ENGINEERING MANAGEMENT SUPPORT, INC.

West Lake OU-1

STANDARD LEVEL IV
REPORT OF ANALYSIS

WORK ORDER #13-07170-OR

August 29, 2013

EBERLINE ANALYTICAL/OAK RIDGE LABORATORY
OAK RIDGE, TN

TABLE OF CONTENTS

Eberline Services – Oak Ridge Laboratory

LABORATORY DATA SUPPORT CHECKLIST

MP-001-3

Eberline Services Work Order # 13-07170

The checklist items listed below are to be initialed by appropriate staff upon completion/verification.

Date for Partial	Initials	Date	Initials	Checklist Items
		7/29/13	KC	Sample Log-In
		8/20/13	KBS	Data Compilation
		8-22-13	MLT	First Technical Data Review
		8/27/13	MSL	Second Technical Data Review
		8/28/13		Data Entry/Electronic Deliverable
		8-28-13		Case Narrative
		8/28/13	KBS	Electronic Deliverable Proof
		8/28/13	MSL	Samples Analyzed within Holding Time Yes? [X] No? [ ]
		8/28/13	MSL	QA/QC Review
				Client in Possession of Data Electronic or Hard Copy
				Invoiced by Laboratory

Technical/Clerical Corrections, Signatures Needed, Problems, Etc	Date/Initials

Date package approved by: _____ 8/29/13

Laboratory Manager Date

Copy No. _____

Radiochemistry Services

SECTION I

CHAIN OF CUSTODY
&
pH CHECK SHEET

13-07170

Chain of Custody Record

№ 1604

Eberline Services
601 Scarboro Road
Oak Ridge, TN 37830
(865) 481-0683 Phone • (865) 483-4821 Fax

EBERLINE SERVICES

Project Name: West Lake Cl	Project Number:
Send Report To: Paul Rodisco	Sampler (Print Name): Jon Wilkinson
Address: 7220 W. Jefferson Ave	Sampler (Print Name):
Suite 406	Shipment Method: Courier
Lakewood, Co 80235	Airbill Number: —
Phone:	Laboratory Receiving:
Fax:	

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① samples preserved w/ HNO_3

Purchase Order #: _____

Field Sample ID	Sample Date	Sample Time	Sample Matrix	Number of Containers	Diss U-235	Diss Ra-226	Diss Thor 232	Tot U-235	Tot Ra-226	Tot Thor-232	Comments, Special Instructions, etc.	Lab Sample ID (to be completed by lab)
PZ-305-AI 4.5	7/22/13	1041	Aqueous	2	✓	✓	✓	✓	✓	✓	①	
LR-104 6.7	7/24/13	1145	↑	2	✓	✓	✓	✓	✓	✓	↑	
PZ-100-KS 8.9	7/23/13	0745		2	✓	✓	✓	✓	✓	✓		
			↓								↓	
			Aqueous								①	

REC'D JUL 26 2013

Relinquished by: (Signature)	Received by: (Signature)	Date:	Time:
	FedEx # 7962 9629 9116 7962 9629 7841	7/23/13	1700
Relinquished by: (Signature)	Received by: (Signature)	Date:	Time:
	Kristen Coulston	7/26/13	820
Relinquished by: (Signature)	Received by: (Signature)	Date:	Time:

Sample Custodian Remarks (Completed By Laboratory):

QA/QC Level	Turnaround	Sample Receipt	
		Total # Containers Received?	
Level I ☐	Routine ☐	COC Seals Present?	
Level II ☐	24 Hour ☐	COC Seals Intact?	
Level III ☐	1 Week ☐	Received Containers Intact?	
Other ☐	Other _____	Temperature?	

13-07170

Chain of Custody Record

№ 1604

Eberline Services
601 Scarboro Road
Oak Ridge, TN 37830
(865) 481-0683 Phone • (865) 483-4621 Fax

EBERLINE SERVICES

Project Name: West Lake OU-1	Project Number:
Send Report To: Paul Rodzisco	Sampler (Print Name):
Address: 7220 W. Jefferson Ave	Sampler (Print Name):
Suite 406	Shipment Method: Courier
Lakewood, Co 80235	Airbill Number: ____
Phone:	Laboratory Receiving:
Fax:	

Page 1 of 1

Purchase Order #: _____

Field Sample ID	Sample Date	Sample Time	Sample Matrix	Number of Containers	Diss U-235, U-234	Diss Ra-226, Ra-228	Diss Thor 230, 232, 228	Tot U-235, 234	Tot Ra-226, 228	Tot Thor-232, 230, 228	Comments, Special Instructions, etc.	Lab Sample ID (to be completed by lab)
Purge Tank 10	7/23/13	0640	Aqueous	1				✓	✓	✓	(1) simplex preserved w/ HNO_3	
			↓								(1)	
			Aqueous								(1)	

REC'D JUL 26 2013

Relinquished by: (Signature)	Received by: (Signature)	Date:	Time:
	FedEx # 7962 9629 8116 7962 9629 7841	7/25/13	1700
Relinquished by: (Signature)	Received by: (Signature)	Date:	Time:
	Kristen Conlon	7/26/13	800
Relinquished by: (Signature)	Received by: (Signature)	Date:	Time:

Sample Custodian Remarks (Completed By Laboratory):

QA/QC Level	Turnaround	Sample Receipt	
Level I ☐	Routine ☐	Total # Containers Received?	
Level II ☐	24 Hour ☐	COC Seals Present?	
Level III ☐	1 Week ☐	COC Seals Intact?	
Other ☐	Other ____	Received Containers Intact?	
		Temperature?	

EBERLINE SERVICES
Oak Ridge Laboratory

Internal Chain of Custody

Work Order #	13-07170
Lab Deadline	8/16/2013
Analysis	UUISO - Level 4
Sample Matrix	Water

Comments	Sample Fraction	HP 210 / 270 Detector Activity	Storage Location
Fxns 04, 06, 08 & 10 are TOTAL Fxns 05, 07 & 09 are DISSOLVED	04	45	W1.5
	05	45	W1.5
	06	43	W1.5
	07	43	W1.5
	08	40	W1.5
	09	40	W1.5
	10	39	W1.5

	Location (circle one)					Initials	Date
Received by	(Sample Storage)	Rough Prep	Prep	Separations	Count Room	JWH	8/8/13 0900
Relinquished by	Sample Storage	Rough Prep	(Prep)	Separations	Count Room	JW	8/12/13 1015
Received by	Sample Storage	Rough Prep	Prep	(Separations)	Count Room	TAS RM	8/12/13
Relinquished by	Sample Storage	Rough Prep	Prep	(Separations)	Count Room	JPD	8/15/13 1158
Received by	Sample Storage	Rough Prep	Prep	Separations	(Count Room)	KB	8/15/13 1200
Relinquished by	Sample Storage	Rough Prep	Prep	Separations	(Count Room)	KB	8/15/13 1557
Received by	(Sample Storage)	Rough Prep	Prep	Separations	Count Room		
Relinquished by	Sample Storage	Rough Prep	Prep	Separations	Count Room		
Received by	Sample Storage	Rough Prep	Prep	Separations	Count Room		
Relinquished by	Sample Storage	Rough Prep	Prep	Separations	Count Room		
Received by	Sample Storage	Rough Prep	Prep	Separations	Count Room		
Relinquished by	Sample Storage	Rough Prep	Prep	Separations	Count Room		
Received by	Sample Storage	Rough Prep	Prep	Separations	Count Room		
Relinquished by	Sample Storage	Rough Prep	Prep	Separations	Count Room		

EBERLINE SERVICES
Oak Ridge Laboratory

Internal Chain of Custody

Work Order #	13-07170
Lab Deadline	8/16/2013
Analysis	ThISO - Level 4
Sample Matrix	Water

Comments	Sample Fraction	HP 210 / 270 Detector Activity	Storage Location
Fxns 04, 06, 08 & 10 are TOTAL Fxns 05, 07 & 09 are DISSOLVED	04	45	W1.5
	05	45	W1.5
	06	43	W1.5
	07	43	W1.5
	08	40	W1.5
	09	40	W1.5
	10	39	W1.5

	Location (circle one)					Initials	Date
Received by	(Sample Storage)	Rough Prep	Prep	Separations	Count Room	[illegible]	8/8/13 0820
Relinquished by	Sample Storage	Rough Prep	(Prep)	Separations	Count Room	[illegible]	8/12/13 1015
Received by	Sample Storage	Rough Prep	Prep	(Separations)	Count Room	1015 TLM	8/12/13
Relinquished by	Sample Storage	Rough Prep	Prep	(Separations)	Count Room	TLD	8/15/13 1230
Received by	Sample Storage	Rough Prep	Prep	Separations	(Count Room)	ICB	8/15/13 1233
Relinquished by	Sample Storage	Rough Prep	Prep	Separations	(Count Room)	ICB	8/15/13 1731
Received by	(Sample Storage)	Rough Prep	Prep	Separations	Count Room		
Relinquished by	Sample Storage	Rough Prep	Prep	Separations	Count Room		
Received by	Sample Storage	Rough Prep	Prep	Separations	Count Room		
Relinquished by	Sample Storage	Rough Prep	Prep	Separations	Count Room		
Received by	Sample Storage	Rough Prep	Prep	Separations	Count Room		
Relinquished by	Sample Storage	Rough Prep	Prep	Separations	Count Room		
Received by	Sample Storage	Rough Prep	Prep	Separations	Count Room		
Relinquished by	Sample Storage	Rough Prep	Prep	Separations	Count Room		

EBERLINE SERVICES
Oak Ridge Laboratory

Internal Chain of Custody

Work Order #	13-07170
Lab Deadline	8/16/2013
Analysis	Ra226 - Level 4
Sample Matrix	Water

Comments

Fxns 04, 06, 08 & 10 are TOTAL

Fxns 05, 07 & 09 are DISSOLVED

Sample Fraction	HP 210 / 270 Detector Activity	Storage Location
04	45	W1.5
05	45	W1.5
06	43	W1.5
07	43	W1.5
08	40	W1.5
09	40	W1.5
10	39	W1.5

	Location (circle one)					Initials	Date
Received by	(Sample Storage)	Rough Prep	Prep	Separations	Count Room	JWolfe	8/8/13 0900
Relinquished by	Sample Storage	Rough Prep	(Prep)	Separations	Count Room	JWolfe	8/8/13 1300
Received by	Sample Storage	Rough Prep	Prep	(Separations)	Count Room	AW	8/8/13 1910
Relinquished by	Sample Storage	Rough Prep	Prep	(Separations)	Count Room	AW	8/9/13 1930
Received by	Sample Storage	Rough Prep	Prep	Separations	(Count Room)	AG	8/9/13 1930
Relinquished by	Sample Storage	Rough Prep	Prep	Separations	(Count Room)	KB	8/12/13 1650
Received by	(Sample Storage)	Rough Prep	Prep	Separations	Count Room		
Relinquished by	Sample Storage	Rough Prep	Prep	Separations	Count Room		
Received by	Sample Storage	Rough Prep	Prep	Separations	Count Room		
Relinquished by	Sample Storage	Rough Prep	Prep	Separations	Count Room		
Received by	Sample Storage	Rough Prep	Prep	Separations	Count Room		
Relinquished by	Sample Storage	Rough Prep	Prep	Separations	Count Room		
Received by	Sample Storage	Rough Prep	Prep	Separations	Count Room		
Relinquished by	Sample Storage	Rough Prep	Prep	Separations	Count Room		

EBERLINE SERVICES
Oak Ridge Laboratory

Internal Chain of Custody

Work Order #	13-07170
Lab Deadline	8/16/2013
Analysis	Ra228 - Level 4
Sample Matrix	Water

Comments	Sample Fraction	HP 210 / 270 Detector Activity	Storage Location
Fxns 04, 06, 08 & 10 are TOTAL Fxns 05, 07 & 09 are DISSOLVED	04	45	W1.5
	05	45	W1.5
	06	43	W1.5
	07	43	W1.5
	08	40	W1.5
	09	40	W1.5
	10	39	W1.5

	Location (circle one)					Initials	Date
Received by	(Sample Storage)	Rough Prep	Prep	Separations	Count Room	JWolfe	8/8/13 0900
Relinquished by	Sample Storage	Rough Prep	(Prep)	Separations	Count Room	JWolfe	8/8/13 1300
Received by	Sample Storage	Rough Prep	Prep	(Separations)	Count Room	LW	8/8/13 1910
Relinquished by	Sample Storage	Rough Prep	Prep	(Separations)	Count Room	LW	8/9/13 1930
Received by	Sample Storage	Rough Prep	Prep	Separations	(Count Room)	AG	8/9/13 1930
Relinquished by	Sample Storage	Rough Prep	Prep	Separations	(Count Room)	ICB	8/12/13 1650
Received by	Sample Storage	Rough Prep	Prep	(Separations)	Count Room	LW	8/13/13 1210
Relinquished by	Sample Storage	Rough Prep	Prep	(Separations)	Count Room	[illegible]	8-19-13 1000
Received by	Sample Storage	Rough Prep	Prep	Separations	(Count Room)	[illegible]	8/19/13 1000
Relinquished by	Sample Storage	Rough Prep	Prep	Separations	(Count Room)	ICB	8/19/13 1223
Received by	(Sample Storage)	Rough Prep	Prep	Separations	Count Room		
Relinquished by	Sample Storage	Rough Prep	Prep	Separations	Count Room		
Received by	Sample Storage	Rough Prep	Prep	Separations	Count Room		
Relinquished by	Sample Storage	Rough Prep	Prep	Separations	Count Room		

EBERLINE SERVICES

Sample Receiving Report
(Volumes, pH, & CPM)

Internal Work Order
13-07170
Received By
KCOULSTON

FR	ClientID	# Btls	Comments	Matrix	Storage	Rec Vol Ttl	CPM Max
01	LCS	0		WA	W1.5		
02	BLANK	0		WA	W1.5		
03	DUP	0		WA	W1.5		
04	PZ-305-AI TOT ✓	2		WA	W1.5	8.00	45
			Container Number	pH Orig	pH Final	Volume (L)	CPM
			1	<2	<2	4.0000	42
			2	<2	<2	4.0000	45
05	PZ-305-AI DIS ✓	2		WA	W1.5	0.00	45
			Container Number	pH Orig	pH Final	Volume (L)	CPM
			1				42
			2				45
06	LR-104 TOT ✓	2		WA	W1.5	8.00	43
			Container Number	pH Orig	pH Final	Volume (L)	CPM
			1	<2	<2	4.0000	40
			2	< 2	<2	4.0000	43
07	LR-104 DIS ✓	2		WA	W1.5	0.00	43
			Container Number	pH Orig	pH Final	Volume (L)	CPM
			1				40
			2				43
08	PZ-100-KS TOT ✓	2		WA	W1.5	8.00	40
			Container Number	pH Orig	pH Final	Volume (L)	CPM
			1	<2	<2	4.0000	39
			2	<2	<2	4.0000	40
09	PZ-100-KS DIS ✓	2		WA	W1.5	0.00	40
			Container Number	pH Orig	pH Final	Volume (L)	CPM
			1				39
			2				40
10	PURGE TANK TOT ✓	1		WA	W1.5	4.00	39
			Container Number	pH Orig	pH Final	Volume (L)	CPM
			1	<2	<2	4.0000	39

Eyr 07/29/13

Received by: Kristen Coulston Date: 7/29/13

SECTION II

SAMPLE ACKNOWLEDGEMENT

Client Name	Contract/PO	Project Type	Date Received	Required Turnaround Days	Eberline Services Work Order
Engineering Management Support, Inc.	**West Lake OU-1**	Environmental	**07/29/2013**	**28**	**13-07170**
Project Name	**Client WO**	**Sample Disp**	**Lab Deadline**	**Internal Deadline**	**Client Deadline**
West Lake OU-1	**Westlake OU-1**	**W**	**08/16/2013**	**08/22/2013**	**08/23/2013**

Internal ID	Client ID	Sample Date	Matrix	Storage	Ra226	Ra228	ThISO	UISO																					Ttl
01	LCS	07/29/13	WA	W1.5	X	X	X	X																					4
02	BLANK	07/29/13	WA	W1.5	X	X	X	X																					4
03	DUP	07/29/13	WA	W1.5	X	X	X	X																					4
04	PZ-305-AI TOT	07/22/13 10:41	WA	W1.5	X	X	X	X																					4
05	PZ-305-AI DIS	07/22/13 10:41	WA	W1.5	X	X	X	X																					4
06	LR-104 TOT	07/22/13 11:45	WA	W1.5	X	X	X	X																					4
07	LR-104 DIS	07/22/13 11:45	WA	W1.5	X	X	X	X																					4
08	PZ-100-KS TOT	07/23/13 07:45	WA	W1.5	X	X	X	X																					4
09	PZ-100-KS DIS	07/23/13 07:45	WA	W1.5	X	X	X	X																					4
10	PURGE TANK TOT	07/23/13 06:40	WA	W1.5	X	X	X	X																					4
																													0
																													0
																													0
																													0
																													0
																													0
																													0
																													0
																													0
																													0
	Totals Per Analysis (non QA samples)				7	7	7	7	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	

EBERLINE SERVICES

Sample Log In Report

Oak Ridge Laboratory
601 Scarboro Rd.
Oak Ridge, TN 37830

Voice: (865) 481-0683
Fax: (865) 483-4621

Invoice		Report Data	
	Paul V. Rosasco, P.E.		Paul V. Rosasco, P.E.
	Engineering Management Support, Inc		Engineering Management Support, Inc
	7220 West Jefferson Avenue, Suite 406		7220 West Jefferson Ave, Suite 406
	Lakewood, CO 80235		Lakewood, CO 80235
Voice	303-640-3426	Voice	303-940-3426
Fax		Fax	
Contact	Lyn Fitzgerald		
Voice	303-601-4255		
Fax			

Printed: 7/29/2013 9:50 AM

Eberline Services – Oak Ridge Laboratory

SAMPLE RECEIPT CHECKLIST
MP-001-2

WORK ORDER # 13-07170

SAMPLE MATRIX/MATRICES: (CIRCLE ONE OR BOTH)

(AQUEOUS) NON-AQUEOUS

(CIRCLE EITHER YES, NO, OR N/A)

WERE SAMPLES:

Received in good condition?	(Y)	N	
If aqueous, properly preserved	(Y)	N	N/A

WERE CHAIN OF CUSTODY SEALS:

Present on outside of package?	(Y)	N
Unbroken on outside of package?	(Y)	N
Present on samples?	(Y)	N
Unbroken on samples?	(Y)	N
Was chain of custody present upon sample receipt?	(Y)	N

IF THE RESPONSE TO ANY OF THE ABOVE IS **NO**, A DISCREPANT SAMPLE RECEIPT REPORT (DSR) HAS BEEN ISSUED.

REMARKS: _____

SIGNATURE: Kristen Carlston DATE: 7/29/13

SECTION III

CASE NARRATIVE

EBERLINE SERVICES

EBERLINE ANALYTICAL CORPORATION
601 SCARBORO ROAD
OAK RIDGE, TENNESSEE 37830
PHONE (865) 481-0683
FAX (865) 483-4621

EBS-OR-36010

August 29, 2013

Paul V. Rosasco, P.E.
Engineering Management Support, Inc.
7220 West Jefferson Ave, Suite 406
Lakewood, CO 80235

CASE NARRATIVE
Work Order # 13-07170-OR

SAMPLE RECEIPT

This work order contains four water samples received 07/26/2013. Three samples were analyzed as total and dissolved for Isotopic Uranium, Isotopic Thorium and Radium-226/228. One sample was analyzed as total for Isotopic Uranium, Isotopic Thorium and Radium-226/228.

CLIENT ID	LAB ID
PZ-305-AI TOT	13-07170-04
PZ-305-AI DIS	13-07170-05
LR-104 TOT	13-07170-06
LR-104 DIS	13-07170-07
PZ-100-KS TOT	13-07170-08
PZ-100-KS DIS	13-07170-09
PURGE TANK TOT	13-07170-10

ANALYTICAL METHODS

Isotopic Uranium and Isotopic Thorium were analyzed using Method HASL 300, 4.5.2. Radium-226 was analyzed using Method EPA 903.0. Radium-228 was analyzed using Method EPA 904.0.

Laboratory qualifiers are as follows:

J - Indicates a situation where the result minus the error is less than the detection limit but greater than zero.

U - Indicates a situation where the result minus the error is less than or equal to zero.

ANALYTICAL RESULTS

Combined Standard Uncertainty is reported at 2-sigma value.

ANALYTICAL RESULTS CONTINUED

ISOTOPIC URANIUM

Samples were prepared by removing representative aliquots followed by mixed acid digestions as appropriate. Uranium was selectively extracted by ion exchange. Uranium was eluted, micro-precipitated and mounted on micro-porous filter media. Sample activities were then determined by alpha spectroscopy using energy specific regions of interest for Uranium-234, Uranium-235 and Uranium-238. Chemical recovery was determined by the use of a Uranium-232 tracer. Activity of the Uranium-232 tracer was determined by alpha spectroscopy using an energy specific region of interest.

Samples demonstrated acceptable results for all Uranium analyses. Chemical recovery was slightly low for sample numbers LR-104 DIS and PURGE TANK TOT. Chemical recovery was acceptable for all other samples. The Uranium-234, Uranium-235 and Uranium-238 method blank demonstrated acceptable results. Results for the Uranium-234, Uranium-235 and Uranium-238 duplicate demonstrated a high relative percent difference; however, normalized difference is within acceptable limits for the analytical technique. Results for the Uranium-234 and Uranium-238 laboratory control sample demonstrated an acceptable percent recovery.

ISOTOPIC THORIUM

Samples were prepared by removing representative aliquots followed by mixed acid digestions as appropriate. Thorium was selectively extracted by ion exchange. Thorium was eluted, micro-precipitated and mounted on micro-porous filter media. Sample activities were then determined by alpha spectroscopy using energy specific regions of interest for Thorium-228, Thorium-230 and Thorium-232. Chemical recovery was determined by the use of a Thorium-229 tracer. Activity of the Thorium-229 tracer was determined by alpha spectroscopy using an energy specific region of interest.

Samples demonstrated acceptable results for all Thorium analyses. Chemical recovery was acceptable for all samples. The Thorium-228, Thorium-230 and Thorium-232 method blank demonstrated acceptable results. Results for the Thorium-228 and Thorium-230 duplicate demonstrated an acceptable relative percent difference and normalized difference. Results for the Thorium-232 duplicate demonstrated a high relative percent difference; however, normalized difference is within acceptable limits for the analytical technique. Results for the Thorium-228, Thorium-230 and Thorium-232 laboratory control sample demonstrated an acceptable percent recovery.

RADIUM-226

Samples were prepared by removing representative aliquots as appropriate. This was followed by selective sulfate precipitations of the Radium. Samples were then mounted by semi-micro-precipitations onto micro-porous filters. Samples were counted by alpha spectroscopy using an energy specific region of interest for Radium-226. Chemical recovery was calculated by the use of a Barium-133 tracer, which was determined by HPGe gamma spectroscopy.

Samples demonstrated acceptable results for all Radium-226 analyses. Chemical recovery was acceptable for all samples. The Radium-226 method blank demonstrated acceptable results. Results for the Radium-226 duplicate demonstrated an acceptable relative percent difference and normalized difference. Results for the Radium-226 laboratory control sample demonstrated an acceptable percent recovery.

ANALYTICAL RESULTS CONTINUED

RADIUM-228

Following alpha spectroscopy analysis of Radium-226, Barium/Radium Sulfate precipitates were redissolved and allowed for sufficient ingrowth of the Actinium-228 daughter. After ingrowth, Actinium-228 was selectively precipitated. Precipitates were filtered and beta emissions for Actinium-228 were then counted on a gas proportional counter. Chemical recovery was determined by the use of a Barium-133 tracer, the activity of which was determined by HPGe gamma spectroscopy and an elemental Yttrium carrier by gravimetric measurements. The product of these two recoveries was used to calculate chemical yield.

Samples demonstrated acceptable results for all Radium-228 analyses. Chemical recovery was acceptable for all samples. The Radium-228 method blank demonstrated acceptable results. Results for the Radium-228 duplicate demonstrated a high relative percent difference; however, normalized difference is within acceptable limits for the analytical technique. Results for the Radium-228 laboratory control sample demonstrated an acceptable percent recovery.

CERTIFICATION OF ACCURACY

I certify that this data report is in compliance with the terms and conditions of the Purchase Order, both technically and for completeness, for other than the conditions detailed above. Release of the data contained in this hard copy data package has been authorized by the cognizant project manager or his/her designee to be accurate as verified by the following signature.

M.R. McDougall
Laboratory Manager

Date: 8/29/2013

Eberline Analytical wants and encourages your feedback regarding our performance providing radioanalytical services. Please visit http://www.eberlineservices.com/client.htm to provide us with feedback on our services.

SECTION IV

ANALYTICAL RESULTS SUMMARY

Paul V. Rosasco, P.E.
Engineering Management Support, Inc.
7220 West Jefferson Ave, Suite 406
Lakewood, CO 80235

Project: West Lake OU-1
SDG: 1307170
Received: 07/26/2013
Matrix: Water

Client Sample ID	Lab Sample ID	Analysis Date/Time	Analyte	Method	Result	Error	CSU	MDA	Qualifier	Units
LCS13-07170-01	13-07170-01	08/12/2013 12:56:00	Radium-226	E903.0	10.38	1.25	2.53	0.22		pCi/l
LCS13-07170-01	13-07170-01	08/19/2013 10:16:23	Radium-228	E904.0	8.42	0.92	2.12	1.18		pCi/l
LCS13-07170-01	13-07170-01	08/15/2013 13:18:39	Thorium-228	HASL 300, 4.5.2	4.91	0.81	0.93	0.06		pCi/l
LCS13-07170-01	13-07170-01	08/15/2013 13:18:39	Thorium-230	HASL 300, 4.5.2	5.38	0.87	1.09	0.06		pCi/l
LCS13-07170-01	13-07170-01	08/15/2013 13:18:39	Thorium-232	HASL 300, 4.5.2	4.94	0.81	0.92	0.07		pCi/l
LCS13-07170-01	13-07170-01	08/15/2013 12:41:13	Uranium-234	HASL 300, 4.5.2	8.18	1.17	1.31	0.09		pCi/l
LCS13-07170-01	13-07170-01	08/15/2013 12:41:13	Uranium-235	HASL 300, 4.5.2	0.78	0.26	0.26	0.11		pCi/l
LCS13-07170-01	13-07170-01	08/15/2013 12:41:13	Uranium-238	HASL 300, 4.5.2	8.26	1.18	1.32	0.08		pCi/l
BLANK13-07170-02	13-07170-02	08/12/2013 12:56:02	Radium-226	E903.0	0.04	0.11	0.11	0.23	U	pCi/l
BLANK13-07170-02	13-07170-02	08/19/2013 10:16:24	Radium-228	E904.0	0.57	0.63	0.64	1.28	U	pCi/l
BLANK13-07170-02	13-07170-02	08/15/2013 13:18:41	Thorium-228	HASL 300, 4.5.2	0.01	0.04	0.04	0.12	U	pCi/l
BLANK13-07170-02	13-07170-02	08/15/2013 13:18:41	Thorium-230	HASL 300, 4.5.2	0.04	0.06	0.06	0.10	U	pCi/l
BLANK13-07170-02	13-07170-02	08/15/2013 13:18:41	Thorium-232	HASL 300, 4.5.2	0.00	0.04	0.04	0.09	U	pCi/l
BLANK13-07170-02	13-07170-02	08/15/2013 12:41:14	Uranium-234	HASL 300, 4.5.2	0.10	0.08	0.08	0.09	J	pCi/l
BLANK13-07170-02	13-07170-02	08/15/2013 12:41:14	Uranium-235	HASL 300, 4.5.2	0.04	0.07	0.07	0.12	U	pCi/l
BLANK13-07170-02	13-07170-02	08/15/2013 12:41:14	Uranium-238	HASL 300, 4.5.2	0.05	0.06	0.06	0.06	U	pCi/l
PURGE TANK TOT_07_23_2013 DUP	13-07170-03	08/12/2013 12:56:03	Radium-226	E903.0	0.67	0.34	0.37	0.23		pCi/l
PURGE TANK TOT_07_23_2013 DUP	13-07170-03	08/19/2013 10:16:24	Radium-228	E904.0	0.87	0.74	0.76	1.48	J	pCi/l
LR-104 TOT_07_22_2013 DUP	13-07170-03	08/15/2013 14:33:55	Thorium-228	HASL 300, 4.5.2	0.05	0.07	0.08	0.13	U	pCi/l
LR-104 TOT_07_22_2013 DUP	13-07170-03	08/15/2013 14:33:55	Thorium-230	HASL 300, 4.5.2	0.12	0.09	0.09	0.09	J	pCi/l
LR-104 TOT_07_22_2013 DUP	13-07170-03	08/15/2013 14:33:55	Thorium-232	HASL 300, 4.5.2	0.02	0.04	0.04	0.07	U	pCi/l
PZ-100-KS TOT_07_23_2013 DUP	13-07170-03	08/15/2013 12:41:15	Uranium-234	HASL 300, 4.5.2	0.02	0.04	0.04	0.07	U	pCi/l
PZ-100-KS TOT_07_23_2013 DUP	13-07170-03	08/15/2013 12:41:15	Uranium-235	HASL 300, 4.5.2	0.04	0.06	0.06	0.09	U	pCi/l
PZ-100-KS TOT_07_23_2013 DUP	13-07170-03	08/15/2013 12:41:15	Uranium-238	HASL 300, 4.5.2	0.05	0.06	0.06	0.08	U	pCi/l
PZ-305-AI TOT_07_22_2013	13-07170-04	08/12/2013 12:56:05	Radium-226	E903.0	0.95	0.46	0.50	0.35		pCi/l
PZ-305-AI TOT_07_22_2013	13-07170-04	08/19/2013 10:16:25	Radium-228	E904.0	1.19	0.69	0.74	1.34	J	pCi/l
PZ-305-AI TOT_07_22_2013	13-07170-04	08/15/2013 14:33:56	Thorium-228	HASL 300, 4.5.2	-0.02	0.09	0.09	0.24	U	pCi/l
PZ-305-AI TOT_07_22_2013	13-07170-04	08/15/2013 14:33:56	Thorium-230	HASL 300, 4.5.2	0.05	0.10	0.10	0.17	U	pCi/l
PZ-305-AI TOT_07_22_2013	13-07170-04	08/15/2013 14:33:56	Thorium-232	HASL 300, 4.5.2	-0.02	0.05	0.05	0.14	U	pCi/l
PZ-305-AI TOT_07_22_2013	13-07170-04	08/15/2013 12:41:16	Uranium-234	HASL 300, 4.5.2	0.09	0.09	0.09	0.11	U	pCi/l
PZ-305-AI TOT_07_22_2013	13-07170-04	08/15/2013 12:41:16	Uranium-235	HASL 300, 4.5.2	0.02	0.07	0.07	0.16	U	pCi/l
PZ-305-AI TOT_07_22_2013	13-07170-04	08/15/2013 12:41:16	Uranium-238	HASL 300, 4.5.2	0.05	0.07	0.07	0.11	U	pCi/l

Paul V. Rosasco, P.E.
Engineering Management Support, Inc.
7220 West Jefferson Ave, Suite 406
Lakewood, CO 80235

Project: West Lake OU-1
SDG: 1307170
Received: 07/26/2013
Matrix: Water

Client Sample ID	Lab Sample ID	Analysis Date/Time	Analyte	Method	Result	Error	CSU	MDA	Qualifier	Units
PZ-305-Al DIS_07_22_2013	13-07170-05	08/12/2013 12:56:07	Radium-226	E903.0	1.43	0.49	0.58	0.20		pCi/l
PZ-305-Al DIS_07_22_2013	13-07170-05	08/19/2013 10:16:29	Radium-228	E904.0	1.51	0.66	0.74	1.23	J	pCi/l
PZ-305-Al DIS_07_22_2013	13-07170-05	08/15/2013 14:33:49	Thorium-228	HASL 300, 4.5.2	-0.03	0.04	0.04	0.14	U	pCi/l
PZ-305-Al DIS_07_22_2013	13-07170-05	08/15/2013 14:33:49	Thorium-230	HASL 300, 4.5.2	0.04	0.07	0.07	0.12	U	pCi/l
PZ-305-Al DIS_07_22_2013	13-07170-05	08/15/2013 14:33:49	Thorium-232	HASL 300, 4.5.2	-0.02	0.04	0.04	0.11	U	pCi/l
PZ-305-Al DIS_07_22_2013	13-07170-05	08/15/2013 12:41:17	Uranium-234	HASL 300, 4.5.2	0.13	0.10	0.10	0.11	J	pCi/l
PZ-305-Al DIS_07_22_2013	13-07170-05	08/15/2013 12:41:17	Uranium-235	HASL 300, 4.5.2	0.04	0.08	0.08	0.13	U	pCi/l
PZ-305-Al DIS_07_22_2013	13-07170-05	08/15/2013 12:41:17	Uranium-238	HASL 300, 4.5.2	0.00	0.04	0.04	0.08	U	pCi/l
LR-104 TOT_07_22_2013	13-07170-06	08/12/2013 12:56:09	Radium-226	E903.0	0.62	0.32	0.34	0.17		pCi/l
LR-104 TOT_07_22_2013	13-07170-06	08/19/2013 10:16:29	Radium-228	E904.0	1.57	0.67	0.76	1.25	J	pCi/l
LR-104 TOT_07_22_2013	13-07170-06	08/15/2013 14:33:50	Thorium-228	HASL 300, 4.5.2	0.06	0.06	0.06	0.07	U	pCi/l
LR-104 TOT_07_22_2013	13-07170-06	08/15/2013 14:33:50	Thorium-230	HASL 300, 4.5.2	0.10	0.07	0.07	0.05	J	pCi/l
LR-104 TOT_07_22_2013	13-07170-06	08/15/2013 14:33:50	Thorium-232	HASL 300, 4.5.2	0.01	0.02	0.02	0.05	U	pCi/l
LR-104 TOT_07_22_2013	13-07170-06	08/15/2013 12:41:18	Uranium-234	HASL 300, 4.5.2	2.94	0.58	0.61	0.11		pCi/l
LR-104 TOT_07_22_2013	13-07170-06	08/15/2013 12:41:18	Uranium-235	HASL 300, 4.5.2	0.14	0.11	0.12	0.12	J	pCi/l
LR-104 TOT_07_22_2013	13-07170-06	08/15/2013 12:41:18	Uranium-238	HASL 300, 4.5.2	2.02	0.45	0.47	0.11		pCi/l
LR-104 DIS_07_22_2013	13-07170-07	08/12/2013 12:56:11	Radium-226	E903.0	0.58	0.29	0.32	0.24		pCi/l
LR-104 DIS_07_22_2013	13-07170-07	08/19/2013 10:16:29	Radium-228	E904.0	0.94	0.57	0.61	1.12	J	pCi/l
LR-104 DIS_07_22_2013	13-07170-07	08/15/2013 14:33:51	Thorium-228	HASL 300, 4.5.2	0.05	0.07	0.07	0.10	U	pCi/l
LR-104 DIS_07_22_2013	13-07170-07	08/15/2013 14:33:51	Thorium-230	HASL 300, 4.5.2	0.09	0.08	0.08	0.07	J	pCi/l
LR-104 DIS_07_22_2013	13-07170-07	08/15/2013 14:33:51	Thorium-232	HASL 300, 4.5.2	0.00	0.03	0.03	0.09	U	pCi/l
LR-104 DIS_07_22_2013	13-07170-07	08/15/2013 12:41:19	Uranium-234	HASL 300, 4.5.2	2.35	1.12	1.14	0.52		pCi/l
LR-104 DIS_07_22_2013	13-07170-07	08/15/2013 12:41:19	Uranium-235	HASL 300, 4.5.2	0.06	0.23	0.23	0.60	U	pCi/l
LR-104 DIS_07_22_2013	13-07170-07	08/15/2013 12:41:19	Uranium-238	HASL 300, 4.5.2	1.24	0.76	0.76	0.48		pCi/l
PZ-100-KS TOT_07_23_2013	13-07170-08	08/12/2013 12:56:13	Radium-226	E903.0	0.22	0.18	0.19	0.20	J	pCi/l
PZ-100-KS TOT_07_23_2013	13-07170-08	08/19/2013 10:16:30	Radium-228	E904.0	0.19	0.64	0.64	1.34	U	pCi/l
PZ-100-KS TOT_07_23_2013	13-07170-08	08/15/2013 14:33:52	Thorium-228	HASL 300, 4.5.2	0.02	0.05	0.05	0.10	U	pCi/l
PZ-100-KS TOT_07_23_2013	13-07170-08	08/15/2013 14:33:52	Thorium-230	HASL 300, 4.5.2	0.04	0.05	0.05	0.07	U	pCi/l
PZ-100-KS TOT_07_23_2013	13-07170-08	08/15/2013 14:33:52	Thorium-232	HASL 300, 4.5.2	0.00	0.03	0.03	0.06	U	pCi/l
PZ-100-KS TOT_07_23_2013	13-07170-08	08/15/2013 12:41:20	Uranium-234	HASL 300, 4.5.2	0.05	0.06	0.06	0.09	U	pCi/l
PZ-100-KS TOT_07_23_2013	13-07170-08	08/15/2013 12:41:20	Uranium-235	HASL 300, 4.5.2	0.05	0.06	0.06	0.09	U	pCi/l
PZ-100-KS TOT_07_23_2013	13-07170-08	08/15/2013 12:41:20	Uranium-238	HASL 300, 4.5.2	-0.02	0.05	0.05	0.14	U	pCi/l

Paul V. Rosasco, P.E.
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7220 West Jefferson Ave, Suite 406
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Project: West Lake OU-1
SDG: 1307170
Received: 07/26/2013
Matrix: Water

Client Sample ID	Lab Sample ID	Analysis Date/Time	Analyte	Method	Result	Error	CSU	MDA	Qualifier	Units
PZ-100-KS DIS_07_23_2013	13-07170-09	08/12/2013 12:56:15	Radium-226	E903.0	0.21	0.20	0.21	0.29	J	pCi/l
PZ-100-KS DIS_07_23_2013	13-07170-09	08/19/2013 10:16:22	Radium-228	E904.0	1.11	0.67	0.71	1.29	J	pCi/l
PZ-100-KS DIS_07_23_2013	13-07170-09	08/15/2013 14:33:53	Thorium-228	HASL 300, 4.5.2	-0.05	0.03	0.03	0.11	U	pCi/l
PZ-100-KS DIS_07_23_2013	13-07170-09	08/15/2013 14:33:53	Thorium-230	HASL 300, 4.5.2	0.13	0.08	0.08	0.06	J	pCi/l
PZ-100-KS DIS_07_23_2013	13-07170-09	08/15/2013 14:33:53	Thorium-232	HASL 300, 4.5.2	-0.01	0.02	0.02	0.06	U	pCi/l
PZ-100-KS DIS_07_23_2013	13-07170-09	08/15/2013 12:41:57	Uranium-234	HASL 300, 4.5.2	0.05	0.05	0.05	0.05	U	pCi/l
PZ-100-KS DIS_07_23_2013	13-07170-09	08/15/2013 12:41:57	Uranium-235	HASL 300, 4.5.2	0.07	0.07	0.07	0.07	U	pCi/l
PZ-100-KS DIS_07_23_2013	13-07170-09	08/15/2013 12:41:57	Uranium-238	HASL 300, 4.5.2	0.03	0.04	0.04	0.06	U	pCi/l
PURGE TANK TOT_07_23_2013	13-07170-10	08/12/2013 12:56:17	Radium-226	E903.0	0.54	0.30	0.32	0.20		pCi/l
PURGE TANK TOT_07_23_2013	13-07170-10	08/19/2013 10:16:22	Radium-228	E904.0	1.56	0.83	0.90	1.61	J	pCi/l
PURGE TANK TOT_07_23_2013	13-07170-10	08/15/2013 14:33:54	Thorium-228	HASL 300, 4.5.2	0.03	0.06	0.06	0.11	U	pCi/l
PURGE TANK TOT_07_23_2013	13-07170-10	08/15/2013 14:33:54	Thorium-230	HASL 300, 4.5.2	0.29	0.16	0.16	0.11		pCi/l
PURGE TANK TOT_07_23_2013	13-07170-10	08/15/2013 14:33:54	Thorium-232	HASL 300, 4.5.2	0.02	0.04	0.04	0.08	U	pCi/l
PURGE TANK TOT_07_23_2013	13-07170-10	08/15/2013 12:41:59	Uranium-234	HASL 300, 4.5.2	1.74	0.76	0.77	0.37		pCi/l
PURGE TANK TOT_07_23_2013	13-07170-10	08/15/2013 12:41:59	Uranium-235	HASL 300, 4.5.2	0.08	0.21	0.21	0.46	U	pCi/l
PURGE TANK TOT_07_23_2013	13-07170-10	08/15/2013 12:41:59	Uranium-238	HASL 300, 4.5.2	0.90	0.51	0.51	0.30		pCi/l

SECTION V

ANALYTICAL STANDARDS

QA/QC REVIEWED
Date 1/16/95 Initials

CERTIFICATE OF CALIBRATION
ALPHA STANDARD SOLUTION

U-8

Radionuclide:	U-238NAT	Customer:	TMA EBERLINE
Half Life:	(4.468 ± 0.005) x 10^9 years	P.O.No.:	OR2778
Catalog No.:	7338	Reference Date:	January 1 1995 12:00 PST.
Source No.:	479-50	Contained Radioactivity:	(Total U) 8.016 μCi
		Contained Radioactivity:	(Total U) 297 kBq

Description of Solution

a. Mass of solution:	65.2896 g in a 50 ml flame sealed ampoule
b. Chemical form:	Uranyl Nitrate in H2O
c. Carrier content:	None
d. Density:	Approximately 1.3202 g/ml @ 20°C.

Radioimpurities: Refer to attached technical data sheet

Radioactive Daughters: Refer to attached technical data sheet

Radionuclide Concentration

(Total U) 0.1228 μCi/g.

Method of Calibration

Activity calculations are based upon known specific activity and mass.

Uncertainty of Measurement

a. Systematic uncertainty in instrument calibration:	±3.0%
b. Random uncertainty in assay:	±0.0%
c. Random uncertainty in weighing(s):	±2.0%
d. Total uncertainty at the 99% confidence level:	±3.6%

NIST Traceability

This calibration is implicitly traceable to the National Institute of Standards and Technology.

Leak Test(s)

See reverse side for Leak Test(s) applied to this source.

Notes

1. Nuclear data were taken from "Table of Radioactive Isotopes", edited by Virginia S. Shirley, 1986.
2. IPL participates in an NIST measurement assurance program to establish and maintain implicit traceability for a number of nuclides, based on the blind assay (and later NIST certification) of Standard Reference Materials (As in NRC Regulatory Guide 4.15).

ERIC ALLAS
QUALITY CONTROL

29 DECEMBER 1994
Date Signed

ISOTOPE PRODUCTS LABORATORIES
3017 N. SAN FERNANDO BLVD.
BURBANK, CALIFORNIA 91504
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EBERLINE SERVICES

QUALITY CONTROL PROGRAM

MP-009

Rev.8; 11/01/03
Title: Radioactive Reference Standards Solutions & Records

EBERLINE SERVICES - OAK RIDGE LABORATORY
RADIOACTIVE REFERENCE SOLUTIONS
PRIMARY DILUTION RECERTIFICATION
MP 009

CURRENT DATE 9/6/2012 0:00

SOLUTION REFERENCE # IPL 479-50 **SOLUTION #** U-8

Principal Radionuclide	Half Life, Years	Half Life, Days
$^{234, 235, 238}U$	4.468E+09	1.632E+12

Radionuclide $^{234, 235, 238}U$ **Reference Date** 1/1/1995 0:00

Certified Activity 8.016E+00 µCi

Certified Concentration µCi per gram

Ampoule /Solution Gross	97.6400	Weight, Grams
Empty Ampoule	32.5020	Weight, Grams
Solution Net	65.1380	Weight, Grams
Total Activity in Ampoule	8.0160	µCi

Chemical Composition of Standard Solution

Uranyl nitrate in dilute HNO_3

Dilution Instructions: **Dilution Solvent Used** 1M HNO_3

Dilute to a volume of 1000.00 **milliliters**

Certified Total Activity of 8.0160 µCi **Which Equals** 1.780E+07 **dpm at the date listed above**

And after dilution the activity of this solution is 1.77955E+04 **dpm/ml**

This activity concentration is based on the original reference date listed above. All activities are corrected to the date and time of analysis by the laboratory data processing software.

Expiration Date: September 6, 2013

Verified & Approved By _____ Date: 9/26/2012 0:00

QC Approval _____ Date: 9/26/12

EBERLINE SERVICES

QUALITY CONTROL PROGRAM
MP-009

Rev.8; 11/01/03
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EBERLINE SERVICES - OAK RIDGE LABORATORY
RADIOACTIVE REFERENCE STANDARD SOLUTIONS
SECONDARY DILUTION RECERTIFICATION

	MP-009	Date	9/6/2012 0:00
Solution Reference #	IPL 479-50	Solution #	U-8a

Principal Radionuclide	Half Life, Years	Half Life, Days
$^{234, 235, 238}U$	4.468E+09	1.632E+12

Radionuclide of Interest	$^{234, 235, 238}U$	Reference Date	1/1/1995 0:00
Parent Solution Conc.	1.7796E+04 dpm/ml		

Chemical Composition of Standard Solution
Uranly Nitrate in 1M HNO_3

Dilution Instructions: **Dilution Solvent Used** 1M HNO_3

SECONDARY VOLUMETRIC DILUTION

Vol. Parent Solution:	4.0000 ml	Final Activity Concentration:	7.1182E+01 dpm/ml
Total Activity:	7.1182E+04 dpm		
Final Volume:	1000.00 ml		

NOTES:

This activity concentration is based on the original reference date listed above. All activities are corrected to the date and time of analysis by the laboratory data processing software.

Isotopic Distribution as:
U-238 Atom % = 48.239 U-238 = 71.182 dpm/ml X 0.48249 = 34.345 dpm/ml
U-235 Atom % = 2.25 U-235 = 71.182 dpm/ml X 0.0225 = 1.602 dpm/ml
U-234 Atom % = 49.501 U-238 = 71.182 dpm/ml X 0.49501 = 35.236 dpm/ml
All values +/- 3.6%

Isotopic ratios from manufacturer's data sheet

Expiration Date: September 6, 2013

Verified & Approved By _____ Date: 9/26/2012 0:00

QC Approval _____ Date: 9/26/12

Tracer Solution for Environmental Analysis & Disequilibrium Studies

Product Description & Measurement Certificate

Description	Principal radionuclide:	**uranium 232** (U-232)	Product code: **UDP10050**
	Daughter Nuclide:	Th-228	Batch Number: 92/232/67
Measurement	Reference date:		01 March 2000
	Radioactive concentration U-232		6.739E+03 becquerels per gram of solution
	which is equivalent to		1.821E-01 microcuries per gram of solution
	Mass of solution		5.35E grams
	Volume of solution		5.035 millilitres
	Total activity of U-232		3.61E+04 becquerels
	which is equivalent to		9.76E-01 microcuries

Method of measurement (see reverse of this certificate)

Accuracy Random uncertainty is: ± 0.7% Systematic uncertainty: ± 0.5%
Overall uncertainty in the radioactive concentration quoted above: ± 1.7%
Overall uncertainty is defined on the reverse of this certificate.

Radionuclidic Purity Any radioactive impurities measured are listed below, expressed as percentages of the activity of the principle radionuclide at the reference date .

Th-228 and daughter activity removed 2 Feb 2000
U-232 daughters activity will increase with time. By alpha 88% U-232, 12% daughters on 1/3/00

Isotopic Purity The isotopic composition, expressed as atom per cent at the reference date .

Not measured

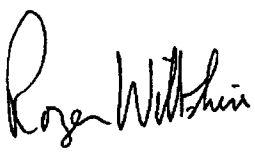
Chemical Composition Calculated weight of U-232, 4.42E-08 grams, as 2M HNO3 solution in a flame sealed glass vial.
This Tracer solution has been produced 'carrier free'.

Physical Data Recommended half life of uranium 232: 6.980E+01 years
Principle energies of alpha emissions (MeV): 5.263 31.7%, 5.320 68.0%
Branching ratio for alpha emission: 100%
Calculated specific activity of uranium 232: 8.167E+05 Bq per microgram U-232.

Remarks For safety information and notes to ensure correct usage by all persons handling this radioactive Tracer solution please read the instructions accompanying the package.

AEA Technology operates a quality management system which has been independently audited and approved to ISO 9001.

Approved Signatory



Project Ref. AE2315

Roger Wiltshire

Prepared and characterised in the UK, for world wide distribution by **Isotrak, AEA Technology, QSA.**

EBERLINE SERVICES

QUALITY CONTROL PROGRAM

MP-009

Rev.8; 11/01/03
Title: Radioactive Reference Standards Solutions & Records

EBERLINE SERVICES - OAK RIDGE LABORATORY
RADIOACTIVE REFERENCE SOLUTIONS
PRIMARY DILUTION RECERTIFICATION
MP 009

CURRENT DATE: 12/13/2012 0:00

SOLUTION REFERENCE #: AEA/Amersham 92/232/67

SOLUTION #: U-10

Principal Radionuclide	Half Life, Years	Half Life, Days
^{232}U	7.200E+01	2.630E+04

Radionuclide: ^{232}U

Reference Date: 3/1/2000 0:00

Certified Activity: 9.760E-01 µCi

Certified Concentration: µCi per gram

Ampoule /Solution Gross: Weight, Grams

Empty Ampoule: Weight, Grams

Solution Net: Weight, Grams

Total Activity in Ampoule: 0.9760 µCi

Chemical Composition of Standard Solution

$^{232}U(NO_3)_6$ in 2M HNO_3

Dilution Instructions:

Dilution Solvent Used: 2M HNO_3

Dilute to a volume of 1000.00 milliliters

Certified Total Activity of 0.9760 µCi Which Equals 2.167E+06 dpm at the date listed above

And after dilution the activity of this solution is 2.167E+03 dpm/ml

This activity concentration is based on the original reference date listed above. All activities are corrected to the date and time of analysis by the laboratory data processing software.

Expiration Date: December 7, 2013

Verified & Approved By _____ Date: 12/13/2012 0:00

QC Approval _____ Date: 12/13/12

EBERLINE SERVICES | **QUALITY CONTROL PROGRAM**
MP-009

Rev.8; 11/01/03
Title: **Radioactive Reference Standards Solutions & Records**

EBERLINE SERVICES - OAK RIDGE LABORATORY
RADIOACTIVE REFERENCE STANDARD SOLUTIONS
SECONDARY DILUTION RECERTIFICATION

MP-009
Solution Reference #: AEA/Amersham 92/232/67
Date: 12/7/2012 0:00
Solution #: U-10a

Principal Radionuclide	Half Life, Years	Half Life, Days
^{232}U	7.200E+01	2.630E+04

Radionuclide of Interest: ^{232}U
Parent Solution Conc.: 2.167E+03 dpm/ml
Reference Date: 3/1/2000 0:00

Chemical Composition of Standard Solution
$^{232}U(NO_3)_6$ in 2M HNO_3

Dilution Instructions:
Dilution Solvent Used: 2M HNO_3

SECONDARY VOLUMETRIC DILUTION

Vol. Parent Solution: 10.0000 ml
Total Activity: 2.1670E+04 dpm
Final Volume: 1000.00 ml

Final Activity Concentration: 2.1670E+01 dpm/ml

NOTES:

This activity concentration is based on the original reference date listed above. All activities are corrected to the date and time of analysis by the laboratory data processing software.

Expiration Date: December 7, 2013

Verified & Approved By _____ Date: 12/13/2012 0:00

QC Approval _____ Date: 12/13/12

QA/QC REVIEWED
Date 10/14/91 Initials MT 10/14/91 MT

CERTIFICATE OF CALIBRATION
ALPHA STANDARD SOLUTION

Received
OCT 14 1991
TMA/Eberline
Oak Ridge Lab

Radionuclide	Th-230	Customer:	TMA EBERLINE
Half Life:	(7.54 ± 0.03) x 10^4 years	P.O.No.:	TT4944
Catalog No.:	7230	Reference Date:	November 1 1991 12:00 PST.
Source No.:	388-116	Contained Radioactivity:	1.036 µCi.

Description of Solution

a. Mass of solution:	5.0042	grams.
b. Chemical form:	Th(NO3)4 in 0.1N HNO3	
c. Carrier content:	None added	
d. Density:	1.0016	gram/ml @ 20°C.

Radioimpurities

See attached technical data sheet

Radioactive Daughters

See attached technical data sheet

Radionuclide Concentration

0.207 µCi/gram.

Method of Calibration

Weighed aliquots of the solution were assayed using a liquid scintillation counter.

Uncertainty of Measurement

a. Systematic uncertainty in instrument calibration:	±2.0%
b. Random uncertainty in assay:	±0.5%
c. Random uncertainty in weighing(s):	±0.2%
d. Total uncertainty at the 99% confidence level:	±2.7%

NIST Traceability

This calibration is implicitly traceable to the National Institute of Standards and Technology.

Notes

1. Nuclear data were taken from "Table of Isotopes", Seventh Edition, edited by Virginia S. Shirley.
2. IPL participates in an NIST measurement assurance program to establish and maintain implicit traceability for a number of nuclides, based on the blind assay(and later NIST certification) of Standard Reference Materials. (As in NRC Regulatory Guide 4.15)

QUALITY CONTROL

ISOTOPE PRODUCTS LABORATORIES
1800 No. Keystone Street.,
Burbank, California 91504
(818) 843 - 7000

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MP-009

Rev.8; 11/01/03
Title: **Radioactive Reference Standards Solutions & Records**

EBERLINE SERVICES - OAK RIDGE LABORATORY
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SECONDARY DILUTION RECERTIFICATION

	MP-009	Date	3/4/2013 0:00
Solution Reference #	IPL 388-116	Solution #	Th-1b

Principal Radionuclide	Half Life, Years	Half Life, Days
^{230}Th	7.540E+04	2.754E+07

Radionuclide of Interest ^{230}Thorium
Parent Solution Conc. 2.30E+03 **dpm/ml**

Reference Date 11/1/1991 0:00

Chemical Composition of Standard Solution
$^{230}Th(NO_3)_4$ in 0.1N HNO_3

Dilution Instructions:

Dilution Solvent Used 0.1N HNO_3

SECONDARY VOLUMETRIC DILUTION

Vol. Parent Solution: 10.0000 **ml**
Total Activity: 2.2999E+04 **dpm**
Final Volume: 1000.00 **ml**

Final Activity Concentration: 2.2999E+01 **dpm/ml**

NOTES:

This activity concentration is based on the original reference date listed above. All activities are corrected to the date and time of analysis by the laboratory data processing software.

Expiration Date: March 4, 2014

Recertified By _____ Date: 3/21/2013 0:00

Verified & Approved By _____ Date: 3/21/13

QC Approval _____ Date: 3/21/13

EBERLINE SERVICES

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MP-009

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EBERLINE SERVICES - OAK RIDGE LABORATORY
RADIOACTIVE REFERENCE SOLUTIONS
PRIMARY DILUTION RECERTIFICATION
MP 009

CURRENT DATE: 3/4/2013 0:00

SOLUTION REFERENCE #: IPL 388-116 SOLUTION #: Th-1

Principal Radionuclide	Half Life, Years	Half Life, Days
^{230}Th	7.540E+04	2.754E+07

Radionuclide: ^{230}Thorium
Reference Date: 11/1/1991 0:00
Certified Activity: 1.036E+00 µCi
Certified Concentration: µCi per gram

Ampoule /Solution Gross	9.2660	Weight, Grams
Empty Ampoule	4.6218	Weight, Grams
Solution Net	4.6442	Weight, Grams
Total Activity in Ampoule	1.0360	µCi

Chemical Composition of Standard Solution

$^{230}Th(NO_3)_4$ in 0.1N HNO_3

Dilution Instructions:

Dilution Solvent Used: 0.1N HNO_3

Dilute to a volume of 1000.00 milliliters

Certified Total Activity of 1.0360 µCi Which Equals 2.300E+06 dpm at the date listed above

And after dilution the activity of this solution is 2.300E+03 dpm/ml

This activity concentration is based on the original reference date listed above. All activities are corrected to the date and time of analysis by the laboratory data processing software.

Expiration Date: March 4, 2014

Recertified By _____ Date: 3/21/2013 0:00

QC Approval _____ Date: 3/21/13

Th-8

CERTIFICATE OF CALIBRATION
ALPHA STANDARD SOLUTION

Radionuclide:	Th-232	Customer:	TMA EBERLINE
Half Life:	(1.405 ± 0.006) x 10^10 years	P.O.No.:	VH1632
Catalog No.:	7232	Reference Date:	November 1 1993 12:00 PST.
Source No.:	435-104-2	Contained Radioactivity:	(Th-232) 0.0933 μCi.
		Contained Radioactivity:	(Th-232) 3.45 kBq.

Description of Solution

a. Mass of solution:	11.9712 g (in a 10 ml flame sealed ampoule)
b. Chemical form:	Th(NO3)4 in water
c. Carrier content:	None added
d. Density:	Approx. 1.21 g/ml @ 20°C.

Radioimpurities: None detected (other than daughters).

Radioactive Daughters

Ra-228, Ac-228, Th-228, Ra-224, Rn-220, Po-216, Pb-212, Bi-212, Po-212, Tl-208

Radionuclide Concentration

(Th-232) 0.00779 μCi/g.

Method of Calibration

Activity calculations are based upon known specific activity and mass.

Uncertainty of Measurement

a. Systematic uncertainty in instrument calibration:	±3.0%
b. Random uncertainty in assay:	±0.0%
c. Random uncertainty in weighing(s):	±2.0%
d. Total uncertainty at the 99% confidence level:	±3.6%

NIST Traceability

This calibration is implicitly traceable to the National Institute of Standards and Technology.

Leak Test(s)

See reverse side for Leak Test(s) applied to this source.

Notes

1. Nuclear data were taken from "Table of Radioactive Isotopes", edited by Virginia S. Shirley, 1986.
2. IPL participates in an NIST measurement assurance program to establish and maintain implicit traceability for a number of nuclides, based on the blind assay (and later NIST certification) of Standard Reference Materials (As in NRC Regulatory Guide 4.15).

ISOTOPE PRODUCTS LABORATORIES
1800 North Keystone Street
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(818) 843 - 7000

Anna U. Khan
QUALITY CONTROL

Nov. 8, 1993
Date Signed

EBERLINE SERVICES

QUALITY CONTROL PROGRAM

MP-009

Rev.8; 1/10/03
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EBERLINE SERVICES - OAK RIDGE LABORATORY
RADIOACTIVE REFERENCE SOLUTIONS
PRIMARY DILUTION RECERTIFICATION
MP 009

CURRENT DATE: 10/9/2012 0:00

SOLUTION REFERENCE #: IPL 435-104-2

SOLUTION #: Th-8

Principal Radionuclide	Half Life, Years	Half Life, Days
^{232}Th, ^{228}Th	1.405E+10	5.132E+12

Radionuclide: $^{232\&228}Th$

Reference Date: 11/1/1993 0:00

Certified Activity: 9.330E-02 µCi

Certified Concentration: µCi per gram

Ampoule /Solution Gross	18.8415	Weight, Grams
Empty Ampoule	6.9296	Weight, Grams
Solution Net	11.9119	Weight, Grams
Total Activity in Ampoule	0.0933	µCi

Chemical Composition of Standard Solution

$Th(NO_3)_4$ in H_2O

Dilution Instructions:

Dilution Solvent Used: 1% Nitric Acid

Dilute to a volume of 1000.00 milliliters

Certified Total Activity of 0.0933 µCi Which Equals 2.071E+05 dpm at the date listed above

And after dilution the activity of this solution is 2.071E+02 dpm/ml

This activity concentration is based on the original reference date listed above. All activities are corrected to the date and time of analysis by the laboratory data processing software.

Expiration Date: October 9, 2013

Verified & Approved By _____ Date: 10/9/2012 0:00

QC Approval _____ Date: 11/12/12

EBERLINE SERVICES | QUALITY CONTROL PROGRAM
MP-009

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EBERLINE SERVICES - OAK RIDGE LABORATORY
RADIOACTIVE REFERENCE STANDARD SOLUTIONS
SECONDARY DILUTION RECERTIFICATION

	MP-009	Date	11/9/2012 0:00
Solution Reference #	IPL 435-104-2	Solution #	Th-8b

Principal Radionuclide	Half Life, Years	Half Life, Days
$^{228\ \&\ 232}Th$	1.405E+10	5.132E+12

Radionuclide of Interest: $^{228\ \&\ 232}Th$
Parent Solution Conc.: 2.07E+02 dpm/ml

Reference Date: 11/1/1993 0:00

Chemical Composition of Standard Solution
$Th(NO_3)_4$ in 1% HNO_3

Dilution Instructions:

Dilution Solvent Used: 1% Nitric Acid

SECONDARY VOLUMETRIC DILUTION

Vol. Parent Solution: 500.0000 ml
Total Activity: 1.0355E+05 dpm
Final Volume: 1000.00 ml

Final Activity Concentration: 1.0356E+02 dpm/ml

NOTES:

This activity concentration is based on the original reference date listed above. All activities are corrected to the date and time of analysis by the laboratory data processing software.

Expiration Date: October 9, 2013

Verified & Approved By _____ Date: 11/9/2012 0:00

QC Approval _____ Date: 11/12/12

Th-18

Isotope Products Laboratories
An Eckert & Ziegler Company

24937 Avenue Tibbitts
Valencia, California 91355

Tel 661•309•1010
Fax 661•257•8303

CERTIFICATE OF CALIBRATION
ALPHA STANDARD SOLUTION

Radionuclide:	Th-229	**Customer:**	EBERLINE SERVICES
Half-life:	7340 ± 160 years	**P.O. No.:**	00009633
Catalog No.:	7229	**Reference Date:**	15-Jan-02 12:00 PST
Source No.:	867-54	**Contained Radioactivity: (Th-229 only)**	1.013 µCi 37.48 kBq

Physical Description:

A. Mass of solution:	5.0147 g in 5 mL flame-sealed ampoule
B. Chemical form:	$Th(NO_3)_4$ in 0.1M HNO_3
C. Carrier content:	10µg Th/mL
D. Density:	1.0016 g/mL @ 20°C.

Radioimpurities:

None detected (daughters in equilibrium)

Radionuclide Concentration: 0.2020 µCi/g, 7.474 kBq/g

Method of Calibration:

This source was prepared from a weighed aliquot of solution whose activity in µCi/g was determined using gamma ray spectrometry.

Peak energy used for integration:	193.5 keV
Branching ratio used:	0.0441 gammas per decay

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 IAEA Technical Report Series No. 261.
- This solution has a working life of 5 years.

Quality Control

9-Jan-02
Date Signed

IPL Ref. No.: 867-54

EBERLINE SERVICES

QUALITY CONTROL PROGRAM

MP-009

Rev.8; 1/10/03
Title: Radioactive Reference Standards Solutions & Records

EBERLINE SERVICES - OAK RIDGE LABORATORY
RADIOACTIVE REFERENCE SOLUTIONS
PRIMARY DILUTION RECERTIFICATION
MP 009

CURRENT DATE 11/9/2012 0:00

SOLUTION REFERENCE # IPL 867-54 **SOLUTION #** Th-18

Principal Radionuclide	Half Life, Years	Half Life, Days
^{229}Th	7.340E+03	2.681E+06

Radionuclide ^{229}Th
Certified Activity 1.013E+00 µCi
Certified Concentration µCi per gram

Reference Date 1/15/2002 0:00

Ampoule /Solution Gross	8.7752	Weight, Grams
Empty Ampoule	3.7591	Weight, Grams
Solution Net	5.0161	Weight, Grams
Total Activity in Ampoule	1.0130	µCi

Chemical Composition of Standard Solution
$^{229}Th(NO_3)_4$ in 0.1M HNO_3

Dilution Instructions:

Dilution Solvent Used 0.1 M HNO_3

Dilute to a volume of 1000.00 **milliliters**

Certified Total Activity of 1.0130 µCi **Which Equals** 2.249E+06 **dpm at the date listed above**

And after dilution the activity of this solution is 2.249E+03 **dpm/ml**

This activity concentration is based on the original reference date listed above. All activities are corrected to the date and time of analysis by the laboratory data processing software.

Expiration Date: October 9, 2013

Verified & Approved By _____ Date: 11/9/2012 0:00

QC Approval _____ Date: 11/12/12

EBERLINE SERVICES | **QUALITY CONTROL PROGRAM**
MP-009

Rev.7; 9/29/99
Title: **Radioactive Reference Standards Solutions & Records**

EBERLINE SERVICES - OAK RIDGE LABORATORY
RADIOACTIVE REFERENCE STANDARD SOLUTIONS
SECONDARY DILUTION RECERTIFICATION

	MP-009	Date	11/9/2012 0:00
Solution Reference #	IPL 867-54	Solution #	Th-18a

Principal Radionuclide	Half Life, Years	Half Life, Days
^{229}Th	7.340E+03	2.681E+06

Radionuclide of Interest	^{229}Th	Reference Date	1/15/2002 0:00
Parent Solution Conc.	2.25E+03 dpm/ml		

Chemical Composition of Standard Solution
$TH(NO_3)_4$ in 0.1M HNO_3

Dilution Instructions: **Dilution Solvent Used** 0.1M HNO_3

SECONDARY VOLUMETRIC DILUTION

Vol. Parent Solution:	10.0000 ml	Final Activity Concentration:	2.2490E+01 dpm/ml
Total Activity:	2.2490E+04 dpm		
Final Volume:	1000.00 ml		

NOTES:

This activity concentration is based on the original reference date listed above. All activities are corrected to the date and time of analysis by the laboratory data processing software.

Expiration Date: October 9, 2013

Verified & Approved By _____ Date: 11/9/2012 0:00

QC Approval _____ Date: 11/12/12

Ba-6
(& 6a)

National Institute of Standards & Technology

Certificate

ORIGINAL

Standard Reference Material 4251C
Barium-133 Radioactivity Standard

ORIGINAL

This Standard Reference Material (SRM) consists of radioactive barium-133 chloride, non-radioactive barium 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 ionization chambers and solid-state gamma-ray spectrometry systems.

Radiological Hazard

The SRM ampoule contains barium-133 with a total activity of approximately 2.5 MBq. Barium-133 decays by electron capture and during the decay process X-rays and gamma rays with energies from 4 to 400 keV are emitted. Most of these photons escape from the SRM ampoule and can represent a radiation hazard. Approximate unshielded dose rates at several distances (as of the reference time) are given in note [a]*. Appropriate shielding and/or distance should be used to minimize personnel exposure. The SRM should be used only by persons qualified to handle radioactive material.

Chemical Hazard

The SRM ampoule contains hydrochloric acid (HCl) with a concentration of 1 mole per liter of water. The solution is corrosive and represents a health hazard if it comes in contact with eyes or skin. If the ampoule is to be opened to transfer the solution, the recommended procedure is given on page 2. The ampoule should be opened only by persons qualified to handle both radioactive material and strong acid solution.

Storage and Handling

The SRM should be stored and used at a temperature between 5 and 65 °C. The solution in an unopened ampoule should remain stable and homogeneous until at least June 2004.

The ampoule (or any subsequent container) should always be clearly marked as containing radioactive material. If the ampoule is transported it should be packed, marked, labeled, and shipped in accordance with the applicable national, international, and carrier regulations. The solution in the ampoule is a dangerous good (hazardous material) both because of the radioactivity and because of the strong acid.

Preparation

This Standard Reference Material was prepared in the Physics Laboratory, Ionizing Radiation Division, Radioactivity Group, J.M.R. Hutchinson, Group Leader. The overall technical direction and physical measurements leading to certification were provided by L.L. Lucas of the Radioactivity Group and D.B. Golas, Nuclear Energy Institute Research Associate.

The support aspects involved in the preparation, certification, and issuance of this SRM were coordinated through the Standard Reference Materials Program by N.M. Trahey.

Gaithersburg, Maryland 20899
October 1994

Thomas E. Gills, Chief
Standard Reference Materials Program

*Notes and references are on pages 5 and 6.

EBERLINE SERVICES

QUALITY CONTROL PROGRAM

QCP-009

Rev.8; 11/10/03
Title: Radioactive Reference Standards Solutions & Records

EBERLINE SERVICES - OAK RIDGE LABORATORY
RADIOACTIVE REFERENCE SOLUTIONS
PRIMARY DILUTION RECERTIFICATION
QCP 009-1

CURRENT DATE: 6/16/2013 0:00

SOLUTION REFERENCE #: NIST SRM4251C

SOLUTION #: Ba-6

Principal Radionuclide	Half Life, Years	Half Life, Days
^{133}Barium	1.048E+01	3.828E+03

Radionuclide: ^{133}Barium

Reference Date: 9/1/1993 0:00

Certified Activity: µCi

Certified Concentration: 1.318E+01 µCi per gram

Ampoule /Solution Gross	9.3081	Weight, Grams
Empty Ampoule	4.2582	Weight, Grams
Solution Net	5.0499	Weight, Grams
Total Activity in Ampoule	66.5577	µCi

Chemical Composition of Standard Solution

$^{133}BaCl_2$ in 1M HCl

Dilution Instructions:

Dilution Solvent Used: 1M HCl

Dilute to a volume of 1000.00 milliliters

Certified Total Activity of 66.5577 µCi Which Equals 1.478E+08 dpm at the date listed above

And after dilution the activity of this solution is 1.478E+05 dpm/ml

This activity concentration is based on the original reference date listed above. All activities are corrected to the date and time of analysis by the laboratory data processing software.

Expiration Date: June 16, 2014

Verified & Approved By _____ Date: 7/1/13

QC Approval _____ Date: 7/2/13

EBERLINE SERVICES | QUALITY CONTROL PROGRAM
QCP-009

Rev.8; 11/10/03
Title: Radioactive Reference Standards Solutions & Records

EBERLINE SERVICES - OAK RIDGE LABORATORY
RADIOACTIVE REFERENCE STANDARD SOLUTIONS
SECONDARY DILUTION RECERTIFICATION

	QCP-009-1-A	Date	6/18/13
Solution Reference #	NIST SRM4251C	Solution #	Ba-6a

Principal Radionuclide	Half Life, Years	Half Life, Days
^{133}Ba	1.048E+01	3.828E+03

Radionuclide of Interest: ^{133}Ba
Parent Solution Conc.: 1.48E+05 dpm/ml

Reference Date: 9/1/1993 0:00

Chemical Composition of Standard Solution
$^{133}BaCl_2$ in 1M HCl

Dilution Instructions:

Dilution Solvent Used: 1M HCl

SECONDARY VOLUMETRIC DILUTION

Vol. Parent Solution: 25.0000 ml
Total Activity: 3.6950E+06 dpm
Final Volume: 1000.00 ml

Final Activity Concentration: 3.6950E+03 dpm/ml

NOTES:

This activity concentration is based on the original reference date listed above. All activities are corrected to the date and time of analysis by the laboratory data processing software.

Expiration Date: June 18, 2014

Verified & Approved By _____ Date: 7/1/13

QC Approval _____ Date: 7/2/13

Ra-5

QA/QC REVIEWED
Date 2/8/94 Initials WT

CERTIFICATE OF CALIBRATION
ALPHA STANDARD SOLUTION

Radionuclide:	Ra-226	Customer:	TMA EBERLINE
Half Life:	1600 ± 7 years	P.O.No.:	VH1888
Catalog No.:	7226	Reference Date:	February 1 1994 12:00 PST.
Source No.:	453-26	Contained Radioactivity: (Ra-226)	1.001 μCi.
		Contained Radioactivity: (Ra-226)	37.0 kBq.

Description of Solution

a. Mass of solution: 5.1864 g (in a 5 ml Flame Sealed Ampoule)

b. Chemical form: Ra(NO3)2 in 1 N HNO3

c. Carrier content: None added

d. Density: 1.0318 g/ml @ 20°C.

Radioimpurities: None detected(other than daughters)

Radioactive Daughters

Rn-222, Po-218, At-218, Pb-214, Bi-214, Po-214, Tl-210, Pb-210, Bi-210, Po-210 and Tl-206.

Radionuclide Concentration

(Ra-226) 0.1929 μCi/g.

Method of Calibration

Weighed aliquots of the solution were assayed using gamma spectrometry:
Energy peak(s) integrated under: 186 keV.
Branching ratio(s) used: 0.0351 gamma rays per decay.

Uncertainty of Measurement

a. Systematic uncertainty in instrument calibration:	±3.4%
b. Random uncertainty in assay:	±3.1%
c. Random uncertainty in weighing(s):	±0.2%
d. Total uncertainty at the 99% confidence level:	±4.6%

NIST Traceability

This calibration is implicitly traceable to the National Institute of Standards and Technology.

Leak Test(s)

See reverse side for Leak Test(s) applied to this source.

Notes

1. Nuclear data were taken from "Table of Radioactive Isotopes", edited by Virginia S. Shirley, 1986.
2. IPL participates in an NIST measurement assurance program to establish and maintain implicit traceability for a number of nuclides, based on the blind assay (and later NIST certification) of Standard Reference Materials (As in NRC Regulatory Guide 4.15).

Ana U. Kuan
QUALITY CONTROL

Feb. 3, 1994
Date Signed

ISOTOPE PRODUCTS LABORATORIES
1800 North Keystone Street
Burbank, California 91504
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EBERLINE SERVICES

QUALITY CONTROL PROGRAM

MP 009

Rev.8; 11/01/03
Title: Radioactive Reference Standards Solutions & Records

EBERLINE SERVICES - OAK RIDGE LABORATORY
RADIOACTIVE REFERENCE SOLUTIONS
PRIMARY DILUTION RECERTIFICATION
MP 009

CURRENT DATE: 11/9/2012 0:00

SOLUTION REFERENCE #: IPL 453-26 | SOLUTION #: Ra-5

Principal Radionuclide	Half Life, Years	Half Life, Days
^{226}Radium	1.600E+03	5.844E+05

Radionuclide: ^{226}Radium
Certified Activity: 1.001E+00 µCi
Certified Concentration: µCi per gram

Reference Date: 2/1/1994 0:00

Ampoule /Solution Gross: Weight, Grams
Empty Ampoule: Weight, Grams
Solution Net: Weight, Grams
Total Activity in Ampoule: 1.0010 µCi

Chemical Composition of Standard Solution
$^{226}Ra(NO_3)_2$ in 1M HNO_3

Dilution Instructions:

Dilution Solvent Used: 1M HNO_3

Dilute to a volume of 1000.00 milliliters

Certified Total Activity of 1.0010 µCi Which Equals 2.222E+06 dpm at the date listed above

And after dilution the activity of this solution is 2.222E+03 dpm/ml

This activity concentration is based on the original reference date listed above. All activities are corrected to the date and time of analysis by the laboratory data processing software.

Expiration Date: November 9, 2013

Verified & Approved By _____ Date: 11/9/2012

QC Approval _____ Date: 11/12/12

EBERLINE SERVICES | **QUALITY CONTROL PROGRAM**
MP 009

Rev.8; 11/01/03
Title: **Radioactive Reference Standards Solutions & Records**

EBERLINE SERVICES - OAK RIDGE LABORATORY
RADIOACTIVE REFERENCE STANDARD SOLUTIONS
SECONDARY DILUTION RECERTIFICATION

MP 009
Solution Reference # IPL-453-26 **Date** 11/9/2012 0:00 **Solution #** Ra-5b

Principal Radionuclide	Half Life, Years	Half Life, Days
^{226}Radium	1.600E+03	5.844E+05

Radionuclide of Interest ^{226}Radium
Parent Solution Conc. 2.22E+03 dpm/ml

Reference Date 2/1/1994 0:00

Chemical Composition of Standard Solution
$^{226}Ra(NO_3)_2$ in 1M HNO_3

Dilution Instructions:

Dilution Solvent Used 1M HNO_3

SECONDARY VOLUMETRIC DILUTION

Vol. Parent Solution: 20.0000 ml
Total Activity: 4.4440E+04 dpm
Final Volume: 1000.00 ml

Final Activity Concentration: 4.4440E+01 dpm/ml
This activity concentration is based on the original reference date listed above. All activities are corrected to the date and time of analysis by the laboratory data processing software.

NOTES:

Expiration Date: November 9, 2013

Verified & Approved By _____ Date: 11/9/2012 0:00

QC Approval _____ Date: 11/12/12

RA-11

ANALYTICS

1380 Seaboard Industrial Blvd.
Atlanta, Georgia 30318 · U.S.A.

Phone (404) 352-8677
Fax (404) 352-2837

CERTIFICATE OF CALIBRATION

Standard Radionuclide Source

62680-416

Ra-228 5 mL Liquid in Flame Sealed Vial

This standard radionuclide source was prepared gravimetrically from a calibrated master solution. The master solution was calibrated using a germanium gamma spectrometer system.

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

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

ISOTOPE:	Ra-228
ACTIVITY (dps):	2.585 E3
HALF-LIFE:	5.75 years
CALIBRATION DATE:	November 7, 2001 12:00 EST
TOTAL UNCERTAINTY*:	4.0%
SYSTEMATIC:	3.0%
RANDOM:	1.0%

*99% Confidence Level

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

5.07198 grams 0.1M HCl solution with 50 µg/g Ba carrier.

P O NUMBER 9508, Item 1 (Part #4339A)

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

Q A APPROVED: 11/7/01

New vial from the 6/11/01 Shipment.
P.S. Different activity Level
8/19/11

US EPA ARCHIVE DOCUMENT

EBERLINE SERVICES

QUALITY CONTROL PROGRAM

MP-009

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Title: Radioactive Reference Standards Solutions & Records

EBERLINE SERVICES - OAK RIDGE LABORATORY
RADIOACTIVE REFERENCE SOLUTIONS
RECERTIFICATION
MP 009

CURRENT DATE: 3/11/2013 0:00
SOLUTION REFERENCE #: Analytics 62680-416
SOLUTION #: Ra-11

Principal Radionuclide	Half Life, Years	Half Life, Days
^{228}Ra	5.750E+00	2.100E+03

Radionuclide: ^{228}Ra
Certified Activity: 6.986E-02 µCi
Certified Concentration: µCi per gram

Reference Date: 11/7/2001 0:00

Ampoule /Solution Gross	9.4982	Weight, Grams
Empty Ampoule	4.4895	Weight, Grams
Solution Net	5.0087	Weight, Grams
Total Activity in Ampoule	0.0699	µCi

Chemical Composition of Standard Solution
$^{228}Ra(NO_3)_2$ in 0.5 M HCl

Dilution Instructions:

Dilution Solvent Used: 0.5 M HCl

Dilute to a volume of 1000.00 milliliters

Certified Total Activity of 0.0699 µCi Which Equals 1.551E+05 dpm at the date listed above

And after dilution the activity of this solution is 1.551E+02 dpm/ml

This activity concentration is based on the original reference date listed above. All activities are corrected to the date and time of analysis by the laboratory data processing software.

Expiration Date: March 26, 2014

Recertified By _____ Date: 5/30/13

QC Approval _____ Date: 5/30/13

SECTION VI

QUALITY CONTROL SAMPLE RESULTS SUMMARY

WO	Analysis	Run	Activity Units	Aliquot Units	Client Name
13-07170	UUISO	1	pCi	l	Engineering Management Support, Inc.

Laboratory Control Sample

Analyte	Normalized Difference	LCS Measured	CSU Measured	LCS Expected	Uncert. Expected	Known	Known Error	Result	CSU	Standard ID	Standard ACT (dpm)	Standard Error	Standard Added (g)
U-234	0.00	99.96%	16.01%	100.00%	3.60%	8.18E+00	2.95E-01	8.18E+00	1.31E+00	U-8a	3.52E+01	3.60E+00	5.15E-01
U-238	0.42	103.55%	15.98%	100.00%	3.60%	7.97E+00	2.87E-01	8.26E+00	1.32E+00	U-8a	3.44E+01	3.60E+00	5.15E-01

Matrix Spike

Analyte	Normalized Difference	MS Actual % Rec	Expected MS Result	Expected MS Uncert	Actual MS Result	Actual MS CSU	Sample Result	Sample CSU	Sample Aliquot	Standard ID	Standard ACT (dpm)	Standard Error %	Standard Added (g)

Replicate Sample

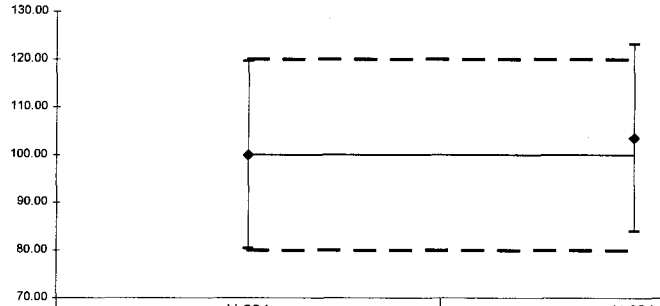
Analyte	Normalized Difference	RPD	Original Result	Original CSU	Replicate Result	Replicate CSU
U-234	0.77	83.68	4.76E-02	6.06E-02	1.95E-02	3.71E-02
U-238	1.84	421.72	-1.85E-02	4.71E-02	5.19E-02	5.85E-02
U-235	0.28	27.79	4.96E-02	6.42E-02	3.75E-02	5.61E-02

QC Summary

LCS Relative Bias	LCS % R	LCS ND	MS % R	MS ND	Rep RPD	Rep ND
1.00	OK	OK			NA	OK
1.04	OK	OK			NA	OK
	OK	OK			NA	OK

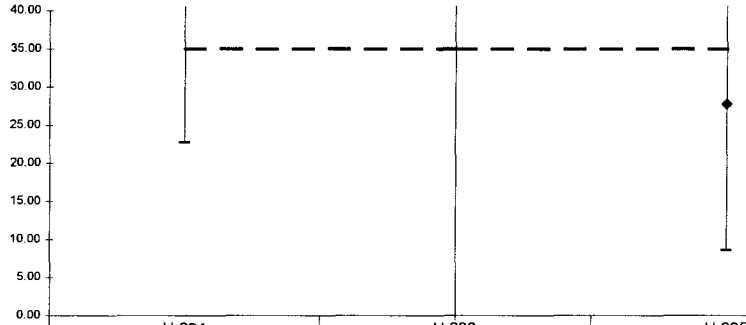
WO	Analysis	Run	Activity Units	Aliquot Units	Client Name
13-07170	UUISO	1	pCi	I	Engineering Management Support, Inc.

LCS % Recovery



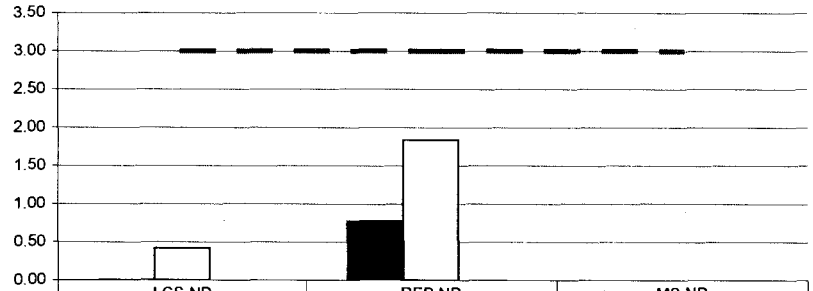
	U-234	U-238
Lower Error	80.35	83.98
Upper Error	119.57	123.13
%R	99.96	103.55
LCL	80	80
Mean	100	100
UCL	120	120

Replicate Sample RPD



	U-234	U-238	U-235
Lower Error	144.66	1088.97	46.99
Upper Error	22.70	-245.54	8.58
RPD	83.68	421.72	27.79
CL	35	35	35

Normalized Difference



	LCS ND	REP ND	MS ND
U-234	0.00	0.77	0.00
U-238	0.42	1.84	0.00
	0.00	0.00	0.00
UCL	3	3	3

No Matrix Spike

Version

WO	Analysis	Run	Activity Units	Aliquot Units	Client Name
13-07170	ThISO	1	pCi	I	Engineering Management Support, Inc.

