

US EPA ARCHIVE DOCUMENT

ENGINEERING MANAGEMENT SUPPORT, INC.

West Lake OU-1

**STANDARD LEVEL IV
REPORT OF ANALYSIS**

WORK ORDER #13-04133-OR

May 22, 2013

**EBERLINE ANALYTICAL/OAK RIDGE LABORATORY
OAK RIDGE, TN**

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**Eberline Services – Oak Ridge Laboratory
LABORATORY DATA SUPPORT CHECKLIST**

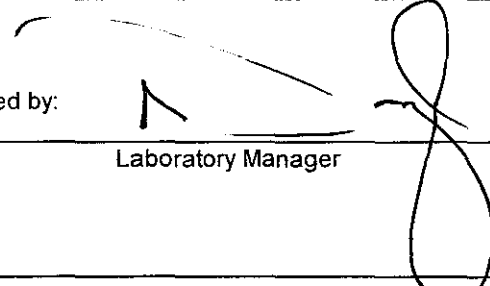
MP-001-3

Eberline Services Work Order # 13-04133

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

Date for Partial	Initials	Date	Initials	Checklist Items
		4/18/13	KC	Sample Log-In
		5/10/13	KBA	Data Compilation
		5-15-13	MMT	First Technical Data Review
		5/15/13	MSA	Second Technical Data Review
		5/21/13	F	Data Entry/Electronic Deliverable
		5/21/13	CE	Case Narrative
		5/22/13	KBA	Electronic Deliverable Proof
		5/22/13	MSA	Samples Analyzed within Holding Time Yes? <input checked="" type="checkbox"/> No? <input type="checkbox"/>
		5/22/13	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

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**SECTION I
CHAIN OF CUSTODY
&
pH CHECK SHEET**



Internal Chain of Custody

Work Order #	13-04133
Lab Deadline	5/9/2013
Analysis	UUISO - Level 4
Sample Matrix	Water

Comments	Sample Fraction	HP 210 / 270 Detector Activity	Storage Location
<p>Fxns 04, 06 & 08 are TOTAL</p> <p>Fxns 05, 07 & 09 are DISSOLVED</p>	04	42	MM1.4
	05	42	MM1.4
	06	37	MM1.4
	07	37	MM1.4
	08	40	MM1.4
	09	40	MM1.4

	Location (circle one)					Initials	Date
Received by	Sample Storage	Rough Prep	Prep	Separations	Count Room	<i>[Signature]</i>	4/29/13
Relinquished by	Sample Storage	Rough Prep	Prep	Separations	Count Room	<i>[Signature]</i>	5/1/13
Received by	Sample Storage	Rough Prep	Prep	Separations	Count Room	<i>[Signature]</i>	4/30/13
Relinquished by	Sample Storage	Rough Prep	Prep	Separations	Count Room	<i>[Signature]</i>	5/6/13
Received by	Sample Storage	Rough Prep	Prep	Separations	Count Room	<i>[Signature]</i>	5/1/13
Relinquished by	Sample Storage	Rough Prep	Prep	Separations	Count Room	<i>[Signature]</i>	5/7/13
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		

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Internal Chain of Custody

Work Order #	13-04133
Lab Deadline	5/9/2013
Analysis	ThISO - Level 4
Sample Matrix	Water

Comments	Sample Fraction	HP 210 / 270 Detector Activity	Storage Location
<p>Fxns 04, 06 & 08 are TOTAL</p> <p>Fxns 05, 07 & 09 are DISSOLVED</p>	04	42	MM1.4
	05	42	MM1.4
	06	37	MM1.4
	07	37	MM1.4
	08	40	MM1.4
	09	40	MM1.4

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	Location (circle one)					Initials	Date
Received by	Sample Storage	Rough Prep	Prep	Separations	Count Room	[Signature]	4/29/13
Relinquished by	Sample Storage	Rough Prep	Prep	Separations	Count Room	[Signature]	4/30/13
Received by	Sample Storage	Rough Prep	Prep	Separations	Count Room	OS45PM	4/30/13
Relinquished by	Sample Storage	Rough Prep	Prep	Separations	Count Room	1000	PM 5/6/13
Received by	Sample Storage	Rough Prep	Prep	Separations	Count Room	[Signature]	
Relinquished by	Sample Storage	Rough Prep	Prep	Separations	Count Room	[Signature]	
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 #	13-04133
Lab Deadline	5/9/2013
Analysis	Ra226 - Level 4
Sample Matrix	Water

Comments	Sample Fraction	HP 210 / 270 Detector Activity	Storage Location
<p>Fxns 04, 06 & 08 are TOTAL</p> <p>Fxns 05, 07 & 09 are DISSOLVED</p>	04	42	MM1.4
	05	42	MM1.4
	06	37	MM1.4
	07	37	MM1.4
	08	40	MM1.4
	09	40	MM1.4

	Location (circle one)					Initials	Date
Received by	Sample Storage	Rough Prep	Prep	Separations	Count Room	[Signature]	4/29/13
Relinquished by	Sample Storage	Rough Prep	Prep	Separations	Count Room	[Signature]	4/29/13
Received by	Sample Storage	Rough Prep	Prep	Separations	Count Room	[Signature]	4-30-13
Relinquished by	Sample Storage	Rough Prep	Prep	Separations	Count Room	[Signature]	5-1-13
Received by	Sample Storage	Rough Prep	Prep	Separations	Count Room	[Signature]	5/1/13
Relinquished by	Sample Storage	Rough Prep	Prep	Separations	Count Room	[Signature]	5/2/13
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		

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Oak Ridge Laboratory


Internal Chain of Custody

Work Order #	13-04133
Lab Deadline	5/9/2013
Analysis	Ra228 - Level 4
Sample Matrix	Water

Comments	Sample Fraction	HP 210 / 270 Detector Activity	Storage Location
<p>Fxns 04, 06 & 08 are TOTAL</p> <p>Fxns 05, 07 & 09 are DISSOLVED</p>	04	42	MM1.4
	05	42	MM1.4
	06	37	MM1.4
	07	37	MM1.4
	08	40	MM1.4
	09	40	MM1.4

	Location (circle one)					Initials	Date
Received by	Sample Storage	Rough Prep	Prep	Separations	Count Room	<i>[Signature]</i>	5/13/13
Relinquished by	Sample Storage	Rough Prep	Prep	Separations	Count Room	<i>[Signature]</i>	5/13/13
Received by	Sample Storage	Rough Prep	Prep	Separations	Count Room	<i>[Signature]</i>	4-20-13 0630
Relinquished by	Sample Storage	Rough Prep	Prep	Separations	Count Room	<i>[Signature]</i>	5-1-13 1415
Received by	Sample Storage	Rough Prep	Prep	Separations	Count Room	<i>[Signature]</i>	5/11/13 1215
Relinquished by	Sample Storage	Rough Prep	Prep	Separations	Count Room	<i>[Signature]</i>	5/2/13 1248
Received by	Sample Storage	Rough Prep	Prep	Separations	Count Room	<i>[Signature]</i>	5/2/13 1415
Relinquished by	Sample Storage	Rough Prep	Prep	Separations	Count Room	<i>[Signature]</i>	5-10-13 0657
Received by	Sample Storage	Rough Prep	Prep	Separations	Count Room	<i>[Signature]</i>	5-11-13 0607
Relinquished by	Sample Storage	Rough Prep	Prep	Separations	Count Room	<i>[Signature]</i>	5/10/13
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		

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	Sample Receiving Report (Volumes, pH, & CPM)	Internal Work Order
		13-04133
		Received By KCOULSTON

FR	ClientID	# Btls	Comments	Matrix	Storage	Rec Vol Ttl	CPM Max	
01	LCS	0		WA	MM1.4			
02	BLANK	0		WA	MM1.4			
03	DUP	0		WA	MM1.4			
04	I-65 TOT ✓	1		WA	MM1.4	9.50	42	
				Container Number	pH Orig	pH Final	Volume (L)	CPM
				1	7	7	9.5000	42
05	I-65 DIS ✓	1		WA	MM1.4	0.00	42	
				Container Number	pH Orig	pH Final	Volume (L)	CPM
				1				42
06	DUP 08 TOT ✓	1		WA	MM1.4	9.50	37	
				Container Number	pH Orig	pH Final	Volume (L)	CPM
				1	7	7	9.5000	37
07	DUP 08 DIS ✓	1		WA	MM1.4	0.00	37	
				Container Number	pH Orig	pH Final	Volume (L)	CPM
				1				37
08	PURGE TANK TOT ✓	1		WA	MM1.4	9.50	40	
				Container Number	pH Orig	pH Final	Volume (L)	CPM
				1	7	7	9.5000	40
09	PURGE TANK DIS ✓	1		WA	MM1.4	0.00	40	
				Container Number	pH Orig	pH Final	Volume (L)	CPM
				1				40

EJ
04/18/13

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Received by: *Kristen Coulston* Date: *4/18/13*

SECTION II
SAMPLE ACKNOWLEDGEMENT



Eberline Services – Oak Ridge Laboratory

SAMPLE RECEIPT CHECKLIST

MP-001-2

13-04133

WORK ORDER # _____

SAMPLE MATRIX/MATRICES:

(CIRCLE ONE OR BOTH)

AQUEOUS NON-AQUEOUS

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

WERE SAMPLES:

Received in good condition?	<u>Y</u>	N	
If aqueous, properly preserved	<u>Y</u>	N	N/A

WERE CHAIN OF CUSTODY SEALS:

Present on outside of package?	<u>Y</u>	N
Unbroken on outside of package?	<u>Y</u>	N
Present on samples?	<u>Y</u>	N
Unbroken on samples?	<u>Y</u>	N
Was chain of custody present upon sample receipt?	<u>Y</u>	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: 4/18/13

SECTION III
CASE NARRATIVE



EBS-OR-35586

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 # 13-04133-OR

SAMPLE RECEIPT

This work order contains three water samples received 04/18/2013. All samples were analyzed as total and dissolved for Isotopic Uranium, Isotopic Thorium and Radium-226/228.

<u>CLIENT ID</u>	<u>LAB ID</u>
I-65 TOT	13-04133-04
I-65 DIS	13-04133-05
DUP 08 TOT	13-04133-06
DUP 08 DIS	13-04133-07
PURGE TANK TOT	13-04133-08
PURGE TANK DIS	13-04133-09

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.

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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 acceptable for all samples. The Uranium-234, Uranium-235 and Uranium-238 method blank demonstrated acceptable results. Results for the Uranium-234 duplicate demonstrated an acceptable relative percent difference and normalized difference. Results for the 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 and Thorium-232 method blank demonstrated acceptable results. The Thorium-230 method blank demonstrated results greater than the detection limit. Results for the Thorium-228 duplicate demonstrated an acceptable relative percent difference and normalized difference. Results for the 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

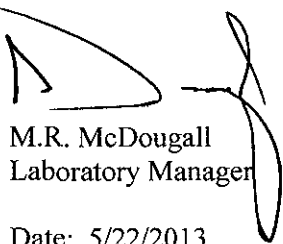
RADIUM-228

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

CERTIFICATION OF ACCURACY

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



M.R. McDougall
Laboratory Manager

Date: 5/22/2013

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

SECTION IV
ANALYTICAL RESULTS SUMMARY

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

Project: West Lake OU-1
 SDG: 1304133
 Received: 04/18/2013
 Matrix: Water

Final Report of Analysis
 Date: 5/22/2013
 Page 1 of 3

<u>Client Sample ID</u>	<u>Lab Sample ID</u>	<u>Analysis Date/Time</u>	<u>Analyte</u>	<u>Method</u>	<u>Result</u>	<u>Error</u>	<u>MDA</u>	<u>Qualifier</u>	<u>Units</u>
LCS13-04133-01	13-04133-01	05/02/2013 09:14:03	Radium-226	E903.0	10.52	1.22	0.18		pCi/l
LCS13-04133-01	13-04133-01	05/10/2013 10:57:32	Radium-228	E904.0	10.94	2.46	2.47		pCi/l
LCS13-04133-01	13-04133-01	05/06/2013 16:25:27	Thorium-228	HASL 300, 4.5.2	5.79	0.90	0.13		pCi/l
LCS13-04133-01	13-04133-01	05/06/2013 16:25:27	Thorium-230	HASL 300, 4.5.2	6.66	1.01	0.08		pCi/l
LCS13-04133-01	13-04133-01	05/06/2013 16:25:27	Thorium-232	HASL 300, 4.5.2	4.44	0.73	0.10		pCi/l
LCS13-04133-01	13-04133-01	05/07/2013 06:01:43	Uranium-234	HASL 300, 4.5.2	7.05	0.90	0.05		pCi/l
LCS13-04133-01	13-04133-01	05/07/2013 06:01:43	Uranium-235	HASL 300, 4.5.2	0.46	0.16	0.06		pCi/l
LCS13-04133-01	13-04133-01	05/07/2013 06:01:43	Uranium-238	HASL 300, 4.5.2	7.69	0.96	0.05		pCi/l
BLANK13-04133-02	13-04133-02	05/02/2013 09:14:05	Radium-226	E903.0	-0.02	0.04	0.13	U	pCi/l
BLANK13-04133-02	13-04133-02	05/10/2013 08:11:15	Radium-228	E904.0	0.44	0.40	0.81	J	pCi/l
BLANK13-04133-02	13-04133-02	05/06/2013 16:25:28	Thorium-228	HASL 300, 4.5.2	0.06	0.09	0.16	U	pCi/l
BLANK13-04133-02	13-04133-02	05/06/2013 16:25:28	Thorium-230	HASL 300, 4.5.2	0.48	0.21	0.13		pCi/l
BLANK13-04133-02	13-04133-02	05/06/2013 16:25:28	Thorium-232	HASL 300, 4.5.2	-0.02	0.04	0.12	U	pCi/l
BLANK13-04133-02	13-04133-02	05/07/2013 06:01:45	Uranium-234	HASL 300, 4.5.2	0.05	0.05	0.05	U	pCi/l
BLANK13-04133-02	13-04133-02	05/07/2013 06:01:45	Uranium-235	HASL 300, 4.5.2	0.01	0.04	0.08	U	pCi/l
BLANK13-04133-02	13-04133-02	05/07/2013 06:01:45	Uranium-238	HASL 300, 4.5.2	0.02	0.03	0.05	U	pCi/l
I-65 TOT DUP	13-04133-03	05/02/2013 09:14:00	Radium-226	E903.0	0.55	0.23	0.12		pCi/l
I-65 TOT DUP	13-04133-03	05/10/2013 08:11:15	Radium-228	E904.0	0.89	0.38	0.71	J	pCi/l
DUP 08 TOT DUP	13-04133-03	05/06/2013 16:25:29	Thorium-228	HASL 300, 4.5.2	0.29	0.15	0.11		pCi/l
DUP 08 TOT DUP	13-04133-03	05/06/2013 16:25:29	Thorium-230	HASL 300, 4.5.2	0.26	0.13	0.08		pCi/l
DUP 08 TOT DUP	13-04133-03	05/06/2013 16:25:29	Thorium-232	HASL 300, 4.5.2	0.04	0.05	0.06	U	pCi/l
DUP 08 TOT DUP	13-04133-03	05/07/2013 06:01:40	Uranium-234	HASL 300, 4.5.2	0.70	0.22	0.07		pCi/l
DUP 08 TOT DUP	13-04133-03	05/07/2013 06:01:40	Uranium-235	HASL 300, 4.5.2	0.20	0.13	0.12	J	pCi/l
DUP 08 TOT DUP	13-04133-03	05/07/2013 06:01:40	Uranium-238	HASL 300, 4.5.2	0.81	0.24	0.10		pCi/l

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EBERLINE ANALYTICAL CORPORATION

601 SCARBORO ROAD OAK RIDGE, TN 37830 865/481-0683 FAX 865/483-4621

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

Project: West Lake OU-1
 SDG: 1304133
 Received: 04/18/2013
 Matrix: Water

Final Report of Analysis
 Date: 5/22/2013
 Page 2 of 3

<u>Client Sample ID</u>	<u>Lab Sample ID</u>	<u>Analysis Date/Time</u>	<u>Analyte</u>	<u>Method</u>	<u>Result</u>	<u>Error</u>	<u>MDA</u>	<u>Qualifier</u>	<u>Units</u>
I-65 TOT	13-04133-04	05/02/2013 09:14:01	Radium-226	E903.0	0.54	0.23	0.11		pCi/l
I-65 TOT	13-04133-04	05/10/2013 08:11:15	Radium-228	E904.0	0.61	0.41	0.81	J	pCi/l
I-65 TOT	13-04133-04	05/06/2013 16:25:30	Thorium-228	HASL 300, 4.5.2	0.25	0.14	0.11		pCi/l
I-65 TOT	13-04133-04	05/06/2013 16:25:30	Thorium-230	HASL 300, 4.5.2	0.09	0.08	0.10	J	pCi/l
I-65 TOT	13-04133-04	05/06/2013 16:25:30	Thorium-232	HASL 300, 4.5.2	0.04	0.05	0.06	U	pCi/l
I-65 TOT	13-04133-04	05/07/2013 06:01:41	Uranium-234	HASL 300, 4.5.2	0.91	0.25	0.07		pCi/l
I-65 TOT	13-04133-04	05/07/2013 06:01:41	Uranium-235	HASL 300, 4.5.2	0.00	0.05	0.11	U	pCi/l
I-65 TOT	13-04133-04	05/07/2013 06:01:41	Uranium-238	HASL 300, 4.5.2	0.85	0.24	0.09		pCi/l
I-65 DIS	13-04133-05	05/02/2013 09:14:14	Radium-226	E903.0	0.30	0.17	0.13		pCi/l
I-65 DIS	13-04133-05	05/10/2013 08:11:15	Radium-228	E904.0	0.81	0.46	0.88	J	pCi/l
I-65 DIS	13-04133-05	05/06/2013 16:25:31	Thorium-228	HASL 300, 4.5.2	-0.03	0.03	0.12	U	pCi/l
I-65 DIS	13-04133-05	05/06/2013 16:25:31	Thorium-230	HASL 300, 4.5.2	0.13	0.09	0.07	J	pCi/l
I-65 DIS	13-04133-05	05/06/2013 16:25:31	Thorium-232	HASL 300, 4.5.2	0.01	0.03	0.07	U	pCi/l
I-65 DIS	13-04133-05	05/07/2013 06:01:54	Uranium-234	HASL 300, 4.5.2	0.64	0.24	0.12		pCi/l
I-65 DIS	13-04133-05	05/07/2013 06:01:54	Uranium-235	HASL 300, 4.5.2	0.05	0.07	0.10	U	pCi/l
I-65 DIS	13-04133-05	05/07/2013 06:01:54	Uranium-238	HASL 300, 4.5.2	0.57	0.22	0.10		pCi/l
DUP 08 TOT	13-04133-06	05/02/2013 09:14:10	Radium-226	E903.0	0.47	0.21	0.15		pCi/l
DUP 08 TOT	13-04133-06	05/10/2013 08:11:15	Radium-228	E904.0	0.91	0.46	0.88	J	pCi/l
DUP 08 TOT	13-04133-06	05/06/2013 16:25:33	Thorium-228	HASL 300, 4.5.2	0.30	0.15	0.12		pCi/l
DUP 08 TOT	13-04133-06	05/06/2013 16:25:33	Thorium-230	HASL 300, 4.5.2	0.17	0.11	0.09	J	pCi/l
DUP 08 TOT	13-04133-06	05/06/2013 16:25:33	Thorium-232	HASL 300, 4.5.2	0.03	0.04	0.07	U	pCi/l
DUP 08 TOT	13-04133-06	05/07/2013 06:01:50	Uranium-234	HASL 300, 4.5.2	0.67	0.21	0.10		pCi/l
DUP 08 TOT	13-04133-06	05/07/2013 06:01:50	Uranium-235	HASL 300, 4.5.2	0.08	0.08	0.09	U	pCi/l
DUP 08 TOT	13-04133-06	05/07/2013 06:01:50	Uranium-238	HASL 300, 4.5.2	0.51	0.19	0.13		pCi/l
DUP 08 DIS	13-04133-07	05/02/2013 09:14:12	Radium-226	E903.0	0.25	0.17	0.16	J	pCi/l
DUP 08 DIS	13-04133-07	05/10/2013 08:11:15	Radium-228	E904.0	0.85	0.48	0.94	J	pCi/l
DUP 08 DIS	13-04133-07	05/06/2013 16:26:09	Thorium-228	HASL 300, 4.5.2	0.01	0.03	0.06	U	pCi/l
DUP 08 DIS	13-04133-07	05/06/2013 16:26:09	Thorium-230	HASL 300, 4.5.2	0.07	0.06	0.05	J	pCi/l
DUP 08 DIS	13-04133-07	05/06/2013 16:26:09	Thorium-232	HASL 300, 4.5.2	0.02	0.04	0.07	U	pCi/l
DUP 08 DIS	13-04133-07	05/07/2013 06:01:52	Uranium-234	HASL 300, 4.5.2	0.60	0.18	0.07		pCi/l
DUP 08 DIS	13-04133-07	05/07/2013 06:01:52	Uranium-235	HASL 300, 4.5.2	0.04	0.05	0.07	U	pCi/l
DUP 08 DIS	13-04133-07	05/07/2013 06:01:52	Uranium-238	HASL 300, 4.5.2	0.57	0.18	0.06		pCi/l

US EPA ARCHIVE DOCUMENT

0021



EBERLINE ANALYTICAL CORPORATION

601 SCARBORO ROAD OAK RIDGE, TN 37830 865/481-0683 FAX 865/483-4621

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

Project: West Lake OU-1
SDG: 1304133
Received: 04/18/2013
Matrix: Water

Final Report of Analysis
Date: 5/22/2013
Page 3 of 3

<u>Client Sample ID</u>	<u>Lab Sample ID</u>	<u>Analysis Date/Time</u>	<u>Analyte</u>	<u>Method</u>	<u>Result</u>	<u>Error</u>	<u>MDA</u>	<u>Qualifier</u>	<u>Units</u>
PURGE TANK TOT	13-04133-08	05/02/2013 09:14:07	Radium-226	E903.0	0.32	0.19	0.13		pCi/l
PURGE TANK TOT	13-04133-08	05/10/2013 08:11:15	Radium-228	E904.0	0.81	0.57	1.12	J	pCi/l
PURGE TANK TOT	13-04133-08	05/06/2013 16:26:11	Thorium-228	HASL 300, 4.5.2	0.02	0.04	0.05	U	pCi/l
PURGE TANK TOT	13-04133-08	05/06/2013 16:26:11	Thorium-230	HASL 300, 4.5.2	0.32	0.13	0.06		pCi/l
PURGE TANK TOT	13-04133-08	05/06/2013 16:26:11	Thorium-232	HASL 300, 4.5.2	0.04	0.04	0.05	U	pCi/l
PURGE TANK TOT	13-04133-08	05/07/2013 06:01:46	Uranium-234	HASL 300, 4.5.2	1.85	0.40	0.06		pCi/l
PURGE TANK TOT	13-04133-08	05/07/2013 06:01:46	Uranium-235	HASL 300, 4.5.2	0.11	0.09	0.08	J	pCi/l
PURGE TANK TOT	13-04133-08	05/07/2013 06:01:46	Uranium-238	HASL 300, 4.5.2	0.78	0.24	0.09		pCi/l
PURGE TANK DIS	13-04133-09	05/02/2013 09:14:08	Radium-226	E903.0	0.45	0.25	0.19		pCi/l
PURGE TANK DIS	13-04133-09	05/10/2013 08:11:15	Radium-228	E904.0	0.98	0.52	1.00	J	pCi/l
PURGE TANK DIS	13-04133-09	05/06/2013 16:26:08	Thorium-228	HASL 300, 4.5.2	-0.03	0.10	0.28	U	pCi/l
PURGE TANK DIS	13-04133-09	05/06/2013 16:26:08	Thorium-230	HASL 300, 4.5.2	0.47	0.33	0.23	J	pCi/l
PURGE TANK DIS	13-04133-09	05/06/2013 16:26:08	Thorium-232	HASL 300, 4.5.2	0.34	0.29	0.29	J	pCi/l
PURGE TANK DIS	13-04133-09	05/07/2013 06:01:48	Uranium-234	HASL 300, 4.5.2	1.97	0.43	0.10		pCi/l
PURGE TANK DIS	13-04133-09	05/07/2013 06:01:48	Uranium-235	HASL 300, 4.5.2	0.03	0.06	0.10	U	pCi/l
PURGE TANK DIS	13-04133-09	05/07/2013 06:01:48	Uranium-238	HASL 300, 4.5.2	0.99	0.28	0.07		pCi/l

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0022



EBERLINE ANALYTICAL CORPORATION

601 SCARBORO ROAD OAK RIDGE, TN 37830 865/481-0683 FAX 865/483-4621

SECTION V
ANALYTICAL STANDARDS

U-8

QA/QC REVIEWED
Date 1/16/95 Initials JA

CERTIFICATE OF CALIBRATION ALPHA STANDARD SOLUTION

Radionuclide: U-238NAT
Half Life: $(4.468 \pm 0.005) \times 10^9$ years
Catalog No.: 7338
Source No.: 479-50

Customer: TMA EBERLINE
P.O.No.: OR2778
Reference Date: January 1 1995 12:00 PST.
Contained Radioactivity: (Total U) 8.016 μ Ci
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.

Radiopurities Refer to attached technical data sheet

Radioactive Daughters Refer to attached technical data sheet

Radionuclide Concentration

(Total U) 0.1228 μ Ci/g.

Method of Calibration

Activity calculations are based upon known specific activity and mass.

Uncertainty of Measurement

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

NIST Traceability

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

Leak Test(s)

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

Notes

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


ERIC ALLAS
QUALITY CONTROL

29 DECEMBER 1994
Date Signed



ISOTOPE PRODUCTS LABORATORIES
3017 N. SAN FERNANDO BLVD.
BURBANK, CALIFORNIA 91504
818-843-7000 FAX 818-843-6168



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

SOLUTION REFERENCE # IPL 479-50 CURRENT DATE 9/6/2012 0:00
SOLUTION # U-8

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

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

Certified Activity 8.016E+00 μCi
Certified Concentration $\mu\text{Ci per gram}$

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 HNO₃

Dilution Instructions: Dilution Solvent Used 1M HNO₃

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 [Signature]

Date: 9/26/2012 0:00

QC Approval [Signature]

Date: 9/26/12

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

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

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

Chemical Composition of Standard Solution
Uranly Nitrate in 1M HNO₃

Dilution Instructions: Dilution Solvent Used 1M HNO₃

SECONDARY VOLUMETRIC DILUTION

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

NOTES:

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

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

Expiration Date: September 6, 2013

Verified & Approved By [Signature]
QC Approval [Signature]

Date: 9/26/2012 0:00
Date: 9/20/12

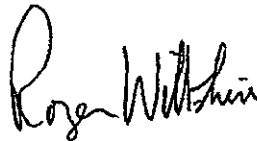
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Tracer Solution for Environmental Analysis & Disequilibrium Studies

Product Description & Measurement Certificate

<i>Description</i>	Principal radionuclide: uranium 232 (U-232) Daughter Nuclide: Th-228	Product code: UDP10050 Batch Number: 92/232/67
<i>Measurement</i>	Reference date: Radioactive concentration U-232 which is equivalent to Mass of solution Volume of solution Total activity of U-232 which is equivalent to	01 March 2000 6.739E+03 becquerels per gram of solution 1.821E-01 microcuries per gram of solution 5.356 grams 5.035 millilitres 3.61E+04 becquerels 9.76E-01 microcuries
<i>Accuracy</i>	Method of measurement (see reverse of this certificate) Random uncertainty is: $\pm 0.7\%$ Systematic uncertainty: $\pm 0.5\%$ Overall uncertainty in the radioactive concentration quoted above: $\pm 1.7\%$ Overall uncertainty is defined on the reverse of this certificate.	
<i>Radionuclidic Purity</i>	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	
<i>Isotopic Purity</i>	The isotopic composition, expressed as atom per cent at the reference date . Not measured	
<i>Chemical Composition</i>	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'.	
<i>Physical Data</i>	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.	
<i>Remarks</i>	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.

US EPA ARCHIVE DOCUMENT



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MP-009

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

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

CURRENT DATE: 12/13/2012 0:00

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

SOLUTION #: U-10

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

Radionuclide	²³² U	Reference Date	3/1/2000 0:00
Certified Activity	9.760E-01 μ Ci		
Certified Concentration	μ Ci per gram		

Ampoule /Solution Gross	Weight, Grams
Empty Ampoule	Weight, Grams
Solution Net	Weight, Grams
Total Activity in Ampoule	0.9760 μ Ci

Chemical Composition of Standard Solution
²³²U(NO₃)₆ in 2M HNO₃

Dilution Instructions: Dilution Solvent Used: 2M HNO₃

Dilute to a volume of 1000.00 milliliters

Certified Total Activity of 0.9760 μ Ci 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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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**
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: ²³²U
Parent Solution Conc. **2.167E+03** dpm/ml

Reference Date: **3/1/2000 0:00**

Chemical Composition of Standard Solution
²³²U(NO₃)₆ in 2M:HNO₃

Dilution Instructions:

Dilution Solvent Used

2M HNO₃

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**

US EPA ARCHIVE DOCUMENT

QA/QC REVIEWED

Date 10/14/91 Initials wt

CERTIFICATE OF CALIBRATION ALPHA STANDARD SOLUTION

Received
OCT 14 1991
TMA/Eberline
Oak Ridge Lab

Radionuclide Th-230
Half Life: $(7.54 \pm 0.03) \times 10^4$ years
Catalog No.: 7230
Source No.: 388-116

Customer: TMA EBERLINE
P.O.No.: TT4944
Reference Date: November 1 1991 12:00 PST.
Contained Radioactivity: 1.036 μ Ci.

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 μ Ci/gram.

Method of Calibration

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

Uncertainty of Measurement

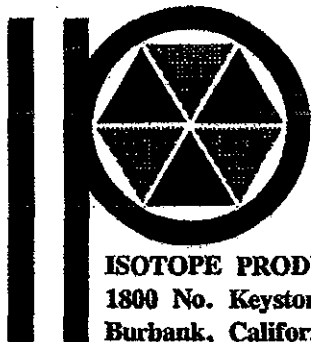
- a. Systematic uncertainty in instrument calibration: $\pm 2.0\%$
- b. Random uncertainty in assay: $\pm 0.5\%$
- c. Random uncertainty in weighing(s): $\pm 0.2\%$
- d. Total uncertainty at the 99% confidence level: $\pm 2.7\%$

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)



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(818) 843 - 7000

[Signature]
QUALITY CONTROL



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** Date **3/4/2013 0:00**
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: ²³⁰Thorium Reference Date: 11/17/1991 0:00
Parent Solution Conc.: 2.30E+03 dpm/ml

Chemical Composition of Standard Solution
²³⁰Th(NO₃)₄ in 0.1N HNO₃

Dilution Instructions: Dilution Solvent Used: 0.1N HNO₃




SECONDARY VOLUMETRIC DILUTION

Vol. Parent Solution: 10.0000 ml	Final Activity Concentration: 2.2999E+01 dpm/ml
Total Activity: 2.2999E+04 dpm	
Final Volume: 1000.00 ml	

NOTES:

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

Expiration Date: March 4, 2014

Recertified By: 
Verified & Approved By: 
QC Approval: 

Date: 3/21/2013 0:00
Date: 3/21/13
Date: 3/21/13

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QUALITY CONTROL PROGRAM

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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: 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 μ Ci		
Certified Concentration	μ Ci 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	μ Ci

Chemical Composition of Standard Solution
²³⁰Th(NO₃)₄ in 0.1N HNO₃

Dilution Instructions: Dilution Solvent Used: 0.1N HNO₃

Dilute to a volume of 1000.00 milliliters

Certified Total Activity of 1.0360 μ Ci 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

CERTIFICATE OF CALIBRATION ALPHA STANDARD SOLUTION

Radionuclide:	Th-232	Customer:	TMA EBERLINE
Half Life:	$(1.405 \pm 0.006) \times 10^{10}$ 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 μ Ci.
		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(NO ₃) 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 μ Ci/g.

Method of Calibration: Activity calculations are based upon known specific activity and mass.

Uncertainty of Measurement

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

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).



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Arma U. Khan
QUALITY CONTROL
Nov. 8, 1993
Date Signed

US EPA ARCHIVE DOCUMENT



QUALITY CONTROL PROGRAM
MP-009

Rev.6; 1/10/03
Title: Radioactive Reference Standards Solutions & Records

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

CURRENT DATE: 10/9/2012 0:00

SOLUTION REFERENCE # IPL 435-104-2

SOLUTION # Th-8

Principal Radionuclide

Half Life, Years

Half Life, Days

²³²Th, ²²⁸Th

1.405E+10

5.132E+12

Radionuclide ^{232 & 228}Th

Reference Date: 11/1/1993 0:00

Certified Activity: 9.930E-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(NO₃)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

[Signature]

Date: 10/9/2012 0:00

QC Approval

[Signature]

Date: 11/12/12

US EPA ARCHIVE DOCUMENT



QUALITY CONTROL PROGRAM
MP-009

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

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

Solution Reference #		MP-009 IPL 435-104-2	Date	11/9/2012 0:00
Principal Radionuclide		Half Life, Years	Solution #	Th-8b
228 & 232 Th		1.405E+10	Half Life, Days	5.132E+12
Radionuclide of Interest	228 & 232 Th	Reference Date	11/1/1993 0:00	
Parent Solution Conc.	2.07E+02 dpm/ml			
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:	600.0000 ml	Final Activity Concentration:	1.0355E+02 dpm/ml
Total Activity:	1.0355E+05 dpm		
Final Volume:	1000.00 ml		

NOTES:

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

Expiration Date: October 9, 2013

Verified & Approved By 
QC Approval 

Date: 11/9/2012 0:00

Date: 11/12/12

US EPA ARCHIVE DOCUMENT



**Isotope Products
Laboratories**

An Eckert & Ziegler Company

24937 Avenue Tibbitts
Valencia, California 91355

Tel 661-309-1010
Fax 661-257-8303

Th-18

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: 1.013 μCi 37.48 kBq (Th-229 only)

Physical Description:

- A. Mass of solution: 5.0147 g in 5 mL flame-sealed ampoule
- B. Chemical form: Th(NO₃)₄ in 0.1M HNO₃
- 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.

Ann H. Khan
Quality Control

9-Jan-02
Date Signed

IPL Ref. No.: 867-54

ISO 9001 CERTIFIED

Medical Imaging Laboratory
24937 Avenue Tibbitts Valencia, California 91355

Industrial Gauging Laboratory
1800 North Keystone Street Burbank, California 91504

0036

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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

SOLUTION REFERENCE # IPL 867-54 CURRENT DATE 11/9/2012 0:00
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 μ Ci		
Certified Concentration	μ Ci 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	μ Ci

Chemical Composition of Standard Solution

²²⁹Th(NO₃)₄ in 0.1M HNO₃

Dilution Instructions: Dilution Solvent Used 0.1M HNO₃

Dilute to a volume of 1000.00 milliliters

Certified Total Activity of 1.0130 μ Ci 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 [Signature]

Date: 11/9/2012 0:00

QC Approval [Signature]

Date: 11/12/12

US EPA ARCHIVE DOCUMENT



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

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

Principal Radionuclide	Half Life, Years	Half Life, Days
²²⁸ Th	7.340E+03	2.681E+06

Radionuclide of Interest ²²⁸Th Reference Date 1/15/2002 0:00
Parent Solution Conc. 2.25E+03 dpm/ml

Chemical Composition of Standard Solution
Th(NO₃)₄ in 0.1M HNO₃

Dilution Instructions: _____ Dilution Solvent Used 0.1M HNO₃

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

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 [Signature]

Date: 11/9/2012 0:00

QC Approval [Signature]

Date: 11/12/12

US EPA ARCHIVE DOCUMENT



National Institute of Standards & Technology

Certificate

Standard Reference Material 4251C
Barium-133 Radioactivity Standard

Ba-6
(f 6a)

ORIGINAL

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

US EPA ARCHIVE DOCUMENT



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

SOLUTION REFERENCE #		NIST SRM4251C	CURRENT DATE	9/20/2012 0:00
SOLUTION #		Ba-6		
Principal Radionuclide	Half Life, Years	Half Life, Days		
¹³³ Barium	1.048E+01	3.828E+03		
Radionuclide	¹³³ Barium	Reference Date	9/17/1993 0:00	
Certified Activity	μCi			
Certified Concentration	1.318E+01 μCi per gram			
Ampoule /Solution Gross	9.3081	Weight, Grams		
Empty Ampoule	4.2582	Weight, Grams		
Solution Net	5.0499	Weight, Grams		
Total Activity in Ampoule	66.5577	μCi		
Chemical Composition of Standard Solution				
¹³³ BaCl ₂ in 1M HCl				

Dilution Instructions: Dilution Solvent Used 1M HCl

Dilute to a volume of 1000.00 milliliters

Certified Total Activity of 66.5577 μCi Which Equals 1.478E+03 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 [Signature] Date: 9/27/12

QC Approval [Signature] Date: 9/27/12

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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

Solution Reference #		QCP-009-1-A	Date	9/20/12
Principal Radionuclide		NIST-SRM4251C	Solution #	Ba-6a
Half Life, Years		1.048E+01	Half Life, Days	
133Ba			3.828E+03	

Radionuclide of Interest	133Ba	Reference Date	9/1/1993 0:00
Parent Solution Conc.	1.48E+05 dpm/ml		

Chemical Composition of Standard Solution
133BaCl₂ in 1M HCl

Dilution Instructions:	Dilution Solvent Used	1M HCl
------------------------	-----------------------	--------

SECONDARY VOLUMETRIC DILUTION

Vol. Parent Solution:	25.0000 ml	Final Activity Concentration:	3.6950E+03 dpm/ml
Total Activity:	3.6950E+06 dpm		
Final Volume:	1000.00 ml		

NOTES:

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

Expiration Date: September 20, 2013

Verified & Approved By
 QC Approval

Date: 9/27/12
 Date: 9/27/12

US EPA ARCHIVE DOCUMENT

CERTIFICATE OF CALIBRATION ALPHA STANDARD SOLUTION

NA/QC REVIEWED
Date 2/8/94 Initials W

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).



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

Ana U. Khan
QUALITY CONTROL

Feb. 3, 1994
Date Signed



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	Reference Date	2/1/1994 0:00
Certified Activity	1.001E+00 μ Ci		
Certified Concentration	μ Ci per gram		

Ampoule /Solution Gross	Weight, Grams
Empty Ampoule	Weight, Grams
Solution Net	Weight, Grams
Total Activity in Ampoule	1.0010 μ Ci

Chemical Composition of Standard Solution

²²⁶Ra(NO₃)₂ in 1M HNO₃

Dilution Instructions: Dilution Solvent Used: 1M HNO₃

Dilute to a volume of 1000.00 milliliters

Certified Total Activity of 1.0010 μ Ci 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

US EPA ARCHIVE DOCUMENT



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	<u>1.600E+03</u>	<u>5.844E+05</u>

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

Reference Date 2/1/1994 0:00

Chemical Composition of Standard Solution

²²⁶Ra(NO₃)₂ in 1M HNO₃

Dilution Instructions:

Dilution Solvent Used

1M HNO₃

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 [Signature]

Date: 11/9/2012 0:00

QC Approval [Signature]

Date: 11/12/12

US EPA ARCHIVE DOCUMENT



ANALYTICS

RA-11

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 μ g/g Ba carrier.

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

SOURCE PREPARED BY:

M. D. Currie
M. D. Currie, Radiochemist

Q A APPROVED:

PCW 11/7/01

*New vial from the 6/11/01 shipment.
R.S. Different activity level 9/19/11*



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

SOLUTION REFERENCE # Analytics 62680-416 CURRENT DATE 4/16/2012 0:00
SOLUTION # Ra-11

Principal Radionuclide ²²⁶Ra Half Life, Years 5.750E+00 Half Life, Days 2.100E+03

Radionuclide ²²⁶Ra Reference Date 11/7/2001 0:00
Certified Activity 6.986E-02 μ Ci
Certified Concentration μ Ci 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 μ Ci

Chemical Composition of Standard Solution
²²⁶Ra(NO₃)₂ in 0.5 M HCl

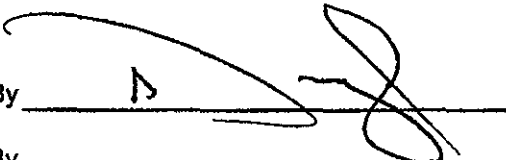
Dilution Instructions: Dilution Solvent Used 0.5 M HCl

Dilute to a volume of 1000.00 milliliters

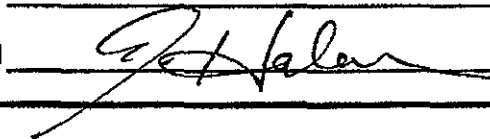
Certified Total Activity of 0.0699 μ Ci Which Equals 1.551E+05 dpm at the date listed above

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

US EPA ARCHIVE DOCUMENT

SECTION VI
QUALITY CONTROL SAMPLE RESULTS SUMMARY

WO	Analysis	Run	Activity Units	Allquot Units	Client Name
13-04133	UUISO	1	pCi	I	Engineering Management Support, Inc.

Laboratory Control Sample

Analyte	Normalized Difference	LCS Measured	CSU Measured	LCS Expected	Uncert. Expected	Known	Known Error	Result	CSU	Standard ID	Standard ACT (dpm)	Standard Error	Standard Added (g)
U-234	2.02	86.75%	14.59%	100.00%	3.60%	8.13E+00	2.93E-01	7.05E+00	1.03E+00	U-8a	3.52E+01	3.60E+00	5.12E-01
U-238	0.40	97.09%	14.41%	100.00%	3.60%	7.92E+00	2.85E-01	7.69E+00	1.11E+00	U-8a	3.44E+01	3.60E+00	5.12E-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

QC Summary

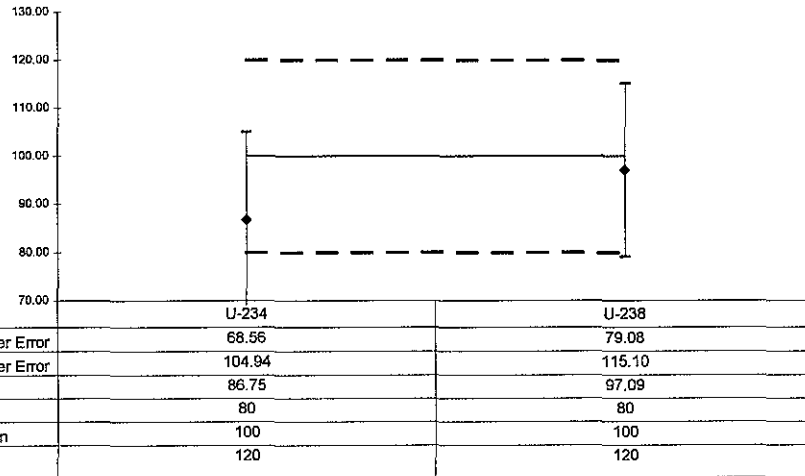
Analyte	Normalized Difference	RPD	Original Result	Original CSU	Replicate Result	Replicate CSU	LCS Relative Bias	LCS % R	LCS ND	MS % R	MS ND	Rep RPD	Rep ND
U-234	0.18	4.32	6.69E-01	2.16E-01	6.99E-01	2.29E-01	0.87	OK	OK			OK	OK
U-238	1.88	45.73	5.08E-01	1.90E-01	8.10E-01	2.51E-01	0.97	OK	OK			INV	OK
U-235	1.44	80.30	8.40E-02	8.03E-02	1.97E-01	1.31E-01		OK	OK			NA	OK

US EPA ARCHIVE DOCUMENT

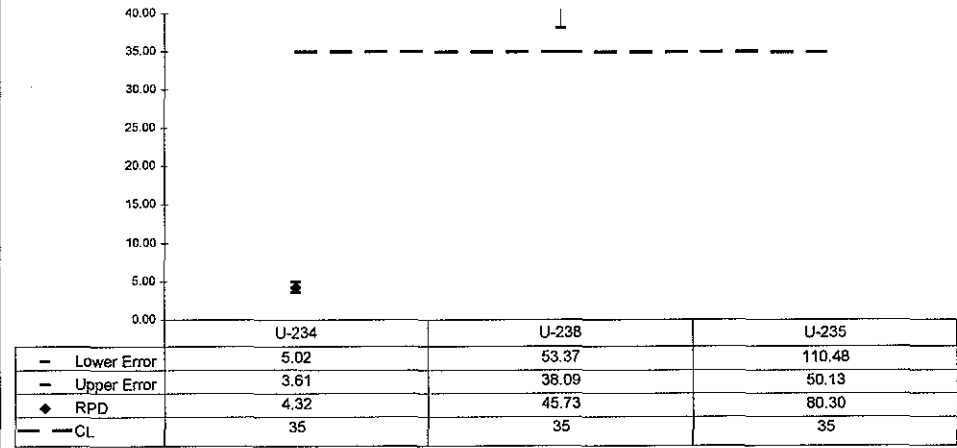
8748

WO	Analysis	Run	Activity Units	Aliquot Units	Client Name
13-04133	UISO	1	pCi	I	Engineering Management Support, Inc.

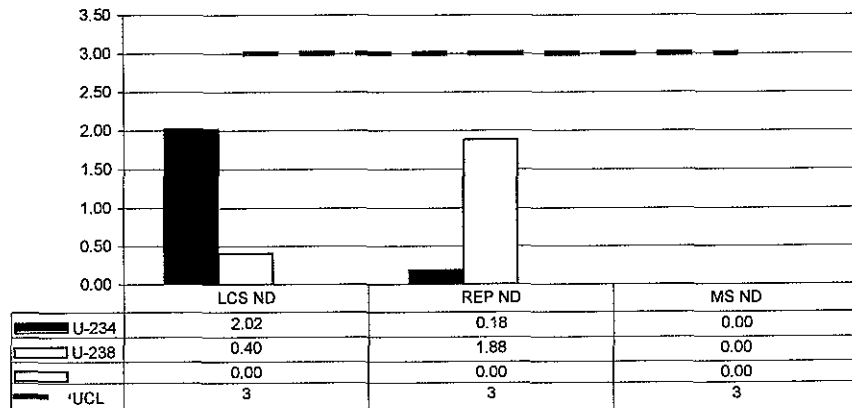
LCS % Recovery



Replicate Sample RPD



Normalized Difference



No Matrix Spike

WO	Analysis	Run	Activity Units	Aliquot Units	Client Name
13-04133	ThISO	1	pCi	I	Engineering Management Support, Inc.

Laboratory Control Sample

Analyte	Normalized Difference	LCS Measured	CSU Measured	LCS Expected	Uncert. Expected	Known	Known Error	Result	CSU	Standard ID	Standard ACT (dpm)	Standard Error	Standard Added (g)
TH-228	1.86	120.95%	18.18%	100.00%	3.60%	4.79E+00	1.72E-01	5.79E+00	1.05E+00	Th-8b	1.04E+02	3.60E+00	1.03E-01
TH-230	1.78	121.62%	19.55%	100.00%	2.70%	5.47E+00	1.48E-01	6.66E+00	1.30E+00	Th-1b	2.35E+01	2.70E+00	5.17E-01
TH-232	0.81	92.78%	18.63%	100.00%	3.60%	4.79E+00	1.72E-01	4.44E+00	8.28E-01	Th-8b	1.04E+02	3.60E+00	1.03E-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

QC Summary

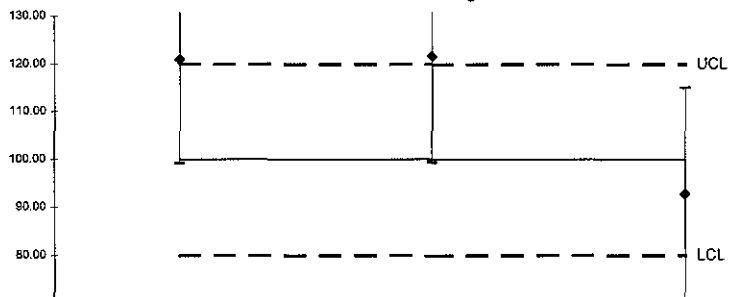
Analyte	Normalized Difference	RPD	Original Result	Original CSU	Replicate Result	Replicate CSU	LCS Relative Bias	LCS % R	LCS ND	MS % R	MS ND	Rep RPD	Rep ND
TH-228	0.09	3.20	3.02E-01	1.55E-01	2.93E-01	1.51E-01	1.21	OK	OK			NA	OK
TH-230	0.93	38.94	1.73E-01	1.12E-01	2.57E-01	1.37E-01	1.22	OK	OK			NA	OK
TH-232	0.52	52.40	2.57E-02	4.38E-02	4.40E-02	5.36E-02	0.93	OK	OK			NA	OK

US EPA ARCHIVE DOCUMENT

0550

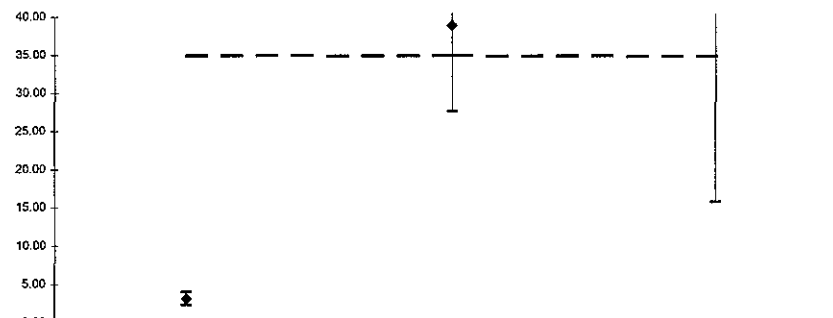
WO	Analysis	Run	Activity Units	Aliquot Units	Client Name
13-04133	ThISO	1	pCi	I	Engineering Management Support, Inc.

LCS % Recovery



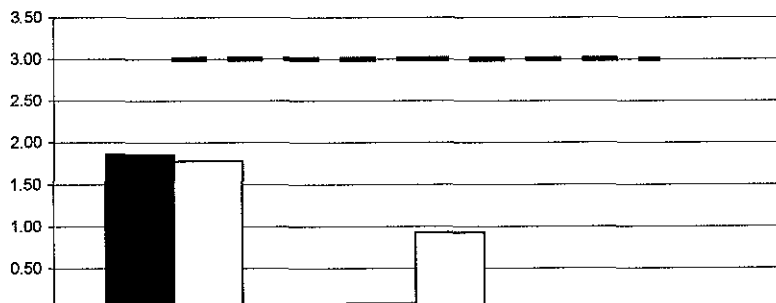
	TH-228	TH-230	TH-232
- Lower Error	99.17	99.37	70.55
- Upper Error	142.72	143.86	115.00
◆ %R	120.95	121.62	92.78
- - LCL	80	80	80
- - Mean	100	100	100
- - UCL	120	120	120

Replicate Sample RPD



	TH-228	TH-230	TH-232
- Lower Error	4.03	50.23	89.06
- Upper Error	2.38	27.64	15.74
◆ RPD	3.20	38.94	52.40
- - CL	35	35	35

Normalized Difference



	LCS ND	REP ND	MS ND
■ TH-228	1.86	0.09	0.00
□ TH-230	1.78	0.93	0.00
- - UCL	3	3	3

No Matrix Spike

WO	Analysis	Run	Activity Units	Aliquot Units	Client Name
13-04133	Ra226	1	pCi	I	Engineering Management Support, Inc.

Laboratory Control Sample

Analyte	Normalized Difference	LCS Measured	CSU Measured	LCS Expected	Uncert. Expected	Known	Known Error	Result	CSU	Standard ID	Standard ACT (dpm)	Standard Error	Standard Added (g)
RA-226	0.20	102.58%	24.11%	100.00%	4.60%	1.03E+01	4.72E-01	1.05E+01	2.54E+00	Ra-5b	4.41E+01	4.60E+00	5.16E-01

Matrix Spike

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

Replicate Sample

QC Summary

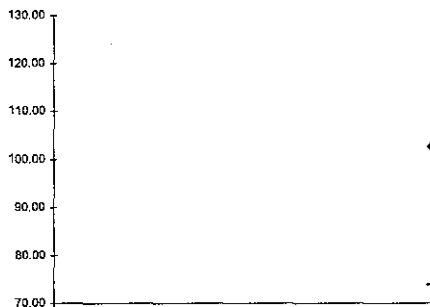
Analyte	Normalized Difference	RPD	Original Result	Original CSU	Replicate Result	Replicate CSU	LCS Relative Bias	LCS % R	LCS ND	MS % R	MS ND	Rep RPD	Rep ND
RA-226	0.06	2.16	5.43E-01	2.54E-01	5.55E-01	2.56E-01	1.03	OK	OK			NA	OK

US EPA ARCHIVE DOCUMENT

0052

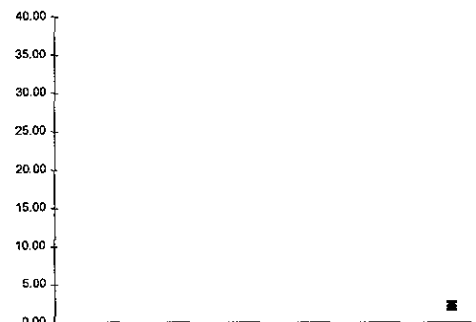
WO	Analysis	Run	Activity Units	Aliquot Units	Client Name
13-04133	Ra226	1	pCi	I	Engineering Management Support, Inc.

