Paragon Analytics

Radiochemistry Case Narrative
Isotopic Polonium

CSU Dep't Ecological Radiological Health Sciences

Tissue Samples

PA WO 0805200

1. This report consists of the analytical results and supporting documentation for 27 tissue samples received by Paragon on 05/29/08.
2. These samples were prepared according to procedures PA SOP773R10 and PA SOP711R7. Modifications were made to the method as described on QASS 365713.
3. The samples were analyzed for the presence of Polonium-210 according to procedure PA SOP714R11. The analyses were completed on 06/15/08.
4. The isotopic analysis results for these samples are reported on an 'as received' basis in units of pCi/gram.
5. Due to insufficient sample volume, a laboratory control sample duplicate (LCSD) was prepared in lieu of a prep batch duplicate for both batches.
6. 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.
7. The tracer recovery for samples 0805200-3, -7, -11, -14, -15, -30, the method blank and laboratory control sample associated with batch PL080606-3 is within the requested 20-110% limit. However, in such cases PA assumes a 100% quantitative recovery in the calculations. While the 'Tracer Yield' on the report form shows the observed recovery, an 'Y1' flag signifies this calculation convention. Results are submitted without further qualification.
8. Paragon Analytics follows the convention outlined in ANSI N42.23 for reporting significant digits in the TPU and MDC results. ANSI N42.23 states that the TPU result should be rounded to two significant digits and that the MDC result should be rounded to the same decimal place as the TPU result. In practice, this could result in an MDC result with a reported value of 0 for samples with significant activity, including the batch laboratory control sample.
9. 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
Radiochemistry Primary Reviewer

06/23/08
Date

Radiochemistry Final Data Review

6/24/08
Date

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PARAGON ANALYTICS
Radiochemistry Data Package

Section 1

CHAIN OF CUSTODY

Paragon Analytics

Sample Number(s) Cross-Reference Table

Paragon OrderNum: 0805200
Client Name: CSU Dep't Ecological Radiological Health Scie
Client Project Name: Tissue samples
Client Project Number:
Client PO Number:

Client Sample Number	Lab Sample Number	COC Number	Matrix	Date Collected	Time Collected
CSUPR-1	0805200-1	liver	TISSUE	20-May-08	
CSUPR-2	0805200-2	lung	TISSUE	20-May-08	
CSUPR-3	0805200-3	muscle	TISSUE	20-May-08	
CSUPR-4	0805200-4	bone	TISSUE	20-May-08	
CSUPR-5	0805200-5	liver	TISSUE	20-May-08	
CSUPR-6	0805200-6	lung	TISSUE	20-May-08	
CSUPR-7	0805200-7	muscle	TISSUE	20-May-08	
CSUPR-8	0805200-8	bone	TISSUE	20-May-08	
CSUPR-9	0805200-9	liver	TISSUE	20-May-08	
CSUPR-10	0805200-10	lung	TISSUE	20-May-08	
CSUPR-11	0805200-11	muscle	TISSUE	20-May-08	
CSUPR-12	0805200-12	bone	TISSUE	20-May-08	
CSUPR-13	0805200-13	liver	TISSUE	19-May-08	
CSUPR-14	0805200-14	lung	TISSUE	19-May-08	
CSUPR-15	0805200-15	muscle	TISSUE	19-May-08	
CSUPR-16	0805200-16	bone	TISSUE	19-May-08	
CSUPR-17	0805200-17	liver	TISSUE	19-May-08	
CSUPR-18	0805200-18	lung	TISSUE	19-May-08	
CSUPR-19	0805200-19	muscle	TISSUE	19-May-08	
CSUPR-20	0805200-20	bone	TISSUE	19-May-08	
CSUPR-21	0805200-21	liver	TISSUE	19-May-08	
CSUPR-22	0805200-22	lung	TISSUE	19-May-08	
CSUPR-23	0805200-23	muscle	TISSUE	19-May-08	
CSUPR-24	0805200-24	bone	TISSUE	19-May-08	
CSUPR-25	0805200-25	carcass	TISSUE	20-May-08	
CSUPR-26	0805200-26	liver	TISSUE	07-Apr-08	
CSUPR-27	0805200-27	lung	TISSUE	07-Apr-08	
CSUPR-28	0805200-28	muscle	TISSUE	07-Apr-08	
CSUPR-29	0805200-29	bone	TISSUE	07-Apr-08	
CSUPR-30	0805200-30	liver	TISSUE	12-Apr-08	
CSUPR-31	0805200-31	lung	TISSUE	12-Apr-08	
CSUPR-32	0805200-32	muscle	TISSUE	12-Apr-08	

Paragon Analytics

Sample Number(s) Cross-Reference Table

Paragon OrderNum: 0805200
Client Name: CSU Dep't Ecological Radiological Health Scie
Client Project Name: Tissue samples
Client Project Number:
Client PO Number:

Client Sample Number	Lab Sample Number	COC Number	Matrix	Date Collected	Time Collected
CSUPR-33	0805200-33	bone	TISSUE	12-Apr-08	
CSUPR-34	0805200-34	liver	TISSUE	13-Apr-08	
CSUPR-35	0805200-35	lung	TISSUE	13-Apr-08	
CSUPR-36	0805200-36	muscle	TISSUE	13-Apr-08	
CSUPR-37	0805200-37	bone	TISSUE	13-Apr-08	

COC for CSU Tissue Samples received 5/27/08 0805200

Samples delivered from Ward Whicker at CSU to Paragon Analytics on May 27, 2009

Sample #	LabID	species	tissue	Collection Date	Analytes requested U-nat	Th-230	Ra-226	Po-210	Pb-210
CSUPR-1	1	CTAIL	liver	5/20/2008		X		X	X
CSUPR-2	2	CTAIL	lung	5/20/2008				X	X
CSUPR-3	3	CTAIL	muscle	5/20/2008	X			X	
CSUPR-4	4	‡ CTAIL	bone	5/20/2008	X	X	X		X
CSUPR-5	5	CTAIL	liver	5/20/2008		X		X	X
CSUPR-6	6	CTAIL	lung	5/20/2008				X	X
CSUPR-7	7	CTAIL	muscle	5/20/2008	X			X	
CSUPR-8	8	‡ CTAIL	bone	5/20/2008	X	X	X		X
CSUPR-9	9	CTAIL	liver	5/20/2008		X		X	X
CSUPR-10	10	CTAIL	lung	5/20/2008				X	X
CSUPR-11	11	CTAIL	muscle	5/20/2008	X			X	
CSUPR-12	12	‡ CTAIL	bone	5/20/2008	X	X	X		X
CSUPR-13	13	JACK	liver	5/19/2008		X		X	X
CSUPR-14	14	JACK	lung	5/19/2008				X	X
CSUPR-15	15	JACK	muscle	5/19/2008	X			X	
CSUPR-16	16	‡ JACK	bone	5/19/2008	X	X	X		X
CSUPR-17	17	JACK	liver	5/19/2008		X		X	X
CSUPR-18	18	JACK	lung	5/19/2008				X	X
CSUPR-19	19	JACK	muscle	5/19/2008	X			X	
CSUPR-20	20	‡ JACK	bone	5/19/2008	X	X	X		X
CSUPR-21	21	JACK	liver	5/19/2008		X		X	X
CSUPR-22	22	JACK	lung	5/19/2008				X	X
CSUPR-23	23	JACK	muscle	5/19/2008	X			X	
CSUPR-24	24	‡ JACK	bone	5/19/2008	X	X	X		X
CSUPR-25	25	K-RAT	carcass	5/20/2008	X	X	X		X
CSUPR-26	26	COW	liver	4/7/2008	X	X		X	X
CSUPR-27	27	COW	lung	4/7/2008				X	X
CSUPR-28	28	COW	muscle	4/7/2008	X			X	
CSUPR-29	29	COW	bone	4/7/2008	X	X	X		X
CSUPR-30	30	COW	liver	4/12/2008	X	X		X	X
CSUPR-31	31	COW	lung	4/12/2008				X	X
CSUPR-32	32	COW	muscle	4/12/2008	X			X	
CSUPR-33	33	COW	bone	4/12/2008	X	X	X		X
CSUPR-34	34	COW	liver	4/13/2008	X	X		X	X
CSUPR-35	35	COW	lung	4/13/2008				X	X
CSUPR-36	36	COW	muscle	4/13/2008	X			X	
CSUPR-37	37	COW	bone	4/13/2008	X	X	X		X

‡ add'l bone (Femur and lower legs) recieved from Ward Whicker 6/5/08 ~ 4:30 pm 6/5/08

Note: original bone samples (all species) were scapula.

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

Client: CSU Workorder No: 0805200

Project Manager: LS Initials: CT Date: 5-29-08

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~~ CT 5-29-08	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):	~~13~~ CT 5-29-08							
No. of custody seals on cooler:	0							
DOT Survey/ Acceptance Information — External µR/hr reading:	NA							
Background µR/hr reading:	13							

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

Samples received frozen

If applicable, was the client contacted? **YES / NO / NA** Contact: _____ Date/Time: _____

Project Manager Signature / Date: 5/29/08

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

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

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PARAGON ANALYTICS
Radiochemistry Data Package

Section 2

SAMPLE RESULTS SUMMARY

Polonium-210 by Alpha Spectroscopy Sample Results Summary

Client Name: CSU Dep't Ecological Radiological Health Sciences
Client Project Name: Tissue samples
Client Project Number:

Laboratory Name: **Paragon Analytics**
PAI Work Order: 0805200

Reported on: Monday, June 23, 2008
5:01:03 PM

Lab Sample ID	Client Sample ID	Sample Type	Nuclide	Result +/- 2 s TPU	MDC	Units	Matrix	Prep Batch	Date Analyzed	Flags
0805200-1	CSUPR-1	Sample	Po-210	0.027 +/- 0.034	0.019	pCi/g	TISSUE	PL080606-3	6/13/2008	LT
0805200-2	CSUPR-2	Sample	Po-210	0.016 +/- 0.046	0.087	pCi/g	TISSUE	PL080606-3	6/13/2008	U
0805200-3	CSUPR-3	Sample	Po-210	-0.022 +/- 0.027	0.065	pCi/g	TISSUE	PL080606-3	6/13/2008	Y1,U
0805200-5	CSUPR-5	Sample	Po-210	0.021 +/- 0.035	0.052	pCi/g	TISSUE	PL080606-3	6/13/2008	U
0805200-6	CSUPR-6	Sample	Po-210	0.051 +/- 0.080	0.134	pCi/g	TISSUE	PL080606-3	6/13/2008	U
0805200-7	CSUPR-7	Sample	Po-210	-0.024 +/- 0.030	0.079	pCi/g	TISSUE	PL080606-3	6/13/2008	Y1,U
0805200-9	CSUPR-9	Sample	Po-210	-0.055 +/- 0.066	0.164	pCi/g	TISSUE	PL080606-3	6/13/2008	U
0805200-10	CSUPR-10	Sample	Po-210	0.026 +/- 0.032	0.048	pCi/g	TISSUE	PL080606-3	6/13/2008	U
0805200-11	CSUPR-11	Sample	Po-210	0.025 +/- 0.030	0.045	pCi/g	TISSUE	PL080606-3	6/13/2008	Y1,U

Comments:

Data Package ID: *PL0805200-1*

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

Polonium-210 by Alpha Spectroscopy Sample Results Summary

Client Name: CSU Dep't Ecological Radiological Health Sciences
Client Project Name: Tissue samples
Client Project Number:

Laboratory Name: **Paragon Analytics**
PAI Work Order: 0805200

Reported on: Monday, June 23, 2008
5:01:03 PM

Lab Sample ID	Client Sample ID	Sample Type	Nuclide	Result +/- 2 s TPU	MDC	Units	Matrix	Prep Batch	Date Analyzed	Flags
0805200-13	CSUPR-13	Sample	Po-210	0.044 +/- 0.051	0.078	pCi/g	TISSUE	PL080606-3	6/13/2008	U
0805200-14	CSUPR-14	Sample	Po-210	0 +/- 0.035	0.066	pCi/g	TISSUE	PL080606-3	6/14/2008	Y1,U
0805200-15	CSUPR-15	Sample	Po-210	0.025 +/- 0.024	0.013	pCi/g	TISSUE	PL080606-3	6/14/2008	Y1,LT
0805200-17	CSUPR-17	Sample	Po-210	0.029 +/- 0.054	0.094	pCi/g	TISSUE	PL080606-3	6/14/2008	U
0805200-18	CSUPR-18	Sample	Po-210	-0.006 +/- 0.029	0.056	pCi/g	TISSUE	PL080606-3	6/14/2008	U
0805200-19	CSUPR-19	Sample	Po-210	-0.005 +/- 0.038	0.077	pCi/g	TISSUE	PL080606-3	6/14/2008	U
0805200-21	CSUPR-21	Sample	Po-210	0.062 +/- 0.059	0.083	pCi/g	TISSUE	PL080606-3	6/14/2008	U
0805200-22	CSUPR-22	Sample	Po-210	0.019 +/- 0.032	0.047	pCi/g	TISSUE	PL080606-3	6/14/2008	U
0805200-23	CSUPR-23	Sample	Po-210	0 +/- 0.019	0.028	pCi/g	TISSUE	PL080606-3	6/15/2008	U

Comments:

Data Package ID: *PL0805200-1*

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

Polonium-210 by Alpha Spectroscopy Sample Results Summary

Client Name: CSU Dep't Ecological Radiological Health Sciences
Client Project Name: Tissue samples
Client Project Number:

Laboratory Name: **Paragon Analytics**
PAI Work Order: 0805200

Reported on: Monday, June 23, 2008
5:01:03 PM

Lab Sample ID	Client Sample ID	Sample Type	Nuclide	Result +/- 2 s TPU	MDC	Units	Matrix	Prep Batch	Date Analyzed	Flags
0805200-26	CSUPR-26	Sample	Po-210	0.74 +/- 0.17	0.08	pCi/g	TISSUE	PL080606-3	6/15/2008	
0805200-27	CSUPR-27	Sample	Po-210	0.29 +/- 0.10	0.02	pCi/g	TISSUE	PL080606-3	6/15/2008	
0805200-28	CSUPR-28	Sample	Po-210	0.094 +/- 0.072	0.087	pCi/g	TISSUE	PL080606-4	6/13/2008	LT
0805200-30	CSUPR-30	Sample	Po-210	0.141 +/- 0.066	0.047	pCi/g	TISSUE	PL080606-4	6/13/2008	Y1,LT
0805200-31	CSUPR-31	Sample	Po-210	0.166 +/- 0.081	0.070	pCi/g	TISSUE	PL080606-4	6/15/2008	LT
0805200-32	CSUPR-32	Sample	Po-210	0.027 +/- 0.033	0.018	pCi/g	TISSUE	PL080606-4	6/15/2008	LT
0805200-34	CSUPR-34	Sample	Po-210	0.025 +/- 0.060	0.109	pCi/g	TISSUE	PL080606-4	6/15/2008	U
0805200-35	CSUPR-35	Sample	Po-210	0.014 +/- 0.033	0.063	pCi/g	TISSUE	PL080606-4	6/15/2008	U
0805200-36	CSUPR-36	Sample	Po-210	0.043 +/- 0.079	0.136	pCi/g	TISSUE	PL080606-4	6/15/2008	U

Comments:

Data Package ID: *PL0805200-1*

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

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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: 0805200
Client Name: CSU Dep't Ecological Radiological Health Sciences
ClientProject ID: Tissue samples

Lab ID: PL080606-3MB

Sample Matrix: TISSUE
Prep SOP: PAI 711 Rev 7
Date Collected: 06-Jun-08
Date Prepared: 06-Jun-08
Date Analyzed: 15-Jun-08

Prep Batch: PL080606-3
QCBatchID: PL080606-3-1
Run ID: PL080606-3A
Count Time: 1000 minutes

Final Aliquot: 0.250 g
Result Units: pCi/g
File Name: Spectrum #1

CASNO	Target Nuclide	Result +/- 2 s TPU	MDC	Requested MDC	Lab Qualifier
13981-52-7	Po-210	0 +/- 0.033	0.072	0.25	Y1,U

Chemical Yield Summary

Carrier/Tracer	Amount Added	Result	Units	Yield	Control Limits	Flag
Po-209	14.42	14.6	pCi/g	102	20 - 110 %	Y1

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: *PL0805200-1*

Polonium-210 by Alpha Spectroscopy

PAI 714 Rev 11

Method Blank Results

Lab Name: **Paragon Analytics**
Work Order Number: 0805200
Client Name: CSU Dep't Ecological Radiological Health Sciences
ClientProject ID: Tissue samples

Lab ID: PL080606-4MB

Sample Matrix: TISSUE
Prep SOP: PAI 711 Rev 7
Date Collected: 06-Jun-08
Date Prepared: 06-Jun-08
Date Analyzed: 15-Jun-08

Prep Batch: PL080606-4
QCBatchID: PL080606-4-1
Run ID: PL080606-4A
Count Time: 1000 minutes

Final Aliquot: 0.250 g
Result Units: pCi/g
File Name: Spectrum #1

CASNO	Target Nuclide	Result +/- 2 s TPU	MDC	Requested MDC	Lab Qualifier
13981-52-7	Po-210	0.008 +/- 0.040	0.075	0.25	U

Chemical Yield Summary

Carrier/Tracer	Amount Added	Result	Units	Yield	Control Limits	Flag
Po-209	14.42	11.4	pCi/g	79.1	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.

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: *PL0805200-1*

Polonium-210 by Alpha Spectroscopy

PAI 714 Rev 11

Laboratory Control Sample(s)

Lab Name: **Paragon Analytics**
Work Order Number: 0805200
Client Name: CSU Dep't Ecological Radiological Health Sciences
ClientProject ID: Tissue samples

Lab ID: PL080606-3LCS

Sample Matrix: TISSUE
Prep SOP: PAI 711 Rev 7
Date Collected: 06-Jun-08
Date Prepared: 06-Jun-08
Date Analyzed: 15-Jun-08

Prep Batch: PL080606-3
QCBatchID: PL080606-3-1
Run ID: PL080606-3A
Count Time: 1000 minutes

Final Aliquot: 0.250 g
Result Units: pCi/g
File Name: Spectrum #1

CASNO	Target Nuclide	Results +/- 2s TPU	MDC	Spike Added	% Rec	Control Limits	Lab Qualifier
13981-52-7	Po-210	40.5 +/- 5.8	0.1	42.4	95.4	83 - 117	P,Y1

Chemical Yield Summary

Carrier/Tracer	Amount Added	Result	Units	Yield	Control Limits	Flag
Po-209	14.42	15.0	pCi/g	104	20 - 110 %	Y1

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: *PL0805200-1*

Polonium-210 by Alpha Spectroscopy

PAI 714 Rev 11

Laboratory Control Sample(s)

Lab Name: **Paragon Analytics**
Work Order Number: 0805200
Client Name: CSU Dep't Ecological Radiological Health Sciences
ClientProject ID: Tissue samples

Lab ID: PL080606-3LCSD

Sample Matrix: TISSUE
Prep SOP: PAI 711 Rev 7
Date Collected: 06-Jun-08
Date Prepared: 06-Jun-08
Date Analyzed: 15-Jun-08

Prep Batch: PL080606-3
QCBatchID: PL080606-3-1
Run ID: PL080606-3A
Count Time: 1000 minutes

Final Aliquot: 0.250 g
Result Units: pCi/g
File Name: Spectrum #1

CASNO	Target Nuclide	Results +/- 2s TPU	MDC	Spike Added	% Rec	Control Limits	Lab Qualifier
13981-52-7	Po-210	42.1 +/- 6.1	0	42.4	99.3	83 - 117	P

Chemical Yield Summary

Carrier/Tracer	Amount Added	Result	Units	Yield	Control Limits	Flag
Po-209	14.42	13.4	pCi/g	92.8	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: *PL0805200-1*

Polonium-210 by Alpha Spectroscopy

PAI 714 Rev 11

Laboratory Control Sample(s)

Lab Name: **Paragon Analytics**
Work Order Number: 0805200
Client Name: CSU Dep't Ecological Radiological Health Sciences
ClientProject ID: Tissue samples

Lab ID: PL080606-4LCS

Sample Matrix: TISSUE
Prep SOP: PAI 711 Rev 7
Date Collected: 06-Jun-08
Date Prepared: 06-Jun-08
Date Analyzed: 13-Jun-08

Prep Batch: PL080606-4
QCBatchID: PL080606-4-1
Run ID: PL080606-4A
Count Time: 1000 minutes

Final Aliquot: 0.250 g
Result Units: pCi/g
File Name: Spectrum #1

CASNO	Target Nuclide	Results +/- 2s TPU	MDC	Spike Added	% Rec	Control Limits	Lab Qualifier
13981-52-7	Po-210	38.9 +/- 5.6	0	42.4	91.7	83 - 117	P

Chemical Yield Summary

Carrier/Tracer	Amount Added	Result	Units	Yield	Control Limits	Flag
Po-209	14.42	14.3	pCi/g	99.3	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: *PL0805200-1*

Polonium-210 by Alpha Spectroscopy

PAI 714 Rev 11

Laboratory Control Sample(s)

Lab Name: **Paragon Analytics**
Work Order Number: 0805200
Client Name: CSU Dep't Ecological Radiological Health Sciences
ClientProject ID: Tissue samples

Lab ID: PL080606-4LCSD

Sample Matrix: TISSUE
Prep SOP: PAI 711 Rev 7
Date Collected: 06-Jun-08
Date Prepared: 06-Jun-08
Date Analyzed: 13-Jun-08

Prep Batch: PL080606-4
QCBatchID: PL080606-4-1
Run ID: PL080606-4A
Count Time: 1000 minutes

Final Aliquot: 0.250 g
Result Units: pCi/g
File Name: Spectrum #1

CASNO	Target Nuclide	Results +/- 2s TPU	MDC	Spike Added	% Rec	Control Limits	Lab Qualifier
13981-52-7	Po-210	42.5 +/- 6.1	0.1	42.4	100	83 - 117	P

Chemical Yield Summary

Carrier/Tracer	Amount Added	Result	Units	Yield	Control Limits	Flag
Po-209	14.42	14.1	pCi/g	97.6	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: *PL0805200-1*

Polonium-210 by Alpha Spectroscopy

PAI 714 Rev 11

Duplicate Sample Results (DER)

Lab Name: **Paragon Analytics**
Work Order Number: 0805200
Client Name: CSU Dep't Ecological Radiological Health Sciences
ClientProject ID: Tissue samples

Field ID:
Lab ID: PL080606-3LCSD

Sample Matrix: TISSUE
Prep SOP: PAI 711 Rev 7
Date Collected: 06-Jun-08
Date Prepared: 06-Jun-08
Date Analyzed: 15-Jun-08

Prep Batch: PL080606-3
QCBatchID: PL080606-3-1
Run ID: PL080606-3A
Count Time: 1000 minutes

Final Aliquot: 0.250 g
Prep Basis: As Received
Moisture(%): NA
Result Units: pCi/g
File Name: Spectrum #1

CASNO	Analyte	Sample Result +/- 2s TPU	Duplicate Result +/- 2s TPU	DER	Control Limit	Lab Qualifiers
13981-52-7	Po-210	40.5 +/- 5.8	42.1 +/- 6.1	0.20	2.13	P

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: *PL0805200-1*

Polonium-210 by Alpha Spectroscopy

PAI 714 Rev 11

Duplicate Sample Results (DER)

Lab Name: **Paragon Analytics**
Work Order Number: 0805200
Client Name: CSU Dep't Ecological Radiological Health Sciences
ClientProject ID: Tissue samples

Field ID:
Lab ID: PL080606-4LCSD

Sample Matrix: TISSUE
Prep SOP: PAI 711 Rev 7
Date Collected: 06-Jun-08
Date Prepared: 06-Jun-08
Date Analyzed: 13-Jun-08

Prep Batch: PL080606-4
QCBatchID: PL080606-4-1
Run ID: PL080606-4A
Count Time: 1000 minutes

Final Aliquot: 0.250 g
Prep Basis: As Received
Moisture(%): NA
Result Units: pCi/g
File Name: Spectrum #1

CASNO	Analyte	Sample Result +/- 2s TPU	Duplicate Result +/- 2s TPU	DER	Control Limit	Lab Qualifiers
13981-52-7	Po-210	38.9 +/- 5.6	42.5 +/- 6.1	0.44	2.13	P

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: *PL0805200-1*

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: 0805200
Client Name: CSU Dep't Ecological Radiological Health Sciences
ClientProject ID: Tissue samples

Field ID:	CSUPR-1
Lab ID:	0805200-1

Sample Matrix: TISSUE
Prep SOP: PAI 711 Rev 7
Date Collected: 20-May-08
Date Prepared: 06-Jun-08
Date Analyzed: 13-Jun-08

Prep Batch: PL080606-3
QCBatchID: PL080606-3-1
Run ID: PL080606-3A
Count Time: 1000 minutes
Report Basis: As Received

Final Aliquot: 0.279 g
Prep Basis: As Received
Moisture(%): NA
Result Units: pCi/g
File Name: Spectrum #1

CASNO	Target Nuclide	Result +/- 2 s TPU	MDC	Requested MDC	Lab Qualifier
13981-52-7	Po-210	0.027 +/- 0.034	0.019	0.25	LT

Chemical Yield Summary

Carrier/Tracer	Amount Added	Result	Units	Yield	Control Limits	Flag
Po-209	12.91	10.9	pCi/g	84.3	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: *PL0805200-1*

Polonium-210 by Alpha Spectroscopy

PAI 714 Rev 11

Sample Results

Lab Name: **Paragon Analytics**
Work Order Number: 0805200
Client Name: CSU Dep't Ecological Radiological Health Sciences
ClientProject ID: Tissue samples

Field ID:	CSUPR-2
Lab ID:	0805200-2

Sample Matrix: TISSUE
Prep SOP: PAI 711 Rev 7
Date Collected: 20-May-08
Date Prepared: 06-Jun-08
Date Analyzed: 13-Jun-08

Prep Batch: PL080606-3
QCBatchID: PL080606-3-1
Run ID: PL080606-3A
Count Time: 1000 minutes
Report Basis: As Received

Final Aliquot: 0.230 g
Prep Basis: As Received
Moisture(%): NA
Result Units: pCi/g
File Name: Spectrum #1

CASNO	Target Nuclide	Result +/- 2 s TPU	MDC	Requested MDC	Lab Qualifier
13981-52-7	Po-210	0.016 +/- 0.046	0.087	0.25	U

Chemical Yield Summary

Carrier/Tracer	Amount Added	Result	Units	Yield	Control Limits	Flag
Po-209	15.67	15.4	pCi/g	98.2	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: *PL0805200-1*

Polonium-210 by Alpha Spectroscopy

PAI 714 Rev 11

Sample Results

Lab Name: **Paragon Analytics**
Work Order Number: 0805200
Client Name: CSU Dep't Ecological Radiological Health Sciences
ClientProject ID: Tissue samples

Field ID:	CSUPR-3
Lab ID:	0805200-3

Sample Matrix: TISSUE
Prep SOP: PAI 711 Rev 7
Date Collected: 20-May-08
Date Prepared: 06-Jun-08
Date Analyzed: 13-Jun-08

Prep Batch: PL080606-3
QCBatchID: PL080606-3-1
Run ID: PL080606-3A
Count Time: 1000 minutes
Report Basis: As Received

Final Aliquot: 0.316 g
Prep Basis: As Received
Moisture(%): NA
Result Units: pCi/g
File Name: Spectrum #1

CASNO	Target Nuclide	Result +/- 2 s TPU	MDC	Requested MDC	Lab Qualifier
13981-52-7	Po-210	-0.022 +/- 0.027	0.065	0.25	Y1,U

Chemical Yield Summary

Carrier/Tracer	Amount Added	Result	Units	Yield	Control Limits	Flag
Po-209	11.40	11.6	pCi/g	102	20 - 110 %	Y1

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: *PL0805200-1*

Polonium-210 by Alpha Spectroscopy

PAI 714 Rev 11

Sample Results

Lab Name: **Paragon Analytics**
Work Order Number: 0805200
Client Name: CSU Dep't Ecological Radiological Health Sciences
ClientProject ID: Tissue samples

Field ID:	CSUPR-5
Lab ID:	0805200-5

Sample Matrix: TISSUE
Prep SOP: PAI 711 Rev 7
Date Collected: 20-May-08
Date Prepared: 06-Jun-08
Date Analyzed: 13-Jun-08

Prep Batch: PL080606-3
QCBatchID: PL080606-3-1
Run ID: PL080606-3A
Count Time: 1000 minutes
Report Basis: As Received

Final Aliquot: 0.250 g
Prep Basis: As Received
Moisture(%): NA
Result Units: pCi/g
File Name: Spectrum #1

CASNO	Target Nuclide	Result +/- 2 s TPU	MDC	Requested MDC	Lab Qualifier
13981-52-7	Po-210	0.021 +/- 0.035	0.052	0.25	U

Chemical Yield Summary

Carrier/Tracer	Amount Added	Result	Units	Yield	Control Limits	Flag
Po-209	14.42	13.8	pCi/g	95.5	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: *PL0805200-1*

Polonium-210 by Alpha Spectroscopy

PAI 714 Rev 11

Sample Results

Lab Name: **Paragon Analytics**
Work Order Number: 0805200
Client Name: CSU Dep't Ecological Radiological Health Sciences
ClientProject ID: Tissue samples

Field ID:	CSUPR-6
Lab ID:	0805200-6

Sample Matrix: TISSUE
Prep SOP: PAI 711 Rev 7
Date Collected: 20-May-08
Date Prepared: 06-Jun-08
Date Analyzed: 13-Jun-08

Prep Batch: PL080606-3
QCBatchID: PL080606-3-1
Run ID: PL080606-3A
Count Time: 1000 minutes
Report Basis: As Received

Final Aliquot: 0.187 g
Prep Basis: As Received
Moisture(%): NA
Result Units: pCi/g
File Name: Spectrum #1

CASNO	Target Nuclide	Result +/- 2 s TPU	MDC	Requested MDC	Lab Qualifier
13981-52-7	Po-210	0.051 +/- 0.080	0.134	0.25	U

Chemical Yield Summary

Carrier/Tracer	Amount Added	Result	Units	Yield	Control Limits	Flag
Po-209	19.28	17.6	pCi/g	91.2	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: *PL0805200-1*

Polonium-210 by Alpha Spectroscopy

PAI 714 Rev 11

Sample Results

Lab Name: **Paragon Analytics**
Work Order Number: 0805200
Client Name: CSU Dep't Ecological Radiological Health Sciences
ClientProject ID: Tissue samples

Field ID:	CSUPR-7
Lab ID:	0805200-7

Sample Matrix: TISSUE
Prep SOP: PAI 711 Rev 7
Date Collected: 20-May-08
Date Prepared: 06-Jun-08
Date Analyzed: 13-Jun-08

Prep Batch: PL080606-3
QCBatchID: PL080606-3-1
Run ID: PL080606-3A
Count Time: 1000 minutes
Report Basis: As Received

Final Aliquot: 0.268 g
Prep Basis: As Received
Moisture(%): NA
Result Units: pCi/g
File Name: Spectrum #1

CASNO	Target Nuclide	Result +/- 2 s TPU	MDC	Requested MDC	Lab Qualifier
13981-52-7	Po-210	-0.024 +/- 0.030	0.079	0.25	Y1,U

Chemical Yield Summary

Carrier/Tracer	Amount Added	Result	Units	Yield	Control Limits	Flag
Po-209	13.45	14.3	pCi/g	106	20 - 110 %	Y1

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: *PL0805200-1*

Polonium-210 by Alpha Spectroscopy

PAI 714 Rev 11

Sample Results

Lab Name: **Paragon Analytics**
Work Order Number: 0805200
Client Name: CSU Dep't Ecological Radiological Health Sciences
ClientProject ID: Tissue samples

Field ID:	CSUPR-9
Lab ID:	0805200-9

Sample Matrix: TISSUE
Prep SOP: PAI 711 Rev 7
Date Collected: 20-May-08
Date Prepared: 06-Jun-08
Date Analyzed: 13-Jun-08

Prep Batch: PL080606-3
QCBatchID: PL080606-3-1
Run ID: PL080606-3A
Count Time: 1000 minutes
Report Basis: As Received

Final Aliquot: 0.154 g
Prep Basis: As Received
Moisture(%): NA
Result Units: pCi/g
File Name: Spectrum #1

CASNO	Target Nuclide	Result +/- 2 s TPU	MDC	Requested MDC	Lab Qualifier
13981-52-7	Po-210	-0.055 +/- 0.066	0.164	0.25	U

Chemical Yield Summary

Carrier/Tracer	Amount Added	Result	Units	Yield	Control Limits	Flag
Po-209	23.41	22.3	pCi/g	95.1	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: *PL0805200-1*

Polonium-210 by Alpha Spectroscopy

PAI 714 Rev 11

Sample Results

Lab Name: **Paragon Analytics**
Work Order Number: 0805200
Client Name: CSU Dep't Ecological Radiological Health Sciences
ClientProject ID: Tissue samples

Field ID:	CSUPR-10
Lab ID:	0805200-10

Sample Matrix: TISSUE
Prep SOP: PAI 711 Rev 7
Date Collected: 20-May-08
Date Prepared: 06-Jun-08
Date Analyzed: 13-Jun-08

Prep Batch: PL080606-3
QCBatchID: PL080606-3-1
Run ID: PL080606-3A
Count Time: 1000 minutes
Report Basis: As Received

Final Aliquot: 0.275 g
Prep Basis: As Received
Moisture(%): NA
Result Units: pCi/g
File Name: Spectrum #1

CASNO	Target Nuclide	Result +/- 2 s TPU	MDC	Requested MDC	Lab Qualifier
13981-52-7	Po-210	0.026 +/- 0.032	0.048	0.25	U

Chemical Yield Summary

Carrier/Tracer	Amount Added	Result	Units	Yield	Control Limits	Flag
Po-209	13.12	11.7	pCi/g	88.9	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: *PL0805200-1*

Polonium-210 by Alpha Spectroscopy

PAI 714 Rev 11

Sample Results

Lab Name: **Paragon Analytics**
Work Order Number: 0805200
Client Name: CSU Dep't Ecological Radiological Health Sciences
ClientProject ID: Tissue samples

Field ID:	CSUPR-11
Lab ID:	0805200-11

Sample Matrix: TISSUE
Prep SOP: PAI 711 Rev 7
Date Collected: 20-May-08
Date Prepared: 06-Jun-08
Date Analyzed: 13-Jun-08

Prep Batch: PL080606-3
QCBatchID: PL080606-3-1
Run ID: PL080606-3A
Count Time: 1000 minutes
Report Basis: As Received

Final Aliquot: 0.268 g
Prep Basis: As Received
Moisture(%): NA
Result Units: pCi/g
File Name: Spectrum #1

CASNO	Target Nuclide	Result +/- 2 s TPU	MDC	Requested MDC	Lab Qualifier
13981-52-7	Po-210	0.025 +/- 0.030	0.045	0.25	Y1,U

Chemical Yield Summary

Carrier/Tracer	Amount Added	Result	Units	Yield	Control Limits	Flag
Po-209	13.47	14.3	pCi/g	106	20 - 110 %	Y1

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: *PL0805200-1*

Polonium-210 by Alpha Spectroscopy

PAI 714 Rev 11

Sample Results

Lab Name: **Paragon Analytics**
Work Order Number: 0805200
Client Name: CSU Dep't Ecological Radiological Health Sciences
ClientProject ID: Tissue samples

Field ID:	CSUPR-13
Lab ID:	0805200-13

Sample Matrix: TISSUE
Prep SOP: PAI 711 Rev 7
Date Collected: 19-May-08
Date Prepared: 06-Jun-08
Date Analyzed: 13-Jun-08

Prep Batch: PL080606-3
QCBatchID: PL080606-3-1
Run ID: PL080606-3A
Count Time: 1000 minutes
Report Basis: As Received

Final Aliquot: 0.272 g
Prep Basis: As Received
Moisture(%): NA
Result Units: pCi/g
File Name: Spectrum #1

CASNO	Target Nuclide	Result +/- 2 s TPU	MDC	Requested MDC	Lab Qualifier
13981-52-7	Po-210	0.044 +/- 0.051	0.078	0.25	U

Chemical Yield Summary

Carrier/Tracer	Amount Added	Result	Units	Yield	Control Limits	Flag
Po-209	13.26	11.4	pCi/g	86.2	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: *PL0805200-1*

Polonium-210 by Alpha Spectroscopy

PAI 714 Rev 11

Sample Results

Lab Name: **Paragon Analytics**
Work Order Number: 0805200
Client Name: CSU Dep't Ecological Radiological Health Sciences
ClientProject ID: Tissue samples

Field ID:	CSUPR-14
Lab ID:	0805200-14

Sample Matrix: TISSUE
Prep SOP: PAI 711 Rev 7
Date Collected: 19-May-08
Date Prepared: 06-Jun-08
Date Analyzed: 14-Jun-08

Prep Batch: PL080606-3
QCBatchID: PL080606-3-1
Run ID: PL080606-3A
Count Time: 1000 minutes
Report Basis: As Received

Final Aliquot: 0.253 g
Prep Basis: As Received
Moisture(%): NA
Result Units: pCi/g
File Name: Spectrum #1

CASNO	Target Nuclide	Result +/- 2 s TPU	MDC	Requested MDC	Lab Qualifier
13981-52-7	Po-210	0 +/- 0.035	0.066	0.25	Y1,U

Chemical Yield Summary

Carrier/Tracer	Amount Added	Result	Units	Yield	Control Limits	Flag
Po-209	14.26	14.6	pCi/g	102	20 - 110 %	Y1

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: *PL0805200-1*

Polonium-210 by Alpha Spectroscopy

PAI 714 Rev 11

Sample Results

Lab Name: **Paragon Analytics**
Work Order Number: 0805200
Client Name: CSU Dep't Ecological Radiological Health Sciences
ClientProject ID: Tissue samples

Field ID:	CSUPR-15
Lab ID:	0805200-15

Sample Matrix: TISSUE
Prep SOP: PAI 711 Rev 7
Date Collected: 19-May-08
Date Prepared: 06-Jun-08
Date Analyzed: 14-Jun-08

Prep Batch: PL080606-3
QCBatchID: PL080606-3-1
Run ID: PL080606-3A
Count Time: 1000 minutes
Report Basis: As Received

Final Aliquot: 0.336 g
Prep Basis: As Received
Moisture(%): NA
Result Units: pCi/g
File Name: Spectrum #1

CASNO	Target Nuclide	Result +/- 2 s TPU	MDC	Requested MDC	Lab Qualifier
13981-52-7	Po-210	0.025 +/- 0.024	0.013	0.25	Y1,LT

Chemical Yield Summary

Carrier/Tracer	Amount Added	Result	Units	Yield	Control Limits	Flag
Po-209	10.71	10.8	pCi/g	101	20 - 110 %	Y1

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: *PL0805200-1*

Polonium-210 by Alpha Spectroscopy

PAI 714 Rev 11

Sample Results

Lab Name: **Paragon Analytics**
Work Order Number: 0805200
Client Name: CSU Dep't Ecological Radiological Health Sciences
ClientProject ID: Tissue samples

Field ID:	CSUPR-17
Lab ID:	0805200-17

Sample Matrix: TISSUE
Prep SOP: PAI 711 Rev 7
Date Collected: 19-May-08
Date Prepared: 06-Jun-08
Date Analyzed: 14-Jun-08

Prep Batch: PL080606-3
QCBatchID: PL080606-3-1
Run ID: PL080606-3A
Count Time: 1000 minutes
Report Basis: As Received

Final Aliquot: 0.282 g
Prep Basis: As Received
Moisture(%): NA
Result Units: pCi/g
File Name: Spectrum #1

CASNO	Target Nuclide	Result +/- 2 s TPU	MDC	Requested MDC	Lab Qualifier
13981-52-7	Po-210	0.029 +/- 0.054	0.094	0.25	U

Chemical Yield Summary

Carrier/Tracer	Amount Added	Result	Units	Yield	Control Limits	Flag
Po-209	12.78	10.8	pCi/g	84.8	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: *PL0805200-1*

Polonium-210 by Alpha Spectroscopy

PAI 714 Rev 11

Sample Results

Lab Name: **Paragon Analytics**
Work Order Number: 0805200
Client Name: CSU Dep't Ecological Radiological Health Sciences
ClientProject ID: Tissue samples

Field ID:	CSUPR-18
Lab ID:	0805200-18

Sample Matrix: TISSUE
Prep SOP: PAI 711 Rev 7
Date Collected: 19-May-08
Date Prepared: 06-Jun-08
Date Analyzed: 14-Jun-08

Prep Batch: PL080606-3
QCBatchID: PL080606-3-1
Run ID: PL080606-3A
Count Time: 1000 minutes
Report Basis: As Received

Final Aliquot: 0.286 g
Prep Basis: As Received
Moisture(%): NA
Result Units: pCi/g
File Name: Spectrum #1

CASNO	Target Nuclide	Result +/- 2 s TPU	MDC	Requested MDC	Lab Qualifier
13981-52-7	Po-210	-0.006 +/- 0.029	0.056	0.25	U

Chemical Yield Summary

Carrier/Tracer	Amount Added	Result	Units	Yield	Control Limits	Flag
Po-209	12.61	12.1	pCi/g	95.8	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: *PL0805200-1*

Polonium-210 by Alpha Spectroscopy

PAI 714 Rev 11

Sample Results

Lab Name: **Paragon Analytics**
Work Order Number: 0805200
Client Name: CSU Dep't Ecological Radiological Health Sciences
ClientProject ID: Tissue samples

Field ID:	CSUPR-19
Lab ID:	0805200-19

Sample Matrix: TISSUE
Prep SOP: PAI 711 Rev 7
Date Collected: 19-May-08
Date Prepared: 06-Jun-08
Date Analyzed: 14-Jun-08

Prep Batch: PL080606-3
QCBatchID: PL080606-3-1
Run ID: PL080606-3A
Count Time: 1000 minutes
Report Basis: As Received

Final Aliquot: 0.426 g
Prep Basis: As Received
Moisture(%): NA
Result Units: pCi/g
File Name: Spectrum #1

CASNO	Target Nuclide	Result +/- 2 s TPU	MDC	Requested MDC	Lab Qualifier
13981-52-7	Po-210	-0.005 +/- 0.038	0.077	0.25	U

Chemical Yield Summary

Carrier/Tracer	Amount Added	Result	Units	Yield	Control Limits	Flag
Po-209	8.463	6.9	pCi/g	81.9	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: *PL0805200-1*

Polonium-210 by Alpha Spectroscopy

PAI 714 Rev 11

Sample Results

Lab Name: **Paragon Analytics**
Work Order Number: 0805200
Client Name: CSU Dep't Ecological Radiological Health Sciences
ClientProject ID: Tissue samples

Field ID:	CSUPR-21
Lab ID:	0805200-21

Sample Matrix: TISSUE
Prep SOP: PAI 711 Rev 7
Date Collected: 19-May-08
Date Prepared: 06-Jun-08
Date Analyzed: 14-Jun-08

Prep Batch: PL080606-3
QCBatchID: PL080606-3-1
Run ID: PL080606-3A
Count Time: 1000 minutes
Report Basis: As Received

Final Aliquot: 0.275 g
Prep Basis: As Received
Moisture(%): NA
Result Units: pCi/g
File Name: Spectrum #1

CASNO	Target Nuclide	Result +/- 2 s TPU	MDC	Requested MDC	Lab Qualifier
13981-52-7	Po-210	0.062 +/- 0.059	0.083	0.25	U

Chemical Yield Summary

Carrier/Tracer	Amount Added	Result	Units	Yield	Control Limits	Flag
Po-209	13.10	10.7	pCi/g	81.9	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: *PL0805200-1*

Polonium-210 by Alpha Spectroscopy

PAI 714 Rev 11

Sample Results

Lab Name: **Paragon Analytics**
Work Order Number: 0805200
Client Name: CSU Dep't Ecological Radiological Health Sciences
ClientProject ID: Tissue samples

Field ID:	CSUPR-22
Lab ID:	0805200-22

Sample Matrix: TISSUE
Prep SOP: PAI 711 Rev 7
Date Collected: 19-May-08
Date Prepared: 06-Jun-08
Date Analyzed: 14-Jun-08

Prep Batch: PL080606-3
QCBatchID: PL080606-3-1
Run ID: PL080606-3A
Count Time: 1000 minutes
Report Basis: As Received

Final Aliquot: 0.309 g
Prep Basis: As Received
Moisture(%): NA
Result Units: pCi/g
File Name: Spectrum #1

CASNO	Target Nuclide	Result +/- 2 s TPU	MDC	Requested MDC	Lab Qualifier
13981-52-7	Po-210	0.019 +/- 0.032	0.047	0.25	U