Laboratory Control Sample

Analyte	Normalized Difference	LCS Measured	CSU Measured	LCS Expected	Uncert. Expected	Known	Known Error	Result	CSU	Standard ID	Standard ACT (dpm)	Standard Error	Standard Added (g)
TH-228	0.05	100.48%	18.96%	100.00%	3.60%	4.89E+00	1.76E-01	4.91E+00	9.31E-01	Th-8b	1.04E+02	3.60E+00	1.05E-01
TH-230	0.18	98.18%	20.34%	100.00%	2.70%	5.48E+00	1.48E-01	5.38E+00	1.09E+00	Th-1b	2.35E+01	2.70E+00	5.17E-01
TH-232	0.10	100.98%	18.65%	100.00%	3.60%	4.89E+00	1.76E-01	4.94E+00	9.21E-01	Th-8b	1.04E+02	3.60E+00	1.05E-01

Matrix Spike

Analyte	*Normalized Difference*	*MS Actual % Rec*	*Expected MS Result*	*Expected MS Uncert*	*Actual MS Result*	*Actual MS CSU*	*Sample Result*	*Sample CSU*	*Sample Aliquot*	*Standard ID*	*Standard ACT (dpm)*	*Standard Error %*	*Standard Added (g)*

Replicate Sample

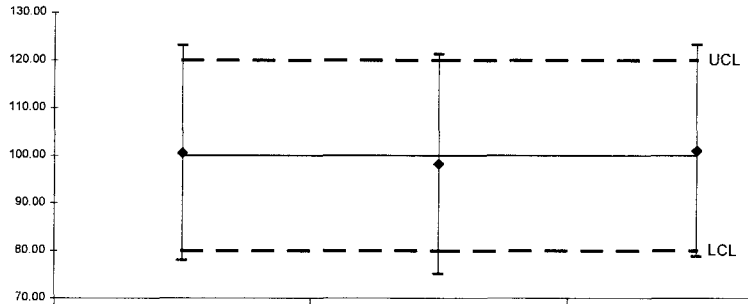
Analyte	*Normalized Difference*	*RPD*	*Original Result*	*Original CSU*	*Replicate Result*	*Replicate CSU*
TH-228	0.14	12.50	5.90E-02	5.67E-02	5.21E-02	7.50E-02
TH-230	0.39	20.29	9.90E-02	6.87E-02	1.21E-01	8.79E-02
TH-232	0.48	73.57	9.29E-03	2.23E-02	2.01E-02	3.84E-02

QC Summary

LCS Relative Bias	*LCS % R*	*LCS ND*	*MS % R*	*MS ND*	*Rep RPD*	*Rep ND*
1.00	OK	OK			NA	OK
0.98	OK	OK			NA	OK
1.01	OK	OK			NA	OK

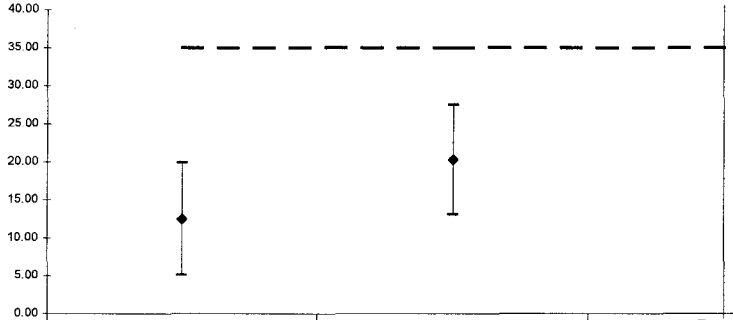
WO	Analysis	Run	Activity Units	Aliquot Units	Client Name
13-07170	ThISO	1	pCi	l	Engineering Management Support, Inc.

LCS % Recovery



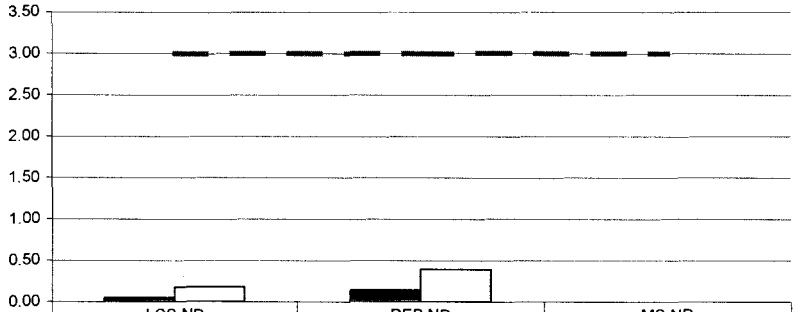
	TH-228	TH-230	TH-232
Lower Error	77.93	75.15	78.73
Upper Error	123.04	121.22	123.23
%R	100.48	98.18	100.98
LCL	80	80	80
Mean	100	100	100
UCL	120	120	120

Replicate Sample RPD



	TH-228	TH-230	TH-232
Lower Error	19.90	27.51	149.52
Upper Error	5.09	13.08	-2.38
RPD	12.50	20.29	73.57
CL	35	35	35

Normalized Difference



	LCS ND	REP ND	MS ND
TH-228	0.05	0.14	0.00
TH-230	0.18	0.39	0.00
UCL	3	3	3

No Matrix Spike

Version

WO	Analysis	Run	Activity Units	Aliquot Units	Client Name
13-07170	Ra226	1	pCi	l	Engineering Management Support, Inc.

Laboratory Control Sample

Analyte	Normalized Difference	LCS Measured	CSU Measured	LCS Expected	Uncert. Expected	Known	Known Error	Result	CSU	Standard ID	Standard ACT (dpm)	Standard Error	Standard Added (g)
RA-226	0.06	100.80%	24.34%	100.00%	4.60%	1.03E+01	4.74E-01	1.04E+01	2.53E+00	Ra-5b	4.41E+01	4.60E+00	5.19E-01

Matrix Spike

Analyte	*Normalized Difference*	*MS Actual % Rec*	*Expected MS Result*	*Expected MS Uncert*	*Actual MS Result*	*Actual MS CSU*	*Sample Result*	*Sample CSU*	*Sample Aliquot*	*Standard ID*	*Standard ACT (dpm)*	*Standard Error %*	*Standard Added (g)*

Replicate Sample

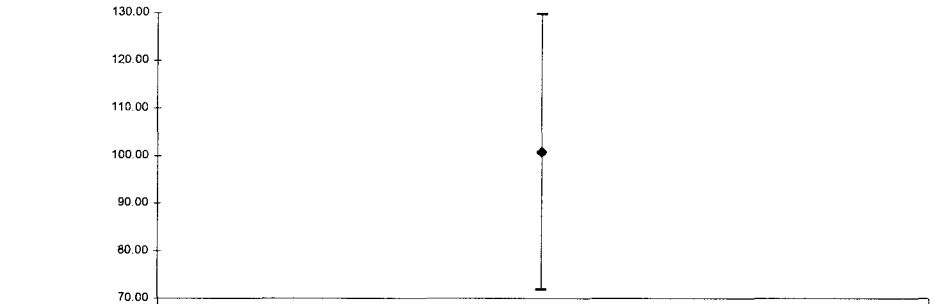
Analyte	*Normalized Difference*	*RPD*	*Original Result*	*Original CSU*	*Replicate Result*	*Replicate CSU*
RA-226	0.52	21.37	5.39E-01	3.23E-01	6.68E-01	3.68E-01

QC Summary

LCS Relative Bias	*LCS % R*	*LCS ND*	*MS % R*	*MS ND*	*Rep RPD*	*Rep ND*
1.01	OK	OK			NA	OK

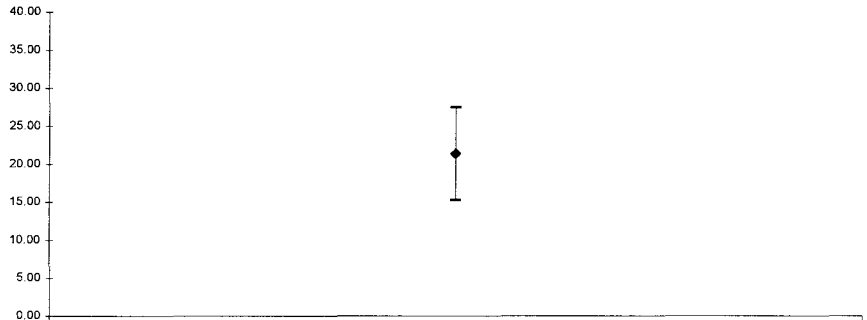
WO	Analysis	Run	Activity Units	Aliquot Units	Client Name
13-07170	Ra226	1	pCi	I	Engineering Management Support, Inc.

LCS % Recovery



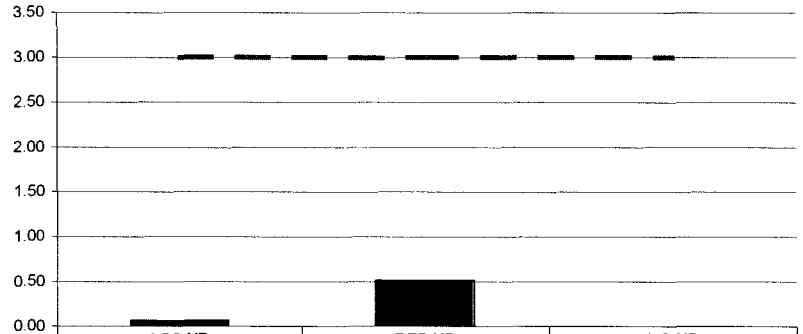
	RA-226
Lower Error	71.86
Upper Error	129.74
%R	100.80
LCL	80
Mean	100
UCL	120

Replicate Sample RPD



	RA-226
Lower Error	27.49
Upper Error	15.26
RPD	21.37
CL	35

Normalized Difference



	LCS ND	REP ND	MS ND
RA-226	0.06	0.52	0.00
UCL	3	3	3

No Matrix Spike

WO	Analysis	Run	Activity Units	Aliquot Units	Client Name
13-07170	Ra228	1	pCi	l	Engineering Management Support, Inc.

Laboratory Control Sample

Analyte	Normalized Difference	LCS Measured	CSU Measured	LCS Expected	Uncert. Expected	Known	Known Error	Result	CSU	Standard ID	Standard ACT (dpm)	Standard Error	Standard Added (g)
RA-228	0.30	96.29%	25.17%	100.00%	5.10%	8.74E+00	4.46E-01	8.42E+00	2.12E+00	Ra-11	3.76E+01	5.10E+00	5.16E-01

Matrix Spike

Analyte	*Normalized Difference*	*MS Actual % Rec*	*Expected MS Result*	*Expected MS Uncert*	*Actual MS Result*	*Actual MS CSU*	*Sample Result*	*Sample CSU*	*Sample Aliquot*	*Standard ID*	*Standard ACT (dpm)*	*Standard Error %*	*Standard Added (g)*

Replicate Sample

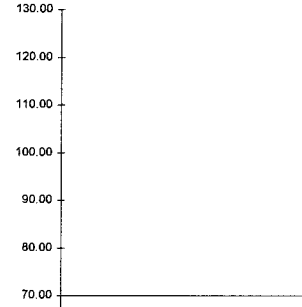
Analyte	*Normalized Difference*	*RPD*	*Original Result*	*Original CSU*	*Replicate Result*	*Replicate CSU*
RA-228	1.13	56.33	1.56E+00	9.03E-01	8.72E-01	7.64E-01

QC Summary

LCS Relative Bias	*LCS % R*	*LCS ND*	*MS % R*	*MS ND*	*Rep RPD*	*Rep ND*
0.96	OK	OK			NA	OK

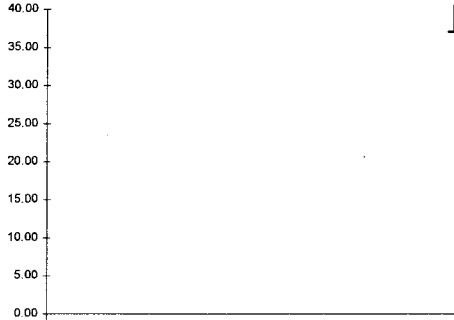
WO	Analysis	Run	Activity Units	Aliquot Units	Client Name
13-07170	Ra228	1	pCi	I	Engineering Management Support, Inc.

LCS % Recovery



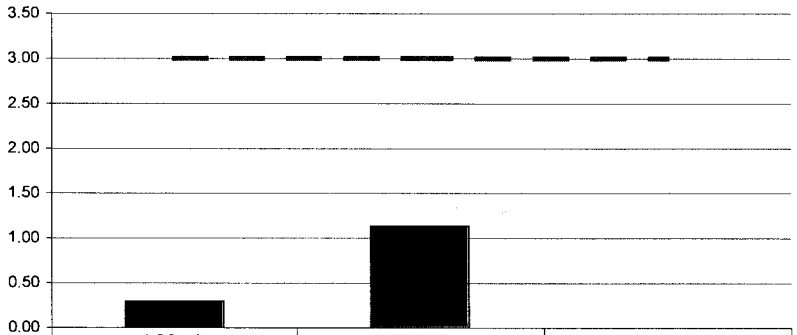
	RA-228
Lower Error	66.03
Upper Error	126.56
%R	96.29
LCL	80
Mean	100
UCL	120

Replicate Sample RPD



	RA-228
Lower Error	75.67
Upper Error	37.00
RPD	56.33
CL	35

Normalized Difference



	LCS ND	REP ND	MS ND
RA-228	0.30	1.13	0.00
UCL	3	3	3

No Matrix Spike

Version

SECTION VII

LABORATORY TECHNICIAN'S NOTES

ISO U NOTES

EBERLINE SERVICES

Work Order Analysis Notes

Oak Ridge Laboratory
601 Scarboro Rd.
Oak Ridge, TN 37830
Voice: 865.481.0683
www.eberlineservices.com

Internal Work Order	13-07170
Analysis Code	UUISO
Run Number	1

#	Date	Dept	User	Notes
1	08/09/13 07:22	PREP	JWOLFE	ALIQUOTED AND ADDED SPIKES AND TRACERS- PRESERVED FRACTIONS 4-7 WITH HNO3 AND DRIED SAMPLES DOWN

JWolfe 8/9/13

EBERLINE SERVICES

Work Order Analysis Notes

Oak Ridge Laboratory
601 Scarboro Rd.
Oak Ridge, TN 37830
Voice: 865.481.0683
www.eberlineservices.com

Internal Work Order	13-07147
Analysis Code	UUISO
Run Number	2

#	Date	Dept	User	Notes
1	08/09/13 07:22	PREP	JWOLFE	ALIQUOTED AND ADDED SPIKES AND TRACERS- PRESERVED FRACTIONS WITH HNO3 AND DRIED SAMPLES DOWN

JWolfe 8/9/13

EBERLINE SERVICES

Work Order Analysis Notes

Oak Ridge Laboratory
601 Scarboro Rd.
Oak Ridge, TN 37830
Voice: 865.481.0683
www.eberlineservices.com

Internal Work Order	13-07170
Analysis Code	UUISO
Run Number	1

#	Date	Dept	User	Notes
1	08/09/13 07:22	PREP	JWOLFE	ALIQUOTED AND ADDED SPIKES AND TRACERS- PRESERVED FRACTIONS 4-7 WITH HNO3 AND DRIED SAMPLES DOWN
2	08/14/13 17:05	CHEM	JDEMELAS	Added concentrated HCl to sample beakers and heated to dryness; Added 20 ml 8N HCL to samples and transferred to new, labeled C-Tubes, rinsing with 8N HCl to bring volume to ~35 ml; Preconditioned resin columns with 35 ml 8N HCl; Centrifuged samples and loaded onto columns; Rinsed C-Tubes with 20 ml 8N HCl, centrifuged as needed and loaded onto columns; Rinsed columns with 35 ml 8N HCl – 0.1N NH4I, 35 ml of 6.5N HCl – 0.04N HF, and 10 ml of 6.5N HCl; Eluted Uranium with 50 ml of 0.5N HCl into clean, labeled 100-ml beakers; Dried-down samples on hotplate; Dissolved samples in ~10 ml of concentrated HCl; Transferred to new, labeled C-Tubes with DI H2O. Set samples aside for later precipitation and filtering.

8/14/13

EBERLINE SERVICES

Work Order Analysis Notes

Oak Ridge Laboratory
601 Scarboro Rd.
Oak Ridge, TN 37830
Voice: 865.481.0683
www.eberlineservices.com

Internal Work Order	13-07170
Analysis Code	UUISO
Run Number	1

#	Date	Dept	User	Notes
1	08/09/13 07:22	PREP	JWOLFE	ALIQUOTED AND ADDED SPIKES AND TRACERS- PRESERVED FRACTIONS 4-7 WITH HNO3 AND DRIED SAMPLES DOWN
2	08/14/13 17:05	CHEM	JDEMELAS	Added concentrated HCl to sample beakers and heated to dryness; Added 20 ml 8N HCL to samples and transferred to new, labeled C-Tubes, rinsing with 8N HCl to bring volume to ~35 ml; Preconditioned resin columns with 35 ml 8N HCl; Centrifuged samples and loaded onto columns; Rinsed C-Tubes with 20 ml 8N HCl, centrifuged as needed and loaded onto columns; Rinsed columns with 35 ml 8N HCl – 0.1N NH4I, 35 ml of 6.5N HCl – 0.04N HF, and 10 ml of 6.5N HCl; Eluted Uranium with 50 ml of 0.5N HCl into clean, labeled 100-ml beakers; Dried-down samples on hotplate; Dissolved samples in ~10 ml of concentrated HCl; Transferred to new, labeled C-Tubes with DI H2O. Set samples aside for later precipitation and filtering.
3	08/15/13 10:24	CHEM	JDEMELAS	Added 0.1 ml Neodymium Carrier, 0.3 ml Titanous Chloride and 1 ml HF to samples in C-Tubes and mixed; Immersed samples in ice bath for minimum of 1 hour; Setup filters, added Alcohol and Carbon Substrate, then added samples; When samples were filtered, added 10 ml DI H2O rinses from C-Tubes and filtered; When rinsates were filtered, placed filters in new, labeled Petri Dishes; and Set T-0. Completed documentation and sent sample set to the Count Room.

John DeMelas
8/15/13

EBERLINE SERVICES

Reagents Used in an Analysis

Internal Work Order	
13-07170	
Analysis Code	Run
UUISO	1

Reagent ID	Reagent Name	Reagent Concentration	Analyst ID	Date Recorded
014109P	Nitric Acid	Reagent Grade	JWOLFE	8/9/2013
014164P	Anion Exchange Resin	Reagent Grade	JDEMELAS	8/14/2013
014143D01	Hydrochloric Acid	0.5N	JDEMELAS	8/14/2013
014199S	Hydrochloric Acid	6.5N	JDEMELAS	8/14/2013
014243S	Hydrochloric Acid	8N	JDEMELAS	8/14/2013
014142P	Hydrochloric Acid	Reagent Grade	JDEMELAS	8/14/2013
014262S	HCl - NH4I	8N - 0.1M	JDEMELAS	8/14/2013
014244S	HCl - HF	6.5N - 0.04N	JDEMELAS	8/14/2013
014041S	Neodymium Carrier	1 mg/ml	JDEMELAS	8/15/2013
013574P	Reagent Alcohol	Reagent Grade	JDEMELAS	8/15/2013
014232P	Hydrofluoric Acid	Reagent Grade	JDEMELAS	8/15/2013
014220P	Titanous Chloride	Reagent Grade	JDEMELAS	8/15/2013
014042S	Carbon substrate	Solution	JDEMELAS	8/15/2013

Alpha #3

Date	Sample #	Client	Load Time	Ct Time	Analysis	Tech
8/15/13	Daily Purge	[illegible]	0828	1.0 —	—	—
8/15/13	1307170A (9-10)	EMS	1242	2hr 5min	[illegible]	KB

Alpha #2

Date	Sample #	Client	Load Time	CT Time	Analyst	Tech
8/12/13	1307153A(15-18)	EMS	1648	2hr50 —	Rak	KB
8/12/13	1307186A(1-4)	UCOR	1649	2hr50 —	Rak	KB
8/13/13	Daily Pulse	[illegible]	0728	[illegible]	—	—
8/13/13	1307147B(1-21,12)	Emglen	0905	2hr	UU7so	—
8/13/13	1307186A(1-7)	Ucor	0905	2hr	UU7so	—
8/13/13	1307152A(1-8)	EMS	1217	2hr50 —	Th	KB
8/14/13	Daily Pulse	[illegible]	0727	[illegible]	—	—
8/14/13	1307154A(4-11)	Eng Man	0927	2hr	UU7so	—
~~8/14/13~~	~~1307186A(1-17)~~	~~UCOR~~	KB 8/14/13	~~2hr50 —~~	~~Pu~~	~~KB~~
~~8/14/13~~	~~1307154A(1-3)~~	~~EMS~~		~~2hr50 —~~	~~Th~~	~~KB~~
8/14/13	1307154A(4-11)	EMS	1244	2hr50 —	Th	KB
8/15/13	Daily Pulse	[illegible]	0728	[illegible]	—	—
8/15/13	1307170A(1-8)	EMS	1241	2hr50 —	UU	KB

ISO TH NOTES

EBERLINE SERVICES

Work Order Analysis Notes

Oak Ridge Laboratory
601 Scarboro Rd.
Oak Ridge, TN 37830
Voice: 865.481.0683
www.eberlineservices.com

Internal Work Order	13-07170
Analysis Code	ThISO
Run Number	1

#	Date	Dept	User	Notes
1	08/09/13 07:21	PREP	JWOLFE	ALIQUOTED AND ADDED SPIKES AND TRACER- PRESERVED FRACTIONS 4-7 WITH HNO3 AND DRIED SAMPLES DOWN

JWolfe
8/9/13

EBERLINE SERVICES

Work Order Analysis Notes

Oak Ridge Laboratory
601 Scarboro Rd.
Oak Ridge, TN 37830
Voice: 865.481.0683
www.eberlineservices.com

Internal Work Order	13-07170
Analysis Code	ThISO
Run Number	1

#	Date	Dept	User	Notes
1	08/09/13 07:21	PREP	JWOLFE	ALIQUOTED AND ADDED SPIKES AND TRACER- PRESERVED FRACTIONS 4-7 WITH HNO3 AND DRIED SAMPLES DOWN
2	08/14/13 17:06	CHEM	JDEMELAS	Added concentrated HNO3 to sample beakers and heated to dryness; Added 20 ml 8N HNO3 to samples and transferred to new, labeled C-Tubes, adding 8N HNO3 to bring volume to ~35 ml; Preconditioned resin columns with 50 ml 8N HNO3; Centrifuged samples as needed, and passed through columns; Rinsed C-Tubes with 20 ml 8N HNO3; Centrifuged rinsates and loaded onto columns; Rinsed columns with 40 ml 8N HNO3; Eluted Thorium with 50 ml of 8N HCl into clean, labeled 100-ml beakers; Dried-down samples on hotplate; Dissolved samples in ~10 ml of concentrated HCl; Transferred to new, labeled C-Tubes with deiononized water, bringing volume to ~15ml. Set samples aside for later precipitation and filtering.

John DeMelas
8/14/13

EBERLINE SERVICES

Work Order Analysis Notes

Oak Ridge Laboratory
601 Scarboro Rd.
Oak Ridge, TN 37830
Voice: 865.481.0683
www.eberlineservices.com

Internal Work Order	13-07170
Analysis Code	ThISO
Run Number	1

#	Date	Dept	User	Notes
1	08/09/13 07:21	PREP	JWOLFE	ALIQUOTED AND ADDED SPIKES AND TRACER- PRESERVED FRACTIONS 4-7 WITH HNO3 AND DRIED SAMPLES DOWN
2	08/14/13 17:06	CHEM	JDEMELAS	Added concentrated HNO3 to sample beakers and heated to dryness; Added 20 ml 8N HNO3 to samples and transferred to new, labeled C-Tubes, adding 8N HNO3 to bring volume to ~35 ml; Preconditioned resin columns with 50 ml 8N HNO3; Centrifuged samples as needed, and passed through columns; Rinsed C-Tubes with 20 ml 8N HNO3; Centrifuged rinsates and loaded onto columns; Rinsed columns with 40 ml 8N HNO3; Eluted Thorium with 50 ml of 8N HCl into clean, labeled 100-ml beakers; Dried-down samples on hotplate; Dissolved samples in ~10 ml of concentrated HCl; Transferred to new, labeled C-Tubes with deiononized water, bringing volume to ~15ml. Set samples aside for later precipitation and filtering.
3	08/15/13 10:25	CHEM	JDEMELAS	Added 0.75 ml of 0.1 mg/ml Cerium Carrier and 1 ml HF to samples in C-Tubes and mixed; Immersed sample set in ice bath for minimum one hour; Setup filters by adding Alcohol and Carbon Substrate, then added samples; When samples were filtered, added 10 ml DI H2O rinses from C-Tubes; When rinsates were filtered, removed filters and placed in new, labeled Petri Dishes; and Set T-0. Completed documentation, and sent set to the Count Room.

John DeMelas
8/15/13

EBERLINE SERVICES

Reagents Used in an Analysis

Internal Work Order	
13-07170	
Analysis Code	Run
ThISO	1

Reagent ID	Reagent Name	Reagent Concentration	Analyst ID	Date Recorded
014109P	Nitric Acid	Reagent Grade	JWOLFE	8/9/2013
014164P	Anion Exchange Resin	Reagent Grade	JDEMELAS	8/14/2013
014243S	Hydrochloric Acid	8N	JDEMELAS	8/14/2013
014142P	Hydrochloric Acid	Reagent Grade	JDEMELAS	8/14/2013
014249S	Nitric Acid	8N	JDEMELAS	8/14/2013
014234P	Nitric Acid	Reagent Grade	JDEMELAS	8/14/2013
014040S	Cerrium Carrier	0.1mg/ml	JDEMELAS	8/15/2013
013574P	Reagent Alcohol	Reagent Grade	JDEMELAS	8/15/2013
014232P	Hydrofluoric Acid	Reagent Grade	JDEMELAS	8/15/2013
014042S	Carbon substrate	Solution	JDEMELAS	8/15/2013

Alpha #3

Date	Sample #	Client	Load Time	C/O Time	Analysis	Tech
8/15/13	Daily Purge	Ar3	0826	10 —	—	—
8/15/13	1307170A (9-10)	EMS	1242	2hr 50m	UU	KB
8/15/13	1307172A (1-4)	UCOR	1715	2hr 50m	Th	KB
8/15/13	1307172A (4)	UCOR	1717	2hr 50m	ThNT	KB
8/15/13	1307171A (1-4, 6)	UCOR	1717	2hr 50m	Th	KB
8/15/13	1307171A (4, 6)	UCOR	1717	2hr 50m	ThNT	KB
8/15/13	1307170A (1-2)	EMS	1318	2hr 50m	Th	KB

Alpha #1

Date	Sample #	Client	Load Time	CT Time	Analyst	Tech
8/14/13	1308004A(1-2,5)	UCOR	0925	2hr	UU750	C
8/14/13	1308004ANT(5)	UCOR	0926	2hr	UUNT	C
8/14/13	1307154A(1-7)	EnergyMan	0926	2hr	UU750	C
8/14/13	1307186A(1-4,7)	UCOR	1245	2hr 50 min	PU	KB
8/14/13	1307154A(1-3)	EMS	1246	2hr 50 min	Th	KB
8/14/13	1307153A(15-18)	EMS	1615	2hr 50 min	Th	KB
8/14/13	1308005A(1-4)	UCOR	1615	2hr 50 min	Rad	KB
8/15/13	Daily Purge	[illegible]	0725	10 min	[illegible]	
8/15/13	1308005A(1-4)	UCOR	1137	2hr 50 min	Am241	KB
8/15/13	1308005A(1-4)	UCOR	1138	2hr 50 min	Am243	KB
8/15/13	1307170A(3-10)	EMS	1434	2hr 50 min	Th	KB

RA-226 NOTES

EBERLINE SERVICES

Work Order Analysis Notes

Oak Ridge Laboratory
601 Scarboro Rd.
Oak Ridge, TN 37830
Voice: 865.481.0683
www.eberlineservices.com

Internal Work Order	13-07170
Analysis Code	Ra226
Run Number	1

#	Date	Dept	User	Notes
1	08/08/13 11:30	PREP	JWOLFE	ALIQUOTED AND ADDED SPIKES AND TRACERS- PH'D SAMPLES- PRECIPITATED WITH BA AND PB CARRIERS AND AMMONIUM SULFATE- DECANTED SAMPLES AND CENTRIFUGED- SUBMITTED RADIUM PRECIP TO SEPARATIONS

JWolfe 8/8/13

EBERLINE SERVICES

Work Order Analysis Notes

Oak Ridge Laboratory
601 Scarboro Rd.
Oak Ridge, TN 37830
Voice: 865.481.0683
www.eberlineservices.com

Internal Work Order	13-07170
Analysis Code	Ra226
Run Number	1

#	Date	Dept	User	Notes
1	08/08/13 11:30	PREP	JWOLFE	ALIQUOTED AND ADDED SPIKES AND TRACERS- PH'D SAMPLES- PRECIPITATED WITH BA AND PB CARRIERS AND AMMONIUM SULFATE- DECANTED SAMPLES AND CENTRIFUGED- SUBMITTED RADIUM PRECIP TO SEPARATIONS
2	08/08/13 19:35	PREP	LWALKER	ADDED EDTA TO PRECIP-VORTEX-LET SIT OVERNIGHT TO DIGEST.
3	08/09/13 19:29	PREP	LWALKER	FOLLOWED STEPS 12.1 TO 12.8 IN AP-006 REV 12 FOR RA 226 ANALYSIS-(SYRINGE FILTERED-PRECIP-FILTERED-DRIED-OBTAIN FINAL WEIGHT)-SUBMIT TO COUNT ROOM.

L. Walker
8/9/13

EBERLINE SERVICES

Reagents Used in an Analysis

Internal Work Order	
13-07170	
Analysis Code	Run
Ra226	1

Reagent ID	Reagent Name	Reagent Concentration	Analyst ID	Date Recorded
013376P	Ammonium Hydroxide	Reagent Grade	JWOLFE	8/8/2013
013930D03	Ammonium Sulfate	200 mg/ml	JWOLFE	8/8/2013
014007D02	Barium Carrier	1 mg/ml	JWOLFE	8/8/2013
014109P	Nitric Acid	Reagent Grade	JWOLFE	8/8/2013
013965D01	Lead Carrier	166 mg/ml	JWOLFE	8/8/2013
014212S	EDTA	0.25M	LWALKER	8/8/2013
011383P	Acetic Acid	Reagent Grade	LWALKER	8/9/2013
013575D05	Ammonium Sulfate	200 mg/ml	LWALKER	8/9/2013

Alpha #3

Date	Sample #	Client	Load Time	Cnt Time	Energy	Tech
8/9/13	Daily Pulser	Lab	0506	1m	—	—
8/9/13	SEC CAL	Lab	0522	24h	—	—
8/9/13	1307154A(1-12)	Eng Man	0904	24hr	Rad	C
8/9/13	1307146A(4)	UCOR	1209	2hr50m	NP	KB
8/9/13	1308003A(1-9)	Access	1209	2hr50m	Rad	KB
8/9/13	System Bkgd	Lab	1624	16.40 hrs	α	KB
8/10/13	Daily Pulser	Lab	1123	10 min	NA	AG
8/10/13	1307147A(9-19)	Eng. Manage	1502	2hr50m	150-Th	AG
8/10/13	Daily Pulser	Lab	0515	1m	—	—
8/12/13	1307149A(1-15)	Eng. Man	0577	24h	44Z50	C
8/12/13	1707152A(4-18)	Eng Man	0979	24hr	44Z50	C
8/12/13	1307145A(4)	Eng Man	0940	24hr	44Z50	C
8/12/13	1307170A(1-10)	EMS	1256	2hr50mins	Rad	KB
8/12/13	1307153A(1-6)	EMS	1256	2hr50min	Rad	KB

RA-228 NOTES

EBERLINE SERVICES

Work Order Analysis Notes

Oak Ridge Laboratory
601 Scarboro Rd.
Oak Ridge, TN 37830
Voice: 865.481.0683
www.eberlineservices.com

Internal Work Order	13-07170
Analysis Code	Ra228
Run Number	1

#	Date	Dept	User	Notes
1	08/08/13 11:30	PREP	JWOLFE	ALIQUOTED AND ADDED SPIKES AND TRACERS- PH'D SAMPLES- PRECIPITATED WITH BA AND PB CARRIERS AND AMMONIUM SULFATE- DECANTED SAMPLES AND CENTRIFUGED- SUBMITTED RADIUM PRECIP TO SEPARATIONS

JWolfe 8/8/13

EBERLINE SERVICES

Work Order Analysis Notes

Oak Ridge Laboratory
601 Scarboro Rd.
Oak Ridge, TN 37830
Voice: 865.481.0683
www.eberlineservices.com

Internal Work Order	13-07170
Analysis Code	Ra228
Run Number	1

#	Date	Dept	User	Notes
1	08/08/13 11:30	PREP	JWOLFE	ALIQUOTED AND ADDED SPIKES AND TRACERS- PH'D SAMPLES- PRECIPITATED WITH BA AND PB CARRIERS AND AMMONIUM SULFATE- DECANTED SAMPLES AND CENTRIFUGED- SUBMITTED RADIUM PRECIP TO SEPARATIONS
2	08/13/13 12:17	PREP	LWALKER	RECEIVED FILTERS BACK FROM COUNT ROOM-PUT BACK INTO C-TUBES-ADDED EDTA AND SWIRLED-LET SIT OVERNIGHT TO DIGEST.
3	08/15/13 15:05	PREP	LWALKER	FOLLOWED STEPS 12.1 TO 12.7 IN AP-007 REV 18 (CHEMICAL CLEANUP FOR RA 228)

L. Walker
8/15/13

EBERLINE SERVICES

Work Order Analysis Notes

Oak Ridge Laboratory
601 Scarboro Rd.
Oak Ridge, TN 37830
Voice: 865.481.0683
www.eberlineservices.com

Internal Work Order	13-07170
Analysis Code	Ra228
Run Number	1

#	Date	Dept	User	Notes
1	08/08/13 11:30	PREP	JWOLFE	ALIQUOTED AND ADDED SPIKES AND TRACERS- PH'D SAMPLES- PRECIPITATED WITH BA AND PB CARRIERS AND AMMONIUM SULFATE- DECANTED SAMPLES AND CENTRIFUGED- SUBMITTED RADIUM PRECIP TO SEPARATIONS
2	08/13/13 12:17	PREP	LWALKER	RECEIVED FILTERS BACK FROM COUNT ROOM-PUT BACK INTO C-TUBES-ADDED EDTA AND SWIRLED-LET SIT OVERNIGHT TO DIGEST.
3	08/15/13 15:05	PREP	LWALKER	FOLLOWED STEPS 12.1 TO 12.7 IN AP-007 REV 18 (CHEMICAL CLEANUP FOR RA 228)
4	08/19/13 08:57	CHEM	TSMITH	Followed steps 12.7 to 12.15 in AP-007 rev. 17 . (Precipitated samples, hot bathed, centrifuged, and discarded supernate. Dissolved precip, precipitated samples, hot bathed, centrifuged, and discarded supernate. Dissolved precip, precipitated and filtered samples, obtained final weights, covered with aluminum foil, and took to count room)

8-19-13

EBERLINE SERVICES

Reagents Used in an Analysis

Internal Work Order	
13-07170	
Analysis Code	Run
Ra228	1

Reagent ID	Reagent Name	Reagent Concentration	Analyst ID	Date Recorded
013376P	Ammonium Hydroxide	Reagent Grade	JWOLFE	8/8/2013
013930D03	Ammonium Sulfate	200 mg/ml	JWOLFE	8/8/2013
014007D02	Barium Carrier	1 mg/ml	JWOLFE	8/8/2013
014109P	Nitric Acid	Reagent Grade	JWOLFE	8/8/2013
013965D01	Lead Carrier	166 mg/ml	JWOLFE	8/8/2013
011504D33	Ammonium Sulfide	2%	LWALKER	8/15/2013
014008D03	Lead Carrier	1.5 mg/ml	LWALKER	8/15/2013
014109P	Nitric Acid	Reagent Grade	LWALKER	8/15/2013
013065D10	Sodium Hydroxide	10M	LWALKER	8/15/2013
013955D01	Yttrium Carrier	9 mg/ml	LWALKER	8/15/2013
013763D02	Ammonium Oxalate	5%	TSMITH	8/19/2013
013910D07	Nitric Acid	1N	TSMITH	8/19/2013
014110D04	Nitric Acid	6N	TSMITH	8/19/2013
013065D10	Sodium Hydroxide	10M	TSMITH	8/19/2013
013065D09	Sodium Hydroxide	18M	TSMITH	8/19/2013

Date	Sample #	Client	Load Time	Count Time	Analysis	Tech
8/15/13	1307154RA(2-13)	EnyMan	0752	2h	RA8	C
8/15/13	1307121546-9)	ERK	0959	2h	SRgal	C
8/15/13	1307157A1X(2-9)	Montgomery	0959	2h	LIB	C
8/15/13	1308005NP(1-4)	UCOR	1700	10min	NP272	C
8/15/13	1308061CL(1.3,5)	UCOR	1505	30mins.	CL36	KC
8/15/13	1308063CL(1.3,5)	UCOR	1506	30mins.	CL36	KC
8/16/13	EFFQC	LAB	0720	3m	LIB	C
8/16/13	BLKQC	LAB	~~0721~~ 0672	6m	LIB	C
8/16/13	1308042RA(1-4)	UCOR	0810	2h	RA8	C
8/16/13	1308043RA(1-4)	UCOR	0810	2h	RA8	C
8/16/13	1307184RA(2-5)	Cal Energy	0810	2h	RA8	C
8/16/13	1308042Pb(1-4)	UCOR	1018	2h	Pb210	C
8/16/13	1308043Pb(1-4)	UCOR	1018	2h	Pb210	C
8/16/13	1308061Pb(1-4)	UCOR	1018	2h	Pb210	C
8/16/13	1307157RA(1,2,4-12,15)	EnyMan	1700	2h	RA8	C
~~8/16/13~~	~~1308061NP(1-4)~~	~~UCOR~~	~~0814~~	~~10m~~	~~NP272~~	~~C~~
8/16/13	1307142AB(2-13)	Accutest	1519	2HR	GAB	AC
8/17/13	Weekly Bkgd	Lab	1421	12HR	αB	AC
8/19/13	EFFQC	LAB	0820	3m	LIB	C
8/19/13	BLKQC	LAB	0822	6m	LIB	C
8/19/13	1307157RA(1-11)	Montgomery	0742	2h	RA8	C
8/19/13	1307170RA(1-10)	EnyMan	1015	2h	RA8	C

SECTION VIII

ANALYTICAL DATA (ISOTOPIC URANIUM)

Work Order	13-07170
Analysis Code	UUISO
Run	1
Date Received	7/29/2013
Lab Deadline	8/16/2013
Client	Engineering Management Support, Inc.
Project	West Lake OU-1
Report Level	4
Activity Units	pCi
Aliquot Units	l
Matrix	WA
Method	HASL 300, 4.5.2
Instrument Type	Alpha Spectroscopy
Radiometric Tracer	U-232
Radiometric Sol#	U-10a
Tracer Act (dpm/g)	19.04
Carrier	
Carrier Conc (mg/ml)	

Internal Fraction	Sample Desc	Client ID	Login CPM	Sample Date	Sample Aliquot
01	LCS	LCS		07/29/13 00:00	1.0000E+00
02	MBL	BLANK		07/29/13 00:00	1.0000E+00
03	DUP	PZ-100-KS TOT	40	07/23/13 07:45	1.0000E+00
04	TRG	PZ-305-AI TOT	45	07/22/13 10:41	1.0000E+00
05	TRG	PZ-305-AI DIS	45	07/22/13 10:41	1.0000E+00
06	TRG	LR-104 TOT	43	07/22/13 11:45	1.0000E+00
07	TRG	LR-104 DIS	43	07/22/13 11:45	1.0000E+00
08	DO	PZ-100-KS TOT	40	07/23/13 07:45	1.0000E+00
09	TRG	PZ-100-KS DIS	40	07/23/13 07:45	1.0000E+00
10	TRG	PURGE TANK TOT	39	07/23/13 06:40	1.0000E+00

* SAF1 is used for Gross Alpha and all other radionuclides. SAF2 is used for Gross Beta only. ** Actual mass exceeded the calibration curve range. Results should be qualified as appropriate.

13-07170
UUISO
Run 1

Internal Fraction	*Sample Desc*	*Tracer Aliquot (g)*	*Tracer Total ACT (dpm)*	*Radiometric Tracer (pCi)*	*Radiometric % Rec*	*Grav Carrier Added (ml)*	*Grav Filter Tare (g)*	*Grav Filter Final (g)*	*Grav Filter Net (g)*	*Grav % Rec*	*Mean % Rec*	*SAF 1**	*SAF 2**
01	LCS	0.6148	11.7		0.00								
02	MBL	0.6079	11.6		0.00								
03	DUP	0.6080	11.6		0.00								
04	TRG	0.6046	11.5		0.00								
05	TRG	0.6088	11.6		0.00								
06	TRG	0.6047	11.5		0.00								
07	TRG	0.6034	11.5		0.00								
08	DO	0.6033	11.5		0.00								
09	TRG	0.6042	11.5		0.00								
10	TRG	0.6023	11.5		0.00								

* SAF1 is used for Gross Alpha and all other radionuclides. SAF2 is used for Gross Beta only. ** Actual mass exceeded the calibration curve range. Results should be qualified as appropriate.

13-07170
UUISO
Run 1

Internal Fraction	Sample Desc	Rough Prep Date	Rough Prep By	Prep Date	Prep By	Sep t0 Date/Time	Sep t0 By	Sep t1 Date/Time	Sep t1 By
01	LCS			08/09/13 07:16	JWOLFE	08/15/13 11:40	JDEMELAS		
02	MBL			08/09/13 07:16	JWOLFE	08/15/13 11:40	JDEMELAS		
03	DUP			08/09/13 07:16	JWOLFE	08/15/13 11:40	JDEMELAS		
04	TRG			08/09/13 07:16	JWOLFE	08/15/13 11:40	JDEMELAS		
05	TRG			08/09/13 07:16	JWOLFE	08/15/13 11:40	JDEMELAS		
06	TRG			08/09/13 07:16	JWOLFE	08/15/13 11:40	JDEMELAS		
07	TRG			08/09/13 07:16	JWOLFE	08/15/13 11:40	JDEMELAS		
08	DO			08/09/13 07:16	JWOLFE	08/15/13 11:40	JDEMELAS		
09	TRG			08/09/13 07:16	JWOLFE	08/15/13 11:40	JDEMELAS		
10	TRG			08/09/13 07:16	JWOLFE	08/15/13 11:40	JDEMELAS		

* SAF1 is used for Gross Alpha and all other radionuclides. SAF2 is used for Gross Beta only. ** Actual mass exceeded the calibration curve range. Results should be qualified as appropriate.

Preliminary Data Report & Analytical Calculations

Work Order: 13-07170-UUISO-1

Client: Engineering Management Support, Inc.
Eberline Services Work Order: 13-07170
Analysis Code: UUISO
Run: 1

Lab Fraction	Nuclide	Sample Desc	Client Identification	Activity Units	Results	Error Estimate	MDA	LCS Known	LCS %R	LCS Flag	RPD Flag	MDA Flag	Blank Flag
01	U-234	LCS	LCS	pCi/l	8.18E+00	1.17E+00	9.22E-02	8.18E+00	99.96	OK		OK	
02	U-234	MBL	BLANK	pCi/l	9.53E-02	7.93E-02	9.22E-02					OK	OK
03	U-234	DUP	PZ-100-KS TOT	pCi/l	1.95E-02	3.71E-02	6.87E-02				NA	OK	
04	U-234	TRG	PZ-305-AI TOT	pCi/l	8.72E-02	9.02E-02	1.14E-01					OK	
05	U-234	TRG	PZ-305-AI DIS	pCi/l	1.26E-01	1.03E-01	1.14E-01					OK	
06	U-234	TRG	LR-104 TOT	pCi/l	2.94E+00	5.76E-01	1.11E-01					OK	
07	U-234	TRG	LR-104 DIS	pCi/l	2.35E+00	1.12E+00	5.23E-01					OK	
08	U-234	DO	PZ-100-KS TOT	pCi/l	4.76E-02	6.05E-02	9.04E-02					OK	
09	U-234	TRG	PZ-100-KS DIS	pCi/l	4.69E-02	4.84E-02	5.11E-02					OK	
10	U-234	TRG	PURGE TANK TOT	pCi/l	1.74E+00	7.59E-01	3.72E-01					OK	

Run: 1
Analysis Code: UUISO
Eberline Services Work Order: 13-07170
Client: Engineering Management Support, Inc.

Lab Fraction	Nuclide	Sample Desc	Sample Date	Sample Aliquot	Radiometric % Rec	Grav % Rec	Mean % Rec	SAF	Sep t0 Date/Time	Sep t1 Date/Time
01	U-234	LCS	07/29/13 00:00	1.00E+00	104.08	0.00	0.00		8/15/2013 11:40	
02	U-234	MBL	07/29/13 00:00	1.00E+00	123.88	0.00	0.00		8/15/2013 11:40	
03	U-234	DUP	07/23/13 07:45	1.00E+00	118.62	0.00	0.00		8/15/2013 11:40	
04	U-234	TRG	07/22/13 10:41	1.00E+00	76.88	0.00	0.00		8/15/2013 11:40	
05	U-234	TRG	07/22/13 10:41	1.00E+00	84.50	0.00	0.00		8/15/2013 11:40	
06	U-234	TRG	07/22/13 11:45	1.00E+00	87.21	0.00	0.00		8/15/2013 11:40	
07	U-234	TRG	07/22/13 11:45	1.00E+00	14.73	0.00	0.00		8/15/2013 11:40	
08	U-234	DO	07/23/13 07:45	1.00E+00	123.95	0.00	0.00		8/15/2013 11:40	
09	U-234	TRG	07/23/13 07:45	1.00E+00	117.40	0.00	0.00		8/15/2013 11:40	
10	U-234	TRG	07/23/13 06:40	1.00E+00	23.08	0.00	0.00		8/15/2013 11:40	

Preliminary Data Report & Analytical Calculations

Work Order: 13-07170-UUISO-1

Run: 1
Analysis Code: UUISO
Eberline Services Work Order: 13-07170
Client: Engineering Management Support, Inc.

Lab Fraction	Nuclide	Sample Desc	Counting Date/Time	Halflife (days)	Detect	Carrier	Count Time	Counts	Bkg CPM	Eff
01	U-234	LCS	08/15/13 12:41		A_Spec	Alpha_019	170.02	5.32 E+02	0.00 E+00	16.6
02	U-234	MBL	08/15/13 12:41		A_Spec	Alpha_022	170.02	6.81 E+00	7.00 E-03	15.3
03	U-234	DUP	08/15/13 12:41		A_Spec	Alpha_023	170	1.49 E+00	3.00 E-03	17.1
04	U-234	TRG	08/15/13 12:41		A_Spec	Alpha_024	170.02	4.32 E+00	4.00 E-03	17.1
05	U-234	TRG	08/15/13 12:41		A_Spec	Alpha_025	170.02	6.98 E+00	6.00 E-03	17.4
06	U-234	TRG	08/15/13 12:41		A_Spec	Alpha_027	170	1.67 E+02	6.00 E-03	17.3
07	U-234	TRG	08/15/13 12:41		A_Spec	Alpha_029	170	2.53 E+01	4.00 E-03	19.5
08	U-234	DO	08/15/13 12:41		A_Spec	Alpha_031	170.02	3.15 E+00	5.00 E-03	14.2
09	U-234	TRG	08/15/13 12:41		A_Spec	Alpha_033	170	3.83 E+00	1.00 E-03	18.5
10	U-234	TRG	08/15/13 12:41		A_Spec	Alpha_034	170	2.80 E+01	0.00 E+00	18.6

Preliminary Data Report & Analytical Calculations

Work Order: 13-07170-UUISO-1

Client: Engineering Management Support, Inc.
Eberline Services Work Order: 13-07170
Analysis Code: UUISO
Run: 1

Lab Fraction	Nuclide	Sample Desc	Client Identification	Activity Units	Results	Error Estimate	MDA	LCS Known	LCS %R	LCS Flag	RPD Flag	MDA Flag	Blank Flag
01	U-238	LCS	LCS	pCi/l	8.26E+00	1.18E+00	8.03E-02	7.97E+00	103.55	OK		OK	
02	U-238	MBL	BLANK	pCi/l	5.34E-02	5.51E-02	5.81E-02					OK	OK
03	U-238	DUP	PZ-100-KS TOT	pCi/l	5.19E-02	5.84E-02	8.21E-02				NA	OK	
04	U-238	TRG	PZ-305-AI TOT	pCi/l	4.66E-02	6.98E-02	1.13E-01					OK	
05	U-238	TRG	PZ-305-AI DIS	pCi/l	-3.06E-03	3.58E-02	7.52E-02					OK	
06	U-238	TRG	LR-104 TOT	pCi/l	2.02E+00	4.46E-01	1.05E-01					OK	
07	U-238	TRG	LR-104 DIS	pCi/l	1.24E+00	7.57E-01	4.84E-01					OK	
08	U-238	DO	PZ-100-KS TOT	pCi/l	-1.85E-02	4.71E-02	1.37E-01					OK	
09	U-238	TRG	PZ-100-KS DIS	pCi/l	3.24E-02	4.19E-02	5.83E-02					OK	
10	U-238	TRG	PURGE TANK TOT	pCi/l	9.05E-01	5.10E-01	2.95E-01					OK	

Client: Engineering Management Support, Inc.
Eberline Services Work Order: 13-07170
Analysis Code: UUISO
Run: 1

Lab Fraction	Nuclide	Sample Desc	Sample Date	Sample Aliquot	Radiometric % Rec	Grav % Rec	Mean % Rec	SAF	Sep t0 Date/Time	Sep t1 Date/Time
01	U-238	LCS	07/29/13 00:00	1.00E+00	104.08	0.00	0.00		8/15/2013 11:40	
02	U-238	MBL	07/29/13 00:00	1.00E+00	123.88	0.00	0.00		8/15/2013 11:40	
03	U-238	DUP	07/23/13 07:45	1.00E+00	118.62	0.00	0.00		8/15/2013 11:40	
04	U-238	TRG	07/22/13 10:41	1.00E+00	76.88	0.00	0.00		8/15/2013 11:40	
05	U-238	TRG	07/22/13 10:41	1.00E+00	84.50	0.00	0.00		8/15/2013 11:40	
06	U-238	TRG	07/22/13 11:45	1.00E+00	87.21	0.00	0.00		8/15/2013 11:40	
07	U-238	TRG	07/22/13 11:45	1.00E+00	14.73	0.00	0.00		8/15/2013 11:40	
08	U-238	DO	07/23/13 07:45	1.00E+00	123.95	0.00	0.00		8/15/2013 11:40	
09	U-238	TRG	07/23/13 07:45	1.00E+00	117.40	0.00	0.00		8/15/2013 11:40	
10	U-238	TRG	07/23/13 06:40	1.00E+00	23.08	0.00	0.00		8/15/2013 11:40	

Run: 1
Analysis Code: UUISO
Eberline Services Work Order: 13-07170
Client: Engineering Management Support, Inc.

Lab Fraction	Nuclide	Sample Desc	Counting Date/Time	Halflife (days)	Detect	Carrier	Count Time	Counts	Bkg CPM	Eff
01	U-238	LCS	08/15/13 12:41		A_Spec	Alpha_019	170.02	5.39 E+02	3.00 E-03	16.6
02	U-238	MBL	08/15/13 12:41		A_Spec	Alpha_022	170.02	3.83 E+00	1.00 E-03	15.3
03	U-238	DUP	08/15/13 12:41		A_Spec	Alpha_023	170	3.98 E+00	6.00 E-03	17.1
04	U-238	TRG	08/15/13 12:41		A_Spec	Alpha_024	170.02	2.32 E+00	4.00 E-03	17.1
05	U-238	TRG	08/15/13 12:41		A_Spec	Alpha_025	170.02	-1.70 E-01	1.00 E-03	17.4
06	U-238	TRG	08/15/13 12:41		A_Spec	Alpha_027	170	1.15 E+02	5.00 E-03	17.3
07	U-238	TRG	08/15/13 12:41		A_Spec	Alpha_029	170	1.35 E+01	3.00 E-03	19.5
08	U-238	DO	08/15/13 12:41		A_Spec	Alpha_031	170.02	-1.23 E+00	1.90 E-02	14.2
09	U-238	TRG	08/15/13 12:41		A_Spec	Alpha_033	170	2.66 E+00	2.00 E-03	18.5
10	U-238	TRG	08/15/13 12:41		A_Spec	Alpha_034	170	1.47 E+01	2.00 E-03	18.6

Preliminary Data Report & Analytical Calculations

Work Order: 13-07170-UUISO-1

Client: Engineering Management Support, Inc.
Eberline Services Work Order: 13-07170
Analysis Code: UUISO
Run: 1

Lab Fraction	Nuclide	Sample Desc	Client Identification	Activity Units	Results	Error Estimate	MDA	LCS Known	LCS %R	LCS Flag	RPD Flag	MDA Flag	Blank Flag
01	U-235	LCS	LCS	pCi/l	7.78E-01	2.57E-01	1.14E-01					OK	
02	U-235	MBL	BLANK	pCi/l	4.26E-02	7.00E-02	1.23E-01					OK	OK
03	U-235	DUP	PZ-100-KS TOT	pCi/l	3.75E-02	5.60E-02	9.11E-02				NA	OK	
04	U-235	TRG	PZ-305-AI TOT	pCi/l	2.44E-02	7.20E-02	1.57E-01					OK	
05	U-235	TRG	PZ-305-AI DIS	pCi/l	4.47E-02	7.60E-02	1.34E-01					OK	
06	U-235	TRG	LR-104 TOT	pCi/l	1.37E-01	1.15E-01	1.23E-01					OK	
07	U-235	TRG	LR-104 DIS	pCi/l	5.60E-02	2.34E-01	6.00E-01					OK	
08	U-235	DO	PZ-100-KS TOT	pCi/l	4.96E-02	6.41E-02	8.91E-02					OK	
09	U-235	TRG	PZ-100-KS DIS	pCi/l	7.03E-02	6.70E-02	7.22E-02					OK	
10	U-235	TRG	PURGE TANK TOT	pCi/l	7.65E-02	2.13E-01	4.59E-01					OK	

Preliminary Data Report & Analytical Calculations

Work Order: 13-07170-UUISO-1

Run: 1
Analysis Code: UUISO
Eberline Services Work Order: 13-07170
Client: Engineering Management Support, Inc.

Lab Fraction	Nuclide	Sample Desc	Sample Date	Sample Aliquot	Radiometric % Rec	Grav % Rec	Mean % Rec	SAF	Sep t0 Date/Time	Sep t1 Date/Time
01	U-235	LCS	07/29/13 00:00	1.00E+00	104.08	0.00	0.00		8/15/2013 11:40	
02	U-235	MBL	07/29/13 00:00	1.00E+00	123.88	0.00	0.00		8/15/2013 11:40	
03	U-235	DUP	07/23/13 07:45	1.00E+00	118.62	0.00	0.00		8/15/2013 11:40	
04	U-235	TRG	07/22/13 10:41	1.00E+00	76.88	0.00	0.00		8/15/2013 11:40	
05	U-235	TRG	07/22/13 10:41	1.00E+00	84.50	0.00	0.00		8/15/2013 11:40	
06	U-235	TRG	07/22/13 11:45	1.00E+00	87.21	0.00	0.00		8/15/2013 11:40	
07	U-235	TRG	07/22/13 11:45	1.00E+00	14.73	0.00	0.00		8/15/2013 11:40	
08	U-235	DO	07/23/13 07:45	1.00E+00	123.95	0.00	0.00		8/15/2013 11:40	
09	U-235	TRG	07/23/13 07:45	1.00E+00	117.40	0.00	0.00		8/15/2013 11:40	
10	U-235	TRG	07/23/13 06:40	1.00E+00	23.08	0.00	0.00		8/15/2013 11:40	

Preliminary Data Report & Analytical Calculations

Work Order: 13-07170-UUISO-1

Run: 1
Analysis Code: UUISO
Eberline Services Work Order: 13-07170
Client: Engineering Management Support, Inc.

Lab Fraction	Nuclide	Sample Desc	Counting Date/Time	Halflife (days)	Detect	Carrier	Count Time	Counts	Bkg CPM	Eff
01	U-235	LCS	08/15/13 12:41		A_Spec	Alpha_019	170.02	4.10 E+01	0.00 E+00	16.6
02	U-235	MBL	08/15/13 12:41		A_Spec	Alpha_022	170.02	2.47 E+00	9.00 E-03	15.3
03	U-235	DUP	08/15/13 12:41		A_Spec	Alpha_023	170	2.32 E+00	4.00 E-03	17.1
04	U-235	TRG	08/15/13 12:41		A_Spec	Alpha_024	170.02	9.80 E-01	6.00 E-03	17.1
05	U-235	TRG	08/15/13 12:41		A_Spec	Alpha_025	170.02	2.00 E+00	0.00 E+00	17.4
06	U-235	TRG	08/15/13 12:41		A_Spec	Alpha_027	170	6.32 E+00	4.00 E-03	17.3
07	U-235	TRG	08/15/13 12:41		A_Spec	Alpha_029	170	4.90 E-01	3.00 E-03	19.5
08	U-235	DO	08/15/13 12:41		A_Spec	Alpha_031	170.02	2.66 E+00	2.00 E-03	14.2
09	U-235	TRG	08/15/13 12:41		A_Spec	Alpha_033	170	4.66 E+00	2.00 E-03	18.5
10	U-235	TRG	08/15/13 12:41		A_Spec	Alpha_034	170	1.00 E+00	0.00 E+00	18.6

Count Room Report
Client: Engineering Management Su

13-07170-UUISO-1 (pCi/l) in WA
Tracer ID: U-10a

Internal Fraction	Sample Desc	Client ID	Sample Date	Sample Aliquot	Tracer Aliquot (g)	Tracer ACT (dpm)	Radiometric Tracer (pCi)	Radiometric % Rec	SAF 1*	SAF 2*
01	LCS	LCS	07/29/13 00:00	1.0000	0.6148	11.7058		0.00		
02	MBL	BLANK	07/29/13 00:00	1.0000	0.6079	11.5744		0.00		
03	DUP	PZ-100-KS TOT	07/23/13 07:45	1.0000	0.6080	11.5763		0.00		
04	TRG	PZ-305-AI TOT	07/22/13 10:41	1.0000	0.6046	11.5116		0.00		
05	TRG	PZ-305-AI DIS	07/22/13 10:41	1.0000	0.6088	11.5916		0.00		
06	TRG	LR-104 TOT	07/22/13 11:45	1.0000	0.6047	11.5135		0.00		
07	TRG	LR-104 DIS	07/22/13 11:45	1.0000	0.6034	11.4887		0.00		
08	DO	PZ-100-KS TOT	07/23/13 07:45	1.0000	0.6033	11.4868		0.00		
09	TRG	PZ-100-KS DIS	07/23/13 07:45	1.0000	0.6042	11.5040		0.00		
10	TRG	PURGE TANK TOT	07/23/13 06:40	1.0000	0.6023	11.4678		0.00		

Spike and Tracer Worksheet

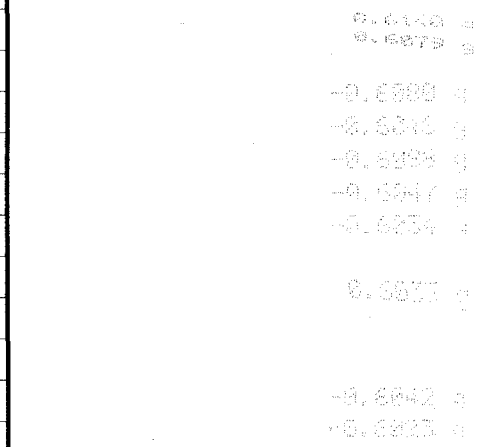
Internal Work Order	Run	Analysis Code	Date	Technician	Technician Initials	Witness Initials
13-07170	1	UUISO	8/9/2013 7:15	JWOLFE	JW	

LCS & Matrix Spikes					LCS	MS	LCSD	MSD	LCS		MS		LCSD		MSD	
Isotope	*Sol #*	*Activity dpm/g*	*Solution Date*	*Approx Addition*	*Volume Used (g)*	*Volume Used (g)*	*Volume Used (g)*	*Volume Used (g)*	*Known pCi*	*Error Estimate*	*Added pCi*	*Error Estimate*	*Known pCi*	*Error Estimate*	*Added pCi*	*Error Estimate*
U-234	U-8a	35.240	8/9/2013	0.500	0.5154				8.18	0.295	0.00	0.000	0.00	0.000	0.00	0.000
U-238	U-8a	34.350	8/9/2013	0.500	0.5154				7.97	0.287	0.00	0.000	0.00	0.000	0.00	0.000

Tracers						
fraction	*Isotope*	*Sol #*	*Activity dpm/g*	*Solution Date*	*Volume Used (g)*	*Approx Addition*
01	U-232	U-10a	19.040	8/9/2013	0.6148	0.6300
02	U-232	U-10a	19.040	8/9/2013	0.6079	0.6300
03	U-232	U-10a	19.040	8/9/2013	0.6080	0.6300
04	U-232	U-10a	19.040	8/9/2013	0.6046	0.6300
05	U-232	U-10a	19.040	8/9/2013	0.6088	0.6300
06	U-232	U-10a	19.040	8/9/2013	0.6047	0.6300
07	U-232	U-10a	19.040	8/9/2013	0.6034	0.6300
08	U-232	U-10a	19.040	8/9/2013	0.6033	0.6300
09	U-232	U-10a	19.040	8/9/2013	0.6042	0.6300
10	U-232	U-10a	19.040	8/9/2013	0.6023	0.6300

Balance Printer Tapes

Tracer



LCS

Matrix Spike

Eberline Analytical
Oak Ridge Laboratory

Aliquot Worksheet

Printed: 8/9/2013 7:16 AM

Work Order	Run	Analysis Code	Rpt Units	Lab Deadline	Technician
13-07170	1	UUISO	liters	8/16/2013	JWOLFE

Lab Fraction	Engineering Management Support, Inc. Client ID	Sample Type	Muffle Data	Dilution Data			Aliquot Data		MS Aliquot Data		H-3 Solids Only	
			Ratio Post/Pre	No of Dils	Dil Factor	Ratio	Aliquot	Net Equiv	Aliquot	Net Equiv	Water Added (ml)	H3 Dist Aliq
01	LCS	LCS					1.0000E+00	1.0000E+00				
02	BLANK	MBL					1.0000E+00	1.0000E+00				
03	PZ-100-KS TOT	DUP					1.0000E+00	1.0000E+00				
04	PZ-305-AI TOT	TRG					1.0000E+00	1.0000E+00				
05	PZ-305-AI DIS	TRG					1.0000E+00	1.0000E+00				
06	LR-104 TOT	TRG					1.0000E+00	1.0000E+00				
07	LR-104 DIS	TRG					1.0000E+00	1.0000E+00				
08	PZ-100-KS TOT	DO					1.0000E+00	1.0000E+00				
09	PZ-100-KS DIS	TRG					1.0000E+00	1.0000E+00				
10	PURGE TANK TOT	TRG					1.0000E+00	1.0000E+00				

Comments	

Technician: JWolfe Date: 8/9/13

KD 9/15/13

Apex-Alpha™

Sample Description: SPIKE
Spectrum File: \\OR-ALPHA1\Canberra\ApexAlpha\Root\Data\00000662
Batch Identification: 1307170A-UU
Sample Identification: 01
Sample Geometry: Shelf 2
Procedure Description: U iso

Detector Name: Alpha_019
Chamber Serial Number:
Detector Serial Number: 19
Env. Background: System Bkgd 64773
Reagent Blank: <not performed>

Sample Size: 1.000E+000 +/- 0.000E+000 liter
Sample Date/Time: 8/15/2013 12:02:00 PM
Acquisition Date/Time: 8/15/2013 12:41:13 PM
Acquisition Live Time: 170.0 minutes
Acquisition Real Time: 170.0 minutes

Tracer Certificate: U232_UU-10A
Tracer Quantity: 0.615 mL
Effective Efficiency: 0.1727 +/- 0.0102
Counting Efficiency: 0.1659 +/- 0.0029 on 2/17/2013 10:45:23 AM
Chem. Recovery Factor: 1.0408 +/- 0.0639

Control Certificate Name: NatU_U-8A
Chem. Recov. of Control: U-238 1.009411 +/- 0.079581
Peak Match Tolerance: 0.150 MeV

PEAK AREA REPORT

Nuclide		Energy (MeV)	Net Pk Area	Pk Area Error %	Ambient Backgnd	Reagent Backgnd	FWHM (keV)
U-232	T	5.246	341.66	10.61	0.34	0.00E+000	10.8
U-234		4.707	532.00	8.51	0.00	0.00E+000	12.3
U-235		4.399	41.00	30.98	0.00	0.00E+000	6.1
U-238		4.126	539.49	8.44	0.51	0.00E+000	13.4

T = Tracer Peak used for Effective Efficiency

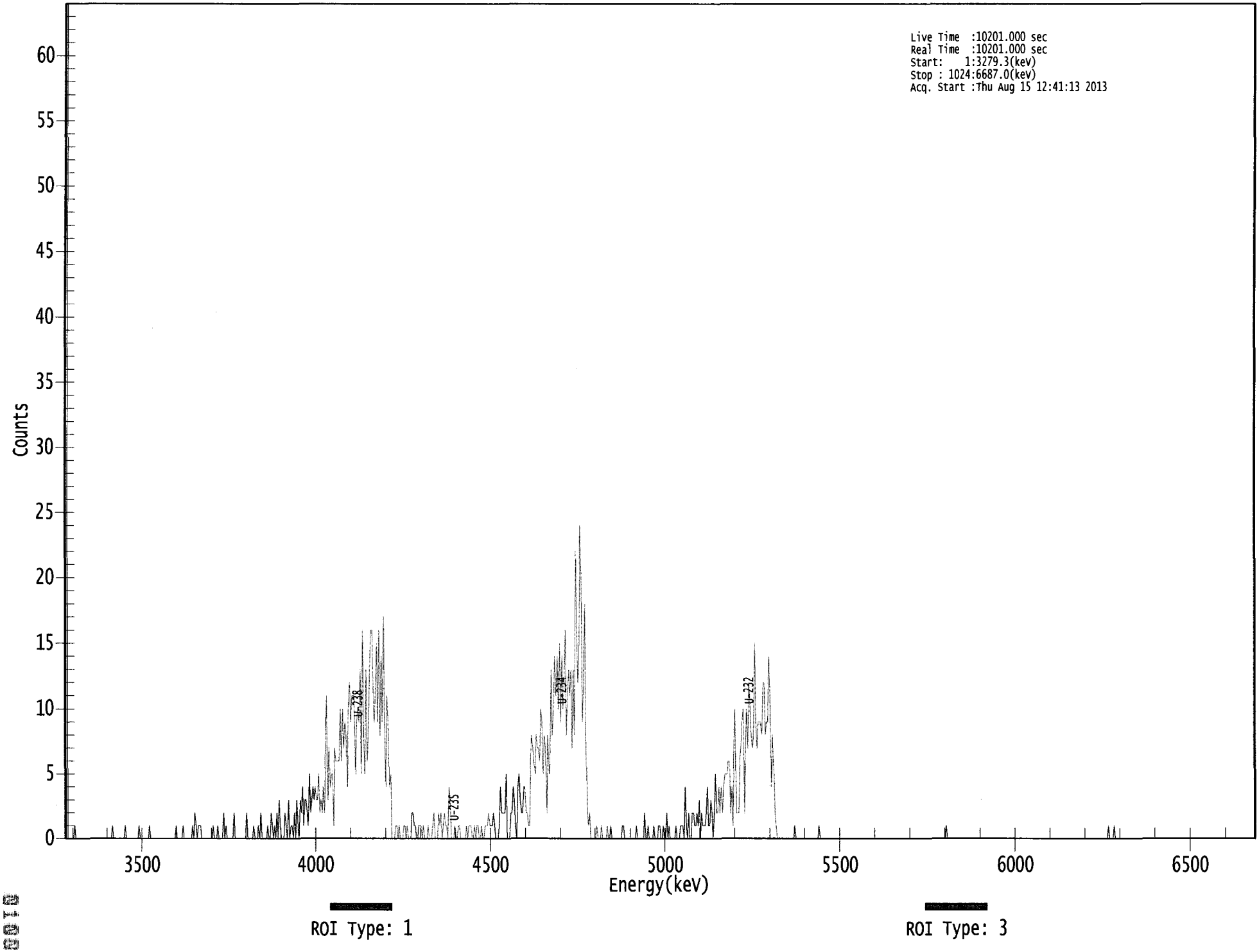
NUCLIDE ANALYSIS RESULTS

Nuclide	Id Conf.	Energy (keV)	Activity (pCi/liter)	MDA (pCi/liter)
U-232	0.978	5302.50*	5.25E+000 +/- 6.06E-001	7.35E-002 +/- 8.47E-003
U-234	0.979	4761.50*	8.18E+000 +/- 1.17E+000	9.22E-002 +/- 1.06E-002
U-235	0.999	4385.50*	7.78E-001 +/- 2.57E-001	1.14E-001 +/- 1.31E-002
U-238	0.976	4184.40*	8.26E+000 +/- 1.18E+000	8.03E-002 +/- 9.26E-003

AG
8/16/13

US EPA ARCHIVE DOCUMENT

0000066262.CNF



****
***** S P E C T R A L D A T A R E P O R T *****
****

Sample Title: 01

Elapsed Live time: 10201
Elapsed Real Time: 10201

Channel								
1:	10201	10201	0	0	0	0	0	0
9:	1	0	0	0	0	0	0	0
17:	0	0	0	0	0	0	0	0
25:	0	0	0	0	0	0	0	0
33:	0	0	0	0	0	0	0	0
41:	0	1	0	0	0	0	0	0
49:	0	0	0	0	1	0	0	0
57:	0	0	0	0	0	0	0	0
65:	1	0	0	0	0	0	0	0
73:	0	1	0	0	0	0	0	0
81:	0	0	0	0	0	0	0	0
89:	0	0	0	0	0	0	0	0
97:	1	0	0	0	0	0	1	0
105:	0	0	0	0	0	0	1	0
113:	2	1	0	1	1	1	0	0
121:	0	0	0	0	0	0	0	0
129:	1	0	0	0	1	0	0	0
137:	0	2	0	1	0	0	0	0
145:	0	0	2	0	0	0	0	0
153:	0	0	0	0	0	2	0	0
161:	0	0	0	1	0	0	0	1
169:	0	2	0	0	0	0	0	1
177:	0	0	2	1	0	1	0	2
185:	0	3	1	0	0	0	2	1
193:	0	3	0	1	1	0	2	0
201:	3	1	0	3	2	4	1	3
209:	3	2	1	5	2	3	4	3
217:	4	3	3	5	2	3	2	4
225:	2	7	11	3	7	4	5	5
233:	1	7	6	6	6	6	10	6
241:	10	7	9	8	4	10	12	9
249:	11	11	11	5	9	10	9	13
257:	5	16	8	5	13	6	8	13
265:	16	16	12	9	11	15	9	16
273:	8	14	9	17	9	4	11	9
281:	4	5	0	0	0	1	1	0
289:	1	0	0	0	1	1	0	1
297:	0	0	0	2	2	1	1	0
305:	0	1	1	1	0	1	0	0
313:	0	1	0	0	0	1	2	0
321:	0	0	2	1	2	0	1	2
329:	1	1	0	4	3	0	0	0
337:	1	0	0	1	1	0	0	0
345:	0	0	1	0	1	1	1	0
353:	0	1	0	1	1	0	0	1
361:	0	0	1	1	1	2	1	1

369:	1	2	1	0	0	0	1	4

Sample Title: 01

Channel								
377:	2	2	2	2	5	0	0	0
385:	2	2	4	3	1	0	4	5
393:	3	2	2	4	4	2	2	1
401:	1	6	8	7	6	5	8	7
409:	7	6	10	9	5	8	7	2
417:	8	5	6	13	8	10	14	11
425:	14	10	15	9	14	10	12	16
433:	8	11	13	11	13	7	13	8
441:	22	16	12	14	24	19	9	12
449:	18	8	2	1	2	0	0	0
457:	0	0	1	0	0	0	1	0
465:	0	0	0	1	0	0	1	0
473:	0	0	0	0	0	0	0	0
481:	1	1	0	0	0	0	0	0
489:	0	0	0	0	1	0	0	0
497:	0	0	0	2	0	0	1	0
505:	0	0	0	1	0	0	0	1
513:	1	0	0	1	0	0	2	0
521:	1	0	0	0	0	0	1	0
529:	0	0	1	1	1	0	4	1
537:	0	2	0	0	2	2	1	1
545:	2	1	3	0	2	1	1	1
553:	2	4	1	1	3	2	0	2
561:	5	2	2	4	2	4	2	4
569:	5	5	5	6	6	2	4	1
577:	7	10	2	2	2	6	7	9
585:	10	2	7	10	7	12	10	8
593:	7	8	15	9	7	9	9	9
601:	8	12	12	8	9	9	14	11
609:	4	8	6	2	1	0	0	0
617:	0	0	0	0	0	0	0	0
625:	0	0	0	0	1	0	0	0
633:	0	0	0	0	0	0	0	0
641:	0	0	0	0	0	0	0	0
649:	0	1	0	0	0	0	0	0
657:	0	0	0	0	0	0	0	0
665:	0	0	0	0	0	0	0	0
673:	0	0	0	0	0	0	0	0
681:	0	0	0	0	0	0	0	0
689:	0	0	0	0	0	0	0	0
697:	0	0	0	0	0	0	0	0
705:	0	0	0	0	0	0	0	0
713:	0	0	0	0	0	0	0	0
721:	0	0	0	0	0	0	0	0
729:	0	0	0	0	0	0	0	0
737:	0	0	0	0	0	0	0	0
745:	0	0	0	0	0	0	0	0
753:	0	0	0	0	0	0	1	0
761:	0	0	0	0	0	0	0	0
769:	0	0	0	0	0	0	0	0
777:	0	0	0	0	0	0	0	0
785:	0	0	0	0	0	0	0	0
793:	0	0	0	0	0	0	0	0

801:	0	0	0	0	0	0	0	0

Sample Title: 01

Channel								
809:	0	0	0	0	0	0	0	0
817:	0	0	0	0	0	0	0	0
825:	0	0	0	0	0	0	0	0
833:	0	0	0	0	0	0	0	0
841:	0	0	0	0	0	0	0	0
849:	0	0	0	0	0	0	0	0
857:	0	0	0	0	0	0	0	0
865:	0	0	0	0	0	0	0	0
873:	0	0	0	0	0	0	0	0
881:	0	0	0	0	0	0	0	0
889:	0	0	0	0	0	0	0	0
897:	0	1	0	0	0	0	1	0
905:	0	0	0	0	0	0	0	0
913:	0	0	0	0	0	0	0	0
921:	0	0	0	0	0	0	0	0
929:	0	0	0	0	0	0	0	0
937:	0	0	0	0	0	0	0	0
945:	0	0	0	0	0	0	0	0
953:	0	0	0	0	0	0	0	0
961:	0	0	0	0	0	0	0	0
969:	0	0	0	0	0	0	0	0
977:	0	0	0	0	0	0	0	0
985:	0	0	0	0	0	0	0	0
993:	0	0	0	0	0	0	0	0
1001:	0	0	0	0	0	0	0	0
1009:	0	0	0	0	0	0	0	0
1017:	0	0	0	0	0	0	0	0

ICB 8/16/13

Apex-Alpha™

Sample Description: BLANK
Spectrum File: \\OR-ALPHA1\Canberra\ApexAlpha\Root\Data\00000662
Batch Identification: 1307170A-UU
Sample Identification: 02
Sample Geometry: Shelf 2
Procedure Description: U iso

Detector Name: Alpha_022
Chamber Serial Number:
Detector Serial Number: 22
Env. Background: System Bkgd 64774
Reagent Blank: <not performed>

Sample Size: 1.000E+000 +/- 0.000E+000 liter
Sample Date/Time: 8/15/2013 12:02:00 PM
Acquisition Date/Time: 8/15/2013 12:41:14 PM
Acquisition Live Time: 170.0 minutes
Acquisition Real Time: 170.0 minutes

Tracer Certificate: U232_UU-10A
Tracer Quantity: 0.608 mL
Effective Efficiency: 0.1897 +/- 0.0108
Counting Efficiency: 0.1531 +/- 0.0029 on 12/15/2012 1:57:26 PM
Chem. Recovery Factor: 1.2388 +/- 0.0744

Peak Match Tolerance: 0.150 MeV

PEAK AREA REPORT

Nuclide		Energy (MeV)	Net Pk Area	Pk Area Error %	Ambient Backgnd	Reagent Backgnd	FWHM (keV)
U-232	T	5.311	371.13	10.20	1.87	0.00E+000	38.0
U-234		4.742	6.81	82.43	1.19	0.00E+000	3.1
U-235		4.405	2.47	163.79	1.53	0.00E+000	3.1
U-238		4.119	3.83	102.72	0.17	0.00E+000	3.1

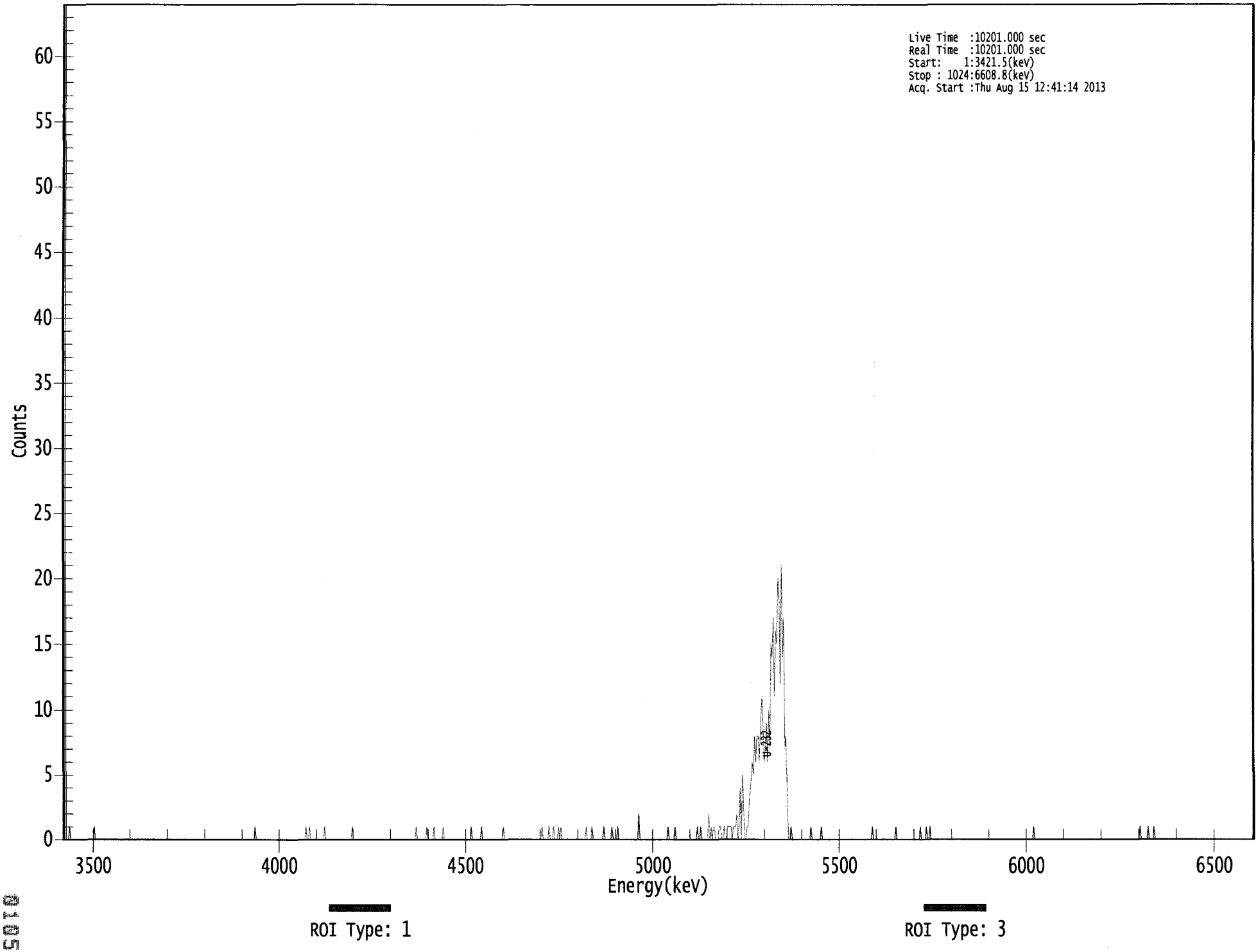
T = Tracer Peak used for Effective Efficiency

NUCLIDE ANALYSIS RESULTS

Nuclide	Id Conf.	Energy (keV)	Activity (pCi/liter)	MDA (pCi/liter)
U-232	1.000	5302.50*	5.19E+000 +/- 5.79E-001	1.06E-001 +/- 1.18E-002
U-234	0.997	4761.50*	9.53E-002 +/- 7.93E-002	9.22E-002 +/- 1.03E-002
U-235	0.997	4385.50*	4.26E-002 +/- 7.00E-002	1.23E-001 +/- 1.37E-002
U-238	0.970	4184.40*	5.34E-002 +/- 5.51E-002	5.81E-002 +/- 6.49E-003

AC 8/16/13

0000066263.CNF



5018 0105

****
***** S P E C T R A L D A T A R E P O R T *****
****

Sample Title: 02

Elapsed Live time: 10201
Elapsed Real Time: 10201

Channel								
1:	10201	10201	0	0	0	1	0	0
9:	0	0	0	0	0	0	0	0
17:	0	0	0	0	0	0	0	0
25:	0	0	1	0	0	0	0	0
33:	0	0	0	0	0	0	0	0
41:	0	0	0	0	0	0	0	0
49:	0	0	0	0	0	0	0	0
57:	0	0	0	0	0	0	0	0
65:	0	0	0	0	0	0	0	0
73:	0	0	0	0	0	0	0	0
81:	0	0	0	0	0	0	0	0
89:	0	0	0	0	0	0	0	0
97:	0	0	0	0	0	0	0	0
105:	0	0	0	0	0	0	0	0
113:	0	0	0	0	0	0	0	0
121:	0	0	0	0	0	0	0	0
129:	0	0	0	0	0	0	0	0
137:	0	0	0	0	0	0	0	0
145:	0	0	0	0	0	0	0	0
153:	0	0	0	0	0	0	0	0
161:	0	0	0	0	0	1	0	0
169:	0	0	0	0	0	0	0	0
177:	0	0	0	0	0	0	0	0
185:	0	0	0	0	0	0	0	0
193:	0	0	0	0	0	0	0	0
201:	0	0	0	0	0	0	0	0
209:	0	1	0	0	1	0	0	0
217:	0	0	0	0	0	0	0	0
225:	0	1	0	0	0	0	0	0
233:	0	0	0	0	0	0	0	0
241:	0	0	0	0	0	0	0	0
249:	0	1	0	0	0	0	0	0
257:	0	0	0	0	0	0	0	0
265:	0	0	0	0	0	0	0	0
273:	0	0	0	0	0	0	0	0
281:	0	0	0	0	0	0	0	0
289:	0	0	0	0	0	0	0	0
297:	0	0	0	0	0	0	0	0
305:	1	0	0	0	0	0	0	0
313:	0	1	0	0	0	0	0	1
321:	0	0	0	0	0	0	0	1
329:	0	0	0	0	0	0	0	0
337:	0	0	0	0	0	0	0	0
345:	0	0	0	0	0	0	0	1
353:	0	0	0	0	0	0	0	0
361:	1	0	0	0	0	0	0	0

