB08-08-12412	S	4/16/2008	LA Monitor-furnace filter, location LAM-0001	
	EPA:901.1	1	SFB08-08-12411	S	4/16/2008	LA Monitor-vacuum bag, location LAM-0001	
		1	SFB08-08-12412	S	4/16/2008	LA Monitor-furnace filter, location LAM-0001	
	EPA:905.0	1	SFB08-08-12411	S	4/16/2008	LA Monitor-vacuum bag, location LAM-0001	
		1	SFB08-08-12412	S	4/16/2008	LA Monitor-furnace filter, location LAM-0001	
	HASL-300:AM-241	1	SFB08-08-12411	S	4/16/2008	LA Monitor-vacuum bag, location LAM-0001	

PRIORITY	METHOD CODE	CNTNR	SAMPLE ID	SAMPLE MATRIX	DATE SAMPLED	SAMPLE COMMEN
	HASL-300:AM-241	1	SFB08-08-12412	S	4/16/2008	LA Monitor-furnace filte location LAM-0001
	HASL-300:ISOPU	1	SFB08-08-12411	S	4/16/2008	LA Monitor-vacuum bag location LAM-0001
		1	SFB08-08-12412	S	4/16/2008	LA Monitor-furnace filte location LAM-0001
	HASL-300:ISOU	1	SFB08-08-12411	S	4/16/2008	LA Monitor-vacuum bag location LAM-0001
		1	SFB08-08-12412	S	4/16/2008	LA Monitor-furnace filte location LAM-0001
	HASL-300:PO-210	1	SFB08-08-12411	S	4/16/2008	LA Monitor-vacuum bag location LAM-0001
		1	SFB08-08-12412	S	4/16/2008	LA Monitor-furnace filter location LAM-0001

Final Page of REQUEST NUMBER 08-1101

Wednesday, May 07, 2008

LAB CHAIN OF CUSTODY DOCUMENT NUMBER: 08-1101C

REQUEST NUMBER: 08-1101

LOS ALAMOS

NATIONAL LABORATORY

ATTN: Lance Steere

Paragon Analytics, Inc.

225 Commerce

Fort Collins, CO 80524

TURNAROUND/REPORT DUE: 6/6/2008

TURNAROUND REQ'D: 30

LAB REQUEST COMMENTS: Phils Samples

SAMPLE ID	CTNR	CTNR DESC	ORDER	PRESERV	MATRIX
SFB08-08-12411	1	1 L POLY	AM241+GS+ISOPU+ISOU+SR90	None	S
SFB08-08-12411	1	500 ML POLY	GROSSA+B	None	S
SFB08-08-12411	1	250 ML POLY	ISO_Po	Ice	S
SFB08-08-12412	1	1 L POLY	AM241+GS+ISOPU+ISOU+SR90	None	S
SFB08-08-12412	1	500 ML POLY	GROSSA+B	None	S
SFB08-08-12412	1	250 ML POLY	ISO_Po	Ice	S

Relinquished By: **Date** 5/7/08 **Time** 3:00

Printed Name Signature

Received By: **Date** **Time**

Printed Name Signature

Printed Name Signature

Printed Name Signature

Printed Name Signature

Printed Name Signature

Received for DISPOSAL By: **Date** **Time**

Printed Name Signature

Remarks:

Los Alamos National Laboratory

SAMPLE COLLECTION LOG/FIELD CHAIN OF CUSTODY

EVENT ID: 415

EVENT NAME: Dust Study, LA Monitor

SAMPLE ID: **SFB08-08-12412**

AS PLANNED **AS COLLECTED** **AS PLANNED**

Los Alamos National Laboratory

SAMPLE COLLECTION LOG/FIELD CHAIN OF CUSTODY

EVENT ID: 415

EVENT NAME: Dust Study, LA Monitor

SAMPLE ID: **SFB08-08-12411**

	AS PLANNED	AS COLLECTED		AS PLANNED	AS COLLECTED
DATE COLLECTED(MM/DD/YYYY):		04/16/2008	MEDIA:	NA	
TIME COLLECTED (HH:MM)					

DATA VALIDATION COVER SHEET

5119-1

Data Validation Cover Sheet

Records Use only

Los Alamos NATIONAL LABORATORY EST. 1943

Section I.

REQUEST NUMBER: 08-1101 VALIDATION DATE: 7/10/08 LAB CODE: PARA

CONTRACT LABORATORY NAME: Paragon Analytics, Inc

VALIDATOR: Eric T. Mink ORGANIZATION: Analytical Quality Associates, Inc

ANALYTICAL SUITE (CHECK ALL THAT APPLY):

- ☐ TPH-GRO
- ☐ TPH-DRO
- ☐ GENERAL CHEMISTRY
- ☐ HIGH EXPLOSIVES
- ☐ METALS
- ☒ RADIOCHEMISTRY
- ☐ DIOXIN FURANS
- ☐ PCB CONGENERS
- ☐ LCMSMS HIGH EXPLOSIVES
- ☐ LCMSMS PERCHLORATES
- ☐ ORGANOCHLORINE PESTICIDES/POLYCHLORINATED BIPHENYLS
- ☐ OTHER (DESCRIBE):

Section II. Completeness Check

YES	NO	N/A	(CHECK ONE)	YES	NO	N/A	(CHECK ONE)
☒	☐	☐	1. CHAIN-OF-CUSTODY FORM(S)	☒	☐	☐	6. RAW/BSS DATA
☒	☐	☐	2. CASE NARRATIVE	☒	☐	☐	7. QUALITY CONTROL FORMS
☒	☐	☐	3. SAMPLE RESULT FORMS	☐	☐	☒	8. QUANTITATION REPORTS
☐	☐	☒	4. SAMPLE CHROMATOGRAMS	☐	☐	☒	9. TICS FORMS
☐	☐	☒	5. STANDARD CHROMATOGRAMS	☐	☐	☒	10. TICS MASS SPECTRA

Comments/problems noted (include information about requests for further information submitted to the contract laboratory and agreed-upon date of resolution and contract laboratory point of contact):

1. The gamma spec Th-234 result for sample SFB08-08-12412 was identified as tentative and, thus, was qualified R,R5a. In the Quality Control samples, several results were also identified as tentative by the laboratory. No sample data were qualified as a result.
2. The duplicate RER value for gamma spec Th-234 was >1. However, the associated parent sample result was < the MDC and, thus, no sample data were qualified..
3. The sample results that were ≤ the MDCs were qualified U,R5.

Reviewed By: KAS **Level:** I **Date:** 7/10/08

VALIDATOR'S SIGNATURE: Eric T. Mik	DATE: 7/10/08
Form 5119-1, Revision 0.0	LOS ALAMOS Environmental Restoration Project

RAD ANALYTICAL DATA VALIDATION CHECKLIST

5119-2 Rad Analytical Data Validation Checklist	Records Use only Los Alamos

RAD ANALYTICAL DATA VALIDATION CHECKLIST

5119-2 Rad Analytical Data Validation Checklist	Records Use only Los Alamos NATIONAL LABORATORY EST. 1943

Yes	No	N/A		Assign Qualifier Listed Below If Criterion = Yes	
(Check One)				Non-detected Analyte	Detected Analyte
☐	☒	☐	12. The tracer is < the Lower Acceptance Level (LAL) but ≥10%R. Follow the external laboratory limits located within the associated data package. Tracer%R is not applicable for Gamma Spectroscopy.	UJ, R3a	J-, R3a
☐	☒	☐	13. The Tracer%R value is > the Upper Acceptance Limit (UAL). Follow the external laboratory limits located within the associated data package. Tracer%R is not applicable for Gamma Spectroscopy.	N/A	J+, R3b
☐	☒	☐	14. Required tracer information is missing. Data may not be acceptable for use. Contact the SMO or external laboratory for information. Tracer%R is not applicable for Gamma Spectroscopy.	R, R3d	R, R3d
☐	☒	☐	15. The LCS percent recovery was <10%. Follow the external laboratory limits located within the associated data package.	R, R12	R, R12
☐	☒	☐	16. The LCS percent recovery was < the LAL but >10%. Follow the external laboratory limits located within the associated data package.	UJ, R12a	J-, R12a
☐	☒	☐	17. The LCS percent recovery was > the UAL. Follow the external laboratory limits located within the associated data package.	N/A	J+, R12b
☐	☒	☐	18. The LCS documentation is missing. Data may not be acceptable for use. Contact the SMO or external laboratory for information.	R, R12c	R, R12c
☒	☐	☐	19. Associated duplicate sample has DER or RER > the analytical laboratory's acceptance limits.	R, R10	J, J10
☐	☒	☐	20. The duplicate sample was not prepared and/or analyzed with the samples for unspecified reasons. The duplicate information is missing. Data may not be acceptable for use. Contact the SMO or external laboratory for information.	R, R6	R, R6

RAD ANALYTICAL DATA VALIDATION CHECKLIST

5119-2 Rad Analytical Data Validation Checklist	Records Use only Los Alamos NATIONAL LABORATORY

Yes	No	N/A		Assign Qualifier Listed Below If Criterion = Yes	
(Check One)				Non-detected Analyte	Detected Analyte
☐	☒	☐	21. The associated matrix spike recovery was <10%. Follow the external laboratory limits. MS/MSD is not applicable to Gamma Spectroscopy.	R, R6	R, R6
☐	☒	☐	22. The associated matrix spike recovery was <10%. Follow the external laboratory limits. MS/MSD is not applicable to Gamma Spectroscopy.	UJ, R6a	J-, R6a
☐	☒	☐	23. The associated matrix spike recovery was above the UAL. Follow the external laboratory limits. MS/MSD is not applicable to Gamma Spectroscopy.	UJ, R6b	J+, R6b
☐	☒	☐	24. Required matrix spike information is missing. Data may not be acceptable for use. Contact the SMO or external laboratory for information. If LCS information is present, do not Reject. Qualify data based on LCS information. MS/MSD is not applicable to Gamma Spectroscopy.	R, R6c	R, R6c
☐	☒	☐	25. Duplicate, dilution, or reanalysis.	UJ, R88	J, R88
☐	☒	☐	26. The LANL project chemist identified quality deficiencies in the reported data that require further qualification. This code can ONLY be used and/or under advisement by the LANL project chemist.	UJ, R, R19	J, R, R19
			27. Quantification of data via data validation did not occur based on Quality Control requirements in	U, U_LAB	J, J_LAB

Isotopic Americium By Alpha Spectroscopy

PAI 714 Rev 11

Sample Results

Lab Name: Paragon Analytics
Work Order Number: 0805078
Client Name: Los Alamos National Laboratory SMO
ClientProject ID: Dust08 -1101

Field ID: SFB08-08-12411
Lab ID: 0805078-1

Analysis ReqCode: Low MDA

Sample Matrix: SOLID
Prep SOP: PAI778 Rev 12
Date Collected: 16-Apr-08
Date Prepared: 06-Jun-08
Date Analyzed: 12-Jun-08

Prep Batch: AS080606-1
QCBatchID: AS080606-1-1
Run ID: AS080606-1C
Count Time: 1000 minutes
Report Basis: As Received

FinalA liquot: 4.52 g
Prep Basis: As Received
Moisture(%): NA
Result Units: pCi/g
File Name: Spectrum #1

CASNO	Target Nuclide	Result +/- 1 s TPU	MDC	Requested MDC	Lab Qualifier
14596-10-2	Am-241	0.0109 +/- 0.0033	0.0068	0.02	LT

ChemicalY ield Summary

Carrier/Tracer	Amount Added	Result	Units	Yield	Control Limits	Flag
Am-243	0.4985	0.237	pCi/g	47.6	30 - 110 %	

Comments:

Qualifiers/Flags:

U - Resulti s less than the sample specific MDC.

Y1 - Chemical Yield is in control at10 0-110%. Quantitative Yield is assumed.

Y2 - Chemical Yield outside defaulti imits.

LT - Resulti s less than Requested MDC, greater than sample specific MDC.

M3 - The requested MDC was notm et, but the reported activity is greater than the reported MDC.

M - The requested MDC was not met.

Abbreviations:

TPU - Total Propagated Uncertainty (see PAIS OP 743)

MDC - Minimum Detectable Concentration (see PAIS OP 709)

BDL - Below Detection Limit

ETM
7/10/08

Data Package ID: *AM0805078-1*

Isotopic Americium By Alpha Spectroscopy

PAI 714 Rev 11

Sample Results

Lab Name: **Paragon Analytics**
Work Order Number: 0805078
Client Name: Los Alamos National Laboratory SMO
ClientProject ID: Dust08 -1101

Field ID: SFB08-08-12412	**Sample Matrix:** SOLID	**Prep Batch:** AS080606-1	**FinalA liquot:** 4.54 g
	Prep SOP: PAI778 Rev 12	**QCBatchID:** AS080606-1-1	**Prep Basis:** As Received

Isotopic Plutonium By Alpha Spectroscopy

PAI 714 Rev 11

Sample Results

Lab Name: Paragon Analytics
Work Order Number: 0805078
Client Name: Los Alamos National Laboratory SMO
ClientProject ID: Dust08 -1101

Field ID: SFB08-08-12411
Lab ID: 0805078-1

Analysis ReqCode: Low MDA

Sample Matrix: SOLID
Prep SOP: PAI778 Rev 12
Date Collected: 16-Apr-08
Date Prepared: 06-Jun-08
Date Analyzed: 12-Jun-08

Prep Batch: AS080606-1
QCBatchID: AS080606-1-1
Run ID: AS080606-1B
Count Time: 1000 minutes
Report Basis: As Received

FinalA liquot: 4.52 g
Prep Basis: As Received
Moisture(%): NA
Result Units: pCi/g
File Name: Spectrum #1

CASNO	Target Nuclide	Result +/- 1 s TPU	MDC	Requested MDC	Lab Qualifier
13981-16-3	Pu-238	0.0005 +/- 0.0013	0.0050	0.02	U U,R5
10-12-8	Pu-239/240	0.0157 +/- 0.0035	0.0058	0.02	LT

ChemicalY ield Summary

Carrier/Tracer	Amount Added	Result	Units	Yield	Control Limits	Flag
Pu-242	0.4985	0.314	pCi/g	62.9	30 - 110 %	

Comments:

Qualifiers/Flags:

U - Resulti s less than the sample specific MDC.

Y1 - Chemical Yield is in control at10 0-110%. Quantitative Yield is assumed.

Y2 - Chemical Yield outside defaultl imits.

LT - Resulti s less than Requested MDC, greater than sample specific MDC.

M3 - The requested MDC was notm et, but the reported activity is greater than the reported MDC.

M - The requested MDC was not met.

Abbreviations:

TPU - Total Propagated Uncertainty (see PAIS OP 743)

MDC - Minimum Detectable Concentration (see PAIS OP 709)

BDL - Below Detection Limit

ETM

Isotopic Plutonium By Alpha Spectroscopy

PAI 714 Rev 11

Sample Results

Lab Name: Paragon Analytics
Work Order Number: 0805078
Client Name: Los Alamos National Laboratory SMO
ClientProject ID: Dust08 -1101

Field ID: SFB08-08-12412
Lab ID: 0805078-2

Analysis ReqCode: Low MDA

Sample Matrix: SOLID
Prep SOP: PAI778 Rev 12
Date Collected: 16-Apr-08
Date Prepared: 06-Jun-08
Date Analyzed: 12-Jun-08

Prep Batch: AS080606-1
QCBatchID: AS080606-1-1
Run ID: AS080606-1B
Count Time: 1000 minutes
Report Basis: As Received

FinalA liquot: 4.54 g
Prep Basis: As Received
Moisture(%): NA
Result Units: pCi/g
File Name: Spectrum #1

CASNO	Target Nuclide	Result +/- 1 s TPU	MDC	Requested MDC	Lab Qualifier
13981-16-3	Pu-238	0.0026 +/- 0.0014	0.0038	0.02	U U,R5
10-12-8	Pu-239/240	0.0847 +/- 0.0096	0.0068	0.02	

ChemicalY ield Summary

Carrier/Tracer	Amount Added	Result	Units	Yield	Control Limits	Flag
Pu-242	0.4956	0.299	pCi/g	60.2	30 - 110 %	

Comments:

Qualifiers/Flags:

U - Resulti s less than the sample specific MDC.

Y1 - Chemical Yield is in control at10 0-110%. Quantitative Yield is assumed.

Y2 - Chemical Yield outside defaultl imits.

LT - Resulti s less than Requested MDC, greater than sample specific MDC.

M3 - The requested MDC was notm et, but the reported activity is greater than the reported MDC.

M - The requested MDC was not met.

Abbreviations:

TPU - Total Propagated Uncertainty (see PAIS OP 743)

MDC - Minimum Detectable Concentration (see PAIS OP 709)

BDL - Below Detection Limit

ETM
7/10/08

Data Package ID: *PU0805078-1*

Polonium-210 by Alpha Spectroscopy

PAI 714 Rev 11

Sample Results

Lab Name: Paragon Analytics
Work Order Number: 0805078
Client Name: Los Alamos National Laboratory SMO
ClientProject ID: Dust08 -1101

Field ID: SFB08-08-12411
Lab ID: 0805078-1

Analysis ReqCode: ASP-A-019

Sample Matrix: SOLID
Prep SOP: PAI711 Rev 7
Date Collected: 16-Apr-08
Date Prepared: 06-Jun-08
Date Analyzed: 08-Jun-08

Prep Batch: PL080606-1
QCBatchID: PL080606-1-1
Run ID: PL080606-1A
Count Time: 1000 minutes
Report Basis: As Received

FinalA liquot: 0.258 g
Prep Basis: As Received
Moisture(%): NA
Result Units: pCi/g
File Name: Spectrum #1

CASNO	Target Nuclide	Result +/- 1 s TPU	MDC	Requested MDC	Lab Qualifier
13981-52-7	Po-210	3.70 +/- 0.33	0.10	0.25	

ChemicalY ield Summary

Carrier/Tracer	Amount Added	Result	Units	Yield	Control Limits	Flag
Po-209	13.98	9.99	pCi/g	71.5	20 - 110 %	

Comments:

Qualifiers/Flags:

U - Resulti s less than the sample specific MDC.

Y1 - Chemical Yield is in control at10 0-110%. Quantitative Yield is assumed.

Y2 - Chemical Yield outside defaultl imits.

LT - Resulti s less than Requested MDC, greater than sample specific MDC.

M3 - The requested MDC was notm et, but the reported activity is greater than the reported MDC.

M - The requested MDC was not met.

Abbreviations:

TPU - Total Propagated Uncertainty (see PAIS OP 743)

MDC - Minimum Detectable Concentration (see PAIS OP 709)

BDL - Below Detection Limit

ETM
7/10/08

Data Package ID: *PL0805078-1*

Polonium-210 by Alpha Spectroscopy

PAI 714 Rev 11

Sample Results

Lab Name: Paragon Analytics
Work Order Number: 0805078
Client Name: Los Alamos National Laboratory SMO
ClientProject ID: Dust08 -1101

Field ID: SFB08-08-12412
Lab ID: 0805078-2

Analysis ReqCode: ASP-A-019

Sample Matrix: SOLID
Prep SOP: PAI711 Rev 7
Date Collected: 16-Apr-08
Date Prepared: 06-Jun-08
Date Analyzed: 08-Jun-08

Prep Batch: PL080606-1
QCBatchID: PL080606-1-1
Run ID: PL080606-1A
Count Time: 1000 minutes
Report Basis: As Received

FinalA liquot: 0.263 g
Prep Basis: As Received
Moisture(%): NA
Result Units: pCi/g
File Name: Spectrum #1

CASNO	Target Nuclide	Result +/- 1 s TPU	MDC	Requested MDC	Lab Qualifier
13981-52-7	Po-210	10.07 +/- 0.78	0.08	0.25	

ChemicalY ield Summary

Carrier/Tracer	Amount Added	Result	Units	Yield	Control Limits	Flag
Po-209	13.71	11.86	pCi/g	86.5	20 - 110 %	

Comments:

Qualifiers/Flags:

U - Resulti s less than the sample specific MDC.

Y1 - Chemical Yield is in control at10 0-110%. Quantitative Yield is assumed.

Y2 - Chemical Yield outside defaultl imits.

LT - Resulti s less than Requested MDC, greater than sample specific MDC.

M3 - The requested MDC was notm et, but the reported activity is greater than the reported MDC.

M - The requested MDC was not met.

Abbreviations:

TPU - Total Propagated Uncertainty (see PAIS OP 743)

MDC - Minimum Detectable Concentration (see PAIS OP 709)

BDL - Below Detection Limit

ETM
7/10/08

Data Package ID: *PL0805078-1*

Isotopic Uranium By Alpha Spectroscopy

PAI 714 Rev 11

Sample Results

Lab Name: Paragon Analytics
Work Order Number: 0805078
Client Name: Los Alamos National Laboratory SMO
ClientProject ID: Dust08 -1101

Field ID: SFB08-08-12411
Lab ID: 0805078-1

Analysis ReqCode: Low MDA

Sample Matrix: SOLID
Prep SOP: PAI778 Rev 12
Date Collected: 16-Apr-08
Date Prepared: 06-Jun-08
Date Analyzed: 11-Jun-08

Prep Batch: AS080606-1
QCBatchID: AS080606-1-1
Run ID: AS080606-1A
Count Time: 1000 minutes
Report Basis: As Received

FinalA liquot: 4.52 g
Prep Basis: As Received
Moisture(%): NA
Result Units: pCi/g
File Name: Spectrum #1

CASNO	Target Nuclide	Result +/- 1 s TPU	MDC	Requested MDC	Lab Qualifier
13966-29-5	U-234	0.425 +/- 0.039	0.008	0.01	
15117-96-1	U-235	0.0224 +/- 0.0047	0.0022	0.01	
7440-61-1	U-238	0.434 +/- 0.040	0.002	0.01	

ChemicalY ield Summary

Carrier/Tracer	Amount Added	Result	Units	Yield	Control Limits	Flag
U-232	0.4923	0.247	pCi/g	50.2	30 - 110 %	

Comments:

Qualifiers/Flags:

U - Resulti s less than the sample specific MDC.

Y1 - Chemical Yield is in control at10 0-110%. Quantitative Yield is assumed.

Y2 - Chemical Yield outside defaultl imits.

LT - Resulti s less than Requested MDC, greater than sample specific MDC.

M3 - The requested MDC was notm et, but the reported activity is greater than the reported MDC.

M - The requested MDC was not met.

Abbreviations:

TPU - Total Propagated Uncertainty (see PAIS OP 743)

MDC - Minimum Detectable Concentration (see PAIS OP 709)

BDL - Below Detection Limit

ETM
7/10/08

Data Package ID: *UR0805078-1*

Isotopic Uranium By Alpha Spectroscopy

PAI 714 Rev 11

Sample Results

Lab Name: Paragon Analytics
Work Order Number: 0805078
Client Name: Los Alamos National Laboratory SMO
ClientProject ID: Dust08 -1101

Field ID: SFB08-08-12412
Lab ID: 0805078-2

Analysis ReqCode: Low MDA

Sample Matrix: SOLID
Prep SOP: PAI778 Rev 12
Date Collected: 16-Apr-08
Date Prepared: 06-Jun-08
Date Analyzed: 11-Jun-08

Prep Batch: AS080606-1
QCBatchID: AS080606-1-1
Run ID: AS080606-1A
Count Time: 1000 minutes
Report Basis: As Received

FinalA liquot: 4.54 g
Prep Basis: As Received
Moisture(%): NA
Result Units: pCi/g
File Name: Spectrum #1

CASNO	Target Nuclide	Result +/- 1 s TPU	MDC	Requested MDC	Lab Qualifier
13966-29-5	U-234	0.614 +/- 0.051	0.007	0.01	
15117-96-1	U-235	0.0335 +/- 0.0050	0.0014	0.01	
7440-61-1	U-238	0.674 +/- 0.056	0.003	0.01	

ChemicalY ield Summary

Carrier/Tracer	Amount Added	Result	Units	Yield	Control Limits	Flag
U-232	0.4894	0.366	pCi/g	74.7	30 - 110 %	

Comments:

Qualifiers/Flags:

U - Resulti s less than the sample specific MDC.

Y1 - Chemical Yield is in control at10 0-110%. Quantitative Yield is assumed.

Y2 - Chemical Yield outside defaultl imits.

LT - Resulti s less than Requested MDC, greater than sample specific MDC.

M3 - The requested MDC was notm et, but the reported activity is greater than the reported MDC.

M - The requested MDC was not met.

Abbreviations:

TPU - Total Propagated Uncertainty (see PAIS OP 743)

MDC - Minimum Detectable Concentration (see PAIS OP 709)

BDL - Below Detection Limit

ETM
7/10/08

Data Package ID: *UR0805078-1*

Gamma Spectroscopy Results

PAI 713 Rev 9

Sample Results

Lab Name: Paragon Analytics
Work Order Number: 0805078
Client Name: Los Alamos National Laboratory SMO
ClientProject ID: Dust08 -1101

Field ID: SFB08-08-12411
Lab ID: 0805078-1
Library: FANP

Sample Matrix: SOLID
Prep SOP: PAI739 Rev 9
Date Collected: 16-Apr-08
Date Prepared: 05-Jun-08
Date Analyzed: 05-Jun-08

Prep Batch: GS080604-5
QCBatchID: GS080604-5-1
Run ID: GS080604-5A
Count Time: 1000 minutes
Report Basis: As Received

FinalA liquot: 32.7 g
Prep Basis: As Received
Moisture(%): NA
Result Units: pCi/g
File Name: 080763d09

CASNO	Target Nuclide	Result +/- 1 s TPU	MDC	Requested MDC	Lab Qualifier
14331-83-0	Ac-228	0.65 +/- 0.14	0.55		G
14391-76-5	Ag-110m	0.011 +/- 0.030	0.100		U,G U,R5
14682-66-7	Al-26	-0.028 +/- 0.030	0.109		U,G
14596-10-2	Am-241	0.053 +/- 0.030	0.098		U,G
13966-02-4	Be-7	2.08 +/- 0.41	1.19		G
14913-49-6	Bi-212	0.86 +/- 0.36	1.13		U,G U,R5
14733-03-0	Bi-214	0.424 +/- 0.094	0.328		G,J
13982-30-4	Ce-139	-0.042 +/- 0.035	0.118		U,G U,R5
14762-78-8	Ce-144	0.029 +/- 0.083	0.279		U,G
14093-03-9	Co-56	0.132 +/- 0.077	0.252		U,G
13981-50-5	Co-57	0.009 +/- 0.010	0.034		U,G
13981-38-9	Co-58	0.064 +/- 0.039	0.126		U,G
10198-40-0	Co-60	-0.002 +/- 0.032	0.110		U,G
14392-02-0	Cr-51	0.50 +/- 0.52	1.72		U,G
13967-70-9	Cs-134	-0.050 +/- 0.028	0.098		U,G

Comments:

Qualifiers/Flags:

U - Resulti s less than the sample specific MDC or less than the associated TPU

Y1 - Chemical Yield is in control at10 0-110%. Quantitative Yield is assumed.

Y2 - Chemical Yield outside defaultl imits.

LT - Resulti s less than Requested MDC, greater than sample specific MDC.

M3 - The requested MDC was notm et, but the reported activity is greater than the reported MDC.

M - The requested MDC was notm et.

SQ - Spectral quality prevents accurate quantitation.

SI - Nuclide identification and/or quantitation is tentative.

TI - Nuclide identification is tentative.

R - Nuclide has exceeded 8 halflives.

G - Sample density differs by more than 15% ofL CS density.

Abbreviations:

TPU - Total Propagated Uncertainty (see PAIS OP 743)

MDC - Minimum Detectable Concentration (see PAIS OP 709)

BDL - Below Detection Limit

ETM
7/10/08

Data Package ID: *GSS0805078-1*

Gamma Spectroscopy Results

PAI 713 Rev 9

Sample Results

Lab Name: Paragon Analytics
Work Order Number: 0805078
Client Name: Los Alamos National Laboratory SMO
ClientProject ID: Dust08 -1101

Field ID: SFB08-08-12411
Lab ID: 0805078-1
Library: FANP

Sample Matrix: SOLID
Prep SOP: PAI739 Rev 9
Date Collected: 16-Apr-08
Date Prepared: 05-Jun-08
Date Analyzed: 05-Jun-08

Prep Batch: GS080604-5
QCBatchID: GS080604-5-1
Run ID: GS080604-5A
Count Time: 1000 minutes
Report Basis: As Received

FinalA liquot: 32.7 g
Prep Basis: As Received
Moisture(%): NA
Result Units: pCi/g
File Name: 080763d09

CASNO	Target Nuclide	Result +/- 1 s TPU	MDC	Requested MDC	Lab Qualifier
10045-97-3	Cs-137	0.013 +/- 0.029	0.098	0.12	U,G U,R5
14683-23-9	Eu-152	0.19 +/- 0.14	0.45		U,G
15585-10-1	Eu-154	-0.05 +/- 0.16	0.55		U,G
14391-16-3	Eu-155	0.002 +/- 0.037	0.124		U,G
14596-12-4	Fe-59	0.05 +/- 0.12	0.41		U,G
10043-66-0	I-131	2.8 +/- 1.7	5.5		U,G
13966-00-2	K-40	12.4 +/- 1.1	2.5		G
13966-31-9	Mn-54	-0.008 +/- 0.032	0.108		U,G U,R5
13966-32-0	Na-22	-0.013 +/- 0.033	0.115		U,G
14681-63-1	Nb-94	0.013 +/- 0.030	0.101		U,G
13967-76-5	Nb-95	0.022 +/- 0.043	0.144		U,G
15100-28-4	Pa-234m	1.4 +/- 4.6	15.8		U,G
15092-94-1	Pb-212	0.546 +/- 0.068	0.188		G
15067-28-4	Pb-214	0.435 +/- 0.088	0.326		G,J
13967-48-1	Ru-106	-0.17 +/- 0.26	0.89		U,G U,R5

Comments:

Qualifiers/Flags:

U - Resulti s less than the sample specific MDC or less than the associated TPU

Y1 - Chemical Yield is in control at10 0-110%. Quantitative Yield is assumed.

Y2 - Chemical Yield outside defaultl imits.

LT - Resulti s less than Requested MDC, greater than sample specific MDC.

M3 - The requested MDC was notm et, but the reported activity is greater than the reported MDC.

M - The requested MDC was notm et.

SQ - Spectral quality prevents accurate quantitation.

SI - Nuclide identification and/or quantitation is tentative.

TI - Nuclide identification is tentative.

R - Nuclide has exceeded 8 halflives.

G - Sample density differs by more than 15% ofL CS density.

Abbreviations:

TPU - Total Propagated Uncertainty (see PAIS OP 743)

MDC - Minimum Detectable Concentration (see PAIS OP 709)

BDL - Below Detection Limit

ETM
7/10/08

Data Package ID: *GSS0805078-1*

Gamma Spectroscopy Results

PAI 713 Rev 9

Sample Results

Lab Name: Paragon Analytics
Work Order Number: 0805078
Client Name: Los Alamos National Laboratory SMO
ClientProject ID: Dust08 -1101

Field ID: SFB08-08-12411
Lab ID: 0805078-1
Library: FANP

Sample Matrix: SOLID
Prep SOP: PAI739 Rev 9
Date Collected: 16-Apr-08
Date Prepared: 05-Jun-08
Date Analyzed: 05-Jun-08

Prep Batch: GS080604-5
QCBatchID: GS080604-5-1
Run ID: GS080604-5A
Count Time: 1000 minutes
Report Basis: As Received

FinalA liquot: 32.7 g
Prep Basis: As Received
Moisture(%): NA
Result Units: pCi/g
File Name: 080763d09

CASNO	Target Nuclide	Result +/- 1 s TPU	MDC	Requested MDC	Lab Qualifier
14683-10-4	Sb-124	-0.053 +/- 0.048	0.163		U,G U,R5
14234-35-6	Sb-125	-0.018 +/- 0.058	0.197		U,G
13967-63-0	Sc-46	-0.004 +/- 0.041	0.140		U,G
15623-47-9	Th-227	0.06 +/- 0.15	0.49		U,G
15065-10-8	Th-234	0.84 +/- 0.41	1.32		U,G
14913-50-9	Tl-208	0.162 +/- 0.060	0.193		U,G
15117-96-1	U-235	0.182 +/- 0.082	0.265		U,G
13982-39-3	Zn-65	0.025 +/- 0.071	0.242		U,G
13233-32-4	Ra-224	0.546 +/- 0.068	0.188		G

Comments:

Qualifiers/Flags:

U - Resulti s less than the sample specific MDC or less than the associated TPU

Y1 - Chemical Yield is in control at10 0-110%. Quantitative Yield is assumed.

Y2 - Chemical Yield outside defaultl imits.

LT - Resulti s less than Requested MDC, greater than sample specific MDC.

M3 - The requested MDC was notm et, but the reported activity is greater than the reported MDC.

M - The requested MDC was notm et.

SQ - Spectral quality prevents accurate quantitation.

SI - Nuclide identification and/or quantitation is tentative.

TI - Nuclide identification is tentative.

R - Nuclide has exceeded 8 halflives.

G - Sample density differs by more than 15% ofL CS density.

Abbreviations:

TPU - Total Propagated Uncertainty (see PAIS OP 743)

MDC - Minimum Detectable Concentration (see PAIS OP 709)

BDL - Below Detection Limit

ETM
7/10/08

Data Package ID: *GSS0805078-1*

Gamma Spectroscopy Results

PAI 713 Rev 9

Sample Results

Lab Name: Paragon Analytics
Work Order Number: 0805078
Client Name: Los Alamos National Laboratory SMO
ClientProject ID: Dust08 -1101

Field ID: SFB08-08-12412
Lab ID: 0805078-2
Library: FANP

Sample Matrix: SOLID
Prep SOP: PAI739 Rev 9
Date Collected: 16-Apr-08
Date Prepared: 05-Jun-08
Date Analyzed: 05-Jun-08

Prep Batch: GS080604-5
QCBatchID: GS080604-5-1
Run ID: GS080604-5A
Count Time: 1000 minutes
Report Basis: As Received

FinalA liquot: 32.0 g
Prep Basis: As Received
Moisture(%): NA
Result Units: pCi/g
File Name: 081125d08

CASNO	Target Nuclide	Result +/- 1 s TPU	MDC	Requested MDC	Lab Qualifier
14331-83-0	Ac-228	0.90 +/- 0.12	0.40		G
14391-76-5	Ag-110m	-0.016 +/- 0.024	0.081		U,G U,R5
14682-66-7	Al-26	-0.021 +/- 0.025	0.089		U,G
14596-10-2	Am-241	-0.016 +/- 0.024	0.081		U,G
13966-02-4	Be-7	4.12 +/- 0.40	0.86		G
14913-49-6	Bi-212	1.09 +/- 0.35	1.11		U,G U,R5
14733-03-0	Bi-214	0.49 +/- 0.12	0.43		G,J
13982-30-4	Ce-139	-0.026 +/- 0.014	0.048		U,G U,R5
14762-78-8	Ce-144	-0.038 +/- 0.078	0.264		U,G
14093-03-9	Co-56	0.112 +/- 0.053	0.169		U,G
13981-50-5	Co-57	0.0046 +/- 0.0097	0.0324		U,G
13981-38-9	Co-58	-0.046 +/- 0.036	0.126		U,G
10198-40-0	Co-60	0.024 +/- 0.026	0.086		U,G
14392-02-0	Cr-51	0.54 +/- 0.45	1.49		U,G
13967-70-9	Cs-134	-0.006 +/- 0.018	0.084		U,G

Comments:

Qualifiers/Flags:

U - Resulti s less than the sample specific MDC or less than the associated TPU

Y1 - Chemical Yield is in control at10 0-110%. Quantitative Yield is assumed.

Y2 - Chemical Yield outside defaultl imits.

LT - Resulti s less than Requested MDC, greater than sample specific MDC.

M3 - The requested MDC was notm et, but the reported activity is greater than the reported MDC.

M - The requested MDC was notm et.

Abbreviations:

TPU - Total Propagated Uncertainty (see PAIS OP 743)

MDC - Minimum Detectable Concentration (see PAIS OP 709)

BDL - Below Detection Limit

SQ - Spectral quality prevents accurate quantitation.

SI - Nuclide identification and/or quantitation is tentative.

TI - Nuclide identification is tentative.

R - Nuclide has exceeded 8 halflives.

G - Sample density differs by more than 15% ofL CS density.

ETM
7/10/08

Data Package ID: *GSS0805078-1*

Gamma Spectroscopy Results

PAI 713 Rev 9

Sample Results

Lab Name: Paragon Analytics
Work Order Number: 0805078
Client Name: Los Alamos National Laboratory SMO
ClientProject ID: Dust08 -1101

Field ID: SFB08-08-12412
Lab ID: 0805078-2
Library: FANP

Sample Matrix: SOLID
Prep SOP: PAI739 Rev 9
Date Collected: 16-Apr-08
Date Prepared: 05-Jun-08
Date Analyzed: 05-Jun-08

Prep Batch: GS080604-5
QCBatchID: GS080604-5-1
Run ID: GS080604-5A
Count Time: 1000 minutes
Report Basis: As Received

FinalA liquot: 32.0 g
Prep Basis: As Received
Moisture(%): NA
Result Units: pCi/g
File Name: 081125d08

CASNO	Target Nuclide	Result +/- 1s TPU	MDC	Requested	Lab Qualifier

Gamma Spectroscopy Results

PAI 713 Rev 9

Sample Results

Lab Name: Paragon Analytics
Work Order Number: 0805078
Client Name: Los Alamos National Laboratory SMO
ClientProject ID: Dust08 -1101

Field ID: SFB08-08-12412
Lab ID: 0805078-2
Library: FANP

Sample Matrix: SOLID
Prep SOP: PAI739 Rev 9
Date Collected: 16-Apr-08
Date Prepared: 05-Jun-08
Date Analyzed: 05-Jun-08

Prep Batch: GS080604-5
QCBatchID: GS080604-5-1
Run ID: GS080604-5A
Count Time: 1000 minutes
Report Basis: As Received

FinalA liquot: 32.0 g
Prep Basis: As Received
Moisture(%): NA
Result Units: pCi/g
File Name: 081125d08

CASNO	Target Nuclide	Result +/- 1 s TPU	MDC	Requested MDC	Lab Qualifier
14683-10-4	Sb-124	0.037 +/- 0.044	0.147		U,G U,R5
14234-35-6	Sb-125	-0.009 +/- 0.047	0.188		U,G
13967-63-0	Sc-46	-0.006 +/- 0.033	0.114		U,G
15623-47-9	Th-227	0.2 +/- 3.1	10.3		U,G
15065-10-8	Th-234	1.50 +/- 0.36	1.13		TI,G R,R5a
14913-50-9	Tl-208	0.287 +/- 0.049	0.155		G
15117-96-1	U-235	0.12 +/- 0.12	0.40		U,G U,R5
13982-39-3	Zn-65	0.27 +/- 0.14	0.45		U,G U,R5
13233-32-4	Ra-224	0.888 +/- 0.085	0.207		G

Comments:

Qualifiers/Flags:

U - Resulti s less than the sample specific MDC or less than the associated TPU

Y1 - Chemical Yield is in control at10 0-110%. Quantitative Yield is assumed.

Y2 - Chemical Yield outside defaulti imits.

LT - Resulti s less than Requested MDC, greater than sample specific MDC.

M3 - The requested MDC was notm et, but the reported activity is greater than the reported MDC.

M - The requested MDC was notm et.

SQ - Spectral quality prevents accurate quantitation.

SI - Nuclide identification and/or quantitation is tentative.

TI - Nuclide identification is tentative.

R - Nuclide has exceeded 8 halflives.

G - Sample density differs by more than 15% ofL CS density.

Abbreviations:

TPU - Total Propagated Uncertainty (see PAIS OP 743)

MDC - Minimum Detectable Concentration (see PAIS OP 709)

BDL - Below Detection Limit

ETM
7/10/08

Data Package ID: *GSS0805078-1*

Gross Alpha/Beta Analysis by GFPC

PAI 724 Rev 10

Sample Results

Lab Name: Paragon Analytics
Work Order Number: 0805078
Client Name: Los Alamos National Laboratory SMO
ClientProject ID: Dust08 -1101

Field ID: SFB08-08-12411
Lab ID: 0805078-1

Analysis ReqCode: GPC-A-005

Sample Matrix: SOLID
Prep SOP: PAI702 Rev 19
Date Collected: 16-Apr-08
Date Prepared: 06-Jun-08
Date Analyzed: 16-Jun-08

Prep Batch: AB080606-4
QCBatchID: AB080606-4-1
Run ID: AB080606-4A
Count Time: 60 minutes
Report Basis: As Received

FinalA liquot: 0.501 g
Prep Basis: As Received
Moisture(%): NA
Result Units: pCi/g
File Name: ABB0616G

CASNO	Target Nuclide	Result +/- 1 s TPU	MDC	Requested MDC	Lab Qualifier
12587-46-1	GROSS ALPHA	3.75 +/- 0.73	1.27	3	
12587-47-2	GROSS BETA	7.40 +/- 0.86	1.71	4	

Comments:

Qualifiers/Flags:

U - Resulti s less than the sample specific MDC.

Y1 - Chemical Yield is in control at10.0-110%. Quantitative Yield is assumed

Gross Alpha/Beta Analysis by GFPC

PAI 724 Rev 10

Sample Results

Lab Name: Paragon Analytics
Work Order Number: 0805078
Client Name: Los Alamos National Laboratory SMO
ClientProject ID: Dust08 -1101

Field ID: SFB08-08-12412
Lab ID: 0805078-2

Analysis ReqCode: GPC-A-005

Sample Matrix: SOLID
Prep SOP: PAI702 Rev 19
Date Collected: 16-Apr-08
Date Prepared: 06-Jun-08
Date Analyzed: 16-Jun-08

Prep Batch: AB080606-4
QCBatchID: AB080606-4-1
Run ID: AB080606-4A
Count Time: 60 minutes
Report Basis: As Received

FinalA liquot: 0.502 g
Prep Basis: As Received
Moisture(%): NA
Result Units: pCi/g
File Name: ABB0616G

CASNO	Target Nuclide	Result +/- 1 s TPU	MDC	Requested MDC	Lab Qualifier
12587-46-1	GROSS ALPHA	13.0 +/- 1.6	1.5	3	
12587-47-2	GROSS BETA	12.8 +/- 1.3	2.0	4	

Comments:

Qualifiers/Flags:

U - Resulti s less than the sample specific MDC.

Y1 - Chemical Yield is in control at10 0-110%. Quantitative Yield is assumed.

Y2 - Chemical Yield outside defaultl imits.

LT - Resulti s less than Requested MDC, greater than sample specific MDC.

M3 - The requested MDC was notm et, but the reported activity is greater than the reported MDC.

M - The requested MDC was not met.

Abbreviations:

TPU - Total Propagated Uncertainty (see PAIS OP 743)

MDC - Minimum Detectable Concentration (see PAIS OP 709)

BDL - Below Detection Limit

ETM
7/10/08

Data Package ID: *AB0805078-1*

Strontium-90 Analysis by GFPC

PAI 724 Rev 10

Sample Results

Lab Name: **Paragon Analytics**
Work Order Number: 0805078
Client Name: Los Alamos National Laboratory SMO
Client Project ID: [illegible]

Strontium-90 Analysis by GFPC

PAI 724 Rev 10

Sample Results

Lab Name: Paragon Analytics
Work Order Number: 0805078
Client Name: Los Alamos National Laboratory SMO
ClientProject ID: Dust08 -1101

Field ID: SFB08-08-12412
Lab ID: 0805078-2

Analysis ReqCode: Low MDA

Sample Matrix: SOLID
Prep SOP: PAI707 Rev 10
Date Collected: 16-Apr-08
Date Prepared: 06-Jun-08
Date Analyzed: 15-Jun-08

Prep Batch: SR080606-1
QCBatchID: SR080606-1-1
Run ID: SR080606-1A
Count Time: 1000 minutes
Report Basis: As Received

FinalA liquot: 3.01 g
Prep Basis: As Received
Moisture(%): NA
Result Units: pCi/g
File Name: SRA0615

CASNO	Target Nuclide	Result +/- 1 s TPU	MDC	Requested MDC	Lab Qualifier
10098-97-2	Sr-90	0.030 +/- 0.015	0.046	0.06	U U,R5

ChemicalY ield Summary

Carrier/Tracer	Amount Added	Result	Units	Yield	Control Limits	Flag
STRONTIUM	1281	1260	ug	98.3	40 - 110 %	

Comments:

Qualifiers/Flags:

U - Resulti s less than the sample specific MDC.

Y1 - Chemical Yield is in control at10 0-110%. Quantitative Yield is assumed.

Y2 - Chemical Yield outside defaultl imits.

LT - Resulti s less than Requested MDC, greater than sample specific MDC.

M3 - The requested MDC was notm et, but the reported activity is greater than the reported MDC.

M - The requested MDC was not met.

Abbreviations:

TPU - Total Propagated Uncertainty (see PAIS OP 743)

MDC - Minimum Detectable Concentration (see PAIS OP 709)

BDL - Below Detection Limit

ETM
7/10/08

Data Package ID: *SR0805078-1*

Paragon Analytics

Sample Number(s) Cross-Reference Table

Paragon OrderNum: 0805078
Client Name: Los Alamos National Laboratory SMO
Client Project Name: Dust
Client Project Number: 08-1101
Client PO Number: 33204-001-06 F3

Client Sample Number	Lab Sample Number	COC Number	Matrix	Date Collected	Time Collected
SFB08-08-12411	0805078-1		SOLID	16-Apr-08	
SFB08-08-12412	0805078-2		SOLID	16-Apr-08	

Wednesday, May 07, 2008

LAB CHAIN OF CUSTODY DOCUMENT NUMBER: 08-1101C

REQUEST NUMBER: 08-1101

LOS ALAMOS

NATIONAL LABORATORY

ATTN: Lance Steere

Paragon Analytics, Inc.

225 Commerce

Fort Collins, CO 80524

TURNAROUND/REPORT DUE: 6/6/2008

TURNAROUND REQ'D: 30

LAB REQUEST COMMENTS: Phils Samples 0805078

	SAMPLE ID	CTNR	CTNR DESC	ORDER	PRESERV	MATRIX
1	SFB08-08-12411	1	1 L POLY	AM241+GS+ISOPU+ISOU+SR90	None	S
	SFB08-08-12411	1	500 ML POLY	GROSSA+B	None	S
	SFB08-08-12411	1	250 ML POLY	ISO_Po	Ice	S
2	SFB08-08-12412	1	1 L POLY	AM241+GS+ISOPU+ISOU+SR90	None	S
	SFB08-08-12412	1	500 ML POLY	GROSSA+B	None	S
	SFB08-08-12412	1	250 ML POLY	ISO_Po	Ice	S

Relinquished By:		Date	Time	Received By:		Date	Time
[illegible]		5/7/08	3:00	Sheri Lafferty	[illegible]	5/8/08	0930
Printed Name	Signature			Printed Name	Signature		
Printed Name	Signature			Printed Name	Signature		
Printed Name	Signature			Printed Name	Signature		

Received for DISPOSAL By: **Date** **Time** **Remarks:**

Printed Name Signature

BER: 08-1101

-1511

300

ENTS	SPECIAL INSTRUCTIONS
m bag,	
e filter,	
m bag,	
e filter,	
m bag,	
e filter,	
m bag,	

080508

Wednesday, May 07, 2008

REQUEST NUMBER: 08-1101

PRIORITY	METHOD CODE	CNTNR	SAMPLE ID	SAMPLE MATRIX	DATE SAMPLED	SAMPLE COMMENTS	SPECIAL INSTRUCTIONS
	HASL-300:AM-241	1	SFB08-08-12412	S	4/16/2008	LA Monitor-furnace filter, location LAM-0001	
	HASL-300:ISOPU	1	SFB08-08-12411	S	4/16/2008	LA Monitor-vacuum bag, location LAM-0001	
		1	SFB08-08-12412	S	4/16/2008	LA Monitor-furnace filter, location LAM-0001	
	HASL-300:ISOU	1	SFB08-08-12411	S	4/16/2008	LA Monitor-vacuum bag, location LAM-0001	
		1	SFB08-08-12412	S	4/16/2008	LA Monitor-furnace filter, location LAM-0001	
	HASL-300:PO-210	1	SFB08-08-12411	S	4/16/2008	LA Monitor-vacuum bag, location LAM-0001	
		1	SFB08-08-12412	S	4/16/2008	LA Monitor-furnace filter, location LAM-0001	

Final Page of REQUEST NUMBER 08-1101

080508

PARAGON ANALYTICS
A Division of OptiChem Laboratories, Inc.

225 Commerce Drive, Fort Collins, Colorado 80524
TF: (800) 443-1511 ◆ PH: (970) 490-1511 ◆ FX: (970) 490-1522
www.paragonlabs.com

Paragon Analytics

Sample Number(s) Cross-Reference Table

Paragon OrderNum: 0805078
Client Name: Los Alamos National Laboratory SMO
Client Project Name: Dust
Client Project Number: 08-1101
Client PO Number: 33204-001-06 F3

Client Sample Number	Lab Sample Number	COC Number	Matrix	Date Collected	Time Collected
SFB08-08-12411	0805078-1		SOLID	16-Apr-08	
SFB08-08-12412	0805078-2		SOLID	16-Apr-08	

Wednesday, May 07, 2008

LAB CHAIN OF CUSTODY DOCUMENT NUMBER: 08-1101C

REQUEST NUMBER: 08-1101

LOS ALAMOS

NATIONAL LABORATORY

ATTN: Lance Steere

Paragon Analytics, Inc.

225 Commerce

Fort Collins, CO 80524

TURNAROUND/REPORT DUE: 6/6/2008

TURNAROUND REQ'D: 30

LAB REQUEST COMMENTS: Phils Samples 0805078

	SAMPLE ID	CTNR	CTNR DESC	ORDER	PRESERV	MATRIX
1	SFB08-08-12411	1	1 L POLY	AM241+GS+ISOPU+ISOU+SR90	None	S
	SFB08-08-12411	1	500 ML POLY	GROSSA+B	None	S
	SFB08-08-12411	1	250 ML POLY	ISO_Po	Ice	S
2	SFB08-08-12412	1	1 L POLY	AM241+GS+ISOPU+ISOU+SR90	None	S
	SFB08-08-12412	1	500 ML POLY	GROSSA+B	None	S
	SFB08-08-12412	1	250 ML POLY	ISO_Po	Ice	S

Relinquished By:		Date	Time	Received By:		Date	Time
[signature]		5/7/08	3:00	Sheri Lafferty	[signature]	5/8/08	0930
Printed Name	Signature			Printed Name	Signature		
Printed Name	Signature			Printed Name	Signature		
Printed Name	Signature			Printed Name	Signature		

Received for DISPOSAL By: **Date** **Time** **Remarks:**

Printed Name Signature

REQUEST NUMBER: 08-1101

2008

TORY

tics, Inc.

e

O 80524

e the enclosed samples

e schedule indicated:

5/7/2008

ND/REPORT DUE: 6/6/2008

ND REQ'D: 30 Days

NING: Not Required

ST COMMENTS: Phils Sample

ACT:

ure:

These Samples are on:

LANL Request Number:08-1101

Per Agreement Number:1-800-443-1511

Project Cost Code: WEPR 1314 0300

D CODE	CNTNR	SAMPLE ID	SAMPLE MATRIX	DATE SAMPLED	SAMPLE COMMENTS	SPECIAL INSTRUCTIONS
	1	SFB08-08-12411	S	4/16/2008	LA Monitor-vacuum bag, location LAM-0001	
	1	SFB08-08-12412	S	4/16/2008	LA Monitor-furnace filter, location LAM-0001	
.1	1	SFB08-08-12411	S	4/16/2008	LA Monitor-vacuum bag, location LAM-0001	
	1	SFB08-08-12412	S	4/16/2008	LA Monitor-furnace filter, location LAM-0001	
.0	1	SFB08-08-12411	S	4/16/2008	LA Monitor-vacuum bag, location LAM-0001	
	1	SFB08-08-12412	S	4/16/2008	LA Monitor-furnace filter, location LAM-0001	
0:AM-241	1	SFB08-08-12411	S	4/16/2008	LA Monitor-vacuum bag, location LAM-0001	

080508

Wednesday, May 07, 2008

REQUEST NUMBER: 08-1101

PRIORITY	METHOD CODE	CNTNR	SAMPLE ID	SAMPLE MATRIX	DATE SAMPLED	SAMPLE COMMENTS	SPECIAL INSTRUCTIONS
	HASL-300:AM-241	1	SFB08-08-12412	S	4/16/2008	LA Monitor-furnace filter, location LAM-0001	
	HASL-300:ISOPU	1	SFB08-08-12411	S	4/16/2008	LA Monitor-vacuum bag, location LAM-0001	
		1	SFB08-08-12412	S	4/16/2008	LA Monitor-furnace filter, location LAM-0001	
	HASL-300:ISOU	1	SFB08-08-12411	S	4/16/2008	LA Monitor-vacuum bag, location LAM-0001	
		1	SFB08-08-12412	S	4/16/2008	LA Monitor-furnace filter, location LAM-0001	
	HASL-300:PO-210	1	SFB08-08-12411	S	4/16/2008	LA Monitor-vacuum bag, location LAM-0001	
		1	SFB08-08-12412	S	4/16/2008	LA Monitor-furnace filter, location LAM-0001	

Final Page of REQUEST NUMBER 08-1101

080508

CONDITION OF SAMPLE UPON RECEIPT FORM **Paragon Analytics**

Client: LANL Workorder No: 0805078

Project Manager: LS Initials: SL Date: 5·8·08

1. Does this project require any **special handling** in addition to standard Paragon procedures?			YES	(NO)
2. Are custody **seals on shipping containers** intact?	NONE		(YES)	NO
3. Are Custody seals on **sample containers** intact?	**NONE**		(YES)	NO
4. Is there a **COC (Chain-of-Custody) present** or other representative documents?			(YES)	NO
5. Are the **COC and bottle labels complete and legible**?			**YES**	(NO)
6. Is the **COC in agreement** with samples received? (IDs, dates, times, no. of samples, no. of containers, matrix, requested analyses, etc.)			**YES**	(NO)
7. Were **airbills / shipping documents** present and/or removable?	DROP OFF		(YES)	NO
8. Are all aqueous **samples requiring preservation preserved correctly?** (excluding volatiles)	(N/A)		**YES**	NO
9. Are all aqueous **non-preserved samples pH 4-9**?	(N/A)		**YES**	NO
10. Is there **sufficient sample** for the requested analyses?			**YES**	(NO)
11. Were all samples placed in the **proper containers** for the requested analyses?			(YES)	NO
12. Are all samples within **holding times** for the requested analyses?			(YES)	NO
13. Were all sample containers received **intact**? (not broken or leaking, etc.)			(YES)	NO
14. Are all samples requiring no headspace (VOC, GRO, Rx CN/S, radon), headspace free? **Size of bubble**: ____ < green pea ____ > green pea	(N/A)		**YES**	NO
15. Were samples checked for and free from the presence of **residual chlorine?** (Applicable when PM has indicated samples are from a chlorinated water source; note if field preservation **with** sodium thiosulfate was not observed.)	(N/A)		YES	NO
16. Were the samples **shipped on ice**?			(YES)	NO
17. Were cooler temperatures measured at 0.1-6.0°C? **IR gun used*:** #2 #4	RAD ONLY		(YES)	NO

Cooler #:	1							
Temperature (°C):	0.8							
No. of custody seals on cooler:	1							
DOT Survey/ Acceptance Information — External µR/hr reading:	16							
Background µR/hr reading:	12							

Were external µR/hr readings ≤ two times background and within DOT acceptance criteria? (YES) / NO / NA (If no, see Form 008.)

Additional Information: PROVIDE DETAILS BELOW FOR A NO RESPONSE TO ANY QUESTION ABOVE, EXCEPT #1 AND #16

No times listed. ok

Received only (1) 500 ml poly (approx 25-30% full) for both samples.

-01 = 146g v fine dust, mix Dust? = Yes ~50% full

-02 = 34g " " " ~10% full

If applicable, was the client contacted? YES / NO / NA Contact: Joy Valdez Date/Time: 5/22

Project Manager Signature / Date: 5/22/08

*IR Gun #2: Oakton, SN 29922500201-0066 *IR Gun #4: Oakton, SN 2372220101-0002

Form 201r20.xls (12/27/07)

0805078

ORIGIN ID: SAFA (505) 665-9508
JOYLENE VALDEZ
LOS ALAMOS NATL LAB
TA00 BLDG 1237 DPU 03

LOS ALAMOS, NM 87545
UNITED STATES US

Ship Date: 07MAY08
ActWgt: 74.0 LB MAN
System#: 0014176/CAFE2355
Account: S *********

(800) 443-1511
FedEx
Express

TO LANCE STEERE
PARAGON
225 COMMERCE

FORT COLLINS, CO 80524

16

Ref: 6b010amr2a015bcgao

Delivery Address
Barcode

BILL SENDER

08

PRIORITY OVERNIGHT

THU
Deliver By:
08MAY08

TRK# 7209 7844 2022

Form
0201

DEN AA

80524 -CO-US

XH FTCA

Part # 156148-434 MPI 11/05

Paragon Analytics

Radiochemistry Case Narrative
Isotopic Uranium

Los Alamos National Laboratory SMO

Dust / 08-1101

PA WO 0805078

1. This report consists of the analytical results and supporting documentation for two solid samples received by Paragon on 05/08/08.
2. These samples were prepared according to procedures PA SOP773R10 and PA SOP778R12. Due to low client detection limits, these samples were prepared at an increased aliquot of 4.5 grams. These samples were muffled for four hours at 600° C. These samples were not ground prior to analysis.
3. The samples were analyzed for the presence of isotopic uranium according to procedure PA SOP714R11. The analyses were completed on 06/12/08.
4. The isotopic analysis results for these samples are reported on an 'as received" basis in units of pCi/gram.
5. This analytical method quantifies U-235 alpha activity in a specific region of interest corresponding to emission energies between those of U-234 and U-238. A potential limitation of this method is that measurable amounts of U-234 in the sample may cause a small amount of characteristic activity in the U-235 region of interest due to poorly resolved alpha activity at the boundary between the two regions. To minimize the potential for a high bias in the U-235 analytical results, the U-235 region of interest has been narrowed and limited to a lower energy region. An 85.1% abundance correction has been made to the final U-235 results.
6. U-234 activity is reported in the associated method blank above the minimum detectable concentration value. The measured blank activity is below the requested MDC (0.01 pCi/g). Results are acceptable according to PA SOP715R15, and are submitted without further qualification.
7. The requested MDC of 0.01 pCi/L was not met for U-235 and U-238 for sample 0805078-1DUP. The reported activity for these samples is greater than the achieved MDC. These samples are identified with an "M3" flag on the final reports.
8. No further anomalous situations were encountered during the preparation or analysis of these samples. All remaining quality control criteria were met.

The data contained in the following report have been reviewed and approved by the personnel listed below. In addition, Paragon Analytics certifies that the analyses reported herein are true, complete and correct within the limits of the methods employed.

1

PARAGON ANALYTICS
Radiochemistry Data Package

Section 1

CHAIN OF CUSTODY

Paragon Analytics

Sample Number(s) Cross-Reference Table

Paragon OrderNum: 0805078
Client Name: Los Alamos National Laboratory SMO
Client Project Name: Dust
Client Project Number: 08-1101
Client PO Number: 33204-001-06 F3

Client Sample Number	Lab Sample Number	COC Number	Matrix	Date Collected	Time Collected
SFB08-08-12411	0805078-1		SOLID	16-Apr-08	
SFB08-08-12412	0805078-2		SOLID	16-Apr-08	

Wednesday, May 07, 2008

LAB CHAIN OF CUSTODY DOCUMENT NUMBER: 08-1101C

REQUEST NUMBER: 08-1101

LOS ALAMOS

NATIONAL LABORATORY

ATTN: Lance Steere

Paragon Analytics, Inc.

225 Commerce

Fort Collins, CO 80524

TURNAROUND/REPORT DUE: 6/6/2008

TURNAROUND REQ'D: 30

LAB REQUEST COMMENTS: Phils Samples 0805078

	SAMPLE ID	CTNR	CTNR DESC	ORDER	PRESERV	MATRIX
1	SFB08-08-12411	1	1 L POLY	AM241+GS+ISOPU+ISOU+SR90	None	S
	SFB08-08-12411	1	500 ML POLY	GROSSA+B	None	S
	SFB08-08-12411	1	250 ML POLY	ISO_Po	Ice	S
2	SFB08-08-12412	1	1 L POLY	AM241+GS+ISOPU+ISOU+SR90	None	S
	SFB08-08-12412	1	500 ML POLY	GROSSA+B	None	S
	SFB08-08-12412	1	250 ML POLY	ISO_Po	Ice	S

Relinquished By:		Date	Time	Received By:		Date	Time
[illegible]		5/7/08	3:00	Sheri Lafferty	[illegible]	5/8/08	0930
Printed Name	Signature			Printed Name	Signature		
Printed Name	Signature			Printed Name	Signature		
Printed Name	Signature			Printed Name	Signature		

Received for DISPOSAL By: **Date** **Time** **Remarks:**

Printed Name Signature

Wednesday, May 07, 2008

REQUEST NUMBER: 08-1101

PRIORITY	METHOD CODE	CNTNR	SAMPLE ID	SAMPLE MATRIX	DATE SAMPLED	SAMPLE COMMENTS	SPECIAL INSTRUCTIONS
	HASL-300:AM-241	1	SFB08-08-12412	S	4/16/2008	LA Monitor-furnace filter, location LAM-0001	
	HASL-300:ISOPU	1	SFB08-08-12411	S	4/16/2008	LA Monitor-vacuum bag, location LAM-0001	
		1	SFB08-08-12412	S	4/16/2008	LA Monitor-furnace filter, location LAM-0001	
	HASL-300:ISOU	1	SFB08-08-12411	S	4/16/2008	LA Monitor-vacuum bag, location LAM-0001	
		1	SFB08-08-12412	S	4/16/2008	LA Monitor-furnace filter, location LAM-0001	
	HASL-300:PO-210	1	SFB08-08-12411	S	4/16/2008	LA Monitor-vacuum bag, location LAM-0001	
		1	SFB08-08-12412	S	4/16/2008	LA Monitor-furnace filter, location LAM-0001	

Final Page of REQUEST NUMBER 08-1101

080507B

7

CONDITION OF SAMPLE UPON RECEIPT FORM **Paragon Analytics**

Client: LANL Workorder No: 0805078

Project Manager: LS Initials: SL Date: 5·8·08

1.	Does this project require any **special handling** in addition to standard Paragon procedures?		YES	(NO)
2.	Are custody **seals** on **shipping containers** intact?	NONE	(YES)	NO
3.	Are Custody seals on **sample containers** intact?	**NONE**	(YES)	NO
4.	Is there a **COC (Chain-of-Custody) present** or other representative documents?		(YES)	NO
5.	Are the **COC and bottle labels complete and legible**?		YES	(NO)
6.	Is the **COC in agreement** with samples received? (IDs, dates, times, no. of samples, no. of containers, matrix, requested analyses, etc.)		YES	(NO)
7.	Were **airbills / shipping documents** present and/or removable?	DROP OFF	(YES)	NO
8.	Are all aqueous **samples requiring preservation preserved correctly**? (excluding volatiles)	(N/A)	YES	NO
9.	Are all aqueous **non-preserved samples pH 4-9**?	(N/A)	YES	NO

0805078

ORIGIN ID: SAFA (505) 665-9966
JOYLENE VALDEZ
LOS ALAMOS NATL LAB.
TA00 BLDG 1237 DPU 03

LOS ALAMOS, NM 87545
UNITED STATES US

Ship Date: 07MAY08
ActWgt: 74.0 LB MAN
System#: 0014176/CAFE2355
Account: 5 ********

(800) 443-1511
FedEx
Express

TO LANCE STEERE
PARAGON
225 COMMERCE

FORT COLLINS, CO 80524

16

Ref: 6b010amr2a015bcgao

Delivery Address Barcode

BILL SENDER

08

PRIORITY OVERNIGHT

THU
Deliver By:
08MAY08

TRK# 7209 7844 2022 Form 0201

DEN AA

80524 -CO-US XH FTCA

2

PARAGON ANALYTICS
Radiochemistry Data Package

Section 2

SAMPLE RESULTS SUMMARY

Uranium By Alpha Spectroscopy Sample Results Summary

oratory SMO

Laboratory Name: Paragon Analytics
PAI Work Order: 0805078

Page: 1 of 1
Reported on: Thursday, June 19, 2008 11:00:55 AM

Sample Type	Nuclide	Result +/- 1 s TPU	MDC	Units	Matrix	Prep Batch	Date Analyzed	Flags
Sample	U-234	0.425 +/- 0.039	0.008	pCi/g	SOLID	AS080606-1	6/11/2008	
Sample	U-235	0.0224 +/- 0.0047	0.0022	pCi/g	SOLID	AS080606-1	6/11/2008	
Sample	U-238	0.434 +/- 0.040	0.002	pCi/g	SOLID	AS080606-1	6/11/2008	
Sample	U-234	0.614 +/- 0.051	0.007	pCi/g	SOLID	AS080606-1	6/11/2008	
Sample	U-235	0.0335 +/- 0.0050	0.0014	pCi/g	SOLID	AS080606-1	6/11/2008	
Sample	U-238	0.674 +/- 0.056	0.003	pCi/g	SOLID	AS080606-1	6/11/2008	

ic MDC.
ssumed.

ater than the reported MDC.

Abbreviations:
TPU - Total Propagated Uncertainty (see PAI SOP 743)
MDC - Minimum Detectable Concentration (see PAI SOP 709)

BDL - Below Detection Limit

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PARAGON ANALYTICS
Radiochemistry Data Package

Section 3

QC RESULTS SUMMARY

Isotopic Uranium By Alpha Spectroscopy

PAI 714 Rev 11

Method Blank Results

Lab Name: Paragon Analytics
Work Order Number: 0805078
Client Name: Los Alamos National Laboratory SMO
ClientProject ID: Dust 08-1101

Lab ID: AS080606-1MB

Sample Matrix: SOLID
Prep SOP: PAI 778 Rev 12
Date Collected: 06-Jun-08
Date Prepared: 06-Jun-08
Date Analyzed: 11-Jun-08

Prep Batch: AS080606-1
QCBatchID: AS080606-1-1
Run ID: AS080606-1A
Count Time: 1000 minutes

Final Aliquot: 4.53 g
Result Units: pCi/g
File Name: Spectrum #1

CASNO	Target Nuclide	Result +/- 1 s TPU	MDC	Requested MDC	Lab Qualifier
13966-29-5	U-234	0.0080 +/- 0.0027	0.0071	0.01	B3
15117-96-1	U-235	0.0006 +/- 0.0016	0.0064	0.01	U
7440-61-1	U-238	0.0045 +/- 0.0018	[illegible]	[illegible]	[illegible]

Isotopic Uranium By Alpha Spectroscopy

PAI 714 Rev 11

Laboratory Control Sample(s)

Lab Name: Paragon Analytics
Work Order Number: 0805078
Client Name: Los Alamos National Laboratory SMO
ClientProject ID: Dust 08-1101

Lab ID: AS080606-1LCS

Sample Matrix: SOLID
Prep SOP: PAI 778 Rev 12
Date Collected: 06-Jun-08
Date Prepared: 06-Jun-08
Date Analyzed: 11-Jun-08

Prep Batch: AS080606-1
QCBatchID: AS080606-1-1
Run ID: AS080606-1A
Count Time: 1000 minutes

Final Aliquot: 4.53 g
Result Units: pCi/g
File Name: Spectrum #1

CASNO	Target Nuclide	Results +/- 1s TPU	MDC	Spike Added	% Rec	Control Limits	Lab Qualifier
13966-29-5	U-234	0.500 +/- 0.042	0.008	0.493	101	82 - 122	P
7440-61-1	U-238	0.544 +/- 0.045	0.005	0.512	106	82 - 122	P

Chemical Yield Summary

Carrier/Tracer	Amount Added	Result	Units	Yield	Control Limits	Flag
U-232	0.4909	0.400	pCi/g	81.4	30 - 110 %	

Comments:

Qualifiers/Flags:

U - Result is less than the sample specific MDC.
LT - Result is less than Requested MDC, greater than sample specific MDC.
Y1 - Chemical Yield is in control at 100-110%. Quantitative Yield is assumed.
Y2 - Chemical Yield outside default limits.
L - LCS Recovery below lower control limit.
H - LCS Recovery above upper control limit.
P - LCS Recovery within control limits.
M - The requested MDC was not met.
M3 - The requested MDC was not met, but thereported activity is greater than the reported MDC.

Abbreviations:

TPU - Total Propagated Uncertainty (see PAI SOP 743)
MDC - Minimum Detectable Concentration (see PAI SOP 709)

Data Package ID: *UR0805078-1*

Isotopic Uranium By Alpha Spectroscopy

PAI 714 Rev 11

Duplicate Sample Results (DER)

Lab Name: Paragon Analytics
Work Order Number: 0805078
Client Name: Los Alamos National Laboratory SMO
ClientProject ID: Dust 08-1101

Field ID: SFB08-08-12411
Lab ID: 0805078-1DUP

Sample Matrix: SOLID
Prep SOP: PAI 778 Rev 12
Date Collected: 16-Apr-08
Date Prepared: 06-Jun-08
Date Analyzed: 12-Jun-08

Prep Batch: AS080606-1
QCBatchID: AS080606-1-1
Run ID: AS080606-1A
Count Time: 1000 minutes
Report Basis: As Received

Final Aliquot: 4.51 g
Prep Basis: As Received
Moisture(%): NA
Result Units: pCi/g
File Name: Spectrum #1

CASNO	Analyte	Sample Result +/- 1s TPU	Duplicate Result +/- 1s TPU	DER	Control Limit	Lab Qualifiers
13966-29-5	U-234	0.425 +/- 0.039	0.412 +/- 0.038	0.12	2.13	
15117-96-1	U-235	0.0224 +/- 0.0047	0.0140 +/- 0.0043	0.66	2.13	M3
7440-61-1	U-238	0.434 +/- 0.040	0.399 +/- 0.037	0.32	2.13	M3

Comments:

Duplicate Qualifiers/Flags:

U - Result is less than the sample specific MDC.
Y1 - Chemical Yield is in control at 100-110%. Quantitative yield is assumed.
Y2 - Chemical Yield outside default limits.
W - DER is greater than Warning Limit of 1.42
D - DER is greater than Control Limit of 2.13
LT - Result is less than Request MDC, greater than sample specific MDC
M - Requested MDC not met.
M3 - The requested MDC was not met, but the reported activity is greater than the reported MDC.
L - LCS Recovery below lower control limit.
H - LCS Recovery above upper control limit.
P - LCS, Matrix Spike Recovery within control limits.
N - Matrix Spike Recovery outside control limits

Abbreviations:

TPU - Total Propagated Uncertainty (see PAI SOP 743)
DER - Duplicate Error Ratio (see PAI SOP 715)
BDL - Below Detection Limit
NR - Not Reported

Data Package ID: *UR0805078-1*

PARAGON ANALYTICS
Radiochemistry Data Package

4

Section 4

INDIVIDUAL SAMPLE RESULTS

Isotopic Uranium By Alpha Spectroscopy

PAI 714 Rev 11

Sample Results

Lab Name: Paragon Analytics
Work Order Number: 0805078
Client Name: Los Alamos National Laboratory SMO
ClientProject ID: Dust 08-1101

Field ID: SFB08-08-12411
Lab ID: 0805078-1

Analysis ReqCode: Low MDA

Sample Matrix: SOLID
Prep SOP: PAI 778 Rev 12
Date Collected: 16-Apr-08
Date Prepared: 06-Jun-08
Date Analyzed: 11-Jun-08

Prep Batch: AS080606-1
QCBatchID: AS080606-1-1
Run ID: AS080606-1A
Count Time: 1000 minutes
Report Basis: As Received

Final Aliquot: 4.52 g
Prep Basis: As Received
Moisture(%): NA
Result Units: pCi/g
File Name: Spectrum #1

CASNO	Target Nuclide	Result +/- 1 s TPU	MDC	Requested MDC	Lab Qualifier
13966-29-5	U-234	0.425 +/- 0.039	0.008	0.01	
15117-96-1	U-235	0.0224 +/- 0.0047	0.0022	0.01	
7440-61-1	U-238	0.434 +/- 0.040	0.002	0.01	

Chemical Yield Summary

Carrier/Tracer	Amount Added	Result	Units	Yield	Control Limits	Flag
U-232	0.4923	0.247	pCi/g	50.2	30 - 110 %	

Comments:

Qualifiers/Flags:

U - Result is less than the sample specific MDC.

Y1 - Chemical Yield is in control at 100-110%. Quantitative Yield is assumed.

Y2 - Chemical Yield outside default limits.

LT - Result is less than Requested MDC, greater than sample specific MDC.

M3 - The requested MDC was not met, but the reported activity is greater than the reported MDC.

M - The requested MDC was not met.

Abbreviations:

TPU - Total Propagated Uncertainty (see PAI SOP 743)

MDC - Minimum Detectable Concentration (see PAI SOP 709)

BDL - Below Detection Limit

Data Package ID: *UR0805078-1*

Isotopic Uranium By Alpha Spectroscopy

PAI 714 Rev 11

Sample Duplicate Results

Lab Name: Paragon Analytics
Work Order Number: 0805078
Client Name: Los Alamos National Laboratory SMO
ClientProject ID: Dust 08-1101

Field ID: SFB08-08-12411
Lab ID: 0805078-1DUP

Sample Matrix: SOLID
Prep SOP: PAI 778 Rev 12
Date Collected: 16-Apr-08
Date Prepared: 06-Jun-08
Date Analyzed: 12-Jun-08

Prep Batch: AS080606-1
QCBatchID: AS080606-1-1
Run ID: AS080606-1A
Count Time: 1000 minutes
Report Basis: As Received

Final Aliquot: 4.51 g
Prep Basis: As Received
Moisture(%): NA
Result Units: pCi/g
File Name: Spectrum #1

CASNO	Target Nuclide	Result +/- 1 s TPU	MDC	Requested MDC	Lab Qualifier
13966-29-5	U-234	0.412 +/- 0.038	0.009	0.01	
15117-96-1	U-235	0.0140 +/- 0.0043	0.0102	0.01	M3
7440-61-1	U-238	0.399 +/- 0.037	0.012	0.01	M3

Chemical Yield Summary

Carrier/Tracer	Amount Added	Result	Units	Yield	Control Limits	Flag
U-232	0.4928	0.253	pCi/g	51.4	30 - 110 %	

Comments:

Qualifiers/Flags:

U - Result is less than the sample specific MDC.

Y1 - Chemical Yield is in control at 100-110%. Quantitative yield is assumed.

Y2 - Chemical Yield outside default limits.

LT - Result is less than Requested MDC, greater than sample specific MDC.

M - The requested MDC was not met.

M3 - The requested MDC was not met, but thereported activity is greater than the reported MDC.

W - DER is greater than Warning Limit of 1.42

D - DER is greater than Control Limit of 2.13

Abbreviations:

TPU - Total Propagated Uncertainty (see PAI SOP 743)

MDC - Minimum Detectable Concentration (see PAI SOP 709)

BDL - Below Detection Limit

Data Package ID: *UR0805078-1*

Isotopic Uranium By Alpha Spectroscopy

PAI 714 Rev 11

Sample Results

Lab Name: Paragon Analytics
Work Order Number: 0805078
Client Name: Los Alamos National Laboratory SMO
ClientProject ID: Dust 08-1101

Field ID: SFB08-08-12412
Lab ID: 0805078-2

Analysis ReqCode: Low MDA

Sample Matrix: SOLID
Prep SOP: PAI 778 Rev 12
Date Collected: 16-Apr-08
Date Prepared: 06-Jun-08
Date Analyzed: 11-Jun-08

Prep Batch: AS080606-1
QCBatchID: AS080606-1-1
Run ID: AS080606-1A
Count Time: 1000 minutes
Report Basis: As Received

Final Aliquot: 4.54 g
Prep Basis: As Received
Moisture(%): NA
Result Units: pCi/g
File Name: Spectrum #1

CASNO	Target Nuclide	Result +/- 1 s TPU	MDC	Requested MDC	Lab Qualifier
13966-29-5	U-234	0.614 +/- 0.051	0.007	0.01	
15117-96-1	U-235	0.0335 +/- 0.0050	0.0014	0.01	
7440-61-1	U-238	0.674 +/- 0.056	0.003	0.01	

Chemical Yield Summary

Carrier/Tracer	Amount Added	Result	Units	Yield	Control Limits	Flag
U-232	0.4894	0.366	pCi/g	74.7	30 - 110 %	

Comments:

Qualifiers/Flags:

U - Result is less than the sample specific MDC.

Y1 - Chemical Yield is in control at 100-110%. Quantitative Yield is assumed.

Y2 - Chemical Yield outside default limits.

LT - Result is less than Requested MDC, greater than sample specific MDC.

M3 - The requested MDC was not met, but the reported activity is greater than the reported MDC.

M - The requested MDC was not met.

Abbreviations:

TPU - Total Propagated Uncertainty (see PAI SOP 743)

MDC - Minimum Detectable Concentration (see PAI SOP 709)

BDL - Below Detection Limit

Data Package ID: *UR0805078-1*

PARAGON ANALYTICS
Radiochemistry Data Package

5

Section 5

RAW DATA

Isotopic Uranium By Alpha Spectroscopy Raw Data Report

Laboratory Name: Paragon Analytics
PAI Work Order: 0805078

Prep SOP: PAI 778
Analytical SOP: PAI 714

Reported on: Friday, June 13, 2008
10:36:02 AM

Sample ID QC Type	Nuclide Type	Sample Date/Time	Prep Batch QCBatchID	Ingrowth Date /Time	Decay Date/Time	Matrix %Moist.	Samp Alq Analy Alq	Inst ID Det ID	AnRunID File Name	Count Date/Time	Net Cnts Bkg Cnts	BaseEff Bkg(min)	CntDur(min) Yield	Activity +/- 1 s TPU	MDC DecLev	ReportUnits ReportBasis	DER RPD	%Spk. Recov Flags
0805078-1	U-232	4/16/2008	AS080606-1	NA	NA	SOLID	4.52 g	AlphaSpec2	AS080606-1A	6/11/2008	699.000	28.19%	1000	0.247	0.006	pCi/g	NA	
SMP	Tracer		AS080606-1-1	NA	NA	NA	4.52 g	22	Spectrum #1	4:06 PM	10.000	1000	50.2%	0.020	NA	As Received	NA	
0805078-1	U-234	4/16/2008	AS080606-1	NA	NA	SOLID	4.52 g	AlphaSpec2	AS080606-1A	6/11/2008	604.000	28.19%	1000	0.425	0.008	pCi/g	NA	
SMP	Trg. Analyte		AS080606-1-1	NA	NA	NA	4.52 g	22	Spectrum #1	4:06 PM	4.000	1000	50.2%	0.039	NA	As Received	NA	
0805078-1	U-235	4/16/2008	AS080606-1	NA	NA	SOLID	4.52 g	AlphaSpec2	AS080606-1A	6/11/2008	27.000	28.19%	1000	0.0224	0.0022	pCi/g	NA	
SMP	Trg. Analyte		AS080606-1-1	NA	NA	NA	4.52 g	22	Spectrum #1	4:06 PM	0.000	1000	50.2%	0.0047	NA	As Received	NA	
0805078-1	U-238	4/16/2008	AS080606-1	NA	NA	SOLID	4.52 g	AlphaSpec2	AS080606-1A	6/11/2008	616.000	28.19%	1000	0.434	0.002	pCi/g	NA	
SMP	Trg. Analyte		AS080606-1-1	NA	NA	NA	4.52 g	22	Spectrum #1	4:06 PM	0.000	1000	50.2%	0.040	NA	As Received	NA	
0805078-1	U-232	4/16/2008	AS080606-1	NA	NA	SOLID	4.51 g	AlphaSpec2	AS080606-1A	6/12/2008	743.000	29.29%	1000	0.253	0.010	pCi/g	NA	
DUP	Tracer		AS080606-1-1	NA	NA	NA	4.51 g	25	Spectrum #1	4:18 PM	32.000	1000	51.4%	0.021	NA	As Received	NA	
0805078-1	U-234	4/16/2008	AS080606-1	NA	NA	SOLID	4.51 g	AlphaSpec2	AS080606-1A	6/12/2008	621.000	29.29%	1000	0.412	0.009	pCi/g	0.12	
DUP	Trg. Analyte		AS080606-1-1	NA	NA	NA	4.51 g	25	Spectrum #1	4:18 PM	6.000	1000	51.4%	0.038	NA	As Received	NA	
0805078-1	U-235	4/16/2008	AS080606-1	NA	NA	SOLID	4.51 g	AlphaSpec2	AS080606-1A	6/12/2008	18.000	29.29%	1000	0.0140	0.0102	pCi/g	0.66	
DUP	Trg. Analyte		AS080606-1-1	NA	NA	NA	4.51 g	25	Spectrum #1	4:18 PM	5.000	1000	51.4%	0.0043	NA	As Received	NA	M3
0805078-1	U-238	4/16/2008	AS080606-1	NA	NA	SOLID	4.51 g	AlphaSpec2	AS080606-1A	6/12/2008	601.000	29.29%	1000	0.399	0.012	pCi/g	0.32	
DUP	Trg. Analyte		AS080606-1-1	NA	NA	NA	4.51 g	25	Spectrum #1	4:18 PM	11.000	1000	51.4%	0.037	NA	As Received	NA	M3
0805078-2	U-232	4/16/2008	AS080606-1	NA	NA	SOLID	4.54 g	AlphaSpec2	AS080606-1A	6/11/2008	1082.000	29.32%	1000	0.366	0.004	pCi/g	NA	
SMP	Tracer		AS080606-1-1	NA	NA	NA	4.54 g	24	Spectrum #1	4:06 PM	3.000	1000	74.7%	0.029	NA	As Received	NA	
0805078-2	U-234	4/16/2008	AS080606-1	NA	NA	SOLID	4.54 g	AlphaSpec2	AS080606-1A	6/11/2008	1357.000	29.32%	1000	0.614	0.007	pCi/g	NA	
SMP	Trg. Analyte		AS080606-1-1	NA	NA	NA	4.54 g	24	Spectrum #1	4:06 PM	8.000	1000	74.7%	0.051	NA	As Received	NA	
0805078-2	U-235	4/16/2008	AS080606-1	NA	NA	SOLID	4.54 g	AlphaSpec2	AS080606-1A	6/11/2008	63.000	29.32%	1000	0.0335	0.0014	pCi/g	NA	
SMP	Trg. Analyte		AS080606-1-1	NA	NA	NA	4.54 g	24	Spectrum #1	4:06 PM	0.000	1000	74.7%	0.0050	NA	As Received	NA	

Comments:

Data Package ID: *UR0805078-1*

Qualifiers/Flags:

U - Result is less than the sample specific MDC.

Y1 - Chemical Yield is in control at 100-110%. Quantitative yield is assumed.

Y2 - Chemical Yield outside default limits.

W - DER is greater than Warning Limit of 1.42

D - DER is greater than Control Limit of 2.13

+ - Duplicate RPD not within limits.

LT - Result is less than Request MDC, greater than sample specific MDC

* - Aliquot Basis is 'As Received' while the Report Basis is 'Dry Weight'.

\# - Aliquot Basis is 'Dry Weight' while the Report Basis is 'As Received'

M - Requested MDC not met.

M3 - The requested MDC was not met, but the reported activity is greater than the reported MDC.

L - LCS Recovery below lower control limit.

H - LCS Recovery above upper control limit.

P - LCS, Matrix Spike Recovery within control limits.

N - Matrix Spike Recovery outside control limits

NC - Not Calculated for duplicate results less than 5 times MDC

B - Analyte concentration greater than MDC.

B3 - Analyte concentration greater than MDC but less than Requested MDC.

Notes:

1) The Tracer results are not yield corrected (i.e. activity measured not activity added).

2) Where sample time is not available, 12:00 PM (Mountain) is used for decay correction.

Abbreviations:

TR- Tracer TA - Target Analyte

TPU - Total Propagated Uncertainty (see PAI SOP 743)

MDC - Minimum Detectable Concentration (see PAI SOP 709)

DER - Duplicate Error Ratio

BDL - Below Detection Limit

Isotopic Uranium By Alpha Spectroscopy Raw Data Report

Laboratory Name: Paragon Analytics
PAI Work Order: 0805078

Prep SOP: PAI 778
Analytical SOP: PAI 714

Reported on: Friday, June 13, 2008
10:36:02 AM

Sample ID QC Type	Nuclide Type	Sample Date/Time	Prep Batch QCBatchID	Ingrowth Date /Time	Decay Date/Time	Matrix %Moist.	Samp Alq Analy Alq	Inst ID Det ID	AnRunID File Name	Count Date/Time	Net Cnts Bkg Cnts	BaseEff Bkg(min)	CntDur(min) Yield	Activity +/- 1 s TPU	MDC DecLev	ReportUnits ReportBasis	DER RPD	%Spk. Recov Flags
0805078-2	U-238	4/16/2008	AS080606-1	NA	NA	SOLID	4.54 g	AlphaSpec2	AS080606-1A	6/11/2008	1491.000	29.32%	1000	0.674	0.003	pCi/g	NA	
SMP	Trg. Analyte		AS080606-1-1	NA	NA	NA	4.54 g	24	Spectrum #1	4:06 PM	1.000	1000	74.7%	0.056	NA	As Received	NA	
AS080606-1	U-232	6/6/2008	AS080606-1	NA	NA	SOLID	4.53 g	AlphaSpec2	AS080606-1A	6/11/2008	978.000	31.26%	1000	0.311	0.009	pCi/g	NA	
MB	Tracer	11:15:52 AM	AS080606-1-1	NA	NA	NA	4.53 g	59	Spectrum #1	3:54 PM	27.000	1000	63.4%	0.025	NA	As Received	NA	
AS080606-1	U-234	6/6/2008	AS080606-1	NA	NA	SOLID	4.53 g	AlphaSpec2	AS080606-1A	6/11/2008	16.000	31.26%	1000	0.0080	0.0071	pCi/g	NA	
MB	Trg. Analyte	11:15:52 AM	AS080606-1-1	NA	NA	NA	4.53 g	59	Spectrum #1	3:54 PM	6.000	1000	63.4%	0.0027	NA	As Received	NA	B3
AS080606-1	U-235	6/6/2008	AS080606-1	NA	NA	SOLID	4.53 g	AlphaSpec2	AS080606-1A	6/11/2008	1.000	31.26%	1000	0.0006	0.0064	pCi/g	NA	
MB	Trg. Analyte	11:15:52 AM	AS080606-1-1	NA	NA	NA	4.53 g	59	Spectrum #1	3:54 PM	3.000	1000	63.4%	0.0016	NA	As Received	NA	U
AS080606-1	U-238	6/6/2008	AS080606-1	NA	NA	SOLID	4.53 g	AlphaSpec2	AS080606-1A	6/11/2008	9.000	31.26%	1000	0.0045	0.0047	pCi/g	NA	
MB	Trg. Analyte	11:15:52 AM	AS080606-1-1	NA	NA	NA	4.53 g	59	Spectrum #1	3:54 PM	2.000	1000	63.4%	0.0018	NA	As Received	NA	U
AS080606-1	U-232	6/6/2008	AS080606-1	NA	NA	SOLID	4.53 g	AlphaSpec2	AS080606-1A	6/11/2008	1239.000	30.83%	1000	0.400	0.007	pCi/g	NA	
LCS	Tracer	11:15:52 AM	AS080606-1-1	NA	NA	NA	4.53 g	60	Spectrum #1	3:54 PM	18.000	1000	81.4%	0.031	NA	As Received	NA	
AS080606-1	U-234	6/6/2008	AS080606-1	NA	NA	SOLID	4.53 g	AlphaSpec2	AS080606-1A	6/11/2008	1262.000	30.83%	1000	0.500	0.008	pCi/g	NA	101
LCS	Trg. Analyte	11:15:52 AM	AS080606-1-1	NA	NA	NA	4.53 g	60	Spectrum #1	3:54 PM	16.000	1000	81.4%	0.042	NA	As Received	NA	P
AS080606-1	U-238	6/6/2008	AS080606-1	NA	NA	SOLID	4.53 g	AlphaSpec2	AS080606-1A	6/11/2008	1372.000	30.83%	1000	0.544	0.005	pCi/g	NA	106
LCS	Trg. Analyte	11:15:52 AM	AS080606-1-1	NA	NA	NA	4.53 g	60	Spectrum #1	3:54 PM	5.000	1000	81.4%	0.045	NA	As Received	NA	P

Comments:

Data Package ID: *UR0805078-1*

Qualifiers/Flags:

U - Result is less than the sample specific MDC.

Y1 - Chemical Yield is in control at 100-110%. Quantitative yield is assumed.

Y2 - Chemical Yield outside default limits.

W - DER is greater than Warning Limit of 1.42

D - DER is greater than Control Limit of 2.13

+ - Duplicate RPD not within limits.

LT - Result is less than Request MDC, greater than sample specific MDC

* - Aliquot Basis is 'As Received' while the Report Basis is 'Dry Weight'.

\# - Aliquot Basis is 'Dry Weight' while the Report Basis is 'As Received'

M - Requested MDC not met.

M3 - The requested MDC was not met, but the reported activity is greater than the reported MDC.

L - LCS Recovery below lower control limit.

H - LCS Recovery above upper control limit.

P - LCS, Matrix Spike Recovery within control limits.

N - Matrix Spike Recovery outside control limits

NC - Not Calculated for duplicate results less than 5 times MDC

B - Analyte concentration greater than MDC.

B3 - Analyte concentration greater than MDC but less than Requested MDC.

Notes:

1) The Tracer results are not yield corrected (i.e. activity measured not activity added).

2) Where sample time is not available, 12:00 PM (Mountain) is used for decay correction.

Abbreviations:

TR- Tracer TA - Target Analyte

TPU - Total Propagated Uncertainty (see PAI SOP 743)

MDC - Minimum Detectable Concentration (see PAI SOP 709)

DER - Duplicate Error Ratio

BDL - Below Detection Limit

Paragon Analytics

Alpha-Spectroscopy Analysis Report

Sample

Sample: 0805078-1
Spectrum #1 Analysis #1

Sample Size : 4.50

Acquisition

Detector: 22
Batch Name: UAS080606-1_A
Nuclide Library: Uranium Default
Analysis Method: Absolute ROI Analysis, Set Name = Uranium Default
ROI Set: Uranium Default

Acquisition Start Date: 6/11/2008 4:06:03PM
Live Time: 1,000.00 min.
Real Time: 1,000.02 min.
Dead Time: 0.00 %

Calibration

Bkgd Info: Sample: B08060922; Det: 22; Spectrum #1; Jun-09-2008 12:17

Calibration Date: 6/9/2008 9:41:34AM

Efficiency Calibration: C08060922

Efficiency: 28.19% +/- 0.15% TPU(2 sigma)

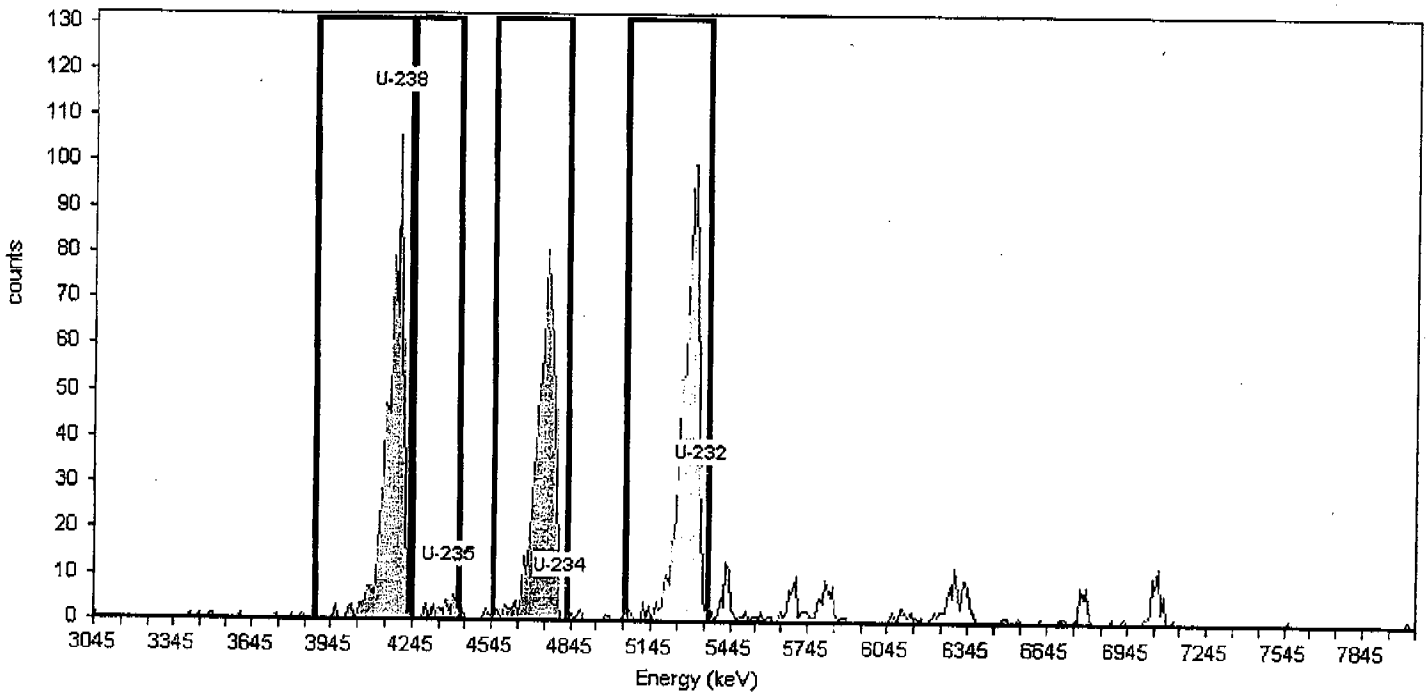
Energy Calibration: C08060922

Energy Cal: Gain = 9.8047 keV / Ch
Offset = 3,036.00 keV
Quadratic = 0.0000 keV / Ch^2

Tracer

Tracer Name: 837.3020.90 U-232
Tracer Activity: 19.77 DPM/mL x (Vol.)0.25 mL = 4.94 DPM

Tracer Nuclide: U-232
Tracer Recovery: 50.73%



Nuclide Summary (ROI)

Nuclide	Peak Energy keV	ROI Start keV	ROI End keV	FWHM keV	B.R. %.	Gross Counts	Bkgd Counts	Net Counts	Activity pCi/g	2.00Sigma TPU pCi/g	Critical Level pCi/g	MDA pCi/g
U-234	4771.4	4545.9	4830.3	74.4	100.0	608.00	4.00	604.00	4.2E-001	6.4E-002	3.3E-003	8.4E-003
U-232	5300.9	5046.0	5359.7	73.2	100.1	709.00	10.00	699.00	2.5E-001	1.9E-002	5.2E-003	1.2E-002
U-238	4163.6	3879.2	4232.2	77.8	100.2	616.00	0.00	616.00	4.3E-001	6.4E-002	0.0E+000	1.9E-003
U-235	4349.8	4242.0	4418.5	62.7	99.7	27.00	0.00	27.00	1.9E-002	7.8E-003	0.0E+000	1.9E-003

Reviewed By: GB JP

Print Date: 6/12/2008 10:32:28AM

AlphaVision v5.3
Custom Report Iteration: 08/09/07

Paragon Analytics

Alpha-Spectroscopy Analysis Report

Sample

Sample: 0805078-1D
Spectrum #1 Analysis #1

Sample Size : 4.50

Acquisition

Detector: 25
Batch Name: UAS080606-1_B
Nuclide Library: Uranium Default
Analysis Method: Absolute Interactive ROI Analysis
ROI Set: Uranium Default

Acquisition Start Date: 6/12/2008 4:18:33PM
Live Time: 1,000.00 min.
Real Time: 1,000.02 min.
Dead Time: 0.00 %

Calibration

Bkgd Info: Sample: B08061025; Det: 25; Spectrum #1; Jun-10-2008 14:12

Calibration Date: 6/10/2008 12:25:06PM

Efficiency Calibration: C08061025

Efficiency: 29.29% +/- 0.20% TPU(2 sigma)

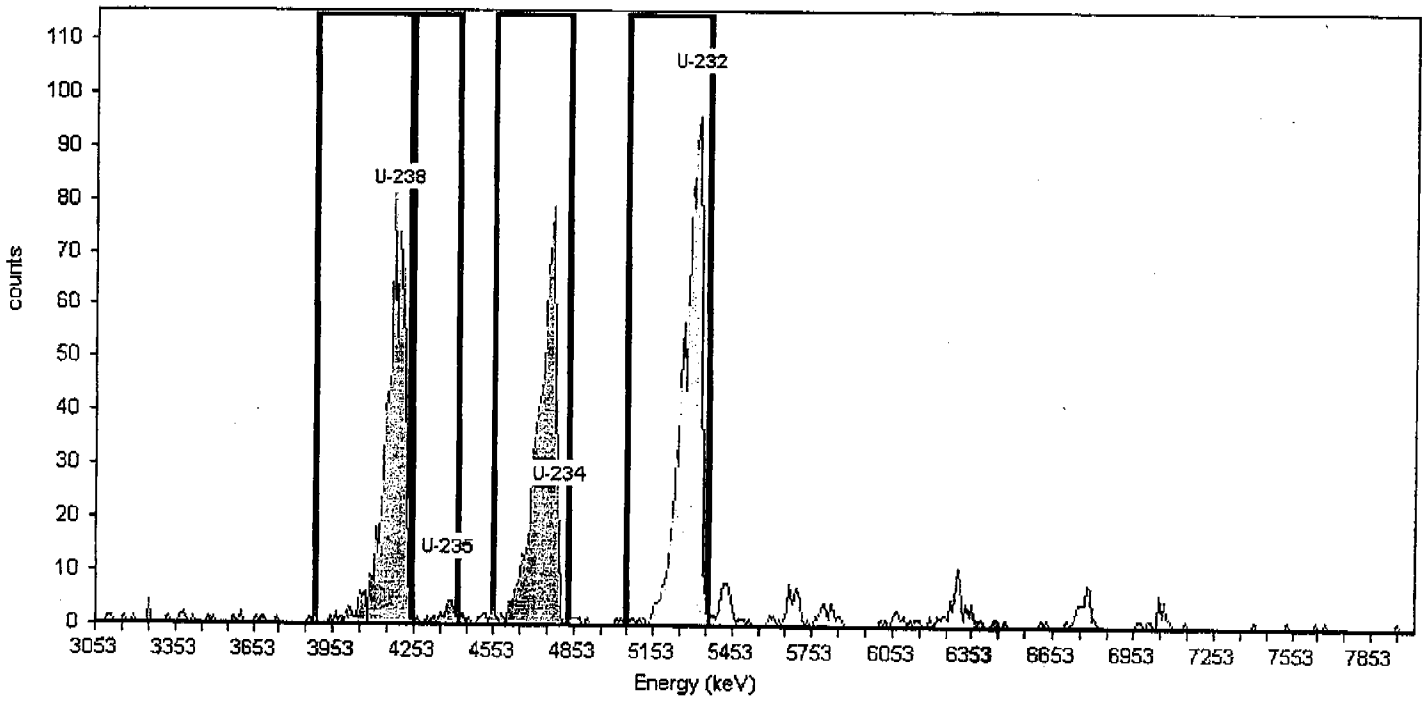
Energy Calibration: C08061025

Energy Cal: Gain = 9.7289 keV / Ch
Offset = 3,043.84 keV
Quadratic = 0.0000 keV / Ch^2

Tracer

Tracer Name: 837.3020.90 U-232
Tracer Activity: 19.77 DPM/mL x (Vol.)0.25 mL = 4.94 DPM

Tracer Nuclide: U-232
Tracer Recovery: 51.91%



Nuclide Summary (ROI)

Nuclide	Peak Energy keV	ROI Start keV	ROI End keV	FWHM keV	B.R. %.	Gross Counts	Bkgd Counts	Net Counts	Activity pCi/g	2.00Sigma TPU pCi/g	Critical Level pCi/g	MDA pCi/g
U-238	4191.8	3880.5	4230.8	44.0	100.2	612.00	11.00	601.00	3.9E-001	6.0E-002	5.1E-003	1.2E-002
U-235	4376.7	4240.5	4415.6	23.8	99.7	23.00	5.00	18.00	1.2E-002	7.1E-003	3.4E-003	8.7E-003
U-234	4795.0	4551.8	4833.9	75.6	100.0	627.00	6.00	621.00	4.1E-001	6.1E-002	3.8E-003	9.3E-003
U-232	5320.4	5048.0	5359.3	~~31.4~~	100.1	775.00	32.00	743.00	2.6E-001	2.0E-002	8.8E-003	1.9E-002

Reviewed By: GB JP ~70 GB 6/13/08

Print Date: 6/13/2008 9:21:55AM

AlphaVision v5.3
Custom Report Iteration: 08/09/07

Paragon Analytics

Alpha-Spectroscopy Analysis Report

Sample

Sample: 0805078-2
Spectrum #1 Analysis #1

Sample Size : 4.50

Acquisition

Detector: 24
Batch Name: UAS080606-1_A
Nuclide Library: Uranium Default
Analysis Method: Absolute Interactive ROI Analysis
ROI Set: Uranium Default

Acquisition Start Date: 6/11/2008 4:06:04PM
Live Time: 1,000.00 min.
Real Time: 1,000.02 min.
Dead Time: 0.00 %

Calibration

Bkgd Info: Sample: B08060924; Det: 24; Spectrum #1; Jun-09-2008 12:17

Calibration Date: 6/9/2008 9:42:11AM

Efficiency Calibration: C08060924

Efficiency: 29.32% +/- 0.12% TPU(2 sigma)

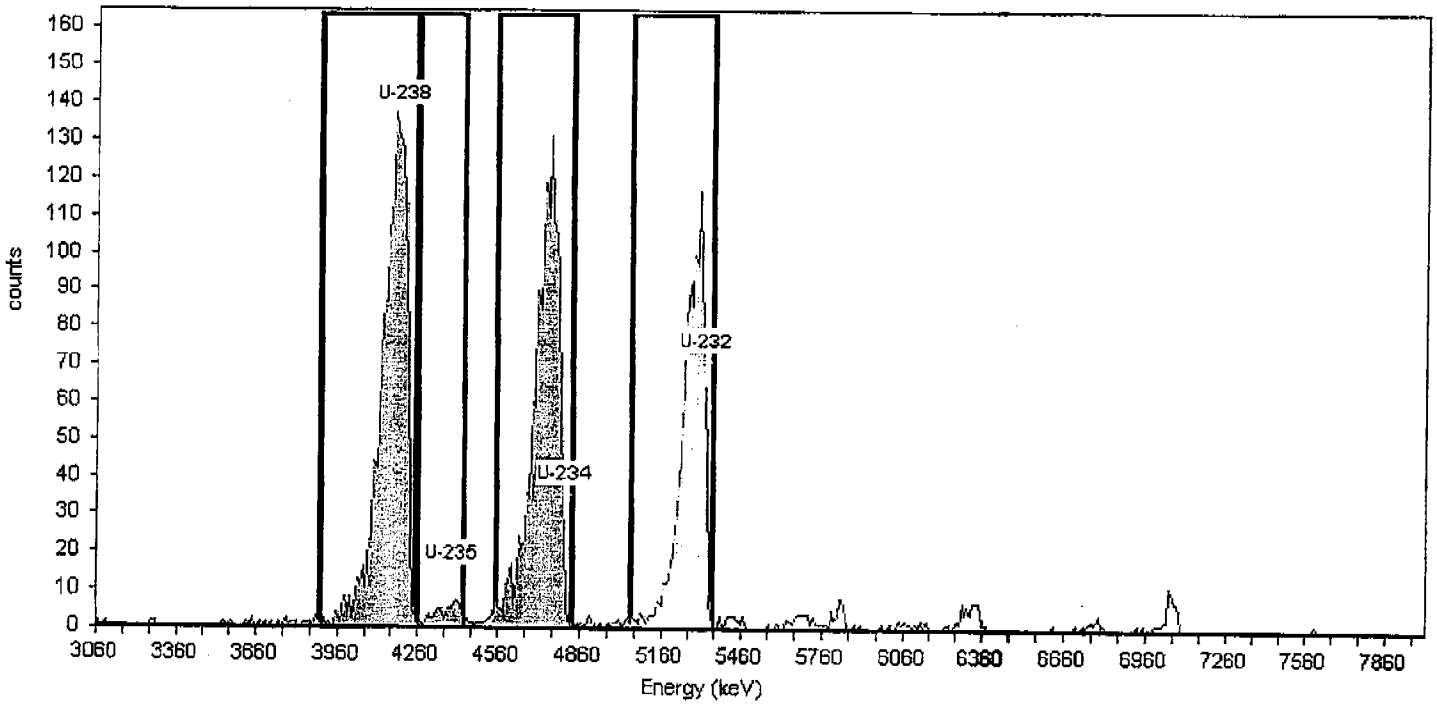
Energy Calibration: C08060924

Energy Cal: Gain = 9.7108 keV / Ch
Offset = 3,050.49 keV
Quadratic = 0.0000 keV / Ch^2

Tracer

Tracer Name: 837.3020.90 U-232
Tracer Activity: 19.77 DPM/mL x (Vol.)0.25 mL = 4.94 DPM

Tracer Nuclide: U-232
Tracer Recovery: 75.50%



Nuclide Summary (ROI)

Nuclide	Peak Energy keV	ROI Start keV	ROI End keV	FWHM keV	B.R. %.	Gross Counts	Bkgd Counts	Net Counts	Activity pCi/g	2.00Sigma TPU pCi/g	Critical Level pCi/g	MDA pCi/g
U-238	4196.4	3895.3	4244.9	52.9	100.2	1,492.00	1.00	1,491.00	6.7E-001	8.6E-002	1.0E-003	3.3E-003
U-235	4380.9	4254.6	4429.4	36.6	99.7	63.00	0.00	63.00	2.9E-002	8.0E-003	0.0E+000	1.2E-003
U-234	4798.4	4546.0	4827.6	100.3	100.0	1,365.00	8.00	1,357.00	6.1E-001	7.9E-002	3.0E-003	7.2E-003
U-232	5322.8	5041.2	5352.0	~~33.3~~	100.1	1,085.00	3.00	1,082.00	3.7E-001	2.3E-002	1.8E-003	4.9E-003

Reviewed By: GB JP <97.11 GB 6/12/08

Print Date: 6/12/2008 10:33:05AM

AlphaVision v5.3
Custom Report Iteration: 08/09/07

Paragon Analytics

Alpha-Spectroscopy Analysis Report

Sample

Sample: AS080606-1MB
Spectrum #1 Analysis #1

Sample Size : 4.50

Acquisition

Detector: 59
Batch Name: UAS080606-1_A
Nuclide Library: Uranium Default
Analysis Method: Absolute Interactive ROI Analysis

Acquisition Start Date: 6/11/2008 3:54:34PM
Live Time: 1,000.00 min.
Real Time: 1,000.05 min.
Dead Time: 0.00 %

Paragon Analytics

Alpha-Spectroscopy Analysis Report

Sample

Sample: AS080606-1LCS
Spectrum #1 Analysis #1

Sample Size : 4.50

Acquisition

Detector: 60
Batch Name: UAS080606-1_A
Nuclide Library: Uranium Default
Analysis Method: Absolute Interactive ROI Analysis
ROI Set: Uranium Default

Acquisition Start Date: 6/11/2008 3:54:35PM
Live Time: 1,000.00 min.
Real Time: 1,000.05 min.
Dead Time: 0.00 %

Calibration

Bkgd Info: Sample: B08061060; Det: 60; Spectrum #1; Jun-10-2008 14:14

Calibration Date: 6/10/2008 1:46:13PM

Efficiency Calibration: C08061060A

Efficiency: 30.83% +/- 0.21% TPU(2 sigma)

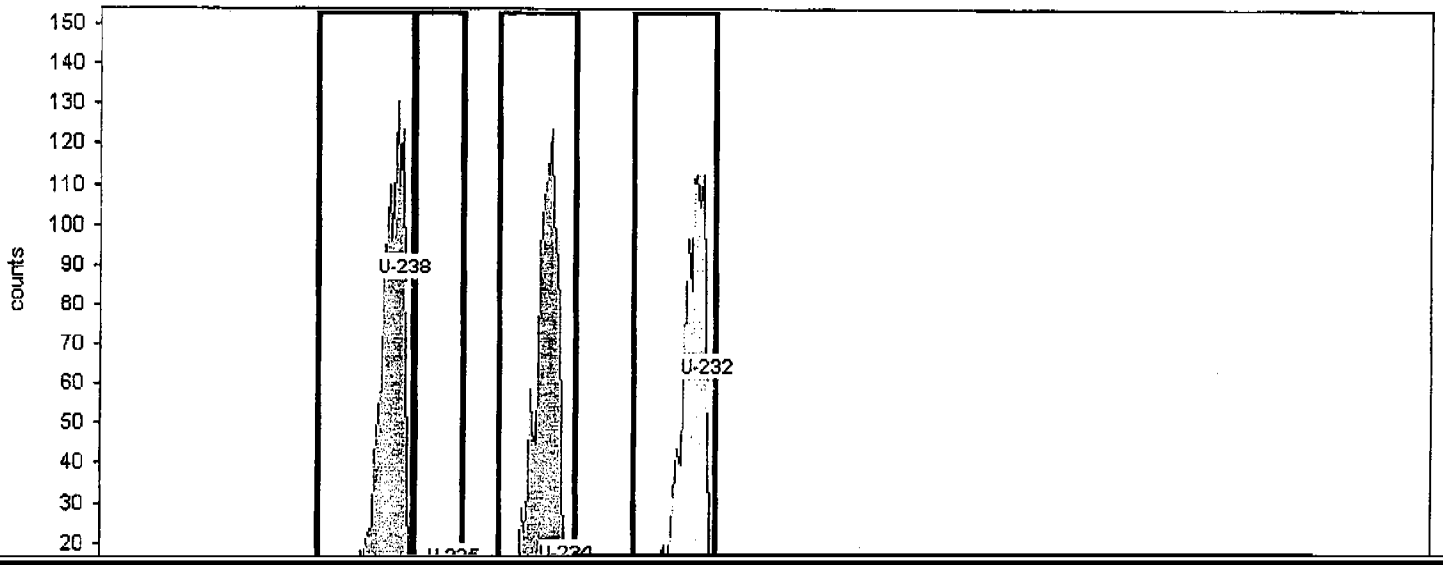
Energy Calibration: C08061060A

Energy Cal: Gain = 9.7108 keV / Ch
Offset = 3,050.49 keV
Quadratic = 0.0000 keV / Ch^2

Tracer

Tracer Name: 837.3020.90 U-232
Tracer Activity: 19.77 DPM/mL x (Vol.)0.25 mL = 4.94 DPM

Tracer Nuclide: U-232
Tracer Recovery: 82.24%



FORM 746r8.xls (10/2/07)

366026

Paragon Analytics

Alpha Spectrometer Instrument Run Log

Date: 6/11/08

Detector	Batch ID	Sample ID	Iso/Matrix	Duration	Initial
2	PAS080606-1-A	0805078-1P	Pu/s	600	GB
4		-2			
5		AS080606-1MB			
6		-1LCS			
7	NAS080604-1-C	0805247-2	Np/s	360	GB
8		-2SYS			
49		-5			
50		-5SYS			
51		-6			
52		-6SYS			
53		-8			
54		-8SYS			
33		-11			
34		-11SYS			
35		-21			
36		-21SYS			
37		-21D			
39		AS080604-1SYS			
40		-1MB			
22	UAS080606-1-A	0805078-1	U/s	1000	GB
23		-1D			
24		-2			
59		AS080606-1MB			
60		-1LCS			

Detector	Batch ID	Sample ID	Iso/Matrix	Duration	Initial
25	TAS080604-4-C	0805247-1	Th/s	1000	GB
26		-2			
27		-3			
28		-5			
29		-8			
30		-9			
31		-11			
32		-13			
57		-14			
58		AS080604-4MB			
17	TAS080604-3-B	0805247-12	Th/s	1000	GB
18		AS080604-3MB			
19		-3LCS			
21		-3LCSD			
61	UAS080606-3-A	0806013-16	U/w	800	GB
62		-17			
63		-18			
64		-19			

JS 6/12/08

Notes:

Reviewed by: GB

Date: 6/12/08

Date: 6/12/08

	Iso/Matrix	Duration	Initial
	Th/W	360	JS
B			
S			
SD			
	Np/S	360	JS 6/12/08
S			
S			
S			
	Pu/S	1000	JS
B			
S			
	1000 ⇔	Am/W	JS
B			
S			
	Pu/S	360	JS
S	Np/S	90	

Reviewed by: GB

Date: 6/13/08

PARAGON ANALYTICS
Radiochemistry Data Package

Section 6

QUALITY ASSURANCE SUMMARY REPORTS

6

No *NON-CONFORMANCE REPORTS* or
QUALITY ASSURANCE SUMMARY SHEETS
are included in this data package.

PARAGON ANALYTICS
Radiochemistry Data Package

Section 7

LABORATORY BENCH SHEETS

7

Radiochemistry Instrument Worksheet

Prep Batch: AS080606-1

Analytical QASS / NCR? Y (N) NA

Cnt 1 Inst/Det	Cnt 1 Pos Chk By	Cnt 2 File	Cnt 2 Inst/Det	Cnt 2 Pos Chk By	Cnt 3 File	Cnt 3 Inst/Det	Cnt 3 Pos Chk By	Notes
22		_50781			_50781	GB 6/13/06		GB 6/13/06
23		_50781D	B 25	GB	_50781D		A	B FWHM
24		_50782			_50782			
59		_6061B			_6061B			
60		_6061L			_6061L	GB 6/13/06		GB 6/13/06

Aliquot	Units	Pipet ID
0.25	ml	AW016
0.25	ml	AW016
0.25	ml	AW016

Spike Solution Information

Soln #	Nuclide	SolnID	Prep Conc	Units	Prep Date	Aliquot	Units	Pipet ID
S1	AM-241	816.2382.92	19.836	DPM/ml	06/06/06	0.25	ml	AW016
S2	U-234	644.3020.52	19.838	DPM/ml	06/06/06	0.25	ml	AW016
S2	U-235	644.3020.52	0.948	DPM/ml	06/06/06	0.25	ml	AW016
S2	U-238	644.3020.52	20.596	DPM/ml	06/06/06	0.25	ml	AW016
S3	Pu-239	819.3020.51	20.927	DPM/ml	06/06/06	0.25	ml	AW016

0805078-1DUP
AS080606-1PS4

AS080606-1MB
AS080606-1PS10

Supersedes: N/A

Radiochemistry Prep Worksheet

ics

Prep Batch: AS080606-1

UISO

Reviewed By: cas

Review Date: 6/10/2008

ment? Y / (N) Batch: N/A Re-Prep? Y / (N) Batch: N/A Prep QASS / NCR? Y / (N) N/A

Rev: 12

Prep Analyst: Crystal Shaeffer
Prep Date: 6/6/2008
Prep Dept: AP

Balance: 27
Balance:

QC Type	Dish No.	Init Alq g	Fin Alq g	Prep Basis	Micro Init	Micro Date	Standards	Prep Notes
SMP		4.5173	4.5173	As Received	JAD	6/10/08	T1,T2,T3	
DUP		4.5126	4.5126	As Received			T1,T2,T3	
SMP		4.5434	4.5434	As Received			T1,T2,T3	
MB		4.53036	4.53036	As Received			T1,T2,T3	
LCS		4.53035	4.53035	As Received			S1,S2,S3,T1,T2,T3	

CWB 6/10/08

for 4 hours at 600C. A PEG treatment was performed on all samples. Due to low detection limits, an increased aliquot of ~4.5g was taken for all samples.

ilhart Date: 6/6/2008

aeffer Date: 6/6/2008

Tracer/Carrier Solution Information

ID	Prep Conc	Units	Prep Date	Aliquot	Units	Pipet ID
20.61	19.995	DPM/ml	06/06/08	0.25	ml	AW016
20.90	19.750	DPM/ml	06/06/08	0.25	ml	AW016
20.88	19.997	DPM/ml	06/06/08	0.25	ml	AW016

Spike Solution Information

Soln #	Nuclide	SolnID	Prep Conc	Units	Prep Date	Aliquot	Units	Pipet ID
S1	AM-241	616.2382.92	19.836	DPM/ml	06/06/08	0.25	ml	AW016
S2	U-234	644.3020.52	19.838	DPM/ml	06/06/08	0.25	ml	AW016
S2	U-235	644.3020.52	0.948	DPM/ml	06/06/08	0.25	ml	AW016
S2	U-238	644.3020.52	20.596	DPM/ml	06/06/08	0.25	ml	AW016
S3	Pu-239	819.3020.51	20.927	DPM/ml	06/06/08	0.25	ml	AW016

Prep Worksheet

Prep Batch: AS080606-1

ot Validated!!!

Reviewed By: Review Date:

/ N Batch: _____ Prep QASS / NCR? Y / N _____

Balance: 27

Balance:

	Standards	Prep Notes
	T1,T2,T3	
	T1,T2,T3	
	T1,T2,T3	
	T1,T2,T3	
	S1,S2,S3,T1,T2,T3	

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10/8/08
1/13/09
10/11/08

Supersedes: NA

SAMPLE CONDITION FORM (SOLIDS)

ANALYST: TC

ANALYSIS DATE: 6/6/08 METHOD: Prep

WORK ORDER	SAMPLE ID	SAMPLE CONDITION		
		Dry/Wet	TEXTURE	Remarks
0805078	1	dry	dust	As rec'd, not dried or ground
↓	2	↓	↓	↓

TC 6/6/08

PARAGON ANALYTICS
Radiochemistry Data Package

Section 8

STANDARDS TRACEABILITY DOCUMENTS

8

Prepare a working level dilution of ampoule 644 to approximately 20 dpm/mL by diluting with 1M HNO_3

① Determine the density of 1M HNO_3
Mass of empty class A volumetric flask (100mL): 68.3017 g Bal 12
Mass of flask + 100mL of 1M HNO_3: 171.2390 g
Mass of 100mL of 1M HNO_3: 102.9373 g
Lot # 063544
$\rho = 1.029$ g/mL

② Transfer 644 to a ~~5~~ 1L nalgene bottle
Mass of empty nalgene w/o lid: 73.6290 g Bal 12
Mass of nalgene + standard: 75.0630 g
Net mass of standard transferred: 1.434 g

③ Dilute with 1M HNO_3
Mass of empty nalgene w/o lid (from above): 73.6290 g Bal 12
Mass of bottle, standard and 1M HNO_3: 1113.9 g Bal 26
Net mass of standard + 1M HNO_3: 1040.271 g

④ [illegible]

National Institute of Standards & Technology

Certificate

PAT ID 0644
rec'd 10-18-02

Standard Reference Material 4321C
Natural Uranium Radioactivity Standard

Recommended Procedure for Opening the SRM Ampoule

1) If the SRM solution is to be diluted, it is recommended that the diluting solution have a composition comparable to that of the SRM solution.

2) Wear eye protection, gloves, and protective clothing and work over a tray with absorbent paper in it. Work in a fume hood. In addition to the radioactive material, the solution contains strong acid and is corrosive.

3) Shake the ampoule to wet all of the inside surface of the ampoule. Return the ampoule to the upright position.

4) Check that all of the liquid has drained out of the neck of the ampoule. If necessary, gently tap the neck to speed the process.

5) Holding the ampoule upright, score the narrowest part of the neck with a scribe or diamond pencil.

6) Lightly wet the scored line. This reduces the crack propagation velocity and makes for a cleaner break.

7) Hold the ampoule upright with a paper towel, a wiper, or a support jig. Position the scored line away from you. Using a paper towel or wiper to avoid contamination, snap off the top of the ampoule by pressing the narrowest part of the neck away from you while pulling the tip of the ampoule towards you.

8) Transfer the solution from the ampoule using a pycnometer or a pipet with dispenser handle. NEVER PIPETTE BY MOUTH.

9) Seal any unused SRM solution in a flame-sealed glass ampoule, if possible, to minimize the evaporation loss.

See also reference [4]*.

*Notes and references are on pages 5 and 6.

PROPERTIES OF SRM 4321C

(Certified values are shown in bold type)

Source identification number	NIST SRM 4321C	
Physical Properties:		
Source description	Liquid in flame-sealed NIST borosilicate-glass ampoule	
Ampoule specifications	Body outside diameter	(16.5 ± 0.5) mm
	Wall Thickness	(0.60 ± 0.04) mm
	Barium content	Less than 2.5%
	Lead-oxide content	Less than 0.02%
	Other heavy elements	Trace quantities
Solution density	**(1.053 ± 0.001) g•mL^{-1} at 21.4 °C [b]***	
Solution mass	**(5.258 ± 0.002) g [b]**	
Chemical Properties:		

EVALUATION OF THE UNCERTAINTY OF THE MASSIC ACTIVITY [d]*

Input Quantity x_i, the source of uncertainty (and individual uncertainty components where appropriate)	Method Used To Evaluate $u(x_i)$, the standard uncertainty of x_i (A) denotes evaluation by statistical methods (B) denotes evaluation by other methods	Relative Uncertainty Of Input Quantity, $u(x_i)/x_i$, (%) [h]	Relative Sensitivity Factor, $\lvert\partial y/\partial x_i\rvert \cdot (x_i/y)$ [i]	Relative Uncertainty Of Output Quantity, $u_i(y)/y$, (%) [j]
[illegible]	[illegible]	[illegible]	[illegible]	[illegible]

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 divided by the total mass of the sample. 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] The value of each standard uncertainty component, and hence the value of the expanded uncertainty itself, is a best estimate based upon all available information, but is only approximately known. That is to say, the "uncertainty of the uncertainty" is large and not well known. This is true for uncertainties evaluated by statistical methods (e.g., the relative standard deviation of the standard deviation of the mean for the massic count rate is approximately 50%) and for uncertainties evaluated by other methods (which could easily be over estimated or under estimated by substantial amounts). The unknown value of the expanded uncertainty is believed to lie in the interval $U/2$ to $2U$ (i.e., within a factor of 2 of the estimated value).

[f] Estimated limits of detection for photon-emitting impurities are:
1.4 $\gamma \cdot s^{-1} \cdot g^{-1}$ for energies between 8 and 59 keV,
1.1 $\gamma \cdot s^{-1} \cdot g^{-1}$ for energies between 67 and 88 keV,
0.5 $\gamma \cdot s^{-1} \cdot g^{-1}$ for energies between 102 and 197 keV,
0.3 $\gamma \cdot s^{-1} \cdot g^{-1}$ for energies between 205 and 762 keV,
0.2 $\gamma \cdot s^{-1} \cdot g^{-1}$ for energies between 770 and 996 keV, and
0.1 $\gamma \cdot s^{-1} \cdot g^{-1}$ for energies between 1006 and 1900 keV,
provided that the photons are separated in energy by 4 keV or more from photons emitted in the decay of uranium-238, uranium-235, uranium-234, or their progeny.

[g] The stated uncertainty is the standard uncertainty. See reference [5].

[b] Relative standard uncertainty of the input quantity x.

PROJECT 837.3020.90 U-232 Notebook No. 3020

Continued From Page

Prepare a working dilution of ~20 dpm/ml of U-232 from primary dilution 837.3020.72.

1) Calculate density of 1 M HNO_3 lot #074741 bal

Mass of 100 ml Volumetric flask 68.2982 g 12

Mass of flask and 100 ml 1 M HNO_3 171.2114 g 1

Net mass of 100 ml 1 M HNO_3 102.9132 g

$\rho = 1.0291$ g/ml

2) Determine Mass of Std. Transferred.

Mass of empty Nalgene 74.4855 g 12

Mass of Nalgene, Standard 77.5008 g 1

Net Mass of Standard Transferred 3.0153 g

3) Dilute Standard to final Vol. with 1 M HNO_3

Mass of empty Nalgene (from above) 74.4855 g

JOO 1/9/08 ~~Ate~~ Gross mass of Nalgene, Standard, + diluent 1120.9 g 26

Net Mass of Standard 1046.4145 g

Final Activity Calculation.

$$\frac{(6745.123\ \frac{dpm}{g})\cdot(3.0153\ g)(1.0291\ g/ml)}{(1046.4145\ g)} = 20.00\ dpm/ml$$

Stnd ID: 837.3020.90 MC 3/20/08

Description: U-232

Expiration: 1/13/2009

Activity: 20.00 dpm/mL

MC 3/20/08 2s Uncertainty: 1.00 dpm/mL

Ref. Date: 3/7/2007

Ref Time: N/A

Prep Date: 1/14/2008 Prep by: JD

Matrix/Comp. 1.0 M HNO3

Half Life (y): 6.89E+01

Reverification Log

Analysis Date	Initials	Expiration Date

MC 3/20/08

MC 3/20/08

Continued on Page

Read and Understood By

Signed 1/14/08 Date Signed 3/20/08 Date

PROJECT 837.3020.72 U-232

Notebook No. _____

Continued From Page _____

Prepare a primary dilution of U-232, RSO #837, by diluting Contrato (#74682-307) to a final volume of approx 40 ml.

1) Prepare a 1.0 M HNO_3 solution by diluting 63 ml conc HNO_3, Fischer lot # 045460

RSO # 837
Rcvd 3/14/07 MMP

Eckert & Ziegler
Analytics

1380 Seaboard Industrial Blvd.
Atlanta, Georgia 30318
Tel 404-352-8677
Fax 404-352-2837
www.analyticsinc.com

CERTIFICATE OF CALIBRATION

Standard Radionuclide Source

74682-307

U-232 5 mL Liquid in Flame Sealed Vial

This standard radionuclide source was prepared gravimetrically from a calibrated master solution. The master solution was calibrated by the Department Des Applications Et De La Metrologie Des Rayonnements Ionisants (DAMRI), Paris, France, as Number 23236.

Radionuclide purity and calibration were checked with a germanium gamma spectrometer system. The nuclear decay rate and assay date for this source are given below.

ANALYTICS maintains traceability to the National Institute of Standards and Technology through Measurements Assurance Programs as described in USNRC Reg. Guide 4.15, Revision 1.

ISOTOPE:	U-232
ACTIVITY (Bq):	4.375 E3
HALF-LIFE:	68.9 years
CALIBRATION DATE:	March 7, 2007 12:00 EST
RELATIVE EXPANDED UNCERTAINTY (k=2):	5.0%

Impurities: γ-impurities <0.1%
U-233 <0.3%
Am-241 <0.15%

5.24665 grams 1M HNO_3 solution.

PO NUMBER 72905, Item 1

SOURCE PREPARED BY: M. Dimitrova
M. D. Dimitrova, Radiochemist

Q A APPROVED: M. M. 3-8-07

PARAGON ANALYTICS
Radiochemistry Data Package

Section 9

ADDITIONAL SUPPORTING DOCUMENTATION

Alpha Spectroscopy

Quality Control Data

Weekly Background, Energy, and Efficiency Calibrations

Calibration Data Summary

Laboratory Name: Paragon Analytics
PAI Work Order: 0805078

Prep SOP: PAI 778
Analytical SOP: PAI 714

Reported on: Friday, June 13, 2008
10:36:02 AM

Lab Sample ID Spectrum Analysis Date	QC Type	Batch ID Analysis Run	Test Name	Detector Id	Eff Spectrum Bkg Spectrum Egy Spectrum	Eff Date Bkg Date Egy Date	RESULTS %Efficiency Bkg CPM Energy keV	FLAGS Efficiency Background Energy	LCL %Efficiency Bkg CPM Energy keV	LWL %Efficiency Bkg CPM Energy keV	UWL %Efficiency Bkg CPM Energy keV	UCL %Efficiency Bkg CPM Energy keV
0805078-1 Spectrum #1 6/11/2008	SMP	AS080606-1 AS080606-1A	UISO	22	C08060922 B08060922 C08060922	6/9/2008 6/9/2008 6/9/2008	28.19 0.2810 5546.0	Pass Pass Pass	26.66 0.0000 5494.2	27.12 0.0498 5504.2	29.00 0.4980 5584.2	29.46 0.7500 5594.2
0805078-1 Spectrum #1 6/12/2008	DUP	AS080606-1 AS080606-1A	UISO	25	C08061025 B08061025 C08061025	6/10/2008 6/10/2008 6/10/2008	29.29 0.3220 5534.4	Pass Pass Pass	26.95 0.0000 5496.0	27.42 0.0500 5506.0	29.32 0.5000 5586.0	29.79 0.7500 5596.0
0805078-2 Spectrum #1 6/11/2008	SMP	AS080606-1 AS080606-1A	UISO	24	C08060924 B08060924 C08060924	6/9/2008 6/9/2008 6/9/2008	29.32 0.2110 5536.5	Pass Pass Pass	28.06 0.0000 5491.8	28.56 0.0498 5501.8	30.52 0.4980 5581.8	31.02 0.7500 5591.8
AS080606-1 Spectrum #1 6/11/2008	MB	AS080606-1 AS080606-1A	UISO	59	C08061059 B08061059 C08061059	6/10/2008 6/10/2008 6/10/2008	31.26 0.3770 5551.9	Pass Pass Pass	30.14 0.0000 5494.3	30.67 0.0500 5504.3	32.79 0.5000 5584.3	33.32 0.7500 5594.3
AS080606-1 Spectrum #1 6/11/2008	LCS	AS080606-1 AS080606-1A	UISO	60	C08061060A B08061060 C08061060A	6/10/2008 6/10/2008 6/10/2008	30.83 0.2860 5536.5	Pass Pass Pass	28.99 0.0000 5476.7	29.50 0.0500 5486.7	31.54 0.5000 5566.7	32.05 0.7500 5576.7

Data Package ID: *UR0805078-1*

Abbreviations:
Eff - Efficiency; Bkg - Background; LCL - Lower Control Limit; UWL - Upper Warning Limit
Egy - Energy; CPM - Counts per Minute; LWL - Lower Warning Limit; UCL - Upper Control Limit; CI - The Analysis Date exceeds the Calibration Date by more than 7 days.

Alpha Spec Calibration Source Re-Certification

Recalibration performed by Isotope Products Laboratories
Primary Certified Source
Source PA ID: 190
Planchet Label: 9
Recalibrated on: 6/1/2007
Received by PA on: 6/5/2007

Values from certificate	
Source ID:	92MIX223027
Total Activity:	3780.5962 dpm
Ref. Date:	6/1/07

Nuclide	Act (Bq)	Act (dpm)	Half-Life (yrs)	Decay Corrected
U-234:	48.91	2994.6	2.46E+05	2994.59 dpm
U-235:	1.10	65.94	7.04E+08	65.94 dpm
Am-241:	12.00	720	432.17	718.68 dpm
			TOTAL	3779.41 dpm

Efficiency Determination for Detector: 25

Source Serial#	PA ID	Sequential #	Count Date	Am-241 net cts	U-234 net cts	U-235 net cts	count dur (s)	Total cpm	Known dpm	Detector efficiency
92MIX223027	190	97-19-103-09	5/20/08	7113	28841	789	2100	1078.37	3779.41	28.53%

Sources 1 through 8 activity determination

Source Serial#	PA ID	Sequential #	Count Date	Am-241 net cts	U-234 net cts	U-235 net cts	count dur (s)	Detector Efficiency	Am-241 dpm	U-234 dpm	U-235 dpm	Combined dpm
92MIX2203026	182	97-19-103-01	5/20/08	12417	73969	1678	2100	28.53%	1243.88	7406.82	166.03	8816.33
92MIX2203026	183	97-19-103-02	5/20/08	14459	141741	3156	2100	28.53%	1447.88	14193.30	316.03	16957.19
92MIX2203024	184	97-19-103-03	5/20/08	68052	68294	1480	2100	28.53%	6814.15	6838.85	148.20	13801.00
92MIX2203021	185	97-19-103-04	5/20/08	20822	58470	1507	2100	28.53%	2085.02	5854.92	150.90	8090.85
92MIX2203025	186	97-19-103-05	5/20/08	94084	114792	2491	2100	28.53%	9421.15	11494.75	249.44	21165.34
92MIX2203022	187	97-19-103-06	5/20/08	71430	75877	1663	2100	28.53%	7152.68	7597.85	166.53	14917.18
92MIX2203023	188	97-19-103-07	5/20/08	41741	65445	1420	2100	28.53%	4178.78	6553.37	142.19	10875.31
92MIX2203029	189	97-19-103-08	5/20/08	31922	200052	4843	2100	28.53%	3196.52	20032.30	484.94	23693.76

Efficiency Verification

Source Serial#	PA ID	Sequential #	Count Date	Am-241 net cts	U-234 net cts	U-235 net cts	Count dur (s)	Total cpm	Known dpm	Detector efficiency	RPD	FLAG
92MIX223027	190	97-19-103-09	5/21/08	6987	28575	781	2100	1066.37	3779.41	28.22%	1.12%	PASS

Sources 1 through 8 activity re-verification

Source Serial#	PA ID	Sequential #	Combined Observed dpm	Combined Certified dpm*	Percent Difference %	Within 5% of Certified value?
92MIX2203026	182	97-19-103-01	8818.33	8867.05	-0.55%	Yes
92MIX2203026	183	97-19-103-02	16957.19	16911.39	-0.34%	Yes
92MIX2203024	184	97-19-103-03	13801.00	13588.11	0.09%	Yes
92MIX2203021	185	97-19-103-04	8090.85	8188.77	-1.20%	Yes
92MIX2203025	186	97-19-103-05	21165.34	21096.48	0.33%	Yes
92MIX2203022	187	97-19-103-06	14917.18	15382.14	-3.02%	Yes
92MIX2203023	188	97-19-103-07	10875.31	10781.48	0.87%	Yes
92MIX2203029	189	97-19-103-08	23693.76	23638.41	0.24%	Yes

* Certificate values decay corrected to the count date

Data from certificates

Reference Date	U-234 (Bq)	U-234 (dpm)	U-235 (Bq)	U-235 (dpm)	Am-241 (Bq)	Am-241 (dpm)
5/1/2003	124.10	7446.00	2.43	145.74	21.43	1285.80
5/1/2003	239.30	14358.00	4.20	252.00	23.55	1413.00
5/1/2003	119.40	7164.00	1.93	115.56	106.00	6360.00
4/1/2003	101.00	6060.00	1.28	75.84	34.50	2070.00
4/1/2003	203.00	12180.00	3.41	204.72	146.40	8784.00
4/1/2003	132.90	7974.00	3.17	189.96	121.30	7278.00
4/1/2003	107.10	6426.00	0.93	55.54	72.28	4336.80
5/1/2003	334.80	20088.00	6.55	393.18	53.02	3181.20

OK
MC
6/5/08

R:\INST\alphspec\Cal Recert\CLCRT052008

AlphaVision v5.3 **Alpha-Spectroscopy Calibration Report**

ORTEC
801 S. Illinois Ave.
Oak Ridge, TN 37830

Analyst: ORTEC
Detector: 25 190 GB 5/21/08

9:19:16AM 5/21/2008

Calibration

Energy Calibration: RSO (Source 9)
Description:

Analysis Date: 5/20/2008 11:57:30AM
Calibration Type: Energy And Efficiency

Source Info

Certificate ID: A9 RSO#190
Prepared by: IPL
Description:

Certification Date: 6/1/2007 12:00:00PM

Acquisition

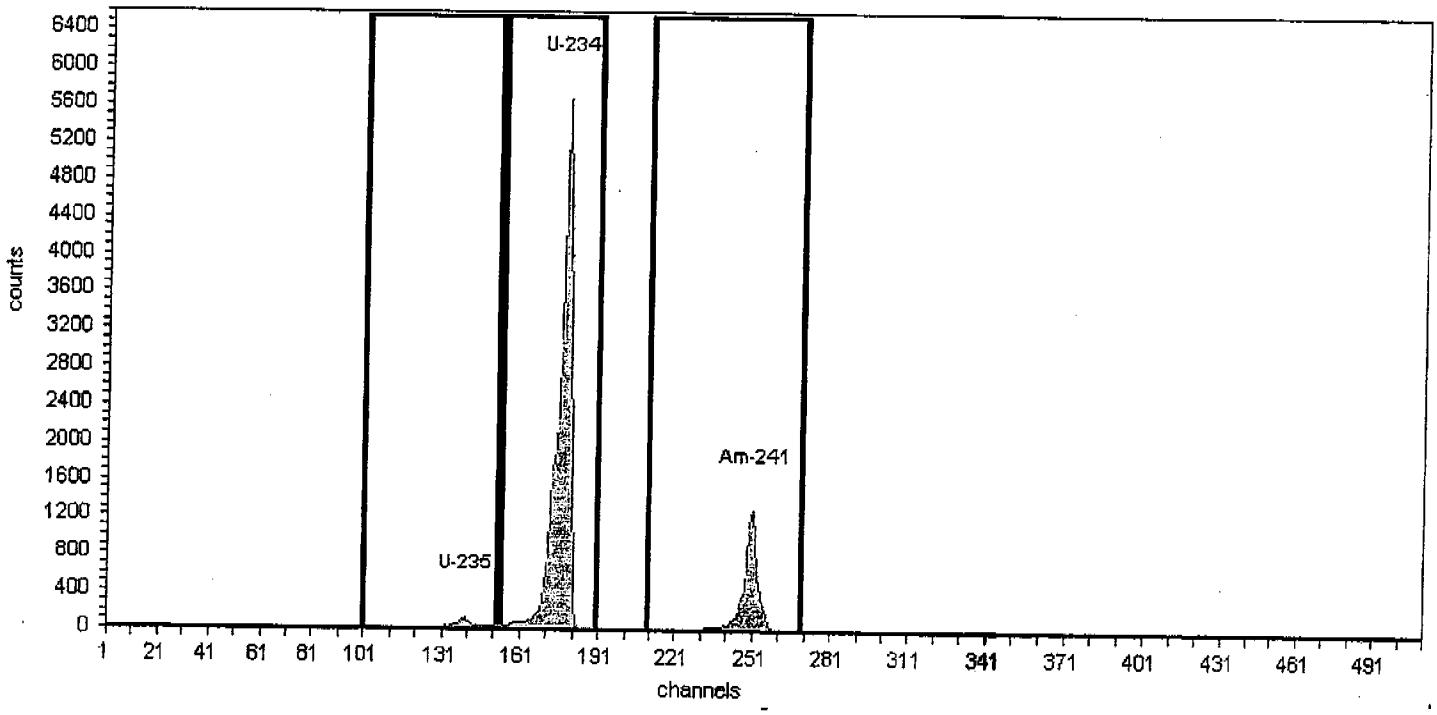
Detector: 25 , SN:
Acquisition Start Date: 5/20/2008 10:43:22AM

Live Time: 35.00 min.
Real Time: 35.01 min.

Efficiency Calibration Name: RSO (Source 9)

Energy Calibration Equation:
Gain = 9.8047 keV / Ch
Offset = 3,026.20 keV
Quadratic = 0.0000 keV / Ch^2

Efficiency: 28.47% +/- 0.30% TPU(2 sigma)



Method: Interactive ROI
Algorithm: Linear

Initial Calibration: No
Shelf: 1

Nuclide Activity Summary

Nuclide	Peak Channel	Peak Energy MeV	ROI Start Channel	ROI End Channel	Gross Counts	Net Count Rate (cpm)
U-235	140	4.40	100	152	789.00	22.54
U-234	178	4.78	153	190	29,841.00	852.60
Am-241	251	5.49	210	270	7,113.00	203.23

AlphaVision v5.3

Alpha-Spectroscopy Calibration Report

ORTEC
801 S. Illinois Ave.
Oak Ridge, TN 37830

Analyst: ORTEC
Detector: 25

9:19:22AM 5/21/2008

Calibration

Energy Calibration: RSO 182 (Source 1)
Description:

Analysis Date: 5/20/2008 12:25:48PM
Calibration Type: Energy And Efficiency

Source Info

Certificate ID: A1 RSO#182
Prepared by: IPL
Description:

Certification Date: 5/1/2003 12:00:45PM

Acquisition

Detector: 25 , SN:
Acquisition Start Date: 5/20/2008 11:35:12AM

Energy Calibration Equation:
Gain = 0.8047 keV / Ch

AlphaVision v5.3 **Alpha-Spectroscopy Calibration Report**

ORTEC
801 S. Illinois Ave.
Oak Ridge, TN 37830
9:19:28AM 5/21/2008

Analyst: ORTEC
Detector: 25

Calibration

Energy Calibration: RSO 183 (Source 2)
Description:

Analysis Date: 5/20/2008 1:05:28PM
Calibration Type: Energy And Efficiency

Source Info

Certificate ID: A2 RSO#183
Prepared by: IPL
Description:

Certification Date: 5/1/2003 12:00:00PM

Acquisition

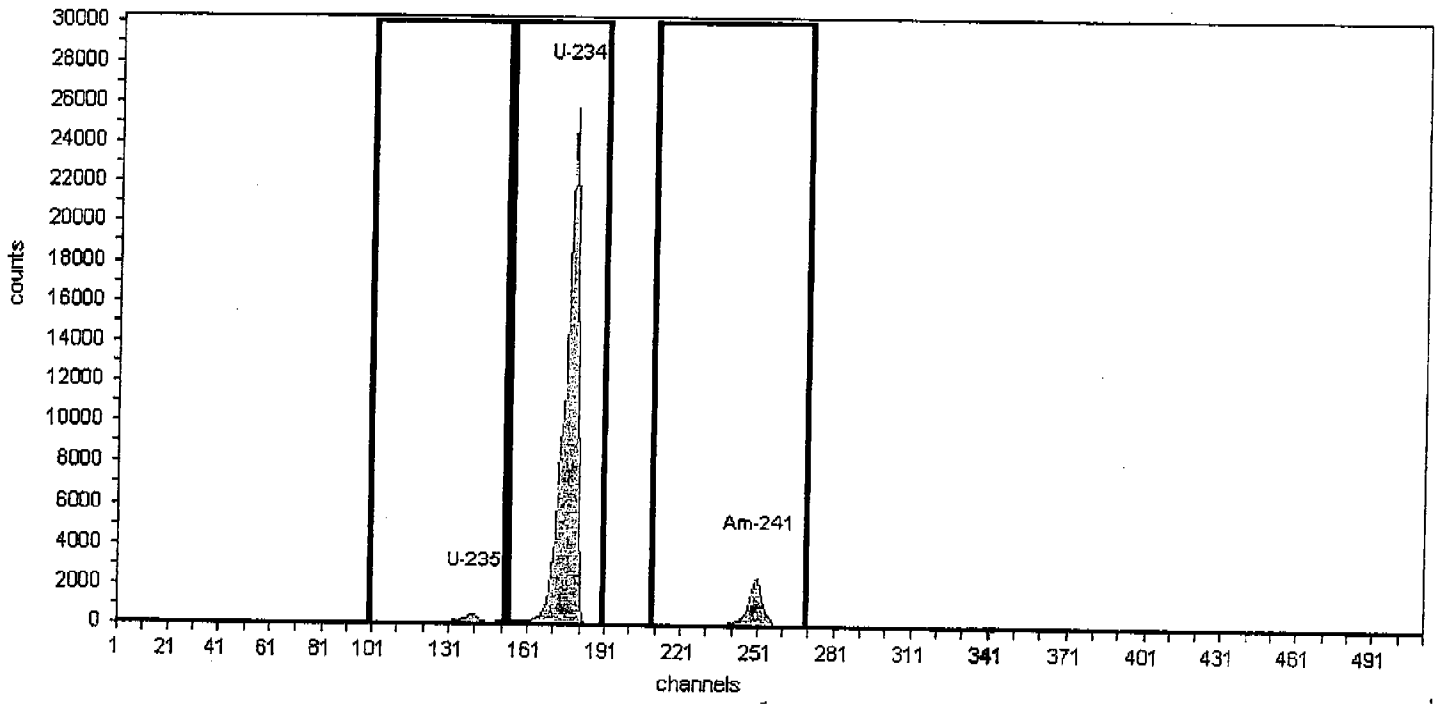
Detector: 25 , SN:
Acquisition Start Date: 5/20/2008 12:26:40PM

Live Time: 35.00 min.
Real Time: 35.05 min.

Efficiency Calibration Name: RSO 183 (Source 2)

Energy Calibration Equation:
Gain = 9.8047 keV / Ch
Offset = 3,026.20 keV
Quadratic = 0.0000 keV / Ch^2

Efficiency: 28.38% +/- 0.14% TPU(2 sigma)



Method: Interactive ROI
Algorithm: Linear

Initial Calibration: No
Shelf: 1

Nuclide Activity Summary

Nuclide	Peak Channel	Peak Energy MeV	ROI Start Channel	ROI End Channel	Gross Counts	Net Count Rate (cpm)
U-235	140	4.40	100	152	3,156.00	90.17
U-234	178	4.78	153	190	141,741.00	4,049.74
Am-241	251	5.49	210	270	14,459.00	413.11

AlphaVision v5.3 **Alpha-Spectroscopy Calibration Report**

ORTEC
801 S. Illinois Ave.
Oak Ridge, TN 37830
9:19:33AM 5/21/2008

Analyst: ORTEC
Detector: 25

Calibration

Energy Calibration: RSO 184 (Source 3)
Description:

Analysis Date: 5/20/2008 1:45:22PM
Calibration Type: Energy And Efficiency

Source Info

Certificate ID: A3 RSO#184
Prepared by: IPL
Description:

Certification Date: 5/1/2003 12:00:00PM

Acquisition

Detector: 25 , SN:
Acquisition Start Date: 5/20/2008 1:06:02PM

Live Time: 35.00 min.
Real Time: 35.04 min.

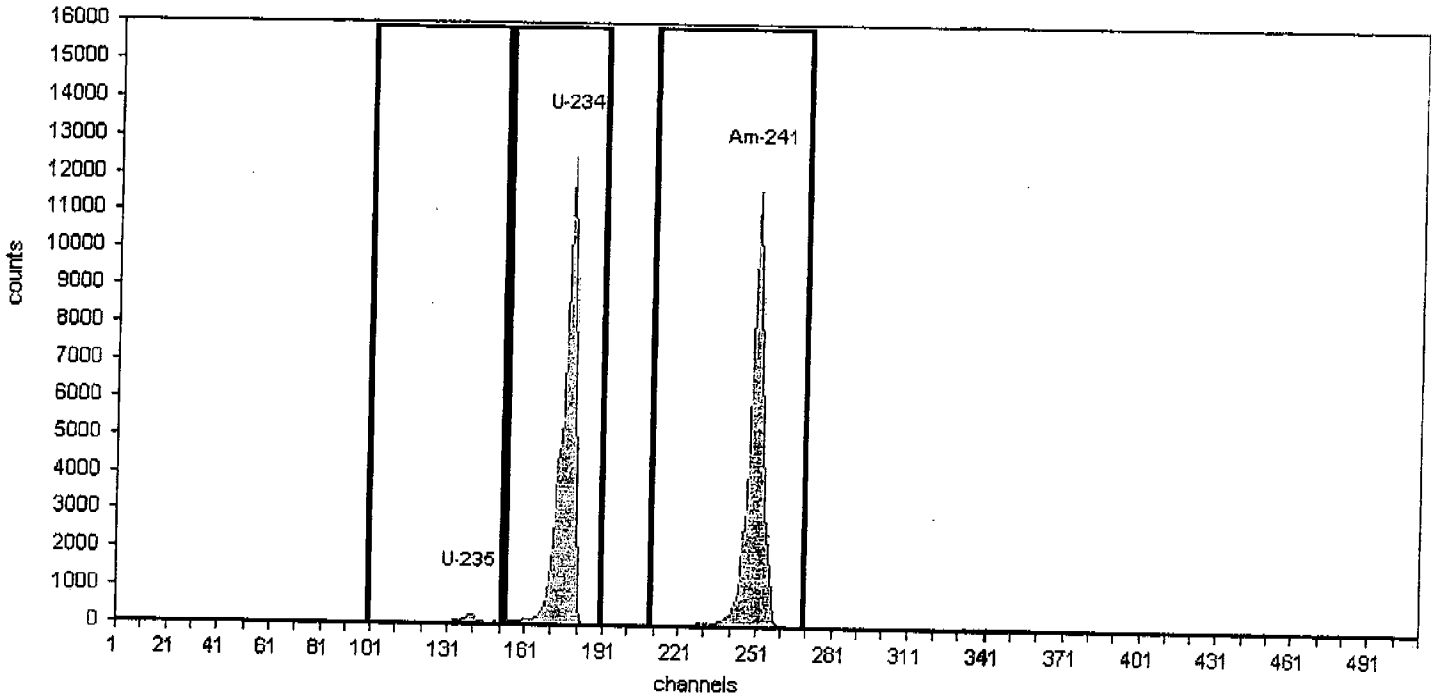
Efficiency Calibration Name: RSO 184 (Source 3)

Energy Calibration Equation:
Gain = 9.7289 keV / Ch

Offset = 3,043.84 keV

Quadratic = 0.0000 keV / Ch^2

Efficiency: 28.45% +/- 0.16% TPU(2 sigma)



Method: Interactive ROI
Algorithm: Linear

Initial Calibration: No
Shelf: 1

Nuclide Activity Summary

Nuclide	Peak Channel	Peak Energy MeV	ROI Start Channel	ROI End Channel	Gross Counts	Net Count Rate (cpm)
U-235	139	4.40	100	152	1,480.00	42.29
U-234	178	4.78	153	190	68,294.00	1,951.26
Am-241	251	5.49	210	270	66,052.00	1,887.20

AlphaVision v5.3 **Alpha-Spectroscopy Calibration Report**

ORTEC
801 S. Illinois Ave.
Oak Ridge, TN 37830
9:21:31AM 5/21/2008

Analyst: ORTEC
Detector: 25

Calibration

Energy Calibration: RSO 185 (Source 4)
Description:

Analysis Date: 5/20/2008 2:41:04PM
Calibration Type: Energy And Efficiency

Source Info

Certificate ID: A4 RSO#185
Prepared by: IPL
Description:

Certification Date: 4/1/2003 12:00:00PM

Acquisition

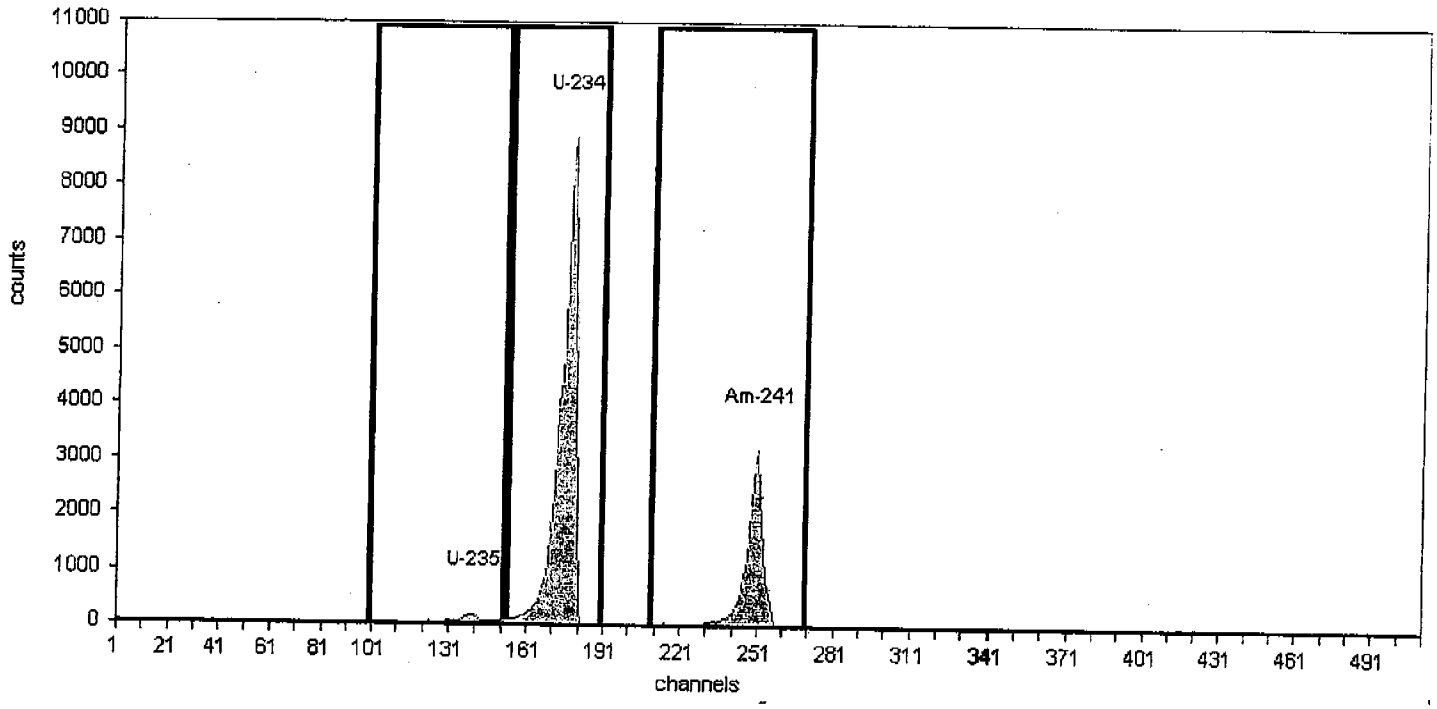
Detector: 25 , SN:
Acquisition Start Date: 5/20/2008 1:45:05PM

Live Time: 35.00 min.
Real Time: 35.02 min.

Efficiency Calibration Name: RSO 185 (Source 4)

Energy Calibration Equation:
Gain = 9.8047 keV / Ch
Offset = 3,026.20 keV
Quadratic = 0.0000 keV / Ch^2

Efficiency: 27.92% +/- 0.20% TPU(2 sigma)



Method: Interactive ROI
Algorithm: Linear

Initial Calibration: No
Shelf: 1

Nuclide Activity Summary

Nuclide	Peak Channel	Peak Energy MeV	ROI Start Channel	ROI End Channel	Gross Counts	Net Count Rate (cpm)
U-235	140	4.40	100	152	1,507.00	43.06
U-234	178	4.78	153	190	58,470.00	1,670.57
Am-241	251	5.49	210	270	20,822.00	594.91

AlphaVision v5.3 **Alpha-Spectroscopy Calibration Report**

ORTEC
801 S. Illinois Ave.
Oak Ridge, TN 37830
9:21:22AM 5/21/2008

Analyst: ORTEC
Detector: 25

Calibration

Energy Calibration: RSO 186 (Source 5)
Description:

Analysis Date: 5/20/2008 3:26:01PM
Calibration Type: Energy And Efficiency

Source Info

Certificate ID: A5 RSO#186
Prepared by: IPL
Description:

Certification Date: 4/1/2003 12:00:00PM

Acquisition

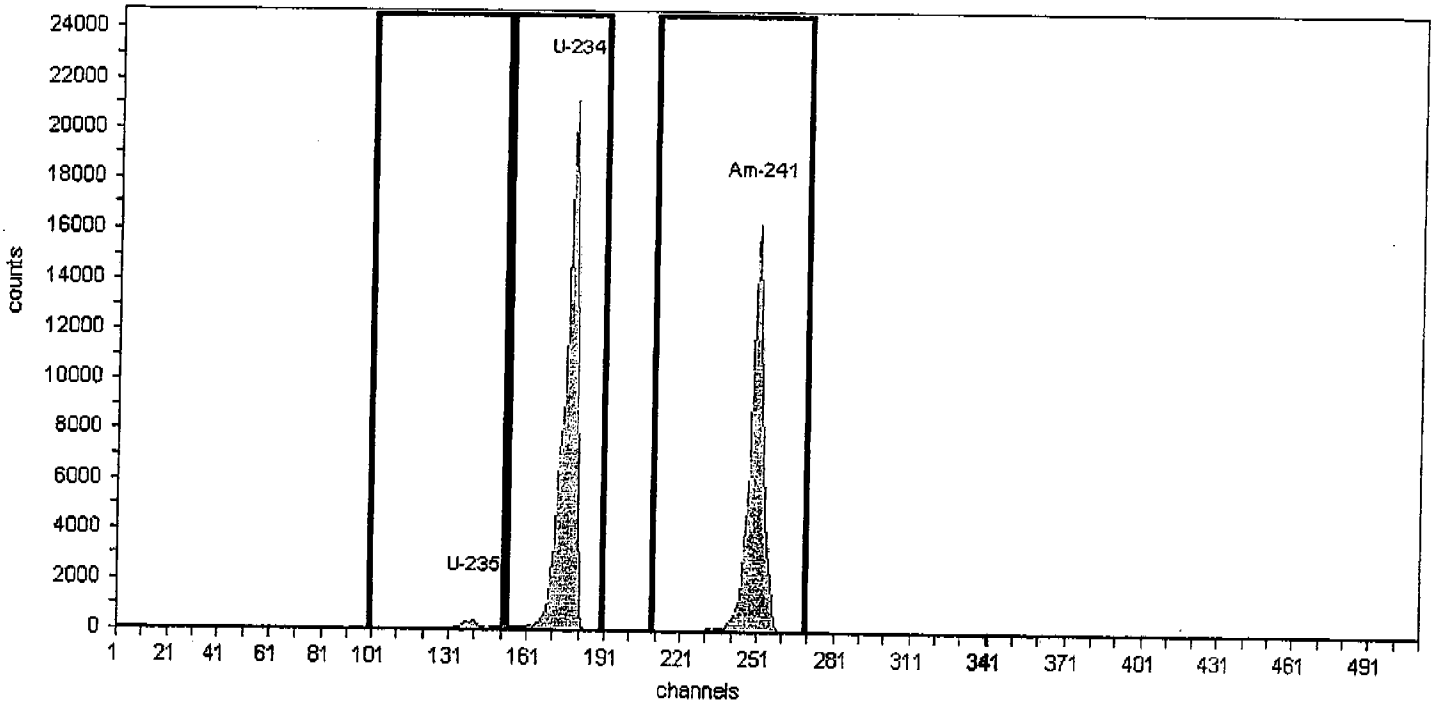
Detector: 25 , SN:
Acquisition Start Date: 5/20/2008 2:41:31PM

Live Time: 35.00 min.
Real Time: 35.06 min.

Efficiency Calibration Name: RSO 186 (Source 5)

Energy Calibration Equation:
Gain = 9.8047 keV / Ch
Offset = 3,026.20 keV
Quadratic = 0.0000 keV / Ch^2

Efficiency: 28.47% +/- 0.13% TPU(2 sigma)



Method: Interactive ROI
Algorithm: Linear

Initial Calibration: No
Shelf: 1

Nuclide Activity Summary

Nuclide	Peak Channel	Peak Energy MeV	ROI Start Channel	ROI End Channel	Gross Counts	Net Count Rate (cpm)
U-235	140	4.40	100	152	2,491.00	71.17
U-234	178	4.78	153	190	114,792.00	3,279.77
Am-241	251	5.49	210	270	94,084.00	2,688.11

AlphaVision v5.3 **Alpha-Spectroscopy Calibration Report**

ORTEC
801 S. Illinois Ave.
Oak Ridge, TN 37830
9:20:21AM 5/21/2008

Analyst: ORTEC
Detector: 25

Calibration

Energy Calibration: RSO 187 (Source 6)
Description:

Analysis Date: 5/20/2008 4:02:57PM
Calibration Type: Energy And Efficiency

Source Info

Certificate ID: A6 RSO#187
Prepared by: IPL
Description:

Certification Date: 4/1/2003 12:00:00PM

Acquisition

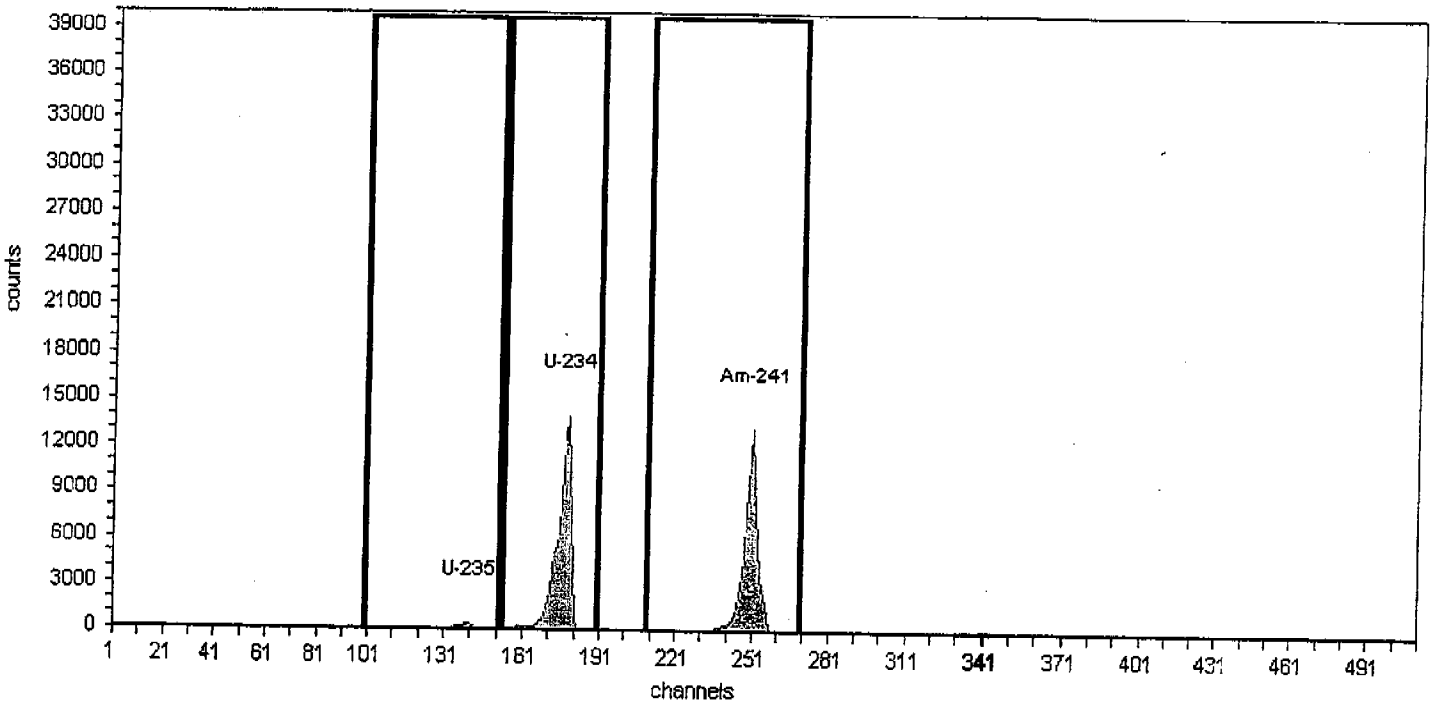
Detector: 25 , SN:
Acquisition Start Date: 5/20/2008 3:26:48PM

Live Time: 35.00 min.
Real Time: 35.05 min.

Efficiency Calibration Name: RSO 187 (Source 6)

Energy Calibration Equation:
Gain = 9.8047 keV / Ch
Offset = 3,026.20 keV
Quadratic = 0.0000 keV / Ch^2

Efficiency: 27.69% +/- 0.14% TPU(2 sigma)



Method: Interactive ROI
Algorithm: Linear

Initial Calibration: No
Shelf: 1

Nuclide Activity Summary

Nuclide	Peak Channel	Peak Energy MeV	ROI Start Channel	ROI End Channel	Gross Counts	Net Count Rate (cpm)
U-235	140	4.40	100	152	1,663.00	47.51
U-234	178	4.78	153	190	75,877.00	2,167.91
Am-241	251	5.49	210	270	71,430.00	2,040.86

AlphaVision v5.3 **Alpha-Spectroscopy Calibration Report**

ORTEC
801 S. Illinois Ave.
Oak Ridge, TN 37830
9:20:28AM 5/21/2008

Analyst: ORTEC
Detector: 25

Calibration

Energy Calibration: RSO 188 (Source 7)
Description:

Analysis Date: 5/20/2008 4:41:56PM
Calibration Type: Energy And Efficiency

Source Info

Certificate ID: A7 RSO#188
Prepared by: IPL
Description:

Certification Date: 4/1/2003 12:00:00PM

Acquisition

Detector: 25 , SN:
Acquisition Start Date: 5/20/2008 4:03:54PM

Live Time: 35.00 min.
Real Time: 35.03 min.