Chemical Yield Summary

Carrier/Tracer	Amount Added	Result	Units	Yield	Control Limits	Flag
Po-209	11.67	9.4	pCi/g	80.5	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: *PL0805200-1*

Polonium-210 by Alpha Spectroscopy

PAI 714 Rev 11

Sample Results

Lab Name: **Paragon Analytics**
Work Order Number: 0805200
Client Name: CSU Dep't Ecological Radiological Health Sciences
ClientProject ID: Tissue samples

Field ID:	CSUPR-23
Lab ID:	0805200-23

Sample Matrix: TISSUE
Prep SOP: PAI 711 Rev 7
Date Collected: 19-May-08
Date Prepared: 06-Jun-08
Date Analyzed: 15-Jun-08

Prep Batch: PL080606-3
QCBatchID: PL080606-3-1
Run ID: PL080606-3A
Count Time: 1000 minutes
Report Basis: As Received

Final Aliquot: 0.443 g
Prep Basis: As Received
Moisture(%): NA
Result Units: pCi/g
File Name: Spectrum #1

CASNO	Target Nuclide	Result +/- 2 s TPU	MDC	Requested MDC	Lab Qualifier
13981-52-7	Po-210	0 +/- 0.019	0.028	0.25	U

Chemical Yield Summary

Carrier/Tracer	Amount Added	Result	Units	Yield	Control Limits	Flag
Po-209	8.138	8.0	pCi/g	98.6	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: *PL0805200-1*

Polonium-210 by Alpha Spectroscopy

PAI 714 Rev 11

Sample Results

Lab Name: **Paragon Analytics**
Work Order Number: 0805200
Client Name: CSU Dep't Ecological Radiological Health Sciences
ClientProject ID: Tissue samples

Field ID:	CSUPR-26
Lab ID:	0805200-26

Sample Matrix: TISSUE
Prep SOP: PAI 711 Rev 7
Date Collected: 07-Apr-08
Date Prepared: 06-Jun-08
Date Analyzed: 15-Jun-08

Prep Batch: PL080606-3
QCBatchID: PL080606-3-1
Run ID: PL080606-3A
Count Time: 1000 minutes
Report Basis: As Received

Final Aliquot: 0.353 g
Prep Basis: As Received
Moisture(%): NA
Result Units: pCi/g
File Name: Spectrum #1

CASNO	Target Nuclide	Result +/- 2 s TPU	MDC	Requested MDC	Lab Qualifier
13981-52-7	Po-210	0.74 +/- 0.17	0.08	0.25	

Chemical Yield Summary

Carrier/Tracer	Amount Added	Result	Units	Yield	Control Limits	Flag
Po-209	10.21	9.9	pCi/g	97.0	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: *PL0805200-1*

Polonium-210 by Alpha Spectroscopy

PAI 714 Rev 11

Sample Results

Lab Name: **Paragon Analytics**
Work Order Number: 0805200
Client Name: CSU Dep't Ecological Radiological Health Sciences
ClientProject ID: Tissue samples

Field ID:	CSUPR-27
Lab ID:	0805200-27

Sample Matrix: TISSUE
Prep SOP: PAI 711 Rev 7
Date Collected: 07-Apr-08
Date Prepared: 06-Jun-08
Date Analyzed: 15-Jun-08

Prep Batch: PL080606-3
QCBatchID: PL080606-3-1
Run ID: PL080606-3A
Count Time: 1000 minutes
Report Basis: As Received

Final Aliquot: 0.297 g
Prep Basis: As Received
Moisture(%): NA
Result Units: pCi/g
File Name: Spectrum #1

CASNO	Target Nuclide	Result +/- 2 s TPU	MDC	Requested MDC	Lab Qualifier
13981-52-7	Po-210	0.29 +/- 0.10	0.02	0.25	

Chemical Yield Summary

Carrier/Tracer	Amount Added	Result	Units	Yield	Control Limits	Flag
Po-209	12.13	10.4	pCi/g	86.0	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: *PL0805200-1*

Polonium-210 by Alpha Spectroscopy

PAI 714 Rev 11

Sample Results

Lab Name: **Paragon Analytics**
Work Order Number: 0805200
Client Name: CSU Dep't Ecological Radiological Health Sciences
ClientProject ID: Tissue samples

Field ID:	CSUPR-28
Lab ID:	0805200-28

Sample Matrix: TISSUE
Prep SOP: PAI 711 Rev 7
Date Collected: 07-Apr-08
Date Prepared: 06-Jun-08
Date Analyzed: 13-Jun-08

Prep Batch: PL080606-4
QCBatchID: PL080606-4-1
Run ID: PL080606-4A
Count Time: 1000 minutes
Report Basis: As Received

Final Aliquot: 0.261 g
Prep Basis: As Received
Moisture(%): NA
Result Units: pCi/g
File Name: Spectrum #1

CASNO	Target Nuclide	Result +/- 2 s TPU	MDC	Requested MDC	Lab Qualifier
13981-52-7	Po-210	0.094 +/- 0.072	0.087	0.25	LT

Chemical Yield Summary

Carrier/Tracer	Amount Added	Result	Units	Yield	Control Limits	Flag
Po-209	13.79	12.0	pCi/g	87.3	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: *PL0805200-1*

Polonium-210 by Alpha Spectroscopy

PAI 714 Rev 11

Sample Results

Lab Name: **Paragon Analytics**
Work Order Number: 0805200
Client Name: CSU Dep't Ecological Radiological Health Sciences
ClientProject ID: Tissue samples

Field ID:	CSUPR-30
Lab ID:	0805200-30

Sample Matrix: TISSUE
Prep SOP: PAI 711 Rev 7
Date Collected: 12-Apr-08
Date Prepared: 06-Jun-08
Date Analyzed: 13-Jun-08

Prep Batch: PL080606-4
QCBatchID: PL080606-4-1
Run ID: PL080606-4A
Count Time: 1000 minutes
Report Basis: As Received

Final Aliquot: 0.301 g
Prep Basis: As Received
Moisture(%): NA
Result Units: pCi/g
File Name: Spectrum #1

CASNO	Target Nuclide	Result +/- 2 s TPU	MDC	Requested MDC	Lab Qualifier
13981-52-7	Po-210	0.141 +/- 0.066	0.047	0.25	Y1,LT

Chemical Yield Summary

Carrier/Tracer	Amount Added	Result	Units	Yield	Control Limits	Flag
Po-209	11.97	12.1	pCi/g	101	20 - 110 %	Y1

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: *PL0805200-1*

Polonium-210 by Alpha Spectroscopy

PAI 714 Rev 11

Sample Results

Lab Name: **Paragon Analytics**
Work Order Number: 0805200
Client Name: CSU Dep't Ecological Radiological Health Sciences
ClientProject ID: Tissue samples

Field ID:	CSUPR-31
Lab ID:	0805200-31

Sample Matrix: TISSUE
Prep SOP: PAI 711 Rev 7
Date Collected: 12-Apr-08
Date Prepared: 06-Jun-08
Date Analyzed: 15-Jun-08

Prep Batch: PL080606-4
QCBatchID: PL080606-4-1
Run ID: PL080606-4A
Count Time: 1000 minutes
Report Basis: As Received

Final Aliquot: 0.314 g
Prep Basis: As Received
Moisture(%): NA
Result Units: pCi/g
File Name: Spectrum #1

CASNO	Target Nuclide	Result +/- 2 s TPU	MDC	Requested MDC	Lab Qualifier
13981-52-7	Po-210	0.166 +/- 0.081	0.070	0.25	LT

Chemical Yield Summary

Carrier/Tracer	Amount Added	Result	Units	Yield	Control Limits	Flag
Po-209	11.47	10.5	pCi/g	91.1	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: *PL0805200-1*

Polonium-210 by Alpha Spectroscopy

PAI 714 Rev 11

Sample Results

Lab Name: **Paragon Analytics**
Work Order Number: 0805200
Client Name: CSU Dep't Ecological Radiological Health Sciences
ClientProject ID: Tissue samples

Field ID:	CSUPR-32
Lab ID:	0805200-32

Sample Matrix: TISSUE
Prep SOP: PAI 711 Rev 7
Date Collected: 12-Apr-08
Date Prepared: 06-Jun-08
Date Analyzed: 15-Jun-08

Prep Batch: PL080606-4
QCBatchID: PL080606-4-1
Run ID: PL080606-4A
Count Time: 1000 minutes
Report Basis: As Received

Final Aliquot: 0.298 g
Prep Basis: As Received
Moisture(%): NA
Result Units: pCi/g
File Name: Spectrum #1

CASNO	Target Nuclide	Result +/- 2 s TPU	MDC	Requested MDC	Lab Qualifier
13981-52-7	Po-210	0.027 +/- 0.033	0.018	0.25	LT

Chemical Yield Summary

Carrier/Tracer	Amount Added	Result	Units	Yield	Control Limits	Flag
Po-209	12.08	12.0	pCi/g	99.6	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: *PL0805200-1*

Polonium-210 by Alpha Spectroscopy

PAI 714 Rev 11

Sample Results

Lab Name: **Paragon Analytics**
Work Order Number: 0805200
Client Name: CSU Dep't Ecological Radiological Health Sciences
ClientProject ID: Tissue samples

Field ID:	CSUPR-34
Lab ID:	0805200-34

Sample Matrix: TISSUE
Prep SOP: PAI 711 Rev 7
Date Collected: 13-Apr-08
Date Prepared: 06-Jun-08
Date Analyzed: 15-Jun-08

Prep Batch: PL080606-4
QCBatchID: PL080606-4-1
Run ID: PL080606-4A
Count Time: 1000 minutes
Report Basis: As Received

Final Aliquot: 0.278 g
Prep Basis: As Received
Moisture(%): NA
Result Units: pCi/g
File Name: Spectrum #1

CASNO	Target Nuclide	Result +/- 2 s TPU	MDC	Requested MDC	Lab Qualifier
13981-52-7	Po-210	0.025 +/- 0.060	0.109	0.25	U

Chemical Yield Summary

Carrier/Tracer	Amount Added	Result	Units	Yield	Control Limits	Flag
Po-209	12.98	11.5	pCi/g	88.7	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.

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: *PL0805200-1*

Polonium-210 by Alpha Spectroscopy

PAI 714 Rev 11

Sample Results

Lab Name: **Paragon Analytics**
Work Order Number: 0805200
Client Name: CSU Dep't Ecological Radiological Health Sciences
ClientProject ID: Tissue samples

Field ID:	CSUPR-35
Lab ID:	0805200-35

Sample Matrix: TISSUE
Prep SOP: PAI 711 Rev 7
Date Collected: 13-Apr-08
Date Prepared: 06-Jun-08
Date Analyzed: 15-Jun-08

Prep Batch: PL080606-4
QCBatchID: PL080606-4-1
Run ID: PL080606-4A
Count Time: 1000 minutes
Report Basis: As Received

Final Aliquot: 0.299 g
Prep Basis: As Received
Moisture(%): NA
Result Units: pCi/g
File Name: Spectrum #1

CASNO	Target Nuclide	Result +/- 2 s TPU	MDC	Requested MDC	Lab Qualifier
13981-52-7	Po-210	0.014 +/- 0.033	0.063	0.25	U

Chemical Yield Summary

Carrier/Tracer	Amount Added	Result	Units	Yield	Control Limits	Flag
Po-209	12.05	11.8	pCi/g	97.7	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.

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: *PL0805200-1*

Polonium-210 by Alpha Spectroscopy

PAI 714 Rev 11

Sample Results

Lab Name: **Paragon Analytics**
Work Order Number: 0805200
Client Name: CSU Dep't Ecological Radiological Health Sciences
ClientProject ID: Tissue samples

Field ID:	CSUPR-36
Lab ID:	0805200-36

Sample Matrix: TISSUE
Prep SOP: PAI 711 Rev 7
Date Collected: 13-Apr-08
Date Prepared: 06-Jun-08
Date Analyzed: 15-Jun-08

Prep Batch: PL080606-4
QCBatchID: PL080606-4-1
Run ID: PL080606-4A
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 +/- 2 s TPU	MDC	Requested MDC	Lab Qualifier
13981-52-7	Po-210	0.043 +/- 0.079	0.136	0.25	U

Chemical Yield Summary

Carrier/Tracer	Amount Added	Result	Units	Yield	Control Limits	Flag
Po-209	13.97	12.9	pCi/g	92.0	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: *PL0805200-1*

PARAGON ANALYTICS
Radiochemistry Data Package

5

Section 5

RAW DATA

Polonium-210 by Alpha Spectroscopy Raw Data Report

Laboratory Name: **Paragon Analytics** **Prep SOP:** PAI 711 **Reported on:** Tuesday, June 17, 2008

PAI Work Order: 0805200 **Analytical SOP:** PAI 714 12:22:35 PM

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 +/- 2 s TPU	MDC DecLev	ReportUnits ReportBasis	DER RPD	%Spk. Recov Flags
0805200-1	Po-209	5/20/2008	PL080606-3	NA	6/07/2008	TISSUE	0.558 g	AlphaSpec2	PL080606-3A	6/13/2008	2134.000	31.63%	1000	10.9	0.1	pCi/g	NA	
SMP	Tracer		PL080606-3-1	NA	7:00:00 AM	NA	0.279 g	35	Spectrum #1	2:39 PM	4.000	1000	84.3%	1.6	NA	As Received	NA	
0805200-1	Po-210	5/20/2008	PL080606-3	NA	6/07/2008	TISSUE	0.558 g	AlphaSpec2	PL080606-3A	6/13/2008	4.000	31.63%	1000	0.027	0.019	pCi/g	NA	
SMP	Trg. Analyte		PL080606-3-1	NA	7:00:00 AM	NA	0.279 g	35	Spectrum #1	2:39 PM	0.000	1000	84.3%	0.034	NA	As Received	NA	LT
0805200-2	Po-209	5/20/2008	PL080606-3	NA	6/07/2008	TISSUE	0.46 g	AlphaSpec2	PL080606-3A	6/13/2008	2203.000	28.02%	1000	15.4	0.1	pCi/g	NA	
SMP	Tracer		PL080606-3-1	NA	7:00:00 AM	NA	0.23 g	36	Spectrum #1	2:39 PM	1.000	1000	98.2%	2.2	NA	As Received	NA	
0805200-2	Po-210	5/20/2008	PL080606-3	NA	6/07/2008	TISSUE	0.46 g	AlphaSpec2	PL080606-3A	6/13/2008	2.000	28.02%	1000	0.016	0.087	pCi/g	NA	
SMP	Trg. Analyte		PL080606-3-1	NA	7:00:00 AM	NA	0.23 g	36	Spectrum #1	2:39 PM	3.000	1000	98.2%	0.046	NA	As Received	NA	U
0805200-3	Po-209	5/20/2008	PL080606-3	NA	6/07/2008	TISSUE	0.632 g	AlphaSpec2	PL080606-3A	6/13/2008	2413.000	29.66%	1000	11.6	0.1	pCi/g	NA	
SMP	Tracer		PL080606-3-1	NA	7:00:00 AM	NA	0.316 g	37	Spectrum #1	2:39 PM	5.000	1000	102.0%	1.7	NA	As Received	NA	Y1
0805200-3	Po-210	5/20/2008	PL080606-3	NA	6/07/2008	TISSUE	0.632 g	AlphaSpec2	PL080606-3A	6/13/2008	-4.000	29.66%	1000	-0.022	0.065	pCi/g	NA	
SMP	Trg. Analyte		PL080606-3-1	NA	7:00:00 AM	NA	0.316 g	37	Spectrum #1	2:39 PM	4.000	1000	102.0%	0.027	NA	As Received	NA	Y1,U
0805200-5	Po-209	5/20/2008	PL080606-3	NA	6/07/2008	TISSUE	0.5 g	AlphaSpec2	PL080606-3A	6/13/2008	2297.000	30.05%	1000	13.8	0	pCi/g	NA	
SMP	Tracer		PL080606-3-1	NA	7:00:00 AM	NA	0.25 g	39	Spectrum #1	2:39 PM	0.000	1000	95.5%	2.0	NA	As Received	NA	
0805200-5	Po-210	5/20/2008	PL080606-3	NA	6/07/2008	TISSUE	0.5 g	AlphaSpec2	PL080606-3A	6/13/2008	3.000	30.05%	1000	0.021	0.052	pCi/g	NA	
SMP	Trg. Analyte		PL080606-3-1	NA	7:00:00 AM	NA	0.25 g	39	Spectrum #1	2:39 PM	1.000	1000	95.5%	0.035	NA	As Received	NA	U
0805200-6	Po-209	5/20/2008	PL080606-3	NA	6/07/2008	TISSUE	0.374 g	AlphaSpec2	PL080606-3A	6/13/2008	2130.000	29.19%	1000	17.6	0.1	pCi/g	NA	
SMP	Tracer		PL080606-3-1	NA	7:00:00 AM	NA	0.187 g	40	Spectrum #1	2:39 PM	2.000	1000	91.2%	2.5	NA	As Received	NA	
0805200-6	Po-210	5/20/2008	PL080606-3	NA	6/07/2008	TISSUE	0.374 g	AlphaSpec2	PL080606-3A	6/13/2008	5.000	29.19%	1000	0.051	0.134	pCi/g	NA	
SMP	Trg. Analyte		PL080606-3-1	NA	7:00:00 AM	NA	0.187 g	40	Spectrum #1	2:39 PM	5.000	1000	91.2%	0.080	NA	As Received	NA	U
0805200-7	Po-209	5/20/2008	PL080606-3	NA	6/07/2008	TISSUE	0.536 g	AlphaSpec2	PL080606-3A	6/13/2008	2661.000	31.36%	1000	14.3	0.1	pCi/g	NA	
SMP	Tracer		PL080606-3-1	NA	7:00:00 AM	NA	0.268 g	42	Spectrum #1	2:39 PM	10.000	1000	106.0%	2.0	NA	As Received	NA	Y1

Comments:

Data Package ID: *PL0805200-1*

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

Polonium-210 by Alpha Spectroscopy Raw Data Report

Laboratory Name: **Paragon Analytics** **Prep SOP:** PAI 711 **Reported on:** Tuesday, June 17, 2008

PAI Work Order: 0805200 **Analytical SOP:** PAI 714 12:22:35 PM

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 +/- 2 s TPU	MDC DecLev	ReportUnits ReportBasis	DER RPD	%Spk. Recov Flags
0805200-7	Po-210	5/20/2008	PL080606-3	NA	6/07/2008	TISSUE	0.536 g	AlphaSpec2	PL080606-3A	6/13/2008	-4.000	31.36%	1000	-0.024	0.079	pCi/g	NA	
SMP	Trg. Analyte		PL080606-3-1	NA	7:00:00 AM	NA	0.268 g	42	Spectrum #1	2:39 PM	5.000	1000	106.0%	0.030	NA	As Received	NA	Y1,U
0805200-9	Po-209	5/20/2008	PL080606-3	NA	6/07/2008	TISSUE	0.308 g	AlphaSpec2	PL080606-3A	6/13/2008	2426.000	31.88%	1000	22.3	0.1	pCi/g	NA	
SMP	Tracer		PL080606-3-1	NA	7:00:00 AM	NA	0.154 g	43	Spectrum #1	2:39 PM	1.000	1000	95.1%	3.2	NA	As Received	NA	
0805200-9	Po-210	5/20/2008	PL080606-3	NA	6/07/2008	TISSUE	0.308 g	AlphaSpec2	PL080606-3A	6/13/2008	-5.000	31.88%	1000	-0.055	0.164	pCi/g	NA	
SMP	Trg. Analyte		PL080606-3-1	NA	7:00:00 AM	NA	0.154 g	43	Spectrum #1	2:39 PM	7.000	1000	95.1%	0.066	NA	As Received	NA	U
0805200-10	Po-209	5/20/2008	PL080606-3	NA	6/07/2008	TISSUE	0.55 g	AlphaSpec2	PL080606-3A	6/13/2008	2254.000	31.68%	1000	11.7	0	pCi/g	NA	
SMP	Tracer		PL080606-3-1	NA	7:00:00 AM	NA	0.275 g	45	Spectrum #1	2:39 PM	1.000	1000	88.9%	1.7	NA	As Received	NA	
0805200-10	Po-210	5/20/2008	PL080606-3	NA	6/07/2008	TISSUE	0.55 g	AlphaSpec2	PL080606-3A	6/13/2008	4.000	31.68%	1000	0.026	0.048	pCi/g	NA	
SMP	Trg. Analyte		PL080606-3-1	NA	7:00:00 AM	NA	0.275 g	45	Spectrum #1	2:39 PM	1.000	1000	88.9%	0.032	NA	As Received	NA	U
0805200-11	Po-209	5/20/2008	PL080606-3	NA	6/07/2008	TISSUE	0.535 g	AlphaSpec2	PL080606-3A	6/13/2008	2636.000	30.95%	1000	14.3	0.1	pCi/g	NA	
SMP	Tracer		PL080606-3-1	NA	7:00:00 AM	NA	0.268 g	46	Spectrum #1	2:39 PM	2.000	1000	106.0%	2.0	NA	As Received	NA	Y1
0805200-11	Po-210	5/20/2008	PL080606-3	NA	6/07/2008	TISSUE	0.535 g	AlphaSpec2	PL080606-3A	6/13/2008	4.000	30.95%	1000	0.025	0.045	pCi/g	NA	
SMP	Trg. Analyte		PL080606-3-1	NA	7:00:00 AM	NA	0.268 g	46	Spectrum #1	2:39 PM	1.000	1000	106.0%	0.030	NA	As Received	NA	Y1,U
0805200-13	Po-209	5/19/2008	PL080606-3	NA	6/07/2008	TISSUE	0.544 g	AlphaSpec2	PL080606-3A	6/13/2008	2075.000	30.08%	1000	11.4	0.1	pCi/g	NA	
SMP	Tracer		PL080606-3-1	NA	7:00:00 AM	NA	0.272 g	47	Spectrum #1	2:39 PM	3.000	1000	86.2%	1.6	NA	As Received	NA	
0805200-13	Po-210	5/19/2008	PL080606-3	NA	6/07/2008	TISSUE	0.544 g	AlphaSpec2	PL080606-3A	6/13/2008	6.000	30.08%	1000	0.044	0.078	pCi/g	NA	
SMP	Trg. Analyte		PL080606-3-1	NA	7:00:00 AM	NA	0.272 g	47	Spectrum #1	2:39 PM	3.000	1000	86.2%	0.051	NA	As Received	NA	U
0805200-14	Po-209	5/19/2008	PL080606-3	NA	6/07/2008	TISSUE	0.506 g	AlphaSpec2	PL080606-3A	6/14/2008	2355.000	28.78%	1000	14.6	0	pCi/g	NA	
SMP	Tracer		PL080606-3-1	NA	7:00:00 AM	NA	0.253 g	1	Spectrum #1	11:47 AM	1.000	1000	102.0%	2.1	NA	As Received	NA	Y1
0805200-14	Po-210	5/19/2008	PL080606-3	NA	6/07/2008	TISSUE	0.506 g	AlphaSpec2	PL080606-3A	6/14/2008	0.000	28.78%	1000	0	0.066	pCi/g	NA	
SMP	Trg. Analyte		PL080606-3-1	NA	7:00:00 AM	NA	0.253 g	1	Spectrum #1	11:47 AM	2.000	1000	102.0%	0.035	NA	As Received	NA	Y1,U

Comments:

Data Package ID: *PL0805200-1*

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

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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

Polonium-210 by Alpha Spectroscopy Raw Data Report

Laboratory Name: **Paragon Analytics** **Prep SOP:** PAI 711 **Reported on:** Tuesday, June 17, 2008

PAI Work Order: 0805200 **Analytical SOP:** PAI 714 12:22:35 PM

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 +/- 2 s TPU	MDC DecLev	ReportUnits ReportBasis	DER RPD	%Spk. Recov Flags
0805200-15	Po-209	5/19/2008	PL080606-3	NA	6/07/2008	TISSUE	0.673 g	AlphaSpec2	PL080606-3A	6/14/2008	2511.000	31.03%	1000	10.8	0.1	pCi/g	NA	
SMP	Tracer		PL080606-3-1	NA	7:00:00 AM	NA	0.336 g	2	Spectrum #1	11:47 AM	4.000	1000	101.0%	1.5	NA	As Received	NA	Y1
0805200-15	Po-210	5/19/2008	PL080606-3	NA	6/07/2008	TISSUE	0.673 g	AlphaSpec2	PL080606-3A	6/14/2008	5.000	31.03%	1000	0.025	0.013	pCi/g	NA	
SMP	Trg. Analyte		PL080606-3-1	NA	7:00:00 AM	NA	0.336 g	2	Spectrum #1	11:47 AM	0.000	1000	101.0%	0.024	NA	As Received	NA	Y1,LT
0805200-17	Po-209	5/19/2008	PL080606-3	NA	6/07/2008	TISSUE	0.564 g	AlphaSpec2	PL080606-3A	6/14/2008	2041.000	30.07%	1000	10.8	0	pCi/g	NA	
SMP	Tracer		PL080606-3-1	NA	7:00:00 AM	NA	0.282 g	4	Spectrum #1	11:47 AM	2.000	1000	84.8%	1.6	NA	As Received	NA	
0805200-17	Po-210	5/19/2008	PL080606-3	NA	6/07/2008	TISSUE	0.564 g	AlphaSpec2	PL080606-3A	6/14/2008	4.000	30.07%	1000	0.029	0.094	pCi/g	NA	
SMP	Trg. Analyte		PL080606-3-1	NA	7:00:00 AM	NA	0.282 g	4	Spectrum #1	11:47 AM	5.000	1000	84.8%	0.054	NA	As Received	NA	U
0805200-18	Po-209	5/19/2008	PL080606-3	NA	6/07/2008	TISSUE	0.572 g	AlphaSpec2	PL080606-3A	6/14/2008	2392.000	31.19%	1000	12.1	0.1	pCi/g	NA	
SMP	Tracer		PL080606-3-1	NA	7:00:00 AM	NA	0.286 g	5	Spectrum #1	11:47 AM	3.000	1000	95.8%	1.7	NA	As Received	NA	
0805200-18	Po-210	5/19/2008	PL080606-3	NA	6/07/2008	TISSUE	0.572 g	AlphaSpec2	PL080606-3A	6/14/2008	-1.000	31.19%	1000	-0.006	0.056	pCi/g	NA	
SMP	Trg. Analyte		PL080606-3-1	NA	7:00:00 AM	NA	0.286 g	5	Spectrum #1	11:47 AM	2.000	1000	95.8%	0.029	NA	As Received	NA	U
0805200-19	Po-209	5/19/2008	PL080606-3	NA	6/07/2008	TISSUE	0.852 g	AlphaSpec2	PL080606-3A	6/14/2008	1986.000	30.30%	1000	6.9	0	pCi/g	NA	
SMP	Tracer		PL080606-3-1	NA	7:00:00 AM	NA	0.426 g	6	Spectrum #1	11:47 AM	6.000	1000	81.9%	1.0	NA	As Received	NA	
0805200-19	Po-210	5/19/2008	PL080606-3	NA	6/07/2008	TISSUE	0.852 g	AlphaSpec2	PL080606-3A	6/14/2008	-1.000	30.30%	1000	-0.005	0.077	pCi/g	NA	
SMP	Trg. Analyte		PL080606-3-1	NA	7:00:00 AM	NA	0.426 g	6	Spectrum #1	11:47 AM	8.000	1000	81.9%	0.038	NA	As Received	NA	U
0805200-21	Po-209	5/19/2008	PL080606-3	NA	6/07/2008	TISSUE	0.55 g	AlphaSpec2	PL080606-3A	6/14/2008	1930.000	29.44%	1000	10.7	0.1	pCi/g	NA	
SMP	Tracer		PL080606-3-1	NA	7:00:00 AM	NA	0.275 g	7	Spectrum #1	11:47 AM	4.000	1000	81.9%	1.5	NA	As Received	NA	
0805200-21	Po-210	5/19/2008	PL080606-3	NA	6/07/2008	TISSUE	0.55 g	AlphaSpec2	PL080606-3A	6/14/2008	8.000	29.44%	1000	0.062	0.083	pCi/g	NA	
SMP	Trg. Analyte		PL080606-3-1	NA	7:00:00 AM	NA	0.275 g	7	Spectrum #1	11:47 AM	3.000	1000	81.9%	0.059	NA	As Received	NA	U
0805200-22	Po-209	5/19/2008	PL080606-3	NA	6/07/2008	TISSUE	0.618 g	AlphaSpec2	PL080606-3A	6/14/2008	2064.000	32.03%	1000	9.4	0	pCi/g	NA	
SMP	Tracer		PL080606-3-1	NA	7:00:00 AM	NA	0.309 g	8	Spectrum #1	11:47 AM	2.000	1000	80.5%	1.3	NA	As Received	NA	

Comments:

Data Package ID: *PL0805200-1*

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.

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MDC - Minimum Detectable Concentration (see PAI SOP 709)

DER - Duplicate Error Ratio

BDL - Below Detection Limit

Polonium-210 by Alpha Spectroscopy Raw Data Report

Laboratory Name: **Paragon Analytics** **Prep SOP:** PAI 711 **Reported on:** Tuesday, June 17, 2008

PAI Work Order: 0805200 **Analytical SOP:** PAI 714 12:22:35 PM

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 +/- 2 s TPU	MDC DecLev	ReportUnits ReportBasis	DER RPD	%Spk. Recov Flags
0805200-22	Po-210	5/19/2008	PL080606-3	NA	6/07/2008	TISSUE	0.618 g	AlphaSpec2	PL080606-3A	6/14/2008	3.000	32.03%	1000	0.019	0.047	pCi/g	NA	
SMP	Trg. Analyte		PL080606-3-1	NA	7:00:00 AM	NA	0.309 g	8	Spectrum #1	11:47 AM	1.000	1000	80.5%	0.032	NA	As Received	NA	U
0805200-23	Po-209	5/19/2008	PL080606-3	NA	6/07/2008	TISSUE	0.886 g	AlphaSpec2	PL080606-3A	6/15/2008	2431.000	30.82%	1000	8.0	0	pCi/g	NA	
SMP	Tracer		PL080606-3-1	NA	7:00:00 AM	NA	0.443 g	33	Spectrum #1	10:54 AM	3.000	1000	98.6%	1.1	NA	As Received	NA	
0805200-23	Po-210	5/19/2008	PL080606-3	NA	6/07/2008	TISSUE	0.886 g	AlphaSpec2	PL080606-3A	6/15/2008	0.000	30.82%	1000	0	0.028	pCi/g	NA	
SMP	Trg. Analyte		PL080606-3-1	NA	7:00:00 AM	NA	0.443 g	33	Spectrum #1	10:54 AM	1.000	1000	98.6%	0.019	NA	As Received	NA	U
0805200-26	Po-209	4/7/2008	PL080606-3	NA	6/07/2008	TISSUE	0.706 g	AlphaSpec2	PL080606-3A	6/15/2008	2378.000	30.62%	1000	9.9	0.1	pCi/g	NA	
SMP	Tracer		PL080606-3-1	NA	7:00:00 AM	NA	0.353 g	34	Spectrum #1	10:54 AM	4.000	1000	97.0%	1.4	NA	As Received	NA	
0805200-26	Po-210	4/7/2008	PL080606-3	NA	6/07/2008	TISSUE	0.706 g	AlphaSpec2	PL080606-3A	6/15/2008	121.000	30.62%	1000	0.74	0.08	pCi/g	NA	
SMP	Trg. Analyte		PL080606-3-1	NA	7:00:00 AM	NA	0.353 g	34	Spectrum #1	10:54 AM	5.000	1000	97.0%	0.17	NA	As Received	NA	
0805200-27	Po-209	4/7/2008	PL080606-3	NA	6/07/2008	TISSUE	0.594 g	AlphaSpec2	PL080606-3A	6/15/2008	2176.000	31.63%	1000	10.4	0.1	pCi/g	NA	
SMP	Tracer		PL080606-3-1	NA	7:00:00 AM	NA	0.297 g	35	Spectrum #1	10:54 AM	4.000	1000	86.0%	1.5	NA	As Received	NA	
0805200-27	Po-210	4/7/2008	PL080606-3	NA	6/07/2008	TISSUE	0.594 g	AlphaSpec2	PL080606-3A	6/15/2008	37.000	31.63%	1000	0.29	0.02	pCi/g	NA	
SMP	Trg. Analyte		PL080606-3-1	NA	7:00:00 AM	NA	0.297 g	35	Spectrum #1	10:54 AM	0.000	1000	86.0%	0.10	NA	As Received	NA	
0805200-28	Po-209	4/7/2008	PL080606-4	NA	6/07/2008	TISSUE	0.523 g	AlphaSpec2	PL080606-4A	6/13/2008	2058.000	29.44%	1000	12.0	0.1	pCi/g	NA	
SMP	Tracer		PL080606-4-1	NA	7:00:00 AM	NA	0.261 g	7	Spectrum #1	1:43 PM	4.000	1000	87.3%	1.7	NA	As Received	NA	
0805200-28	Po-210	4/7/2008	PL080606-4	NA	6/07/2008	TISSUE	0.523 g	AlphaSpec2	PL080606-4A	6/13/2008	10.000	29.44%	1000	0.094	0.087	pCi/g	NA	
SMP	Trg. Analyte		PL080606-4-1	NA	7:00:00 AM	NA	0.261 g	7	Spectrum #1	1:43 PM	2.000	1000	87.3%	0.072	NA	As Received	NA	LT
0805200-30	Po-209	4/12/2008	PL080606-4	NA	6/07/2008	TISSUE	0.602 g	AlphaSpec2	PL080606-4A	6/13/2008	2590.000	32.03%	1000	12.1	0	pCi/g	NA	
SMP	Tracer		PL080606-4-1	NA	7:00:00 AM	NA	0.301 g	8	Spectrum #1	1:43 PM	2.000	1000	101.0%	1.7	NA	As Received	NA	Y1
0805200-30	Po-210	4/12/2008	PL080606-4	NA	6/07/2008	TISSUE	0.602 g	AlphaSpec2	PL080606-4A	6/13/2008	22.000	32.03%	1000	0.141	0.047	pCi/g	NA	
SMP	Trg. Analyte		PL080606-4-1	NA	7:00:00 AM	NA	0.301 g	8	Spectrum #1	1:43 PM	1.000	1000	101.0%	0.066	NA	As Received	NA	Y1,LT

Comments:

Data Package ID: *PL0805200-1*

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

Polonium-210 by Alpha Spectroscopy Raw Data Report

Laboratory Name: **Paragon Analytics** **Prep SOP:** PAI 711 **Reported on:** Tuesday, June 17, 2008

PAI Work Order: 0805200 **Analytical SOP:** PAI 714 12:36:14 PM

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 +/- 2 s TPU	MDC DecLev	ReportUnits ReportBasis	DER RPD	%Spk. Recov Flags
0805200-31	Po-209	4/12/2008	PL080606-4	NA	6/07/2008	TISSUE	0.628 g	AlphaSpec2	PL080606-4A	6/15/2008	2099.000	28.78%	1000	10.5	0	pCi/g	NA	
SMP	Tracer		PL080606-4-1	NA	7:00:00 AM	NA	0.314 g	1	Spectrum #1	10:58 AM	1.000	1000	91.1%	1.5	NA	As Received	NA	
0805200-31	Po-210	4/12/2008	PL080606-4	NA	6/07/2008	TISSUE	0.628 g	AlphaSpec2	PL080606-4A	6/15/2008	22.000	28.78%	1000	0.166	0.070	pCi/g	NA	
SMP	Trg. Analyte		PL080606-4-1	NA	7:00:00 AM	NA	0.314 g	1	Spectrum #1	10:58 AM	2.000	1000	91.1%	0.081	NA	As Received	NA	LT
0805200-32	Po-209	4/12/2008	PL080606-4	NA	6/07/2008	TISSUE	0.597 g	AlphaSpec2	PL080606-4A	6/15/2008	2473.000	31.03%	1000	12.0	0.1	pCi/g	NA	
SMP	Tracer		PL080606-4-1	NA	7:00:00 AM	NA	0.298 g	2	Spectrum #1	10:58 AM	4.000	1000	99.6%	1.7	NA	As Received	NA	
0805200-32	Po-210	4/12/2008	PL080606-4	NA	6/07/2008	TISSUE	0.597 g	AlphaSpec2	PL080606-4A	6/15/2008	4.000	31.03%	1000	0.027	0.018	pCi/g	NA	
SMP	Trg. Analyte		PL080606-4-1	NA	7:00:00 AM	NA	0.298 g	2	Spectrum #1	10:58 AM	0.000	1000	99.6%	0.033	NA	As Received	NA	LT
0805200-34	Po-209	4/13/2008	PL080606-4	NA	6/07/2008	TISSUE	0.555 g	AlphaSpec2	PL080606-4A	6/15/2008	2135.000	30.07%	1000	11.5	0.1	pCi/g	NA	
SMP	Tracer		PL080606-4-1	NA	7:00:00 AM	NA	0.278 g	4	Spectrum #1	10:58 AM	2.000	1000	88.7%	1.7	NA	As Received	NA	
0805200-34	Po-210	4/13/2008	PL080606-4	NA	6/07/2008	TISSUE	0.555 g	AlphaSpec2	PL080606-4A	6/15/2008	3.000	30.07%	1000	0.025	0.109	pCi/g	NA	
SMP	Trg. Analyte		PL080606-4-1	NA	7:00:00 AM	NA	0.278 g	4	Spectrum #1	10:58 AM	5.000	1000	88.7%	0.060	NA	As Received	NA	U
0805200-35	Po-209	4/13/2008	PL080606-4	NA	6/07/2008	TISSUE	0.598 g	AlphaSpec2	PL080606-4A	6/15/2008	2438.000	31.19%	1000	11.8	0.1	pCi/g	NA	
SMP	Tracer		PL080606-4-1	NA	11:30:00 AM	NA	0.299 g	5	Spectrum #1	10:58 AM	3.000	1000	97.7%	1.7	NA	As Received	NA	
0805200-35	Po-210	4/13/2008	PL080606-4	NA	6/07/2008	TISSUE	0.598 g	AlphaSpec2	PL080606-4A	6/15/2008	2.000	31.19%	1000	0.014	0.063	pCi/g	NA	
SMP	Trg. Analyte		PL080606-4-1	NA	11:30:00 AM	NA	0.299 g	5	Spectrum #1	10:58 AM	2.000	1000	97.7%	0.033	NA	As Received	NA	U
0805200-36	Po-209	4/13/2008	PL080606-4	NA	6/07/2008	TISSUE	0.516 g	AlphaSpec2	PL080606-4A	6/15/2008	2231.000	30.30%	1000	12.9	0.1	pCi/g	NA	
SMP	Tracer		PL080606-4-1	NA	11:30:00 AM	NA	0.258 g	6	Spectrum #1	10:58 AM	6.000	1000	92.0%	1.8	NA	As Received	NA	
0805200-36	Po-210	4/13/2008	PL080606-4	NA	6/07/2008	TISSUE	0.516 g	AlphaSpec2	PL080606-4A	6/15/2008	5.000	30.30%	1000	0.043	0.136	pCi/g	NA	
SMP	Trg. Analyte		PL080606-4-1	NA	11:30:00 AM	NA	0.258 g	6	Spectrum #1	10:58 AM	8.000	1000	92.0%	0.079	NA	As Received	NA	U
PL080606-3	Po-209	6/6/2008	PL080606-3	NA	6/07/2008	TISSUE	0.5 g	AlphaSpec2	PL080606-3A	6/15/2008	2277.000	28.02%	1000	14.6	0.1	pCi/g	NA	
MB	Tracer	6:26:19 PM	PL080606-3-1	NA	7:00:00 AM	NA	0.25 g	36	Spectrum #1	10:54 AM	2.000	1000	102.0%	2.1	NA	As Received	NA	Y1

Comments:

Data Package ID: *PL0805200-1*

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

Polonium-210 by Alpha Spectroscopy Raw Data Report

Laboratory Name: **Paragon Analytics** **Prep SOP:** PAI 711 **Reported on:** Tuesday, June 17, 2008

PAI Work Order: 0805200 **Analytical SOP:** PAI 714 12:22:35 PM

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 +/- 2 s TPU	MDC DecLev	ReportUnits ReportBasis	DER RPD	%Spk. Recov Flags
PL080606-3	Po-210	6/6/2008	PL080606-3	NA	6/07/2008	TISSUE	0.5 g	AlphaSpec2	PL080606-3A	6/15/2008	0.000	28.02%	1000	0	0.072	pCi/g	NA	
MB	Trg. Analyte	6:26:19 PM	PL080606-3-1	NA	7:00:00 AM	NA	0.25 g	36	Spectrum #1	10:54 AM	3.000	1000	102.0%	0.033	NA	As Received	NA	Y1,U
PL080606-3	Po-209	6/6/2008	PL080606-3	NA	6/07/2008	TISSUE	0.5 g	AlphaSpec2	PL080606-3A	6/15/2008	2469.000	29.66%	1000	15.0	0.1	pCi/g	NA	
LCS	Tracer	6:26:19 PM	PL080606-3-1	NA	7:00:00 AM	NA	0.25 g	37	Spectrum #1	10:54 AM	5.000	1000	104.0%	2.1	NA	As Received	NA	Y1
PL080606-3	Po-210	6/6/2008	PL080606-3	NA	6/07/2008	TISSUE	0.5 g	AlphaSpec2	PL080606-3A	6/15/2008	6660.000	29.66%	1000	40.5	0.1	pCi/g	NA	95.4
LCS	Trg. Analyte	6:26:19 PM	PL080606-3-1	NA	7:00:00 AM	NA	0.25 g	37	Spectrum #1	10:54 AM	4.000	1000	104.0%	5.8	NA	As Received	NA	P,Y1
PL080606-3	Po-209	6/6/2008	PL080606-3	NA	6/07/2008	TISSUE	0.5 g	AlphaSpec2	PL080606-3A	6/15/2008	2231.000	30.05%	1000	13.4	0	pCi/g	NA	
LCSD	Tracer	6:26:19 PM	PL080606-3-1	NA	7:00:00 AM	NA	0.25 g	39	Spectrum #1	10:54 AM	0.000	1000	92.8%	1.9	NA	As Received	NA	
PL080606-3	Po-210	6/6/2008	PL080606-3	NA	6/07/2008	TISSUE	0.5 g	AlphaSpec2	PL080606-3A	6/15/2008	6518.000	30.05%	1000	42.1	0	pCi/g	0.20	99.3
LCSD	Trg. Analyte	6:26:19 PM	PL080606-3-1	NA	7:00:00 AM	NA	0.25 g	39	Spectrum #1	10:54 AM	1.000	1000	92.8%	6.1	NA	As Received	NA	P
PL080606-4	Po-209	6/6/2008	PL080606-4	NA	6/07/2008	TISSUE	0.5 g	AlphaSpec2	PL080606-4A	6/15/2008	1864.000	29.44%	1000	11.4	0.1	pCi/g	NA	
MB	Tracer	6:30:09 PM	PL080606-4-1	NA	11:30:00 AM	NA	0.25 g	7	Spectrum #1	10:58 AM	3.000	1000	79.1%	1.6	NA	As Received	NA	
PL080606-4	Po-210	6/6/2008	PL080606-4	NA	6/07/2008	TISSUE	0.5 g	AlphaSpec2	PL080606-4A	6/15/2008	1.000	29.44%	1000	0.008	0.075	pCi/g	NA	
MB	Trg. Analyte	6:30:09 PM	PL080606-4-1	NA	11:30:00 AM	NA	0.25 g	7	Spectrum #1	10:58 AM	2.000	1000	79.1%	0.040	NA	As Received	NA	U
PL080606-4	Po-209	6/6/2008	PL080606-4	NA	6/07/2008	TISSUE	0.5 g	AlphaSpec2	PL080606-4A	6/13/2008	2450.000	30.82%	1000	14.3	0.1	pCi/g	NA	
LCS	Tracer	6:30:09 PM	PL080606-4-1	NA	11:30:00 AM	NA	0.25 g	33	Spectrum #1	2:39 PM	3.000	1000	99.3%	2.0	NA	As Received	NA	
PL080606-4	Po-210	6/6/2008	PL080606-4	NA	6/07/2008	TISSUE	0.5 g	AlphaSpec2	PL080606-4A	6/13/2008	6611.000	30.82%	1000	38.9	0	pCi/g	NA	91.7
LCS	Trg. Analyte	6:30:09 PM	PL080606-4-1	NA	11:30:00 AM	NA	0.25 g	33	Spectrum #1	2:39 PM	1.000	1000	99.3%	5.6	NA	As Received	NA	P
PL080606-4	Po-209	6/6/2008	PL080606-4	NA	6/07/2008	TISSUE	0.5 g	AlphaSpec2	PL080606-4A	6/13/2008	2392.000	30.62%	1000	14.1	0.1	pCi/g	NA	
LCSD	Tracer	6:30:09 PM	PL080606-4-1	NA	11:30:00 AM	NA	0.25 g	34	Spectrum #1	2:39 PM	3.000	1000	97.6%	2.0	NA	As Received	NA	
PL080606-4	Po-210	6/6/2008	PL080606-4	NA	6/07/2008	TISSUE	0.5 g	AlphaSpec2	PL080606-4A	6/13/2008	7058.000	30.62%	1000	42.5	0.1	pCi/g	0.44	100
LCSD	Trg. Analyte	6:30:09 PM	PL080606-4-1	NA	11:30:00 AM	NA	0.25 g	34	Spectrum #1	2:39 PM	5.000	1000	97.6%	6.1	NA	As Received	NA	P

Comments:

Data Package ID: *PL0805200-1*

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

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P - LCS, Matrix Spike Recovery within control limits.