369:	0	0	0	0	0	0	0	0

Sample Title: 02

Channel								
377:	0	0	0	1	0	0	0	0
385:	0	0	0	0	0	0	0	0
393:	0	0	0	0	0	0	0	0
401:	0	0	0	0	0	0	0	0
409:	0	0	0	0	1	0	0	0
417:	0	0	1	0	0	0	1	0
425:	0	0	1	0	1	0	0	0
433:	0	0	0	0	0	0	0	0
441:	0	0	0	0	0	0	0	0
449:	0	0	1	0	0	0	0	1
457:	0	0	0	0	0	0	0	0
465:	0	1	0	0	0	0	0	0
473:	1	0	0	0	0	1	0	0
481:	0	0	0	0	0	0	0	0
489:	0	0	0	0	0	0	0	2
497:	0	0	0	0	0	0	0	0
505:	0	0	0	0	0	0	0	0
513:	0	0	0	0	0	0	0	0
521:	1	0	0	0	0	0	1	0
529:	0	0	0	0	0	0	0	0
537:	0	0	0	0	0	0	0	0
545:	0	1	0	0	1	0	0	0
553:	0	0	0	2	0	1	0	1
561:	1	0	0	0	1	1	0	0
569:	1	0	0	1	1	1	1	0
577:	1	1	1	2	0	1	4	0
585:	5	3	0	0	1	1	3	4
593:	5	6	5	8	6	8	8	6
601:	9	11	9	6	7	9	6	10
609:	7	15	14	17	11	16	15	20
617:	19	12	21	14	17	7	8	2
625:	0	0	1	0	0	0	0	0
633:	0	0	0	0	0	0	0	0
641:	0	0	0	1	0	0	0	0
649:	0	0	0	0	1	0	0	0
657:	0	0	0	0	0	0	0	0
665:	0	0	0	0	0	0	0	0
673:	0	0	0	0	0	0	0	0
681:	0	0	0	0	0	0	0	0
689:	0	0	0	0	0	0	0	0
697:	1	0	0	0	0	0	0	0
705:	0	0	0	0	0	0	0	0
713:	0	0	0	0	1	0	0	0
721:	0	0	0	0	0	0	0	0
729:	0	0	0	0	0	0	0	0
737:	0	1	0	0	0	0	1	0
745:	0	1	0	0	0	0	0	0
753:	0	0	0	0	0	0	0	0
761:	0	0	0	0	0	0	0	0
769:	0	0	0	0	0	0	0	0
777:	0	0	0	0	0	0	0	0
785:	0	0	0	0	0	0	0	0
793:	0	0	0	0	0	0	0	0

801:	0	0	0	0	0	0	0	0

Sample Title: 02

Channel								
809:	0	0	0	0	0	0	0	0
817:	0	0	0	0	0	0	0	0
825:	0	0	0	0	0	0	0	0
833:	0	0	1	0	0	0	0	0
841:	0	0	0	0	0	0	0	0
849:	0	0	0	0	0	0	0	0
857:	0	0	0	0	0	0	0	0
865:	0	0	0	0	0	0	0	0
873:	0	0	0	0	0	0	0	0
881:	0	0	0	0	0	0	0	0
889:	0	0	0	0	0	0	0	0
897:	0	0	0	0	0	0	0	0
905:	0	0	0	0	0	0	0	0
913:	0	0	0	0	0	0	0	0
921:	0	0	0	0	0	1	0	0
929:	0	0	0	0	1	0	0	0
937:	0	1	0	0	0	0	0	0
945:	0	0	0	0	0	0	0	0
953:	0	0	0	0	0	0	0	0
961:	0	0	0	0	0	0	0	0
969:	0	0	0	0	0	0	0	0
977:	0	0	0	0	0	0	0	0
985:	0	0	0	0	0	0	0	0
993:	0	0	0	0	0	0	0	0
1001:	0	0	0	0	0	0	0	0
1009:	0	0	0	0	0	0	0	0
1017:	0	0	0	0	0	0	1	0

LCD 9/15/13

Apex-Alpha™

Sample Description: PZ-100-KS TOT DUP
Spectrum File: \\OR-ALPHA1\Canberra\ApexAlpha\Root\Data\00000662
Batch Identification: 1307170A-UU
Sample Identification: 03
Sample Geometry: Shelf 2
Procedure Description: U iso

Detector Name: Alpha_023
Chamber Serial Number:
Detector Serial Number: 23
Env. Background: System Bkgd 64775
Reagent Blank: <not performed>

Sample Size: 1.000E+000 +/- 0.000E+000 liter
Sample Date/Time: 7/23/2013 12:02:00 PM
Acquisition Date/Time: 8/15/2013 12:41:15 PM
Acquisition Live Time: 170.0 minutes
Acquisition Real Time: 170.0 minutes

Tracer Certificate: U232_UU-10A
Tracer Quantity: 0.608 mL
Effective Efficiency: 0.2028 +/- 0.0112
Counting Efficiency: 0.1710 +/- 0.0030 on 7/20/2013 6:18:25 PM
Chem. Recovery Factor: 1.1862 +/- 0.0688

Peak Match Tolerance: 0.150 MeV

PEAK AREA REPORT

Nuclide		Energy (MeV)	Net Pk Area	Pk Area Error %	Ambient Backgnd	Reagent Backgnd	FWHM (keV)
U-232	T	5.294	396.83	9.84	0.17	0.00E+000	7.7
U-234		4.711	1.49	190.02	0.51	0.00E+000	3.1
U-235		4.383	2.32	149.12	0.68	0.00E+000	3.1
U-238		4.084	3.98	112.01	1.02	0.00E+000	3.1

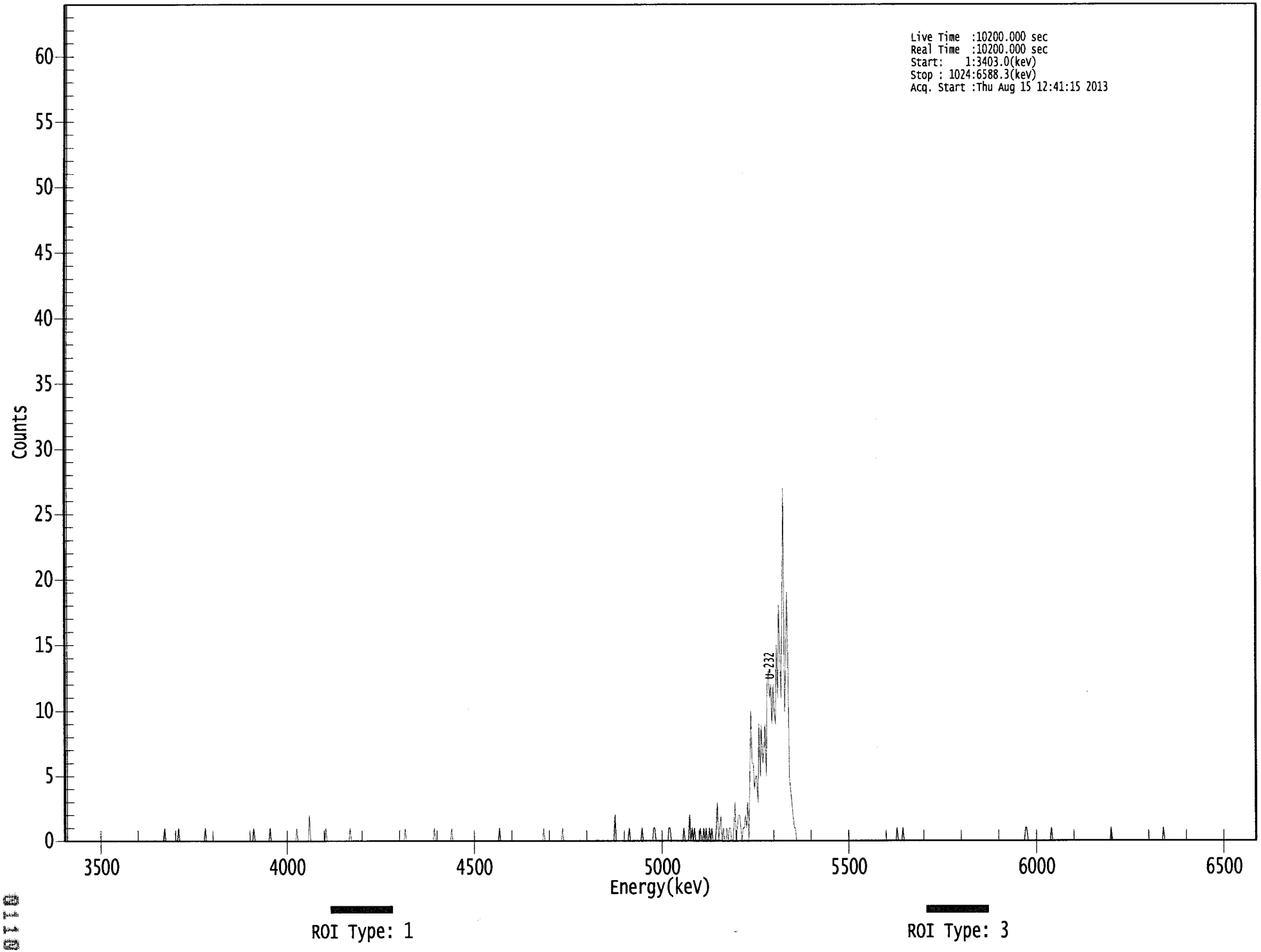
T = Tracer Peak used for Effective Efficiency

NUCLIDE ANALYSIS RESULTS

Nuclide	Id Conf.	Energy (keV)	Activity (pCi/liter)	MDA (pCi/liter)
U-232	1.000	5302.50*	5.20E+000 +/- 5.63E-001	5.47E-002 +/- 5.92E-003
U-234	0.982	4761.50*	1.95E-002 +/- 3.71E-002	6.87E-002 +/- 7.44E-003
U-235	1.000	4385.50*	3.75E-002 +/- 5.60E-002	9.11E-002 +/- 9.86E-003
U-238	0.930	4184.40*	5.19E-002 +/- 5.84E-002	8.21E-002 +/- 8.89E-003

AG
8/16/13

0000066264.CNF



****
***** S P E C T R A L D A T A R E P O R T *****
****

Sample Title: 03

Elapsed Live time: 10200
Elapsed Real Time: 10200

Channel								
1:	10200	10200	0	0	0	0	0	0
9:	0	0	0	0	0	0	0	0
17:	0	0	0	0	0	0	0	0
25:	0	0	0	0	0	0	0	0
33:	0	0	0	0	0	0	0	0
41:	0	0	0	0	0	0	0	0
49:	0	0	0	0	0	0	0	0
57:	0	0	0	0	0	0	0	0
65:	0	0	0	0	0	0	0	0
73:	0	0	0	0	0	0	0	0
81:	0	0	0	0	0	0	1	0
89:	0	0	0	0	0	0	0	0
97:	0	0	1	0	0	0	0	0
105:	0	0	0	0	0	0	0	0
113:	0	0	0	0	0	0	0	0
121:	0	1	0	0	0	0	0	0
129:	0	0	0	0	0	0	0	0
137:	0	0	0	0	0	0	0	0
145:	0	0	0	0	0	0	0	0
153:	0	0	0	0	0	0	0	0
161:	0	0	0	1	0	0	0	0
169:	0	0	0	0	0	0	0	0
177:	0	1	0	0	0	0	0	0
185:	0	0	0	0	0	0	0	0
193:	0	0	0	0	0	0	0	0
201:	1	0	0	0	0	0	0	0
209:	0	0	0	2	0	0	0	0
217:	0	0	0	0	0	0	0	0
225:	0	1	0	0	0	0	0	0
233:	0	0	0	0	0	0	0	0
241:	0	0	0	0	0	0	1	0
249:	0	0	0	0	0	0	0	0
257:	0	0	0	0	0	0	0	0
265:	0	0	0	0	0	0	0	0
273:	0	0	0	0	0	0	0	0
281:	0	0	0	0	0	0	0	0
289:	0	0	0	0	0	1	0	0
297:	0	0	0	0	0	0	0	0
305:	0	0	0	0	0	0	0	0
313:	0	0	0	0	0	0	1	0
321:	0	0	0	0	0	0	0	0
329:	0	0	0	0	0	1	0	0
337:	0	0	0	0	0	0	0	0
345:	0	0	0	0	0	0	0	0
353:	0	0	0	0	0	0	0	0
361:	0	0	0	0	0	0	0	0

369:	0	0	0	0	0	0	1	0

Sample Title: 03

Channel								
377:	0	0	0	0	0	0	0	0
385:	0	0	0	0	0	0	0	0
393:	0	0	0	0	0	0	0	0
401:	0	0	0	0	0	0	0	0
409:	0	0	0	0	1	0	0	0
417:	0	0	0	0	0	0	0	0
425:	0	0	0	0	1	0	0	0
433:	0	0	0	0	0	0	0	0
441:	0	0	0	0	0	0	0	0
449:	0	0	0	0	0	0	0	0
457:	0	0	0	0	0	0	0	0
465:	0	0	0	0	0	0	0	0
473:	0	2	0	0	0	0	0	0
481:	0	0	0	0	0	1	0	0
489:	0	0	0	0	0	0	0	0
497:	1	0	0	0	0	0	0	0
505:	0	0	1	1	0	0	0	0
513:	0	0	0	0	0	0	0	1
521:	1	0	0	0	0	0	0	0
529:	0	0	0	0	1	0	0	0
537:	0	2	0	1	0	1	0	0
545:	0	0	1	0	0	1	0	1
553:	0	0	1	0	1	0	0	0
561:	1	3	0	1	2	0	1	0
569:	0	1	0	1	1	0	0	1
577:	3	0	1	2	2	1	0	1
585:	1	2	1	3	0	5	10	6
593:	6	4	5	5	3	9	5	9
601:	6	7	9	5	12	13	11	12
609:	9	12	10	9	15	11	18	14
617:	11	19	27	10	13	19	14	5
625:	4	3	2	1	1	0	0	0
633:	0	0	0	0	0	0	0	0
641:	0	0	0	0	0	0	0	0
649:	0	0	0	0	0	0	0	0
657:	0	0	0	0	0	0	0	0
665:	0	0	0	0	0	0	0	0
673:	0	0	0	0	0	0	0	0
681:	0	0	0	0	0	0	0	0
689:	0	0	0	0	0	0	0	0
697:	0	0	0	0	0	0	0	0
705:	0	0	0	0	0	0	0	0
713:	0	0	0	1	0	0	0	0
721:	1	0	0	0	0	0	0	0
729:	0	0	0	0	0	0	0	0
737:	0	0	0	0	0	0	0	0
745:	0	0	0	0	0	0	0	0
753:	0	0	0	0	0	0	0	0
761:	0	0	0	0	0	0	0	0
769:	0	0	0	0	0	0	0	0
777:	0	0	0	0	0	0	0	0
785:	0	0	0	0	0	0	0	0
793:	0	0	0	0	0	0	0	0

801:	0	0	0	0	0	0	0	0

Sample Title: 03

Channel								
809:	0	0	0	0	0	0	0	0
817:	0	0	0	0	0	0	0	0
825:	0	1	1	0	0	0	0	0
833:	0	0	0	0	0	0	0	0
841:	0	0	0	0	0	0	0	1
849:	0	0	0	0	0	0	0	0
857:	0	0	0	0	0	0	0	0
865:	0	0	0	0	0	0	0	0
873:	0	0	0	0	0	0	0	0
881:	0	0	0	0	0	0	0	0
889:	0	0	0	0	0	0	0	0
897:	0	0	1	0	0	0	0	0
905:	0	0	0	0	0	0	0	0
913:	0	0	0	0	0	0	0	0
921:	0	0	0	0	0	0	0	0
929:	0	0	0	0	0	0	0	0
937:	0	0	0	0	0	0	0	1
945:	0	0	0	0	0	0	0	0
953:	0	0	0	0	0	0	0	0
961:	0	0	0	0	0	0	0	0
969:	0	0	0	0	0	0	0	0
977:	0	0	0	0	0	0	0	0
985:	0	0	0	0	0	0	0	0
993:	0	0	0	0	0	0	0	0
1001:	0	0	0	0	0	0	0	0
1009:	0	0	0	0	0	0	0	0
1017:	0	0	0	0	0	0	0	0

LCB 8/15/13

Apex-Alpha™

Sample Description: PZ-305-AI TOT
Spectrum File: \\OR-ALPHA1\Canberra\ApexAlpha\Root\Data\00000662
Batch Identification: 1307170A-UU
Sample Identification: 04
Sample Geometry: Shelf 2
Procedure Description: U iso

Detector Name: Alpha_024
Chamber Serial Number:
Detector Serial Number: 24
Env. Background: System Bkgd 64776
Reagent Blank: <not performed>

Sample Size: 1.000E+000 +/- 0.000E+000 liter
Sample Date/Time: 7/22/2013 12:02:00 PM
Acquisition Date/Time: 8/15/2013 12:41:16 PM
Acquisition Live Time: 170.0 minutes
Acquisition Real Time: 170.0 minutes

Tracer Certificate: U232_UU-10A
Tracer Quantity: 0.605 mL
Effective Efficiency: 0.1315 +/- 0.0088
Counting Efficiency: 0.1710 +/- 0.0032 on 12/15/2012 2:02:15 PM
Chem. Recovery Factor: 0.7688 +/- 0.0533

Peak Match Tolerance: 0.150 MeV

PEAK AREA REPORT

Nuclide		Energy (MeV)	Net Pk Area	Pk Area Error %	Ambient Backgnd	Reagent Backgnd	FWHM (keV)
U-232	T	5.298	255.81	12.29	1.19	0.00E+000	18.2
U-234		4.762	4.32	102.62	0.68	0.00E+000	3.1
U-235		4.396	0.98	294.88	1.02	0.00E+000	3.1
U-238		4.127	2.32	149.13	0.68	0.00E+000	3.1

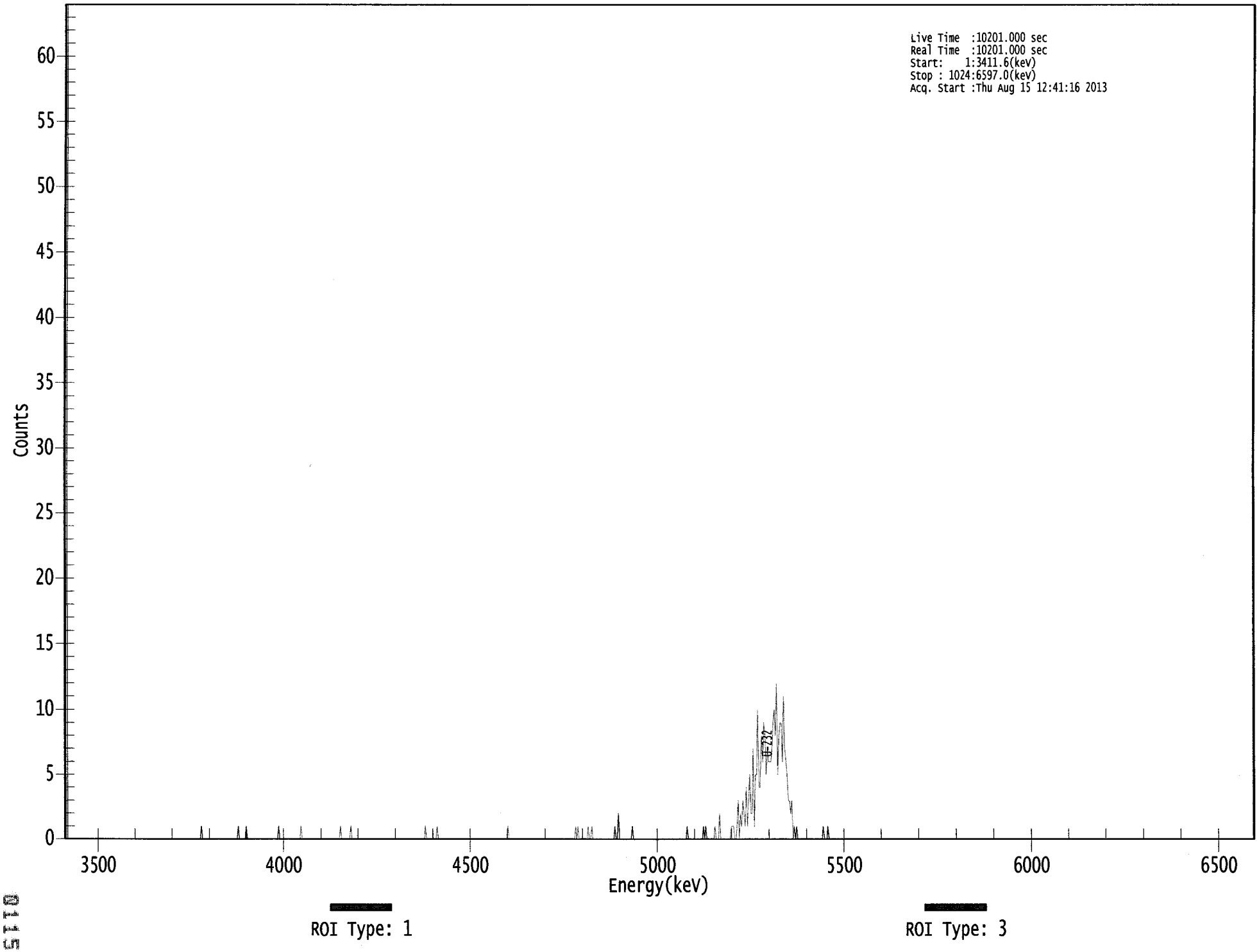
T = Tracer Peak used for Effective Efficiency

NUCLIDE ANALYSIS RESULTS

Nuclide	Id Conf.	Energy (keV)	Activity (pCi/liter)	MDA (pCi/liter)
U-232	1.000	5302.50*	5.17E+000 +/- 6.77E-001	1.33E-001 +/- 1.74E-002
U-234	1.000	4761.50*	8.72E-002 +/- 9.02E-002	1.14E-001 +/- 1.49E-002
U-235	0.999	4385.50*	2.44E-002 +/- 7.20E-002	1.57E-001 +/- 2.05E-002
U-238	0.977	4184.40*	4.66E-002 +/- 6.98E-002	1.13E-001 +/- 1.48E-002

AG
8/16/13

0000066265.CNF



****
***** S P E C T R A L D A T A R E P O R T *****
****

Sample Title: 04

Elapsed Live time: 10201
Elapsed Real Time: 10201

Channel								
1:	10201	10201	0	0	0	0	0	0
9:	0	0	0	0	0	0	0	0
17:	0	0	0	0	0	0	0	0
25:	0	0	0	0	0	0	0	0
33:	0	0	0	0	0	0	0	0
41:	0	0	0	0	0	0	0	0
49:	0	0	0	0	0	0	0	0
57:	0	0	0	0	0	0	0	0
65:	0	0	0	0	0	0	0	0
73:	0	0	0	0	0	0	0	0
81:	0	0	0	0	0	0	0	0
89:	0	0	0	0	0	0	0	0
97:	0	0	0	0	0	0	0	0
105:	0	0	0	0	0	0	0	0
113:	0	0	0	0	0	0	1	0
121:	0	0	0	0	0	0	0	0
129:	0	0	0	0	0	0	0	0
137:	0	0	0	0	0	0	0	0
145:	0	0	0	0	0	0	1	0
153:	0	0	0	0	0	1	0	0
161:	0	0	0	0	0	0	0	0
169:	0	0	0	0	0	0	0	0
177:	0	0	0	0	0	0	0	0
185:	0	1	0	0	0	0	0	0
193:	0	0	0	0	0	0	0	0
201:	0	0	0	0	1	0	0	0
209:	0	0	0	0	0	0	0	0
217:	0	0	0	0	0	0	0	0
225:	0	0	0	0	0	0	0	0
233:	0	0	0	0	0	0	1	0
241:	0	0	0	0	0	0	0	1
249:	0	0	0	0	0	0	0	0
257:	0	0	0	0	0	0	0	0
265:	0	0	0	0	0	0	0	0
273:	0	0	0	0	0	0	0	0
281:	0	0	0	0	0	0	0	0
289:	0	0	0	0	0	0	0	0
297:	0	0	0	0	0	0	0	0
305:	0	0	0	0	0	0	0	1
313:	0	0	0	0	0	0	0	0
321:	0	1	0	0	0	0	0	0
329:	0	0	0	0	0	0	0	0
337:	0	0	0	0	0	0	0	0
345:	0	0	0	0	0	0	0	0
353:	0	0	0	0	0	0	0	0
361:	0	0	0	0	0	0	0	0

369:	0	0	0	0	0	0	0	0

Sample Title: 04

Channel								
377:	0	0	0	0	0	0	1	0
385:	0	0	0	0	0	0	0	0
393:	0	0	0	0	0	0	0	0
401:	0	0	0	0	0	0	0	0
409:	0	0	0	0	0	0	0	0
417:	0	0	0	0	0	0	0	0
425:	0	0	0	0	0	0	0	0
433:	0	0	0	0	0	0	0	0
441:	1	0	1	0	0	0	0	0
449:	0	0	0	1	0	0	1	0
457:	0	0	0	0	0	0	0	0
465:	0	0	0	0	0	0	0	0
473:	0	0	1	0	0	2	0	0
481:	0	0	0	0	0	0	0	0
489:	0	1	0	0	0	0	0	0
497:	0	0	0	0	0	0	0	0
505:	0	0	0	0	0	0	0	0
513:	0	0	0	0	0	0	0	0
521:	0	0	0	0	0	0	0	0
529:	0	0	0	0	0	0	0	0
537:	1	0	0	0	0	0	0	0
545:	0	0	0	0	0	0	1	0
553:	1	0	0	0	0	0	0	0
561:	1	0	0	0	2	0	0	0
569:	0	0	0	0	0	0	1	1
577:	1	0	0	1	3	0	2	1
585:	3	2	1	4	1	3	5	2
593:	2	7	1	5	5	10	4	4
601:	8	6	9	8	5	7	6	6
609:	6	7	9	10	8	12	5	8
617:	9	9	6	11	7	6	5	3
625:	3	2	3	0	1	0	1	0
633:	0	0	0	0	0	0	0	0
641:	0	0	0	0	0	0	0	0
649:	0	0	0	0	0	1	0	0
657:	0	1	0	0	0	0	0	0
665:	0	0	0	0	0	0	0	0
673:	0	0	0	0	0	0	0	0
681:	0	0	0	0	0	0	0	0
689:	0	0	0	0	0	0	0	0
697:	0	0	0	0	0	0	0	0
705:	0	0	0	0	0	0	0	0
713:	0	0	0	0	0	0	0	0
721:	0	0	0	0	0	0	0	0
729:	0	0	0	0	0	0	0	0
737:	0	0	0	0	0	0	0	0
745:	0	0	0	0	0	0	0	0
753:	0	0	0	0	0	0	0	0
761:	0	0	0	0	0	0	0	0
769:	0	0	0	0	0	0	0	0
777:	0	0	0	0	0	0	0	0
785:	0	0	0	0	0	0	0	0
793:	0	0	0	0	0	0	0	0

801:	0	0	0	0	0	0	0	0

Sample Title: 04

Channel								
809:	0	0	0	0	0	0	0	0
817:	0	0	0	0	0	0	0	0
825:	0	0	0	0	0	0	0	0
833:	0	0	0	0	0	0	0	0
841:	0	0	0	0	0	0	0	0
849:	0	0	0	0	0	0	0	0
857:	0	0	0	0	0	0	0	0
865:	0	0	0	0	0	0	0	0
873:	0	0	0	0	0	0	0	0
881:	0	0	0	0	0	0	0	0
889:	0	0	0	0	0	0	0	0
897:	0	0	0	0	0	0	0	0
905:	0	0	0	0	0	0	0	0
913:	0	0	0	0	0	0	0	0
921:	0	0	0	0	0	0	0	0
929:	0	0	0	0	0	0	0	0
937:	0	0	0	0	0	0	0	0
945:	0	0	0	0	0	0	0	0
953:	0	0	0	0	0	0	0	0
961:	0	0	0	0	0	0	0	0
969:	0	0	0	0	0	0	0	0
977:	0	0	0	0	0	0	0	0
985:	0	0	0	0	0	0	0	0
993:	0	0	0	0	0	0	0	0
1001:	0	0	0	0	0	0	0	0
1009:	0	0	0	0	0	0	0	0
1017:	0	0	0	0	0	0	0	0

LCP 8/15/13

Apex-Alpha™

Sample Description: PZ-305-AI DIS
Spectrum File: \\OR-ALPHA1\Canberra\ApexAlpha\Root\Data\00000662
Batch Identification: 1307170A-UU
Sample Identification: 05
Sample Geometry: Shelf 2
Procedure Description: U iso

Detector Name: Alpha_025
Chamber Serial Number:
Detector Serial Number: 25
Env. Background: System Bkgd 64777
Reagent Blank: <not performed>

Sample Size: 1.000E+000 +/- 0.000E+000 liter
Sample Date/Time: 7/22/2013 12:02:00 PM
Acquisition Date/Time: 8/15/2013 12:41:17 PM
Acquisition Live Time: 170.0 minutes
Acquisition Real Time: 170.0 minutes

Tracer Certificate: U232_UU-10A
Tracer Quantity: 0.609 mL
Effective Efficiency: 0.1467 +/- 0.0093
Counting Efficiency: 0.1736 +/- 0.0032 on 12/15/2012 1:57:27 PM
Chem. Recovery Factor: 0.8450 +/- 0.0558

Peak Match Tolerance: 0.150 MeV

PEAK AREA REPORT

Nuclide		Energy (MeV)	Net Pk Area	Pk Area Error %	Ambient Backgnd	Reagent Backgnd	FWHM (keV)
U-232	T	5.278	287.32	11.58	0.68	0.00E+000	22.0
U-234		4.720	6.98	80.28	1.02	0.00E+000	3.1
U-235		4.330	2.00	169.74	0.00	0.00E+000	3.1
U-238		4.134	-0.17	1169.3	0.17	0.00E+000	0.0

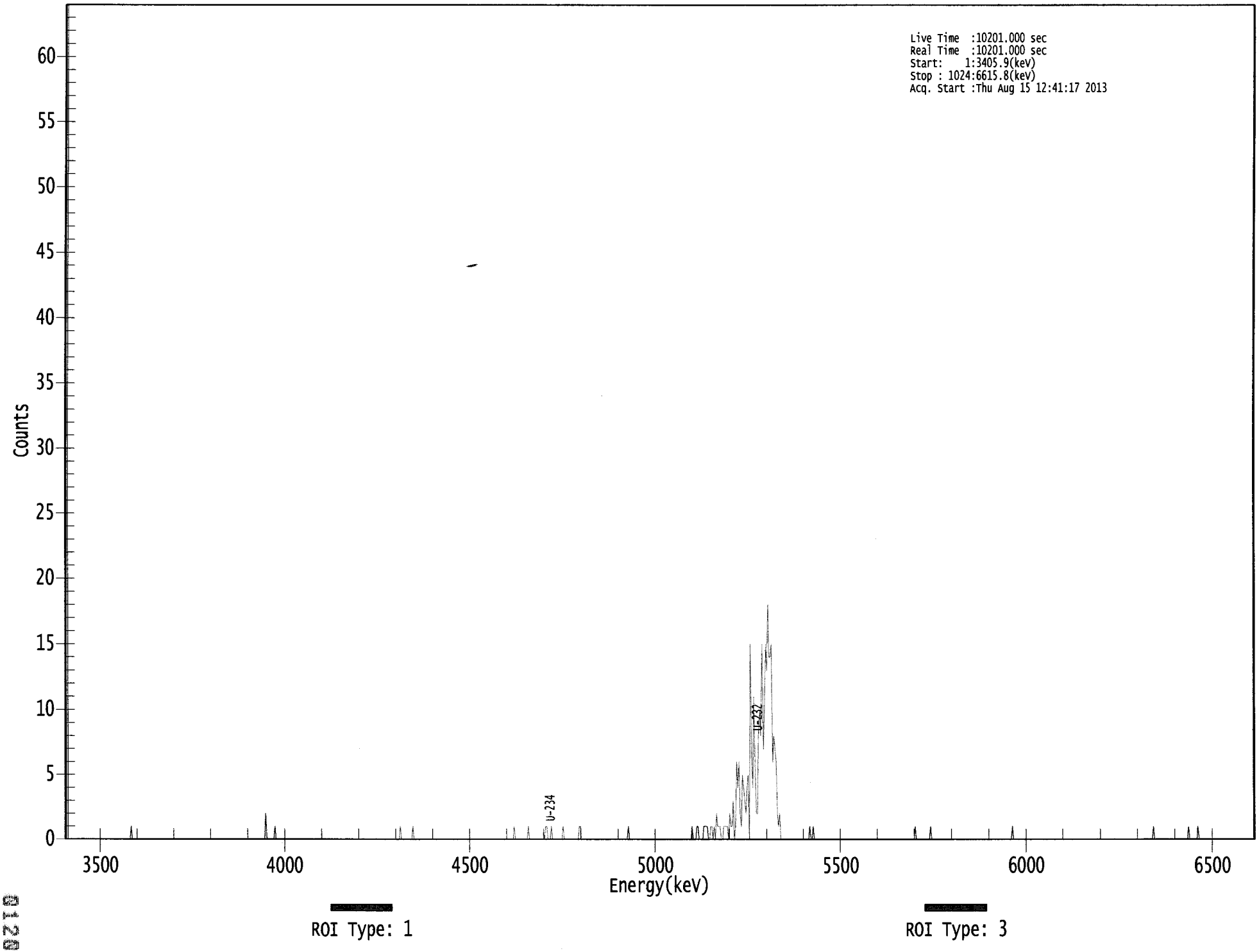
T = Tracer Peak used for Effective Efficiency

NUCLIDE ANALYSIS RESULTS

Nuclide	Id Conf.	Energy (keV)	Activity (pCi/liter)	MDA (pCi/liter)
U-232	0.996	5302.50*	5.20E+000 +/- 6.47E-001	1.02E-001 +/- 1.27E-002
U-234	0.988	4761.50*	1.26E-001 +/- 1.03E-001	1.14E-001 +/- 1.42E-002
U-235	0.978	4385.50*	4.47E-002 +/- 7.60E-002	1.34E-001 +/- 1.66E-002
U-238	0.982	4184.40*	-3.06E-003 +/- 3.58E-002	7.52E-002 +/- 9.35E-003

AG 8/16/13

0000066266.CNF



9219

****
***** S P E C T R A L D A T A R E P O R T *****
****

Sample Title: 05

Elapsed Live time: 10201
Elapsed Real Time: 10201

Channel								
1:	10201	10201	0	0	0	0	0	0
9:	0	0	0	0	0	0	0	0
17:	0	0	0	0	0	0	0	0
25:	0	0	0	0	0	0	0	0
33:	0	0	0	0	0	0	0	0
41:	0	0	0	0	0	0	0	0
49:	0	0	0	0	0	0	0	0
57:	0	1	0	0	0	0	0	0
65:	0	0	0	0	0	0	0	0
73:	0	0	0	0	0	0	0	0
81:	0	0	0	0	0	0	0	0
89:	0	0	0	0	0	0	0	0
97:	0	0	0	0	0	0	0	0
105:	0	0	0	0	0	0	0	0
113:	0	0	0	0	0	0	0	0
121:	0	0	0	0	0	0	0	0
129:	0	0	0	0	0	0	0	0
137:	0	0	0	0	0	0	0	0
145:	0	0	0	0	0	0	0	0
153:	0	0	0	0	0	0	0	0
161:	0	0	0	0	0	0	0	0
169:	0	0	0	0	0	2	0	0
177:	0	0	0	0	0	1	0	0
185:	0	0	0	0	0	0	0	0
193:	0	0	0	0	0	0	0	0
201:	0	0	0	0	0	0	0	0
209:	0	0	0	0	0	0	0	0
217:	0	0	0	0	0	0	0	0
225:	0	0	0	0	0	0	0	0
233:	0	0	0	0	0	0	0	0
241:	0	0	0	0	0	0	0	0
249:	0	0	0	0	0	0	0	0
257:	0	0	0	0	0	0	0	0
265:	0	0	0	0	0	0	0	0
273:	0	0	0	0	0	0	0	0
281:	0	0	0	0	0	0	0	0
289:	0	1	0	0	0	0	0	0
297:	0	0	0	0	1	0	0	0
305:	0	0	0	0	0	0	0	0
313:	0	0	0	0	0	0	0	0
321:	0	0	0	0	0	0	0	0
329:	0	0	0	0	0	0	0	0
337:	0	0	0	0	0	0	0	0
345:	0	0	0	0	0	0	0	0
353:	0	0	0	0	0	0	0	0
361:	0	0	0	0	0	0	0	0

369:	0	0	0	0	0	0	0	0

Sample Title: 05

Channel								
377:	0	0	0	0	0	0	0	0
385:	0	0	0	1	0	0	0	0
393:	0	0	0	0	0	0	0	1
401:	0	0	0	0	0	0	0	0
409:	0	0	0	0	0	0	1	1
417:	0	0	0	1	0	0	0	0
425:	0	0	0	0	0	1	0	0
433:	0	0	0	0	0	0	0	0
441:	0	0	0	1	1	0	0	0
449:	0	0	0	0	0	0	0	0
457:	0	0	0	0	0	0	0	0
465:	0	0	0	0	0	0	0	0
473:	0	0	0	0	0	0	0	0
481:	0	0	0	0	0	1	0	0
489:	0	0	0	0	0	0	0	0
497:	0	0	0	0	0	0	0	0
505:	0	0	0	0	0	0	0	0
513:	0	0	0	0	0	0	0	0
521:	0	0	0	0	0	0	0	0
529:	0	0	0	0	0	0	0	0
537:	0	0	0	0	1	0	0	0
545:	1	1	0	0	0	0	1	1
553:	1	1	0	0	1	1	0	1
561:	0	2	1	1	1	0	0	1
569:	1	1	1	0	2	1	1	3
577:	0	1	6	4	6	2	1	5
585:	4	3	2	4	5	0	15	7
593:	4	11	6	2	2	8	10	8
601:	15	7	10	15	13	18	14	14
609:	15	6	8	7	6	2	1	2
617:	0	0	0	0	0	0	0	0
625:	0	0	0	0	0	0	0	0
633:	0	0	0	0	0	0	0	0
641:	0	1	0	0	1	0	0	0
649:	0	0	0	0	0	0	0	0
657:	0	0	0	0	0	0	0	0
665:	0	0	0	0	0	0	0	0
673:	0	0	0	0	0	0	0	0
681:	0	0	0	0	0	0	0	0
689:	0	0	0	0	0	0	0	0
697:	0	0	0	0	0	0	0	0
705:	0	0	0	0	0	0	0	0
713:	0	0	0	0	0	0	0	0
721:	0	0	0	0	0	0	0	0
729:	0	0	0	0	1	0	0	0
737:	0	0	0	0	0	0	0	0
745:	0	1	0	0	0	0	0	0
753:	0	0	0	0	0	0	0	0
761:	0	0	0	0	0	0	0	0
769:	0	0	0	0	0	0	0	0
777:	0	0	0	0	0	0	0	0
785:	0	0	0	0	0	0	0	0
793:	0	0	0	0	0	0	0	0

801:	0	0	0	0	0	0	0	0

Sample Title: 05

Channel								
809:	0	0	0	0	0	0	0	1
817:	0	0	0	0	0	0	0	0
825:	0	0	0	0	0	0	0	0
833:	0	0	0	0	0	0	0	0
841:	0	0	0	0	0	0	0	0
849:	0	0	0	0	0	0	0	0
857:	0	0	0	0	0	0	0	0
865:	0	0	0	0	0	0	0	0
873:	0	0	0	0	0	0	0	0
881:	0	0	0	0	0	0	0	0
889:	0	0	0	0	0	0	0	0
897:	0	0	0	0	0	0	0	0
905:	0	0	0	0	0	0	0	0
913:	0	0	0	0	0	0	0	0
921:	0	0	0	0	0	0	0	0
929:	0	0	0	0	0	0	0	0
937:	1	0	0	0	0	0	0	0
945:	0	0	0	0	0	0	0	0
953:	0	0	0	0	0	0	0	0
961:	0	0	0	0	0	0	1	0
969:	0	0	0	0	0	0	1	0
977:	0	0	0	0	0	0	0	0
985:	0	0	0	0	0	0	0	0
993:	0	0	0	0	0	0	0	0
1001:	0	0	0	0	0	0	0	0
1009:	0	0	0	0	0	0	0	0
1017:	0	0	0	0	0	0	0	0

Apex-Alpha™

Sample Description:	LR-104 TOT
Spectrum File:	\\OR-ALPHA1\Canberra\ApexAlpha\Root\Data\00000662
Batch Identification:	1307170A-UU
Sample Identification:	06
Sample Geometry:	Shelf 2
Procedure Description:	U iso
Detector Name:	Alpha_027
Chamber Serial Number:	
Detector Serial Number:	27
Env. Background:	System Bkgd 64778
Reagent Blank:	<not performed>
Sample Size:	1.000E+000 +/- 0.000E+000 liter
Sample Date/Time:	7/22/2013 12:02:00 PM
Acquisition Date/Time:	8/15/2013 12:41:18 PM
Acquisition Live Time:	170.0 minutes
Acquisition Real Time:	170.0 minutes
Tracer Certificate:	U232_UU-10A
Tracer Quantity:	0.605 mL
Effective Efficiency:	0.1507 +/- 0.0095
Counting Efficiency:	0.1728 +/- 0.0032 on 12/15/2012 2:27:41 PM
Chem. Recovery Factor:	0.8721 +/- 0.0572
Peak Match Tolerance:	0.150 MeV

PEAK AREA REPORT

Nuclide		Energy (MeV)	Net Pk Area	Pk Area Error %	Ambient Backgnd	Reagent Backgnd	FWHM (keV)
U-232	T	5.267	293.15	11.47	0.85	0.00E+000	13.3
U-234		4.710	166.98	15.22	1.02	0.00E+000	4.4
U-235		4.414	6.32	82.73	0.68	0.00E+000	3.2
U-238		4.127	115.15	18.34	0.85	0.00E+000	5.8

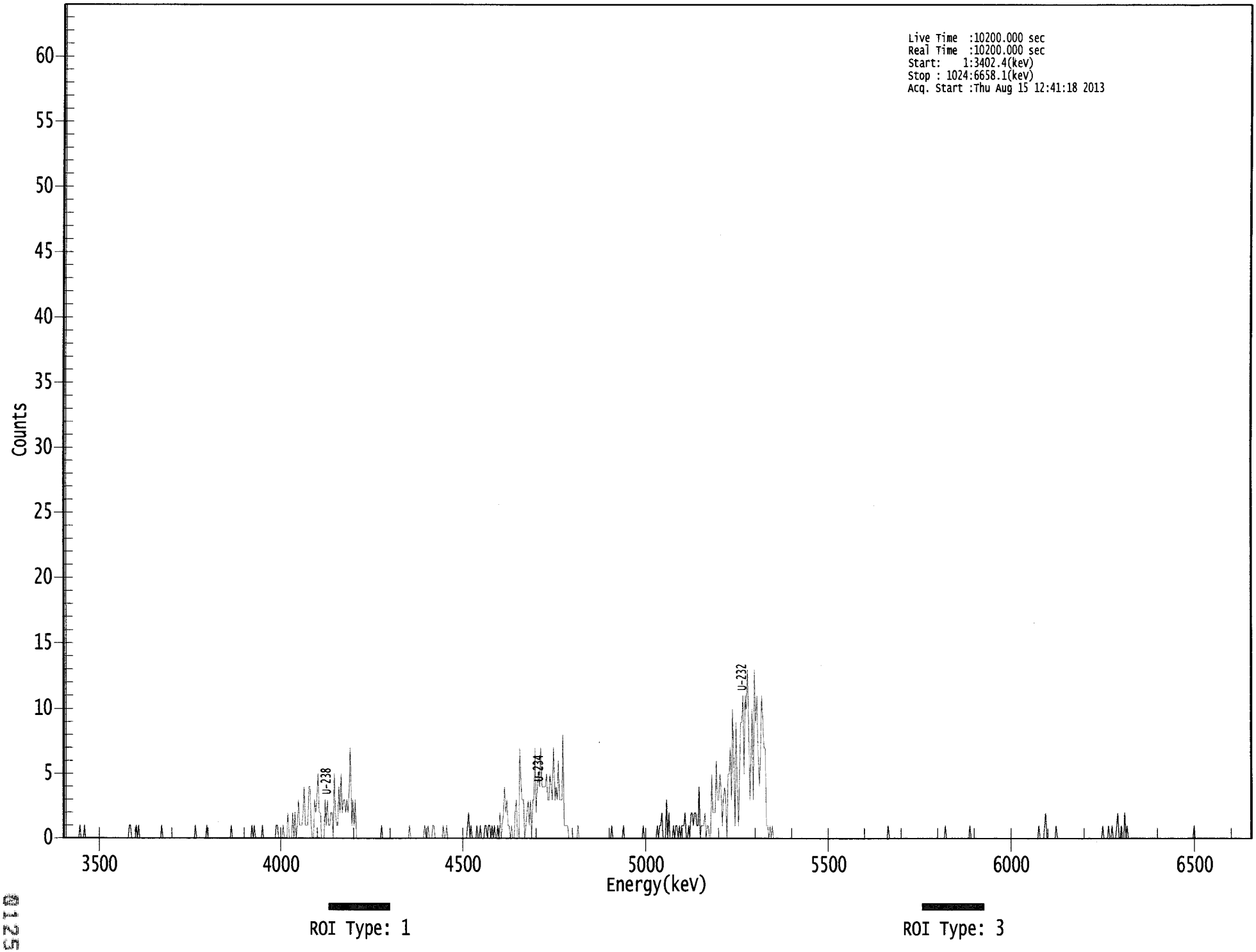
T = Tracer Peak used for Effective Efficiency

NUCLIDE ANALYSIS RESULTS

Nuclide	Id Conf.	Energy (keV)	Activity (pCi/liter)	MDA (pCi/liter)
U-232	0.991	5302.50*	5.17E+000 +/- 6.37E-001	1.06E-001 +/- 1.30E-002
U-234	0.981	4761.50*	2.94E+000 +/- 5.76E-001	1.11E-001 +/- 1.37E-002
U-235	0.994	4385.50*	1.37E-001 +/- 1.15E-001	1.23E-001 +/- 1.51E-002
U-238	0.977	4184.40*	2.02E+000 +/- 4.46E-001	1.05E-001 +/- 1.29E-002

AG
8/16/13

0000066267.CNF



****
***** S P E C T R A L D A T A R E P O R T *****
****

Sample Title: 06

Elapsed Live time: 10200
Elapsed Real Time: 10200

Channel								
1:	10200	10200	0	0	0	0	0	0
9:	0	0	0	0	0	0	1	0
17:	0	0	1	0	0	0	0	0
25:	0	0	0	0	0	0	0	0
33:	0	0	0	0	0	0	0	0
41:	0	0	0	0	0	0	0	0
49:	0	0	0	0	0	0	0	0
57:	0	1	1	0	0	0	0	1
65:	0	1	0	0	0	0	0	0
73:	0	0	0	0	0	0	0	0
81:	0	0	0	0	0	1	0	0
89:	0	0	0	0	0	0	0	0
97:	0	0	0	0	0	0	0	0
105:	0	0	0	0	0	0	0	0
113:	0	0	1	0	0	0	0	0
121:	0	0	0	0	1	0	0	0
129:	0	0	0	0	0	0	0	0
137:	0	0	0	0	0	0	0	0
145:	0	1	0	0	0	0	0	0
153:	0	0	0	0	0	0	0	0
161:	0	0	0	1	0	1	0	0
169:	0	0	0	0	1	0	0	0
177:	0	0	0	0	0	0	0	0
185:	1	1	0	0	0	0	1	0
193:	0	0	2	0	0	0	2	0
201:	2	0	1	3	1	1	1	2
209:	4	1	1	1	4	4	1	0
217:	0	3	2	3	5	2	2	0
225:	0	0	3	1	3	1	1	2
233:	2	0	5	2	1	1	4	2
241:	5	2	3	3	2	3	2	4
249:	7	1	3	1	3	0	0	0
257:	0	0	0	0	0	0	0	0
265:	0	0	0	0	0	0	0	0
273:	0	0	0	1	0	0	0	0
281:	0	0	0	0	0	0	0	0
289:	0	0	0	0	0	0	0	0
297:	0	0	0	1	0	0	0	0
305:	0	0	0	0	0	0	0	0
313:	1	0	0	1	0	0	0	1
321:	1	0	0	0	0	0	0	0
329:	1	0	0	1	0	0	0	0
337:	0	0	0	0	0	0	0	0
345:	0	0	0	0	0	1	2	0
353:	1	0	0	0	0	1	0	0
361:	1	0	0	0	1	1	0	1

369:	1	0	1	0	1	0	0	1

Sample Title: 06

Channel								
377:	0	2	0	1	2	4	2	3
385:	1	1	0	1	0	0	2	3
393:	0	0	7	4	3	3	0	1
401:	2	3	1	3	0	3	3	7
409:	2	4	5	4	7	4	4	4
417:	4	5	3	3	5	4	3	7
425:	3	4	3	6	3	3	3	8
433:	1	1	1	1	0	0	0	0
441:	0	0	0	0	1	0	0	0
449:	0	0	0	0	0	0	0	0
457:	0	0	0	0	0	0	0	0
465:	0	0	0	0	0	0	0	0
473:	0	1	0	0	0	0	0	0
481:	0	0	0	1	0	0	0	0
489:	0	0	0	0	0	0	0	0
497:	0	0	0	0	1	0	0	0
505:	0	0	0	0	0	0	0	0
513:	1	0	1	1	2	0	0	0
521:	3	0	2	0	0	0	1	0
529:	1	1	0	1	0	1	1	1
537:	2	0	0	1	0	2	2	1
545:	2	2	1	1	4	0	1	1
553:	1	2	0	1	1	0	0	5
561:	2	2	2	6	3	3	5	4
569:	1	3	4	3	0	5	5	7
577:	3	10	6	1	9	4	1	5
585:	9	9	11	5	11	10	13	9
593:	3	6	10	3	13	9	11	7
601:	4	7	11	9	7	7	1	1
609:	0	1	0	1	0	0	0	0
617:	0	0	0	0	0	0	0	0
625:	0	0	0	0	0	0	0	0
633:	0	0	0	0	0	0	0	0
641:	0	0	0	0	0	0	0	0
649:	0	0	0	0	0	0	0	0
657:	0	0	0	0	0	0	0	0
665:	0	0	0	0	0	0	0	0
673:	0	0	0	0	0	0	0	0
681:	0	0	0	0	0	0	0	0
689:	0	0	0	0	0	0	0	0
697:	0	0	0	0	0	0	0	0
705:	0	0	0	0	0	0	0	1
713:	0	0	0	0	0	0	0	0
721:	0	0	0	0	0	0	0	0
729:	0	0	0	0	0	0	0	0
737:	0	0	0	0	0	0	0	0
745:	0	0	0	0	0	0	0	0
753:	0	0	0	0	0	0	0	0
761:	1	0	0	0	0	0	0	0
769:	0	0	0	0	0	0	0	0
777:	0	0	0	0	0	1	0	0
785:	0	0	0	0	0	0	0	0
793:	0	0	0	0	0	0	0	0

801:	0	0	0	0	0	0	0	0

Sample Title: 06

Channel								
809:	0	0	0	0	0	0	0	0
817:	0	0	0	0	0	0	0	0
825:	0	0	0	0	0	0	0	0
833:	0	0	0	0	0	0	0	0
841:	1	0	0	0	0	1	2	0
849:	0	0	0	0	0	0	0	1
857:	0	0	0	0	0	0	0	0
865:	0	0	0	0	0	0	0	0
873:	0	0	0	0	0	0	0	0
881:	0	0	0	0	0	0	0	0
889:	0	0	0	0	0	0	0	1
897:	0	0	0	0	1	0	0	1
905:	0	0	0	1	2	0	0	1
913:	0	0	2	0	1	0	0	0
921:	0	0	0	0	0	0	0	0
929:	0	0	0	0	0	0	0	0
937:	0	0	0	0	0	0	0	0
945:	0	0	0	0	0	0	0	0
953:	0	0	0	0	0	0	0	0
961:	0	0	0	0	0	0	0	0
969:	0	0	0	0	0	1	0	0
977:	0	0	0	0	0	0	0	0
985:	0	0	0	0	0	0	0	0
993:	0	0	0	0	0	0	0	0
1001:	0	0	0	0	0	0	0	0
1009:	0	0	0	0	0	0	0	0
1017:	0	0	0	0	0	0	0	0

KCP 8/15/13

Apex-Alpha™

Sample Description: LR-104 DIS
Spectrum File: \\OR-ALPHA1\Canberra\ApexAlpha\Root\Data\00000662
Batch Identification: 1307170A-UU
Sample Identification: 07
Sample Geometry: Shelf 2
Procedure Description: U iso

Detector Name: Alpha_029
Chamber Serial Number:
Detector Serial Number: 29
Env. Background: System Bkgd 64779
Reagent Blank: <not performed>

Sample Size: 1.000E+000 +/- 0.000E+000 liter
Sample Date/Time: 7/22/2013 12:02:00 PM
Acquisition Date/Time: 8/15/2013 12:41:19 PM
Acquisition Live Time: 170.0 minutes
Acquisition Real Time: 170.0 minutes

Tracer Certificate: U232_UU-10A
Tracer Quantity: 0.603 mL
Effective Efficiency: 0.0287 +/- 0.0040
Counting Efficiency: 0.1945 +/- 0.0036 on 12/15/2012 2:30:02 PM
Chem. Recovery Factor: 0.1473 +/- 0.0205

Peak Match Tolerance: 0.150 MeV

PEAK AREA REPORT

Nuclide		Energy (MeV)	Net Pk Area	Pk Area Error %	Ambient Backgnd	Reagent Backgnd	FWHM (keV)
U-232	T	5.271	55.64	26.65	1.36	0.00E+000	4.1
U-234		4.732	25.32	39.56	0.68	0.00E+000	3.1
U-235		4.394	0.49	416.98	0.51	0.00E+000	3.1
U-238		4.153	13.49	54.53	0.51	0.00E+000	4.7

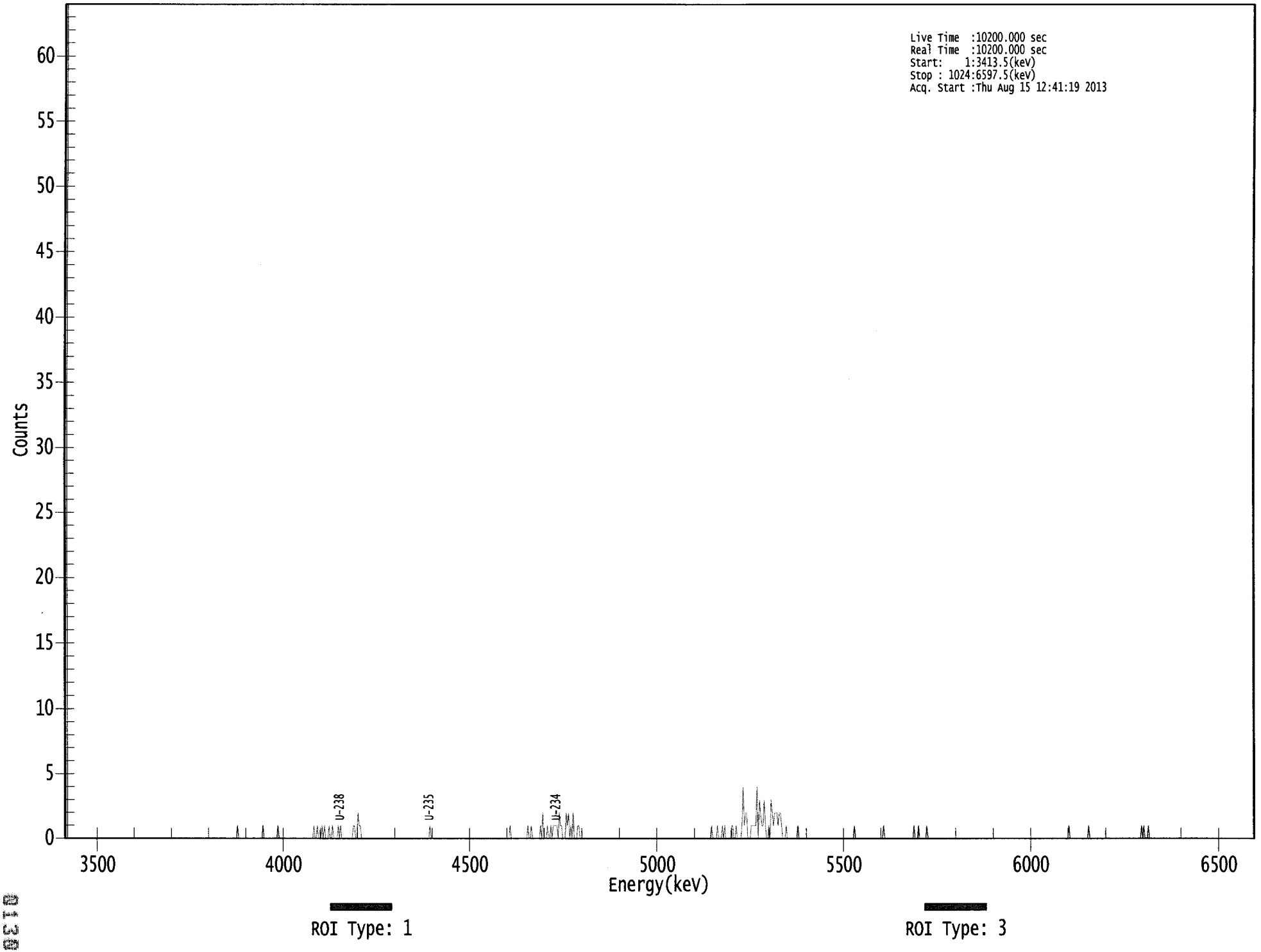
T = Tracer Peak used for Effective Efficiency

NUCLIDE ANALYSIS RESULTS

Nuclide	Id Conf.	Energy (keV)	Activity (pCi/liter)	MDA (pCi/liter)
U-232	0.993	5302.50*	5.16E+000 +/- 1.39E+000	6.36E-001 +/- 1.72E-001
U-234	0.994	4761.50*	2.35E+000 +/- 1.12E+000	5.23E-001 +/- 1.41E-001
U-235	0.999	4385.50*	5.60E-002 +/- 2.34E-001	6.00E-001 +/- 1.62E-001
U-238	0.993	4184.40*	1.24E+000 +/- 7.57E-001	4.84E-001 +/- 1.31E-001

AG
8/16/13

0000066268.CNF



****
***** S P E C T R A L D A T A R E P O R T *****
****

Sample Title: 07

Elapsed Live time: 10200
Elapsed Real Time: 10200

Channel								
1:	10200	10200	0	0	0	0	0	0
9:	0	0	0	0	0	0	0	0
17:	0	0	0	0	0	0	0	0
25:	0	0	0	0	0	0	0	0
33:	0	0	0	0	0	0	0	0
41:	0	0	0	0	0	0	0	0
49:	0	0	0	0	0	0	0	0
57:	0	0	0	0	0	0	0	0
65:	0	0	0	0	0	0	0	0
73:	0	0	0	0	0	0	0	0
81:	0	0	0	0	0	0	0	0
89:	0	0	0	0	0	0	0	0
97:	0	0	0	0	0	0	0	0
105:	0	0	0	0	0	0	0	0
113:	0	0	0	0	0	0	0	0
121:	0	0	0	0	0	0	0	0
129:	0	0	0	0	0	0	0	0
137:	0	0	0	0	0	0	0	0
145:	0	0	0	0	0	1	0	0
153:	0	0	0	0	0	0	0	0
161:	0	0	0	0	0	0	0	0
169:	0	0	0	1	0	0	0	0
177:	0	0	0	0	0	0	0	0
185:	1	0	0	0	0	0	0	0
193:	0	0	0	0	0	0	0	0
201:	0	0	0	0	0	0	0	0
209:	0	0	0	0	0	0	0	1
217:	0	0	1	0	0	0	1	0
225:	1	0	0	0	1	0	0	1
233:	0	0	0	0	1	0	1	0
241:	0	0	0	0	0	0	0	0
249:	0	1	1	0	0	2	1	1
257:	0	0	0	0	0	0	0	0
265:	0	0	0	0	0	0	0	0
273:	0	0	0	0	0	0	0	0
281:	0	0	0	0	0	0	0	0
289:	0	0	0	0	0	0	0	0
297:	0	0	0	0	0	0	0	0
305:	0	0	0	0	0	0	0	0
313:	0	0	0	1	0	0	0	0
321:	0	0	0	0	0	0	0	0
329:	0	0	0	0	0	0	0	0
337:	0	0	0	0	0	0	0	0
345:	0	0	0	0	0	0	0	0
353:	0	0	0	0	0	0	0	0
361:	0	0	0	0	0	0	0	0

369:	0	0	0	0	0	0	0	0

Sample Title: 07

Channel								
377:	0	0	0	0	0	0	0	0
385:	1	0	0	0	0	0	0	0
393:	0	0	0	0	0	0	0	1
401:	0	0	1	0	0	0	0	0
409:	0	0	1	0	2	0	0	0
417:	1	0	0	1	0	1	1	1
425:	1	0	2	1	1	0	0	0
433:	2	1	2	0	1	0	2	0
441:	0	0	1	1	0	0	0	0
449:	0	0	0	0	0	0	0	0
457:	0	0	0	0	0	0	0	0
465:	0	0	0	0	0	0	0	0
473:	0	0	0	0	0	0	0	0
481:	0	0	0	0	0	0	0	0
489:	0	0	0	0	0	0	0	0
497:	0	0	0	0	0	0	0	0
505:	0	0	0	0	0	0	0	0
513:	0	0	0	0	0	0	0	0
521:	0	0	0	0	0	0	0	0
529:	0	0	0	0	0	0	0	0
537:	0	0	0	0	0	0	0	0
545:	0	0	0	0	0	0	0	0
553:	0	0	0	0	0	1	0	0
561:	0	0	1	0	0	0	1	0
569:	1	0	0	0	0	0	1	1
577:	0	0	1	0	0	0	0	1
585:	4	1	2	2	0	0	0	1
593:	1	1	1	1	4	0	3	2
601:	1	1	3	1	0	0	1	0
609:	3	2	1	2	2	2	1	2
617:	2	1	0	0	0	1	0	0
625:	0	0	0	0	0	0	0	1
633:	0	0	0	0	0	0	0	0
641:	0	0	0	0	0	0	0	0
649:	0	0	0	0	0	0	0	0
657:	0	0	0	0	0	0	0	0
665:	0	0	0	0	0	0	0	0
673:	0	0	0	0	0	0	0	0
681:	1	0	0	0	0	0	0	0
689:	0	0	0	0	0	0	0	0
697:	0	0	0	0	0	0	0	0
705:	0	1	0	0	0	0	0	0
713:	0	0	0	0	0	0	0	0
721:	0	0	0	0	0	0	0	0
729:	0	0	0	1	0	0	0	1
737:	0	0	0	0	0	0	1	0
745:	0	0	0	0	0	0	0	0
753:	0	0	0	0	0	0	0	0
761:	0	0	0	0	0	0	0	0
769:	0	0	0	0	0	0	0	0
777:	0	0	0	0	0	0	0	0
785:	0	0	0	0	0	0	0	0
793:	0	0	0	0	0	0	0	0

801:	0	0	0	0	0	0	0	0

Sample Title: 07

Channel								
809:	0	0	0	0	0	0	0	0
817:	0	0	0	0	0	0	0	0
825:	0	0	0	0	0	0	0	0
833:	0	0	0	0	0	0	0	0
841:	0	0	0	0	0	0	0	0
849:	0	0	0	0	0	0	0	0
857:	0	0	0	0	0	0	0	0
865:	1	0	0	0	0	0	0	0
873:	0	0	0	0	0	0	0	0
881:	0	1	0	0	0	0	0	0
889:	0	0	0	0	0	0	0	0
897:	0	0	0	0	0	0	0	0
905:	0	0	0	0	0	0	0	0
913:	0	0	0	0	0	0	0	0
921:	0	0	0	0	0	0	1	0
929:	1	0	0	0	1	0	0	0
937:	0	0	0	0	0	0	0	0
945:	0	0	0	0	0	0	0	0
953:	0	0	0	0	0	0	0	0
961:	0	0	0	0	0	0	0	0
969:	0	0	0	0	0	0	0	0
977:	0	0	0	0	0	0	0	0
985:	0	0	0	0	0	0	0	0
993:	0	0	0	0	0	0	0	0
1001:	0	0	0	0	0	0	0	0
1009:	0	0	0	0	0	0	0	0
1017:	0	0	0	0	0	0	0	0

LCR 8/20/13

Apex-Alpha™

Sample Description: PZ-100-KS TOT
Spectrum File: \\OR-ALPHA1\Canberra\ApexAlpha\Root\Data\00000662
Batch Identification: 1307170A-UU
Sample Identification: 08
Sample Geometry: Shelf 2
Procedure Description: U iso

Detector Name: Alpha_031
Chamber Serial Number:
Detector Serial Number: 31
Env. Background: System Bkgd 64780
Reagent Blank: <not performed>

Sample Size: 1.000E+000 +/- 0.000E+000 liter
Sample Date/Time: 7/23/2013 12:02:00 PM
Acquisition Date/Time: 8/15/2013 12:41:20 PM
Acquisition Live Time: 170.0 minutes
Acquisition Real Time: 170.0 minutes

Tracer Certificate: U232_UU-10A
Tracer Quantity: 0.603 mL
Effective Efficiency: 0.1758 +/- 0.0104
Counting Efficiency: 0.1418 +/- 0.0034 on 6/13/2013 3:23:29 PM
Chem. Recovery Factor: 1.2395 +/- 0.0789

Peak Match Tolerance: 0.150 MeV

PEAK AREA REPORT

Nuclide		Energy (MeV)	Net Pk Area	Pk Area Error %	Ambient Backgnd	Reagent Backgnd	FWHM (keV)
U-232	T	5.282	341.32	10.62	0.68	0.00E+000	5.4
U-234		4.720	3.15	126.68	0.85	0.00E+000	3.1
U-235		4.436	2.66	128.85	0.34	0.00E+000	3.1
U-238		4.097	-1.23	254.36	3.23	0.00E+000	3.1

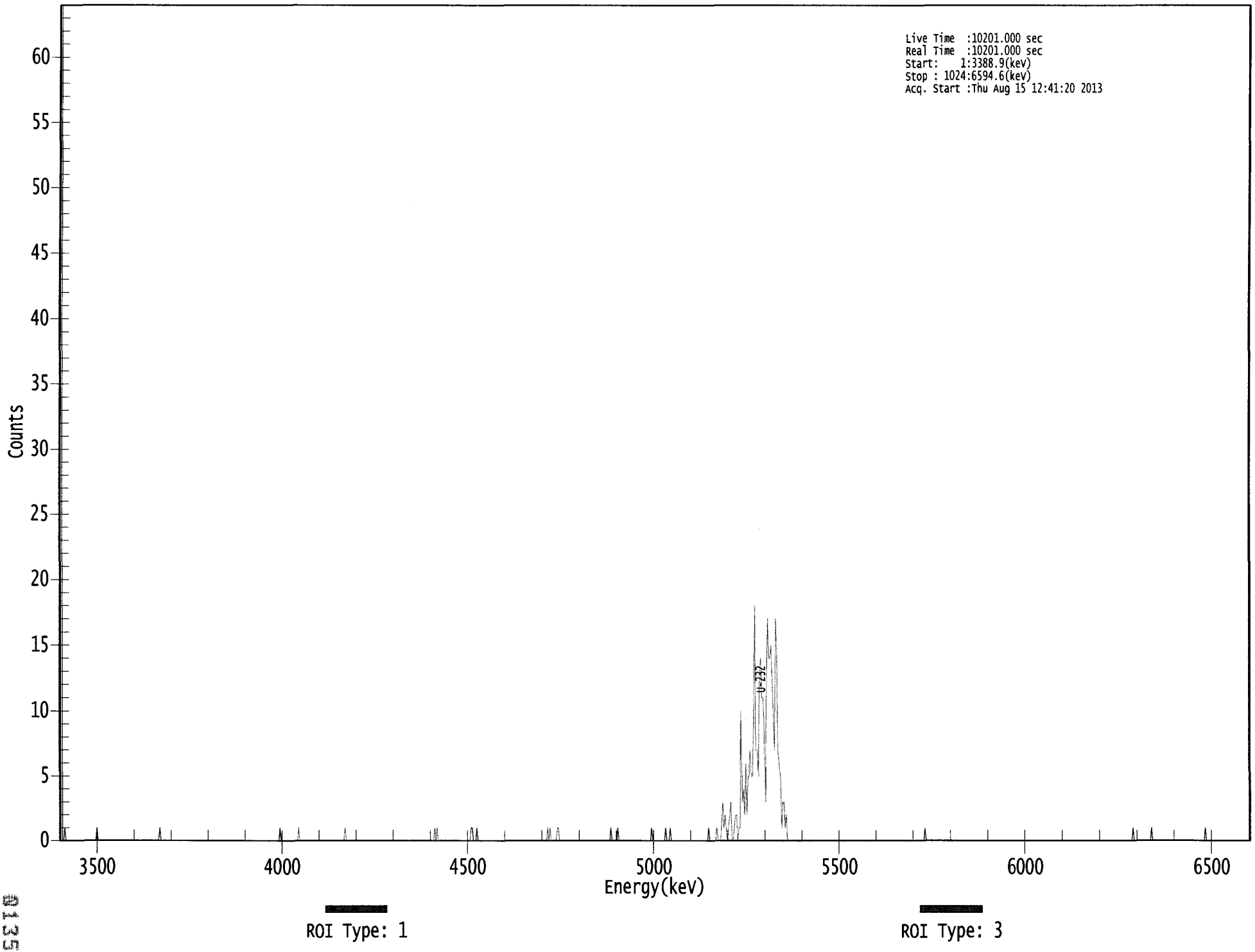
T = Tracer Peak used for Effective Efficiency

NUCLIDE ANALYSIS RESULTS

Nuclide	Id Conf.	Energy (keV)	Activity (pCi/liter)	MDA (pCi/liter)
U-232	0.997	5302.50*	5.16E+000 +/- 5.95E-001	8.52E-002 +/- 9.84E-003
U-234	0.988	4761.50*	4.76E-002 +/- 6.05E-002	9.04E-002 +/- 1.04E-002
U-235	0.982	4385.50*	4.96E-002 +/- 6.41E-002	8.91E-002 +/- 1.03E-002
U-238	0.947	4184.40*	-1.85E-002 +/- 4.71E-002	1.37E-001 +/- 1.58E-002

AG 8/16/13

0000066269.CNF



****
***** S P E C T R A L D A T A R E P O R T *****
****

Sample Title: 08

Elapsed Live time: 10201
Elapsed Real Time: 10201

Channel								
1:	10201	10201	0	0	1	0	0	0
9:	0	0	0	0	0	0	0	0
17:	0	0	0	0	0	0	0	0
25:	0	0	0	0	0	0	0	0
33:	1	0	0	0	0	0	0	0
41:	0	0	0	0	0	0	0	0
49:	0	0	0	0	0	0	0	0
57:	0	0	0	0	0	0	0	0
65:	0	0	0	0	0	0	0	0
73:	0	0	0	0	0	0	0	0
81:	0	0	0	0	0	0	1	0
89:	0	0	0	0	0	0	0	0
97:	0	0	0	0	0	0	0	0
105:	0	0	0	0	0	0	0	0
113:	0	0	0	0	0	0	0	0
121:	0	0	0	0	0	0	0	0
129:	0	0	0	0	0	0	0	0
137:	0	0	0	0	0	0	0	0
145:	0	0	0	0	0	0	0	0
153:	0	0	0	0	0	0	0	0
161:	0	0	0	0	0	0	0	0
169:	0	0	0	0	0	0	0	0
177:	0	0	0	0	0	0	0	0
185:	0	0	0	0	0	0	1	0
193:	0	0	0	0	0	0	0	0
201:	0	0	0	0	0	0	1	0
209:	0	0	0	0	0	0	0	0
217:	0	0	0	0	0	0	0	0
225:	0	0	0	0	0	0	0	0
233:	0	0	0	0	0	0	0	0
241:	0	0	0	0	0	0	1	0
249:	0	0	0	0	0	0	0	0
257:	0	0	0	0	0	0	0	0
265:	0	0	0	0	0	0	0	0
273:	0	0	0	0	0	0	0	0
281:	0	0	0	0	0	0	0	0
289:	0	0	0	0	0	0	0	0
297:	0	0	0	0	0	0	0	0
305:	0	0	0	0	0	0	0	0
313:	0	0	0	0	0	0	0	0
321:	0	0	0	1	0	1	0	0
329:	0	0	0	0	0	0	0	0
337:	0	0	0	0	0	0	0	0
345:	0	0	0	0	0	0	0	0
353:	0	0	1	1	0	0	0	1
361:	0	0	0	0	0	0	0	0

369:	0	0	0	0	0	0	0	0

Sample Title: 08

Channel								
377:	0	0	0	0	0	0	0	0
385:	0	0	0	0	0	0	0	0
393:	0	0	0	0	0	0	0	0
401:	0	0	0	0	0	0	0	0
409:	0	0	0	0	0	0	0	0
417:	0	0	0	0	1	0	1	0
425:	0	0	0	0	1	1	0	0
433:	0	0	0	0	0	0	0	0
441:	0	0	0	0	0	0	0	0
449:	0	0	0	0	0	0	0	0
457:	0	0	0	0	0	0	0	0
465:	0	0	0	0	0	0	0	0
473:	0	0	1	0	0	0	0	0
481:	1	0	0	0	0	0	0	0
489:	0	0	0	0	0	0	0	0
497:	0	0	0	0	0	0	0	0
505:	0	0	0	0	0	1	0	0
513:	0	0	0	0	0	0	0	0
521:	0	1	0	0	0	1	0	0
529:	0	0	0	0	0	0	0	0
537:	0	0	0	0	0	0	0	0
545:	0	0	0	0	0	0	0	0
553:	0	0	0	0	0	0	1	0
561:	0	0	0	0	0	1	0	0
569:	0	1	3	1	2	1	0	1
577:	2	3	0	0	1	2	2	0
585:	1	1	10	3	4	2	6	2
593:	5	5	7	5	5	8	18	7
601:	7	5	13	14	11	11	9	3
609:	12	17	14	14	15	12	10	7
617:	17	14	7	6	5	1	3	3
625:	1	2	0	0	0	0	0	0
633:	0	0	0	0	0	0	0	0
641:	0	0	0	0	0	0	0	0
649:	0	0	0	0	0	0	0	0
657:	0	0	0	0	0	0	0	0
665:	0	0	0	0	0	0	0	0
673:	0	0	0	0	0	0	0	0
681:	0	0	0	0	0	0	0	0
689:	0	0	0	0	0	0	0	0
697:	0	0	0	0	0	0	0	0
705:	0	0	0	0	0	0	0	0
713:	0	0	0	0	0	0	0	0
721:	0	0	0	0	0	0	0	0
729:	0	0	0	0	0	0	0	0
737:	0	0	0	0	0	0	0	0
745:	1	0	0	0	0	0	0	0
753:	0	0	0	0	0	0	0	0
761:	0	0	0	0	0	0	0	0
769:	0	0	0	0	0	0	0	0
777:	0	0	0	0	0	0	0	0
785:	0	0	0	0	0	0	0	0
793:	0	0	0	0	0	0	0	0

801:	0	0	0	0	0	0	0	0

Sample Title: 08

Channel								
809:	0	0	0	0	0	0	0	0
817:	0	0	0	0	0	0	0	0
825:	0	0	0	0	0	0	0	0
833:	0	0	0	0	0	0	0	0
841:	0	0	0	0	0	0	0	0
849:	0	0	0	0	0	0	0	0
857:	0	0	0	0	0	0	0	0
865:	0	0	0	0	0	0	0	0
873:	0	0	0	0	0	0	0	0
881:	0	0	0	0	0	0	0	0
889:	0	0	0	0	0	0	0	0
897:	0	0	0	0	0	0	0	0
905:	0	0	0	0	0	0	0	0
913:	0	0	0	0	0	0	0	0
921:	0	0	1	0	0	0	0	0
929:	0	0	0	0	0	0	0	0
937:	0	0	1	0	0	0	0	0
945:	0	0	0	0	0	0	0	0
953:	0	0	0	0	0	0	0	0
961:	0	0	0	0	0	0	0	0
969:	0	0	0	0	0	0	0	0
977:	0	0	0	0	0	0	0	0
985:	1	0	0	0	0	0	0	0
993:	0	0	0	0	0	0	0	0
1001:	0	0	0	0	0	0	0	0
1009:	0	0	0	0	0	0	0	0
1017:	0	0	0	0	0	0	0	0

KB 8/15/13

Apex-Alpha™

Sample Description: PZ-100-KS DIS
Spectrum File: \\OR-ALPHA1\Canberra\ApexAlpha\Root\Data\00000662
Batch Identification: 1307170A-UU
Sample Identification: 09
Sample Geometry: Shelf 2
Procedure Description: U iso

Detector Name: Alpha_033
Chamber Serial Number: 04026479A
Detector Serial Number: 91132
Env. Background: System Bkgd 64781
Reagent Blank: <not performed>

Sample Size: 1.000E+000 +/- 0.000E+000 liter
Sample Date/Time: 7/23/2013 12:02:00 PM
Acquisition Date/Time: 8/15/2013 12:41:57 PM
Acquisition Live Time: 170.0 minutes
Acquisition Real Time: 173.0 minutes

Tracer Certificate: U232_UU-10A
Tracer Quantity: 0.604 mL
Effective Efficiency: 0.2170 +/- 0.0117
Counting Efficiency: 0.1848 +/- 0.0032 on 7/20/2013 2:31:30 PM
Chem. Recovery Factor: 1.1740 +/- 0.0665

Peak Match Tolerance: 0.150 MeV

PEAK AREA REPORT

Nuclide		Energy (MeV)	Net Pk Area	Pk Area Error %	Ambient Backgnd	Reagent Backgnd	FWHM (keV)
U-232	T	5.295	421.83	9.55	0.17	0.00E+000	23.8
U-234		4.733	3.83	102.72	0.17	0.00E+000	3.0
U-235		4.363	4.66	94.59	0.34	0.00E+000	3.0
U-238		4.129	2.66	128.85	0.34	0.00E+000	3.0

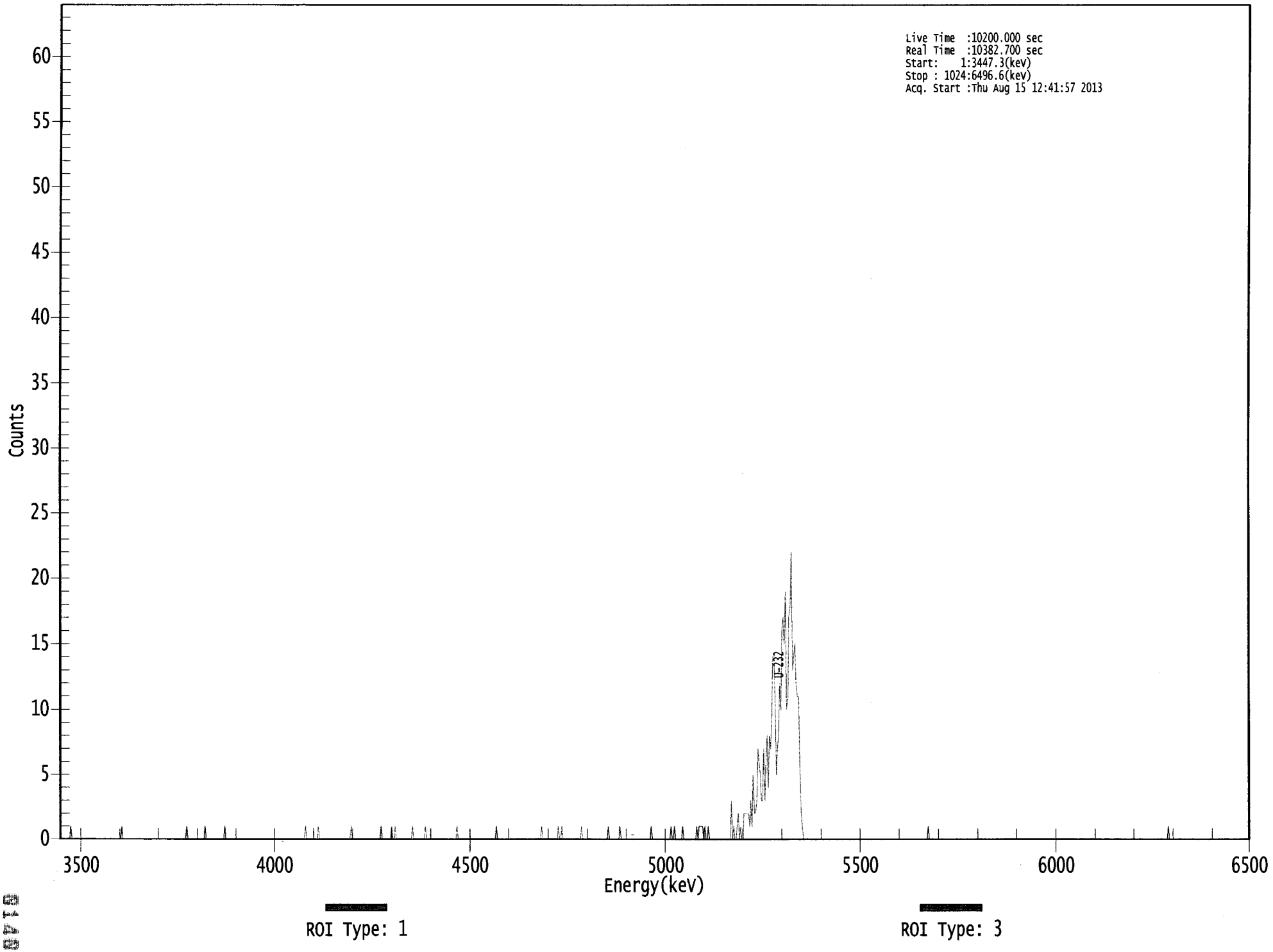
T = Tracer Peak used for Effective Efficiency

NUCLIDE ANALYSIS RESULTS

Nuclide	Id Conf.	Energy (keV)	Activity (pCi/liter)	MDA (pCi/liter)
U-232	1.000	5302.50*	5.17E+000 +/- 5.45E-001	5.11E-002 +/- 5.39E-003
U-234	0.994	4761.50*	4.69E-002 +/- 4.84E-002	5.11E-002 +/- 5.39E-003
U-235	0.996	4385.50*	7.03E-002 +/- 6.70E-002	7.22E-002 +/- 7.62E-003
U-238	0.978	4184.40*	3.24E-002 +/- 4.19E-002	5.83E-002 +/- 6.15E-003

AG
8/16/13

0000066270.CNF



****
***** S P E C T R A L D A T A R E P O R T *****
****

Sample Title: 09

Elapsed Live time: 10200
Elapsed Real Time: 10383

Channel								
1:	0	0	0	0	0	0	0	0
9:	0	1	0	0	0	0	0	0
17:	0	0	0	0	0	0	0	0
25:	0	0	0	0	0	0	0	0
33:	0	0	0	0	0	0	0	0
41:	0	0	0	0	0	0	0	0
49:	0	0	0	0	0	1	0	0
57:	0	0	0	0	0	0	0	0
65:	0	0	0	0	0	0	0	0
73:	0	0	0	0	0	0	0	0
81:	0	0	0	0	0	0	0	0
89:	0	0	0	0	0	0	0	0
97:	0	0	0	0	0	0	0	0
105:	0	0	0	0	0	1	0	0
113:	0	0	0	0	0	0	0	0
121:	0	0	0	0	0	1	0	0
129:	0	0	0	0	0	0	0	0
137:	0	0	0	0	0	0	1	0
145:	0	0	0	0	0	0	0	0
153:	0	0	0	0	0	0	0	0
161:	0	0	0	0	0	0	0	0
169:	0	0	0	0	0	0	0	0
177:	0	0	0	0	0	0	0	0
185:	0	0	0	0	0	0	0	0
193:	0	0	0	0	0	0	0	0
201:	0	0	0	0	0	0	0	0
209:	0	0	0	0	1	0	0	0
217:	0	0	0	0	0	0	0	1
225:	0	0	0	0	0	0	0	0
233:	0	0	0	0	0	0	0	0
241:	0	0	0	0	0	0	0	0
249:	0	0	0	1	0	0	0	0
257:	0	0	0	0	0	0	0	0
265:	0	0	0	0	0	0	0	0
273:	0	0	0	0	0	1	0	0
281:	0	0	0	0	0	0	1	0
289:	0	1	0	0	0	0	0	0
297:	0	0	0	0	0	0	0	0
305:	1	0	0	0	0	0	0	0
313:	0	0	0	1	0	0	0	0
321:	0	0	0	0	0	0	0	0
329:	0	0	0	0	0	0	0	0
337:	0	0	0	0	0	0	1	0
345:	0	0	0	0	0	0	0	0
353:	0	0	0	0	0	0	0	0
361:	0	0	0	0	0	0	0	0

