

MICHAEL PISANI & ASSOCIATES

07-214 / 0494255 Hero Lands

**STANDARD LEVEL IV
REPORT OF ANALYSIS**

WORK ORDER #19-04087-OR

July 2, 2019

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

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STANDARD OPERATING PROCEDURE

Sample Receiving

MP-001, Rev. 20
Effective: 1/15/19
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Eberline Services – Oak Ridge Laboratory LABORATORY DATA SUPPORT CHECKLIST


MP-001-3

Eberline Services Work Order # 19-04087

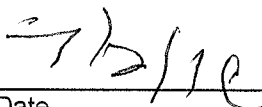
The checklist items listed below are to be initialed by appropriate staff upon completion/verification.

Date for Partial	Initials	Date	Initials	Checklist Items
		4/17/19	AS	Sample Log-In
		5/9/19	AS	Data Compilation
		5-23-19	WV	First Technical Data Review
		5/24/19	JB	Second Technical Data Review
		7/1/19		Data Entry/Electronic Deliverable
		7/1/19		Case Narrative
		7/2/19	EJT	Electronic Deliverable Proof
		7/2/19	JB	Samples Analyzed within Holding Time Yes? <input checked="" type="checkbox"/> No? <input type="checkbox"/>
		7/2/19	JB	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: 

Laboratory Manager



Date

Copy No. _____

Radiochemistry Services

SECTION I
CHAIN OF CUSTODY
& pH CHECK

Chain of Custody Record

No. _____

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



Project Name: HELLS LANDS Project Number: 07-214/049455 Page 1 of 2

Send Report To: DAVE UPTMILLER Sampler (Print Name): GO LEONARD

Address: 3838 W CAUSEWAY Sampler (Print Name): AMON JONES

SE 3000 Shipment Method: ESD EX Purchase Order #: 19-04087

MONTGOMERY LA 70002 Airbill Number: _____

Phone: 381 600-1000 Laboratory Receiving: _____

Fax: _____

REC'D APR 17 2019

Analysis Requested
 RA 226 / RA 228

Field Sample ID	Sample Date	Sample Time	Sample Matrix	Number of Containers	Comments, Special Instructions, etc.	Lab Sample ID (to be completed by lab)
4 BC 27A	4-2-19	1030	W	1		
5 BC 27B		1152				
6 BC 26		1310				
7 BC 11		1440				
8 BC 12		1615				
9 BC 24A	4-3-19	0755				
10 BC 24B		0925				
11 BC 21B		1115				
12 BC 21A		1315				
13 BC 13		1515				
14 BC 14		1705				
15 BC 28B	4-8-19	1045				
16 BC 28A		1215				
17 BC 16		1515				
18 BC 15		1645				
19 BC 22A	4-9-19	0830				
BC 22B		1000				

SAMPLE HAS POPPED

Relinquished by: (Signature) _____ Date: _____ Time: _____

Received by: (Signature) ESD EX Date: 4/17/19 Time: 1014

Relinquished by: (Signature) FedEx Date: _____ Time: _____

Received by: (Signature) _____ Date: _____ Time: _____

QA/QC Level: Level I Level II Level III Other _____

Turnaround: Routine 24 Hour 1 Week Other _____

Sample Receipt: Total # Containers Received? COC Seals Present? COC Seals Intact? Received Containers Intact? Temperature? _____



Internal Chain of Custody

Work Order #	19-04087
Lab Deadline	4/30/2019
Analysis	Ra226 - Level 4
Sample Matrix	Water

Comments	Sample Fraction	HP 210 / 270 Detector Activity	Storage Location
	04	39	II1.4
	05	38	II1.4
	06	30	II1.4
	07	36	II1.4
	08	25	II1.4
	09	33	II1.4
	10	33	II1.4
	11	29	II1.4
	12	36	II1.4
	13	22	II1.4
	14	34	II1.4
	15	40	II1.4
	16	36	II1.4
	17	42	II1.4
	18	37	II1.4
	19	35	II1.4

	Location (circle one)						Initials	Date
Received by	Sample Storage	Rough Prep	Prep	Separations	Count Room			
Relinquished by	Sample Storage	Rough Prep	Prep	Separations	Count Room	J. Harvey	4/26/19 0630	
Received by	Sample Storage	Rough Prep	Prep	Separations	Count Room	DB	4/29/19 0945	
Relinquished by	Sample Storage	Rough Prep	Prep	Separations	Count Room	DB	5/2/19 1610	
Received by	Sample Storage	Rough Prep	Prep	Separations	Count Room	VB	5/2/19 1631	
Relinquished by	Sample Storage	Rough Prep	Prep	Separations	Count Room	VB	5/3/19 1602	
Received by	Sample Storage	Rough Prep	Prep	Separations	Count Room			
Relinquished by	Sample Storage	Rough Prep	Prep	Separations	Count Room			
Received by	Sample Storage	Rough Prep	Prep	Separations	Count Room			
Relinquished by	Sample Storage	Rough Prep	Prep	Separations	Count Room			
Received by	Sample Storage	Rough Prep	Prep	Separations	Count Room			
Relinquished by	Sample Storage	Rough Prep	Prep	Separations	Count Room			



Internal Chain of Custody

Work Order #

19-04087

Lab Deadline

4/30/2019

Analysis

Ra228 - Level 4

Sample Matrix

Water

Comments	Sample Fraction	HP 210 / 270 Detector Activity	Storage Location
	04	39	II1.4
	05	38	II1.4
	06	30	II1.4
	07	36	II1.4
	08	25	II1.4
	09	33	II1.4
	10	33	II1.4
	11	29	II1.4
	12	36	II1.4
	13	22	II1.4
	14	34	II1.4
	15	40	II1.4
	16	36	II1.4
	17	42	II1.4
	18	37	II1.4
	19	35	II1.4

	Location (circle one)					Initials	Date
Received by	Sample Storage	Rough Prep	Prep	Separations	Count Room	<i>J. Harvey</i>	4/22/19 0630
Relinquished by	Sample Storage	Rough Prep	Prep	Separations	Count Room		
Received by	Sample Storage	Rough Prep	Prep	Separations	Count Room	DB	4/29/19 0945
Relinquished by	Sample Storage	Rough Prep	Prep	Separations	Count Room	DB	5/2/19 1610
Received by	Sample Storage	Rough Prep	Prep	Separations	Count Room	KCB	5/2/19 1631
Relinquished by	Sample Storage	Rough Prep	Prep	Separations	Count Room	KCB	5/3/19 1102
Received by	Sample Storage	Rough Prep	Prep	Separations	Count Room	DB	5/3/19 1420
Relinquished by	Sample Storage	Rough Prep	Prep	Separations	Count Room	DB	5/8/19 1455
Received by	Sample Storage	Rough Prep	Prep	Separations	Count Room	KCB	5/8/19 1501
Relinquished by	Sample Storage	Rough Prep	Prep	Separations	Count Room	KCB	5/8/19 1714
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		




Internal Chain of Custody

Work Order #	19-04087
Lab Deadline	4/22/2019
Analysis	TDS - Level 4
Sample Matrix	Water

Comments	Sample Fraction	HP 210 / 270 Detector Activity	Storage Location
	04	39	II1.4
	05	38	II1.4
	06	30	II1.4
	07	36	II1.4
	08	25	II1.4
	09	33	II1.4
	10	33	II1.4
	11	29	II1.4
	12	36	II1.4
	13	22	II1.4
	14	34	II1.4
	15	40	II1.4
	16	36	II1.4
	17	42	II1.4
	18	37	II1.4
	19	35	II1.4

	Location (circle one)					Initials	Date
Received by	<u>Sample Storage</u>	Rough Prep	Prep	Separations	Count Room	<i>glw</i>	<i>4-22-19</i>
Relinquished by	Sample Storage	Rough Prep	Prep	Separations	Count Room	<i>230</i>	<i>4-23-19</i>
Received by	Sample Storage	Rough Prep	Prep	Separations	Count Room		
Relinquished by	Sample Storage	Rough Prep	Prep	Separations	Count Room		
Received by	Sample Storage	Rough Prep	Prep	Separations	Count Room		
Relinquished by	Sample Storage	Rough Prep	Prep	Separations	Count Room		
Received by	Sample Storage	Rough Prep	Prep	Separations	Count Room		
Relinquished by	Sample Storage	Rough Prep	Prep	Separations	Count Room		
Received by	Sample Storage	Rough Prep	Prep	Separations	Count Room		
Relinquished by	Sample Storage	Rough Prep	Prep	Separations	Count Room		
Received by	Sample Storage	Rough Prep	Prep	Separations	Count Room		
Relinquished by	Sample Storage	Rough Prep	Prep	Separations	Count Room		

	Sample Receiving Report (Volumes, pH, & CPM)	Internal Work Order 19-04087
		Received By
		RSPENCER

FR	ClientID	# Btls	Comments	Matrix	Storage	Rec Vol Ttl	CPM Max
01	LCS	0		WA	II1.4		
02	BLANK	0		WA	II1.4		
03	DUP	0		WA	II1.4		
04	BC 27A ✓	1		WA	II1.4	3.76	39
			Container Number	pH Orig	pH Final	Volume (L)	CPM
			1	7	7	3.7600	39
05	BC 27B ✓	1		WA	II1.4	3.76	38
			Container Number	pH Orig	pH Final	Volume (L)	CPM
			1	7	7	3.7600	38
06	BC 26 ✓	1		WA	II1.4	3.76	30
			Container Number	pH Orig	pH Final	Volume (L)	CPM
			1	7	7	3.7600	30
07	BC 11 ✓	1		WA	II1.4	3.76	36
			Container Number	pH Orig	pH Final	Volume (L)	CPM
			1	7	7	3.7600	36
08	BC 12 ✓	1		WA	II1.4	3.76	25
			Container Number	pH Orig	pH Final	Volume (L)	CPM
			1	7	7	3.7600	25
09	BC 24A ✓	1		WA	II1.4	3.76	33
			Container Number	pH Orig	pH Final	Volume (L)	CPM
			1	7	7	3.7600	33
10	BC 24B ✓	1		WA	II1.4	3.76	33
			Container Number	pH Orig	pH Final	Volume (L)	CPM
			1	7	7	3.7600	33
11	BC 21B ✓	1		WA	II1.4	3.76	29
			Container Number	pH Orig	pH Final	Volume (L)	CPM
			1	7	7	3.7600	29
12	BC 21A ✓	1		WA	II1.4	3.76	36
			Container Number	pH Orig	pH Final	Volume (L)	CPM
			1	7	7	3.7600	36
13	BC 13 ✓	1		WA	II1.4	3.76	22
			Container Number	pH Orig	pH Final	Volume (L)	CPM
			1	7	7	3.7600	22
14	BC 14 ✓	1		WA	II1.4	3.76	34
			Container Number	pH Orig	pH Final	Volume (L)	CPM
			1	7	7	3.7600	34
15	BC 28B ✓	1		WA	II1.4	3.76	40
			Container Number	pH Orig	pH Final	Volume (L)	CPM
			1	7	7	3.7600	40
16	BC 28A ✓	1		WA	II1.4	3.76	36
			Container Number	pH Orig	pH Final	Volume (L)	CPM
			1	7	7	3.7600	36
17	BC 16 ✓	1		WA	II1.4	3.76	42
			Container Number	pH Orig	pH Final	Volume (L)	CPM
			1			3.7600	42
18	BC 15 ✓	1		WA	II1.4	3.76	37
			Container Number	pH Orig	pH Final	Volume (L)	CPM
			1	7	7	3.7600	37
19	BC 22A ✓	1		WA	II1.4	3.76	35
			Container Number	pH Orig	pH Final	Volume (L)	CPM
			1	7	7	3.7600	35

✓
WJ
4/18/19

Received by: *Randolph Spencer* Date: *4-17-19*

MP-001, Rev 5
Effective: 11/22/02

0010

SECTION II
SAMPLE ACKNOWLEDGEMENT

Eberline Services - Oak Ridge Laboratory

SAMPLE RECEIPT CHECKLIST
MP-001-2

WORK ORDER # 19-04087

SAMPLE MATRIX/MATRICES:

(CIRCLE ONE OR BOTH)

AQUEOUS NON-AQUEOUS

WERE SAMPLES:

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

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: Randolph Spencer DATE: 4-19-19

SECTION III
CASE NARRATIVE



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

EBS-OR-45649

July 2, 2019

Dave Upthegrove
ERM
840 W Sam Houston Pkwy N #600
Houston, TX 77478

CASE NARRATIVE
Work Order # 19-04087-OR

SAMPLE RECEIPT

This work order contains sixteen water samples received 04/17/2019. Samples were analyzed for Radium-226/228 and Total Dissolved Solids.

<u>CLIENT ID</u>	<u>LAB ID</u>	<u>CLIENT ID</u>	<u>LAB ID</u>
BC 27A	19-04087-04	BC 21A	19-04087-12
BC 27B	19-04087-05	BC 13	19-04087-13
BC 26	19-04087-06	BC 14	19-04087-14
BC 11	19-04087-07	BC 28B	19-04087-15
BC 12	19-04087-08	BC 28A	19-04087-16
BC 24A	19-04087-09	BC 16	19-04087-17
BC 24B	19-04087-10	BC 15	19-04087-18
BC 21B	19-04087-11	BC 22A	19-04087-19

ANALYTICAL METHODS

Radium-226 was analyzed using EPA Method 903.0 Modified. Radium-228 was analyzed using EPA Method 904.0. Total Dissolved Solids were performed using Standard Methods 2540C.

ANALYTICAL RESULTS

Combined Standard Uncertainty is reported at 1-sigma value.

Minimum Detectable Activity (MDA) values for data represented in this report are sample-specific. MDA measurements are determined based on factors and conditions including instrument settings, aliquot size and matrix type.

ANALYTICAL RESULTS CONTINUED

RADIUM-226

Samples were prepared by removing representative aliquots followed by mixed acid digestions as appropriate. This was followed by precipitations of Radium/Barium Sulfate. Precipitates were dissolved in alkaline EDTA. Radium was selectively precipitated and then mounted on micro-porous filter media. Samples were counted by alpha spectroscopy using an energy specific region of interest for Radium-226. Inherent self-absorption from elemental Barium was corrected for in the final result. 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 an acceptable result. Results for the Radium-226 duplicate demonstrated a high relative percent difference; however, normalized difference is within acceptable limits for the analytical technique. Results for the Radium-226 laboratory control sample demonstrated an acceptable percent recovery.

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 an acceptable result. 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.

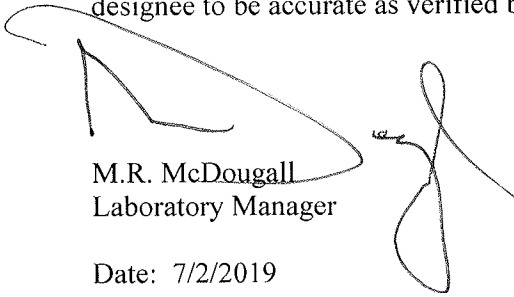
TOTAL DISSOLVED SOLIDS (TDS)

A volumetric aliquot of each sample was filtered through 0.45µm filter media into a tared 250ml beaker. Samples were dried on a hot plate and were allowed to cool. The TDS content was determined by reweighing tared beakers.

Samples demonstrated Total Dissolved Solids content that ranged from 1,898.0 to 112,377.0 mg/L.

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: 7/2/2019

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

SECTION IV
ANALYTICAL RESULTS SUMMARY

Eberline Analytical

Final Report of Analysis

Work Order Details:

SDG: **19-04087**
 Project: 0494255 Hero Lands
 Analysis Category: ENVIRONMENTAL
 Sample Matrix: WA

Report To:

Dave Uptegrove
 ERM
 840 W Sam Houston Pkwy N Suite 600
 Houston, TX 77478

Lab ID	Sample Type	Client ID	Sample Date	Receipt Date	Analysis Date	Batch ID	Analyte	Method	Result	CU	CSU	MDA	Report Units
19-04087-01	LCS	KNOWN	04/18/19 00:00	4/17/2019	5/3/2019	19-04087	Radium-226	EPA 903.0 Modified	1.00E+01	4.61E-01			pCi/l
19-04087-01	LCS	SPIKE	04/18/19 00:00	4/17/2019	5/3/2019	19-04087	Radium-226	EPA 903.0 Modified	1.04E+01	1.49E+00	2.65E+00	3.84E-01	pCi/l
19-04087-02	MBL	BLANK	04/18/19 00:00	4/17/2019	5/3/2019	19-04087	Radium-226	EPA 903.0 Modified	-6.74E-02	9.70E-02	9.80E-02	3.13E-01	pCi/l
19-04087-03	DUP	BC 12	04/02/19 16:15	4/17/2019	5/3/2019	19-04087	Radium-226	EPA 903.0 Modified	2.79E-01	1.79E-01	1.89E-01	1.90E-01	pCi/l
19-04087-04	TRG	BC 27A	04/02/19 10:30	4/17/2019	5/3/2019	19-04087	Radium-226	EPA 903.0 Modified	8.01E+00	1.67E+00	2.38E+00	8.21E-01	pCi/l
19-04087-05	TRG	BC 27B	04/02/19 11:52	4/17/2019	5/3/2019	19-04087	Radium-226	EPA 903.0 Modified	6.02E-01	2.68E-01	2.97E-01	2.08E-01	pCi/l
19-04087-06	TRG	BC 26	04/02/19 13:10	4/17/2019	5/3/2019	19-04087	Radium-226	EPA 903.0 Modified	2.62E+01	3.20E+00	6.40E+00	7.63E-01	pCi/l
19-04087-07	TRG	BC 11	04/02/19 14:40	4/17/2019	5/3/2019	19-04087	Radium-226	EPA 903.0 Modified	2.40E+00	6.86E-01	8.53E-01	2.80E-01	pCi/l
19-04087-08	DO	BC 12	04/03/19 07:55	4/17/2019	5/3/2019	19-04087	Radium-226	EPA 903.0 Modified	4.18E-01	2.97E-01	3.10E-01	2.83E-01	pCi/l
19-04087-09	TRG	BC 24A	04/03/19 09:25	4/17/2019	5/3/2019	19-04087	Radium-226	EPA 903.0 Modified	5.74E+00	1.21E+00	1.71E+00	4.62E-01	pCi/l
19-04087-10	TRG	BC 24B	04/03/19 11:15	4/17/2019	5/3/2019	19-04087	Radium-226	EPA 903.0 Modified	3.84E+00	7.79E-01	1.13E+00	2.70E-01	pCi/l
19-04087-11	TRG	BC 21B	04/03/19 13:15	4/17/2019	5/3/2019	19-04087	Radium-226	EPA 903.0 Modified	2.09E+00	5.81E-01	7.30E-01	1.97E-01	pCi/l
19-04087-12	TRG	BC 21A	04/03/19 15:15	4/17/2019	5/3/2019	19-04087	Radium-226	EPA 903.0 Modified	1.58E+00	5.31E-01	6.27E-01	3.80E-01	pCi/l
19-04087-13	TRG	BC 13	04/03/19 17:05	4/17/2019	5/3/2019	19-04087	Radium-226	EPA 903.0 Modified	2.73E+01	5.13E+00	7.72E+00	2.17E+00	pCi/l
19-04087-14	TRG	BC 14	04/08/19 10:45	4/17/2019	5/3/2019	19-04087	Radium-226	EPA 903.0 Modified	5.92E-01	3.33E-01	3.56E-01	2.98E-01	pCi/l
19-04087-15	TRG	BC 28B	04/08/19 12:15	4/17/2019	5/3/2019	19-04087	Radium-226	EPA 903.0 Modified	2.04E-01	2.15E-01	2.20E-01	3.02E-01	pCi/l
19-04087-16	TRG	BC 28A	04/08/19 15:15	4/17/2019	5/3/2019	19-04087	Radium-226	EPA 903.0 Modified	7.96E+00	1.81E+00	2.47E+00	7.71E-01	pCi/l
19-04087-17	TRG	BC 16	04/08/19 16:45	4/17/2019	5/3/2019	19-04087	Radium-226	EPA 903.0 Modified	7.13E+01	1.16E+01	1.90E+01	2.62E+00	pCi/l
19-04087-18	TRG	BC 15	04/08/19 16:45	4/17/2019	5/3/2019	19-04087	Radium-226	EPA 903.0 Modified	2.53E+01	4.96E+00	7.29E+00	1.82E+00	pCi/l
19-04087-19	TRG	BC 22A	04/09/19 08:30	4/17/2019	5/3/2019	19-04087	Radium-226	EPA 903.0 Modified	1.80E+01	2.76E+00	4.70E+00	6.86E-01	pCi/l

CU=Counting Uncertainty;CSU=Combined Standard Uncertainty (1-sigma);MDA=Minimal Detected Activity;LCS=Laboratory Control Sample; MBL=Blank; DUP=Duplicate; TRG=Normal Sample; DO=Duplicate Original



EBERLINE
ANALYTICAL

EBERLINE ANALYTICAL CORPORATION

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

Eberline Analytical

Final Report of Analysis

Report To: Dave Upthegrove										Work Order Details: 19-04087									
ERM										SDG: 0494255 Hero Lands		Project: ENVIRONMENTAL		Analysis Category: ENVIRONMENTAL					
840 W Sam Houston Pkwy N Suite 600 Houston, TX 77478										Sample Matrix: WA		Result		CSU		MDA		Report Units	
Lab ID	Sample Type	Client ID	Sample Date	Receipt Date	Analysis Date	Batch ID	Analyte	Method	Result	CU	CSU	MDA	Report Units						
19-04087-01	LCS	KNOWN	04/18/19 00:00	4/17/2019	5/8/2019	19-04087	Radium-228	EPA 904.0	9.25E+00	4.72E-01			pCi/l						
19-04087-01	LCS	SPIKE	04/18/19 00:00	4/17/2019	5/8/2019	19-04087	Radium-228	EPA 904.0	8.65E+00	7.29E-01	2.09E+00	8.68E-01	pCi/l						
19-04087-02	MBL	BLANK	04/18/19 00:00	4/17/2019	5/8/2019	19-04087	Radium-228	EPA 904.0	5.61E-02	3.44E-01	3.44E-01	7.34E-01	pCi/l						
19-04087-03	DUP	BC 12	04/02/19 16:15	4/17/2019	5/8/2019	19-04087	Radium-228	EPA 904.0	2.77E-01	4.29E-01	4.34E-01	8.88E-01	pCi/l						
19-04087-04	TRG	BC 27A	04/02/19 10:30	4/17/2019	5/8/2019	19-04087	Radium-228	EPA 904.0	5.74E+00	5.86E-01	1.43E+00	6.91E-01	pCi/l						
19-04087-05	TRG	BC 27B	04/02/19 11:52	4/17/2019	5/8/2019	19-04087	Radium-228	EPA 904.0	1.01E+00	3.88E-01	4.50E-01	7.12E-01	pCi/l						
19-04087-06	TRG	BC 26	04/02/19 13:10	4/17/2019	5/8/2019	19-04087	Radium-228	EPA 904.0	9.89E+00	8.17E-01	2.38E+00	9.53E-01	pCi/l						
19-04087-07	TRG	BC 11	04/02/19 14:40	4/17/2019	5/8/2019	19-04087	Radium-228	EPA 904.0	1.67E+00	4.85E-01	6.14E-01	8.59E-01	pCi/l						
19-04087-08	DO	BC 12	04/03/19 07:55	4/17/2019	5/8/2019	19-04087	Radium-228	EPA 904.0	6.49E-01	3.94E-01	4.21E-01	7.71E-01	pCi/l						
19-04087-09	TRG	BC 24A	04/03/19 09:25	4/17/2019	5/8/2019	19-04087	Radium-228	EPA 904.0	4.62E+00	5.44E-01	1.18E+00	7.29E-01	pCi/l						
19-04087-10	TRG	BC 24B	04/03/19 11:15	4/17/2019	5/8/2019	19-04087	Radium-228	EPA 904.0	3.42E+00	6.30E-01	9.98E-01	1.03E+00	pCi/l						
19-04087-11	TRG	BC 21B	04/03/19 13:15	4/17/2019	5/8/2019	19-04087	Radium-228	EPA 904.0	1.74E+00	4.69E-01	6.12E-01	8.24E-01	pCi/l						
19-04087-12	TRG	BC 21A	04/03/19 15:15	4/17/2019	5/8/2019	19-04087	Radium-228	EPA 904.0	1.51E+00	4.91E-01	5.97E-01	9.01E-01	pCi/l						
19-04087-13	TRG	BC 13	04/03/19 17:05	4/17/2019	5/8/2019	19-04087	Radium-228	EPA 904.0	1.59E+01	9.18E-01	3.72E+00	8.70E-01	pCi/l						
19-04087-14	TRG	BC 14	04/03/19 17:45	4/17/2019	5/8/2019	19-04087	Radium-228	EPA 904.0	9.11E-01	4.55E-01	4.99E-01	8.72E-01	pCi/l						
19-04087-15	TRG	BC 28B	04/08/19 10:45	4/17/2019	5/8/2019	19-04087	Radium-228	EPA 904.0	8.71E-01	4.23E-01	4.67E-01	8.08E-01	pCi/l						
19-04087-16	TRG	BC 28A	04/08/19 12:15	4/17/2019	5/8/2019	19-04087	Radium-228	EPA 904.0	5.48E+00	6.32E-01	1.39E+00	8.73E-01	pCi/l						
19-04087-17	TRG	BC 16	04/08/19 15:15	4/17/2019	5/8/2019	19-04087	Radium-228	EPA 904.0	4.25E+01	1.41E+00	9.73E+00	7.97E-01	pCi/l						
19-04087-18	TRG	BC 15	04/08/19 16:45	4/17/2019	5/8/2019	19-04087	Radium-228	EPA 904.0	1.87E+01	1.03E+00	4.37E+00	1.04E+00	pCi/l						
19-04087-19	TRG	BC 22A	04/09/19 08:30	4/17/2019	5/8/2019	19-04087	Radium-228	EPA 904.0	1.09E+01	7.67E-01	2.59E+00	8.26E-01	pCi/l						

CU=Counting Uncertainty; CSU=Combined Standard Uncertainty (1-sigma); MDA=Minimal Detected Activity; LCS=Laboratory Control Sample; MBL=Blank; DUP=Duplicate; TRG=Normal Sample; DO=Duplicate Original



EBERLINE
ANALYTICAL

EBERLINE ANALYTICAL CORPORATION

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

Lab ID		Sample Type		Client ID		Report To:				Work Order Details:			
						Sample Date	Receipt Date	Analysis Date	Batch ID	Analyte	Method	Result	CU
Eberline Analytical Final Report of Analysis						Dave Upthegrove ERM 840 W Sam Houston Pkwy N Suite 600 Houston, TX 77478				SDG: 19-04087 Project: 0494255 Hero Lands Analysis Category: ENVIRONMENTAL Sample Matrix: WVA			
19-04087-04	TRG	BC 27A	04/02/19 10:30	4/17/2019	4/23/2019	19-04087	TDS	SM2540C	3.42E+04				mg/l
19-04087-05	TRG	BC 27B	04/02/19 11:52	4/17/2019	4/23/2019	19-04087	TDS	SM2540C	9.65E+03				mg/l
19-04087-06	TRG	BC 26	04/02/19 13:10	4/17/2019	4/23/2019	19-04087	TDS	SM2540C	4.45E+04				mg/l
19-04087-07	TRG	BC 11	04/02/19 14:40	4/17/2019	4/23/2019	19-04087	TDS	SM2540C	1.69E+04				mg/l
19-04087-08	TRG	BC 12	04/02/19 16:15	4/17/2019	4/23/2019	19-04087	TDS	SM2540C	1.90E+03				mg/l
19-04087-09	TRG	BC 24A	04/03/19 07:55	4/17/2019	4/23/2019	19-04087	TDS	SM2540C	2.48E+04				mg/l
19-04087-10	TRG	BC 24B	04/03/19 09:25	4/17/2019	4/23/2019	19-04087	TDS	SM2540C	1.99E+04				mg/l
19-04087-11	TRG	BC 21B	04/03/19 11:15	4/17/2019	4/23/2019	19-04087	TDS	SM2540C	1.12E+05				mg/l
19-04087-12	TRG	BC 21A	04/03/19 13:15	4/17/2019	4/23/2019	19-04087	TDS	SM2540C	1.57E+04				mg/l
19-04087-13	TRG	BC 13	04/03/19 15:15	4/17/2019	4/23/2019	19-04087	TDS	SM2540C	7.72E+04				mg/l
19-04087-14	TRG	BC 14	04/03/19 17:05	4/17/2019	4/23/2019	19-04087	TDS	SM2540C	7.45E+03				mg/l
19-04087-15	TRG	BC 28B	04/08/19 10:45	4/17/2019	4/23/2019	19-04087	TDS	SM2540C	2.97E+03				mg/l
19-04087-16	TRG	BC 28A	04/08/19 12:15	4/17/2019	4/23/2019	19-04087	TDS	SM2540C	3.24E+04				mg/l
19-04087-17	TRG	BC 16	04/08/19 15:15	4/17/2019	4/23/2019	19-04087	TDS	SM2540C	1.09E+05				mg/l
19-04087-18	TRG	BC 15	04/08/19 16:45	4/17/2019	4/23/2019	19-04087	TDS	SM2540C	7.00E+04				mg/l
19-04087-19	TRG	BC 22A	04/09/19 08:30	4/17/2019	4/23/2019	19-04087	TDS	SM2540C	6.24E+04				mg/l

CU=Counting Uncertainty;CSU=Combined Standard Uncertainty (1-sigma);MDA=Minimal Detected Activity;LCS=Laboratory Control Sample; MBL=Blank; DUP=Duplicate; TRG=Normal Sample; DO=Duplicate Original



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

SECTION V
ANALYTICAL STANDARD



Ba-6
(#6a)

National Institute of Standards & Technology

Certificate

ORIGINAL

Standard Reference Material 4251C Barium-133 Radioactivity Standard

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



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 4/26/19
NIST SRM4251C Solution # Ba-6a

Principal Radionuclide	Half Life, Years	Half Life, Days
<u>¹³³Ba</u>	<u>1.048E+01</u>	<u>3.828E+03</u>

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

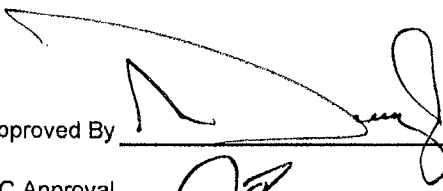

SECONDARY VOLUMETRIC DILUTION

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

Expiration Date: April 25, 2020

Verified & Approved By 
QC Approval 

Date: 4/26/19
Date: 4/26/19

CERTIFICATE OF CALIBRATION ALPHA STANDARD SOLUTION

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

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

Description of Solution

a. Mass of solution: 5.1864 g (in a 5 ml Flame Sealed Ampoule)
b. Chemical form: Ra(NO₃)₂ in 1 N HNO₃
c. Carrier content: None added
d. Density: 1.0318 g/ml @ 20°C.

Radioimpurities: None detected (other than daughters)

Radioactive Daughters

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

Radionuclide Concentration

(Ra-226) 0.1929 μCi/g.

Method of Calibration

Weighed aliquots of the solution were assayed using gamma spectrometry:

Energy peak(s) integrated under: 186 keV.
Branching ratio(s) used: 0.0351 gamma rays per decay.

Uncertainty of Measurement

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

NIST Traceability

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

Leak Test(s)

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

Notes

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



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

Ana U. Kuen
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

SOLUTION REFERENCE # IPL 453-26 CURRENT DATE 9/17/2018 0:00
SOLUTION # Ra-5

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

Radionuclide ²²⁶Radium Reference Date 2/1/1994 0:00
Certified Activity 1.001E+00 μCi
Certified Concentration $\mu\text{Ci per gram}$

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

Chemical Composition of Standard Solution
²²⁶Ra(NO₃)₂ in 1M HNO₃

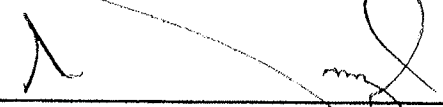
Dilution Instructions: Dilution Solvent Used 1M HNO₃

Dilute to a volume of 1000.00 milliliters

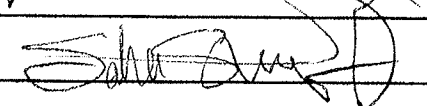
Certified Total Activity of 1.0010 μCi Which Equals 2.222E+06 dpm at the date listed above

And after dilution the activity of this solution is 2.222E+03 dpm/ml
This activity concentration is based on the original reference date listed above. All activities are corrected to the date and time of analysis by the laboratory data processing software.

Expiration Date: September 10, 2019

Verified & Approved By 

Date: 9/17/2018

QC Approval 

Date: 9/18/18



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 9/17/2018 0:00
Solution # Ra-5b

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

Radionuclide of Interest ²²⁶Radium Reference Date 2/1/1994 0:00
Parent Solution Conc. 2.22E+03 dpm/ml

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 Activity Concentration: 4.4440E+01 dpm/ml
Final Volume: 1000.00 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: 10-Sep-19

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

Date: 9/17/2018 0:00
Date: 9/18/18

ANALYTICS

#411 Rec'd 2/15/06 Printed

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

Phone (404) 352-8677

Fax (404) 352-2837

CERTIFICATE OF CALIBRATION
Standard Radionuclide Source

72325-207

Ra²²⁸

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):	4.022 E3
HALF-LIFE:	5.75 years
CALIBRATION DATE:	February 10, 2006 12:00 EST
RELATIVE EXPANDED UNCERTAINTY (k=2):	4.0%

Impurities: γ -impurities <0.1%

5.10721 grams 0.1M HCl solution with 50 μ g/g Ba carrier.

P O NUMBER 00003181, Item 1

SOURCE PREPARED BY: *M. Taskaeva*
M. Taskaeva, Radiochemist

Q A APPROVED: *W.M. [Signature] 2-13-06*



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 7235-207 CURRENT DATE 2/5/2019 0:00
SOLUTION # Ra-12

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

Radionuclide ²²⁸Ra Reference Date 2/10/2006 0:00
Certified Activity 1.087E-01 μCi
Certified Concentration $\mu\text{Ci per gram}$

Ampoule /Solution Gross 9.0741 Weight, Grams
Empty Ampoule 3.9858 Weight, Grams
Solution Net 5.0883 Weight, Grams
Total Activity in Ampoule 0.1087 μCi

Chemical Composition of Standard Solution
²²⁸Ra(NO₃)₂ in 0.5 M HCl

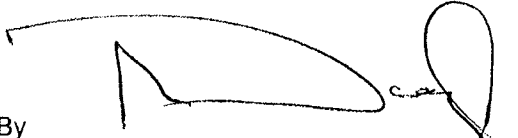
Dilution Instructions: Dilution Solvent Used 0.5 M HCl

Dilute to a volume of 991.00 Kg


Certified Total Activity of 0.1087 μCi Which Equals 2.413E+05 dpm at the date listed above

And after dilution the activity of this solution is 2.435E+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: January 31, 2020

Recertified By 

Date: 2/5/19

QC Approval 

Date: 2/5/19

SECTION VI
QUALITY CONTROL SAMPLE RESULTS SUMMARY

WO	Analysis	Run	Activity Units	Aliquot Units	Client Name
19-04087	Ra226	1	pCi	I	Michael Pisani & Associates, Inc.

Laboratory Control Sample

Analyte	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	103.40%	25.58%	100.00%	4.60%	1.00E+01	4.61E-01	1.04E+01	2.65E+00	Ra-5b	4.40E+01	4.60E+00	5.06E-01

Matrix Spike

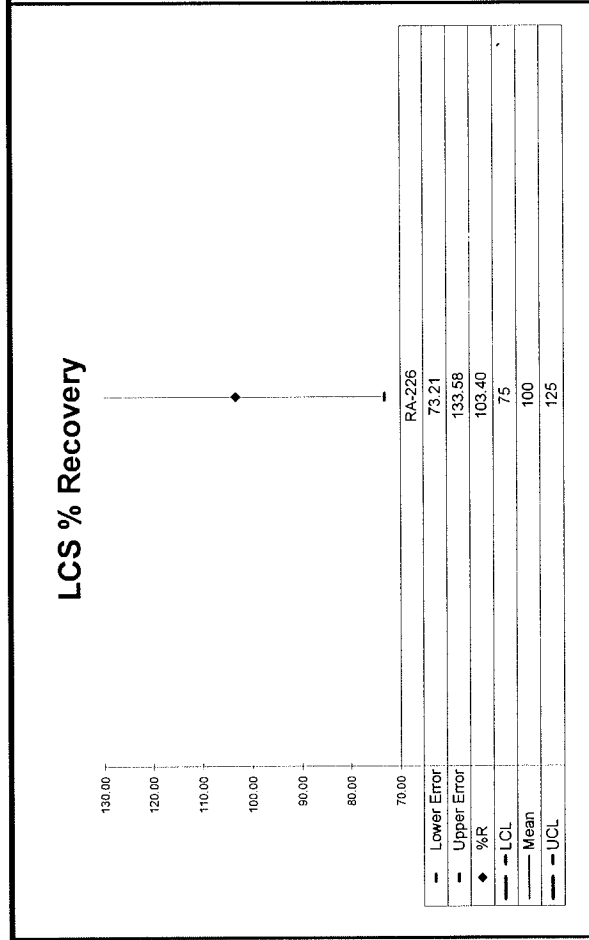
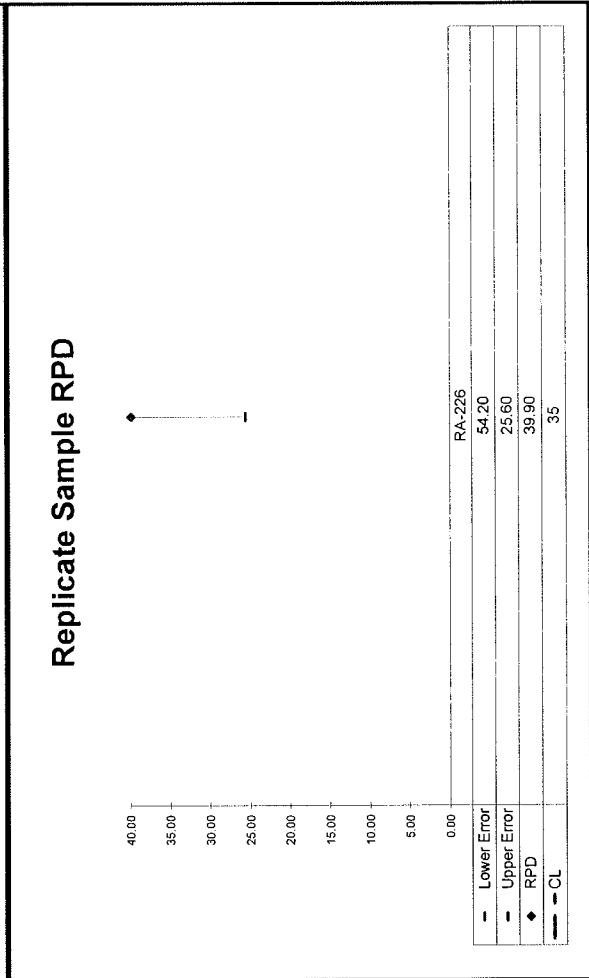
Analyte	Normalized Difference	MS Actual % Rec	Expected MS Result	Expected MS Uncert	Actual MS Result	Actual MS CSU	Sample Result	Sample CSU	Sample Aliquot	Standard ID	Standard ACT (dpm)	Standard Error %	Standard Added (g)

Duplicate Results

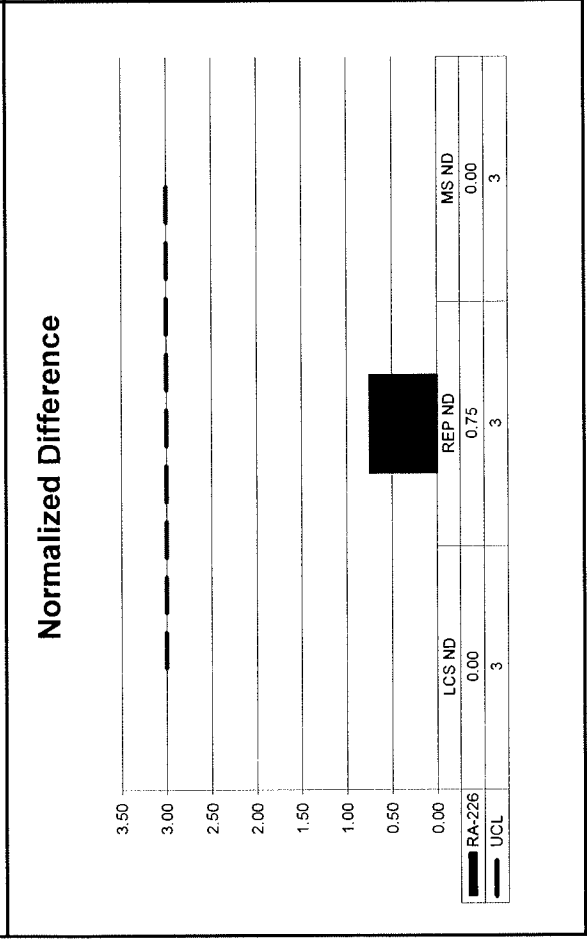
Analyte	Normalized Difference	RPD	Original Result	Original CSU	Duplicate Result	Duplicate CSU	LCS Relative Bias	LCS % R	MS % R	MS ND	Rep RPD	Rep ND
RA-226	0.75	39.90	4.18E-01	3.10E-01	2.79E-01	1.89E-01	1.03	OK			INV	OK

QC Summary

WO	Analysis	Run	Activity Units	Aliquot Units	Client Name
19-04087	Ra226	1	pCi	I	Michael Pisani & Associates, Inc.



No Matrix Spike



WO	Analysis	Run	Activity Units	Aliquot Units	Client Name
19-04087	Ra228	1	pCi	I	Michael Pisani & Associates, Inc.