LCS % Recovery



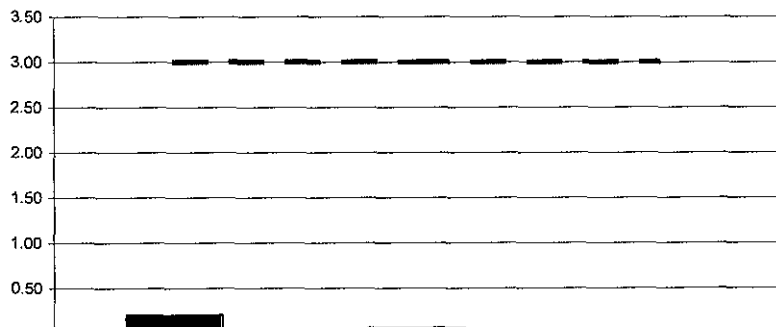
	RA-226
- Lower Error	73.86
- Upper Error	131.29
◆ %R	102.58
- LCL	80
- Mean	100
- UCL	120

Replicate Sample RPD



	RA-226
- Lower Error	2.66
- Upper Error	1.66
◆ RPD	2.16
- CL	35

Normalized Difference



	LCS ND	REP ND	MS ND
■ RA-226	0.20	0.06	0.00
- UCL	3	3	3

No Matrix Spike

US EPA ARCHIVE DOCUMENT

WO	Analysis	Run	Activity Units	Aliquot Units	Client Name
13-04133	Ra228	1	pCi	I	Engineering Management Support, Inc.

Laboratory Control Sample

Analyte	Normalized Difference	LCS Measured	CSU Measured	LCS Expected	Uncert. Expected	Known	Known Error	Result	CSU	Standard ID	Standard ACT (dpm)	Standard Error	Standard Added (g)
RA-228	1.10	121.98%	31.91%	100.00%	5.10%	8.97E+00	4.57E-01	1.09E+01	3.49E+00	Ra-11	3.89E+01	5.10E+00	5.12E-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

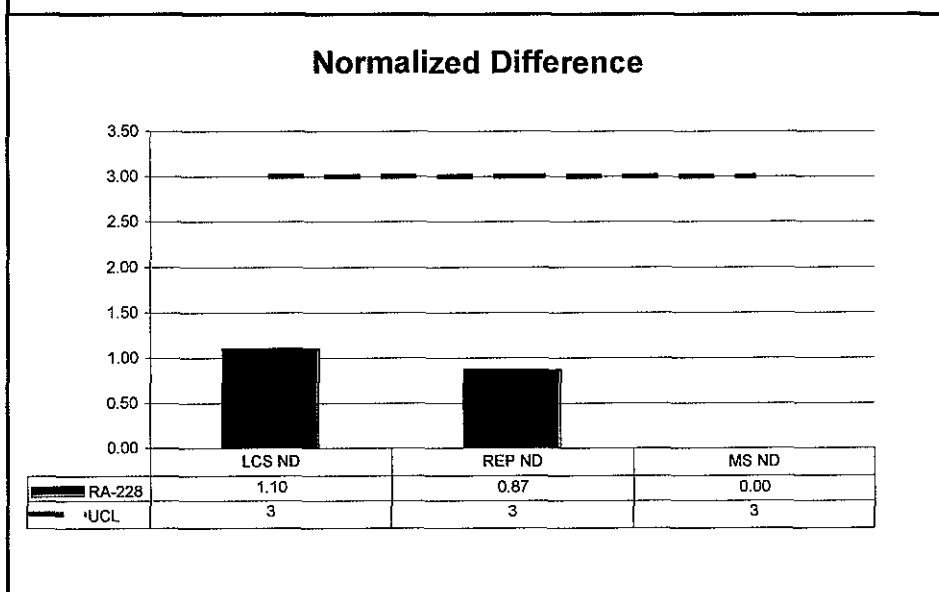
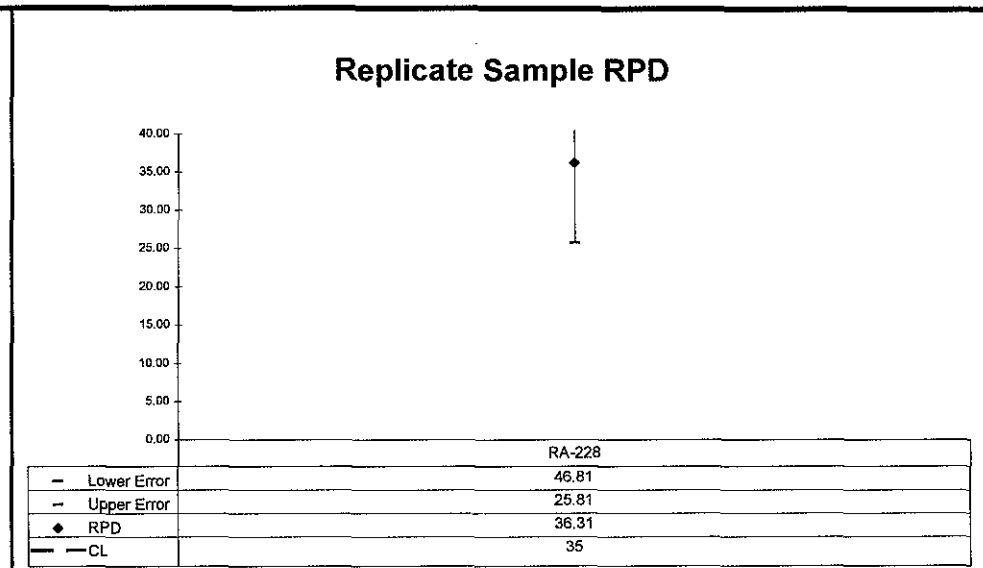
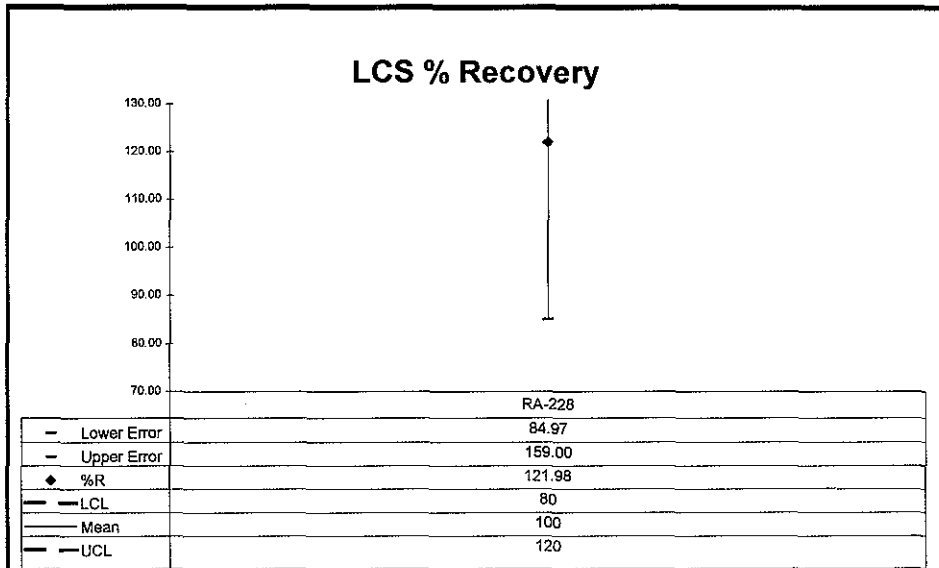
QC Summary

Analyte	Normalized Difference	RPD	Original Result	Original CSU	Replicate Result	Replicate CSU	LCS Relative Bias	LCS % R	LCS ND	MS % R	MS ND	Rep RPD	Rep ND
RA-228	0.87	36.31	6.14E-01	4.35E-01	8.86E-01	4.33E-01	1.22	OK	OK			NA	OK

US EPA ARCHIVE DOCUMENT

US EPA ARCHIVE DOCUMENT


WO	Analysis	Run	Activity Units	Aliquot Units	Client Name
13-04133	Ra228	1	pCi	I	Engineering Management Support, Inc.



No Matrix Spike

SECTION VII
LABORATORY TECHNICIAN'S NOTES


ISO U NOTES

 EBERLINE <small>SERVICES</small> Work Order Analysis Notes	Oak Ridge Laboratory 601 Scarboro Rd. Oak Ridge, TN 37830 Voice: 865.481.0683 www.eberlineservices.com	Internal Work Order	13-04133
		Analysis Code	UISO
		Run Number	1

#	Date	Dept	User	Notes
1	04/29/13 10:35	PREP	JBARNARD	ALIQOTED AND FILTERED DISSOLVED FRACTIONS- ADDED SPIKES AND TRACERS- PRESERVED SAMPLES WITH HNO3 AND DRIED SAMPLES DOWN


[Handwritten signature]
 4/29/13

US EPA ARCHIVE DOCUMENT

 EBERLINE <small>SERVICES</small> Work Order Analysis Notes	Oak Ridge Laboratory 601 Scarboro Rd. Oak Ridge, TN 37830 Voice: 865.481.0683 www.eberlineservices.com	Internal Work Order	13-04133
		Analysis Code	UUISO
		Run Number	1

#	Date	Dept	User	Notes
1	04/29/13 10:35	PREP	JBARNARD	ALIQUOTED AND FILTERED DISSOLVED FRACTIONS- ADDED SPIKES AND TRACERS- PRESERVED SAMPLES WITH HNO3 AND DRIED SAMPLES DOWN
2	05/03/13 17:49	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.

John Demelas
 5/3/13

 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	13-04133
		Analysis Code	UUISO
		Run Number	1

#	Date	Dept	User	Notes
1	04/29/13 10:35	PREP	JBARNARD	ALIUQUOTED AND FILTERED DISSOLVED FRACTIONS- ADDED SPIKES AND TRACERS- PRESERVED SAMPLES WITH HNO3 AND DRIED SAMPLES DOWN
2	05/03/13 17:49	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	05/06/13 05:34	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.

RA
5/6/13



Reagents Used in an Analysis

Internal Work Order

13-04133

Analysis Code

Run

UUISO

1


Reagent ID	Reagent Name	Reagent Concentration	Analyst ID	Date Recorded
013624P	Nitric Acid	Reagent Grade	JBARNARD	4/29/2013
013708P	Anion Exchange Resin	Reagent Grade	JDEMELAS	5/3/2013
013804S	HCl - HF	6.5N - 0.04N	JDEMELAS	5/3/2013
013831S	HCl - NH4I	8N - 0.1M	JDEMELAS	5/3/2013
013675D02	Hydrochloric Acid	0.5N	JDEMELAS	5/3/2013
013734S	Hydrochloric Acid	6.5N	JDEMELAS	5/3/2013
013813S	Hydrochloric Acid	8N	JDEMELAS	5/3/2013
013809P	Hydrochloric Acid	Reagent Grade	JDEMELAS	5/3/2013
013246S	Carbon substrate	Solution	RMARTZ	5/6/2013
012809P	Ethyl Alcohol	Reagent Grade	RMARTZ	5/6/2013
013221P	Hydrofluoric Acid	Reagent Grade	RMARTZ	5/6/2013
013191S	Neodymium Carrier	1 mg/ml	RMARTZ	5/6/2013
013434P	Titanous Chloride	Reagent Grade	RMARTZ	5/6/2013

US EPA ARCHIVE DOCUMENT

Date	Sample #	Client	Sample ID	CTO Flow	Analysis	Teach
5/12/12	1704121A(1-4)	UCOR	1238	2hr	TL250	C
5/12/12	1704121A(1-4)	UCOR	1239	2hr	TLNT	C
5/12/12	1704107A(1-4)	Eng. Manag. Sv	1239	2hr	TL250	C
5/12/13	1304107A(13-19)	Eng. Manag. Sv	1629	2hr 50mins	TH	KB
5/17/12	Daily Pulser	US	0521	1hr	N/A	C
5/17/12	SECAL	US	0545	2hr	N/A	C
5/17/12	1704106A(17-18)	Eng. Man	0820	2hr	Rel	C
5/17/12	1704178A(17-18)	Unitedch	0924	2hr	Am243	C
5/17/12	1705001A(17-18)	UCOR	0924	2hr	Am243	C
5/17/12	1705001A(17-18)	UCOR	1115	2hr	Am243	C
5/17/12	1705001A(11-12)	UCOR	1115	2hr	Pu	C
5/17/12	1705001A(11-12)	UCOR	1115	2hr	Pu	C
5/13/13	1304178A(1-4)	Unitedch	1217	2hr 50min	Pu	KB
5/13/13	1305001A(14,16)	UCOR	1411	2hr 50mins	TH	KB
5/13/13	1305001A(14,16)	UCOR	1411	2hr 50mins	THNT	KB
5/13/13	System Bkgd	Lab	1707	16.40 hrs		KB
5/14/12	Daily Pulser	US	1123	1hr	N/A	C
5/14/12	1704178A(17-18)	Unitedch	1150	2hr	Am243	C
5/14/12	1704178A(1-4)	Unitedch	1151	2hr 50min	TL250	C
5/14/12	1704178A(1-4)	Unitedch	1151	2hr	NP237	C
5/16/12	Daily Pulser	US	0521	1hr	N/A	C
5/16/12	1704108A(1-7)	Eng. Man	0545	2hr	Am243	C
5/16/12	1704108A(1-4)	Eng. Man	0545	2hr	TL250	C
5/16/12	1704195A(17-18)	UCOR	0822	2hr	Am243	C
5/16/12	1704175A(1-4)	UCOR	0920	2hr	Am243	C
5/16/12	1704106A(11-12)	Eng. Man	0942	2hr	Am243	C
5/16/12	1704120A(17-18)	Comp. Sol.	1642	2hr	Am243	C
5/6/13	1304096A(1-9)	New York PE	1238	2hr 50min	Rel	KB
5/6/13	1304133A(7-9)	Eng. Manag. Sv	1625	2hr 50min	TH	KB
5/6/13	1304120A(1-5)	Engy Solutions	1626	2hr 50min	TH	KB
5/6/13	1304135A(1,4)	UCOR	1631	2hr 50mins	Am243	KB
5/17/12	Daily Pulser	US	0546	1hr	N/A	C
5/17/12	1704177A(1-9)	Comptech	0601	2hr	Am243	C

US EPA ARCHIVE DOCUMENT


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	13-04133
		Analysis Code	THISO
		Run Number	1

#	Date	Dept	User	Notes
1	04/29/13 10:35	PREP	JBARNARD	ALIQUOTED AND FILTERED DISSOLVED FRACTIONS- ADDED SPIKES AND TRACERS- PRESERVED SAMPLES WITH HNO3 AND DRIED SAMPLES DOWN

BT
4/29/13


US EPA ARCHIVE DOCUMENT

 EBERLINE <small>SERVICES</small> Work Order Analysis Notes	Oak Ridge Laboratory 601 Scarboro Rd. Oak Ridge, TN 37830 Voice: 865.481.0683 www.eberlineservices.com	Internal Work Order	13-04133
		Analysis Code	ThISO
		Run Number	1

#	Date	Dept	User	Notes
1	04/29/13 10:35	PREP	JBARNARD	ALIQUOTED AND FILTERED DISSOLVED FRACTIONS- ADDED SPIKES AND TRACERS- PRESERVED SAMPLES WITH HNO3 AND DRIED SAMPLES DOWN
2	05/03/13 17:51	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 deionized water, bringing volume to ~15ml. Set samples aside for later precipitation and filtering.

J. Demelas
5/3/13

US EPA ARCHIVE DOCUMENT

 EBERLINE <small>SERVICES</small> Work Order Analysis Notes	Oak Ridge Laboratory 601 Scarboro Rd. Oak Ridge, TN 37830 Voice: 865.481.0683 www.eberlineservices.com	Internal Work Order	13-04133
		Analysis Code	ThISO
		Run Number	1

#	Date	Dept	User	Notes
1	04/29/13 10:35	PREP	JBARNARD	ALIQUTED AND FILTERED DISSOLVED FRACTIONS- ADDED SPIKES AND TRACERS- PRESERVED SAMPLES WITH HNO3 AND DRIED SAMPLES DOWN
2	05/03/13 17:51	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 deionized water, bringing volume to ~15ml. Set samples aside for later precipitation and filtering.
3	05/06/13 05:35	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.

Handwritten signature: J. Demelas

US EPA ARCHIVE DOCUMENT



Reagents Used in an Analysis

Internal Work Order

13-04133

Analysis Code

Run

ThISO

1

Reagent ID	Reagent Name	Reagent Concentration	Analyst ID	Date Recorded
013624P	Nitric Acid	Reagent Grade	JBARNARD	4/29/2013
013809P	Hydrochloric Acid	Reagent Grade	JDEMELAS	5/3/2013
013814S	Nitric Acid	8N	JDEMELAS	5/3/2013
013624P	Nitric Acid	Reagent Grade	JDEMELAS	5/3/2013
013708P	Anion Exchange Resin	Reagent Grade	JDEMELAS	5/3/2013
013825S	Hydrochloric Acid	8N	JDEMELAS	5/3/2013
013246S	Carbon substrate	Solution	RMARTZ	5/6/2013
013017S	Cerrium Carrier	0.1mg/ml	RMARTZ	5/6/2013
012809P	Ethyl Alcohol	Reagent Grade	RMARTZ	5/6/2013
013221P	Hydrofluoric Acid	Reagent Grade	RMARTZ	5/6/2013

US EPA ARCHIVE DOCUMENT


Alpha #7

Date	Sample #	Client	Sample ID	CT (hrs)	Analysis	Peak
5/12/13	1704121A(1-4)	UCOR	1238	2hrs	TH250	C
5/12/13	1704121A(1-4)	UCOR	1239	2hrs	THNT	C
5/12/13	1704107A(1-4)	Eng. Manag. Sol	1239	2hrs	TH250	C
5/12/13	1304107A(13-19)	Eng. Manag. Sol	1629	2hr 50mins	TH	KB
5/12/13	Daily Pulser	UCOR	0521	1hr	N/A	C
5/12/13	SECAL	UCOR	0545	2hrs	N/A	C
5/12/13	1704106A(17-19)	Eng. Manag. Sol	0820	2hrs	Rob	C
5/12/13	1704178A(7-4)	Unitech	0924	2hrs	Am241	C
5/12/13	1705001A(1-7)	UCOR	0924	2hrs	Am241	C
5/12/13	1705001A(7-8-6)	UCOR	1115	2hrs	Am241	C
5/12/13	1705001A(1-4)	UCOR	1115	2hrs	Pu230	C
5/13/13	1304178A(1-4)	Unitech	1217	2hr 50min	Pu	KB
5/13/13	1305001A(4,6)	UCOR	1411	2hr 50mins	TH	KB
5/13/13	1305001A(4,6)	UCOR	1411	2hr 50mins	THNT	KB
5/13/13	System Bkgd	Lab	1707	16.40 hrs		KB
5/14/13	Daily Pulser	UCOR	1123	1hr	N/A	C
5/14/13	1704178A(7-4)	Unitech	1150	2hrs	Am241	C
5/14/13	1704178A(1-4)	Unitech	1151	2hrs	TH250	C
5/14/13	1704178A(1-4)	Unitech	1151	2hrs	NP232	C
5/16/13	Daily Pulser	UCOR	0521	1hr	N/A	C
5/16/13	1704108A(1-7)	Eng. Manag. Sol	0127	2hrs	Am241	C
5/16/13	1704108A(1-4)	Eng. Manag. Sol	0147	2hrs	TH250	C
5/16/13	1704191A(7-4)	UCOR	0822	2hrs	Am241	C
5/16/13	1704171A(1-4)	UCOR	0927	2hrs	Am241	C
5/16/13	1704106A(1-21-6)	Eng. Manag. Sol	0942	2hrs	Am241	C
5/16/13	1704120A(7-4)	Eng. Manag. Sol	1242	2hrs	Am241	C
5/16/13	1304096A(1-9)	New York PE	1236	2hr 50min	Pu	KB
5/16/13	1304133A(7-9)	Eng. Manag. Sol	1625	2hr 50min	TH	KB
5/16/13	1304120A(1-5)	Eng. Solutions	1626	2hr 50min	TH	KB
5/16/13	1304135A(1,4)	UCOR	1631	2hr 50mins	Am241	KB

Alpha #2


Date	Sample #	Client	Facilities	CTFers	Analyses?	Meal
05/17/13	170416ACT-17	Eng/Mc	0544	2hr	Rel	C
05/17/13	SECCAL	MS	1227	2hr	1/4	C
5/17/13	1704178A(1-2)	Unitech	0923	2hr	AN241	C
5/17/13	1704171A(1-4)	Unitech	0923	2hr	AN241	C
5/3/13	System Bkgd	Lab	1708	16.40hrs	2	KB
5/14/13	Daily Puser	LAB	1123	1.0hr	N/A	C
5/14/13	17041001A(2-46)	Unitech	1148	2hr	AN241	C
5/14/13	1704174A(1-2)	Unitech	1150	2hr	AN241	C
5/16/13	Daily Puser	MS	0521	1hr	N/A	-
5/16/13	1704120A(2-5)	Eng/Mc	0921	2hr	AN241	C
5/16/13	1704175A(1-2)	Unitech	0922	2hr	AN241	C
5/16/13	1704170A(3-6)	Eng/Mc	1241	2hr	Phase	C
5/16/13	1704120A(1-2)	Eng/Mc	1241	2hr	AN241	C
5/6/13	1704133A(1-6)	Eng. Manag. Sv.	1625	2hr	Th	KB

RA-226 NOTES

 EBERLINE <small>SERVICES</small> Work Order Analysis Notes	Oak Ridge Laboratory 601 Scarboro Rd. Oak Ridge, TN 37830 Voice: 865.481.0683 www.eberlineservices.com	Internal Work Order	13-04133
		Analysis Code	Ra226
		Run Number	1

#	Date	Dept	User	Notes
1	04/29/13 10:34	PREP	JBARNARD	ALIQOTED AND FILTERED DISSOLVED FRACTIONS- ADDED SPIKES AND TRACERS- PH'D SAMPLES PRECIPITATED WITH BA AND PB CARRIERS AND AMMONIUM SULFATE- DECANTED SAMPLES AND CENTRIFUGED- SUBMITTED RADIUM PRECIP TO SEPARATIONS


JB
 4/29/13

 EBERLINE <small>SERVICES</small> Work Order Analysis Notes	Oak Ridge Laboratory 601 Scarboro Rd. Oak Ridge, TN 37830 Voice: 865.481.0683 www.eberlineservices.com	Internal Work Order	13-04133
		Analysis Code	Ra226
		Run Number	1

#	Date	Dept	User	Notes
1	04/29/13 10:34	PREP	JBARNARD	ALIUQOTED AND FILTERED DISSOLVED FRACTIONS- ADDED SPIKES AND TRACERS- PH'D SAMPLES- PRECIPITATED WITH BA AND PB CARRIERS AND AMMONIUM SULFATE- DECANTED SAMPLES AND CENTRIFUGED- SUBMITTED RADIUM PRECIP TO SEPARATIONS
2	04/30/13 13:52	PREP	LWALKER	ADDED EDTA TO PRECIP-VORTEX-LET SIT OVERNIGHT TO DIGEST.
3	05/01/13 13:07	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)

5-1-13
 TSM

US EPA ARCHIVE DOCUMENT

 Reagents Used in an Analysis		Internal Work Order		
		13-04133		
		Analysis Code		Run
		Ra226		1
Reagent ID	Reagent Name	Reagent Concentration	Analyst ID	Date Recorded
013376P	Ammonium Hydroxide	Reagent Grade	JBARNARD	4/29/2013
013575D02	Ammonium Sulfate	200 mg/ml	JBARNARD	4/29/2013
012766D14	Barium Carrier	1 mg/ml	JBARNARD	4/29/2013
012729D07	Lead Carrier	166 mg/ml	JBARNARD	4/29/2013
013624P	Nitric Acid	Reagent Grade	JBARNARD	4/29/2013
013811S	EDTA	0.25M	LWALKER	4/30/2013
011383P	Acetic Acid	Reagent Grade	TSMITH	5/1/2013
013751D01	Ammonium Sulfate	200 mg/ml	TSMITH	5/1/2013

US EPA ARCHIVE DOCUMENT

Alpha #3

Date	Account	Description	Amount	Balance	Check #
4/27/13	Eng. Manag. Sv.	13041044(13-19)	1049	2450	WU
4/27/13	WU	1304113A(14)	1049	2450	Np
4/25/13	Party Pass		0721		
4/25/13	Eng. Manag. Sv.	13041044(17-19)	1000		
4/25/13	Eng. Manag. Sv.	13041044(14)	1000		
4/29/13	WU	1304113A(14)	1701		TH
4/29/13	WU	1304113A(14)	1701		TH
4/29/13	Eng. Manag. Sv.	13041044(13-19)	1701		TH
4/29/13	Eng. Manag. Sv.	13041044(19)	1701		TH
4/29/13	Eng. Manag. Sv.	13041044(18)	1701		TH
4/29/13	Eng. Manag. Sv.	13041044(13-19)	1620		Rad
4/29/13	Party Pass		0721		
4/29/13	WU	1304113A(14)	0849		Autz
4/29/13	WU	1304113A(14)	0849		Autz
4/29/13	WU	1304113A(14)	1147		Autz
4/29/13	WU	1304113A(14)	1147		Autz
4/29/13	Eng. Manag. Sv.	13041044(3-13)	1443		Autz
5/11/13	Party Pass		0725		
5/11/13	WU	1304113A(14)	0854		Porio
5/11/13	WU	1304113A(14)	0854		Porio
5/11/13	WU	1304113A(14)	0941		Porio
5/11/13	WU	1304113A(14)	0941		Porio
5/11/13	WU	1304113A(14)	0941		Porio
5/11/13	WU	1304113A(14)	1204		Porio
5/11/13	WU	1304113A(14)	1204		Porio
5/11/13	WU	1304113A(14)	1249		Porio
5/11/13	Eng. Manag. Sv.	13041044(13-17)	1249		Porio
5/11/13	Eng. Manag. Sv.	13041044(11-17)	1619		Porio
5/11/13	WU	1304113A(14)	1619		Porio
5/11/13	Party Pass		0717		
5/11/13	WU	1304113A(14)	0337		Porio
5/11/13	WU	1304113A(14)	0337		Porio
5/11/13	WU	1304113A(14)	0810		Porio
5/11/13	WU	1304113A(14)	0810		Porio

Account Description


RA-228 NOTES

 EBERLINE <small>SERVICES</small> Work Order Analysis Notes	Oak Ridge Laboratory 601 Scarboro Rd. Oak Ridge, TN 37830 Voice: 865.481.0683 www.eberlineservices.com	Internal Work Order	13-04133
		Analysis Code	Ra228
		Run Number	1

#	Date	Dept	User	Notes
1	04/29/13 10:34	PREP	JBARNARD	ALIUQUOTED AND FILTERED DISSOLVED FRACTIONS- ADDED SPIKES AND TRACERS- PH'D SAMPLES PRECIPITATED WITH BA AND PB CARRIERS AND AMMONIUM SULFATE- DECANTED SAMPLES AND CENTRIFUGED- SUBMITTED RADIUM PRECIP TO SEPARATIONS

[Handwritten Signature]
 4/29/13


US EPA ARCHIVE DOCUMENT

 EBERLINE <small>SERVICES</small> Work Order Analysis Notes	Oak Ridge Laboratory 601 Scarboro Rd. Oak Ridge, TN 37830 Voice: 865.481.0683 www.eberlineservices.com	Internal Work Order	13-04133
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2	05/02/13 14:18	PREP	LWALKER	RECEIVED FILTERS BACK FROM COUNT ROOM-PUT BACK INTO C-TUBES-ADDED EDTA AND SWIRLED-LET SIT OVERNIGHT TO DIGEST.
3	05/08/13 19:41	PREP	LWALKER	FOLLOWED STEPS 12.1 TO 12.7 IN AP-007 REV 17 (CHEMICAL CLEANUP FOR RA 228)

L. Walker
 5/8/13

US EPA ARCHIVE DOCUMENT

 EBERLINE <small>SERVICES</small> Work Order Analysis Notes	Oak Ridge Laboratory 601 Scarboro Rd. Oak Ridge, TN 37830 Voice: 865.481.0683 www.eberlineservices.com	Internal Work Order	13-04133
		Analysis Code	Ra228
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2	05/02/13 14:18	PREP	LWALKER	RECEIVED FILTERS BACK FROM COUNT ROOM-PUT BACK INTO C-TUBES-ADDED EDTA AND SWIRLED-LET SIT OVERNIGHT TO DIGEST.
3	05/08/13 19:41	PREP	LWALKER	FOLLOWED STEPS 12.1 TO 12.7 IN AP-007 REV 17 (CHEMICAL CLEANUP FOR RA 228)
4	05/10/13 06:18	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)

5-10-13
[Signature]

US EPA ARCHIVE DOCUMENT



Reagents Used in an Analysis

Internal Work Order

13-04133

Analysis Code

Run

Ra228

1

Reagent ID	Reagent Name	Reagent Concentration	Analyst ID	Date Recorded
013376P	Ammonium Hydroxide	Reagent Grade	JBARNARD	4/29/2013
013575D02	Ammonium Sulfate	200 mg/ml	JBARNARD	4/29/2013
012766D14	Barium Carrier	1 mg/ml	JBARNARD	4/29/2013
012729D07	Lead Carrier	166 mg/ml	JBARNARD	4/29/2013
013624P	Nitric Acid	Reagent Grade	JBARNARD	4/29/2013
012729D08	Lead Carrier	1.5 mg/ml	LWALKER	5/8/2013
013797P	Nitric Acid	Reagent Grade	LWALKER	5/8/2013
013690S	Sodium Hydroxide	10M	LWALKER	5/8/2013
013587S	Yttrium Carrier	9 mg/ml	LWALKER	5/8/2013
011504D22	Ammonium Sulfide	2%	LWALKER	5/8/2013
012717D04	Ammonium Oxalate	5%	TSMITH	5/10/2013
013624D03	Nitric Acid	1N	TSMITH	5/10/2013
013686S	Nitric Acid	6N	TSMITH	5/10/2013
013690S	Sodium Hydroxide	10M	TSMITH	5/10/2013
013065D04	Sodium Hydroxide	18M	TSMITH	5/10/2013

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Date	Sample #	Client	Insuffin	CT Time	Analysis	Spec
5/16/17	Phenac	WS	0729	6m	LD	S
5/16/17	ETFE	WS	0672	7m	LD	-
5/16/17	1704094SN(2-4)	NYPE	0824	2m	SN907	C
5/16/17	1704148NAC(4)	MPA	1022	2m	RAY	C
5/17/17	Phenac	WS	0514	6m	LID	C
5/17/17	ETFE	WS	0619	7m	LD	C
5/17/17	1704195SY(2-4)	Udon	0746	2m	SN904	C
5/17/17	1704175SN(1)	Udon	0746	2m	SN904	C
5/17/17	1704170SN(1)	Energy Sol.	0818	7m	SN904	C
5/17/17	1705001N(4.6)	Udon	0857	2m	RAY	C
5/17/17	1704119ON(4-4)	Udon	0958	2m	RAY	C
5/17/17	1705014AN(1)	Hudson	1100	70min	LID	C
5/17/17	1705018AD(1,4)	Hudson	1131	7m	LID	C
5/17/17	17041104N(1)	Energy	1777	2m	RAY	C
5/17/17	Am 11 Arel (1-5)	Lab	1553	15mins	αβ	KB
5/18/17	Phenac	WS	0717	6m	LD	C
5/18/17	ETFE	WS	0618	7m	LD	C
5/18/17	1704107AD(1-10)	Accutest	0820	2m	LID	C
5/18/17	1704107AD(11)	Accutest	1025	2m	LID	C
5/18/17	1704102AD(11-4)	Udon	1049	2m	LID	C
5/19/17	Phenac	WS	0716	6m	LD	C
5/19/17	ETFE	WS	0620	7m	LD	C
5/19/17	1705024AN(1-5)	Udon	0757	18m	LID	C
5/19/17	1704105N(1.6)	Energy	0921	2m	RAY	C
5/19/17	1305030AB(1-4)	Hudson Ranch	1134	1hr	αβ	KB
5/19/17	1704105N(1.19)	Energy	1136	2m	RAY	C
5/19/17	1305074C(1,3,5,7)	UCOR	1539	30mins	CL36	KB
5/20/17	Phenac	WS	0720	6m	LD	C
5/20/17	ETFE	WS	0624	7min	LD	C
5/20/17	1704110SY(1-6)	Energy Sol.	0816	2m	SN904	C
5/20/17	1704110SN(1,7,8)	Energy Sol.	1021	2m	SN904	C
5/20/17	1705017R(1)	Udon	1021	70min	RAY	C
5/20/17	1704113SN(1)	Energy	1027	7m	RAY	C

Date	Sample #	Client	Location	CT Time	Analysis	Notes
5/9/10	1705017SN(1-4)	Udon	0840	2h	SR707	C
5/9/10	1704117SN(1-4)	Unitah	0840	2h	SR707	C
5/9/10	1705017NPL(1-4)	Udon	1046	1h	NP270	C
5/9/10	1704470NPL(1-4)	Udon	1046	1h	NP270	C
5/9/10	1704105NPL(7-18)	Enigma	1111	2h	R48	C
5/9/13	1304170CL(1-3,5)	UCOR	1540	30mins	CL36	KB
5/9/13	1304192CL(1-3,5)	UCOR	1541	30mins	CL36	KB
5/9/17	1305005CL(1-3,5)	UCOR	1542	30mins	CL36	KB
5/10/17	EF70E	us	0870	7a	10	C
5/10/17	BILGORE	us	0857	6a	10	C
5/10/17	1705017NPL(7-4,6)	Udon	0811	7h	R48	C
5/10/17	1704177NPL(2-9)	Enigma	0811	2h	R48	C

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SECTION VIII
ANALYTICAL DATA (ISOTOPIC URANIUM)

Spike and Tracer Worksheet

Internal Work Order		Run	Analysis Code		Date	Technician		Technician Initials	Witness Initials							
13-04133		1	UISO		4/29/2013 10:23	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	4/29/2013	0.500	0.5121				8.13	0.293	0.00	0.000	0.00	0.000	0.00	0.000
U-238	U-8a	34.350	4/29/2013	0.500	0.5121				7.92	0.285	0.00	0.000	0.00	0.000	0.00	0.000

Tracers							Balance Printer Tapes									
fraction	Isotope	Sol #	Activity dpm/g	Solution Date	Volume Used (g)	Approx Addition	Tracer					LCS				
01	U-232	U-10a	19.091	4/29/2013	0.6102	0.6300										
02	U-232	U-10a	19.091	4/29/2013	0.6055	0.6300										
03	U-232	U-10a	19.091	4/29/2013	0.6016	0.6300										
04	U-232	U-10a	19.091	4/29/2013	0.5992	0.6300										
05	U-232	U-10a	19.091	4/29/2013	0.5992	0.6300	0.6102 g					0.5121 g				
06	U-232	U-10a	19.091	4/29/2013	0.5948	0.6300	0.6055 g									
07	U-232	U-10a	19.091	4/29/2013	0.5869	0.6300	-0.6016 g									
08	U-232	U-10a	19.091	4/29/2013	0.5960	0.6300	-0.5992 g									
09	U-232	U-10a	19.091	4/29/2013	0.5987	0.6300	-0.5992 g									
							-0.5948 g									
							-0.5869 g									
							-0.5960 g									
							-0.5987 g									
												Matrix Spike				

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Aliquot Worksheet

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Work Order	Run	Analysis Code	Rpt Units	Lab Deadline	Technician
13-04133	1	UIISO	liters	5/9/2013	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	DUP 08 TOT	DUP					1.0000E+00	1.0000E+00				
04	I-65 TOT	TRG					1.0000E+00	1.0000E+00				
05	I-65 DIS	TRG					1.0000E+00	1.0000E+00				
06	DUP 08 TOT	DO					1.0000E+00	1.0000E+00				
07	DUP 08 DIS	TRG					1.0000E+00	1.0000E+00				
08	PURGE TANK TOT	TRG					1.0000E+00	1.0000E+00				
09	PURGE TANK DIS	TRG					1.0000E+00	1.0000E+00				

Comments	
----------	--

Technician: _____

JB Date: 4/29/13

C
5/7/13

Sample Description: SPIKE
 Spectrum File: \\OR-ALPHA1\Canberra\ApexAlpha\Root\Data\00000572
 Batch Identification: 1304133A-UU
 Sample Identification: 01
 Sample Geometry: Shelf 2
 Procedure Description: U iso

Detector Name: Alpha_033
 Chamber Serial Number: 04026479A
 Detector Serial Number: 91132
 Env. Background: System Bkgd 56372
 Reagent Blank: <not performed>

Sample Size: 1.000E+000 +/- 0.000E+000 liter
 Sample Date/Time: 5/7/2013 7:54:48 AM
 Acquisition Date/Time: 5/7/2013 6:01:43 AM
 Acquisition Live Time: 170.0 minutes
 Acquisition Real Time: 170.1 minutes

Tracer Certificate: U232_UU-10A
 Tracer Quantity: 0.610 mL
 Effective Efficiency: 0.2402 +/- 0.0124
 Counting Efficiency: 0.1825 +/- 0.0032 on 12/16/2012 5:49:18 PM
 Chem. Recovery Factor: 1.3161 +/- 0.0715

Control Certificate Name: NatU_U-8A
 Chem. Recov. of Control: U-238 0.946396 +/- 0.066765
 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	472.83	9.02	0.17	0.00E+000	37.5
U-234	4.737	637.83	7.76	0.17	0.00E+000	37.9
U-235	4.422	33.83	33.80	0.17	0.00E+000	4.5
U-238	4.159	698.83	7.42	0.17	0.00E+000	17.8

T = Tracer Peak used for Effective Efficiency

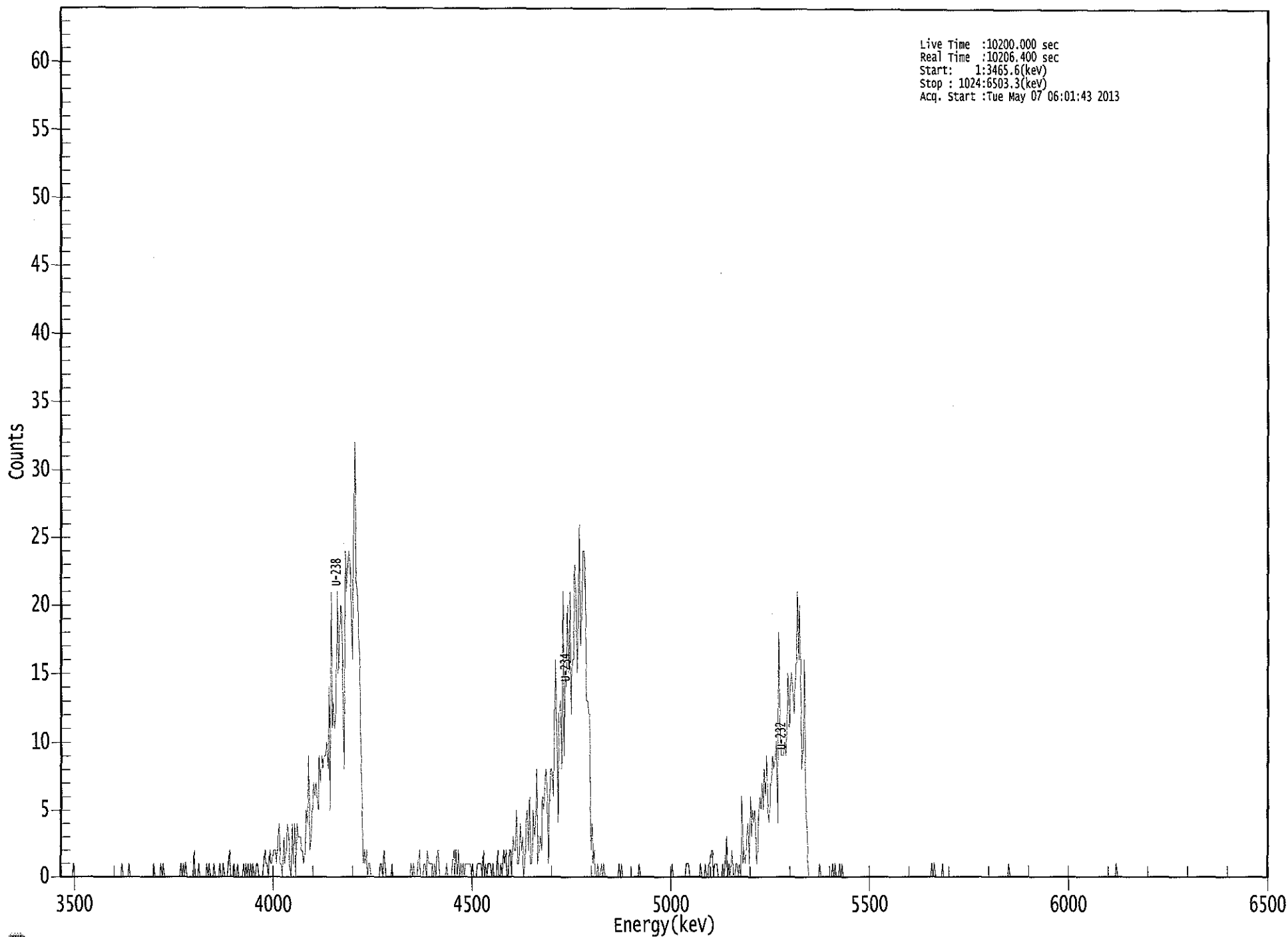
 NUCLIDE ANALYSIS RESULTS

Nuclide	Id Conf.	Energy (keV)	Activity (pCi/liter)	MDA (pCi/liter)
U-232	0.996	5302.50*	5.23E+000 +/- 5.27E-001	4.61E-002 +/- 4.65E-003
U-234	0.996	4761.50*	7.05E+000 +/- 8.97E-001	4.61E-002 +/- 4.65E-003
U-235	0.991	4385.50*	4.61E-001 +/- 1.63E-001	5.69E-002 +/- 5.74E-003
U-238	0.995	4184.40*	7.69E+000 +/- 9.63E-001	4.59E-002 +/- 4.63E-003

AG
5/7/13

0000057286.CNF

Live Time :10200.000 sec
Real Time :10206.400 sec
Start: 1:3465.6(kev)
Stop : 1024:6503.3(kev)
Acq. Start :Tue May 07 06:01:43 2013



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6600

ROI Type: 1

ROI Type: 3

 ***** 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: 10206

Channel	-----	-----	-----	-----	-----	-----	-----	-----
1:	0	0	0	0	0	0	0	0
9:	0	0	0	1	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	1	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	1
81:	0	0	0	0	0	1	0	1
89:	0	0	0	0	0	0	0	0
97:	0	0	0	0	0	0	1	0
105:	1	0	1	0	0	0	0	0
113:	0	2	0	0	0	1	0	0
121:	0	0	0	0	1	0	1	0
129:	0	0	1	0	0	0	0	1
137:	0	0	1	0	0	0	1	2
145:	0	0	0	1	0	0	1	0
153:	0	0	0	1	0	1	0	1
161:	0	1	0	1	0	0	1	1
169:	0	0	0	0	1	2	1	1
177:	0	2	1	1	2	2	2	1
185:	3	4	1	1	0	3	1	2
193:	4	3	1	0	4	1	4	0
201:	4	3	3	3	2	2	1	2
209:	5	4	9	2	3	5	7	6
217:	7	6	5	9	7	9	8	9
225:	9	10	8	14	5	21	11	13
233:	11	12	21	15	18	20	19	13
241:	8	24	21	23	24	23	20	16
249:	26	32	22	21	18	16	10	6
257:	1	2	1	2	0	1	1	0
265:	0	0	0	0	0	0	0	1
273:	1	0	2	1	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	1	0	0	0	1
305:	2	0	0	0	1	1	0	2
313:	1	1	1	1	0	1	0	2
321:	2	0	0	0	0	0	0	1
329:	0	0	0	0	1	2	0	2
337:	0	2	0	1	0	1	0	1
345:	1	1	1	1	0	1	0	0
353:	0	1	1	1	1	0	2	0
361:	1	0	1	1	1	0	1	0

369: 0 0 2 0 0 1 0 2

Sample Title: 01

Channel	1	2	3	4	5	6	7	8
377:	1	2	0	0	2	2	0	3
385:	2	2	5	1	1	4	2	3
393:	0	1	4	5	2	6	1	1
401:	5	3	4	8	1	2	3	2
409:	6	5	7	8	6	1	6	8
417:	8	6	11	16	11	4	12	13
425:	8	21	9	15	14	20	15	21
433:	12	16	16	23	21	15	19	26
441:	17	19	24	24	22	13	13	12
449:	12	2	4	1	2	0	0	1
457:	0	0	1	0	1	0	0	0
465:	0	0	0	0	0	0	0	0
473:	0	1	0	1	0	0	0	0
481:	0	0	0	0	0	0	0	0
489:	0	0	1	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	1	0
521:	0	0	0	0	0	0	0	0
529:	0	0	1	1	1	0	0	0
537:	0	0	0	0	0	0	1	0
545:	0	0	1	0	0	1	1	2
553:	2	0	1	1	1	0	0	0
561:	0	1	0	1	3	0	1	0
569:	1	2	0	0	1	1	0	1
577:	0	6	1	2	1	3	4	1
585:	6	3	5	4	5	2	1	4
593:	6	5	7	5	8	6	9	5
601:	4	7	7	9	8	9	10	4
609:	18	12	9	9	9	10	9	11
617:	15	11	14	15	14	12	14	15
625:	21	16	20	12	8	10	16	5
633:	4	1	0	0	0	0	0	0
641:	0	0	0	1	0	0	0	0
649:	0	0	0	0	0	0	1	0
657:	1	0	0	0	1	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	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	1	0	1	0	0	0
745:	0	0	0	1	0	0	0	0
753:	0	0	0	0	0	0	0	0
761:	0	0	0	0	0	0	0	0
769:	0	0	0	0	0	0	0	0
777:	0	0	0	0	0	0	0	0
785:	0	0	0	0	0	0	0	0
793:	0	0	0	0	0	0	0	0

801: 0 0 0 1 0 0 0 0

Sample Title: 01

Channel	-----	-----	-----	-----	-----	-----	-----	-----
809:	0	0	0	0	0	0	0	0
817:	0	0	0	0	0	0	0	0
825:	0	0	0	0	0	0	0	0
833:	0	0	0	0	0	0	0	0
841:	0	0	0	0	0	0	0	0
849:	0	0	0	0	0	0	0	0
857:	0	0	0	0	0	0	0	0
865:	0	0	0	0	0	0	0	0
873:	0	0	0	0	0	0	0	0
881:	0	0	0	0	0	0	0	0
889:	0	0	0	0	0	0	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:	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



C 57117

Sample Description: BLANK
 Spectrum File: \\OR-ALPHA1\Canberra\ApexAlpha\Root\Data\00000572
 Batch Identification: 1304133A-UU
 Sample Identification: 02
 Sample Geometry: Shelf 2
 Procedure Description: U iso

Detector Name: Alpha_034
 Chamber Serial Number: 04026479B
 Detector Serial Number: 91136
 Env. Background: System Bkgd 56373
 Reagent Blank: <not performed>

Sample Size: 1.000E+000 +/- 0.000E+000 liter
 Sample Date/Time: 5/7/2013 7:54:48 AM
 Acquisition Date/Time: 5/7/2013 6:01:45 AM
 Acquisition Live Time: 170.0 minutes
 Acquisition Real Time: 170.1 minutes

Tracer Certificate: U232_UU-10A
 Tracer Quantity: 0.605 mL
 Effective Efficiency: 0.2411 +/- 0.0124
 Counting Efficiency: 0.1856 +/- 0.0032 on 12/16/2012 5:49:43 PM
 Chem. Recovery Factor: 1.2991 +/- 0.0707

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	471.00	9.04	0.00	0.00E+000	34.5
U-234	4.745	4.66	94.59	0.34	0.00E+000	3.0
U-235	4.396	1.00	277.19	0.00	0.00E+000	3.0
U-238	4.075	1.83	152.56	0.17	0.00E+000	3.0

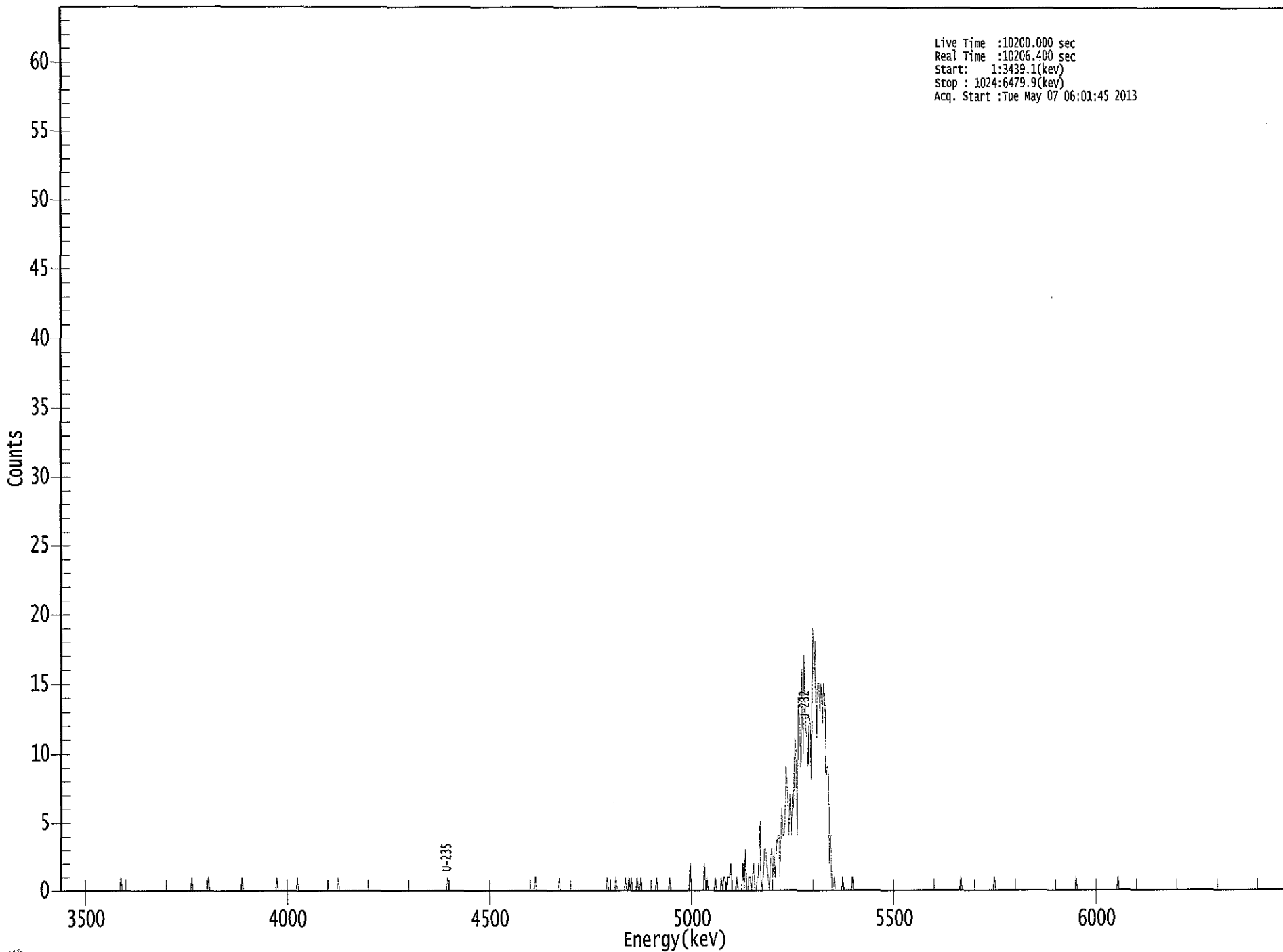
T = Tracer Peak used for Effective Efficiency

