ENGINEERING MANAGEMENT SUPPORT, INC.

West Lake OU-1

STANDARD LEVEL IV
REPORT OF ANALYSIS

WORK ORDER #13-04107-OR

May 22, 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 # 13-04107

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

Date for Partial	Initials	Date	Initials	Checklist Items
		4/16/13	KC	Sample Log-In
		5-15-13	JG	Data Compilation
		5-16-13	MLT	First Technical Data Review
		5/16/13	MSA	Second Technical Data Review
		5/21/13		Data Entry/Electronic Deliverable
		5/21/13		Case Narrative
		5/21/13	KBS	Electronic Deliverable Proof
		5/21/13	MSA	Samples Analyzed within Holding Time Yes? [✓] No? [ ]
		5/21/13	MSA	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: _____ 5/22/13

Laboratory ~~Manager~~ Date

Copy No. _____

Radiochemistry Services

0003

SECTION I

CHAIN OF CUSTODY
&
pH CHECK SHEET

REC'D APR 16 2013 13-04107

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 Rosasco	Sampler (Print Name): John D Regan
Address:	Sampler (Print Name):
	Shipment Method: Courier
	Airbill Number: ——
Phone:	Laboratory Receiving:
Fax:	

Analysis Requested

Page 2 of 2

① Lab to filter for dissolved parameters.

Purchase Order #:

	Field Sample ID	Sample Date	Sample Time	Sample Matrix	Number of Containers	Diss U-238, U-235, U-234	Diss Ra-226, Ra-228	Diss Thor 232, 230, 228	Tot U238, 235, 234	Tot Ra 226, 228	Tot Thor 232, 230, 228						Comments, Special Instructions, etc.	Lab Sample ID (to be completed by lab)
	D-6	4/9/13	1545	Aqueous	1	X	X	X	X	X	X						①	
	D-83	↓	1616	↑	↑	X	X	X	X	X	X						↑	
	Dup Ø5	4/9/13	—			X	X	X	X	X	X							
	PZ-102-SS	4/11/13	0910			X	X	X	X	X	X							
	PZ-102R-SS		1130			X	X	X	X	X	X							
	PZ-104-SD		1138			X	X	X	X	X	X							
	PZ-104-SS		1359			X	X	X	X	X	X							
4,5-	PZ-113-AD		1335			X	X	X	X	X	X							
6,7-	FBØD-3		1350			X	X	X	X	X	X							
8,9-	D-3		1424			X	X	X	X	X	X							
10,11-	D-85		1445			X	X	X	X	X	X							
12,13-	S-84		1530			X	X	X	X	X	X							
14,15-	S-5		1531			X	X	X	X	X	X							
16,17-	PZ-109-SS		1608			X	X	X	X	X	X							
18,19-	PZ-104-KS	↓	1708			X	X	X	X	X	X							
	Dup Ø6	4/11/13	—	↓	↓	X	X	X	X	X	X						↓	
	I-4	4/12/13	1320	Aqueous	1	X	X	X	X	X	X						①	

Relinquished by: (Signature)	Received by: (Signature)	Date:	Time:
[signature]	First Capitol Courier	4/15/13	0800
Relinquished by: (Signature)	Received by: (Signature)	Date:	Time:
	Kristen Carlson	4/16/13	940
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?	

40305

EBERLINE SERVICES
Oak Ridge Laboratory

Internal Chain of Custody

Work Order #	13-04107
Lab Deadline	5/7/2013
Analysis	UUISO - Level 4
Sample Matrix	Water

Comments

Fxns 04, 06, 08, 10, 12, 14, 16 & 18 are TOTAL

Fxns 05, 07, 09, 11, 13, 15, 17 & 19 are DISSOLVED

Sample Fraction	HP 210 / 270 Detector Activity	Storage Location
04	39	LL1.0
05	39	LL1.0
06	44	LL1.0
07	44	LL1.0
08	46	LL1.0
09	46	LL1.0
10	43	LL1.0
11	43	LL1.0
12	42	LL1.0
13	42	LL1.0
14	35	LL1.0
15	35	LL1.0
16	45	LL1.0
17	45	LL1.0
18	38	LL1.0
19	38	LL1.0

	Location (circle one)					Initials	Date
Received by	(Sample Storage)	Rough Prep	Prep	Separations	Count Room	BT	4/29/13 0740
Relinquished by	Sample Storage	Rough Prep	(Prep)	Separations	Count Room	BT	4/29/13 1238
Received by	Sample Storage	Rough Prep	Prep	(Separations)	Count Room	JPD	4/29/13 1238
Relinquished by	Sample Storage	Rough Prep	Prep	(Separations)	Count Room	0845 PM	5/2/13
Received by	Sample Storage	Rough Prep	Prep	Separations	(Count Room)	0845	
Relinquished by	Sample Storage	Rough Prep	Prep	Separations	(Count Room)	ICB	5/2/13 1602
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 #	13-04107
Lab Deadline	5/7/2013
Analysis	ThISO - Level 4
Sample Matrix	Water

Comments

Fxns 04, 06, 08, 10, 12, 14, 16 & 18 are TOTAL

Fxns 05, 07, 09, 11, 13, 15, 17 & 19 are DISSOLVED

Sample Fraction	HP 210 / 270 Detector Activity	Storage Location
04	39	LL1.0
05	39	LL1.0
06	44	LL1.0
07	44	LL1.0
08	46	LL1.0
09	46	LL1.0
10	43	LL1.0
11	43	LL1.0
12	42	LL1.0
13	42	LL1.0
14	35	LL1.0
15	35	LL1.0
16	45	LL1.0
17	45	LL1.0
18	38	LL1.0
19	38	LL1.0

	Location (circle one)					Initials	Date
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	0915 RM	4/29/13
Relinquished by	Sample Storage	Rough Prep	Prep	(Separations)	Count Room	0915 RM	5/2/13
Received by	Sample Storage	Rough Prep	Prep	Separations	(Count Room)	0915	
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		
Received by	Sample Storage	Rough Prep	Prep	Separations	Count Room		
Relinquished by	Sample Storage	Rough Prep	Prep	Separations	Count Room		

US EPA ARCHIVE DOCUMENT

EBERLINE SERVICES
Oak Ridge Laboratory

Internal Chain of Custody

Work Order #	13-04107
Lab Deadline	5/7/2013
Analysis	Ra226 - Level 4
Sample Matrix	Water

Comments	Sample Fraction	HP 210 / 270 Detector Activity	Storage Location
Fxns 04, 06, 08, 10, 12, 14, 16 & 18 are TOTAL Fxns 05, 07, 09, 11, 13, 15, 17 & 19 are DISSOLVED	04	39	LL1.0
	05	39	LL1.0
	06	44	LL1.0
	07	44	LL1.0
	08	46	LL1.0
	09	46	LL1.0
	10	43	LL1.0
	11	43	LL1.0
	12	42	LL1.0
	13	42	LL1.0
	14	35	LL1.0
	15	35	LL1.0
	16	45	LL1.0
	17	45	LL1.0
	18	38	LL1.0
	19	38	LL1.0

	Location (circle one)					Initials	Date
Received by	(Sample Storage)	Rough Prep	Prep	Separations	Count Room		4/2/13 0700
Relinquished by	Sample Storage	Rough Prep	(Prep)	Separations	Count Room		4/2/13 0830
Received by	Sample Storage	Rough Prep	Prep	(Separations)	Count Room		4/2/13 0830
Relinquished by	Sample Storage	Rough Prep	Prep	(Separations)	Count Room		5/10/13 1153
Received by	Sample Storage	Rough Prep	Prep	Separations	(Count Room)	ICB	5/10/13 1159
Relinquished by	Sample Storage	Rough Prep	Prep	Separations	(Count Room)		[illegible]
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 #	13-04107
Lab Deadline	5/7/2013
Analysis	Ra228 - Level 4
Sample Matrix	Water

Comments

Fxns 04, 06, 08, 10, 12, 14, 16 & 18 are TOTAL

Fxns 05, 07, 09, 11, 13, 15, 17 & 19 are DISSOLVED

Sample Fraction	HP 210 / 270 Detector Activity	Storage Location
04	39	LL1.0
05	39	LL1.0
06	44	LL1.0
07	44	LL1.0
08	46	LL1.0
09	46	LL1.0
10	43	LL1.0
11	43	LL1.0
12	42	LL1.0
13	42	LL1.0
14	35	LL1.0
15	35	LL1.0
16	45	LL1.0
17	45	LL1.0
18	38	LL1.0
19	38	LL1.0

	Location (circle one)					Initials	Date
Received by	Sample Storage	Rough Prep	Prep	Separations	Count Room		4/29/13 0740
Relinquished by	Sample Storage	Rough Prep	Prep	Separations	Count Room		4/30/13 0630
Received by	Sample Storage	Rough Prep	Prep	Separations	Count Room		4-30-13 0630
Relinquished by	Sample Storage	Rough Prep	Prep	Separations	Count Room		5-10-13 1153
Received by	Sample Storage	Rough Prep	Prep	Separations	Count Room	KB	5/10/13 1154
Relinquished by	Sample Storage	Rough Prep	Prep	Separations	Count Room		0638
Received by	Sample Storage	Rough Prep	Prep	Separations	Count Room		5/13/13 1240
Relinquished by	Sample Storage	Rough Prep	Prep	Separations	Count Room		5-15-13 0950
Received by	Sample Storage	Rough Prep	Prep	Separations	Count Room		
Relinquished by	Sample Storage	Rough Prep	Prep	Separations	Count Room	KB	5/15/13 1209
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
13-04107
Received By
KCOULSTON

FR	ClientID	# Btls	Comments	Matrix	Storage	Rec Vol Ttl	CPM Max
01	LCS	0		WA	LL1.0		
02	BLANK	0		WA	LL1.0		
03	DUP	0		WA	LL1.0		
04	PZ-113-AD TOT	1		WA	LL1.0	9.50	39
			Container Number	pH Orig	pH Final	Volume (L)	CPM
			1	7	7	9.5000	39
05	PZ-113-AD DIS	1		WA	LL1.0	0.00	39
			Container Number	pH Orig	pH Final	Volume (L)	CPM
			1				39
06	FB D-3 TOT	1		WA	LL1.0	9.50	44
			Container Number	pH Orig	pH Final	Volume (L)	CPM
			1	7	7	9.5000	44
07	FB D-3 DIS	1		WA	LL1.0	0.00	44
			Container Number	pH Orig	pH Final	Volume (L)	CPM
			1				44
08	D-3 TOT	1		WA	LL1.0	9.50	46
			Container Number	pH Orig	pH Final	Volume (L)	CPM
			1	7	7	9.5000	46
09	D-3 DIS	1		WA	LL1.0	0.00	46
			Container Number	pH Orig	pH Final	Volume (L)	CPM
			1				46
10	D-85 TOT	1		WA	LL1.0	9.50	43
			Container Number	pH Orig	pH Final	Volume (L)	CPM
			1	7	7	9.5000	43
11	D-85 DIS	1		WA	LL1.0	0.00	43
			Container Number	pH Orig	pH Final	Volume (L)	CPM
			1				43
12	S-84 TOT	1		WA	LL1.0	9.50	42
			Container Number	pH Orig	pH Final	Volume (L)	CPM
			1	7	7	9.5000	42
13	S-84 DIS	1		WA	LL1.0	0.00	42
			Container Number	pH Orig	pH Final	Volume (L)	CPM
			1				42
14	S-5 TOT	1		WA	LL1.0	9.50	35
			Container Number	pH Orig	pH Final	Volume (L)	CPM
			1	7	7	9.5000	35
15	S-5 DIS	1		WA	LL1.0	0.00	35
			Container Number	pH Orig	pH Final	Volume (L)	CPM
			1				35
16	PZ-109-SS TOT	1		WA	LL1.0	9.50	45
			Container Number	pH Orig	pH Final	Volume (L)	CPM
			1	7	7	9.5000	45
17	PZ-109-SS DIS	1		WA	LL1.0	0.00	45
			Container Number	pH Orig	pH Final	Volume (L)	CPM
			1				45
18	PZ-104-KS TOT	1		WA	LL1.0	9.50	38
			Container Number	pH Orig	pH Final	Volume (L)	CPM
			1	7	7	9.5000	38
19	PZ-104-KS DIS	1		WA	LL1.0	0.00	38
			Container Number	pH Orig	pH Final	Volume (L)	CPM
			1				38

Jeyi 04/16/13

Received by: Kristen Coulston Date: 4/16/13

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	04/16/2013	28	13-04107
Project Name	**Client WO**	**Sample Disp**	**Lab Deadline**	**Internal Deadline**	**Client Deadline**
West Lake OU-1	West Lake OU-1	W	05/07/2013	05/13/2013	05/14/2013

Internal ID	Client ID	Sample Date	Matrix	Storage	Ra226	Ra228	ThISO	UUISO																			Ttl
01	LCS	04/16/13	WA	LL1.0	X	X	X	X																			4
02	BLANK	04/16/13	WA	LL1.0	X	X	X	X																			4
03	DUP	04/16/13	WA	LL1.0	X	X	X	X																			4
04	PZ-113-AD TOT	04/11/13 13:35	WA	LL1.0	X	X	X	X																			4
05	PZ-113-AD DIS	04/11/13 13:35	WA	LL1.0	X	X	X	X																			4
06	FB at D-3 TOT	04/11/13 13:50	WA	LL1.0	X	X	X	X																			4
07	FB at D-3 DIS	04/11/13 13:50	WA	LL1.0	X	X	X	X																			4
08	D-3 TOT	04/11/13 14:24	WA	LL1.0	X	X	X	X																			4
09	D-3 DIS	04/11/13 14:24	WA	LL1.0	X	X	X	X																			4
10	D-85 TOT	04/11/13 14:45	WA	LL1.0	X	X	X	X																			4
11	D-85 DIS	04/11/13 14:45	WA	LL1.0	X	X	X	X																			4
12	S-84 TOT	04/11/13 15:30	WA	LL1.0	X	X	X	X																			4
13	S-84 DIS	04/11/13 15:30	WA	LL1.0	X	X	X	X																			4
14	S-5 TOT	04/11/13 15:31	WA	LL1.0	X	X	X	X																			4
15	S-5 DIS	04/11/13 15:31	WA	LL1.0	X	X	X	X																			4
16	PZ-109-SS TOT	04/11/13 16:08	WA	LL1.0	X	X	X	X																			4
17	PZ-109-SS DIS	04/11/13 16:08	WA	LL1.0	X	X	X	X																			4
18	PZ-104-KS TOT	04/11/13 18:08	WA	LL1.0	X	X	X	X																			4
19	PZ-104-KS DIS	04/11/13 18:08	WA	LL1.0	X	X	X	X																			4
																											0
		Totals Per Analysis (non QA samples)			16	16	16	16	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	
	Paul V. Rosasco, P.E.
	Engineering Management Support, Inc.
	7220 West Jefferson Avenue, Suite 406
	Lakewood, CO 80235
Voice	303-640-3426
Fax	
Contact	Lyn Fitzgerald
Voice	303-601-4255
Fax	

Report Data	
	Paul V. Rosasco, P.E.
	Engineering Management Support, Inc
	7220 West Jefferson Ave, Suite 406
	Lakewood, CO 80235
Voice	303-940-3426
Fax	

Printed: 4/16/2013 12:43 PM

Eberline Services – Oak Ridge Laboratory

SAMPLE RECEIPT CHECKLIST
MP-001-2

WORK ORDER # 13-04107

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 Carlsten DATE: 4/16/13

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-35584

May 22, 2013

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

CASE NARRATIVE
Work Order # 13-04107-OR

SAMPLE RECEIPT

This work order contains eight water samples received 04/16/2013. All samples were analyzed as total and dissolved for Isotopic Uranium, Isotopic Thorium and Radium-226/228.

CLIENT ID	LAB ID	CLIENT ID	LAB ID
PZ-113-AD TOT	13-04107-04	S-84 TOT	13-04107-12
PZ-113-AD DIS	13-04107-05	S-84 DIS	13-04107-13
FB at D-3 TOT	13-04107-06	S-5 TOT	13-04107-14
FB at D-3 DIS	13-04107-07	S-5 DIS	13-04107-15
D-3 TOT	13-04107-08	PZ-109-SS TOT	13-04107-16
D-3 DIS	13-04107-09	PZ-109-SS DIS	13-04107-17
D-85 TOT	13-04107-10	PZ-104-KS TOT	13-04107-18
D-85 DIS	13-04107-11	PZ-104-KS DIS	13-04107-19

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 filtered to disassociate dissolved and total fractions. All samples were prepared by removing a representative aliquot followed by mixed acid digestions and dilutions as appropriate. 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 fractions -04, -14 and -15 (Client IDs: PZ-113-AD TOT, S-5 TOT and S-5 DIS). 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 filtered to disassociate dissolved and total fractions. All samples were prepared by removing a representative aliquot 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, Thorium-230 and 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 filtered to disassociate dissolved and total fractions. All samples were prepared by mixed acid digestions and dilutions 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. Percent mean recovery was slightly low for sample fraction -14 (Client ID: S-5 TOT). In this case the radiometric and gravimetric recoveries were acceptable. Chemical recovery was acceptable for all other samples. The Radium-228 method blank demonstrated acceptable results. Results for the Radium-228 duplicate demonstrated an acceptable relative percent difference and normalized difference. 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: 5/22/2013

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SECTION IV

ANALYTICAL RESULTS SUMMARY

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Lakewood, CO 80235

Project: West Lake OU-1
SDG: 1304107
Received: 04/16/2013
Matrix: Water

Client Sample ID	Lab Sample ID	Analysis Date/Time	Analyte	Method	Result	Error	MDA	Qualifier	Units
LCS13-04107-01	13-04107-01	05/12/2013 12:09:39	Radium-226	E903.0	10.58	1.20	0.23		pCi/l
LCS13-04107-01	13-04107-01	05/15/2013 09:46:32	Radium-228	E904.0	5.80	0.82	1.18		pCi/l
LCS13-04107-01	13-04107-01	05/02/2013 12:39:20	Thorium-228	HASL 300, 4.5.2	5.33	0.84	0.07		pCi/l
LCS13-04107-01	13-04107-01	05/02/2013 12:39:20	Thorium-230	HASL 300, 4.5.2	5.03	0.80	0.08		pCi/l
LCS13-04107-01	13-04107-01	05/02/2013 12:39:20	Thorium-232	HASL 300, 4.5.2	5.66	0.88	0.11		pCi/l
LCS13-04107-01	13-04107-01	05/02/2013 09:15:28	Uranium-234	HASL 300, 4.5.2	7.74	1.06	0.10		pCi/l
LCS13-04107-01	13-04107-01	05/02/2013 09:15:28	Uranium-235	HASL 300, 4.5.2	0.47	0.18	0.09		pCi/l
LCS13-04107-01	13-04107-01	05/02/2013 09:15:28	Uranium-238	HASL 300, 4.5.2	8.39	1.13	0.09		pCi/l
BLANK13-04107-02	13-04107-02	05/12/2013 12:09:40	Radium-226	E903.0	0.02	0.07	0.15	U	pCi/l
BLANK13-04107-02	13-04107-02	05/15/2013 09:46:33	Radium-228	E904.0	1.36	0.56	1.02	J	pCi/l
BLANK13-04107-02	13-04107-02	05/02/2013 12:39:22	Thorium-228	HASL 300, 4.5.2	0.06	0.07	0.09	U	pCi/l
BLANK13-04107-02	13-04107-02	05/02/2013 12:39:22	Thorium-230	HASL 300, 4.5.2	0.09	0.08	0.09	J	pCi/l
BLANK13-04107-02	13-04107-02	05/02/2013 12:39:22	Thorium-232	HASL 300, 4.5.2	0.02	0.04	0.08	U	pCi/l
BLANK13-04107-02	13-04107-02	05/02/2013 09:15:29	Uranium-234	HASL 300, 4.5.2	0.07	0.06	0.06	J	pCi/l
BLANK13-04107-02	13-04107-02	05/02/2013 09:15:29	Uranium-235	HASL 300, 4.5.2	0.03	0.05	0.07	U	pCi/l
BLANK13-04107-02	13-04107-02	05/02/2013 09:15:29	Uranium-238	HASL 300, 4.5.2	0.02	0.04	0.05	U	pCi/l
PZ-109-SS TOT DUP	13-04107-03	05/12/2013 12:09:41	Radium-226	E903.0	1.72	0.40	0.17		pCi/l
PZ-109-SS TOT DUP	13-04107-03	05/15/2013 09:46:33	Radium-228	E904.0	0.68	0.35	0.66	J	pCi/l
FB at D-3 TOT DUP	13-04107-03	05/02/2013 12:39:17	Thorium-228	HASL 300, 4.5.2	0.01	0.03	0.07	U	pCi/l
FB at D-3 TOT DUP	13-04107-03	05/02/2013 12:39:17	Thorium-230	HASL 300, 4.5.2	0.08	0.07	0.07	J	pCi/l
FB at D-3 TOT DUP	13-04107-03	05/02/2013 12:39:17	Thorium-232	HASL 300, 4.5.2	0.01	0.03	0.07	U	pCi/l
FB at D-3 TOT DUP	13-04107-03	05/02/2013 09:15:30	Uranium-234	HASL 300, 4.5.2	0.05	0.06	0.10	U	pCi/l
FB at D-3 TOT DUP	13-04107-03	05/02/2013 09:15:30	Uranium-235	HASL 300, 4.5.2	0.02	0.05	0.10	U	pCi/l
FB at D-3 TOT DUP	13-04107-03	05/02/2013 09:15:30	Uranium-238	HASL 300, 4.5.2	0.01	0.04	0.10	U	pCi/l
PZ-113-AD TOT	13-04107-04	05/12/2013 12:09:42	Radium-226	E903.0	2.27	0.60	0.24		pCi/l
PZ-113-AD TOT	13-04107-04	05/15/2013 09:46:34	Radium-228	E904.0	7.01	0.70	0.85		pCi/l
PZ-113-AD TOT	13-04107-04	05/02/2013 12:39:19	Thorium-228	HASL 300, 4.5.2	0.12	0.09	0.09	J	pCi/l
PZ-113-AD TOT	13-04107-04	05/02/2013 12:39:19	Thorium-230	HASL 300, 4.5.2	0.14	0.10	0.09	J	pCi/l
PZ-113-AD TOT	13-04107-04	05/02/2013 12:39:19	Thorium-232	HASL 300, 4.5.2	0.06	0.06	0.06	U	pCi/l
PZ-113-AD TOT	13-04107-04	05/02/2013 09:15:32	Uranium-234	HASL 300, 4.5.2	0.29	0.27	0.30	J	pCi/l
PZ-113-AD TOT	13-04107-04	05/02/2013 09:15:32	Uranium-235	HASL 300, 4.5.2	-0.02	0.13	0.32	U	pCi/l
PZ-113-AD TOT	13-04107-04	05/02/2013 09:15:32	Uranium-238	HASL 300, 4.5.2	0.15	0.22	0.35	U	pCi/l

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Project: West Lake OU-1
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Matrix: Water

Client Sample ID	Lab Sample ID	Analysis Date/Time	Analyte	Method	Result	Error	MDA	Qualifier	Units
PZ-113-AD DIS	13-04107-05	05/12/2013 12:09:43	Radium-226	E903.0	1.59	0.45	0.20		pCi/l
PZ-113-AD DIS	13-04107-05	05/15/2013 09:46:37	Radium-228	E904.0	2.83	0.53	0.84		pCi/l
PZ-113-AD DIS	13-04107-05	05/02/2013 12:39:13	Thorium-228	HASL 300, 4.5.2	0.04	0.05	0.07	U	pCi/l
PZ-113-AD DIS	13-04107-05	05/02/2013 12:39:13	Thorium-230	HASL 300, 4.5.2	0.12	0.08	0.07	J	pCi/l
PZ-113-AD DIS	13-04107-05	05/02/2013 12:39:13	Thorium-232	HASL 300, 4.5.2	0.01	0.03	0.05	U	pCi/l
PZ-113-AD DIS	13-04107-05	05/02/2013 09:16:02	Uranium-234	HASL 300, 4.5.2	0.06	0.07	0.10	U	pCi/l
PZ-113-AD DIS	13-04107-05	05/02/2013 09:16:02	Uranium-235	HASL 300, 4.5.2	0.09	0.10	0.14	U	pCi/l
PZ-113-AD DIS	13-04107-05	05/02/2013 09:16:02	Uranium-238	HASL 300, 4.5.2	-0.02	0.04	0.15	U	pCi/l
FB at D-3 TOT	13-04107-06	05/12/2013 12:09:44	Radium-226	E903.0	-0.03	0.04	0.16	U	pCi/l
FB at D-3 TOT	13-04107-06	05/15/2013 09:46:38	Radium-228	E904.0	0.52	0.39	0.78	J	pCi/l
FB at D-3 TOT	13-04107-06	05/02/2013 12:39:15	Thorium-228	HASL 300, 4.5.2	-0.02	0.04	0.12	U	pCi/l
FB at D-3 TOT	13-04107-06	05/02/2013 12:39:15	Thorium-230	HASL 300, 4.5.2	0.11	0.10	0.11	J	pCi/l
FB at D-3 TOT	13-04107-06	05/02/2013 12:39:15	Thorium-232	HASL 300, 4.5.2	0.00	0.05	0.11	U	pCi/l
FB at D-3 TOT	13-04107-06	05/02/2013 09:16:03	Uranium-234	HASL 300, 4.5.2	0.07	0.07	0.08	U	pCi/l
FB at D-3 TOT	13-04107-06	05/02/2013 09:16:03	Uranium-235	HASL 300, 4.5.2	0.04	0.06	0.10	U	pCi/l
FB at D-3 TOT	13-04107-06	05/02/2013 09:16:03	Uranium-238	HASL 300, 4.5.2	0.06	0.06	0.07	U	pCi/l
FB at D-3 DIS	13-04107-07	05/12/2013 12:09:45	Radium-226	E903.0	-0.06	0.05	0.18	U	pCi/l
FB at D-3 DIS	13-04107-07	05/15/2013 09:46:38	Radium-228	E904.0	0.94	0.41	0.76	J	pCi/l
FB at D-3 DIS	13-04107-07	05/02/2013 16:29:32	Thorium-228	HASL 300, 4.5.2	0.01	0.05	0.10	U	pCi/l
FB at D-3 DIS	13-04107-07	05/02/2013 16:29:32	Thorium-230	HASL 300, 4.5.2	0.10	0.07	0.08	J	pCi/l
FB at D-3 DIS	13-04107-07	05/02/2013 16:29:32	Thorium-232	HASL 300, 4.5.2	0.00	0.02	0.07	U	pCi/l
FB at D-3 DIS	13-04107-07	05/02/2013 09:16:04	Uranium-234	HASL 300, 4.5.2	0.06	0.06	0.06	U	pCi/l
FB at D-3 DIS	13-04107-07	05/02/2013 09:16:04	Uranium-235	HASL 300, 4.5.2	0.03	0.04	0.08	U	pCi/l
FB at D-3 DIS	13-04107-07	05/02/2013 09:16:04	Uranium-238	HASL 300, 4.5.2	0.02	0.04	0.07	U	pCi/l
D-3 TOT	13-04107-08	05/12/2013 12:09:46	Radium-226	E903.0	2.82	0.71	0.24		pCi/l
D-3 TOT	13-04107-08	05/15/2013 09:46:39	Radium-228	E904.0	4.38	0.64	0.98		pCi/l
D-3 TOT	13-04107-08	05/02/2013 16:29:34	Thorium-228	HASL 300, 4.5.2	0.07	0.08	0.11	U	pCi/l
D-3 TOT	13-04107-08	05/02/2013 16:29:34	Thorium-230	HASL 300, 4.5.2	0.17	0.10	0.07		pCi/l
D-3 TOT	13-04107-08	05/02/2013 16:29:34	Thorium-232	HASL 300, 4.5.2	0.01	0.02	0.06	U	pCi/l
D-3 TOT	13-04107-08	05/02/2013 09:16:06	Uranium-234	HASL 300, 4.5.2	-0.02	0.07	0.18	U	pCi/l
D-3 TOT	13-04107-08	05/02/2013 09:16:06	Uranium-235	HASL 300, 4.5.2	0.11	0.14	0.17	U	pCi/l
D-3 TOT	13-04107-08	05/02/2013 09:16:06	Uranium-238	HASL 300, 4.5.2	0.02	0.06	0.15	U	pCi/l

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Matrix: Water

Client Sample ID	Lab Sample ID	Analysis Date/Time	Analyte	Method	Result	Error	MDA	Qualifier	Units
D-3 DIS	13-04107-09	05/12/2013 12:09:48	Radium-226	E903.0	2.12	0.59	0.33		pCi/l
D-3 DIS	13-04107-09	05/15/2013 09:46:32	Radium-228	E904.0	2.72	0.50	0.79		pCi/l
D-3 DIS	13-04107-09	05/02/2013 16:29:28	Thorium-228	HASL 300, 4.5.2	0.01	0.06	0.12	U	pCi/l
D-3 DIS	13-04107-09	05/02/2013 16:29:28	Thorium-230	HASL 300, 4.5.2	0.17	0.10	0.08	J	pCi/l
D-3 DIS	13-04107-09	05/02/2013 16:29:28	Thorium-232	HASL 300, 4.5.2	0.05	0.05	0.08	U	pCi/l
D-3 DIS	13-04107-09	05/02/2013 09:16:07	Uranium-234	HASL 300, 4.5.2	0.15	0.12	0.13	J	pCi/l
D-3 DIS	13-04107-09	05/02/2013 09:16:07	Uranium-235	HASL 300, 4.5.2	0.10	0.10	0.12	U	pCi/l
D-3 DIS	13-04107-09	05/02/2013 09:16:07	Uranium-238	HASL 300, 4.5.2	0.07	0.08	0.12	U	pCi/l
D-85 TOT	13-04107-10	05/12/2013 12:09:49	Radium-226	E903.0	9.67	1.66	0.50		pCi/l
D-85 TOT	13-04107-10	05/15/2013 09:46:32	Radium-228	E904.0	6.41	1.01	1.57		pCi/l
D-85 TOT	13-04107-10	05/02/2013 16:29:29	Thorium-228	HASL 300, 4.5.2	3.15	0.63	0.10		pCi/l
D-85 TOT	13-04107-10	05/02/2013 16:29:29	Thorium-230	HASL 300, 4.5.2	5.81	1.05	0.06		pCi/l
D-85 TOT	13-04107-10	05/02/2013 16:29:29	Thorium-232	HASL 300, 4.5.2	2.79	0.57	0.07		pCi/l
D-85 TOT	13-04107-10	05/02/2013 09:16:08	Uranium-234	HASL 300, 4.5.2	1.73	0.36	0.09		pCi/l
D-85 TOT	13-04107-10	05/02/2013 09:16:08	Uranium-235	HASL 300, 4.5.2	0.24	0.13	0.09		pCi/l
D-85 TOT	13-04107-10	05/02/2013 09:16:08	Uranium-238	HASL 300, 4.5.2	2.62	0.47	0.06		pCi/l
D-85 DIS	13-04107-11	05/12/2013 12:09:50	Radium-226	E903.0	0.91	0.35	0.19		pCi/l
D-85 DIS	13-04107-11	05/15/2013 09:46:32	Radium-228	E904.0	1.26	0.50	0.93	J	pCi/l
D-85 DIS	13-04107-11	05/02/2013 16:29:30	Thorium-228	HASL 300, 4.5.2	-0.01	0.05	0.14	U	pCi/l
D-85 DIS	13-04107-11	05/02/2013 16:29:30	Thorium-230	HASL 300, 4.5.2	0.12	0.09	0.08	J	pCi/l
D-85 DIS	13-04107-11	05/02/2013 16:29:30	Thorium-232	HASL 300, 4.5.2	-0.01	0.03	0.08	U	pCi/l
D-85 DIS	13-04107-11	05/02/2013 12:37:01	Uranium-234	HASL 300, 4.5.2	0.37	0.14	0.06		pCi/l
D-85 DIS	13-04107-11	05/02/2013 12:37:01	Uranium-235	HASL 300, 4.5.2	0.01	0.03	0.07	U	pCi/l
D-85 DIS	13-04107-11	05/02/2013 12:37:01	Uranium-238	HASL 300, 4.5.2	0.14	0.09	0.06		pCi/l
S-84 TOT	13-04107-12	05/12/2013 12:09:51	Radium-226	E903.0	0.24	0.19	0.23	J	pCi/l
S-84 TOT	13-04107-12	05/15/2013 09:46:34	Radium-228	E904.0	1.92	0.53	0.93		pCi/l
S-84 TOT	13-04107-12	05/02/2013 16:29:31	Thorium-228	HASL 300, 4.5.2	0.12	0.10	0.13	J	pCi/l
S-84 TOT	13-04107-12	05/02/2013 16:29:31	Thorium-230	HASL 300, 4.5.2	0.10	0.08	0.08	J	pCi/l
S-84 TOT	13-04107-12	05/02/2013 16:29:31	Thorium-232	HASL 300, 4.5.2	0.06	0.06	0.08	U	pCi/l
S-84 TOT	13-04107-12	05/02/2013 12:37:02	Uranium-234	HASL 300, 4.5.2	0.24	0.16	0.13	J	pCi/l
S-84 TOT	13-04107-12	05/02/2013 12:37:02	Uranium-235	HASL 300, 4.5.2	-0.01	0.06	0.13	U	pCi/l
S-84 TOT	13-04107-12	05/02/2013 12:37:02	Uranium-238	HASL 300, 4.5.2	0.19	0.14	0.13	J	pCi/l

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Matrix: Water

Client Sample ID	Lab Sample ID	Analysis Date/Time	Analyte	Method	Result	Error	MDA	Qualifier	Units
S-84 DIS	13-04107-13	05/12/2013 12:09:52	Radium-226	E903.0	0.11	0.12	0.17	U	pCi/l
S-84 DIS	13-04107-13	05/15/2013 09:52:06	Radium-228	E904.0	0.63	0.55	1.11	J	pCi/l
S-84 DIS	13-04107-13	05/02/2013 16:30:02	Thorium-228	HASL 300, 4.5.2	-0.01	0.03	0.08	U	pCi/l
S-84 DIS	13-04107-13	05/02/2013 16:30:02	Thorium-230	HASL 300, 4.5.2	0.17	0.10	0.08	J	pCi/l
S-84 DIS	13-04107-13	05/02/2013 16:30:02	Thorium-232	HASL 300, 4.5.2	0.00	0.04	0.08	U	pCi/l
S-84 DIS	13-04107-13	05/02/2013 12:37:03	Uranium-234	HASL 300, 4.5.2	0.05	0.08	0.13	U	pCi/l
S-84 DIS	13-04107-13	05/02/2013 12:37:03	Uranium-235	HASL 300, 4.5.2	0.02	0.06	0.13	U	pCi/l
S-84 DIS	13-04107-13	05/02/2013 12:37:03	Uranium-238	HASL 300, 4.5.2	0.06	0.09	0.15	U	pCi/l
S-5 TOT	13-04107-14	05/12/2013 12:09:54	Radium-226	E903.0	1.10	0.52	0.26		pCi/l
S-5 TOT	13-04107-14	05/15/2013 09:52:07	Radium-228	E904.0	5.03	1.40	2.44		pCi/l
S-5 TOT	13-04107-14	05/02/2013 16:30:03	Thorium-228	HASL 300, 4.5.2	0.05	0.06	0.06	U	pCi/l
S-5 TOT	13-04107-14	05/02/2013 16:30:03	Thorium-230	HASL 300, 4.5.2	0.18	0.11	0.08		pCi/l
S-5 TOT	13-04107-14	05/02/2013 16:30:03	Thorium-232	HASL 300, 4.5.2	-0.01	0.03	0.07	U	pCi/l
S-5 TOT	13-04107-14	05/02/2013 12:37:33	Uranium-234	HASL 300, 4.5.2	-0.06	0.20	0.53	U	pCi/l
S-5 TOT	13-04107-14	05/02/2013 12:37:33	Uranium-235	HASL 300, 4.5.2	0.13	0.34	0.70	U	pCi/l
S-5 TOT	13-04107-14	05/02/2013 12:37:33	Uranium-238	HASL 300, 4.5.2	-0.11	0.22	0.75	U	pCi/l
S-5 DIS	13-04107-15	05/12/2013 12:09:55	Radium-226	E903.0	0.04	0.07	0.11	U	pCi/l
S-5 DIS	13-04107-15	05/15/2013 09:52:07	Radium-228	E904.0	0.45	0.41	0.83	J	pCi/l
S-5 DIS	13-04107-15	05/02/2013 16:29:59	Thorium-228	HASL 300, 4.5.2	0.07	0.06	0.06	J	pCi/l
S-5 DIS	13-04107-15	05/02/2013 16:29:59	Thorium-230	HASL 300, 4.5.2	0.10	0.07	0.06	J	pCi/l
S-5 DIS	13-04107-15	05/02/2013 16:29:59	Thorium-232	HASL 300, 4.5.2	0.01	0.03	0.05	U	pCi/l
S-5 DIS	13-04107-15	05/02/2013 12:37:34	Uranium-234	HASL 300, 4.5.2	0.01	0.14	0.41	U	pCi/l
S-5 DIS	13-04107-15	05/02/2013 12:37:34	Uranium-235	HASL 300, 4.5.2	0.18	0.30	0.50	U	pCi/l
S-5 DIS	13-04107-15	05/02/2013 12:37:34	Uranium-238	HASL 300, 4.5.2	0.03	0.14	0.36	U	pCi/l
PZ-109-SS TOT	13-04107-16	05/12/2013 12:09:57	Radium-226	E903.0	2.15	0.48	0.16		pCi/l
PZ-109-SS TOT	13-04107-16	05/15/2013 09:52:08	Radium-228	E904.0	0.84	0.53	1.04	J	pCi/l
PZ-109-SS TOT	13-04107-16	05/02/2013 16:30:00	Thorium-228	HASL 300, 4.5.2	0.01	0.03	0.06	U	pCi/l
PZ-109-SS TOT	13-04107-16	05/02/2013 16:30:00	Thorium-230	HASL 300, 4.5.2	0.17	0.10	0.06		pCi/l
PZ-109-SS TOT	13-04107-16	05/02/2013 16:30:00	Thorium-232	HASL 300, 4.5.2	0.01	0.04	0.08	U	pCi/l
PZ-109-SS TOT	13-04107-16	05/02/2013 12:37:35	Uranium-234	HASL 300, 4.5.2	1.18	0.27	0.06		pCi/l
PZ-109-SS TOT	13-04107-16	05/02/2013 12:37:35	Uranium-235	HASL 300, 4.5.2	0.12	0.09	0.07	J	pCi/l
PZ-109-SS TOT	13-04107-16	05/02/2013 12:37:35	Uranium-238	HASL 300, 4.5.2	0.52	0.17	0.07		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: 1304107
Received: 04/16/2013
Matrix: Water

Client Sample ID	Lab Sample ID	Analysis Date/Time	Analyte	Method	Result	Error	MDA	Qualifier	Units
PZ-109-SS DIS	13-04107-17	05/12/2013 12:09:58	Radium-226	E903.0	2.29	0.47	0.16		pCi/l
PZ-109-SS DIS	13-04107-17	05/15/2013 09:52:09	Radium-228	E904.0	0.60	0.42	0.84	J	pCi/l
PZ-109-SS DIS	13-04107-17	05/02/2013 16:30:08	Thorium-228	HASL 300, 4.5.2	0.01	0.02	0.05	U	pCi/l
PZ-109-SS DIS	13-04107-17	05/02/2013 16:30:08	Thorium-230	HASL 300, 4.5.2	0.10	0.07	0.05	J	pCi/l
PZ-109-SS DIS	13-04107-17	05/02/2013 16:30:08	Thorium-232	HASL 300, 4.5.2	0.00	0.02	0.05	U	pCi/l
PZ-109-SS DIS	13-04107-17	05/02/2013 12:37:36	Uranium-234	HASL 300, 4.5.2	1.38	0.30	0.07		pCi/l
PZ-109-SS DIS	13-04107-17	05/02/2013 12:37:36	Uranium-235	HASL 300, 4.5.2	0.04	0.05	0.06	U	pCi/l
PZ-109-SS DIS	13-04107-17	05/02/2013 12:37:36	Uranium-238	HASL 300, 4.5.2	0.66	0.19	0.06		pCi/l
PZ-104-KS TOT	13-04107-18	05/12/2013 12:10:00	Radium-226	E903.0	0.32	0.18	0.13		pCi/l
PZ-104-KS TOT	13-04107-18	05/15/2013 09:52:10	Radium-228	E904.0	0.18	0.43	0.90	U	pCi/l
PZ-104-KS TOT	13-04107-18	05/02/2013 16:30:05	Thorium-228	HASL 300, 4.5.2	0.10	0.07	0.06	J	pCi/l
PZ-104-KS TOT	13-04107-18	05/02/2013 16:30:05	Thorium-230	HASL 300, 4.5.2	0.18	0.09	0.07		pCi/l
PZ-104-KS TOT	13-04107-18	05/02/2013 16:30:05	Thorium-232	HASL 300, 4.5.2	0.08	0.07	0.09	J	pCi/l
PZ-104-KS TOT	13-04107-18	05/02/2013 12:37:37	Uranium-234	HASL 300, 4.5.2	0.43	0.15	0.08		pCi/l
PZ-104-KS TOT	13-04107-18	05/02/2013 12:37:37	Uranium-235	HASL 300, 4.5.2	-0.01	0.03	0.07	U	pCi/l
PZ-104-KS TOT	13-04107-18	05/02/2013 12:37:37	Uranium-238	HASL 300, 4.5.2	0.21	0.10	0.07		pCi/l
PZ-104-KS DIS	13-04107-19	05/12/2013 12:10:01	Radium-226	E903.0	0.07	0.10	0.15	U	pCi/l
PZ-104-KS DIS	13-04107-19	05/15/2013 09:52:10	Radium-228	E904.0	0.73	0.44	0.86	J	pCi/l
PZ-104-KS DIS	13-04107-19	05/02/2013 16:30:07	Thorium-228	HASL 300, 4.5.2	0.04	0.05	0.08	U	pCi/l
PZ-104-KS DIS	13-04107-19	05/02/2013 16:30:07	Thorium-230	HASL 300, 4.5.2	0.17	0.09	0.07		pCi/l
PZ-104-KS DIS	13-04107-19	05/02/2013 16:30:07	Thorium-232	HASL 300, 4.5.2	-0.01	0.02	0.07	U	pCi/l
PZ-104-KS DIS	13-04107-19	05/02/2013 12:37:38	Uranium-234	HASL 300, 4.5.2	0.49	0.17	0.08		pCi/l
PZ-104-KS DIS	13-04107-19	05/02/2013 12:37:38	Uranium-235	HASL 300, 4.5.2	0.02	0.05	0.09	U	pCi/l
PZ-104-KS DIS	13-04107-19	05/02/2013 12:37:38	Uranium-238	HASL 300, 4.5.2	0.20	0.10	0.06		pCi/l

SECTION V

ANALYTICAL STANDARDS

QA/QC REVIEWED
Date 1/16/95 Initials [illegible]

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).

[signature], ERIC ALLAS
QUALITY CONTROL

29 DECEMBER 1994
Date Signed

ISOTOPE PRODUCTS LABORATORIES
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EBERLINE SERVICES - OAK RIDGE LABORATORY
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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

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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: $^{234, 235, 238}U$
Parent Solution Conc.: 1.7796E+04 dpm/ml

Reference Date: 1/1/1995 0:00

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
Total Activity: 7.1182E+04 dpm
Final Volume: 1000.00 ml

Final Activity Concentration: 7.1182E+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:

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		5.356 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

Roger Wiltshire

Project Ref. AE2315

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

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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
Certified Activity: 9.760E-01 µCi
Certified Concentration: µCi per gram

Reference Date: 3/1/2000 0:00

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

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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 **Reference Date** 3/1/2000 0:00
Parent Solution Conc. 2.167E+03 dpm/ml

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

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

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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

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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).

Anna U. Khan
QUALITY CONTROL

Nov. 8, 1993
Date Signed

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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 H2O

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
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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: 1.0355E+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 Reference Date: 1/15/2002 0:00
Certified Activity: 1.013E+00 µCi
Certified Concentration: µCi per gram

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

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

Radionuclide of Interest ^{229}Th
Parent Solution Conc. 2.25E+03 dpm/ml

Reference Date 1/15/2002 0:00

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
Total Activity: 2.2490E+04 dpm
Final Volume: 1000.00 ml

Final Activity Concentration: 2.2490E+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: October 9, 2013

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

QC Approval _____ Date: 11/12/12

Ba-6
(f 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: 9/20/2012 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
Certified Activity: µCi
Certified Concentration: 1.318E+01 µCi per gram

Reference Date: 9/1/1993 0:00

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: September 20, 2013

Verified & Approved By _____ Date: 9/27/12

QC Approval _____ Date: 9/27/12

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	9/20/12
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: September 20, 2013

Verified & Approved By _____ Date: 9/27/12

QC Approval _____ Date: 9/27/12

CERTIFICATE OF CALIBRATION
ALPHA STANDARD SOLUTION

Ra-5
QA/QC REVIEWED
Date 2/8/94 Initials WT

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. Kuen
QUALITY CONTROL

Feb. 3, 1994
Date Signed

ISOTOPE PRODUCTS LABORATORIES
1800 North Keystone Street
Burbank, California 91504
(818) 843 - 7000

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

Solution Reference # MP 009 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 **Reference Date** 2/1/1994 0:00
Parent Solution Conc. 2.22E+03 dpm/ml

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

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
RECERTIFICATION
MP 009

CURRENT DATE: 4/16/2012 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
Reference Date: 11/7/2001 0:00
Certified Activity: 6.986E-02 µCi
Certified Concentration: µCi per gram

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: April 12, 2013

Recertified By _____ Date: 4/16/12

Verified & Approved By _____ Date: _____

QC Approval _____ Date: 4/16/12

SECTION VI

QUALITY CONTROL SAMPLE RESULTS SUMMARY

WO	Analysis	Run	Activity Units	Aliquot Units	Client Name
13-04107	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	0.64	95.15%	15.44%	100.00%	3.60%	8.14E+00	2.93E-01	7.74E+00	1.20E+00	U-8a	3.52E+01	3.60E+00	5.13E-01
U-238	0.69	105.74%	15.26%	100.00%	3.60%	7.93E+00	2.86E-01	8.39E+00	1.28E+00	U-8a	3.44E+01	3.60E+00	5.13E-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

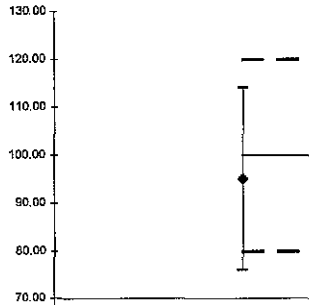
Analyte	Normalized Difference	RPD	Original Result	Original CSU	Replicate Result	Replicate CSU
U-234	0.55	44.49	7.25E-02	6.91E-02	4.61E-02	6.41E-02
U-238	1.45	149.78	6.29E-02	6.25E-02	9.03E-03	3.77E-02
U-235	0.48	65.27	3.73E-02	6.05E-02	1.90E-02	4.55E-02

QC Summary

Analyte	LCS Relative Bias	LCS % R	LCS ND	MS % R	MS ND	Rep RPD	Rep ND
U-234	0.95	OK	OK			INV	OK
U-238	1.06	OK	OK			NA	OK
U-235		OK	OK			NA	OK

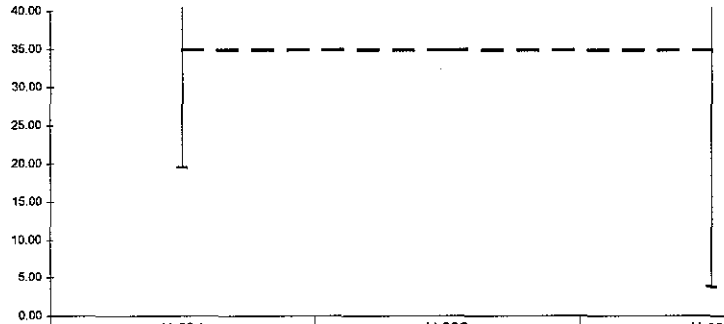
WO	Analysis	Run	Activity Units	Aliquot Units	Client Name
13-04107	UUISO	1	pCi	l	Engineering Management Support, Inc.

LCS % Recovery



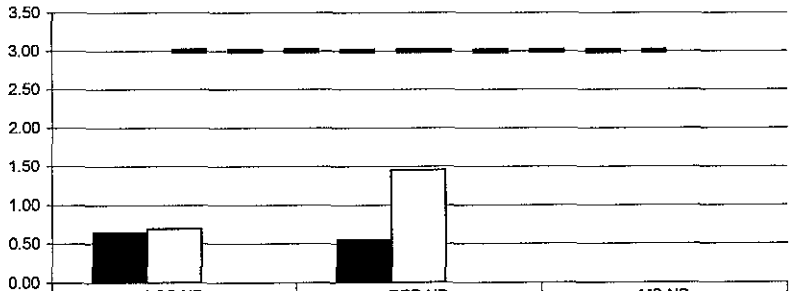
	U-234	U-238
Lower Error	76.11	86.89
Upper Error	114.19	124.60
%R	95.15	105.74
LCL	80	80
Mean	100	100
UCL	120	120

Replicate Sample RPD



	U-234	U-238	U-235
Lower Error	69.46	254.07	126.76
Upper Error	19.51	45.49	3.79
RPD	44.49	149.78	65.27
CL	35	35	35

Normalized Difference



	LCS ND	REP ND	MS ND
U-234	0.64	0.55	0.00
U-238	0.69	1.45	0.00
	0.00	0.00	0.00
UCL	3	3	3

No Matrix Spike

WO	Analysis	Run	Activity Units	Aliquot Units	Client Name
13-04107	ThISO	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)
TH-228	1.11	111.67%	18.35%	100.00%	3.60%	4.77E+00	1.72E-01	5.33E+00	9.78E-01	Th-8b	1.04E+02	3.60E+00	1.02E-01
TH-230	0.78	92.52%	20.17%	100.00%	2.70%	5.44E+00	1.47E-01	5.03E+00	1.02E+00	Th-1b	2.35E+01	2.70E+00	5.14E-01
TH-232	1.71	118.62%	17.89%	100.00%	3.60%	4.77E+00	1.72E-01	5.66E+00	1.01E+00	Th-8b	1.04E+02	3.60E+00	1.02E-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

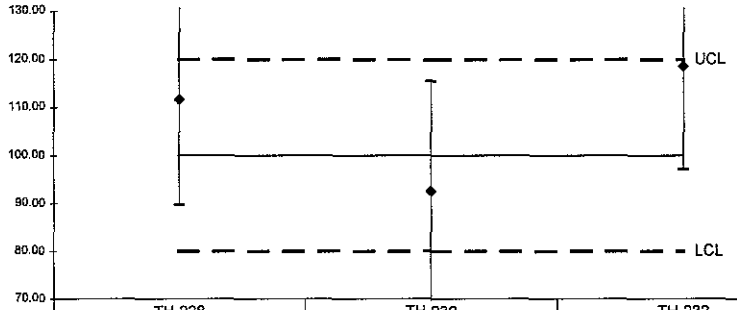
Analyte	Normalized Difference	RPD	Original Result	Original CSU	Replicate Result	Replicate CSU
TH-228	1.13	2066.09	-1.65E-02	4.08E-02	1.36E-02	3.27E-02
TH-230	0.57	38.25	1.14E-01	1.02E-01	7.75E-02	7.24E-02
TH-232	0.42	200.00	0.00E+00	5.27E-02	1.33E-02	3.20E-02

QC Summary

Analyte	LCS Relative Bias	LCS % R	LCS ND	MS % R	MS ND	Rep RPD	Rep ND
TH-228	1.12	OK	OK			NA	OK
TH-230	0.93	OK	OK			NA	OK
TH-232	1.19	OK	OK			OK	OK

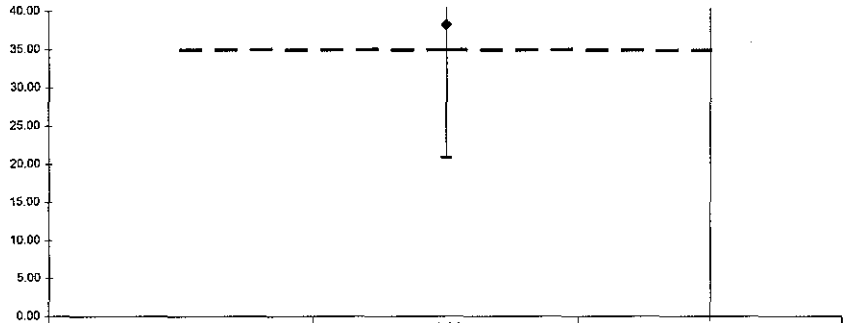
WO	Analysis	Run	Activity Units	Aliquot Units	Client Name
13-04107	ThISO	1	pCi	I	Engineering Management Support, Inc.

LCS % Recovery



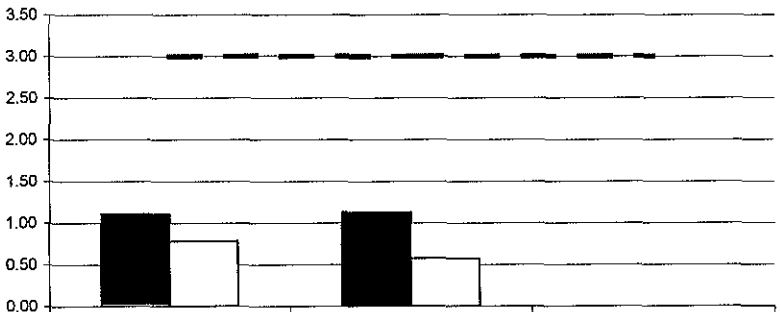
	TH-228	TH-230	TH-232
Lower Error	89.73	69.65	97.13
Upper Error	133.62	115.40	140.11
%R	111.67	92.52	118.62
LCL	80	80	80
Mean	100	100	100
UCL	120	120	120

Replicate Sample RPD



	TH-228	TH-230	TH-232
Lower Error	-24005.04	55.65	836.31
Upper Error	28137.22	20.86	-436.31
RPD	2066.09	38.25	200.00
CL	35	35	35

Normalized Difference



	LCS ND	REP ND	MS ND
TH-228	1.11	1.13	0.00
TH-230	0.78	0.57	0.00
UCL	3	3	3

No Matrix Spike

WO	Analysis	Run	Activity Units	Aliquot Units	Client Name
13-04107	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	0.30	103.79%	23.99%	100.00%	4.60%	1.02E+01	4.69E-01	1.06E+01	2.54E+00	Ra-5b	4.41E+01	4.60E+00	5.14E-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

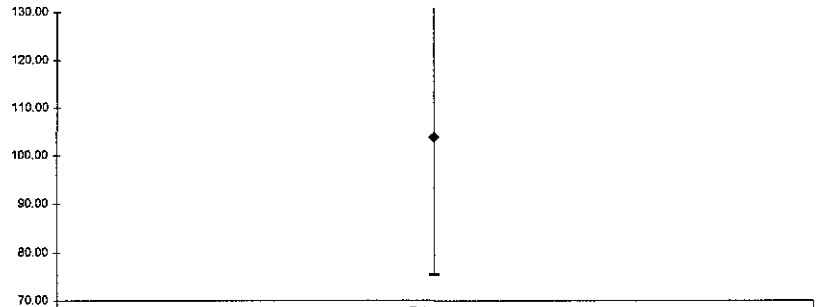
Analyte	Normalized Difference	RPD	Original Result	Original CSU	Replicate Result	Replicate CSU
RA-226	0.99	22.49	2.15E+00	6.65E-01	1.72E+00	5.43E-01

QC Summary

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

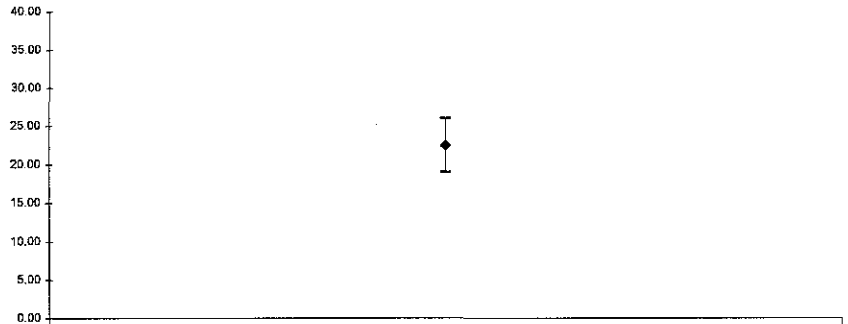
WO	Analysis	Run	Activity Units	Aliquot Units	Client Name
13-04107	Ra226	1	pCi	I	Engineering Management Support, Inc.

LCS % Recovery



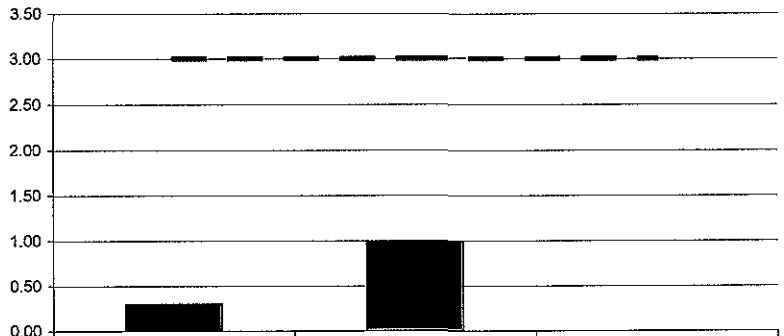
	RA-226
Lower Error	75.20
Upper Error	132.38
%R	103.79
LCL	80
Mean	100
UCL	120

Replicate Sample RPD



	RA-226
Lower Error	25.99
Upper Error	18.98
RPD	22.49
CL	35

Normalized Difference



	LCS ND	REP ND	MS ND
RA-226	0.30	0.99	0.00
UCL	3	3	3

No Matrix Spike

WO	Analysis	Run	Activity Units	Aliquot Units	Client Name
13-04107	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	1.68	81.24%	26.66%	100.00%	5.10%	7.15E+00	3.64E-01	5.80E+00	1.55E+00	Ra-11	3.89E+01	5.10E+00	4.08E-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

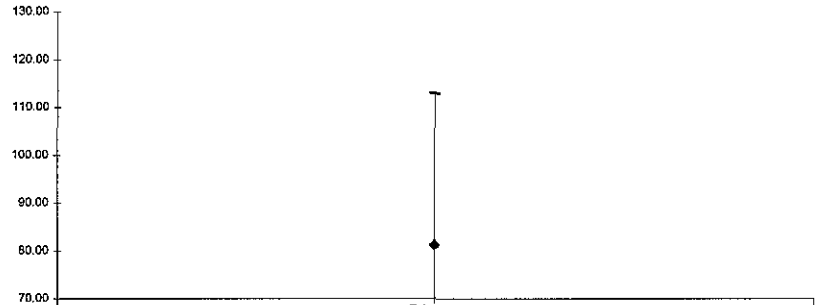
Analyte	*Normalized Difference*	*RPD*	*Original Result*	*Original CSU*	*Replicate Result*	*Replicate CSU*
RA-228	0.47	21.56	8.40E-01	5.61E-01	6.77E-01	3.81E-01

QC Summary

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

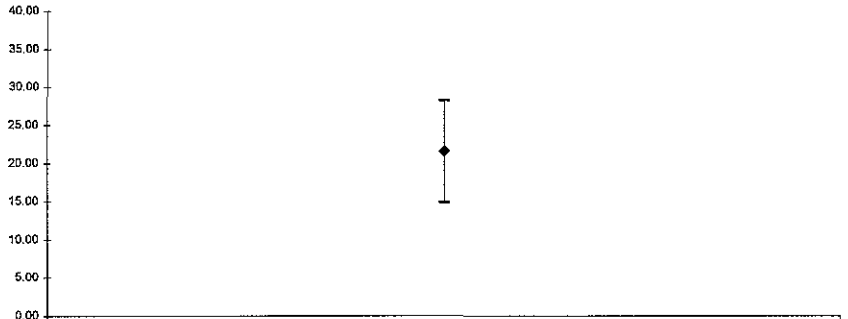
WO	Analysis	Run	Activity Units	Aliquot Units	Client Name
13-04107	Ra228	1	pCi	I	Engineering Management Support, Inc.

LCS % Recovery



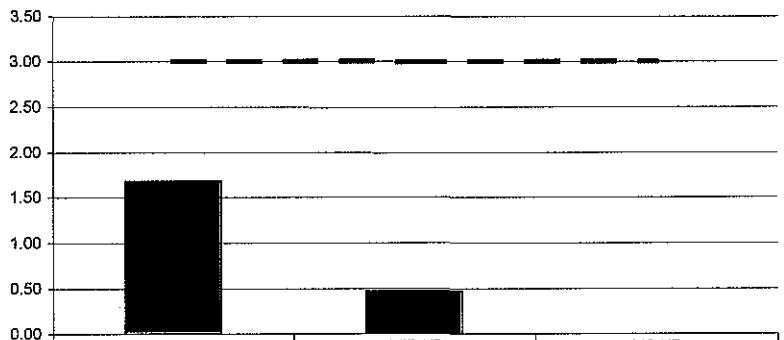
	RA-228
Lower Error	49.48
Upper Error	112.99
%R	81.24
LCL	80
Mean	100
UCL	120

Replicate Sample RPD



	RA-228
Lower Error	28.25
Upper Error	14.87
RPD	21.56
CL	35

Normalized Difference



	LCS ND	REP ND	MS ND
RA-228	1.68	0.47	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	13-04107
Analysis Code	UUISO
Run Number	1

#	Date	Dept	User	Notes
1	04/26/13 10:50	PREP	JBARNARD	ALIQUOTED AND FILTERED DISSOLVED FRACTIONS- ADDED SPIKES AND TRACERS- PRESERVED SAMPLES WITH HNO3- DRIED SAMPLES DOWN

4/26/13

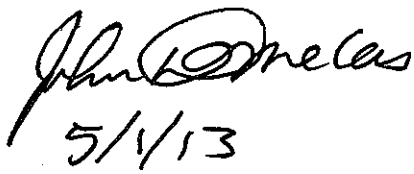
EBERLINE SERVICES

Work Order Analysis Notes

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

Internal Work Order	13-04107
Analysis Code	UUISO
Run Number	1

#	Date	Dept	User	Notes
1	04/26/13 10:50	PREP	JBARNARD	ALIQUOTED AND FILTERED DISSOLVED FRACTIONS- ADDED SPIKES AND TRACERS- PRESERVED SAMPLES WITH HNO3- DRIED SAMPLES DOWN
2	05/01/13 17:34	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.



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	13-04107
Analysis Code	UUISO
Run Number	1

#	Date	Dept	User	Notes
1	04/26/13 10:50	PREP	JBARNARD	ALIQUOTED AND FILTERED DISSOLVED FRACTIONS- ADDED SPIKES AND TRACERS- PRESERVED SAMPLES WITH HNO3- DRIED SAMPLES DOWN
2	05/01/13 17:34	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	05/02/13 05:23	CHEM	RMARTZ	ADDED 0.1 ML NEODYMIUM CARRIER, 0.3 ML TITANOUS CHLORIDE, & 1 ML HF TO C-TUBES; LET SET SIT IN ICE BATH FOR ONE HOUR. SET UP FILTERS BY ADDING ALCOHOL & CARBON SUBSTRATE THEN ADDED SAMPLES; WHEN SAMPLES WERE THROUGH FILTERS, ADDED 10 ML DI H2O RINSES FROM C-TUBES, REMOVED FILTERS, LET DRY IN DESSICATOR.

RT 5/2/13

EBERLINE SERVICES

Reagents Used in an Analysis

Internal Work Order	
13-04107	
Analysis Code	Run
UUISO	1

Reagent ID	Reagent Name	Reagent Concentration	Analyst ID	Date Recorded
013624P	Nitric Acid	Reagent Grade	JBARNARD	4/26/2013
013721P	Anion Exchange Resin	Reagent Grade	JDEMELAS	5/1/2013
013794S	HCl - HF	6.5N - 0.04N	JDEMELAS	5/1/2013
013675D01	Hydrochloric Acid	0.5N	JDEMELAS	5/1/2013
013734S	Hydrochloric Acid	6.5N	JDEMELAS	5/1/2013
013800S	Hydrochloric Acid	8N	JDEMELAS	5/1/2013
013809P	Hydrochloric Acid	Reagent Grade	JDEMELAS	5/1/2013
013813S	Hydrochloric Acid	8N	JDEMELAS	5/1/2013
013815S	HCl - NH4I	8N - 0.1M	JDEMELAS	5/1/2013
013246S	Carbon substrate	Solution	RMARTZ	5/2/2013
012809P	Ethyl Alcohol	Reagent Grade	RMARTZ	5/2/2013
013221P	Hydrofluoric Acid	Reagent Grade	RMARTZ	5/2/2013
013191S	Neodymium Carrier	1 mg/ml	RMARTZ	5/2/2013
013434P	Titanous Chloride	Reagent Grade	RMARTZ	5/2/2013

Alpha Bank #2

Date	Sample #	Client	Load Time	CT Time	Analyst	Seal
4/24/17	1704176A(7-17)	URBAN CO	0743	24hr	[illegible]	c
4/24/17	1704097A(7-8)	[illegible]	0887	2hr	[illegible]	
4/24/17	1704097A(1-7)	[illegible]	1157	2hr	[illegible]	c
4/25/17	Daily Pulse	LAB	0752	10m	NA	
4/25/17	1704081A(7-4)	United	0857	2hr	[illegible]	c
4/25/17	1704081A(1-7)	United	0854	2hr	[illegible]	c
4/25/13	1304103A(7-11)	Accutest	1156	2hr 50m	Rale	KB
4/26/17	Daily Pulse	LAB	0747	10m	NA	
4/26/17	1704117A(1-4)	[illegible]	0902	2hr	[illegible]	
4/26/17	1704117ANT(4)	[illegible]	0907	2hr	[illegible]	c
4/26/17	SECCAL	LAB	1202	2hr	NA	
4/26/13	System Bkgd	Lab	1458	16.40 hrs		KB
4/27/13	Daily Pulser	Lab	1028	10mins	NA	KB
4/27/13	1304104A(7-12)	Eng. Manag. Su	1048	2hr 50m	UU	KB
4/28/17	Daily Pulse	LAB	0729	10m	NA	
4/29/17	1704105A(7-1)	[illegible]	1000	2hr	[illegible]	
4/29/13	1304104A(11-16)	Eng. Manag. Su	1258	2hr 50m	Th	KB
4/30/17	Daily Pulse	LAB	0721	10m	NA	
4/30/17	1704164A(1-4)	[illegible]	0970	2hr	[illegible]	c
4/30/17	1704121A(1-2)	[illegible]	0971	2hr	[illegible]	c
4/30/13	1304105A(10-15)	Eng. Manag. Su.	1243	2hr 50m	Th	KB
4/30/13	1304106A(14-19)	Eng. Manag. Su.	1624	2hr 50m	UU	KB
5/1/17	Daily Pulse	LAB	0826	10m	NA	
5/1/17	1704166A(7-14?)	[illegible]	0940	2hr	[illegible]	c
5/1/17	1704166ANT(4)	[illegible]	0940	2hr	[illegible]	c
5/1/17	1304166A(1-7)	[illegible]	0940	2hr	[illegible]	c
5/1/13	1304104A(7-12)	Eng. Manag. Su	1249	2hr 50m	Th	KB
5/1/13	1304105A(5-10)	Eng. Manag. Su.	1618	2hr 50m	Rale	KB
5/2/17	Daily Pulse	LAB	0718	10m	NA	c
5/2/17	1704107A(1-10)	[illegible]	0946	2hr	[illegible]	c

Alpha #1

Date	Sample #	Client	Load Time	CT Time	Analysis	Tech
5/1/13	1304106A(1-6)	Eng-Manag. Su	1348	2hr50	Th	KB
5/1/13	1304106A(19)	Eng. Manag. Su	1616	2hr50	Th	KB
5/1/13	1304166A(4)	UWOR	1617	2hr50	PU	KB
5/1/13	1304105A(1-4)	Eng. Manag. Su	1618	2hr50	Ra	KB
5/2/13	Daily Pulser	[illegible]	0615	[illegible]	[illegible]	[illegible]
5/2/13	1304105A(18,19)	Eng Man	0755	2hr50	Ra	C
5/2/13	1304148A(1-4)	MA	0755	2hr50	Ra	C
5/2/13	1304176A(3,4)	UWOR	0915	2hr50	U-Iso	[illegible]
5/2/13	1304107A(1-4)	Eng Man	0915	2hr50	U-Iso	[illegible]

Alpha Bank #2

Date	Sample #	Client	Load Time	Count Time	Analysis	Init.
4/24/17	1704176A(7-12)	URBAN CO	0749	2hr	UUZ50	C
4/24/17	1704017A(3-8)	Eng Man	0887	2hr	UUZ50	C
4/24/17	1704017A(2-7)	Eng Man	1157	2hr	TLZ50	C
4/25/17	Daily Pulse	LAB	0722	10 min	NA	C
4/25/17	1704081A(1-4)	Unitech	0857	2hr	UUZ50	C
4/25/17	1704081A(1-7)	Unitech	0854	2hr	PuZ50	C
4/25/13	1304103A(7-11)	Accutest	1156	2hr 50 min	Rale	KB
4/26/17	Daily Pulse	LAB	0717	10 min	NA	C
4/26/17	1704113A(1-4)	U Lon	0902	2hr	UUZ50	C
4/26/17	1704117AM(1-4)	U Lon	0907	2hr	UUNT	C
4/26/17	SECCAL	LAB	1202	2hr	NA	C
4/26/13	System Blkgd	Lab	1458	16.40 hrs	α	KB
4/27/13	Daily Pulser	Lab	1028	10 mins	NA	KB
4/27/13	1304104A(7-12)	Eng. Manag. Su	1048	2hr 50 min	UU	KB
4/29/17	Daily Pulse	LAB	0729	10 min	NA	C
4/29/17	1704105A(7-12)	Eng Man	1000	2hr	UUZ50	C
4/29/13	1304104A(11-16)	Eng. Manag. Su	1258	2hr 50 min	Th	KB
4/30/17	Daily Pulse	LAB	0721	10 min	NA	C
4/30/17	1704166A(1-4)	U Lon	0970	2hr	NPZ77	C
4/30/17	1704121A(1-2)	U Lon	0971	2hr	NPZ77	C
4/30/13	1304105A(10-15)	Eng. Manag. Su.	1243	2hr 50 min	Th	KB
4/30/13	1304106A(14-19)	Eng. Manag. Su.	1624	2hr 50 min	UU	KB
5/1/17	Daily Pulse	LAB	0726	10 min	NA	C
5/1/17	1704166A(7,4,7)	U Lon	0940	2hr	RaZ50	C
5/1/17	1704166ANT(4)	U Lon	0940	2hr	RaNT	C
5/1/17	1304166A(1,2)	U Lon	0940	2hr	ThZ50	C
5/1/13	1304106A(7-12)	Eng. Manag. Su	1249	2hr 50 min	Th	KB
5/1/13	1304105A(5-10)	Eng. Manag. Su.	1618	2hr 50 min	Rale	KB
5/2/17	Daily Pulse	LAB	0715	10 min	NA	C
5/2/17	1704107A(5-10)	Eng Man	0946	2hr	UUZ50	C
5/2/17	1704107A(14-19)	Eng Man	1237	2hr	UUZ50	C

Date	Sample #	Client	Lead Time	CTO Time	Analysis	Tech
5/1/13	1304106A(1-6)	Eng. Manag. Su	1248	2hr50m	TH	KB
5/1/13	1304106A(19)	Eng. Manag. Su	1616	2hr50m	TH	KB
5/1/13	1304166A(4)	UWOR	1617	2hr50m	PH	KB
5/1/13	1304105A(1-4)	Eng. Manag Su	1618	2hr50m	Rad	KB
5/2/13	Daily Pulse	VM	0815	10m	MP	—
5/2/13	1304105A(18.1A)	Eng Man	0822	2hr5m	Rad	C
5/2/13	1304148A(1-4)	MA	0822	2hr5m	Rad	C
5/2/13	1304176A(3-6)	UWOR	0915	2hr5m	UW250	—
5/2/13	1304107A(1-4)	Eng Man	0915	2hr5m	UW10	—
5/2/13	SEE0A(1-3)	VM	1235	2hr5m	Rad	C
5/2/13	1304107A(11-13)	Eng Man	1237	2hr5m	UW250	C

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	13-04107
Analysis Code	ThISO
Run Number	1

#	Date	Dept	User	Notes
1	04/26/13 10:50	PREP	JBARNARD	ALIQUOTED AND FILTERED DISSOLVED FRACTIONS- ADDED SPIKES AND TRACERS- PRESERVED SAMPLES WITH HNO3- DRIED SAMPLES DOWN

4/26/13

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	13-04107
Analysis Code	ThISO
Run Number	1

#	Date	Dept	User	Notes
1	04/26/13 10:50	PREP	JBARNARD	ALIQUOTED AND FILTERED DISSOLVED FRACTIONS- ADDED SPIKES AND TRACERS- PRESERVED SAMPLES WITH HNO3- DRIED SAMPLES DOWN
2	05/01/13 17:34	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.

5/1/13

EBERLINE SERVICES

Work Order Analysis Notes

Oak Ridge Laboratory
601 Scarboro Rd.
Oak Ridge, TN 37830
Voice: 865.481.0683
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Internal Work Order	13-04107
Analysis Code	ThISO
Run Number	1

#	Date	Dept	User	Notes
1	04/26/13 10:50	PREP	JBARNARD	ALIQUOTED AND FILTERED DISSOLVED FRACTIONS- ADDED SPIKES AND TRACERS- PRESERVED SAMPLES WITH HNO3- DRIED SAMPLES DOWN
2	05/01/13 17:34	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	05/02/13 05:23	CHEM	RMARTZ	ADDED 0.75 ML 0.1MG/ML CERIUM CARRIER & 1 ML HF TO C-TUBES & LET SET SIT IN ICE BATH FOR ONE HOUR; SET UP FILTERS BY ADDING ALCOHOL & CARBON SUBSTRATE THEN ADDED SAMPLES; WHEN SAMPLES WERE THROUGH FILTERS, ADDED 10 ML DI H2O RINSES FROM C-TUBES, REMOVED FILTERS, LET DRY IN DESSICATOR.

RA 5/2/13

EBERLINE SERVICES

Reagents Used in an Analysis

Internal Work Order	
13-04107	
Analysis Code	Run
ThISO	1

Reagent ID	Reagent Name	Reagent Concentration	Analyst ID	Date Recorded
013624P	Nitric Acid	Reagent Grade	JBARNARD	4/26/2013
013721P	Anion Exchange Resin	Reagent Grade	JDEMELAS	5/1/2013
013803S	Nitric Acid	8N	JDEMELAS	5/1/2013
013624P	Nitric Acid	Reagent Grade	JDEMELAS	5/1/2013
013809P	Hydrochloric Acid	Reagent Grade	JDEMELAS	5/1/2013
013813S	Hydrochloric Acid	8N	JDEMELAS	5/1/2013
013246S	Carbon substrate	Solution	RMARTZ	5/2/2013
013017S	Cerrium Carrier	0.1mg/ml	RMARTZ	5/2/2013
012809P	Ethyl Alcohol	Reagent Grade	RMARTZ	5/2/2013
013221P	Hydrofluoric Acid	Reagent Grade	RMARTZ	5/2/2013

Alpha #7

Date	Sample #	Client	Load Time	Cl Time	Analysis	Tech
5/24	1704121A(1-4)	[illegible]	1238	[illegible]	TLZ80	[illegible]
5/24/17	1704121A(1-4)	[illegible]	1239	[illegible]	TLNY	[illegible]
5/24/17	1704107A(1-6)	[illegible]	1239	[illegible]	TLZ80	[illegible]

Alpha #7

Date	Sample#	Client	Load Time	CT Time	Analysis	Tech
5/2/[illegible]	1704[illegible]1A(1-4)	[illegible]	1238	[illegible]	TL[illegible]	[illegible]
5/2/[illegible]	1304[illegible]1A(1-4)	[illegible]	1239	[illegible]	TL NY	[illegible]
5/2/[illegible]	1304107A(1-[illegible])	[illegible]	1239	[illegible]	TL[illegible]	[illegible]
5/2/13	1304107A(13-19)	Eng. Manag. Sw	1629	2hr 50mins	Th	ICB

Date	Sample #	Client	Lead Time	C.T. Time	Analysis	Read
5/1/13	1304106A(1-6)	Eng. Manag. Su	1248	2hr50	TH	KB
5/1/13	1304106A(19)	Eng. Manag. Su	1616	2hr50	TH	KB
5/1/13	1304166A(4)	LLOR	1617	2hr50	PU	KB
5/1/13	1304105A(1-4)	Eng. Manag Su	1618	2hr50	Rob	KB
5/2/13	Daily Pulse	VA	0615	10	MP	—
5/2/13	1304105A(18A)	Eng M	0717	2hr5	Rob	C
5/2/13	1304108A(1-4)	MA	0717	2hr5	Rob	C
5/2/13	1304176A(3-4)	LLOR	0915	2hr5	LLOR50	C
5/2/13	1304107A(1-4)	Eng M	0915	2hr5	LLOR50	C
5/2/13	SEEDA(1-3)	VA	1235	2hr5	Rob	C
5/2/13	1304107A(11-13)	Eng M	1237	2hr5	LLOR50	C
5/2/13	1304107A(7-12)	Eng. Manag. Su	1629	2hr50	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	13-04107
Analysis Code	Ra226
Run Number	1

#	Date	Dept	User	Notes
1	04/26/13 19:19	PREP	LWALKER	FILTERED SAMPLES(ODD NUMBERED FRACTIONS ONLY)-SPIKE AND TRACE BEAKERS-ALIQUOT-PUT SAMPLES ON STIR PLATE AND PH TO 2.8-3.0-ADDED BA AND PB CARRIERS-ADDED 20MLS AMMONIUM SULFATE-LET STIR AND SETTLE. DECANT-TRANSFER TO C-TUBES-CENTRIFUGE-POUR OFF SUPERNATE AND SUBMIT PRECIP TO SEPARATIONS.

L. Walker
4/26/13

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	13-04107
Analysis Code	Ra226
Run Number	1

#	Date	Dept	User	Notes
1	04/26/13 19:19	PREP	LWALKER	FILTERED SAMPLES(ODD NUMBERED FRACTIONS ONLY)-SPIKE AND TRACE BEAKERS-ALIQUOT-PUT SAMPLES ON STIR PLATE AND PH TO 2.8-3.0-ADDED BA AND PB CARRIERS-ADDED 20MLS AMMONIUM SULFATE-LET STIR AND SETTLE. DECANT-TRANSFER TO C-TUBES-CENTRIFUGE-POUR OFF SUPERNATE AND SUBMIT PRECIP TO SEPARATIONS.
2	04/29/13 05:51	PREP	JBARNARD	DUE TO FRACTION 10 BEING VERY DIRTY- DRIED SAMPLE DOWN AND DIGESTED WITH MIXED ACIDS BEFORE PRECIPITATING

4/29/13

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	13-04107
Analysis Code	Ra226
Run Number	1

#	Date	Dept	User	Notes
1	04/26/13 19:19	PREP	LWALKER	FILTERED SAMPLES(ODD NUMBERED FRACTIONS ONLY)-SPIKE AND TRACE BEAKERS-ALIQUOT-PUT SAMPLES ON STIR PLATE AND PH TO 2.8-3.0-ADDED BA AND PB CARRIERS-ADDED 20MLS AMMONIUM SULFATE-LET STIR AND SETTLE. DECANT-TRANSFER TO C-TUBES-CENTRIFUGE-POUR OFF SUPERNATE AND SUBMIT PRECIP TO SEPARATIONS.
2	04/29/13 05:51	PREP	JBARNARD	DUE TO FRACTION 10 BEING VERY DIRTY- DRIED SAMPLE DOWN AND DIGESTED WITH MIXED ACIDS BEFORE PRECIPITATING
3	04/30/13 13:40	PREP	LWALKER	ADDED EDTA TO PRECIP-VORTEX-LET SIT OVERNIGHT TO DIGEST.
4	05/10/13 11:59	CHEM	TSMITH	Followed steps 12.1 to 12.8 in AP-006 rev. 12 . (Sringe filtered samples. Precipitated and filtered samples, obtained final weights, and took to count room)

5-10-13

EBERLINE SERVICES

Reagents Used in an Analysis

Internal Work Order	
13-04107	
Analysis Code	Run
Ra226	1

Reagent ID	Reagent Name	Reagent Concentration	Analyst ID	Date Recorded
012127P	Ammonium Hydroxide	Reagent Grade	LWALKER	4/26/2013
012766D14	Barium Carrier	1 mg/ml	LWALKER	4/26/2013
012729D07	Lead Carrier	166 mg/ml	LWALKER	4/26/2013
013624P	Nitric Acid	Reagent Grade	LWALKER	4/26/2013
013575D02	Ammonium Sulfate	200 mg/ml	LWALKER	4/26/2013
013416P	Perchloric Acid	Reagent Grade	JBARNARD	4/29/2013
009098P	Sulfuric Acid	Reagent Grade	JBARNARD	4/29/2013
013811S	EDTA	0.25M	LWALKER	4/30/2013
011383P	Acetic Acid	Reagent Grade	TSMITH	5/10/2013
013751D01	Ammonium Sulfate	200 mg/ml	TSMITH	5/10/2013

Date	Sample #	Client	Count Time	CT Date	Analyst	Tech
5/7/13	1705010A(1-4)	UCOR	1011	2hr	Th/U	C
5/7/13	1705010A(1-4)	UCOR	1011	2hr	Th/U	C
5/7/13	1705010A(1-4)	UCOR	1719	2hr	U/Th	C
5/7/13	1705010A(1-4)	UCOR	1719	2hr	U/Th	C
5/7/13	1305008A(4-5)	Unitech	1653	2hr 50min	U	KCB
5/7/13	1304131A (1-4)	Eng. Manag. Sv.	1654	2hr 50m	Th	KCB
5/8/13	Daily Pulser	UCOR	0926	1d	NP	C
5/8/13	1704135A(3,4)	UCOR	0952	2hr	U/Th	C
5/8/13	1704170A(4)	Energy Sol	0953	2hr	U/Th	C
5/8/13	1704160A(6-7)	Energy Sol	0928	2hr	Th/U	C
5/8/13	1704110A(1-7)	Energy Sol	0928	2hr	Th/U	C
5/8/13	1305010A(1-4)	UCOR	1242	2hr 50m	Th	KCB
5/8/13	1305010A(4)	UCOR	1242	2hr 50m	Th NT	KCB
5/8/13	1304135A(1)	UCOR	1243	2hr 50m	Th	KCB
5/8/13	1304131A(9-13)	Eng. Manag. Sv.	1554	2hr 50m	U	KCB
5/9/13	Daily Pulser	UCOR	0953	1d	NP	C
5/9/13	1704170A(1-4)	UCOR	0946	2hr	Th/U	C
5/9/13	1704170A(1-2)	UCOR	0947	2hr	U/Th	C
5/9/13	1305017A(1-4,6)	UCOR	1253	2hr 50min	Np	KCB
5/9/13	1304170A(1)	UCOR	1253	2hr 50m	Np	KCB
5/9/13	1304132A(1-6)	Eng. Manag. Sv.	1629	2hr 50m	Th	KCB
5/10/13	Daily Pulser	UCOR	0905	1d	NP	C
5/10/13	SECCAL	UCOR	0902	2hr	NP	C
5/10/13	1704160A(2-7)	Energy Sol	1015	2hr	U/Th	C
5/10/13	1704178A(2-4)	Unitech	1729	2hr	Pu/Np	C
5/10/13	1704178A(1-4)	Unitech	1729	2hr	U/Th	C
5/10/13	System Bkgd	Lab	1710	16.4 Ohms	α	KCB
5/11/13	Daily Pulser	Lab	1056	10 min	NA	AG
5/11/13	#36, 39, 43, 45 (Cal check)	Lab	1137	2½ hr	α	AG
5/11/13	1304170ANT (4)	UCOR	1345	2hr 50m	Pu (NT)	AG
5/11/13	1304170A (1-4)	UCOR	1345	2hr 50m	Iso-Th	AG
5/11/13	1304170ANT (4)	UCOR	1345	2hr 50m	Th (NT)	AG
5/12/13	Daily Pulser	Lab	1119	10min	NO	AC
5/12/13	1304107A(1-6)	Eng Manage Sv	1210	2hr 50m	Ra-226	AG

Alpha #2

Date	Sample #	Client	Load Time	CT Time	Analysis	Tech
5/9/13	1304170A(2-4)	UCOR	1254	2hr 50min	Np	KB
5/9/13	1304132A(7-9)	Eng. Manag. Su	1254	2hr 50min	U	KB
5/9/13	1304132A(7-12)	Eng. Manag. Su.	1629	2hr 50mins	Th	KB
5/10/13	Daily Pulser	Lab	0808	10 min	NA	—
5/10/13	1304141A(1-4)	ANR	0900	2 hrs	Po-210	C
5/10/13	[illegible]	Lab	1047	2 hrs	MAC	C
5/10/13	1305017A(4-6)	UCOR	1718	2 hrs	Th-Iso	C
5/10/13	1305017ANY(4-6)	UCOR	1718	2 hrs	[illegible]	C
5/10/13	1304178B(1-2)	United	1718	2 hrs	Pu-Iso	C
5/10/13	System Bkgd	Lab	1710	16.40 hrs	—	KB
5/11/13	Daily Pulser	Lab	1056	10 min	NA	MC
5/11/13	#19 cal check	Lab	1137	2 1/2 hrs	—	AG
5/11/13	1304114A(1-7)	Analysts Inc	1457	2hrs 50m	Am-241	AG
5/12/13	Daily Pulser	Lab	1119	10min	NA	AC
5/12/13	1304107A(7-13)	Eng. Manage Su	1210	2hrs 50m	Ra-226	AG

Alpha #3

Date	Sample #	Client	Load Time	Count Time	analysis	Tech
5/10/13	1304170A(1-4,7)	UCOR	1414	2hr 50m	Pu	KB
5/10/13	System Bkgd	Lab	1710	16.40 hrs	—	KB
5/11/13	Daily Pulser	Lab	1056	10m	NA	AG
5/11/13	1304114A (8-15)	Analysts Inc	1458	2hr 50m	Am-241	AG
5/12/13	Daily Pulser	Lab	1119	10min	NA	AG
5/12/13	1304107A (14-19)	Eng. Manage SD	1210	2hr 50m	Ra-226	AG

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	13-04107
Analysis Code	Ra228
Run Number	1

#	Date	Dept	User	Notes
1	04/26/13 19:20	PREP	LWALKER	FILTERED SAMPLES(ODD NUMBERED FRACTIONS ONLY)-SPIKE AND TRACE BEAKERS-ALIQUOT-PUT SAMPLES ON STIR PLATE AND PH TO 2.8-3.0-ADDED BA AND PB CARRIERS-ADDED 20MLS AMMONIUM SULFATE-LET STIR AND SETTLE. DECANT-TRANSFER TO C-TUBES-CENTRIFUGE-POUR OFF SUPERNATE AND SUBMIT PRECIP TO SEPARATIONS.

L. Walker
4/26/13

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	13-04107
Analysis Code	Ra228
Run Number	1

#	Date	Dept	User	Notes
1	04/26/13 19:20	PREP	LWALKER	FILTERED SAMPLES(ODD NUMBERED FRACTIONS ONLY)-SPIKE AND TRACE BEAKERS-ALIQUOT-PUT SAMPLES ON STIR PLATE AND PH TO 2.8-3.0-ADDED BA AND PB CARRIERS-ADDED 20MLS AMMONIUM SULFATE-LET STIR AND SETTLE. DECANT-TRANSFER TO C-TUBES-CENTRIFUGE-POUR OFF SUPERNATE AND SUBMIT PRECIP TO SEPARATIONS.
2	04/29/13 05:51	PREP	JBARNARD	DUE TO FRACTION 10 BEING VERY DIRTY- DRIED SAMPLE DOWN AND DIGESTED WITH MIXED ACIDS BEFORE PRECIPITATING

4/29/13

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	13-04107
Analysis Code	Ra228
Run Number	1

#	Date	Dept	User	Notes
1	04/26/13 19:20	PREP	LWALKER	FILTERED SAMPLES(ODD NUMBERED FRACTIONS ONLY)-SPIKE AND TRACE BEAKERS-ALIQUOT-PUT SAMPLES ON STIR PLATE AND PH TO 2.8-3.0-ADDED BA AND PB CARRIERS-ADDED 20MLS AMMONIUM SULFATE-LET STIR AND SETTLE. DECANT-TRANSFER TO C-TUBES-CENTRIFUGE-POUR OFF SUPERNATE AND SUBMIT PRECIP TO SEPARATIONS.
2	04/29/13 05:51	PREP	JBARNARD	DUE TO FRACTION 10 BEING VERY DIRTY- DRIED SAMPLE DOWN AND DIGESTED WITH MIXED ACIDS BEFORE PRECIPITATING
3	05/13/13 12:55	PREP	LWALKER	RECEIVED FILTERS BACK FROM COUNT ROOM-PUT BACK INTO C-TUBES-ADDED EDTA AND SWIRLED-LET SIT OVERNIGHT TO DIGEST.
4	05/14/13 18:00	PREP	LWALKER	FOLLOWED STEPS 12.1 TO 12.7 IN AP-007 REV 18 (CHEMICAL CLEANUP FOR RA 228)

L. Walker
5/14/13

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	13-04107
Analysis Code	Ra228
Run Number	1

#	Date	Dept	User	Notes
1	04/26/13 19:20	PREP	LWALKER	FILTERED SAMPLES(ODD NUMBERED FRACTIONS ONLY)-SPIKE AND TRACE BEAKERS-ALIQUOT-PUT SAMPLES ON STIR PLATE AND PH TO 2.8-3.0-ADDED BA AND PB CARRIERS-ADDED 20MLS AMMONIUM SULFATE-LET STIR AND SETTLE. DECANT-TRANSFER TO C-TUBES-CENTRIFUGE-POUR OFF SUPERNATE AND SUBMIT PRECIP TO SEPARATIONS.
2	04/29/13 05:51	PREP	JBARNARD	DUE TO FRACTION 10 BEING VERY DIRTY- DRIED SAMPLE DOWN AND DIGESTED WITH MIXED ACIDS BEFORE PRECIPITATING
3	05/13/13 12:55	PREP	LWALKER	RECEIVED FILTERS BACK FROM COUNT ROOM-PUT BACK INTO C-TUBES-ADDED EDTA AND SWIRLED-LET SIT OVERNIGHT TO DIGEST.
4	05/14/13 18:00	PREP	LWALKER	FOLLOWED STEPS 12.1 TO 12.7 IN AP-007 REV 18 (CHEMICAL CLEANUP FOR RA 228)
5	05/15/13 08:48	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)

5-15-13
JM

EBERLINE SERVICES

Reagents Used in an Analysis

Internal Work Order	
13-04107	
Analysis Code	Run
Ra228	1

Reagent ID	Reagent Name	Reagent Concentration	Analyst ID	Date Recorded
012127P	Ammonium Hydroxide	Reagent Grade	LWALKER	4/26/2013
013624P	Nitric Acid	Reagent Grade	LWALKER	4/26/2013
013575D02	Ammonium Sulfate	200 mg/ml	LWALKER	4/26/2013
012766D14	Barium Carrier	1 mg/ml	LWALKER	4/26/2013
013416P	Perchloric Acid	Reagent Grade	JBARNARD	4/29/2013
009098P	Sulfuric Acid	Reagent Grade	JBARNARD	4/29/2013
011504D22	Ammonium Sulfide	2%	LWALKER	5/14/2013
012729D08	Lead Carrier	1.5 mg/ml	LWALKER	5/14/2013
013797P	Nitric Acid	Reagent Grade	LWALKER	5/14/2013
013690S	Sodium Hydroxide	10M	LWALKER	5/14/2013
013801S	Yttrium Carrier	9 mg/ml	LWALKER	5/14/2013
012717D04	Ammonium Oxalate	5%	TSMITH	5/15/2013
013624D03	Nitric Acid	1N	TSMITH	5/15/2013
013686S	Nitric Acid	6N	TSMITH	5/15/2013
013690S	Sodium Hydroxide	10M	TSMITH	5/15/2013
013065D04	Sodium Hydroxide	18M	TSMITH	5/15/2013

Date	Sample#	Client	Time On	Count Time	Analysis	Tech
5/10/13	1704129SR(2-5)	ERA	1202	2h	SR707	C
5/10/13	1304124SR1(6,7)	ERA	1226	2hrs	Tot Sr	LB
5/11/13	Weekly BKGD	LAB	1248	12HR	αB	AG
5/17/13	Blank	LAB	0507	60 min	LB	C
5/17/13	Eff	LAB	0616	70 min	LB	C
5/17/13	1704170SR1(6)	UCON	0749	2h	SRSOL	C
5/17/13	Pb210 Recount	LAB	1005	15 min	Pb TH	C
5/14/13	Blank	LAB	0505	60 min	LB	C
5/14/13	Eff	LAB	0610	70 min	LB	C
5/14/13	1704175SR(1-4,6)	UCON	0746	2h	SRSOL	C
5/14/13	1704106RA(5-7)	[illegible]	0956	2h	RA8	C
5/14/13	1305029Pb1(1)	UCOR	1210	30 mins	Pb210	ICB
5/14/13	1305029Pb(2-4)	UCOR	1211	2hrs	Pb210	ICB
5/14/13	1305033Np(1-4)	UCOR	1213	10 mins	Np	ICB
5/14/13	1305029RA(1-4)	UCOR	1227	2 hrs	Ra8	ICB
5/15/13	Blank	LAB	0521	60 min	LB	C
5/15/13	Eff	LAB	0627	70 min	LB	—
5/15/13	1704124SR1(4)	LY AH Div RAD	0788	2h	SRSOL	C
5/15/13	1704107RA(17-19)	[illegible]	1005	2h	RA8	C
5/15/13	1704124SR1(10-11)	LY AH Div RAD	1005	2h	SRSOL	C

Date	Sample #	Client	[illegible]	CT Time	Analyst	[illegible]
5/15/17	CF FGC	UAS	0821	20m	[illegible]	C
5/15/17	[illegible]	UAS	0858	[illegible]	[illegible]	C
5/15/17	170507MAB(1-9)	Accutest	0757	2h	[illegible]	C
5/15/17	170410MA(1-17)	[illegible]	0859	2h	[illegible]	C

SECTION VIII

ANALYTICAL DATA (ISOTOPIC URANIUM)

Eberline Services
Oak Ridge Laboratory
Analysis Sheet

13-04107
UUISO
Run 1

Work Order	13-04107
Analysis Code	UUISO
Run	1
Date Received	4/16/2013
Lab Deadline	5/7/2013
Client	Engineering Management Support, Inc.
Project	West Lake OU-1
Report Level	4
Activity Units	pCi
Aliquot Units	l
Matrix	WA
Method	NAS NS-3050 Modified
Instrument Type	Alpha Spectroscopy
Radiometric Tracer	U-232
Radiometric Sol#	U-10a
Tracer Act (dpm/g)	19.093
Carrier	
Carrier Conc (mg/ml)	

Internal Fraction	Sample Desc	Client ID	Login CPM	Sample Date	Sample Aliquot
01	LCS	LCS		04/16/13 00:00	1.0000E+00
02	MBL	BLANK		04/16/13 00:00	1.0000E+00
03	DUP	FB at D-3 TOT	44	04/11/13 13:50	1.0000E+00
04	TRG	PZ-113-AD TOT	39	04/11/13 13:35	1.0000E+00
05	TRG	PZ-113-AD DIS	39	04/11/13 13:35	1.0000E+00
06	DO	FB at D-3 TOT	44	04/11/13 13:50	1.0000E+00
07	TRG	FB at D-3 DIS	44	04/11/13 13:50	1.0000E+00
08	TRG	D-3 TOT	46	04/11/13 14:24	1.0000E+00
09	TRG	D-3 DIS	46	04/11/13 14:24	1.0000E+00
10	TRG	D-85 TOT	43	04/11/13 14:45	1.0000E+00
11	TRG	D-85 DIS	43	04/11/13 14:45	1.0000E+00
12	TRG	S-84 TOT	42	04/11/13 15:30	1.0000E+00
13	TRG	S-84 DIS	42	04/11/13 15:30	1.0000E+00
14	TRG	S-5 TOT	35	04/11/13 15:31	1.0000E+00
15	TRG	S-5 DIS	35	04/11/13 15:31	1.0000E+00
16	TRG	PZ-109-SS TOT	45	04/11/13 16:08	1.0000E+00
17	TRG	PZ-109-SS DIS	45	04/11/13 16:08	1.0000E+00
18	TRG	PZ-104-KS TOT	38	04/11/13 18:08	1.0000E+00
19	TRG	PZ-104-KS DIS	38	04/11/13 18:08	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.