Laboratory Control Sample

Analyte	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	93.53%	24.16%	100.00%	5.10%	9.25E+00	4.72E-01	8.65E+00	2.09E+00	Ra-12	4.94E+01	5.10E+00	4.16E-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)

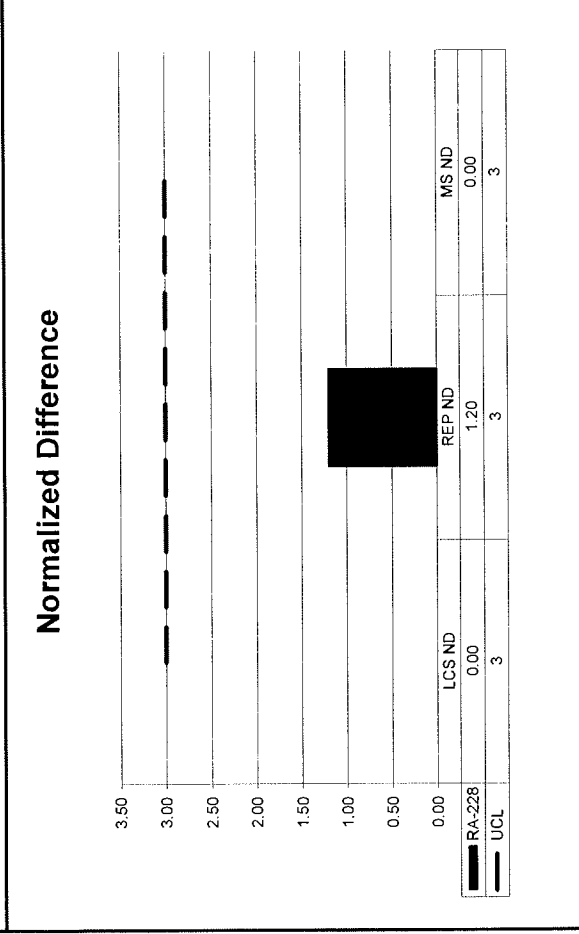
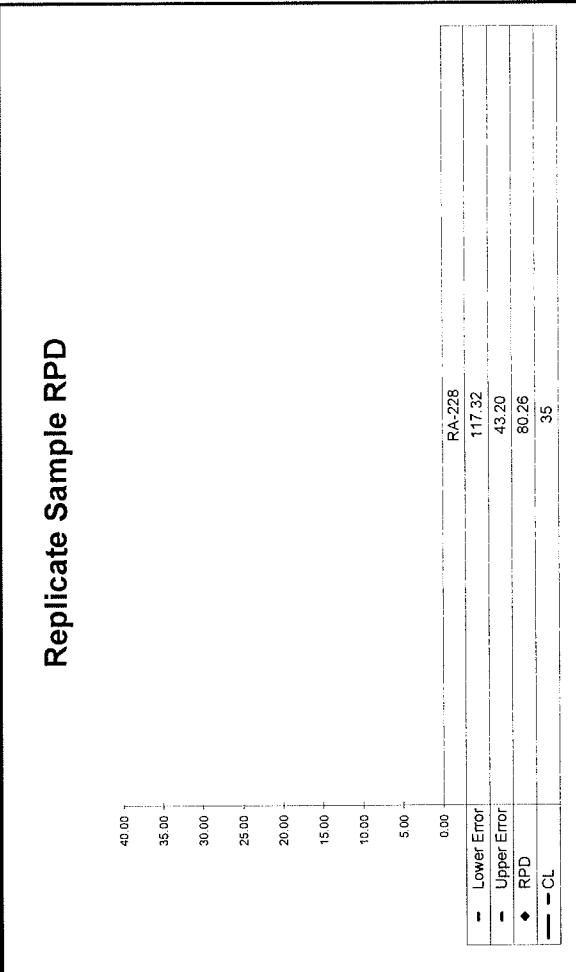
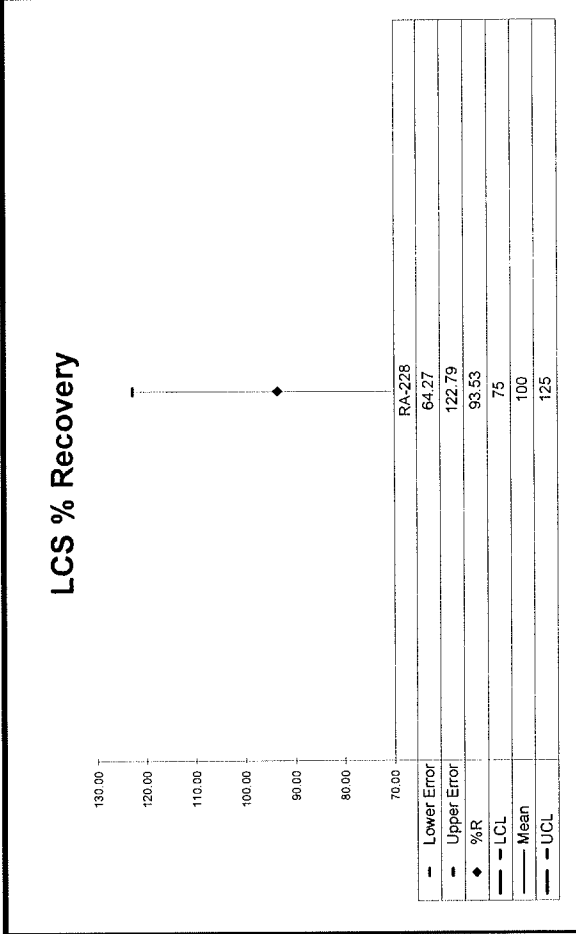
Duplicate Results

Analyte	Normalized Difference	RPD	Original Result	Original CSU	Duplicate Result	Duplicate CSU	LCS Relative Bias	LCS % R	MS % R	MS ND	Rep RPD	Rep ND
RA-228	1.20	80.26	6.49E-01	4.21E-01	2.77E-01	4.34E-01	0.94	OK			INV	OK

QC Summary

Analyte	Normalized Difference	RPD	Original Result	Original CSU	Duplicate Result	Duplicate CSU	LCS Relative Bias	LCS % R	MS % R	MS ND	Rep RPD	Rep ND

WO	Analysis	Run	Activity Units	Aliquot Units	Client Name
19-04087	Ra228	1	pCi	I	Michael Pisani & Associates, Inc.



No Matrix Spike

SECTION VII
LABORATORY TECHNICIAN'S NOTES

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	19-04087
		Analysis Code	Ra226
		Run Number	1

#	Date	Dept	User	Notes
1	04/26/19 11:01	PREP	JHARVEY	ALIUQUOTED AND FILTERED FRACTIONS 4,6,7,9,12,13,16-19- 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

J Harvey
 4/26/19

 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	19-04087
		Analysis Code	Ra226
		Run Number	1

#	Date	Dept	User	Notes
1	04/26/19 11:01	PREP	JHARVEY	ALIUQUOTED AND FILTERED FRACTIONS 4,6,7,9,12,13,16-19- 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	05/02/19 16:09	CHEM	DBUSH	ADDED EDTA TO SAMPLES AND LET SIT. ADDED AMMONIUM SULFATE AND ACETIC ACID TO SAMPLES. FILTERED ONTO TARED FILTER PAPERS, LET DRY UNDER HEAT LAMP, REWEIGHED, AND SUBMITTED TO COUNT.

DBush
5/2/19



EBERLINE
SERVICES

Reagents Used in an Analysis

Internal Work Order

19-04087

Analysis Code

Run

Ra226

1

Reagent ID	Reagent Name	Reagent Concentration	Analyst ID	Date Recorded
020284P	Ammonium Hydroxide	Reagent Grade	JHARVEY	4/26/2019
020902D01	Ammonium Sulfate	200 mg/ml	JHARVEY	4/26/2019
020921D03	Barium Carrier	1 mg/ml	JHARVEY	4/26/2019
019767D02	Lead Carrier	166 mg/ml	JHARVEY	4/26/2019
020995P	Nitric Acid	Reagent Grade	JHARVEY	4/26/2019
020912P	Acetic Acid	Reagent Grade	DBUSH	5/2/2019
020416D03	Ammonium Sulfate	200 mg/ml	DBUSH	5/2/2019
020809S	EDTA	0.25M	DBUSH	5/2/2019

Alpha 1

Date	Sample #	Client	Load time	Count time	Analysis	Tech
4/26/19	System Bkgd	Lab	1751	16:20 hr	α	KB
4/27/19	Daily Pulser	Lab	1721	10 min	NA	KB
4/27/19	1903114A (1-6)	Zion	1419	2hr50 =	Am ²⁴¹	KB
4/29/19	Daily Pulser	Lab	0503	10 min	Na	KP
4/29/19	1904076A (1-3,5)	UCOR	0529	2hr50 min	Th	KP
4/29/19	1904076A (1,2)	UCOR	0530	2hr50 min	Th ²²⁹	KP
4/29/19	1904049A (18,19)	Zion	0851	2hr50 min	Pu	KP
4/29/19	1903116A (1-4)	Zion	0852	2hr50 min	Am ²⁴³	KP
4/29/19	1904076A (1-3,5,8)	UCOR	1133	2hr50 =	Pu	KB
4/30/19	Daily Pulser	Lab	0508	10 min	Na	KP
5/1/19	Daily Pulser	Lab	0517	10 min	Na	KP
5/1/19	1904077A (1-4,7)	UCOR	0841	2hr50 min	Pu	KP
5/1/19	1904077A (1)	UCOR	0841	2hr50 min	Pu ²⁴²	KP
5/1/19	1904077A (1-4)	UCOR	1135	2hr50 =	Uu	KB
5/1/19	1904077A (4)	UCOR	1136	2hr50 =	UuNT	KB
5/2/19	Daily Pulser	Lab	0512	10 min	Na	KP
5/2/19	1903117A (1-6)	Zion	0820	2hr50 min	Am ²⁴³	KP
5/2/19	1904094A (1-6)	MD Dept of Health	1119	16 hrs	Uu	KB
5/3/19	Daily Pulser	Lab	0510	10 min	Na	KP
5/3/19	1904087A (1-6)	MPA	0752	2hr50 min	Ra ²²⁶	KP

Alpha 3

15


Date	Sample #	Client	Loadtime	Counttime	Analysis	Tech
4/29/19	1904076A (1-3,5)	UCOR	0833	2hr50min	Am ²⁴¹	KP
4/29/19	1904076A (1-3,5)	UCOR	0834	2hr50min	Am ²⁴³	KP
4/29/19	1904067A (1-4)	Access	1137	2hr50-	Ra ²²⁶	KB
4/29/19	1904069A (1-4)	Access	1138	2hr50-	Ra ²²⁶	KB
4/29/19	1904076A (1-3,5)	UCOR	1142	2hr50-	Pa ²¹²	KB
4/29/19	1904129A (1)	USA	1148	2hr50-	Uu	KB
4/29/19	1904076A (1)	UCOR	1436	2hr50-	Pu	KB
4/30/19	Daily Pulser	Lab	0508	10 min	Na	KP
4/30/19	1903117A (1-15)	Zion	0803	2hr50min	Am ²⁴¹	KP
4/30/19	1904076A (1-3,5)	UCOR	0804	2hr50min	Np	KP
4/30/19	1904129A (1-4)	USA	1059	2hr50-	Ra ²²⁶	KB
4/30/19	1904080A (1-6)	Gulf Coast	1117	2hr50-	Ra ²²⁶	KB
5/1/19	Daily Pulser	Lab	0517	10 min	Na	KP
5/1/19	1904077A (2-4)	UCOR	0841	2hr50min	Pu ²⁴²	KP
5/1/19	1903117A (1-15)	Zion	0849	2hr50min	Np	KP
5/1/19	1904077A (1-4)	UCOR	0853	2hr50min	Np	KP
5/1/19	1904093A (1-7)	TN Dept of Health	1143	2hr50-	Uu	KB
5/1/19	1904077A (1-4)	UCOR	1144	2hr50-	Th	KB
5/1/19	1904077A (1-4)	UCOR	1145	2hr50-	Th ²³²	KB
5/1/19	1904076A (1-3,5)	UCOR	1422	2hr50-	Ra ²²⁶	KB
5/1/19	1904077A (1-4)	UCOR	1438	2hr50-	Ra ²²⁶	KB
5/1/19	1904093A (1-4)	TN Dept of Health	1448	2hr50-	Uu	KB
5/1/19	1904089A (1-7)	MPA	1626	2hr50-	Ra ²²⁶	KB
5/2/19	Daily Pulser	Lab	0512	10 min	Na	KP
5/2/19	1903117A (7-15)	Zion	0820	2hr50min	Am ²⁴³	KP
5/2/19	1904077A (1-4)	UCOR	0821	2hr50min	Am ²⁴¹	KP
5/2/19	1904077A (1-4)	UCOR	0821	2hr50min	Am ²⁴³	KP
5/2/19	1904094A (7-13)	TN Dept of Health	1119	1hr50-	Uu	KB
5/2/19	1904077A (1-4)	UCOR	1120	2hr50-	Am ²⁴¹	KB
5/3/19	Daily Pulser	Lab	0510	10 min	Na	KP
5/3/19	Cal Check (33-48)	Lab	0524	2hr30min	Na	KP
5/3/19	1904087A (7-19)	MPA	0759	2hr50min	Ra ²²⁶	KP
5/3/19	Cal Check (49-60)	Lab	0800	2hr30min	Na	KP

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	19-04087
		Analysis Code	Ra228
		Run Number	1

#	Date	Dept	User	Notes
1	04/26/19 11:01	PREP	JHARVEY	ALIQUOTED AND FILTERED FRACTIONS 4,6,7,9,12,13,16-19- 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

J. Harvey
 4/26/19

 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	19-04087
		Analysis Code	Ra228
		Run Number	1

#	Date	Dept	User	Notes
1	04/26/19 11:01	PREP	JHARVEY	ALIUQUOTED AND FILTERED FRACTIONS 4,6,7,9,12,13,16-19- 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	05/08/19 14:42	CHEM	DBUSH	ADDED FILTER PAPERS FROM COUNT ROOM TO LABELED C-TUBES, FILLED WITH EDTA SOLUTION AND LET SIT OVERNIGHT. REMOVED FILTER FROM EDTA-ADDED 2MLS YTTRIUM 9MG/ML CARRIER ADDED 18N NAOH TO SAMPLES AND RECORDED T1. HOT BATHED FOR 15 MIN, CENTRIFUGED AND DISCARDED SUPERNANT. ADDED 6N HNO3, DI WATER, AND 10N NAOH. HOT BATHED FOR 15 MIN, CENTRIFUGED AND DISCARDED SUPERNANT. ADDED 1N HNO3, DI WATER, AND AMMONIUM OXALATE. FILTERED ONTO TARED FILTER PAPERS. LET DRY UNDER HEAT LAMP, REWEIGHED AND SUBMITTED TO COUNT.

DBUSH
5/8/19



Reagents Used in an Analysis

Internal Work Order

19-04087

Analysis Code

Run

Ra228

1

Reagent ID	Reagent Name	Reagent Concentration	Analyst ID	Date Recorded
020284P	Ammonium Hydroxide	Reagent Grade	JHARVEY	4/26/2019
020902D01	Ammonium Sulfate	200 mg/ml	JHARVEY	4/26/2019
020921D03	Barium Carrier	1 mg/ml	JHARVEY	4/26/2019
019767D02	Lead Carrier	166 mg/ml	JHARVEY	4/26/2019
020995P	Nitric Acid	Reagent Grade	JHARVEY	4/26/2019
020416D04	Ammonium Oxalate	5%	DBUSH	5/8/2019
020241D07	Nitric Acid	1N	DBUSH	5/8/2019
020774D19	Nitric Acid	6N	DBUSH	5/8/2019
020241D06	Sodium Hydroxide	10M	DBUSH	5/8/2019
020241D05	Sodium Hydroxide	18M	DBUSH	5/8/2019
021061S	Yttrium Carrier	9 mg/ml	DBUSH	5/8/2019

Aqua CB4110

55

Date	Sample #	Client	Load time	Count time	Analysis	Tech
5/6/19	1904043 AB (1)	USA	0727	30 min	XB	KP
5/6/19	1904043 AB (2-5)	USA	0727	2 hrs	XB	KP
5/6/19	1904048 sr (1-7)	Zion	0729	2 hrs	TotSr	KP
5/6/19	1904048 sr (16-18)	Zion	0822	2 hrs	TotSr	KP
5/7/19	Daily Bldg/Qc	Lab	0514/0629	1hr/30 min	XB	KP
5/7/19	Cross Talk	Lab	0657	5 min	XB	KP
5/7/19	Cross Talk	Lab	0706	5 min	XB	KP
5/7/19	1904049 sr (1-13)	Zion	0718	2 hrs	TotSr	KP
5/7/19	1904049 sr (18)	Zion	0920	2 hrs	TotSr	KP
5/7/19	1904047 Np (9-18)	Zion	1242	10 min	Np	KP
5/8/19	Daily Bldg/Qc	Lab	0520/0628	1hr/30 min	XB	KP
5/8/19	Cross Talk	Lab	0709	5 min	XB	KP
5/8/19	Cross Talk	Lab	0715	5 min	XB	KP
5/8/19	1904048 Np (1-10)	Zion	1228	10 min	Np	KP
5/8/19	1904087 FRAC (9-19)	MPA	1514	2 hr	Refr	KB

Red LB4110

49

DATE	Sample #	Client	Lead Time	CT-Time	Analysis	Tech
5/8/19	1904027RA(1-8)	MPA	1514	2hr	Raw	KB

TDS NOTES



Work Order Analysis Notes

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

Internal Work Order

19-04087

Analysis Code

TDS

Run Number

1

#	Date	Dept	User	Notes
1	04/22/19 14:51	PREP	JPACHELLA	Samples were filtered, aliquoted into tared beakers, dried, and reweighed.

4-22-19 JPachella

SECTION VIII
ANALYTICAL DATA (RADIUM-226)

Work Order	19-04087
Analysis Code	Ra226
Run	1
Date Received	4/17/2019
Lab Deadline	4/30/2019
Client	Michael Pisani & Associates, Inc.
Project	HERO LANDS
Report Level	4
Activity Units	pCi
Aliquot Units	I
Matrix	WA
Method	EPA 903.0 Modified
Instrument Type	Alpha Spectroscopy
Radiometric Tracer	Ba-133
Radiometric Sol#	Ba-6a
Tracer Act (dpm/g)	455.75
Carrier	
Carrier Conc (mg/ml)	

Internal Fraction	Sample Desc	Client ID	Login CPM	Sample Date	Sample Aliquot
01	LCS	LCS		04/18/19 00:00	1.0000E+00
02	MBL	BLANK		04/18/19 00:00	1.0000E+00
03	DUP	BC 12	25	04/02/19 16:15	1.0000E+00
04	TRG	BC 27A	39	04/02/19 10:30	5.0000E-01
05	TRG	BC 27B	38	04/02/19 11:52	1.0000E+00
06	TRG	BC 26	30	04/02/19 13:10	5.0000E-01
07	TRG	BC 11	36	04/02/19 14:40	1.0000E+00
08	DO	BC 12	25	04/02/19 16:15	1.0000E+00
09	TRG	BC 24A	33	04/03/19 07:55	1.0000E+00
10	TRG	BC 24B	33	04/03/19 09:25	1.0000E+00
11	TRG	BC 21B	29	04/03/19 11:15	1.0000E+00
12	TRG	BC 21A	36	04/03/19 13:15	1.0000E+00
13	TRG	BC 13	22	04/03/19 15:15	2.0000E-01
14	TRG	BC 14	34	04/03/19 17:05	1.0000E+00
15	TRG	BC 28B	40	04/08/19 10:45	1.0000E+00
16	TRG	BC 28A	36	04/08/19 12:15	5.0000E-01
17	TRG	BC 16	42	04/08/19 15:15	1.0000E-01
18	TRG	BC 15	37	04/08/19 16:45	2.0000E-01
19	TRG	BC 22A	35	04/09/19 08:30	5.0000E-01

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

19-04087
Ra226
Run 1

Eberline Services
Oak Ridge Laboratory
Analysis Sheet

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	2.1973	1001.4	666.0	147.64		0.0201	0.0310	0.0109		110.00	3.00^	1.00
02	MBL	2.1983	1001.9	537.0	118.99		0.0199	0.0315	0.0116		110.00	3.00^	1.00
03	DUP	2.1947	1000.2	459.0	101.87		0.0202	0.0252	0.0050		101.87	1.71	1.00
04	TRG	2.1927	999.3	685.0	152.17		0.0202	0.0286	0.0084		110.00	2.87	1.00
05	TRG	2.1901	998.1	553.0	123.00		0.0202	0.0257	0.0055		110.00	1.95	1.00
06	TRG	2.1906	998.4	434.0	96.51		0.0202	0.0294	0.0092		96.51	3.00^	1.00
07	TRG	2.1856	996.1	524.0	116.78		0.0199	0.0305	0.0106		110.00	3.00^	1.00
08	DO	2.1863	996.4	738.0	164.43		0.0199	0.0281	0.0082		110.00	2.82	1.00
09	TRG	2.1863	996.4	516.0	114.97		0.0200	0.0332	0.0132		110.00	3.00^	1.00
10	TRG	2.1857	996.1	419.0	93.38		0.0200	0.0265	0.0065		93.38	2.34	1.00
11	TRG	2.1859	996.2	475.0	105.85		0.0201	0.0264	0.0063		105.85	2.27	1.00
12	TRG	2.1854	996.0	716.0	159.59		0.0201	0.0267	0.0066		110.00	2.37	1.00
13	TRG	2.1829	994.9	601.0	134.11		0.0203	0.0286	0.0083		110.00	2.84	1.00
14	TRG	2.1815	994.2	443.0	98.92		0.0200	0.0277	0.0077		98.92	2.69	1.00
15	TRG	2.1820	994.4	703.0	156.94		0.0199	0.0276	0.0077		110.00	2.69	1.00
16	TRG	2.1810	994.0	470.0	104.97		0.0199	0.0283	0.0084		104.97	2.87	1.00
17	TRG	2.1785	992.9	541.0	120.97		0.0198	0.0309	0.0111		110.00	3.00^	1.00
18	TRG	2.1778	992.5	813.0	181.84		0.0199	0.0299	0.0100		110.00	3.00^	1.00
19	TRG	2.0900	952.5	662.0	154.29		0.0197	0.0319	0.0122		110.00	3.00^	1.00

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

19-04087
Ra226
Run 1

Eberline Services
Oak Ridge Laboratory
Analysis Sheet

Internal Fraction	Sample Desc	Rough Prep Date	Rough Prep By	Prep Date	Prep By	Sep t0 Date/Time	Sep t0 By	Sep t1 Date/Time	Sep t1 By
01	LCS			04/26/19 10:41	JHARVEY	05/02/19 10:05	DBUSH		
02	MBL			04/26/19 10:41	JHARVEY	05/02/19 10:05	DBUSH		
03	DUP			04/26/19 10:41	JHARVEY	05/02/19 10:05	DBUSH		
04	TRG			04/26/19 10:41	JHARVEY	05/02/19 15:20	DBUSH		
05	TRG			04/26/19 10:41	JHARVEY	05/02/19 10:05	DBUSH		
06	TRG			04/26/19 10:41	JHARVEY	05/02/19 15:20	DBUSH		
07	TRG			04/26/19 10:41	JHARVEY	05/02/19 10:05	DBUSH		
08	DO			04/26/19 10:41	JHARVEY	05/02/19 10:05	DBUSH		
09	TRG			04/26/19 10:41	JHARVEY	05/02/19 10:05	DBUSH		
10	TRG			04/26/19 10:41	JHARVEY	05/02/19 10:05	DBUSH		
11	TRG			04/26/19 10:41	JHARVEY	05/02/19 10:05	DBUSH		
12	TRG			04/26/19 10:41	JHARVEY	05/02/19 10:05	DBUSH		
13	TRG			04/26/19 10:41	JHARVEY	05/02/19 15:20	DBUSH		
14	TRG			04/26/19 10:41	JHARVEY	05/02/19 10:05	DBUSH		
15	TRG			04/26/19 10:41	JHARVEY	05/02/19 10:05	DBUSH		
16	TRG			04/26/19 10:41	JHARVEY	05/02/19 15:20	DBUSH		
17	TRG			04/26/19 10:41	JHARVEY	05/02/19 15:20	DBUSH		
18	TRG			04/26/19 10:41	JHARVEY	05/02/19 15:20	DBUSH		
19	TRG			04/26/19 10:41	JHARVEY	05/02/19 15:20	DBUSH		

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

	Client	Michael Pisani & Associates, Inc.
	Eberline Analytical Work Order	19-04087
	Analysis Code	Ra226
Run	1	

Lab Fraction	Nuclide	Sample Desc	Client Identification	Activity Units	Results	Error Estimate	MDA	LCS Known	LCS %R	LCS Flag	RPD Flag	MDA Flag	Blank Flag
01	RA-226	LCS	LCS	pCi/l	1.04E+01	1.49E+00	3.84E-01	1.00E+01	103.40	OK		OK	
02	RA-226	MBL	BLANK	pCi/l	-6.74E-02	9.70E-02	3.13E-01					OK	OK
03	RA-226	DUP	BC 12	pCi/l	2.79E-01	1.79E-01	1.90E-01				INV	OK	
04	RA-226	TRG	BC 27A	pCi/l	8.01E+00	1.67E+00	8.21E-01					OK	
05	RA-226	TRG	BC 27B	pCi/l	6.02E-01	2.68E-01	2.08E-01					OK	
06	RA-226	TRG	BC 26	pCi/l	2.62E+01	3.20E+00	7.63E-01					OK	
07	RA-226	TRG	BC 11	pCi/l	2.40E+00	6.86E-01	2.80E-01					OK	
08	RA-226	DO	BC 12	pCi/l	4.18E-01	2.97E-01	2.83E-01					OK	
09	RA-226	TRG	BC 24A	pCi/l	5.74E+00	1.21E+00	4.62E-01					OK	
10	RA-226	TRG	BC 24B	pCi/l	3.84E+00	7.79E-01	2.70E-01					OK	
11	RA-226	TRG	BC 21B	pCi/l	2.09E+00	5.81E-01	1.97E-01					OK	
12	RA-226	TRG	BC 21A	pCi/l	1.58E+00	5.31E-01	3.80E-01					OK	
13	RA-226	TRG	BC 13	pCi/l	2.73E+01	5.13E+00	2.17E+00					INV	
14	RA-226	TRG	BC 14	pCi/l	5.92E-01	3.33E-01	2.98E-01					OK	
15	RA-226	TRG	BC 28B	pCi/l	2.04E-01	2.15E-01	3.02E-01					OK	
16	RA-226	TRG	BC 28A	pCi/l	7.96E+00	1.81E+00	7.71E-01					OK	
17	RA-226	TRG	BC 16	pCi/l	7.13E+01	1.16E+01	2.62E+00					INV	
18	RA-226	TRG	BC 15	pCi/l	2.53E+01	4.96E+00	1.82E+00					INV	
19	RA-226	TRG	BC 22A	pCi/l	1.80E+01	2.76E+00	6.86E-01					OK	

	Run	1
	Analysis Code	Ra226
	Eberline Analytical Work Order	19-04087
Client	Michael Pisaní & Associates, Inc.	

Lab Fraction	Nuclide	Sample Desc	Sample Date	Sample Aliquot	Radiometric % Rec	Grav % Rec	Mean % Rec	SAF	Sep to Date/Time	Sep to Date/Time
01	RA-226	LCS	04/18/19 00:00	1.00E+00	100.00	0.00	110.00		5/2/2019 10:05	
02	RA-226	MBL	04/18/19 00:00	1.00E+00	100.00	0.00	110.00		5/2/2019 10:05	
03	RA-226	DUP	04/02/19 16:15	1.00E+00	100.00	0.00	101.87		5/2/2019 10:05	
04	RA-226	TRG	04/02/19 10:30	5.00E-01	100.00	0.00	110.00		5/2/2019 15:20	
05	RA-226	TRG	04/02/19 11:52	1.00E+00	100.00	0.00	110.00		5/2/2019 10:05	
06	RA-226	TRG	04/02/19 13:10	5.00E-01	96.51	0.00	96.51		5/2/2019 15:20	
07	RA-226	TRG	04/02/19 14:40	1.00E+00	100.00	0.00	110.00		5/2/2019 10:05	
08	RA-226	DO	04/02/19 16:15	1.00E+00	100.00	0.00	110.00		5/2/2019 10:05	
09	RA-226	TRG	04/03/19 07:55	1.00E+00	100.00	0.00	110.00		5/2/2019 10:05	
10	RA-226	TRG	04/03/19 09:25	1.00E+00	93.38	0.00	93.38		5/2/2019 10:05	
11	RA-226	TRG	04/03/19 11:15	1.00E+00	100.00	0.00	105.85		5/2/2019 10:05	
12	RA-226	TRG	04/03/19 13:15	1.00E+00	100.00	0.00	110.00		5/2/2019 10:05	
13	RA-226	TRG	04/03/19 15:15	2.00E-01	100.00	0.00	110.00		5/2/2019 15:20	
14	RA-226	TRG	04/03/19 17:05	1.00E+00	98.92	0.00	98.92		5/2/2019 10:05	
15	RA-226	TRG	04/08/19 10:45	1.00E+00	100.00	0.00	110.00		5/2/2019 10:05	
16	RA-226	TRG	04/08/19 12:15	5.00E-01	100.00	0.00	104.97		5/2/2019 15:20	
17	RA-226	TRG	04/08/19 15:15	1.00E-01	100.00	0.00	110.00		5/2/2019 15:20	
18	RA-226	TRG	04/08/19 16:45	2.00E-01	100.00	0.00	110.00		5/2/2019 15:20	
19	RA-226	TRG	04/09/19 08:30	5.00E-01	100.00	0.00	110.00		5/2/2019 15:20	

	Run	1
	Analysis Code	Ra226
	Eberline Analytical Work Order	19-04087
Client	Michael Pisani & Associates, Inc.	

Lab Fraction	Nuclide	Sample Desc	Counting Date/Time	Half-life (days)	Detect	Carrier	Count Time	Counts	Bkg CPM	Eff
01	RA-226	LCS	05/03/19 07:52		A_Spec	Alpha_003	170	1.98 E+02	1.00 E-02	15.2
02	RA-226	MBL	05/03/19 07:52		A_Spec	Alpha_004	170.02	-1.53 E+00	9.00 E-03	18
03	RA-226	DUP	05/03/19 07:52		A_Spec	Alpha_010	170	1.11 E+01	1.10 E-02	18.1
04	RA-226	TRG	05/03/19 07:52		A_Spec	Alpha_011	170.02	9.51 E+01	2.30 E-02	18.1
05	RA-226	TRG	05/03/19 07:52		A_Spec	Alpha_012	170.02	2.13 E+01	1.00 E-02	18.3
06	RA-226	TRG	05/03/19 07:52		A_Spec	Alpha_014	170.02	2.82 E+02	1.40 E-02	17.7
07	RA-226	TRG	05/03/19 07:59		A_Spec	Alpha_033	170	4.83 E+01	4.00 E-03	16
08	RA-226	DO	05/03/19 07:59		A_Spec	Alpha_034	170	8.32 E+00	4.00 E-03	14.9
09	RA-226	TRG	05/03/19 07:59		A_Spec	Alpha_035	170	9.13 E+01	1.00 E-02	12.7
10	RA-226	TRG	05/03/19 07:59		A_Spec	Alpha_036	170	9.76 E+01	8.00 E-03	16.9
11	RA-226	TRG	05/03/19 07:59		A_Spec	Alpha_038	170	5.07 E+01	2.00 E-03	14.6
12	RA-226	TRG	05/03/19 07:59		A_Spec	Alpha_039	170	3.78 E+01	1.90 E-02	15
13	RA-226	TRG	05/03/19 07:59		A_Spec	Alpha_040	170	1.17 E+02	2.00 E-02	16.1
14	RA-226	TRG	05/03/19 07:59		A_Spec	Alpha_041	170	1.36 E+01	8.00 E-03	16.6
15	RA-226	TRG	05/03/19 07:59		A_Spec	Alpha_042	170	4.64 E+00	8.00 E-03	16.2
16	RA-226	TRG	05/03/19 07:59		A_Spec	Alpha_043	170	7.81 E+01	1.10 E-02	14.9
17	RA-226	TRG	05/03/19 07:59		A_Spec	Alpha_044	170	1.53 E+02	4.00 E-03	17.1
18	RA-226	TRG	05/03/19 07:59		A_Spec	Alpha_045	170	1.05 E+02	1.10 E-02	16.5
19	RA-226	TRG	05/03/19 07:59		A_Spec	Alpha_046	170	1.73 E+02	7.00 E-03	15.3

19-04087-Ra226-1 (pCi/l) in WA
Tracer ID: Ba-6a

Count Room Report
Client: Michael Pisani Associat

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	04/18/19 00:00	1.0000	2.1973	1001.4195	666.0000	147.64	3.00^	1.00
02	MBL	BLANK	04/18/19 00:00	1.0000	2.1983	1001.8752	537.0000	118.99	3.00^	1.00
03	DUP	BC 12	04/02/19 16:15	1.0000	2.1947	1000.2345	459.0000	101.87	1.71	1.00
04	TRG	BC 27A	04/02/19 10:30	0.5000	2.1927	999.3230	685.0000	152.17	2.87	1.00
05	TRG	BC 27B	04/02/19 11:52	1.0000	2.1901	998.1381	553.0000	123.00	1.95	1.00
06	TRG	BC 26	04/02/19 13:10	0.5000	2.1906	998.3660	434.0000	96.51	3.00^	1.00
07	TRG	BC 11	04/02/19 14:40	1.0000	2.1856	996.0872	524.0000	116.78	3.00^	1.00
08	DO	BC 12	04/02/19 16:15	1.0000	2.1863	996.4062	738.0000	164.43	2.82	1.00
09	TRG	BC 24A	04/03/19 07:55	1.0000	2.1863	996.4062	516.0000	114.97	3.00^	1.00
10	TRG	BC 24B	04/03/19 09:25	1.0000	2.1857	996.1328	419.0000	93.38	2.34	1.00
11	TRG	BC 21B	04/03/19 11:15	1.0000	2.1859	996.2239	475.0000	105.85	2.27	1.00
12	TRG	BC 21A	04/03/19 13:15	1.0000	2.1854	995.9961	716.0000	159.59	2.37	1.00
13	TRG	BC 13	04/03/19 15:15	0.2000	2.1829	994.8567	601.0000	134.11	2.84	1.00
14	TRG	BC 14	04/03/19 17:05	1.0000	2.1815	994.2186	443.0000	98.92	2.69	1.00
15	TRG	BC 28B	04/08/19 10:45	1.0000	2.1820	994.4465	703.0000	156.94	2.69	1.00
16	TRG	BC 28A	04/08/19 12:15	0.5000	2.1810	993.9908	470.0000	104.97	2.87	1.00
17	TRG	BC 16	04/08/19 15:15	0.1000	2.1785	992.8514	541.0000	120.97	3.00^	1.00
18	TRG	BC 15	04/08/19 16:45	0.2000	2.1778	992.5324	813.0000	181.84	3.00^	1.00
19	TRG	BC 22A	04/09/19 08:30	0.5000	2.0900	952.5175	662.0000	154.29	3.00^	1.00

h-14

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Internal Work Order		Run	Analysis Code		Date	Technician		Technician Initials		Witness Initials		
19-04087		1	Ra226		4/26/2019 10:39	JHARVEY						
LCS & Matrix Spikes												
Isotope	Sol #	Activity dpm/g	Solution Date	Approx Addition	LCS Volume Used (g)	MS Volume Used (g)	LCSD Volume Used (g)	MSD Volume Used (g)	LCS Known pCi	MS Error Estimate	LCSD Error Estimate	MSD Error Estimate
Ra-226	Ra-5b	43.960	4/26/2019	0.500	0.5058				10.02	0.461	0.00	0.000

Balance Printer Tapes												
Tracers												
fraction	Isotope	Sol #	Activity dpm/g	Solution Date	Volume Used (g)	Approx Addition						Tracer
01	Ba-133	Ba-6a	455.750	4/26/2019	2.1973	2.2200						LCS
02	Ba-133	Ba-6a	455.750	4/26/2019	2.1983	2.2200						LCS
03	Ba-133	Ba-6a	455.750	4/26/2019	2.1947	2.2200						LCS
04	Ba-133	Ba-6a	455.750	4/26/2019	2.1927	2.2200						LCS
05	Ba-133	Ba-6a	455.750	4/26/2019	2.1901	2.2200						LCS
06	Ba-133	Ba-6a	455.750	4/26/2019	2.1906	2.2200						LCS
07	Ba-133	Ba-6a	455.750	4/26/2019	2.1856	2.2200						LCS
08	Ba-133	Ba-6a	455.750	4/26/2019	2.1863	2.2200						LCS
09	Ba-133	Ba-6a	455.750	4/26/2019	2.1863	2.2200						LCS
10	Ba-133	Ba-6a	455.750	4/26/2019	2.1857	2.2200						LCS
11	Ba-133	Ba-6a	455.750	4/26/2019	2.1859	2.2200						LCS
12	Ba-133	Ba-6a	455.750	4/26/2019	2.1854	2.2200						LCS
13	Ba-133	Ba-6a	455.750	4/26/2019	2.1829	2.2200						LCS
14	Ba-133	Ba-6a	455.750	4/26/2019	2.1815	2.2200						LCS
15	Ba-133	Ba-6a	455.750	4/26/2019	2.1820	2.2200						LCS
16	Ba-133	Ba-6a	455.750	4/26/2019	2.1810	2.2200						LCS
17	Ba-133	Ba-6a	455.750	4/26/2019	2.1785	2.2200						LCS
18	Ba-133	Ba-6a	455.750	4/26/2019	2.1778	2.2200						LCS
19	Ba-133	Ba-6a	455.750	4/26/2019	2.0900	2.2200						LCS
Matrix Spike												

Aliquot Worksheet

Work Order	Run	Analysis Code	Rpt Units	Lab Deadline	Technician
19-04087	1	Ra226	liters	4/30/2019	JHARVEY

Lab Fraction	Sample		Muffle Data			Dilution Data			Aliquot Data			MS Aliquot Data		H-3 Solids Only	
	Client ID	Type	Ratio Post/Pre	No of Dilis	Dil Factor	Ratio	Aliquot	Net Equiv	Aliquot	Net Equiv	Water Added (ml)	H3 Dist	Aliq		
01	LCS	LCS				1.00E+00	1.0000E+00	1.0000E+00							
02	BLANK	MBL				1.00E+00	1.0000E+00	1.0000E+00							
03	BC 12	DUP				1.00E+00	1.0000E+00	1.0000E+00							
04	BC 27A	TRG				1.00E+00	5.0000E-01	5.0000E-01							
05	BC 27B	TRG				1.00E+00	1.0000E+00	1.0000E+00							
06	BC 26	TRG				1.00E+00	5.0000E-01	5.0000E-01							
07	BC 11	TRG				1.00E+00	1.0000E+00	1.0000E+00							
08	BC 12	DO				1.00E+00	1.0000E+00	1.0000E+00							
09	BC 24A	TRG				1.00E+00	1.0000E+00	1.0000E+00							
10	BC 24B	TRG				1.00E+00	1.0000E+00	1.0000E+00							
11	BC 21B	TRG				1.00E+00	1.0000E+00	1.0000E+00							
12	BC 21A	TRG				1.00E+00	1.0000E+00	1.0000E+00							
13	BC 13	TRG				1.00E+00	2.0000E-01	2.0000E-01							
14	BC 14	TRG				1.00E+00	1.0000E+00	1.0000E+00							
15	BC 28B	TRG				1.00E+00	1.0000E+00	1.0000E+00							
16	BC 28A	TRG				1.00E+00	5.0000E-01	5.0000E-01							
17	BC 16	TRG				1.00E+00	1.0000E-01	1.0000E-01							
18	BC 15	TRG				1.00E+00	2.0000E-01	2.0000E-01							
19	BC 22A	TRG				1.00E+00	5.0000E-01	5.0000E-01							

Comments

Technician: Jharvey Date: 5/3/19

Gravimetric Worksheet

Work Order	Run	Analysis Code	Gravimetric Carrier	Carrier Conc (mg/ml)	Technician
19-04087	1	Ra226			DBUSH

TRetek Fraction	Michael Pisani & Associates, Inc.		Sample Type	Carrier Data		Filter Data			Gravimetric % Recovery	
	Client ID			Carrier Added (ml)	Filter Tare (g)	Filter Final (g)	Filter Net (g)			
01	LCS		LCS			0.0201	0.0310	0.0109		
02	BLANK		MBL			0.0199	0.0315	0.0116		
03	DUP		DUP			0.0202	0.0252	0.0050		
04	BC 27A		TRG			0.0202	0.0286	0.0084		
05	BC 27B		TRG			0.0202	0.0257	0.0055		
06	BC 26		TRG			0.0202	0.0294	0.0092		
07	BC 11		TRG			0.0199	0.0305	0.0106		
08	BC 12		DO			0.0199	0.0281	0.0082		
09	BC 24A		TRG			0.0200	0.0332	0.0132		
10	BC 24B		TRG			0.0200	0.0265	0.0065		
11	BC 21B		TRG			0.0201	0.0264	0.0063		
12	BC 21A		TRG			0.0201	0.0267	0.0066		
13	BC 13		TRG			0.0203	0.0286	0.0083		
14	BC 14		TRG			0.0200	0.0277	0.0077		
15	BC 28B		TRG			0.0199	0.0276	0.0077		
16	BC 28A		TRG			0.0199	0.0283	0.0084		
17	BC 16		TRG			0.0198	0.0309	0.0111		
18	BC 15		TRG			0.0199	0.0299	0.0100		
19	BC 22A		TRG			0.0197	0.0319	0.0122		

Technician: *DBUSH* Date: 5/2/19



Apex-Alpha™

KB
5/3/19

Sample Description: SPIKE
 Spectrum File: \\OR-ALPHA1\Canberra\ApexAlpha\Root\Data\00002417
 Batch Identification: 1904087A-RA
 Sample Identification: 01
 Sample Geometry: Shelf 2
 Procedure Description: Ra

Detector Name: Alpha_003
 Chamber Serial Number:
 Detector Serial Number: 3
 Env. Background: System Bkgd 243621
 Reagent Blank: <not performed>

Sample Size: 1.000E+000 +/- 0.000E+000 liter
 Generic Mult. Factor: 3.000E+000 Generic Div. Factor: 1.000E+000
 Sample Date/Time: 5/3/2019 4:34:10 PM
 Acquisition Date/Time: 5/3/2019 7:52:04 AM
 Acquisition Live Time: 170.0 minutes
 Acquisition Real Time: 170.0 minutes

Chem. Recovery Factor: 1.0000 +/- 0.0000
 Counting Efficiency: 0.1522 +/- 0.0027 on 2/22/2019 4:02:55 PM
 Effective Efficiency: 0.1522 +/- 0.0027

Control Certificate Name: Ra226_Ra-5b
 Chem. Recov. of Control: RA-226 0.344672 +/- 0.027375
 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	5.517	37.43	33.78	3.57	0.00E+000	3.0
RA-226	4.644	198.30	13.99	1.70	0.00E+000	4.0

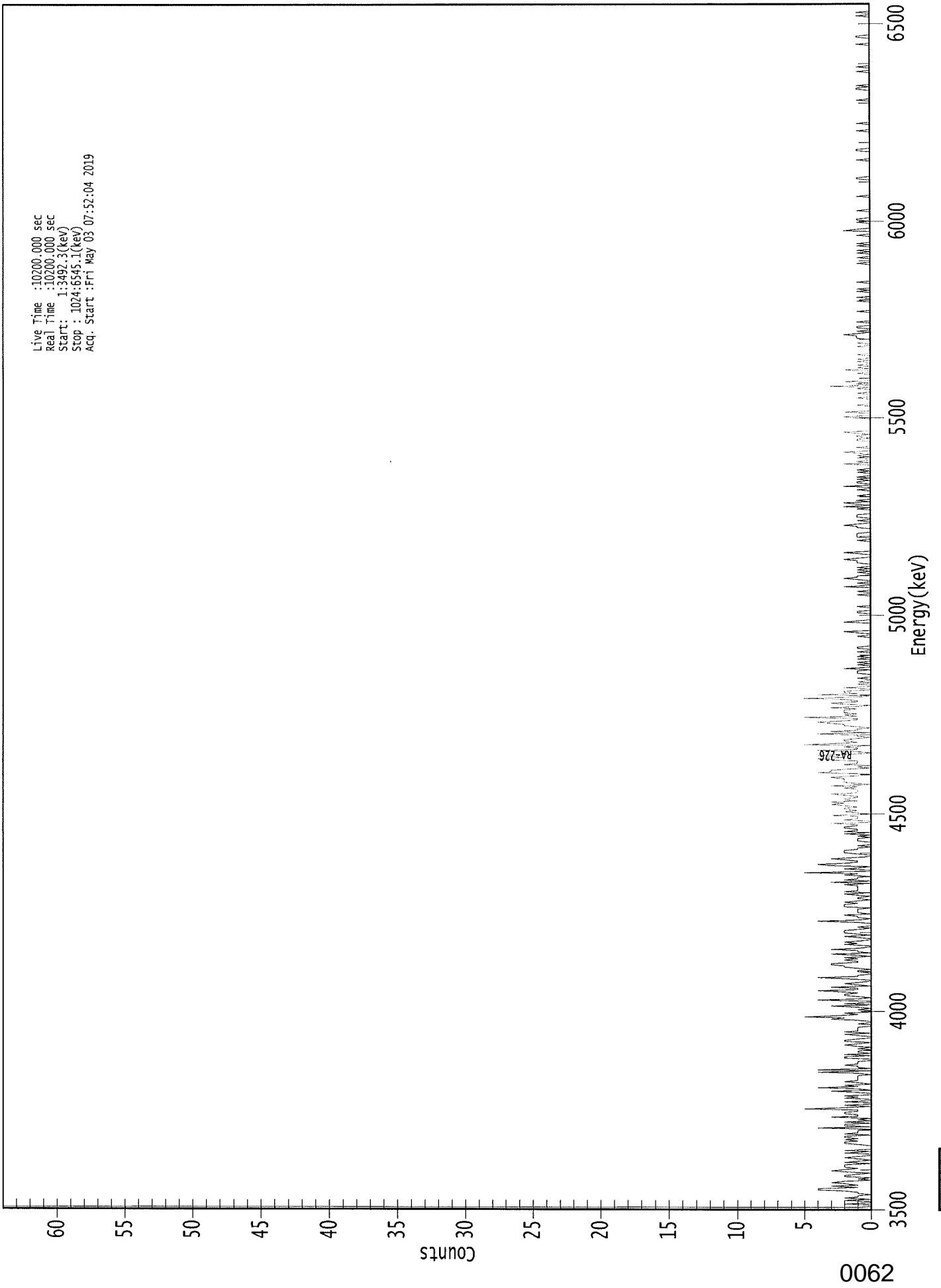
 ----- NUCLIDE ANALYSIS RESULTS -----

Nuclide	Id Conf.	Energy (keV)	Activity (pCi/liter)	MDA (pCi/liter)
RA-224	0.963	5685.50*	2.06E+000 +/- 6.98E-001	5.18E-001 +/- 1.80E-002
RA-226	0.974	4785.00*	1.04E+001 +/- 1.49E+000	3.84E-001 +/- 1.33E-002