 NUCLIDE ANALYSIS RESULTS

Nuclide	Id Conf.	Energy (keV)	Activity (pCi/liter)	MDA (pCi/liter)
U-232	0.997	5302.50*	5.19E+000 +/- 5.24E-001	6.60E-002 +/- 6.67E-003
U-234	0.998	4761.50*	5.13E-002 +/- 4.88E-002	5.27E-002 +/- 5.32E-003
U-235	0.999	4385.50*	1.36E-002 +/- 3.77E-002	8.15E-002 +/- 8.23E-003
U-238	0.919	4184.40*	2.01E-002 +/- 3.07E-002	4.58E-002 +/- 4.62E-003

AG
 5/7/13

US EPA ARCHIVE DOCUMENT



7010

ROI Type: 1

ROI Type: 3

***** 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: 10206

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	1	0	0	0	0	0
57:	0	0	0	0	0	0	0	0
65:	0	0	0	0	0	0	0	0
73:	0	0	0	0	0	0	0	0
81:	0	0	0	0	0	0	0	0
89:	0	0	0	0	0	0	0	0
97:	0	0	0	0	0	0	0	0
105:	0	0	0	0	0	1	0	0
113:	0	0	0	0	0	0	0	0
121:	0	0	0	1	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	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	1	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	0	0	0	0	0	0
225:	0	0	0	0	0	0	0	1
233:	0	0	0	0	0	0	0	0
241:	0	0	0	0	0	0	0	0
249:	0	0	0	0	0	0	0	0
257:	0	0	0	0	0	0	0	0
265:	0	0	0	0	0	0	0	0
273:	0	0	0	0	0	0	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	1	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 0

Sample Title: 02

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



Sample Description: DUP 08 TOT-DUP
 Spectrum File: \\OR-ALPHA1\Canberra\ApexAlpha\Root\Data\00000572
 Batch Identification: 1304133A-UU
 Sample Identification: 03
 Sample Geometry: Shelf 2
 Procedure Description: U iso

Detector Name: Alpha_035
 Chamber Serial Number: 04026477A
 Detector Serial Number: 58771
 Env. Background: System Bkgd 56374
 Reagent Blank: <not performed>

Sample Size: 1.000E+000 +/- 0.000E+000 liter
 Sample Date/Time: 4/16/2013 7:54:48 AM
 Acquisition Date/Time: 5/7/2013 6:01:40 AM
 Acquisition Live Time: 170.0 minutes
 Acquisition Real Time: 170.1 minutes

Tracer Certificate: U232_UU-10A
 Tracer Quantity: 0.602 mL
 Effective Efficiency: 0.1665 +/- 0.0100
 Counting Efficiency: 0.1826 +/- 0.0032 on 12/16/2012 5:49:42 PM
 Chem. Recovery Factor: 0.9118 +/- 0.0572

Peak Match Tolerance: 0.150 MeV

 ----- PEAK AREA REPORT -----

Nuclide	Energy (MeV)	Net Pk Area	Pk Area Error %	Ambient Backgnd	Reagent Backgnd	FWHM (keV)
U-232	T 5.188	323.15	10.92	0.85	0.00E+000	5.9
U-234	4.673	43.83	29.67	0.17	0.00E+000	3.7
U-235	4.441	10.00	65.01	0.00	0.00E+000	4.4
U-238	4.111	51.00	27.71	0.00	0.00E+000	5.9

T = Tracer Peak used for Effective Efficiency

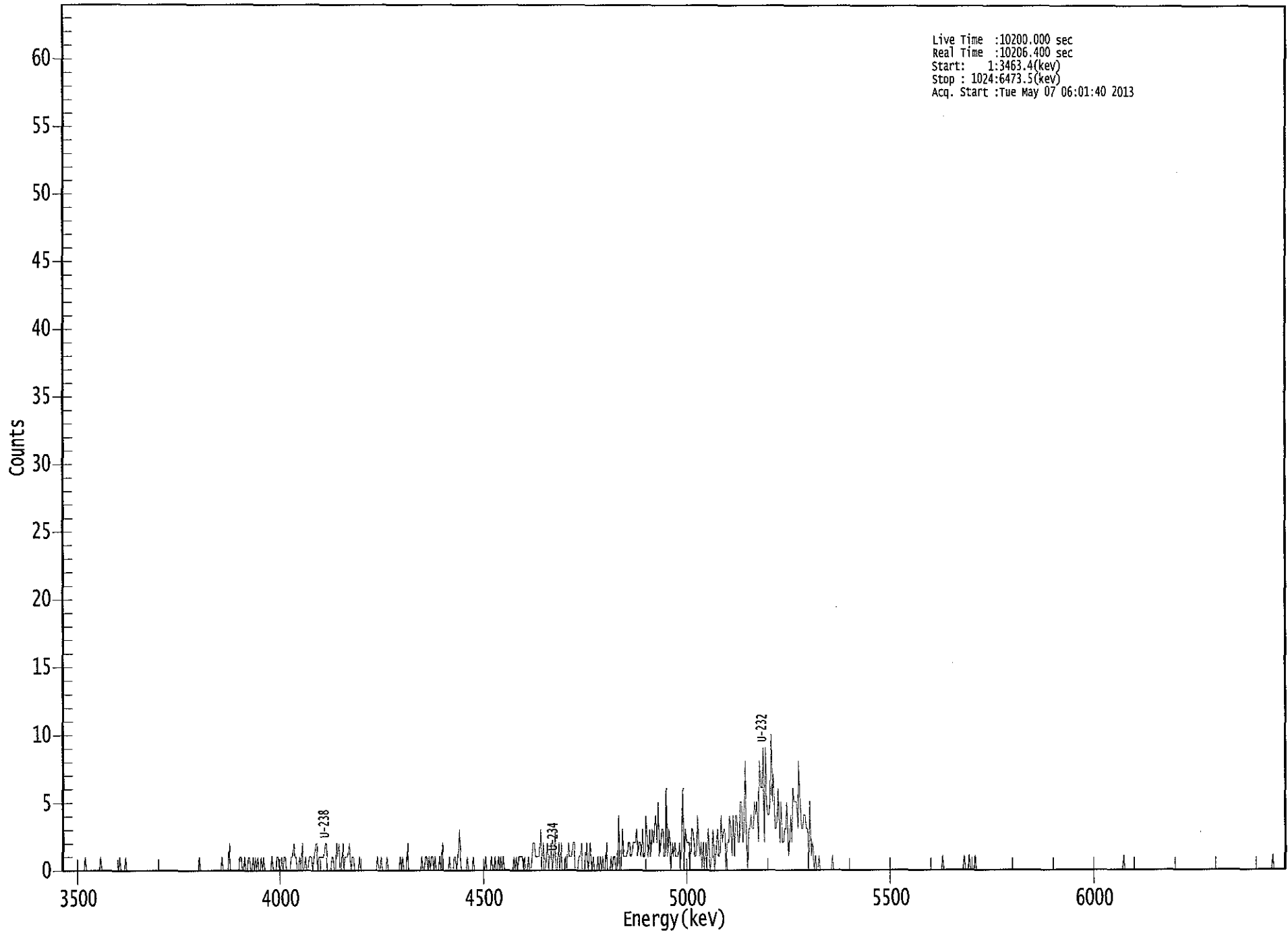
 ----- NUCLIDE ANALYSIS RESULTS -----

Nuclide	Id Conf.	Energy (keV)	Activity (pCi/liter)	MDA (pCi/liter)
U-232	0.911	5302.50*	5.16E+000 +/- 6.09E-001	9.55E-002 +/- 1.13E-002
U-234	0.945	4761.50*	6.99E-001 +/- 2.23E-001	6.66E-002 +/- 7.86E-003
U-235	0.978	4385.50*	1.97E-001 +/- 1.30E-001	1.18E-001 +/- 1.39E-002
U-238	0.963	4184.40*	8.10E-001 +/- 2.44E-001	9.52E-002 +/- 1.12E-002

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US EPA ARCHIVE DOCUMENT

000057298.CNF



0109

ROI Type: 1

 ***** 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: 10206

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

369: 0 1 0 0 0 0 0 0

Sample Title: 03

Channel	1	2	3	4	5	6	7	8
377:	0	0	1	0	1	0	1	1
385:	1	1	0	1	0	0	1	0
393:	0	1	2	2	1	1	1	1
401:	3	0	2	0	0	1	2	0
409:	1	2	0	1	3	0	0	2
417:	0	2	0	0	0	1	0	2
425:	1	1	1	2	2	0	0	0
433:	1	1	2	0	0	0	2	1
441:	0	2	1	0	1	0	0	0
449:	1	0	1	0	1	0	0	2
457:	0	0	0	1	0	1	1	0
465:	0	4	0	0	3	1	1	1
473:	1	2	2	1	1	2	2	2
481:	3	1	2	2	1	3	1	1
489:	4	2	1	3	1	3	2	3
497:	4	2	5	1	2	3	3	1
505:	1	6	1	3	2	0	2	1
513:	2	1	1	1	2	0	3	6
521:	0	3	2	2	2	0	3	3
529:	2	1	1	4	2	1	2	0
537:	2	0	2	0	3	1	0	1
545:	3	1	0	2	3	1	1	4
553:	2	3	3	0	2	2	4	3
561:	1	4	1	4	4	2	2	5
569:	5	2	3	8	2	0	3	3
577:	4	3	3	5	4	5	2	8
585:	6	6	9	2	9	5	4	4
593:	5	10	5	7	3	3	4	6
601:	2	5	2	2	3	3	5	1
609:	2	4	2	6	5	5	5	3
617:	8	5	3	3	4	4	3	3
625:	0	5	1	2	1	0	1	0
633:	0	1	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	0	0
737:	1	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	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: 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	1
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	1	0	0	0
1017:	0	0	0	0	0	0	0	0

C
5/7/13

Sample Description: I-65 TOT
 Spectrum File: \\OR-ALPHA1\Canberra\ApexAlpha\Root\Data\00000572
 Batch Identification: 1304133A-UU
 Sample Identification: 04
 Sample Geometry: Shelf 2
 Procedure Description: U iso

Detector Name: Alpha_037
 Chamber Serial Number: 04026478A
 Detector Serial Number: 91133
 Env. Background: System Bkgd 56375
 Reagent Blank: <not performed>

Sample Size: 1.000E+000 +/- 0.000E+000 liter
 Sample Date/Time: 4/16/2013 7:54:48 AM
 Acquisition Date/Time: 5/7/2013 6:01:41 AM
 Acquisition Live Time: 170.0 minutes
 Acquisition Real Time: 170.1 minutes

Tracer Certificate: U232_UU-10A
 Tracer Quantity: 0.599 mL
 Effective Efficiency: 0.1829 +/- 0.0106
 Counting Efficiency: 0.1783 +/- 0.0033 on 1/26/2013 3:28:25 PM
 Chem. Recovery Factor: 1.0260 +/- 0.0625

Peak Match Tolerance: 0.150 MeV

 ----- PEAK AREA REPORT -----

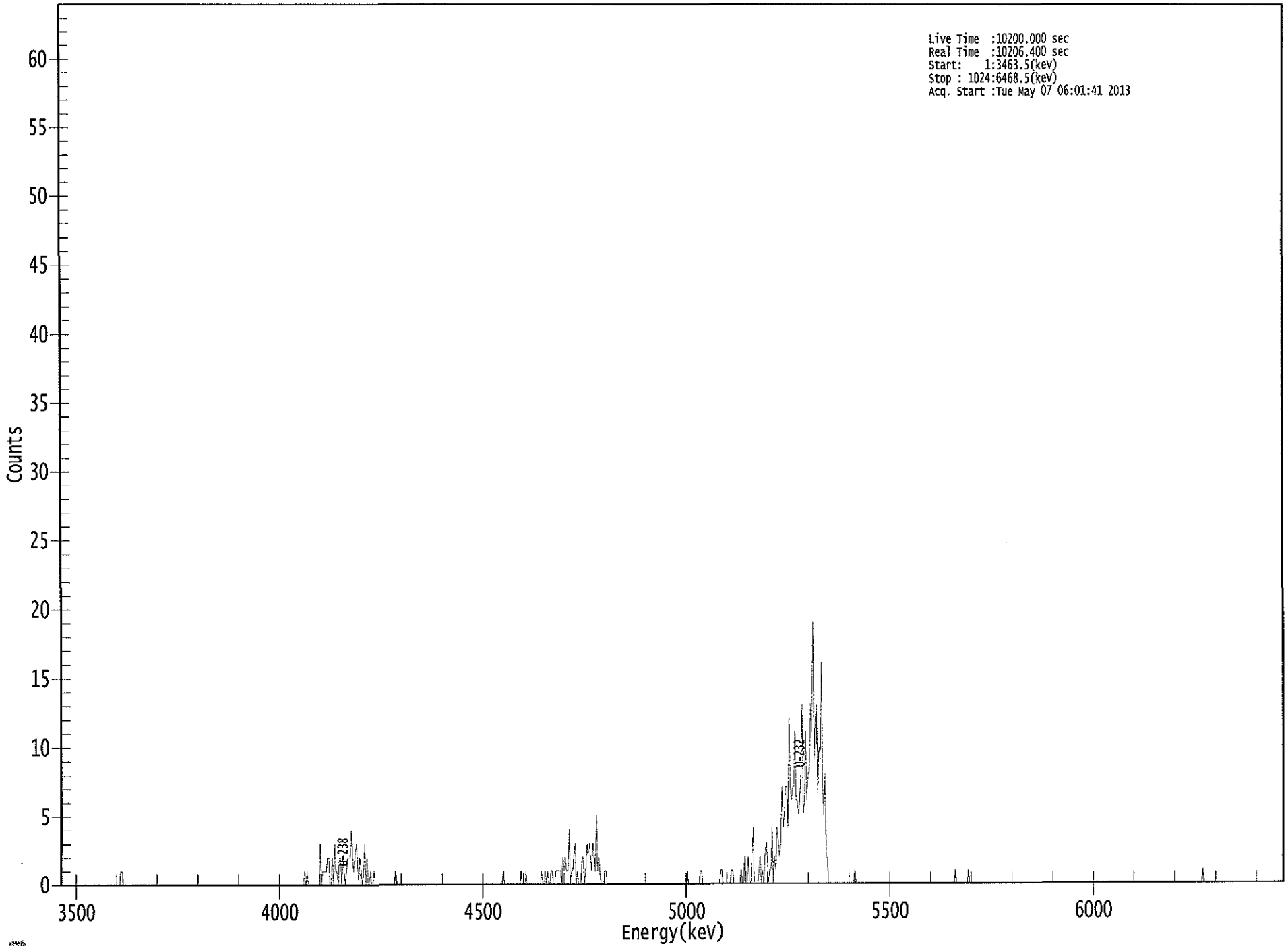
Nuclide	Energy (MeV)	Net Pk Area	Pk Area Error %	Ambient Backgnd	Reagent Backgnd	FWHM (keV)
U-232	T 5.283	353.66	10.43	0.34	0.00E+000	10.7
U-234	4.735	62.66	24.84	0.34	0.00E+000	3.7
U-235	4.398	0.00	1960.0	0.00	0.00E+000	0.0
U-238	4.161	59.00	25.73	0.00	0.00E+000	5.9

T = Tracer Peak used for Effective Efficiency

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

Nuclide	Id Conf.	Energy (keV)	Activity (pCi/liter)	MDA (pCi/liter)
U-232	0.997	5302.50*	5.14E+000 +/- 5.84E-001	6.94E-002 +/- 7.89E-003
U-234	0.995	4761.50*	9.09E-001 +/- 2.48E-001	6.94E-002 +/- 7.88E-003
U-235	0.999	4385.50*	0.00E+000 +/- 4.96E-002	1.07E-001 +/- 1.22E-002
U-238	0.996	4184.40*	8.53E-001 +/- 2.40E-001	8.67E-002 +/- 9.85E-003

AG
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0114

ROI Type: 1

ROI Type: 3

 ***** 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: 10206

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

369: 0 0 1 0 0 0 0 0 0

Sample Title: 04

Channel	1	2	3	4	5	6	7	8
377:	0	0	0	0	0	0	0	0
385:	0	1	0	0	0	1	0	0
393:	0	0	0	0	0	0	0	0
401:	0	0	1	0	0	1	0	1
409:	0	0	1	1	0	0	1	1
417:	1	1	1	0	2	1	2	1
425:	1	4	0	1	1	2	3	0
433:	1	0	0	0	2	2	0	1
441:	3	2	3	2	1	3	2	1
449:	5	1	2	1	0	0	0	1
457:	1	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	1	0	0	0
529:	0	0	0	0	0	0	0	1
537:	1	0	0	0	0	0	0	0
545:	0	0	0	0	0	0	0	0
553:	1	1	0	0	0	0	0	0
561:	0	1	1	0	0	0	0	0
569:	0	1	0	0	2	0	0	2
577:	0	0	2	4	0	0	0	0
585:	1	2	0	1	0	2	3	2
593:	0	1	1	4	0	2	1	4
601:	3	2	3	7	4	5	7	7
609:	4	12	7	6	7	7	11	6
617:	6	5	6	8	13	5	6	11
625:	6	8	8	13	11	19	9	12
633:	13	6	10	9	16	7	5	8
641:	2	2	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:	1	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	1	0	0	0
753:	0	0	0	0	0	0	0	1
761:	0	0	0	0	0	0	0	0
769:	0	0	0	0	0	0	0	0
777:	0	0	0	0	0	0	0	0
785:	0	0	0	0	0	0	0	0
793:	0	0	0	0	0	0	0	0

801: 0 0 0 0 0 0 0 0

Sample Title: 04

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

c
5/7/13

Sample Description: I-65 DIS
 Spectrum File: \\OR-ALPHA1\Canberra\ApexAlpha\Root\Data\00000572
 Batch Identification: 1304133A-UU
 Sample Identification: 05
 Sample Geometry: Shelf 2
 Procedure Description: U iso

Detector Name: Alpha_040
 Chamber Serial Number: 06027396B
 Detector Serial Number: 91135
 Env. Background: System Bkgd 56376
 Reagent Blank: <not performed>

Sample Size: 1.000E+000 +/- 0.000E+000 liter
 Sample Date/Time: 4/16/2013 7:54:48 AM
 Acquisition Date/Time: 5/7/2013 6:01:54 AM
 Acquisition Live Time: 170.0 minutes
 Acquisition Real Time: 170.1 minutes

Tracer Certificate: U232_UU-10A
 Tracer Quantity: 0.599 mL
 Effective Efficiency: 0.1328 +/- 0.0088
 Counting Efficiency: 0.1900 +/- 0.0033 on 12/16/2012 5:49:33 PM
 Chem. Recovery Factor: 0.6987 +/- 0.0481

Peak Match Tolerance: 0.150 MeV

 ----- PEAK AREA REPORT -----

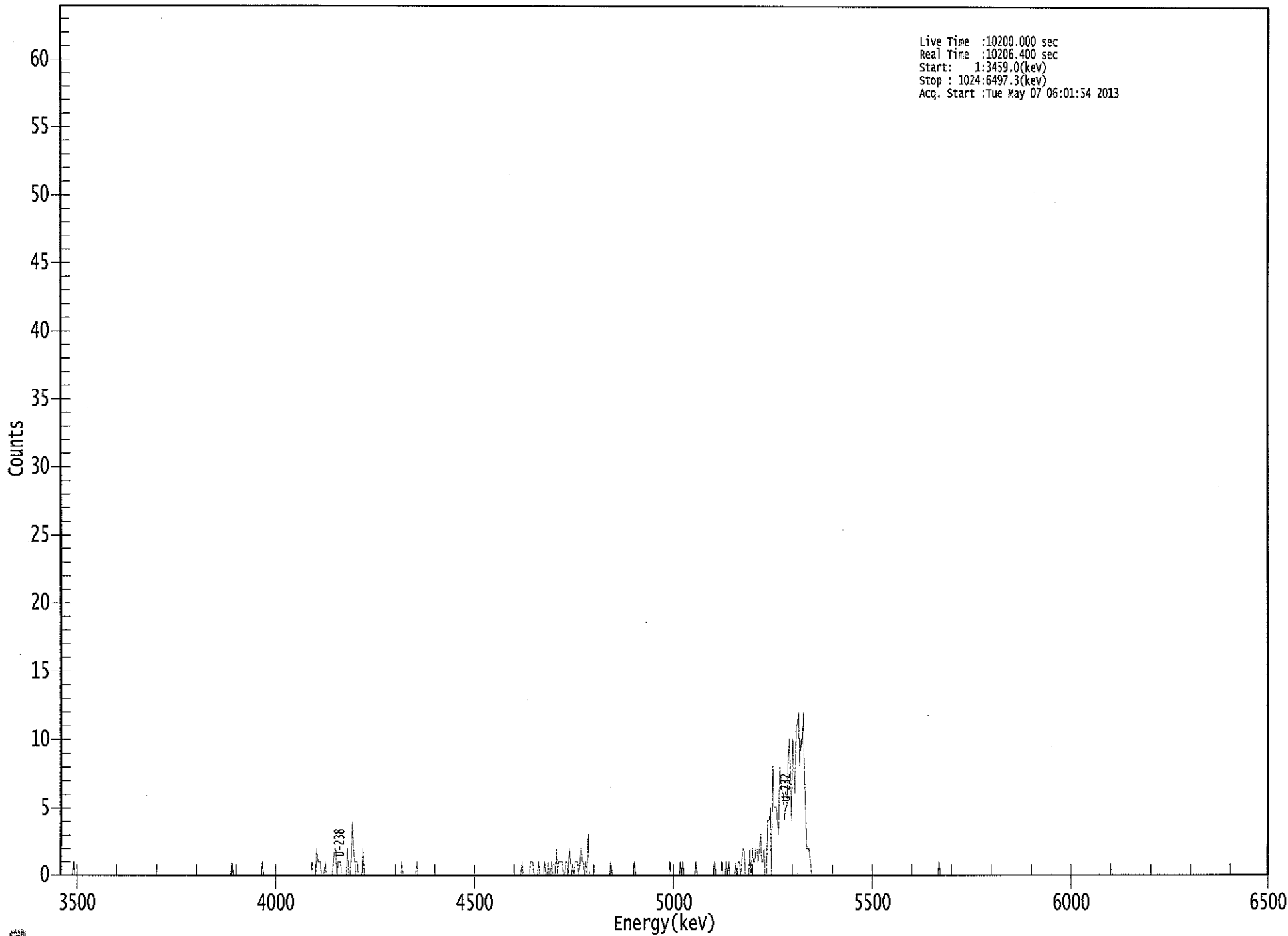
Nuclide	Energy (MeV)	Net Pk Area	Pk Area Error %	Ambient Backgnd	Reagent Backgnd	FWHM (keV)
U-232	T 5.284	256.66	12.24	0.34	0.00E+000	24.7
U-234	4.726	32.00	35.19	0.00	0.00E+000	3.0
U-235	4.337	1.83	152.56	0.17	0.00E+000	3.0
U-238	4.163	28.49	37.10	0.51	0.00E+000	4.9

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*	5.14E+000 +/- 6.70E-001	9.57E-002 +/- 1.25E-002
U-234	0.991	4761.50*	6.40E-001 +/- 2.40E-001	1.20E-001 +/- 1.56E-002
U-235	0.983	4385.50*	4.52E-002 +/- 6.91E-002	1.03E-001 +/- 1.34E-002
U-238	0.997	4184.40*	5.67E-001 +/- 2.23E-001	1.04E-001 +/- 1.36E-002

AG
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Live Time :10200.000 sec
Real Time :10206.400 sec
Start: 1:3459.0(kev)
Stop : 1024:6497.3(kev)
Acq. Start :Tue May 07 06:01:54 2013

 ***** 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: 10206

Channel	-----	-----	-----	-----	-----	-----	-----	-----
1:	0	0	0	0	0	0	0	0
9:	0	0	0	1	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	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	0	0	1	0	0	0	0
177:	0	0	0	0	0	0	0	0
185:	0	0	0	0	0	0	0	0
193:	0	0	0	0	0	0	0	0
201:	0	0	0	0	0	0	0	0
209:	0	0	0	0	0	1	0	0
217:	0	2	1	1	1	0	0	0
225:	1	0	0	0	0	0	0	1
233:	2	2	0	1	1	1	0	0
241:	0	0	0	2	0	0	1	4
249:	2	1	1	1	0	0	0	0
257:	2	0	0	0	0	0	0	0
265:	0	0	0	0	0	0	0	0
273:	0	0	0	0	0	0	0	0
281:	0	0	0	0	0	0	0	0
289:	0	1	0	0	0	0	0	0
297:	0	0	0	0	0	0	1	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 0

Sample Title: 05

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

801: 0 0 0 0 0 0 0 0

Sample Title: 05

Channel								
809:	0	0	0	0	0	0	0	0
817:	0	0	0	0	0	0	0	0
825:	0	0	0	0	0	0	0	0
833:	0	0	0	0	0	0	0	0
841:	0	0	0	0	0	0	0	0
849:	0	0	0	0	0	0	0	0
857:	0	0	0	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

57117

Sample Description: DUP 08 TOT
 Spectrum File: \\OR-ALPHA1\Canberra\ApexAlpha\Root\Data\00000572
 Batch Identification: 1304133A-UU
 Sample Identification: 06
 Sample Geometry: Shelf 2
 Procedure Description: U iso

Detector Name: Alpha_041
 Chamber Serial Number: 05026930A
 Detector Serial Number: 91087
 Env. Background: System Bkgd 56377
 Reagent Blank: <not performed>

Sample Size: 1.000E+000 +/- 0.000E+000 liter
 Sample Date/Time: 4/16/2013 7:54:48 AM
 Acquisition Date/Time: 5/7/2013 6:01:50 AM
 Acquisition Live Time: 170.0 minutes
 Acquisition Real Time: 170.1 minutes

Tracer Certificate: U232_UU-10A
 Tracer Quantity: 0.595 mL
 Effective Efficiency: 0.1817 +/- 0.0106
 Counting Efficiency: 0.1978 +/- 0.0034 on 12/16/2012 5:49:31 PM
 Chem. Recovery Factor: 0.9182 +/- 0.0558

Peak Match Tolerance: 0.150 MeV

 ----- PEAK AREA REPORT -----

Nuclide	Energy (MeV)	Net Pk Area	Pk Area Error %	Ambient Backgnd	Reagent Backgnd	FWHM (keV)
U-232	T 5.280	348.66	10.50	0.34	0.00E+000	33.6
U-234	4.727	45.81	29.40	1.19	0.00E+000	4.4
U-235	4.362	4.66	94.59	0.34	0.00E+000	3.0
U-238	4.149	34.94	34.82	3.06	0.00E+000	3.7

T = Tracer Peak used for Effective Efficiency

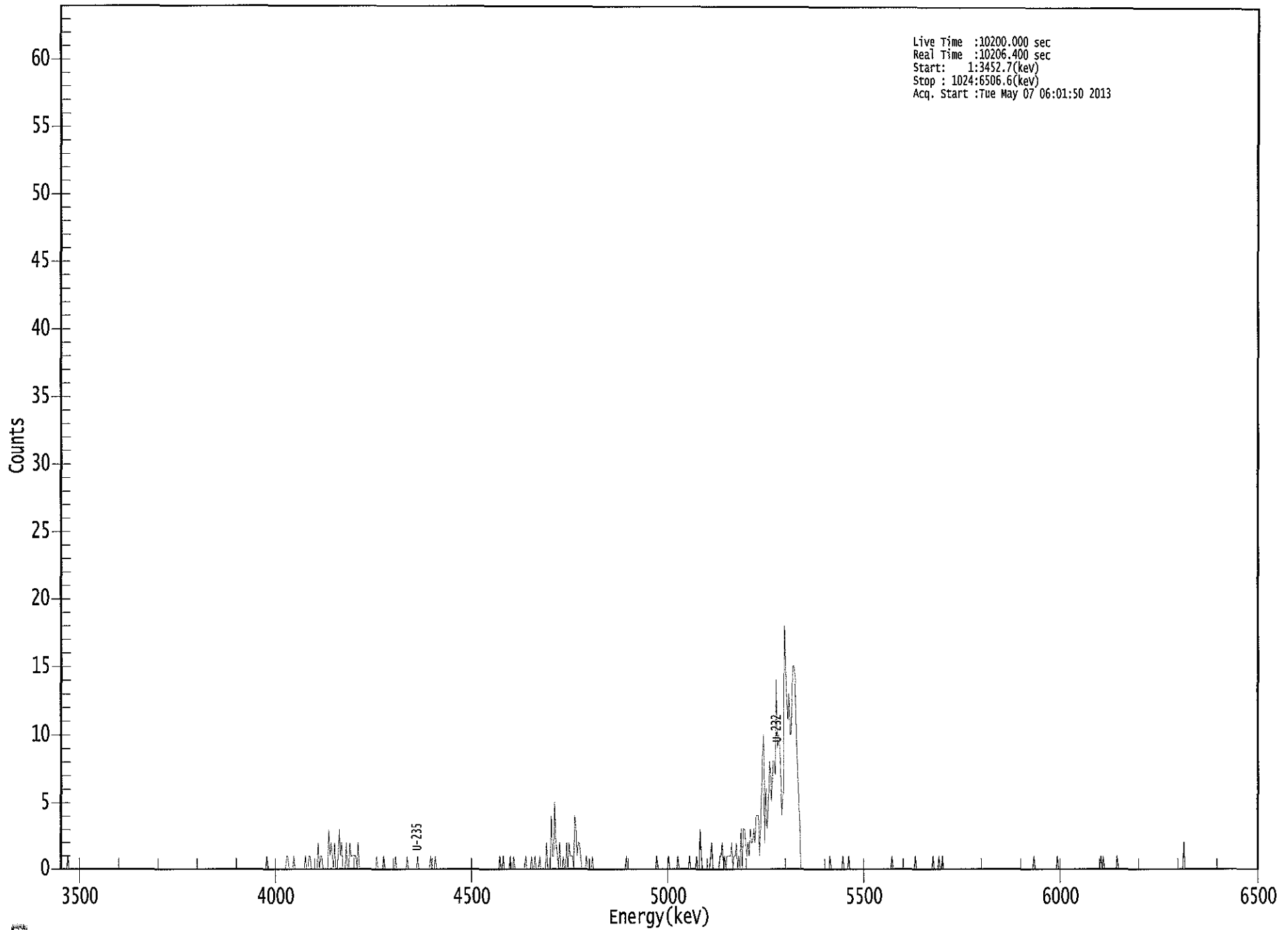
 ----- NUCLIDE ANALYSIS RESULTS -----

Nuclide	Id Conf.	Energy (keV)	Activity (pCi/liter)	MDA (pCi/liter)
U-232	0.996	5302.50*	5.10E+000 +/- 5.83E-001	6.99E-002 +/- 7.99E-003
U-234	0.992	4761.50*	6.69E-001 +/- 2.11E-001	9.63E-002 +/- 1.10E-002
U-235	0.996	4385.50*	8.40E-002 +/- 8.00E-002	8.62E-002 +/- 9.85E-003
U-238	0.991	4184.40*	5.08E-001 +/- 1.86E-001	1.30E-001 +/- 1.49E-002

AG
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US EPA ARCHIVE DOCUMENT

0000057291.CNF



Live Time :10200.000 sec
Real Time :10206.400 sec
Start: 1:3452.7(keV)
Stop : 1024:6506.6(keV)
Acq. Start :Tue May 07 06:01:50 2013

0124

ROI Type: 1

ROI Type: 3

 ***** 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: 10206

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

369: 0 0 0 0 0 0 0 0 1

Sample Title: 06

Channel	-----	-----	-----	-----	-----	-----	-----	-----
377:	0	0	1	0	0	0	0	0
385:	1	0	0	1	0	0	0	0
393:	0	0	0	0	0	1	0	0
401:	0	0	1	0	0	1	0	0
409:	0	1	0	0	0	0	0	2
417:	0	0	0	4	1	1	5	2
425:	1	0	2	0	0	1	0	0
433:	2	0	2	1	1	1	0	4
441:	3	1	2	2	1	0	0	0
449:	0	1	0	0	0	0	1	0
457:	0	0	0	0	0	0	0	0
465:	0	0	0	0	0	0	0	0
473:	0	0	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	0	0	0	0
505:	0	0	0	0	0	1	0	0
513:	0	0	0	0	0	0	0	1
521:	0	0	0	0	0	0	0	1
529:	0	0	0	0	0	0	0	0
537:	0	1	0	0	0	0	0	1
545:	0	0	3	1	0	0	0	0
553:	0	0	0	1	2	0	0	0
561:	0	0	0	1	1	2	0	1
569:	0	1	1	1	1	2	0	1
577:	1	2	0	1	0	3	0	3
585:	3	2	1	2	1	3	2	2
593:	3	2	4	4	4	1	4	8
601:	10	2	6	3	4	8	7	5
609:	8	8	7	14	9	10	9	6
617:	4	6	18	14	13	11	13	10
625:	10	15	15	14	11	7	5	4
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	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	1	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	1	0	0	0	0	1	0
753:	0	1	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	1	2	3	4	5	6	7	8
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	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:	1	0	1	0	0	0	0	0
897:	0	0	0	0	0	0	1	0
905:	0	0	0	0	0	0	0	0
913:	0	0	0	0	0	0	0	0
921:	0	0	0	0	0	0	0	0
929:	0	0	0	0	0	0	0	0
937:	0	0	0	0	0	0	0	0
945:	0	0	0	0	0	0	0	0
953:	0	0	0	0	0	0	0	2
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

C
5/7/13

Sample Description: DUP 08 DIS
 Spectrum File: \\OR-ALPHA1\Canberra\ApexAlpha\Root\Data\00000572
 Batch Identification: 1304133A-UU
 Sample Identification: 07
 Sample Geometry: Shelf 2
 Procedure Description: U iso

Detector Name: Alpha_042
 Chamber Serial Number: 05026930B
 Detector Serial Number: 84185
 Env. Background: System Bkgd 56378
 Reagent Blank: <not performed>

Sample Size: 1.000E+000 +/- 0.000E+000 liter
 Sample Date/Time: 4/16/2013 7:54:48 AM
 Acquisition Date/Time: 5/7/2013 6:01:52 AM
 Acquisition Live Time: 170.0 minutes
 Acquisition Real Time: 170.1 minutes

Tracer Certificate: U232_UU-10A
 Tracer Quantity: 0.587 mL
 Effective Efficiency: 0.2101 +/- 0.0116
 Counting Efficiency: 0.1846 +/- 0.0032 on 12/16/2012 5:49:29 PM
 Chem. Recovery Factor: 1.1379 +/- 0.0658

Peak Match Tolerance: 0.150 MeV

 ----- PEAK AREA REPORT -----

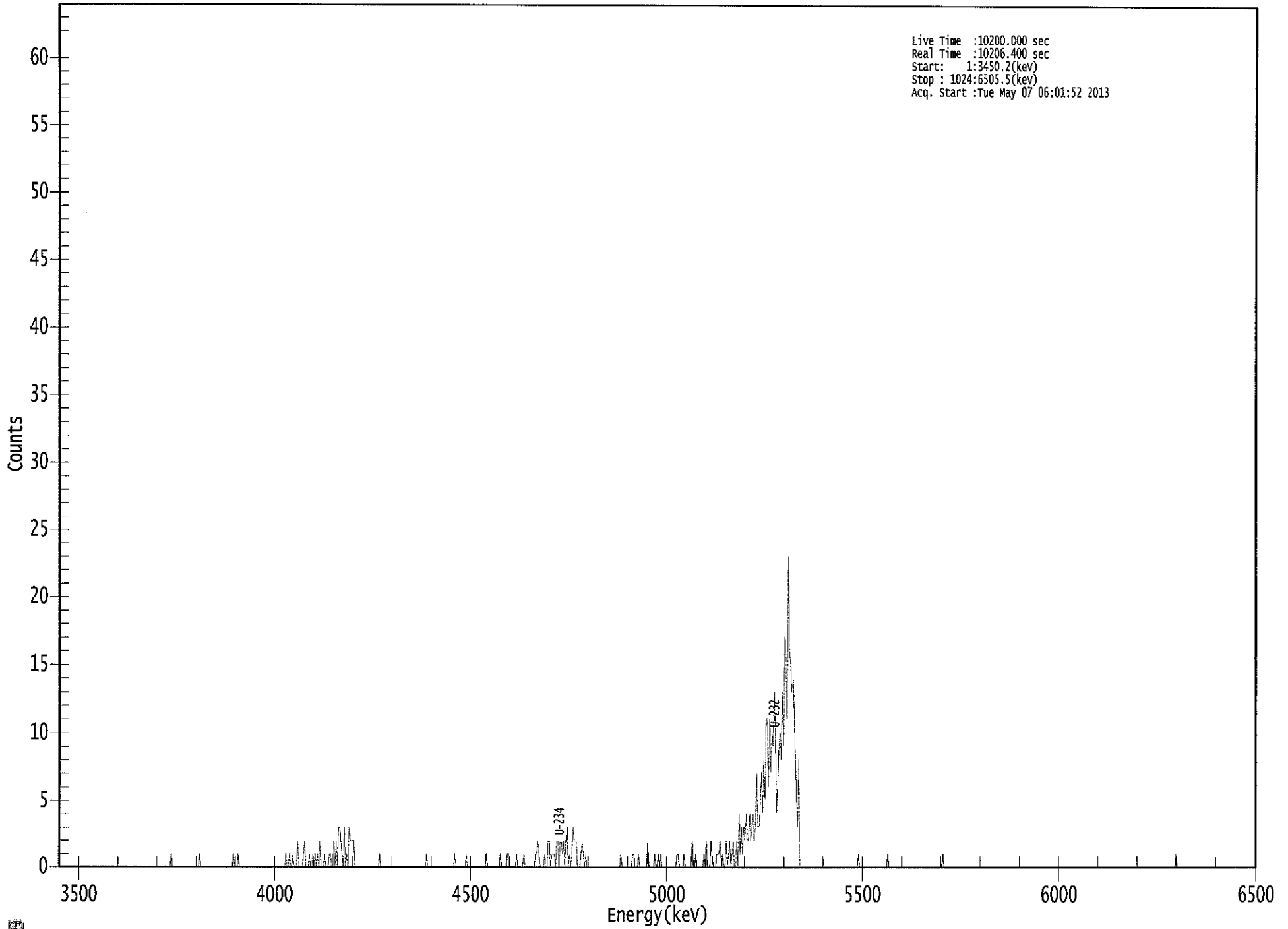
Nuclide	Energy (MeV)	Net Pk Area	Pk Area Error %	Ambient Backgnd	Reagent Backgnd	FWHM (keV)
U-232	T 5.279	397.83	9.83	0.17	0.00E+000	18.2
U-234	4.727	47.49	28.62	0.51	0.00E+000	5.2
U-235	4.446	2.83	120.53	0.17	0.00E+000	3.0
U-238	4.147	45.66	29.13	0.34	0.00E+000	9.0

T = Tracer Peak used for Effective Efficiency

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

Nuclide	Id Conf.	Energy (keV)	Activity (pCi/liter)	MDA (pCi/liter)
U-232	0.996	5302.50*	5.03E+000 +/- 5.44E-001	5.28E-002 +/- 5.71E-003
U-234	0.992	4761.50*	6.00E-001 +/- 1.84E-001	6.63E-002 +/- 7.17E-003
U-235	0.975	4385.50*	4.41E-002 +/- 5.34E-002	6.51E-002 +/- 7.04E-003
U-238	0.990	4184.40*	5.75E-001 +/- 1.79E-001	6.02E-002 +/- 6.51E-003

AG
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Live Time :10200.000 sec
Real Time :10206.400 sec
Start: 1:3450.2(kev)
Stop : 1024:6505.3(kev)
Acq. Start :Tue May 07 06:01:52 2013

***** 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: 10206

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:	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:	1	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	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	1	0	0	1	0	0
201:	1	0	0	0	2	0	0	0
209:	0	1	2	0	0	0	1	0
217:	0	1	0	1	0	1	0	2
225:	0	0	0	1	0	0	0	1
233:	1	0	0	2	0	2	0	3
241:	3	2	1	0	3	0	1	0
249:	3	2	2	2	2	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:	0	0	0	0	0	0	0	0
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	1	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	1	0	0

369: 0 0 0 0 0 0 0 0

Sample Title: 07

Channel	-----	-----	-----	-----	-----	-----	-----	-----
377:	0	1	0	0	0	0	0	1
385:	1	0	0	0	0	0	0	1
393:	0	0	0	0	0	1	0	0
401:	0	0	0	0	0	0	0	1
409:	1	2	1	0	0	0	0	1
417:	0	0	2	2	0	1	1	1
425:	0	2	2	0	2	2	1	2
433:	0	2	3	0	1	0	1	3
441:	2	2	2	0	0	0	1	2
449:	1	0	1	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	1	1	0	0	0	1
497:	0	0	0	0	0	0	0	2
505:	0	0	0	0	0	1	0	0
513:	1	0	1	0	0	0	0	0
521:	0	0	0	0	0	0	0	0
529:	1	1	0	0	0	0	1	0
537:	0	0	0	0	0	2	0	0
545:	1	0	0	0	0	0	0	1
553:	0	2	0	0	0	2	1	0
561:	0	0	1	1	1	2	0	1
569:	0	0	2	0	1	2	0	1
577:	2	0	0	2	0	4	1	3
585:	1	3	2	4	2	2	4	2
593:	3	4	2	3	7	3	3	4
601:	7	4	8	5	11	11	6	11
609:	7	10	9	13	10	4	6	9
617:	10	8	13	9	17	15	11	23
625:	16	15	13	14	12	8	5	3
633:	8	0	0	0	0	0	0	0
641:	0	0	0	0	0	0	0	0
649:	0	0	0	0	0	0	0	0
657:	0	0	0	0	0	0	0	0
665:	0	0	0	0	0	0	0	0
673:	0	0	0	0	0	0	0	0
681:	0	0	0	1	0	0	0	0
689:	0	0	0	0	0	0	0	0
697:	0	0	0	0	0	0	0	0
705:	0	0	0	0	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	1	0	0	0	0
761:	0	0	0	0	0	0	0	0
769:	0	0	0	0	0	0	0	0
777:	0	0	0	0	0	0	0	0
785:	0	0	0	0	0	0	0	0
793:	0	0	0	0	0	0	0	0

801: 0 0 0 0 0 0 0 0

Sample Title: 07

Channel	-----	-----	-----	-----	-----	-----	-----	-----
809:	0	0	0	0	0	0	0	0
817:	0	0	0	0	0	0	0	0
825:	0	0	0	0	0	0	0	0
833:	0	0	0	0	0	0	0	0
841:	0	0	0	0	0	0	0	0
849:	0	0	0	0	0	0	0	0
857:	0	0	0	0	0	0	0	0
865:	0	0	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

Sample Description: PURGE TANK TOT
 Spectrum File: \\OR-ALPHA1\Canberra\ApexAlpha\Root\Data\00000572
 Batch Identification: 1304133A-UU
 Sample Identification: 08
 Sample Geometry: Shelf 2
 Procedure Description: U iso

Detector Name: Alpha_044
 Chamber Serial Number: 04026481B
 Detector Serial Number: 84168
 Env. Background: System Bkgd 56379
 Reagent Blank: <not performed>

Sample Size: 1.000E+000 +/- 0.000E+000 liter
 Sample Date/Time: 4/16/2013 7:54:48 AM
 Acquisition Date/Time: 5/7/2013 6:01:46 AM
 Acquisition Live Time: 170.0 minutes
 Acquisition Real Time: 170.1 minutes

Tracer Certificate: U232_UU-10A
 Tracer Quantity: 0.596 mL
 Effective Efficiency: 0.1705 +/- 0.0102
 Counting Efficiency: 0.1902 +/- 0.0033 on 12/16/2012 5:49:26 PM
 Chem. Recovery Factor: 0.8965 +/- 0.0559

Peak Match Tolerance: 0.150 MeV

 ----- PEAK AREA REPORT -----

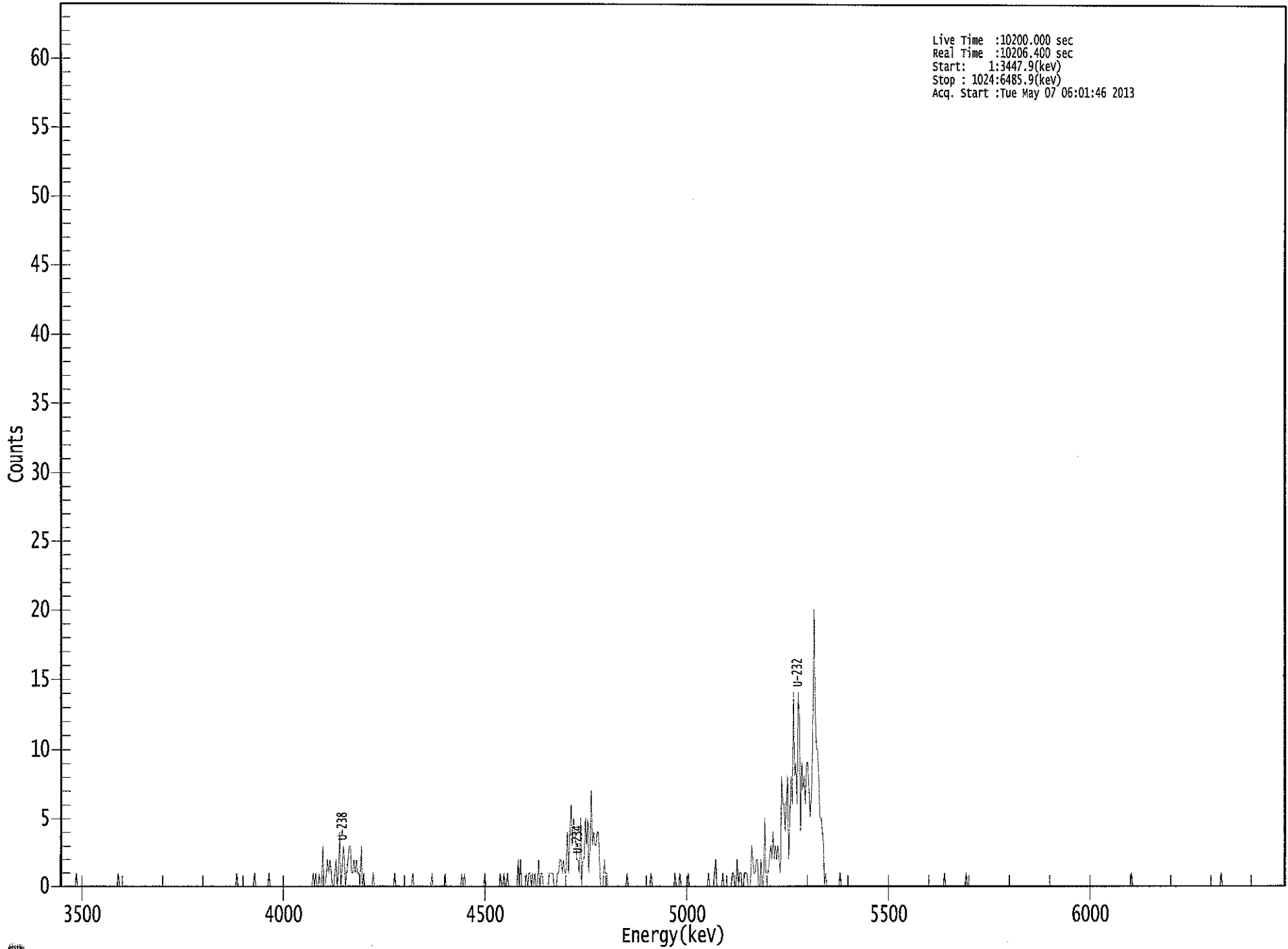
Nuclide	Energy (MeV)	Net Pk Area	Pk Area Error %	Ambient Backgnd	Reagent Backgnd	FWHM (keV)
U-232	T 5.277	327.83	10.83	0.17	0.00E+000	8.9
U-234	4.729	118.83	18.00	0.17	0.00E+000	5.2
U-235	4.414	5.83	82.55	0.17	0.00E+000	3.0
U-238	4.148	50.00	27.99	0.00	0.00E+000	3.5

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*	5.11E+000 +/- 5.99E-001	6.50E-002 +/- 7.63E-003
U-234	0.993	4761.50*	1.85E+000 +/- 3.98E-001	6.50E-002 +/- 7.62E-003
U-235	0.994	4385.50*	1.12E-001 +/- 9.34E-002	8.02E-002 +/- 9.41E-003
U-238	0.991	4184.40*	7.75E-001 +/- 2.35E-001	9.30E-002 +/- 1.09E-002

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Live Time : 10200.000 sec
Real Time : 10206.400 sec
Start: 1:3447.9(keV)
Stop : 1024:6485.9(keV)
Acq. Start : Tue May 07 06:01:46 2013

 ***** 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: 10206

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

369: 0 0 1 0 0 1 0 0

Sample Title: 08

Channel	-----	-----	-----	-----	-----	-----	-----	-----
377:	0	0	0	0	0	0	2	0
385:	2	0	0	0	0	1	0	1
393:	1	0	1	0	1	0	0	2
401:	0	1	1	0	0	0	0	0
409:	1	1	1	1	0	0	0	1
417:	1	2	2	1	2	1	1	4
425:	1	4	6	3	5	4	3	2
433:	2	1	5	0	2	2	5	3
441:	5	1	3	7	3	4	3	3
449:	4	4	2	0	0	0	2	1
457:	1	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	0
489:	0	0	0	0	0	1	0	0
497:	0	0	0	0	0	0	0	0
505:	0	0	0	0	0	0	0	0
513:	0	1	0	0	0	1	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	1	0	0
545:	0	0	1	2	0	0	0	0
553:	0	1	0	0	0	0	0	0
561:	0	1	1	0	0	2	0	1
569:	1	0	0	1	1	1	0	0
577:	0	3	2	1	1	2	2	0
585:	0	2	0	0	5	1	1	1
593:	2	3	2	4	2	3	2	3
601:	2	1	8	6	6	4	6	8
609:	2	5	8	6	14	8	9	6
617:	14	12	4	9	7	8	6	9
625:	9	7	5	7	10	20	13	10
633:	10	8	5	5	4	3	0	1
641:	0	0	0	0	0	0	0	0
649:	0	0	0	1	0	0	0	0
657:	0	0	0	0	0	0	0	0
665:	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	1	0	0	0	0	0
745:	0	0	0	0	0	0	0	0
753:	0	0	0	0	1	0	0	0
761:	0	0	0	0	0	0	0	0
769:	0	0	0	0	0	0	0	0
777:	0	0	0	0	0	0	0	0
785:	0	0	0	0	0	0	0	0
793:	0	0	0	0	0	0	0	0

801: 0 0 0 0 0 0 0 0

Sample Title: 08

Channel								
809:	0	0	0	0	0	0	0	0
817:	0	0	0	0	0	0	0	0
825:	0	0	0	0	0	0	0	0
833:	0	0	0	0	0	0	0	0
841:	0	0	0	0	0	0	0	0
849:	0	0	0	0	0	0	0	0
857:	0	0	0	0	0	0	0	0
865:	0	0	0	0	0	0	0	0
873:	0	0	0	0	0	0	0	0
881:	0	0	0	0	0	0	0	0
889:	0	0	0	0	0	0	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:	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	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

Sample Description: PURGE TANK DIS
 Spectrum File: \\OR-ALPHA1\Canberra\ApexAlpha\Root\Data\00000572
 Batch Identification: 1304133A-UU
 Sample Identification: 09
 Sample Geometry: Shelf 2
 Procedure Description: U iso

Detector Name: Alpha_046
 Chamber Serial Number: 04026482B
 Detector Serial Number: 58762
 Env. Background: System Bkgd 56380
 Reagent Blank: <not performed>

Sample Size: 1.000E+000 +/- 0.000E+000 liter
 Sample Date/Time: 4/16/2013 7:54:48 AM
 Acquisition Date/Time: 5/7/2013 6:01:48 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: 0.1563 +/- 0.0097
 Counting Efficiency: 0.1789 +/- 0.0031 on 12/16/2012 5:49:23 PM
 Chem. Recovery Factor: 0.8737 +/- 0.0564

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	302.00	11.30	0.00	0.00E+000	13.2
U-234	4.724	116.00	18.28	0.00	0.00E+000	9.0
U-235	4.393	1.66	169.38	0.34	0.00E+000	3.0
U-238	4.146	58.83	25.60	0.17	0.00E+000	6.4