13-04107
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	0.6099	11.6		0.00								
02	MBL	0.6040	11.5		0.00								
03	DUP	0.6018	11.5		0.00								
04	TRG	0.5990	11.4		0.00								
05	TRG	0.5970	11.4		0.00								
06	DO	0.5987	11.4		0.00								
07	TRG	0.6010	11.5		0.00								
08	TRG	0.5978	11.4		0.00								
09	TRG	0.5987	11.4		0.00								
10	TRG	0.5976	11.4		0.00								
11	TRG	0.5969	11.4		0.00								
12	TRG	0.5975	11.4		0.00								
13	TRG	0.5963	11.4		0.00								
14	TRG	0.6003	11.5		0.00								
15	TRG	0.5999	11.5		0.00								
16	TRG	0.5975	11.4		0.00								
17	TRG	0.5959	11.4		0.00								
18	TRG	0.5973	11.4		0.00								
19	TRG	0.5968	11.4		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.

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			04/26/13 10:46	JBARNARD				
02	MBL			04/26/13 10:46	JBARNARD				
03	DUP			04/26/13 10:46	JBARNARD				
04	TRG			04/26/13 10:46	JBARNARD				
05	TRG			04/26/13 10:46	JBARNARD				
06	DO			04/26/13 10:46	JBARNARD				
07	TRG			04/26/13 10:46	JBARNARD				
08	TRG			04/26/13 10:46	JBARNARD				
09	TRG			04/26/13 10:46	JBARNARD				
10	TRG			04/26/13 10:46	JBARNARD				
11	TRG			04/26/13 10:46	JBARNARD				
12	TRG			04/26/13 10:46	JBARNARD				
13	TRG			04/26/13 10:46	JBARNARD				
14	TRG			04/26/13 10:46	JBARNARD				
15	TRG			04/26/13 10:46	JBARNARD				
16	TRG			04/26/13 10:46	JBARNARD				
17	TRG			04/26/13 10:46	JBARNARD				
18	TRG			04/26/13 10:46	JBARNARD				
19	TRG			04/26/13 10:46	JBARNARD				

* 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: 13-04107-UUISO-1

Run	1
Analysis Code	UUISO
Eberline Services Work Order	13-04107
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	U-234	LCS	LCS	pCi/l	7.74E+00	1.06E+00	9.90E-02	8.14E+00	95.15	OK		OK	
02	U-234	MBL	BLANK	pCi/l	7.42E-02	6.37E-02	6.27E-02					OK	OK
03	U-234	DUP	FB at D-3 TOT	pCi/l	4.61E-02	6.40E-02	9.72E-02				INV	OK	
04	U-234	TRG	PZ-113-AD TOT	pCi/l	2.87E-01	2.68E-01	3.04E-01					OK	
05	U-234	TRG	PZ-113-AD DIS	pCi/l	6.12E-02	7.37E-02	1.04E-01					OK	
06	U-234	DO	FB at D-3 TOT	pCi/l	7.25E-02	6.89E-02	8.43E-02					OK	
07	U-234	TRG	FB at D-3 DIS	pCi/l	5.97E-02	5.68E-02	6.12E-02					OK	
08	U-234	TRG	D-3 TOT	pCi/l	-2.18E-02	6.65E-02	1.81E-01					OK	
09	U-234	TRG	D-3 DIS	pCi/l	1.51E-01	1.20E-01	1.26E-01					OK	
10	U-234	TRG	D-85 TOT	pCi/l	1.73E+00	3.57E-01	8.56E-02					OK	
11	U-234	TRG	D-85 DIS	pCi/l	3.68E-01	1.44E-01	6.35E-02					OK	
12	U-234	TRG	S-84 TOT	pCi/l	2.41E-01	1.62E-01	1.33E-01					OK	
13	U-234	TRG	S-84 DIS	pCi/l	5.26E-02	7.88E-02	1.28E-01					OK	
14	U-234	TRG	S-5 TOT	pCi/l	-6.40E-02	1.96E-01	5.31E-01					OK	
15	U-234	TRG	S-5 DIS	pCi/l	1.02E-02	1.43E-01	4.08E-01					OK	
16	U-234	TRG	PZ-109-SS TOT	pCi/l	1.18E+00	2.72E-01	6.07E-02					OK	
17	U-234	TRG	PZ-109-SS DIS	pCi/l	1.38E+00	2.98E-01	7.10E-02					OK	
18	U-234	TRG	PZ-104-KS TOT	pCi/l	4.33E-01	1.54E-01	7.59E-02					OK	
19	U-234	TRG	PZ-104-KS DIS	pCi/l	4.94E-01	1.71E-01	8.42E-02					OK	

Preliminary Data Report & Analytical Calculations
Work Order: 13-04107-UUISO-1

Run	Analysis Code	Eberline Services Work Order	Client
1	UUISO	13-04107	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	04/16/13 00:00	1.00E+00	100.12	0.00	0.00			
02	U-234	MBL	04/16/13 00:00	1.00E+00	102.65	0.00	0.00			
03	U-234	DUP	04/11/13 13:50	1.00E+00	76.72	0.00	0.00			
04 -	U-234	TRG	04/11/13 13:35	1.00E+00	26.70	0.00	0.00			
05	U-234	TRG	04/11/13 13:35	1.00E+00	81.12	0.00	0.00			
06	U-234	DO	04/11/13 13:50	1.00E+00	123.18	0.00	0.00			
07	U-234	TRG	04/11/13 13:50	1.00E+00	121.19	0.00	0.00			
08	U-234	TRG	04/11/13 14:24	1.00E+00	47.69	0.00	0.00			
09	U-234	TRG	04/11/13 14:24	1.00E+00	72.74	0.00	0.00			
10	U-234	TRG	04/11/13 14:45	1.00E+00	100.44	0.00	0.00			
11	U-234	TRG	04/11/13 14:45	1.00E+00	101.25	0.00	0.00			
12	U-234	TRG	04/11/13 15:30	1.00E+00	55.91	0.00	0.00			
13	U-234	TRG	04/11/13 15:30	1.00E+00	63.43	0.00	0.00			
14 -	U-234	TRG	04/11/13 15:31	1.00E+00	15.88	0.00	0.00			
15 -	U-234	TRG	04/11/13 15:31	1.00E+00	25.45	0.00	0.00			
16	U-234	TRG	04/11/13 16:08	1.00E+00	122.20	0.00	0.00			
17	U-234	TRG	04/11/13 16:08	1.00E+00	121.53	0.00	0.00			
18	U-234	TRG	04/11/13 18:08	1.00E+00	121.27	0.00	0.00			
19	U-234	TRG	04/11/13 18:08	1.00E+00	102.18	0.00	0.00			

Run	Analysis Code	Eberline Services Work Order	Client
1	UUISO	13-04107	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	05/02/13 09:15		A_Spec	Alpha_010	170	5.74 E+02	1.00 E-02	19.7
02	U-234	MBL	05/02/13 09:15		A_Spec	Alpha_011	170.02	5.66 E+00	2.00 E-03	19.7
03	U-234	DUP	05/02/13 09:15		A_Spec	Alpha_013	170	2.49 E+00	3.00 E-03	18.7
04	U-234	TRG	05/02/13 09:15		A_Spec	Alpha_014	170.02	5.32 E+00	4.00 E-03	18.5
05	U-234	TRG	05/02/13 09:16		A_Spec	Alpha_018	170.02	3.32 E+00	4.00 E-03	17.8
06	U-234	DO	05/02/13 09:16		A_Spec	Alpha_022	170	5.15 E+00	5.00 E-03	15.3
07	U-234	TRG	05/02/13 09:16		A_Spec	Alpha_024	170	4.66 E+00	2.00 E-03	17.1
08	U-234	TRG	05/02/13 09:16		A_Spec	Alpha_025	170	-6.80 E-01	4.00 E-03	17.4
09	U-234	TRG	05/02/13 09:16		A_Spec	Alpha_027	170.02	7.15 E+00	5.00 E-03	17.3
10	U-234	TRG	05/02/13 09:16		A_Spec	Alpha_029	170	1.27 E+02	6.00 E-03	19.5
11	U-234	TRG	05/02/13 12:37		A_Spec	Alpha_011	170	2.77 E+01	2.00 E-03	19.7
12	U-234	TRG	05/02/13 12:37		A_Spec	Alpha_013	170	9.49 E+00	3.00 E-03	18.7
13	U-234	TRG	05/02/13 12:37		A_Spec	Alpha_014	170.02	2.32 E+00	4.00 E-03	18.5
14	U-234	TRG	05/02/13 12:37		A_Spec	Alpha_018	170	-6.80 E-01	4.00 E-03	17.8
15	U-234	TRG	05/02/13 12:37		A_Spec	Alpha_022	170.02	1.50 E-01	5.00 E-03	15.3
16	U-234	TRG	05/02/13 12:37		A_Spec	Alpha_024	170	9.27 E+01	2.00 E-03	17.1
17	U-234	TRG	05/02/13 12:37		A_Spec	Alpha_025	170.02	1.09 E+02	4.00 E-03	17.4
18	U-234	TRG	05/02/13 12:37		A_Spec	Alpha_027	170	3.42 E+01	5.00 E-03	17.3
19	U-234	TRG	05/02/13 12:37		A_Spec	Alpha_029	170	3.70 E+01	6.00 E-03	19.5

Preliminary Data Report & Analytical Calculations

Work Order: 13-04107-UUISO-1

Run	1
Analysis Code	UUISO
Eberline Services Work Order	13-04107
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	U-238	LCS	LCS	pCi/l	8.39E+00	1.13E+00	8.84E-02	7.93E+00	105.74	OK		OK	
02	U-238	MBL	BLANK	pCi/l	2.39E-02	3.65E-02	5.45E-02					OK	OK
03	U-238	DUP	FB at D-3 TOT	pCi/l	9.03E-03	3.77E-02	9.67E-02				NA	OK	
04	U-238	TRG	PZ-113-AD TOT	pCi/l	1.51E-01	2.18E-01	3.53E-01					OK	
05	U-238	TRG	PZ-113-AD DIS	pCi/l	-2.22E-02	4.23E-02	1.47E-01					OK	
06	U-238	DO	FB at D-3 TOT	pCi/l	6.29E-02	6.24E-02	7.35E-02					OK	
07	U-238	TRG	FB at D-3 DIS	pCi/l	1.68E-02	3.64E-02	7.19E-02					OK	
08	U-238	TRG	D-3 TOT	pCi/l	2.11E-02	6.45E-02	1.53E-01					OK	
09	U-238	TRG	D-3 DIS	pCi/l	6.98E-02	8.42E-02	1.19E-01					OK	
10	U-238	TRG	D-85 TOT	pCi/l	2.62E+00	4.70E-01	5.65E-02					OK	
11	U-238	TRG	D-85 DIS	pCi/l	1.43E-01	8.76E-02	5.52E-02					OK	
12	U-238	TRG	S-84 TOT	pCi/l	1.90E-01	1.44E-01	1.33E-01					OK	
13	U-238	TRG	S-84 DIS	pCi/l	6.35E-02	9.12E-02	1.49E-01					OK	
14	U-238	TRG	S-5 TOT	pCi/l	-1.13E-01	2.18E-01	7.49E-01					OK	
15	U-238	TRG	S-5 DIS	pCi/l	3.32E-02	1.39E-01	3.56E-01					OK	
16	U-238	TRG	PZ-109-SS TOT	pCi/l	5.23E-01	1.70E-01	7.13E-02					OK	
17	U-238	TRG	PZ-109-SS DIS	pCi/l	6.60E-01	1.92E-01	5.99E-02					OK	
18	U-238	TRG	PZ-104-KS TOT	pCi/l	2.06E-01	1.05E-01	7.12E-02					OK	
19	U-238	TRG	PZ-104-KS DIS	pCi/l	1.97E-01	1.03E-01	5.55E-02					OK	

Preliminary Data Report & Analytical Calculations

Work Order: 13-04107-UUISO-1

Run: 1
Analysis Code: UUISO
Eberline Services Work Order: 13-04107
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-238	LCS	04/16/13 00:00	1.00E+00	100.12	0.00	0.00			
02	U-238	MBL	04/16/13 00:00	1.00E+00	102.65	0.00	0.00			
03	U-238	DUP	04/11/13 13:50	1.00E+00	76.72	0.00	0.00			
04	U-238	TRG	04/11/13 13:35	1.00E+00	26.70	0.00	0.00			
05	U-238	TRG	04/11/13 13:35	1.00E+00	81.12	0.00	0.00			
06	U-238	DO	04/11/13 13:50	1.00E+00	123.18	0.00	0.00			
07	U-238	TRG	04/11/13 13:50	1.00E+00	121.19	0.00	0.00			
08	U-238	TRG	04/11/13 14:24	1.00E+00	47.69	0.00	0.00			
09	U-238	TRG	04/11/13 14:24	1.00E+00	72.74	0.00	0.00			
10	U-238	TRG	04/11/13 14:45	1.00E+00	100.44	0.00	0.00			
11	U-238	TRG	04/11/13 14:45	1.00E+00	101.25	0.00	0.00			
12	U-238	TRG	04/11/13 15:30	1.00E+00	55.91	0.00	0.00			
13	U-238	TRG	04/11/13 15:30	1.00E+00	63.43	0.00	0.00			
14	U-238	TRG	04/11/13 15:31	1.00E+00	15.88	0.00	0.00			
15	U-238	TRG	04/11/13 15:31	1.00E+00	25.45	0.00	0.00			
16	U-238	TRG	04/11/13 16:08	1.00E+00	122.20	0.00	0.00			
17	U-238	TRG	04/11/13 16:08	1.00E+00	121.53	0.00	0.00			
18	U-238	TRG	04/11/13 18:08	1.00E+00	121.27	0.00	0.00			
19	U-238	TRG	04/11/13 18:08	1.00E+00	102.18	0.00	0.00			

Run	1
Analysis Code	UUISO
Eberline Services Work Order	13-04107
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	05/02/13 09:15		A_Spec	Alpha_010	170	6.25 E+02	7.00 E-03	19.7
02	U-238	MBL	05/02/13 09:15		A_Spec	Alpha_011	170.02	1.83 E+00	1.00 E-03	19.7
03	U-238	DUP	05/02/13 09:15		A_Spec	Alpha_013	170	4.90 E-01	3.00 E-03	18.7
04	U-238	TRG	05/02/13 09:15		A_Spec	Alpha_014	170.02	2.81 E+00	7.00 E-03	18.5
05	U-238	TRG	05/02/13 09:16		A_Spec	Alpha_018	170.02	-1.21 E+00	1.30 E-02	17.8
06	U-238	DO	05/02/13 09:16		A_Spec	Alpha_022	170	4.49 E+00	3.00 E-03	15.3
07	U-238	TRG	05/02/13 09:16		A_Spec	Alpha_024	170	1.32 E+00	4.00 E-03	17.1
08	U-238	TRG	05/02/13 09:16		A_Spec	Alpha_025	170	6.60 E-01	2.00 E-03	17.4
09	U-238	TRG	05/02/13 09:16		A_Spec	Alpha_027	170.02	3.32 E+00	4.00 E-03	17.3
10	U-238	TRG	05/02/13 09:16		A_Spec	Alpha_029	170	1.94 E+02	1.00 E-03	19.5
11	U-238	TRG	05/02/13 12:37		A_Spec	Alpha_011	170	1.08 E+01	1.00 E-03	19.7
12	U-238	TRG	05/02/13 12:37		A_Spec	Alpha_013	170	7.49 E+00	3.00 E-03	18.7
13	U-238	TRG	05/02/13 12:37		A_Spec	Alpha_014	170.02	2.81 E+00	7.00 E-03	18.5
14	U-238	TRG	05/02/13 12:37		A_Spec	Alpha_018	170	-1.21 E+00	1.30 E-02	17.8
15	U-238	TRG	05/02/13 12:37		A_Spec	Alpha_022	170.02	4.90 E-01	3.00 E-03	15.3
16	U-238	TRG	05/02/13 12:37		A_Spec	Alpha_024	170	4.13 E+01	4.00 E-03	17.1
17	U-238	TRG	05/02/13 12:37		A_Spec	Alpha_025	170.02	5.27 E+01	2.00 E-03	17.4
18	U-238	TRG	05/02/13 12:37		A_Spec	Alpha_027	170	1.63 E+01	4.00 E-03	17.3
19	U-238	TRG	05/02/13 12:37		A_Spec	Alpha_029	170	1.48 E+01	1.00 E-03	19.5

Preliminary Data Report & Analytical Calculations

Work Order: 13-04107-UUISO-1

Run	Analysis Code	Eberline Services Work Order	Client
1	UUISO	13-04107	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	U-235	LCS	LCS	pCi/l	4.71E-01	1.83E-01	9.38E-02					OK	
02	U-235	MBL	BLANK	pCi/l	2.96E-02	4.53E-02	6.75E-02					OK	OK
03	U-235	DUP	FB at D-3 TOT	pCi/l	1.90E-02	4.55E-02	9.53E-02				NA	OK	
04	U-235	TRG	PZ-113-AD TOT	pCi/l	-2.26E-02	1.34E-01	3.18E-01					OK	
05	U-235	TRG	PZ-113-AD DIS	pCi/l	9.43E-02	1.02E-01	1.36E-01					OK	
06	U-235	DO	FB at D-3 TOT	pCi/l	3.73E-02	6.05E-02	1.04E-01					OK	
07	U-235	TRG	FB at D-3 DIS	pCi/l	2.62E-02	4.45E-02	7.56E-02					OK	
08	U-235	TRG	D-3 TOT	pCi/l	1.12E-01	1.36E-01	1.65E-01					OK	
09	U-235	TRG	D-3 DIS	pCi/l	9.54E-02	1.04E-01	1.25E-01					OK	
10	U-235	TRG	D-85 TOT	pCi/l	2.43E-01	1.30E-01	8.80E-02					OK	
11	U-235	TRG	D-85 DIS	pCi/l	1.36E-02	3.26E-02	6.84E-02					OK	
12	U-235	TRG	S-84 TOT	pCi/l	-5.33E-03	6.23E-02	1.31E-01					OK	
13	U-235	TRG	S-84 DIS	pCi/l	1.85E-02	5.65E-02	1.34E-01					OK	
14	U-235	TRG	S-5 TOT	pCi/l	1.34E-01	3.35E-01	6.95E-01					OK	
15	U-235	TRG	S-5 DIS	pCi/l	1.81E-01	2.95E-01	5.03E-01					OK	
16	U-235	TRG	PZ-109-SS TOT	pCi/l	1.20E-01	8.81E-02	7.49E-02					OK	
17	U-235	TRG	PZ-109-SS DIS	pCi/l	4.39E-02	5.32E-02	6.48E-02					OK	
18	U-235	TRG	PZ-104-KS TOT	pCi/l	-5.32E-03	3.15E-02	7.47E-02					OK	
19	U-235	TRG	PZ-104-KS DIS	pCi/l	2.46E-02	4.67E-02	8.65E-02					OK	

Preliminary Data Report & Analytical Calculations

Work Order: 13-04107-UUISO-1

Run	Analysis Code	Eberline Services Work Order	Client
1	UUISO	13-04107	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	04/16/13 00:00	1.00E+00	100.12	0.00	0.00			
02	U-235	MBL	04/16/13 00:00	1.00E+00	102.65	0.00	0.00			
03	U-235	DUP	04/11/13 13:50	1.00E+00	76.72	0.00	0.00			
04	U-235	TRG	04/11/13 13:35	1.00E+00	26.70	0.00	0.00			
05	U-235	TRG	04/11/13 13:35	1.00E+00	81.12	0.00	0.00			
06	U-235	DO	04/11/13 13:50	1.00E+00	123.18	0.00	0.00			
07	U-235	TRG	04/11/13 13:50	1.00E+00	121.19	0.00	0.00			
08	U-235	TRG	04/11/13 14:24	1.00E+00	47.69	0.00	0.00			
09	U-235	TRG	04/11/13 14:24	1.00E+00	72.74	0.00	0.00			
10	U-235	TRG	04/11/13 14:45	1.00E+00	100.44	0.00	0.00			
11	U-235	TRG	04/11/13 14:45	1.00E+00	101.25	0.00	0.00			
12	U-235	TRG	04/11/13 15:30	1.00E+00	55.91	0.00	0.00			
13	U-235	TRG	04/11/13 15:30	1.00E+00	63.43	0.00	0.00			
14	U-235	TRG	04/11/13 15:31	1.00E+00	15.88	0.00	0.00			
15	U-235	TRG	04/11/13 15:31	1.00E+00	25.45	0.00	0.00			
16	U-235	TRG	04/11/13 16:08	1.00E+00	122.20	0.00	0.00			
17	U-235	TRG	04/11/13 16:08	1.00E+00	121.53	0.00	0.00			
18	U-235	TRG	04/11/13 18:08	1.00E+00	121.27	0.00	0.00			
19	U-235	TRG	04/11/13 18:08	1.00E+00	102.18	0.00	0.00			

Run	1
Analysis Code	UUISO
Eberline Services Work Order	13-04107
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	05/02/13 09:15		A_Spec	Alpha_010	170	2.83 E+01	4.00 E-03	19.7
02	U-235	MBL	05/02/13 09:15		A_Spec	Alpha_011	170.02	1.83 E+00	1.00 E-03	19.7
03	U-235	DUP	05/02/13 09:15		A_Spec	Alpha_013	170	8.30 E-01	1.00 E-03	18.7
04	U-235	TRG	05/02/13 09:15		A_Spec	Alpha_014	170.02	-3.40 E-01	2.00 E-03	18.5
05	U-235	TRG	05/02/13 09:16		A_Spec	Alpha_018	170.02	4.15 E+00	5.00 E-03	17.8
06	U-235	DO	05/02/13 09:16		A_Spec	Alpha_022	170	2.15 E+00	5.00 E-03	15.3
07	U-235	TRG	05/02/13 09:16		A_Spec	Alpha_024	170	1.66 E+00	2.00 E-03	17.1
08	U-235	TRG	05/02/13 09:16		A_Spec	Alpha_025	170	2.83 E+00	1.00 E-03	17.4
09	U-235	TRG	05/02/13 09:16		A_Spec	Alpha_027	170.02	3.66 E+00	2.00 E-03	17.3
10	U-235	TRG	05/02/13 09:16		A_Spec	Alpha_029	170	1.45 E+01	3.00 E-03	19.5
11	U-235	TRG	05/02/13 12:37		A_Spec	Alpha_011	170	8.30 E-01	1.00 E-03	19.7
12	U-235	TRG	05/02/13 12:37		A_Spec	Alpha_013	170	-1.70 E-01	1.00 E-03	18.7
13	U-235	TRG	05/02/13 12:37		A_Spec	Alpha_014	170.02	6.60 E-01	2.00 E-03	18.5
14	U-235	TRG	05/02/13 12:37		A_Spec	Alpha_018	170	1.15 E+00	5.00 E-03	17.8
15	U-235	TRG	05/02/13 12:37		A_Spec	Alpha_022	170.02	2.15 E+00	5.00 E-03	15.3
16	U-235	TRG	05/02/13 12:37		A_Spec	Alpha_024	170	7.66 E+00	2.00 E-03	17.1
17	U-235	TRG	05/02/13 12:37		A_Spec	Alpha_025	170.02	2.83 E+00	1.00 E-03	17.4
18	U-235	TRG	05/02/13 12:37		A_Spec	Alpha_027	170	-3.40 E-01	2.00 E-03	17.3
19	U-235	TRG	05/02/13 12:37		A_Spec	Alpha_029	170	1.49 E+00	3.00 E-03	19.5

Count Room Report
Client: Engineering Management Su

13-04107-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	04/16/13 00:00	1.0000	0.6099	11.6448		0.00		
02	MBL	BLANK	04/16/13 00:00	1.0000	0.6040	11.5322		0.00		
03	DUP	FB at D-3 TOT	04/11/13 13:50	1.0000	0.6018	11.4902		0.00		
04	TRG	PZ-113-AD TOT	04/11/13 13:35	1.0000	0.5990	11.4367		0.00		
05	TRG	PZ-113-AD DIS	04/11/13 13:35	1.0000	0.5970	11.3985		0.00		
06	DO	FB at D-3 TOT	04/11/13 13:50	1.0000	0.5987	11.4310		0.00		
07	TRG	FB at D-3 DIS	04/11/13 13:50	1.0000	0.6010	11.4749		0.00		
08	TRG	D-3 TOT	04/11/13 14:24	1.0000	0.5978	11.4138		0.00		
09	TRG	D-3 DIS	04/11/13 14:24	1.0000	0.5987	11.4310		0.00		
10	TRG	D-85 TOT	04/11/13 14:45	1.0000	0.5976	11.4100		0.00		
11	TRG	D-85 DIS	04/11/13 14:45	1.0000	0.5969	11.3966		0.00		
12	TRG	S-84 TOT	04/11/13 15:30	1.0000	0.5975	11.4081		0.00		
13	TRG	S-84 DIS	04/11/13 15:30	1.0000	0.5963	11.3852		0.00		
14	TRG	S-5 TOT	04/11/13 15:31	1.0000	0.6003	11.4615		0.00		
15	TRG	S-5 DIS	04/11/13 15:31	1.0000	0.5999	11.4539		0.00		
16	TRG	PZ-109-SS TOT	04/11/13 16:08	1.0000	0.5975	11.4081		0.00		
17	TRG	PZ-109-SS DIS	04/11/13 16:08	1.0000	0.5959	11.3775		0.00		
18	TRG	PZ-104-KS TOT	04/11/13 18:08	1.0000	0.5973	11.4042		0.00		
19	TRG	PZ-104-KS DIS	04/11/13 18:08	1.0000	0.5968	11.3947		0.00		

Spike and Tracer Worksheet

Internal Work Order	Run	Analysis Code	Date	Technician	Technician Initials	Witness Initials
13-04107	1	UUISO	4/26/2013 10:45	JBARNARD		

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	4/26/2013	0.500	0.5126				8.14	0.293	0.00	0.000	0.00	0.000	0.00	0.000
U-238	U-8a	34.350	4/26/2013	0.500	0.5126				7.93	0.286	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	19.093	4/26/2013	0.6099	0.6300
02	U-232	U-10a	19.093	4/26/2013	0.6040	0.6300
03	U-232	U-10a	19.093	4/26/2013	0.6018	0.6300
04	U-232	U-10a	19.093	4/26/2013	0.5990	0.6300
05	U-232	U-10a	19.093	4/26/2013	0.5970	0.6300
06	U-232	U-10a	19.093	4/26/2013	0.5987	0.6300
07	U-232	U-10a	19.093	4/26/2013	0.6010	0.6300
08	U-232	U-10a	19.093	4/26/2013	0.5978	0.6300
09	U-232	U-10a	19.093	4/26/2013	0.5987	0.6300
10	U-232	U-10a	19.093	4/26/2013	0.5976	0.6300
11	U-232	U-10a	19.093	4/26/2013	0.5969	0.6300
12	U-232	U-10a	19.093	4/26/2013	0.5975	0.6300
13	U-232	U-10a	19.093	4/26/2013	0.5963	0.6300
14	U-232	U-10a	19.093	4/26/2013	0.6003	0.6300
15	U-232	U-10a	19.093	4/26/2013	0.5999	0.6300
16	U-232	U-10a	19.093	4/26/2013	0.5975	0.6300
17	U-232	U-10a	19.093	4/26/2013	0.5959	0.6300
18	U-232	U-10a	19.093	4/26/2013	0.5973	0.6300
19	U-232	U-10a	19.093	4/26/2013	0.5968	0.6300

Balance Printer Tapes

Tracer

0.6099 g
0.6040 g
-0.6018 g
-0.5990 g
-0.5970 g
-0.5987 g
-0.6010 g
-0.5978 g
-0.5987 g
-0.5976 g
-0.5969 g
-0.5975 g
-0.5963 g
-0.6003 g
-0.5999 g
-0.5975 g
-0.5959 g
-0.5973 g
-0.5968 g

LCS

0.5126 g

Matrix Spike

Eberline Analytical
Oak Ridge Laboratory

Aliquot Worksheet

Work Order	Run	Analysis Code	Rpt Units	Lab Deadline	Technician
13-04107	1	UUISO	liters	5/7/2013	JBARNARD

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	FB at D-3 TOT	DUP					1.0000E+00	1.0000E+00				
04	PZ-113-AD TOT	TRG					1.0000E+00	1.0000E+00				
05	PZ-113-AD DIS	TRG					1.0000E+00	1.0000E+00				
06	FB at D-3 TOT	DO					1.0000E+00	1.0000E+00				
07	FB at D-3 DIS	TRG					1.0000E+00	1.0000E+00				
08	D-3 TOT	TRG					1.0000E+00	1.0000E+00				
09	D-3 DIS	TRG					1.0000E+00	1.0000E+00				
10	D-85 TOT	TRG					1.0000E+00	1.0000E+00				
11	D-85 DIS	TRG					1.0000E+00	1.0000E+00				
12	S-84 TOT	TRG					1.0000E+00	1.0000E+00				
13	S-84 DIS	TRG					1.0000E+00	1.0000E+00				
14	S-5 TOT	TRG					1.0000E+00	1.0000E+00				
15	S-5 DIS	TRG					1.0000E+00	1.0000E+00				
16	PZ-109-SS TOT	TRG					1.0000E+00	1.0000E+00				
17	PZ-109-SS DIS	TRG					1.0000E+00	1.0000E+00				
18	PZ-104-KS TOT	TRG					1.0000E+00	1.0000E+00				
19	PZ-104-KS DIS	TRG					1.0000E+00	1.0000E+00				

Comments	

Technician: [signature] Date: 4/26/13

KCB 5/2/13

Apex-Alpha™

Sample Description: SPIKE
Spectrum File: \\OR-ALPHA1\Canberra\ApexAlpha\Root\Data\00000569
Batch Identification: 1304107A-UU
Sample Identification: 01
Sample Geometry: Shelf 2
Procedure Description: U iso

Detector Name: Alpha_010
Chamber Serial Number:
Detector Serial Number: 10
Env. Background: System Bkgd 55736
Reagent Blank: <not performed>

Sample Size: 1.000E+000 +/- 0.000E+000 liter
Sample Date/Time: 5/2/2013 7:21:37 AM
Acquisition Date/Time: 5/2/2013 9:15:28 AM
Acquisition Live Time: 170.0 minutes
Acquisition Real Time: 170.0 minutes

Tracer Certificate: U232_UU-10A
Tracer Quantity: 0.610 mL
Effective Efficiency: 0.1969 +/- 0.0110
Counting Efficiency: 0.1967 +/- 0.0036 on 12/15/2012 11:26:40 AM
Chem. Recovery Factor: 1.0012 +/- 0.0589

Control Certificate Name: NatU_U-8A
Chem. Recov. of Control: U-238 1.030787 +/- 0.077357
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	387.62	9.99	2.38	0.00E+000	9.7
U-234		4.735	574.30	8.19	1.70	0.00E+000	40.2
U-235		4.386	28.32	37.34	0.68	0.00E+000	2.9
U-238		4.157	624.81	7.85	1.19	0.00E+000	44.9

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*	5.23E+000 +/- 5.73E-001	1.10E-001 +/- 1.21E-002
U-234	0.995	4761.50*	7.74E+000 +/- 1.06E+000	9.90E-002 +/- 1.09E-002
U-235	1.000	4385.50*	4.71E-001 +/- 1.83E-001	9.38E-002 +/- 1.03E-002
U-238	0.995	4184.40*	8.39E+000 +/- 1.13E+000	8.84E-002 +/- 9.69E-003

AG 5/3/13

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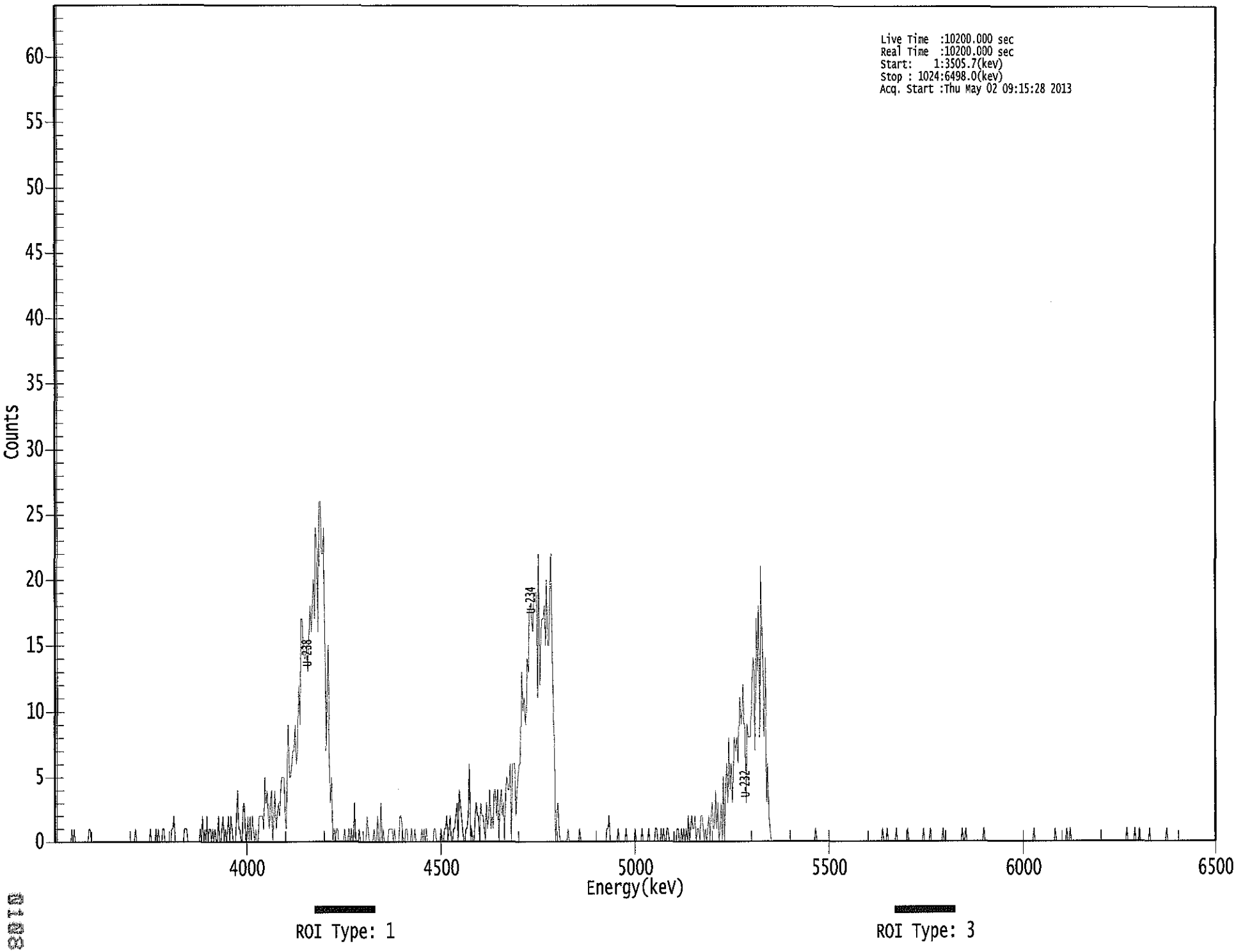

****
***** S P E C T R A L D A T A R E P O R T *****
****

Sample Title: 01

Elapsed Live time: 10200
Elapsed Real Time: 10200

Channel								
1:	10200	10200	0	0	0	0	0	0
9:	0	0	0	0	0	0	0	1
17:	0	1	0	0	0	0	0	0
25:	0	0	0	0	0	0	1	1
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	1
73:	0	0	0	0	0	0	0	0
81:	0	0	0	0	1	0	0	0
89:	0	1	0	1	0	0	0	1
97:	1	0	0	0	0	0	0	1
105:	1	2	0	0	0	0	0	0
113:	0	0	1	1	1	0	0	0
121:	0	0	0	0	0	0	0	0
129:	1	0	2	0	1	0	2	0
137:	1	1	0	1	0	1	0	0
145:	2	0	0	1	2	0	1	0
153:	1	2	0	2	1	0	0	0
161:	2	4	1	1	0	0	3	3
169:	0	0	2	0	2	0	2	1
177:	0	1	0	0	2	2	2	2
185:	1	5	3	4	2	1	3	4
193:	0	2	4	1	2	3	2	4
201:	5	5	5	2	1	6	9	5
209:	5	6	7	7	9	6	7	12
217:	9	17	17	15	14	14	15	13
225:	16	18	16	18	20	17	24	23
233:	16	26	26	22	22	24	16	7
241:	12	15	6	3	5	0	1	0
249:	1	1	0	0	0	0	0	1
257:	0	0	0	1	0	1	0	0
265:	3	0	0	0	1	0	0	0
273:	0	0	0	2	1	0	0	0
281:	0	1	0	0	2	0	0	3
289:	0	1	0	0	0	0	1	1
297:	1	1	0	1	0	0	0	0
305:	2	2	1	0	0	1	1	0
313:	0	0	1	0	0	1	0	0
321:	0	0	0	1	0	1	0	1
329:	0	0	0	0	0	0	1	1
337:	0	0	0	0	1	0	0	1
345:	1	2	0	1	2	0	0	1
353:	1	2	3	0	4	3	2	1
361:	0	0	1	1	2	6	0	1

369:	0	0	2	3	2	2	0	3

Sample Title: 01

Channel								
377:	2	2	1	0	3	1	2	4
385:	1	2	1	4	4	2	4	0
393:	3	4	2	3	0	4	5	4
401:	4	6	0	6	6	6	2	4
409:	5	6	6	13	10	11	10	9
417:	14	13	18	18	17	16	19	19
425:	19	11	22	12	16	17	17	18
433:	15	20	15	15	19	22	14	10
441:	8	0	2	3	1	0	0	0
449:	0	0	0	0	1	0	0	0
457:	0	0	0	0	0	0	1	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	1	1
489:	2	0	0	0	0	0	0	0
497:	1	0	0	0	0	0	0	1
505:	0	0	0	0	0	0	0	1
513:	0	0	0	0	0	1	0	0
521:	0	0	0	1	0	0	0	0
529:	0	1	1	0	0	0	1	0
537:	1	0	0	1	1	0	0	0
545:	0	0	0	0	1	1	0	0
553:	1	0	1	0	1	0	2	0
561:	1	2	1	1	2	0	1	1
569:	0	2	2	1	0	1	0	1
577:	2	0	2	3	1	1	4	1
585:	3	0	1	3	0	5	0	4
593:	6	3	8	4	6	3	6	8
601:	7	8	6	11	10	9	12	9
609:	9	3	9	8	8	8	12	14
617:	13	7	17	13	18	8	21	16
625:	13	8	14	3	6	2	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	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	1	0	0
737:	0	0	0	0	0	1	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	1	0	0
769:	0	0	0	1	0	0	0	0
777:	0	0	0	0	0	0	1	0
785:	0	0	0	0	0	0	0	0
793:	0	0	0	0	0	0	0	1

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	1	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	1	0
865:	0	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	1	0	0	1	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:	1	0	0	0	0	0	0	1
953:	0	0	0	1	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	1	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™

ICB 5/2/13

Sample Description: BLANK
Spectrum File: \\OR-ALPHA1\Canberra\ApexAlpha\Root\Data\00000569
Batch Identification: 1304107A-UU
Sample Identification: 02
Sample Geometry: Shelf 2
Procedure Description: U iso

Detector Name: Alpha_011
Chamber Serial Number:
Detector Serial Number: 11
Env. Background: System Bkgd 55737
Reagent Blank: <not performed>

Sample Size: 1.000E+000 +/- 0.000E+000 liter
Sample Date/Time: 5/2/2013 7:21:37 AM
Acquisition Date/Time: 5/2/2013 9:15:29 AM
Acquisition Live Time: 170.0 minutes
Acquisition Real Time: 170.0 minutes

Tracer Certificate: U232_UU-10A
Tracer Quantity: 0.604 mL
Effective Efficiency: 0.2025 +/- 0.0112
Counting Efficiency: 0.1973 +/- 0.0042 on 12/15/2012 11:28:06 AM
Chem. Recovery Factor: 1.0265 +/- 0.0608

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	5.276	394.83	9.87	0.17	0.00E+000	19.1
U-234		4.774	5.66	85.23	0.34	0.00E+000	2.7
U-235		4.379	1.83	152.56	0.17	0.00E+000	2.7
U-238		4.186	1.83	152.56	0.17	0.00E+000	2.7

T = Tracer Peak used for Effective Efficiency

NUCLIDE ANALYSIS RESULTS

Nuclide	Id Conf.	Energy (keV)	Activity (pCi/liter)	MDA (pCi/liter)
U-232	0.995	5302.50*	5.18E+000 +/- 5.61E-001	5.47E-002 +/- 5.93E-003
U-234	0.999	4761.50*	7.42E-002 +/- 6.37E-002	6.27E-002 +/- 6.80E-003
U-235	1.000	4385.50*	2.96E-002 +/- 4.53E-002	6.75E-002 +/- 7.32E-003
U-238	1.000	4184.40*	2.39E-002 +/- 3.65E-002	5.45E-002 +/- 5.91E-003

AG 5/3/13

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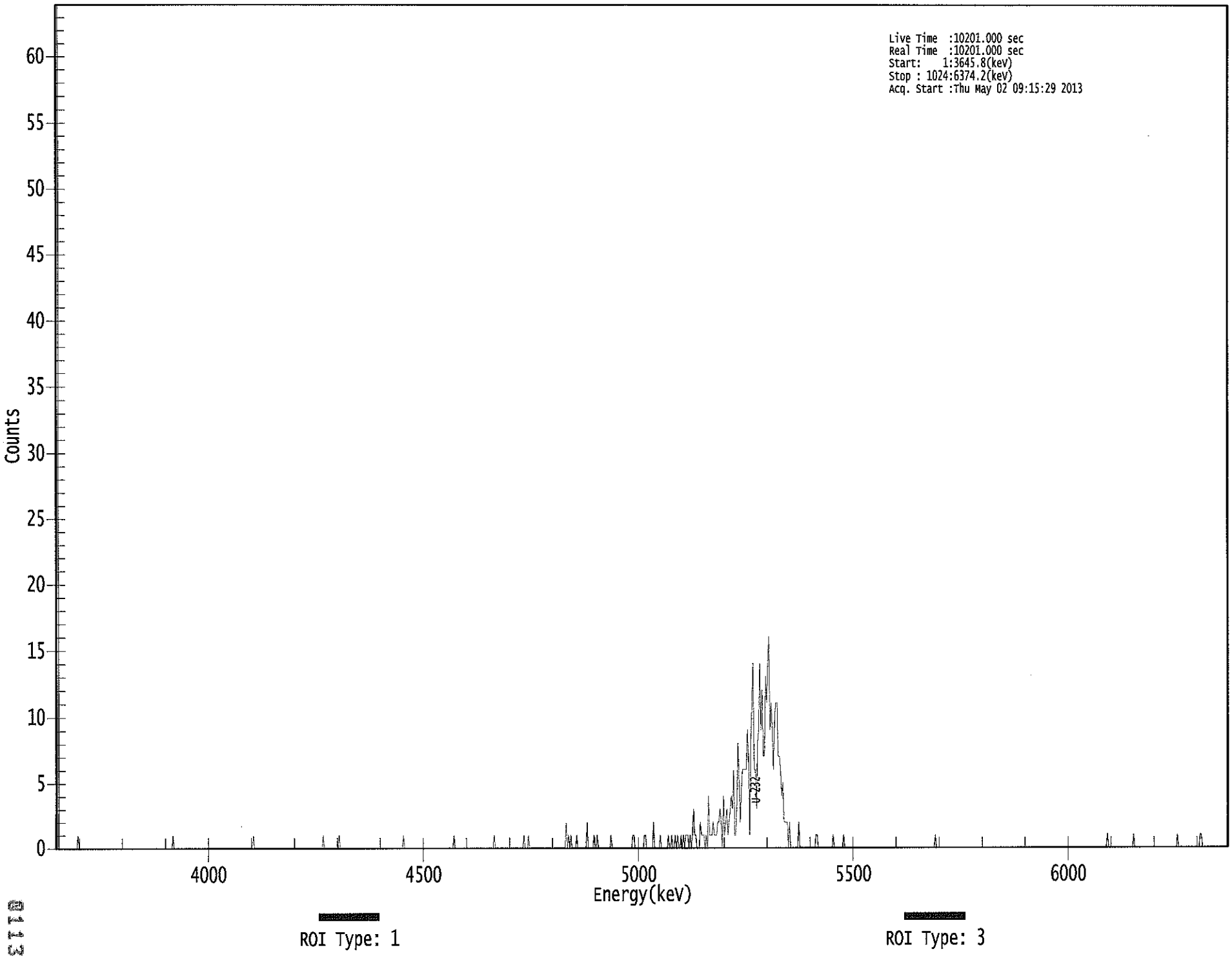


****
***** S P E C T R A L D A T A R E P O R T *****
****

Sample Title: 02

Elapsed Live time: 10201
Elapsed Real Time: 10201

Channel								
1:	10201	10201	0	0	0	0	0	0
9:	0	0	0	0	0	0	0	0
17:	0	0	0	1	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	1	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	1	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	1	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	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	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:	0	0	0	0	0	0	0	0
345:	0	0	0	1	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	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:	1	0	0	0	1	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:	0	0	0	0	0	2	0	1
449:	0	1	0	0	0	0	1	0
457:	0	0	0	0	0	0	0	2
465:	0	0	0	0	0	1	0	0
473:	1	0	0	0	0	0	0	0
481:	0	0	0	0	1	0	0	0
489:	0	0	0	0	0	0	0	0
497:	0	0	0	0	0	0	0	1
505:	1	0	0	0	0	0	0	0
513:	0	1	1	0	0	0	0	0
521:	0	2	0	0	0	0	0	1
529:	0	0	0	0	0	0	1	0
537:	0	1	0	0	1	0	1	0
545:	0	1	0	1	0	1	1	1
553:	0	1	0	1	3	1	1	0
561:	0	0	2	1	1	1	0	1
569:	0	4	1	1	1	2	1	1
577:	1	2	2	3	2	0	4	1
585:	2	3	1	2	3	4	3	6
593:	1	1	4	8	5	2	5	6
601:	6	6	6	9	7	1	8	11
609:	14	6	6	3	8	9	14	9
617:	12	7	7	13	11	14	16	9
625:	11	9	6	10	11	11	7	7
633:	6	4	5	2	2	2	2	0
641:	2	0	0	0	0	0	0	0
649:	2	0	0	0	0	0	0	0
657:	0	0	0	0	0	0	0	1
665:	1	0	0	0	0	0	0	0
673:	0	0	0	0	0	0	1	0
681:	0	0	0	0	0	0	0	1
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	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	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:	0	0	0	0	0	1	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	0	0
961:	0	0	0	0	0	0	0	0
969:	0	0	0	0	0	0	0	0
977:	0	0	1	0	0	0	0	0
985:	0	0	0	0	0	0	0	0
993:	0	0	0	0	0	0	1	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

Apex-Alpha™

ICB 5/2/13

Sample Description: FB AT D-3 TOT-DUP
Spectrum File: \\OR-ALPHA1\Canberra\ApexAlpha\Root\Data\00000569
Batch Identification: 1304107A-UU
Sample Identification: 03
Sample Geometry: Shelf 2
Procedure Description: U iso

Detector Name: Alpha_013
Chamber Serial Number:
Detector Serial Number: 13
Env. Background: System Bkgd 55738
Reagent Blank: <not performed>

Sample Size: 1.000E+000 +/- 0.000E+000 liter
Sample Date/Time: 4/11/2013 7:21:37 AM
Acquisition Date/Time: 5/2/2013 9:15:30 AM
Acquisition Live Time: 170.0 minutes
Acquisition Real Time: 170.0 minutes

Tracer Certificate: U232_UU-10A
Tracer Quantity: 0.602 mL
Effective Efficiency: 0.1434 +/- 0.0092
Counting Efficiency: 0.1869 +/- 0.0035 on 12/15/2012 11:26:45 AM
Chem. Recovery Factor: 0.7672 +/- 0.0514

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	5.283	278.47	11.78	1.53	0.00E+000	8.5
U-234		4.735	2.49	138.29	0.51	0.00E+000	2.8
U-235		4.370	0.83	239.53	0.17	0.00E+000	2.8
U-238		4.251	0.49	416.98	0.51	0.00E+000	2.8

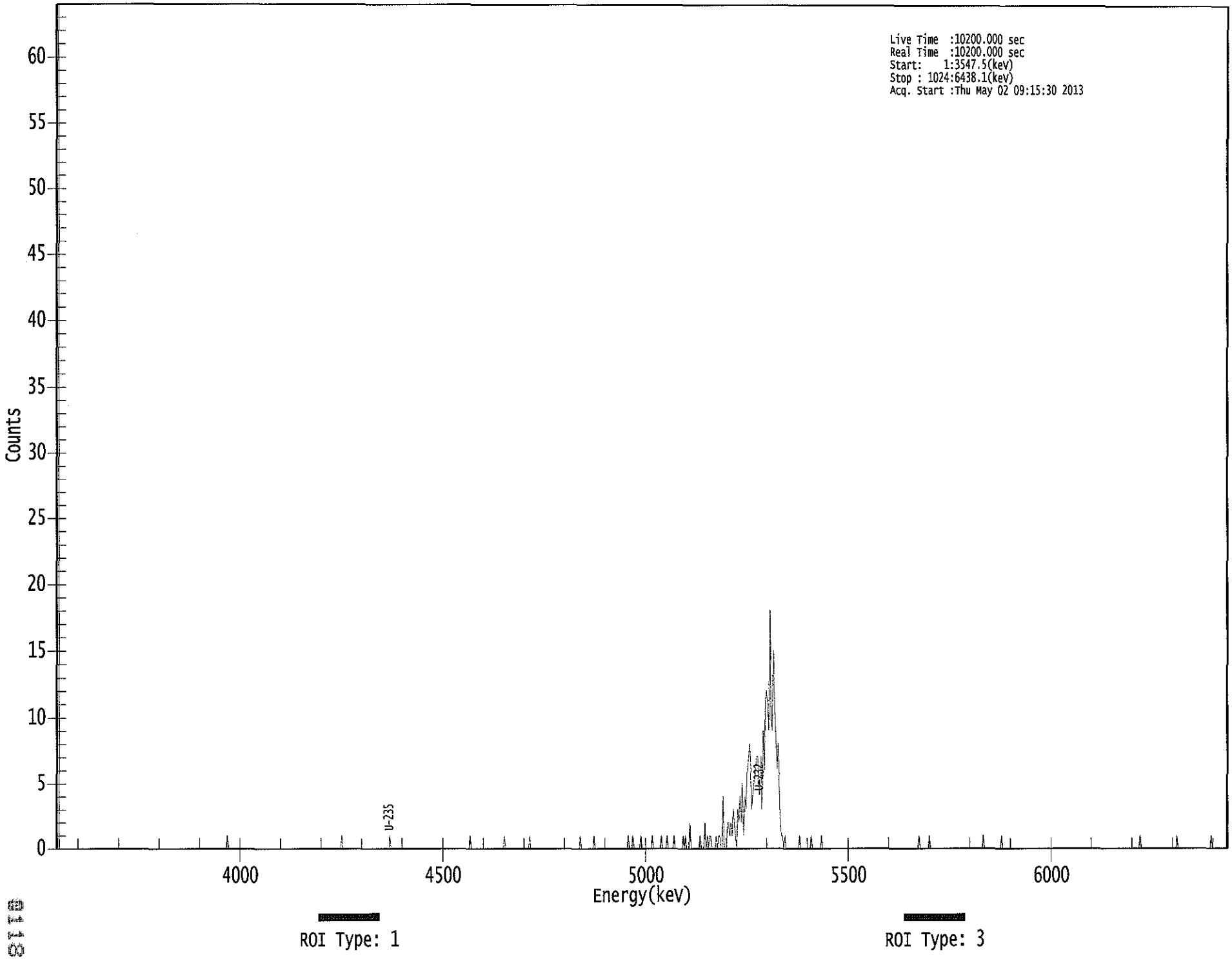
T = Tracer Peak used for Effective Efficiency

NUCLIDE ANALYSIS RESULTS

Nuclide	Id Conf.	Energy (keV)	Activity (pCi/liter)	MDA (pCi/liter)
U-232	0.997	5302.50*	5.16E+000 +/- 6.51E-001	1.32E-001 +/- 1.66E-002
U-234	0.995	4761.50*	4.61E-002 +/- 6.40E-002	9.72E-002 +/- 1.23E-002
U-235	0.998	4385.50*	1.90E-002 +/- 4.55E-002	9.53E-002 +/- 1.20E-002
U-238	0.969	4184.40*	9.03E-003 +/- 3.77E-002	9.67E-002 +/- 1.22E-002

AG 5/3/13

0000056910.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	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	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	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	1	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	1	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	0	0	0	0	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	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	1	0	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	0	0
489:	0	0	0	0	0	0	0	0
497:	0	0	0	1	0	0	0	1
505:	0	0	0	0	0	0	1	0
513:	0	0	0	0	0	0	0	0
521:	1	0	0	0	0	0	0	0
529:	1	0	0	0	0	1	0	0
537:	0	0	0	1	0	0	0	0
545:	0	0	0	1	0	1	0	0
553:	0	2	0	0	0	0	0	0
561:	0	0	1	0	0	0	2	0
569:	1	0	1	1	0	0	0	0
577:	1	0	1	1	0	0	4	0
585:	0	0	2	2	1	2	1	3
593:	2	1	0	3	2	4	2	5
601:	1	4	3	6	7	8	6	3
609:	4	5	6	7	7	5	4	7
617:	3	9	6	11	12	11	9	18
625:	10	9	15	11	9	6	8	5
633:	2	1	1	0	1	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	1	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	1	0	0	0	0	0	0
761:	0	0	1	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	1	0	0	0	0	0	0
817:	0	0	0	0	0	0	0	0
825:	0	1	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	1	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	1	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:	1	0	0	0	0	0	0	0
1017:	0	0	0	0	0	0	0	0

ICB 5/2/13

Apex-Alpha™

Sample Description: PZ-113-AD TOT
Spectrum File: \\OR-ALPHA1\Canberra\ApexAlpha\Root\Data\00000569
Batch Identification: 1304107A-UU
Sample Identification: 04
Sample Geometry: Shelf 2
Procedure Description: U iso

Detector Name: Alpha_014
Chamber Serial Number:
Detector Serial Number: 14
Env. Background: System Bkgd 55739
Reagent Blank: <not performed>

Sample Size: 1.000E+000 +/- 0.000E+000 liter
Sample Date/Time: 4/11/2013 7:21:37 AM
Acquisition Date/Time: 5/2/2013 9:15:32 AM
Acquisition Live Time: 170.0 minutes
Acquisition Real Time: 170.0 minutes

Tracer Certificate: U232_UU-10A
Tracer Quantity: 0.599 mL
Effective Efficiency: 0.0493 +/- 0.0053
Counting Efficiency: 0.1846 +/- 0.0034 on 12/15/2012 11:26:44 AM
Chem. Recovery Factor: 0.2670 +/- 0.0289

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	5.292	95.28	20.41	2.72	0.00E+000	4.9
U-234		4.706	5.32	91.11	0.68	0.00E+000	2.9
U-235		4.398	-0.34	592.84	0.34	0.00E+000	0.0
U-238		4.110	2.81	142.99	1.19	0.00E+000	2.9

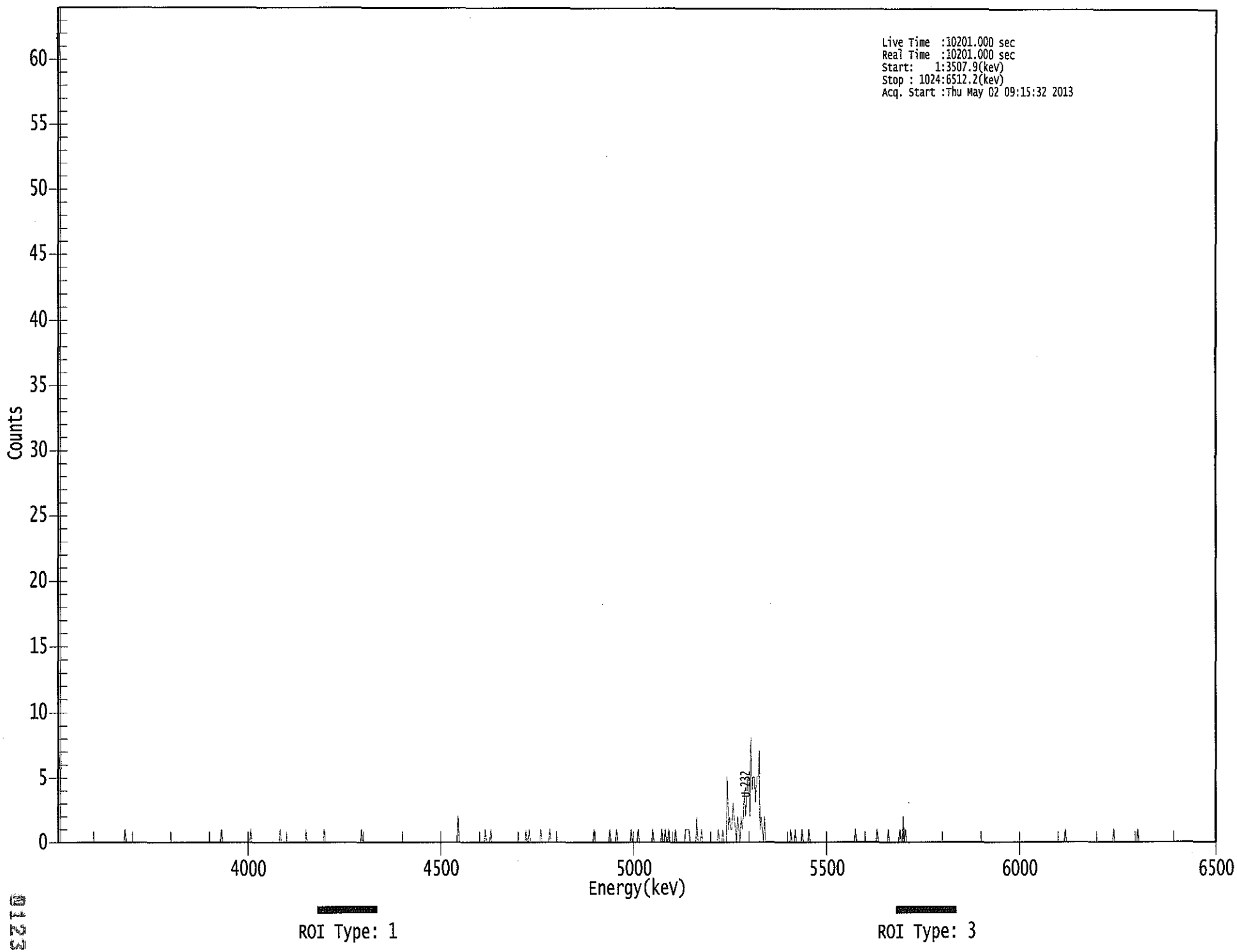
T = Tracer Peak used for Effective Efficiency

NUCLIDE ANALYSIS RESULTS

Nuclide	Id Conf.	Energy (keV)	Activity (pCi/liter)	MDA (pCi/liter)
U-232	0.999	5302.50*	5.14E+000 +/- 1.07E+000	4.62E-001 +/- 9.66E-002
U-234	0.978	4761.50*	2.87E-001 +/- 2.68E-001	3.04E-001 +/- 6.35E-002
U-235	0.999	4385.50*	-2.26E-002 +/- 1.34E-001	3.18E-001 +/- 6.64E-002
U-238	0.961	4184.40*	1.51E-001 +/- 2.18E-001	3.53E-001 +/- 7.39E-002

AG
5/3/13

0000056911.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	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	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:	1	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	1	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	1	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	1	0	0	0	0
225:	0	0	0	0	0	0	0	0
233:	0	0	0	1	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	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	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	2	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	1	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	1	0	0
417:	1	0	0	0	0	0	0	0
425:	0	0	1	0	0	0	0	0
433:	0	0	1	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	1	0	0	0	0	0	0
481:	0	0	0	0	0	0	0	1
489:	0	0	0	0	0	1	0	0
497:	0	0	0	0	0	0	0	0
505:	0	0	1	0	0	0	0	0
513:	1	0	0	0	0	0	0	0
521:	0	0	0	0	0	1	0	0
529:	0	0	0	0	0	1	0	0
537:	1	0	0	1	0	0	0	0
545:	0	1	0	0	0	0	0	0
553:	0	0	1	1	1	1	0	0
561:	0	0	0	0	2	0	0	0
569:	1	0	0	0	0	0	0	0
577:	0	0	0	0	0	0	0	1
585:	0	0	0	1	0	0	0	5
593:	1	2	1	1	3	2	1	0
601:	2	1	0	2	1	2	4	2
609:	3	5	5	2	8	4	5	5
617:	3	5	5	7	1	2	1	0
625:	2	0	0	0	0	0	0	0
633:	0	0	0	0	0	0	0	0
641:	0	0	0	0	0	0	0	1
649:	0	0	0	1	0	0	0	0
657:	0	1	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:	1	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	1	0	0
737:	0	0	0	0	0	0	0	1
745:	0	0	2	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: 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	1	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	1	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

ICB 5/2/13

Apex-Alpha™

Sample Description: PZ-113-AD DIS
Spectrum File: \\OR-ALPHA1\Canberra\ApexAlpha\Root\Data\00000569
Batch Identification: 1304107A-UU
Sample Identification: 05
Sample Geometry: Shelf 2
Procedure Description: U iso

Detector Name: Alpha_018
Chamber Serial Number:
Detector Serial Number: 18
Env. Background: System Bkgd 55740
Reagent Blank: <not performed>

Sample Size: 1.000E+000 +/- 0.000E+000 liter
Sample Date/Time: 4/11/2013 7:21:37 AM
Acquisition Date/Time: 5/2/2013 9:16:02 AM
Acquisition Live Time: 170.0 minutes
Acquisition Real Time: 170.0 minutes

Tracer Certificate: U232_UU-10A
Tracer Quantity: 0.597 mL
Effective Efficiency: 0.1441 +/- 0.0093
Counting Efficiency: 0.1776 +/- 0.0033 on 12/15/2012 1:57:26 PM
Chem. Recovery Factor: 0.8112 +/- 0.0544

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	277.64	11.80	1.36	0.00E+000	10.1
U-234		4.741	3.32	119.77	0.68	0.00E+000	3.1
U-235		4.374	4.15	107.12	0.85	0.00E+000	3.1
U-238		4.170	-1.21	189.96	2.21	0.00E+000	3.1

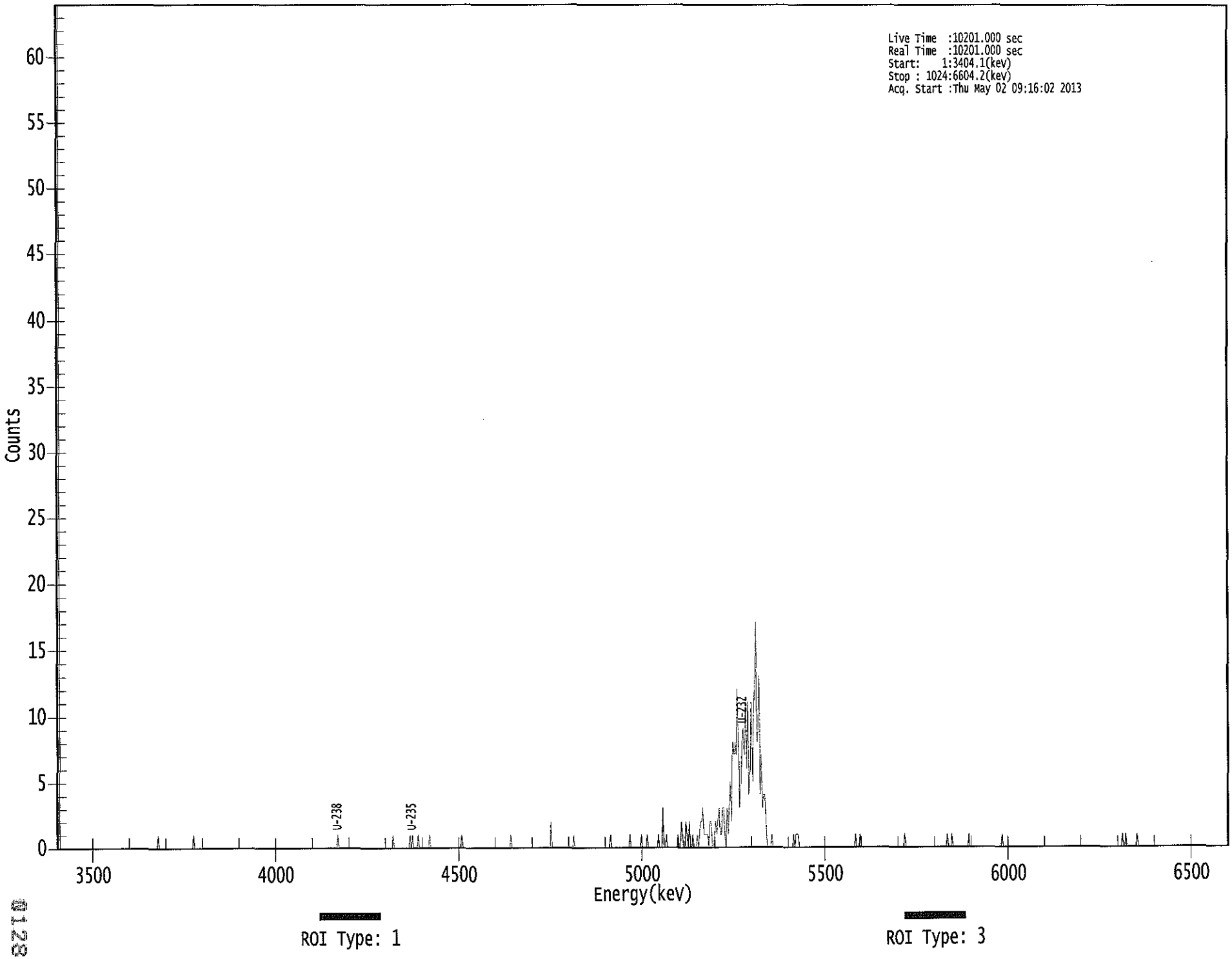
T = Tracer Peak used for Effective Efficiency

NUCLIDE ANALYSIS RESULTS

Nuclide	Id Conf.	Energy (keV)	Activity (pCi/liter)	MDA (pCi/liter)
U-232	0.996	5302.50*	5.12E+000 +/- 6.46E-001	1.26E-001 +/- 1.60E-002
U-234	0.997	4761.50*	6.12E-002 +/- 7.37E-002	1.04E-001 +/- 1.31E-002
U-235	0.999	4385.50*	9.43E-002 +/- 1.02E-001	1.36E-001 +/- 1.72E-002
U-238	0.999	4184.40*	-2.22E-002 +/- 4.23E-002	1.47E-001 +/- 1.85E-002

AG 5/3/13

0000056912.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: 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:	1	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	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	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	1	0	0
297:	0	0	0	0	0	0	0	0
305:	0	0	0	0	1	0	1	0
313:	0	0	0	1	0	0	0	0
321:	0	0	0	0	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	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: 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	1	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	2
433:	0	0	0	0	0	0	0	0
441:	0	0	0	0	0	0	0	0
449:	0	0	0	1	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:	0	0	0	0	0	0	0	0
497:	0	0	0	0	1	0	0	0
505:	0	0	0	0	0	0	1	0
513:	0	0	0	1	0	0	0	0
521:	0	0	0	0	0	1	0	0
529:	0	3	0	0	1	0	0	0
537:	0	0	0	0	0	0	1	0
545:	0	2	1	0	0	2	1	0
553:	2	0	0	1	0	0	0	1
561:	0	1	2	2	3	1	1	1
569:	1	0	2	2	0	0	1	2
577:	1	2	3	1	1	3	3	1
585:	0	3	1	3	5	2	8	7
593:	8	7	12	8	3	5	8	9
601:	7	11	6	11	4	6	11	5
609:	10	12	17	8	9	13	4	7
617:	3	4	4	2	0	0	0	0
625:	1	0	0	0	0	0	0	0
633:	0	0	0	0	0	0	0	0
641:	0	0	0	1	0	1	1	1
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	1	0	0	0	1	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	1	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	1	0	0	0	1	0	0
785:	0	0	0	0	0	0	0	0
793:	0	0	0	0	1	0	0	0

801:	0	0	0	0	0	0	0	0

Sample Title: 05

Channel								
809:	0	0	0	0	0	0	0	0
817:	0	0	0	0	0	0	0	0
825:	0	1	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	1	0	0	1	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

KB 5/2/13

Apex-Alpha™

Sample Description: FB AT D-3 TOT
Spectrum File: \\OR-ALPHA1\Canberra\ApexAlpha\Root\Data\00000569
Batch Identification: 1304107A-UU
Sample Identification: 06
Sample Geometry: Shelf 2
Procedure Description: U iso

Detector Name: Alpha_022
Chamber Serial Number:
Detector Serial Number: 22
Env. Background: System Bkgd 55741
Reagent Blank: <not performed>

Sample Size: 1.000E+000 +/- 0.000E+000 liter
Sample Date/Time: 4/11/2013 7:21:37 AM
Acquisition Date/Time: 5/2/2013 9:16:03 AM
Acquisition Live Time: 170.0 minutes
Acquisition Real Time: 170.0 minutes

Tracer Certificate: U232_UU-10A
Tracer Quantity: 0.599 mL
Effective Efficiency: 0.1886 +/- 0.0108
Counting Efficiency: 0.1531 +/- 0.0029 on 12/15/2012 1:57:26 PM
Chem. Recovery Factor: 1.2318 +/- 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	5.264	364.47	10.29	1.53	0.00E+000	10.6
U-234		4.767	5.15	94.34	0.85	0.00E+000	4.7
U-235		4.415	2.15	161.66	0.85	0.00E+000	3.1
U-238		4.134	4.49	98.45	0.51	0.00E+000	3.1

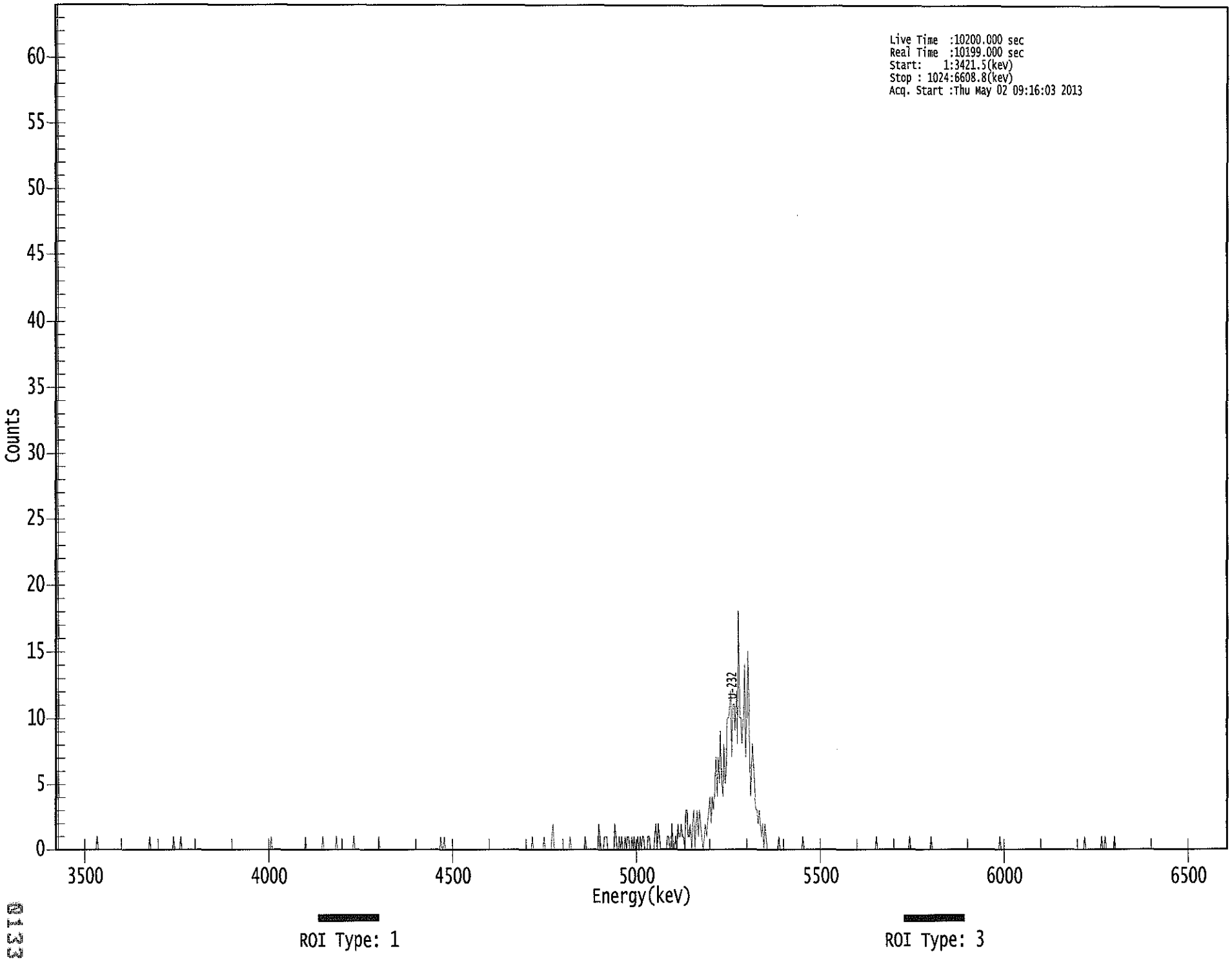
T = Tracer Peak used for Effective Efficiency

NUCLIDE ANALYSIS RESULTS

Nuclide	Id Conf.	Energy (keV)	Activity (pCi/liter)	MDA (pCi/liter)
U-232	0.990	5302.50*	5.13E+000 +/- 5.77E-001	1.00E-001 +/- 1.12E-002
U-234	1.000	4761.50*	7.25E-002 +/- 6.89E-002	8.43E-002 +/- 9.47E-003
U-235	0.994	4385.50*	3.73E-002 +/- 6.05E-002	1.04E-001 +/- 1.17E-002
U-238	0.982	4184.40*	6.29E-002 +/- 6.24E-002	7.35E-002 +/- 8.26E-003

AG 5/3/13

0000056913.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: 10199

Channel								
1:	10199	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	1	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	1	0	0	0	0	0
89:	0	0	0	0	0	0	0	0
97:	0	0	0	0	0	0	0	1
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	1	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	1	0	0	0	0	0
225:	0	0	0	0	0	0	0	0
233:	0	1	0	0	0	0	0	0
241:	0	0	0	0	0	1	0	0
249:	0	0	0	0	0	0	0	0
257:	0	0	0	0	1	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	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:	1	0	0	1	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: 06

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:	1	0	0	0	0	0	0	0
425:	0	0	1	0	0	0	0	0
433:	0	1	2	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	1	0
465:	0	0	0	0	0	0	0	0
473:	0	0	2	1	0	0	0	1
481:	1	1	0	0	0	0	0	0
489:	2	1	0	0	1	0	1	0
497:	0	1	0	1	1	0	0	1
505:	0	1	0	0	1	0	1	0
513:	1	1	0	0	0	1	1	0
521:	0	0	0	1	2	0	2	1
529:	0	0	0	0	0	0	1	1
537:	0	0	2	0	0	1	0	2
545:	1	1	2	1	1	0	3	3
553:	1	1	2	0	2	3	0	2
561:	3	1	3	2	1	0	1	2
569:	1	2	3	4	2	4	3	5
577:	7	4	7	5	9	5	4	8
585:	5	6	10	10	11	12	7	11
593:	11	9	12	8	18	10	10	8
601:	10	14	7	10	15	10	4	6
609:	8	6	4	3	3	2	3	2
617:	1	2	0	2	1	0	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	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:	0	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	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	1	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: 06

Channel								
809:	0	0	0	0	0	0	0	0
817:	0	0	0	0	0	0	0	0
825:	1	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	1	0	0	0	0	0
905:	0	0	0	0	0	0	0	0
913:	0	1	0	0	1	0	0	0
921:	0	0	0	0	1	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 5/2/13

Apex-Alpha™

Sample Description: FB AT D-3 DIS
Spectrum File: \\OR-ALPHA1\Canberra\ApexAlpha\Root\Data\00000569
Batch Identification: 1304107A-UU
Sample Identification: 07
Sample Geometry: Shelf 2
Procedure Description: U iso

Detector Name: Alpha_024
Chamber Serial Number:
Detector Serial Number: 24
Env. Background: System Bkgd 55742
Reagent Blank: <not performed>

Sample Size: 1.000E+000 +/- 0.000E+000 liter
Sample Date/Time: 4/11/2013 7:21:37 AM
Acquisition Date/Time: 5/2/2013 9:16:04 AM
Acquisition Live Time: 170.0 minutes
Acquisition Real Time: 170.0 minutes

Tracer Certificate: U232_UU-10A
Tracer Quantity: 0.601 mL
Effective Efficiency: 0.2073 +/- 0.0114
Counting Efficiency: 0.1710 +/- 0.0032 on 12/15/2012 2:02:15 PM
Chem. Recovery Factor: 1.2119 +/- 0.0704

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	5.259	401.98	9.79	1.02	0.00E+000	29.1
U-234		4.714	4.66	94.59	0.34	0.00E+000	4.7
U-235		4.424	1.66	169.38	0.34	0.00E+000	3.1
U-238		4.072	1.32	215.97	0.68	0.00E+000	3.1

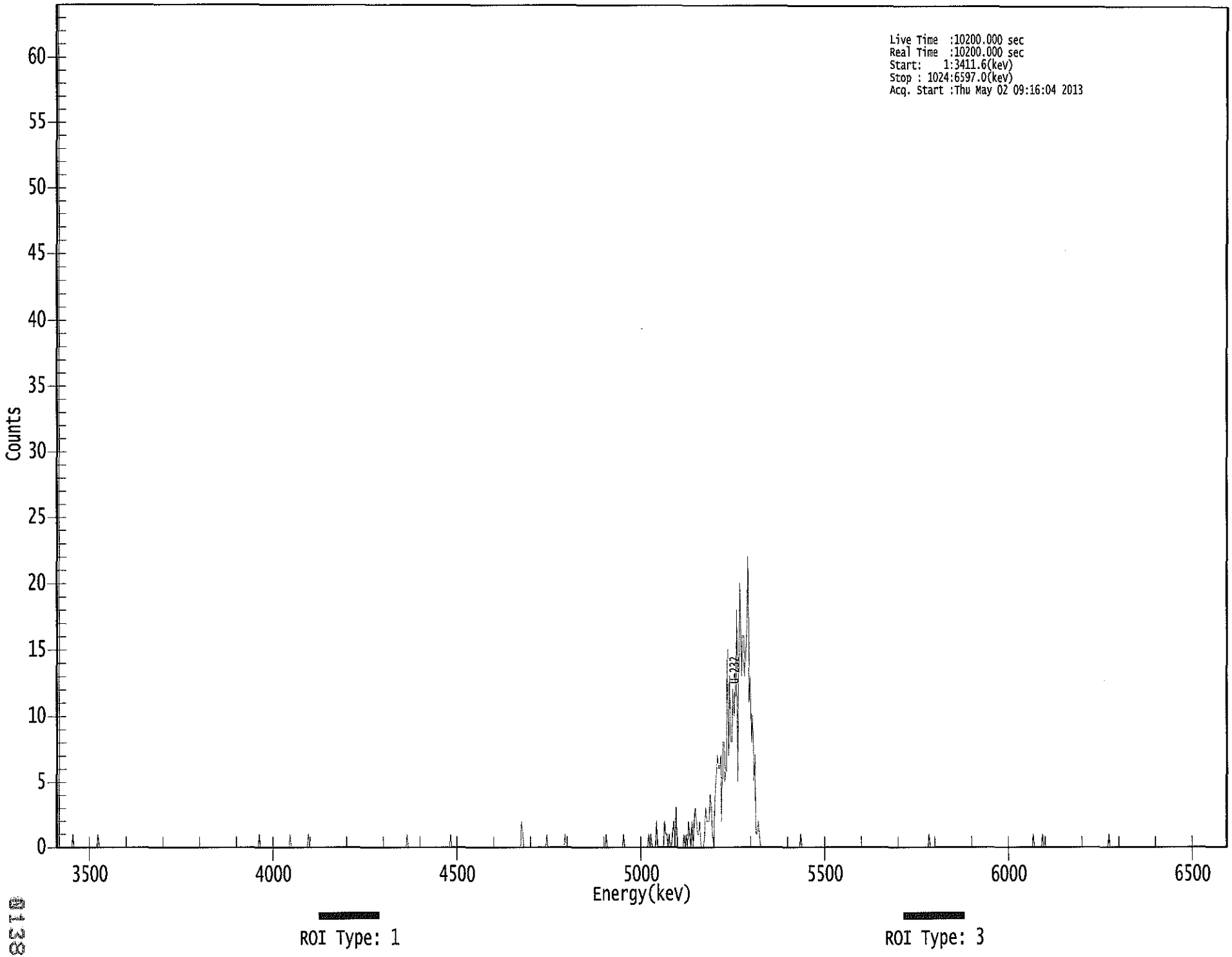
T = Tracer Peak used for Effective Efficiency

NUCLIDE ANALYSIS RESULTS

Nuclide	Id Conf.	Energy (keV)	Activity (pCi/liter)	MDA (pCi/liter)
U-232	0.987	5302.50*	5.15E+000 +/- 5.55E-001	8.08E-002 +/- 8.70E-003
U-234	0.984	4761.50*	5.97E-002 +/- 5.68E-002	6.12E-002 +/- 6.60E-003
U-235	0.990	4385.50*	2.62E-002 +/- 4.45E-002	7.56E-002 +/- 8.14E-003
U-238	0.914	4184.40*	1.68E-002 +/- 3.64E-002	7.19E-002 +/- 7.76E-003

AG 5/3/13

0000056914.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	1	0
17:	0	0	0	0	0	0	0	0
25:	0	0	0	0	0	0	0	0
33:	0	0	0	0	1	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	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:	0	0	0	0	1	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	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	1	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:	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	0	0	0	0

Sample Title: 07

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	2	1
409:	0	0	0	0	0	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	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:	1	0	0	0	0	0	0	0
489:	0	0	0	0	0	0	0	1
497:	0	0	0	0	0	0	0	0
505:	0	0	0	0	0	0	0	0
513:	0	0	0	0	0	1	0	1
521:	0	0	0	0	2	0	0	0
529:	0	0	0	2	1	1	0	1
537:	0	0	1	2	0	3	0	0
545:	0	0	0	0	1	0	1	0
553:	2	1	0	2	0	2	3	2
561:	1	1	2	0	0	0	1	3
569:	2	2	2	4	3	1	0	3
577:	5	7	6	6	7	2	8	8
585:	5	6	15	7	13	8	8	12
593:	10	12	18	5	14	20	13	16
601:	16	13	15	17	22	11	13	8
609:	10	5	7	1	1	2	1	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	1	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	1	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	1	0	0
857:	0	0	0	0	0	1	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	1
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

KCB 5/2/13

Apex-Alpha™

Sample Description: D-3 TOT
Spectrum File: \\OR-ALPHA1\Canberra\ApexAlpha\Root\Data\00000569
Batch Identification: 1304107A-UU
Sample Identification: 08
Sample Geometry: Shelf 2
Procedure Description: U iso

Detector Name: Alpha_025
Chamber Serial Number:
Detector Serial Number: 25
Env. Background: System Bkgd 55743
Reagent Blank: <not performed>

Sample Size: 1.000E+000 +/- 0.000E+000 liter
Sample Date/Time: 4/11/2013 7:21:37 AM
Acquisition Date/Time: 5/2/2013 9:16:06 AM
Acquisition Live Time: 170.0 minutes
Acquisition Real Time: 170.0 minutes

Tracer Certificate: U232_UU-10A
Tracer Quantity: 0.598 mL
Effective Efficiency: 0.0828 +/- 0.0068
Counting Efficiency: 0.1736 +/- 0.0032 on 12/15/2012 1:57:27 PM
Chem. Recovery Factor: 0.4769 +/- 0.0403

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	5.281	159.66	15.53	0.34	0.00E+000	13.6
U-234		4.717	-0.68	304.44	0.68	0.00E+000	0.0
U-235		4.406	2.83	120.53	0.17	0.00E+000	3.1
U-238		4.134	0.66	305.43	0.34	0.00E+000	3.1

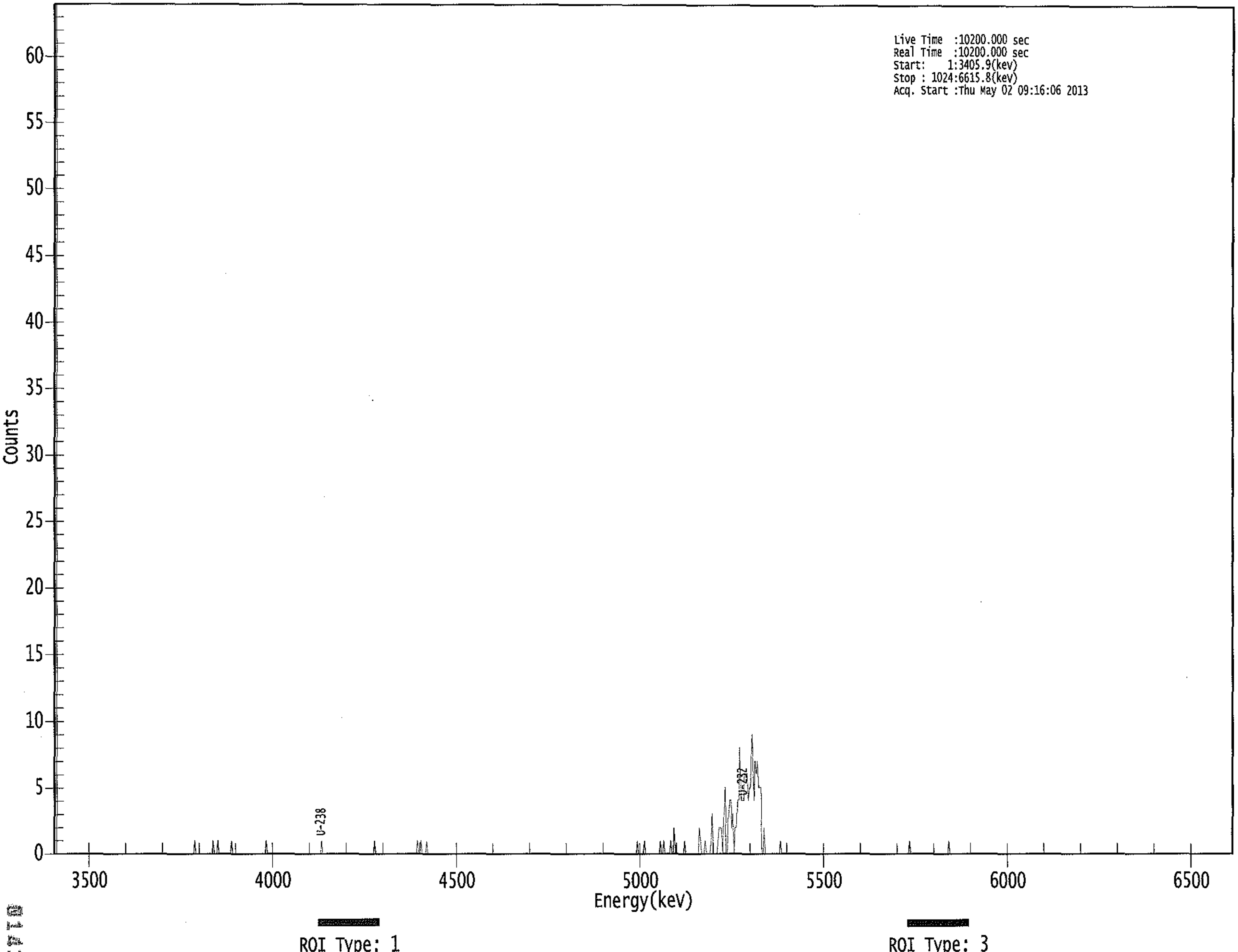
T = Tracer Peak used for Effective Efficiency

NUCLIDE ANALYSIS RESULTS

Nuclide	Id Conf.	Energy (keV)	Activity (pCi/liter)	MDA (pCi/liter)
U-232	0.997	5302.50*	5.12E+000 +/- 8.29E-001	1.53E-001 +/- 2.48E-002
U-234	0.986	4761.50*	-2.18E-002 +/- 6.65E-002	1.81E-001 +/- 2.93E-002
U-235	0.997	4385.50*	1.12E-001 +/- 1.36E-001	1.65E-001 +/- 2.67E-002
U-238	0.982	4184.40*	2.11E-002 +/- 6.45E-002	1.53E-001 +/- 2.47E-002

AG 5/3/13

0000056915.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: 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	1	0	0	0	0	0
129:	0	0	0	0	0	0	0	0
137:	0	0	1	0	0	0	1	0
145:	0	0	0	0	0	0	0	0
153:	0	0	1	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	0	0	0	0	0	0
233:	1	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	1	0	0	1	0
321:	0	0	0	1	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: 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	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	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	1	0	0	0	0	0
513:	1	0	0	0	0	0	0	0
521:	0	0	0	0	0	0	1	0
529:	0	1	0	0	0	0	0	1
537:	0	0	2	0	0	0	0	0
545:	0	0	0	1	0	0	0	0
553:	0	0	0	0	0	0	0	0
561:	2	1	0	0	0	1	0	0
569:	0	0	1	3	0	0	0	0
577:	1	2	2	2	0	3	5	0
585:	0	3	4	4	2	3	0	2
593:	2	4	4	8	4	4	4	6
601:	6	6	4	5	5	9	7	4
609:	7	6	7	5	5	5	0	0
617:	2	0	0	0	0	0	0	0
625:	0	0	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	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	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:	1	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	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 5/2/13

Apex-Alpha™

Sample Description: D-3 DIS
Spectrum File: \\OR-ALPHA1\Canberra\ApexAlpha\Root\Data\00000569
Batch Identification: 1304107A-UU
Sample Identification: 09
Sample Geometry: Shelf 2
Procedure Description: U iso

Detector Name: Alpha_027
Chamber Serial Number:
Detector Serial Number: 27
Env. Background: System Bkgd 55744
Reagent Blank: <not performed>

Sample Size: 1.000E+000 +/- 0.000E+000 liter
Sample Date/Time: 4/11/2013 7:21:37 AM
Acquisition Date/Time: 5/2/2013 9:16:07 AM
Acquisition Live Time: 170.0 minutes
Acquisition Real Time: 170.0 minutes

Tracer Certificate: U232_UU-10A
Tracer Quantity: 0.599 mL
Effective Efficiency: 0.1257 +/- 0.0086
Counting Efficiency: 0.1728 +/- 0.0032 on 12/15/2012 2:27:41 PM
Chem. Recovery Factor: 0.7274 +/- 0.0516

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	5.280	242.81	12.61	1.19	0.00E+000	19.9
U-234		4.716	7.15	78.23	0.85	0.00E+000	3.2
U-235		4.399	3.66	107.88	0.34	0.00E+000	3.2
U-238		4.162	3.32	119.77	0.68	0.00E+000	3.2

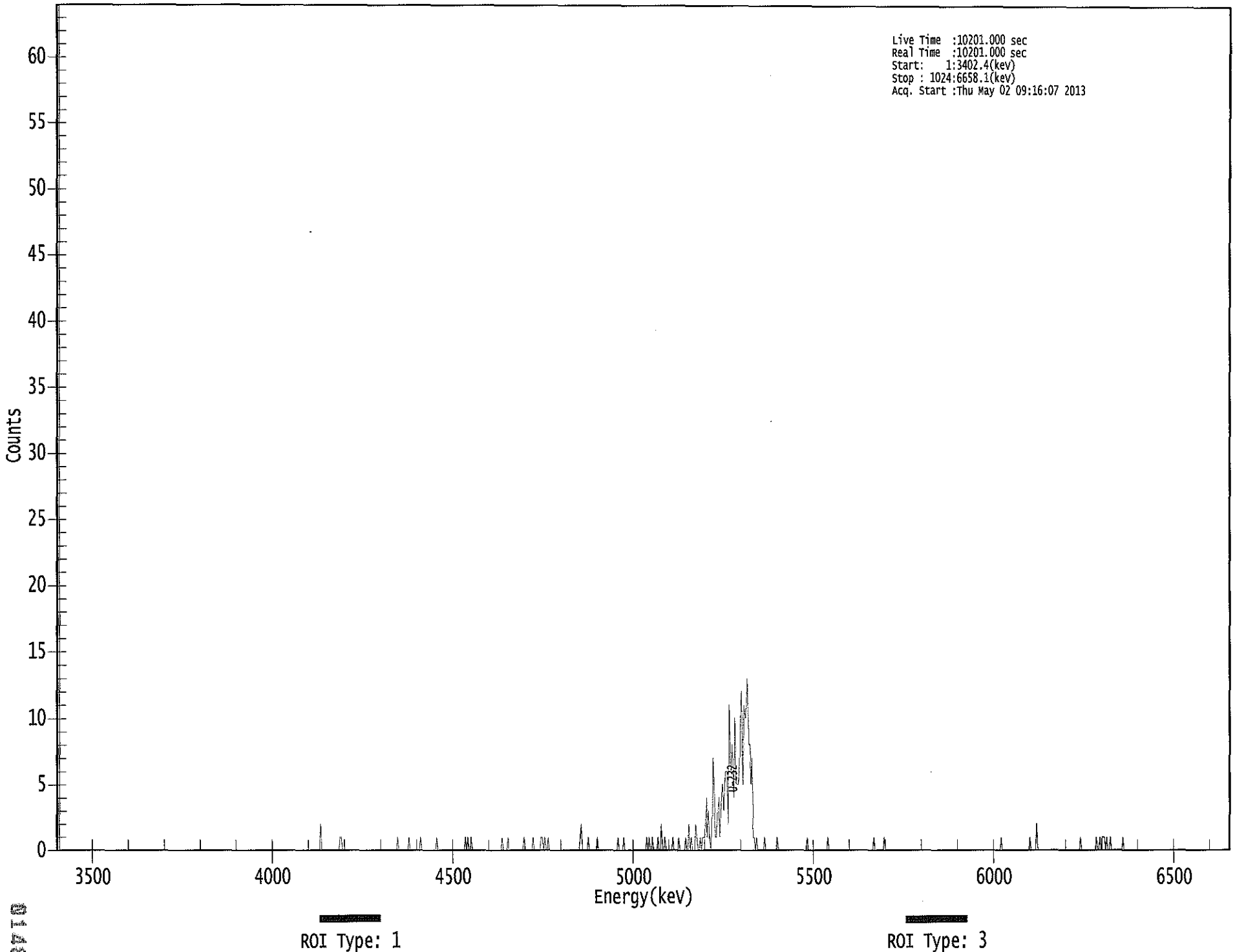
T = Tracer Peak used for Effective Efficiency

NUCLIDE ANALYSIS RESULTS

Nuclide	Id Conf.	Energy (keV)	Activity (pCi/liter)	MDA (pCi/liter)
U-232	0.996	5302.50*	5.13E+000 +/- 6.88E-001	1.39E-001 +/- 1.87E-002
U-234	0.985	4761.50*	1.51E-001 +/- 1.20E-001	1.26E-001 +/- 1.69E-002
U-235	0.999	4385.50*	9.54E-002 +/- 1.04E-001	1.25E-001 +/- 1.67E-002
U-238	0.997	4184.40*	6.98E-002 +/- 8.42E-002	1.19E-001 +/- 1.59E-002