AG
5/3/19

0000241720.CNF

Live Time : 10200.000 sec
Real Time : 10200.000 sec
Start : 1:3492.3(kev)
Stop : 1024:6545.1(kev)
Acq. Start : Fri May 03 07:52:04 2019



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: 10200

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

369: 0 0 4 3 3 2 0 1

Sample Title: 01

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

801: 0 0 1 0 0 0 0 1

Sample Title: 01

Channel	-----	-----	-----	-----	-----	-----	-----	-----
809:	0	0	0	1	0	1	0	0
817:	0	1	0	1	0	0	0	0
825:	0	0	1	0	0	0	2	1
833:	0	0	0	0	0	1	0	1
841:	1	0	0	0	0	0	0	1
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	1	1	0	0	0	0
881:	0	0	0	0	0	0	0	0
889:	0	0	1	0	0	0	0	0
897:	0	0	1	1	0	0	0	0
905:	0	0	0	0	0	0	0	0
913:	0	0	0	1	0	0	0	0
921:	0	1	0	0	0	0	0	0
929:	0	0	0	0	0	0	0	0
937:	0	0	0	0	0	1	0	0
945:	0	0	0	0	0	0	1	1
953:	0	1	0	0	0	0	0	0
961:	0	0	0	0	0	1	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	1	0	0	0
993:	0	0	1	1	0	0	0	0
1001:	0	0	0	0	0	0	0	0
1009:	0	0	0	0	1	0	0	1
1017:	0	0	0	0	0	0	0	0

KB
5/3/19

Sample Description: BLANK
 Spectrum File: \\OR-ALPHA1\Canberra\ApexAlpha\Root\Data\00002417
 Batch Identification: 1904087A-RA
 Sample Identification: 02
 Sample Geometry: Shelf 2
 Procedure Description: Ra

Detector Name: Alpha_004
 Chamber Serial Number:
 Detector Serial Number: 4
 Env. Background: System Bkgd 243622
 Reagent Blank: <not performed>

Sample Size: 1.000E+000 +/- 0.000E+000 liter
 Generic Mult. Factor: 3.000E+000 Generic Div. Factor: 1.000E+000
 Sample Date/Time: 5/3/2019 4:34:10 PM
 Acquisition Date/Time: 5/3/2019 7:52:05 AM
 Acquisition Live Time: 170.0 minutes
 Acquisition Real Time: 170.0 minutes

Chem. Recovery Factor: 1.0000 +/- 0.0000
 Counting Efficiency: 0.1804 +/- 0.0031 on 2/22/2019 4:02:54 PM
 Effective Efficiency: 0.1804 +/- 0.0031

Peak Match Tolerance: 0.350 MeV

 PEAK AREA REPORT

Nuclide	Energy (MeV)	Net Pk Area	Pk Area Error %	Ambient Backgnd	Reagent Backgnd	FWHM (keV)
RA-224	5.381	-0.53	415.04	1.53	0.00E+000	2.9
RA-226	4.602	-1.53	143.79	1.53	0.00E+000	0.0

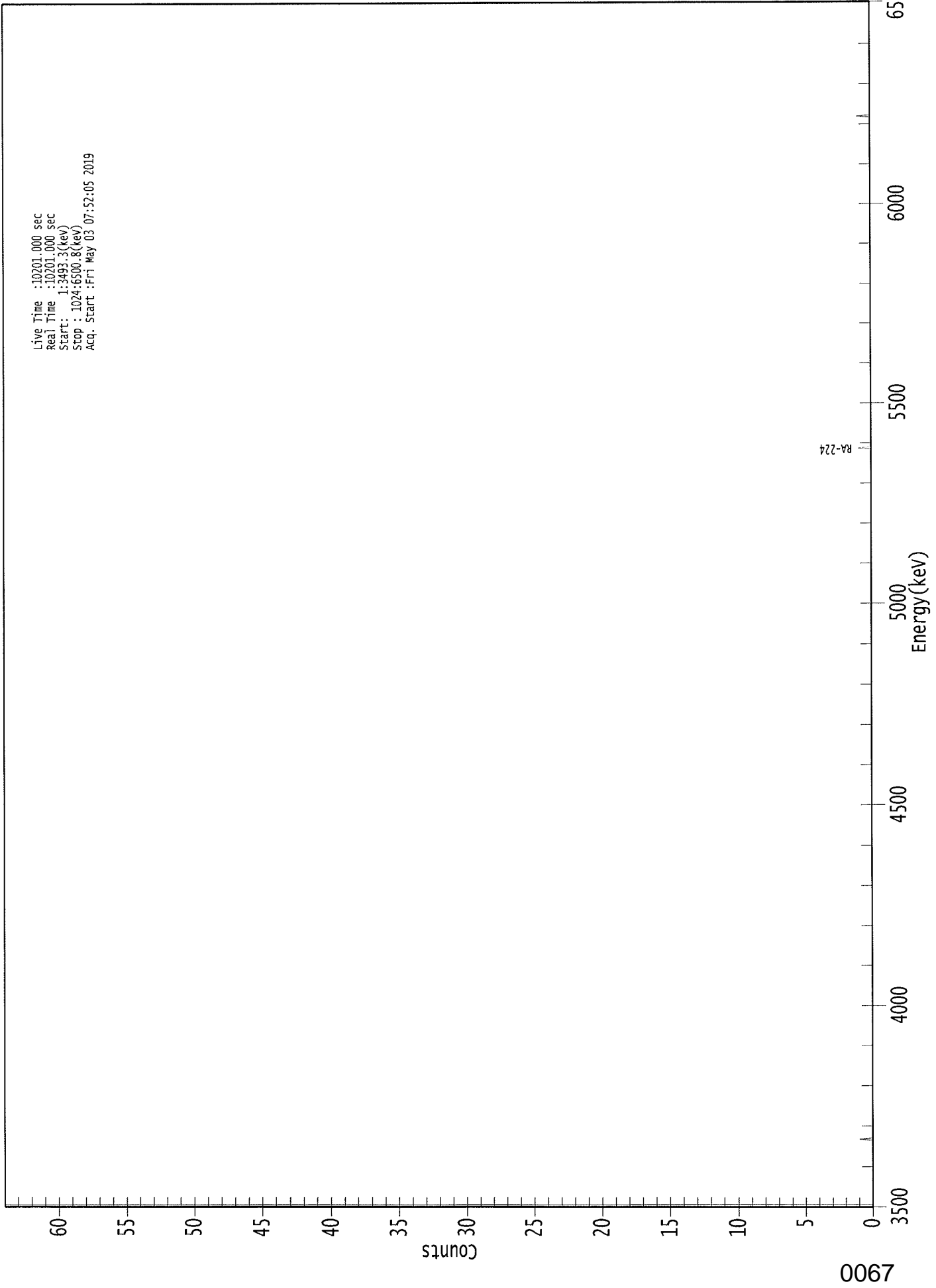
 NUCLIDE ANALYSIS RESULTS

Nuclide	Id Conf.	Energy (keV)	Activity (pCi/liter)	MDA (pCi/liter)
RA-224	0.886	5685.50*	-2.46E-002 +/- 1.02E-001	3.29E-001 +/- 1.11E-002
RA-226	0.957	4785.00*	-6.74E-002 +/- 9.70E-002	3.13E-001 +/- 1.05E-002

AG
5/3/19

0000241702.CNF

Live Time :10201.000 sec
Real Time :10201.000 sec
Start : 1:3493.3(kev)
Stop : 1024:6500.8(kev)
Acq. Start : Fri May 03 07:52:05 2019



0067

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: 10201

Elapsed Real Time: 10201

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

369: 0 0 0 0 0 0 0 0

Sample Title: 02

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

801: 0 0 0 0 0 0 0 0

Sample Title: 02

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

KB
5/3/19

Sample Description: BC 12 DUP
 Spectrum File: \\OR-ALPHA1\Canberra\ApexAlpha\Root\Data\00002417
 Batch Identification: 1904087A-RA
 Sample Identification: 03
 Sample Geometry: Shelf 2
 Procedure Description: Ra

Detector Name: Alpha_010
 Chamber Serial Number:
 Detector Serial Number: 10
 Env. Background: System Bkgd 243623
 Reagent Blank: <not performed>

Sample Size: 1.000E+000 +/- 0.000E+000 liter
 Generic Mult. Factor: 1.710E+000 Generic Div. Factor: 1.000E+000
 Sample Date/Time: 4/2/2019 4:34:10 PM
 Acquisition Date/Time: 5/3/2019 7:52:06 AM
 Acquisition Live Time: 170.0 minutes
 Acquisition Real Time: 170.0 minutes

Chem. Recovery Factor: 1.0000 +/- 0.0000
 Counting Efficiency: 0.1809 +/- 0.0031 on 2/22/2019 4:02:52 PM
 Effective Efficiency: 0.1809 +/- 0.0031

Peak Match Tolerance: 0.350 MeV

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

Nuclide	Energy (MeV)	Net Pk Area	Pk Area Error %	Ambient Backgnd	Reagent Backgnd	FWHM (keV)
RA-224	5.491	3.47	129.55	1.53	0.00E+000	2.9
RA-226	4.552	11.13	64.27	1.87	0.00E+000	4.4

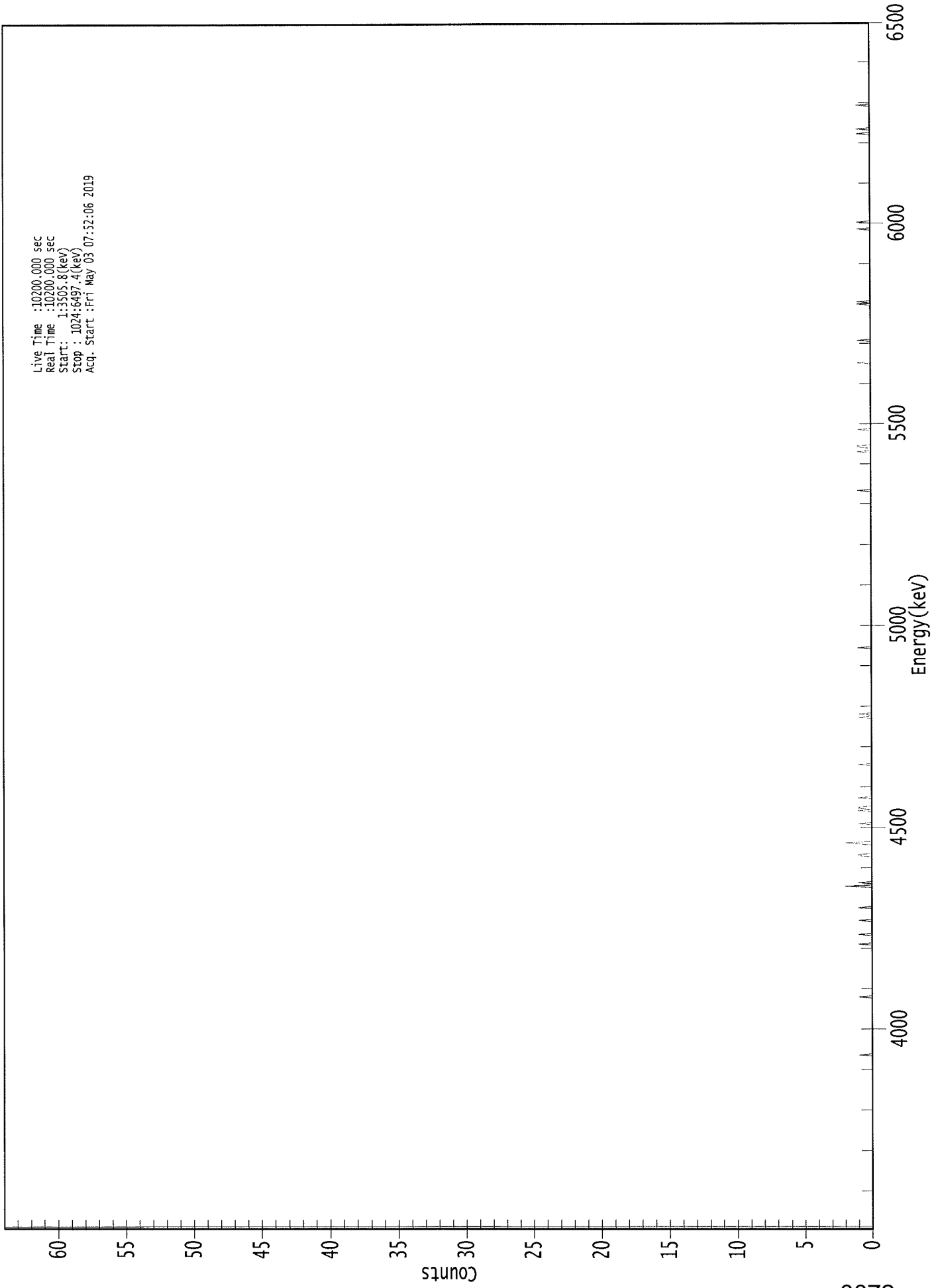
 ----- NUCLIDE ANALYSIS RESULTS -----

Nuclide	Id Conf.	Energy (keV)	Activity (pCi/liter)	MDA (pCi/liter)
RA-224	0.952	5685.50*	9.23E-002 +/- 1.20E-001	1.89E-001 +/- 6.39E-003
RA-226	0.931	4785.00*	2.79E-001 +/- 1.79E-001	1.90E-001 +/- 6.38E-003

AG
5/3/19

0000241703.CNF

Live Time :10200.000 sec
Real Time :10200.000 sec
Start: 1:3505.8(kev)
Stop : 1024.6497.4(kev)
Acq. Start :Fri May 03 07:52:06 2019



ROI Type: 1

0072

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

Sample Title: 03

Elapsed Live time: 10200

Elapsed Real Time: 10200

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

369: 0 0 0 0 0 0 0 0

Sample Title: 03

Channel	-----	-----	-----	-----	-----	-----	-----
377:	0	0	0	0	0	0	0
385:	0	0	0	0	0	0	0
393:	0	1	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	1	0	0	1	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	1	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	0	0	0	0	0
537:	0	0	0	0	0	0	0
545:	0	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	0	0
609:	0	0	0	0	0	0	0
617:	0	0	0	0	0	0	0
625:	0	1	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	1	0	0	1	1
665:	0	0	0	0	0	0	0
673:	0	0	0	0	0	1	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	1	0
737:	0	0	0	0	0	0	0
745:	0	0	0	0	0	0	0
753:	0	1	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:	1	0	1	0	0	0	0
793:	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:	1	0	0	0	0	0	1	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	1	0	0	0	1	0	0
937:	0	0	0	0	0	0	0	0
945:	0	0	0	0	0	0	0	0
953:	0	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

5/3/19

Sample Description: BC 27A
 Spectrum File: \\OR-ALPHA1\Canberra\ApexAlpha\Root\Data\00002417
 Batch Identification: 1904087A-RA
 Sample Identification: 04
 Sample Geometry: Shelf 2
 Procedure Description: Ra

Detector Name: Alpha_011
 Chamber Serial Number:
 Detector Serial Number: 11
 Env. Background: System Bkgd 243624
 Reagent Blank: <not performed>

Sample Size: 5.000E-001 +/- 0.000E+000 liter
 Generic Mult. Factor: 2.870E+000 Generic Div. Factor: 1.000E+000
 Sample Date/Time: 4/2/2019 4:34:10 PM
 Acquisition Date/Time: 5/3/2019 7:52:07 AM
 Acquisition Live Time: 170.0 minutes
 Acquisition Real Time: 170.0 minutes

Chem. Recovery Factor: 1.0000 +/- 0.0000
 Counting Efficiency: 0.1806 +/- 0.0031 on 2/22/2019 4:02:50 PM
 Effective Efficiency: 0.1806 +/- 0.0031

Peak Match Tolerance: 0.350 MeV

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

Nuclide	Energy (MeV)	Net Pk Area	Pk Area Error %	Ambient Backgnd	Reagent Backgnd	FWHM (keV)
RA-224	5.568	7.11	89.29	2.89	0.00E+000	2.6
RA-226	4.592	95.09	20.58	3.91	0.00E+000	3.3

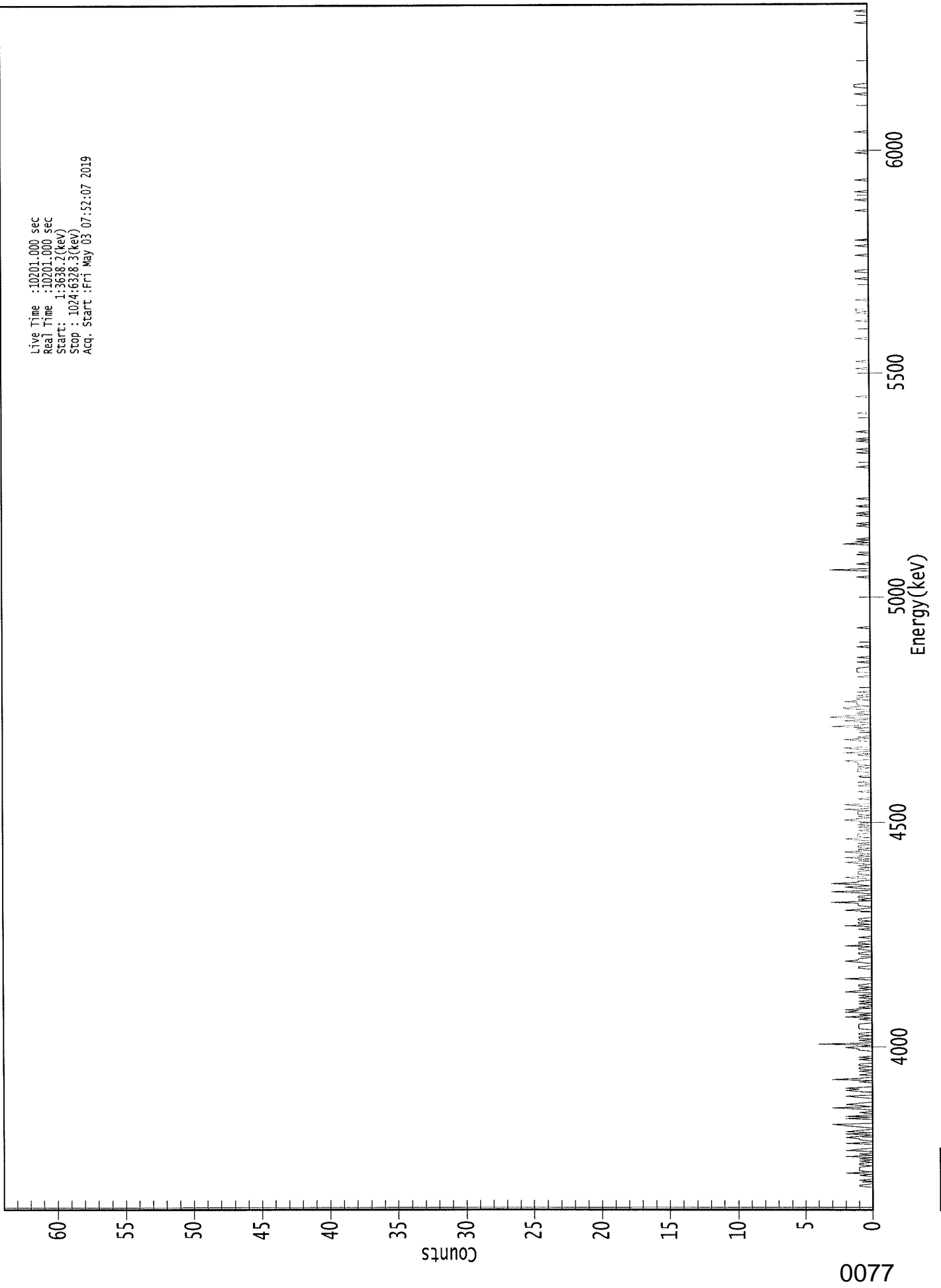
 ----- NUCLIDE ANALYSIS RESULTS -----

Nuclide	Id Conf.	Energy (keV)	Activity (pCi/liter)	MDA (pCi/liter)
RA-224	0.982	5685.50*	6.36E-001 +/- 5.68E-001	7.83E-001 +/- 2.65E-002
RA-226	0.953	4785.00*	8.01E+000 +/- 1.67E+000	8.21E-001 +/- 2.76E-002

AG
5/3/19

0000241704.CNF

Live Time : 10201.000 sec
Real Time : 10201.000 Sec
Start : 1:3638.2(kev)
Stop : 1024:6328.3(kev)
Acq. Start : Fri May 03 07:52:07 2019



0077

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: 10201

Elapsed Real Time: 10201

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

369: 0 0 0 1 1 1 0 1

Sample Title: 04

Channel	-----	-----	-----	-----	-----	-----	-----	-----
377:	0	1	1	1	2	0	0	0
385:	0	1	0	2	0	0	1	2
393:	0	0	0	0	0	1	2	0
401:	1	0	0	0	0	0	1	1
409:	0	3	1	0	0	1	2	0
417:	0	3	2	0	1	1	0	0
425:	2	2	0	1	1	1	2	0
433:	1	1	0	1	0	0	1	0
441:	0	0	0	0	0	0	0	0
449:	0	0	0	1	0	0	0	1
457:	1	1	1	0	0	0	0	1
465:	0	0	0	1	0	0	0	0
473:	0	0	0	0	1	0	0	0
481:	0	0	0	0	0	0	0	0
489:	0	0	0	0	1	0	0	0
497:	0	0	0	0	0	0	0	0
505:	0	0	0	0	0	0	0	0
513:	0	0	0	0	0	0	0	0
521:	0	0	0	0	0	0	0	0
529:	0	0	0	0	0	0	0	1
537:	0	0	0	0	0	3	0	0
545:	0	0	1	0	0	0	0	0
553:	0	0	1	0	0	0	0	0
561:	0	0	0	2	0	1	0	1
569:	0	0	0	0	0	0	0	0
577:	0	0	1	0	1	0	0	0
585:	0	0	0	1	0	1	0	0
593:	0	0	0	1	0	0	0	0
601:	0	1	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	1	0	0	0
633:	0	0	0	0	0	0	0	0
641:	1	0	0	1	0	0	0	0
649:	0	0	1	0	1	0	0	0
657:	0	0	1	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:	1	0	0	0	0	0	0	0
697:	0	0	0	0	0	0	0	0
705:	0	0	0	0	0	0	0	0
713:	1	0	0	0	0	0	1	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	1	0	0	0	0	0	0
761:	1	0	1	1	0	0	0	0
769:	0	0	0	1	0	0	0	0
777:	0	0	0	0	0	0	0	0
785:	0	0	0	0	0	1	0	0
793:	0	0	0	1	1	0	0	0

801: 0 0 0 0 0 0 0 0

Sample Title: 04

Channel	-----	-----	-----	-----	-----	-----	-----	-----
809:	0	1	0	0	0	0	0	0
817:	0	1	0	0	0	0	1	0
825:	0	0	0	0	0	0	0	0
833:	0	0	0	0	0	0	0	0
841:	0	0	0	0	0	0	0	1
849:	0	0	0	0	0	0	0	0
857:	1	0	0	0	0	0	0	1
865:	0	0	0	0	0	0	0	0
873:	0	1	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:	1	0	0	0	0	0	0	0
905:	0	0	0	0	0	0	0	0
913:	0	0	1	0	0	0	0	0
921:	0	0	0	0	0	0	0	0
929:	0	0	0	0	0	0	0	0
937:	0	0	0	0	0	0	0	0
945:	0	0	1	0	0	0	0	0
953:	1	1	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	1	0
1009:	0	0	0	0	0	0	0	0
1017:	1	0	0	0	0	0	0	0

KB
5/3/19

Sample Description: BC 27B
 Spectrum File: \\OR-ALPHA1\Canberra\ApexAlpha\Root\Data\00002417
 Batch Identification: 1904087A-RA
 Sample Identification: 05
 Sample Geometry: Shelf 2
 Procedure Description: Ra

Detector Name: Alpha_012
 Chamber Serial Number:
 Detector Serial Number: 12
 Env. Background: System Bkgd 243625
 Reagent Blank: <not performed>

Sample Size: 1.000E+000 +/- 0.000E+000 liter
 Generic Mult. Factor: 1.950E+000 Generic Div. Factor: 1.000E+000
 Sample Date/Time: 4/2/2019 4:34:10 PM
 Acquisition Date/Time: 5/3/2019 7:52:08 AM
 Acquisition Live Time: 170.0 minutes
 Acquisition Real Time: 170.0 minutes

Chem. Recovery Factor: 1.0000 +/- 0.0000
 Counting Efficiency: 0.1827 +/- 0.0031 on 2/22/2019 4:02:49 PM
 Effective Efficiency: 0.1827 +/- 0.0031

Peak Match Tolerance: 0.350 MeV

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

Nuclide	Energy (MeV)	Net Pk Area	Pk Area Error %	Ambient Backgnd	Reagent Backgnd	FWHM (keV)
RA-224	5.457	7.13	83.91	1.87	0.00E+000	3.0
RA-226	4.574	21.30	44.41	1.70	0.00E+000	3.0

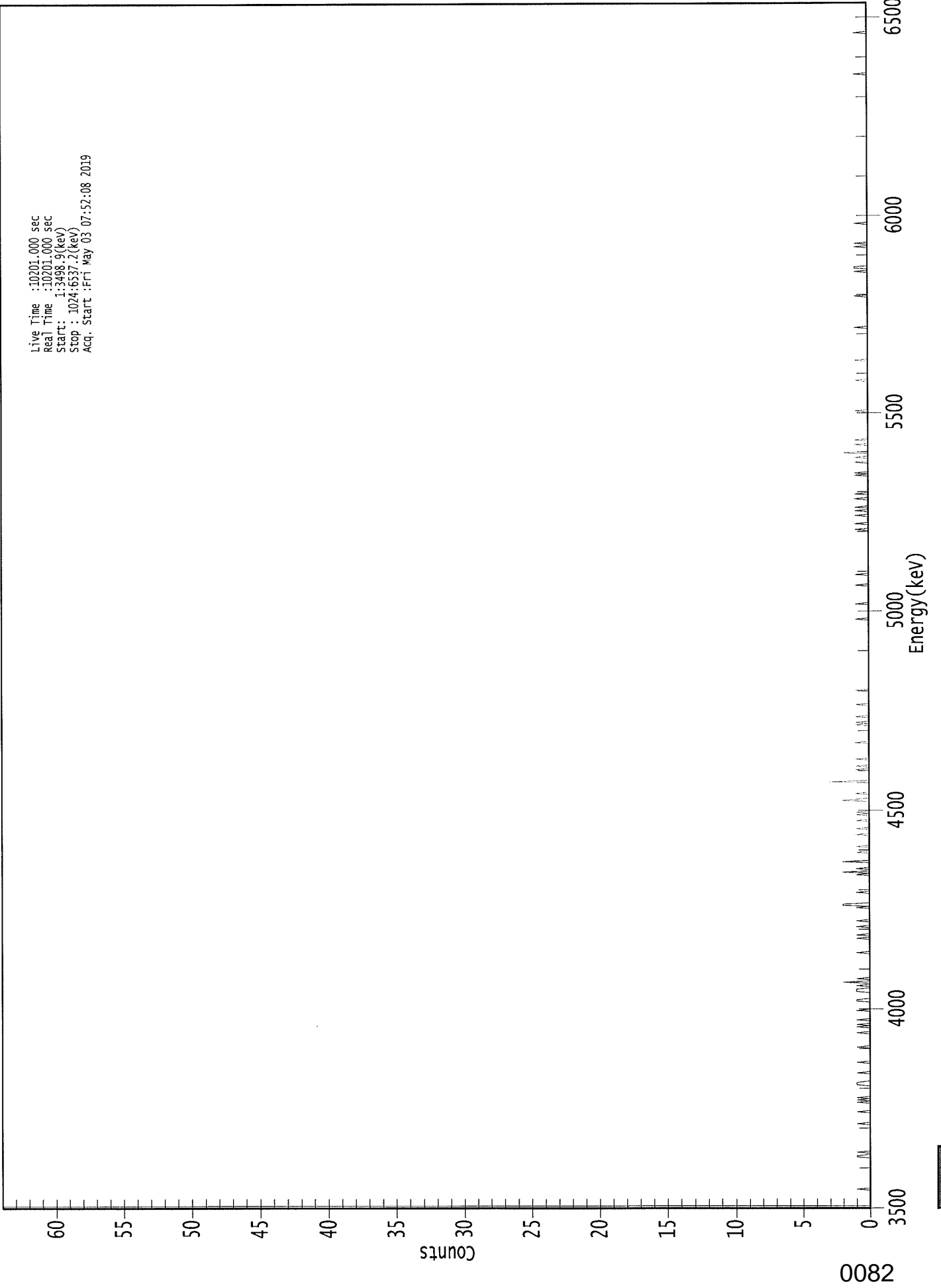
 ----- NUCLIDE ANALYSIS RESULTS -----

Nuclide	Id Conf.	Energy (keV)	Activity (pCi/liter)	MDA (pCi/liter)
RA-224	0.934	5685.50*	2.14E-001 +/- 1.80E-001	2.27E-001 +/- 7.69E-003
RA-226	0.944	4785.00*	6.02E-001 +/- 2.68E-001	2.08E-001 +/- 6.99E-003

AG
5/3/19

0000241705.CNF

Live Time :10201.000 sec
Real Time :10201.000 sec
Start : 1:34:9.9(kev)
Stop : 1024:6537.2(kev)
Acq. Start :Fri May 03 07:52:08 2019



0082

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

369: 0 0 0 1 0 0 1 0

Sample Title: 05

Channel	-----	-----	-----	-----	-----	-----	-----	-----
377:	0	0	0	0	1	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	1	0	1	0	0	0	0
417:	1	0	0	0	0	0	0	0
425:	0	0	1	0	0	0	0	0
433:	0	0	0	0	0	0	1	0
441:	0	0	0	0	0	0	0	0
449:	0	0	0	0	0	0	0	0
457:	0	0	0	0	0	0	0	0
465:	0	0	0	0	0	0	0	0
473:	0	0	0	0	0	0	0	0
481:	0	0	0	0	0	0	0	0
489:	0	0	0	0	0	0	0	0
497:	0	0	1	0	0	0	0	0
505:	0	0	0	0	0	0	0	1
513:	0	0	0	0	0	0	0	0
521:	0	0	0	0	0	0	0	1
529:	0	0	0	0	0	0	0	0
537:	1	0	0	0	0	0	0	0
545:	0	0	0	0	0	0	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	1	0
577:	0	0	0	1	0	0	0	0
585:	0	0	1	0	0	0	1	0
593:	0	1	0	0	0	0	0	0
601:	1	0	0	0	1	0	0	0
609:	0	0	0	0	0	0	0	0
617:	0	0	0	0	1	0	1	0
625:	0	0	0	0	0	0	0	1
633:	0	0	0	1	0	0	0	2
641:	0	0	0	0	0	0	1	0
649:	0	0	1	0	0	0	0	0
657:	0	0	0	0	0	0	0	0
665:	0	0	0	0	0	0	0	0
673:	0	0	0	1	0	0	0	0
681:	0	0	0	0	0	0	0	0
689:	0	0	0	0	0	0	0	0
697:	0	0	0	0	0	1	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	0	0	0	0
745:	0	0	1	0	0	0	0	0
753:	0	0	0	0	0	0	0	0
761:	0	0	0	0	0	0	0	0
769:	0	0	0	0	0	1	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	1	1	0

801: 0 0 0 0 0 0 0 0

Sample Title: 05

Channel								
809:	0	0	0	0	0	0	0	1
817:	0	0	1	0	0	0	0	0
825:	0	0	0	0	0	0	0	0
833:	0	0	0	1	0	0	0	0
841:	0	0	0	0	0	0	0	0
849:	0	0	0	0	0	0	0	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	1	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	1	0	0
1001:	0	0	0	0	0	0	0	0
1009:	0	0	0	0	0	0	0	0
1017:	0	0	0	0	0	0	0	0

108
5/3/19

Sample Description: BC 26
 Spectrum File: \\OR-ALPHA1\Canberra\ApexAlpha\Root\Data\00002417
 Batch Identification: 1904087A-RA
 Sample Identification: 06
 Sample Geometry: Shelf 2
 Procedure Description: Ra

Detector Name: Alpha_014
 Chamber Serial Number:
 Detector Serial Number: 14
 Env. Background: System Bkgd 243626
 Reagent Blank: <not performed>

Sample Size: 5.000E-001 +/- 0.000E+000 liter
 Generic Mult. Factor: 3.000E+000 Generic Div. Factor: 1.000E+000
 Sample Date/Time: 4/2/2019 4:34:10 PM
 Acquisition Date/Time: 5/3/2019 7:52:09 AM
 Acquisition Live Time: 170.0 minutes
 Acquisition Real Time: 170.0 minutes

Chem. Recovery Factor: 0.9651 +/- 0.0000
 Counting Efficiency: 0.1769 +/- 0.0030 on 2/22/2019 4:02:58 PM
 Effective Efficiency: 0.1707 +/- 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	5.511	32.13	35.74	1.87	0.00E+000	2.9
RA-226	4.589	281.62	11.74	2.38	0.00E+000	9.8

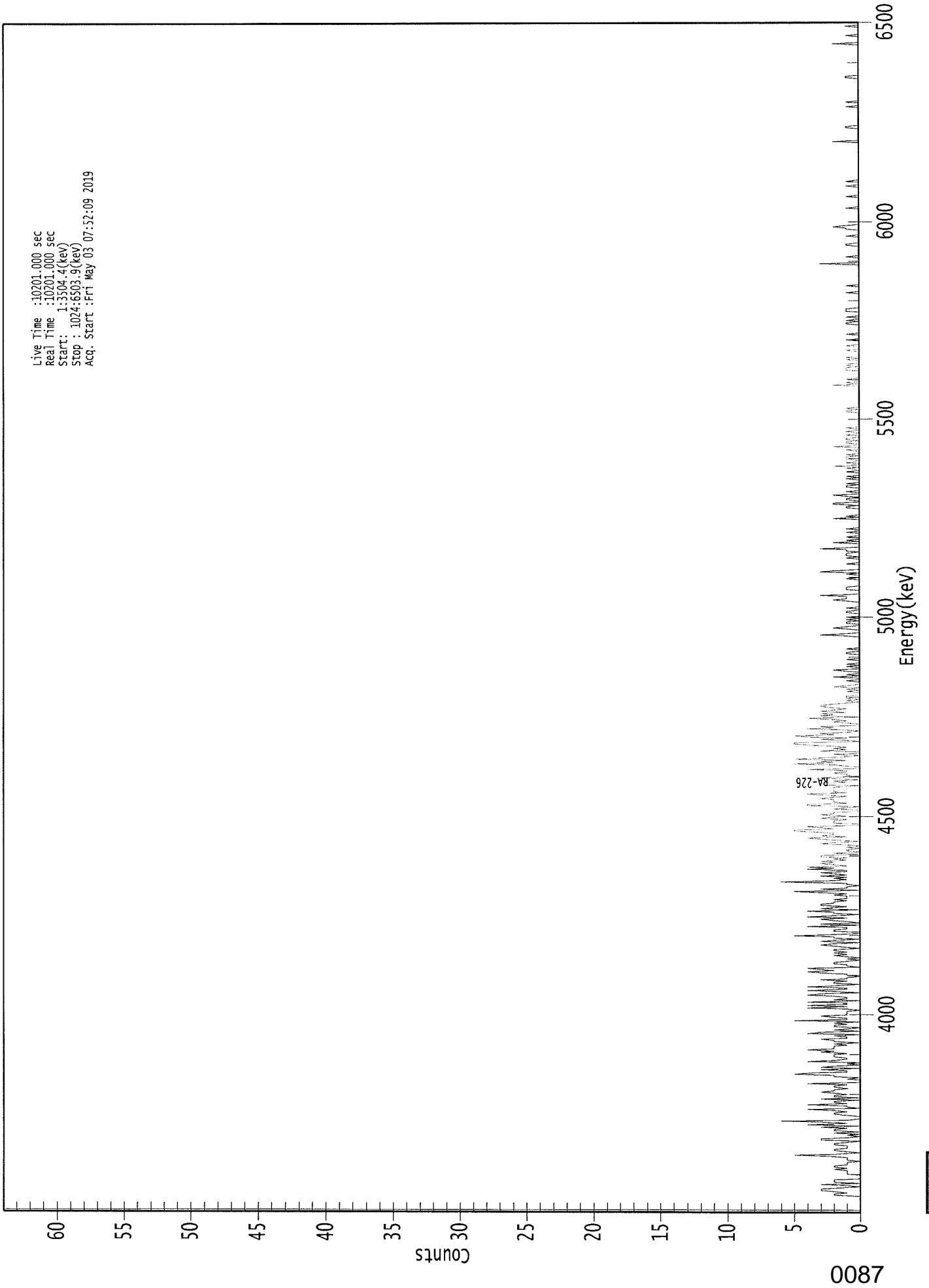
 NUCLIDE ANALYSIS RESULTS

Nuclide	Id Conf.	Energy (keV)	Activity (pCi/liter)	MDA (pCi/liter)
RA-224	0.961	5685.50*	3.18E+000 +/- 1.14E+000	7.49E-001 +/- 2.54E-002
RA-226	0.951	4785.00*	2.62E+001 +/- 3.20E+000	7.63E-001 +/- 2.57E-002

AG
5/3/19

0000241706.CNF

Live Time : 10201.000 sec
Real Time : 10201.000 sec
Start : 1:3504.4(kev)
Stop : 1024:6503.9(kev)
Acq. Start : Fri May 03 07:32:09 2019



0087

ROI Type: 1

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

Sample Title: 06

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

369: 3 1 2 0 2 3 0 1

Sample Title: 06

Channel	-----	-----	-----	-----	-----	-----	-----	-----
377:	1	2	1	1	4	0	0	1
385:	2	5	2	3	1	5	3	1
393:	0	2	0	0	3	1	2	1
401:	2	4	5	5	0	1	3	1
409:	4	5	2	3	1	0	1	4
417:	2	3	0	0	1	2	1	2
425:	4	0	3	2	3	1	3	2
433:	1	2	3	3	2	1	0	1
441:	0	1	1	1	0	0	0	1
449:	0	1	0	2	1	0	0	0
457:	1	0	0	2	0	1	0	0
465:	1	2	0	0	1	0	1	0
473:	0	0	1	0	0	0	0	1
481:	1	0	0	1	0	0	0	0
489:	0	0	0	0	0	0	1	3
497:	1	0	0	0	1	2	1	0
505:	0	1	1	0	1	0	1	0
513:	0	0	1	1	0	0	1	0
521:	0	0	0	0	1	2	1	1
529:	1	3	0	0	0	0	1	1
537:	1	0	0	0	0	0	0	1
545:	0	0	0	1	0	3	2	0
553:	0	0	0	0	1	0	0	0
561:	0	1	0	1	1	1	0	1
569:	1	3	0	0	0	0	2	0
577:	1	0	0	1	0	0	0	1
585:	0	0	1	0	0	0	0	0
593:	0	0	0	2	0	1	0	0
601:	0	0	0	0	1	1	0	2
609:	2	0	0	1	1	0	1	2
617:	0	0	1	0	0	0	1	1
625:	0	1	0	0	0	1	0	1
633:	0	0	0	1	0	0	1	0
641:	2	0	0	1	0	0	1	1
649:	1	0	1	0	0	0	1	0
657:	0	2	0	0	1	1	0	1
665:	1	0	0	1	0	0	1	0
673:	0	1	0	0	0	0	0	0
681:	0	0	0	0	0	0	0	1
689:	1	0	1	0	0	0	0	0
697:	0	0	0	0	0	0	0	0
705:	0	0	0	0	0	0	2	0
713:	1	0	0	1	0	0	0	0
721:	0	0	0	1	1	1	0	1
729:	1	0	0	0	1	0	1	0
737:	0	0	0	0	1	0	0	0
745:	1	0	0	0	0	1	0	0
753:	0	0	1	0	0	0	0	0
761:	0	0	0	1	1	0	1	0
769:	0	1	0	0	0	0	1	1
777:	1	0	0	0	0	0	0	0
785:	0	0	0	0	0	0	1	0
793:	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	3
817:	0	0	0	0	0	1	0	0
825:	0	0	0	0	0	0	0	1
833:	1	0	0	0	0	0	0	1
841:	0	0	0	0	0	1	1	2
849:	1	0	0	0	0	0	0	0
857:	0	0	0	0	0	0	0	1
865:	0	0	0	0	0	0	0	0
873:	0	1	0	0	0	0	0	0
881:	0	0	1	0	0	0	1	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:	2	0	0	0	0	0	0	0
929:	0	0	0	0	1	1	0	0
937:	0	0	0	0	0	0	0	0
945:	0	0	0	0	0	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	1
977:	1	0	0	0	0	0	0	0
985:	0	0	0	0	0	0	0	0
993:	0	0	0	0	0	0	0	0
1001:	0	0	0	0	2	0	0	0
1009:	0	0	0	1	0	0	0	0
1017:	0	0	0	1	0	0	0	0



Apex-Alpha™

CB
5/3/19

Sample Description: BC 11
 Spectrum File: \\OR-ALPHA1\Canberra\ApexAlpha\Root\Data\00002417
 Batch Identification: 1904087A-RA
 Sample Identification: 07
 Sample Geometry: Shelf 2
 Procedure Description: Ra

Detector Name: Alpha_033
 Chamber Serial Number: 04026479A
 Detector Serial Number: 91132
 Env. Background: System Bkgd 243627
 Reagent Blank: <not performed>

Sample Size: 1.000E+000 +/- 0.000E+000 liter
 Generic Mult. Factor: 3.000E+000 Generic Div. Factor: 1.000E+000
 Sample Date/Time: 4/2/2019 4:34:10 PM
 Acquisition Date/Time: 5/3/2019 7:59:13 AM
 Acquisition Live Time: 170.0 minutes
 Acquisition Real Time: 170.0 minutes

Chem. Recovery Factor: 1.0000 +/- 0.0000
 Counting Efficiency: 0.1603 +/- 0.0028 on 2/22/2019 8:51:55 AM
 Effective Efficiency: 0.1603 +/- 0.0028