369:	0	0	0	0	0	0	0	0

Sample Title: 09

Channel								
377:	1	0	0	0	0	0	0	0
385:	0	0	0	0	0	0	0	0
393:	0	0	0	0	0	0	0	0
401:	0	0	0	0	0	0	0	0
409:	0	0	0	0	0	0	0	1
417:	0	0	0	0	0	0	0	0
425:	0	0	0	0	0	1	0	0
433:	1	0	0	0	0	0	0	0
441:	0	0	0	0	0	0	0	0
449:	0	1	0	0	0	0	0	0
457:	0	0	0	0	0	0	0	0
465:	0	0	0	0	0	0	0	0
473:	1	0	0	0	0	0	0	0
481:	0	0	1	0	0	0	0	0
489:	0	0	0	0	0	0	0	0
497:	0	0	0	0	0	0	0	0
505:	0	0	0	0	0	1	0	0
513:	0	0	0	0	0	0	0	0
521:	0	0	0	0	0	0	1	0
529:	0	1	0	0	0	0	0	0
537:	1	0	0	0	0	0	0	0
545:	0	0	0	0	1	0	1	1
553:	1	1	0	1	0	0	1	0
561:	0	0	0	0	0	0	0	0
569:	0	0	0	0	0	0	0	0
577:	0	0	3	0	1	0	0	1
585:	2	0	1	0	0	2	2	2
593:	2	2	1	3	1	5	2	2
601:	3	7	6	5	3	3	7	3
609:	6	8	4	8	7	9	14	14
617:	11	5	7	8	12	10	16	17
625:	15	19	10	11	17	18	22	13
633:	14	15	12	11	11	6	2	1
641:	0	0	0	0	0	0	0	0
649:	0	0	0	0	0	0	0	0
657:	0	0	0	0	0	0	0	0
665:	0	0	0	0	0	0	0	0
673:	0	0	0	0	0	0	0	0
681:	0	0	0	0	0	0	0	0
689:	0	0	0	0	0	0	0	0
697:	0	0	0	0	0	0	0	0
705:	0	0	0	0	0	0	0	0
713:	0	0	0	0	0	0	0	0
721:	0	0	0	0	0	0	0	0
729:	0	0	0	0	0	0	0	0
737:	0	0	0	0	0	0	0	0
745:	0	0	0	1	0	0	0	0
753:	0	0	0	0	0	0	0	0
761:	0	0	0	0	0	0	0	0
769:	0	0	0	0	0	0	0	0
777:	0	0	0	0	0	0	0	0
785:	0	0	0	0	0	0	0	0
793:	0	0	0	0	0	0	0	0

801:	0	0	0	0	0	0	0	0

Sample Title: 09

Channel								
809:	0	0	0	0	0	0	0	0
817:	0	0	0	0	0	0	0	0
825:	0	0	0	0	0	0	0	0
833:	0	0	0	0	0	0	0	0
841:	0	0	0	0	0	0	0	0
849:	0	0	0	0	0	0	0	0
857:	0	0	0	0	0	0	0	0
865:	0	0	0	0	0	0	0	0
873:	0	0	0	0	0	0	0	0
881:	0	0	0	0	0	0	0	0
889:	0	0	0	0	0	0	0	0
897:	0	0	0	0	0	0	0	0
905:	0	0	0	0	0	0	0	0
913:	0	0	0	0	0	0	0	0
921:	0	0	0	0	0	0	0	0
929:	0	0	0	0	0	0	0	0
937:	0	0	0	0	0	0	0	0
945:	0	0	0	0	0	0	0	0
953:	0	1	0	0	0	0	0	0
961:	0	0	0	0	0	0	0	0
969:	0	0	0	0	0	0	0	0
977:	0	0	0	0	0	0	0	0
985:	0	0	0	0	0	0	0	0
993:	0	0	0	0	0	0	0	0
1001:	0	0	0	0	0	0	0	0
1009:	0	0	0	0	0	0	0	0
1017:	0	0	0	0	0	0	0	0

KB 8/15/13

Apex-Alpha™

Sample Description: PURGE TANK TOT
Spectrum File: \\OR-ALPHA1\Canberra\ApexAlpha\Root\Data\00000662
Batch Identification: 1307170A-UU
Sample Identification: 10
Sample Geometry: Shelf 2
Procedure Description: U iso

Detector Name: Alpha_034
Chamber Serial Number: 04026479B
Detector Serial Number: 91136
Env. Background: System Bkgd 64782
Reagent Blank: <not performed>

Sample Size: 1.000E+000 +/- 0.000E+000 liter
Sample Date/Time: 7/23/2013 12:02:00 PM
Acquisition Date/Time: 8/15/2013 12:41:59 PM
Acquisition Live Time: 170.0 minutes
Acquisition Real Time: 173.0 minutes

Tracer Certificate: U232_UU-10A
Tracer Quantity: 0.602 mL
Effective Efficiency: 0.0428 +/- 0.0048
Counting Efficiency: 0.1856 +/- 0.0032 on 12/16/2012 5:49:43 PM
Chem. Recovery Factor: 0.2308 +/- 0.0263

Peak Match Tolerance: 0.150 MeV

PEAK AREA REPORT

Nuclide		Energy (MeV)	Net Pk Area	Pk Area Error %	Ambient Backgnd	Reagent Backgnd	FWHM (keV)
U-232	T	5.287	83.00	21.64	0.00	0.00E+000	6.7
U-234		4.751	28.00	37.70	0.00	0.00E+000	3.0
U-235		4.450	1.00	277.19	0.00	0.00E+000	3.0
U-238		4.169	14.66	51.88	0.34	0.00E+000	3.0

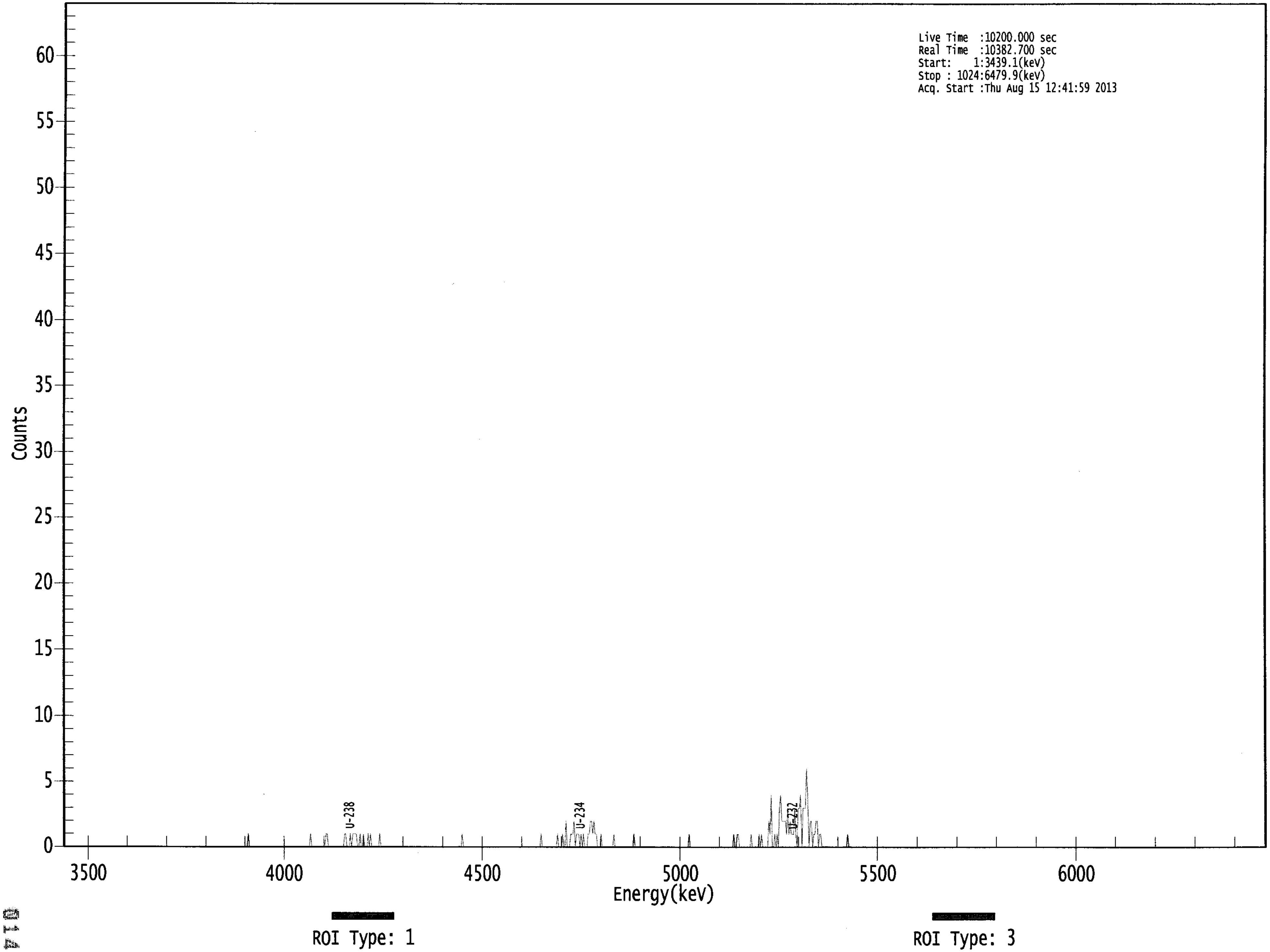
T = Tracer Peak used for Effective Efficiency

NUCLIDE ANALYSIS RESULTS

Nuclide	Id Conf.	Energy (keV)	Activity (pCi/liter)	MDA (pCi/liter)
U-232	0.998	5302.50*	5.15E+000 +/- 1.14E+000	3.72E-001 +/- 8.22E-002
U-234	0.999	4761.50*	1.74E+000 +/- 7.59E-001	3.72E-001 +/- 8.22E-002
U-235	0.971	4385.50*	7.65E-002 +/- 2.13E-001	4.59E-001 +/- 1.01E-001
U-238	0.998	4184.40*	9.05E-001 +/- 5.10E-001	2.95E-001 +/- 6.52E-002

AG 8/16/13

0000066271.CNF



0145

****
***** S P E C T R A L D A T A R E P O R T *****
****

Sample Title: 10

Elapsed Live time: 10200
Elapsed Real Time: 10383

Channel								
1:	0	0	0	0	0	0	0	0
9:	0	0	0	0	0	0	0	0
17:	0	0	0	0	0	0	0	0
25:	0	0	0	0	0	0	0	0
33:	0	0	0	0	0	0	0	0
41:	0	0	0	0	0	0	0	0
49:	0	0	0	0	0	0	0	0
57:	0	0	0	0	0	0	0	0
65:	0	0	0	0	0	0	0	0
73:	0	0	0	0	0	0	0	0
81:	0	0	0	0	0	0	0	0
89:	0	0	0	0	0	0	0	0
97:	0	0	0	0	0	0	0	0
105:	0	0	0	0	0	0	0	0
113:	0	0	0	0	0	0	0	0
121:	0	0	0	0	0	0	0	0
129:	0	0	0	0	0	0	0	0
137:	0	0	0	0	0	0	0	0
145:	0	0	0	0	0	0	0	0
153:	0	0	0	0	0	0	1	0
161:	0	0	0	0	0	0	0	0
169:	0	0	0	0	0	0	0	0
177:	0	0	0	0	0	0	0	0
185:	0	0	0	0	0	0	0	0
193:	0	0	0	0	0	0	0	0
201:	0	0	0	0	0	0	0	0
209:	0	0	0	1	0	0	0	0
217:	0	0	0	0	0	0	0	0
225:	1	1	0	0	0	0	0	0
233:	0	0	0	0	0	0	0	0
241:	1	1	0	0	0	1	0	1
249:	1	1	1	0	0	1	0	0
257:	1	0	0	0	1	0	1	0
265:	0	0	0	0	0	0	1	0
273:	0	0	0	0	0	0	0	0
281:	0	0	0	0	0	0	0	0
289:	0	0	0	0	0	0	0	0
297:	0	0	0	0	0	0	0	0
305:	0	0	0	0	0	0	0	0
313:	0	0	0	0	0	0	0	0
321:	0	0	0	0	0	0	0	0
329:	0	0	0	0	0	0	0	0
337:	0	0	0	0	1	0	0	0
345:	0	0	0	0	0	0	0	0
353:	0	0	0	0	0	0	0	0
361:	0	0	0	0	0	0	0	0

369:	0	0	0	0	0	0	0	0

Sample Title: 10

Channel								
377:	0	0	0	0	0	0	0	0
385:	0	0	0	0	0	0	0	0
393:	0	0	0	0	0	0	0	0
401:	0	0	0	0	0	0	0	1
409:	0	0	0	0	0	0	0	0
417:	0	0	0	0	0	1	0	0
425:	0	1	0	0	2	0	0	0
433:	1	1	1	2	0	1	1	1
441:	0	1	0	1	0	0	0	1
449:	1	2	2	1	2	1	1	0
457:	0	0	1	0	0	0	0	0
465:	0	0	0	0	0	1	0	0
473:	0	0	0	0	0	0	0	0
481:	0	0	0	0	0	0	1	0
489:	0	0	0	0	0	0	0	0
497:	0	0	0	0	0	0	0	0
505:	0	0	0	0	0	0	0	0
513:	0	0	0	0	0	0	0	0
521:	0	0	0	0	0	0	0	0
529:	0	0	0	0	0	1	0	0
537:	0	0	0	0	0	0	0	0
545:	0	0	0	0	0	0	0	0
553:	0	0	0	0	0	0	0	0
561:	0	0	0	0	0	0	0	0
569:	0	0	0	1	0	0	1	1
577:	0	0	0	0	0	0	0	0
585:	0	0	1	0	0	0	0	0
593:	0	1	0	1	0	0	0	0
601:	0	2	1	4	0	0	1	0
609:	1	0	3	4	2	2	2	2
617:	1	3	1	2	1	1	1	3
625:	1	0	3	3	4	0	3	3
633:	3	6	4	0	2	2	0	1
641:	1	2	2	0	1	1	0	0
649:	0	0	0	0	0	0	0	0
657:	0	0	0	0	0	0	0	0
665:	0	0	0	0	1	0	0	0
673:	0	0	0	0	0	0	0	0
681:	0	0	0	0	0	0	0	0
689:	0	0	0	0	0	0	0	0
697:	0	0	0	0	0	0	0	0
705:	0	0	0	0	0	0	0	0
713:	0	0	0	0	0	0	0	0
721:	0	0	0	0	0	0	0	0
729:	0	0	0	0	0	0	0	0
737:	0	0	0	0	0	0	0	0
745:	0	0	0	0	0	0	0	0
753:	0	0	0	0	0	0	0	0
761:	0	0	0	0	0	0	0	0
769:	0	0	0	0	0	0	0	0
777:	0	0	0	0	0	0	0	0
785:	0	0	0	0	0	0	0	0
793:	0	0	0	0	0	0	0	0

801:	0	0	0	0	0	0	0	0

Sample Title: 10

Channel								
809:	0	0	0	0	0	0	0	0
817:	0	0	0	0	0	0	0	0
825:	0	0	0	0	0	0	0	0
833:	0	0	0	0	0	0	0	0
841:	0	0	0	0	0	0	0	0
849:	0	0	0	0	0	0	0	0
857:	0	0	0	0	0	0	0	0
865:	0	0	0	0	0	0	0	0
873:	0	0	0	0	0	0	0	0
881:	0	0	0	0	0	0	0	0
889:	0	0	0	0	0	0	0	0
897:	0	0	0	0	0	0	0	0
905:	0	0	0	0	0	0	0	0
913:	0	0	0	0	0	0	0	0
921:	0	0	0	0	0	0	0	0
929:	0	0	0	0	0	0	0	0
937:	0	0	0	0	0	0	0	0
945:	0	0	0	0	0	0	0	0
953:	0	0	0	0	0	0	0	0
961:	0	0	0	0	0	0	0	0
969:	0	0	0	0	0	0	0	0
977:	0	0	0	0	0	0	0	0
985:	0	0	0	0	0	0	0	0
993:	0	0	0	0	0	0	0	0
1001:	0	0	0	0	0	0	0	0
1009:	0	0	0	0	0	0	0	0
1017:	0	0	0	0	0	0	0	0

8/15/2013 5:50:56 AM

Apex-Alpha™

QA SUMMARY REPORT

Review Of QA Results - Pulser Check

Date : 8/15/2013
Time : 5:50:56 AM

CHAMBER	DEVICE	PARAMETER	FLAG	DATE
Alpha_001	21f	ALL	Not Done	
Alpha_002	21f	ALL	Not Done	
Alpha_003	21f	ALL	Passed	8/15/2013 5:25:08 AM
Alpha_004	21f	ALL	Passed	8/15/2013 5:25:09 AM
Alpha_005	21f	ALL	Not Done	
Alpha_006	21f	ALL	Not Done	
Alpha_007	21f	ALL	Not Done	
Alpha_008	21f	ALL	Not Done	
Alpha_009	21f	ALL	Not Done	
Alpha_010	21f	ALL	Passed	8/15/2013 5:25:10 AM
Alpha_011	21f	ALL	Passed	8/15/2013 5:25:11 AM
Alpha_012	21f	ALL	Passed	8/15/2013 5:25:12 AM
Alpha_013	21f	ALL	Passed	8/15/2013 5:25:12 AM
Alpha_014	21f	ALL	Passed	8/15/2013 5:25:13 AM
Alpha_015	21f	Peak Energy	Action	8/15/2013 5:25:14 AM
Alpha_016	21f	ALL	Not Done	
Alpha_017	AIM730	ALL	Not Done	
Alpha_018	AIM730	ALL	Passed	8/10/2013 11:23:01 AM
Alpha_019	AIM730	ALL	Passed	8/15/2013 5:25:15 AM
Alpha_020	AIM730	ALL	Not Done	
Alpha_021	AIM730	ALL	Not Done	
Alpha_022	AIM730	ALL	Passed	8/15/2013 5:25:16 AM
Alpha_023	AIM730	ALL	Passed	8/15/2013 5:25:16 AM
Alpha_024	AIM730	ALL	Passed	8/15/2013 5:25:17 AM
Alpha_025	AIM730	ALL	Passed	8/15/2013 5:25:18 AM
Alpha_026	AIM730	ALL	Not Done	
Alpha_027	AIM730	ALL	Passed	8/15/2013 5:25:19 AM
Alpha_028	AIM730	ALL	Not Done	
Alpha_029	AIM730	ALL	Passed	8/15/2013 5:25:20 AM
Alpha_030	AIM730	ALL	Not Done	
Alpha_031	AIM730	ALL	Passed	8/15/2013 5:25:20 AM
Alpha_032	AIM730	ALL	Not Done	
Alpha_033	Alpha Analyst100DC	ALL	Passed	8/15/2013 5:25:21 AM
Alpha_034	Alpha Analyst100DC	ALL	Passed	8/15/2013 5:25:23 AM
Alpha_035	Alpha Analyst100DC	ALL	Passed	8/15/2013 5:25:24 AM
Alpha_036	Alpha Analyst100DC	ALL	Passed	8/15/2013 5:25:26 AM
Alpha_037	Alpha Analyst100DC	ALL	Passed	8/15/2013 5:25:28 AM
Alpha_038	Alpha Analyst100DC	ALL	Passed	8/15/2013 5:25:30 AM
Alpha_039	Alpha Analyst100DC	ALL	Passed	8/15/2013 5:25:31 AM
Alpha_040	Alpha Analyst100DC	ALL	Passed	8/15/2013 5:25:33 AM
Alpha_041	Alpha Analyst100DC	ALL	Passed	8/15/2013 5:25:35 AM
Alpha_042	Alpha Analyst100DC	ALL	Passed	8/15/2013 5:25:37 AM

Review of QA Results - Pulser Check

8/15/2013 5:50:56 AM

CHAMBER	DEVICE	PARAMETER	FLAG	DATE
Alpha_043	Alpha Analyst100DC	ALL	Passed	8/15/2013 5:25:40 AM
Alpha_044	Alpha Analyst100DC	ALL	Passed	8/15/2013 5:25:42 AM
Alpha_045	Alpha Analyst100DC	ALL	Passed	8/15/2013 5:25:44 AM
Alpha_046	Alpha Analyst100DC	ALL	Passed	8/15/2013 5:25:47 AM
Alpha_047	Alpha Analyst100DC	ALL	Passed	8/15/2013 5:25:49 AM
Alpha_048	Alpha Analyst100DC	ALL	Passed	8/15/2013 5:25:52 AM

APPROVED BY: ✓

APPROVAL DATE: 8/15/13

****
***** L I B R A R Y L I S T I N G R E P O R T *****
****

Nuclide Library Title: Uranium

Nuclide Library Description: U-232,-234,-235,-238

Nuclide Name	Half-Life (Seconds)	Energy (keV)	Energy Uncert. (keV)	Yield (%)	Yield Uncert.(Abs.+-)
U-232	2.174E+009	5302.500*	0.000	99.8000	0.0000
U-234	7.731E+012	4761.500*	0.000	99.8000	0.0000
U-235	2.221E+016	4385.500*	0.000	80.9000	0.0000
U-238	1.410E+017	4184.400*	0.000	100.2300	0.0000

* = key line

TOTALS: 4 Nuclides 4 Energy Lines

SECTION IX

ANALYTICAL DATA (ISOTOPIC THORIUM)

Work Order	13-07170
Analysis Code	ThISO
Run	1
Date Received	7/29/2013
Lab Deadline	8/16/2013
Client	Engineering Management Support, Inc.
Project	West Lake OU-1
Report Level	4
Activity Units	pCi
Aliquot Units	l
Matrix	WA
Method	HASL 300, 4.5.2
Instrument Type	Alpha Spectroscopy
Radiometric Tracer	Th-229
Radiometric Sol#	Th-18a
Tracer Act (dpm/g)	22.466
Carrier	
Carrier Conc (mg/ml)	

Internal Fraction	Sample Desc	Client ID	Login CPM	Sample Date	Sample Aliquot
01	LCS	LCS		07/29/13 00:00	1.0000E+00
02	MBL	BLANK		07/29/13 00:00	1.0000E+00
03	DUP	LR-104 TOT	43	07/22/13 11:45	1.0000E+00
04	TRG	PZ-305-AI TOT	45	07/22/13 10:41	1.0000E+00
05	TRG	PZ-305-AI DIS	45	07/22/13 10:41	1.0000E+00
06	DO	LR-104 TOT	43	07/22/13 11:45	1.0000E+00
07	TRG	LR-104 DIS	43	07/22/13 11:45	1.0000E+00
08	TRG	PZ-100-KS TOT	40	07/23/13 07:45	1.0000E+00
09	TRG	PZ-100-KS DIS	40	07/23/13 07:45	1.0000E+00
10	TRG	PURGE TANK TOT	39	07/23/13 06:40	1.0000E+00

* SAF1 is used for Gross Alpha and all other radionuclides. SAF2 is used for Gross Beta only. ** Actual mass exceeded the calibration curve range. Results should be qualified as appropriate.

13-07170
ThISO
Run 1

Internal Fraction	Sample Desc	Tracer Aliquot (g)	Tracer Total ACT (dpm)	Radiometric Tracer (pCi)	Radiometric % Rec	Grav Carrier Added (ml)	Grav Filter Tare (g)	Grav Filter Final (g)	Grav Filter Net (g)	Grav % Rec	Mean % Rec	SAF 1*	SAF 2*
01	LCS	0.4800	10.8		0.00								
02	MBL	0.2379	5.3		0.00								
03	DUP	0.2363	5.3		0.00								
04	TRG	0.2363	5.3		0.00								
05	TRG	0.2355	5.3		0.00								
06	DO	0.2353	5.3		0.00								
07	TRG	0.2354	5.3		0.00								
08	TRG	0.2342	5.3		0.00								
09	TRG	0.2334	5.2		0.00								
10	TRG	0.2329	5.2		0.00								

* SAF1 is used for Gross Alpha and all other radionuclides. SAF2 is used for Gross Beta only. ** Actual mass exceeded the calibration curve range. Results should be qualified as appropriate.

13-07170
ThISO
Run 1

Internal Fraction	Sample Desc	Rough Prep Date	Rough Prep By	Prep Date	Prep By	Sep t0 Date/Time	Sep t0 By	Sep t1 Date/Time	Sep t1 By
01	LCS			08/09/13 07:14	JWOLFE	08/15/13 12:00	JDEMELAS		
02	MBL			08/09/13 07:14	JWOLFE	08/15/13 12:00	JDEMELAS		
03	DUP			08/09/13 07:14	JWOLFE	08/15/13 12:00	JDEMELAS		
04	TRG			08/09/13 07:14	JWOLFE	08/15/13 12:00	JDEMELAS		
05	TRG			08/09/13 07:14	JWOLFE	08/15/13 12:00	JDEMELAS		
06	DO			08/09/13 07:14	JWOLFE	08/15/13 12:00	JDEMELAS		
07	TRG			08/09/13 07:14	JWOLFE	08/15/13 12:00	JDEMELAS		
08	TRG			08/09/13 07:14	JWOLFE	08/15/13 12:00	JDEMELAS		
09	TRG			08/09/13 07:14	JWOLFE	08/15/13 12:00	JDEMELAS		
10	TRG			08/09/13 07:14	JWOLFE	08/15/13 12:00	JDEMELAS		

* SAF1 is used for Gross Alpha and all other radionuclides. SAF2 is used for Gross Beta only. ** Actual mass exceeded the calibration curve range. Results should be qualified as appropriate.

Eberline Services
Oak Ridge Laboratory

Preliminary Data Report & Analytical Calculations

Work Order: 13-07170-ThISO-1

Printed: 8/16/2013 9:13 AM

Run: 1
Analysis Code: ThISO
Eberline Services Work Order: 13-07170
Client: Engineering Management Support, Inc.

Lab Fraction	Nuclide	Sample Desc	Client Identification	Activity Units	Results	Error Estimate	MDA	LCS Known	LCS %R	LCS Flag	RPD Flag	MDA Flag	Blank Flag
01	TH-228	LCS	LCS	pCi/l	4.91E+00	8.08E-01	6.20E-02	4.89E+00	100.48	OK		OK	
02	TH-228	MBL	BLANK	pCi/l	6.79E-03	4.40E-02	1.20E-01					OK	OK
03	TH-228	DUP	LR-104 TOT	pCi/l	5.21E-02	7.49E-02	1.26E-01				NA	OK	
04	TH-228	TRG	PZ-305-AI TOT	pCi/l	-2.22E-02	9.15E-02	2.37E-01					OK	
05	TH-228	TRG	PZ-305-AI DIS	pCi/l	-3.13E-02	4.00E-02	1.45E-01					OK	
06	TH-228	DO	LR-104 TOT	pCi/l	5.90E-02	5.64E-02	6.86E-02					OK	
07	TH-228	TRG	LR-104 DIS	pCi/l	5.10E-02	6.52E-02	9.69E-02					OK	
08	TH-228	TRG	PZ-100-KS TOT	pCi/l	2.11E-02	5.09E-02	1.02E-01					OK	
09	TH-228	TRG	PZ-100-KS DIS	pCi/l	-4.72E-02	3.04E-02	1.15E-01					OK	
10	TH-228	TRG	PURGE TANK TOT	pCi/l	2.58E-02	5.60E-02	1.10E-01					OK	

Client: Engineering Management Support, Inc.
Eberline Services Work Order: 13-07170
Analysis Code: ThISO
Run: 1

Lab Fraction	Nuclide	Sample Desc	Sample Date	Sample Aliquot	Radiometric % Rec	Grav % Rec	Mean % Rec	SAF	Sep t0 Date/Time	Sep t1 Date/Time
01	TH-228	LCS	07/29/13 00:00	1.00E+00	98.02	0.00	0.00		8/15/2013 12:00	
02	TH-228	MBL	07/29/13 00:00	1.00E+00	74.36	0.00	0.00		8/15/2013 12:00	
03	TH-228	DUP	07/22/13 11:45	1.00E+00	112.52	0.00	0.00		8/15/2013 12:00	
04	TH-228	TRG	07/22/13 10:41	1.00E+00	57.48	0.00	0.00		8/15/2013 12:00	
05	TH-228	TRG	07/22/13 10:41	1.00E+00	83.44	0.00	0.00		8/15/2013 12:00	
06	TH-228	DO	07/22/13 11:45	1.00E+00	115.48	0.00	0.00		8/15/2013 12:00	
07	TH-228	TRG	07/22/13 11:45	1.00E+00	84.33	0.00	0.00		8/15/2013 12:00	
08	TH-228	TRG	07/23/13 07:45	1.00E+00	101.08	0.00	0.00		8/15/2013 12:00	
09	TH-228	TRG	07/23/13 07:45	1.00E+00	126.92	0.00	0.00		8/15/2013 12:00	
10	TH-228	TRG	07/23/13 06:40	1.00E+00	93.85	0.00	0.00		8/15/2013 12:00	

Preliminary Data Report & Analytical Calculations

Work Order: 13-07170-ThISO-1

Run: 1
Analysis Code: ThISO
Eberline Services Work Order: 13-07170
Client: Engineering Management Support, Inc.

Lab Fraction	Nuclide	Sample Desc	Counting Date/Time	Halflife (days)	Detect	Carrier	Count Time	Counts	Bkg CPM	Eff
01	TH-228	LCS	08/15/13 13:18		A_Spec	Alpha_047	170	3.31 E+02	1.00 E-03	18.2
02	TH-228	MBL	08/15/13 13:18		A_Spec	Alpha_048	170	3.20 E-01	4.00 E-03	16.8
03	TH-228	DUP	08/15/13 14:33		A_Spec	Alpha_003	170	3.77 E+00	1.90 E-02	17.5
04	TH-228	TRG	08/15/13 14:33		A_Spec	Alpha_004	170	-9.10 E-01	2.30 E-02	19.4
05	TH-228	TRG	08/15/13 14:33		A_Spec	Alpha_010	170	-1.89 E+00	1.70 E-02	19.7
06	TH-228	DO	08/15/13 14:33		A_Spec	Alpha_011	170	5.15 E+00	5.00 E-03	20.5
07	TH-228	TRG	08/15/13 14:33		A_Spec	Alpha_012	170.02	3.15 E+00	5.00 E-03	19.9
08	TH-228	TRG	08/15/13 14:33		A_Spec	Alpha_013	170	1.47 E+00	9.00 E-03	18.7
09	TH-228	TRG	08/15/13 14:33		A_Spec	Alpha_014	170	-4.08 E+00	2.40 E-02	18.5
10	TH-228	TRG	08/15/13 14:33		A_Spec	Alpha_015	170	1.32 E+00	4.00 E-03	14.8

Preliminary Data Report & Analytical Calculations

Work Order: 13-07170-ThISO-1

Run	Analysis Code	Eberline Services Work Order	Client
1	ThISO	13-07170	Engineering Management Support, Inc.

Lab Fraction	Nuclide	Sample Desc	Client Identification	Activity Units	Results	Error Estimate	MDA	LCS Known	LCS %R	LCS Flag	RPD Flag	MDA Flag	Blank Flag
01	TH-230	LCS	LCS	pCi/l	5.38E+00	8.69E-01	6.20E-02	5.48E+00	98.18	OK		OK	
02	TH-230	MBL	BLANK	pCi/l	3.53E-02	6.01E-02	1.02E-01					OK	OK
03	TH-230	DUP	LR-104 TOT	pCi/l	1.21E-01	8.66E-02	8.51E-02				NA	OK	
04	TH-230	TRG	PZ-305-AI TOT	pCi/l	5.47E-02	9.73E-02	1.75E-01					OK	
05	TH-230	TRG	PZ-305-AI DIS	pCi/l	3.72E-02	6.60E-02	1.19E-01					OK	
06	TH-230	DO	LR-104 TOT	pCi/l	9.90E-02	6.76E-02	4.68E-02					OK	
07	TH-230	TRG	LR-104 DIS	pCi/l	9.22E-02	7.78E-02	6.60E-02					OK	
08	TH-230	TRG	PZ-100-KS TOT	pCi/l	3.74E-02	4.85E-02	6.72E-02					OK	
09	TH-230	TRG	PZ-100-KS DIS	pCi/l	1.28E-01	7.96E-02	6.39E-02					OK	
10	TH-230	TRG	PURGE TANK TOT	pCi/l	2.93E-01	1.60E-01	1.08E-01					OK	

Client: Engineering Management Support, Inc.
Eberline Services Work Order: 13-07170
Analysis Code: ThISO
Run: 1

Lab Fraction	Nuclide	Sample Desc	Sample Date	Sample Aliquot	Radiometric % Rec	Grav % Rec	Mean % Rec	SAF	Sep t0 Date/Time	Sep t1 Date/Time
01	TH-230	LCS	07/29/13 00:00	1.00E+00	98.02	0.00	0.00		8/15/2013 12:00	
02	TH-230	MBL	07/29/13 00:00	1.00E+00	74.36	0.00	0.00		8/15/2013 12:00	
03	TH-230	DUP	07/22/13 11:45	1.00E+00	112.52	0.00	0.00		8/15/2013 12:00	
04	TH-230	TRG	07/22/13 10:41	1.00E+00	57.48	0.00	0.00		8/15/2013 12:00	
05	TH-230	TRG	07/22/13 10:41	1.00E+00	83.44	0.00	0.00		8/15/2013 12:00	
06	TH-230	DO	07/22/13 11:45	1.00E+00	115.48	0.00	0.00		8/15/2013 12:00	
07	TH-230	TRG	07/22/13 11:45	1.00E+00	84.33	0.00	0.00		8/15/2013 12:00	
08	TH-230	TRG	07/23/13 07:45	1.00E+00	101.08	0.00	0.00		8/15/2013 12:00	
09	TH-230	TRG	07/23/13 07:45	1.00E+00	126.92	0.00	0.00		8/15/2013 12:00	
10	TH-230	TRG	07/23/13 06:40	1.00E+00	93.85	0.00	0.00		8/15/2013 12:00	

Run	Analysis Code	Eberline Services Work Order	Client
1	ThISO	13-07170	Engineering Management Support, Inc.

Lab Fraction	Nuclide	Sample Desc	Counting Date/Time	Halflife (days)	Detect	Carrier	Count Time	Counts	Bkg CPM	Eff
01	TH-230	LCS	08/15/13 13:18		A_Spec	Alpha_047	170	3.62 E+02	1.00 E-03	18.2
02	TH-230	MBL	08/15/13 13:18		A_Spec	Alpha_048	170	1.66 E+00	2.00 E-03	16.8
03	TH-230	DUP	08/15/13 14:33		A_Spec	Alpha_003	170	8.98 E+00	6.00 E-03	17.5
04	TH-230	TRG	08/15/13 14:33		A_Spec	Alpha_004	170	2.30 E+00	1.00 E-02	19.4
05	TH-230	TRG	08/15/13 14:33		A_Spec	Alpha_010	170	2.30 E+00	1.00 E-02	19.7
06	TH-230	DO	08/15/13 14:33		A_Spec	Alpha_011	170	8.83 E+00	1.00 E-03	20.5
07	TH-230	TRG	08/15/13 14:33		A_Spec	Alpha_012	170.02	5.83 E+00	1.00 E-03	19.9
08	TH-230	TRG	08/15/13 14:33		A_Spec	Alpha_013	170	2.66 E+00	2.00 E-03	18.7
09	TH-230	TRG	08/15/13 14:33		A_Spec	Alpha_014	170	1.13 E+01	4.00 E-03	18.5
10	TH-230	TRG	08/15/13 14:33		A_Spec	Alpha_015	170	1.53 E+01	4.00 E-03	14.8

Preliminary Data Report & Analytical Calculations

Work Order: 13-07170-ThISO-1

Run	Analysis Code	Eberline Services Work Order	Client
1	ThISO	13-07170	Engineering Management Support, Inc.

Lab Fraction	Nuclide	Sample Desc	Client Identification	Activity Units	Results	Error Estimate	MDA	LCS Known	LCS %R	LCS Flag	RPD Flag	MDA Flag	Blank Flag
01	TH-232	LCS	LCS	pCi/l	4.94E+00	8.11E-01	7.09E-02	4.89E+00	100.98	OK		OK	
02	TH-232	MBL	BLANK	pCi/l	-3.61E-03	4.22E-02	8.85E-02					OK	OK
03	TH-232	DUP	LR-104 TOT	pCi/l	2.01E-02	3.83E-02	7.08E-02				NA	OK	
04	TH-232	TRG	PZ-305-AI TOT	pCi/l	-2.02E-02	5.00E-02	1.42E-01					OK	
05	TH-232	TRG	PZ-305-AI DIS	pCi/l	-2.20E-02	3.53E-02	1.11E-01					OK	
06	TH-232	DO	LR-104 TOT	pCi/l	9.29E-03	2.23E-02	4.67E-02					OK	
07	TH-232	TRG	LR-104 DIS	pCi/l	2.37E-03	3.31E-02	9.46E-02					OK	
08	TH-232	TRG	PZ-100-KS TOT	pCi/l	-2.38E-03	2.79E-02	5.85E-02					OK	
09	TH-232	TRG	PZ-100-KS DIS	pCi/l	-7.69E-03	2.34E-02	6.38E-02					OK	
10	TH-232	TRG	PURGE TANK TOT	pCi/l	1.59E-02	3.81E-02	7.98E-02					OK	

Run: 1
Analysis Code: ThISO
Eberline Services Work Order: 13-07170
Client: Engineering Management Support, Inc.

Lab Fraction	Nuclide	Sample Desc	Sample Date	Sample Aliquot	Radiometric % Rec	Grav % Rec	Mean % Rec	SAF	Sep t0 Date/Time	Sep t1 Date/Time
01	TH-232	LCS	07/29/13 00:00	1.00E+00	98.02	0.00	0.00		8/15/2013 12:00	
02	TH-232	MBL	07/29/13 00:00	1.00E+00	74.36	0.00	0.00		8/15/2013 12:00	
03	TH-232	DUP	07/22/13 11:45	1.00E+00	112.52	0.00	0.00		8/15/2013 12:00	
04	TH-232	TRG	07/22/13 10:41	1.00E+00	57.48	0.00	0.00		8/15/2013 12:00	
05	TH-232	TRG	07/22/13 10:41	1.00E+00	83.44	0.00	0.00		8/15/2013 12:00	
06	TH-232	DO	07/22/13 11:45	1.00E+00	115.48	0.00	0.00		8/15/2013 12:00	
07	TH-232	TRG	07/22/13 11:45	1.00E+00	84.33	0.00	0.00		8/15/2013 12:00	
08	TH-232	TRG	07/23/13 07:45	1.00E+00	101.08	0.00	0.00		8/15/2013 12:00	
09	TH-232	TRG	07/23/13 07:45	1.00E+00	126.92	0.00	0.00		8/15/2013 12:00	
10	TH-232	TRG	07/23/13 06:40	1.00E+00	93.85	0.00	0.00		8/15/2013 12:00	

Preliminary Data Report & Analytical Calculations

Work Order: 13-07170-ThISO-1

Run	Analysis Code	Eberline Services Work Order	Client
1	ThISO	13-07170	Engineering Management Support, Inc.

Lab Fraction	Nuclide	Sample Desc	Counting Date/Time	Halflife (days)	Detect	Carrier	Count Time	Counts	Bkg CPM	Eff
01	TH-232	LCS	08/15/13 13:18		A_Spec	Alpha_047	170	3.33 E+02	2.00 E-03	18.2
02	TH-232	MBL	08/15/13 13:18		A_Spec	Alpha_048	170	-1.70 E-01	1.00 E-03	16.8
03	TH-232	DUP	08/15/13 14:33		A_Spec	Alpha_003	170	1.49 E+00	3.00 E-03	17.5
04	TH-232	TRG	08/15/13 14:33		A_Spec	Alpha_004	170	-8.50 E-01	5.00 E-03	19.4
05	TH-232	TRG	08/15/13 14:33		A_Spec	Alpha_010	170	-1.36 E+00	8.00 E-03	19.7
06	TH-232	DO	08/15/13 14:33		A_Spec	Alpha_011	170	8.30 E-01	1.00 E-03	20.5
07	TH-232	TRG	08/15/13 14:33		A_Spec	Alpha_012	170.02	1.50 E-01	5.00 E-03	19.9
08	TH-232	TRG	08/15/13 14:33		A_Spec	Alpha_013	170	-1.70 E-01	1.00 E-03	18.7
09	TH-232	TRG	08/15/13 14:33		A_Spec	Alpha_014	170	-6.80 E-01	4.00 E-03	18.5
10	TH-232	TRG	08/15/13 14:33		A_Spec	Alpha_015	170	8.30 E-01	1.00 E-03	14.8

Count Room Report
Client: Engineering Management Su

13-07170-ThISO-1 (pCi/l) in WA
Tracer ID: Th-18a

Internal Fraction	Sample Desc	Client ID	Sample Date	Sample Aliquot	Tracer Aliquot (g)	Tracer ACT (dpm)	Radiometric Tracer (pCi)	Radiometric % Rec	SAF 1*	SAF 2*
01	LCS	LCS	07/29/13 00:00	1.0000	0.4800	10.7837		0.00		
02	MBL	BLANK	07/29/13 00:00	1.0000	0.2379	5.3447		0.00		
03	DUP	LR-104 TOT	07/22/13 11:45	1.0000	0.2363	5.3087		0.00		
04	TRG	PZ-305-AI TOT	07/22/13 10:41	1.0000	0.2363	5.3087		0.00		
05	TRG	PZ-305-AI DIS	07/22/13 10:41	1.0000	0.2355	5.2907		0.00		
06	DO	LR-104 TOT	07/22/13 11:45	1.0000	0.2353	5.2862		0.00		
07	TRG	LR-104 DIS	07/22/13 11:45	1.0000	0.2354	5.2885		0.00		
08	TRG	PZ-100-KS TOT	07/23/13 07:45	1.0000	0.2342	5.2615		0.00		
09	TRG	PZ-100-KS DIS	07/23/13 07:45	1.0000	0.2334	5.2436		0.00		
10	TRG	PURGE TANK TOT	07/23/13 06:40	1.0000	0.2329	5.2323		0.00		

Spike and Tracer Worksheet

Internal Work Order	Run	Analysis Code	Date	Technician	Technician Initials	Witness Initials
13-07170	1	ThISO	8/9/2013 7:14	JWOLFE	JW	

LCS & Matrix Spikes					LCS	MS	LCSD	MSD	LCS		MS		LCSD		MSD	
Isotope	Sol #	Activity dpm/g	Solution Date	Approx Addition	Volume Used (g)	Volume Used (g)	Volume Used (g)	Volume Used (g)	Known pCi	Error Estimate	Added pCi	Error Estimate	Known pCi	Error Estimate	Added pCi	Error Estimate
Th-228	Th-8b	103.560	8/9/2013	0.100	0.1048				4.89	0.176	0.00	0.000	0.00	0.000	0.00	0.000
Th-230	Th-1b	23.525	8/9/2013	0.500	0.5170				5.48	0.148	0.00	0.000	0.00	0.000	0.00	0.000
Th-232	Th-8b	103.560	8/9/2013	0.100	0.1048				4.89	0.176	0.00	0.000	0.00	0.000	0.00	0.000

Tracers

fraction	Isotope	Sol #	Activity dpm/g	Solution Date	Volume Used (g)	Approx Addition
01	Th-229	Th-18a	22.466	8/9/2013	0.4800	0.2200
02	Th-229	Th-18a	22.466	8/9/2013	0.2379	0.2200
03	Th-229	Th-18a	22.466	8/9/2013	0.2363	0.2200
04	Th-229	Th-18a	22.466	8/9/2013	0.2363	0.2200
05	Th-229	Th-18a	22.466	8/9/2013	0.2355	0.2200
06	Th-229	Th-18a	22.466	8/9/2013	0.2353	0.2200
07	Th-229	Th-18a	22.466	8/9/2013	0.2354	0.2200
08	Th-229	Th-18a	22.466	8/9/2013	0.2342	0.2200
09	Th-229	Th-18a	22.466	8/9/2013	0.2334	0.2200
10	Th-229	Th-18a	22.466	8/9/2013	0.2329	0.2200

Balance Printer Tapes

Tracer

LCS

Matrix Spike

Eberline Analytical
Oak Ridge Laboratory

Aliquot Worksheet

Printed: 8/9/2013 7:15 AM

Work Order	Run	Analysis Code	Rpt Units	Lab Deadline	Technician
13-07170	1	ThISO	liters	8/16/2013	JWOLFE

Lab Fraction	Engineering Management Support, Inc. Client ID	Sample Type	Muffle Data	Dilution Data			Aliquot Data		MS Aliquot Data		H-3 Solids Only	
			Ratio Post/Pre	No of Dils	Dil Factor	Ratio	Aliquot	Net Equiv	Aliquot	Net Equiv	Water Added (ml)	H3 Dist Aliq
01	LCS	LCS					1.0000E+00	1.0000E+00				
02	BLANK	MBL					1.0000E+00	1.0000E+00				
03	LR-104 TOT	DUP					1.0000E+00	1.0000E+00				
04	PZ-305-AI TOT	TRG					1.0000E+00	1.0000E+00				
05	PZ-305-AI DIS	TRG					1.0000E+00	1.0000E+00				
06	LR-104 TOT	DO					1.0000E+00	1.0000E+00				
07	LR-104 DIS	TRG					1.0000E+00	1.0000E+00				
08	PZ-100-KS TOT	TRG					1.0000E+00	1.0000E+00				
09	PZ-100-KS DIS	TRG					1.0000E+00	1.0000E+00				
10	PURGE TANK TOT	TRG					1.0000E+00	1.0000E+00				

Comments	

Technician: JWolfe Date: 8/9/13

KD 8/15/13

Apex-Alpha™

Sample Description: SPIKE
Spectrum File: \\OR-ALPHA1\Canberra\ApexAlpha\Root\Data\00000662
Batch Identification: 1307170A-TH
Sample Identification: 01
Sample Geometry: Shelf 2
Procedure Description: Th iso

Detector Name: Alpha_047
Chamber Serial Number: 02030596A
Detector Serial Number: 91086
Env. Background: System Bkgd 64791
Reagent Blank: <not performed>

Sample Size: 1.000E+000 +/- 0.000E+000 liter
Sample Date/Time: 8/15/2013 12:57:41 PM
Acquisition Date/Time: 8/15/2013 1:18:39 PM
Acquisition Live Time: 170.0 minutes
Acquisition Real Time: 170.0 minutes

Tracer Certificate: Th229_TH-18A
Tracer Quantity: 0.480 mL
Effective Efficiency: 0.1786 +/- 0.0113
Counting Efficiency: 0.1822 +/- 0.0032 on 12/16/2012 5:49:21 PM
Chem. Recovery Factor: 0.9802 +/- 0.0645

Control Certificate Name: NatTh_Th-8
Chem. Recov. of Control: TH-232 1.009774 +/- 0.089939
Peak Match Tolerance: 0.175 MeV

PEAK AREA REPORT

Nuclide		Energy (MeV)	Net Pk Area	Pk Area Error %	Ambient Backgnd	Reagent Backgnd	FWHM (keV)
TH-227		5.820	9.66	64.35	0.34	0.00E+000	2.9
TH-228		5.350	330.83	10.78	0.17	0.00E+000	16.2
TH-229	T	4.857	327.32	10.85	0.68	0.00E+000	11.8
TH-230		4.603	361.83	10.31	0.17	0.00E+000	4.0
TH-232		3.931	332.66	10.75	0.34	0.00E+000	6.4

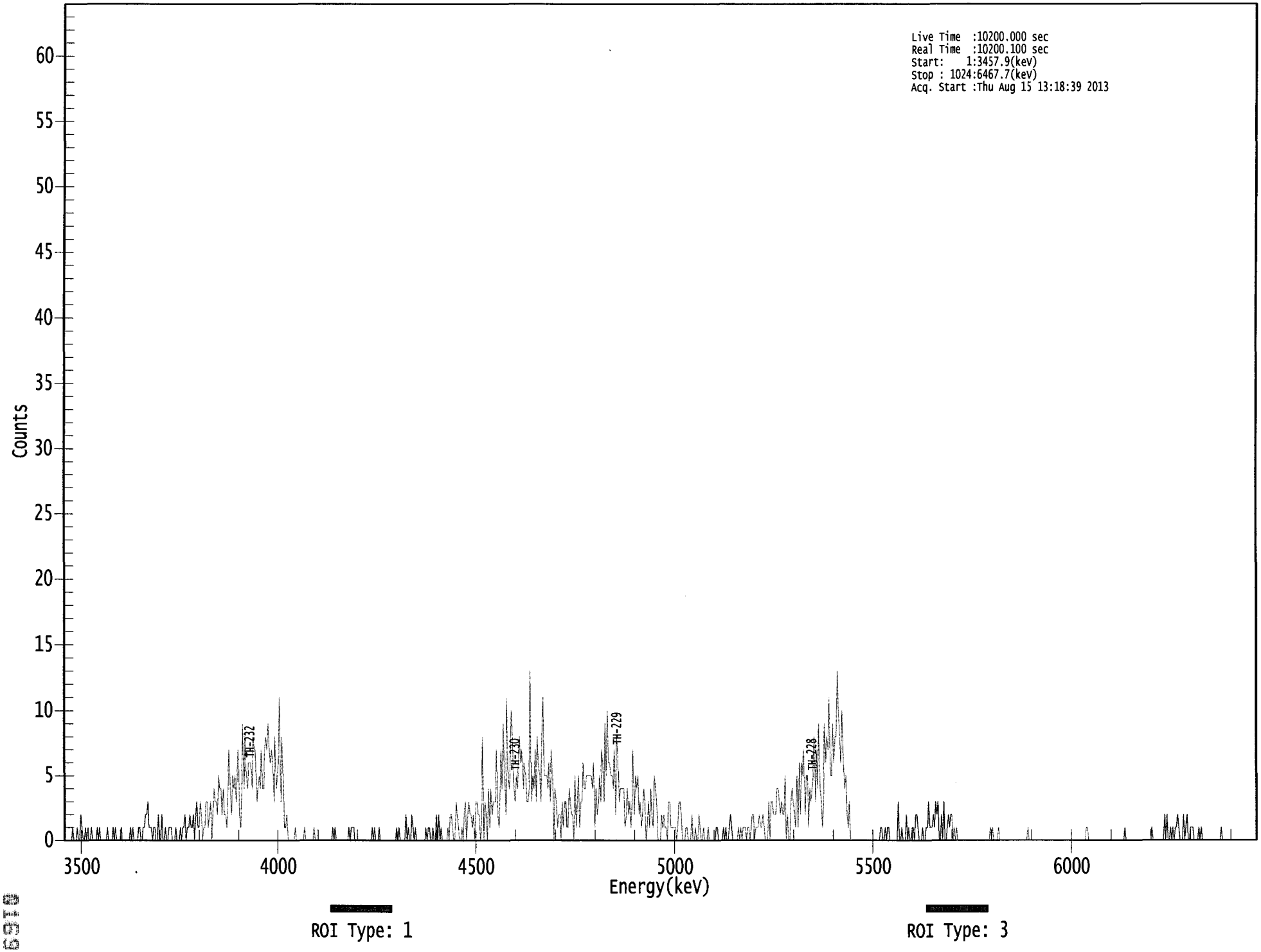
T = Tracer Peak used for Effective Efficiency

NUCLIDE ANALYSIS RESULTS

Nuclide	Id Conf.	Energy (keV)	Activity (pCi/liter)	MDA (pCi/liter)
TH-227	0.995	5850.00*	1.47E-001 +/- 9.64E-002	7.28E-002 +/- 9.05E-003
TH-228	0.987	5400.00*	4.91E+000 +/- 8.08E-001	6.20E-002 +/- 7.70E-003
TH-229	0.999	4872.00*	4.88E+000 +/- 6.07E-001	8.41E-002 +/- 1.05E-002
TH-230	0.976	4672.00*	5.38E+000 +/- 8.69E-001	6.20E-002 +/- 7.71E-003
TH-232	0.978	3997.00*	4.94E+000 +/- 8.11E-001	7.09E-002 +/- 8.82E-003

AG 8/16/13

0000066274.CNF



****
***** S P E C T R A L D A T A R E P O R T *****
****

Sample Title: 01

Elapsed Live time: 10200
Elapsed Real Time: 10200

Channel								
1:	0	0	0	0	0	0	0	1
9:	0	0	0	1	0	0	2	1
17:	0	0	1	0	1	0	0	1
25:	0	0	0	0	1	0	1	0
33:	0	0	0	0	0	1	0	0
41:	0	0	1	0	1	0	0	0
49:	0	1	0	0	0	0	0	0
57:	0	1	0	1	0	0	0	0
65:	1	1	0	0	1	1	2	2
73:	3	1	1	1	0	1	1	0
81:	0	2	0	0	2	0	0	1
89:	0	0	1	1	1	0	0	0
97:	1	0	0	0	1	0	1	1
105:	2	0	1	1	2	1	1	2
113:	0	2	3	1	1	3	2	0
121:	1	1	3	3	1	2	3	0
129:	2	4	3	3	2	5	4	4
137:	2	4	2	2	1	4	7	4
145:	2	5	4	5	3	5	7	2
153:	1	4	9	4	8	5	4	6
161:	6	6	4	8	7	7	3	4
169:	5	4	7	4	4	7	8	7
177:	9	7	6	7	6	3	8	4
185:	5	6	11	3	8	5	1	1
193:	2	0	0	0	0	0	0	1
201:	0	0	0	0	0	0	0	1
209:	0	0	0	0	0	0	0	1
217:	0	0	0	0	0	0	0	0
225:	0	0	0	0	0	0	0	1
233:	0	1	0	0	0	0	0	0
241:	0	0	0	0	0	1	0	1
249:	1	1	0	0	0	0	0	0
257:	0	0	0	0	0	0	0	0
265:	0	1	0	1	0	0	0	1
273:	0	0	0	0	0	0	0	0
281:	0	0	0	0	0	0	1	0
289:	1	0	0	0	0	0	2	0
297:	1	0	0	2	1	0	1	0
305:	0	0	0	0	0	0	0	1
313:	0	1	1	0	0	1	0	0
321:	2	0	2	0	1	0	0	0
329:	0	0	1	0	2	2	1	0
337:	0	3	2	1	0	0	1	0
345:	2	3	0	2	3	2	2	1
353:	2	0	3	3	2	2	0	1
361:	8	0	3	2	0	4	1	4

369:	2	3	3	3	7	2	1	4

Sample Title: 01

Channel								
377:	7	4	9	5	2	11	5	4
385:	6	10	8	4	3	5	4	6
393:	8	6	7	4	6	5	3	3
401:	4	13	3	5	4	7	3	8
409:	6	5	3	8	11	5	5	5
417:	4	6	3	7	5	0	4	3
425:	1	2	2	0	3	1	3	3
433:	1	1	4	3	2	2	0	5
441:	1	3	5	1	3	3	6	4
449:	4	5	5	5	5	5	4	6
457:	1	4	2	3	5	3	7	6
465:	3	9	5	10	6	6	5	5
473:	4	7	2	8	7	3	4	4
481:	4	4	1	2	4	2	3	1
489:	3	7	2	5	4	5	2	3
497:	1	2	4	3	0	1	3	1
505:	4	2	1	5	4	3	0	0
513:	0	2	1	2	1	1	0	3
521:	3	1	1	1	1	1	0	1
529:	3	3	2	0	0	0	1	1
537:	0	0	0	2	0	0	1	0
545:	0	2	1	0	0	1	0	0
553:	0	1	0	0	0	0	0	0
561:	1	1	0	0	0	0	1	0
569:	1	0	0	1	2	1	0	0
577:	0	0	0	1	0	1	0	1
585:	1	1	0	1	1	0	1	2
593:	2	0	1	1	1	2	1	1
601:	2	1	0	0	0	3	0	3
609:	3	2	2	2	4	4	3	2
617:	3	2	2	5	0	2	0	0
625:	3	4	3	2	1	5	1	6
633:	2	6	5	7	2	5	5	1
641:	4	3	4	5	8	3	7	4
649:	9	4	3	1	3	9	6	8
657:	7	11	5	5	9	6	8	8
665:	13	10	8	6	10	7	4	5
673:	2	1	3	0	0	0	0	0
681:	0	0	0	0	0	0	0	0
689:	0	0	0	0	0	0	0	0
697:	0	0	0	0	0	1	1	0
705:	0	1	0	1	1	0	0	0
713:	0	0	0	0	3	0	0	1
721:	0	0	0	2	0	1	0	0
729:	1	1	0	2	2	1	0	0
737:	0	1	0	0	1	1	3	1
745:	1	1	2	1	3	2	3	0
753:	0	2	0	3	0	0	1	2
761:	1	2	2	0	1	0	1	0
769:	0	0	0	0	0	0	0	0
777:	0	0	0	0	0	0	0	0
785:	0	0	0	0	0	0	0	0
793:	0	0	0	1	0	1	0	0

801:	0	0	1	0	0	0	0	0

Sample Title: 01

Channel								
809:	0	0	0	0	0	0	0	0
817:	0	0	0	0	0	0	0	0
825:	0	0	0	1	0	0	0	0
833:	0	0	0	0	0	0	0	0
841:	0	0	0	0	0	0	0	0
849:	0	0	0	0	0	0	0	0
857:	0	0	0	0	0	0	0	0
865:	0	0	0	0	0	0	0	0
873:	0	0	0	0	0	1	1	0
881:	0	0	0	0	0	0	0	0
889:	0	0	0	0	0	0	0	0
897:	0	0	0	0	0	0	0	0
905:	0	0	0	0	0	0	1	0
913:	0	0	0	0	0	0	0	0
921:	0	0	0	0	0	0	0	0
929:	0	0	0	0	0	1	0	0
937:	0	0	0	0	0	0	0	0
945:	2	0	2	0	0	1	0	1
953:	0	1	1	2	1	0	0	0
961:	2	0	1	2	0	0	1	1
969:	1	0	0	0	0	1	0	1
977:	0	0	0	0	0	0	0	0
985:	0	0	0	0	0	0	0	0
993:	1	0	0	0	0	0	0	0
1001:	0	0	0	0	0	0	0	0
1009:	0	0	0	0	0	0	0	0
1017:	0	0	0	0	0	0	0	0

ICB 9/15/13

Apex-Alpha™

Sample Description: BLANK
Spectrum File: \\OR-ALPHA1\Canberra\ApexAlpha\Root\Data\00000662
Batch Identification: 1307170A-TH
Sample Identification: 02
Sample Geometry: Shelf 2
Procedure Description: Th iso

Detector Name: Alpha_048
Chamber Serial Number: 02030596B
Detector Serial Number: 83111
Env. Background: System Bkgd 64792
Reagent Blank: <not performed>

Sample Size: 1.000E+000 +/- 0.000E+000 liter
Sample Date/Time: 8/15/2013 12:57:41 PM
Acquisition Date/Time: 8/15/2013 1:18:41 PM
Acquisition Live Time: 170.0 minutes
Acquisition Real Time: 170.0 minutes

Tracer Certificate: Th229_TH-18A
Tracer Quantity: 0.238 mL
Effective Efficiency: 0.1249 +/- 0.0124
Counting Efficiency: 0.1680 +/- 0.0030 on 12/16/2012 5:49:20 PM
Chem. Recovery Factor: 0.7436 +/- 0.0748

Peak Match Tolerance: 0.175 MeV

PEAK AREA REPORT

Nuclide		Energy (MeV)	Net Pk Area	Pk Area Error %	Ambient Backgnd	Reagent Backgnd	FWHM (keV)
TH-227		5.920	1.00	277.19	0.00	0.00E+000	3.0
TH-228		5.256	0.32	646.93	0.68	0.00E+000	3.0
TH-229	T	4.890	113.49	18.45	0.51	0.00E+000	4.4
TH-230		4.660	1.66	169.38	0.34	0.00E+000	3.0
TH-232		3.949	-0.17	1169.4	0.17	0.00E+000	0.0

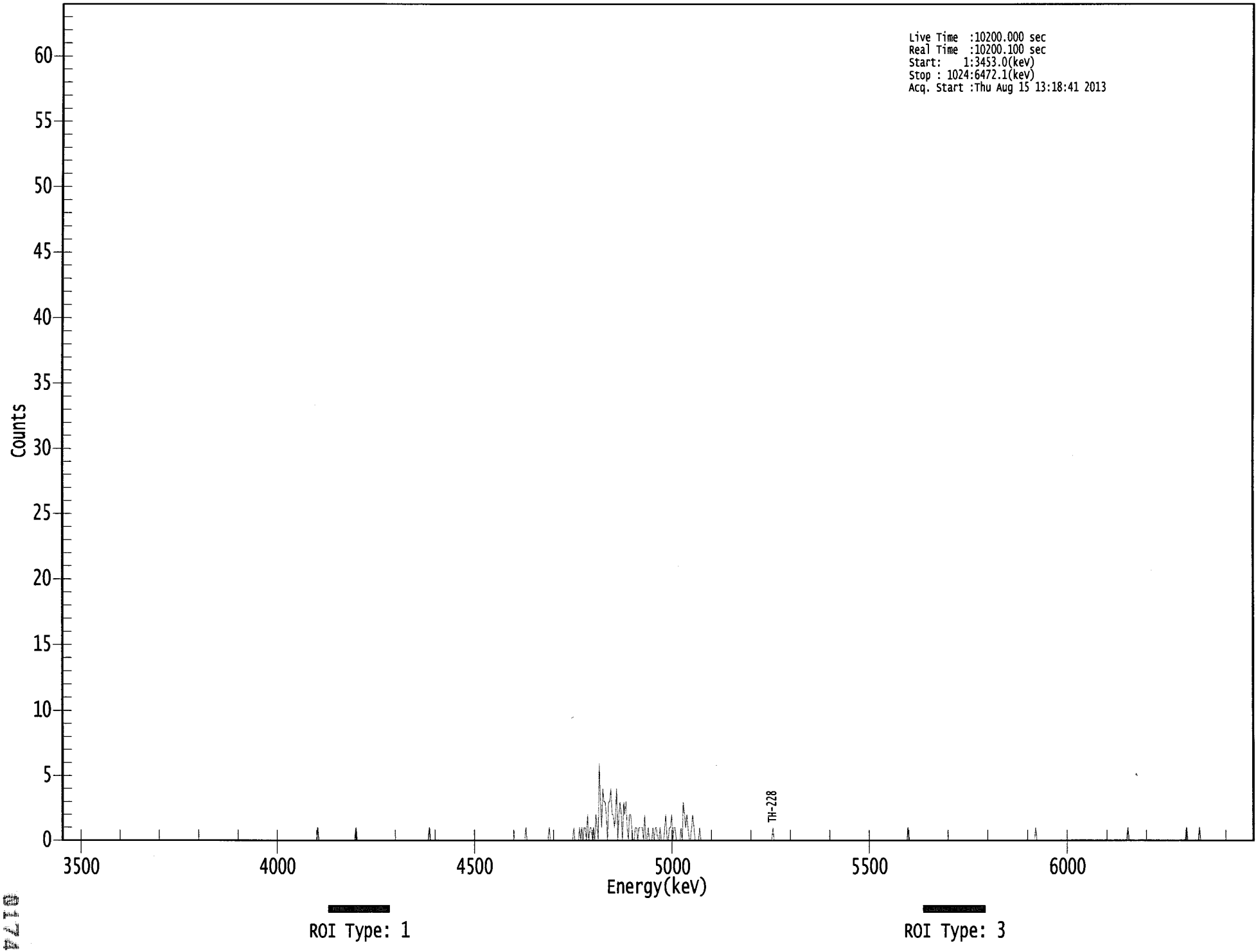
T = Tracer Peak used for Effective Efficiency

NUCLIDE ANALYSIS RESULTS

Nuclide	Id Conf.	Energy (keV)	Activity (pCi/liter)	MDA (pCi/liter)
TH-227	0.975	5850.00*	2.18E-002 +/- 6.05E-002	1.30E-001 +/- 2.53E-002
TH-228	0.898	5400.00*	6.79E-003 +/- 4.40E-002	1.20E-001 +/- 2.33E-002
TH-229	0.998	4872.00*	2.42E+000 +/- 4.70E-001	1.12E-001 +/- 2.17E-002
TH-230	0.999	4672.00*	3.53E-002 +/- 6.01E-002	1.02E-001 +/- 1.97E-002
TH-232	0.988	3997.00*	-3.61E-003 +/- 4.22E-002	8.85E-002 +/- 1.72E-002

AG 8/16/13

0000066275.CNF



****
***** S P E C T R A L D A T A R E P O R T *****
****

Sample Title: 02

Elapsed Live time: 10200
Elapsed Real Time: 10200

Channel								
1:	0	0	0	0	0	0	0	0
9:	0	0	0	0	0	0	0	0
17:	0	0	0	0	0	0	0	0
25:	0	0	0	0	0	0	0	0
33:	0	0	0	0	0	0	0	0
41:	0	0	0	0	0	0	0	0
49:	0	0	0	0	0	0	0	0
57:	0	0	0	0	0	0	0	0
65:	0	0	0	0	0	0	0	0
73:	0	0	0	0	0	0	0	0
81:	0	0	0	0	0	0	0	0
89:	0	0	0	0	0	0	0	0
97:	0	0	0	0	0	0	0	0
105:	0	0	0	0	0	0	0	0
113:	0	0	0	0	0	0	0	0
121:	0	0	0	0	0	0	0	0
129:	0	0	0	0	0	0	0	0
137:	0	0	0	0	0	0	0	0
145:	0	0	0	0	0	0	0	0
153:	0	0	0	0	0	0	0	0
161:	0	0	0	0	0	0	0	0
169:	0	0	0	0	0	0	0	0
177:	0	0	0	0	0	0	0	0
185:	0	0	0	0	0	0	0	0
193:	0	0	0	0	0	0	0	0
201:	0	0	0	0	0	0	0	0
209:	0	0	0	0	0	0	0	0
217:	0	0	0	0	1	0	0	0
225:	0	0	0	0	0	0	0	0
233:	0	0	0	0	0	0	0	0
241:	0	0	0	0	0	0	0	0
249:	0	0	0	0	0	1	0	0
257:	0	0	0	0	0	0	0	0
265:	0	0	0	0	0	0	0	0
273:	0	0	0	0	0	0	0	0
281:	0	0	0	0	0	0	0	0
289:	0	0	0	0	0	0	0	0
297:	0	0	0	0	0	0	0	0
305:	0	0	0	0	0	0	0	0
313:	0	0	0	0	1	0	0	0
321:	0	0	0	0	0	0	0	0
329:	0	0	0	0	0	0	0	0
337:	0	0	0	0	0	0	0	0
345:	0	0	0	0	0	0	0	0
353:	0	0	0	0	0	0	0	0
361:	0	0	0	0	0	0	0	0

369:	0	0	0	0	0	0	0	0

Sample Title: 02

Channel								
377:	0	0	0	0	0	0	0	0
385:	0	0	0	0	0	0	0	0
393:	0	0	0	0	0	0	0	1
401:	0	0	0	0	0	0	0	0
409:	0	0	0	0	0	0	0	0
417:	0	0	0	1	0	0	0	0
425:	0	0	0	0	0	0	0	0
433:	0	0	0	0	0	0	0	0
441:	1	0	0	0	0	1	0	1
449:	0	1	1	0	2	0	1	1
457:	0	1	0	2	1	0	6	3
465:	1	4	3	3	2	0	3	3
473:	4	2	2	1	2	4	0	2
481:	3	2	0	3	2	3	1	0
489:	2	2	1	0	0	1	1	0
497:	1	1	1	1	0	2	0	0
505:	1	0	0	0	1	0	1	1
513:	0	0	1	0	0	0	1	2
521:	0	0	1	1	2	0	1	1
529:	0	0	0	0	1	0	3	2
537:	1	2	1	0	0	1	2	1
545:	0	0	0	0	1	0	0	0
553:	0	0	0	0	0	0	0	0
561:	0	0	0	0	0	0	0	0
569:	0	0	0	0	0	0	0	0
577:	0	0	0	0	0	0	0	0
585:	0	0	0	0	0	0	0	0
593:	0	0	0	0	0	0	0	0
601:	0	0	0	0	0	0	0	0
609:	0	0	0	1	0	0	0	0
617:	0	0	0	0	0	0	0	0
625:	0	0	0	0	0	0	0	0
633:	0	0	0	0	0	0	0	0
641:	0	0	0	0	0	0	0	0
649:	0	0	0	0	0	0	0	0
657:	0	0	0	0	0	0	0	0
665:	0	0	0	0	0	0	0	0
673:	0	0	0	0	0	0	0	0
681:	0	0	0	0	0	0	0	0
689:	0	0	0	0	0	0	0	0
697:	0	0	0	0	0	0	0	0
705:	0	0	0	0	0	0	0	0
713:	0	0	0	0	0	0	0	0
721:	0	0	0	0	0	0	0	1
729:	0	0	0	0	0	0	0	0
737:	0	0	0	0	0	0	0	0
745:	0	0	0	0	0	0	0	0
753:	0	0	0	0	0	0	0	0
761:	0	0	0	0	0	0	0	0
769:	0	0	0	0	0	0	0	0
777:	0	0	0	0	0	0	0	0
785:	0	0	0	0	0	0	0	0
793:	0	0	0	0	0	0	0	0

801:	0	0	0	0	0	0	0	0

Sample Title: 02

Channel								
809:	0	0	0	0	0	0	0	0
817:	0	0	0	0	0	0	0	0
825:	0	0	0	0	0	0	0	0
833:	0	0	0	0	1	0	0	0
841:	0	0	0	0	0	0	0	0
849:	0	0	0	0	0	0	0	0
857:	0	0	0	0	0	0	0	0
865:	0	0	0	0	0	0	0	0
873:	0	0	0	0	0	0	0	0
881:	0	0	0	0	0	0	0	0
889:	0	0	0	0	0	0	0	0
897:	0	0	0	0	0	0	0	0
905:	0	0	0	0	0	0	0	0
913:	0	0	0	1	0	0	0	0
921:	0	0	0	0	0	0	0	0
929:	0	0	0	0	0	0	0	0
937:	0	0	0	0	0	0	0	0
945:	0	0	0	0	0	0	0	0
953:	0	0	0	0	0	0	0	0
961:	0	0	0	0	0	1	0	0
969:	0	0	0	0	0	0	0	0
977:	1	0	0	0	0	0	0	0
985:	0	0	0	0	0	0	0	0
993:	0	0	0	0	0	0	0	0
1001:	0	0	0	0	0	0	0	0
1009:	0	0	0	0	0	0	0	0
1017:	0	0	0	0	0	0	0	0

IAB 8/15/13

Apex-Alpha™

Sample Description: LR-104 TOT DUP
Spectrum File: \\OR-ALPHA1\Canberra\ApexAlpha\Root\Data\00000662
Batch Identification: 1307170A-TH
Sample Identification: 03
Sample Geometry: Shelf 2
Procedure Description: Th iso

Detector Name: Alpha_003
Chamber Serial Number:
Detector Serial Number: 3
Env. Background: System Bkgd 64764
Reagent Blank: <not performed>

Sample Size: 1.000E+000 +/- 0.000E+000 liter
Sample Date/Time: 7/22/2013 12:57:41 PM
Acquisition Date/Time: 8/15/2013 2:33:55 PM
Acquisition Live Time: 170.0 minutes
Acquisition Real Time: 170.0 minutes

Tracer Certificate: Th229_TH-18A
Tracer Quantity: 0.236 mL
Effective Efficiency: 0.1965 +/- 0.0160
Counting Efficiency: 0.1746 +/- 0.0033 on 12/15/2012 11:26:47 AM
Chem. Recovery Factor: 1.1252 +/- 0.0940

Peak Match Tolerance: 0.175 MeV

PEAK AREA REPORT

Nuclide		Energy (MeV)	Net Pk Area	Pk Area Error %	Ambient Backgnd	Reagent Backgnd	FWHM (keV)
TH-227		5.856	-0.21	1438.8	2.21	0.00E+000	3.0
TH-228		5.342	3.77	142.84	3.23	0.00E+000	3.0
TH-229	T	4.873	177.32	14.75	0.68	0.00E+000	5.0
TH-230		4.675	8.98	69.62	1.02	0.00E+000	4.5
TH-232		3.962	1.49	190.02	0.51	0.00E+000	3.0

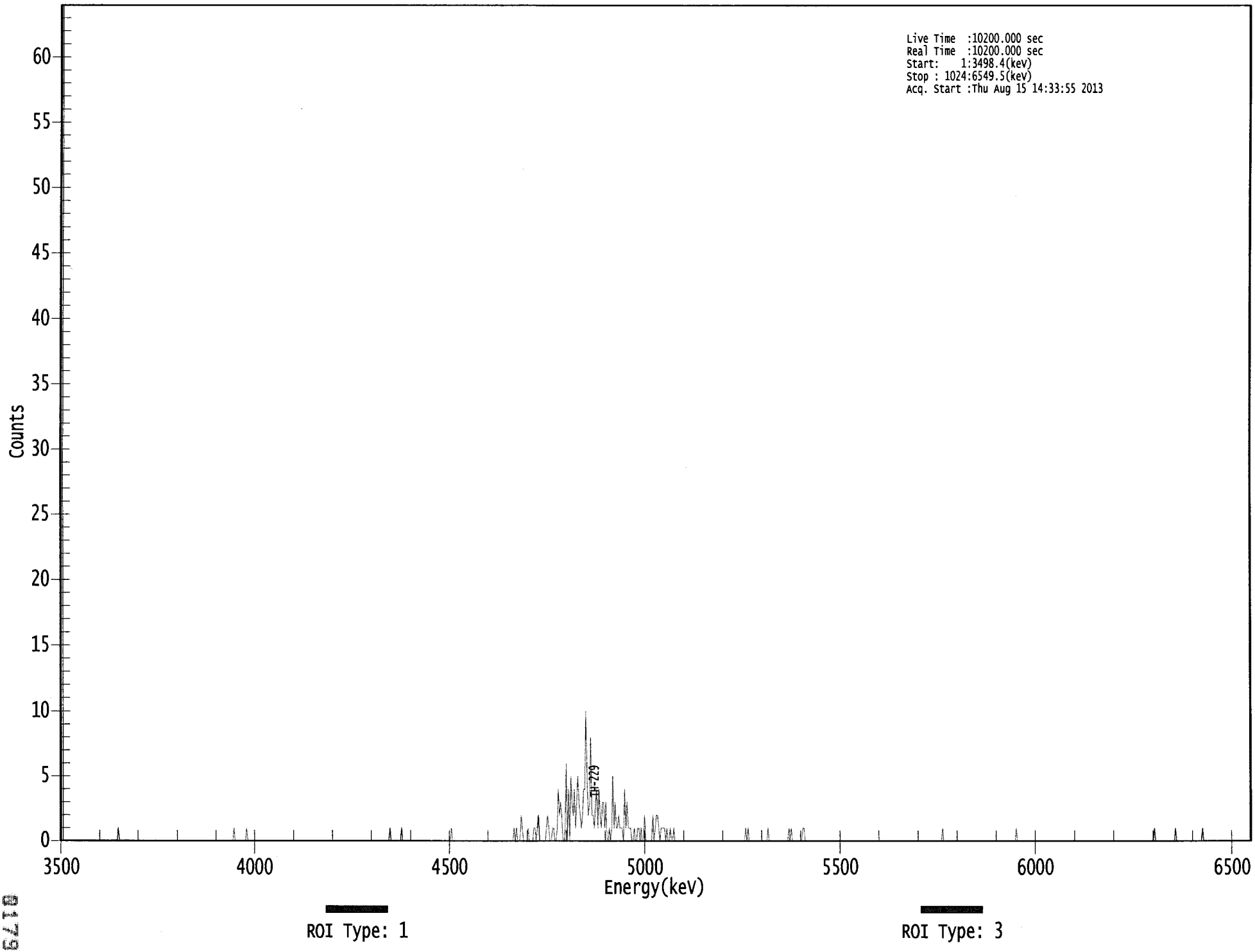
T = Tracer Peak used for Effective Efficiency

NUCLIDE ANALYSIS RESULTS

Nuclide	Id Conf.	Energy (keV)	Activity (pCi/liter)	MDA (pCi/liter)
TH-227	1.000	5850.00*	-2.91E-003 +/- 4.19E-002	1.11E-001 +/- 1.77E-002
TH-228	0.982	5400.00*	5.21E-002 +/- 7.49E-002	1.26E-001 +/- 2.01E-002
TH-229	1.000	4872.00*	2.40E+000 +/- 3.83E-001	7.64E-002 +/- 1.22E-002
TH-230	1.000	4672.00*	1.21E-001 +/- 8.66E-002	8.51E-002 +/- 1.36E-002
TH-232	0.994	3997.00*	2.01E-002 +/- 3.83E-002	7.08E-002 +/- 1.13E-002

AG 8/16/13

0000066290.CNF



****
***** S P E C T R A L D A T A R E P O R T *****
****

Sample Title: 03

Elapsed Live time: 10200
Elapsed Real Time: 10200

Channel								
1:	10200	10200	0	0	0	0	0	0
9:	0	0	0	0	0	0	0	0
17:	0	0	0	0	0	0	0	0
25:	0	0	0	0	0	0	0	0
33:	0	0	0	0	0	0	0	0
41:	0	0	0	0	0	0	0	0
49:	0	0	1	0	0	0	0	0
57:	0	0	0	0	0	0	0	0
65:	0	0	0	0	0	0	0	0
73:	0	0	0	0	0	0	0	0
81:	0	0	0	0	0	0	0	0
89:	0	0	0	0	0	0	0	0
97:	0	0	0	0	0	0	0	0
105:	0	0	0	0	0	0	0	0
113:	0	0	0	0	0	0	0	0
121:	0	0	0	0	0	0	0	0
129:	0	0	0	0	0	0	0	0
137:	0	0	0	0	0	0	0	0
145:	0	0	0	0	0	0	1	0
153:	0	0	0	0	0	0	0	0
161:	0	1	0	0	0	0	0	0
169:	0	0	0	0	0	0	0	0
177:	0	0	0	0	0	0	0	0
185:	0	0	0	0	0	0	0	0
193:	0	0	0	0	0	0	0	0
201:	0	0	0	0	0	0	0	0
209:	0	0	0	0	0	0	0	0
217:	0	0	0	0	0	0	0	0
225:	0	0	0	0	0	0	0	0
233:	0	0	0	0	0	0	0	0
241:	0	0	0	0	0	0	0	0
249:	0	0	0	0	0	0	0	0
257:	0	0	0	0	0	0	0	0
265:	0	0	0	0	0	0	0	0
273:	0	0	0	0	0	0	0	0
281:	0	0	0	0	1	0	0	0
289:	0	0	0	0	0	0	1	0
297:	0	0	0	0	0	0	0	0
305:	0	0	0	0	0	0	0	0
313:	0	0	0	0	0	0	0	0
321:	0	0	0	0	0	0	0	0
329:	0	0	0	0	0	0	0	0
337:	0	1	0	0	0	0	0	0
345:	0	0	0	0	0	0	0	0
353:	0	0	0	0	0	0	0	0
361:	0	0	0	0	0	0	0	0

369:	0	0	0	0	0	0	0	0

Sample Title: 03

Channel								
377:	0	0	0	0	0	0	0	0
385:	0	0	0	0	0	0	0	1
393:	0	1	0	0	0	2	1	0
401:	0	0	0	1	0	0	0	0
409:	1	1	0	1	2	0	0	0
417:	0	0	0	1	2	1	0	0
425:	1	1	0	0	1	4	2	3
433:	2	0	0	1	6	0	4	0
441:	5	3	2	4	1	3	5	3
449:	2	1	2	4	4	10	4	2
457:	3	8	2	2	1	3	4	1
465:	4	2	1	3	3	1	3	0
473:	0	1	0	1	5	1	3	1
481:	1	2	1	1	1	0	4	1
489:	3	1	1	1	0	0	1	0
497:	0	1	1	0	1	0	0	2
505:	0	0	0	0	0	0	2	0
513:	1	2	2	1	0	1	1	1
521:	1	0	1	0	0	1	0	0
529:	1	0	0	0	0	0	0	0
537:	0	0	0	0	0	0	0	0
545:	0	0	0	0	0	0	0	0
553:	0	0	0	0	0	0	0	0
561:	0	0	0	0	0	0	0	0
569:	0	0	0	0	0	0	0	0
577:	0	0	0	0	0	0	0	0
585:	0	0	0	0	0	0	1	0
593:	1	0	0	0	0	0	0	0
601:	0	0	0	0	0	0	0	0
609:	0	1	0	0	0	0	0	0
617:	0	0	0	0	0	0	0	0
625:	0	0	0	1	0	1	0	0
633:	0	0	0	0	0	0	0	1
641:	1	0	0	0	0	0	0	0
649:	0	0	0	0	0	0	0	0
657:	0	0	0	0	0	0	0	0
665:	0	0	0	0	0	0	0	0
673:	0	0	0	0	0	0	0	0
681:	0	0	0	0	0	0	0	0
689:	0	0	0	0	0	0	0	0
697:	0	0	0	0	0	0	0	0
705:	0	0	0	0	0	0	0	0
713:	0	0	0	0	0	0	0	0
721:	0	0	0	0	0	0	0	0
729:	0	0	0	0	0	0	0	0
737:	0	0	0	0	0	0	0	0
745:	0	0	0	0	0	0	0	0
753:	0	0	0	0	0	0	0	1
761:	0	0	0	0	0	0	0	0
769:	0	0	0	0	0	0	0	0
777:	0	0	0	0	0	0	0	0
785:	0	0	0	0	0	0	0	0
793:	0	0	0	0	0	0	0	0

801:	0	0	0	0	0	0	0	0

Sample Title: 03

Channel								
809:	0	0	0	0	0	0	0	0
817:	0	0	0	0	0	0	1	0
825:	0	0	0	0	0	0	0	0
833:	0	0	0	0	0	0	0	0
841:	0	0	0	0	0	0	0	0
849:	0	0	0	0	0	0	0	0
857:	0	0	0	0	0	0	0	0
865:	0	0	0	0	0	0	0	0
873:	0	0	0	0	0	0	0	0
881:	0	0	0	0	0	0	0	0
889:	0	0	0	0	0	0	0	0
897:	0	0	0	0	0	0	0	0
905:	0	0	0	0	0	0	0	0
913:	0	0	0	0	0	0	0	0
921:	0	0	0	0	0	0	0	0
929:	0	0	0	0	0	0	0	0
937:	0	0	0	0	1	0	0	0
945:	0	0	0	0	0	0	0	0
953:	0	0	0	0	0	0	1	0
961:	0	0	0	0	0	0	0	0
969:	0	0	0	0	0	0	0	0
977:	0	0	0	0	0	1	0	0
985:	0	0	0	0	0	0	0	0
993:	0	0	0	0	0	0	0	0
1001:	0	0	0	0	0	0	0	0
1009:	0	0	0	0	0	0	0	0
1017:	0	0	0	0	0	0	0	0

KH 8/15/13

Apex-Alpha™

Sample Description: PZ-305-AI TOT
Spectrum File: \\OR-ALPHA1\Canberra\ApexAlpha\Root\Data\00000662
Batch Identification: 1307170A-TH
Sample Identification: 04
Sample Geometry: Shelf 2
Procedure Description: Th iso

Detector Name: Alpha_004
Chamber Serial Number:
Detector Serial Number: 4
Env. Background: System Bkgd 64765
Reagent Blank: <not performed>

Sample Size: 1.000E+000 +/- 0.000E+000 liter
Sample Date/Time: 7/22/2013 12:57:41 PM
Acquisition Date/Time: 8/15/2013 2:33:56 PM
Acquisition Live Time: 170.0 minutes
Acquisition Real Time: 170.0 minutes

Tracer Certificate: Th229_TH-18A
Tracer Quantity: 0.236 mL
Effective Efficiency: 0.1115 +/- 0.0117
Counting Efficiency: 0.1940 +/- 0.0036 on 12/15/2012 11:26:46 AM
Chem. Recovery Factor: 0.5748 +/- 0.0613