AG 5/3/13

0000056916.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: 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	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	2	0
233:	0	0	0	0	0	0	0	0
241:	0	0	0	0	0	0	0	1
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	0
289:	0	0	0	0	0	0	0	0
297:	0	1	0	0	0	0	0	0
305:	0	0	0	1	0	0	0	0
313:	0	0	0	0	0	1	0	0
321:	0	0	0	0	0	0	0	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	0
353:	0	0	0	0	1	0	1	0
361:	0	1	0	0	0	0	0	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	1	0	0	0
393:	0	1	0	0	0	0	0	0
401:	0	0	0	0	0	0	0	1
409:	0	0	0	0	0	0	0	1
417:	0	0	0	0	0	0	1	1
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:	1	2	0	0	0	0	0	1
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	1	0	0	0	0	1	0
497:	0	0	0	0	0	0	0	0
505:	0	0	0	0	0	0	0	0
513:	0	0	1	0	1	0	0	1
521:	0	0	0	0	1	0	0	2
529:	0	0	1	0	0	0	0	0
537:	0	1	0	0	0	0	1	0
545:	0	0	0	0	1	0	0	2
553:	0	1	0	0	0	2	1	0
561:	0	1	0	1	1	1	4	1
569:	3	1	0	2	7	4	1	1
577:	3	4	1	4	5	3	5	6
585:	6	2	11	7	6	8	4	10
593:	5	5	5	6	10	12	5	11
601:	10	11	13	8	8	5	7	1
609:	1	0	1	0	0	0	0	0
617:	0	1	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	0	0	0	0	0	1	0
657:	0	0	0	0	0	0	0	0
665:	0	0	0	0	0	0	0	0
673:	1	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	0
721:	0	1	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: 09

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:	1	0	0	0	0	0	2	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	1	0	0	0
897:	0	0	0	0	0	0	0	0
905:	0	0	1	0	0	1	0	1
913:	1	1	0	1	0	0	1	0
921:	0	0	0	0	0	0	0	0
929:	0	1	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 5/2/13

Apex-Alpha™

Sample Description: D-85 TOT
Spectrum File: \\OR-ALPHA1\Canberra\ApexAlpha\Root\Data\00000569
Batch Identification: 1304107A-UU
Sample Identification: 10
Sample Geometry: Shelf 2
Procedure Description: U iso

Detector Name: Alpha_029
Chamber Serial Number:
Detector Serial Number: 29
Env. Background: System Bkgd 55745
Reagent Blank: <not performed>

Sample Size: 1.000E+000 +/- 0.000E+000 liter
Sample Date/Time: 4/11/2013 7:21:37 AM
Acquisition Date/Time: 5/2/2013 9:16:08 AM
Acquisition Live Time: 170.0 minutes
Acquisition Real Time: 170.0 minutes

Tracer Certificate: U232_UU-10A
Tracer Quantity: 0.598 mL
Effective Efficiency: 0.1954 +/- 0.0110
Counting Efficiency: 0.1945 +/- 0.0036 on 12/15/2012 2:30:02 PM
Chem. Recovery Factor: 1.0044 +/- 0.0597

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	5.274	376.81	10.12	1.19	0.00E+000	26.5
U-234		4.731	126.98	17.48	1.02	0.00E+000	6.2
U-235		4.386	14.49	52.54	0.51	0.00E+000	3.1
U-238		4.143	193.83	14.09	0.17	0.00E+000	5.7

T = Tracer Peak used for Effective Efficiency

NUCLIDE ANALYSIS RESULTS

Nuclide	Id Conf.	Energy (keV)	Activity (pCi/liter)	MDA (pCi/liter)
U-232	0.994	5302.50*	5.12E+000 +/- 5.67E-001	8.96E-002 +/- 9.92E-003
U-234	0.994	4761.50*	1.73E+000 +/- 3.57E-001	8.56E-002 +/- 9.48E-003
U-235	1.000	4385.50*	2.43E-001 +/- 1.30E-001	8.80E-002 +/- 9.74E-003
U-238	0.988	4184.40*	2.62E+000 +/- 4.70E-001	5.65E-002 +/- 6.25E-003

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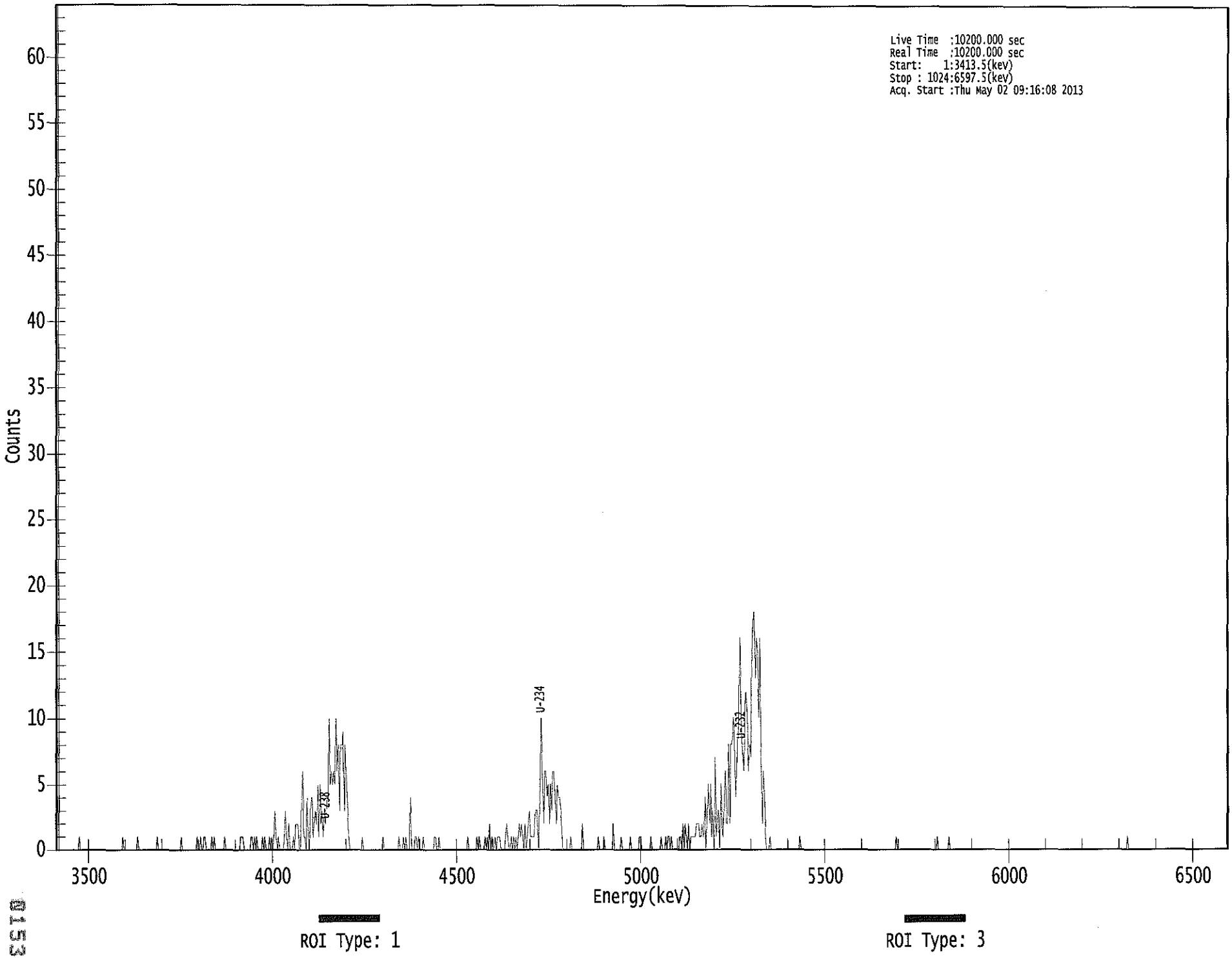
0000056917.CNF



****
***** 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	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	0	0	0
49:	0	0	0	0	0	0	0	0
57:	0	0	1	0	0	0	0	0
65:	0	0	0	0	0	0	0	1
73:	0	0	0	0	0	0	0	0
81:	0	0	0	0	0	0	0	0
89:	1	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	1	0	0	1	0
129:	0	1	1	0	0	0	0	0
137:	1	0	1	0	0	0	0	0
145:	0	0	0	1	0	0	0	0
153:	0	0	0	0	0	0	0	0
161:	0	1	1	1	0	0	0	0
169:	0	0	1	1	0	1	0	1
177:	0	0	0	0	1	0	1	0
185:	0	0	1	0	1	0	1	3
193:	1	0	1	0	0	0	0	1
201:	3	1	0	2	0	0	0	1
209:	0	2	2	2	0	0	4	6
217:	1	1	0	4	1	0	4	4
225:	1	2	3	2	5	1	5	2
233:	3	1	3	2	4	4	10	5
241:	6	5	6	5	10	6	8	3
249:	8	8	9	3	8	5	3	1
257:	0	0	0	0	0	0	0	0
265:	0	0	0	1	0	0	0	0
273:	0	0	0	0	0	0	0	0
281:	0	0	0	0	0	1	0	0
289:	0	0	0	0	0	0	0	0
297:	0	0	0	1	0	0	0	1
305:	0	1	0	0	0	4	0	0
313:	0	1	1	0	1	0	0	0
321:	1	0	0	0	0	0	0	0
329:	0	0	1	1	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	1
361:	0	0	0	0	0	0	0	1

369:	0	1	0	0	0	0	1	0

Sample Title: 10

Channel								
377:	1	0	2	0	1	0	0	1
385:	0	1	1	1	0	0	0	0
393:	1	2	1	0	0	1	0	1
401:	0	1	0	1	2	1	2	1
409:	0	2	0	1	2	3	1	1
417:	1	1	3	3	2	0	5	10
425:	5	2	6	6	4	5	2	5
433:	3	6	6	4	2	5	4	4
441:	3	2	0	0	0	0	0	0
449:	0	1	0	0	0	0	0	0
457:	0	0	0	2	0	0	0	0
465:	0	0	0	0	0	0	0	0
473:	0	1	0	0	0	0	1	0
481:	0	0	0	0	0	0	2	0
489:	0	0	0	0	0	1	0	0
497:	0	0	0	0	0	1	0	0
505:	0	0	0	0	0	1	1	0
513:	0	0	0	0	0	0	0	1
521:	0	0	0	0	0	0	0	0
529:	1	0	0	0	1	0	1	1
537:	0	1	0	0	0	0	0	0
545:	1	1	0	2	0	2	1	0
553:	2	0	1	1	1	1	1	2
561:	2	2	1	1	2	1	4	0
569:	2	5	2	5	1	3	0	7
577:	1	2	3	0	5	2	1	4
585:	6	2	2	8	2	8	8	10
593:	9	4	6	8	12	16	8	8
601:	6	11	12	10	6	8	7	15
609:	17	18	13	16	15	10	16	7
617:	2	6	4	1	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	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	1	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	1	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	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	1
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 5/2/13

Apex-Alpha™

Sample Description: D-85 DIS
Spectrum File: \\OR-ALPHA1\Canberra\ApexAlpha\Root\Data\00000569
Batch Identification: 1304107A-UU
Sample Identification: 11
Sample Geometry: Shelf 2
Procedure Description: U iso

Detector Name: Alpha_011
Chamber Serial Number:
Detector Serial Number: 11
Env. Background: System Bkgd 55737
Reagent Blank: <not performed>

Sample Size: 1.000E+000 +/- 0.000E+000 liter
Sample Date/Time: 4/11/2013 7:21:37 AM
Acquisition Date/Time: 5/2/2013 12:37:01 PM
Acquisition Live Time: 170.0 minutes
Acquisition Real Time: 170.0 minutes

Tracer Certificate: U232_UU-10A
Tracer Quantity: 0.597 mL
Effective Efficiency: 0.1998 +/- 0.0112
Counting Efficiency: 0.1973 +/- 0.0042 on 12/15/2012 11:28:06 AM
Chem. Recovery Factor: 1.0125 +/- 0.0605

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	384.83	9.99	0.17	0.00E+000	23.6
U-234		4.745	27.66	37.53	0.34	0.00E+000	4.0
U-235		4.382	0.83	239.53	0.17	0.00E+000	2.7
U-238		4.151	10.83	60.10	0.17	0.00E+000	4.0

T = Tracer Peak used for Effective Efficiency

NUCLIDE ANALYSIS RESULTS

Nuclide	Id Conf.	Energy (keV)	Activity (pCi/liter)	MDA (pCi/liter)
U-232	0.997	5302.50*	5.12E+000 +/- 5.61E-001	5.55E-002 +/- 6.08E-003
U-234	0.998	4761.50*	3.68E-001 +/- 1.44E-001	6.35E-002 +/- 6.97E-003
U-235	1.000	4385.50*	1.36E-002 +/- 3.26E-002	6.84E-002 +/- 7.50E-003
U-238	0.992	4184.40*	1.43E-001 +/- 8.76E-002	5.52E-002 +/- 6.05E-003

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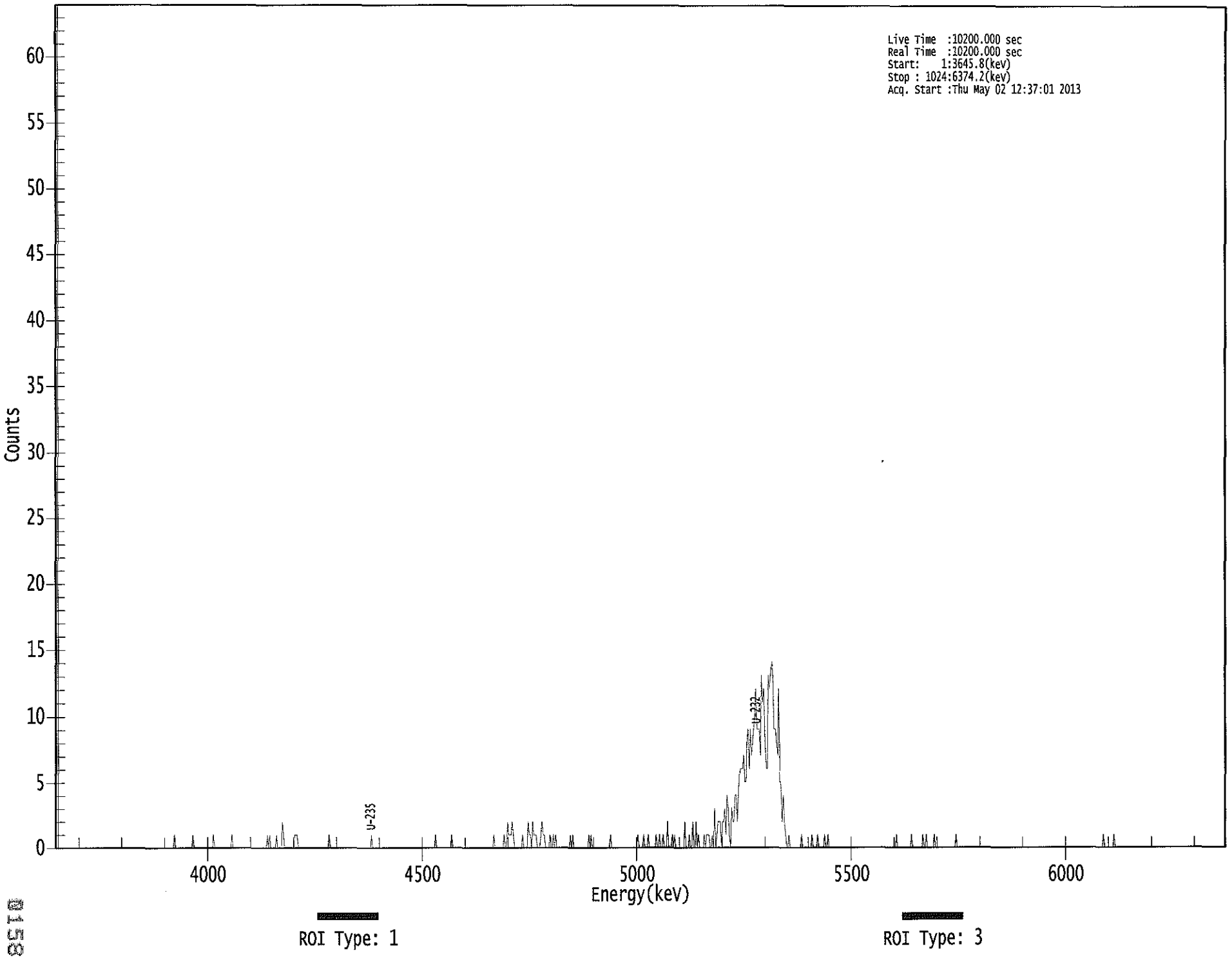
US EPA ARCHIVE DOCUMENT

0000056931.CNF



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

Sample Title: 11

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:	1	0	0	0	0	0	0	0
113:	0	0	0	0	0	0	0	0
121:	1	0	0	0	0	0	0	0
129:	0	0	0	0	0	0	0	0
137:	0	0	1	0	0	0	0	0
145:	0	0	0	0	0	0	0	0
153:	0	0	1	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	1	0	1	0	0	0	0
193:	0	1	0	0	0	0	2	1
201:	0	0	0	0	0	0	0	0
209:	0	1	1	1	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	1	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	1	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: 11

Channel								
377:	0	0	0	0	0	0	0	1
385:	0	0	0	0	0	0	0	0
393:	1	0	0	2	1	1	1	2
401:	1	0	0	0	0	0	0	0
409:	1	0	0	0	0	2	1	1
417:	0	2	1	1	1	0	0	0
425:	1	2	1	1	0	0	0	0
433:	1	0	0	1	0	1	0	0
441:	0	0	0	0	0	0	0	0
449:	0	0	1	0	1	0	0	0
457:	0	0	0	0	0	0	0	0
465:	0	0	1	0	1	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	1	0	0
513:	0	0	1	0	0	0	1	0
521:	0	0	0	0	0	1	0	0
529:	1	0	0	1	0	0	0	2
537:	0	0	0	1	0	1	0	0
545:	0	0	0	0	0	0	2	0
553:	0	0	1	0	0	2	0	0
561:	2	0	1	0	0	0	0	1
569:	0	1	1	1	0	0	1	0
577:	3	0	1	2	2	2	0	2
585:	2	3	1	4	3	1	0	3
593:	2	2	4	4	2	4	6	6
601:	6	7	5	5	8	9	6	9
609:	7	8	9	10	12	9	9	9
617:	7	13	11	12	8	6	6	13
625:	12	13	14	13	9	9	8	7
633:	12	5	5	2	4	2	1	0
641:	0	1	0	0	0	0	0	0
649:	0	0	0	0	1	0	0	0
657:	0	0	0	0	0	1	0	0
665:	0	0	1	0	0	0	0	0
673:	1	0	0	1	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	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	1	0
761:	0	1	0	0	0	0	0	0
769:	1	0	0	0	0	0	0	0
777:	0	0	0	0	0	0	0	0
785:	0	0	0	1	0	0	0	0
793:	0	0	0	0	0	0	0	0

801:	0	0	0	0	0	0	0	0

Sample Title: 11

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	1	0	0	0
921:	0	0	0	0	0	1	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

KCB 5/2/13

Apex-Alpha™

Sample Description: S-84 TOT
Spectrum File: \\OR-ALPHA1\Canberra\ApexAlpha\Root\Data\00000569
Batch Identification: 1304107A-UU
Sample Identification: 12
Sample Geometry: Shelf 2
Procedure Description: U iso

Detector Name: Alpha_013
Chamber Serial Number:
Detector Serial Number: 13
Env. Background: System Bkgd 55738
Reagent Blank: <not performed>

Sample Size: 1.000E+000 +/- 0.000E+000 liter
Sample Date/Time: 4/11/2013 7:21:37 AM
Acquisition Date/Time: 5/2/2013 12:37:02 PM
Acquisition Live Time: 170.0 minutes
Acquisition Real Time: 170.0 minutes

Tracer Certificate: U232_UU-10A
Tracer Quantity: 0.598 mL
Effective Efficiency: 0.1045 +/- 0.0078
Counting Efficiency: 0.1869 +/- 0.0035 on 12/15/2012 11:26:45 AM
Chem. Recovery Factor: 0.5591 +/- 0.0429

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	201.47	13.87	1.53	0.00E+000	23.9
U-234		4.745	9.49	65.59	0.51	0.00E+000	3.5
U-235		4.398	-0.17	1169.4	0.17	0.00E+000	0.0
U-238		4.119	7.49	74.41	0.51	0.00E+000	2.8

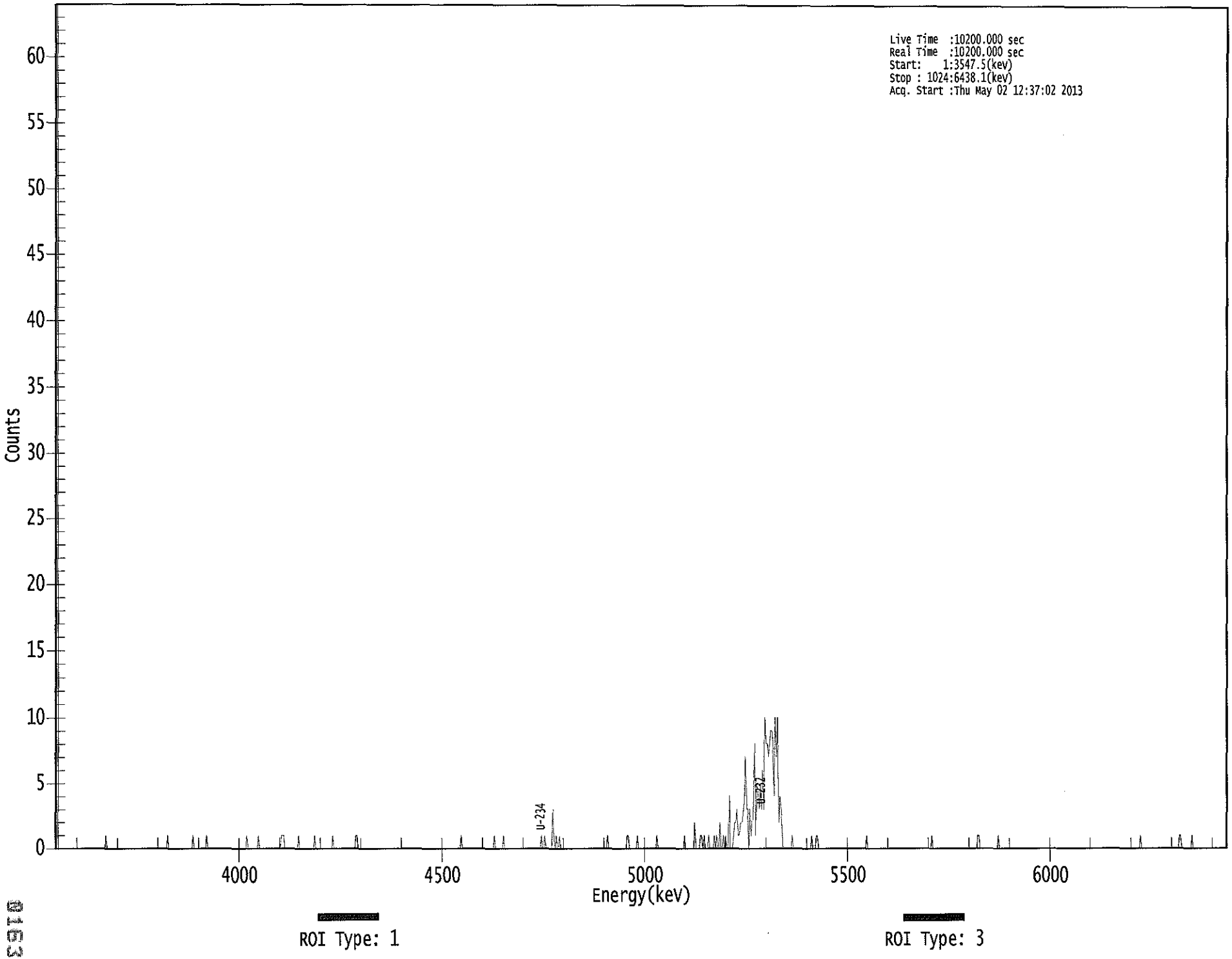
T = Tracer Peak used for Effective Efficiency

NUCLIDE ANALYSIS RESULTS

Nuclide	Id Conf.	Energy (keV)	Activity (pCi/liter)	MDA (pCi/liter)
U-232	0.998	5302.50*	5.12E+000 +/- 7.47E-001	1.81E-001 +/- 2.64E-002
U-234	0.998	4761.50*	2.41E-001 +/- 1.62E-001	1.33E-001 +/- 1.94E-002
U-235	0.999	4385.50*	-5.33E-003 +/- 6.23E-002	1.31E-001 +/- 1.91E-002
U-238	0.970	4184.40*	1.90E-001 +/- 1.44E-001	1.33E-001 +/- 1.94E-002

AG
5/3/13

0000056932.CNF



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

Sample Title: 12

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	1	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	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:	1	0	0	0	0	0	0	0
129:	0	0	0	0	1	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	1
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	1	1	1
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	0
225:	0	0	1	0	0	0	0	0
233:	0	0	0	0	0	0	0	0
241:	0	0	1	0	0	0	0	0
249:	0	0	0	0	0	0	0	0
257:	0	0	0	0	0	0	1	1
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	1	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: 12

Channel								
377:	0	0	0	0	0	0	0	1
385:	0	0	0	0	0	0	0	1
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:	1	0	0	1	0	0	0	0
433:	0	0	3	1	0	1	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	0	0	0	0
473:	0	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	1	1	0	0	0
505:	0	0	0	0	1	0	0	0
513:	0	0	0	0	0	0	0	0
521:	0	0	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	1	0	0
553:	0	0	0	0	0	0	2	0
561:	0	0	0	1	1	0	1	0
569:	0	0	1	0	0	0	0	1
577:	0	1	0	0	2	0	0	1
585:	0	1	0	0	4	0	0	0
593:	1	2	2	3	1	1	2	2
601:	3	4	7	3	3	0	3	1
609:	2	4	8	1	5	4	3	5
617:	3	6	3	10	8	8	7	8
625:	9	9	8	4	10	7	10	2
633:	4	3	2	0	0	0	0	0
641:	0	0	0	1	0	0	0	0
649:	0	0	0	0	0	0	0	0
657:	0	0	0	0	1	0	0	0
665:	1	1	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	1	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	1	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	1	0

Sample Title: 12

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	1	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	1	1	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 5/2/13

Apex-Alpha™

Sample Description: S-84 DIS
Spectrum File: \\OR-ALPHA1\Canberra\ApexAlpha\Root\Data\00000569
Batch Identification: 1304107A-UU
Sample Identification: 13
Sample Geometry: Shelf 2
Procedure Description: U iso

Detector Name: Alpha_014
Chamber Serial Number:
Detector Serial Number: 14
Env. Background: System Bkgd 55739
Reagent Blank: <not performed>

Sample Size: 1.000E+000 +/- 0.000E+000 liter
Sample Date/Time: 4/11/2013 7:21:37 AM
Acquisition Date/Time: 5/2/2013 12:37:03 PM
Acquisition Live Time: 170.0 minutes
Acquisition Real Time: 170.0 minutes

Tracer Certificate: U232_UU-10A
Tracer Quantity: 0.596 mL
Effective Efficiency: 0.1171 +/- 0.0083
Counting Efficiency: 0.1846 +/- 0.0034 on 12/15/2012 11:26:44 AM
Chem. Recovery Factor: 0.6343 +/- 0.0465

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	225.28	13.15	2.72	0.00E+000	8.8
U-234		4.720	2.32	149.13	0.68	0.00E+000	2.9
U-235		4.486	0.66	305.45	0.34	0.00E+000	2.9
U-238		4.183	2.81	142.99	1.19	0.00E+000	5.9

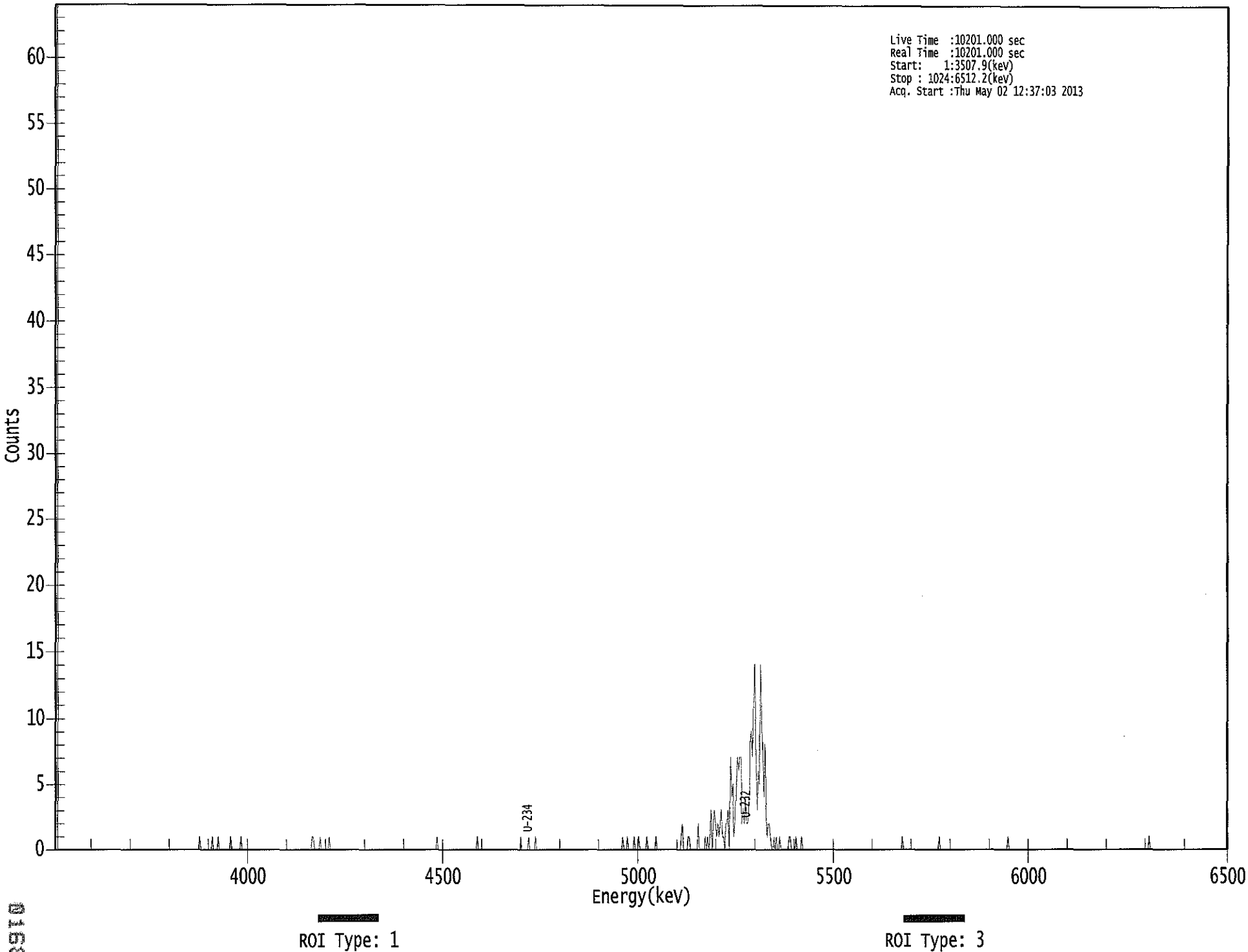
T = Tracer Peak used for Effective Efficiency

NUCLIDE ANALYSIS RESULTS

Nuclide	Id Conf.	Energy (keV)	Activity (pCi/liter)	MDA (pCi/liter)
U-232	0.996	5302.50*	5.11E+000 +/- 7.11E-001	1.95E-001 +/- 2.71E-002
U-234	0.988	4761.50*	5.26E-002 +/- 7.88E-002	1.28E-001 +/- 1.78E-002
U-235	0.931	4385.50*	1.85E-002 +/- 5.65E-002	1.34E-001 +/- 1.86E-002
U-238	1.000	4184.40*	6.35E-002 +/- 9.12E-002	1.49E-001 +/- 2.07E-002

AG 5/3/13

0000056933.CNF



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

Sample Title: 13

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	0	0
121:	0	0	0	0	0	0	1	0
129:	0	0	0	0	0	0	0	0
137:	0	1	0	0	0	0	1	0
145:	0	0	0	0	0	0	0	0
153:	0	1	0	0	0	0	0	0
161:	0	0	1	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:	1	1	0	0	0	0	0	1
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	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:	1	0	0	0	0	0	0	0

Sample Title: 13

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	1	0
409:	0	0	0	0	0	1	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:	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	1
497:	0	0	0	1	0	0	0	0
505:	0	1	0	0	0	1	0	0
513:	0	0	0	0	1	0	0	0
521:	0	0	0	0	1	0	0	0
529:	0	0	0	0	0	0	0	0
537:	0	0	0	0	0	0	0	0
545:	0	0	1	2	0	0	0	0
553:	1	1	0	0	0	0	0	0
561:	0	2	0	0	0	0	0	1
569:	0	1	0	1	3	0	2	3
577:	2	1	2	1	2	3	1	1
585:	0	2	2	3	0	7	4	5
593:	1	2	5	7	6	7	7	2
601:	3	2	4	2	2	3	8	9
609:	7	11	14	7	3	6	5	14
617:	10	8	4	8	3	1	2	2
625:	1	0	0	1	0	1	0	0
633:	1	0	0	0	0	0	0	0
641:	1	1	0	0	0	0	1	0
649:	0	0	0	1	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	1	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	0	0

801:	0	0	0	0	0	0	0	0

Sample Title: 13

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	1
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	1	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 5/2/13

Apex-Alpha™

Sample Description:	S-5 TOT
Spectrum File:	\\OR-ALPHA1\Canberra\ApexAlpha\Root\Data\00000569
Batch Identification:	1304107A-UU
Sample Identification:	14
Sample Geometry:	Shelf 2
Procedure Description:	U iso
Detector Name:	Alpha_018
Chamber Serial Number:	
Detector Serial Number:	18
Env. Background:	System Bkgd 55740
Reagent Blank:	<not performed>
Sample Size:	1.000E+000 +/- 0.000E+000 liter
Sample Date/Time:	4/11/2013 7:21:37 AM
Acquisition Date/Time:	5/2/2013 12:37:33 PM
Acquisition Live Time:	170.0 minutes
Acquisition Real Time:	170.0 minutes
Tracer Certificate:	U232_UU-10A
Tracer Quantity:	0.600 mL
Effective Efficiency:	0.0282 +/- 0.0039
Counting Efficiency:	0.1776 +/- 0.0033 on 12/15/2012 1:57:26 PM
Chem. Recovery Factor:	0.1588 +/- 0.0223
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	5.254	54.64	26.90	1.36	0.00E+000	7.8
U-234		4.718	-0.68	304.44	0.68	0.00E+000	0.0
U-235		4.408	1.15	249.59	0.85	0.00E+000	3.1
U-238		4.139	-1.21	189.99	2.21	0.00E+000	3.1

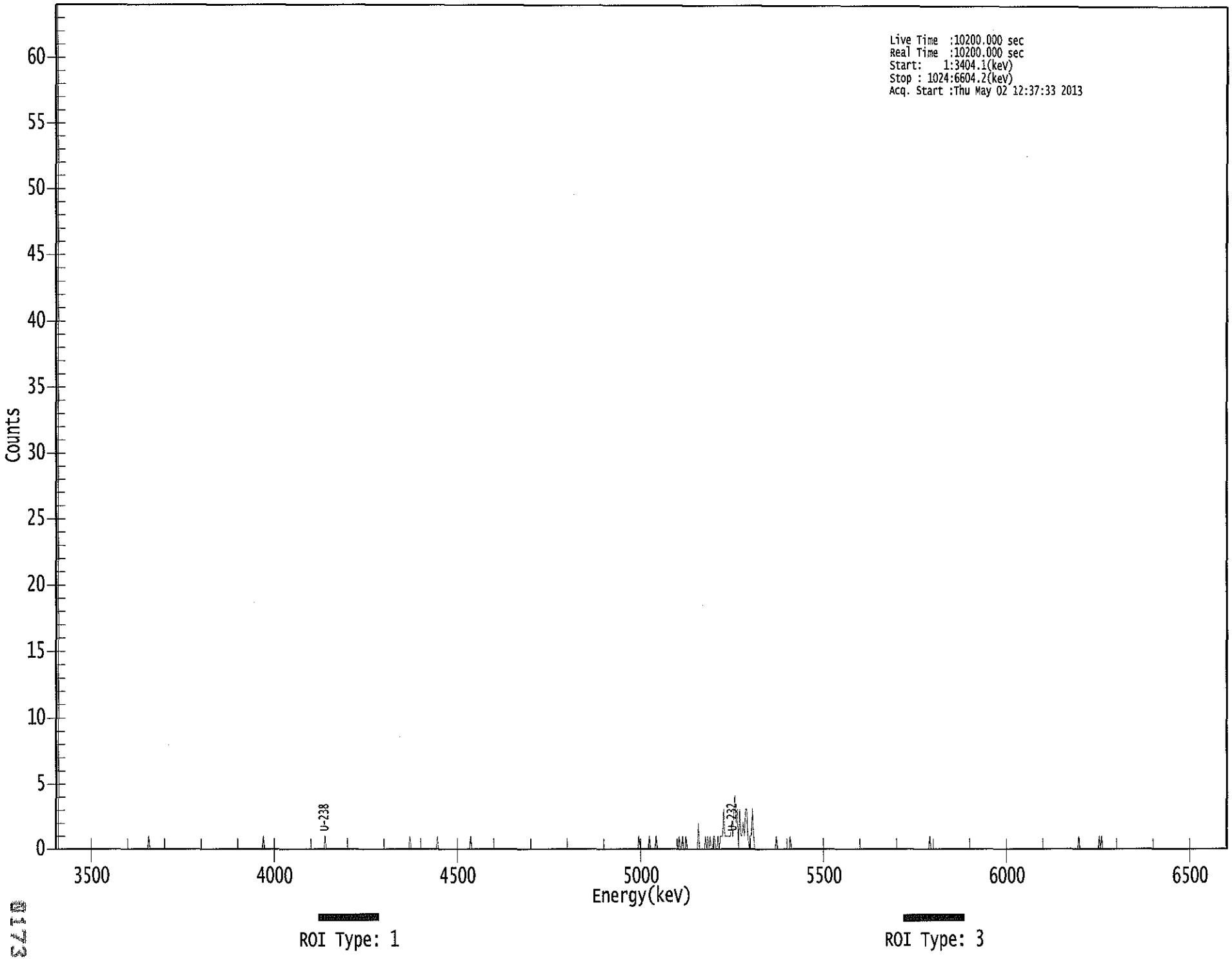
T = Tracer Peak used for Effective Efficiency

NUCLIDE ANALYSIS RESULTS

Nuclide	Id Conf.	Energy (keV)	Activity (pCi/liter)	MDA (pCi/liter)
U-232	0.983	5302.50*	5.15E+000 +/- 1.40E+000	6.46E-001 +/- 1.76E-001
U-234	0.987	4761.50*	-6.40E-002 +/- 1.96E-001	5.31E-001 +/- 1.45E-001
U-235	0.996	4385.50*	1.34E-001 +/- 3.35E-001	6.95E-001 +/- 1.90E-001
U-238	0.986	4184.40*	-1.13E-001 +/- 2.18E-001	7.49E-001 +/- 2.04E-001

AG 5/3/13

0000056934.CNF



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

Sample Title: 14

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	1	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	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	1	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	1	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	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	1	0	0	0	0	0

369:	0	0	0	0	0	0	0	0

Sample Title: 14

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	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	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	1	0
521:	0	0	0	0	1	0	0	0
529:	0	0	0	0	0	0	0	0
537:	0	0	0	0	0	0	0	0
545:	1	0	0	1	0	0	1	0
553:	0	0	0	0	0	0	0	0
561:	0	2	0	0	0	0	0	1
569:	0	1	0	1	0	0	1	1
577:	0	0	1	0	1	1	1	3
585:	1	1	1	1	1	1	2	1
593:	3	4	2	3	0	3	1	1
601:	2	1	3	3	1	0	1	1
609:	3	1	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	0	0	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	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	1	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: 14

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	1	0	0
897:	0	0	0	0	0	0	0	0
905:	0	0	0	0	0	0	0	1
913:	0	1	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

KCB 5-7-13

Apex-Alpha™

Sample Description: S-5 DIS
Spectrum File: \\OR-ALPHA1\Canberra\ApexAlpha\Root\Data\00000569
Batch Identification: 1304107A-UU
Sample Identification: 15
Sample Geometry: Shelf 2
Procedure Description: U iso

Detector Name: Alpha_022
Chamber Serial Number:
Detector Serial Number: 22
Env. Background: System Bkgd 55741
Reagent Blank: <not performed>

Sample Size: 1.000E+000 +/- 0.000E+000 liter
Sample Date/Time: 4/11/2013 7:21:37 AM
Acquisition Date/Time: 5/2/2013 12:37:34 PM
Acquisition Live Time: 170.0 minutes
Acquisition Real Time: 170.0 minutes

Tracer Certificate: U232_UU-10A
Tracer Quantity: 0.600 mL
Effective Efficiency: 0.0390 +/- 0.0046
Counting Efficiency: 0.1531 +/- 0.0029 on 12/15/2012 1:57:26 PM
Chem. Recovery Factor: 0.2545 +/- 0.0306

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	5.277	75.47	22.83	1.53	0.00E+000	6.2
U-234		4.795	0.15	1398.6	0.85	0.00E+000	3.1
U-235		4.373	2.15	161.66	0.85	0.00E+000	3.1
U-238		4.154	0.49	417.03	0.51	0.00E+000	3.1

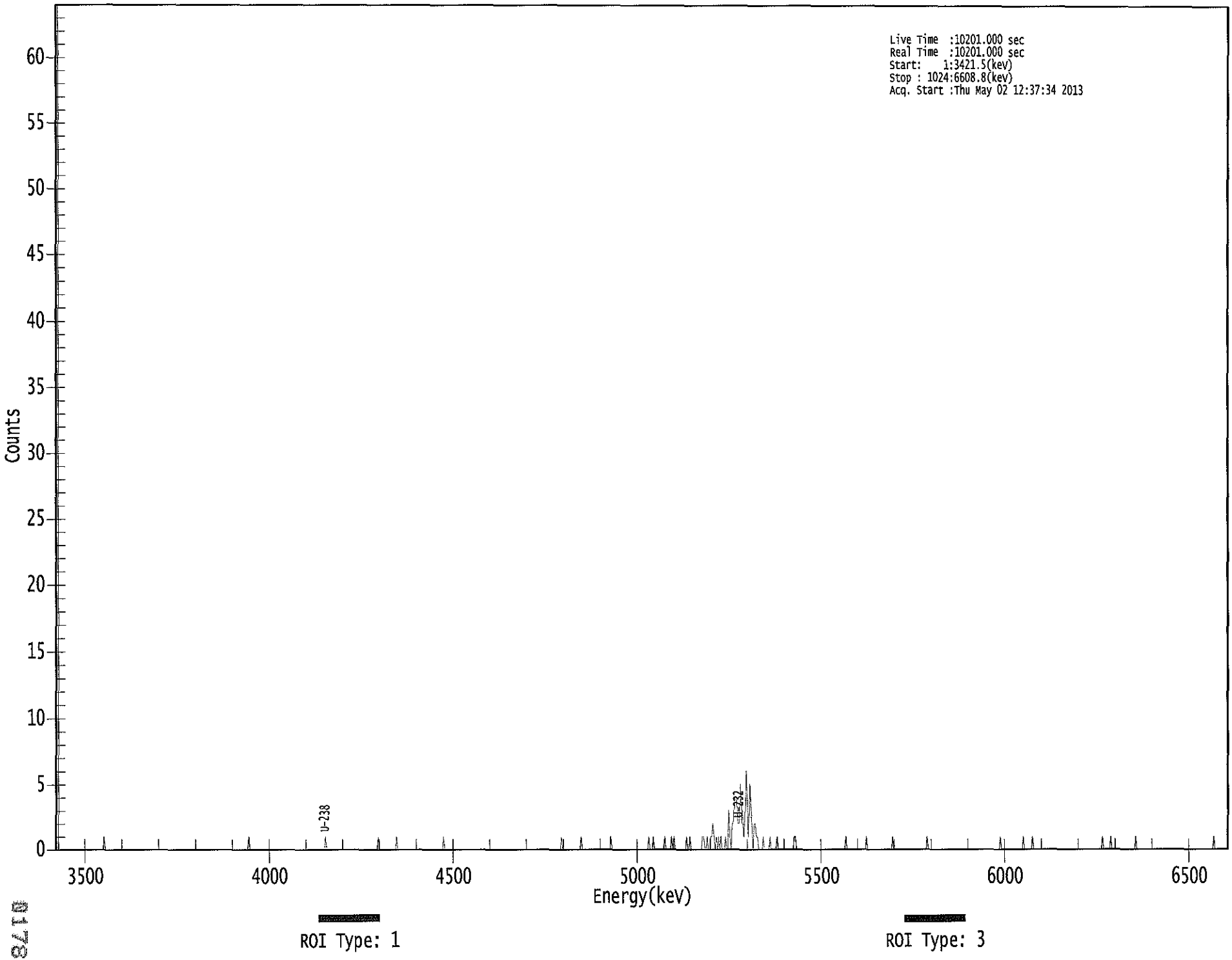
T = Tracer Peak used for Effective Efficiency

NUCLIDE ANALYSIS RESULTS

Nuclide	Id Conf.	Energy (keV)	Activity (pCi/liter)	MDA (pCi/liter)
U-232	0.995	5302.50*	5.14E+000 +/- 1.20E+000	4.84E-001 +/- 1.13E-001
U-234	0.992	4761.50*	1.02E-002 +/- 1.43E-001	4.08E-001 +/- 9.49E-002
U-235	0.999	4385.50*	1.81E-001 +/- 2.95E-001	5.03E-001 +/- 1.17E-001
U-238	0.993	4184.40*	3.32E-002 +/- 1.39E-001	3.56E-001 +/- 8.28E-002

AG 5/3/13

0000056935.CNF



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

Sample Title: 15

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	1	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:	1	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	1	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	1	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	0
329:	0	0	0	0	0	0	0	0
337:	0	0	1	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: 15

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	0	0	0	0
425:	0	0	0	0	0	0	0	0
433:	0	0	0	0	0	0	0	0
441:	0	1	0	0	0	0	0	0
449:	0	0	0	0	0	0	0	0
457:	0	0	1	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	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	1	0	0
521:	0	1	0	0	0	0	0	0
529:	0	0	0	1	0	0	0	0
537:	0	1	0	1	0	0	0	0
545:	0	0	0	0	0	0	1	0
553:	0	1	0	0	0	0	0	0
561:	0	0	0	0	1	1	0	0
569:	1	0	0	1	1	2	1	0
577:	1	0	1	0	1	0	0	0
585:	1	0	0	3	1	0	2	2
593:	4	4	3	2	2	5	2	3
601:	1	3	6	3	1	5	3	2
609:	0	2	2	1	1	0	0	0
617:	0	1	0	0	0	0	0	1
625:	0	0	0	0	0	1	0	0
633:	0	0	0	0	0	0	0	0
641:	0	0	0	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	0	0	0	0
673:	0	0	0	0	0	0	0	0
681:	0	0	0	0	0	0	0	0
689:	0	1	0	0	0	0	0	0
697:	0	0	0	0	0	0	0	0
705:	0	0	0	1	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	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	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: 15

Channel								
809:	0	0	0	0	0	0	0	0
817:	0	0	0	0	0	0	0	0
825:	1	0	0	0	0	0	0	0
833:	0	0	0	0	0	0	0	0
841:	0	0	0	0	1	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	0	0	0
905:	0	0	0	0	0	0	0	0
913:	0	1	0	0	0	0	0	0
921:	1	0	0	0	0	0	0	0
929:	0	0	0	0	0	0	0	0
937:	0	0	0	0	0	0	1	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	1	0	0	0	0	0
1017:	0	0	0	0	0	0	0	0

ICB 5/2/13

Apex-Alpha™

Sample Description: PZ-109-SS TOT
Spectrum File: \\OR-ALPHA1\Canberra\ApexAlpha\Root\Data\00000569
Batch Identification: 1304107A-UU
Sample Identification: 16
Sample Geometry: Shelf 2
Procedure Description: U iso

Detector Name: Alpha_024
Chamber Serial Number:
Detector Serial Number: 24
Env. Background: System Bkgd 55742
Reagent Blank: <not performed>

Sample Size: 1.000E+000 +/- 0.000E+000 liter
Sample Date/Time: 4/11/2013 7:21:37 AM
Acquisition Date/Time: 5/2/2013 12:37:35 PM
Acquisition Live Time: 170.0 minutes
Acquisition Real Time: 170.0 minutes

Tracer Certificate: U232_UU-10A
Tracer Quantity: 0.598 mL
Effective Efficiency: 0.2090 +/- 0.0115
Counting Efficiency: 0.1710 +/- 0.0032 on 12/15/2012 2:02:15 PM
Chem. Recovery Factor: 1.2220 +/- 0.0709

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	5.254	402.98	9.78	1.02	0.00E+000	33.1
U-234		4.711	92.66	20.41	0.34	0.00E+000	6.0
U-235		4.395	7.66	72.63	0.34	0.00E+000	3.1
U-238		4.136	41.32	30.78	0.68	0.00E+000	3.6

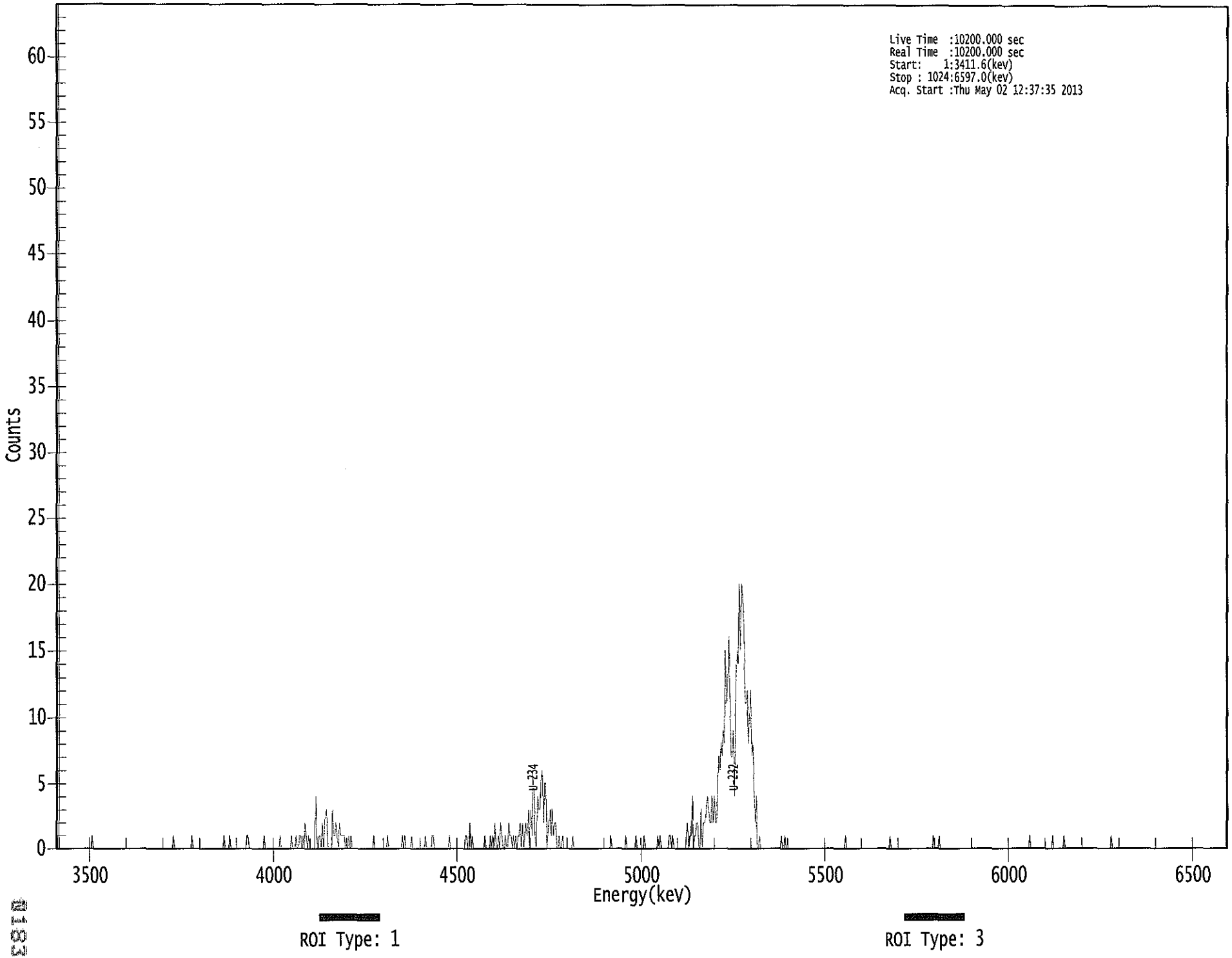
T = Tracer Peak used for Effective Efficiency

NUCLIDE ANALYSIS RESULTS

Nuclide	Id Conf.	Energy (keV)	Activity (pCi/liter)	MDA (pCi/liter)
U-232	0.983	5302.50*	5.12E+000 +/- 5.52E-001	8.01E-002 +/- 8.62E-003
U-234	0.982	4761.50*	1.18E+000 +/- 2.72E-001	6.07E-002 +/- 6.54E-003
U-235	0.999	4385.50*	1.20E-001 +/- 8.81E-002	7.49E-002 +/- 8.07E-003
U-238	0.983	4184.40*	5.23E-001 +/- 1.70E-001	7.13E-002 +/- 7.68E-003

AG 5/3/13

0000056936.CNF



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

Sample Title: 16

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	1
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	1	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	1	0	0	0	0	1
153:	0	0	0	0	0	0	0	0
161:	0	0	0	0	0	0	1	1
169:	0	0	0	0	0	0	0	0
177:	0	0	0	0	0	1	0	0
185:	0	0	0	0	0	0	0	0
193:	0	0	0	1	0	0	0	0
201:	0	0	0	0	0	1	0	0
209:	0	1	0	0	1	1	0	1
217:	0	2	1	0	1	0	0	0
225:	0	0	4	1	0	1	1	0
233:	2	0	2	3	2	0	0	0
241:	0	3	1	1	2	1	0	2
249:	1	1	1	1	0	0	0	1
257:	0	1	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	0	0
289:	0	1	0	0	0	0	0	0
297:	0	0	0	0	0	0	1	0
305:	1	0	0	0	0	0	1	0
313:	0	0	0	0	0	0	0	0
321:	0	0	1	0	0	0	0	0
329:	1	1	0	0	0	0	0	0
337:	0	0	0	0	0	0	0	1
345:	0	0	0	0	0	0	0	0
353:	0	0	0	0	0	1	1	0
361:	0	2	0	1	0	0	0	0

369:	0	0	0	0	0	0	1	0

Sample Title: 16

Channel								
377:	0	0	0	1	0	1	0	2
385:	0	0	1	0	2	1	0	0
393:	1	0	0	2	1	1	0	1
401:	0	1	0	1	1	2	0	2
409:	0	1	2	1	3	0	3	1
417:	6	4	1	0	4	3	3	5
425:	6	2	5	5	0	1	2	3
433:	1	3	1	2	2	0	0	1
441:	0	0	1	0	0	0	0	0
449:	0	0	0	1	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	1	0	0	0
489:	0	0	0	0	0	0	0	0
497:	0	1	0	0	0	0	0	0
505:	0	0	1	0	0	0	0	0
513:	0	1	0	0	0	0	0	0
521:	0	0	0	0	0	1	0	1
529:	0	0	0	0	0	0	0	1
537:	1	0	1	0	0	0	0	0
545:	0	0	0	0	0	0	1	2
553:	0	1	1	4	0	1	1	2
561:	2	0	0	3	0	2	2	3
569:	4	3	2	2	4	2	4	2
577:	2	5	7	6	8	7	9	8
585:	15	11	13	16	11	7	7	9
593:	4	11	15	14	20	15	20	19
601:	17	11	11	12	8	10	12	7
609:	8	4	2	4	0	0	1	0
617:	0	0	0	0	0	0	0	0
625:	0	0	0	0	0	0	0	0
633:	0	1	0	0	1	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	1	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:	1	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	1	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	0	0

801:	0	0	0	0	0	0	0	0

Sample Title: 16

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	1	0	0	0	0	0
857:	0	0	0	0	0	0	0	0
865:	0	0	0	0	0	0	1	0
873:	0	0	0	0	0	0	0	0
881:	1	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	1	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

KCB 5/2/13

Apex-Alpha™

Sample Description: PZ-109-SS DIS
Spectrum File: \\OR-ALPHA1\Canberra\ApexAlpha\Root\Data\00000569
Batch Identification: 1304107A-UU
Sample Identification: 17
Sample Geometry: Shelf 2
Procedure Description: U iso

Detector Name: Alpha_025
Chamber Serial Number:
Detector Serial Number: 25
Env. Background: System Bkgd 55743
Reagent Blank: <not performed>

Sample Size: 1.000E+000 +/- 0.000E+000 liter
Sample Date/Time: 4/11/2013 7:21:37 AM
Acquisition Date/Time: 5/2/2013 12:37:36 PM
Acquisition Live Time: 170.0 minutes
Acquisition Real Time: 170.0 minutes

Tracer Certificate: U232_UU-10A
Tracer Quantity: 0.596 mL
Effective Efficiency: 0.2109 +/- 0.0115
Counting Efficiency: 0.1736 +/- 0.0032 on 12/15/2012 1:57:27 PM
Chem. Recovery Factor: 1.2153 +/- 0.0703

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	405.66	9.74	0.34	0.00E+000	24.5
U-234		4.743	109.32	18.81	0.68	0.00E+000	5.2
U-235		4.394	2.83	120.54	0.17	0.00E+000	3.1
U-238		4.169	52.66	27.11	0.34	0.00E+000	3.9

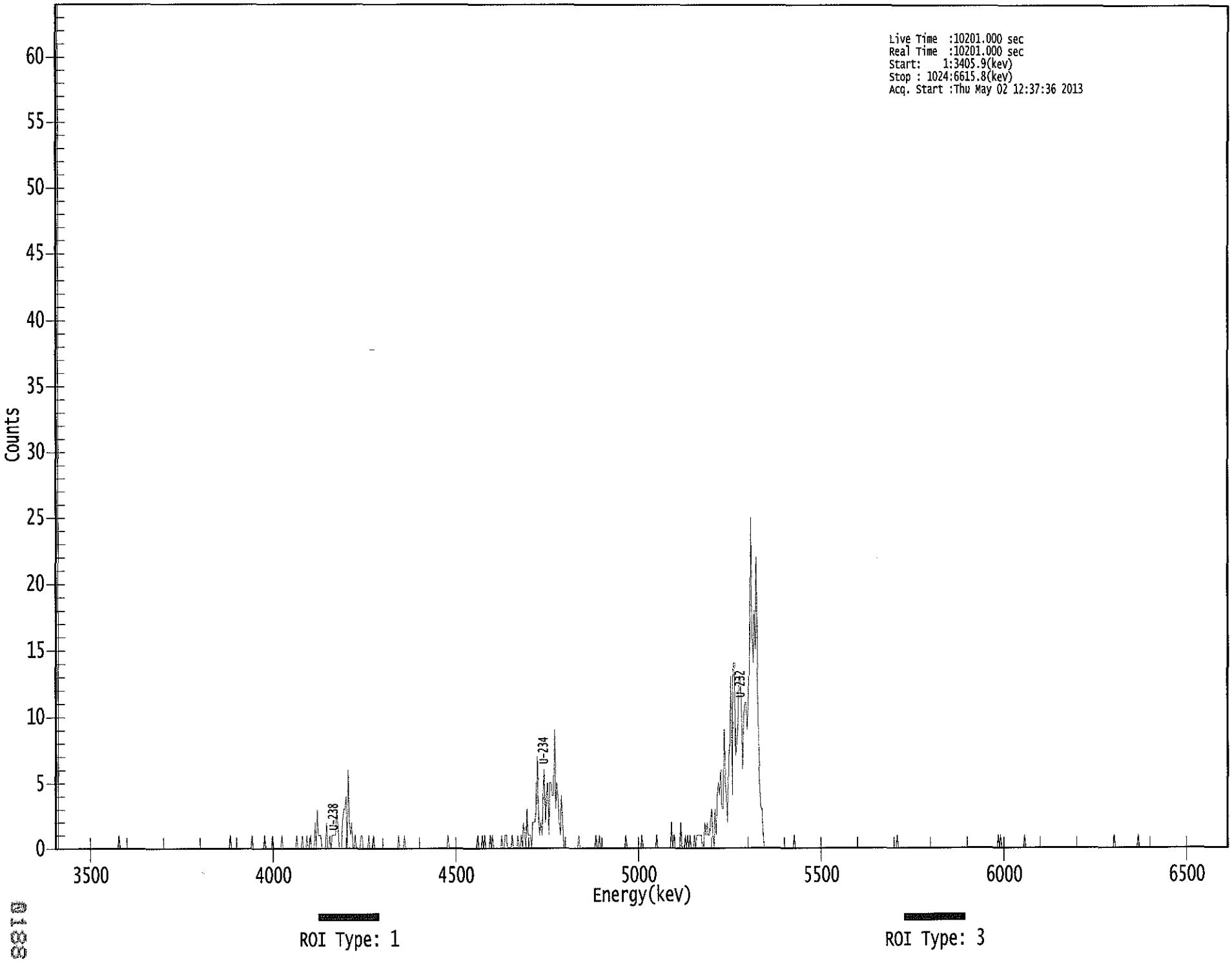
T = Tracer Peak used for Effective Efficiency

NUCLIDE ANALYSIS RESULTS

Nuclide	Id Conf.	Energy (keV)	Activity (pCi/liter)	MDA (pCi/liter)
U-232	0.997	5302.50*	5.11E+000 +/- 5.48E-001	6.02E-002 +/- 6.46E-003
U-234	0.998	4761.50*	1.38E+000 +/- 2.98E-001	7.10E-002 +/- 7.62E-003
U-235	0.999	4385.50*	4.39E-002 +/- 5.32E-002	6.48E-002 +/- 6.95E-003
U-238	0.998	4184.40*	6.60E-001 +/- 1.92E-001	5.99E-002 +/- 6.43E-003

AG 5/3/13

0000056937.CNF



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

Sample Title: 17

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	1
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:	1	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	1	0
185:	0	0	0	0	0	1	0	0
193:	0	0	0	0	0	1	0	0
201:	0	0	0	0	0	0	0	0
209:	0	0	1	0	0	0	0	1
217:	0	0	0	1	0	0	1	0
225:	0	0	2	0	3	1	1	1
233:	0	0	0	0	2	0	0	1
241:	0	1	1	1	1	3	2	0
249:	0	0	2	3	3	4	0	6
257:	2	1	2	0	0	1	0	0
265:	0	0	1	1	0	0	0	0
273:	0	1	0	0	0	1	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:	1	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	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:	1	0	0	0	1	0	1	0

Sample Title: 17

Channel								
377:	0	0	0	1	0	1	0	0
385:	0	0	0	0	0	1	0	0
393:	1	1	0	0	0	0	1	0
401:	0	0	0	1	0	0	1	0
409:	2	1	0	3	1	1	1	0
417:	2	2	2	3	7	3	1	2
425:	1	4	6	2	4	5	1	5
433:	5	4	4	9	3	5	4	2
441:	1	4	2	0	0	0	0	0
449:	0	0	0	0	0	0	0	0
457:	1	0	0	0	0	0	0	0
465:	0	0	0	0	0	0	0	1
473:	0	0	1	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	1	0	0	0	0	0	0
505:	0	0	0	0	0	0	0	1
513:	0	0	0	0	0	0	0	0
521:	0	0	0	0	1	0	0	0
529:	0	0	0	0	0	0	0	0
537:	0	2	0	1	0	0	0	0
545:	0	2	0	0	0	1	0	1
553:	0	1	0	0	0	1	0	1
561:	1	1	1	1	0	0	2	1
569:	2	1	1	2	3	1	0	3
577:	1	4	5	4	6	3	3	9
585:	5	4	2	7	8	13	4	14
593:	14	7	8	9	13	13	11	6
601:	10	11	11	9	11	16	25	16
609:	14	18	15	22	13	8	5	3
617:	3	1	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	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	0	0	1	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: 17

Channel								
809:	0	0	0	0	0	0	0	0
817:	0	0	0	0	0	0	1	0
825:	1	0	0	0	0	0	0	0
833:	0	0	0	0	0	0	0	0
841:	0	0	0	0	0	1	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	1	0	0	0	0
929:	0	0	0	0	0	0	0	0
937:	0	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

KG 5/2/13

Apex-Alpha™

Sample Description: PZ-104-KS TOT
Spectrum File: \\OR-ALPHA1\Canberra\ApexAlpha\Root\Data\00000569
Batch Identification: 1304107A-UU
Sample Identification: 18
Sample Geometry: Shelf 2
Procedure Description: U iso

Detector Name: Alpha_027
Chamber Serial Number:
Detector Serial Number: 27
Env. Background: System Bkgd 55744
Reagent Blank: <not performed>

Sample Size: 1.000E+000 +/- 0.000E+000 liter
Sample Date/Time: 4/11/2013 7:21:37 AM
Acquisition Date/Time: 5/2/2013 12:37:37 PM
Acquisition Live Time: 170.0 minutes
Acquisition Real Time: 170.0 minutes

Tracer Certificate: U232_UU-10A
Tracer Quantity: 0.597 mL
Effective Efficiency: 0.2095 +/- 0.0115
Counting Efficiency: 0.1728 +/- 0.0032 on 12/15/2012 2:27:41 PM
Chem. Recovery Factor: 1.2127 +/- 0.0704

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	5.286	403.81	9.77	1.19	0.00E+000	10.5
U-234		4.733	34.15	34.02	0.85	0.00E+000	6.9
U-235		4.399	-0.34	592.90	0.34	0.00E+000	0.0
U-238		4.169	16.32	49.69	0.68	0.00E+000	8.0

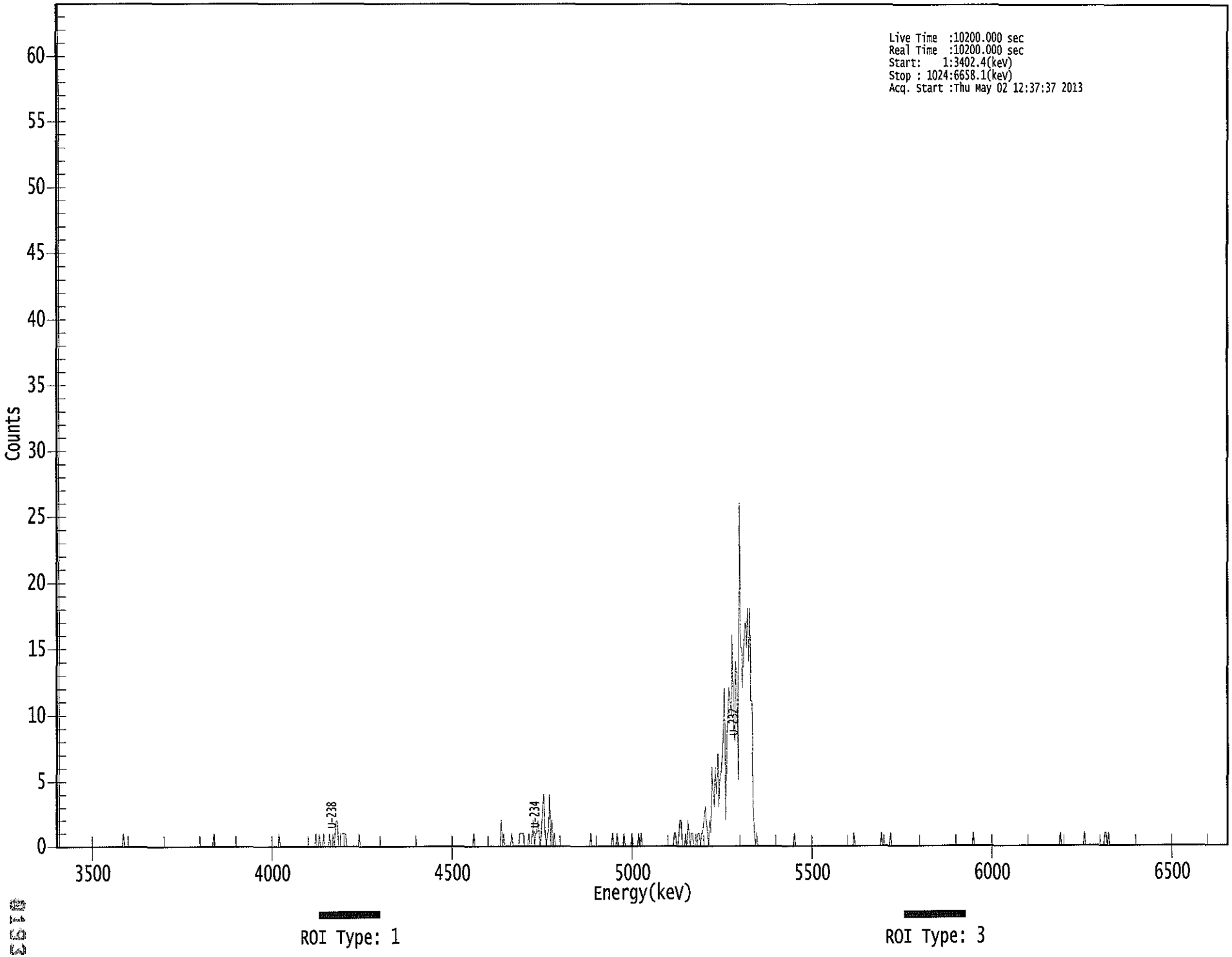
T = Tracer Peak used for Effective Efficiency

NUCLIDE ANALYSIS RESULTS

Nuclide	Id Conf.	Energy (keV)	Activity (pCi/liter)	MDA (pCi/liter)
U-232	0.998	5302.50*	5.12E+000 +/- 5.51E-001	8.35E-002 +/- 8.99E-003
U-234	0.994	4761.50*	4.33E-001 +/- 1.54E-001	7.59E-002 +/- 8.17E-003
U-235	0.999	4385.50*	-5.32E-003 +/- 3.15E-002	7.47E-002 +/- 8.04E-003
U-238	0.998	4184.40*	2.06E-001 +/- 1.05E-001	7.12E-002 +/- 7.66E-003

AG
5/3/13

0000056938.CNF



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

Sample Title: 18

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	1	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	1	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	1	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	1	0	0
233:	0	1	0	0	0	0	1	0
241:	0	1	0	1	2	2	0	0
249:	1	1	1	1	1	0	0	0
257:	0	0	0	0	0	0	0	0
265:	1	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	1	0	0	0

369:	0	0	0	0	0	0	0	0

Sample Title: 18

Channel								
377:	0	0	0	0	0	0	0	0
385:	0	0	0	0	2	0	1	0
393:	0	0	0	0	0	1	0	0
401:	0	0	0	0	1	1	1	1
409:	0	0	0	0	1	0	0	1
417:	2	0	1	1	2	1	0	1
425:	3	4	1	0	1	1	4	0
433:	2	0	1	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	1	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	1	0	0	0	0	0	1
497:	0	0	0	0	0	0	1	0
505:	0	0	0	0	1	0	1	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	1	1	0	0	1
545:	2	2	0	0	0	1	0	2
553:	1	0	1	1	0	0	1	0
561:	1	1	0	1	1	2	3	2
569:	1	0	2	1	6	4	3	6
577:	4	7	3	5	6	7	9	12
585:	2	8	10	12	11	10	16	9
593:	8	14	13	5	26	15	15	12
601:	16	17	15	18	14	18	11	11
609:	3	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	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:	1	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:	1	0	0	0	0	0	0	0
729:	1	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:	1	0	0	0	0	0	0	0

Sample Title: 18

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	1	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	0	0
905:	0	0	0	0	0	0	0	0
913:	0	0	0	1	1	0	1	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

Apex-Alpha™

LCB 5/2/13

Sample Description: PZ-104-KS DIS
Spectrum File: \\OR-ALPHA1\Canberra\ApexAlpha\Root\Data\00000569
Batch Identification: 1304107A-UU
Sample Identification: 19
Sample Geometry: Shelf 2
Procedure Description: U iso

Detector Name: Alpha_029
Chamber Serial Number:
Detector Serial Number: 29
Env. Background: System Bkgd 55745
Reagent Blank: <not performed>

Sample Size: 1.000E+000 +/- 0.000E+000 liter
Sample Date/Time: 4/11/2013 7:21:37 AM
Acquisition Date/Time: 5/2/2013 12:37:38 PM
Acquisition Live Time: 170.0 minutes
Acquisition Real Time: 170.0 minutes

Tracer Certificate: U232_UU-10A
Tracer Quantity: 0.597 mL
Effective Efficiency: 0.1988 +/- 0.0112
Counting Efficiency: 0.1945 +/- 0.0036 on 12/15/2012 2:30:02 PM
Chem. Recovery Factor: 1.0218 +/- 0.0604

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	5.290	382.81	10.04	1.19	0.00E+000	27.5
U-234		4.761	36.98	32.75	1.02	0.00E+000	6.5
U-235		4.400	1.49	190.02	0.51	0.00E+000	3.1
U-238		4.119	14.83	51.24	0.17	0.00E+000	4.7

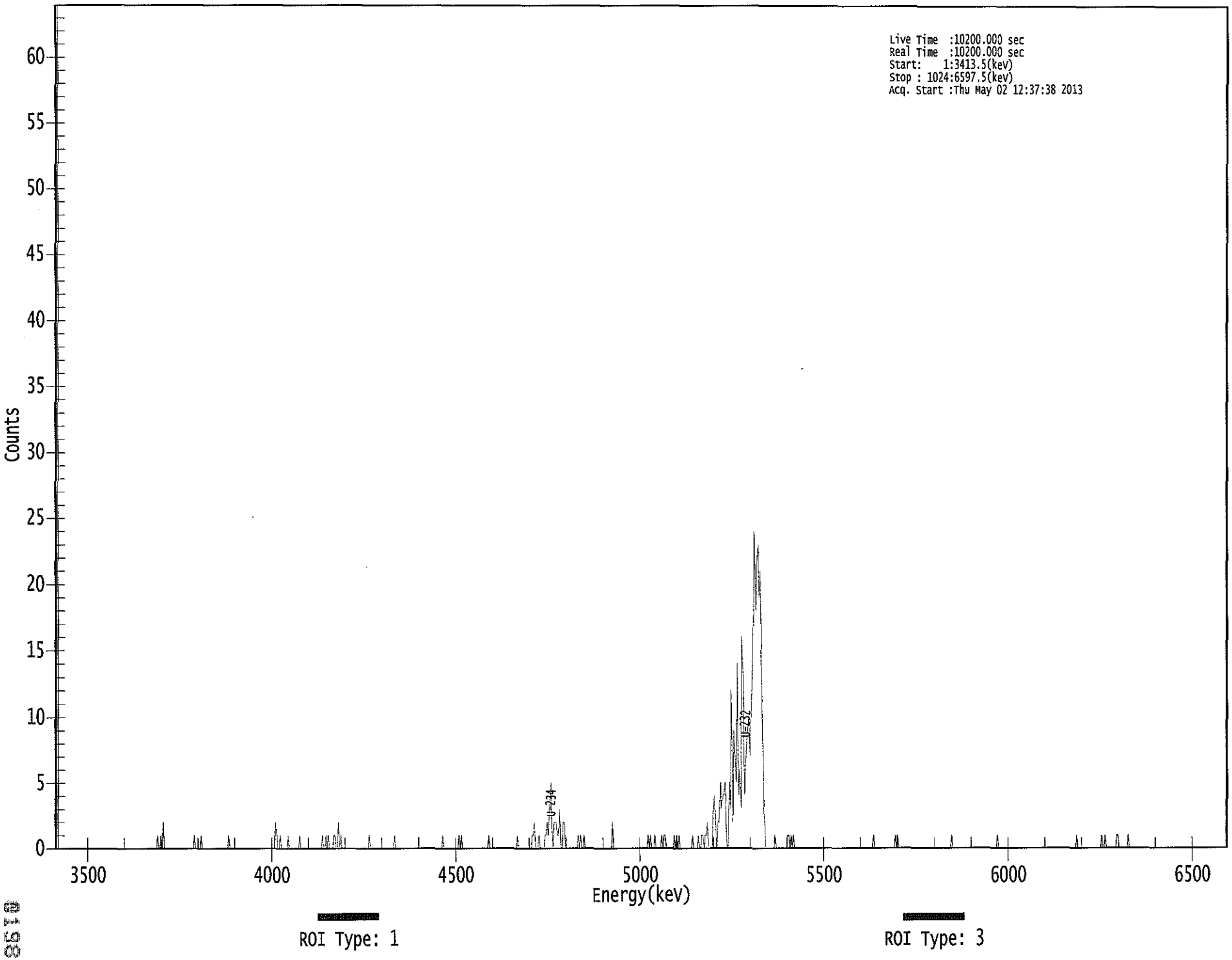
T = Tracer Peak used for Effective Efficiency

NUCLIDE ANALYSIS RESULTS

Nuclide	Id Conf.	Energy (keV)	Activity (pCi/liter)	MDA (pCi/liter)
U-232	0.999	5302.50*	5.12E+000 +/- 5.63E-001	8.81E-002 +/- 9.69E-003
U-234	1.000	4761.50*	4.94E-001 +/- 1.71E-001	8.42E-002 +/- 9.26E-003
U-235	0.998	4385.50*	2.46E-002 +/- 4.67E-002	8.65E-002 +/- 9.51E-003
U-238	0.970	4184.40*	1.97E-001 +/- 1.03E-001	5.55E-002 +/- 6.11E-003

AG 5/3/13

0000056939.CNF



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

Sample Title: 19

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	1	0	0	1	0	2	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	1	0	0	0	0	0	1
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	1
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:	2	1	0	0	1	0	0	0
201:	0	0	0	1	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	1	0	0	1	0	1	0
241:	0	0	0	1	1	0	0	2
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	1	0	0	0	0	0
281:	0	0	0	0	0	0	0	0
289:	0	0	0	0	0	0	0	0
297:	1	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	1	0	0	0	0	0
345:	0	0	0	0	0	0	0	0
353:	1	0	1	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: 19

Channel								
377:	0	0	1	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	1	0	0	0	0
409:	0	0	0	0	0	0	0	0
417:	1	1	2	0	0	0	1	0
425:	0	0	0	1	1	2	1	3
433:	5	2	0	2	2	2	1	1
441:	3	0	0	2	2	0	0	0
449:	0	0	0	0	0	0	0	0
457:	1	0	1	0	0	1	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	2	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	1	0	1
521:	0	0	0	1	0	0	0	0
529:	0	1	0	1	1	0	0	0
537:	0	0	0	0	1	0	1	0
545:	1	0	0	0	0	0	0	0
553:	0	0	0	0	1	0	0	0
561:	0	1	0	0	1	1	0	1
569:	1	2	0	0	0	0	3	4
577:	2	0	2	2	5	3	4	4
585:	5	3	0	0	5	3	12	2
593:	9	7	5	14	4	6	3	16
601:	13	4	6	8	9	10	7	11
609:	13	18	24	18	22	23	19	21
617:	13	10	3	2	0	0	0	0
625:	0	0	0	0	1	0	0	0
633:	0	0	0	0	0	0	0	1
641:	1	0	1	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	1	0	0	0	0	0
721:	0	0	0	0	0	0	0	0
729:	0	0	0	0	0	1	0	1
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	1	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: 19

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	1	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	1	0	0	0
921:	0	0	0	0	0	0	1	1
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	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

5/2/2013 5:59:41 AM

Apex-Alpha™

QA SUMMARY REPORT

Review Of QA Results - Pulser Check

Date : 5/2/2013
Time : 5:59:41 AM

CHAMBER	DEVICE	PARAMETER	FLAG	DATE
Alpha_001	21f	ALL	Not Done	
Alpha_002	21f	ALL	Not Done	
Alpha_003	21f	ALL	Passed	5/2/2013 5:15:45 AM
Alpha_004	21f	ALL	Passed	5/2/2013 5:15:46 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	5/2/2013 5:15:47 AM
Alpha_011	21f	ALL	Passed	5/2/2013 5:15:48 AM
Alpha_012	21f	ALL	Not Done	
Alpha_013	21f	ALL	Passed	5/2/2013 5:15:49 AM
Alpha_014	21f	ALL	Passed	5/2/2013 5:15:49 AM
Alpha_015	21f	ALL	Not Done	
Alpha_016	21f	ALL	Not Done	
Alpha_017	AIM730	ALL	Not Done	
Alpha_018	AIM730	ALL	Passed	5/2/2013 5:15:50 AM
Alpha_019	AIM730	ALL	Not Done	
Alpha_020	AIM730	ALL	Not Done	
Alpha_021	AIM730	ALL	Not Done	
Alpha_022	AIM730	ALL	Passed	5/2/2013 5:15:51 AM
Alpha_023	AIM730	ALL	Not Done	
Alpha_024	AIM730	ALL	Passed	5/2/2013 5:15:52 AM
Alpha_025	AIM730	ALL	Passed	5/2/2013 5:15:53 AM
Alpha_026	AIM730	ALL	Not Done	
Alpha_027	AIM730	ALL	Passed	5/2/2013 5:15:54 AM
Alpha_028	AIM730	ALL	Not Done	
Alpha_029	AIM730	ALL	Passed	5/2/2013 5:15:54 AM
Alpha_030	AIM730	ALL	Not Done	
Alpha_031	AIM730	ALL	Not Done	
Alpha_032	AIM730	ALL	Not Done	
Alpha_033	Alpha Analyst100DC	ALL	Passed	5/2/2013 5:15:56 AM
Alpha_034	Alpha Analyst100DC	ALL	Passed	5/2/2013 5:15:57 AM
Alpha_035	Alpha Analyst100DC	ALL	Passed	5/2/2013 5:15:59 AM
Alpha_036	Alpha Analyst100DC	ALL	Passed	4/29/2013 5:29:59 AM
Alpha_037	Alpha Analyst100DC	ALL	Passed	5/2/2013 5:16:01 AM
Alpha_038	Alpha Analyst100DC	ALL	Not Done	
Alpha_039	Alpha Analyst100DC	ALL	Passed	4/29/2013 5:30:03 AM
Alpha_040	Alpha Analyst100DC	ALL	Passed	5/2/2013 5:16:03 AM
Alpha_041	Alpha Analyst100DC	ALL	Passed	5/2/2013 5:16:04 AM
Alpha_042	Alpha Analyst100DC	ALL	Passed	5/2/2013 5:16:06 AM

Review of QA Results - Pulser Check

5/2/2013 5:59:41 AM

CHAMBER	DEVICE	PARAMETER	FLAG	DATE
Alpha_043	Alpha Analyst100DC	ALL	Passed	4/29/2013 5:30:09 AM
Alpha_044	Alpha Analyst100DC	ALL	Passed	5/2/2013 5:16:09 AM
Alpha_045	Alpha Analyst100DC	ALL	Not Done	
Alpha_046	Alpha Analyst100DC	ALL	Passed	5/2/2013 5:16:12 AM
Alpha_047	Alpha Analyst100DC	ALL	Passed	5/2/2013 5:16:15 AM
Alpha_048	Alpha Analyst100DC	ALL	Passed	5/2/2013 5:16:18 AM

APPROVED BY: C

APPROVAL DATE: 5/2/13

****
***** 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)

13-04107
ThISO
Run 1

Work Order	13-04107
Analysis Code	ThISO
Run	1
Date Received	4/16/2013
Lab Deadline	5/7/2013
Client	Engineering Management Support, Inc.
Project	West Lake OU-1
Report Level	4
Activity Units	pCi
Aliquot Units	l
Matrix	WA
Method	NAS NS-3004 Modified
Instrument Type	Alpha Spectroscopy
Radiometric Tracer	Th-229
Radiometric Sol#	Th-18a
Tracer Act (dpm/g)	22.467
Carrier	
Carrier Conc (mg/ml)	

Internal Fraction	*Sample Desc*	*Client ID*	*Login CPM*	*Sample Date*	*Sample Aliquot*
01	LCS	LCS		04/16/13 00:00	1.0000E+00
02	MBL	BLANK		04/16/13 00:00	1.0000E+00
03	DUP	FB at D-3 TOT	44	04/11/13 13:50	1.0000E+00
04	TRG	PZ-113-AD TOT	39	04/11/13 13:35	1.0000E+00
05	TRG	PZ-113-AD DIS	39	04/11/13 13:35	1.0000E+00
06	DO	FB at D-3 TOT	44	04/11/13 13:50	1.0000E+00
07	TRG	FB at D-3 DIS	44	04/11/13 13:50	1.0000E+00
08	TRG	D-3 TOT	46	04/11/13 14:24	1.0000E+00
09	TRG	D-3 DIS	46	04/11/13 14:24	1.0000E+00
10	TRG	D-85 TOT	43	04/11/13 14:45	1.0000E+00
11	TRG	D-85 DIS	43	04/11/13 14:45	1.0000E+00
12	TRG	S-84 TOT	42	04/11/13 15:30	1.0000E+00
13	TRG	S-84 DIS	42	04/11/13 15:30	1.0000E+00
14	TRG	S-5 TOT	35	04/11/13 15:31	1.0000E+00
15	TRG	S-5 DIS	35	04/11/13 15:31	1.0000E+00
16	TRG	PZ-109-SS TOT	45	04/11/13 16:08	1.0000E+00
17	TRG	PZ-109-SS DIS	45	04/11/13 16:08	1.0000E+00
18	TRG	PZ-104-KS TOT	38	04/11/13 18:08	1.0000E+00
19	TRG	PZ-104-KS DIS	38	04/11/13 18:08	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.

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	0.4783	10.7		0.00								
02	MBL	0.2382	5.4		0.00								
03	DUP	0.2356	5.3		0.00								
04	TRG	0.2336	5.2		0.00								
05	TRG	0.2344	5.3		0.00								
06	DO	0.2340	5.3		0.00								
07	TRG	0.2330	5.2		0.00								
08	TRG	0.2339	5.3		0.00								
09	TRG	0.2338	5.3		0.00								
10	TRG	0.2329	5.2		0.00								
11	TRG	0.2320	5.2		0.00								
12	TRG	0.2330	5.2		0.00								
13	TRG	0.2318	5.2		0.00								
14	TRG	0.2325	5.2		0.00								
15	TRG	0.2310	5.2		0.00								
16	TRG	0.2319	5.2		0.00								
17	TRG	0.2317	5.2		0.00								
18	TRG	0.2326	5.2		0.00								
19	TRG	0.2301	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.