Peak Match Tolerance: 0.350 MeV

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

Nuclide	Energy (MeV)	Net Pk Area	Pk Area Error %	Ambient Backgnd	Reagent Backgnd	FWHM (keV)
RA-224	5.472	9.00	68.87	0.00	0.00E+000	3.0
RA-226	4.576	48.32	28.43	0.68	0.00E+000	6.0

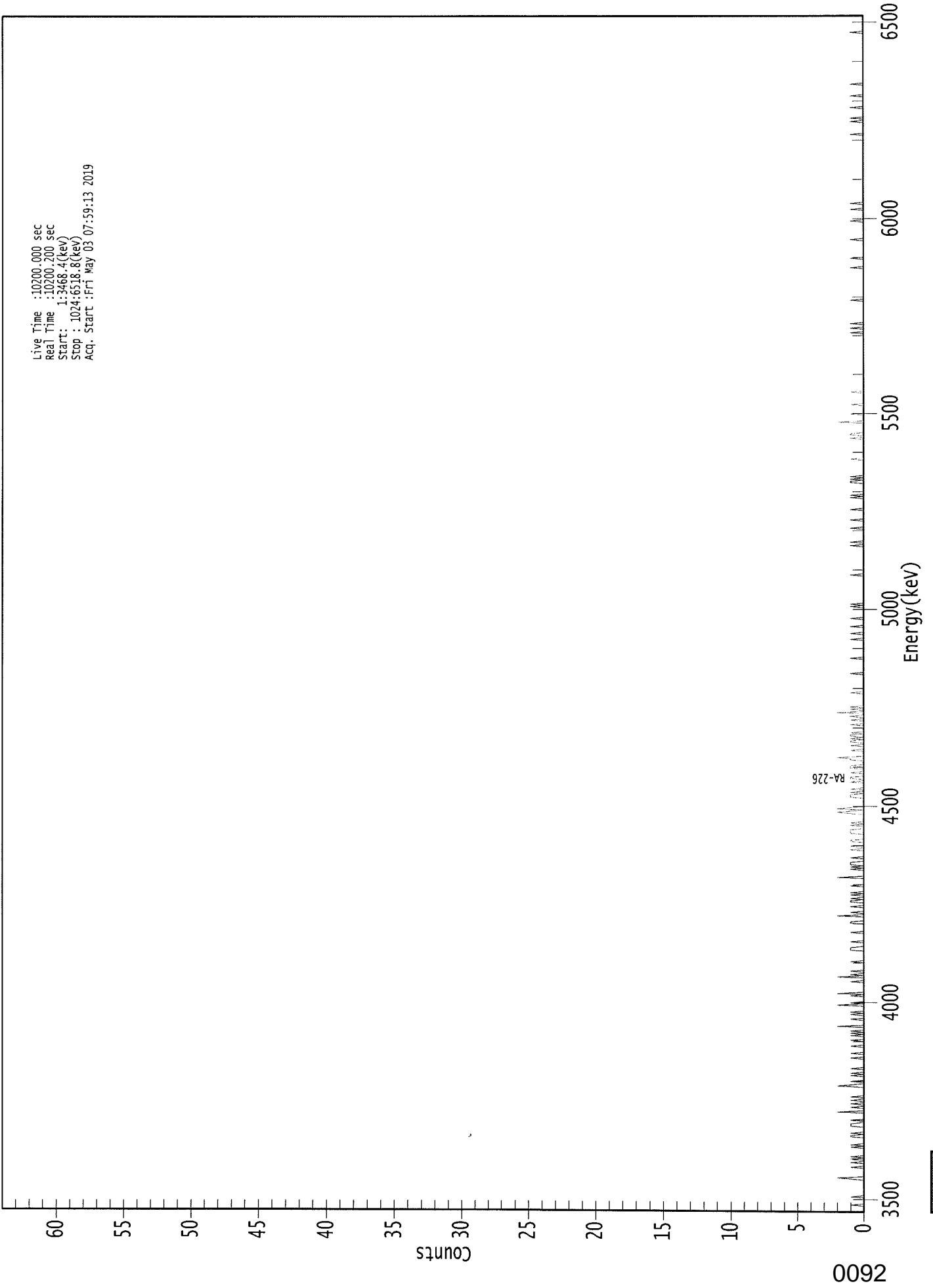
 ----- NUCLIDE ANALYSIS RESULTS -----

Nuclide	Id Conf.	Energy (keV)	Activity (pCi/liter)	MDA (pCi/liter)
RA-224	0.942	5685.50*	4.74E-001 +/- 3.27E-001	3.16E-001 +/- 1.09E-002
RA-226	0.945	4785.00*	2.40E+000 +/- 6.86E-001	2.80E-001 +/- 9.61E-003

AG
5/3/19

0000241707.CNF

Live Time : 10200.000 sec
Real Time : 10200.200 sec
Start : 1:3468.4(kev)
Stop : 1024:6518.8(kev)
Acq. Start : Fri May 03 07:59:13 2019



0092

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: 10200

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

369: 0 0 1 1 0 0 0 1

Sample Title: 07

Channel	-----	-----	-----	-----	-----	-----	-----	-----
377:	0	0	0	1	1	1	0	0
385:	0	0	1	1	2	0	0	0
393:	0	0	1	0	0	0	1	0
401:	0	1	1	0	1	0	1	1
409:	0	1	0	0	0	0	0	0
417:	1	0	0	0	1	0	0	1
425:	0	0	2	0	0	1	0	1
433:	0	0	0	0	0	0	0	0
441:	0	0	0	1	0	0	0	0
449:	0	0	0	0	0	0	0	0
457:	0	0	0	1	0	0	0	0
465:	0	0	0	0	0	0	0	0
473:	1	0	0	0	0	0	0	0
481:	0	0	0	0	0	0	0	0
489:	1	0	0	0	0	1	0	0
497:	0	0	0	1	0	0	0	0
505:	0	0	1	0	0	0	0	0
513:	0	0	0	0	1	0	1	0
521:	0	0	0	0	0	0	0	0
529:	0	0	0	0	0	0	0	0
537:	0	0	0	0	0	0	0	1
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:	1	0	0	1	0	0	0	0
577:	0	0	0	0	0	0	0	1
585:	0	0	0	0	0	0	1	0
593:	0	0	0	0	0	0	0	1
601:	0	0	0	0	0	0	0	0
609:	0	1	0	1	0	0	0	0
617:	0	0	0	0	0	0	1	1
625:	0	1	0	1	0	0	0	0
633:	0	0	0	0	0	0	0	0
641:	0	0	1	0	0	0	0	0
649:	0	0	0	0	0	0	0	0
657:	0	0	0	0	1	0	0	1
665:	1	0	0	0	0	0	0	0
673:	0	0	2	0	0	0	0	0
681:	0	1	0	0	0	0	0	0
689:	0	1	0	0	0	0	0	0
697:	0	0	0	0	1	0	0	0
705:	0	0	0	0	0	0	0	0
713:	0	0	0	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	1
753:	0	0	0	1	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	1	0	0	0	0
785:	0	0	0	0	0	0	0	0
793:	0	0	0	0	0	0	0	0

801: 0 0 0 0 0 0 0 1

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



16
5/3/19

Sample Description: BC 12
 Spectrum File: \\OR-ALPHA1\Canberra\ApexAlpha\Root\Data\00002417
 Batch Identification: 1904087A-RA
 Sample Identification: 08
 Sample Geometry: Shelf 2
 Procedure Description: Ra

Detector Name: Alpha_034
 Chamber Serial Number: 04026479B
 Detector Serial Number: 91136
 Env. Background: System Bkgd 243628
 Reagent Blank: <not performed>

Sample Size: 1.000E+000 +/- 0.000E+000 liter
 Generic Mult. Factor: 2.820E+000 Generic Div. Factor: 1.000E+000
 Sample Date/Time: 4/2/2019 4:34:10 PM
 Acquisition Date/Time: 5/3/2019 7:59:15 AM
 Acquisition Live Time: 170.0 minutes
 Acquisition Real Time: 170.0 minutes

Chem. Recovery Factor: 1.0000 +/- 0.0000
 Counting Efficiency: 0.1488 +/- 0.0026 on 2/22/2019 8:51:53 AM
 Effective Efficiency: 0.1488 +/- 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	5.507	1.66	169.38	0.34	0.00E+000	3.0
RA-226	4.554	8.32	71.13	0.68	0.00E+000	3.0

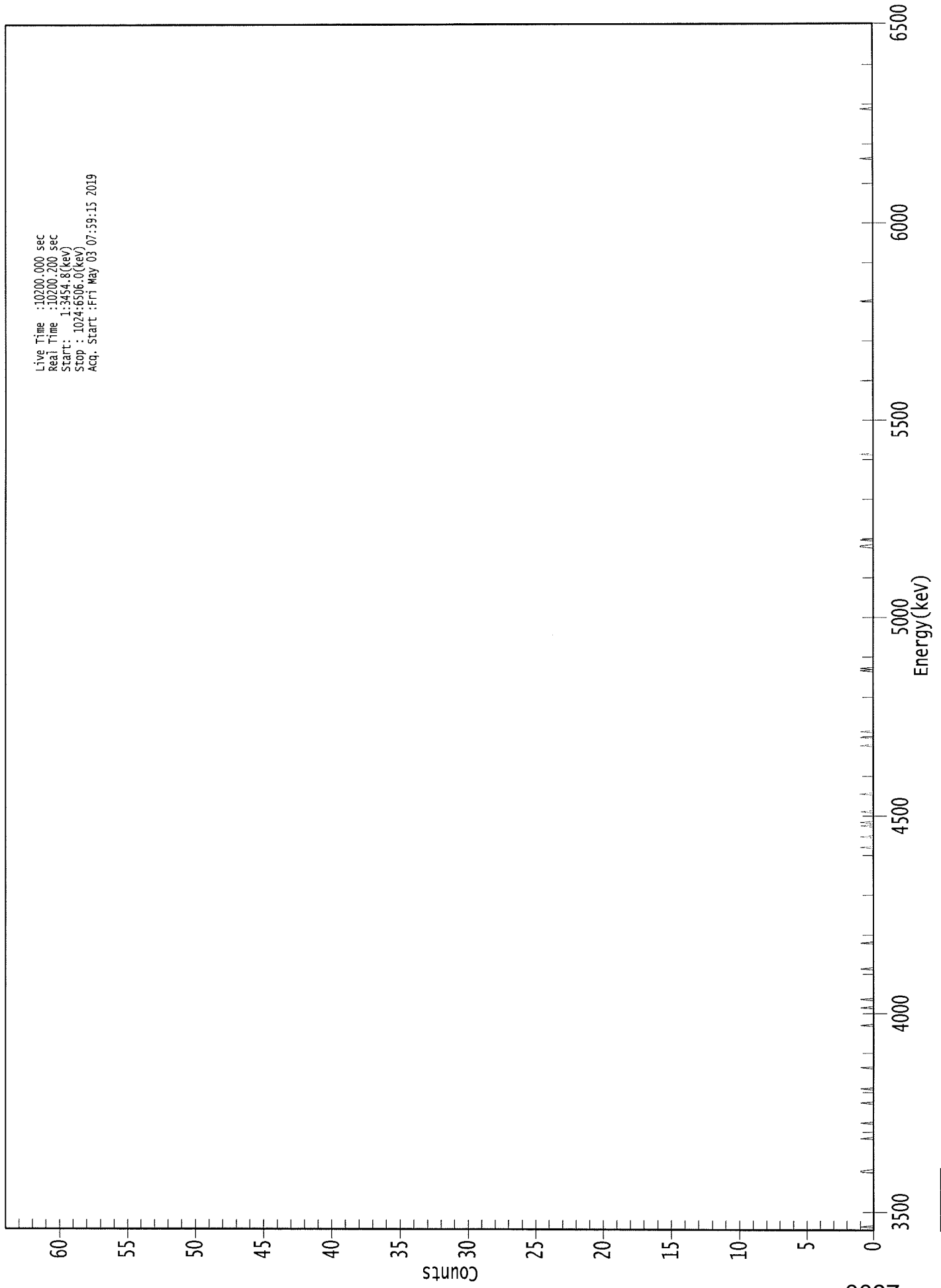
 NUCLIDE ANALYSIS RESULTS

Nuclide	Id Conf.	Energy (keV)	Activity (pCi/liter)	MDA (pCi/liter)
RA-224	0.959	5685.50*	8.85E-002 +/- 1.50E-001	2.55E-001 +/- 8.83E-003
RA-226	0.933	4785.00*	4.18E-001 +/- 2.97E-001	2.83E-001 +/- 9.75E-003

AG
5/3/19

0000241708.CNF

Live Time : 10200.000 sec
Real Time : 10200.200 sec
Start : 1:3454.8(kev)
Stop : 1024:6506.0(kev)
Acq. Start : Fri May 03 07:59:15 2019



0097

ROI Type: 1

369: 0 1 0 0 0 0 0 0

Sample Title: 08

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	1	0	0	0	0
417:	0	1	0	0	0	0	1
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	1	0	1	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	0	0	0	0	0
537:	0	0	0	0	0	0	0
545:	0	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	1	1	0	0	0
585:	1	0	0	0	0	0	0
593:	0	0	0	0	0	0	0
601:	0	0	0	0	0	0	0
609:	0	0	0	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	1	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	1
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	0
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	1	0	0	0
793:	0	0	0	0	0	0	0

801: 0 0 0 0 0 0 0 0

Sample Title: 08

Channel								
809:	0	0	0	0	0	0	0	0
817:	0	0	0	0	0	0	0	0
825:	0	0	0	0	0	0	0	0
833:	0	0	0	0	0	0	0	0
841:	0	0	0	0	0	0	0	0
849:	0	0	0	0	0	0	0	0
857:	0	0	0	0	0	0	0	0
865:	0	0	0	0	0	0	0	0
873:	0	0	0	0	0	0	0	0
881:	0	0	0	0	0	0	0	0
889:	0	0	0	0	0	0	0	0
897:	0	0	0	0	0	0	0	0
905:	0	0	0	0	1	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	1	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	1

KB
5/3/19

Sample Description: BC 24A
 Spectrum File: \\OR-ALPHA1\Canberra\ApexAlpha\Root\Data\00002417
 Batch Identification: 1904087A-RA
 Sample Identification: 09
 Sample Geometry: Shelf 2
 Procedure Description: Ra

Detector Name: Alpha_035
 Chamber Serial Number: 04026477A
 Detector Serial Number: 58771
 Env. Background: System Bkgd 243629
 Reagent Blank: <not performed>

Sample Size: 1.000E+000 +/- 0.000E+000 liter
 Generic Mult. Factor: 3.000E+000 Generic Div. Factor: 1.000E+000
 Sample Date/Time: 4/3/2019 4:34:10 PM
 Acquisition Date/Time: 5/3/2019 7:59:16 AM
 Acquisition Live Time: 170.0 minutes
 Acquisition Real Time: 170.0 minutes

Chem. Recovery Factor: 1.0000 +/- 0.0000
 Counting Efficiency: 0.1265 +/- 0.0023 on 2/22/2019 8:51:52 AM
 Effective Efficiency: 0.1265 +/- 0.0023

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	5.478	6.30	89.57	1.70	0.00E+000	3.0
RA-226	4.562	91.30	20.73	1.70	0.00E+000	3.5

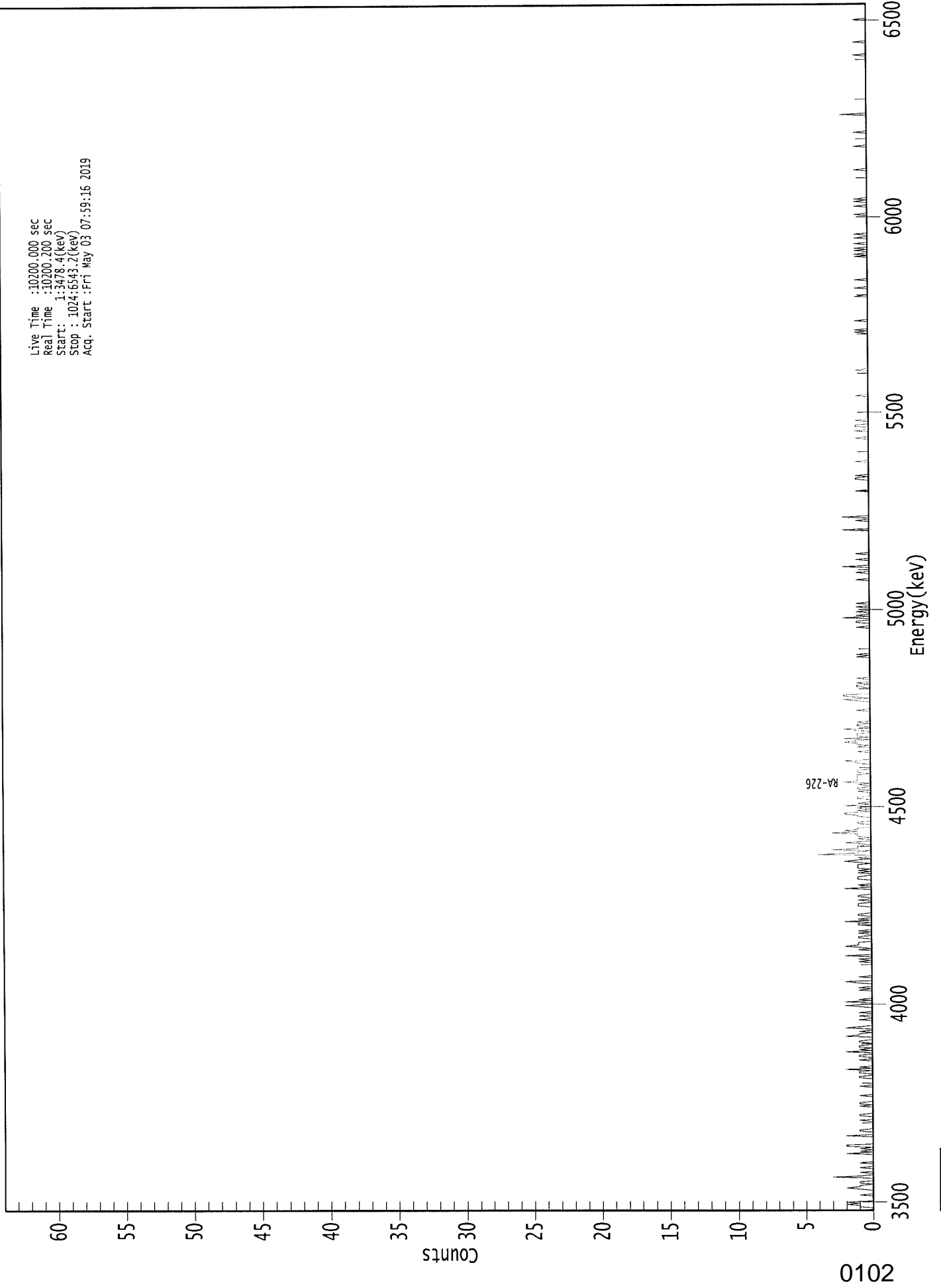
 NUCLIDE ANALYSIS RESULTS

Nuclide	Id Conf.	Energy (keV)	Activity (pCi/liter)	MDA (pCi/liter)
RA-224	0.945	5685.50*	4.20E-001 +/- 3.77E-001	4.90E-001 +/- 1.74E-002
RA-226	0.937	4785.00*	5.74E+000 +/- 1.21E+000	4.62E-001 +/- 1.63E-002

AG
5/3/19

0000241709.CNF

Live Time :10200.000 sec
Real Time :10200.200 sec
Start : 1:34:78.4(kev)
Stop : 1024:6543.2(kev)
Acq. Start :Fri May 03 07:59:16 2019



0102

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: 10200

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

369: 1 0 1 1 1 0 0 0

Sample Title: 09

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

801: 0 0 0 0 0 0 0 0

Sample Title: 09

Channel	-----	-----	-----	-----	-----	-----	-----	-----
809:	1	0	1	0	0	1	0	1
817:	0	0	0	1	0	0	0	0
825:	1	0	0	1	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	1	0	0	0	1
857:	0	1	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	1	0	0	0	0	0
889:	0	0	0	0	0	0	0	0
897:	0	0	0	0	0	0	1	0
905:	0	0	0	0	0	0	0	0
913:	0	0	1	0	0	0	0	0
921:	0	0	0	0	0	0	0	0
929:	0	2	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	1	0	0	0	0
985:	0	0	0	0	0	0	1	0
993:	0	0	0	0	0	0	0	0
1001:	0	0	0	0	0	0	0	0
1009:	0	1	0	0	0	0	0	0
1017:	0	0	0	0	0	0	0	0



Apex-Alpha™

ES
5/3/19

Sample Description: BC 24B
 Spectrum File: \\OR-ALPHA1\Canberra\ApexAlpha\Root\Data\00002417
 Batch Identification: 1904087A-RA
 Sample Identification: 10
 Sample Geometry: Shelf 2
 Procedure Description: Ra

Detector Name: Alpha_036
 Chamber Serial Number: 04026477B
 Detector Serial Number: 84167
 Env. Background: System Bkgd 243630
 Reagent Blank: <not performed>

Sample Size: 1.000E+000 +/- 0.000E+000 liter
 Generic Mult. Factor: 2.340E+000 Generic Div. Factor: 1.000E+000
 Sample Date/Time: 4/3/2019 4:34:10 PM
 Acquisition Date/Time: 5/3/2019 7:59:18 AM
 Acquisition Live Time: 170.0 minutes
 Acquisition Real Time: 170.0 minutes

Chem. Recovery Factor: 0.9338 +/- 0.0000
 Counting Efficiency: 0.1687 +/- 0.0029 on 2/22/2019 8:51:50 AM
 Effective Efficiency: 0.1575 +/- 0.0027

Peak Match Tolerance: 0.350 MeV

 PEAK AREA REPORT

Nuclide	Energy (MeV)	Net Pk Area	Pk Area Error %	Ambient Backgnd	Reagent Backgnd	FWHM (keV)
RA-224	5.491	17.66	47.16	0.34	0.00E+000	4.5
RA-226	4.597	97.64	20.00	1.36	0.00E+000	3.0

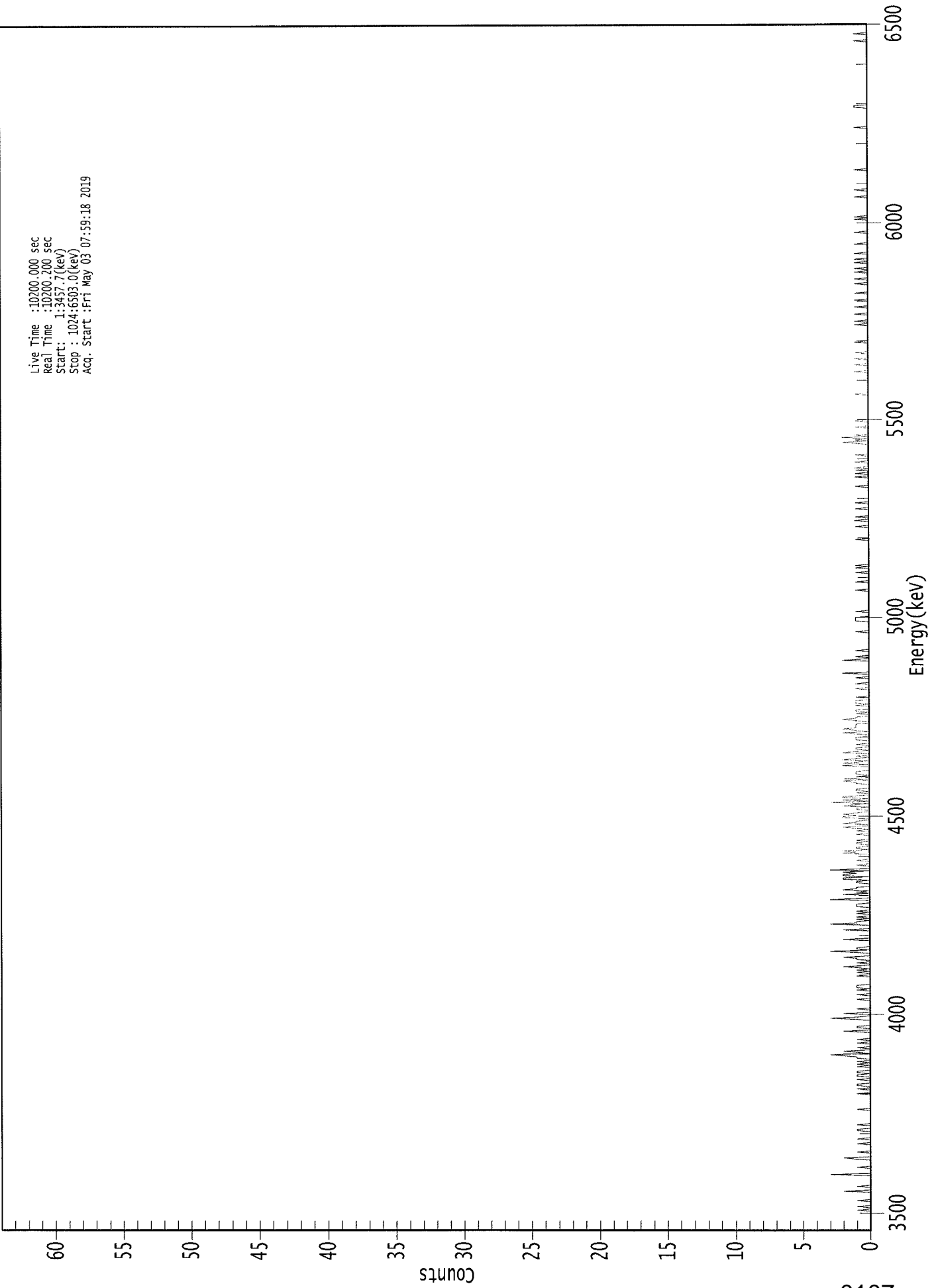
 NUCLIDE ANALYSIS RESULTS

Nuclide	Id Conf.	Energy (keV)	Activity (pCi/liter)	MDA (pCi/liter)
RA-224	0.952	5685.50*	7.38E-001 +/- 3.49E-001	2.00E-001 +/- 6.82E-003
RA-226	0.955	4785.00*	3.84E+000 +/- 7.79E-001	2.70E-001 +/- 9.17E-003

AG
5/3/19

0000241710.CNF

Live Time :10200.000 sec
Real Time :10200.200 sec
Start : 1:34:57.7(kev)
Stop : 1024:6503.0(kev)
Acq. Start :Fri May 03 07:59:18 2019



0107

ROI Type: 1

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

Sample Title: 10

Elapsed Live time: 10200

Elapsed Real Time: 10200

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

369: 0 0 1 0 1 1 0 0

Sample Title: 10

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

801: 0 0 1 0 0 0 1 0

Sample Title: 10

Channel	-----	-----	-----	-----	-----	-----	-----	-----
809:	0	0	0	0	1	0	0	1
817:	0	0	0	0	1	0	0	1
825:	0	0	0	0	1	0	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	1	0	1	0	0	0	0
865:	0	0	0	0	0	0	0	0
873:	0	0	0	0	1	0	0	0
881:	0	0	1	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	0	0
921:	0	0	0	0	0	0	0	0
929:	0	0	0	0	0	0	0	1
937:	0	0	0	0	0	0	0	0
945:	0	0	0	0	0	0	0	0
953:	1	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:	1	0	0	0	0	0	1	0
1017:	0	0	0	0	0	0	0	0

145
5/3/19

Sample Description: BC 21B
 Spectrum File: \\OR-ALPHA1\Canberra\ApexAlpha\Root\Data\00002417
 Batch Identification: 1904087A-RA
 Sample Identification: 11
 Sample Geometry: Shelf 2
 Procedure Description: Ra

Detector Name: Alpha_038
 Chamber Serial Number: 04026478B
 Detector Serial Number: 91134
 Env. Background: System Bkgd 243631
 Reagent Blank: <not performed>

Sample Size: 1.000E+000 +/- 0.000E+000 liter
 Generic Mult. Factor: 2.270E+000 Generic Div. Factor: 1.000E+000
 Sample Date/Time: 4/3/2019 4:34:10 PM
 Acquisition Date/Time: 5/3/2019 7:59:19 AM
 Acquisition Live Time: 170.0 minutes
 Acquisition Real Time: 170.0 minutes

Chem. Recovery Factor: 1.0000 +/- 0.0000
 Counting Efficiency: 0.1461 +/- 0.0026 on 2/22/2019 8:51:47 AM
 Effective Efficiency: 0.1461 +/- 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	5.506	13.66	53.80	0.34	0.00E+000	4.5
RA-226	4.603	50.66	27.65	0.34	0.00E+000	3.0

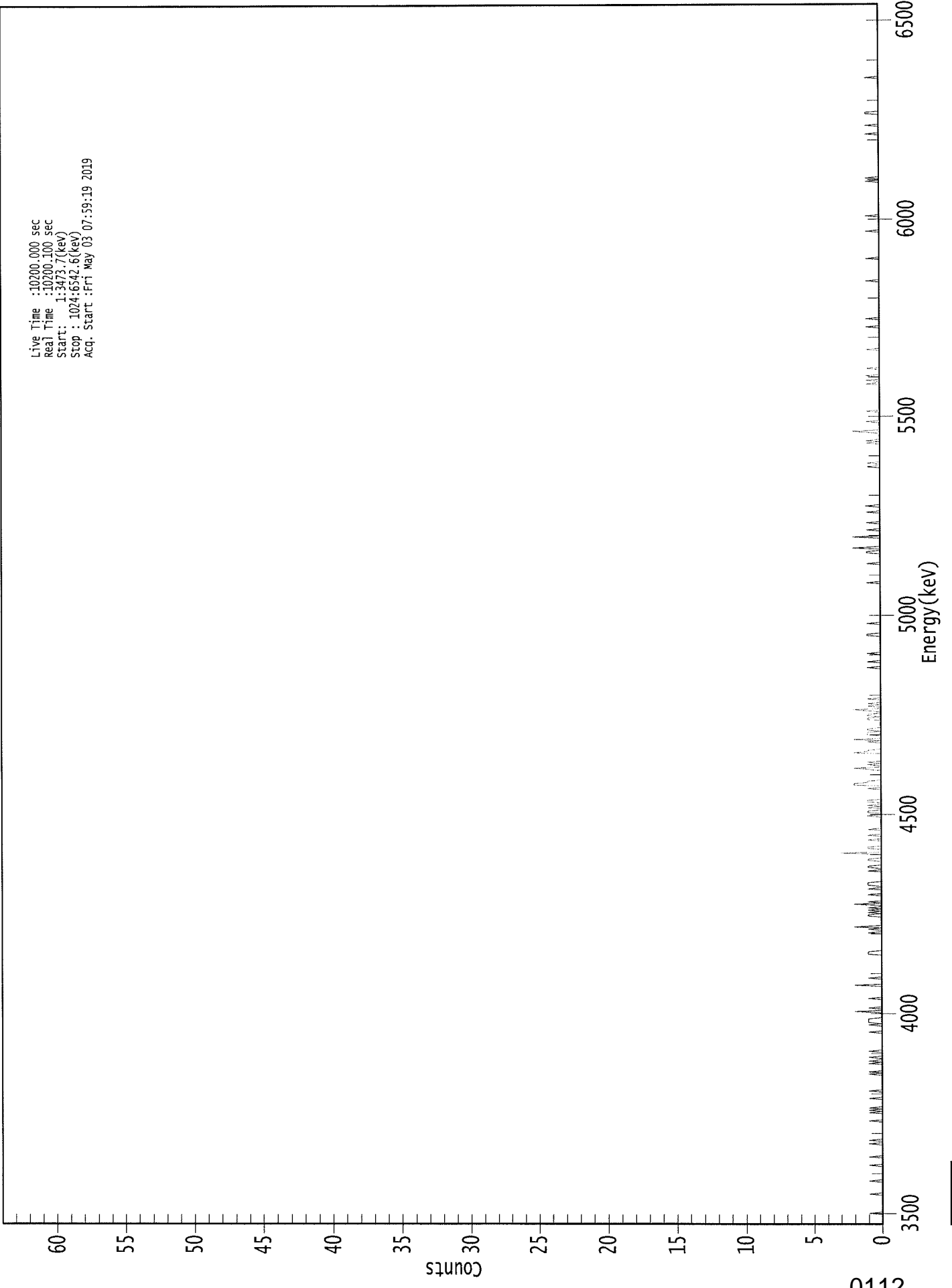
 ----- NUCLIDE ANALYSIS RESULTS -----

Nuclide	Id Conf.	Energy (keV)	Activity (pCi/liter)	MDA (pCi/liter)
RA-224	0.959	5685.50*	5.97E-001 +/- 3.22E-001	2.09E-001 +/- 7.25E-003
RA-226	0.958	4785.00*	2.09E+000 +/- 5.81E-001	1.97E-001 +/- 6.80E-003

AG
5/3/19

0000241711.CNF

Live Time :10200.000 sec
Real Time :10200.100 Sec
Start : 1:3473.7(keV)
Stop : 1024:6542.6(keV)
Acq. Start :Fri May 03 07:59:19 2019



0112

ROI Type: 1

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

Sample Title: 11

Elapsed Live time: 10200

Elapsed Real Time: 10200

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

369: 2 1 1 0 0 0 0 0

Sample Title: 11

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

801: 0 0 0 0 0 0 0 0

Sample Title: 11

Channel	-----	-----	-----	-----	-----	-----	-----	-----
809:	0	1	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	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	1	0	0	1	0	0
881:	0	0	0	0	0	0	0	0
889:	0	0	0	0	0	0	0	0
897:	0	0	0	0	0	0	0	0
905:	0	0	0	0	0	0	0	0
913:	0	0	1	0	0	0	0	0
921:	0	1	0	0	0	0	0	0
929:	0	0	0	1	1	0	0	0
937:	0	0	0	0	0	0	0	0
945:	0	0	0	0	0	0	0	0
953:	0	0	0	0	0	0	0	0
961:	0	1	0	0	0	0	0	0
969:	0	0	0	0	0	0	0	0
977:	0	0	0	0	0	0	0	0
985:	0	0	0	0	0	0	0	0
993:	0	0	0	0	0	0	0	0
1001:	0	0	0	0	0	0	0	0
1009:	0	0	0	0	0	0	0	0
1017:	0	0	0	0	0	0	0	0



Apex-Alpha™

Sample Description: BC 21A
 Spectrum File: \\OR-ALPHA1\Canberra\ApexAlpha\Root\Data\00002417
 Batch Identification: 1904087A-RA
 Sample Identification: 12
 Sample Geometry: Shelf 2
 Procedure Description: Ra

Detector Name: Alpha_039
 Chamber Serial Number: 06027396A
 Detector Serial Number: 83109
 Env. Background: System Bkgd 243632
 Reagent Blank: <not performed>

Sample Size: 1.000E+000 +/- 0.000E+000 liter
 Generic Mult. Factor: 2.370E+000 Generic Div. Factor: 1.000E+000
 Sample Date/Time: 4/3/2019 4:34:10 PM
 Acquisition Date/Time: 5/3/2019 7:59:21 AM
 Acquisition Live Time: 170.0 minutes
 Acquisition Real Time: 170.0 minutes

Chem. Recovery Factor: 1.0000 +/- 0.0000
 Counting Efficiency: 0.1503 +/- 0.0026 on 2/22/2019 8:51:44 AM
 Effective Efficiency: 0.1503 +/- 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	5.550	4.13	119.29	1.87	0.00E+000	3.0
RA-226	4.584	37.77	33.45	3.23	0.00E+000	5.2

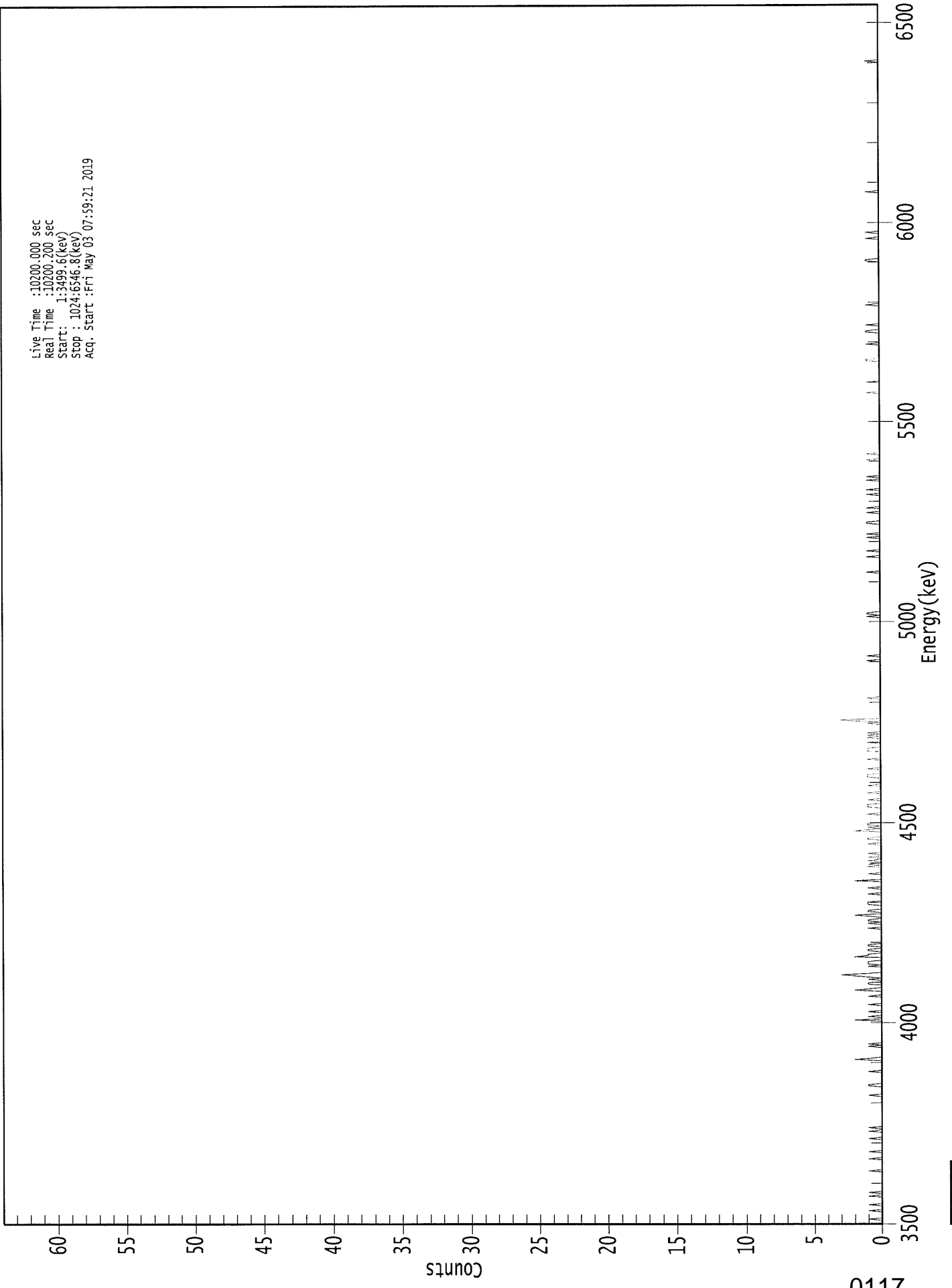
 ----- NUCLIDE ANALYSIS RESULTS -----

Nuclide	Id Conf.	Energy (keV)	Activity (pCi/liter)	MDA (pCi/liter)
RA-224	0.976	5685.50*	1.83E-001 +/- 2.19E-001	3.36E-001 +/- 1.16E-002
RA-226	0.949	4785.00*	1.58E+000 +/- 5.31E-001	3.80E-001 +/- 1.31E-002

AG
5/3/19

0000241719.CNF

Live Time :10200.000 sec
Real Time :10200.200 sec
Start : 1:3459.6(kev)
Stop : 1024:6546.8(kev)
Acq. Start :Fri May 03 07:59:21 2019



0117

ROI Type: 1

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

Sample Title: 12

Elapsed Live time: 10200

Elapsed Real Time: 10200

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

369: 0 0 0 0 0 0 1 1

Sample Title: 12

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

801: 0 0 0 0 0 0 0 0 1

Sample Title: 12

Channel	-----	-----	-----	-----	-----	-----	-----	-----
809:	1	0	0	0	0	0	0	0
817:	0	0	0	0	0	0	0	0
825:	0	0	1	0	0	0	0	1
833:	0	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	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	0	0	0	0	0	0	1
977:	0	0	0	0	0	0	0	0
985:	0	0	0	0	0	0	0	0
993:	0	0	0	0	0	0	0	0
1001:	0	0	0	0	0	0	0	0
1009:	0	0	0	0	0	0	0	0
1017:	0	0	0	0	0	0	0	0



Apex-Alpha™

VB
5/13/19

Sample Description: BC 13
 Spectrum File: \\OR-ALPHA1\Canberra\ApexAlpha\Root\Data\00002417
 Batch Identification: 1904087A-RA
 Sample Identification: 13
 Sample Geometry: Shelf 2
 Procedure Description: Ra

Detector Name: Alpha_040
 Chamber Serial Number: 06027396B
 Detector Serial Number: 91135
 Env. Background: System Bkgd 243633
 Reagent Blank: <not performed>

Sample Size: 2.000E-001 +/- 0.000E+000 liter
 Generic Mult. Factor: 2.840E+000 Generic Div. Factor: 1.000E+000
 Sample Date/Time: 4/3/2019 4:34:10 PM
 Acquisition Date/Time: 5/3/2019 7:59:23 AM
 Acquisition Live Time: 170.0 minutes
 Acquisition Real Time: 170.0 minutes

Chem. Recovery Factor: 1.0000 +/- 0.0000
 Counting Efficiency: 0.1606 +/- 0.0028 on 2/22/2019 8:51:43 AM
 Effective Efficiency: 0.1606 +/- 0.0028

Peak Match Tolerance: 0.350 MeV

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

Nuclide	Energy (MeV)	Net Pk Area	Pk Area Error %	Ambient Backgnd	Reagent Backgnd	FWHM (keV)
RA-224	5.481	24.13	41.67	1.87	0.00E+000	6.0
RA-226	4.595	116.60	18.46	3.40	0.00E+000	3.0