Peak Match Tolerance: 0.175 MeV

PEAK AREA REPORT

Nuclide		Energy (MeV)	Net Pk Area	Pk Area Error %	Ambient Backgnd	Reagent Backgnd	FWHM (keV)
TH-227		5.822	2.15	161.66	0.85	0.00E+000	2.9
TH-228		5.349	-0.91	412.35	3.91	0.00E+000	2.9
TH-229	T	4.887	100.64	19.69	1.36	0.00E+000	4.3
TH-230		4.564	2.30	176.48	1.70	0.00E+000	2.9
TH-232		3.947	-0.85	246.69	0.85	0.00E+000	0.0

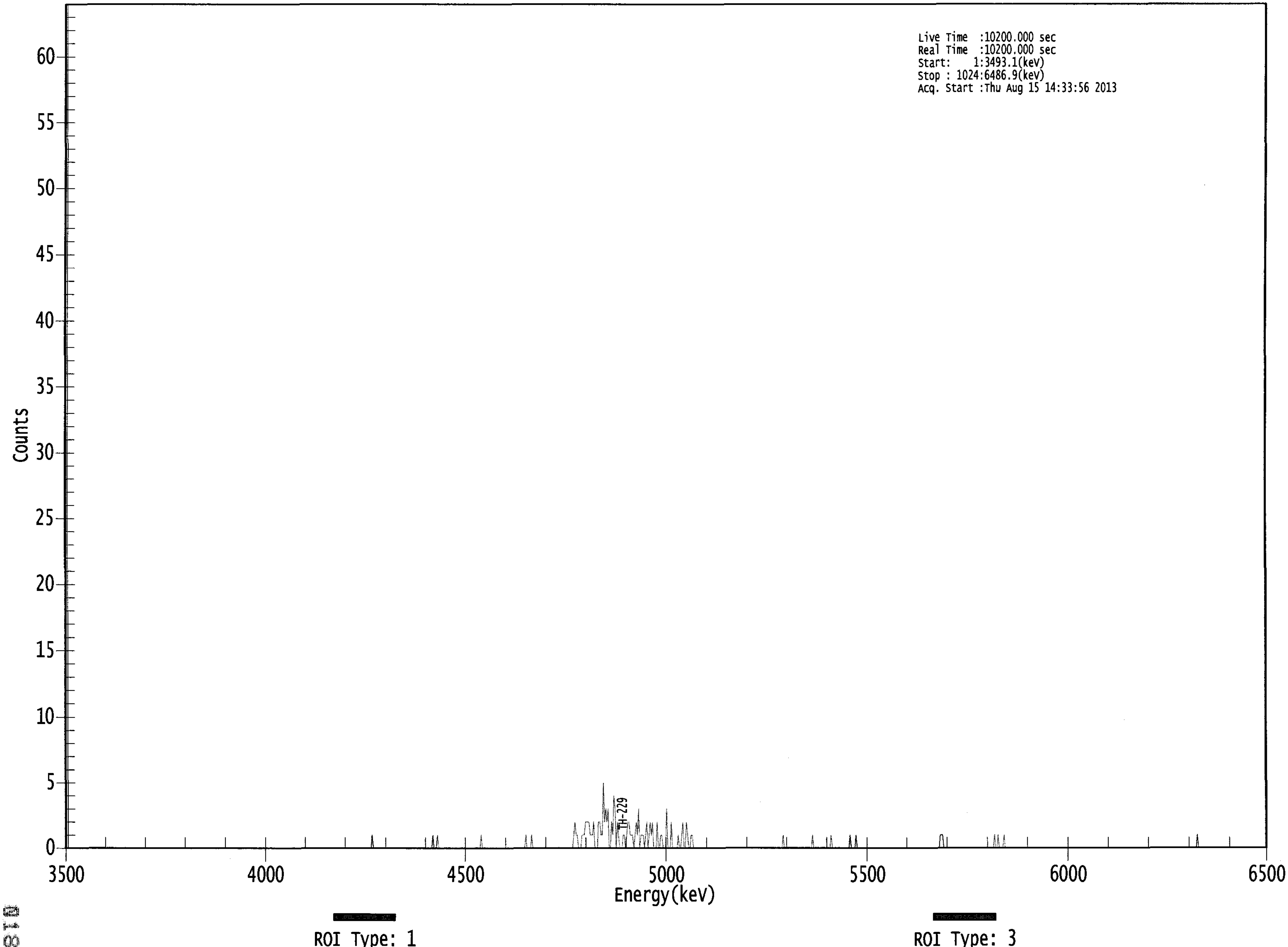
T = Tracer Peak used for Effective Efficiency

NUCLIDE ANALYSIS RESULTS

Nuclide	Id Conf.	Energy (keV)	Activity (pCi/liter)	MDA (pCi/liter)
TH-227	0.996	5850.00*	5.25E-002 +/- 8.56E-002	1.46E-001 +/- 3.01E-002
TH-228	0.986	5400.00*	-2.22E-002 +/- 9.15E-002	2.37E-001 +/- 4.89E-002
TH-229	0.999	4872.00*	2.40E+000 +/- 4.95E-001	1.64E-001 +/- 3.37E-002
TH-230	0.941	4672.00*	5.47E-002 +/- 9.73E-002	1.75E-001 +/- 3.60E-002
TH-232	0.987	3997.00*	-2.02E-002 +/- 5.00E-002	1.42E-001 +/- 2.93E-002

AE 8/16/13

0000066293.CNF



****
***** S P E C T R A L D A T A R E P O R T *****
****

Sample Title: 04

Elapsed Live time: 10200
Elapsed Real Time: 10200

Channel								
1:	10200	10200	0	0	0	0	0	0
9:	0	0	0	0	0	0	0	0
17:	0	0	0	0	0	0	0	0
25:	0	0	0	0	0	0	0	0
33:	0	0	0	0	0	0	0	0
41:	0	0	0	0	0	0	0	0
49:	0	0	0	0	0	0	0	0
57:	0	0	0	0	0	0	0	0
65:	0	0	0	0	0	0	0	0
73:	0	0	0	0	0	0	0	0
81:	0	0	0	0	0	0	0	0
89:	0	0	0	0	0	0	0	0
97:	0	0	0	0	0	0	0	0
105:	0	0	0	0	0	0	0	0
113:	0	0	0	0	0	0	0	0
121:	0	0	0	0	0	0	0	0
129:	0	0	0	0	0	0	0	0
137:	0	0	0	0	0	0	0	0
145:	0	0	0	0	0	0	0	0
153:	0	0	0	0	0	0	0	0
161:	0	0	0	0	0	0	0	0
169:	0	0	0	0	0	0	0	0
177:	0	0	0	0	0	0	0	0
185:	0	0	0	0	0	0	0	0
193:	0	0	0	0	0	0	0	0
201:	0	0	0	0	0	0	0	0
209:	0	0	0	0	0	0	0	0
217:	0	0	0	0	0	0	0	0
225:	0	0	0	0	0	0	0	0
233:	0	0	0	0	0	0	0	0
241:	0	0	0	0	0	0	0	0
249:	0	0	0	0	0	0	0	0
257:	0	0	0	0	0	0	1	0
265:	0	0	0	0	0	0	0	0
273:	0	0	0	0	0	0	0	0
281:	0	0	0	0	0	0	0	0
289:	0	0	0	0	0	0	0	0
297:	0	0	0	0	0	0	0	0
305:	0	0	0	0	0	0	0	0
313:	0	0	1	0	0	0	1	0
321:	0	0	0	0	0	0	0	0
329:	0	0	0	0	0	0	0	0
337:	0	0	0	0	0	0	0	0
345:	0	0	0	0	0	0	0	0
353:	0	0	0	1	0	0	0	0
361:	0	0	0	0	0	0	0	0

Channel								
369:	0	0	0	0	0	0	0	0

Sample Title: 04

Channel								
377:	0	0	0	0	0	0	0	0
385:	0	0	0	0	0	0	0	0
393:	0	1	0	0	0	0	1	0
401:	0	0	0	0	0	0	0	0
409:	0	0	0	0	0	0	0	0
417:	0	0	0	0	0	0	0	0
425:	0	0	0	0	0	0	0	0
433:	0	0	1	2	1	1	0	0
441:	0	1	1	1	2	2	2	2
449:	1	1	1	2	0	0	0	2
457:	2	1	1	5	2	3	2	3
465:	0	0	2	1	4	3	0	2
473:	1	0	0	0	1	1	0	1
481:	2	2	1	1	1	0	1	2
489:	1	3	0	1	1	1	0	1
497:	2	0	1	2	1	2	0	0
505:	0	2	0	0	1	1	0	0
513:	0	3	0	0	0	2	0	0
521:	0	0	0	1	0	0	1	2
529:	0	0	2	1	0	0	1	1
537:	0	0	0	0	0	0	0	0
545:	0	0	0	0	0	0	0	0
553:	0	0	0	0	0	0	0	0
561:	0	0	0	0	0	0	0	0
569:	0	0	0	0	0	0	0	0
577:	0	0	0	0	0	0	0	0
585:	0	0	0	0	0	0	0	0
593:	0	0	0	0	0	0	0	0
601:	0	0	0	0	0	0	0	0
609:	0	0	0	0	1	0	0	0
617:	0	0	0	0	0	0	0	0
625:	0	0	0	0	0	0	0	0
633:	0	0	0	0	0	1	0	0
641:	0	0	0	0	0	0	0	0
649:	0	0	0	0	0	1	0	0
657:	0	0	0	0	0	0	0	0
665:	0	0	0	0	0	1	0	0
673:	0	0	1	0	0	0	0	0
681:	0	0	0	0	0	0	0	0
689:	0	0	0	0	0	0	0	0
697:	0	0	0	0	0	0	0	0
705:	0	0	0	0	0	0	0	0
713:	0	0	0	0	0	0	0	0
721:	0	0	0	0	0	0	0	0
729:	0	0	0	0	0	0	0	0
737:	0	0	0	0	0	0	0	0
745:	0	0	1	1	1	0	0	0
753:	0	0	0	0	0	0	0	0
761:	0	0	0	0	0	0	0	0
769:	0	0	0	0	0	0	0	0
777:	0	0	0	0	0	0	0	0
785:	0	0	0	0	0	0	0	0
793:	1	0	0	1	0	0	0	0

801:	1	0	0	0	0	0	0	0

Sample Title: 04

Channel								
809:	0	0	0	0	0	0	0	0
817:	0	0	0	0	0	0	0	0
825:	0	0	0	0	0	0	0	0
833:	0	0	0	0	0	0	0	0
841:	0	0	0	0	0	0	0	0
849:	0	0	0	0	0	0	0	0
857:	0	0	0	0	0	0	0	0
865:	0	0	0	0	0	0	0	0
873:	0	0	0	0	0	0	0	0
881:	0	0	0	0	0	0	0	0
889:	0	0	0	0	0	0	0	0
897:	0	0	0	0	0	0	0	0
905:	0	0	0	0	0	0	0	0
913:	0	0	0	0	0	0	0	0
921:	0	0	0	0	0	0	0	0
929:	0	0	0	0	0	0	0	0
937:	0	0	0	0	0	0	0	0
945:	0	0	0	0	0	0	0	0
953:	0	0	0	0	0	0	0	0
961:	0	0	0	0	1	0	0	0
969:	0	0	0	0	0	0	0	0
977:	0	0	0	0	0	0	0	0
985:	0	0	0	0	0	0	0	0
993:	0	0	0	0	0	0	0	0
1001:	0	0	0	0	0	0	0	0
1009:	0	0	0	0	0	0	0	0
1017:	0	0	0	0	0	0	0	0

KB 8/15/13

Apex-Alpha™

Sample Description: PZ-305-AI DIS
Spectrum File: \\OR-ALPHA1\Canberra\ApexAlpha\Root\Data\00000662
Batch Identification: 1307170A-TH
Sample Identification: 05
Sample Geometry: Shelf 2
Procedure Description: Th iso

Detector Name: Alpha_010
Chamber Serial Number:
Detector Serial Number: 10
Env. Background: System Bkgd 64766
Reagent Blank: <not performed>

Sample Size: 1.000E+000 +/- 0.000E+000 liter
Sample Date/Time: 7/22/2013 12:57:41 PM
Acquisition Date/Time: 8/15/2013 2:33:49 PM
Acquisition Live Time: 170.0 minutes
Acquisition Real Time: 170.0 minutes

Tracer Certificate: Th229_TH-18A
Tracer Quantity: 0.235 mL
Effective Efficiency: 0.1641 +/- 0.0146
Counting Efficiency: 0.1967 +/- 0.0036 on 12/15/2012 11:26:40 AM
Chem. Recovery Factor: 0.8344 +/- 0.0755

Peak Match Tolerance: 0.175 MeV

PEAK AREA REPORT

Nuclide		Energy (MeV)	Net Pk Area	Pk Area Error %	Ambient Backgnd	Reagent Backgnd	FWHM (keV)
TH-227		5.900	0.28	1302.3	2.72	0.00E+000	2.9
TH-228		5.372	-1.89	126.64	2.89	0.00E+000	2.9
TH-229	T	4.879	147.62	16.28	2.38	0.00E+000	5.1
TH-230		4.576	2.30	176.48	1.70	0.00E+000	2.9
TH-232		3.947	-1.36	159.91	1.36	0.00E+000	0.0

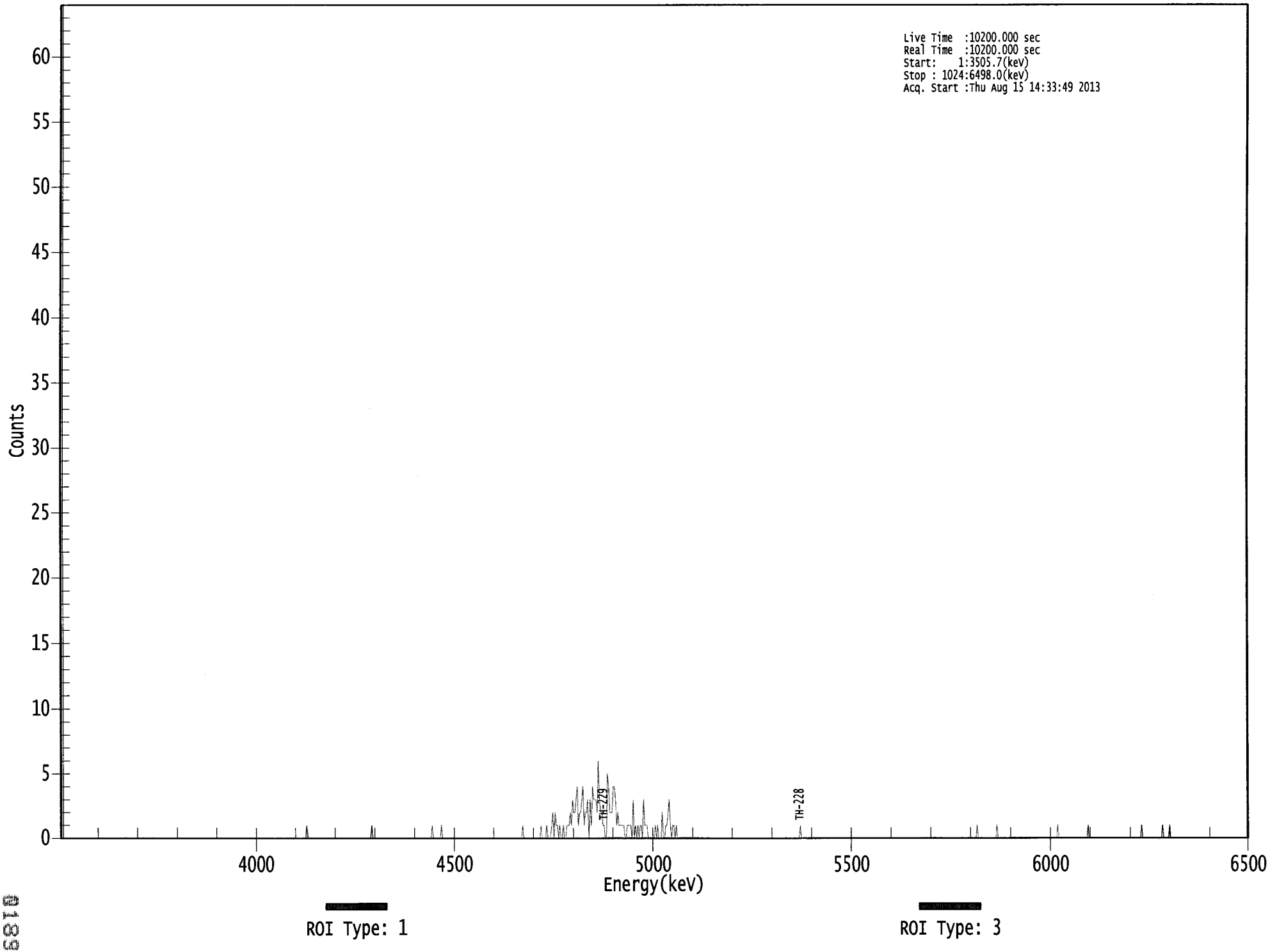
T = Tracer Peak used for Effective Efficiency

NUCLIDE ANALYSIS RESULTS

Nuclide	Id Conf.	Energy (keV)	Activity (pCi/liter)	MDA (pCi/liter)
TH-227	0.987	5850.00*	4.65E-003 +/- 6.05E-002	1.42E-001 +/- 2.47E-002
TH-228	0.996	5400.00*	-3.13E-002 +/- 4.00E-002	1.45E-001 +/- 2.52E-002
TH-229	1.000	4872.00*	2.39E+000 +/- 4.16E-001	1.33E-001 +/- 2.31E-002
TH-230	0.953	4672.00*	3.72E-002 +/- 6.60E-002	1.19E-001 +/- 2.06E-002
TH-232	0.987	3997.00*	-2.20E-002 +/- 3.53E-002	1.11E-001 +/- 1.92E-002

AG 8/16/13

0000066286.CNF



****
***** S P E C T R A L D A T A R E P O R T *****
****

Sample Title: 05

Elapsed Live time: 10200
Elapsed Real Time: 10200

Channel								
1:	10200	10200	0	0	0	0	0	0
9:	0	0	0	0	0	0	0	0
17:	0	0	0	0	0	0	0	0
25:	0	0	0	0	0	0	0	0
33:	0	0	0	0	0	0	0	0
41:	0	0	0	0	0	0	0	0
49:	0	0	0	0	0	0	0	0
57:	0	0	0	0	0	0	0	0
65:	0	0	0	0	0	0	0	0
73:	0	0	0	0	0	0	0	0
81:	0	0	0	0	0	0	0	0
89:	0	0	0	0	0	0	0	0
97:	0	0	0	0	0	0	0	0
105:	0	0	0	0	0	0	0	0
113:	0	0	0	0	0	0	0	0
121:	0	0	0	0	0	0	0	0
129:	0	0	0	0	0	0	0	0
137:	0	0	0	0	0	0	0	0
145:	0	0	0	0	0	0	0	0
153:	0	0	0	0	0	0	0	0
161:	0	0	0	0	0	0	0	0
169:	0	0	0	0	0	0	0	0
177:	0	0	0	0	0	0	0	0
185:	0	0	0	0	0	0	0	0
193:	0	0	0	0	0	0	0	0
201:	0	0	0	0	0	0	0	0
209:	0	0	0	0	0	1	0	0
217:	0	0	0	0	0	0	0	0
225:	0	0	0	0	0	0	0	0
233:	0	0	0	0	0	0	0	0
241:	0	0	0	0	0	0	0	0
249:	0	0	0	0	0	0	0	0
257:	0	0	0	0	0	0	0	0
265:	0	0	0	0	0	1	0	0
273:	0	0	0	0	0	0	0	0
281:	0	0	0	0	0	0	0	0
289:	0	0	0	0	0	0	0	0
297:	0	0	0	0	0	0	0	0
305:	0	0	0	0	0	0	0	0
313:	0	0	0	0	0	0	0	0
321:	0	1	0	0	0	0	0	0
329:	0	1	0	0	0	0	0	0
337:	0	0	0	0	0	0	0	0
345:	0	0	0	0	0	0	0	0
353:	0	0	0	0	0	0	0	0
361:	0	0	0	0	0	0	0	0

369:	0	0	0	0	0	0	0	0

Sample Title: 05

Channel								
377:	0	0	0	0	0	0	0	0
385:	0	0	0	0	0	0	0	0
393:	0	0	0	0	0	0	0	1
401:	0	0	0	0	0	0	0	0
409:	0	0	0	0	0	0	0	1
417:	0	0	0	0	1	0	0	0
425:	1	2	0	2	1	1	0	1
433:	0	0	1	0	0	1	1	1
441:	2	1	3	2	2	3	4	1
449:	2	2	3	4	1	2	2	3
457:	0	3	1	4	3	3	3	2
465:	6	3	2	2	1	1	0	0
473:	5	4	2	2	2	4	4	3
481:	1	2	1	1	1	1	1	0
489:	0	1	1	1	1	0	3	0
497:	1	0	1	0	1	1	0	3
505:	1	1	1	0	0	0	0	0
513:	0	1	0	1	0	0	0	2
521:	0	0	1	1	2	3	1	0
529:	1	1	0	1	0	0	0	0
537:	0	0	0	0	0	0	0	0
545:	0	0	0	0	0	0	0	0
553:	0	0	0	0	0	0	0	0
561:	0	0	0	0	0	0	0	0
569:	0	0	0	0	0	0	0	0
577:	0	0	0	0	0	0	0	0
585:	0	0	0	0	0	0	0	0
593:	0	0	0	0	0	0	0	0
601:	0	0	0	0	0	0	0	0
609:	0	0	0	0	0	0	0	0
617:	0	0	0	0	0	0	0	0
625:	0	0	0	0	0	0	0	0
633:	0	0	0	0	0	0	1	0
641:	0	0	0	0	0	0	0	0
649:	0	0	0	0	0	0	0	0
657:	0	0	0	0	0	0	0	0
665:	0	0	0	0	0	0	0	0
673:	0	0	0	0	0	0	0	0
681:	0	0	0	0	0	0	0	0
689:	0	0	0	0	0	0	0	0
697:	0	0	0	0	0	0	0	0
705:	0	0	0	0	0	0	0	0
713:	0	0	0	0	0	0	0	0
721:	0	0	0	0	0	0	0	0
729:	0	0	0	0	0	0	0	0
737:	0	0	0	0	0	0	0	0
745:	0	0	0	0	0	0	0	0
753:	0	0	0	0	0	0	0	0
761:	0	0	0	0	0	0	0	0
769:	0	0	0	0	0	0	0	0
777:	0	0	0	0	0	0	0	0
785:	0	0	0	0	0	0	1	0
793:	0	0	0	0	0	0	0	0

801:	0	0	0	0	0	0	0	1

Sample Title: 05

Channel								
809:	0	0	0	0	0	0	0	0
817:	0	0	0	0	0	0	0	0
825:	0	0	0	0	0	0	0	0
833:	0	0	0	0	0	0	0	0
841:	0	0	0	0	0	0	0	0
849:	0	0	0	0	0	0	0	0
857:	0	0	0	1	0	0	0	0
865:	0	0	0	0	0	0	0	0
873:	0	0	0	0	0	0	0	0
881:	0	0	0	0	0	1	0	0
889:	0	0	0	0	0	0	0	0
897:	0	0	0	0	0	0	0	0
905:	0	0	0	0	0	0	0	0
913:	0	0	0	0	0	0	0	0
921:	0	0	0	0	0	0	0	0
929:	0	0	0	1	0	0	0	0
937:	0	0	0	0	0	0	0	0
945:	0	0	0	0	0	1	0	0
953:	0	0	0	1	0	0	0	0
961:	0	0	0	0	0	0	0	0
969:	0	0	0	0	0	0	0	0
977:	0	0	0	0	0	0	0	0
985:	0	0	0	0	0	0	0	0
993:	0	0	0	0	0	0	0	0
1001:	0	0	0	0	0	0	0	0
1009:	0	0	0	0	0	0	0	0
1017:	0	0	0	0	0	0	0	0

KB 9/16/13

Apex-Alpha™

Sample Description: LR-104 TOT
Spectrum File: \\OR-ALPHA1\Canberra\ApexAlpha\Root\Data\00000662
Batch Identification: 1307170A-TH
Sample Identification: 06
Sample Geometry: Shelf 2
Procedure Description: Th iso

Detector Name: Alpha_011
Chamber Serial Number:
Detector Serial Number: 11
Env. Background: System Bkgd 64767
Reagent Blank: <not performed>

Sample Size: 1.000E+000 +/- 0.000E+000 liter
Sample Date/Time: 7/22/2013 12:57:41 PM
Acquisition Date/Time: 8/15/2013 2:33:50 PM
Acquisition Live Time: 170.0 minutes
Acquisition Real Time: 170.0 minutes

Tracer Certificate: Th229_TH-18A
Tracer Quantity: 0.235 mL
Effective Efficiency: 0.2368 +/- 0.0178
Counting Efficiency: 0.2051 +/- 0.0035 on 7/20/2013 2:50:46 PM
Chem. Recovery Factor: 1.1548 +/- 0.0892

Peak Match Tolerance: 0.175 MeV

PEAK AREA REPORT

Nuclide		Energy (MeV)	Net Pk Area	Pk Area Error %	Ambient Backgnd	Reagent Backgnd	FWHM (keV)
TH-227		5.769	1.15	249.58	0.85	0.00E+000	2.6
TH-228		5.342	5.15	94.34	0.85	0.00E+000	2.6
TH-229	T	4.882	212.83	13.44	0.17	0.00E+000	4.2
TH-230		4.636	8.83	66.70	0.17	0.00E+000	2.6
TH-232		3.991	0.83	239.53	0.17	0.00E+000	2.6

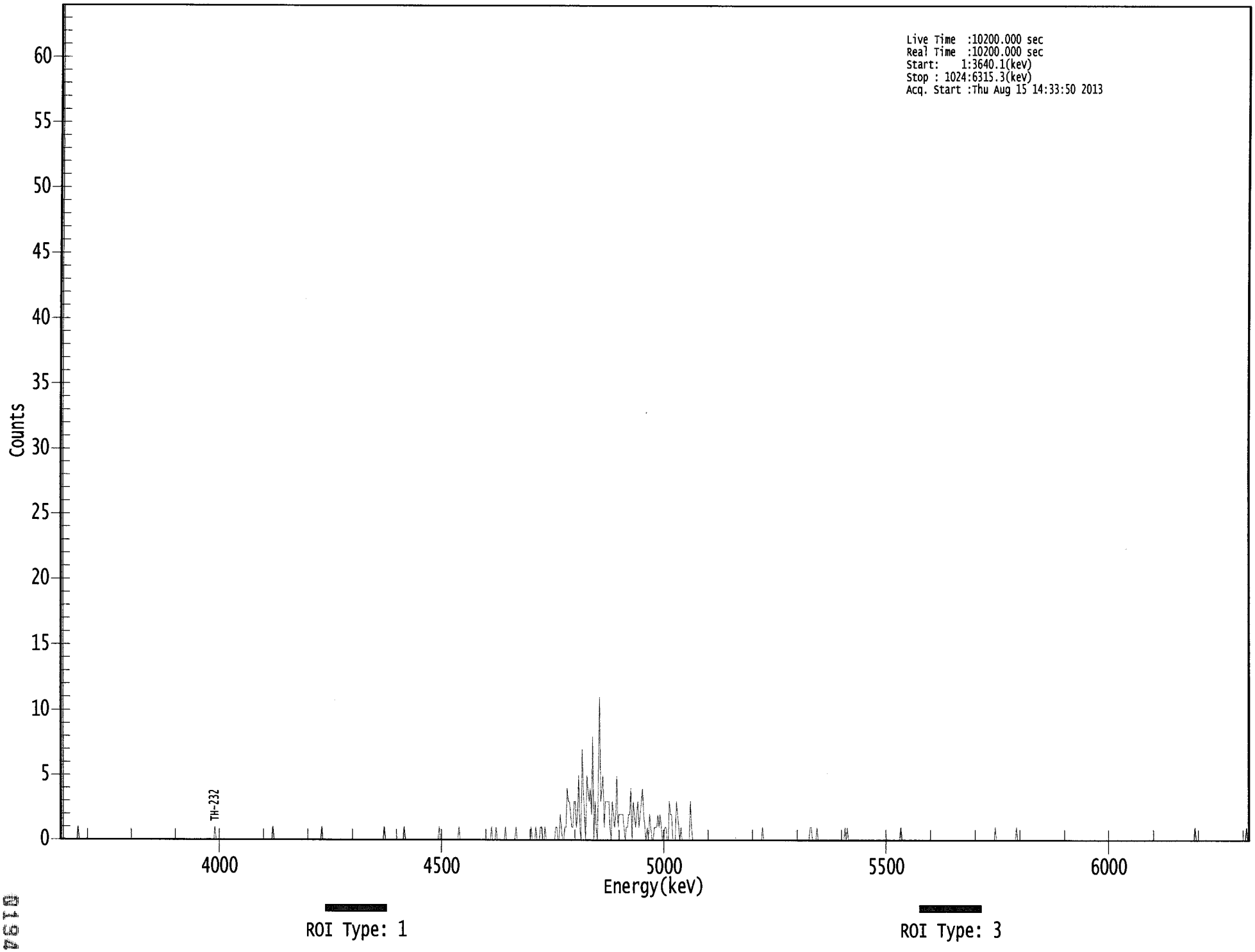
T = Tracer Peak used for Effective Efficiency

NUCLIDE ANALYSIS RESULTS

Nuclide	Id Conf.	Energy (keV)	Activity (pCi/liter)	MDA (pCi/liter)
TH-227	0.966	5850.00*	1.32E-002 +/- 3.31E-002	6.88E-002 +/- 1.02E-002
TH-228	0.982	5400.00*	5.90E-002 +/- 5.64E-002	6.86E-002 +/- 1.01E-002
TH-229	1.000	4872.00*	2.39E+000 +/- 3.53E-001	4.69E-002 +/- 6.92E-003
TH-230	0.993	4672.00*	9.90E-002 +/- 6.76E-002	4.68E-002 +/- 6.90E-003
TH-232	1.000	3997.00*	9.29E-003 +/- 2.23E-002	4.67E-002 +/- 6.89E-003

AG 8/16/13

0000066287.CNF



****
***** S P E C T R A L D A T A R E P O R T *****
****

Sample Title: 06

Elapsed Live time: 10200
Elapsed Real Time: 10200

Channel							
1:	10200	10200	0	0	0	0	0	0
9:	0	0	0	0	0	0	0	1
17:	0	0	0	0	0	0	0	0
25:	0	0	0	0	0	0	0	0
33:	0	0	0	0	0	0	0	0
41:	0	0	0	0	0	0	0	0
49:	0	0	0	0	0	0	0	0
57:	0	0	0	0	0	0	0	0
65:	0	0	0	0	0	0	0	0
73:	0	0	0	0	0	0	0	0
81:	0	0	0	0	0	0	0	0
89:	0	0	0	0	0	0	0	0
97:	0	0	0	0	0	0	0	0
105:	0	0	0	0	0	0	0	0
113:	0	0	0	0	0	0	0	0
121:	0	0	0	0	0	0	0	0
129:	0	0	0	0	0	0	1	0
137:	0	0	0	0	0	0	0	0
145:	0	0	0	0	0	0	0	0
153:	0	0	0	0	0	0	0	0
161:	0	0	0	0	0	0	0	0
169:	0	0	0	0	0	0	0	0
177:	0	0	0	0	0	0	0	0
185:	1	0	0	0	0	0	0	0
193:	0	0	0	0	0	0	0	0
201:	0	0	0	0	0	0	0	0
209:	0	0	0	0	0	0	0	0
217:	0	0	0	0	0	0	0	0
225:	0	0	1	0	0	0	0	0
233:	0	0	0	0	0	0	0	0
241:	0	0	0	0	0	0	0	0
249:	0	0	0	0	0	0	0	0
257:	0	0	0	0	0	0	0	0
265:	0	0	0	0	0	0	0	0
273:	0	0	0	0	0	0	0	0
281:	1	0	0	0	0	0	0	0
289:	0	0	0	0	0	0	0	0
297:	0	1	0	0	0	0	0	0
305:	0	0	0	0	0	0	0	0
313:	0	0	0	0	0	0	0	0
321:	0	0	0	0	0	0	0	1
329:	0	0	0	0	0	0	0	0
337:	0	0	0	0	0	0	0	0
345:	1	0	0	0	0	0	0	0
353:	0	0	0	0	0	0	0	0
361:	0	0	0	0	0	0	0	0

369:	0	0	0	0	1	0	0	0

Sample Title: 06

Channel								
377:	1	0	0	0	0	0	0	0
385:	1	0	0	0	0	0	0	0
393:	0	1	0	0	0	0	0	0
401:	0	0	0	0	0	0	1	0
409:	0	0	1	0	0	0	1	1
417:	0	0	1	0	0	0	0	0
425:	0	0	0	1	1	0	0	2
433:	1	0	0	1	1	4	3	3
441:	2	1	1	3	3	1	2	5
449:	1	0	7	4	2	0	5	4
457:	3	4	2	8	0	3	1	0
465:	5	11	3	4	5	1	3	3
473:	3	3	1	0	3	2	1	2
481:	5	1	2	2	2	2	1	0
489:	1	1	2	2	4	0	3	2
497:	1	2	3	1	2	3	4	2
505:	1	0	1	0	2	1	0	0
513:	1	1	1	2	1	2	1	0
521:	0	1	1	0	0	3	2	2
529:	0	0	0	3	2	1	0	1
537:	0	0	0	0	0	0	0	3
545:	1	0	0	0	0	0	0	0
553:	0	0	0	0	0	0	0	0
561:	0	0	0	0	0	0	0	0
569:	0	0	0	0	0	0	0	0
577:	0	0	0	0	0	0	0	0
585:	0	0	0	0	0	0	0	0
593:	0	0	0	0	0	0	0	0
601:	0	0	0	0	0	1	0	0
609:	0	0	0	0	0	0	0	0
617:	0	0	0	0	0	0	0	0
625:	0	0	0	0	0	0	0	0
633:	0	0	0	0	0	0	0	0
641:	0	0	0	0	0	0	1	1
649:	0	0	0	0	1	0	0	0
657:	0	0	0	0	0	0	0	0
665:	0	0	0	0	0	0	0	0
673:	0	0	0	0	1	0	1	0
681:	0	0	0	0	0	0	0	0
689:	0	0	0	0	0	0	0	0
697:	0	0	0	0	0	0	0	0
705:	0	0	0	0	0	0	0	0
713:	0	0	0	0	0	0	0	0
721:	0	0	0	0	1	0	0	0
729:	0	0	0	0	0	0	0	0
737:	0	0	0	0	0	0	0	0
745:	0	0	0	0	0	0	0	0
753:	0	0	0	0	0	0	0	0
761:	0	0	0	0	0	0	0	0
769:	0	0	0	0	0	0	0	0
777:	0	0	0	0	0	0	0	0
785:	0	0	0	0	0	0	0	0
793:	0	0	0	0	0	0	0	0

801:	0	0	0	0	0	1	0	0

Sample Title: 06

Channel								
809:	0	0	0	0	0	0	0	0
817:	0	0	0	0	0	0	0	1
825:	0	0	0	0	0	0	0	0
833:	0	0	0	0	0	0	0	0
841:	0	0	0	0	0	0	0	0
849:	0	0	0	0	0	0	0	0
857:	0	0	0	0	0	0	0	0
865:	0	0	0	0	0	0	0	0
873:	0	0	0	0	0	0	0	0
881:	0	0	0	0	0	0	0	0
889:	0	0	0	0	0	0	0	0
897:	0	0	0	0	0	0	0	0
905:	0	0	0	0	0	0	0	0
913:	0	0	0	0	0	0	0	0
921:	0	0	0	0	0	0	0	0
929:	0	0	0	0	0	0	0	0
937:	0	0	0	0	0	0	0	0
945:	0	0	0	0	0	0	0	0
953:	0	0	0	0	0	0	0	0
961:	0	0	0	0	0	0	0	0
969:	0	0	0	0	0	0	0	0
977:	1	0	0	0	0	0	0	0
985:	0	0	0	0	0	0	0	0
993:	0	0	0	0	0	0	0	0
1001:	0	0	0	0	0	0	0	0
1009:	0	0	0	0	0	0	0	0
1017:	0	0	0	0	1	0	0	0

LDS 8/15/13

Apex-Alpha™

Sample Description: LR-104 DIS
Spectrum File: \\OR-ALPHA1\Canberra\ApexAlpha\Root\Data\00000662
Batch Identification: 1307170A-TH
Sample Identification: 07
Sample Geometry: Shelf 2
Procedure Description: Th iso

Detector Name: Alpha_012
Chamber Serial Number:
Detector Serial Number: 12
Env. Background: System Bkgd 64768
Reagent Blank: <not performed>

Sample Size: 1.000E+000 +/- 0.000E+000 liter
Sample Date/Time: 7/22/2013 12:57:41 PM
Acquisition Date/Time: 8/15/2013 2:33:51 PM
Acquisition Live Time: 170.0 minutes
Acquisition Real Time: 170.0 minutes

Tracer Certificate: Th229_TH-18A
Tracer Quantity: 0.235 mL
Effective Efficiency: 0.1678 +/- 0.0146
Counting Efficiency: 0.1989 +/- 0.0034 on 12/11/2011 2:21:56 PM
Chem. Recovery Factor: 0.8433 +/- 0.0750

Peak Match Tolerance: 0.175 MeV

PEAK AREA REPORT

Nuclide		Energy (MeV)	Net Pk Area	Pk Area Error %	Ambient Backgnd	Reagent Backgnd	FWHM (keV)
TH-227		5.720	0.83	239.54	0.17	0.00E+000	3.0
TH-228		5.290	3.15	126.68	0.85	0.00E+000	3.0
TH-229	T	4.874	150.83	15.97	0.17	0.00E+000	7.8
TH-230		4.533	5.83	82.55	0.17	0.00E+000	3.0
TH-232		3.826	0.15	1398.6	0.85	0.00E+000	3.0

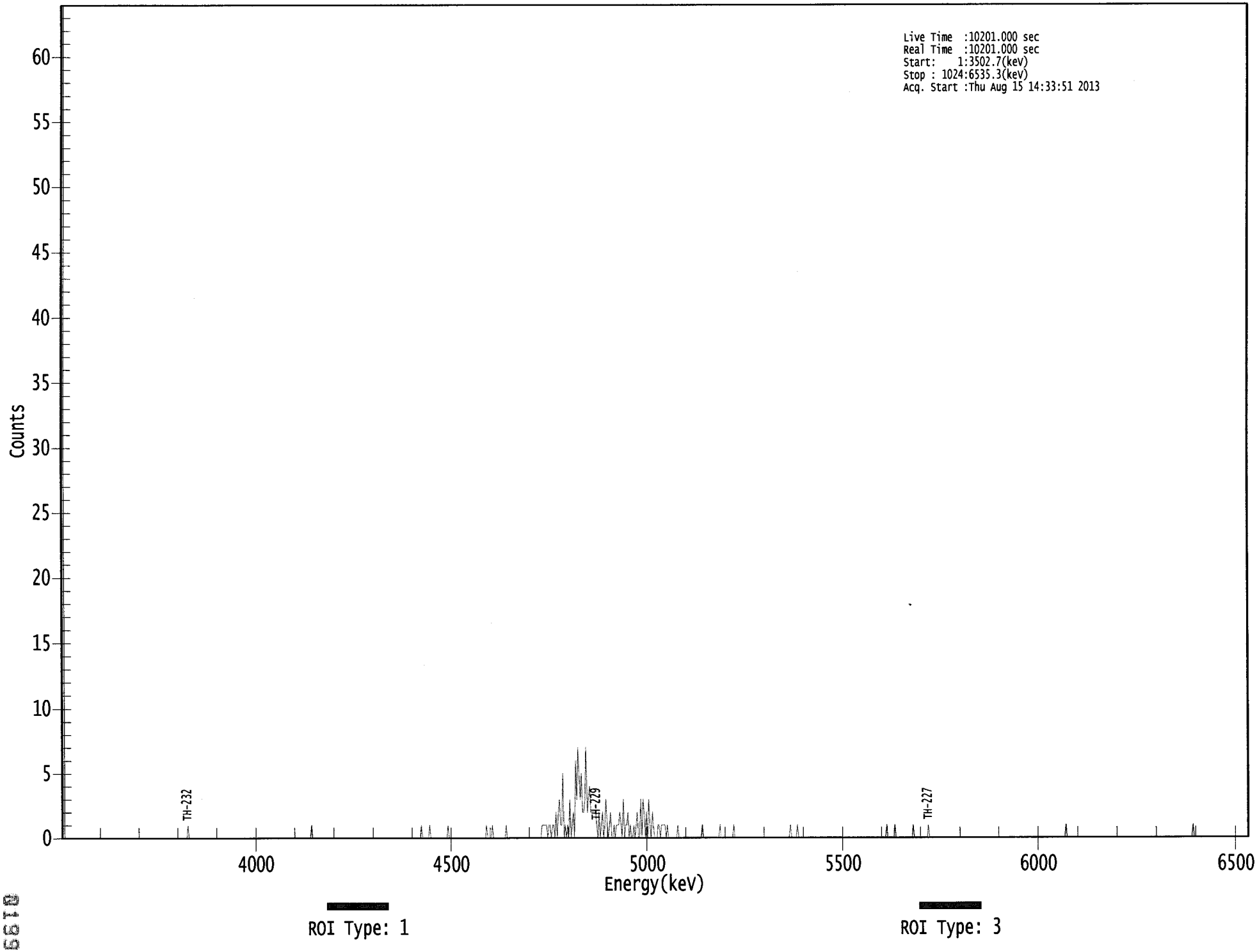
T = Tracer Peak used for Effective Efficiency

NUCLIDE ANALYSIS RESULTS

Nuclide	Id Conf.	Energy (keV)	Activity (pCi/liter)	MDA (pCi/liter)
TH-227	0.916	5850.00*	1.35E-002 +/- 3.24E-002	6.77E-002 +/- 1.16E-002
TH-228	0.939	5400.00*	5.10E-002 +/- 6.52E-002	9.69E-002 +/- 1.66E-002
TH-229	1.000	4872.00*	2.39E+000 +/- 4.09E-001	6.62E-002 +/- 1.13E-002
TH-230	0.904	4672.00*	9.22E-002 +/- 7.78E-002	6.60E-002 +/- 1.13E-002
TH-232	0.858	3997.00*	2.37E-003 +/- 3.31E-002	9.46E-002 +/- 1.62E-002

AG
8/16/13

0000066288.CNF



****
***** S P E C T R A L D A T A R E P O R T *****
****

Sample Title: 07

Elapsed Live time: 10201
Elapsed Real Time: 10201

Channel								
1:	10201	10201	0	0	0	0	0	0
9:	0	0	0	0	0	0	0	0
17:	0	0	0	0	0	0	0	0
25:	0	0	0	0	0	0	0	0
33:	0	0	0	0	0	0	0	0
41:	0	0	0	0	0	0	0	0
49:	0	0	0	0	0	0	0	0
57:	0	0	0	0	0	0	0	0
65:	0	0	0	0	0	0	0	0
73:	0	0	0	0	0	0	0	0
81:	0	0	0	0	0	0	0	0
89:	0	0	0	0	0	0	0	0
97:	0	0	0	0	0	0	0	0
105:	0	0	0	0	0	1	0	0
113:	0	0	0	0	0	0	0	0
121:	0	0	0	0	0	0	0	0
129:	0	0	0	0	0	0	0	0
137:	0	0	0	0	0	0	0	0
145:	0	0	0	0	0	0	0	0
153:	0	0	0	0	0	0	0	0
161:	0	0	0	0	0	0	0	0
169:	0	0	0	0	0	0	0	0
177:	0	0	0	0	0	0	0	0
185:	0	0	0	0	0	0	0	0
193:	0	0	0	0	0	0	0	0
201:	0	0	0	0	0	0	0	0
209:	0	0	0	0	0	0	0	0
217:	1	0	0	0	0	0	0	0
225:	0	0	0	0	0	0	0	0
233:	0	0	0	0	0	0	0	0
241:	0	0	0	0	0	0	0	0
249:	0	0	0	0	0	0	0	0
257:	0	0	0	0	0	0	0	0
265:	0	0	0	0	0	0	0	0
273:	0	0	0	0	0	0	0	0
281:	0	0	0	0	0	0	0	0
289:	0	0	0	0	0	0	0	0
297:	0	0	0	0	0	0	0	0
305:	0	0	0	0	0	0	0	1
313:	0	0	0	0	0	0	1	0
321:	0	0	0	0	0	0	0	0
329:	0	0	0	0	0	0	1	0
337:	0	0	0	0	0	0	0	0
345:	0	0	0	0	0	0	0	0
353:	0	0	0	0	0	0	0	0
361:	0	0	0	0	0	0	0	1

369:	0	0	0	0	1	0	0	0

Sample Title: 07

Channel								
377:	0	0	0	0	0	0	0	0
385:	1	0	0	0	0	0	0	0
393:	0	0	0	0	0	0	0	0
401:	0	0	0	0	0	0	0	0
409:	0	0	0	0	0	0	0	1
417:	1	1	1	1	0	1	1	0
425:	1	1	0	2	0	2	3	1
433:	1	5	0	1	0	1	0	3
441:	0	1	2	0	6	3	7	5
449:	3	5	2	2	3	7	2	3
457:	4	2	2	2	2	2	1	0
465:	2	0	1	2	0	1	3	1
473:	0	1	2	0	0	1	0	1
481:	1	1	2	1	0	3	0	1
489:	1	2	0	1	0	0	1	0
497:	1	2	0	0	3	0	3	2
505:	0	2	0	3	1	0	2	1
513:	0	0	0	1	1	0	1	1
521:	1	1	0	1	0	0	0	0
529:	0	0	0	0	1	0	0	0
537:	0	0	0	0	0	0	0	0
545:	0	0	0	0	0	0	0	0
553:	0	1	0	0	0	0	0	0
561:	0	0	0	0	0	0	0	0
569:	1	0	0	0	0	0	0	0
577:	0	0	0	0	1	0	0	0
585:	0	0	0	0	0	0	0	0
593:	0	0	0	0	0	0	0	0
601:	0	0	0	0	0	0	0	0
609:	0	0	0	0	0	0	0	0
617:	0	0	0	0	0	0	0	0
625:	0	0	0	0	0	1	0	0
633:	0	0	0	1	0	0	0	0
641:	0	0	0	0	0	0	0	0
649:	0	0	0	0	0	0	0	0
657:	0	0	0	0	0	0	0	0
665:	0	0	0	0	0	0	0	0
673:	0	0	0	0	0	0	0	0
681:	0	0	0	0	0	0	0	0
689:	0	0	0	0	0	0	0	0
697:	0	0	0	0	0	0	0	0
705:	0	0	0	0	0	0	0	0
713:	1	0	0	0	0	0	0	1
721:	0	0	0	0	0	0	0	0
729:	0	0	0	0	0	0	0	1
737:	0	0	0	0	0	0	0	0
745:	0	0	0	0	1	0	0	0
753:	0	0	0	0	0	0	0	0
761:	0	0	0	0	0	0	0	0
769:	0	0	0	0	0	0	0	0
777:	0	0	0	0	0	0	0	0
785:	0	0	0	0	0	0	0	0
793:	0	0	0	0	0	0	0	0

801:	0	0	0	0	0	0	0	0

Sample Title: 07

Channel								
809:	0	0	0	0	0	0	0	0
817:	0	0	0	0	0	0	0	0
825:	0	0	0	0	0	0	0	0
833:	0	0	0	0	0	0	0	0
841:	0	0	0	0	0	0	0	0
849:	0	0	0	0	0	0	0	0
857:	0	0	0	0	0	0	0	0
865:	0	0	1	0	0	0	0	0
873:	0	0	0	0	0	0	0	0
881:	0	0	0	0	0	0	0	0
889:	0	0	0	0	0	0	0	0
897:	0	0	0	0	0	0	0	0
905:	0	0	0	0	0	0	0	0
913:	0	0	0	0	0	0	0	0
921:	0	0	0	0	0	0	0	0
929:	0	0	0	0	0	0	0	0
937:	0	0	0	0	0	0	0	0
945:	0	0	0	0	0	0	0	0
953:	0	0	0	0	0	0	0	0
961:	0	0	0	0	0	0	0	0
969:	0	0	0	0	0	0	0	1
977:	0	0	0	0	0	0	0	0
985:	0	0	0	0	0	0	0	0
993:	0	0	0	0	0	0	0	0
1001:	0	0	0	0	0	0	0	0
1009:	0	0	0	0	0	0	0	0
1017:	0	0	0	0	0	0	0	0

KP 8/16/13

Apex-Alpha™

Sample Description: PZ-100-KS TOT
Spectrum File: \\OR-ALPHA1\Canberra\ApexAlpha\Root\Data\00000662
Batch Identification: 1307170A-TH
Sample Identification: 08
Sample Geometry: Shelf 2
Procedure Description: Th iso

Detector Name: Alpha_013
Chamber Serial Number:
Detector Serial Number: 13
Env. Background: System Bkgd 64769
Reagent Blank: <not performed>

Sample Size: 1.000E+000 +/- 0.000E+000 liter
Sample Date/Time: 7/23/2013 12:57:41 PM
Acquisition Date/Time: 8/15/2013 2:33:52 PM
Acquisition Live Time: 170.0 minutes
Acquisition Real Time: 170.0 minutes

Tracer Certificate: Th229_TH-18A
Tracer Quantity: 0.234 mL
Effective Efficiency: 0.1889 +/- 0.0157
Counting Efficiency: 0.1869 +/- 0.0035 on 12/15/2012 11:26:45 AM
Chem. Recovery Factor: 1.0108 +/- 0.0861

Peak Match Tolerance: 0.175 MeV

PEAK AREA REPORT

Nuclide		Energy (MeV)	Net Pk Area	Pk Area Error %	Ambient Backgnd	Reagent Backgnd	FWHM (keV)
TH-227		5.744	1.30	273.42	1.70	0.00E+000	2.8
TH-228		5.395	1.47	240.74	1.53	0.00E+000	2.8
TH-229	T	4.878	168.98	15.13	1.02	0.00E+000	4.1
TH-230		4.635	2.66	128.85	0.34	0.00E+000	2.8
TH-232		3.949	-0.17	1169.5	0.17	0.00E+000	0.0

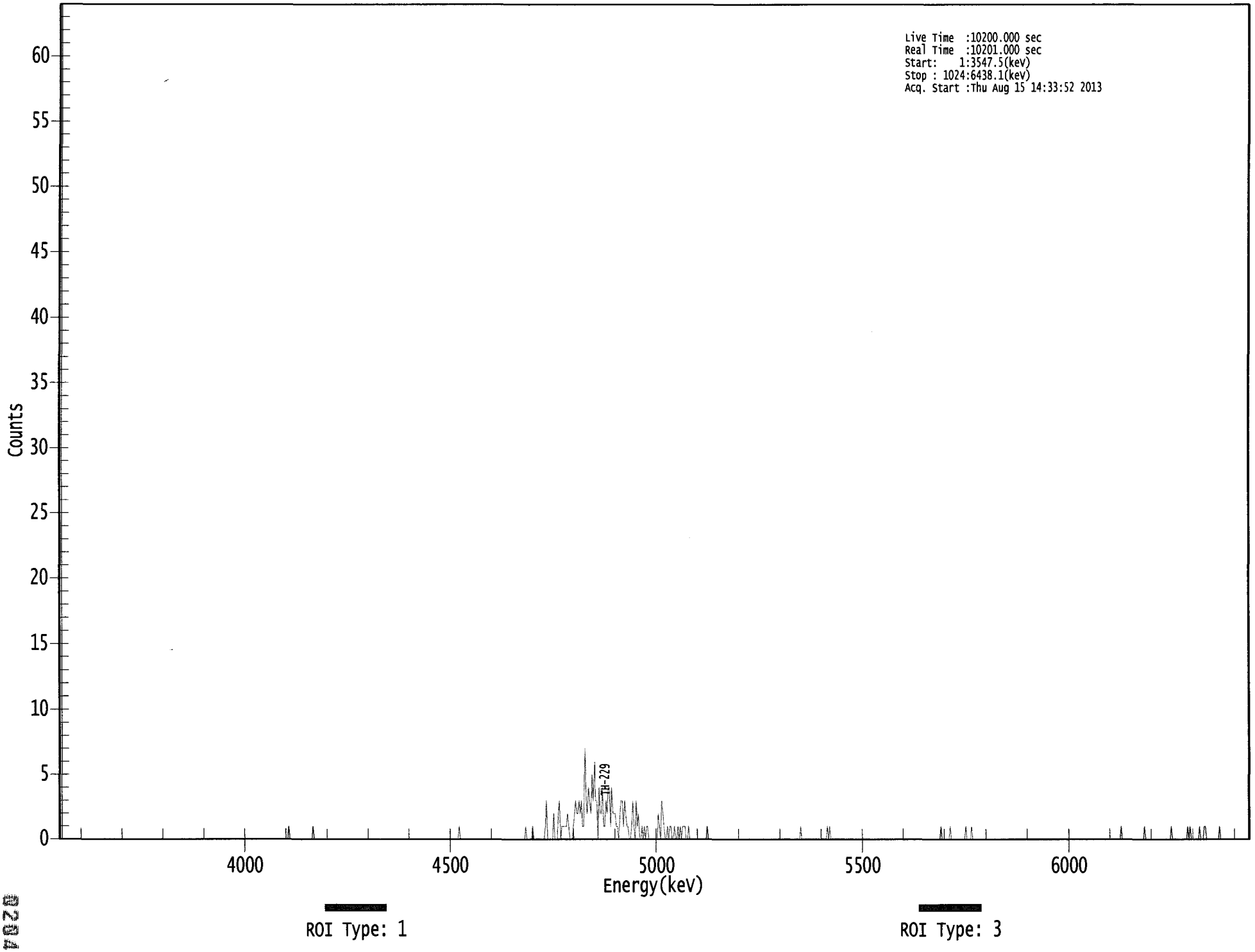
T = Tracer Peak used for Effective Efficiency

NUCLIDE ANALYSIS RESULTS

Nuclide	Id Conf.	Energy (keV)	Activity (pCi/liter)	MDA (pCi/liter)
TH-227	0.943	5850.00*	1.87E-002 +/- 5.13E-002	1.06E-001 +/- 1.73E-002
TH-228	1.000	5400.00*	2.11E-002 +/- 5.09E-002	1.02E-001 +/- 1.66E-002
TH-229	1.000	4872.00*	2.38E+000 +/- 3.88E-001	8.88E-002 +/- 1.45E-002
TH-230	0.993	4672.00*	3.74E-002 +/- 4.85E-002	6.72E-002 +/- 1.10E-002
TH-232	0.988	3997.00*	-2.38E-003 +/- 2.79E-002	5.85E-002 +/- 9.54E-003

AG
8/16/13

0000066289.CNF



0204

****
***** S P E C T R A L D A T A R E P O R T *****
****

Sample Title: 08

Elapsed Live time: 10200
Elapsed Real Time: 10201

Channel								
1:	10201	10200	0	0	0	0	0	0
9:	0	0	0	0	0	0	0	0
17:	0	0	0	0	0	0	0	0
25:	0	0	0	0	0	0	0	0
33:	0	0	0	0	0	0	0	0
41:	0	0	0	0	0	0	0	0
49:	0	0	0	0	0	0	0	0
57:	0	0	0	0	0	0	0	0
65:	0	0	0	0	0	0	0	0
73:	0	0	0	0	0	0	0	0
81:	0	0	0	0	0	0	0	0
89:	0	0	0	0	0	0	0	0
97:	0	0	0	0	0	0	0	0
105:	0	0	0	0	0	0	0	0
113:	0	0	0	0	0	0	0	0
121:	0	0	0	0	0	0	0	0
129:	0	0	0	0	0	0	0	0
137:	0	0	0	0	0	0	0	0
145:	0	0	0	0	0	0	0	0
153:	0	0	0	0	0	0	0	0
161:	0	0	0	0	0	0	0	0
169:	0	0	0	0	0	0	0	0
177:	0	0	0	0	0	0	0	0
185:	0	0	0	0	0	0	0	0
193:	0	0	0	0	0	0	1	0
201:	0	0	0	0	0	0	0	0
209:	0	0	0	0	0	0	0	0
217:	0	0	0	1	0	0	0	0
225:	0	0	0	0	0	0	0	0
233:	0	0	0	0	0	0	0	0
241:	0	0	0	0	0	0	0	0
249:	0	0	0	0	0	0	0	0
257:	0	0	0	0	0	0	0	0
265:	0	0	0	0	0	0	0	0
273:	0	0	0	0	0	0	0	0
281:	0	0	0	0	0	0	0	0
289:	0	0	0	0	0	0	0	0
297:	0	0	0	0	0	0	0	0
305:	0	0	0	0	0	0	0	0
313:	0	0	0	0	0	0	0	0
321:	0	0	0	0	0	0	0	0
329:	0	0	0	0	0	0	0	0
337:	0	0	0	0	0	0	0	0
345:	0	1	0	0	0	0	0	0
353:	0	0	0	0	0	0	0	0
361:	0	0	0	0	0	0	0	0

369:	0	0	0	0	0	0	0	0

Sample Title: 08

Channel								
377:	0	0	0	0	0	0	0	0
385:	0	0	0	0	0	0	0	0
393:	0	0	0	0	0	0	0	0
401:	0	0	1	0	0	0	0	0
409:	1	0	0	0	0	0	0	0
417:	0	0	0	1	3	0	0	0
425:	0	0	2	0	0	0	2	3
433:	0	1	1	1	1	1	2	1
441:	0	0	0	1	2	3	2	2
449:	3	2	3	1	1	7	3	2
457:	4	3	2	5	3	6	3	3
465:	0	4	2	2	4	1	1	3
473:	2	4	4	1	4	2	2	2
481:	1	1	0	2	3	3	1	3
489:	2	1	1	0	0	1	3	1
497:	0	3	1	2	0	0	1	0
505:	1	0	1	1	0	0	0	0
513:	0	0	0	0	2	1	0	3
521:	2	1	0	0	1	0	1	1
529:	0	0	1	0	0	1	0	1
537:	0	1	1	1	0	0	1	0
545:	0	0	0	0	0	0	0	0
553:	0	0	0	0	0	0	1	0
561:	0	0	0	0	0	0	0	0
569:	0	0	0	0	0	0	0	0
577:	0	0	0	0	0	0	0	0
585:	0	0	0	0	0	0	0	0
593:	0	0	0	0	0	0	0	0
601:	0	0	0	0	0	0	0	0
609:	0	0	0	0	0	0	0	0
617:	0	0	0	0	0	0	0	0
625:	0	0	0	0	0	0	0	0
633:	0	0	0	0	0	0	1	0
641:	0	0	0	0	0	0	0	0
649:	0	0	0	0	0	0	0	0
657:	0	0	0	0	0	1	0	1
665:	0	0	0	0	0	0	0	0
673:	0	0	0	0	0	0	0	0
681:	0	0	0	0	0	0	0	0
689:	0	0	0	0	0	0	0	0
697:	0	0	0	0	0	0	0	0
705:	0	0	0	0	0	0	0	0
713:	0	0	0	0	0	0	0	0
721:	0	0	0	0	0	0	0	0
729:	0	0	0	0	0	0	0	0
737:	0	0	0	0	0	0	0	0
745:	0	0	0	0	0	0	0	0
753:	0	0	0	0	0	0	0	1
761:	0	0	0	0	0	0	0	1
769:	0	0	0	0	0	0	0	0
777:	0	0	0	0	1	0	0	0
785:	0	1	0	0	0	0	0	0
793:	0	0	0	0	0	0	0	0

801:	0	0	0	0	0	0	0	0

Sample Title: 08

Channel								
809:	0	0	0	0	0	0	0	0
817:	0	0	0	0	0	0	0	0
825:	0	0	0	0	0	0	0	0
833:	0	0	0	0	0	0	0	0
841:	0	0	0	0	0	0	0	0
849:	0	0	0	0	0	0	0	0
857:	0	0	0	0	0	0	0	0
865:	0	0	0	0	0	0	0	0
873:	0	0	0	0	0	0	0	0
881:	0	0	0	0	0	0	0	0
889:	0	0	0	0	0	0	0	0
897:	0	0	0	0	0	0	0	0
905:	0	0	0	0	0	0	0	0
913:	0	1	0	0	0	0	0	0
921:	0	0	0	0	0	0	0	0
929:	0	0	0	0	0	1	0	0
937:	0	0	0	0	0	0	0	0
945:	0	0	0	0	0	0	0	0
953:	0	0	0	0	1	0	0	0
961:	0	0	0	0	0	0	0	0
969:	0	0	1	0	1	0	0	0
977:	0	0	0	0	1	0	0	0
985:	1	1	0	0	0	0	0	0
993:	0	0	0	0	0	1	0	0
1001:	0	0	0	0	0	0	0	0
1009:	0	0	0	0	0	0	0	0
1017:	0	0	0	0	0	0	0	0

KCS 8/15/13

Apex-Alpha™

Sample Description: PZ-100-KS DIS
Spectrum File: \\OR-ALPHA1\Canberra\ApexAlpha\Root\Data\00000662
Batch Identification: 1307170A-TH
Sample Identification: 09
Sample Geometry: Shelf 2
Procedure Description: Th iso

Detector Name: Alpha_014
Chamber Serial Number:
Detector Serial Number: 14
Env. Background: System Bkgd 64770
Reagent Blank: <not performed>

Sample Size: 1.000E+000 +/- 0.000E+000 liter
Sample Date/Time: 7/23/2013 12:57:41 PM
Acquisition Date/Time: 8/15/2013 2:33:53 PM
Acquisition Live Time: 170.0 minutes
Acquisition Real Time: 170.0 minutes

Tracer Certificate: Th229_TH-18A
Tracer Quantity: 0.233 mL
Effective Efficiency: 0.2343 +/- 0.0178
Counting Efficiency: 0.1846 +/- 0.0034 on 12/15/2012 11:26:44 AM
Chem. Recovery Factor: 1.2692 +/- 0.0993

Peak Match Tolerance: 0.175 MeV

PEAK AREA REPORT

Nuclide		Energy (MeV)	Net Pk Area	Pk Area Error %	Ambient Backgnd	Reagent Backgnd	FWHM (keV)
TH-227		5.721	-0.72	427.20	2.72	0.00E+000	2.9
TH-228		5.299	-4.08	62.52	4.08	0.00E+000	0.0
TH-229	T	4.873	208.81	13.61	1.19	0.00E+000	5.9
TH-230		4.612	11.32	60.27	0.68	0.00E+000	2.9
TH-232		3.948	-0.68	304.44	0.68	0.00E+000	0.0

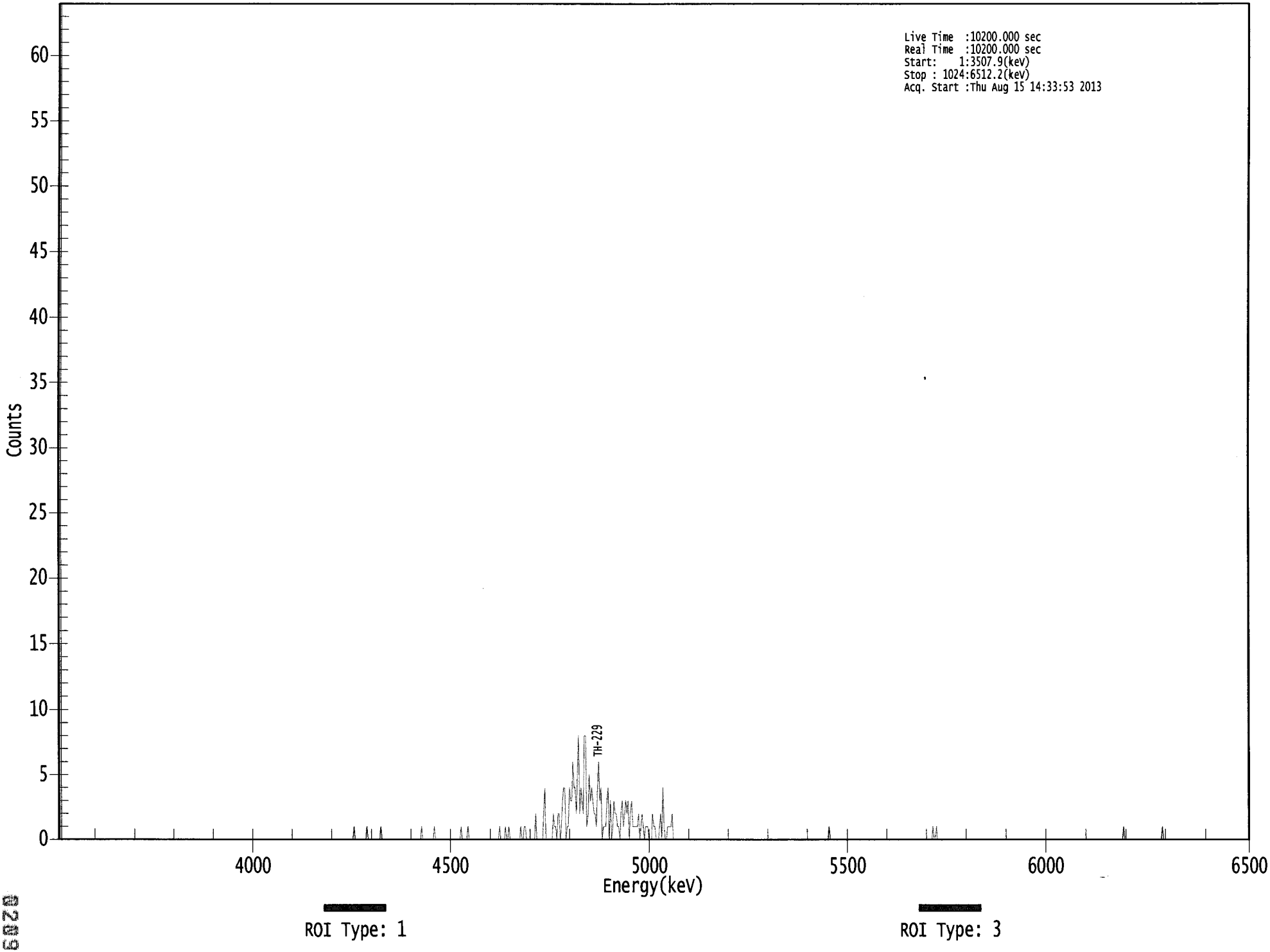
T = Tracer Peak used for Effective Efficiency

NUCLIDE ANALYSIS RESULTS

Nuclide	Id Conf.	Energy (keV)	Activity (pCi/liter)	MDA (pCi/liter)
TH-227	0.916	5850.00*	-8.37E-003 +/- 3.58E-002	9.97E-002 +/- 1.49E-002
TH-228	0.948	5400.00*	-4.72E-002 +/- 3.04E-002	1.15E-001 +/- 1.71E-002
TH-229	1.000	4872.00*	2.37E+000 +/- 3.54E-001	7.49E-002 +/- 1.12E-002
TH-230	0.982	4672.00*	1.28E-001 +/- 7.96E-002	6.39E-002 +/- 9.53E-003
TH-232	0.988	3997.00*	-7.69E-003 +/- 2.34E-002	6.38E-002 +/- 9.51E-003

AG
8/16/13

0000066291.CNF



****
***** S P E C T R A L D A T A R E P O R T *****
****

Sample Title: 09

Elapsed Live time: 10200
Elapsed Real Time: 10200

Channel								
1:	10200	10200	0	0	0	0	0	0
9:	0	0	0	0	0	0	0	0
17:	0	0	0	0	0	0	0	0
25:	0	0	0	0	0	0	0	0
33:	0	0	0	0	0	0	0	0
41:	0	0	0	0	0	0	0	0
49:	0	0	0	0	0	0	0	0
57:	0	0	0	0	0	0	0	0
65:	0	0	0	0	0	0	0	0
73:	0	0	0	0	0	0	0	0
81:	0	0	0	0	0	0	0	0
89:	0	0	0	0	0	0	0	0
97:	0	0	0	0	0	0	0	0
105:	0	0	0	0	0	0	0	0
113:	0	0	0	0	0	0	0	0
121:	0	0	0	0	0	0	0	0
129:	0	0	0	0	0	0	0	0
137:	0	0	0	0	0	0	0	0
145:	0	0	0	0	0	0	0	0
153:	0	0	0	0	0	0	0	0
161:	0	0	0	0	0	0	0	0
169:	0	0	0	0	0	0	0	0
177:	0	0	0	0	0	0	0	0
185:	0	0	0	0	0	0	0	0
193:	0	0	0	0	0	0	0	0
201:	0	0	0	0	0	0	0	0
209:	0	0	0	0	0	0	0	0
217:	0	0	0	0	0	0	0	0
225:	0	0	0	0	0	0	0	0
233:	0	0	0	0	0	0	0	0
241:	0	0	0	0	0	0	0	0
249:	0	0	0	0	0	0	0	1
257:	0	0	0	0	0	0	0	0
265:	0	0	1	0	0	0	0	0
273:	0	0	0	0	0	0	1	0
281:	0	0	0	0	0	0	0	0
289:	0	0	0	0	0	0	0	0
297:	0	0	0	0	0	0	0	0
305:	0	0	0	0	0	0	0	0
313:	0	1	0	0	0	0	0	0
321:	0	0	0	0	1	0	0	0
329:	0	0	0	0	0	0	0	0
337:	0	0	0	0	0	0	0	0
345:	0	0	0	1	0	0	0	0
353:	0	1	0	0	0	0	0	0
361:	0	0	0	0	0	0	0	0

369:	0	0	0	0	0	0	0	0

Sample Title: 09

Channel								
377:	0	0	0	0	1	0	0	0
385:	0	1	0	0	1	0	0	0
393:	0	0	0	0	0	0	1	0
401:	0	1	1	0	0	0	0	0
409:	0	0	0	2	0	0	0	0
417:	0	0	2	4	0	0	0	0
425:	0	0	2	1	1	0	2	2
433:	0	1	3	4	4	0	1	1
441:	4	3	3	6	4	4	2	5
449:	8	2	4	3	2	8	8	1
457:	2	5	3	4	3	2	2	1
465:	4	6	3	4	0	1	1	1
473:	3	4	0	3	0	1	3	2
481:	2	1	1	0	2	3	1	2
489:	3	2	3	0	2	3	1	1
497:	1	1	1	2	0	1	2	1
505:	0	1	1	1	0	0	0	2
513:	1	1	0	0	0	1	2	0
521:	4	1	0	0	1	1	1	1
529:	2	0	0	0	0	0	0	0
537:	0	0	0	0	0	0	0	0
545:	0	0	0	0	0	0	0	0
553:	0	0	0	0	0	0	0	0
561:	0	0	0	0	0	0	0	0
569:	0	0	0	0	0	0	0	0
577:	0	0	0	0	0	0	0	0
585:	0	0	0	0	0	0	0	0
593:	0	0	0	0	0	0	0	0
601:	0	0	0	0	0	0	0	0
609:	0	0	0	0	0	0	0	0
617:	0	0	0	0	0	0	0	0
625:	0	0	0	0	0	0	0	0
633:	0	0	0	0	0	0	0	0
641:	0	0	0	0	0	0	0	0
649:	0	0	0	0	0	0	0	0
657:	0	0	0	0	0	0	0	1
665:	0	0	0	0	0	0	0	0
673:	0	0	0	0	0	0	0	0
681:	0	0	0	0	0	0	0	0
689:	0	0	0	0	0	0	0	0
697:	0	0	0	0	0	0	0	0
705:	0	0	0	0	0	0	0	0
713:	0	0	0	0	0	0	0	0
721:	0	0	0	0	0	0	0	0
729:	0	0	0	0	0	0	0	0
737:	0	0	0	0	0	0	0	0
745:	0	0	0	0	0	0	0	0
753:	1	0	0	1	0	0	0	0
761:	0	0	0	0	0	0	0	0
769:	0	0	0	0	0	0	0	0
777:	0	0	0	0	0	0	0	0
785:	0	0	0	0	0	0	0	0
793:	0	0	0	0	0	0	0	0

801:	0	0	0	0	0	0	0	0

Sample Title: 09

Channel								
809:	0	0	0	0	0	0	0	0
817:	0	0	0	0	0	0	0	0
825:	0	0	0	0	0	0	0	0
833:	0	0	0	0	0	0	0	0
841:	0	0	0	0	0	0	0	0
849:	0	0	0	0	0	0	0	0
857:	0	0	0	0	0	0	0	0
865:	0	0	0	0	0	0	0	0
873:	0	0	0	0	0	0	0	0
881:	0	0	0	0	0	0	0	0
889:	0	0	0	0	0	0	0	0
897:	0	0	0	0	0	0	0	0
905:	0	0	0	0	0	0	0	0
913:	0	0	0	1	0	0	0	0
921:	0	0	0	0	0	0	0	0
929:	0	0	0	0	0	0	0	0
937:	0	0	0	0	0	0	0	0
945:	0	0	0	0	1	0	0	0
953:	0	0	0	0	0	0	0	0
961:	0	0	0	0	0	0	0	0
969:	0	0	0	0	0	0	0	0
977:	0	0	0	0	0	0	0	0
985:	0	0	0	0	0	0	0	0
993:	0	0	0	0	0	0	0	0
1001:	0	0	0	0	0	0	0	0
1009:	0	0	0	0	0	0	0	0
1017:	0	0	0	0	0	0	0	0

RD 8/15/13

Apex-Alpha™

Sample Description:	PURGE TANK TOT
Spectrum File:	\\OR-ALPHA1\Canberra\ApexAlpha\Root\Data\00000662
Batch Identification:	1307170A-TH
Sample Identification:	10
Sample Geometry:	Shelf 2
Procedure Description:	Th iso
Detector Name:	Alpha_015
Chamber Serial Number:	
Detector Serial Number:	15
Env. Background:	System Bkgd 64771
Reagent Blank:	<not performed>
Sample Size:	1.000E+000 +/- 0.000E+000 liter
Sample Date/Time:	7/23/2013 12:57:41 PM
Acquisition Date/Time:	8/15/2013 2:33:54 PM
Acquisition Live Time:	170.0 minutes
Acquisition Real Time:	170.0 minutes
Tracer Certificate:	Th229_TH-18A
Tracer Quantity:	0.233 mL
Effective Efficiency:	0.1386 +/- 0.0132
Counting Efficiency:	0.1477 +/- 0.0027 on 7/20/2013 6:27:27 PM
Chem. Recovery Factor:	0.9385 +/- 0.0912
Peak Match Tolerance:	0.175 MeV

PEAK AREA REPORT

Nuclide		Energy (MeV)	Net Pk Area	Pk Area Error %	Ambient Backgnd	Reagent Backgnd	FWHM (keV)
TH-227		5.844	1.15	249.58	0.85	0.00E+000	3.0
TH-228		5.382	1.32	215.97	0.68	0.00E+000	3.0
TH-229	T	4.873	123.32	17.71	0.68	0.00E+000	3.4
TH-230		4.638	15.32	51.36	0.68	0.00E+000	4.5
TH-232		3.842	0.83	239.53	0.17	0.00E+000	3.0

T = Tracer Peak used for Effective Efficiency

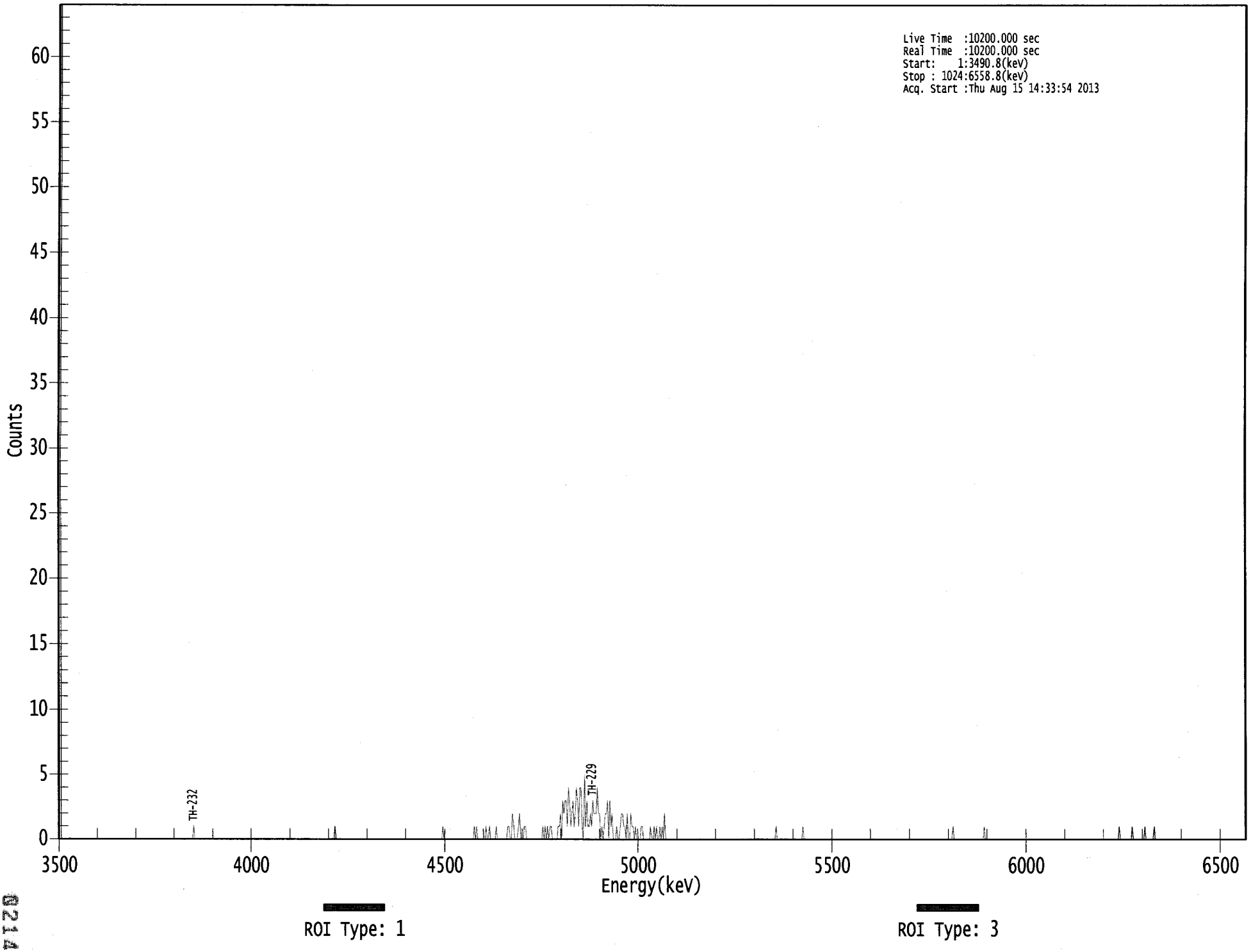
NUCLIDE ANALYSIS RESULTS

Nuclide	Id Conf.	Energy (keV)	Activity (pCi/liter)	MDA (pCi/liter)
TH-227	1.000	5850.00*	2.26E-002 +/- 5.65E-002	1.18E-001 +/- 2.20E-002
TH-228	0.998	5400.00*	2.58E-002 +/- 5.60E-002	1.10E-001 +/- 2.07E-002
TH-229	1.000	4872.00*	2.37E+000 +/- 4.43E-001	1.08E-001 +/- 2.03E-002
TH-230	0.994	4672.00*	2.93E-001 +/- 1.60E-001	1.08E-001 +/- 2.02E-002
TH-232	0.882	3997.00*	1.59E-002 +/- 3.81E-002	7.98E-002 +/- 1.49E-002

AG
8/16/13

US EPA ARCHIVE DOCUMENT

0000066292.CNF



****
***** S P E C T R A L D A T A R E P O R T *****
****

Sample Title: 10

Elapsed Live time: 10200
Elapsed Real Time: 10200

Channel								
1:	10200	10200	0	0	0	0	0	0
9:	0	0	0	0	0	0	0	0
17:	0	0	0	0	0	0	0	0
25:	0	0	0	0	0	0	0	0
33:	0	0	0	0	0	0	0	0
41:	0	0	0	0	0	0	0	0
49:	0	0	0	0	0	0	0	0
57:	0	0	0	0	0	0	0	0
65:	0	0	0	0	0	0	0	0
73:	0	0	0	0	0	0	0	0
81:	0	0	0	0	0	0	0	0
89:	0	0	0	0	0	0	0	0
97:	0	0	0	0	0	0	0	0
105:	0	0	0	0	0	0	0	0
113:	0	0	0	0	0	1	0	0
121:	0	0	0	0	0	0	0	0
129:	0	0	0	0	0	0	0	0
137:	0	0	0	0	0	0	0	0
145:	0	0	0	0	0	0	0	0
153:	0	0	0	0	0	0	0	0
161:	0	0	0	0	0	0	0	0
169:	0	0	0	0	0	0	0	0
177:	0	0	0	0	0	0	0	0
185:	0	0	0	0	0	0	0	0
193:	0	0	0	0	0	0	0	0
201:	0	0	0	0	0	0	0	0
209:	0	0	0	0	0	0	0	0
217:	0	0	0	0	0	0	0	0
225:	0	0	0	0	0	0	0	0
233:	0	0	0	0	0	0	0	1
241:	0	0	0	0	0	0	0	0
249:	0	0	0	0	0	0	0	0
257:	0	0	0	0	0	0	0	0
265:	0	0	0	0	0	0	0	0
273:	0	0	0	0	0	0	0	0
281:	0	0	0	0	0	0	0	0
289:	0	0	0	0	0	0	0	0
297:	0	0	0	0	0	0	0	0
305:	0	0	0	0	0	0	0	0
313:	0	0	0	0	0	0	0	0
321:	0	0	0	0	0	0	0	0
329:	0	0	0	0	1	0	0	0
337:	0	0	0	0	0	0	0	0
345:	0	0	0	0	0	0	0	0
353:	0	0	0	0	0	0	0	1
361:	0	1	0	0	0	0	0	0

369:	0	1	0	0	1	0	0	0

Sample Title: 10

Channel								
377:	0	0	1	0	0	0	0	0
385:	0	0	0	0	1	1	0	0
393:	2	1	0	0	0	1	2	0
401:	0	0	1	1	0	0	0	0
409:	0	0	0	0	0	0	0	0
417:	0	0	1	0	1	0	1	0
425:	1	1	0	0	0	0	0	1
433:	1	2	0	3	2	3	3	1
441:	4	3	1	2	3	1	2	4
449:	3	1	4	4	1	0	5	1
457:	3	1	1	2	1	3	2	2
465:	2	4	2	2	0	1	0	1
473:	2	2	3	0	3	1	2	0
481:	0	0	1	0	0	1	2	2
489:	1	1	0	2	0	0	2	1
497:	1	0	1	0	0	0	0	1
505:	1	0	0	0	0	0	0	1
513:	0	0	1	0	1	0	0	1
521:	0	1	0	2	0	0	0	0
529:	0	0	0	0	0	0	0	0
537:	0	0	0	0	0	0	0	0
545:	0	0	0	0	0	0	0	0
553:	0	0	0	0	0	0	0	0
561:	0	0	0	0	0	0	0	0
569:	0	0	0	0	0	0	0	0
577:	0	0	0	0	0	0	0	0
585:	0	0	0	0	0	0	0	0
593:	0	0	0	0	0	0	0	0
601:	0	0	0	0	0	0	0	0
609:	0	0	0	0	0	0	0	0
617:	0	0	0	1	0	0	0	0
625:	0	0	0	0	0	0	0	0
633:	0	0	0	0	0	0	0	0
641:	0	0	1	0	0	0	0	0
649:	0	0	0	0	0	0	0	0
657:	0	0	0	0	0	0	0	0
665:	0	0	0	0	0	0	0	0
673:	0	0	0	0	0	0	0	0
681:	0	0	0	0	0	0	0	0
689:	0	0	0	0	0	0	0	0
697:	0	0	0	0	0	0	0	0
705:	0	0	0	0	0	0	0	0
713:	0	0	0	0	0	0	0	0
721:	0	0	0	0	0	0	0	0
729:	0	0	0	0	0	0	0	0
737:	0	0	0	0	0	0	0	0
745:	0	0	0	0	0	0	0	0
753:	0	0	0	0	0	0	0	0
761:	0	0	0	0	0	0	0	0
769:	0	0	0	1	0	0	0	0
777:	0	0	0	0	0	0	0	0
785:	0	0	0	0	0	0	0	0
793:	0	0	0	0	0	0	1	0

801:	0	0	0	0	0	0	0	0

Sample Title: 10

Channel								
809:	0	0	0	0	0	0	0	0
817:	0	0	0	0	0	0	0	0
825:	0	0	0	0	0	0	0	0
833:	0	0	0	0	0	0	0	0
841:	0	0	0	0	0	0	0	0
849:	0	0	0	0	0	0	0	0
857:	0	0	0	0	0	0	0	0
865:	0	0	0	0	0	0	0	0
873:	0	0	0	0	0	0	0	0
881:	0	0	0	0	0	0	0	0
889:	0	0	0	0	0	0	0	0
897:	0	0	0	0	0	0	0	0
905:	0	0	0	0	0	0	0	0
913:	0	0	1	0	0	0	0	0
921:	0	0	0	0	0	1	0	0
929:	0	0	0	0	0	0	0	0
937:	1	0	0	0	0	0	0	0
945:	1	0	0	0	0	0	0	0
953:	0	0	0	0	0	0	0	0
961:	0	0	0	0	0	0	0	0
969:	0	0	0	0	0	0	0	0
977:	0	0	0	0	0	0	0	0
985:	0	0	0	0	0	0	0	0
993:	0	0	0	0	0	0	0	0
1001:	0	0	0	0	0	0	0	0
1009:	0	0	0	0	0	0	0	0
1017:	0	0	0	0	0	0	0	0

8/15/2013 5:50:56 AM

Apex-Alpha™

QA SUMMARY REPORT

Review Of QA Results - Pulser Check

Date : 8/15/2013
Time : 5:50:56 AM

CHAMBER	DEVICE	PARAMETER	FLAG	DATE
Alpha_001	21f	ALL	Not Done	
Alpha_002	21f	ALL	Not Done	
Alpha_003	21f	ALL	Passed	8/15/2013 5:25:08 AM
Alpha_004	21f	ALL	Passed	8/15/2013 5:25:09 AM
Alpha_005	21f	ALL	Not Done	
Alpha_006	21f	ALL	Not Done	
Alpha_007	21f	ALL	Not Done	
Alpha_008	21f	ALL	Not Done	
Alpha_009	21f	ALL	Not Done	
Alpha_010	21f	ALL	Passed	8/15/2013 5:25:10 AM
Alpha_011	21f	ALL	Passed	8/15/2013 5:25:11 AM
Alpha_012	21f	ALL	Passed	8/15/2013 5:25:12 AM
Alpha_013	21f	ALL	Passed	8/15/2013 5:25:12 AM
Alpha_014	21f	ALL	Passed	8/15/2013 5:25:13 AM
Alpha_015	21f	Peak Energy	Action	8/15/2013 5:25:14 AM
Alpha_016	21f	ALL	Not Done	
Alpha_017	AIM730	ALL	Not Done	
Alpha_018	AIM730	ALL	Passed	8/10/2013 11:23:01 AM
Alpha_019	AIM730	ALL	Passed	8/15/2013 5:25:15 AM
Alpha_020	AIM730	ALL	Not Done	
Alpha_021	AIM730	ALL	Not Done	
Alpha_022	AIM730	ALL	Passed	8/15/2013 5:25:16 AM
Alpha_023	AIM730	ALL	Passed	8/15/2013 5:25:16 AM
Alpha_024	AIM730	ALL	Passed	8/15/2013 5:25:17 AM
Alpha_025	AIM730	ALL	Passed	8/15/2013 5:25:18 AM
Alpha_026	AIM730	ALL	Not Done	
Alpha_027	AIM730	ALL	Passed	8/15/2013 5:25:19 AM
Alpha_028	AIM730	ALL	Not Done	
Alpha_029	AIM730	ALL	Passed	8/15/2013 5:25:20 AM
Alpha_030	AIM730	ALL	Not Done	
Alpha_031	AIM730	ALL	Passed	8/15/2013 5:25:20 AM
Alpha_032	AIM730	ALL	Not Done	
Alpha_033	Alpha Analyst100DC	ALL	Passed	8/15/2013 5:25:21 AM
Alpha_034	Alpha Analyst100DC	ALL	Passed	8/15/2013 5:25:23 AM
Alpha_035	Alpha Analyst100DC	ALL	Passed	8/15/2013 5:25:24 AM
Alpha_036	Alpha Analyst100DC	ALL	Passed	8/15/2013 5:25:26 AM
Alpha_037	Alpha Analyst100DC	ALL	Passed	8/15/2013 5:25:28 AM
Alpha_038	Alpha Analyst100DC	ALL	Passed	8/15/2013 5:25:30 AM
Alpha_039	Alpha Analyst100DC	ALL	Passed	8/15/2013 5:25:31 AM
Alpha_040	Alpha Analyst100DC	ALL	Passed	8/15/2013 5:25:33 AM
Alpha_041	Alpha Analyst100DC	ALL	Passed	8/15/2013 5:25:35 AM
Alpha_042	Alpha Analyst100DC	ALL	Passed	8/15/2013 5:25:37 AM

Review of QA Results - Pulser Check

8/15/2013 5:50:56 AM

CHAMBER	DEVICE	PARAMETER	FLAG	DATE
Alpha_043	Alpha Analyst100DC	ALL	Passed	8/15/2013 5:25:40 AM
Alpha_044	Alpha Analyst100DC	ALL	Passed	8/15/2013 5:25:42 AM
Alpha_045	Alpha Analyst100DC	ALL	Passed	8/15/2013 5:25:44 AM
Alpha_046	Alpha Analyst100DC	ALL	Passed	8/15/2013 5:25:47 AM
Alpha_047	Alpha Analyst100DC	ALL	Passed	8/15/2013 5:25:49 AM
Alpha_048	Alpha Analyst100DC	ALL	Passed	8/15/2013 5:25:52 AM

APPROVED BY: ✓

APPROVAL DATE: 8/15/13

****
***** L I B R A R Y L I S T I N G R E P O R T *****
****

Nuclide Library Title: Thorium

Nuclide Library Description: Th-227,-228,-229,-230,-232

Nuclide Name	Half-Life (Seconds)	Energy (keV)	Energy Uncert. (keV)	Yield (%)	Yield Uncert.(Abs.+-)
TH-227	6.873E+008	5850.000*	0.000	97.5000	0.0000
TH-228	6.034E+007	5400.000*	0.000	99.9400	0.0000
TH-229	2.487E+011	4872.000*	0.000	99.5200	0.0000
TH-230	2.379E+012	4672.000*	0.000	99.8200	0.0000
TH-232	4.434E+017	3997.000*	0.000	100.0000	0.0000

* = key line

TOTALS: 5 Nuclides 5 Energy Lines

SECTION X

ANALYTICAL DATA (RADIUM-226)

13-07170
Ra226
Run 1

Work Order	13-07170
Analysis Code	Ra226
Run	1
Date Received	7/29/2013
Lab Deadline	8/16/2013
Client	Engineering Management Support, Inc.
Project	West Lake OU-1
Report Level	4
Activity Units	pCi
Aliquot Units	l
Matrix	WA
Method	E903.0
Instrument Type	Alpha Spectroscopy
Radiometric Tracer	Ba-133
Radiometric Sol#	Ba-6a
Tracer Act (dpm/g)	990.043
Carrier	
Carrier Conc (mg/ml)	

Internal Fraction	Sample Desc	Client ID	Login CPM	Sample Date	Sample Aliquot
01	LCS	LCS		07/29/13 00:00	1.0000E+00
02	MBL	BLANK		07/29/13 00:00	1.0000E+00
03	DUP	PURGE TANK TOT	39	07/23/13 06:40	1.0000E+00
04	TRG	PZ-305-AI TOT	45	07/22/13 10:41	1.0000E+00
05	TRG	PZ-305-AI DIS	45	07/22/13 10:41	1.0000E+00
06	TRG	LR-104 TOT	43	07/22/13 11:45	1.0000E+00
07	TRG	LR-104 DIS	43	07/22/13 11:45	1.0000E+00
08	TRG	PZ-100-KS TOT	40	07/23/13 07:45	1.0000E+00
09	TRG	PZ-100-KS DIS	40	07/23/13 07:45	1.0000E+00
10	DO	PURGE TANK TOT	39	07/23/13 06:40	1.0000E+00

* SAF1 is used for Gross Alpha and all other radionuclides. SAF2 is used for Gross Beta only. ** Actual mass exceeded the calibration curve range. Results should be qualified as appropriate.