13-04107
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			04/26/13 10:43	JBARNARD				
02	MBL			04/26/13 10:43	JBARNARD				
03	DUP			04/26/13 10:43	JBARNARD				
04	TRG			04/26/13 10:43	JBARNARD				
05	TRG			04/26/13 10:43	JBARNARD				
06	DO			04/26/13 10:43	JBARNARD				
07	TRG			04/26/13 10:43	JBARNARD				
08	TRG			04/26/13 10:43	JBARNARD				
09	TRG			04/26/13 10:43	JBARNARD				
10	TRG			04/26/13 10:43	JBARNARD				
11	TRG			04/26/13 10:43	JBARNARD				
12	TRG			04/26/13 10:43	JBARNARD				
13	TRG			04/26/13 10:43	JBARNARD				
14	TRG			04/26/13 10:43	JBARNARD				
15	TRG			04/26/13 10:43	JBARNARD				
16	TRG			04/26/13 10:43	JBARNARD				
17	TRG			04/26/13 10:43	JBARNARD				
18	TRG			04/26/13 10:43	JBARNARD				
19	TRG			04/26/13 10:43	JBARNARD				

* 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: 13-04107-ThISO-1

Run	Analysis Code	Eberline Services Work Order	Client
1	ThISO	13-04107	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	5.33E+00	8.39E-01	6.66E-02	4.77E+00	111.67	OK		OK	
02	TH-228	MBL	BLANK	pCi/l	5.87E-02	6.64E-02	9.29E-02					OK	OK
03	TH-228	DUP	FB at D-3 TOT	pCi/l	1.36E-02	3.26E-02	6.83E-02				NA	OK	
04	TH-228	TRG	PZ-113-AD TOT	pCi/l	1.23E-01	9.28E-02	9.23E-02					OK	
05	TH-228	TRG	PZ-113-AD DIS	pCi/l	4.35E-02	5.26E-02	7.40E-02					OK	
06	TH-228	DO	FB at D-3 TOT	pCi/l	-1.65E-02	4.08E-02	1.16E-01					OK	
07	TH-228	TRG	FB at D-3 DIS	pCi/l	1.09E-02	4.83E-02	1.03E-01					OK	
08	TH-228	TRG	D-3 TOT	pCi/l	7.20E-02	7.63E-02	1.14E-01					OK	
09	TH-228	TRG	D-3 DIS	pCi/l	1.15E-02	5.82E-02	1.23E-01					OK	
10	TH-228	TRG	D-85 TOT	pCi/l	3.15E+00	6.33E-01	1.01E-01					OK	
11	TH-228	TRG	D-85 DIS	pCi/l	-8.37E-03	5.47E-02	1.38E-01					OK	
12	TH-228	TRG	S-84 TOT	pCi/l	1.22E-01	1.01E-01	1.35E-01					OK	
13	TH-228	TRG	S-84 DIS	pCi/l	-9.59E-03	2.92E-02	7.95E-02					OK	
14	TH-228	TRG	S-5 TOT	pCi/l	5.37E-02	5.58E-02	5.85E-02					OK	
15	TH-228	TRG	S-5 DIS	pCi/l	7.32E-02	6.34E-02	6.18E-02					OK	
16	TH-228	TRG	PZ-109-SS TOT	pCi/l	1.11E-02	2.65E-02	5.56E-02					OK	
17	TH-228	TRG	PZ-109-SS DIS	pCi/l	7.51E-03	2.30E-02	5.44E-02					OK	
18	TH-228	TRG	PZ-104-KS TOT	pCi/l	1.02E-01	7.13E-02	5.64E-02					OK	
19	TH-228	TRG	PZ-104-KS DIS	pCi/l	3.61E-02	4.88E-02	7.62E-02					OK	

Preliminary Data Report & Analytical Calculations

Work Order: 13-04107-ThISO-1

Run	Analysis Code	Eberline Services Work Order	Client
1	ThISO	13-04107	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-228	LCS	04/16/13 00:00	1.00E+00	96.24	0.00	0.00			
02	TH-228	MBL	04/16/13 00:00	1.00E+00	97.45	0.00	0.00			
03	TH-228	DUP	04/11/13 13:50	1.00E+00	86.98	0.00	0.00			
04	TH-228	TRG	04/11/13 13:35	1.00E+00	98.35	0.00	0.00			
05	TH-228	TRG	04/11/13 13:35	1.00E+00	113.34	0.00	0.00			
06	TH-228	DO	04/11/13 13:50	1.00E+00	83.04	0.00	0.00			
07	TH-228	TRG	04/11/13 13:50	1.00E+00	133.82	0.00	0.00			
08	TH-228	TRG	04/11/13 14:24	1.00E+00	111.92	0.00	0.00			
09	TH-228	TRG	04/11/13 14:24	1.00E+00	110.62	0.00	0.00			
10	TH-228	TRG	04/11/13 14:45	1.00E+00	106.24	0.00	0.00			
11	TH-228	TRG	04/11/13 14:45	1.00E+00	98.73	0.00	0.00			
12	TH-228	TRG	04/11/13 15:30	1.00E+00	107.65	0.00	0.00			
13	TH-228	TRG	04/11/13 15:30	1.00E+00	105.24	0.00	0.00			
14	TH-228	TRG	04/11/13 15:31	1.00E+00	104.07	0.00	0.00			
15	TH-228	TRG	04/11/13 15:31	1.00E+00	114.75	0.00	0.00			
16	TH-228	TRG	04/11/13 16:08	1.00E+00	113.99	0.00	0.00			
17	TH-228	TRG	04/11/13 16:08	1.00E+00	125.19	0.00	0.00			
18	TH-228	TRG	04/11/13 18:08	1.00E+00	115.97	0.00	0.00			
19	TH-228	TRG	04/11/13 18:08	1.00E+00	121.22	0.00	0.00			

Preliminary Data Report & Analytical Calculations

Work Order: 13-04107-ThISO-1

Run	1
Analysis Code	ThISO
Eberline Services Work Order	13-04107
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	05/02/13 12:39		A_Spec	Alpha_041	170	3.83 E+02	2.00 E-03	19.8
02	TH-228	MBL	05/02/13 12:39		A_Spec	Alpha_042	170	3.98 E+00	6.00 E-03	18.5
03	TH-228	DUP	05/02/13 12:39		A_Spec	Alpha_044	170	8.30 E-01	1.00 E-03	19
04	TH-228	TRG	05/02/13 12:39		A_Spec	Alpha_046	170	8.00 E+00	0.00 E+00	17.9
05	TH-228	TRG	05/02/13 12:39		A_Spec	Alpha_047	170	3.32 E+00	4.00 E-03	18.2
06	TH-228	DO	05/02/13 12:39		A_Spec	Alpha_048	170	-8.50 E-01	5.00 E-03	16.8
07	TH-228	TRG	05/02/13 16:29		A_Spec	Alpha_003	170.02	9.40 E-01	1.80 E-02	17.5
08	TH-228	TRG	05/02/13 16:29		A_Spec	Alpha_004	170	5.77 E+00	1.90 E-02	19.4
09	TH-228	TRG	05/02/13 16:29		A_Spec	Alpha_010	170	9.20 E-01	2.40 E-02	19.7
10	TH-228	TRG	05/02/13 16:29		A_Spec	Alpha_011	170.02	2.44 E+02	1.20 E-02	19.7
11	TH-228	TRG	05/02/13 16:29		A_Spec	Alpha_013	170	-5.70 E-01	2.10 E-02	18.7
12	TH-228	TRG	05/02/13 16:29		A_Spec	Alpha_014	170	8.92 E+00	2.40 E-02	18.5
13	TH-228	TRG	05/02/13 16:30		A_Spec	Alpha_033	170	-6.80 E-01	4.00 E-03	18.2
14	TH-228	TRG	05/02/13 16:30		A_Spec	Alpha_034	170	3.83 E+00	1.00 E-03	18.6
15	TH-228	TRG	05/02/13 16:29		A_Spec	Alpha_035	170	5.66 E+00	2.00 E-03	18.3
16	TH-228	TRG	05/02/13 16:30		A_Spec	Alpha_037	170	8.30 E-01	1.00 E-03	17.8
17	TH-228	TRG	05/02/13 16:30		A_Spec	Alpha_040	170	6.60 E-01	2.00 E-03	19
18	TH-228	TRG	05/02/13 16:30		A_Spec	Alpha_041	170	8.66 E+00	2.00 E-03	19.8
19	TH-228	TRG	05/02/13 16:30		A_Spec	Alpha_042	170	2.98 E+00	6.00 E-03	18.5

Preliminary Data Report & Analytical Calculations

Work Order: 13-04107-ThISO-1

Run	1
Analysis Code	ThISO
Eberline Services Work Order	13-04107
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-230	LCS	LCS	pCi/l	5.03E+00	8.03E-01	8.35E-02	5.44E+00	92.52	OK		OK	
02	TH-230	MBL	BLANK	pCi/l	9.07E-02	7.87E-02	8.83E-02					OK	OK
03	TH-230	DUP	FB at D-3 TOT	pCi/l	7.75E-02	7.18E-02	6.70E-02				NA	OK	
04	TH-230	TRG	PZ-113-AD TOT	pCi/l	1.36E-01	9.62E-02	9.04E-02					OK	
05	TH-230	TRG	PZ-113-AD DIS	pCi/l	1.20E-01	8.23E-02	7.25E-02					OK	
06	TH-230	DO	FB at D-3 TOT	pCi/l	1.14E-01	1.01E-01	1.14E-01					OK	
07	TH-230	TRG	FB at D-3 DIS	pCi/l	9.81E-02	7.27E-02	7.79E-02					OK	
08	TH-230	TRG	D-3 TOT	pCi/l	1.73E-01	9.70E-02	7.32E-02					OK	
09	TH-230	TRG	D-3 DIS	pCi/l	1.66E-01	9.68E-02	8.36E-02					OK	
10	TH-230	TRG	D-85 TOT	pCi/l	5.81E+00	1.05E+00	6.05E-02					OK	
11	TH-230	TRG	D-85 DIS	pCi/l	1.22E-01	8.74E-02	7.55E-02					OK	
12	TH-230	TRG	S-84 TOT	pCi/l	9.78E-02	7.62E-02	7.54E-02					OK	
13	TH-230	TRG	S-84 DIS	pCi/l	1.70E-01	1.02E-01	7.80E-02					OK	
14	TH-230	TRG	S-5 TOT	pCi/l	1.83E-01	1.05E-01	7.75E-02					OK	
15	TH-230	TRG	S-5 DIS	pCi/l	9.71E-02	7.21E-02	6.06E-02					OK	
16	TH-230	TRG	PZ-109-SS TOT	pCi/l	1.65E-01	9.62E-02	6.24E-02					OK	
17	TH-230	TRG	PZ-109-SS DIS	pCi/l	9.66E-02	6.74E-02	5.34E-02					OK	
18	TH-230	TRG	PZ-104-KS TOT	pCi/l	1.75E-01	9.48E-02	6.93E-02					OK	
19	TH-230	TRG	PZ-104-KS DIS	pCi/l	1.68E-01	9.40E-02	7.10E-02					OK	

Preliminary Data Report & Analytical Calculations

Work Order: 13-04107-ThISO-1

Run	1
Analysis Code	ThISO
Eberline Services Work Order	13-04107
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-230	LCS	04/16/13 00:00	1.00E+00	96.24	0.00	0.00			
02	TH-230	MBL	04/16/13 00:00	1.00E+00	97.45	0.00	0.00			
03	TH-230	DUP	04/11/13 13:50	1.00E+00	86.98	0.00	0.00			
04	TH-230	TRG	04/11/13 13:35	1.00E+00	98.35	0.00	0.00			
05	TH-230	TRG	04/11/13 13:35	1.00E+00	113.34	0.00	0.00			
06	TH-230	DO	04/11/13 13:50	1.00E+00	83.04	0.00	0.00			
07	TH-230	TRG	04/11/13 13:50	1.00E+00	133.82	0.00	0.00			
08	TH-230	TRG	04/11/13 14:24	1.00E+00	111.92	0.00	0.00			
09	TH-230	TRG	04/11/13 14:24	1.00E+00	110.62	0.00	0.00			
10	TH-230	TRG	04/11/13 14:45	1.00E+00	106.24	0.00	0.00			
11	TH-230	TRG	04/11/13 14:45	1.00E+00	98.73	0.00	0.00			
12	TH-230	TRG	04/11/13 15:30	1.00E+00	107.65	0.00	0.00			
13	TH-230	TRG	04/11/13 15:30	1.00E+00	105.24	0.00	0.00			
14	TH-230	TRG	04/11/13 15:31	1.00E+00	104.07	0.00	0.00			
15	TH-230	TRG	04/11/13 15:31	1.00E+00	114.75	0.00	0.00			
16	TH-230	TRG	04/11/13 16:08	1.00E+00	113.99	0.00	0.00			
17	TH-230	TRG	04/11/13 16:08	1.00E+00	125.19	0.00	0.00			
18	TH-230	TRG	04/11/13 18:08	1.00E+00	115.97	0.00	0.00			
19	TH-230	TRG	04/11/13 18:08	1.00E+00	121.22	0.00	0.00			

Preliminary Data Report & Analytical Calculations

Work Order: 13-04107-ThISO-1

Run	1
Analysis Code	ThISO
Eberline Services Work Order	13-04107
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-230	LCS	05/02/13 12:39		A_Spec	Alpha_041	170	3.61 E+02	5.00 E-03	19.8
02	TH-230	MBL	05/02/13 12:39		A_Spec	Alpha_042	170	6.15 E+00	5.00 E-03	18.5
03	TH-230	DUP	05/02/13 12:39		A_Spec	Alpha_044	170	4.83 E+00	1.00 E-03	19
04	TH-230	TRG	05/02/13 12:39		A_Spec	Alpha_046	170	9.00 E+00	0.00 E+00	17.9
05	TH-230	TRG	05/02/13 12:39		A_Spec	Alpha_047	170	9.32 E+00	4.00 E-03	18.2
06	TH-230	DO	05/02/13 12:39		A_Spec	Alpha_048	170	6.00 E+00	0.00 E+00	16.8
07	TH-230	TRG	05/02/13 16:29		A_Spec	Alpha_003	170.02	8.64 E+00	8.00 E-03	17.5
08	TH-230	TRG	05/02/13 16:29		A_Spec	Alpha_004	170	1.42 E+01	5.00 E-03	19.4
09	TH-230	TRG	05/02/13 16:29		A_Spec	Alpha_010	170	1.36 E+01	8.00 E-03	19.7
10	TH-230	TRG	05/02/13 16:29		A_Spec	Alpha_011	170.02	4.59 E+02	2.00 E-03	19.7
11	TH-230	TRG	05/02/13 16:29		A_Spec	Alpha_013	170	8.49 E+00	3.00 E-03	18.7
12	TH-230	TRG	05/02/13 16:29		A_Spec	Alpha_014	170	7.32 E+00	4.00 E-03	18.5
13	TH-230	TRG	05/02/13 16:30		A_Spec	Alpha_033	170	1.23 E+01	4.00 E-03	18.2
14	TH-230	TRG	05/02/13 16:30		A_Spec	Alpha_034	170	1.33 E+01	4.00 E-03	18.6
15	TH-230	TRG	05/02/13 16:29		A_Spec	Alpha_035	170	7.66 E+00	2.00 E-03	18.3
16	TH-230	TRG	05/02/13 16:30		A_Spec	Alpha_037	170	1.27 E+01	2.00 E-03	17.8
17	TH-230	TRG	05/02/13 16:30		A_Spec	Alpha_040	170	8.66 E+00	2.00 E-03	19
18	TH-230	TRG	05/02/13 16:30		A_Spec	Alpha_041	170	1.51 E+01	5.00 E-03	19.8
19	TH-230	TRG	05/02/13 16:30		A_Spec	Alpha_042	170	1.41 E+01	5.00 E-03	18.5

Preliminary Data Report & Analytical Calculations

Work Order: 13-04107-ThISO-1

Run	Analysis Code	Eberline Services Work Order	Client
1	ThISO	13-04107	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	5.66E+00	8.81E-01	1.11E-01	4.77E+00	118.62	OK		OK	
02	TH-232	MBL	BLANK	pCi/l	1.94E-02	4.21E-02	8.31E-02					OK	OK
03	TH-232	DUP	FB at D-3 TOT	pCi/l	1.33E-02	3.19E-02	6.69E-02				OK	OK	
04	TH-232	TRG	PZ-113-AD TOT	pCi/l	5.77E-02	6.00E-02	6.28E-02					OK	
05	TH-232	TRG	PZ-113-AD DIS	pCi/l	1.07E-02	2.56E-02	5.36E-02					OK	
06	TH-232	DO	FB at D-3 TOT	pCi/l	0.00E+00	5.27E-02	1.14E-01					OK	
07	TH-232	TRG	FB at D-3 DIS	pCi/l	-2.16E-03	2.44E-02	7.47E-02					OK	
08	TH-232	TRG	D-3 TOT	pCi/l	5.98E-03	2.49E-02	6.40E-02					OK	
09	TH-232	TRG	D-3 DIS	pCi/l	4.64E-02	5.49E-02	8.02E-02					OK	
10	TH-232	TRG	D-85 TOT	pCi/l	2.79E+00	5.71E-01	6.63E-02					OK	
11	TH-232	TRG	D-85 DIS	pCi/l	-7.32E-03	2.94E-02	7.54E-02					OK	
12	TH-232	TRG	S-84 TOT	pCi/l	5.53E-02	5.99E-02	7.98E-02					OK	
13	TH-232	TRG	S-84 DIS	pCi/l	0.00E+00	3.82E-02	8.27E-02					OK	
14	TH-232	TRG	S-5 TOT	pCi/l	-7.00E-03	2.81E-02	7.20E-02					OK	
15	TH-232	TRG	S-5 DIS	pCi/l	1.05E-02	2.52E-02	5.28E-02					OK	
16	TH-232	TRG	PZ-109-SS TOT	pCi/l	1.30E-02	3.62E-02	7.82E-02					OK	
17	TH-232	TRG	PZ-109-SS DIS	pCi/l	-3.79E-03	2.25E-02	5.33E-02					OK	
18	TH-232	TRG	PZ-104-KS TOT	pCi/l	7.84E-02	7.03E-02	9.23E-02					OK	
19	TH-232	TRG	PZ-104-KS DIS	pCi/l	-8.05E-03	2.45E-02	6.68E-02					OK	

Preliminary Data Report & Analytical Calculations

Work Order: 13-04107-ThISO-1

Run	1
Analysis Code	ThISO
Eberline Services Work Order	13-04107
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	04/16/13 00:00	1.00E+00	96.24	0.00	0.00			
02	TH-232	MBL	04/16/13 00:00	1.00E+00	97.45	0.00	0.00			
03	TH-232	DUP	04/11/13 13:50	1.00E+00	86.98	0.00	0.00			
04	TH-232	TRG	04/11/13 13:35	1.00E+00	98.35	0.00	0.00			
05	TH-232	TRG	04/11/13 13:35	1.00E+00	113.34	0.00	0.00			
06	TH-232	DO	04/11/13 13:50	1.00E+00	83.04	0.00	0.00			
07	TH-232	TRG	04/11/13 13:50	1.00E+00	133.82	0.00	0.00			
08	TH-232	TRG	04/11/13 14:24	1.00E+00	111.92	0.00	0.00			
09	TH-232	TRG	04/11/13 14:24	1.00E+00	110.62	0.00	0.00			
10	TH-232	TRG	04/11/13 14:45	1.00E+00	106.24	0.00	0.00			
11	TH-232	TRG	04/11/13 14:45	1.00E+00	98.73	0.00	0.00			
12	TH-232	TRG	04/11/13 15:30	1.00E+00	107.65	0.00	0.00			
13	TH-232	TRG	04/11/13 15:30	1.00E+00	105.24	0.00	0.00			
14	TH-232	TRG	04/11/13 15:31	1.00E+00	104.07	0.00	0.00			
15	TH-232	TRG	04/11/13 15:31	1.00E+00	114.75	0.00	0.00			
16	TH-232	TRG	04/11/13 16:08	1.00E+00	113.99	0.00	0.00			
17	TH-232	TRG	04/11/13 16:08	1.00E+00	125.19	0.00	0.00			
18	TH-232	TRG	04/11/13 18:08	1.00E+00	115.97	0.00	0.00			
19	TH-232	TRG	04/11/13 18:08	1.00E+00	121.22	0.00	0.00			

Preliminary Data Report & Analytical Calculations

Work Order: 13-04107-ThISO-1

Run: 1
Analysis Code: ThISO
Eberline Services Work Order: 13-04107
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-232	LCS	05/02/13 12:39		A_Spec	Alpha_041	170	4.07 E+02	1.30 E-02	19.8
02	TH-232	MBL	05/02/13 12:39		A_Spec	Alpha_042	170	1.32 E+00	4.00 E-03	18.5
03	TH-232	DUP	05/02/13 12:39		A_Spec	Alpha_044	170	8.30 E-01	1.00 E-03	19
04	TH-232	TRG	05/02/13 12:39		A_Spec	Alpha_046	170	3.83 E+00	1.00 E-03	17.9
05	TH-232	TRG	05/02/13 12:39		A_Spec	Alpha_047	170	8.30 E-01	1.00 E-03	18.2
06	TH-232	DO	05/02/13 12:39		A_Spec	Alpha_048	170	1.00 E+00	0.00 E+00	16.8
07	TH-232	TRG	05/02/13 16:29		A_Spec	Alpha_003	170.02	-1.90 E-01	7.00 E-03	17.5
08	TH-232	TRG	05/02/13 16:29		A_Spec	Alpha_004	170	4.90 E-01	3.00 E-03	19.4
09	TH-232	TRG	05/02/13 16:29		A_Spec	Alpha_010	170	3.81 E+00	7.00 E-03	19.7
10	TH-232	TRG	05/02/13 16:29		A_Spec	Alpha_011	170.02	2.20 E+02	3.00 E-03	19.7
11	TH-232	TRG	05/02/13 16:29		A_Spec	Alpha_013	170	-5.10 E-01	3.00 E-03	18.7
12	TH-232	TRG	05/02/13 16:29		A_Spec	Alpha_014	170	4.15 E+00	5.00 E-03	18.5
13	TH-232	TRG	05/02/13 16:30		A_Spec	Alpha_033	170	1.00 E+00	0.00 E+00	18.2
14	TH-232	TRG	05/02/13 16:30		A_Spec	Alpha_034	170	-5.10 E-01	3.00 E-03	18.6
15	TH-232	TRG	05/02/13 16:29		A_Spec	Alpha_035	170	8.30 E-01	1.00 E-03	18.3
16	TH-232	TRG	05/02/13 16:30		A_Spec	Alpha_037	170	1.00 E+00	0.00 E+00	17.8
17	TH-232	TRG	05/02/13 16:30		A_Spec	Alpha_040	170	-3.40 E-01	2.00 E-03	19
18	TH-232	TRG	05/02/13 16:30		A_Spec	Alpha_041	170	6.79 E+00	1.30 E-02	19.8
19	TH-232	TRG	05/02/13 16:30		A_Spec	Alpha_042	170	-6.80 E-01	4.00 E-03	18.5

Count Room Report
Client: Engineering Management Su

13-04107-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	04/16/13 00:00	1.0000	0.4783	10.7460		0.00		
02	MBL	BLANK	04/16/13 00:00	1.0000	0.2382	5.3516		0.00		
03	DUP	FB at D-3 TOT	04/11/13 13:50	1.0000	0.2356	5.2932		0.00		
04	TRG	PZ-113-AD TOT	04/11/13 13:35	1.0000	0.2336	5.2483		0.00		
05	TRG	PZ-113-AD DIS	04/11/13 13:35	1.0000	0.2344	5.2663		0.00		
06	DO	FB at D-3 TOT	04/11/13 13:50	1.0000	0.2340	5.2573		0.00		
07	TRG	FB at D-3 DIS	04/11/13 13:50	1.0000	0.2330	5.2348		0.00		
08	TRG	D-3 TOT	04/11/13 14:24	1.0000	0.2339	5.2550		0.00		
09	TRG	D-3 DIS	04/11/13 14:24	1.0000	0.2338	5.2528		0.00		
10	TRG	D-85 TOT	04/11/13 14:45	1.0000	0.2329	5.2326		0.00		
11	TRG	D-85 DIS	04/11/13 14:45	1.0000	0.2320	5.2123		0.00		
12	TRG	S-84 TOT	04/11/13 15:30	1.0000	0.2330	5.2348		0.00		
13	TRG	S-84 DIS	04/11/13 15:30	1.0000	0.2318	5.2079		0.00		
14	TRG	S-5 TOT	04/11/13 15:31	1.0000	0.2325	5.2236		0.00		
15	TRG	S-5 DIS	04/11/13 15:31	1.0000	0.2310	5.1899		0.00		
16	TRG	PZ-109-SS TOT	04/11/13 16:08	1.0000	0.2319	5.2101		0.00		
17	TRG	PZ-109-SS DIS	04/11/13 16:08	1.0000	0.2317	5.2056		0.00		
18	TRG	PZ-104-KS TOT	04/11/13 18:08	1.0000	0.2326	5.2258		0.00		
19	TRG	PZ-104-KS DIS	04/11/13 18:08	1.0000	0.2301	5.1697		0.00		

Spike and Tracer Worksheet

Internal Work Order	Run	Analysis Code	Date	Technician	Technician Initials	Witness Initials
13-04107	1	ThISO	4/26/2013 10:42	JBARNARD		

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	4/26/2013	0.100	0.1023				4.77	0.172	0.00	0.000	0.00	0.000	0.00	0.000
Th-230	Th-1b	23.525	4/26/2013	0.500	0.5135				5.44	0.147	0.00	0.000	0.00	0.000	0.00	0.000
Th-232	Th-8b	103.560	4/26/2013	0.100	0.1023				4.77	0.172	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	22.467	4/26/2013	0.4783	0.2200
02	Th-229	Th-18a	22.467	4/26/2013	0.2382	0.2200
03	Th-229	Th-18a	22.467	4/26/2013	0.2356	0.2200
04	Th-229	Th-18a	22.467	4/26/2013	0.2336	0.2200
05	Th-229	Th-18a	22.467	4/26/2013	0.2344	0.2200
06	Th-229	Th-18a	22.467	4/26/2013	0.2340	0.2200
07	Th-229	Th-18a	22.467	4/26/2013	0.2330	0.2200
08	Th-229	Th-18a	22.467	4/26/2013	0.2339	0.2200
09	Th-229	Th-18a	22.467	4/26/2013	0.2338	0.2200
10	Th-229	Th-18a	22.467	4/26/2013	0.2329	0.2200
11	Th-229	Th-18a	22.467	4/26/2013	0.2320	0.2200
12	Th-229	Th-18a	22.467	4/26/2013	0.2330	0.2200
13	Th-229	Th-18a	22.467	4/26/2013	0.2318	0.2200
14	Th-229	Th-18a	22.467	4/26/2013	0.2325	0.2200
15	Th-229	Th-18a	22.467	4/26/2013	0.2310	0.2200
16	Th-229	Th-18a	22.467	4/26/2013	0.2319	0.2200
17	Th-229	Th-18a	22.467	4/26/2013	0.2317	0.2200
18	Th-229	Th-18a	22.467	4/26/2013	0.2326	0.2200
19	Th-229	Th-18a	22.467	4/26/2013	0.2301	0.2200

Balance Printer Tapes

Tracer

0.4783 g
0.2382 g
-0.2356 g
-0.2336 g
-0.2344 g
-0.2340 g
-0.2330 g
-0.2339 g
-0.2338 g
-0.2329 g
-0.2320 g
-0.2330 g
-0.2318 g
-0.2325 g
-0.2310 g
-0.2319 g
-0.2317 g
-0.2326 g
-0.2301 g

LCS

0.5135 g
0.1023 g

Matrix Spike

Eberline Analytical
Oak Ridge Laboratory

Aliquot Worksheet

Printed: 4/26/2013 10:44 AM

Work Order	Run	Analysis Code	Rpt Units	Lab Deadline	Technician
13-04107	1	ThISO	liters	5/7/2013	JBARNARD

Lab Fraction	Engineering Management Support, Inc. Client ID	Sample Type	Muffle Data Ratio Post/Pre	Dilution Data No of Dils	Dil Factor	Ratio	Aliquot Data Aliquot	Net Equiv	MS Aliquot Data Aliquot	Net Equiv	H-3 Solids Only 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	FB at D-3 TOT	DUP					1.0000E+00	1.0000E+00				
04	PZ-113-AD TOT	TRG					1.0000E+00	1.0000E+00				
05	PZ-113-AD DIS	TRG					1.0000E+00	1.0000E+00				
06	FB at D-3 TOT	DO					1.0000E+00	1.0000E+00				
07	FB at D-3 DIS	TRG					1.0000E+00	1.0000E+00				
08	D-3 TOT	TRG					1.0000E+00	1.0000E+00				
09	D-3 DIS	TRG					1.0000E+00	1.0000E+00				
10	D-85 TOT	TRG					1.0000E+00	1.0000E+00				
11	D-85 DIS	TRG					1.0000E+00	1.0000E+00				
12	S-84 TOT	TRG					1.0000E+00	1.0000E+00				
13	S-84 DIS	TRG					1.0000E+00	1.0000E+00				
14	S-5 TOT	TRG					1.0000E+00	1.0000E+00				
15	S-5 DIS	TRG					1.0000E+00	1.0000E+00				
16	PZ-109-SS TOT	TRG					1.0000E+00	1.0000E+00				
17	PZ-109-SS DIS	TRG					1.0000E+00	1.0000E+00				
18	PZ-104-KS TOT	TRG					1.0000E+00	1.0000E+00				
19	PZ-104-KS DIS	TRG					1.0000E+00	1.0000E+00				

Comments	

Technician: JB Date: 4/26/13

0220

Apex-Alpha™

C Trim

Sample Description: SPIKE
Spectrum File: \\OR-ALPHA1\Canberra\ApexAlpha\Root\Data\00000569
Batch Identification: 1304107A-TH
Sample Identification: 01
Sample Geometry: Shelf 2
Procedure Description: Th iso

Detector Name: Alpha_041
Chamber Serial Number: 05026930A
Detector Serial Number: 91087
Env. Background: System Bkgd 55753
Reagent Blank: <not performed>

Sample Size: 1.000E+000 +/- 0.000E+000 liter
Sample Date/Time: 5/2/2013 7:27:18 AM
Acquisition Date/Time: 5/2/2013 12:39:20 PM
Acquisition Live Time: 170.0 minutes
Acquisition Real Time: 170.0 minutes

Tracer Certificate: Th229_TH-18A
Tracer Quantity: 0.478 mL
Effective Efficiency: 0.1904 +/- 0.0118
Counting Efficiency: 0.1978 +/- 0.0034 on 12/16/2012 5:49:31 PM
Chem. Recovery Factor: 0.9624 +/- 0.0619

Control Certificate Name: NatTh_Th-8
Chem. Recov. of Control: TH-232 1.186193 +/- 0.100732
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		5.739	13.15	56.06	0.85	0.00E+000	5.0
TH-228		5.381	382.66	10.02	0.34	0.00E+000	27.4
TH-229	T	4.878	347.83	10.51	0.17	0.00E+000	6.4
TH-230		4.642	361.15	10.33	0.85	0.00E+000	29.9
TH-232		3.974	406.79	9.75	2.21	0.00E+000	12.6

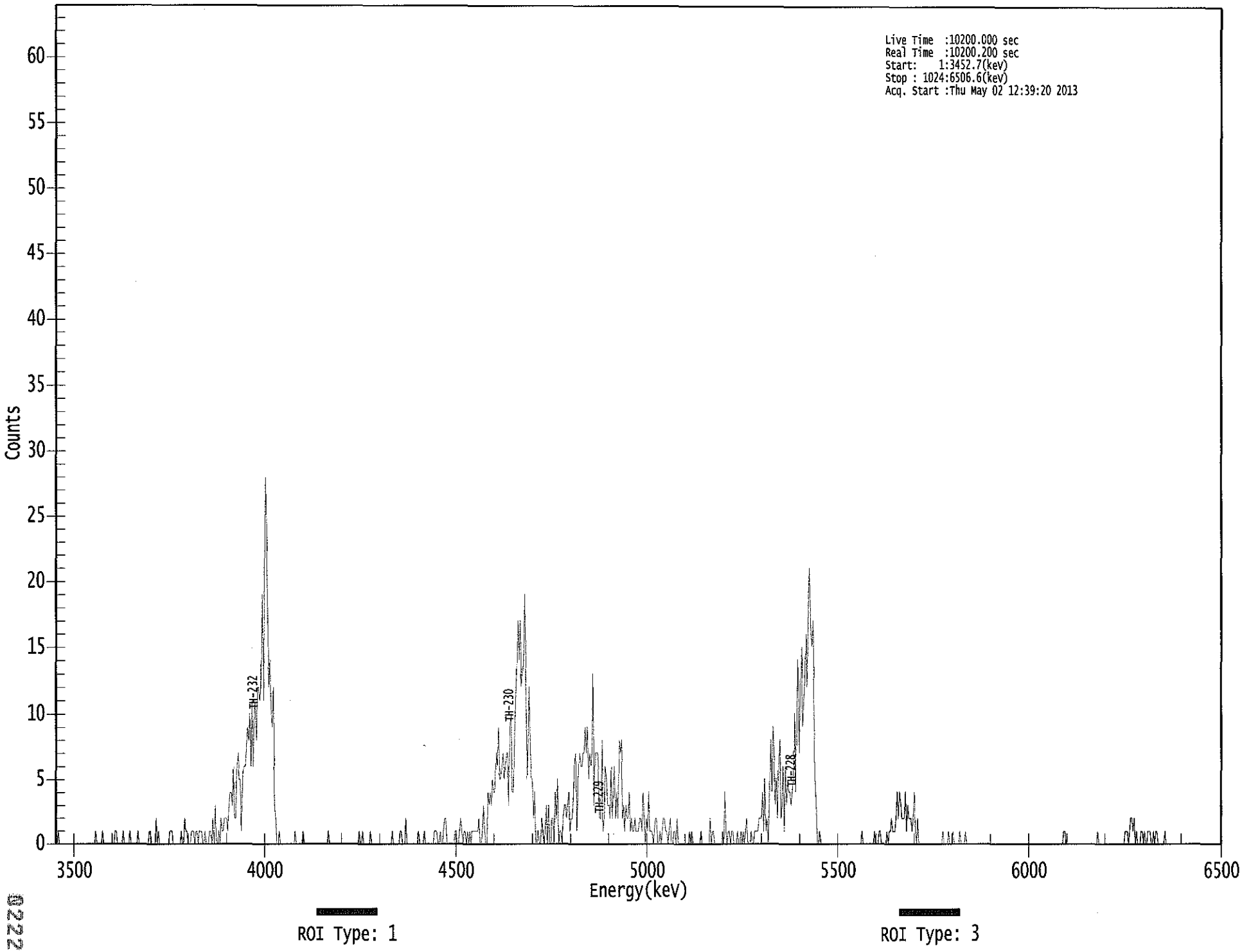
T = Tracer Peak used for Effective Efficiency

NUCLIDE ANALYSIS RESULTS

Nuclide	Id Conf.	Energy (keV)	Activity (pCi/liter)	MDA (pCi/liter)
TH-227	0.937	5850.00*	1.88E-001 +/- 1.08E-001	8.54E-002 +/- 1.04E-002
TH-228	0.998	5400.00*	5.33E+000 +/- 8.39E-001	6.66E-002 +/- 8.08E-003
TH-229	1.000	4872.00*	4.86E+000 +/- 5.91E-001	5.84E-002 +/- 7.09E-003
TH-230	0.995	4672.00*	5.03E+000 +/- 8.03E-001	8.35E-002 +/- 1.01E-002
TH-232	0.997	3997.00*	5.66E+000 +/- 8.81E-001	1.11E-001 +/- 1.35E-002

AG
5/3/13

0000056946.CNF



92222

****
***** 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	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	1	0	0	0	0
41:	0	1	0	0	0	0	0	0
49:	0	0	0	0	1	1	0	0
57:	0	0	0	1	0	0	0	0
65:	0	1	0	0	0	0	0	0
73:	1	0	0	0	0	0	0	0
81:	0	0	1	1	0	0	0	0
89:	2	0	1	0	0	0	0	0
97:	0	0	0	0	1	1	1	0
105:	0	0	0	0	0	0	1	0
113:	0	2	1	1	0	0	0	1
121:	1	1	0	1	1	0	1	1
129:	1	0	0	1	0	0	0	1
137:	1	0	2	0	3	0	0	1
145:	0	2	1	1	2	2	2	1
153:	3	4	4	3	6	2	2	6
161:	7	5	5	1	5	6	6	7
169:	9	8	10	6	11	6	10	11
177:	8	12	12	11	12	19	11	22
185:	28	23	16	12	14	10	9	12
193:	3	2	0	0	1	0	0	0
201:	0	0	0	0	0	0	0	0
209:	0	0	1	0	0	0	0	0
217:	0	1	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	1	0	0	1	0	0
273:	0	0	0	0	1	0	0	0
281:	0	0	0	0	0	0	0	0
289:	0	0	0	0	0	0	0	1
297:	0	0	0	0	0	0	1	1
305:	0	0	0	2	0	0	0	0
313:	0	0	0	0	0	0	1	0
321:	0	0	0	1	0	0	0	0
329:	0	0	0	0	1	1	1	0
337:	0	1	0	0	1	2	2	0
345:	0	0	0	0	0	0	1	1
353:	0	0	1	2	1	0	1	1
361:	0	1	0	1	0	1	1	1

369:	1	1	1	2	0	0	1	3

Sample Title: 01

Channel								
377:	1	0	0	4	3	4	3	5
385:	4	4	7	6	9	5	5	6
393:	7	5	6	7	7	3	9	10
401:	4	4	8	11	13	17	14	17
409:	12	13	14	19	14	5	8	12
417:	7	5	5	2	4	0	0	1
425:	0	0	2	1	0	1	3	0
433:	3	0	0	2	2	0	4	2
441:	5	0	1	1	0	2	3	3
449:	2	3	4	1	2	2	4	6
457:	7	1	5	7	6	6	7	7
465:	9	7	9	5	7	6	7	13
473:	3	7	7	7	5	2	2	8
481:	1	2	6	5	3	3	2	6
489:	2	4	6	2	4	2	8	7
497:	8	2	3	1	3	2	2	4
505:	1	2	1	1	2	1	1	1
513:	2	2	1	4	2	0	2	1
521:	4	1	1	1	0	1	2	2
529:	0	0	1	0	1	2	2	1
537:	1	0	1	2	0	0	1	1
545:	0	2	0	0	0	0	0	0
553:	0	0	0	0	1	0	1	0
561:	0	0	0	0	0	0	1	0
569:	0	0	0	0	0	0	2	0
577:	1	1	0	0	0	0	0	0
585:	0	1	0	4	1	0	1	1
593:	0	1	1	0	0	0	1	0
601:	0	1	0	1	0	1	2	0
609:	0	0	1	0	0	1	1	1
617:	1	2	2	2	4	1	5	1
625:	2	0	3	8	4	9	7	3
633:	5	2	6	8	2	3	6	1
641:	6	3	5	4	4	3	4	5
649:	10	4	10	14	7	12	15	9
657:	11	12	16	12	19	21	16	15
665:	17	10	5	3	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	1	0	0	0	0
713:	0	0	0	0	0	0	1	0
721:	0	0	1	1	0	0	0	0
729:	0	1	0	1	1	2	1	1
737:	1	2	4	2	4	3	2	2
745:	2	4	1	3	2	2	2	1
753:	2	4	1	0	2	0	0	0
761:	0	0	0	0	0	0	0	0
769:	0	0	0	0	0	0	0	0
777:	0	0	1	0	0	0	0	1
785:	0	0	0	1	0	0	0	0
793:	0	1	0	0	0	0	1	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	1	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	1	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	1	1	1	0	1	2
945:	2	1	2	0	1	0	0	0
953:	1	1	0	1	0	0	1	1
961:	1	0	0	1	0	1	1	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

Apex-Alpha™

Sample Description: BLANK
Spectrum File: \\OR-ALPHA1\Canberra\ApexAlpha\Root\Data\00000569
Batch Identification: 1304107A-TH
Sample Identification: 02
Sample Geometry: Shelf 2
Procedure Description: Th iso

Detector Name: Alpha_042
Chamber Serial Number: 05026930B
Detector Serial Number: 84185
Env. Background: System Bkgd 55754
Reagent Blank: <not performed>

Sample Size: 1.000E+000 +/- 0.000E+000 liter
Sample Date/Time: 5/2/2013 7:27:18 AM
Acquisition Date/Time: 5/2/2013 12:39:22 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: 0.1799 +/- 0.0151
Counting Efficiency: 0.1846 +/- 0.0032 on 12/16/2012 5:49:29 PM
Chem. Recovery Factor: 0.9745 +/- 0.0838

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		5.759	1.32	215.97	0.68	0.00E+000	3.0
TH-228		5.348	3.98	112.01	1.02	0.00E+000	3.0
TH-229	T	4.879	163.66	15.34	0.34	0.00E+000	13.4
TH-230		4.631	6.15	85.19	0.85	0.00E+000	3.0
TH-232		3.931	1.32	215.97	0.68	0.00E+000	3.0

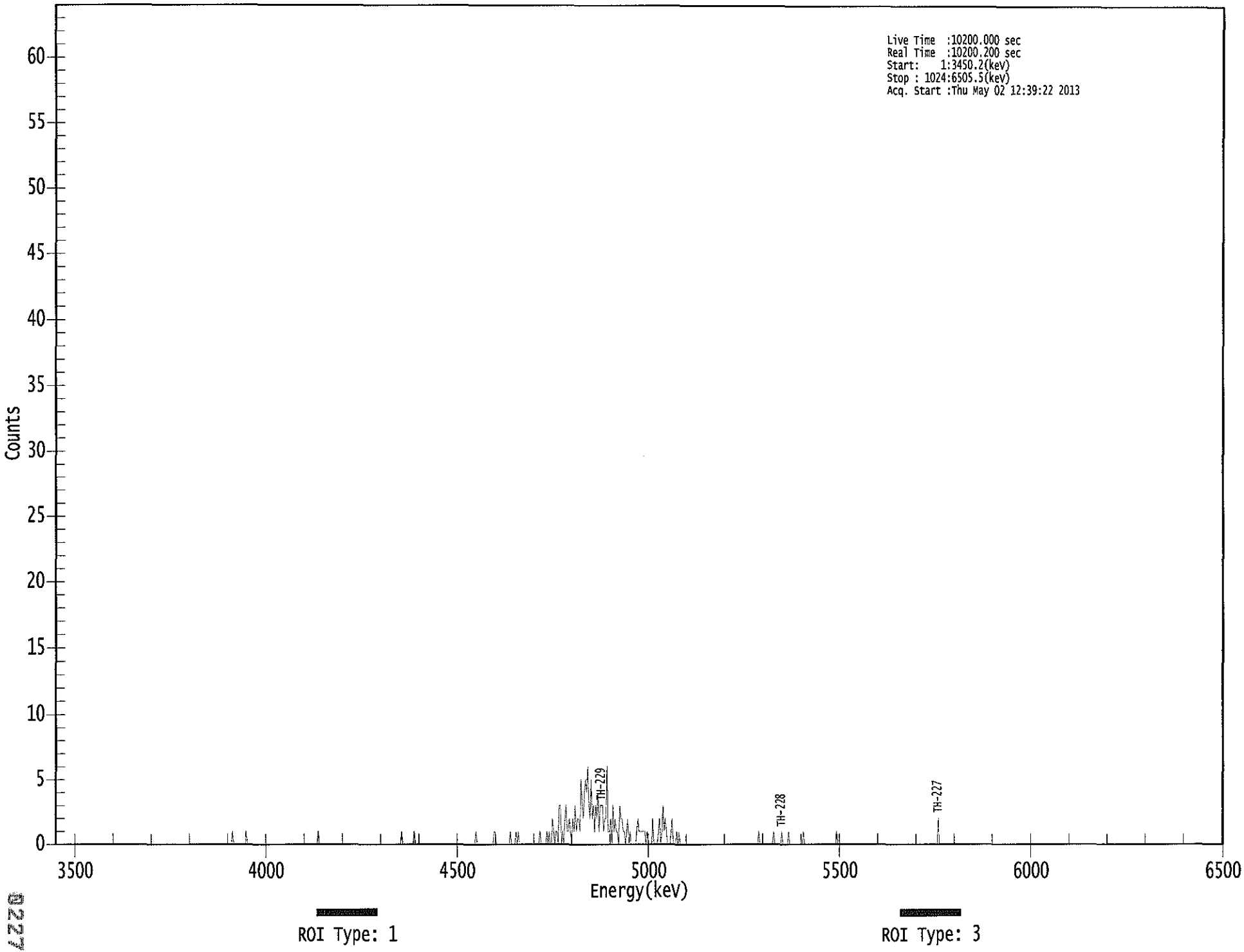
T = Tracer Peak used for Effective Efficiency

NUCLIDE ANALYSIS RESULTS

Nuclide	Id Conf.	Energy (keV)	Activity (pCi/liter)	MDA (pCi/liter)
TH-227	0.957	5850.00*	1.99E-002 +/- 4.32E-002	8.52E-002 +/- 1.41E-002
TH-228	0.986	5400.00*	5.87E-002 +/- 6.64E-002	9.29E-002 +/- 1.53E-002
TH-229	1.000	4872.00*	2.42E+000 +/- 4.00E-001	7.08E-002 +/- 1.17E-002
TH-230	0.991	4672.00*	9.07E-002 +/- 7.87E-002	8.83E-002 +/- 1.46E-002
TH-232	0.978	3997.00*	1.94E-002 +/- 4.21E-002	8.31E-002 +/- 1.37E-002

AG
5/3/13

0000056947.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	1	0	0	0	0
161:	0	0	0	0	0	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	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	1	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	1
305:	0	0	0	0	0	0	0	0
313:	0	0	1	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:	1	0	0	0	0	0	0	0

Sample Title: 02

Channel								
377:	0	0	0	0	0	0	0	0
385:	1	1	0	0	0	0	0	0
393:	0	0	0	0	0	0	1	0
401:	0	0	0	1	0	1	0	0
409:	0	0	0	0	0	0	0	0
417:	0	0	0	0	0	0	0	0
425:	1	0	0	0	0	0	1	0
433:	1	0	0	2	1	0	1	1
441:	0	3	3	0	1	0	2	3
449:	1	1	2	1	0	2	1	3
457:	1	2	2	1	5	3	2	4
465:	5	4	6	3	2	5	2	3
473:	1	3	2	4	1	3	3	3
481:	1	2	2	6	1	1	2	0
489:	3	1	2	1	1	0	3	2
497:	2	1	1	0	1	2	0	1
505:	0	0	0	0	0	1	2	1
513:	1	1	1	1	1	0	1	0
521:	0	0	0	2	0	0	0	0
529:	1	2	0	1	3	1	2	1
537:	0	0	0	1	2	0	0	0
545:	1	0	1	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:	1	0	0	0	0	0	0	0
625:	0	0	0	0	0	1	0	0
633:	0	0	0	0	1	0	0	0
641:	0	0	1	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	0	0
673:	0	0	0	0	0	0	0	0
681:	0	0	0	0	1	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	2	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:	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

Apex-Alpha™

c
TTM

Sample Description: FB AT D-3 TOT-DUP
Spectrum File: \\OR-ALPHA1\Canberra\ApexAlpha\Root\Data\00000569
Batch Identification: 1304107A-TH
Sample Identification: 03
Sample Geometry: Shelf 2
Procedure Description: Th iso

Detector Name: Alpha_044
Chamber Serial Number: 04026481B
Detector Serial Number: 84168
Env. Background: System Bkgd 55756
Reagent Blank: <not performed>

Sample Size: 1.000E+000 +/- 0.000E+000 liter
Sample Date/Time: 4/11/2013 7:27:18 AM
Acquisition Date/Time: 5/2/2013 12:39:17 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: 0.1654 +/- 0.0145
Counting Efficiency: 0.1902 +/- 0.0033 on 12/16/2012 5:49:26 PM
Chem. Recovery Factor: 0.8698 +/- 0.0778

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		5.874	-0.17	1169.4	0.17	0.00E+000	0.0
TH-228		5.298	0.83	239.53	0.17	0.00E+000	3.0
TH-229	T	4.878	148.83	16.08	0.17	0.00E+000	17.8
TH-230		4.679	4.83	91.00	0.17	0.00E+000	3.0
TH-232		3.893	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	0.997	5850.00*	-2.80E-003 +/- 3.27E-002	6.87E-002 +/- 1.18E-002
TH-228	0.947	5400.00*	1.36E-002 +/- 3.26E-002	6.83E-002 +/- 1.17E-002
TH-229	1.000	4872.00*	2.40E+000 +/- 4.12E-001	6.72E-002 +/- 1.15E-002
TH-230	1.000	4672.00*	7.75E-002 +/- 7.18E-002	6.70E-002 +/- 1.15E-002
TH-232	0.945	3997.00*	1.33E-002 +/- 3.19E-002	6.69E-002 +/- 1.15E-002

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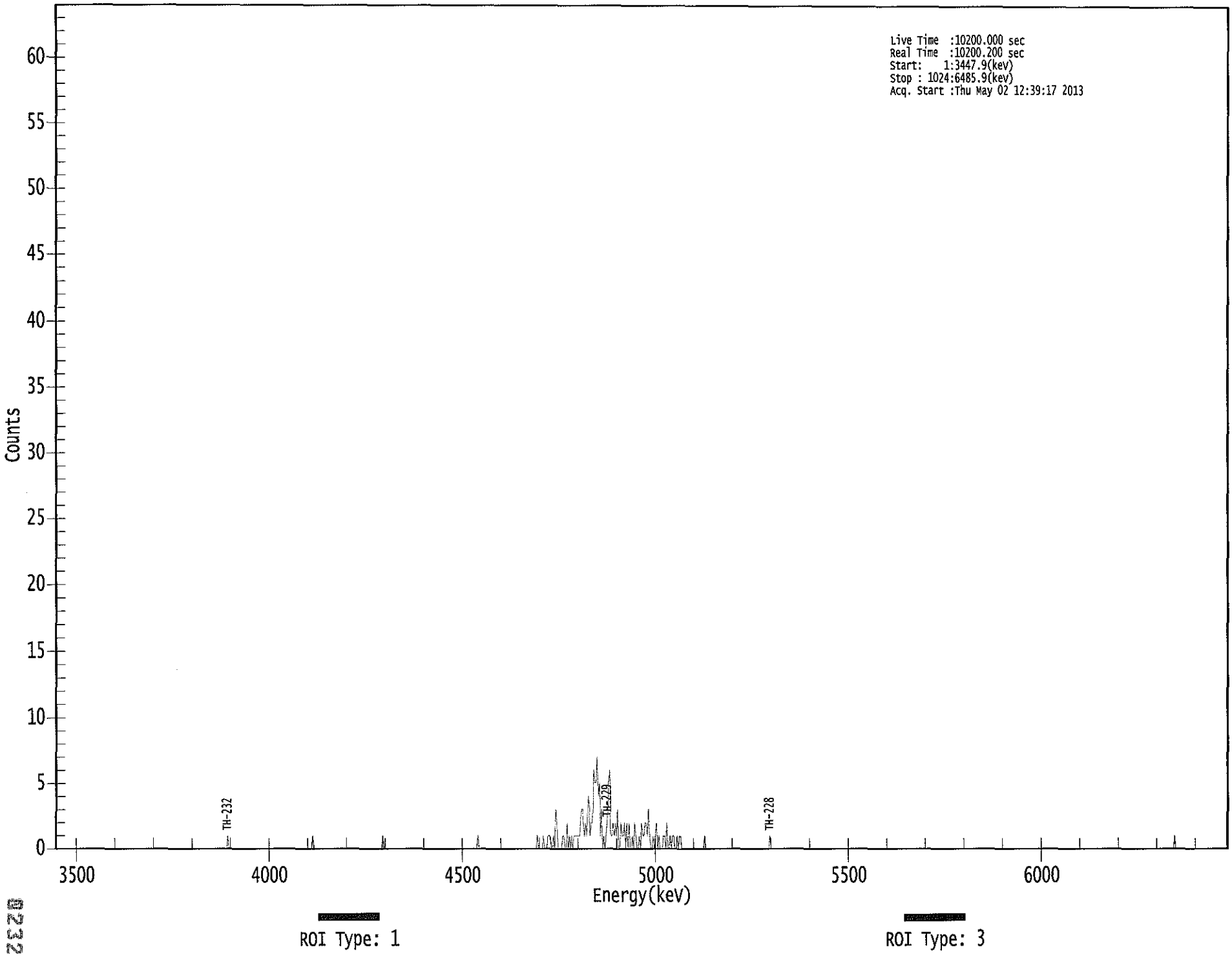
5/3/13

0000056948.CNF



22220

****
***** 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:	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	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	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:	1	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	1	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:	1	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	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	0	0
425:	0	1	0	0	0	1	1	1
433:	0	0	1	0	3	2	0	0
441:	0	0	1	1	0	0	2	0
449:	1	0	1	0	1	1	1	1
457:	1	1	3	3	2	1	2	1
465:	4	3	1	2	2	6	5	5
473:	7	4	5	1	3	0	1	0
481:	1	2	5	6	1	1	2	1
489:	2	1	3	0	0	2	1	1
497:	2	0	2	0	2	0	0	1
505:	0	2	1	0	0	1	0	2
513:	1	1	2	2	1	3	1	0
521:	0	1	0	1	2	0	1	0
529:	0	0	1	1	0	2	0	0
537:	1	0	1	1	0	0	1	0
545:	1	1	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	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	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	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: 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	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	0	0	0	0

Apex-Alpha™

C
5/07/13

Sample Description: PZ-113-AD TOT
Spectrum File: \\OR-ALPHA1\Canberra\ApexAlpha\Root\Data\00000569
Batch Identification: 1304107A-TH
Sample Identification: 04
Sample Geometry: Shelf 2
Procedure Description: Th iso

Detector Name: Alpha_046
Chamber Serial Number: 04026482B
Detector Serial Number: 58762
Env. Background: System Bkgd 55757
Reagent Blank: <not performed>

Sample Size: 1.000E+000 +/- 0.000E+000 liter
Sample Date/Time: 4/11/2013 7:27:18 AM
Acquisition Date/Time: 5/2/2013 12:39:19 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: 0.1760 +/- 0.0151
Counting Efficiency: 0.1789 +/- 0.0031 on 12/16/2012 5:49:23 PM
Chem. Recovery Factor: 0.9835 +/- 0.0862

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		5.773	5.00	96.02	0.00	0.00E+000	3.0
TH-228		5.352	8.00	73.50	0.00	0.00E+000	3.0
TH-229	T	4.881	157.00	15.69	0.00	0.00E+000	6.2
TH-230		4.580	9.00	68.87	0.00	0.00E+000	3.0
TH-232		3.870	3.83	102.72	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	0.970	5850.00*	7.74E-002 +/- 7.54E-002	9.28E-002 +/- 1.56E-002
TH-228	0.988	5400.00*	1.23E-001 +/- 9.28E-002	9.23E-002 +/- 1.55E-002
TH-229	1.000	4872.00*	2.38E+000 +/- 4.00E-001	9.07E-002 +/- 1.53E-002
TH-230	0.957	4672.00*	1.36E-001 +/- 9.62E-002	9.04E-002 +/- 1.52E-002
TH-232	0.920	3997.00*	5.77E-002 +/- 6.00E-002	6.28E-002 +/- 1.06E-002

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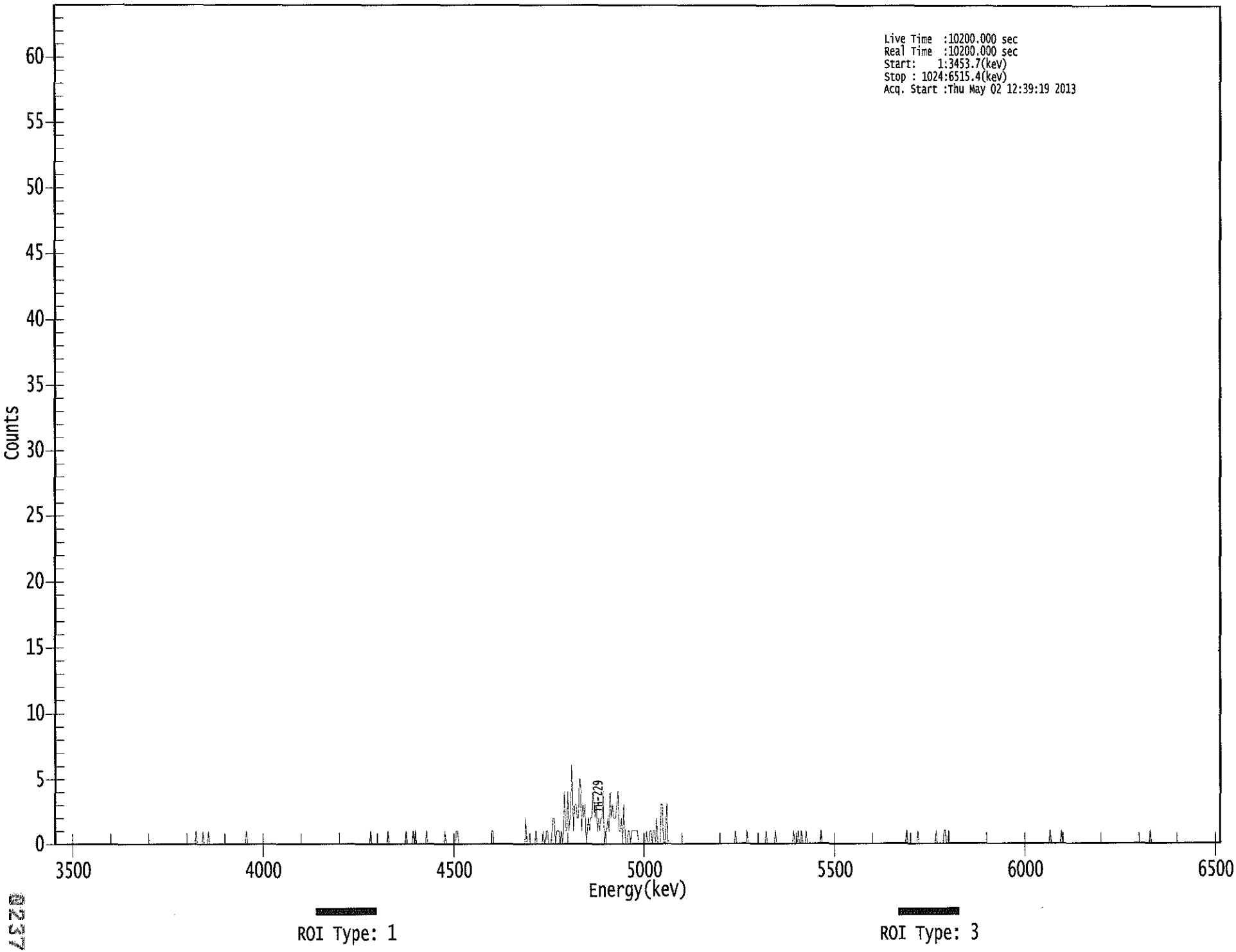
5/3/13

0000056945.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:	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	1	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	0	0
153:	0	0	0	0	0	0	0	0
161:	0	0	0	0	0	0	0	0
169:	1	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	1	0	0
281:	0	0	0	0	0	0	0	0
289:	0	0	0	0	1	0	0	0
297:	0	0	0	0	0	0	0	0
305:	0	0	0	0	1	0	0	0
313:	0	0	1	0	1	0	0	0
321:	0	0	0	0	0	0	1	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:	1	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: 04

Channel								
377:	0	0	0	0	0	0	0	1
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	2	0	0
417:	0	0	0	0	0	0	1	0
425:	0	0	0	0	1	0	0	1
433:	1	0	0	0	1	2	2	0
441:	1	1	1	0	1	0	1	4
449:	1	1	4	1	2	6	4	1
457:	3	3	2	2	5	4	1	3
465:	2	3	0	1	2	1	2	2
473:	4	3	2	3	1	2	1	2
481:	2	4	0	1	1	2	1	4
489:	2	3	2	2	2	3	4	1
497:	1	2	0	3	1	0	0	1
505:	1	0	1	1	1	1	1	1
513:	0	0	0	0	0	0	0	1
521:	0	0	1	1	0	1	1	0
529:	2	0	0	0	3	3	0	0
537:	1	3	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	1	0	0
601:	0	0	0	0	0	0	0	1
609:	0	0	0	0	0	0	0	0
617:	0	0	0	0	0	0	0	0
625:	1	0	0	0	0	0	0	0
633:	1	0	0	0	0	0	0	0
641:	0	0	0	0	0	0	0	0
649:	1	0	0	0	1	0	0	1
657:	0	0	0	1	0	0	0	0
665:	0	0	0	0	0	0	0	0
673:	1	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	1	0	0
761:	0	0	0	0	0	0	0	0
769:	0	0	0	0	0	1	0	0
777:	0	0	0	0	1	1	0	0
785:	1	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	1	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	1	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

Apex-Alpha™

Sample Description: PZ-113-AD DIS
Spectrum File: \\OR-ALPHA1\Canberra\ApexAlpha\Root\Data\00000569
Batch Identification: 1304107A-TH
Sample Identification: 05
Sample Geometry: Shelf 2
Procedure Description: Th iso

Detector Name: Alpha_047
Chamber Serial Number: 02030596A
Detector Serial Number: 91086
Env. Background: System Bkgd 55758
Reagent Blank: <not performed>

Sample Size: 1.000E+000 +/- 0.000E+000 liter
Sample Date/Time: 4/11/2013 7:27:18 AM
Acquisition Date/Time: 5/2/2013 12:39:13 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: 0.2065 +/- 0.0165
Counting Efficiency: 0.1822 +/- 0.0032 on 12/16/2012 5:49:21 PM
Chem. Recovery Factor: 1.1334 +/- 0.0927

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		5.962	0.32	646.93	0.68	0.00E+000	2.9
TH-228		5.392	3.32	119.77	0.68	0.00E+000	2.9
TH-229	T	4.865	184.83	14.42	0.17	0.00E+000	4.7
TH-230		4.668	9.32	66.89	0.68	0.00E+000	2.9
TH-232		3.905	0.83	239.53	0.17	0.00E+000	2.9

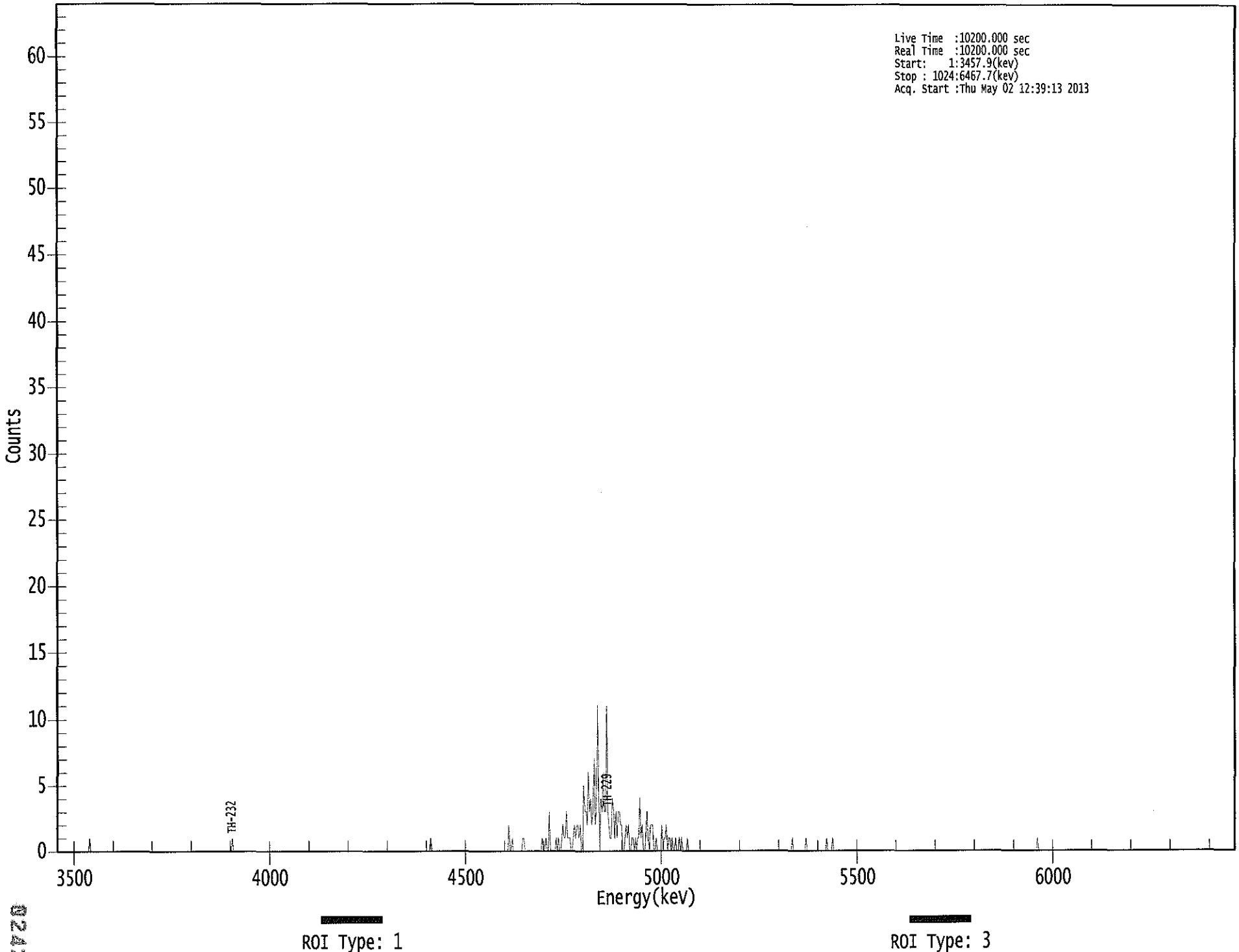
T = Tracer Peak used for Effective Efficiency

NUCLIDE ANALYSIS RESULTS

Nuclide	Id Conf.	Energy (keV)	Activity (pCi/liter)	MDA (pCi/liter)
TH-227	0.937	5850.00*	4.22E-003 +/- 2.73E-002	7.44E-002 +/- 1.16E-002
TH-228	1.000	5400.00*	4.35E-002 +/- 5.26E-002	7.40E-002 +/- 1.16E-002
TH-229	1.000	4872.00*	2.38E+000 +/- 3.73E-001	5.38E-002 +/- 8.42E-003
TH-230	1.000	4672.00*	1.20E-001 +/- 8.23E-002	7.25E-002 +/- 1.14E-002
TH-232	0.957	3997.00*	1.07E-002 +/- 2.56E-002	5.36E-002 +/- 8.38E-003

AG
5/3/13

0000056949.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:	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	1	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:	1	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	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	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:	2	0	0	1	0	0	0	0
401:	0	0	0	0	1	1	0	0
409:	0	0	0	0	0	0	0	0
417:	0	0	0	0	0	1	0	0
425:	1	0	0	3	0	0	0	0
433:	0	1	0	1	0	0	1	2
441:	1	1	3	1	1	1	0	0
449:	1	2	1	2	2	1	2	0
457:	0	5	3	3	2	6	3	4
465:	2	3	7	2	3	11	5	0
473:	4	3	6	3	3	11	3	2
481:	1	1	4	3	1	3	1	3
489:	3	2	2	0	0	1	2	1
497:	2	0	0	1	1	0	1	0
505:	1	1	4	1	2	0	0	1
513:	3	1	0	2	2	2	0	0
521:	1	0	0	0	0	2	0	1
529:	1	2	0	1	1	0	1	0
537:	0	1	0	0	1	0	1	0
545:	0	0	0	1	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	1	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	1	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: 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	1	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

Apex-Alpha™

Sample Description: FB AT D-3 TOT
Spectrum File: \\OR-ALPHA1\Canberra\ApexAlpha\Root\Data\00000570
Batch Identification: 1304107A-TH
Sample Identification: 06
Sample Geometry: Shelf 2
Procedure Description: Th iso

Detector Name: Alpha_048
Chamber Serial Number: 02030596B
Detector Serial Number: 83111
Env. Background: System Bkgd 55759
Reagent Blank: <not performed>

Sample Size: 1.000E+000 +/- 0.000E+000 liter
Sample Date/Time: 4/11/2013 7:27:18 AM
Acquisition Date/Time: 5/2/2013 12:39:15 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: 0.1395 +/- 0.0132
Counting Efficiency: 0.1680 +/- 0.0030 on 12/16/2012 5:49:20 PM
Chem. Recovery Factor: 0.8304 +/- 0.0802

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		5.806	3.00	130.67	0.00	0.00E+000	3.0
TH-228		5.298	-0.85	246.69	0.85	0.00E+000	0.0
TH-229	T	4.872	124.66	17.58	0.34	0.00E+000	4.0
TH-230		4.647	6.00	86.43	0.00	0.00E+000	3.0
TH-232		3.964	0.00	1960.0	0.00	0.00E+000	0.0

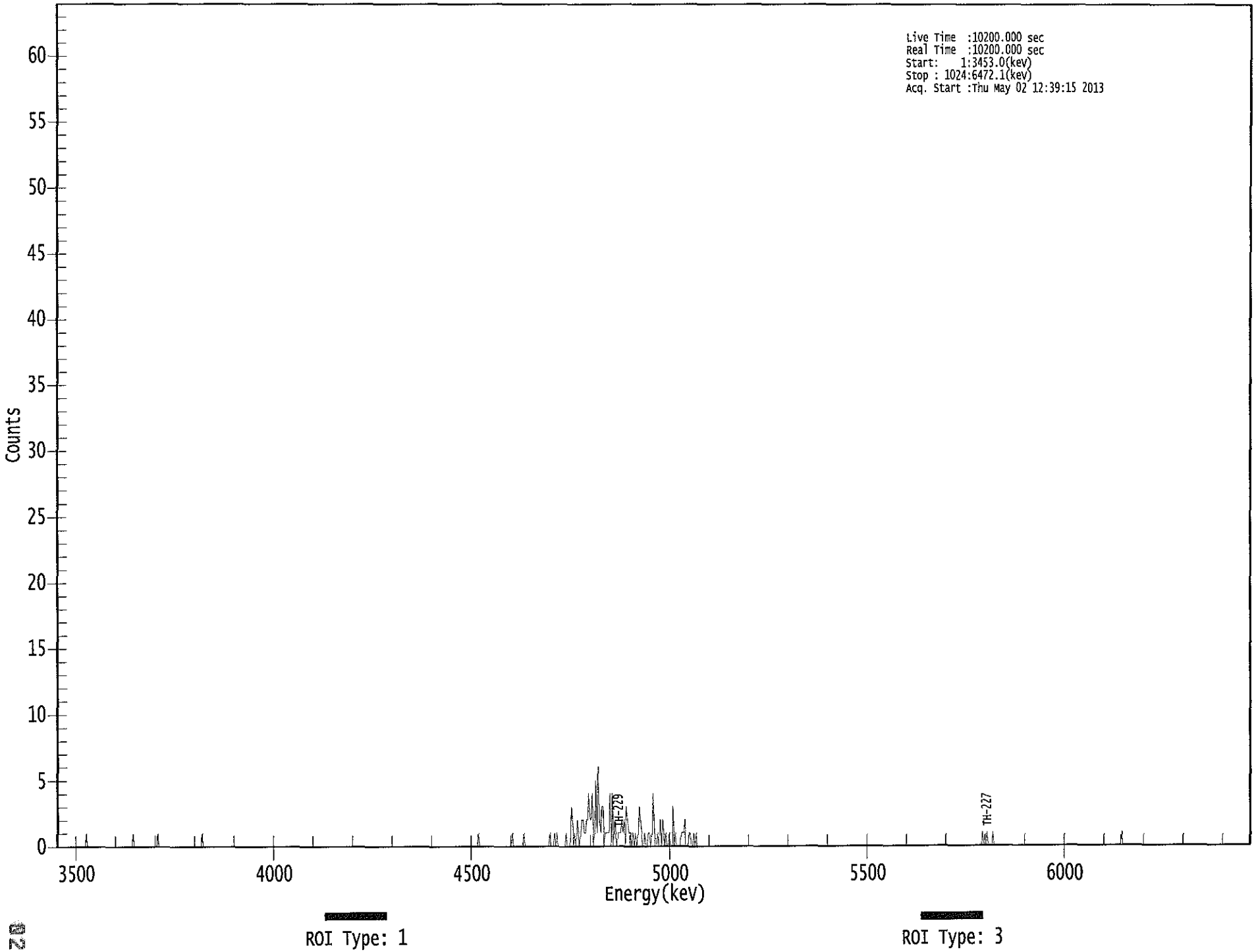
T = Tracer Peak used for Effective Efficiency

NUCLIDE ANALYSIS RESULTS

Nuclide	Id Conf.	Energy (keV)	Activity (pCi/liter)	MDA (pCi/liter)
TH-227	0.990	5850.00*	5.86E-002 +/- 7.73E-002	1.17E-001 +/- 2.18E-002
TH-228	0.947	5400.00*	-1.65E-002 +/- 4.08E-002	1.16E-001 +/- 2.16E-002
TH-229	1.000	4872.00*	2.38E+000 +/- 4.43E-001	9.13E-002 +/- 1.70E-002
TH-230	0.997	4672.00*	1.14E-001 +/- 1.01E-001	1.14E-001 +/- 2.12E-002
TH-232	0.994	3997.00*	0.00E+000 +/- 5.27E-002	1.14E-001 +/- 2.12E-002

MG
5/3/13

0000057016.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	0	0	0	0	0	0	0
17:	0	0	0	0	0	0	0	0
25:	0	1	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	1	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	1	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	1	0	0	0	0	0	0

369:	0	0	0	0	0	0	0	0

Sample Title: 06

Channel								
377:	0	0	0	0	0	0	0	0
385:	0	0	0	0	0	0	1	0
393:	0	0	0	0	0	0	0	0
401:	1	0	0	0	0	0	0	0
409:	0	0	0	0	0	0	0	0
417:	0	0	0	0	0	0	1	0
425:	0	0	1	0	1	0	0	0
433:	0	0	0	0	1	0	0	0
441:	3	2	0	1	0	2	1	0
449:	1	2	2	1	1	2	2	4
457:	2	2	4	0	1	5	1	6
465:	2	1	3	3	0	1	1	1
473:	1	4	0	4	0	2	1	0
481:	1	1	1	2	1	2	0	3
489:	2	1	1	1	0	1	0	1
497:	0	1	3	2	1	0	0	1
505:	0	0	1	1	0	1	4	1
513:	0	0	1	0	2	0	2	1
521:	0	1	0	0	1	0	0	3
529:	0	1	0	0	0	0	1	1
537:	1	2	0	0	0	1	1	0
545:	0	1	0	1	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	1	0	0	0	1	0	0

801:	0	0	1	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	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	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™

5/10/13

Sample Description: FB AT D-3 DIS
Spectrum File: \\OR-ALPHA1\Canberra\ApexAlpha\Root\Data\00000569
Batch Identification: 1304107A-TH
Sample Identification: 07
Sample Geometry: Shelf 2
Procedure Description: Th iso

Detector Name: Alpha_003
Chamber Serial Number:
Detector Serial Number: 3
Env. Background: System Bkgd 55734
Reagent Blank: <not performed>

Sample Size: 1.000E+000 +/- 0.000E+000 liter
Sample Date/Time: 4/11/2013 7:27:18 AM
Acquisition Date/Time: 5/2/2013 4:29:32 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: 0.2337 +/- 0.0178
Counting Efficiency: 0.1746 +/- 0.0033 on 12/15/2012 11:26:47 AM
Chem. Recovery Factor: 1.3382 +/- 0.1049

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		5.818	3.79	130.59	2.21	0.00E+000	3.0
TH-228		5.308	0.94	443.43	3.06	0.00E+000	3.0
TH-229	T	4.882	207.98	13.63	1.02	0.00E+000	4.0
TH-230		4.616	8.64	72.56	1.36	0.00E+000	3.0
TH-232		4.077	-0.19	1130.5	1.19	0.00E+000	3.0

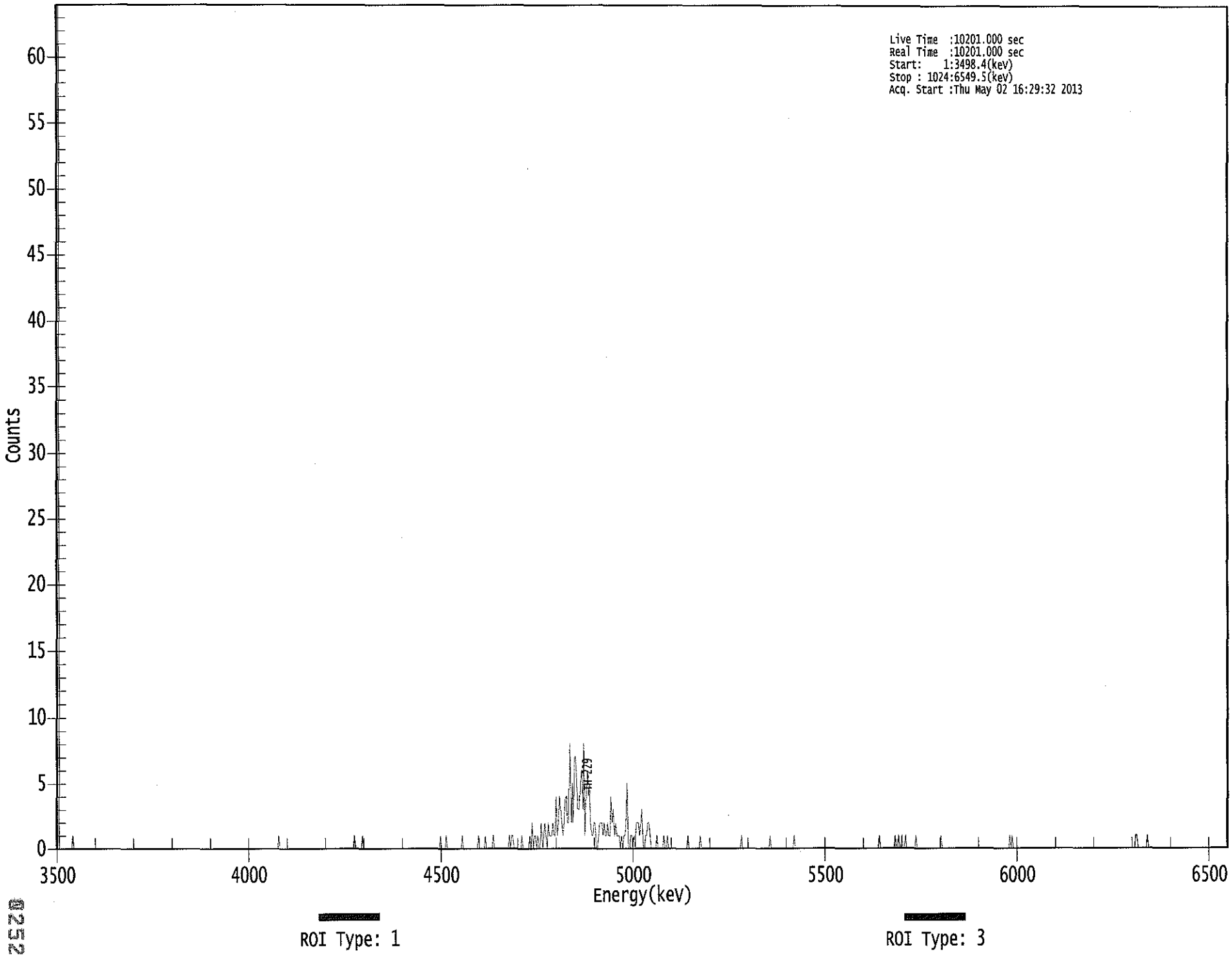
T = Tracer Peak used for Effective Efficiency

NUCLIDE ANALYSIS RESULTS

Nuclide	Id Conf.	Energy (keV)	Activity (pCi/liter)	MDA (pCi/liter)
TH-227	0.995	5850.00*	4.41E-002 +/- 5.80E-002	9.32E-002 +/- 1.39E-002
TH-228	0.957	5400.00*	1.09E-002 +/- 4.83E-002	1.03E-001 +/- 1.54E-002
TH-229	0.999	4872.00*	2.37E+000 +/- 3.54E-001	7.18E-002 +/- 1.07E-002
TH-230	0.984	4672.00*	9.81E-002 +/- 7.27E-002	7.79E-002 +/- 1.16E-002
TH-232	0.967	3997.00*	-2.16E-003 +/- 2.44E-002	7.47E-002 +/- 1.11E-002

AG
5/3/13

0000056955.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	1	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	1	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	1	0	0	0
265:	0	0	0	1	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	1
337:	0	0	0	0	1	0	0	0
345:	0	0	0	0	0	0	0	0
353:	0	0	1	0	0	0	0	0
361:	0	0	0	0	0	0	0	0

369:	1	0	0	0	0	0	1	0

Sample Title: 07

Channel								
377:	0	0	0	0	0	1	0	0
385:	0	0	0	0	0	0	0	0
393:	0	0	0	1	0	1	1	0
401:	0	0	0	0	0	0	1	0
409:	0	0	0	0	0	1	0	2
417:	0	1	1	0	1	0	0	2
425:	0	1	2	1	0	2	1	1
433:	1	2	1	1	4	1	2	4
441:	3	2	1	2	4	4	2	2
449:	8	2	5	2	7	7	4	3
457:	3	5	6	3	8	1	4	6
465:	4	5	2	1	1	2	2	0
473:	0	1	2	2	2	1	2	1
481:	1	2	1	1	4	2	3	1
489:	2	1	1	1	0	1	0	1
497:	1	2	5	0	0	1	1	0
505:	1	0	2	2	2	1	2	3
513:	0	0	1	1	2	2	1	0
521:	0	0	0	0	1	0	0	0
529:	0	0	1	0	0	1	0	0
537:	0	0	0	0	0	0	0	0
545:	0	0	0	0	0	0	0	1
553:	0	0	0	0	0	0	0	0
561:	0	0	1	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	1	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	1
625:	0	0	0	0	0	0	0	0
633:	0	0	0	0	0	0	0	0
641:	0	0	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	1	0
721:	0	0	0	0	0	0	0	0
729:	0	0	0	0	1	0	0	1
737:	0	0	1	0	0	1	0	0
745:	0	0	0	0	0	0	1	0
753:	0	0	0	0	0	0	0	0
761:	0	0	0	0	0	0	0	0
769:	0	0	0	0	1	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:	1	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	0	0	0
929:	0	0	0	0	0	0	0	0
937:	0	0	0	0	0	0	1	1
945:	0	0	0	0	0	0	0	0
953:	1	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

Apex-Alpha™

Sample Description: D-3 TOT
Spectrum File: \\OR-ALPHA1\Canberra\ApexAlpha\Root\Data\00000569
Batch Identification: 1304107A-TH
Sample Identification: 08
Sample Geometry: Shelf 2
Procedure Description: Th iso

Detector Name: Alpha_004
Chamber Serial Number:
Detector Serial Number: 4
Env. Background: System Bkgd 55735
Reagent Blank: <not performed>

Sample Size: 1.000E+000 +/- 0.000E+000 liter
Sample Date/Time: 4/11/2013 7:27:18 AM
Acquisition Date/Time: 5/2/2013 4:29:34 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: 0.2171 +/- 0.0170
Counting Efficiency: 0.1940 +/- 0.0036 on 12/15/2012 11:26:46 AM
Chem. Recovery Factor: 1.1192 +/- 0.0901

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		5.859	2.62	173.91	2.38	0.00E+000	2.9
TH-228		5.391	5.77	104.97	3.23	0.00E+000	2.9
TH-229	T	4.876	193.98	14.12	1.02	0.00E+000	7.5
TH-230		4.636	14.15	53.90	0.85	0.00E+000	2.9
TH-232		3.941	0.49	416.97	0.51	0.00E+000	2.9

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*	3.29E-002 +/- 5.74E-002	1.03E-001 +/- 1.58E-002
TH-228	1.000	5400.00*	7.20E-002 +/- 7.63E-002	1.14E-001 +/- 1.74E-002
TH-229	1.000	4872.00*	2.38E+000 +/- 3.66E-001	7.72E-002 +/- 1.19E-002
TH-230	0.993	4672.00*	1.73E-001 +/- 9.70E-002	7.32E-002 +/- 1.12E-002
TH-232	0.984	3997.00*	5.98E-003 +/- 2.49E-002	6.40E-002 +/- 9.84E-003

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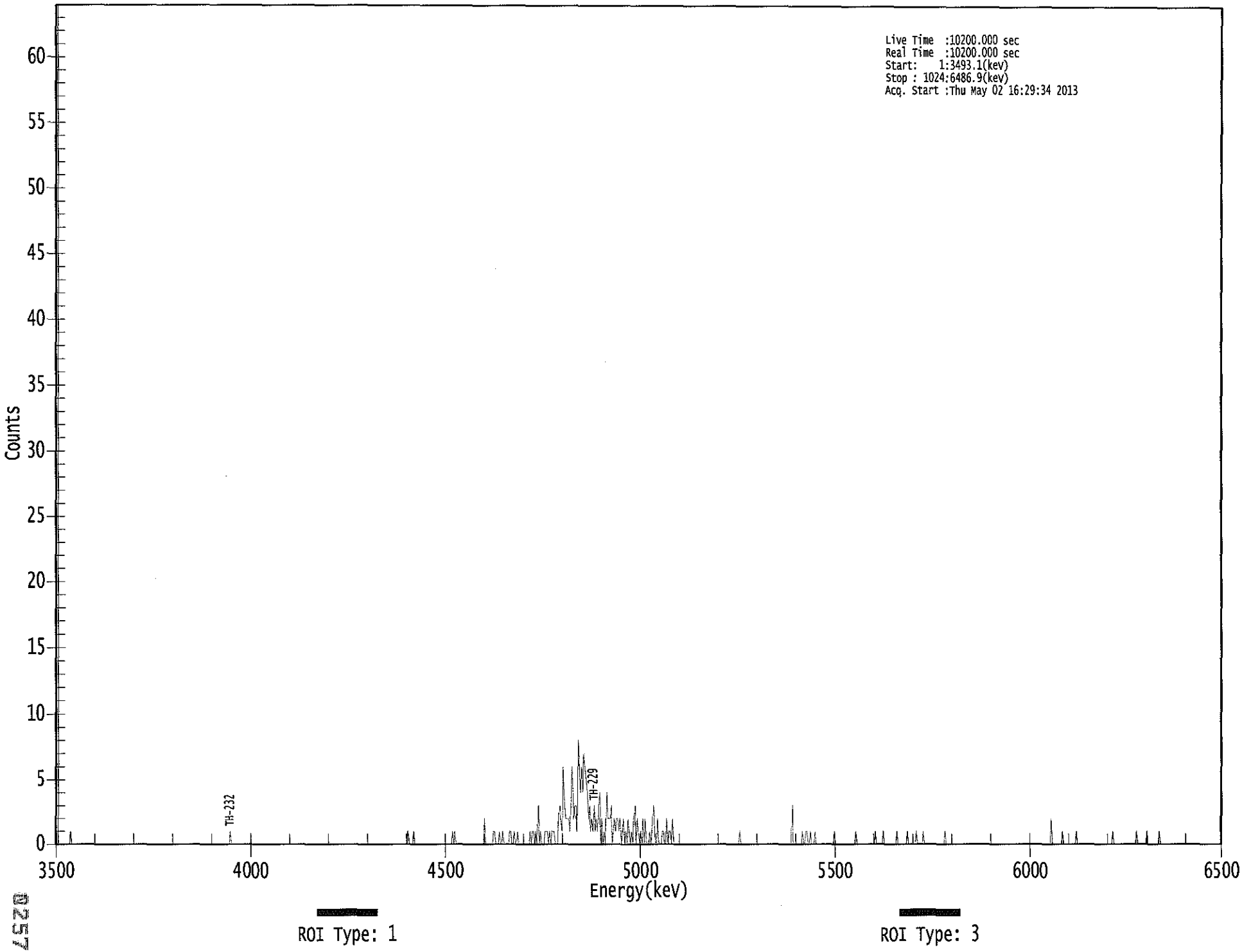
5/8/13

0000056956.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: 10200

Channel								
1:	10200	10200	0	0	0	0	0	0
9:	0	0	0	0	0	1	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	1	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	1	0	0
313:	0	0	1	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	1	0	1	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:	2	0	0	0	0	0	0	0
385:	1	1	0	0	0	1	0	0
393:	1	0	0	0	0	0	1	1
401:	0	0	1	0	0	1	0	0
409:	0	0	0	0	0	0	0	0
417:	1	0	1	1	0	1	0	3
425:	0	1	0	0	0	1	1	1
433:	0	1	0	1	1	1	0	0
441:	0	2	3	2	1	6	3	2
449:	2	2	2	1	4	6	2	3
457:	3	1	8	6	4	6	4	7
465:	6	5	4	2	3	1	2	1
473:	3	1	2	1	3	4	0	2
481:	0	1	0	4	2	2	2	3
489:	0	1	2	1	2	2	1	2
497:	0	1	2	0	1	0	2	1
505:	0	1	0	2	3	0	2	1
513:	0	1	0	2	0	2	0	0
521:	0	1	0	1	3	2	0	0
529:	2	0	0	0	1	1	0	0
537:	2	0	1	1	0	2	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	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	3	0
649:	0	0	0	0	0	0	0	1
657:	0	0	1	1	0	0	1	0
665:	0	0	1	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	1	0
705:	0	0	0	0	0	0	0	0
713:	0	0	0	0	0	0	0	1
721:	0	0	0	0	0	0	1	0
729:	0	0	0	0	0	0	0	0
737:	0	0	1	0	0	0	0	0
745:	0	0	0	1	0	0	0	0
753:	0	0	0	1	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	1	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	2	0	0	0	0	0	0
881:	0	0	0	1	0	0	0	0
889:	0	0	0	0	0	0	0	1
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	1
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	1	0	0
961:	0	0	0	0	0	0	0	0
969:	1	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

Apex-Alpha™

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5/10/13

Sample Description: D-3 DIS
Spectrum File: \\OR-ALPHA1\Canberra\ApexAlpha\Root\Data\00000569
Batch Identification: 1304107A-TH
Sample Identification: 09
Sample Geometry: Shelf 2
Procedure Description: Th iso

Detector Name: Alpha_010
Chamber Serial Number:
Detector Serial Number: 10
Env. Background: System Bkgd 55736
Reagent Blank: <not performed>

Sample Size: 1.000E+000 +/- 0.000E+000 liter
Sample Date/Time: 4/11/2013 7:27:18 AM
Acquisition Date/Time: 5/2/2013 4:29:28 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: 0.2176 +/- 0.0171
Counting Efficiency: 0.1967 +/- 0.0036 on 12/15/2012 11:26:40 AM
Chem. Recovery Factor: 1.1062 +/- 0.0891

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		5.818	5.11	111.77	2.89	0.00E+000	2.9
TH-228		5.387	0.92	508.31	4.08	0.00E+000	2.9
TH-229	T	4.869	194.30	14.13	1.70	0.00E+000	4.6
TH-230		4.603	13.64	56.08	1.36	0.00E+000	2.9
TH-232		3.974	3.81	117.33	1.19	0.00E+000	2.9

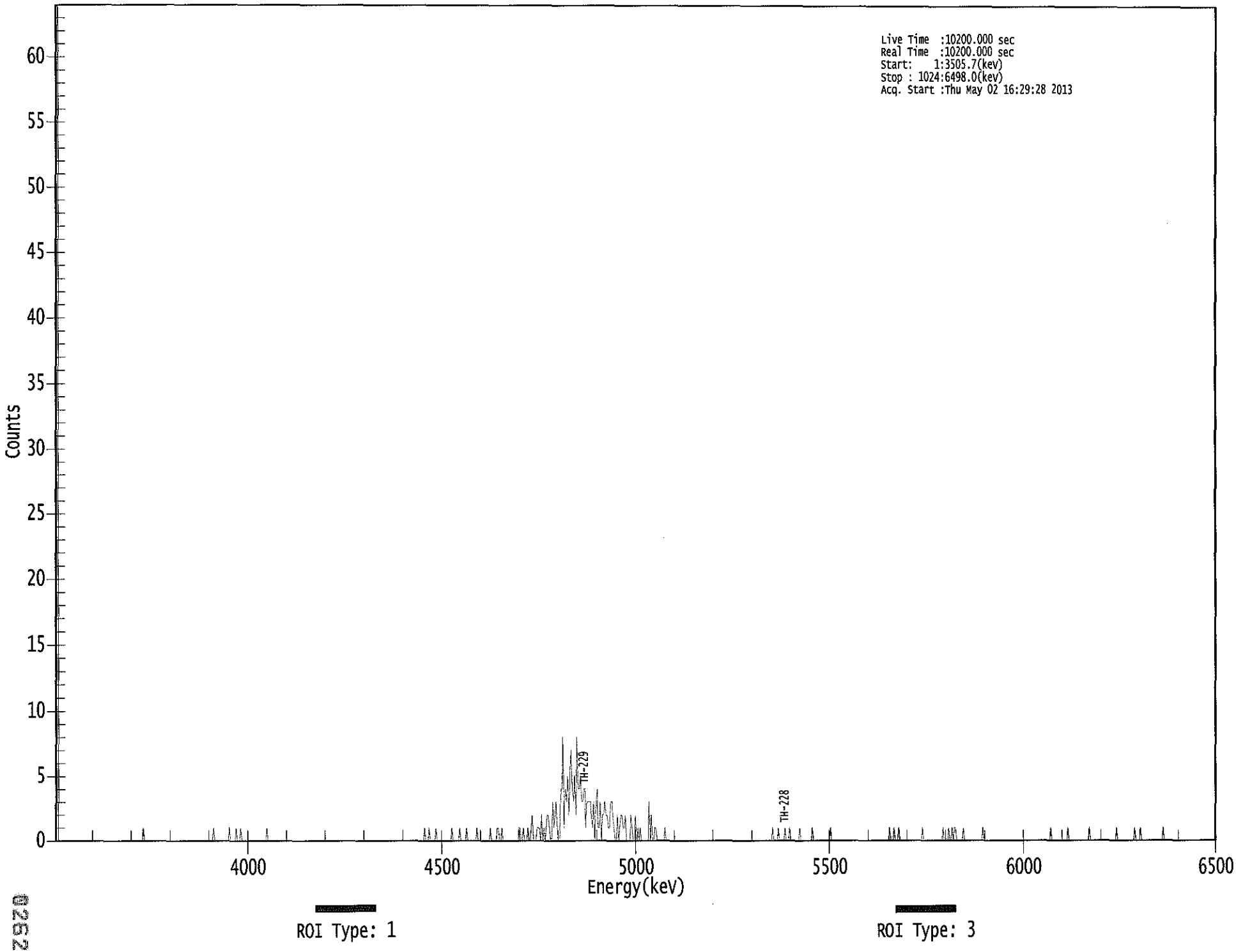
T = Tracer Peak used for Effective Efficiency

NUCLIDE ANALYSIS RESULTS

Nuclide	Id Conf.	Energy (keV)	Activity (pCi/liter)	MDA (pCi/liter)
TH-227	0.995	5850.00*	6.39E-002 +/- 7.21E-002	1.10E-001 +/- 1.69E-002
TH-228	0.999	5400.00*	1.15E-002 +/- 5.82E-002	1.23E-001 +/- 1.89E-002
TH-229	1.000	4872.00*	2.38E+000 +/- 3.66E-001	8.99E-002 +/- 1.38E-002
TH-230	0.975	4672.00*	1.66E-001 +/- 9.68E-002	8.36E-002 +/- 1.29E-002
TH-232	0.997	3997.00*	4.64E-002 +/- 5.49E-002	8.02E-002 +/- 1.23E-002

AG
5/3/13

0000056951.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	1	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	1	0	0	0	0
145:	0	0	0	0	0	0	0	0
153:	0	1	0	0	0	0	0	1
161:	0	0	0	1	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	1	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	1	0	0
329:	0	1	0	0	0	0	0	1
337:	0	0	0	0	0	0	0	0
345:	0	0	0	0	0	1	0	0
353:	0	0	0	0	1	0	0	0
361:	0	0	1	0	0	0	0	0

369:	0	0	0	1	0	0	0	0

Sample Title: 09

Channel								
377:	0	0	0	0	0	0	0	1
385:	0	0	0	0	0	1	1	0
393:	0	1	0	0	0	0	0	0
401:	0	0	0	0	0	0	0	0
409:	1	1	0	0	1	0	0	0
417:	1	0	0	1	2	0	0	0
425:	1	1	1	0	2	0	1	0
433:	1	2	2	1	0	0	3	1
441:	2	3	1	0	0	4	4	8
449:	1	4	3	5	2	5	7	4
457:	3	5	2	8	4	4	5	3
465:	3	4	4	1	3	3	3	3
473:	2	1	3	0	3	4	1	1
481:	3	0	2	2	3	2	2	1
489:	1	3	3	2	1	0	0	2
497:	0	1	2	2	1	1	2	0
505:	0	0	0	2	1	0	0	2
513:	0	1	0	1	0	0	0	0
521:	0	0	0	3	0	2	0	0
529:	1	1	0	0	0	0	0	0
537:	0	1	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:	1	0	0	0	0	1	0	0
641:	0	0	0	1	0	0	0	1
649:	0	0	0	0	0	0	0	0
657:	1	0	0	0	0	0	0	0
665:	0	0	0	1	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	1
737:	0	0	0	1	0	0	0	1
745:	0	0	0	0	0	0	0	0
753:	0	0	0	0	0	0	0	0
761:	0	0	0	0	1	0	0	0
769:	0	0	0	0	0	0	0	0
777:	0	0	0	0	0	0	1	0
785:	0	0	0	1	0	0	1	0
793:	1	1	0	0	0	0	0	0

801:	1	0	0	0	0	0	0	0

Sample Title: 09

Channel								
809:	0	0	0	0	0	0	0	0
817:	0	1	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	1	0	0
881:	0	0	0	0	0	0	0	0
889:	0	0	0	0	1	0	0	0
897:	0	0	0	0	0	0	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	0	0	0	0	1
937:	0	0	0	0	0	0	0	0
945:	0	0	0	0	0	0	0	1
953:	0	0	0	0	1	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	0	0	0	0

Apex-Alpha™

C
5/10/13

Sample Description: D-85 TOT
Spectrum File: \\OR-ALPHA1\Canberra\ApexAlpha\Root\Data\00000569
Batch Identification: 1304107A-TH
Sample Identification: 10
Sample Geometry: Shelf 2
Procedure Description: Th iso

Detector Name: Alpha_011
Chamber Serial Number:
Detector Serial Number: 11
Env. Background: System Bkgd 55737
Reagent Blank: <not performed>

Sample Size: 1.000E+000 +/- 0.000E+000 liter
Sample Date/Time: 4/11/2013 7:27:18 AM
Acquisition Date/Time: 5/2/2013 4:29:29 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: 0.2096 +/- 0.0167
Counting Efficiency: 0.1973 +/- 0.0042 on 12/15/2012 11:28:06 AM
Chem. Recovery Factor: 1.0624 +/- 0.0877

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		5.887	11.13	64.27	1.87	0.00E+000	2.7
TH-228		5.376	243.96	12.61	2.04	0.00E+000	6.9
TH-229	T	4.890	186.47	14.42	1.53	0.00E+000	7.3
TH-230		4.638	458.66	9.16	0.34	0.00E+000	7.1
TH-232		3.966	220.49	13.22	0.51	0.00E+000	3.9

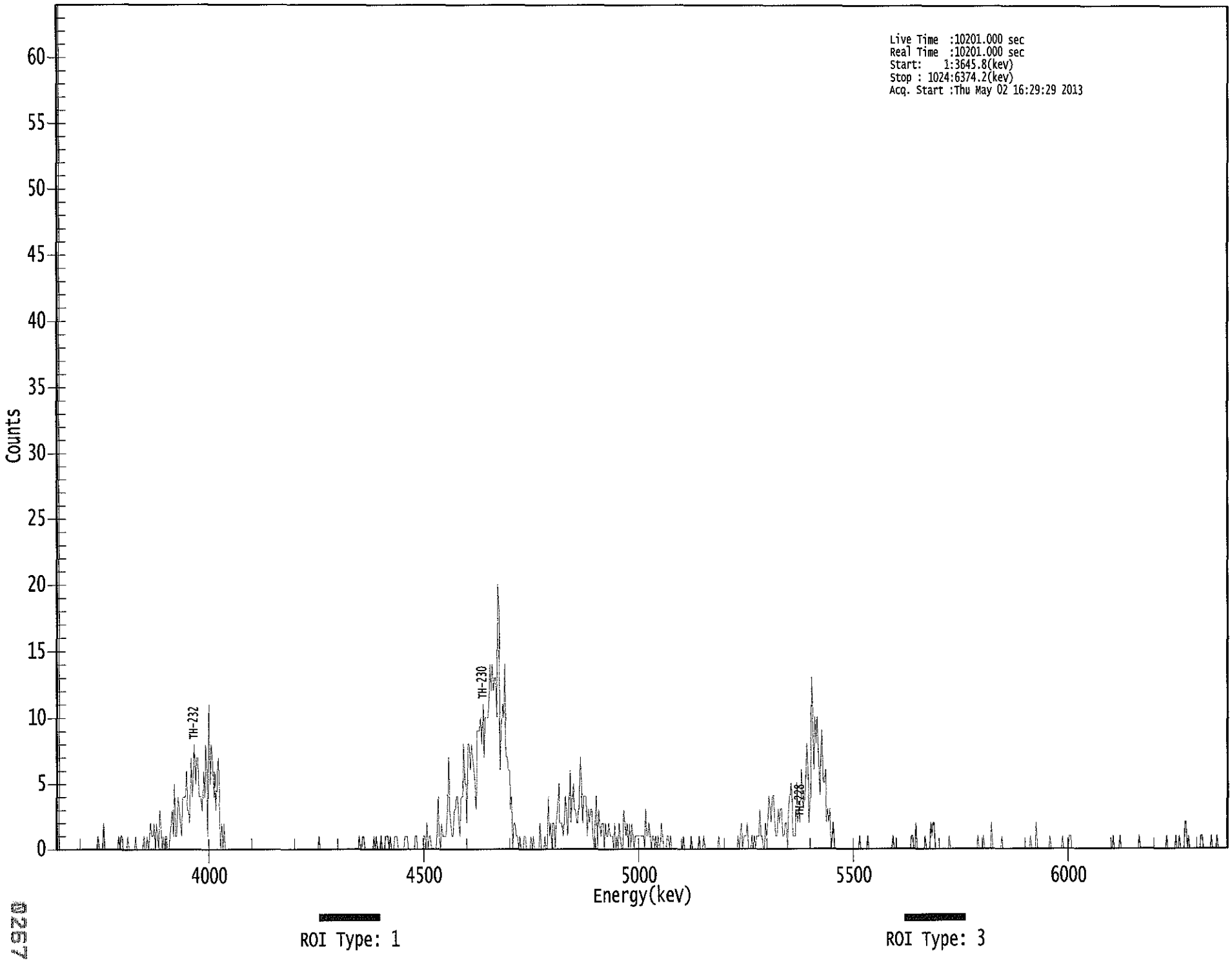
T = Tracer Peak used for Effective Efficiency

NUCLIDE ANALYSIS RESULTS

Nuclide	Id Conf.	Energy (keV)	Activity (pCi/liter)	MDA (pCi/liter)
TH-227	0.993	5850.00*	1.45E-001 +/- 9.56E-002	9.84E-002 +/- 1.54E-002
TH-228	0.997	5400.00*	3.15E+000 +/- 6.33E-001	1.01E-001 +/- 1.57E-002
TH-229	0.998	4872.00*	2.37E+000 +/- 3.71E-001	9.03E-002 +/- 1.41E-002
TH-230	0.994	4672.00*	5.81E+000 +/- 1.05E+000	6.05E-002 +/- 9.47E-003
TH-232	0.995	3997.00*	2.79E+000 +/- 5.71E-001	6.63E-002 +/- 1.04E-002

AG
5/13/13

0000056952.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: 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	1	0	0	0
41:	0	2	0	0	0	0	0	0
49:	0	0	0	0	0	0	1	0
57:	1	1	0	0	0	0	1	0
65:	0	0	0	0	0	1	0	0
73:	0	0	0	0	1	0	0	1
81:	0	1	2	1	1	2	0	2
89:	1	0	3	2	0	1	0	1
97:	1	0	0	1	2	3	1	5
105:	1	1	4	3	2	1	4	4
113:	4	6	3	3	2	7	4	6
121:	8	5	7	7	4	4	4	3
129:	6	4	8	6	1	11	5	8
137:	7	4	6	3	6	7	3	0
145:	2	0	2	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	1	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:	1	0	0	1	1	0	0	0
273:	0	0	0	0	0	1	0	1
281:	0	0	0	1	0	0	0	1
289:	1	1	0	1	0	0	0	1
297:	1	1	0	0	0	0	0	0
305:	1	1	1	0	0	0	0	0
313:	0	1	1	0	0	0	0	0
321:	1	1	0	2	0	1	1	0
329:	0	0	0	0	1	4	1	0
337:	2	1	1	1	1	3	7	3
345:	2	1	1	3	3	4	4	2
353:	1	4	4	8	5	5	2	8
361:	8	6	8	7	6	5	3	9