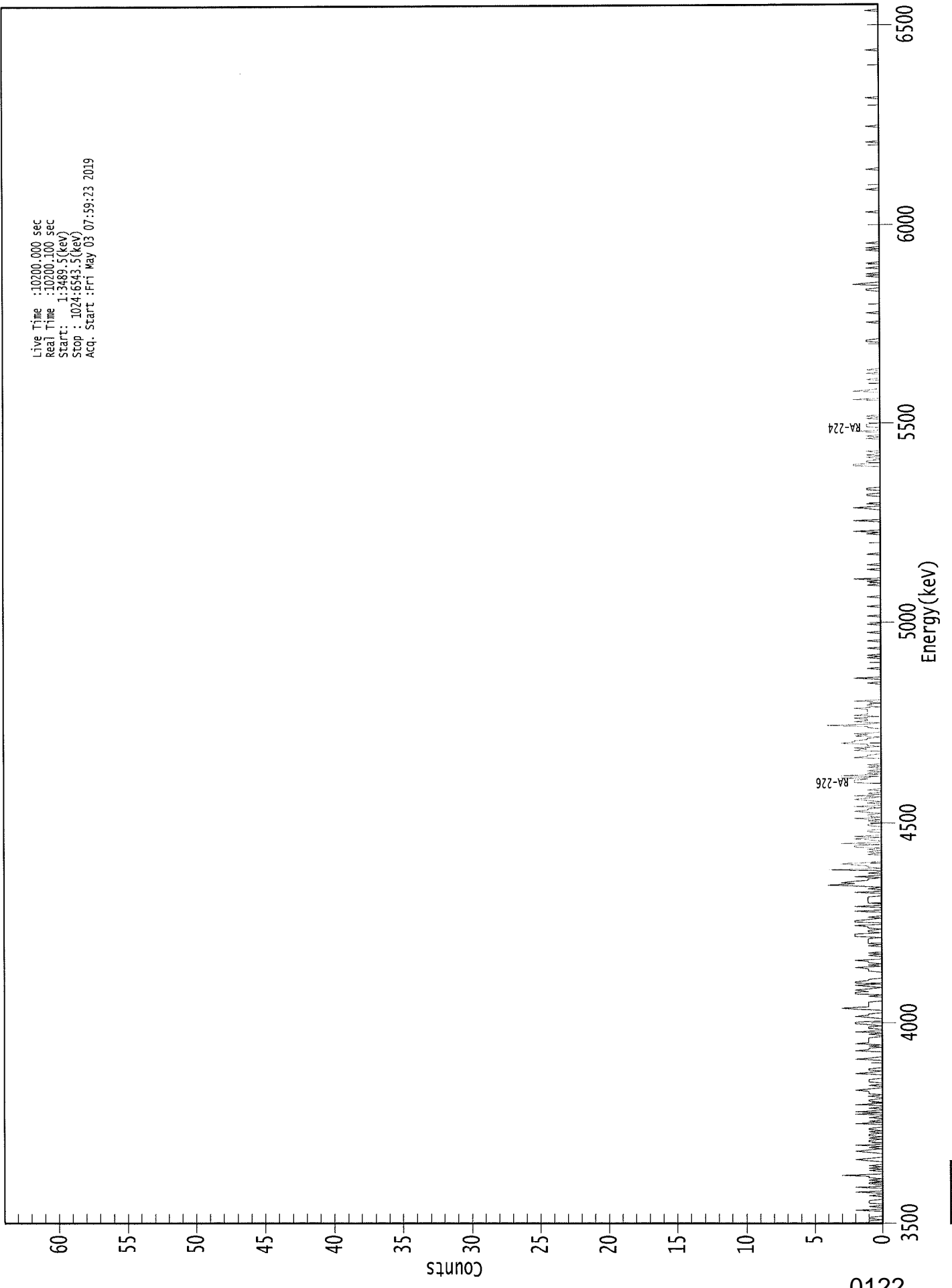
 ----- NUCLIDE ANALYSIS RESULTS -----

Nuclide	Id Conf.	Energy (keV)	Activity (pCi/liter)	MDA (pCi/liter)
RA-224	0.947	5685.50*	6.00E+000 +/- 2.51E+000	1.88E+000 +/- 6.45E-002
RA-226	0.954	4785.00*	2.73E+001 +/- 5.13E+000	2.17E+000 +/- 7.40E-002

AG
5/3/19

0000241716.CNF

Live Time : 10200.000 sec
Real Time : 10200.100 sec
Start : 1:3489.5(kev)
Stop : 1024:6543.5(kev)
Acq. Start : Fri May 03 07:59:23 2019



ROI Type: 1

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

Sample Title: 13

Elapsed Live time: 10200

Elapsed Real Time: 10200

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

369: 0 2 2 2 1 3 0 3

Sample Title: 13

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

801: 0 1 0 0 0 1 0 0

Sample Title: 13

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

KS
5/3/19

Sample Description: BC 14
 Spectrum File: \\OR-ALPHA1\Canberra\ApexAlpha\Root\Data\00002417
 Batch Identification: 1904087A-RA
 Sample Identification: 14
 Sample Geometry: Shelf 2
 Procedure Description: Ra

Detector Name: Alpha_041
 Chamber Serial Number: 05026930A
 Detector Serial Number: 91087
 Env. Background: System Bkgd 243634
 Reagent Blank: <not performed>

Sample Size: 1.000E+000 +/- 0.000E+000 liter
 Generic Mult. Factor: 2.690E+000 Generic Div. Factor: 1.000E+000
 Sample Date/Time: 4/3/2019 4:34:10 PM
 Acquisition Date/Time: 5/3/2019 7:59:25 AM
 Acquisition Live Time: 170.0 minutes
 Acquisition Real Time: 170.0 minutes

Chem. Recovery Factor: 0.9892 +/- 0.0000
 Counting Efficiency: 0.1659 +/- 0.0029 on 2/22/2019 8:51:41 AM
 Effective Efficiency: 0.1641 +/- 0.0028

Peak Match Tolerance: 0.350 MeV

 PEAK AREA REPORT

Nuclide	Energy (MeV)	Net Pk Area	Pk Area Error %	Ambient Backgnd	Reagent Backgnd	FWHM (keV)
RA-224	5.486	3.98	112.01	1.02	0.00E+000	3.0
RA-226	4.623	13.64	56.08	1.36	0.00E+000	3.0

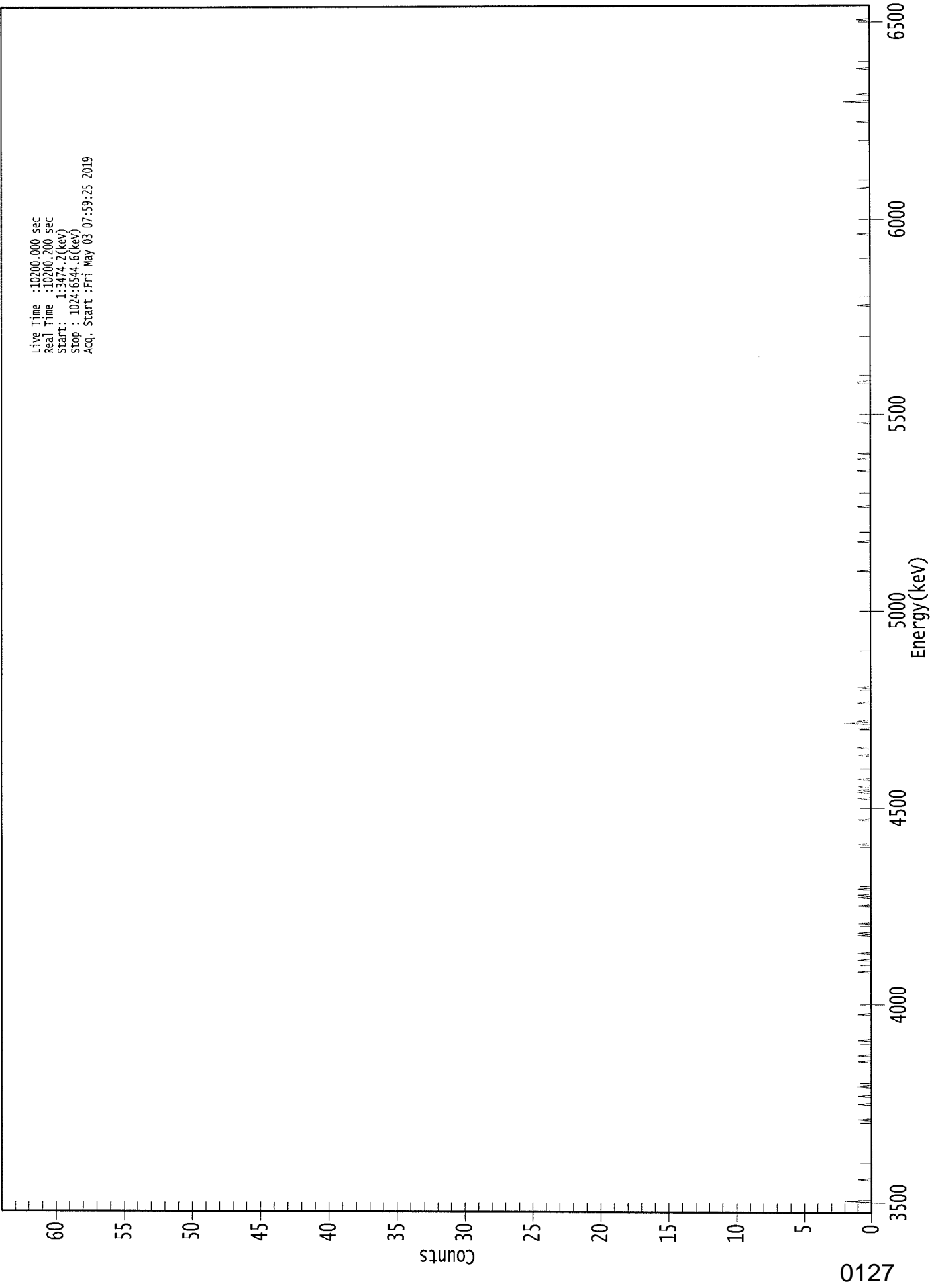
 NUCLIDE ANALYSIS RESULTS

Nuclide	Id Conf.	Energy (keV)	Activity (pCi/liter)	MDA (pCi/liter)
RA-224	0.950	5685.50*	1.84E-001 +/- 2.06E-001	2.91E-001 +/- 9.91E-003
RA-226	0.966	4785.00*	5.92E-001 +/- 3.33E-001	2.98E-001 +/- 1.01E-002

AG
5/3/19

0000241717.CNF

Live Time : 10200.000 sec
Real Time : 10200.200 sec
Start : 1:3474.2(kev)
Stop : 1024:6544.6(kev)
Acq. Start : Fri May 03 07:59:25 2019



0127

ROI Type: 1

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

Sample Title: 14

Elapsed Live time: 10200

Elapsed Real Time: 10200

Channel	1	2	3	4	5	6	7	8	9
1:	0	0	0	0	0	0	0	0	0
9:	0	0	2	0	0	0	0	0	0
17:	0	0	0	0	0	0	0	0	0
25:	0	0	0	0	1	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	1	0	0
81:	0	0	0	0	0	0	0	0	0
89:	0	0	0	1	0	0	0	0	0
97:	0	0	1	0	0	0	0	0	0
105:	0	0	1	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	1
129:	0	0	0	0	1	0	0	0	0
137:	0	0	0	0	0	0	0	0	0
145:	0	1	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	1
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	1	0	0	0	0	0
209:	0	0	0	0	0	1	0	0	0
217:	0	0	0	1	0	0	0	0	0
225:	0	0	0	0	0	0	0	0	0
233:	0	0	1	0	1	0	0	0	0
241:	0	0	0	0	1	0	0	0	0
249:	0	0	0	0	0	0	0	0	0
257:	0	0	0	1	0	0	0	0	0
265:	0	0	1	0	1	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:	0	0	0	0	0	0	0	0	0
305:	0	0	0	0	0	0	0	0	1
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	1	0	0	0	0
337:	0	0	0	0	0	0	0	0	0
345:	0	0	0	0	0	0	1	0	0
353:	0	0	0	1	0	1	0	0	0
361:	1	0	0	0	0	0	1	0	0

369: 0 0 0 0 0 0 0 0

Sample Title: 14

Channel	-----	-----	-----	-----	-----	-----	-----	-----
377:	0	0	0	0	0	0	0	0
385:	0	0	0	1	0	0	0	0
393:	0	1	0	0	0	0	0	0
401:	0	0	0	0	0	0	0	0
409:	0	1	0	0	0	0	2	0
417:	1	0	0	0	0	0	0	0
425:	0	0	0	0	0	0	0	1
433:	0	0	0	0	0	0	0	0
441:	0	0	0	0	1	0	0	0
449:	0	0	0	0	0	0	0	0
457:	0	0	0	0	0	0	0	0
465:	0	0	0	0	0	0	0	0
473:	0	0	0	0	0	0	0	0
481:	0	0	0	0	0	0	0	0
489:	0	0	0	0	0	0	0	0
497:	0	0	0	0	0	0	0	0
505:	0	0	0	0	0	0	0	0
513:	0	0	0	0	0	0	0	0
521:	0	0	0	0	0	0	0	0
529:	0	0	0	0	0	0	0	0
537:	0	0	0	0	0	0	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	1
569:	0	0	0	0	0	0	0	0
577:	0	0	0	0	0	0	0	0
585:	0	0	0	0	0	0	0	0
593:	0	0	0	0	0	1	0	0
601:	0	0	0	0	0	0	0	0
609:	0	0	0	0	0	0	0	0
617:	0	0	0	0	0	0	0	0
625:	0	0	0	1	0	0	0	0
633:	0	0	0	0	0	1	0	0
641:	0	0	1	0	0	0	0	0
649:	0	0	0	0	0	0	0	0
657:	0	0	0	0	0	0	0	0
665:	0	0	0	0	1	0	0	0
673:	0	0	0	0	0	0	0	0
681:	0	0	0	0	0	0	0	0
689:	0	0	0	0	0	0	0	0
697:	0	0	0	0	0	0	1	1
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:	1	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 0

Sample Title: 14

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

WBS
5/3/19

Sample Description: BC 28B
 Spectrum File: \\OR-ALPHA1\Canberra\ApexAlpha\Root\Data\00002417
 Batch Identification: 1904087A-RA
 Sample Identification: 15
 Sample Geometry: Shelf 2
 Procedure Description: Ra

Detector Name: Alpha_042
 Chamber Serial Number: 05026930B
 Detector Serial Number: 84185
 Env. Background: System Bkgd 243635
 Reagent Blank: <not performed>

Sample Size: 1.000E+000 +/- 0.000E+000 liter
 Generic Mult. Factor: 2.690E+000 Generic Div. Factor: 1.000E+000
 Sample Date/Time: 4/8/2019 4:34:10 PM
 Acquisition Date/Time: 5/3/2019 7:59:26 AM
 Acquisition Live Time: 170.0 minutes
 Acquisition Real Time: 170.0 minutes

Chem. Recovery Factor: 1.0000 +/- 0.0000
 Counting Efficiency: 0.1620 +/- 0.0028 on 2/22/2019 8:51:39 AM
 Effective Efficiency: 0.1620 +/- 0.0028

Peak Match Tolerance: 0.350 MeV

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

Nuclide	Energy (MeV)	Net Pk Area	Pk Area Error %	Ambient Backgnd	Reagent Backgnd	FWHM (keV)
RA-224	5.513	3.32	119.77	0.68	0.00E+000	3.0
RA-226	4.634	4.64	105.44	1.36	0.00E+000	3.0

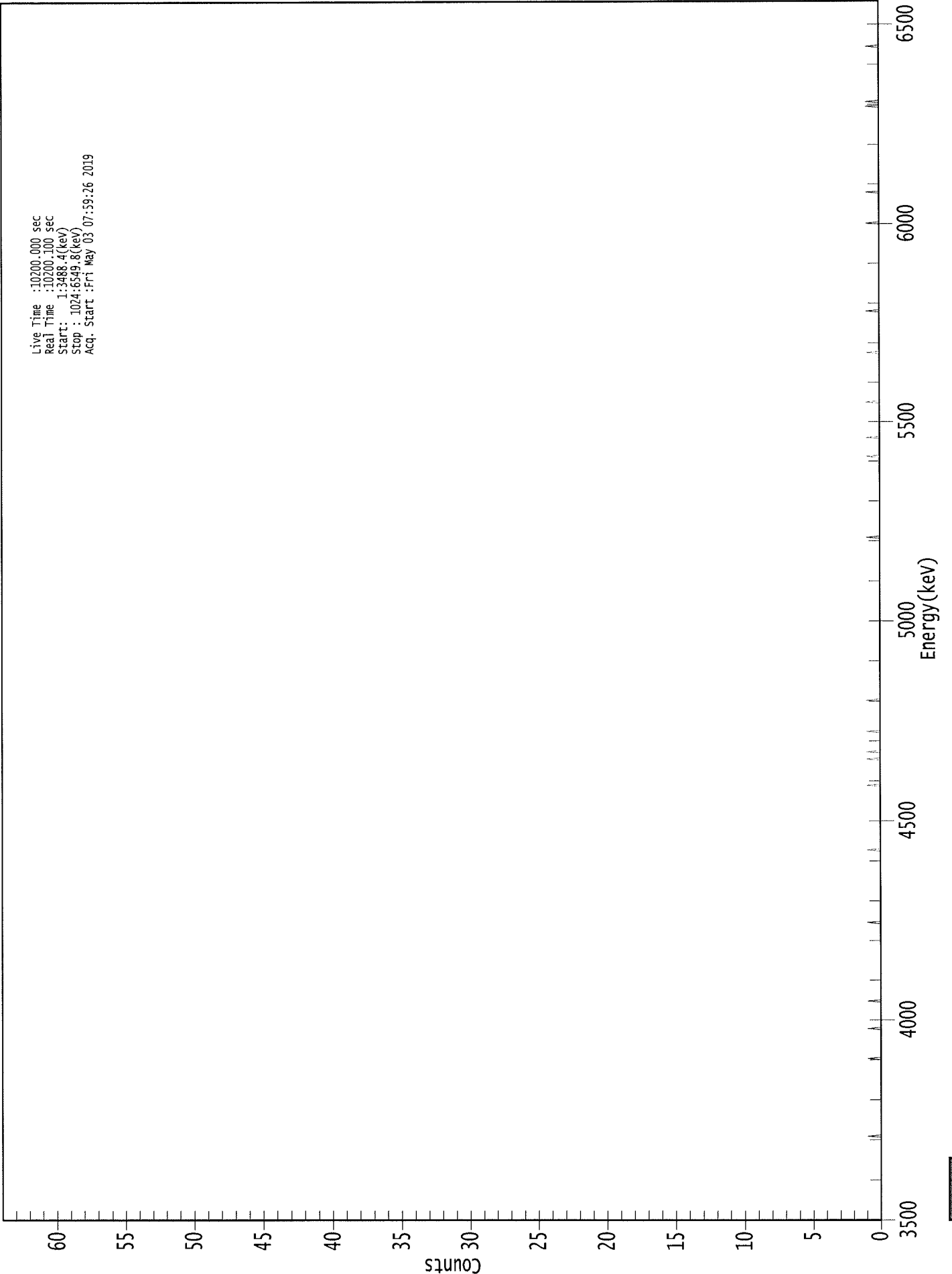
 ----- NUCLIDE ANALYSIS RESULTS -----

Nuclide	Id Conf.	Energy (keV)	Activity (pCi/liter)	MDA (pCi/liter)
RA-224	0.962	5685.50*	1.55E-001 +/- 1.86E-001	2.63E-001 +/- 8.98E-003
RA-226	0.970	4785.00*	2.04E-001 +/- 2.15E-001	3.02E-001 +/- 1.03E-002

AG
5/3/19

0000241718.CNF

Live Time : 10200.000 sec
Real Time : 10200.100 sec
Start : 1:3488.4(kev)
Stop : 1024:6549.8(kev)
Acq. Start : Fri May 03 07:59:26 2019



0132

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

Sample Title: 15

Elapsed Live time: 10200

Elapsed Real Time: 10200

Channel	1	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	1	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	1
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:	1	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	1
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	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	0	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:	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	1	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	1	0	0	0

369: 0 0 0 0 0 0 0 0

Sample Title: 15

Channel								
377:	0	0	0	0	0	0	0	0
385:	0	0	1	0	0	0	0	0
393:	1	0	0	0	0	0	0	0
401:	0	0	0	0	0	0	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	0
433:	0	0	0	1	0	0	0	0
441:	0	0	0	0	0	0	0	0
449:	0	0	0	0	0	0	0	0
457:	0	0	0	0	0	0	0	0
465:	0	0	0	0	0	0	0	0
473:	0	0	0	0	0	0	0	0
481:	0	0	0	0	0	0	0	0
489:	0	0	0	0	0	0	0	0
497:	0	0	0	0	0	0	0	0
505:	0	0	0	0	0	0	0	0
513:	0	0	0	0	0	0	0	0
521:	0	0	0	0	0	0	0	0
529:	0	0	0	0	0	0	0	0
537:	0	0	0	0	0	0	0	0
545:	0	0	0	0	0	0	0	0
553:	0	0	0	0	0	0	0	0
561:	0	0	0	0	0	0	0	0
569:	0	0	0	1	0	0	0	0
577:	0	0	0	0	0	0	0	0
585:	0	0	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	1
641:	0	0	0	0	0	0	0	0
649:	0	0	0	0	0	0	0	1
657:	0	0	0	0	0	0	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	0	0
721:	0	0	0	0	0	0	0	1
729:	0	0	0	0	0	0	0	0
737:	0	0	0	0	0	0	0	0
745:	0	0	0	0	0	0	0	0
753:	0	0	0	0	0	0	0	0
761:	0	0	1	0	0	0	0	0
769:	0	0	0	0	0	0	0	0
777:	0	0	0	0	0	0	0	0
785:	0	0	0	0	0	0	0	0
793:	0	0	0	0	0	0	0	0

801: 0 0 0 0 0 0 0 0 0

Sample Title: 15

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



Apex-Alpha™

100
5/3/19

Sample Description: BC 28A
 Spectrum File: \\OR-ALPHA1\Canberra\ApexAlpha\Root\Data\00002417
 Batch Identification: 1904087A-RA
 Sample Identification: 16
 Sample Geometry: Shelf 2
 Procedure Description: Ra

Detector Name: Alpha_043
 Chamber Serial Number: 04026481A
 Detector Serial Number: 91088
 Env. Background: System Bkgd 243636
 Reagent Blank: <not performed>

Sample Size: 5.000E-001 +/- 0.000E+000 liter
 Generic Mult. Factor: 2.870E+000 Generic Div. Factor: 1.000E+000
 Sample Date/Time: 4/8/2019 4:34:10 PM
 Acquisition Date/Time: 5/3/2019 7:59:28 AM
 Acquisition Live Time: 170.0 minutes
 Acquisition Real Time: 170.0 minutes

Chem. Recovery Factor: 1.0000 +/- 0.0000
 Counting Efficiency: 0.1494 +/- 0.0026 on 2/22/2019 8:51:38 AM
 Effective Efficiency: 0.1494 +/- 0.0026

Peak Match Tolerance: 0.350 MeV

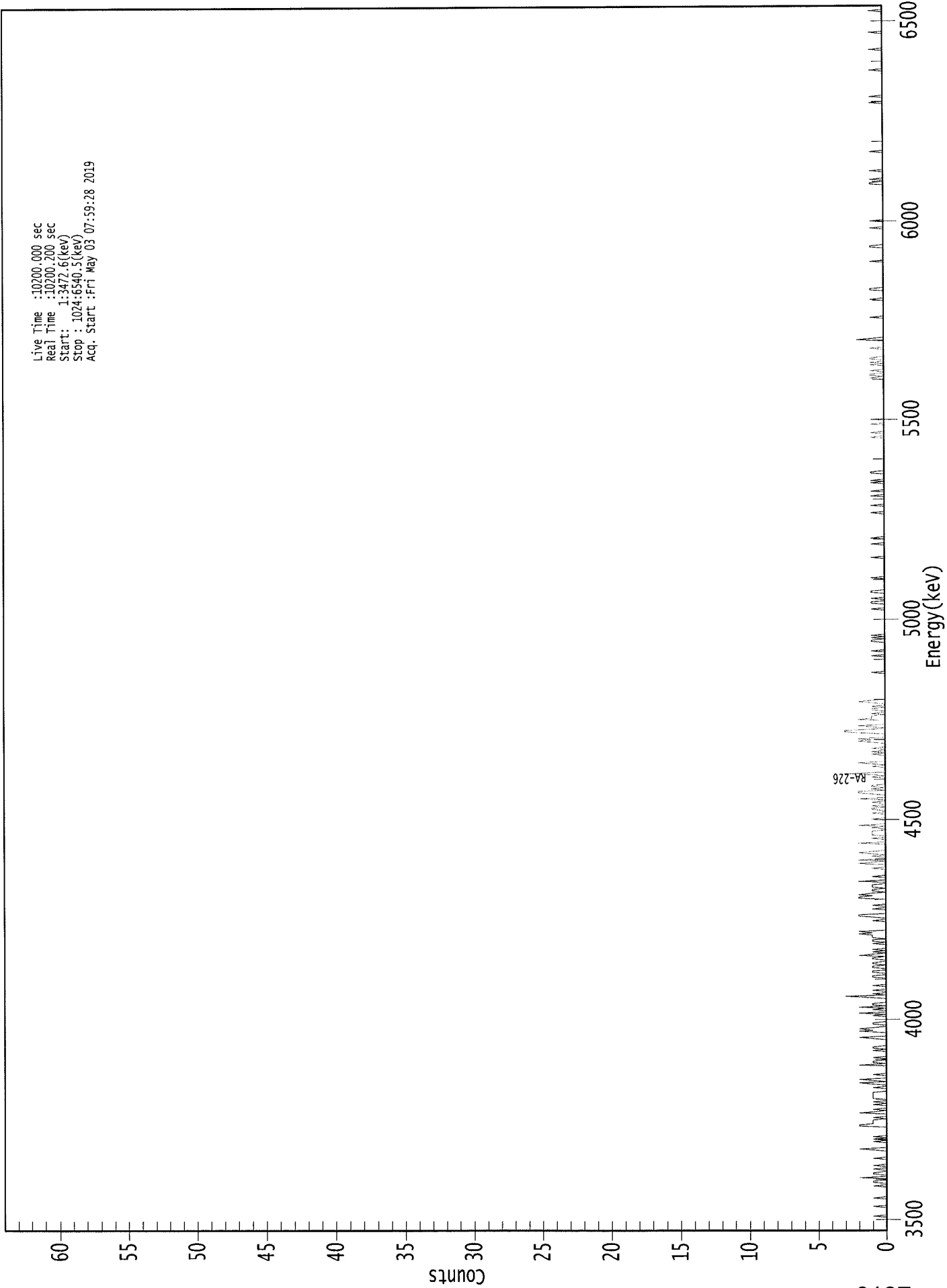
----- ----- PEAK AREA REPORT ----- -----						
Nuclide	Energy (MeV)	Net Pk Area	Pk Area Error %	Ambient Backgnd	Reagent Backgnd	FWHM (keV)
RA-224	5.587	12.32	57.62	0.68	0.00E+000	3.0
RA-226	4.606	78.13	22.48	1.87	0.00E+000	3.7

----- ----- NUCLIDE ANALYSIS RESULTS ----- -----					
Nuclide	Id Conf.	Energy (keV)	Activity (pCi/liter)	MDA (pCi/liter)	
RA-224	0.987	5685.50*	1.33E+000 +/- 7.68E-001	6.09E-001 +/- 2.11E-002	
RA-226	0.959	4785.00*	7.96E+000 +/- 1.81E+000	7.71E-001 +/- 2.66E-002	

AG
5/3/19

0000241712.CNF

Live Time :10200.000 sec
Real Time :10200.200 sec
Start : 1:3472.6(kev)
Stop : 1024:6540.5(kev)
Acq. Start :Fri May 03 07:59:28 2019



0137

ROI Type: 1

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

Sample Title: 16

Elapsed Live time: 10200

Elapsed Real Time: 10200

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

369: 1 0 1 1 0 0 0 0

Sample Title: 16

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

801: 0 0 0 0 0 0 0 0

Sample Title: 16

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

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5/3/19

Sample Description: BC 16
 Spectrum File: \\OR-ALPHA1\Canberra\ApexAlpha\Root\Data\00002417
 Batch Identification: 1904087A-RA
 Sample Identification: 17
 Sample Geometry: Shelf 2
 Procedure Description: Ra

Detector Name: Alpha_044
 Chamber Serial Number: 04026481B
 Detector Serial Number: 84168
 Env. Background: System Bkgd 243637
 Reagent Blank: <not performed>

Sample Size: 1.000E-001 +/- 0.000E+000 liter
 Generic Mult. Factor: 3.000E+000 Generic Div. Factor: 1.000E+000
 Sample Date/Time: 4/8/2019 4:34:10 PM
 Acquisition Date/Time: 5/3/2019 7:59:30 AM
 Acquisition Live Time: 170.0 minutes
 Acquisition Real Time: 170.0 minutes

Chem. Recovery Factor: 1.0000 +/- 0.0000
 Counting Efficiency: 0.1711 +/- 0.0030 on 2/22/2019 8:51:36 AM
 Effective Efficiency: 0.1711 +/- 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	5.492	32.32	34.90	0.68	0.00E+000	6.0
RA-226	4.597	153.32	15.87	0.68	0.00E+000	7.0

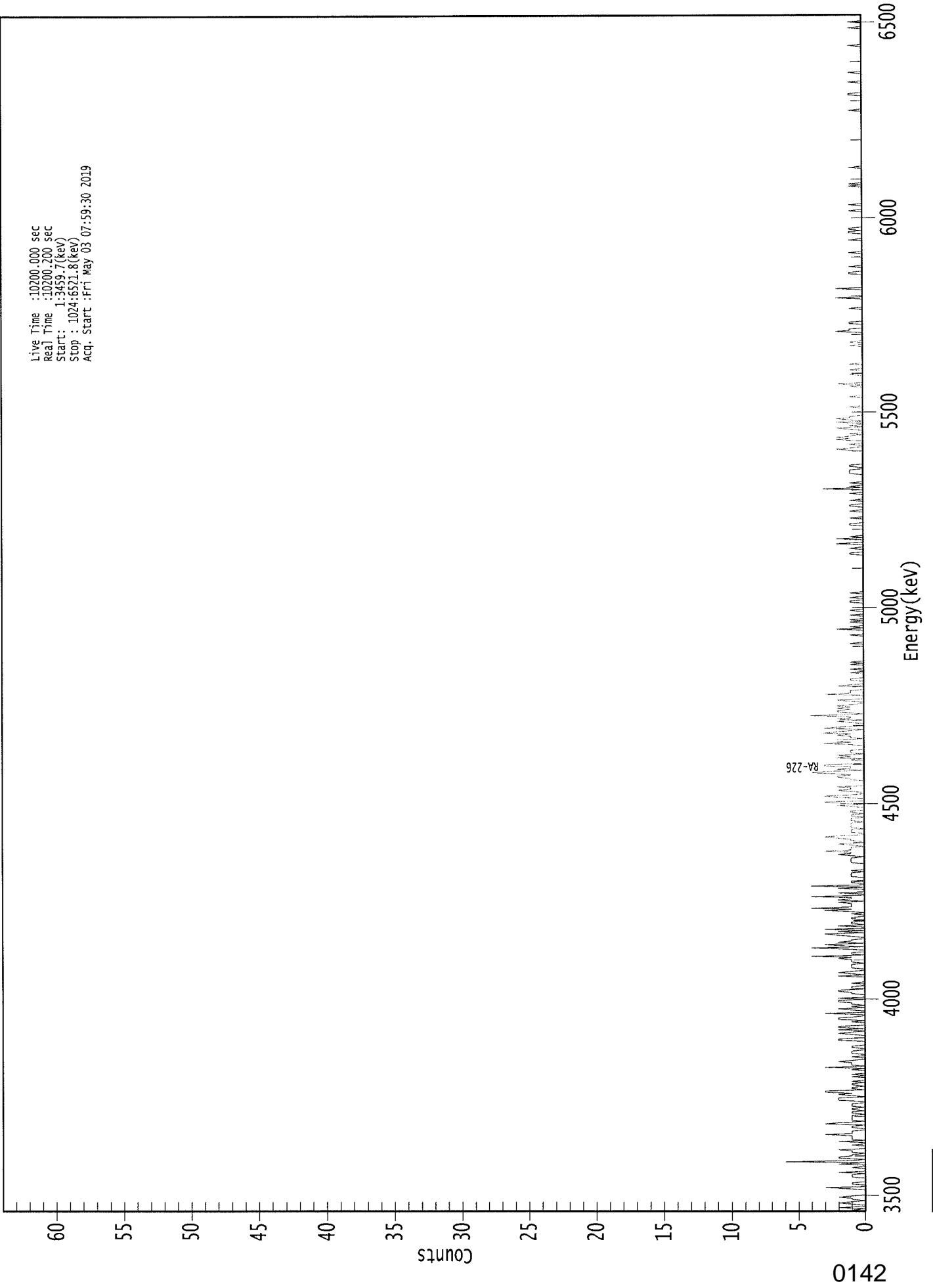
 NUCLIDE ANALYSIS RESULTS

Nuclide	Id Conf.	Energy (keV)	Activity (pCi/liter)	MDA (pCi/liter)
RA-224	0.952	5685.50*	1.59E+001 +/- 5.58E+000	2.78E+000 +/- 9.47E-002
RA-226	0.955	4785.00*	7.13E+001 +/- 1.16E+001	2.62E+000 +/- 8.90E-002

AG
5/3/19

0000241713.CNF

Live Time :10200.000 sec
Real Time :10200.200 Sec
Start : 1:34:59.7(kev)
Stop : 1024:5521.8(kev)
Acq. Start :Fri May 03 07:59:30 2019



ROI Type: 1

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

Sample Title: 17

Elapsed Live time: 10200

Elapsed Real Time: 10200

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

369: 1 1 2 2 1 2 4 3

Sample Title: 17

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

801: 0 1 1 0 0 0 0 1

Sample Title: 17

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

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Apex-Alpha™

Sample Description: BC 15
 Spectrum File: \\OR-ALPHA1\Canberra\ApexAlpha\Root\Data\00002417
 Batch Identification: 1904087A-RA
 Sample Identification: 18
 Sample Geometry: Shelf 2
 Procedure Description: Ra

Detector Name: Alpha_045
 Chamber Serial Number: 04026482A
 Detector Serial Number: 91131
 Env. Background: System Bkgd 243638
 Reagent Blank: <not performed>

Sample Size: 2.000E-001 +/- 0.000E+000 liter
 Generic Mult. Factor: 3.000E+000 Generic Div. Factor: 1.000E+000
 Sample Date/Time: 4/8/2019 4:34:10 PM
 Acquisition Date/Time: 5/3/2019 7:59:31 AM
 Acquisition Live Time: 170.0 minutes
 Acquisition Real Time: 170.0 minutes

Chem. Recovery Factor: 1.0000 +/- 0.0000
 Counting Efficiency: 0.1654 +/- 0.0029 on 2/22/2019 8:52:00 AM
 Effective Efficiency: 0.1654 +/- 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	5.516	26.96	39.38	2.04	0.00E+000	3.0
RA-226	4.577	105.13	19.31	1.87	0.00E+000	3.7

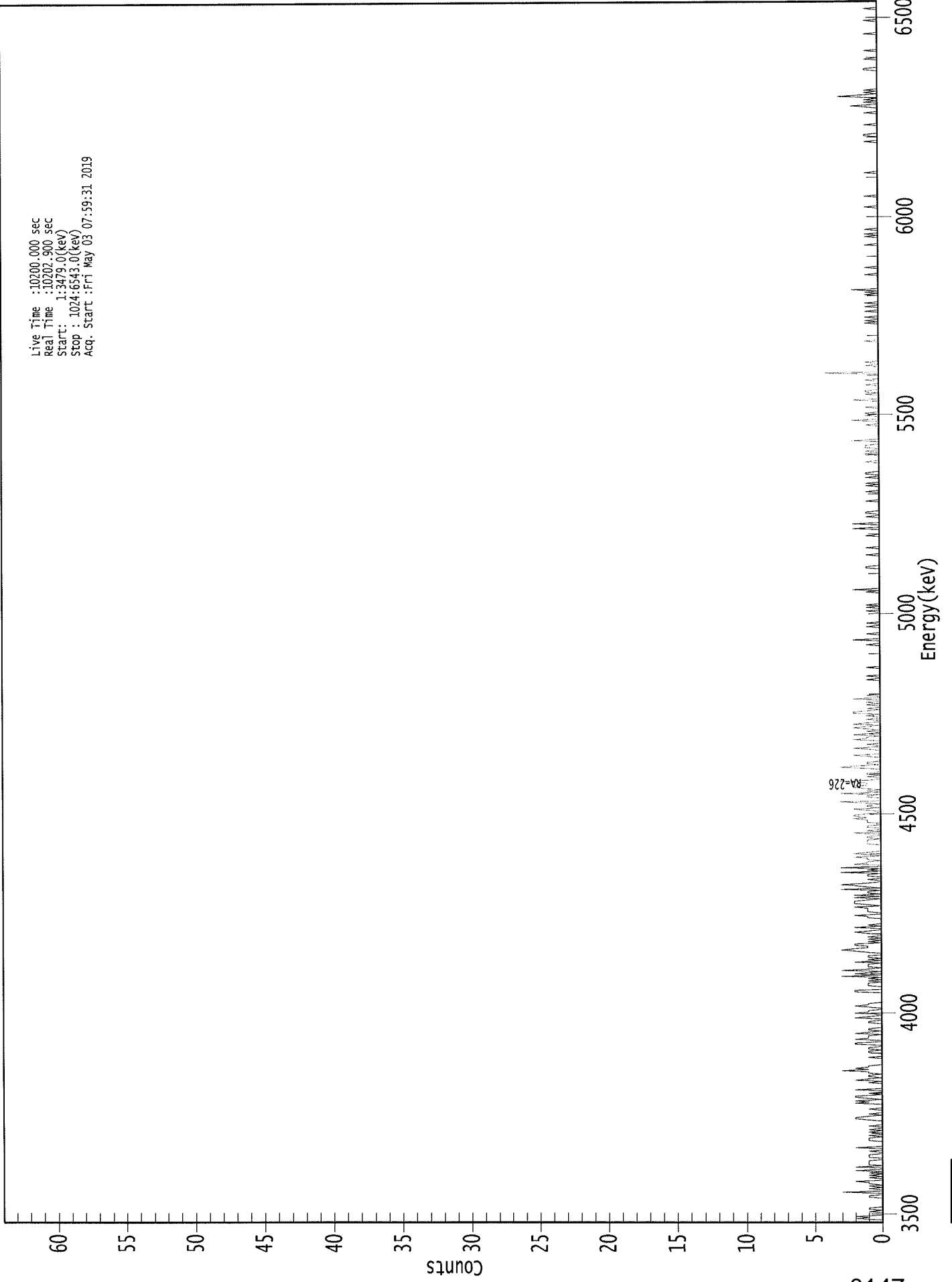
 ----- NUCLIDE ANALYSIS RESULTS -----

Nuclide	Id Conf.	Energy (keV)	Activity (pCi/liter)	MDA (pCi/liter)
RA-224	0.963	5685.50*	6.87E+000 +/- 2.72E+000	1.98E+000 +/- 6.79E-002
RA-226	0.945	4785.00*	2.53E+001 +/- 4.96E+000	1.82E+000 +/- 6.21E-002

AG
5/3/19

0000241714.CNF

Live Time : 10200.000 sec
Real Time : 10202.900 sec
Start : 1:3479.0(kev)
Stop : 1024:6543.0(kev)
Acq. Start : Fri May 03 07:59:31 2019



0147

ROI Type: 1

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

Sample Title: 18

Elapsed Live time: 10200

Elapsed Real Time: 10203

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

369: 3 1 0 0 1 0 1 1

Sample Title: 18

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

801: 0 0 0 0 0 0 0 0

Sample Title: 18

Channel	-----	-----	-----	-----	-----	-----	-----	-----
809:	0	0	0	0	0	0	0	0
817:	0	0	1	0	0	0	0	0
825:	0	1	0	1	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	1	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	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	0	0	0
905:	0	1	0	0	0	0	1	1
913:	0	0	0	0	0	0	0	1
921:	0	0	0	0	0	0	0	0
929:	0	1	0	0	0	0	1	2
937:	0	0	1	0	1	0	1	3
945:	1	0	1	0	1	0	0	0
953:	0	0	0	0	0	0	0	0
961:	0	0	0	0	0	1	1	0
969:	0	0	0	0	0	0	1	0
977:	0	0	0	0	0	1	0	0
985:	0	0	0	0	0	0	0	0
993:	0	0	0	1	0	0	0	0
1001:	0	0	0	0	0	0	1	0
1009:	0	0	0	0	0	0	0	0
1017:	1	0	0	0	0	0	0	0

RB
5/3/19

Sample Description: BC 22A
 Spectrum File: \\OR-ALPHA1\Canberra\ApexAlpha\Root\Data\00002417
 Batch Identification: 1904087A-RA
 Sample Identification: 19
 Sample Geometry: Shelf 2
 Procedure Description: Ra

Detector Name: Alpha_046
 Chamber Serial Number: 04026482B
 Detector Serial Number: 58762
 Env. Background: System Bkgd 243639
 Reagent Blank: <not performed>

Sample Size: 5.000E-001 +/- 0.000E+000 liter
 Generic Mult. Factor: 3.000E+000 Generic Div. Factor: 1.000E+000
 Sample Date/Time: 4/8/2019 4:34:10 PM
 Acquisition Date/Time: 5/3/2019 7:59:33 AM
 Acquisition Live Time: 170.0 minutes
 Acquisition Real Time: 170.0 minutes

Chem. Recovery Factor: 1.0000 +/- 0.0000
 Counting Efficiency: 0.1527 +/- 0.0027 on 2/22/2019 8:51:59 AM
 Effective Efficiency: 0.1527 +/- 0.0027

Peak Match Tolerance: 0.350 MeV

 PEAK AREA REPORT

Nuclide	Energy (MeV)	Net Pk Area	Pk Area Error %	Ambient Backgnd	Reagent Backgnd	FWHM (keV)
RA-224	5.516	25.98	39.33	1.02	0.00E+000	3.0
RA-226	4.588	172.81	14.97	1.19	0.00E+000	4.4

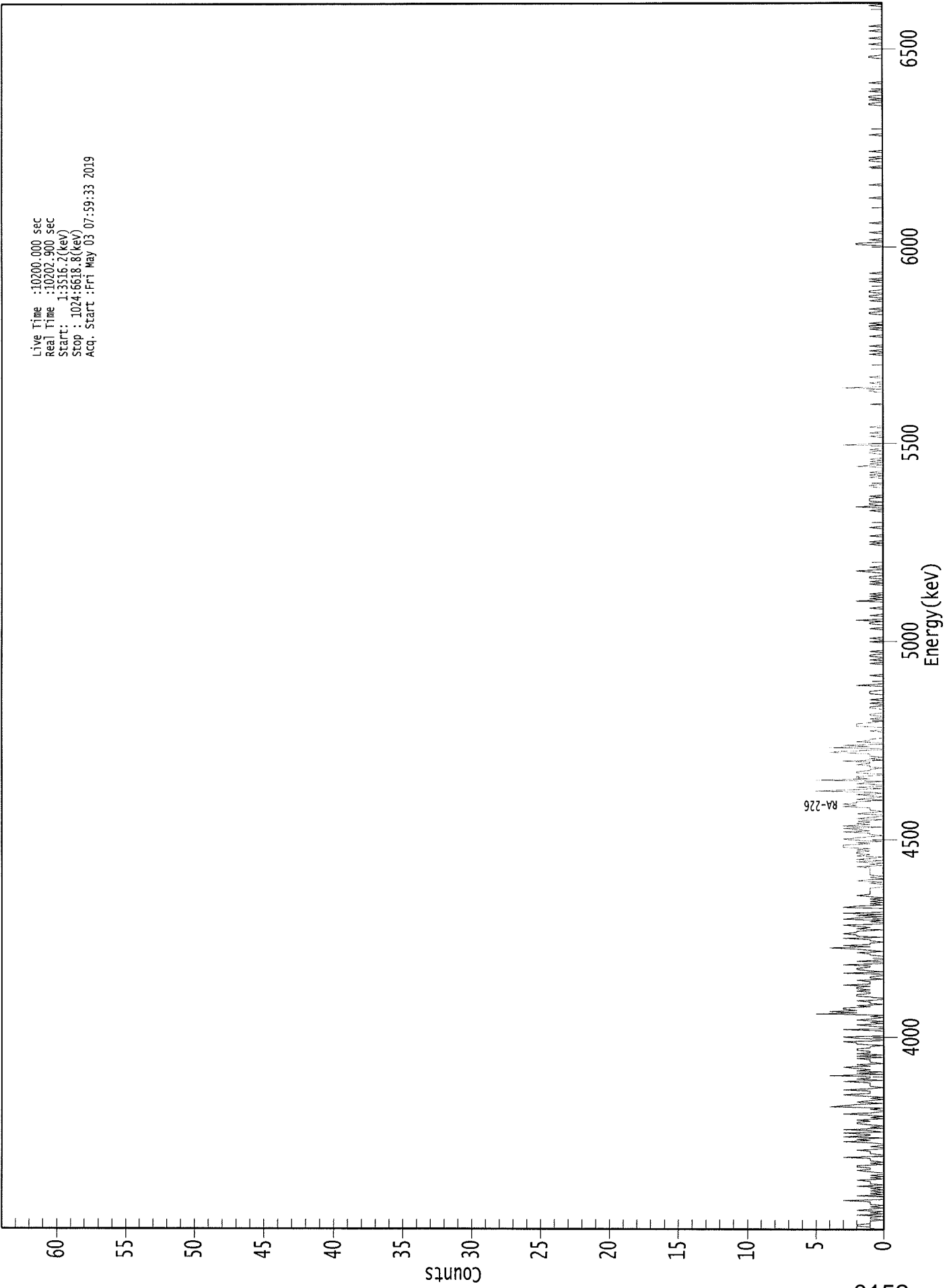
 NUCLIDE ANALYSIS RESULTS

Nuclide	Id Conf.	Energy (keV)	Activity (pCi/liter)	MDA (pCi/liter)
RA-224	0.963	5685.50*	2.87E+000 +/- 1.13E+000	6.95E-001 +/- 2.40E-002
RA-226	0.951	4785.00*	1.80E+001 +/- 2.76E+000	6.86E-001 +/- 2.36E-002