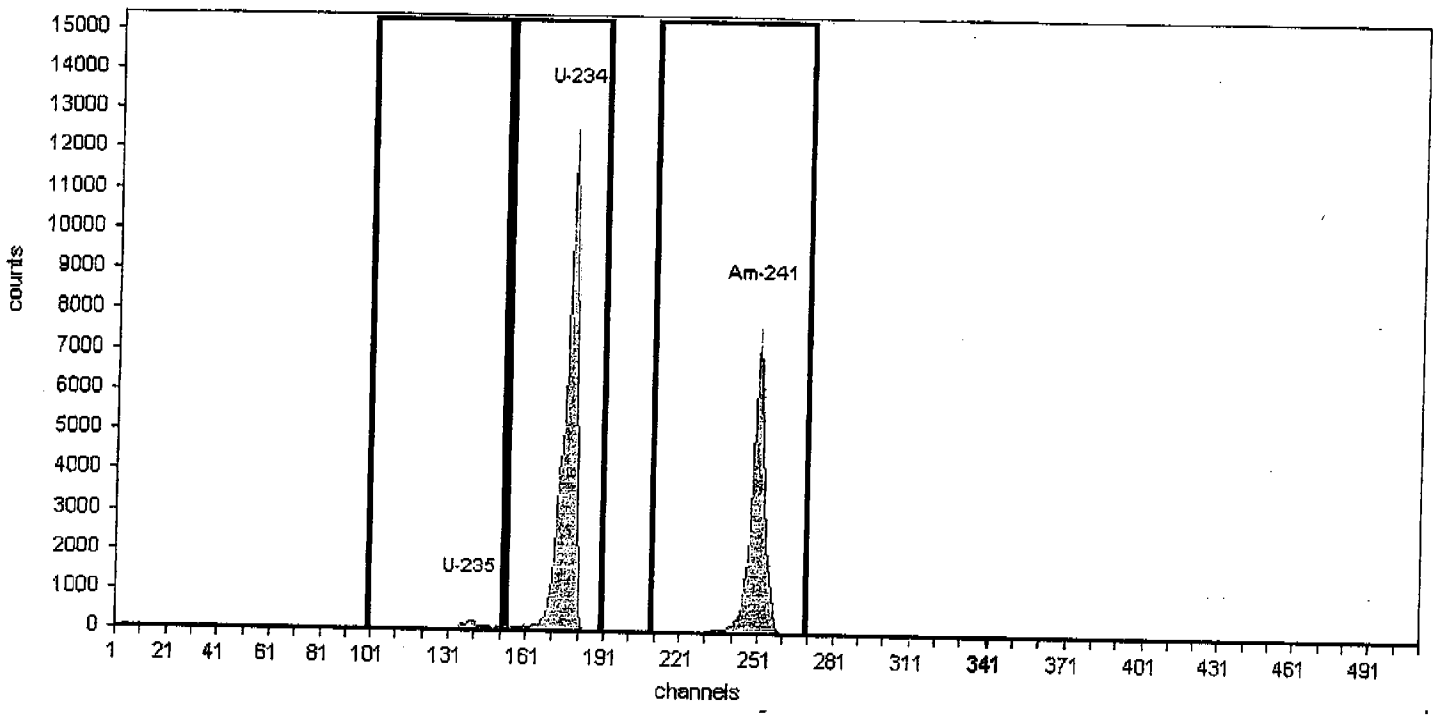
Efficiency Calibration Name: RSO 188 (Source 7)

Energy Calibration Equation:
Gain = 9.7289 keV / Ch

Offset = 3,043.84 keV

Quadratic = 0.0000 keV / Ch^2

Efficiency: 28.55% +/- 0.18% TPU(2 sigma)



Method: Interactive ROI
Algorithm: Linear

Initial Calibration: No
Shelf: 1

Nuclide Activity Summary

Nuclide	Peak Channel	Peak Energy MeV	ROI Start Channel	ROI End Channel	Gross Counts	Net Count Rate (cpm)
U-235	139	4.40	100	152	1,420.00	40.57
U-234	178	4.78	153	190	65,445.00	1,869.86
Am-241	251	5.49	210	270	41,741.00	1,192.60

AlphaVision v5.3

Alpha-Spectroscopy Calibration Report

ORTEC
801 S. Illinois Ave.
Oak Ridge, TN 37830

Analyst: ORTEC
Detector: 25

9:20:33AM 5/21/2008

Calibration

Energy Calibration: RSO 189 (Source 8)
Description:

Analysis Date: 5/21/2008 8:30:29AM
Calibration Type: Energy And Efficiency

Source Info

Certificate ID: A8 RSO#189
Prepared by: IPL
Description:

Certification Date: 4/1/2003 12:00:00PM

Acquisition

Detector: 25 , SN:
Acquisition Start Date: 5/20/2008 4:42:28PM

Live Time: 35.00 min.
Real Time: 35.07 min.

Energy Calibration Equation:
Gain = 9.8047 keV / Ch

Offset = 3,036.00 keV

Quadratic = 0.0000 keV / Ch^2

AlphaVision v5.3 **Alpha-Spectroscopy Calibration Report**

ORTEC
801 S. Illinois Ave.
Oak Ridge, TN 37830
9:20:39AM 5/21/2008

Analyst: ORTEC
Detector: 25

Calibration

Energy Calibration: RSO 190 (Source 9)
Description:

Analysis Date: 5/21/2008 9:08:00AM
Calibration Type: Energy And Efficiency

Source Info

Certificate ID: A9 RSO#190
Prepared by: IPL
Description:

Certification Date: 6/1/2007 12:00:00PM

Acquisition

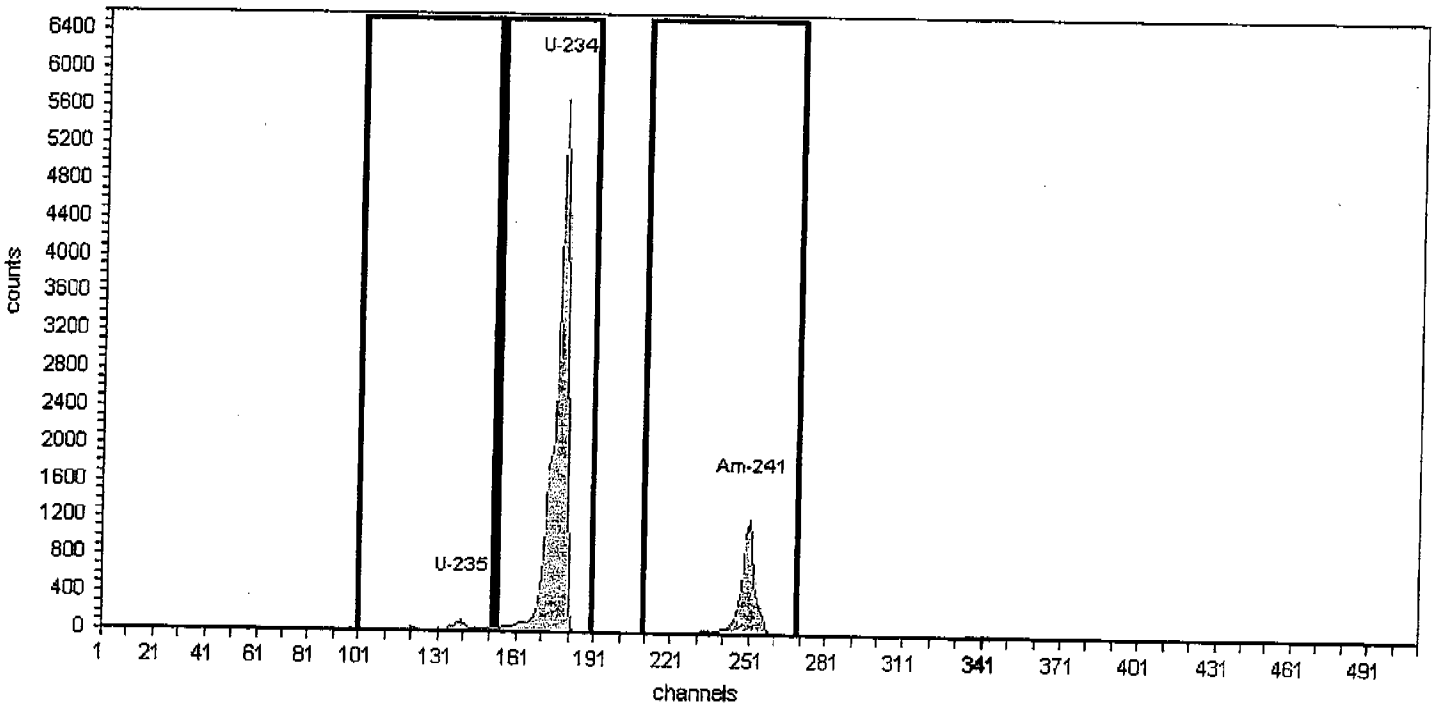
Detector: 25 , SN:
Acquisition Start Date: 5/21/2008 8:31:01AM

Live Time: 35.00 min.
Real Time: 35.01 min.

Efficiency Calibration Name: RSO 190 (Source 9)

Energy Calibration Equation:
Gain = 9.8047 keV / Ch
Offset = 3,026.20 keV
Quadratic = 0.0000 keV / Ch^2

Efficiency: 28.16% +/- 0.30% TPU(2 sigma)



Method: Interactive ROI
Algorithm: Linear

Initial Calibration: No
Shelf: 1

Nuclide Activity Summary

Nuclide	Peak Channel	Peak Energy MeV	ROI Start Channel	ROI End Channel	Gross Counts	Net Count Rate (cpm)
U-235	140	4.40	100	152	781.00	22.31
U-234	178	4.78	153	190	29,575.00	845.00
Am-241	251	5.49	210	270	6,967.00	199.06

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[α] reverified 5/20/08
expires 5/20/09

PAI 187
recalibrated 4-15-03

CERTIFICATE OF CALIBRATION
MIXED ALPHA STANDARD SOURCE

Radionuclide A: U-234
Radionuclide B: U-235
Radionuclide C: Am-241
Half Life (U-234): (2.454 ± 0.006)E+05 years
Half Life (U-235): (7.037 ± 0.011)E+08 years
Half Life (Am-241): 432.17 ± 0.66 years

Customer: PARAGON ANALYTICS, INC.
P.O. No.: EW040203/R2193
Catalog No.: MISC-STD
Reference Date: 1-May-03 12:00 PST
Source No.: 92MIX2203026

Contained Radioactivity:

U-234:	3.354	nCi	(124.1 Bq)	Am-241:	0.5793	nCi	(21.43 Bq)
U-235:	0.06566	nCi	(2.429 Bq)	Total Activity:	3.999	nCi	(148.0 Bq)

Physical description:

A. Capsule type: Disk (22 mm OD X 0.79 mm THK)
B. Nature of active deposit: Electrodeposited and diffusion bonded oxides
C. Active Diameter: 19 mm
D. Backing: Stainless steel
E. Cover: None

Radioimpurities: Not determined

Method of Calibration:

This source was assayed using a windowless internal gas flow proportional counter for total alpha activity. Individual nuclide ratios were taken from those determined in Mar 1998.

Uncertainty of Measurement:

A. Type A (random) uncertainty: ± 0.7%
B. Type B (systematic) uncertainty: ± 3.0%
C. Uncertainty in aliquot weighing: ± 0.0%
D. Total uncertainty at the 99% confidence level: ± 3.1%

Notes:

- See reverse side for leak test(s) performed on this source.
- IPL participates in a 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).
- Nuclear data was taken from "Table of Radioactive Isotopes", edited by Virginia Shirley, 1986.
- This source has a working life of 2 years.
- This source had a total alpha surface emission rate of 4483 α/min in 2π on 11 Apr 03.

Daniel James Van Dalsem
Quality Control

15-Apr-03
Date Signed

IPL Ref. No.: 987-7

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α2 reverified 5/20/08 expires 5/20/09
PAI 183
Recalibrated 4-15-03

CERTIFICATE OF CALIBRATION
MIXED ALPHA STANDARD SOURCE

Radionuclide A:	U-234	**Customer:**	PARAGON ANALYTICS, INC.
Radionuclide B:	U-235	**P.O. No.:**	EW040203/R2193
Radionuclide C:	Am-241	**Catalog No.:**	MISC-STD
Half Life (U-234):	(2.454 ± 0.006)E+05 years	**Reference Date:**	1-May-03 12:00 PST
Half Life (U-235):	(7.037 ± 0.011)E+08 years	**Source No.:**	92MIX2203028
Half Life (Am-241):	432.17 ± 0.66 years		

Contained Radioactivity:

U-234:	6.467	nCi	(239.3 Bq)	Am-241:	0.6366	nCi	(23.55 Bq)
U-235:	0.1135	nCi	(4.200 Bq)	Total Activity:	7.217	nCi	(267.1 Bq)

Physical description:

A. Capsule type:	Disk (22 mm OD X 0.79 mm THK)
B. Nature of active deposit:	Electrodeposited and diffusion bonded oxides
C. Active Diameter:	19 mm
D. Backing:	Stainless steel
E. Cover:	None

Radioimpurities: Not determined

Method of Calibration:

This source was assayed using a windowless internal gas flow proportional counter for total alpha activity. Individual nuclide ratios were taken from those determined in Aug 1992.

Uncertainty of Measurement:

A. Type A (random) uncertainty:	± 0.7%
B. Type B (systematic) uncertainty:	± 3.0%
C. Uncertainty in aliquot weighing:	± 0.0%
D. Total uncertainty at the 99% confidence level:	± 3.1%

Notes:

- See reverse side for leak test(s) performed on this source.
- IPL participates in a NIST measurement assurance program to establish and maintain implicit traceability for a number of nuclides, based on the blind assay (and later NIST [illegible]

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α3

reverified 5/20/08
expires 5/20/09

PAT I.D 184
recalibrated 4-15-02

CERTIFICATE OF CALIBRATION
MIXED ALPHA STANDARD SOURCE

Radionuclide A: U-234
Radionuclide B: U-235
Radionuclide C: Am-241
Half Life (U-234): (2.454 ± 0.006)E+05 years
Half Life (U-235): (7.037 ± 0.011)E+08 years
Half Life (Am-241): 432.17 ± 0.66 years

Customer: PARAGON ANALYTICS, INC.
P.O. No.: EW040203/R2193
Catalog No.: MISC-STD
Reference Date: 1-May-03 12:00 PST
Source No.: 92MIX2203024

Contained Radioactivity:

U-234:	3.227	nCi	(119.4 Bq)	Am-241:	2.866	nCi	(106.0 Bq)
U-235:	0.05205	nCi	(1.926 Bq)	Total Activity:	6.145	nCi	(227.3 Bq)

Physical description:

A. Capsule type: Disk (22 mm OD X 0.79 mm THK)
B. Nature of active deposit: Electrodeposited and diffusion bonded oxides
C. Active Diameter: 19 mm
D. Backing: Stainless steel
E. Cover: None

Radioimpurities: Not determined

Method of Calibration:

This source was assayed using a windowless internal gas flow proportional counter for total alpha activity. Individual nuclide ratios were taken from those determined in Aug 1992.

Uncertainty of Measurement:

A. Type A (random) uncertainty: ± 0.6%
B. Type B (systematic) uncertainty: ± 3.0%
C. Uncertainty in aliquot weighing: ± 0.0%
D. Total uncertainty at the 99% confidence level: ± 3.1%

Notes:

- See reverse side for leak test(s) performed on this source.
- IPL participates in a 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).
- Nuclear data was taken from "Table of Radioactive Isotopes", edited by Virginia Shirley, 1986.
- This source has a working life of 2 years.
- This source had a total alpha surface emission rate of 6889 α/min in 2π on 11 Apr 03.

Daniel James Van Dalsem
Quality Control

15-Apr-03
Date Signed

IPL Ref. No.: 987-7

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α 4

reverified 5/20/08
expires 5/20/09

PAI ID 00185
rec'd from recalibration
3-28-03

CERTIFICATE OF CALIBRATION
ALPHA STANDARD SOURCE

Radionuclide A: U-234
Radionuclide B: U-235
Radionuclide C: Am-241
Half Life (U-234): (2.454 ± 0.006)E+05 years
Half Life (U-235): (7.037 ± 0.011)E+08 years
Half Life (Am-241): 432.17 ± 0.66 years

Customer: PARAGON ANALYTICS, INC.
P.O. No.: EW030603/R2155
Catalog No.: MISC-STD
Reference Date: 1-Apr-03 12:00 PST
Source No.: 92MIX2203021

Contained Radioactivity:

U-234:	2.731	nCi	(101.0 Bq)	Am-241:	0.9325	nCi	(34.50 Bq)
U-235:	0.03416	nCi	(1.264 Bq)	Total Activity:	3.698	nCi	(136.8 Bq)

Physical description:

A. Capsule type: Disk (22 mm OD X 0.79 mm THK)
B. Nature of active deposit: Electrodeposited and diffusion bonded oxides
C. Active Diameter: 19 mm
D. Backing: Stainless steel
E. Cover: None

Radioimpurities: Not determined

Method of Calibration:

This source was assayed using a windowless internal gas flow proportional counter for total alpha activity. Individual nuclide ratios were taken from those determined in Aug 1992.

Uncertainty of Measurement:

A. Type A (random) uncertainty: ± 0.8%
B. Type B (systematic) uncertainty: ± 3.1%
C. Uncertainty in aliquot weighing: ± 0.0%
D. Total uncertainty at the 99% confidence level: ± 3.2%

Notes:

- See reverse side for leak test(s) performed on this source.
- IPL participates in a 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).
- Nuclear data was taken from "Table of Radioactive Isotopes", edited by Virginia Shirley, 1986.
- This source has a working life of 2 years.
- This source had a total alpha surface emission rate of 4145 α/min in 2π on 18 Mar 03.

Daniel James Van Dalsem
Quality Control

19-Mar-03
Date Signed

IPL Ref. No.: 987-2

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α5 reverified 5/20/08 expires 5/20/09
PAI ID 00186
recalibration received 3-28-03

CERTIFICATE OF CALIBRATION
ALPHA STANDARD SOURCE

Radionuclide A: U-234
Radionuclide B: U-235
Radionuclide C: Am-241
Half Life (U-234): (2.454 ± 0.006)E+05 years
Half Life (U-235): (7.037 ± 0.011)E+08 years
Half Life (Am-241): 432.17 ± 0.66 years

Customer: PARAGON ANALYTICS, INC.
P.O. No.: EW030603/R2155
Catalog No.: MISC-STD
Reference Date: 1-Apr-03 12:00 PST
Source No.: 92MIX2203025

Contained Radioactivity:

U-234:	5.486	nCi	(203.0 Bq)	Am-241:	3.958	nCi	(146.4 Bq)
U-235:	0.09221	nCi	(3.412 Bq)	Total Activity:	9.536	nCi	(352.8 Bq)

Physical description:

A. Capsule type: Disk (22 mm OD X 0.79 mm THK)
B. Nature of active deposit: Electrodeposited and diffusion bonded oxides
C. Active Diameter: 19 mm
D. Backing: Stainless steel
E. Cover: None

Radioimpurities: Not determined

Method of Calibration:

This source was assayed using a windowless internal gas flow proportional counter for total alpha activity. Individual nuclide ratios were taken from those determined in Aug 1992.

Uncertainty of Measurement:

A. Type A (random) uncertainty: ± 0.8%
B. Type B (systematic) uncertainty: ± 3.1%
C. Uncertainty in aliquot weighing: ± 0.0%
D. Total uncertainty at the 99% confidence level: ± 3.2%

Notes:

- See reverse side for leak test(s) performed on this source.
- IPL participates in a 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).
- Nuclear data was taken from "Table of Radioactive Isotopes", edited by Virginia Shirley, 1986.
- This source has a working life of 2 years.
- This source had a total alpha surface emission rate of 10690 α/min in 2π on 18 Mar 03.

Daniel James Van Dalsem
Quality Control

19-Mar-03
Date Signed

IPL Ref. No.: 987-2

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α6 reverified 5/20/08
expires 5/20/09
PAID 00187
recd for recalibration
3-28-03

CERTIFICATE OF CALIBRATION
ALPHA STANDARD SOURCE

Radionuclide A:	U-234	**Customer:**	PARAGON ANALYTICS, INC.
Radionuclide B:	U-235	**P.O. No.:**	EW030603/R2155
Radionuclide C:	Am-241	**Catalog No.:**	MISC-STD
Half Life (U-234):	(2.454 ± 0.006)E+05 years	**Reference Date:**	1-Apr-03 12:00 PST
Half Life (U-235):	(7.037 ± 0.011)E+08 years	**Source No.:**	92MIX2203022
Half Life (Am-241):	432.17 ± 0.66 years		

Contained Radioactivity:

U-234:	3.592	nCi	(132.9 Bq)	Am-241:	3.279	nCi	(121.3 Bq)
U-235:	0.08556	nCi	(3.166 Bq)	Total Activity:	6.957	nCi	(257.4 Bq)

Physical description:

A. Capsule type:	Disk (22 mm OD X 0.79 mm THK)
B. Nature of active deposit:	Electrodeposited and diffusion bonded oxides
C. Active Diameter:	19 mm
D. Backing:	Stainless steel
E. Cover:	None

Radioimpurities: Not determined

Method of Calibration:

This source was assayed using a windowless internal gas flow proportional counter for total alpha activity. Individual nuclide ratios were taken from those determined in Aug 1992.

Uncertainty of Measurement:

A. Type A (random) uncertainty:	± 0.8%
B. Type B (systematic) uncertainty:	± 3.1%
C. Uncertainty in aliquot weighing:	± 0.0%
D. Total uncertainty at the 99% confidence level:	± 3.2%

Notes:

- See reverse side for leak test(s) performed on this source.
- IPL participates in a 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).
- Nuclear data was taken from "Table of Radioactive Isotopes", edited by Virginia Shirley, 1986.
- This source has a working life of 2 years.
- This source had a total alpha surface emission rate of 7799 α/min in 2π on 18 Mar 03.

Daniel James Van Dalsem
Quality Control

19-Mar-03
Date Signed

IPL Ref. No.: 987-2

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α7

reverified 5/20/08
expires 5/20/09

PAIP 188
rec'd for recalibration
3-28-03

CERTIFICATE OF CALIBRATION
ALPHA STANDARD SOURCE

Radionuclide A: U-234
Radionuclide B: U-235
Radionuclide C: Am-241
Half Life (U-234): (2.454 ± 0.006)E+05 years
Half Life (U-235): (7.037 ± 0.011)E+08 years
Half Life (Am-241): 432.17 ± 0.66 years

Customer: PARAGON ANALYTICS, INC.
P.O. No.: EW030603/R2155
Catalog No.: MISC-STD
Reference Date: 1-Apr-03 12:00 PST
Source No.: 92MIX2203023

Contained Radioactivity:

U-234:	2.895	nCi	(107.1 Bq)	Am-241:	1.953	nCi	(72.26 Bq)
U-235:	0.02502	nCi	(0.9257 Bq)	Total Activity:	4.873	nCi	(180.3 Bq)

Physical description:

A. Capsule type: Disk (22 mm OD X 0.79 mm THK)
B. Nature of active deposit: Electrodeposited and diffusion bonded oxides
C. Active Diameter: 19 mm
D. Backing: Stainless steel
E. Cover: None

Radioimpurities: Not determined

Method of Calibration:

This source was assayed using a windowless internal gas flow proportional counter for total alpha activity. Individual nuclide ratios were taken from those determined in Aug 1992.

Uncertainty of Measurement:

A. Type A (random) uncertainty: ± 0.8%
B. Type B (systematic) uncertainty: ± 3.1%
C. Uncertainty in aliquot weighing: ± 0.0%
D. Total uncertainty at the 99% confidence level: ± 3.2%

Notes:

- See reverse side for leak test(s) performed on this source.
- IPL participates in a 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).
- Nuclear data was taken from "Table of Radioactive Isotopes", edited by Virginia Shirley, 1986.
- This source has a working life of 2 years.
- This source had a total alpha surface emission rate of 5463 α/min in 2π on 18 Mar 03.

Daniel James Van Dalsem
Quality Control

19-Mar-03
Date Signed

IPL Ref. No.: 987-2

Isotope Products Laboratories
An Eckert & Ziegler Company

24937 Avenue Tibbitts
Valencia, California 91355

Tel 661·309·1010
Fax 661·257·8303

α 8

re verified 5/20/08
expires 5/20/09

PAI ID 189
recd 4-2-03
recalibrated 4-15-03

CERTIFICATE OF CALIBRATION
MIXED ALPHA STANDARD SOURCE

Radionuclide A: U-234
Radionuclide B: U-235
Radionuclide C: Am-241
Half Life (U-234): (2.454 ± 0.006)E+05 years
Half Life (U-235): (7.037 ± 0.011)E+08 years
Half Life (Am-241): 432.17 ± 0.66 years

Customer: PARAGON ANALYTICS, INC.
P.O. No.: EW040203/R2193
Catalog No.: MISC-STD
Reference Date: 1-May-03 12:00 PST
Source No.: 92MIX2203029

Contained Radioactivity:

U-234:	9.048	nCi	(334.8 Bq)	Am-241:	1.433	nCi	(53.02 Bq)
U-235:	0.1771	nCi	(6.553 Bq)	Total Activity:	10.66	nCi	(394.4 Bq)

Physical description:

A. Capsule type: Disk (22 mm OD X 0.79 mm THK)
B. Nature of active deposit: Electrodeposited and diffusion bonded oxides
C. Active Diameter: 19 mm
D. Backing: Stainless steel
E. Cover: None

Radioimpurities: Not determined

Method of Calibration:

This source was assayed using a windowless internal gas flow proportional counter for total alpha activity. Individual nuclide ratios were taken from those determined in Mar 1998.

Uncertainty of Measurement:

A. Type A (random) uncertainty: ± 0.5%
B. Type B (systematic) uncertainty: ± 3.0%
C. Uncertainty in aliquot weighing: ± 0.0%
D. Total uncertainty at the 99% confidence level: ± 3.0%

Notes:

- See reverse side for leak test(s) performed on this source.
- IPL participates in a 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).
- Nuclear data was taken from "Table of Radioactive Isotopes", edited by Virginia Shirley, 1986.
- This source has a working life of 2 years.
- This source had a total alpha surface emission rate of 11950 α/min in 2π on 11 Apr 03.

Daniel James Van Dalsem
Quality Control

15-Apr-03
Date Signed

IPL Ref. No.: 987-7

Eckert & Ziegler
Isotope Products

24937 Avenue Tibbitts
Valencia, California 91355

Tel 661·309·1010
Fax 661·257·8303

RSO #190
Rec'd 6/6/07 GW
Recertification 6/1/07

CERTIFICATE OF CALIBRATION
MIXED ALPHA STANDARD SOURCE

α 9

Radionuclide:	U-234	**Customer:**	PARAGON ANALYTICS, INC.
Radionuclide:	U-235	**P.O. No.:**	73179/R3768
Radio: 23	Am-241	**Catalog No.:**	MISC-STD
Half-life (U-234):	(2.454 ± 0.006)E+05 years	**Reference Date:**	1-Jun-07 12:00 PST
Half-life (U-235):	(7.037 ± 0.011)E+08 years	**Source No.:**	92MIX223027
Half-life (Am-241):	432.17 ± 0.66 years		

Contained Radioactivity:

U-234:	1.349	nCi,	49.91	Bq	Am-241:	0.3243	nCi,	12.00	Bq
U-235:	0.02970	nCi,	1.099	Bq	Total Activity:	1.703	nCi,	63.01	Bq

Physical Description:

A. Capsule type:	Disk (47 mm OD x 0.76 mm THK)
B. Nature of active deposit:	Electrodeposited and diffusion bonded oxide
C. Active diameter/volume:	19 mm
D. Backing:	Stainless steel
E. Cover:	None

Radioimpurities: Not determined

Method of Calibration:

This source was assayed using a windowless internal gas flow proportional counter for total alpha activity. Individual nuclide ratios were taken from those determined in May 2001.

Uncertainty of Measurement:

A. Type A (random) uncertainty:	±	0.9	%
B. Type B (systematic) uncertainty:	±	3.0	%
C. Uncertainty in aliquot weighing:	±	0.0	%
D. Total uncertainty at the 99% confidence level:	±	3.1	%

Notes:

- See reverse side for leak test(s) performed on this source.
- IPL participates in a 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).
- Nuclear data was taken from "Table of Radioactive Isotopes", edited by Virginia Shirley, 1986.
- This source has a working life of 2 years.
- This source had a total alpha surface emission rate of 1909 α/min in 2π on 22-May-07

Quality Control

24 May 07
Date

IPL Ref. No.: 1143-19

Paragon Analytics

Radiochemistry Case Narrative
Isotopic Polonium

Los Alamos National Laboratory SMO

Dust / 08-1101

PA WO 0805078

1. This report consists of the analytical results and supporting documentation for two solid samples received by Paragon on 05/08/08.
2. These samples were prepared according to procedures PA SOP773R10 and PA SOP711R7. These samples were not ground prior to analysis.
3. The samples were analyzed for the presence of Polonium-210 according to procedure PA SOP714R11. The analyses were completed on 06/08/08.
4. The isotopic analysis results for these samples are reported on an 'as received' basis in units of pCi/gram.
5. Results of this analysis are decay-corrected to the sampling date, based on the 138.4 day half-life of Po-210. This decay correction makes no assumptions as to the equilibrium state of Po-210 with the Pb-210 parent nuclide, which has a half-life of 22.3 years.
6. No anomalous situations were encountered during the preparation or analysis of these samples. All quality control criteria were met.

The data contained in the following report have been reviewed and approved by the personnel listed below. In addition, Paragon Analytics certifies that the analyses reported herein are true, complete and correct within the limits of the methods employed.

Linda Arend
Radiochemistry Primary Reviewer

06/20/08
Date

Radiochemistry Final Data Review

6/20/08
Date

1

PARAGON ANALYTICS
Radiochemistry Data Package

Section 1

CHAIN OF CUSTODY

Paragon Analytics

Sample Number(s) Cross-Reference Table

Paragon OrderNum: 0805078
Client Name: Los Alamos National Laboratory SMO
Client Project Name: Dust
Client Project Number: 08-1101
Client PO Number: 33204-001-06 F3

Client Sample Number	Lab Sample Number	COC Number	Matrix	Date Collected	Time Collected
SFB08-08-12411	0805078-1		SOLID	16-Apr-08	
SFB08-08-12412	0805078-2		SOLID	16-Apr-08	

Wednesday, May 07, 2008

LAB CHAIN OF CUSTODY DOCUMENT NUMBER: 08-1101C

REQUEST NUMBER: 08-1101

LOS ALAMOS

NATIONAL LABORATORY

ATTN: Lance Steere

Paragon Analytics, Inc.

225 Commerce

Fort Collins, CO 80524

TURNAROUND/REPORT DUE: 6/6/2008

TURNAROUND REQ'D: 30

LAB REQUEST COMMENTS: Phils Samples 0805078

	SAMPLE ID	CTNR	CTNR DESC	ORDER	PRESERV	MATRIX
1	SFB08-08-12411	1	1 L POLY	AM241+GS+ISOPU+ISOU+SR90	None	S
	SFB08-08-12411	1	500 ML POLY	GROSSA+B	None	S
	SFB08-08-12411	1	250 ML POLY	ISO_Po	Ice	S
2	SFB08-08-12412	1	1 L POLY	AM241+GS+ISOPU+ISOU+SR90	None	S
	SFB08-08-12412	1	500 ML POLY	GROSSA+B	None	S
	SFB08-08-12412	1	250 ML POLY	ISO_Po	Ice	S

Relinquished By:	Date	Time	Received By:	Date	Time
[illegible]	5/7/08	3:00	Sheri Lafferty [illegible]	5/8/08	0930
Printed Name / Signature			Printed Name / Signature		
Printed Name / Signature			Printed Name / Signature		
Printed Name / Signature			Printed Name / Signature		

Received for DISPOSAL By: **Date** **Time** **Remarks:**

Printed Name / Signature

EST NUMBER: 08-1101

08-1101

1-800-443-1511

PR 1314 0300

E COMMENTS	SPECIAL INSTRUCTIONS
tor-vacuum bag, LAM-0001	
or-furnace filter, LAM-0001	
or-vacuum bag, AM-0001	
or-furnace filter, AM-0001	
or-vacuum bag, AM-0001	
or-furnace filter, AM-0001	
or-vacuum bag, AM-0001	

080508

QUEST NUMBER: 08-1101

MPLE COMMENTS	SPECIAL INSTRUCTIONS
Monitor-furnace filter, tion LAM-0001	
Monitor-vacuum bag, ion LAM-0001	
onitor-furnace filter, on LAM-0001	
onitor-vacuum bag, on LAM-0001	
onitor-furnace filter, ion LAM-0001	
onitor-vacuum bag, ion LAM-0001	
onitor-furnace filter, on LAM-0001	

R 08-1101

080508

CONDITION OF SAMPLE UPON RECEIPT FORM

Paragon Analytics

Client: LANL Workorder No: 0805078

Project Manager: LS Initials: SL Date: 5.8.08

1. Does this project require any **special handling** in addition to standard Paragon procedures?		YES	(NO)
2. Are custody **seals** on **shipping containers** intact?	NONE	(YES)	NO
3. Are Custody seals on **sample containers** intact?	NONE	(YES)	NO
4. Is there a **COC (Chain-of-Custody) present** or other representative documents?		(YES)	NO
5. Are the **COC and bottle labels complete and legible**?		YES	(NO)
6. Is the **COC in agreement** with samples received? (IDs, dates, times, no. of samples, no. of containers, matrix, requested analyses, etc.)		YES	(NO)
7. Were **airbills / shipping documents** present and/or removable?	DROP OFF	(YES)	NO
8. Are all aqueous **samples requiring preservation preserved correctly**? (excluding volatiles)	(N/A)	YES	NO
9. Are all aqueous **non-preserved samples pH 4-9**?	(N/A)	YES	NO
10. Is there **sufficient sample** for the requested analyses?		YES	(NO)
11. Were all samples placed in the **proper containers** for the requested analyses?		(YES)	NO
12. Are all samples within **holding times** for the requested analyses?		(YES)	NO
13. Were all sample containers received **intact**? (not broken or leaking, etc.)		(YES)	NO
14. Are all samples requiring no headspace (VOC, GRO, Rx CN/S, radon), headspace free? **Size of bubble**: ___ < green pea ___ > green pea	(N/A)	YES	NO
15. Were samples checked for and free from the presence of **residual chlorine?** (Applicable when PM has indicated samples are from a chlorinated water source; note if field preservation with sodium thiosulfate was not observed.)	(N/A)	YES	NO
16. Were the samples **shipped on ice**?		(YES)	NO
17. Were cooler temperatures measured at 0.1-6.0°C? IR gun used*: #2 #4	RAD ONLY	(YES)	NO

Cooler #:	1						
Temperature (°C):	0.8						
No. of custody seals on cooler:	1						
DOT Survey/ Acceptance Information — External µR/hr reading:	16						
Background µR/hr reading:	12						

Were external µR/hr readings ≤ two times background and within DOT acceptance criteria? (YES) / NO / NA (If no, see Form 008.)

Additional Information: PROVIDE DETAILS BELOW FOR A NO RESPONSE TO ANY QUESTION ABOVE, EXCEPT #1 AND #16

No times listed. ok

Received only (1) 500 ml poly (approx 25-30% full) for both samples.

-01 = 146g v fine dust, mix Dust? = Yes ~50% full

-02 = 34g " " " ~10% full

If applicable, was the client contacted? YES / NO / NA Contact: Joy Valdez Date/Time: 5/22

Project Manager Signature / Date: 5/22/08

*IR Gun #2: Oakton, SN 29922500201-0066 *IR Gun #4: Oakton, SN 2372220101-0002

Form 201r20.xls (12/27/07)

0805078

ORIGIN ID: SAFA (505) 665-9508
JOYLENE VALDEZ
LOS ALAMOS NATL LAB.
TA00 BLDG 1237 DPU 03

LOS ALAMOS, NM 87545
UNITED STATES US

Ship Date: 07MAY08
ActWgt: 74.0 LB MAN
System#: 0014176/CAFE2355
Account: S *********

(800) 443-1511
FedEx
Express

TO LANCE STEERE
PARAGON
225 COMMERCE

FORT COLLINS, CO 80524

16

Ref: 6b010amr2a015bcgae

Delivery Address
Barcode

BILL SENDER

08

PRIORITY OVERNIGHT

THU
Deliver By:
08MAY08

TRK# 7209 7844 2022 Form 0201

DEN AA

80524 -CO-US XH FTCA

2

PARAGON ANALYTICS
Radiochemistry Data Package

Section 2

SAMPLE RESULTS SUMMARY

Polonium-210 by Alpha Spectroscopy Sample Results Summary

Client Name: Los Alamos National Laboratory SMO
Client Project Name: Dust
Client Project Number: 08-1101

Laboratory Name: Paragon Analytics
PAI Work Order: 0805078

Reported on: Thursday, June 19, 2008 11:15:38 AM

Lab Sample ID	Client Sample ID	Sample Type	Nuclide	Result +/- 1 s TPU	MDC	Units	Matrix	Prep Batch	Date Analyzed	Flags
0805078-1	SFB08-08-12411	Sample	Po-210	3.70 +/- 0.33	0.10	pCi/g	SOLID	PL080606-1	6/8/2008	
0805078-2	SFB08-08-12412	Sample	Po-210	10.07 +/- 0.78	0.08	pCi/g	SOLID	PL080606-1	6/8/2008	

Comments:

Data Package ID: *PL0805078-1*

Qualifiers/Flags:

U - Result is less than the sample specific MDC.
LT - Result is less than Requested MDC, greater than sample specific MDC.
Y1 - Chemical Yield is in control at 100-110%. Quantitative Yield is assumed.
Y2 - Chemical Yield outside default limits.
M - The requested MDC was not met.
M3 - The requested MDC was not met, but the reported activity is greater than the reported MDC.

Abbreviations:

TPU - Total Propagated Uncertainty (see PAI SOP 743)
MDC - Minimum Detectable Concentration (see PAI SOP 709)

BDL - Below Detection Limit

3

PARAGON ANALYTICS
Radiochemistry Data Package

Section 3

QC RESULTS SUMMARY

Polonium-210 by Alpha Spectroscopy

PAI 714 Rev 11

Method Blank Results

Lab Name: Paragon Analytics
Work Order Number: 0805078
Client Name: Los Alamos National Laboratory SMO
ClientProject ID: Dust 08-1101

Lab ID: PL080606-1MB

Sample Matrix: SOLID
Prep SOP: PAI 711 Rev 7
Date Collected: 06-Jun-08
Date Prepared: 06-Jun-08
Date Analyzed: 08-Jun-08

Prep Batch: PL080606-1
QCBatchID: PL080606-1-1
Run ID: PL080606-1A
Count Time: 1000 minutes

Final Aliquot: 0.260 g
Result Units: pCi/g
File Name: Spectrum #1

CASNO	Target Nuclide	Result +/- 1 s TPU	MDC	Requested MDC	Lab Qualifier
13981-52-7	Po-210	-0.013 +/- 0.015	0.068	0.25	U

Chemical Yield Summary

Carrier/Tracer	Amount Added	Result	Units	Yield	Control Limits	Flag
Po-209	13.84	12.42	pCi/g	89.7	20 - 110 %	

Comments:

Qualifiers/Flags:

U - Result is less than the sample specific MDC.

Y1 - Chemical Yield is in control at 100-110%. Quantitative Yield is assumed.

Abbreviations:

TPU - Total Propagated Uncertainty (see PAI SOP 743)

Polonium-210 by Alpha Spectroscopy

PAI 714 Rev 11

Laboratory Control Sample(s)

Lab Name: Paragon Analytics
Work Order Number: 0805078
Client Name: Los Alamos National Laboratory SMO
ClientProject ID: Dust 08-1101

Lab ID: PL080606-1LCS

Sample Matrix: SOLID
Prep SOP: PAI 711 Rev 7
Date Collected: 06-Jun-08
Date Prepared: 06-Jun-08
Date Analyzed: 08-Jun-08

Prep Batch: PL080606-1
QCBatchID: PL080606-1-1
Run ID: PL080606-1A
Count Time: 1000 minutes

Final Aliquot: 0.260 g
Result Units: pCi/g
File Name: Spectrum #1

CASNO	Target Nuclide	Results +/- 1s TPU	MDC	Spike Added	% Rec	Control Limits	Lab Qualifier
13981-52-7	Po-210	41.2 +/- 3.0	0.1	40.8	101	83 - 117	P

Chemical Yield Summary

Carrier/Tracer	Amount Added	Result	Units	Yield	Control Limits	Flag
Po-209	13.84	12.44	pCi/g	89.8	20 - 110 %	

Comments:

Qualifiers/Flags:

U - Result is less than the sample specific MDC.
LT - Result is less than Requested MDC, greater than sample specific MDC.
Y1 - Chemical Yield is in control at 100-110%. Quantitative Yield is assumed.
Y2 - Chemical Yield outside default limits.
L - LCS Recovery below lower control limit.
H - LCS Recovery above upper control limit.
P - LCS Recovery within control limits.
M - The requested MDC was not met.
M3 - The requested MDC was not met, but thereported activity is greater than the reported MDC.

Abbreviations:

TPU - Total Propagated Uncertainty (see PAI SOP 743)
MDC - Minimum Detectable Concentration (see PAI SOP 709)

Data Package ID: *PL0805078-1*

Polonium-210 by Alpha Spectroscopy

PAI 714 Rev 11

Duplicate Sample Results (DER)

Lab Name: Paragon Analytics
Work Order Number: 0805078
Client Name: Los Alamos National Laboratory SMO
ClientProject ID: Dust 08-1101

Field ID: SFB08-08-12411
Lab ID: 0805078-1DUP

Sample Matrix: SOLID
Prep SOP: PAI 711 Rev 7
Date Collected: 16-Apr-08
Date Prepared: 06-Jun-08
Date Analyzed: 08-Jun-08

Prep Batch: PL080606-1
QCBatchID: PL080606-1-1
Run ID: PL080606-1A
Count Time: 1000 minutes
Report Basis: As Received

Final Aliquot: 0.264 g
Prep Basis: As Received
Moisture(%): NA
Result Units: pCi/g
File Name: Spectrum #1

CASNO	Analyte	Sample Result +/- 1s TPU	Duplicate Result +/- 1s TPU	DER	Control Limit	Lab Qualifiers
13981-52-7	Po-210	3.70 +/- 0.33	3.32 +/- 0.31	0.41	2.13	

Comments:

Duplicate Qualifiers/Flags:

U - Result is less than the sample specific MDC.
Y1 - Chemical Yield is in control at 100-110%. Quantitative yield is assumed.
Y2 - Chemical Yield outside default limits.
W - DER is greater than Warning Limit of 1.42
D - DER is greater than Control Limit of 2.13
LT - Result is less than Request MDC, greater than sample specific MDC
M - Requested MDC not met.
M3 - The requested MDC was not met, but the reported activity is greater than the reported MDC.
L - LCS Recovery below lower control limit.
H - LCS Recovery above upper control limit.
P - LCS, Matrix Spike Recovery within control limits.
N - Matrix Spike Recovery outside control limits

Abbreviations:

TPU - Total Propagated Uncertainty (see PAI SOP 743)
DER - Duplicate Error Ratio (see PAI SOP 715)
BDL - Below Detection Limit
NR - Not Reported

Data Package ID: *PL0805078-1*

PARAGON ANALYTICS
Radiochemistry Data Package

4

Section 4

INDIVIDUAL SAMPLE RESULTS

Polonium-210 by Alpha Spectroscopy

PAI 714 Rev 11

Sample Results

Lab Name: Paragon Analytics
Work Order Number: 0805078
Client Name: Los Alamos National Laboratory SMO
ClientProject ID: Dust 08-1101

Field ID: SFB08-08-12411
Lab ID: 0805078-1

Analysis ReqCode: ASP-A-019

Sample Matrix: SOLID
Prep SOP: PAI 711 Rev 7
Date Collected: 16-Apr-08
Date Prepared: 06-Jun-08
Date Analyzed: 08-Jun-08

Prep Batch: PL080606-1
QCBatchID: PL080606-1-1
Run ID: PL080606-1A
Count Time: 1000 minutes
Report Basis: As Received

Final Aliquot: 0.258 g
Prep Basis: As Received
Moisture(%): NA
Result Units: pCi/g
File Name: Spectrum #1

CASNO	Target Nuclide	Result +/- 1 s TPU	MDC	Requested MDC	Lab Qualifier
13981-52-7	Po-210	3.70 +/- 0.33	0.10	0.25	

Chemical Yield Summary

Carrier/Tracer	Amount Added	Result	Units	Yield	Control Limits	Flag
Po-209	13.98	9.99	pCi/g	71.5	20 - 110 %	

Comments:

Qualifiers/Flags:

U - Result is less than the sample specific MDC.

Y1 - Chemical Yield is in control at 100-110%. Quantitative Yield is assumed.

Y2 - Chemical Yield outside default limits.

LT - Result is less than Requested MDC, greater than sample specific MDC.

M3 - The requested MDC was not met, but the reported activity is greater than the reported MDC.

M - The requested MDC was not met.

Abbreviations:

TPU - Total Propagated Uncertainty (see PAI SOP 743)

MDC - Minimum Detectable Concentration (see PAI SOP 709)

BDL - Below Detection Limit

Data Package ID: *PL0805078-1*

Polonium-210 by Alpha Spectroscopy

PAI 714 Rev 11

Sample Duplicate Results

Lab Name: Paragon Analytics
Work Order Number: 0805078
Client Name: Los Alamos National Laboratory SMO
ClientProject ID: Dust 08-1101

Field ID: SFB08-08-12411
Lab ID: 0805078-1DUP

Sample Matrix: SOLID
Prep SOP: PAI 711 Rev 7
Date Collected: 16-Apr-08
Date Prepared: 06-Jun-08
Date Analyzed: 08-Jun-08

Prep Batch: PL080606-1
QCBatchID: PL080606-1-1
Run ID: PL080606-1A
Count Time: 1000 minutes
Report Basis: As Received

Final Aliquot: 0.264 g
Prep Basis: As Received
Moisture(%): NA
Result Units: pCi/g
File Name: Spectrum #1

CASNO	Target Nuclide	Result +/- 1 s TPU	MDC	Requested MDC	Lab Qualifier
13981-52-7	Po-210	3.32 +/- 0.31	0.15	0.25	

Chemical Yield Summary

Carrier/Tracer	Amount Added	Result	Units	Yield	Control Limits	Flag
Po-209	13.68	8.99	pCi/g	65.7	20 - 110 %	

Comments:

Qualifiers/Flags:

U - Result is less than the sample specific MDC.

Y1 - Chemical Yield is in control at 100-110%. Quantitative yield is assumed.

Y2 - Chemical Yield outside default limits.

LT - Result is less than Requested MDC, greater than sample specific MDC.

M - The requested MDC was not met.

M3 - The requested MDC was not met, but thereported activity is greater than the reported MDC.

W - DER is greater than Warning Limit of 1.42

D - DER is greater than Control Limit of 2.13

Abbreviations:

TPU - Total Propagated Uncertainty (see PAI SOP 743)

MDC - Minimum Detectable Concentration (see PAI SOP 709)

BDL - Below Detection Limit

Data Package ID: *PL0805078-1*

Polonium-210 by Alpha Spectroscopy

PAI 714 Rev 11

Sample Results

Lab Name: Paragon Analytics
Work Order Number: 0805078
Client Name: Los Alamos National Laboratory SMO
ClientProject ID: Dust 08-1101

Field ID: SFB08-08-12412
Lab ID: 0805078-2

Analysis ReqCode: ASP-A-019

Sample Matrix: SOLID
Prep SOP: PAI 711 Rev 7
Date Collected: 16-Apr-08
Date Prepared: 06-Jun-08
Date Analyzed: 08-Jun-08

Prep Batch: PL080606-1
QCBatchID: PL080606-1-1
Run ID: PL080606-1A
Count Time: 1000 minutes
Report Basis: As Received

Final Aliquot: 0.263 g
Prep Basis: As Received
Moisture(%): NA
Result Units: pCi/g
File Name: Spectrum #1

CASNO	Target Nuclide	Result +/- 1 s TPU	MDC	Requested MDC	Lab Qualifier
13981-52-7	Po-210	10.07 +/- 0.78	0.08	0.25	

Chemical Yield Summary

Carrier/Tracer	Amount Added	Result	Units	Yield	Control Limits	Flag
Po-209	13.71	11.86	pCi/g	86.5	20 - 110 %	

Comments:

Qualifiers/Flags:

U - Result is less than the sample specific MDC.

Y1 - Chemical Yield is in control at 100-110%. Quantitative Yield is assumed.

Y2 - Chemical Yield outside default limits.

LT - Result is less than Requested MDC, greater than sample specific MDC.

M3 - The requested MDC was not met, but the reported activity is greater than the reported MDC.

M - The requested MDC was not met.

Abbreviations:

TPU - Total Propagated Uncertainty (see PAI SOP 743)

MDC - Minimum Detectable Concentration (see PAI SOP 709)

BDL - Below Detection Limit

Data Package ID: *PL0805078-1*

PARAGON ANALYTICS
Radiochemistry Data Package

Section 5

RAW DATA

Units Basis	DER RPD	%Spk. Recov Flags
g	NA	
eived	NA	
g	NA	
eived	NA	
g	NA	
eived	NA	
g	0.41	
eived	NA	
g	NA	
ived	NA	
g	NA	
ived	NA	
g	NA	
ived	NA	
	NA	
ved	NA	U
	NA	
ved	NA	
	NA	101
ved	NA	P

ot activity added).

for decay correction.

Paragon Analytics

Alpha-Spectroscopy Analysis Report

Sample

Sample: 0805078-1
Spectrum #1 Analysis #1

Sample Size : 0.26

Acquisition

Detector: 52
Batch Name: PL080606-1_A
Nuclide Library: Po-210
Analysis Method: Absolute ROI Analysis, Set Name = Po-210
ROI Set: Po-210

Acquisition Start Date: 6/8/2008 11:37:33AM
Live Time: 1,000.00 min.
Real Time: 1,000.02 min.
Dead Time: 0.00 %

Calibration

Bkgd Info: Sample: B08060252; Det: 52; Spectrum #1; Jun-02-2008 14:17

Calibration Date: 6/2/2008 1:10:57PM

Efficiency Calibration: C08060252

Efficiency: 30.30% +/- 0.21% TPU(2 sigma)

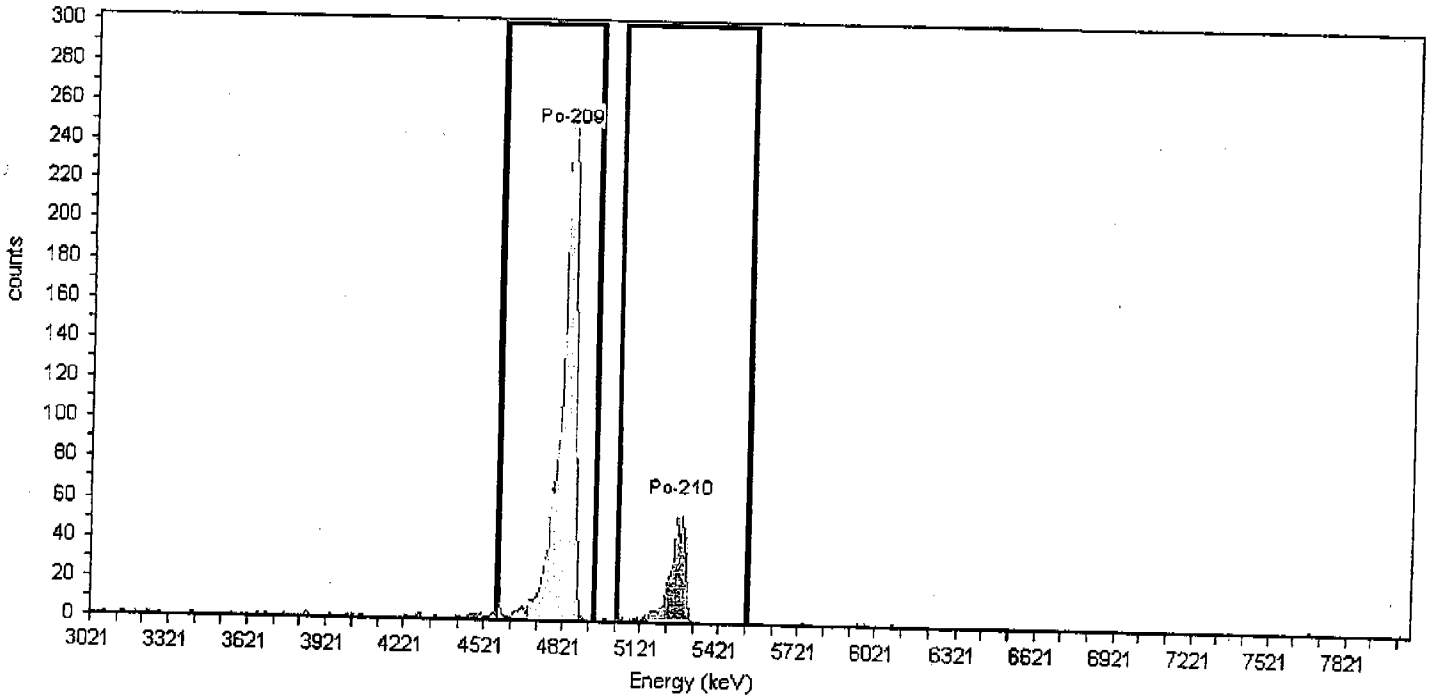
Energy Calibration: C08060252

Energy Cal: Gain = 9.9003 keV / Ch
Offset = 3,011.38 keV
Quadratic = 0.0000 keV / Ch^2

Tracer

Tracer Name: 851.3020.87 Po-209
Tracer Activity: 17.63 DPM/mL x (Vol.)0.50 mL = 8.82 DPM

Tracer Nuclide: Po-209
Tracer Recovery: 71.60%



Nuclide Summary (ROI)

Nuclide	Peak Energy keV	ROI Start keV	ROI End keV	FWHM keV	B.R. %.	Gross Counts	Bkgd Counts	Net Counts	Activity pCi/g	2.00Sigma TPU pCi/g	Critical Level pCi/g	MDA pCi/g
Po-209	4833.0	4565.7	4941.9	67.1	99.7	1,734.00	1.00	1,733.00	1.1E+001	5.3E-001	2.1E-002	6.5E-002
Po-210	5278.5	5031.0	5526.1	69.2	100.0	353.00	2.00	351.00	2.8E+000	4.3E-001	2.6E-002	7.4E-002

Reviewed By: GB JP

Print Date: 6/9/2008 7:44:51AM

AlphaVision v5.3
Custom Report Iteration: 08/09/07

Paragon Analytics

Alpha-Spectroscopy Analysis Report

Sample

Sample: 0805078-1D
Spectrum #1 Analysis #1

Sample Size : 0.26

Acquisition

Detector: 53
Batch Name: PL080606-1_A
Nuclide Library: Po-210
Analysis Method: Absolute ROI Analysis, Set Name = Po-210
ROI Set: Po-210

Acquisition Start Date: 6/8/2008 11:37:33AM
Live Time: 1,000.00 min.
Real Time: 1,000.02 min.
Dead Time: 0.00 %

Calibration

Bkgd Info: Sample: B08060253; Det: 53; Spectrum #1; Jun-02-2008 14:17

Calibration Date: 6/2/2008 1:11:20PM

Efficiency Calibration: C08060253

Efficiency: 32.23% +/- 0.13% TPU(2 sigma)

Energy Calibration: C08060253

Energy Cal: Gain = 9.8224 keV / Ch
Offset = 3,029.39 keV
Quadratic = 0.0000 keV / Ch^2

Paragon Analytics

Alpha-Spectroscopy Analysis Report

Sample

Sample: 0805078-2
Spectrum #1 Analysis #1

Sample Size : 0.26

Acquisition

Detector: 54
Batch Name: PL080606-1_A
Nuclide Library: Po-210
Analysis Method: Absolute ROI Analysis, Set Name = Po-210
ROI Set: Po-210

Acquisition Start Date: 6/8/2008 11:37:34AM
Live Time: 1,000.00 min.
Real Time: 1,000.02 min.
Dead Time: 0.00 %

Calibration

Bkgd Info: Sample: B08060254; Det: 54; Spectrum #1; Jun-02-2008 14:17

Calibration Date: 6/2/2008 1:12:03PM

Efficiency Calibration: C08060254

Efficiency: 31.12% +/- 0.15% TPU(2 sigma)

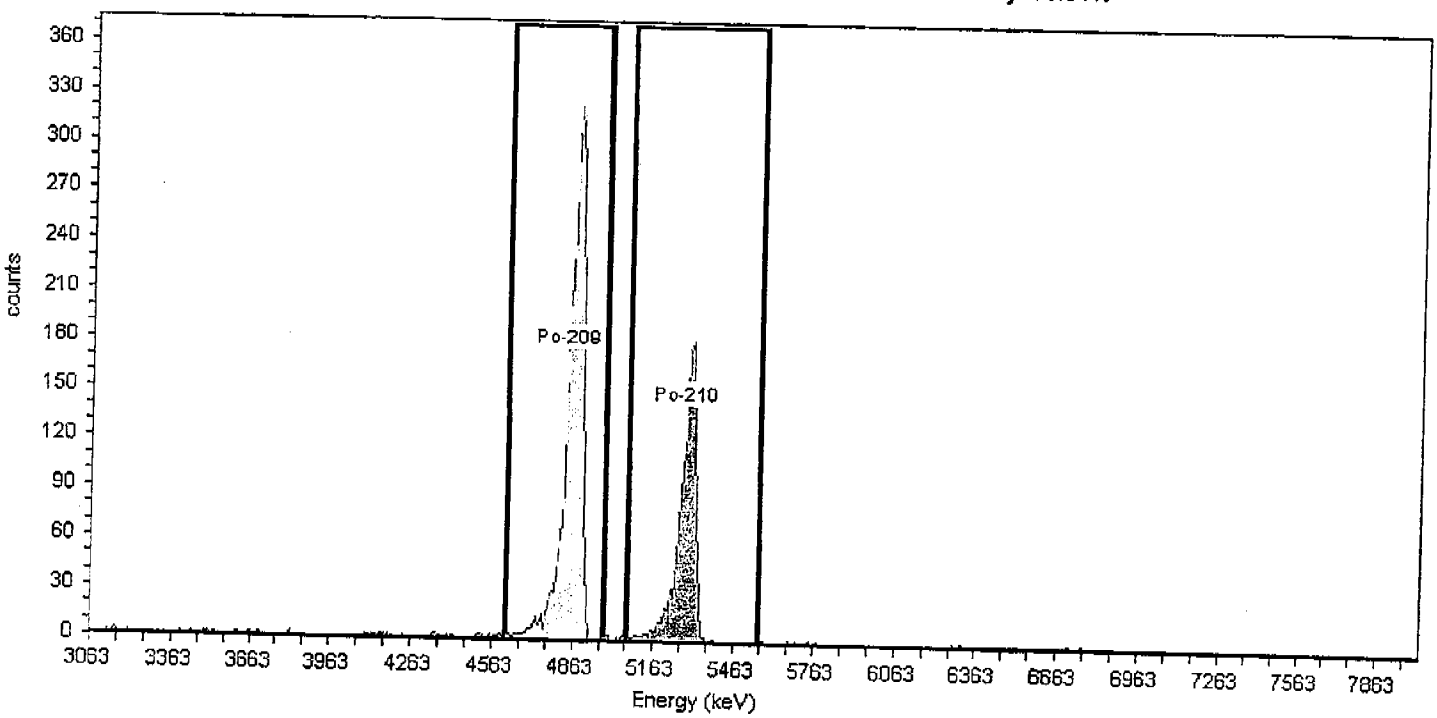
Energy Calibration: C08060254

Energy Cal: Gain = 9.7289 keV / Ch
Offset = 3,053.57 keV
Quadratic = 0.0000 keV / Ch^2

Tracer

Tracer Name: 851.3020.87 Po-209
Tracer Activity: 17.63 DPM/mL x (Vol.)0.50 mL = 8.82 DPM

Tracer Nuclide: Po-209
Tracer Recovery: 86.61%



Nuclide Summary (ROI)

Nuclide	Peak Energy keV	ROI Start keV	ROI End keV	FWHM keV	B.R. %.	Gross Counts	Bkgd Counts	Net Counts	Activity pCi/g	2.00Sigma TPU pCi/g	Critical Level pCi/g	MDA pCi/g
Po-209	4872.9	4610.2	4979.9	63.7	99.7	2,155.00	2.00	2,153.00	1.3E+001	5.7E-001	2.3E-002	6.6E-002
Po-210	5310.7	5067.4	5553.9	67.8	100.0	1,212.00	2.00	1,210.00	7.8E+000	9.6E-001	2.1E-002	6.0E-002

Reviewed By: GB JP

Print Date: 6/9/2008 7:45:16AM

AlphaVision v5.3
Custom Report Iteration: 08/09/07

Paragon Analytics

Alpha-Spectroscopy Analysis Report

Sample

Sample: PL080606-1MB
Spectrum #1 Analysis #1

Sample Size : 0.26

Acquisition

Detector: 33
Batch Name: PL080606-1_A
Nuclide Library: Po-210
Analysis Method: Absolute ROI Analysis, Set Name = Po-210
ROI Set: Po-210

Acquisition Start Date: 6/8/2008 11:26:42AM
Live Time: 1,000.00 min.
Real Time: 1,000.02 min.
Dead Time: 0.00 %

Calibration

Bkgd Info: Sample: B08060333; Det: 33; Spectrum #1; Jun-03-2008 13:07

Calibration Date: 6/3/2008 10:34:57AM

Efficiency Calibration: C08060333

Efficiency: 31.04% +/- 0.20% TPU(2 sigma)

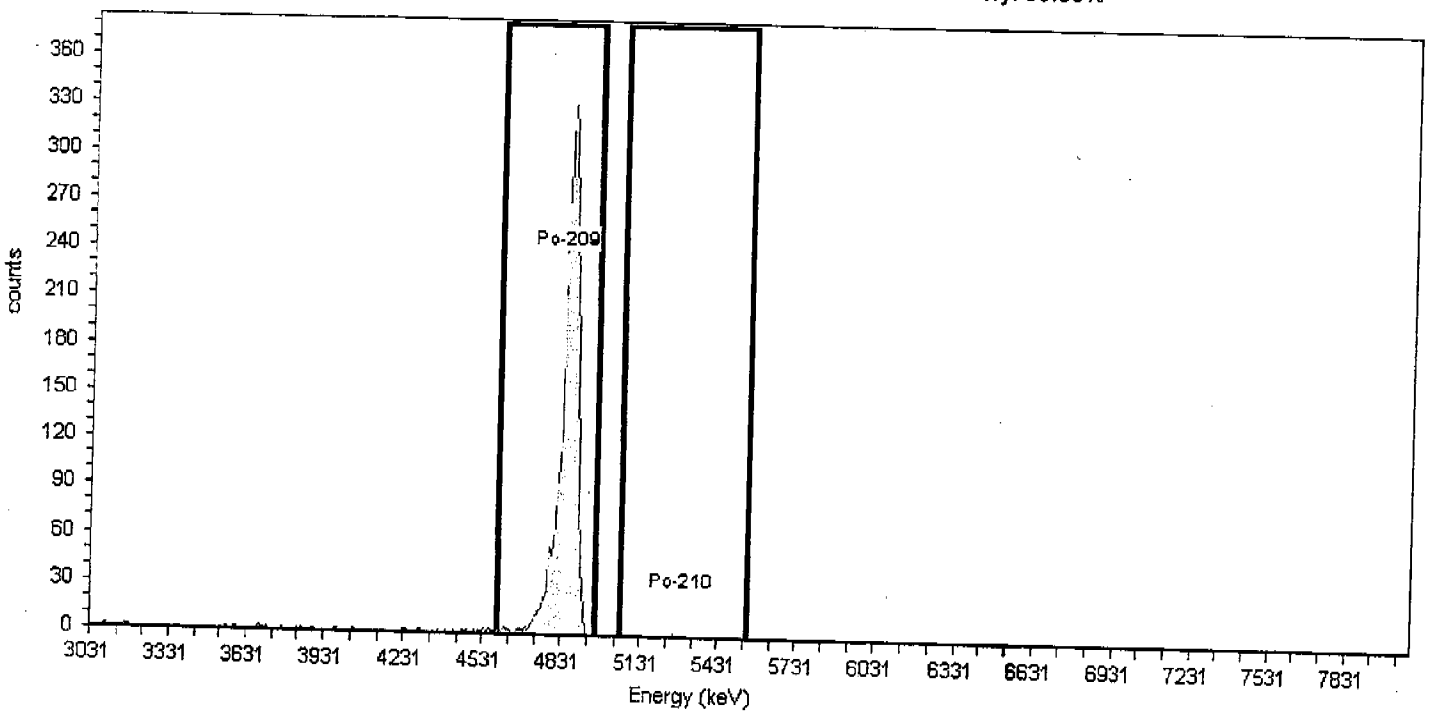
Energy Calibration: C08060333

Energy Cal: Gain = 9.9003 keV / Ch
Offset = 3,021.28 keV
Quadratic = 0.0000 keV / Ch²

Tracer

Tracer Name: 851.3020.87 Po-209
Tracer Activity: 17.63 DPM/mL x (Vol.)0.50 mL = 8.82 DPM

Tracer Nuclide: Po-209
Tracer Recovery: 89.89%



Nuclide Summary (ROI)

Nuclide	Peak Energy keV	ROI Start keV	ROI End keV	FWHM keV	B.R. %.	Gross Counts	Bkgd Counts	Net Counts	Activity pCi/g	2.00Sigma TPU pCi/g	Critical Level pCi/g	MDA pCi/g
Po-209	4852.8	4585.5	4961.7	79.5	99.7	2,231.00	2.00	2,229.00	1.4E+001	5.9E-001	2.3E-002	6.4E-002
Po-210	5308.2	5050.8	5545.9	59.0	100.0	1.00	3.00	-2.00	-1.2E-002	2.5E-002	2.5E-002	6.7E-002

Reviewed By: GB JP

Print Date: 6/9/2008 7:39:38AM

AlphaVision v5.3
Custom Report Iteration: 08/09/07

Paragon Analytics

Alpha-Spectroscopy Analysis Report

Sample

Sample: PL080606-1LCS
Spectrum #1 Analysis #1

Sample Size : 0.26

Acquisition

Detector: 34
Batch Name: PL080606-1_A
Nuclide Library: Po-210
Analysis Method: Absolute ROI Analysis, Set Name = Po-210
ROI Set: Po-210

Acquisition Start Date: 6/8/2008 11:26:42AM
Live Time: 1,000.00 min.
Real Time: 1,000.02 min.
Dead Time: 0.00 %

Calibration

on Analytics

meter Instrument Run Log

Date: 4/8/08

Detector	Batch ID	Sample ID	Iso/Matrix	Duration	Initial
47	PL080406-3_A	0805200-13	Po/s	600	GB
8	↓	↓ -14	↓	↓	↓
			GB 6/9/08		

tore film - refilm before counting

Reviewed by: GB

Date: 4/9/08

PARAGON ANALYTICS
Radiochemistry Data Package

Section 6

QUALITY ASSURANCE SUMMARY REPORTS

6

No *NON-CONFORMANCE REPORTS* or *QUALITY ASSURANCE SUMMARY SHEETS* are included in this data package.

PARAGON ANALYTICS
Radiochemistry Data Package

Section 7

LABORATORY BENCH SHEETS

7

Paragon Analytics

Radiochemistry Instrument Worksheet

Prep Batch: PL080606-1

Prep Procedure: Po210

Analytical QASS / NCR? Y (N) NA

Prep Num	LabID	QC Type	Init Alq	Fin Alq	Units	Report Units	Cnt 1 File	Cnt 1 Inst/Det	Cnt 1 Pos Chk By	Cnt 2 File	Cnt 2 Inst/Det	Cnt 2 Pos Chk By	Cnt 3 File	Cnt 3 Inst/Det	Cnt 3 Pos Chk By	Notes
1	0805078-1	SMP	0.5159	0.268	g	pCi/g	_50781	52	GB	_50781			_50781			
1	0805078-1	DUP	0.527	0.2835	g	pCi/g	_50781D	53		_50781D			_50781D			
1	0805078-2	SMP	0.5256	0.2629	g	pCi/g	_50782	54		_50782			_50782			
1	PL080606-1	MB	0.5209	0.2604	g	pCi/g	_80601B	33		_80601B			_80601B			
1	PL080606-1	LCS	0.5209	0.2604	g	pCi/g	_80601L	34		_80601L			_80601L GB 6/9/08			GB 6/9/08

Tracer/Carrier Solution Information

Soln #	Nuclide	SolnID	Prep Conc	Units	Prep Date	Aliquot	Units	Pipet ID
T1	Po-209	851.3020.87	16.007	DPM/ml	06/06/08	1	ml	AW015

Spike Solution Information

Soln #	Nuclide	SolnID	Prep Conc	Units	Prep Date	Aliquot	Units	Pipet ID
S1	Pb-210	823.3020.41	47.137	DPM/ml	06/06/08	1	ml	AW015
S1	Po-210	823.3020.41	47.137	DPM/ml	06/06/08	1	ml	AW015

Sample Barcodes

0805078-1
PL080606-1PS1

0805078-1DUP
PL080606-1PS2

0805078-2
PL080606-1PS3

PL080606-1MB
PL080606-1PS4

PL080606-1LCS
PL080606-1PS5

diochemistry Prep Worksheet

Prep Batch: PL080606-1

Reviewed By: tde 1DE Review Date: 6/7/2008

Re-Prep? Y / (N) Batch: NA Prep QASS / NCR? Y / (N) NA

t: Tambrae Elhart 1E Balance: 27

e: 6/6/2008 Balance:

t: AP

y Date/Time	Standards	Prep Notes
7/08 07:00	T1	
7/08 07:00	T1	1E 6/7/08
7/08 07:00	T1	
7/08 07:00	T1	
7/08 07:00	S1,T1	

elieved to improve spectral quality.

s	Pipet ID
	AW015

Spike Solution Information

Soln #	Nuclide	SolnID	Prep Conc	Units	Prep Date	Aliquot	Units	Pipet ID
S1	Pb-210	823.3020.41	47.137	DPM/ml	06/06/08	1	ml	AW015
S1	Po-210	823.3020.41	47.137	DPM/ml	06/06/08	1	ml	AW015

Supersedes: 6/6/08 11:29

Paragon Analytics

Radiochemistry Prep Worksheet

Prep Batch : PL080606-1

Prep Procedure: Po210

Prep Batch Not Validated!!!

Reviewed By:

Review Date:

Non-Routine Pre-Treatment? Y / N Batch: _____ Re-Prep? Y / N Batch: _____ Prep QASS / NCR? Y / N _____

Prep SOP: PAI 711 Rev: 7
Prep SOP: NONE
Matrix Class: solid

Prep Analyst: Tambrae Elhart TE
Prep Date: 6/6/2008
Prep Dept: AP

Balance: 27
Balance:

Samp Num	Prep Num	LabID	QC Type	Dish No.	Init Alq g	Fin Alq g	Prep Basis	Decay Date/Time 6/7 0070	Standards	Prep Notes
1	1	0805078-1	SMP		0.5	0.5	As Received	.5159	T1	
2	1	0805078-1	DUP		0.5	0.5	As Received	.5270	T1	
3	1	0805078-2	SMP		0.5	0.5	As Received	.5258	T1	
4	1	PL080606-1	MB		0.5	0.5	As Received		T1	
5	1	PL080606-1	LCS		0.5	0.5	As Received		S1,T1	

Comments

Spiked By: Tambrae Elhart TE Date: 6/6/2008 6/6/08

Witnessed By: Cers Date: 6/6/08

Tracer/Carrier Solution Information

Soln #	Nuclide	SolnID	Prep Conc	Units	Prep Date	Aliquot	Units	Pipet ID
T1	Po-209	851.3020.87	18.007	DPM/ml	06/06/08	1	ml	AW015

12/5/08 Exp

Spike Solution Information

Soln #	Nuclide	SolnID	Prep Conc	Units	Prep Date	Aliquot	Units	Pipet ID
S1	Pb-210/Po-210	~~707.2013.27~~ 823.3020.41	5,087.937	DPM/ml	06/06/08	1	ml	AW015

7/14/08

Paragon Analytics
LIMS Version: 6.154A

Supersedes: N/A

SAMPLE CONDITION FORM (SOLIDS)

ANALYST: TE

ANALYSIS DATE: 6/6/08 METHOD: Prep

WORK ORDER	SAMPLE ID	SAMPLE CONDITION		
		Dry/Wet	TEXTURE	Remarks
0805078	1	dry	dst	As rec'd, not dried or ground
	2			

TE 6/6/08

PARAGON ANALYTICS
Radiochemistry Data Package

Section 8

STANDARDS TRACEABILITY DOCUMENTS

8

Prepare a Working dilution of Po-209 from Primary dilution 851.3020.66 of approximately 20 dpm/mL.

1) Use density of 2M HCl from page 86
$\rho = 1.0322\ g/mL$

2) Transfer ½ of Std to 1 L Nalgene bal 12

Mass of Nalgene (No lid)	73.6812 g
Mass of Nalgene + Std	87.7360 g
Net Mass of Std Transferred	14.0548 g

3) Dilute with 2M HCl to final Vol bal. 12

Mass of Nalgene (from above)	73.6812 g
Mass of Nalgene, Std, and diluent	810.7 – bal. #26
Net Mass of Standard:	737.0188 g

4) Final activity Calculation:

$$\frac{895.743\ \frac{dpm}{g} \cdot 14.0548\ g \cdot 1.0322\ g/mL}{737.0188\ g} = 20.001\ \frac{dpm}{mL}$$ JDD 12/13/07

17.632 dpm/mL

NC 1/14/08

Stnd ID: 851.3020.87

Description: Po-209
Expiration: 12/5/2008
Activity: 17.63 dpm/mL

2s Uncertainty: 0.07 dpm/mL
Ref. Date: 3/15/1994
Ref Time: 0.417
Prep Date: 11/13/2007 Prep by: JD
Matrix/Comp. 2 M HCl
Half Life (y): 1.02E+02

NC 1/14/08

Reverification Log		
Analysis Date	Initials	Expiration Date

NC 1/14/08

NC 1/14/08

Continued on Page

Signed JDD 12/13/07 Date 12/13/07

Read and Understood By Signed 1/14/08 Date

Prepare a Primary Dilution of Po-209 RSO# 851 of approximatly 1000 dpm/at.g
500 11/13/07

1) Prepare 2 M HCl 170 ml HCl and 830 ml DI water
lot #068438

2) Determine density of 2 M HCl bal 12
Mass of 100 ml Vol. flask 66.4344 g
Mass of flask + 100 ml 2M HCl 169.6538 g
Net Mass of 2 M HCl 103.2194 g
ρ = 1.03222 g/ml

3) Transfer contents of vial to 40 ml voa vial bal 12
Mass of Voa Vial (w/o lid) 21.4814 g
Mass of Vial + Standard 26.4704 g
Net Mass of standard Transferred 4.989 g

4) Dilute with 2 M HCl bal 12
Mass of vial, Std, and diluent 50.0271 g

National Institute of Standards & Technology

Certificate

Ram # 851

Standard Reference Material 4326
Polonium-209 Radioactivity Standard

This Standard Reference Material (SRM) consists of radioactive Polonium-209 chloride and hydrochloric 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 Polonium-209 with a total activity of approximately 500Bq. Polonium-209 decays by alpha-particle emission. None of the alpha particles escape from the SRM

Liquid-Scintillation Counting Warning

Polonium-209 decays primarily by alpha-particle emission. One of the principal alpha-particle transition feeds a low-energy, **delayed**, isomeric state in the lead-205 daughter. Liquid scintillation measurements of polonium-209 activity can include some of the activity of this isomeric state. Refer to reference [6] for further information about the effect of this isomeric transition on routine liquid-scintillation counting of polonium-209.

Recommended Procedure for Opening the SRM Ampoule

1) If the SRM solution is to be diluted, it is recommended that the diluting solution have a composition comparable to that of the SRM solution.

2) Wear eye protection, gloves, and protective clothing and work over a tray with absorbent paper in it. Work in a fume hood. In addition to the radioactive material, the solution contains strong acid and is corrosive.

3) Shake the ampoule to wet all of the inside surface of the ampoule. Return the ampoule to the upright position.

4) Check that all of the liquid has drained out of the neck of the ampoule. If necessary, gently tap the neck to speed the process.

5) Holding the ampoule upright, score the narrowest part of the neck around its entire circumference with a scribe or diamond pencil.

6) Lightly wet the scored line. This reduces the crack propagation velocity and makes for a cleaner break.

7) Hold the ampoule upright with a paper towel, a wiper, or a support jig. Using a paper towel or wiper to avoid contamination, snap off the top of the ampoule by pressing the narrowest part of the neck away from you while pulling the tip of the ampoule towards you.

8) Transfer the solution from the ampoule using a pycnometer or a pipet with dispenser handle. NEVER PIPETTE BY MOUTH.

9) Seal any unused SRM solution in a flame-sealed glass ampoule, if possible, to minimize the evaporation loss.

See also reference [4]*.

*Notes and references are on pages 5 and 6.

PROPERTIES OF SRM 4326

Certified values

Radionuclide	**Polonium-209**
Reference time	**1200 EST, 15 March 1994**
Massic alpha-particle-emission rate of the solution [b]*	**85.42 $s^{-1} \cdot g^{-1}$** (Polonium-209 only) [c]
Relative expanded uncertainty (k=2)	**0.42%** [d]

EVALUATION OF THE UNCERTAINTY OF THE MASSIC ACTIVITY [d]*

Input Quantity x_i, the source of uncertainty (and individual uncertainty components where appropriate)	Method Used To Evaluate $u(x_i)$, the standard uncertainty of x_i (A) denotes evaluation by statistical methods (B) denotes evaluation by other methods	Relative Uncertainty Of Input Quantity, $u(x_i)/x_i$, (%) [i]	Relative Sensitivity Factor, $\lvert\partial y/\partial x_i\rvert \cdot (x_i/y)$ [j]	Relative Uncertainty Of Output Quantity, $u_i(y)/y$, (%) [k]
Massic liquid scintillation count rate, corrected for background and decay	Standard deviation for repeated measurements. Six degrees of freedom. (A)	0.06	1.0	0.06
Background variability	Multiple comparisons (A) [7]	0.20	0.02 [m]	0.004
Liquid-scintillator quench corrections	Multiple comparisons (A) [7]	0.12	1.0	0.12
Liquid-scintillation-cocktail stability	Multiple comparisons (A) [7]	0.7	0.007	0.005
Gravimetric measurements	Estimated (B)	0.05	1.0	0.05
Half-life of Po-208 Half-life of Po-209	Standard uncertainty of the half life (A)	0.07 [n] 4.9 [n]	0.0003 [p] 0.004 [p]	0.00002 0.02
Extrapolation of alpha-particle-count-rate-versus-energy to zero energy	Estimated (B) [7]	0.06	1.0	0.06
Live time [q]	Estimated (B) [7]	0.04	1.0	0.04
Alpha-particle detection efficiency of scintillator	Estimated (B) [7]	0.10	1.0	0.10
Correction for non-alpha-particle-decay modes	Estimated (B) [7]	0.06	1.0	0.06
Alpha-particle-emitting impurities	Estimated (B) [r] Limit of detection [s]	8.1 100	0.001 0.0006	0.01 0.06
Photon-emitting impurities	Limit of detection (B) [s]	100	0.0002	0.02
Relative Combined Standard Uncertainty of the Output Quantity, $u_c(y)/y$, (%)				0.21
Coverage Factor, k				x 2
Relative Expanded Uncertainty of the Output Quantity, U/y, (%)				0.42

*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] **Massic alpha-particle-emission rate** is the preferred name for the quantity alpha-particle-emission rate divided by the total mass of the sample. **Massic activity** is the preferred name for the quantity activity divided by the total mass of the sample. See reference [1].

[c] The polonium-209 massic activity of the solution is 85.83 $Bq \cdot g^{-1}$, assuming an alpha-particle branching ratio of $(0.9952 \pm 0.0004)\ s^{-1} \cdot Bq^{-1}$ [h].

[d] The reported value, y, of massic alpha-particle emission rate (alpha-particle emission rate 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 alpha-particle emission rate 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] The stated uncertainty is two times the standard uncertainty.

[f] Estimated limits of detection for alpha-particle-emitting impurities, expressed as massic alpha-particle emission rate, are:
0.002 $s^{-1} \cdot g^{-1}$ for energies less than 3.5 MeV,
0.05 $s^{-1} \cdot g^{-1}$ for energies between 3.5 and 4.2 MeV, and
0.0002 $s^{-1} \cdot g^{-1}$ for energies greater than 5.18 MeV.

[g] Estimated limits of detection for photon-emitting impurities, as of March 1994, expressed as massic photon emission rates, are:
$2 \times 10^4\ s^{-1} \cdot g^{-1}$ for energies between 15 keV and 68 keV,
$2 \times 10^4\ s^{-1} \cdot g^{-1}$ for energies between 81 keV and 256 keV,
$6 \times 10^{-5}\ s^{-1} \cdot g^{-1}$ for energies between 266 keV and 892 keV, and
$4 \times 10^{-6}\ s^{-1} \cdot g^{-1}$ for energies between 900 keV and 3300 keV, provided that the photons are separated in energy by 4 keV or more from photons emitted in the decay of polonium-209 See reference [7] for further information about the impurity analyses.

[h] The stated uncertainty is the standard uncertainty.

[i] Relative standard uncertainty of the input quantity x_i.

[j] The relative change in the output quantity y divided by the relative change in the input quantity x_i. If $|\partial y/\partial x_i| \cdot (x_i/y) = 1.0$, then a 1% change in x_i results in a 1% change in y. If $|\partial y/\partial x_i| \cdot (x_i/y) = 0.05$, then a 1% change in x_i results in a 0.05% change in y.

[k] Relative component of combined standard uncertainty of output quantity y, rounded to two significant figures or less. The relative component of combined standard uncertainty of y is given by $u_r(y)/y \equiv |\partial y/\partial x_i| \cdot u(x_i)/y = |\partial y/\partial x_i| \cdot (x_i/y) \cdot u(x_i)/x_i$. The numerical values of $u(x_i)/x_i$, $|\partial y/\partial x_i| \cdot (x_i/y)$, and $u_r(y)/y$, all dimensionless quantities, are listed in columns 3, 4, and 5, respectively. Thus, the value in column 5 is equal to the value in column 4 multiplied by the value in column 3. The input quantities are independent, or very nearly so. Hence the covariances are zero or negligible.

[m] $|\partial y/\partial x_i| \cdot (x_i/y)$ = (average background count rate)/(average net sample count rate)

Prepare a working level dilution of Pb-210 of appox. 50dpm/mL. Dilute RSO #823 to 1L in 1M HNO_3 (Lot # 061860)

Bal 12

1) Determine density of 1.0M HNO_3
Mass of empty 100mL class A flask: 64.1197g
Mass of flask + 100mL 1.0M HNO_3: 167.0040g
Net mass of 1.0M HNO_3: 102.8843g

$\rho = 1.0288$ g/mL

2) Transfer approx. 1.13g of standard to Nalgene bottle (1L)
Mass of bottle w/out lid: 74.7598g
mass of bottle + standard: 75.9347g
Net mass of standard: 1.1749g

Bal 12

3) Dilute to 1000mL w/ 1.0M HNO_3
mass of bottle + standard + 1.0M HNO_3: 1141.0
mass of bottle: 74.7598g
net mass of std: 1066.24g

bal 12

4) Final Activity

$$\frac{(3.831\times10^4\ \text{dps})\left(\frac{60\ \text{dpm}}{\text{dps}}\right)(1.1749\text{g})(1.0288\text{g/mL})}{(52.10846\text{g})(1066.24\text{g})} = 50.007\ \text{dpm/mL}$$

RG 11/3/06

Stnd ID: 823.3020.41

Description: Pb-210
Expiration: 8/10/2007
Activity: 50.00 dpm/mL

2s Uncertainty: 1.65 dpm/mL
Ref. Date: 7/13/2006
Ref Time: N/A
Prep Date: 8/4/2006 Prep by: AB
Matrix/Comp. 1.0M HNO3
Half Life (y): 2.23E+01

RG 11/3/06

Reverification Log		
Analysis Date	Initials	Expiration Date
7/14/2007	RG	7/14/2008

RG 11/3/06

RG 11/3/06

Continued on Page

Read and Understood By

Amanda Barlage 8/4/06 Signed Date

Renee Gallegos 11/3/06 Signed Date

ANALYTICS
An Isotope Products Laboratories Company

RSO# 823
Rec'd 7/17/06 KAA

1380 Seaboard Industrial Blvd.
Atlanta, Georgia 30318
Tel 404-352-8677
Fax 404-352-2837
www.analyticsinc.com

CERTIFICATE OF CALIBRATION

Standard Radionuclide Source

73351-307

Pb-210 50 mL Liquid in Flame Sealed Vial

This standard radionuclide source was prepared gravimetrically from a calibrated master liquid radionuclide solution source. The master source was calibrated by liquid scintillation counting.

Radionuclide purity and calibration were checked by germanium gamma-ray spectrometry. The nuclear decay rate and assay date for this source are given below.

ANALYTICS maintains traceability to the National Institute of Standards and Technology through Measurements Assurance Programs as described in USNRC Reg. Guide 4.15, Revision 1.

ISOTOPE: Pb-210

ACTIVITY [illegible]

PARAGON ANALYTICS
Radiochemistry Data Package

Section 9

ADDITIONAL SUPPORTING DOCUMENTATION

9

Alpha Spectroscopy

Quality Control Data

Weekly Background, Energy, and Efficiency Calibrations

UCL
ficiency
CPM
rgy keV
1.97
1500
596.0
4.45
1500
596.0
2.85
1500
05.8
1.79
1500
97.9
2.32
1500
88.0

Alpha Spec Calibration Source Re-Certification

Recalibration performed by Isotope Products Laboratories
Primary Certified Source
Source PA ID: 190
Planchet Label: 9
Recalibrated on: 6/1/2007
Received by PA on: 5/5/2007

Values from certificate	
Source ID:	92MIX223027
Total Activity:	3780.5962 dpm
Ref. Date:	6/1/07

Nuclide	Act (Bq)	Act (dpm)	Half-Life (yrs)	Decay Corrected
U-234:	49.93	2994.6	2.46E+05	2894.59 dpm
U-235:	1.10	65.94	7.04E+08	65.94 dpm
Am-241:	12.00	720	432.17	718.68 dpm
			TOTAL	3779.41 dpm

Efficiency Determination for Detector: 25

Source Serial#	PA ID	Sequential #	Count Date	Am-241 net cts	U-234 net cts	U-235 net cts	count dur (s)	Total cpm	Known dpm	Detector efficiency
92MIX223027	190	97-19-103-09	5/20/08	7113	29841	789	2100	1078.37	3779.41	28.53%

Sources 1 through 8 activity determination

Source Serial#	PA ID	Sequential #	Count Date	Am-241 net cts	U-234 net cts	U-235 net cts	count dur (s)	Detector Efficiency	Am-241 dpm	U-234 dpm	U-235 dpm	Combined dpm
92MIX2203026	182	97-19-103-01	5/20/08	12417	73989	1878	2100	28.53%	1243.38	7408.82	188.03	8818.33
92MIX2203028	183	97-19-103-02	5/20/08	14459	141741	3156	2100	28.53%	1447.88	14193.30	316.03	15957.19
92MIX2203024	184	97-19-103-03	5/20/08	68052	68294	1490	2100	28.53%	6814.15	6838.65	148.20	13801.00
92MIX2203021	185	97-19-103-04	5/20/08	20822	58470	1507	2100	28.53%	2085.03	5854.92	150.90	8090.85
92MIX2203025	186	97-19-103-05	5/20/08	94094	114792	2491	2100	28.53%	9421.18	11494.75	249.44	21166.34
92MIX2203022	187	97-19-103-06	5/20/08	71430	75877	1663	2100	28.53%	7152.68	7597.98	166.53	14917.18
92MIX2203023	188	97-19-103-07	5/20/08	41741	85445	1420	2100	28.53%	4179.76	8553.37	142.19	10875.31
92MIX2203029	189	97-19-103-08	5/20/08	31922	200052	4643	2100	28.53%	3196.52	20032.30	464.93	23693.76

Efficiency Verification

Source Serial#	PA ID	Sequential #	Count Date	Am-241 net cts	U-234 net cts	U-235 net cts	Count dur (s)	Total cpm	Known dpm	Detector efficiency	RPD	FLAG
92MIX223027	190	97-19-103-09	5/21/08	6907	28978	701	2100	1058.37	3779.41	28.22%	1.12%	PASS

Sources 1 through 8 activity re-verification

Source Serial#	PA ID	Sequential #	Combined Observed dpm	Combined Certified dpm*	Percent Difference %	Within 5% of Certified value?
92MIX2203026	182	97-19-103-01	8818.33	8867.05	-0.55%	Yes
92MIX2203028	183	97-19-103-02	15957.19	16011.39	-0.34%	Yes
92MIX2203024	184	97-19-103-03	13801.00	13588.11	0.09%	Yes
92MIX2203021	185	97-19-103-04	8090.85	8188.77	-1.20%	Yes
92MIX2203025	186	97-19-103-05	21166.34	21096.46	0.33%	Yes
92MIX2203022	187	97-19-103-06	14917.18	15382.14	-3.02%	Yes
92MIX2203023	188	97-19-103-07	10875.31	10781.48	0.87%	Yes
92MIX2203029	189	97-19-103-08	23693.76	23636.41	0.24%	Yes

* Certificate values decay corrected to the count date

Data from certificates

Reference Date	U-234 (Bq)	U-234 (dpm)	U-235 (Bq)	U-235 (dpm)	Am-241 (Bq)	Am-241 (dpm)
5/1/2003	124.10	7446.00	2.43	145.74	21.43	1285.80
5/1/2003	239.30	14358.00	4.20	252.00	23.55	1413.00
5/1/2003	119.40	7164.00	1.93	115.58	106.00	6360.00
4/1/2003	101.00	6060.00	1.26	75.84	34.50	2070.00
4/1/2003	203.00	12180.00	3.41	204.72	146.40	8784.00
4/1/2003	132.90	7974.00	3.17	189.96	121.30	7278.00
4/1/2003	107.10	6426.00	0.93	55.54	72.26	4335.60
5/1/2003	334.60	20086.00	6.55	393.16	53.02	3181.20

OK
MC
6/5/08

R:\INST\alphspec\Cal Recert\CLCRT052008

AlphaVision v5.3

Alpha-Spectroscopy Calibration Report

ORTEC
801 S. Illinois Ave.
Oak Ridge, TN 37830
9:19:16AM 5/21/2008

Analyst: ORTEC
Detector: 25 190 GB 5/21/08

Energy Calibration: RSO (Source 9)
Description:

Calibration

Analysis Date: 5/20/2008 11:57:30AM
Calibration Type: Energy And Efficiency

Source Info

AlphaVision v5.3 **Alpha-Spectroscopy Calibration Report**

ORTEC
801 S. Illinois Ave.
Oak Ridge, TN 37830
9:19:22AM 5/21/2008

Analyst: ORTEC
Detector: 25

Calibration

Energy Calibration: RSO 182 (Source 1)
Description:

Analysis Date: 5/20/2008 12:25:48PM
Calibration Type: Energy And Efficiency

Source Info

Certificate ID: A1 RSO#182
Prepared by: IPL
Description:

Certification Date: 5/1/2003 12:00:45PM

Acquisition

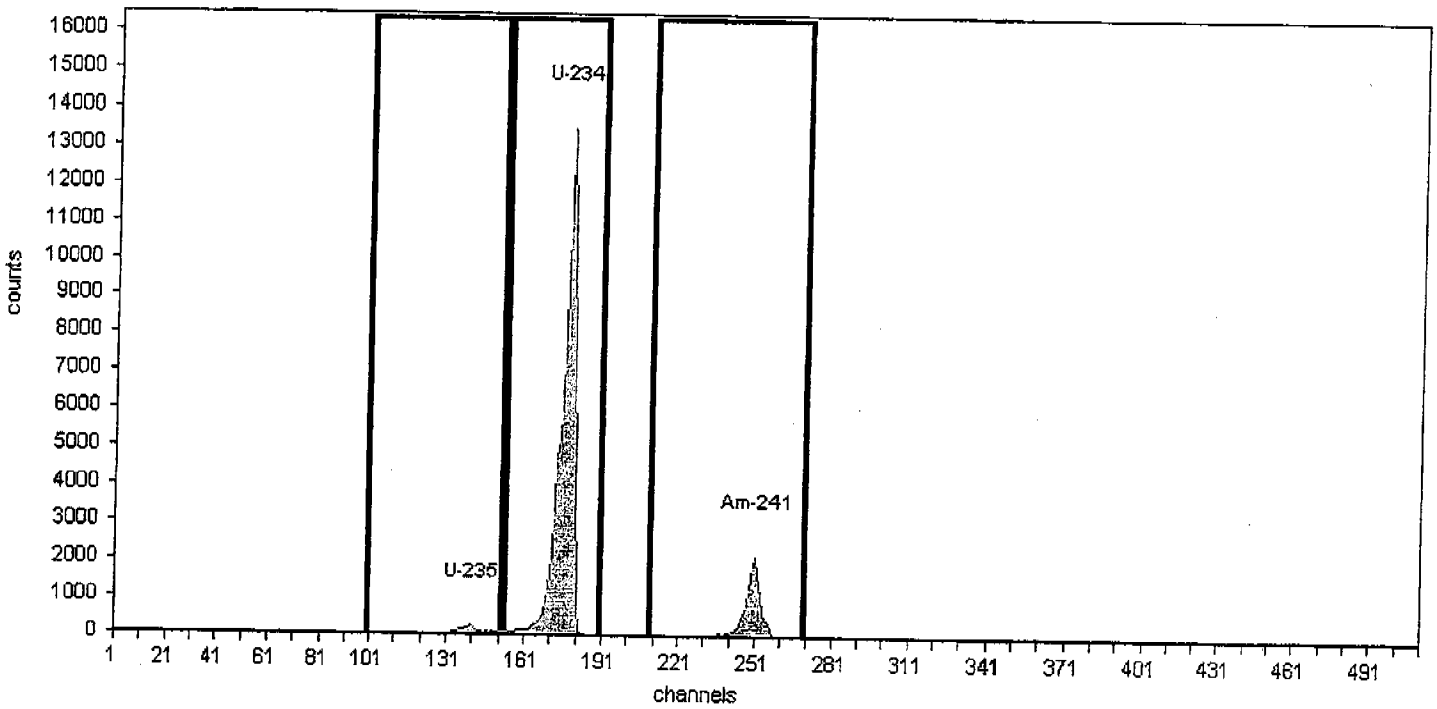
Detector: 25 , SN:
Acquisition Start Date: 5/20/2008 11:35:12AM

Live Time: 35.00 min.
Real Time: 35.03 min.

Efficiency Calibration Name: RSO 182 (Source 1)

Energy Calibration Equation:
Gain = 9.8047 keV / Ch
Offset = 3,026.20 keV
Quadratic = 0.0000 keV / Ch^2

Efficiency: 28.35% +/- 0.19% TPU(2 sigma)



Method: Interactive ROI
Algorithm: Linear

Initial Calibration: No
Shelf: 1

Nuclide Activity Summary

Nuclide	Peak Channel	Peak Energy MeV	ROI Start Channel	ROI End Channel	Gross Counts	Net Count Rate (cpm)
U-235	140	4.40	100	152	1,678.00	47.94
U-234	178	4.78	153	190	73,969.00	2,113.40
Am-241	251	5.49	210	270	12,417.00	354.77

AlphaVision v5.3

Alpha-Spectroscopy Calibration Report

ORTEC
801 S. Illinois Ave.
Oak Ridge, TN 37830
9:19:28AM 5/21/2008

Analyst: ORTEC
Detector: 25

Calibration

Energy Calibration: RSO 183 (Source 2)
Description:

Analysis Date: 5/20/2008 1:05:28PM
Calibration Type: Energy And Efficiency

Source Info

Certificate ID: A2 RSO#183
Prepared by: IPL
Description:

Certification Date: 5/1/2003 12:00:00PM

Acquisition

Detector: 25 , SN:
Acquisition Start Date: 5/20/2008 12:26:40PM

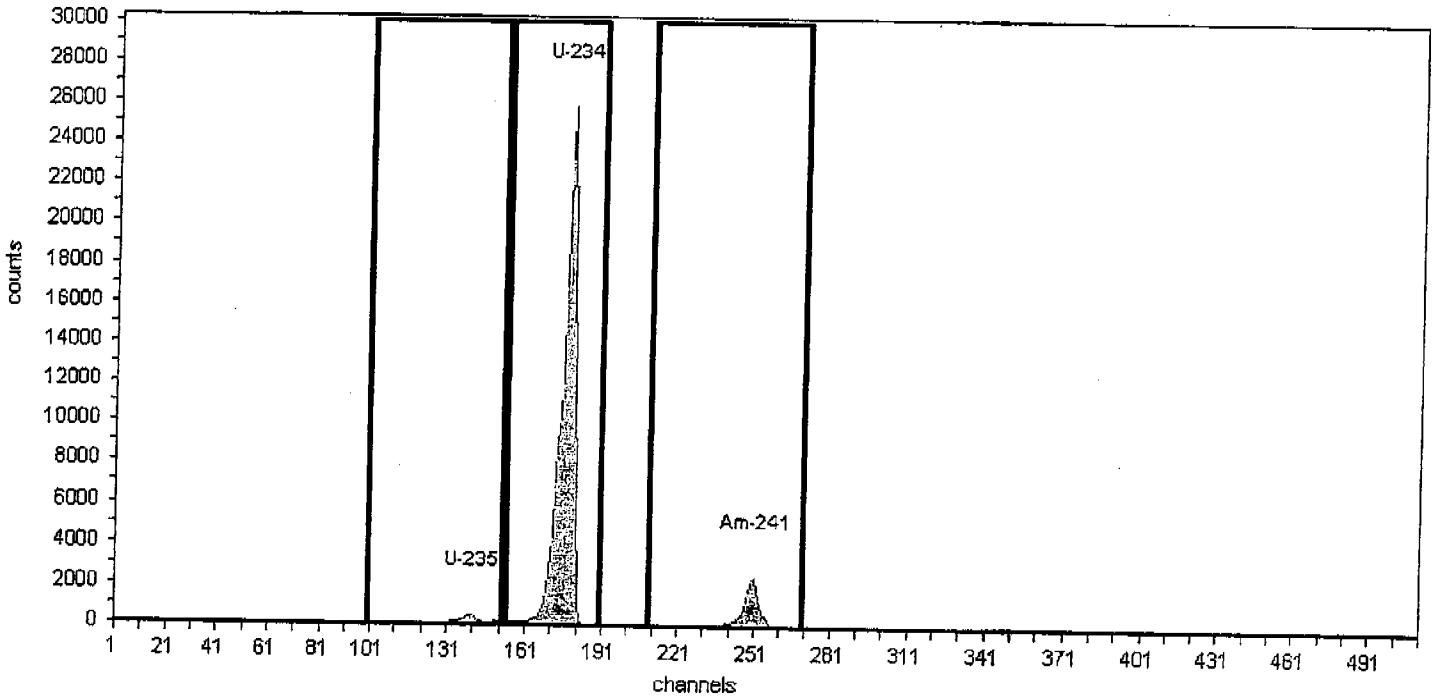
Live Time: 35.00 min.
Real Time: 35.05 min.

Efficiency Calibration Name: RSO 183 (Source 2)

Energy Calibration Equation:
Gain = 9.8047 keV / Ch

Offset = 3,026.20 keV
Quadratic = 0.0000 keV / Ch^2

Efficiency: 28.38% +/- 0.14% TPU(2 sigma)



Method: Interactive ROI
Algorithm: Linear

Initial Calibration: No
Shelf: 1

Nuclide Activity Summary

Nuclide	Peak Channel	Peak Energy MeV	ROI Start Channel	ROI End Channel	Gross Counts	Net Count Rate (cpm)
U-235	140	4.40	100	152	3,156.00	90.17
U-234	178	4.78	153	190	141,741.00	4,049.74
Am-241	251	5.49	210	270	14,459.00	413.11

AlphaVision v5.3 **Alpha-Spectroscopy Calibration Report**

ORTEC
801 S. Illinois Ave.
Oak Ridge, TN 37830
9:19:33AM 5/21/2008

Analyst: ORTEC
Detector: 25

Calibration

Energy Calibration: RSO 184 (Source 3)
Description:

Analysis Date: 5/20/2008 1:45:22PM
Calibration Type: Energy And Efficiency

Source Info

Certificate ID: A3 RSO#184
Prepared by: IPL
Description:

Certification Date: 5/1/2003 12:00:00PM

Acquisition

Detector: 25 , SN:
Acquisition Start Date: 5/20/2008 1:06:02PM

Live Time: 35.00 min.
Real Time: 35.04 min.

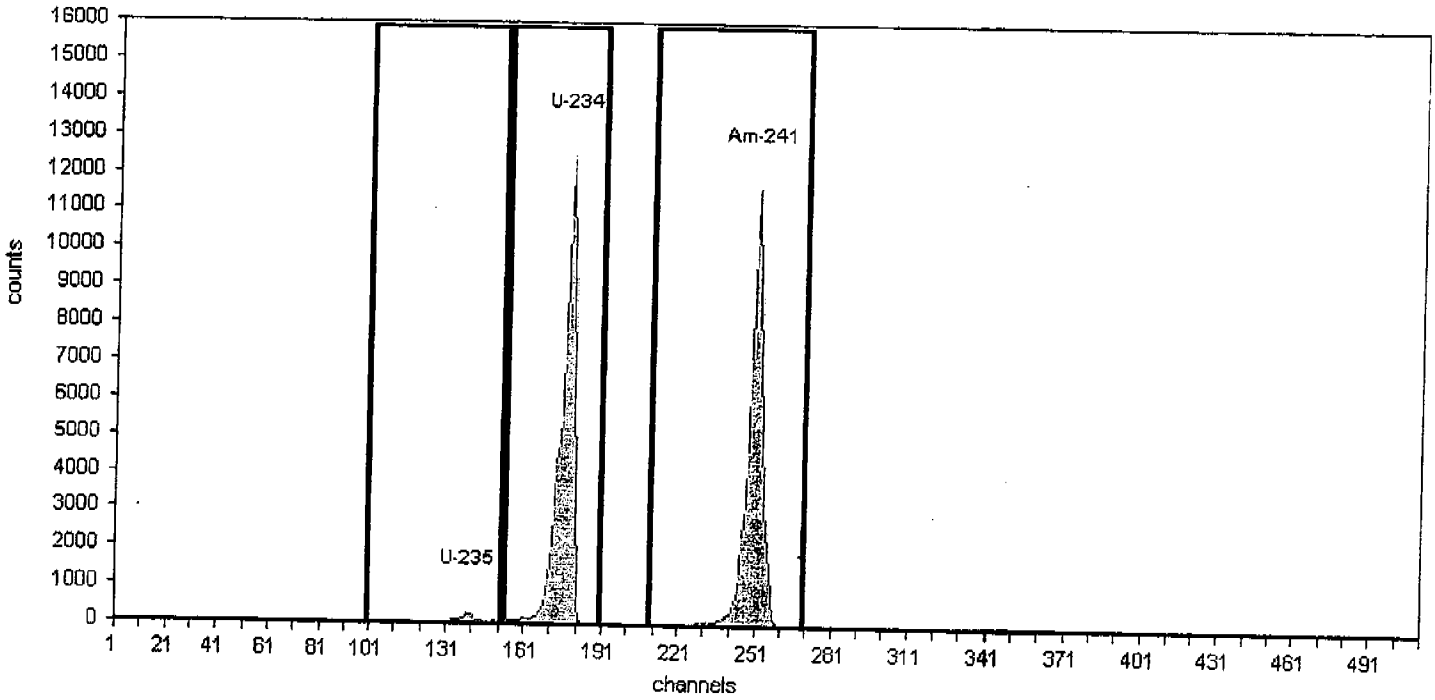
Efficiency Calibration Name: RSO 184 (Source 3)

Energy Calibration Equation:
Gain = 9.7289 keV / Ch

Offset = 3,043.84 keV

Quadratic = 0.0000 keV / Ch^2

Efficiency: 28.45% +/- 0.16% TPU(2 sigma)



Method: Interactive ROI
Algorithm: Linear

Initial Calibration: No
Shelf: 1

Nuclide Activity Summary

Nuclide	Peak Channel	Peak Energy MeV	ROI Start Channel	ROI End Channel	Gross Counts	Net Count Rate (cpm)
U-235	139	4.40	100	152	1,480.00	42.29
U-234	178	4.78	153	190	68,294.00	1,951.26
Am-241	251	5.49	210	270	66,052.00	1,887.20

AlphaVision v5.3

Alpha-Spectroscopy Calibration Report

ORTEC
801 S. Illinois Ave.
Oak Ridge, TN 37830
9:21:31AM 5/21/2008

Analyst: ORTEC
Detector: 25

Calibration

Energy Calibration: RSO 185 (Source 4)
Description:

Analysis Date: 5/20/2008 2:41:04PM
Calibration Type: Energy And Efficiency

Source Info

Certificate ID: A4 RSO#185
Prepared by: IPL
Description:

Certification Date: 4/1/2003 12:00:00PM

Acquisition

Detector: 25 , SN:
Acquisition Start Date: 5/20/2008 1:45:05PM

Live Time: 35.00 min.
Real Time: 35.02 min.

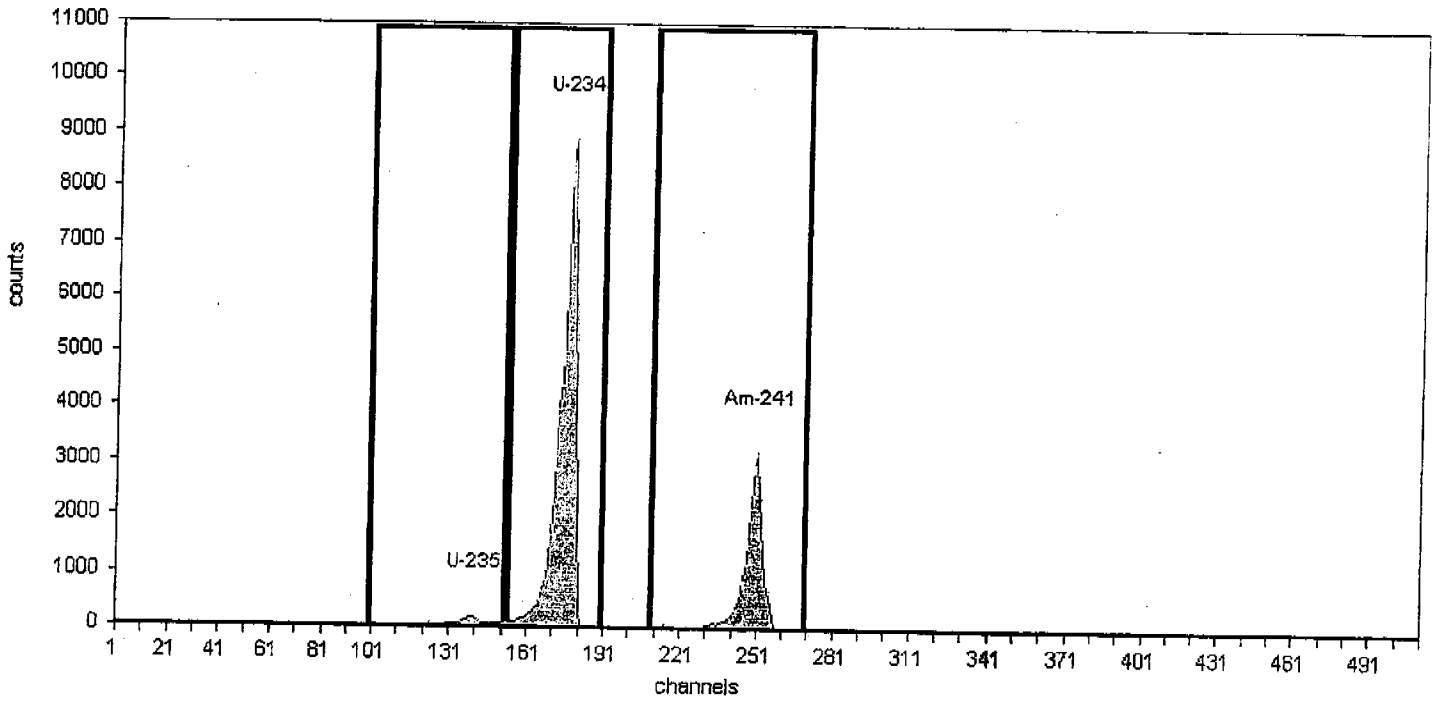
Efficiency Calibration Name: RSO 185 (Source 4)

Energy Calibration Equation:
Gain = 9.8047 keV / Ch

Offset = 3,026.20 keV

Quadratic = 0.0000 keV / Ch^2

Efficiency: 27.92% +/- 0.20% TPU(2 sigma)



Method: Interactive ROI
Algorithm: Linear

Initial Calibration: No
Shelf: 1

Nuclide Activity Summary

Nuclide	Peak Channel	Peak Energy MeV	ROI Start Channel	ROI End Channel	Gross Counts	Net Count Rate (cpm)
U-235	140	4.40	100	152	1,507.00	43.06
U-234	178	4.78	153	190	58,470.00	1,670.57
Am-241	251	5.49	210	270	20,822.00	594.91

AlphaVision v5.3

Alpha-Spectroscopy Calibration Report

ORTEC
801 S. Illinois Ave.
Oak Ridge, TN 37830

9:21:22AM 5/21/2008

Analyst: ORTEC
Detector: 25

Calibration

Energy Calibration: RSO 186 (Source 5)
Description:

Analysis Date: 5/20/2008 3:26:01PM
Calibration Type: Energy And Efficiency

Source Info

Certificate ID: A5 RSO#186
Prepared by: IPL
Description:

Certification Date: 4/1/2003 12:00:00PM

Acquisition

Detector: 25 , SN:
Acquisition Start Date: 5/20/2008 2:41:31PM

Energy Calibration Equation:

AlphaVision v5.3 **Alpha-Spectroscopy Calibration Report**

ORTEC
801 S. Illinois Ave.
Oak Ridge, TN 37830
9:20:21AM 5/21/2008

Analyst: ORTEC
Detector: 25

Calibration

Energy Calibration: RSO 187 (Source 6)
Description:

Analysis Date: 5/20/2008 4:02:57PM
Calibration Type: Energy And Efficiency

Source Info

Certificate ID: A6 RSO#187
Prepared by: IPL
Description:

Certification Date: 4/1/2003 12:00:00PM

Acquisition

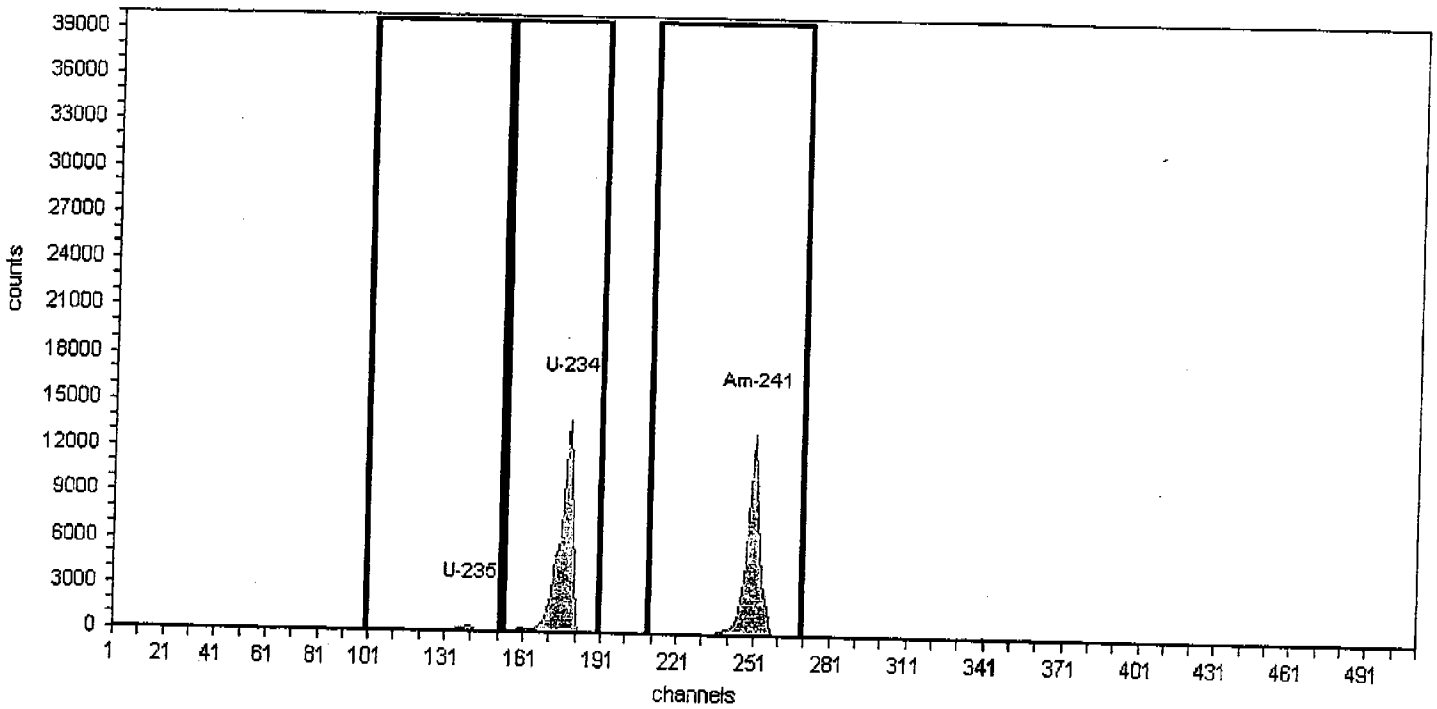
Detector: 25 , SN:
Acquisition Start Date: 5/20/2008 3:26:48PM

Live Time: 35.00 min.
Real Time: 35.05 min.

Efficiency Calibration Name: RSO 187 (Source 6)

Energy Calibration Equation:
Gain = 9.8047 keV / Ch
Offset = 3,026.20 keV
Quadratic = 0.0000 keV / Ch^2

Efficiency: 27.69% +/- 0.14% TPU(2 sigma)



Method: Interactive ROI
Algorithm: Linear

Initial Calibration: No
Shelf: 1

Nuclide Activity Summary

Nuclide	Peak Channel	Peak Energy MeV	ROI Start Channel	ROI End Channel	Gross Counts	Net Count Rate (cpm)
U-235	140	4.40	100	152	1,663.00	47.51
U-234	178	4.78	153	190	75,877.00	2,167.91
Am-241	251	5.49	210	270	71,430.00	2,040.86

AlphaVision v5.3 **Alpha-Spectroscopy Calibration Report**

ORTEC
801 S. Illinois Ave.
Oak Ridge, TN 37830
9:20:28AM 5/21/2008

Analyst: ORTEC
Detector: 25

Calibration

Energy Calibration: RSO 188 (Source 7)
Description:

Analysis Date: 5/20/2008 4:41:56PM
Calibration Type: Energy And Efficiency

Source Info

Certificate ID: A7 RSO#188
Prepared by: IPL
Description:

Certification Date: 4/1/2003 12:00:00PM

Acquisition

Detector: 25 , SN:
Acquisition Start Date: 5/20/2008 4:03:54PM

Live Time: 35.00 min.
Real Time: 35.03 min.

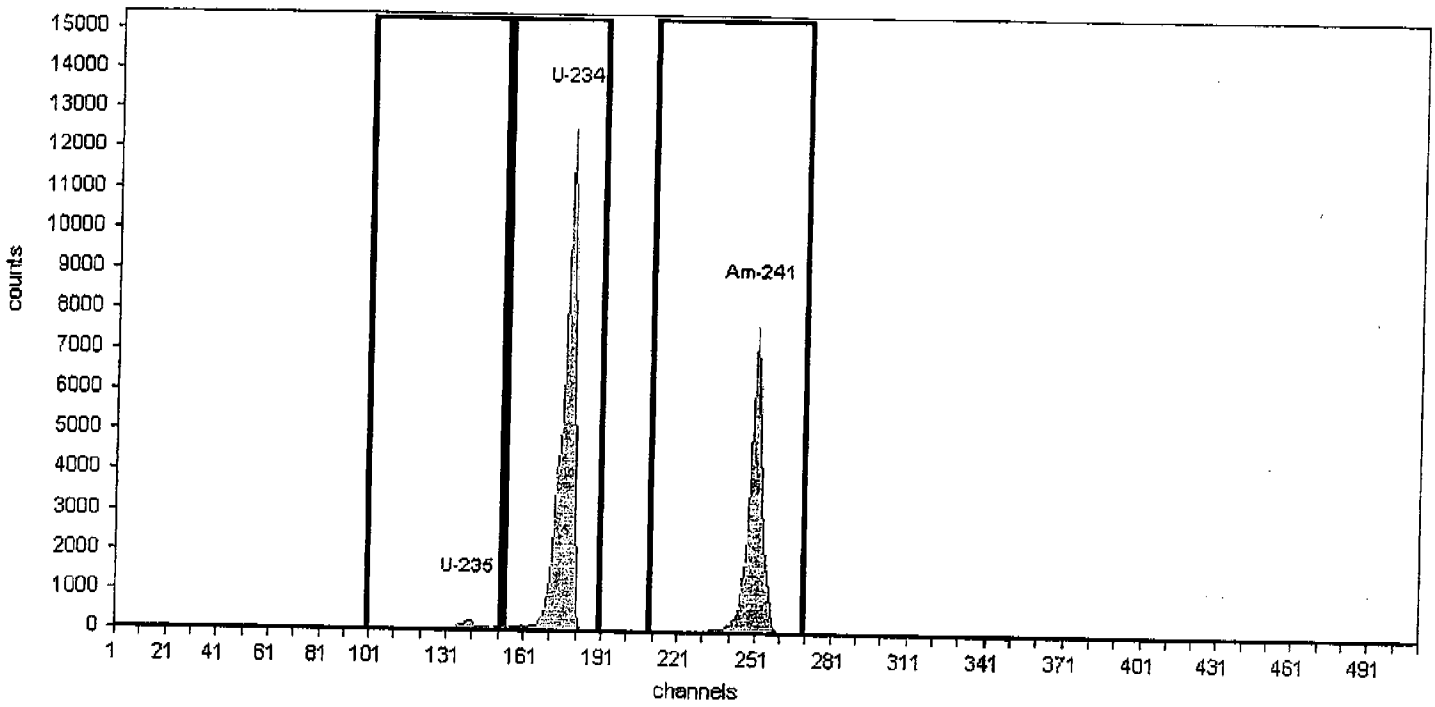
Efficiency Calibration Name: RSO 188 (Source 7)

Energy Calibration Equation:
Gain = 9.7289 keV / Ch

Offset = 3,043.84 keV

Quadratic = 0.0000 keV / Ch^2

Efficiency: 28.55% +/- 0.18% TPU(2 sigma)



Method: Interactive ROI
Algorithm: Linear

Initial Calibration: No
Shelf: 1

Nuclide Activity Summary

Nuclide	Peak Channel	Peak Energy MeV	ROI Start Channel	ROI End Channel	Gross Counts	Net Count Rate (cpm)
U-235	139	4.40	100	152	1,420.00	40.57
U-234	178	4.78	153	190	65,445.00	1,869.86
Am-241	251	5.49	210	270	41,741.00	1,192.60

AlphaVision v5.3 **Alpha-Spectroscopy Calibration Report**

ORTEC
801 S. Illinois Ave.
Oak Ridge, TN 37830
9:20:33AM 5/21/2008

Analyst: ORTEC
Detector: 25

Calibration

Energy Calibration: RSO 189 (Source 8)
Description:

Analysis Date: 5/21/2008 8:30:29AM
Calibration Type: Energy And Efficiency

Source Info

Certificate ID: A8 RSO#189
Prepared by: IPL
Description:

Certification Date: 4/1/2003 12:00:00PM

Acquisition

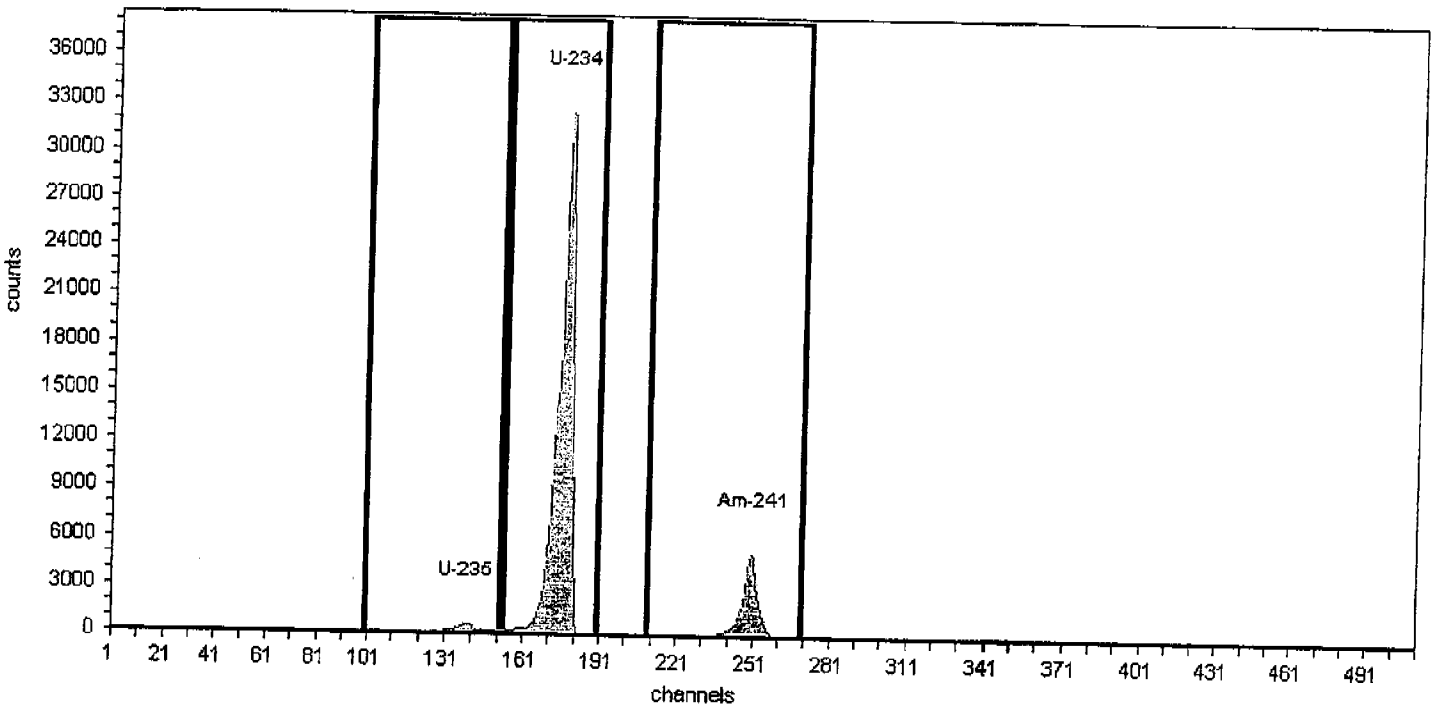
Detector: 25 , SN:
Acquisition Start Date: 5/20/2008 4:42:28PM

Live Time: 35.00 min.
Real Time: 35.07 min.

Efficiency Calibration Name: RSO 189 (Source 8)

Energy Calibration Equation:
Gain = 9.8047 keV / Ch
Offset = 3,036.00 keV
Quadratic = 0.0000 keV / Ch^2

Efficiency: 28.59% +/- 0.12% TPU(2 sigma)



Method: Interactive ROI
Algorithm: Linear

Initial Calibration: No
Shelf: 1

Nuclide Activity Summary

Nuclide	Peak Channel	Peak Energy MeV	ROI Start Channel	ROI End Channel	Gross Counts	Net Count Rate (cpm)
U-235	139	4.40	100	152	4,643.00	132.66
U-234	177	4.78	153	190	200,052.00	5,715.77
Am-241	250	5.49	210	270	31,922.00	912.06

AlphaVision v5.3

Alpha-Spectroscopy Calibration Report

ORTEC
801 S. Illinois Ave.
Oak Ridge, TN 37830
9:20:39AM 5/21/2008

Analyst: ORTEC
Detector: 25

Calibration

Energy Calibration: RSO 190 (Source 9)
Description:

Analysis Date: 5/21/2008 9:08:00AM
Calibration Type: Energy And Efficiency

Source Info

Certificate ID: A9 RSO#190
Prepared by: IPL
Description:

Certification Date: 6/1/2007 12:00:00PM

Acquisition

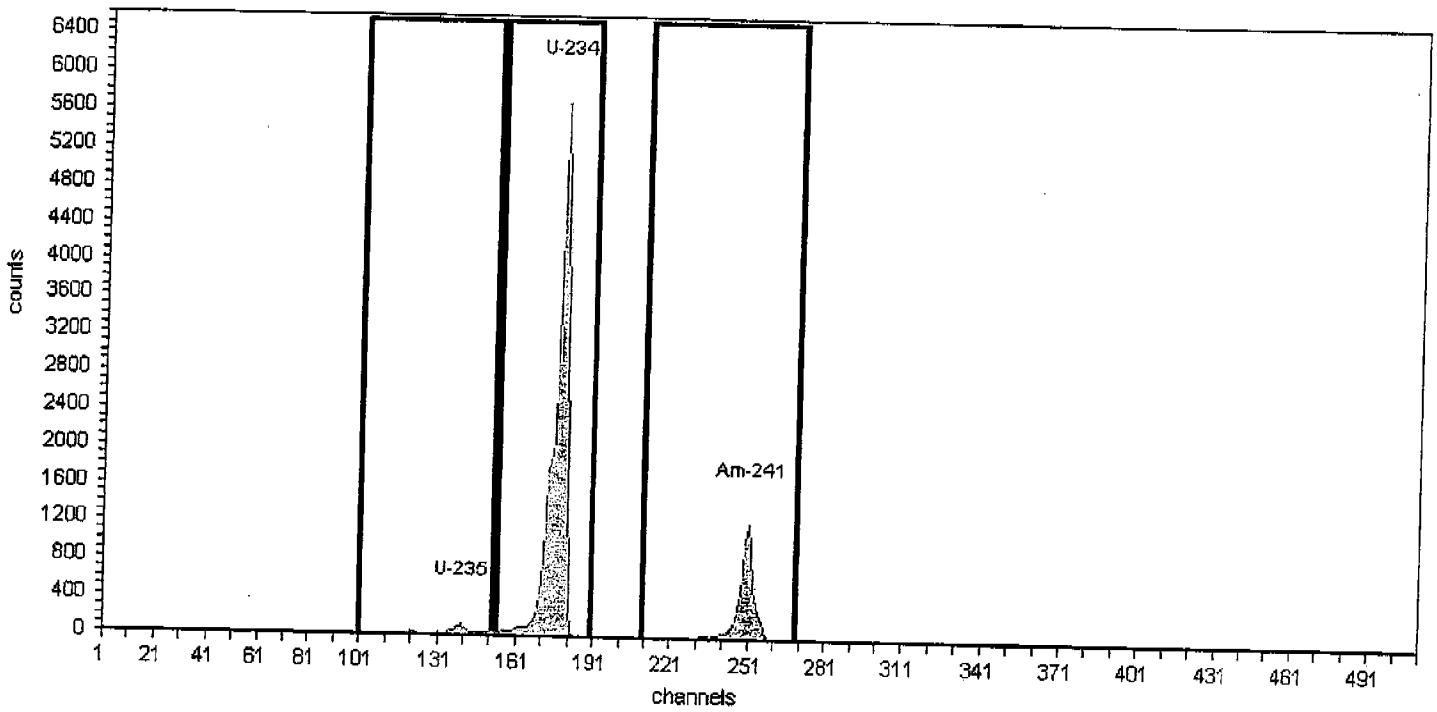
Detector: 25 , SN:
Acquisition Start Date: 5/21/2008 8:31:01AM

Live Time: 35.00 min.
Real Time: 35.01 min.

Efficiency Calibration Name: RSO 190 (Source 9)

Energy Calibration Equation:
Gain = 9.8047 keV / Ch
Offset = 3,026.20 keV
Quadratic = 0.0000 keV / Ch^2

Efficiency: 28.16% +/- 0.30% TPU(2 sigma)



Method: Interactive ROI
Algorithm: Linear

Initial Calibration: No
Shelf: 1

Nuclide Activity Summary

Nuclide	Peak Channel	Peak Energy MeV	ROI Start Channel	ROI End Channel	Gross Counts	Net Count Rate (cpm)
U-235	140	4.40	100	152	781.00	22.31
U-234	178	4.78	153	190	29,575.00	845.00
Am-241	251	5.49	210	270	6,967.00	199.06

Isotope Products Laboratories
An Eckert & Ziegler Company

24937 Avenue Tibbitts
Valencia, California 91355

Tel 661·309·1010
Fax 661·257·8303

[α] reverified 5/20/08
expires 5/20/09

PAI 187
recalibrate 4-15-03

CERTIFICATE OF CALIBRATION
MIXED ALPHA STANDARD SOURCE

Radionuclide A: U-234
Radionuclide B: U-235
Radionuclide C: Am-241
Half Life (U-234): (2.454 ± 0.006)E+05 years
Half Life (U-235): (7.037 ± 0.011)E+08 years
Half Life (Am-241): 432.17 ± 0.66 years

Customer: PARAGON ANALYTICS, INC.
P.O. No.: EW040203/R2193
Catalog No.: MISC-STD
Reference Date: 1-May-03 12:00 PST
Source No.: 92MIX2203026

Contained Radioactivity:

U-234:	3.354	nCi	(124.1 Bq)	Am-241:	0.5793	nCi	(21.43 Bq)
U-235:	0.06566	nCi	(2.429 Bq)	Total Activity:	3.999	nCi	(148.0 Bq)

Physical description:

A. Capsule type: Disk (22 mm OD X 0.79 mm THK)
B. Nature of active deposit: Electrodeposited and diffusion bonded oxides
C. Active Diameter: 19 mm
D. Backing: Stainless steel
E. Cover: None

Radioimpurities: Not determined

Method of Calibration:

This source was assayed using a windowless internal gas flow proportional counter for total alpha activity. Individual nuclide ratios were taken from those determined in Mar 1998.

Uncertainty of Measurement:

A. Type A (random) uncertainty: ± 0.7%
B. Type B (systematic) uncertainty: ± 3.0%
C. Uncertainty in aliquot weighing: ± 0.0%
D. Total uncertainty at the 99% confidence level: ± 3.1%

Notes:

- See reverse side for leak test(s) performed on this source.
- IPL participates in a 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).
- Nuclear data was taken from "Table of Radioactive Isotopes", edited by Virginia Shirley, 1986.
- This source has a working life of 2 years.
- This source had a total alpha surface emission rate of 4483 α/min in 2π on 11 Apr 03.

Daniel James Van Dalsem
Quality Control

15-Apr-03
Date Signed

IPL Ref. No.: 987-7

Isotope Products 24937 Avenue Tibbitts

α2 reverified 5/20/08

Isotope Product 24937 Avenue Tibbitts Z reverified 5/20/08

Isotope Products Laboratories
An Eckert & Ziegler Company

24937 Avenue Tibbitts
Valencia, California 91355

Tel 661·309·1010
Fax 661·257·8303

α 4

reverified 5/20/08
expires 5/20/09

PAI ID 00185
rec'd from recalibration
3-28-03

CERTIFICATE OF CALIBRATION
ALPHA STANDARD SOURCE

Radionuclide A: U-234
Radionuclide B: U-235
Radionuclide C: Am-241
Half Life (U-234): (2.454 ± 0.006)E+05 years
Half Life (U-235): (7.037 ± 0.011)E+08 years
Half Life (Am-241): 432.17 ± 0.66 years

Customer: PARAGON ANALYTICS, INC.
P.O. No.: EW030603/R2155
Catalog No.: MISC-STD
Reference Date: 1-Apr-03 12:00 PST
Source No.: 92MIX2203021

Contained Radioactivity:

U-234:	2.731 nCi (101.0 Bq)	Am-241:	0.9325 nCi (34.50 Bq)
U-235:	0.03416 nCi (1.264 Bq)	Total Activity:	3.698 nCi (136.8 Bq)

Physical description:

A. Capsule type: Disk (22 mm OD X 0.79 mm THK)
B. Nature of active deposit: Electrodeposited and diffusion bonded oxides
C. Active Diameter: 19 mm
D. Backing: Stainless steel
E. Cover: None

Radioimpurities: Not determined

Method of Calibration:

This source was assayed using a windowless internal gas flow proportional counter for total alpha activity. Individual nuclide ratios were taken from those determined in Aug 1992.

Uncertainty of Measurement:

A. Type A (random) uncertainty: ± 0.8%
B. Type B (systematic) uncertainty: ± 3.1%
C. Uncertainty in aliquot weighing: ± 0.0%
D. Total uncertainty at the 99% confidence level: ± 3.2%

Notes:

- See reverse side for leak test(s) performed on this source.
- IPL participates in a 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).
- Nuclear data was taken from "Table of Radioactive Isotopes", edited by Virginia Shirley, 1986.
- This source has a working life of 2 years.
- This source had a total alpha surface emission rate of 4145 α/min in 2π on 18 Mar 03.

Daniel James Van Dalsem
Quality Control

19-Mar-03
Date Signed

IPL Ref. No.: 987-2

Isotope Products Laboratories
An Eckert & Ziegler Company

24937 Avenue Tibbitts
Valencia, California 91355

Tel 661·309·1010
Fax 661·257·8303

α5 reverified 5/20/08 expires 5/20/09
PAI ID 00186
recalibration received ~~186~~ 3-28-03

CERTIFICATE OF CALIBRATION
ALPHA STANDARD SOURCE

Radionuclide A: U-234
Radionuclide B: U-235
Radionuclide C: Am-241
Half Life (U-234): (2.454 ± 0.006)E+05 years
Half Life (U-235): (7.037 ± 0.011)E+08 years
Half Life (Am-241): 432.17 ± 0.66 years

Customer: PARAGON ANALYTICS, INC.
P.O. No.: EW030603/R2155
Catalog No.: MISC-STD
Reference Date: 1-Apr-03 12:00 PST
Source No.: 92MIX2203025

Contained Radioactivity:

U-234:	5.486	nCi	(203.0 Bq)	Am-241:	3.958	nCi	(146.4 Bq)
U-235:	0.09221	nCi	(3.412 Bq)	Total Activity:	9.536	nCi	(352.8 Bq)

Physical description:

A. Capsule type: Disk (22 mm OD X 0.79 mm THK)
B. Nature of active deposit: Electrodeposited and diffusion bonded oxides
C. Active Diameter: 19 mm
D. Backing: Stainless steel
E. Cover: None

Radioimpurities: Not determined

Method of Calibration:

This source was assayed using a windowless internal gas flow proportional counter for total alpha activity. Individual nuclide ratios were taken from those determined in Aug 1992.

Uncertainty of Measurement:

A. Type A (random) uncertainty: ± 0.8%
B. Type B (systematic) uncertainty: ± 3.1%
C. Uncertainty in aliquot weighing: ± 0.0%
D. Total uncertainty at the 99% confidence level: ± 3.2%

Notes:

- See reverse side for leak test(s) performed on this source.
- IPL participates in a 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).
- Nuclear data was taken from "Table of Radioactive Isotopes", edited by Virginia Shirley, 1986.
- This source has a working life of 2 years.
- This source had a total alpha surface emission rate of 10690 α/min in 2π on 18 Mar 03.

Daniel James Van Dalsem
Quality Control

19-Mar-03
Date Signed

IPL Ref. No.: 987-2

Isotope Products Laboratories
An Eckert & Ziegler Company

24937 Avenue Tibbitts
Valencia, California 91355

Tel 661·309·1010
Fax 661·257·8303

α6 reverified 5/20/08 expires 5/20/09
BAID 00187
recd from recalibrate 3-28-03

CERTIFICATE OF CALIBRATION
ALPHA STANDARD SOURCE

Radionuclide A: U-234
Radionuclide B: U-235
Radionuclide C: Am-241
Half Life (U-234): (2.454 ± 0.006)E+05 years
Half Life (U-235): (7.037 ± 0.011)E+08 years
Half Life (Am-241): 432.17 ± 0.66 years

Customer: PARAGON ANALYTICS, INC.
P.O. No.: EW030603/R2155
Catalog No.: MISC-STD
Reference Date: 1-Apr-03 12:00 PST
Source No.: 92MIX2203022

Contained Radioactivity:

U-234:	3.592 nCi (132.9 Bq)	Am-241:	3.279 nCi (121.3 Bq)
U-235:	0.08556 nCi (3.166 Bq)	Total Activity:	6.957 nCi (257.4 Bq)

Physical description:

A. Capsule type: Disk (22 mm OD X 0.79 mm THK)
B. Nature of active deposit: Electrodeposited and diffusion bonded oxides
C. Active Diameter: 19 mm
D. Backing: Stainless steel
E. Cover: None

Radioimpurities: Not determined

Method of Calibration:

This source was assayed using a windowless internal gas flow proportional counter for total alpha activity. Individual nuclide ratios were taken from those determined in Aug 1992.

Uncertainty of Measurement:

A. Type A (random) uncertainty: ± 0.8%
B. Type B (systematic) uncertainty: ± 3.1%
C. Uncertainty in aliquot weighing: ± 0.0%
D. Total uncertainty at the 99% confidence level: ± 3.2%

Notes:

- See reverse side for leak test(s) performed on this source.
- IPL participates in a 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).
- Nuclear data was taken from "Table of Radioactive Isotopes", edited by Virginia Shirley, 1986.
- This source has a working life of 2 years.
- This source had a total alpha surface emission rate of 7799 α/min in 2π on 18 Mar 03.

Daniel James Van Dalsem
Quality Control

19-Mar-03
Date Signed

IPL Ref. No.: 987-2

Isotope Products Laboratories
An Eckert & Ziegler Company

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Valencia, California 91355

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α7

reverified 5/20/08
expires 5/20/09

PA ID 188
rec'd for recalibration
3-28-03

CERTIFICATE OF CALIBRATION
ALPHA STANDARD SOURCE

Radionuclide A: U-234
Radionuclide B: U-235
Radionuclide C: Am-241
Half Life (U-234): (2.454 ± 0.006)E+05 years
Half Life (U-235): (7.037 ± 0.011)E+08 years
Half Life (Am-241): 432.17 ± 0.66 years

Customer: PARAGON ANALYTICS, INC.
P.O. No.: EW030603/R2155
Catalog No.: MISC-STD
Reference Date: 1-Apr-03 12:00 PST
Source No.: 92MIX2203023

Contained Radioactivity:

U-234:	2.895	nCi	(107.1 Bq)
U-235:	0.02502	nCi	(0.9257 Bq)
Am-241:	1.953	nCi	(72.26 Bq)
Total Activity:	4.873	nCi	(180.3 Bq)

Physical description:

A. Capsule type: Disk (22 mm OD X 0.79 mm THK)
B. Nature of active deposit: Electrodeposited and diffusion bonded oxides
C. Active Diameter: 19 mm
D. Backing: Stainless steel
E. Cover: None

Radioimpurities: Not determined

Isotope Products Laboratories
An Eckert & Ziegler Company

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Fax 661·257·8303

α 8

re verified 5/20/08
expires 5/20/09

PAI ID 189
recd 4-2-03
recalibrated 4-15-03

CERTIFICATE OF CALIBRATION
MIXED ALPHA STANDARD SOURCE

Radionuclide A: U-234
Radionuclide B: U-235
Radionuclide C: Am-241
Half Life (U-234): (2.454 ± 0.006)E+05 years
Half Life (U-235): (7.037 ± 0.011)E+08 years
Half Life (Am-241): 432.17 ± 0.66 years

Customer: PARAGON ANALYTICS, INC.
P.O. No.: EW040203/R2193
Catalog No.: MISC-STD
Reference Date: 1-May-03 12:00 PST
Source No.: 92MIX2203029

Contained Radioactivity:

U-234:	9.048	nCi	(334.8 Bq)	Am-241:	1.433	nCi	(53.02 Bq)
U-235:	0.1771	nCi	(6.553 Bq)	Total Activity:	10.66	nCi	(394.4 Bq)

Physical description:

A. Capsule type: Disk (22 mm OD X 0.79 mm THK)
B. Nature of active deposit: Electrodeposited and diffusion bonded oxides
C. Active Diameter: 19 mm
D. Backing: Stainless steel
E. Cover: None

Radioimpurities: Not determined

Method of Calibration:

This source was assayed using a windowless internal gas flow proportional counter for total alpha activity. Individual nuclide ratios were taken from those determined in Mar 1998.

Uncertainty of Measurement:

A. Type A (random) uncertainty: ± 0.5%
B. Type B (systematic) uncertainty: ± 3.0%
C. Uncertainty in aliquot weighing: ± 0.0%
D. Total uncertainty at the 99% confidence level: ± 3.0%

Notes:

- See reverse side for leak test(s) performed on this source.
- IPL participates in a 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).
- Nuclear data was taken from "Table of Radioactive Isotopes", edited by Virginia Shirley, 1986.
- This source has a working life of 2 years.
- This source had a total alpha surface emission rate of 11950 α/min in 2π on 11 Apr 03.

Daniel James Van Dalsem
Quality Control

15-Apr-03
Date Signed

IPL Ref. No.: 987-7

Eckert & Ziegler
Isotope Products

24937 Avenue Tibbitts
Valencia, California 91355

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Fax 661·257·8303

RSO # 190
Rec'd 6/6/07 GW
Recertification 6/1/07

CERTIFICATE OF CALIBRATION
MIXED ALPHA STANDARD SOURCE

α 9

Radionuclide:	U-234	**Customer:**	PARAGON ANALYTICS, INC.
Radionuclide:	U-235	**P.O. No.:**	73179/R3768
Radio: 23	Am-241	**Catalog No.:**	MISC-STD
Half-life (U-234):	(2.454 ± 0.006)E+05 years	**Reference Date:**	1-Jun-07 12:00 PST
Half-life (U-235):	(7.037 ± 0.011)E+08 years	**Source No.:**	92MIX223027
Half-life (Am-241):	432.17 ± 0.66 years		

Contained Radioactivity:

U-234:	1.349	nCi,	49.91	Bq	Am-241:	0.3243	nCi,	12.00	Bq
U-235:	0.02970	nCi,	1.099	Bq	Total Activity:	1.703	nCi,	63.01	Bq

Physical Description:

A. Capsule type: Disk (47 mm OD x 0.76 mm THK)
B. Nature of active deposit: Electrodeposited and diffusion bonded oxide
C. Active diameter/volume: 19 mm
D. Backing: Stainless steel
E. Cover: None

Radioimpurities: Not determined

Method of Calibration:

This source was assayed using a windowless internal gas flow proportional counter for total alpha activity. Individual nuclide ratios were taken from those determined in May 2001.

Uncertainty of Measurement:

A. Type A (random) uncertainty: ± 0.9 %
B. Type B (systematic) uncertainty: ± 3.0 %
C. Uncertainty in aliquot weighing: ± 0.0 %
D. Total uncertainty at the 99% confidence level: ± 3.1 %

Notes:

- See reverse side for leak test(s) performed on this source.
- IPL participates in a 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).
- Nuclear data was taken from "Table of Radioactive Isotopes", edited by Virginia Shirley, 1986.
- This source has a working life of 2 years.
- This source had a total alpha surface emission rate of 1909 α/min in 2π on 22-May-07

Quality Control

24 May 07
Date

IPL Ref. No.: 1143-19

Paragon Analytics

Radiochemistry Case Narrative
Isotopic Plutonium

Los Alamos National Laboratory SMO

Dust / 08-1101

PA WO 0805078

1. This report consists of the analytical results and supporting documentation for two solid samples received by Paragon on 05/08/08.
2. These samples were prepared according to procedures PA SOP773R10 and PA SOP778R12, with procedure modifications outlined on QASS 357739. Due to low client detection limits, these samples were prepared at an increased aliquot of 4.5 grams. These samples were muffled for four hours at 600° C. These samples were not ground prior to analysis.
3. The samples were analyzed for the presence of isotopic plutonium according to procedure PA SOP714R11. The analyses were completed on 06/12/08.
4. The isotopic analysis results for these samples are reported on an 'as received' basis in units of pCi/gram.
5. Pu-240 is indistinguishable from Pu-239. In this report, any plutonium in this region of interest will be reported as Pu-239/240.
6. No further anomalous situations were encountered during the preparation or analysis of these samples. All quality control criteria were met.

The data contained in the following report have been reviewed and approved by the personnel listed below. In addition, Paragon Analytics certifies that the analyses reported herein are true, complete and correct within the limits of the methods employed.

Linda Arend
Radiochemistry Primary Reviewer

06/20/08
Date

Radiochemistry Final Data Review

6/20/06
Date

1

PARAGON ANALYTICS
Radiochemistry Data Package

Section 1

CHAIN OF CUSTODY

Paragon Analytics

Sample Number(s) Cross-Reference Table

Paragon OrderNum: 0805078
Client Name: Los Alamos National Laboratory SMO
Client Project Name: Dust
Client Project Number: 08-1101
Client PO Number: 33204-001-06 F3

Client Sample Number	Lab Sample Number	COC Number	Matrix	Date Collected	Time Collected
SFB08-08-12411	0805078-1		SOLID	16-Apr-08	
SFB08-08-12412	0805078-2		SOLID	16-Apr-08	

Wednesday, May 07, 2008

LAB CHAIN OF CUSTODY DOCUMENT NUMBER: 08-1101C

REQUEST NUMBER: 08-1101

LOS ALAMOS
NATIONAL LABORATORY

ATTN: Lance Steere

Paragon Analytics, Inc.
225 Commerce
Fort Collins, CO 80524

TURNAROUND/REPORT DUE: 6/6/2008
TURNAROUND REQ'D: 30

LAB REQUEST COMMENTS: Phils Samples 0805078

	SAMPLE ID	CTNR	CTNR DESC	ORDER	PRESERV	MATRIX
1	SFB08-08-12411	1	1 L POLY	AM241+GS+ISOPU+ISOU+SR90	None	S
	SFB08-08-12411	1	500 ML POLY	GROSSA+B	None	S
	SFB08-08-12411	1	250 ML POLY	ISO_Po	Ice	S
2	SFB08-08-12412	1	1 L POLY	AM241+GS+ISOPU+ISOU+SR90	None	S
	SFB08-08-12412	1	500 ML POLY	GROSSA+B	None	S
	SFB08-08-12412	1	250 ML POLY	ISO_Po	Ice	S

Relinquished By:	Date	Time	Received By:	Date	Time
[illegible]	5/7/08	3:00	Sheri Lafferty [illegible]	5/8/08	0930
Printed Name / Signature			Printed Name / Signature		
Printed Name / Signature			Printed Name / Signature		
Printed Name / Signature			Printed Name / Signature		

Received for DISPOSAL By: Date Time

Printed Name Signature

Remarks:

Wednesday, May 07, 2008

REQUEST NUMBER: 08-1101

LOS ALAMOS
NATIONAL LABORATORY

ATTN: Lance Steere

Paragon Analytics, Inc.

225 Commerce

Fort Collins, CO 80524

These Samples are on:

LANL Request Number:08-1101

Per Agreement Number:1-800-443-1511

Project Cost Code: WEPR 1314 0300

Please analyse the enclosed samples according to the schedule indicated:

SHIP DATE: 5/7/2008

TURNAROUND/REPORT DUE: 6/6/2008

TURNAROUND REQ'D: 30 Days

RAD SCREENING: Not Required

LAB REQUEST COMMENTS: Phils Sample

LANL ER SMO CONTACT:

Signature:

PRIORITY	METHOD CODE	CNTNR	SAMPLE ID	SAMPLE MATRIX	DATE SAMPLED	SAMPLE COMMENTS	SPECIAL INSTRUCTIONS
	EPA:900	1	SFB08-08-12411	S	4/16/2008	LA Monitor-vacuum bag, location LAM-0001	
		1	SFB08-08-12412	S	4/16/2008	LA Monitor-furnace filter, location LAM-0001	
	EPA:901.1	1	SFB08-08-12411	S	4/16/2008	LA Monitor-vacuum bag, location LAM-0001	
		1	SFB08-08-12412	S	4/16/2008	LA Monitor-furnace filter, location LAM-0001	
	EPA:905.0	1	SFB08-08-12411	S	4/16/2008	LA Monitor-vacuum bag, location LAM-0001	
		1	SFB08-08-12412	S	4/16/2008	LA Monitor-furnace filter, location LAM-0001	
	HASL-300:AM-241	1	SFB08-08-12411	S	4/16/2008	LA Monitor-vacuum bag, location LAM-0001	

080518

Wednesday, May 07, 2008

REQUEST NUMBER: 08-1101

PRIORITY	METHOD CODE	CNTNR	SAMPLE ID	SAMPLE MATRIX	DATE SAMPLED	SAMPLE COMMENTS	SPECIAL INSTRUCTIONS
	HASL-300:AM-241	1	SFB08-08-12412	S	4/16/2008	LA Monitor-furnace filter, location LAM-0001	
	HASL-300:ISOPU	1	SFB08-08-12411	S	4/16/2008	LA Monitor-vacuum bag, location LAM-0001	
		1	SFB08-08-12412	S	4/16/2008	LA Monitor-furnace filter, location LAM-0001	
	HASL-300:ISOU	1	SFB08-08-12411	S	4/16/2008	LA Monitor-vacuum bag, location LAM-0001	
		1	SFB08-08-12412	S	4/16/2008	LA Monitor-furnace filter, location LAM-0001	
	HASL-300:PO-210	1	SFB08-08-12411	S	4/16/2008	LA Monitor-vacuum bag, location LAM-0001	
		1	SFB08-08-12412	S	4/16/2008	LA Monitor-furnace filter, location LAM-0001	

Final Page of REQUEST NUMBER 08-1101

080507B

CONDITION OF SAMPLE UPON RECEIPT FORM

Paragon Analytics

Client: LANL Workorder No: 0805078

Project Manager: LS Initials: SL Date: 5-8-08

1. Does this project require any **special handling** in addition to standard Paragon procedures?		YES	(NO)
2. Are custody **seals on shipping containers** intact?	NONE	(YES)	NO
3. Are Custody seals on **sample containers** intact?	NONE	(YES)	NO
4. Is there a **COC (Chain-of-Custody) present** or other representative documents?		(YES)	NO
5. Are the **COC and bottle labels complete and legible**?		YES	(NO)
6. Is the **COC in agreement** with samples received? (IDs, dates, times, no. of samples, no. of containers, matrix, requested analyses, etc.)		YES	(NO)
7. Were **airbills / shipping documents** present and/or removable?	DROP OFF	(YES)	NO
8. Are all aqueous **samples requiring preservation preserved correctly**? (excluding volatiles)	(N/A)	YES	NO
9. Are all aqueous **non-preserved samples pH 4-9**?	(N/A)	YES	NO
10. Is there **sufficient sample** for the requested analyses?		YES	(NO)
11. Were all samples placed in the **proper containers** for the requested analyses?		(YES)	NO
12. Are all samples within **holding times** for the requested analyses?		(YES)	NO
13. Were all sample containers received **intact**? (not broken or leaking, etc.)		(YES)	NO
14. Are all samples requiring no headspace (VOC, GRO, Rx CN/S, radon), headspace free? **Size of bubble**: ___ < green pea ___ > green pea	(N/A)	YES	NO
15. Were samples checked for and free from the presence of **residual chlorine?** (Applicable when PM has indicated samples are from a chlorinated water source; note if field preservation with sodium thiosulfate was not observed.)	(N/A)	YES	NO
16. Were the samples **shipped on ice**?		(YES)	NO
17. Were cooler temperatures measured at 0.1-6.0°C? IR gun used*: #2 #4	RAD ONLY	(YES)	NO

Cooler #:	1							
Temperature (°C):	0.8							
No. of custody seals on cooler:	1							
DOT Survey/ Acceptance Information — External µR/hr reading:	16							
Background µR/hr reading:	12							

Were external µR/hr readings ≤ two times background and within DOT acceptance criteria? (YES) / NO / NA (If no, see Form 008.)

Additional Information: PROVIDE DETAILS BELOW FOR A NO RESPONSE TO ANY QUESTION ABOVE, EXCEPT #1 AND #16

No times listed. ok

Received only (1) 500 ml poly (approx 25-30% full) for both samples.

-01 = 146g v fine dust, mix Dust? = Yes ~50% full

-02 = 34g " " " ~10% full

If applicable, was the client contacted? (YES) / NO / NA Contact: Joy Valdez Date/Time: 5/22

Project Manager Signature / Date: 5/22/08

*IR Gun #2: Oakton, SN 29922500201-0066 *IR Gun #4: Oakton, SN 2372220101-0002

Form 201r20.xls (12/27/07)

0805078

ORIGIN ID: SAFA (505) 665-5505
JOYLENE VALDEZ
LOS ALAMOS NATL LAB
TA00 BLDG 1237 DPU 03

LOS ALAMOS, NM 87545
UNITED STATES US

Ship Date: 07MAY08
ActWgt: 74.0 LB MAN
System#: 0014176/CAFE2355
Account: 5 *********

(800) 443-1511
FedEx
Express

TO LANCE STEERE
PARAGON
225 COMMERCE

FORT COLLINS, CO 80524

16

Ref: 6b010amr2a015bcgao

Delivery Address
Barcode

BILL SENDER

08

THU
Deliver By:
08MAY08

PRIORITY OVERNIGHT

TRK# 7209 7844 2022 Form 0201

DEN AA

80524 -CO-US XH FTCA

2

PARAGON ANALYTICS
Radiochemistry Data Package

Section 2

SAMPLE RESULTS SUMMARY

ple Results Summary

Reported on: Thursday, June 19, 2008
10:24:07 AM

nits	Matrix	Prep Batch	Date Analyzed	Flags
pCi/g	SOLID	AS080606-1	6/12/2008	U
pCi/g	SOLID	AS080606-1	6/12/2008	LT
pCi/g	SOLID	AS080606-1	6/12/2008	U
pCi/g	SOLID	AS080606-1	6/12/2008	

Abbreviations:

TPU - Total Propagated Uncertainty (see PAI SOP 743)

MDC - Minimum Detectable Concentration (see PAI SOP 709)

BDL - Below Detection Limit

3

PARAGON ANALYTICS
Radiochemistry Data Package

Section 3

QC RESULTS SUMMARY

Isotopic Plutonium By Alpha Spectroscopy

PAI 714 Rev 11

Method Blank Results

Lab Name: Paragon Analytics
Work Order Number: 0805078
Client Name: Los Alamos National Laboratory SMO
ClientProject ID: Dust 08-1101

Lab ID: AS080606-1MB

Sample Matrix: SOLID
Prep SOP: PAI 778 Rev 12
Date Collected: 06-Jun-08
Date Prepared: 06-Jun-08
Date Analyzed: 12-Jun-08

Prep Batch: AS080606-1
QCBatchID: AS080606-1-1
Run ID: AS080606-1B
Count Time: 1000 minutes

Final Aliquot: 4.53 g
Result Units: pCi/g
File Name: Spectrum #1

CASNO	Target Nuclide	Result +/- 1 s TPU	MDC	Requested MDC	Lab Qualifier
13981-16-3	Pu-238	0.0011 +/- 0.0014	0.0015	0.02	U
10-12-8	Pu-239/240	0.0039 +/- 0.0017	0.0041	0.02	U

Chemical Yield Summary

Carrier/Tracer	Amount Added	Result	Units	Yield	Control Limits	Flag
Pu-242	0.4971	0.280	pCi/g	56.3	30 - 110 %	

Comments:

Qualifiers/Flags:

U - Result is less than the sample specific MDC.

Y1 - Chemical Yield is in control at 100-110%. Quantitative Yield is assumed.

Y2 - Chemical Yield outside default limits.

LT - Result is less than Requested MDC, greater than sample specific MDC.

Abbreviations:

TPU - Total Propagated Uncertainty (see PAI SOP 743)

MDC - Minimum Detectable Concentration (see PAI SOP 709)

BDL - Below Detection Limit

M - Requested MDC not met.

B - Analyte concentration greater than MDC.

B3 - Analyte concentration greater than MDC but less than Requested MDC.

Data Package ID: *PU0805078-1*

Isotopic Plutonium By Alpha Spectroscopy

PAI 714 Rev 11

Laboratory Control Sample(s)

Lab Name: Paragon Analytics
Work Order Number: 0805078
Client Name: Los Alamos National Laboratory SMO
ClientProject ID: Dust 08-1101

Lab ID: AS080606-1LCS

Sample Matrix: SOLID
Prep SOP: PAI 778 Rev 12
Date Collected: 06-Jun-08
Date Prepared: 06-Jun-08
Date Analyzed: 12-Jun-08

Prep Batch: AS080606-1
QCBatchID: AS080606-1-1
Run ID: AS080606-1B
Count Time: 1000 minutes

Final Aliquot: 4.53 g
Result Units: pCi/g
File Name: Spectrum #1

CASNO	Target Nuclide	Results +/- 1s TPU	MDC	Spike Added	% Rec	Control Limits	Lab Qualifier
10-12-8	Pu-239/240	0.495 +/- 0.042	0.001	0.520	95.1	82 - 118	P

Chemical Yield Summary

Carrier/Tracer	Amount Added	Result	Units	Yield	Control Limits	Flag
Pu-242	0.4971	0.371	pCi/g	74.7	30 - 110 %	

Comments:

Qualifiers/Flags:

U - Result is less than the sample specific MDC.
LT - Result is less than Requested MDC, greater than sample specific MDC.
Y1 - Chemical Yield is in control at 100-110%. Quantitative Yield is assumed.
Y2 - Chemical Yield outside default limits.
L - LCS Recovery below lower control limit.
H - LCS Recovery above upper control limit.
P - LCS Recovery within control limits.
M - The requested MDC was not met.
M3 - The requested MDC was not met, but thereported activity is greater than the reported MDC.

Abbreviations:

TPU - Total Propagated Uncertainty (see PAI SOP 743)
MDC - Minimum Detectable Concentration (see PAI SOP 709)

Data Package ID: *PU0805078-1*

Isotopic Plutonium By Alpha Spectroscopy

PAI 714 Rev 11

Duplicate Sample Results (DER)

Lab Name: Paragon Analytics
Work Order Number: 0805078
Client Name: Los Alamos National Laboratory SMO
ClientProject ID: Dust 08-1101

Field ID: SFB08-08-12411
Lab ID: 0805078-1DUP

Sample Matrix: SOLID
Prep SOP: PAI 778 Rev 12
Date Collected: 16-Apr-08
Date Prepared: 06-Jun-08
Date Analyzed: 12-Jun-08

Prep Batch: AS080606-1
QCBatchID: AS080606-1-1
Run ID: AS080606-1B
Count Time: 1000 minutes
Report Basis: As Received

Final Aliquot: 4.51 g
Prep Basis: As Received
Moisture(%): NA
Result Units: pCi/g
File Name: Spectrum #1

CASNO	Analyte	Sample Result +/- 1s TPU	Duplicate Result +/- 1s TPU	DER	Control Limit	Lab Qualifiers
13981-16-3	Pu-238	0.0005 +/- 0.0013	0 +/- 0.0013	0.15	2.13	U
10-12-8	Pu-239/240	0.0157 +/- 0.0035	0.0104 +/- 0.0030	0.59	2.13	LT

Comments:

Duplicate Qualifiers/Flags:

U - Result is less than the sample specific MDC.
Y1 - Chemical Yield is in control at 100-110%. Quantitative yield is assumed.
Y2 - Chemical Yield outside default limits.
W - DER is greater than Warning Limit of 1.42
D - DER is greater than Control Limit of 2.13
LT - Result is less than Request MDC, greater than sample specific MDC
M - Requested MDC not met.
M3 - The requested MDC was not met, but the reported activity is greater than the reported MDC.
L - LCS Recovery below lower control limit.
H - LCS Recovery above upper control limit.
P - LCS, Matrix Spike Recovery within control limits.
N - Matrix Spike Recovery outside control limits

Abbreviations:

TPU - Total Propagated Uncertainty (see PAI SOP 743)
DER - Duplicate Error Ratio (see PAI SOP 715)
BDL - Below Detection Limit
NR - Not Reported

Data Package ID: *PU0805078-1*

PARAGON ANALYTICS
Radiochemistry Data Package

4

Section 4

INDIVIDUAL SAMPLE RESULTS

Isotopic Plutonium By Alpha Spectroscopy

PAI 714 Rev 11

Sample Results

Lab Name: Paragon Analytics
Work Order Number: 0805078
Client Name: Los Alamos National Laboratory SMO
ClientProject ID: Dust 08-1101

Field ID: SFB08-08-12411
Lab ID: 0805078-1

Analysis ReqCode: Low MDA

Sample Matrix: SOLID
Prep SOP: PAI 778 Rev 12
Date Collected: 16-Apr-08
Date Prepared: 06-Jun-08
Date Analyzed: 12-Jun-08

Prep Batch: AS080606-1
QCBatchID: AS080606-1-1
Run ID: AS080606-1B
Count Time: 1000 minutes
Report Basis: As Received

Final Aliquot: 4.52 g
Prep Basis: As Received
Moisture(%): NA
Result Units: pCi/g
File Name: Spectrum #1

CASNO	Target Nuclide	Result +/- 1 s TPU	MDC	Requested MDC	Lab Qualifier
13981-16-3	Pu-238	0.0005 +/- 0.0013	0.0050	0.02	U
10-12-8	Pu-239/240	0.0157 +/- 0.0035	0.0058	0.02	LT

Chemical Yield Summary

Carrier/Tracer	Amount Added	Result	Units	Yield	Control Limits	Flag
Pu-242	0.4985	0.314	pCi/g	62.9	30 - 110 %	

Comments:

Qualifiers/Flags:

U - Result is less than the sample specific MDC.

Y1 - Chemical Yield is in control at 100-110%. Quantitative Yield is assumed.

Y2 - Chemical Yield outside default limits.

LT - Result is less than Requested MDC, greater than sample specific MDC.

M3 - The requested MDC was not met, but the reported activity is greater than the reported MDC.

M - The requested MDC was not met.

Abbreviations:

TPU - Total Propagated Uncertainty (see PAI SOP 743)

MDC - Minimum Detectable Concentration (see PAI SOP 709)

BDL - Below Detection Limit

Data Package ID: *PU0805078-1*

Isotopic Plutonium By Alpha Spectroscopy

PAI 714 Rev 11

Sample Duplicate Results

Lab Name: Paragon Analytics
Work Order Number: 0805078
Client Name: Los Alamos National Laboratory SMO
ClientProject ID: Dust 08-1101

Field ID: SFB08-08-12411
Lab ID: 0805078-1DUP

Sample Matrix: SOLID
Prep SOP: PAI 778 Rev 12
Date Collected: 16-Apr-08
Date Prepared: 06-Jun-08
Date Analyzed: 12-Jun-08

Prep Batch: AS080606-1
QCBatchID: AS080606-1-1
Run ID: AS080606-1B
Count Time: 1000 minutes
Report Basis: As Received

Final Aliquot: 4.51 g
Prep Basis: As Received
Moisture(%): NA
Result Units: pCi/g
File Name: Spectrum #1

CASNO	Target Nuclide	Result +/- 1 s TPU	MDC	Requested MDC	Lab Qualifier
13981-16-3	Pu-238	0 +/- 0.0013	0.0038	0.02	U
10-12-8	Pu-239/240	0.0104 +/- 0.0030	0.0068	0.02	LT

Chemical Yield Summary

Carrier/Tracer	Amount Added	Result	Units	Yield	Control Limits	Flag
Pu-242	0.4990	0.307	pCi/g	61.5	30 - 110 %	

Comments:

Qualifiers/Flags:

U - Result is less than the sample specific MDC.

Y1 - Chemical Yield is in control at 100-110%. Quantitative yield is assumed.