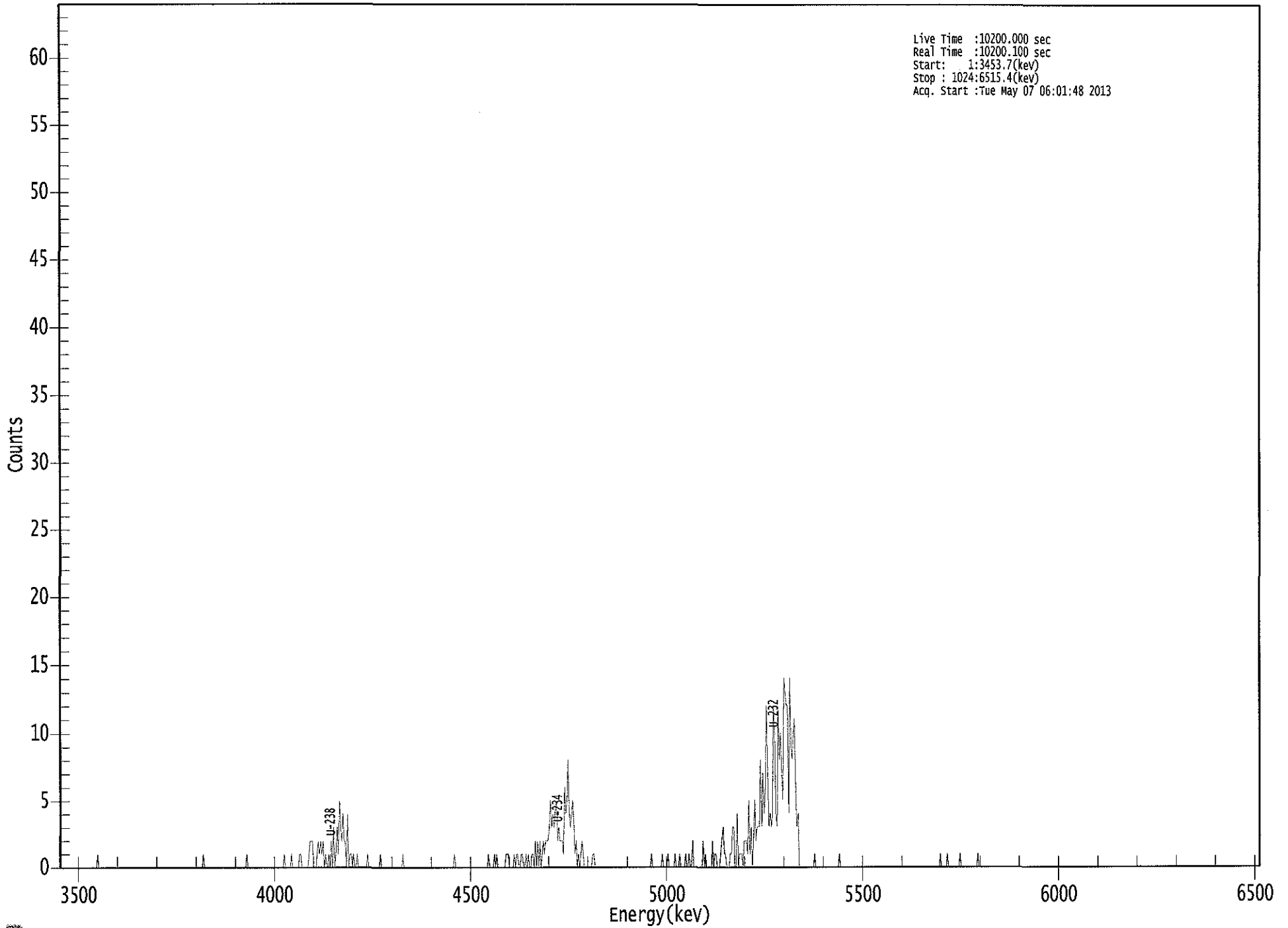
T = Tracer Peak used for Effective Efficiency

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

Nuclide	Id Conf.	Energy (keV)	Activity (pCi/liter)	MDA (pCi/liter)
U-232	0.995	5302.50*	5.13E+000 +/- 6.24E-001	1.02E-001 +/- 1.24E-002
U-234	0.990	4761.50*	1.97E+000 +/- 4.33E-001	1.02E-001 +/- 1.24E-002
U-235	1.000	4385.50*	3.48E-002 +/- 5.91E-002	1.00E-001 +/- 1.22E-002
U-238	0.990	4184.40*	9.95E-001 +/- 2.82E-001	7.06E-002 +/- 8.58E-003

AG
5/7/13

Live Time :10200.000 sec
Real Time :10200.100 sec
Start: 1:3453.7(kev)
Stop : 1024:6515.4(kev)
Acq. Start :Tue May 07 06:01:48 2013



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

Sample Title: 09

Elapsed Live time: 10200
 Elapsed Real Time: 10200

Channel	-----	-----	-----	-----	-----	-----	-----	-----
1:	0	0	0	0	0	0	0	0
9:	0	0	0	0	0	0	0	0
17:	0	0	0	0	0	0	0	0
25:	0	0	0	0	0	0	0	0
33:	1	0	0	0	0	0	0	0
41:	0	0	0	0	0	0	0	0
49:	0	0	0	0	0	0	0	0
57:	0	0	0	0	0	0	0	0
65:	0	0	0	0	0	0	0	0
73:	0	0	0	0	0	0	0	0
81:	0	0	0	0	0	0	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	0	0	0	0	0	0
145:	0	0	0	0	0	0	0	0
153:	0	0	0	0	0	0	0	1
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	1
193:	0	0	0	0	0	1	0	0
201:	0	0	0	0	1	1	0	0
209:	0	0	0	0	1	2	2	2
217:	0	0	0	1	2	1	2	1
225:	2	0	1	0	0	1	0	2
233:	0	3	0	1	3	1	5	3
241:	2	4	2	2	0	4	0	1
249:	1	0	1	0	0	1	0	0
257:	0	0	0	0	0	0	1	0
265:	0	0	0	0	0	0	0	0
273:	0	1	0	0	0	0	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	0	0	0	0
313:	0	0	0	0	0	0	0	0
321:	0	0	0	0	0	0	0	0
329:	0	0	0	0	0	0	0	0
337:	1	0	0	0	0	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	1	0	0

369: 0 0 1 0 1 0 0 0

Sample Title: 09

Channel	-----	-----	-----	-----	-----	-----	-----	-----
377:	0	0	0	0	1	1	1	0
385:	0	0	0	1	0	1	1	0
393:	0	1	1	0	0	1	0	1
401:	0	0	1	1	0	2	0	2
409:	0	2	0	1	2	1	2	2
417:	2	3	5	3	4	3	4	5
425:	2	3	2	2	2	1	6	4
433:	5	8	4	3	4	5	3	1
441:	2	0	1	0	1	2	1	0
449:	0	0	0	0	0	0	1	1
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	1	0	0	0	0	1	0
521:	0	0	0	0	1	0	0	0
529:	1	0	0	0	0	1	0	0
537:	1	0	0	2	0	0	0	0
545:	0	0	0	0	2	0	1	0
553:	0	0	0	0	2	0	1	1
561:	0	0	0	1	2	3	1	1
569:	0	0	0	1	1	3	3	0
577:	0	4	0	1	1	1	0	2
585:	2	2	1	5	1	3	0	2
593:	5	2	3	3	3	8	3	7
601:	4	6	12	7	3	4	3	4
609:	12	10	4	3	12	8	10	7
617:	5	14	13	12	12	4	14	9
625:	8	10	11	5	3	4	0	0
633:	0	0	0	0	0	0	0	0
641:	0	0	0	1	0	0	0	0
649:	0	0	0	0	0	0	0	0
657:	0	0	0	0	0	0	0	0
665:	1	0	0	0	0	0	0	0
673:	0	0	0	0	0	0	0	0
681:	0	0	0	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	1	0
753:	0	0	0	0	1	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	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: 09

Channel	-----	-----	-----	-----	-----	-----	-----	-----
809:	0	0	0	0	0	0	0	0
817:	0	0	0	0	0	0	0	0
825:	0	0	0	0	0	0	0	0
833:	0	0	0	0	0	0	0	0
841:	0	0	0	0	0	0	0	0
849:	0	0	0	0	0	0	0	0
857:	0	0	0	0	0	0	0	0
865:	0	0	0	0	0	0	0	0
873:	0	0	0	0	0	0	0	0
881:	0	0	0	0	0	0	0	0
889:	0	0	0	0	0	0	0	0
897:	0	0	0	0	0	0	0	0
905:	0	0	0	0	0	0	0	0
913:	0	0	0	0	0	0	0	0
921:	0	0	0	0	0	0	0	0
929:	0	0	0	0	0	0	0	0
937:	0	0	0	0	0	0	0	0
945:	0	0	0	0	0	0	0	0
953:	0	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



QA SUMMARY REPORT

Review Of QA Results - Pulser Check

Date : 5/7/2013
Time : 6:00:22 AM

CHAMBER	DEVICE	PARAMETER	FLAG	DATE
Alpha 001	21f	ALL	Not Done	
Alpha 002	21f	ALL	Not Done	
Alpha 003	21f	ALL	Passed	5/7/2013 5:46:31 AM
Alpha 004	21f	ALL	Passed	5/7/2013 5:46:32 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	5/7/2013 5:46:33 AM
Alpha 011	21f	ALL	Passed	5/7/2013 5:46:34 AM
Alpha 012	21f	ALL	Not Done	
Alpha 013	21f	ALL	Passed	5/7/2013 5:46:34 AM
Alpha 014	21f	ALL	Passed	5/7/2013 5:46:35 AM
Alpha 015	21f	ALL	Not Done	
Alpha 016	21f	ALL	Not Done	
Alpha 017	AIM730	ALL	Not Done	
Alpha 018	AIM730	ALL	Passed	5/7/2013 5:46:36 AM
Alpha 019	AIM730	ALL	Not Done	
Alpha 020	AIM730	ALL	Not Done	
Alpha 021	AIM730	ALL	Not Done	
Alpha 022	AIM730	ALL	Passed	5/7/2013 5:46:37 AM
Alpha 023	AIM730	ALL	Not Done	
Alpha 024	AIM730	ALL	Passed	5/7/2013 5:46:38 AM
Alpha 025	AIM730	ALL	Passed	5/7/2013 5:46:39 AM
Alpha 026	AIM730	ALL	Not Done	
Alpha 027	AIM730	ALL	Passed	5/7/2013 5:46:40 AM
Alpha 028	AIM730	ALL	Not Done	
Alpha 029	AIM730	ALL	Passed	5/7/2013 5:46:40 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	5/7/2013 5:46:42 AM
Alpha 034	Alpha Analyst100DC	ALL	Passed	5/7/2013 5:46:44 AM
Alpha 035	Alpha Analyst100DC	ALL	Passed	5/7/2013 5:46:45 AM
Alpha 036	Alpha Analyst100DC	ALL	Not Done	
Alpha 037	Alpha Analyst100DC	ALL	Passed	5/7/2013 5:46:47 AM
Alpha 038	Alpha Analyst100DC	ALL	Not Done	
Alpha 039	Alpha Analyst100DC	ALL	Not Done	
Alpha 040	Alpha Analyst100DC	ALL	Passed	5/7/2013 5:46:48 AM
Alpha 041	Alpha Analyst100DC	ALL	Passed	5/7/2013 5:46:50 AM
Alpha 042	Alpha Analyst100DC	ALL	Passed	5/7/2013 5:46:52 AM

US EPA ARCHIVE DOCUMENT

CHAMBER	DEVICE	PARAMETER	FLAG	DATE
Alpha 043	Alpha Analyst100DC	ALL	Not Done	
Alpha 044	Alpha Analyst100DC	ALL	Passed	5/7/2013 5:46:53 AM
Alpha 045	Alpha Analyst100DC	ALL	Not Done	
Alpha 046	Alpha Analyst100DC	ALL	Passed	5/7/2013 5:46:55 AM
Alpha 047	Alpha Analyst100DC	ALL	Passed	5/7/2013 5:46:57 AM
Alpha 048	Alpha Analyst100DC	ALL	Passed	5/7/2013 5:46:58 AM

APPROVED BY: _____ C _____

APPROVAL DATE: _____ 5/7/13 _____

US EPA ARCHIVE DOCUMENT

***** LIBRARY LISTING REPORT *****

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)**

Aliquot Worksheet


US EPA ARCHIVE DOCUMENT

Work Order	Run	Analysis Code	Rpt Units	Lab Deadline	Technician
13-04133	1	ThISO	liters	5/9/2013	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	DUP 08 TOT	DUP					1.0000E+00	1.0000E+00				
04	I-65 TOT	TRG					1.0000E+00	1.0000E+00				
05	I-65 DIS	TRG					1.0000E+00	1.0000E+00				
06	DUP 08 TOT	DO					1.0000E+00	1.0000E+00				
07	DUP 08 DIS	TRG					1.0000E+00	1.0000E+00				
08	PURGE TANK TOT	TRG					1.0000E+00	1.0000E+00				
09	PURGE TANK DIS	TRG					1.0000E+00	1.0000E+00				

Comments	
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Technician: _____

 Date: 4/29/13

5/7/13

Sample Description: SPIKE
 Spectrum File: \\OR-ALPHA1\Canberra\ApexAlpha\Root\Data\00000572
 Batch Identification: 1304133A-TH
 Sample Identification: 01
 Sample Geometry: Shelf 2
 Procedure Description: Th iso

Detector Name: Alpha_018
 Chamber Serial Number:
 Detector Serial Number: 18
 Env. Background: System Bkgd 56366
 Reagent Blank: <not performed>

Sample Size: 1.000E+000 +/- 0.000E+000 liter
 Sample Date/Time: 5/6/2013 8:09:17 AM
 Acquisition Date/Time: 5/6/2013 4:25:27 PM
 Acquisition Live Time: 170.0 minutes
 Acquisition Real Time: 170.0 minutes

Tracer Certificate: Th229_TH-18A
 Tracer Quantity: 0.472 mL
 Effective Efficiency: 0.1911 +/- 0.0119
 Counting Efficiency: 0.1776 +/- 0.0033 on 12/15/2012 1:57:26 PM
 Chem. Recovery Factor: 1.0760 +/- 0.0699

Control Certificate Name: NatTh_Th-8
 Chem. Recov. of Control: TH-232 0.927774 +/- 0.082516
 Peak Match Tolerance: 0.175 MeV

 ----- PEAK AREA REPORT -----

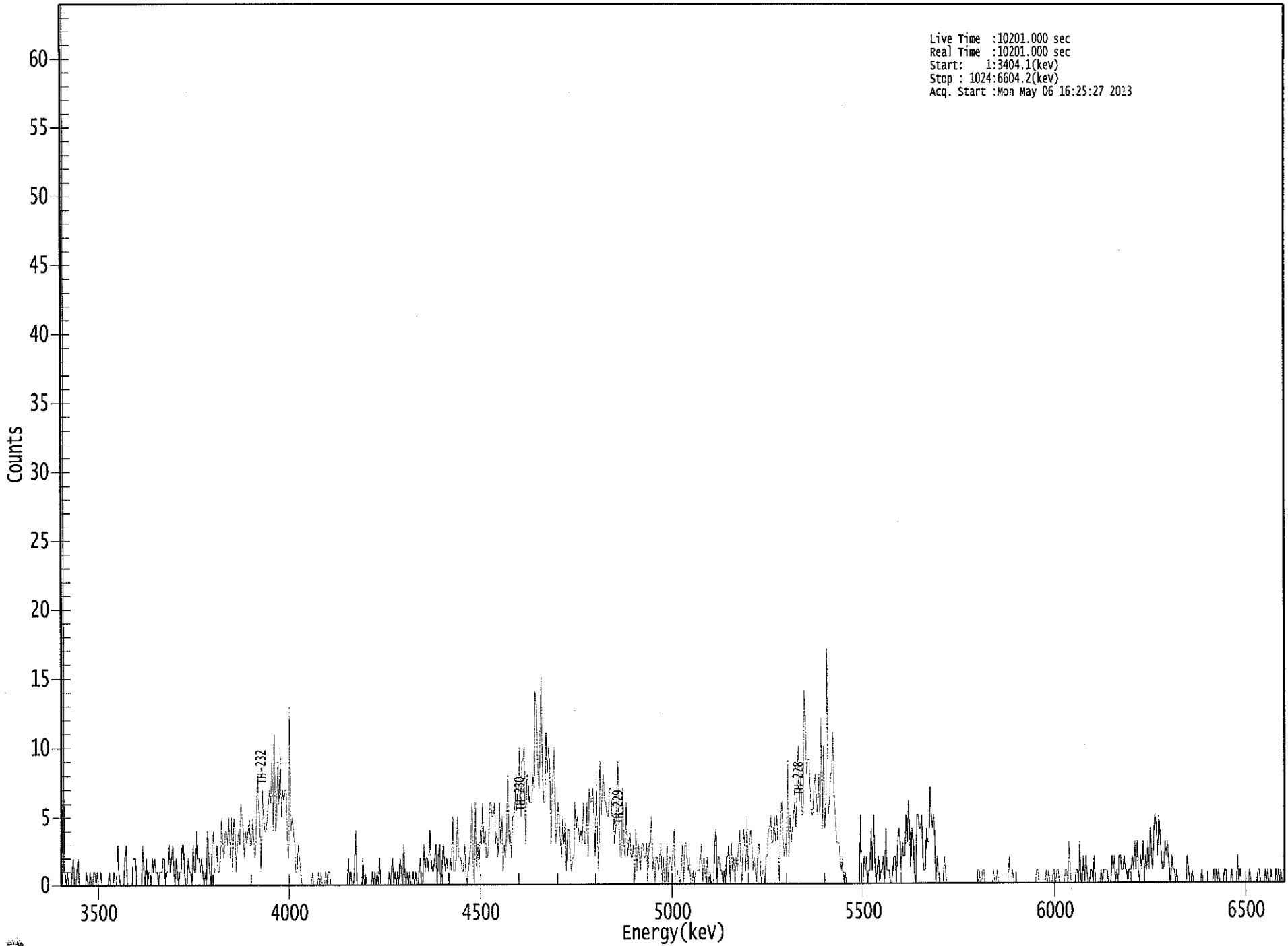
Nuclide	Energy (MeV)	Net Pk Area	Pk Area Error %	Ambient Backgnd	Reagent Backgnd	FWHM (keV)
TH-227	5.908	24.96	41.06	2.04	0.00E+000	3.9
TH-228	5.334	417.60	9.64	3.40	0.00E+000	4.6
TH-229 T	4.862	344.64	10.58	1.36	0.00E+000	37.0
TH-230	4.604	479.32	8.96	0.68	0.00E+000	9.6
TH-232	3.929	320.64	10.97	1.36	0.00E+000	4.1

T = Tracer Peak used for Effective Efficiency

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

Nuclide	Id Conf.	Energy (keV)	Activity (pCi/liter)	MDA (pCi/liter)
TH-227	0.983	5850.00*	3.55E-001 +/- 1.52E-001	1.11E-001 +/- 1.35E-002
TH-228	0.977	5400.00*	5.79E+000 +/- 9.01E-001	1.29E-001 +/- 1.57E-002
TH-229	0.999	4872.00*	4.80E+000 +/- 5.86E-001	9.55E-002 +/- 1.17E-002
TH-230	0.976	4672.00*	6.66E+000 +/- 1.01E+000	7.83E-002 +/- 9.56E-003
TH-232	0.976	3997.00*	4.44E+000 +/- 7.29E-001	9.50E-002 +/- 1.16E-002

AG
 5/7/13



Live Time :10201.000 sec
Real Time :10201.000 sec
Start: 1:3404.1(kev)
Stop : 1024:6604.2(kev)
Acq. Start :Mon May 06 16:25:27 2013

0163

ROI Type: 1

ROI Type: 3

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

Sample Title: 01

Elapsed Live time: 10201

Elapsed Real Time: 10201

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

369: 5 1 3 2 4 8 3 4

Sample Title: 01

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

801: 0 0 0 0 0 0 0 0 0

Sample Title: 01

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

C
5/7/13

Sample Description: BLANK
 Spectrum File: \\OR-ALPHA1\Canberra\ApexAlpha\Root\Data\00000572
 Batch Identification: 1304133A-TH
 Sample Identification: 02
 Sample Geometry: Shelf 2
 Procedure Description: Th iso

Detector Name: Alpha_022
 Chamber Serial Number:
 Detector Serial Number: 22
 Env. Background: System Bkgd 56367
 Reagent Blank: <not performed>

Sample Size: 1.000E+000 +/- 0.000E+000 liter
 Sample Date/Time: 5/6/2013 8:09:17 AM
 Acquisition Date/Time: 5/6/2013 4:25:28 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: 0.1421 +/- 0.0134
 Counting Efficiency: 0.1531 +/- 0.0029 on 12/15/2012 1:57:26 PM
 Chem. Recovery Factor: 0.9275 +/- 0.0890

Peak Match Tolerance: 0.175 MeV

 PEAK AREA REPORT

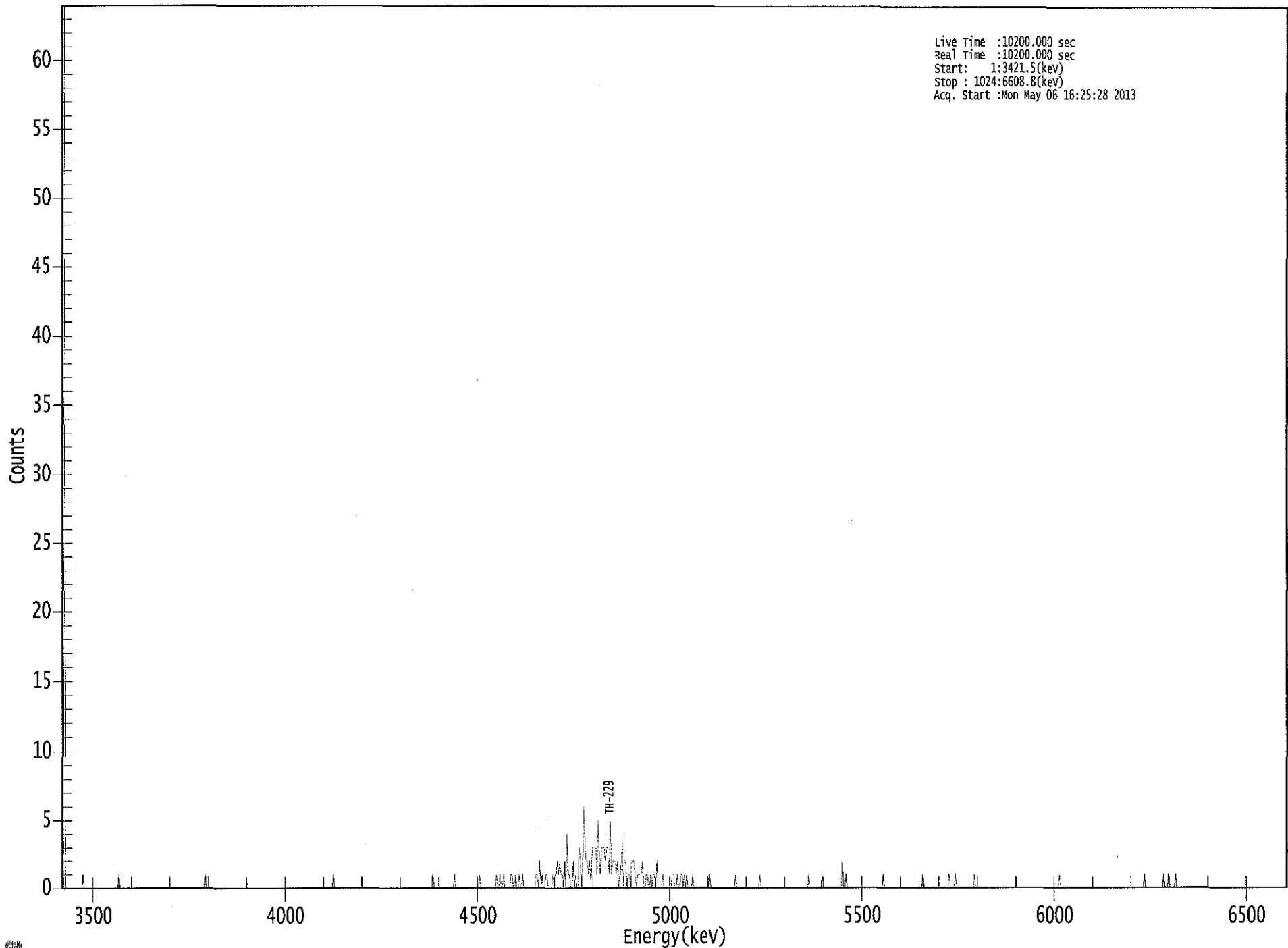
Nuclide	Energy (MeV)	Net Pk Area	Pk Area Error %	Ambient Backgnd	Reagent Backgnd	FWHM (keV)
TH-227	5.819	2.13	191.21	1.87	0.00E+000	3.1
TH-228	5.344	3.28	151.91	2.72	0.00E+000	3.1
TH-229 T	4.846	127.98	17.41	1.02	0.00E+000	5.5
TH-230	4.644	25.64	39.89	1.36	0.00E+000	3.1
TH-232	3.948	-1.02	208.15	1.02	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	0.995	5850.00*	4.08E-002 +/- 7.83E-002	1.45E-001 +/- 2.67E-002
TH-228	0.984	5400.00*	6.12E-002 +/- 9.37E-002	1.60E-001 +/- 2.95E-002
TH-229	0.996	4872.00*	2.40E+000 +/- 4.42E-001	1.18E-001 +/- 2.18E-002
TH-230	0.996	4672.00*	4.79E-001 +/- 2.11E-001	1.28E-001 +/- 2.36E-002
TH-232	0.988	3997.00*	-1.90E-002 +/- 3.98E-002	1.18E-001 +/- 2.17E-002

AG
5/7/13



Live Time :10200.000 sec
Real Time :10200.000 sec
Start: 1:3421.5(kev)
Stop : 1024:6608.8(kev)
Acq. Start :Mon May 06 16:25:28 2013

ROI Type: 1

ROI Type: 3

 ***** 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:	10200	10200	0	0	0	0	0	0
9:	0	0	0	0	0	0	0	0
17:	0	1	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	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	1	0	0	0	0	0
233:	0	0	0	0	0	0	0	0
241:	0	0	0	0	0	0	0	0
249:	0	0	0	0	0	0	0	0
257:	0	0	0	0	0	0	0	0
265:	0	0	0	0	0	0	0	0
273:	0	0	0	0	0	0	0	0
281:	0	0	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	1
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	1	0	0	1	0	0

369: 1 0 0 0 0 0 1 1

Sample Title: 02

Channel	1	2	3	4	5	6	7	8
377:	0	0	1	0	0	1	0	0
385:	1	0	0	0	0	0	0	0
393:	0	0	0	1	1	0	2	0
401:	1	0	0	1	1	0	0	0
409:	0	1	0	1	1	2	1	2
417:	1	1	0	2	0	4	1	1
425:	0	0	2	0	1	0	0	3
433:	2	0	2	6	3	2	2	1
441:	2	0	3	3	3	3	1	5
449:	2	1	3	3	3	2	3	3
457:	1	5	1	2	2	2	1	2
465:	0	1	1	4	0	2	2	0
473:	1	1	0	2	2	2	1	0
481:	1	1	1	1	2	0	0	1
489:	1	0	0	1	0	1	1	0
497:	2	0	0	0	0	1	0	0
505:	0	0	0	0	0	1	1	0
513:	0	1	0	0	1	1	0	1
521:	0	1	0	0	0	0	1	0
529:	0	0	0	0	0	0	0	0
537:	0	0	0	0	1	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	1	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	1	0	0	0	0	0
641:	0	0	0	0	0	0	0	0
649:	0	0	0	2	0	0	1	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	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	1	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	1	0	0	0	0	0	0
753:	0	0	0	0	0	0	0	0
761:	0	1	0	0	0	0	0	0
769:	0	0	0	0	0	0	0	0
777:	0	0	0	0	0	0	0	0
785:	0	0	0	0	0	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:	1	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	1
905:	0	0	0	0	0	0	0	0
913:	0	0	0	0	0	0	0	1
921:	0	0	0	1	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

04117

Sample Description: DUP 08 TOT-DUP
 Spectrum File: \\OR-ALPHA1\Canberra\ApexAlpha\Root\Data\00000572
 Batch Identification: 1304133A-TH
 Sample Identification: 03
 Sample Geometry: Shelf 2
 Procedure Description: Th iso

Detector Name: Alpha_024
 Chamber Serial Number:
 Detector Serial Number: 24
 Env. Background: System Bkgd 56368
 Reagent Blank: <not performed>

Sample Size: 1.000E+000 +/- 0.000E+000 liter
 Sample Date/Time: 4/16/2013 8:09:17 AM
 Acquisition Date/Time: 5/6/2013 4:25:29 PM
 Acquisition Live Time: 170.0 minutes
 Acquisition Real Time: 170.0 minutes

Tracer Certificate: Th229_TH-18A
 Tracer Quantity: 0.235 mL
 Effective Efficiency: 0.1706 +/- 0.0148
 Counting Efficiency: 0.1710 +/- 0.0032 on 12/15/2012 2:02:15 PM
 Chem. Recovery Factor: 0.9974 +/- 0.0886

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	5.785	6.47	87.07	1.53	0.00E+000	3.1
TH-228	5.355	18.47	47.77	1.53	0.00E+000	3.9
TH-229 T	4.843	152.98	15.91	1.02	0.00E+000	10.6
TH-230	4.646	16.49	49.13	0.51	0.00E+000	3.1
TH-232	3.921	2.83	120.54	0.17	0.00E+000	3.1

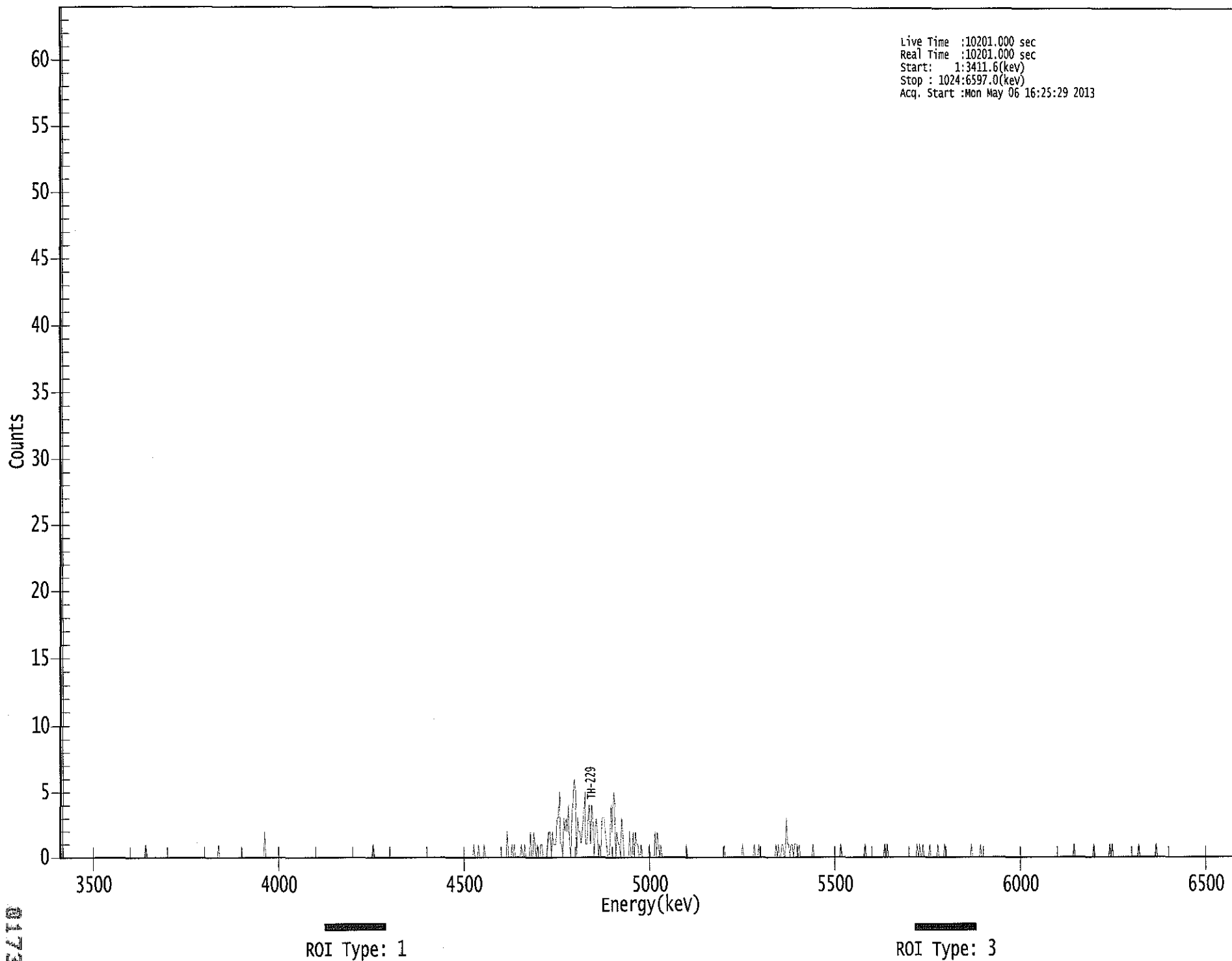
T = Tracer Peak used for Effective Efficiency

 NUCLIDE ANALYSIS RESULTS

Nuclide	Id Conf.	Energy (keV)	Activity (pCi/liter)	MDA (pCi/liter)
TH-227	0.978	5850.00*	1.03E-001 +/- 9.16E-002	1.13E-001 +/- 1.93E-002
TH-228	0.989	5400.00*	2.93E-001 +/- 1.49E-001	1.13E-001 +/- 1.92E-002
TH-229	0.996	4872.00*	2.39E+000 +/- 4.07E-001	9.83E-002 +/- 1.67E-002
TH-230	0.996	4672.00*	2.57E-001 +/- 1.33E-001	8.17E-002 +/- 1.39E-002
TH-232	0.970	3997.00*	4.40E-002 +/- 5.35E-002	6.48E-002 +/- 1.10E-002

AG
 5/7/13

0000057247.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: 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	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	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	2	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	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	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	1	0
361:	0	0	1	0	0	0	0	1

369: 0 0 0 0 0 0 0 0 0

Sample Title: 03

Channel	1	2	3	4	5	6	7	8	9
377:	0	0	0	0	0	0	0	0	0
385:	0	0	0	2	0	0	0	0	1
393:	0	1	0	0	0	0	0	0	1
401:	0	0	1	0	0	0	0	0	2
409:	0	0	2	1	0	1	0	0	0
417:	1	1	0	0	0	0	0	1	2
425:	2	0	2	1	1	1	1	3	3
433:	5	1	1	0	3	2	2	3	2
441:	4	1	0	3	5	6	5	5	0
449:	3	2	2	1	2	3	5	1	1
457:	1	3	4	1	4	3	0	2	2
465:	3	2	0	1	0	3	3	3	3
473:	2	1	0	0	1	4	2	5	5
481:	4	0	2	1	1	0	3	2	2
489:	0	0	0	0	0	2	0	0	0
497:	2	0	2	1	1	0	0	1	1
505:	0	0	0	0	0	0	1	0	0
513:	0	0	0	2	0	2	1	0	0
521:	1	0	0	0	0	0	0	0	0
529:	0	0	0	0	0	0	0	0	0
537:	0	0	0	0	0	0	1	0	0
545:	0	0	0	0	0	0	0	0	0
553:	0	0	0	0	0	0	0	0	0
561:	0	0	0	0	0	0	0	0	0
569:	0	0	0	0	0	0	0	0	1
577:	0	0	0	0	0	0	0	0	0
585:	0	0	0	0	0	0	0	0	1
593:	0	0	0	0	0	0	0	0	0
601:	0	1	0	0	0	1	0	0	0
609:	0	0	0	0	0	0	0	0	0
617:	0	0	0	0	1	0	1	0	0
625:	0	1	1	0	0	3	1	1	1
633:	0	1	1	0	1	1	1	0	0
641:	1	0	0	0	0	0	0	0	0
649:	0	0	0	0	1	0	0	0	0
657:	0	0	0	0	0	0	0	0	0
665:	0	0	0	0	0	0	0	0	0
673:	0	0	0	0	1	0	0	0	0
681:	0	0	0	0	0	0	0	0	0
689:	0	0	0	0	0	0	0	0	0
697:	0	1	0	0	0	0	0	0	0
705:	0	0	0	0	0	0	0	0	0
713:	0	0	1	0	1	0	0	0	0
721:	0	0	0	0	0	0	0	0	0
729:	0	0	0	0	0	0	0	0	0
737:	0	0	0	0	0	0	1	0	0
745:	1	0	0	1	0	0	0	0	0
753:	0	1	0	0	0	0	0	0	0
761:	1	0	0	0	0	0	1	0	0
769:	0	0	0	0	0	0	0	0	0
777:	0	0	0	0	0	0	0	0	0
785:	0	0	0	0	0	1	0	0	0
793:	0	0	0	0	0	1	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	1	0
881:	0	0	0	0	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	1	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	1	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	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

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Sample Description: I-65 TOT
 Spectrum File: \\OR-ALPHA1\Canberra\ApexAlpha\Root\Data\00000572
 Batch Identification: 1304133A-TH
 Sample Identification: 04
 Sample Geometry: Shelf 2
 Procedure Description: Th iso

Detector Name: Alpha_025
 Chamber Serial Number:
 Detector Serial Number: 25
 Env. Background: System Bkgd 56369
 Reagent Blank: <not performed>

Sample Size: 1.000E+000 +/- 0.000E+000 liter
 Sample Date/Time: 4/16/2013 8:09:17 AM
 Acquisition Date/Time: 5/6/2013 4:25:30 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: 0.1733 +/- 0.0150
 Counting Efficiency: 0.1736 +/- 0.0032 on 12/15/2012 1:57:27 PM
 Chem. Recovery Factor: 0.9987 +/- 0.0885

Peak Match Tolerance: 0.175 MeV

 PEAK AREA REPORT

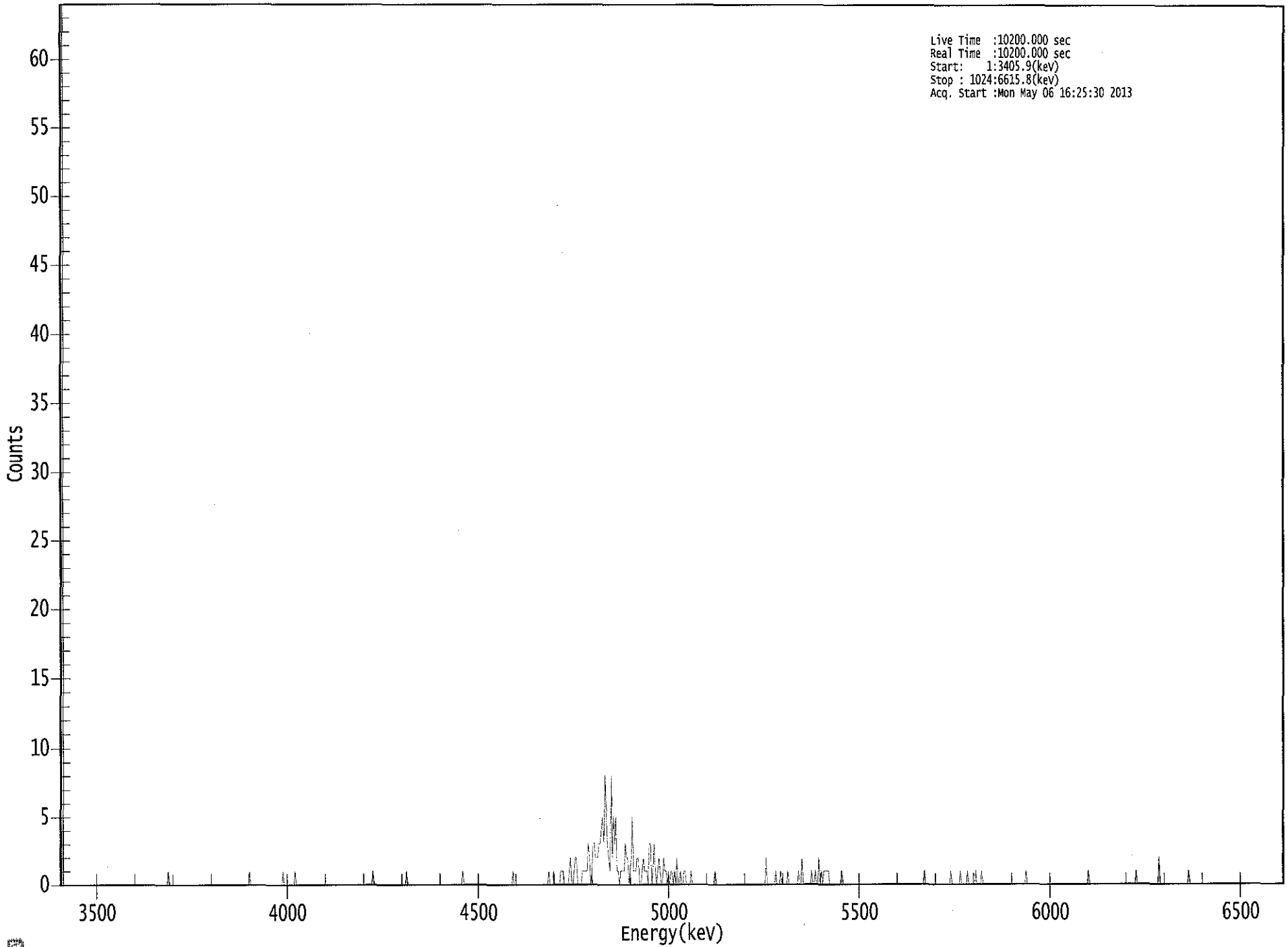
Nuclide	Energy (MeV)	Net Pk Area	Pk Area Error %	Ambient Backgnd	Reagent Backgnd	FWHM (keV)
TH-227	5.809	4.13	119.29	1.87	0.00E+000	3.1
TH-228	5.360	16.30	51.42	1.70	0.00E+000	3.1
TH-229 T	4.870	153.98	15.86	1.02	0.00E+000	7.2
TH-230	4.657	5.81	90.53	1.19	0.00E+000	3.1
TH-232	3.971	2.83	120.53	0.17	0.00E+000	3.1

T = Tracer Peak used for Effective Efficiency

 NUCLIDE ANALYSIS RESULTS

Nuclide	Id Conf.	Energy (keV)	Activity (pCi/liter)	MDA (pCi/liter)
TH-227	0.991	5850.00*	6.49E-002 +/- 7.82E-002	1.19E-001 +/- 2.02E-002
TH-228	0.992	5400.00*	2.54E-001 +/- 1.38E-001	1.15E-001 +/- 1.95E-002
TH-229	1.000	4872.00*	2.37E+000 +/- 4.02E-001	9.68E-002 +/- 1.64E-002
TH-230	0.999	4672.00*	8.90E-002 +/- 8.20E-002	1.01E-001 +/- 1.71E-002
TH-232	0.996	3997.00*	4.33E-002 +/- 5.27E-002	6.38E-002 +/- 1.08E-002

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0178

ROI Type: 1

ROI Type: 3

 ***** 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	10200	10200	0	0	0	0	0	0
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	1	0	0	0	0	0
97:	0	0	0	0	0	0	0	0
105:	0	0	0	0	0	0	0	0
113:	0	0	0	0	0	0	0	0
121:	0	0	0	0	0	0	0	0
129:	0	0	0	0	0	0	0	0
137:	0	0	0	0	0	0	0	0
145:	0	0	0	0	0	0	0	0
153:	0	0	0	0	0	0	1	0
161:	0	0	0	0	0	0	0	0
169:	0	0	0	0	0	0	0	0
177:	0	0	0	0	0	0	0	0
185:	0	0	1	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	1	0	0
265:	0	0	0	0	0	0	0	0
273:	0	0	0	0	0	0	0	0
281:	0	0	0	0	0	0	0	0
289:	0	1	0	0	0	0	0	0
297:	0	0	0	0	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	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 0

Sample Title: 04

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	0	0	0	0	0
409:	1	0	0	0	1	0	0	0
417:	0	0	1	1	1	0	0	0
425:	0	1	2	0	0	1	2	2
433:	0	0	0	0	1	1	1	1
441:	1	3	2	0	1	3	3	2
449:	2	2	3	3	4	5	3	8
457:	5	3	2	1	8	2	5	3
465:	5	1	1	0	1	1	1	1
473:	3	2	2	0	1	2	5	1
481:	1	1	2	2	0	0	1	2
489:	1	1	1	0	3	3	0	1
497:	3	1	0	1	2	1	0	0
505:	2	1	1	0	1	0	1	1
513:	0	1	0	2	0	0	1	0
521:	0	1	1	0	0	0	0	1
529:	0	0	0	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	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	2	0
593:	0	0	0	0	0	0	1	0
601:	0	0	1	0	0	0	0	0
609:	1	0	0	0	0	0	0	0
617:	0	1	0	0	2	0	0	0
625:	0	0	0	0	1	0	0	1
633:	0	0	2	0	1	0	1	1
641:	1	1	1	0	0	0	0	0
649:	0	0	0	0	0	1	0	0
657:	0	0	0	0	0	0	0	0
665:	0	0	0	0	0	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	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:	1	0	0	0	0	0	0	0
753:	1	0	0	0	0	0	1	0
761:	0	0	0	0	0	1	0	0
769:	0	0	1	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 1

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	1	0	0	0	0
865:	0	0	0	0	0	0	0	0
873:	0	0	0	0	0	0	0	0
881:	0	0	0	0	0	0	0	0
889:	0	0	0	0	0	0	0	0
897:	0	0	0	1	0	0	0	0
905:	0	0	0	0	0	0	0	0
913:	0	0	0	0	0	0	2	0
921:	0	0	0	0	0	0	0	0
929:	0	0	0	0	0	0	0	0
937:	0	0	0	0	0	0	0	1
945:	0	0	0	0	0	0	0	0
953:	0	0	0	0	0	0	0	0
961:	0	0	0	0	0	0	0	0
969:	0	0	0	0	0	0	0	0
977:	0	0	0	0	0	0	0	0
985:	0	0	0	0	0	0	0	0
993:	0	0	0	0	0	0	0	0
1001:	0	0	0	0	0	0	0	0
1009:	0	0	0	0	0	0	0	0
1017:	0	0	0	0	0	0	0	0



Sample Description: I-65 DIS
 Spectrum File: \\OR-ALPHA1\Canberra\ApexAlpha\Root\Data\00000573
 Batch Identification: 1304133A-TH
 Sample Identification: 05
 Sample Geometry: Shelf 2
 Procedure Description: Th iso

Detector Name: Alpha_027
 Chamber Serial Number:
 Detector Serial Number: 27
 Env. Background: System Bkgd 56370
 Reagent Blank: <not performed>

Sample Size: 1.000E+000 +/- 0.000E+000 liter
 Sample Date/Time: 4/16/2013 8:09:17 AM
 Acquisition Date/Time: 5/6/2013 4:25:31 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: 0.2086 +/- 0.0167
 Counting Efficiency: 0.1728 +/- 0.0032 on 12/15/2012 2:27:41 PM
 Chem. Recovery Factor: 1.2073 +/- 0.0994

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	5.872	0.81	359.09	1.19	0.00E+000	3.2
TH-228	5.242	-2.06	117.31	3.06	0.00E+000	3.2
TH-229 T	4.859	184.64	14.49	1.36	0.00E+000	8.2
TH-230	4.635	10.49	62.21	0.51	0.00E+000	3.2
TH-232	3.959	0.49	416.98	0.51	0.00E+000	3.2

T = Tracer Peak used for Effective Efficiency

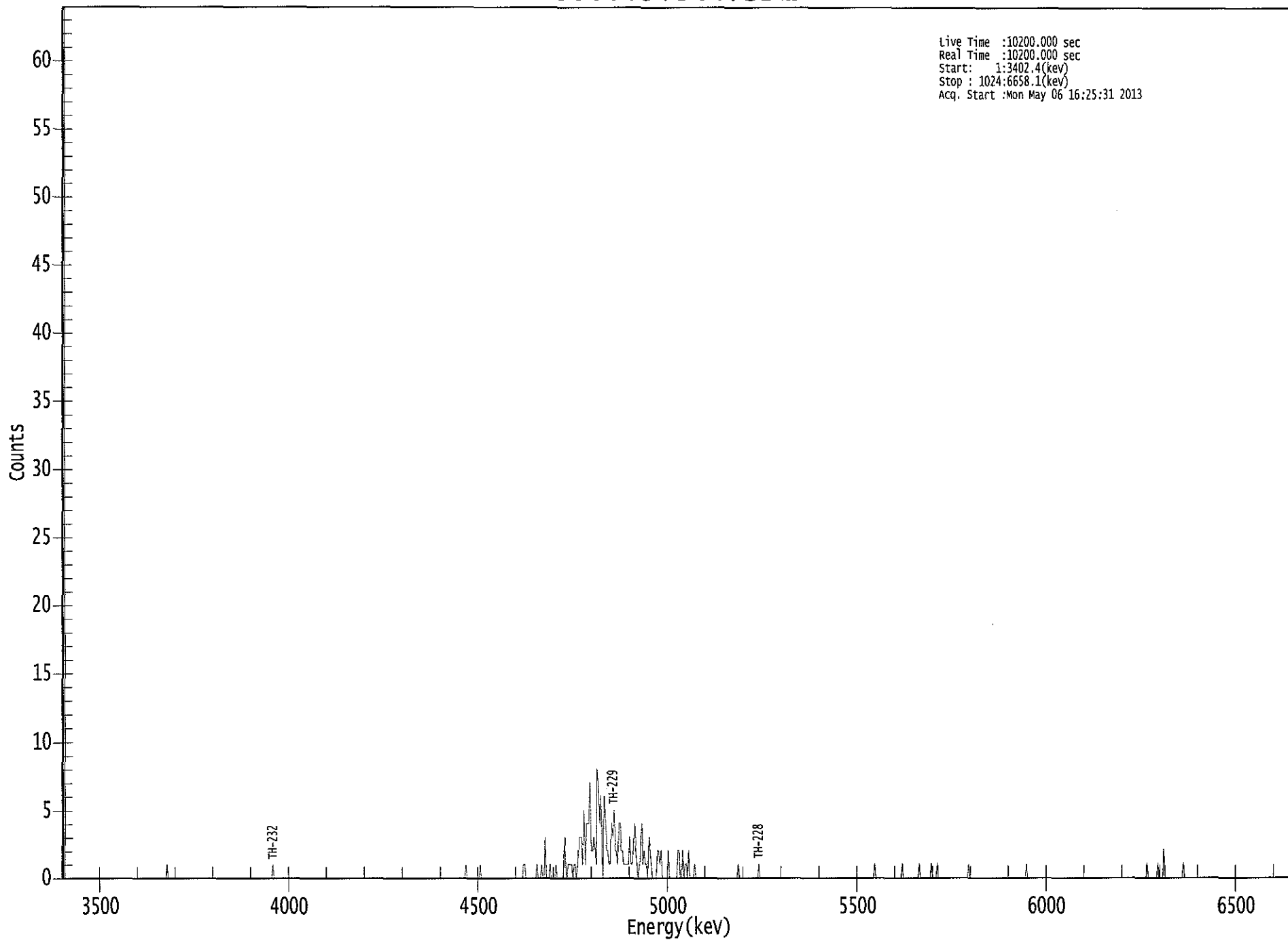
 ----- NUCLIDE ANALYSIS RESULTS -----

Nuclide	Id Conf.	Energy (keV)	Activity (pCi/liter)	MDA (pCi/liter)
TH-227	0.997	5850.00*	1.06E-002 +/- 3.80E-002	8.60E-002 +/- 1.35E-002
TH-228	0.878	5400.00*	-2.67E-002 +/- 3.16E-002	1.16E-001 +/- 1.82E-002
TH-229	0.999	4872.00*	2.36E+000 +/- 3.70E-001	8.75E-002 +/- 1.37E-002
TH-230	0.993	4672.00*	1.34E-001 +/- 8.57E-002	6.68E-002 +/- 1.05E-002
TH-232	0.993	3997.00*	6.23E-003 +/- 2.60E-002	6.67E-002 +/- 1.05E-002

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5/7/13

US EPA ARCHIVE DOCUMENT

0000057300.CNF



ROI Type: 1

ROI Type: 3

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

Sample Title: 05

Elapsed Live time: 10200

Elapsed Real Time: 10200

Channel	-----	-----	-----	-----	-----	-----	-----
1:	10200	10200	0	0	0	0	0
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	1
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	0
129:	0	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	0	0	0	0	0
169:	0	0	0	0	0	0	1
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	0	0	0
233:	0	0	0	0	0	0	0
241:	0	0	0	0	0	0	0
249:	0	0	0	0	0	0	0
257:	0	0	0	0	0	0	0
265:	0	0	0	0	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	1
337:	0	0	0	0	0	0	0
345:	0	0	0	1	0	0	0
353:	0	0	0	0	0	0	0
361:	0	0	0	0	0	0	0