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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:

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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: 0805200-1
Spectrum #1 Analysis #1

Sample Size : 0.28

Acquisition

Detector: 35
Batch Name: PL080606-3_A
Nuclide Library: Po-210
Analysis Method: Absolute ROI Analysis, Set Name = Po-210
ROI Set: Po-210

Acquisition Start Date: 6/13/2008 2:39:42PM
Live Time: 1,000.00 min.
Real Time: 1,000.03 min.
Dead Time: 0.00 %

Calibration

Bkgd Info: Sample: B08061035; Det: 35; Spectrum #1; Jun-10-2008 14:13

Calibration Date: 6/10/2008 12:28:16PM

Efficiency Calibration: C08061035

Efficiency: 31.63% +/- 0.16% TPU(2 sigma)

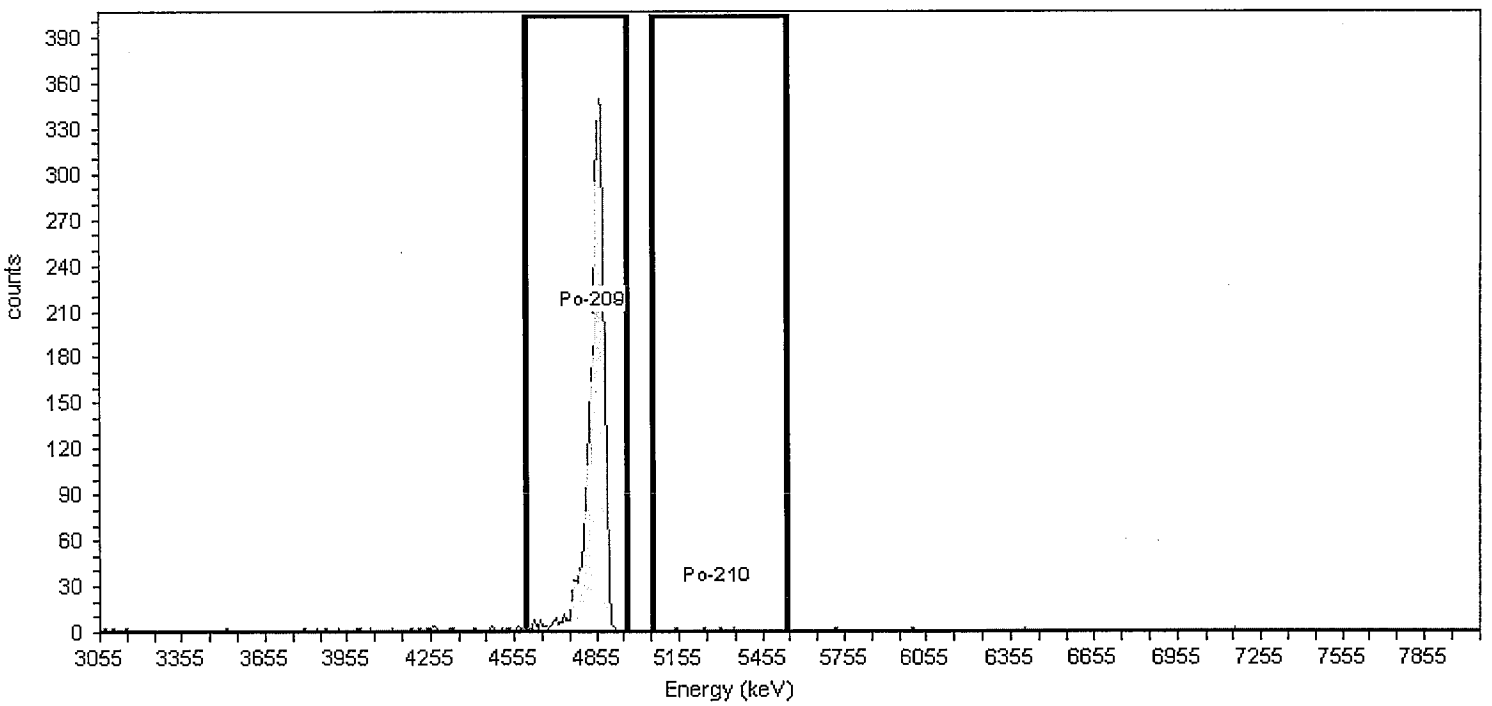
Energy Calibration: C08061035

Energy Cal: Gain = 9.8047 keV / Ch
Offset = 3,045.81 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: 84.45%



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	4859.7	4595.0	4967.5	66.9	99.7	2,138.00	4.00	2,134.00	1.2E+001	5.2E-001	3.1E-002	8.0E-002
Po-210	5310.7	5055.8	5546.0	227.9	100.0	4.00	0.00	4.00	2.4E-002	2.7E-002	0.0E+000	1.6E-002

Reviewed By: GB JP

Paragon Analytics

Alpha-Spectroscopy Analysis Report

Sample

Sample: 0805200-2
Spectrum #1 Analysis #1

Sample Size : 0.23

Acquisition

Detector: 36
Batch Name: PL080606-3_A
Nuclide Library: Po-210
Analysis Method: Absolute Interactive ROI Analysis
ROI Set: Po-210

Acquisition Start Date: 6/13/2008 2:39:43PM
Live Time: 1,000.00 min.
Real Time: 1,000.03 min.
Dead Time: 0.00 %

Calibration

Bkgd Info: Sample: B08061036; Det: 36; Spectrum #1; Jun-10-2008 14:13

Calibration Date: 6/10/2008 12:28:31PM

Efficiency Calibration: C08061036

Efficiency: 28.02% +/- 0.20% TPU(2 sigma)

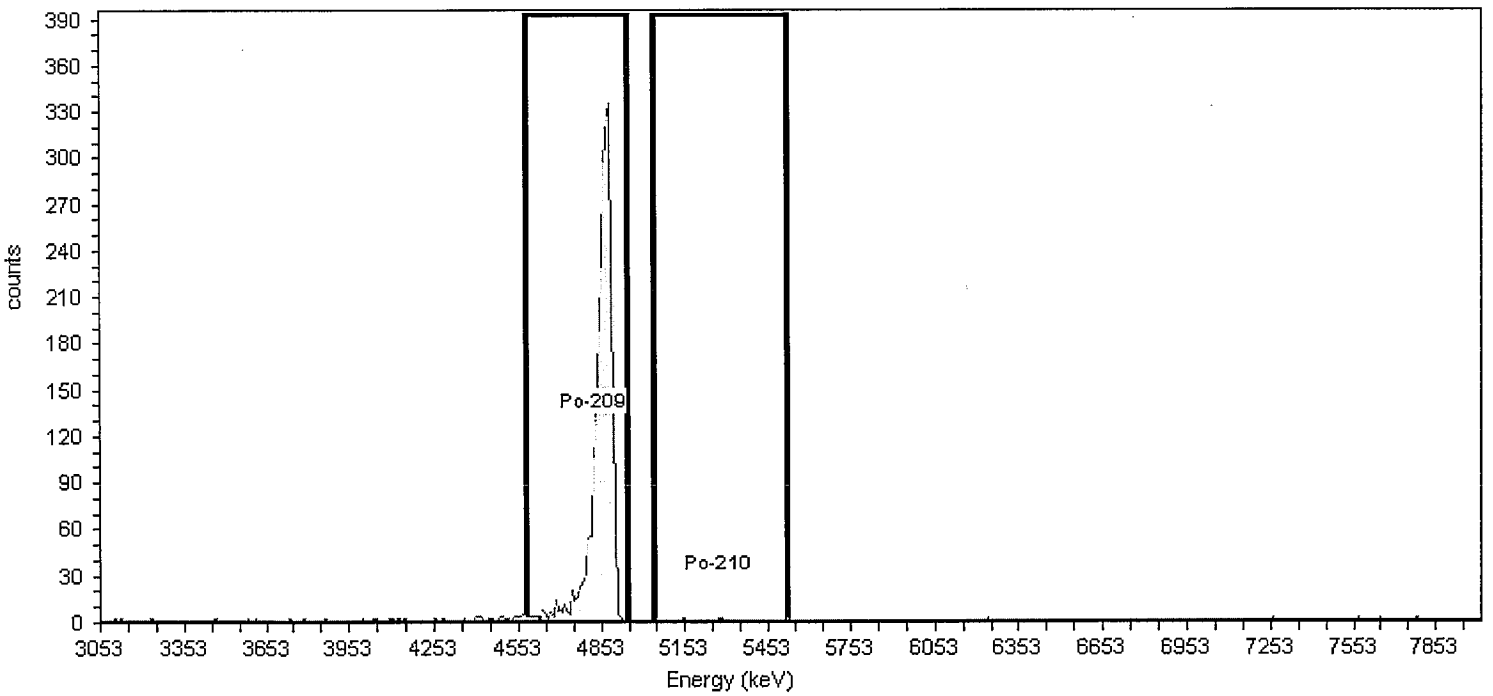
Energy Calibration: C08061036

Energy Cal: Gain = 9.7289 keV / Ch
Offset = 3,043.84 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: 98.42%



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	4824.2	4581.0	4950.7	71.8	99.7	2,204.00	1.00	2,203.00	1.7E+001	7.3E-001	1.8E-002	5.8E-002
Po-210	5271.7	5038.3	5524.7	.4	100.0	5.00	3.00	2.00	1.4E-002	4.0E-002	2.9E-002	7.6E-002

Reviewed By: gb JP

Paragon Analytics

Alpha-Spectroscopy Analysis Report

Sample

Sample: 0805200-3
Spectrum #1 Analysis #1

Sample Size : 0.32

Acquisition

Detector: 37
Batch Name: PL080606-3_A
Nuclide Library: Po-210
Analysis Method: Absolute ROI Analysis, Set Name = Po-210
ROI Set: Po-210

Acquisition Start Date: 6/13/2008 2:39:44PM
Live Time: 1,000.00 min.
Real Time: 1,000.03 min.
Dead Time: 0.00 %

Calibration

Bkgd Info: Sample: B08061037; Det: 37; Spectrum #1; Jun-10-2008 14:13

Calibration Date: 6/10/2008 12:28:56PM

Efficiency Calibration: C08061037

Efficiency: 29.66% +/- 0.13% TPU(2 sigma)

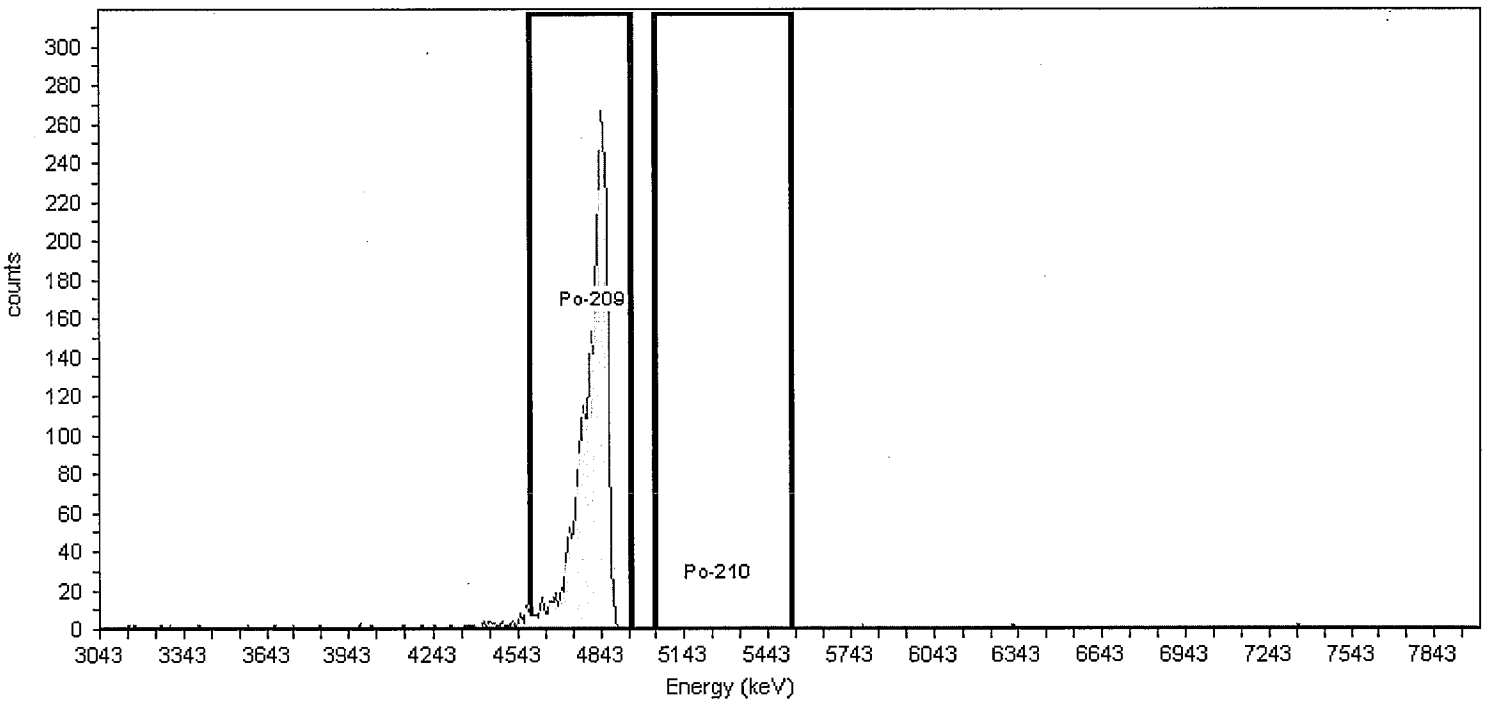
Energy Calibration: C08061037

Energy Cal: Gain = 9.7289 keV / Ch
Offset = 3,034.11 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: 101.85%



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	4843.7	4581.0	4950.7	85.4	99.7	2,418.00	5.00	2,413.00	1.3E+001	5.2E-001	2.7E-002	6.7E-002
Po-210	5291.2	5038.3	5524.7	.0	100.0	0.00	4.00	-4.00	-1.9E-002	2.1E-002	2.2E-002	5.6E-002

Reviewed By: AB JP

Paragon Analytics

Alpha-Spectroscopy Analysis Report

Sample

Sample: 0805200-5
Spectrum #1 Analysis #1

Sample Size : 0.25

Acquisition

Detector: 39
Batch Name: PL080606-3_A
Nuclide Library: Po-210
Analysis Method: Absolute ROI Analysis, Set Name = Po-210
ROI Set: Po-210

Acquisition Start Date: 6/13/2008 2:39:45PM
Live Time: 1,000.00 min.
Real Time: 1,000.03 min.
Dead Time: 0.00 %

Calibration

Bkgd Info: Sample: B08061039; Det: 39; Spectrum #1; Jun-10-2008 14:13

Calibration Date: 6/10/2008 12:29:15PM

Efficiency Calibration: C08061039

Efficiency: 30.05% +/- 0.18% TPU(2 sigma)

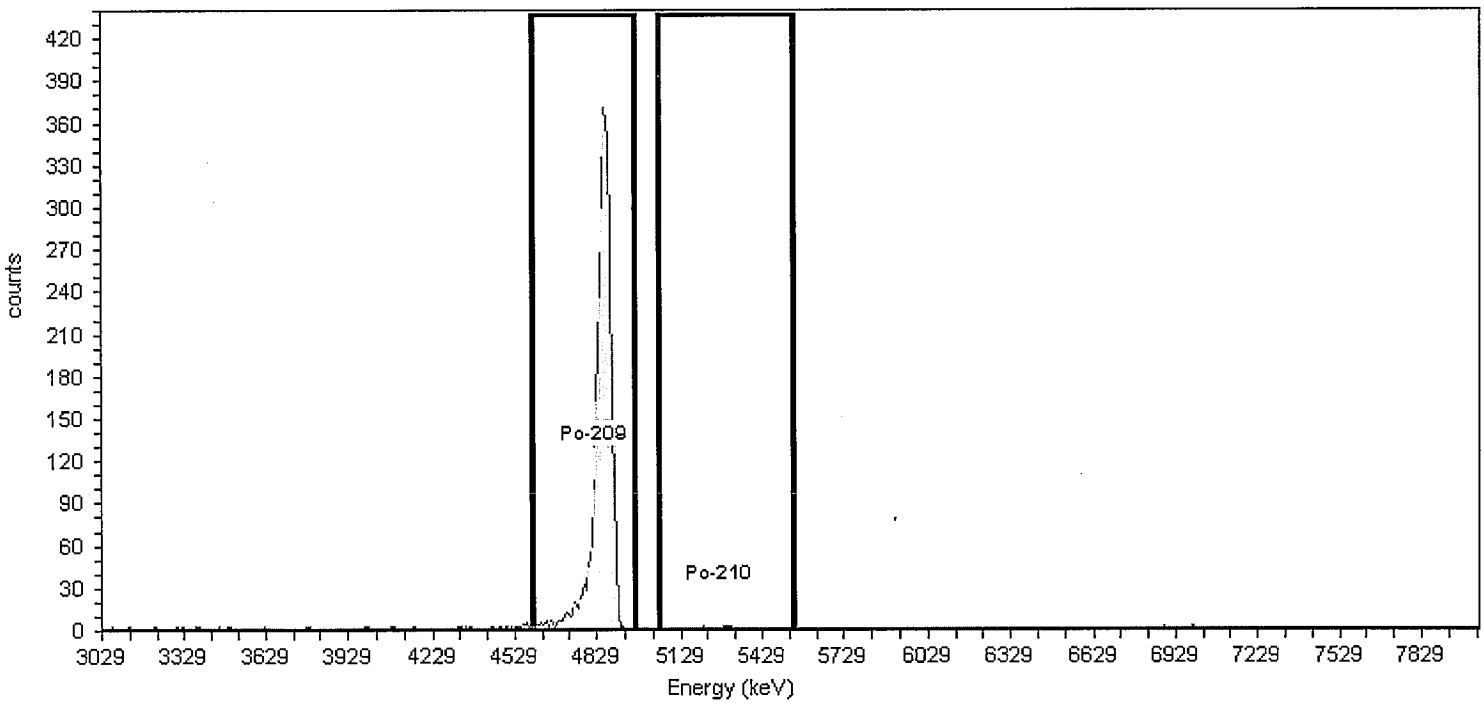
Energy Calibration: C08061039

Energy Cal: Gain = 9.8224 keV / Ch
Offset = 3,019.57 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: 95.68%



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
Po-209	4856.4	4591.2	4964.4	49.9	99.7	2,297.00	0.00	2,297.00	1.5E+001	6.4E-001	0.0E+000	1.9E-002
Po-210	5308.2	5052.8	5543.9	57.7	100.0	4.00	1.00	3.00	1.9E-002	2.8E-002	1.5E-002	4.6E-002

Reviewed By: gb JP

Paragon Analytics

Alpha-Spectroscopy Analysis Report

Sample

Sample: 0805200-6
Spectrum #1 Analysis #1

Sample Size : 0.19

Acquisition

Detector: 40
Batch Name: PL080606-3_A
Nuclide Library: Po-210
Analysis Method: Absolute ROI Analysis, Set Name = Po-210
ROI Set: Po-210

Acquisition Start Date: 6/13/2008 2:39:46PM
Live Time: 1,000.00 min.
Real Time: 1,000.03 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)

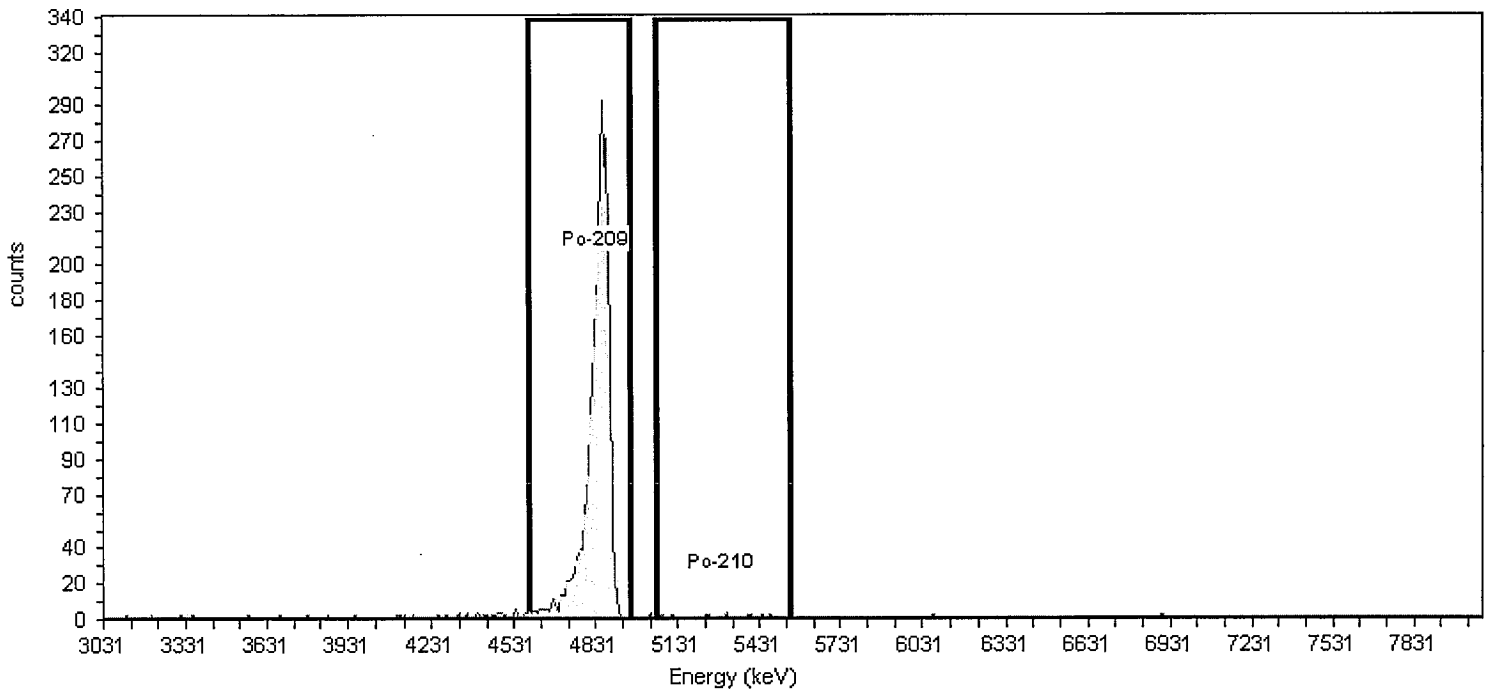
Energy Calibration: C08061040

Energy Cal: Gain = 9.9003 keV / Ch
Offset = 3,021.28 keV
Quadratic = 0.0000 keV / Ch^2

Tracer

Tracer Name: 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: 91.34%



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	80.6	99.7	2,132.00	2.00	2,130.00	1.9E+001	8.5E-001	3.3E-002	9.3E-002
Po-210	5308.2	5050.8	5545.9	.0	100.0	10.00	5.00	5.00	4.5E-002	7.0E-002	4.7E-002	1.2E-001

Reviewed By: GB JP

Paragon Analytics

Alpha-Spectroscopy Analysis Report

Sample

Sample: 0805200-7
Spectrum #1 Analysis #1

Sample Size : 0.27

Acquisition

Detector: 42
Batch Name: PL080606-3_A
Nuclide Library: Po-210
Analysis Method: Absolute ROI Analysis, Set Name = Po-210
ROI Set: Po-210

Acquisition Start Date: 6/13/2008 2:39:46PM
Live Time: 1,000.00 min.
Real Time: 1,000.02 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)

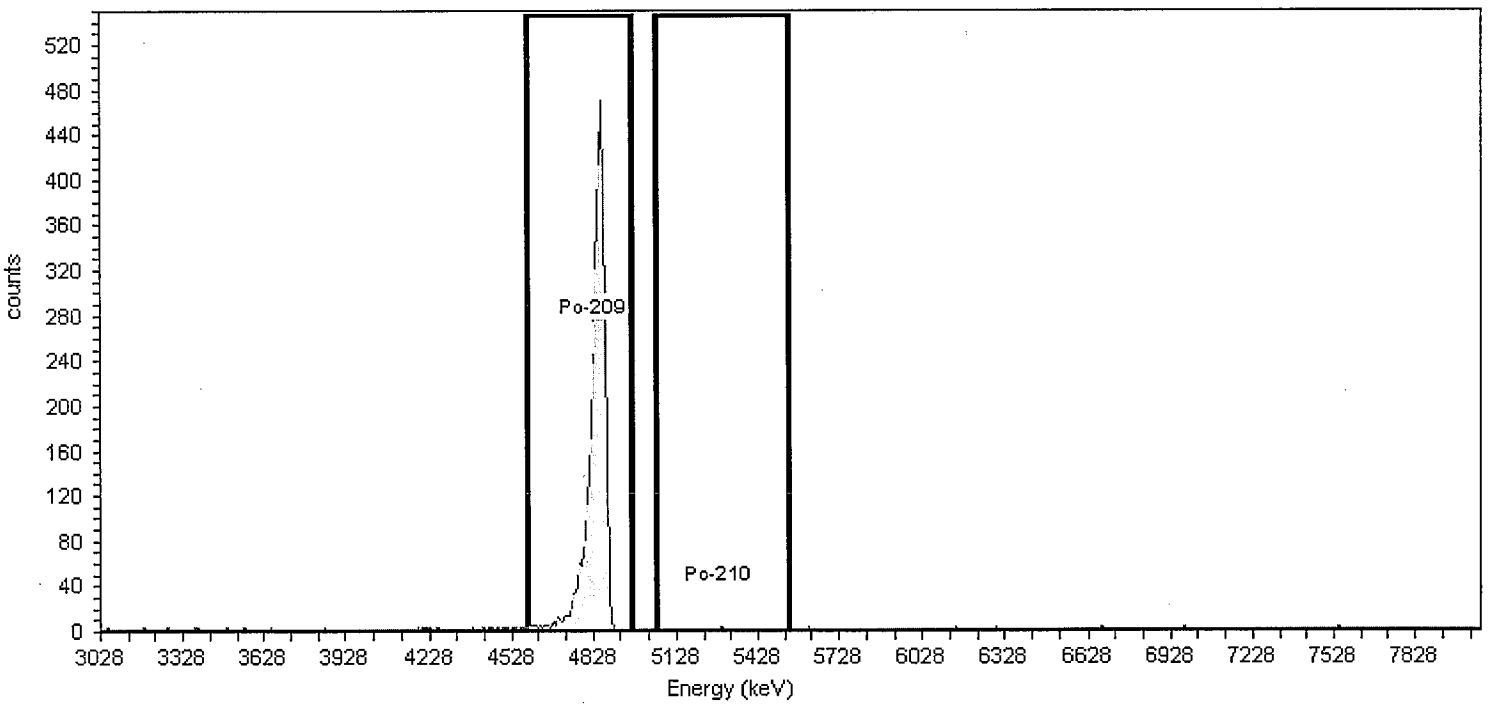
Energy Calibration: C08061042

Energy Cal: Gain = 9.8810 keV / Ch
Offset = 3,018.33 keV
Quadratic = 0.0000 keV / Ch^2

Tracer

Tracer Name: 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: 106.22%



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	4856.2	4589.4	4964.9	67.4	99.7	2,671.00	10.00	2,661.00	1.6E+001	6.1E-001	4.1E-002	9.6E-002
Po-210	5310.7	5053.8	5547.9	58.9	100.0	1.00	5.00	-4.00	-2.0E-002	2.5E-002	2.6E-002	6.6E-002

Reviewed By: GB JP

Paragon Analytics

Alpha-Spectroscopy Analysis Report

Sample

Sample: 0805200-9
Spectrum #1 Analysis #1

Sample Size : 0.15

Acquisition

Detector: 43
Batch Name: PL080606-3_A
Nuclide Library: Po-210
Analysis Method: Absolute ROI Analysis, Set Name = Po-210
ROI Set: Po-210

Acquisition Start Date: 6/13/2008 2:39:47PM
Live Time: 1,000.00 min.
Real Time: 1,000.02 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)

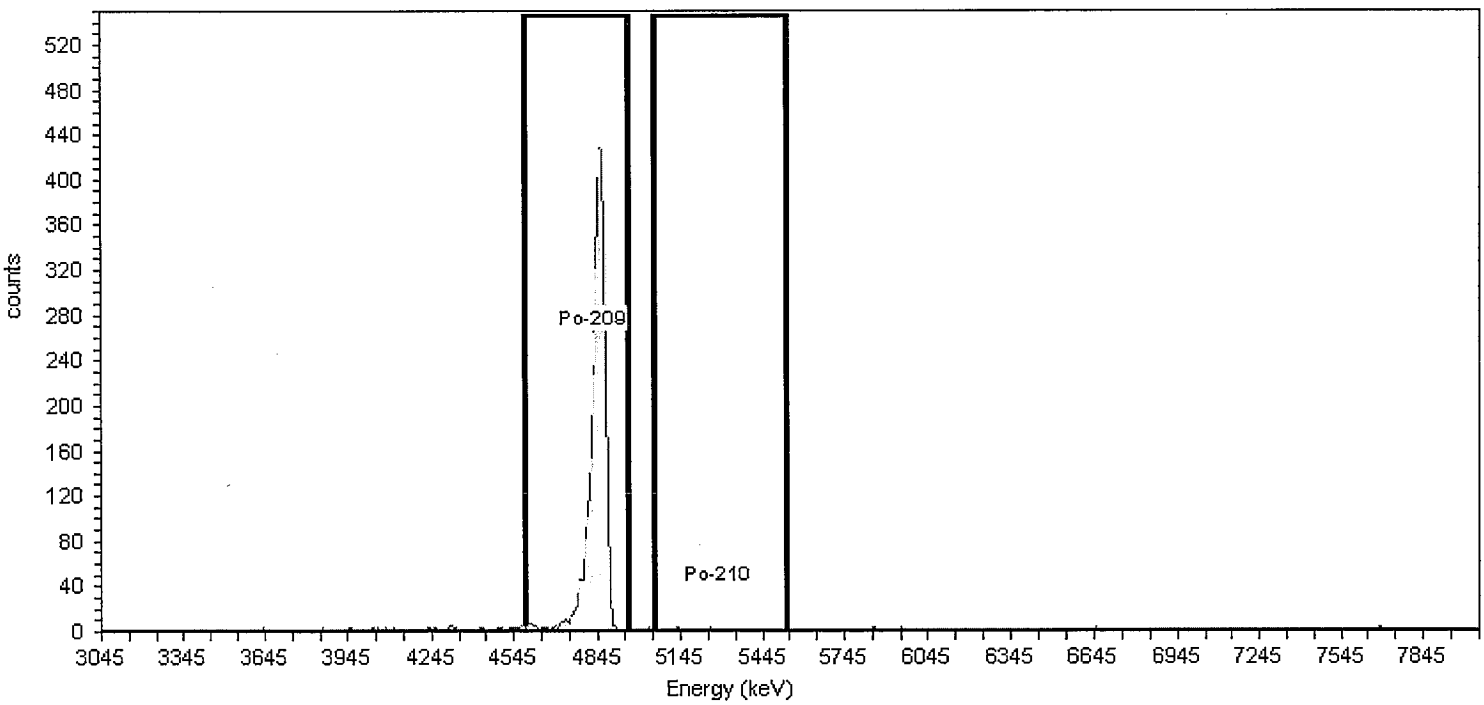
Energy Calibration: C08061043

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

Tracer

Tracer Name: 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: 95.25%



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	4849.9	4585.2	4957.7	65.6	99.7	2,427.00	1.00	2,426.00	2.5E+001	1.0E+000	2.5E-002	7.8E-002
Po-210	5300.9	5046.0	5536.2	.0	100.0	2.00	7.00	-5.00	-4.8E-002	5.8E-002	5.9E-002	1.4E-001

Reviewed By: gb JP

Paragon Analytics

Alpha-Spectroscopy Analysis Report

Sample

Sample: 0805200-10
Spectrum #1 Analysis #1

Sample Size : 0.28

Acquisition

Detector: 45
Batch Name: PL080606-3_A
Nuclide Library: Po-210
Analysis Method: Absolute ROI Analysis, Set Name = Po-210
ROI Set: Po-210

Acquisition Start Date: 6/13/2008 2:39:48PM
Live Time: 1,000.00 min.
Real Time: 1,000.02 min.
Dead Time: 0.00 %

Calibration

Bkgd Info: Sample: B08061045; Det: 45; Spectrum #1; Jun-10-2008 14:13

Calibration Date: 6/10/2008 12:30:25PM

Efficiency Calibration: C08061045

Efficiency: 31.68% +/- 0.13% TPU(2 sigma)

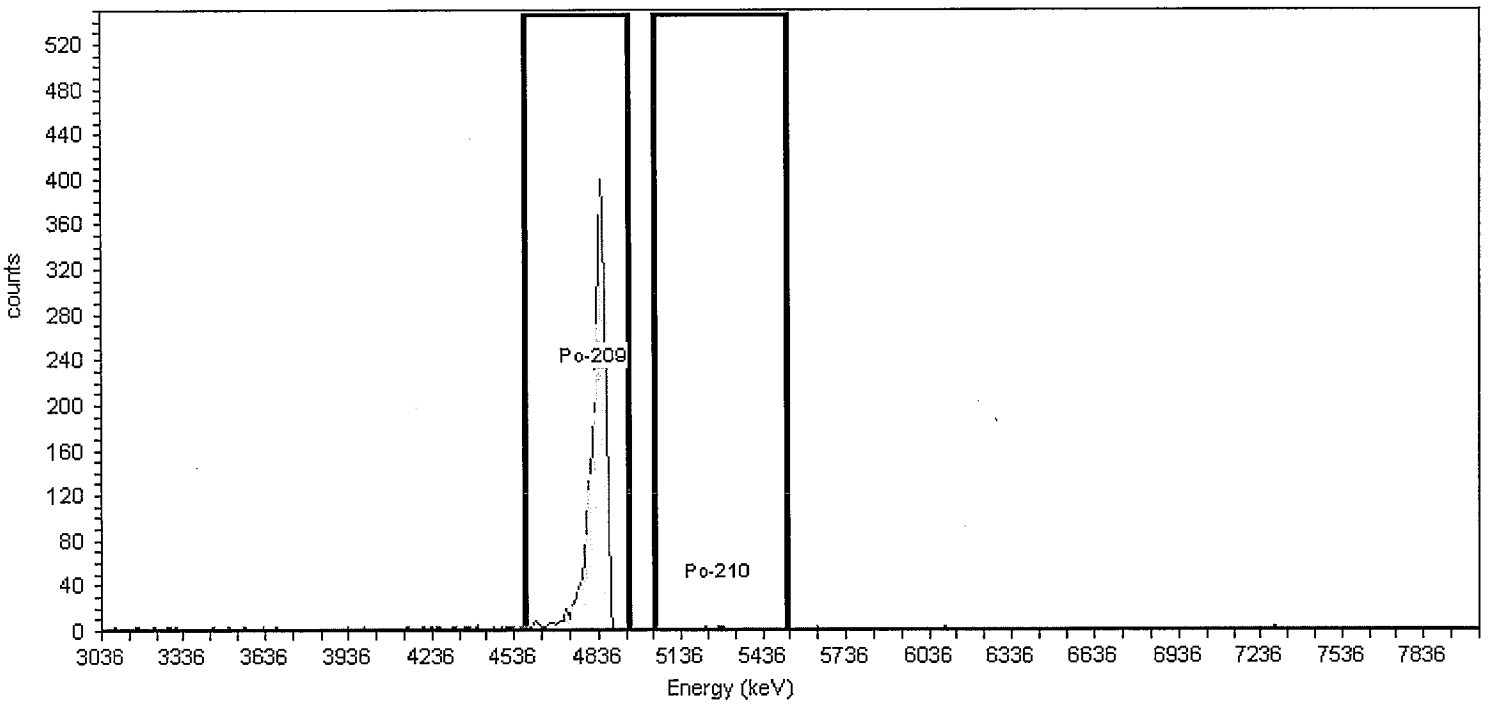
Energy Calibration: C08061045

Energy Cal: Gain = 9.8047 keV / Ch
Offset = 3,026.20 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: 89.08%



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	4840.1	4575.4	4947.9	65.7	99.7	2,255.00	1.00	2,254.00	1.3E+001	5.3E-001	1.5E-002	4.6E-002
Po-210	5291.1	5036.2	5526.4	274.3	100.0	5.00	1.00	4.00	2.3E-002	2.8E-002	1.3E-002	4.2E-002

Reviewed By: GB JP

Paragon Analytics

Alpha-Spectroscopy Analysis Report

Sample

Sample: 0805200-11
Spectrum #1 Analysis #1

Sample Size : 0.27

Acquisition

Detector: 46
Batch Name: PL080606-3_A
Nuclide Library: Po-210
Analysis Method: Absolute ROI Analysis, Set Name = Po-210
ROI Set: Po-210

Acquisition Start Date: 6/13/2008 2:39:49PM
Live Time: 1,000.00 min.
Real Time: 1,000.02 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)

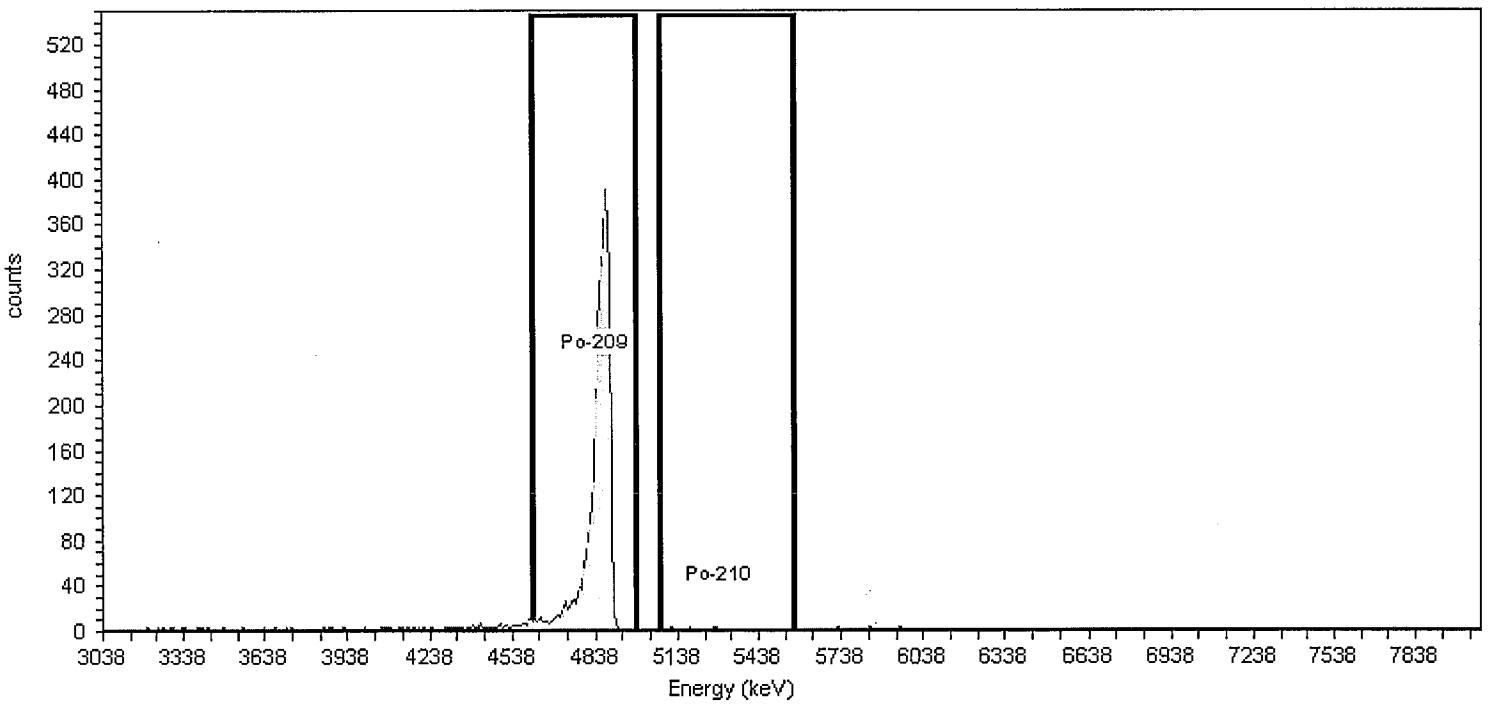
Energy Calibration: C08061046

Energy Cal: Gain = 9.8810 keV / Ch
Offset = 3,028.21 keV
Quadratic = 0.0000 keV / Ch^2

Tracer

Tracer Name: 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: 106.62%



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	4876.0	4609.2	4984.6	72.9	99.7	2,638.00	2.00	2,636.00	1.6E+001	6.2E-001	1.8E-002	5.2E-002
Po-210	5330.5	5073.6	5567.6	63.8	100.0	5.00	1.00	4.00	2.0E-002	2.5E-002	1.2E-002	3.7E-002

Reviewed By: GB JP

Print Date: 6/16/2008 9:33:54AM

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

Paragon Analytics

Alpha-Spectroscopy Analysis Report

Sample

Sample: 0805200-13
Spectrum #1 Analysis #1

Sample Size : 0.27

Acquisition

Detector: 47
Batch Name: PL080606-3_A
Nuclide Library: Po-210
Analysis Method: Absolute ROI Analysis, Set Name = Po-210
ROI Set: Po-210

Acquisition Start Date: 6/13/2008 2:39:49PM
Live Time: 1,000.00 min.
Real Time: 1,000.02 min.
Dead Time: 0.00 %

Calibration

Bkgd Info: Sample: B08061047; Det: 47; Spectrum #1; Jun-10-2008 14:13

Calibration Date: 6/10/2008 12:31:13PM

Efficiency Calibration: C08061047

Efficiency: 30.08% +/- 0.18% TPU(2 sigma)

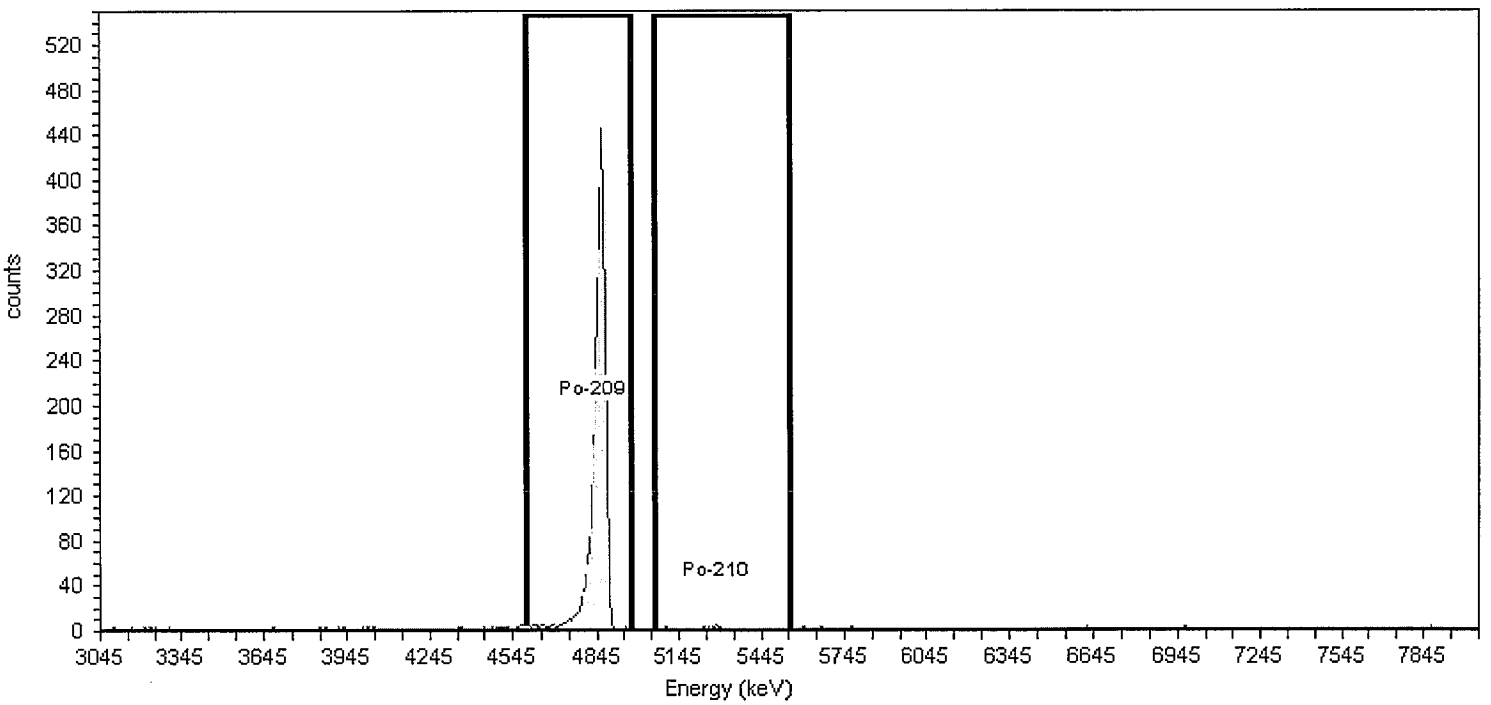
Energy Calibration: C08061047

Energy Cal: Gain = 9.8047 keV / Ch
Offset = 3,036.00 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: 86.36%