Y2 - Chemical Yield outside default limits.

LT - Result is less than Requested MDC, greater than sample specific MDC.

M - The requested MDC was not met.

M3 - The requested MDC was not met, but thereported activity is greater than the reported MDC.

W - DER is greater than Warning Limit of 1.42

D - DER is greater than Control Limit of 2.13

Abbreviations:

TPU - Total Propagated Uncertainty (see PAI SOP 743)

MDC - Minimum Detectable Concentration (see PAI SOP 709)

BDL - Below Detection Limit

Data Package ID: *PU0805078-1*

Isotopic Plutonium By Alpha Spectroscopy

PAI 714 Rev 11

Sample Results

Lab Name: Paragon Analytics
Work Order Number: 0805078
Client Name: Los Alamos National Laboratory SMO
ClientProject ID: Dust 08-1101

Field ID: SFB08-08-12412
Lab ID: 0805078-2

Analysis ReqCode: Low MDA

Sample Matrix: SOLID
Prep SOP: PAI 778 Rev 12
Date Collected: 16-Apr-08
Date Prepared: 06-Jun-08
Date Analyzed: 12-Jun-08

Prep Batch: AS080606-1
QCBatchID: AS080606-1-1
Run ID: AS080606-1B
Count Time: 1000 minutes
Report Basis: As Received

Final Aliquot: 4.54 g
Prep Basis: As Received
Moisture(%): NA
Result Units: pCi/g
File Name: Spectrum #1

CASNO	Target Nuclide	Result +/- 1 s TPU	MDC	Requested MDC	Lab Qualifier
13981-16-3	Pu-238	0.0026 +/- 0.0014	0.0038	0.02	U
10-12-8	Pu-239/240	0.0847 +/- 0.0096	0.0068	0.02	

Chemical Yield Summary

Carrier/Tracer	Amount Added	Result	Units	Yield	Control Limits	Flag
Pu-242	0.4956	0.299	pCi/g	60.2	30 - 110 %	

Comments:

Qualifiers/Flags:

U - Result is less than the sample specific MDC.

Y1 - Chemical Yield is in control at 100-110%. Quantitative Yield is assumed.

Y2 - Chemical Yield outside default limits.

LT - Result is less than Requested MDC, greater than sample specific MDC.

M3 - The requested MDC was not met, but the reported activity is greater than the reported MDC.

M - The requested MDC was not met.

Abbreviations:

TPU - Total Propagated Uncertainty (see PAI SOP 743)

MDC - Minimum Detectable Concentration (see PAI SOP 709)

BDL - Below Detection Limit

Data Package ID: *PU0805078-1*

PARAGON ANALYTICS
Radiochemistry Data Package

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Section 5

RAW DATA

scopy Raw Data Report

Reported on: Friday, June 13, 2008
10:43:05 AM

Count Date/Time	Net Cnts Bkg Cnts	BaseEff Bkg(min)	CntDur(min) Yield	Activity +/- 1 s TPU	MDC DecLev	ReportUnits ReportBasis	DER RPD	%Spk. Recov Flags
6/12/2008	1.000	29.19%	1000	0.0005	0.0050	pCi/g	NA	
4:25 PM	2.000	1000	62.9%	0.0013	NA	As Received	NA	U
6/12/2008	29.000	29.19%	1000	0.0157	0.0058	pCi/g	NA	
4:25 PM	3.000	1000	62.9%	0.0035	NA	As Received	NA	LT
6/12/2008	918.000	29.19%	1000	0.314	0.003	pCi/g	NA	
4:25 PM	1.000	1000	62.9%	0.025	NA	As Received	NA	
6/12/2008	0.000	31.36%	1000	0	0.0038	pCi/g	0.15	
4:25 PM	1.000	1000	61.5%	0.0013	NA	As Received	NA	U
6/12/2008	20.036	31.36%	1000	0.0104	0.0068	pCi/g	0.59	
4:25 PM	4.982	1000	61.5%	0.0030	NA	As Received	NA	LT
6/12/2008	965.000	31.36%	1000	0.307	0.005	pCi/g	NA	
4:25 PM	8.018	1000	61.5%	0.025	NA	As Received	NA	
6/12/2008	5.000	31.88%	1000	0.0026	0.0038	pCi/g	NA	
4:25 PM	1.000	1000	60.2%	0.0014	NA	As Received	NA	U
6/12/2008	164.000	31.88%	1000	0.0847	0.0068	pCi/g	NA	
4:25 PM	5.000	1000	60.2%	0.0096	NA	As Received	NA	
6/12/2008	960.000	31.88%	1000	0.299	0.002	pCi/g	NA	
4:25 PM	1.000	1000	60.2%	0.024	NA	As Received	NA	
6/12/2008	2.000	31.68%	1000	0.0011	0.0015	pCi/g	NA	
4:25 PM	0.000	1000	56.3%	0.0014	NA	As Received	NA	U
6/12/2008	7.000	31.68%	1000	0.0039	0.0041	pCi/g	NA	
4:25 PM	1.000	1000	56.3%	0.0017	NA	As Received	NA	U

Notes:

1) The Tracer results are not yield corrected (i.e. activity measured not activity added).

2) Where sample time is not available, 12:00 PM (Mountain) is used for decay correction.

Abbreviations:

TR- Tracer TA - Target Analyte

TPU - Total Propagated Uncertainty (see PAI SOP 743)

MDC - Minimum Detectable Concentration (see PAI SOP 709)

DER - Duplicate Error Ratio

BDL - Below Detection Limit

MDC

Requested MDC.

Isotopic Plutonium By Alpha Spectroscopy Raw Data Report

e: Paragon Analytics
er: 0805078

Prep SOP: PAI 778
Analytical SOP: PAI 714

Reported on: Friday, June 13, 2008
10:43:05 AM

:lide :pe	Sample Date/Time	Prep Batch QCBatchID	Ingrowth Date /Time	Decay Date/Time	Matrix %Moist.	Samp Alq Analy Alq	Inst ID Det ID	AnRunID File Name	Count Date/Time	Net Cnts Bkg Cnts	BaseEff Bkg(min)	CntDur(min) Yield	Activity +/- 1 s TPU	MDC DecLev	ReportUnits ReportBasis	DER RPD	%Spk. Recov Flags
242	6/6/2008	AS080606-1	NA	NA	SOLID	4.53 g	AlphaSpec2	AS080606-1B	6/12/2008	891.000	31.68%	1000	0.280	0.002	pCi/g	NA	
cer	11:15:52 AM	AS080606-1-1	NA	NA	NA	4.53 g	45	Spectrum #1	4:25 PM	1.000	1000	56.3%	0.022	NA	As Received	NA	
9/240	6/6/2008	AS080606-1	NA	NA	SOLID	4.53 g	AlphaSpec2	AS080606-1B	6/12/2008	1151.000	30.95%	1000	0.495	0.001	pCi/g	NA	95.1
nalyte	11:15:52 AM	AS080606-1-1	NA	NA	NA	4.53 g	46	Spectrum #1	4:25 PM	0.000	1000	74.7%	0.042	NA	As Received	NA	P
242	6/6/2008	AS080606-1	NA	NA	SOLID	4.53 g	AlphaSpec2	AS080606-1B	6/12/2008	1156.000	30.95%	1000	0.371	0.002	pCi/g	NA	
cer	11:15:52 AM	AS080606-1-1	NA	NA	NA	4.53 g	46	Spectrum #1	4:25 PM	1.000	1000	74.7%	0.029	NA	As Received	NA	

e ID: *PU0805078-1*

e sample specific MDC.
control at 100-110%. Quantitative yield is assumed.
ide default limits.
Warning Limit of 1.42
Control Limit of 2.13
Within limits.
Request MDC, greater than sample specific MDC
ceived' while the Report Basis is 'Dry Weight'.
Weight' while the Report Basis is 'As Received'

M - Requested MDC not met.
M3 - The requested MDC was not met, but the reported activity is greater than the reported MDC.
L - LCS Recovery below lower control limit.
H - LCS Recovery above upper control limit.
P - LCS, Matrix Spike Recovery within control limits.
N - Matrix Spike Recovery outside control limits
NC - Not Calculated for duplicate results less than 5 times MDC
B - Analyte concentration greater than MDC.
B3 - Analyte concentration greater than MDC but less than Requested MDC.

Notes:

1) The Tracer results are not yield corrected (i.e. activity measured not activity added).
2) Where sample time is not available, 12:00 PM (Mountain) is used for decay correction.

Abbreviations:

TR- Tracer TA - Target Analyte
TPU - Total Propagated Uncertainty (see PAI SOP 743)
MDC - Minimum Detectable Concentration (see PAI SOP 709)
DER - Duplicate Error Ratio
BDL - Below Detection Limit

Paragon Analytics

Alpha-Spectroscopy Analysis Report

Sample

Sample: 0805078-1
Spectrum #1 Analysis #1

Sample Size : **4.50**

Acquisition

Detector: 40
Batch Name: PAS080606-1_A
Nuclide Library: iso-Pu
Analysis Method: Absolute Interactive ROI Analysis
ROI Set: iso-Pu

Acquisition Start Date: 6/12/2008 4:25:46PM
Live Time: 1,000.00 min.
Real Time: 1,000.02 min.
Dead Time: 0.00 %

Calibration

Bkgd Info: Sample: B08061040; Det: 40; Spectrum #1; Jun-10-2008 14:13

Calibration Date: 6/10/2008 12:29:31PM

Efficiency Calibration: C08061040

Efficiency: 29.19% +/- 0.12% TPU(2 sigma)

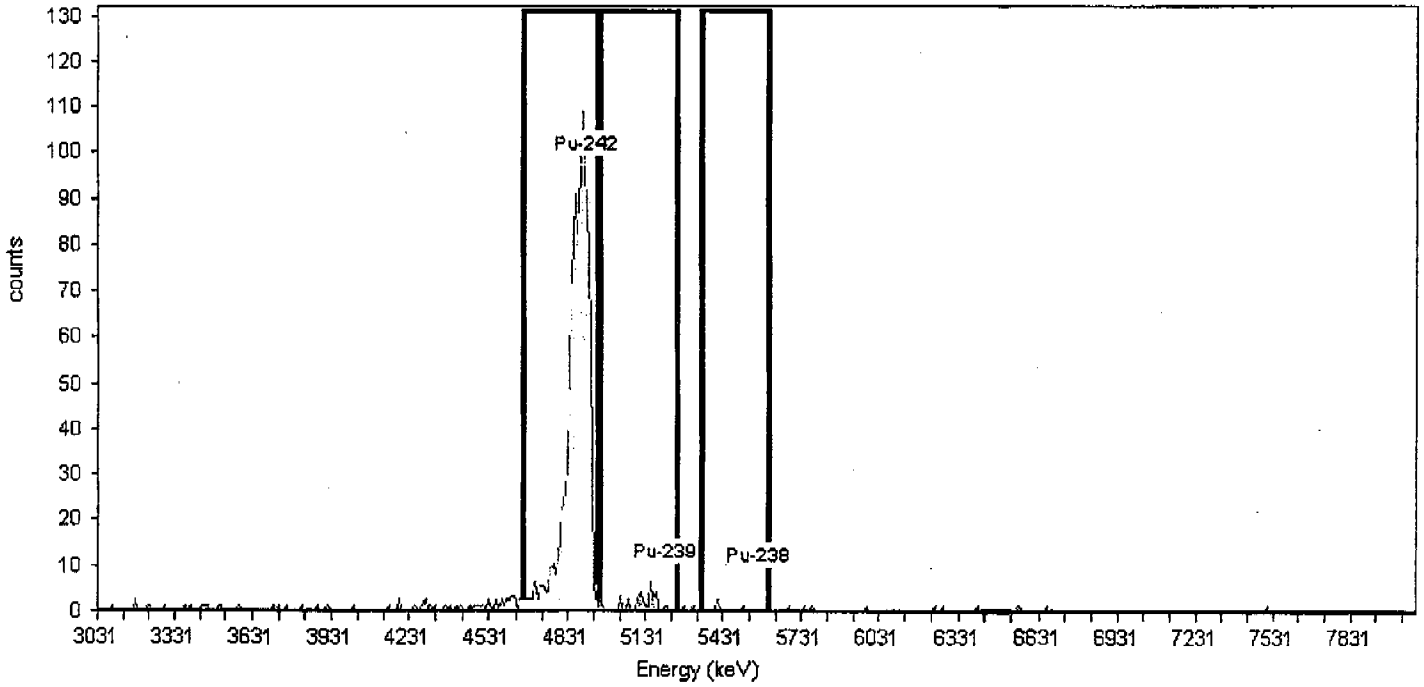
Energy Calibration: C08061040

Energy Cal: **Gain** = 9.9003 keV / Ch
Offset = 3,021.28 keV
Quadratic = 0.0000 keV / Ch^2

Tracer

Tracer Name: 846.3020.88 Pu-242
Tracer Activity: 20.00 DPM/mL x (Vol.)0.25 mL = 5.00 DPM

Tracer Nuclide: Pu-242
Tracer Recovery: 62.58%



Nuclide Summary (ROI)

Nuclide	Peak Energy keV	ROI Start keV	ROI End keV	FWHM keV	B.R. %.	Gross Counts	Bkgd Counts	Net Counts	Activity pCi/g	2.00Sigma TPU pCi/g	Critical Level pCi/g	MDA pCi/g
Pu-242	4902.3	4654.8	4941.9	89.7	100.5	919.00	1.00	918.00	3.1E-001	2.1E-002	1.3E-003	4.0E-003
Pu-239	5209.2	4951.8	5248.8	73.3	100.0	32.00	3.00	29.00	1.6E-002	6.8E-003	2.2E-003	5.9E-003
Pu-238	5565.7	5347.8	5605.3	24.2	100.0	3.00	2.00	1.00	5.5E-004	2.5E-003	1.8E-003	5.1E-003

Reviewed By: GB JP

Print Date: 6/13/2008 9:20:09AM

AlphaVision v5.3
Custom Report Iteration: 08/09/07

Paragon Analytics

Alpha-Spectroscopy Analysis Report

Sample

Sample: 0805078-1D
Spectrum #1 Analysis #1

Sample Size : **4.50**

Acquisition

Detector: 42
Batch Name: PAS080606-1_A
Nuclide Library: iso-Pu
Analysis Method: Absolute ROI Analysis, Set Name = iso-Pu
ROI Set: iso-Pu

Acquisition Start Date: 6/12/2008 4:25:46PM
Live Time: 1,000.00 min.
Real Time: 1,000.01 min.
Dead Time: 0.00 %

Calibration

Bkgd Info: Sample: B08061042; Det: 42; Spectrum #1; Jun-10-2008 14:13

Calibration Date: 6/10/2008 12:29:49PM

Efficiency Calibration: C08061042

Efficiency: 31.36% +/- 0.15% TPU(2 sigma)

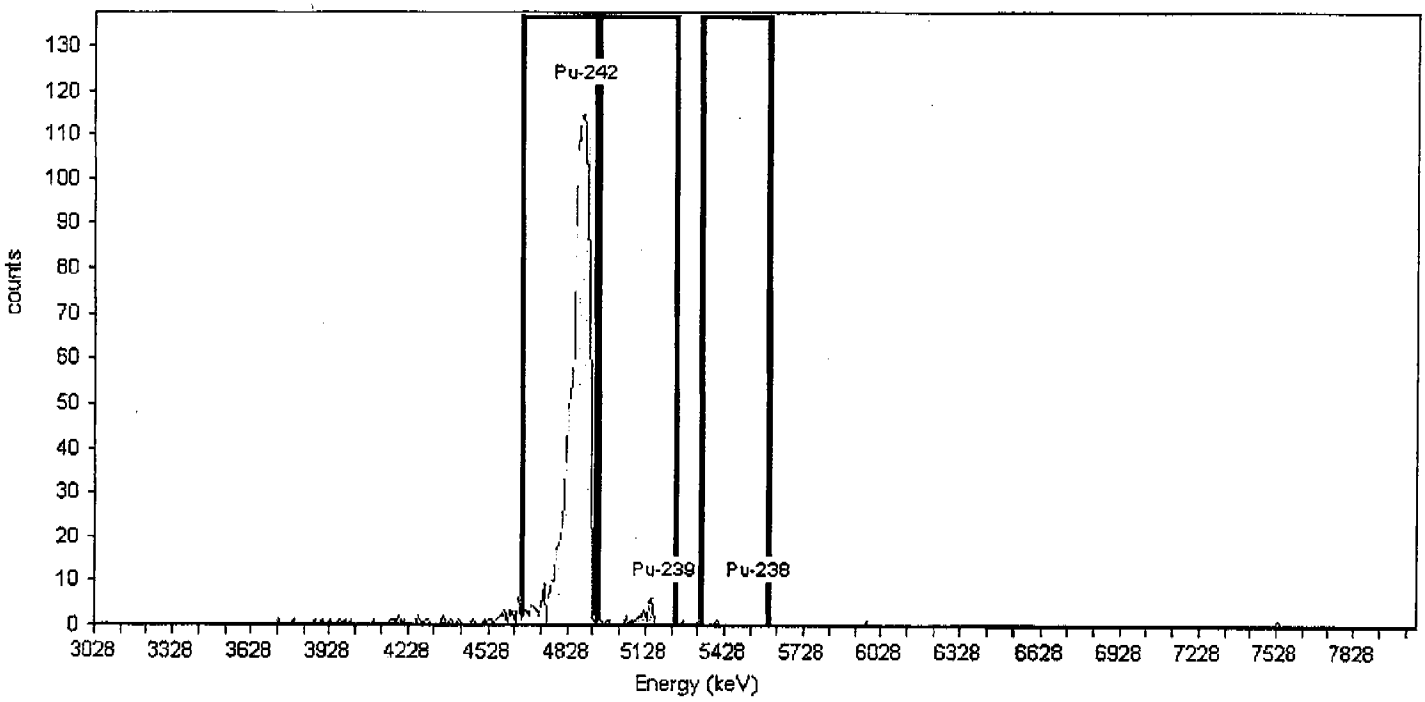
Energy Calibration: C08061042

Energy Cal: **Gain** = 9.8810 keV / Ch
Offset = 3,018.33 keV
Quadratic = 0.0000 keV / Ch^2

Tracer

Tracer Name: 846.3020.88 Pu-242
Tracer Activity: 20.00 DPM/mL x (Vol.)0.25 mL = 5.00 DPM

Tracer Nuclide: Pu-242
Tracer Recovery: 61.24%



Nuclide Summary (ROI)

Nuclide	Peak Energy keV	ROI Start keV	ROI End keV	FWHM keV	B.R. %.	Gross Counts	Bkgd Counts	Net Counts	Activity pCi/g	2.00Sigma TPU pCi/g	Critical Level pCi/g	MDA pCi/g
Pu-242	4886.0	4648.9	4935.4	67.5	100.5	973.02	8.02	965.00	**3.1E-001**	2.0E-002	3.4E-003	8.2E-003
Pu-239	5192.3	4945.3	5241.7	28.3	100.0	25.02	4.98	20.04	**1.0E-002**	5.8E-003	2.7E-003	6.8E-003
Pu-238	5548.0	5340.5	5597.4	24.2	100.0	1.00	1.00	0.00	**0.0E+000**	1.5E-003	1.2E-003	3.8E-003

Reviewed By: GB JP

Print Date: 6/13/2008 9:20:14AM

AlphaVision v5.3
Custom Report Iteration: 08/09/07

Paragon Analytics

Alpha-Spectroscopy Analysis Report

Sample

Sample: 0805078-2
Spectrum #1 Analysis #1

Sample Size : 4.50

Acquisition

Detector: 43
Batch Name: PAS080606-1_A
Nuclide Library: iso-Pu
Analysis Method: Absolute Interactive ROI Analysis
ROI Set: iso-Pu

Acquisition Start Date: 6/12/2008 4:25:47PM
Live Time: 1,000.00 min.
Real Time: 1,000.01 min.
Dead Time: 0.00 %

Calibration

Bkgd Info: Sample: B08061043; Det: 43; Spectrum #1; Jun-10-2008 14:13

Calibration Date: 6/10/2008 12:30:03PM

Efficiency Calibration: C08061043

Efficiency: 31.88% +/- 0.17% TPU(2 sigma)

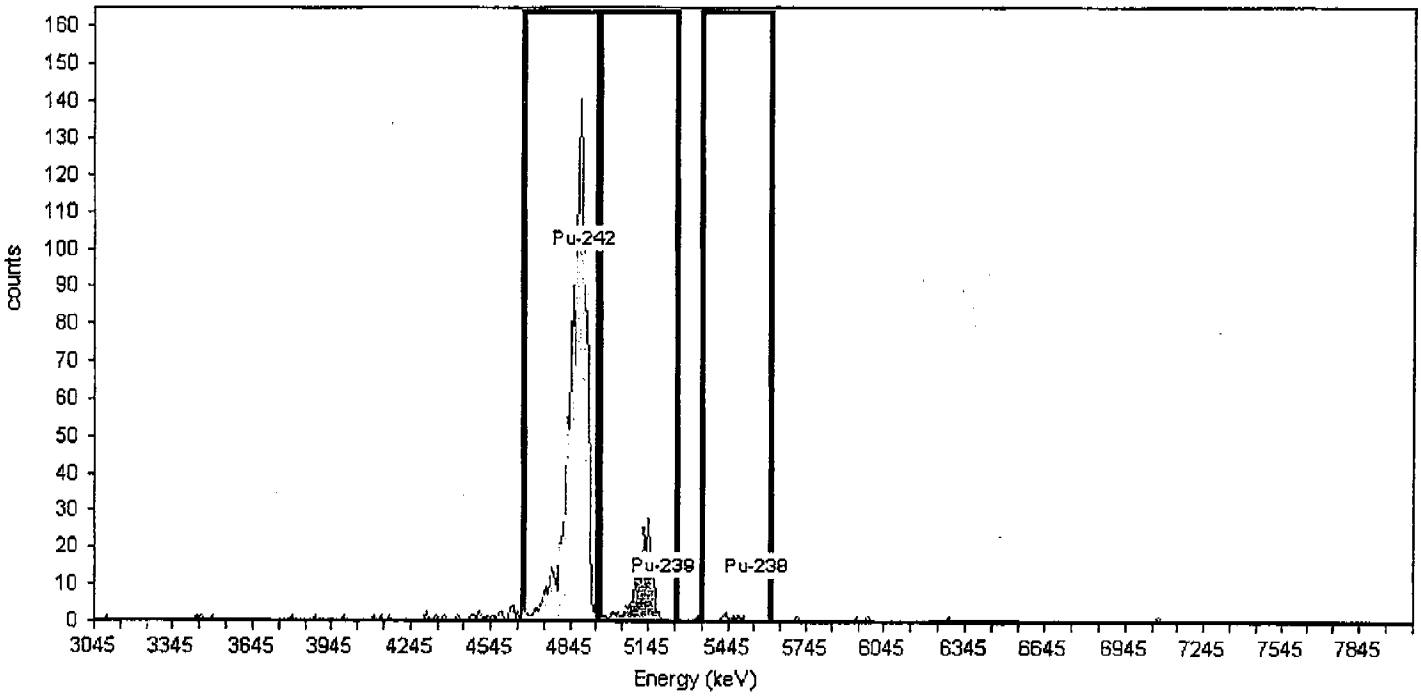
Energy Calibration: C08061043

Energy Cal: Gain = 9.8047 keV / Ch
Offset = 3,036.00 keV
Quadratic = 0.0000 keV / Ch^2

Tracer

Tracer Name: 846.3020.88 Pu-242
Tracer Activity: 20.00 DPM/mL x (Vol.)0.25 mL = 5.00 DPM

Tracer Nuclide: Pu-242
Tracer Recovery: 59.92%



Nuclide Summary (ROI)

Nuclide	Peak Energy keV	ROI Start keV	ROI End keV	FWHM keV	B.R. %.	Gross Counts	Bkgd Counts	Net Counts	Activity pCi/g	2.00Sigma TPU pCi/g	Critical Level pCi/g	MDA pCi/g
Pu-242	4898.9	4663.6	4947.9	68.0	100.5	961.00	1.00	960.00	3.0E-001	1.9E-002	1.2E-003	3.8E-003
Pu-239	5202.9	4957.7	5251.9	56.2	100.0	169.00	5.00	164.00	8.6E-002	1.7E-002	2.7E-003	6.9E-003
Pu-238	5555.8	5349.9	5604.8	21.9	100.0	6.00	1.00	5.00	2.6E-003	2.8E-003	1.2E-003	3.9E-003

Reviewed By: GB JP

Print Date: 6/13/2008 9:20:19AM

AlphaVision v5.3
Custom Report Iteration: 08/09/07

Paragon Analytics

Alpha-Spectroscopy Analysis Report

Sample

Sample: AS080606-1LCS
Spectrum #1 Analysis #1

Sample Size : 4.50

Acquisition

Detector: 46
Batch Name: PAS080606-1_A
Nuclide Library: iso-Pu
Analysis Method: Absolute ROI Analysis, Set Name = iso-Pu
ROI Set: iso-Pu

Acquisition Start Date: 6/12/2008 4:25:48PM
Live Time: 1,000.00 min.
Real Time: 1,000.01 min.
Dead Time: 0.00 %

Calibration

Bkgd Info: Sample: B08061046; Det: 46; Spectrum #1; Jun-10-2008 14:13

Calibration Date: 6/10/2008 12:30:51PM

Efficiency Calibration: C08061046

Efficiency: 30.95% +/- 0.15% TPU(2 sigma)

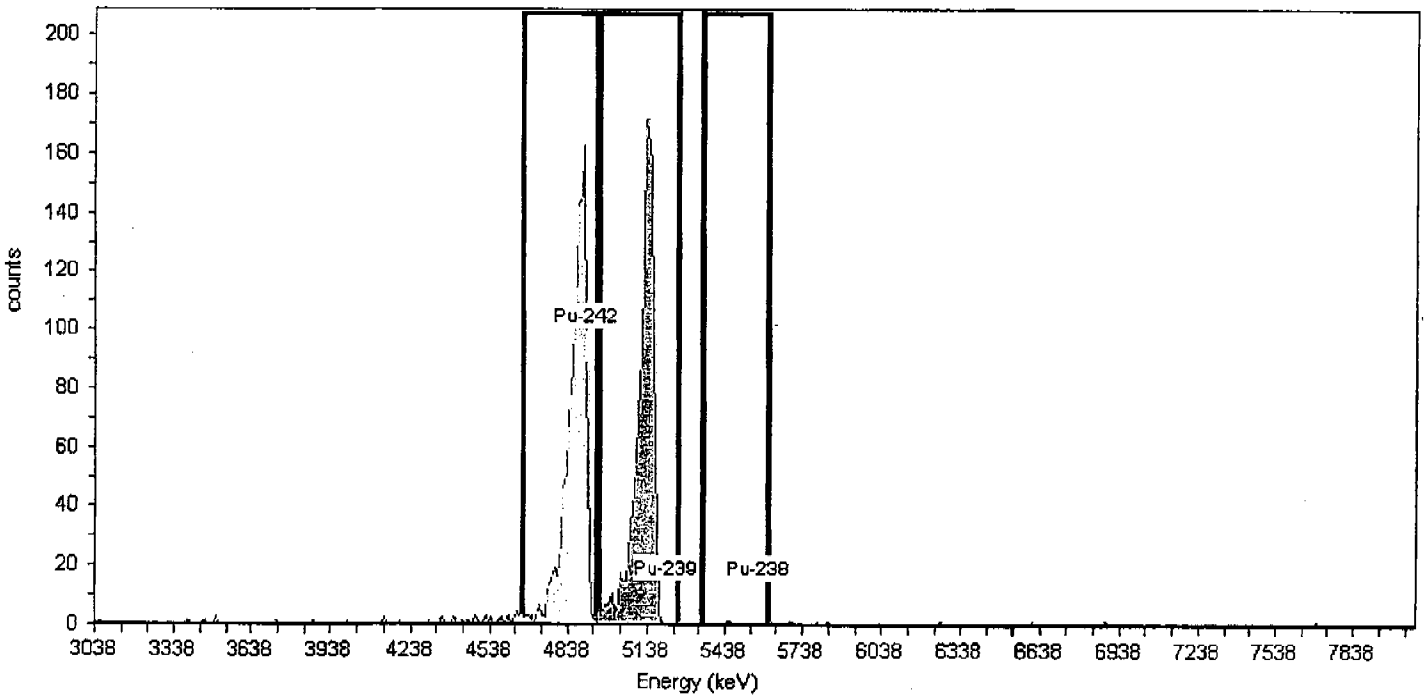
Energy Calibration: C08061046

Energy Cal: Gain = 9.8810 keV / Ch
Offset = 3,028.21 keV
Quadratic = 0.0000 keV / Ch^2

Tracer

Tracer Name: 846.3020.88 Pu-242
Tracer Activity: 20.00 DPM/mL x (Vol.)0.25 mL = 5.00 DPM

Tracer Nuclide: Pu-242
Tracer Recovery: 74.33%



Nuclide Summary (ROI)

Nuclide	Peak Energy keV	ROI Start keV	ROI End keV	FWHM keV	B.R. %.	Gross Counts	Bkgd Counts	Net Counts	Activity pCi/g	2.00Sigma TPU pCi/g	Critical Level pCi/g	MDA pCi/g
Pu-242	4895.7	4658.6	4945.1	62.1	100.5	1,157.00	1.00	1,156.00	3.7E-001	2.2E-002	1.0E-003	3.2E-003
Pu-239	5202.0	4955.0	5251.4	52.2	100.0	1,151.00	0.00	1,151.00	5.0E-001	6.5E-002	0.0E+000	1.2E-003
Pu-238	5557.7	5350.2	5607.1	164.6	100.0	2.00	1.00	1.00	4.4E-004	1.5E-003	1.0E-003	3.2E-003

Reviewed By: GB JP

Print Date: 6/13/2008 9:20:29AM

AlphaVision v5.3
Custom Report Iteration: 08/09/07

FORM 746r8.xls (10/2/07)

366027

Paragon Analytics

Alpha Spectrometer Instrument Run Log

Date: 6/12/08

Detector	Batch ID	Sample ID	Iso/Matrix	Duration	Initial
33	NAS080604-5_B	0805247-12	Np/S	90	JS
34	↓	↓ -12SYS	↓	↓	↓
35	↓	AS080604-5SYS	↓	↓	↓
36	↓	↓ -5MB	↓	↓	↓
37	↓	↓ -5LCS	↓	↓	↓
39	↓	↓ -5LCSD	↓	↓	↓
25	UAS080604-2_C	0805247-14	U/S	300	JS
26	↓	AS080604-2MB	↓	↓	↓
25	UAS080606-1_B	0805078-1	U/S	1000	JS
26	UAS080606-3_B	0806013-20	U/W	800	↓
27	↓	↓ -21	↓	↓	↓
28	↓	↓ -22	↓	↓	↓
29	↓	↓ -23	↓	↓	↓
30	↓	↓ -24	↓	↓	↓
31	↓	↓ -25	↓	↓	↓
32	↓	AS080606-3MB	↓	↓	↓
57	↓	↓ -3LCS	↓	↓	↓
58	↓	↓ -3LCSD	↓	↓	↓
59	TAS080606-2_A	0806013-16	Th/W	360	JS
60	↓	↓ -17	↓	↓	↓
61	↓	↓ -18	↓	↓	↓
62	↓	↓ -19	↓	↓	↓
63	↓	↓ -20	↓	↓	↓
64	↓	↓ -21	↓	↓	↓

Detector	Batch ID	Sample ID	Iso/Matrix	Duration	Initial
17	TAS080606-2_A	0806013-22	Th/W	360	JS
18	↓	↓ -23	↓	↓	↓
19	↓	↓ -24	↓	↓	↓
21	↓	↓ -25	↓	↓	↓
22	↓	AS080606-2MB	↓	↓	↓
23	↓	↓ -2LCS	↓	↓	↓
24	↓	↓ -2LCSD	↓	↓	↓
33	NAS080604-1_D	0805247-5	Np/S	360	NJS 6/12/08
34	↓	↓ -5SYS	↓	↓	↓
35	↓	↓ -6	↓	↓	↓
36	↓	↓ -6SYS	↓	↓	↓
37	↓	↓ -8	↓	↓	↓
39	↓	↓ -8SYS	↓	↓	↓
40	PAS080606-1_A	0805078-1	Pu/S	1000	JS
42	↓	↓ -1D	↓	↓	↓
43	↓	↓ -2	↓	↓	↓
45	↓	AS080606-1MB	↓	↓	↓
46	↓	↓ -1LCS	↓	↓	↓
1	AAS080606-1_A	0805078-1	1000 <-> Am/W		JS
2	↓	↓ -1D	↓	↓	↓
4	↓	↓ -2	↓	↓	↓
5	↓	AS080606-1MB	↓	↓	↓
6	↓	↓ -1LCS	↓	↓	↓
7	PAS080605-1_B	0805236-8	Pu/S	360	JS
8	NAS080605-4_B	0805248-15YS	Np/S	90	↓

Notes:

366058

Reviewed by: UB

Date: 6/13/08

27

PARAGON ANALYTICS
Radiochemistry Data Package

Section 6

QUALITY ASSURANCE SUMMARY REPORTS

6

Paragon Analytics

QUALITY ASSURANCE SUMMARY SHEET

PAR W.O. # / BATCH GENERIC
TEST Pu
METHOD PREP
SOP/REV (PREP) 778/R12
SOP/REV (ANAL)

Briefly document any QA or other problems or deviations associated with the analysis of samples. Problems could result from: log-in, color, odor, dilution, consistency, scheduling, equipment, or instrumentation, or may include documentation of minor deviations necessary due to unique DQO's or sample characteristics.

SR 5/23/08

SOP 778/12 step 8.1.9 states that, when analyzing for Pu, 4 extra 9N HCl rinses must be performed to remove any residual Th interferent from the chloride column. After running

PARAGON ANALYTICS
Radiochemistry Data Package

Section 7

LABORATORY

Radiochemistry Instrument Worksheet

nalytics

Prep Batch: AS080606-1

ure: PuISO

Analytical QASS / NCR? Y (N) NA

	QC Type	Init Aiq	Fin Aiq	Units	Report Units	Cnt 1 File	Cnt 1 Inst/Det	Cnt 1 Pos Chk By	Cnt 2 File	Cnt 2 Inst/Det	Cnt 2 Pos Chk By	Cnt 3 File	Cnt 3 Inst/Det	Cnt 3 Pos Chk By	Notes
	SMP	4.5173	4.5173	g	pCi/g	_50781	40	GB	_50781			50781		A	
	DUP	4.5126	4.5126	g	pCi/g	_50781D	42		_50781D			_50781D			
	SMP	4.5434	4.5434	g	pCi/g	_50782	43		_50782			_50782			
t	MB	4.53035	4.5304	g	pCi/g	_6061B	45		_6061B			_6061B			
1	LCS	4.53035	4.5304	g	pCi/g	_6061L	46		_6061L			_6061L GB 6/13/08			GB 6/12/08

Tracer/Carrier Solution Information

	SolnID	Prep Conc	Units	Prep Date	Aliquot	Units	Pipet ID
3	821.3020.61	19.995	DPM/ml	06/06/08	0.25	ml	AW016
	837.3020.90	19.750	DPM/ml	06/06/08	0.25	ml	AW016
	846.3020.88	19.997	DPM/ml	06/06/08	0.25	ml	AW016

Spike Solution Information

Soln #	Nuclide	SolnID	Prep Conc	Units	Prep Date	Aliquot	Units	Pipet ID
S1	AM-241	616.2382.92	19.836	DPM/ml	06/06/08	0.25	ml	AW016
S2	U-234	644.3020.52	19.838	DPM/ml	06/06/08	0.25	ml	AW016
S2	U-235	644.3020.52	0.948	DPM/ml	06/06/08	0.25	ml	AW016
S2	U-238	844.3020.52	20.596	DPM/ml	06/06/08	0.25	ml	AW016
S3	Pu-239	819.3020.51	20.927	DPM/ml	06/06/08	0.25	ml	AW016

Paragon Analytics

Radiochemistry Prep Worksheet

Prep Batch: AS080606-1

Prep Procedure: PulSO

Reviewed By: cas CAS **Review Date:** 6/10/2008

Non-Routine Pre-Treatment? Y / (N) **Batch:** N/A **Re-Prep?** Y / (N) **Batch:** N/A **Prep QASS / NCR?** (Y) / N 357739

Prep SOP: PAI 778 **Rev:** 12
Prep SOP: NONE
Matrix Class: solid

Prep Analyst: Crystal Shaeffer
Prep Date: 6/6/2008
Prep Dept: AP

Balance: 27
Balance:

Samp Num	Prep Num	LabID	QC Type	Dish No.	Init Aliq g	Fin Aliq g	Prep Basis	Micro Init	Micro Date	Standards	Prep Notes
1	1	0805078-1	SMP		4.5173	4.5173	As Received	CAS	6/11/08	T1,T2,T3	CAS 6/10/08
2	1	0805078-1	DUP		4.5126	4.5126	As Received			T1,T2,T3	
3	1	0805078-2	SMP		4.5434	4.5434	As Received			T1,T2,T3	
4	1	AS080606-1	MB		4.53035	4.53035	As Received			T1,T2,T3	
5	1	AS080606-1	LCS		4.53035	4.53035	As Received			S1,S2,S3,T1,T2,T3	

Comments

Samples were muffled for 4 hours at 600C. A PEG treatment was performed on all samples. Due to low detection limits, an increased aliquot of ~4.5g was taken for all samples.

Spiked By: Tambrae Elhart **Date:** 6/6/2008

Witnessed By: Crystal Shaeffer **Date:** 6/6/2008

Tracer/Carrier Solution Information

Soln #	Nuclide	SolnID	Prep Conc	Units	Prep Date	Aliquot	Units	Pipet ID
T1	Am-243	821.3020.61	19.995	DPM/ml	06/06/08	0.25	ml	AW016
T2	U-232	837.3020.90	19.750	DPM/ml	06/06/08	0.25	ml	AW016
T3	Pu-242	846.3020.88	19.997	DPM/ml	06/06/08	0.25	ml	AW016

Spike Solution Information

Soln #	Nuclide	SolnID	Prep Conc	Units	Prep Date	Aliquot	Units	Pipet ID
S1	AM-241	616.2382.92	19.836	DPM/ml	06/06/08	0.25	ml	AW016
S2	U-234	644.3020.52	19.836	DPM/ml	06/06/08	0.25	ml	AW016
S2	U-235	644.3020.52	0.948	DPM/ml	06/06/08	0.25	ml	AW016
S2	U-238	644.3020.52	20.596	DPM/ml	06/06/08	0.25	ml	AW016
S3	Pu-239	819.3020.51	20.927	DPM/ml	06/06/08	0.25	ml	AW016

Prep Worksheet

Prep Batch: AS080608-1

ot Validated!!!

Reviewed By: Review Date:

N Batch: _____ Prep QASS / NCR? Y / N _____

> Balance: 27

Balance:

Standards	Prep Notes
T1,T2,T3	
T1,T2,T3	
T1,T2,T3	
T1,T2,T3	
S1,S2,S3,T1,T2,T3	

w detection limits, an increased aliquot of ~4.5g was taken for all samples.

Spike Solution Information

Nuclide	SolnID	Prep Conc	Units	Prep Date	Aliquot	Units	Pipet ID
AM-241	616.2382.92	19.836	DPM/ml	06/06/08	0.25	ml	AW016
U-234	644.3020.52	19.836	DPM/ml	06/06/08	0.25	ml	AW016
U-235	644.3020.52	0.948	DPM/ml	06/06/08	0.25	ml	AW016
U-238	644.3020.52	20.596	DPM/ml	06/06/08	0.25	ml	AW016
Pu-239	819.3020.51	20.927	DPM/ml	06/06/08	0.25	ml	AW016

10/8/08
1/13/09
10/11/08

Supersedes: NA

PARAGON ANALYTICS
Radiochemistry Data Package

Section 8

STANDARDS TRACEABILITY DOCUMENTS

8

Prepare a working dilution of approximately 20 dpm/ml from RSD # 846

1) Calculate Density of 3 M HNO_3 Diluent bal. 12
Mass of 100 ml vol. flask. 66.4359 g
Mass of flask and 100 ml 3M HNO_3 175.7312 g
Mass of 100 ml 3 M HNO_3 : 109.2953
ρ = 1.093 g/ml

2) Transfer Ampule #846 to 500 ml Nalgene bal. 12
Mass of Nalgene (No lid) 46.8610 g
Mass of Ampule, Std, 50 ml beaker 38.5810 g
Mass of empty Ampule, + 50 ml beaker 33.1178 g
Net Mass of Std. transferred 5.4632 g

3) Dilute to final Vol w/ 3 N HNO_3
Mass of bottle (No lid) (from above) 46.8610 g
Mass of bottle, Std., + 3 N HNO_3 518.23 g bal. 26
Net Mass of final std. 471.369 g

4) Final Activity Calculation.

$$\frac{\left(26.31\ \frac{Bq}{g}\right)\cdot\left(60\ \frac{dpm}{Bq}\right)\cdot\left(5.4632\ g\right)\left(1.093\ \frac{g}{ml}\right)}{471.369\ g} = \cancel{20.00}\ 19.9976\ dpm/ml$$

MC 1/14/08

MC 1/14/08

Stnd ID: 846.3020.88

MC 1/14/08

Description: Pu-242
Expiration: 12/3/2008
Activity: 20.00 dpm/mL

2s Uncertainty: 0.14 dpm/mL
Ref. Date: 6/7/1994
Ref Time: 0.417
Prep Date: 12/3/2007 Prep by: JD
Matrix/Comp. 3 M HNO3
Half Life (y): 3.74E+05

MC 1/14/08

Reverification Log		
Analysis Date	Initials	Expiration Date

MC 1/14/08

Continued on Page

Read and Understood By

Signed 12/3/07 Date

Signed 1/14/08 Date

National Institute of Standards & Technology

Certificate

Standard Reference Material 4334H

RSO # 4416 57

Recommended Procedure for Opening the SRM Ampoule

1) If the SRM solution is to be diluted, it is recommended that the diluting solution have a composition comparable to that of the SRM solution.

2) Wear eye protection, gloves, and protective clothing and work over a tray with absorbent paper in it. Work in a fume hood. In addition to the radioactive material, the solution contains strong acid and is corrosive.

3) Shake the ampoule to wet all of the inside surface of the ampoule. Return the ampoule to the upright position.

4) Check that all of the liquid has drained out of the neck of the ampoule. If necessary, gently tap the neck to speed the process.

5) Holding the ampoule upright, score the narrowest part of the neck with a scribe or diamond pencil.

6) Lightly wet the scored line. This reduces the crack propagation velocity and makes for a cleaner break.

7) Hold the ampoule upright with a paper towel, a wiper, or a support jig. Position the scored line away from you. Using a paper towel or wiper to avoid contamination, snap off the top of the ampoule by pressing the narrowest part of the neck away from you while pulling the tip of the ampoule towards you.

8) Transfer the solution from the ampoule using a pycnometer or a pipet with dispenser handle. NEVER PIPETTE BY MOUTH.

9) Seal any unused SRM solution in a flame-sealed glass ampoule, if possible, to minimize the evaporation loss.

See also reference [4]*.

*Notes and references are on pages 5 to 7.

PROPERTIES OF SRM 4334H

Certified values

Radionuclide	**Plutonium-242**
Reference time	**1200 EST, 07 June 1994 [b]***
Massic activity of the solution [c]	**26.31 Bq·g^{-1}**
Relative expanded uncertainty (k=2)	**0.72%** [d] [e]
Solution density	**(1.105 ± 0.002) g·mL^{-1} at 20 °C** [f]

Uncertified values

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 mass	Approximately 5.5 g		
Chemical Properties:			
Solution composition	Chemical Formula	Concentration (mol·L^{-1})	Mass Fraction (g·g^{-1})
	H_2O HNO_3 $^{242}Pu^{+6}$	50 3.2 8×10^{-7}	0.81 0.19 2×10^{-7}
Radiological Properties:			
Alpha-particle-emitting impurities	None detected [g] [h]. See table on page 5.		
Beta-particle-emitting impurities	Plutonium-241: (0.092 ± 0.018) Bq·g^{-1} [f] [h]		
Photon-emitting impurities	None detected [i]		
Half lives used	Plutonium-242: (373 500 ± 1100) a [j] [5] Plutonium-241: (14.35 ± 0.10) a [j] [5] Americium-241: (432.2 ± 0.7) a [j] [5]		
Calibration method and measuring instrument(s)	Three 4πα liquid-scintillation counters, a calibrated germanium detector system, and a silicon surface-barrier detector		

*Notes and references are on pages 5 to 7.

EVALUATION OF THE UNCERTAINTY OF THE MASSIC ACTIVITY [d] [e]*

Input Quantity x_i, the source of uncertainty (and individual uncertainty components where appropriate)	Method Used To Evaluate $u(x_i)$, the standard uncertainty of x_i (A) denotes evaluation by statistical methods (B) denotes evaluation by other methods	Relative Uncertainty Of Input Quantity, $u(x_i)/x_i$, (%) [k]	Relative Sensitivity Factor, $\lvert\partial y/\partial x_i\rvert \cdot (x_i/y)$ [m]	Relative Uncertainty Of Output Quantity, $u_i(y)/y$, (%) [n]
Massic alpha-particle emission rate, corrected for background and decay	Standard deviation of the mean for 80 sets of $4\pi\alpha$ liquid-scintillation measurements (A)	0.05	1.0	0.05
Half life of Pu-242	Standard uncertainty of the half life (A)	0.32 [p]	0.00001 [q]	0.000003
Decay-scheme data	Standard uncertainty of the probability of decay by alpha-particle emission (A)	0.001	1.0	0.001
Extrapolation of alpha-particle-count-rate-versus-energy to zero energy	Estimated (B)	0.25	1.0	0.25
Gravimetric measurements	Estimated (B)	0.10	1.0	0.10
Live time [r]	Estimated (B)	0.10	1.0	0.10
Alpha-particle detection efficiency of scintillators	Estimated (B)	0.15	1.0	0.15
Alpha-particle-emitting impurities	Limit of detection (B) [s]	100.	0.001	0.10
Photon-emitting impurities	Limit of detection (B) [s]	100.	0.001	0.10
Relative Combined Standard Uncertainty of the Output Quantity, $u_c(y)/y$, (%)				0.36
Coverage Factor, k				x 2
Relative Expanded Uncertainty of the Output Quantity, U/y, (%)				0.72

*Notes and references are on pages 5 to 7.

RELATIVE ACTIVITIES OF RADIONUCLIDIC IMPURITIES AT THE REFERENCE TIME [b]

Radionuclide	Half-Life (years) [j] [5]	Relative Activity As Determined By	
		LLNL	NIST
Plutonium-242	373 500 ± 1100	1.000 000	1.000 000
Plutonium-241	14.35 ± 0.10	- -	0.0035 ± 0.0004 [t]
Plutonium-240	6 564 ± 11	$^{239}Pu + ^{240}Pu$ <0.000 001 [u]	$^{239}Pu + ^{240}Pu$ 0.000 020 ± 0.000 021 [v]
Plutonium-239	24 110 ± 30		
Plutonium-238	87.7 ± 0.1	$^{238}Pu + ^{241}Am$ <0.000 016 [u]	0.000 009 ± 0.000 016 [v]
Americium-241	432.2 ± 0.7		0.000 000 assumed [t]

NOTES

[r] The Sievert is the SI unit for dose equivalent. See reference [1]. One μSv is equal to 0.1 mrem.

[e] The value of each component of combined standard uncertainty, and hence the value of the expanded uncertainty itself, is a best estimate based upon all available information, but is only approximately known. That is to say, the "uncertainty of the uncertainty" is large and not well known. This is true for uncertainties evaluated by statistical methods (e.g., the relative standard deviation of the standard deviation of the mean for the massic response is approximately 50%) and for uncertainties evaluated by other methods (which could easily be over estimated or under estimated by substantial amounts). The unknown value of the expanded uncertainty is believed to lie in the interval $U/2$ to $2U$ (i.e., within a factor of 2 of the estimated value)

[p] The relative standard uncertainty of $\lambda \cdot t$ is determined by the relative standard uncertainty of λ (i.e., of the half life). The relative standard uncertainty of t is negligible.

[q] $|\partial y/\partial x_i| \cdot (x_i/y) = |\lambda \cdot t|$

PROJECT 819.3020.51 Pu-239 Notebook No. 3020

Continued From Page

Prepare a working level dilution of Pu-239 at approximately 20 dpm/mL by diluting ampoule 819 in 18% HNO_3 (2.88M HNO_3)

① Determine the density of 2.88M HNO_3

Mass of empty 100mL class A volumetric flask: 68.5670 Bal 12

Mass of flask + 100mL 2.88M HNO_3: 177.9032

Net mass of 100mL 2.88M HNO_3: ~~109.365g~~ 109.336g RG 12/28/06

Lot # 063544 $\rho = 1.09\cancel{4}3$ g/mL RG 12/28/06

② Transfer contents of ampoule 819 to a 1L poly bottle

Mass of nalgene bottle w/o lid: 74.7623g Bal 12

Mass of bottle + standard: 80.0108g

Net mass of standard transferred: 5.2485g

③ Dilute with 2.88M HNO_3

Mass of nalgene bottle w/o lid (above): 74.7623g Bal 12

Mass of bottle, standard + 2.88M HNO_3: 720.0g Bal 26

Net mass of standard + 2.88M HNO_3: 645.2377g

④ Final Activity Calculation

$$\frac{(39.24\ Bq/g)(60\ dpm/Bq)(5.2485g)(1.09\cancel{4}3\ g/mL)}{645.2377g} = \cancel{20.95\ dpm/mL}$$

RG 12/28/06

RG 12/28/06 $\boxed{20.93\ dpm/mL}$

RG 12/29/06

Stnd ID: 819.3020.51

Description: Pu-239

Expiration: 11/30/2007

Activity: 20.93 dpm/mL

2s Uncertainty: 0.14 dpm/mL

Ref. Date: 11/15/1999

Ref Time: N/A

Prep Date: 11/28/2006 Prep by: AB

Matrix/Comp. 2.88M HNO3

Half Life (y): 2.41E+04

RG 12/29/06

RG 12/29/06

Reverification Log		
Analysis Date	Initials	Expiration Date
10/11/07	MC	10/11/08

RG 12/29/06

Continued on Page

Read and Understood By

A Barlage 12/14/06 Renee Gallegos 12/28/06

Signed Date Signed Date

RSO # 819 Rec'd 7/3/06 JVB

National Institute of Standards & Technology

Certificate

Standard Reference Material 4330B
Plutonium-239 Radioactivity Standard

This Standard Reference Material (SRM) consists of radioactive plutonium-239 nitrate and nitric acid

Recommended Procedure for Opening the SRM Ampoule

1) If the SRM solution is to be diluted, it is recommended that the diluting solution have a composition comparable to that of the SRM solution.

2) Wear eye protection, gloves, and protective clothing and work over a tray with absorbent paper in it. Work in a fume hood. In addition to the radioactive material, the solution contains strong acid and is corrosive.

3) Shake the ampoule to wet all of the inside surface of the ampoule. Return the ampoule to the upright position.

4) Check that all of the liquid has drained out of the neck of the ampoule. If necessary, gently tap the neck to speed the process.

5) Holding the ampoule upright, score the narrowest part of the neck with a scribe or diamond pencil.

6) Lightly wet the scored line. This reduces the crack propagation velocity and makes for a cleaner break.

7) Hold the ampoule upright with a paper towel, a wiper, or a support jig. Position the scored line away from you. Using a paper towel or wiper to avoid contamination, snap off the top of the ampoule by pressing the narrowest part of the neck away from you while pulling the tip of the ampoule towards you.

8) Transfer the solution from the ampoule using a pycnometer or a pipet with dispenser handle. NEVER PIPETTE BY MOUTH.

9) Seal any unused SRM solution in a flame-sealed glass ampoule, if possible, to minimize the evaporation loss.

See also reference [4]*.

*Notes and references are on pages 5 and 6.

PROPERTIES OF SRM 4330B

Certified values

Radionuclide	**Plutonium-239**
Reference time	**1200 EST, 15 November 1999**
Massic activity of the solution [b]*	**39.24 $Bq \cdot g^{-1}$**
Relative expanded uncertainty (k=2)	**0.68%** [c] [d]
Solution density	**(1.101 ± 0.002) $g \cdot mL^{-1}$ at 21.4 °C** [e]

Uncertified values

Physical Properties:		
Source description	Liquid in flame-sealed NIST borosilicate-glass ampoule	
Ampoule specifications	Body outside diameter	(16.5 ± 0.5) mm
	Wall thickness	(0.60 ± 0.04) mm
	Barium content	Less than 2.5%
	Lead-oxide content	Less than 0.02%
	Other heavy elements	Trace quantities
Solution mass	Approximately 5.5 grams	
Chemical Properties:		

EVALUATION OF THE UNCERTAINTY OF THE MASSIC ACTIVITY [c] [d]*

Input Quantity x_i, the source of uncertainty (and individual uncertainty components where appropriate)	Method Used To Evaluate $u(x_i)$, the standard uncertainty of x_i (A) denotes evaluation by statistical methods (B) denotes evaluation by other methods	Relative Uncertainty Of Input Quantity, $u(x_i)/x_i$, (%) [i]	Relative Sensitivity Factor, $\lvert \partial y/\partial x_i \rvert \cdot (x_i/y)$ [j]	Relative Uncertainty Of Output Quantity, $u_i(y)/y$, (%) [k]
Massic alpha-particle emission rate, corrected for background and decay	Standard deviation of the mean for 18 sets of $4\pi\alpha$ liquid-scintillation measurements (A)	0.02	1.0	0.02
Half life of plutonium-239	Standard uncertainty of the half life (A)	0.11 [m]	0.0005 [n]	0.00005
Decay-scheme data	Standard uncertainty of the probability of decay by alpha-particle emission (A)	0.001	1.0	0.001
Gravimetric measurements	Estimated (B)	0.10	1.0	0.10
Live-time [p]	Estimated (B)	0.10	1.0	0.10
Alpha-particle detection efficiency of the liquid-scintillation counting systems [q]	Estimated (B)	0.27	1.0	0.27
Alpha-particle-emitting impurities	Limit of detection (B) [r]	100.	0.001	0.10
Photon-emitting impurities	Limit of detection (B) [r]	100.	0.001	0.10
Relative Combined Standard Uncertainty of the Output Quantity, $u_c(y)/y$, (%)				0.34
Coverage Factor, k				x 2
Relative Expanded Uncertainty of the Output Quantity, U/y, (%)				0.68

*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] **Massic activity** is the preferred name for the quantity activity divided by the total mass of the sample. See reference [1].

[c] 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, $u_i(y) = |\partial y/\partial x_i| \cdot u(x_i)$, 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].

[d] The value of each component of combined standard uncertainty, and hence the value of the expanded uncertainty itself, is a best estimate based upon all available information, but is only approximately known. That is to say, the "uncertainty of the uncertainty" is large and not well known. This is true for uncertainties evaluated by statistical methods (e.g., the relative standard deviation of the standard deviation of the mean for the massic count rate is approximately 50%) and for uncertainties evaluated by other methods (which could easily be over estimated or under estimated by substantial amounts). The unknown value of the expanded uncertainty is believed to lie in the interval $U/2$ to $2U$ (i.e., within a factor of 2 of the estimated value).

[e] The stated uncertainty is two times the standard uncertainty.

[f] Estimated limits of detection for alpha-particle-emitting impurities are:
0.04 $s^{-1} \cdot g^{-1}$ for energies less than 4.9 MeV and
0.001 $s^{-1} \cdot g^{-1}$ for energies greater than 5.2 MeV.
From mass-spectrometric measurements performed by the supplier, the massic activities of other detected radionuclides (in $Bq \cdot g^{-1}$ at the reference time) are:
^{240}Pu: 0.002; ^{241}Pu: ≈0.02; ^{242}Pu: ≈0.000003; ^{241}Am: ≈0.001
From the photon measurements below, we have ^{241}Am: ≤0.0006

[h] The stated uncertainty is the standard uncertainty.

[i] Relative standard uncertainty of the input quantity x_i.

[j] The relative change in the output quantity y divided by the relative change in the input quantity x_i. If $|\partial y/\partial x_i| \cdot (x_i/y) = 1.0$, then a 1% change in x_i results in a 1% change in y. If $|\partial y/\partial x_i| \cdot (x_i/y) = 0.05$, then a 1% change in x_i results in a 0.05% change in y.

[k] Relative component of combined standard uncertainty of output quantity y, rounded to two significant figures or less. The relative component of combined standard uncertainty of y is given by $u_i(y)/y \equiv |\partial y/\partial x_i| \cdot u(x_i)/y = |\partial y/\partial x_i| \cdot (x_i/y) \cdot u(x_i)/x_i$. The numerical values of $u(x_i)/x_i$, $|\partial y/\partial x_i| \cdot (x_i/y)$, and $u_i(y)/y$, all dimensionless quantities, are listed in columns 3, 4, and 5, respectively. Thus, the value in column 5 is equal to the value in column 4 multiplied by the value in column 3. The input quantities are independent, or very nearly so. Hence the covariances are zero or negligible.

[m] The relative standard uncertainty of $\lambda \cdot t$ is determined by the relative standard uncertainty of λ (i.e., of the half life). The relative standard uncertainty of t is negligible.

[n] $|\partial y/\partial x_i| \cdot (x_i/y) = |\lambda \cdot t|$

[p] The live time is determined by counting the pulses from a gated oscillator.

[q] Includes the uncertainty in the alpha-particle detection efficiency of the liquid-scintillation cocktail and the uncertainty associated with the finite detection threshold of the counting electronics.

[r] The standard uncertainty for each undetected impurity that might reasonably be expected to be present is estimated to be equal to the estimated limit of detection for that impurity, i.e. $u(x_i)/x_i = 100\%$. $|\partial y/\partial x_i| \cdot (x_i/y) = \{$(response per Bq of impurity)/(response per Bq of plutonium-239)$\} \cdot \{$(Bq of impurity)/(Bq of plutonium-239)$\}$. Thus $u_i(y)/y$ is the relative change in y if the impurity were present with a massic activity equal to the estimated limit of detection.

REFERENCES

[1] International Organization for Standardization (ISO), *ISO Standards Handbook - Quantities and Units*, 1993. Available from the American National Standards Institute, 11 West 42nd Street, New York, NY 10036, U.S.A. 1-212-642-4900.

[2] International Organization for Standardization (ISO), *Guide to the Expression of Uncertainty in Measurement*, 1993. Available from the American National Standards Institute, 11 West 42nd Street, New York, NY 10036, U.S.A. 1-212-642-4900. (Listed under ISO miscellaneous publications as "ISO Guide to the Expression 1993".)

[3] B. N. Taylor and C. E. Kuyatt, *Guidelines for Evaluating and Expressing the Uncertainty of NIST Measurement Results*, NIST Technical Note 1297, 1994. Available from the Superintendent of Documents, U.S. Government Printing Office, Washington, DC 20407, U.S.A.

[4] National Council on Radiation Protection and Measurements Report No. 58, *A Handbook of Radioactivity Measurements Procedures*, Second Edition, 1985. Available from the National Council on Radiation Protection and Measurements, 7910 Woodmont Avenue, Bethesda, MD 20814 U.S.A.

[5] Evaluated Nuclear Structure Data File (ENSDF), March 2000.

PARAGON ANALYTICS
Radiochemistry Data Package

Section 9

ADDITIONAL SUPPORTING DOCUMENTATION

9

Alpha Spectroscopy

Quality Control Data

Weekly Background, Energy, and Efficiency Calibrations

Calibration Data Summary

Laboratory Name: Paragon Analytics
PAI Work Order: 0805078

Prep SOP: PAI 778
Analytical SOP: PAI 714

Reported on: Friday, June 13, 2008
10:43:05 AM

Lab Sample ID Spectrum Analysis Date	QC Type	Batch ID Analysis Run	Test Name	Detector Id	Eff Spectrum Bkg Spectrum Egy Spectrum	Eff Date Bkg Date Egy Date	RESULTS %Efficiency Bkg CPM Energy keV	FLAGS Efficiency Background Energy	LCL %Efficiency Bkg CPM Energy keV	LWL %Efficiency Bkg CPM Energy keV	UWL %Efficiency Bkg CPM Energy keV	UCL %Efficiency Bkg CPM Energy keV
0805078-1	SMP	AS080606-1	PulSO	40	C08061040	6/10/2008	29.19	Pass	27.59	28.07	30.01	30.49
Spectrum #1		AS080606-1B			B08061040	6/10/2008	0.0130	Pass	0.0000	0.0100	0.1000	0.1500
6/12/2008					C08061040	6/10/2008	5555.8	Pass	5484.4	5494.4	5584.4	5594.4
0805078-1	DUP	AS080606-1	PulSO	42	C08061042	6/10/2008	31.36	Pass	29.90	30.42	32.52	33.04
Spectrum #1		AS080606-1B			B08061042	6/10/2008	0.0310	Pass	0.0000	0.0100	0.1000	0.1500
6/12/2008					C08061042	6/10/2008	5547.9	Pass	5493.9	5503.9	5583.9	5593.9
0805078-2	SMP	AS080606-1	PulSO	43	C08061043	6/10/2008	31.88	Pass	30.69	31.23	33.39	33.93
Spectrum #1		AS080606-1B			B08061043	6/10/2008	0.0190	Pass	0.0000	0.0100	0.1000	0.1500
6/12/2008					C08061043	6/10/2008	5546.0	Pass	5498.9	5508.9	5588.9	5598.9
AS080606-1	MB	AS080606-1	PulSO	45	C08061045	6/10/2008	31.68	Pass	29.72	30.24	32.32	32.84
Spectrum #1		AS080606-1B			B08061045	6/10/2008	0.0120	Pass	0.0000	0.0100	0.1000	0.1500
6/12/2008					C08061045	6/10/2008	5536.2	Pass	5497.9	5507.9	5587.9	5597.9
AS080606-1	LCS	AS080606-1	PulSO	46	C08061046	6/10/2008	30.95	Pass	29.25	29.76	31.82	32.33
Spectrum #1		AS080606-1B			B08061046	6/10/2008	0.0110	Pass	0.0000	0.0100	0.1000	0.1500
6/12/2008					C08061046	6/10/2008	5557.7	Pass	5498.1	5508.1	5588.1	5598.1

Data Package ID: *PU0805078-1*

Abbreviations:
Eff - Efficiency; Bkg - Background; LCL - Lower Control Limit; UWL - Upper Warning Limit
Egy - Energy; CPM - Counts per Minute; LWL - Lower Warning Limit; UCL - Upper Control Limit; CI - The Analysis Date exceeds the Calibration Date by more than 7 days.

Alpha Spec Calibration Source Re-Certification

Recalibration performed by Isotope Products Laboratories
Primary Certified Source
Source PA ID: 190
Planchet Label: 9
Recalibrated on: 5/1/2007
Received by PA on: 6/6/2007

Values from certificate	
Source ID:	92MIX223027
Total Activity:	3780.5962 dpm
Ref. Date:	5/1/07

Nuclide	Act (Bq)	Act (dpm)	Half-Life (yrs)	Decay Corrected
U-234:	49.91	2994.6	2.48E+05	2994.59 dpm
U-235:	1.10	65.94	7.04E+08	65.94 dpm
Am-241:	12.00	720	432.17	718.88 dpm
			TOTAL	3779.41 dpm

Efficiency Determination for Detector: 25

Source Serial#	PA ID	Sequential #	Count Date	Am-241 net cts	U-234 net cts	U-235 net cts	count dur (s)	Total cpm	Known dpm	Detector efficiency
92MIX223027	190	97-19-103-09	5/20/08	7113	29841	769	2100	1078.37	3779.41	28.53%

Sources 1 through 8 activity determination

Source Serial#	PA ID	Sequential #	Count Date	Am-241 net cts	U-234 net cts	U-235 net cts	count dur (s)	Detector Efficiency	Am-241 dpm	U-234 dpm	U-235 dpm	Combined dpm
92MIX2203028	182	97-19-103-01	5/20/08	12417	73989	1878	2100	28.53%	1243.88	7408.92	188.03	8818.33
92MIX2203026	183	97-19-103-02	5/20/08	14459	141741	3158	2100	28.53%	1447.86	14193.30	316.03	15957.19
92MIX2203024	184	97-19-103-03	5/20/08	68052	68294	1480	2100	28.53%	6814.15	6838.85	148.20	13801.00
92MIX2203021	185	97-19-103-04	5/20/08	20822	58470	1507	2100	28.53%	2085.02	5854.92	150.90	8090.85
92MIX2203025	186	97-19-103-05	5/20/08	94084	114792	2491	2100	28.53%	9421.18	11494.75	249.44	21165.34
92MIX2203022	187	97-19-103-06	5/20/08	71430	75877	1663	2100	28.53%	7152.65	7597.98	166.53	14917.18
92MIX2203023	188	97-19-103-07	5/20/08	41741	85445	1420	2100	28.53%	4179.76	5553.37	142.19	10875.31
92MIX2203029	189	97-19-103-08	5/20/08	31922	200052	4643	2100	28.53%	3196.52	20032.30	464.93	23693.76

Efficiency Verification

Source Serial#	PA ID	Sequential #	Count Date	Am-241 net cts	U-234 net cts	U-235 net cts	Count dur (s)	Total cpm	Known dpm	Detector efficiency	RPD	FLAG
92MIX223027	190	97-19-103-09	6/21/08	8067	29875	761	2100	1000.87	3779.41	26.22%	1.12%	PASS

Sources 1 through 8 activity re-verification

Source Serial#	PA ID	Sequential #	Combined Observed dpm	Combined Certified dpm*	Percent Difference %	Within 5% of Certified value?
92MIX2203028	182	97-19-103-01	8818.33	8867.05	-0.55%	Yes
92MIX2203026	183	97-19-103-02	15957.19	16011.39	-0.34%	Yes
92MIX2203024	184	97-19-103-03	13801.00	13588.11	0.09%	Yes
92MIX2203021	185	97-19-103-04	8090.85	8188.77	-1.20%	Yes
92MIX2203025	186	97-19-103-05	21165.34	21096.48	0.33%	Yes
92MIX2203022	187	97-19-103-06	14917.18	15382.14	-3.02%	Yes
92MIX2203023	188	97-19-103-07	10875.31	10781.46	0.87%	Yes
92MIX2203029	189	97-19-103-08	23693.76	23636.41	0.24%	Yes

* Certificate values decay corrected to the count date

Data from certificates

Reference Date	U-234 (Bq)	U-234 (dpm)	U-235 (Bq)	U-235 (dpm)	Am-241 (Bq)	Am-241 (dpm)
5/1/2003	124.10	7446.00	2.43	145.74	21.43	1285.80
5/1/2003	239.30	14358.00	4.20	252.00	23.55	1413.00
5/1/2003	119.40	7164.00	1.93	115.56	106.00	6360.00
4/1/2003	101.00	6060.00	1.26	75.64	34.50	2070.00
4/1/2003	203.00	12180.00	3.41	204.72	146.40	8784.00
4/1/2003	132.90	7974.00	3.17	189.96	121.30	7278.00
4/1/2003	107.10	6426.00	0.93	55.54	72.26	4335.60
5/1/2003	334.60	20068.00	6.55	393.18	53.02	3181.20

OK
MC
6/5/08

R:\INST\alphspec\Cal Recert\CLCRT052008

AlphaVision v5.3 **Alpha-Spectroscopy Calibration Report**

ORTEC
801 S. Illinois Ave.
Oak Ridge, TN 37830

Analyst: ORTEC
Detector: 25 190 98 5/21/08

9:19:16AM 5/21/2008

Calibration

Energy Calibration: RSO (Source 9)
Description:

Analysis Date: 5/20/2008 11:57:30AM
Calibration Type: Energy And Efficiency

Source Info

Certificate ID: A9 RSO#190
Prepared by: IPL
Description:

Certification Date: 6/1/2007 12:00:00PM

Acquisition

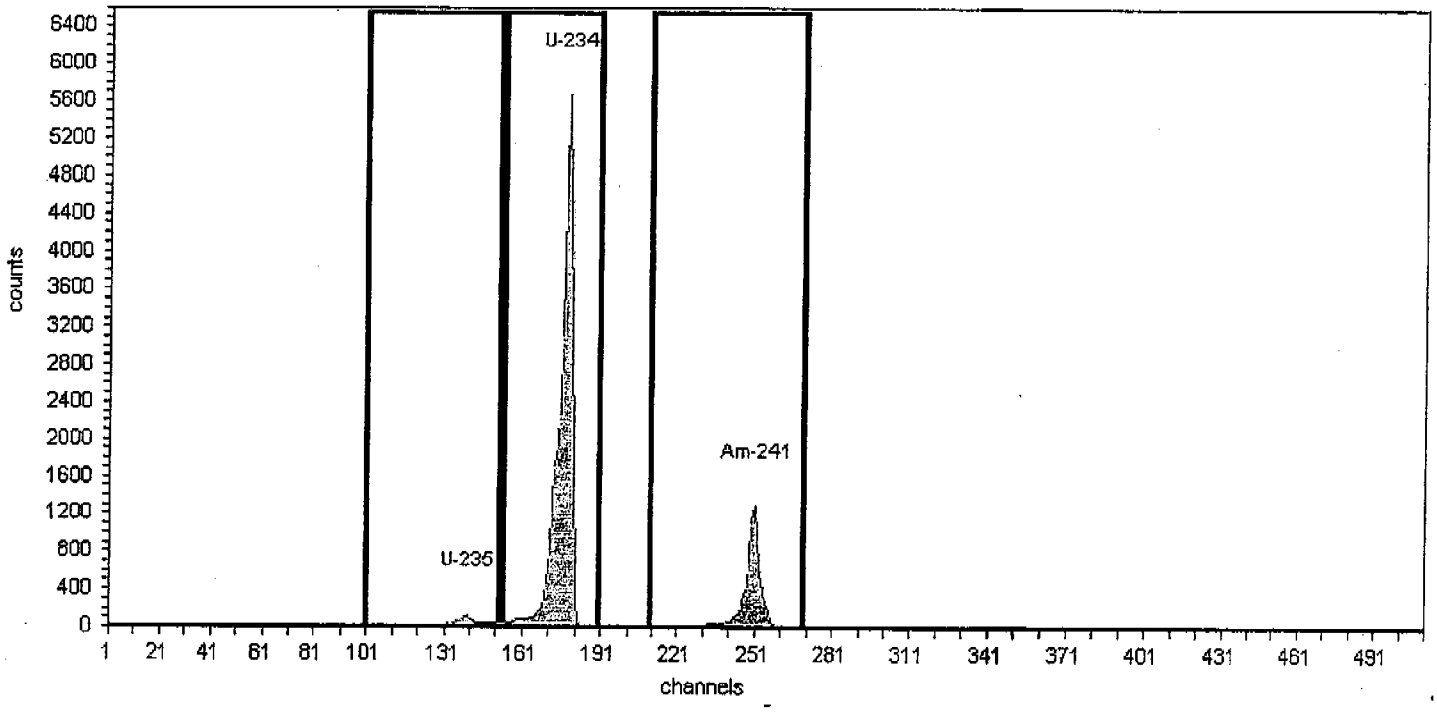
Detector: 25 , SN:
Acquisition Start Date: 5/20/2008 10:43:22AM

Live Time: 35.00 min.
Real Time: 35.01 min.

Efficiency Calibration Name: RSO (Source 9)

Energy Calibration Equation:
Gain = 9.8047 keV / Ch
Offset = 3,026.20 keV
Quadratic = 0.0000 keV / Ch^2

Efficiency: 28.47% +/- 0.30% TPU(2 sigma)



Method: Interactive ROI
Algorithm: Linear

Initial Calibration: No
Shelf: 1

Nuclide Activity Summary

Nuclide	Peak Channel	Peak Energy MeV	ROI Start Channel	ROI End Channel	Gross Counts	Net Count Rate (cpm)
U-235	140	4.40	100	152	789.00	22.54
U-234	178	4.78	153	190	29,841.00	852.60
Am-241	251	5.49	210	270	7,113.00	203.23

AlphaVision v5.3 **Alpha-Spectroscopy Calibration Report**

ORTEC
801 S. Illinois Ave.
Oak Ridge, TN 37830

Analyst: ORTEC
Detector: 25

9:19:22AM 5/21/2008

Calibration

Energy Calibration: RSO 182 (Source 1)
Description:

Analysis Date: 5/20/2008 12:25:48PM
Calibration Type: Energy And Efficiency

Source Info

Certificate ID: A1 RSO#182
Prepared by: IPL
Description:

Certification Date: 5/1/2003 12:00:45PM

Acquisition

Detector: 25 , SN:
Acquisition Start Date: 5/20/2008 11:35:12AM

Live Time: 35.00 min.
Real Time: 35.03 min.

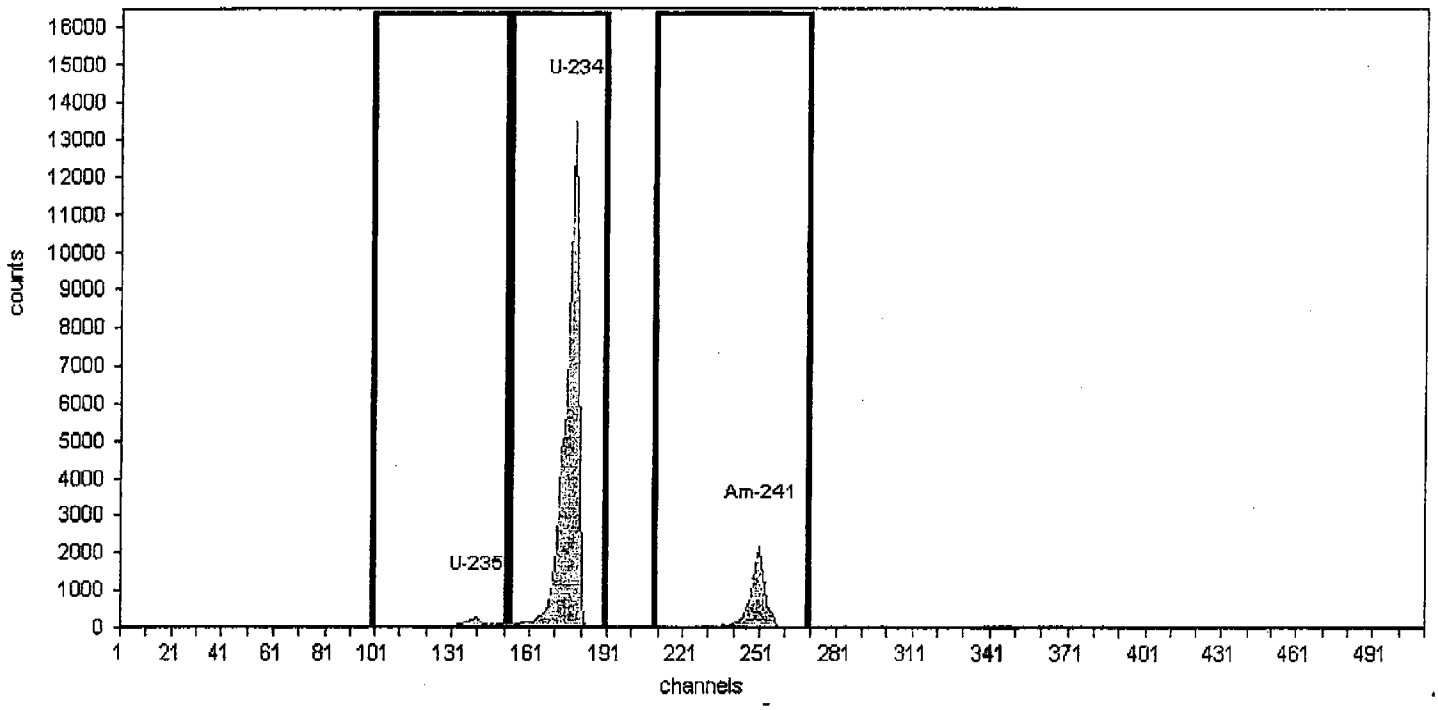
Efficiency Calibration Name: RSO 182 (Source 1)

Energy Calibration Equation:
Gain = 9.8047 keV / Ch

Offset = 3,026.20 keV

Quadratic = 0.0000 keV / Ch^2

Efficiency: 28.35% +/- 0.19% TPU(2 sigma)



Method: Interactive ROI
Algorithm: Linear

Initial Calibration: No
Shelf: 1

Nuclide Activity Summary

Nuclide	Peak Channel	Peak Energy MeV	ROI Start Channel	ROI End Channel	Gross Counts	Net Count Rate (cpm)
U-235	140	4.40	100	152	1,678.00	47.94
U-234	178	4.78	153	190	73,969.00	2,113.40
Am-241	251	5.49	210	270	12,417.00	354.77

AlphaVision v5.3 **Alpha-Spectroscopy Calibration Report**

ORTEC
801 S. Illinois Ave.
Oak Ridge, TN 37830
9:19:28AM 5/21/2008

Analyst: ORTEC
Detector: 25

Calibration

Energy Calibration: RSO 183 (Source 2)
Description:

Analysis Date: 5/20/2008 1:05:28PM
Calibration Type: Energy And Efficiency

Source Info

Certificate ID: A2 RSO#183
Prepared by: IPL
Description:

Certification Date: 5/1/2003 12:00:00PM

Acquisition

Detector: 25 , SN:
Acquisition Start Date: 5/20/2008 12:26:40PM

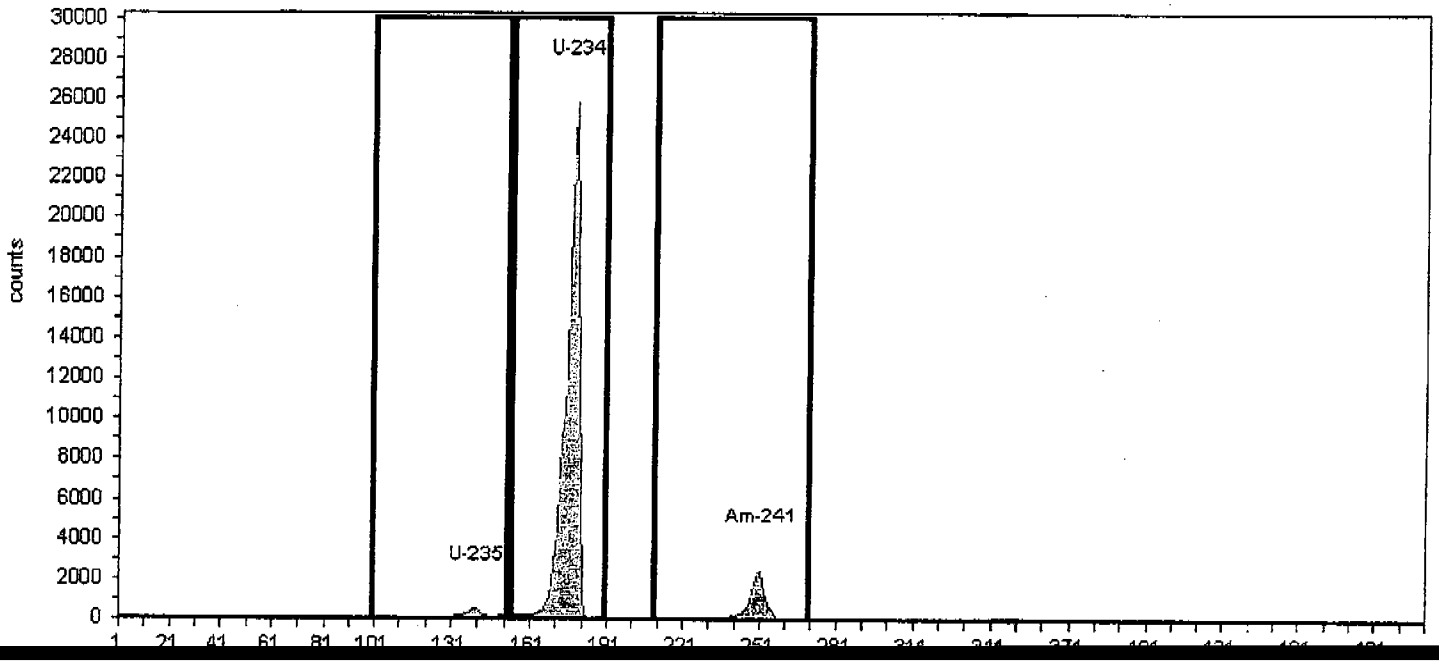
Live Time: 35.00 min.
Real Time: 35.05 min.

Efficiency Calibration Name: RSO 183 (Source 2)

Energy Calibration Equation:
Gain = 9.8047 keV / Ch

Offset = 3,026.20 keV
Quadratic = 0.0000 keV / Ch^2

Efficiency: 28.38% +/- 0.14% TPU(2 sigma)



AlphaVision v5.3

Alpha-Spectroscopy Calibration Report

ORTEC
801 S. Illinois Ave.
Oak Ridge, TN 37830

Analyst: ORTEC
Detector: 25

9:19:33AM 5/21/2008

Calibration

Energy Calibration: RSO 184 (Source 3)
Description:

Analysis Date: 5/20/2008 1:45:22PM
Calibration Type: Energy And Efficiency

Source Info

Certificate ID: A3 RSO#184
Prepared by: IPL
Description:

Certification Date: 5/1/2003 12:00:00PM

Acquisition

Detector: 25 , SN:
Acquisition Start Date: 5/20/2008 1:06:02PM
Live Time: 35.00 min.

Energy Calibration Equation:
Gain = 9.7289 keV / Ch
Offset = 3,043.84 keV

AlphaVision v5.3 **Alpha-Spectroscopy Calibration Report**

ORTEC
801 S. Illinois Ave.
Oak Ridge, TN 37830
9:21:31AM 5/21/2008

Analyst: ORTEC
Detector: 25

Calibration

Energy Calibration: RSO 185 (Source 4)
Description:

Analysis Date: 5/20/2008 2:41:04PM
Calibration Type: Energy And Efficiency

Source Info

Certificate ID: A4 RSO#185
Prepared by: IPL
Description:

Certification Date: 4/1/2003 12:00:00PM

Acquisition

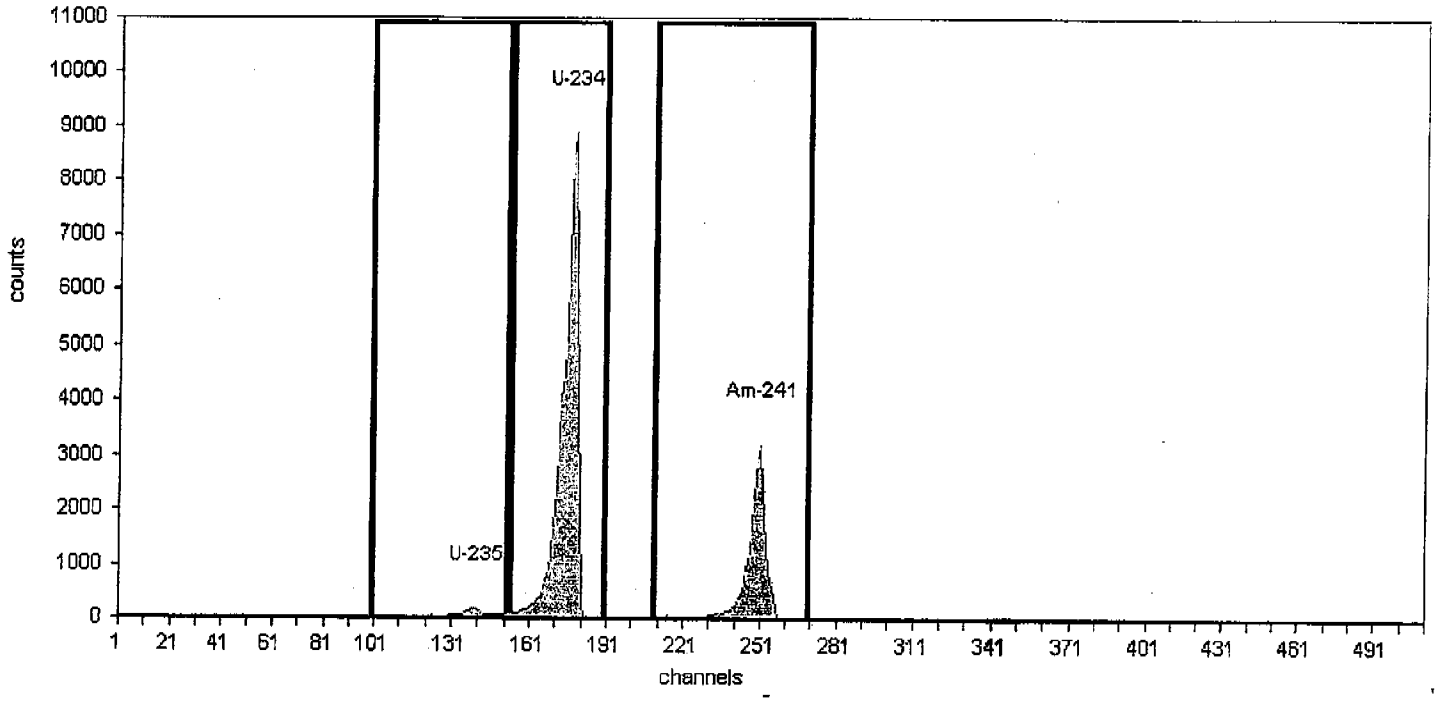
Detector: 25 , SN:
Acquisition Start Date: 5/20/2008 1:45:05PM

Live Time: 35.00 min.
Real Time: 35.02 min.

Efficiency Calibration Name: RSO 185 (Source 4)

Energy Calibration Equation:
Gain = 9.8047 keV / Ch
Offset = 3,026.20 keV
Quadratic = 0.0000 keV / Ch^2

Efficiency: 27.92% +/- 0.20% TPU(2 sigma)



Method: Interactive ROI
Algorithm: Linear

Initial Calibration: No
Shelf: 1

Nuclide Activity Summary

Nuclide	Peak Channel	Peak Energy MeV	ROI Start Channel	ROI End Channel	Gross Counts	Net Count Rate (cpm)
U-235	140	4.40	100	152	1,507.00	43.06
U-234	178	4.78	153	190	58,470.00	1,670.57
Am-241	251	5.49	210	270	20,822.00	594.91

AlphaVision v5.3 **Alpha-Spectroscopy Calibration Report**

ORTEC
801 S. Illinois Ave.
Oak Ridge, TN 37830
9:21:22AM 5/21/2008

Analyst: ORTEC
Detector: 25

Calibration

Energy Calibration: RSO 186 (Source 5)
Description:

Analysis Date: 5/20/2008 3:26:01PM
Calibration Type: Energy And Efficiency

Source Info

Certificate ID: A5 RSO#186
Prepared by: IPL
Description:

Certification Date: 4/1/2003 12:00:00PM

Acquisition

Detector: 25 , SN:
Acquisition Start Date: 5/20/2008 2:41:31PM

Live Time: 35.00 min.
Real Time: 35.06 min.

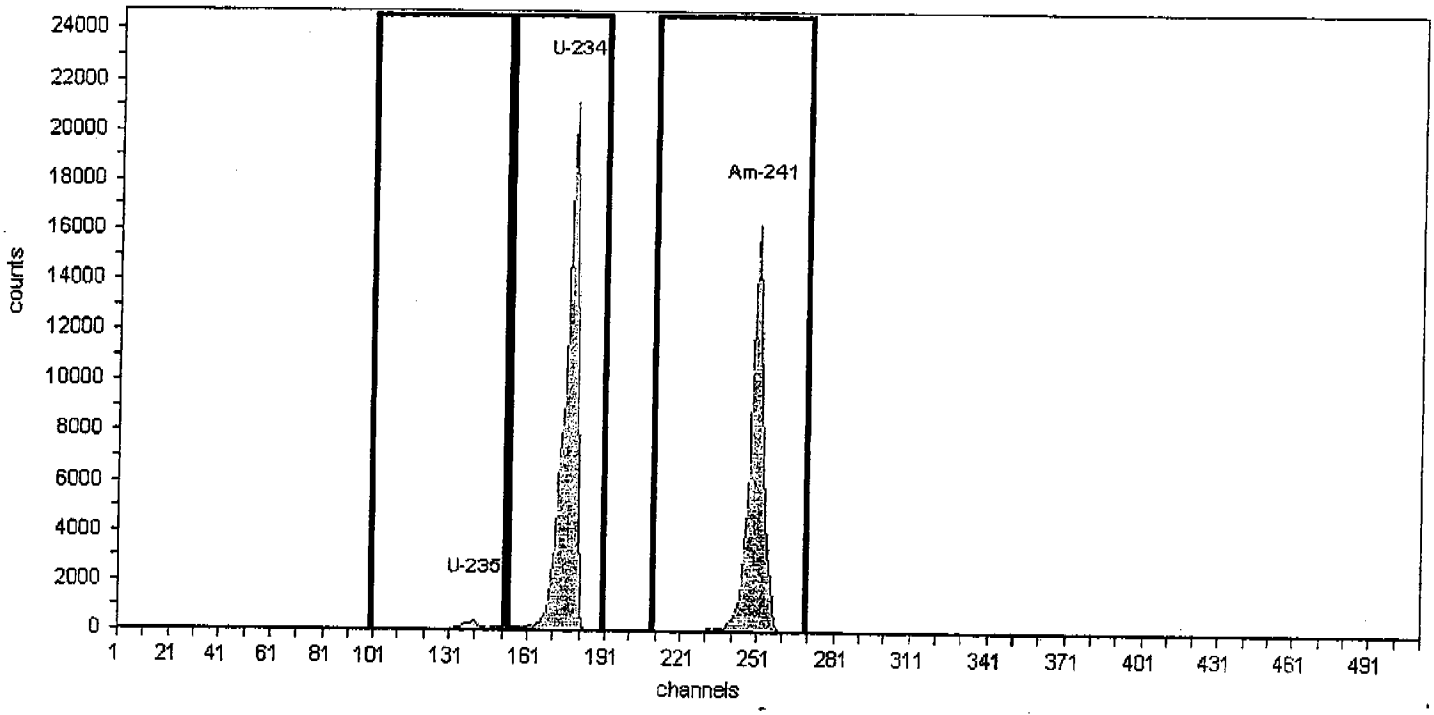
Efficiency Calibration Name: RSO 186 (Source 5)

Energy Calibration Equation:
Gain = 9.8047 keV / Ch

Offset = 3,026.20 keV

Quadratic = 0.0000 keV / Ch^2

Efficiency: 28.47% +/- 0.13% TPU(2 sigma)



Method: Interactive ROI
Algorithm: Linear

Initial Calibration: No
Shelf: 1

Nuclide Activity Summary

Nuclide	Peak Channel	Peak Energy MeV	ROI Start Channel	ROI End Channel	Gross Counts	Net Count Rate (cpm)
U-235	140	4.40	100	152	2,491.00	71.17
U-234	178	4.78	153	190	114,792.00	3,279.77
Am-241	251	5.49	210	270	94,084.00	2,688.11

AlphaVision v5.3

Analyst: ORTEC

Alpha-Spectroscopy Calibration Report

ORTEC
801 S. Illinois Ave.
Oak Ridge, TN 37830

AlphaVision v5.3

Alpha-Spectroscopy Calibration Report

ORTEC
801 S. Illinois Ave.
Oak Ridge, TN 37830

Analyst: ORTEC
Detector: 25

9:20:28AM 5/21/2008

Calibration

Energy Calibration: RSO 188 (Source 7)
Description:

Analysis Date: 5/20/2008 4:41:56PM
Calibration Type: Energy And Efficiency

Source Info

Certificate ID: A7 RSO#188
Prepared by: IPL
Description:

Certification Date: 4/1/2003 12:00:00PM

Acquisition

Detector: 25 , SN:
Acquisition Start Date: 5/20/2008 4:03:54PM

Live Time: 35.00 min.
Real Time: 35.03 min.

Efficiency Calibration Name: RSO 188 (Source 7)

Energy Calibration Equation:
Gain = 9.7289 keV / Ch
Offset = 3,043.84 keV
Quadratic = 0.0000 keV / Ch^2

AlphaVision v5.3 **Alpha-Spectroscopy Calibration Report**

ORTEC
801 S. Illinois Ave.
Oak Ridge, TN 37830
9:20:39AM 5/21/2008

Analyst: ORTEC
Detector: 25

Calibration

Energy Calibration: RSO 190 (Source 9)
Description:

Analysis Date: 5/21/2008 9:08:00AM
Calibration Type: Energy And Efficiency

Source Info

Certificate ID: A9 RSO#190
Prepared by: IPL
Description:

Certification Date: 6/1/2007 12:00:00PM

Acquisition

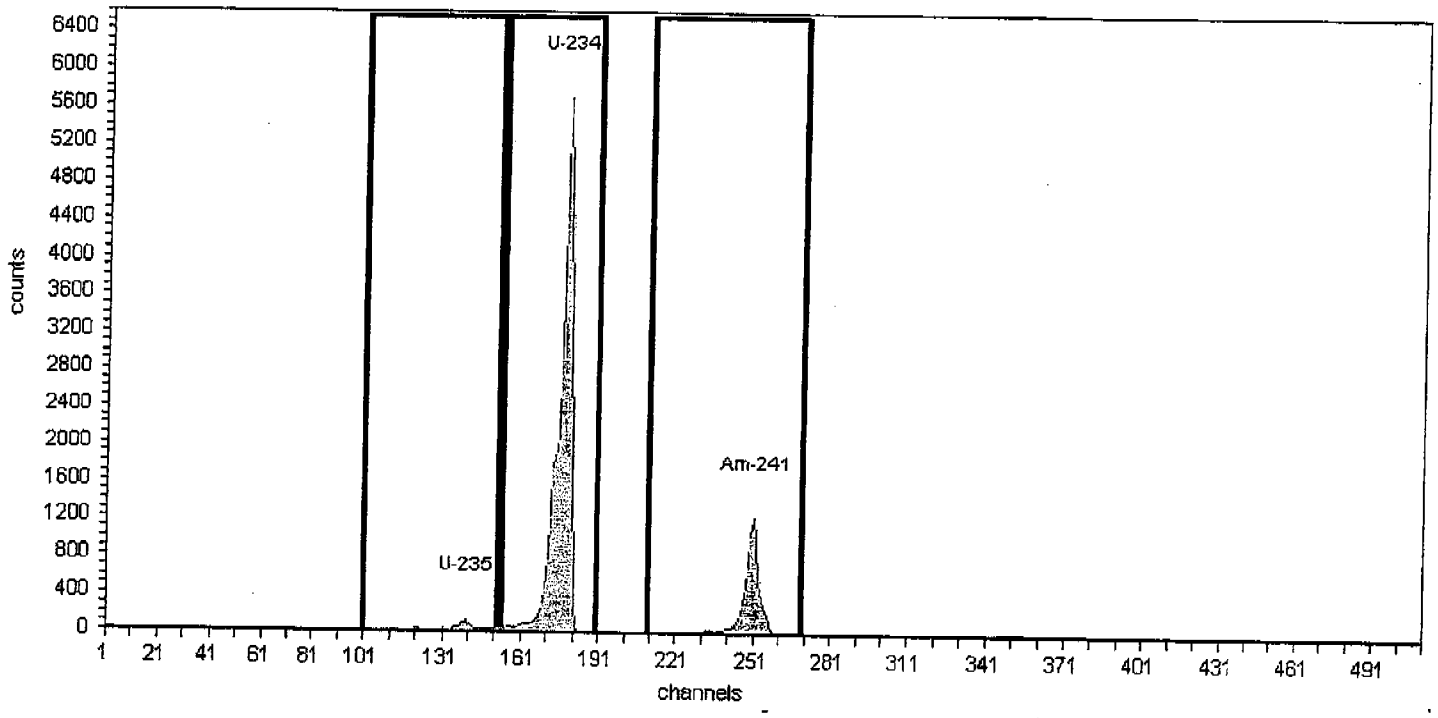
Detector: 25 , SN:
Acquisition Start Date: 5/21/2008 8:31:01AM

Live Time: 35.00 min.
Real Time: 35.01 min.

Efficiency Calibration Name: RSO 190 (Source 9)

Energy Calibration Equation:
Gain = 9.8047 keV / Ch
Offset = 3,026.20 keV
Quadratic = 0.0000 keV / Ch^2

Efficiency: 28.16% +/- 0.30% TPU(2 sigma)



Method: Interactive ROI
Algorithm: Linear

Initial Calibration: No
Shelf: 1

Nuclide Activity Summary

Nuclide	Peak Channel	Peak Energy MeV	ROI Start Channel	ROI End Channel	Gross Counts	Net Count Rate (cpm)
U-235	140	4.40	100	152	781.00	22.31
U-234	178	4.78	153	190	29,575.00	845.00
Am-241	251	5.49	210	270	6,967.00	199.06

Isotope Products Laboratories
An Eckert & Ziegler Company

24937 Avenue Tibbitts
Valencia, California 91355

Tel 661•309•1010
Fax 661•257•8303

[α] reverified 5/20/08
expires 5/20/09

PAI 187
recalibrated 4-15-03

CERTIFICATE OF CALIBRATION
MIXED ALPHA STANDARD SOURCE

Radionuclide A:	U-234	**Customer:**	PARAGON ANALYTICS, INC.
Radionuclide B:	U-235	**P.O. No.:**	EW040203/R2193
Radionuclide C:	Am-241	**Catalog No.:**	MISC-STD
Half Life (U-234):	(2.454 ± 0.006)E+05 years	**Reference Date:**	1-May-03 12:00 PST
Half Life (U-235):	(7.037 ± 0.011)E+08 years	**Source No.:**	92MIX2203026
Half Life (Am-241):	432.17 ± 0.66 years		

Contained Radioactivity:

U-234:	3.354	nCi	(124.1 Bq)	Am-241:	0.5793	nCi	(21.43 Bq)
U-235:	0.06566	nCi	(2.429 Bq)	Total Activity:	3.999	nCi	(148.0 Bq)

Physical description:

A. Capsule type:	Disk (22 mm OD X 0.79 mm THK)
B. Nature of active deposit:	Electrodeposited and diffusion bonded oxides
C. Active Diameter:	19 mm
D. Backing:	Stainless steel
E. Cover:	None

Radioimpurities: Not determined

Method of Calibration:

This source was assayed using a windowless internal gas flow proportional counter for total alpha activity. Individual nuclide ratios were taken from those determined in Mar 1998.

Uncertainty of Measurement:

A. Type A (random) uncertainty:	± 0.7%
B. Type B (systematic) uncertainty:	± 3.0%
C. Uncertainty in aliquot weighing:	± 0.0%
D. Total uncertainty at the 99% confidence level:	± 3.1%

Notes:

- See reverse side for leak test(s) performed on this source.
- IPL participates in a 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).
- Nuclear data was taken from "Table of Radioactive Isotopes", edited by Virginia Shirley, 1986.
- This source has a working life of 2 years.
- This source had a total alpha surface emission rate of 4483 α/min in 2π on 11 Apr 03.

Daniel James Van Dalsem
Quality Control

15-Apr-03
Date Signed

IPL Ref. No.: 987-7

Isotope Products Laboratories
An Eckert & Ziegler Company

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Valencia, California 91355

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α2 reverified 5/20/08
expires 5/20/09
PAI 183
recalibrated 4-15-03

CERTIFICATE OF CALIBRATION
MIXED ALPHA STANDARD SOURCE

Radionuclide A:	U-234	**Customer:**	PARAGON ANALYTICS, INC.
Radionuclide B:	U-235	**P.O. No.:**	EW040203/R2193
Radionuclide C:	Am-241	**Catalog No.:**	MISC-STD
Half Life (U-234):	(2.454 ± 0.006)E+05 years	**Reference Date:**	1-May-03 12:00 PST
Half Life (U-235):	(7.037 ± 0.011)E+08 years	**Source No.:**	92MIX2203028
Half Life (Am-241):	432.17 ± 0.66 years		

Contained Radioactivity:

U-234:	6.467	nCi	(239.3 Bq)	Am-241:	0.6366	nCi	(23.55 Bq)
U-235:	0.1135	nCi	(4.200 Bq)	Total Activity:	7.217	nCi	(267.1 Bq)

Physical description:

A. Capsule type:	Disk (22 mm OD X 0.79 mm THK)
B. Nature of active deposit:	Electrodeposited and diffusion bonded oxides
C. Active Diameter:	19 mm
D. Backing:	Stainless steel
E. Cover:	None

Radioimpurities: Not determined

Method of Calibration:

Isotope Products Laboratories
An Eckert & Ziegler Company

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Valencia, California 91355

Tel 661·309·1010
Fax 661·257·8303

α3

reverified 5/20/08
expires 5/20/09

PAT I.D 184
recalibrated 4-15-03

CERTIFICATE OF CALIBRATION
MIXED ALPHA STANDARD SOURCE

Radionuclide A: U-234
Radionuclide B: U-235
Radionuclide C: Am-241
Half Life (U-234): (2.454 ± 0.006)E+05 years
Half Life (U-235): (7.037 ± 0.011)E+08 years
Half Life (Am-241): 432.17 ± 0.66 years

Customer: PARAGON ANALYTICS, INC.
P.O. No.: EW040203/R2193
Catalog No.: MISC-STD
Reference Date: 1-May-03 12:00 PST
Source No.: 92MIX2203024

Contained Radioactivity:

U-234:	3.227	nCi	(119.4 Bq)	Am-241:	2.866	nCi	(106.0 Bq)
U-235:	0.05205	nCi	(1.926 Bq)	Total Activity:	6.145	nCi	(227.3 Bq)

Physical description:

A. Capsule type: Disk (22 mm OD X 0.79 mm THK)
B. Nature of active deposit: Electrodeposited and diffusion bonded oxides
C. Active Diameter: 19 mm
D. Backing: Stainless steel
E. Cover: None

Radioimpurities: Not determined

Method of Calibration:

This source was assayed using a windowless internal gas flow proportional counter for total alpha activity. Individual nuclide ratios were taken from those determined in Aug 1992.

Uncertainty of Measurement:

A. Type A (random) uncertainty: ± 0.6%
B. Type B (systematic) uncertainty: ± 3.0%
C. Uncertainty in aliquot weighing: ± 0.0%
D. Total uncertainty at the 99% confidence level: ± 3.1%

Notes:

- See reverse side for leak test(s) performed on this source.
- IPL participates in a 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).
- Nuclear data was taken from "Table of Radioactive Isotopes", edited by Virginia Shirley, 1986.
- This source has a working life of 2 years.
- This source had a total alpha surface emission rate of 6889 α/min in 2π on 11 Apr 03.

Daniel James Van Dalsem
Quality Control

15-Apr-03
Date Signed

IPL Ref. No.: 987-7

24937 Avenue Tibbitts

reverified 5/20/08

Isotope Products Laboratories
An Eckert & Ziegler Company

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Valencia, California 91355

Tel 661·309·1010
Fax 661·257·8303

α5

reverified 5/20/08
expires 5/20/09
PAI ID 00186
recalibration
received ~~186~~
3-28-03

CERTIFICATE OF CALIBRATION
ALPHA STANDARD SOURCE

Radionuclide A:	U-234	**Customer:**	PARAGON ANALYTICS, INC.
Radionuclide B:	U-235	**P.O. No.:**	EW030603/R2155
Radionuclide C:	Am-241	**Catalog No.:**	MISC-STD
Half Life (U-234):	(2.454 ± 0.006)E+05 years	**Reference Date:**	1 Apr 03 [illegible]

Isotope Products Laboratories
An Eckert & Ziegler Company

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Valencia, California 91355

Tel 661·309·1010
Fax 661·257·8303

α6 reverified 5/20/08 expires 5/20/09

BAID 00187 recd from recalibrate 3-28-03

CERTIFICATE OF CALIBRATION
ALPHA STANDARD SOURCE

Radionuclide A: U-234
Radionuclide B: U-235
Radionuclide C: Am-241
Half Life (U-234): (2.454 ± 0.006)E+05 years
Half Life (U-235): (7.037 ± 0.011)E+08 years
Half Life (Am-241): 432.17 ± 0.66 years

Customer: PARAGON ANALYTICS, INC.
P.O. No.: EW030603/R2155
Catalog No.: MISC-STD
Reference Date: 1-Apr-03 12:00 PST
Source No.: 92MIX2203022

Contained Radioactivity:

U-234:	3.592	nCi	(132.9 Bq)	Am-241:	3.279	nCi	(121.3 Bq)
U-235:	0.08556	nCi	(3.166 Bq)	Total Activity:	6.957	nCi	(257.4 Bq)

Physical description:

A. Capsule type: Disk (22 mm OD X 0.79 mm THK)
B. Nature of active deposit: Electrodeposited and diffusion bonded oxides
C. Active Diameter: 19 mm
D. Backing: Stainless steel
E. Cover: None

Radioimpurities: Not determined

Method of Calibration:

This source was assayed using a windowless internal gas flow proportional counter for total alpha activity. Individual nuclide ratios were taken from those determined in Aug 1992.

Uncertainty of Measurement:

A. Type A (random) uncertainty: ± 0.8%
B. Type B (systematic) uncertainty: ± 3.1%
C. Uncertainty in aliquot weighing: ± 0.0%
D. Total uncertainty at the 99% confidence level: ± 3.2%

Notes:

- See reverse side for leak test(s) performed on this source.
- IPL participates in a 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).
- Nuclear data was taken from "Table of Radioactive Isotopes", edited by Virginia Shirley, 1986.
- This source has a working life of 2 years.
- This source had a total alpha surface emission rate of 7799 α/min in 2π on 18 Mar 03.

Daniel James Van Dalsem
Quality Control

19-Mar-03
Date Signed

IPL Ref. No.: 987-2

Isotope Produc

24937 Avenue Tibbitts

re-verified 5/20/08

Isotope Products Laboratories
An Eckert & Ziegler Company

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Tel 661·309·1010
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α 8

re verified 5/20/08
expires 5/20/09

PAI ID 189
recd 4-2-03
recalibrated 4-15-03

CERTIFICATE OF CALIBRATION
MIXED ALPHA STANDARD SOURCE

Radionuclide A: U-234
Radionuclide B: U-235
Radionuclide C: Am-241
Half Life (U-234): (2.454 ± 0.006)E+05 years
Half Life (U-235): (7.037 ± 0.011)E+08 years
Half Life (Am-241): 432.17 ± 0.66 years

Customer: PARAGON ANALYTICS, INC.
P.O. No.: EW040203/R2193
Catalog No.: MISC-STD
Reference Date: 1-May-03 12:00 PST
Source No.: 92MIX2203029

Contained Radioactivity:

U-234:	9.048	nCi	(334.8 Bq)
U-235:	0.1771	nCi	(6.553 Bq)
Am-241:	1.433	nCi	(53.02 Bq)
Total Activity:	10.66	nCi	(394.4 Bq)

Physical description:

A. Capsule type: Disk (22 mm OD X 0.79 mm THK)
B. Nature of active deposit: Electrodeposited and diffusion bonded oxides
C. Active Diameter: 19 mm
D. Backing:

Radioimpurities: Not determined

Eckert & Ziegler
Isotope Products

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Valencia, California 91355

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RSO #190
Rec'd 6/6/07 GW
Recertification 6/1/07

CERTIFICATE OF CALIBRATION
MIXED ALPHA STANDARD SOURCE

α 9

Radionuclide:	U-234	**Customer:**	PARAGON ANALYTICS, INC.
Radionuclide:	U-235	**P.O. No.:**	73179/R3768
Radio: 23	Am-241	**Catalog No.:**	MISC-STD
Half-life (U-234):	(2.454 ± 0.006)E+05 years	**Reference Date:**	1-Jun-07 12:00 PST
Half-life (U-235):	(7.037 ± 0.011)E+08 years	**Source No.:**	92MIX223027
Half-life (Am-241):	432.17 ± 0.66 years		

Contained Radioactivity:

U-234:	1.349	**nCi,**	49.91	**Bq**	Am-241:	0.3243	**nCi,**	12.00	**Bq**
U-235:	0.02970	**nCi,**	1.099	**Bq**	Total Activity:	1.703	**nCi,**	63.01	**Bq**

Physical Description:

A. Capsule type: Disk (47 mm OD x 0.76 mm THK)
B. Nature of active deposit: Electrodeposited and diffusion bonded oxide
C. Active diameter/volume: 19 mm
D. Backing: Stainless steel
E. Cover: None

Radioimpurities: Not determined

Method of Calibration:

Paragon Analytics

Radiochemistry Case Narrative
Isotopic Americium

Los Alamos National Laboratory SMO

Dust / 08-1101

PA WO 0805078

1. This report consists of the analytical results and supporting documentation for two solid samples received by Paragon on 05/08/08.

2. These samples were prepared according to procedures [illegible]

1

PARAGON ANALYTICS
Radiochemistry Data Package

Section 1

CHAIN OF CUSTODY

Paragon Analytics

Sample Number(s) Cross-Reference Table

Paragon OrderNum: 0805078
Client Name: Los Alamos National Laboratory SMO
Client Project Name: Dust
Client Project Number: 08-1101
Client PO Number: 33204-001-06 F3

Client Sample Number	Lab Sample Number	COC Number	Matrix	Date Collected	Time Collected
SFB08-08-12411	0805078-1		SOLID	16-Apr-08	
SFB08-08-12412	0805078-2		SOLID	16-Apr-08	

Wednesday, May 07, 2008

LAB CHAIN OF CUSTODY DOCUMENT NUMBER: 08-1101C

REQUEST NUMBER: 08-1101

LOS ALAMOS

NATIONAL LABORATORY

ATTN: Lance Steere

Paragon Analytics, Inc.

225 Commerce

Fort Collins, CO 80524

TURNAROUND/REPORT DUE: 6/6/2008

TURNAROUND REQ'D: 30

LAB REQUEST COMMENTS: Phils Samples 0805078

	SAMPLE ID	CTNR	CTNR DESC	ORDER	PRESERV	MATRIX
1	SFB08-08-12411	1	1 L POLY	AM241+GS+ISOPU+ISOU+SR90	None	S
	SFB08-08-12411	1	500 ML POLY	GROSSA+B	None	S
	SFB08-08-12411	1	250 ML POLY	ISO_Po	Ice	S
2	SFB08-08-12412	1	1 L POLY	AM241+GS+ISOPU+ISOU+SR90	None	S
	SFB08-08-12412	1	500 ML POLY	GROSSA+B	None	S
	SFB08-08-12412	1	250 ML POLY	ISO_Po	Ice	S

Relinquished By:		Date	Time	Received By:		Date	Time
		5/7/08	3:00	Sheri Lafferty		5/8/08	0930
Printed Name	Signature			Printed Name	Signature		
Printed Name	Signature			Printed Name	Signature		
Printed Name	Signature			Printed Name	Signature		

Received for DISPOSAL By: **Date** **Time** **Remarks:**

Printed Name Signature

Wednesday, May 07, 2008

REQUEST NUMBER: 08-1101

LOS ALAMOS
NATIONAL LABORATORY

ATTN: Lance Steere
Paragon Analytics, Inc.
225 Commerce
Fort Collins, CO 80524

These Samples are on:
LANL Request Number:08-1101
Per Agreement Number:1-800-443-1511
Project Cost Code: WEPR 1314 0300

Please analyse the enclosed samples according to the schedule indicated:

SHIP DATE: 5/7/2008
TURNAROUND/REPORT DUE: 6/6/2008
TURNAROUND REQ'D: 30 Days

RAD SCREENING: Not Required
LAB REQUEST COMMENTS: Phils Sample

LANL ER SMO CONTACT:
Signature:

PRIORITY	METHOD CODE	CNTNR	SAMPLE ID	SAMPLE MATRIX	DATE SAMPLED	SAMPLE COMMENTS	SPECIAL INSTRUCTIONS
	EPA:900	1	SFB08-08-12411	S	4/16/2008	LA Monitor-vacuum bag, location LAM-0001	
		1	SFB08-08-12412	S	4/16/2008	LA Monitor-furnace filter, location LAM-0001	
	EPA:901.1	1	SFB08-08-12411	S	4/16/2008	LA Monitor-vacuum bag, location LAM-0001	
		1	SFB08-08-12412	S	4/16/2008	LA Monitor-furnace filter, location LAM-0001	
	EPA:905.0	1	SFB08-08-12411	S	4/16/2008	LA Monitor-vacuum bag, location LAM-0001	
		1	SFB08-08-12412	S	4/16/2008	LA Monitor-furnace filter, location LAM-0001	
	HASL-300:AM-241	1	SFB08-08-12411	S	4/16/2008	LA Monitor-vacuum bag, location LAM-0001	

0805018

5

REQUEST NUMBER: 08-1101

PRIORITY	METHOD CODE	CNTNR	SAMPLE ID	SAMPLE MATRIX	DATE SAMPLED	SAMPLE COMMENTS	SPECIAL INSTRUCTIONS
	HASL-300:AM-241	1	SFB08-08-12412	S	4/16/2008	LA Monitor-furnace filter, location LAM-0001	
	HASL-300:ISOPU	1	SFB08-08-12411	S	4/16/2008	LA Monitor-vacuum bag, location LAM-0001	
		1	SFB08-08-12412	S	4/16/2008	LA Monitor-furnace filter, location LAM-0001	
	HASL-300:ISOU	1	SFB08-08-12411	S	4/16/2008	LA Monitor-vacuum bag, location LAM-0001	
		1	SFB08-08-12412	S	4/16/2008	LA Monitor-furnace filter, location LAM-0001	
	HASL-300:PO-210	1	SFB08-08-12411	S	4/16/2008	LA Monitor-vacuum bag, location LAM-0001	
		1	SFB08-08-12412	S	4/16/2008	LA Monitor-furnace filter, location LAM-0001	

Final Page of REQUEST NUMBER 08-1101

080507B

CONDITION OF SAMPLE UPON RECEIPT FORM

Paragon Analytics

Client: LANL

Workorder No: 0805078

Project Manager: LS

Initials: SL Date: 5·8·08

1. Does this project require any **special handling** in addition to standard Paragon procedures?		YES	(NO)
2. Are custody **seals** on **shipping containers** intact?	NONE	(YES)	NO
3. Are Custody seals on **sample containers** intact?	NONE	(YES)	NO
4. Is there a **COC (Chain-of-Custody) present** or other representative documents?		(YES)	NO
5. Are the **COC and bottle labels complete and legible**?		YES	(NO)
6. Is the **COC in agreement** with samples received? (IDs, dates, times, no. of samples, no. of containers, matrix, requested analyses, etc.)		YES	(NO)
7. Were **airbills / shipping documents** present and/or removable?	DROP OFF	(YES)	NO
8. Are all aqueous **samples requiring preservation preserved correctly**? (excluding volatiles)	(N/A)	YES	NO
9. Are all aqueous **non-preserved samples pH 4-9**?	(N/A)	YES	NO
10. Is there **sufficient sample** for the requested analyses?		YES	(NO)
11. Were all samples placed in the **proper containers** for the requested analyses?		(YES)	NO
12. Are all samples within **holding times** for the requested analyses?		(YES)	NO
13. Were all sample containers received **intact**? (not broken or leaking, etc.)		(YES)	NO
14. Are all samples requiring no headspace (VOC, GRO, Rx CN/S, radon), headspace free? **Size of bubble**: ____ < green pea ____ > green pea	(N/A)	YES	NO
15. Were samples checked for and free from the presence of **residual chlorine?** (Applicable when PM has indicated samples are from a chlorinated water source; note if field preservation with sodium thiosulfate was not observed.)	(N/A)	YES	NO
16. Were the samples **shipped on ice**?		(YES)	NO
17. Were cooler temperatures measured at 0.1-6.0°C?	IR gun used*: #2 #4	RAD ONLY (YES)	NO

Cooler #:	1						
Temperature (°C):	0.8						
No. of custody seals on cooler:	1						
DOT Survey/ Acceptance Information — External µR/hr reading:	16						
Background µR/hr reading:	12						

Were external µR/hr readings ≤ two times background and within DOT acceptance criteria? (YES) / NO / NA (If no, see Form 008.)

Additional Information: PROVIDE DETAILS BELOW FOR A NO RESPONSE TO ANY QUESTION ABOVE, EXCEPT #1 AND #16

No times listed. ok
Received only (1) 500 ml poly (approx 25-30% full) for both samples.

-01 = 146g v fine dust, mix Dust? = Yes ~50% full
-02 = 34g " " " ~10% full

If applicable, was the client contacted? (YES) / NO / NA Contact: Joy Valdez Date/Time: 5/22

Project Manager Signature / Date: 5/22/08

*IR Gun #2: Oakton, SN 29922500201-0066 *IR Gun #4: Oakton, SN 2372220101-0002

Form 201r20.xls (12/27/07)

0805078

ORIGIN ID: SAFA (505) 665-9506
JOYLENE VALDEZ
LOS ALAMOS NATL LAB.
TA00 BLDG 1237 DPU 03

LOS ALAMOS, NM 87545
UNITED STATES US

TO LANCE STEERE
PARAGON

Ship Date: 07MAY08
ActWgt: 74.0 LB MAN
System#: 0014176/CAFE2355
Account: S *********

(800) 443-1511
FedEx

2

PARAGON ANALYTICS
Radiochemistry Data Package

Section 2

SAMPLE RESULTS SUMMARY

Isotopic Americium By Alpha Spectroscopy Sample Results Summary

Client Name: Los Alamos National Laboratory SMO
Client Project Name: Dust
Client Project Number: 08-1101

Laboratory Name: Paragon Analytics
PAI Work Order: 0805078

Page: 1 of 1
Reported on: Thursday, June 19, 2008 10:38:58 AM

Lab Sample ID	Client Sample ID	Sample Type	Nuclide	Result +/- 1 s TPU	MDC	Units	Matrix	Prep Batch	Date Analyzed	Flags
0805078-1	SFB08-08-12411	Sample	Am-241	0.0109 +/- 0.0033	0.0068	pCi/g	SOLID	AS080606-1	6/12/2008	LT
0805078-2	SFB08-08-12412	Sample	Am-241	0.0084 +/- 0.0032	0.0085	pCi/g	SOLID	AS080606-1	6/12/2008	U

Comments:

Data Package ID: *AM0805078-1*

Qualifiers/Flags:

U - Result is less than the sample specific MDC.

LT - Result is less than Requested MDC, greater than sample specific MDC.

Y1 - Chemical Yield is in control at 100-110%. Quantitative Yield is assumed.

Y2 - Chemical Yield outside default limits.

M - The requested MDC was not met.

M3 - The requested MDC was not met, but the reported activity is greater than the reported MDC.

Abbreviations:

TPU - Total Propagated Uncertainty (see PAI SOP 743)

MDC - Minimum Detectable Concentration (see PAI SOP 709)

BDL - Below Detection Limit

3

PARAGON ANALYTICS
Radiochemistry Data Package

Section 3

QC RESULTS SUMMARY

Isotopic Americium By Alpha Spectroscopy

PAI 714 Rev 11

Method Blank Results

Lab Name: Paragon Analytics
Work Order Number: 0805078
Client Name: Los Alamos National Laboratory SMO
ClientProject ID: Dust 08-1101

Lab ID: AS080606-1MB

Sample Matrix: SOLID
Prep SOP: PAI 778 Rev 12
Date Collected: 06-Jun-08
Date Prepared: 06-Jun-08
Date Analyzed: 12-Jun-08

Prep Batch: AS080606-1
QCBatchID: AS080606-1-1
Run ID: AS080606-1C
Count Time: 1000 minutes

Final Aliquot: 4.53 g
Result Units: pCi/g
File Name: Spectrum #1

CASNO	Target Nuclide	Result +/- 1 s TPU	MDC	Requested MDC	Lab Qualifier
14596-10-2	Am-241	0.0008 +/- 0.0019	0.0057	0.02	U

Chemical Yield Summary

Carrier/Tracer	Amount Added	Result	Units	Yield	Control Limits	Flag
Am-243	0.4970	0.203	pCi/g	40.9	30 - 110 %	

Comments:

Qualifiers/Flags:

U - Result is less than the sample specific MDC.

Y1 - Chemical Yield is in control at 100-110%. Quantitative Yield is assumed.

Y2 - Chemical Yield outside default limits.

LT - Result is less than Requested MDC, greater than sample specific MDC.

Abbreviations:

TPU - Total Propagated Uncertainty (see PAI SOP 743)

MDC - Minimum Detectable Concentration (see PAI SOP 709)

BDL - Below Detection Limit

M - Requested MDC not met.

B - Analyte concentration greater than MDC.

B3 - Analyte concentration greater than MDC but less than Requested MDC.

Data Package ID: *AM0805078-1*

Isotopic Americium By Alpha Spectroscopy

PAI 714 Rev 11

Laboratory Control Sample(s)

Lab Name: Paragon Analytics
Work Order Number: 0805078
Client Name: Los Alamos National Laboratory SMO
ClientProject ID: Dust 08-1101

Lab ID: AS080606-1LCS

Sample Matrix: SOLID
Prep SOP: PAI 778 Rev 12
Date Collected: 06-Jun-08
Date Prepared: 06-Jun-08
Date Analyzed: 12-Jun-08

Prep Batch: AS080606-1
QCBatchID: AS080606-1-1
Run ID: AS080606-1C
Count Time: 1000 minutes

Final Aliquot: 4.53 g
Result Units: pCi/g
File Name: Spectrum #1

CASNO	Target Nuclide	Results +/- 1s TPU	MDC	Spike Added	% Rec	Control Limits	Lab Qualifier
14596-10-2	Am-241	0.400 +/- 0.037	0.005	0.493	81.2	79 - 118	P

Chemical Yield Summary

Carrier/Tracer	Amount Added	Result	Units	Yield	Control Limits	Flag
Am-243	0.4970	0.240	pCi/g	48.3	30 - 110 %	

Comments:

Qualifiers/Flags:

U - Result is less than the sample specific MDC.
LT - Result is less than Requested MDC, greater than sample specific MDC.
Y1 - Chemical Yield is in control at 100-110%. Quantitative Yield is assumed.
Y2 - Chemical Yield outside default limits.
L - LCS Recovery below lower control limit.
H - LCS Recovery above upper control limit.
P - LCS Recovery within control limits.
M - The requested MDC

Abbreviations:

TPU - Total Propagated Uncertainty (see PAI SOP 743)
MDC - Minimum Detectable Concentration (see PAI SOP 709)

Isotopic Americium By Alpha Spectroscopy

PAI 714 Rev 11

Duplicate Sample Results (DER)

Lab Name: Paragon Analytics
Work Order Number: 0805078
Client Name: Los Alamos National Laboratory SMO
ClientProject ID: Dust 08-1101

Field ID: SFB08-08-12411
Lab ID: 0805078-1DUP

Sample Matrix: SOLID
Prep SOP: PAI 778 Rev 12
Date Collected: 16-Apr-08
Date Prepared: 06-Jun-08
Date Analyzed: 12-Jun-08

Prep Batch: AS080606-1
QCBatchID: AS080606-1-1
Run ID: AS080606-1C
Count Time: 1000 minutes
Report Basis: As Received

Final Aliquot: 4.51 g
Prep Basis: As Received
Moisture(%): NA
Result Units: pCi/g
File Name: Spectrum #1

CASNO	Analyte	Sample Result +/- 1s TPU	Duplicate Result +/- 1s TPU	DER	Control Limit	Lab Qualifiers
14596-10-2	Am-241	0.0109 +/- 0.0033	0.0033 +/- 0.0020	0.98	2.13	LT

Comments:

Duplicate Qualifiers/Flags:

U - Result is less than the sample specific MDC.
Y1 - Chemical Yield is in control at 100-110%. Quantitative yield is assumed.
Y2 - Chemical Yield outside default limits.
W - DER is greater than Warning Limit of 1.42
D - DER is greater than Control Limit of 2.13
LT - Result is less than Request MDC, greater than sample specific MDC
M - Requested MDC not met.
M3 - The requested MDC was not met, but the reported activity is greater than the reported MDC.
L - LCS Recovery below lower control limit.
H - LCS Recovery above upper control limit.
P - LCS, Matrix Spike Recovery within control limits.
N - Matrix Spike Recovery outside control limits

Abbreviations:

TPU - Total Propagated Uncertainty (see PAI SOP 743)
DER - Duplicate Error Ratio (see PAI SOP 715)
BDL - Below Detection Limit
NR - Not Reported

Data Package ID: *AM0805078-1*

PARAGON ANALYTICS
Radiochemistry Data Package

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Section 4

INDIVIDUAL SAMPLE RESULTS

Isotopic Americium By Alpha Spectroscopy

PAI 714 Rev 11

Sample Results

Lab Name: Paragon Analytics
Work Order Number: 0805078
Client Name: Los Alamos National Laboratory SMO
ClientProject ID: Dust 08-1101

Field ID: SFB08-08-12411
Lab ID: 0805078-1

Analysis ReqCode: Low MDA

Sample Matrix: SOLID
Prep SOP: PAI 778 Rev 12
Date Collected: 16-Apr-08
Date Prepared: 06-Jun-08
Date Analyzed: 12-Jun-08

Prep Batch: AS080606-1
QCBatchID: AS080606-1-1
Run ID: AS080606-1C
Count Time: 1000 minutes
Report Basis: As Received

Final Aliquot: 4.52 g
Prep Basis: As Received
Moisture(%): NA
Result Units: pCi/g
File Name: Spectrum #1

CASNO	Target Nuclide	Result +/- 1 s TPU	MDC	Requested MDC	Lab Qualifier
14596-10-2	Am-241	0.0109 +/- 0.0033	0.0068	0.02	LT

Chemical Yield Summary

Carrier/Tracer	Amount Added	Result	Units	Yield	Control Limits	Flag
Am-243	0.4985	0.237	pCi/g	47.6	30 - 110 %	

Comments:

Qualifiers/Flags:

U - Result is less than the sample specific MDC.

Y1 - Chemical Yield is in control at 100-110%. Quantitative Yield is assumed.

Y2 - Chemical Yield outside default limits.

LT - Result is less than Requested MDC, greater than sample specific MDC.

M3 - The requested MDC was not met, but the reported activity is greater than the reported MDC.

M - The requested MDC was not met.

Abbreviations:

TPU - Total Propagated Uncertainty (see PAI SOP 743)

MDC - Minimum Detectable Concentration (see PAI SOP 709)

BDL - Below Detection Limit

Data Package ID: *AM0805078-1*

Isotopic Americium By Alpha Spectroscopy

PAI 714 Rev 11

Sample Duplicate Results

Lab Name: Paragon Analytics
Work Order Number: 0805078
Client Name: Los Alamos National Laboratory SMO
ClientProject ID: Dust 08-1101

Field ID: SFB08-08-12411
Lab ID: 0805078-1DUP

Sample Matrix: SOLID
Prep SOP: PAI 778 Rev 12
Date Collected: 16-Apr-08
Date Prepared: 06-Jun-08
Date Analyzed: 12-Jun-08

Prep Batch: AS080606-1
QCBatchID: AS080606-1-1
Run ID: AS080606-1C
Count Time: 1000 minutes
Report Basis: As Received

Final Aliquot: 4.51 g
Prep Basis: As Received
Moisture(%): NA
Result Units: pCi/g
File Name: Spectrum #1

CASNO	Target Nuclide	Result +/- 1 s TPU	MDC	Requested	Lab Qualifier

Isotopic Americium By Alpha Spectroscopy

PAI 714 Rev 11

Sample Results

Lab Name: Paragon Analytics
Work Order Number: 0805078
Client Name: Los Alamos National Laboratory SMO
ClientProject ID: Dust 08-1101

Field ID: SFB08-08-12412	**Sample Matrix:** SOLID	**Prep Batch:** AS080606-1	**Final Aliquot:** 4.54 g
Lab ID: 0805078-2	**Prep SOP:** PAI 778 Rev 12	**QCBatchID:** AS080606-1-1	**Prep Basis:** As Received

PARAGON ANALYTICS
Radiochemistry Data Package

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Section 5

RAW DATA

y Alpha Spectroscopy Raw Data Report

Prep SOP: PAI 778
nalytical SOP: PAI 714

Reported on: Friday, June 13, 2008
11:15:31 AM

Samp Alq / Analy Alq	Inst ID / Det ID	AnRunID / File Name	Count / Date/Time	Net Cnts / Bkg Cnts	BaseEff / Bkg(min)	CntDur(min) / Yield	Activity +/- / 1 s TPU	MDC / DecLev	ReportUnits / ReportBasis	DER / RPD	%Spk. Recov / Flags
4.52 g	AlphaSpec2	AS080606-1C	6/12/2008	15.000	28.78%	1000	0.0109	0.0068	pCi/g	NA	
4.52 g	1	Spectrum #1	4:35 PM	2.000	1000	47.6%	0.0033	NA	As Received	NA	LT
4.52 g	AlphaSpec2	AS080606-1C	6/12/2008	685.000	28.78%	1000	0.237	0.003	pCi/g	NA	
4.52 g	1	Spectrum #1	4:35 PM	1.000	1000	47.6%	0.020	NA	As Received	NA	
4.51 g	AlphaSpec2	AS080606-1C	6/12/2008	4.000	31.03%	1000	0.0033	0.0022	pCi/g	0.98	
4.51 g	2	Spectrum #1	4:35 PM	0.000	1000	38.8%	0.0020	NA	As Received	NA	LT
4.51 g	AlphaSpec2	AS080606-1C	6/12/2008	602.000	31.03%	1000	0.194	0.001	pCi/g	NA	
4.51 g	2	Spectrum #1	4:35 PM	0.000	1000	38.8%	0.016	NA	As Received	NA	
4.54 g	AlphaSpec2	AS080606-1C	6/12/2008	12.000	30.07%	1000	0.0084	0.0085	pCi/g	NA	
4.54 g	4	Spectrum #1	4:35 PM	4.000	1000	46.8%	0.0032	NA	As Received	NA	U
4.54 g	AlphaSpec2	AS080606-1C	6/12/2008	704.000	30.07%	1000	0.232	0.003	pCi/g	NA	
4.54 g	4	Spectrum #1	4:35 PM	2.000	1000	46.8%	0.019	NA	As Received	NA	
4.53 g	AlphaSpec2	AS080606-1C	6/12/2008	1.000	31.19%	1000	0.0008	0.0057	pCi/g	NA	
4.53 g	5	Spectrum #1	4:35 PM	1.000	1000	40.9%	0.0019	NA	As Received	NA	U
4.53 g	AlphaSpec2	AS080606-1C	6/12/2008	638.000	31.19%	1000	0.203	0.002	pCi/g	NA	
4.53 g	5	Spectrum #1	4:35 PM	1.000	1000	40.9%	0.017	NA	As Received	NA	
4.53 g	AlphaSpec2	AS080606-1C	6/12/2008	589.000	30.30%	1000	0.400	0.005	pCi/g	NA	81.2
4.53 g	6	Spectrum #1	4:35 PM	1.000	1000	48.3%	0.037	NA	As Received	NA	P
4.53 g	AlphaSpec2	AS080606-1C	6/12/2008	731.000	30.30%	1000	0.240	0.005	pCi/g	NA	
4.53 g	6	Spectrum #1	4:35 PM	7.000	1000	48.3%	0.020	NA	As Received	NA	

MDC not met.

ted MDC was not met, but the reported
greater than the reported MDC.

y below lower control limit.

ry above upper control limit.

Spike Recovery within control limits.

Recovery outside control limits

ted for duplicate results less than 5 times MDC
entration greater than MDC.

centration greater than MDC but less than Requested MDC.

Notes:

1) The Tracer results are not yield corrected (i.e. activity measured not activity added).

2) Where sample time is not available, 12:00 PM (Mountain) is used for decay correction.

Abbreviations:

TR- Tracer TA - Target Analyte

TPU - Total Propagated Uncertainty (see PAI SOP 743)

MDC - Minimum Detectable Concentration (see PAI SOP 709)

DER - Duplicate Error Ratio

BDL - Below Detection Limit

Paragon Analytics

Alpha-Spectroscopy Analysis Report

Sample

Sample: 0805078-1
Spectrum #1 Analysis #1

Sample Size : 4.50

Acquisition

Detector: 1
Batch Name: AAS080606-1_A
Nuclide Library: Am-241
Analysis Method: Absolute ROI Analysis, Set Name = Am-241
ROI Set: Am-241

Acquisition Start Date: 6/12/2008 4:35:32PM
Live Time: 1,000.00 min.
Real Time: 1,000.04 min.
Dead Time: 0.00 %

Calibration

Bkgd Info: Sample: B08060901; Det: 1; Spectrum #1; Jun-09-2008 12:16

Calibration Date: 6/9/2008 8:47:12AM

Efficiency Calibration: C08060901

Efficiency: 28.78% +/- 0.20% TPU(2 sigma)

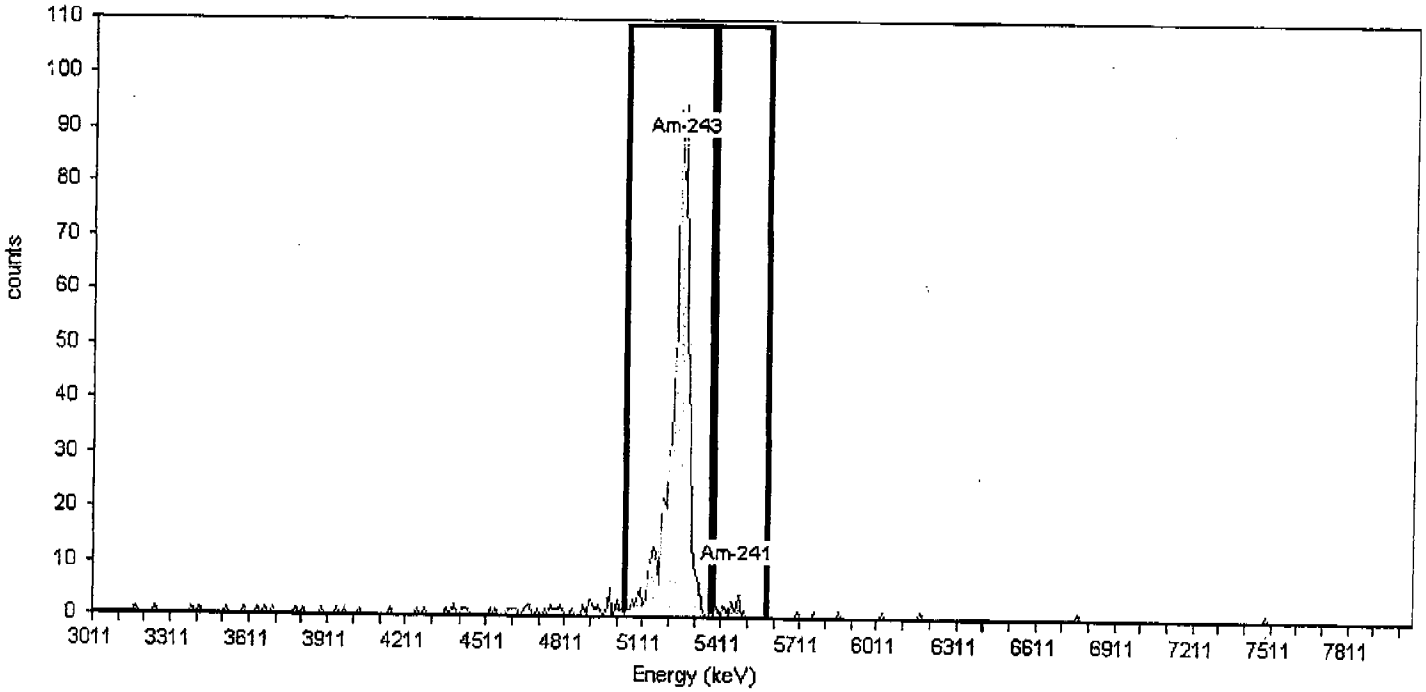
Energy Calibration: C08060901

Energy Cal: Gain = 9.9003 keV / Ch
Offset = 3,001.48 keV
Quadratic = 0.0000 keV / Ch^2

Tracer

Tracer Name: 821.3020.61 Am-243
Tracer Activity: 20.00 DPM/mL x (Vol.)0.25 mL = 5.00 DPM

Tracer Nuclide: Am-243
Tracer Recovery: 47.68%



Nuclide Summary (ROI)

Nuclide	Peak Energy keV	ROI Start keV	ROI End keV	FWHM keV	B.R. %.	Gross Counts	Bkgd Counts	Net Counts	Activity pCi/g	2.00Sigma TPU pCi/g	Critical Level pCi/g	MDA pCi/g
Am-243	5268.6	5040.9	5367.6	72.1	99.9	686.00	1.00	685.00	2.4E-001	1.8E-002	1.7E-003	5.4E-003
Am-241	5476.5	5377.5	5585.5	47.7	100.0	17.00	2.00	15.00	1.1E-002	6.5E-003	2.4E-003	6.8E-003

Reviewed By: GB JP

Print Date: 6/13/2008 9:24:31AM

AlphaVision v5.3
Custom Report Iteration: 08/09/07

Paragon Analytics

Alpha-Spectroscopy Analysis Report

Sample

Sample: 0805078-1D
Spectrum #1 Analysis #1

Sample Size : 4.50

Acquisition

Detector: 2
Batch Name: AAS080606-1_A
Nuclide Library: Am-241
Analysis Method: Absolute Interactive ROI Analysis
ROI Set: Am-241

Acquisition Start Date: 6/12/2008 4:35:33PM
Live Time: 1,000.00 min.
Real Time: 1,000.04 min.
Dead Time: 0.00 %

Calibration

Bkgd Info: Sample: B08060902; Det: 2; Spectrum #1; Jun-09-2008 12:16

Calibration Date: 6/9/2008 8:47:31AM

Efficiency Calibration: C08060902

Efficiency: 31.03% +/- 0.15% TPU(2 sigma)

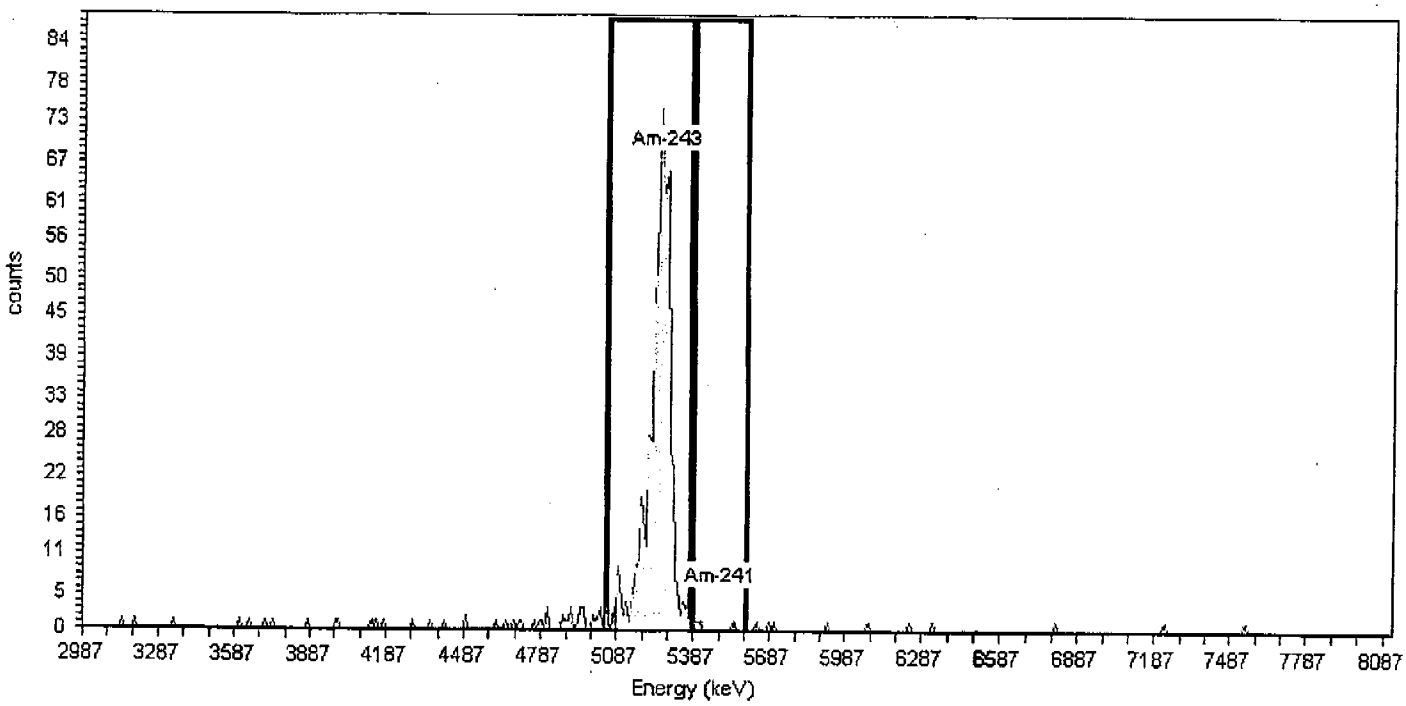
Energy Calibration: C08060902

Energy Cal: Gain = 10.0776 keV / Ch
Offset = 2,977.80 keV
Quadratic = 0.0000 keV / Ch^2

Tracer

Tracer Name: 821.3020.61 Am-243
Tracer Activity: 20.00 DPM/mL x (Vol.)0.25 mL = 5.00 DPM

Tracer Nuclide: Am-243
Tracer Recovery: 38.86%



Nuclide Summary (ROI)

Nuclide	Peak Energy keV	ROI Start keV	ROI End keV	FWHM keV	B.R. %.	Gross Counts	Bkgd Counts	Net Counts	Activity pCi/g	2.00Sigma TPU pCi/g	Critical Level pCi/g	MDA pCi/g
Am-243	5275.5	5043.7	5376.3	77.1	99.9	602.00	0.00	602.00	1.9E-001	1.6E-002	0.0E+000	2.2E-003
Am-241	5487.1	5386.4	5598.0	26.7	100.0	4.00	0.00	4.00	3.3E-003	3.7E-003	0.0E+000	2.2E-003

Reviewed By: GB JP

Print Date: 6/13/2008 9:24:37AM

AlphaVision v5.3
Custom Report Iteration: 08/09/07

Paragon Analytics

Alpha-Spectroscopy Analysis Report

Sample

Sample: 0805078-2
Spectrum #1 Analysis #1

Sample Size : 4.50

Acquisition

Detector: 4
Batch Name: AAS080606-1_A
Nuclide Library: Am-241
Analysis Method: Absolute ROI Analysis, Set Name = Am-241
ROI Set: Am-241

Acquisition Start Date: 6/12/2008 4:35:34PM
Live Time: 1,000.00 min.
Real Time: 1,000.04 min.
Dead Time: 0.00 %

Calibration

Bkgd Info: Sample: B08060904; Det: 4; Spectrum #1; Jun-09-2008 12:16

Calibration Date: 6/9/2008 8:47:46AM

Efficiency Calibration: C08060904

Efficiency: 30.07% +/- 0.21% TPU(2 sigma)

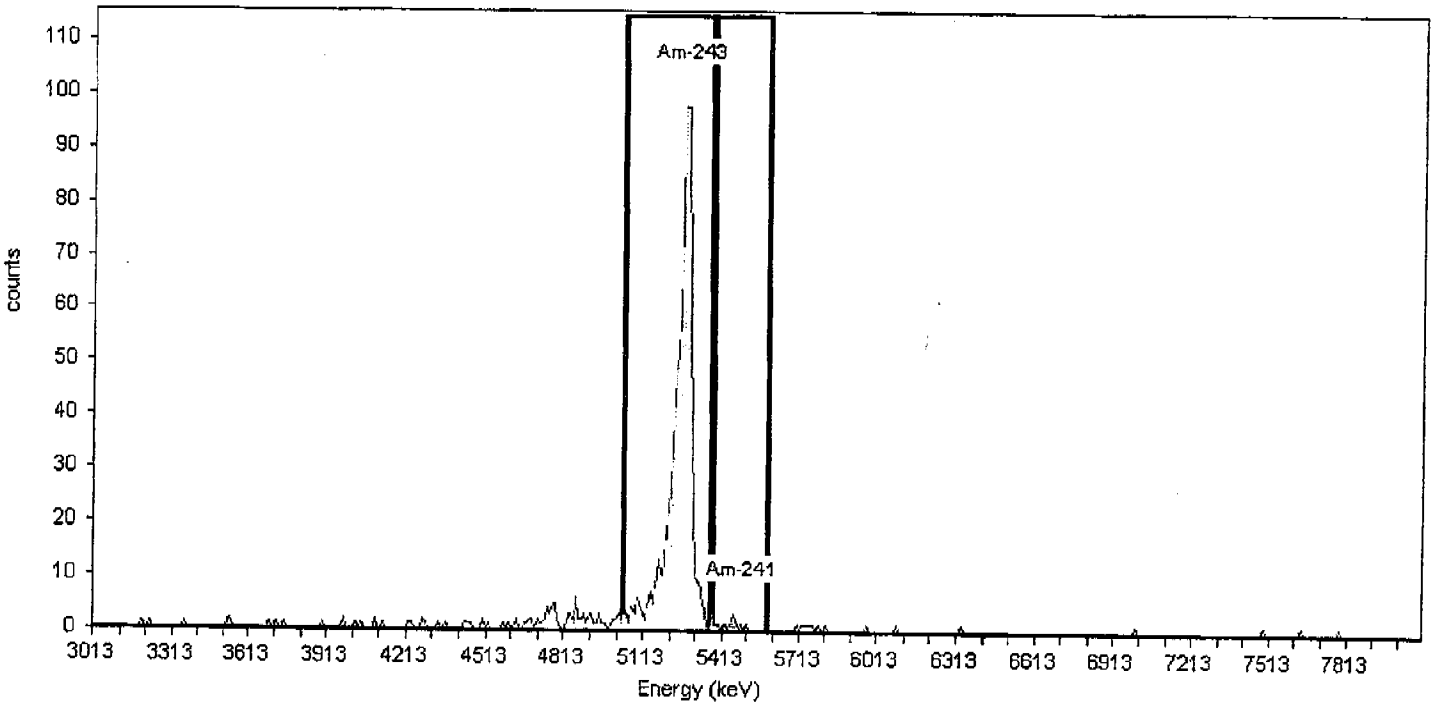
Energy Calibration: C08060904

Energy Cal: Gain = 9.9784 keV / Ch
Offset = 3,003.23 keV
Quadratic = 0.0000 keV / Ch^2

Tracer

Tracer Name: 821.3020.61 Am-243
Tracer Activity: 20.00 DPM/mL x (Vol.)0.25 mL = 5.00 DPM

Tracer Nuclide: Am-243
Tracer Recovery: 46.91%



Nuclide Summary (ROI)

Nuclide	Peak Energy keV	ROI Start keV	ROI End keV	FWHM keV	B.R. %.	Gross Counts	Bkgd Counts	Net Counts	Activity pCi/g	2.00Sigma TPU pCi/g	Critical Level pCi/g	MDA pCi/g
Am-243	5268.3	5038.8	5368.1	73.4	99.9	706.00	2.00	704.00	2.3E-001	1.8E-002	2.3E-003	6.6E-003
Am-241	5477.9	5378.1	5587.7	25.1	100.0	16.00	4.00	12.00	8.5E-003	6.4E-003	3.3E-003	8.5E-003

Reviewed By: GB JP

Print Date: 6/13/2008 9:24:42AM

AlphaVision v5.3
Custom Report Iteration: 08/09/07

Paragon Analytics

Alpha-Spectroscopy Analysis Report

Sample

Sample: AS080606-1MB
Spectrum #1 Analysis #1

Sample Size : 4.50

Acquisition

Detector: 5
Batch Name: AAS080606-1_A
Nuclide Library: Am-241
Analysis Method: Absolute ROI Analysis, Set Name = Am-241
ROI Set: Am-241

Acquisition Start Date: 6/12/2008 4:35:34PM
Live Time: 1,000.00 min.
Real Time: 1,000.04 min.
Dead Time: 0.00 %

Calibration

Bkgd Info: Sample: B08060905; Det: 5; Spectrum #1; Jun-09-2008 12:16

Calibration Date: 6/9/2008 8:48:04AM

Efficiency Calibration: C08060905

Efficiency: 31.19% +/- 0.13% TPU(2 sigma)

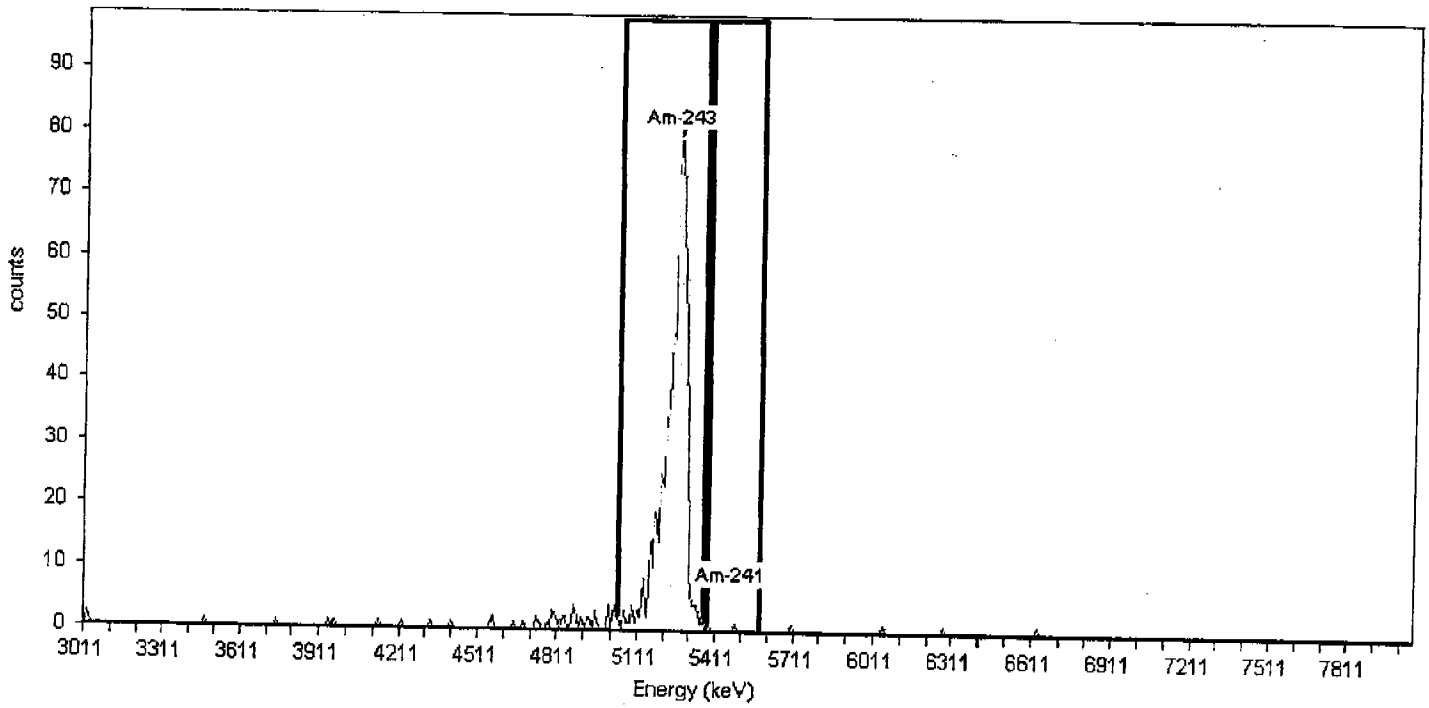
Energy Calibration: C08060905

Energy Cal: Gain = 9.9003 keV / Ch
Offset = 3,001.48 keV
Quadratic = 0.0000 keV / Ch^2

Tracer

Tracer Name: 821.3020.61 Am-243
Tracer Activity: 20.00 DPM/mL x (Vol.)0.25 mL = 5.00 DPM

Tracer Nuclide: Am-243
Tracer Recovery: 40.98%



Nuclide Summary (ROI)

Nuclide	Peak Energy keV	ROI Start keV	ROI End keV	FWHM keV	B.R. %.	Gross Counts	Bkgd Counts	Net Counts	Activity pCi/g	2.00Sigma TPU pCi/g	Critical Level pCi/g	MDA pCi/g
Am-243	5268.6	5040.9	5367.6	80.9	99.9	639.00	1.00	638.00	2.1E-001	1.6E-002	1.8E-003	5.8E-003
Am-241	5476.5	5377.5	5585.5	.0	100.0	2.00	1.00	1.00	7.8E-004	2.7E-003	1.8E-003	5.8E-003

Reviewed By: GB JP

Print Date: 6/13/2008 9:24:47AM

AlphaVision v5.3
Custom Report Iteration: 08/09/07

Paragon Analytics

Alpha-Spectroscopy Analysis Report

Sample

Sample: AS080606-1LCS
Spectrum #1 Analysis #1

Sample Size : 4.50

Acquisition

Detector: 6

Acquisition Start Date: 6/12/2008 4:35:35PM

Date: 6/12/08

	Sample ID	Iso/Matrix	Duration	Initial
A	0806013-22	Th/W	360	JS
	-23			
	-24			
	-25			
	AS080606-2MB			
	-2LCS			
	-2LCSD			
D	0805247-5	Np/S	360	JS
	-5SYS			
	-6			
	-6SYS			
	-8			
	-8SYS			
A	0805078-1	Pu/S	1000	JS
	-1D			
	-2			
	AS080606-1MB			
	-1LCS			
A	0805078-1	1000 ⇔	Am/W	JS
	-1D			
	-2			
	AS080606-1MB			
	-1LCS			
S	0805236-8	Pu/S	360	JS
B	0805248-15YS	Np/S	90	

Reviewed by: UB

Date: 6/13/08

PARAGON ANALYTICS
Radiochemistry Data Package

Section 6

QUALITY ASSURANCE SUMMARY REPORTS

6

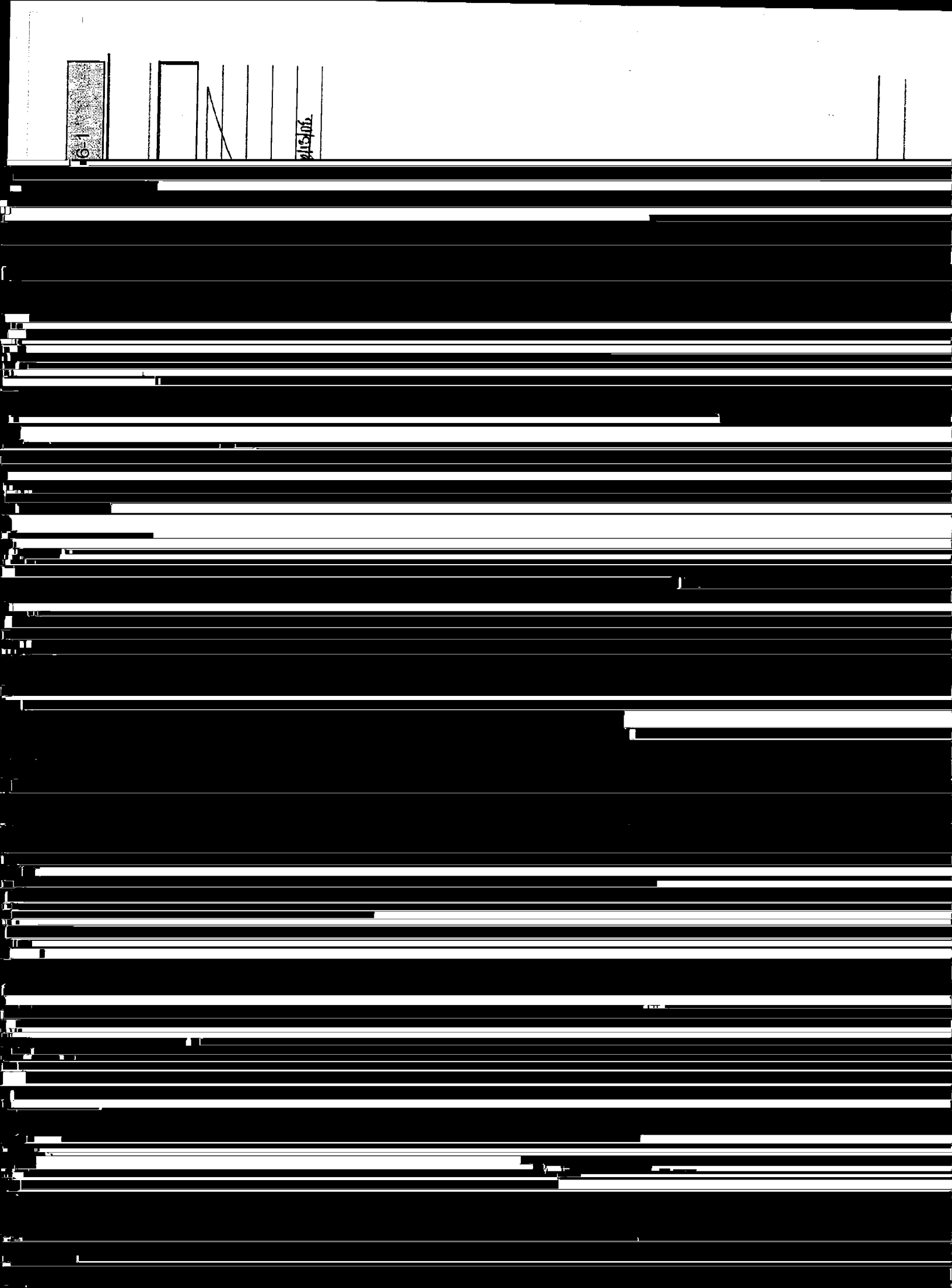
No *NON-CONFORMANCE REPORTS* or *QUALITY ASSURANCE SUMMARY SHEETS* are included in this data package.

PARAGON ANALYTICS
Radiochemistry Data Package

Section 7

LABORATORY BENCH SHEETS

7



Paragon Analytics

Radiochemistry Prep Worksheet

Prep Batch: AS080606-1

Prep Procedure: Am241

Reviewed By: cas CES **Review Date:** 6/10/2008

Non-Routine Pre-Treatment? Y / (N) **Batch:** N/A **Re-Prep?** Y / (N) **Batch:** N/A **Prep QASS / NCR?** Y / (N) N/A

Prep SOP: PAI 778 **Rev:** 12
Prep SOP: NONE
Matrix Class: solid

Prep Analyst: Crystal Shaeffer
Prep Date: 6/6/2008
Prep Dept: AP

Balance: 27
Balance:

Samp Num	Prep Num	LabID	QC Type	Dish No.	Init Aliq g	Fin Aliq g	Prep Basis	Micro Init	Micro Date	Standards	Prep Notes
1	1	0805078-1	SMP		4.5173	4.5173	As Received			T1,T2,T3	
2	1	0805078-1	DUP		4.5126	4.5126	As Received			T1,T2,T3	
3	1	0805078-2	SMP		4.5434	4.5434	As Received			T1,T2,T3	
4	1	AS080606-1	MB		4.53035	4.53035	As Received			T1,T2,T3	
5	1	AS080606-1	LCS		4.53035	4.53035	As Received			S1,S2,S3,T1,T2,T3	

CES 6/10/08

Comments

Samples were muffled for 4 hours at 600C. A PEG treatment was performed on all samples. Due to low detection limits, an increased aliquot of ~4.5g was taken for all samples.

Spiked By: Tambrae Elhart **Date:** 6/6/2008

Witnessed By: Crystal Shaeffer **Date:** 6/6/2008

Tracer/Carrier Solution Information

Soln #	Nuclide	SolnID	Prep Conc	Units	Prep Date	Aliquot	Units	Pipet ID
T1	Am-243	821.3020.61	19.995	DPM/ml	06/06/08	0.25	ml	AW016
T2	U-232	837.3020.90	19.750	DPM/ml	06/06/08	0.25	ml	AW016
T3	Pu-242	846.3020.88	19.997	DPM/ml	06/06/08	0.25	ml	AW016

Spike Solution Information

Soln #	Nuclide	SolnID	Prep Conc	Units	Prep Date	Aliquot	Units	Pipet ID
S1	AM-241	816.2382.92	19.836	DPM/ml	06/06/08	0.25	ml	AW016
S2	U-234	644.3020.52	19.838	DPM/ml	06/06/08	0.25	ml	AW016
S2	U-235	644.3020.52	0.948	DPM/ml	06/06/08	0.25	ml	AW016
S2	U-238	644.3020.52	20.596	DPM/ml	06/06/08	0.25	ml	AW016
S3	Pu-239	819.3020.51	20.927	DPM/ml	06/06/08	0.25	ml	AW016

eet

Prep Batch: AS080606-1

d!!! Reviewed By: Review Date:

Prep QASS / NCR? Y / N

ce: 27
ce:

Prep Notes

eased aliquot of ~4.6g was taken for all samples.

ike Solution Information

Prep Conc	Units	Prep Date	Aliquot	Units	Pipet ID
19.838	DPM/ml	06/06/08	0.25	ml	AW016
19.838	DPM/ml	06/06/08	0.25	ml	AW016
0.948	DPM/ml	06/06/08	0.25	ml	AW016
20.596	DPM/ml	06/06/08	0.25	ml	AW016
20.927	DPM/ml	06/06/08	0.25	ml	AW016

Supersedes: NA

SAMPLE CONDITION FORM (SOLIDS)

ANALYST: TC

ANALYSIS DATE: 6/6/08 METHOD: Prep

WORK ORDER	SAMPLE ID	SAMPLE CONDITION		
		Dry/Wet	TEXTURE	Remarks
0805078	1	dry	dust	As rec'd, not dried or ground
	2			

TC 6/6/08

PARAGON ANALYTICS
Radiochemistry Data Package

Section 8

STANDARDS TRACEABILITY

PROJECT Am-241 616.2382.92

Notebook No. _____

Continued From Page _____

Am-241 working level dilution

Prepare a working level dilution of Am-241 (616.2382.91) at 20 dpm/ml by diluting with 1M HCL (Lot 43065)

① Determine the density of 1M HCL (copied from previous page)

mass of 100 ml class A volumetric flask	67.5757 g (bal 12)
mass of flask and 1M HCL	168.85~~0~~80 g (crated)
net mass of 1M HCL	101.2823 g
	ρ = 1.0128 g/ml

② Transfer approx 0.5 g of 616.2382.91 to a 1L nalgene bottle

mass of nalgene bottle without lid	74.4779 g (bal 12)
mass of standard, VOA vial, transfer pipet + 50 ml beaker before transfer	94.1502 g
mass of standard, VOA vial, transfer pipet + 50 ml beaker after transfer	93.4751 g
net mass of standard transferred	0.6751 g

③ Dilute to final volume with 1M HCL

mass of nalgene bottle without lid (from above)	74.4779 g
mass of bottle, standard and 1M HCL	1003.4 g (bal 26)
net mass of standard	928.92 g

RG 9/6/06

Reverification Log		
Analysis Date	Initials	Expiration Date
8/11/06	RG	8/11/07
10/8/07	MC	10/8/08

RG 9/6/06

RG 9/6/06

④ final Activity calculation

SD 8/1/03 (~~27,168.64~~ ~~27,125.6~~ 28,201.49 dpm/g) MC 10/31/07 (0.6751 g)(1.0128 g/ml) = 20.02 dpm/ml ~~19.97~~ ~~20.00~~ MC 10/31/07 SD 8/1/03

SD 6/2/04

928.92 g

Stnd ID: 616.2382.92

Description: Am-241 MC 11/1/07

Expiration: 5/27/05

Activity: ~~19.97~~ 20.02 dpm/mL

Stnd ID: 616.2382.92 RG 5/13/05

Stnd ID: 616.2382.92 RG 5/5/03

Description: Am-241 MC 11/1/07 ~~19.97~~ 20.02

Activity: ~~20.00~~ SD dpm/ml

Am-241 intermediary dilution

Prepare an intermediate dilution of 616.2382.38 by diluting with 1M HCL (Lot 43015)

(1) Determine the density of 1M HCL

mass of 100 ml Class A volumetric flask	67.5757 g (bal
mass of flask and 1M HCl	168.8580 g
net mass of 1M HCL	101.2823
	ρ = 1.0128 g/ml

(2) Transfer Am-241 (616.2382.38) to a 40 ml VOA vial

mass of empty VOA vial without lid & 50 ml beaker	54.0248 g (bal
mass of standard, transfer pipet & 50 ml beaker (initial)	95.0640 g
mass of standard, transfer pipet & 50 ml beaker after transfer)	~~74~~ 75.0076 g (corrected)
net mass of standard transferred	20.0564 g

(3) Dilute to final volume with 1M HCL

mass of empty VOA VIAL w/o lid & 50 ml beaker (from above)	54.0248 g bal
mass of standard, 1M HCL, VOA vial & 50 ml beaker	92.4609 g
net mass of standard	38.4361 g

(4) final activity calculation

$$\frac{\overset{\text{SD}}{\cancel{8/1/03}}\ (\overset{52{,}128.96}{\cancel{52{,}066}}\ \text{dpm/g})(20.0564\ \text{g})}{38.4361\ \text{g}} = \overset{\text{MC}\ 11/1/07}{\cancel{27{,}168.64}}\ \text{dpm/g}$$

27,201.49

Continued on Page

Read and Understood By

C Moncavage	4/25/03	Renee Gallegos	5/5/03
Signed	Date	Signed	Date

38
PROJECT 6116.2382.38 Am-241

Notebook No. _____
Continued From Page _____

Am-241 primary dilution
prepare a primary dilution (~~SRM~~ SRS 63651-307) by diluting w/ 1M HCl
of RSO 6116 (NIST: ~~SRM~~ SRS 63651-307) by diluting w/ 1M HCl

1) Determine the density of 1M HCl (Lot # 42223 + Lot # 42216)

mass of 100ml Vol flask	62.4712 g	(Bal 12)
mass of flask + 1M HCl	163.8021 g	↓
Net mass of ~~std~~ HCl RG 12/3/02	101.330900 g	

2) Transfer contents of ampule to 40 ml VOA Vial

mass of VOA Vial w/o lid	22.3577 g	(Bal 12)
mass of opened amp ~~mass of VOA Vial~~ + 50 ml beaker	37.9238 g	↓
mass of beaker + empty ampule	32.9862 g	
Net mass of std transferred	4.937600 g	

3) Dilute std to final Vol w/ 1M HCl

mass of VOA Via w/o lid (from above)	22.3577 g	(Bal 12)
mass of std + VOA Vial + 1M HCl	63.7403 g	↓
Net mass of diluted std	41.382600 g	

4) Final Activity Calc

$$\frac{\left(\frac{3.728 \times 10^4 \text{ dps}}{5.11972 \text{ g}}\right)\left(60 \frac{\text{dpm}}{\text{dps}}\right)\left(4.9376 \text{ g}\right)}{41.3826 \text{ g}} = \cancel{52,066} \text{ dpm/g}$$

~~52,066~~ 7/31/03
52,128.96 dpm/g

ANALYTICS
1380 Seaboard Ind Blvd • Atlanta, GA 30318 • USA • 404-352-8677
Am-241
SRS 63651-307 Amount 1.008 µCi QA
Date 4/18/02 12:00 EST Exp. ——
PO # EW040502, Item 3
5.11972 g 1M HCl solution
CAUTION RADIOACTIVE MATERIAL

Continued on Page

Read and Understood By

[signature]	10-14-02	[signature]	2/4/03
Signed	Date	Signed	Date

ANALYTICS

1380 Seaboard Industrial Blvd.
Atlanta, Georgia 30318 · U.S.A.

Phone (404) 352-8677
Fax (404) 352-2837

PAI, FO 0616
rec'd 4-22-02

CERTIFICATE OF CALIBRATION

Standard Radionuclide Source

63651-307

Am-241 5 mL Liquid in Flame Sealed Vial

This standard radionuclide source was prepared gravimetrically from a calibrated master solution. The master solution was calibrated by liquid scintillation counting.