369:	9	9	10	8	11	7	10	10

Sample Title: 10

Channel								
377:	10	11	14	12	14	12	13	13
385:	10	20	18	6	9	11	10	14
393:	7	7	6	6	3	4	0	2
401:	2	1	1	0	1	0	0	0
409:	1	1	0	0	0	0	1	0
417:	1	0	0	0	0	0	2	0
425:	0	0	1	0	0	4	1	2
433:	0	2	2	0	2	3	5	2
441:	2	2	1	2	4	3	1	3
449:	6	2	4	5	3	3	2	2
457:	5	7	4	2	4	4	4	1
465:	3	2	3	3	1	0	2	4
473:	0	3	2	1	2	2	0	2
481:	1	1	2	1	1	1	0	2
489:	0	1	0	2	1	0	0	3
497:	2	1	2	0	2	0	2	1
505:	0	1	1	1	1	1	1	1
513:	1	0	3	1	1	2	1	0
521:	1	1	0	1	0	1	0	0
529:	2	1	0	0	0	1	1	0
537:	1	0	0	0	0	0	0	0
545:	0	0	0	1	0	0	0	0
553:	0	0	1	0	0	0	0	0
561:	0	1	0	0	0	1	0	0
569:	0	0	0	0	0	0	0	0
577:	0	0	1	0	0	0	0	0
585:	0	0	0	0	0	0	0	0
593:	0	0	0	1	0	1	2	0
601:	1	1	1	2	0	0	0	1
609:	0	1	0	1	1	1	3	1
617:	1	0	0	2	1	2	4	3
625:	2	4	4	2	1	1	3	2
633:	3	3	1	1	2	2	0	3
641:	4	5	3	1	1	1	5	2
649:	3	2	6	4	3	4	6	8
657:	5	2	4	13	10	6	10	8
665:	10	7	4	7	9	5	5	6
673:	2	3	2	3	0	1	2	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	0	0
705:	0	0	0	0	1	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	1	1	0	0	2	0
753:	0	0	0	0	0	0	1	0
761:	0	0	0	2	1	2	2	0
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	1	0	0	0

Sample Title: 10

Channel								
809:	0	1	0	0	0	0	0	0
817:	2	0	0	0	0	0	0	0
825:	0	1	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	1	0	0	0	0	2
857:	0	0	0	0	0	0	0	0
865:	0	0	0	1	0	0	0	0
873:	0	0	0	0	0	0	1	0
881:	0	0	0	0	1	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	1	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	1	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	1	0	0	0	0	0	0
977:	0	1	0	0	1	0	0	0
985:	0	2	2	0	1	0	0	0
993:	0	0	0	0	0	0	0	1
1001:	1	0	0	0	0	0	0	0
1009:	1	0	0	0	0	1	0	0
1017:	0	0	0	0	0	0	0	0

Apex-Alpha™

c
1/30/14

Sample Description: D-85 DIS
Spectrum File: \\OR-ALPHA1\Canberra\ApexAlpha\Root\Data\00000569
Batch Identification: 1304107A-TH
Sample Identification: 11
Sample Geometry: Shelf 2
Procedure Description: Th iso

Detector Name: Alpha_013
Chamber Serial Number:
Detector Serial Number: 13
Env. Background: System Bkgd 55738
Reagent Blank: <not performed>

Sample Size: 1.000E+000 +/- 0.000E+000 liter
Sample Date/Time: 4/11/2013 7:27:18 AM
Acquisition Date/Time: 5/2/2013 4:29:30 PM
Acquisition Live Time: 170.0 minutes
Acquisition Real Time: 170.0 minutes

Tracer Certificate: Th229_TH-18A
Tracer Quantity: 0.232 mL
Effective Efficiency: 0.1845 +/- 0.0155
Counting Efficiency: 0.1869 +/- 0.0035 on 12/15/2012 11:26:45 AM
Chem. Recovery Factor: 0.9873 +/- 0.0852

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		5.738	-0.06	6128.9	3.06	0.00E+000	2.8
TH-228		5.289	-0.57	653.05	3.57	0.00E+000	2.8
TH-229	T	4.887	163.49	15.36	0.51	0.00E+000	5.1
TH-230		4.661	8.49	69.59	0.51	0.00E+000	2.8
TH-232		3.949	-0.51	400.63	0.51	0.00E+000	0.0

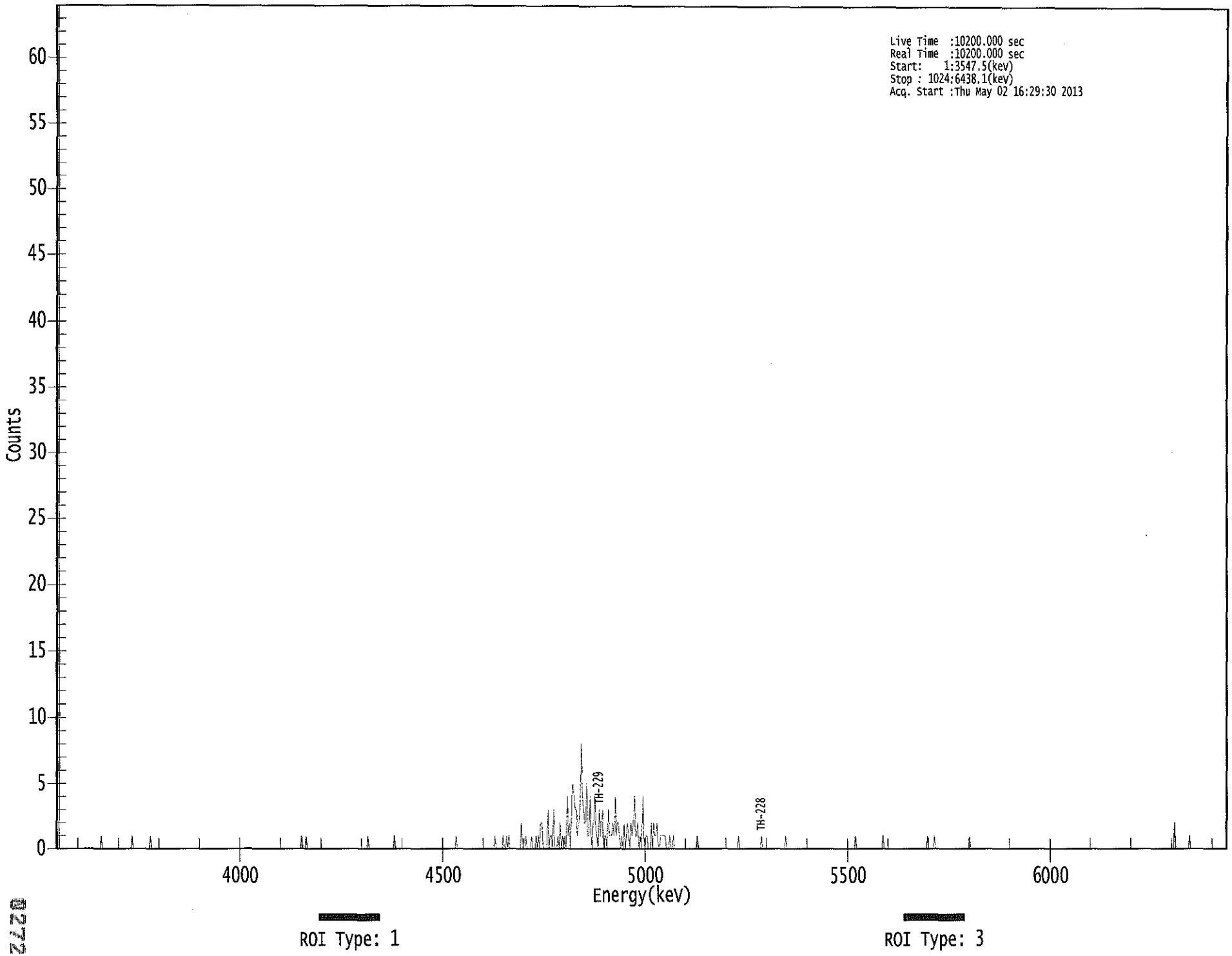
T = Tracer Peak used for Effective Efficiency

NUCLIDE ANALYSIS RESULTS

Nuclide	Id Conf.	Energy (keV)	Activity (pCi/liter)	MDA (pCi/liter)
TH-227	0.937	5850.00*	-8.85E-004 +/- 5.43E-002	1.32E-001 +/- 2.18E-002
TH-228	0.938	5400.00*	-8.37E-003 +/- 5.47E-002	1.38E-001 +/- 2.29E-002
TH-229	0.999	4872.00*	2.36E+000 +/- 3.90E-001	7.57E-002 +/- 1.25E-002
TH-230	0.999	4672.00*	1.22E-001 +/- 8.74E-002	7.55E-002 +/- 1.25E-002
TH-232	0.988	3997.00*	-7.32E-003 +/- 2.94E-002	7.54E-002 +/- 1.24E-002

AG
5/3/13

0000056953.CNF



02720

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

Sample Title: 11

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	1
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	1	0	0	0	0	0
73:	0	0	0	0	0	0	0	0
81:	0	0	1	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	1	0
217:	0	0	1	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:	1	0	0	0	0	0	0	0
281:	0	0	0	0	0	0	0	0
289:	0	0	0	0	0	0	0	1
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	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: 11

Channel								
377:	0	0	0	0	0	0	0	1
385:	0	0	0	0	0	0	1	0
393:	0	1	0	1	0	0	0	0
401:	0	0	0	0	0	0	2	0
409:	0	0	1	0	0	0	0	1
417:	0	0	0	1	0	1	0	2
425:	2	0	0	0	0	3	0	1
433:	1	0	3	0	0	0	1	0
441:	2	0	1	0	1	0	4	1
449:	2	0	4	5	4	3	3	1
457:	2	3	8	4	3	2	2	5
465:	1	1	4	1	0	2	4	2
473:	1	0	3	1	2	3	0	1
481:	1	0	3	1	1	1	2	1
489:	4	1	2	2	1	0	1	0
497:	2	0	1	2	1	0	2	1
505:	2	4	1	1	2	0	1	0
513:	4	1	0	1	1	0	0	0
521:	2	0	2	1	1	2	0	0
529:	1	1	1	1	1	0	0	0
537:	1	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:	1	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	1	0	0	0
601:	0	0	0	0	0	0	0	0
609:	0	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	1	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	1	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	1	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	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: 11

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	2	0	0	0	0	0	0
985:	0	0	0	0	0	0	1	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™

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5/01/13

Sample Description: S-84 TOT
Spectrum File: \\OR-ALPHA1\Canberra\ApexAlpha\Root\Data\00000569
Batch Identification: 1304107A-TH
Sample Identification: 12
Sample Geometry: Shelf 2
Procedure Description: Th iso

Detector Name: Alpha_014
Chamber Serial Number:
Detector Serial Number: 14
Env. Background: System Bkgd 55739
Reagent Blank: <not performed>

Sample Size: 1.000E+000 +/- 0.000E+000 liter
Sample Date/Time: 4/11/2013 7:27:18 AM
Acquisition Date/Time: 5/2/2013 4:29:31 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: 0.1987 +/- 0.0162
Counting Efficiency: 0.1846 +/- 0.0034 on 12/15/2012 11:26:44 AM
Chem. Recovery Factor: 1.0765 +/- 0.0901

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		5.861	8.09	86.22	3.91	0.00E+000	2.9
TH-228		5.345	8.92	81.31	4.08	0.00E+000	2.9
TH-229	T	4.867	176.81	14.80	1.19	0.00E+000	6.4
TH-230		4.619	7.32	76.28	0.68	0.00E+000	2.9
TH-232		3.960	4.15	107.12	0.85	0.00E+000	2.9

T = Tracer Peak used for Effective Efficiency

NUCLIDE ANALYSIS RESULTS

Nuclide	Id Conf.	Energy (keV)	Activity (pCi/liter)	MDA (pCi/liter)
TH-227	0.999	5850.00*	1.11E-001 +/- 9.72E-002	1.34E-001 +/- 2.14E-002
TH-228	0.984	5400.00*	1.22E-001 +/- 1.01E-001	1.35E-001 +/- 2.16E-002
TH-229	1.000	4872.00*	2.37E+000 +/- 3.79E-001	8.83E-002 +/- 1.41E-002
TH-230	0.985	4672.00*	9.78E-002 +/- 7.62E-002	7.54E-002 +/- 1.21E-002
TH-232	0.993	3997.00*	5.53E-002 +/- 5.99E-002	7.98E-002 +/- 1.28E-002

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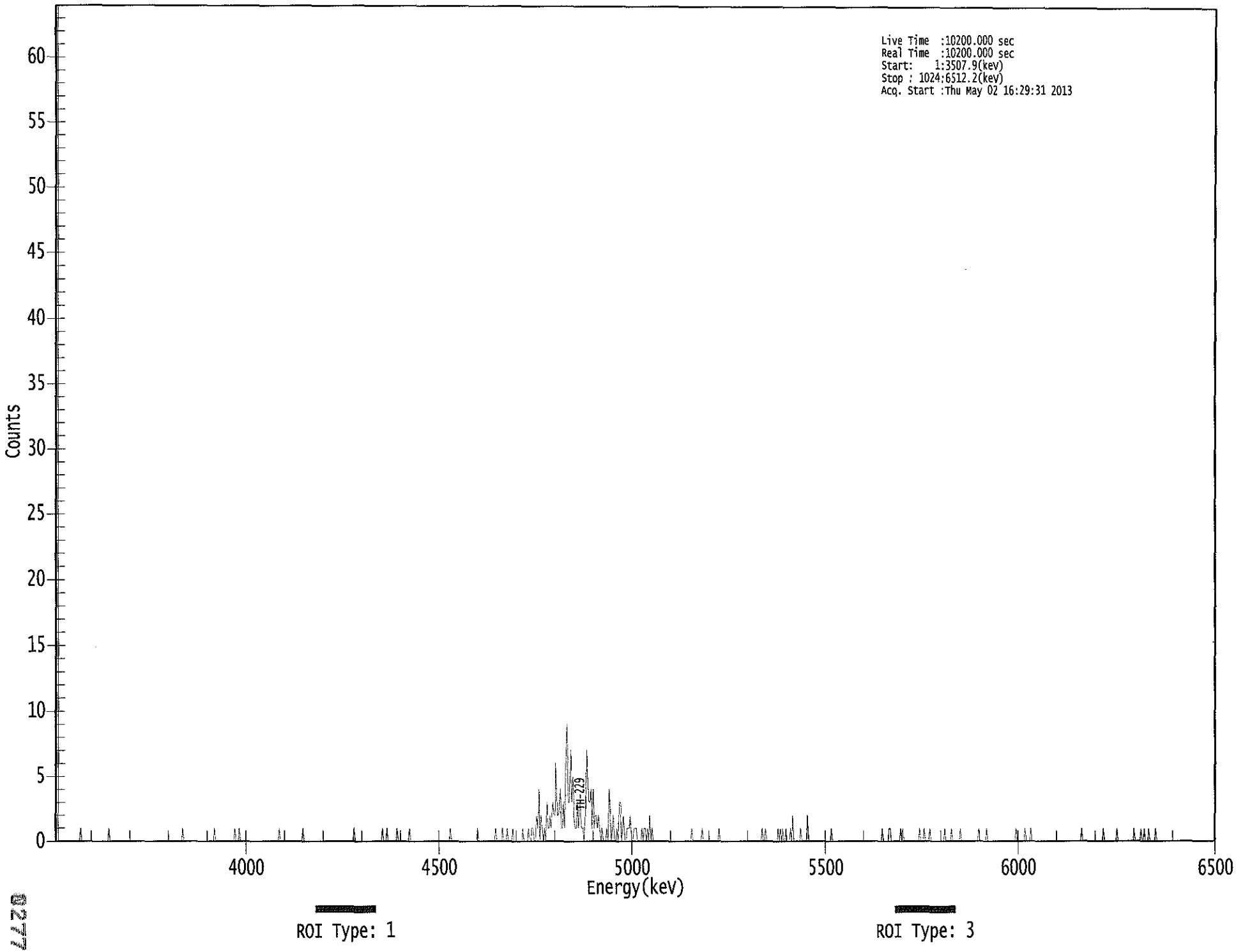
5/3/13

0000056954.CNF



0277

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

Sample Title: 12

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	1	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	1
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:	1	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	1	0	0	0
145:	0	0	0	0	0	0	0	0
153:	0	0	0	0	0	0	1	0
161:	0	0	1	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	1	0	0
201:	0	0	0	0	0	0	0	0
209:	0	0	0	0	0	0	0	0
217:	0	0	1	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	1
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:	1	0	0	0	1	0	0	0
297:	0	0	0	0	0	1	0	0
305:	0	0	0	0	0	0	0	0
313:	1	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	1	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: 12

Channel								
377:	0	0	0	0	0	0	0	0
385:	0	0	0	0	1	0	0	0
393:	0	0	1	0	0	0	1	0
401:	0	0	0	1	0	0	0	0
409:	0	0	0	0	1	0	0	0
417:	0	1	0	0	1	1	0	0
425:	2	1	4	0	2	1	0	1
433:	0	3	1	1	2	1	3	2
441:	2	6	2	2	3	4	1	1
449:	3	1	7	9	3	3	7	3
457:	5	2	1	1	3	1	3	2
465:	1	1	0	2	7	5	3	3
473:	4	1	4	1	2	2	1	2
481:	1	0	1	0	0	0	1	0
489:	4	2	0	1	2	0	0	1
497:	0	3	3	0	1	2	0	0
505:	1	1	1	2	0	0	1	1
513:	1	0	0	0	0	1	0	1
521:	1	0	1	0	2	0	1	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	1	0	0	0	0	0	0
569:	0	0	1	0	0	0	0	0
577:	0	0	0	0	0	0	0	0
585:	0	1	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	1
625:	0	0	1	0	0	0	0	0
633:	0	0	0	0	0	1	0	1
641:	0	1	0	0	1	0	0	0
649:	1	0	2	0	0	0	0	0
657:	0	1	0	0	0	0	0	2
665:	0	0	0	0	0	0	0	0
673:	0	0	0	0	0	0	0	0
681:	0	0	0	0	1	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	1
737:	1	0	0	0	0	0	0	0
745:	0	1	0	1	0	0	0	0
753:	0	0	0	0	0	0	0	0
761:	0	0	1	0	0	0	1	0
769:	0	0	0	1	0	0	0	0
777:	0	0	0	0	0	0	0	0
785:	1	0	0	0	0	0	1	0
793:	0	0	0	0	0	0	1	0

801:	0	0	0	0	0	0	0	0

Sample Title: 12

Channel								
809:	0	0	0	0	0	0	1	0
817:	0	0	0	0	0	1	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	1
849:	0	0	0	0	0	0	0	1
857:	0	0	0	0	1	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	1	0	0	0	0	0	0
913:	0	0	0	0	0	0	0	0
921:	0	0	0	0	1	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	1
953:	0	0	0	0	0	1	0	0
961:	1	0	0	0	1	0	0	0
969:	0	0	1	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

Apex-Alpha™

Sample Description: S-84 DIS
Spectrum File: \\OR-ALPHA1\Canberra\ApexAlpha\Root\Data\00000569
Batch Identification: 1304107A-TH
Sample Identification: 13
Sample Geometry: Shelf 2
Procedure Description: Th iso

Detector Name: Alpha_033
Chamber Serial Number: 04026479A
Detector Serial Number: 91132
Env. Background: System Bkgd 55746
Reagent Blank: <not performed>

Sample Size: 1.000E+000 +/- 0.000E+000 liter
Sample Date/Time: 4/11/2013 7:27:18 AM
Acquisition Date/Time: 5/2/2013 4:30:02 PM
Acquisition Live Time: 170.0 minutes
Acquisition Real Time: 170.0 minutes

Tracer Certificate: Th229_TH-18A
Tracer Quantity: 0.232 mL
Effective Efficiency: 0.1920 +/- 0.0159
Counting Efficiency: 0.1825 +/- 0.0032 on 12/16/2012 5:49:18 PM
Chem. Recovery Factor: 1.0524 +/- 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		5.874	-0.34	592.90	0.34	0.00E+000	0.0
TH-228		5.298	-0.68	304.44	0.68	0.00E+000	0.0
TH-229	T	4.880	170.00	15.08	0.00	0.00E+000	4.7
TH-230		4.649	12.32	57.62	0.68	0.00E+000	4.5
TH-232		3.947	0.00	1960.0	0.00	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	0.997	5850.00*	-4.82E-003 +/- 2.86E-002	6.78E-002 +/- 1.10E-002
TH-228	0.947	5400.00*	-9.59E-003 +/- 2.92E-002	7.95E-002 +/- 1.29E-002
TH-229	1.000	4872.00*	2.36E+000 +/- 3.83E-001	8.31E-002 +/- 1.35E-002
TH-230	0.997	4672.00*	1.70E-001 +/- 1.02E-001	7.80E-002 +/- 1.27E-002
TH-232	0.987	3997.00*	0.00E+000 +/- 3.82E-002	8.27E-002 +/- 1.34E-002

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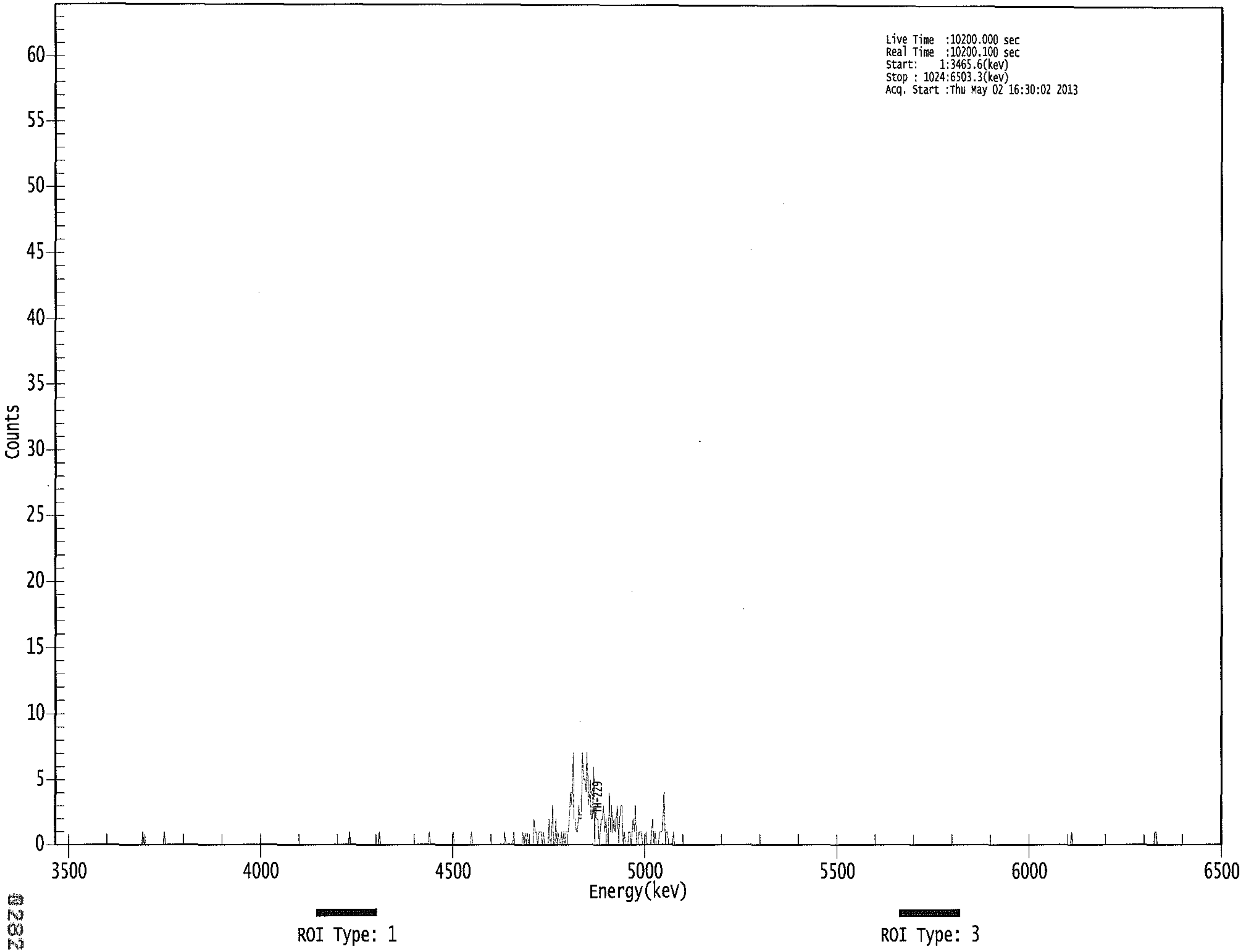
5/3/13

0000056958.CNF



0282

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

Sample Title: 13

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	1	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	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	1	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	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:	1	0	0	0	0	0	0	0
337:	0	0	0	0	0	0	0	0
345:	0	0	0	0	0	1	0	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: 13

Channel								
377:	0	0	0	0	0	0	0	0
385:	0	0	0	0	0	0	0	0
393:	0	0	1	0	0	0	0	0
401:	0	0	1	0	0	0	0	0
409:	0	0	1	0	1	0	1	0
417:	0	0	0	0	2	1	1	0
425:	1	1	1	0	1	0	0	0
433:	0	2	0	0	3	0	0	2
441:	0	1	0	0	1	0	1	0
449:	1	1	1	2	4	3	7	2
457:	2	1	1	3	2	2	7	5
465:	5	4	7	4	3	5	2	2
473:	6	0	3	2	2	0	1	2
481:	2	3	1	2	1	0	4	1
489:	3	1	2	1	2	3	0	2
497:	3	3	0	1	0	0	0	1
505:	1	0	1	2	1	3	0	0
513:	1	1	1	0	0	0	1	0
521:	0	0	0	1	2	0	1	0
529:	0	0	1	1	1	2	4	0
537:	1	1	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:	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: 13

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	1	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	1	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

Apex-Alpha™

Sample Description: S-5 TOT
Spectrum File: \\OR-ALPHA1\Canberra\ApexAlpha\Root\Data\00000569
Batch Identification: 1304107A-TH
Sample Identification: 14
Sample Geometry: Shelf 2
Procedure Description: Th iso

Detector Name: Alpha_034
Chamber Serial Number: 04026479B
Detector Serial Number: 91136
Env. Background: System Bkgd 55747
Reagent Blank: <not performed>

Sample Size: 1.000E+000 +/- 0.000E+000 liter
Sample Date/Time: 4/11/2013 7:27:18 AM
Acquisition Date/Time: 5/2/2013 4:30:03 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: 0.1931 +/- 0.0159
Counting Efficiency: 0.1856 +/- 0.0032 on 12/16/2012 5:49:43 PM
Chem. Recovery Factor: 1.0407 +/- 0.0878

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		5.789	1.66	169.38	0.34	0.00E+000	3.0
TH-228		5.408	3.83	102.72	0.17	0.00E+000	3.0
TH-229	T	4.878	171.49	14.99	0.51	0.00E+000	3.3
TH-230		4.662	13.32	55.28	0.68	0.00E+000	4.5
TH-232		3.947	-0.51	400.63	0.51	0.00E+000	0.0

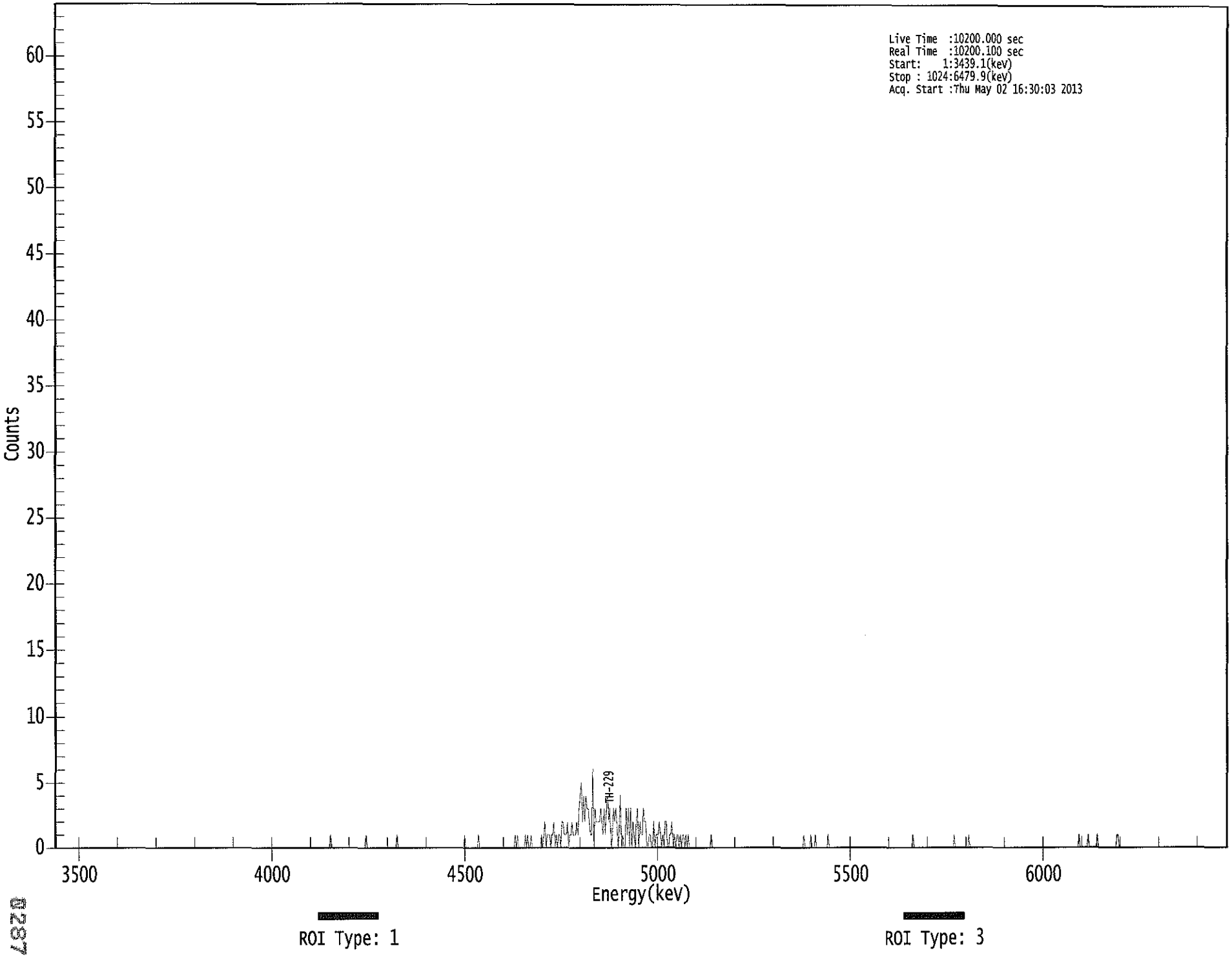
T = Tracer Peak used for Effective Efficiency

NUCLIDE ANALYSIS RESULTS

Nuclide	Id Conf.	Energy (keV)	Activity (pCi/liter)	MDA (pCi/liter)
TH-227	0.981	5850.00*	2.34E-002 +/- 3.98E-002	6.74E-002 +/- 1.09E-002
TH-228	1.000	5400.00*	5.37E-002 +/- 5.58E-002	5.85E-002 +/- 9.47E-003
TH-229	1.000	4872.00*	2.36E+000 +/- 3.82E-001	7.23E-002 +/- 1.17E-002
TH-230	1.000	4672.00*	1.83E-001 +/- 1.05E-001	7.75E-002 +/- 1.25E-002
TH-232	0.987	3997.00*	-7.00E-003 +/- 2.81E-002	7.20E-002 +/- 1.16E-002

AG
5/3/13

0000056959.CNF



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

Sample Title: 14

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	0	0	0	0
225:	0	0	0	0	0	0	0	0
233:	0	0	0	0	0	0	0	0
241:	1	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	1
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	1	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	1	0	0
361:	0	0	0	0	0	0	0	0

369:	0	1	0	0	0	0	0	0

Sample Title: 14

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	1	0	1	0	0	0	0
409:	0	0	1	0	1	0	0	1
417:	0	0	0	0	0	0	0	0
425:	1	0	1	2	0	1	1	1
433:	0	1	1	2	0	1	0	1
441:	1	0	2	2	1	1	1	2
449:	0	1	1	2	1	1	1	2
457:	1	3	4	5	2	4	2	4
465:	3	3	2	1	1	6	0	3
473:	2	2	2	2	3	2	1	3
481:	1	3	4	2	3	0	1	3
489:	2	3	2	0	1	4	0	1
497:	0	0	3	1	3	0	3	0
505:	2	1	0	2	3	0	2	1
513:	1	3	2	2	0	0	1	1
521:	0	0	2	0	1	1	1	2
529:	1	0	1	0	2	2	0	0
537:	1	1	2	0	1	0	1	1
545:	0	1	0	1	1	0	1	0
553:	1	0	0	0	0	0	0	0
561:	0	0	0	0	0	0	0	0
569:	0	0	0	0	1	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	1	0	0
657:	0	0	0	1	0	0	0	1
665:	0	0	0	0	0	0	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	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:	1	0	0	0	0	0	0	0
793:	0	0	0	0	0	1	0	0

801:	0	0	0	0	0	0	0	0

Sample Title: 14

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	1	0	0
897:	0	0	0	0	0	1	0	0
905:	0	0	0	0	0	1	0	0
913:	0	0	0	0	0	0	0	0
921:	0	0	0	0	0	0	1	1
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

Apex-Alpha™

C
5/09/13

Sample Description: S-5 DIS
Spectrum File: \\OR-ALPHA1\Canberra\ApexAlpha\Root\Data\00000569
Batch Identification: 1304107A-TH
Sample Identification: 15
Sample Geometry: Shelf 2
Procedure Description: Th iso

Detector Name: Alpha_035
Chamber Serial Number: 04026477A
Detector Serial Number: 58771
Env. Background: System Bkgd 55748
Reagent Blank: <not performed>

Sample Size: 1.000E+000 +/- 0.000E+000 liter
Sample Date/Time: 4/11/2013 7:27:18 AM
Acquisition Date/Time: 5/2/2013 4:29:59 PM
Acquisition Live Time: 170.0 minutes
Acquisition Real Time: 170.0 minutes

Tracer Certificate: Th229_TH-18A
Tracer Quantity: 0.231 mL
Effective Efficiency: 0.2095 +/- 0.0167
Counting Efficiency: 0.1826 +/- 0.0032 on 12/16/2012 5:49:42 PM
Chem. Recovery Factor: 1.1475 +/- 0.0938

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	2.32	149.12	0.68	0.00E+000	2.9
TH-228		5.314	5.66	85.23	0.34	0.00E+000	2.9
TH-229	T	4.905	184.83	14.42	0.17	0.00E+000	16.9
TH-230		4.600	7.66	72.63	0.34	0.00E+000	2.9
TH-232		4.081	0.83	239.53	0.17	0.00E+000	2.9

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*	3.02E-002 +/- 4.52E-002	7.33E-002 +/- 1.15E-002
TH-228	0.962	5400.00*	7.32E-002 +/- 6.34E-002	6.18E-002 +/- 9.67E-003
TH-229	0.994	4872.00*	2.35E+000 +/- 3.68E-001	5.30E-002 +/- 8.30E-003
TH-230	0.973	4672.00*	9.71E-002 +/- 7.21E-002	6.06E-002 +/- 9.48E-003
TH-232	0.964	3997.00*	1.05E-002 +/- 2.52E-002	5.28E-002 +/- 8.26E-003

AG
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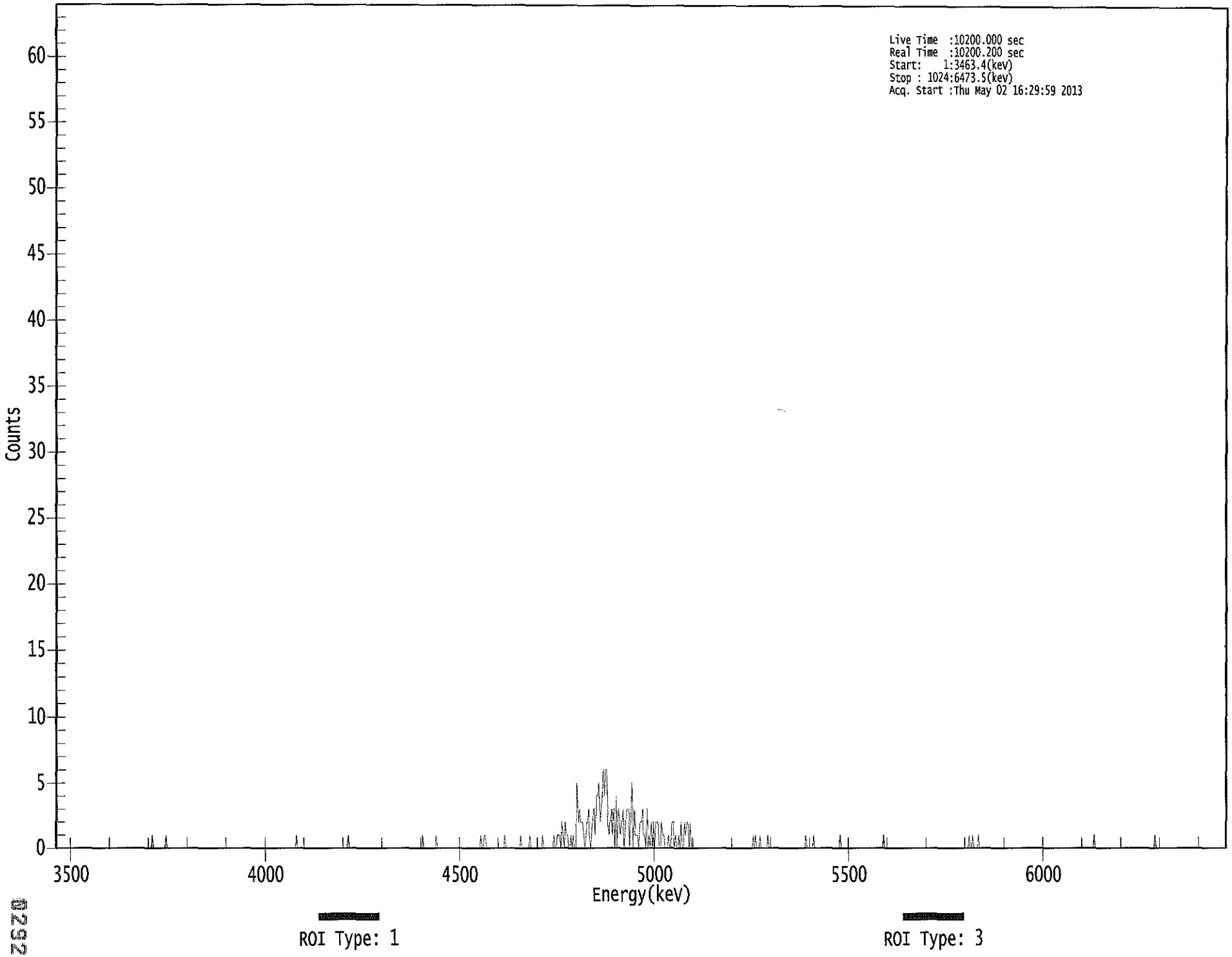
0000056960.CNF



2678

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

Sample Title: 15

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	1	0	0	0
89:	0	0	0	0	0	0	0	0
97:	1	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	1	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	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:	1	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	0
361:	0	0	0	0	0	0	0	0

369:	0	0	0	1	0	0	1	1

Sample Title: 15

Channel								
377:	0	0	0	0	0	0	0	0
385:	0	0	0	0	0	0	0	0
393:	1	0	0	0	0	0	0	0
401:	0	0	0	0	0	0	1	0
409:	0	0	0	0	0	0	1	0
417:	0	0	0	0	0	0	0	0
425:	0	1	0	0	0	0	0	0
433:	0	0	0	1	0	0	1	1
441:	1	0	2	1	0	2	1	1
449:	0	0	1	0	1	0	0	5
457:	2	3	2	2	2	1	0	1
465:	2	3	1	0	1	3	3	1
473:	4	4	5	2	3	4	6	4
481:	6	6	2	1	2	3	1	3
489:	0	4	0	3	2	1	2	3
497:	0	1	3	3	3	0	3	5
505:	0	3	1	1	1	0	2	2
513:	3	1	1	0	3	0	1	0
521:	2	0	2	0	2	2	2	0
529:	0	2	1	1	0	0	0	1
537:	0	0	2	2	0	1	0	0
545:	1	0	2	0	0	2	1	2
553:	2	0	2	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	1	0	1	0	0	0	1
617:	0	0	0	0	0	0	1	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	1
657:	0	0	0	0	0	0	1	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	1	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	1	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	1	0

801:	0	1	0	0	0	0	1	0

Sample Title: 15

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	1	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:	1	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

Apex-Alpha™

C
Flow

Sample Description: PZ-109-SS TOT
Spectrum File: \\OR-ALPHA1\Canberra\ApexAlpha\Root\Data\00000569
Batch Identification: 1304107A-TH
Sample Identification: 16
Sample Geometry: Shelf 2
Procedure Description: Th iso

Detector Name: Alpha_037
Chamber Serial Number: 04026478A
Detector Serial Number: 91133
Env. Background: System Bkgd 55750
Reagent Blank: <not performed>

Sample Size: 1.000E+000 +/- 0.000E+000 liter
Sample Date/Time: 4/11/2013 7:27:18 AM
Acquisition Date/Time: 5/2/2013 4:30:00 PM
Acquisition Live Time: 170.0 minutes
Acquisition Real Time: 170.0 minutes

Tracer Certificate: Th229_TH-18A
Tracer Quantity: 0.232 mL
Effective Efficiency: 0.2032 +/- 0.0164
Counting Efficiency: 0.1783 +/- 0.0033 on 1/26/2013 3:28:25 PM
Chem. Recovery Factor: 1.1399 +/- 0.0946

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		5.758	0.32	646.93	0.68	0.00E+000	2.9
TH-228		5.393	0.83	239.53	0.17	0.00E+000	2.9
TH-229	T	4.874	180.00	14.65	0.00	0.00E+000	4.7
TH-230		4.652	12.66	55.94	0.34	0.00E+000	4.4
TH-232		4.039	1.00	277.19	0.00	0.00E+000	2.9

T = Tracer Peak used for Effective Efficiency

NUCLIDE ANALYSIS RESULTS

Nuclide	Id Conf.	Energy (keV)	Activity (pCi/liter)	MDA (pCi/liter)
TH-227	0.956	5850.00*	4.29E-003 +/- 2.77E-002	7.56E-002 +/- 1.20E-002
TH-228	1.000	5400.00*	1.11E-002 +/- 2.65E-002	5.56E-002 +/- 8.82E-003
TH-229	1.000	4872.00*	2.36E+000 +/- 3.74E-001	7.86E-002 +/- 1.25E-002
TH-230	0.998	4672.00*	1.65E-001 +/- 9.62E-002	6.24E-002 +/- 9.90E-003
TH-232	0.991	3997.00*	1.30E-002 +/- 3.62E-002	7.82E-002 +/- 1.24E-002

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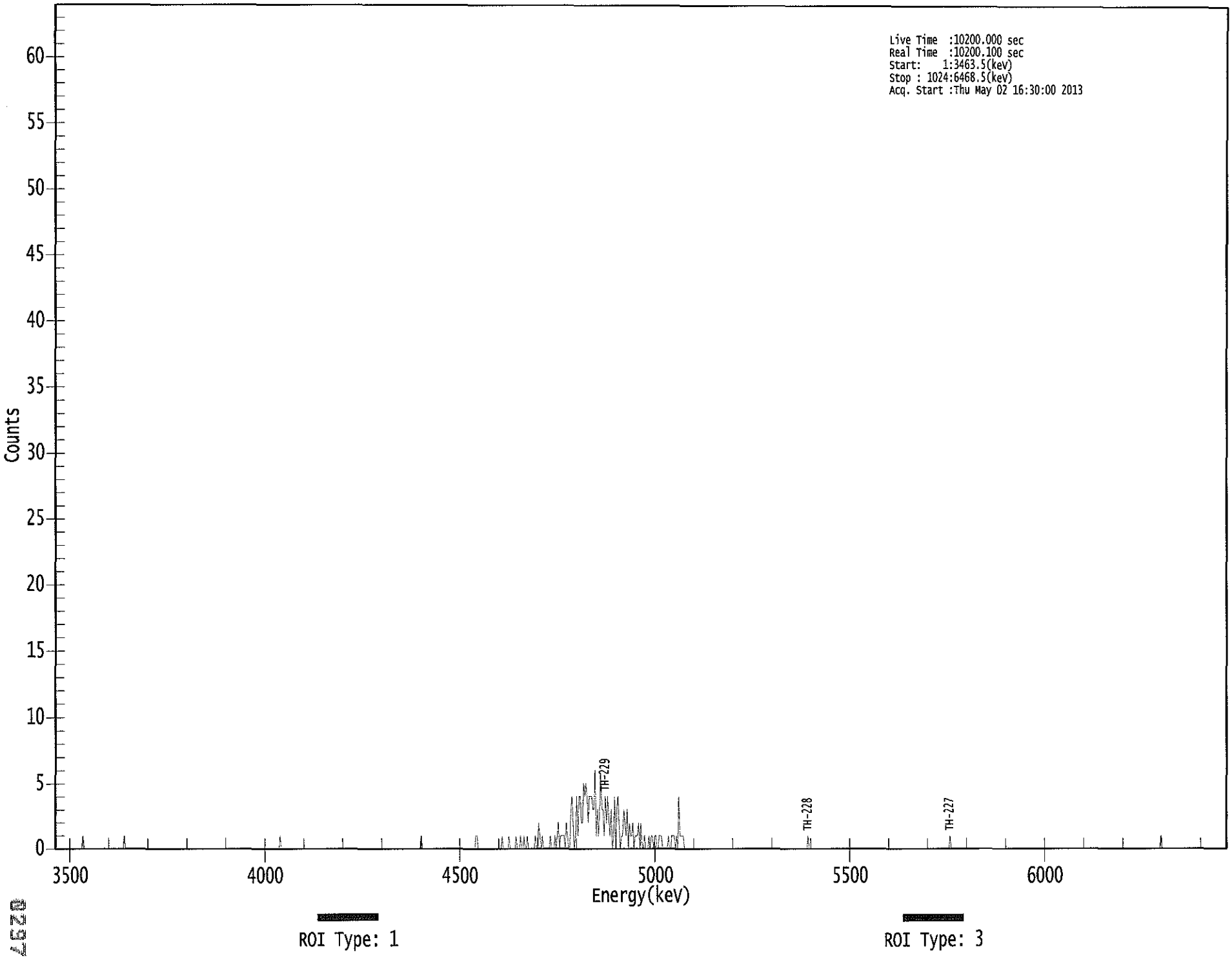
5/3/13

0000056957.CNF



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

Sample Title: 16

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:	1	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	1	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	1	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	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	0	1

369:	1	0	0	0	0	0	0	0

Sample Title: 16

Channel								
377:	0	0	0	0	0	0	0	0
385:	0	0	0	0	0	0	1	0
393:	0	0	0	0	1	0	0	0
401:	0	0	1	0	0	0	1	0
409:	0	1	0	0	1	0	0	0
417:	0	0	0	1	0	0	2	1
425:	0	1	0	0	0	0	0	0
433:	1	0	0	0	1	0	1	2
441:	0	1	1	1	1	0	2	1
449:	0	0	3	4	2	0	1	4
457:	1	4	4	2	2	5	4	5
465:	4	2	4	4	4	3	3	6
473:	1	3	1	3	6	3	3	1
481:	4	2	4	2	1	3	0	1
489:	4	0	3	4	2	0	1	1
497:	3	2	1	3	0	2	1	1
505:	2	0	1	1	1	2	0	2
513:	0	0	1	0	0	0	1	0
521:	1	1	0	1	1	0	0	1
529:	1	1	0	0	0	0	0	1
537:	0	0	1	1	1	0	1	0
545:	4	1	1	1	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	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	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	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: 16

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	1	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

Apex-Alpha™

Sample Description: PZ-109-SS DIS
Spectrum File: \\OR-ALPHA1\Canberra\ApexAlpha\Root\Data\00000569
Batch Identification: 1304107A-TH
Sample Identification: 17
Sample Geometry: Shelf 2
Procedure Description: Th iso

Detector Name: Alpha_040
Chamber Serial Number: 06027396B
Detector Serial Number: 91135
Env. Background: System Bkgd 55752
Reagent Blank: <not performed>

Sample Size: 1.000E+000 +/- 0.000E+000 liter
Sample Date/Time: 4/11/2013 7:27:18 AM
Acquisition Date/Time: 5/2/2013 4:30:08 PM
Acquisition Live Time: 170.0 minutes
Acquisition Real Time: 170.0 minutes

Tracer Certificate: Th229_TH-18A
Tracer Quantity: 0.232 mL
Effective Efficiency: 0.2379 +/- 0.0180
Counting Efficiency: 0.1900 +/- 0.0033 on 12/16/2012 5:49:33 PM
Chem. Recovery Factor: 1.2519 +/- 0.0972

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		5.710	0.66	305.43	0.34	0.00E+000	3.0
TH-228		5.289	0.66	305.43	0.34	0.00E+000	3.0
TH-229	T	4.873	210.49	13.53	0.51	0.00E+000	15.6
TH-230		4.670	8.66	68.12	0.34	0.00E+000	3.0
TH-232		3.946	-0.34	592.90	0.34	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	0.903	5850.00*	7.55E-003 +/- 2.31E-002	5.47E-002 +/- 8.12E-003
TH-228	0.937	5400.00*	7.51E-003 +/- 2.30E-002	5.44E-002 +/- 8.07E-003
TH-229	1.000	4872.00*	2.36E+000 +/- 3.49E-001	5.87E-002 +/- 8.71E-003
TH-230	1.000	4672.00*	9.66E-002 +/- 6.74E-002	5.34E-002 +/- 7.91E-003
TH-232	0.987	3997.00*	-3.79E-003 +/- 2.25E-002	5.33E-002 +/- 7.90E-003

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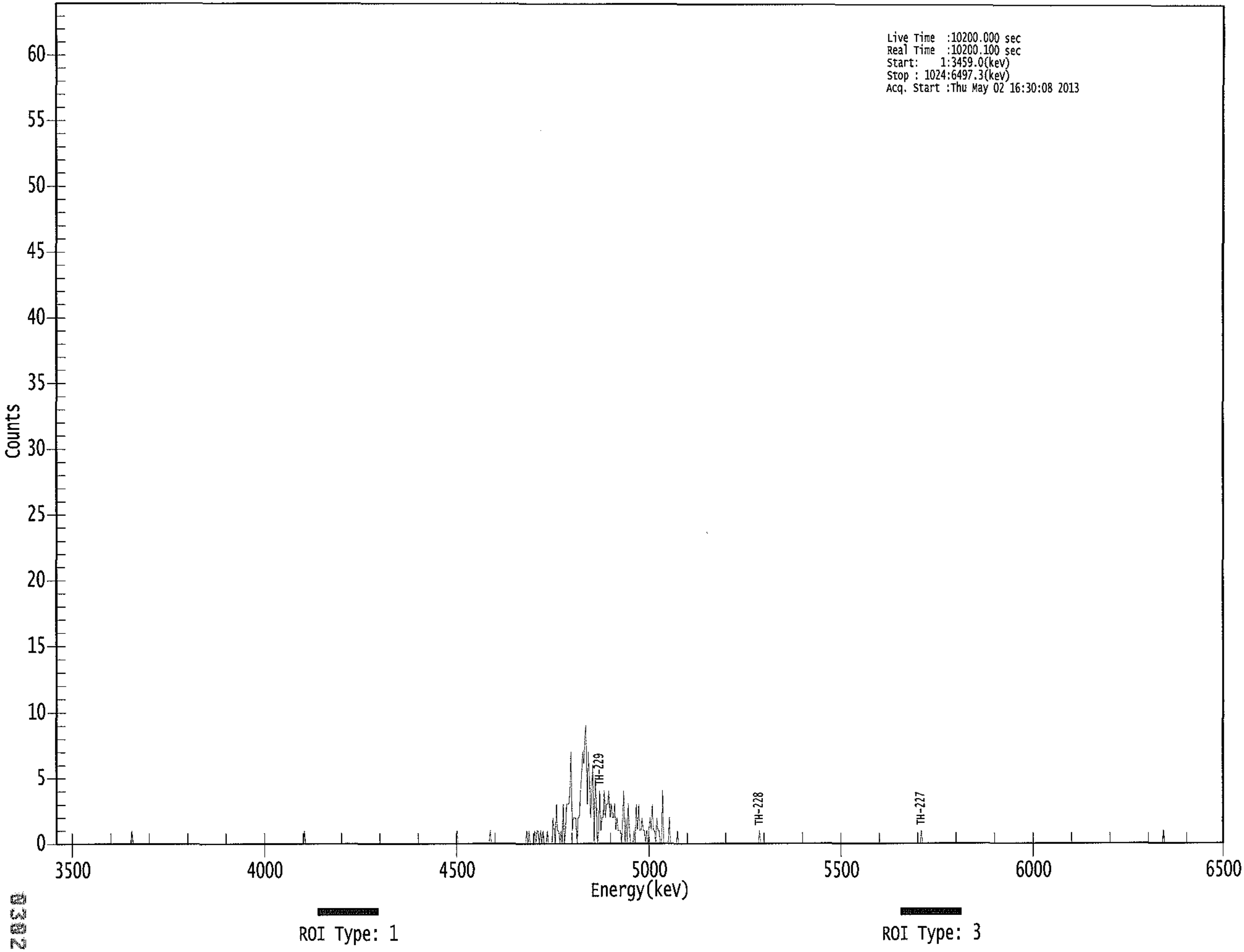

****
***** S P E C T R A L D A T A R E P O R T *****
****

Sample Title: 17

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	1	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	1	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	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: 17

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	1	0	1	0
417:	0	0	0	1	0	1	1	0
425:	1	0	1	0	0	0	1	0
433:	0	0	0	2	1	0	3	1
441:	1	0	1	0	3	0	1	3
449:	3	3	4	7	1	2	2	2
457:	0	2	2	4	5	7	6	8
465:	9	3	7	5	2	4	6	0
473:	5	3	0	1	4	1	2	2
481:	4	2	3	3	4	2	3	2
489:	2	3	1	2	1	1	1	0
497:	2	4	0	2	0	3	1	0
505:	0	0	1	0	3	1	3	1
513:	1	2	1	1	0	1	0	1
521:	2	1	3	1	1	0	2	1
529:	1	0	0	4	0	0	0	0
537:	0	2	0	0	0	0	0	0
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	0	0	0
609:	0	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	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: 17

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	1	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

Apex-Alpha™

C 5/10/13

Sample Description: PZ-104-KS TOT
Spectrum File: \\OR-ALPHA1\Canberra\ApexAlpha\Root\Data\00000569
Batch Identification: 1304107A-TH
Sample Identification: 18
Sample Geometry: Shelf 2
Procedure Description: Th iso

Detector Name: Alpha_041
Chamber Serial Number: 05026930A
Detector Serial Number: 91087
Env. Background: System Bkgd 55753
Reagent Blank: <not performed>

Sample Size: 1.000E+000 +/- 0.000E+000 liter
Sample Date/Time: 4/11/2013 7:27:18 AM
Acquisition Date/Time: 5/2/2013 4:30:05 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: 0.2295 +/- 0.0176
Counting Efficiency: 0.1978 +/- 0.0034 on 12/16/2012 5:49:31 PM
Chem. Recovery Factor: 1.1597 +/- 0.0911

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		5.756	1.15	249.59	0.85	0.00E+000	3.0
TH-228		5.401	8.66	68.12	0.34	0.00E+000	4.5
TH-229	T	4.881	203.83	13.74	0.17	0.00E+000	4.8
TH-230		4.652	15.15	51.98	0.85	0.00E+000	3.0
TH-232		3.991	6.79	88.39	2.21	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	0.955	5850.00*	1.36E-002 +/- 3.41E-002	7.10E-002 +/- 1.07E-002
TH-228	1.000	5400.00*	1.02E-001 +/- 7.13E-002	5.64E-002 +/- 8.48E-003
TH-229	1.000	4872.00*	2.37E+000 +/- 3.55E-001	4.84E-002 +/- 7.27E-003
TH-230	0.998	4672.00*	1.75E-001 +/- 9.48E-002	6.93E-002 +/- 1.04E-002
TH-232	1.000	3997.00*	7.84E-002 +/- 7.03E-002	9.23E-002 +/- 1.39E-002

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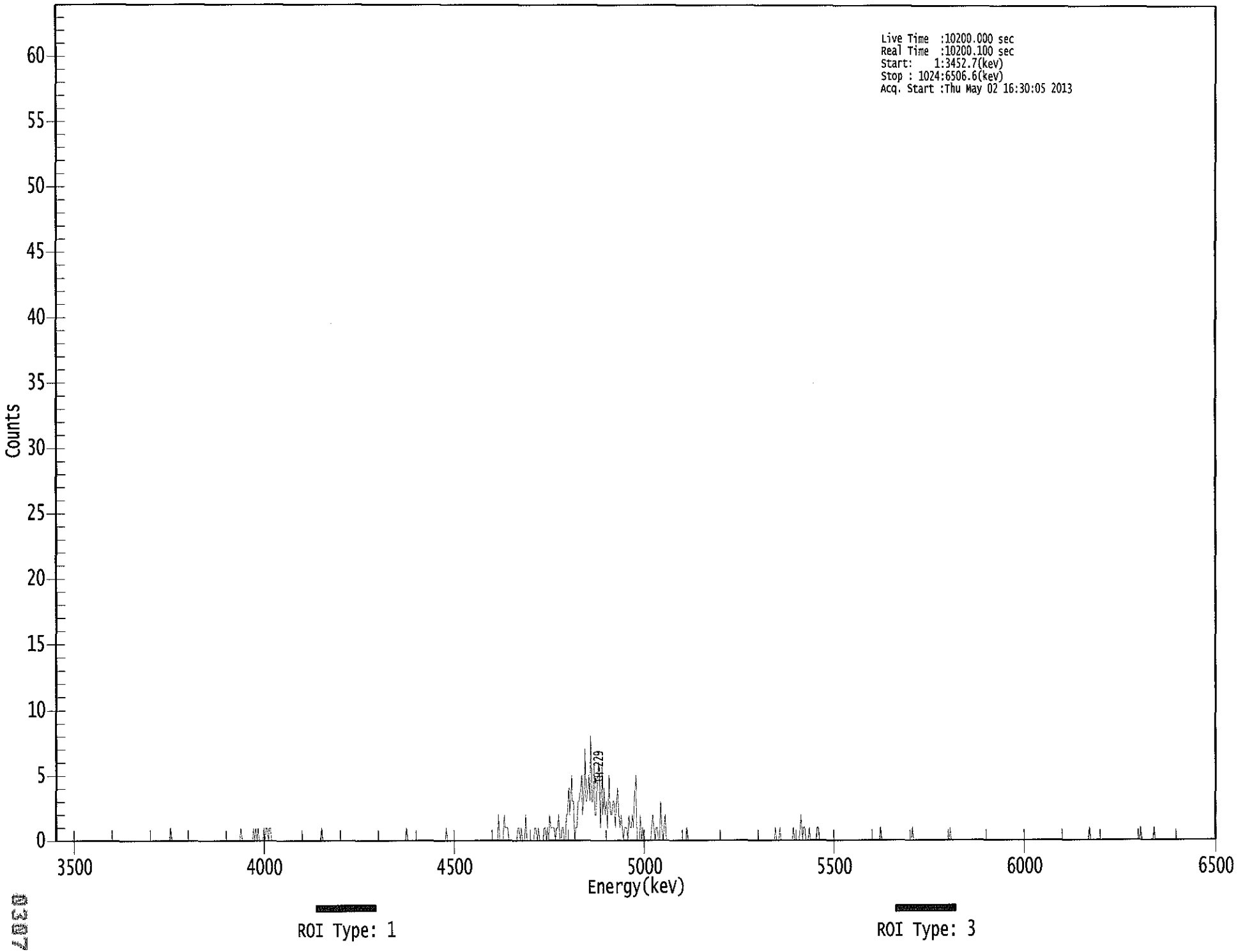
5/3/13

0000056962.CNF



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

Sample Title: 18

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	1	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	1	0	0	0	0
169:	0	0	0	0	0	0	1	0
177:	1	0	1	0	0	0	0	1
185:	0	1	1	0	1	1	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	1	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	1	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:	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	0	0	0	0

Sample Title: 18

Channel								
377:	0	0	0	0	0	0	0	0
385:	0	0	0	0	0	0	2	0
393:	0	0	0	2	1	1	1	0
401:	0	0	0	0	0	0	0	1
409:	1	0	1	0	0	0	2	0
417:	0	0	0	0	0	0	1	1
425:	0	1	0	0	0	0	1	1
433:	0	1	0	2	1	1	1	1
441:	0	1	1	2	0	0	1	1
449:	0	0	2	2	4	2	5	3
457:	3	0	1	1	3	3	4	5
465:	2	3	7	3	3	5	3	8
473:	3	3	6	2	2	5	6	4
481:	1	6	2	4	2	3	1	5
489:	3	2	2	3	3	1	3	4
497:	2	1	2	1	0	1	1	1
505:	0	2	1	1	2	1	4	5
513:	0	0	0	2	0	1	0	0
521:	0	0	0	0	0	1	2	1
529:	0	1	1	0	0	3	1	0
537:	1	2	0	0	0	0	0	0
545:	0	0	0	0	0	0	0	0
553:	0	0	0	0	1	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	1	0	0	0	1	0
641:	0	0	0	0	0	0	0	0
649:	0	0	1	0	0	0	0	0
657:	1	2	0	1	1	0	0	0
665:	1	0	0	0	0	0	0	1
673:	1	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	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	1	0	0	0
793:	0	0	0	0	0	0	0	0

801:	0	0	0	0	0	0	0	0

Sample Title: 18

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	1
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	1	0	0	0
961:	0	0	0	0	0	0	0	0
969:	1	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

Apex-Alpha™

C
5/10/13

Sample Description: PZ-104-KS DIS
Spectrum File: \\OR-ALPHA1\Canberra\ApexAlpha\Root\Data\00000569
Batch Identification: 1304107A-TH
Sample Identification: 19
Sample Geometry: Shelf 2
Procedure Description: Th iso

Detector Name: Alpha_042
Chamber Serial Number: 05026930B
Detector Serial Number: 84185
Env. Background: System Bkgd 55754
Reagent Blank: <not performed>

Sample Size: 1.000E+000 +/- 0.000E+000 liter
Sample Date/Time: 4/11/2013 7:27:18 AM
Acquisition Date/Time: 5/2/2013 4:30:07 PM
Acquisition Live Time: 170.0 minutes
Acquisition Real Time: 170.0 minutes

Tracer Certificate: Th229_TH-18A
Tracer Quantity: 0.230 mL
Effective Efficiency: 0.2238 +/- 0.0174
Counting Efficiency: 0.1846 +/- 0.0032 on 12/16/2012 5:49:29 PM
Chem. Recovery Factor: 1.2122 +/- 0.0967

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		5.866	2.32	149.12	0.68	0.00E+000	3.0
TH-228		5.327	2.98	134.36	1.02	0.00E+000	6.0
TH-229	T	4.882	196.66	13.99	0.34	0.00E+000	5.6
TH-230		4.632	14.15	53.90	0.85	0.00E+000	3.0
TH-232		3.949	-0.68	304.44	0.68	0.00E+000	0.0

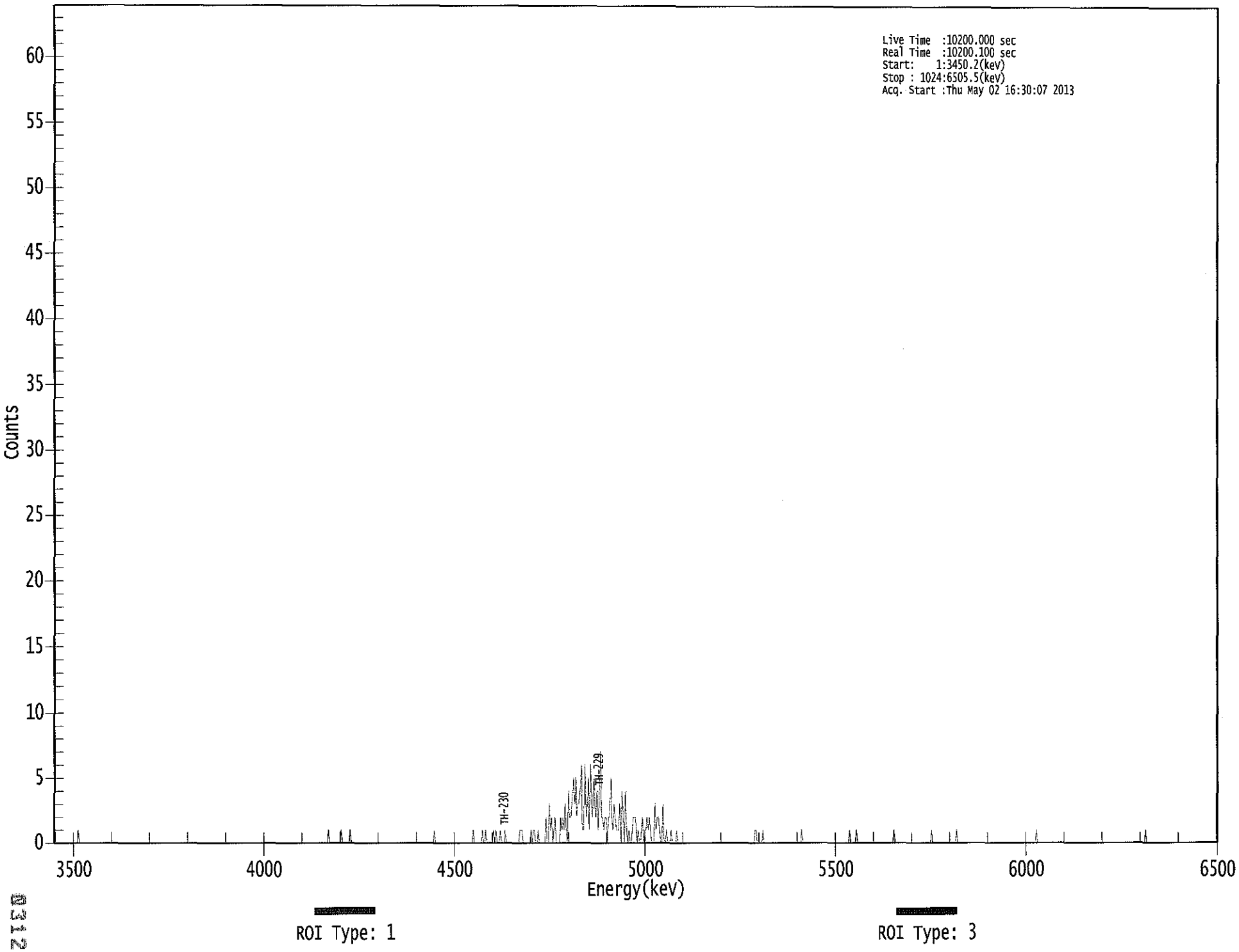
T = Tracer Peak used for Effective Efficiency

NUCLIDE ANALYSIS RESULTS

Nuclide	Id Conf.	Energy (keV)	Activity (pCi/liter)	MDA (pCi/liter)
TH-227	0.999	5850.00*	2.82E-002 +/- 4.23E-002	6.86E-002 +/- 1.05E-002
TH-228	0.972	5400.00*	3.61E-002 +/- 4.88E-002	7.62E-002 +/- 1.16E-002
TH-229	0.999	4872.00*	2.34E+000 +/- 3.57E-001	5.69E-002 +/- 8.68E-003
TH-230	0.992	4672.00*	1.68E-001 +/- 9.40E-002	7.10E-002 +/- 1.08E-002
TH-232	0.988	3997.00*	-8.05E-003 +/- 2.45E-002	6.68E-002 +/- 1.02E-002

AG
5/3/13

0000056963.CNF



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

Sample Title: 19

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	1	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	1	0	0	0	0	0	0
249:	0	0	0	0	1	0	0	0
257:	0	0	0	0	1	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	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	0

369:	1	0	0	0	0	0	0	0

Sample Title: 19

Channel								
377:	1	0	0	1	0	0	0	0
385:	0	0	1	0	1	0	0	0
393:	1	0	0	0	1	0	0	0
401:	0	0	0	0	0	0	0	0
409:	0	1	1	1	0	0	0	0
417:	0	0	0	1	0	1	1	0
425:	0	1	0	0	0	0	0	0
433:	2	0	0	3	1	2	0	1
441:	2	0	0	0	0	2	1	2
449:	1	3	1	0	4	2	2	3
457:	5	3	5	2	3	3	4	6
465:	1	1	6	3	2	5	1	6
473:	3	2	5	3	2	4	1	4
481:	7	2	2	1	2	2	0	2
489:	2	5	2	1	3	2	1	1
497:	1	3	0	4	2	0	4	1
505:	0	1	0	0	1	2	2	2
513:	0	1	0	0	1	2	0	1
521:	1	2	1	2	1	0	0	0
529:	3	1	2	2	1	0	0	3
537:	0	0	1	0	0	0	1	0
545:	0	0	0	1	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:	1	1	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	0	0	0	0	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	1	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	1	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	1	0	0	0	0	0	0

801:	0	0	0	0	0	0	0	0

Sample Title: 19

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	1
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	1
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

5/2/2013 5:59:41 AM

Apex-Alpha™

QA SUMMARY REPORT

Review Of QA Results - Pulser Check

Date : 5/2/2013
Time : 5:59:41 AM

CHAMBER	DEVICE	PARAMETER	FLAG	DATE
Alpha_001	21f	ALL	Not Done	
Alpha_002	21f	ALL	Not Done	
Alpha_003	21f	ALL	Passed	5/2/2013 5:15:45 AM
Alpha_004	21f	ALL	Passed	5/2/2013 5:15:46 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	5/2/2013 5:15:47 AM
Alpha_011	21f	ALL	Passed	5/2/2013 5:15:48 AM
Alpha_012	21f	ALL	Not Done	
Alpha_013	21f	ALL	Passed	5/2/2013 5:15:49 AM
Alpha_014	21f	ALL	Passed	5/2/2013 5:15:49 AM
Alpha_015	21f	ALL	Not Done	
Alpha_016	21f	ALL	Not Done	
Alpha_017	AIM730	ALL	Not Done	
Alpha_018	AIM730	ALL	Passed	5/2/2013 5:15:50 AM
Alpha_019	AIM730	ALL	Not Done	
Alpha_020	AIM730	ALL	Not Done	
Alpha_021	AIM730	ALL	Not Done	
Alpha_022	AIM730	ALL	Passed	5/2/2013 5:15:51 AM
Alpha_023	AIM730	ALL	Not Done	
Alpha_024	AIM730	ALL	Passed	5/2/2013 5:15:52 AM
Alpha_025	AIM730	ALL	Passed	5/2/2013 5:15:53 AM
Alpha_026	AIM730	ALL	Not Done	
Alpha_027	AIM730	ALL	Passed	5/2/2013 5:15:54 AM
Alpha_028	AIM730	ALL	Not Done	
Alpha_029	AIM730	ALL	Passed	5/2/2013 5:15:54 AM
Alpha_030	AIM730	ALL	Not Done	
Alpha_031	AIM730	ALL	Not Done	
Alpha_032	AIM730	ALL	Not Done	
Alpha_033	Alpha Analyst100DC	ALL	Passed	5/2/2013 5:15:56 AM
Alpha_034	Alpha Analyst100DC	ALL	Passed	5/2/2013 5:15:57 AM
Alpha_035	Alpha Analyst100DC	ALL	Passed	5/2/2013 5:15:59 AM
Alpha_036	Alpha Analyst100DC	ALL	Passed	4/29/2013 5:29:59 AM
Alpha_037	Alpha Analyst100DC	ALL	Passed	5/2/2013 5:16:01 AM
Alpha_038	Alpha Analyst100DC	ALL	Not Done	
Alpha_039	Alpha Analyst100DC	ALL	Passed	4/29/2013 5:30:03 AM
Alpha_040	Alpha Analyst100DC	ALL	Passed	5/2/2013 5:16:03 AM
Alpha_041	Alpha Analyst100DC	ALL	Passed	5/2/2013 5:16:04 AM
Alpha_042	Alpha Analyst100DC	ALL	Passed	5/2/2013 5:16:06 AM

Review of QA Results - Pulser Check

5/2/2013 5:59:41 AM

CHAMBER	DEVICE	PARAMETER	FLAG	DATE
Alpha_043	Alpha Analyst100DC	ALL	Passed	4/29/2013 5:30:09 AM
Alpha_044	Alpha Analyst100DC	ALL	Passed	5/2/2013 5:16:09 AM
Alpha_045	Alpha Analyst100DC	ALL	Not Done	
Alpha_046	Alpha Analyst100DC	ALL	Passed	5/2/2013 5:16:12 AM
Alpha_047	Alpha Analyst100DC	ALL	Passed	5/2/2013 5:16:15 AM
Alpha_048	Alpha Analyst100DC	ALL	Passed	5/2/2013 5:16:18 AM

APPROVED BY: C

APPROVAL DATE: 5/2/13

****
***** 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)

13-04107
Ra226
Run 1

Work Order	13-04107
Analysis Code	Ra226
Run	1
Date Received	4/16/2013
Lab Deadline	5/7/2013
Client	Engineering Management Support, Inc.
Project	West Lake OU-1
Report Level	4
Activity Units	pCi
Aliquot Units	l
Matrix	WA
Method	EPA 903.0 Modified
Instrument Type	Alpha Spectroscopy
Radiometric Tracer	Ba-133
Radiometric Sol#	Ba-6a
Tracer Act (dpm/g)	1008.864
Carrier	
Carrier Conc (mg/ml)	

Internal Fraction	Sample Desc	Client ID	Login CPM	Sample Date	Sample Aliquot
01	LCS	LCS		04/16/13 00:00	1.0000E+00
02	MBL	BLANK		04/16/13 00:00	1.0000E+00
03	DUP	PZ-109-SS TOT	45	04/11/13 16:08	1.5000E+00
04	TRG	PZ-113-AD TOT	39	04/11/13 13:35	1.5000E+00
05	TRG	PZ-113-AD DIS	39	04/11/13 13:35	1.5000E+00
06	TRG	FB at D-3 TOT	44	04/11/13 13:50	1.5000E+00
07	TRG	FB at D-3 DIS	44	04/11/13 13:50	1.5000E+00
08	TRG	D-3 TOT	46	04/11/13 14:24	1.5000E+00
09	TRG	D-3 DIS	46	04/11/13 14:24	1.5000E+00
10	TRG	D-85 TOT	43	04/11/13 14:45	1.5000E+00
11	TRG	D-85 DIS	43	04/11/13 14:45	1.5000E+00
12	TRG	S-84 TOT	42	04/11/13 15:30	1.5000E+00
13	TRG	S-84 DIS	42	04/11/13 15:30	1.5000E+00
14	TRG	S-5 TOT	35	04/11/13 15:31	1.5000E+00
15	TRG	S-5 DIS	35	04/11/13 15:31	1.5000E+00
16	DO	PZ-109-SS TOT	45	04/11/13 16:08	1.5000E+00
17	TRG	PZ-109-SS DIS	45	04/11/13 16:08	1.5000E+00
18	TRG	PZ-104-KS TOT	38	04/11/13 18:08	1.5000E+00
19	TRG	PZ-104-KS DIS	38	04/11/13 18:08	1.5000E+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.

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	0.8085	815.7	385.5	104.92		0.0229	0.0287	0.0058		104.92	2.08	1.00
02	MBL	0.8126	819.8	361.0	97.76		0.0226	0.0286	0.0060		97.76	2.16	1.00
03	DUP	0.8110	818.2	385.2	104.52		0.0228	0.0302	0.0074		104.52	2.61	1.00
04	TRG	0.8100	817.2	331.9	90.17		0.0229	0.0349	0.0120		90.17	4.05	1.00
05	TRG	0.8083	815.5	357.3	97.27		0.0225	0.0327	0.0102		97.27	3.34	1.00
06	TRG	0.8080	815.2	363.0	98.86		0.0226	0.0282	0.0056		98.86	2.00	1.00
07	TRG	0.8079	815.1	360.5	98.19		0.0230	0.0288	0.0058		98.19	2.08	1.00
08	TRG	0.8063	813.4	337.2	92.03		0.0232	0.0350	0.0118		92.03	3.96	1.00
09	TRG	0.8069	814.1	391.8	106.85		0.0226	0.0331	0.0105		106.85	3.44	1.00
10	TRG	0.8059	813.0	216.7	59.17		0.0227	0.0351	0.0124		59.17	4.27	1.00
11	TRG	0.8059	813.0	356.4	97.31		0.0226	0.0323	0.0097		97.31	3.20	1.00
12	TRG	0.8079	815.1	337.1	91.82		0.0227	0.0294	0.0067		91.82	2.40	1.00
13	TRG	0.8082	815.4	339.6	92.46		0.0227	0.0297	0.0070		92.46	2.50	1.00
14	TRG	0.8079	815.1	128.1	34.89		0.0224	0.0286	0.0062		34.89	2.23	1.00
15	TRG	0.8074	814.6	389.2	106.07		0.0223	0.0291	0.0068		106.07	2.44	1.00
16	DO	0.8092	816.4	330.0	89.74		0.0225	0.0297	0.0072		89.74	2.55	1.00
17	TRG	0.8072	814.4	358.3	97.68		0.0225	0.0298	0.0073		97.68	2.58	1.00
18	TRG	0.8005	807.6	359.5	98.82		0.0227	0.0294	0.0067		98.82	2.40	1.00
19	TRG	0.8032	810.3	336.3	92.13		0.0225	0.0295	0.0070		92.13	2.50	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.

13-04107
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			04/26/13 15:23	LWALKER	05/10/13 07:40	TSMITH		
02	MBL			04/26/13 15:23	LWALKER	05/10/13 07:40	TSMITH		
03	DUP			04/26/13 15:23	LWALKER	05/10/13 07:40	TSMITH		
04	TRG			04/26/13 15:23	LWALKER	05/10/13 07:40	TSMITH		
05	TRG			04/26/13 15:23	LWALKER	05/10/13 07:40	TSMITH		
06	TRG			04/26/13 15:23	LWALKER	05/10/13 07:40	TSMITH		
07	TRG			04/26/13 15:23	LWALKER	05/10/13 07:40	TSMITH		
08	TRG			04/26/13 15:23	LWALKER	05/10/13 07:40	TSMITH		
09	TRG			04/26/13 15:23	LWALKER	05/10/13 07:40	TSMITH		
10	TRG			04/26/13 15:23	LWALKER	05/10/13 07:40	TSMITH		
11	TRG			04/26/13 15:23	LWALKER	05/10/13 07:40	TSMITH		
12	TRG			04/26/13 15:23	LWALKER	05/10/13 07:40	TSMITH		
13	TRG			04/26/13 15:23	LWALKER	05/10/13 07:40	TSMITH		
14	TRG			04/26/13 15:23	LWALKER	05/10/13 07:40	TSMITH		
15	TRG			04/26/13 15:23	LWALKER	05/10/13 07:40	TSMITH		
16	DO			04/26/13 15:23	LWALKER	05/10/13 07:40	TSMITH		
17	TRG			04/26/13 15:23	LWALKER	05/10/13 07:40	TSMITH		
18	TRG			04/26/13 15:23	LWALKER	05/10/13 07:40	TSMITH		
19	TRG			04/26/13 15:23	LWALKER	05/10/13 07:40	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.

Eberline Services
Oak Ridge Laboratory

Preliminary Data Report & Analytical Calculations

Work Order: 13-04107-Ra226-1

Run	1
Analysis Code	Ra226
Eberline Services Work Order	13-04107
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-226	LCS	LCS	pCi/l	1.06E+01	1.20E+00	2.32E-01	1.02E+01	103.79	OK		OK	
02	RA-226	MBL	BLANK	pCi/l	2.27E-02	7.18E-02	1.52E-01					OK	OK
03	RA-226	DUP	PZ-109-SS TOT	pCi/l	1.72E+00	4.03E-01	1.72E-01				NA	OK	
04	RA-226	TRG	PZ-113-AD TOT	pCi/l	2.27E+00	6.01E-01	2.38E-01					OK	
05	RA-226	TRG	PZ-113-AD DIS	pCi/l	1.59E+00	4.54E-01	2.04E-01					OK	
06	RA-226	TRG	FB at D-3 TOT	pCi/l	-2.67E-02	4.50E-02	1.59E-01					OK	
07	RA-226	TRG	FB at D-3 DIS	pCi/l	-6.09E-02	5.05E-02	1.84E-01					OK	
08	RA-226	TRG	D-3 TOT	pCi/l	2.82E+00	7.14E-01	2.40E-01					OK	
09	RA-226	TRG	D-3 DIS	pCi/l	2.12E+00	5.90E-01	3.33E-01					OK	
10	RA-226	TRG	D-85 TOT	pCi/l	9.67E+00	1.66E+00	4.96E-01					OK	
11	RA-226	TRG	D-85 DIS	pCi/l	9.14E-01	3.49E-01	1.89E-01					OK	
12	RA-226	TRG	S-84 TOT	pCi/l	2.43E-01	1.85E-01	2.34E-01					OK	
13	RA-226	TRG	S-84 DIS	pCi/l	1.14E-01	1.20E-01	1.68E-01					OK	
14	RA-226	TRG	S-5 TOT	pCi/l	1.10E+00	5.16E-01	2.58E-01					OK	
15	RA-226	TRG	S-5 DIS	pCi/l	3.86E-02	6.53E-02	1.11E-01					OK	
16	RA-226	DO	PZ-109-SS TOT	pCi/l	2.15E+00	4.85E-01	1.55E-01					OK	
17	RA-226	TRG	PZ-109-SS DIS	pCi/l	2.29E+00	4.65E-01	1.56E-01					OK	
18	RA-226	TRG	PZ-104-KS TOT	pCi/l	3.25E-01	1.77E-01	1.26E-01					OK	
19	RA-226	TRG	PZ-104-KS DIS	pCi/l	6.93E-02	9.59E-02	1.46E-01					OK	

Preliminary Data Report & Analytical Calculations

Work Order: 13-04107-Ra226-1

Run	1
Analysis Code	Ra226
Eberline Services Work Order	13-04107
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	04/16/13 00:00	1.00E+00	100.00	0.00	104.92		5/10/2013 7:40	
02	RA-226	MBL	04/16/13 00:00	1.00E+00	97.76	0.00	97.76		5/10/2013 7:40	
03	RA-226	DUP	04/11/13 16:08	1.50E+00	100.00	0.00	104.52		5/10/2013 7:40	
04	RA-226	TRG	04/11/13 13:35	1.50E+00	90.17	0.00	90.17		5/10/2013 7:40	
05	RA-226	TRG	04/11/13 13:35	1.50E+00	97.27	0.00	97.27		5/10/2013 7:40	
06	RA-226	TRG	04/11/13 13:50	1.50E+00	98.86	0.00	98.86		5/10/2013 7:40	
07	RA-226	TRG	04/11/13 13:50	1.50E+00	98.19	0.00	98.19		5/10/2013 7:40	
08	RA-226	TRG	04/11/13 14:24	1.50E+00	92.03	0.00	92.03		5/10/2013 7:40	
09	RA-226	TRG	04/11/13 14:24	1.50E+00	100.00	0.00	106.85		5/10/2013 7:40	
10	RA-226	TRG	04/11/13 14:45	1.50E+00	59.17	0.00	59.17		5/10/2013 7:40	
11	RA-226	TRG	04/11/13 14:45	1.50E+00	97.31	0.00	97.31		5/10/2013 7:40	
12	RA-226	TRG	04/11/13 15:30	1.50E+00	91.82	0.00	91.82		5/10/2013 7:40	
13	RA-226	TRG	04/11/13 15:30	1.50E+00	92.46	0.00	92.46		5/10/2013 7:40	
14	RA-226	TRG	04/11/13 15:31	1.50E+00	34.89	0.00	34.89		5/10/2013 7:40	
15	RA-226	TRG	04/11/13 15:31	1.50E+00	100.00	0.00	106.07		5/10/2013 7:40	
16	RA-226	DO	04/11/13 16:08	1.50E+00	89.74	0.00	89.74		5/10/2013 7:40	
17	RA-226	TRG	04/11/13 16:08	1.50E+00	97.68	0.00	97.68		5/10/2013 7:40	
18	RA-226	TRG	04/11/13 18:08	1.50E+00	98.82	0.00	98.82		5/10/2013 7:40	
19	RA-226	TRG	04/11/13 18:08	1.50E+00	92.13	0.00	92.13		5/10/2013 7:40	

Preliminary Data Report & Analytical Calculations

Work Order: 13-04107-Ra226-1

Run	1
Analysis Code	Ra226
Eberline Services Work Order	13-04107
Client	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	05/12/13 12:09		A_Spec	Alpha_003	170	3.35 E+02	1.00 E-02	17.5
02	RA-226	MBL	05/12/13 12:09		A_Spec	Alpha_004	170.02	1.13 E+00	1.10 E-02	19.4
03	RA-226	DUP	05/12/13 12:09		A_Spec	Alpha_010	170	7.33 E+01	1.00 E-02	19.7
04	RA-226	TRG	05/12/13 12:09		A_Spec	Alpha_011	170.02	5.71 E+01	5.00 E-03	19.7
05	RA-226	TRG	05/12/13 12:09		A_Spec	Alpha_013	170.02	4.90 E+01	6.00 E-03	18.7
06	RA-226	TRG	05/12/13 12:09		A_Spec	Alpha_014	170	-1.38 E+00	1.40 E-02	18.5
07	RA-226	TRG	05/12/13 12:09		A_Spec	Alpha_018	170	-2.89 E+00	1.70 E-02	17.8
08	RA-226	TRG	05/12/13 12:09		A_Spec	Alpha_019	170	6.15 E+01	3.00 E-03	16.6
09	RA-226	TRG	05/12/13 12:09		A_Spec	Alpha_022	170	5.35 E+01	1.50 E-02	15.3
10	RA-226	TRG	05/12/13 12:09		A_Spec	Alpha_024	170	1.38 E+02	9.00 E-03	17.1
11	RA-226	TRG	05/12/13 12:09		A_Spec	Alpha_025	170	2.73 E+01	4.00 E-03	17.4
12	RA-226	TRG	05/12/13 12:09		A_Spec	Alpha_027	170	9.11 E+00	1.70 E-02	17.3
13	RA-226	TRG	05/12/13 12:09		A_Spec	Alpha_029	170	4.64 E+00	8.00 E-03	19.5
14	RA-226	TRG	05/12/13 12:09		A_Spec	Alpha_033	170	1.78 E+01	1.00 E-03	18.2
15	RA-226	TRG	05/12/13 12:09		A_Spec	Alpha_034	170	1.66 E+00	2.00 E-03	18.6
16	RA-226	DO	05/12/13 12:09		A_Spec	Alpha_035	170	7.83 E+01	4.00 E-03	18.3
17	RA-226	TRG	05/12/13 12:09		A_Spec	Alpha_036	170	9.68 E+01	7.00 E-03	19.8
18	RA-226	TRG	05/12/13 12:10		A_Spec	Alpha_037	170	1.35 E+01	3.00 E-03	17.8
19	RA-226	TRG	05/12/13 12:10		A_Spec	Alpha_038	170	2.49 E+00	3.00 E-03	17.2

Count Room Report
Client: Engineering Management Su

13-04107-Ra226-1 (pCi/l) in WA
Tracer ID: Ba-6a

2.5

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	04/16/13 00:00	1.0000	0.8085	815.6665	385.5000	104.92	2.08	1.00
02	MBL	BLANK	04/16/13 00:00	1.0000	0.8126	819.8029	361.0000	97.76	2.16	1.00
03	DUP	PZ-109-SS TOT	04/11/13 16:08	1.5000	0.8110	818.1887	385.2000	104.52	2.61	1.00
04	TRG	PZ-113-AD TOT	04/11/13 13:35	1.5000	0.8100	817.1798	331.9000	90.17	4.05	1.00
05	TRG	PZ-113-AD DIS	04/11/13 13:35	1.5000	0.8083	815.4648	357.3000	97.27	3.34	1.00
06	TRG	FB at D-3 TOT	04/11/13 13:50	1.5000	0.8080	815.1621	363.0000	98.86	2.00	1.00
07	TRG	FB at D-3 DIS	04/11/13 13:50	1.5000	0.8079	815.0612	360.5000	98.19	2.08	1.00
08	TRG	D-3 TOT	04/11/13 14:24	1.5000	0.8063	813.4470	337.2000	92.03	3.96	1.00
09	TRG	D-3 DIS	04/11/13 14:24	1.5000	0.8069	814.0524	391.8000	106.85	3.44	1.00
10	TRG	D-85 TOT	04/11/13 14:45	1.5000	0.8059	813.0435	216.7000	59.17	4.27	1.00
11	TRG	D-85 DIS	04/11/13 14:45	1.5000	0.8059	813.0435	356.4000	97.31	3.20	1.00
12	TRG	S-84 TOT	04/11/13 15:30	1.5000	0.8079	815.0612	337.1000	91.82	2.40	1.00
13	TRG	S-84 DIS	04/11/13 15:30	1.5000	0.8082	815.3639	339.6000	92.46	2.50	1.00
14	TRG	S-5 TOT	04/11/13 15:31	1.5000	0.8079	815.0612	128.1000	34.89	2.23	1.00
15	TRG	S-5 DIS	04/11/13 15:31	1.5000	0.8074	814.5568	389.2000	106.07	2.44	1.00
16	DO	PZ-109-SS TOT	04/11/13 16:08	1.5000	0.8092	816.3727	330.0000	89.74	2.55	1.00
17	TRG	PZ-109-SS DIS	04/11/13 16:08	1.5000	0.8072	814.3550	358.3000	97.68	2.58	1.00
18	TRG	PZ-104-KS TOT	04/11/13 18:08	1.5000	0.8005	807.5956	359.5000	98.82	2.40	1.00
19	TRG	PZ-104-KS DIS	04/11/13 18:08	1.5000	0.8032	810.3196	336.3000	92.13	2.50	1.00

3-14

18-29

33-38

E4329

Spike and Tracer Worksheet

Internal Work Order	Run	Analysis Code	Date	Technician	Technician Initials	Witness Initials
13-04107	1	Ra226	4/26/2013 15:05	LWALKER		

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	44.071	4/26/2013	0.500	0.5136				10.20	0.469	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	1008.864	4/26/2013	0.8085	1.0000
02	Ba-133	Ba-6a	1008.864	4/26/2013	0.8126	1.0000
03	Ba-133	Ba-6a	1008.864	4/26/2013	0.8110	1.0000
04	Ba-133	Ba-6a	1008.864	4/26/2013	0.8100	1.0000
05	Ba-133	Ba-6a	1008.864	4/26/2013	0.8083	1.0000
06	Ba-133	Ba-6a	1008.864	4/26/2013	0.8080	1.0000
07	Ba-133	Ba-6a	1008.864	4/26/2013	0.8079	1.0000
08	Ba-133	Ba-6a	1008.864	4/26/2013	0.8063	1.0000
09	Ba-133	Ba-6a	1008.864	4/26/2013	0.8069	1.0000
10	Ba-133	Ba-6a	1008.864	4/26/2013	0.8059	1.0000
11	Ba-133	Ba-6a	1008.864	4/26/2013	0.8059	1.0000
12	Ba-133	Ba-6a	1008.864	4/26/2013	0.8079	1.0000
13	Ba-133	Ba-6a	1008.864	4/26/2013	0.8082	1.0000
14	Ba-133	Ba-6a	1008.864	4/26/2013	0.8079	1.0000
15	Ba-133	Ba-6a	1008.864	4/26/2013	0.8074	1.0000
16	Ba-133	Ba-6a	1008.864	4/26/2013	0.8092	1.0000
17	Ba-133	Ba-6a	1008.864	4/26/2013	0.8072	1.0000
18	Ba-133	Ba-6a	1008.864	4/26/2013	0.8005	1.0000
19	Ba-133	Ba-6a	1008.864	4/26/2013	0.8032	1.0000

Balance Printer Tapes

Tracer

0.8085 g
0.8126 g
-0.8110 g
-0.8100 g
-0.8083 g
-0.8080 g
-0.8079 g
-0.8063 g
-0.8069 g
-0.8059 g
-0.8059 g
-0.8079 g
-0.8082 g
-0.8079 g
-0.8074 g
-0.8092 g
-0.8072 g
-0.8005 g
-0.8032 g

LCS

0.5136 g

Matrix Spike

Eberline Analytical
Oak Ridge Laboratory

Aliquot Worksheet

Work Order	Run	Analysis Code	Rpt Units	Lab Deadline	Technician
13-04107	1	Ra226	liters	5/7/2013	LWALKER

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-109-SS TOT	DUP					1.5000E+00	1.5000E+00				
04	PZ-113-AD TOT	TRG					1.5000E+00	1.5000E+00				
05	PZ-113-AD DIS	TRG					1.5000E+00	1.5000E+00				
06	FB at D-3 TOT	TRG					1.5000E+00	1.5000E+00				
07	FB at D-3 DIS	TRG					1.5000E+00	1.5000E+00				
08	D-3 TOT	TRG					1.5000E+00	1.5000E+00				
09	D-3 DIS	TRG					1.5000E+00	1.5000E+00				
10	D-85 TOT	TRG					1.5000E+00	1.5000E+00				
11	D-85 DIS	TRG					1.5000E+00	1.5000E+00				
12	S-84 TOT	TRG					1.5000E+00	1.5000E+00				
13	S-84 DIS	TRG					1.5000E+00	1.5000E+00				
14	S-5 TOT	TRG					1.5000E+00	1.5000E+00				
15	S-5 DIS	TRG					1.5000E+00	1.5000E+00				
16	PZ-109-SS TOT	DO					1.5000E+00	1.5000E+00				
17	PZ-109-SS DIS	TRG					1.5000E+00	1.5000E+00				
18	PZ-104-KS TOT	TRG					1.5000E+00	1.5000E+00				
19	PZ-104-KS DIS	TRG					1.5000E+00	1.5000E+00				

Comments	

Technician: *L. Walker* Date: *4/26/13*

Gravimetric Worksheet

Work Order	Run	Analysis Code	Gravimetric Carrier	Carrier Conc (mg/ml)	Technician
13-04107	1	Ra226			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		0.0229	0.0287	0.0058	
02	BLANK	MBL		0.0226	0.0286	0.0060	
03	DUP	DUP		0.0228	0.0302	0.0074	
04	PZ-113-AD TOT	TRG		0.0229	0.0349	0.0120	
05	PZ-113-AD DIS	TRG		0.0225	0.0327	0.0102	
06	FB at D-3 TOT	TRG		0.0226	0.0282	0.0056	
07	FB at D-3 DIS	TRG		0.0230	0.0288	0.0058	
08	D-3 TOT	TRG		0.0232	0.0350	0.0118	
09	D-3 DIS	TRG		0.0226	0.0331	0.0105	
10	D-85 TOT	TRG		0.0227	0.0351	0.0124	
11	D-85 DIS	TRG		0.0226	0.0323	0.0097	
12	S-84 TOT	TRG		0.0227	0.0294	0.0067	
13	S-84 DIS	TRG		0.0227	0.0297	0.0070	
14	S-5 TOT	TRG		0.0224	0.0286	0.0062	
15	S-5 DIS	TRG		0.0223	0.0291	0.0068	
16	PZ-109-SS TOT	DO		0.0225	0.0297	0.0072	
17	PZ-109-SS DIS	TRG		0.0225	0.0298	0.0073	
18	PZ-104-KS TOT	TRG		0.0227	0.0294	0.0067	
19	PZ-104-KS DIS	TRG		0.0225	0.0295	0.0070	

Technician: _____ Date: 5/10/13

Apex-Alpha™

Sample Description: SPIKE
Spectrum File: \\OR-ALPHA1\Canberra\ApexAlpha\Root\Data\00000578
Batch Identification: 1304107A-RA
Sample Identification: 01
Sample Geometry: Shelf 2
Procedure Description: Ra

Detector Name: Alpha_003
Chamber Serial Number:
Detector Serial Number: 3
Env. Background: System Bkgd 56970
Reagent Blank: <not performed>