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	4859.7	4595.0	4967.5	64.9	99.7	2,078.00	3.00	2,075.00	1.3E+001	5.6E-001	2.9E-002	7.6E-002
Po-210	5310.7	5055.8	5546.0	63.5	100.0	9.00	3.00	6.00	3.9E-002	4.5E-002	2.6E-002	6.9E-002

Reviewed By: GB JP

Paragon Analytics

Alpha-Spectroscopy Analysis Report

Sample

Sample: 0805200-14
Spectrum #1 Analysis #1

Sample Size : 0.25

Acquisition

Detector: 1
Batch Name: PAS080606-3_B
Nuclide Library: Po-210
Analysis Method: Absolute ROI Analysis, Set Name = Po-210
ROI Set: Po-210

Acquisition Start Date: 6/14/2008 11:47:21AM
Live Time: 1,000.00 min.
Real Time: 1,000.05 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)

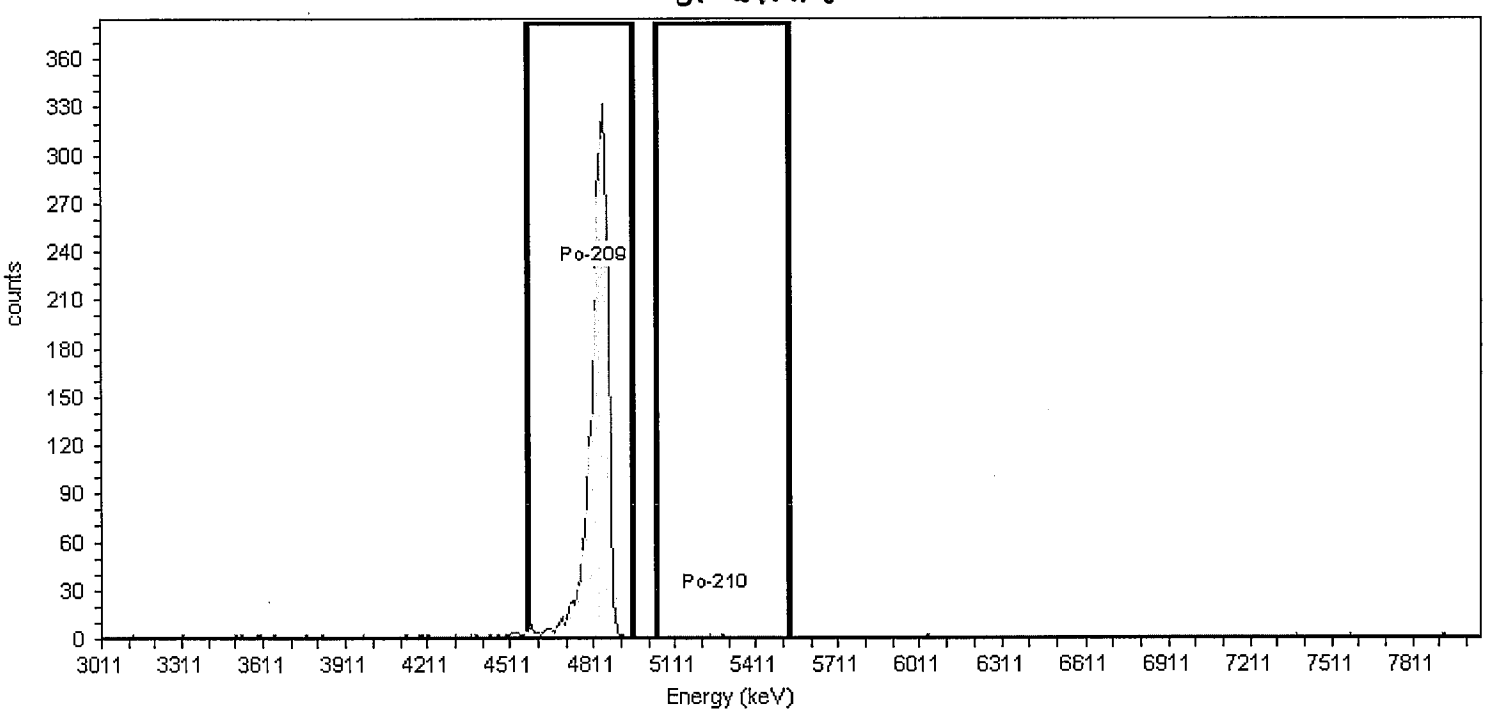
Energy Calibration: C08060901

Energy Cal: Gain = 9.9003 keV / Ch
Offset = 3,001.48 keV
Quadratic = 0.0000 keV / Ch^2

Tracer

Tracer Name: 851.3020.87 Po-209 0.50 = 8.82 DPM
Tracer Activity: 17.63 DPM/mL x (Vol.)~~1.00~~ mL = 1~~7.63 DPM~~ JP 6/19/08

Tracer Nuclide: Po-209
Tracer Recovery: ~~51.22%~~ ~ 102%



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	4842.9	4575.6	4951.8	78.5	99.7	2,356.00	1.00	2,355.00	* 1.6E+001	* 6.7E-001	* 3.1E-002	* 9.8E-002
Po-210	5288.4	5040.9	5536.0	71.4	100.0	2.00	2.00	0.00	0.0E+000	4.8E-002	4.0E-002	1.1E-001

* Estimated Values.
JP 6/19/08

Reviewed By: GB JP

Paragon Analytics

Alpha-Spectroscopy Analysis Report

Sample

Sample: 0805200-15
Spectrum #1 Analysis #1

Sample Size : 0.34

Acquisition

Detector: 2
Batch Name: PAS080606-3_B
Nuclide Library: Po-210
Analysis Method: Absolute ROI Analysis, Set Name = Po-210
ROI Set: Po-210

Acquisition Start Date: 6/14/2008 11:47:12AM
Live Time: 1,000.00 min.
Real Time: 1,000.05 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

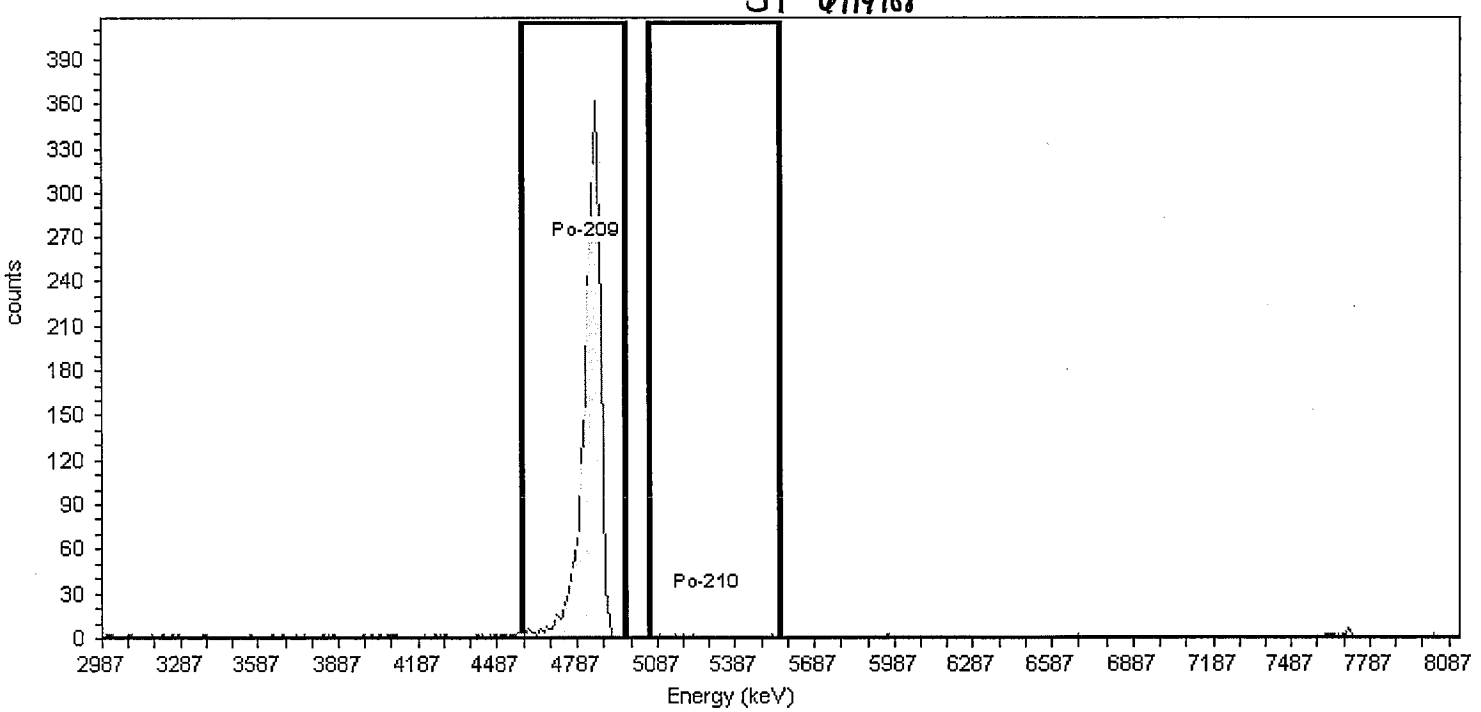
Energy Cal: Gain = 10.0776 keV / Ch
Offset = 2,977.80 keV
Quadratic = 0.0000 keV / Ch^2

Tracer

Tracer Name: 851.3020.87 Po-209 0.50 mL = 8.82 DPM
Tracer Activity: 17.63 DPM/mL x (Vol.)1 ~~.00 mL = 17.63 DPM~~

Tracer Nuclide: Po-209
Tracer Recovery: ~~50.65~~% ~ 101%

JP 6/19/08



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	4852.2	4580.1	4963.1	80.5	99.7	2,515.00	4.00	2,511.00	* 1.2E+001	* 4.8E-001	* 4.4E-002	* 1.1E-001
Po-210	5305.7	5053.8	5557.7	.4	100.0	5.00	0.00	5.00	4.3E-002	4.2E-002	0.0E+000	2.3E-002

* Estimated Values.
JP 6/19/08

Reviewed By: GB JP

Print Date: 6/16/2008 9:46:48AM

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

Paragon Analytics

Alpha-Spectroscopy Analysis Report

Sample

Sample: 0805200-17
Spectrum #1 Analysis #1

Sample Size : 0.28

Acquisition

Detector: 4
Batch Name: PAS080606-3_B
Nuclide Library: Po-210
Analysis Method: Absolute Interactive ROI Analysis
ROI Set: Po-210

Acquisition Start Date: 6/14/2008 11:47:13AM
Live Time: 1,000.00 min.
Real Time: 1,000.05 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)

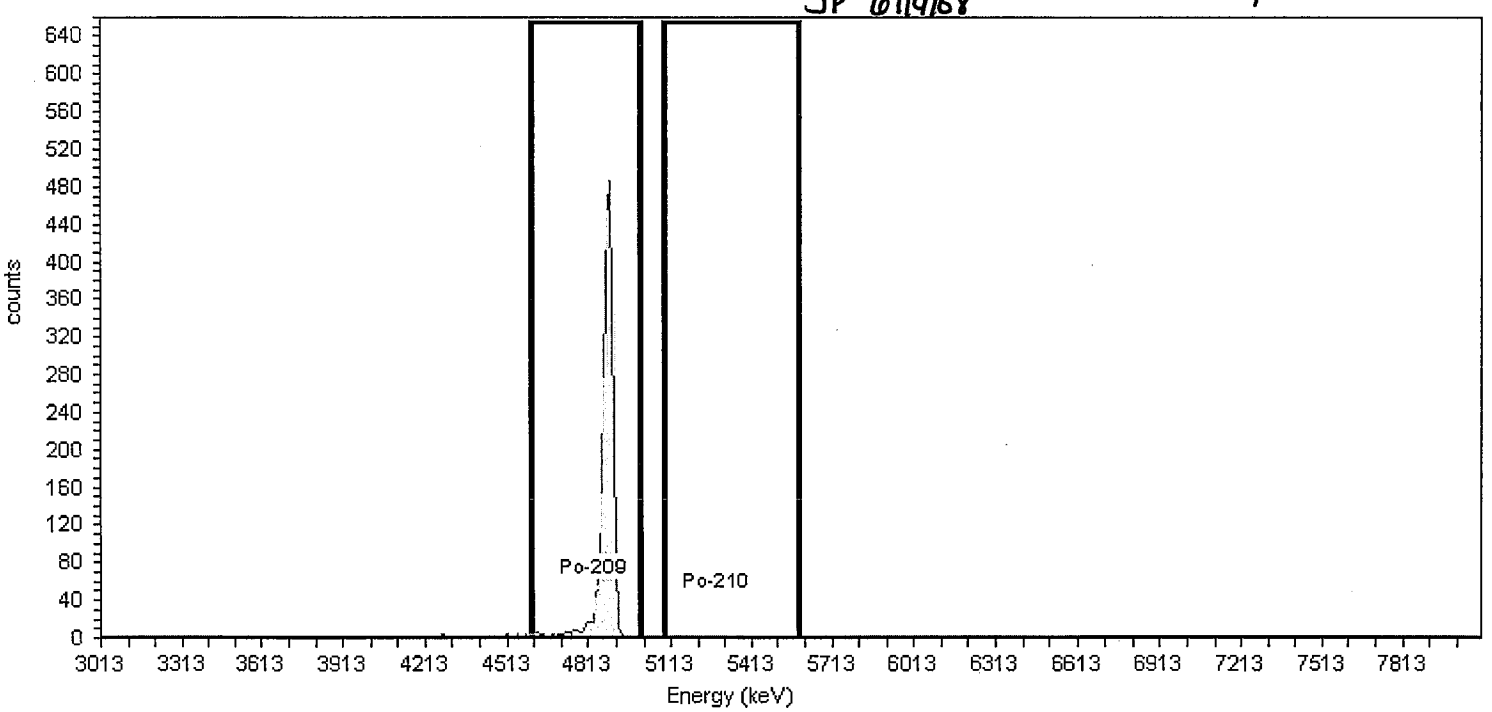
Energy Calibration: C08060904

Energy Cal: Gain = 9.9784 keV / Ch
Offset = 3,003.23 keV
Quadratic = 0.0000 keV / Ch^2

Tracer

Tracer Name: 851.3020.87 Po-209 0.50mL= 8.82 DPM
Tracer Activity: 17.63 DPM/mL x (Vol.)~~1.00 mL = 17.63 DPM~~

Tracer Nuclide: Po-209
Tracer Recovery: ~~42.49%~~ ~ 84.8%
JP 6/19/08



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	4829.3	4599.8	4998.9	59.6	99.7	2,043.00	2.00	2,041.00	*1.2E+001	*5.4E-001	*4.5E-002	*1.3E-001
Po-210	5278.3	5088.7	5587.7	.4	100.0	9.00	5.00	4.00	5.0E-002	9.4E-002	6.5E-002	1.6E-001

* Estimated Values
JP 6/19/08

Reviewed By: GB JP

Print Date: 6/17/2008 12:22:57PM

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

Paragon Analytics

Alpha-Spectroscopy Analysis Report

Sample

Sample: 0805200-18
Spectrum #1 Analysis #1

Sample Size : 0.29

Acquisition

Detector: 5
Batch Name: PAS080606-3_B
Nuclide Library: Po-210
Analysis Method: Absolute ROI Analysis, Set Name = Po-210
ROI Set: Po-210

Acquisition Start Date: 6/14/2008 11:47:14AM
Live Time: 1,000.00 min.
Real Time: 1,000.05 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)

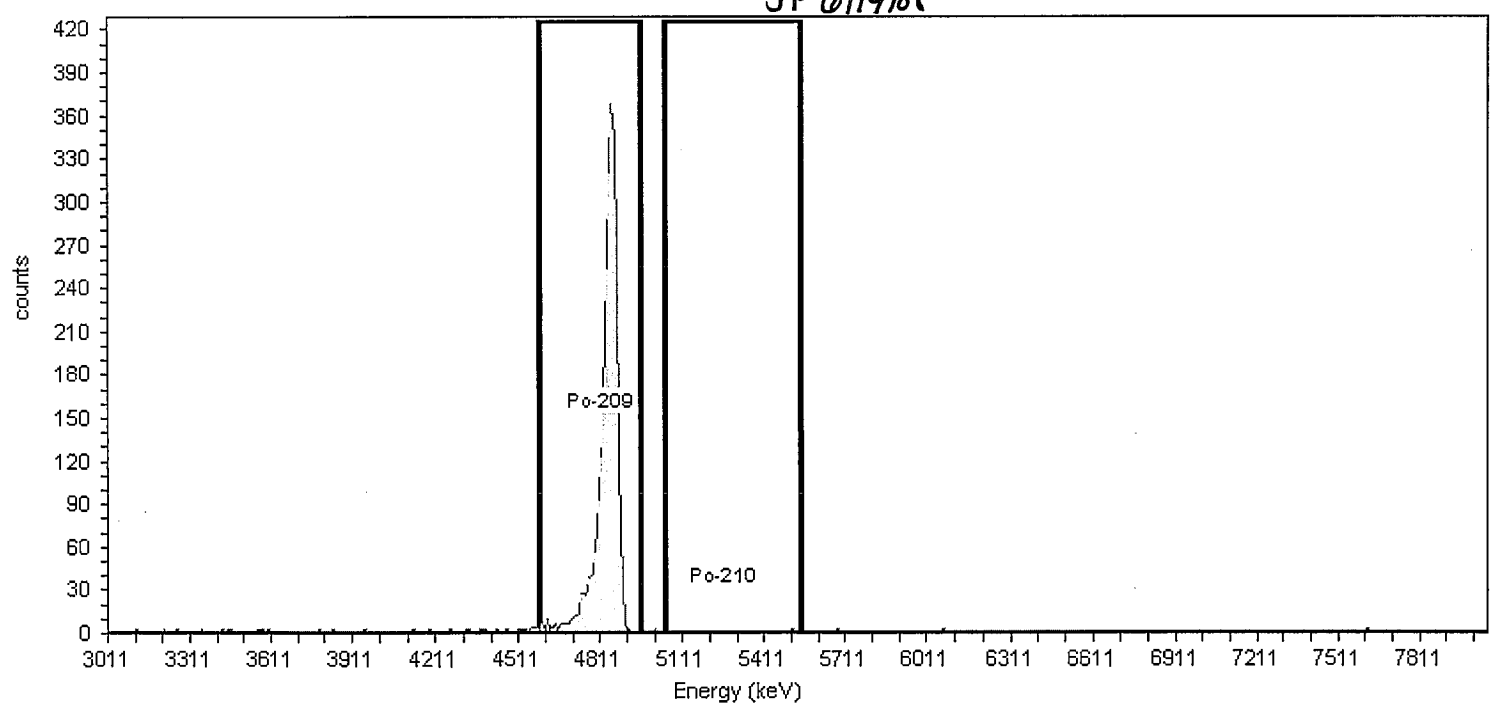
Energy Calibration: C08060905

Energy Cal: Gain = 9.9003 keV / Ch
Offset = 3,001.48 keV
Quadratic = 0.0000 keV / Ch²

Tracer

Tracer Name: 851.3020.87 Po-209 0.50mL = 8.82 DPM
Tracer Activity: 17.63 DPM/mL x (Vol.) ~~1.00 mL = 17.63 DPM~~

Tracer Nuclide: Po-209
Tracer Recovery: ~~48.01~~% ~ 96%
JP 6/19/08



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	53.4	99.7	2,395.00	3.00	2,392.00	* 1.3E+001	* 5.5E-001	* 4.7E-002	* 1.3E-001
Po-210	5298.3	5050.8	5545.9	.0	100.0	1.00	2.00	-1.00	-1.1E-002	3.6E-002	3.5E-002	9.8E-002

*Estimated Values.
JP 6/19/08

Reviewed By: GB JP

Paragon Analytics

Alpha-Spectroscopy Analysis Report

Sample

Sample: 0805200-19
Spectrum #1 Analysis #1

Sample Size : 0.43

Acquisition

Detector: 6
Batch Name: PAS080606-3_B
Nuclide Library: Po-210
Analysis Method: Absolute ROI Analysis, Set Name = Po-210
ROI Set: Po-210

Acquisition Start Date: 6/14/2008 11:47:15AM
Live Time: 1,000.00 min.
Real Time: 1,000.05 min.
Dead Time: 0.00 %

Calibration

Bkgd Info: Sample: B08060906; Det: 6; Spectrum #1; Jun-09-2008 12:16

Calibration Date: 6/9/2008 8:48:25AM

Efficiency Calibration: C08060906

Efficiency: 30.30% +/- 0.15% TPU(2 sigma)

Energy Calibration: C08060906

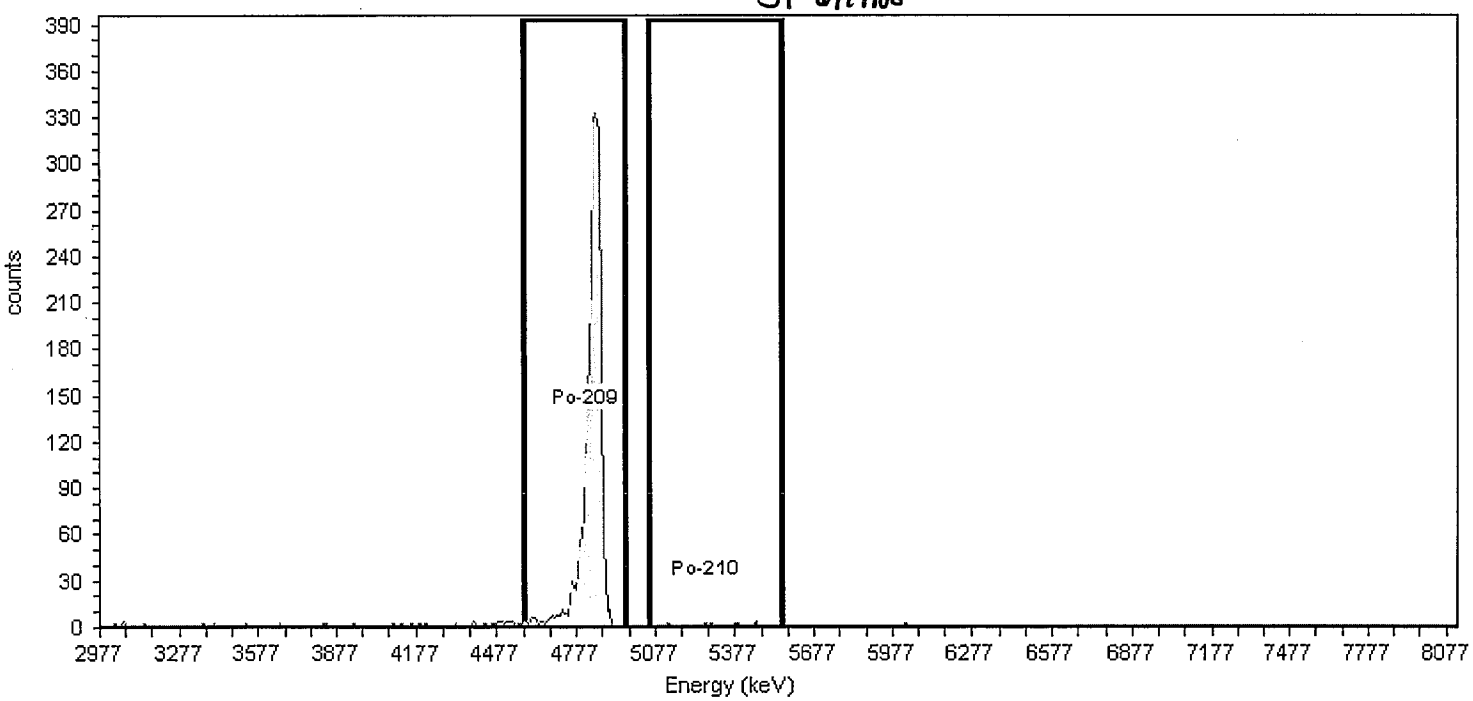
Energy Cal: Gain = 10.0776 keV / Ch
Offset = 2,967.72 keV
Quadratic = 0.0000 keV / Ch^2

Tracer

Tracer Name: 851.3020.87 Po-209 0.50mL = 8.82 DPM
Tracer Activity: 17.63 DPM/mL x (Vol.) ~~1.00 mL = 17.63 DPM~~

Tracer Nuclide: Po-209
Tracer Recovery: 4~~1.02~~% ~ 82%

JP 6/19/08



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	4852.2	4580.1	4963.1	61.2	99.7	1,992.00	6.00	1,986.00	* 7.6E+000	* 3.5E-001	* 5.4E-002	* 1.3E-001
Po-210	5305.7	5053.8	5557.7	233.5	100.0	7.00	8.00	-1.00	-8.5E-003	6.6E-002	5.6E-002	1.3E-001

* Estimated Values. JP 6/19/08

Reviewed By: gb JP

Paragon Analytics

Alpha-Spectroscopy Analysis Report

Sample

Sample: 0805200-21
Spectrum #1 Analysis #1

Sample Size : 0.28

Acquisition

Detector: 7
Batch Name: PAS080606-3_B
Nuclide Library: Po-210
Analysis Method: Absolute ROI Analysis, Set Name = Po-210
ROI Set: Po-210

Acquisition Start Date: 6/14/2008 11:47:15AM
Live Time: 1,000.00 min.
Real Time: 1,000.05 min.
Dead Time: 0.00 %

Calibration

Bkgd Info: Sample: B08060907; Det: 7; Spectrum #1; Jun-09-2008 12:16

Calibration Date: 6/9/2008 8:48:45AM

Efficiency Calibration: C08060907

Efficiency: 29.44% +/- 0.18% TPU(2 sigma)

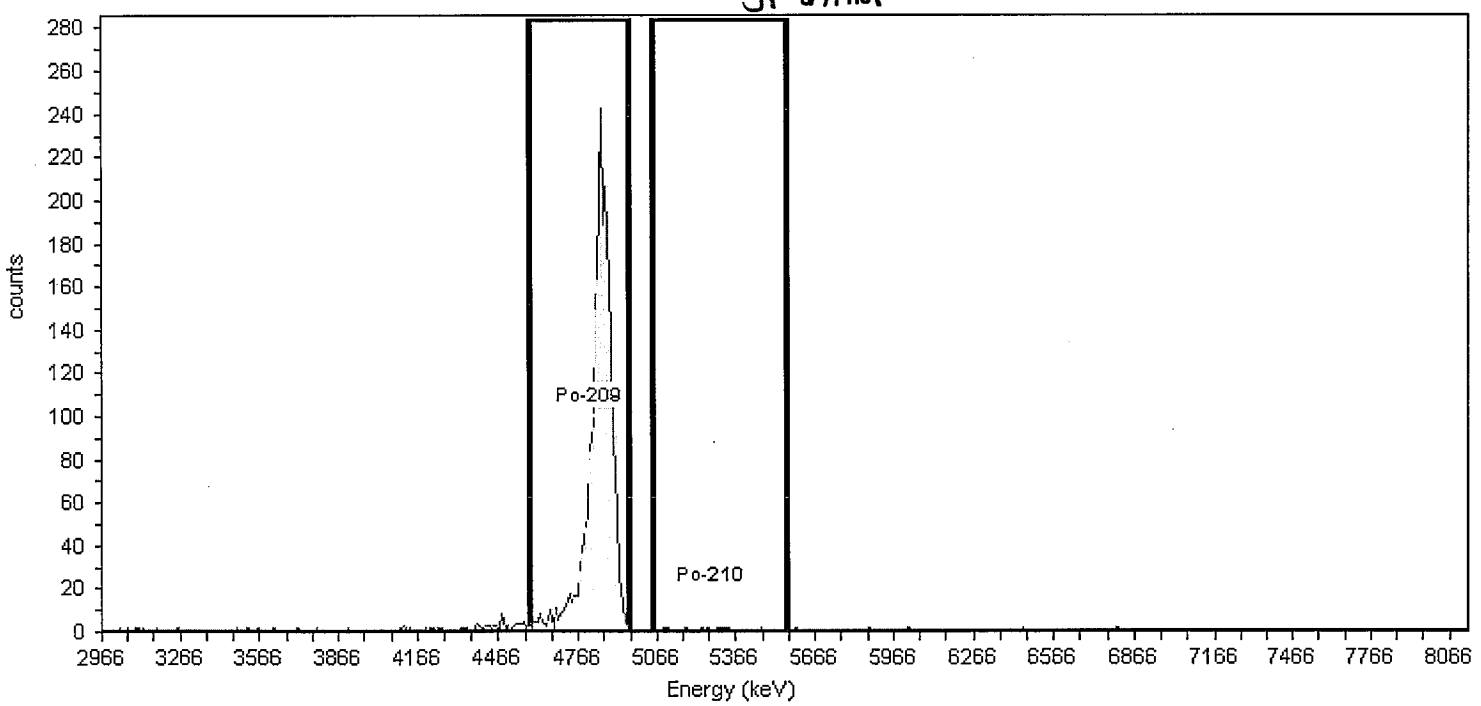
Energy Calibration: C08060907

Energy Cal: Gain = 10.1357 keV / Ch
Offset = 2,956.67 keV
Quadratic = 0.0000 keV / Ch^2

Tracer

Tracer Name: 851.3020.87 Po-209 0.50mL = 8.82 DPM
Tracer Activity: 17.63 DPM/mL x (Vol.)~~1.00 mL = 17.63 DPM~~ JP 6/19/08

Tracer Nuclide: Po-209
Tracer Recovery: ~~41.03%~~ ~82%



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	4852.0	4578.4	4963.5	~~38.5~~	99.7	1,934.00	4.00	1,930.00	* 1.2E+001	* 5.5E-001	* 7.0E-002	* 1.8E-001
Po-210	5308.2	5054.8	5561.5	56.4	100.0	11.00	3.00	8.00	1.1E-001	1.0E-001	5.5E-002	1.5E-001

~70 QB 6/17/08

* Estimated Values.
JP 6/19/08

Reviewed By: QB JP

Paragon Analytics

Alpha-Spectroscopy Analysis Report

Sample

Sample: 0805200-22
Spectrum #1 Analysis #1

Sample Size : 0.31

Acquisition

Detector: 8
Batch Name: PAS080606-3_B
Nuclide Library: Po-210
Analysis Method: Absolute ROI Analysis, Set Name = Po-210
ROI Set: Po-210

Acquisition Start Date: 6/14/2008 11:47:16AM
Live Time: 1,000.00 min.
Real Time: 1,000.05 min.
Dead Time: 0.00 %

Calibration

Bkgd Info: Sample: B08060908; Det: 8; Spectrum #1; Jun-09-2008 12:16

Calibration Date: 6/9/2008 8:49:07AM

Efficiency Calibration: C08060908

Efficiency: 32.03% +/- 0.13% TPU(2 sigma)

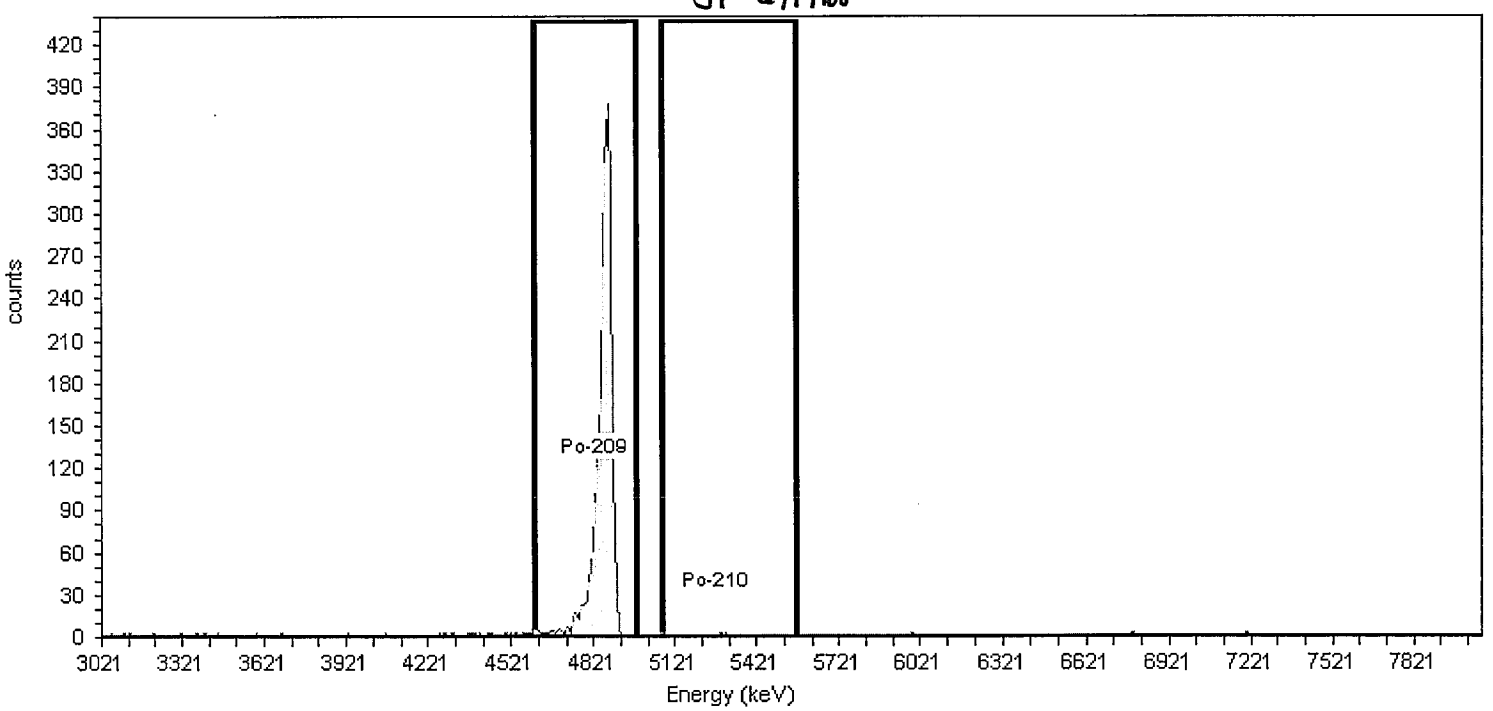
Energy Calibration: C08060908

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 0.50mL= 8.82 DPM
Tracer Activity: 17.63 DPM/mL x (Vol.) ~~1.00 mL = 17.63~~ DPM JP 6/19/08

Tracer Nuclide: Po-209
Tracer Recovery: ~~40.34~~% ~ 80.5%



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	4872.6	4605.3	4981.5	~~39.2~~ ~50	99.7	2,066.00	2.00	2,064.00	*1.0E+001	*4.6E-001	*4.1E-002	*1.2E-001
Po-210	5318.1	5070.6	5565.7	57.6	100.0	4.00	1.00	3.00	3.4E-002	5.1E-002	2.6E-002	8.3E-002

GB 6/17/08

*Estimated Values.
JP 6/19/08

Reviewed By: GB JP

Paragon Analytics

Alpha-Spectroscopy Analysis Report

Sample

Sample: 0805200-23
Spectrum #1 Analysis #1

Sample Size : 0.44

Acquisition

Detector: 33
Batch Name: PL080606-3_C
Nuclide Library: Po-210
Analysis Method: Absolute ROI Analysis, Set Name = Po-210
ROI Set: Po-210

Acquisition Start Date: 6/15/2008 10:54:45AM
Live Time: 1,000.00 min.
Real Time: 1,000.03 min.
Dead Time: 0.00 %

Calibration

Bkgd Info: Sample: B08061033; Det: 33; Spectrum #1; Jun-10-2008 14:13

Calibration Date: 6/10/2008 12:27:33PM

Efficiency Calibration: C08061033

Efficiency: 30.82% +/- 0.20% TPU(2 sigma)

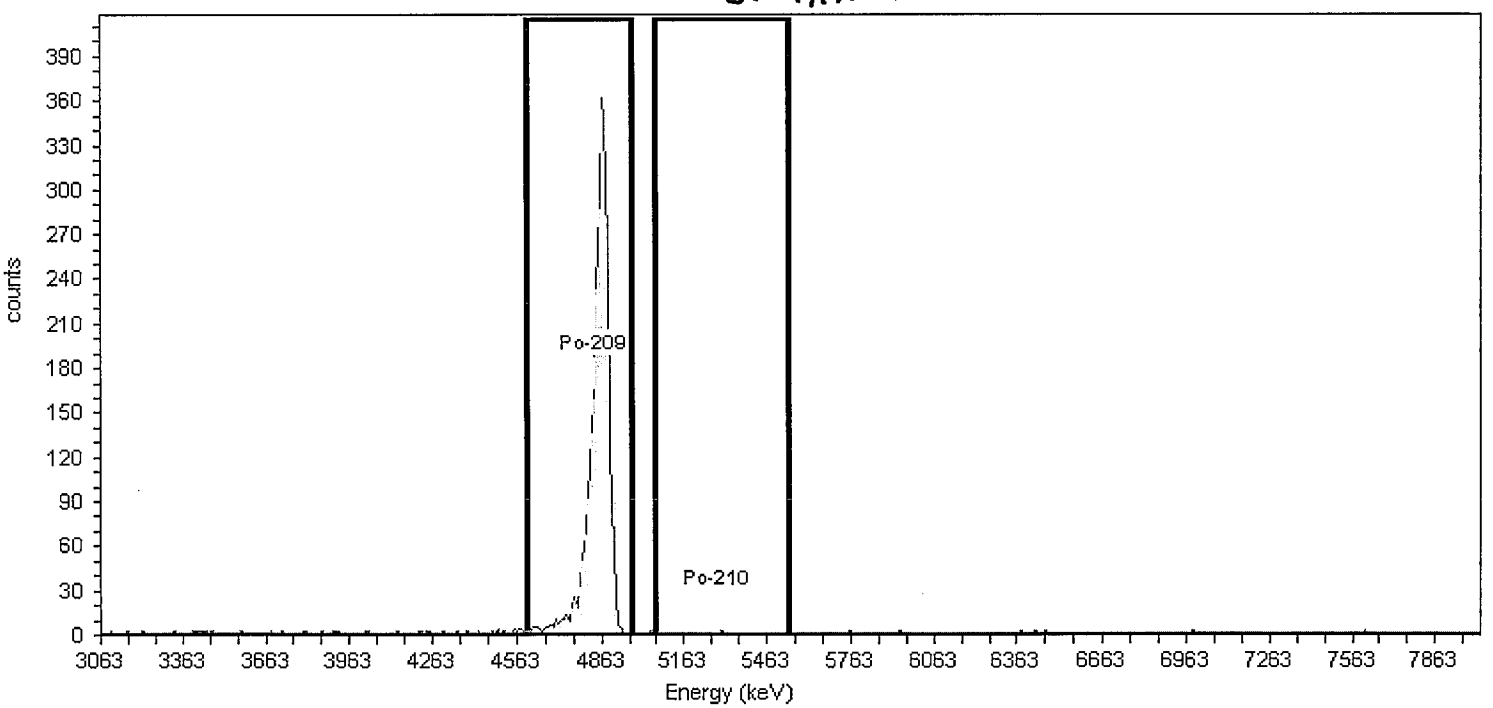
Energy Calibration: C08061033

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 0.50 mL = 8.82 DPM
Tracer Activity: 17.63 DPM/mL x (Vol.) ~~1.00 mL = 17.63 DPM~~ JP 6/19/08

Tracer Nuclide: Po-209
Tracer Recovery: ~~49.38%~~ ~ 98.6%



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	4863.1	4600.5	4970.2	77.1	99.7	2,434.00	3.00	2,431.00	* 8.9E+000	* 3.6E-001	* 3.0E-002	* 7.9E-002
Po-210	5310.7	5057.7	5544.2	23.5	100.0	1.00	1.00	0.00	0.0E+000	1.9E-002	1.6E-002	4.9E-002

*Estimated Values.
JP 6/19/08

Reviewed By: JB JP

Paragon Analytics

Alpha-Spectroscopy Analysis Report

Sample

Sample: 0805200-26
Spectrum #1 Analysis #1

Sample Size : 0.35

Acquisition

Detector: 34
Batch Name: PL080606-3_C
Nuclide Library: Po-210
Analysis Method: Absolute ROI Analysis, Set Name = Po-210
ROI Set: Po-210

Acquisition Start Date: 6/15/2008 10:54:42AM
Live Time: 1,000.00 min.
Real Time: 1,000.03 min.
Dead Time: 0.00 %

Calibration

Bkgd Info: Sample: B08061034; Det: 34; Spectrum #1; Jun-10-2008 14:13

Calibration Date: 6/10/2008 12:27:52PM

Efficiency Calibration: C08061034

Efficiency: 30.62% +/- 0.15% TPU(2 sigma)

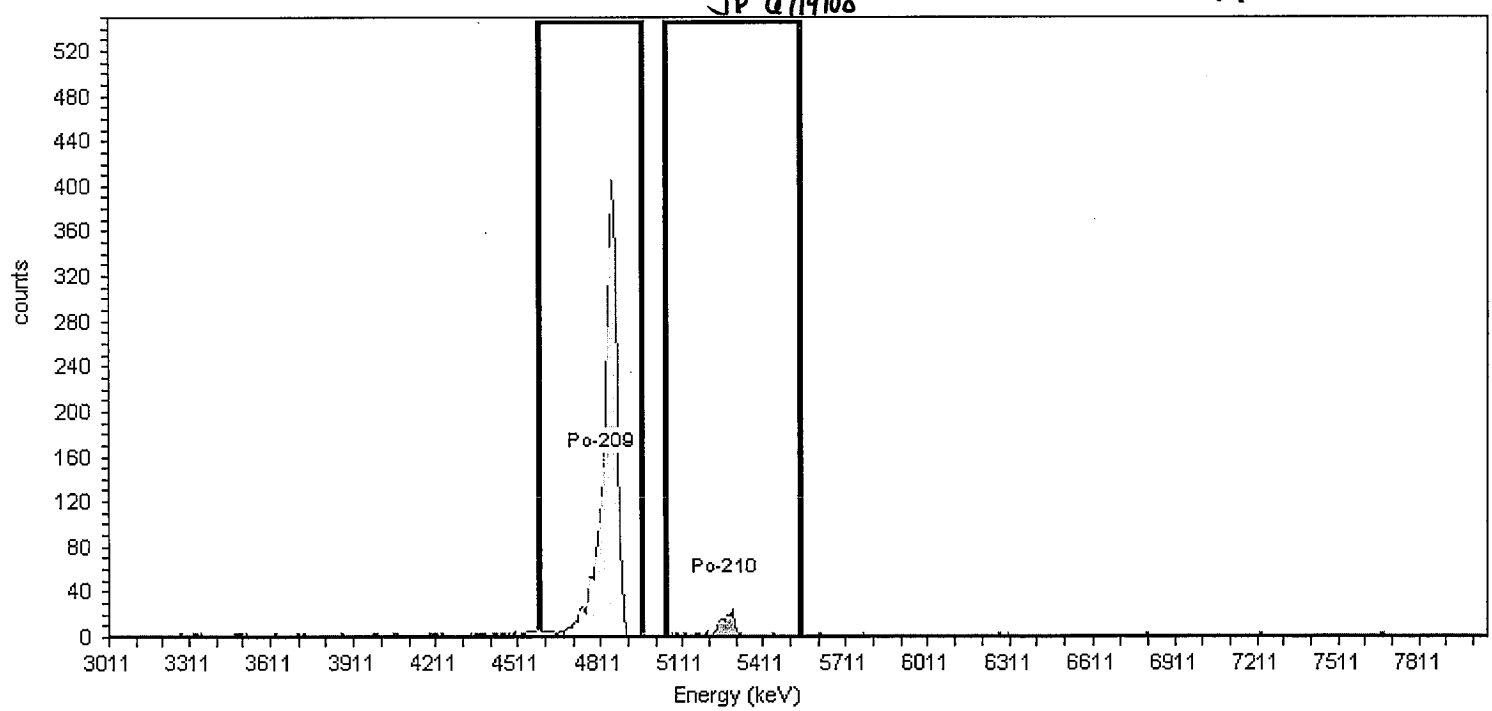
Energy Calibration: C08061034

Energy Cal: Gain = 9.9003 keV / Ch
Offset = 3,001.48 keV
Quadratic = 0.0000 keV / Ch^2