Radionuclide purity and calibration were checked by germanium gamma-ray spectrometry and liquid scintillation counting. The nuclear decay rate and assay date for this source are given below.

ANALYTICS maintains traceability to the National Institute of

PROJECT 821 3020.61 ^{243}Am Notebook No. 3020

Continued From Page N/A

Prepare a working level dilution of Am-243 (RSO# 821) of ~20 dpm/mL using 1M HNO_3 (6% HNO_3).

KSU # 821 Rec'd 4/13/06

National Institute of Standards & Technology

Certificate

Standard Reference Material 4332D

Americium-243 Radioactivity Standard

Recommended Procedure for Opening the SRM Ampoule

1). If the SRM solution is to be

PROPERTIES OF SRM 4332D

Certified values

Radionuclide	**Americium-243**
Reference time	**1200 EST, 20 October 2005** [b]
Massic activity of the solution [c]*	**36.24 Bq·g^{-1}**
Relative expanded uncertainty (k=2)	**0.86%** [d][e]
Solution mass	**(5.143 ± 0.002) g** [f]
Solution density	**(1.030 ± 0.002) g·mL^{-1} at 22.8 °C** [f]

Uncertified values

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	
Chemical Properties:			
Solution composition	Chemical	Concentration	Mass Fraction

EVALUATION OF THE UNCERTAINTY OF THE MASSIC ACTIVITY [d]*

Input Quantity x_i, the source of uncertainty (and individual uncertainty components where appropriate)	Method Used To Evaluate $u(x_i)$, the standard uncertainty of x_i (A) denotes evaluation by statistical methods (B) denotes evaluation by other methods	Relative Uncertainty Of Input Quantity, $u(x_i)/x_i$, (%) [i]	Relative Sensitivity Factor, $\lvert\partial y/\partial x_i\rvert \cdot (x_i/y)$ [j]	Relative Uncertainty Of Output Quantity, $u_i(y)/y$, (%) [k]
Massic alpha-particle emission rate, corrected for background and decay	Standard deviation of the mean for 9 sets of "0.8π" α counter measurements (A)	0.05	1.0	0.05
Half-life of Am-243	Standard uncertainty of the half life (A)	0.54 [m]	0.001 [n]	0.0005
Decay-scheme data	Standard uncertainty of the probability of decay by alpha-particle emission (A)	0.01	1.0	0.01
Extrapolation of alpha-particle-count-rate-versus-energy to zero energy	Estimated (B)	0.25	1.0	0.25
Gravimetric measurements	Estimated (B)	0.05	1.0	0.05
Live time [p]	Estimated (B)	0.10	1.0	0.10
Alpha-particle detection efficiency of scintillator	Estimated (B)	0.20	1.0	0.20
Geometry of "0.8π" α counter	Estimated (B)	0.10	1.0	0.10
Confirmatory measurements (long-term stability)	Estimated (B)	0.20	1.0	0.21
Alpha-particle-emitting impurities	Estimated (B) [q] Limit of detection [r]	13 100	0.0017 0.001	0.02 0.10
Photon-emitting impurities	Limit of detection (B) [r]	100	0.0001	0.01
Relative Combined Standard Uncertainty of the Output Quantity, $u_c(y)/y$, (%)				0.43
Coverage Factor, k				x 2
Relative Expanded Uncertainty of the Output Quantity, Uly, (%)				0.86

*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 americium-243 master solution was chemically purified in 1978. The solution was calibrated in 1983 and in 1995 by primary methods, and was recalibrated with confirmatory measurements in 2005.

[c] **Massic activity** is the preferred name for the quantity activity divided by the total mass of the sample. 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, $u_i(y) = |\partial y/\partial x_i| \cdot u(x_i)$, 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

[k] Relative component of combined standard uncertainty of output quantity y, rounded to two significant figures or less. The relative component of combined standard uncertainty of y is given by $u_r(y)/y \equiv |\partial y/\partial x_i| \cdot u(x_i)/y = |\partial y/\partial x_i| \cdot (x_i/y) \cdot u(x_i)/x_i$. The numerical values of $u(x_i)/x_i$, $|\partial y/\partial x_i| \cdot (x_i/y)$, and $u_r(y)/y$, all dimensionless quantities, are listed in columns 3, 4, and 5, respectively. Thus, the value in column 5 is equal to the value in column 4 multiplied by the value in column 3. The input quantities are independent, or very nearly so. Hence the covariances are zero or negligible.

[m] The relative standard uncertainty of $\lambda \cdot t$ is determined by the relative standard uncertainty of λ (i.e., of the half life). The relative standard uncertainty of t is negligible.

[n] $|\partial y/\partial x_i| \cdot (x_i/y) = |\lambda \cdot t|$.

[p] The live time is determined by counting the pulses from a gated crystal-controlled oscillator.

PARAGON ANALYTICS
Radiochemistry Data Package

Section 9

ADDITIONAL

Alpha Spectroscopy

Quality Control Data

Weekly Background, Energy, and Efficiency Calibrations

Calibration Data Summary

Laboratory Name: Paragon Analytics
PAI Work Order: 0805078

Prep SOP: PAI 778
Analytical SOP: PAI 714

Reported on: Friday, June 13, 2008
11:15:31 AM

Lab Sample ID Spectrum Analysis Date	QC Type	Batch ID Analysis Run	Test Name	Detector Id	Eff Spectrum Bkg Spectrum Egy Spectrum	Eff Date Bkg Date Egy Date	**RESULTS** %Efficiency Bkg CPM Energy keV	FLAGS Efficiency Background Energy	**LCL** %Efficiency Bkg CPM Energy keV	**LWL** %Efficiency Bkg CPM Energy keV	**UWL** %Efficiency Bkg CPM Energy keV	**UCL** %Efficiency Bkg CPM Energy keV
0805078-1	SMP	AS080606-1	Am241	1	C08060901	6/9/2008	28.78	Pass	27.36	27.84	29.76	30.24
Spectrum #1		AS080606-1C			B08060901	6/9/2008	0.0130	Pass	0.0000	0.0102	0.1002	0.1500
6/12/2008					C08060901	6/9/2008	5536.0	Pass	5497.7	5507.7	5587.7	5597.7
0805078-1	DUP	AS080606-1	Am241	2	C08060902	6/9/2008	31.03	Pass	29.81	30.33	32.43	32.95
Spectrum #1		AS080606-1C			B08060902	6/9/2008	0.0220	Pass	0.0000	0.0102	0.1002	0.1500
6/12/2008					C08060902	6/9/2008	5557.7	Pass	5503.6	5513.6	5593.6	5603.6
0805078-2	SMP	AS080606-1	Am241	4	C08060904	6/9/2008	30.07	Pass	28.67	29.17	31.19	31.69
Spectrum #1		AS080606-1C			B08060904	6/9/2008	0.0230	Pass	0.0000	0.0102	0.1002	0.1500
6/12/2008					C08060904	6/9/2008	5557.7	Pass	5505.7	5515.7	5595.7	5605.7
AS080606-1	MB	AS080606-1	Am241	5	C08060905	6/9/2008	31.19	Pass	29.29	29.80	31.86	32.37
Spectrum #1		AS080606-1C			B08060905	6/9/2008	0.0150	Pass	0.0000	0.0102	0.1002	0.1500
6/12/2008					C08060905	6/9/2008	5536.0	Pass	5494.9	5504.9	5584.9	5594.9
AS080606-1	LCS	AS080606-1	Am241	6	C08060906	6/9/2008	30.30	Pass	28.86	29.37	31.39	31.90
Spectrum #1		AS080606-1C			B08060906	6/9/2008	0.0270	Pass	0.0000	0.0102	0.1002	0.1500
6/12/2008					C08060906	6/9/2008	5547.6	Pass	5487.5	5497.5	5577.5	5587.5

Data Package ID: *AM0805078-1*

Abbreviations:

Eff - Efficiency	Bkg - Background	LCL - Lower Control Limit	UWL - Upper Warning Limit
Egy - Energy	CPM - Counts per Minute	LWL - Lower Warning Limit	UCL - Upper Control Limit

CI - The Analysis Date exceeds the Calibration Date by more than 7 days.

Alpha Spec Calibration Source Re-Certification

Recalibration performed by Isotope Products Laboratories
Primary Certified Source
Source PA ID: 190
Planchet Label: 8
Recalibrated on: 5/1/2007
Received by PA on: 5/5/2007

Values from certificate	
Source ID:	92MIX223027
Total Activity:	3780.5962 dpm
Ref. Date:	5/1/07

Nuclide	Act (Bq)	Act (dpm)	Half-Life (yrs)	Decay Corrected
U-234:	48.91	2994.6	2.48E+05	2894.59 dpm
U-235:	1.10	65.94	7.04E+08	65.94 dpm
Am-241:	12.00	720	432.17	718.88 dpm
			TOTAL	3779.41 dpm

Efficiency Determination for Detector: 25

Source Serial#	PA ID	Sequential #	Count Date	Am-241 net cts	U-234 net cts	U-235 net cts	count dur (s)	Total cpm	Known dpm	Detector efficiency
92MIX223027	190	97-19-103-09	5/20/08	7113	29841	789	2100	1078.37	3779.41	28.53%

Sources 1 through 6 activity determination

Source Serial#	PA ID	Sequential #	Count Date	Am-241 net cts	U-234 net cts	U-235 net cts	count dur (s)	Detector Efficiency	Am-241 dpm	U-234 dpm	U-235 dpm	Combined dpm
92MIX2203028	182	97-19-103-01	5/20/08	12417	73969	1878	2100	28.53%	1243.38	7406.92	188.03	8818.33
92MIX2203026	183	97-19-103-02	5/20/08	14459	141741	3158	2100	28.53%	1447.88	14193.30	316.03	15957.19
92MIX2203024	184	97-19-103-03	5/20/08	68052	68294	1480	2100	28.53%	6814.15	6838.65	148.20	13801.00
92MIX2203021	185	97-19-103-04	5/20/08	20822	58470	1507	2100	28.53%	2085.02	5854.92	150.90	8090.85
92MIX2203025	186	97-19-103-05	5/20/08	94084	114792	2491	2100	28.53%	9421.18	11494.75	249.44	21166.34
92MIX2203022	187	97-19-103-06	5/20/08	71430	75877	1663	2100	28.53%	7152.68	7597.98	166.53	14917.18
92MIX2203023	188	97-19-103-07	5/20/08	41741	65445	1420	2100	28.53%	4179.76	6553.37	142.19	10875.31
92MIX2203029	189	97-19-103-08	5/20/08	31922	200052	4843	2100	28.53%	3196.52	20032.30	484.93	23693.76

Efficiency Verification

Source Serial#	PA ID	Sequential #	Count Date	Am-241 net cts	U-234 net cts	U-235 net cts	Count dur (s)	Total cpm	Known dpm	Detector efficiency	RPD	FLAG
92MIX223027	190	97-19-103-00	5/21/08	6967	26575	761	2100	1033.37	3779.41	28.22%	1.12%	PASS

Sources 1 through 6 activity re-verification

Source Serial#	PA ID	Sequential #	Combined Observed dpm	Combined Certified dpm*	Percent Difference %	Within 5% of Certified value?
92MIX2203028	182	97-19-103-01	8818.33	8867.05	-0.55%	Yes
92MIX2203026	183	97-19-103-02	15957.19	16011.39	-0.34%	Yes
92MIX2203024	184	97-19-103-03	13801.00	13588.11	0.09%	Yes
92MIX2203021	185	97-19-103-04	8090.85	8188.77	-1.20%	Yes
92MIX2203025	186	97-19-103-05	21165.34	21096.48	0.33%	Yes
92MIX2203022	187	97-19-103-06	14917.18	15382.14	-3.02%	Yes
92MIX2203023	188	97-19-103-07	10875.31	10781.48	0.87%	Yes
92MIX2203029	189	97-19-103-08	23693.76	23636.41	0.24%	Yes

* Certificate values decay corrected to the count date

Data from certificates

Reference Date	U-234 (Bq)	U-234 (dpm)	U-235 (Bq)	U-235 (dpm)	Am-241 (Bq)	Am-241 (dpm)
5/1/2003	124.10	7446.00	2.43	145.74	21.43	1285.80
5/1/2003	239.30	14358.00	4.20	252.00	23.55	1413.00
5/1/2003	119.40	7164.00	1.93	115.58	106.00	6360.00
4/1/2003	101.00	6060.00	1.28	75.84	34.50	2070.00
4/1/2003	203.00	12180.00	3.41	204.72	146.40	8784.00
4/1/2003	132.90	7974.00	3.17	189.96	121.30	7278.00
4/1/2003	107.10	6426.00	0.93	55.54	72.26	4335.60
6/1/2003	334.60	20088.00	6.55	393.18	53.02	3181.20

OK
MC
6/5/08

R:\INST\alphspec\Cal Recert\CLCRT052008

AlphaVision v5.3 **Alpha-Spectroscopy Calibration Report**

ORTEC
801 S. Illinois Ave.
Oak Ridge, TN 37830

Analyst: ORTEC
Detector: 25 190 GB 5/21/08

9:19:16AM 5/21/2008

Calibration

Energy Calibration: RSO (Source 9)
Description:

Analysis Date: 5/20/2008 11:57:30AM
Calibration Type: Energy And Efficiency

Source Info

Certificate ID: A9 RSO#190
Prepared by: IPL
Description:

Certification Date: 6/1/2007 12:00:00PM

Acquisition

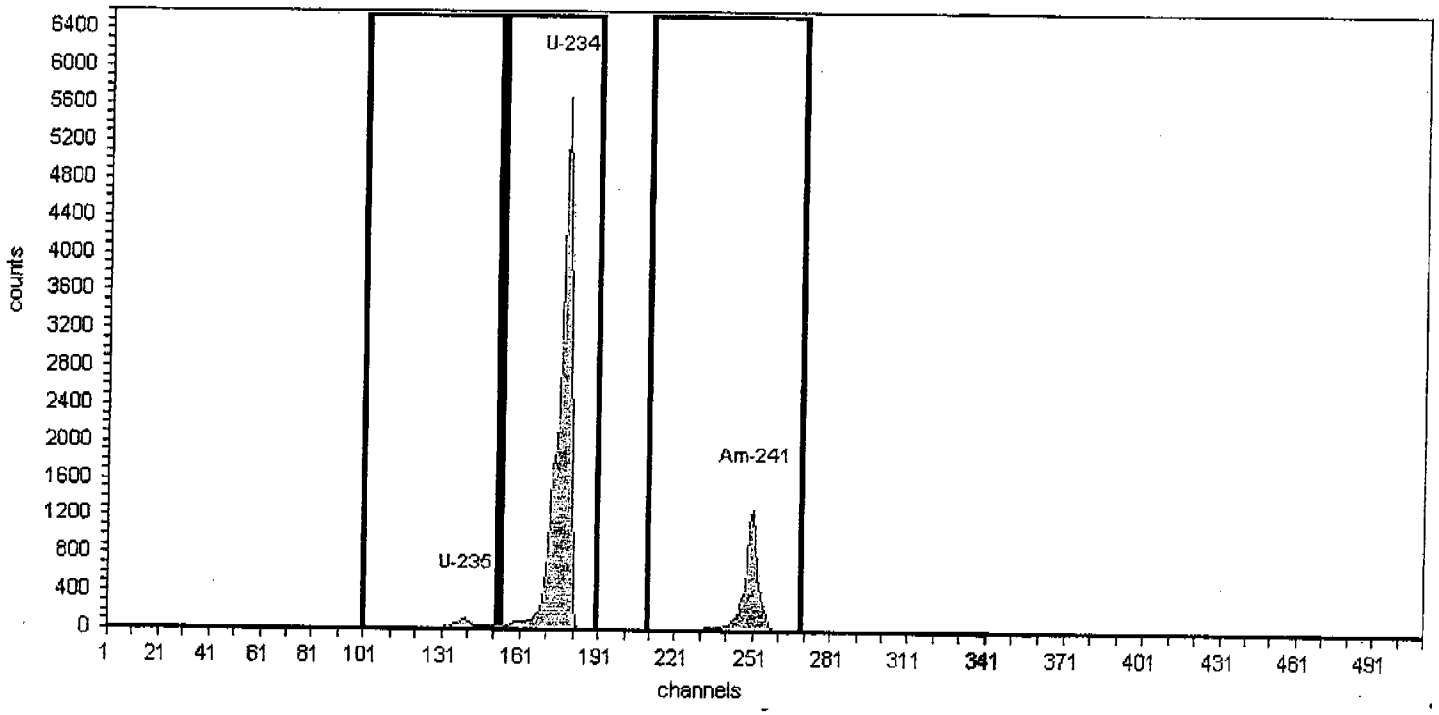
Detector: 25 , SN:
Acquisition Start Date: 5/20/2008 10:43:22AM

Live Time: 35.00 min.
Real Time: 35.01 min.

Efficiency Calibration Name: RSO (Source 9)

Energy Calibration Equation:
Gain = 9.8047 keV / Ch
Offset = 3,026.20 keV
Quadratic = 0.0000 keV / Ch^2

Efficiency: 28.47% +/- 0.30% TPU(2 sigma)



Method: Interactive ROI
Algorithm: Linear

Initial Calibration: No
Shelf: 1

Nuclide Activity Summary

Nuclide	Peak Channel	Peak Energy MeV	ROI Start Channel	ROI End Channel	Gross Counts	Net Count Rate (cpm)
U-235	140	4.40	100	152	789.00	22.54
U-234	178	4.78	153	190	29,841.00	852.60
Am-241	251	5.49	210	270	7,113.00	203.23

AlphaVision v5.3 **Alpha-Spectroscopy Calibration Report**

ORTEC
801 S. Illinois Ave.
Oak Ridge, TN 37830
9:19:22AM 5/21/2008

Analyst: ORTEC
Detector: 25

Calibration

Energy Calibration: RSO 182 (Source 1)
Description:

Analysis Date: 5/20/2008 12:25:48PM
Calibration Type: Energy And Efficiency

Source Info

Certificate ID: A1 RSO#182
Prepared by: IPL
Description:

Certification Date: 5/1/2003 12:00:45PM

Acquisition

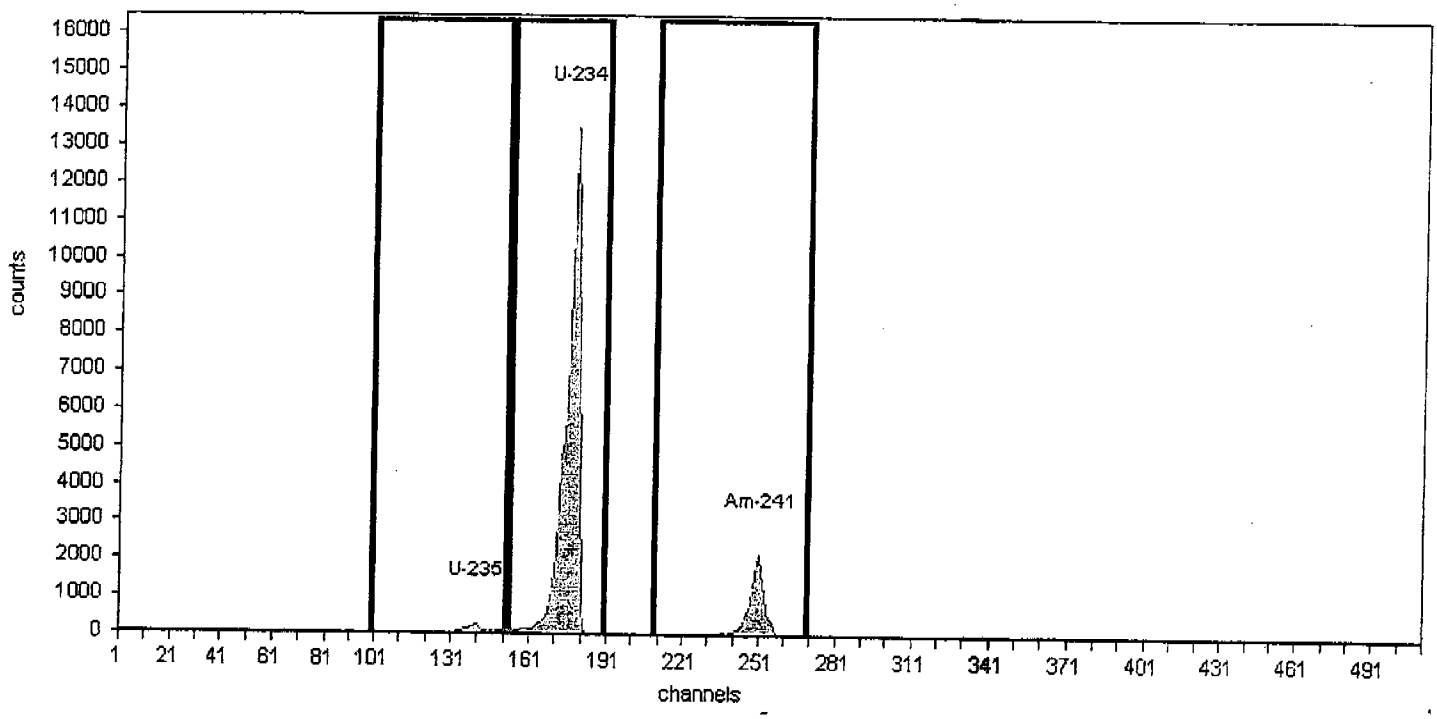
Detector: 25 , SN:
Acquisition Start Date: 5/20/2008 11:35:12AM

Live Time: 35.00 min.
Real Time: 35.03 min.

Efficiency Calibration Name: RSO 182 (Source 1)

Energy Calibration Equation:
Gain = 9.8047 keV / Ch
Offset = 3,026.20 keV
Quadratic = 0.0000 keV / Ch^2

Efficiency: 28.35% +/- 0.19% TPU(2 sigma)



Method: Interactive ROI
Algorithm: Linear

Initial Calibration: No
Shelf: 1

Nuclide Activity Summary

Nuclide	Peak Channel	Peak Energy MeV	ROI Start Channel	ROI End Channel	Gross Counts	Net Count Rate (cpm)
U-235	140	4.40	100	152	1,678.00	47.94
U-234	178	4.78	153	190	73,969.00	2,113.40
Am-241	251	5.49	210	270	12,417.00	354.77

AlphaVision v5.3 **Alpha-Spectroscopy Calibration Report**

ORTEC
801 S. Illinois Ave.
Oak Ridge, TN 37830
9:19:28AM 5/21/2008

Analyst: ORTEC
Detector: 25

Calibration

Energy Calibration: RSO 183 (Source 2)
Description:

Analysis Date: 5/20/2008 1:05:28PM
Calibration Type: Energy And Efficiency

Source Info

Certificate ID: A2 RSO#183
Prepared by: IPL
Description:

Certification Date: 5/1/2003 12:00:00PM

Acquisition

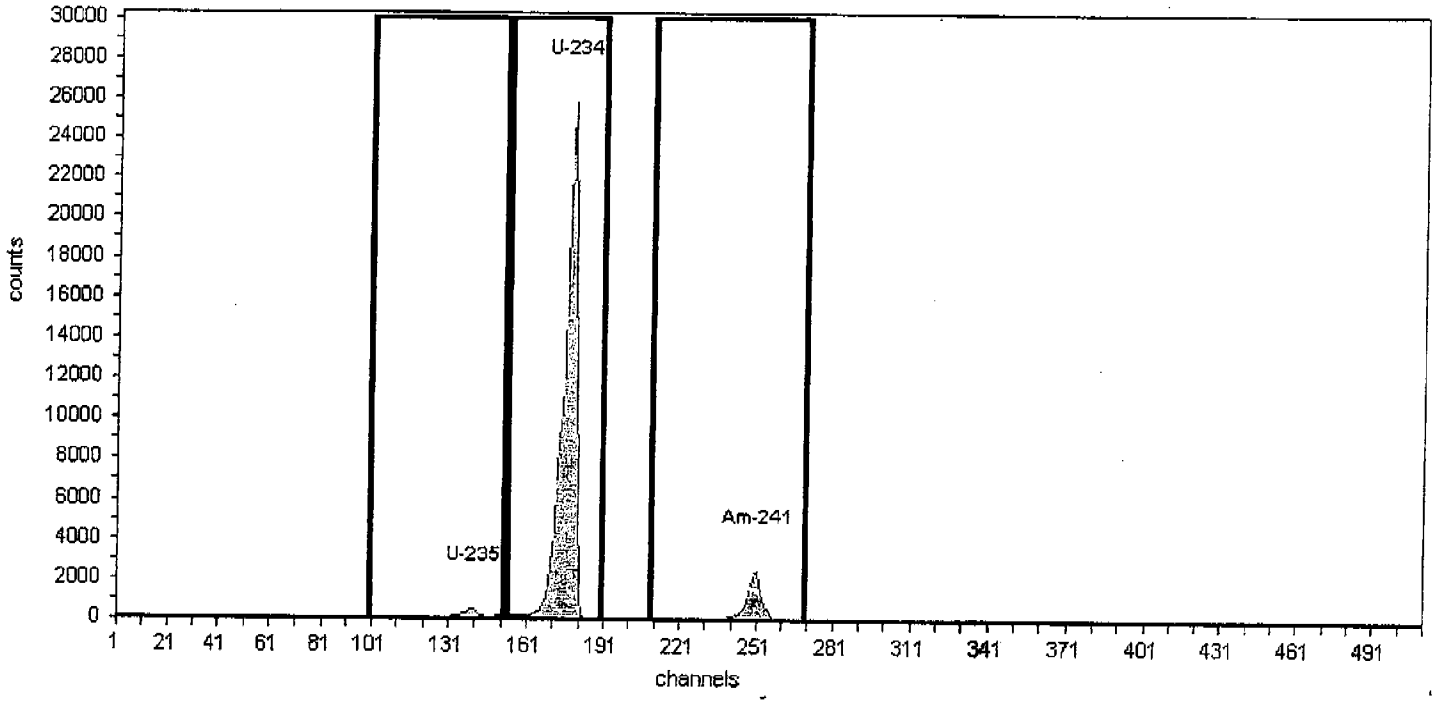
Detector: 25 , SN:
Acquisition Start Date: 5/20/2008 12:26:40PM

Live Time: 35.00 min.
Real Time: 35.05 min.

Efficiency Calibration Name: RSO 183 (Source 2)

Energy Calibration Equation:
Gain = 9.8047 keV / Ch
Offset = 3,026.20 keV
Quadratic = 0.0000 keV / Ch^2

Efficiency: 28.38% +/- 0.14% TPU(2 sigma)



Method: Interactive ROI
Algorithm: Linear

Initial Calibration: No
Shelf: 1

Nuclide Activity Summary

Nuclide	Peak Channel	Peak Energy MeV	ROI Start Channel	ROI End Channel	Gross Counts	Net Count Rate (cpm)
U-235	140	4.40	100	152	3,156.00	90.17
U-234	178	4.78	153	190	141,741.00	4,049.74
Am-241	251	5.49	210	270	14,459.00	413.11

AlphaVision v5.3

Alpha-Spectroscopy Calibration Report

ORTEC
801 S. Illinois Ave.
Oak Ridge, TN 37830

Analyst: ORTEC
Detector: 25

9:19:33AM 5/21/2008

Calibration

Energy Calibration: RSO 184 (Source 3)
Description:

Analysis Date: 5/20/2008 1:45:22PM
Calibration Type: Energy And Efficiency

Source Info

Certificate ID: A3 RSO#184
Prepared by: IPL
Description:

Certification Date: 5/1/2003 12:00:00PM

Acquisition

Detector: 25 , SN:
Acquisition Start Date: 5/20/2008 1:06:02PM

Energy Calibration Equation:
Gain = 9.7289 keV / Ch

AlphaVision v5.3

Alpha-Spectroscopy Calibration Report

ORTEC
801 S. Illinois Ave.
Oak Ridge, TN 37830

Analyst: ORTEC

Detector: 25

9:21:31AM 5/21/2008

Calibration

Energy Calibration: RSO 185 (Source 4)

Analysis Date: 5/20/2008 2:41:04PM

AlphaVision v5.3 **Alpha-Spectroscopy Calibration Report**

ORTEC
801 S. Illinois Ave.
Oak Ridge, TN 37830
9:21:22AM 5/21/2008

Analyst: ORTEC
Detector: 25

Calibration

Energy Calibration: RSO 186 (Source 5)
Description:

Analysis Date: 5/20/2008 3:26:01PM
Calibration Type: Energy And Efficiency

Source Info

Certificate ID: A5 RSO#186
Prepared by: IPL
Description:

Certification Date: 4/1/2003 12:00:00PM

Acquisition

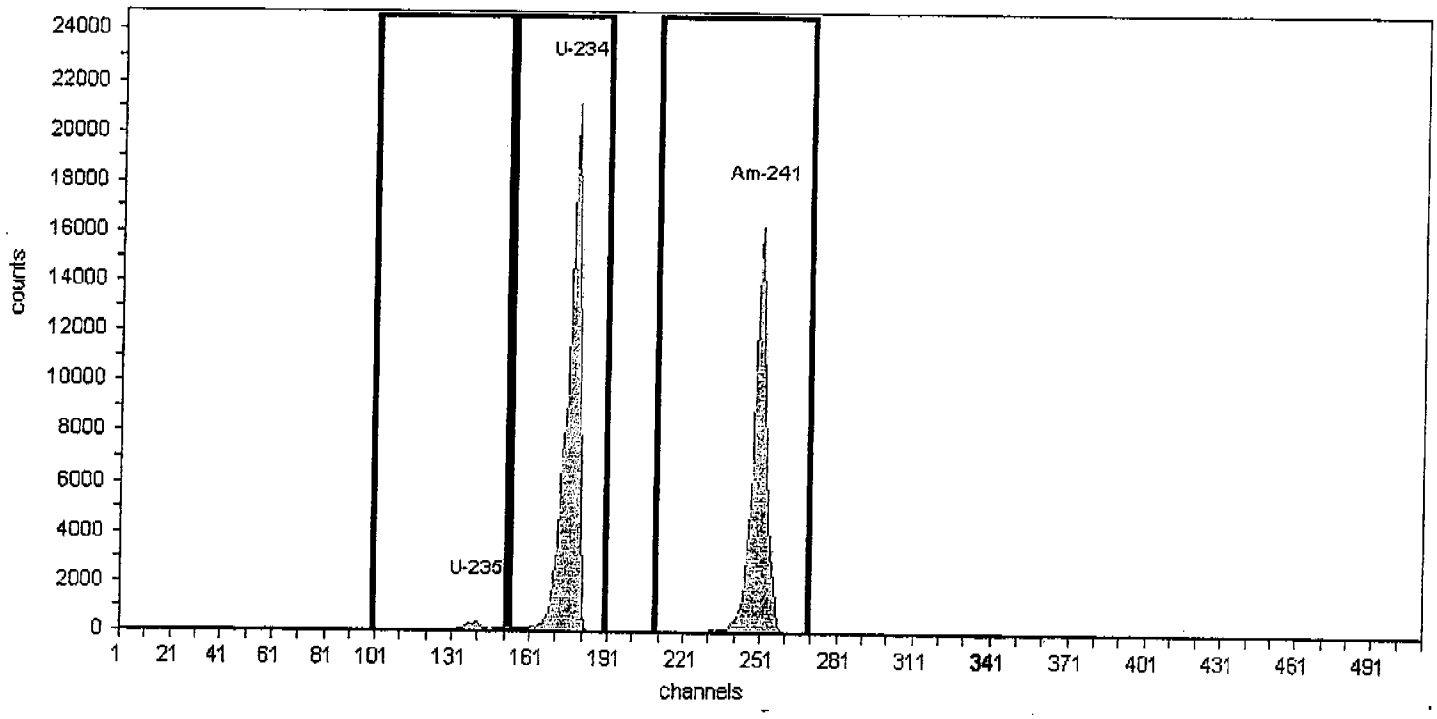
Detector: 25 , SN:
Acquisition Start Date: 5/20/2008 2:41:31PM

Live Time: 35.00 min.
Real Time: 35.06 min.

Efficiency Calibration Name: RSO 186 (Source 5)

Energy Calibration Equation:
Gain = 9.8047 keV / Ch
Offset = 3,026.20 keV
Quadratic = 0.0000 keV / Ch^2

Efficiency: 28.47% +/- 0.13% TPU(2 sigma)



Method: Interactive ROI
Algorithm: Linear

Initial Calibration: No
Shelf: 1

Nuclide Activity Summary

Nuclide	Peak Channel	Peak Energy MeV	ROI Start Channel	ROI End Channel	Gross Counts	Net Count Rate (cpm)
U-235	140	4.40	100	152	2,491.00	71.17
U-234	178	4.78	153	190	114,792.00	3,279.77
Am-241	251	5.49	210	270	94,084.00	2,688.11

AlphaVision v5.3 **Alpha-Spectroscopy Calibration Report**

ORTEC
801 S. Illinois Ave.
Oak Ridge, TN 37830
9:20:21AM 5/21/2008

Analyst: ORTEC
Detector: 25

Calibration

Energy Calibration: RSO 187 (Source 6)
Description:

Analysis Date: 5/20/2008 4:02:57PM
Calibration Type: Energy And Efficiency

Source Info

Certificate ID: A6 RSO#187
Prepared by: IPL
Description:

Certification Date: 4/1/2003 12:00:00PM

Acquisition

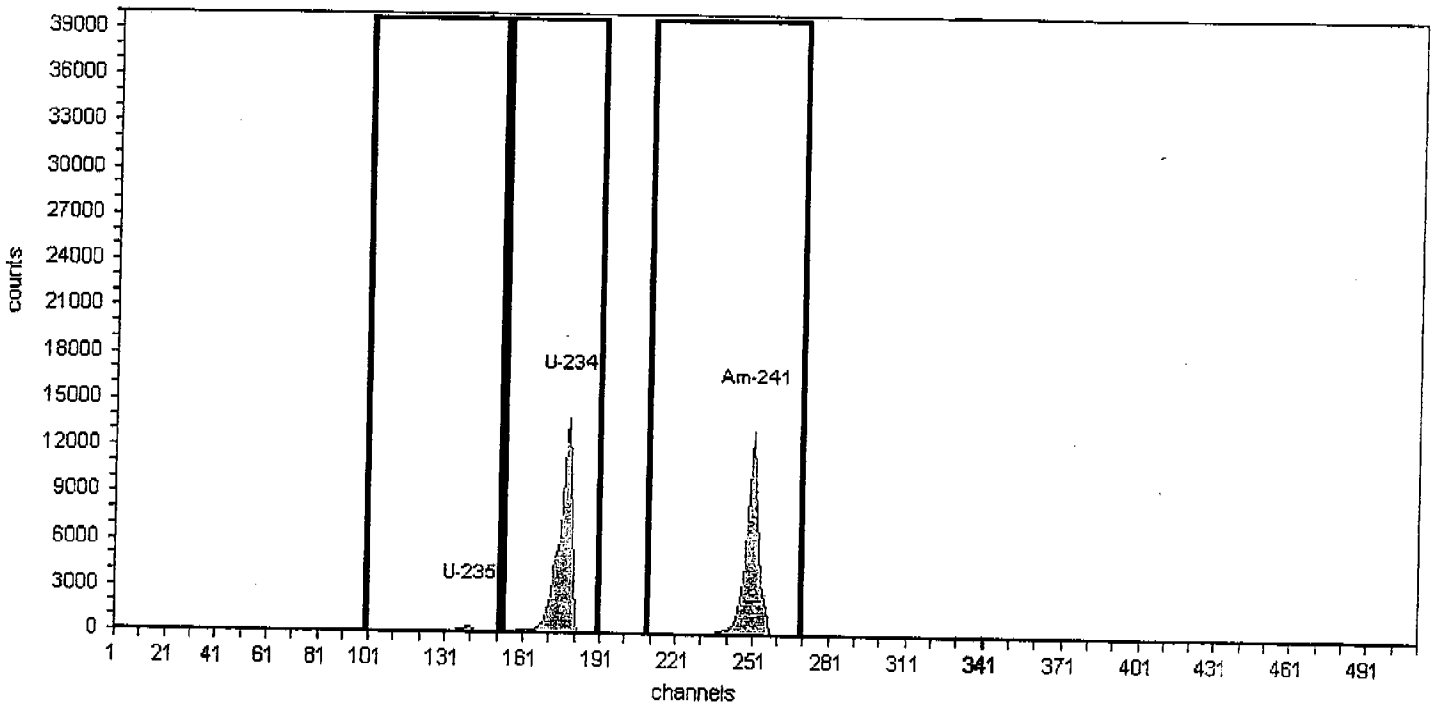
Detector: 25 , SN:
Acquisition Start Date: 5/20/2008 3:26:48PM

Live Time: 35.00 min.
Real Time: 35.05 min.

Efficiency Calibration Name: RSO 187 (Source 6)

Energy Calibration Equation:
Gain = 9.8047 keV / Ch
Offset = 3,026.20 keV
Quadratic = 0.0000 keV / Ch^2

Efficiency: 27.69% +/- 0.14% TPU(2 sigma)



Method: Interactive ROI
Algorithm: Linear

Initial Calibration: No
Shelf: 1

Nuclide Activity Summary

Nuclide	Peak Channel	Peak Energy MeV	ROI Start Channel	ROI End Channel	Gross Counts	Net Count Rate (cpm)
U-235	140	4.40	100	152	1,663.00	47.51
U-234	178	4.78	153	190	75,877.00	2,167.91
Am-241	251	5.49	210	270	71,430.00	2,040.86

AlphaVision v5.3 **Alpha-Spectroscopy Calibration Report**

ORTEC
801 S. Illinois Ave.
Oak Ridge, TN 37830
9:20:28AM 5/21/2008

Analyst: ORTEC
Detector: 25

Calibration

Energy Calibration: RSO 188 (Source 7)
Description:

Analysis Date: 5/20/2008 4:41:56PM
Calibration Type: Energy And Efficiency

Source Info

Certificate ID: A7 RSO#188
Prepared by: IPL
Description:

Certification Date: 4/1/2003 12:00:00PM

Acquisition

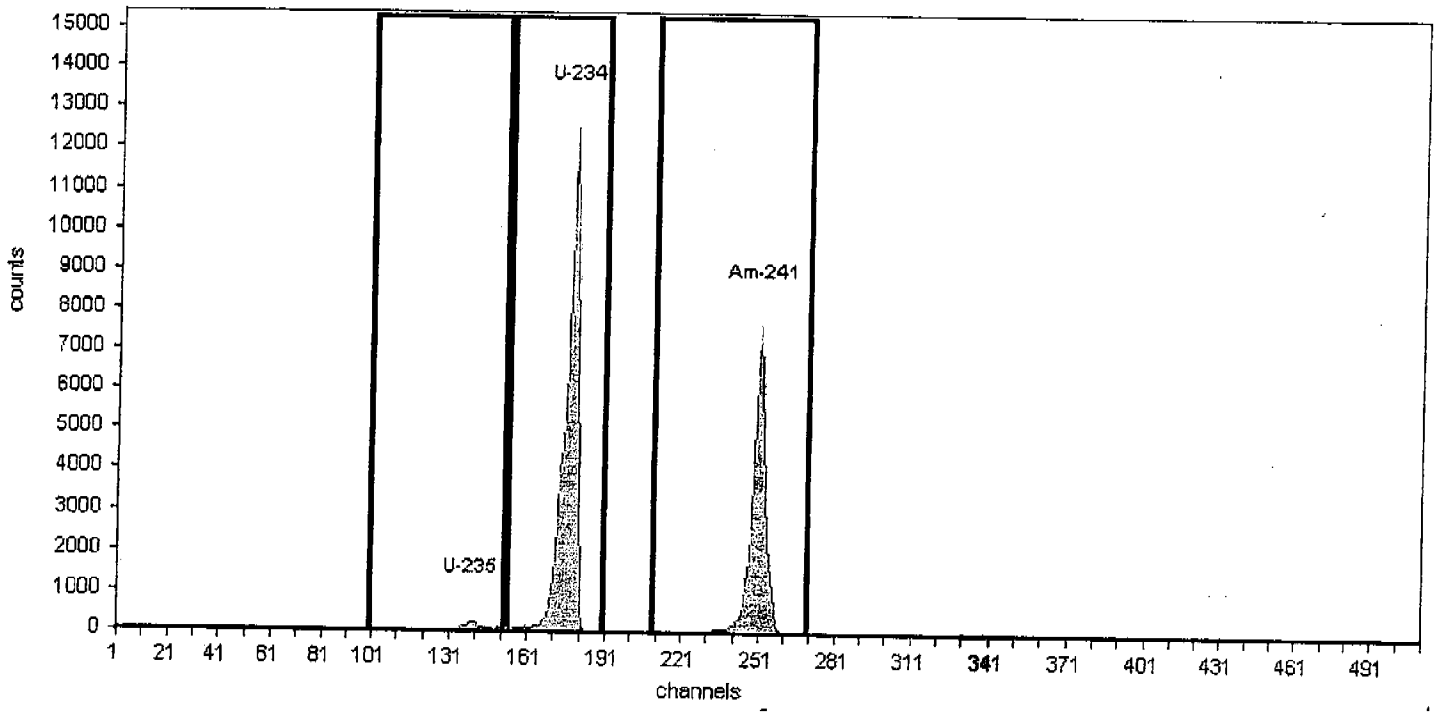
Detector: 25 , SN:
Acquisition Start Date: 5/20/2008 4:03:54PM

Live Time: 35.00 min.
Real Time: 35.03 min.

Efficiency Calibration Name: RSO 188 (Source 7)

Energy Calibration Equation:
Gain = 9.7289 keV / Ch
Offset = 3,043.84 keV
Quadratic = 0.0000 keV / Ch^2

Efficiency: 28.55% +/- 0.18% TPU(2 sigma)



Method: Interactive ROI
Algorithm: Linear

Initial Calibration: No
Shelf: 1

Nuclide Activity Summary

Nuclide	Peak Channel	Peak Energy MeV	ROI Start Channel	ROI End Channel	Gross Counts	Net Count Rate (cpm)
U-235	139	4.40	100	152	1,420.00	40.57
U-234	178	4.78	153	190	65,445.00	1,869.86
Am-241	251	5.49	210	270	41,741.00	1,192.60

AlphaVision v5.3

Alpha-Spectroscopy Calibration Report

ORTEC
801 S. Illinois Ave.
Oak Ridge, TN 37830
9:20:33AM 5/21/2008

Analyst: ORTEC
Detector: 25

Calibration

Energy Calibration: RSO 189 (Source 8)
Description:

Analysis Date: 5/21/2008 8:30:29AM
Calibration Type: Energy And Efficiency

Source Info

Certificate ID: A8 RSO#189
Prepared by: IPL
Description:

Certification Date: 4/1/2003 12:00:00PM

Acquisition

Detector: 25 , SN:
Acquisition Start Date: 5/20/2008 4:42:28PM

Energy Calibration Equation:
Gain = 9.8047 keV / Ch

AlphaVision v5.3 **Alpha-Spectroscopy Calibration Report**

ORTEC
801 S. Illinois Ave.
Oak Ridge, TN 37830
9:20:39AM 5/21/2008

Analyst: ORTEC
Detector: 25

Calibration

Energy Calibration: RSO 190 (Source 9)
Description:

Analysis Date: 5/21/2008 9:08:00AM
Calibration Type: Energy And Efficiency

Source Info

Certificate ID: A9 RSO#190
Prepared by: IPL
Description:

Certification Date: 6/1/2007 12:00:00PM

Acquisition

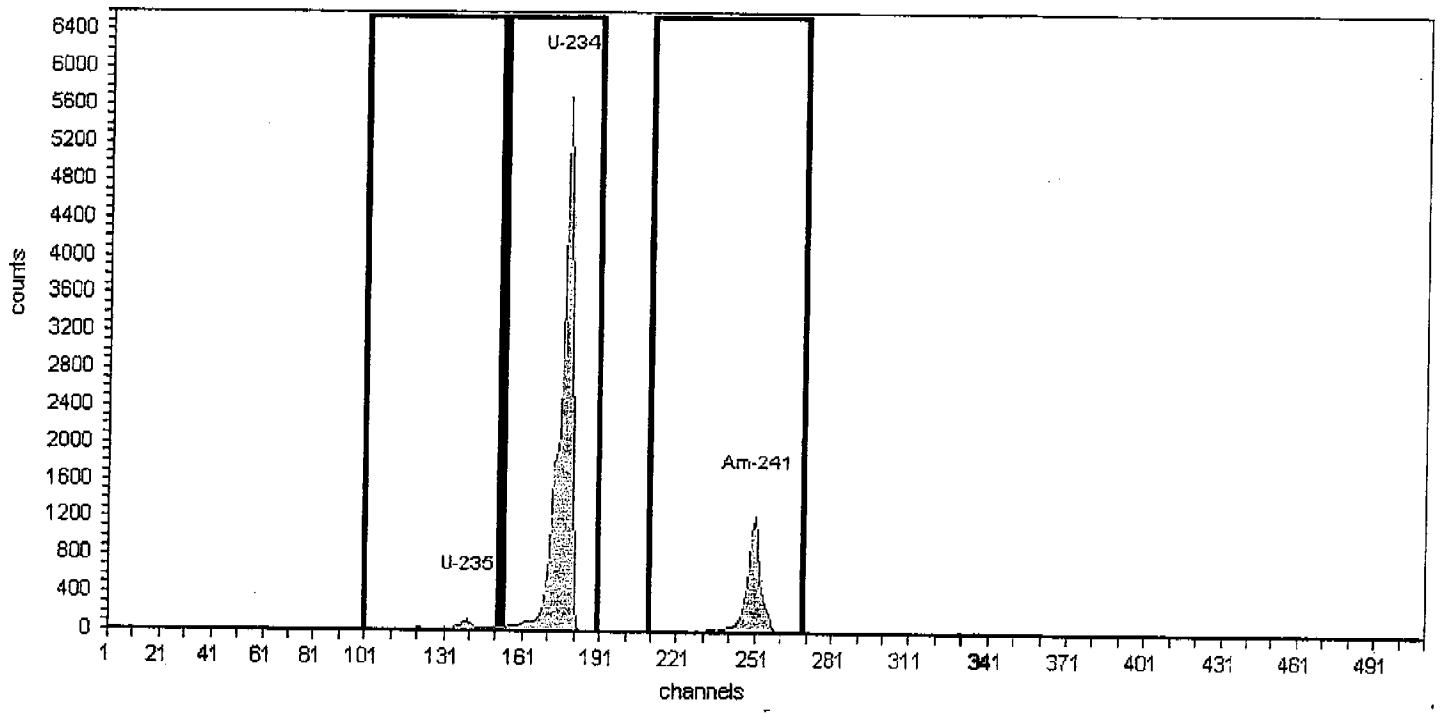
Detector: 25 , SN:
Acquisition Start Date: 5/21/2008 8:31:01AM

Live Time: 35.00 min.
Real Time: 35.01 min.

Efficiency Calibration Name: RSO 190 (Source 9)

Energy Calibration Equation:
Gain = 9.8047 keV / Ch
Offset = 3,026.20 keV
Quadratic = 0.0000 keV / Ch^2

Efficiency: 28.16% +/- 0.30% TPU(2 sigma)



Method: Interactive ROI
Algorithm: Linear

Initial Calibration: No
Shelf: 1

Nuclide Activity Summary

Nuclide	Peak Channel	Peak Energy MeV	ROI Start Channel	ROI End Channel	Gross Counts	Net Count Rate (cpm)
U-235	140	4.40	100	152	781.00	22.31
U-234	178	4.78	153	190	29,575.00	845.00
Am-241	251	5.49	210	270	6,967.00	199.06

Isotope Products
Laboratories

24937 Avenue Tibbitts
Valencia, California 91355

Tel 661-[illegible]

$\boxed{\alpha 1}$

reverified 5/20/08
expires 5/20/09

PAT 18.2

Isotope Products
Laboratories

24937 Avenue Tibbitts
Valencia, California 91355

Tel 661·309·1010

α2

reverified 5/20/08
expires 5/20/09

PAI 183

Isotope Products Laboratories
An Eckert & Ziegler Company

24937 Avenue Tibbitts
Valencia, California 91355

Tel 661•309•1010
Fax 661•257•8303

α 3

reverified 5/20/08
expires 5/20/09

PAT I.D 184
recalibrated 4-15-02

CERTIFICATE OF CALIBRATION
MIXED ALPHA STANDARD SOURCE

Radionuclide A: U-234
Radionuclide B: U-235
Radionuclide C: Am-241
Half Life (U-234): (2.454 ± 0.006)E+05 years
Half Life (U-235): (7.037 ± 0.011)E+08 years
Half Life (Am-241): 432.17 ± 0.66 years

Customer: PARAGON ANALYTICS, INC.
P.O. No.: EW040203/R2193
Catalog No.: MISC-STD
Reference Date: 1-May-03 12:00 PST
Source No.: 92MIX2203024

Contained Radioactivity:

U-234:	3.227	nCi	(119.4 Bq)	Am-241:	2.866	nCi	(106.0 Bq)
U-235:	0.05205	nCi	(1.926 Bq)	Total Activity:	6.145	nCi	(227.3 Bq)

Physical description:

A. Capsule type: Disk (22 mm OD X 0.79 mm THK)
B. Nature of active deposit: Electrodeposited and diffusion bonded oxides
C. Active Diameter: 19 mm
D. Backing: Stainless steel
E. Cover: None

Radioimpurities: Not determined

Method of Calibration:

This source was assayed using a windowless internal gas flow proportional counter for total alpha activity. Individual nuclide ratios were taken from those determined in Aug 1992.

Uncertainty of Measurement:

A. Type A (random) uncertainty: ± 0.6%
B. Type B (systematic) uncertainty: ± 3.0%
C. Uncertainty in aliquot weighing: ± 0.0%
D. Total uncertainty at the 99% confidence level: ± 3.1%

Notes:

- See reverse side for leak test(s) performed on this source.
- IPL participates in a 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

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α 4

reverified 5/20/08
expires 5/20/09

PAI ID 00185
rec'd from recalibration
3-28-03

CERTIFICATE OF CALIBRATION
ALPHA STANDARD SOURCE

Radionuclide A:	U-234	**Customer:**	PARAGON ANALYTICS, INC.
Radionuclide B:	U-235	**P.O. No.:**	EW030603/R2155
Radionuclide C:	Am-241	**Catalog No.:**	MISC-STD
Half Life (U-234):	(2.454 ± 0.006)E+05 years	**Reference Date:**	1-Apr-03 12:00 PST
Half Life (U-235):	(7.037 ± 0.011)E+08 years	**Source No.:**	92MIX2203021
Half Life (Am-241):	432.17 ± 0.66 years		

Contained Radioactivity:

U-234:	2.731	nCi	(101.0 Bq)	Am-241:	0.9325	nCi	(34.50 Bq)
U-235:	0.03416	nCi	(1.264 Bq)	Total Activity:	3.698	nCi	(136.8 Bq)

Physical description:

A. Capsule type:	Disk (22 mm OD X 0.79 mm THK)
B. Nature of active deposit:	Electrodeposited and diffusion bonded oxides
C. Active Diameter:	19 mm
D. Backing:	Stainless steel
E. Cover:	None

Radioimpurities: Not determined

Method of Calibration:

This source was assayed using a windowless internal gas flow proportional counter for total alpha activity. Individual nuclide ratios were taken from those determined in Aug 1992.

Uncertainty of Measurement:

A. Type A (random) uncertainty:	± 0.8%
B. Type B (systematic) uncertainty:	± 3.1%
C. Uncertainty in aliquot weighing:	± 0.0%
D. Total uncertainty at the 99% confidence level:	± 3.2%

Notes:

- See reverse side for leak test(s) performed on this source.
- IPL participates in a 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).
- Nuclear data was taken from "Table of Radioactive Isotopes", edited by Virginia Shirley, 1986.
- This source has a working life of 2 years.
- This source had a total alpha surface emission rate of 4145 α/min in 2π on 18 Mar 03.

Daniel James Van Dalsem
Quality Control

19-Mar-03
Date Signed

IPL Ref. No.: 987-2

Isotope Products Laboratories
An Eckert & Ziegler Company

24937 Avenue Tibbitts
Valencia, California 91355

Tel 661·309·1010
Fax 661·257·8303

α5 reverified 5/20/08
expires 5/20/09
PAI ID 00186
recalibration received ~~1-86~~ 3-28-03

CERTIFICATE OF CALIBRATION
ALPHA STANDARD SOURCE

Radionuclide A:	U-234	**Customer:**	PARAGON ANALYTICS, INC.
Radionuclide B:	U-235	**P.O. No.:**	EW030603/R2155
Radionuclide C:	Am-241	**Catalog No.:**	MISC-STD
Half Life (U-234):	(2.454 ± 0.006)E+05 years	**Reference Date:**	1-Apr-03 12:00 PST
Half Life (U-235):	(7.037 ± 0.011)E+08 years	**Source No.:**	92MIX2203025
Half Life (Am-241):	432.17 ± 0.66 years		

Contained Radioactivity:

U-234:	5.486	nCi	(203.0 Bq)	Am-241:	3.958	nCi	(146.4 Bq)
U-235:	0.09221	nCi	(3.412 Bq)	Total Activity:	9.536	nCi	(352.8 Bq)

Physical description:

A. Capsule type: [redacted]

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An Eckert & Ziegler Company

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Valencia, California 91355

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Fax 661·257·8303

α6 reverified 5/20/08 expires 5/20/09
BAID 00187 recd from recalibrate 3-28-03

CERTIFICATE OF CALIBRATION
ALPHA STANDARD SOURCE

Radionuclide A:	U-234	**Customer:**	PARAGON ANALYTICS, INC.
Radionuclide B:	U-235	**P.O. No.:**	EW030603/R2155
Radionuclide C:	Am-241	**Catalog No.:**	MISC-STD
Half Life (U-234):	(2.454 ± 0.006)E+05 years	**Reference Date:**	1-Apr-03 12:00 PST
Half Life (U-235):	(7.037 ± 0.011)E+08 years	**Source No.:**	92MIX2203022
Half Life (Am-241):	432.17 ± 0.66 years		

Contained Radioactivity:

U-234:	3.592	nCi	(132.9 Bq)	Am-241:	3.279	nCi	(121.3 Bq)
U-235:	0.08556	nCi	(3.166 Bq)	Total Activity:	6.957	nCi	(257.4 Bq)

Physical description:

A. Capsule type:	Disk (22 mm OD X 0.79 mm THK)
B. Nature of active deposit:	Electrodeposited and diffusion bonded oxides
C. Active Diameter:	19 mm
D. Backing:	Stainless steel
E. Cover:	None

Radioimpurities: Not determined

Method of Calibration:

This source was assayed using a windowless internal gas flow proportional counter for total alpha activity. Individual nuclide ratios were taken from those determined in Aug 1992.

Uncertainty of Measurement:

A. Type A (random) uncertainty:	± 0.8%
B. Type B (systematic) uncertainty:	± 3.1%
C. Uncertainty in aliquot weighing:	± 0.0%
D. Total uncertainty at the 99% confidence level:	± 3.2%

Notes:

- See reverse side for leak test(s) performed on this source.
- IPL participates in a 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).
- Nuclear data was taken from "Table of Radioactive Isotopes", edited by Virginia Shirley, 1986.
- This source has a working life of 2 years.
- This source had a total alpha surface emission rate of 7799 α/min in 2π on 18 Mar 03.

Daniel James Van Dalsem
Quality Control

19-Mar-03
Date Signed

IPL Ref. No.: 987-2

Isotope Products Laboratories
An Eckert & Ziegler Company

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Valencia, California 91355

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α 7

reverified 5/20/08
expires 5/20/09

PAID 188
recd for recalibration
3-28-03

CERTIFICATE OF CALIBRATION
ALPHA STANDARD SOURCE

Radionuclide A:	U-234	**Customer:**	PARAGON ANALYTICS, INC.
Radionuclide B:	U-235	**P.O. No.:**	EW030603/R2155
Radionuclide C:	Am-241	**Catalog No.:**	MISC-STD
Half Life (U-234):	(2.454 ± 0.006)E+05 years	**Reference Date:**	1-Apr-03 12:00 PST
Half Life (U-235):	(7.037 ± 0.011)E+08 years	**Source No.:**	92MIX2203023
Half Life (Am-241):	432.17 ± 0.66 years		

Contained Radioactivity:

U-234:	2.895	nCi	(107.1 Bq)	Am-241:	1.953	nCi	(72.26 Bq)
U-235:	0.02502	nCi	(0.9257 Bq)	Total Activity:	4.873	nCi	(180.3 Bq)

Physical description:

A. Capsule type: Disk (22 mm OD X 0.79 mm THK)
B. Nature of active deposit: Electrodeposited and diffusion bonded oxides
C. Active Diameter: 19 mm

Isotope Products Laboratories
An Eckert & Ziegler Company

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α 8

re verified 5/20/08
expires 5/20/09

PAI ID 189
recd 4-2-03
recalibrated 4-15-03

CERTIFICATE OF CALIBRATION
MIXED ALPHA STANDARD SOURCE

Radionuclide A:	U-234	**Customer:**	PARAGON ANALYTICS, INC.
Radionuclide B:	U-235	**P.O. No.:**	EW040203/R2193
Radionuclide C:	Am-241	**Catalog No.:**	MISC-STD
Half Life (U-234):	(2.454 ± 0.006)E+05 years	**Reference Date:**	1-May-03 12:00 PST
Half Life (U-235):	(7.037 ± 0.011)E+08 years	**Source No.:**	92MIX2203029
Half Life (Am-241):	432.17 ± 0.66 years		

Contained Radioactivity:

U-234:	9.048	nCi	(334.8 Bq)	Am-241:	1.433	nCi	(53.02 Bq)
U-235:	0.1771	nCi	(6.553 Bq)	Total Activity:	10.66	nCi	(394.4 Bq)

Physical description:

A. Capsule type:	Disk (22 mm OD X 0.79 mm THK)
B. Nature of active deposit:	Electrodeposited and diffusion bonded oxides
C. Active Diameter:	19 mm
D. Backing:	Stainless steel
E. Cover:	None

Radioimpurities: Not determined

Method of Calibration:

This source was assayed using a windowless internal gas flow proportional counter for total alpha activity. Individual nuclide ratios were taken from those determined in Mar 1998.

Uncertainty of Measurement:

A. Type A (random) uncertainty:	± 0.5%
B. Type B (systematic) uncertainty:	± 3.0%
C. Uncertainty in aliquot weighing:	± 0.0%
D. Total uncertainty at the 99% confidence level:	± 3.0%

Notes:

- See reverse side for leak test(s) performed on this source.
- IPL participates in a 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).
- Nuclear data was taken from "Table of Radioactive Isotopes", edited by Virginia Shirley, 1986.
- This source has a working life of 2 years.
- This source had a total alpha surface emission rate of 11950 α/min in 2π on 11 Apr 03.

Daniel James Van Dalsem
Quality Control

15-Apr-03
Date Signed

IPL Ref. No.: 987-7

Eckert & Ziegler
Isotope Products

24937 Avenue Tibbitts
Valencia, California 91355

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Fax 661·257·8303

RSO #190
Rec'd 6/6/07 GW
Recertification 6/1/07

CERTIFICATE OF CALIBRATION
MIXED ALPHA STANDARD SOURCE

α 9

Radionuclide:	U-234	**Customer:**	PARAGON ANALYTICS, INC.
Radionuclide:	U-235	**P.O. No.:**	73179/R3768
Radio: 23	Am-241	**Catalog No.:**	MISC-STD
Half-life (U-234):	(2.454 ± 0.006)E+05 years	**Reference Date:**	1-Jun-07 12:00 PST
Half-life (U-235):	(7.037 ± 0.011)E+08 years	**Source No.:**	92MIX223027
Half-life (Am-241):	432.17 ± 0.66 years		

Contained Radioactivity:

U-234:	1.349	**nCi,**	49.91	**Bq**	Am-241:	0.3243	**nCi,**	12.00	**Bq**
U-235:	0.02970	**nCi,**	1.099	**Bq**	Total Activity:	1.703	**nCi,**	63.01	**Bq**

Physical Description:

A. Capsule type: Disk (47 mm OD x 0.76 mm THK)
B. Nature of active deposit: Electrodeposited and diffusion bonded oxide
C. Active diameter/volume: 19 mm
D. Backing: Stainless steel
E. Cover: None

Radioimpurities: Not determined

Method of Calibration:

This source was assayed using a windowless internal gas flow proportional counter for total

Paragon Analytics

Radiochemistry Case Narrative
Strontium-90

Los Alamos National Laboratory SMO

Dust / 08-1101

PA WO 0805078

1. This report consists of the analytical results and supporting documentation for two solid samples received by Paragon on 05/08/08.

2. These samples were prepared according to procedures PA-SOP707R10

1

PARAGON ANALYTICS
Radiochemistry Data Package

Section 1

CHAIN OF CUSTODY

Paragon Analytics

Sample Number(s) Cross-Reference Table

Paragon OrderNum: 0805078
Client Name: Los Alamos National Laboratory SMO
Client Project Name: Dust
Client Project Number: 08-1101
Client PO Number: 33204-001-06 F3

Client Sample Number	Lab Sample Number	COC Number	Matrix	Date Collected	Time Collected
SFB08-08-12411	0805078-1		SOLID	16-Apr-08	
SFB08-08-12412	0805078-2		SOLID	16-Apr-08	

Wednesday, May 07, 2008

LAB CHAIN OF CUSTODY DOCUMENT NUMBER: 08-1101C

REQUEST NUMBER: 08-1101

LOS ALAMOS

NATIONAL LABORATORY

ATTN: Lance Steere

Paragon Analytics, Inc.

225 Commerce

Fort Collins, CO 80524

TURNAROUND/REPORT DUE: 6/6/2008

TURNAROUND REQ'D: 30

LAB REQUEST COMMENTS: Phils Samples 0805078

	SAMPLE ID	CTNR	CTNR DESC	ORDER	PRESERV	MATRIX
1	SFB08-08-12411	1	1 L POLY	AM241+GS+ISOPU+ISOU+SR90	None	S
	SFB08-08-12411	1	500 ML POLY	GROSSA+B	None	S
	SFB08-08-12411	1	250 ML POLY	ISO_Po	Ice	S
2	SFB08-08-12412	1	1 L POLY	AM241+GS+ISOPU+ISOU+SR90	None	S
	SFB08-08-12412	1	500 ML POLY	GROSSA+B	None	S
	SFB08-08-12412	1	250 ML POLY	ISO_Po	Ice	S

Relinquished By:		Date	Time	Received By:		Date	Time
[illegible]		5/7/08	3:00	Sheri Lafferty	[illegible]	5/8/08	0930
Printed Name	Signature			Printed Name	Signature		
Printed Name	Signature			Printed Name	Signature		
Printed Name	Signature			Printed Name	Signature		

Received for DISPOSAL By: **Date** **Time** **Remarks:**

Printed Name Signature

Wednesday, May 07, 2008

REQUEST NUMBER: 08-1101

LOS ALAMOS
NATIONAL LABORATORY

ATTN: Lance Steere
Paragon Analytics, Inc.
225 Commerce
Fort Collins, CO 80524

These Samples are on:
LANL Request Number:08-1101
Per Agreement Number:1-800-443-1511
Project Cost Code: WEPR 1314 0300

Please analyse the enclosed samples according to the schedule indicated:

SHIP DATE: 5/7/2008
TURNAROUND/REPORT DUE: 6/6/2008
TURNAROUND REQ'D: 30 Days

RAD SCREENING: Not Required
LAB REQUEST COMMENTS: Phils Sample

LANL ER SMO CONTACT:
Signature:

PRIORITY	METHOD CODE	CNTNR	SAMPLE ID	SAMPLE MATRIX	DATE SAMPLED	SAMPLE COMMENTS	SPECIAL INSTRUCTIONS
	EPA:900	1	SFB08-08-12411	S	4/16/2008	LA Monitor-vacuum bag, location LAM-0001	
		1	SFB08-08-12412	S	4/16/2008	LA Monitor-furnace filter, location LAM-0001	
	EPA:901.1	1	SFB08-08-12411	S	4/16/2008	LA Monitor-vacuum bag, location LAM-0001	
		1	SFB08-08-12412	S	4/16/2008	LA Monitor-furnace filter, location LAM-0001	
	EPA:905.0	1	SFB08-08-12411	S	4/16/2008	LA Monitor-vacuum bag, location LAM-0001	
		1	SFB08-08-12412	S	4/16/2008	LA Monitor-furnace filter, location LAM-0001	
	HASL-300:AM-241	1	SFB08-08-12411	S	4/16/2008	LA Monitor-vacuum bag, location LAM-0001	

080508

5

Wednesday, May 07, 2008

REQUEST NUMBER: 08-1101

PRIORITY	METHOD CODE	CNTNR	SAMPLE ID	SAMPLE MATRIX	DATE SAMPLED	SAMPLE COMMENTS	SPECIAL INSTRUCTIONS
	HASL-300:AM-241	1	SFB08-08-12412	S	4/16/2008	LA Monitor-furnace filter, location LAM-0001	
	HASL-300:ISOPU	1	SFB08-08-12411	S	4/16/2008	LA Monitor-vacuum bag, location LAM-0001	
		1	SFB08-08-12412	S	4/16/2008	LA Monitor-furnace filter, location LAM-0001	
	HASL-300:ISOU	1	SFB08-08-12411	S	4/16/2008	LA Monitor-vacuum bag, location LAM-0001	
		1	SFB08-08-12412	S	4/16/2008	LA Monitor-furnace filter, location LAM-0001	
	HASL-300:PO-210	1	SFB08-08-12411	S	4/16/2008	LA Monitor-vacuum bag, location LAM-0001	
		1	SFB08-08-12412	S	4/16/2008	LA Monitor-furnace filter, location LAM-0001	

Final Page of REQUEST NUMBER 08-1101

080508

CONDITION OF SAMPLE UPON RECEIPT FORM

Paragon Analytics

Client: LANL

Workorder No: 0805078

Project Manager: LS

Initials: SL

Date: 5·8·08

Does this project require any **special handling** in addition to standard Paragon procedures? YES (NO)

0805078

ORIGIN ID: SAFA (505) 665-9966
JOYLENE VALDEZ
LOS ALAMOS NATL LAB.
TA00 BLDG 1237 DPU 03

LOS ALAMOS, NM 87545
UNITED STATES US

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PARAGON ANALYTICS
Radiochemistry Data Package

Section 2

SAMPLE RESULTS SUMMARY

2008

Date Analyzed	Flags
6/15/2008	U
6/15/2008	U

SOP 743)

ee PAI SOP 709)

3

PARAGON ANALYTICS
Radiochemistry Data Package

Section 3

QC RESULTS SUMMARY

Strontium-90 Analysis by GFPC

PAI 724 Rev 10

Method Blank Results

Lab Name: Paragon Analytics
Work Order Number: 0805078
Client Name: Los Alamos National Laboratory SMO
ClientProject ID: Dust 08-1101

Lab ID: SR080606-1MB

Sample Matrix: SOLID
Prep SOP: PAI 707 Rev 10
Date Collected: 06-Jun-08
Date Prepared: 06-Jun-08
Date Analyzed: 15-Jun-08

Prep Batch: SR080606-1
QCBatchID: SR080606-1-1
Run ID: SR080606-1A
Count Time: 1000 minutes

Final Aliquot: 3.00 g
Result Units: pCi/g
File Name: SRA0615

CASNO	Target Nuclide	Result +/- 1 s TPU	MDC	Requested MDC	Lab Qualifier
10098-97-2	Sr-90	-0.002 +/- 0.014	0.046	0.06	U

Chemical Yield Summary

Carrier/Tracer	Amount Added	Result	Units	Yield	Control Limits	Flag
STRONTIUM	1048	1018	ug	97.1	40 - 110 %	

Comments:

Qualifiers/Flags:

U - Result is less than the sample specific MDC.

Y1 - Chemical Yield is in control at 100-110%. Quantitative Yield is assumed.

Y2 - Chemical Yield outside default limits.

LT - Result is less than Requested MDC, greater than sample specific MDC.

Abbreviations:

TPU - Total Propagated Uncertainty (see PAI SOP 743)

MDC - Minimum Detectable Concentration (see PAI SOP 709)

BDL - Below Detection Limit

M - Requested MDC not met.

B - Analyte concentration greater than MDC.

B3 - Analyte concentration greater than MDC but less than Requested MDC.

Data Package ID: *SR0805078-1*

Client Name: Los Alamos National Laboratory SMO
ClientProject ID: Dust 08-1101

Lab ID: SR080606-1LCS

Sample Matrix: SOLID
Prep SOP: PAI 707 Rev 10
Date Collected: 06-Jun-08
Date Prepared: 06-Jun-08
Date Analyzed: 16-Jun-08

Prep Batch: SR080606-1
QCBatchID: SR080606-1-1
Run ID: SR080606-1A
Count Time: 70 minutes

Final Aliquot: 3.00 g
Result Units: pCi/g
File Name: SRB0616A

CASNO	Target Nuclide	Results +/- 1s TPU	MDC	Spike Added	% Rec	Control Limits	Lab Qualifier
10098-97-2	Sr-90	3.75 +/- 0.45	0.15	3.65	103	75 - 125	P,M3

Chemical Yield Summary

Strontium-90 Analysis by GFPC

PAI 724 Rev 10

Duplicate Sample Results (DER)

Lab Name: Paragon Analytics
Work Order Number: 0805078
Client Name: Los Alamos National Laboratory SMO
ClientProject ID: Dust 08-1101

Field ID: SFB08-08-12411
Lab ID: 0805078-1DUP

Sample Matrix: SOLID
Prep SOP: PAI 707 Rev 10
Date Collected: 16-Apr-08
Date Prepared: 06-Jun-08
Date Analyzed: 15-Jun-08

Prep Batch: SR080606-1
QCBatchID: SR080606-1-1
Run ID: SR080606-1A
Count Time: 1000 minutes
Report Basis: As Received

Final Aliquot: 2.97 g
Prep Basis: As Received
Moisture(%): NA
Result Units: pCi/g
File Name: SRA0615

CASNO	Analyte	Sample Result +/- 1s TPU	Duplicate Result +/- 1s TPU	DER	Control Limit	Lab Qualifiers
10098-97-2	Sr-90	0.030 +/- 0.015	0.045 +/- 0.015	0.36	2.13	U

Comments:

Duplicate Qualifiers/Flags:

U - Result is less than the sample specific MDC.
Y1 - Chemical Yield is in control at 100-110%. Quantitative yield is assumed.
Y2 - Chemical Yield outside default limits.
W - DER is greater than Warning Limit of 1.42
D - DER is greater than Control Limit of 2.13
LT - Result is less than Request MDC, greater than sample specific MDC
M - Requested MDC not met.
M3 - The requested MDC was not met, but the reported activity is greater than the reported MDC.
L - LCS Recovery below lower control limit.
H - LCS Recovery above upper control limit.
P - LCS, Matrix Spike Recovery within control limits.
N - Matrix Spike Recovery outside control limits

Abbreviations:

TPU - Total Propagated Uncertainty (see PAI SOP 743)
DER - Duplicate Error Ratio (see PAI SOP 715)
BDL - Below Detection Limit
NR - Not Reported

Data Package ID: *SR0805078-1*

PARAGON ANALYTICS
Radiochemistry Data Package

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Section 4

INDIVIDUAL SAMPLE RESULTS

Strontium-90 Analysis by GFPC

PAI 724 Rev 10

Sample Results

Lab Name: Paragon Analytics
Work Order Number: 0805078
Client Name: Los Alamos National Laboratory SMO
ClientProject ID: Dust 08-1101

Field ID: SFB08-08-12411
Lab ID: 0805078-1

Analysis ReqCode: Low MDA

Sample Matrix: SOLID
Prep SOP: PAI 707 Rev 10
Date Collected: 16-Apr-08
Date Prepared: 06-Jun-08
Date Analyzed: 15-Jun-08

Prep Batch: SR080606-1
QCBatchID: SR080606-1-1
Run ID: SR080606-1A
Count Time: 1000 minutes
Report Basis: As Received

Final Aliquot: 2.99 g
Prep Basis: As Received
Moisture(%): NA
Result Units: pCi/g
File Name: SRA0615

CASNO	Target Nuclide	Result +/- 1 s TPU	MDC	Requested MDC	Lab Qualifier
10098-97-2	Sr-90	0.030 +/- 0.015	0.047	0.06	U

Chemical Yield Summary

Carrier/Tracer	Amount Added	Result	Units	Yield	Control Limits	Flag
STRONTIUM	1233	1164	ug	94.4	40 - 110 %	

Comments:

Qualifiers/Flags:

U - Result is less than the sample specific MDC.

Y1 - Chemical Yield is in control at 100-110%. Quantitative Yield is assumed.

Y2 - Chemical Yield outside default limits.

LT - Result is less than Requested MDC, greater than sample specific MDC.

M3 - The requested MDC was not met, but the reported activity is greater than the reported MDC.

M - The requested MDC was not met.

Abbreviations:

TPU - Total Propagated Uncertainty (see PAI SOP 743)

MDC - Minimum Detectable Concentration (see PAI SOP 709)

BDL - Below Detection Limit

Data Package ID: *SR0805078-1*

Strontium-90 Analysis by GFPC

PAI 724 Rev 10

Sample Duplicate Results

Lab Name: Paragon Analytics
Work Order Number: 0805078
Client Name: Los Alamos National Laboratory SMO
ClientProject ID: Dust 08-1101

Field ID: SFB08-08-12411
Lab ID: 0805078-1DUP

Sample Matrix: SOLID
Prep SOP: PAI 707 Rev 10
Date Collected: 16-Apr-08
Date Prepared: 06-Jun-08
Date Analyzed: 15-Jun-08

Prep Batch: SR080606-1
QCBatchID: SR080606-1-1
Run ID: SR080606-1A
Count Time: 1000 minutes
Report Basis: As Received

Final Aliquot: 2.97 g
Prep Basis: As Received
Moisture(%): NA
Result Units: pCi/g
File Name: SRA0615

CASNO	Target Nuclide	Result +/- 1 s TPU	MDC	Requested MDC	Lab Qualifier
10098-97-2	Sr-90	0.045 +/- 0.015	0.046	0.06	U

Chemical Yield Summary

Carrier/Tracer	Amount Added	Result	Units	Yield	Control Limits	Flag
STRONTIUM	1202	1166	ug	97.0	40 - 110 %	

Comments:

Qualifiers/Flags:

U - Result is less than the sample specific MDC.

Y1 - Chemical Yield is in control at 100-110%. Quantitative yield is assumed.

Y2 - Chemical Yield outside default limits.

LT - Result is less than Requested MDC, greater than sample specific MDC.

M - The requested MDC was not met.

M3 - The requested MDC was not met, but the reported activity is greater than the [illegible] MDC.

Strontium-90 Analysis by GFPC

PAI 724 Rev 10

Sample Results

Lab Name: Paragon Analytics
Work Order Number: 0805078
Client Name: Los Alamos National Laboratory SMO
ClientProject ID: Dust 08-1101

Field ID: SFB08-08-12412
Lab ID: 0805078-2

Analysis ReqCode: Low MDA

Sample Matrix: SOLID
Prep SOP: PAI 707 Rev 10
Date Collected: 16-Apr-08
Date Prepared: 06-Jun-08
Date Analyzed: 15-Jun-08

Prep Batch: SR080606-1
QCBatchID: SR080606-1-1
Run ID: SR080606-1A
Count Time: 1000 minutes
Report Basis: As Received

Final Aliquot: 3.01 g
Prep Basis: As Received
Moisture(%): NA
Result Units: pCi/g
File Name: SRA0615

CASNO	Target Nuclide	Result +/- 1 s TPU	MDC	Requested MDC	Lab Qualifier
10098-97-2	Sr-90	0.030 +/- 0.015	0.046	0.06	U

Chemical Yield Summary

Carrier/Tracer	Amount Added	Result	Units	Yield	Control Limits	Flag
STRONTIUM	1281	1260	ug	98.3	40 - 110 %	

Comments:

Qualifiers/Flags:

U - Result is less than the sample specific MDC.

Y1 - Chemical Yield is in control at 100-110%. Quantitative Yield is assumed.

Y2 - Chemical Yield outside default limits.

LT - Result is less than Requested MDC, greater than sample specific MDC.

M3 - The requested MDC was not met, but the reported activity is greater than the reported MDC.

M - The requested MDC was not met.

Abbreviations:

TPU - Total Propagated Uncertainty (see PAI SOP 743)

MDC - Minimum Detectable Concentration (see PAI SOP 709)

BDL - Below Detection Limit

Data Package ID: *SR0805078-1*

PARAGON ANALYTICS
Radiochemistry Data Package

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Section 5

RAW DATA

sis by GFPC Raw Data Report

ep SOP: PAI 707
al SOP: PAI 724

Reported on: Tuesday, June 17, 2008
12:04:15 PM

q rq	Inst ID Det ID	AnRunID File Name	Count Date/Time	GrossCPM BkgCPM	BaseEff ProgEff	CntDur(min) Yield	Activity +/- 1 s TPU	MDC DecLev	ReportUnits ReportBasis	DER RPD	%Spk. Recov Flags
.04 g	LB4100-A	SR080606-1A	6/15/2008	2.089	40.75%	1000	0.030	0.047	pCi/g	NA	
.99 g	A1	SRA0615	11:10 AM	1.959	NA	94.4%	0.015	NA	As Received	NA	U
.02 g	LB4100-A	SR080606-1A	6/15/2008	2.117	40.60%	1000	0.045	0.046	pCi/g	0.36	
.97 g	A2	SRA0615	11:10 AM	1.916	NA	97.0%	0.015	NA	As Received	NA	U
.05 g	LB4100-A	SR080606-1A	6/15/2008	2.175	40.77%	1000	0.030	0.046	pCi/g	NA	
.01 g	A3	SRA0615	11:10 AM	2.036	NA	98.3%	0.015	NA	As Received	NA	U
.05 g	LB4100-A	SR080606-1A	6/15/2008	1.939	40.45%	1000	-0.002	0.046	pCi/g	NA	
3 g	A4	SRA0615	11:10 AM	1.950	NA	97.1%	0.014	NA	As Received	NA	U
.05 g	LB4100-B	SR080606-1A	6/16/2008	20.271	43.63%	70	3.75	0.15	pCi/g	NA	103
3 g	D2	SR80616A	11:18 AM	1.642	NA	95.5%	0.45	NA	As Received	NA	P,M3

t met.
C was not met, but the reported
han the reported MDC.
lower control limit.
upper control limit.
ecovery within control limits.
ry outside control limits
duplicate results less than 5 times MDC
n greater than MDC.
on greater than MDC but less than Requested MDC.

Notes:

1) The Tracer results are not yield corrected (i.e. activity measured not activity added).
2) Where sample time is not available, 12:00 PM (Mountain) is used for decay correction.

Abbreviations:

TR- Tracer TA - Target Analyte
TPU - Total Propagated Uncertainty (see PAI SOP 743)
MDC - Minimum Detectable Concentration (see PAI SOP 709)
DER - Duplicate Error Ratio
BDL - Below Detection Limit

PAI - Gas Flow Proportional Sample Analysis LB4100-A

Unit Type: LB4100-A/W
Counting Unit ID: Orange
High Voltage Mode: Simultaneous
Application Revision: C
Application Version: PA
Rev.12/28/03 JE

Data file name: SRA0515
Batch ID: SR080606-1
Count Preset (m): 1000
Batch Ended: 6/16/08 3:57

Background logfile: BKGAB
Date of Bkg. Cal: 5/14/08
Alpha efficiency logfile: Am241Wipe-09/07
Alpha attenuation calibration: Am0907
Beta efficiency logfile: Sr90F-09/07
Beta attenuation calibration: Sr0907

Alpha prog. logfile: n/a
Alpha prog. attenuation: n/a
Beta prog. logfile: n/a
Beta prog. attenuation: n/a

Alpha Attenuation Calibration y = b*m^(a*(mass-x0))		Beta Attenuation Calibration y = b*m^(a*(mass-x0))	
Alpha b=	1.98120	Beta b=	1.0791
m=	0.99200	m=	0.9995
a=	1.0000	a=	1.0000
x0=	0.0000	x0=	0.0000
Alpha to Beta X-talk y = b*m^-x		Beta to Alpha X-talk y = b*mass + m	
a ->b xtalk b=	0.1871	b ->a xtalk b=	-2.0000E-06
a ->b xtalk m=	0.9983	b ->a xtalk m=	0.9021

Det. ID	Sample ID	Count End Date & Time	Count Dur. (min)	Resid. Mass (mg)	Alpha Activity Gross CPM	Alpha Bkg. CPM	Alpha b>a xtlk CPM	Alpha Base Eff	Alpha Base Cor.Fact.	Alpha Progeny Eff	Alpha Progeny Cor.Fact.	Beta Activity Gross CPM	Beta Bkg. CPM	Beta a>b xtlk CPM	Beta Base Eff	Beta Base Cor.Fact.	Beta Progeny Eff	Beta Progeny Cor.Fact.
A1	0805078-1	6/16/08 3:57	1000.00	0.0	0.116	0.041	0.000	0.2804	1.101	n/a	n/a	2.069	1.959	0.0140	0.4075	1.079	n/a	n/a
A2	0805078-1D	6/16/08 3:57	1000.00	0.0	0.066	0.054	0.000	0.2616	1.101	n/a	n/a	2.117	1.916	0.0022	0.4080	1.079	n/a	n/a
A3	0805078-2	6/16/08 3:57	1000.00	0.0	0.162	0.061	0.000	0.2588	1.101	n/a	n/a	2.175	2.036	0.0189	0.4077	1.079	n/a	n/a
A4	SR080606-1MB	6/16/08 3:57	1000.00	0.0	0.032	0.053	0.000	0.2670	1.101	n/a	n/a	1.938	1.950	0.0000	0.4045	1.079	n/a	n/a

JH
6/16/08

Date 6/15/08

SOP 724r 10

Paragon Analytics
Low Background Gas Flow Proportional Counter Log
Instrument: LB4100A

Instrument Daily Response and Background Checks

Det.	Daily Response Check Start 1	Status	Start 2	Status	Background Check Start 1	Status	Start 2	Status	Det. Status
1	JH	P			JH	P			P
2	↓	↓			↓	↓			↓
3	↓	↓			↓	↓			↓
4	↓	↓			↓	↓			↓
5	OL	OL			OL	OL			OL
6	↓	↓			↓	↓			↓
7	↓	↓			↓	↓			↓
8	↓	↓			↓	↓			↓
9	↓	↓			↓	↓			↓
10	↓	↓			↓	↓			↓
11	↓	↓			↓	↓			↓
12	↓	↓			↓	↓			↓
13	↓	↓			↓	↓			↓
14	↓	↓			↓	↓			↓
15	↓	↓			↓	↓			↓
16	↓	↓			↓	↓			↓

Det = Detector; α = Alpha; β = Beta; P = Pass; H = High; L = Low; OL = Offline; R = Recount; W = Weekly; NP = Not Processed

Weekly Background Calibration

	Current Calib. File ID	Weekly Calib. Started	Status	File ID
Dr A	BKA0613W			
Dr B	OL			
Dr C	↓			
Dr D	↓			

Dr = Drawer

Gas Supply

P-10 Supply		P-10 Flow	
Tank 1	1600	Dr A	0.15
	↓	Dr B	↓
Tank 2	1100	Dr C	OL
	↓	Dr D	↓

Comments:

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Form 780r8.doc (6/23/06)

Reviewed By / Date JH 6/16/08

Date 6/15/08

SOP 724r 10

Paragon Analytics

Low Background Gas Flow Proportional Counter Log

Instrument: LB4100A

Det.	Sample ID	Batch	Test	Count Dur. (min)	Start Time	Analyst Initials	File ID	Output Initials
1-4	Daily Eff	—	—	30	846	JH	EEA0615	JH
1-4	Daily BKG	—	—	60	856	JH	BKA0615	JH
1	08060047-8	AB080610-1	23	10	1001	JH	AB A0615	JH
2	↓ -16	↓	↓	↓	↓	↓	↓	↓
3	AB080610-1ALCS	↓	↓	↓	↓	↓	↓	↓
4	08060047-30D	↓ -2	↓	↓	1002	↓	AB A0615A	JH
1	08060047-34D	AB080610-2	23	10	1026	JH	AB A0615B	JH
2	AB080610-2ALCS	↓	↓	↓	↓	↓	↓	↓
3	08050180-1	TR080530-1	Ra 707	30	1027	JH	TRA0615	JH
4	08050231-1D	TR080605-1	Ra 707	30	1028	JH	TRA0615A	JH
1	08050078-1	SR080606-1	Sr90	1000	1113	JH	SRA0615	JH
2	↓ -1D	↓	↓	↓	↓	↓	↓	↓
3	↓ -2	↓	↓	↓	↓	↓	↓	↓
4	SR080606-1MS	↓	↓	↓	↓	↓	↓	↓

JH 6/16/08

Comments:

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(cont. from page NA B)

Form 780r8.doc (6/23/06)

Reviewed By / Date JH 6/16/08

PAI - Gas Flow Proportional Sample Analysis LB4100-B

Unit Type: LB4100-B
Counting Unit ID: Aqua
High Voltage Mode: Simultaneous
Application Revision:
Application Version: Standard
Rev.12/29/03 JE

Data file name: SR080616A
Batch ID: SR080606-1
Count Preset (m): 70
2 Batch Ended: 6/16/08 12:22

Background logfile: BKGABW
Date of Bkg. Cal: 6/14/08
Alpha efficiency logfile: AmWipe-11/07
Alpha attenuation calibration: AAN1107
Beta efficiency logfile: Sr90F-11/07
Beta attenuation calibration: ABR1107

Alpha prog. logfile: n/a
Alpha prog. attenuation: n/a
Beta prog. logfile: n/a
Beta prog. attenuation: n/a

Alpha Attenuation Calibration		Beta Attenuation Calibration	
y = b*m^[a*(mass-x0)]		y = b*m^[a*(mass-x0)]	
Alpha b=	1.00000	Beta b=	1.0000
m=	0.89330	m=	0.5396
a=	0.8830	a=	1.0000
x0=	0.0000	x0=	0.0000
Alpha to Beta X-talk		Beta to Alpha X-talk	
y = b *m^-mass		y = b*mass + m	
a -> b xtalk b=	0.2860	b -> a xtalk b=	-2.00E-06
a -> b xtalk m=	0.5890	b -> a xtalk m=	0.0011

Det. ID	Sample ID	Count End Date & Time	Count Dur. (min)	Resid. Mass (mg)	Alpha Activity							Beta Activity						
					Gross CPM	Bkg. CPM	b>a xtlk CPM	Base Eff	Base Cor.Fact.	Progeny Eff	Progeny Cor.Fact.	Gross CPM	Bkg. CPM	a>b xtlk CPM	Base Eff	Base Cor.Fact.	Progeny Eff	Progeny Cor.Fact.
D2	SR080606-1LCS	6/16/08 12:22	70.80	0.0	0.057	0.058	0.020	0.2820	1.000	n/a	n/a	20.271	1.642	0.0000	0.4363	1.096	n/a	n/a

JH
6/16/08

Date 6/16/08

SOP 724r 12

Paragon Analytics

Low Background Gas Flow Proportional Counter Log

Instrument: LB4100B

Instrument Daily Response and Background Checks

Det.	Daily Response Check Start 1	Status	Start 2	Status	Background Check Start 1	Status	Start 2	Status	Det. Status
1	JH	P			JH	P			P
2									
3									
4									OLBW/NP
5		LB	JH	P		HA	~~JH~~ JH 6/16/08		
6		P				P			P
7		LB	JH	LB					OLB
8		P	JH 6/16/08						P
9									OLBW
10							LB	JH	OLB
11							HB		OLBW
12							P		
13									P
14									
15		LB	JH	LB					OLB
16		P				HB			OLBD

Det = Detector; α = Alpha; β = Beta; P = Pass; H = High; L = Low; OL = Offline; R = Recount; W = Weekly; NP = Not Processed

Weekly Background Calibration

	Current Calib. File ID	Weekly Calib. Started	Status	File ID
Dr A	BKLB 0613W + 14W			
Dr B				
Dr C				
Dr D				

Dr = Drawer

Gas Supply

P-10 Supply		P-10 Flow	
Tank 1	1450	Dr A	0.15
		Dr B	
Tank 2	1100	Dr C	
		Dr D	

Comments:

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Form 780r8.doc (6/23/06)

Reviewed By / Date JH 6/17/08

Date 6/16/08

SOP 724r 10

Paragon Analytics

Low Background Gas Flow Proportional Counter Log

Instrument: LB4100B

Det.	Sample ID	Batch	Test	Count Dur. (min)	Start Time	Analyst Initials	File ID	Output Initials
1-16	Daily Eff	—	—	30	810	JH	EF80616	JH
5,7,15	↓	—	—	↓	819	↓	EF80616R	JH
1-16	Daily Bkg	—	—	60	829	JH	BK80616	JH
1	08806107-2	AB080613-2	23	10	941	JH	AB80616	JH
2	-1	↓	↓	↓	↓	↓	↓	↓
3	-3	↓	↓	↓	↓	↓	↓	↓
6	-4	↓	↓	↓	↓	↓	↓	↓
8	-5	↓	↓	↓	↓	↓	↓	↓
13	-6	↓	↓	↓	↓	↓	↓	↓
14	-7	↓	↓	↓	↓	↓	↓	↓
1	08806107-10	AB080613-2	23	10	956	JH	[illegible]	JH

06-1

ew Date: 6/11/2008

Fin Samp Mass (ug)	% Yield	Final Sample Alq
1183.55	94.39%	2.991
1168.045	97.01%	2.970
1259.767	98.31%	3.008
1018.071	97.12%	3.000
1005.793	95.45%	3.000

las (>15%)

e init. conc. treated as zero

Sr	Al	Ca	Fe	K	Mg	Na	Y
0.4998	50.2856	50.4436	20.6711	20.0037	50.3927	20.4340	9.9960
0.0001	-0.0002	0.0079	0.0019	0.0183	0.0086	0.0104	0.0016
0.0628	0.1127	1.0147	0.1629	0.0483	0.1569	0.1573	-0.0001
0.0042	-0.0011	0.0022	-0.0192	0.0165	0.0086	2.4047	-0.0002
0.0652	0.1125	1.0517	0.0915	0.0413	0.1549	0.1619	-0.0006
0.0044	-0.0152	-0.0025	-0.0156	0.0163	0.0042	2.4609	-0.0013
0.0000	-0.0123	0.0000	0.0405	0.0149	0.0000	-0.0001	-0.0018
-0.0001	-0.0176	-0.0065	-0.0143	0.0104	0.0005	2.0519	-0.0022
-0.0001	0.0038	-0.0086	0.0065	0.0051	-0.0046	-0.0064	-0.0024
-0.0002	-0.0138	-0.0075	-0.0137	0.0037	0.0067	2.0630	-0.0026
0.0003	-0.0099	-0.0072	-0.0164	0.0200	0.0009	-0.0073	-0.0026
1.2451	15.8362	114.4432	25.4830	14.3490	14.7375	42.8469	0.0121
0.5003	50.6836	50.0665	20.6698	20.0687	50.5413	20.4526	10.0221
0.0003	0.0229	0.0270	0.0040	-0.0067	0.0214	0.0158	0.0037
0.5818	0.0333	0.2272	0.0183	0.0132	0.0221	0.0609	-0.0014
1.2142	14.4215	104.7317	23.0105	13.7282	13.6637	40.9448	0.0123
0.5830	0.0288	0.1125	-0.0019	-0.0309	0.0074	0.0453	-0.0021
1.2944	107.9441	76.5309	38.2299	5.1900	8.3731	4.3949	0.0229
0.6299	0.1368	0.1571	0.0425	-0.0204	0.0086	0.0050	-0.0024
1.0588	0.0277	0.0435	0.0490	0.0081	0.0091	-0.0002	-0.0027
0.5090	0.0237	0.0198	-0.0155	-0.0485	-0.0046	-0.0034	-0.0026
1.0643	0.0275	0.0543	0.0058	-0.0002	0.0091	0.0019	-0.0027
0.5029	0.0178	0.0072	-0.0086	-0.0102	-0.0060	-0.0064	-0.0028
1.0567	0.0227	0.0388	0.0038	-0.0135	0.0007	-0.0079	-0.0029
0.4958	50.6913	49.8066	20.4432	20.1813	50.3598	20.6524	9.9305
0.0004	0.0186	0.0187	0.0031	-0.0081	0.0149	0.0060	0.0024
5.5627	0.0104	37.1948	8.5024	3.6446	18.9892	154.4857	-0.0014
0.0151	0.0028	0.1438	0.0288	0.1374	0.0573	15.4828	-0.0018
0.0154	-0.0030	0.1740	4.3521	0.3719	0.0399	23.0278	-0.0023
0.0092	-0.0118	0.0794	0.0449	0.1298	0.0311	19.3430	-0.0025
0.0075	-0.0089	0.0956	0.0124	0.1648	0.0286	8.7511	-0.0025
0.0332	-0.0144	1.8253	0.1280	0.1502	0.8200	0.4261	-0.0026
0.4941	50.4722	50.3781	20.6489	19.9324	50.5801	20.4030	9.9753
0.0006	0.0224	0.0230	0.0038	0.0077	0.0223	0.0384	0.0042

PARAGON ANALYTICS
Radiochemistry Data Package

Section 6

QUALITY ASSURANCE SUMMARY REPORTS

6

No *NON-CONFORMANCE REPORTS* or
QUALITY ASSURANCE SUMMARY SHEETS
are included in this data package.

PARAGON ANALYTICS
Radiochemistry Data Package

Section 7

LABORATORY BENCH SHEETS

7

Due 6/20

Paragon Analytics

Radiochemistry Instrument Worksheet

Prep Batch: SR080606-1

Prep Procedure: SR90

Analytical QASS / NCR? Y (N) NA

Prep Num	LabID	QC Type	Init Alq	Fin Alq	Units	Report Units	Residual Mass (mg)	Cnt 1 File	Cnt 1 Inst/Det	Cnt 1 Pos Chk By	Cnt 2 File	Cnt 2 Inst/Det	Cnt 2 Pos Chk By	Cnt 3 File	Cnt 3 Inst/Det	Cnt 3 Pos Chk By	Notes
1	0805078-1	SMP	3.0361	2.9907	g	pCi/g		SRA0615	1	JH							
1	0805078-1	DUP	3.0155	2.9704	g	pCi/g			2								
1	0805078-2	SMP	3.0541	3.0084	g	pCi/g			3								
1	SR080606-1	MB	3.0451	2.9996	g	pCi/g		JH 6/17/08	13 4								
1	SR080606-1	LCS	3.0451	2.9996	g	pCi/g		SRB0616A	14	JH							JH 6/17/08

Tracer/Carrier Solution Information

Soln #	Nuclide	SolnID	Prep Conc	Units	Prep Date	Aliquot	Units	Pipet ID
T1	STRONTIUM	247960	2,004.008	pCi/ml	NA	0.5	ml	RS003

Spike Solution Information

Soln #	Nuclide	SolnID	Prep Conc	Units	Prep Date	Aliquot	Units	Pipet ID
S1	Sr-90	600.3020.82	49.357	DPM/ml	06/06/08	0.5	ml	RS003

Sample Barcodes

0805078-1 SR080606-1PS1	0805078-1DUP SR080606-1PS2
0805078-2 SR080606-1PS3	SR080606-1MB SR080606-1PS4
SR080606-1LCS SR080606-1PS5	SR080606-1CAR SR080606-1PS6

Radiochemistry Prep Worksheet

ytics

Prep Batch: SR080606-1

: SR90

Reviewed By: DBC DBC

Review Date: 6/11/2008

eatment? Y / (N) Batch: N/A Re-Prep? Y / (N) Batch: N/A Prep QASS / NCR? Y / (N) N/A

07 Rev: 10

Prep Analyst: Derek B. Caduff

Prep Date: 6/6/2008

Prep Dept: RS

Balance: 13

Balance:

	QC Type	Dish No.	Init Aiq g	Fin Aiq g	Prep Basis	Column #	Ingrowth Date/Time	Standards	Prep Notes
3-1	SMP		3.0361	2.990710	As Received	9933	06/10/08 10:15	T1	
3-1	DUP		3.0155	2.970418	As Received	9934	06/10/08 10:15	T1	
3-2	SMP		3.0541	3.008441	As Received	9935	06/10/08 10:15	T1	
6-1	MB		3.0451	2.999576	As Received	9936	06/10/08 10:15	T1	
6-1	LCS		3.0451	2.999576	As Received	9937	06/10/08 10:15	T1,S1	

DBC 6/11/08

B. Caduff Date: 6/9/2008

insley Date: 6/9/2008

Tracer/Carrier Solution Information

SolnID	Prep Conc	Units	Prep Date	Aliquot	Units	Pipet ID
247960	2,004.008	pCi/ml	NA	0.5	ml	RS003

Spike Solution Information

Soln #	Nuclide	SolnID	Prep Conc	Units	Prep Date	Aliquot	Units	Pipet ID
S1	Sr-90	600.3020.82	49.357	DPM/ml	06/06/08	0.5	ml	RS003

Supersedes: 6/9/08 10:27

Radiochemistry Prep Worksheet

Paragon Analytics

Prep Batch: SR080606-1

Prep Procedure: SR90

Prep Batch Not Validated!!!

Reviewed By:

Review Date:

Non-Routine Pre-Treatment? Y / N **Batch:** _____ **Re-Prep? Y / N** **Batch:** _____ **Prep QASS / NCR? Y / N** _____

Prep SOP: PAI 707 **Rev:** 10
Prep SOP: NONE
Matrix Class: solid

Prep Analyst: Derek B. Caduff DBC
Prep Date: 6/6/2008
Prep Dept: RS

Balance: 13
Balance:

Samp Num	Prep Num	LabID	QC Type	Dish No.	Init Aiq g	Fin Aiq g	Prep Basis	Column #	Ingrowth Date/Time	Standards	Prep Notes
1	1	0805078-1	SMP		3.0361	3	As Received	9933	6/10/08 10:15	T1	
2	1	0805078-1	DUP		3.0155	3	As Received	9934		T1	
3	1	0805078-2	SMP		3.0541	3	As Received	9935		T1	
4	1	SR080606-1	MB		3.0451	3.0451	As Received	9936		T1	
5	1	SR080606-1	LCS		3.0451	3.0451	As Received	9937		T1,S1	

Comments

Spiked By: Derek B. Caduff DBC Date: 6/9/2008
Witnessed By: EMF Date: 6/9/08

Tracer/Carrier Solution Information

Soln #	Nuclide	SolnID	Prep Conc	Units	Prep Date	Aliquot	Units	Pipet ID
T1	STRONTIUM	247960	2,004.008	pCi/ml	NA	0.5	ml	RS003

T, exp: 8/3/08

Spike Solution Information

Soln #	Nuclide	SolnID	Prep Conc	Units	Prep Date	Aliquot	Units	Pipet ID
S1	Sr-90	600.3020.82	49.357	DPM/ml	06/06/08	0.5	ml	RS003

S, exp: 8/3/08

SAMPLE CONDITION FORM (SOLIDS)

ANALYST: DBC

ANALYSIS DATE: 6/19/08 METHOD: 90 Sr

PARAGON ANALYTICS
Radiochemistry Data Package

Section 8

STANDARDS TRACEABILITY DOCUMENTS

8

Stable Chemistry Solution Report

Solution Id: 247960	**Name:** Strontium Carrier+1<4>			**Type:** IS	
	Lot: multiple	**Vendor Name:** multiple			

Final Vol:	1000	**Dept:**	RS	**Prep By**	DBC	**on**	8/3/2007	**Reviewed By**	JRK	**on**	8/28/2007
Units:	mL	**Location:**	SR/RA	**Opened By**		**on**		**Verified By**	DBC	**on**	8/3/2007
Matrix:	LIQUID	**ExpireDate:**	8/3/2008	**Received By**		**on**		**Deactivated By**		**on**	

Comment:

Component Name	Component ID	Volume Added	Units
Strontium Stable Carrier Source<1>	8256 Y07595	4.8406	g

Constituent Name	Conc of Primary Soln	FinalConc	Summed Conc	Units
STRONTIUM	414000	2004.008		ppm

Associated Parent IDs

8256 Y07595

Abbreviations: NC = Not Calculated for reagents when the volume added is not entered.
NE = Not Entered

82
PROJECT 600.3020.82 Sr-90 Notebook No. 3020
Continued From Page

Prepare a working Standard from intermediate dilution standard 600.2613.30 of approximately 50 dpm/ml

1) Determine Density of the Diluent, Balance ID
0.1 M HCl Lot# 068439
Mass of volumetric flask: 68.2996 g #12
Mass of flask with 100 ml diluent: 168.0571 g ↓
Net mass of diluent: 99.7575 g
$\rho = 0.9976$ g/ml

2) Determine Mass of Standard 600.2613.30
~~Mass of bottle and Standard without lid:~~
~~Mass of bottle and Standard not transferred:~~
~~Mass of transferred Standard:~~ 7/3/07
Mass of empty bottle without lid: 74.7816 g #12
Mass of bottle and standard: 77.3770 g ↓
Net Mass of standard: 2.5954 g

3) Dilute with acid
Mass of empty 1 L bottle w/out lid: 74.7816 g #12
Mass of bottle, standard, and diluent: 1076.2 g #26
Net mass of standard and diluent: 1001.42

4) Final activity Calculation

$$\frac{22{,}390.967 \text{ dpm/g} \cdot 2.5954 \text{ g} \cdot 0.9976 \text{ g/ml}}{1001.42 \text{ g}} = 57.89 \text{ dpm/ml}$$

DB 10/8/07

Stnd ID: 600.3020.82
Description: Sr-90 (Sr-90)
Expiration: ~~8/7/08~~ 8/3/08
Activity: 57.89 dpm/mL
2s Uncertainty: 3.47 dpm/mL
Ref. Date: 12/1/01
Ref Time: N/A
Prep Date: 8/1/07 Prep by: DBC
Matrix/Comp. 0.1M HCl
Half Life (y): 2.88E+01

Reverification Log		
Analysis Date	Initials	Expiration Date

Read and Understood By 10/8/07 SB

Signed: [signature] Date: 7/3/07 Signed: [signature] Date: 10/8/07

PROJECT 600.2613.30 Sr-90

Notebook No. 2613

Continued From Page ___

Transfer contents of ampoule 600 to a 125 ml glass bottle for a 1° solution.

1) Transfer ampoule 600 to a 125 ml bottle

mass of open ampoule + std.	139.6110 g	Bal #12
mass of empty ampoule	89.5551 g	
Net mass of std.	50.0559 g	

RG 4/26/05

50 2/16/02 Density from following page D= 0.9978 g/mL

2) Final Activity Calculation

RG 3/9/06

Stnd ID: 600.2613.30

Description: Sr-90
Expiration: 2/27/07
Activity: 22341.71 dpm/mL

2s Uncertainty: 744.72 dpm/mL
Ref. Date: 12/1/01
Ref Time: N/A
Prep Date: 12/1/03
Matrix/Comp. 0.1 M HCl
Half Life (y): 2.88E+01

Prep by: CRW

RG 3/9/06

RG 4/26/05

Stnd ID: 600.2613.30

Description: Sr-90
Expiration: 12/28/05
Activity: 22341.71 dpm/mL

Uncertainty: 744.72 dpm/mL
Ref. Date: 12/1/01
Ref Time: N/A
Prep Date: 12/1/03
Matrix/Comp. 0.1 M HCl
Half Life (y): 2.88E+01

Prep by: CRW

Requires NCR for ICPT Work

RG 4/26/05

ANALYTICS

1380 Seaboard Industrial Blvd.
Atlanta, Georgia 30318 · U.S.A.

Phone (404) 352-8677
Fax (404) 352-2837

CERTIFICATE OF CALIBRATION

Standard Radionuclide Source

PAI $0.600
rec'd 12-05-01

62751-307

Sr-90 50 mL Liquid in Flame Sealed Vial

This standard radionuclide source was prepared gravimetrically from a calibrated master solution. The master solution was calibrated by the Department Des Applications Et De La Metrologie Des Rayonnements Ionisants (DAMRI), Paris, France, as Number 25931.

Radionuclide purity and calibration were checked by germanium gamma-ray spectrometry and liquid scintillation counting. The nuclear decay rate and assay date for this source are given below.

ANALYTICS maintains traceability to the National Institute of Standards and Technology through Measurements Assurance Programs as described in USNRC Reg. Guide 4.15, Revision 1.

ISOTOPE:	Sr-90
ACTIVITY (dps):	1.868 E4
HALF-LIFE:	28.79 years
CALIBRATION DATE:	December 1, 2001 12:00 EST
TOTAL UNCERTAINTY*:	5.0%

*99% Confidence Level

Impurities: γ-impurities <0.1%

50.3054 grams 0.1M HCl solution with 30 μg/g Sr carrier.

P O NUMBER 001703, Item 1

SOURCE PREPARED BY: M Taskaeva
M. Taskaeva, Radiochemist

Q A APPROVED: 12-4-01

PARAGON ANALYTICS
Radiochemistry Data Package

Section 9

ADDITIONAL SUPPORTING DOCUMENTATION

9

Gas Proportional Counter

Instrument Calibration

Background Calibration

LB4100-A Weekly Instrument Calibration and Check
Background Determinations

Detector ID	Alpha CPM	Alpha LCL	Alpha UCL	Alpha Flag	Beta CPM	Beta LCL	Beta UCL	Beta Flag	Detector ID
A1 (01)	0.041	0.0287	0.1147	PASS	1.959	1.747	2.603	PASS	A1 (01)
A2 (02)	0.054	0.0249	0.0879	PASS	1.916	1.750	2.108	PASS	A2 (02)
A3 (03)	0.061	0.0309	0.0917	PASS	2.036	1.840	2.586	PASS	A3 (03)
A4 (04)	0.053	0.0282	0.0596	PASS	1.950	1.896	2.131	PASS	A4 (04)
B1 (05)	#REF!	-0.1229	0.3597	#REF!	#REF!	-54.809	122.121	#REF!	B1 (05)
B2 (06)	#REF!	0.0162	0.0891	#REF!	#REF!	-10.460	23.690	#REF!	B2 (06)
B3 (07)	#REF!	0.0383	0.1245	#REF!	#REF!	1.794	2.441	#REF!	B3 (07)
B4 (08)	#REF!	0.0299	0.1241	#REF!	#REF!	1.583	1.955	#REF!	B4 (08)
C1 (09)	#REF!	0.0350	0.1166	#REF!	#REF!	1.381	1.824	#REF!	C1 (09)
C2 (10)	#REF!	0.0113	0.0827	#REF!	#REF!	1.593	1.997	#REF!	C2 (10)
C3 (11)	#REF!	0.0177	0.1197	#REF!	#REF!	1.625	1.896	#REF!	C3 (11)
C4 (12)	#REF!	0.0260	0.1276	#REF!	#REF!	1.784	2.001	#REF!	C4 (12)
D1 (13)	#REF!	0.0255	0.1581	#REF!	#REF!	1.648	1.991	#REF!	D1 (13)
D2 (14)	#REF!	0.0134	0.1448	#REF!	#REF!	1.548	1.829	#REF!	D2 (14)
D3 (15)	#REF!	0.0204	0.1022	#REF!	#REF!	1.275	1.624	#REF!	D3 (15)
D4 (16)	#REF!	0.0311	0.1135	#REF!	#REF!	1.407	1.940	#REF!	D4 (16)

Reviewed by: JH Date: 6/14/08

Control Limits set 03/17/08.
LJO 03/17/08

BKA0613W.XLD

Printed 6/14/08 8:49 AM

LB4100-B Weekly Instrument Calibration and Check
Background Determinations

Detector ID	Alpha CPM	Alpha LCL	Alpha UCL	Alpha Flag	Beta CPM	Beta LCL	Beta UCL	Beta Flag	Detector ID
A1 (01)	0.055	0.03727	0.076	PASS	1.443	1.326	1.523	PASS	A1 (01)
A2 (02)	0.086	0.04705	0.105	PASS	1.341	1.218	1.585	PASS	A2 (02)
A3 (03)	0.062	0.03370	0.082	PASS	1.487	1.252	1.553	PASS	A3 (03)
A4 (04)	0.062	0.03284	0.073	PASS	1.618	1.310	1.600	FLAG-HIGH	A4 (04)
B1 (05)	0.058	0.02459	0.073	PASS	1.709	1.388	1.622	FLAG-HIGH	B1 (05)
B2 (06)	0.059	0.04129	0.106	PASS	1.439	1.295	1.534	PASS	B2 (06)
B3 (07)	0.080	0.04493	0.103	PASS	1.478	1.272	1.735	PASS	B3 (07)
B4 (08)	0.089	0.03382	0.151	PASS	1.573	1.390	1.672	PASS	B4 (08)
C1 (09)	0.066	0.03258	0.100	PASS	1.422	1.487	1.661	FLAG-LOW	C1 (09)
C2 (10)	0.086	0.02752	0.107	PASS	1.532	1.360	1.609	PASS	C2 (10)
C3 (11)	0.044	0.03644	0.085	PASS	2.225	1.413	1.743	FLAG-HIGH	C3 (11)
C4 (12)	0.078	0.02405	0.112	PASS	1.561	1.574	1.902	FLAG-LOW	C4 (12)
D1 (13)	0.068	0.04533	0.114	PASS	1.533	1.359	1.678	PASS	D1 (13)
D2 (14)	0.058	0.02718	0.129	PASS	1.642	1.422	1.786	PASS	D2 (14)
D3 (15)	0.052	0.01718	0.103	PASS	1.771	1.524	1.914	PASS	D3 (15)
D4 (16)	**0.074**	**0.00813**	**0.155**	**PASS**	**3.373**	**1.069**	**4.387**	**PASS**	**D4 (16)**

– See recount file BKB0614W JH 6/14/08

Reviewed by: JH Date: 6/14/08

Control Limits set 02/8/07
LJO 2/8/07

BKB0613W.XLD

Printed 6/14/08 8:29 AM

LB4100-B Weekly Instrument Calibration and Check
Background Determinations

Alpha			Beta				Detector
LCL	UCL	Flag	CPM	LCL	UCL	Flag	ID
0.03727	0.076	#REF!	#REF!	1.326	1.523	#REF!	A1 (01)
0.04705	0.105	#REF!	#REF!	1.218	1.585	#REF!	A2 (02)
0.03370	0.082	#REF!	#REF!	1.252	1.553	#REF!	A3 (03)
0.03284	0.073	PASS	1.627	1.310	1.600	FLAG-HIGH	A4 (04)
0.02459	0.073	PASS	1.727	1.388	1.622	FLAG-HIGH	B1 (05)
0.04129	0.106	#REF!	#REF!	1.295	1.534	#REF!	B2 (06)
0.04493	0.103	#REF!	#REF!	1.272	1.735	#REF!	B3 (07)
0.03382	0.151	#REF!	#REF!	1.390	1.672	#REF!	B4 (08)
0.03258	0.100	PASS	1.485	1.487	1.661	FLAG-LOW	C1 (09)
0.02752	0.107	#REF!	#REF!	1.360	1.609	#REF!	C2 (10)
0.03644	0.085	PASS	3.881	1.413	1.743	FLAG-HIGH	C3 (11)
0.02405	0.112	PASS	1.541	1.574	1.902	FLAG-LOW	C4 (12)
0.04533	0.114	#REF!	#REF!	1.359	1.678	#REF!	D1 (13)
0.02718	0.129	#REF!	#REF!	1.422	1.786	#REF!	D2 (14)
0.01718	0.103	#REF!	#REF!	1.524	1.914	#REF!	D3 (15)
0.00813	**0.155**	**#REF!**	**#REF!**	**1.069**	**4.387**	**#REF!**	**D4 (16)**

/08

JH

Date: 6/15/08

Control Limits set 02/8/07
LJO 2/8/07

Printed 6/15/08 8:23 AM

Gas Proportional Counter

Quality Control Data

Daily Background Checks

LB4100-A Daily Instrument Performance Checks
Background Checks

Detector ID	Alpha				Beta				Detector ID
	CPM	LCL	UCL	Flag	CPM	LCL	UCL	Flag	
A1 (01)	0.017	-0.037	0.119	PASS	1.783	1.417	2.501	PASS	A1 (01)
A2 (02)	0.033	-0.036	0.144	PASS	2.083	1.380	2.452	PASS	A2 (02)
A3 (03)	0.050	-0.035	0.157	PASS	1.950	1.483	2.589	PASS	A3 (03)
A4 (04)	0.017	-0.036	0.142	PASS	2.050	1.409	2.491	PASS	A4 (04)
B1 (05)	#REF!	#REF!	#REF!	#REF!	#REF!	#REF!	#REF!	#REF!	B1 (05)
B2 (06)	#REF!	#REF!	#REF!	#REF!	#REF!	#REF!	#REF!	#REF!	B2 (06)
B3 (07)	#REF!	#REF!	#REF!	#REF!	#REF!	#REF!	#REF!	#REF!	B3 (07)
B4 (08)	#REF!	#REF!	#REF!	#REF!	#REF!	#REF!	#REF!	#REF!	B4 (08)
C1 (09)	#REF!	#REF!	#REF!	#REF!	#REF!	#REF!	#REF!	#REF!	C1 (09)
C2 (10)	#REF!	#REF!	#REF!	#REF!	#REF!	#REF!	#REF!	#REF!	C2 (10)
C3 (11)	#REF!	#REF!	#REF!	#REF!	#REF!	#REF!	#REF!	#REF!	C3 (11)
C4 (12)	#REF!	#REF!	#REF!	#REF!	#REF!	#REF!	#REF!	#REF!	C4 (12)
D1 (13)	#REF!	#REF!	#REF!	#REF!	#REF!	#REF!	#REF!	#REF!	D1 (13)
D2 (14)	#REF!	#REF!	#REF!	#REF!	#REF!	#REF!	#REF!	#REF!	D2 (14)
D3 (15)	#REF!	#REF!	#REF!	#REF!	#REF!	#REF!	#REF!	#REF!	D3 (15)
D4 (16)	#REF!	#REF!	#REF!	#REF!	#REF!	#REF!	#REF!	#REF!	D4 (16)

Reviewed by: JH Date: 6/15/08

Control limits established from prevoius weekly background determinations.
Weekly Background File: BKA0613W Date: 6/13/08 Analyst: LJO

LB4100-A Daily Instrument Performance Checks
Background Checks

Alpha			Beta				Detector
	UCL	Flag	CPM	LCL	UCL	Flag	ID
	0.119	PASS	2.300	1.417	2.501	PASS	A1 (01)
	0.144	PASS	1.517	1.380	2.452	PASS	A2 (02)
	0.157	PASS	2.233	1.483	2.589	PASS	A3 (03)
	0.142	PASS	1.600	1.409	2.491	PASS	A4 (04)
	#REF!	#REF!	#REF!	#REF!	#REF!	#REF!	B1 (05)
	#REF!	#REF!	#REF!	#REF!	#REF!	#REF!	B2 (06)
	#REF!	#REF!	#REF!	#REF!	#REF!	#REF!	B3 (07)
	#REF!	#REF!	#REF!	#REF!	#REF!	#REF!	B4 (08)
	#REF!	#REF!	#REF!	#REF!	#REF!	#REF!	C1 (09)
	#REF!	#REF!	#REF!	#REF!	#REF!	#REF!	C2 (10)
	#REF!	#REF!	#REF!	#REF!	#REF!	#REF!	C3 (11)
	#REF!	#REF!	#REF!	#REF!	#REF!	#REF!	C4 (12)
	#REF!	#REF!	#REF!	#REF!	#REF!	#REF!	D1 (13)
	#REF!	#REF!	#REF!	#REF!	#REF!	#REF!	D2 (14)
	#REF!	#REF!	#REF!	#REF!	#REF!	#REF!	D3 (15)
	#REF!	#REF!	#REF!	#REF!	#REF!	#REF!	D4 (16)

JH

Date: 6/16/08

limits established from prevoius weekly background determinations.
ackground File: BKA0613W Date: 6/13/08 Analyst: LJO

Printed 6/16/08 9:35 AM

LB4100-B Daily Instrument Performance Checks
Background Checks

Detector ID	Alpha CPM	Alpha LCL	Alpha UCL	Alpha Flag	Beta CPM	Beta LCL	Beta UCL	Beta Flag	Detector ID
A1 (01)	0.083	-0.036	0.146	PASS	1.433	0.978	1.908	PASS	A1 (01)
A2 (02)	0.067	-0.028	0.200	PASS	1.500	0.893	1.789	PASS	A2 (02)
A3 (03)	0.083	-0.034	0.158	PASS	1.033	1.015	1.959	PASS	A3 (03)
A4 (04)	0.067	-0.037	0.131	PASS	1.550	1.133	2.121	PASS	A4 (04)
B1 (05)	0.133	-0.037	0.121	FLAG-HIGH	1.883	1.218	2.236	PASS	B1 (05)
B2 (06)	0.067	-0.035	0.153	PASS	1.283	0.974	1.904	PASS	B2 (06)
B3 (07)	0.050	-0.030	0.190	PASS	1.250	1.007	1.949	PASS	B3 (07)
B4 (08)	0.067	-0.027	0.205	PASS	1.350	1.087	2.059	PASS	B4 (08)
C1 (09)	0.067	-0.037	0.135	PASS	1.467	1.013	1.957	PASS	C1 (09)
C2 (10)	0.083	-0.028	0.200	PASS	1.033	1.053	2.011	FLAG-LOW	C2 (10)
C3 (11)	0.033	-0.035	0.155	PASS	126.400	3.118	4.644	FLAG-HIGH	C3 (11)
C4 (12)	0.017	-0.035	0.155	PASS	1.500	1.060	2.022	PASS	C4 (12)
D1 (13)	0.067	-0.033	0.169	PASS	1.417	1.053	2.013	PASS	D1 (13)
D2 (14)	0.117	-0.035	0.151	PASS	1.700	1.146	2.138	PASS	D2 (14)
D3 (15)	0.083	-0.036	0.140	PASS	1.650	1.256	2.286	PASS	D3 (15)
D4 (16)	0.050	-0.031	0.179	PASS	6.450	2.662	4.084	FLAG-HIGH	D4 (16)

offline JH 6/16/08

Reviewed by: JH Date: 6/16/08

Control limits established from prevoius weekly background determinations.
Weekly Background File: BKB0613W Date: 6/13/08 Analyst: LJO
BKB0614W 6/14/08 JJH

BKB0616.XLD

Printed 6/16/08 9:34 AM

UCL	Flag	Detector ID
1.908	PASS	A1 (01)
1.789	PASS	A2 (02)
1.959	PASS	A3 (03)
2.121	PASS	A4 (04)
2.236	FLAG-HIGH	B1 (05)
1.904	PASS	B2 (06)
1.949	PASS	B3 (07)
2.059	PASS	B4 (08)
1.957	PASS	C1 (09)
2.011	PASS	C2 (10)
4.644	FLAG-HIGH	C3 (11)
2.022	PASS	C4 (12)
2.013	PASS	D1 (13)
2.138	PASS	D2 (14)
2.286	PASS	D3 (15)
4.084	FLAG-HIGH	D4 (16)

Date: 6/17/08

erminations.
Analyst: LJO
JJH

LB4100-B Daily Instrument Performance Checks
Background Checks

Detector ID	Alpha CPM	Alpha LCL	Alpha UCL	Alpha Flag	Beta CPM	Beta LCL	Beta UCL	Beta Flag	Detector ID
A1 (01)	#REF!	#REF!	#REF!	**#REF!**	#REF!	#REF!	#REF!	**#REF!**	A1 (01)
A2 (02)	#REF!	#REF!	#REF!	**#REF!**	#REF!	#REF!	#REF!	**#REF!**	A2 (02)
A3 (03)	#REF!	#REF!	#REF!	**#REF!**	#REF!	#REF!	#REF!	**#REF!**	A3 (03)
A4 (04)	#REF!	#REF!	#REF!	**#REF!**	#REF!	#REF!	#REF!	**#REF!**	A4 (04)
B1 (05)	0.033	-0.037	0.121	**PASS**	5.767	1.218	2.236	**FLAG-HIGH**	B1 (05)
B2 (06)	#REF!	#REF!	#REF!	**#REF!**	#REF!	#REF!	#REF!	**#REF!**	B2 (06)
B3 (07)	#REF!	#REF!	#REF!	**#REF!**	#REF!	#REF!	#REF!	**#REF!**	B3 (07)
B4 (08)	#REF!	#REF!	#REF!	**#REF!**	#REF!	#REF!	#REF!	**#REF!**	B4 (08)
C1 (09)	#REF!	#REF!	#REF!	**#REF!**	#REF!	#REF!	#REF!	**#REF!**	C1 (09)
C2 (10)	#REF!	#REF!	#REF!	**#REF!**	#REF!	#REF!	#REF!	**#REF!**	C2 (10)
C3 (11)	0.033	-0.035	0.155	**PASS**	1349.783	3.118	4.644	**FLAG-HIGH**	C3 (11)
C4 (12)	#REF!	#REF!	#REF!	**#REF!**	#REF!	#REF!	#REF!	**#REF!**	C4 (12)
D1 (13)	#REF!	#REF!	#REF!	**#REF!**	#REF!	#REF!	#REF!	**#REF!**	D1 (13)
D2 (14)	0.067	-0.035	0.151	**PASS**	1.900	1.146	2.138	**PASS**	D2 (14)
D3 (15)	#REF!	#REF!	#REF!	**#REF!**	#REF!	#REF!	#REF!	**#REF!**	D3 (15)
D4 (16)	0.100	-0.031	0.179	**PASS**	8.433	2.662	4.084	**FLAG-HIGH**	D4 (16)

– offline JH 6/17/08

Reviewed by: JH Date: 6/17/08

Control limits established from prevoius weekly background determinations.
Weekly Background File: BKB0613W Date: 6/13/08 Analyst: LJO
BKB0614W 6/14/08 JJH

BKB0617R.XLD

Printed 6/17/08 12:15 PM

Gas Proportional Counter

Quality Control Data

Daily Instrument Performance Checks

LB4100-A Daily Instrument Performance Check
Efficiency Determinations

Detector ID	Alpha Eff.	Alpha LCL	Alpha UCL	Alpha Flag	Beta Eff.	Beta LCL	Beta UCL	Beta Flag	Detector ID
A1 (01)	0.2423	0.2284	0.2536	PASS	0.3838	0.3689	0.4117	PASS	A1 (01)
A2 (02)	0.2375	0.2273	0.2487	PASS	0.3825	0.3711	0.4042	PASS	A2 (02)
A3 (03)	0.2467	0.2360	0.2650	PASS	0.3905	0.3739	0.4104	PASS	A3 (03)
A4 (04)	0.2348	0.2202	0.2440	PASS	0.3582	0.3377	0.3787	PASS	A4 (04)
B1 (05)	#VALUE!	0.2246	0.2470	#VALUE!	#VALUE!	0.3621	0.4456	#VALUE!	B1 (05)
B2 (06)	#VALUE!	0.2191	0.2451	#VALUE!	#VALUE!	0.3476	0.3828	#VALUE!	B2 (06)
B3 (07)	#VALUE!	0.2015	0.2486	#VALUE!	#VALUE!	0.3583	0.4011	#VALUE!	B3 (07)
B4 (08)	#VALUE!	0.2074	0.2671	#VALUE!	#VALUE!	0.3543	0.4114	#VALUE!	B4 (08)
C1 (09)	#VALUE!	0.2127	0.2331	#VALUE!	#VALUE!	0.3486	0.3691	#VALUE!	C1 (09)
C2 (10)	#VALUE!	0.2410	0.2591	#VALUE!	#VALUE!	0.3673	0.3898	#VALUE!	C2 (10)
C3 (11)	#VALUE!	0.2426	0.2640	#VALUE!	#VALUE!	0.3941	0.4233	#VALUE!	C3 (11)
C4 (12)	#VALUE!	0.2354	0.2553	#VALUE!	#VALUE!	0.3896	0.4174	#VALUE!	C4 (12)
D1 (13)	#VALUE!	0.2429	0.2648	#VALUE!	#VALUE!	0.3970	0.4253	#VALUE!	D1 (13)
D2 (14)	#VALUE!	0.2371	0.2511	#VALUE!	#VALUE!	0.4077	0.4300	#VALUE!	D2 (14)
D3 (15)	#VALUE!	0.1748	0.2406	#VALUE!	#VALUE!	0.3079	0.3945	#VALUE!	D3 (15)
D4 (16)	#VALUE!	0.2040	0.2649	#VALUE!	#VALUE!	0.3606	0.4318	#VALUE!	D4 (16)

Reviewed by: JH Date: 6/15/08

Control Limits Established 12/13/07 by LJO

LB4100-A Daily Instrument Performance Check
Efficiency Determinations

Detector ID	Alpha Eff.	Alpha LCL	Alpha UCL	Alpha Flag	Beta Eff.	Beta LCL	Beta UCL	Beta Flag	Detector ID
A1 (01)	0.2451	0.2284	0.2536	PASS	0.3892	0.3689	0.4117	PASS	A1 (01)
A2 (02)	0.2421	0.2273	0.2487	PASS	0.3935	0.3711	0.4042	PASS	A2 (02)
A3 (03)	0.2518	0.2360	0.2650	PASS	0.3956	0.3739	0.4104	PASS	A3 (03)
A4 (04)	0.2371	0.2202	0.2440	PASS	0.3602	0.3377	0.3787	PASS	A4 (04)
B1 (05)	#VALUE!	0.2246	0.2470	#VALUE!	#VALUE!	0.3621	0.4456	#VALUE!	B1 (05)
B2 (06)	#VALUE!	0.2191	0.2451	#VALUE!	#VALUE!	0.3476	0.3828	#VALUE!	B2 (06)
B3 (07)	#VALUE!	0.2015	0.2486	#VALUE!	#VALUE!	0.3583	0.4011	#VALUE!	B3 (07)
B4 (08)	#VALUE!	0.2074	0.2671	#VALUE!	#VALUE!	0.3543	0.4114	#VALUE!	B4 (08)
C1 (09)	#VALUE!	0.2127	0.2331	#VALUE!	#VALUE!	0.3486	0.3691	#VALUE!	C1 (09)
C2 (10)	#VALUE!	0.2410	0.2591	#VALUE!	#VALUE!	0.3673	0.3898	#VALUE!	C2 (10)
C3 (11)	#VALUE!	0.2426	0.2640	#VALUE!	#VALUE!	0.3941	0.4233	#VALUE!	C3 (11)
C4 (12)	#VALUE!	0.2354	0.2553	#VALUE!	#VALUE!	0.3896	0.4174	#VALUE!	C4 (12)
D1 (13)	#VALUE!	0.2429	0.2648	#VALUE!	#VALUE!	0.3970	0.4253	#VALUE!	D1 (13)
D2 (14)	#VALUE!	0.2371	0.2511	#VALUE!	#VALUE!	0.4077	0.4300	#VALUE!	D2 (14)
D3 (15)	#VALUE!	0.1748	0.2406	#VALUE!	#VALUE!	0.3079	0.3945	#VALUE!	D3 (15)
D4 (16)	#VALUE!	0.2040	0.2649	#VALUE!	#VALUE!	0.3606	0.4318	#VALUE!	D4 (16)

Reviewed by: JH Date: 6/14/08

Control Limits Established 12/13/07 by LJO

Printed 6/16/088:29 AM

LB4100 - B

Daily Instrument Performance Check
Efficiency Determinations

Detector ID	Alpha Eff.	Alpha LCL	Alpha UCL	Alpha Flag	Beta Eff.	Beta LCL	Beta UCL	Beta Flag	Detector ID
A1 (01)	0.2457	0.2375	0.2635	PASS	0.8327	0.8206	0.8809	PASS	A1 (01)
A2 (02)	0.2458	0.2346	0.2572	PASS	0.8244	0.8159	0.8781	PASS	A2 (02)
A3 (03)	0.2544	0.2349	0.2601	PASS	0.8681	0.8334	0.8923	PASS	A3 (03)
A4 (04)	0.2510	0.2329	0.2642	PASS	0.8252	0.8018	0.8543	PASS	A4 (04)
B1 (05)	0.2454	0.2370	0.2643	PASS	0.8164	0.8184	0.8843	FLAG-LOW	B1 (05)
B2 (06)	0.2260	0.2197	0.2472	PASS	0.8215	0.8085	0.8621	PASS	B2 (06)
B3 (07)	0.2364	0.2338	0.2635	PASS	0.8344	0.8402	0.8963	FLAG-LOW	B3 (07)
B4 (08)	0.2463	0.2217	0.2606	PASS	0.8332	0.8055	0.8644	PASS	B4 (08)
C1 (09)	0.2516	0.2388	0.2675	PASS	0.8482	0.8152	0.8761	PASS	C1 (09)
C2 (10)	0.2372	0.2255	0.2581	PASS	0.8391	0.7940	0.8678	PASS	C2 (10)
C3 (11)	0.2416	0.2304	0.2565	PASS	0.8458	0.7780	0.8528	PASS	C3 (11)
C4 (12)	0.2345	0.2215	0.2456	PASS	0.8235	0.7598	0.8391	PASS	C4 (12)
D1 (13)	0.2469	0.2305	0.2610	PASS	0.8163	0.8130	0.8781	PASS	D1 (13)
D2 (14)	0.2419	0.2371	0.2689	PASS	0.8266	0.8125	0.8914	PASS	D2 (14)
D3 (15)	0.2468	0.2411	0.2674	PASS	0.8036	0.8094	0.8752	FLAG-LOW	D3 (15)
D4 (16)	0.2497	0.2379	0.2630	PASS	0.8489	0.8401	0.9052	PASS	D4 (16)

– See recount file EFB0616R JH 6/16/08

Reviewed by: JH Date: 6/16/08

Control Limits Established 02/5/2007. LJO

LB4100 - B

Daily Instrument Performance Check
Efficiency Determinations

Detector ID	Alpha Eff.	Alpha LCL	Alpha UCL	Alpha Flag	Beta Eff.	Beta LCL	Beta UCL	Beta Flag	Detector ID
A1 (01)	#VALUE!	0.2375	0.2635	#VALUE!	#VALUE!	0.8206	0.8809	#VALUE!	A1 (01)
A2 (02)	#VALUE!	0.2346	0.2572	#VALUE!	#VALUE!	0.8159	0.8781	#VALUE!	A2 (02)
A3 (03)	#VALUE!	0.2349	0.2601	#VALUE!	#VALUE!	0.8334	0.8923	#VALUE!	A3 (03)
A4 (04)	#VALUE!	0.2329	0.2642	#VALUE!	#VALUE!	0.8018	0.8543	#VALUE!	A4 (04)
B1 (05)	0.2494	0.2370	0.2643	PASS	0.8256	0.8184	0.8843	PASS	B1 (05)
B2 (06)	#VALUE!	0.2197	0.2472	#VALUE!	#VALUE!	0.8085	0.8621	#VALUE!	B2 (06)
B3 (07)	0.2412	0.2338	0.2635	PASS	0.8301	0.8402	0.8963	FLAG-LOW	B3 (07)
B4 (08)	#VALUE!	0.2217	0.2606	#VALUE!	#VALUE!	0.8055	0.8644	#VALUE!	B4 (08)
C1 (09)	#VALUE!	0.2388	0.2675	#VALUE!	#VALUE!	0.8152	0.8761	#VALUE!	C1 (09)
C2 (10)	#VALUE!	0.2255	0.2581	#VALUE!	#VALUE!	0.7940	0.8678	#VALUE!	C2 (10)
C3 (11)	#VALUE!	0.2304	0.2565	#VALUE!	#VALUE!	0.7780	0.8528	#VALUE!	C3 (11)
C4 (12)	#VALUE!	0.2215	0.2456	#VALUE!	#VALUE!	0.7598	0.8391	#VALUE!	C4 (12)
D1 (13)	#VALUE!	0.2305	0.2610	#VALUE!	#VALUE!	0.8130	0.8781	#VALUE!	D1 (13)
D2 (14)	#VALUE!	0.2371	0.2689	#VALUE!	#VALUE!	0.8125	0.8914	#VALUE!	D2 (14)
D3 (15)	0.2499	0.2411	0.2674	PASS	0.7977	0.8094	0.8752	FLAG-LOW	D3 (15)
D4 (16)	#VALUE!	0.2379	0.2630	#VALUE!	#VALUE!	0.8401	0.9052	#VALUE!	D4 (16)

-Offline JH 6/16/08

Reviewed by: JH Date: 6/16/08

Control Limits Established 02/5/2007. LJO

3

nance Check

nations

	Beta			Detector
ff.	LCL	UCL	Flag	ID
253	0.8206	0.8809	PASS	A1 (01)
321	0.8159	0.8781	PASS	A2 (02)
661	0.8334	0.8923	PASS	A3 (03)
250	0.8018	0.8543	PASS	A4 (04)
319	0.8184	0.8843	PASS	B1 (05)
279	0.8085	0.8621	PASS	B2 (06)
115	0.8402	0.8963	FLAG-LOW	B3 (07)
346	0.8055	0.8644	PASS	B4 (08)
457	0.8152	0.8761	PASS	C1 (09)
357	0.7940	0.8678	PASS	C2 (10)
393	0.7780	0.8528	FLAG-HIGH	C3 (11)
058	0.7598	0.8391	PASS	C4 (12)
090	0.8130	0.8781	FLAG-LOW	D1 (13)
094	0.8125	0.8914	FLAG-LOW	D2 (14)
039	0.8094	0.8752	FLAG-LOW	D3 (15)
517	0.8401	0.9052	PASS	D4 (16)

'08

Date: 6/17/08

2/5/2007. LJO

16 AM

B4100 - B

nt Performance Check

y Determinations

	Beta				Detector
	Eff.	LCL	UCL	Flag	ID
E!	#VALUE!	0.8206	0.8809	#VALUE!	A1 (01)
E!	#VALUE!	0.8159	0.8781	#VALUE!	A2 (02)
E!	#VALUE!	0.8334	0.8923	#VALUE!	A3 (03)
E!	#VALUE!	0.8018	0.8543	#VALUE!	A4 (04)
E!	#VALUE!	0.8184	0.8843	#VALUE!	B1 (05)
E!	#VALUE!	0.8085	0.8621	#VALUE!	B2 (06)
	0.8236	0.8402	0.8963	FLAG-LOW	B3 (07)
E!	#VALUE!	0.8055	0.8644	#VALUE!	B4 (08)
E!	#VALUE!	0.8152	0.8761	#VALUE!	C1 (09)
E!	#VALUE!	0.7940	0.8678	#VALUE!	C2 (10)
	1.5012	0.7780	0.8528	FLAG-HIGH	C3 (11)
E!	#VALUE!	0.7598	0.8391	#VALUE!	C4 (12)
	0.8141	0.8130	0.8781	PASS	D1 (13)
	0.8421	0.8125	0.8914	PASS	D2 (14)
	0.8148	0.8094	0.8752	PASS	D3 (15)
E!	#VALUE!	0.8401	0.9052	#VALUE!	D4 (16)

94 Date: 6/17/08

tablished 02/5/2007. LJO

6/17/08 8:28 AM

Gas Proportional Counter

Instrument Calibration

Initial Efficiency Calibration
Standards Traceability

Instrument: LB4100-A

Calibration: Sr-90 Flat Planchet

Date of Calibration: 09/27/2007

Efficiency Log Files: Sr90F-09/07

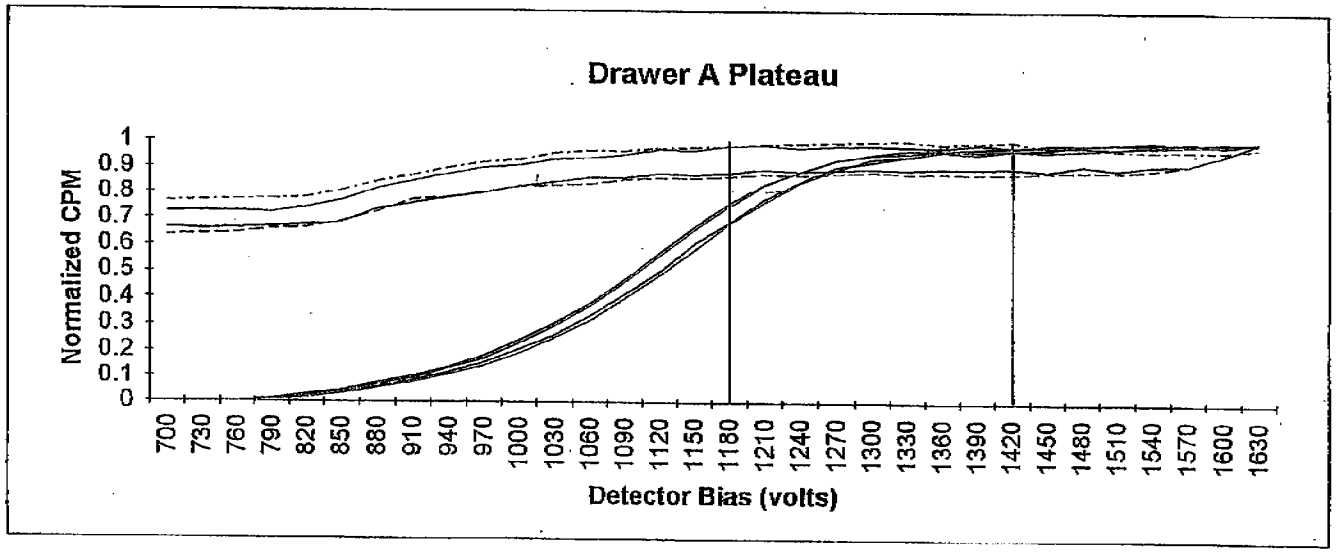
Efficiency Files: ESF0927A
ESF0927B

Source ID's: Sr-90 – 514.1572.73

OK
JCB
10/5/07

Unit Type: LB4100/W-A
Date Performed: 9/18/07 09:58
FileName: PTA0918A
Batch ID: PLATEAU

Unit Id: Orange
Application Revision: B
Application Version: Standard



Optimum alpha beta simultaneous operating voltage: 1420

Optimum alpha only operating voltage: 1180

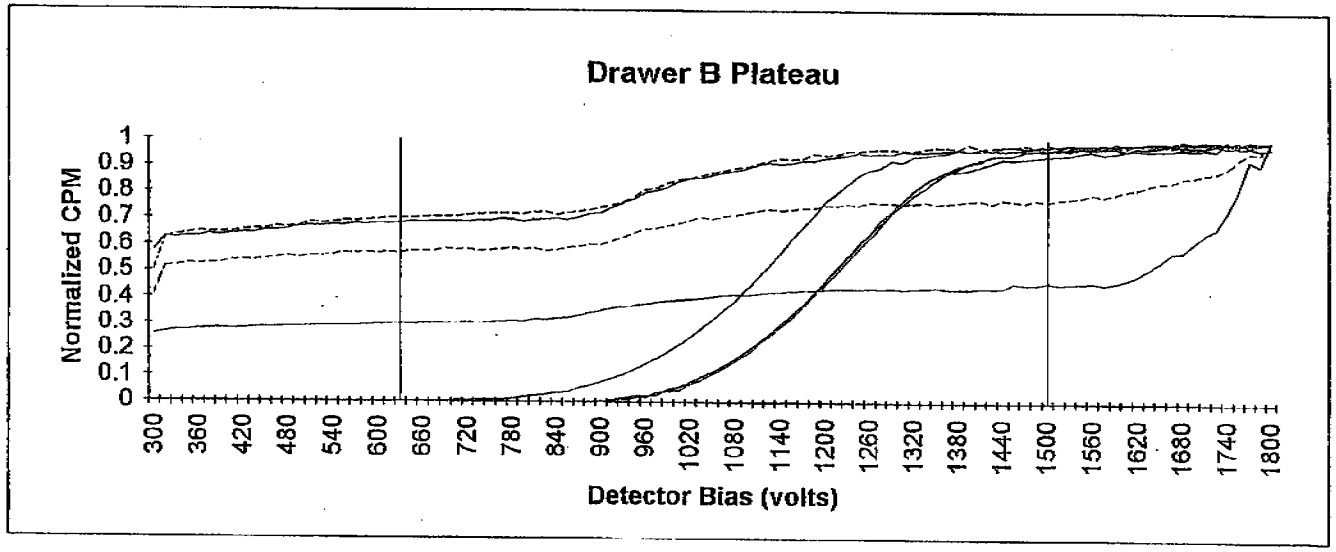
Archieved

	A1	A2	A3	A4
Beta slope at beta voltage	1.99%	1.77%	2.19%	0.99%
Alpha slope at beta voltage	0.06%	0.88%	0.76%	-0.99%
Alpha slope at alpha voltage	0.96%	1.53%	1.44%	1.63%

Printed 9/18/07 4:11 PM

Unit Type: LB4100/W-A
Date Performed: 9/24/07 12:21
FileName: PTA0924B
Batch ID: PLATEAU

Unit Id: Orange
Application Revision: B
Application Version: Standard



Optimum alpha beta simultaneous operating voltage: 1500

Optimum alpha only operating voltage: 630

	B1	B2	B3	B4
Beta slope at beta voltage	1.73%	2.36%	1.03%	1.73%
Alpha slope at beta voltage	0.90%	2.69%	0.15%	-0.13%
Alpha slope at alpha voltage	1.59%	2.19%	1.97%	1.75%

Archieved

4th plateau a working voltage was Found.

Starting Voltage 300
Ending Voltage 1800
15 Volts/step
15 min/step
60,000 ct preset
1000 min + For each source.

Printed 9/26/07 9:14 AM

Date 9/18/07

SOP 724r 10

Paragon Analytics

Low Background Gas Flow Proportional Counter Log

Instrument: LB4100A

Instrument Daily Response and Background Checks

Det.	Daily Response Check Start 1	Status	Start 2	Status	Background Check Start 1	Status	Start 2	Status	Det. Status
1	☆								
2									
3									
4									
5									
6									
7									
8									
9									
10									
11									
12									
13									
14									
15									LO 9/18/07
16									

Det = Detector; α = Alpha; β = Beta; P = Pass; H = High; L = Low; OL = Offline; R = Recount; W = Weekly; NP = Not Processed

Weekly Background Calibration

	Current Calib. File ID	Weekly Calib. Started	Status	File ID
Dr A	NA			
Dr B	↓			
Dr C	OL			
Dr D	↓			

Dr = Drawer

Gas Supply

P-10 Supply		P-10 Flow	
Tank 1	700	Dr A	0.15
	↓	Dr B	↓
Tank 2	1400	Dr C	
	↓	Dr D	

Comments: ☆ Drawers C & D are offline. Drawers A & B do not have a working calibration. LO 9/18/07

226262

Reviewed By / Date 9/19/07

Date 9/18/07

SOP 724r 10

Paragon Analytics

Low Background Gas Flow Proportional Counter Log

Instrument: LB4100A

Det.	Sample ID	Batch	Test	Count Dur. (min)	Start Time	Analyst Initials	File ID	Output Initials
1-4	Plateaus	-	-	5 step	954	LO	PTA0918A	LO
5-8	↓	-	-	↓	↓	↓	PTA0918B	↓

LO 9/18/07

Comments:

Page No.: 326262 B

(cont. from page NA B)

Form 780r8.doc (6/23/06)

Reviewed By / Date W.G. 9/19/07

Date 9/24/07

SOP 724r/0

Paragon Analytics

Low Background Gas Flow Proportional Counter Log

Instrument: LB4100A

Instrument Daily Response and Background Checks

Det.	Daily Response Check Start 1	Status	Start 2	Status	Background Check Start 1	Status	Start 2	Status	Det. Status
1	☆								
2									
3									
4									
5									
6									
7									
8									
9									
10									
11									
12									
13									
14									
15									
16									

Det = Detector; α = Alpha; β = Beta; P = Pass; H = High; L = Low; OL = Offline; R = Recount; W = Weekly; NP = Not Processed

Weekly Background Calibration

	Current Calib. File ID	Weekly Calib. Started	Status	File ID
Dr A	☆			
Dr B				
Dr C				
Dr D				

Dr = Drawer

Gas Supply

P-10 Supply		P-10 Flow	
Tank 1	1300	Dr A	0.15
	↓	Dr B	↓
Tank 2	1400	Dr C	
	↓	Dr D	

Comments: ☆ Drawers C and D are offline. Drawers A & B have no working control limits due to no plateaus or ROIs archieved officially. 9/24/07

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Form 780r8.doc (6/23/06)

Reviewed By / Date 9/24/07

Date 9/24/07

SOP 724r16

Paragon Analytics
Low Background Gas Flow Proportional Counter Log
Instrument: LB4100A

Det.	Sample ID	Batch	Test	Count Dur. (min)	Start Time	Analyst Initials	File ID	Output Initials
5-8	Plateau	–	–	15 step	1210	LO	PTA0924B	LO

WQ 9/26/07

Comments:

Page No.: 326267 B
(cont. from page NA B)

Form 780r8.doc (6/23/06)

Reviewed By / Date WQ 9/26/07

9/8/07 LJG

Plateaus for Drawers A and B

Source Used β		Detector	Source used α
Sr/Y 90	- 406	A1 B1	410 - Am 241
29,600 dpm	- 407	A2 B2	411 - 17,800 dpm
9/15/92	- 408	A3 B3	412 - 2/06/95
↓	- 409	A4 B4	413 - ↓

Parameters

Starting Voltage - 700

Filenames:

PTA0918A

9/24/07 LSD A working voltage could still not be found. It was assumed that the count preset was what governed how many counts were being recorded. Turns out that the plateau file was only gathering the counts for 5 minutes and not trying to hit the count preset. This was remedied by increasing the minutes per step to 15 minutes instead of 5 minutes. Two seperate plateaus were run (seperate alpha & beta ones) on 9/21/07 and 9/22/07.

Parameters
Starting Voltage: 300

Filenames:
PTA0921 → ch[illegible]

PROJECT LB4100A

Notebook No. 2447

Continued From Page

Am241 Adsorption - Am241 on a Ribbed Planchet

Paragon Analytics

QUALITY ASSURANCE SUMMARY SHEET

PAR W.O. # / BATCH GFPC Calibrations
TEST LB4100A
METHOD
SOP/REV (PREP)
SOP/REV (ANAL) 724 R10

Briefly document any QA or other problems or deviations associated with the analysis of samples. Problems could result from: log-in, color, odor, dilution, consistency, scheduling, equipment, or instrumentation, or may include documentation of minor deviations necessary due to unique DQO's or sample characteristics.

Paragon SOP 724 R10 states that efficiency calibrations must be within 5% of the previous value. Prior to the current calibration, Instrument A suffered from exposure to acid fumes from improperly dried sample planchets. Instrument A was dissassembled in an effort to clean the affected detectors.

The detectors were properly recalibrated and returned to service. Some detectors showed new counting efficiencies more than 5% different from [illegible]

Sr-90 Flat Planchet Efficiency Calibration
LB4100-A
Date: 9/27/2007
Source ID: 1176

Det ID	A1	A2	A3	A4	B1	B2	B3	B4
File Name	ESF0927A	ESF0927A	ESF0927A	ESF0927A	ESF0927B	ESF0927B	ESF0927B	ESF0927B
Cnt Time	27.00	27.11	26.99	27.21	22.00	27.59	25.90	26.40
Tot Cnts	10003	10002	10006	10005	10009	10004	10003	10003
Bkg CPM	2.120	1.898	2.164	1.995	87.075	5.871	2.157	1.692
CPM	368.3615	367.0434	368.5659	365.7007	367.880	356.724	384.059	377.210
Alpha EFF	0.000731	0.000573	0.000237	0.00068	0.001411	0.001320	0.000747	0.000820
Beta EFF	0.407485	0.406027	0.407711	0.404542	0.406952	0.394612	0.424851	0.417273
Efficiency	**0.4075**	**0.4060**	**0.4077**	**0.4045**	**0.4070**	**0.3946**	**0.4249**	**0.4173**

Batch Specific:

	Event	Recycle
Orange	1	1

Drawer Specific:

	Date/Time	Official	Bias	Step
A	9/18/07 9:58	TRUE	1420	0
B	9/24/07 12:21	TRUE	1500	0
C	#NUM!	#NUM!	#NUM!	0
D	#NUM!	#NUM!	#NUM!	0

Detector Specific:

	Date/Time	Official	Thres	bLL	bUL	aLL	aUL
A1	9/26/07 0:00	TRUE	0.1	0	29.79	57.53	100
A2	9/26/07 0:00	TRUE	0.1	0	33.08	62.27	100
A3	9/26/07 0:00	TRUE	0.1	0	25.42	49.42	100
A4	9/26/07 0:00	TRUE	0.1	0	27.3	52.3	100
B1	9/26/07 0:00	TRUE	0.1	0	48.74	90.2	100
B2	9/26/07 0:00	TRUE	0.1	0	17.26	39.75	100
B3	9/26/07 0:00	TRUE	0.1	0	17.53	37.8	100
B4	9/26/07 0:00	TRUE	0.1	0	15.75	35.31	100

Printed 9/27/075:34 PM

Date 9/27/07

SOP 724r ~~10~~

Paragon Analytics

Low Background Gas Flow Proportional Counter Log

Instrument: LB4100A

Instrument Daily Response and Background Checks

Det.	Daily Response Check Start 1	Status	Start 2	Status	Background Check Start 1	Status	Start 2	Status	Det. Status
1	WO	☆			WO	P			P
2	↓	↓			↓	↓			↓
3									
4									
5						HB			OLBW
6						LB			↓
7						P			P
8	↓	↓			↓	↓			↓
9	OL	OL			OL	OL			OL
10	↓	↓			↓	↓			↓
11									
12									
13									
14									
15									
16	↓	↓			↓	↓			↓

Det = Detector; α = Alpha; β = Beta; P = Pass; H = High; L = Low; OL = Offline; R = Recount; W = Weekly; NP = Not Processed

Weekly Background Calibration

	Current Calib. File ID	Weekly Calib. Started	Status	File ID
Dr A	BKA 09 26 W			
Dr B	↓			
Dr C	OL			
Dr D	↓			

Dr = Drawer

Gas Supply

P-10 Supply		P-10 Flow	
Tank 1	800	Dr A	0.15
	↓	Dr B	↓
Tank 2	1400	Dr C	↓
	↓	Dr D	↓

Comments: ☆ Pass fail Flags do not count due to ~~interim~~ Historical limits being set. WO 9/27/07 WO 9/27/07

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Form 780r8.doc (6/23/06)

Reviewed By / Date WO 9/28/07

Date 9/27/07

SOP 724r10

Paragon Analytics

Low Background Gas Flow Proportional Counter Log

Instrument: LB4100A

Det.	Sample ID	Batch	Test	Count Dur. (min)	Start Time	Analyst Initials	File ID	Output Initials
18	1130	[illegible]		[illegible]	9:17	[illegible]	[illegible]	[illegible]

Source Database for OSUM for LB4100-A
Number of sources in table: 157

Application Revision: A

Control ID	Isotope	Type	Half-Life (Days)	DPM	Std dev	Date	Status	Alpha/Beta Archive File
1171	Am-241	Alpha	157856.728	9342	467.10	6-Apr-04	PA	Am241Wipe-09/07
1172	Sr-90/Y-90	Beta	10518.912	37044	1852.20	10-Dec-01	PA	Sr90Wipe-09/07
1173	Sr-89	Beta	50.53	14982	749.10	16-Feb-07	PA	Sr89-09/07
1174	Am-241	Alpha	157783.68	5514.295	275.71	19-Mar-99	PA	Am241-09/07
1175	Sr-90	Beta	10518.912	19986.92	999.35	2-Dec-04	PA	Sr90R-09/07
1176	Sr-90	Beta	10518.912	1110	55.50	18-Mar-99	PA	Sr90F-09/07
1177	Th-230	Alpha	27539096	2653.3957	132.67	13-Jul-04	PA	Th230-09/07
1178	Cl-36	Beta	109937240	9959.7	497.99	13-Dec-04	PA	Cl36-09/07
1179	I-129	Beta	5734268000	4414	220.70	15-Apr-93	PA	I129-09/07

Paragon Analytics

270055A

WORKSHEET FOR IN-HOUSE OR RUSH SAMPLES / Ra/Sr Lab

Matrix LIQUID Prep Analyst [illegible] Prep Date 12/15/04 Analyte 90Sr Analytical Batch _____

Pretreatment? (Y / N) Batch _____ Count Date / Time _____ Superseded _____

Paragon WO No.	Sample Wt. (g/L)	Sample Aliq. (g/L)	Aliquot Basis (Dry / AR)	Spike Information	Remarks	Det. No.	Filename	POS Ckd By
0424028.S1	NA	→	→	S1				
.S2	↓	↓	↓	↓				
.S3								
.S4								
.S5								
				[illegible] 12/15/04				

Balance No. NA Spiked By [illegible] Date 12/15/04 Spike Witness [illegible] Date 12/15/04 QASS? (Y / N) No. _____

	Isotope	No 11/29/05	Act / mL	Vol	P	Total Act (dpm)	~~Decay~~ Corrected	PIPET [illegible] 12/15/04	Relinquished by / Date	Received by / Date
Spike 1	90Sr	S14.1572.73	~55.5	10.0		~5500	RS-007	1	[illegible] 12/15/04	
Spike 2										
Spike 3						[illegible] 12/15/04		2		
Spike 4										

Electronic Benchsheet No. (if / when generated) NA Reviewed by / Date [illegible] 12/15/04

279055 B

WORKSHEET FOR IN-HOUSE OR RUSH SAMPLES / Ra/Sr Lab

Initials [illegible] Date 12/15/04 Method (SOP / Rev) 907R8 Matrix LIQUID

COMMENTS

^{90}Sr CALIBRATION

- ~2.5 ml 16N HNO_3 ADDED TO PLANCHETS
- SPIKE ADDED TO PLANCHETS
- DRIED ON HOTPLATE

[illegible] 12/15/04

Reviewed by / Date [illegible] 12/15/04

Sr-90 Calculatons

Sample ID	Sample D & T	Sep. D & T	Count D & T	Ct Dur	Init Vol	Calc Vol	Gross CPM	BKG CPM	Net CPM	Efficiency	Yield	Act	2 sig TPU	MDC	MS Recov	LCS Recov
0424028-S1	3/18/1999 12:00	12/15/2004 12:00	###########	10	1.0000	0.980	406.500	1.453	405.047	0.4337	1.000	258.05	60.71	1.30	103.2%	103.2%
0424028-S2	3/18/1999 12:00	12/15/2004 12:00	###########	10	1.0000	0.980	409.000	1.453	407.547	0.4337	1.000	259.64	61.09	1.30	103.9%	103.9%
0424028-S3	3/18/1999 12:00	12/15/2004 12:00	###########	10	1.0000	0.980	411.200	1.453	409.747	0.4337	1.000	261.04	61.41	1.30	104.4%	104.4%
0424028-S4	3/18/1999 12:00	12/15/2004 12:00	###########	10	1.0000	0.980	420.500	1.453	419.047	0.4337	1.000	266.97	62.79	1.30	106.8%	106.8%
0424028-S5	3/18/1999 12:00	12/15/2004 12:00	###########	10	1.0000	0.980	396.200	1.453	394.747	0.4337	1.000	251.49	59.18	1.30		100.6%
											MEAN=	259.44				
											STDEV=	5.58			Ave Recovery =	104.6% 103.8%
											2SIG LCL	248.28				
											2SIG UCL	270.59				

Sample ID	Spike Soln	Ref Date	Sr-90 Activity DPM/mL	Sr-90 Spike Vol mL	Sr-90 Act pCi Added
0	514.1572.73	3/18/1999	55.50	0.0	#DIV/0!
0424028-S1	514.1572.73	3/18/1999	55.50	10.0	249.992
0	514.1572.73	3/18/1999	55.50	0.0	#DIV/0!
0424028-S2	514.1572.73	3/18/1999	55.50	10.0	249.992
0	514.1572.73	3/18/1999	55.50	0.0	#DIV/0!
0424028-S3	514.1572.73	3/18/1999	55.50	10.0	249.992
0	514.1572.73	3/18/1999	55.50	0.0	#DIV/0!
0424028-S4	514.1572.73	3/18/1999	55.50	10.0	249.992
0	514.1572.73	3/18/1999	55.50	0.0	#DIV/0!
0424028-S5	514.1572.73	3/18/1999	55.50	10.0	249.992

1σ 4 + 5

Using 5 as outlier
LO 11/16/06

t½ 28.8yrs

r:\inst\gfp\0424028SRFOUT.xls

PAI - Gas Flow Proportional Sample Analysis LB4100-B

Unit Type: LB4100-B
Counting Unit ID: Aqua
High Voltage Mode: Simultaneous
Application Revision:
Application Version: Standard
Rev.12/28/03 JE

Data file name: SRB1111
Batch ID: OUTLIER
Count Preset (m): 10
2 Batch Ended: 11/11/06 13:19

Background logfile: BKGABW
Date of Bkg. Cal: 11/11/06
Alpha efficiency logfile: AmR-11/05
Alpha attenuation calibration: AM0106
Beta efficiency logfile: Sr90R-11/05
Beta attenuation calibration: SR1105

Alpha prog. logfile: n/a
Alpha prog. attenuation: n/a
Beta prog. logfile: n/a
Beta prog. attenuation: n/a

Alpha Attenuation Calibration y = b*m^(a*(mass-x0))		Beta Attenuation Calibration y = b*m^(a*(mass-x0))	
Alpha b=	1.16970	Beta b=	0.9791
m=	0.99300	m=	0.9958
a=	0.7986	a=	1.3098
x0=	0.0000	x0=	0.0000
Alpha to Beta X-talk y = b*m^-mass		Beta to Alpha X-talk y = b*mass + m	
a ->b xtalk b=	0.2319	b ->a xtalk b=	-2.71E-06
a ->b xtalk m=	0.3997	b ->a xtalk m=	0.0025

Det. ID	Sample ID	Count End Date & Time	Count Dur. (min)	Resid. Mass (mg)	Alpha Activity Gross CPM	Alpha Activity Bkg. CPM	Alpha Activity b>a xtlk CPM	Alpha Activity Base Eff	Alpha Activity Base Cor.Fact.	Alpha Activity Progeny Eff	Alpha Activity Progeny Cor.Fact.	Beta Activity Gross CPM	Beta Activity Bkg. CPM	Beta Activity a>b xtlk CPM	Beta Activity Base Eff	Beta Activity Base Cor.Fact.	Beta Activity Progeny Eff	Beta Activity Progeny Cor.Fact.
A1	0424028-S1	11/11/06 13:19	10.00	0.0	0.500	0.052	0.203	0.2316	1.170	n/a	n/a	408.500	1.453	0.1159	0.4337	0.870	n/a	n/a

79

LO 9/27/07

ile: BKGABW
Cal: 11/11/06
ile: AmR-11/05
on: AM0106
ile: Sr90R-11/05
on: SR1105

Alpha prog. logfile: n/a
Alpha prog. attenuation: n/a
Beta prog. logfile: n/a
Beta prog. attenuation: n/a

Alpha Attenuation Calibration		Beta Attenuation Calibration	
y = b*m^(a*(mass-x0))		y = b*m^(a*(mass-x0))	
Alpha b=	1.16870	Beta b=	0.9751
m=	0.99300	m=	0.9998
a=	0.7598	a=	1.3096
x0=	0.0000	x0=	0.0000
Alpha to Beta X-talk		Beta to Alpha X-talk	
y = b *m^-mass		y = b*mass + m	
a ->b xtalk b=	0.2318	b ->a xtalk b=	-2.71E-06
a ->b xtalk m=	0.9997	b ->a xtalk m=	0.0006

			Beta Activity						
ct.	Progeny Eff	Progeny Cor.Fact.	Gross CPM	Bkg. CPM	a>b xtlk CPM	Base Eff	Base Cor.Fact.	Progeny Eff	Progeny Cor.Fact.
	n/a	n/a	409.000	1.453	0.0927	0.4337	0.979	n/a	n/a

LO
9/27/07

tional Sample Analysis LB4100-B

ail Type: LB4100-B
g Unit ID: Aqua
e Mode: Simultaneous
evision: 2
Version: Standard
29/03 JE

Data file name: SRB1111D
Batch ID: OUTLIER
Count Preset (m): 10
Batch Ended: 11/11/06 15:21

Background logfile: BKGABW
Date of Bkg. Cal: 11/11/06
Alpha efficiency logfile: AmR-11/05
Alpha attenuation calibration: AM0106
Beta efficiency logfile: Sr90R-11/05
Beta attenuation calibration: SR1105

Alpha prog. logfile: n/a
Alpha prog. attenuation: n/a
Beta prog. logfile: n/a
Beta prog. attenuation: n/a

Alpha Attenuation Calibration		Beta Attenuation Calibration	
y = b*m^(a*(mass-x0))		y = b*m^(a*(mass-x0))	
Alpha b=	1.16970	Beta b=	0.9791
m=	0.99300	m=	0.9998
a=	0.7996	a=	1.3096
x0=	0.0000	x0=	0.0006
Alpha to Beta X-talk		Beta to Alpha X-talk	
y = b *m^-mass		y = b*mass + m	
a ->b xtalk b=	0.2310	b ->a xtalk b=	-2.71E-06
a ->b xtalk m=	0.9997	b ->a xtalk m=	0.0005

	Count End Date & Time	Count Dur. (min)	Resid. Mass (mg)	Alpha Activity							Beta Activity						
				Gross CPM	Bkg. CPM	b>a xtlk CPM	Base Eff	Base Cor.Fact.	Progeny Eff	Progeny Cor.Fact.	Gross CPM	Bkg. CPM	a>b xtlk CPM	Base Eff	Base Cor.Fact.	Progeny Eff	Progeny Cor.Fact.
S3	11/11/06 15:21	10.00	0.0	0.900	0.052	0.206	0.2316	1.170	n/a	n/a	411.200	1.453	0.2086	0.4337	0.979	n/a	n/a

LO
9/27/07

PAI - Gas Flow Proportional Sample Analysis LB4100-B

Unit Type: LB4100-B
Counting Unit ID: Aqua
High Voltage Mode: Simultaneous
Application Revision:
Application Version: Standard
Rev.12/29/03 JE

Data file name: SRB1111F
Batch ID: OUTLIER
Count Preset (m): 10
2 Batch Ended: 11/11/08 15:37

Background logfile: BKGABW
Date of Bkg. Cal: 11/11/08
Alpha efficiency logfile: AmR-11/05
Alpha attenuation calibration: AM0106
Beta efficiency logfile: Sr90R-11/05
Beta attenuation calibration: SR1105

Alpha prog. logfile: n/a
Alpha prog. attenuation: n/a
Beta prog. logfile: n/a
Beta prog. attenuation: n/a

Alpha Attenuation Calibration		Beta Attenuation Calibration	
y = b*m^(a*(mass-x0))		y = b*m^(a*(mass-x0))	
Alpha b=	1.15970	Beta b=	0.9761
m=	0.99300	m=	0.9993
a=	0.7596	a=	1.3089
x0=	0.0000	x0=	0.0000
Alpha to Beta X-talk		Beta to Alpha X-talk	
y = b *m^-mass		y = b*mass + m	
a ->b xtalk b=	0.2318	b ->a xtalk b=	-2.71E-06
a ->b xtalk m=	0.9997	b ->a xtalk m=	0.0005

Det. ID	Sample ID	Count End Date & Time	Count Dur. (min)	Resid. Mass (mg)	Alpha Activity							Beta Activity						
					Gross CPM	Bkg. CPM	b>a xtlk CPM	Base Eff	Base Cor.Fact.	Progeny Eff	Progeny Cor.Fact.	Gross CPM	Bkg. CPM	a>b xtlk CPM	Base Eff	Base Cor.Fact.	Progeny Eff	Progeny Cor.Fact.
A1	0424028-S4	11/11/08 15:37	10.00	0.0	0.600	0.052	0.210	0.2316	1.170	n/a	n/a	420.500	1.453	0.1301	0.4337	0.979	n/a	n/e

LB
9/27/07

tional Sample Analysis LB4100-B

nit Type: LB4100-B
Unit ID: Aqua
e Mode: Simultaneous
evision: 2
Version: Standard
29/03 JE

Data file name: SRB1111H
Batch ID: OUTLIER
Count Preset (m): 10
Batch Ended: 11/11/06 15:55

Background logfile: BKGABW
Date of Bkg. Cal: 11/11/06
Alpha efficiency logfile: AmR-11/05
Alpha attenuation calibration: AM0106
Beta efficiency logfile: Sr90R-11/05
Beta attenuation calibration: BR1105

Alpha prog. logfile: n/a
Alpha prog. attenuation: n/a
Beta prog. logfile: n/a
Beta prog. attenuation: n/a

Alpha Attenuation Calibration		Beta Attenuation Calibration	
y = b*m^(a*(mass-x0))		y = b*m^(a*(mass-x0))	
Alpha b=	1.16970	Beta b=	0.9791
m=	0.99300	m=	0.9858
a=	0.7986	a=	1.3059
x0=	0.0000	x0=	0.0000
Alpha to Beta X-talk		Beta to Alpha X-talk	
y = b *m^-mass		y = b*mass + m	
a -> b xtalk b=	0.2318	b -> a xtalk b=	-2.71E-06
a -> b xtalk m=	0.9997	b -> a xtalk m=	0.0005

	Count End Date & Time	Count Dur. (min)	Resid. Mass (mg)	Alpha Activity							Beta Activity						
				Gross CPM	Bkg. CPM	b>a xtlk CPM	Base Eff	Base Cor.Fact.	Progeny Eff	Progeny Cor.Fact.	Gross CPM	Bkg. CPM	a>b xtlk CPM	Base Eff	Base Cor.Fact.	Progeny Eff	Progeny Cor.Fact.
S5	11/11/06 15:55	10.00	0.0	0.500	0.052	0.198	0.2316	1.170	n/a	n/a	396.200	1.453	0.1391	0.4337	0.979	n/a	n/a

lw
9/27/07

Date 11/11/06

SOP 724r 9

Paragon Analytics
Low Background Gas Flow Proportional Counter Log
Instrument: LB4100B

Instrument Daily Response and Background Checks

Det.	Daily Response Check Start 1	Status	Start 2	Status	Background Check Start 1	Status	Start 2	Status	Det. Status
1	LO	P							P
2									HB
3									P
4									
5									
6									
7									
8									
9									
10									
11									
12									
13									
14									HB
15									P
16									HB

LO 11/11/06

Date 11/11/06

SOP 724r 9

Paragon Analytics

Low Background Gas Flow Proportional Counter Log

Instrument: LB4100B

Det.	Sample ID	Batch	Test	Count Dur. (min)	Start Time	Analyst Initials	File ID	Output Initials
1-16	Daily EFF	—	—	30	1039	LO	EFB1111	LO
1	1156	Ra226 EFF	Ra226	30	1103	LO	ERA1111A	LO
2	↓	↓	↓	↓	↓	↓	↓	↓
3								
4								
5	1156	Ra226EFF	Ra226	30	1118	LO	ERA1111B	LO
6	↓	↓	↓	↓	↓	↓	↓	↓
7								
8								
9	1156	Ra226EFF	Ra226	30	1130	LO	ERA1111C	LO
10	↓	↓	↓	↓	↓	↓	↓	↓
11								
12								
13	1156	Ra226EFF	Ra226	30	1141	LO	ERA1111D	LO
14	↓	↓	↓	↓	↓	↓	↓	↓
15								
16								
1	Alpha	R01 Test	α	10	1117	LO	ABB1111	LO
2	Alpha	R01 Test	α	10	1130	LO	ABB1111A	LO
1	Beta	R01 Test	β	10	1143	LO	ABB1111B	LO
3	Alpha	↓	α	↓	↓	↓	↓	↓
2	Beta	R01 Test	β	10	1200	LO	ABB1111C	LO
4	Alpha	↓	α	↓	↓	↓	↓	↓
3	Beta	↓	↓	↓	1216	LO	ABB1111D	LO
5	Alpha	↓	↓	↓	↓	↓	↓	↓
1	0424028-S1	Outlier	Sr90	10	1308	LO	SRB1111	LO
5	0615044-S1	Outlier	α β LO 11/11/06	10	1310	LO	ABB1111E	↓
9	0614030-S1	Outlier	β	10	1312	LO	ABB1111F	↓
13	0615038-S1	Outlier	Sr89	10	1314	LO	SRB1111A	↓
1	0424028-S2	↓	Sr90	↓	1450	LO	SRB1111B	LO
5	0615044-S2	↓	α	↓	1451	↓	ABB1111G	↓
9	0614030-S2	↓	β	↓	1452	↓	ABB1111H	↓
13	0615038-S2	↓	Sr89	↓	1453	↓	SRB1111C	↓
1	0424028-S3	↓	Sr90	↓	1511	LO	SRB1111D	LO
5	0615044-S3	↓	α	↓	↓	↓	ABB1111I	↓
9	0614030-S3	↓	β	↓	1512	↓	ABB1111J	↓
13	0615038-S3	↓	Sr89	↓	↓	↓	SRB1111E	↓
1	0424028-S4	↓	Sr90	↓	1527	↓	SRB1111F	LO
5	0615044-S4	↓	α	↓	↓	↓	ABB1111K	↓
9	0614030-S4	↓	β	↓	1528	↓	ABB1111L	↓
13	0615038-S4	↓	Sr89	↓	↓	↓	SRB1111G	↓
1	0424028-S5	↓	Sr90	↓	1544	↓	SRB1111H	LO
5	0615044-S5	↓	α	↓	↓	↓	ABB1111M	↓
9	0614030-S5	↓	β	↓	1546	↓	ABB1111N	↓
13	0615038-S5	↓	Sr89	↓	↓	↓	SRB1111I	↓
							LO 11/11/06	

Comments:

Page No.: 318142 B

(cont. from page NA B)

Form 780r8.doc (6/23/06)

Reviewed By / Date LO 11/12/06

PROJECT 514.1572.73 Notebook No. _____ 73

Continued From Page _____

Sr-90 Working Standard

1) Transfer a fraction of std 514.1572.72 to a 500 ml poly bottle + dilute wt 0.1M HCl to a final activity concn of approx 25 pCi/ml

a) 500 ml bottle empty 37.9693 g (Bal 12)
" + 1° std 40.5067
Net 1° std transferred 2.5374 g

b) 500 ml bottle empty 37.9693 g from above
bottle + std + 0.1M HCl 542.5 g (Bal 20)
Total diluted mass ~~216.5 g~~ DCB 3/25/99
504.5 g

2) Calculation

$$\frac{(4984.3\ pCi/g)(2.5374\ g)(.9971\ g/ml)}{504.5\ g\ \cancel{216.5\ g}\ 3/25/99} = \cancel{24.50\ p}\ DCB\ 3/25/99$$

$= 25.00\ pCi/ml$ DCB 3/25/99

Ref Date = 3/18/99
Exp Date = 3/23/04

Verified 3/25/99 DCB

RG 12/6/05 Standard reverified & new label added after Z-out. RG 12/13/04

Stnd ID: 514.1572.73 RG 12/13/04

Description: Sr-90
Expiration: 11/29/05
Activity: 55.50 dpm/mL
2s Uncertainty: 1.48 dpm/mL
Ref. Date: 3/18/99
Ref Time: N/A
Prep Date: 3/23/99 Prep by: DCB.
Matrix/Comp. 0.1 M HCl
Half Life (y): 2.88E+01
NCR required for ICPT work

RG 12/13/04

RG 12/13/04

RG 12/6/05

Stnd ID: 514.1572.73

Description: Sr-90
Expiration: 11/4/06
Activity: 55.50 dpm/mL
2s Uncertainty: 1.48 dpm/mL
Ref. Date: 3/18/99
Ref Time: N/A
Prep Date: 3/23/99 Prep by: DCB
Matrix/Comp. 0.1M HCl
Half Life (y): 2.88E+01

RG 12/6/05

RG 12/6/05

RG 12/6/05

12/13/04

Continued on Page

Read and Understood By

[signature] 3/23/99

PROJECT 514.1572.72

Notebook No. _____

Continued From Page _____

S-90 Primary Standard

1) Transfer RSO#514 (Analytics 57370-307) to a a 250 ml poly bottle + dilute to final conc of approx 5000 pCi/ml w/ 0.1 M HCl.

a) Ampule, full w/ beaker 36.5911 g (Bal 12)
Ampule, empty w/ beaker 31.7310
Net std. transferred 4.8601 g

b) 250 ml poly, empty 26.4116 g (Bal 12)
bottle w/ std, 0.1 M HCl 223.6 g (Bal 16)
Total diluted std mass 197.2 g

2) Density of 0.1 M HCl using 100 ml class A flask

997100 g / 100 ml = .9971 g/ml.