369: 0 0 0 0 0 0 0 0

Sample Title: 05

Channel	1	2	3	4	5	6	7	8
377:	0	0	0	0	0	0	0	1
385:	1	0	0	0	0	0	0	0
393:	0	0	1	0	0	0	1	0
401:	0	3	0	0	0	1	0	0
409:	0	0	1	0	0	0	0	0
417:	0	3	1	0	1	1	1	1
425:	0	1	1	0	1	3	3	3
433:	1	5	1	4	4	4	7	2
441:	2	3	2	1	8	7	4	6
449:	2	0	6	4	2	2	1	1
457:	4	3	5	2	2	1	4	4
465:	2	2	1	1	1	1	1	3
473:	1	1	2	4	2	1	0	1
481:	3	4	1	2	1	1	0	3
489:	2	1	0	0	0	0	2	2
497:	1	2	0	0	0	0	0	2
505:	0	0	0	0	0	0	0	2
513:	2	0	0	2	0	1	1	0
521:	2	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	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	1	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	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	1	0	0	0	0	0	0
705:	0	0	0	0	0	0	0	1
713:	0	0	0	0	0	0	0	0
721:	0	1	0	0	0	0	1	0
729:	0	0	0	0	0	0	0	0
737:	0	0	0	0	0	0	0	0
745:	0	0	0	0	0	0	0	0
753:	1	0	0	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: 05

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

C
5/7/13

Sample Description: DUP 08 TOT
 Spectrum File: \\OR-ALPHA1\Canberra\ApexAlpha\Root\Data\00000572
 Batch Identification: 1304133A-TH
 Sample Identification: 06
 Sample Geometry: Shelf 2
 Procedure Description: Th iso

Detector Name: Alpha_029
 Chamber Serial Number:
 Detector Serial Number: 29
 Env. Background: System Bkgd 56371
 Reagent Blank: <not performed>

Sample Size: 1.000E+000 +/- 0.000E+000 liter
 Sample Date/Time: 4/16/2013 8:09:17 AM
 Acquisition Date/Time: 5/6/2013 4:25:33 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: 0.1711 +/- 0.0149
 Counting Efficiency: 0.1945 +/- 0.0036 on 12/15/2012 2:30:02 PM
 Chem. Recovery Factor: 0.8796 +/- 0.0783

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	5.826	2.96	153.11	2.04	0.00E+000	3.1
TH-228	5.369	19.13	47.31	1.87	0.00E+000	3.9
TH-229 T	4.864	151.49	15.96	0.51	0.00E+000	10.4
TH-230	4.618	11.15	61.26	0.85	0.00E+000	3.1
TH-232	3.882	1.66	169.38	0.34	0.00E+000	3.1

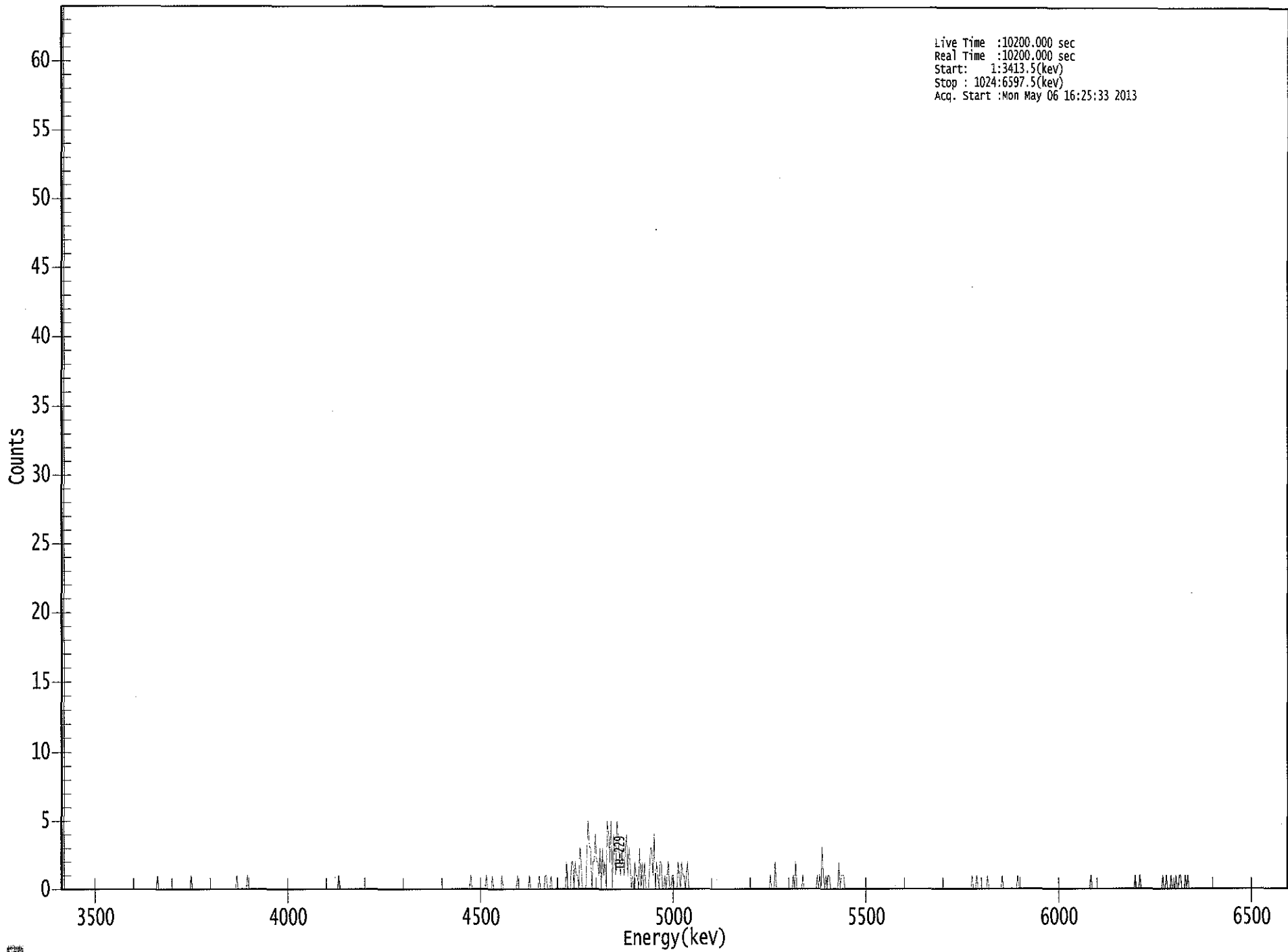
T = Tracer Peak used for Effective Efficiency

 NUCLIDE ANALYSIS RESULTS

Nuclide	Id Conf.	Energy (keV)	Activity (pCi/liter)	MDA (pCi/liter)
TH-227	0.997	5850.00*	4.71E-002 +/- 7.26E-002	1.24E-001 +/- 2.12E-002
TH-228	0.995	5400.00*	3.02E-001 +/- 1.52E-001	1.20E-001 +/- 2.04E-002
TH-229	1.000	4872.00*	2.36E+000 +/- 4.02E-001	8.16E-002 +/- 1.39E-002
TH-230	0.985	4672.00*	1.73E-001 +/- 1.10E-001	9.29E-002 +/- 1.59E-002
TH-232	0.933	3997.00*	2.57E-002 +/- 4.38E-002	7.40E-002 +/- 1.26E-002

AG
5/7/13

US EPA ARCHIVE DOCUMENT



 ***** 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	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:	1	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	1	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	1	0	0	0	0	0
153:	0	0	0	1	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	1
233:	0	0	0	0	0	0	0	0
241:	0	0	0	0	0	0	0	0
249:	0	0	0	0	0	0	0	0
257:	0	0	0	0	0	0	0	0
265:	0	0	0	0	0	0	0	0
273:	0	0	0	0	0	0	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	1	0	0
345:	0	0	0	0	0	0	0	0
353:	0	0	1	0	0	0	0	1
361:	0	0	0	0	0	0	0	1

369: 0 0 0 0 0 0 0 0 0

Sample Title: 06

Channel	1	2	3	4	5	6	7	8	9
377:	0	0	0	0	1	0	0	0	0
385:	0	0	0	0	0	0	1	0	0
393:	0	0	0	0	0	0	1	0	0
401:	0	0	0	1	1	0	0	0	0
409:	1	0	0	0	0	0	0	0	0
417:	0	0	0	0	0	2	0	0	0
425:	0	2	2	0	2	1	1	0	0
433:	3	2	0	0	0	0	3	5	5
441:	3	3	0	2	2	4	2	2	2
449:	1	3	0	3	1	2	0	5	5
457:	4	2	5	0	4	2	1	5	5
465:	4	2	1	3	2	1	3	4	4
473:	1	3	2	0	1	0	2	1	1
481:	1	0	3	0	2	0	2	0	0
489:	0	0	1	3	3	1	4	0	0
497:	2	1	0	2	2	0	0	1	1
505:	0	1	2	0	0	1	1	0	0
513:	0	0	2	1	0	2	1	1	1
521:	0	1	2	0	0	0	0	0	0
529:	0	0	0	0	0	0	0	0	0
537:	0	0	0	0	0	0	0	0	0
545:	0	0	0	0	0	0	0	0	0
553:	0	0	0	0	0	0	0	0	0
561:	0	0	0	0	0	0	0	0	0
569:	0	0	0	0	0	0	0	0	0
577:	0	0	0	0	0	0	0	0	0
585:	0	0	0	0	0	0	0	1	1
593:	0	0	0	2	0	0	0	0	0
601:	0	0	0	0	0	0	0	0	0
609:	0	0	1	0	2	0	0	0	0
617:	0	0	1	0	0	0	0	0	0
625:	0	0	0	0	0	0	1	0	0
633:	1	0	3	1	0	1	0	1	1
641:	1	0	0	0	0	0	0	0	0
649:	2	0	1	1	1	0	0	0	0
657:	0	0	0	0	0	0	0	0	0
665:	0	0	0	0	0	0	0	0	0
673:	0	0	0	0	0	0	0	0	0
681:	0	0	0	0	0	0	0	0	0
689:	0	0	0	0	0	0	0	0	0
697:	0	0	0	0	0	0	0	0	0
705:	0	0	0	0	0	0	0	0	0
713:	0	0	0	0	0	0	0	0	0
721:	0	0	0	0	0	0	0	0	0
729:	0	0	0	0	0	0	0	0	0
737:	0	0	0	0	0	0	0	0	0
745:	0	0	0	0	0	0	0	0	0
753:	0	0	0	0	0	0	0	1	1
761:	0	0	0	1	0	0	0	0	0
769:	0	0	0	0	1	0	0	0	0
777:	0	0	0	0	0	0	0	0	0
785:	1	0	0	0	0	0	0	0	0
793:	0	0	0	0	0	1	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:	0	0	0	0	0	0	0	0
849:	0	0	0	0	0	0	0	0
857:	0	0	1	0	0	0	0	0
865:	0	0	0	0	0	0	0	0
873:	0	0	0	0	0	0	0	0
881:	0	0	0	0	0	0	0	0
889:	0	0	0	0	0	0	0	1
897:	0	0	0	1	0	0	0	0
905:	0	0	0	0	0	0	0	0
913:	0	0	0	0	0	0	1	0
921:	0	1	0	0	0	1	0	0
929:	0	1	0	0	1	1	0	0
937:	0	1	0	1	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



C
JAH112

Sample Description: DUP 08 DIS
 Spectrum File: \\OR-ALPHA1\Canberra\ApexAlpha\Root\Data\00000572
 Batch Identification: 1304133A-TH
 Sample Identification: 07
 Sample Geometry: Shelf 2
 Procedure Description: Th iso

Detector Name: Alpha_033
 Chamber Serial Number: 04026479A
 Detector Serial Number: 91132
 Env. Background: System Bkgd 56372
 Reagent Blank: <not performed>

Sample Size: 1.000E+000 +/- 0.000E+000 liter
 Sample Date/Time: 4/16/2013 8:09:17 AM
 Acquisition Date/Time: 5/6/2013 4:26:09 PM
 Acquisition Live Time: 170.0 minutes
 Acquisition Real Time: 170.8 minutes

Tracer Certificate: Th229_TH-18A
 Tracer Quantity: 0.232 mL
 Effective Efficiency: 0.2185 +/- 0.0171
 Counting Efficiency: 0.1825 +/- 0.0032 on 12/16/2012 5:49:18 PM
 Chem. Recovery Factor: 1.1973 +/- 0.0962

Peak Match Tolerance: 0.175 MeV

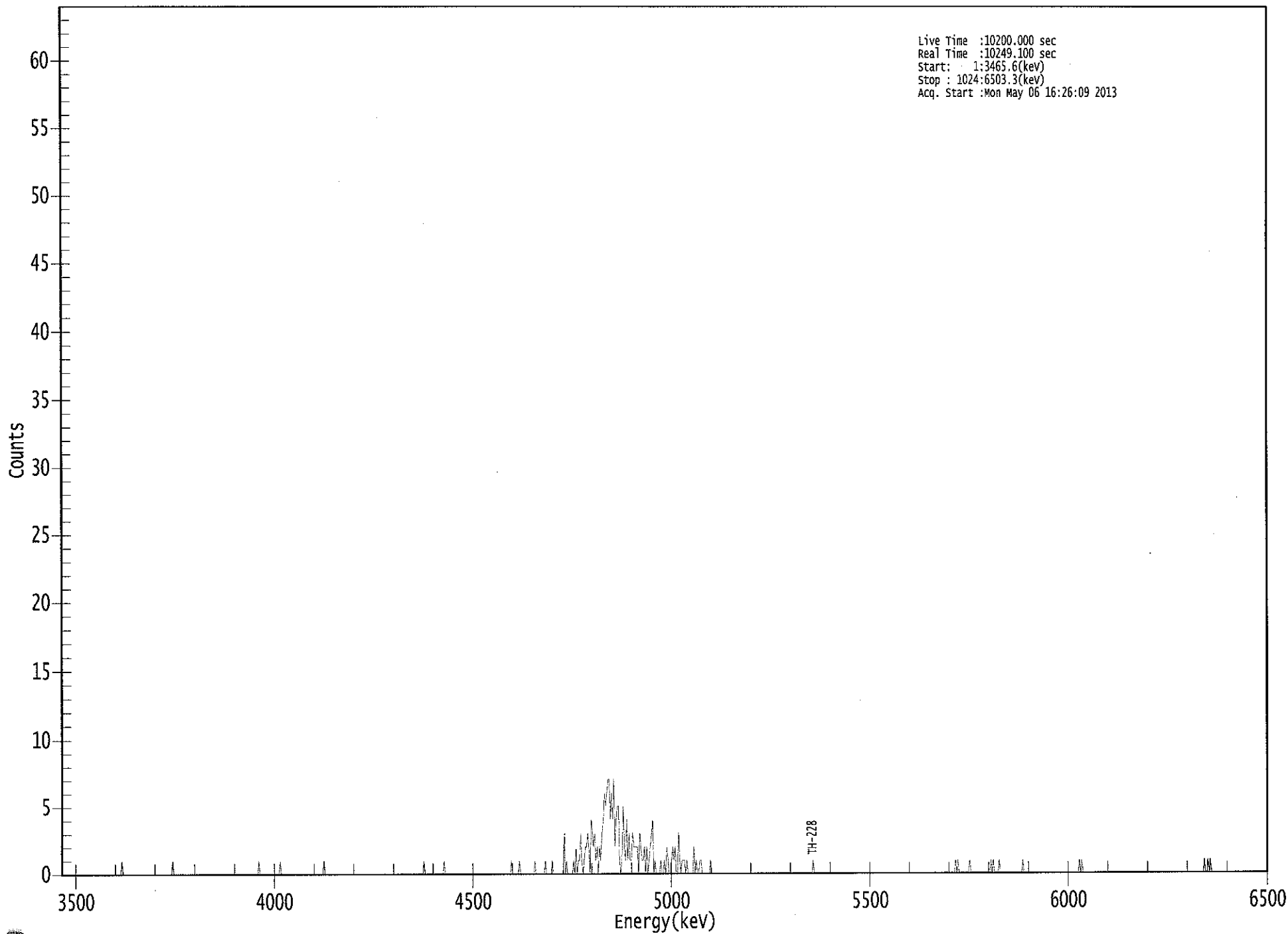
----- ----- PEAK AREA REPORT ----- -----						
Nuclide	Energy (MeV)	Net Pk Area	Pk Area Error %	Ambient Backgnd	Reagent Backgnd	FWHM (keV)
TH-227	5.842	8.15	72.72	0.85	0.00E+000	3.0
TH-228	5.357	0.49	416.98	0.51	0.00E+000	3.0
TH-229 T	4.875	193.49	14.11	0.51	0.00E+000	30.3
TH-230	4.614	5.83	82.55	0.17	0.00E+000	3.0
TH-232	3.988	2.00	169.74	0.00	0.00E+000	3.0

T = Tracer Peak used for Effective Efficiency

----- ----- NUCLIDE ANALYSIS RESULTS ----- -----						
Nuclide	Id Conf.	Energy (keV)	Activity (pCi/liter)		MDA (pCi/liter)	
TH-227	1.000	5850.00*	1.02E-001 +/-	7.55E-002	7.46E-002 +/-	1.15E-002
TH-228	0.990	5400.00*	6.07E-003 +/-	2.53E-002	6.50E-002 +/-	9.98E-003
TH-229	1.000	4872.00*	2.36E+000 +/-	3.62E-001	6.40E-002 +/-	9.83E-003
TH-230	0.982	4672.00*	7.08E-002 +/-	5.95E-002	5.07E-002 +/-	7.79E-003
TH-232	1.000	3997.00*	2.43E-002 +/-	4.13E-002	7.27E-002 +/-	1.12E-002

AG
5/7/13

US EPA ARCHIVE DOCUMENT



0193

ROI Type: 1

ROI Type: 3

 ***** 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: 10249

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	1	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	1	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	1
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	0	0	0
209:	0	0	0	0	0	0	0	0
217:	0	0	0	0	0	0	1	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	1	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 0

Sample Title: 07

Channel	1	2	3	4	5	6	7	8	9
377:	0	0	0	0	0	1	0	0	0
385:	0	0	0	0	1	0	0	0	0
393:	0	0	0	0	0	0	0	0	0
401:	0	1	0	0	0	0	0	0	0
409:	0	0	1	0	0	0	0	0	0
417:	1	0	0	0	0	0	0	0	0
425:	0	0	3	0	1	0	0	0	0
433:	0	0	1	0	2	0	1	1	1
441:	3	1	0	1	2	2	3	2	2
449:	0	4	3	2	3	1	2	0	0
457:	2	1	3	4	6	5	6	7	7
465:	7	4	6	4	7	2	4	5	5
473:	5	1	0	1	5	2	1	4	4
481:	1	3	1	1	3	2	2	2	2
489:	2	0	3	2	1	1	2	0	0
497:	2	0	1	2	3	4	0	1	1
505:	0	0	0	0	1	0	0	1	1
513:	0	2	1	0	0	1	2	1	1
521:	2	0	0	3	1	0	1	1	1
529:	1	0	1	0	0	0	0	0	0
537:	2	0	1	0	0	1	1	0	0
545:	0	0	0	0	0	0	1	0	0
553:	0	0	0	0	0	0	0	0	0
561:	0	0	0	0	0	0	0	0	0
569:	0	0	0	0	0	0	0	0	0
577:	0	0	0	0	0	0	0	0	0
585:	0	0	0	0	0	0	0	0	0
593:	0	0	0	0	0	0	0	0	0
601:	0	0	0	0	0	0	0	0	0
609:	0	0	0	0	0	0	0	0	0
617:	0	0	0	0	0	0	0	0	0
625:	0	0	0	0	0	0	0	0	0
633:	0	0	0	0	0	1	0	0	0
641:	0	0	0	0	0	0	0	0	0
649:	0	0	0	0	0	0	0	0	0
657:	0	0	0	0	0	0	0	0	0
665:	0	0	0	0	0	0	0	0	0
673:	0	0	0	0	0	0	0	0	0
681:	0	0	0	0	0	0	0	0	0
689:	0	0	0	0	0	0	0	0	0
697:	0	0	0	0	0	0	0	0	0
705:	0	0	0	0	0	0	0	0	0
713:	0	0	0	0	0	0	0	0	0
721:	0	0	0	0	0	0	0	0	0
729:	0	0	0	0	0	0	0	0	0
737:	0	0	0	0	0	0	0	0	0
745:	0	0	0	0	0	0	0	0	0
753:	0	0	0	0	0	0	1	0	0
761:	1	0	0	0	0	0	0	0	0
769:	0	0	1	0	0	0	0	0	0
777:	0	0	0	0	0	0	0	0	0
785:	0	0	0	0	1	0	1	0	0
793:	0	0	0	1	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	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	1
865:	0	1	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	1	0	0	1	0	1	0
977:	0	0	0	0	0	0	0	0
985:	0	0	0	0	0	0	0	0
993:	0	0	0	0	0	0	0	0
1001:	0	0	0	0	0	0	0	0
1009:	0	0	0	0	0	0	0	0
1017:	0	0	0	0	0	0	0	0

5/10/13

Sample Description: PURGE TANK TOT
 Spectrum File: \\OR-ALPHA1\Canberra\ApexAlpha\Root\Data\00000572
 Batch Identification: 1304133A-TH
 Sample Identification: 08
 Sample Geometry: Shelf 2
 Procedure Description: Th iso

Detector Name: Alpha_034
 Chamber Serial Number: 04026479B
 Detector Serial Number: 91136
 Env. Background: System Bkgd 56373
 Reagent Blank: <not performed>

Sample Size: 1.000E+000 +/- 0.000E+000 liter
 Sample Date/Time: 4/16/2013 8:09:17 AM
 Acquisition Date/Time: 5/6/2013 4:26:11 PM
 Acquisition Live Time: 170.0 minutes
 Acquisition Real Time: 170.8 minutes

Tracer Certificate: Th229_TH-18A
 Tracer Quantity: 0.228 mL
 Effective Efficiency: 0.2135 +/- 0.0170
 Counting Efficiency: 0.1856 +/- 0.0032 on 12/16/2012 5:49:43 PM
 Chem. Recovery Factor: 1.1505 +/- 0.0939

Peak Match Tolerance: 0.175 MeV

 PEAK AREA REPORT

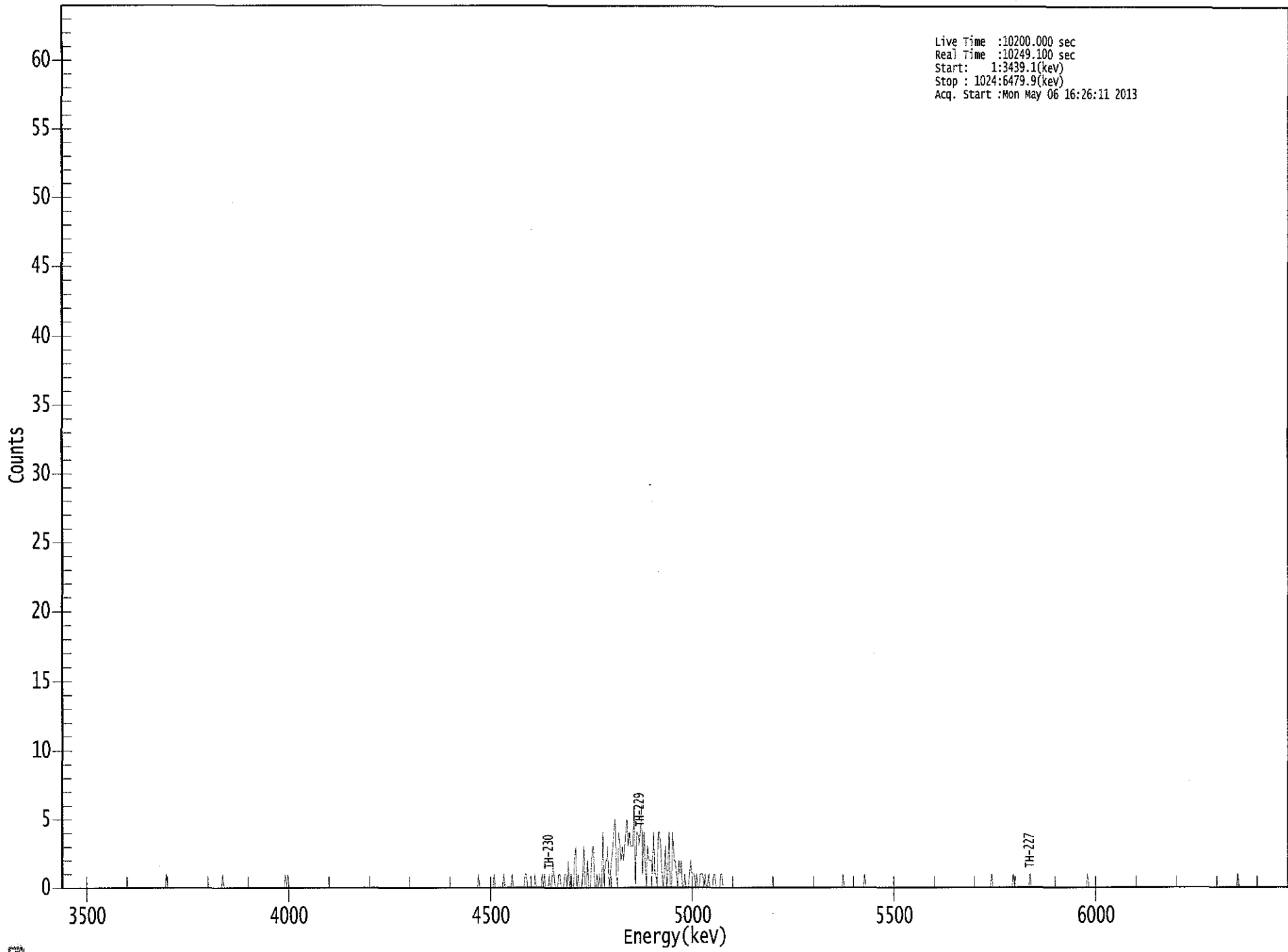
Nuclide	Energy (MeV)	Net Pk Area	Pk Area Error %	Ambient Backgnd	Reagent Backgnd	FWHM (keV)
TH-227	5.839	3.83	102.72	0.17	0.00E+000	3.0
TH-228	5.401	1.83	152.56	0.17	0.00E+000	3.0
TH-229 T	4.872	185.66	14.40	0.34	0.00E+000	4.5
TH-230	4.646	25.66	38.99	0.34	0.00E+000	5.2
TH-232	3.942	2.83	120.53	0.17	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	0.999	5850.00*	4.88E-002 +/- 5.07E-002	5.32E-002 +/- 8.32E-003
TH-228	1.000	5400.00*	2.32E-002 +/- 3.56E-002	5.29E-002 +/- 8.27E-003
TH-229	1.000	4872.00*	2.32E+000 +/- 3.62E-001	5.96E-002 +/- 9.32E-003
TH-230	0.996	4672.00*	3.19E-001 +/- 1.34E-001	5.94E-002 +/- 9.29E-003
TH-232	0.985	3997.00*	3.51E-002 +/- 4.27E-002	5.18E-002 +/- 8.10E-003

*AG
5/7/13*



Live Time :10200.000 sec
Real Time :10249.100 sec
Start: 1:3439.1(keV)
Stop : 1024:6479.9(keV)
Acq. Start :Mon May 06 16:26:11 2013

369: 1 0 0 0 0 0 0 0 1

Sample Title: 08

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

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	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	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	1	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

5/7/13

Sample Description: PRUGE TANK DIS
 Spectrum File: \\OR-ALPHA1\Canberra\ApexAlpha\Root\Data\00000572
 Batch Identification: 1304133A-TH
 Sample Identification: 09
 Sample Geometry: Shelf 2
 Procedure Description: Th iso

Detector Name: Alpha_035
 Chamber Serial Number: 04026477A
 Detector Serial Number: 58771
 Env. Background: System Bkgd 56374
 Reagent Blank: <not performed>

Sample Size: 1.000E+000 +/- 0.000E+000 liter
 Sample Date/Time: 4/16/2013 8:09:17 AM
 Acquisition Date/Time: 5/6/2013 4:26:08 PM
 Acquisition Live Time: 170.0 minutes
 Acquisition Real Time: 170.8 minutes

Tracer Certificate: Th229_TH-18A
 Tracer Quantity: 0.231 mL
 Effective Efficiency: 0.0545 +/- 0.0081
 Counting Efficiency: 0.1826 +/- 0.0032 on 12/16/2012 5:49:42 PM
 Chem. Recovery Factor: 0.2983 +/- 0.0448

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	6.006	-0.02	10615.	1.02	0.00E+000	2.9
TH-228	5.299	-0.68	304.44	0.68	0.00E+000	0.0
TH-229 T	4.859	48.00	28.58	0.00	0.00E+000	3.4
TH-230	4.533	9.66	64.35	0.34	0.00E+000	2.9
TH-232	4.003	7.00	79.20	0.00	0.00E+000	2.9

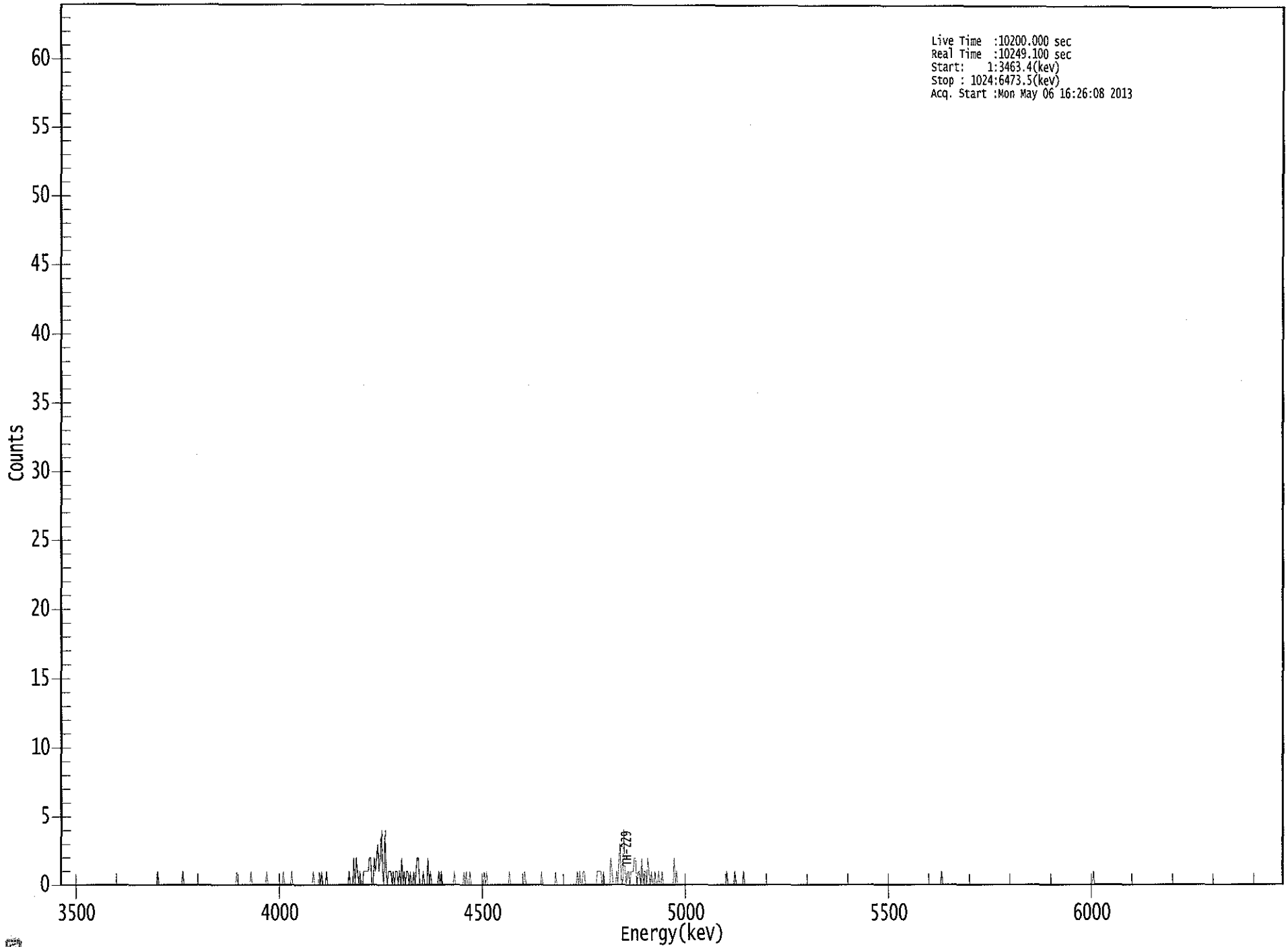
T = Tracer Peak used for Effective Efficiency

 NUCLIDE ANALYSIS RESULTS

Nuclide	Id Conf.	Energy (keV)	Activity (pCi/liter)	MDA (pCi/liter)
TH-227	0.881	5850.00*	-1.00E-003 +/- 1.06E-001	3.15E-001 +/- 9.20E-002
TH-228	0.949	5400.00*	-3.38E-002 +/- 1.03E-001	2.80E-001 +/- 8.19E-002
TH-229	0.999	4872.00*	2.35E+000 +/- 6.86E-001	2.93E-001 +/- 8.57E-002
TH-230	0.904	4672.00*	4.71E-001 +/- 3.33E-001	2.33E-001 +/- 6.81E-002
TH-232	1.000	3997.00*	3.41E-001 +/- 2.88E-001	2.92E-001 +/- 8.53E-002

AG
5/7/13

Live Time :10200.000 sec
Real Time :10249.100 sec
Start: 1:3463.4(kev)
Stop : 1024:6473.5(kev)
Acq. Start :Mon May 06 16:26:08 2013



ROI Type: 1

ROI Type: 3

 ***** 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: 10249

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

369: 0 0 0 0 0 0 0 0 1

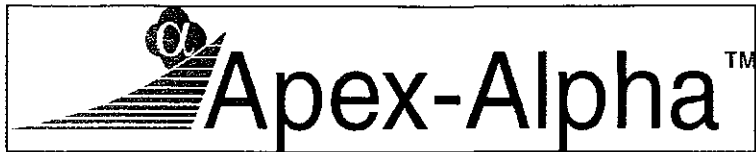
Sample Title: 09

Channel	-----	-----	-----	-----	-----	-----	-----	-----
377:	0	0	0	0	0	0	0	0
385:	0	0	0	0	1	0	0	0
393:	0	0	0	0	0	0	0	0
401:	0	0	1	0	0	0	0	0
409:	0	0	0	0	0	0	1	0
417:	0	0	0	0	0	0	0	0
425:	0	0	0	0	0	0	0	0
433:	1	0	1	0	0	1	1	0
441:	0	0	0	0	0	0	0	0
449:	0	1	1	1	1	0	1	0
457:	0	0	0	0	2	1	0	0
465:	0	1	0	2	3	0	0	4
473:	1	0	1	1	0	1	1	1
481:	2	2	0	1	1	0	2	0
489:	1	1	0	2	1	0	1	0
497:	0	1	0	0	1	0	0	1
505:	0	0	0	0	0	0	0	0
513:	0	2	0	1	0	0	0	0
521:	0	0	0	0	0	0	0	0
529:	0	0	0	0	0	0	0	0
537:	0	0	0	0	0	0	0	0
545:	0	0	0	0	0	0	0	0
553:	0	0	0	0	0	1	0	0
561:	0	0	0	0	1	0	0	0
569:	0	0	0	1	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	1	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	0
825:	0	0	0	0	0	0	0	0
833:	0	0	0	0	0	0	0	0
841:	0	0	0	0	0	0	0	0
849:	0	0	0	0	0	0	0	0
857:	0	0	0	0	0	0	0	0
865:	1	0	0	0	0	0	0	0
873:	0	0	0	0	0	0	0	0
881:	0	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



QA SUMMARY REPORT
Review Of QA Results - Pulser Check

Date : 5/6/2013
Time : 5:36:52 AM

CHAMBER	DEVICE	PARAMETER	FLAG	DATE
Alpha 001	21f	ALL	Not Done	
Alpha 002	21f	ALL	Not Done	
Alpha 003	21f	ALL	Passed	5/6/2013 5:21:40 AM
Alpha 004	21f	ALL	Passed	5/6/2013 5:21:40 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	5/6/2013 5:21:41 AM
Alpha 011	21f	ALL	Passed	5/6/2013 5:21:42 AM
Alpha 012	21f	ALL	Not Done	
Alpha 013	21f	ALL	Passed	5/6/2013 5:21:43 AM
Alpha 014	21f	ALL	Passed	5/6/2013 5:21:44 AM
Alpha 015	21f	ALL	Not Done	
Alpha 016	21f	ALL	Not Done	
Alpha 017	AIM730	ALL	Not Done	
Alpha 018	AIM730	ALL	Passed	5/6/2013 5:21:45 AM
Alpha 019	AIM730	ALL	Not Done	
Alpha 020	AIM730	ALL	Not Done	
Alpha 021	AIM730	ALL	Not Done	
Alpha 022	AIM730	ALL	Passed	5/6/2013 5:21:45 AM
Alpha 023	AIM730	ALL	Not Done	
Alpha 024	AIM730	ALL	Passed	5/6/2013 5:21:46 AM
Alpha 025	AIM730	ALL	Passed	5/6/2013 5:21:47 AM
Alpha 026	AIM730	ALL	Not Done	
Alpha 027	AIM730	ALL	Passed	5/6/2013 5:21:48 AM
Alpha 028	AIM730	ALL	Not Done	
Alpha 029	AIM730	ALL	Passed	5/6/2013 5:21:49 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	5/6/2013 5:21:50 AM
Alpha 034	Alpha Analyst100DC	ALL	Passed	5/6/2013 5:21:51 AM
Alpha 035	Alpha Analyst100DC	ALL	Passed	5/6/2013 5:21:53 AM
Alpha 036	Alpha Analyst100DC	ALL	Not Done	
Alpha 037	Alpha Analyst100DC	ALL	Passed	5/6/2013 5:21:54 AM
Alpha 038	Alpha Analyst100DC	ALL	Not Done	
Alpha 039	Alpha Analyst100DC	ALL	Not Done	
Alpha 040	Alpha Analyst100DC	ALL	Passed	5/6/2013 5:21:56 AM
Alpha 041	Alpha Analyst100DC	ALL	Passed	5/6/2013 5:21:58 AM
Alpha 042	Alpha Analyst100DC	ALL	Passed	5/6/2013 5:21:59 AM

CHAMBER	DEVICE	PARAMETER	FLAG	DATE
Alpha 043	Alpha Analyst100DC	ALL	Not Done	
Alpha 044	Alpha Analyst100DC	ALL	Passed	5/6/2013 5:22:01 AM
Alpha 045	Alpha Analyst100DC	ALL	Not Done	
Alpha 046	Alpha Analyst100DC	ALL	Passed	5/6/2013 5:22:02 AM
Alpha 047	Alpha Analyst100DC	ALL	Passed	5/6/2013 5:22:04 AM
Alpha 048	Alpha Analyst100DC	ALL	Passed	5/6/2013 5:22:06 AM

APPROVED BY: _____



APPROVAL DATE: _____



 ***** LIBRARY LISTING REPORT *****

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)

US EPA ARCHIVE DOCUMENT

Work Order	13-04133	Internal Fraction	Sample Desc	Client ID	Login CPM	Sample Date	Sample Aliquot
Analysis Code	Ra226	01	LCS	LCS		04/18/13 00:00	1.0000E+00
Run	1	02	MBL	BLANK		04/18/13 00:00	1.5000E+00
Date Received	4/18/2013	03	DUP	I-65 TOT	42	04/16/13 10:47	1.5000E+00
Lab Deadline	5/9/2013	04	DO	I-65 TOT	42	04/16/13 10:47	1.5000E+00
Client	Engineering Management Support, Inc.	05	TRG	I-65 DIS	42	04/16/13 10:47	1.5000E+00
Project	West Lake OU-1	06	TRG	DUP 08 TOT	37	04/16/13 00:00	1.5000E+00
Report Level	4	07	TRG	DUP 08 DIS	37	04/16/13 00:00	1.5000E+00
Activity Units	pCi	08	TRG	PURGE TANK TOT	40	04/16/13 11:45	1.5000E+00
Aliquot Units		09	TRG	PURGE TANK DIS	40	04/16/13 11:45	1.5000E+00
Matrix	WA						
Method	EPA 903.0 Modified						
Instrument Type	Alpha Spectroscopy						
Radiometric Tracer	Ba-133						
Radiometric Sol#	Ba-6a						
Tracer Act (dpm/g)	1008.316						
Carrier							
Carrier Conc (mg/ml)							

* 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.

13-04133
Ra226
Run 1

Internal Fraction	Sample Desc	Tracer Aliquot (g)	Tracer Total ACT (dpm)	Radiometric Tracer (pCi)	Radiometric % Rec	Grav Carrier Added (ml)	Grav Filter Tare (g)	Grav Filter Final (g)	Grav Filter Net (g)	Grav % Rec	Mean % Rec	SAF 1*	SAF 2*
01	LCS	0.9131	920.7	426.5	102.84		0.0226	0.0290	0.0064		102.84	2.31	1.00
02	MBL	0.9050	912.5	441.9	107.51		0.0226	0.0288	0.0062		107.51	2.23	1.00
03	DUP	0.9015	909.0	418.2	102.14		0.0229	0.0297	0.0068		102.14	2.44	1.00
04	DO	0.9007	908.2	406.2	99.29		0.0230	0.0297	0.0067		99.29	2.40	1.00
05	TRG	0.8981	905.6	372.5	91.32		0.0225	0.0291	0.0066		91.32	2.37	1.00
06	TRG	0.8968	904.3	387.9	95.23		0.0225	0.0292	0.0067		95.23	2.40	1.00
07	TRG	0.9022	909.7	368.4	89.90		0.0228	0.0295	0.0067		89.90	2.40	1.00
08	TRG	0.8978	905.3	304.0	74.55		0.0228	0.0289	0.0061		74.55	2.20	1.00
09	TRG	0.9009	908.4	341.9	83.56		0.0229	0.0308	0.0079		83.56	2.74	1.00

US EPA ARCHIVE DOCUMENT

0212

* 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			04/29/13 10:21	JBARNARD	05/01/13 10:55	TSMITH		
02	MBL			04/29/13 10:21	JBARNARD	05/01/13 10:55	TSMITH		
03	DUP			04/29/13 10:21	JBARNARD	05/01/13 10:55	TSMITH		
04	DO			04/29/13 10:21	JBARNARD	05/01/13 10:55	TSMITH		
05	TRG			04/29/13 10:21	JBARNARD	05/01/13 10:55	TSMITH		
06	TRG			04/29/13 10:21	JBARNARD	05/01/13 10:55	TSMITH		
07	TRG			04/29/13 10:21	JBARNARD	05/01/13 10:55	TSMITH		
08	TRG			04/29/13 10:21	JBARNARD	05/01/13 10:55	TSMITH		
09	TRG			04/29/13 10:21	JBARNARD	05/01/13 10:55	TSMITH		

US EPA ARCHIVE DOCUMENT

0213

* 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: 13-04133-Ra226-1

Lab Fraction	Nuclide	Sample Desc	Client Identification	Activity Units	Results	Error Estimate	MDA	LCS Known	LCS %R	LCS Flag	RPD Flag	MDA Flag	Blank Flag
01	RA-226	LCS	LCS	pCi/l	1.05E+01	1.22E+00	1.76E-01	1.03E+01	102.58	OK		OK	
02	RA-226	MBL	BLANK	pCi/l	-1.80E-02	4.45E-02	1.27E-01					OK	OK
03	RA-226	DUP	I-65 TOT	pCi/l	5.55E-01	2.28E-01	1.24E-01				NA	OK	
04	RA-226	DO	I-65 TOT	pCi/l	5.43E-01	2.26E-01	1.15E-01					OK	
05	RA-226	TRG	I-65 DIS	pCi/l	3.01E-01	1.71E-01	1.27E-01					OK	
06	RA-226	TRG	DUP 08 TOT	pCi/l	4.68E-01	2.08E-01	1.48E-01					OK	
07	RA-226	TRG	DUP 08 DIS	pCi/l	2.55E-01	1.68E-01	1.61E-01					OK	
08	RA-226	TRG	PURGE TANK TOT	pCi/l	3.20E-01	1.87E-01	1.31E-01					OK	
09	RA-226	TRG	PURGE TANK DIS	pCi/l	4.53E-01	2.46E-01	1.94E-01					OK	

	Run	1
Analysis Code	Ra226	
Eberline Services Work Order	13-04133	
Client	Engineering Management Support, Inc.	

Preliminary Data Report & Analytical Calculations
Work Order: 13-04133-Ra226-1

US EPA ARCHIVE DOCUMENT

Client Engineering Management Support, Inc.	Eberline Services Work Order 13-04133	Analysis Code Ra226	Run 1
			

Lab Fraction	Nuclide	Sample Desc	Sample Date	Sample Aliquot	Radiometric % Rec	Grav % Rec	Mean % Rec	SAF	Sep t0 Date/Time	Sep t1 Date/Time
01	RA-226	LCS	04/18/13 00:00	1.00E+00	100.00	0.00	102.84		5/1/2013 10:55	
02	RA-226	MBL	04/18/13 00:00	1.50E+00	100.00	0.00	107.51		5/1/2013 10:55	
03	RA-226	DUP	04/16/13 10:47	1.50E+00	100.00	0.00	102.14		5/1/2013 10:55	
04	RA-226	DO	04/16/13 10:47	1.50E+00	99.29	0.00	99.29		5/1/2013 10:55	
05	RA-226	TRG	04/16/13 10:47	1.50E+00	91.32	0.00	91.32		5/1/2013 10:55	
06	RA-226	TRG	04/16/13 00:00	1.50E+00	95.23	0.00	95.23		5/1/2013 10:55	
07	RA-226	TRG	04/16/13 00:00	1.50E+00	89.90	0.00	89.90		5/1/2013 10:55	
08	RA-226	TRG	04/16/13 11:45	1.50E+00	74.55	0.00	74.55		5/1/2013 10:55	
09	RA-226	TRG	04/16/13 11:45	1.50E+00	83.56	0.00	83.56		5/1/2013 10:55	

Preliminary Data Report & Analytical Calculations
Work Order: 13-04133-Ra226-1

Lab Fraction	Nuclide	Sample Desc	Counting Date/Time	Half-life (days)	Detect	Carrier	Count Time	Counts	Bkg CPM	Eff
01	RA-226	LCS	05/02/13 09:14		A_Spec	Alpha_033	170	3.13 E+02	3.00 E-03	18.2
02	RA-226	MBL	05/02/13 09:14		A_Spec	Alpha_034	170	-8.50 E-01	5.00 E-03	18.6
03	RA-226	DUP	05/02/13 09:14		A_Spec	Alpha_035	170	2.35 E+01	3.00 E-03	18.3
04	RA-226	DO	05/02/13 09:14		A_Spec	Alpha_037	170	2.27 E+01	2.00 E-03	17.8
05	RA-226	TRG	05/02/13 09:14		A_Spec	Alpha_040	170	1.25 E+01	3.00 E-03	19
06	RA-226	TRG	05/02/13 09:14		A_Spec	Alpha_041	170	2.08 E+01	7.00 E-03	19.8
07	RA-226	TRG	05/02/13 09:14		A_Spec	Alpha_042	170	9.98 E+00	6.00 E-03	18.5
08	RA-226	TRG	05/02/13 09:14		A_Spec	Alpha_044	170	1.17 E+01	2.00 E-03	19
09	RA-226	TRG	05/02/13 09:14		A_Spec	Alpha_046	170	1.40 E+01	0.00 E+00	17.9

	
Run	1
Analysis Code	Ra226
Eberline Services Work Order	13-04133
Client	Engineering Management Support, Inc.