13-07170
Ra226
Run 1

Internal Fraction	Sample Desc	Tracer Aliquot (g)	Tracer Total ACT (dpm)	Radiometric Tracer (pCi)	Radiometric % Rec	Grav Carrier Added (ml)	Grav Filter Tare (g)	Grav Filter Final (g)	Grav Filter Net (g)	Grav % Rec	Mean % Rec	SAF 1*	SAF 2*
01	LCS	0.9197	910.5	386.5	94.23		0.0228	0.0294	0.0066		94.23	2.37	1.00
02	MBL	0.9123	903.2	357.0	87.75		0.0228	0.0293	0.0065		87.75	2.34	1.00
03	DUP	0.9050	896.0	322.0	79.78		0.0226	0.0292	0.0066		79.78	2.37	1.00
04	TRG	0.9043	895.3	356.5	88.40		0.0232	0.0336	0.0104		88.40	3.40	1.00
05	TRG	0.9055	896.5	359.5	89.02		0.0229	0.0301	0.0072		89.02	2.55	1.00
06	TRG	0.9057	896.7	378.8	93.78		0.0230	0.0301	0.0071		93.78	2.53	1.00
07	TRG	0.9013	892.3	429.1	106.75		0.0231	0.0304	0.0073		106.75	2.58	1.00
08	TRG	0.9072	898.2	389.5	96.27		0.0230	0.0298	0.0068		96.27	2.44	1.00
09	TRG	0.9093	900.2	365.9	90.23		0.0225	0.0290	0.0065		90.23	2.34	1.00
10	DO	0.9075	898.5	337.1	83.29		0.0225	0.0294	0.0069		83.29	2.47	1.00

* SAF1 is used for Gross Alpha and all other radionuclides. SAF2 is used for Gross Beta only. ** Actual mass exceeded the calibration curve range. Results should be qualified as appropriate.

13-07170
Ra226
Run 1

Internal Fraction	Sample Desc	Rough Prep Date	Rough Prep By	Prep Date	Prep By	Sep t0 Date/Time	Sep t0 By	Sep t1 Date/Time	Sep t1 By
01	LCS			08/08/13 11:21	JWOLFE	08/09/13 18:09	LWALKER		
02	MBL			08/08/13 11:21	JWOLFE	08/09/13 18:09	LWALKER		
03	DUP			08/08/13 11:21	JWOLFE	08/09/13 18:09	LWALKER		
04	TRG			08/08/13 11:21	JWOLFE	08/09/13 18:09	LWALKER		
05	TRG			08/08/13 11:21	JWOLFE	08/09/13 18:09	LWALKER		
06	TRG			08/08/13 11:21	JWOLFE	08/09/13 18:09	LWALKER		
07	TRG			08/08/13 11:21	JWOLFE	08/09/13 18:09	LWALKER		
08	TRG			08/08/13 11:21	JWOLFE	08/09/13 18:09	LWALKER		
09	TRG			08/08/13 11:21	JWOLFE	08/09/13 18:09	LWALKER		
10	DO			08/08/13 11:21	JWOLFE	08/09/13 18:09	LWALKER		

* SAF1 is used for Gross Alpha and all other radionuclides. SAF2 is used for Gross Beta only. ** Actual mass exceeded the calibration curve range. Results should be qualified as appropriate.

Preliminary Data Report & Analytical Calculations
Work Order: 13-07170-Ra226-1

Client: Engineering Management Support, Inc.
Eberline Services Work Order: 13-07170
Analysis Code: Ra226
Run: 1

Lab Fraction	Nuclide	Sample Desc	Client Identification	Activity Units	Results	Error Estimate	MDA	LCS Known	LCS %R	LCS Flag	RPD Flag	MDA Flag	Blank Flag
01	RA-226	LCS	LCS	pCi/l	1.04E+01	1.25E+00	2.16E-01	1.03E+01	100.80	OK		OK	
02	RA-226	MBL	BLANK	pCi/l	3.81E-02	1.06E-01	2.28E-01					OK	OK
03	RA-226	DUP	PURGE TANK TOT	pCi/l	6.68E-01	3.40E-01	2.26E-01				NA	OK	
04	RA-226	TRG	PZ-305-AI TOT	pCi/l	9.50E-01	4.59E-01	3.52E-01					OK	
05	RA-226	TRG	PZ-305-AI DIS	pCi/l	1.43E+00	4.90E-01	2.04E-01					OK	
06	RA-226	TRG	LR-104 TOT	pCi/l	6.16E-01	3.16E-01	1.73E-01					OK	
07	RA-226	TRG	LR-104 DIS	pCi/l	5.79E-01	2.92E-01	2.39E-01					OK	
08	RA-226	TRG	PZ-100-KS TOT	pCi/l	2.23E-01	1.85E-01	1.99E-01					OK	
09	RA-226	TRG	PZ-100-KS DIS	pCi/l	2.08E-01	2.03E-01	2.87E-01					OK	
10	RA-226	DO	PURGE TANK TOT	pCi/l	5.39E-01	3.02E-01	2.04E-01					OK	

Preliminary Data Report & Analytical Calculations

Work Order: 13-07170-Ra226-1

Run: 1
Analysis Code: Ra226
Eberline Services Work Order: 13-07170
Client: Engineering Management Support, Inc.

Lab Fraction	Nuclide	Sample Desc	Sample Date	Sample Aliquot	Radiometric % Rec	Grav % Rec	Mean % Rec	SAF	Sep t0 Date/Time	Sep t1 Date/Time
01	RA-226	LCS	07/29/13 00:00	1.00E+00	94.23	0.00	94.23		8/9/2013 18:09	
02	RA-226	MBL	07/29/13 00:00	1.00E+00	87.75	0.00	87.75		8/9/2013 18:09	
03	RA-226	DUP	07/23/13 06:40	1.00E+00	79.78	0.00	79.78		8/9/2013 18:09	
04	RA-226	TRG	07/22/13 10:41	1.00E+00	88.40	0.00	88.40		8/9/2013 18:09	
05	RA-226	TRG	07/22/13 10:41	1.00E+00	89.02	0.00	89.02		8/9/2013 18:09	
06	RA-226	TRG	07/22/13 11:45	1.00E+00	93.78	0.00	93.78		8/9/2013 18:09	
07	RA-226	TRG	07/22/13 11:45	1.00E+00	100.00	0.00	106.75		8/9/2013 18:09	
08	RA-226	TRG	07/23/13 07:45	1.00E+00	96.27	0.00	96.27		8/9/2013 18:09	
09	RA-226	TRG	07/23/13 07:45	1.00E+00	90.23	0.00	90.23		8/9/2013 18:09	
10	RA-226	DO	07/23/13 06:40	1.00E+00	83.29	0.00	83.29		8/9/2013 18:09	

Run	Analysis Code	Eberline Services Work Order	Client
1	Ra226	13-07170	Engineering Management Support, Inc.

Lab Fraction	Nuclide	Sample Desc	Counting Date/Time	Halflife (days)	Detect	Carrier	Count Time	Counts	Bkg CPM	Eff
01	RA-226	LCS	08/12/13 12:56		A_Spec	Alpha_033	170	2.88 E+02	0.00 E+00	18.5
02	RA-226	MBL	08/12/13 12:56		A_Spec	Alpha_034	170	1.00 E+00	0.00 E+00	18.6
03	RA-226	DUP	08/12/13 12:56		A_Spec	Alpha_035	170	1.55 E+01	3.00 E-03	18.3
04	RA-226	TRG	08/12/13 12:56		A_Spec	Alpha_036	170	1.78 E+01	7.00 E-03	19.1
05	RA-226	TRG	08/12/13 12:56		A_Spec	Alpha_037	170	3.37 E+01	2.00 E-03	17.8
06	RA-226	TRG	08/12/13 12:56		A_Spec	Alpha_038	170	1.48 E+01	1.00 E-03	17.2
07	RA-226	TRG	08/12/13 12:56		A_Spec	Alpha_039	170	1.66 E+01	8.00 E-03	19.7
08	RA-226	TRG	08/12/13 12:56		A_Spec	Alpha_040	170	6.32 E+00	4.00 E-03	19
09	RA-226	TRG	08/12/13 12:56		A_Spec	Alpha_041	170	5.79 E+00	1.30 E-02	19.2
10	RA-226	DO	08/12/13 12:56		A_Spec	Alpha_042	170	1.27 E+01	2.00 E-03	18.5

Count Room Report
Client: Engineering Management Su

13-07170-Ra226-1 (pCi/l) in WA
Tracer ID: Ba-6a

Printed: 8/12/2013 10:19 AM
Page 1 of 1

Internal Fraction	Sample Desc	Client ID	Sample Date	Sample Aliquot	Tracer Aliquot (g)	Tracer ACT (dpm)	Radiometric Tracer (pCi)	Radiometric % Rec	SAF 1*	SAF 2*
01	LCS	LCS	07/29/13 00:00	1.0000	0.9197	910.5425	386.5000	94.23	2.37	1.00
02	MBL	BLANK	07/29/13 00:00	1.0000	0.9123	903.2162	357.0000	87.75	2.34	1.00
03	DUP	PURGE TANK TOT	07/23/13 06:40	1.0000	0.9050	895.9889	322.0000	79.78	2.37	1.00
04	TRG	PZ-305-AI TOT	07/22/13 10:41	1.0000	0.9043	895.2959	356.5000	88.40	3.40	1.00
05	TRG	PZ-305-AI DIS	07/22/13 10:41	1.0000	0.9055	896.4839	359.5000	89.02	2.55	1.00
06	TRG	LR-104 TOT	07/22/13 11:45	1.0000	0.9057	896.6819	378.8000	93.78	2.53	1.00
07	TRG	LR-104 DIS	07/22/13 11:45	1.0000	0.9013	892.3258	429.1000	106.75	2.58	1.00
08	TRG	PZ-100-KS TOT	07/23/13 07:45	1.0000	0.9072	898.1670	389.5000	96.27	2.44	1.00
09	TRG	PZ-100-KS DIS	07/23/13 07:45	1.0000	0.9093	900.2461	365.9000	90.23	2.34	1.00
10	DO	PURGE TANK TOT	07/23/13 06:40	1.0000	0.9075	898.4640	337.1000	83.29	2.47	1.00

8228

Spike and Tracer Worksheet

Internal Work Order	Run	Analysis Code	Date	Technician	Technician Initials	Witness Initials
13-07170	1	Ra226	8/8/2013 11:19	JWOLFE		

LCS & Matrix Spikes					LCS	MS	LCSD	MSD	LCS		MS		LCSD		MSD	
Isotope	*Sol #*	*Activity dpm/g*	*Solution Date*	*Approx Addition*	*Volume Used (g)*	*Volume Used (g)*	*Volume Used (g)*	*Volume Used (g)*	*Known pCi*	*Error Estimate*	*Added pCi*	*Error Estimate*	*Known pCi*	*Error Estimate*	*Added pCi*	*Error Estimate*
Ra-226	Ra-5b	44.066	8/8/2013	**0.500**	**0.5190**				10.30	0.474	0.00	0.000	0.00	0.000	0.00	0.000

Tracers

fraction	*Isotope*	*Sol #*	*Activity dpm/g*	*Solution Date*	*Volume Used (g)*	*Approx Addition*
01	**Ba-133**	Ba-6a	990.043	8/8/2013	**0.9197**	**1.0200**
02	**Ba-133**	Ba-6a	990.043	8/8/2013	**0.9123**	**1.0200**
03	**Ba-133**	Ba-6a	990.043	8/8/2013	**0.9050**	**1.0200**
04	**Ba-133**	Ba-6a	990.043	8/8/2013	**0.9043**	**1.0200**
05	**Ba-133**	Ba-6a	990.043	8/8/2013	**0.9055**	**1.0200**
06	**Ba-133**	Ba-6a	990.043	8/8/2013	**0.9057**	**1.0200**
07	**Ba-133**	Ba-6a	990.043	8/8/2013	**0.9013**	**1.0200**
08	**Ba-133**	Ba-6a	990.043	8/8/2013	**0.9072**	**1.0200**
09	**Ba-133**	Ba-6a	990.043	8/8/2013	**0.9093**	**1.0200**
10	**Ba-133**	Ba-6a	990.043	8/8/2013	**0.9075**	**1.0200**

Balance Printer Tapes

Tracer

LCS

Matrix Spike

Eberline Services - Oak Ridge
Version 1.0 9/1999

Gravimetric Worksheet

Printed: 8/9/2013 7:27 PM

Work Order	Run	Analysis Code	Gravimetric Carrier	Carrier Conc (mg/ml)	Technician
13-07170	1	Ra226			LWALKER

TRetec	Engineering Management Support, Inc.	Sample	Carrier Data	Filter Data			Gravimetric
Fraction	Client ID	Type	Carrier Added (ml)	Filter Tare (g)	Filter Final (g)	Filter Net (g)	% Recovery
01	LCS	LCS		0.0228	0.0294	0.0066	
02	BLANK	MBL		0.0228	0.0293	0.0065	
03	DUP	DUP		0.0226	0.0292	0.0066	
04	PZ-305-AI TOT	TRG		0.0232	0.0336	0.0104	
05	PZ-305-AI DIS	TRG		0.0229	0.0301	0.0072	
06	LR-104 TOT	TRG		0.0230	0.0301	0.0071	
07	LR-104 DIS	TRG		0.0231	0.0304	0.0073	
08	PZ-100-KS TOT	TRG		0.0230	0.0298	0.0068	
09	PZ-100-KS DIS	TRG		0.0225	0.0290	0.0065	
10	PURGE TANK TOT	DO		0.0225	0.0294	0.0069	

Technician: L Walker Date: 8/9/13

Eberline Analytical
Oak Ridge Laboratory

Aliquot Worksheet

Printed: 8/8/2013 11:23 AM

Work Order	Run	Analysis Code	Rpt Units	Lab Deadline	Technician
13-07170	1	Ra226	liters	8/16/2013	JWOLFE

Lab Fraction	Engineering Management Support, Inc. Client ID	Sample Type	Muffle Data	Dilution Data			Aliquot Data		MS Aliquot Data		H-3 Solids Only	
			Ratio Post/Pre	No of Dils	Dil Factor	Ratio	Aliquot	Net Equiv	Aliquot	Net Equiv	Water Added (ml)	H3 Dist Aliq
01	LCS	LCS					1.0000E+00	1.0000E+00				
02	BLANK	MBL					1.0000E+00	1.0000E+00				
03	PURGE TANK TOT	DUP					1.0000E+00	1.0000E+00				
04	PZ-305-AI TOT	TRG					1.0000E+00	1.0000E+00				
05	PZ-305-AI DIS	TRG					1.0000E+00	1.0000E+00				
06	LR-104 TOT	TRG					1.0000E+00	1.0000E+00				
07	LR-104 DIS	TRG					1.0000E+00	1.0000E+00				
08	PZ-100-KS TOT	TRG					1.0000E+00	1.0000E+00				
09	PZ-100-KS DIS	TRG					1.0000E+00	1.0000E+00				
10	PURGE TANK TOT	DO					1.0000E+00	1.0000E+00				

Comments	

Technician: _____ Date: ____/____/____

KB 8/12/13

Apex-Alpha™

Sample Description: SPIKE
Spectrum File: \\OR-ALPHA1\Canberra\ApexAlpha\Root\Data\00000659
Batch Identification: 1307170A-RA
Sample Identification: 01
Sample Geometry: Shelf 2
Procedure Description: Ra

Detector Name: Alpha_033
Chamber Serial Number: 04026479A
Detector Serial Number: 91132
Env. Background: System Bkgd 64781
Reagent Blank: <not performed>

Sample Size: 1.000E+000 +/- 0.000E+000 liter
Generic Mult. Factor: 2.370E+000 Generic Div. Factor: 1.000E+000
Sample Date/Time: 8/12/2013 10:22:45 AM
Acquisition Date/Time: 8/12/2013 12:56:00 PM
Acquisition Live Time: 170.0 minutes
Acquisition Real Time: 170.0 minutes

Chem. Recovery Factor: 0.9423 +/- 0.0000
Counting Efficiency: 0.1848 +/- 0.0032 on 7/20/2013 2:31:30 PM
Effective Efficiency: 0.1742 +/- 0.0031

Control Certificate Name: Ra226_Ra-5b
Chem. Recov. of Control: RA-226 0.425314 +/- 0.029133
Peak Match Tolerance: 0.350 MeV

PEAK AREA REPORT

Nuclide	Energy (MeV)	Net Pk Area	Pk Area Error %	Ambient Backgnd	Reagent Backgnd	FWHM (keV)
RA-224	5.530	530.15	8.52	0.85	0.00E+000	9.9
RA-226	4.566	288.00	11.57	0.00	0.00E+000	3.6

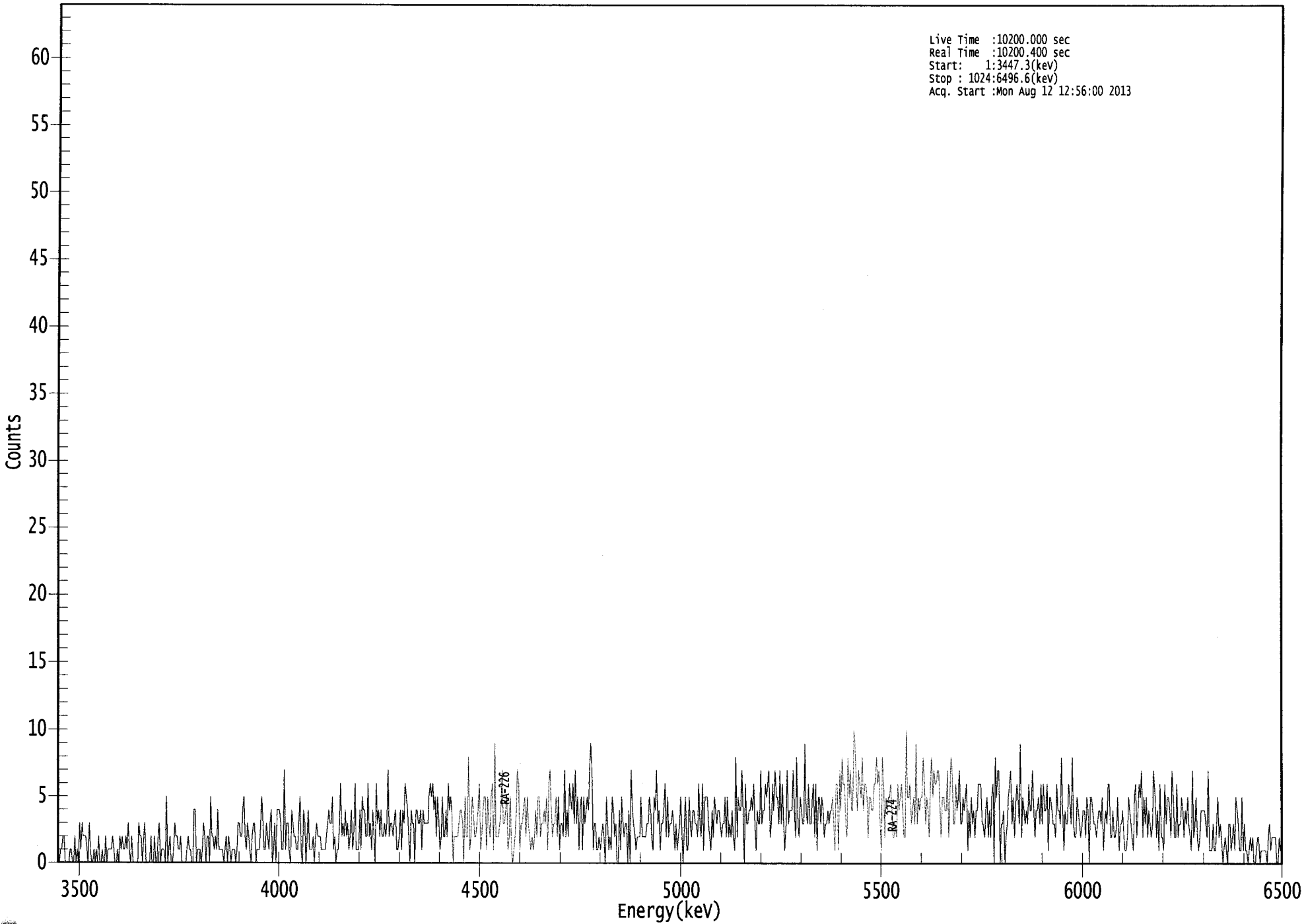
NUCLIDE ANALYSIS RESULTS

Nuclide	Id Conf.	Energy (keV)	Activity (pCi/liter)	MDA (pCi/liter)
RA-224	0.969	5685.50*	2.01E+001 +/- 1.85E+000	2.27E-001 +/- 7.80E-003
RA-226	0.939	4785.00*	1.04E+001 +/- 1.25E+000	2.16E-001 +/- 7.43E-003

AG 8/13/13

US EPA ARCHIVE DOCUMENT

0000065956.CNF



****
***** S P E C T R A L D A T A R E P O R T *****
****

Sample Title: 01

Elapsed Live time: 10200
Elapsed Real Time: 10200

Channel								
1:	1	0	1	1	2	2	0	0
9:	0	0	1	1	0	0	2	0
17:	1	0	3	1	3	2	2	2
25:	1	0	3	1	0	0	1	0
33:	1	0	2	0	0	1	0	0
41:	2	0	1	1	1	1	2	1
49:	0	0	1	0	2	1	2	1
57:	1	2	1	3	1	0	2	0
65:	0	0	0	0	3	2	2	0
73:	2	3	0	0	0	0	2	0
81:	0	2	0	0	2	3	0	1
89:	1	1	0	5	0	1	2	0
97:	0	1	3	2	2	1	1	2
105:	0	0	0	0	1	2	1	1
113:	0	0	4	4	0	1	1	1
121:	0	1	3	2	0	2	2	0
129:	5	2	2	1	2	1	4	1
137:	1	1	1	0	1	2	0	2
145:	1	0	1	1	1	0	1	3
153:	3	2	2	4	5	2	1	3
161:	2	1	0	2	3	3	0	1
169:	1	1	3	5	3	1	1	3
177:	2	1	3	4	0	1	3	0
185:	4	4	4	3	1	1	7	1
193:	3	3	1	0	4	3	2	2
201:	1	1	3	5	1	0	4	3
209:	0	2	4	1	1	1	2	0
217:	2	3	2	2	2	1	1	1
225:	1	2	3	4	3	3	5	1
233:	2	0	1	1	3	6	2	3
241:	2	4	2	3	1	2	4	1
249:	2	6	1	1	1	4	1	5
257:	4	4	2	2	6	2	3	1
265:	4	2	0	6	3	4	2	4
273:	2	2	3	2	3	7	2	3
281:	3	2	3	4	1	1	2	4
289:	1	4	3	6	5	4	2	0
297:	4	3	3	0	4	4	3	3
305:	4	1	4	3	3	3	3	5
313:	6	5	6	4	5	2	5	3
321:	1	2	5	2	2	4	2	6
329:	4	5	4	0	2	2	2	2
337:	3	4	4	3	0	5	2	2
345:	8	1	2	5	4	2	2	3
353:	4	6	1	2	4	5	5	1
361:	5	3	2	5	6	1	9	2

369:	2	2	3	4	7	3	3	4

Sample Title: 01

Channel								
377:	5	1	2	5	1	0	1	2
385:	4	7	6	1	3	3	4	5
393:	2	5	3	2	1	2	1	2
401:	4	2	5	5	2	3	3	4
409:	3	5	1	6	7	4	2	3
417:	3	5	2	5	1	3	3	2
425:	7	2	4	2	6	5	4	6
433:	3	7	3	5	1	4	5	1
441:	5	3	4	5	4	7	9	7
449:	1	3	3	1	1	2	1	2
457:	3	2	0	5	3	1	2	1
465:	5	4	2	3	0	0	4	1
473:	5	3	2	3	3	0	4	0
481:	7	4	3	2	1	2	2	2
489:	5	2	2	2	2	3	3	5
497:	4	2	1	5	4	7	3	4
505:	1	3	3	4	6	2	5	2
513:	3	3	4	3	1	3	1	2
521:	3	5	2	0	3	5	1	1
529:	5	3	2	4	4	3	3	2
537:	6	3	2	6	1	5	5	5
545:	3	2	1	4	2	5	4	3
553:	4	4	3	2	3	3	5	2
561:	5	2	3	2	4	2	1	8
569:	2	5	4	4	7	4	0	6
577:	3	3	4	4	5	4	6	3
585:	1	4	3	3	7	3	4	4
593:	6	5	6	7	2	3	6	4
601:	7	5	5	3	7	3	6	3
609:	1	3	7	3	4	4	4	7
617:	4	2	8	3	2	5	4	3
625:	3	9	4	3	6	3	3	5
633:	6	2	6	1	5	5	3	5
641:	4	2	3	3	4	3	4	4
649:	5	3	1	6	6	1	7	4
657:	8	6	6	3	2	8	5	7
665:	4	4	10	9	6	4	7	6
673:	5	8	4	6	6	5	2	5
681:	5	4	4	6	6	8	6	7
689:	3	1	8	6	2	5	4	5
697:	5	6	4	2	2	3	2	6
705:	4	5	6	4	2	2	10	5
713:	5	6	3	4	5	3	9	3
721:	5	4	5	5	8	6	3	5
729:	4	2	6	8	5	7	6	6
737:	7	7	4	2	5	5	4	4
745:	7	2	5	8	7	3	3	6
753:	4	5	7	3	3	5	4	5
761:	6	1	4	2	5	3	4	2
769:	4	4	6	6	6	3	3	2
777:	4	5	2	4	2	5	6	0
785:	8	5	7	7	0	3	3	4
793:	0	2	3	5	6	7	3	5

801:	2	4	6	5	3	9	2	5

Sample Title: 01

Channel								
809:	4	3	4	3	6	4	4	7
817:	4	2	4	4	5	3	6	3
825:	6	4	4	6	1	5	5	4
833:	3	3	2	6	4	4	3	8
841:	4	1	4	3	3	6	5	3
849:	8	3	2	2	5	4	3	2
857:	3	4	4	2	5	4	0	5
865:	5	4	3	3	2	3	4	4
873:	3	5	1	3	4	3	6	6
881:	2	2	4	2	2	3	5	1
889:	3	3	4	2	1	1	2	5
897:	4	3	2	1	5	6	2	4
905:	6	5	7	2	5	3	5	2
913:	4	3	2	3	7	5	2	4
921:	1	6	2	2	1	6	3	5
929:	5	4	2	7	5	2	2	6
937:	2	3	3	5	4	2	4	3
945:	5	3	2	1	7	2	3	5
953:	2	1	2	4	4	4	4	3
961:	2	7	1	1	1	3	1	1
969:	3	5	2	3	2	0	1	2
977:	1	0	3	3	1	2	3	1
985:	5	4	3	1	1	5	1	3
993:	1	1	0	1	2	1	2	0
1001:	0	1	2	2	0	1	1	1
1009:	1	1	0	2	3	1	2	2
1017:	2	2	0	0	2	1	2	2

IAB 8/12/13

Apex-Alpha™

Sample Description: BLANK
Spectrum File: \\OR-ALPHA1\Canberra\ApexAlpha\Root\Data\00000659
Batch Identification: 1307170A-RA
Sample Identification: 02
Sample Geometry: Shelf 2
Procedure Description: Ra

Detector Name: Alpha_034
Chamber Serial Number: 04026479B
Detector Serial Number: 91136
Env. Background: System Bkgd 64782
Reagent Blank: <not performed>

Sample Size: 1.000E+000 +/- 0.000E+000 liter
Generic Mult. Factor: 2.340E+000 Generic Div. Factor: 1.000E+000
Sample Date/Time: 8/12/2013 10:22:45 AM
Acquisition Date/Time: 8/12/2013 12:56:02 PM
Acquisition Live Time: 170.0 minutes
Acquisition Real Time: 170.0 minutes

Chem. Recovery Factor: 0.8775 +/- 0.0000
Counting Efficiency: 0.1856 +/- 0.0032 on 12/16/2012 5:49:43 PM
Effective Efficiency: 0.1628 +/- 0.0028

Peak Match Tolerance: 0.350 MeV

PEAK AREA REPORT

Nuclide	Energy (MeV)	Net Pk Area	Pk Area Error %	Ambient Backgnd	Reagent Backgnd	FWHM (keV)
RA-224	5.529	-0.34	592.90	0.34	0.00E+000	0.0
RA-226	4.682	1.00	277.19	0.00	0.00E+000	3.0

NUCLIDE ANALYSIS RESULTS

Nuclide	Id Conf.	Energy (keV)	Activity (pCi/liter)	MDA (pCi/liter)
RA-224	0.968	5685.50*	-1.36E-002 +/- 8.07E-002	1.91E-001 +/- 6.53E-003
RA-226	0.986	4785.00*	3.81E-002 +/- 1.06E-001	2.28E-001 +/- 7.79E-003

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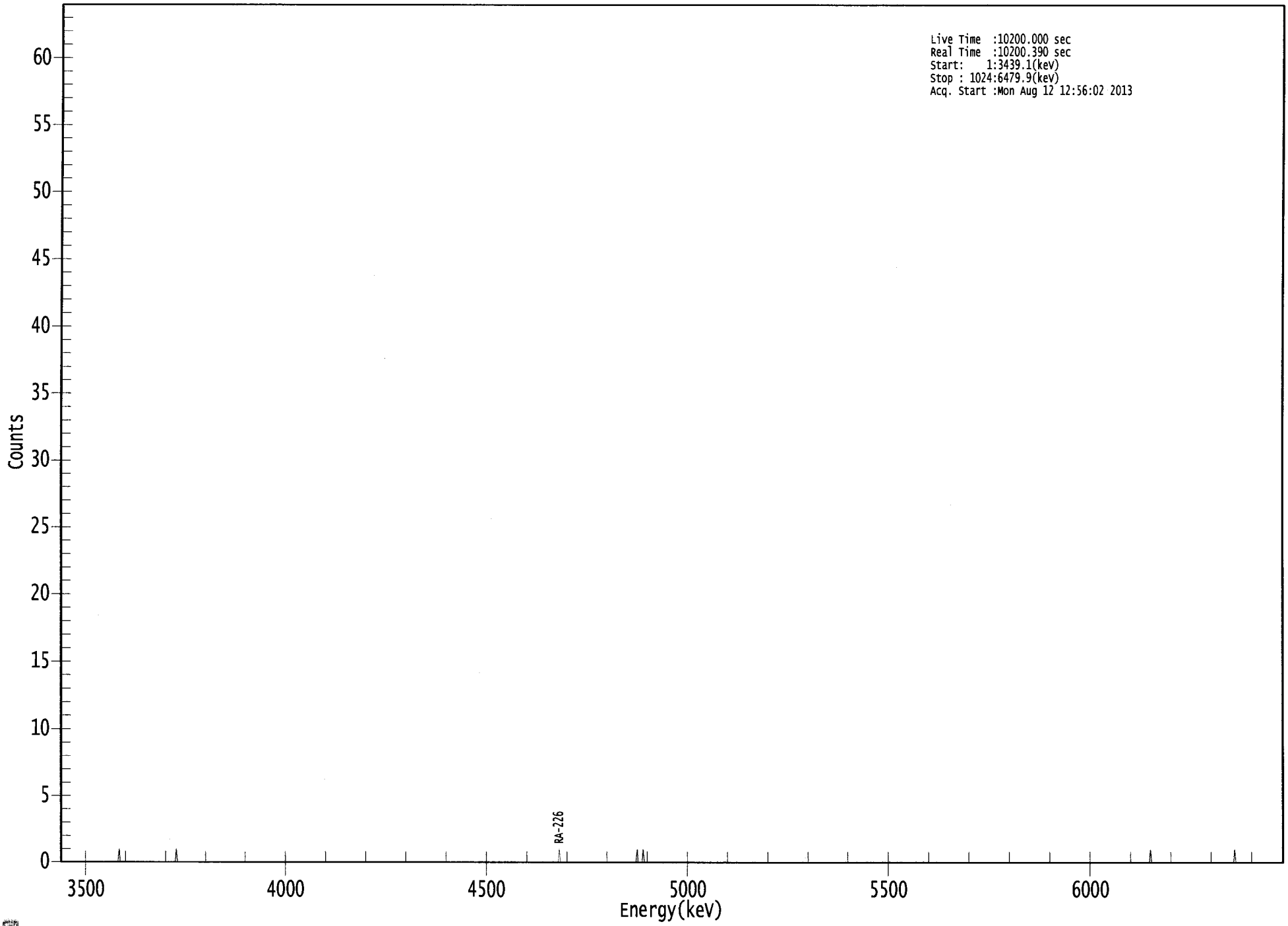
8/13/13

0000065937.CNF



0238

****
***** S P E C T R A L D A T A R E P O R T *****
****

Sample Title: 02

Elapsed Live time: 10200
Elapsed Real Time: 10200

Channel								
1:	0	0	0	0	0	0	0	0
9:	0	0	0	0	0	0	0	0
17:	0	0	0	0	0	0	0	0
25:	0	0	0	0	0	0	0	0
33:	0	0	0	0	0	0	0	0
41:	0	0	0	0	0	0	0	0
49:	0	1	0	0	0	0	0	0
57:	0	0	0	0	0	0	0	0
65:	0	0	0	0	0	0	0	0
73:	0	0	0	0	0	0	0	0
81:	0	0	0	0	0	0	0	0
89:	0	0	0	0	0	0	0	0
97:	0	1	0	0	0	0	0	0
105:	0	0	0	0	0	0	0	0
113:	0	0	0	0	0	0	0	0
121:	0	0	0	0	0	0	0	0
129:	0	0	0	0	0	0	0	0
137:	0	0	0	0	0	0	0	0
145:	0	0	0	0	0	0	0	0
153:	0	0	0	0	0	0	0	0
161:	0	0	0	0	0	0	0	0
169:	0	0	0	0	0	0	0	0
177:	0	0	0	0	0	0	0	0
185:	0	0	0	0	0	0	0	0
193:	0	0	0	0	0	0	0	0
201:	0	0	0	0	0	0	0	0
209:	0	0	0	0	0	0	0	0
217:	0	0	0	0	0	0	0	0
225:	0	0	0	0	0	0	0	0
233:	0	0	0	0	0	0	0	0
241:	0	0	0	0	0	0	0	0
249:	0	0	0	0	0	0	0	0
257:	0	0	0	0	0	0	0	0
265:	0	0	0	0	0	0	0	0
273:	0	0	0	0	0	0	0	0
281:	0	0	0	0	0	0	0	0
289:	0	0	0	0	0	0	0	0
297:	0	0	0	0	0	0	0	0
305:	0	0	0	0	0	0	0	0
313:	0	0	0	0	0	0	0	0
321:	0	0	0	0	0	0	0	0
329:	0	0	0	0	0	0	0	0
337:	0	0	0	0	0	0	0	0
345:	0	0	0	0	0	0	0	0
353:	0	0	0	0	0	0	0	0
361:	0	0	0	0	0	0	0	0

369:	0	0	0	0	0	0	0	0

Sample Title: 02

Channel								
377:	0	0	0	0	0	0	0	0
385:	0	0	0	0	0	0	0	0
393:	0	0	0	0	0	0	0	0
401:	0	0	0	0	0	0	0	0
409:	0	0	0	0	0	0	0	0
417:	0	0	1	0	0	0	0	0
425:	0	0	0	0	0	0	0	0
433:	0	0	0	0	0	0	0	0
441:	0	0	0	0	0	0	0	0
449:	0	0	0	0	0	0	0	0
457:	0	0	0	0	0	0	0	0
465:	0	0	0	0	0	0	0	0
473:	0	0	0	0	0	0	0	0
481:	0	0	0	1	0	0	0	0
489:	1	0	0	0	0	0	0	0
497:	0	0	0	0	0	0	0	0
505:	0	0	0	0	0	0	0	0
513:	0	0	0	0	0	0	0	0
521:	0	0	0	0	0	0	0	0
529:	0	0	0	0	0	0	0	0
537:	0	0	0	0	0	0	0	0
545:	0	0	0	0	0	0	0	0
553:	0	0	0	0	0	0	0	0
561:	0	0	0	0	0	0	0	0
569:	0	0	0	0	0	0	0	0
577:	0	0	0	0	0	0	0	0
585:	0	0	0	0	0	0	0	0
593:	0	0	0	0	0	0	0	0
601:	0	0	0	0	0	0	0	0
609:	0	0	0	0	0	0	0	0
617:	0	0	0	0	0	0	0	0
625:	0	0	0	0	0	0	0	0
633:	0	0	0	0	0	0	0	0
641:	0	0	0	0	0	0	0	0
649:	0	0	0	0	0	0	0	0
657:	0	0	0	0	0	0	0	0
665:	0	0	0	0	0	0	0	0
673:	0	0	0	0	0	0	0	0
681:	0	0	0	0	0	0	0	0
689:	0	0	0	0	0	0	0	0
697:	0	0	0	0	0	0	0	0
705:	0	0	0	0	0	0	0	0
713:	0	0	0	0	0	0	0	0
721:	0	0	0	0	0	0	0	0
729:	0	0	0	0	0	0	0	0
737:	0	0	0	0	0	0	0	0
745:	0	0	0	0	0	0	0	0
753:	0	0	0	0	0	0	0	0
761:	0	0	0	0	0	0	0	0
769:	0	0	0	0	0	0	0	0
777:	0	0	0	0	0	0	0	0
785:	0	0	0	0	0	0	0	0
793:	0	0	0	0	0	0	0	0

801:	0	0	0	0	0	0	0	0

Sample Title: 02

Channel								
809:	0	0	0	0	0	0	0	0
817:	0	0	0	0	0	0	0	0
825:	0	0	0	0	0	0	0	0
833:	0	0	0	0	0	0	0	0
841:	0	0	0	0	0	0	0	0
849:	0	0	0	0	0	0	0	0
857:	0	0	0	0	0	0	0	0
865:	0	0	0	0	0	0	0	0
873:	0	0	0	0	0	0	0	0
881:	0	0	0	0	0	0	0	0
889:	0	0	0	0	0	0	0	0
897:	0	0	0	0	0	0	0	0
905:	0	0	0	0	0	0	0	0
913:	1	0	0	0	0	0	0	0
921:	0	0	0	0	0	0	0	0
929:	0	0	0	0	0	0	0	0
937:	0	0	0	0	0	0	0	0
945:	0	0	0	0	0	0	0	0
953:	0	0	0	0	0	0	0	0
961:	0	0	0	0	0	0	0	0
969:	0	0	0	0	0	0	0	0
977:	0	0	0	0	0	0	1	0
985:	0	0	0	0	0	0	0	0
993:	0	0	0	0	0	0	0	0
1001:	0	0	0	0	0	0	0	0
1009:	0	0	0	0	0	0	0	0
1017:	0	0	0	0	0	0	0	0

KB 8/12/13

Apex-Alpha™

Sample Description: PURGE TANK TOT-DUP
Spectrum File: \\OR-ALPHA1\Canberra\ApexAlpha\Root\Data\00000659
Batch Identification: 1307170A-RA
Sample Identification: 03
Sample Geometry: Shelf 2
Procedure Description: Ra

Detector Name: Alpha_035
Chamber Serial Number: 04026477A
Detector Serial Number: 58771
Env. Background: System Bkgd 64783
Reagent Blank: <not performed>

Sample Size: 1.000E+000 +/- 0.000E+000 liter
Generic Mult. Factor: 2.370E+000 Generic Div. Factor: 1.000E+000
Sample Date/Time: 7/23/2013 10:22:45 AM
Acquisition Date/Time: 8/12/2013 12:56:03 PM
Acquisition Live Time: 170.0 minutes
Acquisition Real Time: 170.0 minutes

Chem. Recovery Factor: 0.7978 +/- 0.0000
Counting Efficiency: 0.1826 +/- 0.0032 on 12/16/2012 5:49:42 PM
Effective Efficiency: 0.1457 +/- 0.0025

Peak Match Tolerance: 0.350 MeV

PEAK AREA REPORT

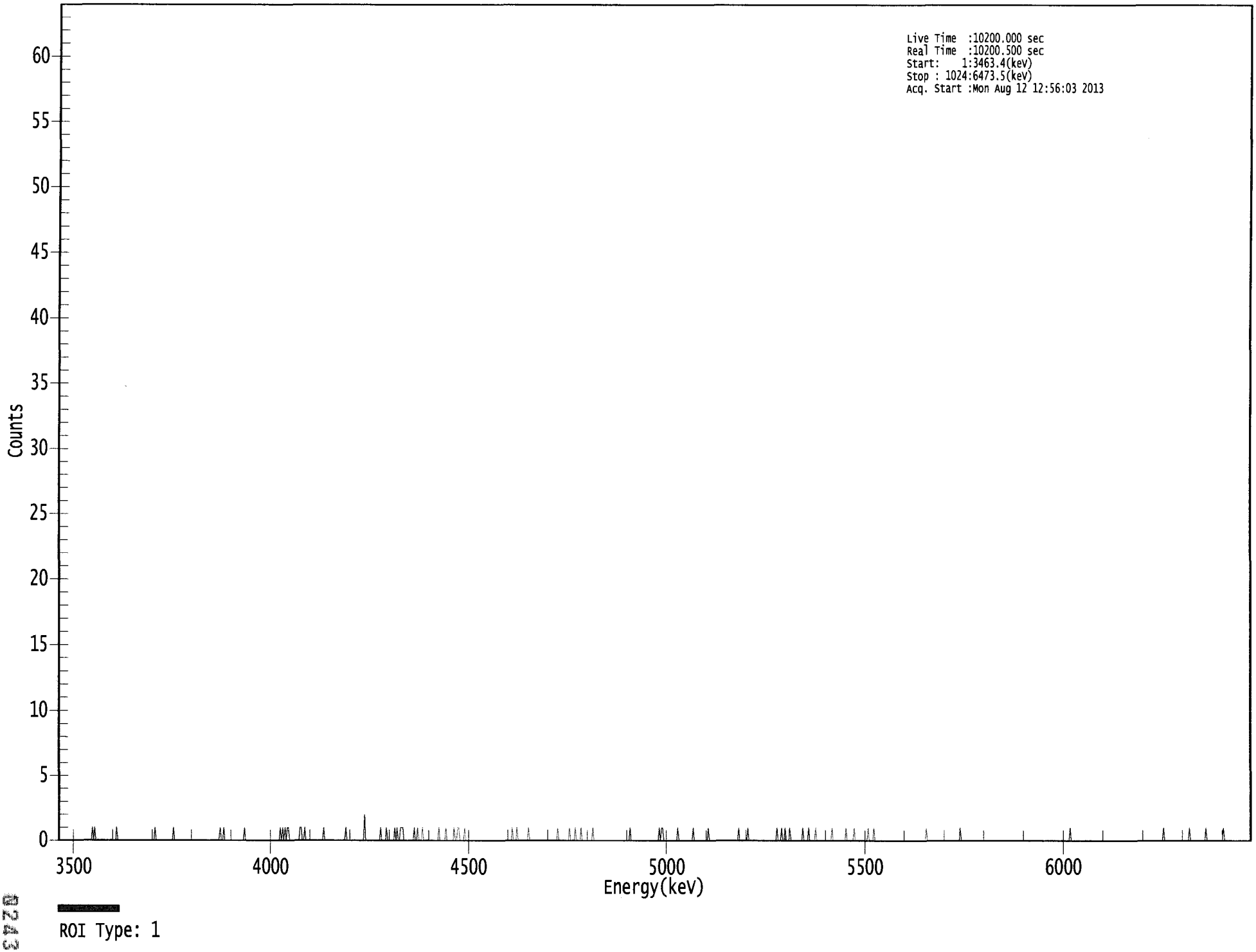
Nuclide	Energy (MeV)	Net Pk Area	Pk Area Error %	Ambient Backgnd	Reagent Backgnd	FWHM (keV)
RA-224	5.487	6.15	85.19	0.85	0.00E+000	2.9
RA-226	4.579	15.49	50.75	0.51	0.00E+000	2.9

NUCLIDE ANALYSIS RESULTS

Nuclide	Id Conf.	Energy (keV)	Activity (pCi/liter)	MDA (pCi/liter)
RA-224	0.950	5685.50*	2.81E-001 +/- 2.39E-001	2.73E-001 +/- 9.38E-003
RA-226	0.946	4785.00*	6.68E-001 +/- 3.40E-001	2.26E-001 +/- 7.75E-003

AG 8/13/13

0000065935.CNF



****
***** S P E C T R A L D A T A R E P O R T *****
****

Sample Title: 03

Elapsed Live time: 10200
Elapsed Real Time: 10201

Channel								
1:	0	0	0	0	0	0	0	0
9:	0	0	0	0	0	0	0	0
17:	0	0	0	0	0	0	0	0
25:	0	0	0	0	0	1	0	1
33:	0	0	0	0	0	0	0	0
41:	0	0	0	0	0	0	0	0
49:	0	0	1	0	0	0	0	0
57:	0	0	0	0	0	0	0	0
65:	0	0	0	0	0	0	0	0
73:	0	0	0	0	0	0	0	0
81:	0	0	0	1	0	0	0	0
89:	0	0	0	0	0	0	0	0
97:	0	0	0	1	0	0	0	0
105:	0	0	0	0	0	0	0	0
113:	0	0	0	0	0	0	0	0
121:	0	0	0	0	0	0	0	0
129:	0	0	0	0	0	0	0	0
137:	0	0	0	1	0	0	1	0
145:	0	0	0	0	0	0	0	0
153:	0	0	0	0	0	0	0	0
161:	1	0	0	0	0	0	0	0
169:	0	0	0	0	0	0	0	0
177:	0	0	0	0	0	0	0	0
185:	0	0	0	0	0	0	0	1
193:	0	1	0	1	0	1	1	0
201:	0	0	0	0	0	0	0	0
209:	1	1	0	0	1	0	0	0
217:	0	0	0	0	0	0	0	0
225:	0	0	0	0	1	0	0	0
233:	0	0	0	0	0	0	0	0
241:	0	0	0	0	0	0	0	1
249:	0	0	0	0	0	0	0	0
257:	0	0	0	0	0	0	0	2
265:	0	0	0	0	0	0	0	0
273:	0	0	0	0	0	1	0	0
281:	0	0	1	0	0	0	0	0
289:	0	1	0	1	0	0	1	1
297:	1	0	0	0	0	0	0	0
305:	0	0	1	0	0	1	0	0
313:	0	1	0	0	0	0	0	0
321:	0	0	0	0	0	0	0	1
329:	0	0	0	0	0	1	0	0
337:	0	0	0	0	1	0	0	1
345:	1	0	0	0	0	1	0	0
353:	0	0	0	0	0	0	0	0
361:	0	0	0	0	0	0	0	0

369:	0	0	0	0	0	0	0	0

Sample Title: 03

Channel								
377:	0	0	0	0	0	0	0	0
385:	0	0	0	0	0	0	1	0
393:	0	0	1	0	0	0	0	0
401:	0	0	0	0	1	0	0	0
409:	0	0	0	0	0	0	0	0
417:	0	0	0	0	0	0	0	0
425:	0	0	0	0	0	1	0	0
433:	0	0	0	0	0	0	0	1
441:	0	0	0	0	1	0	0	0
449:	0	1	0	0	0	0	0	0
457:	0	0	0	1	0	0	0	0
465:	0	0	0	0	0	0	0	0
473:	0	0	0	0	0	0	0	0
481:	0	0	0	0	0	0	0	0
489:	0	0	0	1	0	0	0	0
497:	0	0	0	0	0	0	0	0
505:	0	0	0	0	0	0	0	0
513:	0	0	0	0	1	0	1	1
521:	0	0	0	0	0	0	0	0
529:	0	0	0	0	1	0	0	0
537:	0	0	0	0	0	0	0	0
545:	0	1	0	0	0	0	0	0
553:	0	0	0	0	0	0	1	0
561:	0	0	0	0	0	0	0	0
569:	0	0	0	0	0	0	0	0
577:	0	0	0	0	0	0	0	0
585:	1	0	0	0	0	0	0	0
593:	1	0	0	0	0	0	0	0
601:	0	0	0	0	0	0	0	0
609:	0	0	0	0	0	0	0	0
617:	0	1	0	0	0	1	0	0
625:	1	0	0	0	1	0	0	0
633:	0	0	0	0	0	0	0	1
641:	0	0	0	0	1	0	0	0
649:	0	0	1	0	0	0	0	0
657:	0	0	0	0	0	0	0	0
665:	1	0	0	0	0	0	0	0
673:	0	0	0	0	1	0	0	0
681:	0	0	0	1	0	0	0	0
689:	0	0	0	0	0	0	0	1
697:	0	0	0	0	1	0	0	0
705:	0	0	0	0	0	0	0	0
713:	0	0	0	0	0	0	0	0
721:	0	0	0	0	0	0	0	0
729:	0	0	0	0	0	0	0	0
737:	0	0	0	0	0	0	0	0
745:	0	1	0	0	0	0	0	0
753:	0	0	0	0	0	0	0	0
761:	0	0	0	0	0	0	0	0
769:	0	0	0	0	0	0	1	0
777:	0	0	0	0	0	0	0	0
785:	0	0	0	0	0	0	0	0
793:	0	0	0	0	0	0	0	0

801:	0	0	0	0	0	0	0	0

Sample Title: 03

Channel								
809:	0	0	0	0	0	0	0	0
817:	0	0	0	0	0	0	0	0
825:	0	0	0	0	0	0	0	0
833:	0	0	0	0	0	0	0	0
841:	0	0	0	0	0	0	0	0
849:	0	0	0	0	0	0	0	0
857:	0	0	0	0	0	0	0	0
865:	0	0	0	0	1	0	0	0
873:	0	0	0	0	0	0	0	0
881:	0	0	0	0	0	0	0	0
889:	0	0	0	0	0	0	0	0
897:	0	0	0	0	0	0	0	0
905:	0	0	0	0	0	0	0	0
913:	0	0	0	0	0	0	0	0
921:	0	0	0	0	0	0	0	0
929:	0	0	0	0	0	0	0	0
937:	0	0	0	0	0	0	0	0
945:	0	0	0	0	1	0	0	0
953:	0	0	0	0	0	0	0	0
961:	0	0	0	0	0	0	0	0
969:	0	0	1	0	0	0	0	0
977:	0	0	0	0	0	0	0	0
985:	1	0	0	0	0	0	0	0
993:	0	0	0	0	0	0	0	1
1001:	0	0	0	0	0	0	0	0
1009:	0	0	0	0	0	0	0	0
1017:	0	0	0	0	0	0	0	0

KCB 8/12/13

Apex-Alpha™

Sample Description: PZ-305-AI TOT
Spectrum File: \\OR-ALPHA1\Canberra\ApexAlpha\Root\Data\00000659
Batch Identification: 1307170A-RA
Sample Identification: 04
Sample Geometry: Shelf 2
Procedure Description: Ra

Detector Name: Alpha_036
Chamber Serial Number: 04026477B
Detector Serial Number: 84167
Env. Background: System Bkgd 64784
Reagent Blank: <not performed>

Sample Size: 1.000E+000 +/- 0.000E+000 liter
Generic Mult. Factor: 3.400E+000 Generic Div. Factor: 1.000E+000
Sample Date/Time: 7/22/2013 10:22:45 AM
Acquisition Date/Time: 8/12/2013 12:56:05 PM
Acquisition Live Time: 170.0 minutes
Acquisition Real Time: 170.0 minutes

Chem. Recovery Factor: 0.8840 +/- 0.0000
Counting Efficiency: 0.1910 +/- 0.0033 on 7/20/2013 2:31:37 PM
Effective Efficiency: 0.1688 +/- 0.0029

Peak Match Tolerance: 0.350 MeV

PEAK AREA REPORT

Nuclide	Energy (MeV)	Net Pk Area	Pk Area Error %	Ambient Backgnd	Reagent Backgnd	FWHM (keV)
RA-224	5.475	3.32	119.77	0.68	0.00E+000	3.0
RA-226	4.598	17.81	48.22	1.19	0.00E+000	3.0

NUCLIDE ANALYSIS RESULTS

Nuclide	Id Conf.	Energy (keV)	Activity (pCi/liter)	MDA (pCi/liter)
RA-224	0.944	5685.50*	1.88E-001 +/- 2.25E-001	3.19E-001 +/- 1.09E-002
RA-226	0.955	4785.00*	9.50E-001 +/- 4.59E-001	3.52E-001 +/- 1.20E-002

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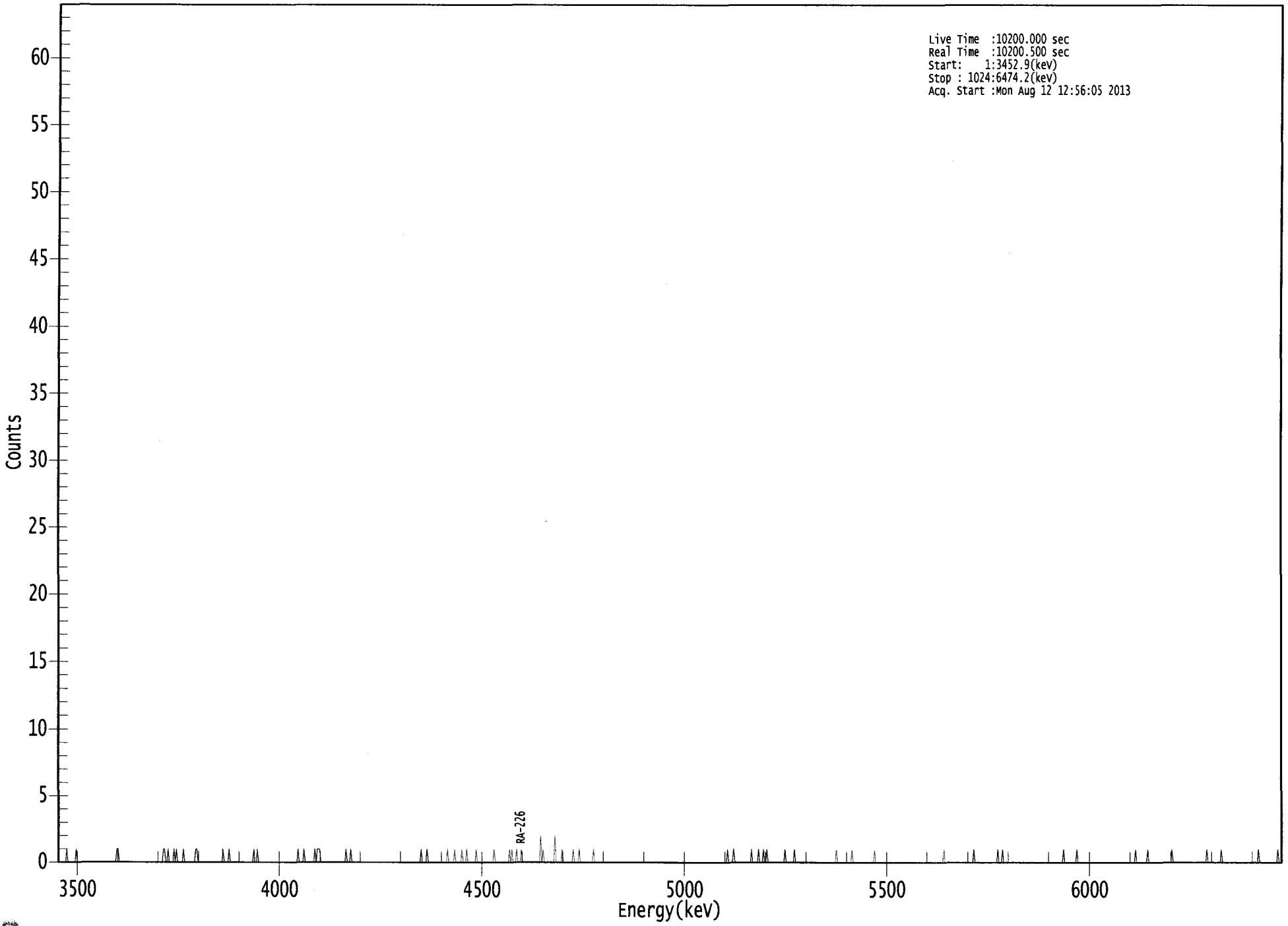
US EPA ARCHIVE DOCUMENT

0000065931.CNF



****
***** S P E C T R A L D A T A R E P O R T *****
****

Sample Title: 04

Elapsed Live time: 10200
Elapsed Real Time: 10201

Channel							
1:	0	0	0	0	0	0	0	1
9:	0	0	0	0	0	0	0	1
17:	0	0	0	0	0	0	0	0
25:	0	0	0	0	0	0	0	0
33:	0	0	0	0	0	0	0	0
41:	0	0	0	0	0	0	0	0
49:	0	1	1	0	0	0	0	0
57:	0	0	0	0	0	0	0	0
65:	0	0	0	0	0	0	0	0
73:	0	0	0	0	0	0	0	0
81:	0	0	0	0	0	0	0	0
89:	1	1	0	0	1	0	0	0
97:	0	1	0	1	0	0	0	0
105:	0	1	0	0	0	0	0	0
113:	0	0	0	1	1	0	0	0
121:	0	0	0	0	0	0	0	0
129:	0	0	0	0	0	0	0	0
137:	0	0	1	0	0	0	0	1
145:	0	0	0	0	0	0	0	0
153:	0	0	0	0	0	0	0	0
161:	0	0	0	0	1	0	0	1
169:	0	0	0	0	0	0	0	0
177:	0	0	0	0	0	0	0	0
185:	0	0	0	0	0	0	0	0
193:	0	0	0	0	0	0	0	0
201:	0	1	0	0	0	0	1	0
209:	0	0	0	0	0	0	0	1
217:	0	1	1	1	0	0	0	0
225:	0	0	0	0	0	0	0	0
233:	0	0	0	0	0	0	0	0
241:	0	1	0	0	0	1	0	0
249:	0	0	0	0	0	0	0	0
257:	0	0	0	0	0	0	0	0
265:	0	0	0	0	0	0	0	0
273:	0	0	0	0	0	0	0	0
281:	0	0	0	0	0	0	0	0
289:	0	0	0	0	0	0	0	0
297:	0	0	0	0	0	0	0	0
305:	1	0	0	0	0	1	0	0
313:	0	0	0	0	0	0	0	0
321:	0	0	0	0	0	0	1	0
329:	0	0	0	0	1	0	0	0
337:	0	0	1	0	0	0	1	0
345:	0	0	0	0	0	0	1	0
353:	0	0	0	0	0	0	0	0
361:	0	0	0	0	0	1	0	0

369:	0	0	0	0	0	0	0	0

Sample Title: 04

Channel								
377:	0	0	1	0	1	0	0	0
385:	1	0	0	0	1	0	0	0
393:	0	0	0	0	0	0	0	0
401:	0	0	0	0	2	0	1	0
409:	0	0	0	0	0	0	0	0
417:	2	0	0	0	0	0	1	0
425:	0	0	0	0	0	0	0	1
433:	0	0	0	0	1	0	0	0
441:	0	0	0	0	0	0	0	0
449:	1	0	0	0	0	0	0	0
457:	0	0	0	0	0	0	0	0
465:	0	0	0	0	0	0	0	0
473:	0	0	0	0	0	0	0	0
481:	0	0	0	0	0	0	0	0
489:	0	0	0	0	0	0	0	0
497:	0	0	0	0	0	0	0	0
505:	0	0	0	0	0	0	0	0
513:	0	0	0	0	0	0	0	0
521:	0	0	0	0	0	0	0	0
529:	0	0	0	0	0	0	0	0
537:	0	0	0	0	0	0	0	0
545:	0	0	0	0	0	0	0	0
553:	0	0	0	0	0	0	0	0
561:	1	0	0	0	0	1	0	0
569:	0	0	0	0	0	0	0	0
577:	0	0	0	0	1	0	0	0
585:	0	0	1	0	0	0	1	0
593:	0	1	0	0	0	0	0	0
601:	0	0	0	0	0	0	0	0
609:	1	0	0	0	0	0	0	0
617:	1	0	0	0	0	0	0	0
625:	0	0	0	0	0	0	0	0
633:	0	0	0	0	0	0	0	0
641:	0	0	0	0	0	0	0	0
649:	0	0	0	1	0	0	0	0
657:	0	0	0	0	0	0	0	0
665:	1	0	0	0	0	0	0	0
673:	0	0	0	0	0	0	0	0
681:	0	0	0	1	0	0	0	0
689:	0	0	0	0	0	0	0	0
697:	0	0	0	0	0	0	0	0
705:	0	0	0	0	0	0	0	0
713:	0	0	0	0	0	0	0	0
721:	0	0	0	0	0	0	0	0
729:	0	0	0	0	0	0	0	0
737:	0	0	0	0	0	1	0	0
745:	0	0	0	0	0	0	0	0
753:	0	0	0	0	0	0	0	0
761:	0	0	0	0	0	0	1	0
769:	0	0	0	0	0	0	0	0
777:	0	0	0	0	0	0	0	0
785:	0	0	1	0	0	0	1	0
793:	0	0	0	0	0	0	0	0

801:	0	0	0	0	0	0	0	0

Sample Title: 04

Channel								
809:	0	0	0	0	0	0	0	0
817:	0	0	0	0	0	0	0	0
825:	0	0	0	0	0	0	0	0
833:	0	0	0	0	0	0	0	0
841:	0	1	0	0	0	0	0	0
849:	0	0	0	0	1	0	0	0
857:	0	0	0	0	0	0	0	0
865:	0	0	0	0	0	0	0	0
873:	0	0	0	0	0	0	0	0
881:	0	0	0	0	0	0	0	0
889:	0	0	0	0	0	0	0	0
897:	0	0	0	0	0	1	0	0
905:	0	0	0	0	0	0	0	1
913:	0	0	0	0	0	0	0	0
921:	0	0	0	0	0	0	0	0
929:	0	0	0	1	0	0	0	0
937:	0	0	0	0	0	0	0	0
945:	0	0	0	0	0	0	0	0
953:	0	0	0	0	0	0	0	0
961:	1	0	0	0	0	0	0	0
969:	0	0	0	0	1	0	0	0
977:	0	0	0	0	0	0	0	0
985:	0	0	0	0	0	0	0	0
993:	0	0	0	0	0	0	0	0
1001:	0	0	0	1	0	0	0	0
1009:	0	0	0	0	0	0	0	0
1017:	0	0	0	1	0	0	0	0

KB 8/12/13

Apex-Alpha™

Sample Description: PZ-305-AI DIS
Spectrum File: \\OR-ALPHA1\Canberra\ApexAlpha\Root\Data\00000659
Batch Identification: 1307170A-RA
Sample Identification: 05
Sample Geometry: Shelf 2
Procedure Description: Ra

Detector Name: Alpha_037
Chamber Serial Number: 04026478A
Detector Serial Number: 91133
Env. Background: System Bkgd 62769
Reagent Blank: <not performed>

Sample Size: 1.000E+000 +/- 0.000E+000 liter
Generic Mult. Factor: 2.550E+000 Generic Div. Factor: 1.000E+000
Sample Date/Time: 7/22/2013 10:22:45 AM
Acquisition Date/Time: 8/12/2013 12:56:07 PM
Acquisition Live Time: 170.0 minutes
Acquisition Real Time: 170.0 minutes

Chem. Recovery Factor: 0.8902 +/- 0.0000
Counting Efficiency: 0.1783 +/- 0.0033 on 1/26/2013 3:28:25 PM
Effective Efficiency: 0.1587 +/- 0.0029

Peak Match Tolerance: 0.350 MeV

PEAK AREA REPORT

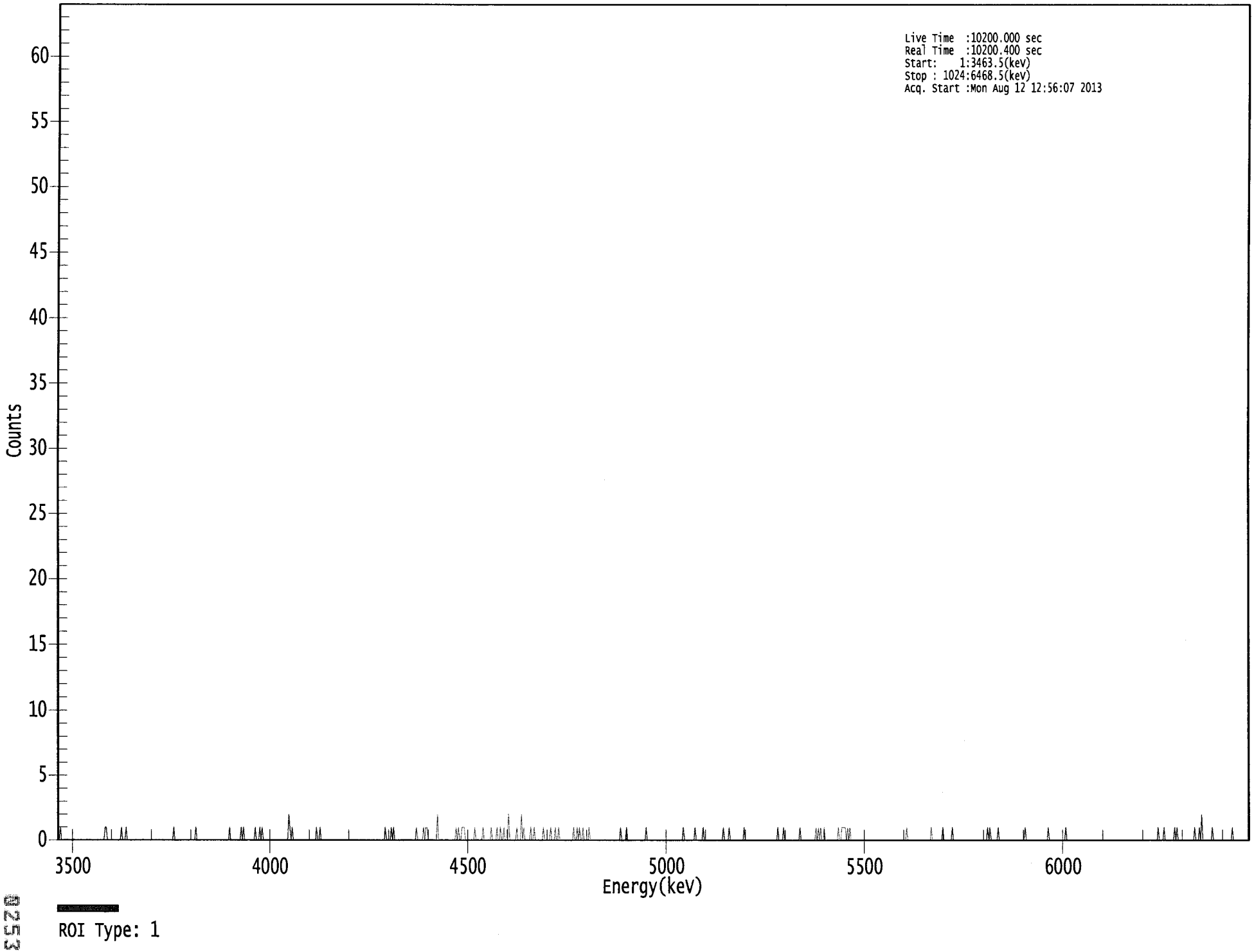
Nuclide	Energy (MeV)	Net Pk Area	Pk Area Error %	Ambient Backgnd	Reagent Backgnd	FWHM (keV)
RA-224	5.460	12.83	55.14	0.17	0.00E+000	2.9
RA-226	4.589	33.66	33.98	0.34	0.00E+000	2.9

NUCLIDE ANALYSIS RESULTS

Nuclide	Id Conf.	Energy (keV)	Activity (pCi/liter)	MDA (pCi/liter)
RA-224	0.936	5685.50*	5.78E-001 +/- 3.20E-001	1.88E-001 +/- 6.86E-003
RA-226	0.951	4785.00*	1.43E+000 +/- 4.90E-001	2.04E-001 +/- 7.41E-003

AG
8/13/13

0000065929.CNF



5528

****
***** S P E C T R A L D A T A R E P O R T *****
****

Sample Title: 05

Elapsed Live time: 10200
Elapsed Real Time: 10200

Channel								
1:	0	0	1	0	0	0	0	0
9:	0	0	0	0	0	0	0	0
17:	0	0	0	0	0	0	0	0
25:	0	0	0	0	0	0	0	0
33:	0	0	0	0	0	0	0	0
41:	0	1	1	0	0	0	0	0
49:	0	0	0	0	0	0	0	1
57:	0	0	0	1	0	0	0	0
65:	0	0	0	0	0	0	0	0
73:	0	0	0	0	0	0	0	0
81:	0	0	0	0	0	0	0	0
89:	0	0	0	0	0	0	0	0
97:	0	0	0	0	1	0	0	0
105:	0	0	0	0	0	0	0	0
113:	0	0	0	0	0	0	0	1
121:	0	0	0	0	0	0	0	0
129:	0	0	0	0	0	0	0	0
137:	0	0	0	0	0	0	0	0
145:	0	0	0	0	1	0	0	0
153:	0	0	0	0	0	0	1	0
161:	1	0	0	0	0	0	0	0
169:	0	0	1	0	0	0	1	0
177:	1	0	0	0	0	0	0	0
185:	0	0	0	0	0	0	0	0
193:	0	0	0	0	0	0	0	2
201:	1	0	1	0	0	0	0	0
209:	0	0	0	0	0	0	0	0
217:	0	0	0	0	0	0	0	1
225:	0	0	1	0	0	0	0	0
233:	0	0	0	0	0	0	0	0
241:	0	0	0	0	0	0	0	0
249:	0	0	0	0	0	0	0	0
257:	0	0	0	0	0	0	0	0
265:	0	0	0	0	0	0	0	0
273:	0	0	0	0	0	0	0	0
281:	0	0	1	0	0	0	0	1
289:	0	1	0	0	0	0	0	0
297:	0	0	0	0	0	0	0	0
305:	0	0	0	0	0	1	0	0
313:	0	0	0	1	0	1	1	0
321:	0	0	0	0	0	0	0	2
329:	0	0	0	0	0	0	0	0
337:	0	0	0	0	0	0	0	1
345:	0	1	0	0	1	1	1	0
353:	0	0	0	0	0	0	0	1
361:	0	0	0	0	0	0	1	0

369:	0	0	0	0	0	1	0	0

Sample Title: 05

Channel								
377:	0	0	1	0	0	1	0	0
385:	1	0	0	0	2	0	0	0
393:	0	0	0	1	0	0	0	2
401:	0	1	0	0	0	0	0	1
409:	0	0	1	0	0	0	0	0
417:	0	0	1	0	0	0	0	0
425:	1	0	0	0	1	0	0	1
433:	0	0	0	0	0	0	0	0
441:	0	0	0	0	1	0	0	1
449:	0	1	0	0	1	0	0	0
457:	0	1	0	0	0	0	0	0
465:	0	0	0	0	0	0	0	0
473:	0	0	0	0	0	0	0	0
481:	0	0	0	0	1	0	0	0
489:	0	1	0	0	0	0	0	0
497:	0	0	0	0	0	0	0	0
505:	0	0	1	0	0	0	0	0
513:	0	0	0	0	0	0	0	0
521:	0	0	0	0	0	0	0	0
529:	0	0	0	0	0	0	0	0
537:	0	0	1	0	0	0	0	0
545:	0	0	0	0	1	0	0	0
553:	0	0	0	1	0	0	0	0
561:	0	0	0	0	0	0	0	0
569:	0	0	0	0	1	0	0	0
577:	0	1	0	0	0	0	0	0
585:	0	0	0	0	0	0	1	0
593:	0	0	0	0	0	0	0	0
601:	0	0	0	0	0	0	0	0
609:	0	0	0	0	0	0	0	0
617:	0	0	0	1	0	0	0	0
625:	1	0	0	0	0	0	0	0
633:	0	0	0	0	0	0	1	0
641:	0	0	0	0	0	0	0	0
649:	0	0	0	0	1	0	1	0
657:	1	0	0	1	0	0	0	0
665:	0	0	0	0	0	0	0	1
673:	0	0	1	1	1	1	0	1
681:	0	1	0	0	0	0	0	0
689:	0	0	0	0	0	0	0	0
697:	0	0	0	0	0	0	0	0
705:	0	0	0	0	0	0	0	0
713:	0	0	0	0	0	0	0	0
721:	0	0	0	0	0	0	0	0
729:	0	0	1	0	0	0	0	0
737:	0	0	0	0	0	0	0	0
745:	0	0	0	0	0	0	0	1
753:	0	0	0	0	0	0	0	0
761:	0	1	0	0	0	0	0	0
769:	0	1	0	0	0	0	0	0
777:	0	0	0	0	0	0	0	0
785:	0	0	0	0	0	0	0	0
793:	0	0	0	0	0	0	0	1

801:	0	1	0	0	0	0	0	0

Sample Title: 05

Channel								
809:	1	0	0	0	0	0	0	0
817:	0	0	0	0	0	0	0	0
825:	0	0	0	0	0	0	0	1
833:	0	0	0	0	0	0	0	0
841:	0	0	0	0	0	0	0	0
849:	0	0	0	1	0	0	0	0
857:	0	0	0	0	0	0	0	0
865:	0	0	1	0	0	0	0	0
873:	0	0	0	0	0	0	0	0
881:	0	0	0	0	0	0	0	0
889:	0	0	0	0	0	0	0	0
897:	0	0	0	0	0	0	0	0
905:	0	0	0	0	0	0	0	0
913:	0	0	0	0	0	0	0	0
921:	0	0	0	0	0	0	0	0
929:	0	0	0	0	0	0	0	0
937:	0	0	0	0	0	0	0	0
945:	0	1	0	0	0	0	1	0
953:	0	0	0	0	0	0	0	1
961:	0	1	0	0	0	0	0	0
969:	0	0	0	0	0	0	0	0
977:	1	0	0	0	1	0	2	0
985:	0	0	0	0	0	0	0	1
993:	0	0	0	0	0	0	0	0
1001:	0	0	0	0	0	0	0	0
1009:	1	0	0	0	0	0	0	0
1017:	0	0	0	0	0	0	0	0

ICB 8/12/13

Apex-Alpha™

Sample Description: LR-104 TOT
Spectrum File: \\OR-ALPHA1\Canberra\ApexAlpha\Root\Data\00000659
Batch Identification: 1307170A-RA
Sample Identification: 06
Sample Geometry: Shelf 2
Procedure Description: Ra

Detector Name: Alpha_038
Chamber Serial Number: 04026478B
Detector Serial Number: 91134
Env. Background: System Bkgd 64785
Reagent Blank: <not performed>

Sample Size: 1.000E+000 +/- 0.000E+000 liter
Generic Mult. Factor: 2.530E+000 Generic Div. Factor: 1.000E+000
Sample Date/Time: 7/22/2013 10:22:45 AM
Acquisition Date/Time: 8/12/2013 12:56:09 PM
Acquisition Live Time: 170.0 minutes
Acquisition Real Time: 170.0 minutes

Chem. Recovery Factor: 0.9378 +/- 0.0000
Counting Efficiency: 0.1722 +/- 0.0030 on 5/11/2013 5:13:35 PM
Effective Efficiency: 0.1615 +/- 0.0028