3) Calculations

orig. std: $\left(\frac{3.757\,E4\ dps}{5.02081\ g}\right)\left(\frac{60\ s/m}{2.22\ dpm/pCi}\right) = 202,239.4$ pCi/g

[illegible]

ANALYTICS

PAL 514
rcd 3-23-99

1380 Seaboard Industrial Blvd.
Atlanta, Georgia 30318 · U.S.A.
Phone (404) 352-8677
Fax (404) 352-2837

CERTIFICATE OF CALIBRATION

Standard Radionuclide Source

57370-307

Sr-90 5 mL Liquid in Flame Sealed Vial

This standard radionuclide source was prepared gravimetrically from a calibrated master liquid radionuclide solution source. The master source was calibrated by liquid scintillation counting.

ANALYTICS maintains traceability to the National Institute of Standards and Technology through Measurements Assurance Programs as described in USNRC Reg. Guide 4.15, Revision 1.

Radionuclide purity and calibration were checked by germanium gamma-ray spectrometry and liquid scintillation counting. The nuclear decay rate and assay date for this source are given below.

ISOTOPE:	Sr-90
ACTIVITY (dps):	3.757 E+04
HALF-LIFE:	28.74 years
CALIBRATION DATE:	March 18, 1999 12:00 EST
TOTAL UNCERTAINTY:	4.0%
SYSTEMATIC:	3.5%
RANDOM:	0.5%

5.02081 grams of solution 30 ppm Sr carrier in 0.1M HCl.

P O NUMBER 22170, Item 2

SOURCE PREPARED BY: _____ for
M. D. Currie, Radiochemist

Q A APPROVED: _____ 3-18-99

ICVs, ICBs

Sr-90 Calculatons

Det	Sample ID	Sample D & T	Sep. D & T	Count D & T	Ct Dur	Init Vol (L)	Calc Vol (L)	Gross CPM	BKG CPM	Net CPM	Efficiency	Yield	Decay	ngrowth	k	Act pCi/L	1 sig CU	1 sig TPU	2 sig TPU	MDC	LCS Recov
A1	0714506-B1MB	2/20/2007 12:00	2/22/2007 15:07	9/27/2007 15:49	30	1	0.9801049	2.000	2.120	-0.120	0.4075	0.943	0.8817597	2	1.4742	-0.08	0.18	0.18	0.36	0.90	
A4	0714506-B3MB	2/20/2007 12:00	2/22/2007 15:07	9/27/2007 15:49	30	1	0.9801049	1.900	1.995	-0.095	0.4045	0.924	0.8817597	2	1.4334	-0.07	0.18	0.18	0.36	0.90	
B2	0714506-B1MB	2/20/2007 12:00	2/22/2007 15:07	9/27/2007 16:24	30	1	0.9801049	1.533	2.167	-0.634	0.3946	0.943	0.8817597	2	1.4275	-0.44	0.16	0.17	0.34	0.94	
B3	0714506-B2MB	2/20/2007 12:00	2/22/2007 15:07	9/27/2007 15:49	30	1	0.9801049	2.033	2.157	-0.124	0.4249	0.955	0.8817597	2	1.5574	-0.08	0.17	0.17	0.34	0.86	
A2	0714506-S1LCS	2/20/2007 12:00	2/22/2007 15:07	9/27/2007 15:49	30	1	0.9801049	16.500	1.898	14.602	0.4060	0.943	0.8817597	2	1.4695	9.94	0.51	1.27	2.55	0.86	98.5%
A3	0714506-S2LCS	2/20/2007 12:00	2/22/2007 15:07	9/27/2007 15:49	30	1	0.9801049	18.100	2.164	15.936	0.4077	0.913	0.8817597	2	1.4275	11.16	0.55	1.42	2.84	0.94	110.7%
B4	0714506-S3LCS	2/20/2007 12:00	2/22/2007 15:07	9/27/2007 15:49	30	1	0.9801049	17.467	1.692	15.775	0.4173	0.969	0.8817597	2	1.5522	10.16	0.49	1.29	2.58	0.77	100.7%

Sample ID	Spike Soln	Ref Date	Sr-90 Activity DPM/mL	Sr-90 Spike Vol mL	Sr-90 Act pCi/L Added
0714506-S1LCS	800.3020.50	12/1/2001	49.78	0.5	10.088
0714506-S2LCS			49.78	0.5	10.088
0714506-S3LCS			49.78	0.5	10.088

Ave Recovery = 103.3%

r:\inst\gfp\calibration\outliers and icvs\sr90sept07

0714506-SILCS Det A2

Final Al:

$$1000\,ml\left(\frac{10-0.1}{10}\right)\left(\frac{1000.5-10}{1000.5}\right) = \boxed{980.1049\,ml}$$

vs 980.1 ml = 100%

% Yield

$[ICP]_i = 1.0108\,ug/ml$ dilution $\left(\frac{10}{10}\right)$ Vol = ~~1000~~ 1001 ml

$$1.0108\,\frac{ug}{ml}\left(\frac{10}{10}\right)(1001\,ml) = 1011.8108\,ug\left(\frac{10-0.1}{10}\right) = \boxed{1001.6927\,ug}$$

vs 1001.703 ug = 99.99%

$[ICP]_{Ref} = 1.0076\,ug/ml$ dilution $\left(\frac{10}{10}\right)$ Vol = 1000.5 ml

$$1.0076\,\frac{ug}{ml}\left(\frac{10}{10}\right)(1000.5\,ml) = 1008.1038\,ug\left(\frac{10-0.1}{10}\right) = \boxed{998.0228\,ug}$$

99.99% = vs 998.0328 ug

$[ICP]_F = 0.9449\,ug/ml$ dilution $\left(\frac{10}{0.1}\right)$ Vol = 10 ml

$$0.9449\,\frac{ug}{ml}\left(\frac{10}{0.1}\right)(10\,ml) = \boxed{944.9\,ug}$$

vs 944.9 ug = 100%

$$\%\,Yield = \frac{944.9\,ug}{\quad} = 0.9433 \times 100 = \boxed{94.33\%}$$

Decay Fx $e^{(-\ln 2.0/28.8\,yrs)t}$

2 | 22 | 07 15:07
−12 | 1 | 01 12:00
10 ~~22~~ 21 6 3:07 (10/1/07)

6.0575 yrs + 0.0004 = 6.0579 yrs

6.0579 yrs − 0.8333 yrs = 5.2246 yrs

$$e^{(-\ln 2/28.8\,yrs)(5.2246\,yrs)} = e^{-0.1257243} = 0.8818$$

Act

$$\frac{16.500\ \text{Gross} - 1.898\ \text{Bkg}}{2.22 \cdot 0.4060 \cdot (1+1) \cdot 0.9433 \cdot 0.8818 \cdot 0.9801049} = k$$

$$\frac{14.602}{1.469607 = k} = \boxed{9.936\ pCi/L}$$

vs 9.94 pCi/L = 100%

CU

$$\frac{\sqrt{\left(\frac{16.500}{30}\right) + \left(\frac{1.898}{1000}\right)}}{1.4696} = \boxed{0.5055}$$

vs 0.51 = 100%

TPU

$$\sqrt{(0.5055)^2 + (0.1033 \cdot 9.936)^2 + (0.0561 \cdot 9.936)^2} = \boxed{1.2727}$$

vs 1.2167 = ~~101.01%~~ 100%
10/1/07 10/1/07

MDC

$$\frac{4.65\sqrt{1.898/30} + 2.71/30}{1.4696} = \boxed{0.8573}$$

vs 0.86 = 100%

% Recovery

$$\frac{9.936}{10.088} = 0.9849 \times 100 = \boxed{98.49\%}$$

vs 98.5% = 100%

Paragon Analytics

Radiochemistry Instrument Worksheet

Prep Batch: SR070220-1

Prep Procedure: SR90

Analytical QASS / NCR? Y (N) NA

Prep Num	LabID	QC Type	Init Alq	Fin Alq	Units	Residual Mass (mg)	Cnt 1 File	Cnt 1 Inst/Det	Cnt 1 Pos. Chk By	Cnt 2 File	Cnt 2 Inst/Det	Cnt 2 Pos Chk By	Cnt 3 File	Cnt 3 Inst/Det	Cnt 3 Pos Chk By	Notes
1	0714506-B1	MB	1000	980.1049	ml		SRA0927	1	W	SRA0927A	6	W				
1	0714506-B2	MB	1000	980.1049	ml			09/27/07								
1	0714506-B3	MB	1000	980.1049	ml			7								
1	0714506-S1	LCS	1000	980.1098	ml			4								
1	0714506-S2	LCS	1000	980.1098	ml			2								
1	0714506-S3	LCS	1000	980.1098	ml			3								
								8								

09/27/07 09/27/07

Tracer/Carrier Solution Information

Soln #	Nuclide	SolnID	Prep Conc	Units	Prep Date	Aliquot	Units	Pipet ID
T1	STRONTIUM	247942	2,004.671	ppm	NA	0.5	ppm	RS004

Spike Solution Information

Soln #	Nuclide	SolnID	Prep Conc	Units	Prep Date	Aliquot	Units	Pipet ID
S1	Sr-90	600.3020.50	43.895	DPM/ml	02/20/07	0.5	ml	RS004

Sample Barcodes

0714506-RC1CAR

0714506-S2LCS

0714506-B2MB

0714506-B3MB

0714506-S3LCS

0714506-S1LCS

0714506-B1MB

Paragon Analytics

Radiochemistry Prep Worksheet

Prep Batch: SR070220-1

Prep Procedure: SR90

Reviewed By: LNT DS **Review Date:** 2/25/2007

Non-Routine Pre-Treatment? Y (N) **Batch:** ND **Re-Prep?** Y (N) **Batch:** NA **Prep QASS / NCR?** Y (N) NA

Prep SOP: PAI 707 **Rev:** 9
Prep SOP: NONE
Matrix Class: liquid

Prep Analyst: Lindsay Tearman
Prep Date: 2/20/2007
Prep Dept: RS

Balance:
Balance:

Samp Num	Prep Num	LabID	QC Type	Dish No.	Init Alq ml	Fin Alq ml	Prep Basis	Column #	Ingrowth Date/Time	Standards	Prep Notes
1	1	0714506-B1	MB		1000	980.1049	Unfiltered	8769	02/22/07 15:07	T1	
2	1	0714506-B2	MB		1000	980.1049	Unfiltered	8770	02/22/07 15:07	T1	
3	1	0714506-B3	MB		1000	980.1049	Unfiltered	8771	02/22/07 15:07	T1	
4	1	0714506-S1	LCS		1000	980.1098	Unfiltered	8772	02/22/07 15:07	T1,S1	
5	1	0714506-S2	LCS		1000	980.1098	Unfiltered	8773	02/22/07 15:07	T1,S1	
6	1	0714506-S3	LCS		1000	980.1098	Unfiltered	8774	02/22/07 15:07	T1,S1	

DS 2/25/07

Spiked By: Lindsay Tearman **Date:** 2/20/2007

Witnessed By: MaryNeal Piazza **Date:** 2/20/2007

Tracer/Carrier Solution Information

Soln #	Nuclide	SolnID	Prep Conc	Units	Prep Date	Aliquot	Units	Pipet ID
T1	STRONTIUM	247942	2,004.671	ppm	NA	0.5	ppm	RS004

Spike Solution Information

Soln #	Nuclide	SolnID	Prep Conc	Units	Prep Date	Aliquot	Units	Pipet ID
S1	Sr-90	600.3020.50	43.895	DPM/ml	02/20/07	0.5	ml	RS004

Comments

Paragon Analytics

Radiochemistry ICP Worksheet

Prep Batch: SR070220-1

Prep Procedure: **SR90**

Reviewed By: LNT

Review Date: 2/25/2007

STRONTIUM Recovery Results

Reference Carrier

LabID	QC Type	Carr Vol	Ref Carr Dil Vol	Ref Carr ICP Alq	Ref Carr ICP Dil Vol	Ref Carr ICP Run	Ref Carr ICP Conc
0714506-RC1	CAR	0.5	1000.5	10	10		1.0076

Samples

Prep Num	LabID	QC Type	Init Samp Alq (ml)	Car Vol (ml)	Samp Dil Vol (ml)	Init ICP Alq (ml)	Init ICP Dil Vol (ml)	Pre-Con Vol (ml)	Post Con Vol (ml)	Pre-Sep Vol (ml)	Post Sep Vol (ml)	Fin ICP Alq (ml)	Fin ICP Dil Vol (ml)	Initial ICP Run	Final ICP Run	Init ICP Conc (ug/ml)	Fin ICP Conc (ug/ml)	Init Samp Mass (ug)	Ref Mass (ug)	Flag	Fin Samp Mass (ug)	% Yield	Final Sample Alq
1	0714506-B1	MB	1000	0.5	1000.5	10	10	990.5	990.5	990.5	10	0.1	10			1.0101	0.9433	1000.504	998.0278		943.3	94.28%	980.1
1	0714506-B2	MB	1000	0.5	1000.5	10	10	990.5	990.5	990.5	10	0.1	10			1.0098	0.9554	1000.207	998.0278		955.4	95.52%	980.1
1	0714506-B3	MB	1000	0.5	1000.5	10	10	990.5	990.5	990.5	10	0.1	10			1.0211	0.934	1011.4	998.0278		934	92.35%	980.1
1	0714506-S1	LCS	1000	0.5	1001	10	10	991	991	991	10	0.1	10			1.0108	0.9449	1001.703	998.0328		944.9	94.33%	980.1
1	0714506-S2	LCS	1000	0.5	1001	10	10	991	991	991	10	0.1	10			1.0199	0.9223	1010.721	998.0328		922.2999	91.25%	980.1
1	0714506-S3	LCS	1000	0.5	1001	10	10	991	991	991	10	0.1	10			1.0085	0.9688	999.4235	998.0328		968.8	96.94%	980.1

LNT 2/25/07

Paragon Analytics
LIMS Version: 5.482A

FLAG - LB: low blas (<= 15%) 15%: low blas (>15%)
Z: Negative init. conc. treated as zer

Supersedes: _____

Paragon Analytics

Radiochemistry Prep Worksheet

Prep Batch: SR070220-1

Prep Procedure: SR90

Prep Batch Not Validated!!!

Reviewed By:

Review Date:

Non-Routine Pre-Treatment? Y / N Batch: _____ Re-Prep? Y / N Batch: _____ Prep QASS / NCR? Y / N _____

Prep SOP: PAI 707 Rev: 9
Prep SOP: NONE
Matrix Class: liquid

Prep Analyst: Lindsay Tearman LS
Prep Date: 2/20/2007
Prep Dept: RS

Balance:
Balance:

Samp Num	Prep Num	LabID	QC Type	Dish No.	Init Alq ml	Fin Alq ml	Prep Basis	Column #	Ingrowth Date/Time	Standards	Prep Notes
1	1	0714506-B1	MB		1000	980.1049	Unfiltered	8769	2/22/07 3:07PM	T1	
2	1	0714506-B2	MB		1000	980.1049	Unfiltered	8770		T1	
3	1	0714506-B3	MB		1000	980.1049	Unfiltered	8771		T1	
4	1	0714506-S1	LCS		1000	980.1098	Unfiltered	8772		T1,S1	
5	1	0714506-S2	LCS		1000	980.1098	Unfiltered	8773		T1,S1	
6	1	0714506-S3	LCS		1000	980.1098	Unfiltered	8774		T1,S1	

Spiked By: Lindsay Tearman LS Date: 2/20/2007 2/20/07

Witnessed By: MAP Date: 2-20-07

Tracer/Carrier Solution Information

Soln #	Nuclide	SolnID	Prep Conc	Units	Prep Date	Aliquot	Units	Pipet ID
T1	STRONTIUM	247942	2,004.671	ppm	NA	0.5	ppm	RS004

ex: 5/8/07

Spike Solution Information

Soln #	Nuclide	SolnID	Prep Conc	Units	Prep Date	Aliquot	Units	Pipet ID
S1	Sr-90	600.3020.50	43.895	DPM/ml	02/20/07	0.5	ml	RS004

ex: 11/8/07

DRAFT

Comments

ple Id1	Ba	Sr	Y	Fe	Ni
02098-16	0.2005	0.0682	0.0013	5.9108	2.1681
02098-16	0.0010	-0.0002	-0.0063	0.0475	1.7754
02098-17	0.2501	0.0601	0.0016	7.0286	2.1849
02098-17	0.0009	-0.0003	-0.0065	0.0129	1.7377
02098-18	0.2474	0.0565	0.0015	6.6862	2.1583
02098-18	0.0010	-0.0002	-0.0068	0.0263	1.7442
02098-19	0.1724	0.0898	0.0017	6.3755	2.1823
02098-19	0.0009	-0.0002	-0.0066	0.0379	1.7561
	0.4939	0.4973	10.0338	21.1606	0.5094
	0.0002	0.0002	0.0042	0.0138	0.0013
070220-1MB	0.0008	-0.0003	-0.0058	-0.0249	2.2212
070220-1MB	0.0008	-0.0002	-0.0059	0.0056	1.7668
070220-1LCS	0.0007	-0.0003	-0.0064	-0.0285	2.1777
070220-1LCS	0.0009	-0.0002	-0.0063	0.0082	1.7655
0220-1RC	0.0008	-0.0003	-0.0064	-0.0137	2.1945
02062-9	0.0085	0.1026	-0.0065	-0.0024	0.0071
02062-9	0.0664	0.0010	-0.0067	-0.0012	0.0217
02062-10	0.0051	1.0559	-0.0068	-0.0104	0.0327
02062-10	0.0660	0.0064	-0.0068	-0.0118	0.0205
02062-11	0.0079	0.5344	-0.0067	-0.0112	0.0063
	0.4952	0.4982	10.0979	21.3844	0.5189
	0.0004	0.0003	0.0047	0.0143	0.0017
02062-11	0.0640	0.0030	-0.0059	0.0134	0.0206
02062-12	0.0095	0.3182	-0.0061	-0.0096	0.0059
02062-12	0.0640	0.0040	-0.0064	0.0103	0.0211
02062-13	0.0084	0.0326	-0.0064	0.2255	0.0061
02062-13	0.0633	0.0001	-0.0066	0.0038	0.0208
02062-14	0.0040	0.1264	-0.0066	0.0348	0.0052
02062-14	0.0642	0.0007	-0.0067	-0.0037	0.0208
02062-15	0.0350	3.6667	-0.0068	-0.0222	0.0046
02062-15	0.0673	0.0482	-0.0067	0.0092	0.0213
02062-15D	0.0352	3.6486	-0.0066	0.0008	0.0054
	0.4927	0.4942	10.0482	21.3325	0.5141
	0.0003	0.0008	0.0050	0.0243	0.0009
02062-15D	0.0653	0.0470	-0.0058	0.0187	0.0212
070222-1MB	0.0000	0.0002	-0.0062	0.0050	0.0045
070222-1MB	0.0627	0.0000	-0.0064	0.0091	0.0209
070222-1LCS	0.0001	-0.0001	-0.0064	-0.0154	0.0101
070222-1LCS	0.0642	-0.0002	-0.0066	-0.0010	0.0211
0222-1RC	1.6304	0.0003	-0.0066	-0.0157	0.0050
14506-B1	0.0014	1.0101	-0.0066	-0.0127	0.0020
14506-B1	0.0008	0.9433	-0.0067	-0.0181	0.0167
14506-B2	0.0000	1.0098	-0.0068	-0.0277	0.0021
14506-B2	0.0007	0.9554	-0.0067	-0.0158	0.0173

Sample Id1	Ba	Sr	Y	Fe	Ni
CCV	0.5036	0.5033	10.0724	20.9468	0.5057
CCB	0.0004	0.0010	0.0073	0.0085	0.0009
I 0714506-B3	-0.0002	1.0211	-0.0060	-0.0212	0.0016
F 0714506-B3	0.0007	0.9340	-0.0062	0.0175	0.0177
I 0714506-S1	-0.0001	1.0108	-0.0063	-0.0169	0.0039
F 0714506-S1	0.0007	0.9449	-0.0064	0.0130	0.0174
I 0714506-S2	-0.0002	1.0199	-0.0067	-0.0263	0.0026
F 0714506-S2	0.0006	0.9223	-0.0066	-0.0059	0.0173
I 0714506-S3	-0.0002	1.0085	-0.0066	-0.0106	0.0023
F 0714506-S3	0.0007	0.9688	-0.0065	0.0073	0.0183
0714506-RC	-0.0002	1.0076	-0.0068	-0.0065	0.0021
I 0702061-1	0.0075	0.0605	-0.0066	0.0078	0.0055
CCV	0.4947	0.4941	10.0385	21.1385	0.5077
CCB	0.0000	0.0005	0.0010	0.0109	-0.0004
F 0702061-1	0.0646	0.0005	-0.0057	0.0131	0.0281
I RE070222-1MB	0.0000	-0.0003	-0.0062	-0.0115	0.0052
F RE070222-1MB	0.0655	-0.0002	-0.0064	-0.0020	0.0204
I RE070222-1LCS	0.0000	-0.0003	-0.0064	-0.0037	0.0049
F RE070222-1LCS	0.0677	-0.0002	-0.0066	0.0115	0.0208
I RE070222-1LCSD	-0.0001	-0.0004	-0.0066	-0.0192	0.0048
F RE070222-1LCSD	0.0641	-0.0003	-0.0068	0.0022	0.0202
RE070222-1RC	1.6003	0.0000	-0.0066	-0.0034	0.0052
CCV	0.4948	0.4965	10.0858	21.2778	0.5112
CCB	0.0002	0.0004	0.0024	0.0168	0.0004
I 0702139-1	0.1697	1.0447	0.0304	7.8570	0.0260
F 0702139-1	0.0012	0.9955	-0.0066	0.0183	0.0213
I 0702139-1D	0.1706	1.0463	0.0296	7.9080	0.0256
F 0702139-1D	0.0013	0.9756	-0.0065	0.0189	0.0209
I 0702139-2	0.0354	0.9905	-0.0054	1.9375	0.0193
F 0702139-2	0.0009	0.9455	-0.0067	0.0133	0.0205
I SR070222-1MB	0.0006	0.9989	-0.0067	0.0021	0.0166
F SR070222-1MB	0.0008	0.9774	-0.0067	0.0066	0.0207
I SR070222-1LCS	0.0007	1.0168	-0.0067	0.0099	0.0166
F SR070222-1LCS	0.0007	0.9703	-0.0068	-0.0046	0.0200
CCV	0.4946	0.4932	10.0065	21.0050	0.5048
CCB	0.0001	0.0006	0.0025	0.0129	0.0007
SR070222-1RC	0.0008	1.0146	-0.0059	0.0058	0.0175
CCV	0.4964	0.4964	10.0640	21.2203	0.5090
CCB	0.0003	0.0007	0.0043	0.0150	0.0007

PAI - Gas Flow Proportional Sample Analysis LB4100-A

Unit Type: LB4100-A/W
Counting Unit ID: Orange
High Voltage Mode: Simultaneous
Application Revision: C
Application Version: PA
Rev.12/29/03 JE

Data file name: SRA0927
Batch ID: SR90 ICV
Count Preset (m): 30
Batch Ended: 9/27/07 16:19

Background logfile: BKGAB
Date of Bkg. Cal: 9/27/07
Alpha efficiency logfile: Am241-09/07
Alpha attenuation calibration: Am0306
Beta efficiency logfile: Sr90F-09/07
Beta attenuation calibration: Sr-90-06/07

Alpha prog. logfile: n/a
Alpha prog. attenuation: n/a
Beta prog. logfile: n/a
Beta prog. attenuation: n/a

Alpha Attenuation Calibration y = b*m^[a*(mass-x0)]		Beta Attenuation Calibration y = b*m^[a*(mass-x0)]	
Alpha b=	1.02260	Beta b=	1.0199
m=	0.04860	m=	0.9998
a=	0.1293	a=	1.0000
x0=	0.0000	x0=	0.0000
Alpha to Beta X-talk y = b*m^-x		**Beta to Alpha X-talk y = b*mass + m**	
a ->b xtalk b=	0.2398	b ->a xtalk b=	6.713E-07
a ->b xtalk m=	1.0082	b ->a xtalk m=	0.0012

Det. ID	Sample ID	Count End Date & Time	Count Dur. (min)	Resid. Mass (mg)	Alpha Activity Gross CPM	Alpha Bkg. CPM	Alpha b>a xtlk CPM	Alpha Base Eff	Alpha Base Cor.Fact.	Alpha Progeny Eff	Alpha Progeny Cor.Fact.	Beta Activity Gross CPM	Beta Bkg. CPM	Beta a>b xtlk CPM	Beta Base Eff	Beta Base Cor.Fact.	Beta Progeny Eff	Beta Progeny Cor.Fact.
A1	0714506-B1MB	9/27/07 16:19	30.00	0.0	0.033	0.043	0.002	0.2178	1.023	n/a	n/a	2.000	2.120	0.0080	0.4075	1.020	n/a	n/a
A2	0714506-S1LCS	9/27/07 16:19	30.00	0.0	0.067	0.035	0.020	0.2422	1.023	n/a	n/a	16.500	1.898	0.0160	0.4060	1.020	n/a	n/a
A3	0714506-S2LCS	9/27/07 16:19	30.00	0.0	0.133	0.045	0.022	0.2320	1.023	n/a	n/a	18.100	2.164	0.0320	0.4077	1.020	n/a	n/a
A4	0714506-B3MB	9/27/07 16:19	30.00	0.0	0.000	0.047	0.002	0.2265	1.023	n/a	n/a	1.900	1.995	0.0000	0.4045	1.020	n/a	n/a
B3	0714506-B2MB	9/27/07 16:19	30.00	0.0	0.000	0.058	0.002	0.2385	1.023	n/a	n/a	2.033	2.157	0.0000	0.4249	1.020	n/a	n/a
B4	0714506-S3LCS	9/27/07 16:19	30.00	0.0	0.000	0.054	0.021	0.2315	1.023	n/a	n/a	17.467	1.892	0.0000	0.4173	1.020	n/a	n/a

W
9/27/07

PAI - Gas Flow Proportional Sample Analysis LB4100-A

Unit Type: LB4100-A/W
Counting Unit ID: Orange
High Voltage Mode: Simultaneous
Application Revision: C
Application Version: PA
Rev.12/29/93 JE

Data file name: SRA0927A
Batch ID: SR90 ICB
Count Preset (m): 30
Batch Ended: 9/27/07 16:54

Background logfile: BKGAB
Date of Bkg. Cal: 9/27/07
Alpha efficiency logfile: Am241-09/07
Alpha attenuation calibration: Am0306
Beta efficiency logfile: Sr90F-09/07
Beta attenuation calibration: Sr-90-06/07

Alpha prog. logfile: n/a
Alpha prog. attenuation: n/a
Beta prog. logfile: n/a
Beta prog. attenuation: n/a

Alpha Attenuation Calibration y = b*m^(a*(mass-x0))		Beta Attenuation Calibration y = b*m^(a*(mass-x0))	
Alpha b=	1.02290	Beta b=	1.0199
m=	0.94950	m=	0.9998
a=	0.1293	a=	1.0000
x0=	0.0040	x0=	0.0000
Alpha to Beta X-talk y = b*m^-x		Beta to Alpha X-talk y = b*mass + m	
a ->b xtalk b=	0.2388	b ->a xtalk b=	8.7136E-07
a ->b xtalk m=	1.0002	b ->a xtalk m=	0.0012

Det. ID	Sample ID	Count End Date & Time	Count Dur. (min)	Resid. Mass (mg)	Alpha Activity Gross CPM	Alpha Bkg. CPM	Alpha b>a xtlk CPM	Alpha Base Eff	Alpha Base Cor.Fact.	Alpha Progeny Eff	Alpha Progeny Cor.Fact.	Beta Activity Gross CPM	Beta Bkg. CPM	Beta a>b xtlk CPM	Beta Base Eff	Beta Base Cor.Fact.	Beta Progeny Eff	Beta Progeny Cor.Fact.
B2	0714506-B1MB	9/27/07 16:54	30.00	0.0	0.087	0.039	0.002	0.2484	1.023	n/a	n/a	1.533	5.871	0.0160	0.3946	1.020	n/a	n/a

99

W 9/27/07

Date 9/27/07

SOP 724r 10

Paragon Analytics

Low Background Gas Flow Proportional Counter Log

Instrument: LB4100A

Instrument Daily Response and Background Checks

Det.	Daily Response Check Start 1	Status	Start 2	Status	Background Check Start 1	Status	Start 2	Status	Det. Status
1	WO	☆			WO	P			P
2	↓	↓			↓	↓			↓
3									
4									
5						HB			OLBW
6						LB			↓
7						P			P
8	↓	↓			↓	↓			↓
9	OL	OL			OL	OL			OL
10	↓	↓			↓	↓			↓
11									
12									
13									
14									
15									
16	↓	↓			↓	↓			↓

Det = Detector; α = Alpha; β = Beta; P = Pass; H = High; L = Low; OL = Offline; R = Recount; W = Weekly; NP = Not Processed

Weekly Background Calibration

	Current Calib. File ID	Weekly Calib. Started	Status	File ID
Dr A	BKA 092LOW			
Dr B	↓			
Dr C	OL			
Dr D	↓			

Dr = Drawer

Gas Supply

P-10 Supply		P-10 Flow	
Tank 1	800	Dr A	0.15
	↓	Dr B	↓
Tank 2	1400	Dr C	
	↓	Dr D	↓

Comments: ☆ Pass fail flags do not count due to ~~interim~~ Historical limits being set. WO 9/27/07 WO 9/27/07

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Form 780r8.doc (6/23/06)

Reviewed By / Date WO 9/28/07

Date 9/27/07

SOP 724r 10

Paragon Analytics

Low Background Gas Flow Proportional Counter Log

Instrument: LB4100A

Det.	Sample ID	Batch	Test	Count Dur. (min)	Start Time	Analyst Initials	File ID	Output Initials
1-8	1130	Daily EFF	–	30	947	LO	EFA0927	LO
1-8	Daily BKG	–	–	60	1021	LO	BKA0927	LO
1	1171	Am Wipe EFF	α	30	1140	LO	EAW0927	LO
2					1147		A	
3					1154		B	
4					1201		C	
5					1506		D	LO
6					1512		E	
7					1519		F	
8					1532		G	
1	1172	Sr Wipe EFF	β		1219		ESW0927	LO
2					1215		A	
3					1211		B	
4					1208		C	
5					1154		D	LO
6					1151		E	
7					1146		F	
8					1140		G	
1-4	1173	Sr89 EFF	β	~~30~~ 60	1349	LO	ESE0927A	LO
5-8					1468		B	

LO 9/27/07

histry Solution Report

ID: 247942	Name: Strontium Carrier+1<2>			Type: IR	
	Lot: multiple	Vendor Name: multiple			

Vol:	1000	Dept:	RS	Prep By	ALB	on	5/8/2006	Reviewed By	JRK	on	5/10/2006
nits:	mL	Location:	SR/RA	Opened By		on		Verified By		on	
trix:	LIQUID	ExpireDate:	5/8/2007	Received By		on		Deactivated By		on	

ent:

Component Name	Component ID	Volume Added	Units
Strontium Stable Carrier Source	ST050517-5	4.8422	g

Constituent Name	Conc of Primary Soln	FinalConc	Summed Conc	Units
TRONTIUM	414000	2004.671		ppm

d Parent IDs

517-5

Not Calculated for reagents when the volume added is not entered.
Not Entered

50
PROJECT 600.3020.50 ^{90}Sr Notebook No. 3020
Continued From Page

Prepare a working level dilution of 600.2613.30 at ~50 dpm/mL.

Balance

① Determine density of 0.1N HCl
Mass of 100mL vol flask: 68.5659 g — 12
Lot# 061842 Mass of flask + 100mL 0.1N HCl: 168.4196 g
Mass of 100mL 0.1N HCl: 99.8537 g
$\rho = 0.9985$ g/mL

② Transfer standard to 1L Nalgene
Mass of bottle w/o lid: 74.7716 g — 12
Mass of bottle + standard: 77.0681 g
Net mass of standard: 2.2965 g

③ Dilute to 1L w/ 0.1N HCl
Mass of bottle + standard + 0.1N HCl: 1101.1 g — 726
Mass of bottle (from above): 74.7716 g
Net mass of standard: 1026.3284 g

④ Final Activity Calculation

$$\frac{(\cancel{22390.97}\ 22,279.91\ \text{dpm/g})(2.2965\ \text{g})(0.9985\ \text{g/mL})}{1026.3284\ \text{g}} = \boxed{\cancel{50.03}\ \text{dpm/mL}}$$

RG 12/14/06

RG 12/14/06 $\boxed{49.78\ \text{dpm/mL}}$

Stnd ID: 600.3020.50

Description: Sr-90
Expiration: 11/8/2007
Activity: 49.78 dpm/mL

RG 12/14/06

Reverification Log		
Analysis Date	Initials	Expiration Date

ROJECT 600.2613.30 Sr-90

Notebook No. 2613

Continued From Page

Transfer contents of ampoule 600 to a 125 mL glass bottle for a 1° solution.

1) Transfer ampoule 600 to a 125 mL bottle

mass of open ampoule + std	139.6110 g
mass of empty ampoule	89.5551 g
Net mass of std	50.0559 g

50 2/10/02 Density from following page P= 0.9978 g/mL

Stnd ID: 600.2613.30
Description: Sr-90
Expiration: 2/27/07
Activity: 22341.71 dpm/mL
2s Uncertainty: 744.72 dpm/mL
Ref. Date: 12/1/01
Ref Time: N/A
Prep Date: 12/1/03
Matrix/Comp. 0.1 M HCl
Half Life (y): 2.88E+01
rep by: CRW

600.2613.30
Sr-90
12/28/05
22341.71 dpm/mL
744.72 dpm/mL
12/1/01
N/A
12/1/03
0.1 M HCl
2.88E+01
rep by: CRW
es NCR for ICPT Work

ANALYTICS

1380 Seaboard Industrial Blvd.
Atlanta, Georgia 30318 · U.S.A.

Phone (404) 352-8677
Fax (404) 352-2837

CERTIFICATE OF CALIBRATION

Standard Radionuclide Source

PAI 00600
rec'd 12-05-01

62751-307

Sr-90 50 mL Liquid in Flame Sealed Vial

This standard radionuclide source was prepared gravimetrically from a calibrated master solution. The master solution was calibrated by the Department Des Applications Et De La Metrologie Des Rayonnements Ionisants (DAMRI), Paris, France, as Number 25931.

Radionuclide purity and calibration were checked by germanium gamma-ray spectrometry and liquid scintillation counting. The nuclear decay rate and assay date for this source are given below.

ANALYTICS maintains traceability to the National Institute of Standards and Technology through Measurements Assurance Programs as described in USNRC Reg. Guide 4.15, Revision 1.

ISOTOPE:	Sr-90
ACTIVITY (dps):	1.868 E4
HALF-LIFE:	28.79 years
CALIBRATION DATE:	December 1, 2001 12:00 EST
TOTAL UNCERTAINTY*:	5.0%

*99% Confidence Level

Impurities: γ-impurities <0.1%

50.3054 grams 0.1M HCl solution with 30 μg/g Sr carrier.

P O NUMBER 001703, Item 1

SOURCE PREPARED BY: M Taskaeva

M. Taskaeva, Radiochemist

Instrument: LB4100-B

Calibration: Sr-90 Flat Planchet

Date of Calibration: 7/11/2007 & 11/12/2007

Efficiency Log Files: Sr90F-11/07
Sr90F-07/07

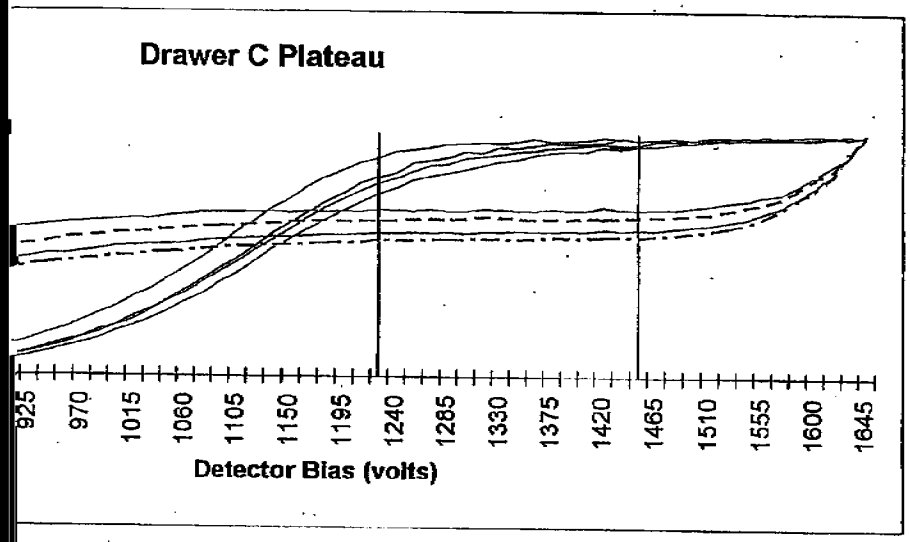
OK
MC
11/23/07

Source ID's: Sr-90 514.1572.73

Instrument Plateaus

0/W
7 10:55
17C
EAU

Unit Id: Aqua
Application Revision: 2
Application Version: Standard



ta simultaneous operating voltage: 1447.5

mum alpha only operating voltage: 1225

	C1	C2	C3	C4
ge	0.11%	0.53%	3.38%	2.91%
ge	-0.98%	2.95%	2.05%	2.37%
ge	1.11%	1.75%	2.27%	2.86%

Printed 5/18/07 9:11 AM

Date 5/17/07

SOP 724r 9

Paragon Analytics
Low Background Gas Flow Proportional Counter Log
Instrument: LB4100B

Instrument Daily Response and Background Checks

Det.	Daily Response Check Start 1	Status	Start 2	Status	Backeround Check Start 1	Status	Start 2	Status	Det. Status
1	JH	P	JH	P	JH	P			P
2						HB	JH	P	
3						P	JH		
4							JH 5/17/07		
5									
6									
7									
8									
9									OL
10		L, LB		L, LB					
11				P					
12				L, LB					
13		P		P					P
14									
15									
16						H α, H β			OL α β

Det = Detector; α = Alpha; β = Beta; P = Pass; H = High; L = Low; OL = Offline; R = Recount; W = Weekly; NP = Not Processed

Weekly Background Calibration

	Current Calib. File ID	Weekly Calib. Started	Status	File ID
Dr A	BKG05 11.W			
Dr B				
Dr C				
Dr D				

Dr = Drawer

Gas Supply

P-10 Supply		P-10 Flow	
Tank 1	1400	Dr A	0.15
		Dr B	
Tank 2	2000	Dr C	
		Dr D	

Comments:

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Form 780r8.doc (6/23/06)

Reviewed By / Date JH 5/18/07

Date 5/17/07 SOP 724r 9

Paragon Analytics
Low Background Gas Flow Proportional Counter Log
Instrument: LB4100B

Det.	Sample ID	Batch	Test	Count Dur. (min)	Start Time	Analyst Initials	File ID	Output Initials
1-16	Daily Eff	—	—	30	809	JH	EFB0517	JH
1-16	Daily BKG	—	—	60	820	JH	BKB0517	JH
2	Daily BKG	—	—	60	928	JH	BKB0517R	JH
1-16	Daily Eff	—	—	30	1037	JH	EFB0517R	JH
9-12	α β	Plateau	—	5 step	1055	JH	PTB0517C	JH
1	0705016-1	RA070510-1	Ra228	256	1301	LD	RAB0517	LD
2	-2							
3	-3							
4	0705037-1							
13	-2							
14	-3							
15	RA070510-1MB							
5	-1LCS	RA070510-1	Ra228	LD	1304	LD	RAB0517A	JH
6	-1LCSD							
5	0705065-2	AB070515-1	α β	1000	1530	JH	ABB0517	JH
6	-2D							
7	-3							
8	-4							
1	0705043-2	AB070515-2	α β	450	1719	LD	ABB0517A	JH
2	AB070515-2MB							
3	0705056165-1	AB070515-1	α β	1050	1721	LD	ABB0517B	JH
4	-7			400	1722		ABB0517C	JH
13	0705074-5							
14	0705065-5			880	1724		ABB0517D	JH
15	-6							

LD 5/17/07

JH 5/18/07

Comments:

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(cont. from page NA B)

Form 780r8.doc (6/23/06)

Reviewed By / Date JH 5/18/07

5/17/07 Drawer C Calibration

Plateaus for Drawer C

Source β used:		Detector	Source α used:
Sr/Y 90	- 406	C1	410 - Am 241
29,600 dpm	- 407	C2	411 - 17,800 dpm
9/15/02	- 408	C3	412 - 2/04/95
↓	- 409	C4	413 - ↓

Parameters:

Start Voltage: 700
Ending Voltage: 1650
30 Volts/step
5 min/step
40,000 Count preset

Filename:

PTB0516C

5/17/07 A working voltage could not be found. A plateau will be run again using the same sources but different parameters.

Parameters:

Start voltage: 700
Ending Voltage: 1650
15 Volts/step
5 min/step
60,000 Count preset

Filename:

PTB0517C

Continued on Page

Read and Understood By

Signed	Date	Signed	Date
[signature]	5/17/07	[signature]	7/12/07

7/10/07 JH ROI's set for drawer C using Sr/Y 90 planchets from plateaus.

7/11/07 JH Sample Pucks and carriers were cleaned with Radiac Wash on 7/10/07, for drawer C. The drawer was then wiped out with methanol.

7/11/07 JH New "daily efficiency" Interim control limits ~~Lo~~ JH 7/11/07 for drawer C will be set using files EFB0709A, EFB0710A and EFB0712. Historical control limits will be JH 7/11/07 set after 30 data points are collected.

AM241 Wipe Calibration (Drawer C)

7/11/07 JH

Source: #746 Source ID: 1166 Logfile: AmWipe-07/07

JH 7/11/07
Filenames: EAW0711 → C

* Alpha to beta crosstalk was calculated for each detector using the following equation:

$$\frac{\text{counts in beta channel}}{\text{counts in alpha channel}}$$

Sr90 Wipe Calibration (Drawer C)

Source: #602 Source ID: 1167 Logfile: SrWipe-07/07

Filenames: ESW0711 → C

* Beta to alpha crosstalk was calculated for each detector using the following equation:

$$\frac{\text{counts in alpha channel}}{\text{counts in beta channel}}$$

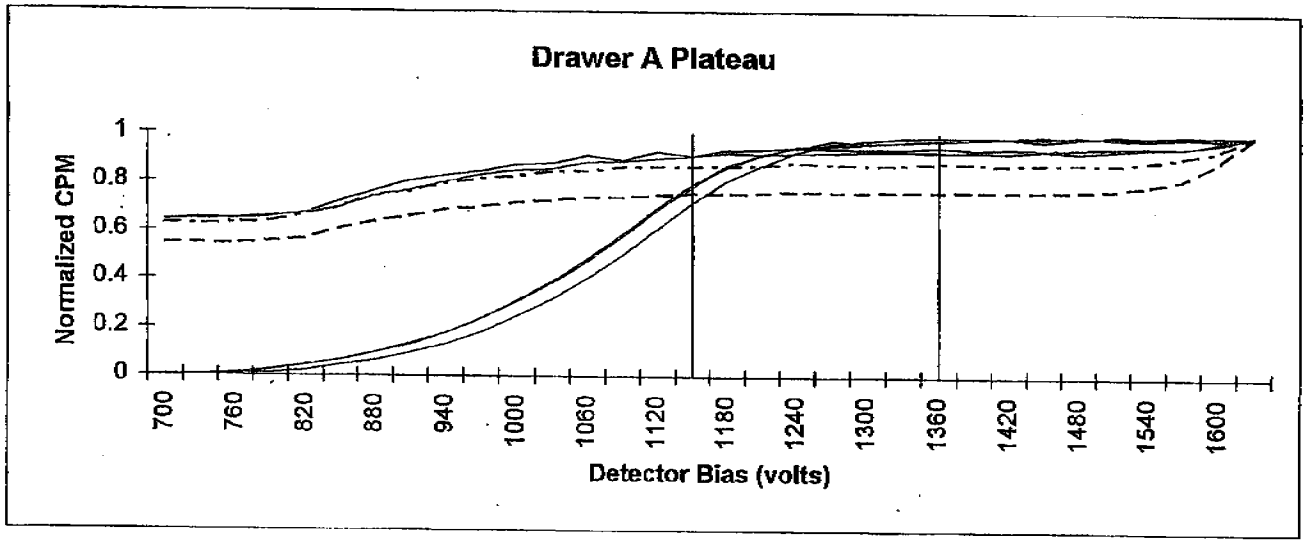
Continued on Page

Read and Understood By

Signed	Date	Signed	Date
[illegible]	7/11/07	[illegible]	7/12/07

Unit Type: LB4100/W
Date Performed: 11/6/07 10:11
FileName: PTB1106A
Batch ID: PLATEAU

Unit Id: Aqua
Application Revision: 2
Application Version: Standard



Optimum alpha beta simultaneous operating voltage: 1357.5

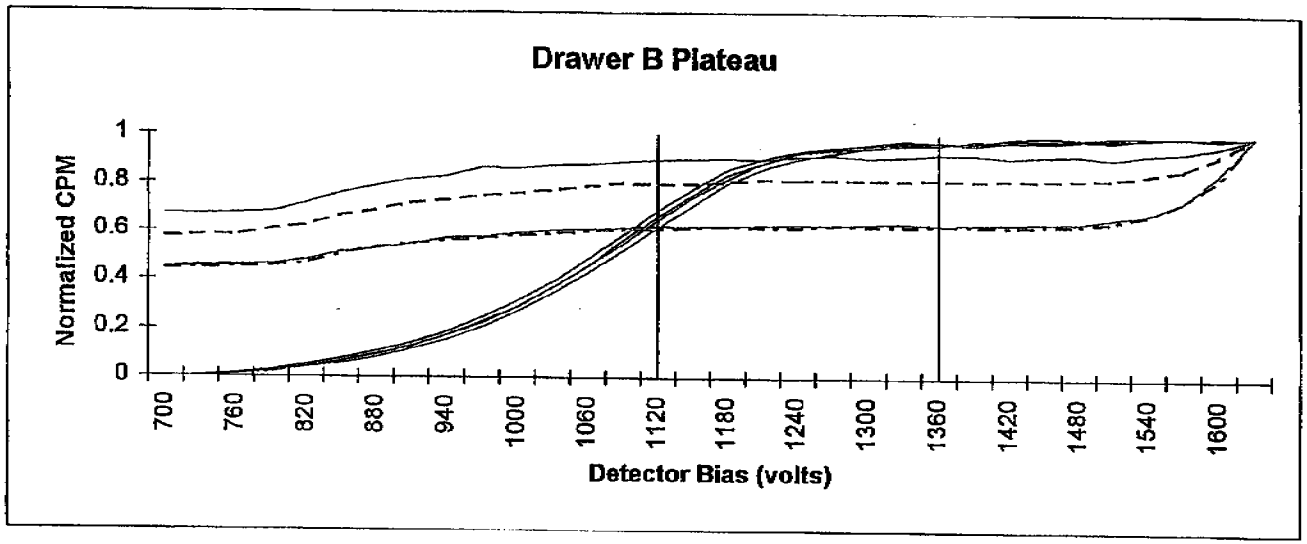
Optimum alpha only operating voltage: 1150

	A1	A2	A3	A4
Beta slope at beta voltage	2.43%	1.21%	1.72%	0.92%
Alpha slope at beta voltage	-0.31%	0.57%	0.24%	0.47%
Alpha slope at alpha voltage	2.90%	1.98%	3.45%	0.50%

Printed 11/6/07 5:40 PM

Unit Type: LB4100/W
Date Performed: 11/6/07 10:11
FileName: PTB1106B
Batch ID: PLATEAU

Unit Id: Aqua
Application Revision: 2
Application Version: Standard



Optimum alpha beta simultaneous operating voltage: 1357.5

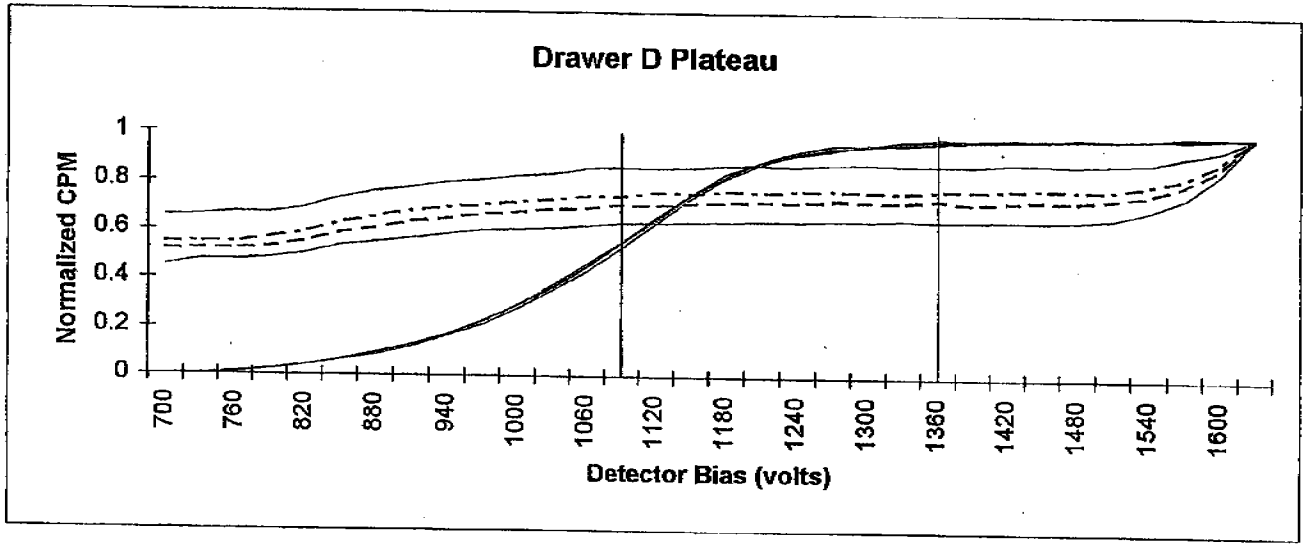
Optimum alpha only operating voltage: 1120

	B1	B2	B3	B4
Beta slope at beta voltage	1.59%	1.87%	2.27%	2.56%
Alpha slope at beta voltage	0.61%	-0.09%	0.13%	0.17%
Alpha slope at alpha voltage	2.65%	1.46%	2.06%	3.21%

Printed 11/6/07 5:40 PM

Unit Type: LB4100/W
Date Performed: 11/7/07 09:36
FileName: PTB1107D
Batch ID: PLATEAU

Unit Id: Aqua
Application Revision: 2
Application Version: Standard



Optimum alpha beta simultaneous operating voltage: 1357.5

Optimum alpha only operating voltage: 1090

	D1	D2	D3	D4
Beta slope at beta voltage	2.11%	3.05%	2.40%	1.91%
Alpha slope at beta voltage	0.44%	0.03%	0.31%	1.23%
Alpha slope at alpha voltage	3.50%	3.30%	2.16%	3.43%

Printed 11/8/07 9:50 AM

Date 11/6/07 SOP 724r 10

Paragon Analytics
Low Background Gas Flow Proportional Counter Log
Instrument: LB4100B

Instrument Daily Response and Background Checks

Det.	Daily Response Check Start 1	Status	Start 2	Status	Background Check Start 1	Status	Start 2	Status	Det. Status
1	JH	P			JH	P			P
2									
3									
4									
5									OLBW
6									P
7									
8									
9									
10		LB	JH	P					
11		P							
12									OLBW
13									P
14									
15									
16									

Det = Detector; α = Alpha; β = Beta; P = Pass; H = High; L = Low; OL = Offline; R = Recount; W = Weekly; NP = Not Processed

Weekly Background Calibration

	Current Calib. File ID	Weekly Calib. Started	Status	File ID
Dr A	BKB1102W ~~+03W~~	JH 11/6/07		
Dr B	+03W			
Dr C				
Dr D				

Dr = Drawer

Gas Supply

P-10 Supply		P-10 Flow	
Tank 1	1000	Dr A	0.15
		Dr B	
Tank 2	700	Dr C	
		Dr D	

Comments:

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Date 11/6/07

SOP 724r 16

Paragon Analytics

Low Background Gas Flow Proportional Counter Log

Instrument: LB4100B

Det.	Sample ID	Batch	Test	Count Dur. (min)	Start Time	Analyst Initials	File ID	Output Initials

Date 11/7/07

SOP 724r 10

Paragon Analytics
Low Background Gas Flow Proportional Counter Log
Instrument: LB4100B

Instrument Daily Response and Background Checks

Det.	Daily Response Check Start 1	Status	Start 2	Status	Background Check Start 1	Status	Start 2	Status	Det. Status
1	JH	P			JH	P			P
2	↓	↓			↓	↓			↓
3									
4									
5									OL&W
6									P
7									↓
8									
9									
10						↓			
11						HL	JH	P	↓
12						P			OL&W
13						↓			P
14									↓
15	↓	↓			↓	↓			
16									

Det = Detector; α = Alpha; β = Beta; P = Pass; H = High; L = Low; OL = Offline; R = Recount; W = Weekly; NP = Not Processed

Weekly Background Calibration

	Current Calib. File ID	Weekly Calib. Started	Status	File ID
Dr A	BKB 1102W			
Dr B	↓ 1103W			
Dr C	↓			
Dr D				

Dr = Drawer

Gas Supply

P-10 Supply		P-10 Flow	
Tank 1	1000	Dr A	0.15
	↓	Dr B	↓
Tank 2	500	Dr C	
	↓	Dr D	

Comments:

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Reviewed By / Date JH 11/8/07

Date 11/7/07

SOP 724r 10

Paragon Analytics

Low Background Gas Flow Proportional Counter Log

Instrument: LB4100B

Det.	Sample ID	Batch	Test	Count Dur. (min)	Start Time	Analyst Initials	File ID	Output Initials
1-16	Daily Eff	—	—	30	806	JH	EFB1107	JH
1-16	Daily BKG	—	—	60	818	JH	BKB1107	JH
11	Daily BKG	—	—	60	931	JH	BKB1107R	JH
[illegible]	[illegible]	[illegible]	[illegible]	60	930	JH	[illegible]	[illegible]

JH
11/6/07 Drawers A, B and D Calibration

Plateaus for Drawers A, B + D

Source β used:	Detectors	Source α used:
Sr/Y 90 - 406	A1 B1 D1	410 - Am 241
29,600 cpm - 407	A2 B2 D2	411 - 17,800 dpm
9/15/02 - 408	A3 B3 D3	412 - 2/06/95
↓ - 409	A4 B4 D4	413 - ↓

Parameters:

Start Voltage: 700
Ending Voltage: 1650
30 volts/step
5 min / step
40,000 count preset

Filenames:

PTB1106A, B
PTB1107D

*note: Plateau voltage did not change therefore historical limits are still in place.

JH Am241 Calibration on a Ruced Planchet (Drawers A, B + D)

Instrument ROIs

Batch Specific:

	Event	Recycle
Aqua	1	0.01

Drawer Specific:

	Date/Time	Official	Bias	Step
A	11-6-06 15:37	TRUE	1357.5	0
B	11-6-06 15:38	TRUE	1357.5	0
C	5-17-07 10:55	TRUE	1447.5	0
D	11-8-06 16:05	TRUE	1360	0

etector Specific:

	Date/Time	Official	Thres	bLL	bUL	aLL	aUL	Time
A1	11-9-06 0:00	TRUE	0.1	0	18.94	36.63	100	75
A2	11-9-06 0:00	TRUE	0.1	0	21.97	39.12	100	75
A3	11-9-06 0:00	TRUE	0.1	0	20.17	37.58	100	75
A4	11-9-06 0:00	TRUE	0.1	0	22.41	41.61	100	75
B1	11-9-06 0:00	TRUE	0.1	0	27.15	50.15	100	75
B2	11-9-06 0:00	TRUE	0.1	0	24.37	45.1	100	75
B3	11-9-06 0:00	TRUE	0.1	0	22.97	45.47	100	75
B4	11-9-06 0:00	TRUE	0.1	0	24.37	45.93	100	75
C1	7-10-07 0:00	TRUE	0.1	0	52.42	95.97	100	75
C2	7-10-07 0:00	TRUE	0.1	0	47.08	90.08	100	75
C3	7-10-07 0:00	TRUE	0.1	0	46.76	94.74	100	75
C4	7-10-07 0:00	TRUE	0.1	0	42.44	82.44	100	75
D1	11-9-06 0:00	TRUE	0.1	0	20.24	38.16	100	75
D2	11-9-06 0:00	TRUE	0.1	0	20.9	39.29	100	75
D3	11-9-06 0:00	TRUE	0.1	0	23.29	43.71	100	75
D4	11-9-06 0:00	TRUE	0.1	0	24	45.27	100	75

Efficiencies

7/11/07 JH

Sr-89 Calibration - Sr-89 on a Flat Planchet

Benchsheet: 315029A Source ID: 1168
Logfile: Sr89-07/07

Source: ~~1168~~ JH 7/11/07	Detector:	Filename:
0717502-S2	C1	ESE0711
-S3	C2	
-S4	C3	
-S5	C4	

7/11/07 JH

Sr-90 Calibration on a Flat Planchet

Benchsheet: 279055A Source ID: 1169

Source: ~~1169~~ JH 7/11/07	Detector:	Filename:
0424028-S1	C1	ESF0711
-S2	C2	
-S3	C3	
-S4	C4	

7/11/07 JH

Sr90 Calibration on a Ringed Planchet

Benchsheet: 290476A Source ID: 1170
Logfile: Sr90R-07/07

Source:	Detector:	Filename:
0614030-S1	C1	ESR0711
-S2	C2	
-S3	C3	
-S4	C4	

Continued on Page

Read and Understood By

Signed 7/11/07 Date Signed 7/12/07 Date

JH 11/7/07

Sr90 Calibration on a Ringed Planchet (Drawers A, B + D)

Benchsheet: 2904764 Source ID: 1173

Logfile Sr90R-11/07 JH 11/7/07

Source:	Detectors	File Names
0614030-S1	A1 B1 D1	ESR1107, B
-S2	A2 B2 D2	ESR1108
-S3	A3 B3 D3	
-S4	A4 B4 D4	

Sr-90 Calibration on a Flat Planchet (Drawers A, B + D)

JH 11/7/07

Benchsheet: 2790551A Source ID: 1174

Logfile Sr90F11/07

Source:	Detectors	Filenames
0429028-S1	A1 B1 D1	ESF1107, B
-S2	A2 B2 D2	ESF1108
-S3	A3 B3 D3	
-S4	A4 B4 D4	

JH 11/7/07

Am241 Wipe Calibration (Drawers A, B + D)

Source: #746 Source ID: 1175 Logfile: AmWipe11/07

Filenames: EAW1107 → G
EAW1108 → C

*Alpha to beta crosstalk was calculated for each detector using the following equation:

$$\frac{\text{counts in } \cancel{\text{alpha}}\ \text{beta channel}}{\text{Counts in alpha channel}}$$ JH 11/8/07

Continued on Page

Read and Understood By

Signed 11/7/07 Date Signed 11/24/07 Date

Sr-90 FLAT Planchet Efficiency Calibration
LB4100-B
Date: 11/13/2007
Source ID: 1169 & 1174

Det ID	A1	A2	A3	A4	B1	B2	B3	B4
File Name	ESF1107	ESF1107	ESF1107	ESF1107	ESF1107B	ESF1107B	ESF1107B	ESF1107B
Cnt Time	25.60	25.95	24.41	24.88	24.41	25.38	25.89	24.90
Tot Cnts	10003	10004	10005	10005	10002	10003	10004	10002
Bkg CPM	1.421	1.584	1.486	1.525	2.080	1.491	1.562	1.595
CPM	389.3212	383.9266	408.387	400.6052	407.670	392.638	384.842	400.092
Alpha EFF	0.000347	0.000218	0.000101	0.000351	0.000271	0.000260	0.000290	0.000241
Beta EFF	0.431831	0.425848	0.452979	0.444347	0.452185	0.435512	0.426864	0.443779
Efficiency	**0.4318**	**0.4258**	**0.4529**	**0.4443**	**0.4522**	**0.4355**	**0.4269**	**0.4438**

Det ID	C1	C2	C3	C4	D1	D2	D3	D4
File Name	ESF0711	ESF0711	ESF0711	ESF0711	ESF1108	ESF1108	ESF1108	ESF1108
Cnt Time	24.75	25.21	25.54	25.64	25.55	25.33	25.77	24.39
Tot Cnts	10001	10003	10001	10001	10008	10006	10003	10003
Bkg CPM	1.622	1.279	1.508	1.670	1.55	1.66	1.77	3.08
CPM	402.4588	395.5080	390.0738	388.3846	390.1575	393.3627	386.3975	407.0451
Alpha EFF	0.000986	0.000663	0.000405	0.000357	0.001112	0.000806	0.000171	0.000162
Beta EFF	0.442922	0.435272	0.429292	0.427433	0.432787	0.436430	0.428617	0.451520
Efficiency	**0.4429**	**0.4353**	**0.4293**	**0.4274**	**0.4328**	**0.4364**	**0.4286**	**0.4515**

Date 7/11/07

SOP 724r 9

Paragon Analytics
Low Background Gas Flow Proportional Counter Log
Instrument: LB4100B

Instrument Daily Response and Background Checks

Det.	Daily Response Check Start 1	Status	Start 2	Status	Background Check Start 1	Status	Start 2	Status	Det. Status
1	JH	P			JH	P			P
2									
3									
4									
5						HB			OLBW
6						P			P
7									
8									
9									
10									
11									
12		Lα							OLα JH 7/11/07
13		P							P
14									
15									
16						HB			OLBW

Det = Detector; α = Alpha; β = Beta; P = Pass; H = High; L = Low; OL = Offline; R = Recount; W = Weekly; NP = Not Processed

Weekly Background Calibration

	Current Calib. File ID	Weekly Calib. Started	Status	File ID
Dr A	BKB0706W 707W			
Dr B				
Dr C				
Dr D				

Dr = Drawer

Gas Supply

P-10 Supply		P-10 Flow	
Tank 1	650	Dr A	0.15
		Dr B	
Tank 2	1600	Dr C	
		Dr D	

Comments:

Date 7/11/07 SOP 724r 9

Paragon Analytics

Low Background Gas Flow Proportional Counter Log

Instrument: LB4100B

Det.	Sample ID	Batch	Test	Count Dur. (min)	Start Time	Analyst Initials	File ID	Output Initials
1-16	Daily Eff	—	—	30	810	JH	EFB0711	JH
1-16	Daily BKG	—	—	60	831	JH	BKG0711	JH
3	Filter Blank 1	1-070627-1	1129	60	1126	60	1080711	60
6	↓ 2	↓	↓	↓	↓	↓	↓	↓
14	↓ 3	↓	↓	↓	↓	↓	↓	↓
9	1166	Am Wipe Eff.	α	30	1204	JH	EAW0711	JH
12	1167	Sr Wipe Eff.	β	30	1204	JH	ESW0711	↓
10	1166	Am Wipe Eff	α	30	1209	JH	EAW0711A	↓
11	1167	Sr Wipe Eff	β	30	1210	JH	ESW0711A	↓
11	1166	Am Wipe Eff	α	30	1215	JH	EAW0711B	↓
10	1167	Sr Wipe Eff	β	30	1216	JH	ESW0711B	↓
12	1166	Am Wipe Eff	α	30	1221	JH	~~EAW0711C~~	JH 7/11/07
9	1167	Sr Wipe Eff	β	30	1221	JH	ESW0711C	↓
9	0717502-S2	Sr89 eff	β	75	1403	JH	ESE0711	JH
10	↓ -S3	↓	↓	↓	↓	↓	↓	↓
11	↓ -S4	↓	↓	↓	↓	↓	↓	↓
12	↓ -S5	↓	↓	↓	↓	↓	↓	↓
9	0424028-S1	Sr90F eff	β	75	1453	JH	ESF0711	JH
10	↓ -S2	↓	↓	↓	↓	↓	↓	↓
11	↓ -S3	↓	↓	↓	↓	↓	↓	↓
12	↓ -S4	↓	↓	↓	↓	↓	↓	↓
9	0614030-S1	Sr90R eff	β	75	1536	JH	ESR0711	JH
10	↓ -S2	↓	↓	↓	↓	↓	↓	↓
11	↓ -S3	↓	↓	↓	↓	↓	↓	↓
12	↓ -S4	↓	↓	↓	↓	↓	↓	↓
9	0615044-S2	Am241R eff	α	75	1558	JH	EAM0711	JH
10	↓ -S3	↓	↓	↓	↓	↓	↓	↓
11	↓ -S4	↓	↓	↓	↓	↓	↓	↓
12	↓ -S5	↓	↓	↓	↓	↓	↓	↓

JH 7/12/07

Comments: ~~ESW0711~~ JH 7/11/07
EAW0711C JH 7/11/07

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(cont. from page NA B)

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Reviewed By / Date: JH 7/12/07 RG 7/12/07

Date 11/2/07 SOP 734a 10 [redacted]

Date 11/7/07

SOP 724r 10

Paragon Analytics

Low Background Gas Flow Proportional Counter Log

Instrument: LB4100B

Det.	Sample ID	Batch	Test	Count Dur. (min)	Start Time	Analyst Initials	File ID	Output Initials
1-16	Daily Eff	—	—	30	806	JH	EFB1107	JH
1-16	Daily BKG	—	—	60	818	JH	BKB1107	JH
11	Daily BKG	—	—	60	931	JH	BKB1107R	JH
9	0710261-360	~~AB071105-5~~	αβ	90	930	JH	AB01107	JH
10	↓ -37	↓	↓	↓	↓	↓	↓	↓
13-16	ALPHA	Plateau	α	5 step	937	JH	PTB11070	
~~4-4~~	~~Am241 eff~~	~~Am241~~			~~952~~			JH 11/7/07
JH 11/7/07 1	0615044-52	Am241eff.R	~~α~~ 1172	75	952	JH	EAM1107	JH
2	-53	JH 11/7/07						
3	-54							
4	-55							
5	0615044-52	Am241EffR	1172	75	1014	JH	EAM1107B	JH
6	-53							
7	-54							
8	-55							
JH 11/7/07 1	0614030-51	Sr90eff R	1173	75	1020	JH	ESR1107	JH
2	-52							
3	-3							
4	-4							
5	0614030-51	Sr90eff R	1173	75	1031	JH	ESR1107B	JH
6	-52							

Date 11/8/07

SOP 724r 10

Paragon Analytics

Low Background Gas Flow Proportional Counter Log

Instrument: LB4100B

Instrument Daily Response and Background Checks

Det.	Daily Response Check Start 1	Status	Start 2	Status	Background Check Start 1	Status	Start 2	Status	Det. Status
1	JH	P			JH	P			P
2									
3									
4									
5						HL			OLBW
6		LB	JH	LB		P			OLBD
7		P				HL	JH	P	P
8						P			
9									
10									
11									
12									OLBW
13									P
14									
15									
16						LB			

Det = Detector; α = Alpha; β = Beta; P = Pass; H = High; L = Low; OL = Offline; R = Recount; W = Weekly; NP = Not Processed

Weekly Background Calibration

	Current Calib. File ID	Weekly Calib. Started	Status	File ID
Dr A	BKB1102W			
Dr B	103W			
Dr C				
Dr D				

Dr = Drawer

Gas Supply

P-10 Supply		P-10 Flow	
Tank 1	1000	Dr A	0.15
		Dr B	
Tank 2	2100	Dr C	
		Dr D	

Comments:

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Form 780r8.doc (6/23/06)

Reviewed By / Date JH 11/9/07

Date 11/8/07 SOP 724r 10

Paragon Analytics

Low Background Gas Flow Proportional Counter Log

Instrument: LB4100B

Det.	Sample ID	Batch	Test	Count Dur. (min)	Start Time	Analyst Initials	File ID	Output Initials
1-16	Daily Eff	—	—	30	830	JH	EFB1108	JH
6	Daily Eff	—	—	30	838	JH	EFB1108R	JH
1-16	Daily BKG	—	—	60	853	JH	BKB1108	JH
9	0710261-73	AB071105-7	αβ	90	1001	JH	ABB1108	JH
10	-74							
11	-75							
13	AmWipe Eff	746	1175	75	1003	JH	EAW1108	JH
16	SrWipe Eff	602	1176		1004		ESW1108	JH
1	ICV TEST	ICV TEST	α	10	1205	JH	ABB1108D	JH
4			β					
7	Daily BKG	—	—	60	1007	JH	BKB1108R	JH
8	0710274-4	TR071102-1	RaTot	45	1008	JH	TRB1108	JH
14	AmWipe Eff	746	1175	75	1011	JH	EAW1108A	JH
15	SrWipe Eff	602	1176		1012		ESW1108A	
1	0710274-5	TR071102-1	RaTot	45	1015	JH	TRB1108A	JH
2	-8							
3	-9							
4	-10							
14	AmWipe Eff	746	1175	75	1020	JH	EAW1108B	JH
JH 11/8/07 15 ~~13~~	SrWipe Eff	602	1176		1021		ESW1108B	
13	SrWipe Eff	602	1176	75	1027	JH	ESW1108C	JH
16	AmWipe Eff	746	1175				EAW1108C	
13	0424028-S1	Sr90 eff F	1174	75	1034	JH	ESF1108	JH
14	-S2							
15	-S3							
16	-S4							
1	0710274-11	TR071102-1	RaTot	45	1108	JH	TRB1108B	JH
2	TR071102-1LB							
13	0614030-S1	Sr90 eff R	1173	75	1114	JH	ESR1108	JH
14	-S2							
15	-S3							
16	-S4							
13	0615044-S2	Am241 eff R	1172	75	1121	JH	EAM1108	JH
14	-S3							
15	-S4							
16	-S5							
13	0717502-S1	Sr89 eff F	1177	75	1133	JH	ESE1108	JH
14	-S2							
15	-S3							
16	-S4							
7	ICV TEST	ICV TEST	α	10	1143	JH	ABB1108A	JH
8			β					
9	0710261-74A	AB071105-7	αβ	90	1155	JH	ABB1108B	JH for LD
10	-67	AB071105-6			1156		ABB1108C	
11	-68							
14	ICV TEST	ICV TEST	α	10	1221	JH	ABB1108E	JH
15			β					

Comments:

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(cont. from page NA B)

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Reviewed By / Date: JH 11/9/07

Source Database for OSUM for LB4100-B

Number of sources in table: 96

Application Revision: A

Control ID	Isotope	Type	Half-Life (days)	DPM	Std dev	Date	Status	Alpha/Beta Archive File
1169	Sr-90/Y-90	Beta	10519.2	1110	55.50	18-Mar-99	PA	Sr90F-07/07
1170	Sr-90/Y-90	Beta	10519.2	19986.92	999.35	2-Dec-04	PA	Sr90R-07/07
1171	AM-241	Alpha	157783.68	5514.295	275.71	6-Jul-01	PA	Am241-07/07
1172	AM-241	Alpha	157783.68	5514.295	275.71	6-Jul-01	PA	Am241-11/07
1173	Sr-90/Y-90	Beta	10519.2	19986.92	999.35	2-Dec-04	PA	Sr90R-11/07
1174	Sr-90/Y-90	Beta	10519.2	1110	55.50	18-Mar-99	PA	Sr90F-11/07

279055A

WORKSHEET FOR IN-HOUSE OR RUSH SAMPLES / Ra/Sr Lab

Matrix LIQUID **Prep Analyst** [illegible] **Prep Date** 12/15/04 **Analyte** 90Sr **Analytical Batch** _____

Pretreatment? (Y / N) **Batch** _____ **Count Date / Time** _____ **Superseded** _____

Paragon WO No.	Sample Wt. (g/L)	Sample Aliq. (g/L)	Aliquot Basis (Dry / AR)	Spike Information	Remarks	Det. No.	Filename	POS Ckd By
0424028-S1	NA	→	→	S1				
S2	↓	↓	↓	↓				
S3								
S4								
S5	↓	↓	↓	↓				
				[illegible] 12/15/04				

Balance No. NA **Spiked By** [illegible] **Date** 12/15/04 **Spike Witness** [illegible] **Date** 12/15/04 **QASS?** (Y / N) **No.** _____

	Isotope	*No* 11/29/05	*Act / mL*	*Vol*	*P*	*Total Act (dpm)*	~~*Decay*~~ *Corrected*	PIPET [illegible] 12/15/04	*Relinquished by / Date*	*Received by / Date*
Spike 1	90Sr	514.1572.73	~55.5	10.0		~5500	RS-007	1	[illegible] 12/15/04	
Spike 2										
Spike 3						[illegible] 12/15/04		2		
Spike 4										

Electronic Benchsheet No. (if / when generated) NA **Reviewed by / Date** [illegible] 12/15/04

279055 B

WORKSHEET FOR IN-HOUSE OR RUSH SAMPLES / Ra/Sr Lab

Initials [illegible] Date 12/15/04 Method (SOP / Rev) 907R8 Matrix LIQUID

COMMENTS

^{90}Sr CALIBRATION

- ~2.5 ml 16N HNO_3 ADDED TO PLANCHETS
- SPIKE ADDED TO PLANCHETS
- DRIED ON HOTPLATE

[illegible] 12/15/04

Reviewed by / Date [illegible] 12/15/04

Sr-90 Calculatons

Sample ID	Sample D & T	Sep. D & T	Count D & T	Ct Dur	Init Vol	Calc Vol	Gross CPM	BKG CPM	Net CPM	Efficieny	Yield
0424028-S1	3/18/1999 12:00	12/15/2004 12:00	11/11/2006 13:09	10	1.0000	0.980	406.500	1.453	405.047	0.4337	1.000
0424028-S2	3/18/1999 12:00	12/15/2004 12:00	11/11/2006 14:50	10	1.0000	0.980	409.000	1.453	407.547	0.4337	1.000
0424028-S3	3/18/1999 12:00	12/15/2004 12:00	11/11/2006 15:11	10	1.0000	0.980	411.200	1.453	409.747	0.4337	1.000
0424028-S4	3/18/1999 12:00	12/15/2004 12:00	11/11/2006 15:27	10	1.0000	0.980	420.500	1.453	419.047	0.4337	1.000
0424028-S5	3/18/1999 12:00	12/15/2004 12:00	11/11/2006 15:45	10	1.0000	0.980	396.200	1.453	394.747	0.4337	1.000

Mean=	408.680		
StDev=	8.756		
2 Sig LCL=	391.168	1 Sig LCL=	399.924
2 Sig UCL=	426.192	1 Sig UCL=	417.436

Sample ID	Spike Soln	Ref Date	Sr-90 Activity DPM/mL	Sr-90 Spike Vol mL	Sr-90 Act pCi Added
0424028-S1	514.1572.73	3/18/1999	55.50	10.0	249.992
0424028-S2	514.1572.73	3/18/1999	55.50	10.0	249.992
0424028-S3	514.1572.73	3/18/1999	55.50	10.0	249.992
0424028-S4	514.1572.73	3/18/1999	55.50	10.0	249.992
0424028-S5	514.1572.73	3/18/1999	55.50	10.0	249.992

0424028-S5 is rejected as the outlier

PAI - Gas Flow Proportional Sample Analysis LB4100-B

Unit Type: LB4100-B
Counting Unit ID: Aqua
High Voltage Mode: Simultaneous
Application Revision:
Application Version: Standard
Rev.12/29/03 JE

Data file name: SRB1111
Batch ID: OUTLIER
Count Preset (m): 10
2 Batch Ended: 11/11/06 13:19

Background logfile: BKGABW
Date of Bkg. Cal: 11/11/06
Alpha efficiency logfile: AmR-11/05
Alpha attenuation calibration: AM8106
Beta efficiency logfile: Sr90R-11/05
Beta attenuation calibration: SR1105

Alpha prog. logfile: n/a
Alpha prog. attenuation: n/a
Beta prog. logfile: n/a
Beta prog. attenuation: n/a

Alpha Attenuation Calibration y = b*m^(a*(mass-x0))		Beta Attenuation Calibration y = b*m^(a*(mass-x0))	
Alpha b=	1.16870	Beta b=	0.9791
m=	0.99300	m=	0.9998
a=	0.7996	a=	1.3088
x0=	0.0000	x0=	0.0000
Alpha to Beta X-talk y = b*m^-mass		**Beta to Alpha X-talk y = b*mass + m**	
a -> b xtalk b=	0.2310	b -> a xtalk b=	-2.71E-06
a -> b xtalk m=	0.9997	b -> a xtalk m=	0.0005

Det. ID	Sample ID	Count End Date & Time	Count Dur. (min)	Resid. Mass (mg)	Alpha Activity Gross CPM	Alpha Bkg. CPM	Alpha b>a xtlk CPM	Alpha Base Eff	Alpha Base Cor.Fact.	Alpha Progeny Eff	Alpha Progeny Cor.Fact.	Beta Activity Gross CPM	Beta Bkg. CPM	Beta a>b xtlk CPM	Beta Base Eff	Beta Base Cor.Fact.	Beta Progeny Eff	Beta Progeny Cor.Fact.
A1	0424028-S1	11/11/06 13:19	10.00	0.0	0.500	0.052	0.203	0.2316	1.170	n/a	n/a	406.500	1.453	0.1159	0.4337	0.979	n/a	n/a

W 9/21/07

PAI - Gas Flow Proportional Sample Analysis LB4100-B

Unit Type: LB4100 -B
Counting Unit ID: Aqua
High Voltage Mode: Simultaneous
Application Revision:
Application Version: Standard
Rev.12/29/03 JE

Data file name: SRB1111B
Batch ID: OUTLIER
Count Preset (m): 10
2 Batch Ended: 11/11/06 15:00

Background logfile: BKGABW
Date of Bkg. Cal: 11/11/06
Alpha efficiency logfile: AmR-11/05
Alpha attenuation calibration: AM0106
Beta efficiency logfile: Sr90R-11/05
Beta attenuation calibration: SR1105

Alpha prog. logfile: n/a
Alpha prog. attenuation: n/a
Beta prog. logfile: n/a
Beta prog. attenuation: n/a

Alpha Attenuation Calibration		Beta Attenuation Calibration	
y = b*m^(a*(mass-x0))		y = b*m^(a*(mass-x0))	
Alpha b=	1.16970	Beta b=	0.9791
m=	0.99320	m=	0.9990
a=	0.1906	a=	1.3096
x0=	0.0000	x0=	0.0000
Alpha to Beta X-talk		Beta to Alpha X-talk	
y = b *m^-mass		y = b*mass + m	
a ->b xtalk b=	0.2316	b ->a xtalk b=	-2.71E-06
a ->b xtalk m=	0.9983	b ->a xtalk m=	0.0005

Det. ID	Sample ID	Count End Date & Time	Count Dur. (min)	Resid. Mass (mg)	Alpha Activity Gross CPM	Alpha Bkg. CPM	Alpha b>a xtlk CPM	Alpha Base Eff	Alpha Base Cor.Fact.	Alpha Progeny Eff	Alpha Progeny Cor.Fact.	Beta Activity Gross CPM	Beta Bkg. CPM	Beta a>b xtlk CPM	Beta Base Eff	Beta Base Cor.Fact.	Beta Progeny Eff	Beta Progeny Cor.Fact.
A1	0424028-S2	11/11/06 15:00	10.00	0.0	0.400	0.052	0.205	0.2316	1.176	n/a	n/a	409.000	1.453	0.0927	0.4337	0.979	n/a	n/a

W 9/27/07

PAI - Gas Flow Proportional Sample Analysis LB4100-B

Unit Type: LB4100 -B
Counting Unit ID: Aqua
High Voltage Mode: Simultaneous
Application Revision:
Application Version: Standard
Rev.12/29/03 JE

Data file name: SRB1111D
Batch ID: OUTLIER
Count Preset (m): 10
2 Batch Ended: 11/11/05 15:21

Background logfile: BKGABW
Date of Bkg. Cal: 11/11/05
Alpha efficiency logfile: AmR-11/05
Alpha attenuation calibration: AM0108
Beta efficiency logfile: SrD9R-11/05
Beta attenuation calibration: SR1105

Alpha prog. logfile: n/a
Alpha prog. attenuation: n/a
Beta prog. logfile: n/a
Beta prog. attenuation: n/a

Alpha Attenuation Calibration		Beta Attenuation Calibration	
y = b*m^(a*(mass-x0))		y = b*m^(a*(mass-x0))	
Alpha b=	1.18970	Beta b=	0.9791
m=	0.99300	m=	0.9999
a=	0.7966	a=	1.3068
x0=	0.0000	x0=	0.0000
Alpha to Beta X-talk		Beta to Alpha X-talk	
y = b*m^mass		y = b*mass + m	
a ->b xtalk b=	0.2318	b ->a xtalk b=	-2.71E-06
a ->b xtalk m=	0.0997	b ->a xtalk m=	0.0005

Det. ID	Sample ID	Count End Date & Time	Count Dur. (min)	Resid. Mass (mg)	Alpha Activity							Beta Activity						
					Gross CPM	Bkg. CPM	b>a xtlk CPM	Base Eff	Base Cor.Fact.	Progeny Eff	Progeny Cor.Fact.	Gross CPM	Bkg. CPM	a>b xtlk CPM	Base Eff	Base Cor.Fact.	Progeny Eff	Progeny Cor.Fact.
A1	0424028-S3	11/11/05 15:21	10.00	0.0	0.906	0.052	0.206	0.2316	1.170	n/a	n/a	411.200	1.453	0.2086	0.4337	0.979	n/a	n/a

LD 01/27/06

PAI - Gas Flow Proportional Sample Analysis LB4100-B

Unit Type: LB4100-B
Counting Unit ID: Aqua
High Voltage Mode: Simultaneous
Application Revision: 2
Application Version: Standard
Rev.12/29/03 JE

Data file name: SRB1111F
Batch ID: OUTLIER
Count Preset (m): 10
Batch Ended: 11/11/06 15:37

Background logfile: BKGABW
Date of Bkg. Cal: 11/11/06
Alpha efficiency logfile: AmR-11/05
Alpha attenuation calibration: AM8186
Beta efficiency logfile: Sr90R-11/05
Beta attenuation calibration: SR1105

Alpha prog. logfile: n/a
Alpha prog. attenuation: n/a
Beta prog. logfile: n/a
Beta prog. attenuation: n/a

Alpha Attenuation Calibration		Beta Attenuation Calibration	
y = b*m^(a*(mass-x0))		y = b*m^(a*(mass-x0))	
Alpha b=	1.16970	Beta b=	0.9781
m=	0.99300	m=	0.9998
a=	0.1985	a=	1.3898
x0=	0.0000	x0=	0.0000
Alpha to Beta X-talk		Beta to Alpha X-talk	
y = b*m^-mass		y = b*mass + m	
a -> b xtalk b=	0.2318	b -> a xtalk b=	-2.71E-05
a -> b xtalk m=	0.9937	b -> a xtalk m=	0.0005

Det. ID	Sample ID	Count End Date & Time	Count Dur. (min)	Resid. Mass (mg)	Alpha Activity							Beta Activity						
					Gross CPM	Bkg. CPM	b>a xtlk CPM	Base Eff	Base Cor.Fact.	Progeny Eff	Progeny Cor.Fact.	Gross CPM	Bkg. CPM	a>b xtlk CPM	Base Eff	Base Cor.Fact.	Progeny Eff	Progeny Cor.Fact.
A1	0424028-S4	11/11/06 15:37	10.00	0.0	0.600	0.052	0.210	0.2316	1.170	n/a	n/a	420.500	1.453	0.1391	0.4337	0.979	n/a	n/a

6
1/22/07

PAI - Gas Flow Proportional Sample Analysis LB4100-B

Unit Type: LB4100-B
Counting Unit ID: Aqua
High Voltage Mode: Simultaneous
Application Revision:
Application Version: Standard
Rev.12/29/03 JB

Data file name: SRB1111H
Batch ID: OUTLIER
Count Preset (m): 10
2 Batch Ended: 11/11/06 15:55

Background logfile: BKGABW
Date of Bkg. Cal: 11/11/06
Alpha efficiency logfile: AmR-11/05
Alpha attenuation calibration: AM0106
Beta efficiency logfile: Sr90R-11/05
Beta attenuation calibration: SR1105

Alpha prog. logfile: n/a
Alpha prog. attenuation: n/a
Beta prog. logfile: n/a
Beta prog. attenuation: n/a

Alpha Attenuation Calibration		Beta Attenuation Calibration	
y = b*m*(a^(mass-x0))		y = b*m^(a^(mass-x0))	
Alpha b=	1.16970	Beta b=	0.9191
m=	0.99300	m=	0.9998
a=	0.7986	a=	1.3998
x0=	0.0000	x0=	0.0000
Alpha to Beta X-talk		Beta to Alpha X-talk	
y = b*m^-mass		y = b*mass + m	
a ->b xtalk b=	0.2316	b ->a xtalk b=	-2.71E-05
a ->b xtalk m=	0.9997	b ->a xtalk m=	0.0005

Det. ID	Sample ID	Count End Date & Time	Count Dur. (min)	Resid. Mass (mg)	Alpha Activity							Beta Activity						
					Gross CPM	Bkg. CPM	b>a xtlk CPM	Base Eff	Base Cor.Fact.	Progeny Eff	Progeny Cor.Fact.	Gross CPM	Bkg. CPM	a>b xtlk CPM	Base Eff	Base Cor.Fact.	Progeny Eff	Progeny Cor.Fact.
A1	0424028-S5	11/11/06 15:55	10.00	0.0	0.500	0.052	0.198	0.2316	1.170	n/a	n/a	396.206	1.453	0.1391	0.4337	0.979	n/a	n/a

10
2/27/07

Date 11/11/06

SOP 724r 9

Paragon Analytics
Low Background Gas Flow Proportional Counter Log
Instrument: LB4100B

Instrument Daily Response and Background Checks

Det.	Daily Response Check Start 1	Status	Start 2	Status	★ Background Check Start 1	Status	Start 2	Status	Det. Status
1	LO	P							P
2									H α
3									P
4									
5									
6									
7									
8									
9									
10									
11									
12									
13									
14									H α
15									P
16									H β

LO 11/11/06

Det = Detector; α = Alpha; β = Beta; P = Pass; H = High; L = Low; OL = Offline; R = Recount; W = Weekly; NP = Not Processed

Weekly Background Calibration

	Current Calib. File ID	Weekly Calib. Started	Status	File ID
Dr A	BKB1110W	LO	2 HB	BKB1111W
Dr B				
Dr C				
Dr D		LO	14 P 16 HB	BKB1111W

Dr = Drawer

★ Daily Bkg not run due to Weekly Bkg run the night before 10/11/06.

Gas Supply

P-10 Supply		P-10 Flow	
Tank 1	2000	Dr A	6.15
		Dr B	
Tank 2	1200	Dr C	
		Dr D	

Comments:

Page No. 518142 A

Form 780r8.doc (6/23/06)

Reviewed By / Date 10/11/06

Date 11/11/06

SOP 724r 9

Paragon Analytics

Low Background Gas Flow Proportional Counter Log

Instrument: LB4100B

Det.	Sample ID	Batch	Test	Count Dur. (min)	Start Time	Analyst Initials	File ID	Output Initials
1-16	Daily EFF	—	—	30	1039	LO	EFB1111	LO
1	1156	Ra226 EFF	Ra226	30	1103	LO	ERA1111A	LO
2	↓	↓	↓	↓	↓	↓	↓	↓
3								
4								
5	1156	Ra226EFF	Ra226	30	1118	LO	ERA1111B	LO
6	↓	↓	↓	↓	↓	↓	↓	↓
7								
8								
9	1156	Ra226EFF	Ra226	30	1130	LO	ERA1111C	LO
10	↓	↓	↓	↓	↓	↓	↓	↓
11								
12								
13	1156	Ra226EFF	Ra226	30	1141	LO	ERA1111D	LO
14	↓	↓	↓	↓	↓	↓	↓	↓
15								
16								
1	Alpha	R01 Test	α	10	1117	LO	ABB1111	LO
2	Alpha	R01 Test	α	10	1130	LO	ABB1111A	LO
1	Beta	R01 Test	β	10	1143	LO	ABB1111B	LO
3	Alpha	↓	α	↓	↓	↓	↓	↓
2	Beta	R01 Test	β	10	1200	LO	ABB1111C	LO
4	Alpha	↓	α	↓	↓	↓	↓	↓
3	Beta	↓	↓	↓	1216	LO	ABB1111D	LO
5	Alpha				↓	↓	↓	↓
					1248	LO	SOB1111	LO

PROJECT 574.1572.73 Notebook No. _____ 73

Continued From Page _____

Sr90 Working Standard

1.) Transfer a fraction of std 574.1572.72 to a 500 ml poly bottle + dilute w/ 0.1M HCl to a final activity conc of approx 25 pCi/ml

a) 500 ml bottle empty 37.9693 g (Bal 12)
" + 1° std 40.5067
Net 1° std transferred 2.5374 g

b) 500 ml bottle empty 37.9693 g from above
bottle + std + 0.1M HCl 542.5 g (Bal 20)
~~Total diluted mass 216.5 g~~
Total diluted mass 504.5 g

2) Calculation

$$\frac{(4984.3\ pCi/g)(2.5374\ g)(.9971\ g/ml)}{504.5\ g\ \cancel{216.5\ g}} = \cancel{24.90\ pCi/ml}$$

$$= 25.00\ pCi/ml$$

Ref Date = 3/18/99
Exp Date = 3/23/99

72
PROJECT 514.1572.72

Notebook No. _____

Continued From Page _____

S-90 Primary Standard

1) Transfer RSO# 514 (Analytics 57370-307) to a
a 250 ml poly bottle + dilute to [illegible]

ANALYTICS

DAL 514
rcd 3-23-99

1380 Seaboard Industrial Blvd.
Atlanta, Georgia 30318 · U.S.A.
Phone (404) 352-8677
Fax (404) 352-2837

CERTIFICATE OF CALIBRATION

Standard Radionuclide Source

57370-307

Sr-90 5 mL Liquid in Flame Sealed Vial

This standard radionuclide source was prepared gravimetrically from a calibrated master liquid radionuclide solution source. The master source was calibrated by liquid scintillation counting.

ANALYTICS maintains traceability to the National Institute of Standards and Technology through Measurements Assurance Programs

ICBs
&
ICVs

Sr-90 Calculations

Sample ID	Sample D & T	Sep. D & T	Count D & T	Ct Dur	Init Vol	Calc Vol	Gross CPM	BKG CPM	Net CPM	Efficiency	Yield	Decay	Ingrowth	k	Act	1 sig CU	1 sig TPU	2 sig TPU	MDC	LCS Recov
0714506-01MB	2/20/2007 12:00	2/22/2007 15:07	11/8/2007 13:10	30	1.0000	0.980	1.167	1.421	-0.254	0.4318	0.943	0.9998597	2	1.7713	-0.14	0.11	0.11	0.23	0.62	
0714506-02MB	2/20/2007 12:00	2/22/2007 15:07	11/8/2007 13:10	30	1.0000	0.980	1.667	1.662	0.006	0.4289	0.965	0.9998597	2	1.7743	0.00	0.13	0.13	0.26	0.65	
0714506-03MB	2/20/2007 12:00	2/22/2007 15:07	11/8/2007 13:10	30	1.0000	0.980	1.600	1.545	0.055	0.4326	0.924	0.9998597	2	1.7391	0.03	0.13	0.13	0.27	0.68	
0714506-01MB	2/20/2007 12:00	2/22/2007 15:07	11/12/2007 10:37	30	1.0000	0.980	1.900	1.577	0.323	0.4429	0.943	0.9998597	2	1.6169	0.18	0.14	0.14	0.28	0.64	
0714506-01LCS	2/20/2007 12:00	2/22/2007 15:07	11/8/2007 13:10	30	1.0000	0.980	17.967	1.486	16.481	0.4530	0.943	0.9998597	2	1.6593	8.58	0.42	1.11	2.23	0.61	69.7%
0714506-02LCS	2/20/2007 12:00	2/22/2007 15:07	11/8/2007 13:10	30	1.0000	0.980	16.367	1.595	14.772	0.4436	0.913	0.9998597	2	1.7620	8.38	0.42	1.06	2.13	0.66	84.8%
0714506-03LCS	2/20/2007 12:00	2/22/2007 15:07	11/8/2007 13:10	30	1.0000	0.980	16.533	1.767	14.766	0.4286	0.959	0.9998597	2	1.8078	8.17	0.44	1.04	2.07	0.67	82.6%
0714506-01LCS	2/20/2007 12:00	2/22/2007 15:07	11/12/2007 10:37	30	1.0000	0.980	16.207	1.475	16.792	0.4353	0.943	0.9998597	2	1.7866	9.40	0.44	1.16	2.36	0.69	95.1%

Sample ID	Spike Soln	Ref Date	Sr-90 Activity SPM/mL	Sr-90 Spike Vol mL	Sr-90 Act pCi Added
0714506-01LCS	600.3029.50	2/20/2007	43.90	0.5	9.886
0714506-02LCS			43.90	0.5	9.886
0714506-03LCS			43.90	0.5	9.886
0714506-01LCS			43.90	0.5	9.886

Ave Recovery = 88.0%

r:\nat\cip\Sr-90 Worksheet.xls

Final Aliquot = $1000ml\left(\frac{10-0.1}{1.0}\right)\left(\frac{1000.5-10}{1000.5}\right) = 980.1049ml$

% Yield = [ICP,] = 1.0108 ug/ml, dilution = $\frac{10}{10}$, volume = 1001 ml

$= 1.0108 mg/ml\left(\frac{10}{10}\right)(1001 ml) = 1,011.81$

$1,011.81\Big/\left(\frac{10-0.1}{10}\right) = 1001.69 ug$ vs 1001.703

Ingrowth

2/22/2007 15:07
11/8/2007 13:10
8 mo ~~16~~ day 15 1:57

= 6,121.95 hours

$$= 2 - e^{(-0.01814)(6121.95)}$$
$$= 2$$

Decay

11/8/2007 13:10
2/20/2007 12:00
8mo/18d/0 1:10

= 6,193.166 hours

$$= e^{(-0.000003)(6,193.166)}$$
$$= 0.9816$$

$$\text{Activity} = \frac{17.967 - 1.486}{(2.22)(2)(0.9816)(.980)(.4\tfrac{5}{30})(.94)} = \frac{16.481}{1.8187} = 9.06 \text{ vs } \cancel{9.10}\ 8.86$$

$$\text{CU} = \frac{\sqrt{\frac{17.967}{20} + \frac{1.486}{1000}}}{1.8187} = \frac{\sqrt{0.5989 + 0.001486}}{1.81} = 0.43$$

$$\text{TPU} = \sqrt{(0.43)^2 + (0.0561 \times 9.1)^2 + (0.1031 \times 9.1)^2}$$
$$= \sqrt{0.1849 + 0.2606 + 0.88024}$$

(1 sigma) = 1.15 vs 1.11

$$\text{MDC} = \frac{4.65\sqrt{\frac{1.486}{30}} + \frac{2.71}{30}}{1.8187} = \frac{1.035 + 0.09033}{1.8187}$$

= 0.619 vs 0.61

ksheet

Prep Batch: SR070220-1

Analytical QASS / NCR? Y / N NA

os y	Cnt 3 File	Cnt 3 Inst/Det	Cnt 3 Pos Chk By	Notes

JH 11/12/07

Solution Information

ep Conc	Units	Prep Date	Aliquot	Units	Pipet ID
43.895	DPM/ml	02/20/07	0.5	ml	RS004

Supersedes: N/A

Paragon Analytics

Radiochemistry Prep Worksheet

Prep Batch: SR070220-1

Prep Procedure: SR90

Reviewed By: LNT **Review Date:** 2/25/2007

Non-Routine Pre-Treatment? Y / N **Batch:** NA **Re-Prep? Y / N** **Batch:** NA **Prep QASS / NCR? Y / N** NA

Prep SOP: PAI 707 **Rev:** 9
Prep SOP: NONE
Matrix Class: liquid

Prep Analyst: Lindsay Tearman
Prep Date: 2/20/2007
Prep Dept: RS

Balance:
Balance:

Samp Num	Prep Num	LabID	QC Type	Dish No.	Init Alq ml	Fin Alq ml	Prep Basis	Column #	Ingrowth Date/Time	Standards	Prep Notes
1	1	0714506-B1	MB		1000	980.1049	Unfiltered	8769	02/22/07 15:07	T1	
2	1	0714506-B2	MB		1000	980.1049	Unfiltered	8770	02/22/07 15:07	T1	
3	1	0714506-B3	MB		1000	980.1049	Unfiltered	8771	02/22/07 15:07	T1	
4	1	0714506-S1	LCS		1000	980.1098	Unfiltered	8772	02/22/07 15:07	T1,S1	
5	1	0714506-S2	LCS		1000	980.1098	Unfiltered	8773	02/22/07 15:07	T1,S1	
6	1	0714506-S3	LCS		1000	980.1098	Unfiltered	8774	02/22/07 15:07	T1,S1	

LNT 2/25/07

Spiked By: Lindsay Tearman Date: 2/20/2007

Witnessed By: MaryNeal Piazza Date: 2/20/2007

Tracer/Carrier Solution Information

Soln #	Nuclide	SolnID	Prep Conc	Units	Prep Date	Aliquot	Units	Pipet ID
T1	STRONTIUM	247942	2,004.671	ppm	NA	0.5	ppm	RS004

Spike Solution Information

Soln #	Nuclide	SolnID	Prep Conc	Units	Prep Date	Aliquot	Units	Pipet ID
S1	Sr-90	600.3020.50	43.895	DPM/ml	02/20/07	0.5	ml	RS004

Comments

152

Paragon Analytics

Radiochemistry ICP Worksheet

Prep Batch: SR070220-1

Prep Procedure: **SR90**

Reviewed By: LNT

Review Date: 2/25/2007

STRONTIUM Recovery Results

Reference Carrier

LabID	QC Type	Carr Vol	Ref Carr Dil Vol	Ref Carr ICP Alq	Ref Carr ICP Dil Vol	Ref Carr ICP Run	Ref Carr ICP Conc
0714506-RC1	CAR	0.5	1000.5	10	10		1.0076

Samples

Prep Num	LabID	QC Type	Init Samp Alq (ml)	Car Vol (ml)	Samp Dil Vol (ml)	Init ICP Alq (ml)	Init ICP Dil Vol (ml)	Pre-Con Vol (ml)	Post Con Vol (ml)	Pre-Sep Vol (ml)	Post Sep Vol (ml)	Fin ICP Alq (ml)	Fin ICP Dil Vol (ml)	Initial ICP Run	Final ICP Run	Init ICP Conc (ug/ml)	Fin ICP Conc (ug/ml)	Init Samp Mass (ug)	Ref Mass (ug)	Flag	Fin Samp Mass (ug)	% Yield	Final Sample Alq
1	0714506-B1	MB	1000	0.5	1000.5	10	10	990.5	990.5	990.5	10	0.1	10			1.0101	0.9433	1000.504	998.0278		943.3	94.28%	980.1
1	0714506-B2	MB	1000	0.5	1000.5	10	10	990.5	990.5	990.5	10	0.1	10			1.0098	0.9554	1000.207	998.0278		955.4	95.52%	980.1
1	0714506-B3	MB	1000	0.5	1000.5	10	10	990.5	990.5	990.5	10	0.1	10			1.0211	0.934	1011.4	998.0278		934	92.35%	980.1
1	0714506-S1	LCS	1000	0.5	1001	10	10	991	991	991	10	0.1	10			1.0108	0.9449	1001.703	998.0328		944.9	94.33%	980.1
1	0714506-S2	LCS	1000	0.5	1001	10	10	991	991	991	10	0.1	10			1.0199	0.9223	1010.721	998.0328		922.2999	91.25%	980.1
1	0714506-S3	LCS	1000	0.5	1001	10	10	991	991	991	10	0.1	10			1.0085	0.9688	999.4235	998.0328		968.8	96.94%	980.1

W 2/25/07

FLAG - LB: low bias (<= 15%) 15%: low bias (>15%)
Z: Negative init. conc. treated as zer

Supersedes: _____

Paragon Analytics

Radiochemistry Prep Worksheet

Prep Batch: SR070220-1

Prep Procedure: SR90

Prep Batch Not Validated!!!

Reviewed By:

Review Date:

Non-Routine Pre-Treatment? Y / N Batch: _____ Re-Prep? Y / N Batch: _____ Prep QASS / NCR? Y / N _____

Prep SOP: PAI 707 Rev: 9
Prep SOP: NONE
Matrix Class: liquid

Prep Analyst: Lindsay Tearman LS
Prep Date: 2/20/2007
Prep Dept: RS

Balance:
Balance:

Samp Num	Prep Num	LabID	QC Type	Dish No.	Init Alq ml	Fin Alq ml	Prep Basis	Column #	Ingrowth Date/Time	Standards	Prep Notes
1	1	0714506-B1	MB		1000	980.1049	Unfiltered	8769	2/22/07 3:07PM	T1	
2	1	0714506-B2	MB		1000	980.1049	Unfiltered	8770		T1	
3	1	0714506-B3	MB		1000	980.1049	Unfiltered	8771		T1	
4	1	0714506-S1	LCS		1000	980.1098	Unfiltered	8772		T1,S1	
5	1	0714506-S2	LCS		1000	980.1098	Unfiltered	8773		T1,S1	
6	1	0714506-S3	LCS		1000	980.1098	Unfiltered	8774		T1,S1	

Spiked By: Lindsay Tearman LS Date: 2/20/2007 2/20/07

Witnessed By: MAO Date: 2-20-07

Tracer/Carrier Solution Information

Soln #	Nuclide	SolnID	Prep Conc	Units	Prep Date	Aliquot	Units	Pipet ID
T1	STRONTIUM	247942	2,004.671	ppm	NA	0.5	ppm	RS004

ex: 5/8/07

Spike Solution Information

Soln #	Nuclide	SolnID	Prep Conc	Units	Prep Date	Aliquot	Units	Pipet ID
S1	Sr-90	600.3020.50	43.895	DPM/ml	02/20/07	0.5	ml	RS004

ex: 11/8/07

DRAFT

Comments

ple Id1	Ba	Sr	Y	Fe	Ni
702098-16	0.2005	0.0682	0.0013	5.9108	2.1681
702098-16	0.0010	-0.0002	-0.0063	0.0475	1.7754
702098-17	0.2501	0.0601	0.0016	7.0286	2.1849
702098-17	0.0009	-0.0003	-0.0065	0.0129	1.7377
702098-18	0.2474	0.0565	0.0015	6.6862	2.1583
702098-18	0.0010	-0.0002	-0.0068	0.0263	1.7442
702098-19	0.1724	0.0898	0.0017	6.3755	2.1823
02098-19	0.0009	-0.0002	-0.0066	0.0379	1.7561
	0.4939	0.4973	10.0338	21.1606	0.5094
	0.0002	0.0002	0.0042	0.0138	0.0013
070220-1MB	0.0008	-0.0003	-0.0058	-0.0249	2.2212
070220-1MB	0.0008	-0.0002	-0.0059	0.0056	1.7668
070220-1LCS	0.0007	-0.0003	-0.0064	-0.0285	2.1777
070220-1LCS	0.0009	-0.0002	-0.0063	0.0082	1.7655
0220-1RC	0.0008	-0.0003	-0.0064	-0.0137	2.1945
02062-9	0.0085	0.1026	-0.0065	-0.0024	0.0071
02062-9	0.0664	0.0010	-0.0067	-0.0012	0.0219
02062-10	0.0051	1.0559	-0.0068	-0.0104	0.0327
02062-10	0.0660	0.0064	-0.0068	-0.0118	0.0205
02062-11	0.0079	0.5344	-0.0067	-0.0112	0.0063
	0.4952	0.4982	10.0979	21.3844	0.5189
	0.0004	0.0003	0.0047	0.0143	0.0017
02062-11	0.0640	0.0030	-0.0059	0.0134	0.0206
02062-12	0.0095	0.3182	-0.0061	-0.0096	0.0059
02062-12	0.0640	0.0040	-0.0064	0.0103	0.0211
02062-13	0.0084	0.0326	-0.0064	0.2255	0.0061
02062-13	0.0633	0.0001	-0.0066	0.0038	0.0208
02062-14	0.0040	0.1264	-0.0066	0.0348	0.0052
02062-14	0.0642	0.0007	-0.0067	-0.0037	0.0208
02062-15	0.0350	3.6667	-0.0068	-0.0222	0.0046
02062-15	0.0673	0.0482	-0.0067	0.0092	0.0213
02062-15D	0.0352	3.6486	-0.0066	0.0008	0.0054
	0.4927	0.4942	10.0482	21.3325	0.5141
	0.0003	0.0008	0.0050	0.0243	0.0009
02062-15D	0.0653	0.0470	-0.0058	0.0187	0.0212
070222-1MB	0.0000	0.0002	-0.0062	0.0050	0.0045
070222-1MB	0.0627	0.0000	-0.0064	0.0091	0.0209
070222-1LCS	0.0001	-0.0001	-0.0064	-0.0154	0.0101
070222-1LCS	0.0642	-0.0002	-0.0066	-0.0010	0.0211
0222-1RC	1.6304	0.0003	-0.0066	-0.0157	0.0050
14506-B1	0.0014	1.0101	-0.0066	-0.0127	0.0020
14506-B1	0.0008	0.9433	-0.0067	-0.0181	0.0167
14506-B2	0.0000	1.0098	-0.0068	-0.0277	0.0021
14506-B2	0.0007	0.9554	-0.0067	-0.0158	0.0173

Sample Id1	Ba	Sr	Y	Fe	Ni
CCV	0.5036	0.5033	10.0724	20.9468	0.5057
CCB	0.0004	0.0010	0.0073	0.0085	0.0009
I 0714506-B3	-0.0002	1.0211	-0.0060	-0.0212	0.0016
F 0714506-B3	0.0007	0.9340	-0.0062	0.0175	0.0177
I 0714506-S1	-0.0001	1.0108	-0.0063	-0.0169	0.0039
F 0714506-S1	0.0007	0.9449	-0.0064	0.0130	0.0174
I 0714506-S2	-0.0002	1.0199	-0.0067	-0.0263	0.0026
F 0714506-S2	0.0006	0.9223	-0.0066	-0.0059	0.0173
I 0714506-S3	-0.0002	1.0085	-0.0066	-0.0106	0.0023
F 0714506-S3	0.0007	0.9688	-0.0065	0.0073	0.0183
0714506-RC	-0.0002	1.0076	-0.0068	-0.0065	0.0021
I 0702061-1	0.0075	0.0605	-0.0066	0.0078	0.0055
CCV	0.4947	0.4941	10.0385	21.1385	0.5077
CCB	0.0000	0.0005	0.0010	0.0109	-0.0004
F 0702061-1	0.0646	0.0005	-0.0057	0.0131	0.0281
I RE070222-1MB	0.0000	-0.0003	-0.0062	-0.0115	0.0052
F RE070222-1MB	0.0655	-0.0002	-0.0064	-0.0020	0.0204
I RE070222-1LCS	0.0000	-0.0003	-0.0064	-0.0037	0.0049
F RE070222-1LCS	0.0677	-0.0002	-0.0066	0.0115	0.0208
I RE070222-1LCSD	-0.0001	-0.0004	-0.0066	-0.0192	0.0048
F RE070222-1LCSD	0.0641	-0.0003	-0.0068	0.0022	0.0202
RE070222-1RC	1.6003	0.0000	-0.0066	-0.0034	0.0052
CCV	0.4948	0.4965	10.0858	21.2778	0.5112
CCB	0.0002	0.0004	0.0024	0.0168	0.0004
I 0702139-1	0.1697	1.0447	0.0304	7.8570	0.0260
F 0702139-1	0.0012	0.9955	-0.0066	0.0183	0.0213
I 0702139-1D	0.1706	1.0463	0.0296	7.9080	0.0256
F 0702139-1D	0.0013	0.9756	-0.0065	0.0189	0.0209
I 0702139-2	0.0354	0.9905	-0.0054	1.9375	0.0193
F 0702139-2	0.0009	0.9455	-0.0067	0.0133	0.0205
I SR070222-1MB	0.0006	0.9989	-0.0067	0.0021	0.0166
F SR070222-1MB	0.0008	0.9774	-0.0067	0.0066	0.0207
I SR070222-1LCS	0.0007	1.0168	-0.0067	0.0099	0.0166
F SR070222-1LCS	0.0007	0.9703	-0.0068	-0.0046	0.0200
CCV	0.4946	0.4932	10.0065	21.0050	0.5048
CCB	0.0001	0.0006	0.0025	0.0129	0.0007
SR070222-1RC	0.0008	1.0146	-0.0059	0.0058	0.0175
CCV	0.4964	0.4964	10.0640	21.2203	0.5090
CCB	0.0003	0.0007	0.0043	0.0150	0.0007

PAI - Gas Flow Proportional Sample Analysis LB4100-B

Unit Type: LB4100 -B
Counting Unit ID: Aqua
High Voltage Mode: Simultaneous
Application Revision:
Application Version: Standard
Rev.12/28/03 JE

Data file name: SRB1108
Batch ID: SR070220-1
Count Presel (m): 30
Batch Ended: 11/8/07 13:40

Background logfile: BKGABW
Date of Bkg. Cal: 11/3/07
Alpha efficiency logfile: AmWipe-11/07
Alpha attenuation calibration: AAM1106
Beta efficiency logfile: Sr90F-11/07
Beta attenuation calibration: ABR1106

Alpha prog. logfile: n/a
Alpha prog. attenuation: n/a
Beta prog. logfile: n/a
Beta prog. attenuation: n/a

Alpha Attenuation Calibration		Beta Attenuation Calibration	
y = b*m^(a*(mass-x0))		y = b*m^(a*(mass-x0))	
Alpha b=	1.00740	Beta b=	1.0677
m=	0.99140	m=	0.9962
a=	0.9985	a=	0.9156
x0=	0.0000	x0=	0.0000
Alpha to Beta X-talk		Beta to Alpha X-talk	
y = b *m^-mass		y = b*mass + m	
a ->b xtalk b=	0.2200	b ->a xtalk b=	-2.43E-05
a ->b xtalk m=	0.9880	b ->a xtalk m=	0.0005

Det. ID	Sample ID	Count End Date & Time	Count Dur. (min)	Resid. Mass (mg)	Alpha Activity							Beta Activity						
					Gross CPM	Bkg. CPM	b>a xtlk CPM	Base Eff	Base Cor.Fact.	Progeny Eff	Progeny Cor.Fact.	Gross CPM	Bkg. CPM	a>b xtlk CPM	Base Eff	Base Cor.Fact.	Progeny Eff	Progeny Cor.Fact.
A1	0714506-B1MB	11/8/07 13:40	30.00	0.0	0.000	0.039	0.001	0.2848	1.007	n/a	n/a	1.167	1.421	0.0000	0.4318	1.058	n/a	n/a
A3	0714506-S1LCS	11/8/07 13:40	30.00	0.0	0.333	0.073	0.009	0.2910	1.007	n/a	n/a	17.967	1.496	0.0733	0.4530	1.058	n/a	n/a
B3	0714506-B2MB	11/8/07 13:40	30.00	0.0	0.067	0.086	0.001	0.2805	1.007	n/a	n/a	1.567	1.552	0.0147	0.4269	1.058	n/a	n/a
B4	0714506-S2LCS	11/8/07 13:40	30.00	0.0	0.167	0.104	0.006	0.2750	1.007	n/a	n/a	16.367	1.595	0.0367	0.4438	1.058	n/a	n/a
D1	0714506-B3MB	11/8/07 13:40	30.00	0.0	0.033	0.093	0.001	0.2865	1.007	n/a	n/a	1.600	1.545	0.0073	0.4328	1.058	n/a	n/a
D3	0714506-S3LCS	11/8/07 13:40	30.00	0.0	0.133	0.040	0.008	0.2861	1.007	n/a	n/a	16.533	1.767	0.0293	0.4286	1.058	n/a	n/a

W 11/8/07

PAI - Gas Flow Proportional Sample Analysis LB4100-B

Unit Type: LB4100 -B
Counting Unit ID: Aqua
High Voltage Mode: Simultaneous
Application Revision:
Application Version: Standard
Rev.12/28/03 JE

Data file name: SRB11126
Batch ID: SR070220-1
Count Presel (m): 30
2 Batch Ended: 11/12/07 11:07

Background logfile: BKGASW
Date of Bkg. Cal: 11/11/07
Alpha efficiency logfile: Am241-11/06
Alpha attenuation calibration: AAM1106
Beta efficiency logfile: Sr90F-07/07
Beta attenuation calibration: ASR1106

Alpha prog. logfile: n/a
Alpha prog. attenuation: n/a
Beta prog. logfile: n/a
Beta prog. attenuation: n/a

Alpha Attenuation Calibration		Beta Attenuation Calibration	
y = b*m^[a*(mass-x0)]		y = b*m^[a*(mass-x0)]	
Alpha b=	1.00740	Beta b=	1.0577
m=	0.99348	m=	0.9992
a=	0.9965	a=	0.9168
x0=	0.0080	x0=	0.0000
Alpha to Beta X-talk		Beta to Alpha X-talk	
y = b *m^-mass		y = b*mass + m	
a ->b xtalk b=	0.2200	b ->a xtalk b=	-2.43E-06
a ->b xtalk m=	0.9980	b ->a xtalk m=	0.0006

Det. ID	Sample ID	Count End Date & Time	Count Dur. (min)	Resid. Mass (mg)	Alpha Activity Gross CPM	Alpha Activity Bkg. CPM	Alpha Activity b>a xtlk CPM	Alpha Activity Base Eff	Alpha Activity Base Cor.Fact.	Alpha Activity Progeny Eff	Alpha Activity Progeny Cor.Fact.	Beta Activity Gross CPM	Beta Activity Bkg. CPM	Beta Activity a>b xtlk CPM	Beta Activity Base Eff	Beta Activity Base Cor.Fact.	Beta Activity Progeny Eff	Beta Activity Progeny Cor.Fact.
C1	0714506-B1MB	11/12/07 11:07	30.00	0.0	0.167	0.084	0.001	0.2711	1.007	n/a	n/a	1.900	1.577	0.0367	0.4429	1.058	n/a	n/a
C2	0714506-S1LCS	11/12/07 11:07	30.00	0.0	0.167	0.099	0.009	0.2592	1.007	n/a	n/a	18.267	1.475	0.0387	0.4353	1.058	n/a	n/a

Date 11/8/07

SOP 724r 10

Paragon Analytics

Low Background Gas Flow Proportional Counter Log

Instrument: LB4100B

Instrument Daily Response and Background Checks

Det.	Daily Response Check Start 1	Status	Start 2	Status	Background Check Start 1	Status	Start 2	Status	Det. Status
1	JH	P			JH	P			P
2									
3									
4									
5						HL			OLBW
6		LB	JH	LB		P			OLBD
7		P				HL	JH	P	P
8						P			
9									
10									
11									
12									OLBW
13									P
14									
15									
16						LB			

Det = Detector; α = Alpha; β = Beta; P = Pass; H = High; L = Low; OL = Offline; R = Recount; W = Weekly; NP = Not Processed

Weekly Background Calibration

	Current Calib. File ID	Weekly Calib. Started	Status	File ID
Dr A	BKB1102W			
Dr B	103W			
Dr C				
Dr D				

Dr = Drawer

Gas Supply

P-10 Supply		P-10 Flow	
Tank 1	1060	Dr A	0.15
		Dr B	
Tank 2	2100	Dr C	
		Dr D	

Comments:

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Form 780r8.doc (6/23/06)

Reviewed By / Date JH 11/9/07

Date 11/8/07

SOP 724r 10

Paragon Analytics

Low Background Gas Flow Proportional Counter Log

Instrument: LB4100B

Det.	Sample ID	Batch	Test	Count Dur. (min)	Start Time	Analyst Initials	File ID	Output Initials
1	0714506-B1MB	SR070220-1	Sr90	30	1301	JH	SRB1108	JH for LO
7	-B2MB							
13	-B3MB							
3	-S1LCS							
8	-S2LCS							
15	-S3LCS							
9	0710261-69	AB071105-6	αβ	90	1355	LO	ABB1108F	JH
10	-70							
11	-71							
9	0710261-710	AB071105-6	αβ	90	1539	JH	ABB1108G	LO
10	-72							
11	AB071105-6MB							
1	0710268-4	TR071102-1	Ra-Tot	500	1542	JH	TRB1108C	JH

Date 11/12/07 SOP 724r 10

Paragon Analytics

Low Background Gas Flow Proportional Counter Log

Instrument: LB4100B

Instrument Daily Response and Background Checks

Det.	Daily Response Check Start 1	Status	Start 2	Status	Background Check Start 1	Status	Start 2	Status	Det. Status
1	JH	P			JH	P			P
2					*				P
3					JH	P			OLBW
4									
5									
6									
7									P
8									
9									
10									
11									
12									
13									
14									
15		LB	JH	P					
16		P							OLBW

Det = Detector; α = Alpha; β = Beta; P = Pass; H = High; L = Low; OL = Offline; R = Recount; W = Weekly; NP = Not Processed

Weekly Background Calibration

	Current Calib. File ID	Weekly Calib. Started	Status	File ID
Dr A	BKB110 9W, 10W + 11W			
Dr B				
Dr C				
Dr D				

Dr = Drawer

Gas Supply

P-10 Supply		P-10 Flow	
Tank 1	1800	Dr A	0.15
		Dr B	
Tank 2	2100	Dr C	
		Dr D	

Comments: * Daily background not run due to weekly background being run on 11/11/07.
JH 11/11/07

Page No.: 357322 A Form 780r8.doc (6/23/06) Reviewed By / Date JH 11/12/07

Date 11/12/07 SOP 724r 10

Paragon Analytics

Low Background Gas Flow Proportional Counter Log

Instrument: LB4100B

Det.	Sample ID	Batch	Test	Count Dur. (min)	Start Time	Analyst Initials	File ID	Output Initials
1-16	Daily Eff	—	—	30	815	JH	EFB111212	JH 11/12/07
15	Daily Eff	—	—	30	835	JH	EFB1112R	JH
1,3-16	Daily BKG	—	—	60	846	JH	BKB1117	JH
1	0710140-140	SR071105-2	Sr-90	60	953	JH	SRB1112	JH
2	↓ -15	↓	↓	↓	↓	↓	↓	↓
7	↓ -16	↓	↓	↓	↓	↓	↓	↓
8	0710140-5	SR071105-1	Sr-90	60	954	JH	SRB1112A	JH
9	0711012-11	AB071109-2	LB	10	1000	JH	ABB1112	JH
10	↓ -12	↓	↓	↓	↓	↓	↓	↓
11	AB071109-2MB	↓	↓	↓	↓	↓	↓	↓
12	0711012-14	↓	↓	↓	↓	↓	↓	↓
13	↓ -19	↓	↓	↓	1003	↓	ABB1112A	JH
14	↓ -20	↓	↓	↓	↓	↓	↓	↓
15	AB071109-2LCS	↓	↓	↓	↓	↓	↓	↓
9	0711012-4	AB071109-2	LB	10	1021	JH	ABB1112B	JH
10	↓ -5	↓	↓	↓	↓	↓	↓	↓
11	↓ -~~7~~ 120	↓	↓	↓	↓	↓	↓	↓
12	↓ -~~12~~ -6	↓	↓	↓	↓	↓	↓	↓
13	0711012-24	AB071109-4	LB	10	1019	JH	ABB1112C	JH
14	↓ -27	↓	↓	↓	↓	↓	↓	↓
15	↓ -30	↓	↓	↓	↓	↓	↓	↓
13 ~~9~~	AB071105-6LCS	AB071105-6	LB	30	1044	JH	ABB1112D	JH
14 ~~10~~	AB071105-5MB	AB071105-5	LB	90	1043	JH	ABB1112E	
15 ~~4~~	0711012-31	AB071109-4	LB	10	1045	JH	ABB1112F	JH
12								JH 11/12/07
9	0714506-BLMB	SR070220-1	Sr-90	30	1037	JH	SRB1112B	JH
10	↓ -5LCS	↓	↓	↓	↓	↓	↓	↓
1	0711086-1	AB071112-1	LB	10	1117	JH	ABB1112G	JH
2	↓ -2	↓	↓	↓	↓	↓	↓	↓
7	↓ -3	↓	↓	↓	↓	↓	↓	↓
8	↓ -4	↓	↓	↓	↓	↓	↓	↓
9	↓ -5	↓	↓	↓	1118	↓	ABB1112H	JH
10	↓ -6	↓	↓	↓	↓	↓	↓	↓
11	↓ -7	↓	↓	↓	↓	↓	↓	↓
12	↓ -14	↓	↓	↓	↓	↓	↓	↓
9	0711086-11	AB071112-1	LB	10	1134	JH	ABB1112I	JH
10	↓ -12	↓	↓	↓	↓	↓	↓	↓
11	↓ -140	↓	↓	↓	↓	↓	↓	↓
12	↓ -13	↓	↓	↓	↓	↓	↓	↓
1	↓ -70	↓	↓	↓	1137	↓	ABB1112J	JH
2	↓ -8	↓	↓	↓	↓	↓	↓	↓
7	↓ -9	↓	↓	↓	↓	↓	↓	↓
8	↓ -10	↓	↓	↓	↓	↓	↓	↓
			JH 11/12/07					

Comments:

Page No.: 357322 B

(cont. from page NA B)

Form 780r8.doc (6/23/06)

Reviewed By / Date JH 11/12/07

Type: IR

Reviewed By	JRK	on	5/10/2006
Verified By		on	
Deactivated By		on	

t ID	Volume Added	Units
5	4.8422	g

inalConc	Summed Conc	Units
004.671		ppm

50
PROJECT 600.3020.50 905

Notebook No. 3020
Continued From Page

Prepare a working level dilution of 600.2613.30
at ~ 50 dpm/mL

Balance

(1) Determine density of 0.1 N HCl

Mass of 100 mL vol. flask: 68.5659 g

Lot # 061842

Mass of flask + 100 mL 0.1N HCl: 168.4196 g

Mass of 100 mL 0.1N HCl: 99.8537 g

12
↓

PROJECT 600.2613.30 Sr-90 Notebook No. 2613

Continued From Page

Transfer contents of ampoule 600 to a 125 mL glass bottle for a 1° solution.

1) Transfer ampoule 600 to a 125 mL bottle

mass of open ampoule + std. 139.6110 g

mass of empty ampoule 89.5551 g

Net mass of std. 50.0559 g

Density from following page P = 0.9978 g/mL

2) Final Activity Calculation

(1.868×10⁴ dps)(60 ppm/dps)

22,390.967 dpm

(22,279.914 dpm)(0.9978 g/mL)

50.0559

50.3054 g

CW 12/10/03

CW 12/10/03

22,341.767

= 22,230.298 dpm/mL

Sind ID: 600.2613.30

Description: Sr-90

Expiration: 12/2/04

Activity: 22341.71 dpm/mL

2s Uncertainty: 744.72 dpm/mL

Ref. Date: 12/1/01

Ref Time: N/A

Prep Date: 12/1/03 Prep by: CW

Matrix/Comp. 0.1 M HCl

Half Life (y): 2.88E+01

Sind ID: 600.2613.30

Description: Sr-90

Expiration: 11/29/05

Activity: 22341.71 dpm/mL

Requires NCR for ICPT Work

2s Uncertainty: 744.72 dpm/mL

Ref. Date: 12/1/01

Ref Time: N/A

Prep Date: 12/1/03 Prep by: CRW

Matrix/Comp. 0.1 M HCl

Half Life (y): 2.88E+01

Sind ID: 600.2613.30

Description: Sr-90

Expiration: 12/28/05

Activity: 22341.71 dpm/mL

2s Uncertainty: 744.72 dpm/mL

Ref. Date: 12/1/01

Ref Time: N/A

Prep Date: 12/1/03 Prep by: CRW

Matrix/Comp. 0.1 M HCl

Half Life (y): 2.88E+01

Requires NCR for ICPT Work

Sind ID: 600.2613.30

Description: Sr-90

Expiration: 12/27/07

Activity: 22341.71 dpm/mL

2s Uncertainty: 744.72 dpm/mL

Ref. Date: 12/1/01

Ref Time: N/A

Prep Date: 12/1/03 Prep by: CRW

Matrix/Comp. 0.1 M HCl

Half Life (y): 2.88E+01

Continued on Page

Signed Date Signed Date 12/10/03

ANALYTICS

1380 Seaboard Industrial Blvd.
Atlanta, Georgia 30318 · U.S.A.

Phone (404) 352-8677
Fax (404) 352-2837

CERTIFICATE OF CALIBRATION

Standard Radionuclide Source

PAI 00600
rec'd 12-05-01

62751-307

Sr-90 50 mL Liquid in Flame Sealed Vial

This standard radionuclide source was prepared gravimetrically from a calibrated master solution. The master solution was calibrated by the Department Des Applications Et De La Metrologie Des Rayonnements Ionisants (DAMRI), Paris, France, as Number 25931.

Radionuclide purity and calibration were checked by germanium gamma-ray spectrometry and liquid scintillation counting. The nuclear decay rate and assay date for this source are given below.

ANALYTICS maintains traceability to the National Institute of Standards and Technology through Measurements Assurance Programs as described in USNRC Reg. Guide 4.15, Revision 1.

ISOTOPE:	Sr-90
ACTIVITY (dps):	1.868 E4
HALF-LIFE:	28.79 years
CALIBRATION DATE:	December 1, 2001 12:00 EST
TOTAL UNCERTAINTY*:	5.0%

*99% Confidence Level

Impurities: γ-impurities <0.1%

50.3054 grams 0.1M HCl solution with 30 μg/g Sr carrier

Paragon Analytics

Radiochemistry Case Narrative
Gross Alpha/Beta

Los Alamos National Laboratory SMO

Dust / 08-1101

PA WO 0805078

1. This report consists of the analytical results and supporting documentation for two solid samples received by Paragon on 05/08/08.
2. The samples were prepared according to Paragon Analytics procedure PA SOP702R19.
3. The samples were analyzed for gross alpha and beta activity by gas flow proportional counting according to Paragon Analytics procedure SOP724R10. The analyses were completed on 06/16/08. Gross alpha results are referenced to ^{241}Am. Gross beta results are referenced to ^{90}Sr/Y.
4. The analysis results for these samples are reported on an 'as received' basis in units of pCi/gram.
5. These samples were flamed, as prescribed in EPA Methods 900.0 and 9310 for samples that demonstrate hygroscopicity. This could reduce the beta activity if the samples contained ^{137}Cs, or other beta emitters, that may be volatile under the conditions associated with flaming.
6. The residual mass for sample 0805078-2 exceeds the upper control limit of 100 mg. The mass attenuation curve for gross alpha/beta is calibrated to 160.9 mg for instrument B and this sample is within the calibrated range. The results for this sample are not believed to be compromised and are included in this data package. Please refer to QASS 358123 in section 6 of this report.
7. No further anomalous situations were encountered during the preparation or analysis of these samples. All remaining quality control criteria were met.

The data contained in the following report have been reviewed and approved by the personnel listed below. In addition, Paragon Analytics certifies that the analyses reported herein are true, complete and correct within the limits of the methods employed.

Linda Arend — 06/19/08
Radiochemistry Primary Reviewer — Date

Radiochemistry Final Reviewer — 6/19/08
Date

1

PARAGON ANALYTICS
Radiochemistry Data Package

Section 1

CHAIN OF CUSTODY

Paragon Analytics

Sample Number(s) Cross-Reference Table

Paragon OrderNum: 0805078
Client Name: Los Alamos National Laboratory SMO
Client Project Name: Dust
Client Project Number: 08-1101
Client PO Number: 33204-001-06 F3

Client Sample Number	Lab Sample Number	COC Number	Matrix	Date Collected	Time Collected
SFB08-08-12411	0805078-1		SOLID	16-Apr-08	
SFB08-08-12412	0805078-2		SOLID	16-Apr-08	

Wednesday, May 07, 2008

LAB CHAIN OF CUSTODY DOCUMENT NUMBER: 08-1101C

REQUEST NUMBER: 08-1101

LOS ALAMOS

NATIONAL LABORATORY

ATTN: Lance Steere

Paragon Analytics, Inc.

225 Commerce

Fort Collins, CO 80524

TURNAROUND/REPORT DUE: 6/6/2008

TURNAROUND REQ'D: 30

LAB REQUEST COMMENTS: Phils Samples 0805078

	SAMPLE ID	CTNR	CTNR DESC	ORDER	PRESERV	MATRIX
1	SFB08-08-12411	1	1 L POLY	AM241+GS+ISOPU+ISOU+SR90	None	S
	SFB08-08-12411	1	500 ML POLY	GROSSA+B	None	S
	SFB08-08-12411	1	250 ML POLY	ISO_Po	Ice	S
2	SFB08-08-12412	1	1 L POLY	AM241+GS+ISOPU+ISOU+SR90	None	S
	SFB08-08-12412	1	500 ML POLY	GROSSA+B	None	S
	SFB08-08-12412	1	250 ML POLY	ISO_Po	Ice	S

Relinquished By:		Date	Time	Received By:		Date	Time
		5/7/08	3:00	Sheri Lafferty		5/8/08	0930
Printed Name	Signature			Printed Name	Signature		
Printed Name	Signature			Printed Name	Signature		
Printed Name	Signature			Printed Name	Signature		

Received for DISPOSAL By:		Date	Time	Remarks:
Printed Name	Signature			

UEST NUMBER: 08-1101

:

r:08-1101

er:1-800-443-1511

EPR 1314 0300

PLE COMMENTS	SPECIAL INSTRUCTIONS
onitor-vacuum bag, ion LAM-0001	
onitor-furnace filter, ion LAM-0001	
onitor-vacuum bag, ion LAM-0001	
onitor-furnace filter, ion LAM-0001	
onitor-vacuum bag, ion LAM-0001	
onitor-furnace filter, ion LAM-0001	
onitor-vacuum bag, ion LAM-0001	

0805018

Wednesday, May 07, 2008

REQUEST NUMBER: 08-1101

PRIORITY	METHOD CODE	CNTNR	SAMPLE ID	SAMPLE MATRIX	DATE SAMPLED	SAMPLE COMMENTS	SPECIAL INSTRUCTIONS
	HASL-300:AM-241	1	SFB08-08-12412	S	4/16/2008	LA Monitor-furnace filter, location LAM-0001	
	HASL-300:ISOPU	1	SFB08-08-12411	S	4/16/2008	LA Monitor-vacuum bag, location LAM-0001	
		1	SFB08-08-12412	S	4/16/2008	LA Monitor-furnace filter, location LAM-0001	
	HASL-300:ISOU	1	SFB08-08-12411	S	4/16/2008	LA Monitor-vacuum bag, location LAM-0001	
		1	SFB08-08-12412	S	4/16/2008	LA Monitor-furnace filter, location LAM-0001	
	HASL-300:PO-210	1	SFB08-08-12411	S	4/16/2008	LA Monitor-vacuum bag, location LAM-0001	
		1	SFB08-08-12412	S	4/16/2008	LA Monitor-furnace filter, location LAM-0001	

Final Page of REQUEST NUMBER 08-1101

080508

CONDITION OF SAMPLE UPON RECEIPT FORM

Paragon Analytics

Client: LANL Workorder No: 0805078

Project Manager: LS Initials: SL Date: 5·8·08

1. Does this project require any **special handling** in addition to standard Paragon procedures?		YES	(NO)
2. Are custody **seals** on **shipping containers** intact?	NONE	(YES)	NO
3. Are Custody seals on **sample containers** intact?	NONE	(YES)	NO
4. Is there a **COC (Chain-of-Custody) present** or other representative documents?		(YES)	NO
5. Are the **COC and bottle labels complete and legible**?		YES	(NO)
6. Is the **COC in agreement** with samples received? (IDs, dates, times, no. of samples, no. of containers, matrix, requested analyses, etc.)		YES	(NO)
7. Were **airbills / shipping documents** present and/or removable?	DROP OFF	(YES)	NO
8. Are all aqueous **samples requiring preservation preserved correctly**? (excluding volatiles)	(N/A)	YES	NO
9. Are all aqueous **non-preserved samples pH 4-9**?	(N/A)	YES	NO
10. Is there **sufficient sample** for the requested analyses?		YES	(NO)
11. Were all samples placed in the **proper containers** for the requested analyses?		(YES)	NO
12. Are all samples within **holding times** for the requested analyses?		(YES)	NO
13. Were all sample containers received **intact**? (not broken or leaking, etc.)		(YES)	NO
14. Are all samples requiring no headspace (VOC, GRO, Rx CN/S, radon), headspace free? **Size of bubble**: ____ < green pea ____ > green pea	(N/A)	YES	NO
15. Were samples checked for and free from the presence of **residual chlorine?** (Applicable when PM has indicated samples are from a chlorinated water source; note if field preservation with sodium thiosulfate was not observed.)	(N/A)	YES	NO
16. Were the samples **shipped on ice**?		(YES)	NO
17. Were cooler temperatures measured at 0.1-6.0°C? IR gun used*: #2 #4	RAD ONLY	(YES)	NO

Cooler #:	1							
Temperature (°C):	0.8							
No. of custody seals on cooler:	1							
DOT Survey/ Acceptance Information — External µR/hr reading:	16							
Background µR/hr reading:	12							

Were external µR/hr readings ≤ two times background and within DOT acceptance criteria? (YES) / NO / NA (If no, see Form 008.)

Additional Information: PROVIDE DETAILS BELOW FOR A NO RESPONSE TO ANY QUESTION ABOVE. EXCEPT #1 AND #16

No times listed. ok
Received only (1) 500 ml poly (approx 25-30% full) for both samples.

-01 = 146g v fine dust, mix Dust? = Yes ~50% full
-02 = 34g " " " ~10% full

If applicable, was the client contacted? YES / NO / NA Contact: Joy Valdez Date/Time: 5/22

Project Manager Signature / Date: 5/22/08

*IR Gun #2: Oakton, SN 29922500201-0066 *IR Gun #4: Oakton, SN 2372220101-0002

Form 201r20.xls (12/27/07)

0805078

ORIGIN ID: SAFA (505) 665-9508
JOYLENE VALDEZ
LOS ALAMOS NATL LAB.
TA00 BLDG 1237 DPU 03

LOS ALAMOS, NM 87545
UNITED STATES US

Ship Date: 07MAY08
ActWgt: 74.0 LB MAN
System#: 0014176/CAFE2365
Account: S *********

(800) 443-1511
FedEx
Express

TO LANCE STEERE
PARAGON
225 COMMERCE

FORT COLLINS, CO 80524

16

Ref: 6b010amr2a015bcgao

Delivery Address Barcode

BILL SENDER

0.8

PRIORITY OVERNIGHT

THU
Deliver By:
08MAY08

TRK# 7209 7844 2022 Form 0201

DEN AA

80524 -CO-US

XH FTCA

2

PARAGON ANALYTICS
Radiochemistry Data Package

Section 2

SAMPLE RESULTS SUMMARY

Gross Alpha/Beta Analysis by GFPC Sample Results Summary

Client Name: Los Alamos National Laboratory SMO
Client Project Name: Dust
Client Project Number: 08-1101

Laboratory Name: Paragon Analytics
PAI Work Order: 0805078

Reported on: Thursday, June 19, 2008 10:28:26 AM

Lab Sample ID	Client Sample ID	Sample Type	Nuclide	Result +/- 1 s TPU	MDC	Units	Matrix	Prep Batch	Date Analyzed	Flags
0805078-1	SFB08-08-12411	Sample	GROSS ALPHA	3.75 +/- 0.73	1.27	pCi/g	SOLID	AB080606-4	6/16/2008	
0805078-1	SFB08-08-12411	Sample	GROSS BETA	7.40 +/- 0.86	1.71	pCi/g	SOLID	AB080606-4	6/16/2008	
0805078-2	SFB08-08-12412	Sample	GROSS ALPHA	13.0 +/- 1.6	1.5	pCi/g	SOLID	AB080606-4	6/16/2008	
0805078-2	SFB08-08-12412	Sample	GROSS BETA	12.8 +/- 1.3	2.0	pCi/g	SOLID	AB080606-4	6/16/2008	

Comments:

Data Package ID: *AB0805078-1*

Qualifiers/Flags:

U - Result is less than the sample specific MDC.

LT - Result is less than Requested MDC, greater than sample specific MDC.

Y1 - Chemical Yield is in control at 100-110%. Quantitative Yield is assumed.

Y2 - Chemical Yield outside default limits.

M - The requested MDC was not met.

M3 - The requested MDC was not met, but the reported activity is greater than the reported MDC.

Abbreviations:

TPU - Total Propagated Uncertainty (see PAI SOP 743)

MDC - Minimum Detectable Concentration (see PAI SOP 709)

BDL - Below Detection Limit

3

PARAGON ANALYTICS
Radiochemistry Data Package

Section 3

QC RESULTS SUMMARY

Gross Alpha/Beta Analysis by GFPC

PAI 724 Rev 10

Method Blank Results

Lab Name: Paragon Analytics
Work Order Number: 0805078
Client Name: Los Alamos National Laboratory SMO
ClientProject ID: Dust 08-1101

Lab ID: AB080606-4MB

Sample Matrix: SOLID
Prep SOP: PAI 702 Rev 19
Date Collected: 06-Jun-08
Date Prepared: 06-Jun-08
Date Analyzed: 16-Jun-08

Prep Batch: AB080606-4
QCBatchID: AB080606-4-1
Run ID: AB080606-4A
Count Time: 60 minutes

Final Aliquot: 2.01 g
Result Units: pCi/g
File Name: ABB0616H

CASNO	Target Nuclide	Result +/- 1 s TPU	MDC	Requested MDC	Lab Qualifier
12587-46-1	GROSS ALPHA	-0.002 +/- 0.047	0.275	3	U
12587-47-2	GROSS BETA	-0.125 +/- 0.082	0.423	4	U

Comments:

Qualifiers/Flags:

U - Result is less than the sample specific MDC.

Y1 - Chemical Yield is in control at 100-110%. Quantitative Yield is assumed.

Y2 - Chemical Yield outside default limits.

LT - Result is less than Requested MDC, greater than sample specific MDC.

Abbreviations:

TPU - Total Propagated Uncertainty (see PAI SOP 743)

MDC - Minimum Detectable Concentration (see PAI SOP 709)

BDL - Below Detection Limit

M - Requested MDC not met.

B - Analyte concentration greater than MDC.

B3 - Analyte concentration greater than MDC but less than Requested MDC.

Data Package ID: *AB0805078-1*

Gross Alpha/Beta Analysis by GFPC

PAI 724 Rev 10

Laboratory Control Sample(s)

Lab Name: Paragon Analytics
Work Order Number: 0805078
Client Name: Los Alamos National Laboratory SMO
ClientProject ID: Dust 08-1101

Lab ID: AB080606-4LCS

Sample Matrix: SOLID
Prep SOP: PAI 702 Rev 19
Date Collected: 06-Jun-08
Date Prepared: 06-Jun-08
Date Analyzed: 16-Jun-08

Prep Batch: AB080606-4
QCBatchID: AB080606-4-1
Run ID: AB080606-4A
Count Time: 60 minutes

Final Aliquot: 2.01 g
Result Units: pCi/g
File Name: ABB0616H

CASNO	Target Nuclide	Results +/- 1s TPU	MDC	Spike Added	% Rec	Control Limits	Lab Qualifier
12587-46-1	GROSS ALPHA	14.3 +/- 1.3	0.3	15.0	94.9	70 - 130	P
12587-47-2	GROSS BETA	14.7 +/- 1.2	0.7	14.8	99.2	70 - 130	P

Comments:

Qualifiers/Flags:

U - Result is less than the sample specific MDC.

LT - Result is less than Requested MDC, greater than sample specific MDC.

Y1 - Chemical Yield is in control at 100-110%. Quantitative Yield is assumed.

Y2 - Chemical Yield outside default limits.

L - LCS Recovery below lower control limit.

H - LCS Recovery above upper control limit.

P - LCS Recovery within control limits.

M - The requested MDC was not met.

M3 - The requested MDC was not met, but thereported activity is greater than the reported MDC.

Abbreviations:

TPU - Total Propagated Uncertainty (see PAI SOP 743)

MDC - Minimum Detectable Concentration (see PAI SOP 709)

Data Package ID: *AB0805078-1*

Gross Alpha/Beta Analysis by GFPC

PAI 724 Rev 10

Matrix Spike Results

Lab Name: Paragon Analytics
Work Order Number: 0805078
Client Name: Los Alamos National Laboratory SMO
ClientProject ID: Dust 08-1101

Field ID: SFB08-08-12411
Lab ID: 0805078-1MS

Analysis ReqCode: GPC-A-005

Sample Matrix: SOLID
Prep SOP: PAI 702
Date Collected: 16-Apr-08
Date Prepared: 06-Jun-08
Date Analyzed: 16-Jun-08

Prep Batch: AB080606-4
QCBatchID: AB080606-4-1
Run ID: AB080606-4A
Count Time: 60 minutes
Report Basis: As Received

Final Aliquot: 0.501 g
Prep Basis: As Received
Moisture(%): NA
Result Units: pCi/g
File Name: ABB0616G

CASNO	Target Nuclide	Matrix Spike	Sample Results	MDC	Spike Added	% Rec	Control Limits	Lab Qualifier
12587-46-1	GROSS ALPHA	16.6	3.75	1.5	15.1	85.6	70 - 130	P
12587-47-2	GROSS BETA	25.4	7.40	2.1	14.8	122	70 - 130	P

Comments:

Qualifiers/Flags:

U - Result is less than the sample specific MDC.

LT - Result is less than Requested MDC, greater than sample specific MDC.

Y1 - Chemical Yield in control at 100-110%. Quantitative yield is assumed.

Y2 - Chemical Yield outside default limits.

N - Matrix Spike Recovery outside control limits

P - Matrix Spike Recovery within control limits

M - The requested MDC was not met.

M3 - The requested MDC was not met, but thereported activity is greater than the reported MDC.

Abbreviations:

MDC - Minimum Detectable Concentration (see PAI SOP 709)

Data Package ID: *AB0805078-1*

Gross Alpha/Beta Analysis by GFPC

PAI 724 Rev 10

Duplicate Sample Results (DER)

Lab Name: Paragon Analytics
Work Order Number: 0805078
Client Name: Los Alamos National Laboratory SMO
ClientProject ID: Dust 08-1101

Field ID: SFB08-08-12411
Lab ID: 0805078-1DUP

Sample Matrix: SOLID
Prep SOP: PAI 702 Rev 19
Date Collected: 16-Apr-08
Date Prepared: 06-Jun-08
Date Analyzed: 16-Jun-08

Prep Batch: AB080606-4
QCBatchID: AB080606-4-1
Run ID: AB080606-4A
Count Time: 60 minutes
Report Basis: As Received

Final Aliquot: 0.502 g
Prep Basis: As Received
Moisture(%): NA
Result Units: pCi/g
File Name: ABB0616G

CASNO	Analyte	Sample Result +/- 1s TPU	Duplicate Result +/- 1s TPU	DER	Control Limit	Lab Qualifiers
12587-46-1	GROSS ALPHA	3.75 +/- 0.73	2.50 +/- 0.57	0.67	2.13	LT
12587-47-2	GROSS BETA	7.40 +/- 0.86	7.68 +/- 0.88	0.12	2.13	

Comments:

Duplicate Qualifiers/Flags:

U - Result is less than the sample specific MDC.
Y1 - Chemical Yield is in control at 100-110%. Quantitative yield is assumed.
Y2 - Chemical Yield outside default limits.
W - DER is greater than Warning Limit of 1.42
D - DER is greater than Control Limit of 2.13
LT - Result is less than Request MDC, greater than sample specific MDC
M - Requested MDC not met.
M3 - The requested MDC was not met, but the reported activity is greater than the reported MDC.
L - LCS Recovery below lower control limit.
H - LCS Recovery above upper control limit.
P - LCS, Matrix Spike Recovery within control limits.
N - Matrix Spike Recovery outside control limits

Abbreviations:

TPU - Total Propagated Uncertainty (see PAI SOP 743)
DER - Duplicate Error Ratio (see PAI SOP 715)
BDL - Below Detection Limit
NR - Not Reported

Data Package ID: *AB0805078-1*

PARAGON ANALYTICS
Radiochemistry Data Package

4

Section 4

INDIVIDUAL SAMPLE RESULTS

Gross Alpha/Beta Analysis by GFPC

PAI 724 Rev 10

Sample Results

Lab Name: Paragon Analytics
Work Order Number: 0805078
Client Name: Los Alamos National Laboratory SMO
ClientProject ID: Dust 08-1101

Field ID: SFB08-08-12411
Lab ID: 0805078-1

Analysis ReqCode: GPC-A-005

Sample Matrix: SOLID
Prep SOP: PAI 702 Rev 19
Date Collected: 16-Apr-08
Date Prepared: 06-Jun-08
Date Analyzed: 16-Jun-08

Prep Batch: AB080606-4
QCBatchID: AB080606-4-1
Run ID: AB080606-4A
Count Time: 60 minutes
Report Basis: As Received

Final Aliquot: 0.501 g
Prep Basis: As Received
Moisture(%): NA
Result Units: pCi/g
File Name: ABB0616G

CASNO	Target Nuclide	Result +/- 1 s TPU	MDC	Requested MDC	Lab Qualifier
12587-46-1	GROSS ALPHA	3.75 +/- 0.73	1.27	3	
12587-47-2	GROSS BETA	7.40 +/- 0.86	1.71	4	

Comments:

Qualifiers/Flags:

U - Result is less than the sample specific MDC.

Y1 - Chemical Yield is in control at 100-110%. Quantitative Yield is assumed.

Y2 - Chemical Yield outside default limits.

LT - Result is less than Requested MDC, greater than sample specific MDC.

M3 - The requested MDC was not met, but the reported activity is greater than the reported MDC.

M - The requested MDC was not met.

Abbreviations:

TPU - Total Propagated Uncertainty (see PAI SOP 743)

MDC - Minimum Detectable Concentration (see PAI SOP 709)

BDL - Below Detection Limit

Data Package ID: *AB0805078-1*

Gross Alpha/Beta Analysis by GFPC

PAI 724 Rev 10

Sample Duplicate Results

Lab Name: Paragon Analytics
Work Order Number: 0805078
Client Name: Los Alamos National Laboratory SMO
ClientProject ID: Dust 08-1101

Field ID: SFB08-08-12411
Lab ID: 0805078-1DUP

Sample Matrix: SOLID
Prep SOP: PAI 702 Rev 19
Date Collected: 16-Apr-08
Date Prepared: 06-Jun-08
Date Analyzed: 16-Jun-08

Prep Batch: AB080606-4
QCBatchID: AB080606-4-1
Run ID: AB080606-4A
Count Time: 60 minutes
Report Basis: As Received

Final Aliquot: 0.502 g
Prep Basis: As Received
Moisture(%): NA
Result Units: pCi/g
File Name: ABB0616G

CASNO	Target Nuclide	Result +/- 1 s TPU	MDC	Requested MDC	Lab Qualifier
12587-46-1	GROSS ALPHA	2.50 +/- 0.57	1.16	3	LT
12587-47-2	GROSS BETA	7.68 +/- 0.88	1.69	4	

Comments:

Qualifiers/Flags:

U - Result is less than the sample specific MDC.

Y1 - Chemical Yield is in control at 100-110%. Quantitative yield is assumed.

Y2 - Chemical Yield outside default limits.

LT - Result is less than Requested MDC, greater than sample specific MDC.

M - The requested MDC was not met.

M3 - The requested MDC was not met, but thereported activity is greater than the reported MDC.

W - DER is greater than Warning Limit of 1.42

D - DER is greater than Control Limit of 2.13

Abbreviations:

TPU - Total Propagated Uncertainty (see PAI SOP 743)

MDC - Minimum Detectable Concentration (see PAI SOP 709)

BDL - Below Detection Limit

Data Package ID: *AB0805078-1*

Gross Alpha/Beta Analysis by GFPC

PAI 724 Rev 10

Sample Results

Lab Name: Paragon Analytics
Work Order Number: 0805078
Client Name: Los Alamos National Laboratory SMO
ClientProject ID: Dust 08-1101

Field ID: SFB08-08-12412
Lab ID: 0805078-2

Analysis ReqCode: GPC-A-005

Sample Matrix: SOLID
Prep SOP: PAI 702 Rev 19
Date Collected: 16-Apr-08
Date Prepared: 06-Jun-08
Date Analyzed: 16-Jun-08

Prep Batch: AB080606-4
QCBatchID: AB080606-4-1
Run ID: AB080606-4A
Count Time: 60 minutes
Report Basis: As Received

Final Aliquot: 0.502 g
Prep Basis: As Received
Moisture(%): NA
Result Units: pCi/g
File Name: ABB0616G

CASNO	Target Nuclide	Result +/- 1 s TPU	MDC	Requested MDC	Lab Qualifier
12587-46-1	GROSS ALPHA	13.0 +/- 1.6	1.5	3	
12587-47-2	GROSS BETA	12.8 +/- 1.3	2.0	4	

Comments:

Qualifiers/Flags:

U - Result is less than the sample specific MDC.

Y1 - Chemical Yield is in control at 100-110%. Quantitative Yield is assumed.

Y2 - Chemical Yield outside default limits.

LT - Result is less than Requested MDC, greater than sample specific MDC.

M3 - The requested MDC was not met, but the reported activity is greater than the reported MDC.

M - The requested MDC was not met.

Abbreviations:

TPU - Total Propagated Uncertainty (see PAI SOP 743)

MDC - Minimum Detectable Concentration (see PAI SOP 709)

BDL - Below Detection Limit

Data Package ID: *AB0805078-1*

PARAGON ANALYTICS
Radiochemistry Data Package

5

Section 5

RAW DATA

Gross Alpha/Beta Analysis by GFPC Raw Data Report

Laboratory Name: Paragon Analytics
PAI Work Order: 0805078

Prep SOP: PAI 702
Analytical SOP: PAI 724

Reported on: Tuesday, June 17, 2008
11:43:58 AM

Sample ID QC Type	Nuclide Type	Sample Date/Time	Prep Batch QCBatchID	Ingrowth Date /Time	Decay Date/Time	Matrix %Moist.	Samp Alq Analy Alq	Inst ID Det ID	AnRunID File Name	Count Date/Time	GrossCPM BkgCPM	BaseEff ProgEff	CntDur(min) Yield	Activity +/- 1 s TPU	MDC DecLev	ReportUnits ReportBasis	DER RPD	%Spk. Recov Flags
0805078-1	GROSS ALPHA	4/16/2008	AB080606-4	NA	NA	SOLID	3 g	LB4100-B	AB080606-4A	6/16/2008	0.650	25.27%	60	3.75	1.27	pCi/g	NA	
SMP	Trg. Analyte		AB080606-4-1	NA	NA	NA	0.501 g	A3	ABB0616G	11:16 AM	0.062	NA	NA	0.73	NA	As Received	NA	
0805078-1	GROSS BETA	4/16/2008	AB080606-4	NA	NA	SOLID	3 g	LB4100-B	AB080606-4A	6/16/2008	5.183	41.16%	60	7.40	1.71	pCi/g	NA	
SMP	Trg. Analyte		AB080606-4-1	NA	NA	NA	0.501 g	A3	ABB0616G	11:16 AM	1.487	NA	NA	0.86	NA	As Received	NA	
0805078-1	GROSS ALPHA	4/16/2008	AB080606-4	NA	NA	SOLID	3.01 g	LB4100-B	AB080606-4A	6/16/2008	0.483	25.94%	60	2.50	1.16	pCi/g	0.67	
DUP	Trg. Analyte		AB080606-4-1	NA	NA	NA	0.502 g	B2	ABB0616G	11:16 AM	0.059	NA	NA	0.57	NA	As Received	NA	LT
0805078-1	GROSS BETA	4/16/2008	AB080606-4	NA	NA	SOLID	3.01 g	LB4100-B	AB080606-4A	6/16/2008	5.167	40.22%	60	7.68	1.69	pCi/g	0.12	
DUP	Trg. Analyte		AB080606-4-1	NA	NA	NA	0.502 g	B2	ABB0616G	11:16 AM	1.439	NA	NA	0.88	NA	As Received	NA	
0805078-1	GROSS ALPHA	4/16/2008	AB080606-4	NA	NA	SOLID	3 g	LB4100-B	AB080606-4A	6/16/2008	2.717	24.41%	60	16.6	1.5	pCi/g	NA	85.6
MS	Trg. Analyte		AB080606-4-1	NA	NA	NA	0.501 g	B4	ABB0616G	11:16 AM	0.089	NA	NA	1.9	NA	As Received	NA	P
0805078-1	GROSS BETA	4/16/2008	AB080606-4	NA	NA	SOLID	3 g	LB4100-B	AB080606-4A	6/16/2008	14.067	39.75%	60	25.4	2.1	pCi/g	NA	122
MS	Trg. Analyte		AB080606-4-1	NA	NA	NA	0.501 g	B4	ABB0616G	11:16 AM	1.573	NA	NA	2.3	NA	As Received	NA	P
0805078-2	GROSS ALPHA	4/16/2008	AB080606-4	NA	NA	SOLID	3.01 g	LB4100-B	AB080606-4A	6/16/2008	1.883	22.89%	60	13.0	1.5	pCi/g	NA	
SMP	Trg. Analyte		AB080606-4-1	NA	NA	NA	0.502 g	D1	ABB0616G	11:16 AM	0.068	NA	NA	1.6	NA	As Received	NA	
0805078-2	GROSS BETA	4/16/2008	AB080606-4	NA	NA	SOLID	3.01 g	LB4100-B	AB080606-4A	6/16/2008	7.900	39.28%	60	12.8	2.0	pCi/g	NA	
SMP	Trg. Analyte		AB080606-4-1	NA	NA	NA	0.502 g	D1	ABB0616G	11:16 AM	1.533	NA	NA	1.3	NA	As Received	NA	
AB080606-4	GROSS ALPHA	6/6/2008	AB080606-4	NA	NA	SOLID	3.01 g	LB4100-B	AB080606-4A	6/16/2008	0.067	22.89%	60	-0.002	0.275	pCi/g	NA	
MB	Trg. Analyte	3:53:03 PM	AB080606-4-1	NA	NA	NA	2.01 g	D1	ABB0616H	2:33 PM	0.068	NA	NA	0.047	NA	As Received	NA	U
AB080606-4	GROSS BETA	6/6/2008	AB080606-4	NA	NA	SOLID	3.01 g	LB4100-B	AB080606-4A	6/16/2008	1.300	39.28%	60	-0.125	0.423	pCi/g	NA	
MB	Trg. Analyte	3:53:03 PM	AB080606-4-1	NA	NA	NA	2.01 g	D1	ABB0616H	2:33 PM	1.533	NA	NA	0.082	NA	As Received	NA	U
AB080606-4	GROSS ALPHA	6/6/2008	AB080606-4	NA	NA	SOLID	3.01 g	LB4100-B	AB080606-4A	6/16/2008	11.917	25.56%	60	14.3	0.3	pCi/g	NA	94.9
LCS	Trg. Analyte	3:53:03 PM	AB080606-4-1	NA	NA	NA	2.01 g	D2	ABB0616H	2:33 PM	0.058	NA	NA	1.3	NA	As Received	NA	P

Comments:

Data Package ID: *AB0805078-1*

Qualifiers/Flags:

U - Result is less than the sample specific MDC.