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09/13

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 <i>7</i>	LCS	LCS	04/18/13 00:00	1.0000	0.9131	920.6933	426.5000	102.84	2.31	1.00
02	MBL	BLANK	04/18/13 00:00	1.5000	0.9050	912.5260	441.9000	107.51	2.23	1.00
03	DUP	I-65 TOT	04/16/13 10:47	1.5000	0.9015	908.9969	418.2000	102.14	2.44	1.00
04	DO	I-65 TOT	04/16/13 10:47	1.5000	0.9007	908.1902	406.2000	99.29	2.40	1.00
05	TRG	I-65 DIS	04/16/13 10:47	1.5000	0.8981	905.5686	372.5000	91.32	2.37	1.00
06	TRG	DUP 08 TOT	04/16/13 00:00	1.5000	0.8968	904.2578	387.9000	95.23	2.40	1.00
07	TRG	DUP 08 DIS	04/16/13 00:00	1.5000	0.9022	909.7027	368.4000	89.90	2.40	1.00
08	TRG	PURGE TANK TOT	04/16/13 11:45	1.5000	0.8978	905.2661	304.0000	74.55	2.20	1.00
09 <i>46</i>	TRG	PURGE TANK DIS	04/16/13 11:45	1.5000	0.9009	908.3919	341.9000	83.56	2.74	1.00

US EPA ARCHIVE DOCUMENT

Internal Work Order					Run	Analysis Code		Date		Technician			Technician Initials		Witness Initials	
13-04133					1	Ra226		4/29/2013 10:20		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
Ra-226	Ra-5b	44.071	4/29/2013	0.500	0.5164				10.25	0.472	0.00	0.000	0.00	0.000	0.00	0.000

Tracers							Balance Printer Tapes									
fraction	Isotope	Sol #	Activity dpm/g	Solution Date	Volume Used (g)	Approx Addition	Tracer					LCS				
01	Ba-133	Ba-6a	1008.316	4/29/2013	0.9131	1.0000										
02	Ba-133	Ba-6a	1008.316	4/29/2013	0.9050	1.0000										
03	Ba-133	Ba-6a	1008.316	4/29/2013	0.9015	1.0000										
04	Ba-133	Ba-6a	1008.316	4/29/2013	0.9007	1.0000										
05	Ba-133	Ba-6a	1008.316	4/29/2013	0.8981	1.0000	0.9131 g					0.5164 g				
06	Ba-133	Ba-6a	1008.316	4/29/2013	0.8968	1.0000	0.9050 g					0.5120 g				
07	Ba-133	Ba-6a	1008.316	4/29/2013	0.9022	1.0000	-0.9015 g									
08	Ba-133	Ba-6a	1008.316	4/29/2013	0.8978	1.0000	-0.9007 g									
09	Ba-133	Ba-6a	1008.316	4/29/2013	0.9009	1.0000	-0.8981 g									
							-0.8981 g									
							-0.8968 g									
							-0.9022 g									
							-0.8978 g									
							-0.9009 g									
												Matrix Spike				

US EPA ARCHIVE DOCUMENT

Aliquot Worksheet


US EPA ARCHIVE DOCUMENT

Work Order	Run	Analysis Code	Rpt Units	Lab Deadline	Technician
13-04133	1	Ra226	liters	5/9/2013	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					1.5000E+00	1.5000E+00				
03	I-65 TOT	DUP					1.5000E+00	1.5000E+00				
04	I-65 TOT	DO					1.5000E+00	1.5000E+00				
05	I-65 DIS	TRG					1.5000E+00	1.5000E+00				
06	DUP 08 TOT	TRG					1.5000E+00	1.5000E+00				
07	DUP 08 DIS	TRG					1.5000E+00	1.5000E+00				
08	PURGE TANK TOT	TRG					1.5000E+00	1.5000E+00				
09	PURGE TANK DIS	TRG					1.5000E+00	1.5000E+00				

Comments	
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Technician: _____

 Date: 4/29/13

Gravimetric Worksheet

Work Order	Run	Analysis Code	Gravimetric Carrier	Carrier Conc (mg/ml)	Technician
13-04133	1	Ra226			TSMITH

TRetec Fraction	Engineering Management Support, Inc. Client ID	Sample Type	Carrier Data Carrier Added (ml)	Filter Data			Gravimetric % Recovery
				Filter Tare (g)	Filter Final (g)	Filter Net (g)	
01	LCS	LCS		0.0226	0.0290	0.0064	
02	BLANK	MBL		0.0226	0.0288	0.0062	
03	DUP	DUP		0.0229	0.0297	0.0068	
04	I-65 TOT	DO		0.0230	0.0297	0.0067	
05	I-65 DIS	TRG		0.0225	0.0291	0.0066	
06	DUP 08 TOT	TRG		0.0225	0.0292	0.0067	
07	DUP 08 DIS	TRG		0.0228	0.0295	0.0067	
08	PURGE TANK TOT	TRG		0.0228	0.0289	0.0061	
09	PURGE TANK DIS	TRG		0.0229	0.0308	0.0079	

US EPA ARCHIVE DOCUMENT

0220

Technician: *T Smith* Date: 5/1/13

KCB
5/2/13

Apex-Alpha™

Sample Description: SPIKE
 Spectrum File: \\OR-ALPHA1\Canberra\ApexAlpha\Root\Data\00000569
 Batch Identification: 1304133A-RA
 Sample Identification: 01
 Sample Geometry: Shelf 2
 Procedure Description: Ra

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

Sample Size: 1.000E+000 +/- 0.000E+000 liter
 Generic Mult. Factor: 2.310E+000 Generic Div. Factor: 1.000E+000
 Sample Date/Time: 5/2/2013 10:55:51 AM
 Acquisition Date/Time: 5/2/2013 9:14:03 AM
 Acquisition Live Time: 170.0 minutes
 Acquisition Real Time: 174.0 minutes

Chem. Recovery Factor: 1.0000 +/- 0.0000
 Counting Efficiency: 0.1825 +/- 0.0032 on 12/16/2012 5:49:18 PM
 Effective Efficiency: 0.1825 +/- 0.0032

Control Certificate Name: Ra226_Ra-5b
 Chem. Recov. of Control: RA-226 0.444033 +/- 0.029469
 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	5.532	542.66	8.42	0.34	0.00E+000	5.1
RA-226	4.647	313.49	11.08	0.51	0.00E+000	3.9

 NUCLIDE ANALYSIS RESULTS

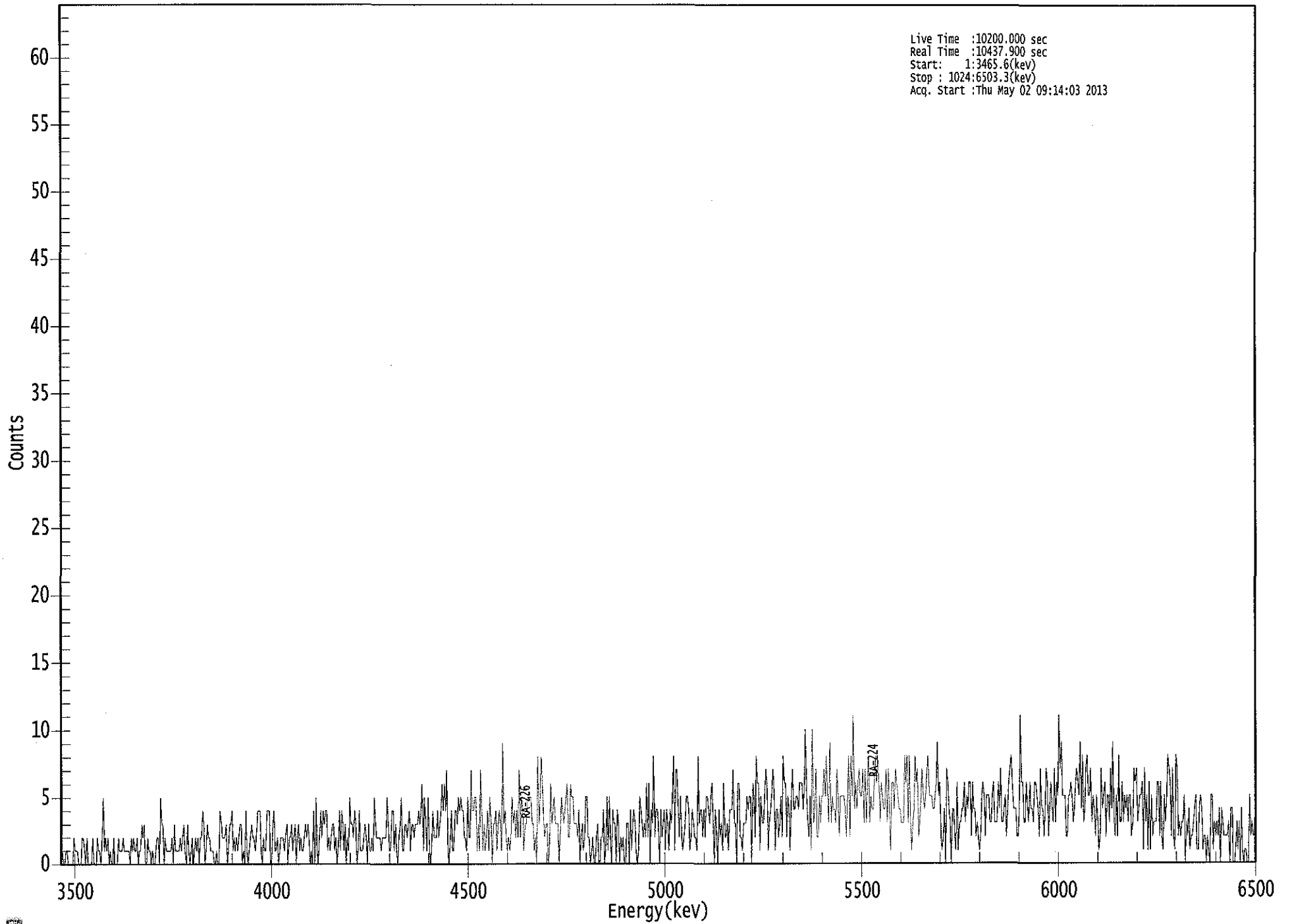
Nuclide	Id Conf.	Energy (keV)	Activity (pCi/liter)	MDA (pCi/liter)
RA-224	0.970	5685.50*	1.89E+001 +/- 3.46E+002	1.66E-001 +/- 3.05E+000
RA-226	0.976	4785.00*	1.05E+001 +/- 1.22E+000	1.76E-001 +/- 6.06E-003

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5/2/13

US EPA ARCHIVE DOCUMENT

0000056927.CNF

Live Time :10200.000 sec
Real Time :10437.900 sec
Start: 1:3465.6(kev)
Stop : 1024:6503.3(kev)
Acq. Start :Thu May 02 09:14:03 2013



US EPA ARCHIVE DOCUMENT

0222

ROI Type: 1

 ***** 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: 10438

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

369: 3 0 3 3 4 1 3 4

Sample Title: 01

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

801: 3 3 6 4 7 3 3 4

Sample Title: 01

Channel	-----	-----	-----	-----	-----	-----	-----	-----
809:	5	2	4	6	7	8	6	4
817:	4	4	2	2	4	11	6	6
825:	3	3	6	4	3	6	4	4
833:	3	6	6	5	4	2	7	4
841:	4	2	4	7	6	2	4	6
849:	4	3	7	3	6	5	11	7
857:	9	5	5	5	2	2	5	5
865:	6	5	3	4	6	7	6	5
873:	9	4	8	3	4	7	8	5
881:	5	7	3	5	4	2	5	3
889:	1	2	7	4	5	6	2	5
897:	5	3	7	4	9	3	2	5
905:	2	8	3	3	6	3	5	4
913:	5	3	5	5	2	3	7	6
921:	7	3	4	5	5	6	1	7
929:	3	5	1	6	1	5	2	3
937:	3	3	6	6	2	6	2	1
945:	5	3	5	8	7	6	2	7
953:	2	1	8	7	2	3	2	3
961:	3	5	0	3	2	4	1	2
969:	2	3	4	5	1	1	4	5
977:	4	1	2	2	0	2	1	0
985:	5	5	1	3	2	3	2	4
993:	0	4	3	2	2	2	2	3
1001:	0	4	4	0	0	1	3	1
1009:	3	0	4	1	0	1	1	0
1017:	0	5	2	3	2	2	5	4

103
5/2/13

Apex-Alpha™

Sample Description: BLANK
 Spectrum File: \\OR-ALPHA1\Canberra\ApexAlpha\Root\Data\00000569
 Batch Identification: 1304133A-RA
 Sample Identification: 02
 Sample Geometry: Shelf 2
 Procedure Description: Ra

Detector Name: Alpha_034
 Chamber Serial Number: 04026479B
 Detector Serial Number: 91136
 Env. Background: System Bkgd 55747
 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: 5/2/2013 10:55:51 AM
 Acquisition Date/Time: 5/2/2013 9:14:05 AM
 Acquisition Live Time: 170.0 minutes
 Acquisition Real Time: 174.0 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

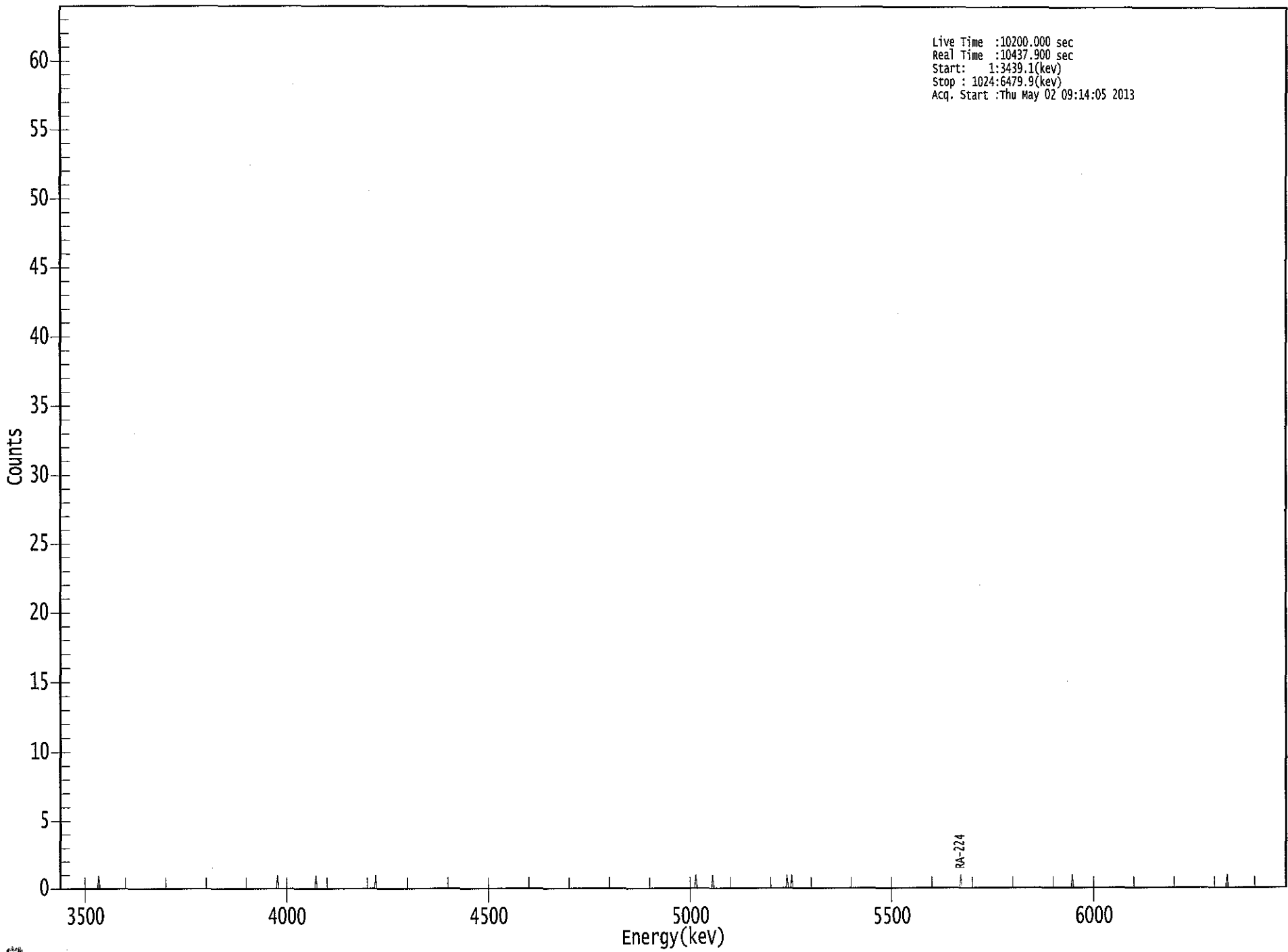
Nuclide	Energy (MeV)	Net Pk Area	Pk Area Error %	Ambient Backgnd	Reagent Backgnd	FWHM (keV)
RA-224	5.671	0.83	239.53	0.17	0.00E+000	3.0
RA-226	4.601	-0.85	246.69	0.85	0.00E+000	0.0

 NUCLIDE ANALYSIS RESULTS

Nuclide	Id Conf.	Energy (keV)	Activity (pCi/liter)	MDA (pCi/liter)
RA-224	1.000	5685.50*	1.83E-002 +/- 3.38E-001	9.19E-002 +/- 1.68E+000
RA-226	0.957	4785.00*	-1.80E-002 +/- 4.45E-002	1.27E-001 +/- 4.34E-003

AG
5/2/13

US EPA ARCHIVE DOCUMENT



0227

ROI Type: 1

 ***** 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: 10438

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:	1	0	0	0	0	0	0	0
41:	0	0	0	0	0	0	0	0
49:	0	0	0	0	0	0	0	0
57:	0	0	0	0	0	0	0	0
65:	0	0	0	0	0	0	0	0
73:	0	0	0	0	0	0	0	0
81:	0	0	0	0	0	0	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	1	0	0
217:	0	0	0	0	0	0	0	0
225:	0	0	0	0	0	0	0	0
233:	0	0	0	0	0	0	0	0
241:	0	0	0	0	0	0	0	0
249:	0	0	0	0	0	0	0	0
257:	0	0	0	0	0	0	0	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	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
385:	0	0	0	0	0	0	0
393:	0	0	0	0	0	0	0
401:	0	0	0	0	0	0	0
409:	0	0	0	0	0	0	0
417:	0	0	0	0	0	0	0
425:	0	0	0	0	0	0	0
433:	0	0	0	0	0	0	0
441:	0	0	0	0	0	0	0
449:	0	0	0	0	0	0	0
457:	0	0	0	0	0	0	0
465:	0	0	0	0	0	0	0
473:	0	0	0	0	0	0	0
481:	0	0	0	0	0	0	0
489:	0	0	0	0	0	0	0
497:	0	0	0	0	0	0	0
505:	0	0	0	0	0	0	0
513:	0	0	0	0	0	0	0
521:	0	0	0	0	0	0	0
529:	0	0	1	0	0	0	0
537:	0	0	0	0	0	0	0
545:	1	0	0	0	0	0	0
553:	0	0	0	0	0	0	0
561:	0	0	0	0	0	0	0
569:	0	0	0	0	0	0	0
577:	0	0	0	0	0	0	0
585:	0	0	0	0	0	0	0
593:	0	0	0	0	0	0	0
601:	0	0	0	0	0	1	0
609:	0	0	1	0	0	0	0
617:	0	0	0	0	0	0	0
625:	0	0	0	0	0	0	0
633:	0	0	0	0	0	0	0
641:	0	0	0	0	0	0	0
649:	0	0	0	0	0	0	0
657:	0	0	0	0	0	0	0
665:	0	0	0	0	0	0	0
673:	0	0	0	0	0	0	0
681:	0	0	0	0	0	0	0
689:	0	0	0	0	0	0	0
697:	0	0	0	0	0	0	0
705:	0	0	0	0	0	0	0
713:	0	0	0	0	0	0	0
721:	0	0	0	0	0	0	0
729:	0	0	0	0	0	0	0
737:	0	0	0	0	0	0	0
745:	0	0	0	0	0	0	1
753:	0	0	0	0	0	0	0
761:	0	0	0	0	0	0	0
769:	0	0	0	0	0	0	0
777:	0	0	0	0	0	0	0
785:	0	0	0	0	0	0	0
793:	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	1	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	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

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Apex-Alpha™

Sample Description: I-65 TOT-DUP
 Spectrum File: \\OR-ALPHA1\Canberra\ApexAlpha\Root\Data\00000569
 Batch Identification: 1304133A-RA
 Sample Identification: 03
 Sample Geometry: Shelf 2
 Procedure Description: Ra

Detector Name: Alpha_035
 Chamber Serial Number: 04026477A
 Detector Serial Number: 58771
 Env. Background: System Bkgd 55748
 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: 5/1/2013 10:55:51 AM
 Acquisition Date/Time: 5/2/2013 9:14:00 AM
 Acquisition Live Time: 170.0 minutes
 Acquisition Real Time: 174.0 minutes

Chem. Recovery Factor: 1.0000 +/- 0.0000
 Counting Efficiency: 0.1826 +/- 0.0032 on 12/16/2012 5:49:42 PM
 Effective Efficiency: 0.1826 +/- 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	5.515	20.66	43.53	0.34	0.00E+000	2.9
RA-226	4.612	23.49	40.95	0.51	0.00E+000	2.9

 NUCLIDE ANALYSIS RESULTS

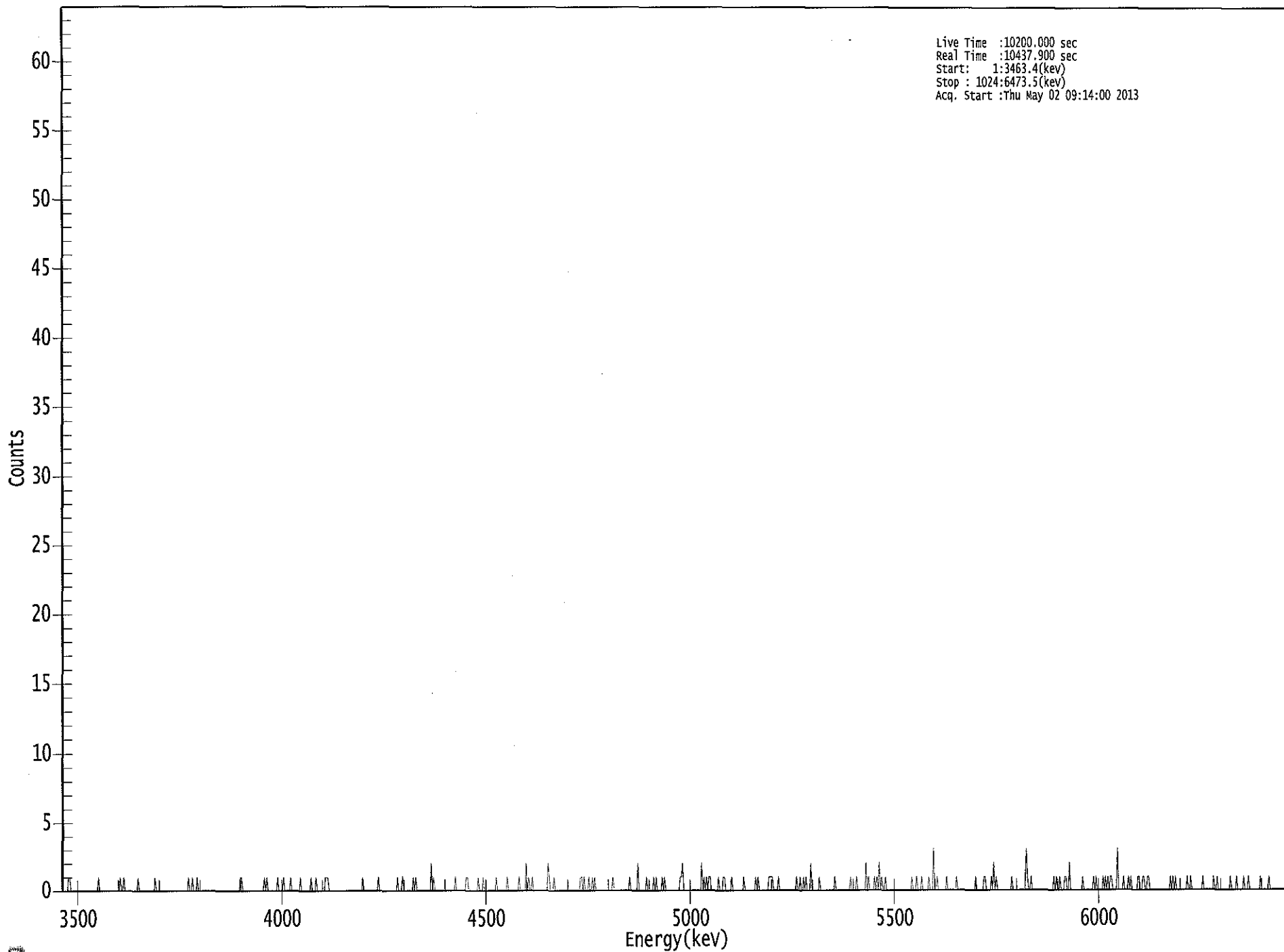
Nuclide	Id Conf.	Energy (keV)	Activity (pCi/liter)	MDA (pCi/liter)
RA-224	0.963	5685.50*	6.12E-001 +/- 1.47E+002	1.42E-001 +/- 3.41E+001
RA-226	0.962	4785.00*	5.55E-001 +/- 2.28E-001	1.24E-001 +/- 4.24E-003

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US EPA ARCHIVE DOCUMENT

0000056921.CNF

Live Time :10200.000 sec
Real Time :10437.900 sec
Start : 1:3463.4(kev)
Stop : 1024:6473.5(kev)
Acq. Start :Thu May 02 09:14:00 2013



US EPA ARCHIVE DOCUMENT

0232

ROI Type: 1

 ***** 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: 10438

Channel	-----	-----	-----	-----	-----	-----	-----	-----
1:	0	0	0	0	0	1	1	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	1	0
33:	0	0	0	0	0	0	0	0
41:	0	0	0	0	0	0	0	0
49:	1	0	0	1	0	0	0	0
57:	0	0	0	0	0	0	0	1
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	1	0	0	1	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	0	0	0	0
145:	0	0	0	0	1	1	0	0
153:	0	0	0	0	0	0	0	0
161:	0	0	0	0	0	0	0	0
169:	1	0	1	0	0	0	0	0
177:	0	0	0	1	0	0	0	0
185:	1	0	0	0	0	0	1	0
193:	0	0	0	0	0	0	1	0
201:	0	0	0	0	0	0	0	1
209:	0	0	0	1	0	0	0	0
217:	0	0	0	1	1	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	1	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	1
281:	0	0	0	1	0	0	0	0
289:	0	0	0	0	1	0	1	0
297:	0	0	0	0	0	0	0	0
305:	0	0	0	2	0	1	0	0
313:	0	0	0	0	0	0	0	0
321:	0	0	0	0	0	0	0	1
329:	0	0	0	0	0	0	0	0
337:	1	1	0	0	0	0	0	0
345:	0	0	1	0	0	0	1	0
353:	0	0	0	0	0	0	0	0
361:	0	1	0	0	0	0	0	0

369: 0 0 1 0 0 0 0 0

Sample Title: 03

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

801: 0 0 3 1 0 0 1 0

Sample Title: 03

Channel	1	2	3	4	5	6	7	8
809:	0	0	0	0	0	0	0	0
817:	0	0	0	0	0	0	0	0
825:	0	1	0	1	0	0	1	0
833:	0	0	1	1	0	0	2	0
841:	0	0	0	0	0	0	0	0
849:	0	1	0	0	0	0	0	0
857:	0	0	1	0	1	0	0	0
865:	0	0	1	0	1	0	1	0
873:	1	1	0	0	0	0	3	0
881:	0	0	0	1	0	0	0	1
889:	0	1	0	0	0	0	0	1
897:	1	0	0	1	1	0	0	1
905:	1	0	0	0	0	0	0	0
913:	0	0	0	0	0	0	0	0
921:	0	0	1	0	1	0	1	0
929:	0	0	0	0	0	0	0	0
937:	1	0	0	1	0	0	0	0
945:	0	0	0	0	0	1	0	0
953:	0	0	0	0	0	0	1	0
961:	0	1	0	0	0	0	0	0
969:	0	0	0	0	1	0	0	0
977:	0	1	0	0	0	0	0	1
985:	0	0	0	1	0	0	0	0
993:	0	0	0	0	0	1	0	0
1001:	0	0	0	0	1	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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Sample Description: I-65 TOT
 Spectrum File: \\OR-ALPHA1\Canberra\ApexAlpha\Root\Data\00000569
 Batch Identification: 1304133A-RA
 Sample Identification: 04
 Sample Geometry: Shelf 2
 Procedure Description: Ra

Detector Name: Alpha_037
 Chamber Serial Number: 04026478A
 Detector Serial Number: 91133
 Env. Background: System Bkgd 55750
 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: 5/1/2013 10:55:51 AM
 Acquisition Date/Time: 5/2/2013 9:14:01 AM
 Acquisition Live Time: 170.0 minutes
 Acquisition Real Time: 174.0 minutes

Chem. Recovery Factor: 0.9929 +/- 0.0000
 Counting Efficiency: 0.1783 +/- 0.0033 on 1/26/2013 3:28:25 PM
 Effective Efficiency: 0.1770 +/- 0.0033

Peak Match Tolerance: 0.350 MeV

 ----- PEAK AREA REPORT -----

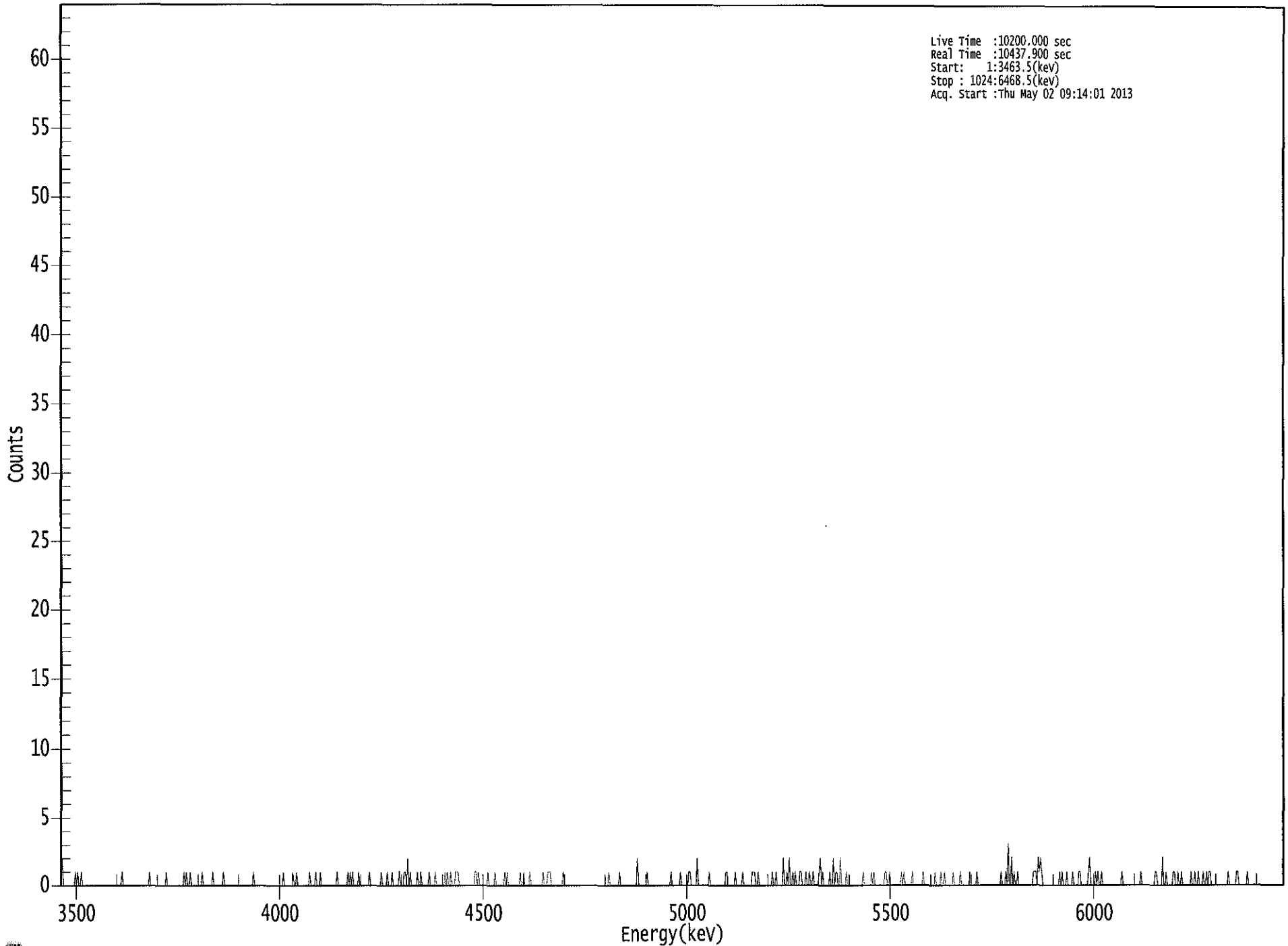
Nuclide	Energy (MeV)	Net Pk Area	Pk Area Error %	Ambient Backgnd	Reagent Backgnd	FWHM (keV)
RA-224	5.521	17.83	46.68	0.17	0.00E+000	2.9
RA-226	4.543	22.66	41.53	0.34	0.00E+000	2.9

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

Nuclide	Id Conf.	Energy (keV)	Activity (pCi/liter)	MDA (pCi/liter)
RA-224	0.965	5685.50*	5.35E-001 +/- 1.29E+002	1.25E-001 +/- 3.02E+001
RA-226	0.926	4785.00*	5.43E-001 +/- 2.26E-001	1.15E-001 +/- 4.17E-003

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US EPA ARCHIVE DOCUMENT



0237

ROI Type: 1

***** 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: 10438

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

369: 0 0 0 1 0 1 0 0

Sample Title: 04

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

801: 1 0 0 0 0 0 0 0 0

Sample Title: 04

Channel	1	2	3	4	5	6	7	8	9
809:	0	0	0	0	0	1	1	1	
817:	0	2	1	2	1	0	0	0	
825:	0	0	0	0	0	0	0	0	
833:	0	0	0	1	0	1	0	0	
841:	0	1	0	0	0	0	1	0	
849:	0	0	0	1	1	0	0	0	
857:	0	0	0	1	2	0	0	0	
865:	0	1	0	1	0	0	1	0	
873:	0	0	0	0	0	0	0	0	
881:	0	0	0	0	0	0	0	1	
889:	0	0	0	0	0	0	0	0	
897:	0	0	0	0	0	0	0	1	
905:	0	0	0	0	0	0	0	0	
913:	0	0	0	1	1	0	0	0	
921:	0	2	0	0	1	0	0	0	
929:	0	0	1	1	0	0	1	0	
937:	0	1	0	0	0	0	0	0	
945:	0	1	0	0	1	0	0	1	
953:	0	0	0	1	0	0	1	0	
961:	1	1	0	0	0	0	0	0	
969:	0	0	0	0	0	0	0	0	
977:	1	0	0	0	0	0	0	1	
985:	1	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	1	

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Apex-Alpha™

Sample Description: I-65 DIS
 Spectrum File: \\OR-ALPHA1\Canberra\ApexAlpha\Root\Data\00000569
 Batch Identification: 1304133A-RA
 Sample Identification: 05
 Sample Geometry: Shelf 2
 Procedure Description: Ra

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

Sample Size: 1.500E+000 +/- 0.000E+000 liter
 Generic Mult. Factor: 2.370E+000 Generic Div. Factor: 1.000E+000
 Sample Date/Time: 5/1/2013 10:55:51 AM
 Acquisition Date/Time: 5/2/2013 9:14:14 AM
 Acquisition Live Time: 170.0 minutes
 Acquisition Real Time: 174.0 minutes

Chem. Recovery Factor: 0.9132 +/- 0.0000
 Counting Efficiency: 0.1900 +/- 0.0033 on 12/16/2012 5:49:33 PM
 Effective Efficiency: 0.1735 +/- 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	5.529	7.32	76.28	0.68	0.00E+000	3.0
RA-226	4.622	12.49	56.77	0.51	0.00E+000	3.0

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

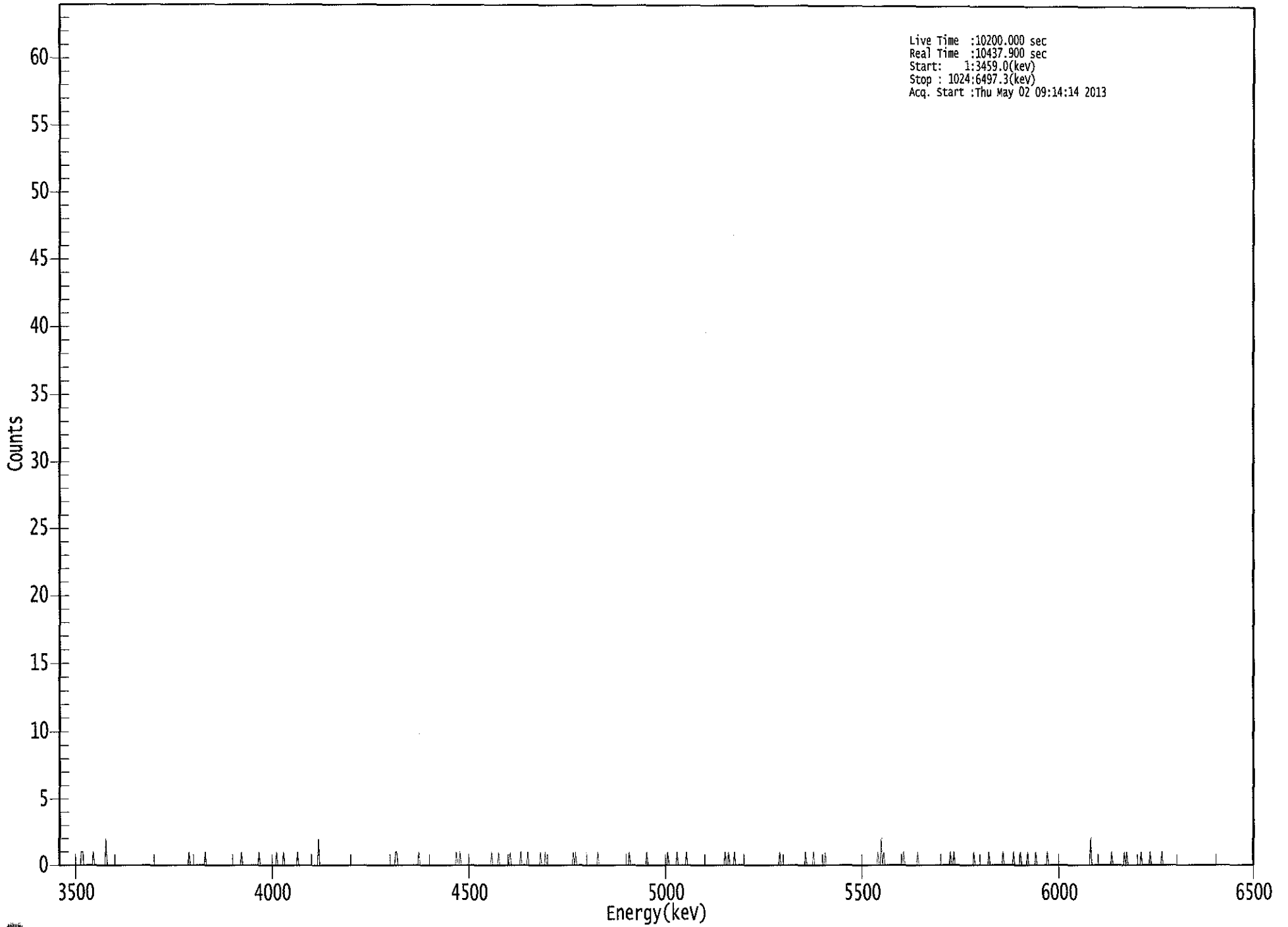
Nuclide	Id Conf.	Energy (keV)	Activity (pCi/liter)	MDA (pCi/liter)
RA-224	0.968	5685.50*	2.21E-001 +/- 5.34E+001	1.71E-001 +/- 4.11E+001
RA-226	0.966	4785.00*	3.01E-001 +/- 1.71E-001	1.27E-001 +/- 4.31E-003

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US EPA ARCHIVE DOCUMENT

0000056922.CNF

Live Time :10200.000 sec
Real Time :10437.900 sec
Start: 1:3459.0(kev)
Stop : 1024:6497.3(kev)
Acq. Start :Thu May 02 09:14:14 2013



US EPA ARCHIVE DOCUMENT

0242

ROI Type: 1

 ***** 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: 10438

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

369: 0 0 1 0 0 0 0 0

Sample Title: 05

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

801: 0 0 0 0 0 0 0 0 0

Sample Title: 05

Channel	-----	-----	-----	-----	-----	-----	-----	-----
809:	1	0	0	0	0	0	0	0
817:	0	1	0	0	0	0	0	1
825:	0	0	0	0	0	1	0	0
833:	0	0	0	0	1	0	0	0
841:	0	0	0	0	0	0	1	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	2	0	0	0	0
889:	0	0	0	0	0	0	0	0
897:	0	0	0	0	0	1	0	0
905:	0	0	0	0	0	0	0	0
913:	1	0	1	0	0	0	0	0
921:	0	0	0	0	0	0	1	0
929:	0	0	0	0	0	0	1	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

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Apex-Alpha™

Sample Description: DUP 08 TOT
 Spectrum File: \\OR-ALPHA1\Canberra\ApexAlpha\Root\Data\00000569
 Batch Identification: 1304133A-RA
 Sample Identification: 06
 Sample Geometry: Shelf 2
 Procedure Description: Ra

Detector Name: Alpha_041
 Chamber Serial Number: 05026930A
 Detector Serial Number: 91087
 Env. Background: System Bkgd 55753
 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: 5/1/2013 10:55:51 AM
 Acquisition Date/Time: 5/2/2013 9:14:10 AM
 Acquisition Live Time: 170.0 minutes
 Acquisition Real Time: 174.0 minutes

Chem. Recovery Factor: 0.9523 +/- 0.0000
 Counting Efficiency: 0.1978 +/- 0.0034 on 12/16/2012 5:49:31 PM
 Effective Efficiency: 0.1884 +/- 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	5.521	15.66	50.15	0.34	0.00E+000	3.0
RA-226	4.621	20.81	44.38	1.19	0.00E+000	3.0

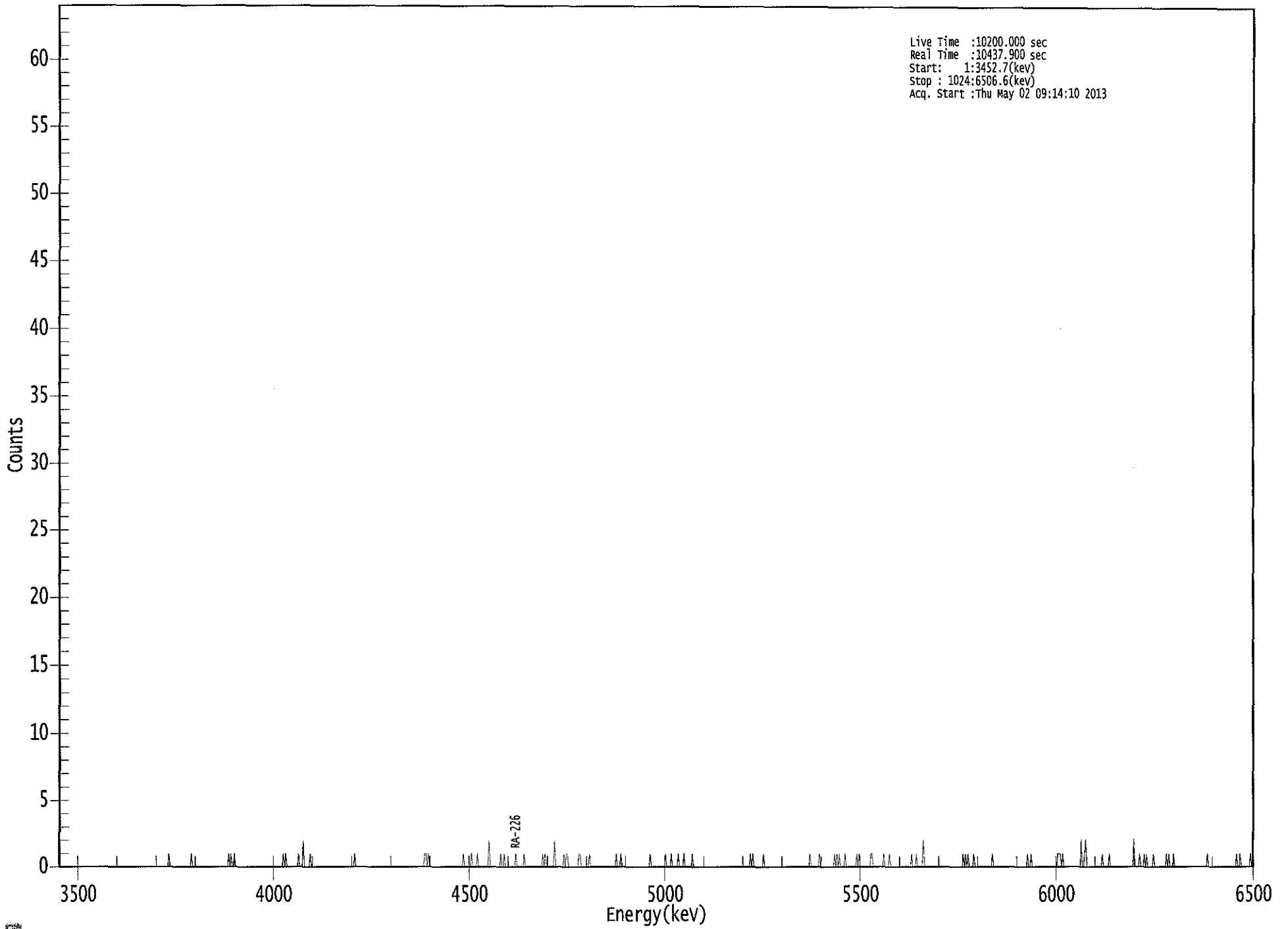
 ----- NUCLIDE ANALYSIS RESULTS -----

Nuclide	Id Conf.	Energy (keV)	Activity (pCi/liter)	MDA (pCi/liter)
RA-224	0.965	5685.50*	4.42E-001 +/- 1.06E+002	1.35E-001 +/- 3.25E+001
RA-226	0.965	4785.00*	4.68E-001 +/- 2.08E-001	1.48E-001 +/- 5.02E-003

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US EPA ARCHIVE DOCUMENT

Live Time :10200.000 sec
Real Time :10437.900 sec
Start : 1:3452.7(kev)
Stop : 1024:6506.6(kev)
Acq. Start :Thu May 02 09:14:10 2013



 ***** 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: 10438

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

369: 2 0 0 0 0 0 0 0 0

Sample Title: 06

Channel	-----	-----	-----	-----	-----	-----	-----	-----
377:	0	0	1	0	0	1	0	0
385:	0	0	0	0	0	0	0	1
393:	0	0	0	0	0	0	1	0
401:	0	0	0	0	0	0	0	0
409:	0	0	0	0	0	0	1	0
417:	1	0	0	0	0	0	0	0
425:	2	0	0	0	0	0	0	0
433:	1	0	1	1	0	0	0	0
441:	0	0	0	0	0	1	1	0
449:	0	0	0	0	0	0	1	0
457:	0	0	0	0	0	0	0	0
465:	0	0	0	0	0	0	0	0
473:	0	0	0	0	0	1	0	0
481:	0	1	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:	0	0	0	0	0	0	0	1
521:	0	0	0	0	1	0	0	0
529:	0	0	1	0	0	0	0	1
537:	0	0	0	0	0	0	1	0
545:	0	0	0	0	0	0	0	0
553:	0	0	0	0	0	0	0	0
561:	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	0	1	0	0	0	0	0
601:	0	0	0	1	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	1	0	0	0	0
649:	0	0	0	1	0	0	0	0
657:	0	0	0	0	0	0	0	0
665:	1	0	1	0	1	0	0	0
673:	0	1	0	0	0	0	0	0
681:	0	0	0	1	0	1	0	0
689:	0	0	0	0	0	0	0	1
697:	1	0	0	0	0	0	0	0
705:	0	0	1	0	0	0	0	1
713:	0	0	0	0	0	0	0	0
721:	0	0	0	0	0	0	0	0
729:	0	0	1	0	0	0	1	0
737:	0	0	0	0	2	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	1	0
777:	1	0	1	0	0	0	0	1
785:	0	0	0	0	0	0	0	0
793:	0	0	0	0	0	0	0	1

801: 0 0 0 0 0 0 0 0 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	1	0	0
833:	1	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:	1	1	0	1	0	0	0	0
865:	0	0	0	0	0	0	0	0
873:	0	0	0	2	0	0	1	2
881:	0	0	0	0	0	0	0	0
889:	0	0	0	0	0	1	0	0
897:	0	0	0	1	0	0	0	0
905:	0	0	0	0	0	0	0	0
913:	0	0	0	0	0	0	0	0
921:	2	0	0	0	0	1	0	0
929:	0	1	0	1	0	0	0	0
937:	0	1	0	0	0	0	0	0
945:	0	0	0	0	1	0	1	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	1
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	1	0	0	0	0
1017:	0	0	0	0	1	0	0	0

KB
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Apex-Alpha™

Sample Description: DUP 08 DIS
 Spectrum File: \\OR-ALPHA1\Canberra\ApexAlpha\Root\Data\00000569
 Batch Identification: 1304133A-RA
 Sample Identification: 07
 Sample Geometry: Shelf 2
 Procedure Description: Ra

Detector Name: Alpha_042
 Chamber Serial Number: 05026930B
 Detector Serial Number: 84185
 Env. Background: System Bkgd 55754
 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: 5/1/2013 10:55:51 AM
 Acquisition Date/Time: 5/2/2013 9:14:12 AM
 Acquisition Live Time: 170.0 minutes
 Acquisition Real Time: 174.0 minutes

Chem. Recovery Factor: 0.8990 +/- 0.0000
 Counting Efficiency: 0.1846 +/- 0.0032 on 12/16/2012 5:49:29 PM
 Effective Efficiency: 0.1660 +/- 0.0029

Peak Match Tolerance: 0.350 MeV

 ----- PEAK AREA REPORT -----

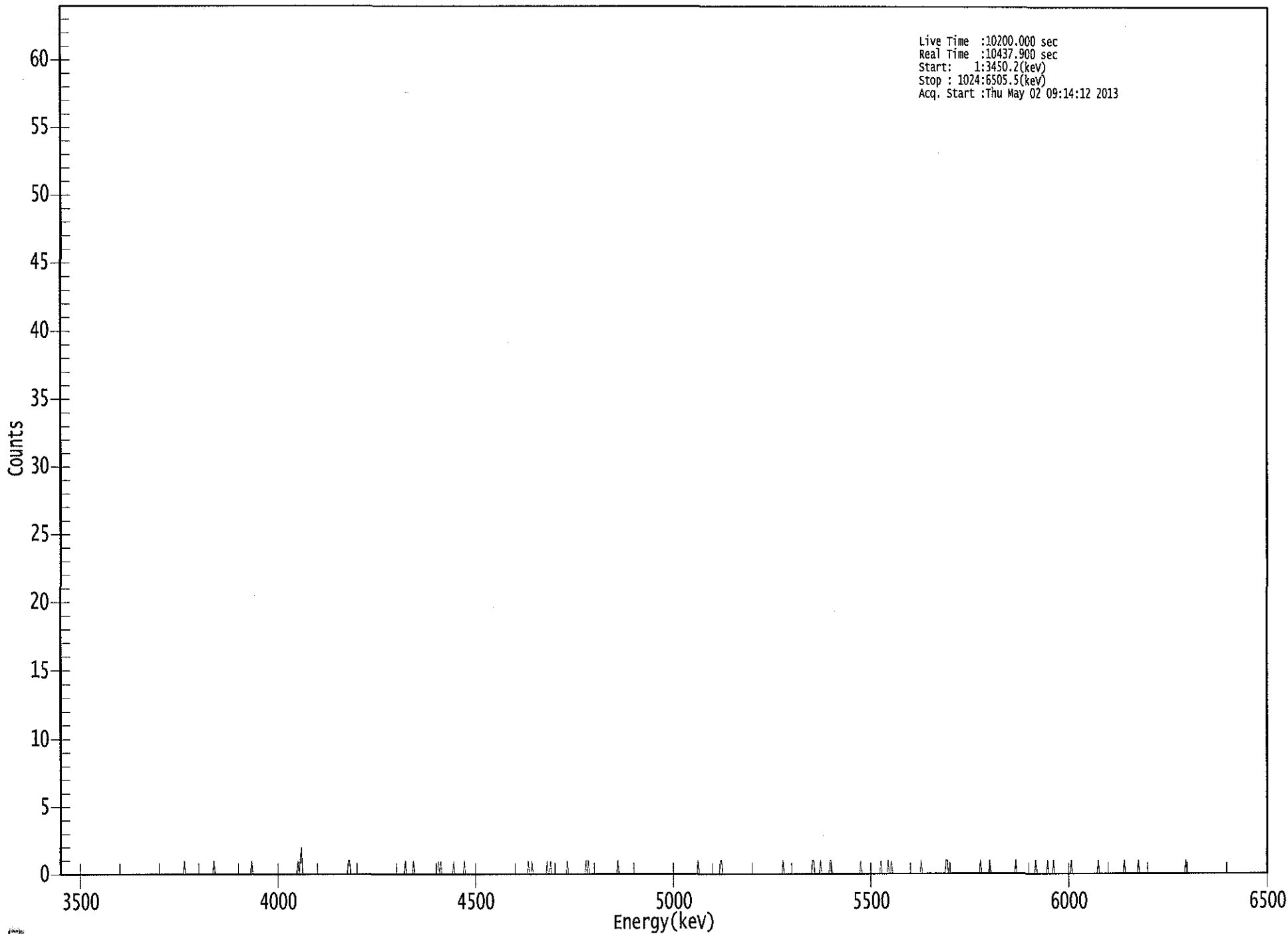
Nuclide	Energy (MeV)	Net Pk Area	Pk Area Error %	Ambient Backgnd	Reagent Backgnd	FWHM (keV)
RA-224	5.487	7.15	78.23	0.85	0.00E+000	3.0
RA-226	4.607	9.98	65.65	1.02	0.00E+000	3.0

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

Nuclide	Id Conf.	Energy (keV)	Activity (pCi/liter)	MDA (pCi/liter)
RA-224	0.950	5685.50*	2.29E-001 +/- 5.52E+001	1.92E-001 +/- 4.62E+001
RA-226	0.959	4785.00*	2.55E-001 +/- 1.68E-001	1.61E-001 +/- 5.48E-003

AG
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US EPA ARCHIVE DOCUMENT



0252

ROI Type: 1

***** 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: 10438

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

369: 0 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	1	0	0	1
401:	0	0	0	0	0	0	0	0
409:	0	0	0	0	1	0	0	1
417:	0	0	0	0	0	0	0	0
425:	0	0	0	0	0	1	0	0
433:	0	0	0	0	0	0	0	0
441:	0	0	0	0	0	1	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	0	0	0
473:	1	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	1	0	0	0
545:	0	0	0	0	0	0	0	0
553:	0	0	0	0	0	0	0	1
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	0	0	0	0
601:	0	0	0	0	0	0	0	0
609:	0	0	0	0	1	0	0	0
617:	0	0	0	0	0	0	0	0
625:	0	0	0	0	0	0	0	0
633:	0	0	0	0	0	1	1	0
641:	0	0	0	0	1	0	0	0
649:	0	0	0	0	1	1	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	1	0
681:	0	0	0	0	0	0	0	0
689:	0	0	0	0	0	0	0	1
697:	0	0	0	0	0	1	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	1	0	0	0	0	0	0
737:	0	0	0	0	0	0	0	0
745:	0	0	0	0	0	0	1	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	1	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: 07

Channel	1	2	3	4	5	6	7	8
809:	0	1	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	1	0	0	0
841:	0	1	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	1
881:	0	0	0	0	0	0	0	0
889:	0	0	0	0	0	0	0	0
897:	0	0	0	0	0	1	0	0
905:	0	0	0	0	0	0	0	0
913:	0	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	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

KJB
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Apex-Alpha™

Sample Description: PURGE TANK TOT
 Spectrum File: \\OR-ALPHA1\Canberra\ApexAlpha\Root\Data\00000569
 Batch Identification: 1304133A-RA
 Sample Identification: 08
 Sample Geometry: Shelf 2
 Procedure Description: Ra

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

Sample Size: 1.500E+000 +/- 0.000E+000 liter
 Generic Mult. Factor: 2.200E+000 Generic Div. Factor: 1.000E+000
 Sample Date/Time: 5/1/2013 10:55:51 AM
 Acquisition Date/Time: 5/2/2013 9:14:07 AM
 Acquisition Live Time: 170.0 minutes
 Acquisition Real Time: 174.0 minutes