Sample Size: 1.000E+000 +/- 0.000E+000 liter
Generic Mult. Factor: 2.080E+000 Generic Div. Factor: 1.000E+000
Sample Date/Time: 5/10/2013 7:40:27 AM
Acquisition Date/Time: 5/12/2013 12:09:39 PM
Acquisition Live Time: 170.0 minutes
Acquisition Real Time: 170.0 minutes

Chem. Recovery Factor: 1.0000 +/- 0.0000
Counting Efficiency: 0.1746 +/- 0.0033 on 12/15/2012 11:26:47 AM
Effective Efficiency: 0.1746 +/- 0.0033

Control Certificate Name: Ra226_Ra-5b
Chem. Recov. of Control: RA-226 0.498965 +/- 0.032526
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	5.524	400.24	9.86	4.76	0.00E+000	7.5
RA-226	4.680	335.30	10.74	1.70	0.00E+000	4.6

NUCLIDE ANALYSIS RESULTS

Nuclide	Id Conf.	Energy (keV)	Activity (pCi/liter)	MDA (pCi/liter)
RA-224	0.965	5685.50*	2.01E+001 +/- 1.14E+004	5.26E-001 +/- 2.98E+002
RA-226	0.986	4785.00*	1.06E+001 +/- 1.20E+000	2.32E-001 +/- 8.49E-003

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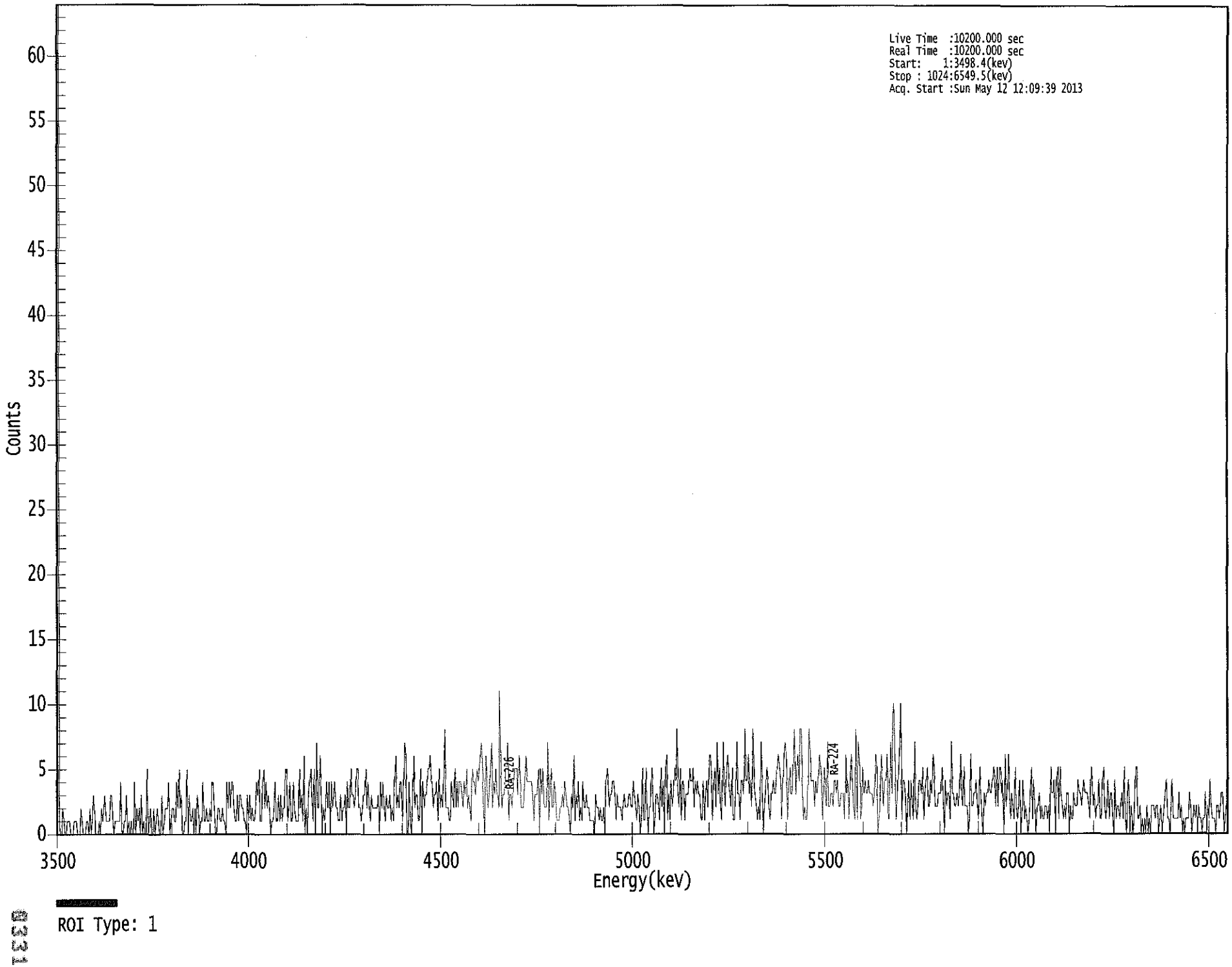
0000057882.CNF



****
***** 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:	10200	10200	1	0	0	2	1	0
9:	0	1	1	1	0	0	0	1
17:	1	1	0	0	0	2	1	0
25:	0	0	1	1	0	2	0	1
33:	3	2	0	0	0	1	0	2
41:	1	2	3	1	1	1	1	3
49:	3	1	0	1	1	1	1	1
57:	4	0	0	1	1	3	0	1
65:	0	1	0	0	4	0	2	1
73:	2	0	3	0	1	0	0	5
81:	0	1	2	0	0	2	0	1
89:	2	1	0	0	3	0	1	2
97:	2	2	4	0	1	2	2	1
105:	1	4	2	5	2	3	0	0
113:	1	1	5	0	3	1	1	2
121:	0	2	0	3	2	0	1	1
129:	4	1	1	2	1	1	2	1
137:	4	4	2	0	0	2	2	1
145:	1	2	1	1	0	4	2	4
153:	2	4	4	2	1	1	3	1
161:	3	3	2	2	1	1	0	3
169:	1	3	1	2	1	1	2	4
177:	3	5	1	1	4	5	2	4
185:	2	3	2	0	1	1	2	4
193:	1	1	3	1	3	1	2	2
201:	5	5	1	2	4	1	1	4
209:	2	1	1	1	5	2	3	1
217:	6	0	2	0	3	4	5	3
225:	1	5	0	7	2	2	6	4
233:	0	2	1	2	4	2	4	0
241:	4	2	3	4	2	2	1	1
249:	3	1	2	2	3	0	4	2
257:	2	5	3	3	2	3	5	5
265:	2	2	1	2	3	3	5	2
273:	4	2	1	3	2	2	2	2
281:	2	3	0	4	2	4	2	1
289:	3	2	2	3	1	2	1	4
297:	6	2	3	2	4	4	1	4
305:	7	6	0	0	4	1	0	3
313:	6	2	3	3	1	1	5	0
321:	4	2	3	3	5	5	6	4
329:	4	2	3	3	4	1	5	2
337:	3	2	4	8	2	2	2	1
345:	1	4	3	2	5	2	4	2
353:	4	4	3	2	4	3	5	2
361:	3	2	1	5	4	4	3	5

369:	4	5	6	7	5	2	0	6

Sample Title: 01

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

801:	2	3	3	4	2	1	5	3

Sample Title: 01

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

Apex-Alpha™

5/17/13

Sample Description: BLANK
Spectrum File: \\OR-ALPHA1\Canberra\ApexAlpha\Root\Data\00000578
Batch Identification: 1304107A-RA
Sample Identification: 02
Sample Geometry: Shelf 2
Procedure Description: Ra

Detector Name: Alpha_004
Chamber Serial Number:
Detector Serial Number: 4
Env. Background: System Bkgd 56971
Reagent Blank: <not performed>

Sample Size: 1.500E+000 +/- 0.000E+000 liter
Generic Mult. Factor: 2.160E+000 Generic Div. Factor: 1.000E+000
Sample Date/Time: 5/10/2013 7:40:27 AM
Acquisition Date/Time: 5/12/2013 12:09:40 PM
Acquisition Live Time: 170.0 minutes
Acquisition Real Time: 170.0 minutes

Chem. Recovery Factor: 0.9776 +/- 0.0000
Counting Efficiency: 0.1940 +/- 0.0036 on 12/15/2012 11:26:46 AM
Effective Efficiency: 0.1897 +/- 0.0035

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	5.511	12.45	61.85	2.55	0.00E+000	2.9
RA-226	4.752	1.13	315.99	1.87	0.00E+000	2.9

NUCLIDE ANALYSIS RESULTS

Nuclide	Id Conf.	Energy (keV)	Activity (pCi/liter)	MDA (pCi/liter)
RA-224	0.959	5685.50*	3.98E-001 +/- 2.26E+002	2.68E-001 +/- 1.52E+002
RA-226	0.999	4785.00*	2.27E-002 +/- 7.18E-002	1.52E-001 +/- 5.48E-003

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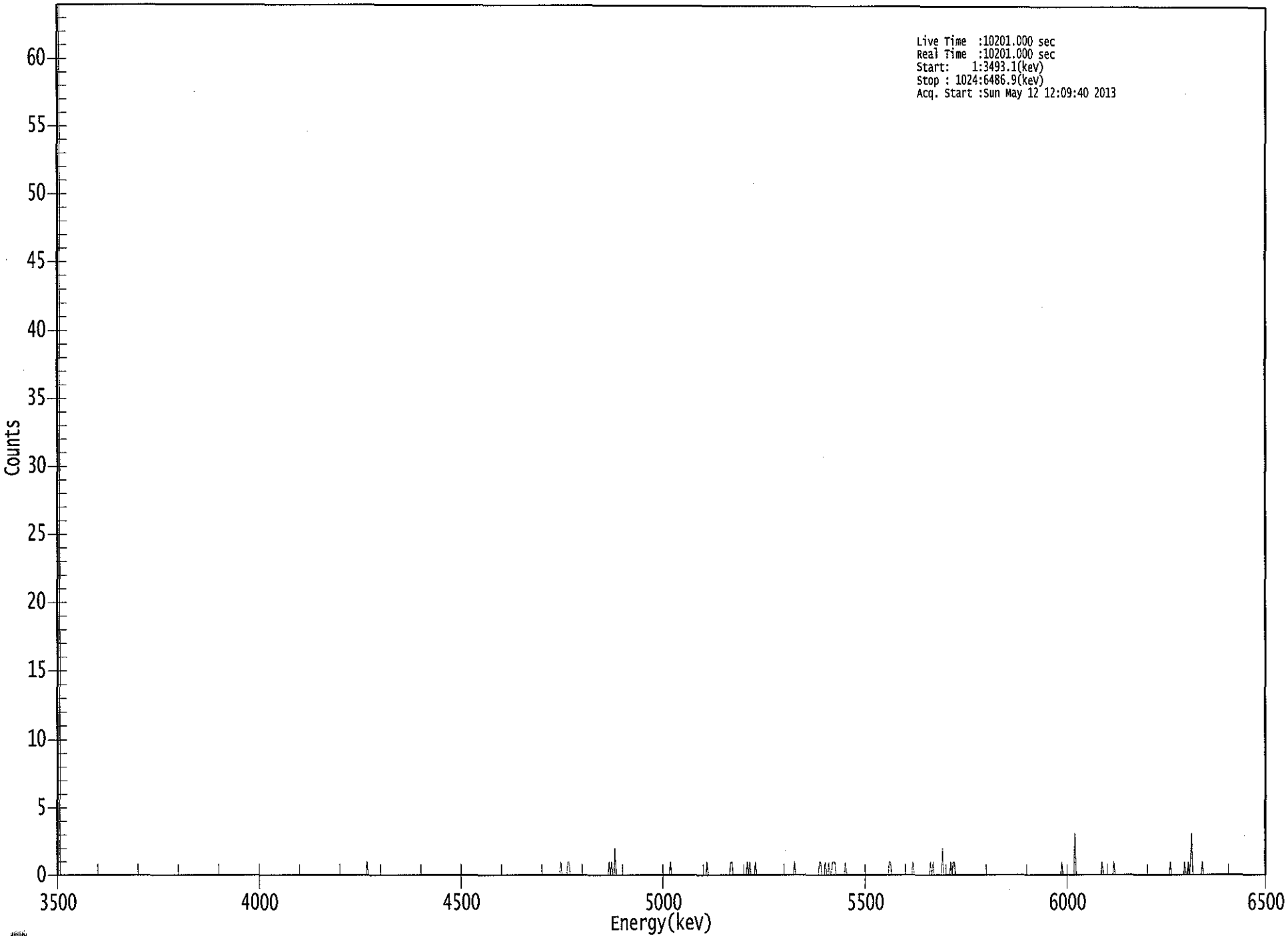

****
***** S P E C T R A L D A T A R E P O R T *****
****

Sample Title: 02

Elapsed Live time: 10201
Elapsed Real Time: 10201

Channel								
1:	10201	10201	0	0	0	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	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	0	0	0	0	0	0
425:	0	0	1	0	0	0	0	0
433:	1	1	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	1	0	1	0	0
473:	2	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	1
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	1	0
553:	0	0	0	0	0	0	0	0
561:	0	0	0	0	0	0	0	0
569:	0	0	1	1	0	0	0	0
577:	0	0	0	0	0	0	0	0
585:	1	0	1	0	0	0	0	1
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:	1	0	0	0	0	0	0	0
633:	0	0	0	0	0	0	0	0
641:	0	0	0	0	0	1	1	0
649:	0	0	1	0	0	1	0	0
657:	1	1	1	0	0	0	0	0
665:	0	0	0	1	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:	1	1	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	1	0	1	0	0
745:	0	0	0	0	0	2	0	0
753:	0	0	0	0	1	0	1	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: 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	1	0	0	0	0	0
857:	0	0	0	0	0	3	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	1	0	0	0
889:	0	0	0	0	0	0	1	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	1	0
945:	0	0	0	0	0	0	0	0
953:	0	0	1	0	0	1	0	1
961:	3	0	0	0	0	0	0	0
969:	0	1	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

Apex-Alpha™

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5/13/13

Sample Description: PZ-109-SS TOT DUP
Spectrum File: \\OR-ALPHA1\Canberra\ApexAlpha\Root\Data\00000578
Batch Identification: 1304107A-RA
Sample Identification: 03
Sample Geometry: Shelf 2
Procedure Description: Ra

Detector Name: Alpha_010
Chamber Serial Number:
Detector Serial Number: 10
Env. Background: System Bkgd 56972
Reagent Blank: <not performed>

Sample Size: 1.500E+000 +/- 0.000E+000 liter
Generic Mult. Factor: 2.610E+000 Generic Div. Factor: 1.000E+000
Sample Date/Time: 5/10/2013 7:40:27 AM
Acquisition Date/Time: 5/12/2013 12:09:41 PM
Acquisition Live Time: 170.0 minutes
Acquisition Real Time: 170.0 minutes

Chem. Recovery Factor: 1.0000 +/- 0.0000
Counting Efficiency: 0.1967 +/- 0.0036 on 12/15/2012 11:26:40 AM
Effective Efficiency: 0.1967 +/- 0.0036

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	5.485	21.24	47.78	4.76	0.00E+000	2.9
RA-226	4.601	73.30	23.20	1.70	0.00E+000	5.9

NUCLIDE ANALYSIS RESULTS

Nuclide	Id Conf.	Energy (keV)	Activity (pCi/liter)	MDA (pCi/liter)
RA-224	0.947	5685.50*	7.92E-001 +/- 4.49E+002	3.90E-001 +/- 2.21E+002
RA-226	0.957	4785.00*	1.72E+000 +/- 4.03E-001	1.72E-001 +/- 6.15E-003

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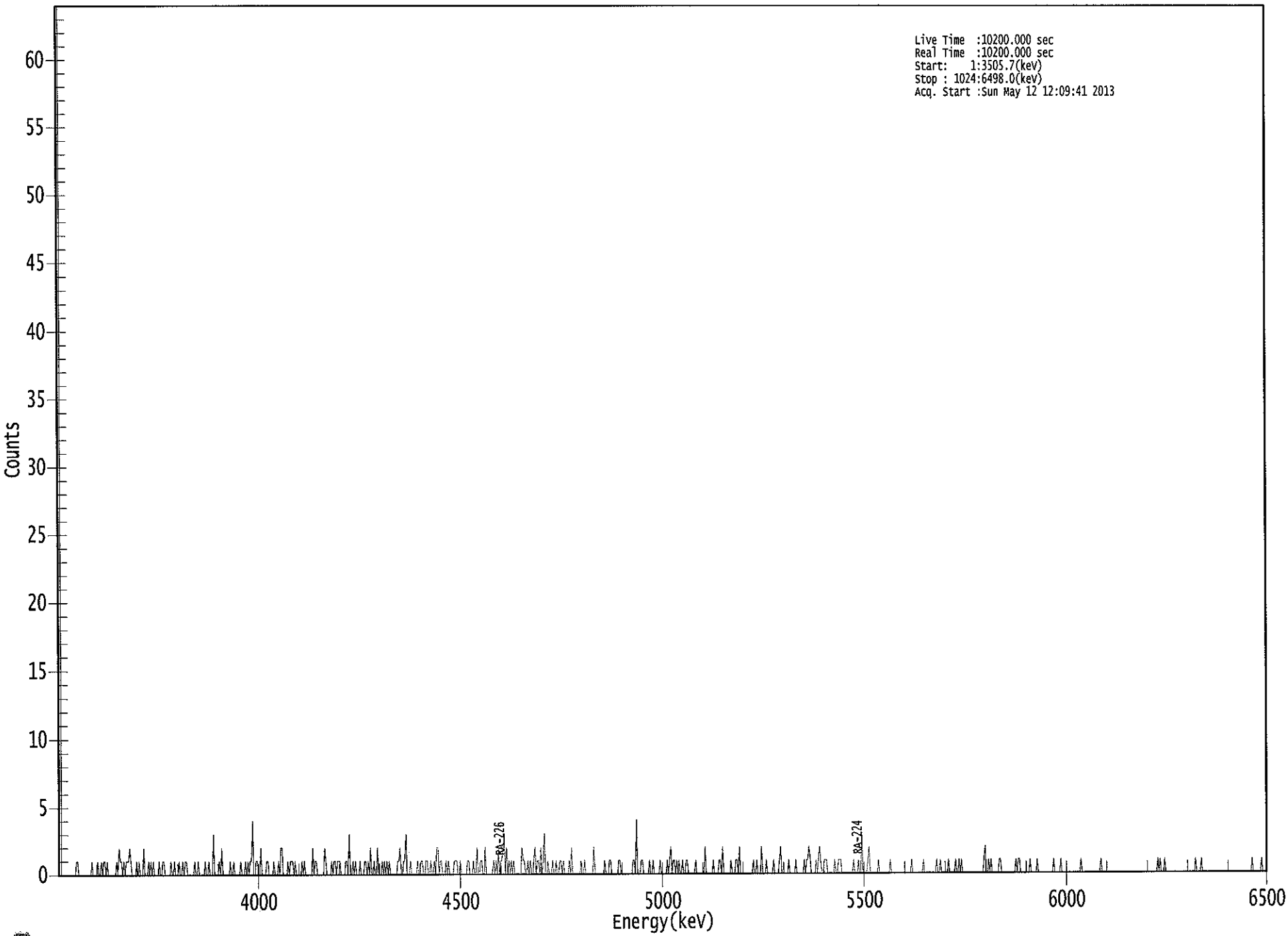
5/13/13

0000057817.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	1
17:	1	0	0	0	0	0	0	0
25:	0	0	0	0	1	0	0	0
33:	0	1	0	0	1	0	1	1
41:	0	1	0	0	0	0	0	0
49:	0	1	0	2	1	1	0	1
57:	0	1	1	1	2	1	0	0
65:	0	0	1	0	1	0	0	0
73:	2	0	0	0	1	0	1	0
81:	1	0	0	0	0	1	0	0
89:	1	1	0	0	0	0	0	1
97:	0	0	1	0	0	0	1	0
105:	0	1	0	1	1	0	0	0
113:	0	0	0	1	0	0	1	0
121:	0	0	0	0	1	0	0	1
129:	0	0	0	3	0	0	0	0
137:	1	0	2	0	0	0	0	0
145:	0	1	0	0	1	0	0	0
153:	0	0	1	0	0	0	1	0
161:	1	0	1	1	4	0	0	1
169:	1	0	0	2	0	0	0	0
177:	1	1	0	0	0	0	1	0
185:	0	0	1	0	2	2	0	0
193:	0	0	1	0	1	1	1	0
201:	1	0	0	0	0	0	1	0
209:	1	0	0	0	0	0	0	2
217:	0	1	1	0	0	0	0	0
225:	0	2	1	0	0	0	0	1
233:	0	1	1	0	1	1	1	0
241:	0	0	0	1	1	0	3	0
249:	0	1	0	1	0	0	0	1
257:	0	0	0	1	1	0	1	0
265:	2	0	0	1	0	0	2	0
273:	0	0	1	0	1	0	1	0
281:	1	0	0	0	0	0	0	1
289:	1	2	0	0	1	1	3	0
297:	0	0	1	0	0	0	0	0
305:	1	0	0	1	1	0	0	1
313:	1	0	0	1	0	0	1	0
321:	2	2	0	1	1	0	0	0
329:	1	0	1	0	0	0	0	1
337:	1	1	0	0	1	0	0	0
345:	0	0	1	1	0	0	0	1
353:	0	0	2	0	0	1	1	0
361:	0	2	0	0	0	0	0	0

369:	1	0	1	0	2	0	1	1

Sample Title: 03

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

801:	0	0	0	0	0	0	0	0

Sample Title: 03

Channel								
809:	0	0	1	0	1	1	0	0
817:	0	0	0	0	0	0	1	0
825:	0	0	0	0	1	0	0	0
833:	0	0	0	0	0	0	0	0
841:	0	0	1	0	0	0	0	0
849:	1	0	0	0	0	0	0	0
857:	0	0	0	0	0	0	0	0
865:	0	1	0	0	0	0	0	0
873:	0	0	0	0	0	0	0	0
881:	0	0	1	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	1	0	1	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	1	0	0	0	0	1
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	1	0	0	0	0	0
1017:	0	0	1	0	0	0	0	0

Apex-Alpha™

C
5/17/13

Sample Description: PZ-113-AD TOT
Spectrum File: \\OR-ALPHA1\Canberra\ApexAlpha\Root\Data\00000578
Batch Identification: 1304107A-RA
Sample Identification: 04
Sample Geometry: Shelf 2
Procedure Description: Ra

Detector Name: Alpha_011
Chamber Serial Number:
Detector Serial Number: 11
Env. Background: System Bkgd 56973
Reagent Blank: <not performed>

Sample Size: 1.500E+000 +/- 0.000E+000 liter
Generic Mult. Factor: 4.000E+000 Generic Div. Factor: 1.000E+000
Sample Date/Time: 5/10/2013 7:40:27 AM
Acquisition Date/Time: 5/12/2013 12:09:42 PM
Acquisition Live Time: 170.0 minutes
Acquisition Real Time: 170.0 minutes

Chem. Recovery Factor: 0.9017 +/- 0.0000
Counting Efficiency: 0.1973 +/- 0.0042 on 12/15/2012 11:28:06 AM
Effective Efficiency: 0.1779 +/- 0.0037

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	5.499	12.75	64.72	4.25	0.00E+000	2.7
RA-226	4.583	57.15	26.15	0.85	0.00E+000	2.7

NUCLIDE ANALYSIS RESULTS

Nuclide	Id Conf.	Energy (keV)	Activity (pCi/liter)	MDA (pCi/liter)
RA-224	0.954	5685.50*	8.06E-001 +/- 4.57E+002	6.35E-001 +/- 3.60E+002
RA-226	0.948	4785.00*	2.27E+000 +/- 6.01E-001	2.38E-001 +/- 9.82E-003

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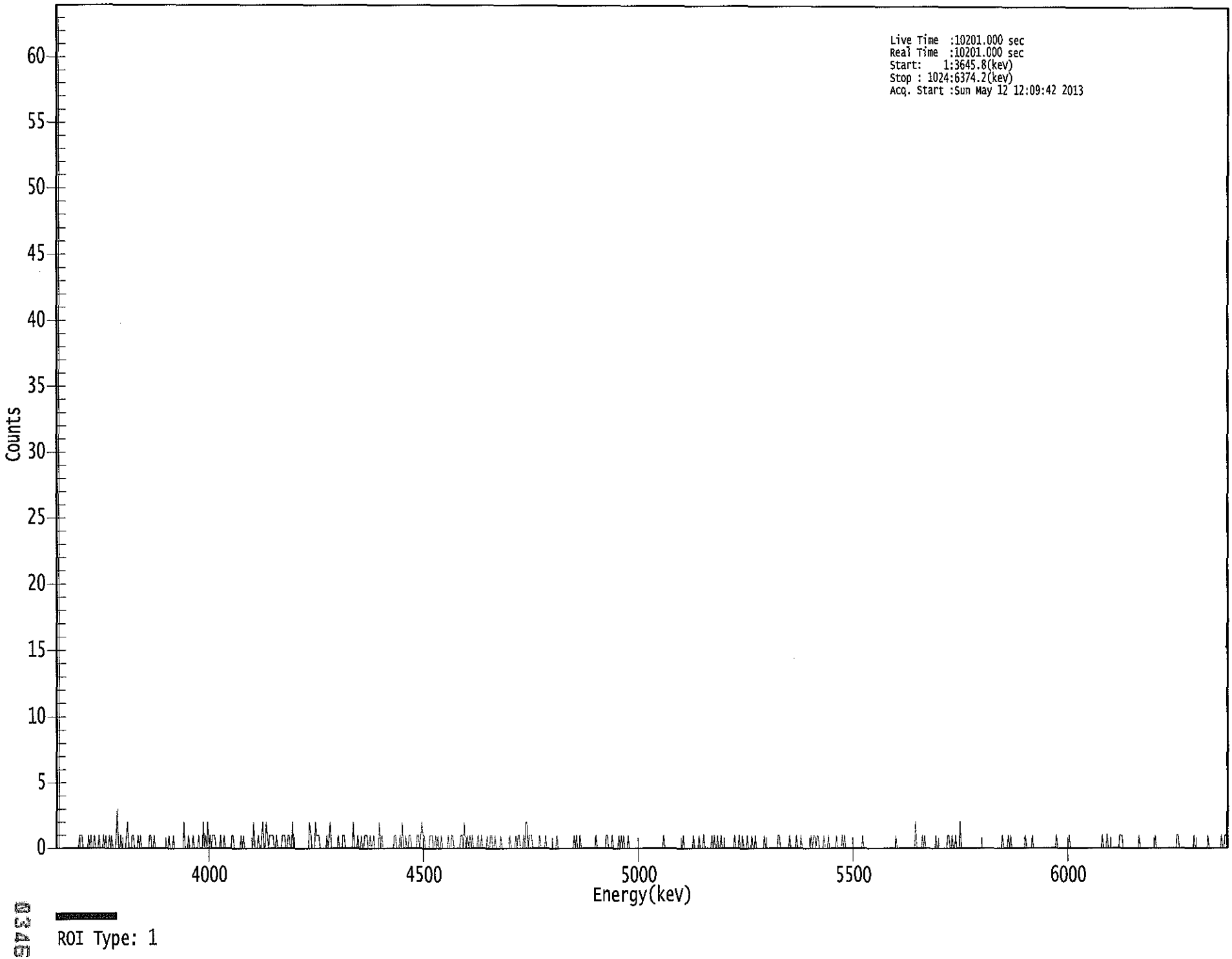
5/13/13

0000057818.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	1	1	1	0
25:	0	0	0	0	1	0	1	0
33:	0	1	0	0	0	1	0	0
41:	0	1	0	1	0	0	1	0
49:	1	0	0	0	1	3	0	0
57:	1	0	0	0	0	1	2	0
65:	0	0	1	1	0	0	0	1
73:	0	1	0	0	0	0	0	0
81:	0	1	1	0	0	1	0	0
89:	0	0	0	0	0	0	0	0
97:	0	0	1	0	0	0	1	0
105:	0	0	0	0	0	0	0	2
113:	0	0	0	1	0	0	0	1
121:	0	0	0	0	1	0	0	0
129:	2	0	1	0	2	0	1	0
137:	1	1	1	0	0	0	0	1
145:	0	0	1	0	0	0	0	0
153:	0	1	1	0	0	0	0	0
161:	0	1	0	1	0	0	0	0
169:	0	0	0	0	2	0	0	0
177:	1	0	0	1	2	0	0	2
185:	1	0	1	1	1	1	0	0
193:	1	0	0	0	0	1	1	1
201:	0	0	1	1	0	0	2	0
209:	0	0	0	0	0	0	0	0
217:	0	0	0	0	0	2	1	0
225:	0	0	2	1	1	1	0	0
233:	0	0	0	0	1	0	1	2
241:	0	0	0	0	0	0	1	0
249:	0	0	1	1	0	0	0	0
257:	0	0	0	2	0	0	0	1
265:	0	0	1	0	0	1	1	1
273:	0	0	1	0	0	1	0	0
281:	0	0	2	0	1	0	0	0
289:	0	0	0	0	0	0	0	1
297:	1	0	0	0	1	0	2	0
305:	0	1	0	0	1	1	0	0
313:	0	0	0	1	1	0	1	2
321:	1	1	0	0	0	0	1	1
329:	1	0	0	1	0	1	0	0
337:	1	0	0	0	0	0	1	0
345:	0	1	1	0	0	0	0	0
353:	0	1	1	0	2	0	0	1
361:	0	1	0	1	0	0	0	0

369:	1	0	0	1	0	0	0	0

Sample Title: 04

Channel								
377:	1	0	0	1	1	0	0	1
385:	0	0	0	0	1	0	0	0
393:	0	0	0	0	1	0	0	0
401:	0	1	0	1	1	0	0	0
409:	1	0	2	2	0	1	1	1
417:	0	0	0	0	0	0	1	0
425:	0	0	0	1	0	0	0	0
433:	0	0	0	0	0	1	0	0
441:	0	0	0	0	0	0	0	0
449:	0	0	0	0	1	0	1	0
457:	0	1	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:	1	1	0	0	0	1	0	0
489:	0	0	0	1	0	1	0	1
497:	0	0	0	1	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	1	0	0	0	0	0
537:	0	0	0	0	0	0	0	0
545:	0	0	0	1	0	0	0	0
553:	0	0	0	0	1	0	0	0
561:	0	1	0	0	0	1	0	0
569:	0	0	0	0	1	0	1	0
577:	0	1	0	0	1	0	0	0
585:	0	0	0	0	0	0	0	0
593:	1	0	0	0	1	0	0	1
601:	0	0	0	1	0	0	0	1
609:	0	0	1	0	0	0	0	0
617:	0	0	1	0	0	0	0	0
625:	0	0	0	0	0	0	1	1
633:	0	0	0	0	0	0	0	0
641:	1	0	0	0	0	0	1	0
649:	0	0	1	0	0	0	0	0
657:	0	0	0	1	0	1	1	0
665:	1	1	0	0	0	0	1	0
673:	0	0	1	0	0	0	0	0
681:	0	1	0	0	0	0	1	0
689:	1	0	0	0	0	0	0	0
697:	0	0	0	0	0	0	0	0
705:	1	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	1	0	0
737:	0	0	0	0	0	0	0	0
745:	0	0	0	0	0	0	2	0
753:	0	0	0	0	1	0	1	0
761:	0	0	0	0	0	0	0	0
769:	1	0	0	0	0	0	0	0
777:	0	0	1	1	0	0	1	0
785:	0	1	0	0	0	2	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	1	0	0	0	0	1
833:	0	1	0	0	0	0	0	0
841:	0	0	0	0	0	0	1	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	1	0	0	0	0	0	0
881:	0	0	0	0	1	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	1	0	0
921:	0	0	0	0	0	0	0	0
929:	1	1	1	0	0	0	0	0
937:	0	0	0	0	0	0	0	0
945:	0	1	0	0	0	0	0	0
953:	0	0	0	0	0	0	0	1
961:	0	0	0	0	0	0	0	0
969:	0	0	0	0	0	0	0	0
977:	0	0	1	1	0	0	0	0
985:	0	0	0	0	0	0	0	0
993:	0	1	0	0	0	0	0	0
1001:	0	0	0	0	0	1	0	0
1009:	0	0	0	0	0	0	0	0
1017:	0	1	0	0	1	1	0	0

Apex-Alpha™

C
5/13/13

Sample Description: PZ-113-AD DIS
Spectrum File: \\OR-ALPHA1\Canberra\ApexAlpha\Root\Data\00000578
Batch Identification: 1304107A-RA
Sample Identification: 05
Sample Geometry: Shelf 2
Procedure Description: Ra

Detector Name: Alpha_013
Chamber Serial Number:
Detector Serial Number: 13
Env. Background: System Bkgd 56974
Reagent Blank: <not performed>

Sample Size: 1.500E+000 +/- 0.000E+000 liter
Generic Mult. Factor: 3.340E+000 Generic Div. Factor: 1.000E+000
Sample Date/Time: 5/10/2013 7:40:27 AM
Acquisition Date/Time: 5/12/2013 12:09:43 PM
Acquisition Live Time: 170.0 minutes
Acquisition Real Time: 170.0 minutes

Chem. Recovery Factor: 0.9727 +/- 0.0000
Counting Efficiency: 0.1869 +/- 0.0035 on 12/15/2012 11:26:45 AM
Effective Efficiency: 0.1818 +/- 0.0034

Peak Match Tolerance: 0.350 MeV

PEAK AREA REPORT

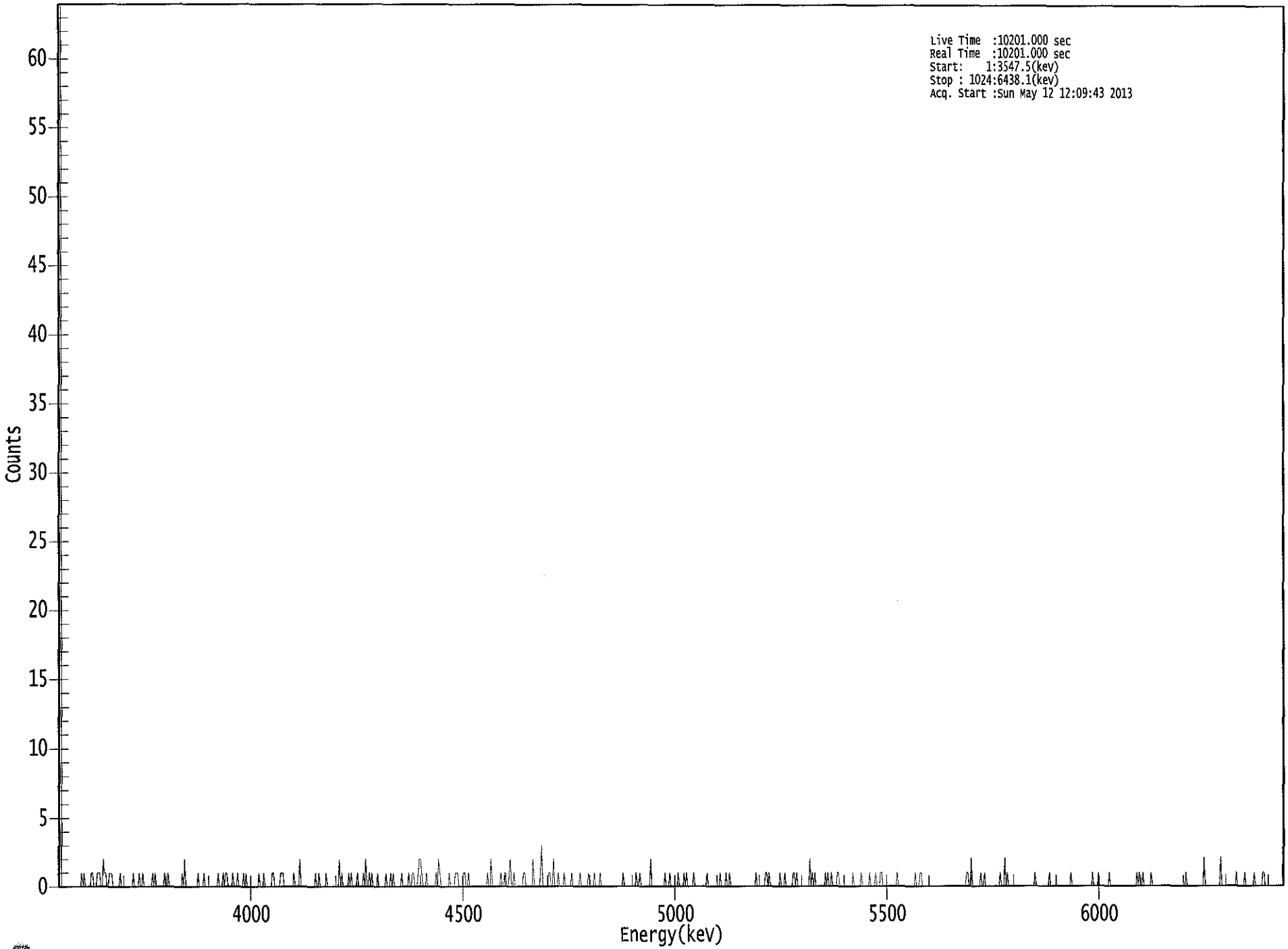
Nuclide	Energy (MeV)	Net Pk Area	Pk Area Error %	Ambient Backgnd	Reagent Backgnd	FWHM (keV)
RA-224	5.499	9.94	72.51	3.06	0.00E+000	5.7
RA-226	4.575	48.98	28.34	1.02	0.00E+000	3.5

NUCLIDE ANALYSIS RESULTS

Nuclide	Id Conf.	Energy (keV)	Activity (pCi/liter)	MDA (pCi/liter)
RA-224	0.954	5685.50*	5.13E-001 +/- 2.91E+002	4.61E-001 +/- 2.62E+002
RA-226	0.944	4785.00*	1.59E+000 +/- 4.54E-001	2.04E-001 +/- 7.41E-003

AG
5/13/13

0000057820.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: 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	1	0	1	0	0
25:	0	0	0	1	1	0	0	0
33:	1	1	1	0	0	2	1	1
41:	0	0	1	1	1	0	0	0
49:	0	0	0	1	0	0	0	0
57:	0	0	0	0	0	0	1	0
65:	0	0	0	1	0	0	1	0
73:	0	0	0	0	0	0	1	0
81:	1	0	0	0	0	0	0	0
89:	1	0	0	1	0	0	0	0
97:	0	0	0	0	0	0	0	1
105:	0	2	0	0	0	0	0	0
113:	0	0	0	0	1	0	0	0
121:	0	1	0	0	0	0	0	0
129:	0	0	0	0	0	1	0	0
137:	0	1	0	1	1	0	0	0
145:	0	1	0	0	0	1	0	0
153:	0	0	1	0	1	0	0	0
161:	0	0	0	0	0	0	0	1
169:	0	0	0	1	0	0	0	0
177:	0	0	1	1	0	0	0	0
185:	0	1	1	1	0	0	0	0
193:	0	0	0	0	1	0	0	0
201:	0	2	0	0	0	0	0	0
209:	0	0	0	0	0	0	1	0
217:	0	1	0	0	0	0	0	1
225:	0	0	0	0	0	0	0	0
233:	0	0	2	0	1	0	0	0
241:	0	0	1	0	1	0	0	0
249:	0	1	0	0	0	0	1	0
257:	2	0	0	1	0	1	0	0
265:	0	0	1	0	0	0	0	0
273:	0	1	0	0	0	1	0	1
281:	0	0	0	0	0	0	1	0
289:	0	0	0	0	1	0	0	1
297:	1	0	0	0	1	2	2	1
305:	0	0	0	1	0	0	0	0
313:	0	0	0	1	0	2	1	0
321:	0	0	0	0	0	0	1	0
329:	0	0	0	1	1	1	0	0
337:	0	0	1	1	0	0	1	0
345:	0	0	0	0	0	0	0	0
353:	0	0	0	0	0	0	1	0
361:	0	2	0	0	0	0	0	0

369:	0	1	0	0	1	1	0	0

Sample Title: 05

Channel								
377:	1	2	0	0	1	0	0	0
385:	0	0	0	0	1	1	0	0
393:	0	0	0	0	2	0	0	0
401:	0	0	1	3	0	0	0	0
409:	0	1	1	0	0	2	0	0
417:	0	1	0	0	0	0	1	0
425:	0	0	0	0	1	0	0	0
433:	0	0	0	1	0	0	0	0
441:	0	0	1	0	0	0	0	1
449:	0	0	0	0	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	1	0	0	1	0	0
489:	0	0	0	0	0	0	2	0
497:	0	0	0	0	0	0	0	0
505:	0	0	1	0	0	0	1	0
513:	0	0	0	0	0	1	0	0
521:	0	0	1	0	1	0	0	0
529:	0	0	1	0	0	0	0	0
537:	0	0	0	0	0	1	0	0
545:	0	0	0	0	0	0	0	0
553:	1	0	0	0	0	1	0	0
561:	1	0	0	0	0	0	0	0
569:	0	0	0	0	0	0	0	0
577:	0	0	0	0	0	0	1	0
585:	0	0	0	0	0	0	1	1
593:	0	1	0	0	0	0	0	0
601:	0	0	1	0	0	0	1	0
609:	0	0	0	0	0	1	1	0
617:	1	0	0	0	0	0	0	0
625:	0	0	0	2	0	1	0	1
633:	0	0	0	0	0	0	0	0
641:	1	0	1	0	0	1	0	0
649:	0	0	1	1	0	0	0	0
657:	0	0	0	0	0	0	0	1
665:	0	0	0	0	0	0	1	0
673:	0	0	0	0	0	1	0	0
681:	0	0	1	0	0	0	1	1
689:	0	0	0	0	0	0	0	0
697:	0	0	0	0	1	0	0	0
705:	0	0	0	0	0	0	0	0
713:	0	0	0	1	0	0	0	1
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	1	1
761:	0	0	2	0	0	0	0	0
769:	0	0	1	0	0	1	0	0
777:	0	0	0	0	0	0	0	0
785:	0	0	1	0	0	0	2	0
793:	1	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	1	0	0	0	0
833:	0	0	0	0	0	0	0	0
841:	0	0	0	0	0	1	0	0
849:	0	0	0	0	0	0	0	0
857:	0	0	0	0	0	0	0	1
865:	0	0	0	0	1	0	0	0
873:	0	0	0	0	0	1	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	1	0	1	0
905:	0	1	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	1	0	0
945:	0	0	0	0	0	0	0	0
953:	0	0	0	0	2	0	0	0
961:	0	0	0	0	0	0	0	0
969:	0	0	2	0	0	0	0	0
977:	0	0	0	0	0	0	0	1
985:	0	0	0	0	0	0	1	0
993:	0	0	0	0	0	0	1	0
1001:	0	0	0	0	0	1	1	0
1009:	0	0	0	0	0	0	0	0
1017:	0	0	0	0	0	0	0	0

Apex-Alpha™

Sample Description: FBAT D-3 TOT
Spectrum File: \\OR-ALPHA1\Canberra\ApexAlpha\Root\Data\00000578
Batch Identification: 1304107A-RA
Sample Identification: 06
Sample Geometry: Shelf 2
Procedure Description: Ra

Detector Name: Alpha_014
Chamber Serial Number:
Detector Serial Number: 14
Env. Background: System Bkgd 56975
Reagent Blank: <not performed>

Sample Size: 1.500E+000 +/- 0.000E+000 liter
Generic Mult. Factor: 2.000E+000 Generic Div. Factor: 1.000E+000
Sample Date/Time: 5/10/2013 7:40:27 AM
Acquisition Date/Time: 5/12/2013 12:09:44 PM
Acquisition Live Time: 170.0 minutes
Acquisition Real Time: 170.0 minutes

Chem. Recovery Factor: 0.9886 +/- 0.0000
Counting Efficiency: 0.1846 +/- 0.0034 on 12/15/2012 11:26:44 AM
Effective Efficiency: 0.1825 +/- 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	5.451	-1.74	182.88	3.74	0.00E+000	2.9
RA-226	4.721	-1.38	168.33	2.38	0.00E+000	2.9

NUCLIDE ANALYSIS RESULTS

Nuclide	Id Conf.	Energy (keV)	Activity (pCi/liter)	MDA (pCi/liter)
RA-224	0.929	5685.50*	-5.36E-002 +/- 3.04E+001	2.95E-001 +/- 1.68E+002
RA-226	0.995	4785.00*	-2.67E-002 +/- 4.50E-002	1.59E-001 +/- 5.77E-003

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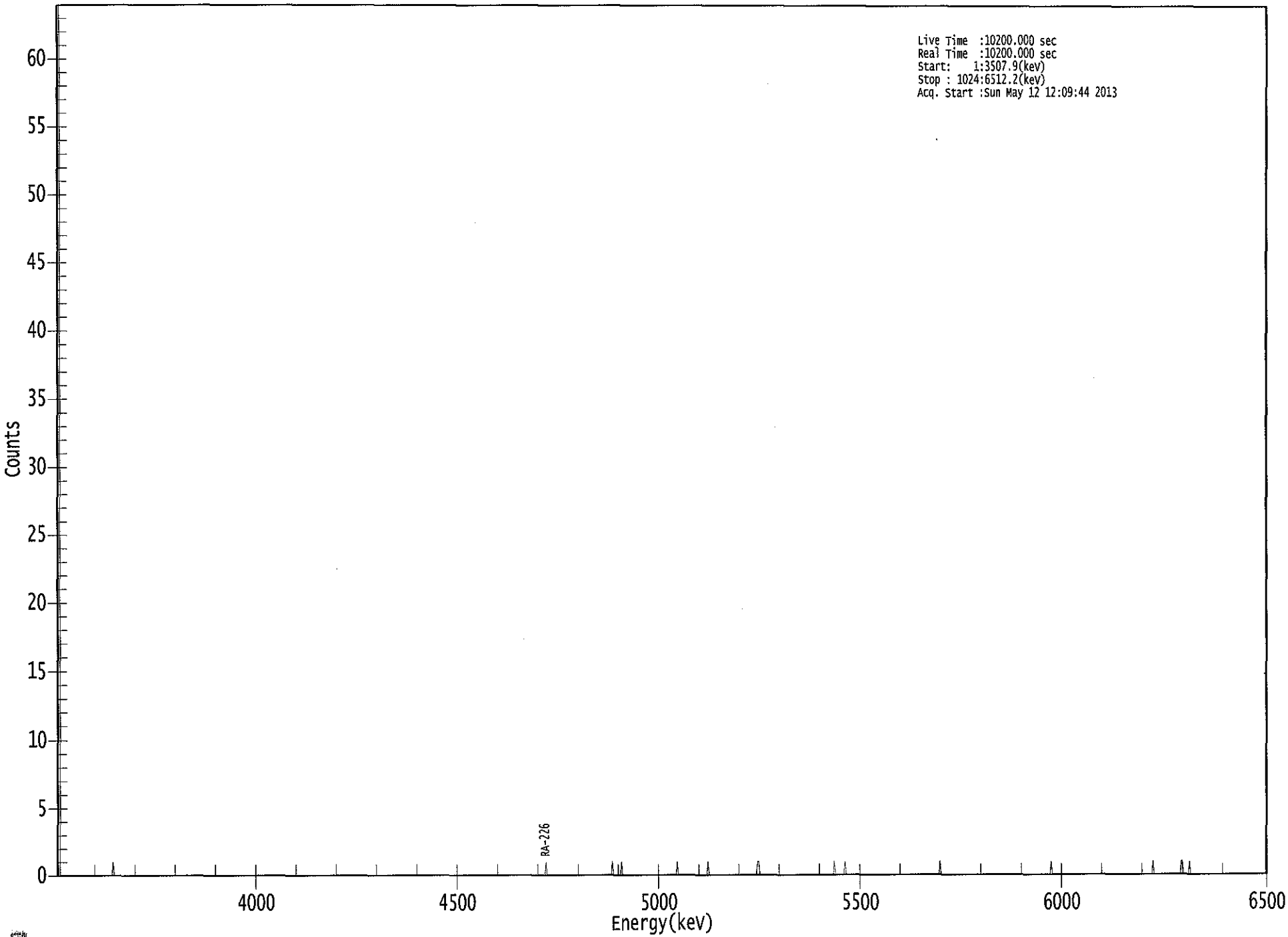
0000057819.CNF



****
***** 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	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	1
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	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: 06

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	1	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:	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	1	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	0	0	0	0
521:	0	0	0	0	1	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	1	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:	1	1	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	1	0	0	0	0	0	0
665:	0	0	1	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	1	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: 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	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	1	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	1	1
953:	0	0	0	0	0	1	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

Apex-Alpha™

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5/13/13

Sample Description: FB AT D-3 DIS
Spectrum File: \\OR-ALPHA1\Canberra\ApexAlpha\Root\Data\00000578
Batch Identification: 1304107A-RA
Sample Identification: 07
Sample Geometry: Shelf 2
Procedure Description: Ra

Detector Name: Alpha_018
Chamber Serial Number:
Detector Serial Number: 18
Env. Background: System Bkgd 56976
Reagent Blank: <not performed>

Sample Size: 1.500E+000 +/- 0.000E+000 liter
Generic Mult. Factor: 2.080E+000 Generic Div. Factor: 1.000E+000
Sample Date/Time: 5/10/2013 7:40:27 AM
Acquisition Date/Time: 5/12/2013 12:09:45 PM
Acquisition Live Time: 170.0 minutes
Acquisition Real Time: 170.0 minutes

Chem. Recovery Factor: 0.9819 +/- 0.0000
Counting Efficiency: 0.1776 +/- 0.0033 on 12/15/2012 1:57:26 PM
Effective Efficiency: 0.1744 +/- 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	5.456	-2.08	154.65	4.08	0.00E+000	3.1
RA-226	4.602	-2.89	82.82	2.89	0.00E+000	0.0

NUCLIDE ANALYSIS RESULTS

Nuclide	Id Conf.	Energy (keV)	Activity (pCi/liter)	MDA (pCi/liter)
RA-224	0.932	5685.50*	-6.97E-002 +/- 3.95E+001	3.32E-001 +/- 1.88E+002
RA-226	0.957	4785.00*	-6.09E-002 +/- 5.05E-002	1.84E-001 +/- 6.72E-003

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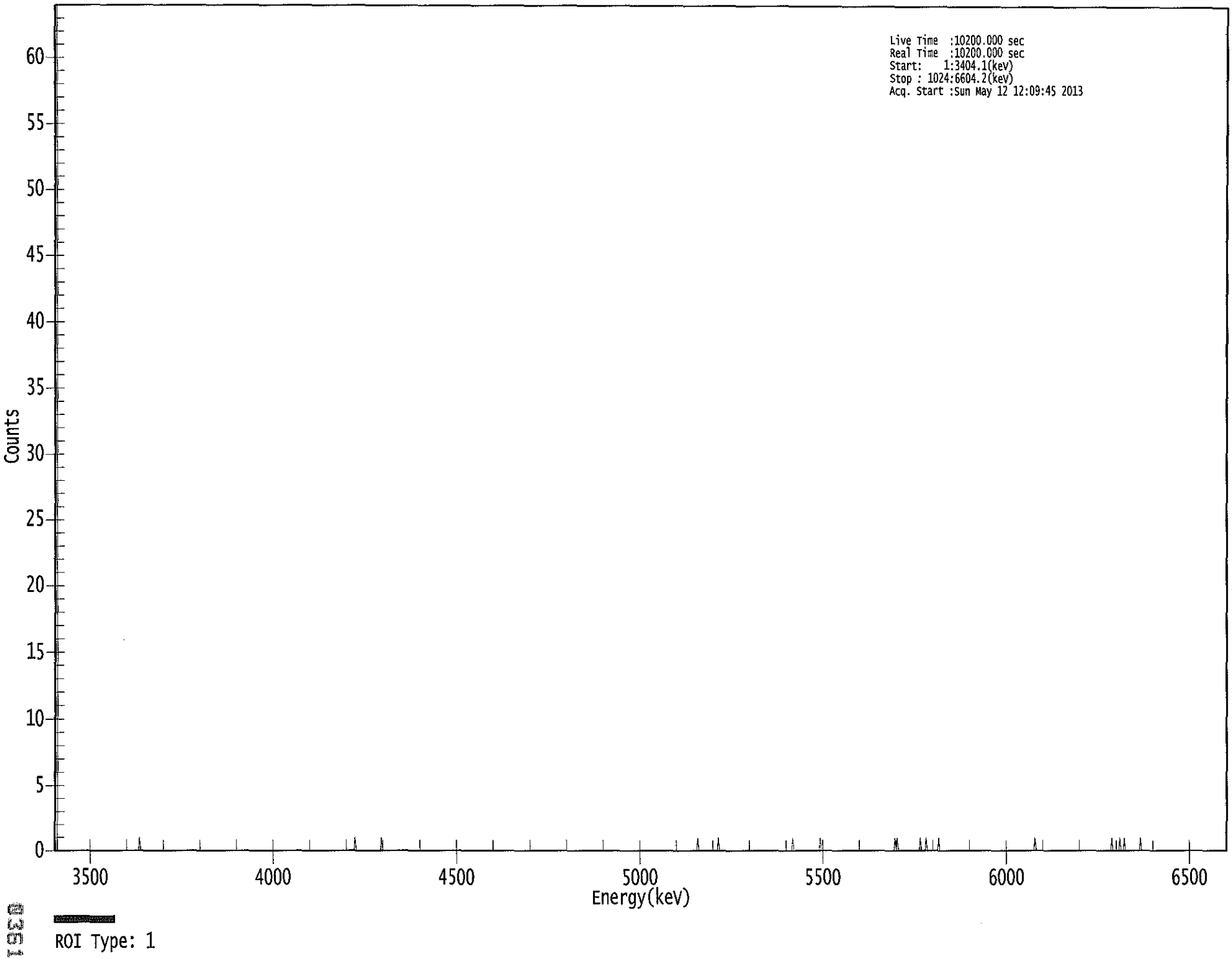
0000057821.CNF



****
***** 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	1	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	1	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: 07

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	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	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:	0	1	0	0	0	0	0	0
569:	0	0	0	0	0	0	0	0
577:	0	0	0	1	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	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	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	1	0	1
737:	0	0	0	0	0	0	0	0
745:	0	0	0	0	0	0	0	0
753:	0	0	0	1	0	0	0	0
761:	1	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	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	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	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	1	0	0	0	1	0	0
937:	0	0	0	0	0	0	0	0
945:	0	0	0	1	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

Apex-Alpha™

Sample Description: D-3 TOT
Spectrum File: \\OR-ALPHA1\Canberra\ApexAlpha\Root\Data\00000578
Batch Identification: 1304107A-RA
Sample Identification: 08
Sample Geometry: Shelf 2
Procedure Description: Ra

Detector Name: Alpha_019
Chamber Serial Number:
Detector Serial Number: 19
Env. Background: System Bkgd 51759
Reagent Blank: <not performed>

Sample Size: 1.500E+000 +/- 0.000E+000 liter
Generic Mult. Factor: 3.960E+000 Generic Div. Factor: 1.000E+000
Sample Date/Time: 5/10/2013 7:40:27 AM
Acquisition Date/Time: 5/12/2013 12:09:46 PM
Acquisition Live Time: 170.0 minutes
Acquisition Real Time: 170.0 minutes

Chem. Recovery Factor: 0.9203 +/- 0.0000
Counting Efficiency: 0.1659 +/- 0.0029 on 2/17/2013 10:45:23 AM
Effective Efficiency: 0.1527 +/- 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	5.497	15.00	52.27	0.00	0.00E+000	3.3
RA-226	4.587	61.49	25.12	0.51	0.00E+000	3.3

----- NUCLIDE ANALYSIS RESULTS -----

Nuclide	Id Conf.	Energy (keV)	Activity (pCi/liter)	MDA (pCi/liter)
RA-224	0.953	5685.50*	1.09E+000 +/- 6.20E+002	4.37E-001 +/- 2.48E+002
RA-226	0.950	4785.00*	2.82E+000 +/- 7.14E-001	2.40E-001 +/- 8.34E-003

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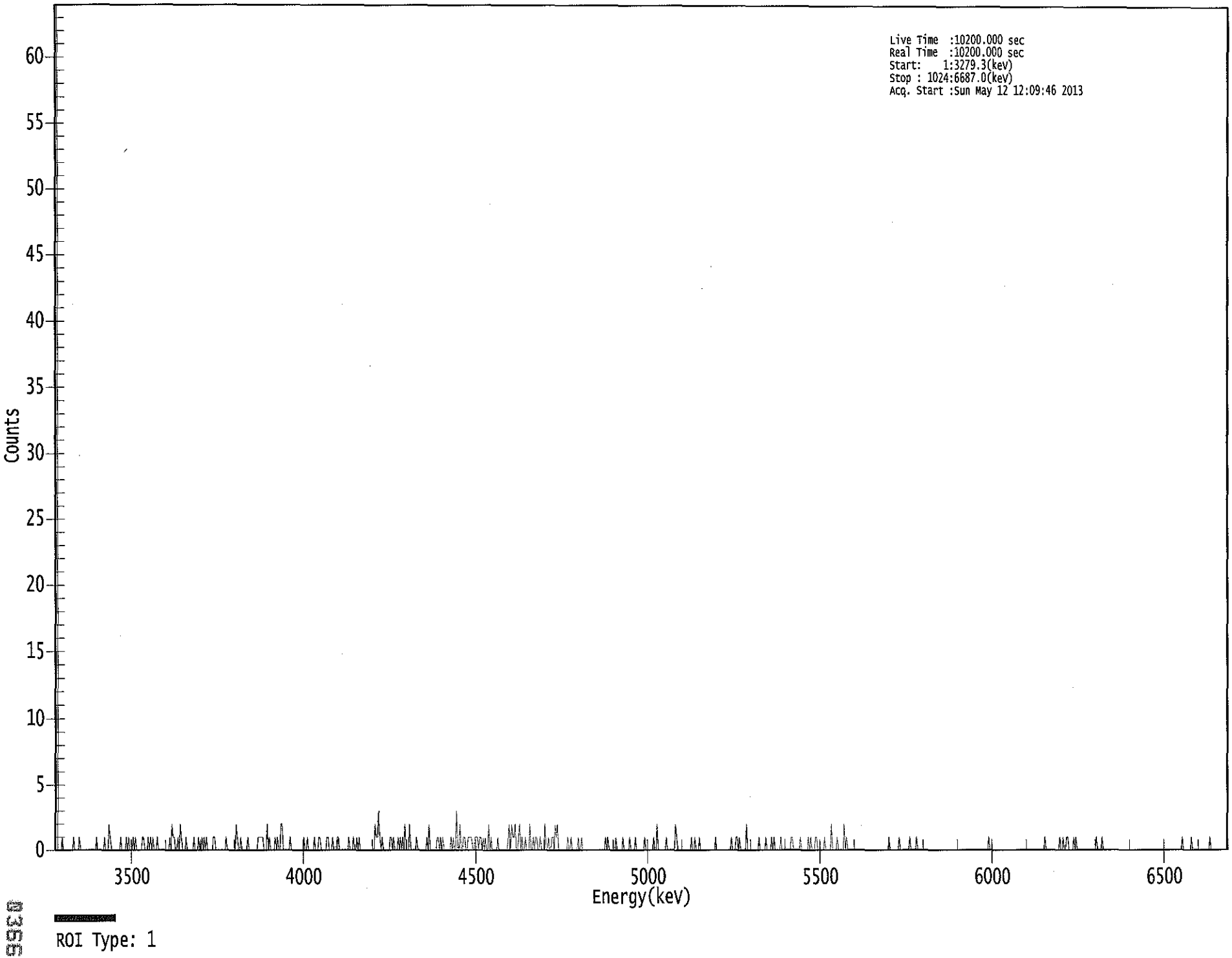
0000057822.CNF



****
***** 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: 10200

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

369:	1	0	1	1	0	1	0	1

Sample Title: 08

Channel								
377:	0	0	2	0	1	0	0	0
385:	0	0	1	0	0	0	0	0
393:	0	0	0	1	2	0	2	1
401:	1	2	0	0	1	2	0	1
409:	0	0	1	0	0	0	2	0
417:	0	1	0	1	1	0	0	1
425:	0	0	0	2	0	0	1	0
433:	0	1	1	0	2	1	2	0
441:	0	0	0	0	0	0	0	1
449:	0	0	1	0	0	0	0	0
457:	1	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:	1	0	1	0	0	0	0	0
489:	0	1	0	0	0	0	0	1
497:	0	0	0	0	0	1	0	0
505:	0	0	1	0	0	0	0	0
513:	0	0	1	0	0	0	0	0
521:	0	0	1	0	0	2	0	0
529:	0	0	0	0	0	1	0	0
537:	0	0	0	0	0	2	1	0
545:	0	0	0	0	0	0	0	0
553:	0	0	0	1	0	0	1	0
561:	0	0	1	0	0	0	0	0
569:	0	0	0	0	0	0	0	0
577:	1	0	0	0	0	0	0	0
585:	0	0	0	0	0	0	1	0
593:	0	0	1	1	0	1	0	0
601:	0	0	0	2	0	0	0	0
609:	0	0	0	0	0	0	1	0
617:	0	0	0	0	1	0	0	0
625:	0	1	0	1	0	0	0	0
633:	0	1	0	0	0	0	0	0
641:	0	0	1	1	0	0	0	0
649:	0	0	1	0	0	0	0	0
657:	0	1	0	1	0	0	0	1
665:	1	0	0	0	0	0	0	1
673:	0	0	0	0	0	2	0	0
681:	0	0	1	0	0	0	0	0
689:	2	0	1	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:	1	0	0	0	0	0	0	0
745:	0	1	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: 08

Channel								
809:	0	0	0	0	0	0	1	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	1
865:	0	0	0	0	0	0	0	0
873:	0	0	0	0	1	0	0	1
881:	0	0	1	1	0	0	0	0
889:	1	0	1	0	0	0	0	0
897:	0	0	0	0	0	0	0	0
905:	0	0	0	0	1	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	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	1
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	1
1009:	0	0	0	0	0	0	0	0
1017:	0	0	0	0	0	0	0	0

Apex-Alpha™

Sample Description: D-3 DIS
Spectrum File: \\OR-ALPHA1\Canberra\ApexAlpha\Root\Data\00000578
Batch Identification: 1304107A-RA
Sample Identification: 09
Sample Geometry: Shelf 2
Procedure Description: Ra

Detector Name: Alpha_022
Chamber Serial Number:
Detector Serial Number: 22
Env. Background: System Bkgd 56977
Reagent Blank: <not performed>

Sample Size: 1.500E+000 +/- 0.000E+000 liter
Generic Mult. Factor: 3.440E+000 Generic Div. Factor: 1.000E+000
Sample Date/Time: 5/10/2013 7:40:27 AM
Acquisition Date/Time: 5/12/2013 12:09:48 PM
Acquisition Live Time: 170.0 minutes
Acquisition Real Time: 170.0 minutes

Chem. Recovery Factor: 1.0000 +/- 0.0000
Counting Efficiency: 0.1531 +/- 0.0029 on 12/15/2012 1:57:26 PM
Effective Efficiency: 0.1531 +/- 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	5.524	9.47	69.45	1.53	0.00E+000	3.1
RA-226	4.628	53.45	27.55	2.55	0.00E+000	3.1

NUCLIDE ANALYSIS RESULTS

Nuclide	Id Conf.	Energy (keV)	Activity (pCi/liter)	MDA (pCi/liter)
RA-224	0.965	5685.50*	5.98E-001 +/- 3.39E+002	4.49E-001 +/- 2.54E+002
RA-226	0.968	4785.00*	2.12E+000 +/- 5.90E-001	3.33E-001 +/- 1.24E-002

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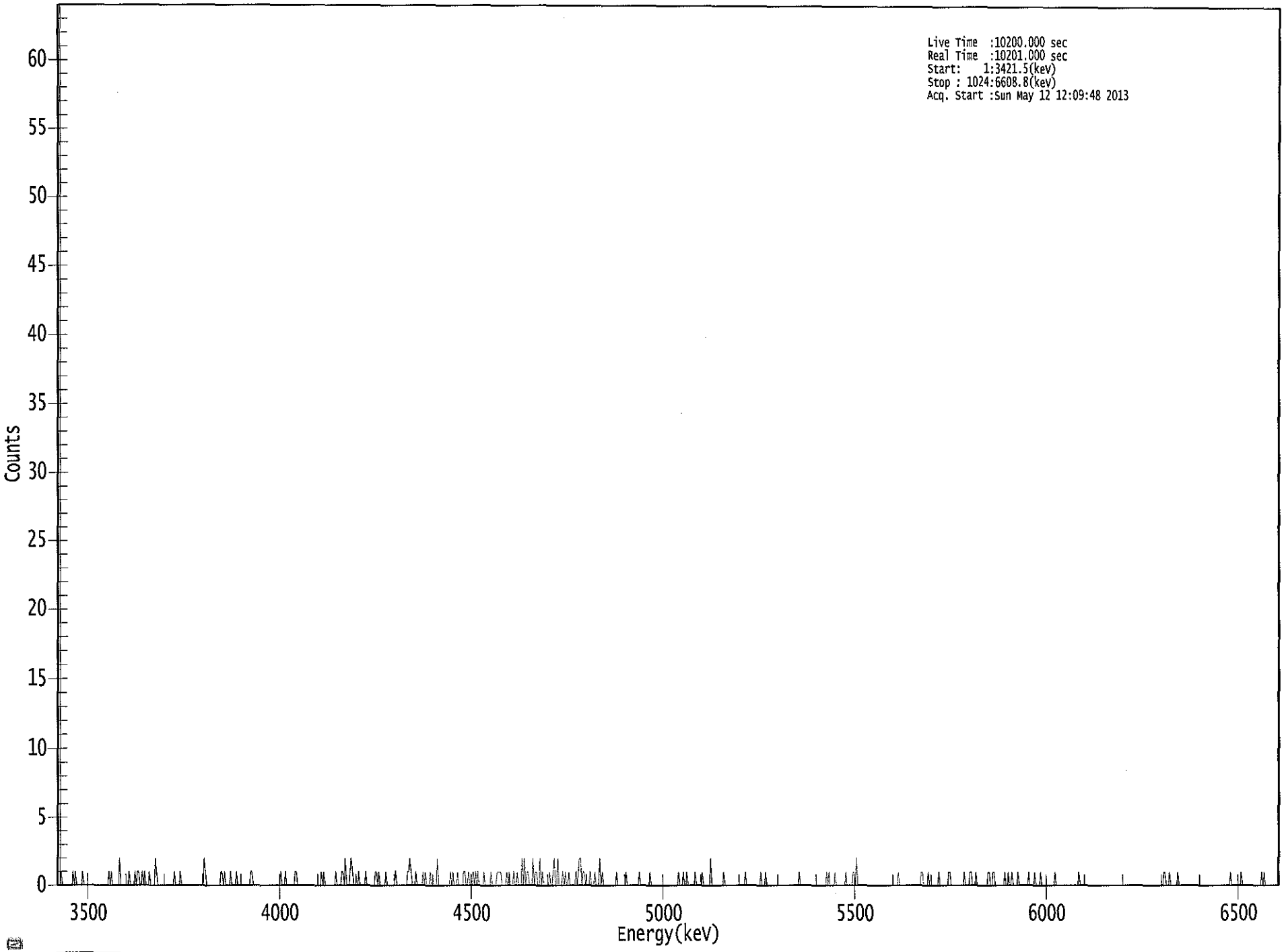

0371

****
***** 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: 10201

Channel								
1:	10201	10200	0	1	0	0	0	0
9:	0	0	0	0	0	1	0	1
17:	0	0	0	0	0	1	0	0
25:	0	0	0	0	0	0	0	0
33:	0	0	0	0	0	0	0	0
41:	0	0	0	1	0	1	0	0
49:	0	0	0	0	2	0	0	0
57:	0	0	0	0	1	0	0	0
65:	0	1	0	1	1	0	0	1
73:	0	1	0	0	0	1	0	0
81:	0	0	2	1	0	0	0	0
89:	0	0	0	0	0	0	0	0
97:	0	0	1	0	0	0	0	1
105:	0	0	0	0	0	0	0	0
113:	0	0	0	0	0	0	0	0
121:	0	0	0	2	1	0	0	0
129:	0	0	0	0	0	0	0	0
137:	0	1	1	0	1	0	0	0
145:	0	1	0	0	0	0	1	0
153:	0	0	0	0	0	0	0	0
161:	0	0	1	1	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	1	0	0	0	1
193:	0	0	0	0	0	0	0	1
201:	1	0	0	0	0	0	0	0
209:	0	0	0	0	0	0	0	0
217:	0	0	0	0	0	1	0	1
225:	0	0	0	0	0	0	0	0
233:	0	1	0	0	0	0	1	1
241:	0	2	0	0	0	1	2	1
249:	0	0	0	0	1	0	0	0
257:	0	0	1	0	0	0	0	0
265:	0	0	1	1	0	1	0	0
273:	0	0	0	1	0	0	0	0
281:	0	0	0	1	0	0	0	0
289:	0	0	0	0	0	1	1	2
297:	1	0	0	0	1	0	0	0
305:	0	0	1	0	1	0	0	0
313:	1	0	0	0	0	0	2	0
321:	0	0	0	0	0	0	0	0
329:	0	1	0	1	0	0	0	1
337:	0	0	0	0	1	1	0	0
345:	1	0	0	0	1	0	1	0
353:	1	0	0	0	0	1	0	0
361:	0	0	0	1	0	0	0	0

369:	1	1	1	1	0	0	0	0

Sample Title: 09

Channel								
377:	1	0	1	0	0	0	1	0
385:	0	1	0	0	0	2	0	2
393:	0	1	1	0	0	0	2	0
401:	1	1	0	0	2	0	1	0
409:	0	0	0	0	1	0	0	1
417:	2	0	0	2	0	0	0	1
425:	0	1	0	0	1	0	0	0
433:	0	0	1	0	1	2	2	0
441:	1	1	0	0	0	0	1	0
449:	0	0	1	0	0	0	2	0
457:	1	0	0	0	0	0	0	0
465:	0	0	0	0	1	0	0	0
473:	0	0	0	0	1	0	0	0
481:	0	0	0	0	0	0	0	1
489:	0	0	0	0	0	0	0	0
497:	1	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	1	0	0	1
529:	0	0	0	0	0	0	1	0
537:	0	0	0	0	1	0	0	0
545:	0	0	0	2	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:	1	0	0	0	0	0	0	0
585:	0	0	0	0	0	1	0	0
593:	0	1	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	1	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	1	0	1	0
649:	0	0	0	1	0	0	0	0
657:	0	0	0	0	1	0	0	0
665:	0	0	1	1	0	2	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:	1	0	0	0	0	0	0	0
713:	0	0	0	0	0	0	0	0
721:	0	0	0	1	1	0	0	0
729:	0	1	0	0	0	0	0	0
737:	0	0	1	0	0	0	0	0
745:	0	0	1	1	0	0	0	0
753:	0	0	0	0	0	0	0	1
761:	0	0	0	0	1	1	0	0
769:	0	1	0	0	0	0	0	0
777:	0	0	0	1	1	0	0	1
785:	1	0	0	0	0	0	0	0
793:	0	1	0	0	1	0	0	1

801:	0	0	0	0	1	0	0	0

Sample Title: 09

Channel								
809:	0	0	0	0	0	1	0	0
817:	0	0	1	0	0	0	0	1
825:	0	0	0	0	0	0	0	0
833:	0	0	0	1	0	0	0	0
841:	0	0	0	0	0	0	0	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	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	1
929:	0	0	0	1	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	1	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	1	0	0	0	0	0
1017:	0	0	0	0	0	0	0	0

Apex-Alpha™

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5/17/13

Sample Description: D-85 TOT
Spectrum File: \\OR-ALPHA1\Canberra\ApexAlpha\Root\Data\00000578
Batch Identification: 1304107A-RA
Sample Identification: 10
Sample Geometry: Shelf 2
Procedure Description: Ra

Detector Name: Alpha_024
Chamber Serial Number:
Detector Serial Number: 24
Env. Background: System Bkgd 56978
Reagent Blank: <not performed>

Sample Size: 1.500E+000 +/- 0.000E+000 liter
Generic Mult. Factor: 4.000E+000 Generic Div. Factor: 1.000E+000
Sample Date/Time: 5/10/2013 7:40:27 AM
Acquisition Date/Time: 5/12/2013 12:09:49 PM
Acquisition Live Time: 170.0 minutes
Acquisition Real Time: 170.0 minutes

Chem. Recovery Factor: 0.5917 +/- 0.0000
Counting Efficiency: 0.1710 +/- 0.0032 on 12/15/2012 2:02:15 PM
Effective Efficiency: 0.1012 +/- 0.0019

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	5.525	51.79	27.91	2.21	0.00E+000	3.1
RA-226	4.591	138.47	16.76	1.53	0.00E+000	4.2

NUCLIDE ANALYSIS RESULTS

Nuclide	Id Conf.	Energy (keV)	Activity (pCi/liter)	MDA (pCi/liter)
RA-224	0.965	5685.50*	5.75E+000 +/- 3.26E+003	8.88E-001 +/- 5.04E+002
RA-226	0.952	4785.00*	9.67E+000 +/- 1.66E+000	4.96E-001 +/- 1.82E-002

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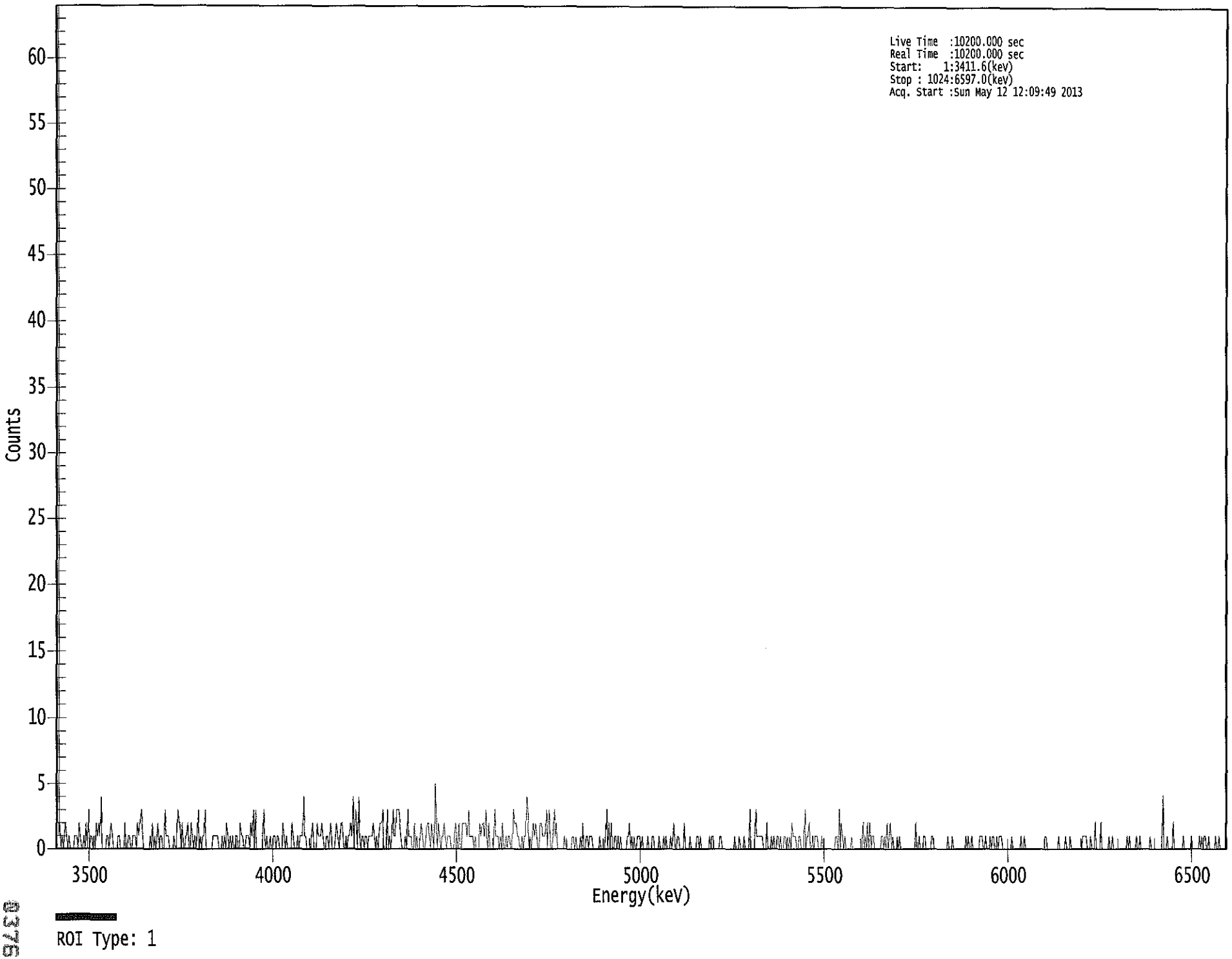
5/13/13

0000057823.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	1	2	0	1	0	1
9:	2	1	0	1	0	0	0	0
17:	1	1	1	0	2	1	0	0
25:	1	0	2	0	3	0	1	1
33:	0	1	0	2	1	2	1	4
41:	0	0	0	0	1	1	0	1
49:	2	1	0	0	0	0	1	1
57:	0	0	0	0	2	0	0	1
65:	1	0	0	1	1	1	0	2
73:	1	2	3	2	0	0	0	0
81:	0	0	1	0	2	0	1	0
89:	1	2	0	1	1	0	0	3
97:	1	1	1	0	0	0	0	1
105:	0	0	3	2	2	0	2	0
113:	0	1	1	2	0	0	2	1
121:	0	1	0	1	3	0	1	0
129:	1	1	3	0	0	0	0	0
137:	0	1	1	1	1	1	0	0
145:	0	1	0	1	0	2	1	0
153:	1	0	1	0	0	1	1	0
161:	0	2	1	1	0	0	1	1
169:	1	0	2	1	3	0	3	0
177:	0	0	0	0	0	3	1	0
185:	1	0	0	1	0	0	1	1
193:	0	1	1	0	0	0	2	1
201:	0	1	0	0	0	0	2	1
209:	0	0	0	1	0	1	1	1
217:	4	1	1	0	0	0	0	1
225:	2	0	0	0	2	1	1	1
233:	2	1	0	0	1	1	0	1
241:	2	0	0	0	1	2	1	0
249:	1	2	2	0	0	1	0	1
257:	1	2	1	4	0	3	2	0
265:	4	1	0	1	1	0	1	1
273:	0	1	1	1	1	2	1	0
281:	1	0	1	2	2	3	0	0
289:	0	3	0	1	0	1	3	1
297:	1	3	3	3	2	1	0	0
305:	0	1	0	3	1	1	1	0
313:	0	2	0	1	0	0	1	2
321:	1	0	0	1	2	2	1	0
329:	2	1	0	5	2	0	2	1
337:	0	1	1	2	1	0	1	1
345:	1	0	0	0	1	2	1	0
353:	2	0	0	2	2	2	2	1
361:	3	1	1	1	1	0	1	0

369:	0	0	2	1	2	2	1	3

Sample Title: 10

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

801:	1	0	0	0	0	0	0	1

Sample Title: 10

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

Apex-Alpha™

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5/17/13

Sample Description: D-85 DIS
Spectrum File: \\OR-ALPHA1\Canberra\ApexAlpha\Root\Data\00000578
Batch Identification: 1304107A-RA
Sample Identification: 11
Sample Geometry: Shelf 2
Procedure Description: Ra

Detector Name: Alpha_025
Chamber Serial Number:
Detector Serial Number: 25
Env. Background: System Bkgd 56979
Reagent Blank: <not performed>

Sample Size: 1.500E+000 +/- 0.000E+000 liter
Generic Mult. Factor: 3.200E+000 Generic Div. Factor: 1.000E+000
Sample Date/Time: 5/10/2013 7:40:27 AM
Acquisition Date/Time: 5/12/2013 12:09:50 PM
Acquisition Live Time: 170.0 minutes
Acquisition Real Time: 170.0 minutes

Chem. Recovery Factor: 0.9731 +/- 0.0000
Counting Efficiency: 0.1736 +/- 0.0032 on 12/15/2012 1:57:27 PM
Effective Efficiency: 0.1689 +/- 0.0031

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	5.523	6.96	86.10	2.04	0.00E+000	3.1
RA-226	4.618	27.32	38.04	0.68	0.00E+000	3.1

NUCLIDE ANALYSIS RESULTS

Nuclide	Id Conf.	Energy (keV)	Activity (pCi/liter)	MDA (pCi/liter)
RA-224	0.964	5685.50*	3.71E-001 +/- 2.10E+002	4.15E-001 +/- 2.35E+002
RA-226	0.964	4785.00*	9.14E-001 +/- 3.49E-001	1.89E-001 +/- 6.90E-003

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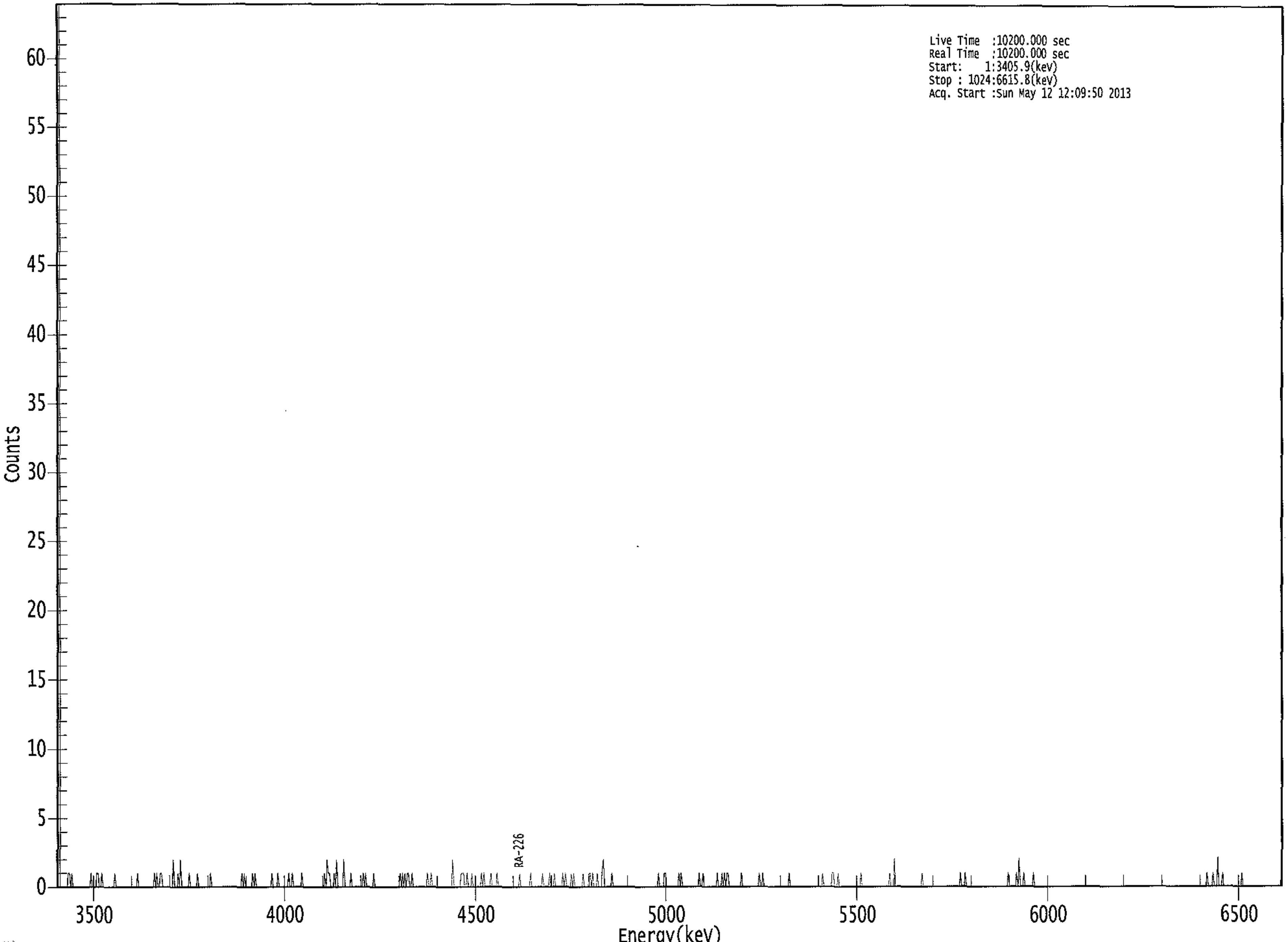
0000057825.CNF



ROI Type: 1

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

Sample Title: 11

Elapsed Live time: 10200
Elapsed Real Time: 10200

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

369:	0	0	0	0	0	0	0	0

Sample Title: 11

Channel								
377:	0	0	0	0	0	0	0	0
385:	0	0	1	0	0	0	0	0
393:	0	0	0	1	0	0	0	0
401:	0	0	0	0	0	1	0	0
409:	0	0	0	1	0	0	0	1
417:	0	0	0	0	0	0	1	0
425:	1	0	0	0	0	1	0	1
433:	0	0	0	0	0	0	0	1
441:	0	0	0	0	1	1	0	1
449:	0	0	0	1	0	0	0	1
457:	2	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	0	0	0	0	1	0
505:	0	0	0	1	1	0	0	0
513:	0	0	0	0	0	0	0	1
521:	0	1	0	0	0	0	0	0
529:	0	0	0	0	0	0	0	0
537:	1	0	0	1	0	0	0	0
545:	0	0	0	0	0	0	0	1
553:	0	0	0	1	0	1	0	1
561:	1	0	0	0	0	0	0	0
569:	0	0	0	1	0	0	0	0
577:	0	0	0	0	0	0	0	0
585:	0	0	1	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	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	1
641:	0	0	0	0	0	0	0	1
649:	1	0	0	0	1	0	0	0
657:	0	0	0	0	0	0	0	0
665:	0	0	0	0	0	0	0	1
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	1
697:	0	0	0	2	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	1	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	1	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	1	0	0	0	0	0

801:	0	1	0	2	0	0	0	1

Sample Title: 11

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:	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	1	0	0
969:	0	2	0	0	0	1	0	0
977:	0	0	0	0	0	0	0	0
985:	0	0	0	0	0	1	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

Apex-Alpha™

C
5/17/13

Sample Description: S-84 TOT
Spectrum File: \\OR-ALPHA1\Canberra\ApexAlpha\Root\Data\00000578
Batch Identification: 1304107A-RA
Sample Identification: 12
Sample Geometry: Shelf 2
Procedure Description: Ra

Detector Name: Alpha_027
Chamber Serial Number:
Detector Serial Number: 27
Env. Background: System Bkgd 56980
Reagent Blank: <not performed>

Sample Size: 1.500E+000 +/- 0.000E+000 liter
Generic Mult. Factor: 2.400E+000 Generic Div. Factor: 1.000E+000
Sample Date/Time: 5/10/2013 7:40:27 AM
Acquisition Date/Time: 5/12/2013 12:09:51 PM
Acquisition Live Time: 170.0 minutes
Acquisition Real Time: 170.0 minutes

Chem. Recovery Factor: 0.9182 +/- 0.0000
Counting Efficiency: 0.1728 +/- 0.0032 on 12/15/2012 2:27:41 PM
Effective Efficiency: 0.1586 +/- 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	5.460	6.45	93.33	2.55	0.00E+000	3.2
RA-226	4.610	9.11	76.04	2.89	0.00E+000	3.2

NUCLIDE ANALYSIS RESULTS

Nuclide	Id Conf.	Energy (keV)	Activity (pCi/liter)	MDA (pCi/liter)
RA-224	0.934	5685.50*	2.74E-001 +/- 1.56E+002	3.57E-001 +/- 2.02E+002
RA-226	0.961	4785.00*	2.43E-001 +/- 1.85E-001	2.34E-001 +/- 8.60E-003

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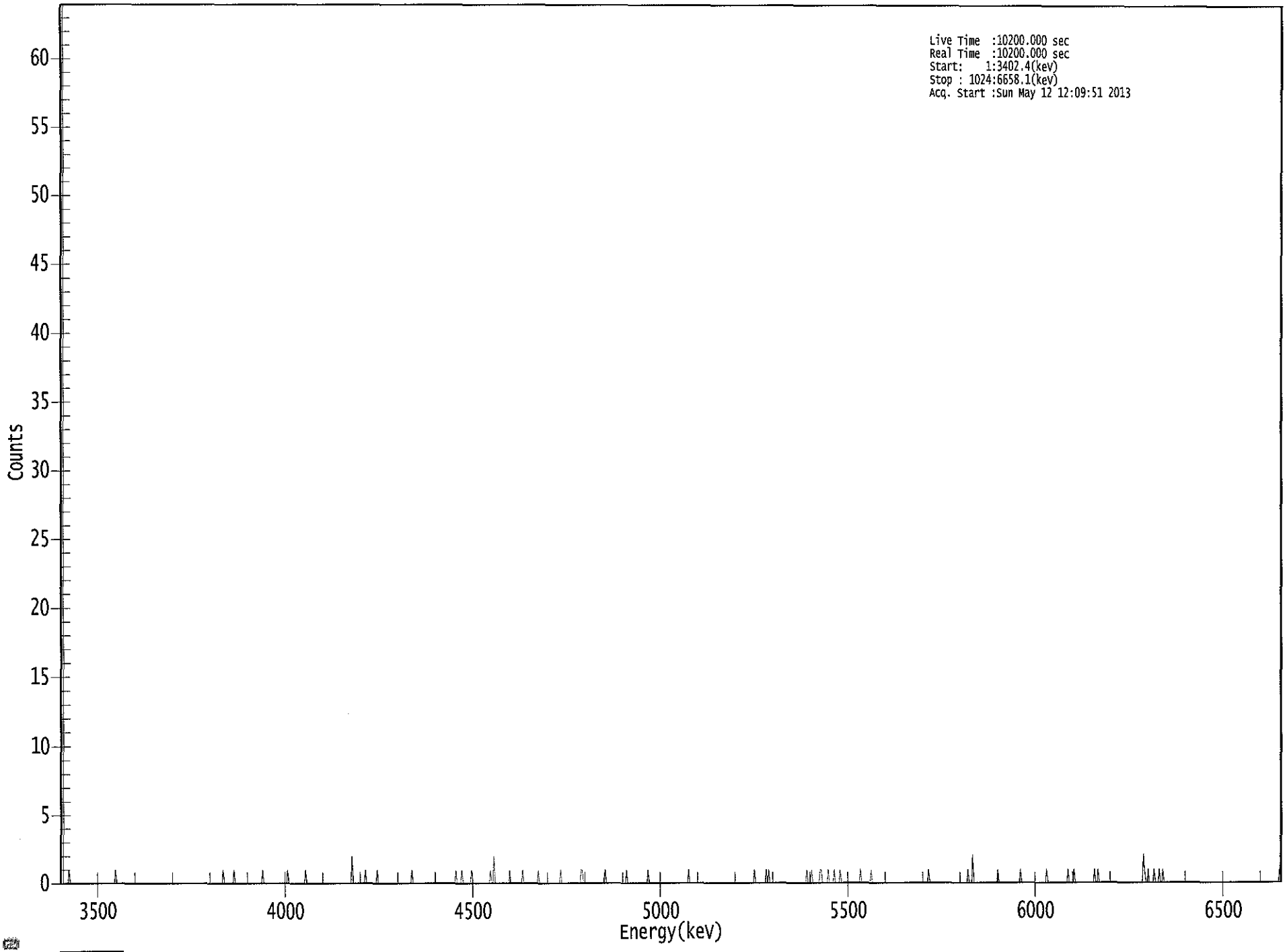
0000057827.CNF



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

Sample Title: 12

Elapsed Live time: 10200
Elapsed Real Time: 10200

Channel								
1:	10200	10200	0	0	0	0	0	1
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	1	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:	1	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	0	0	0	0	0
169:	0	1	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	1	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	2	0	0	0
249:	0	0	0	0	0	0	0	1
257:	0	0	0	0	0	0	0	0
265:	0	1	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	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	1	0	0	0	0
337:	1	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:	1	0	0	2	0	0	0	0

369:	0	0	0	0	0	0	0	0

Sample Title: 12

Channel								
377:	1	0	0	0	0	0	0	0
385:	0	0	0	1	0	0	0	0
393:	0	0	0	0	0	0	0	0
401:	1	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	1	1	0	0
441:	0	0	0	0	0	0	0	0
449:	0	0	0	0	0	0	0	0
457:	1	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:	0	0	0	0	0	0	0	0
489:	0	0	0	0	1	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	1	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	1	0	0
585:	0	0	0	0	0	0	0	1
593:	0	1	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	1	0	0	0	1	0	0
633:	0	0	0	0	1	1	0	0
641:	0	0	0	1	0	0	0	0
649:	1	0	0	0	0	1	0	0
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	1
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:	1	0	0	0	2	0	0	0
769:	0	0	0	0	0	0	0	0
777:	0	0	0	0	0	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	1	0	0	0

Sample Title: 12

Channel								
809:	0	0	0	0	0	0	0	0
817:	0	0	0	0	0	0	0	0
825:	0	0	1	0	0	0	0	0
833:	0	0	0	0	0	0	0	0
841:	0	0	0	0	1	0	0	0
849:	0	1	0	0	0	0	0	0
857:	0	0	0	0	0	0	0	0
865:	0	0	1	0	0	1	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	2	1	0	0	1
913:	0	0	0	0	1	0	0	0
921:	1	0	0	1	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	1	0	0

Apex-Alpha™

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5/17/13

Sample Description: S-84 DIS
Spectrum File: \\OR-ALPHA1\Canberra\ApexAlpha\Root\Data\00000578
Batch Identification: 1304107A-RA
Sample Identification: 13
Sample Geometry: Shelf 2
Procedure Description: Ra

Detector Name: Alpha_029
Chamber Serial Number:
Detector Serial Number: 29
Env. Background: System Bkgd 56981
Reagent Blank: <not performed>

Sample Size: 1.500E+000 +/- 0.000E+000 liter
Generic Mult. Factor: 2.500E+000 Generic Div. Factor: 1.000E+000
Sample Date/Time: 5/10/2013 7:40:27 AM
Acquisition Date/Time: 5/12/2013 12:09:52 PM
Acquisition Live Time: 170.0 minutes
Acquisition Real Time: 170.0 minutes

Chem. Recovery Factor: 0.9246 +/- 0.0000
Counting Efficiency: 0.1945 +/- 0.0036 on 12/15/2012 2:30:02 PM
Effective Efficiency: 0.1799 +/- 0.0033

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	5.454	2.81	142.99	1.19	0.00E+000	6.2
RA-226	4.561	4.64	105.44	1.36	0.00E+000	3.1

NUCLIDE ANALYSIS RESULTS

Nuclide	Id Conf.	Energy (keV)	Activity (pCi/liter)	MDA (pCi/liter)
RA-224	0.931	5685.50*	1.10E-001 +/- 6.23E+001	2.57E-001 +/- 1.46E+002
RA-226	0.937	4785.00*	1.14E-001 +/- 1.20E-001	1.68E-001 +/- 6.06E-003