Tracer

Tracer Name: 851.3020.87 Po-209 0.50mL = 8.82 DPM
Tracer Activity: 17.63 DPM/mL x (Vol.) ~~1.00 mL = 17.63 DPM~~ JP 6/19/08

Tracer Nuclide: Po-209
Tracer Recovery: ~~48.61~~% ~97%



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	61.9	99.7	2,382.00	4.00	2,378.00	* 1.1E+001	* 4.5E-001	* 4.4E-002	* 1.1E-001
Po-210	5308.2	5050.8	5545.9	65.3	100.0	126.00	5.00	121.00	1.0E+000	2.3E-001	4.5E-002	1.1E-001

* Estimated Values.
JP 6/19/08

Reviewed By: gb JP

Print Date: 6/16/2008 9:34:22AM

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

Paragon Analytics

Alpha-Spectroscopy Analysis Report

Sample

Sample: 0805200-27
Spectrum #1 Analysis #1

Sample Size : 0.30

Acquisition

Detector: 35
Batch Name: PL080606-3_C
Nuclide Library: Po-210
Analysis Method: Absolute Interactive ROI Analysis
ROI Set: Po-210

Acquisition Start Date: 6/15/2008 10:54:43AM
Live Time: 1,000.00 min.
Real Time: 1,000.03 min.
Dead Time: 0.00 %

Calibration

Bkgd Info: Sample: B08061035; Det: 35; Spectrum #1; Jun-10-2008 14:13

Calibration Date: 6/10/2008 12:28:16PM

Efficiency Calibration: C08061035

Efficiency: 31.63% +/- 0.16% TPU(2 sigma)

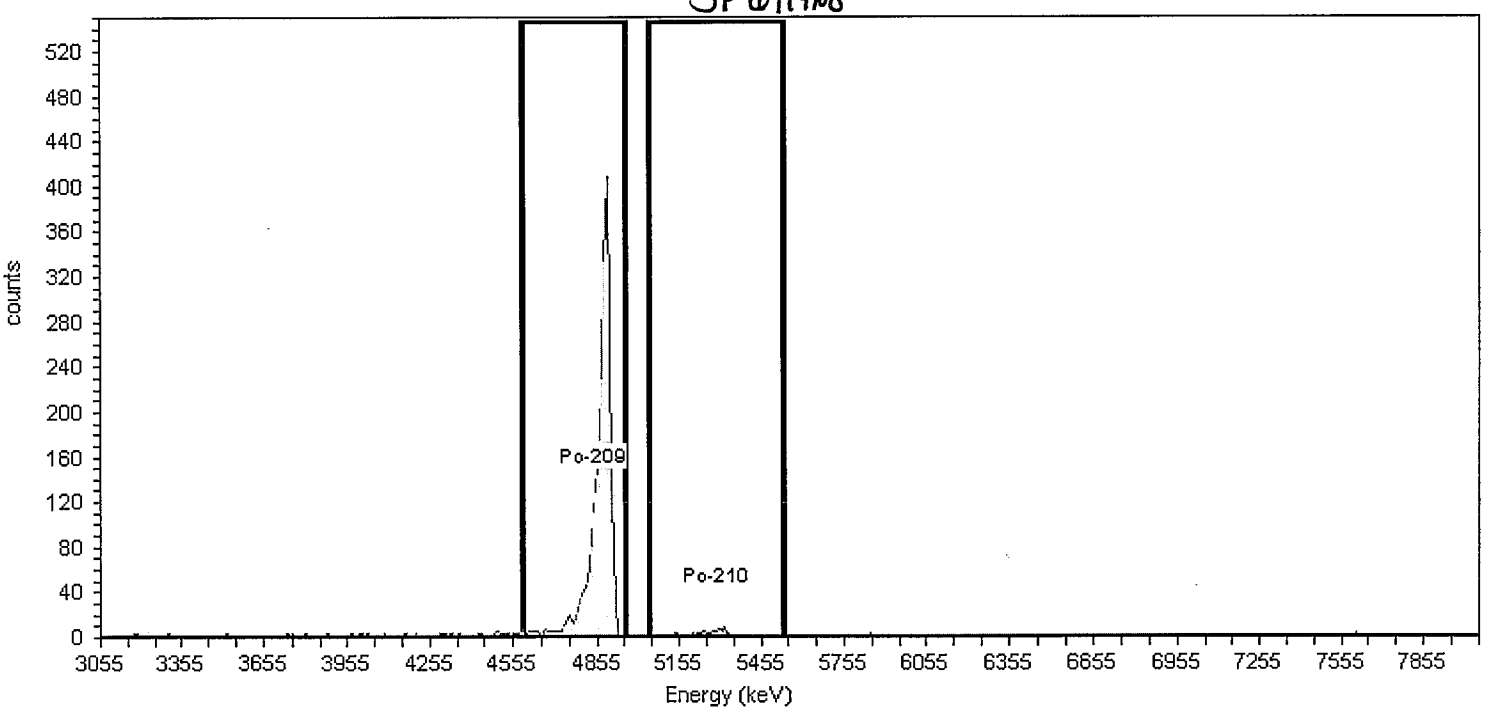
Energy Calibration: C08061035

Energy Cal: Gain = 9.8047 keV / Ch
Offset = 3,045.81 keV
Quadratic = 0.0000 keV / Ch^2

Tracer

Tracer Name: 851.3020.87 Po-209 0.50mL = 8.82 DPM
Tracer Activity: 17.63 DPM/mL x (Vol.) ~~1.00 mL = 17.63 DPM~~ JP 6/19/08

Tracer Nuclide: Po-209
Tracer Recovery: ~~43.06%~~ ~ 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
Po-209	4840.1	4585.2	4957.7	67.6	99.7	2,180.00	4.00	2,176.00	* 1.2E+001	* 5.0E-001	* 5.7E-002	* 1.5E-001
Po-210	5291.1	5046.0	5536.2	72.1	100.0	37.00	0.00	37.00	4.1E-001	1.4E-001	0.0E+000	3.0E-002

*Estimated Values.
JP 6/19/08

Reviewed By: GB JP

Paragon Analytics

Alpha-Spectroscopy Analysis Report

Sample

Sample: 0805200-28
Spectrum #1 Analysis #1

Sample Size : 0.26

Acquisition

Detector: 7
Batch Name: PL080606-4_A
Nuclide Library: Po-210
Analysis Method: Absolute ROI Analysis, Set Name = Po-210
ROI Set: Po-210

Acquisition Start Date: 6/13/2008 1:43:26PM
Live Time: 1,000.00 min.
Real Time: 1,000.08 min.
Dead Time: 0.01 %

Calibration

Bkgd Info: Sample: B08060907; Det: 7; Spectrum #1; Jun-09-2008 12:16

Calibration Date: 6/9/2008 8:48:45AM

Efficiency Calibration: C08060907

Efficiency: 29.44% +/- 0.18% TPU(2 sigma)

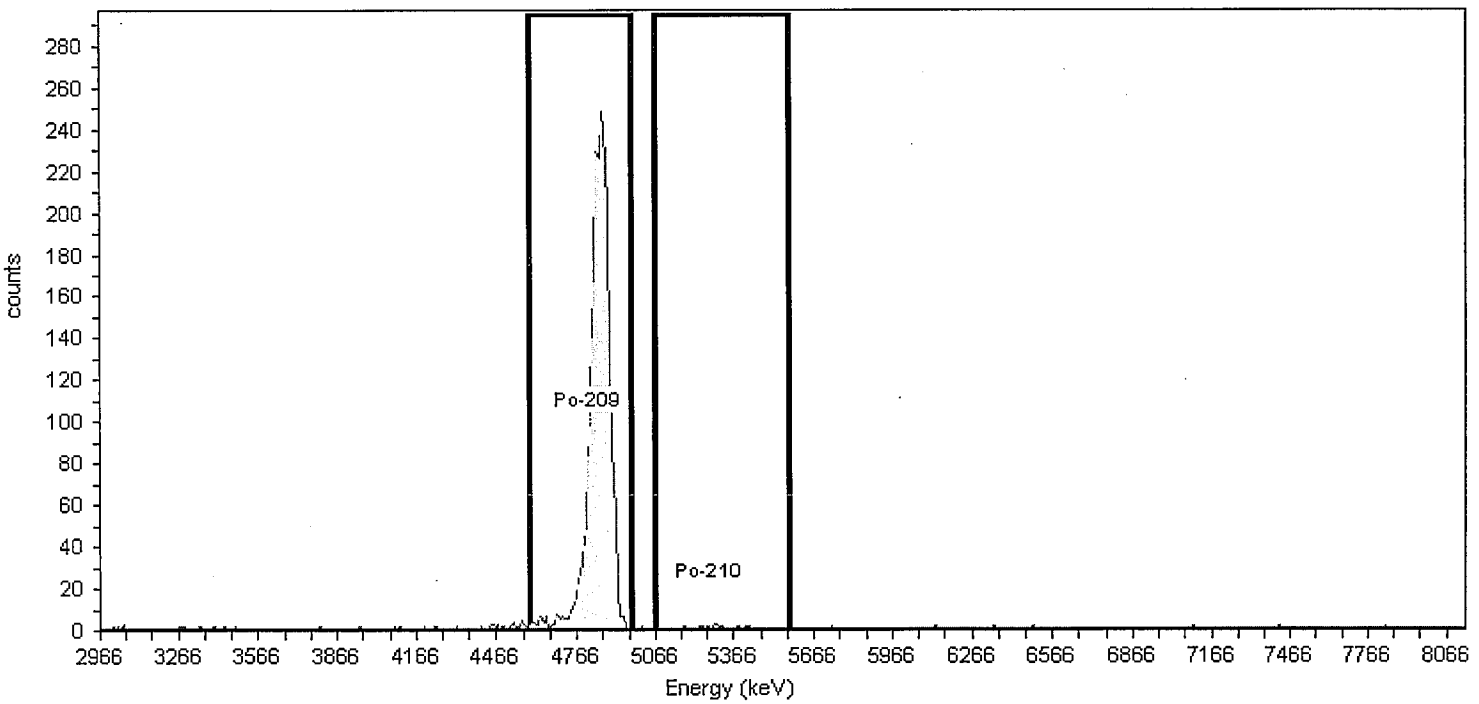
Energy Calibration: C08060907

Energy Cal: Gain = 10.1357 keV / Ch
Offset = 2,956.67 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: 87.50%



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
Po-209	4862.2	4588.5	4973.7	46.4	99.7	2,062.00	4.00	2,058.00	1.3E+001	6.0E-001	3.5E-002	8.9E-002
Po-210	5318.3	5064.9	5571.7	75.9	100.0	12.00	2.00	10.00	6.7E-002	5.1E-002	2.2E-002	6.2E-002

Reviewed By: GB JP

Paragon Analytics

Alpha-Spectroscopy Analysis Report

Sample

Sample: 0805200-30
Spectrum #1 Analysis #1

Sample Size : 0.30

Acquisition

Detector: 8
Batch Name: PL080606-4_A
Nuclide Library: Po-210
Analysis Method: Absolute ROI Analysis, Set Name = Po-210
ROI Set: Po-210

Acquisition Start Date: 6/13/2008 1:43:27PM
Live Time: 1,000.00 min.
Real Time: 1,000.08 min.
Dead Time: 0.01 %

Calibration

Bkgd Info: Sample: B08060908; Det: 8; Spectrum #1; Jun-09-2008 12:16

Calibration Date: 6/9/2008 8:49:07AM

Efficiency Calibration: C08060908

Efficiency: 32.03% +/- 0.13% TPU(2 sigma)

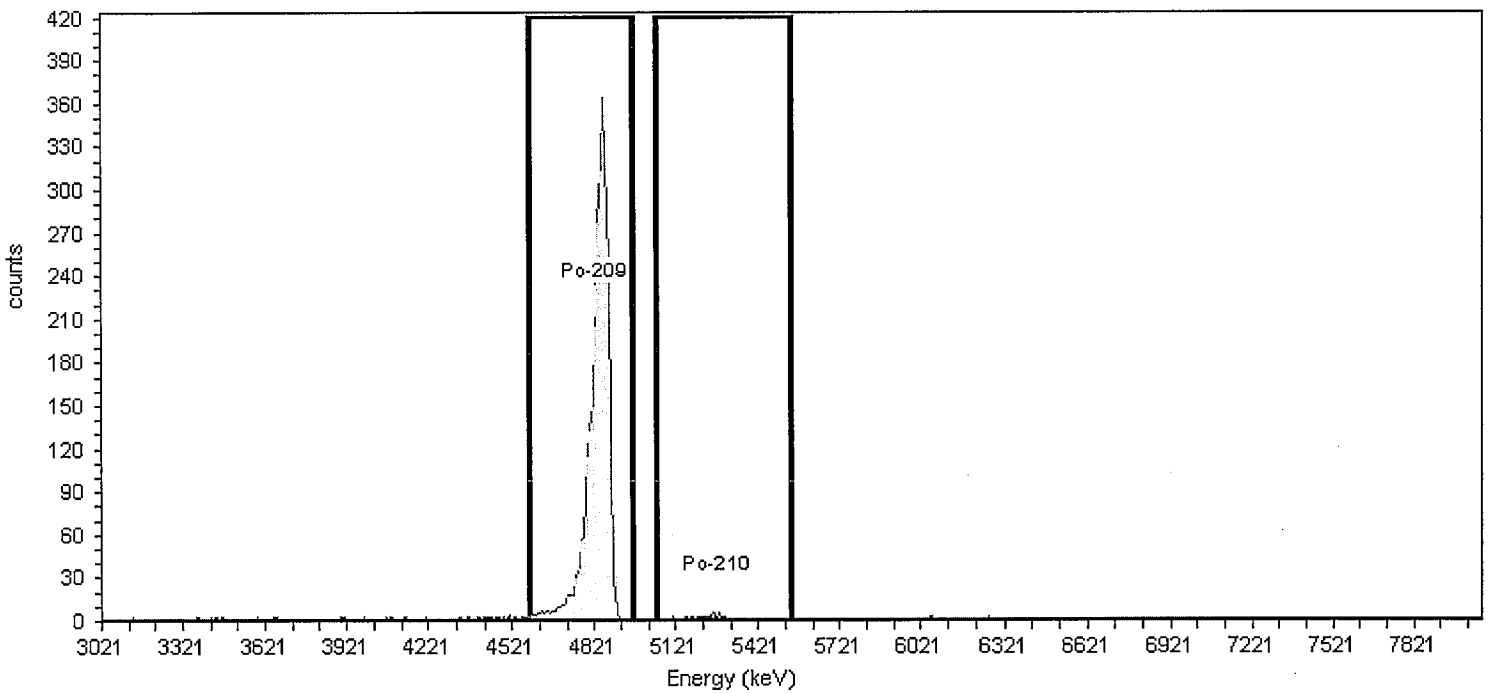
Energy Calibration: C08060908

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: 101.24%



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
Po-209	4852.8	4585.5	4961.7	80.6	99.7	2,592.00	2.00	2,590.00	1.3E+001	5.3E-001	1.7E-002	4.7E-002
Po-210	5298.3	5050.8	5545.9	84.3	100.0	23.00	1.00	22.00	1.0E-001	4.7E-002	1.1E-002	3.4E-002

Reviewed By: gb JP

Print Date: 6/16/2008 9:33:11AM

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

Paragon Analytics

Alpha-Spectroscopy Analysis Report

Sample

Sample: 0805200-31
Spectrum #1 Analysis #1

Sample Size : 0.31

Acquisition

Detector: 1
Batch Name: PL080606-4_A
Nuclide Library: Po-210
Analysis Method: Absolute ROI Analysis, Set Name = Po-210
ROI Set: Po-210

Acquisition Start Date: 6/15/2008 10:58:18AM
Live Time: 1,000.00 min.
Real Time: 1,000.03 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)

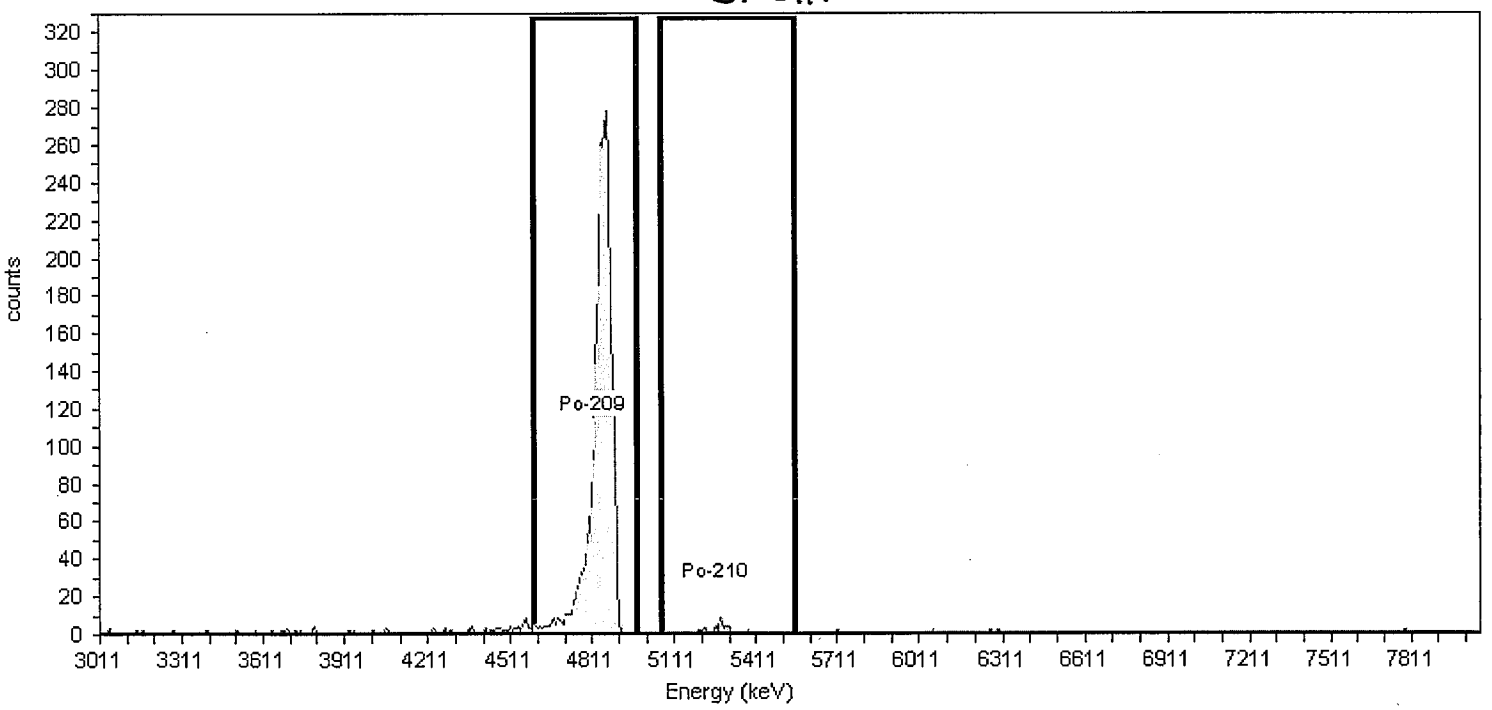
Energy Calibration: C08060901

Energy Cal: Gain = 9.9003 keV / Ch
Offset = 3,001.48 keV
Quadratic = 0.0000 keV / Ch^2

Tracer

Tracer Name: 851.3020.87 Po-209 0.5mL 8.82
Tracer Activity: 17.63 DPM/mL x (Vol.) ~~1.00~~ mL = ~~17.63~~ DPM JP 6/19/08

Tracer Nuclide: Po-209
Tracer Recovery: ~~45.65%~~ ~ 91.1%



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	4862.7	4595.4	4971.6	47.8	99.7	2,100.00	1.00	2,099.00	* 1.2E+001	* 5.1E-001	* 2.8E-002	* 8.9E-002
Po-210	5308.2	5060.7	5555.8	59.3	100.0	24.00	2.00	22.00	2.4E-001	1.1E-001	3.6E-002	1.0E-001

* Estimated Values
JP 6/19/08

Reviewed By: GB JP

Paragon Analytics

Alpha-Spectroscopy Analysis Report

Sample

Sample: 0805200-32
Spectrum #1 Analysis #1

Sample Size : 0.30

Acquisition

Detector: 2
Batch Name: PL080606-4_A
Nuclide Library: Po-210
Analysis Method: Absolute ROI Analysis, Set Name = Po-210
ROI Set: Po-210

Acquisition Start Date: 6/15/2008 10:58:18AM
Live Time: 1,000.00 min.
Real Time: 1,000.03 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

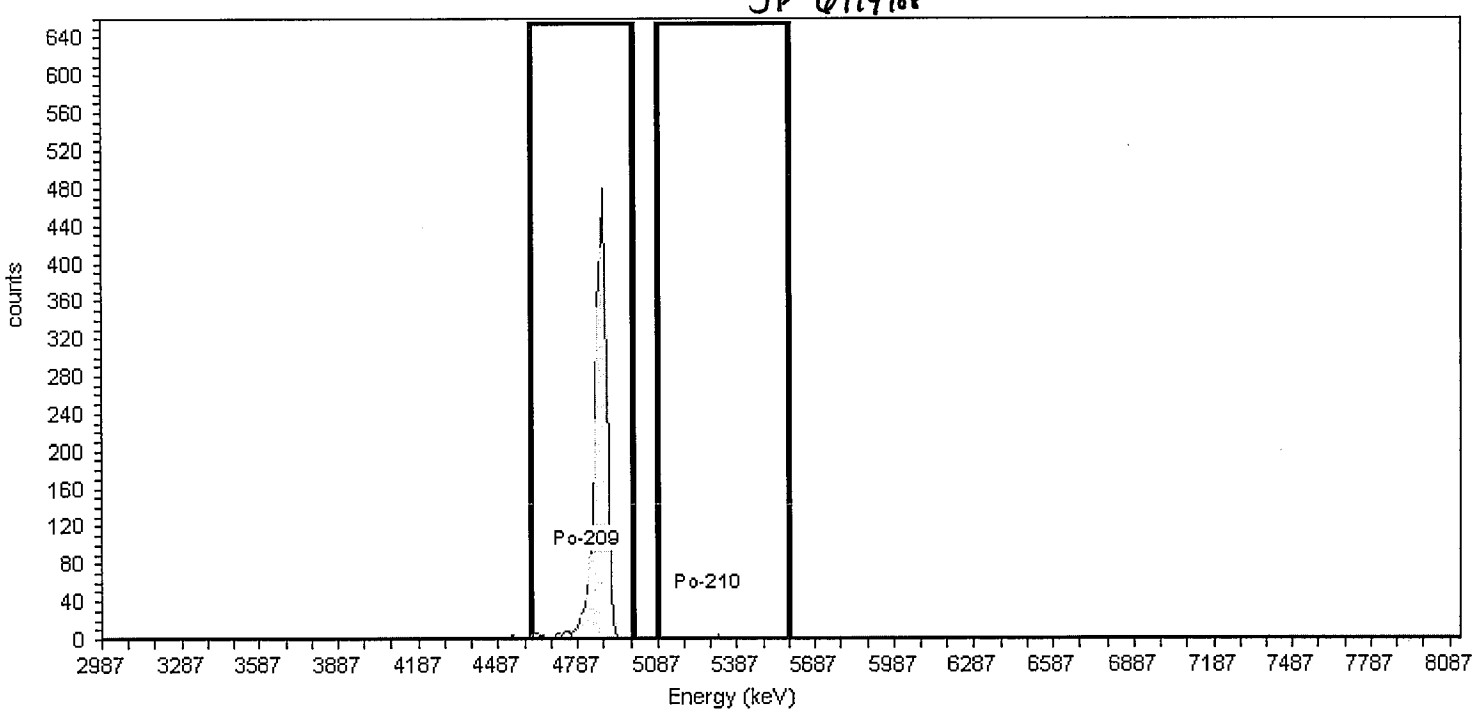
Energy Cal: Gain = 10.0776 keV / Ch
Offset = 2,977.80 keV
Quadratic = 0.0000 keV / Ch^2

Tracer

Tracer Name: 851.3020.87 Po-209
Tracer Activity: 17.63 DPM/mL x (Vol.) ~~1.00~~ mL = ~~17.63 DPM~~ 0.5 mL = 8.82 DPM

Tracer Nuclide: Po-209
Tracer Recovery: ~~49.88~~% ~ 99.6%

JP 6/19/08



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	4882.5	4610.4	4993.3	~~27.4~~	99.7	2,477.00	4.00	2,473.00	* 1.3E+001	* 5.4E-001	* 5.0E-002	* 1.3E-001
Po-210	5336.0	5084.0	5587.9	66.9	100.0	4.00	0.00	4.00	3.9E-002	4.4E-002	0.0E+000	2.6E-002

~50 GB 6/16/08

* Estimated Values.
JP 6/19/08

Reviewed By: GB JP

Paragon Analytics

Alpha-Spectroscopy Analysis Report

Sample

Sample: 0805200-34
Spectrum #1 Analysis #1

Sample Size : 0.28

Acquisition

Detector: 4
Batch Name: PL080606-4_A
Nuclide Library: Po-210
Analysis Method: Absolute ROI Analysis, Set Name = Po-210
ROI Set: Po-210

Acquisition Start Date: 6/15/2008 10:58:19AM
Live Time: 1,000.00 min.
Real Time: 1,000.03 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

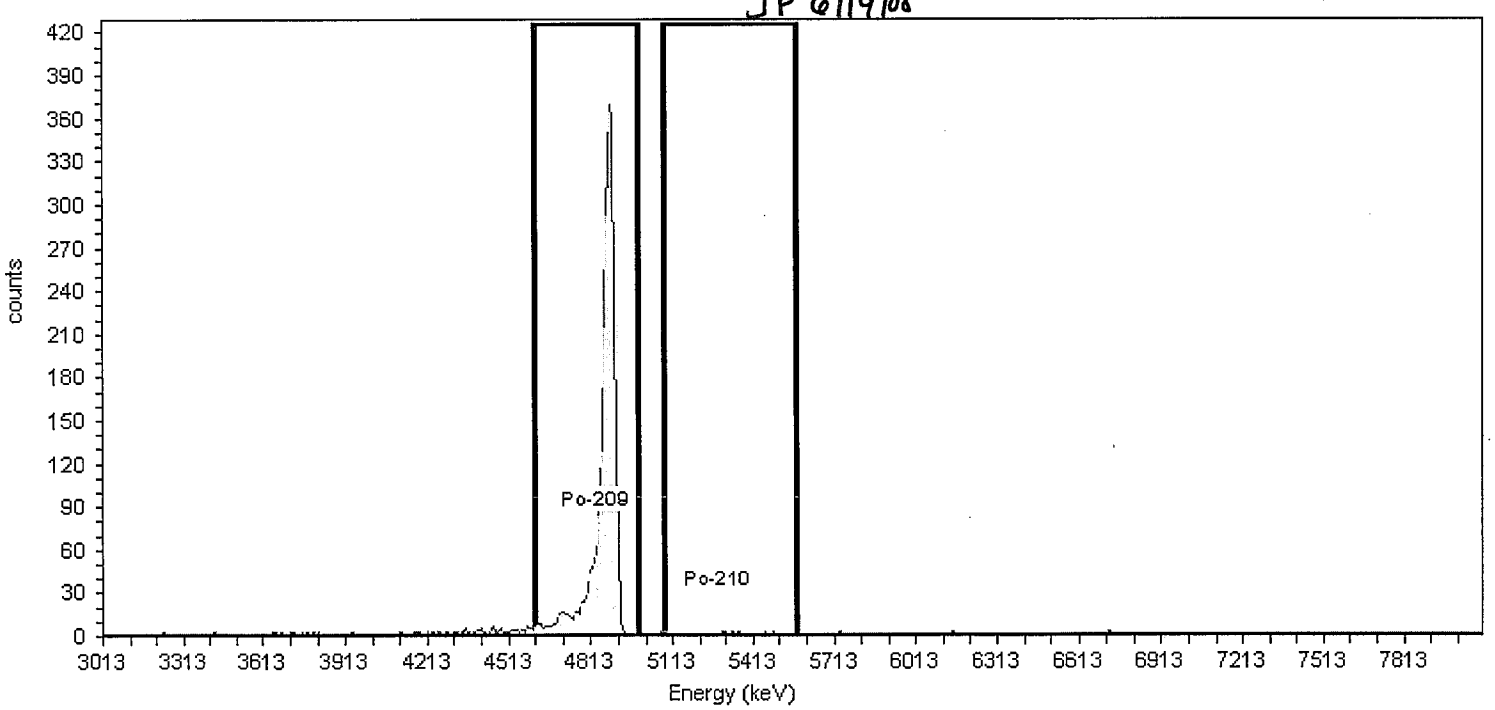
Energy Cal: Gain = 9.9784 keV / Ch
Offset = 3,003.23 keV
Quadratic = 0.0000 keV / Ch^2

Tracer

Tracer Name: 851.3020.87 Po-209
Tracer Activity: 17.63 DPM/mL x (Vol.) ~~1.00 mL~~ = ~~17.63~~ DPM 0.5 mL = 8.82 DPM

Tracer Nuclide: Po-209
Tracer Recovery: ~~44.45%~~ ~ 88.7%

JP 6/19/08



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	4879.2	4609.8	4988.9	~~23.0~~	99.7	2,137.00	2.00	2,135.00	* 1.3E+001	* 5.6E-001	* 4.4E-002	* 1.2E-001
Po-210	5328.2	5078.8	5577.7	13.5	100.0	8.00	5.00	3.00	3.6E-002	8.8E-002	6.3E-002	1.6E-001

NED GB 6/16/08

* Estimated Values.
JP 6/19/08

Reviewed By: GB

Print Date: 6/16/2008 9:34:21AM

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

Paragon Analytics

Alpha-Spectroscopy Analysis Report

Sample

Sample: 0805200-35
Spectrum #1 Analysis #1

Sample Size : 0.30

Acquisition

Detector: 5
Batch Name: PL080606-4_A
Nuclide Library: Po-210
Analysis Method: Absolute ROI Analysis, Set Name = Po-210
ROI Set: Po-210

Acquisition Start Date: 6/15/2008 10:58:20AM
Live Time: 1,000.00 min.
Real Time: 1,000.03 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

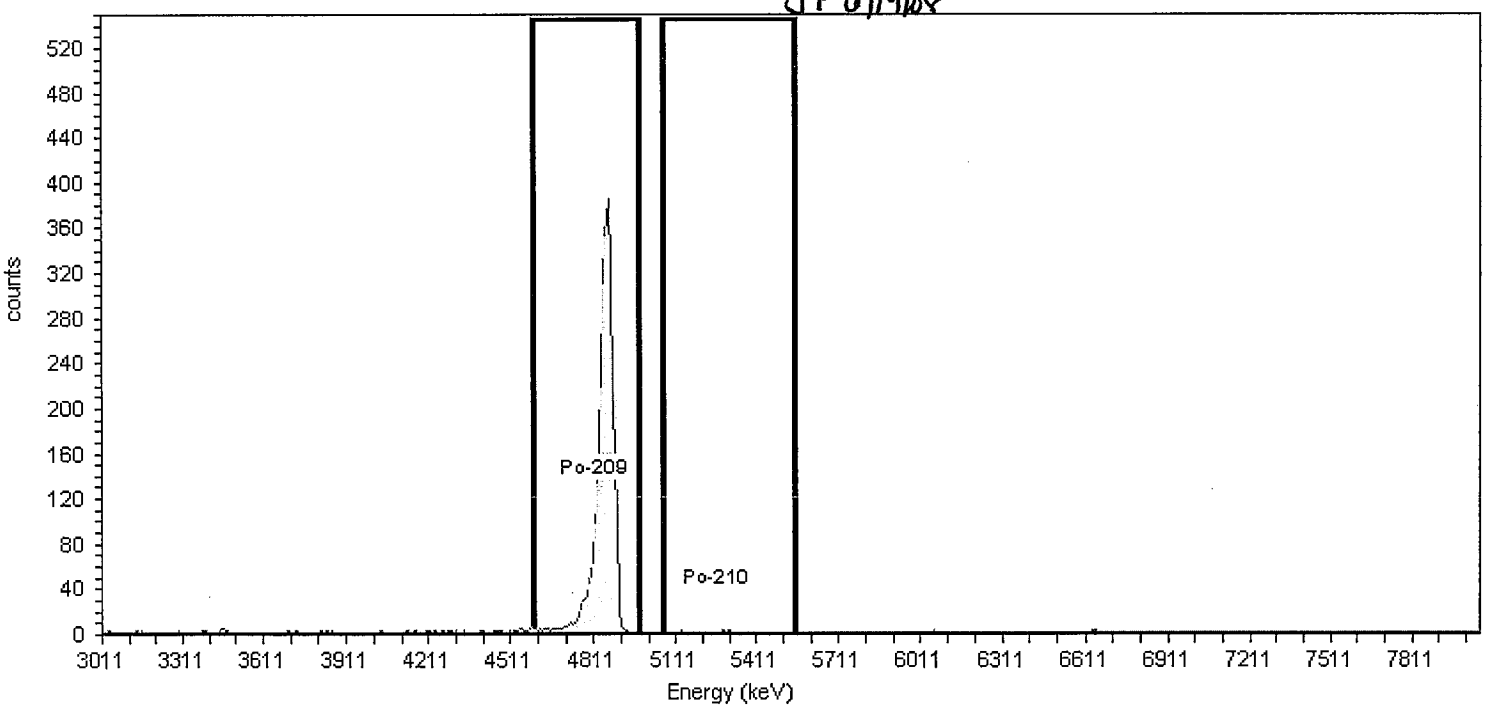
Energy Cal: Gain = 9.9003 keV / Ch
Offset = 3,001.48 keV
Quadratic = 0.0000 keV / Ch^2

Tracer

Tracer Name: 851.3020.87 Po-209 0.5 mL = 8.82 DPM
Tracer Activity: 17.63 DPM/mL x (Vol.) ~~1.00 mL~~ = ~~17.63 DPM~~

Tracer Nuclide: Po-209
Tracer Recovery: ~~48.03%~~ ~97.7%

JP 6/19/08



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	4862.7	4595.4	4971.6	43.4	99.7	2,441.00	3.00	2,438.00	* 1.3E+001	* 5.3E-001	* 4.4E-002	* 1.2E-001
Po-210	5308.2	5060.7	5555.8	57.6	100.0	4.00	2.00	2.00	2.0E-002	4.8E-002	3.2E-002	9.2E-002

* Estimated Values.
JP 6/19/08

Reviewed By: GB JP

Paragon Analytics

Alpha-Spectroscopy Analysis Report

Sample

Sample: 0805200-36
Spectrum #1 Analysis #1

Sample Size : 0.26

Acquisition

Detector: 6
Batch Name: PL080606-4_A
Nuclide Library: Po-210
Analysis Method: Absolute ROI Analysis, Set Name = Po-210
ROI Set: Po-210

Acquisition Start Date: 6/15/2008 10:58:21AM
Live Time: 1,000.00 min.
Real Time: 1,000.03 min.
Dead Time: 0.00 %

Calibration

Bkgd Info: Sample: B08060906; Det: 6; Spectrum #1; Jun-09-2008 12:16

Calibration Date: 6/9/2008 8:48:25AM

Efficiency Calibration: C08060906

Efficiency: 30.30% +/- 0.15% TPU(2 sigma)

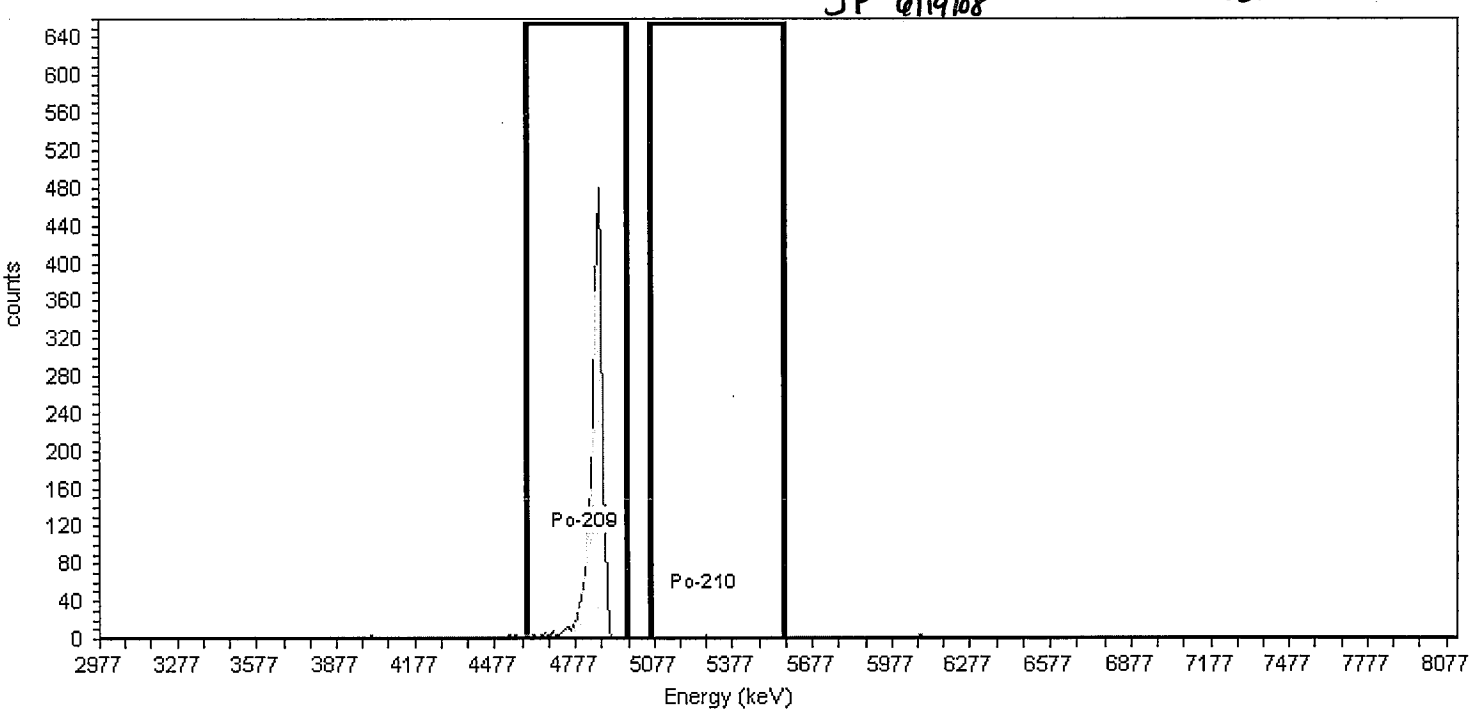
Energy Calibration: C08060906

Energy Cal: Gain = 10.0776 keV / Ch
Offset = 2,967.72 keV
Quadratic = 0.0000 keV / Ch^2

Tracer

Tracer Name: 851.3020.87 Po-209 0.5 mL = 8.82 DPM
Tracer Activity: 17.63 DPM/mL x (Vol.) ~~1.00 mL~~ = ~~17.63 DPM~~

Tracer Nuclide: Po-209
Tracer Recovery: ~~46.08%~~ ~ 92%
JP 6/19/08



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	4862.3	4590.2	4973.2	~~21.2~~ ~40 GB 6/16/08	99.7	2,237.00	6.00	2,231.00	* 1.4E+001	* 6.1E-001	* 7.9E-002	* 1.9E-001
Po-210	5315.8	5063.9	5567.8	32.8	100.0	13.00	8.00	5.00	6.3E-002	1.1E-001	8.2E-002	2.0E-001

* Estimated Values.
JP 6/19/08

Reviewed By: GB JP

Paragon Analytics

Alpha-Spectroscopy Analysis Report

Sample

Sample: PL080606-3MB
Spectrum #1 Analysis #1

Sample Size : 0.25

Acquisition

Detector: 36
Batch Name: PL080606-3_C
Nuclide Library: Po-210
Analysis Method: Absolute ROI Analysis, Set Name = Po-210
ROI Set: Po-210

Acquisition Start Date: 6/15/2008 10:54:43AM
Live Time: 1,000.00 min.
Real Time: 1,000.03 min.
Dead Time: 0.00 %

Calibration

Bkgd Info: Sample: B08061036; Det: 36; Spectrum #1; Jun-10-2008 14:13

Calibration Date: 6/10/2008 12:28:31PM

Efficiency Calibration: C08061036

Efficiency: 28.02% +/- 0.20% TPU(2 sigma)

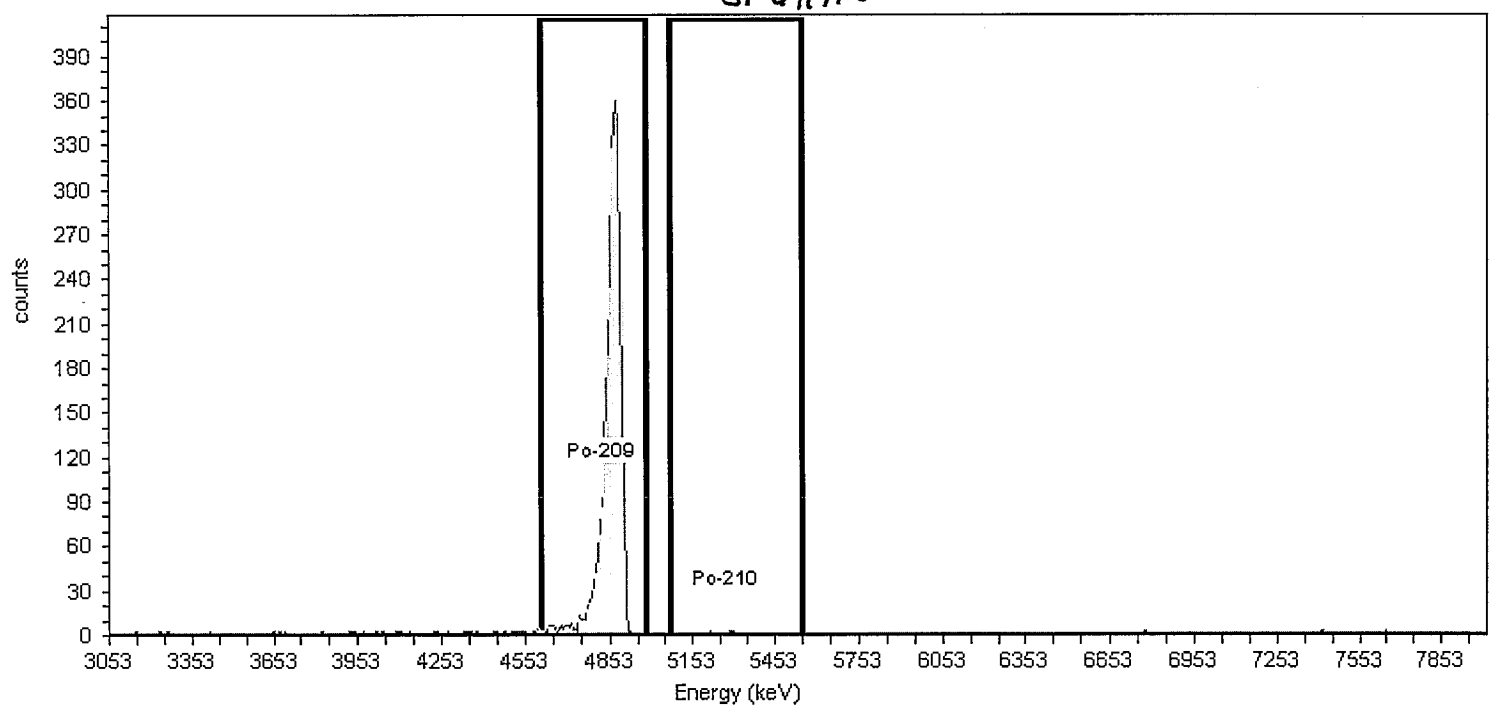
Energy Calibration: C08061036

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

Tracer

Tracer Name: 851.3020.87 Po-209 0.50mL = 8.82 DPM
Tracer Activity: 17.63 DPM/mL x (Vol.) ~~1.00 mL = 17.63 DPM~~ JP 6/19/08