Chem. Recovery Factor: 0.7455 +/- 0.0000
 Counting Efficiency: 0.1902 +/- 0.0033 on 12/16/2012 5:49:26 PM
 Effective Efficiency: 0.1418 +/- 0.0025

Peak Match Tolerance: 0.350 MeV

 PEAK AREA REPORT

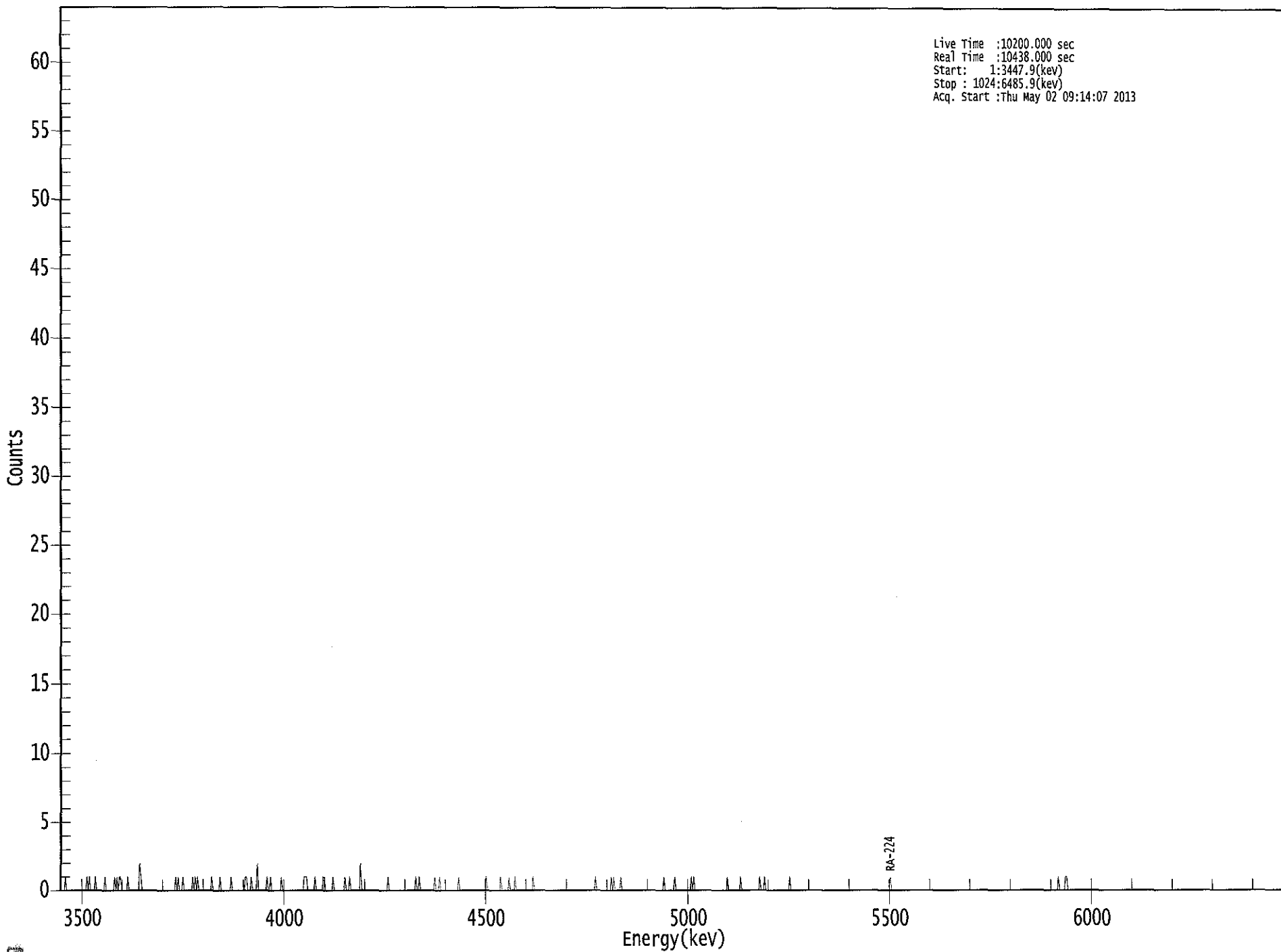
Nuclide	Energy (MeV)	Net Pk Area	Pk Area Error %	Ambient Backgnd	Reagent Backgnd	FWHM (keV)
RA-224	5.503	0.83	239.53	0.17	0.00E+000	3.0
RA-226	4.602	11.66	58.37	0.34	0.00E+000	3.0

 NUCLIDE ANALYSIS RESULTS

Nuclide	Id Conf.	Energy (keV)	Activity (pCi/liter)	MDA (pCi/liter)
RA-224	0.957	5685.50*	2.85E-002 +/- 6.88E+000	1.43E-001 +/- 3.46E+001
RA-226	0.957	4785.00*	3.20E-001 +/- 1.87E-001	1.31E-001 +/- 4.47E-003

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US EPA ARCHIVE DOCUMENT



Live Time :10200.000 sec
Real Time :10438.000 sec
Start : 1:3447.9(kev)
Stop : 1024:6485.9(kev)
Acq. Start :Thu May 02 09:14:07 2013

0257

ROI Type: 1

 ***** 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: 10438

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

369: 0 0 0 0 0 0 1 0

Sample Title: 08

Channel	-----	-----	-----	-----	-----	-----	-----	-----
377:	0	0	0	1	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	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	1	0
449:	0	0	0	0	0	0	0	0
457:	0	0	0	1	0	1	0	0
465:	0	0	0	1	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	1
505:	0	0	0	0	0	0	0	0
513:	1	0	0	0	0	0	0	0
521:	0	0	0	0	0	0	1	0
529:	1	0	0	0	0	0	0	0
537:	0	0	0	0	0	0	0	0
545:	0	0	0	0	0	0	0	0
553:	0	0	0	0	1	0	0	0
561:	0	0	0	0	0	0	0	1
569:	0	0	0	0	0	0	0	0
577:	0	0	0	0	0	0	0	1
585:	0	0	0	1	0	0	0	0
593:	0	0	0	0	0	0	0	0
601:	0	0	0	0	0	0	0	0
609:	1	0	0	0	0	0	0	0
617:	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	1	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: 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:	1	0	0	0	0	0	1	1
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

100
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Apex-Alpha™

Sample Description: PURGE TANK DIS
 Spectrum File: \\OR-ALPHA1\Canberra\ApexAlpha\Root\Data\00000569
 Batch Identification: 1304133A-RA
 Sample Identification: 09
 Sample Geometry: Shelf 2
 Procedure Description: Ra

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

Sample Size: 1.500E+000 +/- 0.000E+000 liter
 Generic Mult. Factor: 2.740E+000 Generic Div. Factor: 1.000E+000
 Sample Date/Time: 5/1/2013 10:55:51 AM
 Acquisition Date/Time: 5/2/2013 9:14:08 AM
 Acquisition Live Time: 170.0 minutes
 Acquisition Real Time: 170.1 minutes

Chem. Recovery Factor: 0.8356 +/- 0.0000
 Counting Efficiency: 0.1789 +/- 0.0031 on 12/16/2012 5:49:23 PM
 Effective Efficiency: 0.1495 +/- 0.0026

Peak Match Tolerance: 0.350 MeV

 PEAK AREA REPORT

Nuclide	Energy (MeV)	Net Pk Area	Pk Area Error %	Ambient Backgnd	Reagent Backgnd	FWHM (keV)
RA-224	5.535	9.00	68.87	0.00	0.00E+000	3.0
RA-226	4.594	14.00	54.22	0.00	0.00E+000	3.0

 NUCLIDE ANALYSIS RESULTS

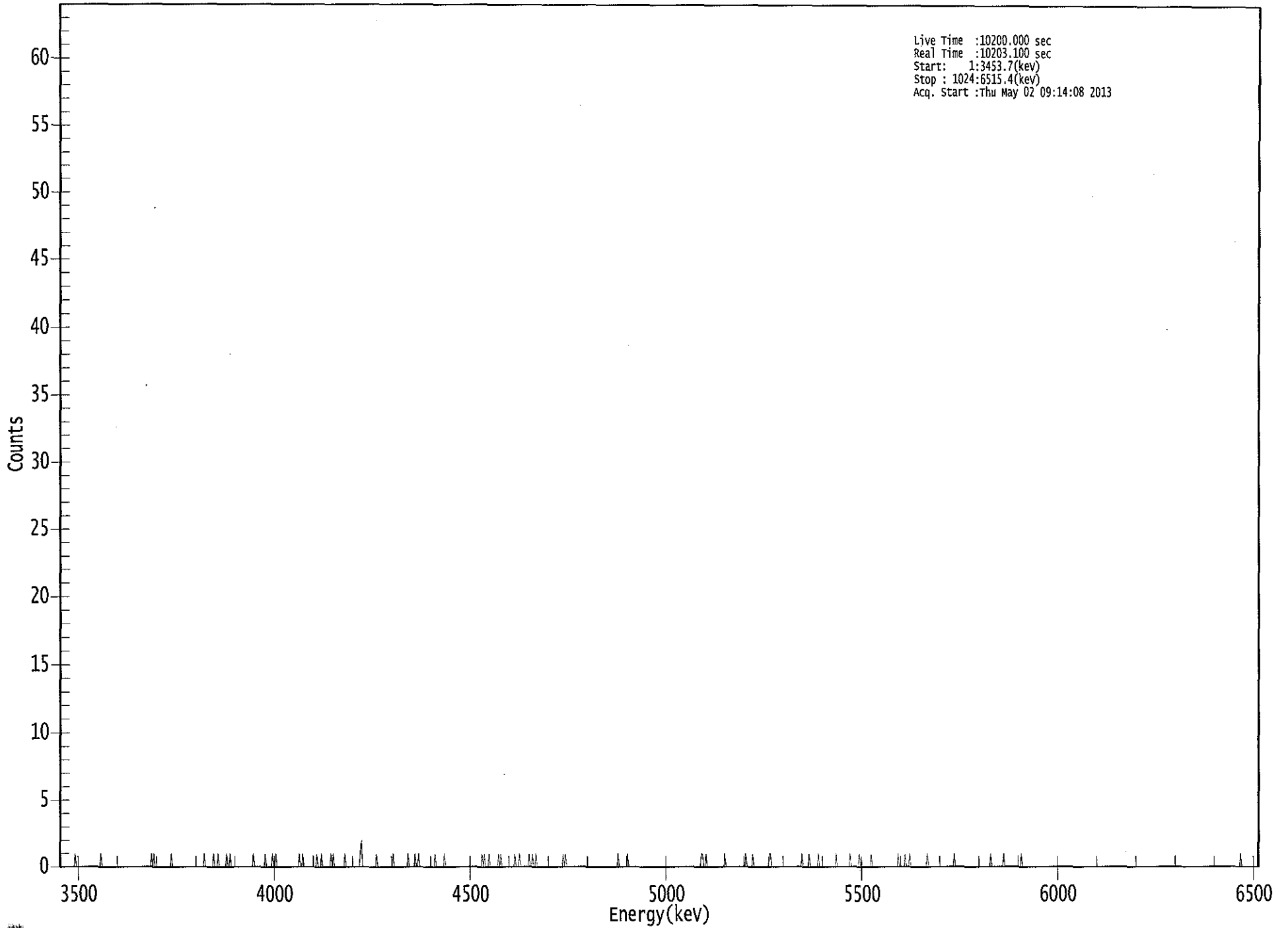
Nuclide	Id Conf.	Energy (keV)	Activity (pCi/liter)	MDA (pCi/liter)
RA-224	0.970	5685.50*	3.65E-001 +/- 8.80E+001	2.43E-001 +/- 5.87E+001
RA-226	0.954	4785.00*	4.53E-001 +/- 2.46E-001	1.94E-001 +/- 6.68E-003

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US EPA ARCHIVE DOCUMENT

0000056903.CNF

Live Time :10200.000 sec
Real Time :10203.100 sec
Start: 1:3453.7(kev)
Stop : 1024:6515.4(kev)
Acq. Start :Thu May 02 09:14:08 2013



US EPA ARCHIVE DOCUMENT

0252

ROI Type: 1

***** 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: 10203

Channel	-----	-----	-----	-----	-----	-----	-----	-----
1:	0	0	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	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	0	0	0	0	0	0
65:	0	0	0	0	0	0	0	0
73:	0	0	0	0	0	0	1	0
81:	1	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	1	0	0	0	0
129:	0	0	0	1	0	0	0	1
137:	0	0	0	0	0	0	1	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	1	0	0
169:	0	0	0	0	0	0	0	1
177:	0	0	0	0	0	1	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	1	0	0	1
209:	0	0	0	0	0	0	0	0
217:	0	0	0	1	0	0	0	1
225:	0	0	0	0	0	0	0	1
233:	0	1	0	0	0	0	0	0
241:	0	0	0	1	0	0	0	0
249:	0	0	0	0	0	0	0	0
257:	1	2	0	0	0	0	0	0
265:	0	0	0	0	0	0	1	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	1	0	0	0	0	0	1
305:	0	0	1	0	0	0	0	0
313:	0	0	0	0	0	0	0	0
321:	1	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	0	0	0
353:	0	0	0	0	0	0	0	0
361:	1	0	1	0	0	0	1	0

369: 0 0 0 0 0 0 1 0

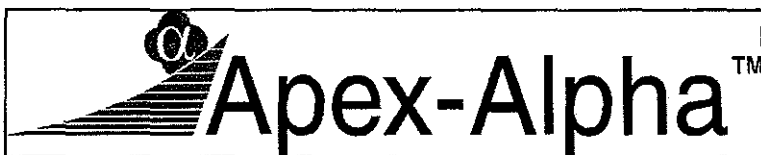
Sample Title: 09

Channel	-----	-----	-----	-----	-----	-----	-----	-----
377:	1	0	0	0	0	0	0	0
385:	0	0	0	0	1	0	0	0
393:	1	0	0	0	0	0	0	0
401:	1	0	0	1	0	0	1	0
409:	0	0	0	0	0	0	0	0
417:	0	0	0	0	0	0	0	0
425:	0	0	0	0	0	1	0	1
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	1	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	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	1	1	0	0	1
553:	0	0	0	0	0	0	0	0
561:	0	0	0	0	0	0	0	1
569:	0	0	0	0	0	0	0	0
577:	0	0	0	0	0	0	0	0
585:	0	1	0	0	0	0	0	1
593:	0	0	0	0	0	0	0	0
601:	0	0	0	0	0	1	1	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	1	0	0	0	0	0	1
641:	0	0	0	0	0	0	0	1
649:	0	0	0	0	0	0	0	0
657:	0	0	0	0	0	0	1	0
665:	0	0	0	0	0	0	0	0
673:	0	0	1	0	0	0	0	0
681:	0	0	1	0	0	0	0	0
689:	0	0	0	0	1	0	0	0
697:	0	0	0	0	0	0	0	0
705:	0	0	0	0	0	0	0	0
713:	0	0	0	1	0	0	0	0
721:	0	1	0	0	0	1	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	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	1	0	0	0	0	0

801: 0 0 0 0 0 1 0 0

Sample Title: 09

Channel	-----	-----	-----	-----	-----	-----	-----	-----
809:	0	0	0	0	0	0	0	0
817:	0	0	0	0	1	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	1
1009:	0	0	0	0	0	0	0	0
1017:	0	0	0	0	0	0	0	0



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

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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

 ***** LIBRARY LISTING REPORT *****

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

US EPA ARCHIVE DOCUMENT

SECTION XI
ANALYTICAL DATA (RADIUM-228)

US EPA ARCHIVE DOCUMENT

Work Order	13-04133	Internal Fraction	Sample Desc	Client ID	Login CPM	Sample Date	Sample Aliquot
Analysis Code	Ra228	01	LCS	LCS		04/18/13 00:00	1.0000E+00
Run	1	02	MBL	BLANK		04/18/13 00:00	1.5000E+00
Date Received	4/18/2013	03	DUP	I-65 TOT	42	04/16/13 10:47	1.5000E+00
Lab Deadline	5/9/2013	04	DO	I-65 TOT	42	04/16/13 10:47	1.5000E+00
Client	Engineering Management Support, Inc.	05	TRG	I-65 DIS	42	04/16/13 10:47	1.5000E+00
Project	West Lake OU-1	06	TRG	DUP 08 TOT	37	04/16/13 00:00	1.5000E+00
Report Level	4	07	TRG	DUP 08 DIS	37	04/16/13 00:00	1.5000E+00
Activity Units	pCi	08	TRG	PURGE TANK TOT	40	04/16/13 11:45	1.5000E+00
Aliquot Units	I	09	TRG	PURGE TANK DIS	40	04/16/13 11:45	1.5000E+00
Matrix	WA						
Method	EPA 904.0 Modified						
Instrument Type	Alpha/Beta GPC						
Radiometric Tracer	Ba-133						
Radiometric Sol#	Ba-6a						
Tracer Act (dpm/g)	1008.316						
Carrier	Yttrium						
Carrier Conc (mg/ml)	34						

* 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	0.9131	920.7	426.5	102.84	2.000	0.0910	0.1441	0.0531	78.09	80.31	1.00	1.00
02	MBL	0.9050	912.5	441.9	107.51	2.000	0.0928	0.1449	0.0521	76.62	82.37	1.00	1.00
03	DUP	0.9015	909.0	418.2	102.14	2.000	0.0904	0.1453	0.0549	80.74	82.46	1.00	1.00
04	DO	0.9007	908.2	406.2	99.29	2.000	0.0909	0.1478	0.0569	83.68	83.08	1.00	1.00
05	TRG	0.8981	905.6	372.5	91.32	2.000	0.0925	0.1472	0.0547	80.44	73.46	1.00	1.00
06	TRG	0.8968	904.3	387.9	95.23	2.000	0.0906	0.1467	0.0561	82.50	78.57	1.00	1.00
07	TRG	0.9022	909.7	368.4	89.90	2.000	0.0907	0.1454	0.0547	80.44	72.32	1.00	1.00
08	TRG	0.8978	905.3	304.0	74.55	2.000	0.0923	0.1489	0.0566	83.24	62.05	1.00	1.00
09	TRG	0.9009	908.4	341.9	83.56	2.000	0.0907	0.1466	0.0559	82.21	68.69	1.00	1.00

US EPA ARCHIVE DOCUMENT

0271

* 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			04/29/13 10:21	JBARNARD	05/01/13 10:55	TSMITH	05/10/13 04:06	TSMITH
02	MBL			04/29/13 10:21	JBARNARD	05/01/13 10:55	TSMITH	05/10/13 04:06	TSMITH
03	DUP			04/29/13 10:21	JBARNARD	05/01/13 10:55	TSMITH	05/10/13 04:06	TSMITH
04	DO			04/29/13 10:21	JBARNARD	05/01/13 10:55	TSMITH	05/10/13 04:06	TSMITH
05	TRG			04/29/13 10:21	JBARNARD	05/01/13 10:55	TSMITH	05/10/13 04:06	TSMITH
06	TRG			04/29/13 10:21	JBARNARD	05/01/13 10:55	TSMITH	05/10/13 04:06	TSMITH
07	TRG			04/29/13 10:21	JBARNARD	05/01/13 10:55	TSMITH	05/10/13 04:06	TSMITH
08	TRG			04/29/13 10:21	JBARNARD	05/01/13 10:55	TSMITH	05/10/13 04:06	TSMITH
09	TRG			04/29/13 10:21	JBARNARD	05/01/13 10:55	TSMITH	05/10/13 04:06	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: 13-04133-Ra228-1

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	1.09E+01	2.46E+00	2.47E+00	8.97E+00	121.98	OK		INV	
02	RA-228	MBL	BLANK	pCi/l	4.42E-01	4.04E-01	8.15E-01					OK	OK
03	RA-228	DUP	I-65 TOT	pCi/l	8.86E-01	3.83E-01	7.10E-01				NA	OK	
04	RA-228	DO	I-65 TOT	pCi/l	6.14E-01	4.12E-01	8.12E-01					OK	
05	RA-228	TRG	I-65 DIS	pCi/l	8.08E-01	4.57E-01	8.86E-01					OK	
06	RA-228	TRG	DUP 08 TOT	pCi/l	9.07E-01	4.59E-01	8.80E-01					OK	
07	RA-228	TRG	DUP 08 DIS	pCi/l	8.47E-01	4.84E-01	9.39E-01					OK	
08	RA-228	TRG	PURGE TANK TOT	pCi/l	8.08E-01	5.68E-01	1.12E+00					OK	
09	RA-228	TRG	PURGE TANK DIS	pCi/l	9.79E-01	5.17E-01	9.96E-01					OK	



Run **1**

Analysis Code **Ra228**

Eberline Services Work Order **13-04133**

Client **Engineering Management Support, Inc.**

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Preliminary Data Report & Analytical Calculations
Work Order: 13-04133-Ra228-1

Eberline Services Work Order		Analysis Code		Run		Client					
13-04133		Ra228		1		Engineering Management Support, Inc.					
Lab Fraction	Nuclide	Sample Desc	Sample Date	Sample Aliquot	Radiometric % Rec	Grav % Rec	Mean % Rec	SAF	Sep 10 Date/Time	Sep 11 Date/Time	
01	RA-228	LCS	04/18/13 00:00	1.00E+00	102.84	78.09	80.31	1.00	5/1/2013 10:55	5/10/2013 4:06	
02	RA-228	MBL	04/18/13 00:00	1.50E+00	107.51	76.62	82.37	1.00	5/1/2013 10:55	5/10/2013 4:06	
03	RA-228	DUP	04/16/13 10:47	1.50E+00	102.14	80.74	82.46	1.00	5/1/2013 10:55	5/10/2013 4:06	
04	RA-228	DO	04/16/13 10:47	1.50E+00	99.29	83.68	83.08	1.00	5/1/2013 10:55	5/10/2013 4:06	
05	RA-228	TRG	04/16/13 10:47	1.50E+00	91.32	80.44	73.46	1.00	5/1/2013 10:55	5/10/2013 4:06	
06	RA-228	TRG	04/16/13 00:00	1.50E+00	95.23	82.50	78.57	1.00	5/1/2013 10:55	5/10/2013 4:06	
07	RA-228	TRG	04/16/13 00:00	1.50E+00	89.90	80.44	72.32	1.00	5/1/2013 10:55	5/10/2013 4:06	
08	RA-228	TRG	04/16/13 11:45	1.50E+00	74.55	83.24	62.05	1.00	5/1/2013 10:55	5/10/2013 4:06	
09	RA-228	TRG	04/16/13 11:45	1.50E+00	83.56	82.21	68.69	1.00	5/1/2013 10:55	5/10/2013 4:06	

Preliminary Data Report & Analytical Calculations
Work Order: 13-04133-Ra228-1

Lab Fraction	Nuclide	Sample Desc	Counting Date/Time	Half-life (days)	Detect	Carrier	Count Time	Counts	Bkg CPM	Eff
01	RA-228	LCS	05/10/13 10:57		LB4110A	C1	30	159	1.233333333	0.4667
02	RA-228	MBL	05/10/13 08:11		LB4110R	A1	120	185	1.216666667	0.4776
03	RA-228	DUP	05/10/13 08:11		LB4110R	A2	120	183	0.883333333	0.4699
04	RA-228	DO	05/10/13 08:11		LB4110R	A3	120	205	1.25	0.4809
05	RA-228	TRG	05/10/13 08:11		LB4110R	A4	120	197	1.116666667	0.4732
06	RA-228	TRG	05/10/13 08:11		LB4110R	B1	120	230	1.283333333	0.4754
07	RA-228	TRG	05/10/13 08:11		LB4110R	B2	120	206	1.183333333	0.4658
08	RA-228	TRG	05/10/13 08:11		LB4110R	B3	120	207	1.283333333	0.4713
09	RA-228	TRG	05/10/13 08:11		LB4110R	B4	120	224	1.266666667	0.4773



Client: Engineering Management Support, Inc.

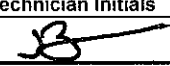
Eberline Services Work Order: 13-04133

Analysis Code: Ra228

Run: 1

US EPA ARCHIVE DOCUMENT

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	04/18/13 00:00	1.0000	0.9131	920.6933	426.5000	102.84	1.00	1.00
02	MBL	BLANK	04/18/13 00:00	1.5000	0.9050	912.5260	441.9000	107.51	1.00	1.00
03	DUP	I-65 TOT	04/16/13 10:47	1.5000	0.9015	908.9969	418.2000	102.14	1.00	1.00
04	DO	I-65 TOT	04/16/13 10:47	1.5000	0.9007	908.1902	406.2000	99.29	1.00	1.00
05	TRG	I-65 DIS	04/16/13 10:47	1.5000	0.8981	905.5686	372.5000	91.32	1.00	1.00
06	TRG	DUP 08 TOT	04/16/13 00:00	1.5000	0.8968	904.2578	387.9000	95.23	1.00	1.00
07	TRG	DUP 08 DIS	04/16/13 00:00	1.5000	0.9022	909.7027	368.4000	89.90	1.00	1.00
08	TRG	PURGE TANK TOT	04/16/13 11:45	1.5000	0.8978	905.2661	304.0000	74.55	1.00	1.00
09	TRG	PURGE TANK DIS	04/16/13 11:45	1.5000	0.9009	908.3919	341.9000	83.56	1.00	1.00

Internal Work Order 13-04133		Run 1	Analysis Code Ra228		Date 4/29/2013 10:21	Technician JBARNARD		Technician Initials 	Witness Initials
--	--	-----------------	-------------------------------	--	-------------------------	-------------------------------	--	--	------------------

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	38.890	4/29/2013	0.510	0.5120				8.97	0.457	0.00	0.000	0.00	0.000	0.00	0.000

Tracers							Balance Printer Tapes			
fraction	Isotope	Sol #	Activity dpm/g	Solution Date	Volume Used (g)	Approx Addition	Tracer		LCS	
01	Ba-133	Ba-6a	1008.316	4/29/2013	0.9131	1.0000				
02	Ba-133	Ba-6a	1008.316	4/29/2013	0.9050	1.0000				
03	Ba-133	Ba-6a	1008.316	4/29/2013	0.9015	1.0000				
04	Ba-133	Ba-6a	1008.316	4/29/2013	0.9007	1.0000				
05	Ba-133	Ba-6a	1008.316	4/29/2013	0.8981	1.0000				
06	Ba-133	Ba-6a	1008.316	4/29/2013	0.8968	1.0000				
07	Ba-133	Ba-6a	1008.316	4/29/2013	0.9022	1.0000				
08	Ba-133	Ba-6a	1008.316	4/29/2013	0.8978	1.0000				
09	Ba-133	Ba-6a	1008.316	4/29/2013	0.9009	1.0000				
							Matrix Spike			

US EPA ARCHIVE DOCUMENT

6277

Aliquot Worksheet


Work Order	Run	Analysis Code	Rpt Units	Lab Deadline	Technician
13-04133	1	Ra228	liters	5/9/2013	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					1.5000E+00	1.5000E+00				
03	I-65 TOT	DUP					1.5000E+00	1.5000E+00				
04	I-65 TOT	DO					1.5000E+00	1.5000E+00				
05	I-65 DIS	TRG					1.5000E+00	1.5000E+00				
06	DUP 08 TOT	TRG					1.5000E+00	1.5000E+00				
07	DUP 08 DIS	TRG					1.5000E+00	1.5000E+00				
08	PURGE TANK TOT	TRG					1.5000E+00	1.5000E+00				
09	PURGE TANK DIS	TRG					1.5000E+00	1.5000E+00				

Comments	
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Technician: _____

 Date: 4/29/13

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Gravimetric Worksheet

Work Order	Run	Analysis Code	Gravimetric Carrier	Carrier Conc (mg/ml)	Technician
13-04133	1	Ra228	Yttirum	34.0000	TSMITH

TRetec Fraction	Engineering Management Support, Inc. Client ID	Sample Type	Carrier Data	Filter Data			Gravimetric
			Carrier Added (ml)	Filter Tare (g)	Filter Final (g)	Filter Net (g)	% Recovery
01	LCS	LCS	2.0000	0.0910	0.1441	0.0531	78.09
02	BLANK	MBL	2.0000	0.0928	0.1449	0.0521	76.62
03	DUP	DUP	2.0000	0.0904	0.1453	0.0549	80.74
04	I-65 TOT	DO	2.0000	0.0909	0.1478	0.0569	83.68
05	I-65 DIS	TRG	2.0000	0.0925	0.1472	0.0547	80.44
06	DUP 08 TOT	TRG	2.0000	0.0906	0.1467	0.0561	82.50
07	DUP 08 DIS	TRG	2.0000	0.0907	0.1454	0.0547	80.44
08	PURGE TANK TOT	TRG	2.0000	0.0923	0.1489	0.0566	83.24
09	PURGE TANK DIS	TRG	2.0000	0.0907	0.1466	0.0559	82.21

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Technician:  Date: 5 / 10 / 13

AG
5/10/11

(A)

Detector ID	Sample ID	Alpha	Beta	Count Time	Voltage	TOD
C1	1304133-01	5	159	30	1400	5/10/13 11:27

AG
5/10/13
(R)

Detector ID	Sample ID	Alpha	Beta	Count Time	Voltage	TOD
A1	1304133-02	26	185	120	1400	5/10/13 10:11
A2	1304133-03	10	183	120	1400	5/10/13 10:11
A3	1304133-04	12	205	120	1400	5/10/13 10:11
A4	1304133-05	16	197	120	1400	5/10/13 10:11
B1	1304133-06	19	230	120	1400	5/10/13 10:11
B2	1304133-07	23	206	120	1400	5/10/13 10:11
B3	1304133-08	6	207	120	1400	5/10/13 10:11
B4	1304133-09	15	224	120	1400	5/10/13 10:11

GPC Detector Report
(ALL Backgrounds)

C
5/10/13

Detector	Alpha/Beta	Calibration Date	Count Date	Bkg CPM	PFW	LCL	Mean	UCL
LB4110A - A1	Alpha	11/18/2007	5/10/2013	0.00E+00	P	-2.18E+01	2.93E-01	2.24E+01
LB4110A - A2	Alpha	11/18/2007	5/10/2013	5.00E-02	P	-1.85E+01	2.62E-01	1.90E+01
LB4110A - A3	Alpha	11/18/2007	5/10/2013	3.33E-02	P	-1.80E+01	2.24E-01	1.85E+01
LB4110A - A4	Alpha	11/18/2007	5/10/2013	5.00E-02	P	-1.91E+01	2.45E-01	1.96E+01
LB4110A - B1	Alpha	11/18/2007	5/10/2013	1.67E-02	P	-9.88E-02	7.51E-02	2.49E-01
LB4110A - B2	Alpha	11/18/2007	5/10/2013	1.67E-01	P	-7.94E-02	7.28E-02	2.25E-01
LB4110A - B3	Alpha	11/18/2007	5/10/2013	6.67E-02	P	-6.39E-02	5.32E-02	1.70E-01
LB4110A - B4	Alpha	11/18/2007	5/10/2013	1.50E-01	P	-1.43E-01	7.92E-02	3.02E-01
LB4110A - C1	Alpha	11/18/2007	5/10/2013	5.00E-02	P	-1.52E-01	8.92E-02	3.31E-01
LB4110A - C2	Alpha	11/18/2007	5/10/2013	5.00E-02	P	-1.80E-01	8.82E-02	3.56E-01
LB4110A - C3	Alpha	11/18/2007	5/10/2013	1.33E-01	P	-1.76E-01	1.01E-01	3.78E-01
LB4110A - C4	Alpha	11/18/2007	5/10/2013	6.67E-02	P	-6.27E-02	6.88E-02	2.00E-01
LB4110A - D1	Alpha	11/18/2007	5/10/2013	5.00E-02	P	-5.36E-02	8.41E-02	2.22E-01
LB4110A - D2	Alpha	11/18/2007	5/10/2013	5.00E-02	P	-7.02E-02	6.04E-02	1.91E-01
LB4110A - D3	Alpha	11/18/2007	5/10/2013	5.00E-02	P	-4.75E-02	7.19E-02	1.91E-01
LB4110A - D4	Alpha	11/18/2007	5/10/2013	1.50E-01	P	-5.75E-02	7.09E-02	1.99E-01
LB4110R - A1	Alpha	11/24/2006	5/10/2013	1.17E-01	P	-1.01E-01	1.01E-01	3.03E-01
LB4110R - A2	Alpha	11/24/2006	5/10/2013	1.17E-01	P	-9.00E-02	7.75E-02	2.45E-01
LB4110R - A3	Alpha	11/24/2006	5/10/2013	6.67E-02	P	-7.35E-02	7.68E-02	2.27E-01
LB4110R - A4	Alpha	11/24/2006	5/10/2013	8.33E-02	P	-5.29E-02	7.17E-02	1.96E-01
LB4110R - B1	Alpha	11/24/2006	5/10/2013	0.00E+00	P	-9.58E-02	6.20E-02	2.20E-01
LB4110R - B2	Alpha	11/24/2006	5/10/2013	1.67E-02	P	-6.94E-02	6.43E-02	1.98E-01
LB4110R - B3	Alpha	11/24/2006	5/10/2013	6.67E-02	P	-6.52E-02	7.01E-02	2.05E-01
LB4110R - B4	Alpha	11/24/2006	5/10/2013	1.00E-01	P	-6.47E-02	7.08E-02	2.06E-01
LB4110R - C1	Alpha	11/24/2006	5/10/2013	8.33E-02	P	-7.79E-02	7.44E-02	2.27E-01
LB4110R - C2	Alpha	11/24/2006	5/10/2013	5.00E-02	P	-7.54E-02	7.22E-02	2.20E-01
LB4110R - C3	Alpha	11/24/2006	5/10/2013	5.00E-02	P	-8.90E-02	8.47E-02	2.58E-01
LB4110R - C4	Alpha	11/24/2006	5/10/2013	6.67E-02	P	-6.23E-02	8.20E-02	2.26E-01
LB4110R - D1	Alpha	11/24/2006	5/10/2013	0.00E+00	P	-9.94E-02	7.30E-02	2.45E-01
LB4110R - D2	Alpha	11/24/2006	5/10/2013	0.00E+00	P	-7.35E-02	7.24E-02	2.18E-01
LB4110R - D3	Alpha	11/24/2006	5/10/2013	0.00E+00	P	-7.88E-02	7.21E-02	2.23E-01
LB4110R - D4	Alpha	11/24/2006	5/10/2013	0.00E+00	P	-7.02E-02	7.71E-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

GPC Detector Report
(ALL Backgrounds)

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Detector	Alpha/Beta	Calibration Date	Count Date	Bkg CPM	PFW	LCL	Mean	UCL
LB4110A - A1	Beta	11/18/2007	5/10/2013	8.05E+00	P	-2.96E+02	7.63E+00	3.11E+02
LB4110A - A2	Beta	11/18/2007	5/10/2013	3.55E+00	P	-3.11E+01	2.55E+00	3.62E+01
LB4110A - A3	Beta	11/18/2007	5/10/2013	1.48E+00	P	-5.13E+01	2.67E+00	5.66E+01
LB4110A - A4	Beta	11/18/2007	5/10/2013	6.97E+00	P	-3.33E+01	3.03E+00	3.94E+01
LB4110A - B1	Beta	11/18/2007	5/10/2013	1.43E+00	P	-1.04E+01	3.26E+00	1.70E+01
LB4110A - B2	Beta	11/18/2007	5/10/2013	2.25E+00	P	-7.55E+00	1.99E+00	1.15E+01
LB4110A - B3	Beta	11/18/2007	5/10/2013	1.23E+00	P	1.06E-01	1.36E+00	2.62E+00
LB4110A - B4	Beta	11/18/2007	5/10/2013	2.18E+00	P	-7.60E+00	1.97E+00	1.15E+01
LB4110A - C1	Beta	11/18/2007	5/10/2013	1.23E+00	P	-5.50E+00	2.15E+00	9.81E+00
LB4110A - C2	Beta	11/18/2007	5/10/2013	1.88E+00	P	3.79E-01	1.27E+00	2.16E+00
LB4110A - C3	Beta	11/18/2007	5/10/2013	1.08E+00	P	4.69E-01	1.47E+00	2.47E+00
LB4110A - C4	Beta	11/18/2007	5/10/2013	1.13E+00	P	-1.77E+00	2.14E+00	6.05E+00
LB4110A - D1	Beta	11/18/2007	5/10/2013	1.92E+00	P	-2.38E+00	2.59E+00	7.55E+00
LB4110A - D2	Beta	11/18/2007	5/10/2013	1.32E+00	P	-6.80E-01	1.57E+00	3.81E+00
LB4110A - D3	Beta	11/18/2007	5/10/2013	3.98E+00	P	1.22E+00	4.47E+00	7.72E+00
LB4110A - D4	Beta	11/18/2007	5/10/2013	1.65E+00	P	-4.50E-01	1.38E+00	3.20E+00
LB4110R - A1	Beta	11/24/2006	5/10/2013	1.22E+00	P	-6.20E+01	3.77E+00	6.95E+01
LB4110R - A2	Beta	11/24/2006	5/10/2013	8.83E-01	P	-4.92E+01	2.05E+00	5.33E+01
LB4110R - A3	Beta	11/24/2006	5/10/2013	1.25E+00	P	-4.56E+01	2.79E+00	5.12E+01
LB4110R - A4	Beta	11/24/2006	5/10/2013	1.12E+00	P	-4.55E+01	2.02E+00	4.95E+01
LB4110R - B1	Beta	11/24/2006	5/10/2013	1.28E+00	P	-4.79E+01	2.05E+00	5.20E+01
LB4110R - B2	Beta	11/24/2006	5/10/2013	1.18E+00	P	-4.78E+01	2.08E+00	5.20E+01
LB4110R - B3	Beta	11/24/2006	5/10/2013	1.28E+00	P	-4.76E+01	2.71E+00	5.30E+01
LB4110R - B4	Beta	11/24/2006	5/10/2013	1.27E+00	P	-4.80E+01	1.95E+00	5.19E+01
LB4110R - C1	Beta	11/24/2006	5/10/2013	1.28E+00	P	-4.77E+01	3.03E+00	5.38E+01
LB4110R - C2	Beta	11/24/2006	5/10/2013	1.88E+00	P	-4.77E+01	2.75E+00	5.32E+01
LB4110R - C3	Beta	11/24/2006	5/10/2013	1.80E+00	P	-4.82E+01	2.56E+00	5.33E+01
LB4110R - C4	Beta	11/24/2006	5/10/2013	1.35E+00	P	-5.44E+01	2.98E+00	6.03E+01
LB4110R - D1	Beta	11/24/2006	5/10/2013	0.00E+00	P	-4.51E+01	5.77E+00	5.67E+01
LB4110R - D2	Beta	11/24/2006	5/10/2013	0.00E+00	P	-4.86E+01	1.95E+00	5.25E+01
LB4110R - D3	Beta	11/24/2006	5/10/2013	0.00E+00	P	-5.20E+01	5.75E+00	6.34E+01
LB4110R - D4	Beta	11/24/2006	5/10/2013	0.00E+00	P	-4.83E+01	2.32E+00	5.30E+01
LB5100 - 1	Beta	7/10/2006	10/26/2007	4.52E+00	F	-3.19E-01	1.58E+00	3.48E+00

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Detector	Alpha/Beta	Calibration Date	Count Date	Eff	PFW	LCL	Mean	UCL
LB4110A - A1	Alpha	11/18/2007	5/10/2013	0.2476	P	-0.0187	0.2147	0.4481
LB4110A - A2	Alpha	11/18/2007	5/10/2013	0.2093	P	-0.0562	0.1726	0.4013
LB4110A - A3	Alpha	11/18/2007	5/10/2013	0.2056	P	-0.0798	0.1614	0.4026
LB4110A - A4	Alpha	11/18/2007	5/10/2013	0.2179	P	-0.0582	0.1804	0.4189
LB4110A - B1	Alpha	11/18/2007	5/10/2013	0.2232	P	0.1943	0.2246	0.2550
LB4110A - B2	Alpha	11/18/2007	5/10/2013	0.2127	P	0.1929	0.2218	0.2506
LB4110A - B3	Alpha	11/18/2007	5/10/2013	0.2299	P	0.1293	0.2326	0.3359
LB4110A - B4	Alpha	11/18/2007	5/10/2013	0.2305	P	0.2090	0.2367	0.2644
LB4110A - C1	Alpha	11/18/2007	5/10/2013	0.2220	P	0.1973	0.2208	0.2444
LB4110A - C2	Alpha	11/18/2007	5/10/2013	0.2215	P	0.1966	0.2252	0.2538
LB4110A - C3	Alpha	11/18/2007	5/10/2013	0.2417	P	0.2228	0.2494	0.2759
LB4110A - C4	Alpha	11/18/2007	5/10/2013	0.2224	P	0.1965	0.2258	0.2550
LB4110A - D1	Alpha	11/18/2007	5/10/2013	0.2152	P	0.2036	0.2334	0.2632
LB4110A - D2	Alpha	11/18/2007	5/10/2013	0.2465	P	0.2278	0.2584	0.2890
LB4110A - D3	Alpha	11/18/2007	5/10/2013	0.2339	W	0.2314	0.2639	0.2963
LB4110A - D4	Alpha	11/18/2007	5/10/2013	0.1837	P	0.1651	0.1999	0.2347
LB4110R - A1	Alpha	11/24/2006	5/10/2013	0.2356	P	0.2031	0.2389	0.2747
LB4110R - A2	Alpha	11/24/2006	5/10/2013	0.2146	P	0.1899	0.2207	0.2514
LB4110R - A3	Alpha	11/24/2006	5/10/2013	0.2209	P	0.1963	0.2249	0.2534
LB4110R - A4	Alpha	11/24/2006	5/10/2013	0.2514	P	0.2160	0.2457	0.2755
LB4110R - B1	Alpha	11/24/2006	5/10/2013	0.2191	P	0.1877	0.2261	0.2645
LB4110R - B2	Alpha	11/24/2006	5/10/2013	0.2058	P	0.1801	0.2176	0.2550
LB4110R - B3	Alpha	11/24/2006	5/10/2013	0.2465	P	0.2067	0.2440	0.2813
LB4110R - B4	Alpha	11/24/2006	5/10/2013	0.2183	P	0.1938	0.2320	0.2702
LB4110R - C1	Alpha	11/24/2006	5/10/2013	0.2079	P	0.1861	0.2153	0.2445
LB4110R - C2	Alpha	11/24/2006	5/10/2013	0.2161	P	0.1963	0.2248	0.2533
LB4110R - C3	Alpha	11/24/2006	5/10/2013	0.2334	P	0.2064	0.2398	0.2731
LB4110R - C4	Alpha	11/24/2006	5/10/2013	0.2078	P	0.1859	0.2229	0.2600
LB4110R - D1	Alpha	11/24/2006	5/10/2013	0.0000	F	0.0378	0.2072	0.3767
LB4110R - D2	Alpha	11/24/2006	5/10/2013	0.0000	F	0.0437	0.2357	0.4276
LB4110R - D3	Alpha	11/24/2006	5/10/2013	0.0000	F	0.0430	0.2315	0.4200
LB4110R - D4	Alpha	11/24/2006	5/10/2013	0.0000	F	0.0329	0.1866	0.3402
LB5100 - 1	Alpha	7/10/2006	10/26/2007	0.3368	P	0.3332	0.3455	0.3578

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Detector	Alpha/Beta	Calibration Date	Count Date	Eff	PFW	LCL	Mean	UCL
LB4110A - A1	Beta	11/18/2007	5/10/2013	0.5553	P	0.2035	0.5628	0.9221
LB4110A - A2	Beta	11/18/2007	5/10/2013	0.4919	P	0.1543	0.4633	0.7723
LB4110A - A3	Beta	11/18/2007	5/10/2013	0.4661	P	0.0816	0.4570	0.8325
LB4110A - A4	Beta	11/18/2007	5/10/2013	0.5226	P	0.1340	0.4877	0.8415
LB4110A - B1	Beta	11/18/2007	5/10/2013	0.5174	P	0.4637	0.5306	0.5974
LB4110A - B2	Beta	11/18/2007	5/10/2013	0.5187	P	0.4639	0.5276	0.5914
LB4110A - B3	Beta	11/18/2007	5/10/2013	0.5356	P	0.3191	0.5321	0.7451
LB4110A - B4	Beta	11/18/2007	5/10/2013	0.5326	P	0.4922	0.5546	0.6170
LB4110A - C1	Beta	11/18/2007	5/10/2013	0.5050	P	0.4501	0.5027	0.5552
LB4110A - C2	Beta	11/18/2007	5/10/2013	0.4932	P	0.4279	0.5011	0.5743
LB4110A - C3	Beta	11/18/2007	5/10/2013	0.5832	P	0.5277	0.5901	0.6526
LB4110A - C4	Beta	11/18/2007	5/10/2013	0.5232	P	0.4568	0.5251	0.5933
LB4110A - D1	Beta	11/18/2007	5/10/2013	0.5204	P	0.4798	0.5543	0.6287
LB4110A - D2	Beta	11/18/2007	5/10/2013	0.5426	P	0.4904	0.5888	0.6871
LB4110A - D3	Beta	11/18/2007	5/10/2013	0.5848	P	0.5368	0.6155	0.6943
LB4110A - D4	Beta	11/18/2007	5/10/2013	0.4324	P	0.3864	0.4735	0.5605
LB4110R - A1	Beta	11/24/2006	5/10/2013	0.5663	P	0.4814	0.5680	0.6546
LB4110R - A2	Beta	11/24/2006	5/10/2013	0.5145	P	0.4209	0.5089	0.5969
LB4110R - A3	Beta	11/24/2006	5/10/2013	0.5201	P	0.4580	0.5398	0.6215
LB4110R - A4	Beta	11/24/2006	5/10/2013	0.6081	P	0.5100	0.5918	0.6735
LB4110R - B1	Beta	11/24/2006	5/10/2013	0.5318	P	0.4535	0.5428	0.6321
LB4110R - B2	Beta	11/24/2006	5/10/2013	0.5098	P	0.4313	0.5203	0.6093
LB4110R - B3	Beta	11/24/2006	5/10/2013	0.6073	P	0.5016	0.5913	0.6810
LB4110R - B4	Beta	11/24/2006	5/10/2013	0.5166	P	0.4623	0.5500	0.6377
LB4110R - C1	Beta	11/24/2006	5/10/2013	0.4666	P	0.4241	0.5033	0.5824
LB4110R - C2	Beta	11/24/2006	5/10/2013	0.5192	P	0.4503	0.5292	0.6082
LB4110R - C3	Beta	11/24/2006	5/10/2013	0.5555	P	0.4813	0.5713	0.6613
LB4110R - C4	Beta	11/24/2006	5/10/2013	0.4969	P	0.4324	0.5265	0.6206
LB4110R - D1	Beta	11/24/2006	5/10/2013	0.0000	F	0.0893	0.4956	0.9018
LB4110R - D2	Beta	11/24/2006	5/10/2013	0.0000	F	0.1011	0.5569	1.0126
LB4110R - D3	Beta	11/24/2006	5/10/2013	0.0000	F	0.0981	0.5408	0.9835
LB4110R - D4	Beta	11/24/2006	5/10/2013	0.0000	F	0.0773	0.4452	0.8131
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

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5/2/13

Configuration : DKA100:[GAMMA.SCUSR.ARCHIVE]SMP_130413301_GE5_BAFIL_191202.CN
 Analyses by : PEAK V16.9 PEAKEFF V2.2
 Client ID : SPIKE
 Deposition Date :
 Sample Date : 2-MAY-2013 00:00:00. Acquisition date : 2-MAY-2013 06:56:34.
 Sample ID : 1304133-01 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 00:15:01.18 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	8.84	16	0	0.38	90.19	86	8	1.78E-02	25.0	
2	0	11.42	19	3	1.12	114.92	109	14	2.14E-02	30.4	
3	0	12.91	13	5	0.14	129.28	123	11	1.44E-02	44.3	
4	0	21.15	129	14	0.67	208.32	199	18	1.44E-01	11.0	
5	7	29.22	24	89	1.05	285.73	276	44	2.63E-02	86.2	1.65E+00
6	7	31.05	2075	65	0.76	303.31	276	44	2.31E+00	2.4	
7	3	35.15	437	23	0.64	342.66	335	24	4.85E-01	5.4	3.34E+00
8	3	36.12	98	16	0.57	352.00	335	24	1.09E-01	18.0	
9	0	53.32	54	18	0.46	517.05	505	21	6.03E-02	21.3	
10	0	61.89	260	65	0.69	599.24	586	23	2.89E-01	9.2	
11	0	66.05	143	37	0.66	639.15	625	31	1.59E-01	13.4	
12	0	78.03	9	19	0.23	754.13	740	16	1.02E-02	96.3	
13	1	79.74	53	8	0.76	770.54	760	36	5.93E-02	28.8	9.95E-01
14	1	81.19	845	13	0.71	784.45	760	36	9.39E-01	3.6	
15	0	84.88	17	18	0.29	819.90	802	20	1.88E-02	56.1	
16	0	112.13	185	64	0.79	1081.32	1068	25	2.06E-01	12.4	
17	1	116.26	100	22	0.77	1121.00	1106	28	1.11E-01	13.3	5.87E+00
18	1	116.96	17	10	0.85	1127.74	1106	28	1.87E-02	53.5	
19	1	276.23	33	7	1.03	2656.00	2645	25	3.71E-02	27.5	1.25E+00
20	1	277.06	32	5	1.03	2664.00	2645	25	3.51E-02	21.7	
21	0	303.01	140	7	0.65	2913.01	2897	26	1.55E-01	9.3	
22	6	333.93	75	2	1.07	3209.69	3195	25	8.29E-02	12.4	8.39E-01
23	6	334.38	11	1	1.10	3214.00	3195	25	1.24E-02	68.9	
24	0	356.22	432	14	1.04	3423.56	3407	35	4.80E-01	5.2	
25	5	384.02	71	4	1.02	3690.30	3674	27	7.93E-02	13.9	1.67E+00
26	5	384.72	47	0	1.16	3697.00	3674	27	5.24E-02	13.7	
27	5	386.24	14	0	1.15	3711.66	3705	26	1.51E-02	55.8	2.10E+00
28	5	387.21	130	5	0.69	3720.91	3705	26	1.45E-01	10.0	
29	5	387.90	13	2	1.03	3727.52	3705	26	1.42E-02	39.0	
30	0	391.18	39	3	0.79	3759.05	3743	26	4.33E-02	17.9	

Summary of Nuclide Activity

Sample ID : 1304133-01

Acquisition date : 2-MAY-2013 06:56:34

Total number of lines in spectrum 30
 Number of unidentified lines 22
 Number of lines tentatively identified by NID 8 26.67%

Nuclide Type : FISSION

Nuclide	Hlife	Decay	Wtd Mean		Decay Corr 2-Sigma Error	2-Sigma %Error	Flags
			Uncorrected pCi/filter	Decay Corr pCi/filter			
BA-133	10.50Y	1.00	4.265E+02	4.265E+02	0.718E+02	16.83	
NP-237	2.14E+06Y	1.00	3.203E+01	3.203E+01	3.608E+01	112.62	
Total Activity :			4.585E+02	4.585E+02			

Nuclide Type : NATURAL

Nuclide	Hlife	Decay	Wtd Mean		Decay Corr 2-Sigma Error	2-Sigma %Error	Flags
			Uncorrected pCi/filter	Decay Corr pCi/filter			
PA-231	3.28E+04Y	1.00	1.144E+00	1.144E+00	0.574E+00	50.17	
PA-234	4.47E+09Y	1.00	5.991E+00	5.991E+00	1.344E+00	22.44	
TH-234	4.47E+09Y	1.00	2.350E+02	2.350E+02	0.444E+02	18.90	
Total Activity :			2.422E+02	2.422E+02			

Grand Total Activity : 7.007E+02 7.007E+02

Flags: "K" = Keyline not found
 "E" = Manually edited

"M" = Manually accepted
 "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	4.265E+02	4.265E+02	16.83	OK
	302.84	17.80	2.575E+00	9.156E+02	9.156E+02	32.24	OK
	356.01	60.00	4.312E+00	5.011E+02	5.011E+02	17.76	OK

Final Mean for 3 Valid Peaks = 4.265E+02+/- 7.180E+01 (16.83%)

NP-237	86.50	12.60*	1.262E+01	3.203E+01	3.203E+01	112.62	OK
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Final Mean for 1 Valid Peaks = 3.203E+01+/- 3.608E+01 (112.62%)

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	1.144E+00	1.144E+00	50.17	OK
	10.11	20.20	1.000E+02	2.379E+00	2.379E+00	50.17	OK
	283.67	1.60	2.191E+00	-----	Line Not Found	-----	Absent
	302.67	2.30	2.572E+00	7.096E+03	7.096E+03	30.66	OK

Final Mean for 3 Valid Peaks = 1.144E+00+/- 5.740E-01 (50.17%)