AG
5/3/19

0000241715.CNF

Live Time :10200.000 sec
Real Time :10202.900 sec
Start : 1:3516.2(kev)
Stop : 1024:6618.8(kev)
Acq. Start : Fri May 03 07:59:33 2019



0152

ROI Type: 1

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

Sample Title: 19

Elapsed Live time: 10200

Elapsed Real Time: 10203

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

369: 2 0 0 2 1 0 5 1

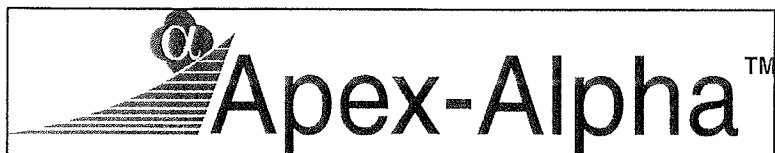
Sample Title: 19

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

801: 0 0 0 0 0 0 0 0 0

Sample Title: 19

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



QA SUMMARY REPORT

Review Of QA Results - Pulser Check

Date : 5/3/2019
Time : 5:30:39 AM

CHAMBER	DEVICE	PARAMETER	FLAG	DATE
Alpha 001	21f	ALL	Not Done	
Alpha 002	21f	ALL	Not Done	
Alpha 003	21f	ALL	Passed	5/3/2019 5:09:35 AM
Alpha 004	21f	ALL	Passed	5/3/2019 5:09:35 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	5/3/2019 5:09:36 AM
Alpha 011	21f	ALL	Passed	5/3/2019 5:09:37 AM
Alpha 012	21f	ALL	Passed	5/3/2019 5:09:38 AM
Alpha 013	21f	ALL	Not Done	
Alpha 014	21f	ALL	Passed	5/3/2019 5:09:39 AM
Alpha 015	21f	ALL	Not Done	
Alpha 016	21f	ALL	Not Done	
Alpha 033	Alpha Analyst100DC	ALL	Passed	5/3/2019 5:09:40 AM
Alpha 034	Alpha Analyst100DC	ALL	Passed	5/3/2019 5:09:42 AM
Alpha 035	Alpha Analyst100DC	ALL	Passed	5/3/2019 5:09:43 AM
Alpha 036	Alpha Analyst100DC	ALL	Passed	5/3/2019 5:09:45 AM
Alpha 037	Alpha Analyst100DC	ALL	Not Done	
Alpha 038	Alpha Analyst100DC	Peak Energy	Action	5/3/2019 5:09:47 AM
Alpha 039	Alpha Analyst100DC	Peak FWHM	Action	5/3/2019 5:09:50 AM
Alpha 040	Alpha Analyst100DC	ALL	Passed	5/3/2019 5:09:53 AM
Alpha 041	Alpha Analyst100DC	ALL	Passed	5/3/2019 5:09:55 AM
Alpha 042	Alpha Analyst100DC	ALL	Passed	5/3/2019 5:09:57 AM
Alpha 043	Alpha Analyst100DC	ALL	Passed	5/3/2019 5:10:00 AM
Alpha 044	Alpha Analyst100DC	ALL	Passed	5/3/2019 5:10:02 AM
Alpha 045	Alpha Analyst100DC	ALL	Passed	5/3/2019 5:10:04 AM
Alpha 046	Alpha Analyst100DC	ALL	Passed	5/3/2019 5:10:07 AM
Alpha 047	Alpha Analyst100DC	ALL	Passed	5/3/2019 5:10:09 AM
Alpha 048	Alpha Analyst100DC	ALL	Passed	5/3/2019 5:10:12 AM
Alpha 049	Alpha Analyst100DC	ALL	Passed	5/3/2019 5:10:14 AM
Alpha 050	Alpha Analyst100DC	ALL	Passed	5/3/2019 5:10:17 AM
Alpha 051	Alpha Analyst100DC	ALL	Not Done	
Alpha 052	Alpha Analyst100DC	ALL	Not Done	
Alpha 053	Alpha Analyst100DC	ALL	Passed	5/3/2019 5:10:20 AM
Alpha 054	Alpha Analyst100DC	ALL	Passed	5/3/2019 5:10:23 AM
Alpha 055	Alpha Analyst100DC	ALL	Passed	5/3/2019 5:10:25 AM
Alpha 056	Alpha Analyst100DC	ALL	Passed	5/3/2019 5:10:28 AM
Alpha 057	Alpha Analyst100DC	ALL	Passed	5/3/2019 5:10:31 AM
Alpha 058	Alpha Analyst100DC	ALL	Passed	5/3/2019 5:10:34 AM

CHAMBER	DEVICE	PARAMETER	FLAG	DATE
Alpha_059	Alpha Analyst100DC	ALL	Passed	5/3/2019 5:10:36 AM
Alpha_060	Alpha Analyst100DC	ALL	Passed	5/3/2019 5:10:39 AM

APPROVED BY: KP

APPROVAL DATE: 5/3/19

***** 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

SECTION IX
ANALYTICAL DATA (RADIUM-228)

Work Order	19-04087
Analysis Code	Ra228
Run	1
Date Received	4/17/2019
Lab Deadline	4/30/2019
Client	Michael Pisani & Associates, Inc.
Project	HERO LANDS
Report Level	4
Activity Units	pCi
Aliquot Units	I
Matrix	WA
Method	EPA 904.0
Instrument Type	Alpha/Beta GPC
Radiometric Tracer	Ba-133
Radiometric Sol#	Ba-6a
Tracer Act (dpm/g)	454.76
Carrier	Yttrium
Carrier Conc (mg/ml)	30.6333

Internal Fraction	Sample Desc	Client ID	Login CPM	Sample Date	Sample Aliquot
01	LCS	LCS		04/18/19 00:00	1.0000E+00
02	MBL	BLANK		04/18/19 00:00	1.0000E+00
03	DUP	BC 12	25	04/02/19 16:15	1.0000E+00
04	TRG	BC 27A	39	04/02/19 10:30	1.0000E+00
05	TRG	BC 27B	38	04/02/19 11:52	1.0000E+00
06	TRG	BC 26	30	04/02/19 13:10	1.0000E+00
07	TRG	BC 11	36	04/02/19 14:40	1.0000E+00
08	DO	BC 12	25	04/02/19 16:15	1.0000E+00
09	TRG	BC 24A	33	04/03/19 07:55	1.0000E+00
10	TRG	BC 24B	33	04/03/19 09:25	1.0000E+00
11	TRG	BC 21B	29	04/03/19 11:15	1.0000E+00
12	TRG	BC 21A	36	04/03/19 13:15	1.0000E+00
13	TRG	BC 13	22	04/03/19 15:15	1.0000E+00
14	TRG	BC 14	34	04/03/19 17:05	1.0000E+00
15	TRG	BC 28B	40	04/08/19 10:45	1.0000E+00
16	TRG	BC 28A	36	04/08/19 12:15	1.0000E+00
17	TRG	BC 16	42	04/08/19 15:15	1.0000E+00
18	TRG	BC 15	37	04/08/19 16:45	1.0000E+00
19	TRG	BC 22A	35	04/09/19 08:30	1.0000E+00

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

19-04087
Ra228
Run 1

Internal Fraction	Sample Desc	Tracer Aliquot (g)	Tracer Total ACT (dpm)	Radiometric Tracer (pCi)	Radiometric % Rec	Grav Carrier Added (ml)	Grav Filter Tare (g)	Grav Filter Final (g)	Grav Filter Net (g)	Grav % Rec	Mean % Rec	SAF 1*	SAF 2*
01	LCS	2.1973	999.2	666.0	147.96	2.000	0.0711	0.1301	0.0590	96.30	105.93	1.00	1.00
02	MBL	2.1983	999.7	537.0	119.25	2.000	0.0716	0.1276	0.0560	91.40	100.54	1.00	1.00
03	DUP	2.1947	998.1	459.0	102.10	2.000	0.0707	0.1286	0.0579	94.50	96.49	1.00	1.00
04	TRG	2.1927	997.2	685.0	152.50	2.000	0.0706	0.1267	0.0561	91.57	100.72	1.00	1.00
05	TRG	2.1901	996.0	553.0	123.26	2.000	0.0705	0.1290	0.0585	95.48	105.03	1.00	1.00
06	TRG	2.1906	996.2	434.0	96.72	2.000	0.0703	0.1280	0.0577	94.18	91.09	1.00	1.00
07	TRG	2.1856	993.9	524.0	117.04	2.000	0.0707	0.1251	0.0544	88.79	97.67	1.00	1.00
08	DO	2.1863	994.2	738.0	164.78	2.000	0.0709	0.1302	0.0593	96.79	106.47	1.00	1.00
09	TRG	2.1863	994.2	516.0	115.22	2.000	0.0706	0.1306	0.0600	97.93	107.73	1.00	1.00
10	TRG	2.1857	994.0	419.0	93.58	2.000	0.0708	0.1293	0.0585	95.48	89.36	1.00	1.00
11	TRG	2.1859	994.1	475.0	106.08	2.000	0.0709	0.1305	0.0596	97.28	103.19	1.00	1.00
12	TRG	2.1854	993.8	716.0	159.94	2.000	0.0707	0.1309	0.0602	98.26	108.08	1.00	1.00
13	TRG	2.1829	992.7	601.0	134.40	2.000	0.0712	0.1283	0.0571	93.20	102.52	1.00	1.00
14	TRG	2.1815	992.1	443.0	99.13	2.000	0.0713	0.1324	0.0611	99.73	98.86	1.00	1.00
15	TRG	2.1820	992.3	703.0	157.28	2.000	0.0702	0.1269	0.0567	92.55	101.80	1.00	1.00
16	TRG	2.1810	991.8	470.0	105.20	2.000	0.0705	0.1298	0.0593	96.79	101.82	1.00	1.00
17	TRG	2.1785	990.7	541.0	121.23	2.000	0.0705	0.1273	0.0568	92.71	101.98	1.00	1.00
18	TRG	2.1778	990.4	813.0	182.24	2.000	0.0702	0.1247	0.0545	88.96	97.85	1.00	1.00
19	TRG	2.0900	950.4	662.0	154.63	2.000	0.0704	0.1297	0.0593	96.79	106.47	1.00	1.00

* SAF1 is used for Gross Alpha and all other radionuclides. SAF2 is used for Gross Beta only. ^ Indicates estimated SAF value.
 ** 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			05/08/19 13:09	DBUSH	05/02/19 10:05	DBUSH	05/08/19 13:16	DBUSH
02	MBL			05/08/19 13:09	DBUSH	05/02/19 10:05	DBUSH	05/08/19 13:16	DBUSH
03	DUP			05/08/19 13:09	DBUSH	05/02/19 10:05	DBUSH	05/08/19 13:16	DBUSH
04	TRG			05/08/19 13:09	DBUSH	05/02/19 15:20	DBUSH	05/08/19 13:16	DBUSH
05	TRG			05/08/19 13:09	DBUSH	05/02/19 10:05	DBUSH	05/08/19 13:16	DBUSH
06	TRG			05/08/19 13:09	DBUSH	05/02/19 15:20	DBUSH	05/08/19 13:16	DBUSH
07	TRG			05/08/19 13:09	DBUSH	05/02/19 10:05	DBUSH	05/08/19 13:16	DBUSH
08	DO			05/08/19 13:09	DBUSH	05/02/19 10:05	DBUSH	05/08/19 13:16	DBUSH
09	TRG			05/08/19 13:09	DBUSH	05/02/19 10:05	DBUSH	05/08/19 13:16	DBUSH
10	TRG			05/08/19 13:09	DBUSH	05/02/19 10:05	DBUSH	05/08/19 13:16	DBUSH
11	TRG			05/08/19 13:09	DBUSH	05/02/19 10:05	DBUSH	05/08/19 13:16	DBUSH
12	TRG			05/08/19 13:09	DBUSH	05/02/19 10:05	DBUSH	05/08/19 13:16	DBUSH
13	TRG			05/08/19 13:09	DBUSH	05/02/19 15:20	DBUSH	05/08/19 13:16	DBUSH
14	TRG			05/08/19 13:09	DBUSH	05/02/19 10:05	DBUSH	05/08/19 13:16	DBUSH
15	TRG			05/08/19 13:09	DBUSH	05/02/19 10:05	DBUSH	05/08/19 13:16	DBUSH
16	TRG			05/08/19 13:09	DBUSH	05/02/19 15:20	DBUSH	05/08/19 13:16	DBUSH
17	TRG			05/08/19 13:09	DBUSH	05/02/19 15:20	DBUSH	05/08/19 13:16	DBUSH
18	TRG			05/08/19 13:09	DBUSH	05/02/19 15:20	DBUSH	05/08/19 13:16	DBUSH
19	TRG			05/08/19 13:09	DBUSH	05/02/19 15:20	DBUSH	05/08/19 13:16	DBUSH

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

	Run	1
	Analysis Code	Ra228
	Eberline Analytical Work Order	19-04087

Lab Fraction	Nuclide	Sample Desc	Client Identification	Activity Units	Results	Error Estimate	MDA	LCS Known	LCS %R	LCS Flag	RPD Flag	MDA Flag	Blank Flag
01	RA-228	LCS	LCS	pCi/l	8.65E+00	7.29E-01	8.68E-01	9.25E+00	93.53	OK		OK	
02	RA-228	MBL	BLANK	pCi/l	5.61E-02	3.44E-01	7.34E-01					OK	OK
03	RA-228	DUP	BC 12	pCi/l	2.77E-01	4.29E-01	8.88E-01				INV	OK	
04	RA-228	TRG	BC 27A	pCi/l	5.74E+00	5.86E-01	6.91E-01					OK	
05	RA-228	TRG	BC 27B	pCi/l	1.01E+00	3.88E-01	7.12E-01					OK	
06	RA-228	TRG	BC 26	pCi/l	9.89E+00	8.17E-01	9.53E-01					OK	
07	RA-228	TRG	BC 11	pCi/l	1.67E+00	4.85E-01	8.59E-01					OK	
08	RA-228	DO	BC 12	pCi/l	6.49E-01	3.94E-01	7.71E-01					OK	
09	RA-228	TRG	BC 24A	pCi/l	4.62E+00	5.44E-01	7.29E-01					OK	
10	RA-228	TRG	BC 24B	pCi/l	3.42E+00	6.30E-01	1.03E+00					OK	
11	RA-228	TRG	BC 21B	pCi/l	1.74E+00	4.69E-01	8.24E-01					OK	
12	RA-228	TRG	BC 21A	pCi/l	1.51E+00	4.91E-01	9.01E-01					OK	
13	RA-228	TRG	BC 13	pCi/l	1.59E+01	9.18E-01	8.70E-01					OK	
14	RA-228	TRG	BC 14	pCi/l	9.11E-01	4.55E-01	8.72E-01					OK	
15	RA-228	TRG	BC 28B	pCi/l	8.71E-01	4.23E-01	8.08E-01					OK	
16	RA-228	TRG	BC 28A	pCi/l	5.48E+00	6.32E-01	8.73E-01					OK	
17	RA-228	TRG	BC 16	pCi/l	4.25E+01	1.41E+00	7.97E-01					OK	
18	RA-228	TRG	BC 15	pCi/l	1.87E+01	1.03E+00	1.04E+00					OK	
19	RA-228	TRG	BC 22A	pCi/l	1.09E+01	7.67E-01	8.26E-01					OK	

Client
Michael Pisani & Associates, Inc.

	Run	1
	Analysis Code	Ra228
	Eberline Analytical Work Order	19-04087
Client	Michael Pisani & Associates, 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	04/18/19 00:00	1.00E+00	147.96	96.30	105.93	1.00	5/2/2019 10:05	5/8/2019 13:16
02	RA-228	MBL	04/18/19 00:00	1.00E+00	119.25	91.40	100.54	1.00	5/2/2019 10:05	5/8/2019 13:16
03	RA-228	DUP	04/02/19 16:15	1.00E+00	102.10	94.50	96.49	1.00	5/2/2019 10:05	5/8/2019 13:16
04	RA-228	TRG	04/02/19 10:30	1.00E+00	152.50	91.57	100.72	1.00	5/2/2019 15:20	5/8/2019 13:16
05	RA-228	TRG	04/02/19 11:52	1.00E+00	123.26	95.48	105.03	1.00	5/2/2019 10:05	5/8/2019 13:16
06	RA-228	TRG	04/02/19 13:10	1.00E+00	96.72	94.18	91.09	1.00	5/2/2019 15:20	5/8/2019 13:16
07	RA-228	TRG	04/02/19 14:40	1.00E+00	117.04	88.79	97.67	1.00	5/2/2019 10:05	5/8/2019 13:16
08	RA-228	DO	04/02/19 16:15	1.00E+00	164.78	96.79	106.47	1.00	5/2/2019 10:05	5/8/2019 13:16
09	RA-228	TRG	04/03/19 07:55	1.00E+00	115.22	97.93	107.73	1.00	5/2/2019 10:05	5/8/2019 13:16
10	RA-228	TRG	04/03/19 09:25	1.00E+00	93.58	95.48	89.36	1.00	5/2/2019 10:05	5/8/2019 13:16
11	RA-228	TRG	04/03/19 11:15	1.00E+00	106.08	97.28	103.19	1.00	5/2/2019 10:05	5/8/2019 13:16
12	RA-228	TRG	04/03/19 13:15	1.00E+00	159.94	98.26	108.08	1.00	5/2/2019 10:05	5/8/2019 13:16
13	RA-228	TRG	04/03/19 15:15	1.00E+00	134.40	93.20	102.52	1.00	5/2/2019 15:20	5/8/2019 13:16
14	RA-228	TRG	04/03/19 17:05	1.00E+00	99.13	99.73	98.86	1.00	5/2/2019 10:05	5/8/2019 13:16
15	RA-228	TRG	04/08/19 10:45	1.00E+00	157.28	92.55	101.80	1.00	5/2/2019 10:05	5/8/2019 13:16
16	RA-228	TRG	04/08/19 12:15	1.00E+00	105.20	96.79	101.82	1.00	5/2/2019 15:20	5/8/2019 13:16
17	RA-228	TRG	04/08/19 15:15	1.00E+00	121.23	92.71	101.98	1.00	5/2/2019 15:20	5/8/2019 13:16
18	RA-228	TRG	04/08/19 16:45	1.00E+00	182.24	88.96	97.85	1.00	5/2/2019 15:20	5/8/2019 13:16
19	RA-228	TRG	04/09/19 08:30	1.00E+00	154.63	96.79	106.47	1.00	5/2/2019 15:20	5/8/2019 13:16

Preliminary Data Report & Analytical Calculations
Work Order: 19-04087-Ra228-1

	Run	1
	Analysis Code	Ra228
	Eberline Analytical Work Order	19-04087
Client	Michael Pisani & Associates, Inc.	

Lab Fraction	Nuclide	Sample Desc	Counting Date/Time	Half-life (days)	Detect	Carrier	Count Time	Counts	Bkg CPM	Eff
01	RA-228	LCS	05/08/19 15:13		LB4110A	F1	120	959	1.466666667	0.4754
02	RA-228	MBL	05/08/19 15:13		LB4110A	F2	120	125	1	0.4658
03	RA-228	DUP	05/08/19 15:13		LB4110A	F3	120	192	1.4	0.4713
04	RA-228	TRG	05/08/19 15:13		LB4110A	F4	120	638	0.933333333	0.4773
05	RA-228	TRG	05/08/19 15:13		LB4110A	G1	120	221	1.05	0.4705
06	RA-228	TRG	05/08/19 15:13		LB4110A	G2	120	972	1.416666667	0.4676
07	RA-228	TRG	05/08/19 15:13		LB4110A	G3	120	297	1.283333333	0.4614
08	RA-228	DO	05/08/19 15:13		LB4110A	G4	120	216	1.283333333	0.4714
09	RA-228	TRG	05/08/19 15:13		LB4110A	A1	120	601	1.216666667	0.4803
10	RA-228	TRG	05/08/19 15:13		LB4110A	A2	120	471	1.633333333	0.4724
11	RA-228	TRG	05/08/19 15:13		LB4110A	A3	120	327	1.383333333	0.4719
12	RA-228	TRG	05/08/19 15:13		LB4110A	A4	120	345	1.7	0.4548
13	RA-228	TRG	05/08/19 15:13		LB4110A	B1	120	1614	1.466666667	0.4626
14	RA-228	TRG	05/08/19 15:13		LB4110A	B3	120	231	1.283333333	0.449
15	RA-228	TRG	05/08/19 15:13		LB4110A	B4	120	226	1.233333333	0.4619
16	RA-228	TRG	05/08/19 15:13		LB4110A	C1	120	674	1.483333333	0.4667
17	RA-228	TRG	05/08/19 15:13		LB4110A	C2	120	3922	1.183333333	0.4578
18	RA-228	TRG	05/08/19 15:13		LB4110A	C3	120	1880	1.983333333	0.4699
19	RA-228	TRG	05/08/19 15:13		LB4110A	D3	120	1224	1.483333333	0.4719

Count Room Report
Client: Michael Pisani Associat

19-04087-Ra228-1 (pCi/l) in WA
Tracer ID: Ba-6a

Internal Fraction	Sample Desc	Client ID	Sample Date	Sample Aliquot	Tracer Aliquot (g)	Tracer ACT (dpm)	Radiometric Tracer (pCi)	Radiometric % Rec	SAF 1*	SAF 2*
01	LCS	LCS	04/18/19 00:00	1.0000	2.1973	999.2441	666.0000	147.96	1.00	1.00
02	MBL	BLANK	04/18/19 00:00	1.0000	2.1983	999.6989	537.0000	119.25	1.00	1.00
03	DUP	BC 12	04/02/19 16:15	1.0000	2.1947	998.0618	459.0000	102.10	1.00	1.00
04	TRG	BC 27A	04/02/19 10:30	1.0000	2.1927	997.1523	685.0000	152.50	1.00	1.00
05	TRG	BC 27B	04/02/19 11:52	1.0000	2.1901	995.9699	553.0000	123.26	1.00	1.00
06	TRG	BC 26	04/02/19 13:10	1.0000	2.1906	996.1973	434.0000	96.72	1.00	1.00
07	TRG	BC 11	04/02/19 14:40	1.0000	2.1856	993.9235	524.0000	117.04	1.00	1.00
08	DO	BC 12	04/02/19 16:15	1.0000	2.1863	994.2418	738.0000	164.78	1.00	1.00
09	TRG	BC 24A	04/03/19 07:55	1.0000	2.1863	994.2418	516.0000	115.22	1.00	1.00
10	TRG	BC 24B	04/03/19 09:25	1.0000	2.1857	993.9689	419.0000	93.58	1.00	1.00
11	TRG	BC 21B	04/03/19 11:15	1.0000	2.1859	994.0599	475.0000	106.08	1.00	1.00
12	TRG	BC 21A	04/03/19 13:15	1.0000	2.1854	993.8325	716.0000	159.94	1.00	1.00
13	TRG	BC 13	04/03/19 15:15	1.0000	2.1829	992.6956	601.0000	134.40	1.00	1.00
14	TRG	BC 14	04/03/19 17:05	1.0000	2.1815	992.0589	443.0000	99.13	1.00	1.00
15	TRG	BC 28B	04/08/19 10:45	1.0000	2.1820	992.2863	703.0000	157.28	1.00	1.00
16	TRG	BC 28A	04/08/19 12:15	1.0000	2.1810	991.8316	470.0000	105.20	1.00	1.00
17	TRG	BC 16	04/08/19 15:15	1.0000	2.1785	990.6947	541.0000	121.23	1.00	1.00
18	TRG	BC 15	04/08/19 16:45	1.0000	2.1778	990.3763	813.0000	182.24	1.00	1.00
19	TRG	BC 22A	04/09/19 08:30	1.0000	2.0900	950.4484	662.0000	154.63	1.00	1.00

Aliquot Worksheet

Work Order	Run	Analysis Code	Rpt Units	Lab Deadline	Technician
19-04087	1	Ra228	liters	4/30/2019	JHARVEY

Lab Fraction	Michael Pisani & Associates, Inc.		Sample Type	Muffle Data		No of Dits	Dilution Data			Aliquot Data			MS Aliquot Data		H-3 Solids Only	
	Client ID			Ratio Post/Pre			Dil Factor	Ratio	Aliquot	Net Equiv	Aliquot	Net Equiv	Water Added (ml)	H3 Dist Allq		
01	LCS		LCS						1.00E+00	1.0000E+00	1.0000E+00					
02	BLANK		MBL						1.00E+00	1.0000E+00	1.0000E+00					
03	BC 12		DUP						1.00E+00	1.0000E+00	1.0000E+00					
04	BC 27A		TRG						1.00E+00	1.0000E+00	1.0000E+00					
05	BC 27B		TRG						1.00E+00	1.0000E+00	1.0000E+00					
06	BC 26		TRG						1.00E+00	1.0000E+00	1.0000E+00					
07	BC 11		TRG						1.00E+00	1.0000E+00	1.0000E+00					
08	BC 12		DO						1.00E+00	1.0000E+00	1.0000E+00					
09	BC 24A		TRG						1.00E+00	1.0000E+00	1.0000E+00					
10	BC 24B		TRG						1.00E+00	1.0000E+00	1.0000E+00					
11	BC 21B		TRG						1.00E+00	1.0000E+00	1.0000E+00					
12	BC 21A		TRG						1.00E+00	1.0000E+00	1.0000E+00					
13	BC 13		TRG						1.00E+00	1.0000E+00	1.0000E+00					
14	BC 14		TRG						1.00E+00	1.0000E+00	1.0000E+00					
15	BC 28B		TRG						1.00E+00	1.0000E+00	1.0000E+00					
16	BC 28A		TRG						1.00E+00	1.0000E+00	1.0000E+00					
17	BC 16		TRG						1.00E+00	1.0000E+00	1.0000E+00					
18	BC 15		TRG						1.00E+00	1.0000E+00	1.0000E+00					
19	BC 22A		TRG						1.00E+00	1.0000E+00	1.0000E+00					

Comments

Technician: J Harvey Date: 5/3/19

Gravimetric Worksheet

Work Order	Run	Analysis Code	Gravimetric Carrier	Carrier Conc (mg/ml)	Technician
19-04087	1	Ra228	Yttrium	30.6333	DBUSH

TRetek Fraction	Michael Pisani & Associates, 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	0.0711	0.1301	0.0590	96.30		
02	BLANK	MBL	2.0000	0.0716	0.1276	0.0560	91.40		
03	DUP	DUP	2.0000	0.0707	0.1286	0.0579	94.50		
04	BC 27A	TRG	2.0000	0.0706	0.1267	0.0561	91.57		
05	BC 27B	TRG	2.0000	0.0705	0.1290	0.0585	95.48		
06	BC 26	TRG	2.0000	0.0703	0.1280	0.0577	94.18		
07	BC 11	TRG	2.0000	0.0707	0.1251	0.0544	88.79		
08	BC 12	DO	2.0000	0.0709	0.1302	0.0593	96.79		
09	BC 24A	TRG	2.0000	0.0706	0.1306	0.0600	97.93		
10	BC 24B	TRG	2.0000	0.0708	0.1293	0.0585	95.48		
11	BC 21B	TRG	2.0000	0.0709	0.1305	0.0596	97.28		
12	BC 21A	TRG	2.0000	0.0707	0.1309	0.0602	98.26		
13	BC 13	TRG	2.0000	0.0712	0.1283	0.0571	93.20		
14	BC 14	TRG	2.0000	0.0713	0.1324	0.0611	99.73		
15	BC 28B	TRG	2.0000	0.0702	0.1269	0.0567	92.55		
16	BC 28A	TRG	2.0000	0.0705	0.1298	0.0593	96.79		
17	BC 16	TRG	2.0000	0.0705	0.1273	0.0568	92.71		
18	BC 15	TRG	2.0000	0.0702	0.1247	0.0545	88.96		
19	BC 22A	TRG	2.0000	0.0704	0.1297	0.0593	96.79		

Technician: *DBUSH* Date: 5/8/19

KP
5/8/19

Detector ID	Sample ID	Alpha	Beta	Count Time	Voltage	TOD
F1	1904087-01	30	959	120	1410	5/8/2019 3:13:11 PM
F2	1904087-02	7	125	120	1410	5/8/2019 3:13:11 PM
F3	1904087-03	17	192	120	1410	5/8/2019 3:13:11 PM
F4	1904087-04	13	638	120	1410	5/8/2019 3:13:11 PM
G1	1904087-05	15	221	120	1410	5/8/2019 3:13:11 PM
G2	1904087-06	13	972	120	1410	5/8/2019 3:13:12 PM
G3	1904087-07	21	297	120	1410	5/8/2019 3:13:12 PM
G4	1904087-08	10	216	120	1410	5/8/2019 3:13:12 PM
A1	1904087-09	22	601	120	1410	5/8/2019 3:13:10 PM
A2	1904087-10	33	471	120	1410	5/8/2019 3:13:10 PM
A3	1904087-11	12	327	120	1410	5/8/2019 3:13:10 PM
A4	1904087-12	26	345	120	1410	5/8/2019 3:13:10 PM
B1	1904087-13	53	1614	120	1410	5/8/2019 3:13:10 PM
B3	1904087-14	20	231	120	1410	5/8/2019 3:13:10 PM
B4	1904087-15	15	226	120	1410	5/8/2019 3:13:10 PM
C1	1904087-16	22	674	120	1410	5/8/2019 3:13:10 PM
C2	1904087-17	67	3922	120	1410	5/8/2019 3:13:11 PM
C3	1904087-18	37	1880	120	1410	5/8/2019 3:13:11 PM
D3	1904087-19	24	1224	120	1410	5/8/2019 3:13:11 PM

GPC Detector Report
(ALL Backgrounds)

14P
5/8/19

Detector	Alpha/Beta	Calibration Date	Count Date	Bkg CPM	PFW	LCL	Mean	UCL
LB4110A - A1	Alpha	11/2/2017	5/8/2019	1.00E-01	P	-4.03E-02	1.02E-01	2.45E-01
LB4110A - A2	Alpha	11/2/2017	5/8/2019	1.33E-01	P	-4.02E-02	1.12E-01	2.64E-01
LB4110A - A3	Alpha	11/2/2017	5/8/2019	1.17E-01	P	-3.27E-02	1.10E-01	2.52E-01
LB4110A - A4	Alpha	11/2/2017	5/8/2019	1.83E-01	P	-4.22E-02	1.10E-01	2.62E-01
LB4110A - B1	Alpha	11/2/2017	5/8/2019	6.67E-02	P	-3.78E-02	1.32E-01	3.01E-01
LB4110A - B2	Alpha	11/2/2017	5/8/2019	2.50E-01	P	-2.85E-02	1.45E-01	3.19E-01
LB4110A - B3	Alpha	11/2/2017	5/8/2019	6.67E-02	P	-5.05E-02	8.40E-02	2.18E-01
LB4110A - B4	Alpha	11/2/2017	5/8/2019	1.00E-01	P	-4.34E-02	8.89E-02	2.21E-01
LB4110A - C1	Alpha	11/2/2017	5/8/2019	1.17E-01	P	-2.72E-02	8.66E-02	2.00E-01
LB4110A - C2	Alpha	11/2/2017	5/8/2019	1.17E-01	P	-3.63E-02	7.05E-02	1.77E-01
LB4110A - C3	Alpha	11/2/2017	5/8/2019	5.00E-02	P	-4.82E-02	6.86E-02	1.86E-01
LB4110A - C4	Alpha	11/2/2017	5/8/2019	2.83E-01	P	-4.34E-02	1.00E-01	2.44E-01
LB4110A - D1	Alpha	11/2/2017	5/8/2019	2.67E-01	P	-1.80E-02	1.54E-01	3.26E-01
LB4110A - D2	Alpha	11/2/2017	5/8/2019	5.00E-02	P	-2.94E-02	1.14E-01	2.58E-01
LB4110A - D3	Alpha	11/2/2017	5/8/2019	1.83E-01	P	-3.11E-02	1.07E-01	2.46E-01
LB4110A - D4	Alpha	11/2/2017	5/8/2019	1.33E-01	P	-4.32E-03	1.56E-01	3.16E-01
LB4110A - E1	Alpha	11/2/2017	3/23/2018	0.00E+00	P	-4.29E-02	1.10E-01	2.62E-01
LB4110A - E2	Alpha	11/2/2017	3/23/2018	0.00E+00	P	-3.09E-02	6.37E-02	1.58E-01
LB4110A - E3	Alpha	11/2/2017	3/23/2018	0.00E+00	P	-8.81E-02	9.11E-02	2.70E-01
LB4110A - E4	Alpha	11/2/2017	3/23/2018	0.00E+00	P	-4.55E-02	7.04E-02	1.86E-01
LB4110A - F1	Alpha	11/2/2017	5/8/2019	5.00E-02	P	-3.82E-02	7.09E-02	1.80E-01
LB4110A - F2	Alpha	11/2/2017	5/8/2019	1.67E-02	P	-4.09E-02	4.93E-02	1.40E-01
LB4110A - F3	Alpha	11/2/2017	5/8/2019	1.00E-01	P	-4.18E-02	5.90E-02	1.60E-01
LB4110A - F4	Alpha	11/2/2017	5/8/2019	0.00E+00	P	-3.89E-02	6.42E-02	1.67E-01
LB4110A - G1	Alpha	11/2/2017	5/8/2019	3.33E-02	P	-4.56E-02	6.46E-02	1.75E-01
LB4110A - G2	Alpha	11/2/2017	5/8/2019	1.00E-01	P	-3.89E-02	7.79E-02	1.95E-01
LB4110A - G3	Alpha	11/2/2017	5/8/2019	2.00E-01	P	-4.27E-02	8.16E-02	2.06E-01
LB4110A - G4	Alpha	11/2/2017	5/8/2019	5.00E-02	P	-3.90E-02	8.41E-02	2.07E-01

GPC Detector Report
(ALL Backgrounds)

14P
5/8/19

Detector	Alpha/Beta	Calibration Date	Count Date	Bkg CPM	PFW	LCL	Mean	UCL
LB4110A - A1	Beta	11/2/2017	5/8/2019	1.22E+00	P	8.82E-01	1.37E+00	1.86E+00
LB4110A - A2	Beta	11/2/2017	5/8/2019	1.63E+00	P	9.70E-01	1.54E+00	2.10E+00
LB4110A - A3	Beta	11/2/2017	5/8/2019	1.38E+00	P	1.01E+00	1.48E+00	1.96E+00
LB4110A - A4	Beta	11/2/2017	5/8/2019	1.70E+00	P	9.81E-01	1.43E+00	1.87E+00
LB4110A - B1	Beta	11/2/2017	5/8/2019	1.47E+00	P	1.04E+00	1.52E+00	2.00E+00
LB4110A - B2	Beta	11/2/2017	5/8/2019	1.52E+00	P	6.68E-01	1.45E+00	2.23E+00
LB4110A - B3	Beta	11/2/2017	5/8/2019	1.28E+00	P	9.19E-01	1.36E+00	1.80E+00
LB4110A - B4	Beta	11/2/2017	5/8/2019	1.23E+00	P	7.54E-01	1.33E+00	1.90E+00
LB4110A - C1	Beta	11/2/2017	5/8/2019	1.48E+00	P	8.39E-01	1.27E+00	1.70E+00
LB4110A - C2	Beta	11/2/2017	5/8/2019	1.18E+00	P	-1.39E-01	1.19E+00	2.53E+00
LB4110A - C3	Beta	11/2/2017	5/8/2019	1.98E+00	P	2.49E-01	1.79E+00	3.34E+00
LB4110A - C4	Beta	11/2/2017	5/8/2019	1.50E+00	P	8.25E-01	1.24E+00	1.66E+00
LB4110A - D1	Beta	11/2/2017	5/8/2019	1.48E+00	P	8.92E-01	1.33E+00	1.76E+00
LB4110A - D2	Beta	11/2/2017	5/8/2019	2.48E+00	F	-2.46E+01	3.04E+00	3.07E+01
LB4110A - D3	Beta	11/2/2017	5/8/2019	1.48E+00	P	7.97E-01	1.27E+00	1.74E+00
LB4110A - D4	Beta	11/2/2017	5/8/2019	1.45E+00	P	9.69E-01	1.45E+00	1.94E+00
LB4110A - E1	Beta	11/2/2017	3/23/2018	3.33E-02	P	7.66E-01	1.32E+00	1.88E+00
LB4110A - E2	Beta	11/2/2017	3/23/2018	1.67E-02	P	5.45E-01	9.58E-01	1.37E+00
LB4110A - E3	Beta	11/2/2017	3/23/2018	6.67E-02	P	4.98E-01	1.20E+00	1.91E+00
LB4110A - E4	Beta	11/2/2017	3/23/2018	0.00E+00	P	5.67E-01	1.04E+00	1.50E+00
LB4110A - F1	Beta	11/2/2017	5/8/2019	1.47E+00	P	7.38E-01	1.29E+00	1.84E+00
LB4110A - F2	Beta	11/2/2017	5/8/2019	1.00E+00	P	4.52E-01	8.79E-01	1.31E+00
LB4110A - F3	Beta	11/2/2017	5/8/2019	1.40E+00	P	2.32E-01	1.16E+00	2.08E+00
LB4110A - F4	Beta	11/2/2017	5/8/2019	9.33E-01	P	5.48E-01	1.08E+00	1.62E+00
LB4110A - G1	Beta	11/2/2017	5/8/2019	1.05E+00	P	5.88E-01	1.26E+00	1.94E+00
LB4110A - G2	Beta	11/2/2017	5/8/2019	1.42E+00	P	1.03E+00	1.74E+00	2.46E+00
LB4110A - G3	Beta	11/2/2017	5/8/2019	1.28E+00	P	6.29E-01	1.37E+00	2.12E+00
LB4110A - G4	Beta	11/2/2017	5/8/2019	1.28E+00	P	-1.62E+00	1.46E+00	4.54E+00

GPC Detector Report
(ALL Efficiencies)

KP
5/8/19

Detector	Alpha/Beta	Calibration Date	Count Date	Eff	PFW	LCL	Mean	UCL
LB4110A - A1	Alpha	11/2/2017	5/8/2019	0.2310	P	0.2122	0.2262	0.2403
LB4110A - A2	Alpha	11/2/2017	5/8/2019	0.2011	P	0.1899	0.2093	0.2286
LB4110A - A3	Alpha	11/2/2017	5/8/2019	0.1967	P	0.1823	0.1988	0.2154
LB4110A - A4	Alpha	11/2/2017	5/8/2019	0.2279	P	0.2037	0.2254	0.2470
LB4110A - B1	Alpha	11/2/2017	5/8/2019	0.2289	P	0.2068	0.2239	0.2411
LB4110A - B2	Alpha	11/2/2017	5/8/2019	0.1982	P	0.1859	0.2003	0.2148
LB4110A - B3	Alpha	11/2/2017	5/8/2019	0.2358	P	0.2201	0.2351	0.2501
LB4110A - B4	Alpha	11/2/2017	5/8/2019	0.2296	P	0.2059	0.2231	0.2404
LB4110A - C1	Alpha	11/2/2017	5/8/2019	0.2044	P	0.1951	0.2070	0.2189
LB4110A - C2	Alpha	11/2/2017	5/8/2019	0.2142	P	-0.0286	0.2220	0.4725
LB4110A - C3	Alpha	11/2/2017	5/8/2019	0.2395	P	0.2245	0.2408	0.2571
LB4110A - C4	Alpha	11/2/2017	5/8/2019	0.2194	P	0.2001	0.2157	0.2313
LB4110A - D1	Alpha	11/2/2017	5/8/2019	0.2204	P	0.2094	0.2214	0.2334
LB4110A - D2	Alpha	11/2/2017	5/8/2019	0.2351	P	0.2198	0.2460	0.2723
LB4110A - D3	Alpha	11/2/2017	5/8/2019	0.2548	P	0.2300	0.2488	0.2676
LB4110A - D4	Alpha	11/2/2017	5/8/2019	0.1877	P	0.1711	0.1940	0.2168
LB4110A - E1	Alpha	11/2/2017	3/23/2018	0.0000	F	0.1687	0.2258	0.2830
LB4110A - E2	Alpha	11/2/2017	3/23/2018	0.0000	F	0.1518	0.2051	0.2584
LB4110A - E3	Alpha	11/2/2017	3/23/2018	0.0000	F	0.1547	0.2075	0.2603
LB4110A - E4	Alpha	11/2/2017	3/23/2018	0.0000	F	0.1747	0.2355	0.2963
LB4110A - F1	Alpha	11/2/2017	5/8/2019	0.2188	P	0.1577	0.2127	0.2677
LB4110A - F2	Alpha	11/2/2017	5/8/2019	0.1858	P	0.1434	0.1819	0.2204
LB4110A - F3	Alpha	11/2/2017	5/8/2019	0.2283	P	0.1788	0.2312	0.2836
LB4110A - F4	Alpha	11/2/2017	5/8/2019	0.2190	P	0.1626	0.2105	0.2585
LB4110A - G1	Alpha	11/2/2017	5/8/2019	0.1938	P	0.1780	0.1947	0.2114
LB4110A - G2	Alpha	11/2/2017	5/8/2019	0.1855	P	0.1800	0.1980	0.2159
LB4110A - G3	Alpha	11/2/2017	5/8/2019	0.2157	P	0.2027	0.2204	0.2382
LB4110A - G4	Alpha	11/2/2017	5/8/2019	0.1852	P	0.1693	0.1926	0.2158

GPC Detector Report
(ALL Efficiencies)