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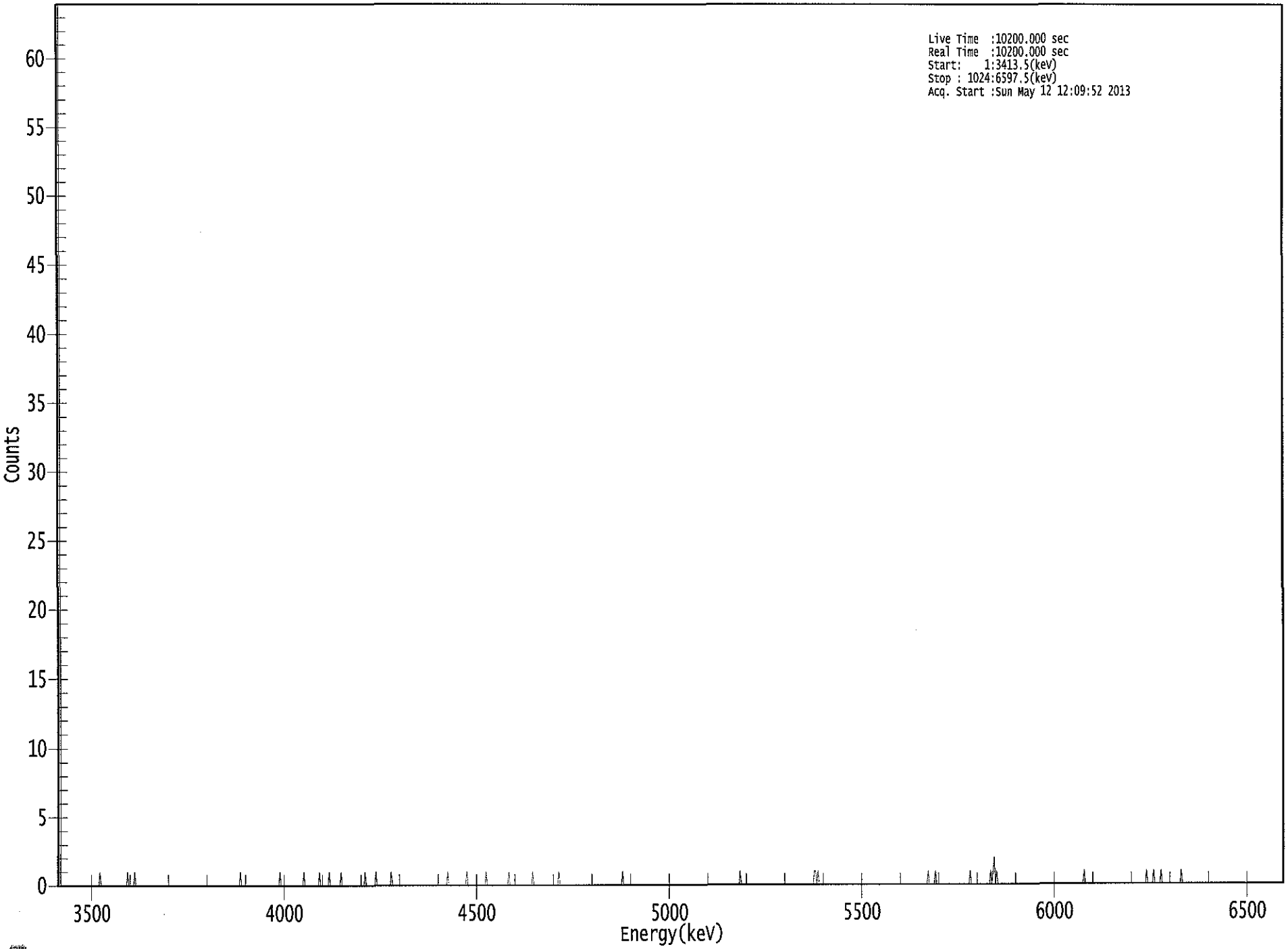
5/13/13

0000057826.CNF



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

Sample Title: 13

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	1	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	1	0	0	0	0	0
65:	1	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:	1	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	1	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	0	0	0	0
225:	0	0	1	0	0	0	0	0
233:	0	0	0	0	1	0	0	0
241:	0	0	0	0	0	0	0	0
249:	0	0	0	0	0	0	0	0
257:	1	0	0	0	0	0	0	0
265:	0	1	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	1	0	0
329:	0	0	0	0	0	0	0	0
337:	0	0	0	0	0	1	0	0
345:	0	0	0	0	0	0	0	0
353:	0	0	0	0	0	1	0	0
361:	0	0	0	0	0	0	0	0

369:	0	0	0	0	0	0	0	0

Sample Title: 13

Channel								
377:	1	0	0	0	0	0	0	0
385:	0	0	0	0	0	0	0	0
393:	0	0	0	0	1	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	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	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	1	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	1
633:	1	0	1	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	1	0
729:	0	0	0	0	1	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	1	0	1	2	0	1
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: 13

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:	1	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	1	0	0	0
913:	0	0	1	0	0	0	0	0
921:	1	0	0	0	0	0	0	0
929:	0	0	0	0	0	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	0	0

Apex-Alpha™

Sample Description: S-5 TOT
Spectrum File: \\OR-ALPHA1\Canberra\ApexAlpha\Root\Data\00000578
Batch Identification: 1304107A-RA
Sample Identification: 14
Sample Geometry: Shelf 2
Procedure Description: Ra

Detector Name: Alpha_033
Chamber Serial Number: 04026479A
Detector Serial Number: 91132
Env. Background: System Bkgd 56982
Reagent Blank: <not performed>

Sample Size: 1.500E+000 +/- 0.000E+000 liter
Generic Mult. Factor: 2.230E+000 Generic Div. Factor: 1.000E+000
Sample Date/Time: 5/10/2013 7:40:27 AM
Acquisition Date/Time: 5/12/2013 12:09:54 PM
Acquisition Live Time: 170.0 minutes
Acquisition Real Time: 170.6 minutes

Chem. Recovery Factor: 0.3489 +/- 0.0000
Counting Efficiency: 0.1825 +/- 0.0032 on 12/16/2012 5:49:18 PM
Effective Efficiency: 0.0637 +/- 0.0011

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	5.498	3.98	112.01	1.02	0.00E+000	3.0
RA-226	4.565	17.83	46.68	0.17	0.00E+000	3.0

NUCLIDE ANALYSIS RESULTS

Nuclide	Id Conf.	Energy (keV)	Activity (pCi/liter)	MDA (pCi/liter)
RA-224	0.953	5685.50*	3.92E-001 +/- 2.22E+002	6.20E-001 +/- 3.52E+002
RA-226	0.939	4785.00*	1.10E+000 +/- 5.16E-001	2.58E-001 +/- 8.89E-003

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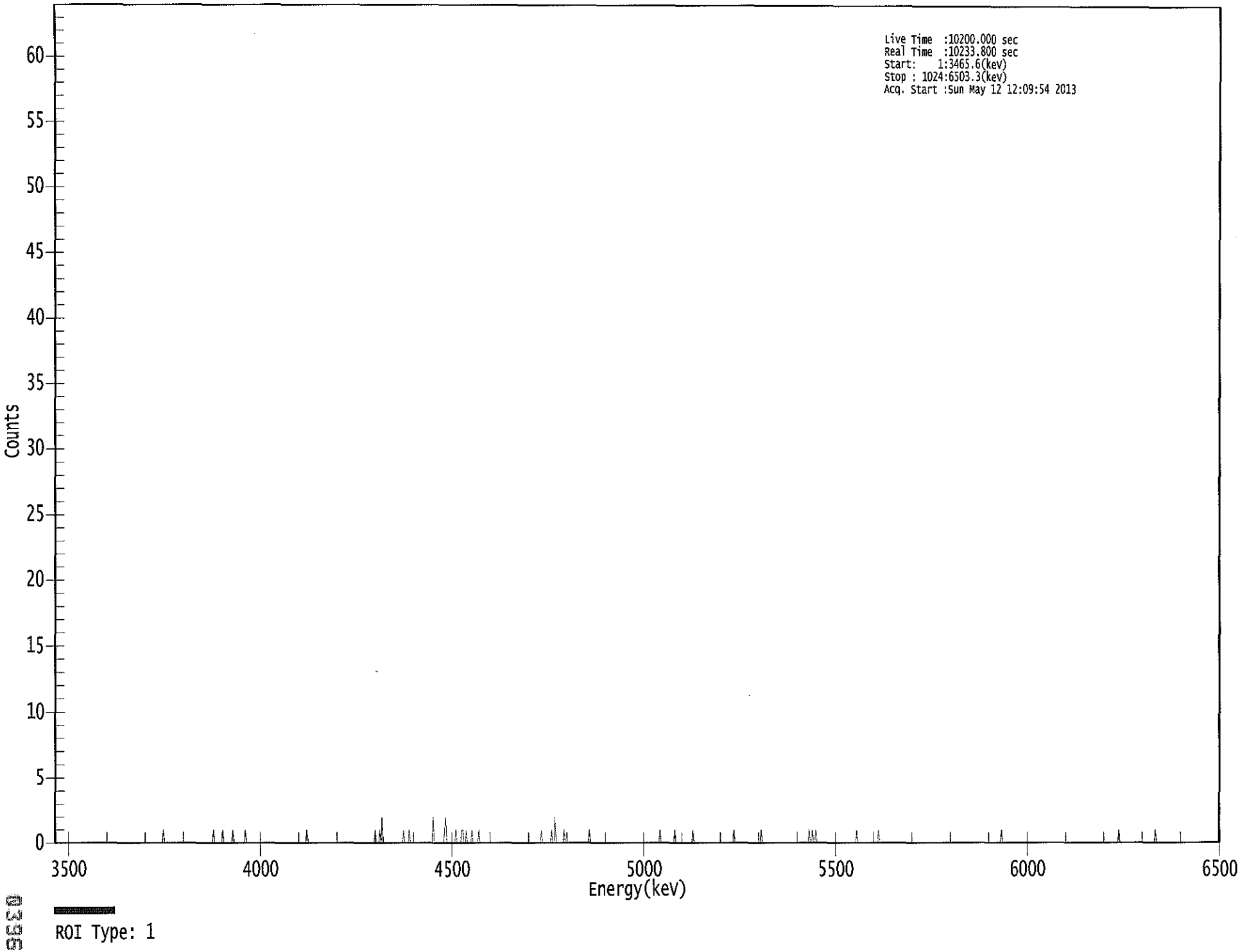

****
***** S P E C T R A L D A T A R E P O R T *****
****

Sample Title: 14

Elapsed Live time: 10200
Elapsed Real Time: 10234

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	1
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	1	0	0	0	0
145:	0	0	0	1	0	0	0	0
153:	0	0	0	0	1	0	0	0
161:	0	0	0	0	0	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	0	0	0	0	0	0	0
209:	0	0	0	0	0	0	0	0
217:	0	0	0	0	0	1	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	1	0	0	0	1	0	2
289:	0	0	0	0	0	0	0	0
297:	0	0	0	0	0	0	0	0
305:	0	0	1	0	0	0	0	1
313:	0	0	0	0	0	0	0	0
321:	0	0	0	0	0	0	0	0
329:	0	0	0	0	2	0	0	0
337:	0	0	0	0	0	0	1	2
345:	0	0	0	0	0	0	0	0
353:	1	0	0	0	0	1	1	0
361:	0	1	0	0	0	0	1	0

369:	0	0	0	0	1	0	0	0

Sample Title: 14

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	0	0	0	0
425:	0	0	0	1	0	0	0	0
433:	0	0	0	0	1	0	0	2
441:	0	0	0	0	0	0	0	1
449:	0	0	0	0	0	0	0	0
457:	0	0	0	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	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	1	0	0	0	0
537:	0	0	0	0	0	0	0	0
545:	1	0	0	0	0	0	0	0
553:	0	0	0	0	0	0	0	0
561:	1	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	1	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	1	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	1	0
665:	0	1	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:	1	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	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: 14

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	1
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	1	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	1	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

Apex-Alpha™

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5/13/13

Sample Description: S-5 DIS
Spectrum File: \\OR-ALPHA1\Canberra\ApexAlpha\Root\Data\00000578
Batch Identification: 1304107A-RA
Sample Identification: 15
Sample Geometry: Shelf 2
Procedure Description: Ra

Detector Name: Alpha_034
Chamber Serial Number: 04026479B
Detector Serial Number: 91136
Env. Background: System Bkgd 56983
Reagent Blank: <not performed>

Sample Size: 1.500E+000 +/- 0.000E+000 liter
Generic Mult. Factor: 2.440E+000 Generic Div. Factor: 1.000E+000
Sample Date/Time: 5/10/2013 7:40:27 AM
Acquisition Date/Time: 5/12/2013 12:09:55 PM
Acquisition Live Time: 170.0 minutes
Acquisition Real Time: 170.6 minutes

Chem. Recovery Factor: 1.0000 +/- 0.0000
Counting Efficiency: 0.1856 +/- 0.0032 on 12/16/2012 5:49:43 PM
Effective Efficiency: 0.1856 +/- 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	5.633	1.66	169.38	0.34	0.00E+000	3.0
RA-226	4.683	1.66	169.38	0.34	0.00E+000	3.0

NUCLIDE ANALYSIS RESULTS

Nuclide	Id Conf.	Energy (keV)	Activity (pCi/liter)	MDA (pCi/liter)
RA-224	0.995	5685.50*	6.13E-002 +/- 3.48E+001	1.77E-001 +/- 1.00E+002
RA-226	0.987	4785.00*	3.86E-002 +/- 6.53E-002	1.11E-001 +/- 3.79E-003

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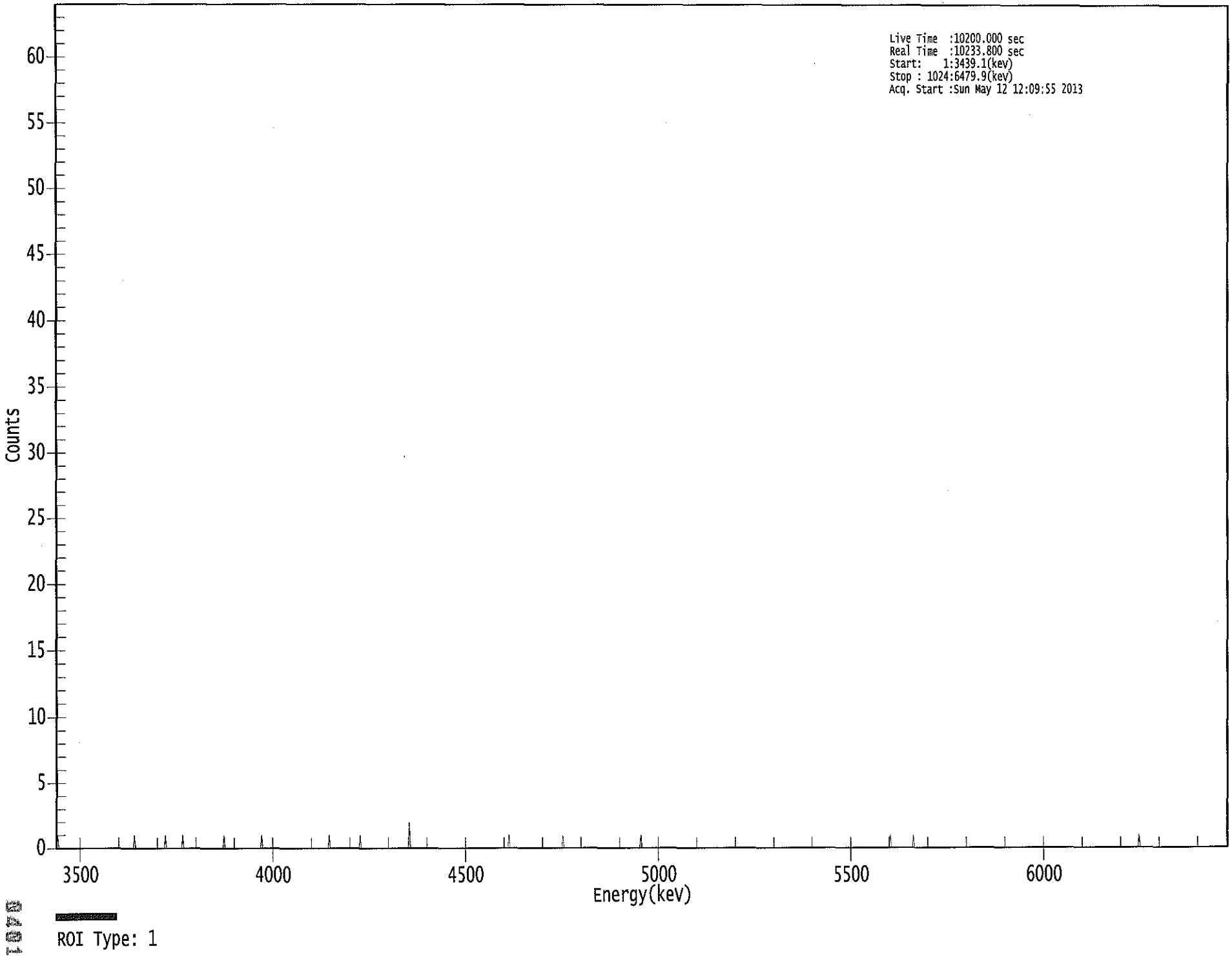

****
***** S P E C T R A L D A T A R E P O R T *****
****

Sample Title: 15

Elapsed Live time: 10200
Elapsed Real Time: 10234

Channel							
1:	0	1	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	1	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	1
97:	0	0	0	0	0	0	0	0
105:	0	0	0	0	0	0	1	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	1	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	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	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	0
249:	0	0	0	0	0	0	0	0
257:	0	0	0	0	0	0	0	0
265:	0	1	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	2	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: 15

Channel								
377:	0	0	0	0	0	0	0	0
385:	0	0	0	0	0	0	0	0
393:	0	0	0	1	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:	0	0	1	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	0	0	0	0	0	1	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:	1	0	0	0	0	0	0	0
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: 15

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	1	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

Apex-Alpha™

Sample Description: PZ-109-SS TOT
Spectrum File: \\OR-ALPHA1\Canberra\ApexAlpha\Root\Data\00000578
Batch Identification: 1304107A-RA
Sample Identification: 16
Sample Geometry: Shelf 2
Procedure Description: Ra

Detector Name: Alpha_035
Chamber Serial Number: 04026477A
Detector Serial Number: 58771
Env. Background: System Bkgd 56984
Reagent Blank: <not performed>

Sample Size: 1.500E+000 +/- 0.000E+000 liter
Generic Mult. Factor: 2.550E+000 Generic Div. Factor: 1.000E+000
Sample Date/Time: 5/10/2013 7:40:27 AM
Acquisition Date/Time: 5/12/2013 12:09:57 PM
Acquisition Live Time: 170.0 minutes
Acquisition Real Time: 170.6 minutes

Chem. Recovery Factor: 0.8974 +/- 0.0000
Counting Efficiency: 0.1826 +/- 0.0032 on 12/16/2012 5:49:42 PM
Effective Efficiency: 0.1638 +/- 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	5.508	16.00	50.51	0.00	0.00E+000	2.9
RA-226	4.614	78.32	22.26	0.68	0.00E+000	2.9

NUCLIDE ANALYSIS RESULTS

Nuclide	Id Conf.	Energy (keV)	Activity (pCi/liter)	MDA (pCi/liter)
RA-224	0.958	5685.50*	7.00E-001 +/- 3.97E+002	2.62E-001 +/- 1.49E+002
RA-226	0.962	4785.00*	2.15E+000 +/- 4.85E-001	1.55E-001 +/- 5.31E-003

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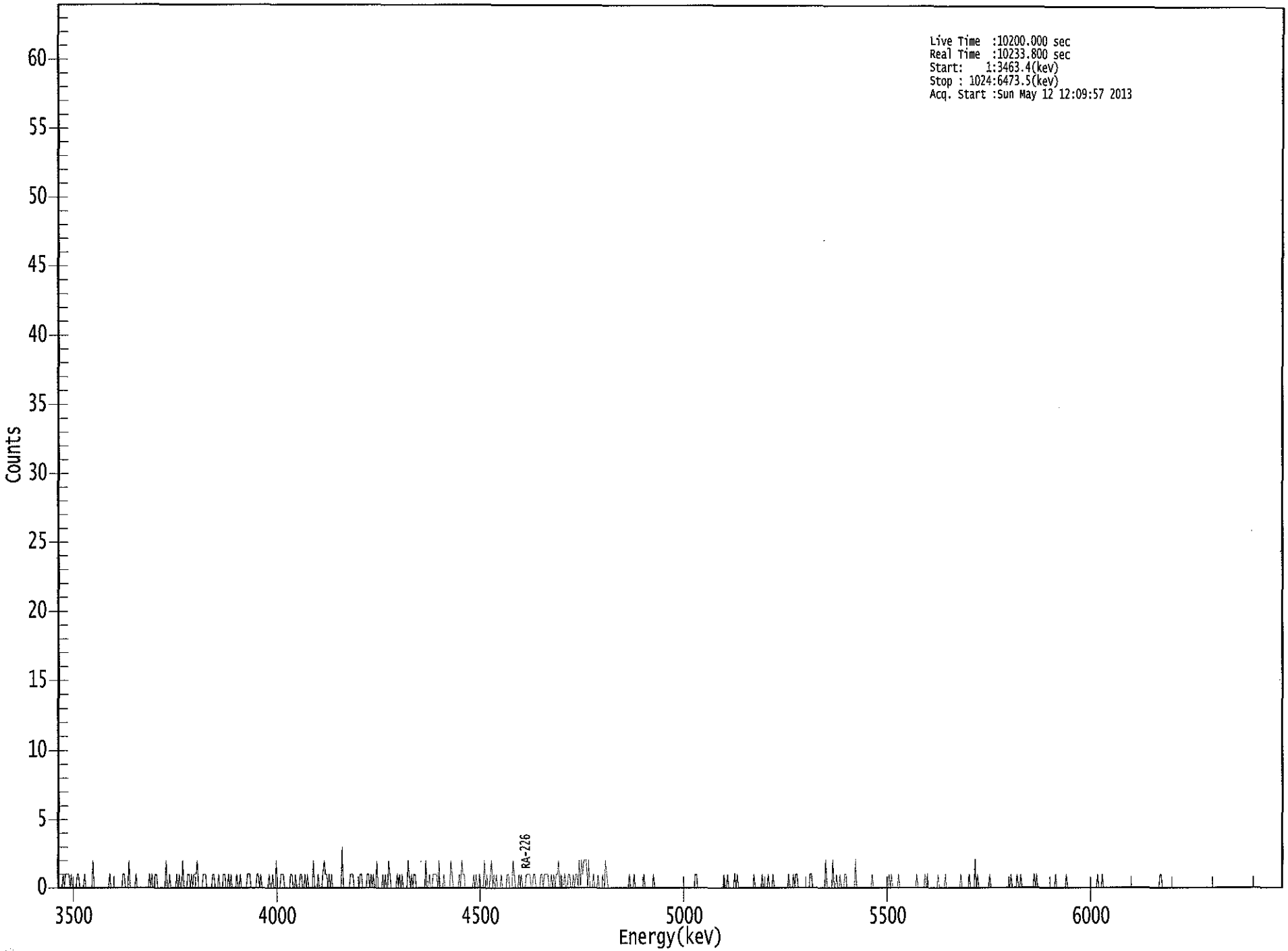
5/13/13

0000057831.CNF



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

Sample Title: 16

Elapsed Live time: 10200
Elapsed Real Time: 10234

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

369:	0	0	1	0	0	0	0	1

Sample Title: 16

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

801:	0	1	0	0	1	0	0	0

Sample Title: 16

Channel								
809:	0	0	0	0	0	0	0	1
817:	0	1	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	1	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:	1	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:	1	1	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

Apex-Alpha™

Sample Description: PZ-109-SS DIS
Spectrum File: \\OR-ALPHA1\Canberra\ApexAlpha\Root\Data\00000578
Batch Identification: 1304107A-RA
Sample Identification: 17
Sample Geometry: Shelf 2
Procedure Description: Ra

Detector Name: Alpha_036
Chamber Serial Number: 04026477B
Detector Serial Number: 84167
Env. Background: System Bkgd 55749
Reagent Blank: <not performed>

Sample Size: 1.500E+000 +/- 0.000E+000 liter
Generic Mult. Factor: 2.580E+000 Generic Div. Factor: 1.000E+000
Sample Date/Time: 5/10/2013 7:40:27 AM
Acquisition Date/Time: 5/12/2013 12:09:58 PM
Acquisition Live Time: 170.0 minutes
Acquisition Real Time: 170.6 minutes

Chem. Recovery Factor: 0.9768 +/- 0.0000
Counting Efficiency: 0.1975 +/- 0.0034 on 4/20/2013 2:01:29 PM
Effective Efficiency: 0.1930 +/- 0.0033

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	5.515	25.32	39.56	0.68	0.00E+000	3.0
RA-226	4.575	96.81	20.06	1.19	0.00E+000	12.6

NUCLIDE ANALYSIS RESULTS

Nuclide	Id Conf.	Energy (keV)	Activity (pCi/liter)	MDA (pCi/liter)
RA-224	0.961	5685.50*	9.52E-001 +/- 5.40E+002	2.12E-001 +/- 1.20E+002
RA-226	0.944	4785.00*	2.29E+000 +/- 4.65E-001	1.56E-001 +/- 5.28E-003

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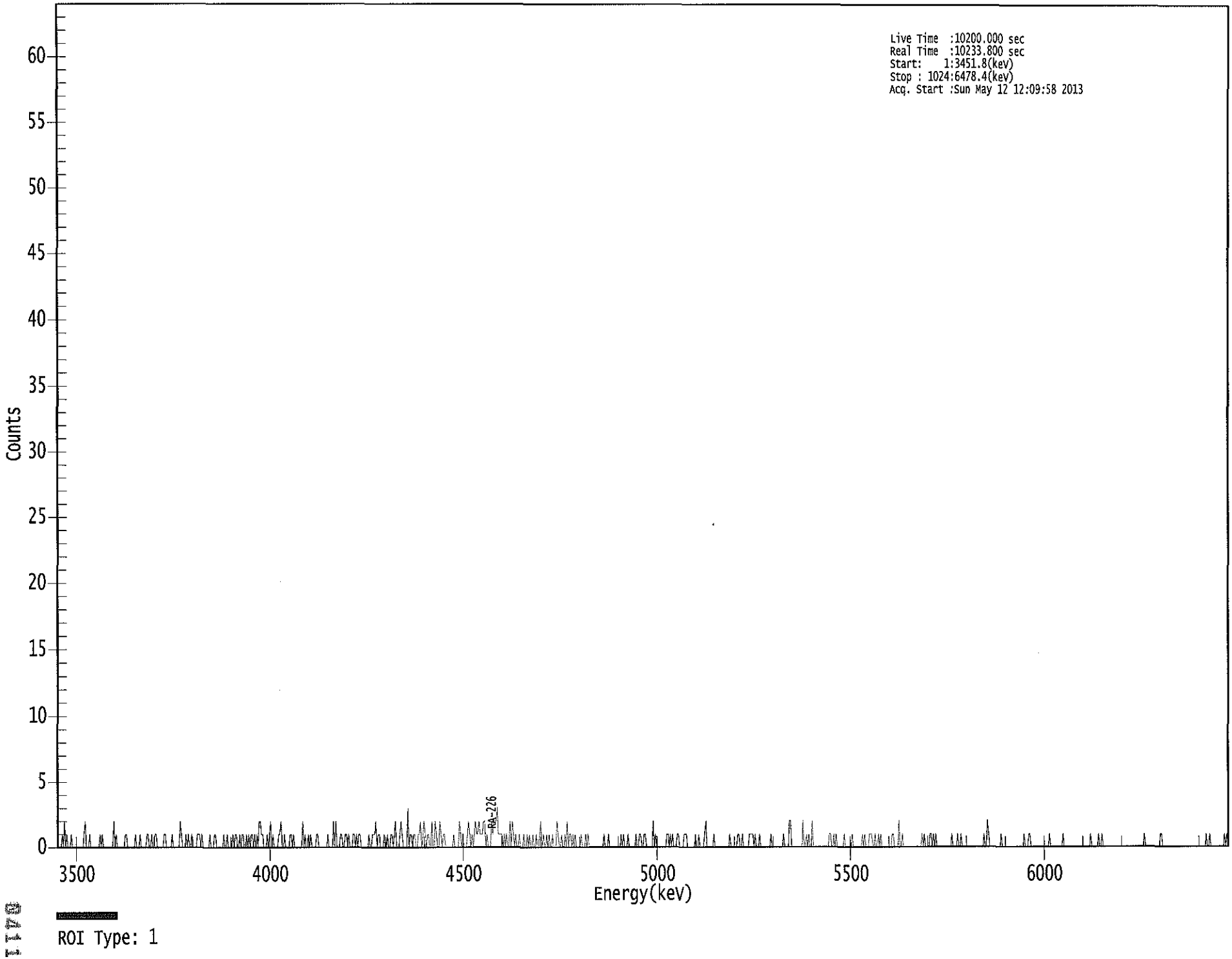
5/13/13

0000057830.CNF



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

Sample Title: 17

Elapsed Live time: 10200
Elapsed Real Time: 10234

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

369:	2	1	1	1	2	2	0	1

Sample Title: 17

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

801:	0	0	0	0	0	0	0	0

Sample Title: 17

Channel								
809:	0	1	0	0	2	1	0	0
817:	0	0	0	0	0	0	0	0
825:	1	0	0	0	0	0	0	0
833:	0	0	0	0	0	0	0	0
841:	0	0	0	0	1	0	0	0
849:	1	1	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	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	1	0
905:	0	0	0	0	0	1	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	1	0	0
953:	0	0	0	0	0	0	0	0
961:	0	0	0	1	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	1	0	0	1	0
1009:	0	0	0	0	0	0	0	0
1017:	0	0	0	1	0	1	0	0

Apex-Alpha™

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5/13/13

Sample Description: PZ-104-KS TOT
Spectrum File: \\OR-ALPHA1\Canberra\ApexAlpha\Root\Data\00000578
Batch Identification: 1304107A-RA
Sample Identification: 18
Sample Geometry: Shelf 2
Procedure Description: Ra

Detector Name: Alpha_037
Chamber Serial Number: 04026478A
Detector Serial Number: 91133
Env. Background: System Bkgd 56985
Reagent Blank: <not performed>

Sample Size: 1.500E+000 +/- 0.000E+000 liter
Generic Mult. Factor: 2.400E+000 Generic Div. Factor: 1.000E+000
Sample Date/Time: 5/10/2013 7:40:27 AM
Acquisition Date/Time: 5/12/2013 12:10:00 PM
Acquisition Live Time: 170.0 minutes
Acquisition Real Time: 170.6 minutes

Chem. Recovery Factor: 0.9882 +/- 0.0000
Counting Efficiency: 0.1783 +/- 0.0033 on 1/26/2013 3:28:25 PM
Effective Efficiency: 0.1762 +/- 0.0033

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	5.466	6.66	78.18	0.34	0.00E+000	2.9
RA-226	4.606	13.49	54.53	0.51	0.00E+000	2.9

NUCLIDE ANALYSIS RESULTS

Nuclide	Id Conf.	Energy (keV)	Activity (pCi/liter)	MDA (pCi/liter)
RA-224	0.938	5685.50*	2.55E-001 +/- 1.45E+002	1.83E-001 +/- 1.04E+002
RA-226	0.959	4785.00*	3.25E-001 +/- 1.77E-001	1.26E-001 +/- 4.60E-003

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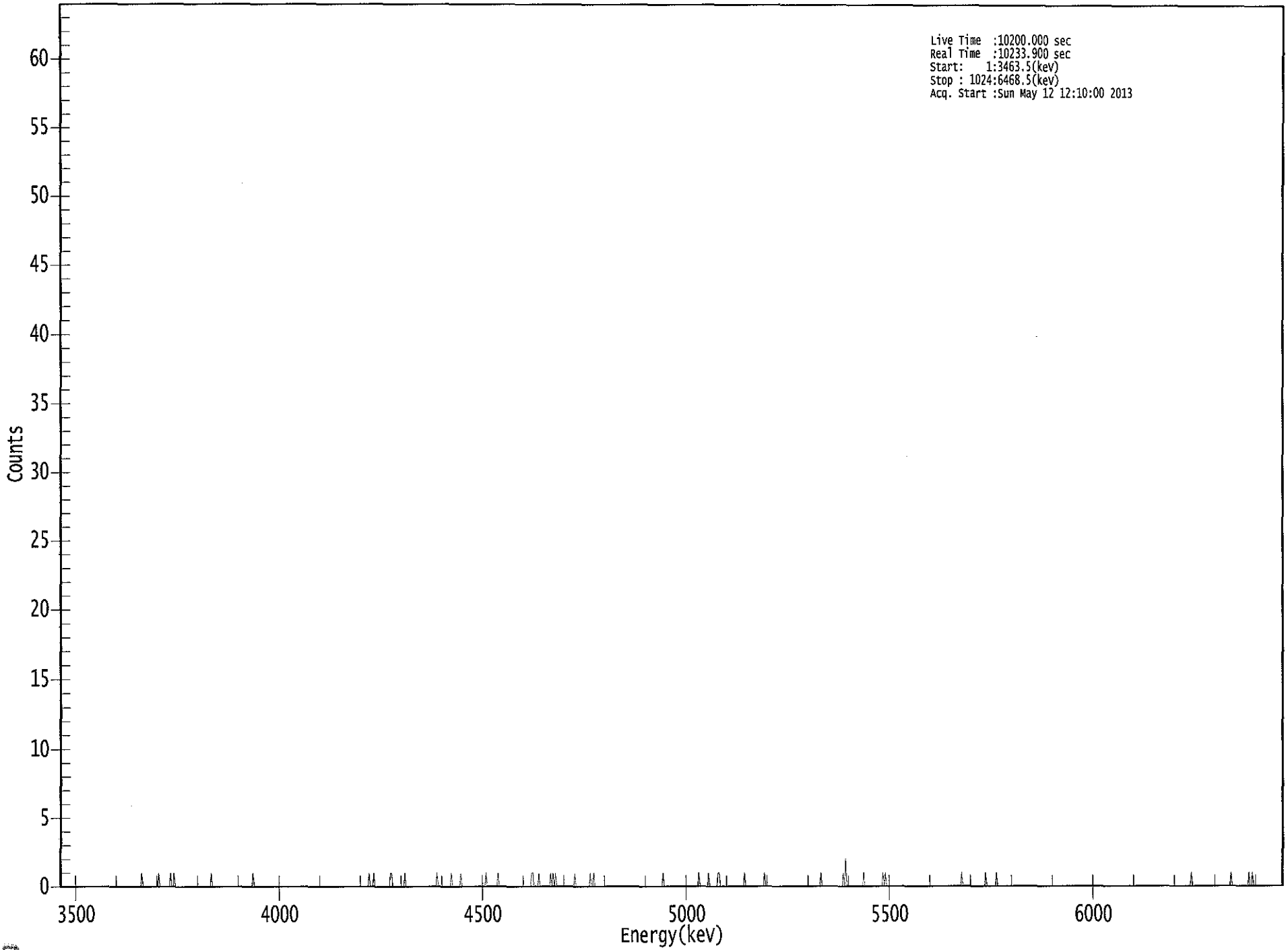
US EPA ARCHIVE DOCUMENT

0000057829.CNF



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

Sample Title: 18

Elapsed Live time: 10200
Elapsed Real Time: 10234

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	1	0	0	0
73:	0	0	0	0	0	0	0	0
81:	0	0	1	0	0	0	0	0
89:	0	0	0	0	1	0	0	1
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	1	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	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	1	0	0	0	1	0
265:	0	0	0	0	0	0	0	0
273:	0	0	0	0	1	1	0	0
281:	0	0	0	0	0	0	0	0
289:	1	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	1
329:	0	0	0	0	0	0	0	1
337:	0	0	0	0	0	0	0	0
345:	0	0	0	0	0	0	0	0
353:	0	0	0	0	1	0	0	0
361:	0	0	0	0	0	0	1	0

369:	0	0	0	0	0	0	0	0

Sample Title: 18

Channel								
377:	0	0	0	0	0	0	0	0
385:	0	0	0	0	0	0	0	0
393:	0	0	1	1	0	0	0	0
401:	1	0	0	0	0	0	0	0
409:	0	0	1	0	1	0	1	0
417:	0	0	0	0	0	0	0	0
425:	0	0	0	0	0	0	1	0
433:	0	0	0	0	0	0	0	0
441:	0	0	0	1	0	0	1	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:	1	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	1	0
537:	0	0	0	0	0	0	1	0
545:	0	0	0	0	0	0	1	1
553:	0	0	0	0	0	0	0	0
561:	0	0	0	0	0	0	0	0
569:	0	0	0	0	1	0	0	0
577:	0	0	0	0	0	0	0	0
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	0	0	0	0	0	0	0
649:	0	0	0	0	0	0	0	1
657:	0	2	0	0	0	0	0	0
665:	0	0	0	0	0	0	0	0
673:	1	0	0	0	0	0	0	0
681:	0	0	0	0	0	0	0	0
689:	1	0	1	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	1	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	1
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: 18

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	1	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	1	0	0	0	0
985:	0	0	0	0	0	0	0	0
993:	0	0	1	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

Apex-Alpha™

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Sample Description: PZ-104-KS DIS
Spectrum File: \\OR-ALPHA1\Canberra\ApexAlpha\Root\Data\00000578
Batch Identification: 1304107A-RA
Sample Identification: 19
Sample Geometry: Shelf 2
Procedure Description: Ra

Detector Name: Alpha_038
Chamber Serial Number: 04026478B
Detector Serial Number: 91134
Env. Background: System Bkgd 55208
Reagent Blank: <not performed>

Sample Size: 1.500E+000 +/- 0.000E+000 liter
Generic Mult. Factor: 2.500E+000 Generic Div. Factor: 1.000E+000
Sample Date/Time: 5/10/2013 7:40:27 AM
Acquisition Date/Time: 5/12/2013 12:10:01 PM
Acquisition Live Time: 170.0 minutes
Acquisition Real Time: 170.6 minutes

Chem. Recovery Factor: 0.9213 +/- 0.0000
Counting Efficiency: 0.1722 +/- 0.0030 on 5/11/2013 5:13:35 PM
Effective Efficiency: 0.1586 +/- 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	5.554	0.66	305.43	0.34	0.00E+000	3.0
RA-226	4.514	2.49	138.29	0.51	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*	2.92E-002 +/- 1.66E+001	2.12E-001 +/- 1.20E+002
RA-226	0.909	4785.00*	6.93E-002 +/- 9.59E-002	1.46E-001 +/- 5.03E-003

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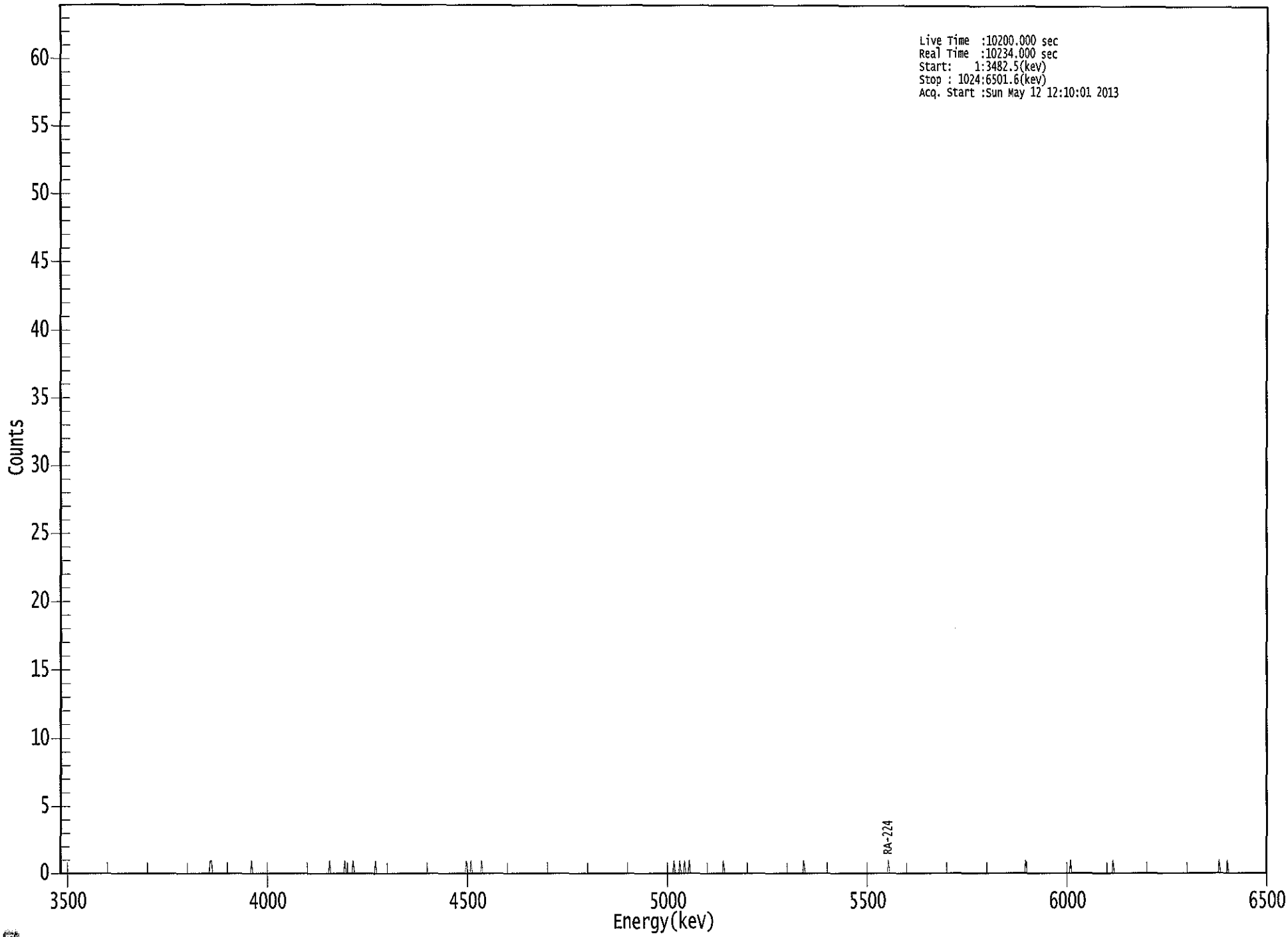

****
***** S P E C T R A L D A T A R E P O R T *****
****

Sample Title: 19

Elapsed Live time: 10200
Elapsed Real Time: 10234

Channel							
1:	0	0	0	0	0	0	0
9:	0	0	0	0	0	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:	0	0	0	0	0	0	0
57:	0	0	0	0	0	0	0
65:	0	0	0	0	0	0	0
73:	0	0	0	0	0	0	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	0	0
113:	0	0	0	0	0	0	0
121:	0	0	0	0	0	0	1
129:	1	0	0	0	0	0	0
137:	0	0	0	0	0	0	0
145:	0	0	0	0	0	0	0
153:	0	0	0	0	0	0	0
161:	0	0	1	0	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	0	0	0	0	0
209:	0	0	0	0	0	0	0
217:	0	0	0	0	0	0	0
225:	0	0	0	0	1	0	0
233:	0	0	0	0	0	0	0
241:	0	1	0	0	0	0	0
249:	1	0	0	0	0	0	0
257:	0	0	0	0	0	0	0
265:	0	0	0	1	0	0	0
273:	0	0	0	0	0	0	0
281:	0	0	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:	1	0	0	0	1	0	0	0
353:	0	0	0	0	0	1	0	0
361:	0	0	0	0	0	0	0	0

369:	0	0	0	0	0	0	0	0

Sample Title: 19

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	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	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:	1	0	0	0	0	1	0	0
529:	0	1	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	1	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	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	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	1	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: 19

Channel								
809:	0	0	0	0	0	0	0	0
817:	0	0	1	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:	1	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	1	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	1	0
985:	0	0	0	0	0	1	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

5/12/2013 11:33:24 AM

Apex-Alpha™

QA SUMMARY REPORT
Review Of QA Results - Pulser Check

Date : 5/12/2013
Time : 11:33:24 AM

CHAMBER	DEVICE	PARAMETER	FLAG	DATE
Alpha_003	21f	ALL	Passed	5/12/2013 11:18:52 AM
Alpha_004	21f	ALL	Passed	5/12/2013 11:18:53 AM
Alpha_010	21f	ALL	Passed	5/12/2013 11:18:54 AM
Alpha_011	21f	ALL	Passed	5/12/2013 11:18:55 AM
Alpha_013	21f	ALL	Passed	5/12/2013 11:18:55 AM
Alpha_014	21f	ALL	Passed	5/12/2013 11:18:56 AM
Alpha_018	AIM730	ALL	Passed	5/12/2013 11:18:57 AM
Alpha_019	AIM730	ALL	Passed	5/12/2013 11:18:58 AM
Alpha_022	AIM730	ALL	Passed	5/12/2013 11:18:59 AM
Alpha_024	AIM730	ALL	Passed	5/12/2013 11:19:00 AM
Alpha_025	AIM730	ALL	Passed	5/12/2013 11:19:01 AM
Alpha_027	AIM730	ALL	Passed	5/12/2013 11:19:02 AM
Alpha_029	AIM730	ALL	Passed	5/12/2013 11:19:03 AM
Alpha_033	Alpha Analyst100DC	ALL	Passed	5/12/2013 11:19:04 AM
Alpha_034	Alpha Analyst100DC	ALL	Passed	5/12/2013 11:19:06 AM
Alpha_035	Alpha Analyst100DC	ALL	Passed	5/12/2013 11:19:07 AM
Alpha_036	Alpha Analyst100DC	ALL	Passed	5/12/2013 11:19:09 AM
Alpha_037	Alpha Analyst100DC	ALL	Passed	5/12/2013 11:19:10 AM
Alpha_038	Alpha Analyst100DC	ALL	Passed	5/12/2013 11:19:12 AM
Alpha_039	Alpha Analyst100DC	ALL	Passed	5/12/2013 11:19:13 AM
Alpha_040	Alpha Analyst100DC	ALL	Passed	5/12/2013 11:19:15 AM
Alpha_041	Alpha Analyst100DC	ALL	Passed	5/12/2013 11:19:17 AM
Alpha_042	Alpha Analyst100DC	ALL	Passed	5/12/2013 11:19:18 AM
Alpha_044	Alpha Analyst100DC	ALL	Passed	5/12/2013 11:19:20 AM
Alpha_045	Alpha Analyst100DC	ALL	Passed	5/12/2013 11:19:22 AM
Alpha_046	Alpha Analyst100DC	ALL	Passed	5/12/2013 11:19:23 AM
Alpha_047	Alpha Analyst100DC	ALL	Passed	5/12/2013 11:19:25 AM
Alpha_048	Alpha Analyst100DC	ALL	Passed	5/12/2013 11:19:27 AM

APPROVED BY: AG

APPROVAL DATE: 5/12/13

****
***** 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)

Eberline Services
Oak Ridge Laboratory
Analysis Sheet

13-04107
Ra228
Run 1

Work Order	13-04107
Analysis Code	Ra228
Run	1
Date Received	4/16/2013
Lab Deadline	5/7/2013
Client	Engineering Management Support, Inc.
Project	West Lake OU-1
Report Level	4
Activity Units	pCi
Aliquot Units	l
Matrix	WA
Method	EPA 904.0 Modified
Instrument Type	Alpha/Beta GPC
Radiometric Tracer	Ba-133
Radiometric Sol#	Ba-6a
Tracer Act (dpm/g)	1008.864
Carrier	Yttirum
Carrier Conc (mg/ml)	34

Internal Fraction	*Sample Desc*	*Client ID*	*Login CPM*	*Sample Date*	*Sample Aliquot*
01	LCS	LCS		04/16/13 00:00	1.0000E+00
02	MBL	BLANK		04/16/13 00:00	1.0000E+00
03	DUP	PZ-109-SS TOT	45	04/11/13 16:08	1.5000E+00
04	TRG	PZ-113-AD TOT	39	04/11/13 13:35	1.5000E+00
05	TRG	PZ-113-AD DIS	39	04/11/13 13:35	1.5000E+00
06	TRG	FB at D-3 TOT	44	04/11/13 13:50	1.5000E+00
07	TRG	FB at D-3 DIS	44	04/11/13 13:50	1.5000E+00
08	TRG	D-3 TOT	46	04/11/13 14:24	1.5000E+00
09	TRG	D-3 DIS	46	04/11/13 14:24	1.5000E+00
10	TRG	D-85 TOT	43	04/11/13 14:45	1.5000E+00
11	TRG	D-85 DIS	43	04/11/13 14:45	1.5000E+00
12	TRG	S-84 TOT	42	04/11/13 15:30	1.5000E+00
13	TRG	S-84 DIS	42	04/11/13 15:30	1.5000E+00
14	TRG	S-5 TOT	35	04/11/13 15:31	1.5000E+00
15	TRG	S-5 DIS	35	04/11/13 15:31	1.5000E+00
16	DO	PZ-109-SS TOT	45	04/11/13 16:08	1.5000E+00
17	TRG	PZ-109-SS DIS	45	04/11/13 16:08	1.5000E+00
18	TRG	PZ-104-KS TOT	38	04/11/13 18:08	1.5000E+00
19	TRG	PZ-104-KS DIS	38	04/11/13 18:08	1.5000E+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.

13-04107
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	0.8085	815.7	385.5	104.92	2.000	0.0911	0.1467	0.0556	81.76	85.79	1.00	1.00
02	MBL	0.8126	819.8	361.0	97.76	2.000	0.0928	0.1500	0.0572	84.12	82.23	1.00	1.00
03	DUP	0.8110	818.2	385.2	104.52	2.000	0.0928	0.1510	0.0582	85.59	89.45	1.00	1.00
04	TRG	0.8100	817.2	331.9	90.17	2.000	0.0912	0.1481	0.0569	83.68	75.45	1.00	1.00
05	TRG	0.8083	815.5	357.3	97.27	2.000	0.0928	0.1524	0.0596	87.65	85.25	1.00	1.00
06	TRG	0.8080	815.2	363.0	98.86	2.000	0.0937	0.1534	0.0597	87.79	86.79	1.00	1.00
07	TRG	0.8079	815.1	360.5	98.19	2.000	0.0926	0.1499	0.0573	84.26	82.74	1.00	1.00
08	TRG	0.8063	813.4	337.2	92.03	2.000	0.0932	0.1508	0.0576	84.71	77.95	1.00	1.00
09	TRG	0.8069	814.1	391.8	106.85	2.000	0.0934	0.1499	0.0565	83.09	88.78	1.00	1.00
10	TRG	0.8059	813.0	216.7	59.17	2.000	0.0920	0.1494	0.0574	84.41	49.95	1.00	1.00
11	TRG	0.8059	813.0	356.4	97.31	2.000	0.0933	0.1495	0.0562	82.65	80.43	1.00	1.00
12	TRG	0.8079	815.1	337.1	91.82	2.000	0.0934	0.1509	0.0575	84.56	77.64	1.00	1.00
13	TRG	0.8082	815.4	339.6	92.46	2.000	0.0920	0.1447	0.0527	77.50	71.66	1.00	1.00
14	TRG	0.8079	815.1	128.1	34.89	2.000	0.0928	0.1474	0.0546	80.29	28.02	1.00	1.00
15	TRG	0.8074	814.6	389.2	106.07	2.000	0.0935	0.1500	0.0565	83.09	88.13	1.00	1.00
16	DO	0.8092	816.4	330.0	89.74	2.000	0.0918	0.1484	0.0566	83.24	74.69	1.00	1.00
17	TRG	0.8072	814.4	358.3	97.68	2.000	0.0930	0.1507	0.0577	84.85	82.88	1.00	1.00
18	TRG	0.8005	807.6	359.5	98.82	2.000	0.0932	0.1516	0.0584	85.88	84.87	1.00	1.00
19	TRG	0.8032	810.3	336.3	92.13	2.000	0.0919	0.1522	0.0603	88.68	81.70	1.00	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.

13-04107
Ra228
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			04/26/13 15:24	LWALKER	05/10/13 07:40	TSMITH	05/15/13 05:38	TSMITH
02	MBL			04/26/13 15:24	LWALKER	05/10/13 07:40	TSMITH	05/15/13 05:38	TSMITH
03	DUP			04/26/13 15:24	LWALKER	05/10/13 07:40	TSMITH	05/15/13 05:38	TSMITH
04	TRG			04/26/13 15:24	LWALKER	05/10/13 07:40	TSMITH	05/15/13 05:38	TSMITH
05	TRG			04/26/13 15:24	LWALKER	05/10/13 07:40	TSMITH	05/15/13 05:38	TSMITH
06	TRG			04/26/13 15:24	LWALKER	05/10/13 07:40	TSMITH	05/15/13 05:38	TSMITH
07	TRG			04/26/13 15:24	LWALKER	05/10/13 07:40	TSMITH	05/15/13 05:38	TSMITH
08	TRG			04/26/13 15:24	LWALKER	05/10/13 07:40	TSMITH	05/15/13 05:38	TSMITH
09	TRG			04/26/13 15:24	LWALKER	05/10/13 07:40	TSMITH	05/15/13 05:38	TSMITH
10	TRG			04/26/13 15:24	LWALKER	05/10/13 07:40	TSMITH	05/15/13 05:38	TSMITH
11	TRG			04/26/13 15:24	LWALKER	05/10/13 07:40	TSMITH	05/15/13 05:38	TSMITH
12	TRG			04/26/13 15:24	LWALKER	05/10/13 07:40	TSMITH	05/15/13 05:38	TSMITH
13	TRG			04/26/13 15:24	LWALKER	05/10/13 07:40	TSMITH	05/15/13 05:38	TSMITH
14	TRG			04/26/13 15:24	LWALKER	05/10/13 07:40	TSMITH	05/15/13 05:38	TSMITH
15	TRG			04/26/13 15:24	LWALKER	05/10/13 07:40	TSMITH	05/15/13 05:38	TSMITH
16	DO			04/26/13 15:24	LWALKER	05/10/13 07:40	TSMITH	05/15/13 05:38	TSMITH
17	TRG			04/26/13 15:24	LWALKER	05/10/13 07:40	TSMITH	05/15/13 05:38	TSMITH
18	TRG			04/26/13 15:24	LWALKER	05/10/13 07:40	TSMITH	05/15/13 05:38	TSMITH
19	TRG			04/26/13 15:24	LWALKER	05/10/13 07:40	TSMITH	05/15/13 05:38	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: 13-04107-Ra228-1

Client	Engineering Management Support, Inc.
Eberline Services Work Order	13-04107
Analysis Code	Ra228
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-228	LCS	LCS	pCi/l	5.80E+00	8.17E-01	1.18E+00	7.15E+00	81.24	OK		OK	
02	RA-228	MBL	BLANK	pCi/l	1.36E+00	5.60E-01	1.02E+00					OK	OK
03	RA-228	DUP	PZ-109-SS TOT	pCi/l	6.77E-01	3.49E-01	6.65E-01				NA	OK	
04	RA-228	TRG	PZ-113-AD TOT	pCi/l	7.01E+00	7.04E-01	8.53E-01					OK	
05	RA-228	TRG	PZ-113-AD DIS	pCi/l	2.83E+00	5.25E-01	8.45E-01					OK	
06	RA-228	TRG	FB at D-3 TOT	pCi/l	5.21E-01	3.93E-01	7.80E-01					OK	
07	RA-228	TRG	FB at D-3 DIS	pCi/l	9.42E-01	4.06E-01	7.57E-01					OK	
08	RA-228	TRG	D-3 TOT	pCi/l	4.38E+00	6.42E-01	9.77E-01					OK	
09	RA-228	TRG	D-3 DIS	pCi/l	2.72E+00	4.98E-01	7.90E-01					OK	
10	RA-228	TRG	D-85 TOT	pCi/l	6.41E+00	1.01E+00	1.57E+00					OK	
11	RA-228	TRG	D-85 DIS	pCi/l	1.26E+00	4.96E-01	9.28E-01					OK	
12	RA-228	TRG	S-84 TOT	pCi/l	1.92E+00	5.28E-01	9.30E-01					OK	
13	RA-228	TRG	S-84 DIS	pCi/l	6.29E-01	5.53E-01	1.11E+00					OK	
14	RA-228	TRG	S-5 TOT	pCi/l	5.03E+00	1.40E+00	2.44E+00					INV	
15	RA-228	TRG	S-5 DIS	pCi/l	4.46E-01	4.13E-01	8.33E-01					OK	
16	RA-228	DO	PZ-109-SS TOT	pCi/l	8.40E-01	5.27E-01	1.04E+00					OK	
17	RA-228	TRG	PZ-109-SS DIS	pCi/l	5.97E-01	4.23E-01	8.36E-01					OK	
18	RA-228	TRG	PZ-104-KS TOT	pCi/l	1.82E-01	4.29E-01	8.98E-01					OK	
19	RA-228	TRG	PZ-104-KS DIS	pCi/l	7.33E-01	4.41E-01	8.60E-01					OK	

Preliminary Data Report & Analytical Calculations

Work Order: 13-04107-Ra228-1

Run	Analysis Code	Eberline Services Work Order	Client
1	Ra228	13-04107	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	04/16/13 00:00	1.00E+00	104.92	81.76	85.79	1.00	5/10/2013 7:40	5/15/2013 5:38
02	RA-228	MBL	04/16/13 00:00	1.00E+00	97.76	84.12	82.23	1.00	5/10/2013 7:40	5/15/2013 5:38
03	RA-228	DUP	04/11/13 16:08	1.50E+00	104.52	85.59	89.45	1.00	5/10/2013 7:40	5/15/2013 5:38
04	RA-228	TRG	04/11/13 13:35	1.50E+00	90.17	83.68	75.45	1.00	5/10/2013 7:40	5/15/2013 5:38
05	RA-228	TRG	04/11/13 13:35	1.50E+00	97.27	87.65	85.25	1.00	5/10/2013 7:40	5/15/2013 5:38
06	RA-228	TRG	04/11/13 13:50	1.50E+00	98.86	87.79	86.79	1.00	5/10/2013 7:40	5/15/2013 5:38
07	RA-228	TRG	04/11/13 13:50	1.50E+00	98.19	84.26	82.74	1.00	5/10/2013 7:40	5/15/2013 5:38
08	RA-228	TRG	04/11/13 14:24	1.50E+00	92.03	84.71	77.95	1.00	5/10/2013 7:40	5/15/2013 5:38
09	RA-228	TRG	04/11/13 14:24	1.50E+00	106.85	83.09	88.78	1.00	5/10/2013 7:40	5/15/2013 5:38
10	RA-228	TRG	04/11/13 14:45	1.50E+00	59.17	84.41	49.95	1.00	5/10/2013 7:40	5/15/2013 5:38
11	RA-228	TRG	04/11/13 14:45	1.50E+00	97.31	82.65	80.43	1.00	5/10/2013 7:40	5/15/2013 5:38
12	RA-228	TRG	04/11/13 15:30	1.50E+00	91.82	84.56	77.64	1.00	5/10/2013 7:40	5/15/2013 5:38
13	RA-228	TRG	04/11/13 15:30	1.50E+00	92.46	77.50	71.66	1.00	5/10/2013 7:40	5/15/2013 5:38
14	RA-228	TRG	04/11/13 15:31	1.50E+00	34.89	80.29	28.02	1.00	5/10/2013 7:40	5/15/2013 5:38
15	RA-228	TRG	04/11/13 15:31	1.50E+00	106.07	83.09	88.13	1.00	5/10/2013 7:40	5/15/2013 5:38
16	RA-228	DO	04/11/13 16:08	1.50E+00	89.74	83.24	74.69	1.00	5/10/2013 7:40	5/15/2013 5:38
17	RA-228	TRG	04/11/13 16:08	1.50E+00	97.68	84.85	82.88	1.00	5/10/2013 7:40	5/15/2013 5:38
18	RA-228	TRG	04/11/13 18:08	1.50E+00	98.82	85.88	84.87	1.00	5/10/2013 7:40	5/15/2013 5:38
19	RA-228	TRG	04/11/13 18:08	1.50E+00	92.13	88.68	81.70	1.00	5/10/2013 7:40	5/15/2013 5:38

Preliminary Data Report & Analytical Calculations

Work Order: 13-04107-Ra228-1

Run	Analysis Code	Eberline Services Work Order	Client
1	Ra228	13-04107	Engineering Management Support, Inc.

Lab Fraction	Nuclide	Sample Desc	Counting Date/Time	Halflife (days)	Detect	Carrier	Count Time	Counts	Bkg CPM	Eff
01	RA-228	LCS	05/15/13 09:46		LB4110R	A1	120	500	1.216666667	0.4776
02	RA-228	MBL	05/15/13 09:46		LB4110R	A2	120	174	0.8	0.4699
03	RA-228	DUP	05/15/13 09:46		LB4110R	A3	120	179	0.95	0.4809
04	RA-228	TRG	05/15/13 09:46		LB4110R	A4	120	689	1.083333333	0.4732
05	RA-228	TRG	05/15/13 09:46		LB4110R	B1	120	422	1.383333333	0.4754
06	RA-228	TRG	05/15/13 09:46		LB4110R	B2	120	187	1.166666667	0.4658
07	RA-228	TRG	05/15/13 09:46		LB4110R	B3	120	204	1.016666667	0.4713
08	RA-228	TRG	05/15/13 09:46		LB4110R	B4	120	552	1.566666667	0.4773
09	RA-228	TRG	05/15/13 09:46		LB4110R	C1	120	408	1.283333333	0.4705
10	RA-228	TRG	05/15/13 09:46		LB4110R	C2	120	526	1.6	0.4676
11	RA-228	TRG	05/15/13 09:46		LB4110R	C3	120	272	1.4	0.4614
12	RA-228	TRG	05/15/13 09:46		LB4110R	C4	120	321	1.366666667	0.4714
13	RA-228	TRG	05/15/13 09:52		LB4110A	B1	120	236	1.583333333	0.4626
14	RA-228	TRG	05/15/13 09:52		LB4110A	B2	120	288	1.183333333	0.4691
15	RA-228	TRG	05/15/13 09:52		LB4110A	B3	120	189	1.25	0.449
16	RA-228	DO	05/15/13 09:52		LB4110A	B4	120	242	1.483333333	0.4619
17	RA-228	TRG	05/15/13 09:52		LB4110A	C1	120	195	1.2	0.4667
18	RA-228	TRG	05/15/13 09:52		LB4110A	C3	120	194	1.483333333	0.4699
19	RA-228	TRG	05/15/13 09:52		LB4110A	C4	120	212	1.25	0.4692

Count Room Report
Client: Engineering Management Su

13-04107-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	04/16/13 00:00	1.0000	0.8085	815.6665	385.5000	104.92	1.00	1.00
02	MBL	BLANK	04/16/13 00:00	1.0000	0.8126	819.8029	361.0000	97.76	1.00	1.00
03	DUP	PZ-109-SS TOT	04/11/13 16:08	1.5000	0.8110	818.1887	385.2000	104.52	1.00	1.00
04	TRG	PZ-113-AD TOT	04/11/13 13:35	1.5000	0.8100	817.1798	331.9000	90.17	1.00	1.00
05	TRG	PZ-113-AD DIS	04/11/13 13:35	1.5000	0.8083	815.4648	357.3000	97.27	1.00	1.00
06	TRG	FB at D-3 TOT	04/11/13 13:50	1.5000	0.8080	815.1621	363.0000	98.86	1.00	1.00
07	TRG	FB at D-3 DIS	04/11/13 13:50	1.5000	0.8079	815.0612	360.5000	98.19	1.00	1.00
08	TRG	D-3 TOT	04/11/13 14:24	1.5000	0.8063	813.4470	337.2000	92.03	1.00	1.00
09	TRG	D-3 DIS	04/11/13 14:24	1.5000	0.8069	814.0524	391.8000	106.85	1.00	1.00
10	TRG	D-85 TOT	04/11/13 14:45	1.5000	0.8059	813.0435	216.7000	59.17	1.00	1.00
11	TRG	D-85 DIS	04/11/13 14:45	1.5000	0.8059	813.0435	356.4000	97.31	1.00	1.00
12	TRG	S-84 TOT	04/11/13 15:30	1.5000	0.8079	815.0612	337.1000	91.82	1.00	1.00
13	TRG	S-84 DIS	04/11/13 15:30	1.5000	0.8082	815.3639	339.6000	92.46	1.00	1.00
14	TRG	S-5 TOT	04/11/13 15:31	1.5000	0.8079	815.0612	128.1000	34.89	1.00	1.00
15	TRG	S-5 DIS	04/11/13 15:31	1.5000	0.8074	814.5568	389.2000	106.07	1.00	1.00
16	DO	PZ-109-SS TOT	04/11/13 16:08	1.5000	0.8092	816.3727	330.0000	89.74	1.00	1.00
17	TRG	PZ-109-SS DIS	04/11/13 16:08	1.5000	0.8072	814.3550	358.3000	97.68	1.00	1.00
18	TRG	PZ-104-KS TOT	04/11/13 18:08	1.5000	0.8005	807.5956	359.5000	98.82	1.00	1.00
19	TRG	PZ-104-KS DIS	04/11/13 18:08	1.5000	0.8032	810.3196	336.3000	92.13	1.00	1.00

Spike and Tracer Worksheet

Internal Work Order	Run	Analysis Code	Date	Technician	Technician Initials	Witness Initials
13-04107	1	Ra228	4/26/2013 15:23	LWALKER		

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	38.929	4/26/2013	0.510	0.4075				7.15	0.364	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	1008.864	4/26/2013	0.8085	1.0000
02	Ba-133	Ba-6a	1008.864	4/26/2013	0.8126	1.0000
03	Ba-133	Ba-6a	1008.864	4/26/2013	0.8110	1.0000
04	Ba-133	Ba-6a	1008.864	4/26/2013	0.8100	1.0000
05	Ba-133	Ba-6a	1008.864	4/26/2013	0.8083	1.0000
06	Ba-133	Ba-6a	1008.864	4/26/2013	0.8080	1.0000
07	Ba-133	Ba-6a	1008.864	4/26/2013	0.8079	1.0000
08	Ba-133	Ba-6a	1008.864	4/26/2013	0.8063	1.0000
09	Ba-133	Ba-6a	1008.864	4/26/2013	0.8069	1.0000
10	Ba-133	Ba-6a	1008.864	4/26/2013	0.8059	1.0000
11	Ba-133	Ba-6a	1008.864	4/26/2013	0.8059	1.0000
12	Ba-133	Ba-6a	1008.864	4/26/2013	0.8079	1.0000
13	Ba-133	Ba-6a	1008.864	4/26/2013	0.8082	1.0000
14	Ba-133	Ba-6a	1008.864	4/26/2013	0.8079	1.0000
15	Ba-133	Ba-6a	1008.864	4/26/2013	0.8074	1.0000
16	Ba-133	Ba-6a	1008.864	4/26/2013	0.8092	1.0000
17	Ba-133	Ba-6a	1008.864	4/26/2013	0.8072	1.0000
18	Ba-133	Ba-6a	1008.864	4/26/2013	0.8005	1.0000
19	Ba-133	Ba-6a	1008.864	4/26/2013	0.8032	1.0000

Balance Printer Tapes

Tracer	LCS
	0.4075 g

Matrix Spike

Eberline Analytical
Oak Ridge Laboratory

Aliquot Worksheet

Work Order	Run	Analysis Code	Rpt Units	Lab Deadline	Technician
13-04107	1	Ra228	liters	5/7/2013	LWALKER

Lab Fraction	Engineering Management Support, Inc. Client ID	Sample Type	Muffle Data Ratio Post/Pre	Dilution Data No of Dils	Dil Factor	Ratio	Aliquot Data Aliquot	Net Equiv	MS Aliquot Data Aliquot	Net Equiv	H-3 Solids Only 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-109-SS TOT	DUP					1.5000E+00	1.5000E+00				
04	PZ-113-AD TOT	TRG					1.5000E+00	1.5000E+00				
05	PZ-113-AD DIS	TRG					1.5000E+00	1.5000E+00				
06	FB at D-3 TOT	TRG					1.5000E+00	1.5000E+00				
07	FB at D-3 DIS	TRG					1.5000E+00	1.5000E+00				
08	D-3 TOT	TRG					1.5000E+00	1.5000E+00				
09	D-3 DIS	TRG					1.5000E+00	1.5000E+00				
10	D-85 TOT	TRG					1.5000E+00	1.5000E+00				
11	D-85 DIS	TRG					1.5000E+00	1.5000E+00				
12	S-84 TOT	TRG					1.5000E+00	1.5000E+00				
13	S-84 DIS	TRG					1.5000E+00	1.5000E+00				
14	S-5 TOT	TRG					1.5000E+00	1.5000E+00				
15	S-5 DIS	TRG					1.5000E+00	1.5000E+00				
16	PZ-109-SS TOT	DO					1.5000E+00	1.5000E+00				
17	PZ-109-SS DIS	TRG					1.5000E+00	1.5000E+00				
18	PZ-104-KS TOT	TRG					1.5000E+00	1.5000E+00				
19	PZ-104-KS DIS	TRG					1.5000E+00	1.5000E+00				

Comments	

Technician: L. Walker Date: 4,26,13

Eberline Services - Oak Ridge
Version 1.0 9/1999

Gravimetric Worksheet

Printed: 5/15/2013 9:26 AM

Work Order	Run	Analysis Code	Gravimetric Carrier	Carrier Conc (mg/ml)	Technician
13-04107	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	0.0911	0.1467	**0.0556**	**81.76**
02	BLANK	MBL	2.0000	0.0928	0.1500	**0.0572**	**84.12**
03	DUP	DUP	2.0000	0.0928	0.1510	**0.0582**	**85.59**
04	PZ-113-AD TOT	TRG	2.0000	0.0912	0.1481	**0.0569**	**83.68**
05	PZ-113-AD DIS	TRG	2.0000	0.0928	0.1524	**0.0596**	**87.65**
06	FB at D-3 TOT	TRG	2.0000	0.0937	0.1534	**0.0597**	**87.79**
07	FB at D-3 DIS	TRG	2.0000	0.0926	0.1499	**0.0573**	**84.26**
08	D-3 TOT	TRG	2.0000	0.0932	0.1508	**0.0576**	**84.71**
09	D-3 DIS	TRG	2.0000	0.0934	0.1499	**0.0565**	**83.09**
10	D-85 TOT	TRG	2.0000	0.0920	0.1494	**0.0574**	**84.41**
11	D-85 DIS	TRG	2.0000	0.0933	0.1495	**0.0562**	**82.65**
12	S-84 TOT	TRG	2.0000	0.0934	0.1509	**0.0575**	**84.56**
13	S-84 DIS	TRG	2.0000	0.0920	0.1447	**0.0527**	**77.50**
14	S-5 TOT	TRG	2.0000	0.0928	0.1474	**0.0546**	**80.29**
15	S-5 DIS	TRG	2.0000	0.0935	0.1500	**0.0565**	**83.09**
16	PZ-109-SS TOT	DO	2.0000	0.0918	0.1484	**0.0566**	**83.24**
17	PZ-109-SS DIS	TRG	2.0000	0.0930	0.1507	**0.0577**	**84.85**
18	PZ-104-KS TOT	TRG	2.0000	0.0932	0.1516	**0.0584**	**85.88**
19	PZ-104-KS DIS	TRG	2.0000	0.0919	0.1522	**0.0603**	**88.68**

Technician: [signature] Date: 5/15/13

0437

R 5/15/13 XB

Detector ID	Sample ID	Alpha	Beta	Count Time	Voltage	TOD
C1	1304107-09	16	408	120	1400	5/15/13 11:46
A1	1304107-01	25	500	120	1400	5/15/13 11:46
C2	1304107-10	17	526	120	1400	5/15/13 11:46
C3	1304107-11	9	272	120	1400	5/15/13 11:46
A2	1304107-02	13	174	120	1400	5/15/13 11:46
A3	1304107-03	14	179	120	1400	5/15/13 11:46
A4	1304107-04	11	689	120	1400	5/15/13 11:46
C4	1304107-12	27	321	120	1400	5/15/13 11:46
B1	1304107-05	12	422	120	1400	5/15/13 11:46
B2	1304107-06	21	187	120	1400	5/15/13 11:46
B3	1304107-07	17	204	120	1400	5/15/13 11:46
B4	1304107-08	9	552	120	1400	5/15/13 11:46

A 5/15/13 ICB

Detector ID	Sample ID	Alpha	Beta	Count Time	Voltage	TOD
B1	1304107-13	16	236	120	1400	5/15/13 11:52
B2	1304107-14	24	288	120	1400	5/15/13 11:52
B3	1304107-15	14	189	120	1400	5/15/13 11:52
B4	1304107-16	14	242	120	1400	5/15/13 11:52
C1	1304107-17	16	195	120	1400	5/15/13 11:52
C3	1304107-18	15	194	120	1400	5/15/13 11:52
C4	1304107-19	25	212	120	1400	5/15/13 11:52

GPC Detector Report
(ALL Backgrounds)

C

Detector	Alpha/Beta	Calibration Date	Count Date	Bkg CPM	PFW	LCL	Mean	UCL
LB4110A - A1	Alpha	11/18/2007	5/15/2013	3.33E-02	P	-2.18E+01	2.93E-01	2.24E+01
LB4110A - A2	Alpha	11/18/2007	5/15/2013	5.00E-02	P	-1.85E+01	2.62E-01	1.90E+01
LB4110A - A3	Alpha	11/18/2007	5/15/2013	1.67E-02	P	-1.80E+01	2.23E-01	1.84E+01
LB4110A - A4	Alpha	11/18/2007	5/15/2013	6.67E-02	P	-1.91E+01	2.44E-01	1.96E+01
LB4110A - B1	Alpha	11/18/2007	5/15/2013	1.17E-01	P	-9.87E-02	7.51E-02	2.49E-01
LB4110A - B2	Alpha	11/18/2007	5/15/2013	5.00E-02	P	-7.92E-02	7.28E-02	2.25E-01
LB4110A - B3	Alpha	11/18/2007	5/15/2013	1.00E-01	P	-6.39E-02	5.33E-02	1.70E-01
LB4110A - B4	Alpha	11/18/2007	5/15/2013	6.67E-02	P	-1.43E-01	7.92E-02	3.02E-01
LB4110A - C1	Alpha	11/18/2007	5/15/2013	8.33E-02	P	-1.52E-01	8.93E-02	3.31E-01
LB4110A - C2	Alpha	11/18/2007	5/15/2013	2.17E-01	P	-1.80E-01	8.82E-02	3.56E-01
LB4110A - C3	Alpha	11/18/2007	5/15/2013	1.50E-01	P	-1.76E-01	1.01E-01	3.78E-01
LB4110A - C4	Alpha	11/18/2007	5/15/2013	1.67E-02	P	-6.27E-02	6.87E-02	2.00E-01
LB4110A - D1	Alpha	11/18/2007	5/15/2013	6.67E-02	P	-5.36E-02	8.40E-02	2.22E-01
LB4110A - D2	Alpha	11/18/2007	5/15/2013	8.33E-02	P	-7.02E-02	6.05E-02	1.91E-01
LB4110A - D3	Alpha	11/18/2007	5/15/2013	3.33E-02	P	-4.76E-02	7.18E-02	1.91E-01
LB4110A - D4	Alpha	11/18/2007	5/15/2013	5.00E-02	P	-5.74E-02	7.09E-02	1.99E-01
LB4110R - A1	Alpha	11/24/2006	5/15/2013	1.17E-01	P	-1.01E-01	1.01E-01	3.03E-01
LB4110R - A2	Alpha	11/24/2006	5/15/2013	5.00E-02	P	-8.99E-02	7.74E-02	2.45E-01
LB4110R - A3	Alpha	11/24/2006	5/15/2013	5.00E-02	P	-7.34E-02	7.68E-02	2.27E-01
LB4110R - A4	Alpha	11/24/2006	5/15/2013	1.67E-02	P	-5.30E-02	7.16E-02	1.96E-01
LB4110R - B1	Alpha	11/24/2006	5/15/2013	8.33E-02	P	-9.57E-02	6.20E-02	2.20E-01
LB4110R - B2	Alpha	11/24/2006	5/15/2013	3.33E-02	P	-6.95E-02	6.43E-02	1.98E-01
LB4110R - B3	Alpha	11/24/2006	5/15/2013	1.67E-02	P	-6.52E-02	7.01E-02	2.05E-01
LB4110R - B4	Alpha	11/24/2006	5/15/2013	1.50E-01	P	-6.47E-02	7.08E-02	2.06E-01
LB4110R - C1	Alpha	11/24/2006	5/15/2013	8.33E-02	P	-7.78E-02	7.44E-02	2.27E-01
LB4110R - C2	Alpha	11/24/2006	5/15/2013	5.00E-02	P	-7.54E-02	7.21E-02	2.20E-01
LB4110R - C3	Alpha	11/24/2006	5/15/2013	1.00E-01	P	-8.90E-02	8.47E-02	2.58E-01
LB4110R - C4	Alpha	11/24/2006	5/15/2013	1.33E-01	P	-6.22E-02	8.20E-02	2.26E-01
LB4110R - D1	Alpha	11/24/2006	5/15/2013	0.00E+00	P	-9.95E-02	7.28E-02	2.45E-01
LB4110R - D2	Alpha	11/24/2006	5/15/2013	0.00E+00	P	-7.37E-02	7.22E-02	2.18E-01
LB4110R - D3	Alpha	11/24/2006	5/15/2013	0.00E+00	P	-7.90E-02	7.20E-02	2.23E-01
LB4110R - D4	Alpha	11/24/2006	5/15/2013	0.00E+00	P	-7.04E-02	7.69E-02	2.24E-01
LB5100 - 1	Alpha	7/10/2006	10/26/2007	5.00E-02	P	-1.56E-02	9.58E-02	2.07E-01

Eberline Analytical
Oak Ridge Laboratory

GPC Detector Report
(ALL Backgrounds)

Detector	Alpha/Beta	Calibration Date	Count Date	Bkg CPM	PFW	LCL	Mean	UCL
LB4110A - A1	Beta	11/18/2007	5/15/2013	7.65E+00	P	-2.95E+02	7.63E+00	3.11E+02
LB4110A - A2	Beta	11/18/2007	5/15/2013	2.58E+00	P	-3.11E+01	2.55E+00	3.62E+01
LB4110A - A3	Beta	11/18/2007	5/15/2013	1.12E+00	P	-5.12E+01	2.67E+00	5.66E+01
LB4110A - A4	Beta	11/18/2007	5/15/2013	7.35E+00	P	-3.33E+01	3.04E+00	3.94E+01
LB4110A - B1	Beta	11/18/2007	5/15/2013	1.58E+00	P	-1.04E+01	3.25E+00	1.69E+01
LB4110A - B2	Beta	11/18/2007	5/15/2013	1.18E+00	P	-7.54E+00	1.99E+00	1.15E+01
LB4110A - B3	Beta	11/18/2007	5/15/2013	1.25E+00	P	1.07E-01	1.36E+00	2.62E+00
LB4110A - B4	Beta	11/18/2007	5/15/2013	1.48E+00	P	-7.60E+00	1.97E+00	1.15E+01
LB4110A - C1	Beta	11/18/2007	5/15/2013	1.20E+00	P	-5.50E+00	2.15E+00	9.80E+00
LB4110A - C2	Beta	11/18/2007	5/15/2013	1.35E+00	P	3.79E-01	1.27E+00	2.16E+00
LB4110A - C3	Beta	11/18/2007	5/15/2013	1.48E+00	P	4.70E-01	1.47E+00	2.46E+00
LB4110A - C4	Beta	11/18/2007	5/15/2013	1.25E+00	P	-1.77E+00	2.14E+00	6.04E+00
LB4110A - D1	Beta	11/18/2007	5/15/2013	1.60E+00	P	-2.38E+00	2.58E+00	7.55E+00
LB4110A - D2	Beta	11/18/2007	5/15/2013	1.40E+00	P	-6.78E-01	1.57E+00	3.81E+00
LB4110A - D3	Beta	11/18/2007	5/15/2013	3.93E+00	P	1.23E+00	4.47E+00	7.72E+00
LB4110A - D4	Beta	11/18/2007	5/15/2013	1.12E+00	P	-4.49E-01	1.37E+00	3.20E+00
LB4110R - A1	Beta	11/24/2006	5/15/2013	1.22E+00	P	-6.19E+01	3.77E+00	6.94E+01
LB4110R - A2	Beta	11/24/2006	5/15/2013	8.00E-01	P	-4.92E+01	2.05E+00	5.33E+01
LB4110R - A3	Beta	11/24/2006	5/15/2013	9.50E-01	P	-4.55E+01	2.79E+00	5.11E+01
LB4110R - A4	Beta	11/24/2006	5/15/2013	1.08E+00	P	-4.54E+01	2.02E+00	4.95E+01
LB4110R - B1	Beta	11/24/2006	5/15/2013	1.38E+00	P	-4.78E+01	2.05E+00	5.19E+01
LB4110R - B2	Beta	11/24/2006	5/15/2013	1.17E+00	P	-4.78E+01	2.08E+00	5.19E+01
LB4110R - B3	Beta	11/24/2006	5/15/2013	1.02E+00	P	-4.76E+01	2.70E+00	5.30E+01
LB4110R - B4	Beta	11/24/2006	5/15/2013	1.57E+00	P	-4.79E+01	1.95E+00	5.18E+01
LB4110R - C1	Beta	11/24/2006	5/15/2013	1.28E+00	P	-4.77E+01	3.03E+00	5.37E+01
LB4110R - C2	Beta	11/24/2006	5/15/2013	1.60E+00	P	-4.77E+01	2.75E+00	5.32E+01
LB4110R - C3	Beta	11/24/2006	5/15/2013	1.40E+00	P	-4.82E+01	2.56E+00	5.33E+01
LB4110R - C4	Beta	11/24/2006	5/15/2013	1.37E+00	P	-5.43E+01	2.98E+00	6.03E+01
LB4110R - D1	Beta	11/24/2006	5/15/2013	0.00E+00	P	-4.51E+01	5.76E+00	5.66E+01
LB4110R - D2	Beta	11/24/2006	5/15/2013	0.00E+00	P	-4.86E+01	1.95E+00	5.25E+01
LB4110R - D3	Beta	11/24/2006	5/15/2013	0.00E+00	P	-5.19E+01	5.74E+00	6.34E+01
LB4110R - D4	Beta	11/24/2006	5/15/2013	0.00E+00	P	-4.83E+01	2.32E+00	5.29E+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)

Detector	Alpha/Beta	Calibration Date	Count Date	Eff	PFW	LCL	Mean	UCL
LB4110A - A1	Alpha	11/18/2007	5/15/2013	0.2456	P	-0.0185	0.2147	0.4480
LB4110A - A2	Alpha	11/18/2007	5/15/2013	0.2103	P	-0.0559	0.1726	0.4012
LB4110A - A3	Alpha	11/18/2007	5/15/2013	0.2125	P	-0.0795	0.1615	0.4025
LB4110A - A4	Alpha	11/18/2007	5/15/2013	0.2238	P	-0.0579	0.1804	0.4188
LB4110A - B1	Alpha	11/18/2007	5/15/2013	0.2206	P	0.1943	0.2246	0.2549
LB4110A - B2	Alpha	11/18/2007	5/15/2013	0.2175	P	0.1929	0.2218	0.2506
LB4110A - B3	Alpha	11/18/2007	5/15/2013	0.2373	P	0.1295	0.2326	0.3358
LB4110A - B4	Alpha	11/18/2007	5/15/2013	0.2287	P	0.2090	0.2367	0.2643
LB4110A - C1	Alpha	11/18/2007	5/15/2013	0.2174	P	0.1973	0.2208	0.2443
LB4110A - C2	Alpha	11/18/2007	5/15/2013	0.2254	P	0.1967	0.2252	0.2538
LB4110A - C3	Alpha	11/18/2007	5/15/2013	0.2542	P	0.2228	0.2494	0.2759
LB4110A - C4	Alpha	11/18/2007	5/15/2013	0.2252	P	0.1965	0.2258	0.2550
LB4110A - D1	Alpha	11/18/2007	5/15/2013	0.2237	P	0.2035	0.2334	0.2632
LB4110A - D2	Alpha	11/18/2007	5/15/2013	0.2508	P	0.2278	0.2584	0.2890
LB4110A - D3	Alpha	11/18/2007	5/15/2013	0.2621	P	0.2314	0.2639	0.2963
LB4110A - D4	Alpha	11/18/2007	5/15/2013	0.1826	P	0.1650	0.1998	0.2347
LB4110R - A1	Alpha	11/24/2006	5/15/2013	0.2382	P	0.2031	0.2389	0.2747
LB4110R - A2	Alpha	11/24/2006	5/15/2013	0.2173	P	0.1899	0.2206	0.2514
LB4110R - A3	Alpha	11/24/2006	5/15/2013	0.2195	P	0.1964	0.2249	0.2534
LB4110R - A4	Alpha	11/24/2006	5/15/2013	0.2427	P	0.2160	0.2457	0.2755
LB4110R - B1	Alpha	11/24/2006	5/15/2013	0.2190	P	0.1878	0.2261	0.2644
LB4110R - B2	Alpha	11/24/2006	5/15/2013	0.2112	P	0.1801	0.2176	0.2550
LB4110R - B3	Alpha	11/24/2006	5/15/2013	0.2466	P	0.2068	0.2440	0.2813
LB4110R - B4	Alpha	11/24/2006	5/15/2013	0.2170	P	0.1938	0.2320	0.2702
LB4110R - C1	Alpha	11/24/2006	5/15/2013	0.2129	P	0.1861	0.2153	0.2444
LB4110R - C2	Alpha	11/24/2006	5/15/2013	0.2199	P	0.1963	0.2248	0.2533
LB4110R - C3	Alpha	11/24/2006	5/15/2013	0.2340	P	0.2064	0.2397	0.2731
LB4110R - C4	Alpha	11/24/2006	5/15/2013	0.2079	P	0.1858	0.2229	0.2600
LB4110R - D1	Alpha	11/24/2006	5/15/2013	0.0000	F	0.0361	0.2069	0.3777
LB4110R - D2	Alpha	11/24/2006	5/15/2013	0.0000	F	0.0418	0.2352	0.4287
LB4110R - D3	Alpha	11/24/2006	5/15/2013	0.0000	F	0.0411	0.2311	0.4211
LB4110R - D4	Alpha	11/24/2006	5/15/2013	0.0000	F	0.0314	0.1863	0.3411
LB5100 - 1	Alpha	7/10/2006	10/26/2007	0.3368	P	0.3332	0.3455	0.3578

GPC Detector Report
(ALL Efficiencies)

Detector	Alpha/Beta	Calibration Date	Count Date	Eff	PFW	LCL	Mean	UCL
LB4110A - A1	Beta	11/18/2007	5/15/2013	0.5543	P	0.2039	0.5628	0.9217
LB4110A - A2	Beta	11/18/2007	5/15/2013	0.4865	P	0.1546	0.4634	0.7721
LB4110A - A3	Beta	11/18/2007	5/15/2013	0.4853	P	0.0820	0.4571	0.8321
LB4110A - A4	Beta	11/18/2007	5/15/2013	0.5266	P	0.1344	0.4878	0.8412
LB4110A - B1	Beta	11/18/2007	5/15/2013	0.5187	P	0.4637	0.5305	0.5973
LB4110A - B2	Beta	11/18/2007	5/15/2013	0.5193	P	0.4639	0.5276	0.5913
LB4110A - B3	Beta	11/18/2007	5/15/2013	0.5486	P	0.3193	0.5321	0.7449
LB4110A - B4	Beta	11/18/2007	5/15/2013	0.5359	P	0.4922	0.5546	0.6170
LB4110A - C1	Beta	11/18/2007	5/15/2013	0.5092	P	0.4502	0.5027	0.5552
LB4110A - C2	Beta	11/18/2007	5/15/2013	0.4951	P	0.4280	0.5011	0.5743
LB4110A - C3	Beta	11/18/2007	5/15/2013	0.6029	P	0.5277	0.5902	0.6526
LB4110A - C4	Beta	11/18/2007	5/15/2013	0.5182	P	0.4568	0.5251	0.5933
LB4110A - D1	Beta	11/18/2007	5/15/2013	0.5339	P	0.4798	0.5542	0.6287
LB4110A - D2	Beta	11/18/2007	5/15/2013	0.5549	P	0.4903	0.5887	0.6871
LB4110A - D3	Beta	11/18/2007	5/15/2013	0.6099	P	0.5368	0.6155	0.6942
LB4110A - D4	Beta	11/18/2007	5/15/2013	0.4396	P	0.3863	0.4734	0.5605
LB4110R - A1	Beta	11/24/2006	5/15/2013	0.5626	P	0.4814	0.5680	0.6545
LB4110R - A2	Beta	11/24/2006	5/15/2013	0.5116	P	0.4209	0.5089	0.5968
LB4110R - A3	Beta	11/24/2006	5/15/2013	0.5139	P	0.4580	0.5397	0.6215
LB4110R - A4	Beta	11/24/2006	5/15/2013	0.5997	P	0.5101	0.5918	0.6734
LB4110R - B1	Beta	11/24/2006	5/15/2013	0.5243	P	0.4535	0.5427	0.6320
LB4110R - B2	Beta	11/24/2006	5/15/2013	0.5119	P	0.4313	0.5202	0.6092
LB4110R - B3	Beta	11/24/2006	5/15/2013	0.6083	P	0.5017	0.5913	0.6810
LB4110R - B4	Beta	11/24/2006	5/15/2013	0.5215	P	0.4623	0.5500	0.6376
LB4110R - C1	Beta	11/24/2006	5/15/2013	0.4652	P	0.4240	0.5032	0.5824
LB4110R - C2	Beta	11/24/2006	5/15/2013	0.5105	P	0.4503	0.5292	0.6081
LB4110R - C3	Beta	11/24/2006	5/15/2013	0.5598	P	0.4814	0.5713	0.6612
LB4110R - C4	Beta	11/24/2006	5/15/2013	0.5007	P	0.4324	0.5265	0.6205
LB4110R - D1	Beta	11/24/2006	5/15/2013	0.0000	F	0.0853	0.4947	0.9041
LB4110R - D2	Beta	11/24/2006	5/15/2013	0.0000	F	0.0966	0.5559	1.0152
LB4110R - D3	Beta	11/24/2006	5/15/2013	0.0000	F	0.0937	0.5399	0.9860
LB4110R - D4	Beta	11/24/2006	5/15/2013	0.0000	F	0.0737	0.4444	0.8151
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

5/10/13

VAX/VMS Peak Search Report Generated 10-MAY-2013 12:21:21.16

Configuration : DKA100:[GAMMA.SCUSR.ARCHIVE]SMP_130410701_GE5_BAFIL_191410.CN
Analyses by : PEAK V16.9 PEAKEFF V2.2
Client ID : SPIKE
Deposition Date :
Sample Date : 10-MAY-2013 00:00:00 Acquisition date : 10-MAY-2013 12:06:03
Sample ID : 1304107-01 Sample Quantity : 1.00000E+00 filter
Sample type : FILTER Sample Geometry : 0
Detector name : GE5 Detector Geometry: BAFIL
Elapsed live time: 0 00:15:00.00 Elapsed real time: 0 00:15:01.17 0.1%
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	0	13.68	15	3	0.79	136.63	130	12	1.67E-02	34.5	
2	1	20.91	55	18	0.50	206.00	187	31	6.06E-02	23.2	4.02E+00
3	1	21.53	58	8	0.51	212.00	187	31	6.42E-02	17.4	
4	0	26.48	6	19	1.17	259.43	249	12	6.78E-03	168.8	
5	0	31.15	1933	98	0.77	304.26	291	26	2.15E+00	2.7	
6	4	35.24	340	66	0.65	343.57	334	26	3.78E-01	8.1	2.10E+00
7	4	36.01	104	45	0.77	350.94	334	26	1.16E-01	24.8	
8	0	43.74	20	6	0.76	425.15	412	21	2.27E-02	35.9	
9	0	53.49	49	23	0.51	518.66	508	17	5.44E-02	23.8	
10	0	62.06	244	27	0.94	600.87	589	26	2.71E-01	8.0	
11	1	66.31	114	21	0.73	641.63	626	28	1.27E-01	13.5	2.15E+00
12	1	67.22	29	5	0.60	650.36	626	28	3.22E-02	19.9	
13	1	79.97	35	21	0.76	772.73	761	36	3.91E-02	42.6	1.19E+00
14	1	81.41	764	13	0.71	786.59	761	36	8.48E-01	3.7	
15	0	112.54	151	83	0.80	1085.25	1071	30	1.67E-01	17.7	
16	0	161.29	32	11	0.65	1553.08	1541	21	3.50E-02	26.5	
17	1	276.65	24	10	1.13	2660.07	2650	24	2.64E-02	36.3	9.42E-01
18	1	277.69	30	7	1.03	2670.00	2650	24	3.29E-02	16.9	
19	0	303.80	110	11	1.05	2920.55	2904	27	1.22E-01	11.1	
20	0	308.34	22	7	0.38	2964.13	2949	23	2.43E-02	30.7	
21	1	334.27	17	3	1.21	3212.94	3204	26	1.85E-02	43.2	4.62E+00
22	1	335.01	78	2	1.10	3220.00	3204	26	8.63E-02	9.8	
23	0	357.07	352	10	1.06	3431.70	3415	29	3.91E-01	5.6	
24	0	385.02	65	8	0.91	3699.89	3682	28	7.25E-02	15.1	
25	1	387.42	12	16	1.16	3723.00	3712	29	1.31E-02	104.4	2.13E+01
26	1	387.95	332	19	1.16	3728.00	3712	29	3.69E-01	4.3	
27	0	415.95	28	2	0.29	3996.70	3983	25	3.08E-02	21.7	
28	0	419.39	12	13	0.13	4029.69	4015	20	1.37E-02	59.1	

Sample ID : 1304107-01 Acquisition date : 10-MAY-2013 12:06:03

Total number of lines in spectrum	28	
Number of unidentified lines	22	
Number of lines tentatively identified by NID	6	21.43%

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	3.855E+02	3.855E+02	0.655E+02	16.99	
	Total Activity :		3.855E+02	3.855E+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	2.202E+02	2.202E+02	0.366E+02	16.61	
	Total Activity :		2.202E+02	2.202E+02			
	Grand Total Activity :		6.057E+02	6.057E+02			

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

Acquisition date : 10-MAY-2013 12:06:03

Nuclide Type: FISSION

Nuclide	Energy	%Abn	%Eff	Uncorrected pCi/filter	Decay Corr pCi/filter	2-Sigma %Error	Status
BA-133	81.00	33.00*	1.802E+01	3.855E+02	3.855E+02	16.99	OK
	302.84	17.80	2.575E+00	7.219E+02	7.220E+02	34.52	OK
	356.01	60.00	4.312E+00	4.089E+02	4.089E+02	18.35	OK

Final Mean for 3 Valid Peaks = 3.855E+02+/- 6.549E+01 (16.99%)

Nuclide Type: NATURAL

Nuclide	Energy	%Abn	%Eff	Uncorrected pCi/filter	Decay Corr pCi/filter	2-Sigma %Error	Status
TH-234	63.29	3.80*	8.750E+01	2.202E+02	2.202E+02	16.61	OK

Final Mean for 1 Valid Peaks = 2.202E+02+/- 3.657E+01 (16.61%)

Flag: "*" = Keyline

---- Identified Nuclides ----

Nuclide	Activity (pCi/filter)	Act error	MDA (pCi/filter)	MDA error	Act/MDA
BA-133	3.855E+02	6.549E+01	1.188E+01	1.750E+00	32.444
TH-234	2.202E+02	3.657E+01	2.651E+01	3.410E-01	8.306

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

Nuclide	Key-Line Activity (pCi/filter)	K.L. Ided	Act error	MDA (pCi/filter)	MDA error	Act/MDA
CO-57	-2.572E-01		1.198E+01	2.260E+01	7.661E+00	-0.011
CD-109	1.079E+01		7.219E+01	1.403E+02	1.350E+01	0.077
PA-231	9.360E-02		8.564E-01	1.610E+00	1.812E-02	0.058
PA-234	2.675E+00	+	9.358E-01	1.894E+00	2.132E-02	1.413
NP-237	-8.270E+00		2.097E+01	3.677E+01	3.243E+00	-0.225
AM-241	1.337E+00		1.355E+00	2.509E+00	2.824E-02	0.533