Tracer Nuclide: Po-209
Tracer Recovery: ~~50.87~~% ~ 102%



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	~~24.5~~	99.7	2,279.00	2.00	2,277.00	* 1.6E+001	* 6.9E-001	* 4.6E-002	* 1.3E-001
Po-210	5320.4	5067.4	5553.9	116.7	100.0	3.00	3.00	0.00	0.0E+000	6.2E-002	5.1E-002	1.4E-001

~70 GB 6/17/08

* Estimated Values.
JP 6/19/08

Reviewed By: GB JP

Print Date: 6/16/2008 9:38:49AM

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

Paragon Analytics

Alpha-Spectroscopy Analysis Report

Sample

Sample: PL080606-3LCS
Spectrum #1 Analysis #1

Sample Size : 0.25

Acquisition

Detector: 37
Batch Name: PL080606-3_C
Nuclide Library: Po-210
Analysis Method: Absolute Interactive ROI Analysis
ROI Set: Po-210

Acquisition Start Date: 6/15/2008 10:54:44AM
Live Time: 1,000.00 min.
Real Time: 1,000.03 min.
Dead Time: 0.00 %

Calibration

Bkgd Info: Sample: B08061037; Det: 37; Spectrum #1; Jun-10-2008 14:13

Calibration Date: 6/10/2008 12:28:56PM

Efficiency Calibration: C08061037

Efficiency: 29.66% +/- 0.13% TPU(2 sigma)

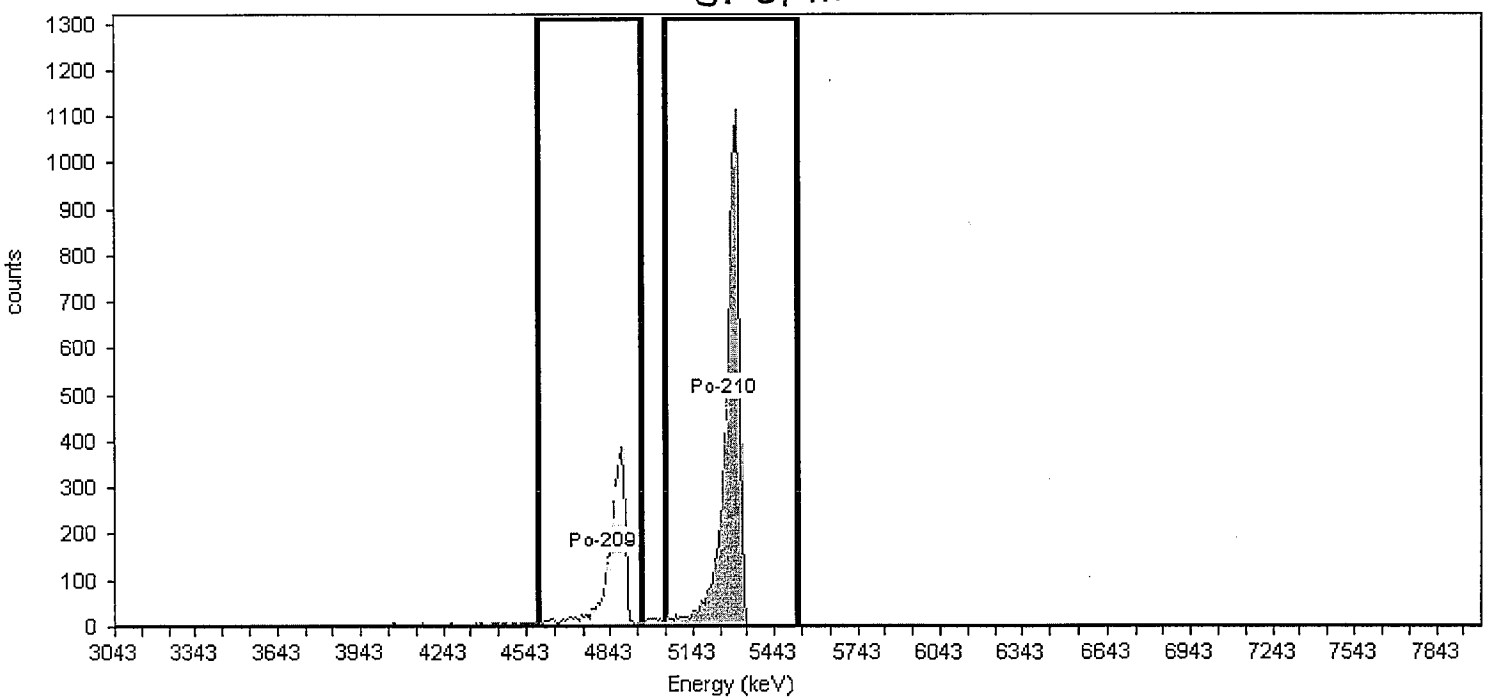
Energy Calibration: C08061037

Energy Cal: Gain = 9.7289 keV / Ch
Offset = 3,034.11 keV
Quadratic = 0.0000 keV / Ch^2

Tracer

Tracer Name: 851.3020.87 Po-209 0.50mL= 8.82 DPM
Tracer Activity: 17.63 DPM/mL x (Vol.) ~~1.00 mL = 17.63 DPM~~ JP 6/19/08

Tracer Nuclide: Po-209
Tracer Recovery: ~~52.11%~~ ~104%



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	4814.5	4581.0	4950.7	69.7	99.7	2,474.00	5.00	2,469.00	* 1.7E+001	* 6.7E-001	* 6.7E-002	* 1.7E-001
Po-210	5262.0	5038.3	5524.7	63.4	100.0	6,664.00	4.00	6,660.00	7.8E+001	8.6E+000	5.4E-002	1.4E-001

* Estimated Values. JP 6/19/08

Reviewed By: GB JP

Paragon Analytics

Alpha-Spectroscopy Analysis Report

Sample

Sample: PL080606-3LCSD
Spectrum #1 Analysis #1

Sample Size : 0.25

Acquisition

Detector: 39
Batch Name: PL080606-3_C
Nuclide Library: Po-210
Analysis Method: Absolute ROI Analysis, Set Name = Po-210
ROI Set: Po-210

Acquisition Start Date: 6/15/2008 10:54:44AM
Live Time: 1,000.00 min.
Real Time: 1,000.03 min.
Dead Time: 0.00 %

Calibration

Bkgd Info: Sample: B08061039; Det: 39; Spectrum #1; Jun-10-2008 14:13

Calibration Date: 6/10/2008 12:29:15PM

Efficiency Calibration: C08061039

Efficiency: 30.05% +/- 0.18% TPU(2 sigma)

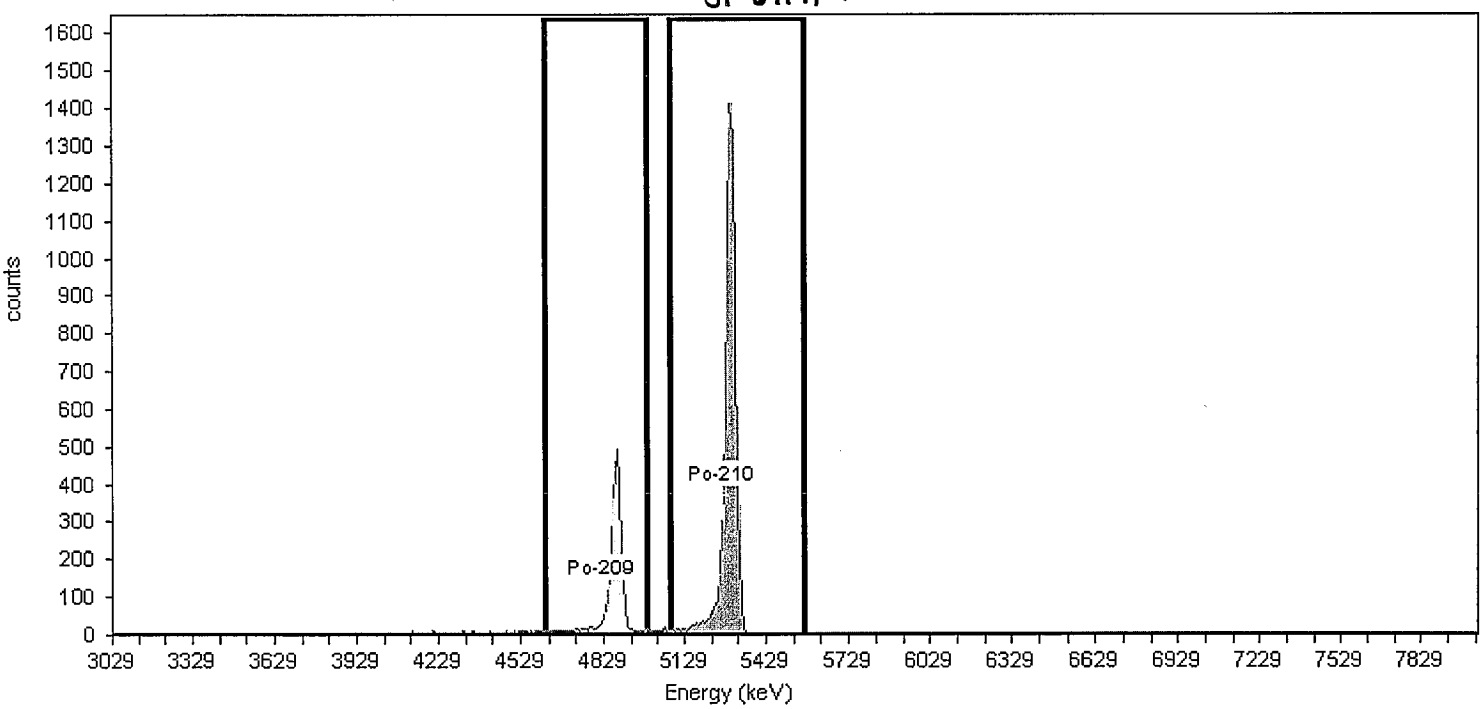
Energy Calibration: C08061039

Energy Cal: Gain = 9.8224 keV / Ch
Offset = 3,019.57 keV
Quadratic = 0.0000 keV / Ch^2

Tracer

Tracer Name: 851.3020.87 Po-209 0.50 mL= 8.82 DPM
Tracer Activity: 17.63 DPM/mL x (Vol.) ~~1.00 mL = 17.63 DPM~~ JP 6/19/08

Tracer Nuclide: Po-209
Tracer Recovery: ~~46.47%~~ ~ 92.8%



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	4876.0	4610.8	4984.1	~~27.3~~ ~46	99.7	2,231.00	0.00	2,231.00	* 1.5E+001	* 6.3E-001	* 0.0E+000	* 3.9E-002
Po-210	5327.8	5072.5	5563.6	59.9	100.0	6,519.00	1.00	6,518.00	8.4E+001	9.4E+000	3.0E-002	9.5E-002

AB 6/17/08

* Estimated Values
JP 6/19/08

Reviewed By: AB JP

Paragon Analytics

Alpha-Spectroscopy Analysis Report

Sample

Sample: PL080606-4MB
Spectrum #1 Analysis #1

Sample Size : 0.25

Acquisition

Detector: 7
Batch Name: PL080606-4_A
Nuclide Library: Po-210
Analysis Method: Absolute ROI Analysis, Set Name = Po-210
ROI Set: Po-210

Acquisition Start Date: 6/15/2008 10:58:21AM
Live Time: 1,000.00 min.
Real Time: 1,000.03 min.
Dead Time: 0.00 %

Calibration

Bkgd Info: Sample: B08060907; Det: 7; Spectrum #1; Jun-09-2008 12:16

Calibration Date: 6/9/2008 8:48:45AM

Efficiency Calibration: C08060907

Efficiency: 29.44% +/- 0.18% TPU(2 sigma)

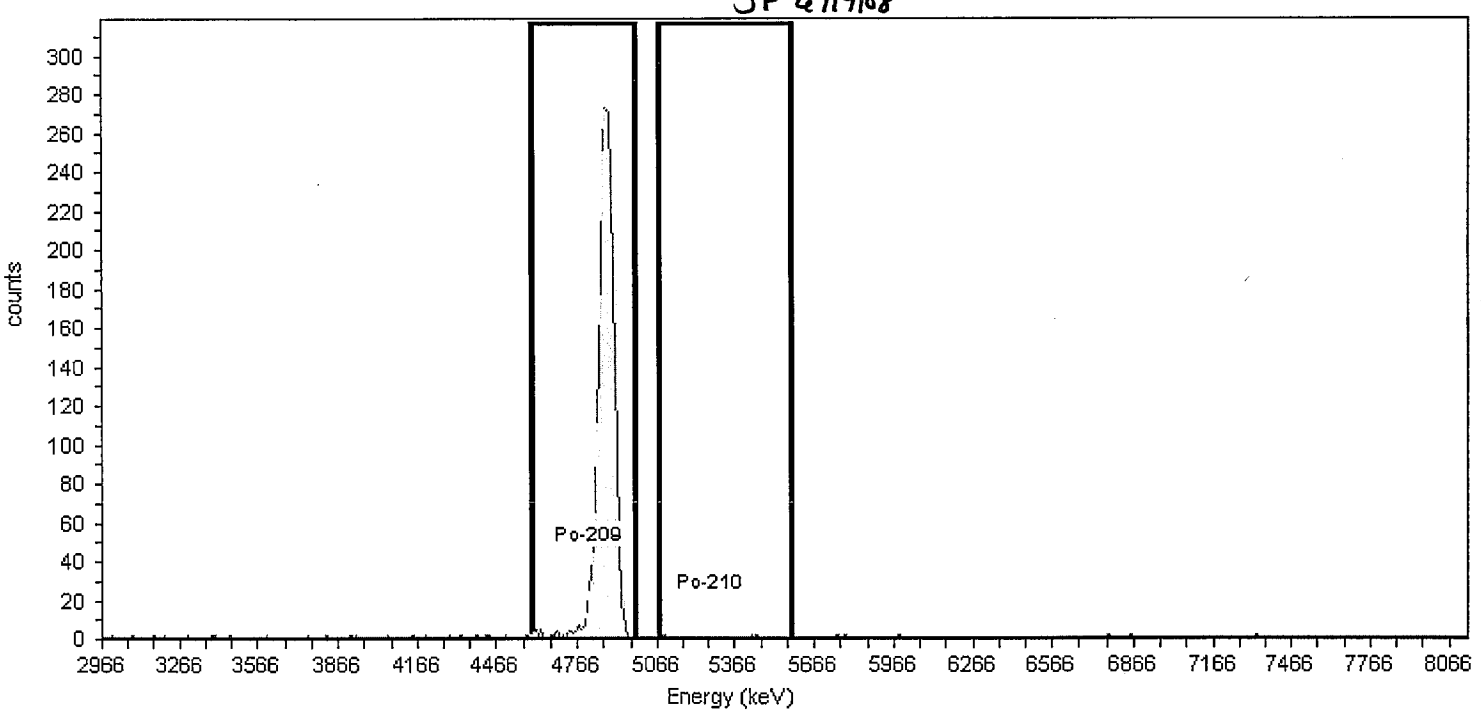
Energy Calibration: C08060907

Energy Cal: Gain = 10.1357 keV / Ch
Offset = 2,956.67 keV
Quadratic = 0.0000 keV / Ch^2

Tracer

Tracer Name: 851.3020.87 Po-209 0.5 mL = 8.82 DPM
Tracer Activity: 17.63 DPM/mL x (Vol.) ~~1.00 mL~~ = 17.~~63 DPM~~
JP 6/19/08

Tracer Nuclide: Po-209
Tracer Recovery: ~~39.63%~~ ~ 79.1%



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	4872.3	4598.7	4983.8	43.7	99.7	1,867.00	3.00	1,864.00	*1.3E+001	*5.9E-001	*6.9E-002	*1.8E-001
Po-210	5328.4	5075.0	5581.8	384.2	100.0	3.00	2.00	1.00	1.5E-002	6.9E-002	5.1E-002	1.4E-001

*Estimated Values.
JP 6/19/08

Reviewed By: gb JP

Paragon Analytics

Alpha-Spectroscopy Analysis Report

Sample

Sample: PL080606-4LCS
Spectrum #1 Analysis #1

Sample Size : 0.25

Acquisition

Detector: 33
Batch Name: PL080606-4_A
Nuclide Library: Po-210
Analysis Method: Absolute ROI Analysis, Set Name = Po-210
ROI Set: Po-210

Acquisition Start Date: 6/13/2008 2:39:25PM
Live Time: 1,000.00 min.
Real Time: 1,000.03 min.
Dead Time: 0.00 %

Calibration

Bkgd Info: Sample: B08061033; Det: 33; Spectrum #1; Jun-10-2008 14:13

Calibration Date: 6/10/2008 12:27:33PM

Efficiency Calibration: C08061033

Efficiency: 30.82% +/- 0.20% TPU(2 sigma)

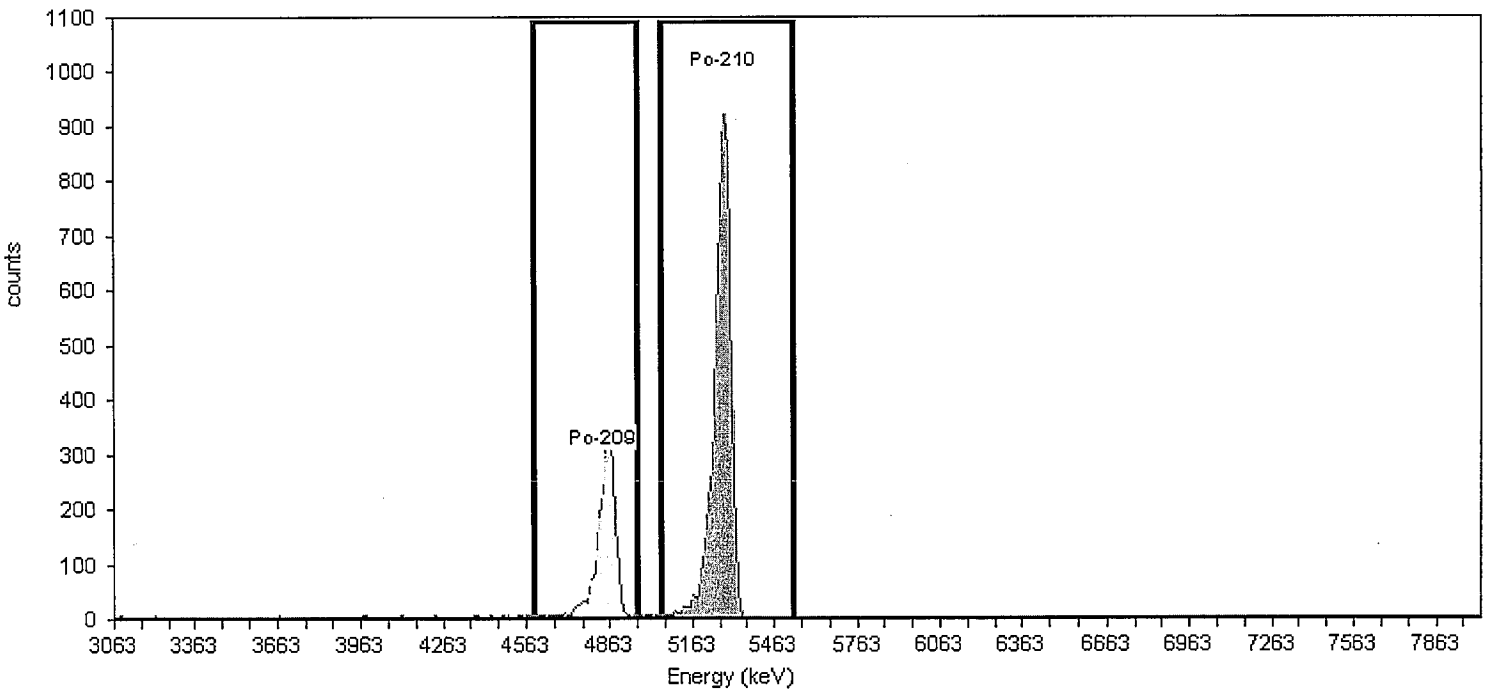
Energy Calibration: C08061033

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: 99.52%



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	4853.4	4590.7	4960.4	81.1	99.7	2,453.00	3.00	2,450.00	1.6E+001	6.5E-001	2.6E-002	7.0E-002
Po-210	5300.9	5048.0	5534.4	70.4	100.0	6,612.00	1.00	6,611.00	3.9E+001	4.3E+000	1.4E-002	4.3E-002

Reviewed By: GB JP

Paragon Analytics

Alpha-Spectroscopy Analysis Report

Sample

Sample: PL080606-4LCSD
Spectrum #1 Analysis #1

Sample Size : 0.25

Acquisition

Detector: 34
Batch Name: PL080606-4_A
Nuclide Library: Po-210
Analysis Method: Absolute ROI Analysis, Set Name = Po-210
ROI Set: Po-210

Acquisition Start Date: 6/13/2008 2:39:26PM
Live Time: 1,000.00 min.
Real Time: 1,000.03 min.
Dead Time: 0.00 %

Calibration

Bkgd Info: Sample: B08061034; Det: 34; Spectrum #1; Jun-10-2008 14:13

Calibration Date: 6/10/2008 12:27:52PM

Efficiency Calibration: C08061034

Efficiency: 30.62% +/- 0.15% TPU(2 sigma)

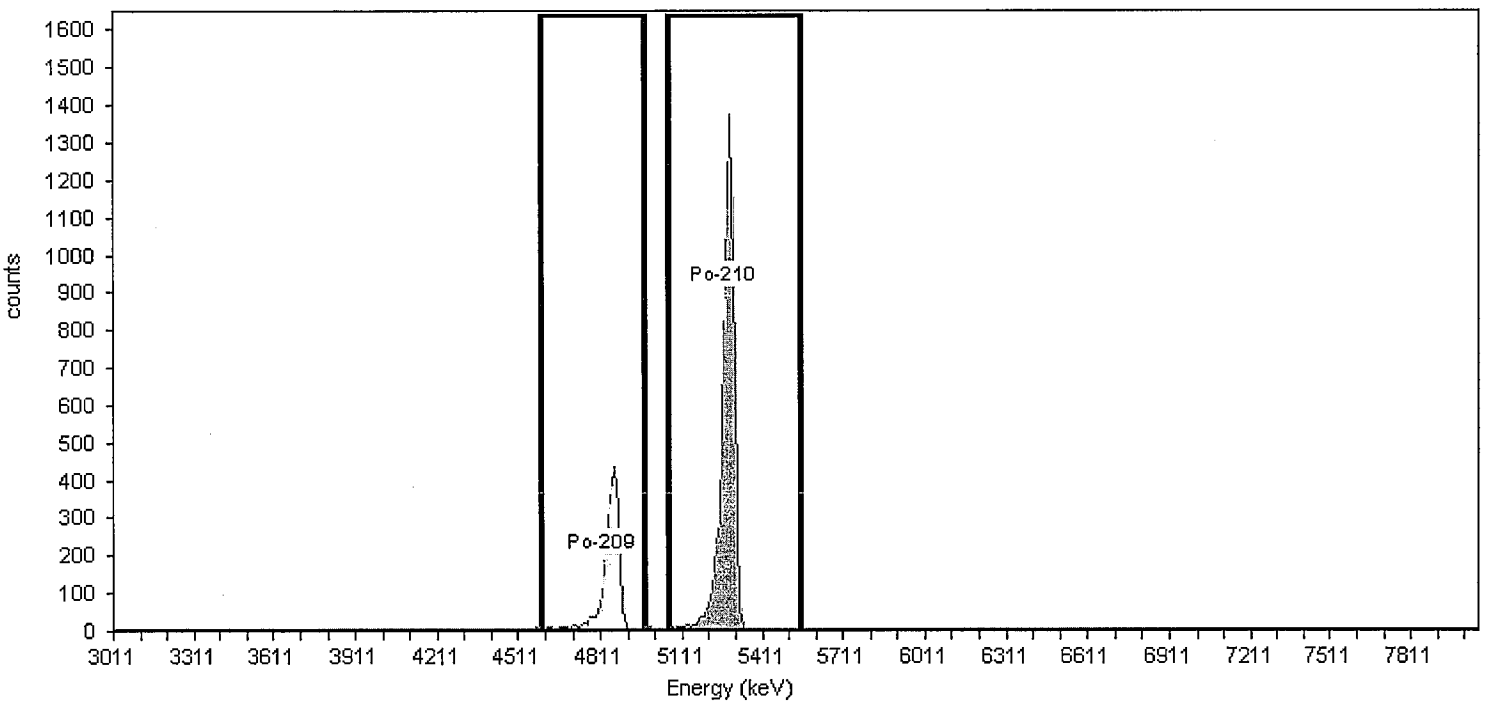
Energy Calibration: C08061034

Energy Cal: Gain = 9.9003 keV / Ch
Offset = 3,001.48 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: 97.79%



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	4862.7	4595.4	4971.6	44.7	99.7	2,395.00	3.00	2,392.00	1.6E+001	6.4E-001	2.7E-002	7.1E-002
Po-210	5318.1	5060.7	5555.8	63.4	100.0	7,063.00	5.00	7,058.00	4.2E+001	4.7E+000	3.1E-002	7.9E-002

Reviewed By: GB JP

Paragon Analytics

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

366028

Alpha Spectrometer Instrument Run Log

Date: 6/13/06

Detector	Batch ID	Sample ID	Iso/Matrix	Duration	Initial
33	PL0806006-2_C	06016009-1	Po/s	300	GB
34		-2			
35		-3			
36		-4			
37		-5			
39		PL0806006-2MB			
40		-2LCS			
42		-2LCSD			
25	UAS0806006-3_C	AS0806006-3LCSD	U/W	800	GB
17	TAS0806009-1_A	06016041-6	Th/s	600	GB
18		-7			
19		-8			
21		-8D			
22		-9			
23		-10			
24		AS0806009-1MB			
26		-1LCS			
27	TAS0806007-1_A	0805200-1	Th/s	1000	GB
28		-4			
29		-5			
30		-8			
31		-9			
32		-12			
57		-13			

Detector	Batch ID	Sample ID	Iso/Matrix	Duration	Initial
58	TAS0806007-1_A	0805200-16	Th/s	1000	GB
59		-17			
60		-20			
61		-21			
62		-24			
63		-25			
64		-26			
1	NAS0806004-1_D	0805247-21	Np/s	360	GB
2	NAS0806004-5_C	0805247-12	Np/s	1006	GB
4		-12SYS			
5		AS0806004-5SYS			
6		-5MB			
35	PL0806006-3_A	0805200-1	Po/s	1000	GB
36		-2			
37		-3			
39		-5			
40		-6			
42		-7			
43		-9			
45		-10			
46		-11			
47		-13			
7	PL0806006-4_A	0805200-28	Po/s	1000	GB
8		-30			

Notes:

Reviewed by: GB

Date: 6/16/06

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

366029

Paragon Analytics

Alpha Spectrometer Instrument Run Log

Date: 6/13/06

Detector	Batch ID	Sample ID	Iso/Matrix	Duration	Initial
49	PL0606006-4-A	0605200-31	Po/s	1000	GB
50		-32			
51		-34			
52		-35			
53		-36			
54		PL0606006-4 MB			
33		-4 LCS			
34		-4 LCSD			

JH 6/14/06

Detector	Batch ID	Sample ID	Iso/Matrix	Duration	Initial

JH 6/14/06

Notes:

Reviewed by: GB

Date: 6/16/06

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

366030

Paragon Analytics

Alpha Spectrometer Instrument Run Log

Date: 6/14/08

Detector	Batch ID	Sample ID	Iso/Matrix	Duration	Initial
17	TAS080607-1_B	0805200-29	Th/S	1000	JH
18		-30			
19		-33			
21		-34			
22		-37			
23		AS080607-1M3			
24		-1LCS			
25		-1LCSD			
26	TAS080612-1_A	0806061-1	Th/W	1000	JH
27		-2			
28		-3			
29		-4			
30		-5			
31		-6			
32		-7			
57		AS080612-1M3			
58		-1LCS			
59		-1LCSD			
60	TAS080611-6_A	0805237-23	Th/W	360	JH
61		AS080611-6M3			
62		-6LCS			
63		-6LCSD			
1	PAS080606-3_B	0805200-~~13~~ 14	Po/S	1000	JH
2		~~14~~ 15			

JH 6/14/08

Detector	Batch ID	Sample ID	Iso/Matrix	Duration	Initial
4	PAS080606-3_B	0805200-~~15~~ 17	Po/S	1000	JH
5		-~~17~~ 18			
6		-~~18~~ 19			
7		-~~19~~ 21			
8		-~~21~~ 22			
49		-~~22~~ 23			
50		-~~23~~ 26			
51		-~~26~~ 27			
52		PL080606-3-~~27~~ M3			
53		PL080606-3-~~M3~~ LCS			
54		-3LCSD			
33	AAS080611-4_A	~~0806024-23LCSD~~	Am/W	420	JH
34		-5		420	JH
35		0806053-2			
36		-20			
37		AS080611-4M3			
39		-4LCS			
42	NAS080611-7_A	0805237-23	Np/W	600	JH
40		-23SYS			
43		AS080611-7SYS			
45		-7M3			
46		-7LCS			
47		-7LCSD			

JH 6/14/08

JH 6/14/08

JH 6/14/08

JH 6/15/08

Notes:

Reviewed by: GB

Date: 6/16/08

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

366031

Paragon Analytics

Alpha Spectrometer Instrument Run Log

Date: 6/15/08

Detector	Batch ID	Sample ID	Iso/Matrix	Duration	Initial
1	PL080606-4-B	0805200-31	Po/S	1000	JH
2	JH 6/15/08	-32			
4		-34			
5		-35			
6		-36			
7		PL080606-4MS			
33	PL080606-3-C	0805200-23	Po/S	1000	JH
34		-26			
35		-27			
36		PL080606-3MS			
37		-3LCS			
37		-3LCSD			
8	NAS080611-2-A	0805237-1	Np/S	180	JH
40		-1SYS			
42		-2			
43		-2SYS			
45		-3			
46		-3SYS			
47		-4			
17	TAS080611-1-A	0805237-1	Th/S	180	JH
18		-2			
19		-3			
21		JH 6/15/08 -430			
22		-4			

Detector	Batch ID	Sample ID	Iso/Matrix	Duration	Initial
23	TAS080611-1-A	0805237-5	Th/S	180	JH
24		-6			
25		0806052-2			
26		-20			
27		-8			
28		AS080611-1MS			
29		-1LCS			

GB 6/16/08

Notes:

Reviewed by: GB

Date: 6/16/08

PARAGON ANALYTICS
Radiochemistry Data Package

Section 6

QUALITY ASSURANCE SUMMARY REPORTS

6

Paragon Analytics

QUALITY ASSURANCE SUMMARY SHEET

PAR W.O. # / BATCH 0805200
TEST various
METHOD Prep
SOP/REV (PREP) Various
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.

TE 6/7/08

The following applies to animal tissue samples 0805200-1 to –37:

1. The entire sample was placed in a drying oven for %moisture analysis.
2. The entire dried sample was then placed into a 220mL polypropylene cup.
3. A common digestion was performed by adding 25mL each of HCl and HNO_3 to the sample cups. The samples were capped, placed on the steambath, uncapped after four hours, and allowed to dry.
4. Step 3 was repeated to ensure a total digestion of the samples.
5. After the second digestion, the dried samples were brought up in 10mL HNO_3 and ~80mL DI water and placed on the steambath for 30minutes.
6. The samples were removed from the steambath and diluted with DI water to a total volume of 100ml. TE 6/7/08
7. TE 6/7/08 At this time, Paragon received extra volume from the client for bone samples 4, 8, 12, 16, 20, and 24. Steps 1-6 were performed on the extra volumes. These extra sample volumes were then combined with the original sample. The samples were evaporated to less than 100ml on the steambath and then brought to a total volume of 100ml with DI water.
8. The sample digestates were then split to target the necessary analyses aliquots provided by the project manager using the following equation:

$$\text{Sample Size(g)} = \frac{\text{(Original Sample Wet Weight(g))} * \text{(Digestate Volume Taken for Analysis(ml))}}{\text{(Total Volume of Digestate(ml))}}$$

All wet weights and digestate splits are listed on the "Animal Tissue Digestate Splits" spreadsheets.

9. All samples were spike/traced for the individual analyses following the digestate splits.
10. Two sets of reagent blanks, LCS's, and LCSD's were created at step 3 for analyses containing more than 20 samples. As all samples were prepped together, the QC are interchangeable. Due to limited sample volume, the LCSD's were created to meet QC requirements.

TE 6/7/08

TECHNICIAN/ANALYST T Elliot DATE 6/7/08

DEPARTMENT MANAGER [signature] DATE 6/7/08

365713 FORM 302r6.doc (4/22/04)

PARAGON ANALYTICS
Radiochemistry Data Package

Section 7

LABORATORY BENCH SHEETS

7

Radiochemistry Instrument Worksheet

Paragon Analytics

Prep Batch: PL080606-3

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	0805200-1	SMP	0.5584	0.2792	g	pCi/g	_52001	35	JH	_52001			52001			A *
1	0805200-2	SMP	0.46	0.23	g	pCi/g	_52002	36		_52002			_52002			
1	0805200-3	SMP	0.6324	0.3162	g	pCi/g	_52003	37		_52003			_52003			
1	0805200-5	SMP	0.5	0.25	g	pCi/g	_52005	39		_52005			_52005			
1	0805200-6	SMP	0.374	0.187	g	pCi/g	_52006	40		_52006			_52006			
1	0805200-7	SMP	0.5358	0.2679	g	pCi/g	_52007	42		_52007			_52007			
1	0805200-9	SMP	0.308	0.154	g	pCi/g	_52009	43		_52009			_52009			
1	0805200-10	SMP	0.5495	0.2748	g	pCi/g	_520010	45		_520010			_520010			
1	0805200-11	SMP	0.5354	0.2677	g	pCi/g	_520011	46		_520011			_520011			
1	0805200-13	SMP	0.5436	0.2718	g	pCi/g	_520013	47		_520013			_520013			
1	0805200-14	SMP	0.5056	0.2528	g	pCi/g	_520014	1	JH	_520014			_520014			B
1	0805200-15	SMP	0.673	0.3365	g	pCi/g	_520015	2		_520015			_520015			
1	0805200-17	SMP	0.564	0.282	g	pCi/g	_520017	4		_520017			_520017			
1	0805200-18	SMP	0.5715	0.2858	g	pCi/g	_520018	5		_520018			_520018			
1	0805200-19	SMP	0.8518	0.4259	g	pCi/g	_520019	6		_520019			_520019			
1	0805200-21	SMP	0.5502	0.2751	g	pCi/g	_520021	7		_520021			_520021			
1	0805200-22	SMP	0.6176	0.3088	g	pCi/g	_520022	8		_520022			520022			GB 6/17/06
1	0805200-23	SMP	0.8858	0.4429	g	pCi/g	_520023	☐ 49		_520023	33	GB	_520023			
1	0805200-26	SMP	0.7059	0.353	g	pCi/g	_520026	50		_520026	34		_520026			
1	0805200-27	SMP	0.5945	0.2973	g	pCi/g	_520027	51		_520027	35		_520027			
1	PL080606-3	MB	0.5	0.25	g	pCi/g	_80603B	52		_80603B	36		_80603B			
1	PL080606-3	LCS	0.5	0.25	g	pCi/g	_80603L	53		_80603L	37		_80603L			
1	PL080606-3	LCSD	0.5	0.25	g	pCi/g	_80603LD	54		_80603LD	39		_80603LD			GB 6/17/06

Tracer/Carrier Solution Information

Soln #	Nuclide	SolnID	Prep Conc	Units	Prep Date	Aliquot	Units	Pipet ID
T1	Po-209	851.3020.87	16.006	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	47.136	DPM/ml	06/06/08	1	ml	AW015
S1	Po-210	823.3020.41	47.136	DPM/ml	06/06/08	1	ml	AW015

☐ Recount. Dead time > 10% JP 6/19/08 * ct for 1000 minutes

6/7/2006 17:47

Date Printed: 6/12/2008 10:41

Paragon Analytics

LIMS Version: 6.158A

Supersedes: ~~6/7/06 17:47 NA~~ GB 6/17/06

Radiochemistry Instrument Worksheet

Paragon Analytics

Prep Batch: PL080606-3

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	0805200-1	SMP	0.5584	0.2792	g	pCi/g	_52001	35	GB	_52001			52001			A
1	0805200-2	SMP	0.46	0.23	g	pCi/g	_52002	36		_52002			_52002			
1	0805200-3	SMP	0.6324	0.3162	g	pCi/g	_52003	37		_52003			_52003			
1	0805200-5	SMP	0.5	0.25	g	pCi/g	_52005	39		_52005			_52005			
1	0805200-6	SMP	0.374	0.187	g	pCi/g	_52006	40		_52006			_52006			
1	0805200-7	SMP	0.5358	0.2679	g	pCi/g	_52007	42		_52007			_52007			
1	0805200-9	SMP	0.308	0.154	g	pCi/g	_52009	43		_52009			_52009			
1	0805200-10	SMP	0.5495	0.2748	g	pCi/g	_520010	45		_520010			_520010			
1	0805200-11	SMP	0.5354	0.2677	g	pCi/g	_520011	46		_520011			_520011			
1	0805200-13	SMP	0.5436	0.2718	g	pCi/g	_520013	47		_520013			_520013			
1	0805200-14	SMP	0.5056	0.2528	g	pCi/g	_520014	8		_520014			_520014			
1	0805200-15	SMP	0.673	0.3365	g	pCi/g	_520015	34	GB	_520015			_520015			B
1	0805200-17	SMP	0.564	0.282	g	pCi/g	_520017	35		_520017			_520017			
1	0805200-18	SMP	0.5715	0.2858	g	pCi/g	_520018	36		_520018			_520018			
1	0805200-19	SMP	0.8518	0.4259	g	pCi/g	_520019	37		_520019			_520019			
1	0805200-21	SMP	0.5502	0.2751	g	pCi/g	_520021	39		_520021			_520021			
1	0805200-22	SMP	0.6176	0.3088	g	pCi/g	_520022	40		_520022			_520022			
1	0805200-23	SMP	0.8858	0.4429	g	pCi/g	_520023	42		_520023			_520023			
1	0805200-26	SMP	0.7059	0.353	g	pCi/g	_520026	43		_520026			_520026			
1	0805200-27	SMP	0.5945	0.2973	g	pCi/g	_520027	45		_520027			_520027			
1	PL080606-3	MB	0.5	0.25	g	pCi/g	_80603B	~~46~~ 2	GB	_80603B			_80603B			C
1	PL080606-3	LCS	0.5	0.25	g	pCi/g	_80603L	~~47~~ 4	GB 6/9/08	_80603L			_80603L			
1	PL080606-3	LCSD	0.5	0.25	g	pCi/g	_80603LD	5		_80603LD			80603LD GB 6/11/08			GB 6/11/08

DATA NOT USED GB 6/17/08

Tracer/Carrier Solution Information

Soln #	Nuclide	SolnID	Prep Conc	Units	Prep Date	Aliquot	Units	Pipet ID
T1	Po-209	851.3020.87	16.006	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	47.136	DPM/ml	06/06/08	1	ml	AW015
S1	Po-210	823.3020.41	47.136	DPM/ml	06/06/08	1	ml	AW015

Supersedes: NA

Radiochemistry Instrument Worksheet

Paragon Analytics

Prep Batch: PL080606-3

Sample Barcodes

0805200-1 PL080606-3PS1	0805200-2 PL080606-3PS2
0805200-3 PL080606-3PS3	0805200-5 PL080606-3PS4
0805200-6 PL080606-3PS5	0805200-7 PL080606-3PS6
0805200-9 PL080606-3PS7	0805200-10 PL080606-3PS8
0805200-11 PL080606-3PS9	0805200-13 PL080606-3PS10
0805200-14 PL080606-3PS11	0805200-15 PL080606-3PS12
0805200-17 PL080606-3PS13	0805200-18 PL080606-3PS14
0805200-19 PL080606-3PS15	0805200-21 PL080606-3PS16
0805200-22 PL080606-3PS17	0805200-23 PL080606-3PS18
0805200-26 PL080606-3PS19	0805200-27 PL080606-3PS20
PL080606-3MB PL080606-3PS21	PL080606-3LCS PL080606-3PS22
PL080606-3LCSD PL080606-3PS23	

Radiochemistry Prep Worksheet

Paragon Analytics

Prep Batch: PL080606-3

Prep Procedure: Po210

Prep Batch Not Validated!!!

Reviewed By:

Review Date:

Non-Routine Pre-Treatment? (Y) / N **Batch:** See QASS **Re-Prep?** Y / (N) **Batch:** NA **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:
Balance:

Samp Num	Prep Num	LabID	QC Type	Dish No.	Init Alq g	Fin Alq g	Prep Basis	Total Digestate Vol(ml)	Digestate Vol Taken(ml)	Decay Date/Time	Standards	Prep Notes
1	1	0805200-1	SMP		13.96	0.5584	As Received	100	4	06/01/72 07:00	T1	
2	1	0805200-2	SMP		4.6	0.46	As Received	100	10	06/01/72 07:00	T1	
3	1	0805200-3	SMP		21.08	0.6324	As Received	100	3	06/01/72 07:00	T1	
4	1	0805200-5	SMP		12.5	0.5	As Received	100	4	06/01/72 07:00	T1	
5	1	0805200-6	SMP		3.74	0.374	As Received	100	10	06/01/72 07:00	T1	
6	1	0805200-7	SMP		26.79	0.5358	As Received	100	2	06/01/72 07:00	T1	
7	1	0805200-9	SMP		7.7	0.308	As Received	100	4	06/01/72 07:00	T1	
8	1	0805200-10	SMP		7.85	0.5495	As Received	100	7	06/01/72 07:00	T1	
9	1	0805200-11	SMP		26.77	0.5354	As Received	100	2	06/01/72 07:00	T1	
10	1	0805200-13	SMP		13.59	0.5436	As Received	100	4	06/01/72 07:00	T1	
11	1	0805200-14	SMP		12.64	0.5056	As Received	100	4	06/01/72 07:00	T1	
12	1	0805200-15	SMP		33.65	0.673	As Received	100	2	06/01/72 07:00	T1	
13	1	0805200-17	SMP		18.8	0.564	As Received	100	3	06/01/72 07:00	T1	
14	1	0805200-18	SMP		11.43	0.5715	As Received	100	5	06/01/72 07:00	T1	
15	1	0805200-19	SMP		42.59	0.8518	As Received	100	2	06/01/72 07:00	T1	
16	1	0805200-21	SMP		18.34	0.5502	As Received	100	3	06/01/72 07:00	T1	
17	1	0805200-22	SMP		15.44	0.6176	As Received	100	4	06/01/72 07:00	T1	
18	1	0805200-23	SMP		44.29	0.8858	As Received	100	2	06/01/72 07:00	T1	
19	1	0805200-26	SMP		23.53	0.7059	As Received	100	3	06/01/72 07:00	T1	
20	1	0805200-27	SMP		11.89	0.5945	As Received	100	5	06/01/72 07:00	T1	
21	1	PL080606-3	MB		20	0.5	As Received	100	2.5	06/01/72 07:00	T1	
22	1	PL080606-3	LCS		20	0.5	As Received	100	2.5	06/01/72 07:00	S1,T1	
23	1	PL080606-3	LCSD		20	0.5	As Received	100	2.5	06/01/72 07:00	S1,T1	

Radiochemistry Prep Worksheet

Paragon Analytics

Prep Batch: PL080606-3

Prep Procedure: Po210

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

Non-Routine Pre-Treatment? (Y) N **Batch:** See QASS **Re-Prep?** Y / (N) **Batch:** NA **Prep QASS / NCR?** (Y) N 365713

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:
Balance:

Samp Num	Prep Num	LabID	QC Type	Dish No.	Init Alq g	Fin Alq g	Prep Basis	Total Digestate Vol(ml)	Digestate Vol Taken(ml)	Decay Date/Time	Standards	Prep Notes
1	1	0805200-1	SMP		0.5584	0.2792	As Received	100	4	06/07/08 07:00	T1	
2	1	0805200-2	SMP		0.46	0.23	As Received	100	10	06/07/08 07:00	T1	
3	1	0805200-3	SMP		0.6324	0.3162	As Received	100	3	06/07/08 07:00	T1	
4	1	0805200-5	SMP		0.5	0.25	As Received	100	4	06/07/08 07:00	T1	
5	1	0805200-6	SMP		0.374	0.187	As Received	100	10	06/07/08 07:00	T1	
6	1	0805200-7	SMP		0.5358	0.2679	As Received	100	2	06/07/08 07:00	T1	
7	1	0805200-9	SMP		0.308	0.154	As Received	100	4	06/07/08 07:00	T1	
8	1	0805200-10	SMP		0.5495	0.27475	As Received	100	7	06/07/08 07:00	T1	
9	1	0805200-11	SMP		0.5354	0.2677	As Received	100	2	06/07/08 07:00	T1	
10	1	0805200-13	SMP		0.5436	0.2718	As Received	100	4	06/07/08 07:00	T1	
11	1	0805200-14	SMP		0.5056	0.2528	As Received	100	4	06/07/08 07:00	T1	
12	1	0805200-15	SMP		0.673	0.3365	As Received	100	2	06/07/08 07:00	T1	
13	1	0805200-17	SMP		0.564	0.282	As Received	100	3	06/07/08 07:00	T1	
14	1	0805200-18	SMP		0.5715	0.28575	As Received	100	5	06/07/08 07:00	T1	
15	1	0805200-19	SMP		0.8518	0.4259	As Received	100	2	06/07/08 07:00	T1	
16	1	0805200-21	SMP		0.5502	0.2751	As Received	100	3	06/07/08 07:00	T1	
17	1	0805200-22	SMP		0.6176	0.3088	As Received	100	4	06/07/08 07:00	T1	
18	1	0805200-23	SMP		0.8858	0.4429	As Received	100	2	06/07/08 07:00	T1	
19	1	0805200-26	SMP		0.7059	0.35295	As Received	100	3	06/07/08 07:00	T1	
20	1	0805200-27	SMP		0.5945	0.29725	As Received	100	5	06/07/08 07:00	T1	
21	1	PL080606-3	MB		0.5	0.25	As Received	100	2.5	06/07/08 07:00	T1	
22	1	PL080606-3	LCS		0.5	0.25	As Received	100	2.5	06/07/08 07:00	S1,T1	
23	1	PL080606-3	LCSD		0.5	0.25	As Received	100	2.5	06/07/08 07:00	S1,T1	

TE 6/7/08

Radiochemistry Prep Worksheet

Paragon Analytics

Prep Batch: PL080606-3

Prep Procedure: Po210

Reviewed By: tde TDE **Review Date:** 6/7/2008

Non-Routine Pre-Treatment? (Y) N **Batch:** See QASS **Re-Prep?** Y (N) **Batch:** NA **Prep QASS / NCR?** (Y) / N 365713

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:
Balance:

Samp Num	Prep Num	LabID	QC Type	Dish No.	Init Alq g	Fin Alq g	Prep Basis	Total Digestate Vol(ml)	Digestate Vol Taken(ml)	Decay Date/Time	Standards	Prep Notes

Comments
Silver disks used in lieu of nickel disks, as they are believed to improve spectral quality.