Peak Match Tolerance: 0.350 MeV

PEAK AREA REPORT

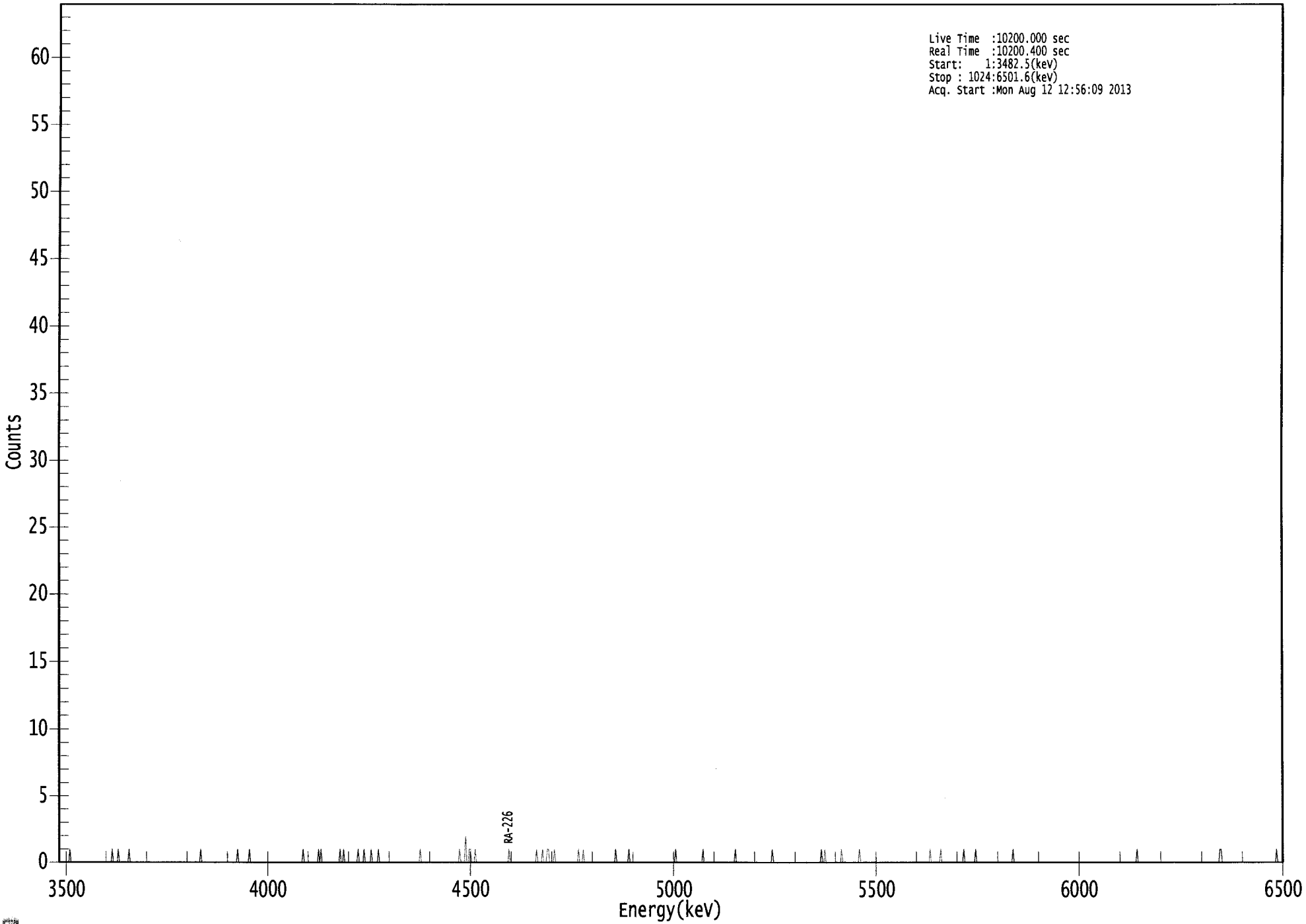
Nuclide	Energy (MeV)	Net Pk Area	Pk Area Error %	Ambient Backgnd	Reagent Backgnd	FWHM (keV)
RA-224	5.509	3.81	117.34	1.19	0.00E+000	3.0
RA-226	4.594	14.83	51.24	0.17	0.00E+000	3.0

NUCLIDE ANALYSIS RESULTS

Nuclide	Id Conf.	Energy (keV)	Activity (pCi/liter)	MDA (pCi/liter)
RA-224	0.960	5685.50*	1.68E-001 +/- 1.97E-001	2.90E-001 +/- 9.99E-003
RA-226	0.953	4785.00*	6.16E-001 +/- 3.16E-001	1.73E-001 +/- 5.96E-003

AG 8/13/13

0000065930.CNF



****
***** S P E C T R A L D A T A R E P O R T *****
****

Sample Title: 06

Elapsed Live time: 10200
Elapsed Real Time: 10200

Channel								
1:	0	0	0	0	0	0	0	0
9:	0	1	0	0	0	0	0	0
17:	0	0	0	0	0	0	0	0
25:	0	0	0	0	0	0	0	0
33:	0	0	0	0	0	0	0	0
41:	0	0	0	0	0	1	0	0
49:	0	0	1	0	0	0	0	0
57:	0	0	0	1	0	0	0	0
65:	0	0	0	0	0	0	0	0
73:	0	0	0	0	0	0	0	0
81:	0	0	0	0	0	0	0	0
89:	0	0	0	0	0	0	0	0
97:	0	0	0	0	0	0	0	0
105:	0	0	0	0	0	0	0	0
113:	0	0	0	0	0	0	0	1
121:	0	0	0	0	0	0	0	0
129:	0	0	0	0	0	0	0	0
137:	0	0	0	0	0	0	0	0
145:	0	0	0	0	0	0	1	0
153:	0	0	0	0	0	0	0	0
161:	1	0	0	0	0	0	0	0
169:	0	0	0	0	0	0	0	0
177:	0	0	0	0	0	0	0	0
185:	0	0	0	0	0	0	0	0
193:	0	0	0	0	0	0	0	0
201:	0	0	0	0	0	1	0	0
209:	0	0	0	0	0	0	0	0
217:	0	0	1	0	1	0	0	0
225:	0	0	0	0	0	0	0	0
233:	0	0	0	0	1	0	0	1
241:	0	0	0	0	0	0	0	0
249:	0	0	0	1	0	0	0	0
257:	1	0	0	0	0	0	1	0
265:	0	0	0	0	1	0	0	0
273:	0	0	0	0	0	0	0	0
281:	0	0	0	0	0	0	0	0
289:	0	0	0	0	0	0	0	0
297:	0	0	0	0	0	0	0	1
305:	0	0	0	0	0	0	0	0
313:	0	0	0	0	0	0	0	0
321:	0	0	0	0	0	0	0	0
329:	0	0	0	0	0	0	0	0
337:	1	0	0	0	0	2	0	0
345:	1	1	0	0	0	1	0	0
353:	0	0	0	0	0	0	0	0
361:	0	0	0	0	0	0	0	0

369:	0	0	0	0	0	0	0	0

Sample Title: 06

Channel								
377:	0	1	0	0	0	0	0	0
385:	0	0	0	0	0	0	0	0
393:	0	0	0	0	0	0	0	0
401:	1	0	0	0	0	1	0	0
409:	0	1	1	0	0	0	0	1
417:	0	0	0	0	0	0	0	0
425:	0	0	0	0	0	0	0	0
433:	0	0	0	1	0	0	0	1
441:	0	0	0	0	0	0	0	0
449:	0	0	0	0	0	0	0	0
457:	0	0	0	0	0	0	0	0
465:	0	0	1	0	0	0	0	0
473:	0	0	0	0	0	1	0	0
481:	0	0	0	0	0	0	0	0
489:	0	0	0	0	0	0	0	0
497:	0	0	0	0	0	0	0	0
505:	0	0	0	0	0	0	0	0
513:	0	0	0	0	1	0	0	0
521:	0	0	0	0	0	0	0	0
529:	0	0	0	0	0	0	0	0
537:	0	0	0	1	0	0	0	0
545:	0	0	0	0	0	0	0	0
553:	0	0	0	0	0	0	0	0
561:	0	0	0	0	0	0	1	0
569:	0	0	0	0	0	0	0	0
577:	0	0	0	0	0	0	0	0
585:	0	0	0	0	0	0	0	0
593:	0	0	0	0	0	1	0	0
601:	0	0	0	0	0	0	0	0
609:	0	0	0	0	0	0	0	0
617:	0	0	0	0	0	0	0	0
625:	0	0	0	0	0	0	0	0
633:	0	0	0	0	0	0	1	0
641:	0	1	0	0	0	0	0	0
649:	0	0	0	0	0	0	0	1
657:	0	0	0	0	0	0	0	0
665:	0	0	0	0	0	0	1	0
673:	0	0	0	0	0	0	0	0
681:	0	0	0	0	0	0	0	0
689:	0	0	0	0	0	0	0	0
697:	0	0	0	0	0	0	0	0
705:	0	0	0	0	0	0	0	0
713:	0	0	0	0	0	0	0	0
721:	0	0	0	0	0	0	0	0
729:	0	1	0	0	0	0	0	0
737:	0	0	1	0	0	0	0	0
745:	0	0	0	0	0	0	0	0
753:	0	0	0	0	0	1	0	0
761:	0	0	0	0	0	0	0	1
769:	0	0	0	0	0	0	0	0
777:	0	0	0	0	0	0	0	0
785:	0	0	0	0	0	0	0	0
793:	0	0	0	0	0	0	1	0

801:	0	0	0	0	0	0	0	0

Sample Title: 06

Channel								
809:	0	0	0	0	0	0	0	0
817:	0	0	0	0	0	0	0	0
825:	0	0	0	0	0	0	0	0
833:	0	0	0	0	0	0	0	0
841:	0	0	0	0	0	0	0	0
849:	0	0	0	0	0	0	0	0
857:	0	0	0	0	0	0	0	0
865:	0	0	0	0	0	0	0	0
873:	0	0	0	0	0	0	0	0
881:	0	0	0	0	0	0	0	0
889:	0	0	0	0	0	0	0	0
897:	0	0	0	0	0	1	0	0
905:	0	0	0	0	0	0	0	0
913:	0	0	0	0	0	0	0	0
921:	0	0	0	0	0	0	0	0
929:	0	0	0	0	0	0	0	0
937:	0	0	0	0	0	0	0	0
945:	0	0	0	0	0	0	0	0
953:	0	0	0	0	0	0	0	0
961:	0	0	0	0	0	0	0	0
969:	0	0	1	1	0	0	0	0
977:	0	0	0	0	0	0	0	0
985:	0	0	0	0	0	0	0	0
993:	0	0	0	0	0	0	0	0
1001:	0	0	0	0	0	0	0	0
1009:	0	0	0	0	0	0	0	0
1017:	0	1	0	0	0	0	0	0

ICB 8/12/13

Apex-Alpha™

Sample Description: LR-104 DIS
Spectrum File: \\OR-ALPHA1\Canberra\ApexAlpha\Root\Data\00000659
Batch Identification: 1307170A-RA
Sample Identification: 07
Sample Geometry: Shelf 2
Procedure Description: Ra

Detector Name: Alpha_039
Chamber Serial Number: 06027396A
Detector Serial Number: 83109
Env. Background: System Bkgd 64786
Reagent Blank: <not performed>

Sample Size: 1.000E+000 +/- 0.000E+000 liter
Generic Mult. Factor: 2.580E+000 Generic Div. Factor: 1.000E+000
Sample Date/Time: 7/22/2013 10:22:45 AM
Acquisition Date/Time: 8/12/2013 12:56:11 PM
Acquisition Live Time: 170.0 minutes
Acquisition Real Time: 170.0 minutes

Chem. Recovery Factor: 1.0000 +/- 0.0000
Counting Efficiency: 0.1965 +/- 0.0034 on 4/20/2013 2:01:25 PM
Effective Efficiency: 0.1965 +/- 0.0034

Peak Match Tolerance: 0.350 MeV

PEAK AREA REPORT

Nuclide	Energy (MeV)	Net Pk Area	Pk Area Error %	Ambient Backgnd	Reagent Backgnd	FWHM (keV)
RA-224	5.548	9.15	68.23	0.85	0.00E+000	3.0
RA-226	4.580	16.64	50.29	1.36	0.00E+000	3.0

NUCLIDE ANALYSIS RESULTS

Nuclide	Id Conf.	Energy (keV)	Activity (pCi/liter)	MDA (pCi/liter)
RA-224	0.976	5685.50*	3.37E-001 +/- 2.30E-001	2.21E-001 +/- 7.51E-003
RA-226	0.947	4785.00*	5.79E-001 +/- 2.92E-001	2.39E-001 +/- 8.10E-003

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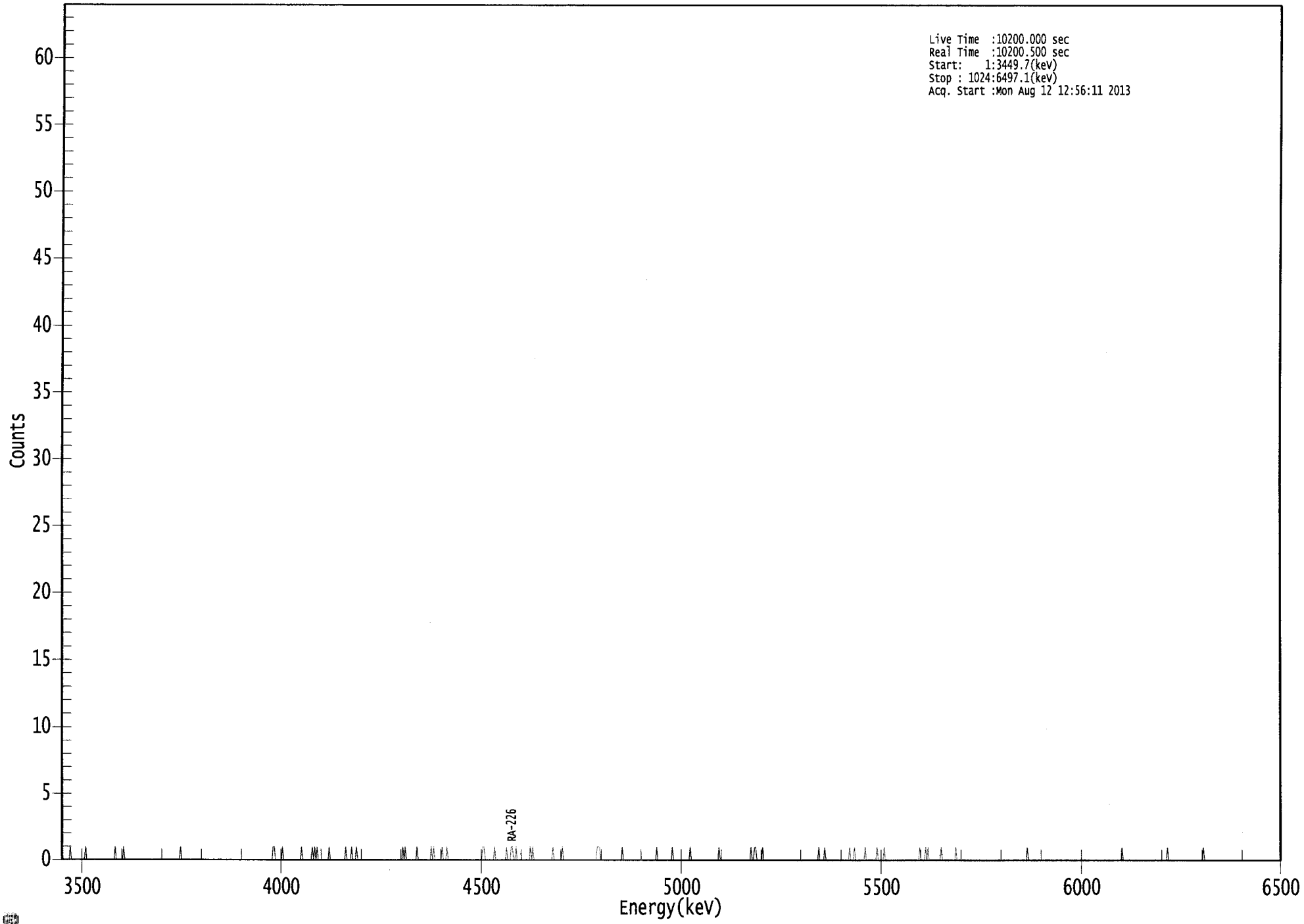
US EPA ARCHIVE DOCUMENT

0000065932.CNF



****
***** S P E C T R A L D A T A R E P O R T *****
****

Sample Title: 07

Elapsed Live time: 10200
Elapsed Real Time: 10201

Channel							
1:	1	0	0	0	0	0	0	1
9:	0	0	0	0	0	0	0	0
17:	0	0	0	0	1	0	0	0
25:	0	0	0	0	0	0	0	0
33:	0	0	0	0	0	0	0	0
41:	0	0	0	0	0	1	0	0
49:	0	0	0	0	1	0	0	0
57:	0	0	0	0	0	0	0	0
65:	0	0	0	0	0	0	0	0
73:	0	0	0	0	0	0	0	0
81:	0	0	0	0	0	0	0	0
89:	0	0	0	0	0	0	0	0
97:	0	0	0	0	1	0	0	0
105:	0	0	0	0	0	0	0	0
113:	0	0	0	0	0	0	0	0
121:	0	0	0	0	0	0	0	0
129:	0	0	0	0	0	0	0	0
137:	0	0	0	0	0	0	0	0
145:	0	0	0	0	0	0	0	0
153:	0	0	0	0	0	0	0	0
161:	0	0	0	0	0	0	0	0
169:	0	0	0	0	0	0	0	0
177:	0	0	1	1	0	0	0	0
185:	0	0	1	0	0	0	0	0
193:	0	0	0	0	0	0	0	0
201:	0	0	1	0	0	0	0	0
209:	0	0	0	1	0	1	0	1
217:	0	0	0	0	0	0	0	0
225:	0	1	0	0	0	0	0	0
233:	0	0	0	0	0	0	0	1
241:	0	0	0	0	1	0	0	0
249:	1	0	0	0	0	0	0	0
257:	0	0	0	0	0	0	0	0
265:	0	0	0	0	0	0	0	0
273:	0	0	0	0	0	0	0	0
281:	0	0	0	0	0	0	0	1
289:	0	1	0	0	0	0	0	0
297:	0	0	0	1	0	0	0	0
305:	0	0	0	0	0	0	0	1
313:	0	1	0	0	0	0	0	0
321:	1	0	0	0	1	0	0	0
329:	0	0	0	0	0	0	0	0
337:	0	0	0	0	0	0	0	0
345:	0	0	0	0	0	0	0	0
353:	0	0	1	1	0	0	0	0
361:	0	0	0	0	1	0	0	0

369:	0	0	0	0	0	0	1	0

Sample Title: 07

Channel								
377:	0	0	1	1	0	0	1	0
385:	0	0	0	0	0	0	0	0
393:	0	0	1	0	1	0	0	0
401:	0	0	0	0	0	0	0	0
409:	0	0	0	0	0	1	0	0
417:	0	0	0	0	0	1	0	0
425:	0	0	0	0	0	0	0	0
433:	0	0	0	0	0	0	0	0
441:	0	0	0	0	0	0	0	0
449:	0	0	1	1	1	0	0	0
457:	0	0	0	0	0	0	0	0
465:	0	0	0	0	0	0	0	1
473:	0	0	0	0	0	0	0	0
481:	0	0	0	0	0	0	0	0
489:	0	0	0	0	0	0	0	0
497:	0	0	0	0	1	0	0	0
505:	0	0	0	0	0	0	0	0
513:	0	1	0	0	0	0	0	0
521:	0	0	0	0	0	0	0	0
529:	1	0	0	0	0	0	0	0
537:	0	0	0	0	0	0	0	0
545:	0	0	0	0	0	0	0	0
553:	1	0	0	0	0	0	0	0
561:	0	0	0	0	0	0	0	0
569:	0	0	0	0	0	0	0	0
577:	0	0	0	1	0	0	1	1
585:	0	0	0	0	0	1	0	0
593:	0	0	0	0	0	0	0	0
601:	0	0	0	0	0	0	0	0
609:	0	0	0	0	0	0	0	0
617:	0	0	0	0	0	0	0	0
625:	0	0	0	0	0	0	0	0
633:	0	0	0	0	1	0	0	0
641:	0	1	0	0	0	0	0	0
649:	0	0	0	0	0	0	0	0
657:	0	0	0	0	0	0	1	0
665:	0	0	1	0	0	0	0	0
673:	0	0	0	1	0	0	0	0
681:	0	0	0	0	0	1	0	0
689:	0	0	0	1	0	0	0	0
697:	0	0	0	0	0	0	0	0
705:	0	0	0	0	0	0	0	0
713:	0	0	0	0	0	0	0	0
721:	0	1	0	0	0	0	1	0
729:	1	0	0	0	0	0	0	0
737:	0	0	0	1	0	0	0	0
745:	0	0	0	0	0	0	0	1
753:	0	0	0	0	0	0	0	0
761:	0	0	0	0	0	0	0	0
769:	0	0	0	0	0	0	0	0
777:	0	0	0	0	0	0	0	0
785:	0	0	0	0	0	0	0	0
793:	0	0	0	0	0	0	0	0

801:	0	0	0	0	0	0	0	0

Sample Title: 07

Channel								
809:	0	0	0	1	0	0	0	0
817:	0	0	0	0	0	0	0	0
825:	0	0	0	0	0	0	0	0
833:	0	0	0	0	0	0	0	0
841:	0	0	0	0	0	0	0	0
849:	0	0	0	0	0	0	0	0
857:	0	0	0	0	0	0	0	0
865:	0	0	0	0	0	0	0	0
873:	0	0	0	0	0	0	0	0
881:	0	0	0	0	0	0	0	0
889:	0	0	1	0	0	0	0	0
897:	0	0	0	0	0	0	0	0
905:	0	0	0	0	0	0	0	0
913:	0	0	0	0	0	0	0	0
921:	0	0	0	0	0	0	0	0
929:	1	0	0	0	0	0	0	0
937:	0	0	0	0	0	0	0	0
945:	0	0	0	0	0	0	0	0
953:	0	0	0	0	0	0	1	0
961:	0	0	0	0	0	0	0	0
969:	0	0	0	0	0	0	0	0
977:	0	0	0	0	0	0	0	0
985:	0	0	0	0	0	0	0	0
993:	0	0	0	0	0	0	0	0
1001:	0	0	0	0	0	0	0	0
1009:	0	0	0	0	0	0	0	0
1017:	0	0	0	0	0	0	0	0

KB 7/12/13

Apex-Alpha™

Sample Description: PZ-100-KS TOT
Spectrum File: \\OR-ALPHA1\Canberra\ApexAlpha\Root\Data\00000659
Batch Identification: 1307170A-RA
Sample Identification: 08
Sample Geometry: Shelf 2
Procedure Description: Ra

Detector Name: Alpha_040
Chamber Serial Number: 06027396B
Detector Serial Number: 91135
Env. Background: System Bkgd 64787
Reagent Blank: <not performed>

Sample Size: 1.000E+000 +/- 0.000E+000 liter
Generic Mult. Factor: 2.440E+000 Generic Div. Factor: 1.000E+000
Sample Date/Time: 7/23/2013 10:22:45 AM
Acquisition Date/Time: 8/12/2013 12:56:13 PM
Acquisition Live Time: 170.0 minutes
Acquisition Real Time: 170.0 minutes

Chem. Recovery Factor: 0.9627 +/- 0.0000
Counting Efficiency: 0.1900 +/- 0.0033 on 12/16/2012 5:49:33 PM
Effective Efficiency: 0.1829 +/- 0.0032

Peak Match Tolerance: 0.350 MeV

PEAK AREA REPORT

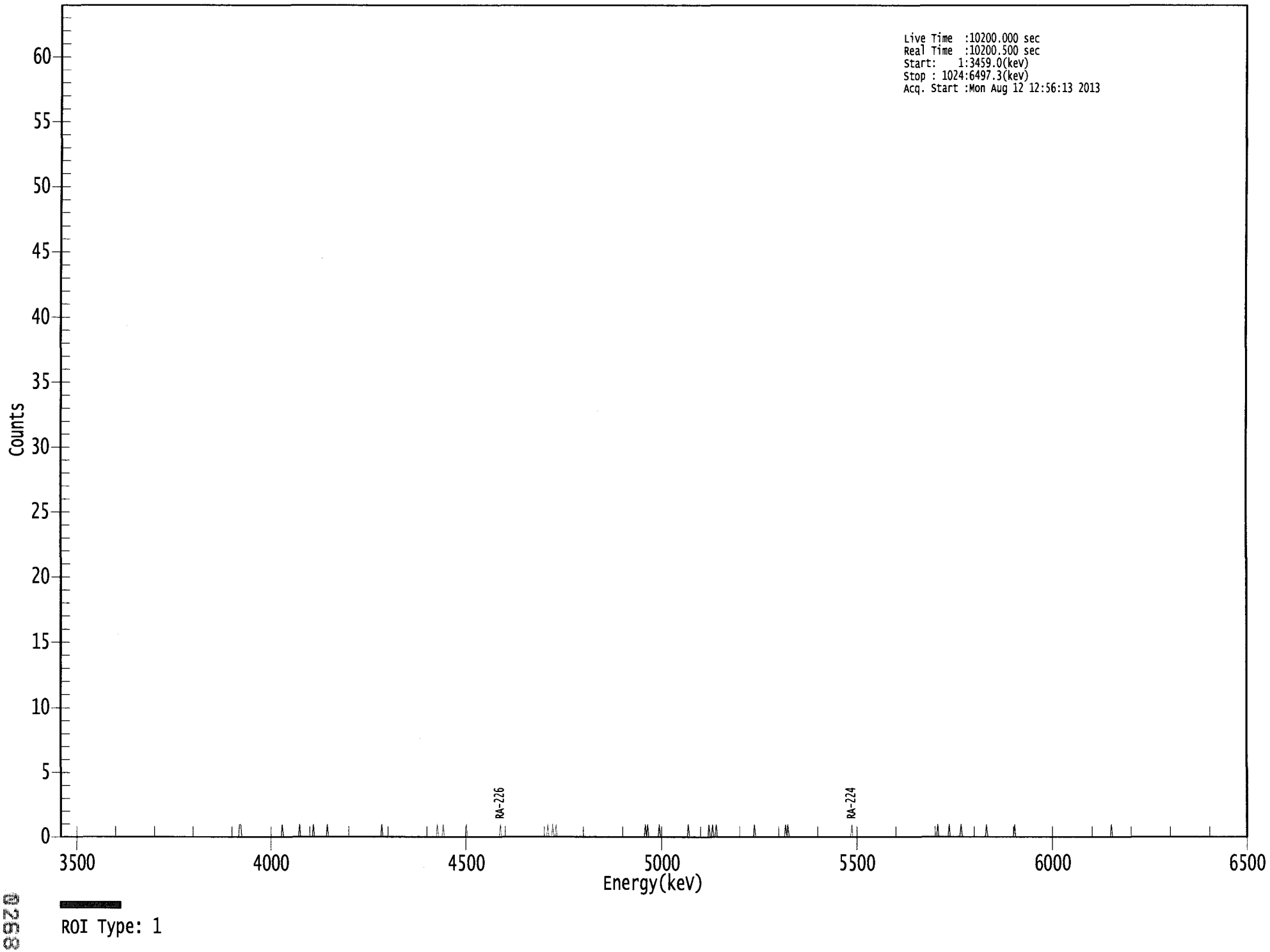
Nuclide	Energy (MeV)	Net Pk Area	Pk Area Error %	Ambient Backgnd	Reagent Backgnd	FWHM (keV)
RA-224	5.488	0.49	416.98	0.51	0.00E+000	3.0
RA-226	4.588	6.32	82.73	0.68	0.00E+000	3.0

NUCLIDE ANALYSIS RESULTS

Nuclide	Id Conf.	Energy (keV)	Activity (pCi/liter)	MDA (pCi/liter)
RA-224	0.950	5685.50*	1.83E-002 +/- 7.64E-002	1.96E-001 +/- 6.69E-003
RA-226	0.951	4785.00*	2.23E-001 +/- 1.85E-001	1.99E-001 +/- 6.78E-003

AG
8/13/13

0000065933.CNF



****
***** S P E C T R A L D A T A R E P O R T *****
****

Sample Title: 08

Elapsed Live time: 10200
Elapsed Real Time: 10201

Channel								
1:	0	0	0	0	0	0	0	0
9:	0	0	0	0	0	0	0	0
17:	0	0	0	0	0	0	0	0
25:	0	0	0	0	0	0	0	0
33:	0	0	0	0	0	0	0	0
41:	0	0	0	0	0	0	0	0
49:	0	0	0	0	0	0	0	0
57:	0	0	0	0	0	0	0	0
65:	0	0	0	0	0	0	0	0
73:	0	0	0	0	0	0	0	0
81:	0	0	0	0	0	0	0	0
89:	0	0	0	0	0	0	0	0
97:	0	0	0	0	0	0	0	0
105:	0	0	0	0	0	0	0	0
113:	0	0	0	0	0	0	0	0
121:	0	0	0	0	0	0	0	0
129:	0	0	0	0	0	0	0	0
137:	0	0	0	0	0	0	0	0
145:	0	0	0	0	0	0	0	0
153:	0	0	0	1	1	0	0	0
161:	0	0	0	0	0	0	0	0
169:	0	0	0	0	0	0	0	0
177:	0	0	0	0	0	0	0	0
185:	0	0	0	0	0	0	0	0
193:	1	0	0	0	0	0	0	0
201:	0	0	0	0	0	0	0	1
209:	0	0	0	0	0	0	0	0
217:	0	0	0	1	0	0	0	0
225:	0	0	0	0	0	0	0	1
233:	0	0	0	0	0	0	0	0
241:	0	0	0	0	0	0	0	0
249:	0	0	0	0	0	0	0	0
257:	0	0	0	0	0	0	0	0
265:	0	0	0	0	0	0	0	0
273:	0	0	0	0	0	0	1	0
281:	0	0	0	0	0	0	0	0
289:	0	0	0	0	0	0	0	0
297:	0	0	0	0	0	0	0	0
305:	0	0	0	0	0	0	0	0
313:	0	0	0	0	0	0	0	0
321:	0	0	0	0	0	0	1	0
329:	0	0	0	1	0	0	0	0
337:	0	0	0	0	0	0	0	0
345:	0	0	0	0	0	0	0	1
353:	0	0	0	0	0	0	0	0
361:	0	0	0	0	0	0	0	0

369:	0	0	0	0	0	0	0	0

Sample Title: 08

Channel								
377:	0	0	0	0	1	0	0	0
385:	0	0	0	0	0	0	0	0
393:	0	0	0	0	0	0	0	0
401:	0	0	0	0	0	0	0	0
409:	0	0	0	0	0	0	0	0
417:	0	0	0	0	0	1	0	0
425:	0	1	0	0	1	0	0	0
433:	0	0	0	0	0	0	0	0
441:	0	0	0	0	0	0	0	0
449:	0	0	0	0	0	0	0	0
457:	0	0	0	0	0	0	0	0
465:	0	0	0	0	0	0	0	0
473:	0	0	0	0	0	0	0	0
481:	0	0	0	0	0	0	0	0
489:	0	0	0	0	0	0	0	0
497:	0	0	0	0	0	0	0	0
505:	0	1	0	1	0	0	0	0
513:	0	0	0	0	0	1	0	0
521:	0	0	0	0	0	0	0	0
529:	0	0	0	0	0	0	0	0
537:	0	0	0	0	0	0	1	0
545:	0	0	0	0	0	0	0	0
553:	0	0	0	0	0	0	0	0
561:	1	0	0	1	0	0	1	0
569:	0	0	0	0	0	0	0	0
577:	0	0	0	0	0	0	0	0
585:	0	0	0	0	0	0	0	0
593:	0	0	0	0	0	0	0	1
601:	0	0	0	0	0	0	0	0
609:	0	0	0	0	0	0	0	0
617:	0	0	0	0	0	0	0	0
625:	0	0	1	0	1	0	0	0
633:	0	0	0	0	0	0	0	0
641:	0	0	0	0	0	0	0	0
649:	0	0	0	0	0	0	0	0
657:	0	0	0	0	0	0	0	0
665:	0	0	0	0	0	0	0	0
673:	0	0	0	0	0	0	0	0
681:	0	0	0	1	0	0	0	0
689:	0	0	0	0	0	0	0	0
697:	0	0	0	0	0	0	0	0
705:	0	0	0	0	0	0	0	0
713:	0	0	0	0	0	0	0	0
721:	0	0	0	0	0	0	0	0
729:	0	0	0	0	0	0	0	0
737:	0	0	0	0	0	0	0	0
745:	0	0	0	0	0	0	0	0
753:	0	0	0	0	0	1	0	0
761:	0	0	0	0	0	0	0	1
769:	0	0	0	0	0	0	0	0
777:	0	1	0	0	0	0	0	0
785:	0	0	0	0	0	0	0	0
793:	0	0	0	0	0	0	0	1

801:	0	0	0	0	0	0	0	0

Sample Title: 08

Channel								
809:	0	0	0	0	0	0	0	0
817:	0	0	0	0	0	0	0	1
825:	0	0	0	0	0	0	0	0
833:	0	0	0	0	0	0	0	0
841:	0	0	0	0	0	0	0	0
849:	0	0	0	0	0	0	0	0
857:	0	0	0	0	0	0	0	0
865:	0	0	0	0	0	0	0	0
873:	0	0	0	0	0	0	0	0
881:	0	0	0	0	0	0	0	0
889:	0	0	0	0	0	0	0	0
897:	0	0	0	0	0	0	0	0
905:	0	0	1	0	0	0	0	0
913:	0	0	0	0	0	0	0	0
921:	0	0	0	0	0	0	0	0
929:	0	0	0	0	0	0	0	0
937:	0	0	0	0	0	0	0	0
945:	0	0	0	0	0	0	0	0
953:	0	0	0	0	0	0	0	0
961:	0	0	0	0	0	0	0	0
969:	0	0	0	0	0	0	0	0
977:	0	0	0	0	0	0	0	0
985:	0	0	0	0	0	0	0	0
993:	0	0	0	0	0	0	0	0
1001:	0	0	0	0	0	0	0	0
1009:	0	0	0	0	0	0	0	0
1017:	0	0	0	0	0	0	0	0

ICB 8/12/13

Apex-Alpha™

Sample Description: PZ-100-KS DIS
Spectrum File: \\OR-ALPHA1\Canberra\ApexAlpha\Root\Data\00000659
Batch Identification: 1307170A-RA
Sample Identification: 09
Sample Geometry: Shelf 2
Procedure Description: Ra

Detector Name: Alpha_041
Chamber Serial Number: 05026930A
Detector Serial Number: 91087
Env. Background: System Bkgd 64058
Reagent Blank: <not performed>

Sample Size: 1.000E+000 +/- 0.000E+000 liter
Generic Mult. Factor: 2.340E+000 Generic Div. Factor: 1.000E+000
Sample Date/Time: 7/23/2013 10:22:45 AM
Acquisition Date/Time: 8/12/2013 12:56:15 PM
Acquisition Live Time: 170.0 minutes
Acquisition Real Time: 170.0 minutes

Chem. Recovery Factor: 0.9023 +/- 0.0000
Counting Efficiency: 0.1917 +/- 0.0033 on 8/10/2013 2:59:03 PM
Effective Efficiency: 0.1730 +/- 0.0030

Peak Match Tolerance: 0.350 MeV

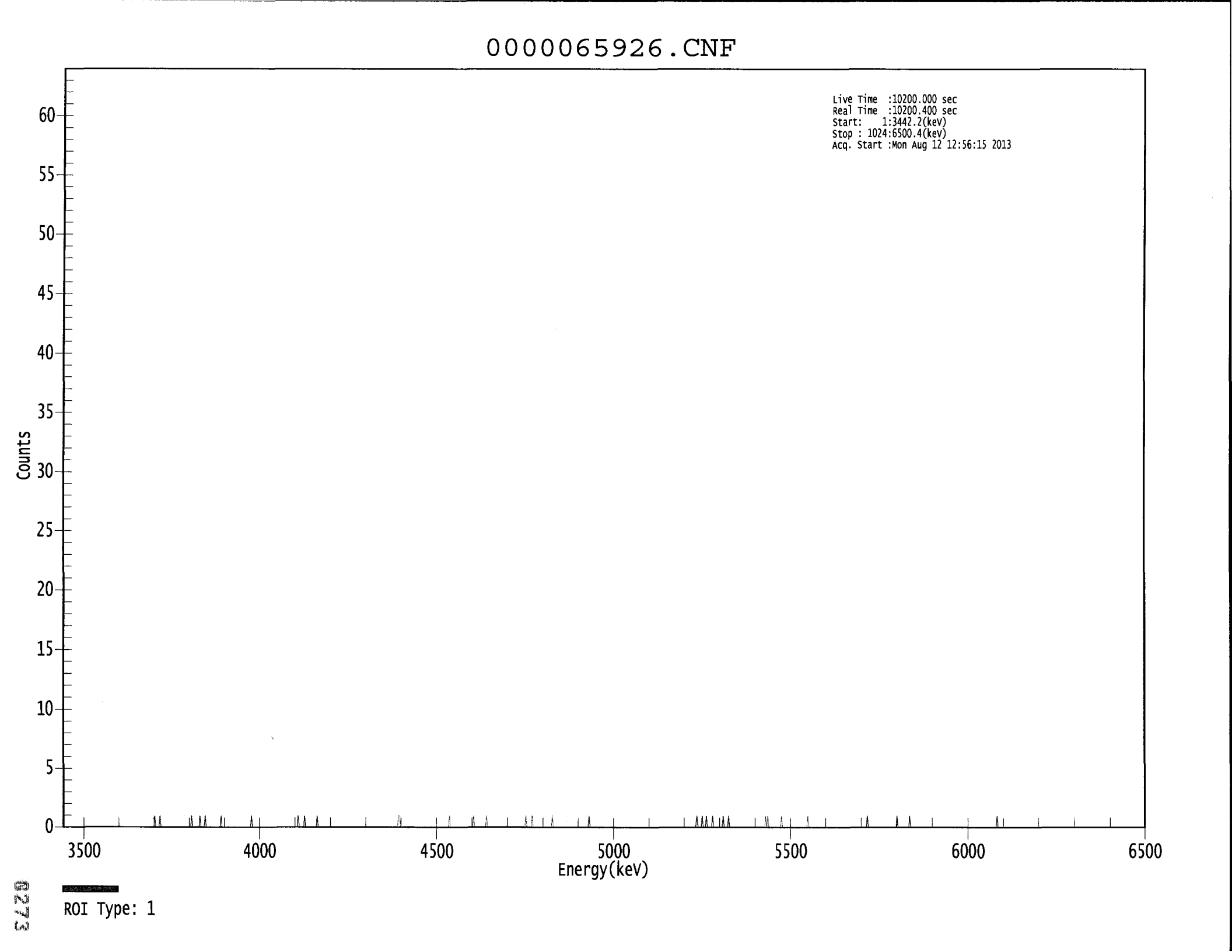
PEAK AREA REPORT

Nuclide	Energy (MeV)	Net Pk Area	Pk Area Error %	Ambient Backgnd	Reagent Backgnd	FWHM (keV)
RA-224	5.473	3.49	113.53	0.51	0.00E+000	3.0
RA-226	4.615	5.79	97.97	2.21	0.00E+000	6.0

NUCLIDE ANALYSIS RESULTS

Nuclide	Id Conf.	Energy (keV)	Activity (pCi/liter)	MDA (pCi/liter)
RA-224	0.943	5685.50*	1.32E-001 +/- 1.50E-001	1.99E-001 +/- 6.78E-003
RA-226	0.963	4785.00*	2.08E-001 +/- 2.03E-001	2.87E-001 +/- 9.74E-003

AG 8/13/13


0000065926.CNF
Live Time :10200.000 sec
Real Time :10200.400 sec
Start: 1:3442.2(kev)
Stop : 1024:6500.4(kev)
Acq. Start :Mon Aug 12 12:56:15 2013
Counts
0
5
10
15
20
25
30
35
40
45
50
55
60
3500
4000
4500
5000
5500
6000
6500
Energy(keV)
ROI Type: 1
5226

****
***** S P E C T R A L D A T A R E P O R T *****
****

Sample Title: 09

Elapsed Live time: 10200
Elapsed Real Time: 10200

Channel								
1:	0	0	0	0	0	0	0	0
9:	0	0	0	0	0	0	0	0
17:	0	0	0	0	0	0	0	0
25:	0	0	0	0	0	0	0	0
33:	0	0	0	0	0	0	0	0
41:	0	0	0	0	0	0	0	0
49:	0	0	0	0	0	0	0	0
57:	0	0	0	0	0	0	0	0
65:	0	0	0	0	0	0	0	0
73:	0	0	0	0	0	0	0	0
81:	0	0	0	0	0	0	0	1
89:	0	0	0	0	1	0	0	0
97:	0	0	0	0	0	0	0	0
105:	0	0	0	0	0	0	0	0
113:	0	0	0	0	0	0	0	0
121:	0	0	1	0	0	0	0	0
129:	0	0	1	0	0	0	0	1
137:	0	0	0	0	0	0	0	0
145:	0	0	0	0	0	0	1	0
153:	0	0	0	0	0	0	0	0
161:	0	0	0	0	0	0	0	0
169:	0	0	0	0	0	0	0	0
177:	0	0	0	1	0	0	0	0
185:	0	0	0	0	0	0	0	0
193:	0	0	0	0	0	0	0	0
201:	0	0	0	0	0	0	0	0
209:	0	0	0	0	0	0	0	0
217:	0	0	0	0	0	0	0	1
225:	0	0	0	0	0	1	0	0
233:	0	0	0	0	0	0	0	0
241:	0	1	0	0	0	0	0	0
249:	0	0	0	0	0	0	0	0
257:	0	0	0	0	0	0	0	0
265:	0	0	0	0	0	0	0	0
273:	0	0	0	0	0	0	0	0
281:	0	0	0	0	0	0	0	0
289:	0	0	0	0	0	0	0	0
297:	0	0	0	0	0	0	0	0
305:	0	0	0	0	0	0	0	0
313:	0	0	0	0	0	0	1	1
321:	0	0	0	0	0	0	0	0
329:	0	0	0	0	0	0	0	0
337:	0	0	0	0	0	0	0	0
345:	0	0	0	0	0	0	0	0
353:	0	0	0	0	0	0	0	0
361:	0	0	0	0	0	0	1	0

369:	0	0	0	0	0	0	0	0

Sample Title: 09

Channel								
377:	0	0	0	0	0	0	0	0
385:	0	0	0	0	0	1	0	0
393:	0	0	0	0	0	0	0	0
401:	0	1	0	0	0	0	0	0
409:	0	0	0	0	0	0	0	0
417:	0	0	0	0	0	0	0	0
425:	0	0	0	0	0	0	0	0
433:	0	0	0	0	0	0	1	0
441:	0	0	0	0	1	0	0	0
449:	0	0	0	0	0	0	0	0
457:	0	0	0	0	0	0	0	1
465:	0	0	0	0	0	0	0	0
473:	0	0	0	0	0	0	0	0
481:	0	0	0	0	0	0	0	0
489:	0	0	0	0	0	0	0	0
497:	0	0	1	0	0	0	0	0
505:	0	0	0	0	0	0	0	0
513:	0	0	0	0	0	0	0	0
521:	0	0	0	0	0	0	0	0
529:	0	0	0	0	0	0	0	0
537:	0	0	0	0	0	0	0	0
545:	0	0	0	0	0	0	0	0
553:	0	0	0	0	0	0	0	0
561:	0	0	0	0	0	0	0	0
569:	0	0	0	0	0	0	0	0
577:	0	0	0	0	0	0	0	0
585:	0	0	0	0	0	0	0	0
593:	0	0	0	0	0	0	0	0
601:	1	0	0	0	0	1	0	0
609:	0	1	0	0	0	0	0	1
617:	0	0	0	0	0	0	0	0
625:	0	1	0	0	0	0	1	0
633:	0	0	0	0	0	0	0	0
641:	0	0	0	0	0	0	0	0
649:	0	0	0	0	0	0	0	0
657:	0	0	0	0	0	0	0	0
665:	0	1	0	1	0	0	0	0
673:	0	0	0	0	0	0	0	0
681:	1	0	0	0	0	0	0	0
689:	0	0	0	0	0	0	0	0
697:	0	0	0	0	0	0	0	0
705:	0	1	0	0	0	0	0	0
713:	0	0	0	0	0	0	0	0
721:	0	0	0	0	0	0	0	0
729:	0	0	0	0	0	0	0	0
737:	0	0	0	0	0	0	0	0
745:	0	0	0	0	0	0	0	0
753:	0	0	0	0	0	0	0	0
761:	0	1	0	0	0	0	0	0
769:	0	0	0	0	0	0	0	0
777:	0	0	0	0	0	0	0	0
785:	0	0	0	0	0	1	0	0
793:	0	0	0	0	0	0	0	0

801:	0	1	0	0	0	0	0	0

Sample Title: 09

Channel								
809:	0	0	0	0	0	0	0	0
817:	0	0	0	0	0	0	0	0
825:	0	0	0	0	0	0	0	0
833:	0	0	0	0	0	0	0	0
841:	0	0	0	0	0	0	0	0
849:	0	0	0	0	0	0	0	0
857:	0	0	0	0	0	0	0	0
865:	0	0	0	0	0	0	0	0
873:	0	0	0	0	0	0	0	0
881:	0	0	0	1	0	0	0	0
889:	0	0	0	0	0	0	0	0
897:	0	0	0	0	0	0	0	0
905:	0	0	0	0	0	0	0	0
913:	0	0	0	0	0	0	0	0
921:	0	0	0	0	0	0	0	0
929:	0	0	0	0	0	0	0	0
937:	0	0	0	0	0	0	0	0
945:	0	0	0	0	0	0	0	0
953:	0	0	0	0	0	0	0	0
961:	0	0	0	0	0	0	0	0
969:	0	0	0	0	0	0	0	0
977:	0	0	0	0	0	0	0	0
985:	0	0	0	0	0	0	0	0
993:	0	0	0	0	0	0	0	0
1001:	0	0	0	0	0	0	0	0
1009:	0	0	0	0	0	0	0	0
1017:	0	0	0	0	0	0	0	0

KB 8/12/13

Apex-Alpha™

Sample Description: PURGE TANK TOT
Spectrum File: \\OR-ALPHA1\Canberra\ApexAlpha\Root\Data\00000659
Batch Identification: 1307170A-RA
Sample Identification: 10
Sample Geometry: Shelf 2
Procedure Description: Ra

Detector Name: Alpha_042
Chamber Serial Number: 05026930B
Detector Serial Number: 84185
Env. Background: System Bkgd 64788
Reagent Blank: <not performed>

Sample Size: 1.000E+000 +/- 0.000E+000 liter
Generic Mult. Factor: 2.470E+000 Generic Div. Factor: 1.000E+000
Sample Date/Time: 7/23/2013 10:22:45 AM
Acquisition Date/Time: 8/12/2013 12:56:17 PM
Acquisition Live Time: 170.0 minutes
Acquisition Real Time: 170.0 minutes

Chem. Recovery Factor: 0.8329 +/- 0.0000
Counting Efficiency: 0.1846 +/- 0.0032 on 12/16/2012 5:49:29 PM
Effective Efficiency: 0.1538 +/- 0.0027

Peak Match Tolerance: 0.350 MeV

PEAK AREA REPORT

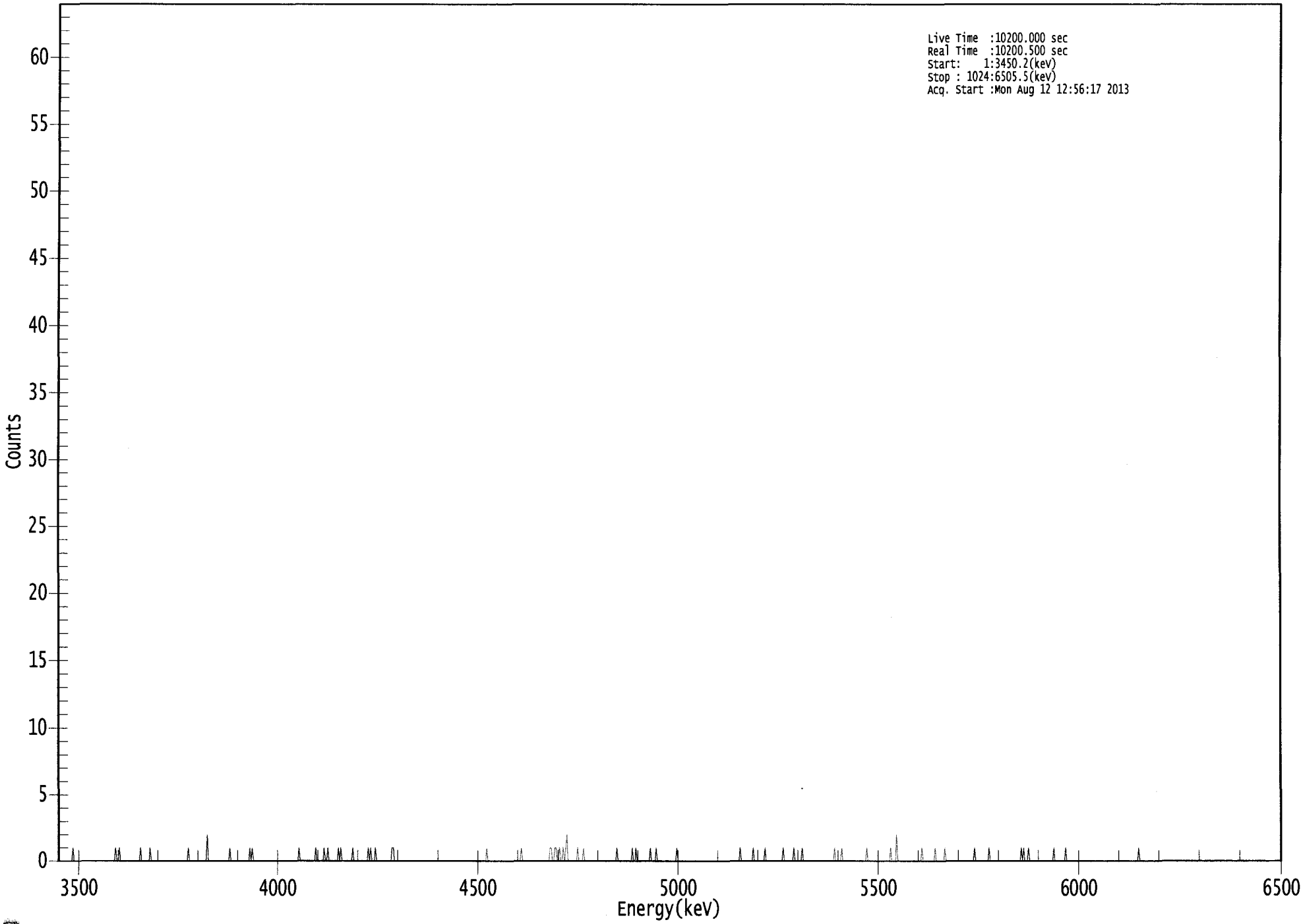
Nuclide	Energy (MeV)	Net Pk Area	Pk Area Error %	Ambient Backgnd	Reagent Backgnd	FWHM (keV)
RA-224	5.535	8.66	68.12	0.34	0.00E+000	3.0
RA-226	4.691	12.66	55.94	0.34	0.00E+000	4.5

NUCLIDE ANALYSIS RESULTS

Nuclide	Id Conf.	Energy (keV)	Activity (pCi/liter)	MDA (pCi/liter)
RA-224	0.971	5685.50*	3.90E-001 +/- 2.66E-001	2.15E-001 +/- 7.36E-003
RA-226	0.988	4785.00*	5.39E-001 +/- 3.02E-001	2.04E-001 +/- 6.94E-003

AG
8/13/13

0000065927.CNF



****
***** S P E C T R A L D A T A R E P O R T *****
****

Sample Title: 10

Elapsed Live time: 10200
Elapsed Real Time: 10201

Channel							
1:	1	0	0	0	0	0	0
9:	0	0	0	0	1	0	0
17:	0	0	0	0	0	0	0
25:	0	0	0	0	0	0	0
33:	0	0	0	0	0	0	0
41:	0	0	0	0	0	0	0
49:	1	0	0	1	0	0	0
57:	0	0	0	0	0	0	0
65:	0	0	0	0	0	1	0
73:	0	0	0	0	0	1	0
81:	0	0	0	0	0	0	0
89:	0	0	0	0	0	0	0
97:	0	0	0	0	0	0	0
105:	0	0	0	0	0	1	0
113:	0	0	0	0	0	0	0
121:	0	0	0	0	0	2	0
129:	0	0	0	0	0	0	0
137:	0	0	0	0	0	0	0
145:	1	0	0	0	0	0	0
153:	0	0	0	0	0	0	0
161:	0	1	0	1	0	0	0
169:	0	0	0	0	0	0	0
177:	0	0	0	0	0	0	0
185:	0	0	0	0	0	0	0
193:	0	0	0	0	0	0	0
201:	0	0	1	0	0	0	0
209:	0	0	0	0	0	0	0
217:	1	0	0	0	0	0	1
225:	0	0	1	0	0	0	0
233:	0	0	0	1	0	1	0
241:	0	0	0	0	0	0	1
249:	0	0	0	0	0	0	0
257:	0	0	0	0	1	0	1
265:	0	0	1	0	0	0	0
273:	0	0	0	0	0	0	0
281:	1	1	0	0	0	0	0
289:	0	0	0	0	0	0	0
297:	0	0	0	0	0	0	0
305:	0	0	0	0	0	0	0
313:	0	0	0	0	0	0	0
321:	0	0	0	0	0	0	0
329:	0	0	0	0	0	0	0
337:	0	0	0	0	0	0	0
345:	0	0	0	0	0	0	0
353:	0	0	0	0	0	0	1
361:	0	0	0	0	0	0	0

369:	0	0	0	0	0	0	0	0

Sample Title: 10

Channel								
377:	0	0	0	0	0	0	0	0
385:	0	0	0	0	1	0	0	0
393:	0	0	0	0	0	0	0	0
401:	0	0	0	0	0	0	0	0
409:	0	0	0	0	1	1	0	0
417:	1	1	0	0	1	0	0	1
425:	0	1	2	0	0	0	0	0
433:	0	0	0	1	0	0	0	0
441:	1	0	0	0	0	0	0	0
449:	0	0	0	0	0	0	0	0
457:	0	0	0	0	0	0	0	0
465:	0	0	0	0	1	0	0	0
473:	0	0	0	0	0	0	0	0
481:	0	1	0	0	1	0	0	0
489:	0	0	0	0	0	0	0	0
497:	1	0	0	0	0	1	0	0
505:	0	0	0	0	0	0	0	0
513:	0	0	0	0	0	0	1	0
521:	0	0	0	0	0	0	0	0
529:	0	0	0	0	0	0	0	0
537:	0	0	0	0	0	0	0	0
545:	0	0	0	0	0	0	0	0
553:	0	0	0	0	0	0	0	0
561:	0	0	0	0	0	0	0	0
569:	0	0	0	1	0	0	0	0
577:	0	0	0	0	0	0	1	0
585:	0	0	0	0	0	0	0	0
593:	1	0	0	0	0	0	0	0
601:	0	0	0	0	0	0	0	1
609:	0	0	0	0	0	0	0	0
617:	1	0	0	0	0	0	0	1
625:	0	0	0	0	0	0	0	0
633:	0	0	0	0	0	0	0	0
641:	0	0	0	0	0	0	0	0
649:	0	0	1	0	0	0	0	0
657:	1	0	0	0	0	0	0	0
665:	0	0	0	0	0	0	0	0
673:	0	0	0	0	0	1	0	0
681:	0	0	0	0	0	0	0	0
689:	0	0	0	0	0	0	0	0
697:	0	1	0	0	0	0	2	0
705:	0	0	0	0	0	0	0	0
713:	0	0	0	0	0	0	0	0
721:	0	0	0	1	0	0	0	0
729:	0	0	0	0	0	0	1	0
737:	0	0	0	0	0	0	1	0
745:	0	0	0	0	0	0	0	0
753:	0	0	0	0	0	0	0	0
761:	0	0	0	0	0	0	0	1
769:	0	0	0	0	0	0	0	0
777:	0	0	0	1	0	0	0	0
785:	0	0	0	0	0	0	0	0
793:	0	0	0	0	0	0	0	0

801:	0	0	0	0	0	0	1	0

Sample Title: 10

Channel								
809:	1	0	0	0	1	0	0	0
817:	0	0	0	0	0	0	0	0
825:	0	0	0	0	0	0	0	0
833:	0	1	0	0	0	0	0	0
841:	0	0	0	1	0	0	0	0
849:	0	0	0	0	0	0	0	0
857:	0	0	0	0	0	0	0	0
865:	0	0	0	0	0	0	0	0
873:	0	0	0	0	0	0	0	0
881:	0	0	0	0	0	0	0	0
889:	0	0	0	0	0	0	0	0
897:	0	0	0	0	0	0	0	0
905:	1	0	0	0	0	0	0	0
913:	0	0	0	0	0	0	0	0
921:	0	0	0	0	0	0	0	0
929:	0	0	0	0	0	0	0	0
937:	0	0	0	0	0	0	0	0
945:	0	0	0	0	0	0	0	0
953:	0	0	0	0	0	0	0	0
961:	0	0	0	0	0	0	0	0
969:	0	0	0	0	0	0	0	0
977:	0	0	0	0	0	0	0	0
985:	0	0	0	0	0	0	0	0
993:	0	0	0	0	0	0	0	0
1001:	0	0	0	0	0	0	0	0
1009:	0	0	0	0	0	0	0	0
1017:	0	0	0	0	0	0	0	0

8/12/2013 6:43:21 AM

Apex-Alpha™

QA SUMMARY REPORT

Review Of QA Results - Pulser Check

Date : 8/12/2013
Time : 6:43:21 AM

CHAMBER	DEVICE	PARAMETER	FLAG	DATE
Alpha_001	21f	ALL	Not Done	
Alpha_002	21f	ALL	Not Done	
Alpha_003	21f	ALL	Passed	8/12/2013 5:20:50 AM
Alpha_004	21f	ALL	Passed	8/12/2013 5:20:50 AM
Alpha_005	21f	ALL	Not Done	
Alpha_006	21f	ALL	Not Done	
Alpha_007	21f	ALL	Not Done	
Alpha_008	21f	ALL	Not Done	
Alpha_009	21f	ALL	Not Done	
Alpha_010	21f	ALL	Passed	8/12/2013 5:20:51 AM
Alpha_011	21f	ALL	Passed	8/12/2013 5:20:52 AM
Alpha_012	21f	ALL	Passed	8/12/2013 5:20:53 AM
Alpha_013	21f	ALL	Passed	8/12/2013 5:20:53 AM
Alpha_014	21f	ALL	Passed	8/12/2013 5:20:54 AM
Alpha_015	21f	Peak Energy	Action	8/12/2013 5:20:55 AM
Alpha_016	21f	ALL	Not Done	
Alpha_017	AIM730	ALL	Not Done	
Alpha_018	AIM730	ALL	Passed	8/10/2013 11:23:01 AM
Alpha_019	AIM730	ALL	Passed	8/12/2013 5:20:55 AM
Alpha_020	AIM730	ALL	Not Done	
Alpha_021	AIM730	ALL	Not Done	
Alpha_022	AIM730	ALL	Passed	8/12/2013 5:20:56 AM
Alpha_023	AIM730	ALL	Passed	8/12/2013 5:20:57 AM
Alpha_024	AIM730	ALL	Passed	8/12/2013 5:20:57 AM
Alpha_025	AIM730	ALL	Passed	8/12/2013 5:20:58 AM
Alpha_026	AIM730	ALL	Not Done	
Alpha_027	AIM730	ALL	Passed	8/12/2013 5:20:59 AM
Alpha_028	AIM730	ALL	Not Done	
Alpha_029	AIM730	ALL	Passed	8/12/2013 5:20:59 AM
Alpha_030	AIM730	ALL	Not Done	
Alpha_031	AIM730	ALL	Passed	8/12/2013 5:21:00 AM
Alpha_032	AIM730	ALL	Not Done	
Alpha_033	Alpha Analyst100DC	Peak CPS	Action	8/12/2013 5:21:01 AM
Alpha_034	Alpha Analyst100DC	Peak CPS	Action	8/12/2013 5:21:02 AM
Alpha_035	Alpha Analyst100DC	Peak CPS	Action	8/9/2013 5:06:44 AM
Alpha_036	Alpha Analyst100DC	Peak FWHM	Action	8/12/2013 5:21:05 AM
Alpha_036	Alpha Analyst100DC	Peak CPS	Action	8/12/2013 5:21:05 AM
Alpha_037	Alpha Analyst100DC	ALL	Passed	8/12/2013 5:21:06 AM
Alpha_038	Alpha Analyst100DC	ALL	Passed	8/12/2013 5:21:09 AM
Alpha_039	Alpha Analyst100DC	ALL	Passed	8/12/2013 5:21:10 AM
Alpha_040	Alpha Analyst100DC	ALL	Passed	8/12/2013 5:21:12 AM
Alpha_041	Alpha Analyst100DC	ALL	Passed	8/12/2013 5:22:26 AM

Review of QA Results - Pulser Check

8/12/2013 6:43:21 AM

CHAMBER	DEVICE	PARAMETER	FLAG	DATE
Alpha_042	Alpha Analyst100DC	ALL	Passed	8/12/2013 5:21:15 AM
Alpha_043	Alpha Analyst100DC	ALL	Passed	8/12/2013 5:22:23 AM
Alpha_044	Alpha Analyst100DC	ALL	Passed	8/12/2013 5:22:22 AM
Alpha_045	Alpha Analyst100DC	ALL	Passed	8/12/2013 5:21:19 AM
Alpha_046	Alpha Analyst100DC	ALL	Passed	8/12/2013 5:21:21 AM
Alpha_047	Alpha Analyst100DC	ALL	Passed	8/12/2013 5:21:22 AM
Alpha_048	Alpha Analyst100DC	ALL	Passed	8/12/2013 5:21:24 AM

APPROVED BY: _____

APPROVAL DATE: 8/12

****
***** L I B R A R Y L I S T I N G R E P O R T *****
****

Nuclide Library Title: Radium

Nuclide Library Description: Ra-226, Po-218, Rn-222

Nuclide Name	Half-Life (Seconds)	Energy (keV)	Energy Uncert. (keV)	Yield (%)	Yield Uncert.(Abs.+-)
PO-218	5.049E+010	6003.000*	0.000	99.9800	0.0000
RN-222	5.049E+010	5490.000*	0.000	99.9200	0.0000
RA-226	5.049E+010	4785.000*	0.000	100.0000	0.0000

* = key line

TOTALS: 3 Nuclides 3 Energy Lines

SECTION XI

ANALYTICAL DATA (RADIUM-228)

Work Order	13-07170
Analysis Code	Ra228
Run	1
Date Received	7/29/2013
Lab Deadline	8/16/2013
Client	Engineering Management Support, Inc.
Project	West Lake OU-1
Report Level	4
Activity Units	pCi
Aliquot Units	l
Matrix	WA
Method	E904.0
Instrument Type	Alpha/Beta GPC
Radiometric Tracer	Ba-133
Radiometric Sol#	Ba-6a
Tracer Act (dpm/g)	990.043
Carrier	Yttirum
Carrier Conc (mg/ml)	34

Internal Fraction	Sample Desc	Client ID	Login CPM	Sample Date	Sample Aliquot
01	LCS	LCS		07/29/13 00:00	1.0000E+00
02	MBL	BLANK		07/29/13 00:00	1.0000E+00
03	DUP	PURGE TANK TOT	39	07/23/13 06:40	1.0000E+00
04	TRG	PZ-305-AI TOT	45	07/22/13 10:41	1.0000E+00
05	TRG	PZ-305-AI DIS	45	07/22/13 10:41	1.0000E+00
06	TRG	LR-104 TOT	43	07/22/13 11:45	1.0000E+00
07	TRG	LR-104 DIS	43	07/22/13 11:45	1.0000E+00
08	TRG	PZ-100-KS TOT	40	07/23/13 07:45	1.0000E+00
09	TRG	PZ-100-KS DIS	40	07/23/13 07:45	1.0000E+00
10	DO	PURGE TANK TOT	39	07/23/13 06:40	1.0000E+00

* SAF1 is used for Gross Alpha and all other radionuclides. SAF2 is used for Gross Beta only. ** Actual mass exceeded the calibration curve range. Results should be qualified as appropriate.

13-07170
Ra228
Run 1

Internal Fraction	Sample Desc	Tracer Aliquot (g)	Tracer Total ACT (dpm)	Radiometric Tracer (pCi)	Radiometric % Rec	Grav Carrier Added (ml)	Grav Filter Tare (g)	Grav Filter Final (g)	Grav Filter Net (g)	Grav % Rec	Mean % Rec	SAF 1*	SAF 2*
01	LCS	0.9197	910.5	386.5	94.23	2.000	0.0957	0.1529	0.0572	84.12	79.27	1.00	1.00
02	MBL	0.9123	903.2	357.0	87.75	2.000	0.0954	0.1497	0.0543	79.85	70.07	1.00	1.00
03	DUP	0.9050	896.0	322.0	79.78	2.000	0.0956	0.1498	0.0542	79.71	63.59	1.00	1.00
04	TRG	0.9043	895.3	356.5	88.40	2.000	0.0954	0.1512	0.0558	82.06	72.54	1.00	1.00
05	TRG	0.9055	896.5	359.5	89.02	2.000	0.0953	0.1499	0.0546	80.29	71.48	1.00	1.00
06	TRG	0.9057	896.7	378.8	93.78	2.000	0.0963	0.1536	0.0573	84.26	79.03	1.00	1.00
07	TRG	0.9013	892.3	429.1	106.75	2.000	0.0962	0.1521	0.0559	82.21	87.76	1.00	1.00
08	TRG	0.9072	898.2	389.5	96.27	2.000	0.0959	0.1506	0.0547	80.44	77.44	1.00	1.00
09	TRG	0.9093	900.2	365.9	90.23	2.000	0.0960	0.1515	0.0555	81.62	73.64	1.00	1.00
10	DO	0.9075	898.5	337.1	83.29	2.000	0.0957	0.1519	0.0562	82.65	68.84	1.00	1.00

1026

* SAF1 is used for Gross Alpha and all other radionuclides. SAF2 is used for Gross Beta only. ** Actual mass exceeded the calibration curve range. Results should be qualified as appropriate.

Internal Fraction	Sample Desc	Rough Prep Date	Rough Prep By	Prep Date	Prep By	Sep t0 Date/Time	Sep t0 By	Sep t1 Date/Time	Sep t1 By
01	LCS			08/08/13 11:23	JWOLFE	08/09/13 18:09	LWALKER	08/19/13 06:26	TSMITH
02	MBL			08/08/13 11:23	JWOLFE	08/09/13 18:09	LWALKER	08/19/13 06:26	TSMITH
03	DUP			08/08/13 11:23	JWOLFE	08/09/13 18:09	LWALKER	08/19/13 06:26	TSMITH
04	TRG			08/08/13 11:23	JWOLFE	08/09/13 18:09	LWALKER	08/19/13 06:26	TSMITH
05	TRG			08/08/13 11:23	JWOLFE	08/09/13 18:09	LWALKER	08/19/13 06:26	TSMITH
06	TRG			08/08/13 11:23	JWOLFE	08/09/13 18:09	LWALKER	08/19/13 06:26	TSMITH
07	TRG			08/08/13 11:23	JWOLFE	08/09/13 18:09	LWALKER	08/19/13 06:26	TSMITH
08	TRG			08/08/13 11:23	JWOLFE	08/09/13 18:09	LWALKER	08/19/13 06:26	TSMITH
09	TRG			08/08/13 11:23	JWOLFE	08/09/13 18:09	LWALKER	08/19/13 06:26	TSMITH
10	DO			08/08/13 11:23	JWOLFE	08/09/13 18:09	LWALKER	08/19/13 06:26	TSMITH

* SAF1 is used for Gross Alpha and all other radionuclides. SAF2 is used for Gross Beta only. ** Actual mass exceeded the calibration curve range. Results should be qualified as appropriate.

Preliminary Data Report & Analytical Calculations

Work Order: 13-07170-Ra228-1

Run: 1
Analysis Code: Ra228
Eberline Services Work Order: 13-07170
Client: Engineering Management Support, Inc.

Lab Fraction	Nuclide	Sample Desc	Client Identification	Activity Units	Results	Error Estimate	MDA	LCS Known	LCS %R	LCS Flag	RPD Flag	MDA Flag	Blank Flag
01	RA-228	LCS	LCS	pCi/l	8.42E+00	9.25E-01	1.18E+00	8.74E+00	96.29	OK		OK	
02	RA-228	MBL	BLANK	pCi/l	5.73E-01	6.30E-01	1.28E+00					OK	OK
03	RA-228	DUP	PURGE TANK TOT	pCi/l	8.72E-01	7.38E-01	1.48E+00				NA	OK	
04	RA-228	TRG	PZ-305-AI TOT	pCi/l	1.19E+00	6.92E-01	1.34E+00					OK	
05	RA-228	TRG	PZ-305-AI DIS	pCi/l	1.51E+00	6.62E-01	1.23E+00					OK	
06	RA-228	TRG	LR-104 TOT	pCi/l	1.57E+00	6.69E-01	1.25E+00					OK	
07	RA-228	TRG	LR-104 DIS	pCi/l	9.44E-01	5.72E-01	1.12E+00					OK	
08	RA-228	TRG	PZ-100-KS TOT	pCi/l	1.94E-01	6.39E-01	1.34E+00					OK	
09	RA-228	TRG	PZ-100-KS DIS	pCi/l	1.11E+00	6.65E-01	1.29E+00					OK	
10	RA-228	DO	PURGE TANK TOT	pCi/l	1.56E+00	8.32E-01	1.61E+00					OK	

Preliminary Data Report & Analytical Calculations

Work Order: 13-07170-Ra228-1

Run: 1
Analysis Code: Ra228
Eberline Services Work Order: 13-07170
Client: Engineering Management Support, Inc.

Lab Fraction	Nuclide	Sample Desc	Sample Date	Sample Aliquot	Radiometric % Rec	Grav % Rec	Mean % Rec	SAF	Sep t0 Date/Time	Sep t1 Date/Time
01	RA-228	LCS	07/29/13 00:00	1.00E+00	94.23	84.12	79.27	1.00	8/9/2013 18:09	8/19/2013 6:26
02	RA-228	MBL	07/29/13 00:00	1.00E+00	87.75	79.85	70.07	1.00	8/9/2013 18:09	8/19/2013 6:26
03	RA-228	DUP	07/23/13 06:40	1.00E+00	79.78	79.71	63.59	1.00	8/9/2013 18:09	8/19/2013 6:26
04	RA-228	TRG	07/22/13 10:41	1.00E+00	88.40	82.06	72.54	1.00	8/9/2013 18:09	8/19/2013 6:26
05	RA-228	TRG	07/22/13 10:41	1.00E+00	89.02	80.29	71.48	1.00	8/9/2013 18:09	8/19/2013 6:26
06	RA-228	TRG	07/22/13 11:45	1.00E+00	93.78	84.26	79.03	1.00	8/9/2013 18:09	8/19/2013 6:26
07	RA-228	TRG	07/22/13 11:45	1.00E+00	106.75	82.21	87.76	1.00	8/9/2013 18:09	8/19/2013 6:26
08	RA-228	TRG	07/23/13 07:45	1.00E+00	96.27	80.44	77.44	1.00	8/9/2013 18:09	8/19/2013 6:26
09	RA-228	TRG	07/23/13 07:45	1.00E+00	90.23	81.62	73.64	1.00	8/9/2013 18:09	8/19/2013 6:26
10	RA-228	DO	07/23/13 06:40	1.00E+00	83.29	82.65	68.84	1.00	8/9/2013 18:09	8/19/2013 6:26

Client: Engineering Management Support, Inc.
Eberline Services Work Order: 13-07170
Analysis Code: Ra228
Run: 1

Lab Fraction	Nuclide	Sample Desc	Counting Date/Time	Halflife (days)	Detect	Carrier	Count Time	Counts	Bkg CPM	Eff
01	RA-228	LCS	08/19/13 10:16		LB4110R	A1	120	622	1.1	0.4776
02	RA-228	MBL	08/19/13 10:16		LB4110R	A2	120	147	0.983333333	0.4699
03	RA-228	DUP	08/19/13 10:16		LB4110R	A3	120	177	1.133333333	0.4809
04	RA-228	TRG	08/19/13 10:16		LB4110R	A4	120	205	1.183333333	0.4732
05	RA-228	TRG	08/19/13 10:16		LB4110R	B1	120	195	0.966666667	0.4754
06	RA-228	TRG	08/19/13 10:16		LB4110R	B2	120	231	1.183333333	0.4658
07	RA-228	TRG	08/19/13 10:16		LB4110R	B3	120	202	1.183333333	0.4713
08	RA-228	TRG	08/19/13 10:16		LB4110R	B4	120	177	1.383333333	0.4773
09	RA-228	TRG	08/19/13 10:16		LB4110R	C1	120	193	1.116666667	0.4705
10	RA-228	DO	08/19/13 10:16		LB4110R	C2	120	259	1.516666667	0.4676

Count Room Report
Client: Engineering Management Su

13-07170-Ra228-1 (pCi/l) in WA
Tracer ID: Ba-6a

Internal Fraction	Sample Desc	Client ID	Sample Date	Sample Aliquot	Tracer Aliquot (g)	Tracer ACT (dpm)	Radiometric Tracer (pCi)	Radiometric % Rec	SAF 1*	SAF 2*
01	LCS	LCS	07/29/13 00:00	1.0000	0.9197	910.5425	386.5000	94.23	1.00	1.00
02	MBL	BLANK	07/29/13 00:00	1.0000	0.9123	903.2162	357.0000	87.75	1.00	1.00
03	DUP	PURGE TANK TOT	07/23/13 06:40	1.0000	0.9050	895.9889	322.0000	79.78	1.00	1.00
04	TRG	PZ-305-AI TOT	07/22/13 10:41	1.0000	0.9043	895.2959	356.5000	88.40	1.00	1.00
05	TRG	PZ-305-AI DIS	07/22/13 10:41	1.0000	0.9055	896.4839	359.5000	89.02	1.00	1.00
06	TRG	LR-104 TOT	07/22/13 11:45	1.0000	0.9057	896.6819	378.8000	93.78	1.00	1.00
07	TRG	LR-104 DIS	07/22/13 11:45	1.0000	0.9013	892.3258	429.1000	106.75	1.00	1.00
08	TRG	PZ-100-KS TOT	07/23/13 07:45	1.0000	0.9072	898.1670	389.5000	96.27	1.00	1.00
09	TRG	PZ-100-KS DIS	07/23/13 07:45	1.0000	0.9093	900.2461	365.9000	90.23	1.00	1.00
10	DO	PURGE TANK TOT	07/23/13 06:40	1.0000	0.9075	898.4640	337.1000	83.29	1.00	1.00

Spike and Tracer Worksheet

Internal Work Order	Run	Analysis Code	Date	Technician	Technician Initials	Witness Initials
13-07170	1	Ra228	8/8/2013 11:22	JWOLFE		

LCS & Matrix Spikes					LCS	MS	LCSD	MSD	LCS		MS		LCSD		MSD	
Isotope	*Sol #*	*Activity dpm/g*	*Solution Date*	*Approx Addition*	*Volume Used (g)*	*Volume Used (g)*	*Volume Used (g)*	*Volume Used (g)*	*Known pCi*	*Error Estimate*	*Added pCi*	*Error Estimate*	*Known pCi*	*Error Estimate*	*Added pCi*	*Error Estimate*
Ra-228	Ra-11	37.615	8/8/2013	0.530	0.5160				8.74	0.446	0.00	0.000	0.00	0.000	0.00	0.000

Tracers						
fraction	*Isotope*	*Sol #*	*Activity dpm/g*	*Solution Date*	*Volume Used (g)*	*Approx Addition*
01	Ba-133	Ba-6a	990.043	8/8/2013	0.9197	1.0200
02	Ba-133	Ba-6a	990.043	8/8/2013	0.9123	1.0200
03	Ba-133	Ba-6a	990.043	8/8/2013	0.9050	1.0200
04	Ba-133	Ba-6a	990.043	8/8/2013	0.9043	1.0200
05	Ba-133	Ba-6a	990.043	8/8/2013	0.9055	1.0200
06	Ba-133	Ba-6a	990.043	8/8/2013	0.9057	1.0200
07	Ba-133	Ba-6a	990.043	8/8/2013	0.9013	1.0200
08	Ba-133	Ba-6a	990.043	8/8/2013	0.9072	1.0200
09	Ba-133	Ba-6a	990.043	8/8/2013	0.9093	1.0200
10	Ba-133	Ba-6a	990.043	8/8/2013	0.9075	1.0200

Balance Printer Tapes

Tracer

LCS

Matrix Spike

Eberline Analytical
Oak Ridge Laboratory

Aliquot Worksheet

Printed: 8/8/2013 11:23 AM

Work Order	Run	Analysis Code	Rpt Units	Lab Deadline	Technician
13-07170	1	Ra228	liters	8/16/2013	JWOLFE

Lab Fraction	Engineering Management Support, Inc. Client ID	Sample Type	Muffle Data	Dilution Data			Aliquot Data		MS Aliquot Data		H-3 Solids Only	
			Ratio Post/Pre	No of Dils	Dil Factor	Ratio	Aliquot	Net Equiv	Aliquot	Net Equiv	Water Added (ml)	H3 Dist Aliq
01	LCS	LCS					1.0000E+00	1.0000E+00				
02	BLANK	MBL					1.0000E+00	1.0000E+00				
03	PURGE TANK TOT	DUP					1.0000E+00	1.0000E+00				
04	PZ-305-AI TOT	TRG					1.0000E+00	1.0000E+00				
05	PZ-305-AI DIS	TRG					1.0000E+00	1.0000E+00				
06	LR-104 TOT	TRG					1.0000E+00	1.0000E+00				
07	LR-104 DIS	TRG					1.0000E+00	1.0000E+00				
08	PZ-100-KS TOT	TRG					1.0000E+00	1.0000E+00				
09	PZ-100-KS DIS	TRG					1.0000E+00	1.0000E+00				
10	PURGE TANK TOT	DO					1.0000E+00	1.0000E+00				

Comments	

Technician: JWolfe Date: 8/8/13

Eberline Services - Oak Ridge
Version 1.0 9/1999

Gravimetric Worksheet

Printed: 8/19/2013 9:41 AM

Work Order	Run	Analysis Code	Gravimetric Carrier	Carrier Conc (mg/ml)	Technician
13-07170	1	Ra228	Yttirum	34.0000	TSMITH

TRetec	Engineering Management Support, Inc.	Sample	Carrier Data	Filter Data			Gravimetric
Fraction	Client ID	Type	Carrier Added (ml)	Filter Tare (g)	Filter Final (g)	Filter Net (g)	% Recovery
01	LCS	LCS	2.0000	0.0957	0.1529	0.0572	84.12
02	BLANK	MBL	2.0000	0.0954	0.1497	0.0543	79.85
03	DUP	DUP	2.0000	0.0956	0.1498	0.0542	79.71
04	PZ-305-AI TOT	TRG	2.0000	0.0954	0.1512	0.0558	82.06
05	PZ-305-AI DIS	TRG	2.0000	0.0953	0.1499	0.0546	80.29
06	LR-104 TOT	TRG	2.0000	0.0963	0.1536	0.0573	84.26
07	LR-104 DIS	TRG	2.0000	0.0962	0.1521	0.0559	82.21
08	PZ-100-KS TOT	TRG	2.0000	0.0959	0.1506	0.0547	80.44
09	PZ-100-KS DIS	TRG	2.0000	0.0960	0.1515	0.0555	81.62
10	PURGE TANK TOT	DO	2.0000	0.0957	0.1519	0.0562	82.65

Technician: _____ Date: 8/19/13

R 8/19/13 ICB

Detector ID	Sample ID	Alpha	Beta	Count Time	Voltage	TOD
C1	1307170-09	5	193	120	1400	8/19/13 12:16
C2	1307170-10	15	259	120	1400	8/19/13 12:16
A1	1307170-01	12	622	120	1400	8/19/13 12:16
A2	1307170-02	9	147	120	1400	8/19/13 12:16
A3	1307170-03	13	177	120	1400	8/19/13 12:16
A4	1307170-04	17	205	120	1400	8/19/13 12:16
B1	1307170-05	13	195	120	1400	8/19/13 12:16
B2	1307170-06	11	231	120	1400	8/19/13 12:16
B3	1307170-07	14	202	120	1400	8/19/13 12:16
B4	1307170-08	13	177	120	1400	8/19/13 12:16

GPC Detector Report
(ALL Backgrounds)

C
8/19/13

Detector	Alpha/Beta	Calibration Date	Count Date	Bkg CPM	PFW	LCL	Mean	UCL
LB4110A - A1	Alpha	11/18/2007	8/19/2013	5.00E-02	P	-2.13E+01	2.81E-01	2.18E+01
LB4110A - A2	Alpha	11/18/2007	8/19/2013	5.00E-02	P	-1.81E+01	2.53E-01	1.86E+01
LB4110A - A3	Alpha	11/18/2007	8/19/2013	3.33E-02	P	-1.76E+01	2.16E-01	1.80E+01
LB4110A - A4	Alpha	11/18/2007	8/19/2013	0.00E+00	P	-1.87E+01	2.36E-01	1.91E+01
LB4110A - B1	Alpha	11/18/2007	8/19/2013	5.00E-02	P	-9.67E-02	7.51E-02	2.47E-01
LB4110A - B2	Alpha	11/18/2007	8/19/2013	1.67E-02	P	-7.81E-02	7.20E-02	2.22E-01
LB4110A - B3	Alpha	11/18/2007	8/19/2013	3.33E-02	P	-6.28E-02	5.34E-02	1.70E-01
LB4110A - B4	Alpha	11/18/2007	8/19/2013	1.00E-01	P	-1.40E-01	7.88E-02	2.97E-01
LB4110A - C1	Alpha	11/18/2007	8/19/2013	6.67E-02	P	-1.49E-01	8.85E-02	3.26E-01
LB4110A - C2	Alpha	11/18/2007	8/19/2013	0.00E+00	P	-1.77E-01	8.64E-02	3.50E-01
LB4110A - C3	Alpha	11/18/2007	8/19/2013	1.67E-02	P	-1.72E-01	1.00E-01	3.72E-01
LB4110A - C4	Alpha	11/18/2007	8/19/2013	3.33E-02	P	-6.26E-02	6.82E-02	1.99E-01
LB4110A - D1	Alpha	11/18/2007	8/19/2013	3.33E-02	P	-5.37E-02	8.31E-02	2.20E-01
LB4110A - D2	Alpha	11/18/2007	8/19/2013	3.33E-02	P	-7.01E-02	6.06E-02	1.91E-01
LB4110A - D3	Alpha	11/18/2007	8/19/2013	1.67E-02	P	-4.89E-02	7.05E-02	1.90E-01
LB4110A - D4	Alpha	11/18/2007	8/19/2013	5.00E-02	P	-5.71E-02	7.03E-02	1.98E-01
LB4110R - A1	Alpha	11/24/2006	8/19/2013	1.33E-01	P	-9.81E-02	1.01E-01	3.00E-01
LB4110R - A2	Alpha	11/24/2006	8/19/2013	5.00E-02	P	-8.91E-02	7.63E-02	2.42E-01
LB4110R - A3	Alpha	11/24/2006	8/19/2013	1.67E-02	P	-7.31E-02	7.73E-02	2.28E-01
LB4110R - A4	Alpha	11/24/2006	8/19/2013	1.67E-02	P	-5.27E-02	7.08E-02	1.94E-01
LB4110R - B1	Alpha	11/24/2006	8/19/2013	6.67E-02	P	-9.41E-02	6.15E-02	2.17E-01
LB4110R - B2	Alpha	11/24/2006	8/19/2013	5.00E-02	P	-6.93E-02	6.33E-02	1.96E-01
LB4110R - B3	Alpha	11/24/2006	8/19/2013	6.67E-02	P	-6.48E-02	6.99E-02	2.05E-01
LB4110R - B4	Alpha	11/24/2006	8/19/2013	6.67E-02	P	-6.37E-02	7.02E-02	2.04E-01
LB4110R - C1	Alpha	11/24/2006	8/19/2013	5.00E-02	P	-7.67E-02	7.35E-02	2.24E-01
LB4110R - C2	Alpha	11/24/2006	8/19/2013	1.67E-02	P	-7.55E-02	7.09E-02	2.17E-01
LB4110R - C3	Alpha	11/24/2006	8/19/2013	6.67E-02	P	-8.78E-02	8.43E-02	2.56E-01
LB4110R - C4	Alpha	11/24/2006	8/19/2013	1.00E-01	P	-6.17E-02	8.12E-02	2.24E-01
LB4110R - D1	Alpha	11/24/2006	8/19/2013	0.00E+00	P	-1.03E-01	7.00E-02	2.43E-01
LB4110R - D2	Alpha	11/24/2006	8/19/2013	0.00E+00	P	-7.81E-02	6.94E-02	2.17E-01
LB4110R - D3	Alpha	11/24/2006	8/19/2013	0.00E+00	P	-8.31E-02	6.92E-02	2.22E-01
LB4110R - D4	Alpha	11/24/2006	8/19/2013	0.00E+00	P	-7.55E-02	7.40E-02	2.23E-01
LB5100 - 1	Alpha	7/10/2006	10/26/2007	5.00E-02	P	-1.56E-02	9.58E-02	2.07E-01