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5/10/13

VAX/VMS Peak Search Report Generated 10-MAY-2013 12:47:41.58

Configuration : DKA100:[GAMMA.SCUSR.ARCHIVE]SMP_130410702_GE5_BAFIL_191412.CN
Analyses by : PEAK V16.9 PEAKEFF V2.2
Client ID : BLANK
Deposition Date :
Sample Date : 10-MAY-2013 00:00:00 Acquisition date : 10-MAY-2013 12:32:22
Sample ID : 1304107-02 Sample Quantity : 1.00000E+00 filter
Sample type : FILTER Sample Geometry : 0
Detector name : GE5 Detector Geometry: BAFIL
Elapsed live time: 0 00:15:00.00 Elapsed real time: 0 00:15:01.10 0.1%
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	0	21.33	56	41	0.69	210.05	203	17	6.19E-02	31.8	
2	0	25.37	24	13	0.44	248.87	241	17	2.66E-02	39.9	
3	0	31.13	1871	110	0.75	304.12	293	22	2.08E+00	2.7	
4	2	35.27	399	28	0.68	343.86	334	29	4.44E-01	6.2	1.32E+00
5	2	36.12	88	6	0.57	352.00	334	29	9.73E-02	22.8	
6	0	47.10	23	0	0.13	457.30	449	18	2.56E-02	20.9	
7	0	53.60	40	13	0.72	519.74	513	13	4.47E-02	22.4	
8	0	62.02	232	35	0.82	600.53	585	30	2.58E-01	9.1	
9	1	65.72	42	36	0.66	636.00	630	29	4.72E-02	30.4	2.44E+00
10	1	66.24	65	42	0.66	641.00	630	29	7.27E-02	25.4	
11	1	79.93	36	36	0.76	772.33	761	35	4.05E-02	41.5	4.64E-01
12	1	81.38	715	23	0.70	786.24	761	35	7.94E-01	4.0	
13	0	112.43	154	54	0.91	1084.25	1072	24	1.71E-01	13.8	
14	0	115.06	13	6	0.60	1109.45	1102	12	1.44E-02	42.8	
15	0	116.67	34	12	1.17	1124.89	1115	18	3.82E-02	26.3	
16	2	277.05	24	8	1.25	2663.90	2651	23	2.69E-02	31.1	3.92E-01
17	2	277.54	22	3	0.83	2668.61	2651	23	2.40E-02	24.8	
18	2	303.22	11	11	1.06	2915.00	2903	27	1.20E-02	111.0	7.03E-01
19	2	303.84	89	6	0.86	2920.94	2903	27	9.93E-02	12.5	
20	0	308.40	26	9	0.57	2964.68	2946	26	2.86E-02	28.9	
21	2	356.47	11	2	1.13	3426.00	3415	29	1.27E-02	159.0	6.14E-01
22	2	357.03	359	5	1.11	3431.32	3415	29	3.99E-01	5.4	
23	1	384.19	12	6	1.16	3692.00	3679	31	1.31E-02	79.1	4.73E+00
24	1	384.83	85	7	1.04	3698.11	3679	31	9.42E-02	11.5	
25	0	387.94	131	13	0.83	3727.96	3713	27	1.45E-01	10.3	
26	0	392.16	26	10	0.70	3768.47	3751	27	2.90E-02	32.6	

Sample ID : 1304107-02 Acquisition date : 10-MAY-2013 12:32:22

Total number of lines in spectrum 26
Number of unidentified lines 20
Number of lines tentatively identified by NID 6 23.08%

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	3.610E+02	3.610E+02	0.622E+02	17.24	
	Total Activity :		3.610E+02	3.610E+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	2.096E+02	2.096E+02	0.390E+02	18.60	
	Total Activity :		2.096E+02	2.096E+02			
	Grand Total Activity :		5.706E+02	5.706E+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*	1.802E+01	3.610E+02	3.610E+02	17.24	OK
	302.84	17.80	2.575E+00	7.079E+01	7.080E+01	223.65	OK
	356.01	60.00	4.312E+00	1.330E+01	1.330E+01	318.31	OK

Final Mean for 3 Valid Peaks = 3.610E+02+/- 6.224E+01 (17.24%)

Nuclide Type: NATURAL

Nuclide	Energy	%Abn	%Eff	Uncorrected pCi/filter	Decay Corr pCi/filter	2-Sigma %Error	Status
TH-234	63.29	3.80*	8.750E+01	2.096E+02	2.096E+02	18.60	OK

Final Mean for 1 Valid Peaks = 2.096E+02+/- 3.898E+01 (18.60%)

Flag: "*" = Keyline

---- Identified Nuclides ----

Nuclide	Activity (pCi/filter)	Act error	MDA (pCi/filter)	MDA error	Act/MDA
BA-133	3.610E+02	6.224E+01	1.359E+01	2.000E+00	26.573
TH-234	2.096E+02	3.898E+01	2.651E+01	3.410E-01	7.906

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

Nuclide	Key-Line Activity (pCi/filter)	K.L. Ided	Act error	MDA (pCi/filter)	MDA error	Act/MDA
CO-57	-9.969E+00		1.451E+01	2.322E+01	7.871E+00	-0.429
CD-109	-9.694E+00		7.386E+01	1.364E+02	1.313E+01	-0.071
PA-231	-1.874E-02		8.634E-01	1.589E+00	1.789E-02	-0.012
PA-234	2.576E+00	+	1.643E+00	2.004E+00	2.256E-02	1.286
NP-237	-2.463E+01		2.482E+01	3.862E+01	3.406E+00	-0.638
AM-241	5.813E-01		1.502E+00	2.454E+00	2.762E-02	0.237

LCS 5/10/13

VAX/VMS Peak Search Report Generated 10-MAY-2013 12:48:06.03

Configuration : DKA100:[GAMMA.SCUSR.ARCHIVE]SMP_130410703_GE3_BAFIL_191413.CN
Analyses by : PEAK V16.9 PEAKEFF V2.2
Client ID : PZ-109-SS TOT
Deposition Date :
Sample Date : 10-MAY-2013 00:00:00 Acquisition date : 10-MAY-2013 12:32:46
Sample ID : 1304107-03 Sample Quantity : 1.00000E+00 filter
Sample type : FILTER Sample Geometry : 0
Detector name : GE3 Detector Geometry: BAFIL
Elapsed live time: 0 00:15:00.00 Elapsed real time: 0 00:15:03.71 0.4%
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	6	27.95	60	52	1.57	28.27	27	12	6.62E-02	20.2	5.95E+01
2	6	30.89	1826	65	1.43	31.21	27	12	2.03E+00	2.4	
3	6	35.01	502	101	2.33	35.33	27	12	5.57E-01	7.0	
4	0	51.92	39	126	1.43	52.24	49	7	4.37E-02	49.7	
5	3	61.79	257	77	1.77	62.11	58	12	2.86E-01	8.0	1.99E+00
6	3	65.78	102	101	1.83	66.10	58	12	1.13E-01	20.1	
7	0	81.10	804	121	1.95	81.42	79	8	8.93E-01	4.3	
8	4	111.86	206	55	1.80	112.17	107	16	2.29E-01	8.5	1.53E+00
9	4	116.50	58	41	2.13	116.82	107	16	6.44E-02	24.5	
10	0	276.69	49	36	1.83	277.00	273	9	5.44E-02	26.3	
11	2	302.88	126	18	1.61	303.19	299	22	1.40E-01	10.1	1.92E+00
12	2	306.95	23	21	1.99	307.25	299	22	2.56E-02	46.9	
13	2	333.65	62	16	2.01	333.96	329	13	6.90E-02	16.4	1.52E+00
14	2	338.34	25	11	2.02	338.65	329	13	2.77E-02	32.4	
15	4	356.12	477	11	1.62	356.43	353	22	5.31E-01	4.7	2.48E+00
16	4	365.16	17	5	2.47	365.47	353	22	1.88E-02	43.7	
17	4	369.48	15	4	2.47	369.78	353	22	1.63E-02	50.6	
18	2	383.57	114	24	1.94	383.87	381	10	1.26E-01	12.5	4.12E+01
19	2	387.05	205	42	1.77	387.35	381	10	2.28E-01	8.4	
20	0	391.67	34	20	2.60	391.97	391	6	3.83E-02	30.5	
21	4	414.72	34	9	1.96	415.03	411	18	3.76E-02	23.2	9.59E-01
22	4	418.50	22	12	2.52	418.80	411	18	2.49E-02	44.7	
23	4	421.90	17	12	2.53	422.20	411	18	1.84E-02	53.7	
24	0	437.00	100	4	1.58	437.30	433	8	1.11E-01	10.6	
25	0	467.96	28	4	2.23	468.25	465	7	3.06E-02	22.2	
26	0	511.46	12	4	2.79	511.76	507	8	1.33E-02	40.8	
27	0	596.22	8	2	1.38	596.52	593	7	9.11E-03	44.1	

Sample ID : 1304107-03 Acquisition date : 10-MAY-2013 12:32:46

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	3.852E+02	3.852E+02	0.692E+02	17.95	
	Total Activity :		3.852E+02	3.852E+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	7.685E+02	7.685E+02	1.336E+02	17.39	
	Total Activity :		7.685E+02	7.685E+02			
	Grand Total Activity :		1.154E+03	1.154E+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*	1.899E+01	3.852E+02	3.852E+02	17.95	OK
	302.84	17.80	6.222E+00	3.404E+02	3.405E+02	28.81	OK
	356.01	60.00	5.860E+00	4.078E+02	4.078E+02	16.53	OK

Final Mean for 3 Valid Peaks = 3.852E+02+/- 6.916E+01 (17.95%)

Nuclide Type: NATURAL

Nuclide	Energy	%Abn	%Eff	Uncorrected pCi/filter	Decay Corr pCi/filter	2-Sigma %Error	Status
TH-234	63.29	3.80*	2.648E+01	7.685E+02	7.685E+02	17.39	OK

Final Mean for 1 Valid Peaks = 7.685E+02+/- 1.336E+02 (17.39%)

Flag: "*" = Keyline

---- Identified Nuclides ----

Nuclide	Activity (pCi/filter)	Act error	MDA (pCi/filter)	MDA error	Act/MDA
BA-133	3.852E+02	6.916E+01	2.109E+01	3.226E+00	18.263
TH-234	7.685E+02	1.336E+02	1.417E+02	7.610E+00	5.424

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

Nuclide	Key-Line Activity (pCi/filter)	K.L. Ided	Act error	MDA (pCi/filter)	MDA error	Act/MDA
CO-57	-2.199E+00		5.595E+00	8.564E+00	9.784E-01	-0.257
CD-109	-2.987E+01		1.247E+02	1.945E+02	1.603E+01	-0.154
PA-231	1.714E+00		1.523E+00	2.981E+00	4.240E-02	0.575
PA-234	3.202E+00		1.391E+00	2.742E+00	3.900E-02	1.167
NP-237	6.701E+00		3.535E+01	5.769E+01	4.664E+00	0.116
AM-241	2.152E+01		9.447E+00	1.814E+01	8.920E-01	1.186

VAX/VMS Peak Search Report Generated 10-MAY-2013 13:04:28.98

C
Filter

Configuration : DKA100:[GAMMA.SCUSR.ARCHIVE]SMP_130410704_GE3_BAFIL_191416.CN
Analyses by : PEAK V16.9 PEAKEFF V2.2
Client ID : PZ-113-AD TOT
Deposition Date :
Sample Date : 10-MAY-2013 00:00:00 Acquisition date : 10-MAY-2013 12:49:09
Sample ID : 1304107-04 Sample Quantity : 1.00000E+00 filter
Sample type : FILTER Sample Geometry : 0
Detector name : GE3 Detector Geometry: BAFIL
Elapsed live time: 0 00:15:00.00 Elapsed real time: 0 00:15:04.13 0.5%
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	30.89	1616	81	1.59	31.21	27	23	1.80E+00	2.6	7.20E+00
2	3	35.10	395	63	1.64	35.42	27	23	4.39E-01	6.0	
3	3	46.61	21	56	1.79	46.93	27	23	2.29E-02	63.2	
4	0	51.76	63	105	2.23	52.08	49	8	7.02E-02	30.5	
5	2	61.81	184	81	1.66	62.13	58	15	2.05E-01	10.5	3.43E+00
6	2	66.39	87	78	1.67	66.71	58	15	9.66E-02	19.4	
7	0	81.17	692	116	1.92	81.49	77	10	7.69E-01	4.8	
8	3	109.16	21	29	1.92	109.48	108	12	2.29E-02	49.3	1.62E+00
9	3	111.98	187	41	1.93	112.30	108	12	2.08E-01	9.4	
10	3	116.20	32	37	1.93	116.52	108	12	3.61E-02	36.9	
11	0	242.21	39	22	6.57	242.52	238	9	4.32E-02	27.2	
12	0	268.63	6	26	2.58	268.94	264	7	6.75E-03	145.2	
13	0	276.72	45	20	1.28	277.03	275	6	5.01E-02	21.5	
14	0	303.03	121	22	1.44	303.33	301	6	1.34E-01	11.0	
15	0	307.99	16	19	1.04	308.30	307	5	1.73E-02	49.2	
16	0	323.56	20	14	1.94	323.86	319	8	2.23E-02	39.2	
17	2	333.69	53	17	2.01	333.99	329	14	5.89E-02	19.3	4.36E+00
18	2	338.04	20	20	2.02	338.35	329	14	2.25E-02	44.8	
19	5	351.34	16	1	2.03	351.65	351	9	1.83E-02	20.3	1.91E+00
20	5	356.11	412	6	1.54	356.41	351	9	4.58E-01	5.0	
21	4	384.01	77	31	2.34	384.32	381	10	8.60E-02	21.8	1.14E+01
22	4	387.00	169	44	1.86	387.30	381	10	1.88E-01	9.9	
23	0	391.62	31	15	1.23	391.92	391	5	3.43E-02	28.8	
24	0	416.64	31	27	4.70	416.94	411	12	3.40E-02	38.5	
25	0	437.15	76	9	1.76	437.45	433	9	8.44E-02	13.5	
26	0	467.70	28	7	1.47	468.00	463	9	3.15E-02	25.0	
27	0	511.13	19	4	2.18	511.43	507	10	2.11E-02	31.4	
28	0	556.37	6	0	1.00	556.67	554	6	6.67E-03	40.8	

Sample ID : 1304107-04 Acquisition date : 10-MAY-2013 12:49:09

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	3.319E+02	3.319E+02	0.614E+02	18.49	
	Total Activity :		3.319E+02	3.319E+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	5.501E+02	5.501E+02	1.212E+02	22.03	
	Total Activity :		5.501E+02	5.501E+02			
	Grand Total Activity :		8.820E+02	8.820E+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*	1.899E+01	3.319E+02	3.319E+02	18.49	OK
	302.84	17.80	6.222E+00	3.277E+02	3.277E+02	30.14	OK
	356.01	60.00	5.860E+00	3.517E+02	3.517E+02	16.93	OK

Final Mean for 3 Valid Peaks = 3.319E+02+/- 6.136E+01 (18.49%)

Nuclide Type: NATURAL

Nuclide	Energy	%Abn	%Eff	Uncorrected pCi/filter	Decay Corr pCi/filter	2-Sigma %Error	Status
TH-234	63.29	3.80*	2.648E+01	5.501E+02	5.501E+02	22.03	OK

Final Mean for 1 Valid Peaks = 5.501E+02+/- 1.212E+02 (22.03%)

Flag: "*" = Keyline

---- Identified Nuclides ----

Nuclide	Activity (pCi/filter)	Act error	MDA (pCi/filter)	MDA error	Act/MDA
BA-133	3.319E+02	6.136E+01	1.886E+01	2.884E+00	17.603
TH-234	5.501E+02	1.212E+02	1.265E+02	6.793E+00	4.350

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

Nuclide	Key-Line Activity (pCi/filter)	K.L. Ided	Act error	MDA (pCi/filter)	MDA error	Act/MDA
CO-57	2.991E+00		5.242E+00	9.249E+00	1.057E+00	0.323
CD-109	-6.644E+00		1.138E+02	1.818E+02	1.499E+01	-0.037
PA-231	1.632E+00		1.719E+00	3.274E+00	4.656E-02	0.499
PA-234	3.029E+00		1.325E+00	2.631E+00	3.741E-02	1.152
NP-237	2.292E+01		3.103E+01	5.413E+01	4.376E+00	0.423
AM-241	1.931E+01		9.010E+00	1.665E+01	8.185E-01	1.160

VAX/VMS Peak Search Report Generated 10-MAY-2013 13:01:59.29

Configuration : DKA100:[GAMMA.SCUSR.ARCHIVE]SMP_130410705_GE2_BAFIL_191414.CN
Analyses by : PEAK V16.9 PEAKEFF V2.2
Client ID : PZ-113-AD DIS
Deposition Date :
Sample Date : 10-MAY-2013 00:00:00 Acquisition date : 10-MAY-2013 12:46:15
Sample ID : 1304107-05 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	2	30.95	1875	111	1.41	31.07	27	12	2.08E+00	2.4	6.00E+00
2	2	35.15	446	96	1.53	35.27	27	12	4.95E-01	6.0	
3	0	52.75	83	123	2.60	52.86	50	7	9.20E-02	25.0	
4	1	61.91	185	53	1.46	62.03	58	12	2.06E-01	9.4	1.49E+00
5	1	65.90	89	54	1.47	66.02	58	12	9.84E-02	16.3	
6	0	81.12	706	120	1.42	81.23	77	9	7.85E-01	4.7	
7	3	111.93	158	41	1.47	112.04	108	21	1.76E-01	9.4	1.94E+00
8	3	116.36	40	61	1.88	116.47	108	21	4.50E-02	35.9	
9	0	161.22	27	61	1.61	161.33	158	7	3.05E-02	50.4	
10	0	185.47	49	43	3.41	185.58	183	6	5.41E-02	25.9	
11	0	270.18	10	14	2.35	270.29	268	5	1.10E-02	64.7	
12	0	276.96	75	14	2.02	277.07	273	9	8.34E-02	14.9	
13	1	302.94	133	15	1.47	303.05	299	12	1.47E-01	9.5	1.37E+00
14	1	306.98	19	20	1.79	307.09	299	12	2.09E-02	49.6	
15	3	333.82	73	15	1.76	333.93	328	14	8.16E-02	14.5	2.63E+00
16	3	338.35	12	27	2.20	338.45	328	14	1.29E-02	79.9	
17	2	352.06	11	12	2.01	352.17	350	16	1.22E-02	52.3	8.60E+00
18	2	356.13	488	16	1.53	356.24	350	16	5.42E-01	4.7	
19	2	358.73	14	21	1.84	358.83	350	16	1.54E-02	160.5	
20	1	383.72	115	11	1.86	383.83	380	19	1.28E-01	11.1	3.82E+00
21	1	386.99	176	10	1.86	387.10	380	19	1.96E-01	9.4	
22	1	391.06	35	9	1.86	391.17	380	19	3.85E-02	28.1	
23	0	414.85	22	21	1.16	414.96	412	7	2.40E-02	41.4	
24	0	431.37	9	5	1.06	431.48	427	7	9.80E-03	54.6	
25	0	437.06	66	5	1.67	437.16	434	7	7.33E-02	13.6	
26	0	466.90	22	5	2.84	467.00	462	10	2.44E-02	28.6	
27	4	511.25	19	0	2.61	511.36	506	12	2.07E-02	30.8	1.86E+00
28	4	515.08	6	0	1.96	515.18	506	12	6.24E-03	68.9	

Sample ID : 1304107-05 Acquisition date : 10-MAY-2013 12:46:15

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	3.573E+02	3.573E+02	0.709E+02	19.84	
	Total Activity :		3.573E+02	3.573E+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	6.346E+02	6.346E+02	1.330E+02	20.96	
	Total Activity :		6.346E+02	6.346E+02			
	Grand Total Activity :		9.919E+02	9.919E+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	3.573E+02	3.573E+02	19.84	OK
	302.84	17.80	7.560E+00	2.957E+02	2.957E+02	35.38	OK
	356.01	60.00	7.170E+00	3.405E+02	3.405E+02	17.78	OK

Final Mean for 3 Valid Peaks = 3.573E+02+/- 7.089E+01 (19.84%)

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	6.346E+02	6.346E+02	20.96	OK

Final Mean for 1 Valid Peaks = 6.346E+02+/- 1.330E+02 (20.96%)

Flag: "*" = Keyline

---- Identified Nuclides ----

Nuclide	Activity (pCi/filter)	Act error	MDA (pCi/filter)	MDA error	Act/MDA
BA-133	3.573E+02	7.089E+01	1.978E+01	3.367E+00	18.067
TH-234	6.346E+02	1.330E+02	1.311E+02	1.084E+01	4.839

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

Nuclide	Key-Line Activity (pCi/filter)	K.L. Ided	Act error	MDA (pCi/filter)	MDA error	Act/MDA
CO-57	4.621E-01		5.341E+00	9.470E+00	1.454E+00	0.049
CD-109	-1.838E+01		1.133E+02	1.808E+02	2.076E+01	-0.102
PA-231	3.413E+01		4.534E+00	8.981E+00	1.710E-01	3.800
PA-234	3.334E+00		1.694E+00	3.258E+00	6.721E-02	1.023
NP-237	-1.179E+00		3.319E+01	5.374E+01	6.067E+00	-0.022
AM-241	1.883E+01		9.518E+00	1.776E+01	1.374E+00	1.060

VAX/VMS Peak Search Report Generated 10-MAY-2013 13:03:37.99

Configuration : DKA100:[GAMMA.SCUSR.ARCHIVE]SMP_130410706_GE5_BAFIL_191415.CN
Analyses by : PEAK V16.9 PEAKEFF V2.2
Client ID : FB AT D-3 TOT
Deposition Date :
Sample Date : 10-MAY-2013 00:00:00 Acquisition date : 10-MAY-2013 12:48:18
Sample ID : 1304107-06 Sample Quantity : 1.00000E+00 filter
Sample type : FILTER Sample Geometry : 0
Detector name : GE5 Detector Geometry: BAFIL
Elapsed live time: 0 00:15:00.00 Elapsed real time: 0 00:15:01.11 0.1%
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	0	31.12	1807	88	0.75	303.99	293	24	2.01E+00	2.7	
2	2	35.27	326	16	0.68	343.82	331	30	3.62E-01	6.8	6.10E-01
3	2	36.17	101	11	0.62	352.46	331	30	1.12E-01	19.5	
4	0	41.43	12	7	0.23	402.91	395	13	1.28E-02	54.4	
5	0	53.53	39	9	0.60	519.01	512	15	4.30E-02	22.1	
6	0	56.47	18	8	0.91	547.29	537	16	1.98E-02	38.6	
7	0	62.03	203	34	0.76	600.59	589	25	2.25E-01	9.6	
8	3	65.44	16	5	0.59	633.37	630	25	1.83E-02	35.0	2.40E+00
9	3	66.03	82	25	0.66	639.00	630	25	9.11E-02	18.1	
10	3	67.13	18	23	0.60	649.51	630	25	2.05E-02	50.8	
11	1	79.89	68	7	0.76	771.98	762	36	7.51E-02	17.0	9.99E-01
12	1	81.40	719	7	0.70	786.52	762	36	7.99E-01	3.8	
13	0	93.32	9	11	0.47	900.87	890	14	9.54E-03	80.1	
14	0	112.32	177	39	0.62	1083.16	1069	25	1.97E-01	10.9	
15	0	277.23	43	3	0.41	2665.60	2652	24	4.82E-02	17.1	
16	0	303.64	95	10	0.71	2919.06	2904	25	1.06E-01	12.3	
17	0	334.53	55	7	0.65	3215.48	3200	26	6.07E-02	16.6	
18	1	356.47	39	6	1.13	3426.00	3414	32	4.38E-02	47.1	7.21E+00
19	1	357.20	347	14	1.13	3433.00	3414	32	3.85E-01	5.5	
20	1	384.40	29	2	1.16	3694.00	3684	27	3.17E-02	27.4	1.27E+00
21	1	384.92	52	4	1.16	3699.00	3684	27	5.81E-02	17.8	
22	0	388.02	130	16	0.89	3728.67	3714	27	1.45E-01	10.6	
23	0	416.01	23	5	0.72	3997.31	3979	27	2.51E-02	28.9	

Sample ID : 1304107-06 Acquisition date : 10-MAY-2013 12:48:18

Total number of lines in spectrum	23	
Number of unidentified lines	18	
Number of lines tentatively identified by NID	5	21.74%

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	3.630E+02	3.630E+02	0.619E+02	17.05	
	Total Activity :		3.630E+02	3.630E+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	1.832E+02	1.832E+02	0.359E+02	19.58	
	Total Activity :		1.832E+02	1.832E+02			
	Grand Total Activity :		5.461E+02	5.462E+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*	1.802E+01	3.630E+02	3.630E+02	17.05	OK
	302.84	17.80	2.575E+00	6.236E+02	6.236E+02	36.04	OK
	356.01	60.00	4.312E+00	4.572E+01	4.573E+01	95.39	OK

Final Mean for 3 Valid Peaks = 3.630E+02+/- 6.191E+01 (17.05%)

Nuclide Type: NATURAL

Nuclide	Energy	%Abn	%Eff	Uncorrected pCi/filter	Decay Corr pCi/filter	2-Sigma %Error	Status
TH-234	63.29	3.80*	8.750E+01	1.832E+02	1.832E+02	19.58	OK

Final Mean for 1 Valid Peaks = 1.832E+02+/- 3.586E+01 (19.58%)

Flag: "*" = Keyline

---- Identified Nuclides ----

Nuclide	Activity (pCi/filter)	Act error	MDA (pCi/filter)	MDA error	Act/MDA
BA-133	3.630E+02	6.191E+01	1.240E+01	1.825E+00	29.285
TH-234	1.832E+02	3.586E+01	2.174E+01	2.797E-01	8.426

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

Nuclide	Key-Line Activity (pCi/filter)	K.L. Ided	Act error	MDA (pCi/filter)	MDA error	Act/MDA
CO-57	1.423E+01		1.455E+01	2.923E+01	9.910E+00	0.487
CD-109	2.709E+01		9.017E+01	1.730E+02	1.665E+01	0.157
PA-231	-4.872E-02		7.485E-01	1.392E+00	1.567E-02	-0.035
PA-234	1.561E+00		1.083E+00	2.096E+00	2.360E-02	0.744
NP-237	-3.423E+01		2.694E+01	3.980E+01	3.511E+00	-0.860
AM-241	2.986E-01		1.166E+00	1.981E+00	2.230E-02	0.151

VAX/VMS Peak Search Report Generated 10-MAY-2013 13:17:47.59

C
5/10/13

Configuration : DKA100:[GAMMA.SCUSR.ARCHIVE]SMP_130410707_GE2_BAFIL_191417.CN
Analyses by : PEAK V16.9 PEAKEFF V2.2
Client ID : FB AT D-3 DIS
Deposition Date :
Sample Date : 10-MAY-2013 00:00:00 Acquisition date : 10-MAY-2013 13:02:30
Sample ID : 1304107-07 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 00:15:00.28 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	31.00	1796	126	1.39	31.11	26	15	2.00E+00	2.5	5.18E+00
2	3	35.29	499	134	1.68	35.40	26	15	5.55E-01	5.7	
3	0	53.02	58	131	1.38	53.14	50	7	6.41E-02	35.9	
4	4	61.86	204	64	1.66	61.97	58	15	2.26E-01	9.1	1.86E+00
5	4	66.03	97	67	1.95	66.15	58	15	1.08E-01	18.4	
6	0	81.10	712	138	1.53	81.21	76	10	7.91E-01	4.9	
7	0	94.46	13	69	2.50	94.57	90	7	1.50E-02	105.5	
8	7	109.10	35	28	2.19	109.21	107	18	3.94E-02	31.9	1.50E+00
9	7	112.02	178	33	1.99	112.14	107	18	1.97E-01	9.4	
10	7	116.74	56	44	2.76	116.85	107	18	6.25E-02	27.7	
11	0	130.24	35	44	3.88	130.36	127	7	3.84E-02	36.1	
12	0	161.71	17	52	1.13	161.83	159	6	1.94E-02	69.6	
13	0	186.40	29	52	1.41	186.51	183	8	3.22E-02	47.4	
14	1	272.05	11	8	1.75	272.16	271	12	1.18E-02	41.4	6.64E+00
15	1	276.73	47	16	1.76	276.84	271	12	5.28E-02	21.1	
16	1	302.87	135	23	1.54	302.98	298	12	1.50E-01	9.8	2.86E+00
17	1	307.05	14	27	1.79	307.16	298	12	1.61E-02	62.0	
18	1	333.73	64	16	1.81	333.84	330	12	7.15E-02	15.9	2.56E+00
19	1	336.73	12	12	1.82	336.83	330	12	1.29E-02	84.3	
20	4	352.58	17	12	2.43	352.68	350	11	1.87E-02	39.6	2.33E+00
21	4	356.13	509	10	1.54	356.24	350	11	5.65E-01	4.5	
22	7	384.24	88	15	2.71	384.35	380	15	9.76E-02	18.5	5.50E+00
23	7	386.93	142	8	1.51	387.04	380	15	1.58E-01	9.9	
24	7	391.24	32	12	2.66	391.34	380	15	3.57E-02	44.1	
25	1	414.77	25	16	1.88	414.88	411	17	2.75E-02	31.6	1.57E+00
26	1	419.07	17	9	1.89	419.17	411	17	1.93E-02	42.0	
27	0	437.09	82	9	2.04	437.19	433	9	9.17E-02	12.8	
28	5	463.96	8	2	2.82	464.07	462	18	9.41E-03	40.9	1.75E+00
29	5	468.71	14	2	2.46	468.81	462	18	1.57E-02	36.9	
30	5	476.19	5	0	2.83	476.29	462	18	6.10E-03	75.1	
31	2	507.27	6	2	2.15	507.37	506	16	6.16E-03	44.2	1.21E+00
32	2	510.88	17	6	2.16	510.98	506	16	1.85E-02	31.2	
33	2	517.79	7	6	2.16	517.89	506	16	8.25E-03	61.7	
34	0	649.90	7	3	1.14	650.00	647	5	7.22E-03	53.6	
35	0	662.10	5	5	1.34	662.20	659	5	5.56E-03	80.6	

Sample ID : 1304107-07 Acquisition date : 10-MAY-2013 13:02:30

Total number of lines in spectrum	35	
Number of unidentified lines	30	
Number of lines tentatively identified by NID	5	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	3.604E+02	3.605E+02	0.721E+02	20.00	
	Total Activity :		3.604E+02	3.605E+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	6.986E+02	6.986E+02	1.421E+02	20.34	
	Total Activity :		6.986E+02	6.986E+02			
	Grand Total Activity :		1.059E+03	1.059E+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	3.604E+02	3.605E+02	20.00	OK
	302.84	17.80	7.560E+00	3.018E+02	3.018E+02	35.74	OK
	356.01	60.00	7.170E+00	3.553E+02	3.553E+02	17.64	OK

Final Mean for 3 Valid Peaks = 3.605E+02+/- 7.209E+01 (20.00%)

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	6.986E+02	6.986E+02	20.34	OK

Final Mean for 1 Valid Peaks = 6.986E+02+/- 1.421E+02 (20.34%)

Flag: "*" = Keyline

---- Identified Nuclides ----

Nuclide	Activity (pCi/filter)	Act error	MDA (pCi/filter)	MDA error	Act/MDA
BA-133	3.605E+02	7.209E+01	1.867E+01	3.179E+00	19.308
TH-234	6.986E+02	1.421E+02	1.210E+02	1.000E+01	5.773

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

Nuclide	Key-Line Activity (pCi/filter)	K.L. Ided	Act error	MDA (pCi/filter)	MDA error	Act/MDA
CO-57	-2.207E+00		4.790E+00	8.019E+00	1.232E+00	-0.275
CD-109	1.663E+01		1.157E+02	1.707E+02	1.959E+01	0.097
PA-231	3.580E+01		4.637E+00	9.165E+00	1.745E-01	3.906
PA-234	3.506E+00		1.832E+00	3.327E+00	6.863E-02	1.054
NP-237	1.095E+01		3.406E+01	5.150E+01	5.815E+00	0.213
AM-241	2.362E+01		9.420E+00	1.811E+01	1.402E+00	1.304

VAX/VMS Peak Search Report Generated 10-MAY-2013 13:20:31.21

Configuration : DKA100:[GAMMA.SCUSR.ARCHIVE]SMP_130410708_GE3_BAFIL_191419.CN
Analyses by : PEAK V16.9 PEAKEFF V2.2
Client ID : D-3 TOT
Deposition Date :
Sample Date : 10-MAY-2013 00:00:00 Acquisition date : 10-MAY-2013 13:05:13
Sample ID : 1304107-08 Sample Quantity : 1.00000E+00 filter
Sample type : FILTER Sample Geometry : 0
Detector name : GE3 Detector Geometry: BAFIL
Elapsed live time: 0 00:15:00.00 Elapsed real time: 0 00:15:03.76 0.4%
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	30.90	1561	83	1.42	31.22	27	14	1.73E+00	2.6	6.46E+00
2	3	35.10	389	80	1.66	35.42	27	14	4.32E-01	6.2	
3	0	52.80	71	93	3.62	53.12	50	8	7.87E-02	26.3	
4	5	58.55	24	38	1.50	58.86	58	15	2.63E-02	39.5	4.36E+00
5	5	61.97	246	75	1.94	62.28	58	15	2.74E-01	8.6	
6	5	65.87	96	88	2.22	66.19	58	15	1.06E-01	21.6	
7	0	81.11	703	112	1.97	81.43	77	10	7.82E-01	4.7	
8	7	92.98	40	41	2.77	93.29	90	16	4.49E-02	29.9	1.20E+00
9	7	97.62	31	54	2.78	97.94	90	16	3.46E-02	48.2	
10	7	101.75	35	53	2.80	102.07	90	16	3.91E-02	42.3	
11	0	111.65	150	100	1.66	111.96	108	7	1.67E-01	13.7	
12	0	161.09	22	84	2.84	161.40	157	9	2.43E-02	78.5	
13	3	205.20	10	22	2.07	205.51	203	16	1.15E-02	68.8	1.18E+00
14	3	208.17	15	33	2.07	208.49	203	16	1.70E-02	70.5	
15	3	213.68	15	33	2.08	213.99	203	16	1.69E-02	65.4	
16	0	276.93	34	33	1.35	277.24	274	7	3.80E-02	32.3	
17	0	302.97	109	30	1.46	303.28	300	7	1.21E-01	12.7	
18	0	333.90	59	21	1.42	334.20	330	7	6.59E-02	18.2	
19	0	338.48	29	9	2.13	338.78	337	5	3.23E-02	24.8	
20	0	356.25	361	31	1.86	356.55	352	10	4.01E-01	6.0	
21	0	365.14	13	12	1.25	365.44	362	7	1.46E-02	51.7	
22	2	383.71	87	18	2.06	384.02	381	16	9.64E-02	13.2	8.76E+00
23	2	387.00	174	9	1.82	387.31	381	16	1.94E-01	8.4	
24	2	391.06	38	5	1.91	391.36	381	16	4.25E-02	29.4	
25	4	414.61	32	9	2.52	414.91	409	16	3.60E-02	26.6	1.06E+00
26	4	418.63	22	5	2.09	418.93	409	16	2.45E-02	33.6	
27	0	437.10	74	13	1.60	437.40	433	7	8.17E-02	14.4	
28	0	467.91	14	5	2.04	468.21	464	7	1.53E-02	38.5	
29	0	511.53	21	5	2.15	511.83	507	9	2.28E-02	28.9	
30	0	558.70	4	8	1.92	559.00	554	8	4.44E-03	132.3	
31	0	600.07	11	0	2.97	600.36	597	8	1.22E-02	30.2	

Sample ID : 1304107-08 Acquisition date : 10-MAY-2013 13:05:13

Total number of lines in spectrum	31	
Number of unidentified lines	26	
Number of lines tentatively identified by NID	5	16.13%

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	3.371E+02	3.372E+02	0.620E+02	18.38	
	Total Activity :		3.371E+02	3.372E+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	7.347E+02	7.347E+02	1.356E+02	18.46	
AM-241	432.20Y	1.00	6.835E+00	6.835E+00	5.416E+00	79.23	
	Total Activity :		7.415E+02	7.415E+02			
	Grand Total Activity :		1.079E+03	1.079E+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*	1.899E+01	3.371E+02	3.372E+02	18.38	OK
	302.84	17.80	6.222E+00	2.945E+02	2.946E+02	32.74	OK
	356.01	60.00	5.860E+00	3.083E+02	3.083E+02	18.21	OK

Final Mean for 3 Valid Peaks = 3.372E+02+/- 6.199E+01 (18.38%)

Nuclide Type: NATURAL

Nuclide	Energy	%Abn	%Eff	Uncorrected pCi/filter	Decay Corr pCi/filter	2-Sigma %Error	Status
TH-234	63.29	3.80*	2.648E+01	7.347E+02	7.347E+02	18.46	OK

Final Mean for 1 Valid Peaks = 7.347E+02+/- 1.356E+02 (18.46%)

AM-241	59.54	35.90*	2.893E+01	6.835E+00	6.835E+00	79.23	OK

Final Mean for 1 Valid Peaks = 6.835E+00+/- 5.416E+00 (79.23%)

Flag: "*" = Keyline

---- Identified Nuclides ----

Nuclide	Activity (pCi/filter)	Act error	MDA (pCi/filter)	MDA error	Act/MDA
BA-133	3.372E+02	6.199E+01	1.987E+01	3.038E+00	16.971
TH-234	7.347E+02	1.356E+02	1.083E+02	5.818E+00	6.782
AM-241	6.835E+00	5.416E+00	1.047E+01	5.149E-01	0.653

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

Nuclide	Key-Line Activity (pCi/filter)	K.L. Ided	Act error	MDA (pCi/filter)	MDA error	Act/MDA
CO-57	3.677E+00		4.955E+00	9.465E+00	1.081E+00	0.388
CD-109	1.185E+00		1.113E+02	1.596E+02	1.316E+01	0.007
PA-231	1.731E+00		1.717E+00	3.282E+00	4.668E-02	0.528
PA-234	2.076E+00		1.352E+00	2.582E+00	3.672E-02	0.804
NP-237	1.411E+01		3.328E+01	5.059E+01	4.090E+00	0.279

VAX/VMS Peak Search Report Generated 10-MAY-2013 13:19:13.25

C
5/10

Configuration : DKA100:[GAMMA.SCUSR.ARCHIVE]SMP_130410709_GE5_BAFIL_191418.CN
Analyses by : PEAK V16.9 PEAKEFF V2.2
Client ID : D-3 DIS
Deposition Date :
Sample Date : 10-MAY-2013 00:00:00 Acquisition date : 10-MAY-2013 13:03:57
Sample ID : 1304107-09 Sample Quantity : 1.00000E+00 filter
Sample type : FILTER Sample Geometry : 0
Detector name : GE5 Detector Geometry: BAFIL
Elapsed live time: 0 00:15:00.00 Elapsed real time: 0 00:15:01.10 0.1%
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	0	8.28	15	6	1.14	84.86	77	15	1.63E-02	47.8	
2	0	21.35	76	50	0.45	210.24	198	23	8.42E-02	27.2	
3	0	31.15	1804	95	0.73	304.31	293	26	2.00E+00	2.8	
4	2	35.22	354	15	0.68	343.36	330	29	3.94E-01	6.5	2.48E+00
5	2	35.66	106	15	0.62	347.54	330	29	1.18E-01	21.6	
6	0	48.54	8	3	0.48	471.18	466	11	8.59E-03	55.8	
7	0	49.81	3	6	0.16	483.30	476	9	2.78E-03	170.3	
8	0	53.72	31	37	0.33	520.89	506	20	3.42E-02	44.8	
9	0	62.05	200	34	0.47	600.79	590	23	2.22E-01	9.6	
10	4	66.23	73	24	0.67	640.87	628	27	8.13E-02	18.9	1.16E+00
11	4	67.09	31	7	0.64	649.16	628	27	3.48E-02	28.0	
12	1	79.96	56	19	0.76	772.67	763	34	6.24E-02	23.1	7.54E-01
13	1	81.40	776	13	0.70	786.44	763	34	8.62E-01	3.7	
14	0	112.35	179	38	0.58	1083.46	1073	21	1.98E-01	10.5	
15	0	116.54	47	11	0.82	1123.70	1115	16	5.26E-02	19.6	
16	0	277.19	39	3	0.63	2665.23	2653	22	4.34E-02	18.0	
17	1	303.22	77	6	1.06	2915.00	2904	26	8.55E-02	14.0	4.66E+00
18	1	304.05	44	8	1.06	2923.00	2904	26	4.87E-02	20.8	
19	0	334.55	39	18	0.64	3215.61	3198	27	4.36E-02	27.3	
20	0	357.03	361	19	0.99	3431.30	3415	29	4.02E-01	5.8	
21	1	384.51	28	5	1.16	3695.00	3685	27	3.10E-02	31.8	2.45E+00
22	1	385.03	71	13	1.16	3700.00	3685	27	7.85E-02	14.4	
23	1	388.05	102	16	1.16	3729.00	3712	28	1.13E-01	13.1	1.01E+00
24	1	388.47	29	8	1.16	3733.00	3712	28	3.27E-02	38.0	
25	1	415.56	41	2	1.19	3993.00	3978	28	4.50E-02	16.0	1.51E+00
26	1	416.19	15	2	1.19	3999.00	3978	28	1.72E-02	36.6	

Sample ID : 1304107-09 Acquisition date : 10-MAY-2013 13:03:57

Total number of lines in spectrum 26
Number of unidentified lines 20
Number of lines tentatively identified by NID 6 23.08%

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	3.918E+02	3.918E+02	0.665E+02	16.97	
Total Activity :			3.918E+02	3.918E+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
PA-231	3.28E+04Y	1.00	1.049E+00	1.049E+00	1.003E+00	95.67	
PA-234	4.47E+09Y	1.00	3.505E+00	3.505E+00	1.910E+00	54.50	
TH-234	4.47E+09Y	1.00	1.804E+02	1.804E+02	0.354E+02	19.61	
Total Activity :			1.850E+02	1.850E+02			
Grand Total Activity :			5.768E+02	5.768E+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*	1.802E+01	3.918E+02	3.918E+02	16.97	OK
	302.84	17.80	2.575E+00	5.043E+02	5.044E+02	38.48	OK
	356.01	60.00	4.312E+00	4.196E+02	4.196E+02	18.53	OK

Final Mean for 3 Valid Peaks = 3.918E+02+/- 6.650E+01 (16.97%)

Nuclide Type: NATURAL

Nuclide	Energy	%Abn	%Eff	Uncorrected pCi/filter	Decay Corr pCi/filter	2-Sigma %Error	Status
PA-231	9.28	42.00*	1.000E+02	1.049E+00	1.049E+00	95.67	OK
	10.11	20.20	1.000E+02	2.180E+00	2.180E+00	95.67	OK
	283.67	1.60	2.191E+00	----- Line Not Found		-----	Absent
	302.67	2.30	2.572E+00	3.909E+03	3.909E+03	37.16	OK

Final Mean for 3 Valid Peaks = 1.049E+00+/- 1.003E+00 (95.67%)

PA-234	9.89	89.00	1.000E+02	4.949E-01	4.949E-01	95.67	OK
	21.72	64.90*	1.000E+02	3.505E+00	3.505E+00	54.50	OK
	37.93	23.75	1.000E+02	----- Line Not Found		-----	Absent
	131.42	20.40	2.473E+00	----- Line Not Found		-----	Absent

Final Mean for 2 Valid Peaks = 3.505E+00+/- 1.910E+00 (54.50%)

TH-234	63.29	3.80*	8.750E+01	1.804E+02	1.804E+02	19.61	OK

Final Mean for 1 Valid Peaks = 1.804E+02+/- 3.539E+01 (19.61%)

Flag: "*" = Keyline

---- Identified Nuclides ----

Nuclide	Activity (pCi/filter)	Act error	MDA (pCi/filter)	MDA error	Act/MDA
BA-133	3.918E+02	6.650E+01	1.312E+01	1.932E+00	29.853
PA-231	1.049E+00	1.003E+00	1.192E+00	1.342E-02	0.880
PA-234	3.505E+00	1.910E+00	1.394E+00	1.569E-02	2.514
TH-234	1.804E+02	3.539E+01	2.209E+01	2.842E-01	8.167

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

Nuclide	Key-Line Activity (pCi/filter)	K.L. Ided	Act error	MDA (pCi/filter)	MDA error	Act/MDA
CO-57	-4.982E+00		1.424E+01	2.478E+01	8.401E+00	-0.201
CD-109	3.430E+01		9.352E+01	1.799E+02	1.732E+01	0.191
NP-237	-2.268E+01		2.680E+01	4.304E+01	3.796E+00	-0.527
AM-241	1.503E+00		1.307E+00	2.524E+00	2.841E-02	0.595

IAB 5/10/13

VAX/VMS Peak Search Report Generated 10-MAY-2013 13:37:31.02

Configuration : DKA100:[GAMMA.SCUSR.ARCHIVE]SMP_130410710_GE2_BAFIL_191420.CN
Analyses by : PEAK V16.9 PEAKEFF V2.2
Client ID : D-85 TOT
Deposition Date :
Sample Date : 10-MAY-2013 00:00:00 Acquisition date : 10-MAY-2013 13:22:10
Sample ID : 1304107-10 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 00:15:00.24 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	1120	86	1.34	31.10	27	15	1.24E+00	3.2	1.89E+00
2	2	35.12	272	84	1.53	35.24	27	15	3.02E-01	8.2	
3	0	52.72	30	134	2.55	52.84	50	7	3.37E-02	66.4	
4	3	61.84	127	52	1.76	61.95	59	12	1.41E-01	12.4	1.50E+00
5	3	66.33	39	44	1.77	66.44	59	12	4.31E-02	33.2	
6	0	81.08	428	109	1.46	81.20	77	9	4.76E-01	6.5	
7	0	93.48	35	62	1.21	93.59	90	7	3.89E-02	41.4	
8	3	111.86	81	49	1.88	111.97	108	12	8.97E-02	18.4	1.68E+00
9	3	116.07	18	57	1.88	116.19	108	12	2.01E-02	73.3	
10	0	162.95	19	62	1.71	163.06	159	8	2.09E-02	76.2	
11	0	186.01	29	41	1.57	186.12	183	6	3.24E-02	39.8	
12	0	223.95	10	27	1.47	224.06	219	7	1.12E-02	90.7	
13	0	238.58	26	52	2.74	238.69	233	13	2.89E-02	60.4	
14	0	277.08	54	15	1.90	277.19	273	9	6.01E-02	18.9	
15	0	303.14	77	36	1.22	303.25	300	6	8.50E-02	15.8	
16	0	333.87	24	16	1.14	333.98	331	6	2.69E-02	32.6	
17	0	356.14	265	28	1.67	356.25	351	10	2.95E-01	7.2	
18	1	383.72	82	10	1.86	383.83	380	16	9.10E-02	14.2	4.24E+00
19	1	386.72	99	13	1.86	386.83	380	16	1.10E-01	14.1	
20	1	391.72	24	15	1.86	391.83	380	16	2.67E-02	31.9	
21	0	415.77	33	20	1.58	415.88	413	8	3.67E-02	29.2	
22	0	437.23	40	13	1.28	437.34	434	7	4.48E-02	21.4	
23	0	469.40	6	9	1.34	469.50	466	6	6.67E-03	89.0	
24	1	508.90	6	9	1.78	509.00	506	11	7.13E-03	68.4	4.05E+00
25	1	513.72	11	2	1.96	513.82	506	11	1.25E-02	53.5	
26	0	610.90	6	8	1.10	611.00	605	8	6.67E-03	91.3	
27	0	652.01	5	6	2.85	652.11	646	8	5.66E-03	94.2	
28	0	661.69	10	2	1.96	661.79	658	7	1.14E-02	37.7	

Sample ID : 1304107-10 Acquisition date : 10-MAY-2013 13:22:10

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	2.166E+02	2.167E+02	0.473E+02	21.85	
Total Activity :			2.166E+02	2.167E+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	4.345E+02	4.345E+02	1.149E+02	26.45	
Total Activity :			4.345E+02	4.345E+02			

Grand Total Activity :	6.511E+02	6.511E+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	2.166E+02	2.167E+02	21.85	OK
	302.84	17.80	7.560E+00	1.708E+02	1.708E+02	43.55	OK
	356.01	60.00	7.170E+00	1.853E+02	1.853E+02	20.85	OK

Final Mean for 3 Valid Peaks = 2.167E+02+/- 4.733E+01 (21.85%)

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	4.345E+02	4.345E+02	26.45	OK

Final Mean for 1 Valid Peaks = 4.345E+02+/- 1.149E+02 (26.45%)

Flag: "*" = Keyline

---- Identified Nuclides ----

Nuclide	Activity (pCi/filter)	Act error	MDA (pCi/filter)	MDA error	Act/MDA
BA-133	2.167E+02	4.733E+01	1.899E+01	3.234E+00	11.408
TH-234	4.345E+02	1.149E+02	1.206E+02	9.970E+00	3.601

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

Nuclide	Key-Line Activity (pCi/filter)	K.L. Ided	Act error	MDA (pCi/filter)	MDA error	Act/MDA
CO-57	3.165E+00		5.119E+00	9.062E+00	1.392E+00	0.349
CD-109	5.728E+01		1.060E+02	1.675E+02	1.924E+01	0.342
PA-231	3.546E+01		4.684E+00	9.228E+00	1.757E-01	3.843
PA-234	3.130E+00		1.485E+00	2.925E+00	6.034E-02	1.070
NP-237	-1.394E+01		3.564E+01	4.805E+01	5.425E+00	-0.290
AM-241	8.121E+00		1.008E+01	1.585E+01	1.227E+00	0.512

KB 5/10/13

VAX/VMS Peak Search Report Generated 10-MAY-2013 13:38:30.83

Configuration : DKA100:[GAMMA.SCUSR.ARCHIVE]SMP_130410711_GE3_BAFIL_191421.CN
Analyses by : PEAK V16.9 PEAKEFF V2.2
Client ID : D-85 DIS
Deposition Date :
Sample Date : 10-MAY-2013 00:00:00 Acquisition date : 10-MAY-2013 13:22:47
Sample ID : 1304107-11 Sample Quantity : 1.00000E+00 filter
Sample type : FILTER Sample Geometry : 0
Detector name : GE3 Detector Geometry: BAFIL
Elapsed live time: 0 00:15:00.00 Elapsed real time: 0 00:15:03.31 0.4%
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	30.87	1906	89	1.57	31.19	26	18	2.12E+00	2.4	9.09E+00
2	4	35.20	454	77	1.84	35.52	26	18	5.04E-01	5.9	
3	0	52.40	77	118	3.16	52.72	49	8	8.58E-02	26.9	
4	2	61.72	222	73	1.66	62.04	57	13	2.46E-01	9.3	3.98E+00
5	2	65.67	114	73	1.67	65.99	57	13	1.27E-01	16.4	
6	0	81.06	744	152	1.89	81.37	76	10	8.26E-01	4.8	
7	0	92.05	26	94	1.92	92.37	90	7	2.93E-02	63.7	
8	3	111.92	180	62	1.93	112.23	108	15	2.00E-01	10.6	2.31E+00
9	3	116.16	35	50	1.93	116.48	108	15	3.84E-02	39.9	
10	0	160.32	22	40	1.00	160.64	159	4	2.44E-02	45.9	
11	0	277.03	24	36	1.07	277.34	275	6	2.64E-02	44.4	
12	5	302.98	121	21	1.84	303.29	299	16	1.34E-01	10.6	5.90E+00
13	5	307.15	38	16	2.49	307.45	299	16	4.25E-02	30.3	
14	5	311.60	19	12	2.28	311.91	299	16	2.13E-02	49.6	
15	0	334.07	63	47	1.40	334.38	330	8	7.04E-02	22.4	
16	0	356.15	464	16	1.94	356.46	354	8	5.16E-01	4.9	
17	1	383.53	92	9	1.87	383.83	381	16	1.02E-01	12.4	8.54E+00
18	1	386.87	173	7	1.87	387.17	381	16	1.92E-01	9.5	
19	1	391.53	45	6	1.88	391.83	381	16	4.95E-02	20.2	
20	1	414.53	36	12	1.89	414.83	410	12	3.98E-02	24.1	5.79E+00
21	1	417.70	11	14	1.72	418.00	410	12	1.20E-02	78.6	
22	0	437.21	84	13	1.63	437.52	434	9	9.36E-02	13.1	
23	0	468.51	19	10	1.95	468.81	463	8	2.09E-02	37.3	
24	0	510.90	28	6	2.78	511.20	505	10	3.11E-02	26.0	

Sample ID : 1304107-11 Acquisition date : 10-MAY-2013 13:22:47

Total number of lines in spectrum	24	
Number of unidentified lines	20	
Number of lines tentatively identified by NID	4	16.67%

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	3.564E+02	3.564E+02	0.659E+02	18.50	
	Total Activity :		3.564E+02	3.564E+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	6.611E+02	6.611E+02	1.306E+02	19.75	
	Total Activity :		6.611E+02	6.611E+02			
	Grand Total Activity :		1.017E+03	1.018E+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*	1.899E+01	3.564E+02	3.564E+02	18.50	OK
	302.84	17.80	6.222E+00	3.269E+02	3.269E+02	29.56	OK
	356.01	60.00	5.860E+00	3.966E+02	3.966E+02	16.79	OK

Final Mean for 3 Valid Peaks = 3.564E+02+/- 6.594E+01 (18.50%)

Nuclide Type: NATURAL

Nuclide	Energy	%Abn	%Eff	Uncorrected pCi/filter	Decay Corr pCi/filter	2-Sigma %Error	Status
TH-234	63.29	3.80*	2.648E+01	6.611E+02	6.611E+02	19.75	OK

Final Mean for 1 Valid Peaks = 6.611E+02+/- 1.306E+02 (19.75%)

Flag: "*" = Keyline

---- Identified Nuclides ----

Nuclide	Activity (pCi/filter)	Act error	MDA (pCi/filter)	MDA error	Act/MDA
BA-133	3.564E+02	6.594E+01	1.886E+01	2.884E+00	18.903
TH-234	6.611E+02	1.306E+02	1.196E+02	6.422E+00	5.529

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

Nuclide	Key-Line Activity (pCi/filter)	K.L. Ided	Act error	MDA (pCi/filter)	MDA error	Act/MDA
CO-57	-1.469E+00		5.778E+00	9.028E+00	1.031E+00	-0.163
CD-109	4.822E+01		1.342E+02	1.986E+02	1.637E+01	0.243
PA-231	1.876E+00		1.515E+00	2.989E+00	4.251E-02	0.628
PA-234	2.853E+00		1.385E+00	2.598E+00	3.695E-02	1.098
NP-237	2.626E+01		3.836E+01	5.907E+01	4.775E+00	0.445
AM-241	2.916E+01		9.381E+00	1.806E+01	8.879E-01	1.615

KB 5/10/13

VAX/VMS Peak Search Report Generated 10-MAY-2013 13:38:53.32

Configuration : DKA100:[GAMMA.SCUSR.ARCHIVE]SMP_130410712_GE5_BAFIL_191422.CN
Analyses by : PEAK V16.9 PEAKEFF V2.2
Client ID : S-84 TOT
Deposition Date :
Sample Date : 10-MAY-2013 00:00:00 Acquisition date : 10-MAY-2013 13:23:32
Sample ID : 1304107-12 Sample Quantity : 1.00000E+00 filter
Sample type : FILTER Sample Geometry : 0
Detector name : GE5 Detector Geometry: BAFIL
Elapsed live time: 0 00:15:00.00 Elapsed real time: 0 00:15:01.11 0.1%
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	6	20.38	18	12	0.54	200.95	197	18	2.04E-02	38.6	9.50E-01
2	6	21.25	56	18	0.57	209.28	197	18	6.18E-02	21.0	
3	0	31.11	1550	73	0.77	303.95	291	24	1.72E+00	2.9	
4	0	35.49	386	28	0.74	345.95	332	29	4.29E-01	6.5	
5	0	46.89	10	3	0.88	455.37	447	13	1.07E-02	50.3	
6	0	49.08	15	0	0.26	476.33	468	15	1.67E-02	25.8	
7	0	53.56	26	8	0.45	519.37	513	13	2.88E-02	28.0	
8	0	62.07	206	28	0.68	601.01	588	23	2.29E-01	8.9	
9	1	65.72	43	17	0.66	636.00	629	28	4.76E-02	26.2	1.74E+00
10	1	66.24	53	19	0.66	641.00	629	28	5.91E-02	24.5	
11	0	71.48	20	10	0.21	691.25	682	15	2.21E-02	37.3	
12	1	79.86	28	10	0.76	771.67	765	35	3.15E-02	31.9	8.33E-01
13	1	81.38	668	19	0.67	786.31	765	35	7.42E-01	4.1	
14	0	112.30	173	15	0.48	1083.00	1071	22	1.92E-01	9.0	
15	0	277.31	26	2	0.73	2666.35	2654	21	2.87E-02	22.9	
16	6	302.91	15	0	1.29	2912.03	2904	26	1.65E-02	47.0	6.05E-01
17	6	303.75	75	2	0.89	2920.12	2904	26	8.37E-02	11.7	
18	0	308.22	22	3	0.69	2962.97	2946	26	2.44E-02	25.7	
19	0	334.73	33	11	0.14	3217.32	3202	28	3.64E-02	26.5	
20	0	357.02	305	3	0.71	3431.25	3415	32	3.39E-01	5.9	
21	0	384.91	38	12	1.21	3698.89	3684	22	4.21E-02	23.5	
22	4	387.42	12	10	1.16	3723.00	3713	28	1.31E-02	96.2	1.74E+00
23	4	387.90	110	13	1.34	3727.54	3713	28	1.22E-01	12.0	

Sample ID : 1304107-12 Acquisition date : 10-MAY-2013 13:23:32

Total number of lines in spectrum	23	
Number of unidentified lines	18	
Number of lines tentatively identified by NID	5	21.74%

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	3.371E+02	3.371E+02	0.584E+02	17.31	
	Total Activity :		3.371E+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	1.863E+02	1.863E+02	0.341E+02	18.29	
	Total Activity :		1.863E+02	1.863E+02			
	Grand Total Activity :		5.234E+02	5.234E+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*	1.802E+01	3.371E+02	3.371E+02	17.31	OK
	302.84	17.80	2.575E+00	9.750E+01	9.751E+01	97.60	OK
	356.01	60.00	4.312E+00	3.539E+02	3.539E+02	18.60	OK

Final Mean for 3 Valid Peaks = 3.371E+02+/- 5.837E+01 (17.31%)

Nuclide Type: NATURAL

Nuclide	Energy	%Abn	%Eff	Uncorrected pCi/filter	Decay Corr pCi/filter	2-Sigma %Error	Status
TH-234	63.29	3.80*	8.750E+01	1.863E+02	1.863E+02	18.29	OK

Final Mean for 1 Valid Peaks = 1.863E+02+/- 3.407E+01 (18.29%)

Flag: "*" = Keyline

---- Identified Nuclides ----

Nuclide	Activity (pCi/filter)	Act error	MDA (pCi/filter)	MDA error	Act/MDA
BA-133	3.371E+02	5.837E+01	1.381E+01	2.033E+00	24.413
TH-234	1.863E+02	3.407E+01	1.928E+01	2.481E-01	9.659

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

Nuclide	Key-Line Activity (pCi/filter)	K.L. Ided	Act error	MDA (pCi/filter)	MDA error	Act/MDA
CO-57	-4.566E+00		1.172E+01	2.049E+01	6.945E+00	-0.223
CD-109	1.079E+01		7.220E+01	1.403E+02	1.350E+01	0.077
PA-231	2.586E-01		7.773E-01	1.533E+00	1.726E-02	0.169
PA-234	2.575E+00	+	1.088E+00	1.924E+00	2.166E-02	1.338
NP-237	-1.924E+01		2.185E+01	3.460E+01	3.052E+00	-0.556
AM-241	3.102E-01		1.312E+00	2.132E+00	2.400E-02	0.145

VAX/VMS Peak Search Report Generated 10-MAY-2013 13:58:06.50

Configuration : DKA100:[GAMMA.SCUSR.ARCHIVE]SMP_130410713_GE2_BAFIL_191423.CN
Analyses by : PEAK V16.9 PEAKEFF V2.2
Client ID : S-84 DIS
Deposition Date :
Sample Date : 10-MAY-2013 00:00:00 Acquisition date : 10-MAY-2013 13:42:49
Sample ID : 1304107-13 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	2	30.99	1736	116	1.38	31.11	27	16	1.93E+00	2.5	8.72E+00
2	2	35.05	381	139	1.53	35.17	27	16	4.23E-01	7.1	
3	0	52.16	53	201	2.43	52.28	48	10	5.84E-02	52.9	
4	1	61.80	191	60	1.46	61.91	59	11	2.12E-01	9.4	2.33E+00
5	1	65.86	65	60	1.47	65.97	59	11	7.23E-02	21.4	
6	0	81.12	671	121	1.56	81.24	77	9	7.46E-01	4.9	
7	0	92.50	16	86	1.73	92.61	90	7	1.78E-02	99.3	
8	0	111.97	166	95	1.38	112.09	108	7	1.84E-01	12.5	
9	0	159.57	12	80	1.50	159.68	157	7	1.35E-02	124.4	
10	0	185.73	24	70	1.68	185.84	182	8	2.63E-02	64.7	
11	0	276.93	47	24	1.86	277.04	273	8	5.27E-02	23.0	
12	3	302.93	134	21	1.50	303.04	299	12	1.49E-01	9.9	2.34E+00
13	3	307.43	17	29	2.16	307.54	299	12	1.89E-02	62.3	
14	0	324.01	12	19	2.91	324.12	320	9	1.31E-02	71.6	
15	3	333.90	76	11	2.19	334.00	328	19	8.39E-02	14.3	3.04E+00
16	3	337.87	26	8	2.20	337.98	328	19	2.90E-02	32.3	
17	0	356.24	455	41	1.57	356.34	352	8	5.06E-01	5.3	
18	6	383.92	106	11	1.57	384.02	382	14	1.18E-01	11.4	1.52E+00
19	6	387.04	170	9	1.54	387.15	382	14	1.89E-01	8.6	
20	6	391.18	37	11	2.33	391.29	382	14	4.10E-02	30.0	
21	0	417.57	48	30	4.59	417.67	412	13	5.30E-02	29.2	
22	0	437.27	71	18	1.60	437.37	433	9	7.86E-02	16.1	
23	1	467.88	32	2	1.93	467.98	464	13	3.56E-02	19.9	3.94E-01
24	1	472.03	6	5	1.93	472.13	464	13	6.43E-03	83.8	
25	0	510.80	30	11	1.94	510.90	506	9	3.35E-02	27.0	

Sample ID : 1304107-13 Acquisition date : 10-MAY-2013 13:42:49

Total number of lines in spectrum	25	
Number of unidentified lines	21	
Number of lines tentatively identified by NID	4	16.00%

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	3.396E+02	3.396E+02	0.680E+02	20.01	
	Total Activity :		3.396E+02	3.396E+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	6.537E+02	6.537E+02	1.367E+02	20.92	
	Total Activity :		6.537E+02	6.537E+02			
	Grand Total Activity :		9.933E+02	9.933E+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	3.396E+02	3.396E+02	20.01	OK
	302.84	17.80	7.560E+00	2.989E+02	2.989E+02	35.92	OK
	356.01	60.00	7.170E+00	3.177E+02	3.177E+02	18.46	OK

Final Mean for 3 Valid Peaks = 3.396E+02+/- 6.797E+01 (20.01%)

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	6.537E+02	6.537E+02	20.92	OK

Final Mean for 1 Valid Peaks = 6.537E+02+/- 1.367E+02 (20.92%)

Flag: "*" = Keyline

---- Identified Nuclides ----

Nuclide	Activity (pCi/filter)	Act error	MDA (pCi/filter)	MDA error	Act/MDA
BA-133	3.396E+02	6.797E+01	1.993E+01	3.393E+00	17.041
TH-234	6.537E+02	1.367E+02	1.468E+02	1.213E+01	4.455

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

Nuclide	Key-Line Activity (pCi/filter)	K.L. Ided	Act error	MDA (pCi/filter)	MDA error	Act/MDA
CO-57	-1.561E+00		4.716E+00	8.041E+00	1.235E+00	-0.194
CD-109	-3.740E+00		1.215E+02	1.738E+02	1.996E+01	-0.022
PA-231	3.565E+01		4.792E+00	9.393E+00	1.789E-01	3.795
PA-234	1.354E+00		1.660E+00	3.043E+00	6.277E-02	0.445
NP-237	3.810E+00		3.490E+01	5.107E+01	5.766E+00	0.075
AM-241	2.048E+01		1.113E+01	1.877E+01	1.453E+00	1.091

KGB 5/10/13

VAX/VMS Peak Search Report Generated 10-MAY-2013 13:58:46.92

Configuration : DKA100:[GAMMA.SCUSR.ARCHIVE]SMP_130410714_GE3_BAFIL_191424.CN
Analyses by : PEAK V16.9 PEAKEFF V2.2
Client ID : S-5 TOT
Deposition Date :
Sample Date : 10-MAY-2013 00:00:00 Acquisition date : 10-MAY-2013 13:43:31
Sample ID : 1304107-14 Sample Quantity : 1.00000E+00 filter
Sample type : FILTER Sample Geometry : 0
Detector name : GE3 Detector Geometry: BAFIL
Elapsed live time: 0 00:15:00.00 Elapsed real time: 0 00:15:02.67 0.3%
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	30.84	622	52	1.58	31.16	26	14	6.91E-01	4.5	7.02E+00
2	2	35.40	141	46	1.59	35.72	26	14	1.56E-01	11.6	
3	1	61.82	62	55	1.51	62.14	59	13	6.88E-02	22.2	2.13E+00
4	1	65.82	37	52	1.52	66.14	59	13	4.11E-02	36.2	
5	0	81.22	267	72	1.86	81.53	77	11	2.97E-01	8.8	
6	0	93.25	19	60	1.09	93.57	91	7	2.10E-02	71.6	
7	3	111.95	80	27	1.93	112.26	107	15	8.92E-02	15.5	6.69E-01
8	3	116.97	16	15	1.93	117.28	107	15	1.77E-02	56.6	
9	0	141.91	28	25	5.71	142.22	138	9	3.12E-02	37.1	
10	0	252.76	15	10	1.34	253.07	250	6	1.70E-02	41.6	
11	0	276.55	21	11	1.18	276.86	275	5	2.37E-02	31.8	
12	1	299.86	8	1	1.80	300.16	299	12	9.37E-03	7.3	2.65E+00
13	1	302.86	32	7	1.80	303.16	299	12	3.53E-02	23.2	
14	1	307.53	14	9	1.81	307.84	299	12	1.54E-02	40.4	
15	4	333.92	30	7	2.22	334.23	330	12	3.33E-02	23.7	7.08E-01
16	4	338.60	13	7	2.44	338.91	330	12	1.46E-02	50.7	
17	0	356.33	156	25	1.97	356.64	351	12	1.73E-01	10.4	
18	4	384.02	28	10	2.49	384.32	381	9	3.17E-02	33.0	1.32E+01
19	4	387.07	55	7	2.04	387.37	381	9	6.14E-02	17.8	
20	0	404.52	8	6	1.15	404.83	401	8	8.65E-03	65.5	
21	0	417.53	19	10	3.67	417.83	412	14	2.14E-02	42.1	
22	0	436.87	41	6	1.99	437.17	432	11	4.50E-02	19.3	
23	0	511.04	25	6	3.44	511.34	506	12	2.78E-02	28.0	

Sample ID : 1304107-14 Acquisition date : 10-MAY-2013 13:43:31

Total number of lines in spectrum	23	
Number of unidentified lines	19	
Number of lines tentatively identified by NID	4	17.39%

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	1.281E+02	1.281E+02	0.303E+02	23.63	
	Total Activity :		1.281E+02	1.281E+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	1.847E+02	1.847E+02	0.828E+02	44.83	
	Total Activity :		1.847E+02	1.847E+02			
	Grand Total Activity :		3.128E+02	3.128E+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*	1.899E+01	1.281E+02	1.281E+02	23.63	OK
	302.84	17.80	6.222E+00	8.624E+01	8.625E+01	50.73	OK
	356.01	60.00	5.860E+00	1.330E+02	1.330E+02	24.87	OK

Final Mean for 3 Valid Peaks = 1.281E+02+/- 3.027E+01 (23.63%)

Nuclide Type: NATURAL

Nuclide	Energy	%Abn	%Eff	Uncorrected pCi/filter	Decay Corr pCi/filter	2-Sigma %Error	Status
TH-234	63.29	3.80*	2.648E+01	1.847E+02	1.847E+02	44.83	OK

Final Mean for 1 Valid Peaks = 1.847E+02+/- 8.281E+01 (44.83%)

Flag: "*" = Keyline

---- Identified Nuclides ----

Nuclide	Activity (pCi/filter)	Act error	MDA (pCi/filter)	MDA error	Act/MDA
BA-133	1.281E+02	3.027E+01	1.482E+01	2.266E+00	8.645
TH-234	1.847E+02	8.281E+01	9.374E+01	5.035E+00	1.970

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

Nuclide	Key-Line Activity (pCi/filter)	K.L. Ided	Act error	MDA (pCi/filter)	MDA error	Act/MDA
CO-57	1.038E+00		3.539E+00	6.403E+00	7.315E-01	0.162
CD-109	3.672E+01		8.477E+01	1.351E+02	1.114E+01	0.272
PA-231	2.014E+00		1.598E+00	3.134E+00	4.457E-02	0.643
PA-234	7.469E-01		1.091E+00	1.924E+00	2.737E-02	0.388
NP-237	4.858E+00		2.378E+01	3.651E+01	2.952E+00	0.133
AM-241	7.154E+00		6.398E+00	1.168E+01	5.745E-01	0.612

5/10/13

VAX/VMS Peak Search Report Generated 10-MAY-2013 13:59:11.47

Configuration : DKA100:[GAMMA.SCUSR.ARCHIVE]SMP_130410715_GE5_BAFIL_191425.CN
Analyses by : PEAK V16.9 PEAKEFF V2.2
Client ID : S-5 DIS
Deposition Date :
Sample Date : 10-MAY-2013 00:00:00 Acquisition date : 10-MAY-2013 13:43:57
Sample ID : 1304107-15 Sample Quantity : 1.00000E+00 filter
Sample type : FILTER Sample Geometry : 0
Detector name : GE5 Detector Geometry: BAFIL
Elapsed live time: 0 00:15:00.00 Elapsed real time: 0 00:15:01.15 0.1%
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	0	21.17	96	23	0.88	208.51	198	18	1.06E-01	15.5	
2	0	31.13	1724	97	0.77	304.12	293	23	1.92E+00	2.8	
3	0	35.35	445	35	0.54	344.58	331	28	4.94E-01	6.1	
4	0	62.13	229	48	0.88	601.60	590	25	2.54E-01	9.6	
5	2	66.27	69	32	0.80	641.33	631	25	7.63E-02	22.9	6.37E-01
6	2	66.76	28	26	0.66	646.00	631	25	3.14E-02	53.1	
7	4	79.95	59	8	1.02	772.58	762	34	6.51E-02	23.7	1.65E+00
8	4	81.38	771	17	0.73	786.32	762	34	8.56E-01	3.7	
9	0	112.31	159	31	0.73	1083.05	1071	23	1.77E-01	11.0	
10	0	116.41	36	18	0.51	1122.44	1114	18	4.00E-02	28.9	
11	0	303.68	124	2	1.00	2919.37	2903	28	1.37E-01	9.4	
12	0	308.08	31	5	0.54	2961.67	2948	24	3.47E-02	22.1	
13	0	334.64	51	2	1.08	3216.46	3202	25	5.66E-02	15.1	
14	0	357.01	345	3	0.93	3431.15	3414	33	3.83E-01	5.5	
15	4	384.51	68	4	1.16	3695.00	3681	28	7.52E-02	14.1	3.25E+00
16	4	384.92	12	4	1.16	3699.00	3681	28	1.31E-02	77.7	
17	4	385.41	34	3	0.76	3703.69	3681	28	3.81E-02	17.7	
18	2	387.42	12	20	1.16	3723.00	3714	25	1.31E-02	99.0	6.22E-01
19	2	388.06	105	21	0.94	3729.10	3714	25	1.17E-01	12.5	
20	0	415.82	29	0	0.63	3995.45	3978	27	3.22E-02	18.6	

Sample ID : 1304107-15 Acquisition date : 10-MAY-2013 13:43:57

Total number of lines in spectrum	20	
Number of unidentified lines	15	
Number of lines tentatively identified by NID	5	25.00%

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	3.892E+02	3.892E+02	0.661E+02	16.97	
	Total Activity :		3.892E+02	3.892E+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	2.065E+02	2.065E+02	0.407E+02	19.72	
	Total Activity :		2.065E+02	2.065E+02			
	Grand Total Activity :		5.957E+02	5.957E+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*	1.802E+01	3.892E+02	3.892E+02	16.97	OK
	302.84	17.80	2.575E+00	8.102E+02	8.103E+02	32.36	OK
	356.01	60.00	4.312E+00	4.003E+02	4.003E+02	18.16	OK

Final Mean for 3 Valid Peaks = 3.892E+02+/- 6.606E+01 (16.97%)

Nuclide Type: NATURAL

Nuclide	Energy	%Abn	%Eff	Uncorrected pCi/filter	Decay Corr pCi/filter	2-Sigma %Error	Status
TH-234	63.29	3.80*	8.750E+01	2.065E+02	2.065E+02	19.72	OK

Final Mean for 1 Valid Peaks = 2.065E+02+/- 4.073E+01 (19.72%)

Flag: "*" = Keyline

---- Identified Nuclides ----

Nuclide	Activity (pCi/filter)	Act error	MDA (pCi/filter)	MDA error	Act/MDA
BA-133	3.892E+02	6.606E+01	1.077E+01	1.586E+00	36.129
TH-234	2.065E+02	4.073E+01	2.513E+01	3.233E-01	8.217

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

Nuclide	Key-Line Activity (pCi/filter)	K.L. Ided	Act error	MDA (pCi/filter)	MDA error	Act/MDA
CO-57	-4.522E+00		1.390E+01	2.436E+01	8.258E+00	-0.186
CD-109	-3.789E+01		1.020E+02	1.764E+02	1.698E+01	-0.215
PA-231	-3.373E-02		9.581E-01	1.739E+00	1.958E-02	-0.019
PA-234	4.423E+00	+	1.386E+00	2.061E+00	2.320E-02	2.146
NP-237	8.433E+00		2.779E+01	5.240E+01	4.622E+00	0.161
AM-241	1.078E+00		1.336E+00	2.457E+00	2.766E-02	0.439

10B 5/10/13

VAX/VMS Peak Search Report Generated 10-MAY-2013 14:14:55.05

Configuration : DKA100:[GAMMA.SCUSR.ARCHIVE]SMP_130410716_GE2_BAFIL_191426.CN
Analyses by : PEAK V16.9 PEAKEFF V2.2
Client ID : PZ-109-SS TOT
Deposition Date :
Sample Date : 10-MAY-2013 00:00:00 Acquisition date : 10-MAY-2013 13:59:37
Sample ID : 1304107-16 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 00:15:00.27 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	30.97	1733	118	1.45	31.08	26	15	1.93E+00	2.5	1.24E+01
2	3	35.23	425	136	1.53	35.35	26	15	4.72E-01	6.3	
3	1	62.00	177	70	1.46	62.11	57	13	1.96E-01	9.9	2.74E+00
4	1	65.75	75	65	1.47	65.87	57	13	8.34E-02	19.0	
5	0	81.15	652	99	1.68	81.26	77	7	7.25E-01	4.6	
6	0	93.62	21	60	1.09	93.73	90	6	2.38E-02	61.0	
7	1	111.86	149	41	1.55	111.97	108	13	1.66E-01	10.5	1.36E+00
8	1	116.03	33	40	1.56	116.14	108	13	3.62E-02	34.4	
9	0	135.04	14	50	1.76	135.16	132	6	1.60E-02	81.1	
10	0	161.09	23	69	1.92	161.20	156	8	2.53E-02	67.6	
11	0	187.12	22	94	1.50	187.24	182	9	2.50E-02	80.7	
12	0	212.06	17	55	2.94	212.17	207	8	1.89E-02	79.8	
13	0	224.17	26	20	1.31	224.28	222	6	2.86E-02	34.3	
14	0	277.13	61	37	2.03	277.24	272	10	6.76E-02	22.8	
15	0	303.04	137	43	1.13	303.15	301	6	1.52E-01	11.2	
16	0	333.56	56	23	1.52	333.67	329	8	6.18E-02	20.3	
17	0	356.11	460	23	1.55	356.22	351	10	5.11E-01	5.0	
18	0	365.61	10	23	1.45	365.72	362	7	1.15E-02	80.8	
19	2	384.06	89	20	2.04	384.16	381	9	9.83E-02	15.0	3.74E+00
20	2	386.92	159	27	1.65	387.03	381	9	1.76E-01	9.7	
21	4	414.93	32	8	2.51	415.03	410	18	3.58E-02	25.6	9.72E-01
22	4	418.33	9	7	2.28	418.43	410	18	9.80E-03	90.1	
23	0	437.38	66	20	1.55	437.48	433	9	7.29E-02	17.5	
24	0	469.46	9	21	1.46	469.56	465	9	1.03E-02	94.0	
25	6	510.01	19	3	2.16	510.11	506	12	2.16E-02	31.5	1.21E+00
26	6	512.51	21	5	3.16	512.62	506	12	2.28E-02	36.5	
27	0	583.92	6	2	1.04	584.02	581	5	6.25E-03	59.3	
28	0	794.74	6	0	1.98	794.83	792	6	6.67E-03	40.8	
29	0	895.25	4	3	2.66	895.34	891	6	4.60E-03	81.9	

Sample ID : 1304107-16 Acquisition date : 10-MAY-2013 13:59:37

Total number of lines in spectrum	29	
Number of unidentified lines	24	
Number of lines tentatively identified by NID	5	17.24%

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	3.300E+02	3.300E+02	0.654E+02	19.81	
	Total Activity :		3.300E+02	3.300E+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	6.062E+02	6.062E+02	1.326E+02	21.87	
	Total Activity :		6.062E+02	6.062E+02			
	Grand Total Activity :		9.362E+02	9.362E+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	3.300E+02	3.300E+02	19.81	OK
	302.84	17.80	7.560E+00	3.051E+02	3.051E+02	37.41	OK
	356.01	60.00	7.170E+00	3.213E+02	3.213E+02	18.20	OK

Final Mean for 3 Valid Peaks = 3.300E+02+/- 6.537E+01 (19.81%)

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	6.062E+02	6.062E+02	21.87	OK

Final Mean for 1 Valid Peaks = 6.062E+02+/- 1.326E+02 (21.87%)

Flag: "*" = Keyline

---- Identified Nuclides ----

Nuclide	Activity (pCi/filter)	Act error	MDA (pCi/filter)	MDA error	Act/MDA
BA-133	3.300E+02	6.537E+01	2.139E+01	3.642E+00	15.428
TH-234	6.062E+02	1.326E+02	1.443E+02	1.192E+01	4.202

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

Nuclide	Key-Line Activity (pCi/filter)	K.L. Ided	Act error	MDA (pCi/filter)	MDA error	Act/MDA
CO-57	-5.331E-02		5.932E+00	9.600E+00	1.474E+00	-0.006
CD-109	-5.726E+01		1.115E+02	1.705E+02	1.957E+01	-0.336
PA-231	3.221E+01		4.913E+00	9.511E+00	1.811E-01	3.386
PA-234	2.169E+00		1.792E+00	3.147E+00	6.492E-02	0.689
NP-237	1.983E+00		3.615E+01	5.233E+01	5.908E+00	0.038
AM-241	1.287E+01		9.183E+00	1.743E+01	1.349E+00	0.738

KJB 5/10/13

VAX/VMS Peak Search Report Generated 10-MAY-2013 14:15:30.57

Configuration : DKA100:[GAMMA.SCUSR.ARCHIVE]SMP_130410717_GE3_BAFIL_191427.CN
Analyses by : PEAK V16.9 PEAKEFF V2.2
Client ID : PZ-109-SS DIS
Deposition Date :
Sample Date : 10-MAY-2013 00:00:00 Acquisition date : 10-MAY-2013 14:00:13
Sample ID : 1304107-17 Sample Quantity : 1.00000E+00 filter
Sample type : FILTER Sample Geometry : 0
Detector name : GE3 Detector Geometry: BAFIL
Elapsed live time: 0 00:15:00.00 Elapsed real time: 0 00:15:03.18 0.4%
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	30.88	1866	79	1.49	31.20	27	22	2.07E+00	2.4	6.40E+00
2	3	35.12	418	67	1.66	35.44	27	22	4.64E-01	5.9	
3	0	52.60	97	137	3.50	52.91	49	10	1.07E-01	24.7	
4	0	61.86	200	125	1.37	62.18	59	6	2.22E-01	11.4	
5	0	65.95	82	103	1.70	66.26	65	5	9.06E-02	22.1	
6	0	81.11	748	186	1.86	81.43	76	11	8.31E-01	5.1	
7	0	93.24	52	88	1.23	93.55	91	7	5.73E-02	33.0	
8	5	111.97	222	54	1.56	112.28	108	16	2.47E-01	8.2	1.60E+00
9	5	116.40	55	46	2.34	116.72	108	16	6.16E-02	31.6	
10	0	161.58	39	69	1.29	161.89	158	8	4.30E-02	41.1	
11	0	276.48	66	26	1.27	276.79	273	8	7.30E-02	18.3	
12	0	303.18	102	41	1.44	303.49	300	7	1.13E-01	14.3	
13	3	333.95	75	21	2.01	334.26	329	19	8.29E-02	14.6	2.53E+00
14	3	337.56	16	14	2.22	337.86	329	19	1.75E-02	59.2	
15	0	356.14	447	27	1.88	356.45	352	9	4.97E-01	5.2	
16	2	383.72	76	18	2.06	384.02	381	15	8.44E-02	14.5	1.59E+01
17	2	387.04	188	10	1.88	387.34	381	15	2.09E-01	8.2	
18	2	390.99	32	5	2.06	391.30	381	15	3.60E-02	36.0	
19	1	414.86	32	14	1.89	415.16	411	11	3.50E-02	25.7	3.33E+00
20	1	418.53	15	21	1.90	418.83	411	11	1.65E-02	55.0	
21	0	437.19	79	8	1.78	437.49	434	8	8.73E-02	12.9	
22	4	468.22	14	3	2.57	468.52	465	14	1.60E-02	34.8	1.24E+00
23	4	473.65	9	1	2.58	473.95	465	14	9.78E-03	50.8	
24	0	510.76	18	3	1.18	511.06	508	6	2.00E-02	28.1	
25	0	596.46	8	0	2.75	596.75	594	6	8.89E-03	35.4	

Sample ID : 1304107-17 Acquisition date : 10-MAY-2013 14:00:13

Total number of lines in spectrum	25	
Number of unidentified lines	21	
Number of lines tentatively identified by NID	4	16.00%

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	3.583E+02	3.583E+02	0.674E+02	18.80	
	Total Activity :		3.583E+02	3.583E+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	5.955E+02	5.955E+02	1.411E+02	23.69	
	Total Activity :		5.955E+02	5.955E+02			
	Grand Total Activity :		9.538E+02	9.538E+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*	1.899E+01	3.583E+02	3.583E+02	18.80	OK
	302.84	17.80	6.222E+00	2.762E+02	2.763E+02	35.31	OK
	356.01	60.00	5.860E+00	3.819E+02	3.819E+02	17.12	OK

Final Mean for 3 Valid Peaks = 3.583E+02+/- 6.738E+01 (18.80%)

Nuclide Type: NATURAL

Nuclide	Energy	%Abn	%Eff	Uncorrected pCi/filter	Decay Corr pCi/filter	2-Sigma %Error	Status
TH-234	63.29	3.80*	2.648E+01	5.955E+02	5.955E+02	23.69	OK

Final Mean for 1 Valid Peaks = 5.955E+02+/- 1.411E+02 (23.69%)

Flag: "*" = Keyline

---- Identified Nuclides ----

Nuclide	Activity (pCi/filter)	Act error	MDA (pCi/filter)	MDA error	Act/MDA
BA-133	3.583E+02	6.738E+01	2.015E+01	3.081E+00	17.786
TH-234	5.955E+02	1.411E+02	1.531E+02	8.222E+00	3.890

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

Nuclide	Key-Line Activity (pCi/filter)	K.L. Ided	Act error	MDA (pCi/filter)	MDA error	Act/MDA
CO-57	2.317E+00		4.513E+00	8.103E+00	9.257E-01	0.286
CD-109	2.780E+01		1.305E+02	1.900E+02	1.567E+01	0.146
PA-231	1.146E+00		1.666E+00	3.132E+00	4.454E-02	0.366
PA-234	3.061E+00		1.369E+00	2.698E+00	3.838E-02	1.135
NP-237	1.810E+01		3.774E+01	5.686E+01	4.596E+00	0.318
AM-241	2.331E+01		9.695E+00	1.693E+01	8.323E-01	1.377

KB 5/10/13

VAX/VMS Peak Search Report Generated 10-MAY-2013 14:16:23.98

Configuration : DKA100:[GAMMA.SCUSR.ARCHIVE]SMP_130410718_GE5_BAFIL_191428.CN
Analyses by : PEAK V16.9 PEAKEFF V2.2
Client ID : PZ-104-KS TOT
Deposition Date :
Sample Date : 10-MAY-2013 00:00:00 Acquisition date : 10-MAY-2013 14:00:43
Sample ID : 1304107-18 Sample Quantity : 1.00000E+00 filter
Sample type : FILTER Sample Geometry : 0
Detector name : GE5 Detector Geometry: BAFIL
Elapsed live time: 0 00:15:00.00 Elapsed real time: 0 00:15:01.15 0.1%
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	0	10.58	13	3	0.67	106.95	100	13	1.44E-02	39.7	
2	1	20.91	40	32	0.50	206.00	202	17	4.40E-02	27.4	6.35E+00
3	1	21.43	64	25	0.51	211.00	202	17	7.14E-02	24.1	
4	0	31.12	1601	107	0.87	304.01	292	24	1.78E+00	3.0	
5	2	35.28	309	17	0.58	343.89	331	31	3.43E-01	6.8	6.00E-01
6	2	36.21	93	18	0.69	352.86	331	31	1.03E-01	20.6	
7	0	53.50	19	28	0.44	518.76	512	13	2.13E-02	54.3	
8	0	62.05	226	32	0.76	600.80	586	26	2.51E-01	8.7	
9	2	79.94	31	31	0.84	772.45	759	40	3.42E-02	51.4	1.08E+00
10	2	81.40	712	15	0.68	786.48	759	40	7.91E-01	3.9	
11	0	84.56	16	16	0.91	816.84	803	19	1.77E-02	56.8	
12	0	112.33	138	31	0.69	1083.24	1072	20	1.54E-01	11.8	
13	0	116.37	29	12	0.40	1121.99	1114	15	3.17E-02	29.8	
14	10	277.21	56	2	1.15	2665.45	2650	25	6.24E-02	14.1	5.53E-01
15	10	277.89	11	1	0.66	2671.98	2650	25	1.22E-02	26.4	
16	0	303.83	77	12	0.87	2920.89	2904	26	8.61E-02	13.9	
17	0	334.74	39	6	0.52	3217.41	3202	26	4.37E-02	19.4	
18	0	356.97	311	15	0.76	3430.80	3414	30	3.46E-01	6.2	
19	0	384.89	59	8	0.32	3698.69	3682	27	6.61E-02	15.9	
20	0	387.83	108	12	0.96	3726.88	3712	29	1.20E-01	11.4	

Sample ID : 1304107-18 Acquisition date : 10-MAY-2013 14:00:43

Total number of lines in spectrum	20	
Number of unidentified lines	12	
Number of lines tentatively identified by NID	8	40.00%

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	3.594E+02	3.595E+02	0.617E+02	17.17	
NP-237	2.14E+06Y	1.00	3.016E+01	3.016E+01	3.436E+01	113.92	
Total Activity :			3.896E+02	3.896E+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
PA-231	3.28E+04Y	1.00	9.273E-01	9.273E-01	7.380E-01	79.59	
PA-234	4.47E+09Y	1.00	2.971E+00	2.971E+00	1.438E+00	48.39	
TH-234	4.47E+09Y	1.00	2.041E+02	2.041E+02	0.367E+02	17.96	
Total Activity :			2.080E+02	2.080E+02			

Grand Total Activity : 5.976E+02 5.976E+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*	1.802E+01	3.594E+02	3.595E+02	17.17	OK
	302.84	17.80	2.575E+00	5.076E+02	5.077E+02	38.34	OK
	356.01	60.00	4.312E+00	3.614E+02	3.614E+02	19.03	OK
	Final Mean for 3 Valid Peaks = 3.595E+02+/- 6.171E+01 (17.17%)						
NP-237	86.50	12.60*	1.262E+01	3.016E+01	3.016E+01	113.92	OK
	Final Mean for 1 Valid Peaks = 3.016E+01+/- 3.436E+01 (113.92%)						

Nuclide Type: NATURAL

Nuclide	Energy	%Abn	%Eff	Uncorrected pCi/filter	Decay Corr pCi/filter	2-Sigma %Error	Status
PA-231	9.28	42.00*	1.000E+02	9.273E-01	9.273E-01	79.59	OK
	10.11	20.20	1.000E+02	1.928E+00	1.928E+00	79.59	OK
	283.67	1.60	2.191E+00	----- Line Not Found		-----	Absent
	302.67	2.30	2.572E+00	3.935E+03	3.935E+03	37.02	OK
	Final Mean for 3 Valid Peaks = 9.273E-01+/- 7.380E-01 (79.59%)						
PA-234	9.89	89.00	1.000E+02	4.376E-01	4.376E-01	79.59	OK
	21.72	64.90*	1.000E+02	2.971E+00	2.971E+00	48.39	OK
	37.93	23.75	1.000E+02	1.177E+01	1.177E+01	41.51	OK
	131.42	20.40	2.473E+00	----- Line Not Found		-----	Absent
	Final Mean for 3 Valid Peaks = 2.971E+00+/- 1.438E+00 (48.39%)						
TH-234	63.29	3.80*	8.750E+01	2.041E+02	2.041E+02	17.96	OK
	Final Mean for 1 Valid Peaks = 2.041E+02+/- 3.667E+01 (17.96%)						

Flag: "*" = Keyline

---- Identified Nuclides ----

Nuclide	Activity (pCi/filter)	Act error	MDA (pCi/filter)	MDA error	Act/MDA
BA-133	3.595E+02	6.171E+01	1.394E+01	2.052E+00	25.792
PA-231	9.273E-01	7.380E-01	1.287E+00	1.449E-02	0.720
PA-234	2.971E+00	1.438E+00	8.382E-01	9.435E-03	3.545
TH-234	2.041E+02	3.667E+01	2.472E+01	3.181E-01	8.257
NP-237	3.016E+01	3.436E+01	4.916E+01	4.336E+00	0.613

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

Nuclide	Key-Line Activity (pCi/filter)	K.L. Ided	Act error	MDA (pCi/filter)	MDA error	Act/MDA
CO-57	5.408E+00		1.398E+01	2.721E+01	9.225E+00	0.199
CD-109	3.448E+01		8.675E+01	1.695E+02	1.631E+01	0.203
AM-241	2.414E-01		1.412E+00	2.243E+00	2.525E-02	0.108

16
5/12/13

VAX/VMS Peak Search Report Generated 10-MAY-2013 14:30:37.76

Configuration : DKA100:[GAMMA.SCUSR.ARCHIVE]SMP_130410719_GE2_BAFIL_191430.CN
Analyses by : PEAK V16.9 PEAKEFF V2.2
Client ID : PZ-104-KS DIS
Deposition Date :
Sample Date : 10-MAY-2013 00:00:00 Acquisition date : 10-MAY-2013 14:15:19
Sample ID : 1304107-19 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	28.02	36	132	1.66	28.13	26	19	4.05E-02	60.4	7.62E+00
2	3	31.01	1785	100	1.37	31.13	26	19	1.98E+00	2.5	
3	3	35.05	445	116	1.68	35.17	26	19	4.95E-01	6.0	
4	0	46.78	39	111	1.84	46.90	45	5	4.34E-02	43.6	
5	0	53.26	113	136	3.10	53.38	50	8	1.26E-01	20.4	
6	1	59.02	28	27	1.45	59.13	58	16	3.11E-02	25.6	6.01E+00
7	1	61.99	172	53	1.46	62.10	58	16	1.91E-01	10.0	
8	1	65.79	75	53	1.47	65.90	58	16	8.29E-02	19.0	
9	1	81.02	665	43	1.50	81.14	76	11	7.38E-01	4.3	5.43E+00
10	1	83.89	14	40	1.37	84.00	76	11	1.60E-02	124.2	
11	0	93.65	44	87	2.16	93.77	90	9	4.93E-02	40.9	
12	1	111.87	149	44	1.55	111.99	108	12	1.66E-01	10.8	1.83E+00
13	1	116.01	31	39	1.56	116.12	108	12	3.49E-02	36.8	
14	0	156.62	13	61	2.69	156.74	153	6	1.43E-02	100.9	
15	0	207.03	24	104	5.36	207.14	200	13	2.67E-02	90.7	
16	0	276.30	39	44	1.88	276.41	271	11	4.37E-02	36.3	
17	1	302.93	172	14	1.46	303.03	298	25	1.92E-01	8.1	3.22E+00
18	1	306.98	17	14	1.79	307.09	298	25	1.93E-02	49.7	
19	1	311.73	11	14	1.79	311.84	298	25	1.19E-02	59.1	
20	1	315.06	9	13	1.79	315.16	298	25	1.02E-02	77.2	
21	1	333.87	67	17	1.76	333.97	330	15	7.47E-02	14.8	1.78E+00
22	1	337.96	29	13	1.82	338.07	330	15	3.20E-02	29.2	
23	1	352.01	18	5	1.83	352.12	350	13	2.04E-02	24.0	2.89E+00
24	1	356.06	513	6	1.50	356.17	350	13	5.70E-01	4.4	
25	7	383.83	82	13	2.31	383.94	380	17	9.16E-02	15.8	4.64E+00
26	7	386.99	175	10	1.84	387.10	380	17	1.95E-01	9.6	
27	7	391.30	41	11	2.37	391.40	380	17	4.54E-02	25.8	
28	0	398.43	9	2	1.49	398.54	396	5	9.80E-03	42.6	
29	0	418.04	53	33	3.70	418.15	412	16	5.86E-02	28.7	
30	0	437.27	87	4	1.45	437.37	434	8	9.67E-02	11.4	
31	0	469.22	7	13	1.19	469.33	466	6	7.83E-03	87.4	
32	0	491.18	10	2	2.57	491.29	488	6	1.06E-02	38.3	
33	0	498.26	11	0	3.92	498.36	495	7	1.22E-02	30.2	
34	0	511.54	24	9	1.76	511.64	507	8	2.62E-02	30.8	
35	0	670.73	6	0	2.74	670.83	668	6	6.67E-03	40.8	

Sample ID : 1304107-19 Acquisition date : 10-MAY-2013 14:15:19

Total number of lines in spectrum	35	
Number of unidentified lines	30	
Number of lines tentatively identified by NID	5	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	3.363E+02	3.363E+02	0.655E+02	19.49	
	Total Activity :		3.363E+02	3.363E+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	5.887E+02	5.887E+02	1.294E+02	21.98	
AM-241	432.20Y	1.00	9.509E+00	9.509E+00	4.937E+00	51.92	
	Total Activity :		5.982E+02	5.982E+02			
	Grand Total Activity :		9.345E+02	9.345E+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	3.363E+02	3.363E+02	19.49	OK
	302.84	17.80	7.560E+00	3.846E+02	3.847E+02	33.97	OK
	356.01	60.00	7.170E+00	3.581E+02	3.581E+02	17.50	OK

Final Mean for 3 Valid Peaks = 3.363E+02+/- 6.554E+01 (19.49%)

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	5.887E+02	5.887E+02	21.98	OK

Final Mean for 1 Valid Peaks = 5.887E+02+/- 1.294E+02 (21.98%)

AM-241	59.54	35.90*	2.461E+01	9.509E+00	9.509E+00	51.92	OK

Final Mean for 1 Valid Peaks = 9.509E+00+/- 4.937E+00 (51.92%)

Flag: "*" = Keyline

---- Identified Nuclides ----

Nuclide	Activity (pCi/filter)	Act error	MDA (pCi/filter)	MDA error	Act/MDA
BA-133	3.363E+02	6.554E+01	1.713E+01	2.917E+00	19.631
TH-234	5.887E+02	1.294E+02	1.325E+02	1.095E+01	4.443
AM-241	9.509E+00	4.937E+00	1.310E+01	1.014E+00	0.726

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

Nuclide	Key-Line Activity (pCi/filter)	K.L. Ided	Act error	MDA (pCi/filter)	MDA error	Act/MDA
CO-57	2.622E+00		4.945E+00	8.715E+00	1.338E+00	0.301
CD-109	-4.902E+01		1.180E+02	1.583E+02	1.818E+01	-0.310
PA-231	3.303E+01		5.079E+00	9.779E+00	1.862E-01	3.377
PA-234	4.309E+00		1.703E+00	3.222E+00	6.646E-02	1.337
NP-237	8.645E+00		2.911E+01	4.473E+01	5.051E+00	0.193