Spiked By: Tambrae Elhart **Date:** 6/6/2008

Witnessed By: Preston Mathiesen **Date:** 6/6/2008

Tracer/Carrier Solution Information

Soln #	Nuclide	SolnID	Prep Conc	Units	Prep Date	Aliquot	Units	Pipet ID
T1	Po-209	851.3020.87	16.006	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	47.136	DPM/ml	06/06/08	1	ml	AW015
S1	Po-210	823.3020.41	47.136	DPM/ml	06/06/08	1	ml	AW015

Radiochemistry Prep Worksheet

Paragon Analytics

Prep Batch: PL080606-3

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:
Balance:

Samp Num	Prep Num	LabID	QC Type	Dish No.	Init Alq g	Fin Alq g	Prep Basis	Total Digestate Vol(ml)	Digestate Vol Taken(ml)	Decay Date/Time	Standards	Prep Notes

Comments

Spiked By: Tambrae Elhart **Date:** 6/6/2008

Witnessed By: Preston Mathiesen **Date:** 6/6/2008

Tracer/Carrier Solution Information

Soln #	Nuclide	SolnID	Prep Conc	Units	Prep Date	Aliquot	Units	Pipet ID
T1	Po-209	851.3020.87	16.006	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	47.136	DPM/ml	06/06/08	1	ml	AW015
S1	Po-210	823.3020.41	47.136	DPM/ml	06/06/08	1	ml	AW015

Radiochemistry Prep Worksheet

Paragon Analytics

Prep Batch: PL080606-3

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:
Balance:

Samp Num	Prep Num	LabID	QC Type	Dish No.	Init Alq g	Fin Alq g	Prep Basis	Decay Date/Time	Standards	Prep Notes
1	1	0805200-1	SMP		0.5	0.5	As Received	6/7 00700	T1	
2	1	0805200-2	SMP		0.5	0.5	As Received		T1	
3	1	0805200-3	SMP		0.5	0.5	As Received		T1	
4	1	0805200-5	SMP		0.5	0.5	As Received		T1	
5	1	0805200-6	SMP		0.5	0.5	As Received		T1	
6	1	0805200-7	SMP		0.5	0.5	As Received		T1	
7	1	0805200-9	SMP		0.5	0.5	As Received		T1	
8	1	0805200-10	SMP		0.5	0.5	As Received		T1	
9	1	0805200-11	SMP		0.5	0.5	As Received		T1	
10	1	0805200-13	SMP		0.5	0.5	As Received		T1	
11	1	0805200-14	SMP		0.5	0.5	As Received		T1	
12	1	0805200-15	SMP		0.5	0.5	As Received		T1	
13	1	0805200-17	SMP		0.5	0.5	As Received		T1	
14	1	0805200-18	SMP		0.5	0.5	As Received		T1	
15	1	0805200-19	SMP		0.5	0.5	As Received		T1	
16	1	0805200-21	SMP		0.5	0.5	As Received		T1	
17	1	0805200-22	SMP		0.5	0.5	As Received		T1	
18	1	0805200-23	SMP		0.5	0.5	As Received		T1	
19	1	0805200-26	SMP		0.5	0.5	As Received		T1	
20	1	0805200-27	SMP		0.5	0.5	As Received		T1	
21	1	PL080606-3	MB		0.5	0.5	As Received		T1	
22	1	PL080606-3	LCS		0.5	0.5	As Received		S1,T1	
23	1	PL080606-3	LCSD		0.5	0.5	As Received		S1,T1	

Radiochemistry Prep Worksheet

Paragon Analytics

Prep Batch: PL080606-3

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:
Balance:

Samp Num	Prep Num	LabID	QC Type	Dish No.	Init Alq g	Fin Alq g	Prep Basis	Decay Date/Time	Standards	Prep Notes

Comments

Spiked By: TE **Date:** 6/6/08
Witnessed By: [illegible] **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	16.006	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	47.136	DPM/ml	06/06/08	1	ml	AW015
S1	Po-210	823.3020.41	47.136	DPM/ml	06/06/08	1	ml	AW015

12/5/08

Exp
7/14/08

Radiochemistry Instrument Worksheet

Paragon Analytics

Prep Batch: PL080606-4

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	0805200-28	SMP	0.5226	0.2613	g	pCi/g	_520028	7	JH	_520028			_520028			A ct for 1000 min
1	0805200-30	SMP	0.6021	0.3011	g	pCi/g	_520030	8		_520030			_520030	GB 6/17/08		
1	0805200-31	SMP	0.6284	0.3142	g	pCi/g	_520031	49		_520031	1	GB	_520031			
1	0805200-32	SMP	0.597	0.2985	g	pCi/g	_520032	50		_520032	2		_520032			
1	0805200-34	SMP	0.5552	0.2776	g	pCi/g	_520034	51		_520034	4		_520034			
1	0805200-35	SMP	0.5984	0.2992	g	pCi/g	_520035	52		_520035	5		_520035			
1	0805200-36	SMP	0.516	0.258	g	pCi/g	_520036	53		_520036	6		_520036			
1	PL080606-4	MB	0.5	0.25	g	pCi/g	_80604B	54		_80604B	7		_80604B			
1	PL080606-4	LCS	0.5	0.25	g	pCi/g	_80604L	33		_80604L			_80604L			
1	PL080606-4	LCSD	0.5	0.25	g	pCi/g	_80604LD	34		_80604LD	GB 6/17/08		_80604LD	GB 6/17/08		

Tracer/Carrier Solution Information

Soln #	Nuclide	SolnID	Prep Conc	Units	Prep Date	Aliquot	Units	Pipet ID
T1	Po-209	851.3020.87	16.006	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	47.136	DPM/ml	06/06/08	1	ml	AW015
S1	Po-210	823.3020.41	47.136	DPM/ml	06/06/08	1	ml	AW015

0 Recount → Dead time > 10% JP 6/19/08

Sample Barcodes

0805200-28 PL080606-4PS1	0805200-30 PL080606-4PS2
0805200-31 PL080606-4PS3	0805200-32 PL080606-4PS4
0805200-34 PL080606-4PS5	0805200-35 PL080606-4PS6
0805200-36 PL080606-4PS7	PL080606-4MB PL080606-4PS8
PL080606-4LCS PL080606-4PS9	PL080606-4LCSD PL080606-4PS10

Radiochemistry Instrument Worksheet

Paragon Analytics

Prep Batch: PL080606-4

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	0805200-28	SMP	0.5226	0.2613	g	pCi/g	_520028	1	QB	_520028			_520028		A	
1	0805200-30	SMP	0.6021	0.3011	g	pCi/g	_520030	2		_520030			_520030			
1	0805200-31	SMP	0.6284	0.3142	g	pCi/g	_520031	4		_520031			_520031			
1	0805200-32	SMP	0.597	0.2985	g	pCi/g	_520032	5		_520032			_520032			
1	0805200-34	SMP	0.5552	0.2776	g	pCi/g	_520034	6		_520034			_520034	QB 6/11/08		QB 6/11/08
1	0805200-35	SMP	0.5984	0.2992	g	pCi/g	_520035	7		_520035 C	1	QB	520035		C	C refilm & recount
1	0805200-36	SMP	0.516	0.258	g	pCi/g	_520036	~~8~~ 33	QB	_520036			_520036		7-B	
1	PL080606-4	MB	0.5	0.25	g	pCi/g	_80604B	49	QB	_80604B			_80604B		4-A	
1	PL080606-4	LCS	0.5	0.25	g	pCi/g	_80604L	50		_80604L			_80604L			
1	PL080606-4	LCSD	0.5	0.25	g	pCi/g	_80604LD	51		_80604LD			_80604LD	QB 6/11/08		QB 6/11/08

8/6/2008

Tracer/Carrier Solution Information

Soln #	Nuclide	SolnID	Prep Conc	Units	Prep Date	Aliquot	Units	Pipet ID
T1	Po-209	851.3020.87	16.006	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	47.136	DPM/ml	06/06/08	1	ml	AW015
S1	Po-210	823.3020.41	47.136	DPM/ml	06/06/08	1	ml	AW015

o Planchet stuck to thin-film on another sample & tore when loading. Refilm & count.

Sample Barcodes

0805200-28 PL080606-4PS1	0805200-30 PL080606-4PS2
0805200-31 PL080606-4PS3	0805200-32 PL080606-4PS4
0805200-34 PL080606-4PS5	0805200-35 PL080606-4PS6
0805200-36 PL080606-4PS7	PL080606-4MB PL080606-4PS8
PL080606-4LCS PL080606-4PS9	PL080606-4LCSD PL080606-4PS10

Radiochemistry Prep Worksheet

Paragon Analytics

Prep Batch: PL080606-4

Prep Procedure: Po210

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

Non-Routine Pre-Treatment? (Y) / N **Batch:** See QASS **Re-Prep?** Y / (N) **Batch:** NA **Prep QASS / NCR?** (Y) / N 365713

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

Prep Analyst: Tambrae Elhart 1E
Prep Date: 6/6/2008
Prep Dept: AP

Balance:
Balance:

Samp Num	Prep Num	LabID	QC Type	Dish No.	Init Alq g	Fin Alq g	Prep Basis	Total Digestate Vol(ml)	Digestate Vol Taken(ml)	Decay Date/Time	Standards	Prep Notes
1	1	0805200-28	SMP		0.5226	0.2613	As Received	100	2	06/07/08 07:00	T1	
2	1	0805200-30	SMP		0.6021	0.30105	As Received	100	3	06/07/08 07:00	T1	
3	1	0805200-31	SMP		0.6284	0.3142	As Received	100	4	06/07/08 07:00	T1	
4	1	0805200-32	SMP		0.597	0.2985	As Received	100	3	06/07/08 07:00	T1	
5	1	0805200-34	SMP		0.5552	0.2776	As Received	100	4	06/07/08 07:00	T1	
6	1	0805200-35	SMP		0.5984	0.2992	As Received	100	4	06/07/08 11:30	T1	
7	1	0805200-36	SMP		0.516	0.258	As Received	100	2	06/07/08 11:30	T1	
8	1	PL080606-4	MB		0.5	0.25	As Received	100	2.5	06/07/08 11:30	T1	
9	1	PL080606-4	LCS		0.5	0.25	As Received	100	2.5	06/07/08 11:30	S1,T1	
10	1	PL080606-4	LCSD		0.5	0.25	As Received	100	2.5	06/07/08 11:30	S1,T1	

1E 6/7/08

Comments

Silver disks used in lieu of the nickel disks, as they are believed to improve spectral quality.

Spiked By: Tambrae Elhart **Date:** 6/6/2008

Witnessed By: Preston Mathiesen **Date:** 6/6/2008

Tracer/Carrier Solution Information

Soln #	Nuclide	SolnID	Prep Conc	Units	Prep Date	Aliquot	Units	Pipet ID
T1	Po-209	851.3020.87	16.006	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	47.136	DPM/ml	06/06/08	1	ml	AW015
S1	Po-210	823.3020.41	47.136	DPM/ml	06/06/08	1	ml	AW015

Radiochemistry Prep Worksheet

Paragon Analytics

Prep Batch: PL080606-4

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
Prep Date: 6/6/2008
Prep Dept: AP

Balance:
Balance:

Samp Num	Prep Num	LabID	QC Type	Dish No.	Init Alq g	Fin Alq g	Prep Basis	Total Digestate Vol(ml)	Digestate Vol Taken(ml)	Decay Date/Time	Standards	Prep Notes
1	1	0805200-28	SMP		26.13	0.5226	As Received	100	2	06/07/08 07:00	T1	
2	1	0805200-30	SMP		20.07	0.6021	As Received	100	3	06/07/08 07:00	T1	
3	1	0805200-31	SMP		15.71	0.6284	As Received	100	4	06/07/08 07:00	T1	
4	1	0805200-32	SMP		19.9	0.597	As Received	100	3	06/07/08 07:00	T1	
5	1	0805200-34	SMP		13.88	0.5552	As Received	100	4	06/07/08 07:00	T1	
6	1	0805200-35	SMP		14.96	0.5984	As Received	100	4	06/07/08 11:30	T1	
7	1	0805200-36	SMP		25.8	0.516	As Received	100	2	06/07/08 11:30	T1	
8	1	PL080606-4	MB		20	0.5	As Received	100	2.5	06/07/08 11:30	T1	
9	1	PL080606-4	LCS		20	0.5	As Received	100	2.5	06/07/08 11:30	S1,T1	
10	1	PL080606-4	LCSD		20	0.5	As Received	100	2.5	06/07/08 11:30	S1,T1	

Comments

Silver disks used in lieu of the nickel disks, as they are believed to improve spectral quality.

Spiked By: Tambrae Elhart **Date:** 6/6/2008

Witnessed By: Preston Mathiesen **Date:** 6/6/2008

Tracer/Carrier Solution Information

Soln #	Nuclide	SolnID	Prep Conc	Units	Prep Date	Aliquot	Units	Pipet ID
T1	Po-209	851.3020.87	16.006	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	47.136	DPM/ml	06/06/08	1	ml	AW015
S1	Po-210	823.3020.41	47.136	DPM/ml	06/06/08	1	ml	AW015

Supersedes: 6/6/08 18:32

Radiochemistry Prep Worksheet

Paragon Analytics

Prep Batch: PL080606-4

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:
Balance:

Samp Num	Prep Num	LabID	QC Type	Dish No.	Init Alq g	Fin Alq g	Prep Basis	Decay Date/Time	Standards	Prep Notes
1	1	0805200-28	SMP		0.5	0.5	As Received	6/7@0700	T1	
2	1	0805200-30	SMP		0.5	0.5	As Received		T1	
3	1	0805200-31	SMP		0.5	0.5	As Received		T1	
4	1	0805200-32	SMP		0.5	0.5	As Received		T1	
5	1	0805200-34	SMP		0.5	0.5	As Received		T1	
6	1	0805200-35	SMP		0.5	0.5	As Received	6/7@11:30	T1	
7	1	0805200-36	SMP		0.5	0.5	As Received		T1	
8	1	PL080606-4	MB		0.5	0.5	As Received		T1	
9	1	PL080606-4	LCS		0.5	0.5	As Received		S1,T1	
10	1	PL080606-4	LCSD		0.5	0.5	As Received		S1,T1	

Comments

Spiked By: TE **Date:** 6/6/08
Witnessed By: RM **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	16.006	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	47.136	DPM/ml	06/06/08	1	ml	AW015
S1	Po-210	823.3020.41	47.136	DPM/ml	06/06/08	1	ml	AW015

12/5/08 Exp 7/14/08

SAMPLE CONDITION FORM (SOLIDS)

ANALYST: TE

ANALYSIS DATE: 5/30/08 METHOD: Prep

WORK ORDER	SAMPLE ID	SAMPLE CONDITION		
		Dry/Wet	TEXTURE	Remarks
0805200	1	wet	As Rec'd	soft animal tissue
	2			↓
	3			
	4			bone
	5			soft animal tissue
	6			↓
	7			
	8			bone
	9			soft animal tissue
	10			↓
	11			
	12			bone
	13			soft animal tissue
	14			↓
	15			
	16			bone
	17			soft animal tissue
	18			↓
	19			
✓	20	✓	✓	bone

SAMPLE CONDITION FORM (SOLIDS)

ANALYST: TE

ANALYSIS DATE: 5/30/08 METHOD: Prep

WORK ORDER	SAMPLE ID	SAMPLE CONDITION		
		Dry/Wet	TEXTURE	Remarks
0805200	21	wet	As Rec'd	Soft animal tissue
	22			↓
	23			
	24			bone
	25			carcass
	26			Soft animal tissue
	27			↓
	28			
	29			bone
	30			Soft animal tissue
	31			↓
	32			
	33			bone
	34			Soft animal tissue
	35			↓
	36			
	37	✓	✓	bone
			TE 5/30/08	

Percent Moisture

Method SOP642M Revision 0

Lab Name: Paragon Analytics

Date Extracted: 06/02/2008
Date Analyzed: 06/02/2008
Analyst: Tambrae Elhart

Balance ID: 25
Oven ID: 18
In Oven: 5/30/2008 @ 6:00:00 PM
Out of Oven: 6/1/2008 @ 12:00:00 PM

Validated By: tde
Validation Date: 06/02/2008
Validation Time: 5:30:37 PM

Run ID	Prep Batch ID	QC Batch ID	Lab ID	QC Type	Dish Wt	Wet Wt	Dry Wt	Dry Wt-Dish Wt	Percent Moisture	Percent Solids	RPD
MOI080602-1A	MOI080602-1	MOI080602-1-1	MOI080602-1	MB	0	2.22	2.22	2.22	0.0	100.0	
MOI080602-1A	MOI080602-1	MOI080602-1-1	0805200-1	SMP	2.25	13.96	5.93	3.68	73.6	26.4	
MOI080602-1A	MOI080602-1	MOI080602-1-1	0805200-2	SMP	2.25	4.6	3.28	1.03	77.6	22.4	
MOI080602-1A	MOI080602-1	MOI080602-1-1	0805200-3	SMP	2.24	21.08	7.16	4.92	76.7	23.3	
MOI080602-1A	MOI080602-1	MOI080602-1-1	0805200-4	SMP	2.23	1.18	2.95	0.72	39.0	61.0	
MOI080602-1A	MOI080602-1	MOI080602-1-1	0805200-5	SMP	2.23	12.5	5.49	3.26	73.9	26.1	
MOI080602-1A	MOI080602-1	MOI080602-1-1	0805200-6	SMP	2.22	3.74	2.97	0.75	79.9	20.1	
MOI080602-1A	MOI080602-1	MOI080602-1-1	0805200-7	SMP	2.24	26.79	8.91	6.67	75.1	24.9	
MOI080602-1A	MOI080602-1	MOI080602-1-1	0805200-8	SMP	2.24	1.2	2.96	0.72	40.0	60.0	
MOI080602-1A	MOI080602-1	MOI080602-1-1	0805200-9	SMP	2.24	7.7	4.06	1.82	76.4	23.6	
MOI080602-1A	MOI080602-1	MOI080602-1-1	0805200-10	SMP	2.23	7.85	3.76	1.53	80.5	19.5	
MOI080602-1A	MOI080602-1	MOI080602-1-1	0805200-11	SMP	2.25	26.77	8.59	6.34	76.3	23.7	
MOI080602-1A	MOI080602-1	MOI080602-1-1	0805200-12	SMP	2.22	1.45	2.97	0.75	48.3	51.7	
MOI080602-1A	MOI080602-1	MOI080602-1-1	0805200-13	SMP	2.25	13.59	5.82	3.57	73.7	26.3	
MOI080602-1A	MOI080602-1	MOI080602-1-1	0805200-14	SMP	2.25	12.64	5.05	2.80	77.8	22.2	
MOI080602-1A	MOI080602-1	MOI080602-1-1	0805200-15	SMP	2.26	33.65	10.31	8.05	76.1	23.9	
MOI080602-1A	MOI080602-1	MOI080602-1-1	0805200-16	SMP	2.26	4.1	4.69	2.43	40.7	59.3	
MOI080602-1A	MOI080602-1	MOI080602-1-1	0805200-17	SMP	2.25	18.8	7.08	4.83	74.3	25.7	
MOI080602-1A	MOI080602-1	MOI080602-1-1	0805200-18	SMP	2.25	11.43	4.87	2.62	77.1	22.9	
MOI080602-1A	MOI080602-1	MOI080602-1-1	0805200-19	SMP	2.26	42.59	12.87	10.61	75.1	24.9	
MOI080602-1A	MOI080602-1	MOI080602-1-1	0805200-20	SMP	2.25	3.48	4.42	2.17	37.6	62.4	

Percent Moisture

Method SOP642M Revision 0

Lab Name: Paragon Analytics

Date Extracted: 06/02/2008
Date Analyzed: 06/02/2008
Analyst: Tambrae Elhart

Balance ID: 25
Oven ID: 18
In Oven: 5/30/2008 @ 6:00:00 PM
Out of Oven: 6/1/2008 @ 12:00:00 PM

Validated By: tde
Validation Date: 06/02/2008
Validation Time: 5:30:37 PM

Run ID	Prep Batch ID	QC Batch ID	Lab ID	QC Type	Dish Wt	Wet Wt	Dry Wt	Dry Wt-Dish Wt	Percent Moisture	Percent Solids	RPD

QC Types

CAR	Carrier reference sample
LCS	Laboratory Control Sample
MB	Method Blank
MSD	Laboratory Matrix Spike Duplicate
SMP	Field Sample

DUP	Laboratory Duplicate
LCSD	Laboratory Control Sample Duplicate
MS	Laboratory Matrix Spike
REP	Sample replicate
SYS	Sample Yield Spike

Comments:

DUP = Sample Duplicate
Wet Wt = Sample Wet Wt - Dish Wt
Dry Wt = Sample Dry Wt + Dish Wt
Dry Wt - Dish Wt = Sample Dry Wt - Dish Wt
All weight values shown above are expressed in grams.

$$RPD = \frac{(\text{Sample Value - Duplicate Value})}{2} \times 100$$

$$\% \text{ Solids} = \frac{\text{Dry Weight}}{\text{Wet Weight}} \times 100$$

$$\% \text{ Moisture} = \frac{(\text{Wet Weight - Dry Weight})}{\text{Wet Weight}} \times 100$$

Percent Moisture

Method SOP642M Revision 0

Lab Name: Paragon Analytics

Date Extracted: 06/02/2008
Date Analyzed: 06/02/2008
Analyst: Tambrae Elhart

Balance ID: 25
Oven ID: 18
In Oven: 5/30/2008 @ 6:00:00 PM
Out of Oven: 6/1/2008 @ 12:00:00 PM

Validated By: tde
Validation Date: 06/02/2008
Validation Time: 5:49:18 PM

Run ID	Prep Batch ID	QC Batch ID	Lab ID	QC Type	Dish Wt	Wet Wt	Dry Wt	Dry Wt-Dish Wt	Percent Moisture	Percent Solids	RPD
MOI080602-3A	MOI080602-3	MOI080602-3-1	MOI080602-3	MB	0	2.25	2.25	2.25	0.0	100.0	
MOI080602-3A	MOI080602-3	MOI080602-3-1	0805200-21	SMP	2.2	18.34	6.89	4.69	74.4	25.6	
MOI080602-3A	MOI080602-3	MOI080602-3-1	0805200-22	SMP	2.25	15.44	5.44	3.19	79.3	20.7	
MOI080602-3A	MOI080602-3	MOI080602-3-1	0805200-23	SMP	2.21	44.29	12.69	10.48	76.3	23.7	
MOI080602-3A	MOI080602-3	MOI080602-3-1	0805200-24	SMP	2.21	4.04	4.89	2.68	33.7	66.3	
MOI080602-3A	MOI080602-3	MOI080602-3-1	0805200-25	SMP	2.21	8.01	4.16	1.95	75.7	24.3	
MOI080602-3A	MOI080602-3	MOI080602-3-1	0805200-26	SMP	2.21	23.53	7.33	5.12	78.2	21.8	
MOI080602-3A	MOI080602-3	MOI080602-3-1	0805200-27	SMP	2.23	11.89	4.92	2.69	77.4	22.6	
MOI080602-3A	MOI080602-3	MOI080602-3-1	0805200-28	SMP	2.23	26.13	5.42	3.19	87.8	12.2	
MOI080602-3A	MOI080602-3	MOI080602-3-1	0805200-29	SMP	2.26	9.22	9.88	7.62	17.4	82.6	
MOI080602-3A	MOI080602-3	MOI080602-3-1	0805200-30	SMP	2.25	20.07	7.54	5.29	73.6	26.4	
MOI080602-3A	MOI080602-3	MOI080602-3-1	0805200-31	SMP	2.26	15.71	5.34	3.08	80.4	19.6	
MOI080602-3A	MOI080602-3	MOI080602-3-1	0805200-32	SMP	2.25	19.9	6.3	4.05	79.6	20.4	
MOI080602-3A	MOI080602-3	MOI080602-3-1	0805200-33	SMP	2.22	13.63	12.52	10.30	24.4	75.6	
MOI080602-3A	MOI080602-3	MOI080602-3-1	0805200-34	SMP	2.22	13.88	5.09	2.87	79.3	20.7	
MOI080602-3A	MOI080602-3	MOI080602-3-1	0805200-35	SMP	2.26	14.96	5.11	2.85	80.9	19.1	
MOI080602-3A	MOI080602-3	MOI080602-3-1	0805200-36	SMP	2.24	25.8	7.5	5.26	79.6	20.4	
MOI080602-3A	MOI080602-3	MOI080602-3-1	0805200-37	SMP	2.22	10.44	10.66	8.44	19.2	80.8	

QC Types

CAR	Carrier reference sample
LCS	Laboratory Control Sample
MB	Method Blank
MSD	Laboratory Matrix Spike Duplicate
SMP	Field Sample

DUP	Laboratory Duplicate
LCSD	Laboratory Control Sample Duplicate
MS	Laboratory Matrix Spike
REP	Sample replicate
SYS	Sample Yield Spike

Comments:

DUP = Sample Duplicate
Wet Wt = Sample Wet Wt - Dish Wt
Dry Wt = Sample Dry Wt + Dish Wt
Dry Wt - Dish Wt = Sample Dry Wt - Dish Wt
All weight values shown above are expressed in grams.

$$RPD = \frac{(\text{Sample Value - Duplicate Value})}{2} \times 100$$

$$\% \text{ Solids} = \frac{\text{Dry Weight}}{\text{Wet Weight}} \times 100$$

$$\% \text{ Moisture} = \frac{(\text{Wet Weight - Dry Weight})}{\text{Wet Weight}} \times 100$$

Animal Tissue Digestate Splits

Sample ID	Original Wet Wt (g)	Total Digest. Volume (ml)	Digestate Volume Taken for Analysis (ml)				
			Po-210	Pb-210	Th-ISO	Ra-226	U6020
0805200-1	13.96	100	4	36	36	NA	NA
0805200-2	4.6	100	10	90	NA	NA	NA
0805200-3	21.08	100	3	NA	NA	NA	24
0805200-4	8.06	100	NA	5	28	50	17
0805200-5	12.5	100	4	40	40	NA	NA
0805200-6	3.74	100	10	90	NA	NA	NA
0805200-7	26.79	100	2	NA	NA	NA	19
0805200-8	8.44	100	NA	5	28	50	17
0805200-9	7.7	100	4	48	48	NA	NA
0805200-10	7.85	100	7	64	NA	NA	NA
0805200-11	26.77	100	2	NA	NA	NA	19
0805200-12	7.68	100	NA	5	28	50	17
0805200-13	13.59	100	4	37	37	NA	NA
0805200-14	12.64	100	4	40	NA	NA	NA
0805200-15	33.65	100	2	NA	NA	NA	15
0805200-16	15.28	100	NA	7	33	33	20
0805200-17	18.8	100	3	27	27	NA	NA
0805200-18	11.43	100	5	44	NA	NA	NA
0805200-19	42.59	100	2	NA	NA	NA	12
0805200-20*	13.93	100	NA	7.1	35.7	35.7	21.5
0805200-MB	20	100	2.5	20	20	20	20
0805200-LCS	20	100	2.5	20	20	20	20
0805200-LCSD	20	100	2.5	20	20	20	20

1. *=sample not enough to take full aliquots, analysis aliquot adjusted proportionally
2. Samples split using graduated cylinder or calibrated pipet

Animal Tissue Digestate Splits

Sample ID	Original Wet Wt (g)	Total Digest. Volume (ml)	Digestate Volume Taken for Analysis (ml)				
			Po-210	Pb-210	Th-ISO	Ra-226	U6020
0805200-21	18.34	100	3	28	28	NA	NA
0805200-22	15.44	100	4	33	NA	NA	NA
0805200-23	44.29	100	2	NA	NA	NA	12
0805200-24	19.13	100	NA	6	27	27	16
0805200-25	8.01	100	NA	25	25	25	25
0805200-26	23.53	100	3	22	22	NA	NA
0805200-27	11.89	100	5	43	NA	NA	NA
0805200-28	26.13	100	2	NA	NA	NA	20
0805200-29*	9.22	100	NA	7.1	35.7	35.7	21.5
0805200-30	20.07	100	3	25	25	NA	NA
0805200-31	15.71	100	4	32	NA	NA	NA
0805200-32	19.9	100	3	NA	NA	NA	26
0805200-33*	13.63	100	NA	7.1	35.7	35.7	21.5
0805200-34	13.88	100	4	37	37	NA	NA
0805200-35	14.96	100	4	34	NA	NA	NA
0805200-36	25.8	100	2	NA	NA	NA	20
0805200-37*	10.44	100	NA	7.1	35.7	35.7	21.5
0805200-MB	20	100	2.5	20	20	20	20
0805200-LCS	20	100	2.5	20	20	20	20
0805200-LCSD	20	100	2.5	20	20	20	20

1. *=sample not enough to take full aliquots, analysis aliquot adjusted proportionally
2. Samples split using graduated cylinder or calibrated pipet

PARAGON ANALYTICS
Radiochemistry Data Package

Section 8

STANDARDS TRACEABILITY DOCUMENTS

8

Prepare a Working dilution of Po-209 from Primary dilution 851.3020.86 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:

JDD 12/13/07

$$\frac{895.743 \frac{dpm}{g} \cdot 14.0548\,g \cdot 1.0322\,g/ml}{737.0188\,g} = 20.001 \frac{dpm}{ml}$$ 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

NC 1/14/08

Reverification Log		
Analysis Date	Initials	Expiration Date

NC 1/14/08

Continued on Page

Read and Understood By

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

Signed 1/14/08 Date

Prepare a Primary Dilution of Po-209 RSO# 851 of approximatly 1000 dpm/~~at~~ g JDD 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

$\rho = 1.0322$ 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
Mass of vial (from above)	21.4814 g
Net Mass of std	~~50.0271 g~~ 28.5457 g

JDD 11/13/07

5) Final Activity Calculation:

JDD 12/13/07

$$\frac{(500\ Bq)\cdot\left(\frac{60\ secs}{1\ Min}\right)\cdot(4.989\ g)}{(28.5457\ g)\cdot(5.16\ g)} = 1016.119\ \frac{dpm}{g}$$

$$\frac{\left(85.42\ \frac{Bq}{g}\right)\cdot\left(\frac{60\ secs}{1\ Min}\right)(4.989\ g)}{(28.5457\ g)} = 895.743\ \frac{dpm}{g}$$

Continued on Page

Read and Understood By

Signed	JDD 12/13/07 12/13/07 Date	Signed	1/14/08 Date

National Institute of Standards & Technology

Certificate

Rom # 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 ampoule. During the decay process X-rays and gamma rays with energies from approximately 10 keV to 900 keV are also emitted. Most of these photons escape from the SRM ampoule but their intensities are so small that they do not represent a radiation hazard. Approximate unshielded dose rates at several distances (as of the reference time) are given in note [a]*. The SRM should be used only by persons qualified to handle radioactive material.

Chemical Hazard: The SRM ampoule contains hydrochloric acid with a concentration of 2 moles per liter of water. The solution is corrosive and represents a health hazard if it comes in contact with eyes or skin. If the ampoule is to be opened to transfer the solution, the recommended procedure is given on page 2. The ampoule should be opened only by persons qualified to handle both radioactive material and strong acid solution.

Storage and Handling: The SRM should be stored and used at a temperature between 5 and 65 °C. The solution in an unopened ampoule should remain stable and homogeneous for at least five (5) years after receipt. Refer to reference [5] for details on the long-term stability of polonium solution standards. The ampoule (or any subsequent container) should always be clearly marked as containing radioactive material. If the ampoule is transported, it should be packed, marked, labeled, and shipped in accordance with the applicable national, international, and carrier regulations. The solution in the ampoule is a dangerous good (hazardous material) because of both the radioactivity and the strong acid.

Preparation: This Standard Reference Material was prepared in the Physics Laboratory, Ionizing Radiation Division, Radioactivity Group, J.M.R. Hutchinson, Group Leader. The overall technical direction and physical measurements leading to certification were provided by R. Collé of the Radioactivity Group, and Z. Lin, Guest Researcher. The support aspects involved in the preparation, certification, and issuance of this SRM were coordinated through the Standard Reference Materials Program.

Lisa R. Karam, Deputy Chief
Ionizing Radiation Division

Robert L. Watters, Jr., Chief
Measurement Services Division

Gaithersburg, Maryland 20899
January 1995 (Text only revised November 1997)
Text revised and expiration date extended December 2005

*Notes and references are on pages 5 and 6.

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]
Solution mass	**(5.160 ± 0.003) g** [e]
Solution density	**(1.031 ± 0.004) $g \cdot mL^{-1}$ at 22 °C** [e]

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 Formula	Concentration ($mol \cdot L^{-1}$)	Mass Fraction ($g \cdot g^{-1}$)
	H_2O	53	0.93
	HCl	2.0	0.07
	HNO_3	$< 3 \times 10^{-3}$	$< 2 \times 10^{-4}$
	$PoCl_4$	7×10^{-10}	2×10^{-10}
Radiological Properties:			
Alpha-particle-emitting impurities (massic alpha-particle emission rate)	Polonium-208: (0.106 ± 0.017) $s^{-1} \cdot g^{-1}$ [e, f]		
Photon-emitting impurities	None detected [g]		
Half lives used	Polonium-209: (102 ± 5) a [8][h] Polonium-208: (2.898 ± 0.002) a [8][h]		
Calibration method and measuring instrument(s)	Two 4πα liquid-scintillation counting systems, 2πα gas-flow proportional counter, and silicon surface-barrier detector.		

*Notes and references are on pages 5 and 6.

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 $u_i(y)/y \equiv |\partial y/\partial x_i| \cdot u(x_i)/y = |\partial y/\partial x_i| \cdot (x_i/y) \cdot u(x_i)/x_i$. 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] $|\partial y/\partial x_i| \cdot (x_i/y)$ = (average background count rate)/(average net sample count rate)

[n] 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.

[p] $|\partial y/\partial x_i| \cdot (x_i/y) = |\lambda \cdot t|$

[q] The live time is determined by counting the pulses from a gated crystal-controlled oscillator.

[r] The standard uncertainty the detected impurity. $|\partial y/\partial x_i| \cdot (x_i/y)$ = {(response per Bq of impurity)/(response per Bq of Polonium-209)}·{(Bq of impurity)/(Bq of Polonium-209)}.

[s] 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 Polonium-209)}·{(Bq of impurity)/(Bq of Polonium-209)}. 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 Global Engineering Documents, 12 Inverness Way East, Englewood, CO 80112, U.S.A. Telephone 1-800-854-7179.

[2] International Organization for Standardization (ISO), *Guide to the Expression of Uncertainty in Measurement*, 1993 (corrected and reprinted, 1995). Available from Global Engineering Documents, 12 Inverness Way East, Englewood, CO 80112, U.S.A. Telephone 1-800-854-7179.

[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] R. Collé, Long-term Stability of a Carrier-Free Polonium Solution Standards, *Radioactivity and Radiochemistry*, **4** (1993) 18.

[6] R. Collé, Z. Lin, J.M.R. Hutchinson and F.J. Schima, A Delayed Isomeric State in ^{205}Pb and Its Implications for $4\pi\alpha$ Liquid-Scintillation Spectrometry of ^{209}Po, *Appl. Radiat. Isot.*, **45** (1994) 1165.

[7] R. Collé, Z. Lin, F.J. Schima, P.A. Hodge, J.W.L. Thomas, J.M.R. Hutchinson, and B.M. Coursey, Preparation and Calibration of Carrier Free ^{209}Po Solution Standards, *J. Res. NIST*, **100** (1995)1.

[8] Evaluated Nuclear Structure Data File (ENSDF), July 1994.

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

D = 1.0288g/mL

2) Transfer approx. 1.13g of standard to Nalgene bottle (1L)
Bal 12
Mass of bottle w/out lid: 74.7598g
mass of bottle + standard: 75.9347g
Net mass of standard: 1.1749g

3) Dilute to 1000mL w/ 1.0M HNO_3
bal 12
mass of bottle + standard + 1.0M HNO_3: 1141.0
mass of bottle: 74.7598g
net mass of std: 1066.24g

4) Final Activity

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

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

RG 11/3/06

Reverification Log

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

RG 11/3/06

Continued on Page

Read and Understood By

Amanda Barlage — Signed — 8/4/06 — Date

Renee Gallegos — Signed — 11/3/06 — 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 (dps):	3.831 E4
HALF-LIFE:	22.3 years
CALIBRATION DATE:	July 13, 2006 12:00 EST
RELATIVE EXPANDED UNCERTAINTY (k=2):	3.3%

Impurities: γ-impurities <0.1%
α-impurities (other than decay products) <0.01%

52.10846 grams 1M HNO_3 solution.

P O NUMBER 71239 6-13-06, Item 1

SOURCE PREPARED BY: M Taskaeva
M. Taskaeva, Radiochemist

Q A APPROVED: 7-13-06

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: 0805200

Prep SOP: PAI 711
Analytical SOP: PAI 714

Reported on: Tuesday, June 17, 2008
12:22:35 PM

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
0805200-1	SMP	PL080606-3	Po210	35	C08061035	6/10/2008	31.63	Pass	29.98	30.51	32.61	33.14
Spectrum #1		PL080606-3A			B08061035	6/10/2008	0.0120	Pass	0.0000	0.0100	0.1000	0.1500
6/13/2008					C08061035	6/10/2008	5555.8	Pass	5496.0	5506.0	5586.0	5596.0
0805200-2	SMP	PL080606-3	Po210	36	C08061036	6/10/2008	28.02	Pass	27.15	27.63	29.53	30.01
Spectrum #1		PL080606-3A			B08061036	6/10/2008	0.0130	Pass	0.0000	0.0100	0.1000	0.1500
6/13/2008					C08061036	6/10/2008	5534.4	Pass	5486.2	5496.2	5576.2	5586.2
0805200-3	SMP	PL080606-3	Po210	37	C08061037	6/10/2008	29.66	Pass	28.00	28.49	30.45	30.94
Spectrum #1		PL080606-3A			B08061037	6/10/2008	0.0250	Pass	0.0000	0.0100	0.1000	0.1500
6/13/2008					C08061037	6/10/2008	5524.7	Pass	5496.0	5506.0	5586.0	5596.0
0805200-5	SMP	PL080606-3	Po210	39	C08061039	6/10/2008	30.05	Pass	28.86	29.37	31.39	31.90
Spectrum #1		PL080606-3A			B08061039	6/10/2008	0.0130	Pass	0.0000	0.0100	0.1000	0.1500
6/13/2008					C08061039	6/10/2008	5534.1	Pass	5496.0	5506.0	5586.0	5596.0
0805200-6	SMP	PL080606-3	Po210	40	C08061040	6/10/2008	29.19	Pass	27.59	28.07	30.01	30.49
Spectrum #1		PL080606-3A			B08061040	6/10/2008	0.0130	Pass	0.0000	0.0100	0.1000	0.1500
6/13/2008					C08061040	6/10/2008	5555.8	Pass	5484.4	5494.4	5584.4	5594.4
0805200-7	SMP	PL080606-3	Po210	42	C08061042	6/10/2008	31.36	Pass	29.90	30.42	32.52	33.04
Spectrum #1		PL080606-3A			B08061042	6/10/2008	0.0310	Pass	0.0000	0.0100	0.1000	0.1500
6/13/2008					C08061042	6/10/2008	5547.9	Pass	5493.9	5503.9	5583.9	5593.9
0805200-9	SMP	PL080606-3	Po210	43	C08061043	6/10/2008	31.88	Pass	30.69	31.23	33.39	33.93
Spectrum #1		PL080606-3A			B08061043	6/10/2008	0.0190	Pass	0.0000	0.0100	0.1000	0.1500
6/13/2008					C08061043	6/10/2008	5546.0	Pass	5498.9	5508.9	5588.9	5598.9
0805200-10	SMP	PL080606-3	Po210	45	C08061045	6/10/2008	31.68	Pass	29.72	30.24	32.32	32.84
Spectrum #1		PL080606-3A			B08061045	6/10/2008	0.0120	Pass	0.0000	0.0100	0.1000	0.1500
6/13/2008					C08061045	6/10/2008	5536.2	Pass	5497.9	5507.9	5587.9	5597.9
0805200-11	SMP	PL080606-3	Po210	46	C08061046	6/10/2008	30.95	Pass	29.25	29.76	31.82	32.33
Spectrum #1		PL080606-3A			B08061046	6/10/2008	0.0110	Pass	0.0000	0.0100	0.1000	0.1500
6/13/2008					C08061046	6/10/2008	5557.7	Pass	5498.1	5508.1	5588.1	5598.1

Data Package ID: *PL0805200-1*

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.

Calibration Data Summary

Laboratory Name: **Paragon Analytics**
PAI Work Order: 0805200

Prep SOP: PAI 711
Analytical SOP: PAI 714

Reported on: Tuesday, June 17, 2008
12:22:35 PM

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
0805200-13	SMP	PL080606-3	Po210	47	C08061047	6/10/2008	30.08	Warning	29.87	30.39	32.49	33.01
Spectrum #1		PL080606-3A			B08061047	6/10/2008	0.0190	Pass	0.0000	0.0100	0.1000	0.1500
6/13/2008					C08061047	6/10/2008	5546.0	Pass	5484.4	5494.4	5574.4	5584.4
0805200-14	SMP	PL080606-3	Po210	1	C08060901	6/9/2008	28.78	Pass	27.36	27.84	29.76	30.24
Spectrum #1		PL080606-3A			B08060901	6/9/2008	0.0130	Pass	0.0000	0.0102	0.1002	0.1500
6/14/2008					C08060901	6/9/2008	5536.0	Pass	5497.7	5507.7	5587.7	5597.7
0805200-15	SMP	PL080606-3	Po210	2	C08060902	6/9/2008	31.03	Pass	29.81	30.33	32.43	32.95
Spectrum #1		PL080606-3A			B08060902	6/9/2008	0.0220	Pass	0.0000	0.0102	0.1002	0.1500
6/14/2008					C08060902	6/9/2008	5557.7	Pass	5503.6	5513.6	5593.6	5603.6
0805200-17	SMP	PL080606-3	Po210	4	C08060904	6/9/2008	30.07	Pass	28.67	29.17	31.19	31.69
Spectrum #1		PL080606-3A			B08060904	6/9/2008	0.0230	Pass	0.0000	0.0102	0.1002	0.1500
6/14/2008					C08060904	6/9/2008	5557.7	Pass	5505.7	5515.7	5595.7	5605.7
0805200-18	SMP	PL080606-3	Po210	5	C08060905	6/9/2008	31.19	Pass	29.29	29.80	31.86	32.37
Spectrum #1		PL080606-3A			B08060905	6/9/2008	0.0150	Pass	0.0000	0.0102	0.1002	0.1500
6/14/2008					C08060905	6/9/2008	5536.0	Pass	5494.9	5504.9	5584.9	5594.9
0805200-19	SMP	PL080606-3	Po210	6	C08060906	6/9/2008	30.30	Pass	28.86	29.37	31.39	31.90
Spectrum #1		PL080606-3A			B08060906	6/9/2008	0.0270	Pass	0.0000	0.0102	0.1002	0.1500
6/14/2008					C08060906	6/9/2008	5547.6	Pass	5487.5	5497.5	5577.5	5587.5
0805200-21	SMP	PL080606-3	Po210	7	C08060907	6/9/2008	29.44	Pass	28.02	28.51	30.47	30.96
Spectrum #1		PL080606-3A			B08060907	6/9/2008	0.0150	Pass	0.0000	0.0102	0.1002	0.1500
6/14/2008					C08060907	6/9/2008	5551.4	Pass	5497.7	5507.7	5587.7	5597.7
0805200-22	SMP	PL080606-3	Po210	8	C08060908	6/9/2008	32.03	Pass	30.12	30.65	32.77	33.30
Spectrum #1		PL080606-3A			B08060908	6/9/2008	0.0160	Pass	0.0000	0.0102	0.1002	0.1500
6/14/2008					C08060908	6/9/2008	5545.9	Pass	5495.8	5505.8	5585.8	5595.8
0805200-23	SMP	PL080606-3	Po210	33	C08061033	6/10/2008	30.82	Pass	28.77	29.27	31.29	31.79
Spectrum #1		PL080606-3A			B08061033	6/10/2008	0.0150	Pass	0.0000	0.0100	0.1000	0.1500
6/15/2008					C08061033	6/10/2008	5544.2	Pass	5497.9	5507.9	5587.9	5597.9

Data Package ID: *PL0805200-1*

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.