GPC Detector Report
(ALL Backgrounds)

C
8/15/17

Detector	Alpha/Beta	Calibration Date	Count Date	Bkg CPM	PFW	LCL	Mean	UCL
LB4110A - A1	Beta	11/18/2007	8/19/2013	6.65E+00	P	-2.88E+02	7.63E+00	3.04E+02
LB4110A - A2	Beta	11/18/2007	8/19/2013	3.38E+00	P	-3.03E+01	2.60E+00	3.54E+01
LB4110A - A3	Beta	11/18/2007	8/19/2013	1.50E+00	P	-5.00E+01	2.62E+00	5.53E+01
LB4110A - A4	Beta	11/18/2007	8/19/2013	7.17E+00	P	-3.23E+01	3.23E+00	3.88E+01
LB4110A - B1	Beta	11/18/2007	8/19/2013	1.57E+00	P	-1.04E+01	3.22E+00	1.68E+01
LB4110A - B2	Beta	11/18/2007	8/19/2013	1.30E+00	P	-7.61E+00	1.99E+00	1.16E+01
LB4110A - B3	Beta	11/18/2007	8/19/2013	1.15E+00	P	1.17E-01	1.36E+00	2.60E+00
LB4110A - B4	Beta	11/18/2007	8/19/2013	1.02E+00	P	-7.60E+00	1.97E+00	1.15E+01
LB4110A - C1	Beta	11/18/2007	8/19/2013	9.67E-01	P	-5.37E+00	2.11E+00	9.60E+00
LB4110A - C2	Beta	11/18/2007	8/19/2013	9.33E-01	P	3.81E-01	1.26E+00	2.15E+00
LB4110A - C3	Beta	11/18/2007	8/19/2013	9.00E-01	P	4.70E-01	1.46E+00	2.45E+00
LB4110A - C4	Beta	11/18/2007	8/19/2013	9.50E-01	P	-1.75E+00	2.09E+00	5.94E+00
LB4110A - D1	Beta	11/18/2007	8/19/2013	1.85E+00	P	-2.30E+00	2.56E+00	7.42E+00
LB4110A - D2	Beta	11/18/2007	8/19/2013	1.30E+00	P	-6.37E-01	1.56E+00	3.75E+00
LB4110A - D3	Beta	11/18/2007	8/19/2013	4.20E+00	P	1.29E+00	4.47E+00	7.65E+00
LB4110A - D4	Beta	11/18/2007	8/19/2013	1.28E+00	P	-4.20E-01	1.37E+00	3.16E+00
LB4110R - A1	Beta	11/24/2006	8/19/2013	1.10E+00	P	-6.07E+01	3.66E+00	6.81E+01
LB4110R - A2	Beta	11/24/2006	8/19/2013	9.83E-01	P	-4.82E+01	2.01E+00	5.23E+01
LB4110R - A3	Beta	11/24/2006	8/19/2013	1.13E+00	P	-4.47E+01	2.73E+00	5.01E+01
LB4110R - A4	Beta	11/24/2006	8/19/2013	1.18E+00	P	-4.45E+01	1.99E+00	4.85E+01
LB4110R - B1	Beta	11/24/2006	8/19/2013	9.67E-01	P	-4.69E+01	2.02E+00	5.09E+01
LB4110R - B2	Beta	11/24/2006	8/19/2013	1.18E+00	P	-4.68E+01	2.04E+00	5.09E+01
LB4110R - B3	Beta	11/24/2006	8/19/2013	1.18E+00	P	-4.66E+01	2.64E+00	5.19E+01
LB4110R - B4	Beta	11/24/2006	8/19/2013	1.38E+00	P	-4.70E+01	1.92E+00	5.08E+01
LB4110R - C1	Beta	11/24/2006	8/19/2013	1.12E+00	P	-4.68E+01	2.96E+00	5.27E+01
LB4110R - C2	Beta	11/24/2006	8/19/2013	1.52E+00	P	-4.67E+01	2.71E+00	5.21E+01
LB4110R - C3	Beta	11/24/2006	8/19/2013	1.83E+00	P	-4.72E+01	2.51E+00	5.22E+01
LB4110R - C4	Beta	11/24/2006	8/19/2013	2.08E+00	P	-5.33E+01	2.94E+00	5.91E+01
LB4110R - D1	Beta	11/24/2006	8/19/2013	0.00E+00	P	-4.44E+01	5.54E+00	5.55E+01
LB4110R - D2	Beta	11/24/2006	8/19/2013	0.00E+00	P	-4.77E+01	1.87E+00	5.14E+01
LB4110R - D3	Beta	11/24/2006	8/19/2013	0.00E+00	P	-5.11E+01	5.51E+00	6.21E+01
LB4110R - D4	Beta	11/24/2006	8/19/2013	0.00E+00	P	-4.74E+01	2.23E+00	5.19E+01
LB5100 - 1	Beta	7/10/2006	10/26/2007	4.52E+00	F	-3.19E-01	1.58E+00	3.48E+00

GPC Detector Report
(ALL Efficiencies)

C
8/19/13

Detector	Alpha/Beta	Calibration Date	Count Date	Eff	PFW	LCL	Mean	UCL
LB4110A - A1	Alpha	11/18/2007	8/19/2013	0.2471	P	-0.0123	0.2160	0.4444
LB4110A - A2	Alpha	11/18/2007	8/19/2013	0.2022	P	-0.0498	0.1743	0.3984
LB4110A - A3	Alpha	11/18/2007	8/19/2013	0.2052	P	-0.0731	0.1635	0.4002
LB4110A - A4	Alpha	11/18/2007	8/19/2013	0.2122	P	-0.0516	0.1822	0.4160
LB4110A - B1	Alpha	11/18/2007	8/19/2013	0.2198	P	0.1943	0.2243	0.2543
LB4110A - B2	Alpha	11/18/2007	8/19/2013	0.2113	P	0.1924	0.2213	0.2502
LB4110A - B3	Alpha	11/18/2007	8/19/2013	0.2381	P	0.1281	0.2323	0.3364
LB4110A - B4	Alpha	11/18/2007	8/19/2013	0.2332	P	0.2089	0.2363	0.2638
LB4110A - C1	Alpha	11/18/2007	8/19/2013	0.2076	P	0.1976	0.2207	0.2438
LB4110A - C2	Alpha	11/18/2007	8/19/2013	0.2169	P	0.1971	0.2252	0.2532
LB4110A - C3	Alpha	11/18/2007	8/19/2013	0.2398	P	0.2234	0.2494	0.2755
LB4110A - C4	Alpha	11/18/2007	8/19/2013	0.2174	P	0.1970	0.2256	0.2543
LB4110A - D1	Alpha	11/18/2007	8/19/2013	0.2227	P	0.2028	0.2328	0.2628
LB4110A - D2	Alpha	11/18/2007	8/19/2013	0.2515	P	0.2277	0.2580	0.2884
LB4110A - D3	Alpha	11/18/2007	8/19/2013	0.2549	P	0.2309	0.2633	0.2958
LB4110A - D4	Alpha	11/18/2007	8/19/2013	0.1857	P	0.1642	0.1992	0.2341
LB4110R - A1	Alpha	11/24/2006	8/19/2013	0.2313	P	0.1983	0.2385	0.2786
LB4110R - A2	Alpha	11/24/2006	8/19/2013	0.2100	P	0.1851	0.2201	0.2550
LB4110R - A3	Alpha	11/24/2006	8/19/2013	0.2134	P	0.1924	0.2243	0.2563
LB4110R - A4	Alpha	11/24/2006	8/19/2013	0.2421	P	0.2118	0.2453	0.2788
LB4110R - B1	Alpha	11/24/2006	8/19/2013	0.2241	P	0.1832	0.2257	0.2681
LB4110R - B2	Alpha	11/24/2006	8/19/2013	0.2052	P	0.1754	0.2169	0.2585
LB4110R - B3	Alpha	11/24/2006	8/19/2013	0.2430	P	0.2016	0.2438	0.2861
LB4110R - B4	Alpha	11/24/2006	8/19/2013	0.2182	P	0.1882	0.2312	0.2742
LB4110R - C1	Alpha	11/24/2006	8/19/2013	0.2116	P	0.1834	0.2150	0.2466
LB4110R - C2	Alpha	11/24/2006	8/19/2013	0.2160	P	0.1932	0.2245	0.2558
LB4110R - C3	Alpha	11/24/2006	8/19/2013	0.2354	P	0.2034	0.2394	0.2753
LB4110R - C4	Alpha	11/24/2006	8/19/2013	0.2113	P	0.1826	0.2222	0.2618
LB4110R - D1	Alpha	11/24/2006	8/19/2013	0.0000	F	0.0022	0.1989	0.3955
LB4110R - D2	Alpha	11/24/2006	8/19/2013	0.0000	F	0.0032	0.2261	0.4491
LB4110R - D3	Alpha	11/24/2006	8/19/2013	0.0000	F	0.0031	0.2221	0.4411
LB4110R - D4	Alpha	11/24/2006	8/19/2013	0.0000	F	0.0011	0.1790	0.3569
LB5100 - 1	Alpha	7/10/2006	10/26/2007	0.3368	P	0.3332	0.3455	0.3578

GPC Detector Report
(ALL Efficiencies)

8/19/13

Detector	Alpha/Beta	Calibration Date	Count Date	Eff	PFW	LCL	Mean	UCL
LB4110A - A1	Beta	11/18/2007	8/19/2013	0.5546	P	0.2118	0.5624	0.9131
LB4110A - A2	Beta	11/18/2007	8/19/2013	0.4894	P	0.1627	0.4649	0.7671
LB4110A - A3	Beta	11/18/2007	8/19/2013	0.4687	P	0.0909	0.4573	0.8237
LB4110A - A4	Beta	11/18/2007	8/19/2013	0.5090	P	0.1436	0.4893	0.8350
LB4110A - B1	Beta	11/18/2007	8/19/2013	0.5089	P	0.4633	0.5296	0.5960
LB4110A - B2	Beta	11/18/2007	8/19/2013	0.5155	P	0.4632	0.5268	0.5903
LB4110A - B3	Beta	11/18/2007	8/19/2013	0.5538	P	0.3173	0.5314	0.7455
LB4110A - B4	Beta	11/18/2007	8/19/2013	0.5446	P	0.4918	0.5538	0.6157
LB4110A - C1	Beta	11/18/2007	8/19/2013	0.4782	P	0.4510	0.5026	0.5541
LB4110A - C2	Beta	11/18/2007	8/19/2013	0.4834	P	0.4293	0.5010	0.5726
LB4110A - C3	Beta	11/18/2007	8/19/2013	0.5917	P	0.5292	0.5907	0.6522
LB4110A - C4	Beta	11/18/2007	8/19/2013	0.5147	P	0.4579	0.5247	0.5916
LB4110A - D1	Beta	11/18/2007	8/19/2013	0.5312	P	0.4783	0.5529	0.6274
LB4110A - D2	Beta	11/18/2007	8/19/2013	0.5623	P	0.4886	0.5870	0.6853
LB4110A - D3	Beta	11/18/2007	8/19/2013	0.5933	P	0.5375	0.6149	0.6922
LB4110A - D4	Beta	11/18/2007	8/19/2013	0.4330	P	0.3844	0.4717	0.5591
LB4110R - A1	Beta	11/24/2006	8/19/2013	0.5631	P	0.4744	0.5672	0.6600
LB4110R - A2	Beta	11/24/2006	8/19/2013	0.5021	P	0.4158	0.5085	0.6012
LB4110R - A3	Beta	11/24/2006	8/19/2013	0.5159	P	0.4503	0.5383	0.6264
LB4110R - A4	Beta	11/24/2006	8/19/2013	0.5918	P	0.5033	0.5914	0.6796
LB4110R - B1	Beta	11/24/2006	8/19/2013	0.5306	P	0.4464	0.5421	0.6379
LB4110R - B2	Beta	11/24/2006	8/19/2013	0.4886	P	0.4247	0.5195	0.6143
LB4110R - B3	Beta	11/24/2006	8/19/2013	0.6028	P	0.4940	0.5917	0.6894
LB4110R - B4	Beta	11/24/2006	8/19/2013	0.5258	P	0.4540	0.5489	0.6437
LB4110R - C1	Beta	11/24/2006	8/19/2013	0.4655	P	0.4159	0.5015	0.5871
LB4110R - C2	Beta	11/24/2006	8/19/2013	0.5147	P	0.4441	0.5283	0.6125
LB4110R - C3	Beta	11/24/2006	8/19/2013	0.5600	P	0.4755	0.5705	0.6655
LB4110R - C4	Beta	11/24/2006	8/19/2013	0.4935	P	0.4258	0.5249	0.6240
LB4110R - D1	Beta	11/24/2006	8/19/2013	0.0000	F	0.0045	0.4755	0.9465
LB4110R - D2	Beta	11/24/2006	8/19/2013	0.0000	F	0.0057	0.5343	1.0629
LB4110R - D3	Beta	11/24/2006	8/19/2013	0.0000	F	0.0055	0.5190	1.0324
LB4110R - D4	Beta	11/24/2006	8/19/2013	0.0000	F	0.0017	0.4272	0.8527
LB5100 - 1	Beta	7/10/2006	10/26/2007	0.4428	F	0.4555	0.4731	0.4906

SECTION XII

BARIUM-133 ANALYTICAL TRACER DATA

VAX/VMS Peak Search Report Generated 12-AUG-2013 07:44:52.96

Configuration : DKA100:[GAMMA.SCUSR.ARCHIVE]SMP_130717001_GE1_BAFIL_194571.CN
Analyses by : PEAK V16.9 PEAKEFF V2.2
Client ID : SPIKE
Deposition Date :
Sample Date : 12-AUG-2013 00:00:00 Acquisition date : 12-AUG-2013 07:29:28
Sample ID : 1307170-01 Sample Quantity : 1.00000E+00 filter
Sample type : FILTER Sample Geometry : 0
Detector name : GE1 Detector Geometry: BAFIL
Elapsed live time: 0 00:15:00.00 Elapsed real time: 0 00:15:00.30 0.0%
Start channel : 25 End channel : 4096
Sensitivity : 3.00000 Gaussian : 10.00000
Critical level : No

Pk	It	Energy	Area	Bkgnd	FWHM	Channel	Left	Pw	Cts/Sec	%Err	Fit
1	4	30.82	2152	63	1.47	31.05	27	13	2.39E+00	2.2	2.15E+01
2	4	35.12	581	45	1.64	35.35	27	13	6.45E-01	4.6	
3	0	52.48	74	84	2.73	52.71	49	7	8.23E-02	23.6	
4	1	61.87	225	66	1.58	62.10	58	17	2.51E-01	9.0	3.69E+00
5	1	65.72	123	79	1.58	65.95	58	17	1.37E-01	14.2	
6	0	81.24	833	134	1.88	81.47	77	9	9.26E-01	4.3	
7	0	93.35	49	113	1.27	93.58	90	8	5.42E-02	40.5	
8	0	112.05	195	116	1.76	112.28	108	7	2.17E-01	11.6	
9	0	161.48	33	78	1.82	161.70	158	8	3.64E-02	49.9	
10	0	239.63	38	57	1.17	239.85	236	8	4.22E-02	37.9	
11	0	276.69	49	47	1.29	276.90	273	8	5.47E-02	27.8	
12	0	302.98	133	52	1.75	303.19	300	7	1.48E-01	12.4	
13	0	308.81	37	31	1.60	309.03	307	7	4.14E-02	32.3	
14	2	333.94	70	29	1.72	334.15	330	13	7.77E-02	16.7	2.64E+00
15	2	338.14	30	28	2.03	338.35	330	13	3.37E-02	39.1	
16	0	356.40	613	38	1.90	356.61	351	10	6.81E-01	4.5	
17	0	377.64	14	15	1.02	377.85	375	6	1.53E-02	53.4	
18	3	384.31	164	11	2.27	384.52	381	17	1.82E-01	10.7	3.89E+00
19	3	387.28	246	4	1.67	387.48	381	17	2.73E-01	7.4	
20	3	391.66	63	1	2.22	391.87	381	17	6.99E-02	15.3	
21	2	415.43	48	9	2.09	415.64	411	19	5.35E-02	18.8	1.38E+00
22	2	419.16	15	9	2.09	419.36	411	19	1.69E-02	56.0	
23	2	421.91	17	9	2.09	422.11	411	19	1.89E-02	44.1	
24	0	437.41	106	5	1.66	437.61	433	8	1.17E-01	10.3	
25	0	468.39	30	8	2.29	468.59	464	8	3.32E-02	24.6	
26	0	511.90	23	11	2.24	512.09	507	9	2.54E-02	33.7	
27	0	682.31	10	0	2.00	682.50	679	7	1.11E-02	31.6	
28	0	912.80	9	1	1.29	912.97	910	6	9.61E-03	40.5	

Sample ID : 1307170-01 Acquisition date : 12-AUG-2013 07:29:28

Total number of lines in spectrum 28
Number of unidentified lines 24
Number of lines tentatively identified by NID 4 14.29%

Nuclide Type : FISSION

Nuclide	Hlife	Decay	Wtd Mean Uncorrected pCi/filter	Wtd Mean Decay Corr pCi/filter	Decay Corr 2-Sigma Error	2-Sigma %Error	Flags
BA-133	10.50Y	1.00	3.864E+02	3.865E+02	0.732E+02	18.94	
	Total Activity :		3.864E+02	3.865E+02			

Nuclide Type : NATURAL

Nuclide	Hlife	Decay	Wtd Mean Uncorrected pCi/filter	Wtd Mean Decay Corr pCi/filter	Decay Corr 2-Sigma Error	2-Sigma %Error	Flags
TH-234	4.47E+09Y	1.00	3.038E+02	3.038E+02	0.567E+02	18.67	
	Total Activity :		3.038E+02	3.038E+02			
	Grand Total Activity :		6.902E+02	6.903E+02			

Flags: "K" = Keyline not found "M" = Manually accepted
"E" = Manually edited "A" = Nuclide specific abn. limit

Nuclide Type: FISSION

Nuclide	Energy	%Abn	%Eff	Uncorrected pCi/filter	Decay Corr pCi/filter	2-Sigma %Error	Status
BA-133	81.00	33.00*	1.963E+01	3.864E+02	3.865E+02	18.94	OK
	302.84	17.80	4.915E+00	4.570E+02	4.571E+02	38.38	OK
	356.01	60.00	6.963E+00	4.404E+02	4.405E+02	17.58	OK

Final Mean for 3 Valid Peaks = 3.865E+02+/- 7.319E+01 (18.94%)

Nuclide Type: NATURAL

Nuclide	Energy	%Abn	%Eff	Uncorrected pCi/filter	Decay Corr pCi/filter	2-Sigma %Error	Status
TH-234	63.29	3.80*	5.865E+01	3.038E+02	3.038E+02	18.67	OK

Final Mean for 1 Valid Peaks = 3.038E+02+/- 5.672E+01 (18.67%)

Flag: "*" = Keyline

---- Identified Nuclides ----

Nuclide	Activity (pCi/filter)	Act error	MDA (pCi/filter)	MDA error	Act/MDA
BA-133	3.865E+02	7.319E+01	1.944E+01	3.191E+00	19.882
TH-234	3.038E+02	5.672E+01	6.214E+01	1.991E+00	4.890

---- Non-Identified Nuclides ----

Nuclide	Key-Line Activity (pCi/filter)	K.L. Ided	Act error	MDA (pCi/filter)	MDA error	Act/MDA
CO-57	2.168E+00		1.174E+01	2.074E+01	6.476E+00	0.105
CD-109	-1.496E+01		1.649E+02	2.265E+02	2.930E+01	-0.066
PA-231	0.000E+00		0.000E+00	1.933E-01	3.632E-03	0.000
PA-234	1.009E+01		1.772E+00	3.727E+00	7.003E-02	2.708
NP-237	2.378E+01		3.983E+01	6.090E+01	7.415E+00	0.390
AM-241	7.146E+00		3.308E+00	6.333E+00	1.486E-01	1.129

C
8/12/13

VAX/VMS Peak Search Report Generated 12-AUG-2013 08:10:53.76

Configuration : DKA100:[GAMMA.SCUSR.ARCHIVE]SMP_130717002_GE1_BAFIL_194573.CN
Analyses by : PEAK V16.9 PEAKEFF V2.2
Client ID : BLANK
Deposition Date :
Sample Date : 12-AUG-2013 00:00:00 Acquisition date : 12-AUG-2013 07:55:36
Sample ID : 1307170-02 Sample Quantity : 1.00000E+00 filter
Sample type : FILTER Sample Geometry : 0
Detector name : GE1 Detector Geometry: BAFIL
Elapsed live time: 0 00:15:00.00 Elapsed real time: 0 00:15:00.28 0.0%
Start channel : 25 End channel : 4096
Sensitivity : 3.00000 Gaussian : 10.00000
Critical level : No

Pk	It	Energy	Area	Bkgnd	FWHM	Channel	Left	Pw	Cts/Sec	%Err	Fit
1	3	30.84	2106	62	1.46	31.08	27	13	2.34E+00	2.2	2.41E+01
2	3	35.08	527	61	1.69	35.31	27	13	5.86E-01	4.9	
3	0	53.08	67	97	2.00	53.31	50	8	7.40E-02	28.3	
4	6	62.06	275	78	1.82	62.29	58	13	3.06E-01	7.7	3.49E+00
5	6	66.15	115	106	1.94	66.38	58	13	1.27E-01	18.4	
6	0	81.40	770	193	1.93	81.63	76	12	8.55E-01	5.1	
7	0	93.59	65	108	1.72	93.82	89	10	7.23E-02	32.3	
8	2	112.07	251	53	1.81	112.30	108	13	2.78E-01	7.8	1.92E+00
9	2	116.63	58	41	1.82	116.86	108	13	6.44E-02	23.3	
10	0	276.68	64	17	1.29	276.89	273	7	7.09E-02	16.6	
11	3	303.04	165	14	1.60	303.25	299	18	1.83E-01	8.4	2.53E+00
12	3	307.33	30	18	2.20	307.55	299	18	3.29E-02	41.2	
13	3	313.28	9	18	2.21	313.50	299	18	1.04E-02	89.0	
14	1	333.85	85	16	1.69	334.07	330	15	9.43E-02	12.9	2.43E+00
15	1	337.95	16	22	1.84	338.16	330	15	1.81E-02	58.3	
16	5	356.47	609	7	1.69	356.68	351	21	6.77E-01	4.0	5.42E+00
17	5	365.01	22	1	2.73	365.22	351	21	2.45E-02	35.4	
18	2	384.15	171	10	2.06	384.36	381	17	1.90E-01	8.2	1.15E+01
19	2	387.43	235	13	2.07	387.64	381	17	2.61E-01	7.9	
20	2	391.68	45	12	1.82	391.89	381	17	4.97E-02	20.4	
21	1	414.92	61	6	1.89	415.13	412	10	6.77E-02	15.1	2.25E+00
22	1	418.73	36	13	1.90	418.94	412	10	3.95E-02	25.4	
23	0	437.59	105	11	1.84	437.80	433	8	1.17E-01	11.1	
24	3	468.23	24	9	2.04	468.43	465	13	2.63E-02	28.4	3.88E+00
25	3	472.38	11	5	2.33	472.58	465	13	1.25E-02	60.3	
26	0	481.41	6	2	2.38	481.61	478	6	6.11E-03	55.3	
27	0	511.42	29	10	2.08	511.62	508	10	3.22E-02	27.6	

Sample ID : 1307170-02 Acquisition date : 12-AUG-2013 07:55:36

Total number of lines in spectrum	27	
Number of unidentified lines	23	
Number of lines tentatively identified by NID	4	14.81%

Nuclide Type : FISSION

Nuclide	Hlife	Decay	Wtd Mean Uncorrected pCi/filter	Wtd Mean Decay Corr pCi/filter	Decay Corr 2-Sigma Error	2-Sigma %Error	Flags
BA-133	10.50Y	1.00	3.570E+02	3.570E+02	0.706E+02	19.76	
	Total Activity :		3.570E+02	3.570E+02			

Nuclide Type : NATURAL

Nuclide	Hlife	Decay	Wtd Mean Uncorrected pCi/filter	Wtd Mean Decay Corr pCi/filter	Decay Corr 2-Sigma Error	2-Sigma %Error	Flags
TH-234	4.47E+09Y	1.00	3.710E+02	3.710E+02	0.602E+02	16.23	
	Total Activity :		3.710E+02	3.710E+02			
	Grand Total Activity :		7.280E+02	7.280E+02			

Flags: "K" = Keyline not found "M" = Manually accepted
"E" = Manually edited "A" = Nuclide specific abn. limit

Nuclide Type: FISSION

Nuclide	Energy	%Abn	%Eff	Uncorrected pCi/filter	Decay Corr pCi/filter	2-Sigma %Error	Status
BA-133	81.00	33.00*	1.963E+01	3.570E+02	3.570E+02	19.76	OK
	302.84	17.80	4.915E+00	5.665E+02	5.665E+02	33.74	OK
	356.01	60.00	6.963E+00	4.377E+02	4.377E+02	17.16	OK

Final Mean for 3 Valid Peaks = 3.570E+02+/- 7.055E+01 (19.76%)

Nuclide Type: NATURAL

Nuclide	Energy	%Abn	%Eff	Uncorrected pCi/filter	Decay Corr pCi/filter	2-Sigma %Error	Status
TH-234	63.29	3.80*	5.865E+01	3.710E+02	3.710E+02	16.23	OK

Final Mean for 1 Valid Peaks = 3.710E+02+/- 6.022E+01 (16.23%)

Flag: "*" = Keyline

---- Identified Nuclides ----

Nuclide	Activity (pCi/filter)	Act error	MDA (pCi/filter)	MDA error	Act/MDA
BA-133	3.570E+02	7.055E+01	1.985E+01	3.259E+00	17.984
TH-234	3.710E+02	6.022E+01	5.617E+01	1.800E+00	6.605

---- Non-Identified Nuclides ----

Nuclide	Key-Line Activity (pCi/filter)	K.L. Ided	Act error	MDA (pCi/filter)	MDA error	Act/MDA
CO-57	-2.525E+00		1.378E+01	2.137E+01	6.671E+00	-0.118
CD-109	8.298E+00		1.404E+02	1.995E+02	2.581E+01	0.042
PA-231	0.000E+00		0.000E+00	1.933E-01	3.632E-03	0.000
PA-234	9.283E+00		1.690E+00	3.572E+00	6.713E-02	2.599
NP-237	1.374E+01		3.982E+01	5.890E+01	7.171E+00	0.233
AM-241	8.762E+00		3.353E+00	6.307E+00	1.480E-01	1.389

VAX/VMS Peak Search Report Generated 12-AUG-2013 08:32:12.21

8/12/13

Configuration : DKA100:[GAMMA.SCUSR.ARCHIVE]SMP_130717003_GE1_BAFIL_194577.CN
Analyses by : PEAK V16.9 PEAKEFF V2.2
Client ID : PURGE TANK TOT
Deposition Date :
Sample Date : 12-AUG-2013 00:00:00 Acquisition date : 12-AUG-2013 08:16:43
Sample ID : 1307170-03 Sample Quantity : 1.00000E+00 filter
Sample type : FILTER Sample Geometry : 0
Detector name : GE1 Detector Geometry: BAFIL
Elapsed live time: 0 00:15:00.00 Elapsed real time: 0 00:15:00.26 0.0%
Start channel : 25 End channel : 4096
Sensitivity : 3.00000 Gaussian : 10.00000
Critical level : No

Pk	It	Energy	Area	Bkgnd	FWHM	Channel	Left	Pw	Cts/Sec	%Err	Fit
1	3	30.84	1864	75	1.36	31.08	27	13	2.07E+00	2.4	5.22E+00
2	3	35.08	437	55	1.65	35.32	27	13	4.85E-01	5.6	
3	0	53.56	38	104	2.76	53.80	48	8	4.22E-02	49.3	
4	1	58.91	19	38	1.57	59.14	58	11	2.08E-02	45.7	1.95E+01
5	1	61.91	257	63	1.58	62.14	58	11	2.86E-01	8.0	
6	1	65.63	93	63	1.58	65.86	58	11	1.04E-01	19.0	
7	0	81.24	694	113	1.92	81.47	76	11	7.71E-01	4.8	
8	0	93.08	37	67	1.20	93.31	90	7	4.12E-02	40.0	
9	0	103.05	23	65	2.40	103.28	100	7	2.51E-02	64.4	
10	0	111.49	208	74	1.93	111.71	107	8	2.31E-01	10.0	
11	0	161.61	30	79	1.85	161.83	157	9	3.30E-02	57.0	
12	7	186.26	32	32	3.05	186.48	183	25	3.55E-02	36.3	1.80E+00
13	7	192.82	27	42	3.06	193.04	183	25	3.00E-02	50.3	
14	7	198.21	21	39	2.74	198.44	183	25	2.30E-02	59.3	
15	7	202.30	16	29	2.10	202.52	183	25	1.82E-02	61.2	
16	0	211.84	35	71	3.71	212.06	208	12	3.92E-02	50.1	
17	0	276.38	60	25	1.21	276.60	273	8	6.67E-02	19.5	
18	2	303.10	163	12	2.00	303.31	299	17	1.81E-01	8.4	2.56E+00
19	2	307.49	33	12	2.01	307.70	299	17	3.63E-02	25.8	
20	7	334.24	51	31	1.93	334.45	330	15	5.61E-02	23.1	5.81E+00
21	7	339.35	31	30	3.17	339.57	330	15	3.42E-02	47.8	
22	0	356.43	529	29	1.72	356.64	352	8	5.88E-01	4.7	
23	2	383.84	90	16	1.85	384.04	381	17	9.96E-02	13.8	1.28E+01
24	2	387.07	196	12	2.06	387.28	381	17	2.18E-01	9.2	
25	2	391.43	41	7	2.07	391.64	381	17	4.53E-02	23.2	
26	4	415.29	31	17	2.52	415.49	412	14	3.47E-02	33.2	2.49E+00
27	4	418.59	38	11	2.11	418.80	412	14	4.18E-02	23.5	
28	4	422.42	12	9	2.53	422.62	412	14	1.38E-02	56.2	
29	0	437.54	86	10	1.72	437.74	434	9	9.57E-02	12.8	
30	0	468.26	34	2	2.08	468.46	465	7	3.81E-02	18.2	
31	0	473.55	8	0	1.96	473.75	472	5	8.89E-03	35.4	
32	0	486.71	7	4	1.04	486.91	482	7	7.22E-03	61.8	
33	0	511.83	28	8	2.70	512.03	506	12	3.12E-02	28.2	

Sample ID : 1307170-03 Acquisition date : 12-AUG-2013 08:16:43

Total number of lines in spectrum 33
Number of unidentified lines 28
Number of lines tentatively identified by NID 5 15.15%

Nuclide Type : FISSION

Nuclide	Hlife	Decay	Wtd Mean Uncorrected pCi/filter	Wtd Mean Decay Corr pCi/filter	Decay Corr 2-Sigma Error	2-Sigma %Error	Flags
BA-133	10.50Y	1.00	3.219E+02	3.220E+02	0.626E+02	19.45	
	Total Activity :		3.219E+02	3.220E+02			

Nuclide Type : NATURAL

Nuclide	Hlife	Decay	Wtd Mean Uncorrected pCi/filter	Wtd Mean Decay Corr pCi/filter	Decay Corr 2-Sigma Error	2-Sigma %Error	Flags
TH-234	4.47E+09Y	1.00	3.467E+02	3.467E+02	0.582E+02	16.79	
AM-241	432.20Y	1.00	1.956E+00	1.956E+00	1.788E+00	91.43	
	Total Activity :		3.486E+02	3.486E+02			
	Grand Total Activity :		6.706E+02	6.706E+02			

Flags: "K" = Keyline not found "M" = Manually accepted
"E" = Manually edited "A" = Nuclide specific abn. limit

Nuclide Type: FISSION

Nuclide	Energy	%Abn	%Eff	Uncorrected pCi/filter	Decay Corr pCi/filter	2-Sigma %Error	Status
BA-133	81.00	33.00*	1.963E+01	3.219E+02	3.220E+02	19.45	OK
	302.84	17.80	4.915E+00	5.582E+02	5.583E+02	33.75	OK
	356.01	60.00	6.963E+00	3.802E+02	3.802E+02	17.82	OK

Final Mean for 3 Valid Peaks = 3.220E+02+/- 6.261E+01 (19.45%)

Nuclide Type: NATURAL

Nuclide	Energy	%Abn	%Eff	Uncorrected pCi/filter	Decay Corr pCi/filter	2-Sigma %Error	Status
TH-234	63.29	3.80*	5.865E+01	3.467E+02	3.467E+02	16.79	OK

Final Mean for 1 Valid Peaks = 3.467E+02+/- 5.821E+01 (16.79%)

AM-241	59.54	35.90*	8.010E+01	1.956E+00	1.956E+00	91.43	OK

Final Mean for 1 Valid Peaks = 1.956E+00+/- 1.788E+00 (91.43%)

Flag: "*" = Keyline

Sample ID : 1307170-03 Acquisition date : 12-AUG-2013 08:16:43

---- Identified Nuclides ----

Nuclide	Activity (pCi/filter)	Act error	MDA (pCi/filter)	MDA error	Act/MDA
BA-133	3.220E+02	6.261E+01	1.672E+01	2.744E+00	19.260
TH-234	3.467E+02	5.821E+01	5.604E+01	1.796E+00	6.186
AM-241	1.956E+00	1.788E+00	4.335E+00	1.017E-01	0.451

---- Non-Identified Nuclides ----

Nuclide	Key-Line Activity (pCi/filter)	K.L. Ided	Act error	MDA (pCi/filter)	MDA error	Act/MDA
CO-57	5.391E+00		1.202E+01	2.161E+01	6.746E+00	0.250
CD-109	6.053E+00		1.338E+02	1.904E+02	2.463E+01	0.032
PA-231	0.000E+00		0.000E+00	1.933E-01	3.632E-03	0.000
PA-234	8.504E+00		1.649E+00	3.471E+00	6.523E-02	2.450
NP-237	2.654E+01		3.744E+01	5.863E+01	7.138E+00	0.453

VAX/VMS Peak Search Report Generated 12-AUG-2013 08:51:01.70

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Configuration : DKA100:[GAMMA.SCUSR.ARCHIVE]SMP_130717004_GE1_BAFIL_194581.CN
Analyses by : PEAK V16.9 PEAKEFF V2.2
Client ID : PZ-305-AI TOT
Deposition Date :
Sample Date : 12-AUG-2013 00:00:00 Acquisition date : 12-AUG-2013 08:35:45
Sample ID : 1307170-04 Sample Quantity : 1.00000E+00 filter
Sample type : FILTER Sample Geometry : 0
Detector name : GE1 Detector Geometry: BAFIL
Elapsed live time: 0 00:15:00.00 Elapsed real time: 0 00:15:00.25 0.0%
Start channel : 25 End channel : 4096
Sensitivity : 3.00000 Gaussian : 10.00000
Critical level : No

Pk	It	Energy	Area	Bkgnd	FWHM	Channel	Left	Pw	Cts/Sec	%Err	Fit
1	1	30.78	1903	66	1.52	31.02	27	15	2.11E+00	2.4	2.87E+01
2	1	34.91	436	43	1.53	35.14	27	15	4.84E-01	5.6	
3	0	52.95	60	93	2.09	53.18	49	9	6.65E-02	31.7	
4	1	61.91	188	76	1.58	62.14	58	13	2.09E-01	10.4	3.74E+00
5	1	65.63	93	91	1.58	65.86	58	13	1.03E-01	19.8	
6	0	81.25	769	144	1.92	81.47	77	10	8.54E-01	4.7	
7	1	111.92	175	60	1.64	112.15	108	12	1.95E-01	10.0	2.50E+00
8	1	115.92	43	49	1.65	116.15	108	12	4.77E-02	30.5	
9	0	161.54	20	69	1.78	161.77	157	7	2.20E-02	73.4	
10	0	185.54	44	88	5.50	185.76	181	10	4.87E-02	43.1	
11	0	212.19	24	45	1.88	212.41	210	7	2.62E-02	51.2	
12	0	276.92	69	33	1.36	277.13	274	7	7.67E-02	18.3	
13	4	303.30	162	12	1.78	303.52	300	13	1.80E-01	8.4	4.44E+00
14	4	307.73	28	22	2.04	307.95	300	13	3.11E-02	31.1	
15	2	334.14	61	12	2.03	334.35	331	12	6.76E-02	15.8	2.37E+00
16	2	338.44	28	12	2.03	338.65	331	12	3.10E-02	28.9	
17	0	356.51	531	18	1.66	356.72	353	8	5.90E-01	4.6	
18	0	365.08	19	15	2.52	365.29	362	7	2.08E-02	41.9	
19	3	383.69	98	11	2.00	383.89	380	17	1.09E-01	12.5	2.66E+01
20	3	386.98	208	7	1.86	387.18	380	17	2.31E-01	8.6	
21	3	391.86	67	4	1.90	392.07	380	17	7.45E-02	14.2	
22	1	414.88	33	26	1.89	415.08	411	12	3.64E-02	32.4	5.19E+00
23	1	418.62	16	50	1.90	418.83	411	12	1.81E-02	68.7	
24	0	423.41	20	11	1.07	423.61	422	6	2.24E-02	36.3	
25	0	437.39	96	14	1.91	437.59	434	10	1.06E-01	12.4	
26	0	467.38	31	9	1.92	467.58	462	12	3.45E-02	26.3	
27	0	511.38	25	3	2.96	511.58	508	7	2.74E-02	23.7	
28	0	528.75	7	4	2.89	528.95	524	8	7.98E-03	60.7	
29	0	771.82	6	0	2.88	772.00	770	5	6.67E-03	40.8	

Sample ID : 1307170-04 Acquisition date : 12-AUG-2013 08:35:45

Total number of lines in spectrum 29
Number of unidentified lines 25
Number of lines tentatively identified by NID 4 13.79%

Nuclide Type : FISSION

Nuclide	Hlife	Decay	Wtd Mean Uncorrected pCi/filter	Wtd Mean Decay Corr pCi/filter	Decay Corr 2-Sigma Error	2-Sigma %Error	Flags
BA-133	10.50Y	1.00	3.565E+02	3.565E+02	0.688E+02	19.29	
	Total Activity :		3.565E+02	3.565E+02			

Nuclide Type : NATURAL

Nuclide	Hlife	Decay	Wtd Mean Uncorrected pCi/filter	Wtd Mean Decay Corr pCi/filter	Decay Corr 2-Sigma Error	2-Sigma %Error	Flags
TH-234	4.47E+09Y	1.00	2.532E+02	2.532E+02	0.545E+02	21.51	
	Total Activity :		2.532E+02	2.532E+02			
	Grand Total Activity :		6.096E+02	6.096E+02			

Flags: "K" = Keyline not found "M" = Manually accepted
"E" = Manually edited "A" = Nuclide specific abn. limit

Nuclide Type: FISSION

Nuclide	Energy	%Abn	%Eff	Uncorrected pCi/filter	Decay Corr pCi/filter	2-Sigma %Error	Status
BA-133	81.00	33.00*	1.963E+01	3.565E+02	3.565E+02	19.29	OK
	302.84	17.80	4.915E+00	5.558E+02	5.558E+02	33.70	OK
	356.01	60.00	6.963E+00	3.818E+02	3.818E+02	17.68	OK

Final Mean for 3 Valid Peaks = 3.565E+02+/- 6.878E+01 (19.29%)

Nuclide Type: NATURAL

Nuclide	Energy	%Abn	%Eff	Uncorrected pCi/filter	Decay Corr pCi/filter	2-Sigma %Error	Status
TH-234	63.29	3.80*	5.865E+01	2.532E+02	2.532E+02	21.51	OK

Final Mean for 1 Valid Peaks = 2.532E+02+/- 5.445E+01 (21.51%)

Flag: "*" = Keyline

---- Identified Nuclides ----

Nuclide	Activity (pCi/filter)	Act error	MDA (pCi/filter)	MDA error	Act/MDA
BA-133	3.565E+02	6.878E+01	1.985E+01	3.259E+00	17.956
TH-234	2.532E+02	5.445E+01	6.030E+01	1.932E+00	4.198

---- Non-Identified Nuclides ----

Nuclide	Key-Line Activity (pCi/filter)	K.L. Ided	Act error	MDA (pCi/filter)	MDA error	Act/MDA
CO-57	1.590E+01		1.339E+01	2.312E+01	7.219E+00	0.688
CD-109	-2.292E+01		1.382E+02	2.156E+02	2.790E+01	-0.106
PA-231	0.000E+00		0.000E+00	1.933E-01	3.632E-03	0.000
PA-234	7.308E+00		1.563E+00	3.280E+00	6.164E-02	2.228
NP-237	6.797E+00		3.843E+01	6.227E+01	7.581E+00	0.109
AM-241	6.216E+00		3.363E+00	6.048E+00	1.419E-01	1.028

VAX/VMS Peak Search Report Generated 12-AUG-2013 09:12:20.56

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Configuration : DKA100:[GAMMA.SCUSR.ARCHIVE]SMP_130717005_GE1_BAFIL_194585.CN
Analyses by : PEAK V16.9 PEAKEFF V2.2
Client ID : PZ-305-AI DIS
Deposition Date :
Sample Date : 12-AUG-2013 00:00:00 Acquisition date : 12-AUG-2013 08:57:01
Sample ID : 1307170-05 Sample Quantity : 1.00000E+00 filter
Sample type : FILTER Sample Geometry : 0
Detector name : GE1 Detector Geometry: BAFIL
Elapsed live time: 0 00:15:00.00 Elapsed real time: 0 00:15:00.27 0.0%
Start channel : 25 End channel : 4096
Sensitivity : 3.00000 Gaussian : 10.00000
Critical level : No

Pk	It	Energy	Area	Bkgnd	FWHM	Channel	Left	Pw	Cts/Sec	%Err	Fit
1	3	30.83	2009	70	1.45	31.06	27	12	2.23E+00	2.3	2.38E+01
2	3	35.09	415	79	1.55	35.32	27	12	4.62E-01	5.9	
3	0	52.82	74	106	1.92	53.05	49	9	8.17E-02	27.8	
4	2	62.00	237	63	1.73	62.23	58	12	2.63E-01	8.3	4.15E+00
5	2	65.67	118	69	1.74	65.90	58	12	1.31E-01	15.5	
6	0	81.20	775	158	1.94	81.43	76	11	8.61E-01	4.8	
7	0	92.71	43	91	1.09	92.94	90	7	4.72E-02	40.3	
8	4	112.01	207	45	1.87	112.23	106	14	2.30E-01	8.6	7.11E-01
9	4	116.08	63	44	2.20	116.30	106	14	6.96E-02	26.5	
10	0	160.42	60	80	4.57	160.64	155	12	6.62E-02	33.2	
11	0	192.35	13	52	2.29	192.57	190	6	1.39E-02	95.0	
12	0	227.48	16	45	1.12	227.69	225	6	1.73E-02	73.4	
13	0	276.91	61	30	1.28	277.13	275	6	6.80E-02	18.9	
14	2	303.45	154	17	1.70	303.67	299	24	1.72E-01	8.6	6.79E+00
15	2	308.08	42	17	2.01	308.30	299	24	4.63E-02	21.4	
16	2	319.79	9	15	2.01	320.00	299	24	1.05E-02	76.5	
17	5	330.91	9	11	2.23	331.12	330	7	1.05E-02	50.6	1.03E+01
18	5	334.17	86	14	1.36	334.38	330	7	9.59E-02	12.3	
19	2	356.47	528	7	1.47	356.68	353	21	5.87E-01	4.3	1.39E+00
20	2	364.95	19	15	2.05	365.16	353	21	2.06E-02	37.4	
21	0	377.26	26	10	1.67	377.47	373	8	2.88E-02	28.8	
22	2	384.79	104	7	1.71	385.00	381	15	1.15E-01	11.8	2.21E+01
23	2	391.43	43	17	2.07	391.64	381	15	4.75E-02	22.2	
24	1	414.97	42	5	1.89	415.17	410	18	4.63E-02	19.6	2.14E+00
25	1	418.97	32	9	1.90	419.17	410	18	3.50E-02	26.8	
26	2	434.80	10	8	1.73	435.00	432	9	1.12E-02	49.0	5.48E+00
27	2	437.67	97	8	1.62	437.87	432	9	1.08E-01	11.9	
28	0	469.96	19	11	1.82	470.17	464	12	2.08E-02	43.4	
29	0	511.35	27	5	2.02	511.55	508	9	2.96E-02	24.3	

Sample ID : 1307170-05 Acquisition date : 12-AUG-2013 08:57:01

Total number of lines in spectrum 29
Number of unidentified lines 25
Number of lines tentatively identified by NID 4 13.79%

Nuclide Type : FISSION

Nuclide	Hlife	Decay	Wtd Mean Uncorrected pCi/filter	Wtd Mean Decay Corr pCi/filter	Decay Corr 2-Sigma Error	2-Sigma %Error	Flags
BA-133	10.50Y	1.00	3.595E+02	3.595E+02	0.698E+02	19.41	
Total Activity :			3.595E+02	3.595E+02			

Nuclide Type : NATURAL

Nuclide	Hlife	Decay	Wtd Mean Uncorrected pCi/filter	Wtd Mean Decay Corr pCi/filter	Decay Corr 2-Sigma Error	2-Sigma %Error	Flags
TH-234	4.47E+09Y	1.00	3.189E+02	3.189E+02	0.556E+02	17.44	
Total Activity :			3.189E+02	3.189E+02			

Grand Total Activity : 6.783E+02 6.783E+02

Flags: "K" = Keyline not found "M" = Manually accepted
"E" = Manually edited "A" = Nuclide specific abn. limit

Nuclide Type: FISSION

Nuclide	Energy	%Abn	%Eff	Uncorrected pCi/filter	Decay Corr pCi/filter	2-Sigma %Error	Status
BA-133	81.00	33.00*	1.963E+01	3.595E+02	3.595E+02	19.41	OK
	302.84	17.80	4.915E+00	5.299E+02	5.300E+02	33.97	OK
	356.01	60.00	6.963E+00	3.798E+02	3.798E+02	17.41	OK

Final Mean for 3 Valid Peaks = 3.595E+02+/- 6.978E+01 (19.41%)

Nuclide Type: NATURAL

Nuclide	Energy	%Abn	%Eff	Uncorrected pCi/filter	Decay Corr pCi/filter	2-Sigma %Error	Status
TH-234	63.29	3.80*	5.865E+01	3.189E+02	3.189E+02	17.44	OK

Final Mean for 1 Valid Peaks = 3.189E+02+/- 5.562E+01 (17.44%)

Flag: "*" = Keyline

---- Identified Nuclides ----

Nuclide	Activity (pCi/filter)	Act error	MDA (pCi/filter)	MDA error	Act/MDA
BA-133	3.595E+02	6.978E+01	1.736E+01	2.850E+00	20.707
TH-234	3.189E+02	5.562E+01	5.342E+01	1.712E+00	5.969

---- Non-Identified Nuclides ----

Nuclide	Key-Line Activity (pCi/filter)	K.L. Ided	Act error	MDA (pCi/filter)	MDA error	Act/MDA
CO-57	1.980E+00		1.197E+01	1.967E+01	6.142E+00	0.101
CD-109	9.418E+01		1.284E+02	2.034E+02	2.631E+01	0.463
PA-231	0.000E+00		0.000E+00	1.933E-01	3.632E-03	0.000
PA-234	8.173E+00		1.701E+00	3.520E+00	6.615E-02	2.322
NP-237	1.344E+01		4.064E+01	5.985E+01	7.287E+00	0.224
AM-241	8.446E+00		3.216E+00	6.104E+00	1.432E-01	1.384

VAX/VMS Peak Search Report Generated 12-AUG-2013 08:11:22.25

C
8/12/13

Configuration : DKA100:[GAMMA.SCUSR.ARCHIVE]SMP_130717006_GE2_BAFIL_194574.CN
Analyses by : PEAK V16.9 PEAKEFF V2.2
Client ID : LR-104 TOT
Deposition Date :
Sample Date : 12-AUG-2013 00:00:00 Acquisition date : 12-AUG-2013 07:56:03
Sample ID : 1307170-06 Sample Quantity : 1.00000E+00 filter
Sample type : FILTER Sample Geometry : 0
Detector name : GE2 Detector Geometry: BAFIL
Elapsed live time: 0 00:15:00.00 Elapsed real time: 0 00:15:00.30 0.0%
Start channel : 25 End channel : 4096
Sensitivity : 3.00000 Gaussian : 10.00000
Critical level : No

Pk	It	Energy	Area	Bkgnd	FWHM	Channel	Left	Pw	Cts/Sec	%Err	Fit
1	4	28.07	49	83	1.80	28.19	26	15	5.48E-02	25.9	6.87E+00
2	4	31.02	1912	100	1.39	31.14	26	15	2.12E+00	2.4	
3	4	35.13	488	127	1.85	35.24	26	15	5.42E-01	7.2	
4	0	52.57	45	91	1.35	52.69	49	7	4.95E-02	38.5	
5	4	61.78	227	77	1.51	61.90	57	13	2.52E-01	8.8	3.08E-01
6	4	66.08	96	83	1.85	66.19	57	13	1.06E-01	19.4	
7	1	81.02	749	42	1.50	81.14	76	11	8.32E-01	3.9	5.17E+00
8	1	83.89	15	42	1.37	84.00	76	11	1.69E-02	117.0	
9	3	111.85	221	66	1.88	111.96	107	20	2.45E-01	8.9	1.53E+00
10	3	115.99	36	57	1.88	116.10	107	20	4.02E-02	43.1	
11	3	123.31	14	52	1.90	123.43	107	20	1.51E-02	92.1	
12	0	185.92	34	84	1.44	186.04	182	9	3.76E-02	51.6	
13	0	278.41	25	64	1.28	278.52	273	8	2.78E-02	58.9	
14	1	302.94	169	11	1.68	303.05	298	20	1.88E-01	8.2	2.17E+00
15	1	306.93	39	11	1.79	307.04	298	20	4.34E-02	26.0	
16	1	333.73	71	14	1.81	333.84	330	16	7.89E-02	13.9	1.01E+00
17	1	338.06	22	7	1.82	338.17	330	16	2.47E-02	31.5	
18	1	342.73	9	4	1.82	342.83	330	16	1.04E-02	60.4	
19	0	356.19	528	40	1.57	356.30	351	10	5.87E-01	4.9	
20	1	383.79	126	23	1.86	383.89	380	16	1.40E-01	11.2	6.30E+00
21	1	387.06	199	22	1.86	387.17	380	16	2.22E-01	9.2	
22	1	390.95	47	21	1.86	391.06	380	16	5.18E-02	26.1	
23	4	415.08	34	17	2.51	415.19	411	15	3.82E-02	30.1	2.57E+00
24	4	418.72	11	17	1.89	418.83	411	15	1.19E-02	77.3	
25	2	436.95	81	9	1.68	437.06	433	19	8.99E-02	12.7	8.91E-01
26	2	445.26	8	9	2.10	445.36	433	19	8.89E-03	73.7	
27	6	468.26	23	2	2.22	468.36	462	16	2.50E-02	25.1	1.70E+00
28	6	473.25	8	1	3.11	473.35	462	16	9.13E-03	64.4	
29	0	500.40	8	6	1.11	500.50	497	8	9.01E-03	62.9	
30	0	511.12	36	5	2.95	511.22	506	10	4.00E-02	20.3	
31	0	518.78	9	4	2.23	518.88	516	7	9.44E-03	50.1	
32	0	672.18	5	2	1.27	672.28	669	5	5.08E-03	69.6	
33	0	723.86	8	1	2.84	723.96	721	6	8.52E-03	43.7	
34	0	833.90	7	2	1.69	834.00	831	7	7.84E-03	49.2	

Sample ID : 1307170-06 Acquisition date : 12-AUG-2013 07:56:03

Total number of lines in spectrum 34
Number of unidentified lines 29
Number of lines tentatively identified by NID 5 14.71%

Nuclide Type : FISSION

Nuclide	Hlife	Decay	Wtd Mean Uncorrected pCi/filter	Wtd Mean Decay Corr pCi/filter	Decay Corr 2-Sigma Error	2-Sigma %Error	Flags
CO-57	270.90D	1.00	3.773E+00	3.777E+00	6.981E+00	184.86	
BA-133	10.50Y	1.00	3.787E+02	3.788E+02	0.727E+02	19.18	
	Total Activity :		3.825E+02	3.825E+02			

Nuclide Type : NATURAL

Nuclide	Hlife	Decay	Wtd Mean Uncorrected pCi/filter	Wtd Mean Decay Corr pCi/filter	Decay Corr 2-Sigma Error	2-Sigma %Error	Flags
TH-234	4.47E+09Y	1.00	7.784E+02	7.784E+02	1.544E+02	19.84	
	Total Activity :		7.784E+02	7.784E+02			

Grand Total Activity : 1.161E+03 1.161E+03

Flags: "K" = Keyline not found "M" = Manually accepted
"E" = Manually edited "A" = Nuclide specific abn. limit

Nuclide Type: FISSION

Nuclide	Energy	%Abn	%Eff	Uncorrected pCi/filter	Decay Corr pCi/filter	2-Sigma %Error	Status
CO-57	122.06	85.51*	1.264E+01	3.773E+00	3.777E+00	184.86	OK
	136.48	10.60	1.164E+01	----- Line Not Found		-----	Absent
	Final Mean for 1 Valid Peaks = 3.777E+00+/- 6.981E+00 (184.86%)						
BA-133	81.00	33.00*	1.799E+01	3.787E+02	3.788E+02	19.18	OK
	302.84	17.80	7.560E+00	3.780E+02	3.780E+02	34.09	OK
	356.01	60.00	7.170E+00	3.685E+02	3.685E+02	18.04	OK
	Final Mean for 3 Valid Peaks = 3.788E+02+/- 7.266E+01 (19.18%)						

Nuclide Type: NATURAL

Nuclide	Energy	%Abn	%Eff	Uncorrected pCi/filter	Decay Corr pCi/filter	2-Sigma %Error	Status
TH-234	63.29	3.80*	2.305E+01	7.784E+02	7.784E+02	19.84	OK
	Final Mean for 1 Valid Peaks = 7.784E+02+/- 1.544E+02 (19.84%)						

Flag: "*" = Keyline

---- Identified Nuclides ----

Nuclide	Activity (pCi/filter)	Act error	MDA (pCi/filter)	MDA error	Act/MDA
CO-57	3.777E+00	6.981E+00	9.712E+00	1.491E+00	0.389
BA-133	3.788E+02	7.266E+01	1.749E+01	2.977E+00	21.662
TH-234	7.784E+02	1.544E+02	1.392E+02	1.150E+01	5.593

---- Non-Identified Nuclides ----

Nuclide	Key-Line Activity (pCi/filter)	K.L. Ided	Act error	MDA (pCi/filter)	MDA error	Act/MDA
CD-109	-5.899E+01		1.141E+02	1.742E+02	2.000E+01	-0.339
PA-231	2.888E+01		4.088E+00	8.208E+00	1.563E-01	3.518
PA-234	2.411E+00		1.697E+00	3.034E+00	6.258E-02	0.795
NP-237	-2.784E+01		3.343E+01	4.890E+01	5.521E+00	-0.569
AM-241	2.434E+01		1.041E+01	1.946E+01	1.506E+00	1.251

C
8/12/13

VAX/VMS Peak Search Report Generated 12-AUG-2013 08:32:42.72

Configuration : DKA100:[GAMMA.SCUSR.ARCHIVE]SMP_130717007_GE2_BAFIL_194578.CN
Analyses by : PEAK V16.9 PEAKEFF V2.2
Client ID : LR-104 DIS
Deposition Date :
Sample Date : 12-AUG-2013 00:00:00 Acquisition date : 12-AUG-2013 08:17:29
Sample ID : 1307170-07 Sample Quantity : 1.00000E+00 filter
Sample type : FILTER Sample Geometry : 0
Detector name : GE2 Detector Geometry: BAFIL
Elapsed live time: 0 00:15:00.00 Elapsed real time: 0 00:15:00.30 0.0%
Start channel : 25 End channel : 4096
Sensitivity : 3.00000 Gaussian : 10.00000
Critical level : No

Pk	It	Energy	Area	Bkgnd	FWHM	Channel	Left	Pw	Cts/Sec	%Err	Fit
1	4	30.96	2089	87	1.38	31.08	26	15	2.32E+00	2.3	2.82E+00
2	4	35.21	537	71	1.64	35.33	26	15	5.96E-01	5.1	
3	0	52.84	99	85	2.18	52.96	50	8	1.10E-01	18.8	
4	5	61.76	250	74	1.85	61.88	58	15	2.78E-01	8.4	1.44E+00
5	5	66.03	116	73	2.15	66.14	58	15	1.29E-01	16.2	
6	1	81.02	848	48	1.50	81.14	77	11	9.42E-01	3.6	1.70E+01
7	1	83.89	18	33	1.37	84.00	77	11	2.05E-02	98.4	
8	0	92.33	45	60	1.29	92.44	88	7	5.04E-02	31.9	
9	1	111.85	192	48	1.55	111.97	108	22	2.13E-01	9.5	2.42E+00
10	1	115.75	60	42	1.56	115.86	108	22	6.65E-02	21.2	
11	1	118.75	14	39	1.56	118.86	108	22	1.51E-02	84.5	
12	0	186.05	26	63	1.10	186.16	183	6	2.86E-02	52.6	
13	0	276.45	42	30	1.64	276.56	274	6	4.70E-02	25.3	
14	3	302.89	152	19	1.48	303.00	299	13	1.69E-01	9.0	6.57E-01
15	3	307.38	17	27	2.16	307.49	299	13	1.87E-02	63.5	
16	0	334.10	51	49	1.86	334.21	330	8	5.71E-02	27.2	
17	0	356.11	545	35	1.43	356.22	351	10	6.05E-01	4.7	
18	0	365.17	11	18	2.17	365.28	362	6	1.18E-02	70.7	
19	8	383.78	133	14	1.92	383.89	380	16	1.48E-01	10.4	6.42E+00
20	8	386.85	174	9	1.60	386.95	380	16	1.93E-01	8.4	
21	8	391.59	36	13	2.73	391.69	380	16	3.95E-02	31.2	
22	3	415.10	29	13	2.28	415.21	410	15	3.17E-02	31.4	5.02E+00
23	3	418.32	22	12	2.28	418.42	410	15	2.42E-02	41.9	
24	3	421.87	13	8	2.29	421.98	410	15	1.47E-02	39.9	
25	0	437.01	97	7	1.54	437.12	432	10	1.07E-01	11.5	
26	1	467.80	24	8	1.93	467.91	462	15	2.64E-02	27.4	8.53E-01
27	1	471.72	8	5	1.93	471.82	462	15	8.85E-03	65.6	
28	0	486.90	9	0	2.88	487.00	485	5	1.00E-02	33.3	
29	0	512.03	22	12	3.31	512.13	507	9	2.47E-02	36.0	
30	0	595.54	14	3	5.71	595.65	590	11	1.60E-02	34.3	
31	0	609.33	8	5	2.10	609.43	606	7	8.97E-03	58.3	
32	0	1461.25	6	0	1.47	1461.33	1458	6	6.67E-03	40.8	

Sample ID : 1307170-07 Acquisition date : 12-AUG-2013 08:17:29

Total number of lines in spectrum	32	
Number of unidentified lines	28	
Number of lines tentatively identified by NID	4	12.50%

Nuclide Type : FISSION

Nuclide	Hlife	Decay	Wtd Mean Uncorrected pCi/filter	Wtd Mean Decay Corr pCi/filter	Decay Corr 2-Sigma Error	2-Sigma %Error	Flags
BA-133	10.50Y	1.00	4.291E+02	4.291E+02	0.812E+02	18.93	
	Total Activity :		4.291E+02	4.291E+02			

Nuclide Type : NATURAL

Nuclide	Hlife	Decay	Wtd Mean Uncorrected pCi/filter	Wtd Mean Decay Corr pCi/filter	Decay Corr 2-Sigma Error	2-Sigma %Error	Flags
TH-234	4.47E+09Y	1.00	8.565E+02	8.565E+02	1.635E+02	19.09	
	Total Activity :		8.565E+02	8.565E+02			
	Grand Total Activity :		1.286E+03	1.286E+03			

Flags: "K" = Keyline not found "M" = Manually accepted
"E" = Manually edited "A" = Nuclide specific abn. limit

Nuclide Type: FISSION

Nuclide	Energy	%Abn	%Eff	Uncorrected pCi/filter	Decay Corr pCi/filter	2-Sigma %Error	Status
BA-133	81.00	33.00*	1.799E+01	4.291E+02	4.291E+02	18.93	OK
	302.84	17.80	7.560E+00	3.393E+02	3.393E+02	34.87	OK
	356.01	60.00	7.170E+00	3.802E+02	3.802E+02	17.87	OK

Final Mean for 3 Valid Peaks = 4.291E+02+/- 8.122E+01 (18.93%)

Nuclide Type: NATURAL

Nuclide	Energy	%Abn	%Eff	Uncorrected pCi/filter	Decay Corr pCi/filter	2-Sigma %Error	Status
TH-234	63.29	3.80*	2.305E+01	8.565E+02	8.565E+02	19.09	OK

Final Mean for 1 Valid Peaks = 8.565E+02+/- 1.635E+02 (19.09%)

Flag: "*" = Keyline

---- Identified Nuclides ----

Nuclide	Activity (pCi/filter)	Act error	MDA (pCi/filter)	MDA error	Act/MDA
BA-133	4.291E+02	8.122E+01	1.936E+01	3.297E+00	22.162
TH-234	8.565E+02	1.635E+02	1.240E+02	1.025E+01	6.907

---- Non-Identified Nuclides ----

Nuclide	Key-Line Activity (pCi/filter)	K.L. Ided	Act error	MDA (pCi/filter)	MDA error	Act/MDA
CO-57	-1.442E+00		5.587E+00	9.525E+00	1.463E+00	-0.151
CD-109	4.700E+01		1.021E+02	1.604E+02	1.842E+01	0.293
PA-231	2.762E+01		4.077E+00	8.159E+00	1.554E-01	3.385
PA-234	3.602E+00		1.808E+00	3.302E+00	6.810E-02	1.091
NP-237	1.281E+01		2.953E+01	4.626E+01	5.223E+00	0.277
AM-241	3.023E+01		1.016E+01	1.965E+01	1.521E+00	1.539

VAX/VMS Peak Search Report Generated 12-AUG-2013 08:51:36.55

Configuration : DKA100:[GAMMA.SCUSR.ARCHIVE]SMP_130717008_GE2_BAFIL_194582.CN
Analyses by : PEAK V16.9 PEAKEFF V2.2
Client ID : PZ-100-KS TOT
Deposition Date :
Sample Date : 12-AUG-2013 00:00:00 Acquisition date : 12-AUG-2013 08:36:22
Sample ID : 1307170-08 Sample Quantity : 1.00000E+00 filter
Sample type : FILTER Sample Geometry : 0
Detector name : GE2 Detector Geometry: BAFIL
Elapsed live time: 0 00:15:00.00 Elapsed real time: 0 00:15:00.28 0.0%
Start channel : 25 End channel : 4096
Sensitivity : 3.00000 Gaussian : 10.00000
Critical level : No

Pk	It	Energy	Area	Bkgnd	FWHM	Channel	Left	Pw	Cts/Sec	%Err	Fit
1	3	28.18	34	122	1.66	28.30	26	15	3.79E-02	66.9	7.12E+00
2	3	30.95	1894	83	1.41	31.06	26	15	2.10E+00	2.4	
3	3	35.05	460	78	1.68	35.17	26	15	5.11E-01	5.7	
4	0	52.81	87	87	2.15	52.92	50	8	9.71E-02	21.2	
5	0	61.56	168	129	1.43	61.68	58	6	1.86E-01	13.4	
6	0	66.21	90	81	1.42	66.32	65	5	1.00E-01	18.6	
7	1	81.02	770	49	1.50	81.14	76	12	8.55E-01	3.9	5.10E+00
8	1	84.78	18	46	1.50	84.90	76	12	2.06E-02	62.8	
9	0	92.50	40	94	3.14	92.62	89	10	4.45E-02	47.8	
10	1	109.03	15	40	1.55	109.14	108	11	1.61E-02	60.6	1.23E+01
11	1	112.01	174	58	1.55	112.13	108	11	1.94E-01	10.1	
12	1	115.75	26	52	1.56	115.86	108	11	2.92E-02	48.4	
13	0	238.71	19	36	2.80	238.82	235	8	2.06E-02	60.6	
14	0	276.90	88	33	1.76	277.01	272	10	9.78E-02	16.4	
15	1	302.81	142	14	1.61	302.92	299	24	1.58E-01	9.3	1.32E+00
16	1	306.99	28	17	1.79	307.10	299	24	3.11E-02	33.8	
17	3	333.35	73	14	2.05	333.45	329	12	8.07E-02	14.4	2.11E+00
18	3	337.86	26	7	2.10	337.97	329	12	2.91E-02	28.1	
19	1	351.89	17	10	1.83	352.00	350	11	1.85E-02	28.7	9.78E+00
20	1	356.06	498	12	1.50	356.17	350	11	5.54E-01	4.6	
21	5	384.09	121	16	2.35	384.20	380	21	1.34E-01	14.2	3.17E+00
22	5	386.98	174	9	1.89	387.08	380	21	1.94E-01	9.8	
23	5	391.35	57	5	2.33	391.45	380	21	6.31E-02	18.8	
24	0	404.41	14	11	3.55	404.52	400	9	1.51E-02	52.2	
25	3	415.01	22	11	2.28	415.12	409	18	2.45E-02	36.2	1.12E+00
26	3	418.33	11	11	2.28	418.43	409	18	1.27E-02	70.5	
27	3	433.77	6	4	2.30	433.87	432	8	7.04E-03	48.0	3.48E+00
28	3	436.96	79	4	1.66	437.07	432	8	8.78E-02	11.9	
29	0	445.78	9	6	2.18	445.89	442	9	9.78E-03	62.4	
30	0	467.88	14	11	1.16	467.99	465	7	1.52E-02	48.0	
31	0	511.23	35	8	5.09	511.33	507	9	3.91E-02	22.6	
32	0	597.45	9	0	2.79	597.56	595	6	1.00E-02	33.3	
33	0	609.93	11	1	2.20	610.03	607	6	1.18E-02	35.5	

Sample ID : 1307170-08 Acquisition date : 12-AUG-2013 08:36:22

Total number of lines in spectrum 33
Number of unidentified lines 28
Number of lines tentatively identified by NID 5 15.15%

Nuclide Type : FISSION

Nuclide	Hlife	Decay	Wtd Mean Uncorrected pCi/filter	Wtd Mean Decay Corr pCi/filter	Decay Corr 2-Sigma Error	2-Sigma %Error	Flags
BA-133	10.50Y	1.00	3.895E+02	3.895E+02	0.745E+02	19.12	
NP-237	2.14E+06Y	1.00	2.607E+01	2.607E+01	3.290E+01	126.20	
	Total Activity :		4.155E+02	4.155E+02			

Nuclide Type : NATURAL

Nuclide	Hlife	Decay	Wtd Mean Uncorrected pCi/filter	Wtd Mean Decay Corr pCi/filter	Decay Corr 2-Sigma Error	2-Sigma %Error	Flags
TH-234	4.47E+09Y	1.00	5.755E+02	5.755E+02	1.628E+02	28.28	
	Total Activity :		5.755E+02	5.755E+02			

Grand Total Activity : 9.910E+02 9.911E+02

Flags: "K" = Keyline not found "M" = Manually accepted
"E" = Manually edited "A" = Nuclide specific abn. limit

Nuclide Type: FISSION

Nuclide	Energy	%Abn	%Eff	Uncorrected pCi/filter	Decay Corr pCi/filter	2-Sigma %Error	Status
BA-133	81.00	33.00*	1.799E+01	3.895E+02	3.895E+02	19.12	OK
	302.84	17.80	7.560E+00	3.164E+02	3.164E+02	35.18	OK
	356.01	60.00	7.170E+00	3.478E+02	3.478E+02	17.68	OK
	Final Mean for 3 Valid Peaks = 3.895E+02+/- 7.448E+01 (19.12%)						
NP-237	86.50	12.60*	1.691E+01	2.607E+01	2.607E+01	126.20	OK
	Final Mean for 1 Valid Peaks = 2.607E+01+/- 3.290E+01 (126.20%)						

Nuclide Type: NATURAL

Nuclide	Energy	%Abn	%Eff	Uncorrected pCi/filter	Decay Corr pCi/filter	2-Sigma %Error	Status
TH-234	63.29	3.80*	2.305E+01	5.755E+02	5.755E+02	28.28	OK
	Final Mean for 1 Valid Peaks = 5.755E+02+/- 1.628E+02 (28.28%)						

Flag: "*" = Keyline

---- Identified Nuclides ----

Nuclide	Activity (pCi/filter)	Act error	MDA (pCi/filter)	MDA error	Act/MDA
BA-133	3.895E+02	7.448E+01	1.806E+01	3.075E+00	21.567
TH-234	5.755E+02	1.628E+02	1.551E+02	1.282E+01	3.711
NP-237	2.607E+01	3.290E+01	4.581E+01	5.173E+00	0.569

---- Non-Identified Nuclides ----

Nuclide	Key-Line Activity (pCi/filter)	K.L. Ided	Act error	MDA (pCi/filter)	MDA error	Act/MDA
CO-57	-1.746E+00		5.956E+00	9.282E+00	1.426E+00	-0.188
CD-109	-2.633E+01		1.066E+02	1.480E+02	1.700E+01	-0.178
PA-231	2.739E+01		4.120E+00	8.216E+00	1.565E-01	3.334
PA-234	4.136E+00		1.740E+00	3.256E+00	6.716E-02	1.270
AM-241	2.381E+01		1.126E+01	1.931E+01	1.495E+00	1.233

VAX/VMS Peak Search Report Generated 12-AUG-2013 09:13:03.70

Configuration : DKA100:[GAMMA.SCUSR.ARCHIVE]SMP_130717009_GE2_BAFIL_194586.CN
Analyses by : PEAK V16.9 PEAKEFF V2.2
Client ID : PZ-100-KS DIS
Deposition Date :
Sample Date : 12-AUG-2013 00:00:00 Acquisition date : 12-AUG-2013 08:57:47
Sample ID : 1307170-09 Sample Quantity : 1.00000E+00 filter
Sample type : FILTER Sample Geometry : 0
Detector name : GE2 Detector Geometry: BAFIL
Elapsed live time: 0 00:15:00.00 Elapsed real time: 0 00:15:00.29 0.0%
Start channel : 25 End channel : 4096
Sensitivity : 3.00000 Gaussian : 10.00000
Critical level : No

Pk	It	Energy	Area	Bkgnd	FWHM	Channel	Left	Pw	Cts/Sec	%Err	Fit
1	1	30.92	1799	87	1.38	31.03	26	15	2.00E+00	2.5	1.46E+01
2	1	35.01	394	73	1.39	35.13	26	15	4.38E-01	6.5	
3	1	52.94	40	68	1.44	53.06	48	22	4.43E-02	32.7	2.52E+00
4	1	61.93	195	63	1.46	62.04	48	22	2.17E-01	9.5	
5	1	65.75	67	60	1.47	65.87	48	22	7.43E-02	22.0	
6	0	81.04	723	95	1.37	81.15	78	7	8.03E-01	4.3	
7	0	111.52	141	101	1.30	111.64	108	7	1.56E-01	13.5	
8	0	186.77	43	57	3.88	186.88	183	8	4.75E-02	34.3	
9	0	197.35	15	61	1.81	197.46	194	6	1.70E-02	85.5	
10	0	277.46	49	55	1.66	277.57	273	10	5.44E-02	31.7	
11	0	295.99	21	16	2.20	296.09	293	7	2.34E-02	39.1	
12	0	303.22	137	52	1.38	303.33	299	8	1.52E-01	12.5	
13	2	333.75	86	11	1.95	333.86	328	18	9.58E-02	12.3	2.24E+00
14	2	338.24	29	8	2.00	338.35	328	18	3.19E-02	28.0	
15	3	356.08	554	5	1.66	356.18	351	17	6.15E-01	4.3	1.81E+00
16	3	364.43	16	7	2.23	364.54	351	17	1.74E-02	42.4	
17	1	383.72	109	23	1.86	383.83	380	18	1.21E-01	12.6	5.13E+00
18	1	386.97	183	22	1.84	387.08	380	18	2.03E-01	9.4	
19	1	391.06	45	21	1.86	391.17	380	18	5.03E-02	24.9	
20	4	411.06	8	6	1.88	411.16	409	18	9.16E-03	45.4	4.53E+00
21	4	415.07	27	7	1.88	415.17	409	18	2.99E-02	26.8	
22	4	419.10	24	6	2.51	419.20	409	18	2.62E-02	36.0	
23	1	433.72	5	1	1.90	433.83	431	12	5.84E-03	107.2	1.87E+00
24	1	437.03	87	4	1.90	437.14	431	12	9.66E-02	11.4	
25	2	465.90	6	5	1.75	466.00	462	16	6.19E-03	72.4	9.78E-01
26	2	471.90	14	6	2.12	472.00	462	16	1.54E-02	42.0	
27	0	511.18	15	12	1.04	511.29	507	8	1.67E-02	47.6	
28	0	545.37	7	4	2.02	545.47	542	7	8.08E-03	56.9	

Sample ID : 1307170-09
Acquisition date : 12-AUG-2013 08:57:47

Total number of lines in spectrum 28
Number of unidentified lines 24
Number of lines tentatively identified by NID 4 14.29%

Nuclide Type : FISSION

Nuclide	Hlife	Decay	Wtd Mean Uncorrected pCi/filter	Wtd Mean Decay Corr pCi/filter	Decay Corr 2-Sigma Error	2-Sigma %Error	Flags
BA-133	10.50Y	1.00	3.659E+02	3.659E+02	0.714E+02	19.52	
	Total Activity :		3.659E+02	3.659E+02			

Nuclide Type : NATURAL

Nuclide	Hlife	Decay	Wtd Mean Uncorrected pCi/filter	Wtd Mean Decay Corr pCi/filter	Decay Corr 2-Sigma Error	2-Sigma %Error	Flags
TH-234	4.47E+09Y	1.00	6.700E+02	6.700E+02	1.418E+02	21.16	
	Total Activity :		6.700E+02	6.700E+02			

Grand Total Activity : 1.036E+03 1.036E+03

Flags: "K" = Keyline not found "M" = Manually accepted
"E" = Manually edited "A" = Nuclide specific abn. limit

Nuclide Type: FISSION

Nuclide	Energy	%Abn	%Eff	Uncorrected pCi/filter	Decay Corr pCi/filter	2-Sigma %Error	Status
BA-133	81.00	33.00*	1.799E+01	3.659E+02	3.659E+02	19.52	OK
	302.84	17.80	7.560E+00	3.051E+02	3.052E+02	39.00	OK
	356.01	60.00	7.170E+00	3.866E+02	3.866E+02	17.41	OK

Final Mean for 3 Valid Peaks = 3.659E+02+/- 7.144E+01 (19.52%)

Nuclide Type: NATURAL

Nuclide	Energy	%Abn	%Eff	Uncorrected pCi/filter	Decay Corr pCi/filter	2-Sigma %Error	Status
TH-234	63.29	3.80*	2.305E+01	6.700E+02	6.700E+02	21.16	OK

Final Mean for 1 Valid Peaks = 6.700E+02+/- 1.418E+02 (21.16%)

Flag: "*" = Keyline

---- Identified Nuclides ----

Nuclide	Activity (pCi/filter)	Act error	MDA (pCi/filter)	MDA error	Act/MDA
BA-133	3.659E+02	7.144E+01	2.082E+01	3.545E+00	17.576
TH-234	6.700E+02	1.418E+02	1.471E+02	1.215E+01	4.556

---- Non-Identified Nuclides ----

Nuclide	Key-Line Activity (pCi/filter)	K.L. Ided	Act error	MDA (pCi/filter)	MDA error	Act/MDA
CO-57	-4.675E+00		5.795E+00	9.227E+00	1.417E+00	-0.507
CD-109	-1.953E+01		1.132E+02	1.804E+02	2.072E+01	-0.108
PA-231	2.685E+01		4.232E+00	8.369E+00	1.594E-01	3.208
PA-234	2.895E+00		1.726E+00	3.123E+00	6.442E-02	0.927
NP-237	-4.583E+00		3.330E+01	5.329E+01	6.016E+00	-0.086
AM-241	2.023E+01		9.946E+00	1.920E+01	1.486E+00	1.054

VAX/VMS Peak Search Report Generated 12-AUG-2013 09:37:06.93

9
8/12/13

Configuration : DKA100:[GAMMA.SCUSR.ARCHIVE]SMP_130717010_GE2_BAFIL_194590.CN
Analyses by : PEAK V16.9 PEAKEFF V2.2
Client ID : PURGE TANK TOT
Deposition Date :
Sample Date : 12-AUG-2013 00:00:00 Acquisition date : 12-AUG-2013 09:21:49
Sample ID : 1307170-10 Sample Quantity : 1.00000E+00 filter
Sample type : FILTER Sample Geometry : 0
Detector name : GE2 Detector Geometry: BAFIL
Elapsed live time: 0 00:15:00.00 Elapsed real time: 0 00:15:00.29 0.0%
Start channel : 25 End channel : 4096
Sensitivity : 3.00000 Gaussian : 10.00000
Critical level : No

Pk	It	Energy	Area	Bkgnd	FWHM	Channel	Left	Pw	Cts/Sec	%Err	Fit
1	2	30.99	1814	101	1.34	31.10	26	16	2.02E+00	2.5	3.72E+00
2	2	35.15	427	79	1.53	35.27	26	16	4.74E-01	6.1	
3	0	52.47	60	82	1.71	52.58	49	8	6.70E-02	29.0	
4	4	58.32	26	30	1.75	58.44	57	12	2.84E-02	33.4	4.45E+00
5	4	61.77	191	59	1.94	61.89	57	12	2.12E-01	10.2	
6	4	65.75	92	57	1.95	65.86	57	12	1.02E-01	18.5	
7	1	81.02	666	46	1.50	81.14	77	13	7.40E-01	4.3	5.35E+00
8	1	83.89	15	46	1.37	84.00	77	13	1.69E-02	119.6	
9	0	91.79	39	61	3.47	91.90	89	7	4.34E-02	36.9	
10	1	109.03	16	37	1.55	109.14	108	7	1.74E-02	56.0	3.36E+00
11	1	111.77	178	54	1.50	111.88	108	7	1.98E-01	9.4	
12	0	163.86	24	43	2.60	163.97	162	5	2.72E-02	46.5	
13	0	186.55	29	73	1.42	186.66	184	8	3.26E-02	53.5	
14	0	277.46	49	71	1.86	277.57	272	12	5.41E-02	37.7	
15	1	302.92	147	7	1.68	303.03	298	13	1.63E-01	8.7	2.61E+00
16	1	307.05	36	6	1.79	307.16	298	13	3.97E-02	24.5	
17	1	333.98	60	11	1.81	334.08	329	18	6.68E-02	14.8	2.81E+00
18	1	337.95	25	12	1.82	338.05	329	18	2.82E-02	28.7	
19	0	356.15	462	46	1.46	356.25	352	9	5.13E-01	5.4	
20	1	383.72	100	29	1.86	383.83	380	11	1.11E-01	14.5	1.73E+01
21	1	387.04	144	55	1.86	387.14	380	11	1.60E-01	12.3	
22	0	391.56	37	8	1.81	391.67	390	6	4.12E-02	22.5	
23	2	414.53	29	12	2.06	414.64	411	18	3.22E-02	25.5	1.74E+00
24	2	418.25	19	8	2.08	418.36	411	18	2.13E-02	40.2	
25	2	422.53	8	5	2.08	422.64	411	18	8.53E-03	73.2	
26	0	436.94	89	9	1.50	437.04	432	9	9.89E-02	12.2	
27	0	467.93	18	14	1.26	468.03	464	8	1.95E-02	44.1	
28	0	510.68	34	6	2.07	510.78	505	12	3.78E-02	22.4	
29	0	568.90	10	0	3.33	569.00	566	7	1.11E-02	31.6	
30	0	672.23	6	0	1.92	672.33	669	6	6.67E-03	40.8	
31	0	716.90	8	0	2.09	717.00	714	6	8.89E-03	35.4	
32	0	958.15	6	1	1.23	958.24	955	5	6.27E-03	51.9	
33	0	1461.09	6	0	1.98	1461.17	1458	6	6.67E-03	40.8	

Sample ID : 1307170-10 Acquisition date : 12-AUG-2013 09:21:49

Total number of lines in spectrum	33	
Number of unidentified lines	28	
Number of lines tentatively identified by NID	5	15.15%

Nuclide Type : FISSION

Nuclide	Hlife	Decay	Wtd Mean Uncorrected pCi/filter	Wtd Mean Decay Corr pCi/filter	Decay Corr 2-Sigma Error	2-Sigma %Error	Flags
BA-133	10.50Y	1.00	3.370E+02	3.371E+02	0.657E+02	19.48	
	Total Activity :		3.370E+02	3.371E+02			

Nuclide Type : NATURAL

Nuclide	Hlife	Decay	Wtd Mean Uncorrected pCi/filter	Wtd Mean Decay Corr pCi/filter	Decay Corr 2-Sigma Error	2-Sigma %Error	Flags
TH-234	4.47E+09Y	1.00	6.550E+02	6.550E+02	1.461E+02	22.30	
AM-241	432.20Y	1.00	8.702E+00	8.702E+00	5.855E+00	67.29	
	Total Activity :		6.637E+02	6.637E+02			
	Grand Total Activity :		1.001E+03	1.001E+03			

Flags: "K" = Keyline not found "M" = Manually accepted
"E" = Manually edited "A" = Nuclide specific abn. limit

Nuclide Type: FISSION

Nuclide	Energy	%Abn	%Eff	Uncorrected pCi/filter	Decay Corr pCi/filter	2-Sigma %Error	Status
BA-133	81.00	33.00*	1.799E+01	3.370E+02	3.371E+02	19.48	OK
	302.84	17.80	7.560E+00	3.271E+02	3.272E+02	34.56	OK
	356.01	60.00	7.170E+00	3.225E+02	3.225E+02	18.56	OK

Final Mean for 3 Valid Peaks = 3.371E+02+/- 6.568E+01 (19.48%)

Nuclide Type: NATURAL

Nuclide	Energy	%Abn	%Eff	Uncorrected pCi/filter	Decay Corr pCi/filter	2-Sigma %Error	Status
TH-234	63.29	3.80*	2.305E+01	6.550E+02	6.550E+02	22.30	OK

Final Mean for 1 Valid Peaks = 6.550E+02+/- 1.461E+02 (22.30%)

AM-241	59.54	35.90*	2.461E+01	8.702E+00	8.702E+00	67.29	OK

Final Mean for 1 Valid Peaks = 8.702E+00+/- 5.855E+00 (67.29%)

Flag: "*" = Keyline

---- Identified Nuclides ----

Nuclide	Activity (pCi/filter)	Act error	MDA (pCi/filter)	MDA error	Act/MDA
BA-133	3.371E+02	6.568E+01	1.936E+01	3.297E+00	17.409
TH-234	6.550E+02	1.461E+02	1.325E+02	1.095E+01	4.943
AM-241	8.702E+00	5.855E+00	1.310E+01	1.014E+00	0.664

---- Non-Identified Nuclides ----

Nuclide	Key-Line Activity (pCi/filter)	K.L. Ided	Act error	MDA (pCi/filter)	MDA error	Act/MDA
CO-57	6.381E-01		4.604E+00	8.326E+00	1.279E+00	0.077
CD-109	6.336E+01		1.038E+02	1.662E+02	1.908E+01	0.381
PA-231	2.578E+01		4.146E+00	8.213E+00	1.564E-01	3.139
PA-234	4.542E+00		1.758E+00	3.315E+00	6.839E-02	1.370
NP-237	-1.087E+00		3.320E+01	5.377E+01	6.071E+00	-0.020