PA-234	9.89	89.00	1.000E+02	5.399E-01	5.399E-01	50.17	OK
	21.72	64.90*	1.000E+02	5.991E+00	5.991E+00	22.44	OK
	37.93	23.75	1.000E+02	1.236E+01	1.236E+01	36.24	OK
	131.42	20.40	2.473E+00	-----	Line Not Found	-----	Absent

Final Mean for 3 Valid Peaks = 5.991E+00+/- 1.344E+00 (22.44%)

TH-234	63.29	3.80*	8.750E+01	2.350E+02	2.350E+02	18.90	OK
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Final Mean for 1 Valid Peaks = 2.350E+02+/- 4.442E+01 (18.90%)

Flag: "*" = Keyline

---- Identified Nuclides ----

Nuclide	Activity (pCi/filter)	Act error	MDA (pCi/filter)	MDA error	Act/MDA
BA-133	4.265E+02	7.180E+01	1.240E+01	1.825E+00	34.408
PA-231	1.144E+00	5.740E-01	1.803E+00	2.030E-02	0.634
PA-234	5.991E+00	1.344E+00	9.485E-01	1.068E-02	6.316
TH-234	2.350E+02	4.442E+01	2.345E+01	3.017E-01	10.023
NP-237	3.203E+01	3.608E+01	5.051E+01	4.456E+00	0.634

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

Nuclide	Key-Line Activity K.L. (pCi/filter) Ided	Act error	MDA (pCi/filter)	MDA error	Act/MDA
CO-57	7.618E+00	1.406E+01	2.772E+01	9.397E+00	0.275
CD-109	4.640E+01	1.016E+02	1.950E+02	1.877E+01	0.238
AM-241	1.807E+00	1.493E+00	2.744E+00	3.089E-02	0.658

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11217

Configuration : DKA100: [GAMMA.SCUSR.ARCHIVE] SMP_130413302_GE5_BAFIL_191205.CN
 Analyses by : PEAK V16.9 PEAKEFF V2.2
 Client ID : BLANK
 Deposition Date :
 Sample Date : 2-MAY-2013 00:00:00. Acquisition date : 2-MAY-2013 07:15:57.
 Sample ID : 1304133-02 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 00:15:01.18 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	3.84	11	60	0.35	42.20	38	12	1.25E-02	155.2	
2	0	7.57	9	6	0.77	78.00	71	11	9.44E-03	63.5	
3	0	10.94	9	8	0.13	110.38	106	9	1.02E-02	66.3	
4	0	21.24	79	38	0.33	209.18	201	15	8.78E-02	20.9	
5	0	25.33	39	0	0.68	248.46	240	18	4.33E-02	16.0	
6	0	28.67	26	57	1.81	280.53	268	20	2.91E-02	74.6	
7	0	31.06	2137	121	0.70	303.41	287	33	2.37E+00	2.7	
8	2	35.17	498	17	0.68	342.87	331	32	5.54E-01	5.1	1.81E+00
9	2	36.12	126	3	0.57	352.00	331	32	1.40E-01	14.8	
10	0	53.66	34	42	0.51	520.25	508	20	3.79E-02	44.7	
11	0	61.86	277	27	0.68	598.94	587	26	3.08E-01	7.4	
12	0	66.09	133	39	0.45	639.52	629	23	1.48E-01	13.4	
13	0	81.21	875	102	0.56	784.67	771	23	9.73E-01	4.2	
14	0	84.37	21	6	1.17	815.01	805	17	2.36E-02	30.9	
15	0	93.27	13	6	0.30	900.35	893	12	1.46E-02	42.3	
16	0	112.09	183	47	0.58	1081.00	1069	26	2.03E-01	11.7	
17	0	116.20	42	16	0.45	1120.38	1110	19	4.70E-02	24.6	
18	0	161.07	26	22	0.43	1550.95	1534	24	2.94E-02	39.9	
19	0	175.62	11	9	0.33	1690.57	1680	15	1.19E-02	57.3	
20	6	190.80	8	1	0.48	1836.25	1835	18	9.14E-03	21.7	2.67E-01
21	6	191.73	26	6	0.89	1845.15	1835	18	2.85E-02	23.7	
22	0	276.70	39	20	0.53	2660.53	2649	20	4.37E-02	26.6	
23	0	303.06	120	5	0.62	2913.43	2898	26	1.33E-01	9.8	
24	0	307.46	23	2	0.26	2955.66	2943	22	2.51E-02	24.1	
25	0	333.87	69	2	0.88	3209.07	3194	27	7.62E-02	12.9	
26	0	356.15	372	11	0.83	3422.88	3406	30	4.13E-01	5.5	
27	1	383.26	30	4	1.16	3683.00	3673	29	3.36E-02	25.5	1.83E+00
28	1	384.09	61	5	1.16	3691.00	3673	29	6.79E-02	15.1	
29	3	386.59	125	11	1.16	3715.00	3703	27	1.39E-01	10.9	5.13E+00
30	3	387.16	74	6	0.96	3720.46	3703	27	8.21E-02	17.9	
31	0	415.03	24	6	0.93	3987.93	3976	20	2.65E-02	27.1	

Summary of Nuclide Activity

Sample ID : 1304133-02

Acquisition date : 2-MAY-2013 07:15:57

Total number of lines in spectrum 31
 Number of unidentified lines 24
 Number of lines tentatively identified by NID 7 22.58%

Nuclide Type : FISSION

Nuclide	Hlife	Decay	Wtd Mean	Wtd Mean	Decay Corr 2-Sigma Error	2-Sigma %Error	Flags
			Uncorrected pCi/filter	Decay Corr pCi/filter			
BA-133	10.50Y	1.00	4.419E+02	4.419E+02	0.768E+02	17.38	
Total Activity :			4.419E+02	4.419E+02			

Nuclide Type : NATURAL

Nuclide	Hlife	Decay	Wtd Mean	Wtd Mean	Decay Corr 2-Sigma Error	2-Sigma %Error	Flags
			Uncorrected pCi/filter	Decay Corr pCi/filter			
PA-231	3.28E+04Y	1.00	6.582E-01	6.582E-01	8.732E-01	132.66	
PA-234	4.47E+09Y	1.00	3.657E+00	3.657E+00	1.533E+00	41.92	
TH-234	4.47E+09Y	1.00	2.505E+02	2.505E+02	0.383E+02	15.31	
Total Activity :			2.548E+02	2.548E+02			

Grand Total Activity : 6.967E+02 6.967E+02

Flags: "K" = Keyline not found
 "E" = Manually edited

"M" = Manually accepted
 "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	4.419E+02	4.419E+02	17.38	OK
	302.84	17.80	2.575E+00	7.848E+02	7.848E+02	32.91	OK
	356.01	60.00	4.312E+00	4.315E+02	4.315E+02	18.18	OK

Final Mean for 3 Valid Peaks = 4.419E+02 +/- 7.682E+01 (17.38%)

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	6.582E-01	6.582E-01	132.66	OK
	10.11	20.20	1.000E+02	1.369E+00	1.369E+00	132.66	OK
	283.67	1.60	2.191E+00	-----	Line Not Found	-----	Absent
	302.67	2.30	2.572E+00	6.083E+03	6.083E+03	31.36	OK

Final Mean for 3 Valid Peaks = 6.582E-01 +/- 8.732E-01 (132.66%)

PA-234	9.89	89.00	1.000E+02	3.106E-01	3.106E-01	132.66	OK
	21.72	64.90*	1.000E+02	3.657E+00	3.657E+00	41.92	OK
	37.93	23.75	1.000E+02	1.595E+01	1.595E+01	29.91	OK
	131.42	20.40	2.473E+00	-----	Line Not Found	-----	Absent

Final Mean for 3 Valid Peaks = 3.657E+00 +/- 1.533E+00 (41.92%)

TH-234	63.29	3.80*	8.750E+01	2.505E+02	2.505E+02	15.31	OK
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Final Mean for 1 Valid Peaks = 2.505E+02 +/- 3.835E+01 (15.31%)

Flag: "*" = Keyline

---- Identified Nuclides ----

Nuclide	Activity (pCi/filter)	Act error	MDA (pCi/filter)	MDA error	Act/MDA
BA-133	4.419E+02	7.682E+01	1.832E+01	2.698E+00	24.117
PA-231	6.582E-01	8.732E-01	1.778E+00	2.002E-02	0.370
PA-234	3.657E+00	1.533E+00	1.134E+00	1.276E-02	3.226
TH-234	2.505E+02	3.835E+01	2.189E+01	2.816E-01	11.444

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

Nuclide	Key-Line Activity K.L. (pCi/filter) Ided	Act error	MDA (pCi/filter)	MDA error	Act/MDA
CO-57	-1.376E+00	1.508E+01	2.737E+01	9.279E+00	-0.050
CD-109	2.234E+01	9.384E+01	1.776E+02	1.709E+01	0.126
NP-237	8.618E-01	2.644E+01	4.371E+01	3.856E+00	0.020
AM-241	1.086E+00	1.355E+00	2.407E+00	2.710E-02	0.451

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Configuration : DKA100:[GAMMA.SCUSR.ARCHIVE]SMP_130413303_GE5_BAFIL_191207.CN
 Analyses by : PEAK V16.9 PEAKEFF V2.2
 Client ID : I-65 TOT
 Deposition Date :
 Sample Date : 2-MAY-2013 00:00:00. Acquisition date : 2-MAY-2013 07:37:17.
 Sample ID : 1304133-03 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 00:15:01.14 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	10.62	27	4	1.02	107.29	99	15	3.01E-02	24.7	
2	0	21.21	75	32	0.76	208.95	200	16	8.36E-02	20.4	
3	0	31.05	1992	106	0.70	303.36	290	27	2.21E+00	2.7	
4	5	35.18	428	39	0.59	342.95	335	25	4.76E-01	5.8	7.56E-01
5	5	35.97	120	23	0.81	350.56	335	25	1.33E-01	22.0	
6	0	37.42	9	2	0.30	364.47	359	10	9.65E-03	47.8	
7	0	47.89	8	3	0.46	464.96	458	11	9.14E-03	52.4	
8	0	54.03	26	34	0.76	523.84	508	17	2.94E-02	46.0	
9	0	61.93	251	29	0.72	599.62	587	25	2.79E-01	8.0	
10	4	65.20	13	16	0.96	631.07	625	26	1.47E-02	64.8	4.99E+00
11	4	66.03	103	29	0.66	639.00	625	26	1.14E-01	13.8	
12	2	79.83	60	10	0.84	771.40	759	36	6.63E-02	31.3	8.12E-01
13	2	81.20	828	17	0.67	784.52	759	36	9.20E-01	3.6	
14	0	83.93	37	4	1.59	810.73	801	21	4.14E-02	19.6	
15	0	112.13	146	64	0.75	1081.34	1068	25	1.62E-01	15.4	
16	0	115.95	47	17	1.50	1117.98	1106	23	5.18E-02	25.2	
17	0	143.22	20	13	0.14	1379.70	1363	26	2.23E-02	47.0	
18	0	161.18	23	30	1.20	1551.99	1534	24	2.50E-02	53.1	
19	0	276.66	45	12	0.62	2660.14	2645	23	4.95E-02	21.3	
20	3	302.60	11	5	1.06	2909.00	2898	25	1.20E-02	102.9	9.33E-01
21	3	303.12	89	4	0.77	2914.05	2898	25	9.86E-02	12.1	
22	2	307.06	14	2	1.29	2951.85	2943	19	1.60E-02	38.0	9.92E-01
23	2	307.60	33	3	1.07	2957.00	2943	19	3.62E-02	13.9	
24	0	334.10	35	22	1.13	3211.32	3191	25	3.92E-02	30.2	
25	0	356.16	366	7	0.70	3422.95	3406	34	4.07E-01	5.4	
26	1	383.88	143	11	1.16	3689.00	3676	26	1.59E-01	7.8	6.55E+00
27	1	384.51	12	10	1.16	3695.00	3676	26	1.31E-02	81.6	
28	3	387.01	202	11	1.26	3719.03	3706	24	2.25E-01	6.5	5.79E+00
29	3	387.53	27	4	1.16	3724.00	3706	24	2.98E-02	41.0	
30	0	391.37	39	13	1.73	3760.86	3740	31	4.34E-02	25.6	

Summary of Nuclide Activity

Sample ID : 1304133-03

Acquisition date : 2-MAY-2013 07:37:17

Total number of lines in spectrum 30
 Number of unidentified lines 23
 Number of lines tentatively identified by NID 7 23.33%

Nuclide Type : FISSION

Nuclide	Hlife	Decay	Wtd Mean	Wtd Mean	Decay Corr 2-Sigma Error	2-Sigma %Error	Flags
			Uncorrected pCi/filter	Decay Corr pCi/filter			
BA-133	10.50Y	1.00	4.181E+02	4.182E+02	0.707E+02	16.91	
Total Activity :			4.181E+02	4.182E+02			

Nuclide Type : NATURAL

Nuclide	Hlife	Decay	Wtd Mean	Wtd Mean	Decay Corr 2-Sigma Error	2-Sigma %Error	Flags
			Uncorrected pCi/filter	Decay Corr pCi/filter			
PA-231	3.28E+04Y	1.00	1.940E+00	1.940E+00	0.963E+00	49.66	
PA-234	4.47E+09Y	1.00	3.482E+00	3.482E+00	1.426E+00	40.95	
TH-234	4.47E+09Y	1.00	2.268E+02	2.268E+02	0.374E+02	16.50	
Total Activity :			2.322E+02	2.322E+02			

Grand Total Activity : 6.503E+02 6.504E+02

Flags: "K" = Keyline not found
 "E" = Manually edited

"M" = Manually accepted
 "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	4.181E+02	4.182E+02	16.91	OK
	302.84	17.80	2.575E+00	7.074E+01	7.074E+01	207.57	OK
	356.01	60.00	4.312E+00	4.251E+02	4.251E+02	18.09	OK

Final Mean for 3 Valid Peaks = 4.182E+02 +/- 7.071E+01 (16.91%)

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	1.940E+00	1.940E+00	49.66	OK
	10.11	20.20	1.000E+02	4.033E+00	4.033E+00	49.66	OK
	283.67	1.60	2.191E+00	-----	Line Not Found	-----	Absent
	302.67	2.30	2.572E+00	5.483E+02	5.483E+02	207.33	OK

Final Mean for 3 Valid Peaks = 1.940E+00 +/- 9.633E-01 (49.66%)

PA-234	9.89	89.00	1.000E+02	9.154E-01	9.154E-01	49.66	OK
	21.72	64.90*	1.000E+02	3.482E+00	3.482E+00	40.95	OK
	37.93	23.75	1.000E+02	1.098E+00	1.098E+00	95.77	OK
	131.42	20.40	2.473E+00	-----	Line Not Found	-----	Absent

Final Mean for 3 Valid Peaks = 3.482E+00 +/- 1.426E+00 (40.95%)

TH-234	63.29	3.80*	8.750E+01	2.268E+02	2.268E+02	16.50	OK
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Final Mean for 1 Valid Peaks = 2.268E+02 +/- 3.743E+01 (16.50%)

Flag: "*" = Keyline

---- Identified Nuclides ----

Nuclide	Activity (pCi/filter)	Act error	MDA (pCi/filter)	MDA error	Act/MDA
BA-133	4.182E+02	7.071E+01	1.221E+01	1.797E+00	34.258
PA-231	1.940E+00	9.633E-01	1.375E+00	1.548E-02	1.411
PA-234	3.482E+00	1.426E+00	8.953E-01	1.008E-02	3.890
TH-234	2.268E+02	3.743E+01	1.730E+01	2.225E-01	13.112

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

Nuclide	Key-Line Activity (pCi/filter)	K.L. Ided	Act error	MDA (pCi/filter)	MDA error	Act/MDA
CO-57	-1.195E+01		1.652E+01	2.618E+01	8.874E+00	-0.457
CD-109	-2.820E+00		9.656E+01	1.759E+02	1.693E+01	-0.016
NP-237	-1.566E+01		2.942E+01	4.282E+01	3.777E+00	-0.366
AM-241	7.011E-01		1.741E+00	2.790E+00	3.141E-02	0.251

5/11/13

Configuration : DKA100:[GAMMA.SCUSR.ARCHIVE]SMP_130413304_GE5_BAFIL_191209.CN
 Analyses by : PEAK V16.9 PEAKEFF V2.2
 Client ID : I-65 TOT
 Deposition Date :
 Sample Date : 2-MAY-2013 00:00:00. Acquisition date : 2-MAY-2013 07:54:32.
 Sample ID : 1304133-04 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	21.34	99	33	0.76	210.14	202	26	1.10E-01	20.9	
2	0	26.56	8	17	1.00	260.23	251	11	8.93E-03	115.0	
3	0	31.08	2007	113	0.78	303.59	293	30	2.23E+00	2.9	
4	2	35.17	383	11	0.68	342.87	331	27	4.25E-01	6.1	8.12E-01
5	2	36.03	125	2	0.61	351.10	331	27	1.39E-01	15.1	
6	1	52.10	41	47	0.68	505.36	494	31	4.51E-02	38.2	2.53E+00
7	1	53.05	25	24	0.69	514.42	494	31	2.76E-02	65.4	
8	1	53.79	35	1	0.69	521.51	494	31	3.90E-02	17.3	
9	0	61.89	208	67	0.69	599.22	586	25	2.31E-01	11.3	
10	10	65.93	105	20	0.95	638.01	627	30	1.16E-01	13.5	2.27E+00
11	10	66.86	30	11	0.66	647.00	627	30	3.35E-02	43.4	
12	10	67.37	11	4	0.49	651.81	627	30	1.25E-02	56.8	
13	3	79.74	45	10	0.77	770.59	765	34	4.96E-02	18.8	6.32E-01
14	3	81.21	804	26	0.66	784.64	765	34	8.94E-01	3.8	
15	0	84.64	8	18	0.88	817.58	808	13	8.38E-03	109.6	
16	1	111.68	33	50	0.77	1077.00	1069	24	3.62E-02	51.4	3.08E+00
17	1	112.20	182	45	0.77	1082.00	1069	24	2.02E-01	11.0	
18	0	116.47	38	24	0.29	1122.95	1111	24	4.19E-02	33.4	
19	0	276.55	34	8	0.12	2659.09	2646	23	3.73E-02	24.3	
20	0	303.07	117	6	0.70	2913.52	2898	27	1.30E-01	10.0	
21	0	333.90	43	9	1.14	3209.43	3195	24	4.78E-02	20.1	
22	4	355.69	93	2	0.90	3418.49	3407	33	1.03E-01	20.9	3.87E+00
23	4	356.37	343	3	1.13	3425.00	3407	33	3.81E-01	5.8	
24	0	384.08	79	11	0.35	3690.87	3675	27	8.73E-02	13.9	
25	1	386.80	181	14	1.16	3717.00	3703	29	2.01E-01	7.4	5.36E+00
26	1	387.32	12	10	1.16	3722.00	3703	29	1.31E-02	106.8	

Summary of Nuclide Activity

Sample ID : 1304133-04

Acquisition date : 2-MAY-2013 07:54:32

Total number of lines in spectrum 26
 Number of unidentified lines 19
 Number of lines tentatively identified by NID 7 26.92%

Nuclide Type : FISSION

Nuclide	Hlife	Decay	Wtd Mean	Wtd Mean	Decay Corr	2-Sigma Error	2-Sigma	Flags
			Uncorrected	Decay Corr				
BA-133	10.50Y	1.00	4.062E+02	4.062E+02	0.691E+02	17.01		
NP-237	2.14E+06Y	1.00	1.424E+01	1.424E+01	3.124E+01	219.39		
Total Activity :			4.204E+02	4.204E+02				

Nuclide Type : NATURAL

Nuclide	Hlife	Decay	Wtd Mean	Wtd Mean	Decay Corr	2-Sigma Error	2-Sigma	Flags
			Uncorrected	Decay Corr				
TH-234	4.47E+09Y	1.00	1.882E+02	1.882E+02	0.432E+02	22.96		
Total Activity :			1.882E+02	1.882E+02				

Grand Total Activity : 6.086E+02 6.086E+02

Flags: "K" = Keyline not found
 "E" = Manually edited

"M" = Manually accepted
 "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	4.062E+02	4.062E+02	17.01	OK
	302.84	17.80	2.575E+00	7.662E+02	7.662E+02	33.16	OK
	356.01	60.00	4.312E+00	1.079E+02	1.079E+02	44.20	OK

Final Mean for 3 Valid Peaks = 4.062E+02+/- 6.908E+01 (17.01%)

NP-237	86.50	12.60*	1.262E+01	1.424E+01	1.424E+01	219.39	OK
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Final Mean for 1 Valid Peaks = 1.424E+01+/- 3.124E+01 (219.39%)

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	1.882E+02	1.882E+02	22.96	OK

Final Mean for 1 Valid Peaks = 1.882E+02+/- 4.320E+01 (22.96%)

Flag: "*" = Keyline

---- Identified Nuclides ----

Nuclide	Activity (pCi/filter)	Act error	MDA (pCi/filter)	MDA error	Act/MDA
BA-133	4.062E+02	6.908E+01	1.643E+01	2.420E+00	24.717
TH-234	1.882E+02	4.320E+01	2.685E+01	3.454E-01	7.008
NP-237	1.424E+01	3.124E+01	4.337E+01	3.825E+00	0.328

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

Nuclide	Key-Line Activity K.L. (pCi/filter) Ided	Act error	MDA (pCi/filter)	MDA error	Act/MDA
CO-57	-1.683E+00	1.306E+01	2.391E+01	8.106E+00	-0.070
CD-109	1.800E+01	1.016E+02	1.889E+02	1.818E+01	0.095
PA-231	-2.531E-01	7.683E-01	1.357E+00	1.527E-02	-0.187
PA-234	4.576E+00 +	1.923E+00	2.217E+00	2.496E-02	2.064
AM-241	1.499E+00	1.555E+00	2.745E+00	3.090E-02	0.546

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Configuration : DKA100: [GAMMA.SCUSR.ARCHIVE] SMP_130413305_GE5_BAFIL_191211.CN
 Analyses by : PEAK V16.9 PEAKEFF V2.2
 Client ID : I-65 DIS
 Deposition Date :
 Sample Date : 2-MAY-2013 00:00:00. Acquisition date : 2-MAY-2013 08:23:49.
 Sample ID : 1304133-05 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 00:15:01.20 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	21.30	71	37	0.52	209.77	201	17	7.87E-02	23.2	
2	6	29.48	31	42	0.96	288.24	281	40	3.47E-02	43.5	9.43E-01
3	6	31.06	1981	50	0.76	303.39	281	40	2.20E+00	2.4	
4	3	35.23	460	5	0.75	343.40	330	33	5.12E-01	5.1	4.10E+00
5	3	36.02	123	7	0.57	351.00	330	33	1.37E-01	15.0	
6	0	43.32	11	18	1.60	421.09	410	18	1.22E-02	95.3	
7	0	53.53	35	35	0.19	519.06	509	17	3.84E-02	38.2	
8	0	61.87	256	44	0.82	599.08	587	33	2.84E-01	9.1	
9	1	65.82	46	35	0.66	637.00	629	25	5.12E-02	31.0	2.07E+00
10	1	66.24	41	32	0.66	641.00	629	25	4.60E-02	37.2	
11	2	79.96	49	21	0.84	772.66	762	38	5.41E-02	41.1	1.52E+00
12	2	81.22	738	12	0.67	784.77	762	38	8.20E-01	4.0	
13	0	102.00	17	2	0.15	984.17	978	12	1.90E-02	28.1	
14	8	110.75	17	18	0.57	1068.08	1064	32	1.90E-02	38.3	1.23E+00
15	8	112.00	187	38	0.92	1080.06	1064	32	2.07E-01	10.9	
16	1	115.17	19	7	0.73	1110.49	1107	33	2.10E-02	20.1	2.15E+00
17	1	116.05	40	17	0.77	1119.00	1107	33	4.47E-02	27.4	
18	0	161.09	16	18	0.46	1551.19	1543	14	1.72E-02	51.5	
19	0	276.55	39	6	0.34	2659.12	2643	24	4.33E-02	20.4	
20	0	303.02	114	10	0.62	2913.03	2895	28	1.27E-01	10.9	
21	1	306.97	25	3	1.07	2951.00	2939	24	2.72E-02	26.5	1.15E+00
22	1	307.39	27	1	1.07	2955.00	2939	24	2.97E-02	22.8	
23	0	333.85	54	6	0.74	3208.95	3193	26	6.00E-02	15.9	
24	1	355.64	11	7	1.13	3418.00	3407	34	1.27E-02	170.2	1.65E+01
25	1	356.16	703	13	1.13	3423.00	3407	34	7.81E-01	3.0	
26	0	383.95	58	7	0.97	3689.64	3677	22	6.40E-02	15.9	
27	1	386.60	106	15	1.28	3715.11	3704	28	1.18E-01	13.1	6.26E+00
28	1	387.11	155	15	1.16	3720.00	3704	28	1.72E-01	9.1	
29	0	391.30	40	10	1.00	3760.18	3745	26	4.48E-02	21.8	
30	0	414.87	33	3	0.32	3986.39	3971	25	3.68E-02	19.6	

Summary of Nuclide Activity

Sample ID : 1304133-05

Acquisition date : 2-MAY-2013 08:23:49

Total number of lines in spectrum 30
 Number of unidentified lines 24
 Number of lines tentatively identified by NID 6 20.00%

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	3.724E+02	3.725E+02	0.640E+02	17.19	
Total Activity :			3.724E+02	3.725E+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	2.312E+02	2.312E+02	0.432E+02	18.67	
Total Activity :			2.312E+02	2.312E+02			

Grand Total Activity : 6.037E+02 6.037E+02

Flags: "K" = Keyline not found
 "E" = Manually edited

"M" = Manually accepted
 "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	3.724E+02	3.725E+02	17.19	OK
	302.84	17.80	2.575E+00	7.484E+02	7.485E+02	34.25	OK
	356.01	60.00	4.312E+00	8.157E+02	8.157E+02	15.64	OK

Final Mean for 3 Valid Peaks = 3.725E+02+/- 6.403E+01 (17.19%)

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	2.312E+02	2.312E+02	18.67	OK

Final Mean for 1 Valid Peaks = 2.312E+02+/- 4.316E+01 (18.67%)

Flag: "*" = Keyline

---- Identified Nuclides ----

Nuclide	Activity (pCi/filter)	Act error	MDA (pCi/filter)	MDA error	Act/MDA
BA-133	3.725E+02	6.403E+01	1.467E+01	2.160E+00	25.391
TH-234	2.312E+02	4.316E+01	2.525E+01	3.248E-01	9.158

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

Nuclide	Key-Line Activity (pCi/filter)	K.L. Ided	Act error	MDA (pCi/filter)	MDA error	Act/MDA
CO-57	-5.806E+00		1.527E+01	2.629E+01	8.913E+00	-0.221
CD-109	1.529E+01		1.032E+02	1.909E+02	1.837E+01	0.080
PA-231	-1.874E-02		8.634E-01	1.589E+00	1.789E-02	-0.012
PA-234	3.276E+00	+	1.528E+00	2.127E+00	2.394E-02	1.540
NP-237	-3.884E+01		2.901E+01	4.265E+01	3.762E+00	-0.911
AM-241	-5.905E-01		1.469E+00	2.071E+00	2.331E-02	-0.285

Handwritten: 51247

Configuration : DKA100:[GAMMA.SCUSR.ARCHIVE]SMP_130413306_GE1_BAFIL_191203.CN
 Analyses by : PEAK V16.9 PEAKEFF V2.2
 Client ID : DUP 08 TOT
 Deposition Date :
 Sample Date : 2-MAY-2013 00:00:00. Acquisition date : 2-MAY-2013 07:14:44.
 Sample ID : 1304133-06 Sample Quantity : 1.00000E+00 filter
 Sample type : FILTER Sample Geometry : 0
 Detector name : GE1 Detector Geometry: BAFIL
 Elapsed live time: 0 00:15:00.00 Elapsed real time: 0 00:15:00.27 0.0%
 Start channel : 25 End channel : 4096
 Sensitivity : 3.00000 Gaussian : 10.00000
 Critical level : No

Pk	It	Energy	Area	Bkgnd	FWHM	Channel	Left	Pw	Cts/Sec	%Err	Fit
1	3	30.82	1957	62	1.38	31.06	27	13	2.17E+00	2.3	1.34E+01
2	3	35.10	539	40	1.62	35.33	27	13	5.99E-01	4.8	
3	0	53.15	59	115	2.11	53.38	50	8	6.50E-02	34.3	
4	1	61.87	261	75	1.58	62.10	58	12	2.90E-01	8.0	7.30E+00
5	1	65.70	117	69	1.58	65.93	58	12	1.29E-01	14.3	
6	2	81.08	837	54	1.76	81.31	77	15	9.30E-01	3.6	1.30E+01
7	2	83.92	24	53	1.61	84.15	77	15	2.65E-02	91.4	
8	0	92.68	19	68	1.11	92.91	91	6	2.16E-02	70.1	
9	2	111.90	229	40	1.72	112.13	107	19	2.54E-01	7.8	2.15E+00
10	2	116.00	56	34	1.81	116.23	107	19	6.21E-02	22.3	
11	2	118.77	15	32	1.50	119.00	107	19	1.71E-02	71.4	
12	0	172.77	24	61	1.44	173.00	170	8	2.66E-02	59.7	
13	0	185.30	19	91	1.32	185.52	182	8	2.10E-02	90.0	
14	0	277.49	44	38	1.42	277.70	273	8	4.89E-02	28.6	
15	2	303.02	147	14	1.68	303.23	300	15	1.63E-01	8.7	5.02E+00
16	2	307.82	36	11	2.01	308.04	300	15	3.98E-02	25.3	
17	1	333.78	73	12	1.80	333.99	328	15	8.10E-02	14.0	8.50E-01
18	1	337.88	19	19	1.84	338.09	328	15	2.10E-02	48.7	
19	0	356.30	551	36	1.93	356.51	351	11	6.13E-01	4.7	
20	0	365.56	15	17	1.41	365.77	363	7	1.71E-02	50.1	
21	3	383.71	139	38	2.27	383.92	381	10	1.54E-01	13.8	8.45E+01
22	3	387.00	235	49	1.86	387.21	381	10	2.61E-01	8.6	
23	0	391.77	53	16	1.41	391.98	391	5	5.88E-02	19.6	
24	1	414.63	33	22	1.89	414.83	410	17	3.68E-02	28.1	8.83E-01
25	1	417.97	24	23	1.90	418.17	410	17	2.65E-02	42.8	
26	0	437.23	124	5	1.96	437.43	432	9	1.37E-01	9.5	
27	0	468.75	12	16	1.20	468.95	465	7	1.35E-02	61.5	
28	0	511.38	24	6	1.90	511.58	506	12	2.67E-02	28.9	

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	3.879E+02	3.879E+02	0.713E+02	18.39	
Total Activity :			3.879E+02	3.879E+02			

Nuclide Type : NATURAL

Nuclide	Hlife	Decay	Wtd Mean Uncorrected pCi/filter	Wtd Mean Decay Corr pCi/filter	Decay Corr 2-Sigma Error	2-Sigma %Error	Flags
TH-234	4.47E+09Y	1.00	3.516E+02	3.516E+02	0.592E+02	16.84	
Total Activity :			3.516E+02	3.516E+02			

Grand Total Activity : 7.395E+02 7.395E+02

Flags: "K" = Keyline not found
 "E" = Manually edited

"M" = Manually accepted
 "A" = Nuclide specific abn. limit

Nuclide Type: FISSION

Nuclide	Energy	%Abn	%Eff	Uncorrected pCi/filter	Decay Corr pCi/filter	2-Sigma %Error	Status
BA-133	81.00	33.00*	1.963E+01	3.879E+02	3.879E+02	18.39	OK
	302.84	17.80	4.915E+00	5.040E+02	5.040E+02	33.98	OK
	356.01	60.00	6.963E+00	3.962E+02	3.963E+02	17.88	OK

Final Mean for 3 Valid Peaks = 3.879E+02+/- 7.134E+01 (18.39%)

Nuclide Type: NATURAL

Nuclide	Energy	%Abn	%Eff	Uncorrected pCi/filter	Decay Corr pCi/filter	2-Sigma %Error	Status
TH-234	63.29	3.80*	5.865E+01	3.516E+02	3.516E+02	16.84	OK

Final Mean for 1 Valid Peaks = 3.516E+02+/- 5.922E+01 (16.84%)

Flag: "*" = Keyline

---- Identified Nuclides ----

Nuclide	Activity (pCi/filter)	Act error	MDA (pCi/filter)	MDA error	Act/MDA
BA-133	3.879E+02	7.134E+01	1.710E+01	2.806E+00	22.692
TH-234	3.516E+02	5.922E+01	5.398E+01	1.730E+00	6.513

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

Nuclide	Key-Line Activity K.L. (pCi/filter) Ided	Act error	MDA (pCi/filter)	MDA error	Act/MDA
CO-57	-2.416E+00	1.157E+01	1.959E+01	6.116E+00	-0.123
CD-109	2.543E+01	1.321E+02	2.153E+02	2.785E+01	0.118
PA-231	0.000E+00	0.000E+00	1.933E-01	3.632E-03	0.000
PA-234	9.240E+00	1.768E+00	3.674E+00	6.904E-02	2.515
NP-237	1.580E+01	3.737E+01	6.224E+01	7.577E+00	0.254
AM-241	1.195E+01	3.480E+00	6.774E+00	1.589E-01	1.764

Handwritten: 5/21/13

Configuration : DKA100:[GAMMA.SCUSR.ARCHIVE]SMP_130413307_GE1_BAFIL_191206.CN
 Analyses by : PEAK V16.9 PEAKEFF V2.2
 Client ID : DUP 08 DIS
 Deposition Date :
 Sample Date : 2-MAY-2013 00:00:00. Acquisition date : 2-MAY-2013 07:36:30.
 Sample ID : 1304133-07 Sample Quantity : 1.00000E+00 filter
 Sample type : FILTER Sample Geometry : 0
 Detector name : GE1 Detector Geometry: BAFIL
 Elapsed live time: 0 00:15:00.00 Elapsed real time: 0 00:15:00.27 0.0%
 Start channel : 25 End channel : 4096
 Sensitivity : 3.00000 Gaussian : 10.00000
 Critical level : No

Pk	It	Energy	Area	Bkgnd	FWHM	Channel	Left	Pw	Cts/Sec	%Err	Fit
1	1	30.81	1978	68	1.43	31.05	27	13	2.20E+00	2.3	2.27E+01
2	1	34.91	431	54	1.53	35.14	27	13	4.79E-01	5.7	
3	0	52.59	53	83	2.94	52.82	49	7	5.87E-02	31.8	
4	2	61.85	251	54	1.73	62.08	57	17	2.79E-01	7.7	4.09E+00
5	2	65.87	159	45	1.74	66.10	57	17	1.77E-01	11.3	
6	0	81.13	794	99	1.88	81.36	77	7	8.83E-01	4.1	
7	0	92.37	32	100	1.17	92.60	89	8	3.51E-02	57.7	
8	0	111.84	195	89	1.50	112.07	108	7	2.17E-01	10.8	
9	0	116.84	31	64	1.66	117.07	116	6	3.48E-02	47.0	
10	0	225.75	16	51	2.46	225.97	221	8	1.77E-02	82.0	
11	0	276.71	77	32	1.59	276.93	273	9	8.56E-02	17.4	
12	2	302.99	180	18	1.58	303.20	300	10	2.00E-01	7.9	1.40E+01
13	2	306.97	22	19	2.00	307.18	300	10	2.47E-02	51.8	
14	3	333.90	74	13	1.70	334.11	329	14	8.22E-02	13.9	2.45E+00
15	3	338.23	20	12	2.23	338.44	329	14	2.20E-02	49.2	
16	0	356.28	527	36	1.90	356.49	352	9	5.86E-01	4.8	
17	3	384.36	125	24	2.27	384.56	381	19	1.39E-01	13.3	4.94E+00
18	3	387.29	213	11	1.75	387.50	381	19	2.37E-01	7.8	
19	3	391.32	52	9	2.18	391.52	381	19	5.73E-02	26.7	
20	0	418.59	14	31	1.09	418.79	417	5	1.57E-02	65.1	
21	0	437.21	113	4	1.85	437.41	433	8	1.25E-01	9.9	
22	0	468.16	25	8	2.15	468.36	465	7	2.72E-02	27.2	
23	0	511.89	20	11	3.55	512.09	508	7	2.19E-02	36.8	
24	0	594.02	9	2	1.73	594.21	591	8	9.60E-03	44.8	
25	0	610.39	16	4	2.90	610.58	607	7	1.72E-02	32.3	
26	0	716.31	8	0	1.32	716.50	714	6	8.89E-03	35.4	
27	0	881.33	6	0	1.88	881.50	879	5	6.67E-03	40.8	

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	Wtd Mean	Decay Corr	2-Sigma Error	2-Sigma	Flags
			Uncorrected pCi/filter	Decay Corr pCi/filter				
BA-133	10.50Y	1.00	3.684E+02	3.684E+02	0.692E+02	18.80		
Total Activity :			3.684E+02	3.684E+02				

Nuclide Type : NATURAL

Nuclide	Hlife	Decay	Wtd Mean	Wtd Mean	Decay Corr	2-Sigma Error	2-Sigma	Flags
			Uncorrected pCi/filter	Decay Corr pCi/filter				
TH-234	4.47E+09Y	1.00	3.384E+02	3.384E+02	0.549E+02	16.23		
Total Activity :			3.384E+02	3.384E+02				

Grand Total Activity : 7.068E+02 7.068E+02

Flags: "K" = Keyline not found
 "E" = Manually edited

"M" = Manually accepted
 "A" = Nuclide specific abn. limit

Nuclide Type: FISSION

Nuclide	Energy	%Abn	%Eff	Uncorrected pCi/filter	Decay Corr pCi/filter	2-Sigma %Error	Status
BA-133	81.00	33.00*	1.963E+01	3.684E+02	3.684E+02	18.80	OK
	302.84	17.80	4.915E+00	6.186E+02	6.187E+02	33.26	OK
	356.01	60.00	6.963E+00	3.789E+02	3.790E+02	17.95	OK

Final Mean for 3 Valid Peaks = 3.684E+02+/- 6.925E+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*	5.865E+01	3.384E+02	3.384E+02	16.23	OK

Final Mean for 1 Valid Peaks = 3.384E+02+/- 5.492E+01 (16.23%)

Flag: "*" = Keyline

---- Identified Nuclides ----

Nuclide	Activity (pCi/filter)	Act error	MDA (pCi/filter)	MDA error	Act/MDA
BA-133	3.684E+02	6.925E+01	1.972E+01	3.236E+00	18.686
TH-234	3.384E+02	5.492E+01	4.990E+01	1.599E+00	6.781

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

Nuclide	Key-Line Activity K.L. (pCi/filter) Ided	Act error	MDA (pCi/filter)	MDA error	Act/MDA
CO-57	-5.129E+00	1.275E+01	1.909E+01	5.961E+00	-0.269
CD-109	-1.035E+02	1.438E+02	2.086E+02	2.698E+01	-0.497
PA-231	0.000E+00	0.000E+00	1.933E-01	3.632E-03	0.000
PA-234	9.436E+00	1.771E+00	3.688E+00	6.931E-02	2.559
NP-237	3.580E+00	4.391E+01	6.200E+01	7.548E+00	0.058
AM-241	1.174E+01	3.310E+00	6.552E+00	1.537E-01	1.792

C
12/10

Configuration : DKA100: [GAMMA.SCUSR.ARCHIVE] SMP_130413308_GE1_BAFIL_191208.CN
 Analyses by : PEAK V16.9 PEAKEFF V2.2
 Client ID : PURGE TANK TOT
 Deposition Date :
 Sample Date : 2-MAY-2013 00:00:00. Acquisition date : 2-MAY-2013 07:53:29.
 Sample ID : 1304133-08 Sample Quantity : 1.00000E+00 filter
 Sample type : FILTER Sample Geometry : 0
 Detector name : GE1 Detector Geometry: BAFIL
 Elapsed live time: 0 00:15:00.00 Elapsed real time: 0 00:15:00.24 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	27.90	17	48	1.51	28.14	27	12	1.93E-02	56.7	2.55E+01
2	2	30.86	1608	56	1.36	31.10	27	12	1.79E+00	2.6	
3	2	34.91	372	57	1.68	35.15	27	12	4.13E-01	6.1	
4	0	52.66	58	73	2.80	52.89	49	8	6.48E-02	28.4	
5	3	61.76	167	73	1.91	61.99	57	13	1.86E-01	11.6	4.27E+00
6	3	65.66	93	89	1.87	65.89	57	13	1.03E-01	19.6	
7	0	81.16	656	101	1.89	81.39	77	9	7.28E-01	4.8	
8	0	92.43	24	64	1.20	92.66	91	6	2.67E-02	55.8	
9	0	111.94	152	81	1.76	112.17	109	7	1.68E-01	12.8	
10	0	185.42	19	43	1.22	185.64	183	5	2.09E-02	56.9	
11	0	276.80	45	35	1.19	277.01	274	7	4.99E-02	26.2	
12	0	303.26	115	29	1.70	303.47	300	6	1.28E-01	11.8	
13	0	312.13	17	11	1.69	312.35	311	5	1.90E-02	37.2	
14	0	333.98	78	10	1.49	334.20	332	5	8.63E-02	12.9	
15	0	356.27	455	32	1.92	356.48	352	10	5.06E-01	5.2	
16	1	383.72	94	20	1.86	383.93	381	10	1.05E-01	14.8	3.28E+01
17	1	386.67	145	44	1.88	386.88	381	10	1.61E-01	12.4	
18	0	391.68	39	10	2.80	391.89	391	4	4.36E-02	21.5	
19	1	414.62	41	17	1.89	414.83	412	11	4.50E-02	22.3	2.26E+00
20	1	417.97	8	27	1.90	418.17	412	11	8.46E-03	127.9	
21	0	437.57	82	11	1.67	437.77	434	9	9.13E-02	13.2	
22	1	467.97	23	8	1.93	468.18	462	17	2.60E-02	29.6	1.25E+00
23	1	471.97	9	7	1.93	472.18	462	17	1.01E-02	65.3	
24	0	511.01	19	8	2.25	511.21	507	8	2.11E-02	34.5	
25	0	584.06	8	0	1.25	584.25	582	6	8.89E-03	35.4	
26	0	695.65	7	1	2.68	695.83	693	6	7.50E-03	47.4	

Summary of Nuclide Activity

Sample ID : 1304133-08

Acquisition date : 2-MAY-2013 07:53:29

Total number of lines in spectrum 26
 Number of unidentified lines 22
 Number of lines tentatively identified by NID 4 15.38%

Nuclide Type : FISSION

Nuclide	Hlife	Decay	Wtd Mean	Wtd Mean	Decay Corr	2-Sigma Error	2-Sigma	Flags
			Uncorrected pCi/filter	Decay Corr pCi/filter				
BA-133	10.50Y	1.00	3.040E+02	3.040E+02	0.590E+02	19.42		
Total Activity :			3.040E+02	3.040E+02				

Nuclide Type : NATURAL

Nuclide	Hlife	Decay	Wtd Mean	Wtd Mean	Decay Corr	2-Sigma Error	2-Sigma	Flags
			Uncorrected pCi/filter	Decay Corr pCi/filter				
TH-234	4.47E+09Y	1.00	2.255E+02	2.255E+02	0.536E+02	23.77		
Total Activity :			2.255E+02	2.255E+02				

Grand Total Activity : 5.294E+02 5.294E+02

Flags: "K" = Keyline not found
 "E" = Manually edited

"M" = Manually accepted
 "A" = Nuclide specific abn. limit

Nuclide Type: FISSION

Nuclide	Energy	%Abn	%Eff	Uncorrected pCi/filter	Decay Corr pCi/filter	2-Sigma %Error	Status
BA-133	81.00	33.00*	1.963E+01	3.040E+02	3.040E+02	19.42	OK
	302.84	17.80	4.915E+00	3.962E+02	3.962E+02	37.62	OK
	356.01	60.00	6.963E+00	3.273E+02	3.273E+02	18.42	OK

Final Mean for 3 Valid Peaks = 3.040E+02+/- 5.903E+01 (19.42%)

Nuclide Type: NATURAL

Nuclide	Energy	%Abn	%Eff	Uncorrected pCi/filter	Decay Corr pCi/filter	2-Sigma %Error	Status
TH-234	63.29	3.80*	5.865E+01	2.255E+02	2.255E+02	23.77	OK

Final Mean for 1 Valid Peaks = 2.255E+02+/- 5.359E+01 (23.77%)

Flag: "*" = Keyline

---- Identified Nuclides ----

Nuclide	Activity (pCi/filter)	Act error	MDA (pCi/filter)	MDA error	Act/MDA
BA-133	3.040E+02	5.903E+01	1.688E+01	2.771E+00	18.008
TH-234	2.255E+02	5.359E+01	5.454E+01	1.748E+00	4.134

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

Nuclide	Key-Line Activity (pCi/filter)	K.L. Ided	Act error	MDA (pCi/filter)	MDA error	Act/MDA
CO-57	1.303E+00		1.194E+01	2.093E+01	6.533E+00	0.062
CD-109	1.148E+02		1.338E+02	2.137E+02	2.764E+01	0.537
PA-231	0.000E+00		0.000E+00	1.933E-01	3.632E-03	0.000
PA-234	8.254E+00		1.777E+00	3.627E+00	6.817E-02	2.276
NP-237	9.211E+00		4.030E+01	5.856E+01	7.130E+00	0.157
AM-241	6.677E+00		3.139E+00	5.812E+00	1.363E-01	1.149

*Comp 17413
Hendry*

Configuration : DKA100: [GAMMA.SCUSR.ARCHIVE] SMP_130413309_GE1_BAFIL_191210.CN
 Analyses by : PEAK V16.9 PEAKEFF V2.2
 Client ID : PURGE TANK DIS
 Deposition Date :
 Sample Date : 2-MAY-2013 00:00:00. Acquisition date : 2-MAY-2013 08:23:07.
 Sample ID : 1304133-09 Sample Quantity : 1.00000E+00 filter
 Sample type : FILTER Sample Geometry : 0
 Detector name : GE1 Detector Geometry: BAFIL
 Elapsed live time: 0 00:15:00.00 Elapsed real time: 0 00:15:00.28 0.0%
 Start channel : 25 End channel : 4096
 Sensitivity : 3.00000 Gaussian : 10.00000
 Critical level : No

Pk	It	Energy	Area	Bkgnd	FWHM	Channel	Left	Pw	Cts/Sec	%Err	Fit
1	3	30.83	2051	71	1.37	31.06	27	13	2.28E+00	2.3	9.78E+00
2	3	35.06	502	61	1.56	35.29	27	13	5.58E-01	5.1	
3	0	46.12	28	40	1.34	46.35	44	5	3.06E-02	39.5	
4	0	53.20	69	104	2.56	53.43	50	8	7.61E-02	28.5	
5	0	61.54	250	151	1.30	61.77	58	7	2.78E-01	10.3	
6	0	65.80	81	108	1.34	66.03	65	5	8.98E-02	22.8	
7	2	81.05	737	63	1.76	81.28	77	11	8.19E-01	4.0	2.21E+01
8	2	83.77	19	50	1.46	84.00	77	11	2.15E-02	103.0	
9	1	92.62	47	52	1.62	92.85	89	11	5.24E-02	28.0	2.72E+00
10	1	95.62	19	53	1.62	95.85	89	11	2.10E-02	71.0	
11	1	111.77	217	53	1.64	111.99	106	21	2.41E-01	8.6	2.38E+00
12	1	116.62	64	51	1.65	116.85	106	21	7.12E-02	22.3	
13	0	134.90	24	45	3.15	135.13	133	6	2.68E-02	48.0	
14	0	211.48	101	144	21.69	211.70	199	27	1.12E-01	35.0	
15	0	276.92	66	32	1.41	277.14	273	8	7.33E-02	19.3	
16	0	303.13	158	18	1.61	303.35	300	6	1.75E-01	9.0	
17	3	333.70	87	15	1.85	333.91	330	12	9.71E-02	12.9	3.71E+00
18	3	338.33	20	9	2.23	338.54	330	12	2.25E-02	44.3	
19	0	356.36	547	28	1.92	356.57	351	11	6.07E-01	4.7	
20	3	383.98	121	19	1.60	384.19	382	9	1.35E-01	11.2	2.37E+00
21	3	387.19	218	29	1.76	387.39	382	9	2.43E-01	8.0	
22	0	391.75	35	15	1.41	391.96	391	6	3.86E-02	27.0	
23	0	406.50	15	7	2.90	406.71	402	8	1.63E-02	42.1	
24	3	415.02	32	5	2.29	415.23	411	18	3.55E-02	25.7	2.92E+00
25	3	417.81	26	3	2.30	418.02	411	18	2.88E-02	33.7	
26	3	420.81	14	1	2.30	421.01	411	18	1.57E-02	52.7	
27	0	437.40	118	10	1.93	437.60	434	7	1.31E-01	10.3	
28	0	468.49	31	8	2.00	468.69	465	7	3.40E-02	24.1	
29	7	510.48	29	0	3.46	510.68	508	9	3.17E-02	14.9	1.68E+00
30	7	514.05	7	0	2.15	514.25	508	9	8.20E-03	66.4	

Summary of Nuclide Activity

Sample ID : 1304133-09

Acquisition date : 2-MAY-2013 08:23:07

Total number of lines in spectrum 30
 Number of unidentified lines 25
 Number of lines tentatively identified by NID 5 16.67%

Nuclide Type : FISSION

Nuclide	Hlife	Decay	Wtd Mean	Wtd Mean	Decay Corr	2-Sigma	Flags
			Uncorrected	Decay Corr			
BA-133	10.50Y	1.00	3.419E+02	3.419E+02	0.640E+02	18.71	
Total Activity :			3.419E+02	3.419E+02			

Nuclide Type : NATURAL

Nuclide	Hlife	Decay	Wtd Mean	Wtd Mean	Decay Corr	2-Sigma	Flags
			Uncorrected	Decay Corr			
TH-234	4.47E+09Y	1.00	3.374E+02	3.374E+02	0.719E+02	21.31	
AM-241	432.20Y	1.00	2.615E+01	2.615E+01	0.554E+01	21.20	
Total Activity :			3.635E+02	3.635E+02			

Grand Total Activity : 7.054E+02 7.054E+02

Flags: "K" = Keyline not found
 "E" = Manually edited

"M" = Manually accepted
 "A" = Nuclide specific abn. limit

Nuclide Type: FISSION

Nuclide	Energy	%Abn	%Eff	Uncorrected pCi/filter	Decay Corr pCi/filter	2-Sigma %Error	Status
BA-133	81.00	33.00*	1.963E+01	3.419E+02	3.419E+02	18.71	OK
	302.84	17.80	4.915E+00	5.416E+02	5.416E+02	34.37	OK
	356.01	60.00	6.963E+00	3.928E+02	3.928E+02	17.79	OK

Final Mean for 3 Valid Peaks = 3.419E+02+/- 6.397E+01 (18.71%)

Nuclide Type: NATURAL

Nuclide	Energy	%Abn	%Eff	Uncorrected pCi/filter	Decay Corr pCi/filter	2-Sigma %Error	Status
TH-234	63.29	3.80*	5.865E+01	3.374E+02	3.374E+02	21.31	OK

Final Mean for 1 Valid Peaks = 3.374E+02+/- 7.189E+01 (21.31%)

AM-241	59.54	35.90*	8.010E+01	2.615E+01	2.615E+01	21.20	OK
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Final Mean for 1 Valid Peaks = 2.615E+01+/- 5.542E+00 (21.20%)

Flag: "*" = Keyline

---- Identified Nuclides ----

Nuclide	Activity (pCi/filter)	Act error	MDA (pCi/filter)	MDA error	Act/MDA
BA-133	3.419E+02	6.397E+01	1.773E+01	2.910E+00	19.289
TH-234	3.374E+02	7.189E+01	7.543E+01	2.417E+00	4.473
AM-241	2.615E+01	5.542E+00	4.944E+00	1.160E-01	5.288

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

Nuclide	Key-Line Activity K.L. (pCi/filter) Ided	Act error	MDA (pCi/filter)	MDA error	Act/MDA
CO-57	4.361E+00	1.333E+01	2.351E+01	7.338E+00	0.186
CD-109	-2.722E+00	1.458E+02	2.040E+02	2.639E+01	-0.013
PA-231	0.000E+00	0.000E+00	1.933E-01	3.632E-03	0.000
PA-234	8.423E+00	1.732E+00	3.577E+00	6.722E-02	2.355
NP-237	-5.791E+00	3.997E+01	5.485E+01	6.678E+00	-0.106