Y1 - Chemical Yield is in control at 100-110%. Quantitative yield is assumed.

Y2 - Chemical Yield outside default limits.

W - DER is greater than Warning Limit of 1.42

D - DER is greater than Control Limit of 2.13

+ - Duplicate RPD not within limits.

LT - Result is less than Request MDC, greater than sample specific MDC

* - Aliquot Basis is 'As Received' while the Report Basis is 'Dry Weight'.

- Aliquot Basis is 'Dry Weight' while the Report Basis is 'As Received'

M - Requested MDC not met

M3 - The requested MDC was not met, but the reported activity is greater than the reported MDC.

L - LCS Recovery below lower control limit.

H - LCS Recovery above upper control limit.

P - LCS, Matrix Spike Recovery within control limits.

N - Matrix Spike Recovery outside control limits

NC - Not Calculated for duplicate results less than 5 times MDC

B - Analyte concentration greater than MDC.

B3 - Analyte concentration greater than MDC but less than Requested MDC.

Notes:

1) The Tracer results are not yield corrected (i.e. activity measured not activity added).

2) Where sample time is not available, 12:00 PM (Mountain) is used for decay correction.

Abbreviations:

TR- Tracer TA - Target Analyte

TPU - Total Propagated Uncertainty (see PAI SOP 743)

MDC - Minimum Detectable Concentration (see PAI SOP 709)

DER - Duplicate Error Ratio

BDL - Below Detection Limit

Gross Alpha/Beta Analysis by GFPC Raw Data Report

Laboratory Name: Paragon Analytics
PAI Work Order: 0805078

Prep SOP: PAI 702
Analytical SOP: PAI 724

Reported on: Tuesday, June 17, 2008
11:43:58 AM

Sample ID QC Type	Nuclide Type	Sample Date/Time	Prep Batch QCBatchID	Ingrowth Date /Time	Decay Date/Time	Matrix %Moist.	Samp Alq Analy Alq	Inst ID Det ID	AnRunID File Name	Count Date/Time	GrossCPM BkgCPM	BaseEff ProgEff	CntDur(min) Yield	Activity +/- 1 s TPU	MDC DecLev	ReportUnits ReportBasis	DER RPD	%Spk. Recov Flags
AB080606-4	GROSS BETA	6/6/2008	AB080606-4	NA	NA	SOLID	3.01 g	LB4100-B	AB080606-4A	6/16/2008	32.000	39.00%	60	14.7	0.7	pCi/g	NA	99.2
LCS	Trg. Analyte	3:53:03 PM	AB080606-4-1	NA	NA	NA	2.01 g	D2	ABB0616H	2:33 PM	1.642	NA	NA	1.2	NA	As Received	NA	P

Comments:

Data Package ID: *AB0805078-1*

Qualifiers/Flags:

U - Result is less than the sample specific MDC.

Y1 - Chemical Yield is in control at 100-110%. Quantitative yield is assumed.

Y2 - Chemical Yield outside default limits.

W - DER is greater than Warning Limit of 1.42

D - DER is greater than Control Limit of 2.13

+ - Duplicate RPD not within limits.

LT - Result is less than Request MDC, greater than sample specific MDC

* - Aliquot Basis is 'As Received' while the Report Basis is 'Dry Weight'.

\# - Aliquot Basis is 'Dry Weight' while the Report Basis is 'As Received'

M - Requested MDC not met.

M3 - The requested MDC was not met, but the reported activity is greater than the reported MDC.

L - LCS Recovery below lower control limit.

H - LCS Recovery above upper control limit.

P - LCS, Matrix Spike Recovery within control limits.

N - Matrix Spike Recovery outside control limits

NC - Not Calculated for duplicate results less than 5 times MDC

B - Analyte concentration greater than MDC.

B3 - Analyte concentration greater than MDC but less than Requested MDC.

Notes:

1) The Tracer results are not yield corrected (i.e. activity measured not activity added).

2) Where sample time is not available, 12:00 PM (Mountain) is used for decay correction.

Abbreviations:

TR- Tracer TA - Target Analyte

TPU - Total Propagated Uncertainty (see PAI SOP 743)

MDC - Minimum Detectable Concentration (see PAI SOP 709)

DER - Duplicate Error Ratio

BDL - Below Detection Limit

PAI - Gas Flow Proportional Sample Analysis LB4100-B

Unit Type: LB4100 -B
Counting Unit ID: Aqua
High Voltage Mode: Simultaneous
Application Revision: 2
Application Version: Standard
Rev.12/29/03 JE

Data file name: ABB0616G
Batch ID: AB080606-4
Count Preset (m): 60
Batch Ended: 6/16/08 12:14

Background logfile: BKGABW
Date of Bkg. Cal: 6/14/08
Alpha efficiency logfile: Am241-11/07
Alpha attenuation calibration: AAM1107
Beta efficiency logfile: Sr90R-11/07
Beta attenuation calibration: ABR1107

Alpha prog. logfile: n/a
Alpha prog. attenuation: n/a
Beta prog. logfile: n/a
Beta prog. attenuation: n/a

Alpha Attenuation Calibration		Beta Attenuation Calibration	
y = b*m^(a*(mass-x0))		y = b*m^(a*(mass-x0))	
Alpha b=	1.00000	Beta b=	1.0960
m=	0.99330	m=	0.9995
a=	0.8930	a=	1.0000
x0=	0.0000	x0=	0.0000
Alpha to Beta X-talk		Beta to Alpha X-talk	
y = b *m^-mass		y= b*mass + m	
a -> b xtalk b=	0.2960	b -> a xtalk b=	-2.90E-06
a -> b xtalk m=	0.9990	b -> a xtalk m=	0.0011

Det. ID	Sample ID	Count End Date & Time	Count Dur. (min)	Resid. Mass (mg)	Alpha Activity Gross CPM	Alpha Bkg. CPM	Alpha b>a xtlk CPM	Alpha Base Eff	Alpha Base Cor.Fact.	Alpha Progeny Eff	Alpha Progeny Cor.Fact.	Beta Activity Gross CPM	Beta Bkg. CPM	Beta a>b xtlk CPM	Beta Base Eff	Beta Base Cor.Fact.	Beta Progeny Eff	Beta Progeny Cor.Fact.
D1	0805078-2	6/16/08 12:14	60.00	101.7	1.863	0.068	0.008	0.2289	0.547	n/a	n/a	7.900	1.533	0.5125	0.3928	1.042	n/a	n/a
A3	0805078-1	6/16/08 12:14	60.00	99.0	0.650	0.062	0.003	0.2527	0.556	n/a	n/a	5.183	1.487	0.1858	0.4116	1.043	n/a	n/a
B2	0805078-1D	6/16/08 12:14	60.00	91.5	0.483	0.059	0.003	0.2594	0.581	n/a	n/a	5.167	1.438	0.1188	0.4022	1.047	n/a	n/a
B4	0805078-1MS	6/16/08 12:14	60.00	92.0	2.717	0.089	0.011	0.2441	0.579	n/a	n/a	14.067	1.573	0.7347	0.3975	1.047	n/a	n/a

JH
6/16/08

PAI - Gas Flow Proportional Sample Analysis LB4100-B

Unit Type: LB4100 -B
Counting Unit ID: Aqua
High Voltage Mode: Simultaneous
Application Revision: 2
Application Version: Standard
Rev.12/29/03 JE

Data file name: ABB0616H
Batch ID: AB080606-4
Count Preset (m): 60
Batch Ended: 6/16/08 15:32

Background logfile: BKGABW
Date of Bkg. Cal: 6/14/08
Alpha efficiency logfile: Am241-11/07
Alpha attenuation calibration: AAM1107
Beta efficiency logfile: Sr90R-11/07
Beta attenuation calibration: ABR1107

Alpha prog. logfile: n/a
Alpha prog. attenuation: n/a
Beta prog. logfile: n/a
Beta prog. attenuation: n/a

Alpha Attenuation Calibration		Beta Attenuation Calibration	
y = b*m^(a*(mass-x0))		y = b*m^(a*(mass-x0))	
Alpha b=	1.00000	Beta b=	1.0980
m=	0.99330	m=	0.9995
a=	0.9830	a=	1.0000
x0=	0.0000	x0=	0.0000
Alpha to Beta X-talk		Beta to Alpha X-talk	
y = b *m^-mass		y = b*mass + m	
a -> b xtalk b=	0.2560	b -> a xtalk b=	-2.00E-06
a -> b xtalk m=	0.9990	b -> a xtalk m=	0.0011

Det. ID	Sample ID	Count End Date & Time	Count Dur. (min)	Resid. Mass (mg)	Alpha Activity Gross CPM	Alpha Bkg. CPM	Alpha b>a xtlk CPM	Alpha Base Eff	Alpha Base Cor.Fact.	Alpha Progeny Eff	Alpha Progeny Cor.Fact.	Beta Activity Gross CPM	Beta Bkg. CPM	Beta a>b xtlk CPM	Beta Base Eff	Beta Base Cor.Fact.	Beta Progeny Eff	Beta Progeny Cor.Fact.
D1	AB080606-4MB	6/16/08 15:32	60.00	55.5	0.067	0.068	0.000	0.2289	0.719	n/a	n/a	1.380	1.533	0.0000	0.3925	1.066	n/a	n/a
D2	AB080606-4LCS	6/16/08 15:32	60.00	53.5	11.947	0.058	0.030	0.2558	0.728	n/a	n/a	32.000	1.542	3.1902	0.3908	1.067	n/a	n/a

JH 6/16/08

Date 6/16/08

SOP 724r 10

Paragon Analytics

Low Background Gas Flow Proportional Counter Log

Instrument: LB4100B

Instrument Daily Response and Background Checks

Det.	Daily Response Check Start 1	Status	Start 2	Status	Background Check Start 1	Status	Start 2	Status	Det. Status
1	JH	P			JH	P			P
2									
3									
4									OLBW NP
5		LB	JH	P		Hα	JH		
6		P				P			P
7		LB	JH	LB					OLBB
8		P	JH 6/16/08				JH 6/16/08		P
9									OLBW
10						LB	JH		OLBB
11						HB			OLBW
12						P			
13									P
14									
15		LB	JH	LB					OLBB
16		P				HB			OLBD

Det = Detector; α = Alpha; β = Beta; P = Pass; H = High; L = Low; OL = Offline; R = Recount; W = Weekly; NP = Not Processed

Weekly Background Calibration

	Current Calib. File ID	Weekly Calib. Started	Status	File ID
Dr A	BKB 0613W + 14W			
Dr B				
Dr C				
Dr D				

Dr = Drawer

Gas Supply

P-10 Supply		P-10 Flow	
Tank 1	1450	Dr A	0.15
		Dr B	
Tank 2	1100	Dr C	
		Dr D	

Comments:

Page No.: 364581 A

Form 780r8.doc (6/23/06)

Reviewed By / Date JH 6/17/08

Date 6/16/08 SOP 724r 10

Paragon Analytics

Low Background Gas Flow Proportional Counter Log

Instrument: LB4100B

Det.	Sample ID	Batch	Test	Count Dur. (min)	Start Time	Analyst Initials	File ID	Output Initials
1-16	Daily Eff	—	—	30	810	JH	EFB0616	JH
5,7,15	↓	—	—	↓	819	↓	EFB0616R	JH
1-16	Daily BKG	—	—	60	829	JH	BKB0616	JH
1	0806107-2	AB080613-2	LB	10	941	JH	AB30616	JH
2	-1							
3	-3							
6	-4							
8	-5							
13	-6							
14	-7							
1	0806107-10	AB080613-2	LB	10	956	JH	AB30616A	JH
2	-8							
3	-9							
6	-10							
8	-11							
13	-12							
14	-13							
1	0806107-110	AB080613-2	LB	10	1014	JH	AB30616B	JH
2	-14							
3	-15							
6	-16							
8	-17							
13	-18							
14	-19							

Date 6/16/08

SOP 724r 10

Paragon Analytics

Low Background Gas Flow Proportional Counter Log

Instrument: LB4100B

Det.	Sample ID	Batch	Test	Count Dur. (min)	Start Time	Analyst Initials	File ID	Output Initials
1	0805224-1	TR080610-1	RA267	30	1228	JH	TR30616	JH
2	↓ -4	↓	↓	↓	↓	↓	↓	↓
3	0806053-3							
6	TR080610-1MS							
8	↓ -1LCS							
14	↓ -1LCSD							
1	0806013-23	RA080610-1	RA228	250	1324	JH	RA30616	JH
2	↓ -24	↓	↓	↓	↓	↓	↓	↓
3	↓ -25							
6	RA080610-1MS							
8	↓ -1LCS			↓	↓	↓	↓	↓
13	↓ -1LCSD			60	1325	JH	RA30616A	JH
14	RA080605-1LCS	RA080605-1	RA228	60	1325	JH	RA30616B	JH
13	AB080606-4MB	AB080606-4	LB	60	1432	JH	ABB0616H	JH
14	↓ -4LCS	↓	↓	↓	↓	↓	↓	↓
9	Test	—	—	60	1517	JH	Test	JH
10	↓	—	—	↓	↓	↓	↓	JH
13	0805774-1	SR080530-1	SR90	60	1546	JH	SR30616B	JH
14	↓ -4	↓	↓	↓	↓	↓	↓	↓
13	SR080530-1MS	SR080530-1	SR90	60	1716	JH	SR30616C	JH
14	↓ -1LCS	↓	↓	↓	↓	↓	↓	↓
1	0806054-5	AB080609-3	LB	150	1750	JH	ABB0616I	JH
2	0806004-1	AB080611-3	LB	80	1751	JH	ABB0616J	JH
3	↓ -3	↓	↓	↓	↓	↓	↓	↓
6	↓ -6							
8	↓ -12	↓	↓	↓	↓	↓	↓	↓

JH 6/17/08

Comments:

Page No.: 364582 B

(cont. from page 364581 B)

Form 780r8.doc (6/23/06)

Reviewed By/Date JH 6/17/08

PARAGON ANALYTICS
Radiochemistry Data Package

Section 6

6

Paragon Analytics

QUALITY ASSURANCE SUMMARY SHEET

PAR W.O. # / BATCH AB080606-4

TEST 698

METHOD Prep 702.19

SOP/REV (PREP) _____

SOP/REV (ANAL) _____

Briefly document any QA or other problems or deviations associated with the analysis of samples. Problems could result from: log-in, color, odor, dilution, consistency, scheduling, equipment, or instrumentation, or may include documentation of minor deviations necessary due to unique DQO's or sample characteristics.

Sample 08050852 had a final mass of 101.7 mg which is above the UCL of 100 mg. It is, however, within the calibrated range. Data is submitted without further qualification.

DBL
6/10/08

TECHNICIAN/ANALYST _____ DATE 6/10/08

PARAGON ANALYTICS
Radiochemistry Data Package

Section 7

LABORATORY BENCH SHEETS

7

Radiochemistry Instrument Worksheet

Paragon Analytics

Prep Batch: AB080606-4

Prep Procedure: GAB

Analytical QASS / NCR? Y / (N) NA

Prep Num	LabID	QC Type	Init Atq	Fin Atq	Units	Report Units	Residual Mass (mg)	Cnt 1 File	Cnt 1 Inst/Det	Cnt 1 Pos Chk By	Cnt 2 File	Cnt 2 Inst/Det	Cnt 2 Pos Chk By	Cnt 3 File	Cnt 3 Inst/Det	Cnt 3 Pos Chk By	Notes
1	0805078-1	SMP	3.0043	0.5007	g	pCi/g	99	A3306166	43	JH							
1	0805078-1	DUP	3.0149	0.5025	g	pCi/g	91.5		6								
1	0805078-1	MS	3.0049	0.5008	g	pCi/g	92		8								
1	0805078-2	SMP	3.011	0.5018	g	pCi/g	101.7		13								
1	AB080606-4	MB	3.0077	2.0051	g	pCi/g	55.5	A3306164	13	JH							
1	AB080606-4	LCS	3.0077	2.0051	g	pCi/g	53.5		14								

JH 6/17/08

Spike Solution Information

Soln #	Nuclide	SolnID	Prep Conc	Units	Prep Date	Aliquot	Units	Pipet ID
S1	Sr-90	600.3020.82	49.357	DPM/ml	06/06/08	1	ml	RS-005
S2	AM-241	616.3020.93	100.455	DPM/ml	06/06/08	1	ml	RS-005

Sample Barcodes

0805078-1 AB080606-4PS1	0805078-1DUP AB080606-4PS2
0805078-1MS AB080606-4PS3	0805078-2 AB080606-4PS4
AB080606-4MB AB080606-4PS5	AB080606-4LCS AB080606-4PS6

Paragon Analytics

Radiochemistry Prep Worksheet

Prep Batch: AB080606-4

Prep Procedure: GAB

Reviewed By: DBC DBC **Review Date:** 6/10/2008

Non-Routine Pre-Treatment? Y / (N) **Batch:** N/A **Re-Prep?** Y / (N) **Batch:** N/A **Prep** (QASS) / **NCR?** (Y) / N 35843

Prep SOP: PAI 702 **Rev:** 19
Prep SOP: NONE
Matrix Class: solid

Prep Analyst: Derek B. Caduff
Prep Date: 6/6/2008
Prep Dept: RS

Balance: 13
Balance:

Samp Num	Prep Num	LabID	QC Type	Dish No.	Init Alq g	Fin Alq g	Prep Basis	Standards	Prep Notes
1	1	0805078-1	SMP		3.0043	0.500717	As Received		
2	1	0805078-1	DUP		3.0149	0.502483	As Received	DBC 6/10/08	
3	1	0805078-1	MS		3.0049	0.500817	As Received	S1,S2	
4	1	0805078-2	SMP		3.011	0.501833	As Received		
5	1	AB080606-4	MB		3.00765	2.0051	As Received	DBC 6/10/08	
6	1	AB080606-4	LCS		3.00765	2.0051	As Received	S1,S2	

DBC 6/10/08

DBC 6/10/08

Comments
ALL SAMPLES FLAMED. ALL SAMPLES DESICCATED AT 10:30 ON 6/10/2008.

Spiked By: Derek B. Caduff **Date:** 6/9/2008

Witnessed By: Erin Finsley **Date:** 6/9/2008

Spike solution information

Soln #	Nuclide	SolnID	Prep Conc	Units	Prep Date	Aliquot	Units	Pipet ID
S1	Sr-90	600.3020.82	49.357	DPM/ml	06/06/08	1	ml	RS-005
S2	AM-241	616.3020.93	100.455	DPM/ml	06/06/08	1	ml	RS-005

Paragon Analytics

Radiochemistry Prep Worksheet

Prep Batch: AB080606-4

Prep Procedure: GAB

Prep Batch Not Validated!!!

Reviewed By:

Review Date:

Non-Routine Pre-Treatment? Y / N **Batch:** _____ **Re-Prep? Y / N** **Batch:** _____ **Prep QASS / NCR? Y / N** _____

Prep SOP: PAI 702 **Rev:** 19
Prep SOP: NONE
Matrix Class: solid

Prep Analyst: Derek B. Caduff DBC
Prep Date: 6/6/2008
Prep Dept: RS

Balance: 13
Balance:

Samp Num	Prep Num	LabID	QC Type	Dish No.	Init Aliq g	Fin Aliq g	Prep Basis	Standards	Prep Notes
1	1	0805078-1	SMP		3.0043	3	As Received		
2	1	0805078-1	DUP		3.0149	3	As Received		
3	1	0805078-1	MS		3.0049	3	As Received	S1,S2	
4	1	0805078-2	SMP		3.011	3	As Received		
5	1	AB080606-4	MB		3.00765	3.00765	As Received		
6	1	AB080606-4	LCS		3.00765	3.00765	As Received	S1,S2	

Comments
all samples flamed. all samples desiccated @ 10:30 on 6/10/08

Spiked By: Derek B. Caduff DBC **Date:** 6/9/2008
Witnessed By: EMF **Date:** 6/9/08

Spike Solution Information

Soln #	Nuclide	SolnID	Prep Conc	Units	Prep Date	Aliquot	Units	Pipet ID
S1	Sr-90	600.3020.82	49.357	DPM/ml	06/06/08	1	ml	RS-005
S2	AM-241	616.3020.93	100.455	DPM/ml	06/06/08	1	ml	RS-005

S1 exp: 8/3/08
S2 exp: 2/16/09

Supersedes: N/A

Paragon Analytics

Radiochemistry Gravimetric Worksheet

Prep Batch: AB080606-4

Prep Procedure: **GAB**

Reviewed By: DBC DBC

Review Date: 6/10/2008

Prep Num	Planc. Num	LabID	QC Type	Test Alq (ml)	Tare Mass (g)	Initial Gross Mass (g)	Initial Net Mass (mg)	Suggested Alq (ml)	Samp Vol Available (ml)	Samp Vol Taken (ml)	Fin Gross Mass (g)	Final Net Mass (mg)	Salt Sol. Added (ml)	Flag
1	1	0805078-1	SMP	5	9.5156	9.6079	92.3	4	30	5	9.6146	99	0	
1	2	0805078-1	DUP	5	9.5087	9.6000	91.3	4	30	5	9.6002	91.5	0	
1	3	0805078-1	MS	5	9.5049	9.6012	96.3	4	30	5	9.5969	92	0	
1	4	0805078-2	SMP	5	9.5068	9.6081	101.3	4	30	5	9.6085	101.7	0	
1	5	AB080606-4	MB	5	9.4585	0.0000	0	30	30	20	9.5140	55.5	2	
1	6	AB080606-4	LCS	5	9.5119	0.0000	0	30	30	20	9.5654	53.5	2	

SAMPLE CONDITION FORM (SOLIDS)

ANALYST: DBC

ANALYSIS DATE: 6/9/08 METHOD: 6 9B

WORK ORDER	SAMPLE ID	SAMPLE CONDITION		
		Dry/Wet	TEXTURE	Remarks
080878	1	Dry	fine	Samples are dust
↓	2	↓	↓	↓

DBC 6/9/08

PARAGON ANALYTICS
Radiochemistry Data Package

Section 8

STANDARDS TRACEABILITY DOCUMENTS

8

82
PROJECT 600.3020.82 Sr-90 Notebook No. 3020
Continued From Page

Prepare a working Standard from intermediate dilution standard 600.2613.30 of approximately 50 dpm/ml.

1) Determine Density of the Diluent. Balance ID
0.1 M HCl Lot# 068039
Mass of volumetric flask: 68.2996 g #12
Mass of flask with 100 ml diluent: 168.0571 g
Net mass of diluent: 99.7575 g
$\rho = 0.9976$ g/ml

2) Determine Mass of Standard 600.2613.30

PROJECT 600.2613.30 Sr-90

Notebook No. 2613

Continued From Page ___

Transfer contents of ampoule 600 to a 125 ml

613.30

dpm/mL

dpm/mL

rep by: CRW

HCl

RG 3/9/06

ANALYTICS

1380 Seaboard Industrial Blvd.
Atlanta, Georgia 30318 · U.S.A.

Phone (404) 352-8677
Fax (404) 352-2837

CERTIFICATE OF CALIBRATION

Standard Radionuclide Source

PAI 00600
rec'd 12-05-01

62751-307

Sr-90 50 mL Liquid in Flame Sealed Vial

This standard radionuclide source was prepared gravimetrically from a calibrated master solution. The master solution was calibrated by the Department Des Applications Et De La Metrologie Des Rayonnements Ionisants (DAMRI), Paris, France, as Number 25931.

Radionuclide purity and calibration were checked by germanium gamma-ray spectrometry and liquid scintillation counting. The nuclear decay rate and assay date for this source are given below.

ANALYTICS maintains traceability to the National Institute of

Prepare a working dilution of Am-241 from Intermediate dilution 616.2382.91 of approximately 100 dpm/ml.

1) Prepare 1M HCl, 83 ml of HCl and 917 ml DI water.
lot# 070640

2) Determine density of 1M HCl. Bal.

Mass of 100 ml volumetric flask:	66.4330 g	
Mass of flask + 100ml 1M HCl:	167.8039 g	

Am-241 intermediary dilution

Prepare an intermediate dilution of 616.2382.38 by diluting with 1M HCL (Lot 43015)

(1) Determine the density of 1M HCL

mass of 100 ml Class A volumetric flask	67.5757 g (bal 1
mass of flask and 1M HCl	168.8580 g
net mass of 1M HCL	101.2823
	ρ = 1.0128 g/ml

(2) Transfer Am-241 (616.2382.38) to a 40 ml VOA vial

mass of empty VOA vial without lid & 50 ml beaker	54.0248 g (bal 1
mass of standard, transfer pipet & 50 ml beaker (initial)	95.0640 g
mass of standard, transfer pipet & 50 ml beaker after transfer)	~~74~~ 75.0076 g (corrected)
net mass of standard transferred	20.0564 g

(3) Dilute to final volume with 1M HCL

mass of empty VOA VIAL w/o lid & 50 ml beaker (from above)	54.0248 g bal 1
mass of standard, 1M HCL, VOA vial & 50 ml beaker	92.4609 g
net mass of standard	38.4361 g

(4) final activity calculation

$$\frac{\overset{\text{SD}}{\cancel{81.103}}\ (\overset{52,128.96}{\cancel{52,066}}\ \text{dpm/g})(20.0564\ \text{g})}{38.4361\ \text{g}} = \overset{\text{MC}\ 11/1/07}{\cancel{27168.64}}\ \text{dpm/g}$$

27,201.49

Continued on Page

Read and Understood By

C Moncavage	4/25/03	Renee Gallegos	5/5/03
Signed	Date	Signed	Date

ANALYTICS
1380 Seaboard Industrial Blvd.
Atlanta, Georgia 30318 U.S.A.
Phone (404) 352-8677
Fax (404) 352-2837

PAI.FO 0616
rec'd 4-22-02

CERTIFICATE OF CALIBRATION

Standard Radionuclide Source

63651-307

Am-241 5 mL Liquid in Flame Sealed Vial

This standard radionuclide source was prepared gravimetrically from a calibrated master solution. The master solution was calibrated by liquid scintillation counting.

Radionuclide purity and calibration were checked by germanium gamma-ray spectrometry and liquid scintillation counting. The nuclear decay rate and assay date for this source are given below.

ANALYTICS maintains traceability to the National Institute of Standards and Technology through Measurements Assurance Programs

PARAGON ANALYTICS
Radiochemistry Data Package

Section 9

ADDITIONAL SUPPORTING DOCUMENTATION

9

Gas Proportional Counter

Instrument Calibration

Background Calibration

LB4100-B Weekly Instrument Calibration and Check
Background Determinations

Detector ID	Alpha CPM	Alpha LCL	Alpha UCL	Alpha Flag	Beta CPM	Beta LCL	Beta UCL	Beta Flag	Detector ID
A1 (01)	0.055	0.03727	0.076	PASS	1.443	1.326	1.523	PASS	A1 (01)
A2 (02)	0.086	0.04705	0.105	PASS	1.341	1.218	1.585	PASS	A2 (02)
A3 (03)	0.062	0.03370	0.082	PASS	1.487	1.252	1.553	PASS	A3 (03)
A4 (04)	0.062	0.03284	0.073	PASS	1.618	1.310	1.600	FLAG-HIGH	A4 (04)
B1 (05)	0.058	0.02459	0.073	PASS	1.709	1.388	1.622	FLAG-HIGH	B1 (05)
B2 (06)	0.059	0.04129	0.106	PASS	1.439	1.295	1.534	PASS	B2 (06)
B3 (07)	0.080	0.04493	0.103	PASS	1.478	1.272	1.735	PASS	B3 (07)
B4 (08)	0.089	0.03382	0.151	PASS	1.573	1.390	1.672	PASS	B4 (08)
C1 (09)	0.066	0.03258	0.100	PASS	1.422	1.487	1.661	FLAG-LOW	C1 (09)
C2 (10)	0.086	0.02752	0.107	PASS	1.532	1.360	1.609	PASS	C2 (10)
C3 (11)	0.044	0.03644	0.085	PASS	2.225	1.413	1.743	FLAG-HIGH	C3 (11)
C4 (12)	0.078	0.02405	0.112	PASS	1.561	1.574	1.902	FLAG-LOW	C4 (12)
D1 (13)	0.068	0.04533	0.114	PASS	1.533	1.359	1.678	PASS	D1 (13)
D2 (14)	0.058	0.02718	0.129	PASS	1.642	1.422	1.786	PASS	D2 (14)
D3 (15)	0.052	0.01718	0.103	PASS	1.771	1.524	1.914	PASS	D3 (15)
D4 (16)	**0.074**	**0.00813**	**0.155**	**PASS**	**3.373**	**1.069**	**4.387**	**PASS**	**D4 (16)**

– See recount file BKB0614W JH 6/14/08

Reviewed by: JH Date: 6/14/08

Control Limits set 02/8/07
LJO 2/8/07

BKB0613W.XLD

Printed 6/14/08 8:29 AM

LB4100-B Weekly Instrument Calibration and Check
Background Determinations

Detector ID	Alpha CPM	Alpha LCL	Alpha UCL	Alpha Flag	Beta CPM	Beta LCL	Beta UCL	Beta Flag	Detector ID
A1 (01)	#REF!	0.03727	0.076	#REF!	#REF!	1.326	1.523	#REF!	A1 (01)
A2 (02)	#REF!	0.04705	0.105	#REF!	#REF!	1.218	1.585	#REF!	A2 (02)
A3 (03)	#REF!	0.03370	0.082	#REF!	#REF!	1.252	1.553	#REF!	A3 (03)
A4 (04)	0.047	0.03284	0.073	PASS	1.627	1.310	1.600	FLAG-HIGH	A4 (04)
B1 (05)	0.042	0.02459	0.073	PASS	1.727	1.388	1.622	FLAG-HIGH	B1 (05)
B2 (06)	#REF!	0.04129	0.106	#REF!	#REF!	1.295	1.534	#REF!	B2 (06)
B3 (07)	#REF!	0.04493	0.103	#REF!	#REF!	1.272	1.735	#REF!	B3 (07)
B4 (08)	#REF!	0.03382	0.151	#REF!	#REF!	1.390	1.672	#REF!	B4 (08)
C1 (09)	0.049	0.03258	0.100	PASS	1.485	1.487	1.661	FLAG-LOW	C1 (09)
C2 (10)	#REF!	0.02752	0.107	#REF!	#REF!	1.360	1.609	#REF!	C2 (10)
C3 (11)	0.060	0.03644	0.085	PASS	3.881	1.413	1.743	FLAG-HIGH	C3 (11)
C4 (12)	0.060	0.02405	0.112	PASS	1.541	1.574	1.902	FLAG-LOW	C4 (12)
D1 (13)	#REF!	0.04533	0.114	#REF!	#REF!	1.359	1.678	#REF!	D1 (13)
D2 (14)	#REF!	0.02718	0.129	#REF!	#REF!	1.422	1.786	#REF!	D2 (14)
D3 (15)	#REF!	0.01718	0.103	#REF!	#REF!	1.524	1.914	#REF!	D3 (15)
D4 (16)	#REF!	0.00813	0.155	#REF!	#REF!	1.069	4.387	#REF!	D4 (16)

offline JH 6/15/08

Reviewed by: JH Date: 6/15/08

Control Limits set 02/8/07
LJO 2/8/07

BKB0614W.XLD

Printed 6/15/08 8:23 AM

Gas Proportional Counter

Quality Control Data

Daily Background Checks

LB4100-B Daily Instrument Performance Checks
Background Checks

Detector ID	Alpha CPM	Alpha LCL	Alpha UCL	Alpha Flag	Beta CPM	Beta LCL	Beta UCL	Beta Flag	Detector ID
A1 (01)	0.083	-0.036	0.146	PASS	1.433	0.978	1.908	PASS	A1 (01)
A2 (02)	0.067	-0.028	0.200	PASS	1.500	0.893	1.789	PASS	A2 (02)
A3 (03)	0.083	-0.034	0.158	PASS	1.033	1.015	1.959	PASS	A3 (03)
A4 (04)	0.067	-0.037	0.131	PASS	1.550	1.133	2.121	PASS	A4 (04)
B1 (05)	0.133	-0.037	0.121	FLAG-HIGH	1.883	1.218	2.236	PASS	B1 (05)
B2 (06)	0.067	-0.035	0.153	PASS	1.283	0.974	1.904	PASS	B2 (06)
B3 (07)	0.050	-0.030	0.190	PASS	1.250	1.007	1.949	PASS	B3 (07)
B4 (08)	0.067	-0.027	0.205	PASS	1.350	1.087	2.059	PASS	B4 (08)
C1 (09)	0.067	-0.037	0.135	PASS	1.467	1.013	1.957	PASS	C1 (09)
C2 (10)	0.083	-0.028	0.200	PASS	1.033	1.053	2.011	FLAG-LOW	C2 (10)
C3 (11)	0.033	-0.035	0.155	PASS	126.400	3.118	4.644	FLAG-HIGH	C3 (11)
C4 (12)	0.017	-0.035	0.155	PASS	1.500	1.060	2.022	PASS	C4 (12)
D1 (13)	0.067	-0.033	0.169	PASS	1.417	1.053	2.013	PASS	D1 (13)
D2 (14)	0.117	-0.035	0.151	PASS	1.700	1.146	2.138	PASS	D2 (14)
D3 (15)	0.083	-0.036	0.140	PASS	1.650	1.256	2.286	PASS	D3 (15)
D4 (16)	0.050	-0.031	0.179	PASS	6.450	2.662	4.084	FLAG-HIGH	D4 (16)

offline JH 6/16/08

Reviewed by: JH Date: 6/16/08

Control limits established from prevoius weekly background determinations.
Weekly Background File: BKB0613W Date: 6/13/08 Analyst: LJO
BKB0614W 6/14/08 JJH

BKB0616.XLD

Printed 6/16/08 9:34 AM

LB4100-B Daily Instrument Performance Checks
Background Checks

Detector ID	Alpha CPM	Alpha LCL	Alpha UCL	Alpha Flag	Beta CPM	Beta LCL	Beta UCL	Beta Flag	Detector ID
A1 (01)	0.017	-0.036	0.146	PASS	1.533	0.978	1.908	PASS	A1 (01)
A2 (02)	0.067	-0.028	0.200	PASS	1.500	0.893	1.789	PASS	A2 (02)
A3 (03)	0.033	-0.034	0.158	PASS	1.833	1.015	1.959	PASS	A3 (03)
A4 (04)	0.067	-0.037	0.131	PASS	1.500	1.133	2.121	PASS	A4 (04)
B1 (05)	0.033	-0.037	0.121	PASS	5.317	1.218	2.236	FLAG-HIGH	B1 (05)
B2 (06)	0.117	-0.035	0.153	PASS	1.533	0.974	1.904	PASS	B2 (06)
B3 (07)	0.050	-0.030	0.190	PASS	1.583	1.007	1.949	PASS	B3 (07)
B4 (08)	0.067	-0.027	0.205	PASS	1.517	1.087	2.059	PASS	B4 (08)
C1 (09)	0.067	-0.037	0.135	PASS	1.617	1.013	1.957	PASS	C1 (09)
C2 (10)	0.067	-0.028	0.200	PASS	1.083	1.053	2.011	PASS	C2 (10)
C3 (11)	0.017	-0.035	0.155	PASS	1497.217	3.118	4.644	FLAG-HIGH	C3 (11)
C4 (12)	0.067	-0.035	0.155	PASS	1.633	1.060	2.022	PASS	C4 (12)
D1 (13)	0.167	-0.033	0.169	PASS	1.850	1.053	2.013	PASS	D1 (13)
D2 (14)	0.183	-0.035	0.151	FLAG-HIGH	1.700	1.146	2.138	PASS	D2 (14)
D3 (15)	0.100	-0.036	0.140	PASS	1.800	1.256	2.286	PASS	D3 (15)
D4 (16)	0.067	-0.031	0.179	PASS	8.517	2.662	4.084	FLAG-HIGH	D4 (16)

—See recount file BKB0617R JH 6/17/08

Reviewed by: JH Date: 6/17/08

Control limits established from prevoius weekly background determinations.
Weekly Background File: BKB0613W Date: 6/13/08 Analyst: LJO
BKB0614W 6/14/08 JJH

LB4100-B Daily Instrument Performance Checks
Background Checks

Detector ID	Alpha CPM	Alpha LCL	Alpha UCL	Alpha Flag	Beta CPM	Beta LCL	Beta UCL	Beta Flag	Detector ID
A1 (01)	#REF!	#REF!	#REF!	#REF!	#REF!	#REF!	#REF!	#REF!	A1 (01)
A2 (02)	#REF!	#REF!	#REF!	#REF!	#REF!	#REF!	#REF!	#REF!	A2 (02)
A3 (03)	#REF!	#REF!	#REF!	#REF!	#REF!	#REF!	#REF!	#REF!	A3 (03)
A4 (04)	#REF!	#REF!	#REF!	#REF!	#REF!	#REF!	#REF!	#REF!	A4 (04)
B1 (05)	0.033	-0.037	0.121	PASS	5.767	1.218	2.236	FLAG-HIGH	B1 (05)
B2 (06)	#REF!	#REF!	#REF!	#REF!	#REF!	#REF!	#REF!	#REF!	B2 (06)
B3 (07)	#REF!	#REF!	#REF!	#REF!	#REF!	#REF!	#REF!	#REF!	B3 (07)
B4 (08)	#REF!	#REF!	#REF!	#REF!	#REF!	#REF!	#REF!	#REF!	B4 (08)
C1 (09)	#REF!	#REF!	#REF!	#REF!	#REF!	#REF!	#REF!	#REF!	C1 (09)
C2 (10)	#REF!	#REF!	#REF!	#REF!	#REF!	#REF!	#REF!	#REF!	C2 (10)
C3 (11)	0.033	-0.035	0.155	PASS	1349.783	3.118	4.644	FLAG-HIGH	C3 (11)
C4 (12)	#REF!	#REF!	#REF!	#REF!	#REF!	#REF!	#REF!	#REF!	C4 (12)
D1 (13)	#REF!	#REF!	#REF!	#REF!	#REF!	#REF!	#REF!	#REF!	D1 (13)
D2 (14)	0.067	-0.035	0.151	PASS	1.900	1.146	2.138	PASS	D2 (14)
D3 (15)	#REF!	#REF!	#REF!	#REF!	#REF!	#REF!	#REF!	#REF!	D3 (15)
D4 (16)	0.100	-0.031	0.179	PASS	8.433	2.662	4.084	FLAG-HIGH	D4 (16)

– offline JH 6/17/08

Reviewed by: JH Date: 6/17/08

Control limits established from prevoius weekly background determinations.
Weekly Background File: BKB0613W Date: 6/13/08 Analyst: LJO
BKB0614W 6/14/08 JJH

BKB0617R.XLD

Printed 6/17/08 12:15 PM

Gas Proportional Counter

Quality Control Data

Daily Instrument Performance Checks

Beta UCL	Flag	Detector ID
0.8809	PASS	A1 (01)
0.8781	PASS	A2 (02)
0.8923	PASS	A3 (03)
0.8543	PASS	A4 (04)
0.8843	FLAG-LOW	B1 (05)
0.8621	PASS	B2 (06)
0.8963	FLAG-LOW	B3 (07)
0.8644	PASS	B4 (08)
0.8761	PASS	C1 (09)
0.8678	PASS	C2 (10)
0.8528	PASS	C3 (11)
0.8391	PASS	C4 (12)
0.8781	PASS	D1 (13)
0.8914	PASS	D2 (14)
0.8752	FLAG-LOW	D3 (15)
0.9052	PASS	D4 (16)

Date: 6/14/08

LB4100 - B

Daily Instrument Performance Check
Efficiency Determinations

Detector ID	Alpha Eff.	Alpha LCL	Alpha UCL	Alpha Flag	Beta Eff.	Beta LCL	Beta UCL	Beta Flag	Detector ID
A1 (01)	#VALUE!	0.2375	0.2635	#VALUE!	#VALUE!	0.8206	0.8809	#VALUE!	A1 (01)
A2 (02)	#VALUE!	0.2346	0.2572	#VALUE!	#VALUE!	0.8159	0.8781	#VALUE!	A2 (02)
A3 (03)	#VALUE!	0.2349	0.2601	#VALUE!	#VALUE!	0.8334	0.8923	#VALUE!	A3 (03)
A4 (04)	#VALUE!	0.2329	0.2642	#VALUE!	#VALUE!	0.8018	0.8543	#VALUE!	A4 (04)
B1 (05)	0.2494	0.2370	0.2643	PASS	0.8256	0.8184	0.8843	PASS	B1 (05)
B2 (06)	#VALUE!	0.2197	0.2472	#VALUE!	#VALUE!	0.8085	0.8621	#VALUE!	B2 (06)
B3 (07)	0.2412	0.2338	0.2635	PASS	0.8301	0.8402	0.8963	FLAG-LOW	B3 (07)
B4 (08)	#VALUE!	0.2217	0.2606	#VALUE!	#VALUE!	0.8055	0.8644	#VALUE!	B4 (08)
C1 (09)	#VALUE!	0.2388	0.2675	#VALUE!	#VALUE!	0.8152	0.8761	#VALUE!	C1 (09)
C2 (10)	#VALUE!	0.2255	0.2581	#VALUE!	#VALUE!	0.7940	0.8678	#VALUE!	C2 (10)
C3 (11)	#VALUE!	0.2304	0.2565	#VALUE!	#VALUE!	0.7780	0.8528	#VALUE!	C3 (11)
C4 (12)	#VALUE!	0.2215	0.2456	#VALUE!	#VALUE!	0.7598	0.8391	#VALUE!	C4 (12)
D1 (13)	#VALUE!	0.2305	0.2610	#VALUE!	#VALUE!	0.8130	0.8781	#VALUE!	D1 (13)
D2 (14)	#VALUE!	0.2371	0.2689	#VALUE!	#VALUE!	0.8125	0.8914	#VALUE!	D2 (14)
D3 (15)	0.2499	0.2411	0.2674	PASS	0.7977	0.8094	0.8752	FLAG-LOW	D3 (15)
D4 (16)	#VALUE!	0.2379	0.2630	#VALUE!	#VALUE!	0.8401	0.9052	#VALUE!	D4 (16)

-Offline JH 6/16/08

Reviewed by: JH Date: 6/16/08

Control Limits Established 02/5/2007. LJO

EFB0616R.XLD

Printed 6/16/08 8:27 AM

etector ID
A1 (01)
A2 (02)
A3 (03)
A4 (04)
B1 (05)
B2 (06)
B3 (07)
B4 (08)
C1 (09)
C2 (10)
C3 (11)
C4 (12)
D1 (13)
D2 (14)
D3 (15)
D4 (16)

LB4100 - B

Daily Instrument Performance Check
Efficiency Determinations

Alpha				Beta				Detector
Eff.	LCL	UCL	Flag	Eff.	LCL	UCL	Flag	ID
LUE!	0.2375	0.2635	#VALUE!	#VALUE!	0.8206	0.8809	#VALUE!	A1 (01)
LUE!	0.2346	0.2572	#VALUE!	#VALUE!	0.8159	0.8781	#VALUE!	A2 (02)
LUE!	0.2349	0.2601	#VALUE!	#VALUE!	0.8334	0.8923	#VALUE!	A3 (03)
LUE!	0.2329	0.2642	#VALUE!	#VALUE!	0.8018	0.8543	#VALUE!	A4 (04)
LUE!	0.2370	0.2643	#VALUE!	#VALUE!	0.8184	0.8843	#VALUE!	B1 (05)
LUE!	0.2197	0.2472	#VALUE!	#VALUE!	0.8085	0.8621	#VALUE!	B2 (06)
443	0.2338	0.2635	PASS	0.8236	0.8402	0.8963	FLAG-LOW	B3 (07)
LUE!	0.2217	0.2606	#VALUE!	#VALUE!	0.8055	0.8644	#VALUE!	B4 (08)
LUE!	0.2388	0.2675	#VALUE!	#VALUE!	0.8152	0.8761	#VALUE!	C1 (09)
LUE!	0.2255	0.2581	#VALUE!	#VALUE!	0.7940	0.8678	#VALUE!	C2 (10)
462	0.2304	0.2565	PASS	1.5012	0.7780	0.8528	FLAG-HIGH	C3 (11)
LUE!	0.2215	0.2456	#VALUE!	#VALUE!	0.7598	0.8391	#VALUE!	C4 (12)
389	0.2305	0.2610	PASS	0.8141	0.8130	0.8781	PASS	D1 (13)
482	0.2371	0.2689	PASS	0.8421	0.8125	0.8914	PASS	D2 (14)
483	0.2411	0.2674	PASS	0.8148	0.8094	0.8752	PASS	D3 (15)
LUE!	0.2379	0.2630	#VALUE!	#VALUE!	0.8401	0.9052	#VALUE!	D4 (16)

H 6/17/08

d by: JH Date: 6/17/08

Control Limits Established 02/5/2007. LJO

Printed 6/17/08 8:28 AM

Gas Proportional Counter

Instrument Calibration

Initial Efficiency Calibration
Standards Traceability

Instrument: LB4100-B Drawers A, B and D

Calibration: Gross Alpha / Beta

Date of Calibration: 11/08/2007

Efficiency Log Files: Am241R-11/07
Sr90R-11/07

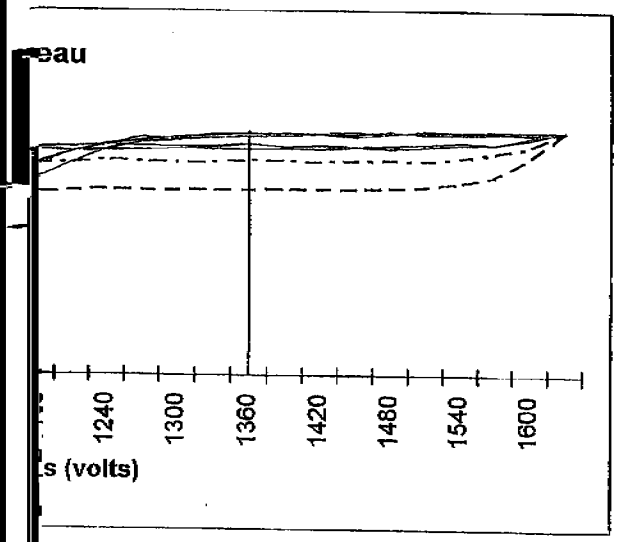
Efficiency Files: EAM1107, B; EAM1108
ESR1107, B; ESR1108

OK
MC
11/23/07

Source ID's: Am-241 – 585.1320.27
Sr-90 – 777.3020.11

Instrument Plateaus

Unit Id: Aqua
Application Revision: 2
Application Version: Standard



voltage: 1357.5

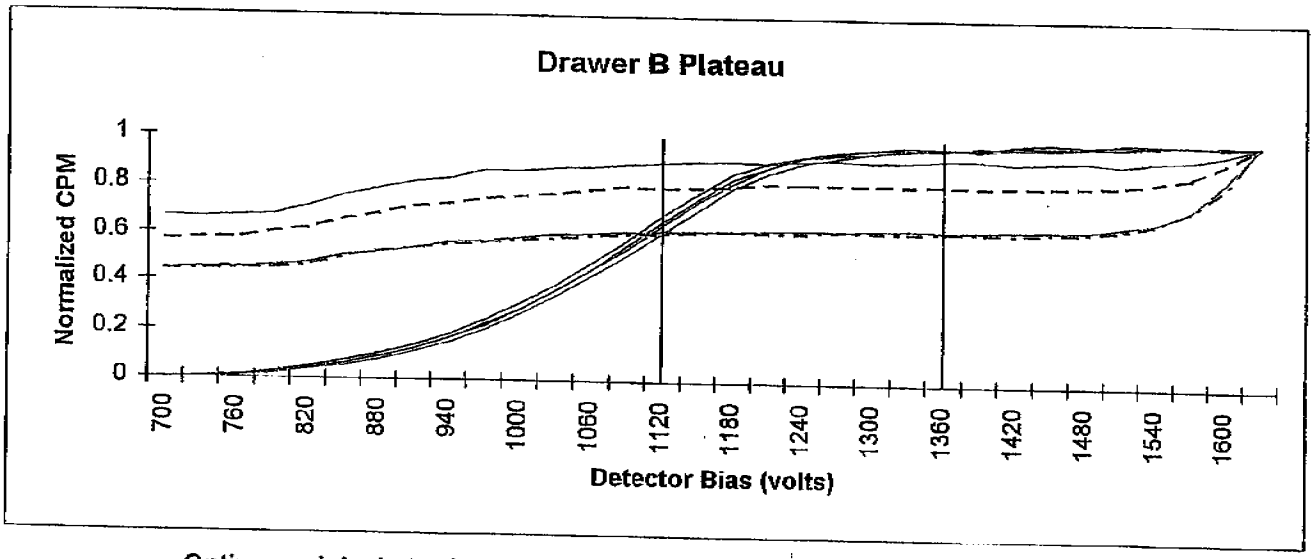
voltage: 1150

A3	A4
1.72%	0.92%
0.24%	0.47%
3.45%	0.50%

5:40 PM

Unit Type: LB4100/W
Date Performed: 11/6/07 10:11
FileName: PTB1106B
Batch ID: PLATEAU

Unit Id: Aqua
Application Revision: 2
Application Version: Standard



Optimum alpha beta simultaneous operating voltage: 1367.5

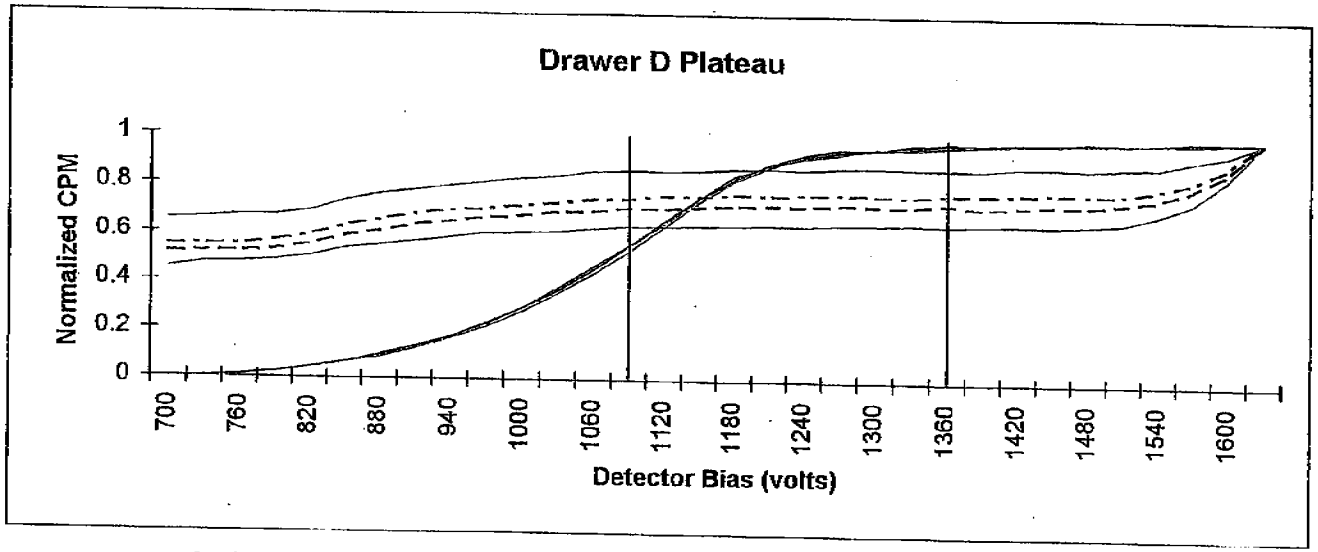
Optimum alpha only operating voltage: 1120

	B1	B2	B3	B4
Beta slope at beta voltage	1.59%	1.87%	2.27%	2.56%
Alpha slope at beta voltage	0.61%	-0.09%	0.13%	0.17%
Alpha slope at alpha voltage	2.65%	1.46%	2.06%	3.21%

Printed 11/6/07 5:40 PM

Unit Type: LB4100/W
Date Performed: 11/7/07 09:36
FileName: PTB1107D
Batch ID: PLATEAU

Unit Id: Aqua
Application Revision: 2
Application Version: Standard



Optimum alpha beta simultaneous operating voltage: 1357.5

Optimum alpha only operating voltage: 1090

	D1	D2	D3	D4
Beta slope at beta voltage	2.11%	3.05%	2.40%	1.91%
Alpha slope at beta voltage	0.44%	0.03%	0.31%	1.23%
Alpha slope at alpha voltage	3.50%	3.30%	2.16%	3.43%

Printed 11/8/07 9:50 AM

Date 11/6/07

SOP 724r 10

Paragon Analytics
Low Background Gas Flow Proportional Counter Log
Instrument: LB4100B

Instrument Daily Response and Background Checks

Det.	Daily Response Check Start 1	Status	Start 2	Status	Background Check Start 1	Status	Start 2	Status	Det. Status
1	JH	P			JH	P			P
2									
3									
4									
5									OLBW
6									P
7									
8									
9									
10		LB	JH	P					
11		P							
12									OLBW
13									P
14									
15									
16									

Det = Detector; α = Alpha; β = Beta; P = Pass; H = High; L = Low; OL = Offline; R = Recount; W = Weekly; NP = Not Processed

Weekly Background Calibration

	Current Calib. File ID	Weekly Calib. Started	Status	File ID
Dr A	BKB1102W ~~+03W~~	JH 11/6/07		
Dr B	+03W			
Dr C				
Dr D				

Dr = Drawer

Gas Supply

P-10 Supply		P-10 Flow	
Tank 1	1000	Dr A	0.15
		Dr B	
Tank 2	700	Dr C	
		Dr D	

Comments:

Page No.: 357312 A

Form 780r8.doc (6/23/06)

Reviewed By / Date JH 11/7/07

Date 11/6/07

SOP 724r 16

Paragon Analytics

Low Background Gas Flow Proportional Counter Log

Instrument: LB4100B

Date 11/7/07

SOP 724r 10

Paragon Analytics

Low Background Gas Flow Proportional Counter Log

Instrument: LB4100B

Instrument Daily Response and Background Checks

Det.	Daily Response Check Start 1	Status	Start 2	Status	Background Check Start 1	Status	Start 2	Status	Det. Status
1	JH	P			JH	P			P
2									
3									
4									
5									OLBW
6									P
7									
8									
9									
10									
11						HL	JH	P	
12						P			OLBW
13									P
14									
15									
16									

Date 11/7/07 SOP 724r 10

Paragon Analytics

Low Background Gas Flow Proportional Counter Log

Instrument: LB4100B

Det.	Sample ID	Batch	Test	Count Dur. (min)	Start Time	Analyst Initials	File ID	Output Initials
1-16	Daily Eff	—	—	30	806	JH	EFB1107	JH
1-16	Daily BKG	—	—	60	818	JH	BKB1107	JH
11	Daily BKG	—	—	60	931	JH	BKB1107R	JH
9	0710261-360	AB071105-5	α-β	90	930	JH	ABB1107	JH
10	↓ -37	↓	↓	↓	↓	↓	↓	↓
13-16	AIPHA/BETA	Plateau	α,β	5 step	937	JH	PTB1107D	MC FOR JH
~~1-4~~	~~Am241 eff~~	~~Am241~~			~~952~~			
1	0615044-52	Am241eff.R	~~α~~ 1172	75	952	JH	EAM1107	JH
2	↓ -53	↓	↓	↓	↓	↓	↓	↓
3	↓ -54	↓	↓	↓	↓	↓	↓	↓
4	↓ -55	↓	↓	↓	↓	↓	↓	↓
5	0615044-52	Am241EffR	1172	75	1014	JH	EAM1107B	JH
6	↓ -53	↓	↓	↓	↓	↓	↓	↓
7	↓ -54	↓	↓	↓	↓	↓	↓	↓
8	↓ -55	↓	↓	↓	↓	↓	↓	↓

JH 11/7/07

JH 11/7/07

MC 11/19/07

JH 11/7/07

JH
11/6/07 Drawers A, B and D Calibration

Plateaus for Drawers A, B + D

Source β used:	Detectors	Source α used:
Sr/Y 90 - 406	A1 B1 D1	410 - Am 241
29,600 dpm - 407	A2 B2 D2	411 - 17,800 dpm
9/15/02 - 408	A3 B3 D3	412 - 2/06/95
↓ - 409	A4 B4 D4	413 - ↓

Parameters:

Start Voltage: 700
Ending Voltage: 1650
30 volts/step
5 min/step
40,000 count preset

Filenames:

PTB1106A, B
PTB1107D

*note: Plateau voltage did not change therefore historical limits are still in place.

JH
11/7/07 Am241 Calibration on a Ringed Planchet (Drawers A, B + D)

Benchsheet: 2904486A Source ID: 1172

Logfile Am241 11/07

Source:	Detectors	Filenames:
06150044 - 52	A1 B1 D1	EAM1107, B
↓ - 53	A2 B2 D2	EAM1108
- 54	A3 B3 D3	
- 55	A4 B4 D4	

Continued on Page

Read and Understood By

Signed 11/6/07 Date Signed 11/24/07 Date

Instrument ROIs

DISCRIMINATOR SETTINGS

Batch Specific:

	Event	Recycle
Aqua	1	0.01

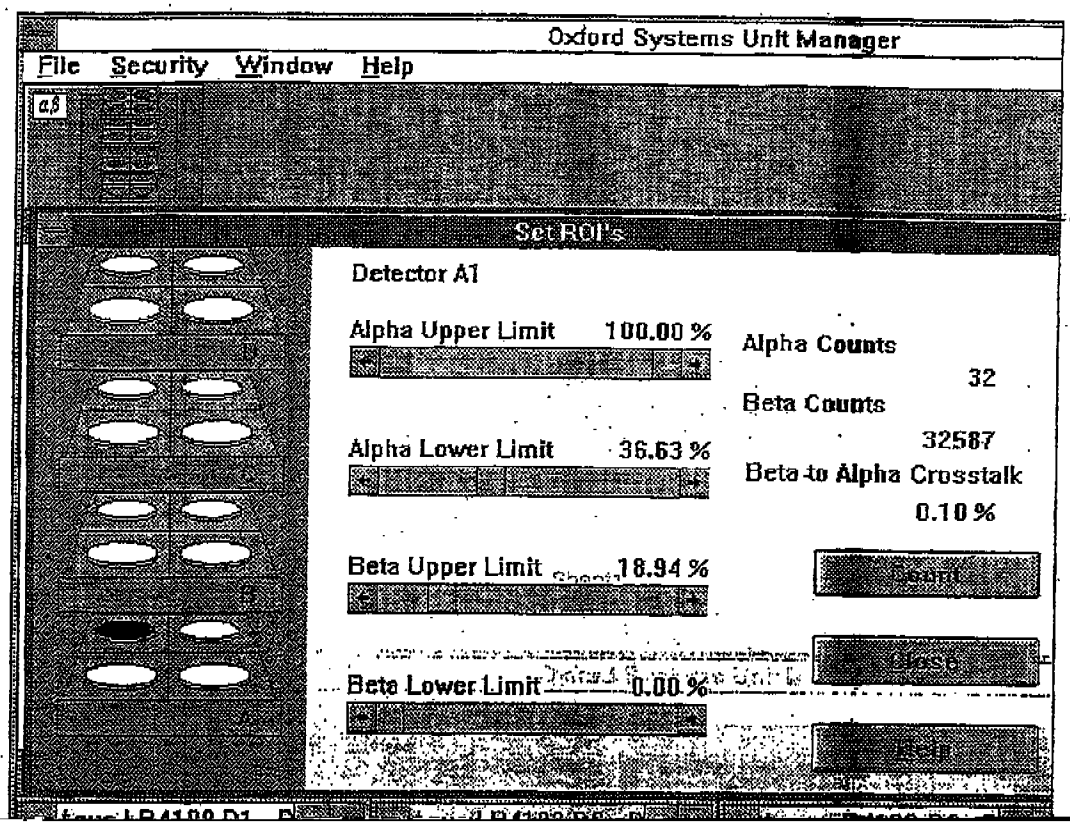
Drawer Specific:

	Date/Time	Official	Bias	Step
A	11-6-06 15:37	TRUE	1357.5	0
B	11-6-06 15:38	TRUE	1357.5	0
C	5-17-07 10:55	TRUE	1447.5	0
D	11-8-06 16:05	TRUE	1360	0

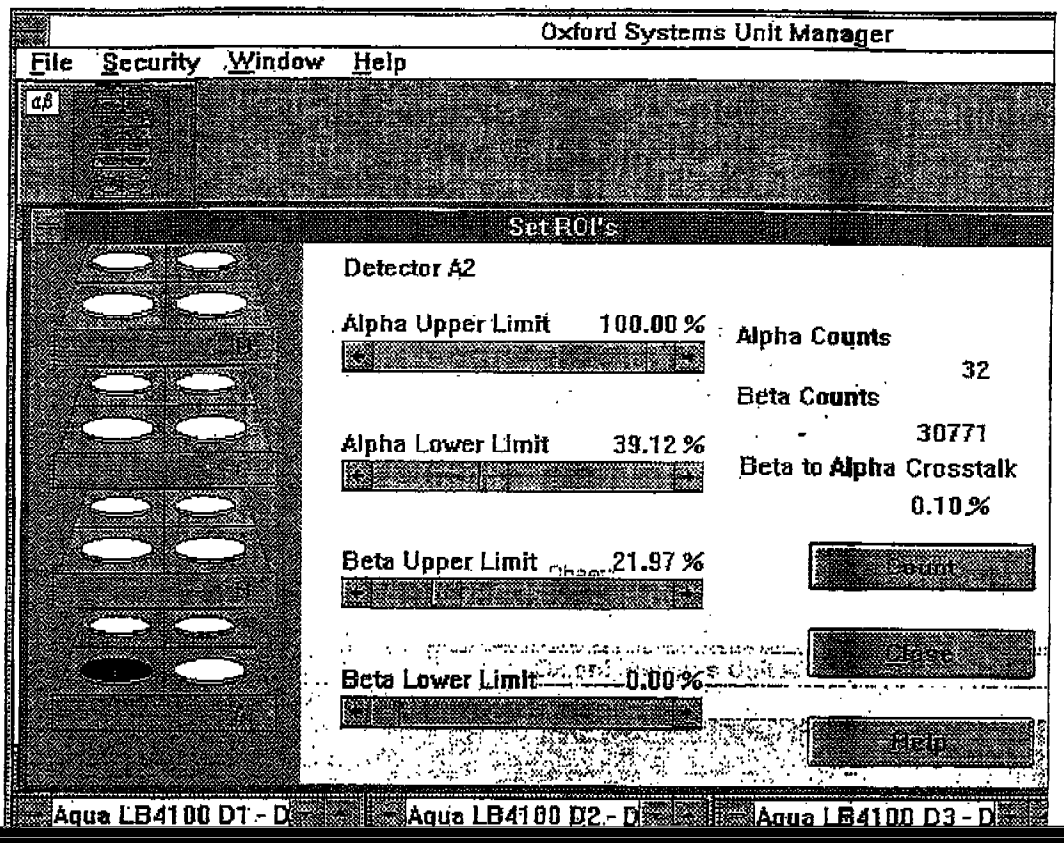
etector Specific:

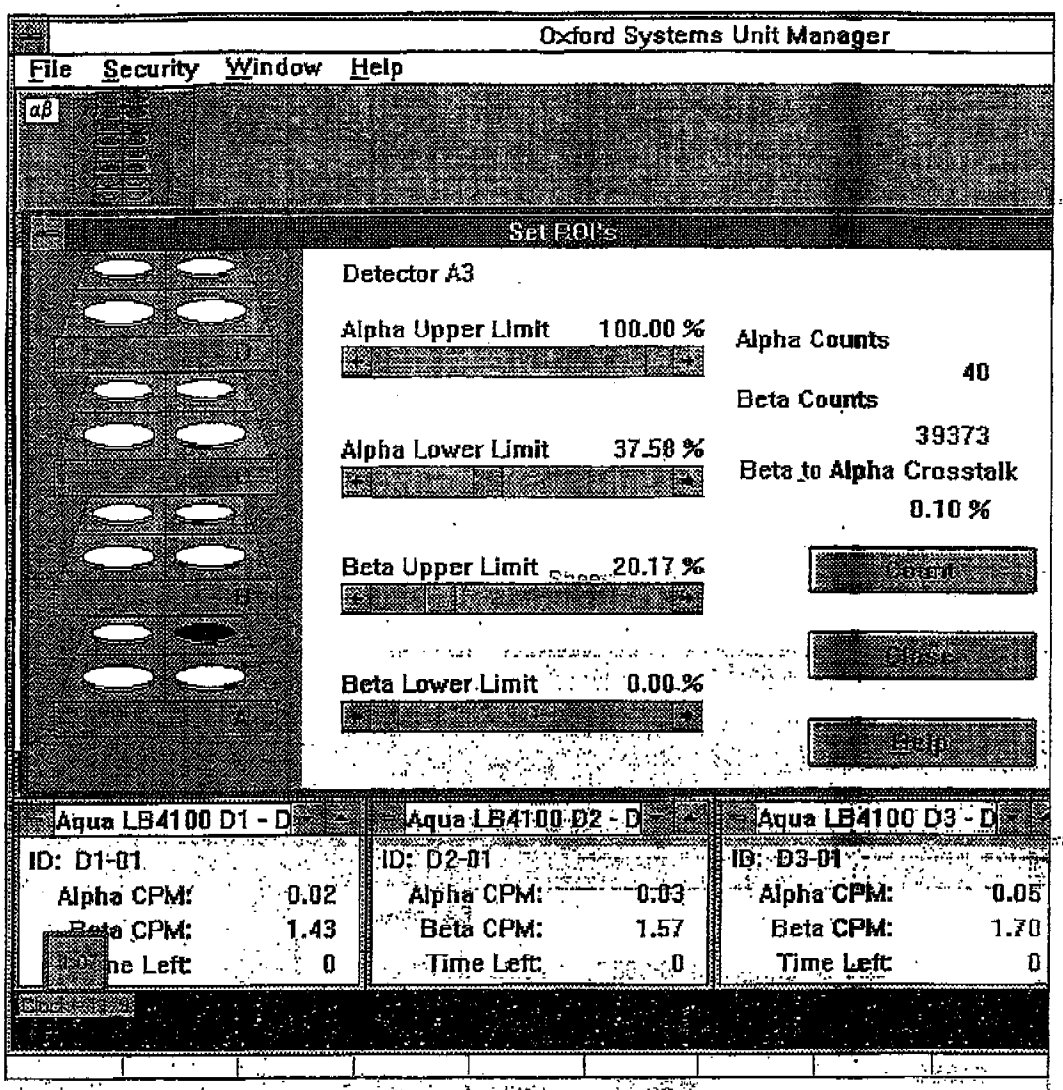
	Date/Time	Official	Thres	bLL	bUL	aLL
A1	11-9-06 0:00	TRUE	0.1	0	18.94	36.63
A2	11-9-06 0:00	TRUE	0.1	0	21.97	39.12
A3	11-9-06 0:00	TRUE	0.1	0	20.17	37.58
A4	11-9-06 0:00	TRUE	0.1	0	22.41	41.61
B1	11-9-06 0:00	TRUE	0.1	0	27.15	50.15
B2	11-9-06 0:00	TRUE	0.1	0	24.37	45.1
B3	11-9-06 0:00	TRUE	0.1	0	22.97	45.47
B4	11-9-06 0:00	TRUE	0.1	0	24.37	45.93
C1	7-10-07 0:00	TRUE	0.1	0	52.42	95.97
C2	7-10-07 0:00	TRUE	0.1	0	47.08	90.08
C3	7-10-07 0:00	TRUE	0.1	0	46.76	94.74
C4	7-10-07 0:00	TRUE	0.1	0	42.44	82.44
D1	11-9-06 0:00	TRUE	0.1	0	20.24	38.16
D2	11-9-06 0:00	TRUE	0.1	0	20.9	39.29
D3	11-9-06 0:00	TRUE	0.1	0	23.29	43.71
D4	11-9-06 0:00	TRUE	0.1	0	24	45.27

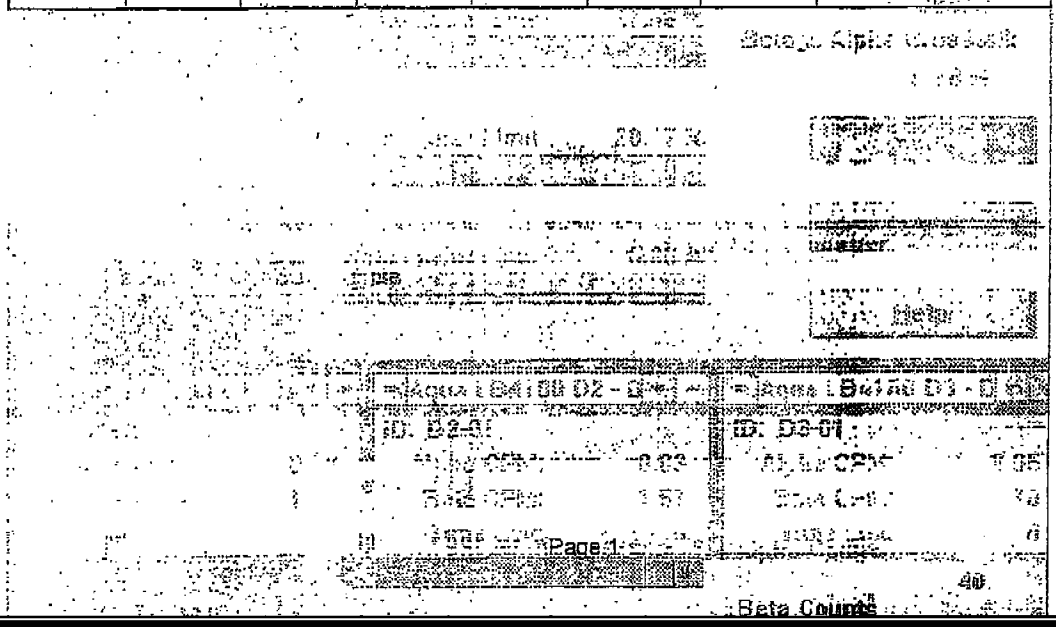
Sheet1

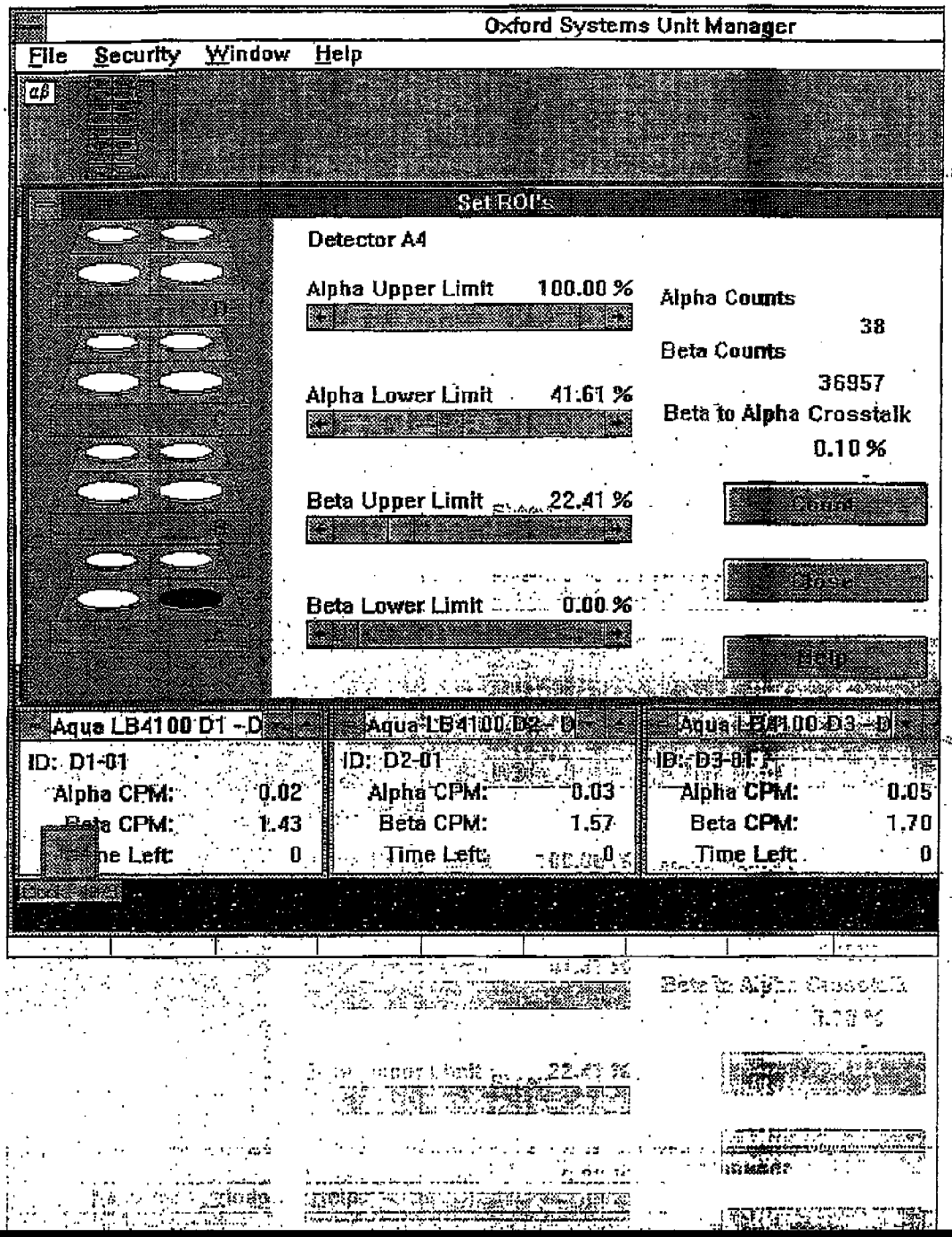

Oxford Systems Unit Manager
File
Security
Window
Help
Set ROI's
Detector A1
Alpha Upper Limit 100.00 %
Alpha Counts
32
Beta Counts
32587
Alpha Lower Limit 36.63 %
Beta to Alpha Crosstalk
0.10 %
Beta Upper Limit 18.94 %
Beta Lower Limit 0.00 %
Close
Help

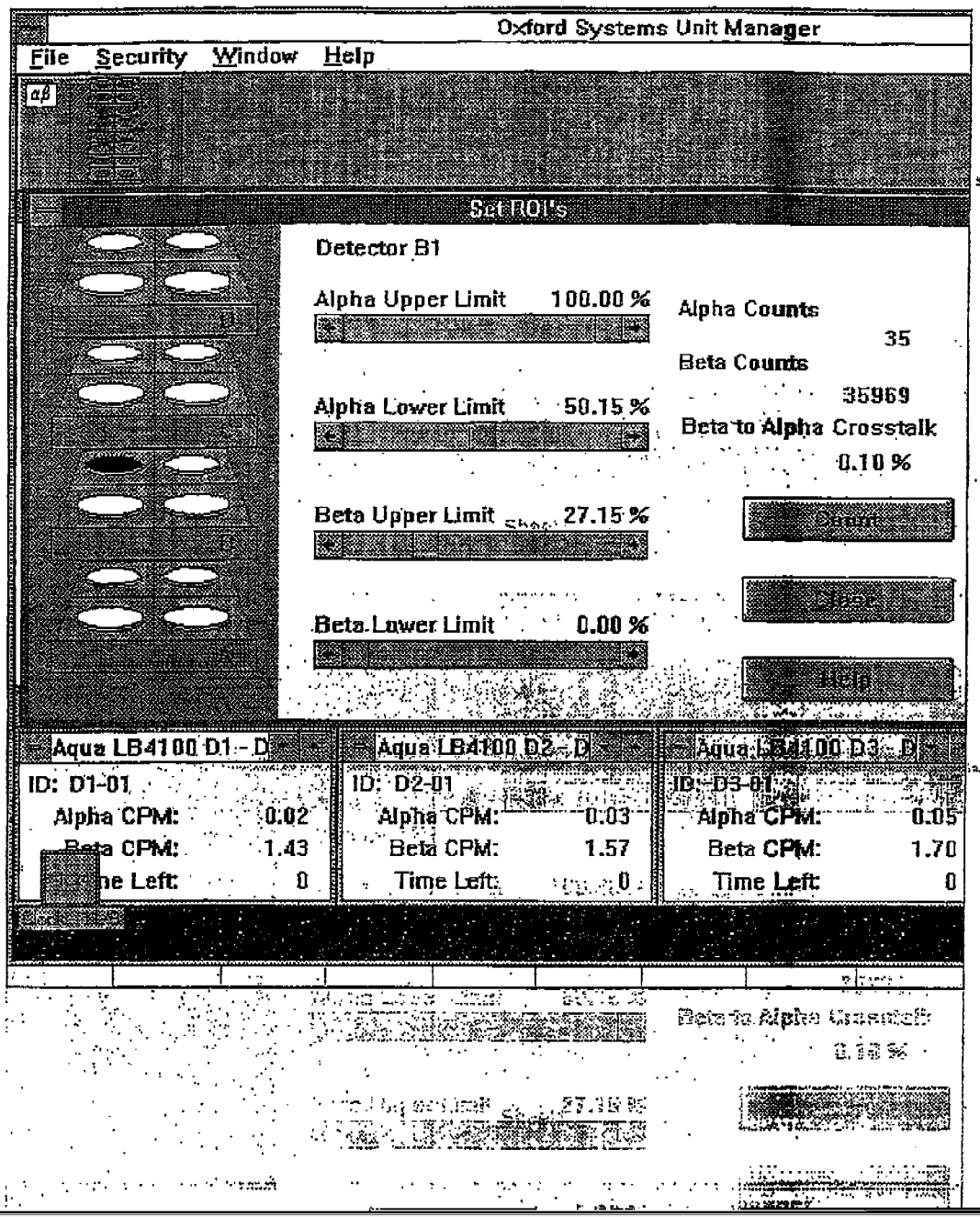
Sheet1

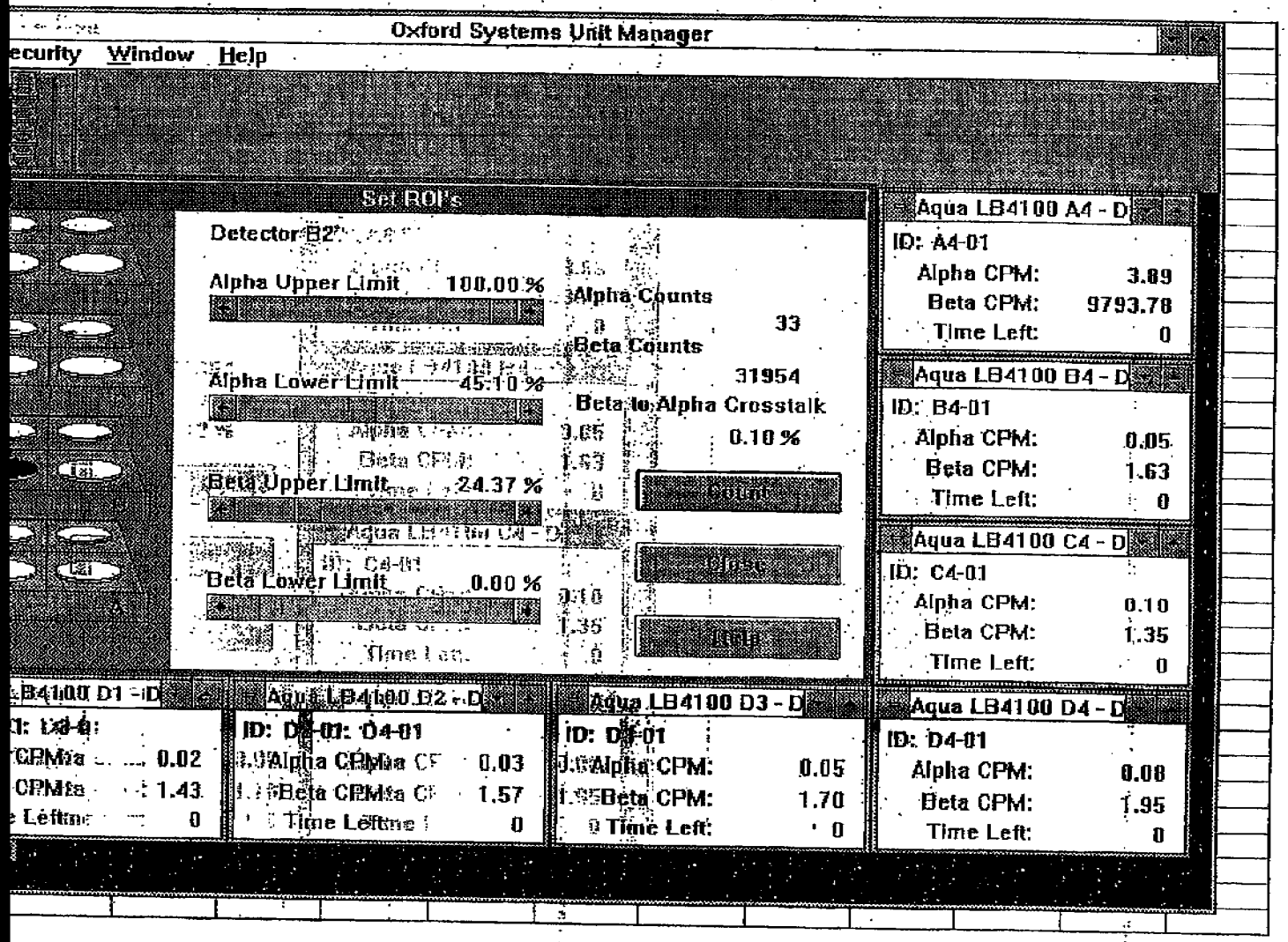

Oxford Systems Unit Manager
File
Security
Window
Help
Set ROI's
Detector A2
Alpha Upper Limit 100.00 %
Alpha Lower Limit 39.12 %
Beta Upper Limit 21.97 %
Beta Lower Limit 0.00 %
Alpha Counts
32
Beta Counts
30771
Beta to Alpha Crosstalk
0.10 %
Close
Help
Aqua LB4100 D1 - D
Aqua LB4100 D2 - D
Aqua LB4100 D3 - D

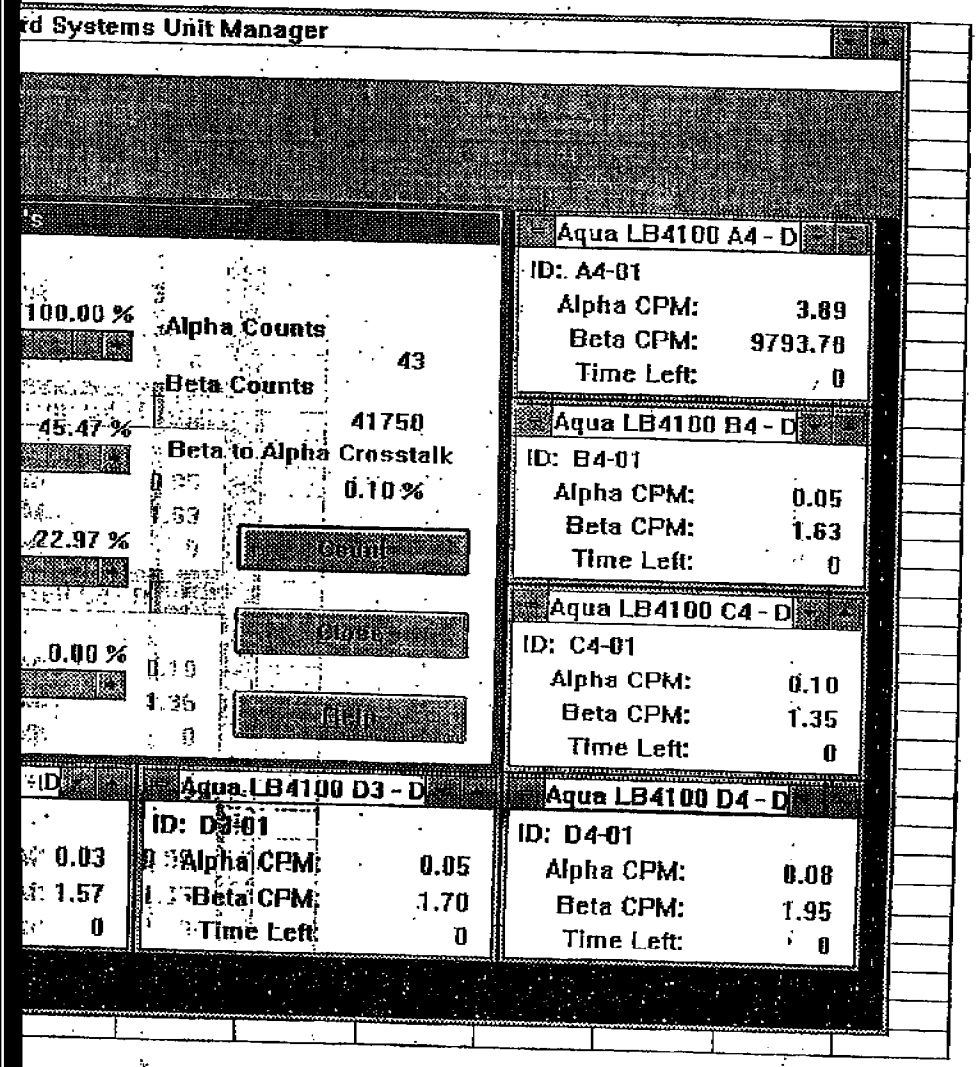

Oxford Systems Unit Manager
File Security Window Help
Set POI's
Detector A3
Alpha Upper Limit 100.00 %
Alpha Lower Limit 37.58 %
Beta Upper Limit 20.17 %
Beta Lower Limit 0.00 %
Alpha Counts
40
Beta Counts
39373
Beta to Alpha Crosstalk
0.10 %
Close
Help
Aqua LB4100 D1 - D
ID: D1-01
Alpha CPM: 0.02
Beta CPM: 1.43
Time Left: 0
Aqua LB4100 D2 - D
ID: D2-01
Alpha CPM: 0.03
Beta CPM: 1.57
Time Left: 0
Aqua LB4100 D3 - D
ID: D3-01
Alpha CPM: 0.05
Beta CPM: 1.70
Time Left: 0

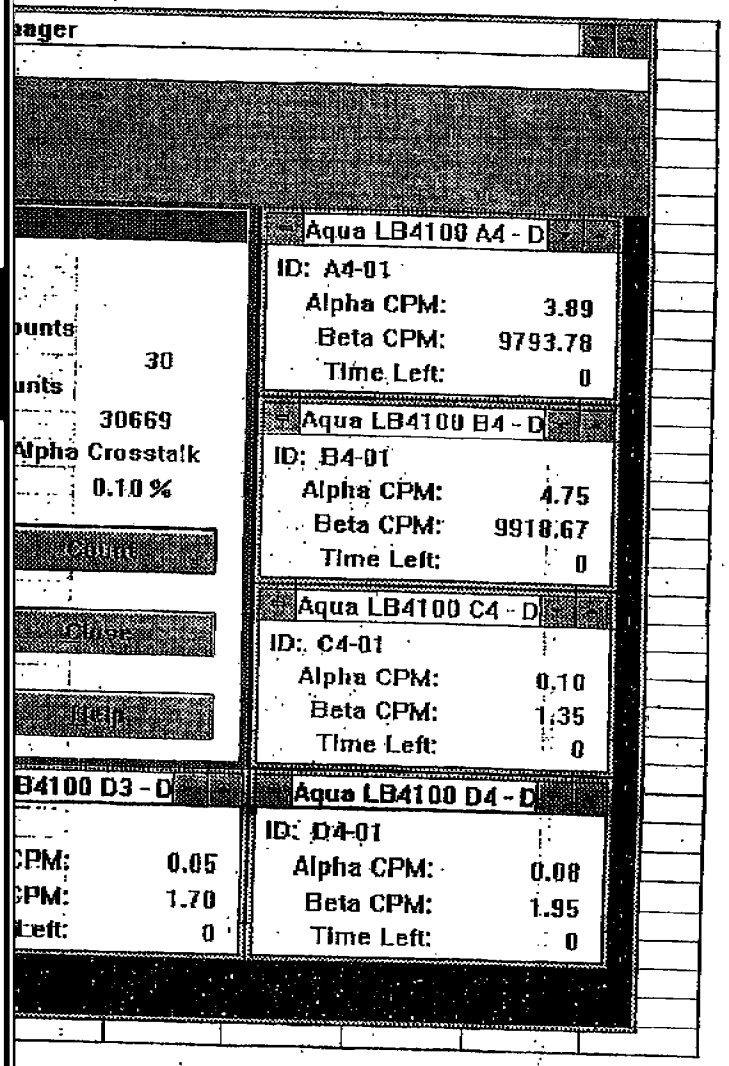

Page 1
Beta Counts

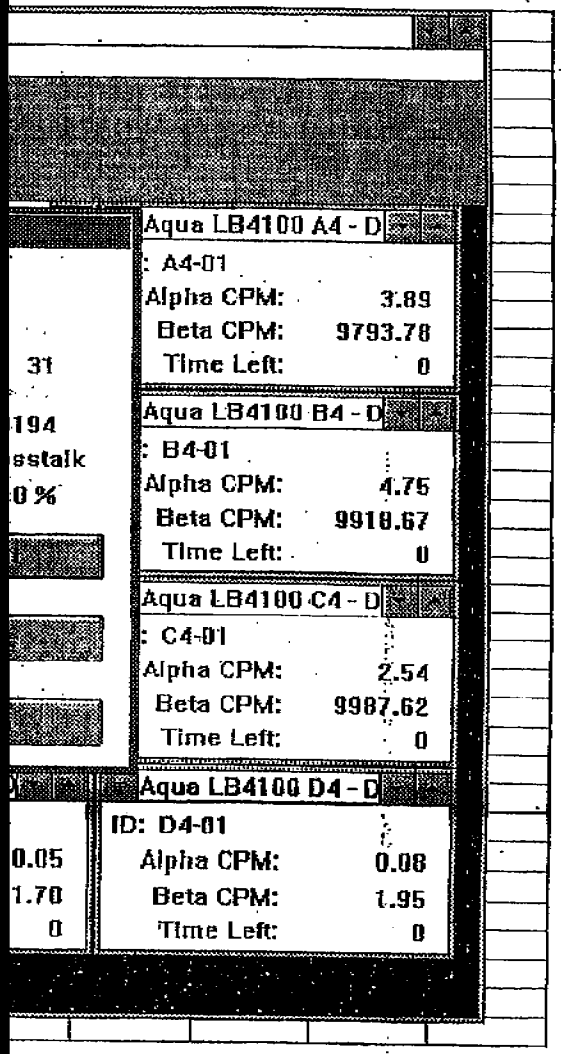

Oxford Systems Unit Manager
File
Security
Window
Help
Set ROI's
Detector A4
Alpha Upper Limit 100.00 %
Alpha Lower Limit 41.61 %
Beta Upper Limit 22.41 %
Beta Lower Limit 0.00 %
Alpha Counts
38
Beta Counts
36957
Beta to Alpha Crosstalk
0.10 %
Close
Help
Aqua LB4100 D1 - D
ID: D1-01
Alpha CPM: 0.02
Beta CPM: 1.43
Time Left: 0
Aqua LB4100 D2 - D
ID: D2-01
Alpha CPM: 0.03
Beta CPM: 1.57
Time Left: 0
Aqua LB4100 D3 - D
ID: D3-01
Alpha CPM: 0.05
Beta CPM: 1.70
Time Left: 0


Oxford Systems Unit Manager
File
Security
Window
Help
Set ROI's
Detector B1
Alpha Upper Limit 100.00 %
Alpha Lower Limit 50.15 %
Beta Upper Limit 27.15 %
Beta Lower Limit 0.00 %
Alpha Counts
35
Beta Counts
35969
Beta to Alpha Crosstalk
0.10 %
Close
Help
Aqua LB4100 D1 - D
ID: D1-01
Alpha CPM: 0.02
Beta CPM: 1.43
Time Left: 0
Aqua LB4100 D2 - D
ID: D2-01
Alpha CPM: 0.03
Beta CPM: 1.57
Time Left: 0
Aqua LB4100 D3 - D
ID: D3-01
Alpha CPM: 0.05
Beta CPM: 1.70
Time Left: 0


Oxford Systems Unit Manager
ecurity Window Help
Set ROI's
Detector B2
Alpha Upper Limit 100.00 %
Alpha Counts
33
Beta Counts
31954
Alpha Lower Limit 45.10 %
Beta to Alpha Crosstalk
0.10 %
Beta Upper Limit 24.37 %
Beta Lower Limit 0.00 %
Aqua LB4100 A4 - D
ID: A4-01
Alpha CPM: 3.89
Beta CPM: 9793.78
Time Left: 0
Aqua LB4100 B4 - D
ID: B4-01
Alpha CPM: 0.05
Beta CPM: 1.63
Time Left: 0
Aqua LB4100 C4 - D
ID: C4-01
Alpha CPM: 0.10
Beta CPM: 1.35
Time Left: 0
Aqua LB4100 D2 - D
ID: D4-01
Alpha CPM: 0.03
Beta CPM: 1.57
Time Left: 0
Aqua LB4100 D3 - D
ID: D4-01
Alpha CPM: 0.05
Beta CPM: 1.70
Time Left: 0
Aqua LB4100 D4 - D
ID: D4-01
Alpha CPM: 0.08
Beta CPM: 1.95
Time Left: 0


rd Systems Unit Manager
100.00 %
Alpha Counts
43
Beta Counts
45.47 %
41750
Beta to Alpha Crosstalk
0.10 %
22.97 %
0.00 %
Aqua LB4100 A4 - D
ID: A4-01
Alpha CPM: 3.89
Beta CPM: 9793.78
Time Left: 0
Aqua LB4100 B4 - D
ID: B4-01
Alpha CPM: 0.05
Beta CPM: 1.63
Time Left: 0
Aqua LB4100 C4 - D
ID: C4-01
Alpha CPM: 0.10
Beta CPM: 1.35
Time Left: 0
Aqua LB4100 D3 - D
ID: D3-01
Alpha CPM: 0.05
Beta CPM: 1.70
Time Left: 0
Aqua LB4100 D4 - D
ID: D4-01
Alpha CPM: 0.08
Beta CPM: 1.95
Time Left: 0


eager
ounts
30
unts
30669
Alpha Crosstalk
0.10 %
Count
Other
Help
Aqua LB4100 A4 - D
ID: A4-01
Alpha CPM: 3.89
Beta CPM: 9793.78
Time Left: 0
Aqua LB4100 B4 - D
ID: B4-01
Alpha CPM: 4.75
Beta CPM: 9918.67
Time Left: 0
Aqua LB4100 C4 - D
ID: C4-01
Alpha CPM: 0.10
Beta CPM: 1.35
Time Left: 0
B4100 D3 - D
CPM: 0.05
CPM: 1.70
Left: 0
Aqua LB4100 D4 - D
ID: D4-01
Alpha CPM: 0.08
Beta CPM: 1.95
Time Left: 0


Aqua LB4100 A4 - D
: A4-01
Alpha CPM: 3.89
Beta CPM: 9793.78
Time Left: 0
Aqua LB4100 B4 - D
: B4-01
Alpha CPM: 4.75
Beta CPM: 9918.67
Time Left: 0
Aqua LB4100 C4 - D
: C4-01
Alpha CPM: 2.54
Beta CPM: 9987.62
Time Left: 0
Aqua LB4100 D4 - D
ID: D4-01
Alpha CPM: 0.08
Beta CPM: 1.95
Time Left: 0
31
194
sstalk
0 %
0.05
1.70
0

A4 - D

3.89
9793.78
0

B4 - D

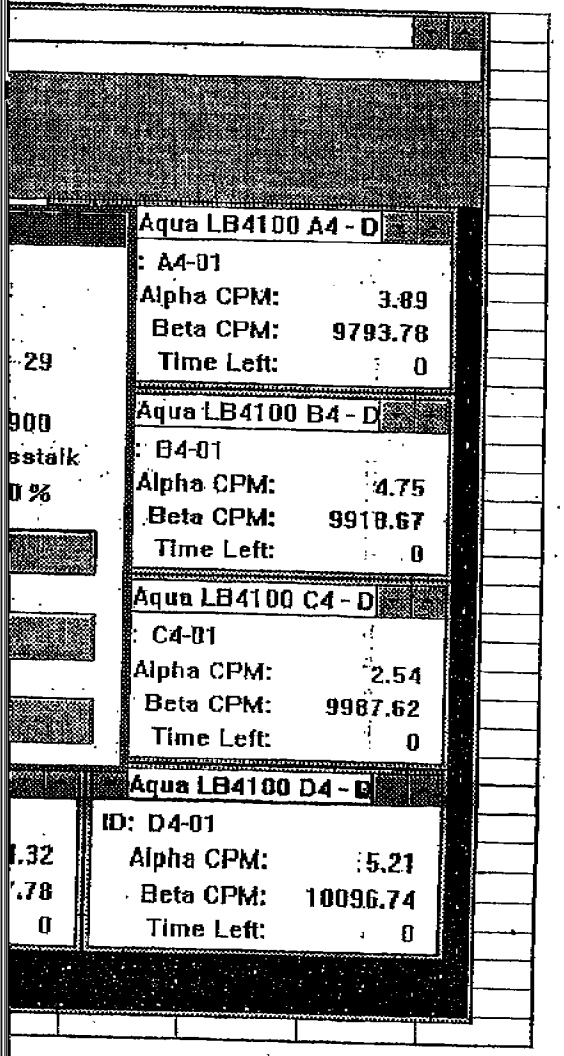
4.75
9918.67
0

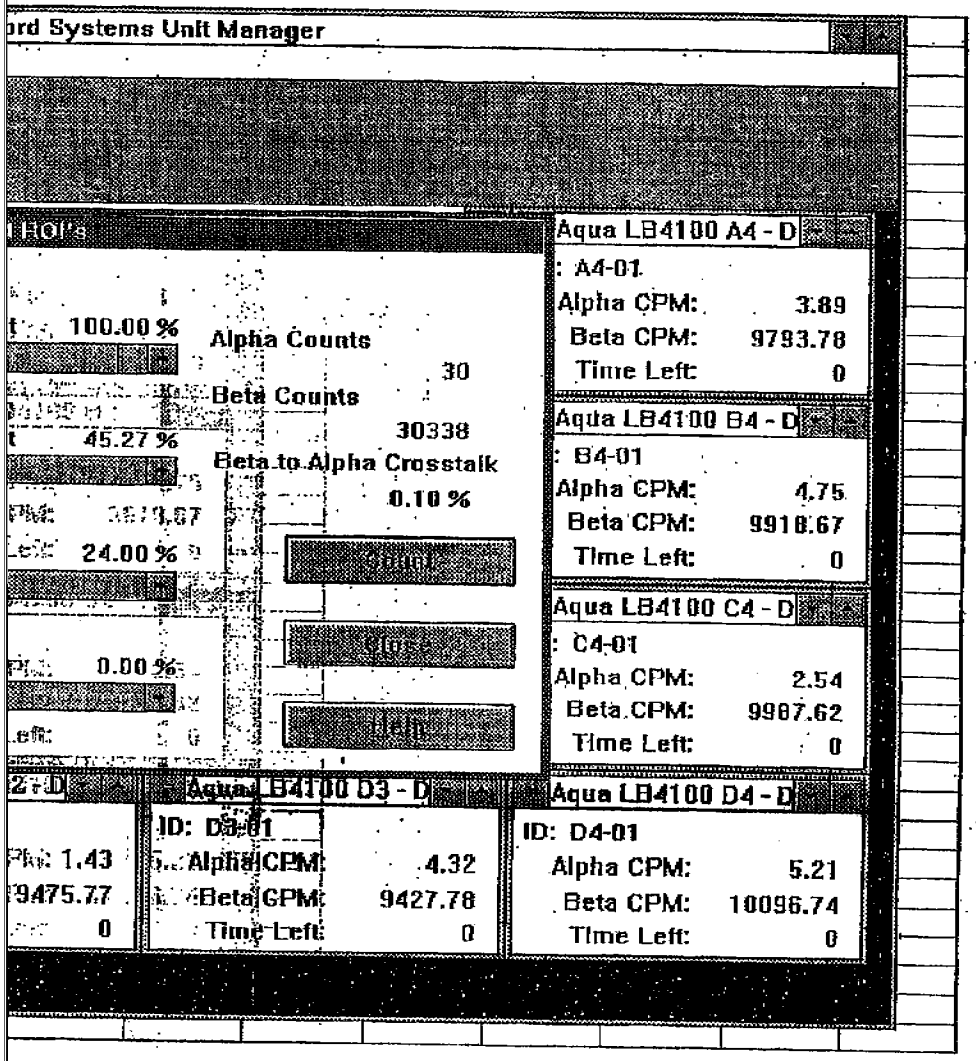
C4 - D

2.54
9987.62
0

D4 - D

0.08
1.95
0


Aqua LB4100 A4 - D
: A4-01
Alpha CPM: 3.89
Beta CPM: 9793.78
Time Left: 0
Aqua LB4100 B4 - D
: B4-01
Alpha CPM: 4.75
Beta CPM: 9918.67
Time Left: 0
Aqua LB4100 C4 - D
: C4-01
Alpha CPM: 2.54
Beta CPM: 9987.62
Time Left: 0
Aqua LB4100 D4 - D
ID: D4-01
Alpha CPM: 5.21
Beta CPM: 10096.74
Time Left: 0


ord Systems Unit Manager
100.00 %
Alpha Counts
30
Beta Counts
30338
45.27 %
Beta to Alpha Crosstalk
0.10 %
24.00 %
0.00 %
Aqua LB4100 A4 - D
: A4-01
Alpha CPM: 3.89
Beta CPM: 9793.78
Time Left: 0
Aqua LB4100 B4 - D
: B4-01
Alpha CPM: 4.75
Beta CPM: 9918.67
Time Left: 0
Aqua LB4100 C4 - D
: C4-01
Alpha CPM: 2.54
Beta CPM: 9987.62
Time Left: 0
Aqua LB4100 D3 - D
ID: D3-01
Alpha CPM: 4.32
Beta CPM: 9427.78
Time Left: 0
Aqua LB4100 D4 - D
ID: D4-01
Alpha CPM: 5.21
Beta CPM: 10096.74
Time Left: 0

Efficiencies

B3	B4
M1107B	EAM1107B
7.41	7.51
0021	10009
.086	0.104
2.2757	1332.652
47738	0.244143
98880	0.104530
2478	**0.2441**

D3	D4
M1108	EAM1108
7.23	7.30
0010	10017
0.04	0.10
84.47	1372.09
53637	0.251370
78912	0.102003
2536	**0.2514**

Source Database for OSUM for LB4100-B

Number of sources in table: 96

Application Revision: A

Control ID	Isotope	Type	Half-Life (days)	DPM	Std dev	Date	Status	Alpha/Beta Archive File
1172	AM-241	Alpha	157783.68	5514.295	275.71	6-Jul-01	PA	Am241-11/07
1173	Sr-90/Y-90	Beta	10519.2	19986.92	999.35	2-Dec-04	PA	Sr90R-11/07

Am-241 ON A RINGED PLANCHET

DETECTOR	EFFICIENCY '06	EFFICIENCY '07	% DIFFERENCE
A1	0.2365	0.2381	0.68
A2	0.2558	0.2534	-0.94
A3	0.2499	0.2527	1.12
A4	0.2474	0.2514	1.62
B1	0.2362	0.2363	0.04
B2	0.2554	0.2594	1.57
B3	0.2487	0.2477	-0.40
B4	0.2471	0.2441	-1.21
D1	0.2269	0.2289	0.88
D2	0.2549	0.2556	0.27
D3	0.2529	0.2536	0.28
D4	0.2482	0.2514	1.29

Date 11/7/07

SOP 724r 10

Paragon Analytics
Low Background Gas Flow Proportional Counter Log
Instrument: LB4100B

Instrument Daily Response and Background Checks

Det.	Daily Response Check Start 1	Status	Start 2	Status	Background Check Start 1	Status	Start 2	Status	Det. Status
1	JH	P			JH	P			P
2	↓	↓			↓	↓			↓
3									
4									
5									OL,W
6									P
7									↓
8									
9									
10						↓			
11						HL	JH	P	↓
12						P			OL,W
13						↓			P
14									↓
15									
16	↓	↓			↓	↓			↓

Det = Detector; α = Alpha; β = Beta; P = Pass; H = High; L = Low; OL = Offline; R = Recount; W = Weekly; NP = Not Processed

Weekly Background Calibration

	Current Calib. File ID	Weekly Calib. Started	Status	File ID
Dr A	BKB 1102W			
Dr B	↓ 1103W			
Dr C	↓			
Dr D	↓			

Dr = Drawer

Gas Supply

P-10 Supply		P-10 Flow	
Tank 1	1000	Dr A	0.15
	↓	Dr B	
Tank 2	500	Dr C	↓
	↓	Dr D	↓

Comments:

Page No.: 357313 A

Form 780r8.doc (6/23/06)

Reviewed By / Date JH 11/8/07

Date 11/7/07

SOP 724r 10

Paragon Analytics

Low Background Gas Flow Proportional Counter Log

Instrument: LB4100B

Det.	Sample ID	Batch	Test	Count Dur. (min)	Start Time	Analyst Initials	File ID	Output Initials
1-16	Daily Eff	—	—	30	806	JH	EFB1107	JH
1-16	Daily BKG	—	—	60	818	JH	BKB1107	JH
11	Daily BKG	—	—	60	931	JH	BKB1107R	JH
9	0710261-36D	AB071105-5	αβ	90	930	JH	AB01107	JH
10	↓ -37	↓	↓	↓	↓	↓	↓	↓
13-16	ALPHA	Plateau	α	5 step	937	JH	PTB11070	JH
~~1-4~~	~~Am241 eff~~	~~Am241~~			~~952~~			JH 11/7/07
JH 11/7/07 1	0615044-S2	Am241eff.R	α 1172	75	952	JH	EAM1107	JH
2	-S3	JH 11/7/07						
3	-S4							
4	-S5							
5	0615044-S2	Am241Eff R	1172	75	1014	JH	EAM1107B	JH
6	-S3							
7	-S4							
8	-S5							
JH 11/7/07 1	0614030-S1	Sr90 eff R	1173	75	1020	JH	ESR1107	JH
2	-S2							
3	-3							
4	-4							
5	0614030-S1	Sr90eff R	1173	75	1031	JH	ESR1107B	JH
6	-S2							
7	-S3							
8	-S4							
1	0424028-S1	Sr90eff F	1174	75	1037	JH	ESF1107	JH
2	-S2							
3	-S3							
4	-S4							
5	Am Wipe Eff	#746 *	1175	75	1100	JH	EAW1107	JH
8	Sr Wipe Eff	#602 ↓	1176	↓	1101	↓	ESW1107	JH
9	0710261-38	AB071105-5	αβ	90	1106	JH	ABB1107A	JH
10	-40							
11	-41							
6	Am Wipe Eff	#746 *	1175	75	1108	JH	EAW1107A	JH
7	Sr Wipe Eff	#602	1176	↓	1109	↓	ESW1107A	JH
7	Am Wipe Eff	#746	1175	75	1120	JH	EAW1107B	JH
6	Sr Wipe Eff	#602	1176	↓	1121	↓	ESW1107B	JH
8	Am Wipe Eff	#746	1175	75	1140	JH	EAW1107C	JH
5	Sr Wipe Eff	#602	1176	↓	1141	↓	ESW1107C	JH
1	Am Wipe Eff	#746	1175	75	1148	JH	EAW11070	JH
4	Sr Wipe Eff	#602	1176	↓	1149	↓	ESW1107D	JH
5	0424028-S1	Sr90eff F	1174	75	1149	JH	ESF1107~~A~~B	JH JH 11/7/07
6	-S2							
7	-S3							
8	-S4							
2	Am Wipe Eff	#746	1175	75	1155	JH	EAW1107E	JH
3	Sr Wipe Eff	#602	1176	↓	1156	↓	ESW1107E	↓ JH 11/7/07

Comments: * Sample ID and Batch Columns switched JH 11/7/07

357313

Page No.: B

(cont. from page NA B)

Form 780r8.doc (6/23/06)

Reviewed By / Date JH 11/8/07

Date 11/8/07 SOP 724r 10

Paragon Analytics
Low Background Gas Flow Proportional Counter Log
Instrument: LB4100B

Instrument Daily Response and Background Checks

Det.	Daily Response Check Start 1	Status	Start 2	Status	Background Check Start 1	Status	Start 2	Status	Det. Status
1	JH	P			JH	P			P
2									
3									
4									
5						HL			OLBW
6		LB	JH	LB		P			OLOD
7		P				HL	JH	P	P
8						P			
9									
10									
11									
12									OLBW
13									P
14									
15									
16						LB			

Det = Detector; α = Alpha; β = Beta; P = Pass; H = High; L = Low; OL = Offline; R = Recount; W = Weekly; NP = Not Processed

Weekly Background Calibration

	Current Calib. File ID	Weekly Calib. Started	Status	File ID
Dr A	BKB1102W			
Dr B	103W			
Dr C				
Dr D				

Dr = Drawer

Gas Supply

P-10 Supply		P-10 Flow	
Tank 1	1000	Dr A	0.15
		Dr B	
Tank 2	2100	Dr C	
		Dr D	

Comments:

Page No.: 357315 A Form 780r8.doc (6/23/06) Reviewed By / Date JH 11/9/07

Date 11/8/07

SOP 724r 10

Paragon Analytics

Low Background Gas Flow Proportional Counter Log

Instrument: LB4100B

Det.	Sample ID	Batch	Test	Count Dur. (min)	Start Time	Analyst Initials	File ID	Output Initials
1-16	Daily Eff	—	—	30	830	JH	EFB1108	JH
6	Daily Eff	—	—	30	838	JH	EFB1108R	JH
1-16	Daily BKG	—	—	60	853	JH	BKB1108	JH
9	0710261-73	AB071105-7	αβ	90	1001	JH	ABB1108	JH
10	-74							
11	-75							
13	AmWipe Eff	746	1175	75	1003	JH	EAW1108	JH
16	SrWipe Eff	602	1176		1004		ESW1108	JH
1	ICV TEST	ICV TEST	α	10	1205	JH	ABB1108D	JH
4			β					
7	Daily BKG	—	—	60	1007	JH	BKB1108R	JH
8	0710274-4	TR071102-1	RaToT	45	1008	JH	TRB1108	JH
14	AmWipe Eff	746	1175	75	1011	JH	EAW1108A	JH
15	SrWipe Eff	602	1176		1012		ESW1108A	
1	0710274-5	TR071102-1	RaToT	45	1015	JH	TRB1108A	JH
2	-8							
3	-9							
4	-10							
JH 11/8/07 15 14	AmWipe Eff	746 JH	1175 JH	75	1020	JH	EAW1108B	JH
JH 11/8/07 ~~15 13~~	~~SrWipe Eff~~ JH	~~602~~ JH	~~1176~~ JH		1021		~~ESW1108B~~	* JH 11/9/07
13	SrWipe Eff	602	1176	75	1027	JH	ESW1108C	JH
16	AmWipe Eff	746	1175				EAW1108C	
13	0424028-S1	Sr90 eff E	1174	75	1034	JH	ESE1108	JH
14	-S2							
15	-S3							
16	-S4							
1	0710274-11	TR071102-1	RaToT	45	1108	JH	TRB1108B	JH
2	TR071102-1168							
13	0614030-S1	Sr90 eff R	1173	75	1114	JH	ESR1108	JH
14	-S2							
15	-S3							
16	-S4							
13	0615044-S2	Am241 eff R	1172	75	1121	JH	EAM1108	JH
14	-S3							
15	-S4							
16	-S5							
13	0717502-S1	Sr89 eff E	1177	75	1133	JH	ESE1108	JH
14	-S2							
15	-S3							
16	-S4							
7	ICV TEST	ICV TEST	α	10	1143	JH	ABB1108A	JH
8			β					
9	0710261-74A	AB071105-7	αβ	90	1155	JH	ABB1108B	JH for LD
10	-67	AB071105-6			1156		ABB1108C	
11	-69							
14	ICV TEST	ICV TEST	α	10	1221	JH	ABB1108E	JH
15			β					
* 14	SrWipe eff	602	α	75	1021	JH	ESW1108B	JH

Comments:

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(cont. from page NA B)

Form 780r8.doc (6/23/06)

Reviewed By / Date: JH 11/9/07

JH
11/6/07 Drawers A, B and D Calibration

Plateaus for Drawers A, B + D

Source β used:	Detectors	Source α used:
Sr/Y 90 - 406	A1 B1 D1	410 - Am 241
29,600 dpm - 407	A2 B2 D2	411 - 17,800 dpm
9/15/02 - 408	A3 B3 D3	412 - 2/06/95
↓ - 409	A4 B4 D4	413 - ↓

Parameters:

Start Voltage: 700
Ending Voltage: 1650
30 volts/step
5 min/step
40,000 count preset

Filenames:

PTB1106A, B
PTB1107D

★note: Plateau voltage did not change therefore historical limits are still in place.

JH
11/7/07 Am241 Calibration on a Ringed Planchet (Drawers A, B + D)

Benchsheet: 290486A Source ID: 1172

Logfile Am241 11/07

Source:	Detectors	Filenames:
06150044 - S2	A1 B1 D1	EAM1107, B
↓ - S3	A2 B2 D2	EAM1108
- S4	A3 B3 D3	
- S5	A4 B4 D4	

Continued on Page

Read and Understood By

Signed 11/6/07 Date Signed 11/24/07 Date

JH 11/7/07

Sr90 Calibration on a Ringed Planchet (Drawers A, B + D)

Benchsheet: 2904764 Source ID: 1173

Logfile Sr90R-11/07 JH 11/7/07

Source:	Detectors	Filenames
0614030 - S1	A1 B1 D1	ESR1107, B
- S2	A2 B2 D2	ESR1108
- S3	A3 B3 D3	
- S4	A4 B4 D4	

Sr.90 Calibration on a Flat Planchet (Drawers A, B + D)

JH 11/7/07 Benchsheet: 2790557A Source ID: 1174

Logfile Sr90F 11/07

Source:	Detectors	Filenames
0424028 - S1	A1 B1 D1	ESF1107, B
- S2	A2 B2 D2	ESF1108
- S3	A3 B3 D3	
- S4	A4 B4 D4	

JH 11/7/07

Am241 Wipe Calibration (Drawers A, B + D)

Source: #746 Source ID: 1175 Logfile: AmWipe 11/07

Filenames: EAW1107 → G
EAW1108 → C

*Alpha to beta crosstalk was calculated for each detector using the following equation:

$$\frac{\text{counts in alpha-beta channel}}{\text{Counts in alpha channel}}$$

JH 11/7/07

Continued on Page

Read and Understood By

Signed 11/7/07 Date Signed 11/24/07 Date

Paragon Analytics

ET FOR IN-HOUSE OR RUSH SAMPLES / Ra/Sr Lab

Date 3/15/06 Analyte 241 Am Analytical Batch

Date / Time Superseded

Basis AR)	Spike Information	Remarks	Det. No.	Filename	POS Ckd By
	S1	Non			
	S2				

Spike Witness Date 3/15/06 QASS? (Y / N) No. NA

Vol	P	Total Act (dpm)	Corrected		Relinquished by / Date	Received by / Date
0.1		5,514.295	RS-021	1		
5.0		538.5	RS-011			
				2		

Reviewed by / Date 3/15/06

290486 B

WORKSHEET FOR IN-HOUSE OR RUSH SAMPLES / Ra/Sr Lab

Paragon Analytics

Initials JRK Date 3/15/06 Method (SOP / Rev) NA Matrix NA

COMMENTS

^{241}Am Standard Verification / Efficiency Calibration

- 5 mL 16 N HNO_3 added to each planchet
- Appropriate spike and volume added to each planchet
- Dried on a hot plate
- Labeled and submitted for analysis

Reviewed by / Date 3/15/06

Gross Alpha / Beta Calculations

Atten. Constants		b	m	a	x0		b	m
Alpha	y = b*m^(a*(x-x0))	1.1697	0.9930	0.7986	0	y = b*m^-x	0.2318	0.9997
Beta	y = b*m^(a*(x-x0))	0.9791	0.9998	1.3098	0.0	y = b*x+m	-2.71E-06	0.0005

Sample ID	Initial Aliquot	Final Sam. Size	Count Date	Count Dur.	Residual Mass (mg)	Alpha Gross CPM	Bkg CPM	Atten.	Efficiency
0615044-S1	0.200	0.200	11/11/2006	10	0.0	1239.500	0.036	1.170	0.2296
0615044-S2	0.200	0.200	11/11/2006	10	0.0	1300.700	0.036	1.170	0.2296
0615044-S3	0.200	0.200	11/11/2006	10	0.0	1409.500	0.036	1.170	0.2296
0615044-S4	0.200	0.200	11/11/2006	10	0.0	1369.900	0.036	1.170	0.2296
0615044-S5	0.200	0.200	11/11/2006	10	0.0	1381.700	0.036	1.170	0.2296
					Mean=	1340.260			
					StDev=	69.115			
					2 Sig LCL=	1202.030	1 Sig LCL=	1271.145	
					2 Sig UCL=	1478.490	1 Sig UCL=	1409.375	

0615044-S1 was rejected as the outlier

Spike Information

Sample ID	Alpha Std ID	Ref. Date	Halflife Yrs	Act (pCi/ml)	Spike Vol (mL)	Decay Corr. Spike Act. Added
0615044-S1	585.3020.27	7/6/2001	432	24839.17	0.1	12313.4
0615044-S2	585.3020.27	7/6/2001	432	24839.17	0.1	12313.4
0615044-S3	585.3020.27	7/6/2001	432	24839.17	0.1	12313.4
0615044-S4	585.3020.27	7/6/2001	432	24839.17	0.1	12313.4
0615044-S5	585.3020.27	7/6/2001	432	24839.17	0.1	12313.4

PAI - Gas Flow Proportional Sample Analysis LB4100-B

Unit Type: LB4100 -B
Counting Unit ID: Aqua
High Voltage Mode: Simultaneous
Application Revision:
Application Version: Standard
Rev.12/29/03 JE

Data file name: ABB1111E
Batch ID: OUTLIER
Count Preset (m): 10
2 Batch Ended: 11/11/06 13:20

Background logfile: BKGABW
Date of Bkg. Cal: 11/11/06
Alpha efficiency logfile: AmR-11/05
Alpha attenuation calibration: AM4106
Beta efficiency logfile: Sr90R-11/05
Beta attenuation calibration: SR1105

Alpha prog. logfile: n/a
Alpha prog. attenuation: n/a
Beta prog. logfile: n/a
Beta prog. attenuation: n/a

Alpha Attenuation Calibration		Beta Attenuation Calibration	
y = b*m^[a*(mass-x0)]		y = b*m^[a*(mass-x0)]	
Alpha b=	1.16970	Beta b=	0.9791
m=	0.05300	m=	0.9996
a=	0.7985	a=	1.3046
x0=	0.0000	x0=	0.0000
Alpha to Beta X-talk		Beta to Alpha X-talk	
y = b *m^-mass		y = b*mass + m	
a ->b xtalk b=	0.2318	b ->a xtalk b=	-2.71E-06
a ->b xtalk m=	0.9997	b ->a xtalk m=	0.0065

Det. ID	Sample ID	Count End Date & Time	Count Dur. (min)	Resid. Mass (mg)	Alpha Activity							Beta Activity						
					Gross CPM	Bkg. CPM	b>a xtlk CPM	Base Eff	Base Cor.Fact.	Progeny Eff	Progeny Cor.Fact.	Gross CPM	Bkg. CPM	a>b xtlk CPM	Base Eff	Base Cor.Fact.	Progeny Eff	Progeny Cor.Fact.
B1	0615044-S1	11/11/06 13:20	10.00	0.0	1239.500	0.036	0.247	0.2298	1.170	n/a	n/a	494.500	1.499	287.3181	0.4385	0.979	n/a	n/a

PAI - Gas Flow Proportional Sample Analysis LB4100-B

Unit Type: LB4100-B
Counting Unit ID: Aqua
High Voltage Mode: Simultaneous
Application Version: 2
Application Version: Standard
Rev.12/29/03 JE

Data file name: ABB1111G
Batch ID: OUTLIER
Count Preset (m): 10
Batch Ended: 11/11/06 15:01

Background logfile: BKGABW
Date of Bkg. Cal: 11/11/06
Alpha efficiency logfile: AmR-11/05
Alpha attenuation calibration: AM0106
Beta efficiency logfile: Sr90R-11/05
Beta attenuation calibration: SR1105

Alpha prog. logfile: n/a
Alpha prog. attenuation: n/a
Beta prog. logfile: n/a
Beta prog. attenuation: n/a

Alpha Attenuation Calibration		Beta Attenuation Calibration	
y = b*m^(a*(mass-x0))		y = b*m^(a*(mass-x0))	
Alpha b=	1.16970	Beta b=	0.9751
m=	0.99300	m=	0.3995
a=	0.7988	a=	1.3092
x0=	0.0000	x0=	0.0000
Alpha to Beta X-talk		Beta to Alpha X-talk	
y = b *m^-mass		y = b*mass + m	
a -> b xtalk b=	0.2318	b -> a xtalk b=	-2.71E-06
a -> b xtalk m=	0.9997	b -> a xtalk m=	0.0005

Dat. ID	Sample ID	Count End Date & Time	Count Dur. (min)	Resid. Mass (mg)	Alpha Activity							Beta Activity						
					Gross CPM	Bkg. CPM	b>a xtlk CPM	Base Eff	Base Cor.Fact.	Progeny Eff	Progeny Cor.Fact.	Gross CPM	Bkg. CPM	a>b xtlk CPM	Base Eff	Base Cor.Fact.	Progeny Eff	Progeny Cor.Fact.
B1	0615044-S2	11/11/06 15:01	10.00	0.0	1300.700	0.036	0.252	0.2296	1.170	n/a	n/a	503.100	1.499	301.5023	0.4385	0.979	n/a	n/a

PAI - Gas Flow Proportional Sample Analysis LB4100-B

Unit Type: LB4100 -B
Counting Unit ID: Aqua
High Voltage Mode: Simultaneous
Application Revision:
Application Version: Standard
Rev.12/28/03 JE

Data file name: ABB1111I
Batch ID: OUTLIER
Count Preset (m): 10
2 Batch Ended: 11/11/06 15:21

Background logfile: BKGABW
Date of Bkg. Cal: 11/11/06
Alpha efficiency logfile: AmR-11/05
Alpha attenuation calibration: AM0106
Beta efficiency logfile: Sr90R-11/05
Beta attenuation calibration: SR1105

Alpha prog. logfile: n/a
Alpha prog. attenuation: n/a
Beta prog. logfile: n/a
Beta prog. attenuation: n/a

Alpha Attenuation Calibration y = b*m^(a*(mass-x0))		Beta Attenuation Calibration y = b*m^(a*(mass-x0))	
Alpha b=	1.4970	Beta b=	0.9791
m=	0.9300	m=	0.9998
a=	0.7994	a=	1.3098
x0=	0.0000	x0=	0.0000
Alpha to Beta X-talk y = b *m^-mass		Beta to Alpha X-talk y = b*mass + m	
a -> b xtalk b=	0.2316	b -> a xtalk b=	-2.71E-06
a -> b xtalk m=	0.9997	b -> a xtalk m=	0.0005

Det. ID	Sample ID	Count End Date & Time	Count Dur. (min)	Resid. Mass (mg)	Alpha Activity Gross CPM	Alpha Bkg. CPM	Alpha b>a xtlk CPM	Alpha Base Eff	Alpha Base Cor.Fact.	Alpha Progeny Eff	Alpha Progeny Cor.Fact.	Beta Activity Gross CPM	Beta Bkg. CPM	Beta a>b xtlk CPM	Beta Base Eff	Beta Base Cor.Fact.	Beta Progeny Eff	Beta Progeny Cor.Fact.
B1	0615044-S3	11/11/06 15:21	10.00	0.0	1409.500	0.036	0.262	0.2296	1.170	n/a	n/a	524.700	1.498	326.7221	0.4286	0.978	n/a	n/a

PAI - Gas Flow Proportional Sample Analysis LB4100-B

Unit Type: LB4100 -B
Counting Unit ID: Aqua
High Voltage Mode: Simultaneous
Application Revision:
Application Version: Standard
Rev.12/29/03 JE

Data file name: ABB1111K
Batch ID: OUTLIER
Count Preset (m): 10
2 Batch Ended: 11/11/06 15:38

Background logfile: BKGABW
Date of Bkg. Cal: 11/11/06
Alpha efficiency logfile: AmR-11/05
Alpha attenuation calibration: AM0186
Beta efficiency logfile: Sr90R-11/05
Beta attenuation calibration: SR1165

Alpha prog. logfile: n/a
Alpha prog. attenuation: n/a
Beta prog. logfile: n/a
Beta prog. attenuation: n/a

Alpha Attenuation Calibration y = b*m^(a*(mass-x0))		Beta Attenuation Calibration y = b*m^(a*(mass-x0))	
Alpha b=	1.15970	Beta b=	0.8791
m=	0.98300	m=	0.9998
a=	0.7966	a=	1.3098
x0=	0.0000	x0=	0.0000
Alpha to Beta X-talk y = b *m^-mass		Beta to Alpha X-talk y = b*mass + m	
a -> b xtalk b=	0.7318	b -> a xtalk b=	-2.71E-06
a -> b xtalk m=	0.9997	b -> a xtalk m=	0.0005

Det. ID	Sample ID	Count End Date & Time	Count Dur. (min)	Resid. Mass (mg)	Alpha Activity Gross CPM	Alpha Bkg. CPM	Alpha b>a xtlk CPM	Alpha Base Eff	Alpha Base Cor.Fact.	Alpha Progeny Eff	Alpha Progeny Cor.Fact.	Beta Activity Gross CPM	Beta Bkg. CPM	Beta a>b xtlk CPM	Beta Base Eff	Beta Base Cor.Fact.	Beta Progeny Eff	Beta Progeny Cor.Fact.
B1	0615044-34	11/11/06 15:38	10.00	0.0	1369.900	0.038	0.251	0.2296	1.170	n/a	n/a	522.200	1.499	317.5428	0.4385	0.979	n/a	n/a

PAI - Gas Flow Proportional Sample Analysis LB4100-B

Unit Type: LB4100-B
Counting Unit ID: Aqua
High Voltage Mode: Simultaneous
Application Revision:
Application Version: Standard
Rev.12/29/03 JE

Data file name: AB611111M
Batch ID: OUTLIER
Count Preset (m): 10
2 Batch Ended: 11/11/06 15:56

Background logfile: BKGABW
Date of Bkg. Cal: 11/11/06
Alpha efficiency logfile: AmR-11/05
Alpha attenuation calibration: AM0106
Beta efficiency logfile: Sr90R-11/05
Beta attenuation calibration: BR1105

Alpha prog. logfile: n/a
Alpha prog. attenuation: n/a
Beta prog. logfile: n/a
Beta prog. attenuation: n/a

Alpha Attenuation Calibration		Beta Attenuation Calibration	
y = b*m^(a*(mass-x0))		y = b*m^(a*(mass-x0))	
Alpha b=	1.16970	Beta b=	0.9761
m=	0.99300	m=	0.9969
a=	0.7999	a=	1.3098
x0=	0.0000	x0=	0.0000
Alpha to Beta X-talk		Beta to Alpha X-talk	
y = b *m^-mass		y = b*mass + m	
a -> b xtalk b=	0.2310	b -> a xtalk b=	-2.71E-06
a -> b xtalk m=	0.9997	b -> a xtalk m=	0.0005

Det. ID	Sample ID	Count End Date & Time	Count Dur. (min)	Resid. Mass (mg)	Alpha Activity							Beta Activity						
					Gross CPM	Bkg. CPM	b>a xtlk CPM	Base Eff	Base Cor.Fact.	Progeny Eff	Progeny Cor.Fact.	Gross CPM	Bkg. CPM	a>b xtlk CPM	Base Eff	Base Cor.Fact.	Progeny Eff	Progeny Cor.Fact.
B1	0615044-S5	11/11/06 15:56	10.00	9.0	1381.700	0.036	0.260	0.2296	1.170	n/a	n/a	520.400	1.499	320.2781	0.4385	0.979	n/a	n/a

Date 11/11/06

SOP 724r 9

Paragon Analytics
Low Background Gas Flow Proportional Counter Log
Instrument: LB4100B

Instrument Daily Response and Background Checks

Det.	Daily Response Check Start 1	Status	Start 2	Status	Background Check Start 1	Status	Start 2	Status	Det. Status
1	LO	P							P
2									H
3									P
4									
5									
6									
7									
8									
9									
10									
11									
12									
13									

LO 11/11/06

Date 11/11/06

SOP 724r 9

Paragon Analytics

Low Background Gas Flow Proportional Counter Log

Instrument: LB4100B

Det.	Sample ID	Batch	Test	Count Dur. (min)	Start Time	Analyst Initials	File ID	Output Initials
[illegible]	[illegible]	[illegible]	[illegible]	30	1039	[illegible]	[illegible]	[illegible]

Am-241

Project 585.3020.27 Notebook No. Continued From Page 27

Prepare a primary dilution of RSO#585 (Analytics #62034-307) to a final volume of approx 40 mL.

1) Prepare 1.0M HCl by diluting 42mL conc. HCl (12N) (Fisher lot # 041145) to a final volume of 500mL.

2) Determine density of 1.0M HCl

	Bal 12
Mass of empty VMF (100mL)	62.4693g
Mass of VMF + 100mL 1.0M HCl	163.9500g
Mass of 100mL HCl (1.0M)	101.4807g
÷ 100mL = density =	1.0148 g/mL

3) Transfer RSO #585 to a 40mL VOA vial

	Bal 12
Mass of empty vial (w/ lid)	24.7400g
Mass of vial + std.	29.7998g
Mass of std. transfered	5.0598g

4) Dilute to volume w/ 1.0M HCl

	Bal 12
Mass of vial (w/ lid) + std + soln	66.7165g
Mass of empty vial (from above)	24.7400g
Mass of primary dilution	41.9765g

5) Final activity calculation (dpm/g)

$$\frac{(3.88 \times 10^4 d/s)(60 s/min)(5.0598 g)}{(5.16417 g)(41.9765 g)} = 54338.74 \frac{dpm}{g}$$

6) Final activity calculation (dpm/mL)

$$54338.74 \frac{dpm}{g} \times 1.0148 \frac{g}{mL} = \boxed{55142.95 \frac{dpm}{mL}}$$

ANALYTICS

1380 Seaboard Industrial Blvd.
Atlanta, Georgia 30318 · U.S.A.

Phone (404) 352-8677
Fax (404) 352-2837

CERTIFICATE OF CALIBRATION

Standard Radionuclide Source

PAI ID 00585
Recd 7-09-01

62034-307

Am-241 5 mL Liquid in Flame Sealed Vial

This standard radionuclide source was prepared gravimetrically from a calibrated master solution. The master solution was calibrated by liquid scintillation counting.

Radionuclide purity and calibration

EFF_PAGE_B_2006

Sr-90 Ringed Planchet Efficiency Calibration
LB4100-B
Date: 8/14/2007
Source ID: 1173

Det ID	A1	A2	A3	A4	B1	B2	B3	B4
File Name	ESR1107	ESR1107	ESR1107	ESR1107	ESR1107B	ESR1107B	ESR1107B	ESR1107B
Cnt Time	1.35	1.33	1.31	1.36	1.32	1.34	1.31	1.36
Tot Cnts	10043	10136	10044	10086	10060	10041	10078	10071
Bkg CPM	1.421	1.584	1.486	1.525	2.080	1.491	2.130	-286.421
CPM	7437.838	7619.469	7665.69	7414.651	7619.132	7491.793	7691.000	7691.568
Alpha Efficiency	0.000117	0.00044	0.000201	0.000313	0.000240	0.000281	0.000239	0.000508
Beta Efficiency	0.399332	0.409083	0.411565	0.38087	0.409065	0.402229	0.412954	0.397491
Efficiency	**0.4993**	**0.4091**	**0.4117**	**0.3809**	**0.4091**	**0.4022**	**0.4130**	**0.3975**

Det ID	C1	C2	C3	C4	D1	D2	D3	D4
File Name	NA	NA	NA	NA	ESR1108	ESR1108	ESR1108	ESR1108
Cnt Time	NA	NA	NA	NA	1.38	1.38	1.39	1.35
Tot Cnts	NA	NA	NA	NA	10098	10026	10085	10069
Bkg CPM	NA	NA	NA	NA	1.55	1.66	1.77	3.08
CPM	NA	NA	NA	NA	7315.85	7263.55	7253.63	7455.44
Alpha Efficiency	NA	NA	NA	NA	0.000501	0.000578	0.000346	0.000233
Beta Efficiency	NA	NA	NA	NA	0.394868	0.414579	0.402361	0.395874
Efficiency	NA	NA	NA	NA	**0.3949**	**0.4146**	**0.4024**	**0.3959**

Source Database for OSUM for LB4100-B

Number of sources in table: 96

Application Revision: A

Control ID	Isotope	Type	Half-Life (days)	DPM	Std dev	Date	Status	Alpha/Beta Archive File
1172	AM-241	Alpha	157783.68	5514.295	275.71	6-Jul-01	PA	Am241-11/07
1173	Sr-90/Y-90	Beta	10519.2	19986.92	999.35	2-Dec-04	PA	Sr90R-11/07

Sr-90 ON A RINGED PLANCHET

DETECTOR	EFFICIENCY '06	EFFICIENCY '07	% DIFFERENCE
A1	0.4125	0.3993	-3.20
A2	0.4034	0.4091	1.41
A3	0.4077	0.4116	0.96
A4	0.3961	0.3981	0.50
B1	0.4059	0.4091	0.79
B2	0.4079	0.4022	-1.40
B3	0.4058	0.4130	1.77
B4	0.3971	0.3975	0.10
D1	0.3949	0.3928	-0.53
D2	0.4146	0.3900	-5.93
D3	0.4024	0.3895	-3.21
D4	0.3959	0.4003	1.11

Paragon Analytics

DR RUSH SAMPLES / Ra/Sr Lab

alyte ^{90}Sr Analytical Batch _____

Superseded _____

on	Remarks			Det. No.	Filename	POS Ckd By
	Tare wt(g)	Gross wt(g)	Net wt (mg			
	8.9410	N/A	0			
	8.9855					
	8.9196					
	8.9268					
	8.9227					
	8.9546					
	9.1710					
	8.9544					

Date 2/9/06 QASS? (Y/N) No. NA

(dpm) 6 8/2/2006	~~Decay~~ Pipet ID Corrected	KA 2/9/06	Relinquished by / Date	Received by / Date
	RS-011	1		
[illegible]	T-201			
[illegible]		2		

2/9/06

1075

290476

B

WORKSHEET FOR IN-HOUSE OR RUSH SAMPLES / Ra/Sr Lab

Paragon Analytics

Initials KAA Date 2/9/00

Method (SOP / Rev) KAA 2/9/00 90Sr 702 R17

Matrix water

COMMENTS

90Sr Efficiency / STD: VERIFICATION

- Spike added to cups
- 20 ml 16 N HNO3 added to cups
- Dried on steambath
- Transferred to ringed planchets with 1 m HNO3

KAA 2/9/00

Reviewed by / Date 2/9/00

Gross Alpha / Beta Calculations

Atten. Constants		b	m	a	x0		b	m
Alpha	y = b*m^(a*(x-x0))	1.1697	0.9930	0.7986	0	y = b*m^-x	0.2318	0.9997
Beta	y = b*m^(a*(x-x0))	0.9791	0.9998	1.3098	0.0	y = b*x+m	-2.71E-06	0.0005

Beta

Sample ID	Initial Aliquot	Final Sam. Size	Count Date	Count Dur.	Residual Mass (mg)	Gross CPM	Bkg CPM	Atten.	Efficiency
0614030-S1	0.200	0.200	11/11/2006	10	0.0	7724.900	1.573	0.979	0.4312
0614030-S2	0.200	0.200	11/11/2006	10	0.0	7797.200	1.573	0.979	0.4312
0614030-S3	0.200	0.200	11/11/2006	10	0.0	7781.300	1.573	0.979	0.4312
0614030-S4	0.200	0.200	11/11/2006	10	0.0	7621.900	1.573	0.979	0.4312
0614030-S5	0.200	0.200	11/11/2006	10	0.0	7617.100	1.573	0.979	0.4312
					Mean=	7708.480			
					StDev=	85.571619			
					2Sig LCL=	7537.3368	1Sig LCL=	7622.908	
					2Sig UCL=	7879.6232	1Sig UCL=	7794.052	

0614030-S5 rejected as outlier

Spike Information

Sample ID	Beta Std ID	Ref. Date	Halflife Yrs	Act (pCi/ml)	Spike Vol (mL)	Decay Corr. Spike Act. Added
0614030-S1	777.3020.11	12/2/2004	28.8	2250.78	2.0	42960.9
0614030-S2	777.3020.11	12/2/2004	28.8	2250.78	2.0	42960.9
0614030-S3	777.3020.11	12/2/2004	28.8	2250.78	2.0	42960.9
0614030-S4	777.3020.11	12/2/2004	28.8	2250.78	2.0	42960.9
0614030-S5	777.3020.11	12/2/2004	28.8	2250.78	2.0	42960.9

** Act. Is based on Sr-90 -- Act. Multiplied by 2

PAI - Gas Flow Proportional Sample Analysis LB4100-B

Unit Type: LB4100 -B
Counting Unit ID: Aqua
High Voltage Mode: Simultaneous
Application Revision:
Application Version: Standard
Rev.12/29/03 JE

Data file name: ABB1111F
Batch ID: OUTLIER
Count Preset (m): 10
2 Batch Ended: 11/11/08 13:22

Background logfile: BKGABW
Date of Bkg. Cal: 11/11/08
Alpha efficiency logfile: AmR-11/05
Alpha attenuation calibration: AM0106
Beta efficiency logfile: Sr90R-11/05
Beta attenuation calibration: SR6105

Alpha prog. logfile: n/a
Alpha prog. attenuation: n/a
Beta prog. logfile: n/a
Beta prog. attenuation: n/a

Alpha Attenuation Calibration		Beta Attenuation Calibration	
y = b*m^(a*(mass-x0))		y = b*m^(a*(mass-x0))	
Alpha b=	1.16979	Beta b=	0.9751
m=	0.99300	m=	0.9999
a=	0.7996	a=	1.3058
x0=	0.0000	x0=	0.0000
Alpha to Beta X-talk		Beta to Alpha X-talk	
y = b*m^-mass		y = b*mass + m	
a->b xtalk b=	0.2316	b->a xtalk b=	-2.11E-05
a->b xtalk m=	0.9997	b->a xtalk m=	0.9005

Det. ID	Sample ID	Count End Date & Time	Count Dur. (min)	Resid. Mass (mg)	Alpha Activity							Beta Activity						
					Gross CPM	Bkg. CPM	b>a xtlk CPM	Base Eff	Base Cor.Fact.	Progeny Eff	Progeny Cor.Fact.	Gross CPM	Bkg. CPM	a>b xtlk CPM	Base Eff	Base Cor.Fact.	Progeny Eff	Progeny Cor.Fact.
C7	0814030-S1	11/11/08 13:22	10.00	0.0	7.500	0.099	3.862	0.2265	1.170	n/a	n/a	7724.900	1.573	1.7385	0.4312	0.979	n/a	n/a

PAI - Gas Flow Proportional Sample Analysis LB4100-B

Unit Type: LB4100 -B
Counting Unit ID: Aqua
High Voltage Mode: Simultaneous
Application Revision:
Application Version: Standard
Rev.12/29/03 JB

Data file name: ABB1111H
Batch ID: OUTLIER
Count Preset (m): 10
2 Batch Ended: 11/11/06 15:02

Background logfile: BKGABW
Date of Bkg. Cal: 11/11/06
Alpha efficiency logfile: AmR-11/05
Alpha attenuation calibration: AM0109
Beta efficiency logfile: Sr90R-11/05
Beta attenuation calibration: SR1109

Alpha prog. logfile: n/a
Alpha prog. attenuation: n/a
Beta prog. logfile: n/a
Beta prog. attenuation: n/a

Alpha Attenuation Calibration		Beta Attenuation Calibration	
y = b*m^(a*(mass-x0))		y = b*m^(a*(mass-x0))	
Alpha b=	1.16970	Beta b=	0.9791
m=	0.98300	m=	0.9990
a=	0.7986	a=	1.3098
x0=	0.0000	x0=	0.0000
Alpha to Beta K-talk		Beta to Alpha X-talk	
y = b *m^-mass		y = b*mass + m	
a -> b xtalk b=	0.2316	b -> a xtalk b=	-2.71E-06
a -> b xtalk m=	0.9997	b -> a xtalk m=	0.0005

Det. ID	Sample ID	Count End Date & Time	Count Dur. (min)	Resid. Mass (mg)	Alpha Activity							Beta Activity						
					Gross CPM	Bkg. CPM	b>a xtlk CPM	Base Eff	Base Cor.Fact.	Progeny Eff	Progeny Cor.Fact.	Gross CPM	Bkg. CPM	a>b xtlk CPM	Base Eff	Base Cor.Fact.	Progeny Eff	Progeny Cor.Fact.
C1	0814030-S2	11/11/06 15:02	10.00	0.0	10.500	0.099	3.899	0.2265	1.170	n/a	n/a	7797.200	1.573	2.4339	0.4312	0.979	n/a	n/a

PAI - Gas Flow Proportional Sample Analysis LB4100-B

Unit Type: LB4100-B
Counting Unit ID: Aqua
High Voltage Mode: Simultaneous
Application Revision:
Application Version: Standard
Rev.12/29/03 JE

Data file name: ABB1111J
Batch ID: OUTLIER
Count Preset (m): 10
2 Batch Ended: 11/11/06 15:22

Background logfile: BKGABW
Date of Bkg. Cal: 11/11/06
Alpha efficiency logfile: AmR-11/05
Alpha attenuation calibration: AM0105
Beta efficiency logfile: Sr90R-11/05
Beta attenuation calibration: SR1105

Alpha prog. logfile: n/a
Alpha prog. attenuation: n/a
Beta prog. logfile: n/a
Beta prog. attenuation: n/a

Alpha Attenuation Calibration		Beta Attenuation Calibration	
y = b*m^(a*(mass-x0))		y = b*m^(a*(mass-x0))	
Alpha b=	1.16970	Beta b=	0.9781
m=	0.99300	m=	0.9998
a=	0.7996	a=	1.3098
x0=	0.0000	x0=	0.0000
Alpha to Beta X-talk		Beta to Alpha X-talk	
y = b *m^-mass		y = b*mass + m	
a -> b xtalk b=	0.2318	b -> a xtalk b=	-3.71E-06
a -> b xtalk m=	0.9997	b -> a xtalk m=	0.0005

Det. ID	Sample ID	Count End Date & Time	Count Dur. (min)	Resid. Mass (mg)	Alpha Activity							Beta Activity						
					Gross CPM	Bkg. CPM	b>a xtlk CPM	Base Eff	Base Cor.Fact.	Progeny Eff	Progeny Cor.Fact.	Gross CPM	Bkg. CPM	a>b xtlk CPM	Base Eff	Base Cor.Fact.	Progeny Eff	Progeny Cor.Fact.
C1	0614030-S3	11/11/06 15:22	10.00	0.0	9.200	0.099	3.891	0.2265	1.170	n/a	n/a	7781.300	1.573	2.1326	0.4312	0.679	n/a	n/a

PAI - Gas Flow Proportional Sample Analysis LB4100-B

Unit Type: LB4100 -B
Counting Unit ID: Aqua
High Voltage Mode: Simultaneous
Application Revision: 2
Application Version: Standard
Rev.12/29/03 JE

Data file name: ABB11111L
Batch ID: OUTLIER
Count Preset (m): 10
Batch Ended: 11/11/06 15:38

Background logfile: BKGABW
Date of Bkg. Cal: 11/11/06
Alpha efficiency logfile: AmR-11/05
Alpha attenuation calibration: AM0106
Beta efficiency logfile: Sr90R-11/05
Beta attenuation calibration: SR1105

Alpha prog. logfile: n/a
Alpha prog. attenuation: n/a
Beta prog. logfile: n/a
Beta prog. attenuation: n/a

Alpha Attenuation Calibration		Beta Attenuation Calibration	
y = b*m^(x^[mass-x0])		y = b*m^(a^[mass-x0])	
Alpha b=	1.16970	Beta b=	0.9191
m=	0.99300	m=	0.9968
a=	0.7966	a=	1.3968
x0=	0.0000	x0=	0.0000
Alpha to Beta X-talk		Beta to Alpha X-talk	
y = b *m^-mass		y = b*mass + m	
a -> b xtalk b=	0.2319	b -> a xtalk b=	-2.71E-06
a -> b xtalk m=	0.9897	b -> a xtalk m=	0.0005

Del. ID	Sample ID	Count End Date & Time	Count Dur. (min)	Resid. Mass (mg)	Alpha Activity							Beta Activity						
					Gross CPM	Bkg. CPM	b>a xtlk CPM	Base Eff	Base Cor.Fact.	Progeny Eff	Progeny Cor.Fact.	Gross CPM	Bkg. CPM	a>b xtlk CPM	Base Eff	Base Cor.Fact.	Progeny Eff	Progeny Cor.Fact.
C1	0614030-S4	11/11/06 15:38	10.00	0.0	10.200	0.099	3.811	0.2265	1.170	n/a	n/a	7621.900	1.573	2.3644	0.4312	0.979	n/a	n/a

PAI - Gas Flow Proportional Sample Analysis LB4100-B

Unit Type: LB4100 -B
Counting Unit ID: Aqua
High Voltage Mode: Simultaneous
Application Revision: 2
Application Version: Standard
Rev.12/29/03 JB

Data file name: ABB1111N
Batch ID: OUTLIER
Count Preset (m): 10
Batch Ended: 11/11/06 15:56

Background logfile: BKGABW
Date of Bkg. Cal: 11/11/06
Alpha efficiency logfile: AmR-11/05
Alpha attenuation calibration: AM0106
Beta efficiency logfile: Sr90R-11/05
Beta attenuation calibration: SR1105

Alpha prog. logfile: n/a
Alpha prog. attenuation: n/a
Beta prog. logfile: n/a
Beta prog. attenuation: n/a

Alpha Attenuation Calibration		Beta Attenuation Calibration	
y = b*m^(a*(mass-x0))		y = b*m^(a*(mass-x0))	
Alpha b=	1.16930	Beta b=	0.9791
m=	0.98300	m=	0.9988
a=	0.7986	a=	1.3098
x0=	0.0000	x0=	0.0000
Alpha to Beta X-talk		Beta to Alpha X-talk	
y = b*m^-mass		y = b*mass + m	
a -> b xtalk b=	0.2316	b -> a xtalk b=	-2.71E-06
a -> b xtalk m=	0.9997	b -> a xtalk m=	0.0005

Det. ID	Sample ID	Count End Date & Time	Count Dur. (min)	Resid. Mass (mg)	Alpha Activity							Beta Activity						
					Gross CPM	Bkg. CPM	b>a xtlk CPM	Base Eff	Base Cor.Fact.	Progeny Eff	Progeny Cor.Fact.	Gross CPM	Bkg. CPM	a>b xtlk CPM	Base Eff	Base Cor.Fact.	Progeny Eff	Progeny Cor.Fact.
C1	0614030-S5	11/11/06 15:56	10.00	0.0	8.700	0.098	3.899	0.2265	1.170	n/a	n/a	7617.100	1.573	2.0167	0.4312	0.978	n/a	n/a

Date 11/11/06

SOP 724r 9

Paragon Analytics
Low Background Gas Flow Proportional Counter Log
Instrument: LB4100B

Instrument Daily Response and Background Checks

Date 11/11/06

SOP 724r 9

Paragon Analytics

Low Background Gas Flow Proportional Counter Log

Prepare a secondary dilution of RSO #777 (Analytics #9573-307) in 0.1M HCl to a final volume of approx. 500mL.

1) Prepare 0.1M HCl by diluting 8.3mL HCl (12M) (Fisher Scientific Lot #055784) to a final volume of 1L.

2) Determine the density of 0.1M HCl

Weight of empty volumetric flask (100mL)	68.549
Mass of flask + 100mL 0.1M HCl	168.319
Mass of 100mL of 0.1M HCl	99.770

BL 2/6

ANALYTICS

RSO #777
Rec'd 12/9/04
DCB

1380 Seaboard Industrial Blvd.
Atlanta, Georgia 30318 - U.S.A.

Phone (404) 352-8677
Fax (404) 352-2837

CERTIFICATE OF CALIBRATION

Standard Radionuclide Source

69573-307

Sr-90 5 mL Liquid in Flame Sealed Vial

This standard radionuclide source was prepared gravimetrically from a calibrated master solution. The master solution was calibrated by liquid scintillation counting.

Radionuclide purity and calibration were checked by germanium

Mass Attenuation Curves

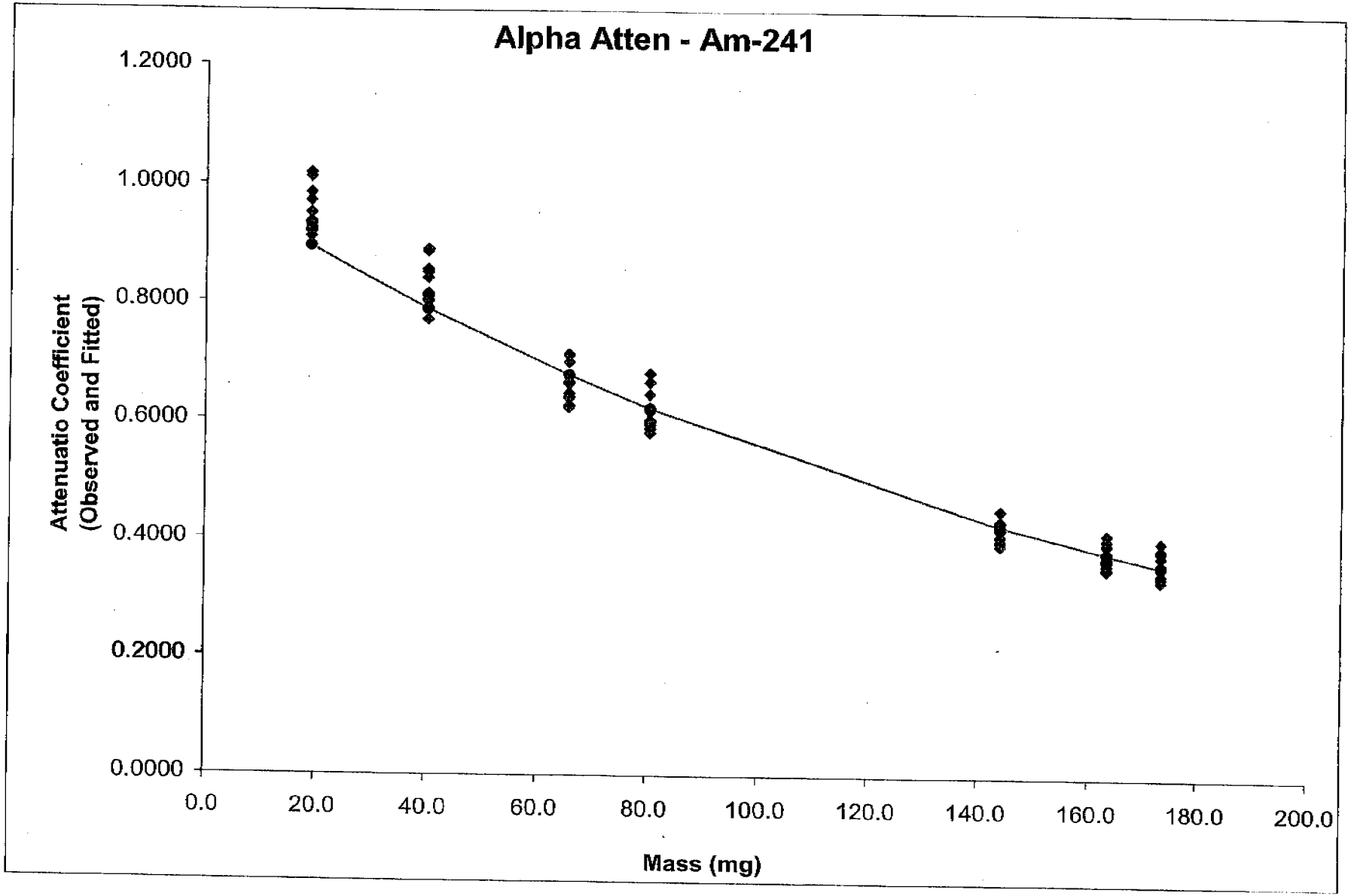
Cross-Talk Equation	y=b*m^-x
b =	0.2550
m =	0.9990
% Diff Max. =	41.9%

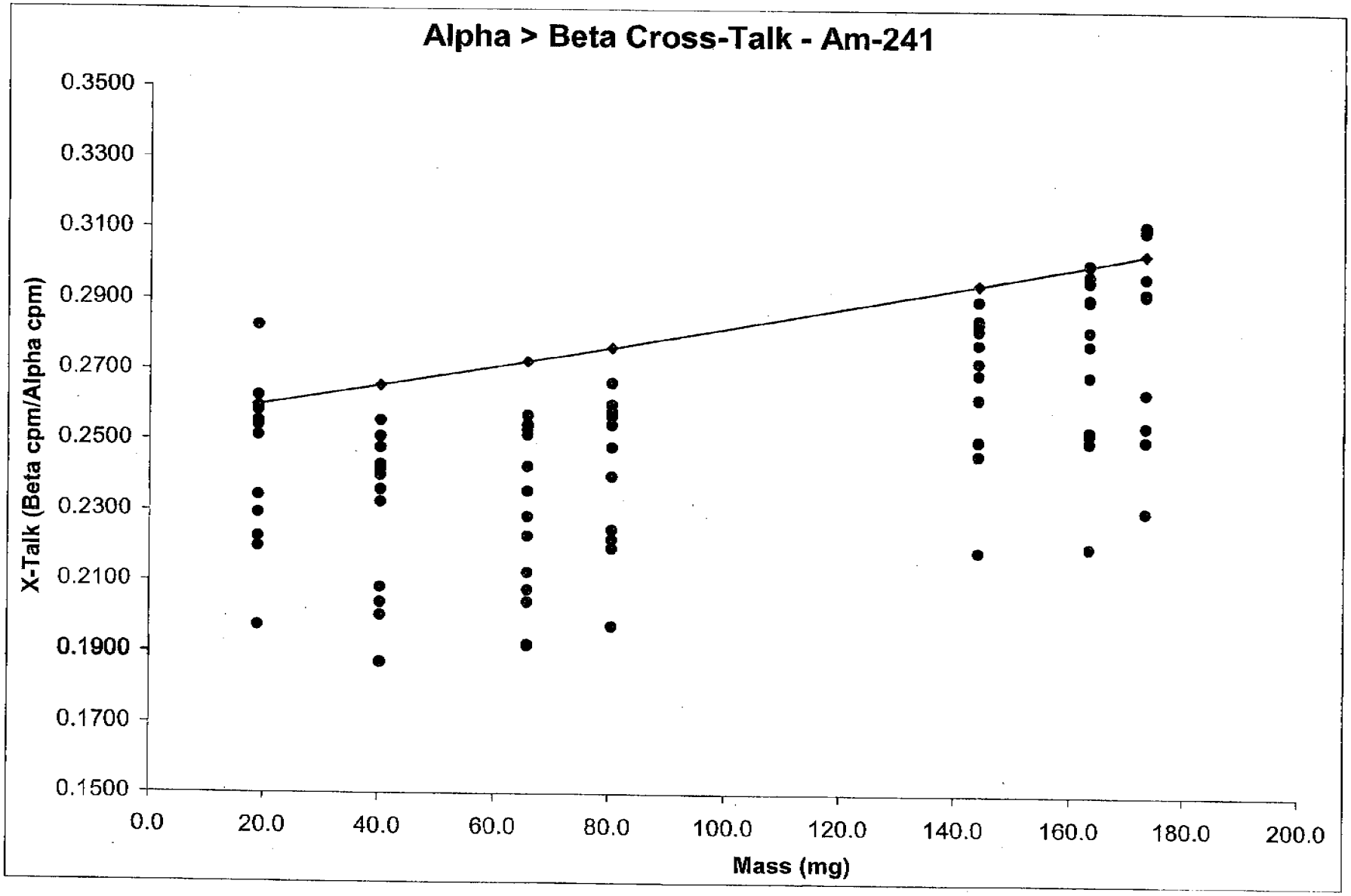
itted n Fact.	% Diff.	α > β X Tlk Actual	α > β X Tlk Fitted	% Diff.
8939	12.2%	0.2294	0.2599	-13.3%
8939	4.4%	0.2554	0.2599	-1.7%
8939	7.9%	0.2827	0.2599	8.1%
8939	5.9%	0.2227	0.2599	-16.7%
8939	11.6%	0.2199	0.2599	-18.2%
8939	1.8%	0.2592	0.2599	-0.3%
8939	3.9%	0.2542	0.2599	-2.2%
8939	2.9%	0.2626	0.2599	1.0%
8939	9.2%	0.2513	0.2599	-3.4%
8939	3.4%	0.2344	0.2599	-10.9%
8939	2.8%	0.1973	0.2599	-31.7%
8939	4.2%	0.2584	0.2599	-0.6%
7882	11.3%	0.2040	0.2655	-30.1%
7882	3.3%	0.2361	0.2655	-12.4%
7882	7.4%	0.2511	0.2655	-5.7%
7882	7.9%	0.2003	0.2655	-32.6%
7882	11.0%	0.2082	0.2655	-27.5%
7882	-2.3%	0.2556	0.2655	-3.9%
7882	1.7%	0.2431	0.2655	-9.2%
7882	1.7%	0.2478	0.2655	-7.1%
7882	6.3%	0.2401	0.2655	-10.6%
7882	1.9%	0.2325	0.2655	-14.2%
7882	2.6%	0.1870	0.2655	-42.0%
7882	3.0%	0.2418	0.2655	-9.8%
3780	4.7%	0.2076	0.2724	-31.2%
3780	-2.3%	0.2230	0.2724	-22.2%
3780	3.1%	0.2426	0.2724	-12.3%
3780	-1.7%	0.2041	0.2724	-33.4%
3780	5.0%	0.2125	0.2724	-28.1%
3780	-8.5%	0.2515	0.2724	-8.3%
3780	-8.6%	0.2571	0.2724	-5.9%
3780	-8.3%	0.2545	0.2724	-7.0%
3780	-2.1%	0.2357	0.2724	-15.5%
3780	-6.1%	0.2285	0.2724	-19.2%
3780	-4.8%	0.1919	0.2724	-41.9%
3780	**-5.7%**	**0.2531**	**0.2724**	**-7.6%**
213	**8.8%**	**0.2221**	**0.2764**	**-24.5%**
213	-0.7%	0.2399	0.2764	-15.2%
213	3.8%	0.2580	0.2764	-7.1%
213	-0.3%	0.2195	0.2764	-25.9%
213	6.7%	0.2248	0.2764	-22.9%
213	-7.0%	0.2582	0.2764	-7.1%
213	-3.2%	0.2544	0.2764	-8.6%
213	-4.5%	0.2569	0.2764	-7.6%
213	0.3%	0.2602	0.2764	-6.2%
213	-5.7%	0.2461	0.2764	-11.4%
213	-3.8%	0.1972	0.2764	-40.1%
213	-3.7%	0.2663	0.2764	-3.8%
270	5.8%	0.2501	0.2945	-17.7%
270	-1.5%	0.2817	0.2945	-4.5%
270	1.4%	0.2847	0.2945	-3.4%
270	-1.1%	0.2462	0.2945	-19.6%
270	1.9%	0.2621	0.2945	-12.4%
270	-8.5%	0.2900	0.2945	-1.6%
270	-4.2%	0.2836	0.2945	-3.9%

5	-6.0%
5	-9.5%
5	-8.1%
5	-34.5%
5	-1.5%
3	-20.1%
3	-11.7%
3	0.1%
3	-18.6%
3	-19.0%
3	-0.9%
3	-3.4%
3	-3.2%
3	-8.1%
3	-6.6%
3	-38.3%
3	-1.5%
3	-19.1%
3	-3.9%
3	-2.1%
3	-21.0%
3	-14.9%
3	2.3%
3	2.6%
3	2.3%
3	-3.6%
3	-3.9%
3	-31.6%
3	2.1%

% Diff.	α > β X Tik α > β X Tik		% Diff.
	Actual	Fitted	
-4.4%	0.2614	0.2895	-10.7%
-13.0%	0.2713	0.2895	-6.7%
-9.5%	0.2937	0.2895	1.4%
-10.3%	0.2472	0.2895	-17.1%
-4.4%	0.2477	0.2895	-16.9%
-21.8%	0.2912	0.2895	0.6%
-16.2%	0.2863	0.2895	-1.1%
-17.9%	0.2906	0.2895	0.4%
-10.1%	0.2693	0.2895	-7.5%
-18.6%	0.2702	0.2895	-7.1%
-16.2%	0.2397	0.2895	-20.8%
-18.3%	0.2972	0.2895	2.6%
-2.8%	0.2537	0.2820	-11.1%
-10.7%	0.2567	0.2820	-9.9%
-3.3%	0.2645	0.2820	-6.6%
-7.3%	0.2323	0.2820	-21.4%
-6.2%	0.2466	0.2820	-14.4%
-18.2%	0.2898	0.2820	-4.5%
-15.6%	0.2709	0.2820	-4.1%
-14.4%	0.2765	0.2820	-2.0%
-6.9%	0.2497	0.2820	-12.9%
-15.7%	0.2636	0.2820	-7.0%
-15.3%	0.2169	0.2820	-30.0%
-16.8%	0.2836	0.2820	0.6%
15.3%	0.2049	0.2655	-29.8%
9.4%	0.2274	0.2655	-16.8%
11.1%	0.2442	0.2655	-8.7%
10.7%	0.1954	0.2655	-35.9%
13.0%	0.2186	0.2655	-21.5%
2.3%	0.2518	0.2655	-5.5%
4.4%	0.2493	0.2655	-6.5%
7.0%	0.2499	0.2655	-8.3%
10.2%	0.2364	0.2655	-12.3%
3.3%	0.2362	0.2655	-12.4%
5.1%	0.1876	0.2655	-41.5%
5.1%	0.2486	0.2655	-6.8%
15.6%	0.2232	0.2600	-16.5%
7.4%	0.2433	0.2600	-6.9%
11.1%	0.2646	0.2600	1.7%
7.9%	0.2180	0.2600	-18.7%
12.6%	0.2228	0.2600	-16.7%
1.8%	0.2561	0.2600	-1.5%
6.4%	0.2491	0.2600	-4.4%
6.0%	0.2494	0.2600	-4.2%
11.6%	**0.2472**	**0.2600**	**-5.2%**
4.4%	**0.2370**	**0.2600**	**-8.7%**
6.6%	**0.1908**	**0.2600**	**-36.4%**
5.4%	0.2507	0.2600	-3.7%
11.4%	0.2137	0.2700	-26.3%
3.8%	0.2386	0.2700	-13.2%
7.0%	0.2393	0.2700	-12.9%
5.6%	0.2114	0.2700	-27.7%
9.3%	0.2213	0.2700	-22.0%
-2.9%	0.2553	0.2700	-5.8%
2.2%	0.2473	0.2700	-9.2%
0.2%	0.2557	0.2700	-5.6%
5.2%	0.2492	0.2700	-8.4%
-1.2%	0.2412	0.2700	-12.0%
1.1%	0.1889	0.2700	-43.0%
0.3%	0.2505	0.2700	-7.8%
-5.8%	0.2590	0.2923	-12.8%
-13.9%	0.2906	0.2923	-0.6%
-7.8%	0.2890	0.2923	-1.1%
-12.4%	0.2488	0.2923	-17.5%

3	0.4178	0.4471	-7.0%	0.2506	0.2923	-16.6%
3	0.3673	0.4471	-21.7%	0.2959	0.2923	1.2%
8	0.3822	0.4471	-17.0%	0.2764	0.2923	-5.7%
3	0.3766	0.4471	-18.7%	0.2868	0.2923	-0.8%
2	0.3981	0.4471	-12.3%	0.2726	0.2923	-7.2%
4	0.3763	0.4471	-18.8%	0.2763	0.2923	-5.8%
3	0.3824	0.4471	-16.9%	0.2210	0.2923	-32.2%
5	0.3703	0.4471	-20.8%	0.3038	0.2923	3.8%
6	0.3822	0.4458	-16.7%	0.2447	0.2924	-19.5%
7	0.3508	0.4458	-27.1%	0.2692	0.2924	-8.8%
3	0.3662	0.4458	-21.7%	0.2842	0.2924	-2.9%
7	0.3585	0.4458	-24.4%	0.2376	0.2924	-23.1%
9	0.3719	0.4458	-19.9%	0.2489	0.2924	-17.5%
3	0.3209	0.4458	-38.9%	0.2870	0.2924	-1.9%
9	0.3332	0.4458	-33.6%	0.2854	0.2924	-2.4%
6	0.3330	0.4458	-33.9%	0.2836	0.2924	-3.1%
3	0.3560	0.4458	-25.2%	0.2710	0.2924	-7.9%
8	0.3380	0.4458	-31.9%	0.2529	0.2924	-15.6%
6	0.3361	0.4458	-31.9%	0.2188	0.2924	-33.7%
0	0.3385	0.4458	-31.7%	0.2843	0.2924	-2.9%
5	0.5433	0.5534	-1.8%	0.2408	0.2819	-17.1%
7	0.5106	0.5534	-8.4%	0.2503	0.2819	-12.6%
8	0.5217	0.5534	-6.1%	0.2663	0.2819	-5.8%
2	0.5224	0.5534	-5.9%	0.2318	0.2819	-21.6%
4	0.5381	0.5534	-2.8%	0.2262	0.2819	-23.5%
5	0.4699	0.5534	-17.8%	0.2737	0.2819	-3.0%
5	0.4856	0.5534	-13.9%	0.2773	0.2819	-1.7%
9	0.4867	0.5534	-13.7%	0.2663	0.2819	-5.1%
9	0.5139	0.5534	-7.7%	0.2496	0.2819	-12.9%
3	0.4757	0.5534	-16.3%	0.2609	0.2819	-8.0%
6	0.4605	0.5534	-15.2%	0.2195	0.2819	-28.4%
8	0.4834	0.5534	-14.5%	0.2800	0.2819	-0.7%
6	0.6642	0.6533	1.6%	0.2198	0.2741	-24.7%
4	0.6029	0.6533	-8.3%	0.2339	0.2741	-17.2%
5	0.6510	0.6533	-0.2%	0.2361	0.2741	-15.1%
4	0.6267	0.6533	-4.2%	0.2060	0.2741	-33.7%
7	0.6661	0.6533	1.9%	0.2180	0.2741	-25.7%
8	0.5816	0.6533	-12.3%	0.2531	0.2741	-8.3%
4	0.5997	0.6533	-8.9%	0.2526	0.2741	-8.5%
3	0.6019	0.6533	-8.5%	0.2546	0.2741	-7.7%
1	0.6197	0.6533	-5.4%	0.2509	0.2741	-9.2%
8	0.5855	0.6533	-11.6%	0.2380	0.2741	-15.2%
8	0.5984	0.6533	-9.2%	0.1854	0.2741	-47.9%
5	0.5878	0.6533	-11.1%	0.2568	0.2741	-5.9%


Alpha Atten - Am-241
Attenuatio Coefficient (Observed and Fitted)
1.2000
1.0000
0.8000
0.6000
0.4000
0.2000
0.0000
0.0
20.0
40.0
60.0
80.0
100.0
120.0
140.0
160.0
180.0
200.0
Mass (mg)


Alpha > Beta Cross-Talk - Am-241
X-Talk (Beta cpm/Alpha cpm)
0.3500
0.3300
0.3100
0.2900
0.2700
0.2500
0.2300
0.2100
0.1900
0.1700
0.1500
0.0
20.0
40.0
60.0
80.0
100.0
120.0
140.0
160.0
180.0
200.0
Mass (mg)

Paragon Analytics

QUALITY ASSURANCE SUMMARY SHEET

PAR W.O. # / BATCH GAB Calibration
TEST GFPC
METHOD Am241 curve
SOP/REV (PREP)
SOP/REV (ANAL) 724 R 7/10
JH 11/21/07

Briefly document any QA or other problems or deviations associated with the analysis of samples. Problems could result from: log-in, color, odor, dilution, consistency, scheduling, equipment, or instrumentation, or may include documentation of minor deviations necessary due to unique DQO's or sample characteristics.