LP
5/8/19

Detector	Alpha/Beta	Calibration Date	Count Date	Eff	PFW	LCL	Mean	UCL
LB4110A - A1	Beta	11/2/2017	5/8/2019	0.5592	P	0.5047	0.5419	0.5790
LB4110A - A2	Beta	11/2/2017	5/8/2019	0.4464	P	0.4003	0.4594	0.5185
LB4110A - A3	Beta	11/2/2017	5/8/2019	0.4760	P	0.4331	0.4782	0.5233
LB4110A - A4	Beta	11/2/2017	5/8/2019	0.5462	P	0.4973	0.5418	0.5863
LB4110A - B1	Beta	11/2/2017	5/8/2019	0.5402	P	0.5055	0.5416	0.5778
LB4110A - B2	Beta	11/2/2017	5/8/2019	0.4979	P	0.4676	0.4997	0.5318
LB4110A - B3	Beta	11/2/2017	5/8/2019	0.5843	P	0.5508	0.5837	0.6167
LB4110A - B4	Beta	11/2/2017	5/8/2019	0.5589	P	0.5068	0.5482	0.5896
LB4110A - C1	Beta	11/2/2017	5/8/2019	0.4780	P	0.4472	0.4786	0.5101
LB4110A - C2	Beta	11/2/2017	5/8/2019	0.5265	P	0.4875	0.5201	0.5526
LB4110A - C3	Beta	11/2/2017	5/8/2019	0.5788	P	0.5494	0.5947	0.6401
LB4110A - C4	Beta	11/2/2017	5/8/2019	0.5174	P	0.4862	0.5237	0.5611
LB4110A - D1	Beta	11/2/2017	5/8/2019	0.6488	P	0.6104	0.6397	0.6691
LB4110A - D2	Beta	11/2/2017	5/8/2019	0.5830	P	0.5365	0.6260	0.7155
LB4110A - D3	Beta	11/2/2017	5/8/2019	0.6557	P	0.5906	0.6403	0.6901
LB4110A - D4	Beta	11/2/2017	5/8/2019	0.4898	P	0.4514	0.5000	0.5486
LB4110A - E1	Beta	11/2/2017	3/23/2018	0.0436	F	0.4162	0.5409	0.6655
LB4110A - E2	Beta	11/2/2017	3/23/2018	0.0428	F	0.3730	0.4913	0.6097
LB4110A - E3	Beta	11/2/2017	3/23/2018	0.0551	F	0.3852	0.4994	0.6137
LB4110A - E4	Beta	11/2/2017	3/23/2018	0.0569	F	0.4534	0.5890	0.7247
LB4110A - F1	Beta	11/2/2017	5/8/2019	0.5420	P	0.4370	0.5313	0.6256
LB4110A - F2	Beta	11/2/2017	5/8/2019	0.4489	P	0.4081	0.4562	0.5043
LB4110A - F3	Beta	11/2/2017	5/8/2019	0.5759	P	0.4764	0.5963	0.7161
LB4110A - F4	Beta	11/2/2017	5/8/2019	0.5573	P	0.4423	0.5339	0.6255
LB4110A - G1	Beta	11/2/2017	5/8/2019	0.4498	P	0.4277	0.4543	0.4810
LB4110A - G2	Beta	11/2/2017	5/8/2019	0.4473	P	0.4272	0.4739	0.5205
LB4110A - G3	Beta	11/2/2017	5/8/2019	0.5225	P	0.4842	0.5313	0.5784
LB4110A - G4	Beta	11/2/2017	5/8/2019	0.4412	P	0.4039	0.4671	0.5303

SECTION X

BARIUM-133 ANALYTICAL TRACER DATA

*rel
5/2/19*

Analysis Report for 1904087-01
SPIKE

GAMMA SPECTRUM ANALYSIS

Sample Identification : 1904087-01
 Sample Description : SPIKE
 Sample Type : RA RECOVERY

Sample Size : 1.000E+00 units
 Facility : Countroom

Sample Taken On : 5/2/2019 8:37:57AM
 Acquisition Started : 5/2/2019 4:32:01PM

Procedure : BAFIL
 Operator : Administrator
 Detector Name : GE1
 Geometry : BAFIL
 Live Time : 900.0 seconds
 Real Time : 900.4 seconds

Dead Time : 0.04 %

Peak Locate Threshold : 2.50
 Peak Locate Range (in channels) : 1 - 4096
 Peak Area Range (in channels) : 18 - 4096
 Identification Energy Tolerance : 1.000FWHM

Energy Calibration Used Done On : 6/16/2018
 Efficiency Calibration Used Done On : 2/17/2018
 Efficiency Calibration Description :

Sample Number : 81242

PEAK ANALYSIS REPORT

Peak Analysis Performed on : 5/2/2019 4:47:04PM
 Peak Analysis From Channel : 1
 Peak Analysis To Channel : 4096

Peak No.	Energy (keV)	ROI start	ROI end	Peak Centroid	Net Peak Area	Net Area Uncertainty	Continuum Counts	FWHM (keV)
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Analysis Report for 1904087-01

SPIKE

	Peak No.	Energy (keV)	ROI start	ROI end	Peak Centroid	Net Peak Area	Net Area Uncertainty	Continuum Counts	FWHM (keV)
M	1	30.78	26 -	42	31.16	2.74E+03	122.61	5.41E+02	3.82
m	2	34.94	26 -	42	35.31	5.99E+02	118.34	4.91E+02	3.18
	3	52.11	48 -	56	52.48	4.86E+01	47.39	3.17E+02	1.92
	4	63.16	57 -	73	63.53	4.68E+02	94.85	6.71E+02	3.41
	5	81.00	76 -	86	81.37	1.02E+03	90.75	5.58E+02	3.80
	6	112.81	107 -	121	113.17	3.26E+02	70.80	3.92E+02	4.79
	7	144.37	138 -	152	144.71	1.05E+02	55.26	2.77E+02	11.61
M	8	275.55	273 -	281	275.87	5.08E+01	25.36	8.41E+01	1.88
m	9	278.65	273 -	281	278.97	2.64E+01	24.96	7.19E+01	1.88
M	10	302.62	296 -	310	302.93	1.92E+02	45.29	1.39E+02	3.69
m	11	306.39	296 -	310	306.69	3.65E+01	29.73	1.11E+02	2.09
M	12	332.06	328 -	342	332.36	3.29E+01	25.78	7.76E+01	2.32
m	13	334.72	328 -	342	335.02	4.93E+01	25.51	5.61E+01	2.11
	14	356.12	350 -	363	356.41	7.90E+02	68.83	1.77E+02	4.11
M	15	383.69	380 -	393	383.98	1.15E+02	45.52	1.25E+02	2.78
m	16	386.58	380 -	393	386.87	3.12E+02	57.71	2.15E+02	3.80
M	17	413.63	409 -	427	413.91	3.31E+01	23.62	3.96E+01	2.87
m	18	417.33	409 -	427	417.62	3.28E+01	20.93	2.75E+01	2.39
m	19	420.94	409 -	427	421.23	2.45E+01	18.92	2.36E+01	2.38
M	20	436.01	433 -	444	436.29	1.00E+02	25.96	2.80E+01	2.92
m	21	438.13	433 -	444	438.40	3.33E+01	26.57	2.80E+01	2.39
M	22	464.08	463 -	474	464.35	5.72E+00	6.22	5.75E+00	2.19
m	23	467.11	463 -	474	467.38	1.73E+01	14.59	1.12E+01	2.19
m	24	469.75	463 -	474	470.02	1.96E+01	14.59	8.76E+00	2.19
	25	496.85	494 -	499	497.11	4.58E+00	5.74	2.83E+00	1.84
	26	529.78	527 -	532	530.04	5.25E+00	7.07	5.50E+00	2.92
	27	835.20	833 -	837	835.40	5.00E+00	4.47	0.00E+00	1.70

M = First peak in a multiplet region
 m = Other peak in a multiplet region
 F = Fitted singlet
 Errors quoted at 2.000sigma

BACKGROUND SUBTRACT REPORT

Peak Analysis Performed on : 5/2/2019 4:47:04PM

Env. Background File : \\OR-GAMMA1\ApexRoot\Countroom\Data\0000080014.CNF

	Peak No.	Energy (keV)	Original Area	Orig. Area Uncertainty	Ambient Background	Backgr. Uncert.	Subtracted Area	Subtracted Uncert.
M	1	30.78	2.74E+03	122.61			2.74E+03	1.23E+02
m	2	34.94	5.99E+02	118.34			5.99E+02	1.18E+02

Analysis Report for 1904087-01

SPIKE

Peak No.	Energy (keV)	Original Area	Orig. Area Uncertainty	Ambient Background	Backgr. Uncert.	Subtracted Area	Subtracted Uncert.
	3	52.11	4.86E+01	47.39		4.86E+01	4.74E+01
	4	63.16	4.68E+02	94.85	2.07E+01	2.02E+00	4.48E+02
	5	81.00	1.02E+03	90.75		1.02E+03	9.07E+01
	6	112.81	3.26E+02	70.80		3.26E+02	7.08E+01
	7	144.37	1.05E+02	55.26		1.05E+02	5.53E+01
M	8	275.55	5.08E+01	25.36		5.08E+01	2.54E+01
m	9	278.65	2.64E+01	24.96		2.64E+01	2.50E+01
M	10	302.62	1.92E+02	45.29		1.92E+02	4.53E+01
m	11	306.39	3.65E+01	29.73		3.65E+01	2.97E+01
M	12	332.06	3.29E+01	25.78		3.29E+01	2.58E+01
m	13	334.72	4.93E+01	25.51		4.93E+01	2.55E+01
	14	356.12	7.90E+02	68.83		7.90E+02	6.88E+01
M	15	383.69	1.15E+02	45.52		1.15E+02	4.55E+01
m	16	386.58	3.12E+02	57.71		3.12E+02	5.77E+01
M	17	413.63	3.31E+01	23.62		3.31E+01	2.36E+01
m	18	417.33	3.28E+01	20.93		3.28E+01	2.09E+01
m	19	420.94	2.45E+01	18.92		2.45E+01	1.89E+01
M	20	436.01	1.00E+02	25.96		1.00E+02	2.60E+01
m	21	438.13	3.33E+01	26.57		3.33E+01	2.66E+01
M	22	464.08	5.72E+00	6.22		5.72E+00	6.22E+00
m	23	467.11	1.73E+01	14.59		1.73E+01	1.46E+01
m	24	469.75	1.96E+01	14.59		1.96E+01	1.46E+01
	25	496.85	4.58E+00	5.74		4.58E+00	5.74E+00
	26	529.78	5.25E+00	7.07		5.25E+00	7.07E+00
	27	835.20	5.00E+00	4.47		5.00E+00	4.47E+00

M = First peak in a multiplet region

m = Other peak in a multiplet region

F = Fitted singlet

Errors quoted at 2.000sigma

NUCLIDE IDENTIFICATION REPORT

Nuclide Library Used : \\OR-GAMMA1\ApexRoot\Countroom\Library\WSRC.NLB

IDENTIFIED NUCLIDES

Nuclide Name	Id Confidence	Energy (keV)	Yield(%)	Activity (pCi/units)	Activity Uncertainty
I-125	0.99	35.49 *	6.49	5.43E+00	1.07E+00
BA-133	1.00	30.80 *	97.60	5.06E-01	2.27E-02
		302.84 *	17.80	8.50E+02	4.25E+02
		356.01 *	60.00	6.66E+02	9.31E+01

0178

Analysis Report for 1904087-01

SPIKE

Nuclide Name	Id Confidence	Energy (keV)	Yield(%)	Activity (pCi/units)	Activity Uncertainty
HG-203	0.99	279.19 *	77.30	3.21E+01	3.47E+01
PA-231	1.00	9.28	42.00		
		10.11	20.20		
		283.67	1.60		
		302.67 *	2.30	6.57E+03	3.29E+03
TH-234	0.99	63.29 *	3.80	5.61E+02	1.20E+02

* = Energy line found in the spectrum.

- = Manually added nuclide.

? = Manually edited nuclide.

@ = Energy line not used for Weighted Mean Activity

Energy Tolerance : 2.000FWHM

Nuclide confidence index threshold = 0.30

Errors quoted at 2.000sigma

INTERFERENCE CORRECTED REPORT

	Nuclide Name	Nuclide Id Confidence	Wt mean Activity (pCi/units)	Wt mean Activity Uncertainty	Comments
	I-125	0.991	5.43E+00	1.07E+00	
X	I-129	0.919			
	BA-133	1.000	5.06E-01	2.27E-02	
	HG-203	0.991	3.21E+01	3.47E+01	
	PA-231	1.000	6.57E+03	3.29E+03	
	TH-234	0.999	5.61E+02	1.20E+02	
X	NP-237	0.938			

? = nuclide is part of an undetermined solution

X = nuclide rejected by the interference analysis

@ = nuclide contains energy lines not used in Weighted Mean Activity

Errors quoted at 2.000sigma

Analysis Report for 1904087-01

SPIKE

UNIDENTIFIED PEAKS

Peak Locate Performed on : 5/2/2019 4:47:04PM
 Peak Locate From Channel : 1
 Peak Locate To Channel : 4096

Peak No.	Energy (keV)	Peak Size (CPS)	Peak CPS (%) Uncertainty	Peak Type	Tolerance Nuclide
3	52.11	5.39479E-02	48.80		
5	81.00	1.12905E+00	4.47		
6	112.81	3.62237E-01	10.86	Tol.	U-237
7	144.37	1.16203E-01	26.42		
M 8	275.55	5.64622E-02	24.95		
m 11	306.39	4.05024E-02	40.78		
M 12	332.06	3.65269E-02	39.21	Sum	
m 13	334.72	5.47659E-02	25.88	Sum	
M 15	383.69	1.27886E-01	19.77		
m 16	386.58	3.47211E-01	9.23	Sum	
M 17	413.63	3.67821E-02	35.68		
m 18	417.33	3.64242E-02	31.92	Sum	
m 19	420.94	2.72637E-02	38.56	Sum	
M 20	436.01	1.11510E-01	12.93		
m 21	438.13	3.69811E-02	39.92		
M 22	464.08	6.35387E-03	54.43		
m 23	467.11	1.92057E-02	42.19		
m 24	469.75	2.17750E-02	37.21		
25	496.85	5.09259E-03	62.67		
26	529.78	5.83333E-03	67.34		
27	835.20	5.55556E-03	44.72		

M = First peak in a multiplet region
 m = Other peak in a multiplet region
 F = Fitted singlet
 Errors quoted at 2.000sigma

NUCLIDE MDA REPORT

Nuclide Library Used : \\OR-GAMMA1\ApexRoot\Countroom\Library\WSRC.NLB

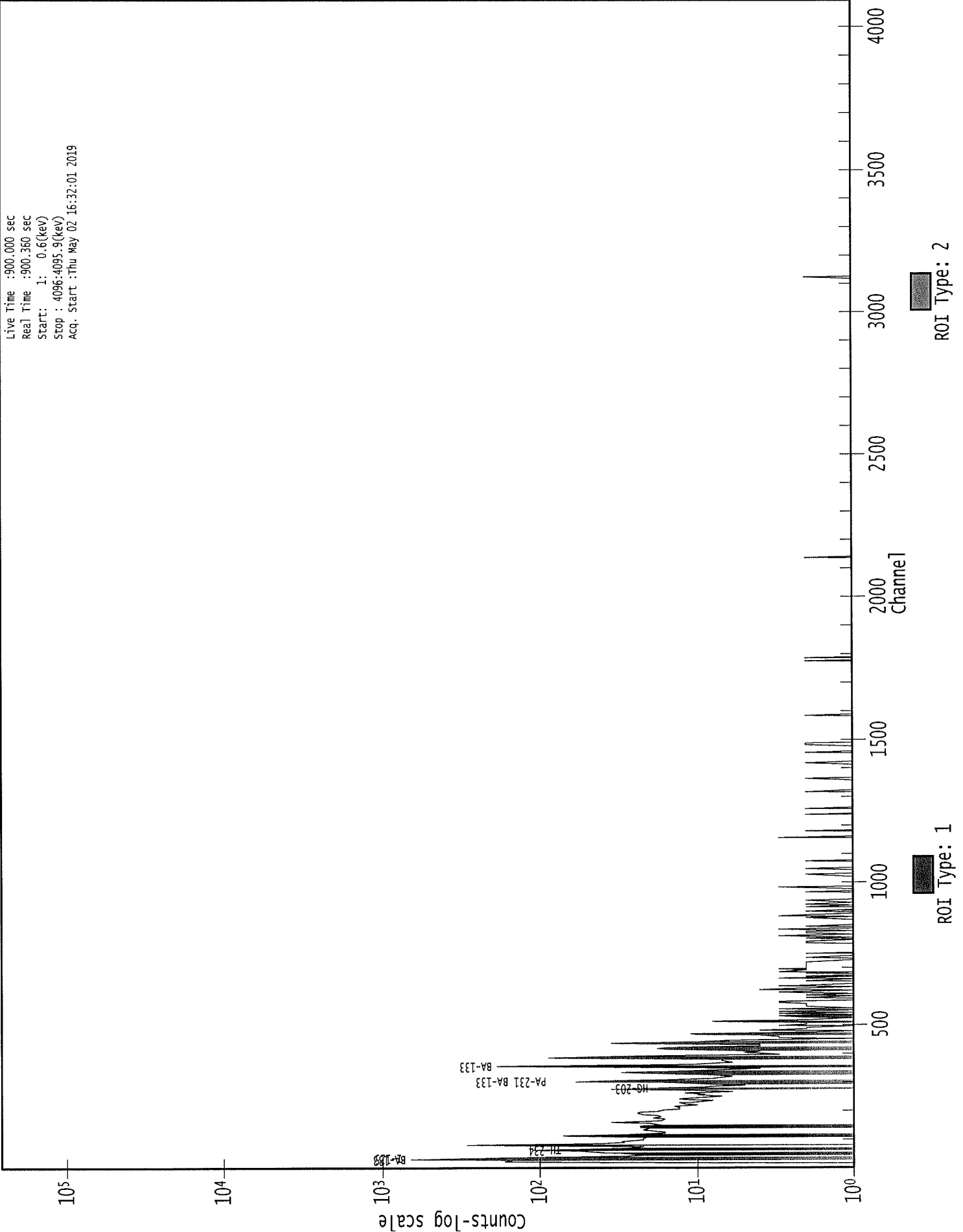
Analysis Report for 1904087-01

SPIKE

Nuclide Name	Energy (keV)	Yield(%)	Line MDA (pCi/units)	Nuclide MDA (pCi/units)	Activity (pCi/units)	Dec. Level (pCi/units)
FE-55	5.89	24.50	1.90E-13	1.90E-13	0.00E+00	0.00E+00
CO-57	122.06	85.51	3.53E+01	3.53E+01	-4.22E-02	1.65E+01
	136.48	10.60	3.70E+02		2.86E+01	1.73E+02
NI-59	6.92	29.80	2.77E-12	2.77E-12	0.00E+00	0.00E+00
MO-93	16.59	52.90	9.18E-06	9.18E-06	-1.11E-05	4.15E-06
	18.60	10.00	4.23E-04		9.27E-05	2.02E-04
NB-93M	16.57	9.43	5.07E-05	5.07E-05	-6.13E-05	2.29E-05
CD-109	88.03	3.72	3.89E+02	3.89E+02	4.08E+01	1.85E+02
SN-113	255.12	1.93	2.11E+03	3.62E+01	4.96E+02	9.78E+02
	391.69	61.90	3.62E+01		5.37E-01	1.73E+01
SN-119M	23.87	16.10	7.53E-03	7.53E-03	1.28E-02	3.66E-03
	25.10	22.70	9.12E-03		1.26E-02	4.43E-03
+ I-125	35.49	* 6.49	1.45E+00	1.45E+00	5.43E+00	7.13E-01
I-129	29.78	* 57.00	5.09E-02	5.09E-02	8.66E-01	2.50E-02
	33.60	* 13.20	7.10E-01		2.66E+00	3.49E-01
	39.58	7.52	1.69E+00		-3.70E-01	8.16E-01
+ BA-133	30.80	* 97.60	2.97E-02	2.97E-02	5.06E-01	1.46E-02
	302.84	* 17.80	3.26E+02		8.50E+02	1.57E+02
	356.01	* 60.00	5.74E+01		6.66E+02	2.76E+01
CE-139	165.85	80.35	6.47E+01	6.47E+01	4.57E+00	3.03E+01
CE-144	133.54	10.80	3.89E+02	3.89E+02	3.30E+02	1.83E+02
+ HG-203	279.19	* 77.30	5.60E+01	5.60E+01	3.21E+01	2.63E+01
PB-210	46.50	4.25	6.27E+00	6.27E+00	-6.27E-01	2.94E+00
+ PA-231	9.28	42.00	2.61E-10	2.61E-10	0.00E+00	0.00E+00
	10.11	20.20	2.08E-09		0.00E+00	0.00E+00
	283.67	1.60	1.88E+03		6.10E+02	8.63E+02
	302.67	* 2.30	2.52E+03		6.57E+03	1.21E+03
TH-231	25.64	14.70	1.72E-02	1.72E-02	-4.88E-03	8.34E-03
	84.21	6.40	3.10E+02		1.09E+02	1.50E+02
PA-234M	9.89	89.00	3.36E-10	3.36E-10	0.00E+00	0.00E+00
	21.72	64.90	6.85E-04		1.92E-03	3.33E-04
	37.93	23.75	5.56E-01		7.95E-01	2.71E-01
	131.42	20.40	1.82E+02		-5.94E+01	8.51E+01
+ TH-234	63.29	* 3.80	1.78E+02	1.78E+02	5.61E+02	8.75E+01
NP-237	29.37	* 14.00	2.07E-01	2.07E-01	3.52E+00	1.02E-01
	86.50	12.60	1.10E+02		4.11E+00	5.27E+01
U-237	97.08	16.30	1.11E+02	7.96E+01	3.05E-01	5.22E+01
	101.07	26.30	7.96E+01		9.11E+00	3.75E+01
	114.00	12.30	4.10E+02		5.02E+02	1.98E+02
	208.01	22.00	2.23E+02		-4.59E+01	1.03E+02
AM-241	59.54	35.90	7.68E+00	7.68E+00	4.72E+00	3.71E+00
AM-243	74.67	66.00	9.05E+00	9.05E+00	-4.16E-01	4.28E+00

- + = Nuclide identified during the nuclide identification
* = Energy line found in the spectrum
> = MDA value not calculated
@ = Half-life too short to be able to perform the decay correction

Live Time :900.000 sec
Real Time :900.360 sec
Start: 1: 0.6(keV)
Stop : 4096:4095.9(keV)
Acq. Start :Thu May 02 16:32:01 2019



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5/2/19

Analysis Report for 1904087-02
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GAMMA SPECTRUM ANALYSIS

Sample Identification : 1904087-02
 Sample Description : BLANK
 Sample Type : RA RECOVERY

 Sample Size : 1.000E+00 units
 Facility : Countroom

 Sample Taken On : 5/2/2019 8:38:04AM
 Acquisition Started : 5/2/2019 4:32:08PM

 Procedure : BAFIL
 Operator : Administrator
 Detector Name : GE2
 Geometry : BAFIL
 Live Time : 900.0 seconds
 Real Time : 900.3 seconds

 Dead Time : 0.03 %

 Peak Locate Threshold : 2.50
 Peak Locate Range (in channels) : 1 - 4096
 Peak Area Range (in channels) : 28 - 4096
 Identification Energy Tolerance : 1.000FWHM

 Energy Calibration Used Done On : 2/17/2018
 Efficiency Calibration Used Done On : 2/24/2018
 Efficiency Calibration Description :

 Sample Number : 81243

PEAK ANALYSIS REPORT

Peak Analysis Performed on : 5/2/2019 4:47:19PM

Peak Analysis From Channel : 1
 Peak Analysis To Channel : 4096

Peak No.	Energy (keV)	ROI start	ROI end	Peak Centroid	Net Peak Area	Net Area Uncertainty	Continuum Counts	FWHM (keV)
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Analysis Report for 1904087-02

BLANK

	Peak No.	Energy (keV)	ROI start	ROI end	Peak Centroid	Net Peak Area	Net Area Uncertainty	Continuum Counts	FWHM (keV)
	1	35.91	35 -	39	35.69	5.39E+02	73.32	3.82E+02	2.57
	2	53.27	50 -	58	53.04	6.76E+01	42.91	2.39E+02	2.74
M	3	62.20	58 -	70	61.97	2.23E+02	40.52	1.29E+02	1.65
m	4	66.32	58 -	70	66.09	1.17E+02	35.12	1.93E+02	1.67
	5	81.60	78 -	85	81.36	1.11E+03	75.13	1.99E+02	1.79
M	6	112.32	108 -	120	112.06	2.13E+02	35.65	9.72E+01	1.72
m	7	116.33	108 -	120	116.08	6.09E+01	34.43	1.18E+02	2.22
	8	160.57	158 -	163	160.29	3.70E+01	26.94	1.18E+02	2.59
	9	181.72	176 -	188	181.44	5.60E+01	47.09	2.36E+02	8.37
	10	277.06	273 -	280	276.73	9.70E+01	26.00	4.80E+01	1.72
M	11	303.30	299 -	310	302.96	2.01E+02	32.11	5.16E+01	1.54
m	12	307.64	299 -	310	307.29	2.29E+01	17.64	4.20E+01	1.69
M	13	334.07	329 -	342	333.71	9.32E+01	22.87	2.06E+01	1.90
m	14	338.68	329 -	342	338.31	1.92E+01	16.22	2.31E+01	1.90
	15	356.47	352 -	359	356.10	6.58E+02	53.81	4.41E+01	1.39
	16	368.62	363 -	373	368.24	1.50E+01	18.65	3.80E+01	2.90
M	17	384.36	382 -	398	383.98	1.45E+02	24.82	1.05E+01	1.47
m	18	387.43	382 -	398	387.04	2.03E+02	36.44	1.08E+01	1.89
m	19	391.95	382 -	398	391.56	4.74E+01	20.81	8.19E+00	2.39
M	20	414.90	410 -	428	414.50	2.67E+01	14.63	6.00E+00	2.00
m	21	418.82	410 -	428	418.42	1.78E+01	15.03	6.00E+00	2.01
m	22	422.40	410 -	428	422.00	7.21E+00	9.19	5.00E+00	1.51
	23	437.41	433 -	439	437.00	1.03E+02	21.18	5.98E+00	1.59
	24	628.11	625 -	630	627.60	4.43E+00	6.78	5.14E+00	1.37
	25	1022.02	1018 -	1024	1021.29	7.00E+00	5.29	0.00E+00	3.41

M = First peak in a multiplet region

m = Other peak in a multiplet region

F = Fitted singlet

Errors quoted at 2.000sigma

BACKGROUND SUBTRACT REPORT

Peak Analysis Performed on : 5/2/2019 4:47:19PM

Env. Background File : \\OR-GAMMA1\ApexRoot\Countroom\Data\0000080015.CNF

	Peak No.	Energy (keV)	Original Area	Orig. Area Uncertainty	Ambient Background	Backgr. Uncert.	Subtracted Area	Subtracted Uncert.
	1	35.91	5.39E+02	73.32			5.39E+02	7.33E+01
	2	53.27	6.76E+01	42.91			6.76E+01	4.29E+01
M	3	62.20	2.23E+02	40.52			2.23E+02	4.05E+01
m	4	66.32	1.17E+02	35.12			1.17E+02	3.51E+01

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Analysis Report for 1904087-02

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	Peak No.	Energy (keV)	Original Area	Orig. Area Uncertainty	Ambient Background	Backgr. Uncert.	Subtracted Area	Subtracted Uncert.
	5	81.60	1.11E+03	75.13			1.11E+03	7.51E+01
M	6	112.32	2.13E+02	35.65	8.57E-01	1.81E+00	2.12E+02	3.57E+01
m	7	116.33	6.09E+01	34.43			6.09E+01	3.44E+01
	8	160.57	3.70E+01	26.94			3.70E+01	2.69E+01
	9	181.72	5.60E+01	47.09			5.60E+01	4.71E+01
	10	277.06	9.70E+01	26.00			9.70E+01	2.60E+01
M	11	303.30	2.01E+02	32.11			2.01E+02	3.21E+01
m	12	307.64	2.29E+01	17.64			2.29E+01	1.76E+01
M	13	334.07	9.32E+01	22.87			9.32E+01	2.29E+01
m	14	338.68	1.92E+01	16.22	7.39E-01	1.27E+00	1.84E+01	1.63E+01
	15	356.47	6.58E+02	53.81			6.58E+02	5.38E+01
	16	368.62	1.50E+01	18.65			1.50E+01	1.86E+01
M	17	384.36	1.45E+02	24.82			1.45E+02	2.48E+01
m	18	387.43	2.03E+02	36.44			2.03E+02	3.64E+01
m	19	391.95	4.74E+01	20.81			4.74E+01	2.08E+01
M	20	414.90	2.67E+01	14.63			2.67E+01	1.46E+01
m	21	418.82	1.78E+01	15.03			1.78E+01	1.50E+01
m	22	422.40	7.21E+00	9.19			7.21E+00	9.19E+00
	23	437.41	1.03E+02	21.18			1.03E+02	2.12E+01
	24	628.11	4.43E+00	6.78			4.43E+00	6.78E+00
	25	1022.02	7.00E+00	5.29			7.00E+00	5.29E+00

M = First peak in a multiplet region

m = Other peak in a multiplet region

F = Fitted singlet

Errors quoted at 2.000sigma

NUCLIDE IDENTIFICATION REPORT

Nuclide Library Used : \\OR-GAMMA1\ApexRoot\Countroom\Library\WSRC.NLB

IDENTIFIED NUCLIDES

Nuclide Name	Id Confidence	Energy (keV)	Yield(%)	Activity (pCi/units)	Activity Uncertainty
SN-113	0.96	255.12	1.93		
		391.69	* 61.90	2.90E+01	1.29E+01
I-125	0.99	35.49	* 6.49	2.13E+01	2.90E+00
PA-231	1.00	9.28	42.00		
		10.11	20.20		
		283.67	1.60		
		302.67	* 2.30	5.90E+03	2.02E+03

Analysis Report for 1904087-02

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* = Energy line found in the spectrum.
 - = Manually added nuclide.
 ? = Manually edited nuclide.
 @ = Energy line not used for Weighted Mean Activity
 Energy Tolerance : 2.000FWHM
 Nuclide confidence index threshold = 0.30
 Errors quoted at 2.000sigma

INTERFERENCE CORRECTED REPORT

<i>Nuclide Name</i>	<i>Nuclide Id Confidence</i>	<i>Wt mean Activity (pCi/units)</i>	<i>Wt mean Activity Uncertainty</i>	<i>Comments</i>
SN-113	0.966	2.90E+01	1.29E+01	
I-125	0.995	2.13E+01	2.90E+00	
PA-231	1.000	5.90E+03	2.02E+03	

? = nuclide is part of an undetermined solution
 X = nuclide rejected by the interference analysis
 @ = nuclide contains energy lines not used in Weighted Mean Activity

Errors quoted at 2.000sigma

Analysis Report for 1904087-02

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 UNIDENTIFIED PEAKS

Peak Locate Performed on : 5/2/2019 4:47:19PM
 Peak Locate From Channel : 1
 Peak Locate To Channel : 4096

Peak No.	Energy (keV)	Peak Size (CPS)	Peak CPS (%) Uncertainty	Peak Type	Tolerance Nuclide
	2	53.27	7.50891E-02	31.75	
M	3	62.20	2.47460E-01	9.10	
m	4	66.32	1.30532E-01	14.95	
	5	81.60	1.23514E+00	3.38	
M	6	112.32	2.35716E-01	8.41	Tol. U-237
m	7	116.33	6.76785E-02	28.26	
	8	160.57	4.10648E-02	36.45	
	9	181.72	6.22158E-02	42.04	
	10	277.06	1.07778E-01	13.40	
m	12	307.64	2.54905E-02	38.45	
M	13	334.07	1.03556E-01	12.27	
m	14	338.68	2.04993E-02	44.09	Sum
	15	356.47	7.31061E-01	4.09	
	16	368.62	1.66830E-02	62.10	
M	17	384.36	1.60752E-01	8.58	
m	18	387.43	2.26013E-01	8.96	
M	20	414.90	2.96736E-02	27.39	
m	21	418.82	1.98068E-02	42.17	
m	22	422.40	8.00771E-03	63.77	
	23	437.41	1.14455E-01	10.28	
	24	628.11	4.92063E-03	76.57	
	25	1022.02	7.77778E-03	37.80	

M = First peak in a multiplet region
 m = Other peak in a multiplet region
 F = Fitted singlet
 Errors quoted at 2.000sigma

Analysis Report for 1904087-02

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NUCLIDE MDA REPORT

Nuclide Library Used : \\OR-GAMMA1\ApexRoot\Countroom\Library\WSRC.NLB

Nuclide Name	Energy (keV)	Yield(%)	Line MDA (pCi/units)	Nuclide MDA (pCi/units)	Activity (pCi/units)	Dec. Level (pCi/units)
FE-55	5.89	24.50	1.20E-10	1.20E-10	0.00E+00	0.00E+00
CO-57	122.06	85.51	2.24E+01	2.24E+01	2.23E-01	1.02E+01
	136.48	10.60	2.65E+02		1.04E+02	1.23E+02
NI-59	6.92	29.80	9.43E-10	9.43E-10	0.00E+00	0.00E+00
MO-93	16.59	52.90	1.78E-05	1.78E-05	0.00E+00	0.00E+00
	18.60	10.00	2.91E-04		0.00E+00	0.00E+00
NB-93M	16.57	9.43	9.85E-05	9.85E-05	0.00E+00	0.00E+00
CD-109	88.03	3.72	2.80E+02	2.80E+02	-5.44E+01	1.31E+02
+ SN-113	255.12	1.93	1.37E+03	1.92E+01	3.57E+02	6.23E+02
	391.69	*	61.90	1.92E+01	2.90E+01	8.79E+00
SN-119M	23.87	16.10	1.78E-03	1.78E-03	0.00E+00	0.00E+00
	25.10	22.70	1.93E-03		0.00E+00	0.00E+00
+ I-125	35.49	*	6.49	5.58E+00	2.13E+01	2.74E+00
I-129	29.78	57.00	2.33E-01	2.33E-01	9.41E-01	1.15E-01
	33.60	13.20	1.81E+00		-1.63E+00	8.87E-01
	39.58	7.52	2.16E+00		-3.92E+00	9.92E-01
BA-133	30.80	97.60	2.11E-01	2.11E-01	2.22E+00	1.04E-01
	302.84	17.80	2.77E+02		7.97E+02	1.33E+02
	356.01	60.00	9.98E+01		5.37E+02	4.88E+01
CE-139	165.85	80.35	4.81E+01	4.81E+01	2.99E+01	2.25E+01
CE-144	133.54	10.80	2.30E+02	2.30E+02	3.39E+00	1.06E+02
HG-203	279.19	77.30	4.33E+01	4.33E+01	4.54E+01	2.03E+01
PB-210	46.50	4.25	1.13E+01	1.13E+01	2.83E+00	5.24E+00
+ PA-231	9.28	42.00	3.13E-08	3.13E-08	0.00E+00	0.00E+00
	10.11	20.20	1.87E-07		0.00E+00	0.00E+00
	283.67	1.60	9.17E+02		-2.90E+02	3.95E+02
	302.67	*	2.30	1.50E+03	5.90E+03	7.09E+02
TH-231	25.64	14.70	3.57E-03	3.57E-03	0.00E+00	0.00E+00
	84.21	6.40	3.70E+02		8.67E+02	1.80E+02
PA-234M	9.89	89.00	3.24E-08	3.24E-08	0.00E+00	0.00E+00
	21.72	64.90	1.91E-04		0.00E+00	0.00E+00
	37.93	23.75	7.23E-01		-1.26E+00	3.40E-01
	131.42	20.40	1.16E+02		-2.73E+01	5.33E+01
TH-234	63.29	3.80	1.56E+02	1.56E+02	-2.30E+01	7.58E+01
NP-237	29.37	14.00	3.09E-01	3.09E-01	-8.09E+00	1.49E-01
	86.50	12.60	8.27E+01		9.43E+00	3.88E+01
U-237	97.08	16.30	8.96E+01	6.93E+01	-6.86E+01	4.18E+01
	101.07	26.30	6.93E+01		3.28E+01	3.26E+01
	114.00	12.30	3.48E+02		4.48E+02	1.68E+02
	208.01	22.00	1.61E+02		-2.24E+01	7.40E+01
AM-241	59.54	35.90	7.53E+00	7.53E+00	-3.53E+01	3.57E+00
AM-243	74.67	66.00	1.04E+01	1.04E+01	-7.29E-01	4.90E+00

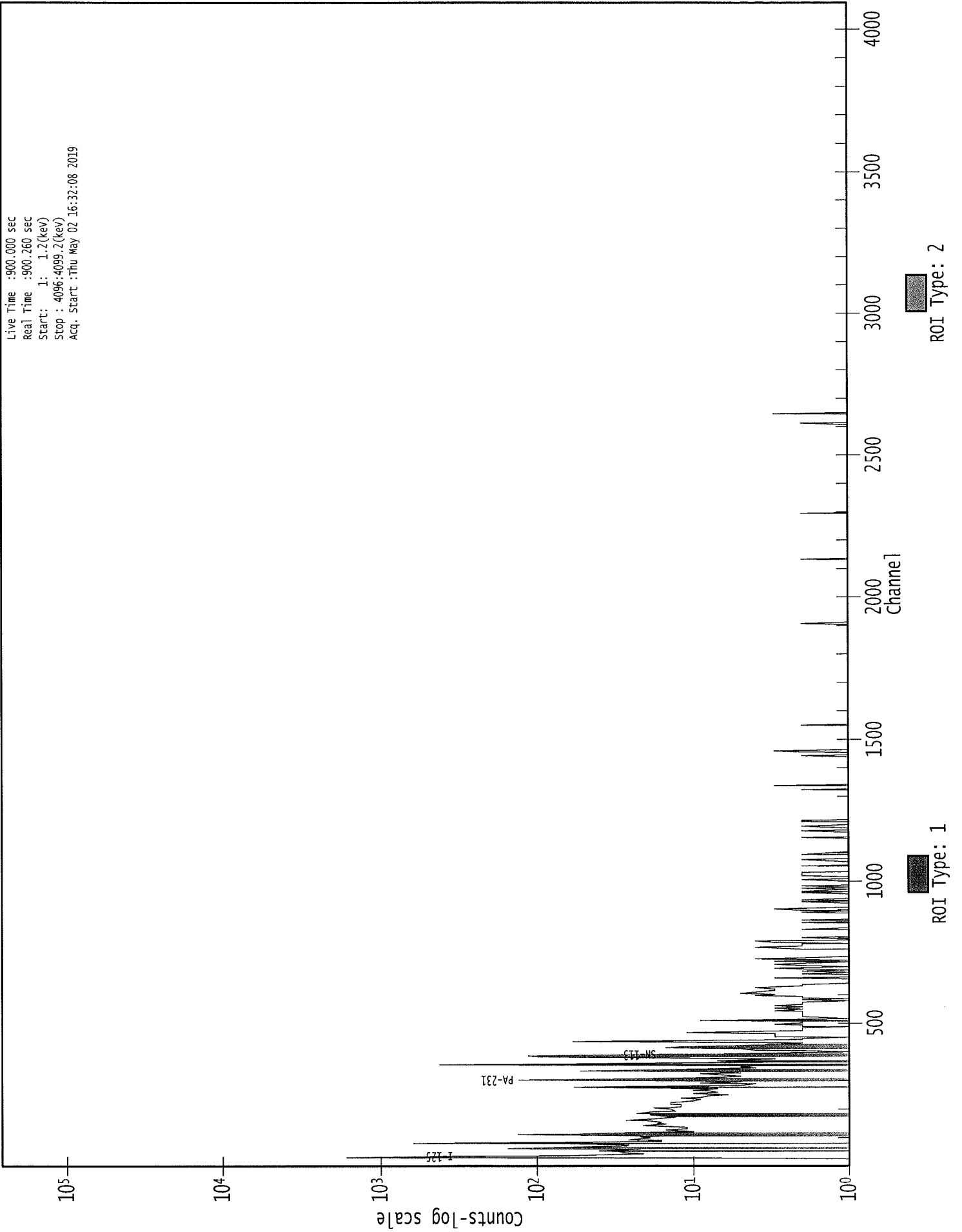
Analysis Report for 1904087-02

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- + = Nuclide identified during the nuclide identification
 - * = Energy line found in the spectrum
 - > = MDA value not calculated
 - @ = Half-life too short to be able to perform the decay correction
-

0000081243.CNF

Live Time :900.000 sec
Real Time :900.260 sec
Start: 1: 1.2(keV)
Stop : 4096.4099.2(keV)
Acq. Start :Thu May 02 16:32:08 2019



VLS
5/2/19

Analysis Report for 1904087-03
BC 12

GAMMA SPECTRUM ANALYSIS

Sample Identification : 1904087-03
 Sample Description : BC 12
 Sample Type : RA RECOVERY

 Sample Size : 1.000E+00 units
 Facility : Countroom

 Sample Taken On : 5/2/2019 8:38:26AM
 Acquisition Started : 5/2/2019 4:32:16PM

 Procedure : BAFIL
 Operator : Administrator
 Detector Name : GE3
 Geometry : BAFIL
 Live Time : 900.0 seconds
 Real Time : 902.3 seconds

 Dead Time : 0.26 %

 Peak Locate Threshold : 2.50
 Peak Locate Range (in channels) : 1 - 4096
 Peak Area Range (in channels) : 9 - 4096
 Identification Energy Tolerance : 1.000FWHM

 Energy Calibration Used Done On : 7/21/2018
 Efficiency Calibration Used Done On : 7/21/2018
 Efficiency Calibration Description :

 Sample Number : 81244

PEAK ANALYSIS REPORT

Peak Analysis Performed on : 5/2/2019 4:47:31PM

Peak Analysis From Channel : 1
 Peak Analysis To Channel : 4096

Peak No.	Energy (keV)	ROI start	ROI end	Peak Centroid	Net Peak Area	Net Area Uncertainty	Continuum Counts	FWHM (keV)
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Analysis Report for 1904087-03

BC 12

	Peak No.	Energy (keV)	ROI start	ROI end	Peak Centroid	Net Peak Area	Net Area Uncertainty	Continuum Counts	FWHM (keV)
M	1	21.51	17 -	40	21.87	1.16E+02	46.56	2.93E+02	2.63
m	2	31.03	17 -	40	31.39	2.25E+03	101.60	1.96E+02	1.88
m	3	35.16	17 -	40	35.52	5.45E+02	60.55	1.78E+02	1.89
	4	52.12	48 -	58	52.48	7.65E+01	48.67	2.75E+02	2.81
M	5	61.86	58 -	75	62.21	2.99E+02	49.87	2.06E+02	2.26
m	6	65.86	58 -	75	66.21	1.30E+02	46.47	2.31E+02	2.24
	7	81.20	76 -	87	81.54	9.25E+02	81.04	3.53E+02	2.10
M	8	111.88	106 -	136	112.21	2.46E+02	43.80	1.47E+02	2.33
m	9	115.89	106 -	136	116.21	7.88E+01	39.53	1.41E+02	2.34
M	10	182.38	181 -	189	182.68	2.67E+01	16.78	4.82E+01	1.62
	11	276.67	273 -	282	276.93	6.30E+01	27.17	6.80E+01	2.20
M	12	302.80	299 -	314	303.04	1.70E+02	29.71	3.73E+01	2.22
m	13	307.64	299 -	314	307.88	4.76E+01	26.66	3.26E+01	2.86
m	14	311.63	299 -	314	311.87	1.82E+01	18.29	2.23E+01	2.49
M	15	333.68	328 -	341	333.92	6.72E+01	24.90	5.79E+01	2.55
m	16	338.00	328 -	341	338.23	3.12E+01	19.99	3.87E+01	2.29
	17	356.00	351 -	361	356.23	5.29E+02	51.10	6.69E+01	2.01
M	18	383.82	379 -	402	384.03	1.39E+02	35.43	5.33E+01	2.33
m	19	387.08	379 -	402	387.29	1.92E+02	37.16	3.70E+01	2.02
m	20	391.10	379 -	402	391.31	3.92E+01	26.37	3.15E+01	2.42
M	21	414.90	409 -	425	415.10	3.91E+01	24.04	5.48E+01	3.47
m	22	421.80	409 -	425	422.00	1.61E+01	16.81	2.42E+01	2.37
	23	436.88	432 -	440	437.07	1.02E+02	21.64	9.87E+00	1.88
	24	446.13	442 -	450	446.32	1.30E+01	8.96	4.00E+00	2.04
M	25	464.58	461 -	476	464.76	1.02E+01	15.23	2.71E+01	2.64
m	26	467.58	461 -	476	467.76	4.53E+01	16.12	1.99E+01	2.64
	27	490.03	485 -	494	490.20	6.61E+00	7.81	4.78E+00	1.86
	28	862.76	859 -	865	862.80	5.00E+00	4.47	0.00E+00	2.41

M = First peak in a multiplet region
m = Other peak in a multiplet region
F = Fitted singlet
Errors quoted at 2.000sigma

BACKGROUND SUBTRACT REPORT

Peak Analysis Performed on : 5/2/2019 4:47:31PM

Env. Background File : \\OR-GAMMA1\ApexRoot\Countroom\Data\0000080016.CNF

	Peak No.	Energy (keV)	Original Area	Orig. Area Uncertainty	Ambient Background	Backgr. Uncert.	Subtracted Area	Subtracted Uncert.
M	1	21.51	1.16E+02	46.56			1.16E+02	4.66E+01

0192

Analysis Report for 1904087-03

BC 12

	Peak No.	Energy (keV)	Original Area	Orig. Area Uncertainty	Ambient Background	Backgr. Uncert.	Subtracted Area	Subtracted Uncert.
m	2	31.03	2.25E+03	101.60			2.25E+03	1.02E+02
m	3	35.16	5.45E+02	60.55			5.45E+02	6.05E+01
	4	52.12	7.65E+01	48.67			7.65E+01	4.87E+01
M	5	61.86	2.99E+02	49.87	1.56E+01	2.88E+00	2.84E+02	5.00E+01
m	6	65.86	1.30E+02	46.47			1.30E+02	4.65E+01
	7	81.20	9.25E+02	81.04			9.25E+02	8.10E+01
M	8	111.88	2.46E+02	43.80			2.46E+02	4.38E+01
m	9	115.89	7.88E+01	39.53			7.88E+01	3.95E+01
M	10	182.38	2.67E+01	16.78			2.67E+01	1.68E+01
	11	276.67	6.30E+01	27.17			6.30E+01	2.72E+01
M	12	302.80	1.70E+02	29.71			1.70E+02	2.97E+01
m	13	307.64	4.76E+01	26.66			4.76E+01	2.67E+01
m	14	311.63	1.82E+01	18.29			1.82E+01	1.83E+01
M	15	333.68	6.72E+01	24.90			6.72E+01	2.49E+01
m	16	338.00	3.12E+01	19.99			3.12E+01	2.00E+01
	17	356.00	5.29E+02	51.10			5.29E+02	5.11E+01
M	18	383.82	1.39E+02	35.43			1.39E+02	3.54E+01
m	19	387.08	1.92E+02	37.16			1.92E+02	3.72E+01
m	20	391.10	3.92E+01	26.37			3.92E+01	2.64E+01
M	21	414.90	3.91E+01	24.04			3.91E+01	2.40E+01
m	22	421.80	1.61E+01	16.81			1.61E+01	1.68E+01
	23	436.88	1.02E+02	21.64			1.02E+02	2.16E+01
	24	446.13	1.30E+01	8.96			1.30E+01	8.96E+00
M	25	464.58	1.02E+01	15.23			1.02E+01	1.52E+01
m	26	467.58	4.53E+01	16.12			4.53E+01	1.61E+01
	27	490.03	6.61E+00	7.81			6.61E+00	7.81E+00
	28	862.76	5.00E+00	4.47			5.00E+00	4.47E+00

M = First peak in a multiplet region

m = Other peak in a multiplet region

F = Fitted singlet

Errors quoted at 2.000sigma

NUCLIDE IDENTIFICATION REPORT

Nuclide Library Used : \\OR-GAMMA1\ApexRoot\Countroom\Library\WSRC.NLB

IDENTIFIED NUCLIDES

Nuclide Name	Id Confidence	Energy (keV)	Yield(%)	Activity (pCi/units)	Activity Uncertainty
SN-113	0.95	255.12	1.93		
		391.69 *	61.90	2.74E+01	1.86E+01

0193

Analysis Report for 1904087-03

BC 12

Nuclide Name	Id Confidence	Energy (keV)	Yield(%)	Activity (pCi/units)	Activity Uncertainty
I-125	0.99	35.49 *	6.49	2.50E+01	2.78E+00
BA-133	0.99	30.80 *	97.60	3.03E+00	1.37E-01
		302.84 *	17.80	6.39E+02	2.58E+02
		356.01 *	60.00	4.59E+02	6.86E+01
TH-234	0.96	63.29 *	3.80	4.44E+02	7.96E+01

* = Energy line found in the spectrum.