Calibration Data Summary

Laboratory Name: **Paragon Analytics**
PAI Work Order: 0805200

Prep SOP: PAI 711
Analytical SOP: PAI 714

Reported on: Tuesday, June 17, 2008
12:22:35 PM

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
0805200-26	SMP	PL080606-3	Po210	34	C08061034	6/10/2008	30.62	Pass	29.24	29.75	31.81	32.32
Spectrum #1		PL080606-3A			B08061034	6/10/2008	0.0190	Pass	0.0000	0.0100	0.1000	0.1500
6/15/2008					C08061034	6/10/2008	5536.0	Pass	5488.0	5498.0	5578.0	5588.0
0805200-27	SMP	PL080606-3	Po210	35	C08061035	6/10/2008	31.63	Pass	29.98	30.51	32.61	33.14
Spectrum #1		PL080606-3A			B08061035	6/10/2008	0.0120	Pass	0.0000	0.0100	0.1000	0.1500
6/15/2008					C08061035	6/10/2008	5555.8	Pass	5496.0	5506.0	5586.0	5596.0
0805200-28	SMP	PL080606-4	Po210	7	C08060907	6/9/2008	29.44	Pass	28.02	28.51	30.47	30.96
Spectrum #1		PL080606-4A			B08060907	6/9/2008	0.0150	Pass	0.0000	0.0102	0.1002	0.1500
6/13/2008					C08060907	6/9/2008	5551.4	Pass	5497.7	5507.7	5587.7	5597.7
0805200-30	SMP	PL080606-4	Po210	8	C08060908	6/9/2008	32.03	Pass	30.12	30.65	32.77	33.30
Spectrum #1		PL080606-4A			B08060908	6/9/2008	0.0160	Pass	0.0000	0.0102	0.1002	0.1500
6/13/2008					C08060908	6/9/2008	5545.9	Pass	5495.8	5505.8	5585.8	5595.8
0805200-31	SMP	PL080606-4	Po210	1	C08060901	6/9/2008	28.78	Pass	27.36	27.84	29.76	30.24
Spectrum #1		PL080606-4A			B08060901	6/9/2008	0.0130	Pass	0.0000	0.0102	0.1002	0.1500
6/15/2008					C08060901	6/9/2008	5536.0	Pass	5497.7	5507.7	5587.7	5597.7
0805200-32	SMP	PL080606-4	Po210	2	C08060902	6/9/2008	31.03	Pass	29.81	30.33	32.43	32.95
Spectrum #1		PL080606-4A			B08060902	6/9/2008	0.0220	Pass	0.0000	0.0102	0.1002	0.1500
6/15/2008					C08060902	6/9/2008	5557.7	Pass	5503.6	5513.6	5593.6	5603.6
0805200-34	SMP	PL080606-4	Po210	4	C08060904	6/9/2008	30.07	Pass	28.67	29.17	31.19	31.69
Spectrum #1		PL080606-4A			B08060904	6/9/2008	0.0230	Pass	0.0000	0.0102	0.1002	0.1500
6/15/2008					C08060904	6/9/2008	5557.7	Pass	5505.7	5515.7	5595.7	5605.7
0805200-35	SMP	PL080606-4	Po210	5	C08060905	6/9/2008	31.19	Pass	29.29	29.80	31.86	32.37
Spectrum #1		PL080606-4A			B08060905	6/9/2008	0.0150	Pass	0.0000	0.0102	0.1002	0.1500
6/15/2008					C08060905	6/9/2008	5536.0	Pass	5494.9	5504.9	5584.9	5594.9
0805200-36	SMP	PL080606-4	Po210	6	C08060906	6/9/2008	30.30	Pass	28.86	29.37	31.39	31.90
Spectrum #1		PL080606-4A			B08060906	6/9/2008	0.0270	Pass	0.0000	0.0102	0.1002	0.1500
6/15/2008					C08060906	6/9/2008	5547.6	Pass	5487.5	5497.5	5577.5	5587.5

Data Package ID: *PL0805200-1*

Abbreviations:

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Calibration Data Summary

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PAI Work Order: 0805200

Prep SOP: PAI 711
Analytical SOP: PAI 714

Reported on: Tuesday, June 17, 2008
12:22:35 PM

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
PL080606-3	MB	PL080606-3	Po210	36	C08061036	6/10/2008	28.02	Pass	27.15	27.63	29.53	30.01
Spectrum #1		PL080606-3A			B08061036	6/10/2008	0.0130	Pass	0.0000	0.0100	0.1000	0.1500
6/15/2008					C08061036	6/10/2008	5534.4	Pass	5486.2	5496.2	5576.2	5586.2
PL080606-3	LCS	PL080606-3	Po210	37	C08061037	6/10/2008	29.66	Pass	28.00	28.49	30.45	30.94
Spectrum #1		PL080606-3A			B08061037	6/10/2008	0.0250	Pass	0.0000	0.0100	0.1000	0.1500
6/15/2008					C08061037	6/10/2008	5524.7	Pass	5496.0	5506.0	5586.0	5596.0
PL080606-3	LCSD	PL080606-3	Po210	39	C08061039	6/10/2008	30.05	Pass	28.86	29.37	31.39	31.90
Spectrum #1		PL080606-3A			B08061039	6/10/2008	0.0130	Pass	0.0000	0.0100	0.1000	0.1500
6/15/2008					C08061039	6/10/2008	5534.1	Pass	5496.0	5506.0	5586.0	5596.0
PL080606-4	MB	PL080606-4	Po210	7	C08060907	6/9/2008	29.44	Pass	28.02	28.51	30.47	30.96
Spectrum #1		PL080606-4A			B08060907	6/9/2008	0.0150	Pass	0.0000	0.0102	0.1002	0.1500
6/15/2008					C08060907	6/9/2008	5551.4	Pass	5497.7	5507.7	5587.7	5597.7
PL080606-4	LCS	PL080606-4	Po210	33	C08061033	6/10/2008	30.82	Pass	28.77	29.27	31.29	31.79
Spectrum #1		PL080606-4A			B08061033	6/10/2008	0.0150	Pass	0.0000	0.0100	0.1000	0.1500
6/13/2008					C08061033	6/10/2008	5544.2	Pass	5497.9	5507.9	5587.9	5597.9
PL080606-4	LCSD	PL080606-4	Po210	34	C08061034	6/10/2008	30.62	Pass	29.24	29.75	31.81	32.32
Spectrum #1		PL080606-4A			B08061034	6/10/2008	0.0190	Pass	0.0000	0.0100	0.1000	0.1500
6/13/2008					C08061034	6/10/2008	5536.0	Pass	5488.0	5498.0	5578.0	5588.0

Data Package ID: *PL0805200-1*

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: 6/6/2007

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:	49.91	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	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%	1243.38	7406.92	168.03	8818.33
92MIX2203028	183	97-19-103-02	5/20/08	14459	141741	3156	2100	28.53%	1447.86	14193.30	316.03	15957.19
92MIX2203024	184	97-19-103-03	5/20/08	66052	68294	1480	2100	28.53%	6614.15	6838.65	148.20	13601.00
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	7597.98	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	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	6967	29575	781	2100	1066.37	3779.41	28.22%	1.12%	PASS

Sources 1 through 8 activity re-verification

Source Serial#	PA ID	Sequential #	Combined Obseved 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	13601.00	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	115.56	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	334.80	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

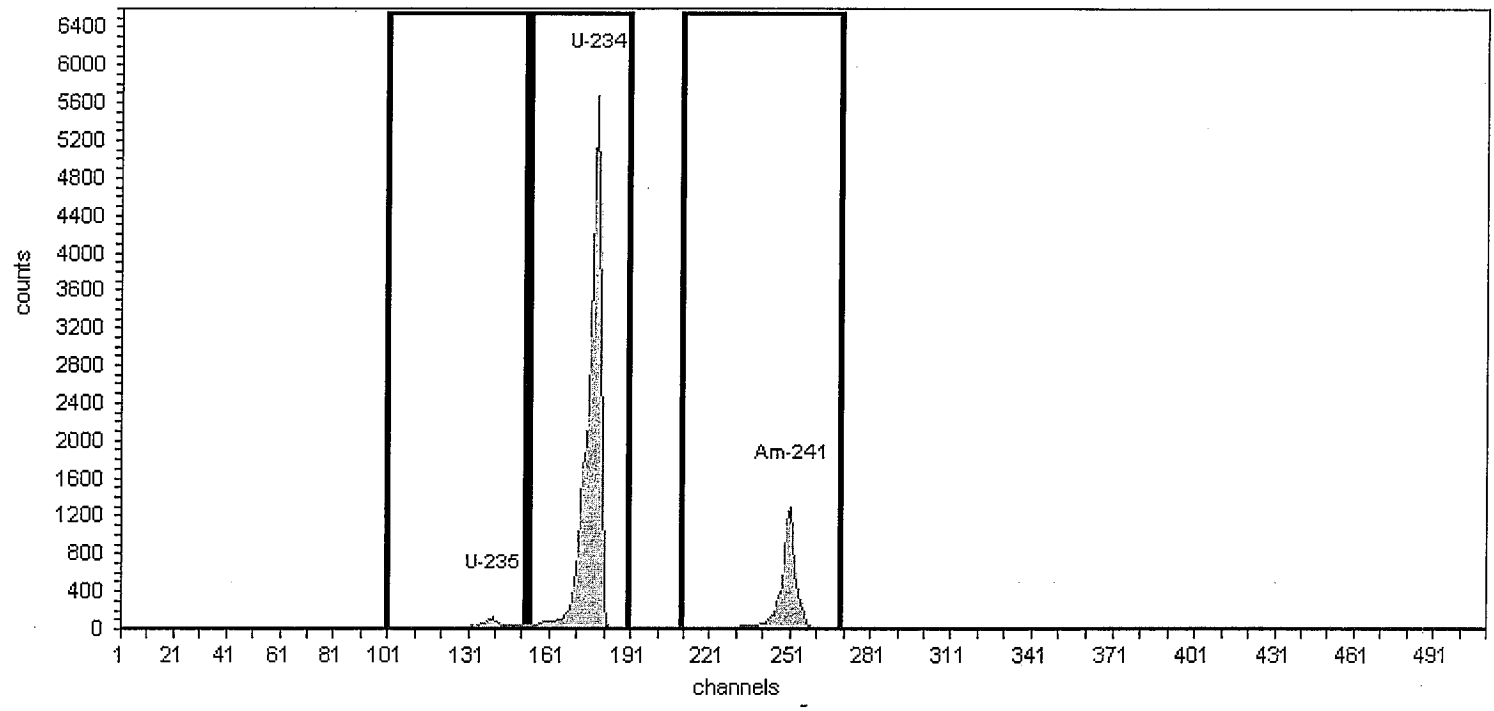
Detector: 25 , SN:
Acquisition Start Date: 5/20/2008 10:43:22AM

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

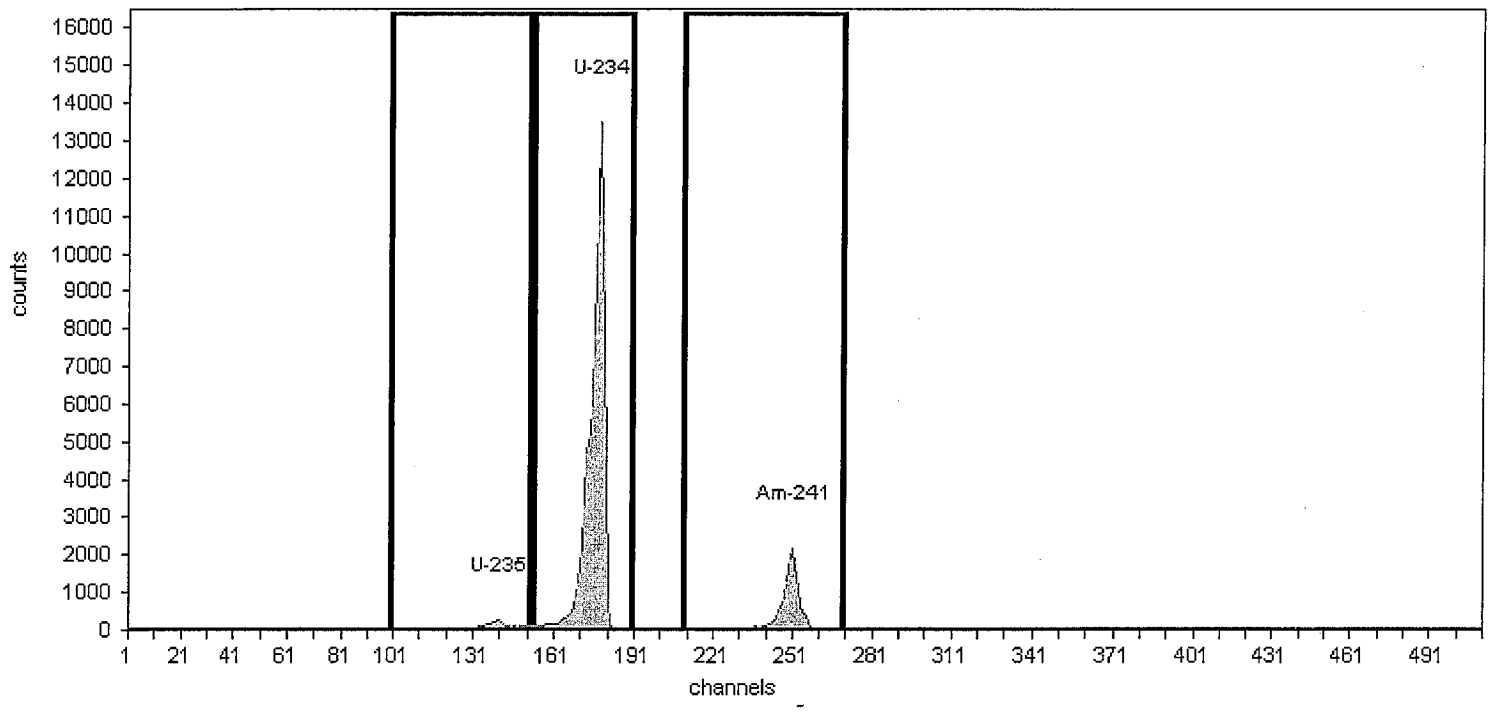
Detector: 25 , SN:
Acquisition Start Date: 5/20/2008 11:35:12AM

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

Analyst: ORTEC
Detector: 25

9:19:28AM 5/21/2008

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.

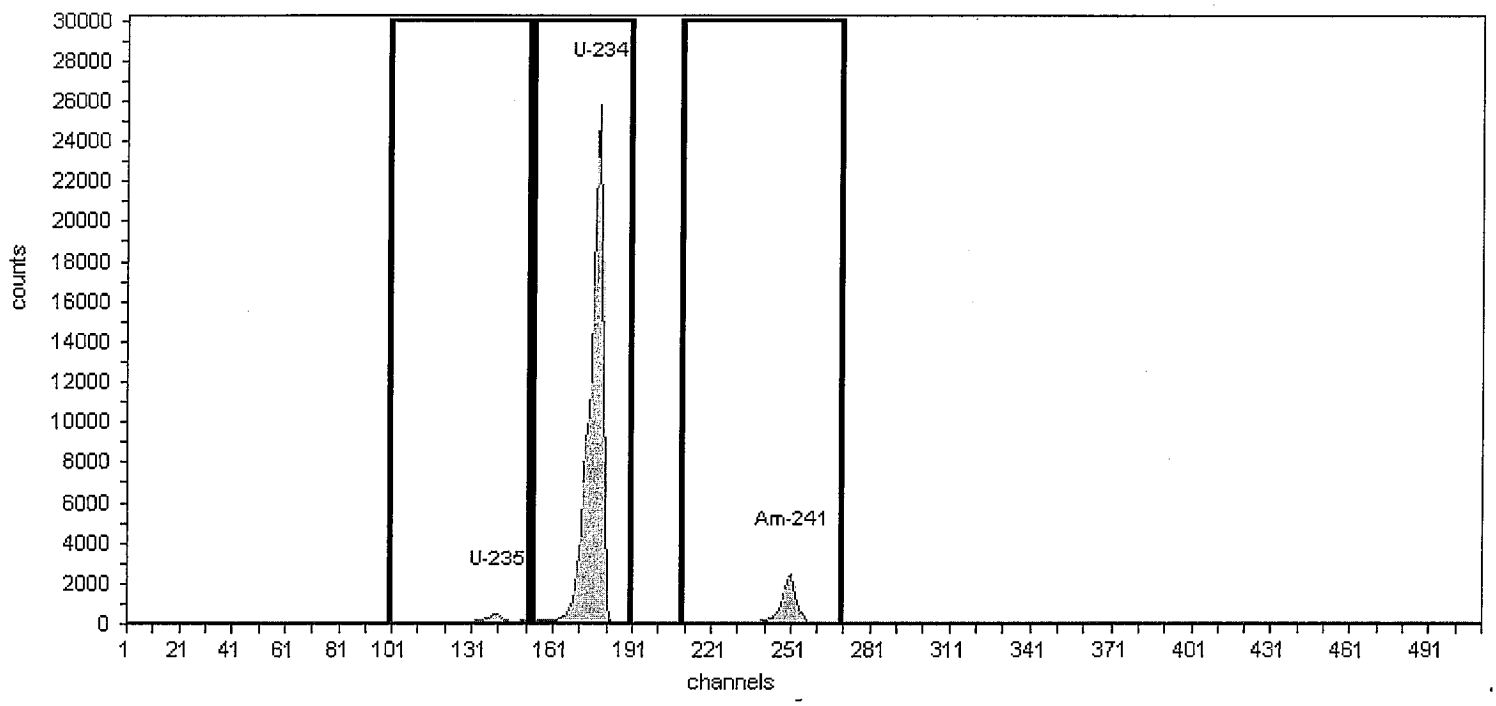
Efficiency Calibration Name: RSO 183 (Source 2)

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

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

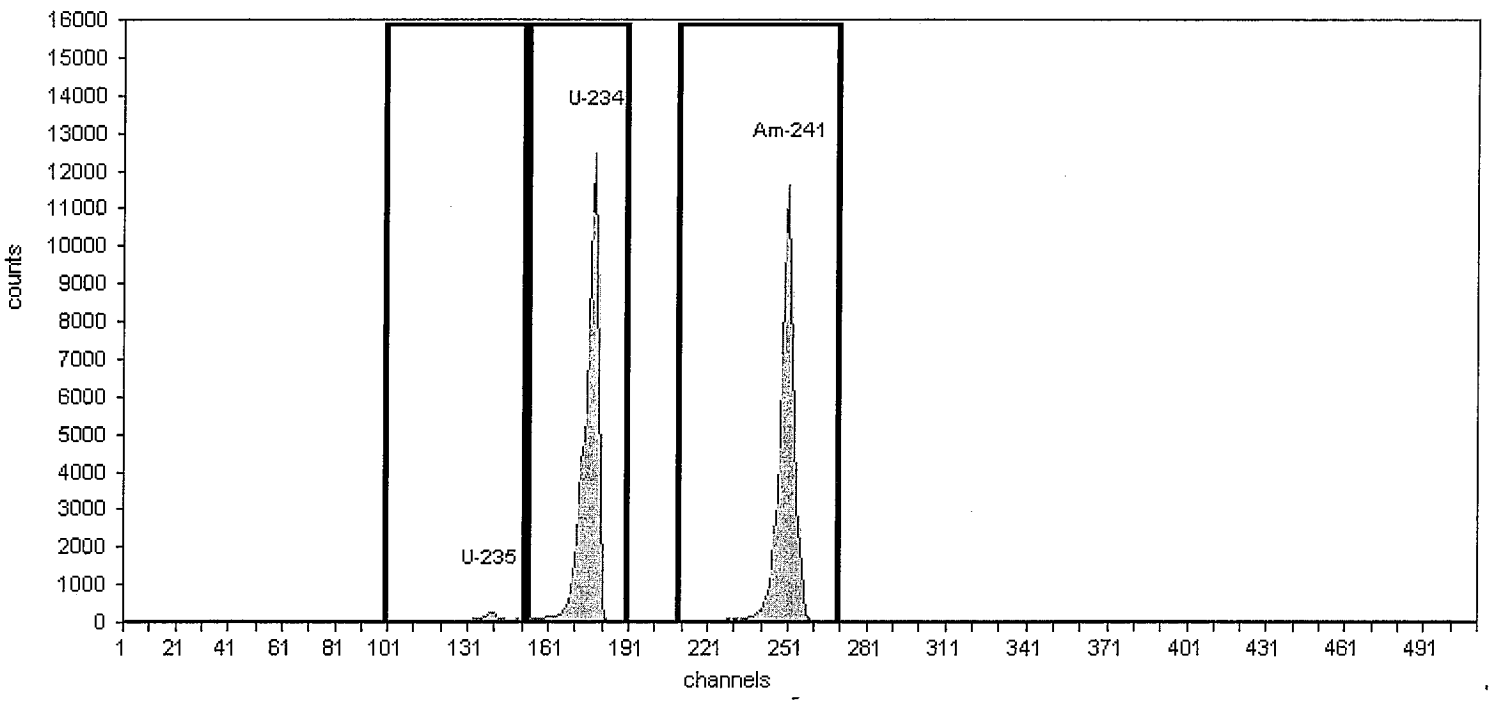
Efficiency Calibration Name: RSO 184 (Source 3)

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

Analyst: ORTEC
Detector: 25

9:21:31AM 5/21/2008

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.

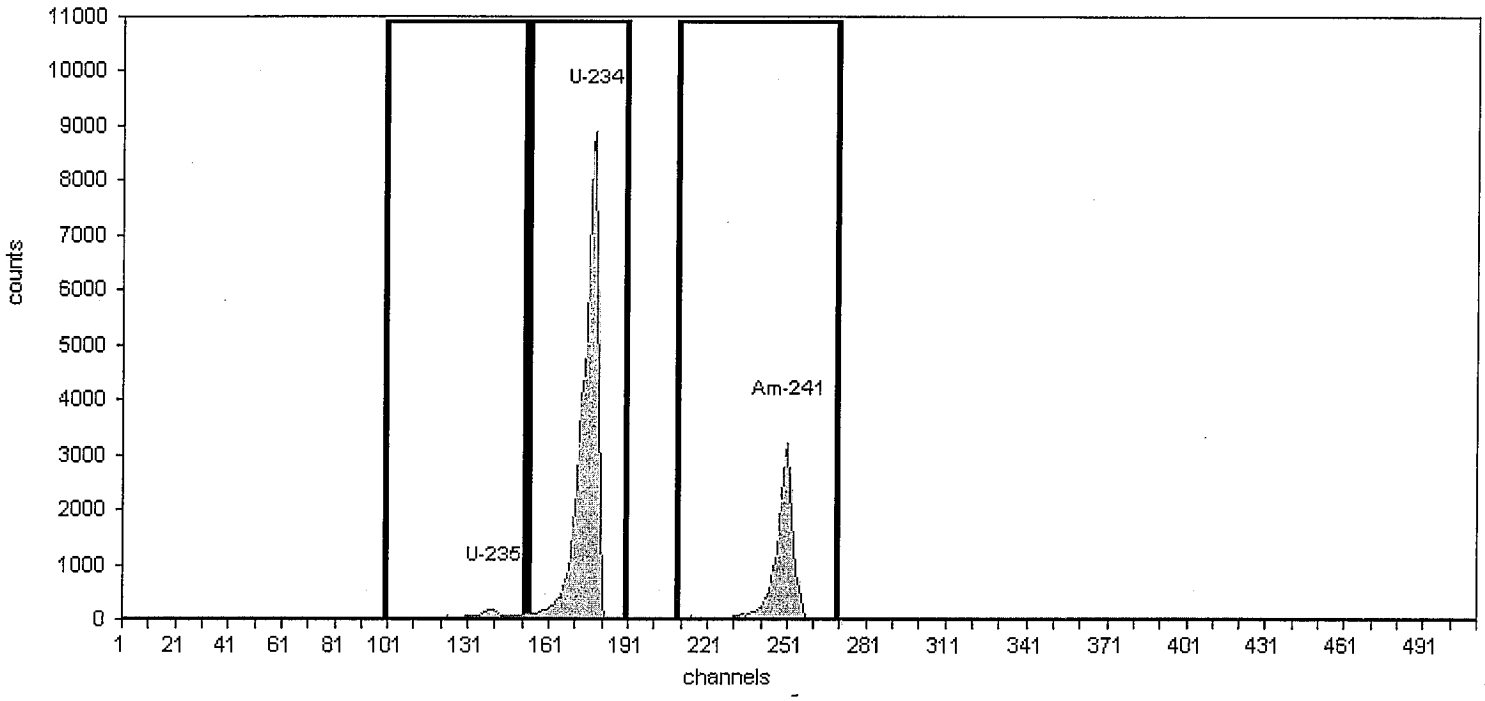
Efficiency Calibration Name: RSO 185 (Source 4)

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

Analyst: ORTEC
Detector: 25

9:21:22AM 5/21/2008

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.

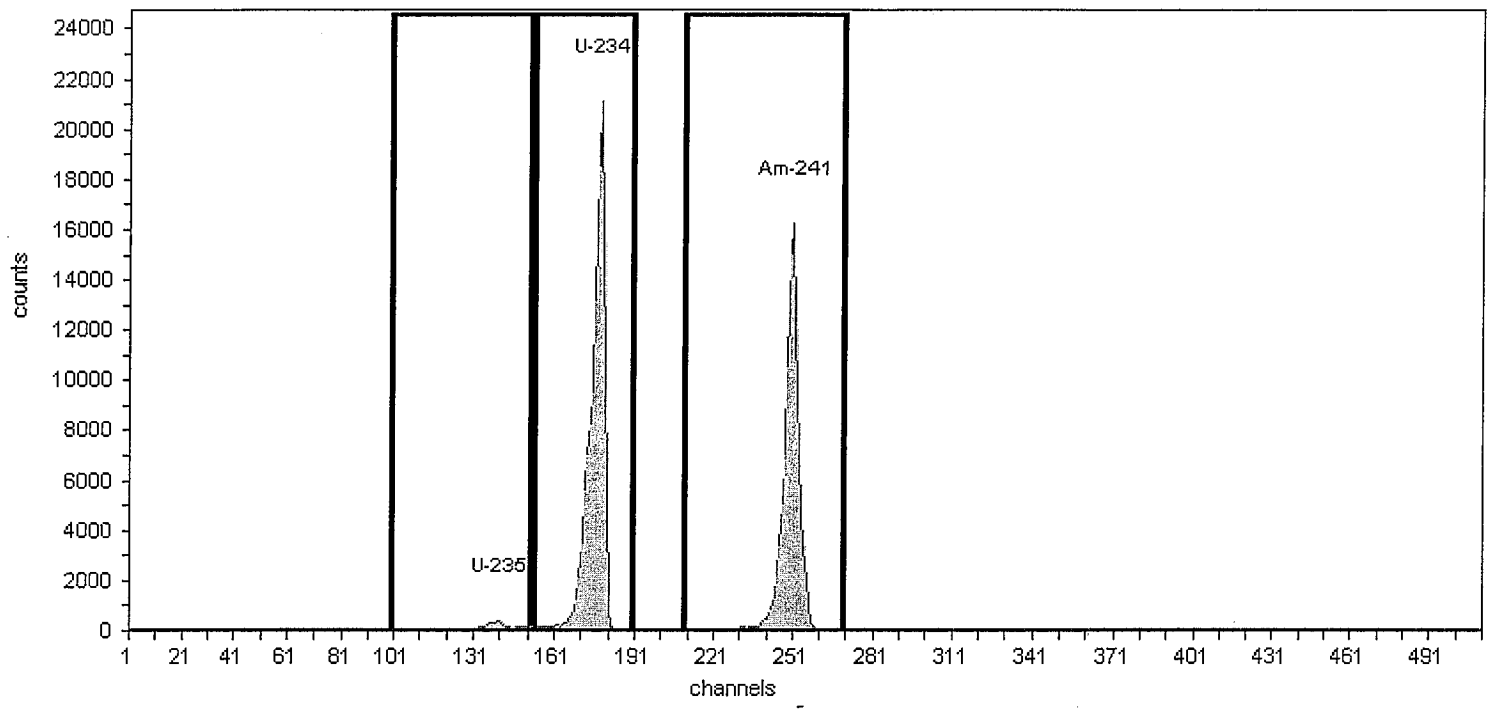
Efficiency Calibration Name: RSO 186 (Source 5)

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

Analyst: ORTEC
Detector: 25

9:20:21AM 5/21/2008

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

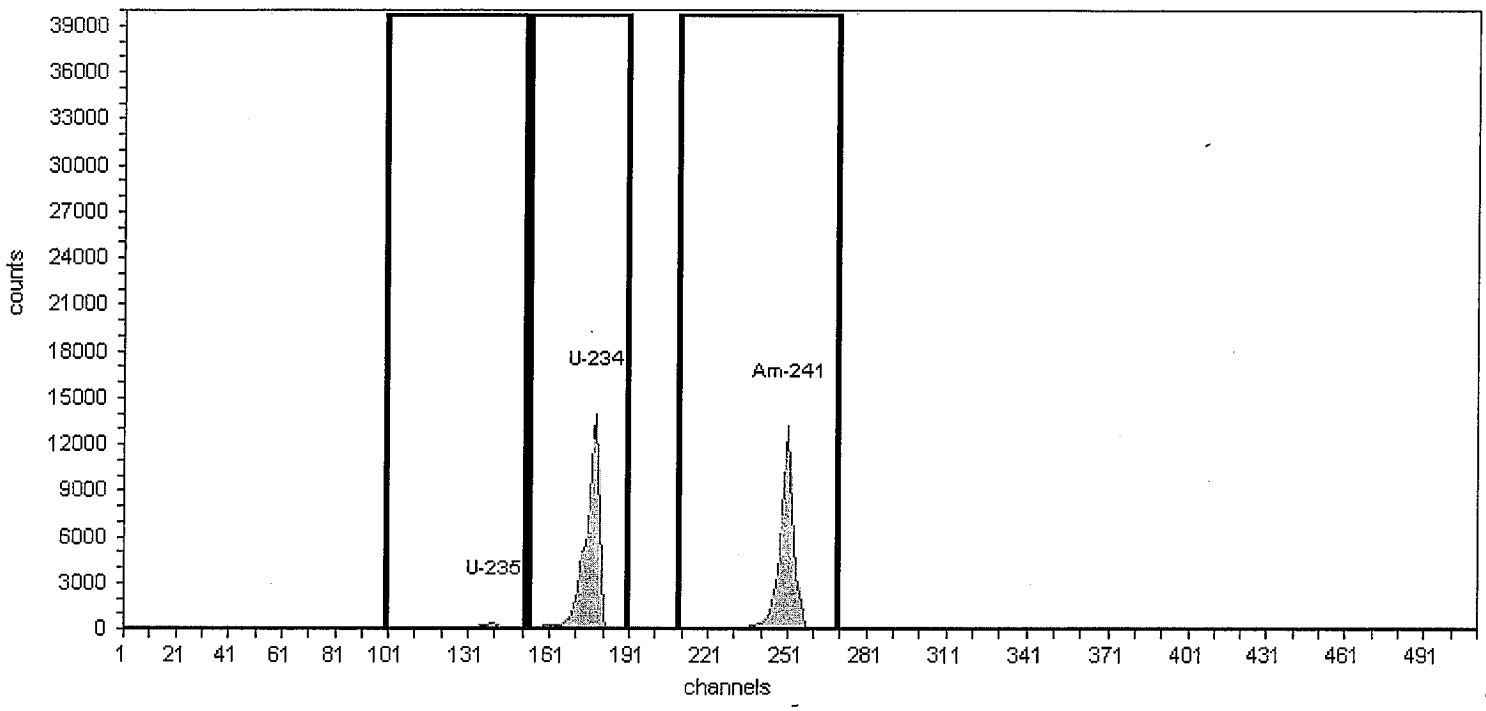
Detector: 25 , SN:
Acquisition Start Date: 5/20/2008 3:26:48PM

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

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.

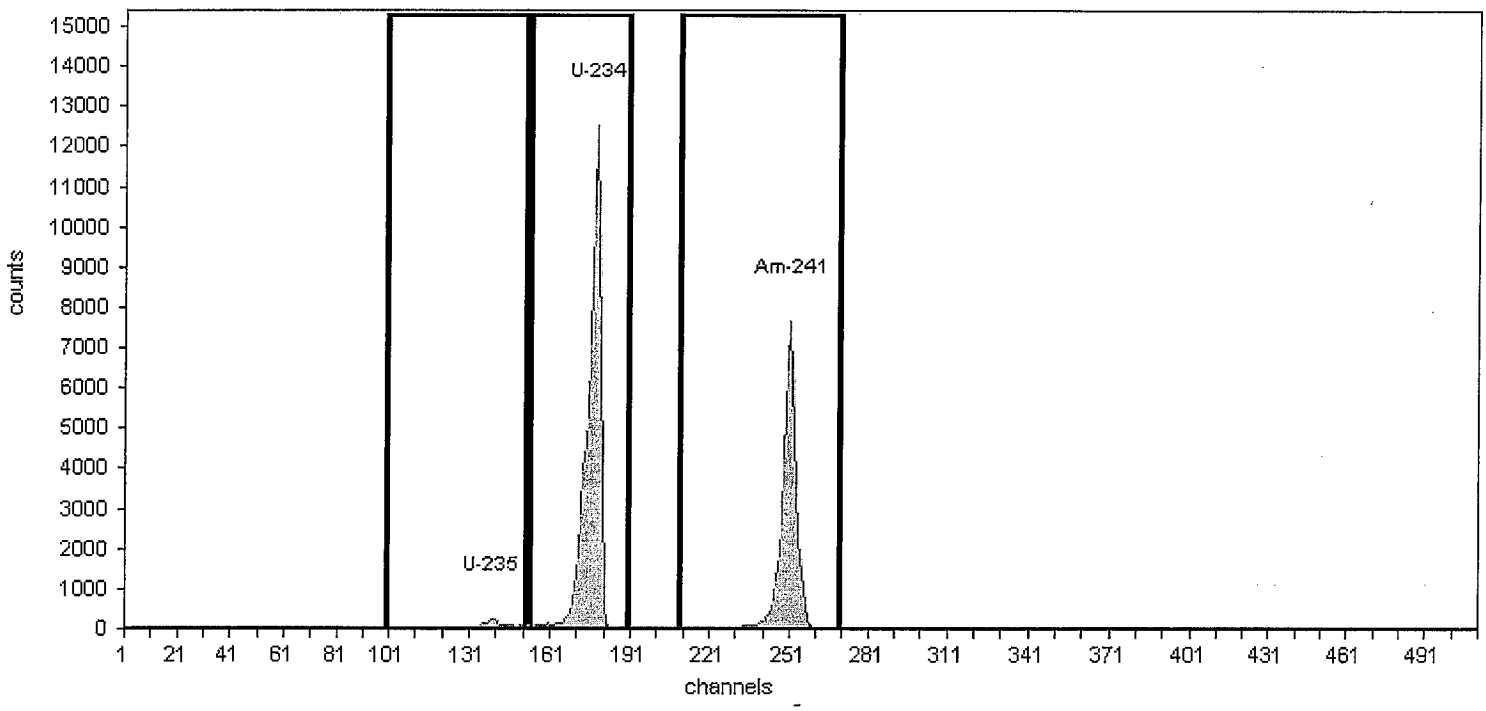
Efficiency Calibration Name: RSO 188 (Source 7)

Energy Calibration Equation:
Gain = 9.7289 keV / Ch

Offset = 3,043.84 keV

Quadratic = 0.0000 keV / Ch^2

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.

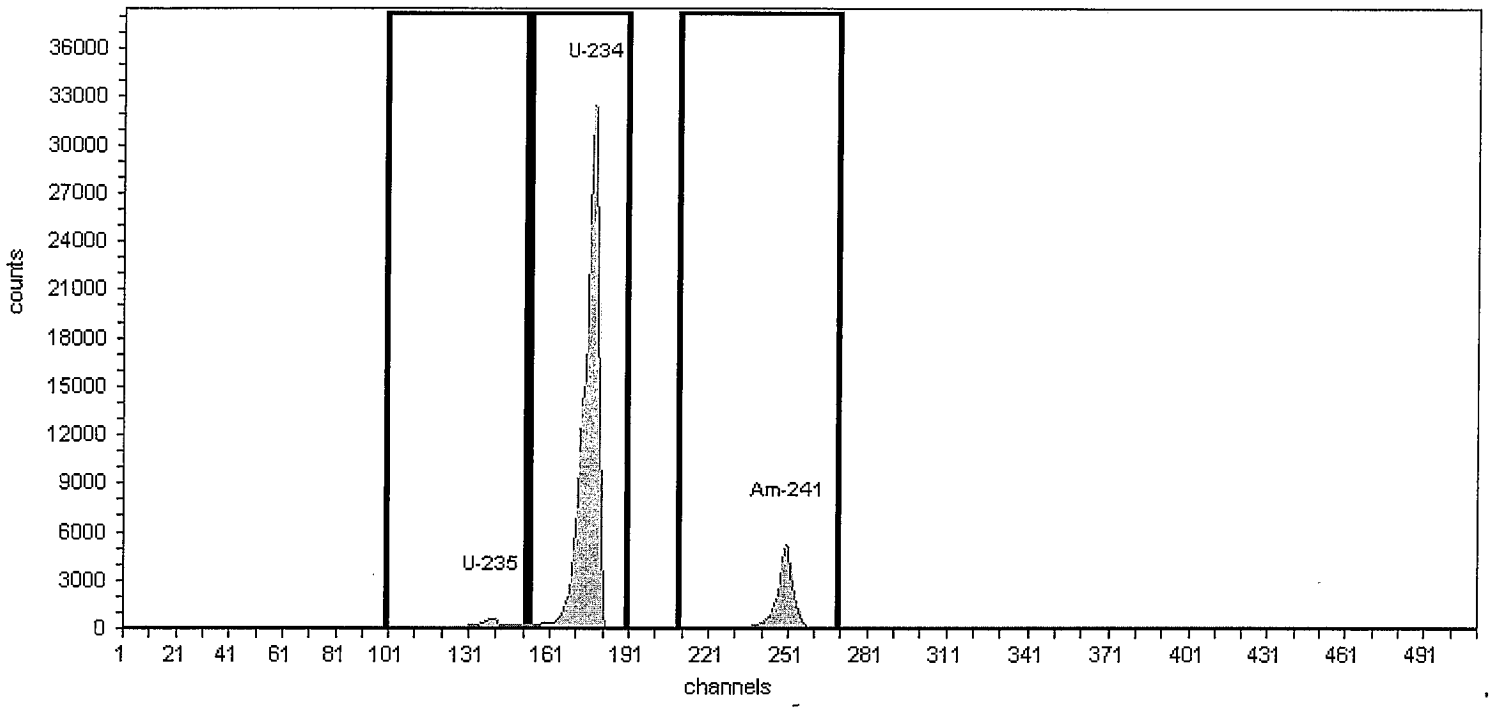
Efficiency Calibration Name: RSO 189 (Source 8)

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

Analyst: ORTEC
Detector: 25

9:20:39AM 5/21/2008

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

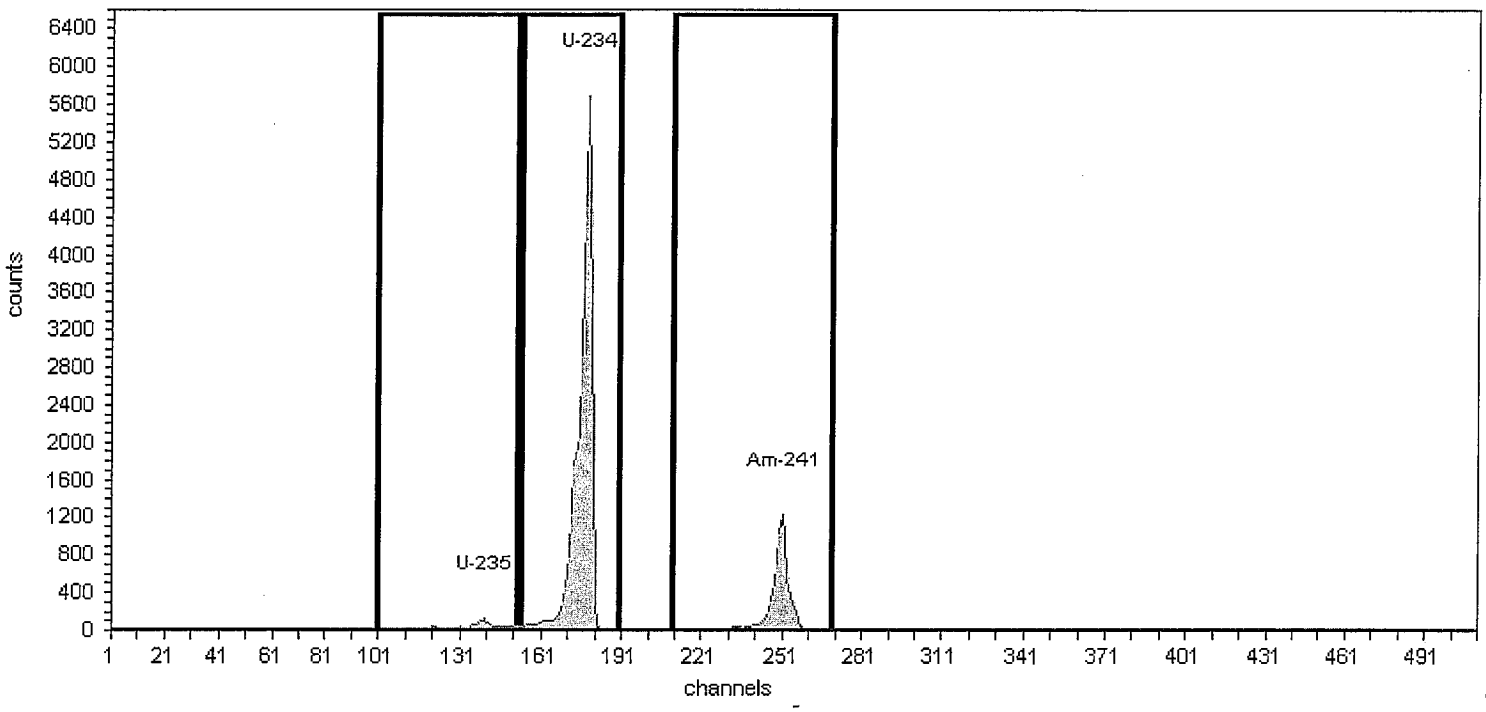
Detector: 25 , SN:
Acquisition Start Date: 5/21/2008 8:31:01AM

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

24937 Avenue Tibbitts
Valencia, California 91355

Tel 661•309•1010
Fax 661•257•8303

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 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 8091 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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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	**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.:**	92MIX2203024
Half Life (Am-241):	432.17 ± 0.66 years		

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	**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

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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 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:	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	**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
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

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α 8

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

PAI ID 189
recd 4-21-03
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

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Isotope Products

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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:

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