JH 11/21/07

1. All data for samples 0718500-9, -10, -11, -12 and -13 were rejected [illegible]

Date 11/13/07

SOP 724r 10

Paragon Analytics

Low Background Gas Flow Proportional Counter Log

Instrument: LB4100B

Instrument Daily Response and Background Checks

Det.	Daily Response Check Start 1	Status	Start 2	Status	Background Check Start 1	Status	Start 2	Status	Det. Status
1	JH	P			JH	P			P
2						HB	JH	P	
3						P			OLSW
4									
5									
6		LB	JH	LB					
7		P							P
8									
9									
10									
11									
12									
13									
14									
15		LB	JH	P					
16						HB			OLSW

Det = Detector; α = Alpha; β = Beta; P = Pass; H = High; L = Low; OL = Offline; R = Recount; W = Weekly; NP = Not Processed

Weekly Background Calibration

	Current Calib. File ID	Weekly Calib. Started	Status	File ID
Dr A	BKB1109W, 10W & 11W			
Dr B				
Dr C				
Dr D				

Dr = Drawer

Gas Supply

P-10 Supply		P-10 Flow	
Tank 1	1600	Dr A	0.15
		Dr B	
Tank 2	2100	Dr C	
		Dr D	

Comments:

Page No.: 357324 A

Form 780r8.doc (6/23/06)

Reviewed By / Date JH 11/14/07

Date 11/13/07

SOP 724r / 0

Paragon Analytics

Low Background Gas Flow Proportional Counter Log

Instrument: LB4100B

Det.	Sample ID	Batch	Test	Count Dur. (min)	Start Time	Analyst Initials	File ID	Output Initials
1-16	Daily Eff	—	—	30	823	JH	EFB1113	JH
6,15-16	Daily Eff	—	—	30	837	JH	EFB1113R	JH
1-16	Daily BKG	—	—	60	852	JH	BKB1113	JH
2	Daily BKG	—	—	60	959	JH	BKB1113R	W for JH
9	0710199-1	AB071107-2	LB	70	1002	JH	ABB1113	JH
10	-2							
11	-3							
12	-4							
9	0710199-5	AB071107-2	LA	70	1114	JH	ABB1113A	W
10	AB071107-2MB							
11	-2LCS							
12	-2LCSD							
1-8,13-16	Mass Curve	AB070525-1	SrGOR	—	1125	JH	ASR1113	W

Date 11/13/07 SOP 724r / 0

Paragon Analytics

Low Background Gas Flow Proportional Counter Log

Instrument: LB4100B

Det.	Sample ID	Batch	Test	Count Dur. (min)	Start Time	Analyst Initials	File ID	Output Initials
1-16	Daily Eff	—	—	30	823	JH	EFB1113	JH
6,15-16	Daily Eff	—	—	30	837	JH	EFB1113R	JH
1-16	Daily BKG	—	—	60	852	JH	BKB1113	JH
2	Daily BKG	—	—	60	959	JH	BKB1113R	W for JH
9	0710199-1	AB071107-2	αB	70	1002	JH	ABB1113	JH
10	-2							
11	-3							
12	-4							
9	0710199-5	AB071107-2	αB	70	1116	JH	ABB1113A	W
10	AB071107-2MB							
11	-2LCS							
12	-2LCSD							
1-8,13-16	Mass Curve	AB070525-1	S-60R	—	1125	JH	ASR1113	W
9	0710246-3	RA071107-1	RA228	250	1240	W	RAB1113	W
10	-4							
11	RA071107-1MB							
12	-1LCS							
1-8,13-16	Mass Curve	AB070611-4	AM241R	—	1405	JH	AAM1113	W
9	0711021-1	AB071107-1	αB	70	1705	W	ABB1113B	W
10	0711023-4							
11	-4D							
12	-6							
9	0710299-11	AB071106-5	αB	100	1841	W	ABB1113C	JH
10	-12							
11	-15							
12	-16							

JH 11/14/07

Comments:

Page No.: 357324 B

(cont. from page NA B)

Form 780r8.doc (6/23/06)

Reviewed By / Date JH 11/14/07

Date 11/14/07

SOP 724r 10

Paragon Analytics

Low Background Gas Flow Proportional Counter Log

Instrument: LB4100B

Instrument Daily Response and Background Checks

Det.	Daily Response Check Start 1	Status	Start 2	Status	Background Check Start 1	Status	Start 2	Status	Det. Status
1	JH	P			JH	P			P
2		↓							↓
3		HL	JH	P					OLBW
4		P							
5									
6									↓
7									P
8		↓							
9		P							
10		LB	JH	P		↓			
11		P				LB	JH	P	↓
12		LB	JH	LB		P			OLOB
13		P							P
14									
15						↓			↓
16	↓	↓			↓	LB	~~JH~~		OLBW

Det = Detector; α = Alpha; β = Beta; P = Pass; H = High; L = Low; OL = Offline; R = Recount; W = Weekly; NP = Not Processed

JH 11/14/07

Weekly Background Calibration

	Current Calib. File ID	Weekly Calib. Started	Status	File ID
Dr A	BKGB 11 09W, 10W + 11W			
Dr B				
Dr C				
Dr D	↓ ↓			

Dr = Drawer

Gas Supply

P-10 Supply		P-10 Flow	
Tank 1	1400	Dr A	0.15
	↓	Dr B	
Tank 2	2100	Dr C	
	↓	Dr D	↓

Comments:

Page No.: 357325 A

Form 780r8.doc (6/23/06)

Reviewed By / Date JH 11/15/07

Date 11/14/07 SOP 724r 10

Paragon Analytics

Low Background Gas Flow Proportional Counter Log

Instrument: LB4100B

Det.	Sample ID	Batch	Test	Count Dur. (min)	Start Time	Analyst Initials	File ID	Output Initials
1-16	Daily Eff	—	—	30	815	JH	EFB1114	JH
3,10,12	Daily Eff	—	—	30	826	JH	EFB1114R	JH
1-16	Daily BKG	—	—	60	841	JH	BKB1114	JH
11	↓	—	—	60	953	JH	BKB1114R	JH
9	AB071109-1LCS	AB071109-1	αβ	60	952	JH	ABB1114	JH
10	↓ -1LCSD	↓	↓	↓	↓	↓	↓	↓
1-4,9-16	Mass Curve	AB070611-4	Am241R	—	957	JH	AAM1114	↓
9	0710296-4	AB071107-1	αβ	110	1114	JH	ABB1114A	↓ for JH
10	↓ -5	↓	↓	↓	↓	↓	↓	↓
11	0711009-12	↓	↓	↓	↓	↓	↓	↓
7	RA071108-1LCS	RA071108-1	Ra228	60	1330	↓	RAB1114	↓
10	↓ -1LCSD	↓	↓	↓	↓	↓	↓	↓
11	AB071112-3LCS	AB071112-3	αβ	60	1333	↓	ABB1114B	↓
9	0710229-1	RA071108-1	Ra228	250	1443	↓	RAB1114A	↓

Sr90 Attenuation Curve = Gross Beta Ringed

Source: 0711509 S1 → S16

JH 11/12/07 Benchsheet: AB070525-1 Filenames: ASR1112, ASR1113

JH 11/12/07

Det	1358	1410	1419	1432	1443	1509	1125	1136	1146	1157	1209	1245	1257	1311	1326	1341
A1	1	2	3	4	5	6	7	8	9	10	11	12	13	14	15	16
A2	2	3	4	5	6	7	8	9	10	11	12	13	14	15	16	1
A3	3	4	5	6	7	8	9	10	11	12	13	14	15	16	1	2
A4	4	5	6	7	8	9	10	11	12	13	14	15	16	1	2	3
B1	5	6	7	8	9	10	11	12	13	14	15	16	1	2	3	4
B2	6	7	8	9	10	11	12	13	14	15	16	1	2	3	4	5
B3	7	8	9	10	11	12	13	14	15	16	1	2	3	4	5	6
B4	8	9	10	11	12	13	14	15	16	1	2	3	4	5	6	7
D1	9	10	11	12	13	14	15	16	1	2	3	4	5	6	7	8
D2	10	11	12	13	14	15	16	1	2	3	4	5	6	7	8	9
D3	11	12	13	14	15	16	1	2	3	4	5	6	7	8	9	10
D4	12	13	14	15	16	1	2	3	4	5	6	7	8	9	10	11

Am-241 Mass Attenuation Curve = Gross Alpha Ringed

Source: 0718500-1LCS → 16LCS

JH 11/15/07

JH

Paragon Analytics

Radiochemistry Instrument Worksheet

Prep Batch: AB070611-4

Prep Procedure: GAB

α attenuation mass curve.

Analytical QASS / NCR? Y (N) NA

Prep Num	LabID	QC Type	Init Alq	Fin Alq	Units	Residual Mass (mg)	Cnt 1 File	Cnt 1 Inst/Det	Cnt 1 Pos Chk By	Cnt 2 File	Cnt 2 Inst/Det	Cnt 2 Pos Chk By	Cnt 3 File	Cnt 3 Inst/Det	Cnt 3 Pos Chk By	Notes
1	0718500-10	LCS	200	200	ml	100.5										
1	0718500-11	LCS	200	200	ml	138.3										
1	0718500-12	LCS	200	200	ml	126.8										
1	0718500-13	LCS	200	200	ml	136.8										
1	0718500-14	LCS	200	200	ml	144.1										
1	0718500-15	LCS	200	200	ml	163.3										
1	0718500-16	LCS	200	200	ml	173.3										
1	0718500-1	LCS	200	200	ml	19										
1	0718500-2	LCS	200	200	ml	19.4										
1	0718500-3	LCS	200	200	ml	40.3										
1	0718500-4	LCS	200	200	ml	40.5										
1	0718500-5	LCS	200	200	ml	65.8										
1	0718500-6	LCS	200	200	ml	57.3										
1	0718500-7	LCS	200	200	ml	80.6										
1	0718500-8	LCS	200	200	ml	72.1										
1	0718500-9	LCS	200	200	ml	100.2										

JH 11/21/07

Spike Solution Information

Soln #	Nuclide	SolnID	Prep Conc	Units	Prep Date	Aliquot	Units	Pipet ID
S1	AM-241	585.3020.27	54,620.615	DPM/ml	06/11/07	0.1	ml	RS-008

Paragon Analytics

Radiochemistry Instrument Worksheet

Prep Batch: AB070611-4

Sample Barcodes

0718500-10LCS AB070611-4PS1	0718500-11LCS AB070611-4PS2
0718500-12LCS AB070611-4PS3	0718500-13LCS AB070611-4PS4
0718500-14LCS AB070611-4PS5	0718500-15LCS AB070611-4PS6
0718500-16LCS AB070611-4PS7	0718500-1LCS AB070611-4PS8
0718500-2LCS AB070611-4PS9	0718500-3LCS AB070611-4PS10
0718500-4LCS AB070611-4PS11	0718500-5LCS AB070611-4PS12
0718500-6LCS AB070611-4PS13	0718500-7LCS AB070611-4PS14
0718500-8LCS AB070611-4PS15	0718500-9LCS AB070611-4PS16

Paragon Analytics

Radiochemistry Prep Worksheet

Prep Batch: AB070611-4

Prep Procedure: GAB

Reviewed By: emf **Review Date:** 6/16/07

Non-Routine Pre-Treatment? Y / (N) **Batch:** N/A **Re-Prep?** Y / (N) **Batch:** N/A **Prep QASS / NCR?** Y / (N) N/A

Prep SOP: PAI 702 **Rev:** 18
Prep SOP: NONE
Matrix Class: liquid

Prep Analyst: Erin Finsley EMF
Prep Date: 6/11/07
Prep Dept: RS

Balance: 13
Balance:

Samp Num	Prep Num	LabID	QC Type	Dish No.	Init Alq ml	Fin Alq ml	Prep Basis	Standards	Prep Notes
1	1	0718500-10	LCS		200	200	Unfiltered	S1	2.5 ML OF SALT
2	1	0718500-11	LCS		200	200	Unfiltered	S1	3.0
3	1	0718500-12	LCS		200	200	Unfiltered	S1	3.0
4	1	0718500-13	LCS		200	200	Unfiltered	S1	3.5
5	1	0718500-14	LCS		200	200	Unfiltered	S1	3.5
6	1	0718500-15	LCS		200	200	Unfiltered	S1	4.0
7	1	0718500-16	LCS		200	200	Unfiltered	S1	4.0
8	1	0718500-1	LCS		200	200	Unfiltered	S1	0.5
9	1	0718500-2	LCS		200	200	Unfiltered	S1	0.5
10	1	0718500-3	LCS		200	200	Unfiltered	S1	1.0
11	1	0718500-4	LCS		200	200	Unfiltered	S1	1.0
12	1	0718500-5	LCS		200	200	Unfiltered	S1	1.5
13	1	0718500-6	LCS		200	200	Unfiltered	S1	1.5
14	1	0718500-7	LCS		200	200	Unfiltered	S1	2.0
15	1	0718500-8	LCS		200	200	Unfiltered	S1	2.0
16	1	0718500-9	LCS		200	200	Unfiltered	S1	2.5

Spiked By: Erin Finsley **Date:** 6/11/07
Witnessed By: Melissa Cromer **Date:** 6/11/07

Spike Solution Information

Soln #	Nuclide	SolnID	Prep Conc	Units	Prep Date	Aliquot	Units	Pipet ID
S1	AM-241	585.3020.27	54,620.815	DPM/ml	06/11/07	0.1	ml	RS-008

Comments
ALL SAMPLES DESICCATED AT 10:30 ON 6/15/2007.

Gravimetric Worksheet

Prep Batch: AB070611-4

Reviewed By: emf EMF

Review Date: 6/16/07

ttal Mass ng)	Suggested Alq (ml)	Samp Vol Available (ml)	Samp Vol Taken (ml)	Fin Gross Mass (g)	Final Net Mass (mg)	Salt Sol. Added (ml)	Flag
0	200	200	200	9.6067	100.5	0	FM
0	200	200	200	9.6621	136.3	0	FM
0	200	200	200	9.6180	126.8	0	FM
0	200	200	200	9.6400	136.8	0	FM
0	200	200	200	9.6562	144.1	0	FM
0	200	200	200	9.6671	163.3	0	FM
0	200	200	200	9.6632	173.3	0	FM
0	200	200	200	9.5588	19	0	
0	200	200	200	9.4868	19.4	0	
0	200	200	200	9.5687	40.3	0	
0	200	200	200	9.5633	40.5	0	
0	200	200	200	9.5632	65.8	0	
0	200	200	200	9.5862	57.3	0	
0	200	200	200	9.5708	80.6	0	
0	200	200	200	9.5996	72.1	0	
0	200	200	200	9.6343	100.2	0	FM

Supersedes: N/A

Paragon Analytics

Radiochemistry Prep Worksheet

Prep Batch: AB070611-4

Prep Procedure: GAB

Prep Batch Not Validated!!!

Reviewed By:

Review Date:

Non-Routine Pre-Treatment? Y / N **Batch:** _____ **Re-Prep? Y / N** **Batch:** _____ **Prep QASS / NCR? Y / N** _____

Prep SOP: PAI 702 **Rev:** 18
Prep SOP: NONE
Matrix Class: liquid

Prep Analyst: Erin Finsley EMF
Prep Date: 6/11/2007
Prep Dept: RS

Balance:
Balance:

Samp Num	Prep Num	LabID	QC Type	Dish No.	Init Alq ml	Fin Alq ml	Prep Basis	Standards	Prep Notes ml of spit
1	1	0718500-10	LCS		200	200	Unfiltered	S1	0.5 2.5
2	1	0718500-11	LCS		200	200	Unfiltered	S1	0.5 3.0
3	1	0718500-12	LCS		200	200	Unfiltered	S1	1.0 3.0
4	1	0718500-13	LCS		200	200	Unfiltered	S1	1.0 3.5
5	1	0718500-14	LCS		200	200	Unfiltered	S1	1.5 3.5
6	1	0718500-15	LCS		200	200	Unfiltered	S1	1.5 4.0
7	1	0718500-16	LCS		200	200	Unfiltered	S1	2.0 4.0
8	1	0718500-1	LCS		200	200	Unfiltered	S1	2.0 0.5
9	1	0718500-2	LCS		200	200	Unfiltered	S1	2.5 0.5
10	1	0718500-3	LCS		200	200	Unfiltered	S1	2.5 1.0
11	1	0718500-4	LCS		200	200	Unfiltered	S1	3.0 1.0
12	1	0718500-5	LCS		200	200	Unfiltered	S1	3.0 1.5
13	1	0718500-6	LCS		200	200	Unfiltered	S1	3.5 1.5
14	1	0718500-7	LCS		200	200	Unfiltered	S1	3.5 2.0
15	1	0718500-8	LCS		200	200	Unfiltered	S1	4.0 2.0
16	1	0718500-9	LCS		200	200	Unfiltered	S1	4.0 2.5

EMF 6/11/07

Spiked By: EMF **Date:** 6/11/07
Witnessed By: MMC **Date:** 6/11/07

Soln #	Nuclide	SolnID	Prep Conc	Units	Prep Date	Aliquot	Units	Pipet ID
S1	AM-241	585.3020.27	54,620.815	DPM/ml	06/11/07	0.1	ml	RS-008

exp 3/19/07

Comments
ALL SAMPLES DESICCATED AT ~~11:15 on 6/11/07 EMF~~ 6/12/07 10:30 on 6/12/07

Paragon Analytics
LIMS Version: 6.020A

Supersedes: N/A

x+m
DE-06
211
1%
Mil.
7%
7%
5%
1%
4%
1%
89%
1%
5%
1%
5%
7%
9%
93%
5%
5%
5%
5%
1%
5%
1%
5%
5%
5%
5

ASR1113	B4	1	72.7	11/13/2007	8	10012	6.37	1.26	1571.74	0.3975	3723.78	0.4221	0.4202	1.0616	1.0570	0.5%	0.0008	0.0010	99.6%
ASR1113	D1	1	72.7	11/13/2007	22	10012	6.47	3.40	1547.45	0.3928	3723.78	0.4156	0.4152	1.0579	1.0570	0.1%	0.0022	0.0010	99.9%
ASR1113	D2	1	72.7	11/13/2007	11	10013	6.31	1.74	1586.85	0.3900	3723.78	0.4281	0.4122	1.0927	1.0570	3.3%	0.0011	0.0010	98.9%
ASR1113	D3	1	72.7	11/13/2007	15	10018	6.32	2.37	1585.13	0.3896	3723.78	0.4257	0.4117	1.0929	1.0570	3.3%	0.0016	0.0010	98.9%
ASR1112	D4	1	72.7	11/12/2007	9	10003	6.39	1.41	1565.41	0.4003	3724.02	0.4204	0.4231	1.0501	1.0570	-0.7%	0.0009	0.0010	100.6%
ASR1113	A1	16	78.9	11/13/2007	5	10015	6.49	0.77	1543.14	0.3993	3723.78	0.4144	0.4208	1.0378	1.0538	-1.5%	0.0005	0.0009	101.5%
ASR1113	A2	16	78.9	11/13/2007	10	10010	6.55	1.53	1528.24	0.4091	3723.78	0.4104	0.4311	1.0032	1.0538	-5.0%	0.0010	0.0009	104.8%
ASR1113	A3	16	78.9	11/13/2007	11	10017	6.38	1.72	1570.06	0.4116	3723.78	0.4216	0.4337	1.0244	1.0538	-2.9%	0.0011	0.0009	102.7%
ASR1113	A4	16	78.9	11/13/2007	8	10017	6.47	1.24	1546.22	0.3981	3723.78	0.4158	0.4195	1.0444	1.0538	-0.9%	0.0008	0.0009	100.9%
ASR1113	B1	16	78.9	11/13/2007	7	10015	6.38	1.10	1569.75	0.4091	3723.78	0.4215	0.4311	1.0304	1.0538	-2.3%	0.0007	0.0009	102.2%
ASR1113	B2	16	78.9	11/13/2007	17	10007	6.39	2.86	1566.04	0.4022	3723.78	0.4206	0.4238	1.0466	1.0538	-0.8%	0.0017	0.0009	100.7%
ASR1113	B3	16	78.9	11/13/2007	6	10008	6.51	1.23	1537.33	0.4130	3723.78	0.4128	0.4352	0.9898	1.0538	-5.4%	0.0008	0.0009	105.1%
ASR1113	B4	16	78.9	11/13/2007	10	10005	6.50	1.54	1539.23	0.3975	3723.78	0.4134	0.4189	1.0399	1.0538	-1.3%	0.0010	0.0009	101.3%
ASR1113	D1	16	78.9	11/13/2007	40	10016	6.65	6.02	1508.17	0.3928	3723.78	0.4045	0.4139	1.0297	1.0538	-2.3%	0.0040	0.0009	102.2%
ASR1113	D2	16	78.9	11/13/2007	16	10001	6.47	2.32	1545.76	0.3900	3723.78	0.4151	0.4110	1.0644	1.0538	1.0%	0.0015	0.0009	99.1%
ASR1112	D3	16	78.9	11/12/2007	12	10006	6.42	1.87	1558.66	0.3895	3724.02	0.4186	0.4104	1.0747	1.0538	1.9%	0.0012	0.0009	98.2%
ASR1112	D4	16	78.9	11/12/2007	5	10014	6.38	0.79	1574.53	0.4003	3724.02	0.4226	0.4218	1.0562	1.0538	0.2%	0.0005	0.0009	99.8%
ASR1112	A1	2	94.5	11/12/2007	4	10006	6.51	0.81	1537.02	0.3993	3724.02	0.4127	0.4175	1.0336	1.0456	-1.2%	0.0004	0.0009	101.1%
ASR1112	A2	2	94.5	11/12/2007	8	10013	6.32	1.27	1584.34	0.4091	3724.02	0.4254	0.4278	1.0399	1.0456	-0.6%	0.0008	0.0009	100.5%
ASR1112	A3	3	94.5	11/12/2007	10	10014	6.19	1.62	1617.77	0.4116	3724.02	0.4344	0.4304	1.0554	1.0456	0.9%	0.0010	0.0009	99.1%
ASR1113	A4	2	94.5	11/13/2007	9	10029	6.23	1.44	1609.79	0.4116	3723.78	0.4323	0.4304	1.0503	1.0456	0.4%	0.0009	0.0009	99.6%
ASR1113	B1	2	94.5	11/13/2007	5	10014	6.38	0.78	1569.59	0.3981	3723.78	0.4215	0.4163	1.0598	1.0456	1.2%	0.0005	0.0009	98.8%
ASR1113	B2	2	94.5	11/13/2007	13	10029	6.35	2.05	1579.37	0.4091	3723.78	0.4241	0.4278	1.0387	1.0456	-0.9%	0.0013	0.0009	100.8%
ASR1113	B3	2	94.5	11/13/2007	17	10007	6.27	2.71	1596.01	0.4022	3723.78	0.4266	0.4206	1.0656	1.0456	1.9%	0.0017	0.0009	98.2%
ASR1113	B4	2	94.5	11/13/2007	3	10008	6.29	0.48	1591.10	0.4130	3723.78	0.4273	0.4318	1.0346	1.0456	-1.1%	0.0003	0.0009	101.0%
ASR1113	D1	2	94.5	11/13/2007	10	10007	6.43	1.66	1558.30	0.3975	3723.78	0.4179	0.4156	1.0614	1.0456	0.5%	0.0010	0.0009	99.6%
ASR1113	D2	2	94.5	11/13/2007	22	10004	6.42	3.43	1558.28	0.3928	3723.78	0.4185	0.4107	1.0853	1.0456	1.8%	0.0022	0.0009	98.2%
ASR1113	D3	2	94.5	11/13/2007	10	10005	6.34	1.58	1578.08	0.3900	3723.78	0.4238	0.4078	1.0866	1.0456	3.8%	0.0010	0.0009	98.4%
ASR1113	D4	2	94.5	11/13/2007	12	10018	6.56	1.83	1527.13	0.3895	3723.78	0.4101	0.4073	1.0529	1.0456	0.7%	0.0012	0.0009	99.3%
ASR1112	A1	3	102.4	11/12/2007	4	10016	6.34	0.63	1579.65	0.4003	3723.78	0.4242	0.4186	1.0597	1.0456	1.3%	0.0004	0.0009	98.7%
ASR1112	A2	3	102.4	11/12/2007	2	10010	6.35	0.31	1576.38	0.3993	3724.02	0.4233	0.4158	1.0601	1.0415	1.6%	0.0002	0.0009	98.3%
ASR1113	A4	3	102.4	11/12/2007	7	10040	6.32	1.11	1586.61	0.4091	3724.02	0.4266	0.4261	1.0427	1.0415	0.1%	0.0007	0.0009	99.9%
ASR1113	B1	3	102.4	11/13/2007	8	10009	6.34	1.26	1578.71	0.3981	3723.78	0.4240	0.4146	1.0649	1.0415	2.2%	0.0008	0.0009	97.9%
ASR1113	B2	3	102.4	11/13/2007	10	10023	6.28	1.59	1598.02	0.4091	3723.78	0.4286	0.4261	1.0477	1.0415	0.6%	0.0010	0.0009	99.4%
ASR1113	B3	3	102.4	11/13/2007	9	10015	6.27	1.44	1597.29	0.4022	3723.78	0.4289	0.4189	1.0665	1.0415	2.3%	0.0009	0.0009	97.8%
ASR1113	B4	3	102.4	11/13/2007	7	10007	6.28	1.11	1593.47	0.4130	3723.78	0.4279	0.4302	1.0381	1.0415	-0.5%	0.0007	0.0009	100.5%
ASR1113	D1	3	102.4	11/13/2007	14	10008	6.43	2.18	1556.45	0.3975	3723.78	0.4169	0.4140	1.0515	1.0415	0.9%	0.0014	0.0009	99.1%
ASR1113	D2	3	102.4	11/13/2007	19	10006	6.45	2.95	1551.32	0.3928	3723.78	0.4186	0.4091	1.0606	1.0415	1.8%	0.0019	0.0009	98.3%
ASR1113	D3	3	102.4	11/13/2007	12	10025	6.31	1.90	1586.75	0.3900	3723.78	0.4266	0.4062	1.0940	1.0415	4.6%	0.0012	0.0009	95.4%
ASR1113	D4	3	102.4	11/13/2007	13	10021	6.33	2.05	1583.10	0.3895	3723.78	0.4251	0.4057	1.0915	1.0415	4.6%	0.0013	0.0009	95.6%
ASR1112	A1	4	122.4	11/12/2007	3	10014	6.50	0.46	1540.62	0.3993	3724.02	0.4293	0.4169	1.0724	1.0415	2.9%	0.0011	0.0009	97.2%
ASR1112	A2	4	122.4	11/12/2007	10	10016	6.31	1.58	1587.32	0.4091	3724.02	0.4137	0.4118	1.0381	1.0312	0.5%	0.0003	0.0009	99.5%
ASR1112	A3	4	122.4	11/12/2007	9	10017	6.25	1.44	1602.72	0.4116	3724.02	0.4262	0.4219	1.0419	1.0312	1.0%	0.0010	0.0009	99.0%
ASR1112	A4	4	122.4	11/12/2007	8	10005	6.54	1.22	1529.82	0.3981	3724.02	0.4304	0.4245	1.0456	1.0312	1.4%	0.0009	0.0009	98.7%
ASR1113	B1	4	122.4	11/13/2007	10	10021	6.29	1.59	1593.16	0.4091	3723.78	0.4108	0.4105	1.0319	1.0312	0.1%	0.0008	0.0009	99.9%
ASR1113	B2	4	122.4	11/13/2007	17	10018	6.30	2.70	1589.84	0.4022	3723.78	0.4278	0.4219	1.0458	1.0312	1.4%	0.0010	0.0009	98.6%
ASR1113	B3	4	122.4	11/13/2007	9	10018	6.37	1.41	1572.66	0.4130	3723.78	0.4289	0.4148	1.0615	1.0312	2.9%	0.0017	0.0009	97.2%
ASR1113	B4	4	122.4	11/13/2007	15	10007	6.46	2.31	1544.29	0.3975	3723.78	0.4223	0.4259	1.0226	1.0312	-0.8%	0.0009	0.0009	100.8%
ASR1113	D1	4	122.4	11/13/2007	17	10014	6.53	2.60	1533.54	0.3928	3723.78	0.4147	0.4099	1.0433	1.0312	1.2%	0.0015	0.0009	98.9%
ASR1113	D2	4	122.4	11/13/2007	8	10009	6.39	1.25	1568.35	0.3900	3723.78	0.4116	0.4051	1.0484	1.0312	1.6%	0.0017	0.0009	98.4%
ASR1113	D3	4	122.4	11/13/2007	6	10008	6.45	0.93	1551.63	0.3895	3723.78	0.4206	0.4022	1.0786	1.0312	4.4%	0.0008	0.0009	95.7%
ASR1113	D4	4	122.4	11/13/2007	9	10013	6.39	1.41	1566.98	0.4003	3723.78	0.4167	0.4017	1.0698	1.0312	3.6%	0.0006	0.0009	96.5%
ASR1112	A1	5	123.1	11/12/2007	0	10007	6.42	0.00	1558.72	0.3993	3724.02	0.4206	0.4128	1.0512	1.0312	1.9%	0.0008	0.0009	98.2%
ASR1112	A2	5	123.1	11/12/2007	7	10013	6.27	1.12	1596.97	0.4091	3724.02	0.4186	0.4116	1.0452	1.0309	1.7%	0.0000	0.0009	98.4%
ASR1112	A3	5	123.1	11/12/2007	3	10010	6.20	0.48	1614.52	0.4116	3724.02	0.4288	0.4217	1.0452	1.0309	1.7%	0.0007	0.0009	98.4%
ASR1112	A4	5	123.1	11/12/2007	5	10008	6.39	0.78	1566.20	0.3981	3724.02	0.4335	0.4243	1.0533	1.0309	2.1%	0.0003	0.0009	97.9%
ASR1112	B1	5	123.1	11/12/2007	6	10006	6.37	1.26	1570.80	0.4091	3724.02	0.4206	0.4104	1.0564	1.0309	2.4%	0.0005	0.0009	97.7%
ASR1113	B2	5	123.1	11/13/2007	10	10005	6.35	1.57	1575.59	0.4022	3723.78	0.4218	0.4217	1.0310	1.0309	0.0%	0.0008	0.0009	100.0%
ASR1113	B3	5	123.1	11/13/2007	4	10012	6.63	0.81	1493.23	0.4130	3723.78	0.4231	0.4146	1.0520	1.0309	2.0%	0.0010	0.0009	98.1%
ASR1113	B4	5	123.1	11/13/2007	14	10009	6.60	2.16	1539.85	0.3975	3723.78	0.4117	0.4267	0.9970	1.0309	-3.4%	0.0004	0.0009	103.3%
ASR1113	D1	5	123.1	11/13/2007	23	10025	6.61	3.53	1539.94	0.3928	3723.78	0.4136	0.4098	1.0403	1.0309	0.9%	0.0014	0.0009	99.1%
ASR1113	D2	5	123.1	11/13/2007	15	10024	6.34	2.37	1581.07	0.3900	3723.78	0.4135	0.4049	1.0528	1.0309	2.1%	0.0023	0.0009	98.0%
ASR1113	D3	5	123.1	11/13/2007	15	10015	6.41	2.34	1562.40	0.3895	3723.78	0.4246	0.4020	1.0887	1.0309	5.3%	0.0015	0.0009	94.6%
ASR1113	D4	5	123.1	11/13/2007	4	10010	6.33	0.63	1581.36	0.4003	3723.78	0.4106	0.4015	1.0772	1.0309	4.3%	0.0015	0.0009	95.8%
ASR1112	A1	6	125.5	11/12/2007	3	10015	6.58	0.46	1519.73	0.3993	3724.02	0.4247	0.4127	1.0609	1.0309	2.8%	0.0004	0.0009	97.3%
ASR1112	A2	6	125.5	11/12/2007	10	10016	6.47	1.55	1546.07	0.4091	3724.02	0.4081	0.4111	1.0220	1.0296	-0.7%	0.0003	0.0008	100.7%
ASR1112	A3	6	125.5	11/12/2007	4	10012	6.30	0.63	1589.21	0.4116	3724.02	0.4157	0.4212	1.0181	1.0296	-1.3%	0.0010	0.0008	101.3%
ASR1112	A4	6	125.5	11/12/2007	7	10026	6.45	1.09	1554.42	0.3981	3724.02	0.4267	0.4238	1.0368	1.0296	0.7%	0.0004	0.0008	99.3%
ASR1112	B1	6	125.5	11/12/2007	7	10018	6.39	1.10	1567.76	0.4091	3724.02	0.4174	0.4099	1.0485	1.0296	1.8%	0.0007	0.0008	98.3%
ASR1112	B2	6	125.5	11/12/2007	10	10014	6.49	1.54	1542.99	0.4022	3724.02	0.4210	0.4212	1.0291	1.0296	-0.1%	0.0007	0.0008	100.1%
ASR1113	B3	6	125.5	11/13/2007	6	10015	6.60	0.91	1517.42	0.4130	3723.78	0.4143	0.4141	1.0302	1.0296	0.1%	0.0010	0.0008	99.9%
ASR1113	B4	6	125.5	11/13/2007	7	10005	6.59	1.06	1518.21	0.3975	3723.78	0.4075	0.4252	0.9867	1.0296	-4.4%	0.0006	0.0008	104.2%
ASR1113	D1	6	125.5	11/13/2007	15	10016	6.74	2.37	1486.05	0.3928	3723.78	0.4077	0.4093	1.0257	1.0296	-0.4%	0.0007	0.0008	100.4%
ASR1113	D2	6	125.5	11/13/2007	10	10018	6.49	1.54	1543.61	0.3900	3723.78	0.3991	0.4044	1.0160	1.0296	-1.3%	0.0016	0.0008	101.3%
ASR1113	D3	6	125.5	11/13/2007	9	10017	6.60	1.36	1517.73	0.3895	3723.78	0.4145	0.4016	1.0629	1.0296	3.1%	0.0010	0.0008	97.0%
ASR1113	D4	6	125.5	11/13/2007	5	10016	6.41	0.78	1562.56	0.4003	3723.78	0.4078	0.4010	1.0464	1.0296	1.6%	0.0009	0.0008	98.4%
ASR1113	A1	7	140.6	11/13/2007	8	10015	6.62	1.21	1512.84	0.3993	3723.78	0.4196	0.4122	1.0483	1.0296	1.8%	0.0005	0.0008	98.3%
ASR1112	A2	7	140.6	11/12/2007	6	10010	6.59	0.91	1518.97	0.4091	3724.02	0.4063	0.4081	1.0174	1.0219	-0.4%	0.0008	0.0008	100.4%
ASR1112	A3	7	140.6	11/12/2007	8	10009	6.44	1.24	1554.19	0.4116	3724.02	0.4079	0.4181	0.9970	1.0219	-2.5%	0.0006	0.0008	102.4%
ASR1112	A4	7	140.6	11/12/2007	1	10009	6.51	0.15	1537.48	0.3981	3724.02	0.4173	0.4206	1.0140	1.0219	-0.8%	0.0006	0.0008	100.6%
												0.4129	0.4068	1.0371	1.0219	1.5%	0.0001	0.0008	98.6%

ASR1112	B1	7	140.6	11/12/2007	7	10007	6.50	1.08	1539.54	0.4091	3724.02	0.4134	0.4181	1.0105	1.0219	-1.1%	0.0007	0.0008	101.1%
ASR1112	B2	7	140.6	11/12/2007	13	10015	6.51	2.00	1538.40	0.4022	3724.02	0.4131	0.4110	1.0271	1.0219	0.5%	0.0013	0.0008	99.5%
ASR1112	B3	7	140.6	11/12/2007	2	10018	6.46	0.31	1550.77	0.4130	3724.02	0.4164	0.4221	1.0063	1.0219	-1.4%	0.0002	0.0008	101.3%
ASR1113	B4	7	140.6	11/13/2007	9	10016	6.52	1.38	1536.20	0.3975	3723.78	0.4125	0.4062	1.0376	1.0219	1.5%	0.0009	0.0008	98.5%
ASR1113	D1	7	140.6	11/13/2007	20	10019	6.71	2.98	1493.14	0.3928	3723.78	0.4018	0.4014	1.0208	1.0219	-0.1%	0.0020	0.0008	100.1%
ASR1113	D2	7	140.6	11/13/2007	14	10013	6.67	2.10	1501.20	0.3900	3723.78	0.4031	0.3986	1.0337	1.0219	1.1%	0.0014	0.0008	98.9%
ASR1113	D3	7	140.6	11/13/2007	12	10013	6.56	1.83	1528.70	0.3895	3723.78	0.4105	0.3980	1.0540	1.0219	3.0%	0.0012	0.0008	97.0%
ASR1113	D4	7	140.6	11/13/2007	5	10010	6.53	0.77	1532.92	0.4003	3723.78	0.4117	0.4081	1.0284	1.0219	0.6%	0.0005	0.0008	99.4%
ASR1113	A1	8	160.9	11/13/2007	4	10013	6.55	0.61	1528.70	0.3993	3723.78	0.4105	0.4040	1.0281	1.0117	1.6%	0.0004	0.0008	98.4%
ASR1113	A2	8	160.9	11/13/2007	16	10010	6.51	2.46	1537.63	0.4091	3723.78	0.4129	0.4139	1.0093	1.0117	-0.2%	0.0016	0.0008	100.2%
ASR1112	A3	8	160.9	11/12/2007	7	10015	6.50	1.08	1540.77	0.4116	3724.02	0.4137	0.4164	1.0052	1.0117	-0.6%	0.0007	0.0008	100.6%
ASR1112	A4	8	160.9	11/12/2007	1	10008	6.66	0.15	1502.70	0.3881	3724.02	0.4035	0.4027	1.0136	1.0117	0.2%	0.0001	0.0008	99.8%
ASR1112	B1	8	160.9	11/12/2007	6	10015	6.42	0.93	1559.97	0.4091	3724.02	0.4189	0.4139	1.0239	1.0117	1.2%	0.0006	0.0008	98.8%
ASR1112	B2	8	160.9	11/12/2007	9	10007	6.57	1.37	1523.14	0.4022	3724.02	0.4090	0.4069	1.0166	1.0117	0.5%	0.0009	0.0008	99.5%
ASR1112	B3	8	160.9	11/12/2007	3	10008	6.53	0.46	1532.62	0.4130	3724.02	0.4115	0.4176	0.9965	1.0117	-1.5%	0.0003	0.0008	101.5%
ASR1112	B4	8	160.9	11/12/2007	10	10015	6.65	1.50	1506.02	0.3975	3724.02	0.4044	0.4021	1.0174	1.0117	0.6%	0.0010	0.0008	99.4%
ASR1113	D1	8	160.9	11/13/2007	25	10005	6.60	3.78	1515.91	0.3928	3723.78	0.4071	0.3974	1.0364	1.0117	2.4%	0.0025	0.0008	97.6%
ASR1113	D2	8	160.9	11/13/2007	15	10005	6.48	2.31	1543.98	0.3900	3723.78	0.4146	0.3945	1.0631	1.0117	4.8%	0.0015	0.0008	95.2%
ASR1113	D3	8	160.9	11/13/2007	6	10022	6.57	0.91	1525.42	0.3895	3723.78	0.4096	0.3940	1.0517	1.0117	3.8%	0.0006	0.0008	96.2%
ASR1113	D4	8	160.9	11/13/2007	12	10003	6.37	1.88	1570.33	0.4003	3723.78	0.4217	0.4050	1.0535	1.0117	4.0%	0.0012	0.0008	96.1%

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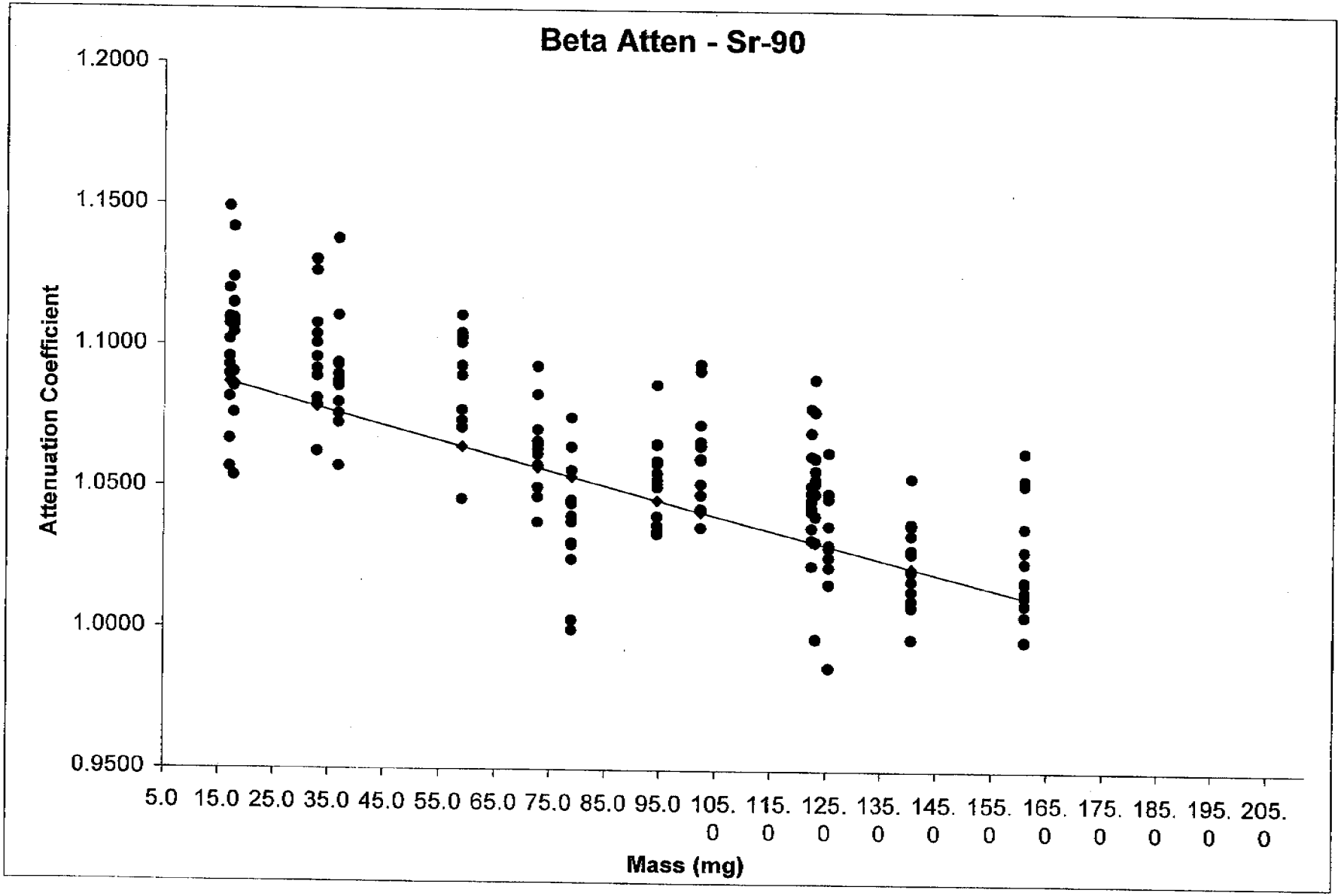
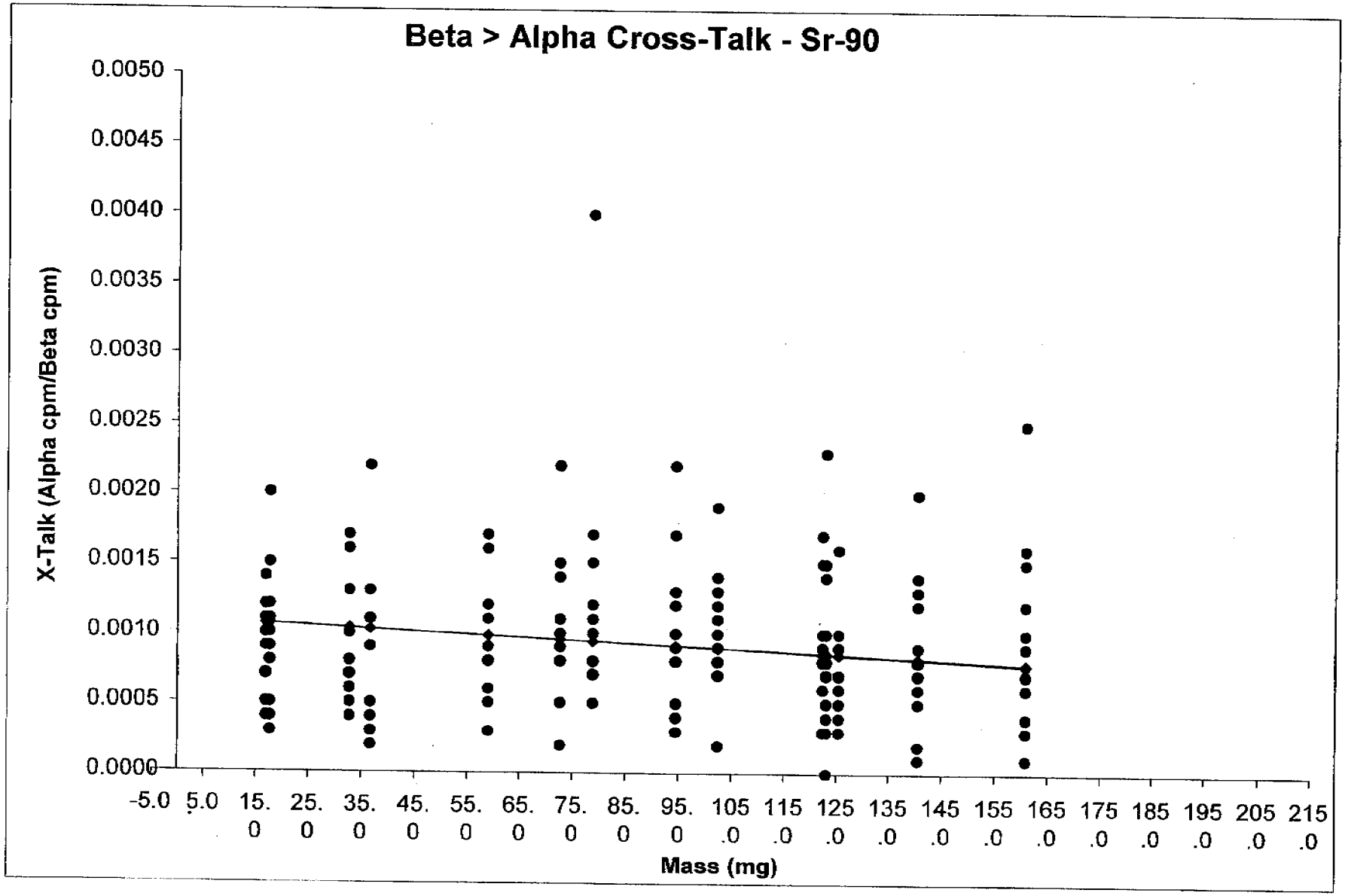
R1113	A1	15	58.2	11/13/2007	8	10009	6.24	1.28	1604.01	0.3993	3723.78	0.4307	0.4251	1.0788	1.0647	1.3%	0.0008	0.0010	98.8%
R1113	A2	15	58.2	11/13/2007	12	10035	6.30	1.90	1592.86	0.4091	3723.78	0.4278	0.4356	1.0455	1.0647	-1.8%	0.0012	0.0010	101.7%
R1113	A3	15	58.2	11/13/2007	11	10032	6.17	1.78	1625.93	0.4110	3723.78	0.4368	0.4382	1.0606	1.0647	-0.4%	0.0011	0.0010	100.3%
R1113	A4	15	58.2	11/13/2007	6	10006	6.38	0.94	1568.34	0.3961	3723.78	0.4212	0.4238	1.0579	1.0647	-0.6%	0.0008	0.0010	100.6%
R1113	B1	15	58.2	11/13/2007	7	10018	6.16	1.14	1626.30	0.4091	3723.78	0.4367	0.4356	1.0676	1.0647	0.3%	0.0007	0.0010	99.7%
R1113	B2	15	58.2	11/13/2007	25	10008	6.27	3.99	1596.17	0.4022	3723.78	0.4288	0.4282	1.0657	1.0647	0.1%	0.0025	0.0010	99.9%
R1113	B3	15	58.2	11/13/2007	8	10005	6.30	1.27	1586.10	0.4130	3723.78	0.4285	0.4397	1.0326	1.0647	-3.1%	0.0008	0.0010	102.8%
R1113	B4	15	58.2	11/13/2007	21	10016	6.31	3.33	1587.32	0.3975	3723.78	0.4263	0.4232	1.0724	1.0647	0.7%	0.0021	0.0010	99.3%
R1113	D1	15	58.2	11/13/2007	26	10013	6.34	4.10	1579.34	0.3928	3723.78	0.4241	0.4182	1.0797	1.0647	1.4%	0.0026	0.0010	98.7%
R1112	D2	15	58.2	11/12/2007	3	10006	6.04	0.50	1656.62	0.3900	3724.02	0.4446	0.4152	1.1406	1.0647	6.7%	0.0003	0.0010	93.7%
R1112	D3	15	58.2	11/12/2007	10	10012	6.23	1.61	1607.06	0.3895	3724.02	0.4315	0.4147	1.1079	1.0647	3.9%	0.0010	0.0010	96.3%
R1112	D4	15	58.2	11/12/2007	2	10012	6.05	0.33	1654.86	0.4003	3724.02	0.4444	0.4262	1.1101	1.0647	4.1%	0.0002	0.0010	96.2%
R1113	A1	9	161.3	11/13/2007	4	10010	6.52	0.61	1535.28	0.3993	3723.78	0.4123	0.4039	1.0325	1.0115	2.0%	0.0004	0.0008	98.0%
R1113	A2	9	161.3	11/13/2007	8	10013	6.50	1.23	1540.48	0.4091	3723.78	0.4137	0.4138	1.0112	1.0115	0.0%	0.0008	0.0008	100.0%
R1113	A3	9	161.3	11/13/2007	9	10020	6.00	1.13	1252.50	0.4116	3723.78	0.3364	0.4163	0.8172	1.0115	-23.8%	0.0009	0.0008	123.5%
R1112	A4	9	161.3	11/12/2007	7	10007	6.58	1.06	1520.82	0.3981	3724.02	0.4084	0.4027	1.0256	1.0115	1.4%	0.0007	0.0008	98.8%
R1112	B1	9	161.3	11/12/2007	4	10022	6.42	0.62	1561.06	0.4091	3724.02	0.4192	0.4136	1.0247	1.0115	1.3%	0.0004	0.0008	98.7%
R1112	B2	9	161.3	11/12/2007	7	10010	6.47	1.08	1547.14	0.4022	3724.02	0.4154	0.4066	1.0329	1.0115	2.1%	0.0007	0.0008	97.9%
R1112	B3	9	161.3	11/12/2007	7	10018	6.49	1.06	1543.61	0.4130	3724.02	0.4145	0.4177	1.0036	1.0115	-0.8%	0.0007	0.0008	100.8%
R1112	B4	9	161.3	11/12/2007	7	10021	6.51	1.08	1539.32	0.3975	3724.02	0.4133	0.4021	1.0399	1.0115	2.7%	0.0007	0.0008	97.3%
R1112	D1	9	161.3	11/12/2007	13	10012	6.59	1.97	1519.27	0.3928	3724.02	0.4080	0.3973	1.0368	1.0115	2.6%	0.0013	0.0008	97.4%
R1113	D2	9	161.3	11/13/2007	9	10015	6.53	1.38	1533.69	0.3900	3723.78	0.4119	0.3945	1.0561	1.0115	4.2%	0.0009	0.0008	95.8%
R1113	D3	9	161.3	11/13/2007	12	10009	6.52	1.84	1535.12	0.3895	3723.78	0.4122	0.3940	1.0584	1.0115	4.4%	0.0012	0.0008	95.6%
R1113	D4	9	161.3	11/13/2007	5	10008	6.53	0.77	1532.62	0.4003	3723.78	0.4116	0.4049	1.0282	1.0115	1.6%	0.0005	0.0008	98.4%


Beta Atten - Sr-90
Attenuation Coefficient
1.2000
1.1500
1.1000
1.0500
1.0000
0.9500
5.0 15.0 25.0 35.0 45.0 55.0 65.0 75.0 85.0 95.0 105.0 115.0 125.0 135.0 145.0 155.0 165.0 175.0 185.0 195.0 205.0
Mass (mg)


Beta > Alpha Cross-Talk - Sr-90
X-Talk (Alpha cpm/Beta cpm)
0.0050
0.0045
0.0040
0.0035
0.0030
0.0025
0.0020
0.0015
0.0010
0.0005
0.0000
-5.0 5.0 15.0 25.0 35.0 45.0 55.0 65.0 75.0 85.0 95.0 105.0 115.0 125.0 135.0 145.0 155.0 165.0 175.0 185.0 195.0 205.0 215.0
Mass (mg)

Paragon Analytics

QUALITY ASSURANCE SUMMARY SHEET

PAR W.O. # / BATCH GAB Calibration
TEST GFPC
METHOD Sr90 Curve
SOP/REV (PREP)
SOP/REV (ANAL) 724 R10

Briefly document any QA or other problems or deviations associated with the analysis of samples. Problems could result from: log-in, color, odor, dilution, consistency, scheduling, equipment, or instrumentation, or may include documentation of minor deviations necessary due to unique DQO's or sample characteristics.

JH 11/21/07

1. All data for sample 0717509-9 was rejected as outlier data for Drawers A, B and

Date 11/12/07

SOP 724 [illegible]

Date 11/12/07 SOP 724r 10

Paragon Analytics

Low Background Gas Flow Proportional Counter Log

Instrument: LB4100B

Det.	Sample ID	Batch	Test	Count Dur. (min)	Start Time	Analyst Initials	File ID	Output Initials
1	0711086-15	AB071112-1	2B	10	1153	JH	AB01112K	JH
2	-16							
7	-17							
8	-18							
9	-19				1155		AB01112L	JH
10	-20							
11	AB071112-1ALCS							
12	-1BLCS							
9	0711086-22	AB071112-2	2B	10	1213	JH	AB01112M	JH
10	AB071112-2ALCS							
11	-2BLCS							
12	-2MB							
1	0711086-17	AB071112-1			1217		AB01112N	JH
2	-18							
7	AB071112-1MB							
8	0711086-21	AB071112-2			1218		AB01112O	JH
9	0710238-1	RA071106-9	Ra228	256	1256	LO	RAB1112	LO
10	-2							
11	RA071106-1MB							
13	-1LCS			LO 600 11/12/07	1253		RAB1112A	JH
14	-1LCSD							
1	0711086-220	AB071112-2	2B	10	1232	JH	AB01112P	JH
1-8, 13-14	Mass Curve	AR070525-1	Sr90R	—	1358	JH	ASR1112	JH
1	0710193-1	SR071105-1	Sr90	1000	1528	JH	SRB1112C	JH
2	-7							
7	-9							
8	-19							
13	SR071105-1MB							
14	0710299-1	AB071106-5	2B	1000	1530	JH	AB01112Q	JH
15	AB071106-5MB							
9	0710299-5	AB071106-5	2B	1000	1705	LO	AB01112R	JH
10	-8			LO 11/12/07				
11	-9							
12	-10							

JH 11/13/07

Comments:

Page No.: 357323 B

(cont. from page 357322 B)

Form 780r8.doc (6/23/06)

Reviewed By / Date JH 11/23/07

Date 11/13/07

SOP 724r 10

Paragon Analytics

Low Background Gas Flow Proportional Counter Log

Instrument: LB4100B

Instrument Daily Response and Background Checks

	Daily Response Check				Background Check				Det.
	Start 1	Status	Start 2	Status	Start 1	Status	Start 2	Status	Status

Paragon Analytics

Radiochemistry Instrument Worksheet

Prep Batch: AB070525-1

Prep Procedure: GAB

Analytical QASS / NCR? Y (N) NA

Prep Num	LabID	QC Type	Init Alq	Fin Alq	Units	Residual Mass (mg)	Cnt 1 File	Cnt 1 Inst/Det	Cnt 1 Pos Chk By	Cnt 2 File	Cnt 2 Inst/Det	Cnt 2 Pos Chk By	Cnt 3 File	Cnt 3 Inst/Det	Cnt 3 Pos Chk By	Notes
1	0717509-S10	LCS	200	200	ml	18.9										
1	0717509-S11	LCS	200	200	ml	17.7										
1	0717509-S12	LCS	200	200	ml	32.8										
1	0717509-S13	LCS	200	200	ml	36.7										
1	0717509-S14	LCS	200	200	ml	59										
1	0717509-S15	LCS	200	200	ml	58.2										
1	0717509-S16	LCS	200	200	ml	78.9										
1	0717509-S1	LCS	200	200	ml	72.7										
1	0717509-S2	LCS	200	200	ml	94.5										
1	0717509-S3	LCS	200	200	ml	102.4										
1	0717509-S4	LCS	200	200	ml	122.4										
1	0717509-S5	LCS	200	200	ml	123.1										
1	0717509-S6	LCS	200	200	ml	125.5										
1	0717509-S7	LCS	200	200	ml	140.6										
1	0717509-S8	LCS	200	200	ml	160.9										
1	0717509-S9	LCS	200	200	ml	161.3										

JH 11/21/07

Spike Solution Information

Soln #	Nuclide	SolnID	Prep Conc	Units	Prep Date	Aliquot	Units	Pipet ID
S1	Sr-90	777.3020.11	4,707.458	DPM/ml	05/25/07	0.4	ml	RS-010

Paragon Analytics

Radiochemistry Instrument Worksheet

Prep Batch: AB070525-1

Sample Barcodes

0717509-S10LCS AB070525-1PS1	0717509-S11LCS AB070525-1PS2
0717509-S12LCS AB070525-1PS3	0717509-S13LCS AB070525-1PS4
0717509-S14LCS AB070525-1PS5	0717509-S15LCS AB070525-1PS6
0717509-S16LCS AB070525-1PS7	0717509-S1LCS AB070525-1PS8
0717509-S2LCS AB070525-1PS9	0717509-S3LCS AB070525-1PS10
0717509-S4LCS AB070525-1PS11	0717509-S5LCS AB070525-1PS12
0717509-S6LCS AB070525-1PS13	0717509-S7LCS AB070525-1PS14
0717509-S8LCS AB070525-1PS15	0717509-S9LCS AB070525-1PS16

Radiochemistry Prep Worksheet

Prep Batch: AB070525-1

Reviewed By: DBC DBC **Review Date:** 5/30/07

NA **Re-Prep? Y / N** **Batch:** N/A **Prep QASS / NCR? Y / N** N/A

Prep Analyst: Derek B. Caduff **Balance:** 13
Prep Date: 5/25/07 **Balance:**
Prep Dept: RS

Basis	Standards	Prep Notes
tered	S1	
tered	S1	
tered	S1	
tered	S1	
tered	S1	
tered	S1	
tered	S1	
tered	S1	
tered	S1	
tered	S1	
tered	S1	
tered	S1	
tered	S1	
tered	S1	
tered	S1	
tered	S1	

DBC 5/30/07

Solution Information

Soln #	Nuclide	SolnID	Prep Conc	Units	Prep Date	Aliquot	Units	Pipet ID
S1	Sr-90	777.3020.11	4,707.458	DPM/ml	05/25/07	0.4	ml	RS-010

Paragon Analytics
LIMS Version: 6.019A

Supersedes: 5/26/07 13:38

Paragon Analytics

Radiochemistry Gravimetric Worksheet

Prep Batch: AB070525-1

Prep Procedure: **GAB**

Reviewed By: DBC DBC

Review Date: 5/30/07

Prep Num	Planc. Num	LabID	QC Type	Test Alq (ml)	Tare Mass (g)	Initial Gross Mass (g)	Initial Net Mass (mg)	Suggested Alq (ml)	Samp Vol Available (ml)	Samp Vol Taken (ml)	Fin Gross Mass (g)	Final Net Mass (mg)	Salt Sol. Added (ml)	Flag
1	1	0717509-S10	LCS	10	9.5115	0.0000	0	200	200	0	9.5264	16.9	0.5	
1	2	0717509-S11	LCS	10	9.5230	0.0000	0	200	200	0	9.5407	17.7	0.5	
1	3	0717509-S12	LCS	10	9.5018	0.0000	0	200	200	0	9.5346	32.8	1	
1	4	0717509-S13	LCS	10	9.5297	0.0000	0	200	200	0	9.5664	36.7	1	
1	5	0717509-S14	LCS	10	9.5259	0.0000	0	200	200	0	9.5849	59	1.5	
1	6	0717509-S15	LCS	10	9.5226	0.0000	0	200	200	0	9.5808	58.2	1.5	
1	7	0717509-S16	LCS	10	9.5314	0.0000	0	200	200	0	9.6103	78.9	2	
1	8	0717509-S1	LCS	10	9.5017	0.0000	0	200	200	0	9.5744	72.7	2	
1	9	0717509-S2	LCS	10	9.5032	0.0000	0	200	200	0	9.5977	94.5	2.5	
1	10	0717509-S3	LCS	10	9.5382	0.0000	0	200	200	0	9.6406	102.4	2.5	FM
1	11	0717509-S4	LCS	10	9.5424	0.0000	0	200	200	0	9.6648	122.4	3	FM
1	12	0717509-S5	LCS	10	9.5507	0.0000	0	200	200	0	9.6738	123.1	3	FM
1	13	0717509-S6	LCS	10	9.5523	0.0000	0	200	200	0	9.6778	125.5	3.5	FM
1	14	0717509-S7	LCS	10	9.5150	0.0000	0	200	200	0	9.6556	140.6	3.5	FM
1	15	0717509-S8	LCS	10	9.5501	0.0000	0	200	200	0	9.7110	160.9	4	FM
1	16	0717509-S9	LCS	10	9.5239	0.0000	0	200	200	0	9.6852	161.3	4	FM

Supersedes: N/A

Paragon Analytics

Radiochemistry Prep Worksheet

Prep Batch: AB070525-1

Prep Procedure: GAB

Prep Batch Not Validated!!!

Reviewed By:

Review Date:

Non-Routine Pre-Treatment? Y / (N) Batch: N/A

Re-Prep? Y / (N) Batch: N/A

Prep QASS / NCR? Y / (N) N/A

Prep SOP: PAI 702 Rev: 18

Prep SOP: NONE

Matrix Class: liquid

Prep Analyst: Derek B. Caduff DBC

Prep Date: 5/25/2007

Prep Dept: RS

Balance: 13

Balance:

Samp Num	Prep Num	LabID	QC Type	Dish No.	Init Alq ml	Fin Alq ml	Prep Basis	Standards	Prep Notes
1	1	0717509-S10	LCS		200	200	Unfiltered	S1	
2	1	0717509-S11	LCS		200	200	Unfiltered	S1	
3	1	0717509-S12	LCS		200	200	Unfiltered	S1	
4	1	0717509-S13	LCS		200	200	Unfiltered	S1	
5	1	0717509-S14	LCS		200	200	Unfiltered	S1	
6	1	0717509-S15	LCS		200	200	Unfiltered	S1	
7	1	0717509-S16	LCS		200	200	Unfiltered	S1	
8	1	0717509-S1	LCS		200	200	Unfiltered	S1	
9	1	0717509-S2	LCS		200	200	Unfiltered	S1	
10	1	0717509-S3	LCS		200	200	Unfiltered	S1	
11	1	0717509-S4	LCS		200	200	Unfiltered	S1	
12	1	0717509-S5	LCS		200	200	Unfiltered	S1	
13	1	0717509-S6	LCS		200	200	Unfiltered	S1	
14	1	0717509-S7	LCS		200	200	Unfiltered	S1	
15	1	0717509-S8	LCS		200	200	Unfiltered	S1	
16	1	0717509-S9	LCS		200	200	Unfiltered	S1	

Spiked By: Amanda Barlage

Date: 5/26/2007

Witnessed By: Tambrae Elhart

Date: 5/26/2007 5/26/07

Tray# 3 1-16

Spike Solution Information

Soln #	Nuclide	SolnID	Prep Conc	Units	Prep Date	Aliquot	Units	Pipet ID
S1	Sr-90	777.3020.11	4,707.458	DPM/ml	05/25/07	0.4	ml	RS-010

Exp 11/8/07

Comments

ALL SAMPLES DESICCATED AT 16:30 on 5/29/07.

Supersedes: N/A

ICBs
&
ICVs

R:\INST\GFP\MISC

Am-241/Sr-90 Attenuati

Atten. Constants

Sample ID	Initial Aliquot (ml)	Fi S
0616003-B1	0.200	
0616003-B2	0.200	
0616003-B3	0.200	
0616003-S1	0.200	
0616003-S2	0.200	
0616003-S3	0.200	

Spike Information

Sample ID	Alpha Std ID	
0616003-S1	616.2613.100	4/
0616003-S2	616.2613.100	4/1
0616003-S3	616.2613.100	4/1

R:\INST\GFP\CALIB

$$\alpha\ \text{att.} = 1.0 * 0.9933^{(0.8830*(18.0-0))}$$
$$= 1 * 0.9933^{15.894} = \underline{0.899} \quad \text{vs } 0.899$$

$$\text{Batt.} = 1.0960 * 0.9995^{(1*(18.0-0))}$$
$$= 1.0960 * 0.9995^{18} = \underline{1.086} \quad \text{vs } 1.086$$

$$\alpha\text{-}\beta\ \text{XTLK} = (0.2550)(0.9990)^{-18.0} * 26.141 = \underline{6.7871}$$
vs 6.7871

$$\beta \Rightarrow \alpha\ \text{XTLK} = (2 \times 10^{-6})(\overset{18.0}{\cancel{0.0011}}) + 0.0011 * 53.950 = \underline{0.0574}$$
vs 0.057

$$\alpha\ \text{act.} = \frac{26.141 - 0.073 - 0.0574}{(2.22)(.2527)(0.200)(0.899)} = \frac{26.0106}{0.10086672} = \underline{257.87}$$
vs 257.97

$$\beta\ \text{act} = \frac{53.950 - 1.588 - 6.7871}{(2.22)(0.4116)(0.200)(1.086)} = \frac{45.5749}{0.19846693} = \underline{229.63}$$
vs

229.60

$$\alpha\ \text{cu} = \frac{\sqrt{\frac{26.141}{220} + \frac{0.073}{1000} + \frac{\overset{0.0574}{\cancel{6.7871}}}{\cancel{1000}\ 220}}}{0.10086672} = \frac{\sqrt{0.1188 + 0.000073 + \cancel{0.03685045}\ \cancel{0.00678710}\ 0.00026091}}{0.10086672}$$

$$= \underline{\overset{3.42}{\cancel{3.51}}} \quad \text{vs } 3.4235$$

$$\underline{\$\,CU} = \frac{\sqrt{\frac{\cancel{53.59}\ 53.95}{220} + \frac{1.588}{220} + \frac{\cancel{0.0574}\ 6.7871}{\cancel{1000}\ 220}}}{0.19846693} = \frac{\sqrt{0.24522 + 0.001588 + \cancel{0.00005740}\ 0.03081818}}{0.19846693}$$

$$= \underline{2.6549} \quad \text{vs} \quad 2.6546$$

$$\underline{\alpha\ TPU} = \sqrt{(3.42)^2 + (0.0565 * 257.87)^2 + (0.0561 * \cancel{229.63}\ 257.87)^2}$$

$$= \sqrt{11.6964 + 212.2748 + \cancel{165.9522}\ 209.2798}$$

$$= \cancel{19.75}\ 20.815 \times 2\ \text{sigma} = \underline{41.63} \quad \text{vs.} \quad 41.7$$

$$\underline{\$\,TPU} = \sqrt{(2.6549)^2 + (0.0565 \times 229.63)^2 + (0.0561 \times 229.63)^2}$$

$$= \sqrt{7.0485 + 168.32714 + 165.9522}$$

$$= 18.48 \times 2\ \text{sigma} = \underline{36.95} \quad \text{vs} \quad 37.0$$

$$\underline{\alpha\ MDC} = \frac{4.65\sqrt{(0.073 + 0.0574)220} + 2.71}{(0.10086672)(220)} = \frac{27.616}{22.191} = \underline{1.24} \quad \text{vs} \quad 1.24$$

$$\underline{\$\,MDC} = \frac{4.65\sqrt{(1.588 + 6.7871)(220)} + 2.71}{(0.19846693)(220)} = \frac{20231}{43.663} = \underline{4.63} \quad \text{vs} \quad 4.63$$

$$\alpha\ \%\ \text{Recovery} = \frac{257.87}{\dfrac{(48.51)(1\,mL)\left(e^{(\ln 0.5)(5.57)}\right)}{0.200\,mL}\Big/432\,\text{years}} = \frac{257.87}{240.4}$$

11/16/2007
4/18/2002
6 | 29d | 5y
= 2,034 days
= 5.57 years

$$= 107.27\%$$ vs 107.3%

$$\beta\ \%\ \text{Recovery} = \frac{229.63}{\dfrac{(2)(25.5)(1\,mL)\left(e^{(\ln 0.5)(5.95)}\right)}{0.200\,mL}\Big/28.8} = \frac{229.63}{220.98}$$

$$= 103.91\%$$

vs 103.9%

11/16/2007
12/1/2001
11 15d 5y
= 2,170 days
= 5.95 years

Paragon Analytics

Radiochemistry Instrument Worksheet

Prep Batch: AB060406-3

Prep Procedure: GAB

Analytical QASS / NCR? Y (N) NA

Prep Num	LabID	QC Type	Init Alq	Fin Alq	Units	Residual Mass (mg)	Cnt 1 File	Cnt 1 Inst/Det	Cnt 1 Pos Chk By	Cnt 2 File	Cnt 2 Inst/Det	Cnt 2 Pos Chk By	Cnt 3 File	Cnt 3 Inst/Det	Cnt 3 Pos Chk By	Notes
1	0616003-B1	MB	200	200	ml	19.5	AB61116A	1	JH							
1	0616003-B2	MB	200	200	ml	60.9		7								
1	0616003-B3	MB	200	200	ml	104.5		14								
1	0616003-S1	LCS	200	200	ml	18		3								
1	0616003-S2	LCS	200	200	ml	61.8		8								
1	0616003-S3	LCS	200	200	ml	105.1		15								

JH 11/21/07

Spike Solution Information

Soln #	Nuclide	SolnID	Prep Conc	Units	Prep Date	Aliquot	Units	Pipet ID
S1	Sr-90	600.2613.96	50.719	DPM/ml	04/06/06	1	ml	RS-006
S2	AM-241	616.2613.100	107.024	DPM/ml	04/06/06	1	ml	RS-006

Sample Barcodes

0616003-S3LCS	0616003-S2LCS
0616003-S1LCS	0616003-B3MB
0616003-B2MB	0616003-B1MB

Paragon Analytics

Radiochemistry Prep Worksheet

Prep Batch: AB060406-3

Prep Procedure: GAB

Reviewed By: JRK JH for JRK **Review Date:** 4/10/2006

Non-Routine Pre-Treatment? Y / (N) **Batch:** NA **Re-Prep? Y / (N)** **Batch:** NA **Prep QASS / NCR? Y / (N)** NA

Prep SOP: PAI 702 **Rev:** 17
Prep SOP: NONE
Matrix Class: liquid

Prep Analyst: Jeff Kujawa
Prep Date: 4/6/2006
Prep Dept: RS

Balance: 13
Balance:

Samp Num	Prep Num	LabID	QC Type	Dish No.	Init Alq ml	Fin Alq ml	Prep Basis	Standards	Prep Notes
1	1	0616003-B1	MB		200	200	Unfiltered		
2	1	0616003-B2	MB		200	200	Unfiltered		
3	1	0616003-B3	MB		200	200	Unfiltered		
4	1	0616003-S1	LCS		200	200	Unfiltered	S1,S2	
5	1	0616003-S2	LCS		200	200	Unfiltered	S1,S2	
6	1	0616003-S3	LCS		200	200	Unfiltered	S1,S2	

JH 11/21/07

Spiked By: Jeff Kujawa **Date:** 4/6/2006

Witnessed By: Amanda Barlage **Date:** 4/6/2006

Spike Solution Information

Soln #	Nuclide	SolnID	Prep Conc	Units	Prep Date	Aliquot	Units	Pipet ID
S1	Sr-90	600.2613.96	50.719	DPM/ml	04/06/06	1	ml	RS-006
S2	AM-241	616.2613.100	107.024	DPM/ml	04/06/06	1	ml	RS-006

Comments
ALL DESICCATED 4/7/06 @ 14:40

Paragon Analytics

Radiochemistry Gravimetric Worksheet

Prep Batch: AB060406-3

Prep Procedure: **GAB**

Reviewed By: JRK JH for JRK

Review Date: 4/10/2006

Prep Num	Planc. Num	LabID	QC Type	Test Alq (ml)	Tare Mass (g)	Initial Gross Mass (g)	Initial Net Mass (mg)	Suggested Alq (ml)	Samp Vol Available (ml)	Samp Vol Taken (ml)	Fin Gross Mass (g)	Final Net Mass (mg)	Salt Sol. Added (ml)	Flag
1	1	0616003-B1	MB	10	9.3808	0.0000	0	200	200	200	9.4003	19.5	0.5	
1	2	0616003-B2	MB	10	9.4780	0.0000	0	200	200	200	9.5389	60.9	1.5	
1	3	0616003-B3	MB	10	9.4354	0.0000	0	200	200	200	9.5399	104.5	2.5	FM
1	4	0616003-S1	LCS	10	9.4437	0.0000	0	200	200	200	9.4617	18	0.5	
1	5	0616003-S2	LCS	10	9.4568	0.0000	0	200	200	200	9.5186	61.8	1.5	
1	6	0616003-S3	LCS	10	9.4827	0.0000	0	200	200	200	9.5878	105.1	2.5	FM

Supersedes: _____

[redacted]

60-06B

view Date:

quished By:
Date:
eceived By:
Date:

tional Sample Analysis LB4100-B

lt Type: LB4100 -B
Unit ID: Aqua
e Mode: Simultaneous
evision: 2
Version: Standard
29/03 JE

Data file name: ABB1116A
Batch ID: AB066406-3
Count Preset (m): 220
Batch Ended: 11/16/07 13:59

Background logfile: BKGABW
Date of Bkg. Cal: 11/11/07
Alpha efficiency logfile: Am241-11/07
Alpha attenuation calibration: AAM1107
Beta efficiency logfile: Sr90R-11/07
Beta attenuation calibration: ABR1107

Alpha prog. logfile: n/a
Alpha prog. attenuation: n/a
Beta prog. logfile: n/a
Beta prog. attenuation: n/a

Alpha Attenuation Calibration y = b*m^(a*(mass-x0))		Beta Attenuation Calibration y = b*m^(a*(mass-x0))	
Alpha b=	1.00000	Beta b=	1.0000
m=	0.99330	m=	0.9995
a=	0.0000	a=	1.0000
x0=	0.0000	x0=	0.0000
Alpha to Beta X-talk y = b *m^-mass		Beta to Alpha X-talk y = b*mass + m	
a ->b xtalk b=	0.2550	b ->a xtalk b=	-2.00E-06
a ->b xtalk m=	0.9990	b ->a xtalk m=	0.0011

	Count End Date & Time	Count Dur. (min)	Resid. Mass (mg)	Alpha Activity Gross CPM	Bkg. CPM	b>a xtlk CPM	Base Eff	Base Cor.Fact.	Progeny Eff	Progeny Cor.Fact.	Beta Activity Gross CPM	Bkg. CPM	a>b xtlk CPM	Base Eff	Base Cor.Fact.	Progeny Eff	Progeny Cor.Fact.
MB	11/16/07 13:59	220.00	19.5	0.059	0.046	0.002	0.2381	0.681	n/a	n/a	1.800	1.464	0.0154	0.3993	1.085	n/a	n/a
LCS	11/16/07 13:59	220.00	18.0	25.141	0.073	0.057	0.2527	0.699	n/a	n/a	53.950	1.588	8.7871	0.4116	1.086	n/a	n/a
MB	11/16/07 13:59	220.00	104.5	0.082	0.062	0.002	0.2556	0.538	n/a	n/a	1.814	1.675	0.0232	0.3900	1.040	n/a	n/a
LCS	11/16/07 13:59	220.00	105.1	13.477	0.051	0.039	0.2536	0.535	n/a	n/a	43.800	1.798	3.8178	0.3895	1.040	n/a	n/a
MB	11/16/07 13:59	220.00	60.9	0.050	0.100	0.002	0.2477	0.697	n/a	n/a	1.809	1.613	0.0136	0.4130	1.063	n/a	n/a
LCS	11/16/07 13:59	220.00	61.8	18.414	0.083	0.047	0.2441	0.693	n/a	n/a	48.473	1.638	4.9950	0.3975	1.063	n/a	n/a

JH
11/21/07

Date 11/16/07 SOP 724r 1D

Paragon Analytics
Low Background Gas Flow Proportional Counter Log
Instrument: LB4100B

Instrument Daily Response and Background Checks

Det.	Daily Response Check Start 1	Status	Start 2	Status	Background Check Start 1	Status	Start 2	Status	Det. Status
1	JH	P			JH	P			P
2									
3									OLWB
4									
5									
6									
7									P
8		LB	JH	P					
9		P							
10									
11		LB	JH	LB					
12		Hα, LB		Hα, LB					
13		P							
14									
15									
16						LB			OLWB

Det = Detector; α = Alpha; β = Beta; P = Pass; H = High; L = Low; OL = Offline; R = Recount; W = Weekly; NP = Not Processed

Weekly Background Calibration

	Current Calib. File ID		Weekly Calib. Started	Status	File ID
Dr A	BKB1109W,	10W + 11W	JH	1-4 P	BKB1116W
Dr B				5 βH; 7 αH; 6, 8 P	
Dr C				9-11 P; 12 βL	
Dr D				13-16 P	

Dr = Drawer

Gas Supply

P-10 Supply		P-10 Flow	
Tank 1	900	Dr A	0.15
		Dr B	
Tank 2	2000	Dr C	
		Dr D	

Comments:

Page No.: 357327 A Form 780r8.doc (6/23/06) Reviewed By / Date RG 11/17/07

Date 11/16/07

SOP 724r 10

Paragon Analytics

Low Background Gas Flow Proportional Counter Log

Instrument: LB4100B

Det.	Sample ID	Batch	Test	Count Dur. (min)	Start Time	Analyst Initials	File ID	Output Initials
1-16	Daily Eff	—	—	30	815	JH	EFB1116	JH
8,11,12	↓	—	—	30	832	JH	EFB1116R	JH
1-16	Daily BKG	—	—	60	851	JH	BKB1116	JH
9	0711040-1	AB071112-5	2B	70	1001	JH	ABB1116	JH
10	↓ -2	↓	↓	↓	↓	↓	↓	↓
1	0616003-B1MB	AB060406-3	2B	220	1018	JH	ABB1116A	JH
7	-B2MB							
14	-B3MB							
3	-S1LCS							
8	-S2LCS							
15	↓ -S3LCS	↓	↓	↓	↓	↓	↓	↓
9	0711040-3	AB071112-5	2B	70	1116	JH	ABB1116B	JH
10	↓ -4	↓	↓	↓	↓	↓	↓	↓
9	0711040-5	AB071112-5	2B	70	1315	JH	ABB1116C	JH
10	AB071112-5MB	↓	↓	↓	↓	↓	↓	↓
9	AB071112-5LCS	AB071112-5	2B	60	1439	JH	ABB1116D	JH
10	↓ -5LCSD	↓	↓	↓	↓	↓	↓	↓
1-16	Weekly BKG	—	—	6000	1546	JH	BKB1116W	RG

RG 11/17/07

Comments:

Page No. 357327 B

100
PROJECT 241 Am 616.2613.100

Notebook No. 2613

Continued From Page

PROJECT 6116.2382.38 AM-241 NOTEBOOK NO. _____

Continued From Page _____

Am-241 primary dilution

prepare a primary dilution of RSO 6116 (NIST: ~~SRM~~ CM 10-14-02 SRS 63651-307) by diluting w/ 1M HCl

SB 10/14/02

1) Determine the density of 1M HCl (Lot # 42223 & Lot # 42216)

mass of 100ml Vol flask	62.4712 g	(Bal 12)
mass of flask + 1M HCl	163.802 g	↓
Net mass of ~~std~~ HCl RG 12/3/02	101.330900 g	

2) Transfer contents of ampule to 40 ml VOA Vial

mass of VOA Vial w/o lid	22.3577 g	(Bal 12)
mass of opened amp ~~mass of VOA Vial~~ CM 10-14-02 + 50 ml beaker	37.9238 g	↓
mass of beaker + empty ampule	32.9862 g	
Net mass of std transferred	4.937600 g	

3) Dilute std to final Vol w/ 1M HCl

mass of VOA Vial w/o lid (from above)	22.3577 g	(Bal 12)
mass of std + VOA Vial + 1M HCl	63.7403 g	↓
Net mass of diluted std	41.382600 g	

4) Final Activity Calc

$$\frac{\left(\frac{3.728 \times 10^4 \text{ dps}}{5.1972 \text{ g}}\right)\left(60 \frac{\text{dpm}}{\text{dps}}\right)\left(4.9376 \text{ g}\right)}{41.3826 \text{ g}} = \cancel{52,066} \text{ dpm/g}$$

SB 7/31/03

52,128.96 dpm/g

ANALYTICS
1380 Seaboard Ind Blvd Atlanta GA 39318 USA 404-352-8677
Am-241
SRS 63651-307 Amount 1.008 µCi QA

ANALYTICS

1380 Seaboard Industrial Blvd.
Atlanta, Georgia 30318 · U.S.A.

Phone (404) 352-8677
Fax (404) 352-2837

PAI, FO 0616
rcvd 4-22-02

CERTIFICATE OF CALIBRATION

Standard Radionuclide Source

63651-307

Am-241 5 mL Liquid in Flame Sealed Vial

This standard radionuclide source was prepared gravimetrically from a calibrated master solution. The master solution was calibrated by liquid scintillation counting.

Radionuclide purity and calibration were checked by germanium gamma-ray spectrometry and liquid scintillation counting. The nuclear decay rate and assay date for this source are given below.

ANALYTICS maintains traceability to the National Institute of Standards and Technology through Measurements Assurance Programs as described in USNRC Reg. Guide 4.15, Revision 1.

ISOTOPE:	Am-241
ACTIVITY (dps):	3.728 E4
HALF-LIFE:	4.322 E2 years
CALIBRATION DATE:	April 18, 2002 12:00 EST
TOTAL UNCERTAINTY*:	3.3%
SYSTEMATIC:	3.0%
RANDOM:	0.3%

*99% confidence level.

Impurities: γ-impurities <0.1%

5.11972 grams 1M HCl solution.

P O NUMBER EW040502, Item 3

SOURCE PREPARED BY: M Taskaeva
M. Taskaeva, Radiochemist

Q A APPROVED: M Rosty 4-19-02

Prep: 9/28/07

PREPARE A WORKING LEVEL DILUTION OF ^{90}Sr @ ~50dpm/ml BY DILUTING 600.2613.30 (2234.71 dpm/ml) WITH 0.1N HCl

HCl LOT # 050750

① DETERMINE DENSITY OF 0.1N HCl: Bal 12

MASS OF 100 ml VOLUMETRIC FLASK, CLASS A:	68.29783
MASS OF FLASK + 100 ml 0.1N HCl:	168.12369
Net mass of 1N HCl:	99.82586

$\rho = .998258 g/ml$

② TRANSFER ^{90}Sr 600.2613.30 TO * NALGENE BOTTLE: Bal 12

MASS OF 1L BOTTLE w/o LID:	74.3785g
MASS OF BOTTLE + STANDARD:	76.9060g
NET MASS OF STANDARD TRANSFERRED:	2.5275g

③ DILUTE TO FINAL VOLUME w/ 0.1N HCl

MASS OF BOTTLE w/o LID (FROM ABOVE): 74.3785g

Transfer contents of ampoule 600 to a 125 ml glass bottle for a 1° solution.

1) Transfer ampoule 600 to a 125 ml bottle

mass of open ampoule + std	139.6110 g Std
mass of empty ampoule	89.5551 g
Net mass of std	50.0559 g

ANALYTICS

1380 Seaboard Industrial Blvd.
Atlanta, Georgia 30318 · U.S.A.

Phone (404) 352-8677
Fax (404) 352-2837

CERTIFICATE OF CALIBRATION

Standard Radionuclide Source

PAI 00600
rec'd 12-05-01

62751-307

Sr-90 50 mL Liquid in Flame Sealed Vial

This standard radionuclide source was prepared gravimetrically from a calibrated master solution. The master solution was calibrated by the Department Des Applications Et De La Metrologie Des Rayonnements Ionisants (DAMRI), Paris, France, as Number 25931.

Radionuclide purity and calibration were checked by germanium gamma-ray spectrometry and liquid scintillation counting. The nuclear decay rate and assay date for this source are given below.

ANALYTICS maintains traceability to the National Institute of Standards and Technology through Measurements Assurance Programs as described in USNRC Reg. Guide 4.15, Revision 1.

ISOTOPE:	Sr-90
ACTIVITY (dps):	1.868 E4
HALF-LIFE:	28.79 years
CALIBRATION DATE:	December 1, 2001 12:00 EST
TOTAL UNCERTAINTY*:	5.0%

*99% Confidence Level

Impurities: γ-impurities <0.1%

50.3054 grams 0.1M HCl solution with 30 μg/g Sr carrier.

P O NUMBER 001703, Item 1

SOURCE PREPARED BY: M Taskaeva
M. Taskaeva, Radiochemist

Q A APPROVED: [illegible] 12-4-01

Paragon Analytics

Radiochemistry Case Narrative
Gamma Spectroscopy

Los Alamos National Laboratory SMO

Dust / 08-1101

Paragon Work Order 0805078

1. This report consists of analytical results and supporting documentation for two solid samples received by Paragon Analytics on 05/08/08.
2. These samples were prepared according to procedure PA SOP739R9. These samples were not ground prior to analysis.
3. The samples were analyzed for the presence of gamma emitting radionuclides according to procedure PA SOP713R9. The analyses were completed on 06/09/08.
4. The analysis results for these samples are reported on an "As Received" basis in units of pCi/gram.
5. Duplicate analysis results above the DER warning limit of 1.42 have been flagged as "W" for Warning. Elevated DER values may be attributable to sample inhomogeneity.
6. Activity concentrations above the calculated MDC are reported in some instances where minimum nuclide identification criteria are not met. Such tentative identifications result when the software attempts to calculate net activity concentrations for analytes where either one or both of the following criteria are not satisfied: the 'diagnostic' peak for a nuclide must be identified above the critical level, or the minimum library peak abundance must be attained. Nuclides not meeting these requirements have been flagged with a "TI" qualifier.
7. There are cases where the sample density is less than the associated calibration standard density. Cases that exceed the limit of +/- 15% of the density of the calibration standard are flagged with a 'G', denoting a significant density difference between the sample and calibration standard. Consequently, the results may be biased high for the flagged results in this workorder. If requested, Paragon Analytics can perform a transmission spike in order to estimate a magnitude of this bias. The results are reported without further qualification. Please refer to QASS 365709 in section 6 of this report.
8. Paragon Analytics has found there to be a significant low bias to ^{214}Pb and ^{214}Bi results when using a mixed nuclide gamma source for efficiency calibrations. The magnitude of this bias has been determined to be approximately 32% for ^{214}Bi, and 23% for ^{214}Pb. Therefore, any reported results for ^{214}Pb and ^{214}Bi are flagged with a "J" qualifier, indicating the activity values to be an estimated value. Results are reported without further qualification.
9. Technical considerations made in the creation of the gamma spectroscopy library used in this analysis are detailed in the document "Technical Comments Regarding Gamma Spectroscopy Libraries" found in Section 5.

10. There are cases where the magnitude of negative activity is greater than the 2σ TPU. Under typical conditions, where background data is normally distributed and analyzed by paired observations, this event is likely to occur at least 2.5% of the time. Review of the data does not indicate a problem with the instrument or reporting systems and results are reported without further qualification.

11. No further problems were encountered with either the client samples or the associated quality

1

PARAGON ANALYTICS
Radiochemistry Data Package

Section 1

CHAIN OF CUSTODY

Paragon Analytics

Sample Number(s) Cross-Reference Table

Paragon OrderNum: 0805078
Client Name: Los Alamos National Laboratory SMO
Client Project Name: Dust
Client Project Number: 08-1101
Client PO Number: 33204-001-06 F3

Client Sample Number	Lab Sample Number	COC Number	Matrix	Date Collected	Time Collected
SFB08-08-12411	0805078-1		SOLID	16-Apr-08	
SFB08-08-12412	0805078-2		SOLID	16-Apr-08	

Wednesday, May 07, 2008

LAB CHAIN OF CUSTODY DOCUMENT NUMBER: 08-1101C

REQUEST NUMBER: 08-1101

LOS ALAMOS

NATIONAL LABORATORY

ATTN: Lance Steere

Paragon Analytics, Inc.

225 Commerce

Fort Collins, CO 80524

TURNAROUND/REPORT DUE: 6/6/2008

TURNAROUND REQ'D: 30

LAB REQUEST COMMENTS: Phils Samples 0805078

	SAMPLE ID	CTNR	CTNR DESC	ORDER	PRESERV	MATRIX
1	SFB08-08-12411	1	1 L POLY	AM241+GS+ISOPU+ISOU+SR90	None	S
	SFB08-08-12411	1	500 ML POLY	GROSSA+B	None	S
	SFB08-08-12411	1	250 ML POLY	ISO_Po	Ice	S
2	SFB08-08-12412	1	1 L POLY	AM241+GS+ISOPU+ISOU+SR90	None	S
	SFB08-08-12412	1	500 ML POLY	GROSSA+B	None	S
	SFB08-08-12412	1	250 ML POLY	ISO_Po	Ice	S

Relinquished By:		Date	Time	Received By:		Date	Time
[illegible]		5/7/08	3:00	Sheri Lafferty	[illegible]	5/8/08	0930
Printed Name	Signature			Printed Name	Signature		
Printed Name	Signature			Printed Name	Signature		
Printed Name	Signature			Printed Name	Signature		

Received for DISPOSAL By: **Date** **Time** **Remarks:**

Printed Name Signature

Wednesday, May 07, 2008

REQUEST NUMBER: 08-1101

LOS ALAMOS
NATIONAL LABORATORY

ATTN: Lance Steere
Paragon Analytics, Inc.
225 Commerce
Fort Collins, CO 80524

These Samples are on:
LANL Request Number:08-1101
Per Agreement Number:1-800-443-1511
Project Cost Code: WEPR 1314 0300

Please analyse the enclosed samples according to the schedule indicated:

SHIP DATE: 5/7/2008
TURNAROUND/REPORT DUE: 6/6/2008
TURNAROUND REQ'D: 30 Days

RAD SCREENING: Not Required
LAB REQUEST COMMENTS: Phils Sample

LANL ER SMO CONTACT:
Signature:

PRIORITY	METHOD CODE	CNTNR	SAMPLE ID	SAMPLE MATRIX	DATE SAMPLED	SAMPLE COMMENTS	SPECIAL INSTRUCTIONS
	EPA:900	1	SFB08-08-12411	S	4/16/2008	LA Monitor-vacuum bag, location LAM-0001	
		1	SFB08-08-12412	S	4/16/2008	LA Monitor-furnace filter, location LAM-0001	
	EPA:901.1	1	SFB08-08-12411	S	4/16/2008	LA Monitor-vacuum bag, location LAM-0001	
		1	SFB08-08-12412	S	4/16/2008	LA Monitor-furnace filter, location LAM-0001	
	EPA:905.0	1	SFB08-08-12411	S	4/16/2008	LA Monitor-vacuum bag, location LAM-0001	
		1	SFB08-08-12412	S	4/16/2008	LA Monitor-furnace filter, location LAM-0001	
	HASL-300:AM-241	1	SFB08-08-12411	S	4/16/2008	LA Monitor-vacuum bag, location LAM-0001	

080508

Wednesday, May 07, 2008

REQUEST NUMBER: 08-1101

PRIORITY	METHOD CODE	CNTNR	SAMPLE ID	SAMPLE MATRIX	DATE SAMPLED	SAMPLE COMMENTS	SPECIAL INSTRUCTIONS
	HASL-300:AM-241	1	SFB08-08-12412	S	4/16/2008	LA Monitor-furnace filter, location LAM-0001	
	HASL-300:ISOPU	1	SFB08-08-12411	S	4/16/2008	LA Monitor-vacuum bag, location LAM-0001	
		1	SFB08-08-12412	S	4/16/2008	LA Monitor-furnace filter, location LAM-0001	
	HASL-300:ISOU	1	SFB08-08-12411	S	4/16/2008	LA Monitor-vacuum bag, location LAM-0001	
		1	SFB08-08-12412	S	4/16/2008	LA Monitor-furnace filter, location LAM-0001	
	HASL-300:PO-210	1	SFB08-08-12411	S	4/16/2008	LA Monitor-vacuum bag, location LAM-0001	
		1	SFB08-08-12412	S	4/16/2008	LA Monitor-furnace filter, location LAM-0001	

Final Page of REQUEST NUMBER 08-1101

080507B

7

CONDITION OF SAMPLE UPON RECEIPT FORM

Paragon Analytics

Client: LANL Workorder No: 0805078

Project Manager: LS Initials: SL Date: 5.8.08

1. Does this project require any **special handling** in addition to standard Paragon procedures?		YES	(NO)
2. Are custody **seals** on **shipping containers** intact?	NONE	(YES)	NO
3. Are Custody seals on **sample containers** intact?	NONE	(YES)	NO
4. Is there a **COC (Chain-of-Custody) present** or other representative documents?		(YES)	NO
5. Are the **COC and bottle labels complete and legible**?		YES	(NO)
6. Is the **COC in agreement** with samples received? (IDs, dates, times, no. of samples, no. of containers, matrix, requested analyses, etc.)		YES	(NO)
7. Were **airbills / shipping documents** present and/or removable?	DROP OFF	(YES)	NO
8. Are all aqueous **samples requiring preservation preserved correctly**? (excluding volatiles)	(N/A)	YES	NO
9. Are all aqueous **non-preserved samples pH 4-9**?	(N/A)	YES	NO
10. Is there **sufficient sample** for the requested analyses?		YES	(NO)
11. Were all samples placed in the **proper containers** for the requested analyses?		(YES)	NO
12. Are all samples within **holding times** for the requested analyses?		(YES)	NO
13. Were all sample containers received **intact**? (not broken or leaking, etc.)		(YES)	NO
14. Are all samples requiring no headspace (VOC, GRO, Rx CN/S, radon), headspace free? **Size of bubble**: ____ < green pea ____ > green pea	(N/A)	YES	NO
15. Were samples checked for and free from the presence of **residual chlorine?** (Applicable when PM has indicated samples are from a chlorinated water source; note if field preservation with sodium thiosulfate was not observed.)	(N/A)	YES	NO
16. Were the samples **shipped on ice**?		(YES)	NO
17. Were cooler temperatures measured at 0.1-6.0°C? IR gun used*: #2 #4	RAD ONLY	(YES)	NO

Cooler #:	1						
Temperature (°C):	0.8						
No. of custody seals on cooler:	1						
DOT Survey/ Acceptance Information — External µR/hr reading:	16						
Background µR/hr reading:	12						

Were external µR/hr readings ≤ two times background and within DOT acceptance criteria? (YES) / NO / NA (If no, see Form 008.)

Additional Information: PROVIDE DETAILS BELOW FOR A NO RESPONSE TO ANY QUESTION ABOVE, EXCEPT #1 AND #16

No times listed. ok
Received only (1) 500 ml poly (approx 25-30% full) for both samples.

-01 = 146g v fine dust, mix Dust? = Yes ~50% full
-02 = 34g " " " ~10% full

If applicable, was the client contacted? YES / NO / NA Contact: Joy Valdez Date/Time: 5/22

Project Manager Signature / Date: 5/22/08

*IR Gun #2: Oakton, SN 29922500201-0066 *IR Gun #4: Oakton, SN 2372220101-0002

Form 201r20.xls (12/27/07)

0805078

ORIGIN ID: SAFA (505) 665-5966
JOYLENE VALDEZ
LOS ALAMOS NATL LAB.
TA00 BLDG 1237 DPU 03

LOS ALAMOS, NM 87545
UNITED STATES US

Ship Date: 07MAY08
ActWgt: 74.0 LB MAN
System#: 0014176/CAFE2355
Account: 5 ********

(800) 443-1511
FedEx
Express

TO LANCE STEERE
PARAGON
225 COMMERCE

FORT COLLINS, CO 80524

16

Ref: 6b010amr2a015bcgao

Delivery Address Barcode

BILL SENDER

08

PRIORITY OVERNIGHT

TRK# 7209 7844 2022 Form 0201

THU
Deliver By:
08MAY08

DEN AA

80524 -CO-US XH FTCA

2

PARAGON ANALYTICS
Radiochemistry Data Package

Section 2

SAMPLE RESULTS SUMMARY

Due to the nature of gamma spectroscopy data, a summary report is not provided.

Please refer to the individual sample results in Section 4.

3

PARAGON ANALYTICS
Radiochemistry Data Package

Section 3

QC RESULTS SUMMARY

Gamma Spectroscopy Results

PAI 713 Rev 9

Method Blank Results

Lab Name: **Paragon Analytics**
Work Order Number: 0805078
Client Name: Los Alamos National Laboratory SMO
ClientProject ID: Dust 08-1101

Lab ID: GS080604-5MB	**Sample Matrix:** SOLID	**Prep Batch:** GS080604-5	**Final Aliquot:** 32.4 g
	Prep SOP: PAI 739 Rev 9	**QCBatchID:** GS080604-5-1	**Result Units:** pCi/g

Gamma Spectroscopy Results

PAI 713 Rev 9

Method Blank Results

Lab Name: Paragon Analytics
Work Order Number: 0805078
Client Name: Los Alamos National Laboratory SMO
ClientProject ID: Dust 08-1101

Lab ID: GS080604-5MB
Library: FANP

Sample Matrix: SOLID
Prep SOP: PAI 739 Rev 9
Date Collected: 05-Jun-08
Date Prepared: 05-Jun-08
Date Analyzed: 07-Jun-08

Prep Batch: GS080604-5
QCBatchID: GS080604-5-1
Run ID: GS080604-5A
Count Time: 1000 minutes

Final Aliquot: 32.4 g
Result Units: pCi/g
File Name: 080772d09

CASNO	Target Nuclide	Result +/- 1 s TPU	MDC	Requested MDC	Lab Qualifier
10045-97-3	Cs-137	-0.052 +/- 0.029	0.100	0.12	U
14683-23-9	Eu-152	-0.01 +/- 0.13	0.47		U
15585-10-1	Eu-154	-0.20 +/- 0.15	0.52		U
14391-16-3	Eu-155	0.097 +/- 0.034	0.107		U
14596-12-4	Fe-59	-0.003 +/- 0.050	0.173		U
10043-66-0	I-131	0.018 +/- 0.021	0.071		U
13966-00-2	K-40	-0.23 +/- 0.74	2.50		U
13966-31-9	Mn-54	0.040 +/- 0.027	0.089		U
13966-32-0	Na-22	0.002 +/- 0.026	0.090		U
14681-63-1	Nb-94	0.021 +/- 0.029	0.098		U
13967-76-5	Nb-95	-0.024 +/- 0.023	0.079		U
15100-28-4	Pa-234m	4.8 +/- 4.4	14.7		U
15092-94-1	Pb-212	-0.011 +/- 0.063	0.211		U
15067-28-4	Pb-214	0.058 +/- 0.096	0.317		U,J
13967-48-1	Ru-106	-0.08 +/- 0.22	0.76		U

Comments:

Qualifiers/Flags:

U - Result is less than the sample specific MDC or less than the associated TPU
Y1 - Chemical Yield is in control at 100-110%. Quantitative Yield is assumed.
Y2 - Chemical Yield outside default limits.
LT - Result is less than Requested MDC, greater than sample specific MDC.
SQ - Spectral quality prevents accurate quantitation.
SI - Nuclide identification and/or quantitation is tentative.
TI - Nuclide identification is tentative.
R - Nuclide has exceeded 8 halflives.
M - Requested MDC not met.
B - Analyte concentration greater than MDC.
B3 - Analyte concentration greater than MDC but less than Requested MDC.

Abbreviations:

TPU - Total Propagated Uncertainty (see PAI SOP 743)
MDC - Minimum Detectable Concentration (see PAI SOP 709)
BDL - Below Detection Limit

Data Package ID: *GSS0805078-1*

Gamma Spectroscopy Results

PAI 713 Rev 9

Method Blank Results

Lab Name: Paragon Analytics
Work Order Number: 0805078
Client Name: Los Alamos National Laboratory SMO
ClientProject ID: Dust 08-1101

Lab ID: GS080604-5MB
Library: FANP

Sample Matrix: SOLID
Prep SOP: PAI 739 Rev 9
Date Collected: 05-Jun-08
Date Prepared: 05-Jun-08
Date Analyzed: 07-Jun-08

Prep Batch: GS080604-5
QCBatchID: GS080604-5-1
Run ID: GS080604-5A
Count Time: 1000 minutes

Final Aliquot: 32.4 g
Result Units: pCi/g
File Name: 080772d09

CASNO	Target Nuclide	Result +/- 1 s TPU	MDC	Requested MDC	Lab Qualifier
14683-10-4	Sb-124	0.020 +/- 0.026	0.087		U
14234-35-6	Sb-125	0.019 +/- 0.054	0.182		U
13967-63-0	Sc-46	0.012 +/- 0.026	0.088		U
15623-47-9	Th-227	-0.04 +/- 0.13	0.46		U
15065-10-8	Th-234	0.22 +/- 0.37	1.22		U
14913-50-9	Tl-208	0.036 +/- 0.026	0.085		U
15117-96-1	U-235	0.214 +/- 0.074	0.249		U
13982-39-3	Zn-65	0.112 +/- 0.058	0.188		U
13233-32-4	Ra-224	-0.011 +/- 0.063	0.211		U

Comments:

Qualifiers/Flags:

U - Result is less than the sample specific MDC or less than the associated TPU
Y1 - Chemical Yield is in control at 100-110%. Quantitative Yield is assumed.
Y2 - Chemical Yield outside default limits.
LT - Result is less than Requested MDC, greater than sample specific MDC.
SQ - Spectral quality prevents accurate quantitation.
SI - Nuclide identification and/or quantitation is tentative.
TI - Nuclide identification is tentative.
R - Nuclide has exceeded 8 halflives.
M - Requested MDC not met.
B - Analyte concentration greater than MDC.
B3 - Analyte concentration greater than MDC but less than Requested MDC.

Abbreviations:

TPU - Total Propagated Uncertainty (see PAI SOP 743)
MDC - Minimum Detectable Concentration (see PAI SOP 709)
BDL - Below Detection Limit

Data Package ID: *GSS0805078-1*

Gamma Spectroscopy Results

Gamma Spectroscopy Results

PAI 713 Rev 9

Duplicate Sample Results (DER)

Lab Name: Paragon Analytics
Work Order Number: 0805078
Client Name: Los Alamos National Laboratory SMO
ClientProject ID: Dust 08-1101

Field ID: SFB08-08-12411
Lab ID: 0805078-1DUP
Library: FANP

Sample Matrix: SOLID
Prep SOP: PAI 739 Rev 9
Date Collected: 16-Apr-08
Date Prepared: 05-Jun-08
Date Analyzed: 05-Jun-08

Prep Batch: GS080604-5
QCBatchID: GS080604-5-1
Run ID: GS080604-5A
Count Time: 1000 minutes
Report Basis: As Received

Final Aliquot: 36.3 g
Prep Basis: As Received
Moisture(%): NA
Result Units: pCi/g
File Name: 080965d06

CASNO	Analyte	Sample Result +/- 1s TPU	Duplicate Result +/- 1s TPU	DER	Control Limit	Lab Qualifiers
14331-83-0	Ac-228	0.65 +/- 0.14	0.56 +/- 0.10	0.25	2.13	TI,G
14391-76-5	Ag-110m	0.011 +/- 0.030	-0.019 +/- 0.022	0.41	2.13	U,G
14682-66-7	Al-26	-0.028 +/- 0.030	0.038 +/- 0.021	0.90	2.13	U,G
14596-10-2	Am-241	0.053 +/- 0.030	-0.19 +/- 0.27	0.45	2.13	U,G
13966-02-4	Be-7	2.08 +/- 0.41	1.84 +/- 0.30	0.24	2.13	G
14913-49-6	Bi-212	0.86 +/- 0.36	0.30 +/- 0.28	0.62	2.13	U,G
14733-03-0	Bi-214	0.424 +/- 0.094	0.425 +/- 0.074	0.00	2.13	G,J
13982-30-4	Ce-139	-0.042 +/- 0.035	0.003 +/- 0.017	0.58	2.13	U,G
14762-78-8	Ce-144	0.029 +/- 0.083	0.02 +/- 0.10	0.04	2.13	U,G
14093-03-9	Co-56	0.132 +/- 0.077	0.197 +/- 0.059	0.33	2.13	TI,G
13981-50-5	Co-57	0.009 +/- 0.010	-0.002 +/- 0.013	0.32	2.13	U,G
13981-38-9	Co-58	0.064 +/- 0.039	-0.017 +/- 0.031	0.82	2.13	U,G
10198-40-0	Co-60	-0.002 +/- 0.032	-0.012 +/- 0.022	0.13	2.13	U,G
14392-02-0	Cr-51	0.50 +/- 0.52	-0.09 +/- 0.47	0.42	2.13	U,G
13967-70-9	Cs-134	-0.050 +/- 0.028	-0.021 +/- 0.023	0.40	2.13	U,G
10045-97-3	Cs-137	0.013 +/- 0.029	0.042 +/- 0.022	0.40	2.13	U,G
14683-23-9	Eu-152	0.19 +/- 0.14	-0.06 +/- 0.10	0.74	2.13	U,G

Comments:

Duplicate Qualifiers/Flags:

U - Result is less than the sample specific MDC.
Y1 - Chemical Yield is in control at 100-110%. Quantitative yield is assumed.
Y2 - Chemical Yield outside default limits.
W - DER is greater than Warning Limit of 1.42
D - DER is greater than Control Limit of 2.13
LT - Result is less than Request MDC, greater than sample specific MDC
M - Requested MDC not met.
M3 - The requested MDC was not met, but the reported activity is greater than the reported MDC.
L - LCS Recovery below lower control limit.
H - LCS Recovery above upper control limit.
P - LCS, Matrix Spike Recovery within control limits.
N - Matrix Spike Recovery outside control limits

SQ - Spectral quality prevents accurate quantitation.
SI - Nuclide identification and/or quantitation is tentative.
TI - Nuclide identification is tentative.
R - Nuclide has exceeded 8 halflives.
G - Sample density differs by more than 15% of LCS density.

Abbreviations:

TPU - Total Propagated Uncertainty (see PAI SOP 743)
DER - Duplicate Error Ratio (see PAI SOP 715)
BDL - Below Detection Limit
NR - Not Reported

Data Package ID: *GSS0805078-1*

Gamma Spectroscopy Results

PAI 713 Rev 9

Duplicate Sample Results (DER)

Lab Name: Paragon Analytics
Work Order Number: 0805078
Client Name: Los Alamos National Laboratory SMO
ClientProject ID: Dust 08-1101

Field ID: SFB08-08-12411
Lab ID: 0805078-1DUP
Library: FANP

Sample Matrix: SOLID
Prep SOP: PAI 739 Rev 9
Date Collected: 16-Apr-08
Date Prepared: 05-Jun-08
Date Analyzed: 05-Jun-08

Prep Batch: GS080604-5
QCBatchID: GS080604-5-1
Run ID: GS080604-5A
Count Time: 1000 minutes
Report Basis: As Received

Final Aliquot: 36.3 g
Prep Basis: As Received
Moisture(%): NA
Result Units: pCi/g
File Name: 080965d06

CASNO	Analyte	Sample Result +/- 1s TPU	Duplicate Result +/- 1s TPU	DER	Control Limit	Lab Qualifiers
15585-10-1	Eu-154	-0.05 +/- 0.16	-0.09 +/- 0.12	0.12	2.13	U,G
14391-16-3	Eu-155	0.002 +/- 0.037	0.081 +/- 0.038	0.75	2.13	U,G
14596-12-4	Fe-59	0.05 +/- 0.12	-0.020 +/- 0.079	0.25	2.13	U,G
10043-66-0	I-131	2.8 +/- 1.7	-0.1 +/- 1.2	0.70	2.13	U,G
13966-00-2	K-40	12.4 +/- 1.1	13.0 +/- 1.1	0.21	2.13	G
13966-31-9	Mn-54	-0.008 +/- 0.032	0.024 +/- 0.023	0.41	2.13	U,G
13966-32-0	Na-22	-0.013 +/- 0.033	0.018 +/- 0.023	0.38	2.13	U,G
14681-63-1	Nb-94	0.013 +/- 0.030	-0.019 +/- 0.022	0.43	2.13	U,G
13967-76-5	Nb-95	0.022 +/- 0.043	0.057 +/- 0.032	0.33	2.13	U,G
15100-28-4	Pa-234m	1.4 +/- 4.6	3.8 +/- 3.5	0.20	2.13	U,G
15092-94-1	Pb-212	0.546 +/- 0.068	0.530 +/- 0.066	0.08	2.13	G
15067-28-4	Pb-214	0.435 +/- 0.088	0.459 +/- 0.055	0.12	2.13	G,J
13967-48-1	Ru-106	-0.17 +/- 0.26	-0.56 +/- 0.22	0.58	2.13	U,G
14683-10-4	Sb-124	-0.053 +/- 0.048	-0.023 +/- 0.039	0.24	2.13	U,G
14234-35-6	Sb-125	-0.018 +/- 0.058	0 +/- 0.049	0.12	2.13	U,G
13967-63-0	Sc-46	-0.004 +/- 0.041	0.003 +/- 0.029	0.07	2.13	U,G
15623-47-9	Th-227	0.06 +/- 0.15	0.05 +/- 0.16	0.01	2.13	U,G

Comments:

Duplicate Qualifiers/Flags:

U - Result is less than the sample specific MDC.
Y1 - Chemical Yield is in control at 100-110%. Quantitative yield is assumed.
Y2 - Chemical Yield outside default limits.
W - DER is greater than Warning Limit of 1.42
D - DER is greater than Control Limit of 2.13
LT - Result is less than Request MDC, greater than sample specific MDC
M - Requested MDC not met.
M3 - The requested MDC was not met, but the reported activity is greater than the reported MDC.
L - LCS Recovery below lower control limit.
H - LCS Recovery above upper control limit.
P - LCS, Matrix Spike Recovery within control limits.
N - Matrix Spike Recovery outside control limits

SQ - Spectral quality prevents accurate quantitation.
SI - Nuclide identification and/or quantitation is tentative.
TI - Nuclide identification is tentative.
R - Nuclide has exceeded 8 halflives.
G - Sample density differs by more than 15% of LCS density.

Abbreviations:

TPU - Total Propagated Uncertainty (see PAI SOP 743)
DER - Duplicate Error Ratio (see PAI SOP 715)
BDL - Below Detection Limit
NR - Not Reported

Data Package ID: *GSS0805078-1*

Gamma Spectroscopy Results

PAI 713 Rev 9

Duplicate Sample Results (DER)

Lab Name: Paragon Analytics
Work Order Number: 0805078
Client Name: Los Alamos National Laboratory SMO
ClientProject ID: Dust 08-1101

Field ID: SFB08-08-12411
Lab ID: 0805078-1DUP
Library: FANP

Sample Matrix: SOLID
Prep SOP: PAI 739 Rev 9
Date Collected: 16-Apr-08
Date Prepared: 05-Jun-08
Date Analyzed: 05-Jun-08

Prep Batch: GS080604-5
QCBatchID: GS080604-5-1
Run ID: GS080604-5A
Count Time: 1000 minutes
Report Basis: As Received

Final Aliquot: 36.3 g
Prep Basis: As Received
Moisture(%): NA
Result Units: pCi/g
File Name: 080965d06

CASNO	Analyte	Sample Result +/- 1s TPU	Duplicate Result +/- 1s TPU	DER	Control Limit	Lab Qualifiers
15065-10-8	Th-234	0.84 +/- 0.41	2.54 +/- 0.36	1.58	2.13	TI,W,G
14913-50-9	Tl-208	0.162 +/- 0.060	0.154 +/- 0.045	0.05	2.13	G
15117-96-1	U-235	0.182 +/- 0.082	-0.14 +/- 0.25	0.61	2.13	U,G
13982-39-3	Zn-65	0.025 +/- 0.071	0.033 +/- 0.051	0.04	2.13	U,G
13233-32-4	Ra-224	0.546 +/- 0.068	0.530 +/- 0.066	0.08	2.13	G

Comments:

Duplicate Qualifiers/Flags:

U - Result is less than the sample specific MDC.
Y1 - Chemical Yield is in control at 100-110%. Quantitative yield is assumed.
Y2 - Chemical Yield outside default limits.
W - DER is greater than Warning Limit of 1.42
D - DER is greater than Control Limit of 2.13
LT - Result is less than Request MDC, greater than sample specific MDC
M - Requested MDC not met.
M3 - The requested MDC was not met, but the reported activity is greater than the reported MDC.
L - LCS Recovery below lower control limit.
H - LCS Recovery above upper control limit.
P - LCS, Matrix Spike Recovery within control limits.
N - Matrix Spike Recovery outside control limits
SQ - Spectral quality prevents accurate quantitation.
SI - Nuclide identification and/or quantitation is tentative.
TI - Nuclide identification is tentative.
R - Nuclide has exceeded 8 halflives.
G - Sample density differs by more than 15% of LCS density.

Abbreviations:

TPU - Total Propagated Uncertainty (see PAI SOP 743)
DER - Duplicate Error Ratio (see PAI SOP 715)
BDL - Below Detection Limit
NR - Not Reported

Data Package ID: *GSS0805078-1*

PARAGON ANALYTICS
Radiochemistry Data Package

4

Section 4

INDIVIDUAL SAMPLE RESULTS

Gamma Spectroscopy Results

PAI 713 Rev 9

Sample Results

Lab Name: Paragon Analytics
Work Order Number: 0805078
Client Name: Los Alamos National Laboratory SMO
ClientProject ID: Dust 08-1101

Field ID: SFB08-08-12411
Lab ID: 0805078-1
Library: FANP

Sample Matrix: SOLID
Prep SOP: PAI 739 Rev 9
Date Collected: 16-Apr-08
Date Prepared: 05-Jun-08
Date Analyzed: 05-Jun-08

Prep Batch: GS080604-5
QCBatchID: GS080604-5-1
Run ID: GS080604-5A
Count Time: 1000 minutes
Report Basis: As Received

Final Aliquot: 32.7 g
Prep Basis: As Received
Moisture(%): NA
Result Units: pCi/g
File Name: 080763d09

CASNO	Target Nuclide	Result +/- 1 s TPU	MDC	Requested MDC	Lab Qualifier
14331-83-0	Ac-228	0.65 +/- 0.14	0.55		G
14391-76-5	Ag-110m	0.011 +/- 0.030	0.100		U,G
14682-66-7	Al-26	-0.028 +/- 0.030	0.109		U,G
14596-10-2	Am-241	0.053 +/- 0.030	0.098		U,G
13966-02-4	Be-7	2.08 +/- 0.41	1.19		G
14913-49-6	Bi-212	0.86 +/- 0.36	1.13		U,G
14733-03-0	Bi-214	0.424 +/- 0.094	0.328		G,J
13982-30-4	Ce-139	-0.042 +/- 0.035	0.118		U,G
14762-78-8	Ce-144	0.029 +/- 0.083	0.279		U,G
14093-03-9	Co-56	0.132 +/- 0.077	0.252		U,G
13981-50-5	Co-57	0.009 +/- 0.010	0.034		U,G

Gamma Spectroscopy Results

PAI 713 Rev 9

Sample Results

Lab Name: Paragon Analytics
Work Order Number: 0805078
Client Name: Los Alamos National Laboratory SMO
ClientProject ID: Dust 08-1101

Field ID: SFB08-08-12411
Lab ID: 0805078-1
Library: FANP

Sample Matrix: SOLID
Prep SOP: PAI 739 Rev 9
Date Collected: 16-Apr-08
Date Prepared: 05-Jun-08
Date Analyzed: 05-Jun-08

Prep Batch: GS080604-5
QCBatchID: GS080604-5-1
Run ID: GS080604-5A
Count Time: 1000 minutes
Report Basis: As Received

Final Aliquot: 32.7 g
Prep Basis: As Received
Moisture(%): NA
Result Units: pCi/g
File Name: 080763d09

CASNO	Target Nuclide	Result +/- 1 s TPU	MDC	Requested MDC	Lab Qualifier
10045-97-3	Cs-137	0.013 +/- 0.029	0.098	0.12	U,G
14683-23-9	Eu-152	0.19 +/- 0.14	0.45		U,G
15585-10-1	Eu-154	-0.05 +/- 0.16	0.55		U,G
14391-16-3	Eu-155	0.002 +/- 0.037	0.124		U,G
14596-12-4	Fe-59	0.05 +/- 0.12	0.41		U,G
10043-66-0	I-131	2.8 +/- 1.7	5.5		U,G
13966-00-2	K-40	12.4 +/- 1.1	2.5		G
13966-31-9	Mn-54	-0.008 +/- 0.032	0.108		U,G
13966-32-0	Na-22	-0.013 +/- 0.033	0.115		U,G
14681-63-1	Nb-94	0.013 +/- 0.030	0.101		U,G
13967-76-5	Nb-95	0.022 +/- 0.043	0.144		U,G
15100-28-4	Pa-234m	1.4 +/- 4.6	15.8		U,G
15092-94-1	Pb-212	0.546 +/- 0.068	0.188		G
15067-28-4	Pb-214	0.435 +/- 0.088	0.326		G,J
13967-48-1	Ru-106	-0.17 +/- 0.26	0.89		U,G

Comments:

Qualifiers/Flags:

U - Result is less than the sample specific MDC or less than the associated TPU

Y1 - Chemical Yield is in control at 100-110%. Quantitative Yield is assumed.

Y2 - Chemical Yield outside default limits.

LT - Result is less than Requested MDC, greater than sample specific MDC.

M3 - The requested MDC was not met, but the reported activity is greater than the reported MDC.

M - The requested MDC was not met.

SQ - Spectral quality prevents accurate quantitation.

SI - Nuclide identification and/or quantitation is tentative.

TI - Nuclide identification is tentative.

R - Nuclide has exceeded 8 halflives.

G - Sample density differs by more than 15% of LCS density.

Abbreviations:

TPU - Total Propagated Uncertainty (see PAI SOP 743)

MDC - Minimum Detectable Concentration (see PAI SOP 709)

BDL - Below Detection Limit

Data Package ID: *GSS0805078-1*

Gamma Spectroscopy Results

PAI 713 Rev 9

Sample Results

Lab Name: Paragon Analytics
Work Order Number: 0805078
Client Name: Los Alamos National Laboratory SMO
ClientProject ID: Dust 08-1101

Field ID: SFB08-08-12411
Lab ID: 0805078-1
Library: FANP

Sample Matrix: SOLID
Prep SOP: PAI 739 Rev 9
Date Collected: 16-Apr-08
Date Prepared: 05-Jun-08
Date Analyzed: 05-Jun-08

Prep Batch: GS080604-5
QCBatchID: GS080604-5-1
Run ID: GS080604-5A
Count Time: 1000 minutes
Report Basis: As Received

Final Aliquot: 32.7 g
Prep Basis: As Received
Moisture(%): NA
Result Units: pCi/g
File Name: 080763d09

CASNO	Target Nuclide	Result +/- 1 s TPU	MDC	Requested MDC	Lab Qualifier
14683-10-4	Sb-124	-0.053 +/- 0.048	0.163		U,G
14234-35-6	Sb-125	-0.018 +/- 0.058	0.197		U,G
13967-63-0	Sc-46	-0.004 +/- 0.041	0.140		U,G
15623-47-9	Th-227	0.06 +/- 0.15	0.49		U,G
15065-10-8	Th-234	0.84 +/- 0.41	1.32		U,G
14913-50-9	Tl-208	0.162 +/- 0.060	0.193		U,G
15117-96-1	U-235	0.182 +/- 0.082	0.265		U,G
13982-39-3	Zn-65	0.025 +/- 0.071	0.242		U,G
13233-32-4	Ra-224	0.546 +/- 0.068	0.188		G

Comments:

Qualifiers/Flags:

U - Result is less than the sample specific MDC or less than the associated TPU

Y1 - Chemical Yield is in control at 100-110%. Quantitative Yield is assumed.

Y2 - Chemical Yield outside default limits.

LT - Result is less than Requested MDC, greater than sample specific MDC.

M3 - The requested MDC was not met, but the reported activity is greater than the reported MDC.

M - The requested MDC was not met.

SQ - Spectral quality prevents accurate quantitation.

SI - Nuclide identification and/or quantitation is tentative.

TI - Nuclide identification is tentative.

R - Nuclide has exceeded 8 halflives.

G - Sample density differs by more than 15% of LCS density.

Abbreviations:

TPU - Total Propagated Uncertainty (see PAI SOP 743)

MDC - Minimum Detectable Concentration (see PAI SOP 709)

BDL - Below Detection Limit

Data Package ID: *GSS0805078-1*

Gamma Spectroscopy Results

PAI 713 Rev 9

Sample Duplicate Results

Lab Name: Paragon Analytics
Work Order Number: 0805078
Client Name: Los Alamos National Laboratory SMO
ClientProject ID: Dust 08-1101

Field ID: SFB08-08-12411
Lab ID: 0805078-1DUP

Library: FANP

Sample Matrix: SOLID
Prep SOP: PAI 739 Rev 9
Date Collected: 16-Apr-08
Date Prepared: 05-Jun-08
Date Analyzed: 05-Jun-08

Prep Batch: GS080604-5
QCBatchID: GS080604-5-1
Run ID: GS080604-5A
Count Time: 1000 minutes
Report Basis: As Received

Final Aliquot: 36.3 g
Prep Basis: As Received
Moisture(%): NA
Result Units: pCi/g
File Name: 080965d06

CASNO	Target Nuclide	Result +/- 1 s TPU	MDC	Requested MDC	Lab Qualifier
14331-83-0	Ac-228	0.56 +/- 0.10	0.49		TI,G
14391-76-5	Ag-110m	-0.019 +/- 0.022	0.076		U,G
14682-66-7	Al-26	0.038 +/- 0.021	0.067		U,G
14596-10-2	Am-241	-0.19 +/- 0.27	0.92		U,G
13966-02-4	Be-7	1.84 +/- 0.30	0.84		G
14913-49-6	Bi-212	0.30 +/- 0.28	0.95		U,G
14733-03-0	Bi-214	0.425 +/- 0.074	0.265		G,J
13982-30-4	Ce-139	0.003 +/- 0.017	0.056		U,G
14762-78-8	Ce-144	0.02 +/- 0.10	0.34		U,G
14093-03-9	Co-56	0.197 +/- 0.059	0.183		TI,G
13981-50-5	Co-57	-0.002 +/- 0.013	0.045		U,G
13981-38-9	Co-58	-0.017 +/- 0.031	0.108		U,G
10198-40-0	Co-60	-0.012 +/- 0.022	0.075		U,G

Comments:

Qualifiers/Flags:

U - Result is less than the sample specific MDC or less than the associated TPU.
Y1 - Chemical Yield is in control at 100-110%. Quantitative yield is assumed.
Y2 - Chemical Yield outside default limits.
LT - Result is less than Requested MDC, greater than sample specific MDC.
M - The requested MDC was not met.
M3 - The requested MDC was not met, but thereported activity is greater than the reported MDC.
W - DER is greater than Warning Limit of 1.42
D - DER is greater than Control Limit of 2.13

SQ - Spectral quality prevents accurate quantitation.
SI - Nuclide identification and/or quantitation is tentative.
TI - Nuclide identification is tentative.
R - Nuclide has exceeded 8 halflives.
G - Sample density differs by more than 15% of LCS density.

Abbreviations:

TPU - Total Propagated Uncertainty (see PAI SOP 743)
MDC - Minimum Detectable Concentration (see PAI SOP 709)
BDL - Below Detection Limit

Data Package ID: *GSS0805078-1*

Gamma Spectroscopy Results

PAI 713 Rev 9

Sample Duplicate Results

Lab Name: **Paragon Analytics**

Work Order Number: 0805078

Client Name: Los Alamos National Laboratory SMO

Client Project ID: Dust 08-1101

Gamma Spectroscopy Results

PAI 713 Rev 9

Sample Duplicate Results

Lab Name: Paragon Analytics
Work Order Number: 0805078
Client Name: Los Alamos National Laboratory SMO
ClientProject ID: Dust 08-1101

Field ID: SFB08-08-12411
Lab ID: 0805078-1DUP
Library: FANP

Sample Matrix: SOLID
Prep SOP: PAI 739 Rev 9
Date Collected: 16-Apr-08
Date Prepared: 05-Jun-08
Date Analyzed: 05-Jun-08

Prep Batch: GS080604-5
QCBatchID: GS080604-5-1
Run ID: GS080604-5A
Count Time: 1000 minutes
Report Basis: As Received

Final Aliquot: 36.3 g
Prep Basis: As Received
Moisture(%): NA
Result Units: pCi/g
File Name: 080965d06

CASNO	Target Nuclide	Result +/- 1 s TPU	MDC	Requested MDC	Lab Qualifier
15100-28-4	Pa-234m	3.8 +/- 3.5	11.6		U,G
15092-94-1	Pb-212	0.530 +/- 0.066	0.183		G
15067-28-4	Pb-214	0.459 +/- 0.055	0.204		G,J
13967-48-1	Ru-106	-0.56 +/- 0.22	0.75		U,G
14683-10-4	Sb-124	-0.023 +/- 0.039	0.134		U,G
14234-35-6	Sb-125	0 +/- 0.049	0.165		U,G
13967-63-0	Sc-46	0.003 +/- 0.029	0.098		U,G
15623-47-9	Th-227	0.05 +/- 0.16	0.53		U,G
15065-10-8	Th-234	2.54 +/- 0.36	0.99		TI,W,G
14913-50-9	Tl-208	0.154 +/- 0.045	0.143		G
15117-96-1	U-235	-0.14 +/- 0.25	0.85		U,G
13982-39-3	Zn-65	0.033 +/- 0.051	0.172		U,G
13233-32-4	Ra-224	0.530 +/- 0.066	0.183		G

Comments:

Qualifiers/Flags:

U - Result is less than the sample specific MDC or less than the associated TPU.

Y1 - Chemical Yield is in control at 100-110%. Quantitative yield is assumed.

Y2 - Chemical Yield outside default limits.

LT - Result is less than Requested MDC, greater than [illegible] specific MDC.

SQ - Spectral quality prevents accurate quantitation.

SI - Nuclide identification and/or quantitation is tentative.

TI - Nuclide identification is tentative.

Gamma Spectroscopy Results

PAI 713 Rev 9

Sample Results

Lab Name: Paragon Analytics
Work Order Number: 0805078
Client Name: Los Alamos National Laboratory SMO
ClientProject ID: Dust 08-1101

Field ID: SFB08-08-12412
Lab ID: 0805078-2
Library: FANP

Sample Matrix: SOLID
Prep SOP: PAI 739 Rev 9
Date Collected: 16-Apr-08
Date Prepared: 05-Jun-08
Date Analyzed: 05-Jun-08

Prep Batch: GS080604-5
QCBatchID: GS080604-5-1
Run ID: GS080604-5A
Count Time: 1000 minutes
Report Basis: As Received

Final Aliquot: 32.0 g
Prep Basis: As Received
Moisture(%): NA
Result Units: pCi/g
File Name: 081125d08

CASNO	Target Nuclide	Result +/- 1 s TPU	MDC	Requested MDC	Lab Qualifier
14331-83-0	Ac-228	0.90 +/- 0.12	0.40		G
14391-76-5	Ag-110m	-0.016 +/- 0.024	0.081		U,G
14682-66-7	Al-26	-0.021 +/- 0.025	0.089		U,G
14596-10-2	Am-241	-0.016 +/- 0.024	0.081		U,G
13966-02-4	Be-7	4.12 +/- 0.40	0.86		G
14913-49-6	Bi-212	1.09 +/- 0.35	1.11		U,G
14733-03-0	Bi-214	0.49 +/- 0.12	0.43		G,J
13982-30-4	Ce-139	-0.026 +/- 0.014	0.048		U,G
14762-78-8	Ce-144	-0.038 +/- 0.078	0.264		U,G
14093-03-9	Co-56	0.112 +/- 0.053	0.169		U,G
13981-50-5	Co-57	0.0046 +/- 0.0097	0.0324		U,G
13981-38-9	Co-58	-0.046 +/- 0.036	0.126		U,G
10198-40-0	Co-60	0.024 +/- 0.026	0.086		U,G
14392-02-0	Cr-51	0.54 +/- 0.45	1.49		U,G
13967-70-9	Cs-134	-0.006 +/- 0.018	0.084		U,G

Comments:

Qualifiers/Flags:

U - Result is less than the sample specific MDC or less than the associated TPU

Y1 - Chemical Yield is in control at 100-110%. Quantitative Yield is assumed.

Y2 - Chemical Yield outside default limits.

LT - Result is less than Requested MDC, greater than sample specific MDC.

M3 - The requested MDC was not met, but the reported activity is greater than the reported MDC.

M - The requested MDC was not met.

SQ - Spectral quality prevents accurate quantitation.

SI - Nuclide identification and/or quantitation is tentative.

TI - Nuclide identification is tentative.

R - Nuclide has exceeded 8 halflives.

G - Sample density differs by more than 15% of LCS density.

Abbreviations:

TPU - Total Propagated Uncertainty (see PAI SOP 743)

MDC - Minimum Detectable Concentration (see PAI SOP 709)

BDL - Below Detection Limit

Data Package ID: *GSS0805078-1*

Gamma Spectroscopy Results

PAI 713 Rev 9

Sample Results

Lab Name: Paragon Analytics
Work Order Number: 0805078
Client Name: Los Alamos National Laboratory SMO
ClientProject ID: Dust 08-1101

Field ID: SFB08-08-12412
Lab ID: 0805078-2
Library: FANP

Sample Matrix: SOLID
Prep SOP: PAI 739 Rev 9
Date Collected: 16-Apr-08
Date Prepared: 05-Jun-08
Date Analyzed: 05-Jun-08

Prep Batch: GS080604-5
QCBatchID: GS080604-5-1
Run ID: GS080604-5A
Count Time: 1000 minutes
Report Basis: As Received

Final Aliquot: 32.0 g
Prep Basis: As Received
Moisture(%): NA
Result Units: pCi/g
File Name: 081125d08

CASNO	Target Nuclide	Result +/- 1 s TPU	MDC	Requested MDC	Lab Qualifier
10045-97-3	Cs-137	0.112 +/- 0.022	0.064	0.12	LT,G
14683-23-9	Eu-152	-0.10 +/- 0.12	0.43		U,G
15585-10-1	Eu-154	-0.13 +/- 0.13	0.47		U,G
14391-16-3	Eu-155	0.073 +/- 0.045	0.148		U,G
14596-12-4	Fe-59	0.001 +/- 0.096	0.329		U,G
10043-66-0	I-131	-2.3 +/- 1.4	4.9		U,G
13966-00-2	K-40	15.3 +/- 1.2	2.1		G
13966-31-9	Mn-54	0.003 +/- 0.025	0.085		U,G
13966-32-0	Na-22	0.007 +/- 0.027	0.091		U,G
14681-63-1	Nb-94	0.043 +/- 0.026	0.085		U,G
13967-76-5	Nb-95	0.015 +/- 0.040	0.133		U,G
15100-28-4	Pa-234m	3.5 +/- 4.1	13.6		U,G
15092-94-1	Pb-212	0.888 +/- 0.085	0.207		G
15067-28-4	Pb-214	0.643 +/- 0.076	0.261		G,J
13967-48-1	Ru-106	-0.13 +/- 0.23	0.77		U,G

Comments:

Qualifiers/Flags:

U - Result is less than the sample specific MDC or less than the associated TPU

Y1 - Chemical Yield is in control at 100-110%. Quantitative Yield is assumed.

Y2 - Chemical Yield outside default limits.

LT - Result is less than Requested MDC, greater than sample specific MDC.

M3 - The requested MDC was not met, but the reported activity is greater than the reported MDC.

M - The requested MDC was not met.

SQ - Spectral quality prevents accurate quantitation.

SI - Nuclide identification and/or quantitation is tentative.

TI - Nuclide identification is tentative.

R - Nuclide has exceeded 8 halflives.

G - Sample density differs by more than 15% of LCS density.

Abbreviations:

TPU - Total Propagated Uncertainty (see PAI SOP 743)

MDC - Minimum Detectable Concentration (see PAI SOP 709)

BDL - Below Detection Limit

Data Package ID: *GSS0805078-1*

Gamma Spectroscopy Results

PAI 713 Rev 9

Sample Results

Lab Name: Paragon Analytics
Work Order Number: 0805078
Client Name: Los Alamos National Laboratory SMO
ClientProject ID: Dust 08-1101

Field ID: SFB08-08-12412
Lab ID: 0805078-2
Library: FANP

Sample Matrix: SOLID
Prep SOP: PAI 739 Rev 9
Date Collected: 16-Apr-08
Date Prepared: 05-Jun-08
Date Analyzed: 05-Jun-08

Prep Batch: GS080604-5
QCBatchID: GS080604-5-1
Run ID: GS080604-5A
Count Time: 1000 minutes
Report Basis: As Received

Final Aliquot: 32.0 g
Prep Basis: As Received
Moisture(%): NA
Result Units: pCi/g
File Name: 081125d08

CASNO	Target Nuclide	Result +/- 1 s TPU	MDC	Requested MDC	Lab Qualifier
14683-10-4	Sb-124	0.037 +/- 0.044	0.147		U,G
14234-35-6	Sb-125	-0.009 +/- 0.047	0.188		U,G
13967-63-0	Sc-46	-0.006 +/- 0.033	0.114		U,G
15623-47-9	Th-227	0.2 +/- 3.1	10.3		U,G
15065-10-8	Th-234	1.50 +/- 0.36	1.13		TI,G
14913-50-9	Tl-208	0.287 +/- 0.049	0.155		G
15117-96-1	U-235	0.12 +/- 0.12	0.40		U,G
13982-39-3	Zn-65	0.27 +/- 0.14	0.45		U,G
13233-32-4	Ra-224	0.888 +/- 0.085	0.207		G

Comments:

Qualifiers/Flags:

U - Result is less than the sample specific MDC or less than the associated TPU

Y1 - Chemical Yield is in control at 100-110%. Quantitative Yield is assumed.

Y2 - Chemical Yield outside default limits.

LT - Result is less than Requested MDC, greater than sample specific MDC.

M3 - The requested MDC was not met, but the reported activity is greater than the reported MDC.

M - The requested MDC was not met.

SQ - Spectral quality prevents accurate quantitation.

SI - Nuclide identification and/or quantitation is tentative.

TI - Nuclide identification is tentative.

R - Nuclide has exceeded 8 halflives.

G - Sample density differs by more than 15% of LCS density.

Abbreviations:

TPU - Total Propagated Uncertainty (see PAI SOP 743)

MDC - Minimum Detectable Concentration (see PAI SOP 709)

BDL - Below Detection Limit

Data Package ID: *GSS0805078-1*

PARAGON ANALYTICS
Radiochemistry Data Package

5

Section 5

RAW DATA

080763D09.SPC Analyzed by JNO

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SEEKER G A M M A A N A L Y S I S R E S U L T S PS Version 1.8.4

Paragon Analytics, Div. of DataChem Lab
GammaScan

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Geo.11 / Solid

Sample ID: 0805078-1 GS080604-5

Sampling Start:	04/16/2008 12:00:00	Counting Start:	06/05/2008 15:57:06
Sampling Stop:	04/16/2008 12:00:00	Decay Time.	1.20E+003 Hrs
Buildup Time.	0.00E+000 Hrs	Live Time	60000 Sec
Sample Size	3.27E+001 g	Real Time	60036 Sec
Collection Efficiency	1.0000	Spc. File	.080763D09.SPC

Detector #: 9 (Detector 9)

Energy(keV) = 1.21 + 0.500*Ch + 0.00E+00*Ch^2 + 0.00E+00*Ch^3 06/05/2008
FWHM(keV) = 0.46 + 0.026*En + 4.17E-04*En^2 + 0.00E+00*En^3 01/14/2008
Where En = Sqrt(Energy in keV)

Search Sensitivity: 1.00 | Sigma Multiplier: 2.00 | Search Start/End: 80/4000

PEAK SEARCH RESULTS

PK. #	ENERGY (keV)	ADDRESS CHANNEL	NET/MDA COUNTS	UN-CERTAINTY	C.L. COUNTS	BKG COUNTS	FWHM (keV)	FLAG
1	46.48	90.63	1285	98	55	675	0.71 a	
2	53.22	104.13	108	81	65	839	0.76 a	
3	57.63	112.95	24	44	35	341	0.34 a	NET< CL
4	59.33	116.36	82	92	74	1022	0.97 b	
5	63.27	124.24	477	80	55	681	0.66 c	
6	66.39	130.48	193	95	74	1022	0.91 d	
7	74.79	147.30	495	94	68	935	0.74 a	
8	77.07	151.86	663	87	58	748	0.68 b	
9	84.38	166.50	298	107	84	1105	1.35 a	Wide Pk
10	87.11	171.97	276	79	59	691	0.83 b	
11	89.85	177.46	204	77	59	691	0.80 c	
12	92.70	183.16	808	99	67	829	1.06 d	
13	113.30	224.40	25	48	39	376	0.45 a	NET< CL
14	129.26	256.34	55	50	39	376	0.41 a	
15	136.75	271.34	70	86	70	826	1.16 a	NET< CL
16	139.74	277.32	150	61	46	472	0.73 b	
17	144.25	286.36	93	87	70	826	1.09 c	
18	185.88	369.68	357	77	55	607	0.80 a	
19	198.65	395.25	219	86	66	744	1.21 a	
20	209.47	416.90	61	64	51	522	0.83 a	
21	238.71	475.45	828	89	56	580	0.90 a	
22	241.48	481.00	167	97	77	870	1.40 b	
23	295.21	588.54	241	76	57	558	1.06 a	

080763D09.SPC Analyzed by

PEAK SEARCH RESULTS

PK. #	ENERGY (keV)	ADDRESS CHANNEL	NET/MDA COUNTS	UN-CERTAINTY	C.L. COUNTS	BKG COUNTS	FWHM (keV)	FLAG
25	338.37	674.95	112	56	43	366	0.84 a	
26	351.93	702.10	395	70	47	407	1.00 a	
27	385.91	770.12	11	34	28	187	0.57 a	NET< CL
28	462.71	923.85	29	37	29	214	0.61 a	NET< CL
29	477.79	954.04	161	60	45	367	1.23 a	
30	511.00	1020.52	1336	122	80	786	2.55 a	Wide Pk
31	537.77	1074.11	39	43	34	248	1.06 a	
32	558.52	1115.66	193	56	40	294	1.32 a	
33	569.43	1137.50	85	64	50	418	1.67 a	
34	583.28	1165.22	227	56	39	296	1.16 a	
35	609.35	1217.40	277	65	46	388	1.32 a	
36	693.68	1386.23	57	69	56	481	1.86 a	
37	727.33	1453.59	52	42	33	208	1.20 a	
38	803.02	1605.11	119	42	30	184	1.31 a	
39	897.44	1794.11	28	33	26	148	1.07 a	
40	911.32	1821.89	165	45	30	180	1.51 a	
41	968.79	1936.96	78	40	30	183	1.32 a	
42	1120.35	2240.34	41	38	30	173	1.47 a	
43	1460.80	2921.88	808	65	26	121	1.98 a	
44	1764.55	3529.93	54	26	18	61	1.76 a	

080763D09.SPC Analyzed by

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SEEKER B A C K G R O U N D S U B T R A C T R E S U L T S Vers. 2.2.1

Paragon Analytics, Div. of DataChem Lab
GammaScan

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Background File:. . . . . DET090530.BKG (080530-9 WEEKLY BACKGROUND)

Bkg.File Detector #: 9

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BACKGROUND SUBTRACT RESULTS

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PK#	ENERGY (keV)	OLD NET COUNTS	OLD UN-CERTAINTY	OLD CR.LEVEL	NEW NET COUNTS	NEW UN-CERTAINTY	NEW CR.LEVEL	FLAG
1	46.48	1285	98	55	859	173	133	
2	53.22	108	81	65	39	131	108	NET<CL
5	63.27	477	80	55	46	165	135	NET<CL
6	66.39	193	95	74	29	191	157	NET<CL
7	74.79	495	94	68	357	130	102	
8	77.07	663	87	58	537	172	136	
9	84.38	298	107	84	206	192	156	
10	87.11	276	79	59	246	125	100	
12	92.70	808	99	67	215	207	168	
16	139.74	150	61	46	53	141	116	NET<CL
17	144.25	93	87	70	-8	198	163	NET<CL
18	185.88	357	77	55	109	156	127	NET<CL
19	198.65	219	86	66	111	142	115	NET<CL
21	238.71	828	89	56	602	134	102	
23	295.21	241	76	57	186	129	104	
25	338.37	112	56	43	64	138	112	NET<CL
26	351.93	395	70	47	301	140	112	
30	511.00	1336	122	80	89	261	214	NET<CL
32	558.52	193	56	40	83	113	91	NET<CL
33	569.43	85	64	50	25	109	89	NET<CL
34	583.28	227	56	39	153	112	90	
35	609.35	277	65	46	220	106	84	
38	803.02	119	42	30	22	90	73	NET<CL
39	897.44	28	33	26	-18	82	68	NET<CL
40	911.32	165	45	30	117	80	63	
43	1460.80	808	65	26	675	96	67	

080763D09.SPC Analyzed by

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SEEKER F I N A L A C T I V I T Y R E P O R T Version 2.2.1

Paragon Analytics, Div. of DataChem Lab
GammaScan

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Geo.11 / Solid

Sample ID: 0805078-1 GS080604-5

Sampling Start:	04/16/2008 12:00:00	Counting Start:	06/05/2008 15:57:06
Sampling Stop:	04/16/2008 12:00:00	Decay Time.	1.20e+003 Hrs
Buildup Time.	0.00e+000 Hrs	Live Time	60000 Sec
Sample Size	3.27e+001 g	Real Time	60036 Sec
Collection Efficiency	1.0000	Spectrum File	.080763D09.SPC
Cr. Level Confidence Interval:	95 %	Det. Limit Confidence Interval:	95 %

Detector #: 9 (Detector 9)

Efficiency File: (D09)(Sh11).EFF (Geo 11 Eff Cal)

Eff=10^[-7.00E+00 +6.03E+00*L +-1.56E+00*L^2 +0.00E+00*L^3] 01/15/2008

Eff.= EXP[1.49E+00 + -8.33E-01 * En + -7.65E-03 * En^2] Above 180.00 keV

Library File: . . . . . .FANP.LIB (FANP (Fiss. Act. and Nat. Products))

MEASURED or MDA CONCENTRATIONS

Nuclide	ENERGY (keV)	N E T	Concentration (pCi/g)	MDA	Critical Level	Halflife (hrs)
Am-241	59.54		5.32E-02 +- 5.98E-02	9.83E-02	4.83E-02	3.80E+06
Th-234	92.50		8.36E-01 +- 8.05E-01	1.32E+00	6.55E-01	3.92E+13
Pb-212	238.63		5.46E-01 +- 1.21E-01	1.88E-01	9.26E-02	1.67E+04
Pb-214	Average:x		4.35E-01 +- 1.68E-01	. . . .	. . . .	1.40E+07
	295.22		4.40E-01 +- 3.06E-01	4.98E-01	2.46E-01	1.40E+07
	351.99		4.33E-01 +- 2.02E-01	3.26E-01	1.61E-01	1.40E+07
Be-7	477.56		2.08E+00 +- 7.75E-01	1.19E+00	5.78E-01	1.28E+03
Tl-208	583.14		1.62E-01 +- 1.19E-01	1.93E-01	9.51E-02	1.67E+04
Bi-214	Average:x		4.25E-01 +- 1.82E-01	. . . .	. . . .	1.40E+07
	609.32		4.25E-01 +- 2.04E-01	3.28E-01	1.61E-01	1.40E+07
	1120.28		4.24E-01 +- 3.99E-01	6.48E-01	3.10E-01	1.40E+07
Bi-212	727.17		8.62E-01 +- 7.03E-01	1.13E+00	5.44E-01	1.67E+04
Ac-228	Average:x		6.47E-01 +- 2.68E-01	. . . .	. . . .	5.04E+04
	911.07		5.97E-01 +- 4.07E-01	6.58E-01	3.22E-01	5.04E+04
	968.90		6.85E-01 +- 3.56E-01	5.51E-01	2.63E-01	5.04E+04
K-40	1460.75		1.24E+01 +- 1.76E+00	2.49E+00	1.22E+00	1.12E+13
Eu-155	105.31	N	2.13E-03 +- 7.34E-02	1.24E-01	6.04E-02	4.35E+04
Co-57	122.07	N	9.24E-03 +- 2.01E-02	3.35E-02	1.63E-02	6.48E+03
Ce-144	133.53	N	2.89E-02 +- 1.66E-01	2.79E-01	1.36E-01	6.82E+03
U-235	143.76	N	1.82E-01 +- 1.63E-01	2.65E-01	1.29E-01	6.17E+12
Ce-139	165.85	N	-4.21E-02 +- 7.02E-02	1.18E-01	5.82E-02	3.30E+03
Th-227	236.00	N	5.74E-02 +- 2.95E-01	4.90E-01R	2.41E-01	1.90E+05
Cr-51	320.07	N	5.02E-01 +- 1.03E+00	1.72E+00	8.35E-01	6.65E+02
I-131	364.48	N	2.82E+00 +- 3.34E+00	5.49E+00	2.68E+00	1.93E+02

080763D09.SPC Analyzed by

MEASURED or MDA CONCENTRATIONS

Nuclide	ENERGY (keV)	NET	Concentration (pCi/g)	MDA	Critical Level	Halflife (hrs)
Sb-125	427.95	N	-1.79E-02 +- 1.16E-01	1.97E-01	9.57E-02	2.43E+04
Sb-124	602.71	N	-5.28E-02 +- 9.49E-02	1.63E-01	7.95E-02	1.44E+03
Cs-134	604.66	N	-5.02E-02 +- 5.61E-02	9.76E-02B	4.75E-02	1.91E+04

080763D09.SPC Analyzed by

UNKNOWN, SUM or ESCAPE PEAKS

PK. #	ENERGY (keV)	ADDRESS CHANNEL	NET COUNTS	UN-CERTAINTY	C.L. COUNTS	BKG COUNTS	FWHM (keV)	FLAG
25	338.37	674.95	64	138	112	366	0.84	Deleted
27	385.91	770.12	11	34	28	187	0.57	Deleted
28	462.71	923.85	29	37	29	214	0.61	Deleted
30	511.00	1020.52	89	261	214	786	2.55	Deleted

080965D06.SPC Analyzed by hp

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SEEKER G A M M A A N A L Y S I S R E S U L T S PS Version 1.8.4

Paragon Analytics, Div. of DataChem Lab
GammaScan

****

Geo.11 / Solid

Sample ID: 0805078-1D GS080604-5

Sampling Start:	04/16/2008 12:00:00	Counting Start:	06/05/2008 16:27:40
Sampling Stop:	04/16/2008 12:00:00	Decay Time.	1.20E+003 Hrs
Buildup Time.	0.00E+000 Hrs	Live Time	60000 Sec
Sample Size	3.63E+001 g	Real Time	60036 Sec
Collection Efficiency	1.0000	Spc. File	.080965D06.SPC

Detector #: 6 (Detector 6)

Energy(keV)= -0.58 + 0.500*Ch + 0.00E+00*Ch^2 + 0.00E+00*Ch^3 06/05/2008
FWHM(keV) = 0.79 + 0.009*En + 6.42E-04*En^2 + 0.00E+00*En^3 07/24/2007
Where En = Sqrt(Energy in keV)

Search Sensitivity: 1.00 | Sigma Multiplier: 2.00 | Search Start/End: 80/4000

PEAK SEARCH RESULTS

PK. #	ENERGY (keV)	ADDRESS CHANNEL	NET/MDA COUNTS	UN-CERTAINTY	C.L. COUNTS	BKG COUNTS	FWHM (keV)	FLAG
1	66.49	134.03	84	86	69	957	0.86 a	
2	68.98	139.00	3	59	48	574	0.47 b	NET< CL
3	74.84	150.71	146	94	75	1036	1.05 a	
4	77.10	155.24	213	85	65	863	0.88 b	
5	84.56	170.15	103	65	51	573	0.69 a	Wide Pk
6	87.20	175.41	111	55	42	429	0.56 b	
7	90.98	182.98	2	193	159	2434	2.73 c	NET< CL
8	92.75	186.52	358	91	68	859	1.05 d	
9	105.29	211.57	56	52	41	412	0.48 a	
10	139.86	280.66	126	67	52	593	0.73 a	
11	185.85	372.56	259	88	68	848	1.02 a	

080965D06.SPC Analyzed by

PEAK SEARCH RESULTS

PK. #	ENERGY (keV)	ADDRESS CHANNEL	NET/MDA COUNTS	UN-CERTAINTY	C.L. COUNTS	BKG COUNTS	FWHM (keV)	FLAG
25	510.95	1022.26	1306	122	80	833	2.53 a	Wide Pk
26	558.58	1117.44	153	58	43	347	1.27 a	
27	569.62	1139.52	54	38	29	206	0.69 a	
28	583.32	1166.88	258	61	43	341	1.27 a	
29	596.28	1192.80	49	38	29	210	0.71 a	
30	597.55	1195.33	73	76	61	578	1.74 b	
31	609.31	1218.84	396	76	53	489	1.47 a	
32	669.72	1339.55	60	71	57	441	2.27 a	
33	787.03	1574.00	37	42	33	221	1.38 a	
34	803.04	1605.98	102	46	34	239	1.37 a	
35	898.59	1796.95	46	48	38	249	1.77 a	
36	911.25	1822.24	166	49	34	215	1.60 a	
37	962.56	1924.79	71	42	32	199	1.51 a	
38	969.14	1937.93	114	53	40	265	1.89 b	
39	1078.00	2155.48	37	29	22	110	0.96 a	
40	1078.32	2156.13	-10	23	19	92	0.89 b	NET< CL
41	1120.50	2240.43	52	35	26	148	1.23 a	
42	1378.02	2755.05	34	28	21	88	1.60 a	
43	1460.77	2920.43	1352	78	22	87	2.15 a	
44	1592.12	3182.93	29	29	22	88	1.98 a	
45	1764.38	3527.19	70	30	20	72	2.10 a	

080965D06.SPC Analyzed by

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SEEKER B A C K G R O U N D S U B T R A C T R E S U L T S Vers. 2.2.1

Paragon Analytics, Div. of DataChem Lab
GammaScan

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Background File:. . . . . DET060530.BKG (080530-6 WEEKLY BACKGROUND)

Bkg.File Detector #: 6

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BACKGROUND SUBTRACT RESULTS

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PK#	ENERGY (keV)	OLD NET COUNTS	OLD UN-CERTAINTY	OLD CR.LEVEL	NEW NET COUNTS	NEW UN-CERTAINTY	NEW CR.LEVEL	FLAG
1	66.49	84	86	69	-81	179	148	NET<CL
5	84.56	103	65	51	40	169	138	NET<CL
7	90.98	2	193	159	-176	260	215	NET<CL
10	139.86	126	67	52	-33	151	125	NET<CL

080965D06.SPC Analyzed by

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SEEKER F I N A L A C T I V I T Y R E P O R T Version 2.2.1

Paragon Analytics, Div. of DataChem Lab
GammaScan

****

Geo.11 / Solid

Sample ID: 0805078-1D GS080604-5

Sampling Start:	04/16/2008 12:00:00	Counting Start:	06/05/2008 16:27:40
Sampling Stop:	04/16/2008 12:00:00	Decay Time.	1.20e+003 Hrs
Buildup Time.	0.00e+000 Hrs	Live Time	60000 Sec
Sample Size	3.63e+001 g	Real Time	60036 Sec
Collection Efficiency	1.0000	Spectrum File	.080965D06.SPC
Cr. Level Confidence Interval:	95 %	Det. Limit Confidence Interval:	95 %

Detector #: 6 (Detector 6)

Efficiency File: (D06)(Sh11).EFF (Det.6 Geo.11 Eff Cal)

Eff.= EXP[-7.91E+01 + 3.09E+01 * En + -3.14E+00 * En^2] 07/31/2007

Eff.=10^[-9.55E+00 +9.86E+00*L +-3.72E+00*L^2 +4.29E-01*L^3] Above 180.00 keV

Library File: . . . . . .FANP.LIB (FANP (Fiss. Act. and Nat. Products))

MEASURED or MDA CONCENTRATIONS

Nuclide	ENERGY (keV)	N E T	Concentration (pCi/g)	MDA	Critical Level	Halflife (hrs)
Th-234	92.50		2.54E+00 +- 6.46E-01	9.86E-01	4.83E-01	3.92E+13
Eu-155	105.31		8.07E-02 +- 7.46E-02	1.21E-01	5.87E-02	4.35E+04
U-235	143.76	N	-1.44E-01 +- 5.09E-01	8.45E-01	4.20E-01	6.17E+12
	185.72		I.D.	. . . .	. . . .	6.17E+12
Pb-212	238.63		5.30E-01 +- 1.17E-01	1.83E-01	9.04E-02	1.67E+04
Pb-214	Average:x		4.59E-01 +- 9.59E-02	. . . .	. . . .	1.40E+07
	295.22		4.73E-01 +- 1.34E-01	2.04E-01	9.94E-02	1.40E+07
	351.99		4.44E-01 +- 1.37E-01	2.17E-01	1.07E-01	1.40E+07
Ac-228	Average:x		5.60E-01 +- 1.99E-01	. . . .	. . . .	5.04E+04
	338.40		5.37E-01 +- 3.07E-01	4.95E-01	2.43E-01	5.04E+04
	911.07	N	3.50E-01 +- 4.35E-01	7.15E-01	3.53E-01	5.04E+04
	968.90		7.06E-01 +- 3.26E-01	5.08E-01	2.45E-01	5.04E+04
Be-7	477.56		1.84E+00 +- 5.61E-01	8.42E-01	4.09E-01	1.28E+03
Tl-208	583.14		1.54E-01 +- 8.83E-02	1.43E-01	7.04E-02	1.67E+04
Bi-214	Average:x		4.25E-01 +- 1.39E-01	. . . .	. . . .	1.40E+07
	609.32		4.47E-01 +- 1.66E-01	2.65E-01	1.31E-01	1.40E+07
	1120.28		3.75E-01 +- 2.53E-01	3.98E-01	1.89E-01	1.40E+07
K-40	1460.75		1.30E+01 +- 1.47E+00	2.05E+00	1.01E+00	1.12E+13
Am-241	59.54	N	-1.94E-01 +- 5.46E-01	9.22E-01	4.53E-01	3.80E+06
Co-57	122.07	N	-1.66E-03 +- 2.67E-02	4.50E-02	2.20E-02	6.48E+03
Ce-144	133.53	N	1.95E-02 +- 2.01E-01	3.36E-01	1.65E-01	6.82E+03
Ce-139	165.85	N	3.40E-03 +- 3.36E-02	5.63E-02	2.76E-02	3.30E+03
Th-227	236.00	N	5.27E-02 +- 3.19E-01	5.29E-01R	2.61E-01	1.90E+05
Cr-51	320.07	N	-8.69E-02 +- 9.38E-01	1.58E+00	7.73E-01	6.65E+02

080965D06.SPC Analyzed by

MEASURED or MDA CONCENTRATIONS

Nuclide	ENERGY (keV)	NET	Concentration (pCi/g)	MDA	Critical Level	Halflife (hrs)
I-131	364.48	N	-1.02E-01 +- 2.43E+00	4.11E+00	2.00E+00	1.93E+02
Sb-125	427.95	N	0.00E+00 +- 9.79E-02	1.65E-01	8.05E-02	2.43E+04
Sb-124	602.71	N	-2.32E-02 +- 7.89E-02	1.34E-01b	6.54E-02	1.44E+03
Cs-134	604.66	N	-2.10E-02 +- 4.60E-02	7.85E-02B	3.83E-02	1.81E+04
Ru-106	621.84	N	-5.61E-01 +- 4.26E-01	7.51E-01	3.66E-01	8.84E+03
Ag-110M	657.75	N	-1.93E-02 +- 4.43E-02	7.63E-02	3.70E-02	6.00E+03
Cs-137	661.62	N	4.25E-02 +- 4.28E-02	6.98E-02	3.38E-02	2.64E+05
Nb-94	702.50	N	-1.92E-02 +- 4.47E-02	7.65E-02	3.72E-02	1.78E+08
Bi-212	727.17	N	3.00E-01 +- 5.68E-01	9.45E-01	4.57E-01	1.67E+04
Nb-95	765.82	N	5.74E-02 +- 6.30E-02	1.03E-01	4.98E-02	1.54E+03

080965D06.SPC Analyzed by

UNKNOWN,SUM or ESCAPE PEAKS

PK. #	ENERGY (keV)	ADDRESS CHANNEL	NET COUNTS	UN-CERTAINTY	C.L. COUNTS	BKG COUNTS	FWHM (keV)	FLAG
27	569.62	1139.52	-22	106	88	206	0.69	Deleted
29	596.28	1192.80	49	38	29	210	0.71	Unknown
30	597.55	1195.33	73	76	61	578	1.74	Unknown
32	669.72	1339.55	60	71	57	441	2.27	Unknown
33	787.03	1574.00	37	42	33	221	1.38	Unknown
34	803.04	1605.98	-9	98	81	239	1.37	Deleted
35	898.59	1796.95	7	71	58	249	1.77	Deleted
37	962.56	1924.79	-25	108	89	199	1.51	Deleted
39	1078.00	2155.48	37	29	22	110	0.96	Unknown
40	1078.32	2156.13	-10	23	19	92	0.89	Deleted
42	1378.02	2755.05	34	28	21	88	1.60	Unknown
44	1592.12	3182.93	29	29	22	88	1.98	Unknown
45	1764.38	3527.19	26	63	51	72	2.10	Deleted

c:\SEEKER\BIN\080965d06.res Analysis Results Saved.

081125D08.SPC Analyzed by

081125D08.SPC Analyzed by

PEAK SEARCH RESULTS

PK. #	ENERGY (keV)	ADDRESS CHANNEL	NET/MDA COUNTS	UN-CERTAINTY	C.L. COUNTS	BKG COUNTS	FWHM (keV)		FLAG
25	241.70	486.19	340	98	74	873	1.35	b	HiResid
26	245.16	493.10	92	66	52	546	0.82	c	HiResid
27	260.96	524.67	34	46	36	325	0.49	a	NET< CL
28	270.04	542.81	70	100	81	969	1.43	a	NET< CL
29	277.26	557.24	54	46	35	310	0.50	a	
30	295.16	592.99	430	73	49	488	0.77	a	
31	299.98	602.62	94	79	63	683	1.10	b	
32	328.03	658.68	73	81	65	676	1.32	a	
33	338.18	678.94	268	73	53	526	0.93	a	
34	351.86	706.28	797	90	57	559	1.07	a	
35	409.19	820.80	28	37	29	211	0.56	a	NET< CL
36	463.06	928.41	50	41	31	242	0.59	a	
37	477.57	957.39	410	65	41	362	0.96	a	
38	485.73	973.68	28	38	30	222	0.60	a	NET< CL
39	510.93	1024.03	1948	138	88	944	2.60	a	Wide Pk
40	558.52	1119.08	242	62	45	366	1.29	a	
41	569.93	1141.86	65	50	39	323	0.90	a	
42	583.13	1168.21	443	67	43	363	1.10	a	
43	609.29	1220.46	597	79	51	479	1.29	a	
44	661.62	1324.96	129	49	36	267	0.95	a	
45	665.64	1332.99	24	34	27	178	0.69	b	NET< CL
46	727.25	1456.01	85	54	42	322	1.30	a	
47	794.84	1590.97	52	48	38	262	1.25	a	
48	802.78	1606.81	127	46	33	234	1.02	a	
49	860.47	1721.99	37	49	39	297	1.47	a	NET< CL

081125D08.SPC Analyzed by

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SEEKER B A C K G R O U N D S U B T R A C T R E S U L T S Vers. 2.2.1

Paragon Analytics, Div. of DataChem Lab

GammaScan

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Background File:. . . . . DET080530.BKG (080530-8 WEEKLY BACKGROUND)

Bkg.File Detector #: 8

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BACKGROUND SUBTRACT RESULTS

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PK#	ENERGY (keV)	OLD NET COUNTS	OLD UN-CERTAINTY	OLD CR.LEVEL	NEW NET COUNTS	NEW UN-CERTAINTY	NEW CR.LEVEL	FLAG
1	46.43	2331	124	64	1789	212	160	
2	51.94	10	45	37	-109	136	113	NET<CL
4	63.19	756	94	62	130	198	162	NET<CL
5	66.34	132	104	84	-184	223	185	NET<CL
6	74.75	844	87	54	491	217	174	
7	77.02	1198	105	65	880	191	149	
8	84.27	301	99	76	143	225	184	NET<CL
9	87.10	467	92	67	355	154	123	
10	89.78	203	75	57	133	143	116	
11	92.64	1165	106	67	440	204	164	
14	139.70	183	68	51	36	141	116	NET<CL
15	143.72	114	66	51	60	118	96	NET<CL
18	159.05	34	51	41	-14	108	89	NET<CL
20	185.77	598	103	74	263	178	144	
21	198.23	253	76	57	-70	186	154	NET<CL
24	238.51	1477	100	52	1184	181	137	
30	295.16	430	73	49	329	113	88	
34	351.86	797	90	57	579	146	114	
39	510.93	1948	138	88	319	287	235	
40	558.52	242	62	45	55	117	95	NET<CL
41	569.93	65	50	39	-30	151	124	NET<CL
42	583.13	443	67	43	346	119	93	
43	609.29	597	79	51	316	179	144	
48	802.78	127	46	33	-21	107	89	NET<CL
50	911.05	284	53	33	193	97	76	
51	962.88	146	82	64	85	108	88	NET<CL
52	968.78	193	62	45	128	122	99	
53	1120.37	101	48	36	74	69	55	
56	1460.68	1313	80	27	1122	113	75	
57	1764.52	77	29	19	19	75	62	NET<CL

081125D08.SPC Analyzed by

081125D08.SPC Analyzed by

MEASURED or MDA CONCENTRATIONS

Nuclide	ENERGY (keV)	N E T	Concentration (pCi/g	)	MDA	Critical Level	Halflife (hrs)
	1120.28		5.80E-01 +-	5.48E-01	8.96E-01	4.37E-01	1.40E+07
Cs-137	661.62		1.12E-01 +-	4.25E-02	6.43E-02	3.10E-02	2.64E+05
Bi-212	727.17		1.09E+00 +-	6.95E-01	1.11E+00	5.37E-01	1.67E+04
Cs-134	Average:	x	-5.60E-03 +-	3.66E-02	. . . .	. . . .	1.81E+04
	795.76		5.59E-02 +-	5.14E-02	8.36E-02	4.04E-02	1.81E+04
	604.66	N	-6.86E-02 +-	5.21E-02	9.07E-02B	4.44E-02	1.81E+04
Co-56	1238.28		1.12E-01 +-	1.04E-01	1.69E-01	8.03E-02	1.86E+03
K-40	1460.75		1.53E+01 +-	1.54E+00	2.07E+00	1.02E+00	1.12E+13
Am-241	59.54	N	-1.57E-02 +-	4.77E-02	8.06E-02B	3.95E-02	3.80E+06
Co-57	122.07	N	4.60E-03 +-	1.94E-02	3.24E-02	1.58E-02	6.48E+03
Ce-144	133.53	N	-3.83E-02 +-	1.56E-01	2.64E-01	1.29E-01	6.82E+03
Ce-139	165.85	N	-2.62E-02 +-	2.77E-02	4.79E-02	2.34E-02	3.30E+03
Th-227	236.00	N	1.62E-01 +-	6.26E+00	1.03E+01P	5.15E+00	1.90E+05
Cr-51	320.07	N	5.36E-01 +-	9.02E-01	1.49E+00	7.28E-01	6.65E+02
I-131	364.48	N	-2.30E+00 +-	2.84E+00	4.89E+00	2.39E+00	1.93E+02
Sb-124	602.71	N	3.70E-02 +-	8.81E-02	1.47E-01	7.16E-02	1.44E+03
Ru-106	621.84	N	-1.33E-01 +-	4.51E-01	7.71E-01	3.75E-01	8.84E+03
Ag-110M	657.75	N	-1.63E-02 +-	4.72E-02	8.11E-02B	3.93E-02	6.00E+03
Nb-94	702.50	N	4.33E-02 +-	5.19E-02	8.54E-02	4.16E-02	1.78E+08
Nb-95	765.82	N	1.48E-02 +-	7.91E-02	1.33E-01	6.46E-02	1.54E+03
Co-58	810.75	N	-4.61E-02 +-	7.23E-02	1.26E-01	6.10E-02	1.70E+03
Mn-54	834.81	N	2.66E-03 +-	4.99E-02	8.46E-02	4.09E-02	7.49E+03
Sc-46	889.26	N	-5.88E-03 +-	6.68E-02	1.14E-01	5.52E-02	2.01E+03
Pa-234m	1001.03	N	3.47E+00 +-	8.13E+00	1.36E+01	6.55E+00	3.92E+13
Eu-154	1004.80	N	-1.34E-01 +-	2.68E-01	4.68E-01	2.26E-01	7.45E+04
Fe-59	1099.22	N	9.02E-04 +-	1.93E-01	3.29E-01	1.59E-01	1.08E+03
Zn-65	1115.52	N	2.72E-01 +-	2.74E-01	4.49E-01P	2.21E-01	5.85E+03
Na-22	1274.54	N	6.92E-03 +-	5.33E-02	9.09E-02	4.36E-02	2.28E+04
Co-60	1332.51	N	2.40E-02 +-	5.14E-02	8.61E-02b	4.11E-02	4.62E+04
Eu-152	1408.08	N	-9.75E-02 +-	2.45E-01	4.31E-01	2.06E-01	1.17E+05
Al-26	1808.65	N	-2.05E-02 +-	4.97E-02	8.89E-02	4.20E-02	6.31E+09

MEASURED TOTAL: 3.02E+01 +- 2.10E+01 pCi/g

UNKNOWN, SUM or ESCAPE PEAKS

PK. #	ENERGY (keV)	ADDRESS CHANNEL	NET COUNTS	UN-CERTAINTY	C.L. COUNTS	BKG COUNTS	FWHM (keV)	FLAG
1	46.43	95.97	1789	212	160	916	0.67	Unknown
2	51.94	106.98	-109	136	113	380	0.37	Deleted
3	53.22	109.53	64	73	59	759	0.64	Unknown
4	63.19	129.47	130	198	162	863	0.73	Deleted
5	66.34	135.76	-184	223	185	1294	0.97	Deleted
6	74.75	152.56	491	217	174	707	0.54	Unknown
7	77.02	157.11 Pb Xray	880	191	149	943	0.70	Unknown
8	84.27	171.58	143	225	184	1080	0.97	Deleted
9	87.10	177.25	355	154	123	900	0.78	Unknown

081125D08.SPC Analyzed by

UNKNOWN,SUM or ESCAPE PEAKS

PK. #	ENERGY (keV)	ADDRESS CHANNEL	NET COUNTS	UN-CERTAINTY	C.L. COUNTS	BKG COUNTS	FWHM (keV)	FLAG
10	89.78	182.61	133	143	116	720	0.58	Unknown
13	128.76	260.50	99	94	76	984	1.15	Unknown
14	139.70	282.36	36	141	116	578	0.68	Deleted
16	151.61	306.17	40	51	41	416	0.56	Deleted
17	153.91	310.76	59	52	41	416	0.43	Unknown
18	159.05	321.04	-14	108	89	413	0.55	Deleted
21	198.23	399.32	-70	186	154	647	0.89	Deleted
22	209.10	421.04	86	61	48	502	0.61	Unknown
23	212.71	428.26	37	69	56	628	0.87	Deleted
25	241.70	486.19	340	98	74	873	1.35	Unknown
26	245.16	493.10	92	66	52	546	0.82	Unknown
27	260.96	524.67	34	46	36	325	0.50	Deleted
28	270.04	542.81	70	100	81	969	1.43	Deleted
32	328.03	658.68	73	81	65	676	1.32	Unknown
35	409.19	820.80	28	37	29	211	0.56	Deleted
38	485.73	973.68	28	38	30	222	0.60	Deleted
39	510.93	1024.03	319	287	235	944	2.60	Unknown
40	558.52	1119.08	55	117	95	366	1.29	Deleted
41	569.93	1141.86	-30	151	124	323	0.90	Deleted
45	665.64	1332.99	24	34	27	178	0.69	Deleted
48	802.78	1606.81	-21	107	89	234	1.02	Deleted
49	860.47	1721.99	37	49	39	297	1.47	Deleted
51	962.88	1926.41	85	108	88	508	3.23	Deleted
55	1326.60	2652.21	24	26	19	94	0.97	Unknown
57	1764.52	3525.58	19	75	62	76	1.48	Deleted

c:\SEEKER\BIN\081125d08.res Analysis Results Saved.

080772D09.SPC Analyzed by

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SEEKER G A M M A A N A L Y S I S R E S U L T S PS Version 1.8.4

Paragon Analytics, Div. of DataChem Lab
GammaScan

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Geo.11 / Solid

Sample ID: GS080604-5MB GS080604-5

Sampling Start:	06/07/2008 11:00:00	Counting Start:	06/07/2008 11:53:28
Sampling Stop:	06/07/2008 11:00:00	Decay Time.	8.91E-001 Hrs
Buildup Time.	0.00E+000 Hrs	Live Time	60000 Sec
Sample Size	3.23E+001 g	Real Time	60033 Sec
Collection Efficiency	1.0000	Spc. File	.080772D09.SPC

Detector #: 9 (Detector 9)

Energy(keV) = 1.23 + 0.500*Ch + 0.00E+00*Ch^2 + 0.00E+00*Ch^3 06/07/2008

FWHM(keV) = 0.46 + 0.026*En + 4.17E-04*En^2 + 0.00E+00*En^3 01/14/2008

Where En = Sqrt(Energy in keV)

Search Sensitivity: 1.00 | Sigma Multiplier: 2.00 | Search Start/End: 80/4000

PEAK SEARCH RESULTS

PK. #	ENERGY (keV)	ADDRESS CHANNEL	NET/MDA COUNTS	UN-CERTAINTY	C.L. COUNTS	BKG COUNTS	FWHM (keV)	FLAG
1	46.53	90.69	342	72	51	569	0.63	a

080772D09.SPC Analyzed by

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SEEKER B A C K G R O U N D S U B T R A C T R E S U L T S Vers. 2.2.1

Paragon Analytics, Div. of DataChem Lab
GammaScan

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Background File:. . . . . DET090606.BKG (080606-9 WEEKLY BACKGROUND)

Bkg.File Detector #: 9

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BACKGROUND SUBTRACT RESULTS

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PK#	ENERGY (keV)	OLD NET COUNTS	OLD UN-CERTAINTY	OLD CR.LEVEL	NEW NET COUNTS	NEW UN-CERTAINTY	NEW CR.LEVEL	FLAG
1	46.53	342	72	51	-58	163	134	NET<CL
3	51.60	17	40	32	-33	168	139	NET<CL
5	63.25	366	72	50	-104	162	135	NET<CL
6	66.42	198	77	59	-138	222	184	NET<CL
7	74.90	170	47	33	-38	121	100	NET<CL
8	77.14	115	76	60	-71	183	151	NET<CL
9	84.20	57	71	57	-66	176	145	NET<CL
10	87.41	41	40	31	-25	144	119	NET<CL
11	92.63	579	91	64	57	188	154	NET<CL
13	139.93	100	48	36	-27	142	117	NET<CL
14	143.84	76	73	59	22	118	97	NET<CL
16	185.90	288	69	50	94	167	137	NET<CL
17	198.45	208	87	67	73	156	127	NET<CL
20	238.78	182	70	53	-12	145	119	NET<CL
22	352.28	166	78	61	40	131	108	NET<CL
23	511.06	1272	113	72	74	260	214	NET<CL
25	558.50	165	49	35	-5	111	92	NET<CL
26	569.85	65	47	36	26	91	74	NET<CL
27	583.40	32	51	41	-45	100	83	NET<CL
28	609.29	67	47	36	-51	125	103	NET<CL
30	803.21	91	45	33	-18	102	84	NET<CL
32	1461.16	116	33	21	-12	80	66	NET<CL

080772D09.SPC Analyzed by

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SEEKER F I N A L A C T I V I T Y R E P O R T Version 2.2.1

Paragon Analytics, Div. of DataChem Lab
GammaScan

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Geo.11 / Solid

Sample ID: GS080604-5MB GS080604-5

Sampling Start:	06/07/2008 11:00:00	Counting Start:	06/07/2008 11:53:28
Sampling Stop:	06/07/2008 11:00:00	Decay Time.	8.91e-001 Hrs
Buildup Time.	0.00e+000 Hrs	Live Time	60000 Sec
Sample Size	3.23e+001 g	Real Time	60033 Sec
Collection Efficiency	1.0000	Spectrum File	.080772D09.SPC
Cr. Level Confidence Interval:	95 %	Det. Limit Confidence Interval:	95 %

Detector #: 9 (Detector 9)

Efficiency File: (D09)(Sh11).EFF (Geo 11 Eff Cal)

Eff=10^[-7.00E+00 +6.03E+00*L +-1.56E+00*L^2 +0.00E+00*L^3] 01/15/2008

Eff.= EXP[1.49E+00 + -8.33E-01 * En + -7.65E-03 * En^2] Above 180.00 keV

Library File: . . . . . .FANP.LIB (FANP (Fiss. Act. and Nat. Products))

MEASURED or MDA CONCENTRATIONS

Nuclide	ENERGY (keV)	NET	Concentration (pCi/g)	MDA	Critical Level	Halflife (hrs)
Th-234	92.50	N	2.23E-01 +- 7.38E-01	1.22E+00	6.05E-01	3.92E+13
U-235	Average:	x	2.14E-01 +- 1.46E-01	. . . .	. . . .	6.17E+12
	163.35		3.70E-01 +- 4.53E-01	7.45E-01	3.65E-01	6.17E+12
	143.76	N	1.96E-01 +- 1.54E-01	2.49E-01	1.21E-01	6.17E+12
Pb-212	238.63	N	-1.07E-02 +- 1.27E-01	2.11E-01	1.04E-01	1.67E+04
Ac-228	Average:	x	2.22E-01 +- 1.55E-01	. . . .	. . . .	5.04E+04
	338.40		2.21E-01 +- 2.34E-01	3.83E-01	1.85E-01	5.04E+04

080772D09.SPC Analyzed by

MEASURED or MDA CONCENTRATIONS

Nuclide	ENERGY (keV)	NET	Concentration (pCi/g)	MDA	Critical Level	Halflife (hrs)
Ru-106	621.84	N	-8.40E-02 +- 4.41E-01	7.56E-01b	3.65E-01	8.84E+03
Ag-110M	657.75	N	7.03E-02 +- 5.10E-02	8.19E-02	3.95E-02	6.00E+03
Cs-137	661.62	N	-5.22E-02 +- 5.68E-02	9.98E-02	4.84E-02	2.64E+05
Nb-94	702.50	N	2.11E-02 +- 5.86E-02	9.80E-02	4.76E-02	1.78E+08
Bi-212	727.17	N	9.36E-01 +- 7.57E-01	1.22E+00	5.89E-01	1.67E+04
Nb-95	765.82	N	-2.43E-02 +- 4.51E-02	7.92E-02	3.81E-02	1.54E+03
Co-58	810.75	N	3.36E-02 +- 4.60E-02	7.59E-02	3.63E-02	1.70E+03
Mn-54	834.81	N	3.98E-02 +- 5.39E-02	8.89E-02	4.28E-02	7.49E+03
Sc-46	889.26	N	1.15E-02 +- 5.21E-02	8.83E-02	4.24E-02	2.01E+03
Pa-234m	1001.03	N	4.84E+00 +- 8.79E+00	1.47E+01	7.01E+00	3.92E+13
Eu-154	1004.80	N	-1.99E-01 +- 2.92E-01	5.20E-01	2.49E-01	7.45E+04
Fe-59	1099.22	N	-3.33E-03 +- 1.00E-01	1.73E-01	8.27E-02	1.08E+03
Zn-65	1115.52	N	1.12E-01 +- 1.15E-01	1.88E-01	8.99E-02	5.85E+03
Co-56	1238.28	N	3.11E-02 +- 9.00E-02	1.52E-01	7.25E-02	1.86E+03
Na-22	1274.54	N	1.79E-03 +- 5.19E-02	9.00E-02	4.26E-02	2.28E+04
Co-60	1332.51	N	-1.87E-02 +- 6.15E-02	1.08E-01	5.15E-02	4.62E+04

080772D09.SPC Analyzed by

UNKNOWN,SUM or ESCAPE PEAKS

PK. #	ENERGY (keV)	ADDRESS CHANNEL	NET COUNTS	UN-CERTAINTY	C.L. COUNTS	BKG COUNTS	FWHM (keV)	FLAG
28	609.29	1217.13	-51	125	103	272	1.03	Deleted
29	617.09	1232.75	63	47	37	267	1.21	Unknown
30	803.21	1605.30	-18	102	84	213	1.53	Deleted
31	911.32	1821.69	26	35	27	154	1.29	Deleted

c:\SEEKER\BIN\080772d09.res Analysis Results Saved.

080978D06.SPC Analyzed by dho

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SEEKER G A M M A A N A L Y S I S R E S U L T S PS Version 1.8.4

Paragon Analytics, Div. of DataChem Lab
GammaScan

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Geo.11 / Solid

Sample ID: GS080604-5LCS GS080604-5

Sampling Start:	06/09/2008 09:00:00	Counting Start:	06/09/2008 09:49:57
Sampling Stop:	06/09/2008 09:00:00	Decay Time.	8.33E-001 Hrs
Buildup Time.	0.00E+000 Hrs	Live Time	1800 Sec
Sample Size	1.00E+002 g	Real Time	1848 Sec
Collection Efficiency	1.0000	Spc. File	.080978D06.SPC

Detector #: 6 (Detector 6)

Energy(keV) = -0.49 + 0.501*Ch + 0.00E+00*Ch^2 + 0.00E+00*Ch^3 06/09/2008

FWHM(keV) = 0.79 + 0.009*En + 6.42E-04*En^2 + 0.00E+00*En^3 07/24/2007

Where En = Sqrt(Energy in keV)

Search Sensitivity: 1.00 | Sigma Multiplier: 2.00 | Search Start/End: 80/4000

PEAK SEARCH RESULTS

PK. #	ENERGY (keV)	ADDRESS CHANNEL	NET/MDA COUNTS	UN-CERTAINTY	C.L. COUNTS	BKG COUNTS	FWHM (keV)	FLAG
1	59.61	120.05	14030	283	127	3271	0.88 a	
2	88.09	176.94	35447	412	138	3831	0.89 a	
3	122.16	245.00	13931	279	122	2766	0.92 a	
4	136.55	273.75	1864	167	117	2541	0.92 a	
5	165.91	332.40	3680	182	112	2306	0.93 a	
6	169.72	340.00	17	84	68	1153	0.51 b	NET< CL
7	251.45	503.26	71	120	98	1933	0.81 a	NET< CL
8	391.88	783.76	1369	138	96	1927	1.02 a	
9	618.65	1236.74	67	66	53	691	0.71 a	
10	661.80	1322.93	40189	417	93	1519	1.43 a	HiResid
11	732.41	1463.98	108	105	85	1394	1.49 a	
12	898.22	1795.19	1117	142	103	2051	1.49 a	
13	1173.46	2344.98	35845	388	69	906	1.85 a	HiResid
14	1332.74	2663.15	32134	362	41	312	1.99 a	HiResid
15	1836.31	3669.03	638	58	24	101	2.11 a	

080978D06.SPC Analyzed by

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SEEKER B A C K G R O U N D S U B T R A C T R E S U L T S Vers. 2.2.1

Paragon Analytics, Div. of DataChem Lab
GammaScan

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Background File:. . . . . DET060606.BKG (080606-6 WEEKLY BACKGROUND)

Bkg.File Detector #: 6

BACKGROUND SUBTRACT RESULTS

PK#	ENERGY (keV)	OLD NET COUNTS	OLD UN-CERTAINTY	OLD CR.LEVEL	NEW NET COUNTS	NEW UN-CERTAINTY	NEW CR.LEVEL	FLAG
12	898.22	1117	142	103	1115	142	103	

080978D06.SPC Analyzed by

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SEEKER F I N A L A C T I V I T Y R E P O R T Version 2.2.1

Paragon Analytics, Div. of DataChem Lab
GammaScan

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Geo.11 / Solid

Sample ID: GS080604-5LCS GS080604-5

Sampling Start:	06/09/2008 09:00:00	Counting Start:	06/09/2008 09:49:57
Sampling Stop:	06/09/2008 09:00:00	Decay Time.	8.33e-001 Hrs
Buildup Time.	0.00e+000 Hrs	Live Time	1800 Sec
Sample Size	1.00e+002 g	Real Time	1848 Sec
Collection Efficiency	1.0000	Spectrum File	.080978D06.SPC
Cr. Level Confidence Interval:	95 %	Det. Limit Confidence Interval:	95 %

Detector #: 6 (Detector 6)

Efficiency File: (D06)(Sh11).EFF (Det.6 Geo.11 Eff Cal)

Eff.= EXP[-7.91E+01 + 3.09E+01 * En + -3.14E+00 * En^2] 07/31/2007

Eff.=10^[-9.55E+00 +9.86E+00*L +-3.72E+00*L^2 +4.29E-01*L^3] Above 180.00 keV

Library File: . . . .ANALYTICAL.LIB (Analytical)

MEASURED or MDA CONCENTRATIONS

Nuclide	ENERGY (keV)	N E T	Concentration (pCi/g)	MDA	Critical Level	Halflife (hrs)
Am-241	59.54		1.03E+03 +- 2.07E+01	1.89E+01	9.33E+00	3.79E+06
Cd-109	88.02		5.32E+03 +- 6.18E+01	4.18E+01	2.07E+01	1.11E+04
Co-57	122.07		4.91E+01 +- 9.83E-01	8.71E-01	4.31E-01	6.50E+03
Ce-139	165.85		1.47E+01 +- 7.26E-01	9.01E-01	4.45E-01	3.30E+03
Sn-113	391.68		1.10E+01 +- 1.10E+00	1.55E+00	7.65E-01	2.76E+03
Cs-137	661.62		3.86E+02 +- 4.01E+00	1.82E+00	8.98E-01	2.64E+05
Y-88	Average:	x	1.28E+01 +- 9.51E-01	. . . .	. . . .	2.56E+03
	898.02		1.29E+01 +- 1.64E+00	2.42E+00	1.19E+00	2.56E+03
	1836.01		1.28E+01 +- 1.17E+00	1.01E+00	4.78E-01	2.56E+03
Co-60	Average:	x	4.95E+02 +- 3.86E+00	. . . .	. . . .	4.62E+04
	1173.21		4.94E+02 +- 5.35E+00	1.93E+00	9.45E-01	4.62E+04
	1332.48		4.95E+02 +- 5.57E+00	1.31E+00	6.33E-01	4.62E+04
Hg-203	279.18		MDA	1.22E+00	6.05E-01	1.12E+03

MEASURED TOTAL: 7.31E+03 +- 9.42E+01 pCi/g

UNKNOWN,SUM or ESCAPE PEAKS

PK. #	ENERGY (keV)	ADDRESS CHANNEL	NET COUNTS	UN-CERTAINTY	C.L. COUNTS	BKG COUNTS	FWHM (keV)	FLAG
4	136.55	273.75	1864	167	117	2541	0.92	Unknown
6	169.72	340.00	17	84	68	1153	0.51	Deleted

080978D06.SPC Analyzed by

UNKNOWN, SUM or ESCAPE PEAKS

PK. #	ENERGY (keV)	ADDRESS CHANNEL	NET COUNTS	UN-CERTAINTY	C.L. COUNTS	BKG COUNTS	FWHM (keV)	FLAG
7	251.45	503.26	71	120	98	1933	0.81	Deleted
9	618.65	1236.74	67	66	53	691	0.71	Unknown
11	732.41	1463.98	108	105	85	1394	1.49	Unknown

c:\SEEKER\BIN\080978d06.res Analysis Results Saved.

Paragon Analytics

Gamma Spectrometer Run Log

Date: 6-5-08

Reviewed By/Date: [illegible] 6-6-08

Sample ID	Ver[1]	Det. No.	Geo[2]	Count Dur. (min.)[3]	Start Time	Analyst	File ID/Comments	Saved?

Paragon Analytics

Gamma Spectrometer Run Log

Date: 6/7/08 Reviewed By/Date: [illegible] 6-9-08

Sample ID	Ver[1]	Det. No.	Geo[2]	Count Dur. (min.)[3]	Start Time	Analyst	File ID/Comments	Saved?
080607-Z	QB	2	NA	1000	11:53	MC	080929D02.SPC	QB
GS080516-5MB	QB	3	1	500	↓	↓	080409D03.SPC	QB
0805ZZZ-1D	QB	4	1	1000	↓	↓	080996D04.SPC	QB
↓ -2	QB	6	↓	↓	↓	↓	080973D06.SPC	QB
0805Z47-1B	QB	8	↓	500	↓	↓	081133D08.SPC	QB
GS080604-5MB	QB	9	11	1000	↓	↓	080772D09.SPC	QB

QB 11/8/08

MC 6/7/08

[1] Analyst will verify the position, detector, and geometry when the sample is removed from the detector.

[2] Calibration geometry.

[3] Count duration.

KEY:
- * sample was counted on a puck
- ↑ sample was counted with air flow arrow pointing up
- ↓ sample was counted with air flow arrow pointing down

365472 B

Gamma Spectrometer Run Log

Date: 6-9-08 Reviewed By/Date: MDC 6-10-08

Sample ID	Ver[1]	Det. No.	Geo[2]	Count Dur. (min.)[3]	Start Time	Analyst	File ID/Comments	Saved?
GS080604-5LCS	MDC	6	11	30	9:49	MDC	080978D06.SPC	MDC
GS080605-5LCS	↓	8	17	↓	9:53	↓	081137D08.SPC	MDC
0805237-23D	↓	2	1	210	10:00	↓	080933D02.SPC	↓
0806004-4	↓	3	↓	↓	10:01	↓	080414D03.SPC	↓
↓ -7	↓	4	↓	↓	↓	↓	081000D04.SPC	↓
0805247-7	MDC	9	11	30	10:04	MDC	080778D09.SPC	MDC
0805247-1	↓	6	↓	↓	10:56	↓	080979D06.SPC	↓
↓ -7D	↓	8	↓	↓	10:57	↓	081138D08.SPC	↓
↓ -8	↓	9	↓	↓	↓	↓	080779D09.SPC	↓
0805247-1D	tro	8	11	30	11:48	MDC	081139D08.SPC	tro
↓ -9	tro	6	↓	↓	↓	↓	080980D06.SPC	tro
↓ -10	tro	9	↓	↓	11:49	↓	080780D09.SPC	tro
0805247-11	tro	6	11	30	1231	tro	080981D06.SPC	tro
↓ -12	tro	8	↓	↓	↓	↓	081140D08.SPC	tro
↓ -13	tro	9	↓	↓	↓	↓	080781D09.SPC	tro
0805247-14	MDC	6	11	30	1312	tro	080982D06.SPC	MDC
↓ -15	↓	8	↓	↓	↓	↓	081141D08.SPC	↓
↓ -21	↓	9	↓	↓	↓	↓	080782D09.SPC	↓
0805247-12	MDC	2	↓	30	14:02	MDC	080934D02.SPC	↓
↓ -13	↓	4	↓	↓	↓	↓	081001D04.SPC	↓
↓ -15	↓	6	↓	↓	↓	↓	080983D06.SPC	↓
0805247-22	MDC	2	11	30	14:50	MDC	080935D02.SPC	MDC
↓ -23	↓	4	↓	↓	14:51	↓	081002D04.SPC	↓
↓ -24	↓	6	↓	↓	↓	↓	080984D06.SPC	↓

[1] Analyst will verify the position, detector, and geometry when the sample is removed from the detector.

[2] Calibration geometry.

[3] Count duration.

KEY:
- * sample was counted **on** a puck
- ↑ sample was counted **with** air flow arrow pointing up
- ↓ sample was counted **with** air flow arrow pointing down

365474 B

Technical Comments Regarding Analysis using the FANP Gamma Spectroscopy Library

Analysis using the **FANP** (Fission, Activation, and Natural Products) library is limited to the list of gamma emitting radionuclides specified by Paragon Analytics. Paragon Analytics specifies all values assigned to the nuclides in this library. In cases where multiple gamma emissions are used to quantify activity, the most abundant emission is used for quantification in the absence of any supporting gamma emissions. It should be noted that the current software program used for gamma spectroscopic analysis is limited to a +/- 2.0 keV photo-peak resolution tolerance. Thus, any gamma emissions occurring within the same +/- 2.0 keV range will suffer interference, consequently preventing accurate quantification. Nuclide specific information regarding analysis using the **FANP** library is as follows:

Nuclide: ^{228}Ac Energy: various Photon Abundance: various

All activity values for ^{228}Ac are calculated using the half-life, $t_{1/2}$=5.75 years, of the long-lived ^{228}Ra parent. It is assumed that secular equilibrium is achieved between the ^{228}Ra parent and the ^{228}Ac progeny.

Nuclide: ^{212}Bi, ^{212}Pb, ^{208}Tl Energy: various Photon Abundance: various

All activity values for ^{212}Bi, ^{212}Pb, and ^{208}Tl are calculated using the half-life, $t_{1/2}$=1.91 years, of

Nuclide: ^{134}Cs Energy: 604.66 Photon Abundance: 0.9762

Cesium-134 suffers from coincidence summing, due to the multiple simultaneous photon emissions during each decay event. This results in a potentially low bias in the final analytical results. The magnitude of this low bias is highly dependent on the Cs-134 activity levels and the specific counting geometry. Any Cs-134 activity reported above the associated Minimum Detectable Concentration should be considered to have a potential low bias.

The most abundant gamma emission specified for quantification of this nuclide suffers from possible resolution interference due to the ^{124}Sb gamma emission occurring at 602.71 keV (0.9826, abundance). Therefore, a possibility of a high bias to the ^{134}Cs results may occur in the presence of elevated ^{124}Sb activity.

Other gamma emissions used for quantification of this nuclide suffer from possible resolution interference due to multiple gamma emissions of ^{228}Ac. Therefore, a possible high bias to the ^{134}Cs activity results may occur in the presence of elevated ^{228}Ac activity.

Nuclide: ^{137}Cs Energy: 661.62 keV Photon Abundance: 0.8512

Cesium-137 does not emit any gamma photons useful for quantification. However, it can be

Nuclide: ^{95}Nb Energy: 765.82 Photon Abundance: 0.9999

All activity values for ^{95}Nb are calculated using the half-life, $t_{1/2}$=64.02 days, of the ^{95}Zr parent. It is assumed that a transient equilibrium is achieved between the ^{95}Zr parent and the ^{95}Nb progeny.

The only gamma emission useful for quantification of this nuclide suffers from possible resolution interference due to the ^{234m}Pa gamma emission occurring at 766.6 keV (0.0020, abundance). Therefore, a possibility of a high bias to the ^{95}Nb results may occur in the presence of elevated ^{234m}Pa activity.

Nuclide: ^{234m}Pa Energy: 1001.03 Photon Abundance: 0.0059

All activity values for ^{234m}Pa are calculated using the half-life, $t_{1/2}$=4.468E+09 yrs, of the long-lived ^{238}U parent. It is assumed that secular equilibrium is achieved between the ^{238}U parent and the ^{234m}Pa progeny.

Nuclide: ^{106}Ru Energy: various Photon Abundance: various

Ru-106 does not emit any gamma photons. Therefore, all activity values for ^{106}Ru are calculated using the gamma emissions of the short-lived ^{106}Rh daughter. The half-life, $t_{1/2}$=368.2 days, of the ^{106}Ru parent is used in the activity calculations. It is assumed that a secular equilibrium is achieved between the ^{106}Ru parent and the ^{106}Rh progeny.

Nuclide: ^{124}Sb Energy: 602.71 Photon Abundance: 0.9826

The most abundant gamma emission specified for quantification of this nuclide suffers from possible resolution interference due to the ^{134}Cs gamma emission occurring at 604.66 keV (0.9762, abundance). Therefore, a possibility of a high bias to the ^{124}Sb results may occur in the presence of elevated ^{134}Cs activity.

Nuclide: ^{125}Sb Energy: 600.77 Photon Abundance: 0.1786

The gamma emission specified for quantification of this nuclide that occurs at 600.77 keV suffers from possible resolution interference due to the ^{124}Sb gamma emission occurring at 602.71 keV (0.9826, abundance). Therefore, this photo-peak will be used as an identifier only and not in the

Nuclide: ^{234}Th Energy: 92.50 Photon Abundance: 0.0553

The 92.50 keV photo-peak used in this library for Th-234 quantification is actually two separate photo-peaks, occurring at 92.4 keV and 92.8 keV. The current software used for gamma spectroscopic analysis cannot resolve two photo-peaks that occur within the 2-keV resolution tolerance. Therefore, these two photopeaks are observed as a single photo-peak. Therefore, the average of the two photo-peak energies is used in this library. Also, the sum of the two photo-peak abundances, 0.0553, is used in the activity calculations for this observed 'single' photo-peak.

All activity values for ^{234}Th are calculated using the half-life, $t_{1/2}$=4.468E+09 yrs, of the long-lived ^{238}U parent. It is assumed that secular equilibrium is achieved between the ^{238}U parent and the ^{234}Th progeny.

Nuclide: ^{235}U Energy: 185.70 Photon Abundance: 0.5720

Quantifying ^{235}U activity using the 185.70 keV photo-peak is vulnerable to a significant high bias due to interference from gamma emissions from ^{226}Ra occurring at 186.21 keV (0.0328, abundance). Therefore, this emission will be used as an identifier only and not in the activity calculations for this nuclide.

11/20/07

Gamma Spectroscopist Date

Radiochemistry Instrumentation Laboratory

11/20/07

Radiochemistry Manager Date

Library File: FANP.lib
File I.D.: FANP (Fiss. Act. and Nat. Products)

Pk. #	Energy (keV)	Isotope Name	2ndary Pk #	Type	Gamma Fraction	Halflife
24	338.40	Ac-228	61	QUANT	0.1127	5.7500E+00 yrs
61	911.07	Ac-228	63	NET	0.2580	5.7500E+00 yrs
63	968.90	Ac-228	24	QUANT	0.1580	5.7500E+00 yrs
41	657.75	Ag-110M	43	NET	0.9314	2.4990E+02 dys
43	677.71	Ag-110M	46	QUANT	0.1054	2.4990E+02 dys
46	706.67	Ag-110M	49	QUANT	0.1646	2.4990E+02 dys
49	763.93	Ag-110M	59	QUANT	0.2198	2.4990E+02 dys
59	884.67	Ag-110M	62	QUANT	0.7163	2.4990E+02 dys
62	937.48	Ag-110M	84	QUANT	0.3375	2.4990E+02 dys
84	1384.27	Ag-110M	87	QUANT	0.2394	2.4990E+02 dys
87	1505.00	Ag-110M	41	QUANT	0.1289	2.4990E+02 dys
90	1808.65	Al-26	0	NET	0.9973	7.2000E+05 yrs
1	59.54	Am-241	0	NET	0.3590	4.3310E+02 yrs
30	477.56	Be-7	0	NET	0.1052	5.3440E+01 dys
48	727.17	Bi-212	0	NET	0.0658	1.9100E+00 yrs
38	609.32	Bi-214	73	NET	0.4609	1.6000E+03 yrs
73	1120.28	Bi-214	38	QUANT	0.1510	1.6000E+03 yrs
11	165.85	Ce-139	0	NET	0.8035	1.3766E+02 dys
7	133.53	Ce-144	44	NET	0.1109	2.8414E+02 dys
44	696.49	Ce-144	7	QUANT	0.0130	2.8414E+02 dys
56	846.81	Co-56	67	QUANT	0.9999	7.7300E+01 dys
67	1037.83	Co-56	76	QUANT	0.1400	7.7300E+01 dys
76	1175.13	Co-56	77	ID	0.0228	7.7300E+01 dys
77	1238.28	Co-56	81	NET	0.6760	7.7300E+01 dys
81	1360.22	Co-56	89	QUANT	0.0429	7.7300E+01 dys
89	1771.49	Co-56	56	QUANT	0.1570	7.7300E+01 dys
6	122.07	Co-57	8	NET	0.8560	2.7000E+02 dys
8	136.43	Co-57	6	QUANT	0.1068	2.7000E+02 dys
54	810.75	Co-58	0	NET	0.9945	7.0780E+01 dys
75	1173.23	Co-60	80	QUANT	0.9997	5.2721E+00 yrs
80	1332.51	Co-60	75	NET	0.9998	5.2721E+00 yrs
23	320.07	Cr-51	0	NET	0.1000	2.7700E+01 dys
31	563.26	Cs-134	32	QUANT	0.0835	2.0623E+00 yrs
32	569.29	Cs-134	37	QUANT	0.1538	2.0623E+00 yrs
37	604.66	Cs-134	52	NET	0.9762	2.0623E+00 yrs
52	795.76	Cs-134	53	QUANT	0.8553	2.0623E+00 yrs
53	801.84	Cs-134	74	QUANT	0.0869	2.0623E+00 yrs
74	1167.86	Cs-134	82	QUANT	0.0180	2.0623E+00 yrs
82	1365.13	Cs-134	31	QUANT	0.0304	2.0623E+00 yrs
42	661.62	Cs-137	0	NET	0.8512	3.0104E+01 yrs
25	344.30	Eu-152	51	QUANT	0.2650	1.3330E+01 yrs
51	778.90	Eu-152	69	QUANT	0.1294	1.3330E+01 yrs
69	1085.80	Eu-152	71	QUANT	0.1021	1.3330E+01 yrs
71	1112.07	Eu-152	85	QUANT	0.1364	1.3330E+01 yrs
85	1408.08	Eu-152	25	NET	0.2100	1.3330E+01 yrs
18	248.04	Eu-154	34	QUANT	0.0660	8.5019E+00 yrs
34	591.70	Eu-154	58	QUANT	0.0460	8.5019E+00 yrs
58	873.20	Eu-154	64	QUANT	0.1227	8.5019E+00 yrs
64	996.30	Eu-154	66	QUANT	0.1030	8.5019E+00 yrs
66	1004.80	Eu-154	18	NET	0.1801	8.5019E+00 yrs
4	105.31	Eu-155	0	NET	0.2120	4.9600E+00 yrs

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Pk. #	Energy (keV)	Isotope Name	2ndary Pk #	Type	Gamma Fraction	Halflife
14	192.34	Fe-59	70	QUANT	0.0308	4.5100E+01 dys
70	1099.22	Fe-59	79	NET	0.5650	4.5100E+01 dys
79	1291.56	Fe-59	14	QUANT	0.4320	4.5100E+01 dys
20	284.29	I-131	27	QUANT	0.0614	8.0405E+00 dys
27	364.48	I-131	20	NET	0.8170	8.0405E+00 dys
86	1460.75	K-40	0	NET	0.1100	1.2800E+09 yrs
55	834.81	Mn-54	0	NET	0.9997	3.1220E+02 dys
78	1274.54	Na-22	0	NET	0.9994	2.6000E+00 yrs
45	702.50	Nb-94	0	NET	0.9790	2.0300E+04 yrs
50	765.82	Nb-95	0	NET	0.9999	6.4020E+01 dys
65	1001.03	Pa-234m	0	NET	0.0059	4.4680E+09 yrs
5	115.18	Pb-212	17	QUANT	0.0059	1.9100E+00 yrs
17	238.63	Pb-212	22	NET	0.4330	1.9100E+00 yrs

PARAGON ANALYTICS
Radiochemistry Data Package

Section 6

QUALITY ASSURANCE SUMMARY REPORTS

6

Paragon Analytics

QUALITY ASSURANCE SUMMARY SHEET

PAR W.O. # / BATCH 0805078
TEST γ
METHOD Prep
SOP/REV (PREP) 7391 9
SOP/REV (ANAL)

Briefly document any QA or other problems or deviations associated with the analysis of samples. Problems could result from: log-in, color, odor, dilution, consistency, scheduling, equipment, or instrumentation, or may include documentation of minor deviations necessary due to unique DQO's or sample characteristics.

Due to limited sample volume, sample 08-05-078-2 does not meet the required geometry 11 volume by ~ 2mm. Therefore, a high bias may exist.

6/5/08

TECHNICIAN/ANALYST T Elliot DATE 6/5/08

DEPARTMENT MANAGER [signature] DATE 6/5/08

365709

FORM 302r6.doc (4/22/04)

PARAGON ANALYTICS
Radiochemistry Data Package

Section 7

LABORATORY BENCH SHEETS

7

Prep Batch: GS080604-5

QASS / NCR? Y / N NA

Notes

R 108

Aliquot	Units	Pipet ID
100	g	
100	g	
100	g	

sedes: NA

Radiochemistry Prep Worksheet

Paragon Analytics

Prep Batch: GS080604-5

Prep Procedure: GAMMASCAN

Reviewed By: TDE 1DE **Review Date:** 6/5/2008

Non-Routine Pre-Treatment? Y / (N) **Batch:** NA **Re-Prep?** Y / (N) **Batch:** NA **Prep QASS / NCR?** (Y) N 365709

Prep SOP: PAI 739 **Rev:** 9
Prep SOP: NONE
Matrix Class: solid

Prep Analyst: Tambrae Elhart 1E
Prep Date: 6/5/2008
Prep Dept: GM

Balance: 19
Balance:

Samp Num	Prep Num	LabID	QC Type	Dish No.	Init Alq g	Fin Alq g	Prep Basis	Geometry	Standards	Prep Notes
1	1	0805078-1	SMP		32.7	32.7	As Received	11		
2	1	0805078-1	DUP		36.3	36.3	As Received	11		
3	1	0805078-2	SMP		32	32	As Received	11		
4	1	GS080604-5	MB		32.35	32.35	As Received	11		
5	1	GS080604-5	LCS		100	100	As Received	11	S1	

1C 6/5/08

1C 6/5/08

Comments
Samples are dust.

Spiked By: N/A **Date:** N/A

Witnessed By: N/A **Date:** N/A

Spike Solution Information

Soln #	Nuclide	SolnID	Prep Conc	Units	Prep Date	Aliquot	Units	Pipet ID
S1	Am-241	826	2,191.001	DPM/g	06/05/08	100	g	
S1	Co-60	826	1,098.779	DPM/g	06/05/08	100	g	
S1	Cs-137	826	841.504	DPM/g	06/05/08	100	g	

Radiochemistry Prep Worksheet

Prep Batch: GS080604-5

N

Reviewed By: tde TDE

Review Date: 6/5/2008

n: NA

Re-Prep? Y / (N)

Batch: NA

Prep QASS / NCR? Y / N 365709

Prep Analyst: Tambrae Elhart TE

Prep Date: 6/5/2008

Prep Dept: GM

Balance: 19

Balance:

n Aliq g	Prep Basis	Geometry	Standards	Prep Notes
32.7	As Received	11		
56.3	As Received	11	TE 6/5/08	
32	As Received	11		TE 6/5/08
2.35	As Received	11		
2.35	As Received	11	S1	

N/A

N/A

Spike Solution Information

Soln #	Nuclide	SolnID	Prep Conc	Units	Prep Date	Aliquot	Units	Pipet ID
S1	Am-241	826	2,191.001	DPM/g	06/05/08	100	g	
S1	Co-60	826	1,098.779	DPM/g	06/05/08	100	g	
S1	Cs-137	826	841.504	DPM/g	06/05/08	100	g	

Supersedes: NA

SAMPLE CONDITION FORM (SOLIDS)

ANALYST: TE

ANALYSIS DATE: 6/5/08 METHOD: Prep

WORK ORDER	SAMPLE ID	SAMPLE CONDITION		
		Dry/Wet	TEXTURE	Remarks
08-05-078	1	dry	dust	As received, not sieved
↓	2	↓	↓	↓

TE 6/5/08

PARAGON ANALYTICS
Radiochemistry Data Package

Section 8

STANDARDS TRACEABILITY DOCUMENTS

8

ANALYTICS
An Isotope Products Laboratories Company

1380 Seaboard Industrial Blvd.
Atlanta, Georgia 30318
Tel 404·352·8677
Fax 404·352·2837
www.analyticsinc.com

CERTIFICATE OF CALIBRATION

Standard Radionuclide Source

73489-307 RSO #826 Rec'd 8/29/06 903

100 Grams Sand in 16 Ounce PP MRP Jar

This standard was [illegible]

PARAGON ANALYTICS
Radiochemistry Data Package

Section 9

ADDITIONAL SUPPORTING DOCUMENTATION

9

Gamma Spectroscopy

Initial Calibration
Standards Traceability

ANALYTICS
An Isotope Products Laboratories Company

RSO #829
Rec'd 2/5/07
DCB

1380 Seaboard Industrial Blvd.
Atlanta, Georgia 30318
Tel 404•352•8677
Fax 404•352•2837
www.analyticsinc.com

CERTIFICATE OF CALIBRATION

Standard Radionuclide Source

74248A-307

Sand in 16 Ounce PP MRP Jar

Customer: Paragon Analytics / Fort Collins, CO
P.O. No.: 71239, DCB 11/03/06, Item 3
Calibration Date: 01-Jan-2007 12:00 EST **Grams of Master Source:** 0.01064

This standard radionuclide source was prepared using aliquots measured gravimetrically from master radionuclide solutions. Calibration and purity were checked using a germanium gamma spectrometer system. At the time of calibration no interfering gamma-ray emitting impurities were detected. The gamma-ray emission rates for the most intense gamma-ray lines are given. Analytics maintains traceability to the National Institute of Standards and Technology through a Measurements Assurance Program as described in USNRC Regulatory Guide 4.15, Revision 1, February, 1979, and compliance with ANSI N42.22-1995, "Traceability of Radioactive Sources to NIST."

Nuclide	Gamma-Ray Energy (keV)	Half-Life, Days	Master Source* γps/gram	This Source γps	Uncertainty, % Type u_A	u_B	U	Calibration Method
Am-241	59.5	157860	———	1.343E+03	0.33	1.46	2.99	4π LS
Cd-109	88.0	462.60	1.777E+05	1.890E+03	0.57	1.70	3.59	HPGe
Co-57	122.1	271.79	9.484E+04	1.009E+03	0.34	1.30	2.69	HPGe
Ce-139	165.9	137.6	1.339E+05	1.424E+03	0.35	1.10	2.31	HPGe
Hg-203	279.2	46.61	2.680E+05	2.851E+03	0.40	1.10	2.34	HPGe
Sn-113	391.7	115.1	1.861E+05	1.979E+03	0.42	1.10	2.35	HPGe
Cs-137	661.7	10983	1.176E+05	1.251E+03	0.70	1.20	2.78	HPGe
Y-88	898.0	106.6	4.568E+05	4.859E+03	0.50	1.10	2.42	HPGe
Co-60	1173.2	1925.4	2.244E+05	2.387E+03	0.60	1.10	2.51	HPGe
Co-60	1332.5	1925.4	2.247E+05	2.390E+03	0.90	1.10	2.84	HPGe
Y-88	1836.1	106.6	4.843E+05	5.151E+03	0.90	1.10	2.84	HPGe

* Master Source refers to Analytics' 8-isotope mixture which is calibrated quarterly.

Calibration Methods: 4π LS - 4 pi Liquid Scintillation Counting, HPGe - High Purity Germanium Gamma-Ray Spectrometer, IC - Ionization Chamber. **Uncertainty:** U - Relative expanded uncertainty, k = 2. See NIST Technical Note 1297, "Guidelines for Evaluating and Expressing the Uncertainty of NIST Measurement Results."

Comments:
500 grams/290 mL customer supplied sand.
This standard will expire one year after the calibration date.

Source Prepared by: M Dimitrova
M. D. Dimitrova, Radiochemist

QA Approved: DM Montgomery
D. M. Montgomery, QA Manager

Date: 1-30-07

End of Certificate

Corporate Office
24937 Avenue Tibbitts Valencia, California 91355

Laboratory
1380 Seaboard Industrial Blvd. Atlanta, Georgia, 30318

Eckert & Ziegler

Analytics

RSO# 849
rec 7-23-07

1380 Seaboard Industrial Blvd.
Atlanta, Georgia 30318
Tel 404•352•8677
Fax 404•352•2837
www.analyticsinc.com

CERTIFICATE OF CALIBRATION

Standard Radionuclide Source

75356-307

100 Grams of Sand in 16 Ounce PP MRP Jar

Customer: Paragon Analytics
P.O. No.: 72905, Item 3
Calibration Date: 01-Jul-2007 12:00 EST **Grams of Master Source:** 0.011387

This standard radionuclide source was prepared using aliquots measured gravimetrically from master radionuclide solutions. Calibration and purity were checked using a germanium gamma spectrometer system. At the time of calibration no interfering gamma-ray emitting impurities were detected. The gamma-ray emission rates for the most intense gamma-ray lines are given. Analytics maintains traceability to the National Institute of Standards and Technology through a Mas

071037D06.SPC Analyzed by

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SEEKER G A M M A A N A L Y S I S R E S U L T S PS Version 1.8.4

Paragon Analytics, Div. of DataChem Lab
GammaScan

****

Geo 13 / Solid

Sample ID: 0713001-6 FWHM CAL (829)

Sampling Start:	01/01/2007 10:00:00	Counting Start:	07/24/2007 13:17:46
Sampling Stop:	01/01/2007 10:00:00	Decay Time.	4.90E+003 Hrs
Buildup Time.	0.00E+000 Hrs	Live Time	3600 Sec
Sample Size	5.00E+002 g	Real Time	3735 Sec
Collection Efficiency	1.0000	Spc. File	.071037D06.SPC

Detector #: 6 (Detector 6)

Energy(keV) = -0.55 + 0.500*Ch + 0.00E+00*Ch^2 + 0.00E+00*Ch^3 07/24/2007
FWHM(keV) = 1.19 + -0.002*En + 7.29E-04*En^2 + 0.00E+00*En^3 07/24/2006
Where En = Sqrt(Energy in keV)

Search Sensitivity: 1.00 | Sigma Multiplier: 2.00 | Search Start/End: 80/4000

PEAK SEARCH RESULTS

PK. #	ENERGY (keV)	ADDRESS CHANNEL	NET/MDA COUNTS	UN-CERTAINTY	C.L. COUNTS	BKG COUNTS	FWHM (keV)	FLAG
1	59.51	120.03	10613	325	207	9061	0.92 a	HiResid
2	85.86	172.69	1720	525	427	26895	1.89 a	
3	88.01	176.98	55130	551	236	11796	0.93 b	
4	122.08	245.07	42567	492	221	10285	0.95 a	
5	136.49	273.87	5701	289	202	8642	0.98 a	
6	165.86	332.57	39047	458	191	7688	1.01 a	
7	255.14	510.98	1117	205	160	5378	1.02 a	
8	279.22	559.11	8320	271	165	5379	1.13 a	
9	309.98	620.58	42	129	105	2733	0.69 a	NET< CL
10	391.75	783.99	26476	368	142	3964	1.22 a	
11	510.86	1022.03	593	[illegible]	[illegible]	[illegible]	[illegible]	

071037D06.SPC Analyzed by

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SEEKER C A L I B R A T I O N R E S U L T S Version 2.0.4

****

Sample ID: 0713001-6 FWHM CAL (829)
Stds. Match Tolerance: 2.00 keV

Detector Number: 06 Calibration Date. . . 07/24/2007 13:17:46

FWHM(keV) = 0.79 + 0.009*En + 6.42e-04*En^2 + 0.00e+00*En^3
(Where En = SQR(Energy in keV))

Pk. #	Energy (kev)	Measured FWHM(keV)	% Diff.	Calculated FWHM(keV)	% Diff.	Prev.Calc. FWHM(kev)
1	59.50	0.919	-1.88	0.902	26.05	1.219
2	88.04	0.933	0.19	0.935	24.39	1.236
3	122.06	0.954	1.80	0.972	22.75	1.258
4	165.85	1.015	0.15	1.016	20.97	1.286

070785D08.SPC Analyzed by

SEEKER G A M M A A N A L Y S I S R E S U L T S PS Version 1.8.4

Paragon Analytics, Div. of DataChem Lab
GammaScan

Geo 13 / Solid

Sample ID: 0713001-8 FWHM CAL (829)

Sampling Start:	01/01/2007 10:00:00	Counting Start:	06/13/2007 14:29:52
Sampling Stop:	01/01/2007 10:00:00	Decay Time.	3.92E+003 Hrs
Buildup Time.	0.00E+000 Hrs	Live Time	1800 Sec
Sample Size	5.00E+002 g	Real Time	1905 Sec
Collection Efficiency	1.0000	Spc. File	.070785D08.SPC

Detector #: 8 (Detector 8)

Energy(keV) = -1.28 + 0.500*Ch + 1.98E-07*Ch^2 + 0.00E+00*Ch^3 06/13/2007
FWHM(keV) = 0.74 + 0.003*En + 7.24E-04*En^2 + 0.00E+00*En^3 05/22/2007
Where En = Sqrt(Energy in keV)

Search Sensitivity: 1.00 | Sigma Multiplier: 2.00 | Search Start/End: 80/4000

PEAK SEARCH RESULTS

PK. #	ENERGY (keV)	ADDRESS CHANNEL	NET/MDA COUNTS	UN-CERTAINTY	C.L. COUNTS	BKG COUNTS	FWHM (keV)	FLAG
1	47.30	97.13	207	240	196	7752	0.89 a	Wide Pk
2	49.29	101.10	1952	426	343	17410	1.55 b	
3	57.90	118.32	1753	526	427	25267	1.64 a	Wide Pk
4	59.52	121.55	59280	561	228	10510	0.75 b	
5	67.25	137.02	3015	625	506	27023	2.46 a	HiResid Wide Pk
6	70.79	144.09	1950	552	448	23420	2.11 b	HiResid
7	72.91	148.33	1410	268	211	9008	0.89 c	HiResid
8	74.74	151.99	291	259	211	9008	0.76 d	HiResid
9	85.34	173.18	1416	670	547	31626	2.51 a	Wide Pk
10	88.02	178.54	68440	584	214	9219	0.78 b	
11	105.15	212.79	114	152	123	3751	0.43 a	NET< CL
12	122.00	246.47	34043	420	166	5538	0.81 a	
13	136.43	275.31	4110	222	149	4450	0.79 a	
14	165.80	334.03	27919	373	137	3789	0.87 a	
15	199.15	400.68	485	156	123	3074	0.88 a	
16	255.05	512.40	798	161	124	2848	0.96 a	
17	279.12	560.52	8183	230	117	2539	0.99 a	
18	391.63	785.34	18314	304	113	2195	1.11 a	
19	462.56	927.06	87	104	84	1417	0.76 a	
20	511.17	1024.17	299	139	111	2126	1.41 a	
21	608.66	1218.91	82	82	66	988	0.89 a	
22	661.66	1324.79	20091	307	97	1754	1.35 a	
23	735.97	1473.19	92	103	84	1289	1.30 a	

070785D08.SPC Analyzed by

PEAK SEARCH RESULTS

PK. #	ENERGY (keV)	ADDRESS CHANNEL	NET/MDA COUNTS	UN-CERTAINTY	C.L. COUNTS	BKG COUNTS	FWHM (keV)	FLAG
24	744.17	1489.56	49	93	75	1123	1.21 a	NET< CL
25	814.35	1629.70	303	112	88	1344	1.48 a	
26	898.00	1796.73	21137	317	104	1780	1.56 a	
27	999.61	1999.58	46	64	52	663	0.80 a	NET< CL
28	1087.02	2174.05	47	70	57	746	0.96 a	NET< CL
29	1173.27	2346.20	23246	319	76	1014	1.80 a	
30	1325.01	2648.98	429	87	63	610	2.33 a	
31	1332.53	2663.99	21428	301	56	523	1.94 b	
32	1394.95	2788.52	30	57	46	414	1.81 a	NET< CL
33	1579.10	3155.83	43	60	49	498	1.44 a	NET< CL
34	1836.16	3668.41	12897	230	29	147	2.35 a	

070785D08.SPC Analyzed by

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SEEKER C A L I B R A T I O N R E S U L T S Version 2.0.4

****

Sample ID: 0713001-8 FWHM CAL (829)
Stds. Match Tolerance: 2.00 keV

Detector Number: 08 Calibration Date. . . 06/13/2007 14:29:52

FWHM(keV) = 0.61 + 0.011*En + 6.87e-04*En^2 + 0.00e+00*En^3
(Where En = SQR(Energy in keV))

Pk. #	Energy (kev)	Measured FWHM(keV)	% Diff.	Calculated FWHM(keV)	% Diff.	Prev.Calc. FWHM(kev)
1	59.50	0.751	-1.37	0.741	8.76	0.812
2	88.04	0.777	0.34	0.779	7.09	0.839
3	122.06	0.808	1.61	0.821	5.53	0.869
4	165.85	0.872	-0.11	0.871	3.94	0.907
5	279.00	0.992	-0.04	0.992	1.08	1.003
6	391.68	1.109	-0.51	1.103	-0.78	1.095
7	661.64	1.354	0.03	1.355	-3.33	1.311
8	898.02	1.562	0.16	1.564	-4.49	1.497
9	1173.21	1.803	-0.08	1.801	-5.24	1.711
10	1332.48	1.937	-0.07	1.936	-5.51	1.835
11	1836.01	2.351	0.05	2.352	-5.89	2.221

Calibration Results Saved.

080005D09.SPC Analyzed by MC

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SEEKER G A M M A A N A L Y S I S R E S U L T S PS Version 1.8.4

Paragon Analytics, Div. of DataChem Lab
GammaScan

****

Geo.11 / Solid

Sample ID: 0813514-9 FWHM CAL (849)

Sampling Start:	07/01/2007 10:00:00	Counting Start:	01/14/2008 15:32:34
Sampling Stop:	07/01/2007 10:00:00	Decay Time.	4.73E+003 Hrs
Buildup Time.	0.00E+000 Hrs	Live Time	1800 Sec
Sample Size	1.00E+002 g	Real Time	1984 Sec
Collection Efficiency	1.0000	Spc. File	.080005D09.SPC

Detector #: 9 (Detector 9)

Energy(keV) = 1.18 + 0.500*Ch + 0.00E+00*Ch^2 + 0.00E+00*Ch^3 01/14/2008

FWHM(keV) = 0.54 + 0.019*En + 5.56E-04*En^2 + 0.00E+00*En^3 01/14/2008

Where En = Sqrt(Energy in keV)

Search Sensitivity: 1.00 | Sigma Multiplier: 2.00 | Search Start/End: 80/4000

PEAK SEARCH RESULTS

PK. #	ENERGY (keV)	ADDRESS CHANNEL	NET/MDA COUNTS	UN-CERTAINTY	C.L. COUNTS	BKG COUNTS	FWHM (keV)	FLAG
1	49.47	96.63	3663	504	403	25686	1.23	a Wide Pk
2	59.49	116.69	147960	815	222	10935	0.68	a HiResid
3	65.89	129.49	1088	344	277	13118	1.21	a HiResid Wide Pk
4	67.22	132.15	4184	588	471	25936	2.20	b HiResid
5	70.52	138.77	4514	623	500	29204	2.09	c HiResid
6	72.78	143.29	1032	307	247	12326	0.85	d HiResid
7	78.34	154.41	382	167	134	4945	0.39	a
8	87.98	173.70	149017	809	198	8686	0.69	a HiResid
9	122.13	242.06	66413	551	161	5205	0.84	a HiResid
10	136.55	270.90	8010	253	147	4364	0.86	a
11	165.92	329.68	47182	474	155	4463	0.90	a
12	199.20	396.28	1264	197	151	4232	0.90	a
13	203.79	405.47	233	117	93	2116	0.52	b
14	255.23	508.42	1248	177	134	3303	1.05	a
15	279.29	556.56	8950	244	127	2973	1.00	a
16	298.56	595.14	58	91	74	1353	0.52	a NET< CL
17	391.82	781.77	26334	357	123	2567	1.15	a HiResid
18	510.91	1020.09	371	229	186	4440	2.53	a Wide Pk
19	511.76	1021.81	115	114	92	1776	0.92	b
20	541.36	1081.03	70	95	77	1351	0.83	a NET< CL
21	661.71	1321.89	32900	393	124	2670	1.40	a HiResid
22	734.81	1468.18	83	175	144	2901	2.10	a NET< CL
23	813.84	1626.33	516	135	105	2029	1.59	a

Page 001

080005D09.SPC Analyzed by

PEAK SEARCH RESULTS

PK. #	ENERGY (keV)	ADDRESS CHANNEL	NET/MDA COUNTS	UN-CERTAINTY	C.L. COUNTS	BKG COUNTS	FWHM (keV)	FLAG
24	898.15	1795.07	24441	345	120	2655	1.58	a HiResid
25	1173.33	2345.77	33220	377	79	1212	1.85	a HiResid
26	1324.99	2649.29	590	122	92	1136	3.43	a HiResid Wide Pk
27	1332.61	2664.52	29852	353	59	649	1.99	b HiResid
28	1836.06	3672.06	13779	239	38	249	2.34	a HiResid

Page 002

080005D09.SPC Analyzed by

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SEEKER C A L I B R A T I O N R E S U L T S Version 2.0.4

****

Sample ID: 0813514-9 FWHM CAL (849)

Stds. Match Tolerance: 2.00 keV

Detector Number: 09 Calibration Date. . . 01/14/2008 15:32:34

FWHM(keV) = 0.46 + 0.026*En + 4.17e-04*En^2 + 0.00e+00*En^3

071070D06.SPC Analyzed by JK

****

SEEKER G A M M A A N A L Y S I S R E S U L T S PS Version 1.8.4

Paragon Analytics, Div. of DataChem Lab
GammaScan

****

Geo.11 / Solid

Sample ID: 0713007-6 GEO 11 EFF CAL (849)

Sampling Start:	07/01/2007 10:00:00	Counting Start:	07/31/2007 13:10:41
Sampling Stop:	07/01/2007 10:00:00	Decay Time.	7.23E+002 Hrs
Buildup Time.	0.00E+000 Hrs	Live Time	1800 Sec
Sample Size	1.00E+002 g	Real Time	2031 Sec
Collection Efficiency	1.0000	Spc. File	.071070D06.SPC

Detector #: 6 (Detector 6)

Energy(keV)= -0.57 + 0.500*Ch + 0.00E+00*Ch^2 + 0.00E+00*Ch^3 07/31/2007

FWHM(keV) = 0.79 + 0.009*En + 6.42E-04*En^2 + 0.00E+00*En^3 07/24/2007

Where En = Sqrt(Energy in keV)

Search Sensitivity: 1.00 | Sigma Multiplier: 2.00 | Search Start/End: 80/4000

PEAK SEARCH RESULTS

PK. #	ENERGY (keV)	ADDRESS CHANNEL	NET/MDA COUNTS	UN-CERTAINTY	C.L. COUNTS	BKG	FWHM

071070D06.SPC Analyzed by

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SEEKER B A C K G R O U N D S U B T R A C T R E S U L T S Version 1.8.2

Paragon Analytics, Div. of DataChem Lab

GammaScan

****

Background File:. . . . . DET060727.BKG (WEEKLY BKG 070727-6)

Bkg.File Detector #: 6

BACKGROUND SUBTRACT RESULTS

PK#	ENERGY (keV)	OLD NET COUNTS	OLD UN-CERTAINTY	OLD CR.LEVEL	NEW NET COUNTS	NEW UN-CERTAINTY	NEW CR.LEVEL	FLAG
5	85.43	6062	884	716	6060	884	716	
13	511.12	1610	346	277	1573	346	277	
14	557.88	139	181	147	134	181	147	NET<CL
17	898.07	94731	648	167	94730	648	167	

Page 002

071070D06.SPC Analyzed by

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SEEKER C A L I B R A T I O N R E S U L T S Version 2.0.4

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Sample ID: 0713007-6 GEO 11 EFF CAL (849)
Stds. Match Tolerance: 2.00 keV

Detector Number: 06 Calibration Date. . . 07/31/2007 13:10:41
Geometry File (D06)(Sh11).EFF ID. Det.6 Geo.11 Eff Cal
Amount of Std. in Calib. Source: 100.000000 gm

Crossover: 180.00 keV

Below Crossover Efficiency Fit:
Eff = exp ^ [-7.91e+01 + 3.09e+01*En +-3.14e+00*En^2]
(Where En = LGN(Energy in keV)) (Linear/Quad)
Above Knee Efficiency Fit:
Eff = 10 ^ [-9.55e+00 + 9.86e+00*En +-3.72e+00*En^2 + 4.29e-01*En^3]
(Where En = LOG(Energy in keV)) (Polynomial)

Pk. #	Energy (kev)	Measured Efficiency	% Difference	Calculated Efficiency	% Difference	Prev.Calc. Efficiency
1	59.50	5.62e-03	1.28	5.69e-03	2.41	5.83e-03
2	88.04	2.91e-02	-4.69	2.78e-02	0.12	2.78e-02
3	122.06	4.73e-02	5.03	4.98e-02	-0.39	4.96e-02
4	165.85	4.78e-02	-1.88	4.69e-02	0.32	4.70e-02
5	279.00	3.71e-02	-0.16	3.70e-02	0.47	3.72e-02
6	391.68	2.87e-02	0.59	2.89e-02	-0.14	2.88e-02
7	661.64	1.87e-02	-1.81	1.83e-02	-0.15	1.83e-02
8	898.02	1.35e-02	2.31	1.39e-02	0.08	1.39e-02
9	1173.21	1.09e-02	-0.54	1.09e-02	0.24	1.09e-02
10	1332.48	9.82e-03	-0.67	9.75e-03	0.27	9.78e-03
11	1836.01	7.52e-03	0.23	7.54e-03	0.12	7.55e-03

Calibration Results Saved.

Calibration verification

eometry11								
/2005					Count Date:	7/31/2007		
		EXPECTED ACTIVITY						
lass of								# of Half Lives
andard			DPS	pCi/g	Activity	Recovery	Pass/Fail	Expired
100	g	Am-241	3682.5	995.3	951	96%	Pass	0.00
		Cd-109	51745.2	13985.2	14100	101%	Pass	1.64
		Co-57	1196.3	323.3	295	91%	Pass	2.80
		Ce-139	1733.7	468.6	494	105%	>5 h-lives	5.52
		Hg-203	3909.9	1056.7	NR	>5 h-lives	>5 h-lives	16.31
		Sn-113	3067.8	829.1	783	94%	>5 h-lives	6.60
		Cs-137	1454.1	393.0	377	96%	Pass	0.07
		Y-88	5239.8	1416.2	1210	85%	>5 h-lives	7.13
		Co-60	2419.7	654.0	623	95%	Pass	0.39
		Co-60	2442.5	660.1	632	96%	Pass	0.39
		Y-88	5136.8	1388.3	1290	93%	>5 h-lives	7.13

OK RG 8/15/07

071072D06.SPC Analyzed by Jdc

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SEEKER G A M M A A N A L Y S I S R E S U L T S PS Version 1.8.4

Paragon Analytics, Div. of DataChem Lab
GammaScan

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Geo.11 / Solid

Sample ID: 0713007-6 GEO 11 CAL VER (796)

Sampling Start:	07/01/2005 10:00:00	Counting Start:	07/31/2007 17:10:02
Sampling Stop:	07/01/2005 10:00:00	Decay Time.	1.82E+004 Hrs
Buildup Time.	0.00E+000 Hrs	Live Time	1800 Sec
Sample Size	1.00E+002 g	Real Time	1862 Sec
Collection Efficiency	1.0000	Spc. File	.071072D06.SPC

Detector #: 6 (Detector 6)

Energy(keV) = -0.57 + 0.500*Ch + 0.00E+00*Ch^2 + 0.00E+00*Ch^3 07/31/2007

FWHM(keV) = 0.79 + 0.009*En + 6.42E-04*En^2 + 0.00E+00*En^3 07/24/2007

Where En = Sqrt(Energy in keV)

Search Sensitivity: 1.00 | Sigma Multiplier: 2.00 | Search Start/End: 80/4000

PEAK SEARCH RESULTS

PK. #	ENERGY (keV)	ADDRESS CHANNEL	NET/MDA COUNTS	UN-CERTAINTY	C.L. COUNTS	BKG COUNTS	FWHM (keV)	FLAG

071072D06.SPC Analyzed by

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SEEKER B A C K G R O U N D S U B T R A C T R E S U L T S Vers. 2.2.1

Paragon Analytics, Div. of DataChem Lab
GammaScan

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Background File:. . . . . DET060727.BKG (WEEKLY BKG 070727-6)

Bkg.File Detector #: 6

BACKGROUND SUBTRACT RESULTS

PK#	ENERGY (keV)	OLD NET COUNTS	OLD UN-CERTAINTY	OLD CR.LEVEL	NEW NET COUNTS	NEW UN-CERTAINTY	NEW CR.LEVEL	FLAG
2	87.96	30148	395	154	30147	395	154	
12	511.77	68	86	70	31	87	71	NET<CL
15	897.97	746	122	90	745	122	90	

071072D06.SPC Analyzed by

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SEEKER F I N A L A C T I V I T Y R E P O R T Version 2.2.1

Paragon Analytics, Div. of DataChem Lab

GammaScan

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Geo.11 / Solid

Sample ID: 0713007-6 GEO 11 CAL VER (796)

Sampling Start:	07/01/2005 10:00:00	Counting Start:	07/31/2007 17:10:02
Sampling Stop:	07/01/2005 10:00:00	Decay Time.	1.82e+004 Hrs
Buildup Time.	0.00e+000 Hrs	Live Time	1800 Sec
Sample Size	1.00e+002 g	Real Time	1862 Sec
Collection Efficiency	1.0000	Spectrum File	.071072D06.SPC
Cr. Level Confidence Interval:	95 %	Det. Limit Confidence Interval:	95 %

Detector #: 6 (Detector 6)

Efficiency File: (D06)(Sh11).EFF (Det.6 Geo.11 Eff Cal)

Eff.= EXP[-7.91E+01 + 3.09E+01 * Fn + [illegible]

071072D06.SPC Analyzed by

UNKNOWN, SUM or ESCAPE PEAKS

PK. #	ENERGY (keV)	ADDRESS CHANNEL	NET COUNTS	UN-CERTAINTY	C.L. COUNTS	BKG COUNTS	FWHM (keV)	FLAG
7	277.14	555.06	38	131	107	2125	1.06	Deleted
8	282.45	565.67	49	81	66	1063	0.56	Deleted
9	310.29	621.31	66	95	77	1327	0.58	Deleted
11	432.66	865.91	95	167	137	3064	1.63	Deleted
12	511.77	1024.02	31	87	71	1104	0.80	Deleted
14	791.59	1583.32	57	71	57	805	0.78	Deleted

c:\SEEKER\BIN\071072d06.res Analysis Results Saved.

071127D08.SPC Analyzed by

SEEKER G A M M A A N A L Y S I S R E S U L T S PS Version 1.8.4

Paragon Analytics, Div. of DataChem Lab
GammaScan

Geo.11 / Solid

Sample ID: 0713007-8 GEO 11 EFF CAL (849)

Sampling Start:	07/01/2007 10:00:00	Counting Start:	08/16/2007 15:30:09
Sampling Stop:	07/01/2007 10:00:00	Decay Time.	1.11E+003 Hrs
Buildup Time.	0.00E+000 Hrs	Live Time	900 Sec
Sample Size	1.00E+002 g	Real Time	1046 Sec
Collection Efficiency	1.0000	Spc. File	.071127D08.SPC

Detector #: 8 (Detector 8)

Energy(keV)= -1.25 + 0.500*Ch + 1.91E-07*Ch^2 + 0.00E+00*Ch^3 08/16/2007
FWHM(keV) = 0.61 + 0.011*En + 6.87E-04*En^2 + 0.00E+00*En^3 06/13/2007
Where En = Sqrt(Energy in keV)

Search Sensitivity: 1.00 | Sigma Multiplier: 2.00 | Search Start/End: 80/4000

PEAK SEARCH RESULTS

PK. #	ENERGY (keV)	ADDRESS CHANNEL	NET/MDA COUNTS	UN-CERTAINTY	C.L. COUNTS	BKG COUNTS	FWHM (keV)	FLAG
1	43.59	89.63	819	291	235	10188	0.95	a
2	49.83	102.11	2371	506	408	23093	1.64	a Wide Pk
3	59.58	121.60	86171	638	205	9323	0.71	a HiResid
4	64.98	132.38	255	272	222	9914	0.85	a Wide Pk
5	66.34	135.10	1641	393	316	16863	1.20	b

071127D08.SPC Analyzed by

PEAK SEARCH RESULTS

PK. #	ENERGY (keV)	ADDRESS CHANNEL	NET/MDA COUNTS	UN-CERTAINTY	C.L. COUNTS	BKG COUNTS	FWHM (keV)	FLAG
24	511.30	1024.22	709	227	181	4215	2.40 a	Wide Pk
25	661.74	1324.68	21881	329	119	2604	1.38 a	
26	814.03	1628.76	773	127	94	1529	1.46 a	
27	872.71	1745.91	41	75	61	917	0.77 a	NET< CL
28	898.07	1796.54	44470	442	108	2164	1.56 a	
29	1173.34	2345.95	23560	324	85	1273	1.79 a	
30	1194.14	2387.45	134	121	98	1416	2.41 a	
31	1324.99	2648.52	857	129	95	1366	2.70 a	
32	1332.60	2663.70	21197	304	72	964	1.92 b	
33	1354.09	2706.57	56	61	49	555	1.21 a	
34	1836.21	3668.02	25987	328	51	440	2.29 a	HiResid

071127D08.SPC Analyzed by

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SEEKER B A C K G R O U N D S U B T R A C T R E S U L T S Version 1.8.2

Paragon Analytics, Div. of DataChem Lab
GammaScan

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Background File:. . . . . DET080810.BKG (WEEKLY BKG 070810-8)

Bkg.File Detector #: 8

BACKGROUND SUBTRACT RESULTS

PK#	ENERGY (keV)	OLD NET COUNTS	OLD UN-CERTAINTY	OLD CR.LEVEL	NEW NET COUNTS	NEW UN-CERTAINTY	NEW CR.LEVEL	FLAG
4	64.98	255	272	222	252	272	222	
6	68.40	3295	619	500	3295	619	500	
9	74.51	404	349	285	400	349	285	
11	85.24	4731	595	476	4730	595	476	
12	88.10	114767	725	211	114766	725	211	
16	199.21	1948	214	160	1944	214	160	
24	511.30	709	227	181	685	227	181	
28	898.07	44470	442	108	44469	442	108	

071127D08.SPC Analyzed by

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SEEKER C A L I B R A T I O N R E S U L T S Version 2.0.4

****

Sample ID: 0713007-8 GEO 11 EFF CAL (849)
Stds. Match Tolerance: 2.00 keV

Detector Number: 08 Calibration Date. . . 08/16/2007 15:30:09
Geometry File (D08)(Sh11).EFF ID. Geo 11 Eff Cal
Amount of Std. in Calib. Source: 100.000000 gm

Crossover: 180.00 keV

Below Crossover Efficiency Fit:
Eff = 10 ^ [-6.48e+00 + 5.55e+00*En +-1.44e+00*En^2 + 0.00e+00*En^3]
(Where En = LOG(Energy in keV)) (Polynomial)
Above Knee Efficiency Fit:
Eff = 10 ^ [-5.02e+00 + 5.30e+00*En +-2.19e+00*En^2 + 2.57e-01*En^3]
(Where En = LOG(Energy in keV)) (Polynomial)

Pk. #	Energy (kev)	Measured Efficiency	% Difference	Calculated Efficiency	% Difference	Prev.Calc. Efficiency
1	59.50	6.97e-02	-0.94	6.90e-02	-0.09	6.90e-02
2	88.04	7.24e-02	3.27	7.49e-02	-1.17	7.40e-02
3	122.06	7.18e-02	-3.82	6.92e-02	-1.39	6.82e-02
4	165.85	5.62e-02	1.35	5.69e-02	1.94	5.81e-02
5	279.00	4.06e-02	-0.03	4.06e-02	-2.46	3.96e-02
6	391.68	3.05e-02	0.24	3.06e-02	-2.51	2.98e-02
7	661.64	1.93e-02	-1.31	1.91e-02	-1.28	1.88e-02
8	898.02	1.41e-02	2.09	1.44e-02	-0.62	1.43e-02
9	1173.21	1.14e-02	-0.55	1.13e-02	-0.73	1.13e-02
10	1332.48	1.02e-02	-0.79	1.02e-02	-1.16	1.00e-02
11	1836.01	7.79e-03	0.31	7.81e-03	-3.83	7.52e-03

Calibration Results Saved.

OK
MC 8/23/07

Page 004

Geometry 11 Calibration Verification: Gamma Mixed Nuclide Source; Geometry11

Detector 8

NEW SOURCE : 796 **REF DATE :** 7/1/2005 **Count Date:** 8/16/2007

FROM CALIBRATION CERTIFICATE | FROM ANALYTICS.LIB | EXPECTED ACTIVITY

Isotope	KeV	Half Life(y)	Gammas/Sec.	Gamma Fraction:	Mass of Standard	
Am-241	59.5	432.0000	1322	0.3590	100	g
Cd-109	88	1.2666	1868	0.0361		
Co-57	122	0.7441	1024	0.8560		
Ce-139	166	0.3768	1393	0.8035		
Hg-203	279	0.1276	3185	0.8146		
Sn-113	392	0.3151	1991	0.6490		
Cs-137	662	30.0000	1239	0.8521		
Y-88	898	0.2919	4894	0.9340		
Co-60	1173	5.2714	2419	0.9997		
Co-60	1332	5.2714	2442	0.9998		
Y-88	1836	0.2919	5105	0.9938		

NR = NOT REPORTED

	DPS	pCi/g	Activity	Recovery	Pass/Fail	# of Half Lives Expired
Am-241	3682.5	995.3	969	97%	Pass	0.00
Cd-109	51745.2	13985.2	13100	94%	Pass	1.68
Co-57	1196.3	323.3	321	99%	Pass	2.86
Ce-139	1733.7	468.6	460	>5 h-lives	>5 h-lives	5.64
Hg-203	3909.9	1056.7	NR	>5 h-lives	>5 h-lives	16.65
Sn-113	3067.8	829.1	852	>5 h-lives	>5 h-lives	6.74
Cs-137	1454.1	393.0	383	97%	Pass	0.07
Y-88	5239.8	1416.2	1190	>5 h-lives	>5 h-lives	7.28
Co-60	2419.7	654.0	630	96%	Pass	0.40
Co-60	2442.5	660.1	637	96%	Pass	0.40
Y-88	5136.8	1388.3	1310	>5 h-lives	>5 h-lives	7.28

OK
MC
8/23/07

071128D08.SPC Analyzed by JH

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SEEKER G A M M A A N A L Y S I S R E S U L T S PS Version 1.8.4

Paragon Analytics, Div. of DataChem Lab

GammaScan

071128D08.SPC Analyzed by

PEAK SEARCH RESULTS

PK. #	ENERGY (keV)	ADDRESS CHANNEL	NET/MDA COUNTS	UN-CERTAINTY	C.L. COUNTS	BKG COUNTS	FWHM (keV)	FLAG
23	1173.31	2345.90	36005	389	71	886	1.76 a	HiResid
24	1332.57	2663.65	32597	364	37	264	1.88 a	
25	1353.31	2705.03	29	23	17	73	0.98 a	
26	1836.26	3668.12	437	47	18	61	2.17 a	

071128D08.SPC Analyzed by

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SEEKER B A C K G R O U N D S U B T R A C T R E S U L T S Vers. 2.2.1

Paragon Analytics, Div. of DataChem Lab

GammaScan

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Background File:. . . . . DET080810.BKG (WEEKLY BKG 070810-8)

Bkg.File Detector #: 8

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BACKGROUND SUBTRACT RESULTS

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PK#	ENERGY (keV)	OLD NET COUNTS	OLD UN-CERTAINTY	OLD CR.LEVEL	NEW NET COUNTS	NEW UN-CERTAINTY	NEW CR.LEVEL	FLAG
4	66.50	757	256	206.	752	[illegible]	[illegible]	

071128D08.SPC Analyzed by

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SEEKER F I N A L A C T I V I T Y R E P O R T Version 2.2.1

Paragon Analytics, Div. of DataChem Lab
GammaScan

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Geo.11 / Solid

Sample ID: 0713007-8 GEO 11 CAL VER (796)

Sampling Start:	07/01/2005 10:00:00	Counting Start:	08/16/2007 15:53:23
Sampling Stop:	07/01/2005 10:00:00	Decay Time.	1.86e+004 Hrs
Buildup Time.	0.00e+000 Hrs	Live Time	1800 Sec
Sample Size	1.00e+002 g	Real Time	1888 Sec
Collection Efficiency	1.0000	Spectrum File	.071128D08.SPC
Cr. Level Confidence Interval:	95 %	Det. Limit Confidence Interval:	95 %

Detector #: 8 (Detector 8)

Efficiency File: (D08)(Sh11).EFF (Geo 11 Eff Cal)

Eff=10^[-6.48E+00 +5.55E+00*L +-1.44E+00*L^2 +0.00E+00*L^3] 08/16/2007

Eff.=10^[-5.02E+00 +5.30E+00*L +-2.19E+00*L^2 +2.57E-01*L^3] Above 180.00 keV

Library File: . . . .ANALYTICAL.LIB (Analytical)

MEASURED or MDA CONCENTRATIONS

Nuclide	ENERGY (keV)	NET	Concentration (pCi/g)	MDA	Critical Level	Halflife (hrs)
Am-241	59.54		9.69E+02 +- 5.04E+00	2.25E+00	1.12E+00	3.79E+06
Cd-109	88.02		1.31E+04 +- 1.01E+02	5.22E+01	2.59E+01	1.11E+04
Co-57	122.07		3.21E+02 +- 5.38E+00	3.81E+00	1.88E+00	6.50E+03
Ce-139	165.85		4.60E+02 +- 2.50E+01	3.01E+01	1.48E+01	3.30E+03
Sn-113	391.68		8.52E+02 +- 1.13E+02	1.66E+02	8.19E+01	2.76E+03
Cs-137	661.62		3.83E+02 +- 3.97E+00	1.62E+00	[illegible]	[illegible]

071128D08.SPC Analyzed by

UNKNOWN,SUM or ESCAPE PEAKS

PK. #	ENERGY (keV)	ADDRESS CHANNEL	NET COUNTS	UN-CERTAINTY	C.L. COUNTS	BKG COUNTS	FWHM (keV)	FLAG
4	66.50	135.42	752	257	206	7240	1.20	Unknown
5	68.18	138.79	539	296	240	9148	1.27	Unknown
6	78.09	158.59	173	146	118	3405	0.43	Unknown
8	103.12	208.62	163	75	58	941	0.40	Unknown
10	136.42	275.19	2078	148	96	1849	0.83	Unknown
12	199.30	400.84	118	149	122	2517	1.12	Deleted
13	310.48	623.02	118	105	85	1448	0.77	1333DEsc
14	371.56	745.05	32	100	81	1338	0.83	Deleted
16	416.33	834.49	84	130	106	1912	1.14	Deleted
17	609.52	1220.38	55	90	73	1038	1.14	Deleted
19	703.94	1408.94	48	68	55	689	0.82	Deleted
20	821.57	1643.81	179	130	104	1693	1.80	1333SEsc
22	1061.05	2121.86	78	68	54	727	0.88	Unknown
25	1353.31	2705.03	29	23	17	73	0.98	Unknown

c:\SEEKER\BIN\071128d08.res Analysis Results Saved.

080016D09.SPC Analyzed by MC

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SEEKER G A M M A A N A L Y S I S R E S U L T S PS Version 1.8.4

Paragon Analytics, Div. of DataChem Lab
GammaScan

****

Geo.11 / Solid

Sample ID: 0813508-9 GEO11 CAL (849)

Sampling Start:	07/01/2007 10:00:00	Counting Start:	01/15/2008 18:41:12
Sampling Stop:	07/01/2007 10:00:00	Decay Time.	4.76E+003 Hrs
Buildup Time.	0.00E+000 Hrs	Live Time	3600 Sec
Sample Size	1.00E+002 g	Real Time	4014 Sec
Collection Efficiency	1.0000	Spc. File	.080016D09.SPC

Detector #: 9 (Detector 9)

Energy(keV) = 1.15 + 0.500*Ch + 0.00E+00*Ch^2 + 0.00E+00*Ch^3 01/15/2008

FWHM(keV) = 0.46 + 0.026*En + 4.17E-04*En^2 + 0.00E+00*En^3 01/14/2008

Where En = Sqrt(Energy in keV)

Search Sensitivity: 1.00 | Sigma Multiplier: 2.00 | Search Start/End: 80/4000

PEAK SEARCH RESULTS

PK. #	ENERGY (keV)	ADDRESS CHANNEL	NET/MDA COUNTS	UN-CERTAINTY	C.L. COUNTS	BKG COUNTS	FWHM (keV)	FLAG
1	49.52	96.81	8985	698	553	48390	1.34	a Wide Pk
2	51.07	99.92	1450	504	410	33864	0.78	b
3	59.46	116.70	294726	1151	315	21949	0.66	a HiResid
4	66.39	130.57	1225	481	392	28352	0.93	a
5	70.70	139.21	2131	512	414	31709	1.00	a
6	72.83	143.46	2675	325	254	15855	0.52	b
7	77.96	153.73	789	367	298	19712	0.68	a
8	87.94	173.71	294672	1138	281	17500	0.67	a HiResid
9	122.11	242.09	131040	776	230	10693	0.82	a HiResid
10	136.52	270.93	15698	358	210	8880	0.84	a
11	165.89	329.71	92883	653	192	7396	0.89	a HiResid
12	199.13	396.24	3030	306	235	9391	1.13	a
13	203.70	405.40	837	260	209	8049	1.00	b
14	255.20	508.48	2386	226	168	5661	0.86	a
15	279.25	556.60	17477	342	178	5853	1.02	a
16	310.42	618.98	232	231	188	6054	1.08	a
17	391.78	781.83	51678	504	179	5490	1.14	a HiResid
18	413.28	824.87	151	191	156	4471	0.94	a NET< CL
19	510.51	1019.46	480	202	162	4847	1.29	a
20	511.99	1022.43	260	181	147	4241	1.07	b
21	661.66	1321.97	65208	548	163	4904	1.37	a HiResid
22	759.43	1517.67	130	153	124	3038	1.06	a
23	768.78	1536.38	99	129	105	2533	0.98	a NET< CL
24	813.84	1626.56	864	168	129	3434	1.37	a

080016D09.SPC Analyzed by

PEAK SEARCH RESULTS

PK. #	ENERGY (keV)	ADDRESS CHANNEL	NET/MDA COUNTS	UN-CERTAINTY	C.L. COUNTS	BKG COUNTS	FWHM (keV)	FLAG
25	821.07	1641.03	127	130	106	2575	0.93 b	
26	898.10	1795.20	49006	487	166	5083	1.62 a	HiResid
27	1173.25	2345.90	65486	530	114	2509	1.84 a	HiResid
28	1194.68	2388.80	186	125	100	1947	1.73 a	
29	1324.96	2649.55	1134	176	134	2403	3.36 a	HiResid Wide Pk
30	1332.54	2664.71	59200	498	86	1373	1.94 b	HiResid
31	1353.89	2707.45	15	170	140	2471	3.76 a	NET< CL Wide Pk
32	1835.96	3672.29	27362	337	54	491	2.37 a	HiResid
33	1849.24	3698.87	39	42	33	241	1.26 a	

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080016D09.SPC Analyzed by

****

SEEKER B A C K G R O U N D S U B T R A C T R E S U L T S Version 1.8.2

Paragon Analytics, Div. of DataChem Lab

GammaScan

****

Background File:. . . . . DET090114.BKG (080114-9 WEEKLY BACKGROUND)

Bkg.File Detector #: 9

BACKGROUND SUBTRACT RESULTS

PK#	ENERGY (keV)	OLD NET COUNTS	OLD UN-CERTAINTY	OLD CR.LEVEL	NEW NET COUNTS	NEW UN-CERTAINTY	NEW CR.LEVEL	FLAG
4	66.39	1225	481	392	1210	482	392	
7	77.96	789	367	298	780	367	298	
8	87.94	294672	1138	281	294666	1138	281	
12	199.13	3030	306	235	3021	306	[illegible]	

080016D09.SPC Analyzed by

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SEEKER C A L I B R A T I O N R E S U L T S Version 2.0.4

****

Sample ID: 0813508-9 GEO11 CAL (849)
Stds. Match Tolerance: 2.00 keV

Detector Number: 09 Calibration Date. . . 01/15/2008 18:41:12
Geometry File (D09)(Sh11).EFF ID. Geo 11 Eff Cal
Amount of Std. in Calib. Source: 100.000000 gm

Crossover: 180.00 keV

Below Crossover Efficiency Fit:
Eff = 10 ^ [-7.00e+00 + 6.03e+00*En +-1.56e+00*En^2 + 0.00e+00*En^3]
(Where En = LOG(Energy in keV)) (Polynomial)
Above Knee Efficiency Fit:
Eff = exp ^ [1.49e+00 +-8.33e-01*En +-7.65e-03*En^2]
(Where En = Energy in keV) (Linear/Quad)

Pk. #	Energy (kev)	Measured Efficiency	% Difference	Calculated Efficiency	% Difference	Prev.Calc. Efficiency
1	59.50	5.96e-02	-0.85	5.91e-02	-0.01	5.91e-02
2	88.04	6.24e-02 *	2.98	6.43e-02	-6.92	6.01e-02
3	122.06	6.08e-02	-3.47	5.88e-02	-6.97	5.50e-02
4	165.85	4.68e-02	1.22	4.74e-02	-1.05	4.69e-02
5	279.00	3.15e-02	1.52	3.20e-02	-0.03	3.19e-02
6	391.68	2.40e-02	-2.51	2.34e-02	1.65	2.38e-02
7	661.64	1.45e-02	-1.10	1.44e-02	1.31	1.46e-02
8	898.02	1.04e-02	3.24	1.08e-02	0.38	1.08e-02
9	1173.21	8.37e-03	0.31	8.40e-03	-0.60	8.35e-03
10	1332.48	7.55e-03	-1.38	7.45e-03	-1.09	7.37e-03
11	1836.01	5.51e-03	-0.19	5.50e-03	-2.34	5.37e-03

Calibration Results Saved.

*MANUALLY ADJUSTED EFFICIENCY FROM ORIGINAL VALUE OF 5.84×10^{-2}. % DIFF. FROM NEWLY CALIBRATED VALUE OF 6.43×10^{-2}:

$$\left| \frac{5.84 \times 10^{-2}}{6.43 \times 10^{-2}} - 1 \right| \times 100 = 9.18\%$$

CHANGE IS O.K. PER P.A. SOP 713

MC
1/17/08

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Eckert & Ziegler
Analytics

RSO# 849
rec 7-23-07

1380 Seaboard Industrial Blvd.
Atlanta, Georgia 30318
Tel 404-352-8677
Fax 404-352-2837
www.analyticsinc.com

CERTIFICATE OF CALIBRATION

Standard Radionuclide Source

75356-307

100 Grams of Sand in 16 Ounce PP MRP Jar

Customer: Paragon Analytics
P.O. No.: 72905, Item 3
Calibration Date: 01-Jul-2007 12:00 EST **Grams of Master Source:** 0.011387

This standard radionuclide source was prepared using aliquots measured gravimetrically from master radionuclide solutions. Calibration and purity were checked using a germanium gamma spectrometer system. At the time of calibration no interfering gamma-ray emitting impurities were detected. The gamma-ray emission rates for the most intense gamma-ray lines are given. Analytics maintains traceability to the National Institute of Standards and Technology through a Measurements Assurance Program as described in USNRC Regulatory Guide 4.15, Revision 1, February, 1979, and compliance with ANSI N42.22-1995, "Traceability of Radioactive Sources to NIST."

Nuclide	Gamma-Ray Energy (keV)	Half-Life, Days	Master Source* γps/gram	This Source γps	Uncertainty, % Type u_A	u_B	U	Calibration Method
Am-241	59.5	157860	———	1.374E+03	0.3	1.5	3.1	4π LS
Cd-109	88.0	462.60	1.657E+05	1.887E+03	0.9	1.7	3.8	HPGe
Co-57	122.1	271.79	8.714E+04	9.923E+02	0.6	1.3	2.9	HPGe
Ce-139	165.9	137.6	1.237E+05	1.409E+03	0.5	1.1	2.4	HPGe
Hg-203	279.2	46.61	2.588E+05	2.947E+03	0.5	1.1	2.4	HPGe
Sn-113	391.7	115.1	1.737E+05	1.978E+03	0.6	1.1	2.5	HPGe
Cs-137	661.7	10983	1.109E+05	1.263E+03	0.7	1.2	2.8	HPGe
Y-88	898.0	106.6	4.154E+05	4.730E+03	0.7	1.1	2.6	HPGe
Co-60	1173.2	1925.4	2.050E+05	2.334E+03	0.8	1.1	2.7	HPGe
Co-60	1332.5	1925.4	2.054E+05	2.339E+03	0.9	1.1	2.8	HPGe
Y-88	1836.1	106.6	4.398E+05	5.008E+03	0.7	1.1	2.6	HPGe

* Master Source refers to Analytics' 8-isotope mixture which is calibrated quarterly.

Calibration Methods: 4π LS - 4 pi Liquid Scintillation Counting, HPGe - High Purity Germanium Gamma-Ray Spectrometer, IC - Ionization Chamber. **Uncertainty:** U - Relative expanded uncertainty, k = 2. See NIST Technical Note 1297, "Guidelines

Standards File. Gsstd11.std
Assay Date 07/01/2007 10:00
ID.: Geo 11 Std# 849 100g Mixed Gamma

Pk #	Nuclide	Energy	Halflife	Br.Ratio	dps/gm
1	Am-241	59.50	4.322E+02 yrs	0.35900	38.27
2	Cd-109	88.04	4.626E+02 dys	0.03610	522.72
3	Co-57	122.06	2.718E+02 dys	0.85510	11.60
4	Ce-139	165.85	1.376E+02 dys	0.85350	17.54
5	Hg-203	279.00	4.660E+01 dys	0.77300	38.12
6	Sn-113	391.68	1.151E+02 dys	0.64900	30.48
7	Cs-137	661.64	3.017E+01 yrs	0.85120	14.84
8	Y-88	898.02	1.066E+02 dys	0.93400	50.64
9	Co-60	1173.21	5.271E+00 yrs	0.99980	23.34
10	Co-60	1332.48	5.271E+00 yrs	0.99990	23.39
11	Y-88	1836.01	1.066E+02 dys	0.99380	50.39

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Geometry 11 Calibration Verification: Gamma Mixed Nuclide Source

Detector 9 Cal source=849

VER STD 826 **REF DATE : 7/1/2006** **Count Date: 1/15/2008**

FROM CALIBRATION CERTIFICATE				FROM ANALYTICS.LIB		EXPECTED ACTIVITY						
Isotope	KeV	Half Life(y)	Gammas/Sec.	Gamma Fraction:	Mass of Standard		DPS	pCi/g	Activity	Recovery	Pass/Fail	# of Half Lives Expired
Am-241	59.5	432.0000	1315	0.3590	100 g	Am-241	3663.0	990.0	1050	106%	Pass	0.00
Cd-109	88	1.2666	1861	0.0361		Cd-109	51551.2	13932.8	13700	98%	Pass	1.22
Co-57	122	0.7441	978.8	0.8560		Co-57	1143.5	309.0	331	107%	Pass	2.07
Ce-139	166	0.3768	1383	0.8035		Ce-139	1721.2	465.2	493	106%	Pass	4.09
Hg-203	279	0.1276	3069	0.8146		Hg-203	3767.5	1018.2	NR	>5 h-lives	>5 h-lives	12.08
Sn-113	392	0.3151	1958	0.6490		Sn-113	3016.9	815.4	875	107%	Pass	4.89
Cs-137	662	30.0000	1248	0.8521		Cs-137	1464.6	395.8	409	103%	Pass	0.05
Y-88	898	0.2919	4827	0.9340		Y-88	5168.1	1396.8	1370	98%	Pass	5.28
Co-60	1173	5.2714	2362	0.9997		Co-60	2362.7	638.6	646	101%	Pass	0.29
Co-60	1332	5.2714	2360	0.9998		Co-60	2360.5	638.0	654	103%	Pass	0.29
Y-88	1836	0.2919	5052	0.9938		Y-88	5083.5	1373.9	1410	103%	Pass	5.28

NR = NOT REPORTED

OK
MC
1/17/08

080017D09.SPC Analyzed by MC

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SEEKER G A M M A A N A L Y S I S R E S U L T S PS Version 1.8.4

Paragon Analytics, Div. of DataChem Lab
GammaScan

****

Geo.11 / Solid

Sample ID: 0813508-9 GEO11 CAL✓(826)

VERIF. MC 1/17/08

Sampling Start:	07/01/2006 10:00:00	Counting Start:	01/15/2008 20:41:08
Sampling Stop:	07/01/2006 10:00:00	Decay Time.	1.35E+004 Hrs
Buildup Time.	0.00E+000 Hrs	Live Time	1800 Sec
Sample Size	1.00E+002 g	Real Time	1944 Sec
Collection Efficiency	1.0000	Spc. File	.080017D09.SPC

Detector #: 9 (Detector 9)

Energy(keV) = 1.15 + 0.500*Ch + 0.00E+00*Ch^2 + 0.00E+00*Ch^3 01/15/2008

FWHM(keV) = 0.46 + 0.026*En + 4.17E-04*En^2 + 0.00E+00*En^3 01/14/2008

Where En = Sqrt(Energy in keV)

Search Sensitivity: 1.00 | Sigma Multiplier: 2.00 | Search Start/End: 80/4000

PEAK SEARCH RESULTS

PK. #	ENERGY (keV)	ADDRESS CHANNEL	NET/MDA COUNTS	UN-CERTAINTY	C.L. COUNTS	BKG COUNTS	FWHM (keV)	FLAG
1	49.41	96.60	3555	453	360	20504	1.26	a Wide Pk
2	59.48	116.74	147605	802	188	7837	0.67	a HiResid
3	65.36	128.51	186	111	88	2153	0.35	a Wide Pk
4	67.08	131.96	1470	419	339	14137	1.94	b
5	69.04	135.87	732	317	257	10480	1.24	c
6	77.90	153.61	247	125	99	2727	0.36	a
7	87.96	173.75	91200	628	140	4367	0.68	a HiResid
8	109.79	217.43	125	80	63	1099	0.40	a
9	122.12	242.12	26271	348	105	2202	0.83	a HiResid
10	136.53	270.96	3221	165	99	1967	0.86	a
11	146.05	290.00	88	133	109	2182	0.97	a NET< CL
12	165.90	329.75	7324	204	91	1677	0.83	a HiResid
13	199.27	396.52	249	135	108	2158	0.98	a
14	255.47	509.01	123	126	102	1932	0.92	a
15	260.04	518.15	111	111	89	1610	0.87	b
16	310.14	618.42	136	133	107	1969	1.21	a
17	379.69	757.62	85	138	113	2011	1.32	a NET< CL
18	391.77	781.82	2971	166	103	1821	1.10	a
19	422.29	842.90	60	142	116	2345	1.53	a NET< CL
20	511.08	1020.60	146	143	116	2104	1.79	a
21	661.68	1322.03	32195	375	88	1351	1.39	a HiResid
22	683.65	1366.00	84	90	72	1029	1.10	a
23	898.09	1795.18	2360	157	102	1905	1.58	a
24	1173.29	2345.99	29507	352	64	798	1.85	a HiResid

080017D09.SPC Analyzed by

PEAK SEARCH RESULTS

PK. #	ENERGY (keV)	ADDRESS CHANNEL	NET/MDA COUNTS	UN-CERTAINTY	C.L. COUNTS	BKG COUNTS	FWHM (keV)	FLAG
25	1332.57	2664.77	26488	329	40	295	1.97 a	HiResid
26	1836.02	3672.40	1320	76	19	58	2.38 a	

080017D09.SPC Analyzed by

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SEEKER B A C K G R O U N D S U B T R A C T R E S U L T S Vers. 2.2.1

Paragon Analytics, Div. of DataChem Lab
GammaScan

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Background File:. . . . . DET090114.BKG (080114-9 WEEKLY BACKGROUND)

Bkg.File Detector #: 9

==========

BACKGROUND SUBTRACT RESULTS

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PK#	ENERGY (keV)	OLD NET COUNTS	OLD UN-CERTAINTY	OLD CR.LEVEL	NEW NET COUNTS	NEW UN-CERTAINTY	NEW CR.LEVEL	FLAG
3	65.36	186	111	88	179	111	88	
6	77.90	247	125	99	243	125	99	
7	87.96	91200	628	140	91197	628	140	
11	146.05	88	133	109	87	133	109	NET<CL
13	199.27	249	135	108	244	135	108	
20	511.08	146	143	116	109	144	117	NET<CL
23	898.09	2360	157	102	2359	157	102	

080017D09.SPC Analyzed by

SEEKER **F I N A L A C T I V I T Y R E P O R T** Version 2.2.1

Paragon Analytics, Div. of DataChem Lab
GammaScan

Geo.11 / Solid

Sample ID: 0813508-9 GEO11 CAL (826)

VERIF. MC 1/17/08

Sampling Start:	07/01/2006 10:00:00	Counting Start:	01/15/2008 20:41:08
Sampling Stop:	07/01/2006 10:00:00	Decay Time.	1.35e+004 Hrs
Buildup Time.	0.00e+000 Hrs	Live Time	1800 Sec
Sample Size	1.00e+002 g	Real Time	1944 Sec
Collection Efficiency	1.0000	Spectrum File	.080017D09.SPC
Cr. Level Confidence Interval:	95 %	Det. Limit Confidence Interval:	95 %

Detector #: 9 (Detector 9)

Efficiency File: (D09)(Sh11).eff (Geo 11 Eff Cal)

*Eff=10^[-7.00E+00 +6.03E+00*L +-1.56E+00*L^2 +0.00E+00*L^3] 01/15/2008

Eff.= EXP[1.49E+00 + -8.33E-01 * En + -7.65E-03 * En^2] **Above** 180.00 keV

Library File: . . . .ANALYTICAL.LIB (Analytical)

MEASURED or MDA CONCENTRATIONS

Nuclide	ENERGY (keV)	NET	Concentration (pCi/g)	MDA	Critical Level	Halflife (hrs)
Am-241	59.54		1.05E+03 +- 5.68E+00	2.68E+00	1.33E+00	3.79E+06
Cd-109	88.02		1.37E+04 +- 9.42E+01	4.25E+01	2.11E+01	1.11E+04
Co-57	122.07		3.31E+02 +- 4.39E+00	2.67E+00	1.32E+00	6.50E+03
Ce-139	165.85		4.93E+02 +- 1.37E+01	1.25E+01	6.14E+00	3.30E+03
Sn-113	391.68		8.75E+02 +- 4.90E+01	6.16E+01	3.04E+01	2.76E+03
Cs-137	661.62		4.09E+02 +- 4.76E+00	2.27E+00	1.12E+00	2.64E+05
Y-88	Average:x		1.39E+03 +- 6.08E+01	. . . .	. . . .	2.56E+03
	898.02		1.37E+03 +- 9.12E+01	1.20E+02	5.90E+01	2.56E+03
	1836.01		1.41E+03 +- 8.15E+01	4.30E+01	2.00E+01	2.56E+03
Co-60	Average:x		6.50E+02 +- 5.60E+00	. . . .	. . . .	4.62E+04
	1173.21		6.46E+02 +- 7.72E+00	2.88E+00	1.41E+00	4.62E+04
	1332.48		6.54E+02 +- 8.13E+00	2.04E+00	9.87E-01	4.62E+04
Hg-203	279.18		MDA	5.06E+03	2.50E+03	1.12E+03

MEASURED TOTAL: 1.89E+04 +- 2.38E+02 pCi/g

UNKNOWN,SUM or ESCAPE PEAKS

PK. #	ENERGY (keV)	ADDRESS CHANNEL	NET COUNTS	UN-CERTAINTY	C.L. COUNTS	BKG COUNTS	FWHM (keV)	FLAG
1	49.41	96.60	3555	453	360	20504	1.26	Unknown
3	65.36	128.51	179	111	88	2153	0.35	Unknown

080017D09.SPC Analyzed by

UNKNOWN,SUM or ESCAPE PEAKS

PK. #	ENERGY (keV)	ADDRESS CHANNEL	NET COUNTS	UN-CERTAINTY	C.L. COUNTS	BKG COUNTS	FWHM (keV)	FLAG
4	67.08	131.96	1470	419	339	14137	1.94	Unknown
5	69.04	135.87	732	317	257	10480	1.24	Unknown
6	77.90	153.62	243	125	99	2727	0.36	Unknown
8	109.79	217.43	125	80	63	1099	0.40	Unknown
10	136.53	270.96	3221	165	99	1967	0.86	Unknown
11	146.05	290.00	87	133	109	2182	0.97	Deleted
13	199.27	396.52	244	135	108	2158	0.98	Unknown
14	255.47	509.01	123	126	102	1932	0.92	Unknown
15	260.04	518.15	111	111	89	1610	0.87	Unknown
16	310.14	618.42	136	133	107	1969	1.21	1333DEsc
17	379.69	757.62	85	138	113	2011	1.32	Deleted
19	422.29	842.90	60	142	116	2345	1.53	Deleted
20	511.08	1020.60	109	144	117	2104	1.79	Deleted
22	683.65	1366.00	84	90	72	1029	1.10	Unknown

ANALYTICS
An Isotope Products Laboratories Company

1380 Seaboard Industrial Blvd.
Atlanta, Georgia 30318
Tel 404·352·8677
Fax 404·352·2837

Gamma Spectroscopy

Quality Control Data

Weekly Background Calibrations

Paragon Analytics

Gamma Spectrometer Calibration Log

Date: 5-30-08

Reviewed By/Date: MJC 5-30-08

Det. No.	Out Of Service	Background		Source Check			Repeat Source Check			
		Started	OK	Started	OK	Failed Parameter(s)	OK	Failed Parameter(s)	Corrective Action Taken **	Removed from Service
1.	MJC									
2.		MJC	GB°	MJC	MJC					
3.				MJC	MJC					
4.				MJC	MJC					
5.	MJC	*								
6.			GB	MJC	MJC					
7.				MJC		60 KeV FWHM	MJC			
8.				MJC	MJC					
9.				MJC	MJC					
10.			☆	MJC		60 KeV centroid 662 KeV Centroid		60 KeV Centroid 662 KeV Centroid		MJC

** Corrective Action: * Weekly background NOT started on Detector # 5. MJC 5-30-08

☆ Failed 50 → 150 KeV Bkg
↓ 40 → 50 KeV Bkg

° GAIN SHIFT; RECOUNT. MC 6/1/08

365458 A

080936D06.SPC Analyzed by MC

****

SEEKER GAMMA ANALYSIS RESULTS PS Version 1.8.4

Paragon Analytics, Div. of DataChem Lab
GammaScan

****

Weekly Background Check

Sample ID: 080530-6 WEEKLY BACKGROUND

Sampling Start:	05/30/2008 15:11:02	Counting Start:	05/30/2008 15:11:02
Sampling Stop:	05/30/2008 15:11:02	Decay Time.	0.00E+000 Hrs
Buildup Time.	0.00E+000 Hrs	Live Time	60000 Sec
Sample Size	1.00E+000 L	Real Time	60029 Sec
Collection Efficiency	1.0000	Spc. File	.080936D06.SPC

Detector #: 6 (Detector 6)

Energy(keV)= -0.57 + 0.501*Ch + 0.00E+00*Ch^2 + 0.00E+00*Ch^3 05/30/2008

FWHM(keV) = 0.79 + 0.009*En + 6.42E-04*En^2 + 0.00E+00*En^3 07/24/2007

Where En = Sqrt(Energy in keV)

Search Sensitivity: 1.00 | Sigma Multiplier: 2.00 | Search Start/End: 80/4000

PEAK SEARCH RESULTS

PK. #	ENERGY (keV)	ADDRESS CHANNEL	NET/MDA COUNTS	UN-CERTAINTY	C.L. COUNTS	BKG COUNTS	FWHM (keV)	FLAG
1	53.64	108.30	97	128	104	1495	1.64 a	NET< CL Wide Pk
2	66.59	134.17	166	79	61	754	0.75 a	
3	84.55	170.05	63	78	63	726	0.95 a	
4	92.80	186.53	178	87	68	795	1.09 a	
5	140.02	280.86	159	68	52	541	0.86 a	Wide Pk
6	143.27	287.38	91	109	88	1082	1.66 b	
7	163.52	327.82	28	47	38	352	0.51 a	NET< CL
8	186.02	372.77	108	67	53	562	0.84 a	
9	198.40	397.50	157	51	37	334	0.57 a	
10	238.75	478.12	130	64	49	480	0.82 a	
11	332.51	665.43	48	63	50	501	1.10 a	NET< CL
12	352.25	704.87	85	51	39	344	0.85 a	
13	504.12	1008.29	39	40	31	224	0.79 a	Wide Pk
14	508.18	1016.39	16	34	27	180	0.67 b	NET< CL
15	511.30	1022.63	1336	118	76	718	2.55 c	
16	558.63	1117.17	150	50	36	249	1.19 a	
17	569.76	1139.42	76	50	38	287	1.08 a	
18	583.36	1166.59	52	50	39	288	1.32 a	
19	609.59	1218.98	68	48	37	289	0.97 a	
20	651.46	1302.64	31	30	23	125	0.72 a	
21	803.42	1606.23	111	43	31	199	1.29 a	
22	898.31	1795.81	38	26	19	90	0.82 a	
23	911.79	1822.73	68	56	44	272	2.57 a	Wide Pk

080936D06.SPC Analyzed by

PEAK SEARCH RESULTS

PK. #	ENERGY (keV)	ADDRESS CHANNEL	NET/MDA COUNTS	UN-CERTAINTY	C.L. COUNTS	BKG COUNTS	FWHM (keV)	FLAG
24	962.65	1924.34	97	50	38	218	2.27	a
25	1461.49	2920.93	310	44	21	89	1.80	a
26	1764.66	3526.60	43	28	20	68	2.37	a

080936D06.SPC Analyzed by

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SEEKER B A C K G R O U N D Q. C. A N A L Y S I S Version 2.2.2

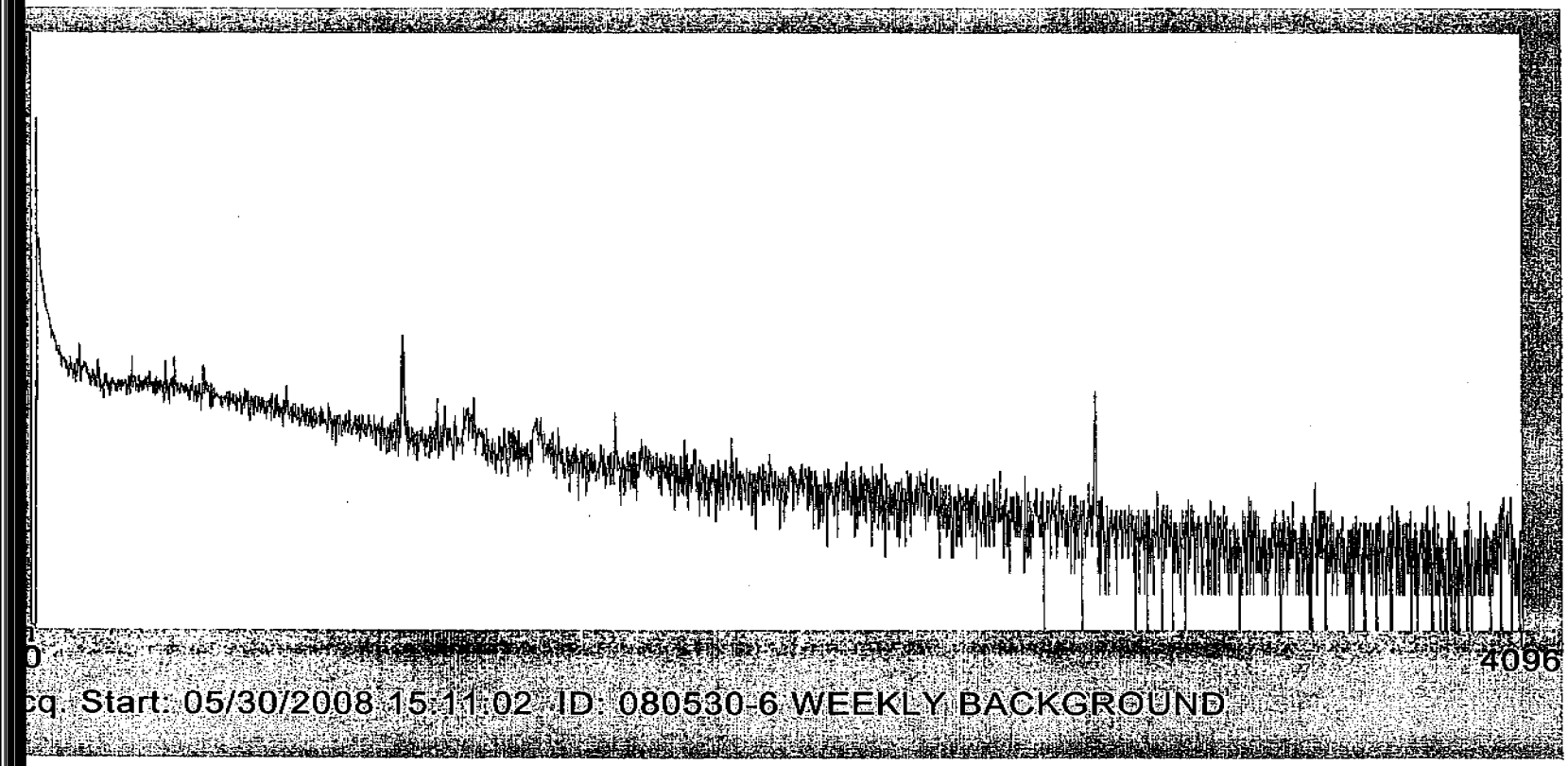
****

ID: 080530-6 WEEKLY BACKGROUND

Detector # 6 Background Q.C. Analysis for 05/30/2008 15:11:02

#	Parameter	Value	n Sigma Test	Bounds Test	T-Test
10	50-> 150 keV Bkg	25.208	N.A.	Pass	N.A.
11	150-> 250 keV Bkg	21.417	N.A.	Pass	N.A.
12	250-> 500 keV Bkg	31.715	N.A.	Pass	N.A.
13	500->1000 keV Bkg	30.505	N.A.	Pass	N.A.
14	1000->2000 keV Bkg	17.148	N.A.	Pass	N.A.
15	40-> 50 keV Bkg	3.667	N.A.	Pass	N.A.

Q.C. Results Saved.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4096
cq. Start: 05/30/2008 15:11:02 ID: 080530-6 WEEKLY BACKGROUND

081087D08.SPC Analyzed by MC

****

SEEKER G A M M A A N A L Y S I S R E S U L T S PS Version 1.8.4

Paragon Analytics, Div. of DataChem Lab
GammaScan

****

Weekly Background Check

Sample ID: 080530-8 WEEKLY BACKGROUND

Sampling Start:	05/30/2008 15:11:41	Counting Start:	05/30/2008 15:11:41
Sampling Stop:	05/30/2008 15:11:41	Decay Time.	0.00E+000 Hrs
Buildup Time.	0.00E+000 Hrs	Live Time	60000 Sec
Sample Size	1.00E+000 L	Real Time	60183 Sec
Collection Efficiency	1.0000	Spc. File	.081087D08.SPC

Detector #: 8 (Detector 8)

Energy(keV)= -1.45 + 0.501*Ch + 2.08E-07*Ch^2 + 0.00E+00*Ch^3 05/30/2008

FWHM(keV) = 0.61 + 0.011*En + 6.87E-04*En^2 + 0.00E+00*En^3 06/13/2007

Where En = Sqrt(Energy in keV)

Search Sensitivity: 1.00 | Sigma Multiplier: 2.00 | Search Start/End: 80/4000

PEAK SEARCH RESULTS

PK. #	ENERGY (keV)	ADDRESS CHANNEL	NET/MDA COUNTS	UN-CERTAINTY	C.L. COUNTS	BKG COUNTS	FWHM (keV)		FLAG
1	46.55	95.88	542	86	59	708	0.78	a	
2	53.55	109.86	119	64	49	542	0.65	a	
3	63.32	129.37	625	87	59	694	0.82	a	HiResid Wide Pk
4	66.32	135.36	316	98	75	972	1.13	b	HiResid
5	69.02	140.76	50	52	41	417	0.43	c	HiResid
6	70.93	144.57	192	115	92	1250	1.40	d	HiResid
7	74.93	152.56	353	99	75	972	1.11	e	HiResid
8	77.21	157.12	318	80	59	694	0.90	f	HiResid
9	84.71	172.11	157	101	80	1023	1.25	a	Wide Pk
10	87.42	177.51	111	62	48	511	0.69	b	
11	90.11	182.89	70	61	48	511	0.65	c	
12	92.77	188.19	724	87	56	639	0.85	d	
13	98.48	199.60	49	86	69	821	1.20	a	NET< CL
14	112.90	228.39	50	48	38	349	0.41	a	
15	139.84	282.19	147	62	47	486	0.70	a	
16	144.02	290.55	54	49	38	365	0.42	b	
17	159.47	321.41	48	47	37	344	0.56	a	
18	185.92	374.23	334	73	52	538	0.86	a	
19	194.44	391.24	96	88	70	780	1.35	a	
20	198.47	399.29	323	85	63	683	1.13	b	
21	205.94	414.21	62	89	72	813	1.33	a	NET< CL
22	238.67	479.56	293	75	55	563	0.96	a	
23	295.24	592.51	101	43	32	247	0.51	a	

081087D08.SPC Analyzed by

PEAK SEARCH RESULTS

PK. #	ENERGY (keV)	ADDRESS CHANNEL	NET/MDA COUNTS	UN-CERTAINTY	C.L. COUNTS	BKG COUNTS	FWHM (keV)		FLAG
24	352.08	705.99	218	58	41	339	0.84	a	
25	421.42	844.41	44	57	46	361	1.17	a	NET< CL
26	434.07	869.66	38	39	31	209	0.57	a	
27	452.61	906.67	39	43	34	233	0.74	a	
28	489.16	979.64	32	35	27	183	0.60	a	
29	511.28	1023.78	1629	126	80	814	2.48	a	Wide Pk
30	537.84	1076.78	17	34	27	176	0.62	a	NET< CL
31	558.92	1118.85	187	49	34	243	1.04	a	
32	570.10	1141.17	95	71	56	491	1.86	a	
33	583.65	1168.21	96	49	37	274	1.16	a	
34	592.65	1186.18	8	32	26	170	0.65	a	NET< CL
35	609.71	1220.22	281	80	60	560	1.78	a	
36	693.12	1386.65	29	44	35	258	1.02	a	NET< CL Wide Pk
37	695.49	1391.39	128	107	86	817	3.04	b	
38	803.50	1606.88	148	48	34	219	1.35	a	
39	911.82	1822.94	91	41	30	180	1.38	a	
40	962.52	1924.05	61	35	26	148	1.12	a	
41	969.83	1938.65	64	53	41	274	2.10	b	
42	1121.36	2240.81	27	25	19	89	0.88	a	
43	1461.62	2919.05	191	40	24	109	1.75	a	
44	1765.77	3524.99	58	35	26	95	3.17	a	

081087D08.SPC Analyzed by

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SEEKER B A C K G R O U N D Q. C. A N A L Y S I S Version 2.2.2

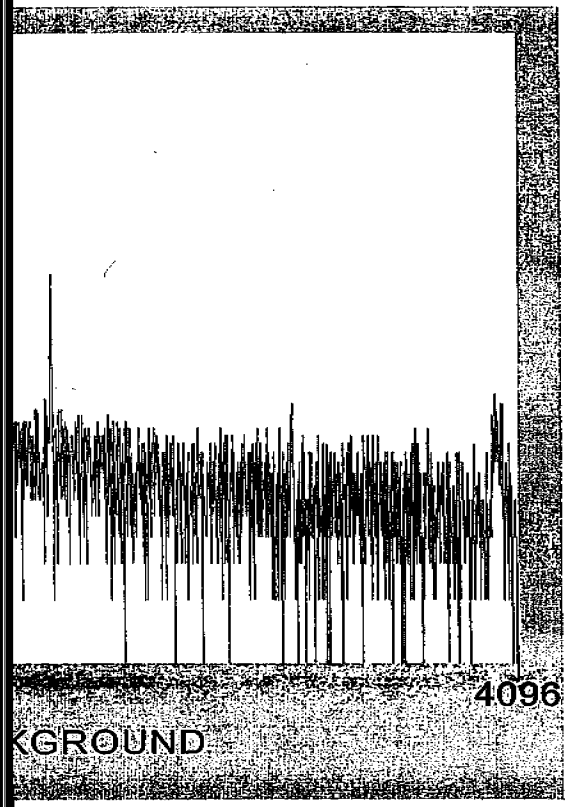
****

ID: 080530-8 WEEKLY BACKGROUND

Detector # 8 Background Q.C. Analysis for 05/30/2008 15:11:41

#	Parameter	Value	n Sigma Test	Bounds Test	T-Test
10	50-> 150 keV Bkg	28.253	N.A.	Pass	N.A.
11	150-> 250 keV Bkg	21.623	N.A.	Pass	N.A.
12	250-> 500 keV Bkg	32.764	N.A.	Pass	N.A.
13	500->1000 keV Bkg	35.838	N.A.	Pass	N.A.
14	1000->2000 keV Bkg	20.096	N.A.	Pass	N.A.
15	40-> 50 keV Bkg	3.685	N.A.	Pass	N.A.

Q.C. Results Saved.


4096
KGROUND

080727D09.SPC Analyzed by MC

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SEEKER G A M M A A N A L Y S I S R E S U L T S PS Version 1.8.4

Paragon Analytics, Div. of DataChem Lab
GammaScan

****

Weekly Background Check

Sample ID: 080530-9 WEEKLY BACKGROUND

Sampling Start:	05/30/2008 15:12:00	Counting Start:	05/30/2008 15:12:00
Sampling Stop:	05/30/2008 15:12:00	Decay Time.	0.00E+000 Hrs
Buildup Time.	0.00E+000 Hrs	Live Time	60000 Sec
Sample Size	1.00E+000 L	Real Time	60029 Sec
Collection Efficiency	1.0000	Spc. File	.080727D09.SPC

Detector #: 9 (Detector 9)

Energy(keV) = 1.20 + 0.500*Ch + 0.00E+00*Ch^2 + 0.00E+00*Ch^3 05/30/2008
FWHM(keV) = 0.46 + 0.026*En + 4.17E-04*En^2 + 0.00E+00*En^3 01/14/2008
Where En = Sqrt(Energy in keV)

Search Sensitivity: 1.00 | Sigma Multiplier: 2.00 | Search Start/End: 80/4000

PEAK SEARCH RESULTS

PK. #	ENERGY (keV)	ADDRESS CHANNEL	NET/MDA COUNTS	UN-CERTAINTY	C.L. COUNTS	BKG COUNTS	FWHM (keV)	FLAG
1	46.53	90.70	426	71	47	500	0.66 a	
2	53.55	104.73	68	52	40	400	0.43 a	
3	55.18	108.00	17	39	31	267	0.34 b	NET< CL
4	63.31	124.27	431	72	48	520	0.66 a	
5	66.33	130.31	164	83	65	780	0.91 b	
6	74.89	147.44	138	45	31	272	0.40 a	
7	77.12	151.90	126	74	58	679	0.74 b	
8	84.57	166.81	92	80	64	751	0.99 a	
9	87.49	172.64	30	49	39	376	0.43 b	NET< CL
10	92.59	182.85	593	91	63	733	0.92 a	
11	139.88	277.46	96	64	50	501	0.87 a	
12	143.91	285.54	102	89	71	801	1.35 b	
13	149.14	295.99	38	53	42	394	0.60 a	NET< CL
14	167.19	332.11	54	68	55	550	1.01 a	NET< CL
15	185.92	369.59	248	68	49	493	0.79 a	
16	198.45	394.65	108	56	43	413	0.60 a	
17	205.07	407.91	25	43	34	289	0.46 a	NET< CL
18	238.83	475.45	227	50	33	261	0.56 a	
19	245.81	489.41	29	40	32	250	0.49 a	NET< CL
20	279.30	556.42	43	39	30	220	0.55 a	
21	295.49	588.81	55	52	41	343	0.82 a	
22	338.68	675.23	48	63	50	433	1.08 a	NET< CL
23	352.15	702.18	94	61	48	385	1.06 a	
24	511.21	1020.42	1248	115	75	692	2.60 a	Wide Pk

080727D09.SPC Analyzed by

PEAK SEARCH RESULTS

PK. #	ENERGY (keV)	ADDRESS CHANNEL	NET/MDA COUNTS	UN-CERTAINTY	C.L. COUNTS	BKG COUNTS	FWHM (keV)	FLAG
25	558.71	1115.46	111	49	36	260	1.11	a
26	569.88	1137.81	60	44	34	242	0.99	a
27	583.50	1165.06	74	48	37	256	1.28	a
28	609.50	1217.08	57	42	32	236	0.89	a
29	669.72	1337.57	38	45	36	237	1.32	a
30	803.33	1604.89	97	40	28	164	1.25	a
31	897.87	1794.04	46	38	29	163	1.49	a
32	911.58	1821.48	48	33	25	132	1.20	a
33	962.15	1922.66	37	34	26	144	1.27	a
34	1210.00	2418.54	21	22	17	70	0.94	a
35	1461.16	2921.08	133	36	22	88	2.13	a

080727D09.SPC Analyzed by

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SEEKER B A C K G R O U N D Q. C. A N A L Y S I S Version 2.2.2

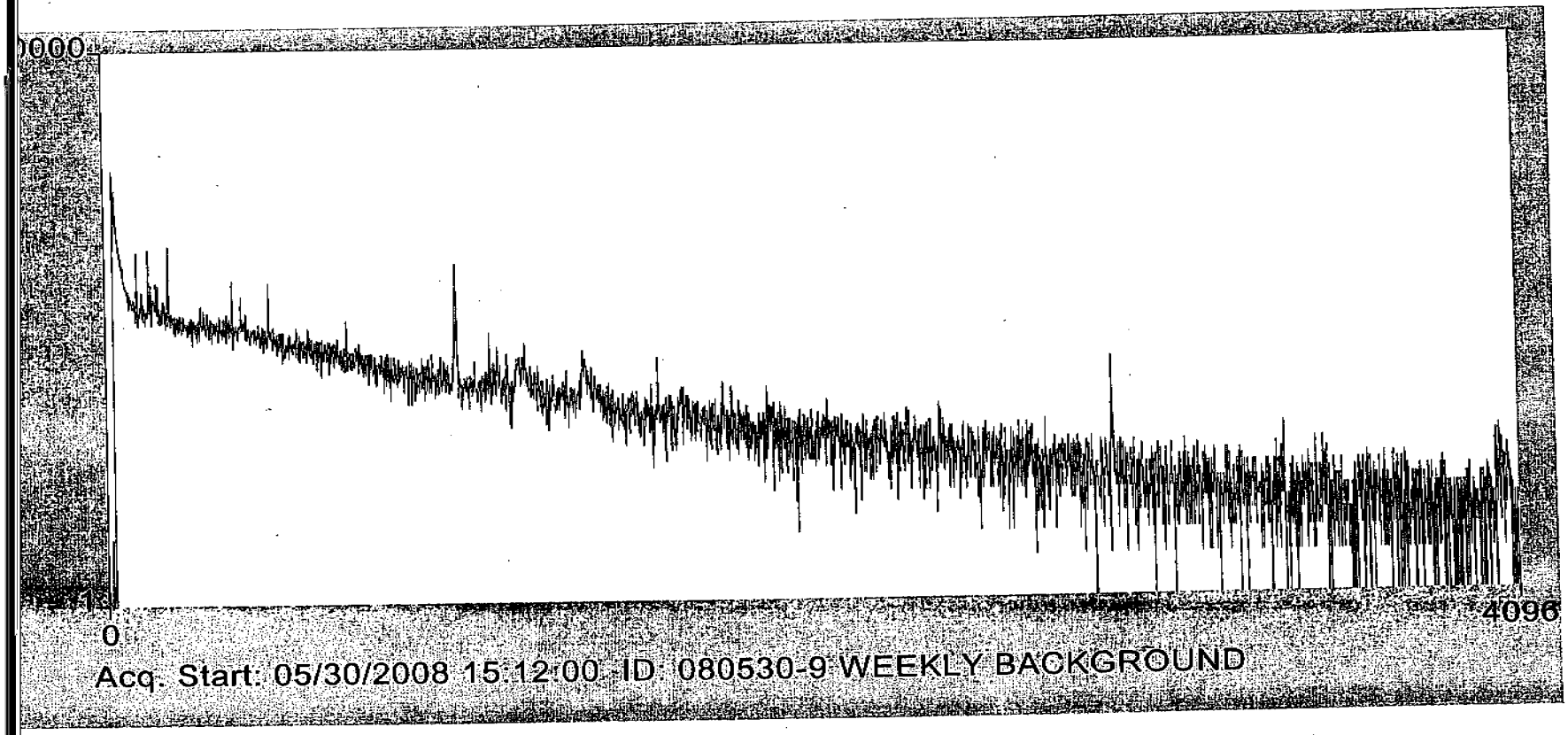
****

ID: 080530-9 WEEKLY BACKGROUND

Detector # 9 Background Q.C. Analysis for 05/30/2008 15:12:00

#	Parameter	Value	n Sigma Test	Bounds Test	T-Test
10	50-> 150 keV Bkg	24.823	N.A.	Pass	N.A.
11	150-> 250 keV Bkg	19.141	N.A.	Pass	N.A.
12	250-> 500 keV Bkg	27.979	N.A.	Pass	N.A.
13	500->1000 keV Bkg	28.748	N.A.	Pass	N.A.
14	1000->2000 keV Bkg	16.468	N.A.	Pass	N.A.
15	40-> 50 keV Bkg	3.261	N.A.	Pass	N.A.

Q.C. Results Saved.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4096
Acq. Start: 05/30/2008 15:12:00 ID: 080530-9 WEEKLY BACKGROUND

Paragon Analytics

Gamma Spectrometer Calibration Log

Date: 6-6-08

Reviewed By/Date: MC 6/7/08

Det. No.	Out Of Service	Background		Source Check			Repeat Source Check			
		Started	OK	Started	OK	Failed Parameter(s)	OK	Failed Parameter(s)	Corrective Action Taken **	Removed from Service
1.	MHC	✓	✓	✓	✓					
2.		MHC	MC°	MHC	MHC					
3.		MHC	↓	↓	↓					
4.		MHC	↓	↓	↓					
5.	MHC	✓	✓	✓	✓					
6.		MHC	MC	MHC	MHC					
7.		↓	↓	↓	✓	662 keV centroid/FWHM 1332 keV centroid/FWHM	✓	662 keV FWHM	Pole zero + gain adj	no
8.		↓	↓	↓	MHC					
9.		↓	↓	↓	↓					
10.	MHC	↓	↓	↓	MHC					

** Corrective Action: ° DETECTOR PASSED ALL R.O.I'S, HOWEVER, A SLIGHT GAIN SHIFT WAS EVIDENCED FOR THE 1460 keV LINE. RECOUNT.

MC 6/7/08

365470 A

080971D06.SPC Analyzed by MC

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SEEKER G A M M A A N A L Y S I S R E S U L T S PS Version 1.8.4

Paragon Analytics, Div. of DataChem Lab
GammaScan

****

Weekly Background Check

Sample ID: 080606-6 WEEKLY BACKGROUND

Sampling Start:	06/06/2008 12:00:00	Counting Start:	06/06/2008 15:51:54
Sampling Stop:	06/06/2008 12:00:00	Decay Time.	3.87E+000 Hrs
Buildup Time.	0.00E+000 Hrs	Live Time	60000 Sec
Sample Size	1.00E+000 L	Real Time	60033 Sec
Collection Efficiency	1.0000	Spc. File	.080971D06.SPC

Detector #: 6 (Detector 6)

Energy(keV) = -0.52 + 0.501*Ch + 0.00E+00*Ch^2 + 0.00E+00*Ch^3 06/06/2008
FWHM(keV) = 0.79 + 0.009*En + 6.42E-04*En^2 + 0.00E+00*En^3 07/24/2007
Where En = Sqrt(Energy in keV)

Search Sensitivity: 1.00 | Sigma Multiplier: 2.00 | Search Start/End: 80/4000

PEAK SEARCH RESULTS

PK. #	ENERGY (keV)	ADDRESS CHANNEL	NET/MDA COUNTS	UN-CERTAINTY	C.L. COUNTS	BKG COUNTS	FWHM (keV)	FLAG
1	53.46	107.81	56	55	44	474	0.45 a	
2	66.53	133.93	135	81	64	825	0.83 a	
3	70.25	141.37	70	57	45	495	0.47 b	
4	75.20	151.24	63	56	44	478	0.46 a	
5	92.82	186.44	93	51	39	374	0.52 a	
6	98.30	197.39	33	48	38	358	0.48 a	NET< CL
7	139.97	280.62	119	80	63	744	0.92 a	
8	159.43	319.51	56	48	38	348	0.51 a	
9	172.46	345.53	35	100	82	983	1.48 a	NET< CL
10	185.78	372.14	125	69	54	583	0.83 a	
11	198.48	397.50	171	78	61	677	0.97 a	
12	238.94	478.33	75	46	35	307	0.54 a	

080971D06.SPC Analyzed by

PEAK SEARCH RESULTS

PK. #	ENERGY (keV)	ADDRESS CHANNEL	NET/MDA COUNTS	UN-CERTAINTY	C.L. COUNTS	BKG COUNTS	FWHM (keV)	FLAG
25	898.97	1796.79	64	46	36	214	1.91	a
26	911.56	1821.94	47	40	31	181	1.69	a
27	1461.66	2920.80	294	42	21	82	1.87	a
28	1631.28	3259.64	23	20	14	45	1.36	a
29	1765.35	3527.45	49	26	18	63	1.76	a

080971D06.SPC Analyzed by

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SEEKER B A C K G R O U N D Q. C. A N A L Y S I S Version 2.2.2

****

ID: 080606-6 WEEKLY BACKGROUND

Detector # 6 Background Q.C. Analysis for 06/06/2008 15:51:54

#	Parameter	Value	n Sigma Test	Bounds Test	T-Test
10	50-> 150 keV Bkg	26.552	N.A.	Pass	N.A.
11	150-> 250 keV Bkg	21.976	N.A.	Pass	N.A.
12	250-> 500 keV Bkg	32.642	N.A.	Pass	N.A.
13	500->1000 keV Bkg	31.872	N.A.	Pass	N.A.
14	1000->2000 keV Bkg	17.423	N.A.	Pass	N.A.
15	40-> 50 keV Bkg	3.714	N.A.	Pass	N.A.

Q.C. Results Saved.

4096

080769D09.SPC Analyzed by MC

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SEEKER G A M M A A N A L Y S I S R E S U L T S PS Version 1.8.4

Paragon Analytics, Div. of DataChem Lab
GammaScan

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Weekly Background Check

Sample ID: 080606-9 WEEKLY BACKGROUND

Sampling Start:	06/06/2008 12:00:00	Counting Start:	06/06/2008 15:53:05
Sampling Stop:	06/06/2008 12:00:00	Decay Time.	3.88E+000 Hrs
Buildup Time.	0.00E+000 Hrs	Live Time	60000 Sec
Sample Size	1.00E+000 L	Real Time	60033 Sec
Collection Efficiency	1.0000	Spc. File	.080769D09.SPC

Detector #: 9 (Detector 9)

Energy(keV) = 1.21 + 0.500*Ch + 0.00E+00*Ch^2 + 0.00E+00*Ch^3 06/06/2008
FWHM(keV) = 0.46 + 0.026*En + 4.17E-04*En^2 + 0.00E+00*En^3 01/14/2008
Where En = Sqrt(Energy in keV)

Search Sensitivity: 1.00 | Sigma Multiplier: 2.00 | Search Start/End: 80/4000

PEAK SEARCH RESULTS

PK. #	ENERGY (keV)	ADDRESS CHANNEL	NET/MDA COUNTS	UN-CERTAINTY	C.L. COUNTS	BKG COUNTS	FWHM (keV)	FLAG
1	46.51	90.66	400	73	50	559	0.65 a	
2	53.22	104.08	49	82	66	809	0.90 a	NET< CL
3	57.45	112.56	51	41	31	270	0.40 a	
4	63.27	124.19	470	73	48	511	0.69 a	Wide Pk
5	66.14	129.95	336	104	80	1023	1.29 b	
6	69.71	137.09	138	119	96	1278	1.65 c	
7	72.93	143.53	214	111	88	1151	1.45 d	
8	74.91	147.49	207	56	39	384	0.48 e	
9	76.88	151.44	185	83	64	767	0.96 f	
10	84.36	166.41	123	80	64	746	1.04 a	
11	87.13	171.95	66	69	56	622	0.75 b	
12	92.65	183.00	522	82	56	632	0.78 a	
13	109.11	215.94	36	45	36	316	0.53 a	
14	139.94	277.65	127	67	52	539	0.83 a	
15	143.82	285.42	54	46	36	324	0.44 b	
16	185.76	369.34	194	76	58	627	0.93 a	
17	198.58	395.02	135	65	50	495	0.83 a	
18	238.76	475.41	195	63	47	443	0.82 a	
19	245.07	488.04	45	64	52	496	0.96 a	NET< CL
20	254.22	506.37	47	40	31	240	0.49 a	
21	269.77	537.48	36	39	31	232	0.52 a	

PEAK SEARCH RESULTS

PK. #	ENERGY (keV)	ADDRESS CHANNEL	NET/MDA COUNTS	UN-CERTAINTY	C.L. COUNTS	BKG COUNTS	FWHM (keV)	FLAG
25	352.15	702.36	126	53	39	313	0.88 a	
26	385.47	769.04	36	51	41	309	0.98 a	NET< CL
27	511.20	1020.68	1198	117	78	748	2.56 a	Wide Pk
28	558.64	1115.61	170	50	35	240	1.14 a	
29	569.77	1137.88	39	39	30	208	0.79 a	
30	583.20	1164.77	77	43	32	223	1.01 a	
31	598.67	1195.74	85	70	56	485	1.77 a	
32	609.29	1216.99	118	58	44	359	1.32 a	
33	670.28	1339.04	31	41	32	205	1.14 a	NET< CL
34	803.39	1605.45	109	46	33	207	1.58 a	
35	1461.21	2921.98	129	36	23	93	2.22 a	

080769D09.SPC Analyzed by

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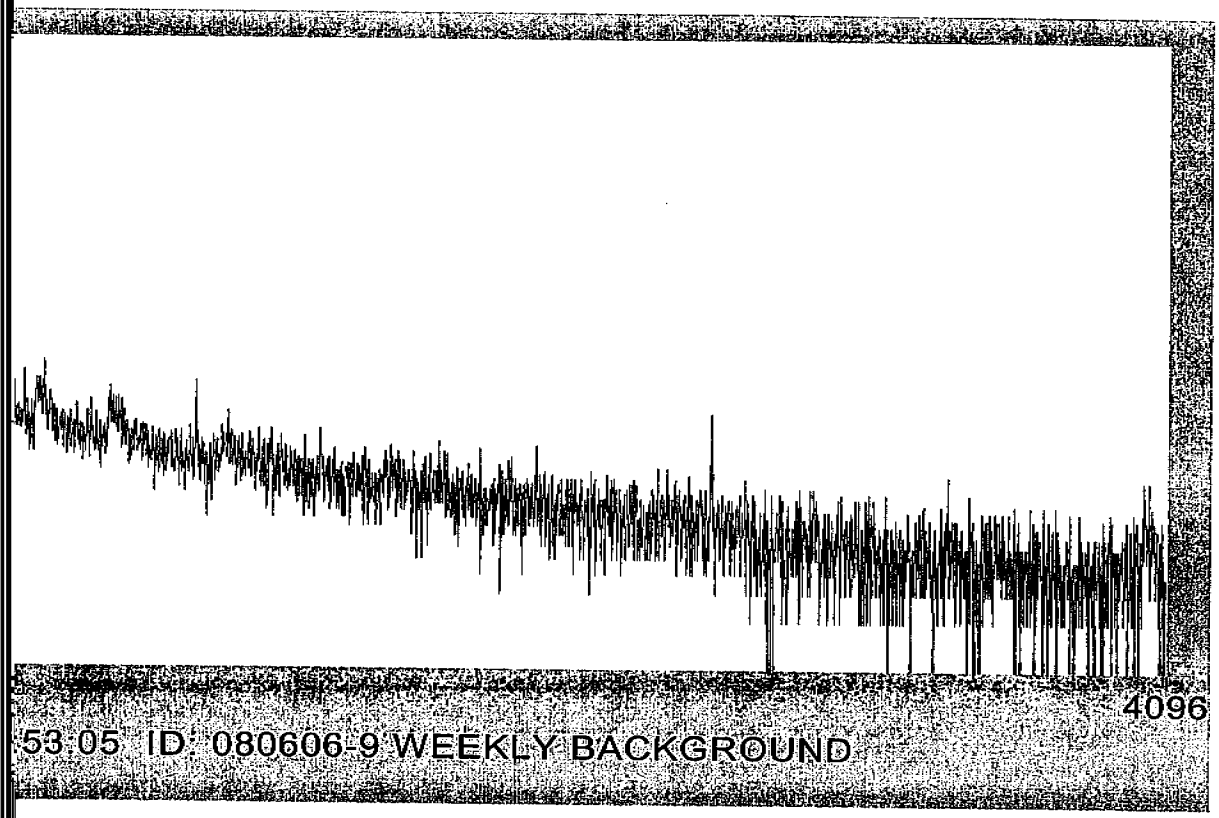
SEEKER B A C K G R O U N D Q. C. A N A L Y S I S Version 2.2.2

****

ID: 080606-9 WEEKLY BACKGROUND

Detector # 9 Background Q.C. Analysis for 06/06/2008 15:53:05

#	Parameter	Value	n Sigma Test	Bounds Test	T-Test
10	50-> 150 keV Bkg	25.866	N.A.	Pass	N.A.
11	150-> 250 keV Bkg	19.443	N.A.	Pass	N.A.
12	250-> 500 keV Bkg	29.360	N.A.	Pass	N.A.
13	500->1000 keV Bkg	29.520	N.A.	Pass	N.A.


4096
53.05 ID: 080606-9 WEEKLY BACKGROUND

Gamma Spectroscopy

Quality Control Data

Daily Instrument Performance Checks

ANALYTICS

1380 Seaboard Industrial Blvd.
Atlanta, Georgia 30318 · U.S.A.

Phone (404) 352-8677
Fax (404) 352-2837

CERTIFICATE OF CALIBRATION

Standard Radionuclide Source

PAII 0720

66354A-307

215 Grams of Sand in Metal Can

This standard radionuclide source was prepared using aliquots measured gravimetrically from master radionuclide solution sources. The Am-241 was calibrated by 4 pi alpha liquid scintillation counting. All other radionuclides were calibrated using a germanium gamma spectrometer system. Calibration and purity were checked using a germanium gamma spectrometer system. At the time of calibration no interfering gamma-ray emitting impurities were detected. The gamma-ray emission rates for the most intense gamma-ray lines are given. Analytics maintains traceability to the National Institute of Standards and Technology through a Measurements Assurance Program as described in USNRC Regulatory Guide 4.15, Rev. 1, February, 1979.

Calibration date: July 1, 2003 12:00 EST

ISOTOPE	GAMMA-RAY ENERGY	HALF-LIFE		GAMMA-RAYS PER SECOND	TOTAL UNCERTAINTY %
Am-241	59.5	432	y	1316	3.0
Cd-109	88	462.6	d	1879	3.3
Co-57	122	271.79	d	1042	2.8
Ce-139	166	137.6	d	1432	2.8
Hg-203	279	46.61	d	3223	2.7
Sn-113	392	115.1	d	1978	2.6
Cs-137	662	30.07	y	1272	3.0
Y-88	898	106.6	d	5106	2.6
Co-60	1173	5.2714	y	2424	2.7
Co-60	1332	5.2714	y	2449	2.6
Y-88	1836	106.6	d	5335	2.6

Approximately 126.5 mL of customer supplied sand.
P O NUMBER EW060303, Item 4

SOURCE PREPARED BY: M. D. Currie
M. D. Currie, Radiochemist

Q A APPROVED: LM. Mitz 8-1-03

This standard will expire one year after the calibration date.

ANALYTICS

RSO #767

1380 Seaboard Industrial Blvd.
Atlanta, Georgia 30318 - U.S.A.

ANALYTICS

1380 Seaboard Industrial Blvd.
Atlanta, Georgia 30318 · U.S.A.

Phone (404) 352-8677
Fax (404) 352-2837

PAI ID 0636
rec'd 8-02-02

CERTIFICATE OF CALIBRATION

Standard Radionuclide Source

64122-307

215 Grams of Sand in Metal Can

This standard radionuclide source was prepared using aliquots measured gravimetrically from master radionuclide solution sources. The Am-241 was calibrated by 4 pi alpha liquid scintillation counting. All other radionuclides were calibrated using a germanium gamma spectrometer system. Calibration and purity were checked using a germanium gamma spectrometer system. At the time of calibration no interfering gamma-ray emitting impurities were detected. The gamma-ray emission rates for the most intense gamma-ray lines are given. Analytics maintains traceability to the National Institute of Standards and Technology through a Measurements Assurance Program as described in USNRC Regulatory Guide 4.15, Rev. 1, February, 1979.

Calibration date: July 1, 2002 12:00 EST

ISOTOPE	GAMMA-RAY ENERGY	HALF-LIFE		GAMMA-RAYS PER SECOND	TOTAL UNCERTAINTY %
Am-241	59.5	432	y	1301	5.0
Cd-109	88	462.6	d	1882	5.0
Co-57	122	271.79	d	994.2	4.7
Ce-139	166	137.6	d	1420	4.3
Hg-203	279	46.61	d	3085	4.1
Sn-113	392	115.1	d	2094	4.1
Cs-137	662	30.07	y	1320	4.8
Y-88	898	106.6	d	4847	4.2
Co-60	1173	5.2714	y	2354	4.1
Co-60	1332	5.2714	y	2382	4.2
Y-88	1836	106.6	d	5068	4.0

Approximately 140 mL customer supplied sand.
P O NUMBER EW060602, Item 4

SOURCE PREPARED BY: MTaskaeva
M. Taskaeva Radiochemist

Q A APPROVED: [illegible] 7/31/02

This standard will expire one year after the calibration date.

RSO #720 was opened and split into multiple LSC vials, as shown

720.3020.47	-1	35.8071 g (BeO12)
	-2	36.1586 g
	-3	36.1325
	-4	36.0040
	-5	36.4197
	-6	34.5663

PROJECT 767.3020.48

Notebook No.

Continued From Page

RSO #767 was opened and split into multiple LSC vials, to be used a γ check sources, as shown

767.3020.48-	7	36.6640 g	(Bal (2))
	8	36.1856 g	
	9	36.3396 g	
	10	35.9937 g	
	11	36.7952 g	
	12	33.1100 g	

10/30/06

Continued on Page

Read and Understood By

Signed

10/30/06

Date

Signed

Date

RSO # 636 was opened and split into multiple LSC vials, to be used as daily check sources, as shown

636.3020.49 - 13	34.2237 g	(Bal 12)
14	33.7917	
15	34.6628	
16	34.1622	
17	34.2401	
18	34.6838	

Paragon Analytics

Gamma Spectrometer Calibration Log

Date: 6-5-08

Reviewed By/Date: MDC 6-5-08

Det. No.	Out Of Service	Background		Source Check			Repeat Source Check			
		Started	OK	Started	OK	Failed Parameter(s)	OK	Failed Parameter(s)	Corrective Action Taken **	Removed from Service
1.	MDC			/	/					
2.				MDC	MDC					
3.				↓	↓					
4.				↓	↓					
5.	MDC			/	/					
6.				MDC	MDC					
7.				↓	/	*	/	1332 KeV Centroid 1332 KeV FWHM	Pole zero. gain adj.	MDC
8.				↓	MDC					
9.				↓	↓					
10.	MDC			/	/					

** Corrective Action:

* 662 KeV centroid
662 KeV FWHM
1332 KeV Centroid
1332 KeV FWHM

365468 A

Form 754r13a.doc (7/20/07)

080957D06.SPC Analyzed by MJC

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SEEKER D E T E C T O R Q. C. A N A L Y S I S Version 2.2.2

****

ID: DAILY CHECK
Detector # 6 Detector Q.C. Analysis for 06/05/2008 08:46:05
Standards File #: 98 (Daily Performance Check)

#	Parameter	Value	n Sigma Test	Bounds Test	T-Test
1	60 keV Centroid	120.147	N.A.	Pass	N.A.
2	60 keV FWHM	8.573E-01	N.A.	Pass	N.A.
3	60 keV Efficiency	8.562E-03	N.A.	Pass	N.A.
4	662 keV Centroid	1323.429	N.A.	Pass	N.A.
5	662 keV FWHM	1.352	N.A.	Pass	N.A.
6	662 keV Efficiency	2.755E-02	N.A.	Pass	N.A.
7	1332 keV Centroid	2664.047	N.A.	Pass	N.A.
8	1332 keV FWHM	2.040	N.A.	Pass	N.A.
9	1332 keV Efficiency	3.733E-02	N.A.	Pass	N.A.

Q.C. Results Saved.

081116D08.SPC Analyzed by MHC

****

SEEKER D E T E C T O R Q. C. A N A L Y S I S Version 2.2.2

****

ID: DAILY CHECK

Detector # 8 Detector Q.C. Analysis for 06/05/2008 08:46:34

Standards File #: 98 (Daily Performance Check)

#	Parameter	Value	n Sigma Test	Bounds Test	T-Test
1	60 keV Centroid	122.094	N.A.	Pass	N.A.
2	60 keV FWHM	7.052E-01	N.A.	Pass	N.A.
3	60 keV Efficiency	8.869E-02	N.A.	Pass	N.A.
4	662 keV Centroid	1324.997	N.A.	Pass	N.A.
5	662 keV FWHM	1.308	N.A.	Pass	N.A.
6	662 keV Efficiency	3.035E-02	N.A.	Pass	N.A.
7	1332 keV Centroid	2663.943	N.A.	Pass	N.A.
8	1332 keV FWHM	1.918	N.A.	Pass	N.A.
9	1332 keV Efficiency	4.636E-02	N.A.	Pass	N.A.

Q.C. Results Saved.

080756D09.SPC Analyzed by MLK

****

SEEKER D E T E C T O R Q. C. A N A L Y S I S Version 2.2.2

****

ID: DAILY CHECK

Detector # 9 Detector Q.C. Analysis for 06/05/2008 08:46:50

Standards File #: 97 (Daily Performance Check(S SOURCES 1-12))

#	Parameter	Value	n Sigma Test	Bounds Test	T-Test
1	60 keV Centroid	116.709	N.A.	Pass	N.A.

Paragon Analytics

Gamma Spectrometer Calibration Log

Date: 6-6-08

Reviewed By/Date: MC 6/7/08

Det. No.	Out Of Service	Background		Source Check			Repeat Source Check			
		Started	OK	Started	OK	Failed Parameter(s)	OK	Failed Parameter(s)	Corrective Action Taken **	Removed from Service
1.	MHO	/	/	/	/					
2.		MHO	MC	MHO	MHO					

080966D06.SPC Analyzed by NAE

****

SEEKER D E T E C T O R Q. C. A N A L Y S I S Version 2.2.2

****

ID: DAILY CHECK

Detector # 6 Detector Q.C. Analysis for 06/06/2008 09:28:36

Standards File #: 98 (Daily Performance Check)

#	Parameter	Value	n Sigma Test	Bounds Test	T-Test
1	60 keV Centroid	119.996	N.A.	Pass	N.A.
2	60 keV FWHM	8.441E-01	N.A.	Pass	N.A.
3	60 keV Efficiency	9.238E-03	N.A.	Pass	N.A.
4	662 keV Centroid	[illegible]	[illegible]	[illegible]	[illegible]

081126D08.SPC Analyzed by [illegible]

****

SEEKER D E T E C T O R Q. C. A N A L Y S I S Version 2.2.2

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ID: DAILY CHECK
Detector # 8 Detector Q.C. Analysis for 06/06/2008 09:29:06
Standards File #: 98 (Daily Performance Check)

#	Parameter	Value	n Sigma Test	Bounds Test	T-Test
1	60 keV Centroid	121.837	N.A.	Pass	N.A.
2	60 keV FWHM	7.015E-01	N.A.	Pass	N.A.
3	60 keV Efficiency	8.756E-02	N.A.	Pass	N.A.
4	662 keV Centroid	1324.275	N.A.	Pass	N.A.
5	662 keV FWHM	1.348	N.A.	Pass	N.A.
6	662 keV Efficiency	2.991E-02	N.A.	Pass	N.A.
7	1332 keV Centroid	2662.695	N.A.	Pass	N.A.
8	1332 keV FWHM	1.814	N.A.	Pass	N.A.
9	1332 keV Efficiency	4.527E-02	N.A.	Pass	N.A.

Q.C. Results Saved.

080764D09.SPC Analyzed by [illegible]

****

Paragon Analytics

Gamma Spectrometer Calibration Log

Date: 6/7/08

Reviewed By/Date: MG 6-9-08

Det. No.	Out Of Service	Background		Source Check			Repeat Source Check			
		Started	OK	Started	OK	Failed Parameter(s)	OK	Failed Parameter(s)	Corrective Action Taken **	Removed from Service
1.	MC			MC 6/7/08 M	✓					
2.		MC	MG	MC	MC					
3.				↓	↓					
4.				↓	↓					
5.	MC			✓	✓					
6.				MC	MC					
7.				↓	✓	662 CENT.	✓	1332 FWHM 662 ↓	GAIN ADJUST.	MC
8.				↓	MC					
9.				↓	✓	662 FWHM	MC			
10.	MC			↓	✓	60 CENT.	✓		GAIN ADJUST.	MC

** Corrective Action:

365472 A

080770D09.SPC Analyzed by MC

****

SEEKER D E T E C T O R Q. C. A N A L Y S I S Version 2.2.2

****

ID: DAILY CK

Detector # 9 Detector Q.C. Analysis for 06/07/2008 10:23:51

Standards File #: 97 (Daily Performance Check(S SOURCES 1-12))

#	Parameter	Value	n Sigma Test	Bounds Test	T-Test
1	60 keV Centroid	116.714	N.A.	Pass	N.A.
2	60 keV FWHM	7.201E-01	N.A.	Pass	N.A.
3	60 keV Efficiency	5.296E-02	N.A.	Pass	N.A.
4	662 keV Centroid	1322.164	N.A.	Pass	N.A.
5	662 keV FWHM	1.265	N.A.	<FAIL>	N.A.
6	662 keV Efficiency	1.270E-02	N.A.	Pass	N.A.
7	1332 keV Centroid	2665.061	N.A.	Pass	N.A.
8	1332 keV FWHM	1.888	N.A.	Pass	N.A.
9	1332 keV Efficiency	7.094E-03	N.A.	Pass	N.A.

080771D09.SPC Analyzed by MC

****

SEEKER D E T E C T O R Q. C. A N A L Y S I S Version 2.2.2

****

ID: DAILY CK

Detector # 9 Detector Q.C. Analysis for 06/07/2008 11:08:51

Standards File #: 97 (Daily Performance Check(S SOURCES 1-12))

#	Parameter	Value	n Sigma Test	Bounds Test	T-Test
1	60 keV Centroid	116.625	N.A.	Pass	N.A.
2	60 keV FWHM	7.206E-01	N.A.	Pass	N.A.
3	60 keV Efficiency	5.274E-02	N.A.	Pass	N.A.
4	662 keV Centroid	1321.946	N.A.	Pass	N.A.
5	662 keV FWHM	1.376	N.A.	Pass	N.A.
6	662 keV Efficiency	1.291E-02	N.A.	Pass	N.A.
7	1332 keV Centroid	2664.701	N.A.	Pass	N.A.
8	1332 keV FWHM	1.902	N.A.	Pass	N.A.
9	1332 keV Efficiency	6.944E-03	N.A.	Pass	N.A.

Paragon Analytics

Gamma Spectrometer Calibration Log

Date: 6/8/08

Reviewed By/Date: Mdo 6-9-08

Det. No.	Out Of Service	Background		Source Check			Repeat Source Check			
		Started	OK	Started	OK	Failed Parameter(s)	OK	Failed Parameter(s)	Corrective Action Taken **	Removed from Service
1.	QB			✓	✓					
2.				QB	QB					
3.				↓	QB					
4.				↓	QB					
5.	QB			✓	✓					
6.				QB	QB					
7.				↓	✓	1332 FWHM 662 ↓	✓	1332 FWHM		
8.				↓	QB					
9.				↓	QB					
10.	QB			✓	✓					

** Corrective Action:

365473 A

080773D09.SPC Analyzed by

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SEEKER D E T E C T O R Q. C. A N A L Y S I S Version 2.2.2

****

ID: DAILY CHECK
Detector # 9 Detector Q.C. Analysis for 06/08/2008 10:06:44
Standards File #: 97 (Daily Performance Check(S SOURCES 1-12))

#	Parameter	Value	n Sigma Test	Bounds Test	T-Test
1	60 keV Centroid	116.722	N.A.	Pass	N.A.
2	60 keV FWHM	7.151E-01	N.A.	Pass	N.A.
3	60 keV Efficiency	5.288E-02	N.A.	Pass	N.A.
4	662 keV Centroid	1322.263	N.A.	Pass	N.A.
5	662 keV FWHM	1.339	N.A.	Pass	N.A.
6	662 keV Efficiency	1.382E-02	N.A.	Pass	N.A.
7	1332 keV Centroid	2665.144	N.A.	Pass	N.A.
8	1332 keV FWHM	1.800	N.A.	Pass	N.A.
9	1332 keV Efficiency	7.066E-03	N.A.	Pass	N.A.

Paragon Analytics

Gamma Spectrometer Calibration Log

Date: 6-9-08

Reviewed By/Date: MSK 6-9-08

Det. No.	Out Of Service	Background		Source Check			Repeat Source Check			
		Started	OK	Started	OK	Failed Parameter(s)	OK	Failed Parameter(s)	Corrective Action Taken **	Removed from Service
1.	MSK			/	/					
2.				MSK	MSK					
3.				↓	↓					
4.				↓	↓					
5.	MSK			/	/					
6.				MSK	MSK					
7.				↓	/	662 KeV FWHM 1332 KeV Centroid 1332 KeV FWHM				
8.				↓	MSK					MSK
9.				↓	/	60 KeV FWHM	MSK			
10.	MSK			↓	/	1332 KeV centroid	/	60 KeV Centroid	gain adj.	MSK

.** Corrective Action:

365474 A

080977D06.SPC Analyzed by MJC

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SEEKER D E T E C T O R Q. C. A N A L Y S I S Version 2.2.2

****

ID: DAILY CHECK
Detector # 6 Detector Q.C. Analysis for 06/09/2008 09:15:34
Standards File #: 98 (Daily Performance Check)

#	Parameter	Value	n Sigma Test	Bounds Test	T-Test
1	60 keV Centroid	120.026	N.A.	Pass	N.A.
2	60 keV FWHM	8.459E-01	N.A.	Pass	N.A.
3	60 keV Efficiency	9.464E-03	N.A.	Pass	N.A.
4	662 keV Centroid	1322.610	N.A.	Pass	N.A.
5	662 keV FWHM	1.407	N.A.	Pass	N.A.
6	662 keV Efficiency	2.922E-02	N.A.	Pass	N.A.
7	1332 keV Centroid	2662.614	N.A.	Pass	N.A.
8	1332 keV FWHM	1.962	N.A.	Pass	N.A.
9	1332 keV Efficiency	3.527E-02	N.A.	Pass	N.A.

Q.C. Results Saved.

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Paragon Analytics

Gamma Spectrometer Calibration Log

Date: 6-10-07

080986D06.SPC Analyzed by

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SEEKER D E T E C T O R Q. C. A N A L Y S I S Version 2.2.2

****

ID: DAILY CHECK
Detector # 6 Detector Q.C. Analysis for 06/10/2008 09:08:09
Standards File #: 98 (Daily Performance Check)

#	Parameter	Value	n Sigma Test	Bounds Test	T-Test
1	60 keV Centroid	120.201	N.A.	Pass	N.A.
2	60 keV FWHM	8.438E-01	N.A.	Pass	N.A.
3	60 keV Efficiency	8.997E-03	N.A.	Pass	N.A.
4	662 keV Centroid	1323.277	N.A.	Pass	N.A.
5	662 keV FWHM	1.522	N.A.	Pass	N.A.
6	662 keV Efficiency	2.849E-02	N.A.	Pass	N.A.
7	1332 keV Centroid	2663.943	N.A.	Pass	N.A.
8	1332 keV FWHM	1.942	N.A.	Pass	N.A.
9	1332 keV Efficiency	3.559E-02	N.A.	Pass	N.A.

Q.C. Results Saved.

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