- = Manually added nuclide.

? = Manually edited nuclide.

@ = Energy line not used for Weighted Mean Activity

Energy Tolerance : 2.000FWHM

Nuclide confidence index threshold = 0.30

Errors quoted at 2.000sigma

INTERFERENCE CORRECTED REPORT

Nuclide Name	Nuclide Id Confidence	Wt mean Activity (pCi/units)	Wt mean Activity Uncertainty	Comments
SN-113	0.958	2.74E+01	1.86E+01	
I-125	0.998	2.50E+01	2.78E+00	
X I-129	0.902			
BA-133	0.999	3.03E+00	1.37E-01	
TH-234	0.964	4.44E+02	7.96E+01	
X NP-237	0.885			

? = nuclide is part of an undetermined solution

X = nuclide rejected by the interference analysis

@ = nuclide contains energy lines not used in Weighted Mean Activity

Errors quoted at 2.000sigma

Analysis Report for 1904087-03

BC 12

UNIDENTIFIED PEAKS

Peak Locate Performed on : 5/2/2019 4:47:31PM
 Peak Locate From Channel : 1
 Peak Locate To Channel : 4096

<i>Peak No.</i>	<i>Energy (keV)</i>	<i>Peak Size (CPS)</i>	<i>Peak CPS (%) Uncertainty</i>	<i>Peak Type</i>	<i>Tolerance Nuclide</i>	
M	1	21.51	1.29031E-01	20.05	Tol.	PA-234M
	4	52.12	8.50000E-02	31.81		
m	6	65.86	1.44382E-01	17.88	Sum	
	7	81.20	1.02817E+00	4.38		
M	8	111.88	2.72798E-01	8.92	Tol.	U-237
m	9	115.89	8.75635E-02	25.08		
M	10	182.38	2.97047E-02	31.38		
	11	276.67	7.00229E-02	21.55		
m	13	307.64	5.28592E-02	28.01		
m	14	311.63	2.02379E-02	50.21		
M	15	333.68	7.46266E-02	18.54	Sum	
m	16	338.00	3.47154E-02	31.99	Sum	
M	18	383.82	1.53953E-01	12.79		
m	19	387.08	2.13117E-01	9.69		
M	21	414.90	4.34386E-02	30.75		
m	22	421.80	1.78860E-02	52.21		
	23	436.88	1.13406E-01	10.60	Sum	
	24	446.13	1.44444E-02	34.45		
M	25	464.58	1.12839E-02	74.99		
m	26	467.58	5.02945E-02	17.81		
	27	490.03	7.34568E-03	59.07		
	28	862.76	5.55556E-03	44.72		

M = First peak in a multiplet region
 m = Other peak in a multiplet region
 F = Fitted singlet
 Errors quoted at 2.000sigma

Analysis Report for 1904087-03

BC 12

NUCLIDE MDA REPORT

Nuclide Library Used : \\OR-GAMMA1\ApexRoot\Countroom\Library\WSRC.NLB

Nuclide Name	Energy (keV)	Yield(%)	Line MDA (pCi/units)	Nuclide MDA (pCi/units)	Activity (pCi/units)	Dec. Level (pCi/units)
FE-55	5.89	24.50	5.37E-09	5.37E-09	-2.17E-08	1.90E-09
CO-57	122.06	85.51	2.45E+01	2.45E+01	-3.63E+01	1.15E+01
	136.48	10.60	2.84E+02		4.97E+01	1.34E+02
NI-59	6.92	29.80	1.13E-07	1.13E-07	1.48E-08	5.20E-08
MO-93	16.59	52.90	1.11E-03	1.11E-03	-2.71E-04	5.31E-04
	18.60	10.00	1.96E-02		2.23E-02	9.42E-03
NB-93M	16.57	9.43	6.17E-03	6.17E-03	-1.50E-03	2.95E-03
CD-109	88.03	3.72	3.06E+02	3.06E+02	-1.22E+01	1.45E+02
+ SN-113	255.12	1.93	1.36E+03	5.25E+01	8.01E+01	6.26E+02
	391.69	*	61.90	5.25E+01	2.74E+01	2.53E+01
SN-119M	23.87	16.10	9.57E-02	9.57E-02	-9.03E-02	4.62E-02
	25.10	22.70	9.64E-02		-8.18E-01	4.65E-02
+ I-125	35.49	*	6.49	7.63E+00	2.50E+01	3.75E+00
I-129	29.78	*	57.00	3.84E-01	5.18E+00	1.89E-01
	33.60	*	13.20	3.74E+00	1.23E+01	1.84E+00
	39.58	*	7.52	5.05E+00	8.03E-01	2.41E+00
+ BA-133	30.80	*	97.60	2.24E-01	3.03E+00	1.10E-01
	302.84	*	17.80	1.76E+02	6.39E+02	8.27E+01
	356.01	*	60.00	3.42E+01	4.59E+02	1.59E+01
CE-139	165.85	80.35	4.68E+01	4.68E+01	-1.45E+01	2.21E+01
CE-144	133.54	10.80	2.63E+02	2.63E+02	3.95E+01	1.24E+02
HG-203	279.19	77.30	4.13E+01	4.13E+01	4.10E+01	1.93E+01
PB-210	46.50	4.25	1.77E+01	1.77E+01	-9.31E-01	8.37E+00
PA-231	9.28	42.00	4.17E-06	4.17E-06	6.85E-06	1.99E-06
	10.11	20.20	2.19E-05		3.60E-05	1.05E-05
	283.67	1.60	1.25E+03		-6.87E+01	5.65E+02
	302.67	2.30	1.95E+03		3.35E+03	9.34E+02
TH-231	25.64	14.70	1.78E-01	1.78E-01	-4.80E+00	8.59E-02
	84.21	6.40	3.38E+02		8.90E+02	1.65E+02
PA-234M	9.89	89.00	3.93E-06	3.93E-06	6.46E-06	1.88E-06
	21.72	64.90	1.13E-02		1.12E-02	5.46E-03
	37.93	23.75	2.34E+00		7.63E+00	1.14E+00
	131.42	20.40	1.36E+02		7.11E+01	6.43E+01
+ TH-234	63.29	*	3.80	1.95E+02	4.44E+02	9.55E+01
NP-237	29.37	*	14.00	1.56E+00	2.11E+01	7.69E-01
	86.50	12.60	9.11E+01		8.57E+00	4.33E+01
U-237	97.08	16.30	8.84E+01	6.42E+01	-7.29E+01	4.17E+01
	101.07	26.30	6.42E+01		2.80E+01	3.04E+01
	114.00	12.30	3.47E+02		1.05E+03	1.69E+02
	208.01	22.00	1.64E+02		-2.14E+01	7.64E+01
AM-241	59.54	35.90	1.32E+01	1.32E+01	3.41E+01	6.43E+00
AM-243	74.67	66.00	1.04E+01	1.04E+01	-3.62E+01	4.96E+00

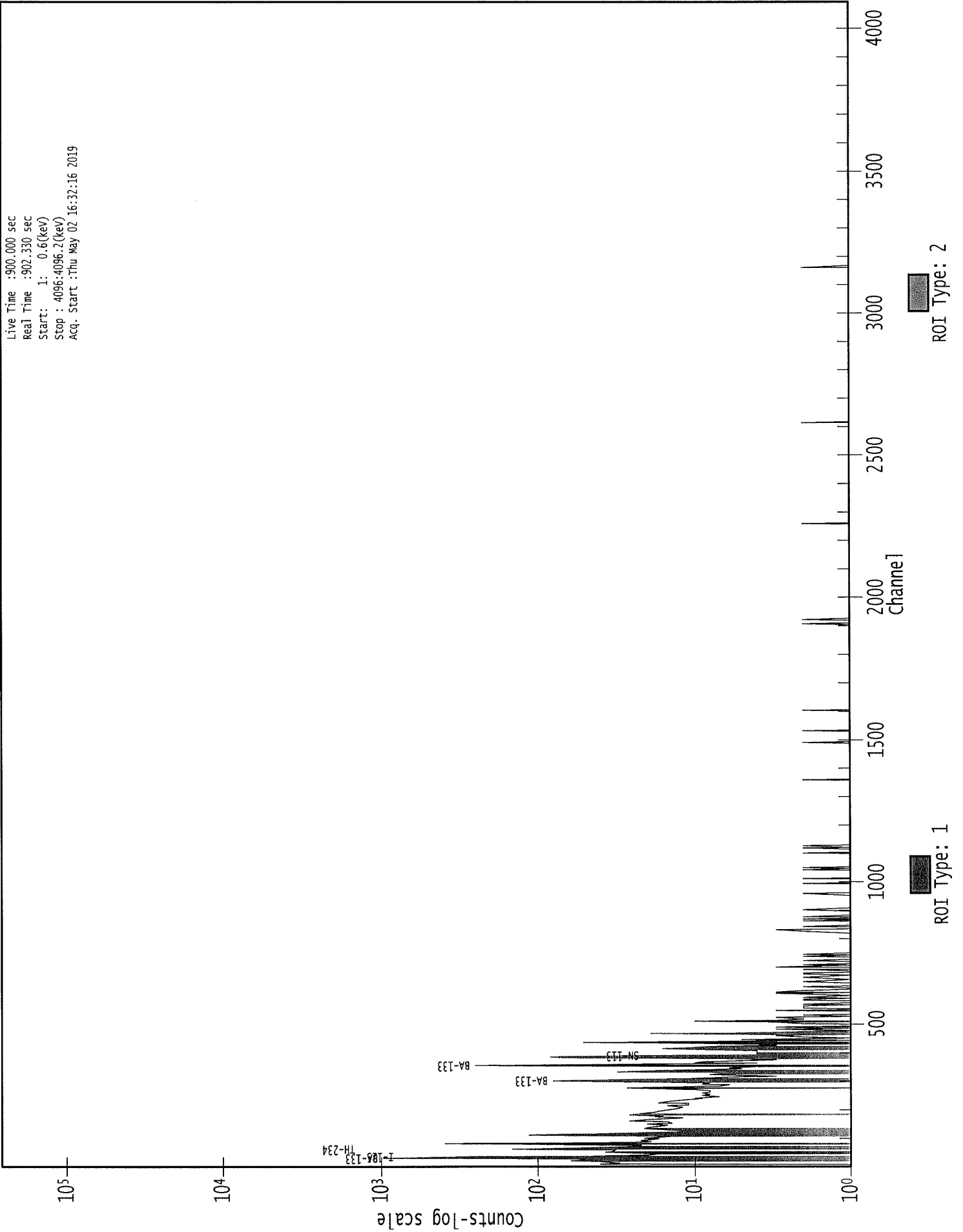
Analysis Report for 1904087-03

BC 12

- + = Nuclide identified during the nuclide identification
 - * = Energy line found in the spectrum
 - > = MDA value not calculated
 - @ = Half-life too short to be able to perform the decay correction
-

0000081244.CNF

Live Time :900.000 sec
Real Time :902.330 sec
Start: 1: 0.6(keV)
Stop : 4096:4096.2(keV)
Acq. Start :Thu May 02 16:32:16 2019



200
5/2/19

Analysis Report for 1904087-04
BC 27A

GAMMA SPECTRUM ANALYSIS

Sample Identification : 1904087-04
 Sample Description : BC 27A
 Sample Type : RA RECOVERY

 Sample Size : 1.000E+00 units
 Facility : Countroom

 Sample Taken On : 5/2/2019 8:38:39AM
 Acquisition Started : 5/2/2019 4:32:23PM

 Procedure : BAFIL
 Operator : Administrator
 Detector Name : GE4
 Geometry : BAFIL
 Live Time : 900.0 seconds
 Real Time : 925.2 seconds

 Dead Time : 2.73 %

 Peak Locate Threshold : 2.50
 Peak Locate Range (in channels) : 1 - 4096
 Peak Area Range (in channels) : 9 - 4096
 Identification Energy Tolerance : 1.000FWHM

 Energy Calibration Used Done On : 2/24/2018
 Efficiency Calibration Used Done On : 11/9/2014
 Efficiency Calibration Description :

 Sample Number : 81245

PEAK ANALYSIS REPORT

Peak Analysis Performed on : 5/2/2019 4:47:51PM

Peak Analysis From Channel : 1
 Peak Analysis To Channel : 4096

Peak No.	Energy (keV)	ROI start	ROI end	Peak Centroid	Net Peak Area	Net Area Uncertainty	Continuum Counts	FWHM (keV)
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Analysis Report for 1904087-04

BC 27A

	Peak No.	Energy (keV)	ROI start	ROI end	Peak Centroid	Net Peak Area	Net Area Uncertainty	Continuum Counts	FWHM (keV)
	1	20.66	17 -	23	19.71	7.59E+01	38.72	2.18E+02	2.36
M	2	30.88	24 -	39	29.94	2.31E+03	103.55	2.04E+02	2.19
m	3	35.25	24 -	39	34.31	5.56E+02	75.44	1.87E+02	2.18
	4	53.05	48 -	55	52.13	7.79E+01	32.50	1.24E+02	2.19
	5	61.50	57 -	63	60.58	1.64E+02	49.25	3.64E+02	1.94
	6	66.22	64 -	69	65.30	6.34E+01	40.98	2.67E+02	1.59
	7	81.12	75 -	85	80.22	8.97E+02	76.19	2.92E+02	2.15
M	8	111.59	104 -	123	110.71	2.24E+02	42.42	1.29E+02	2.87
m	9	116.49	104 -	123	115.62	5.43E+01	31.74	1.04E+02	2.21
	10	161.18	157 -	165	160.34	3.06E+01	33.72	1.53E+02	3.26
	11	185.09	180 -	189	184.27	3.70E+01	34.67	1.52E+02	1.93
	12	253.57	248 -	257	252.80	2.54E+01	24.88	7.11E+01	4.83
	13	276.54	270 -	280	275.80	6.58E+01	26.77	6.05E+01	2.17
M	14	303.07	297 -	310	302.35	1.05E+02	27.00	4.74E+01	2.14
m	15	307.44	297 -	310	306.72	1.54E+01	26.15	8.33E+01	2.69
M	16	333.69	326 -	342	332.99	6.59E+01	19.62	1.78E+01	2.39
m	17	338.57	326 -	342	337.87	3.33E+01	17.78	5.05E+00	2.81
	18	356.29	351 -	360	355.61	4.36E+02	46.48	5.72E+01	2.39
M	19	384.15	380 -	394	383.49	1.01E+02	28.24	3.27E+01	2.84
m	20	387.06	380 -	394	386.41	1.62E+02	33.47	2.36E+01	2.65
m	21	391.42	380 -	394	390.77	3.55E+01	17.82	2.26E+00	2.85
M	22	413.45	410 -	423	412.82	3.10E+01	13.29	3.77E+00	4.18
m	23	418.31	410 -	423	417.69	2.52E+01	16.87	1.20E+01	3.03
	24	427.40	423 -	430	426.79	1.22E+01	8.49	3.64E+00	3.39
	25	437.06	432 -	441	436.45	7.33E+01	18.14	5.50E+00	2.20
	26	467.80	461 -	472	467.22	2.12E+01	15.10	1.76E+01	3.16
	27	612.10	606 -	615	611.64	1.40E+01	7.48	0.00E+00	1.91

M = First peak in a multiplet region

m = Other peak in a multiplet region

F = Fitted singlet

Errors quoted at 2.000sigma

BACKGROUND SUBTRACT REPORT

Peak Analysis Performed on : 5/2/2019 4:47:51PM

Env. Background File : \\OR-GAMMA1\ApexRoot\Countroom\Data\0000080017.CNF

	Peak No.	Energy (keV)	Original Area	Orig. Area Uncertainty	Ambient Background	Backgr. Uncert.	Subtracted Area	Subtracted Uncert.
	1	20.66	7.59E+01	38.72			7.59E+01	3.87E+01
M	2	30.88	2.31E+03	103.55			2.31E+03	1.04E+02

0200

Analysis Report for 1904087-04

BC 27A

	Peak No.	Energy (keV)	Original Area	Orig. Area Uncertainty	Ambient Background	Backgr. Uncert.	Subtracted Area	Subtracted Uncert.
m	3	35.25	5.56E+02	75.44			5.56E+02	7.54E+01
	4	53.05	7.79E+01	32.50			7.79E+01	3.25E+01
	5	61.50	1.64E+02	49.25	1.28E+01	1.96E+00	1.51E+02	4.93E+01
	6	66.22	6.34E+01	40.98			6.34E+01	4.10E+01
	7	81.12	8.97E+02	76.19			8.97E+02	7.62E+01
M	8	111.59	2.24E+02	42.42			2.24E+02	4.24E+01
m	9	116.49	5.43E+01	31.74			5.43E+01	3.17E+01
	10	161.18	3.06E+01	33.72			3.06E+01	3.37E+01
	11	185.09	3.70E+01	34.67	7.12E+00	1.55E+00	2.99E+01	3.47E+01
	12	253.57	2.54E+01	24.88			2.54E+01	2.49E+01
	13	276.54	6.58E+01	26.77			6.58E+01	2.68E+01
M	14	303.07	1.05E+02	27.00			1.05E+02	2.70E+01
m	15	307.44	1.54E+01	26.15			1.54E+01	2.62E+01
M	16	333.69	6.59E+01	19.62			6.59E+01	1.96E+01
m	17	338.57	3.33E+01	17.78			3.33E+01	1.78E+01
	18	356.29	4.36E+02	46.48			4.36E+02	4.65E+01
M	19	384.15	1.01E+02	28.24			1.01E+02	2.82E+01
m	20	387.06	1.62E+02	33.47			1.62E+02	3.35E+01
m	21	391.42	3.55E+01	17.82			3.55E+01	1.78E+01
M	22	413.45	3.10E+01	13.29			3.10E+01	1.33E+01
m	23	418.31	2.52E+01	16.87			2.52E+01	1.69E+01
	24	427.40	1.22E+01	8.49			1.22E+01	8.49E+00
	25	437.06	7.33E+01	18.14			7.33E+01	1.81E+01
	26	467.80	2.12E+01	15.10			2.12E+01	1.51E+01
	27	612.10	1.40E+01	7.48			1.40E+01	7.48E+00

M = First peak in a multiplet region
m = Other peak in a multiplet region
F = Fitted singlet
Errors quoted at 2.000sigma

NUCLIDE IDENTIFICATION REPORT

Nuclide Library Used : \\OR-GAMMA1\ApexRoot\Countroom\Library\WSRC.NLB

IDENTIFIED NUCLIDES

Nuclide Name	Id Confidence	Energy (keV)	Yield(%)	Activity (pCi/units)	Activity Uncertainty
SN-113	0.99	255.12 *	1.93	1.05E+03	1.07E+03
		391.69 *	61.90	5.59E+01	2.91E+01
I-125	0.99	35.49 *	6.49	4.98E+02	6.86E+01
BA-133	0.99	30.80 *	97.60	1.04E+02	5.06E+00

0201

Analysis Report for 1904087-04

BC 27A

Nuclide Name	Id Confidence	Energy (keV)	Yield(%)	Activity (pCi/units)	Activity Uncertainty
BA-133	0.99	302.84 *	17.80	5.18E+02	2.08E+02
		356.01 *	60.00	<u>6.85E+02</u>	<u>1.15E+02</u>
TH-234	0.94	63.29 *	3.80	6.37E+02	2.12E+02
AM-241	0.92	59.54 *	35.90	6.74E+01	2.25E+01

* = Energy line found in the spectrum.

- = Manually added nuclide.

? = Manually edited nuclide.

@ = Energy line not used for Weighted Mean Activity

Energy Tolerance : 2.000FWHM

Nuclide confidence index threshold = 0.30

Errors quoted at 2.000sigma

INTERFERENCE CORRECTED REPORT

Nuclide Name	Nuclide Id Confidence	Wt mean Activity (pCi/units)	Wt mean Activity Uncertainty	Comments
SN-113	0.997	5.66E+01	2.91E+01	
I-125	0.999	4.98E+02	6.86E+01	
X I-129	0.853			
BA-133	0.999	1.06E+02	5.06E+00	
? TH-234	0.940	6.37E+02	2.12E+02	
X NP-237	0.567			
? AM-241	0.929	6.74E+01	2.25E+01	

? = nuclide is part of an undetermined solution

X = nuclide rejected by the interference analysis

@ = nuclide contains energy lines not used in Weighted Mean Activity

Errors quoted at 2.000sigma

Analysis Report for 1904087-04

BC 27A

UNIDENTIFIED PEAKS

Peak Locate Performed on : 5/2/2019 4:47:51PM
 Peak Locate From Channel : 1
 Peak Locate To Channel : 4096

<i>Peak No.</i>	<i>Energy (keV)</i>	<i>Peak Size (CPS)</i>	<i>Peak CPS (%) Uncertainty</i>	<i>Peak Type</i>	<i>Tolerance Nuclide</i>
1	20.66	8.43604E-02	25.50		
4	53.05	8.65357E-02	20.86		
6	66.22	7.04879E-02	32.30	Sum	
7	81.12	9.96494E-01	4.25		
M 8	111.59	2.49245E-01	9.45		
m 9	116.49	6.03640E-02	29.21		
10	161.18	3.39979E-02	55.09		
11	185.09	3.32522E-02	57.98		
13	276.54	7.30556E-02	20.36		
m 15	307.44	1.70870E-02	85.03		
M 16	333.69	7.32234E-02	14.89	Sum	
m 17	338.57	3.70115E-02	26.68	Sum	
M 19	384.15	1.12715E-01	13.92		
m 20	387.06	1.79716E-01	10.35	Sum	
M 22	413.45	3.44415E-02	21.43		
m 23	418.31	2.80384E-02	33.42	Sum	
24	427.40	1.35317E-02	34.84	Sum	
25	437.06	8.13889E-02	12.38		
26	467.80	2.35370E-02	35.64		
27	612.10	1.55556E-02	26.73		

M = First peak in a multiplet region
 m = Other peak in a multiplet region
 F = Fitted singlet
 Errors quoted at 2.000sigma

NUCLIDE MDA REPORT

Nuclide Library Used : \\OR-GAMMA1\ApexRoot\Countroom\Library\WSRC.NLB

Analysis Report for 1904087-04

BC 27A

Nuclide Name	Energy (keV)	Yield(%)	Line MDA (pCi/units)	Nuclide MDA (pCi/units)	Activity (pCi/units)	Dec. Level (pCi/units)
FE-55	5.89	24.50	5.43E-03	5.43E-03	0.00E+00	0.00E+00
CO-57	122.06	85.51	1.90E+01	1.90E+01	-1.44E+01	8.83E+00
	136.48	10.60	2.00E+02		-2.31E+01	9.40E+01
NI-59	6.92	29.80	4.18E-02	4.18E-02	-6.26E-02	1.71E-02
MO-93	16.59	52.90	1.26E+00	1.26E+00	2.94E-01	6.03E-01
	18.60	10.00	9.32E+00		9.99E-01	4.48E+00
NB-93M	16.57	9.43	7.04E+00	7.04E+00	1.64E+00	3.37E+00
CD-109	88.03	3.72	3.24E+02	3.24E+02	-1.35E+02	1.52E+02
+ SN-113	255.12 *	1.93	1.65E+03	5.22E+01	1.05E+03	7.70E+02
	391.69 *	61.90	5.22E+01		5.59E+01	2.40E+01
SN-119M	23.87	16.10	9.48E+00	7.43E+00	-3.89E+01	4.53E+00
	25.10	22.70	7.43E+00		-1.56E+02	3.55E+00
+ I-125	35.49 *	6.49	9.65E+01	9.65E+01	4.98E+02	4.70E+01
I-129	29.78 *	57.00	8.35E+00	8.35E+00	1.78E+02	4.07E+00
	33.60 *	13.20	4.72E+01		2.44E+02	2.30E+01
	39.58 *	7.52	5.52E+01		-1.45E+00	2.63E+01
+ BA-133	30.80 *	97.60	4.88E+00	4.88E+00	1.04E+02	2.38E+00
	302.84 *	17.80	2.60E+02		5.18E+02	1.23E+02
	356.01 *	60.00	5.68E+01		6.85E+02	2.63E+01
CE-139	165.85	80.35	2.71E+01	2.71E+01	-1.09E+01	1.26E+01
CE-144	133.54	10.80	1.81E+02	1.81E+02	-1.96E+01	8.45E+01
HG-203	279.19	77.30	4.98E+01	4.98E+01	6.69E+01	2.34E+01
PB-210	46.50	4.25	1.04E+02	1.04E+02	4.88E+01	4.86E+01
PA-231	9.28	42.00	1.98E-01	1.98E-01	1.14E-01	9.22E-02
	10.11	20.20	6.21E-01		4.38E-01	2.93E-01
	283.67	1.60	1.30E+03		1.90E+02	5.78E+02
	302.67	2.30	2.26E+03		3.57E+03	1.08E+03
TH-231	25.64	14.70	1.45E+01	1.45E+01	-4.13E+02	7.00E+00
	84.21	6.40	5.40E+02		2.59E+03	2.64E+02
PA-234M	9.89	89.00	1.32E-01	1.32E-01	9.33E-02	6.23E-02
	21.72	64.90	2.03E+00		1.93E+00	9.74E-01
	37.93	23.75	3.16E+01		1.12E+02	1.54E+01
	131.42	20.40	9.08E+01		-8.18E+00	4.24E+01
+ TH-234	63.29 *	3.80	3.73E+02	3.73E+02	6.37E+02	1.81E+02
NP-237	29.37 *	14.00	3.40E+01	3.40E+01	7.26E+02	1.66E+01
	86.50	12.60	1.00E+02		-1.56E+01	4.73E+01
U-237	97.08	16.30	8.77E+01	5.41E+01	-2.80E+01	4.12E+01
	101.07	26.30	5.41E+01		-6.13E+00	2.53E+01
	114.00	12.30	2.66E+02		6.25E+02	1.28E+02
	208.01	22.00	1.25E+02		3.19E+01	5.81E+01
+ AM-241	59.54 *	35.90	3.95E+01	3.95E+01	6.74E+01	1.91E+01
AM-243	74.67	66.00	1.69E+01	1.69E+01	-2.11E+00	8.02E+00

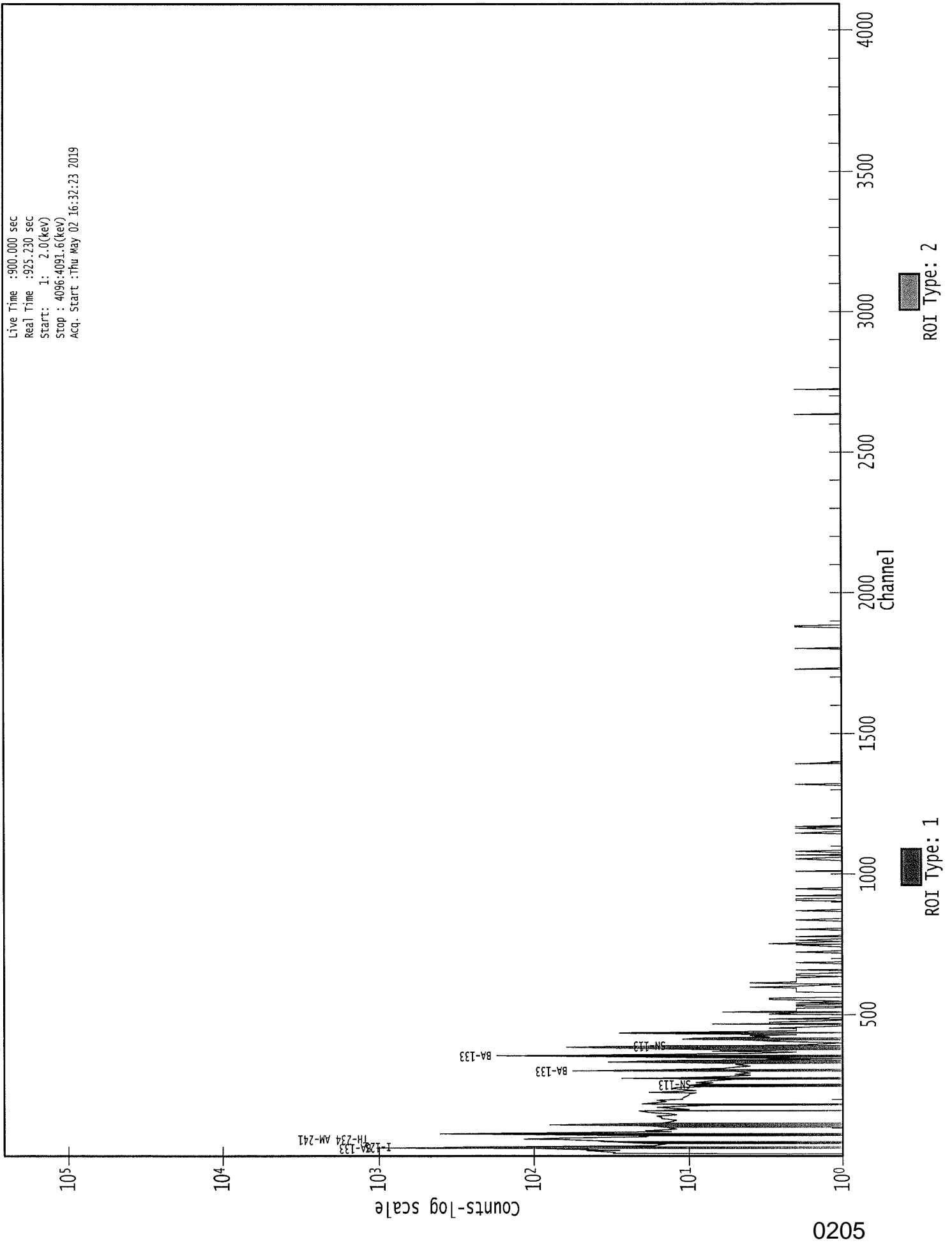
+ = Nuclide identified during the nuclide identification

* = Energy line found in the spectrum

> = MDA value not calculated

@ = Half-life too short to be able to perform the decay correction

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WS
5/2/19

Analysis Report for 1904087-05
BC 27B

GAMMA SPECTRUM ANALYSIS

Sample Identification : 1904087-05
 Sample Description : BC 27B
 Sample Type : RA RECOVERY

 Sample Size : 1.000E+00 units
 Facility : Countroom

 Sample Taken On : 5/2/2019 8:38:50AM
 Acquisition Started : 5/2/2019 4:48:28PM

 Procedure : BAFIL
 Operator : Administrator
 Detector Name : GE1
 Geometry : BAFIL
 Live Time : 900.0 seconds
 Real Time : 900.3 seconds

 Dead Time : 0.04 %

 Peak Locate Threshold : 2.50
 Peak Locate Range (in channels) : 1 - 4096
 Peak Area Range (in channels) : 19 - 4096
 Identification Energy Tolerance : 1.000FWHM

 Energy Calibration Used Done On : 6/16/2018
 Efficiency Calibration Used Done On : 2/17/2018
 Efficiency Calibration Description :

 Sample Number : 81246

PEAK ANALYSIS REPORT

Peak Analysis Performed on : 5/2/2019 5:03:31PM
 Peak Analysis From Channel : 1
 Peak Analysis To Channel : 4096

Peak No.	Energy (keV)	ROI start	ROI end	Peak Centroid	Net Peak Area	Net Area Uncertainty	Continuum Counts	FWHM (keV)
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Analysis Report for 1904087-05

BC 27B

	Peak No.	Energy (keV)	ROI start	ROI end	Peak Centroid	Net Peak Area	Net Area Uncertainty	Continuum Counts	FWHM (keV)
	1	31.63	26 -	40	32.01	2.77E+03	140.09	8.89E+02	4.01
M	2	62.04	49 -	72	62.41	3.01E+02	72.11	4.56E+02	3.95
m	3	66.60	49 -	72	66.97	1.22E+02	72.03	4.49E+02	3.97
	4	81.13	76 -	89	81.50	8.13E+02	93.46	6.10E+02	3.29
	5	111.00	106 -	116	111.36	1.36E+02	68.41	5.41E+02	3.56
	6	276.77	273 -	282	277.09	5.48E+01	32.62	1.22E+02	4.48
M	7	302.86	297 -	316	303.17	1.46E+02	42.57	1.53E+02	3.94
m	8	307.81	297 -	316	308.12	4.39E+01	38.31	9.37E+01	3.70
	9	333.55	329 -	338	333.85	7.10E+01	37.85	1.62E+02	3.05
	10	356.23	350 -	375	356.53	6.55E+02	81.17	2.93E+02	3.73
M	11	384.94	381 -	392	385.23	2.04E+02	46.69	1.57E+02	3.45
m	12	387.61	381 -	392	387.90	1.45E+02	54.26	2.39E+02	3.45
M	13	414.88	410 -	425	415.17	6.07E+01	23.19	3.33E+01	3.16
m	14	418.66	410 -	425	418.94	3.73E+01	24.45	3.01E+01	3.17
	15	436.67	432 -	443	436.95	1.25E+02	26.38	2.58E+01	2.65
	16	467.71	462 -	471	467.99	1.64E+01	20.35	4.92E+01	3.33
	17	623.42	620 -	627	623.66	9.96E+00	8.00	4.08E+00	3.92
	18	713.24	711 -	715	713.46	5.50E+00	6.67	5.00E+00	1.73
	19	739.45	737 -	742	739.67	5.00E+00	7.07	6.00E+00	2.73

M = First peak in a multiplet region

m = Other peak in a multiplet region

F = Fitted singlet

Errors quoted at 2.000sigma

BACKGROUND SUBTRACT REPORT

Peak Analysis Performed on : 5/2/2019 5:03:31PM

Env. Background File : \\OR-GAMMA1\ApexRoot\Countroom\Data\0000080014.CNF

	Peak No.	Energy (keV)	Original Area	Orig. Area Uncertainty	Ambient Background	Backgr. Uncert.	Subtracted Area	Subtracted Uncert.
	1	31.63	2.77E+03	140.09			2.77E+03	1.40E+02
M	2	62.04	3.01E+02	72.11	2.07E+01	2.02E+00	2.80E+02	7.21E+01
m	3	66.60	1.22E+02	72.03			1.22E+02	7.20E+01
	4	81.13	8.13E+02	93.46			8.13E+02	9.35E+01
	5	111.00	1.36E+02	68.41			1.36E+02	6.84E+01
	6	276.77	5.48E+01	32.62			5.48E+01	3.26E+01
M	7	302.86	1.46E+02	42.57			1.46E+02	4.26E+01
m	8	307.81	4.39E+01	38.31			4.39E+01	3.83E+01
	9	333.55	7.10E+01	37.85			7.10E+01	3.79E+01
	10	356.23	6.55E+02	81.17			6.55E+02	8.12E+01

0207

Analysis Report for 1904087-05

BC 27B

	Peak No.	Energy (keV)	Original Area	Orig. Area Uncertainty	Ambient Background	Backgr. Uncert.	Subtracted Area	Subtracted Uncert.
M	11	384.94	2.04E+02	46.69			2.04E+02	4.67E+01
m	12	387.61	1.45E+02	54.26			1.45E+02	5.43E+01
M	13	414.88	6.07E+01	23.19			6.07E+01	2.32E+01
m	14	418.66	3.73E+01	24.45			3.73E+01	2.44E+01
	15	436.67	1.25E+02	26.38			1.25E+02	2.64E+01
	16	467.71	1.64E+01	20.35			1.64E+01	2.03E+01
	17	623.42	9.96E+00	8.00			9.96E+00	8.00E+00
	18	713.24	5.50E+00	6.67			5.50E+00	6.67E+00
	19	739.45	5.00E+00	7.07			5.00E+00	7.07E+00

M = First peak in a multiplet region
m = Other peak in a multiplet region
F = Fitted singlet
Errors quoted at 2.000sigma

NUCLIDE IDENTIFICATION REPORT

Nuclide Library Used : \\OR-GAMMA1\ApexRoot\Countroom\Library\WSRC.NLB

IDENTIFIED NUCLIDES

Nuclide Name	Id Confidence	Energy (keV)	Yield(%)	Activity (pCi/units)	Activity Uncertainty
BA-133	0.98	30.80 *	97.60	6.66E-01	3.36E-02
		302.84 *	17.80	6.44E+02	3.40E+02
		356.01 *	60.00	5.53E+02	9.12E+01
PA-231	1.00	9.28	42.00		
		10.11	20.20		
		283.67	1.60		
TH-234	0.95	302.67 *	2.30	4.99E+03	2.63E+03
		63.29 *	3.80	3.16E+02	8.17E+01

* = Energy line found in the spectrum.
- = Manually added nuclide.
? = Manually edited nuclide.
@ = Energy line not used for Weighted Mean Activity
Energy Tolerance : 2.000FWHM
Nuclide confidence index threshold = 0.30
Errors quoted at 2.000sigma

Analysis Report for 1904087-05

BC 27B

INTERFERENCE CORRECTED REPORT

Nuclide Name	Nuclide Id Confidence	Wt mean Activity (pCi/units)	Wt mean Activity Uncertainty	Comments
BA-133	0.988	6.66E-01	3.36E-02	
PA-231	1.000	4.98E+03	2.63E+03	
TH-234	0.954	3.16E+02	8.17E+01	

- ? = nuclide is part of an undetermined solution
X = nuclide rejected by the interference analysis
@ = nuclide contains energy lines not used in Weighted Mean Activity

Errors quoted at 2.000sigma

Analysis Report for 1904087-05

BC 27B

UNIDENTIFIED PEAKS

Peak Locate Performed on : 5/2/2019 5:03:31PM
 Peak Locate From Channel : 1
 Peak Locate To Channel : 4096

Peak No.	Energy (keV)	Peak Size (CPS)	Peak CPS (%) Uncertainty	Peak Type	Tolerance Nuclide
m	3	66.60	1.35394E-01	29.55	
	4	81.13	9.03195E-01	5.75	
	5	111.00	1.50595E-01	25.24	
	6	276.77	6.09004E-02	29.76	
m	8	307.81	4.87989E-02	43.62	
	9	333.55	7.88999E-02	26.65	Sum
M	11	384.94	2.26449E-01	11.45	
m	12	387.61	1.61609E-01	18.65	Sum
M	13	414.88	6.74979E-02	19.09	
m	14	418.66	4.14816E-02	32.74	Sum
	15	436.67	1.39010E-01	10.54	
	16	467.71	1.82385E-02	61.98	
	17	623.42	1.10648E-02	40.17	
	18	713.24	6.11111E-03	60.64	Sum
	19	739.45	5.55556E-03	70.71	

M = First peak in a multiplet region
 m = Other peak in a multiplet region
 F = Fitted singlet
 Errors quoted at 2.000sigma

NUCLIDE MDA REPORT

Nuclide Library Used : \\OR-GAMMA1\ApexRoot\Countroom\Library\WSRC.NLB

Nuclide Name	Energy (keV)	Yield(%)	Line MDA (pCi/units)	Nuclide MDA (pCi/units)	Activity (pCi/units)	Dec. Level (pCi/units)
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Analysis Report for 1904087-05

BC 27B

Nuclide Name	Energy (keV)	Yield(%)	Line MDA (pCi/units)	Nuclide MDA (pCi/units)	Activity (pCi/units)	Dec. Level (pCi/units)
FE-55	5.89	24.50	1.90E-13	1.90E-13	0.00E+00	0.00E+00
CO-57	122.06	85.51	3.48E+01	3.48E+01	-5.39E+00	1.62E+01
	136.48	10.60	3.70E+02		1.88E+02	1.73E+02
NI-59	6.92	29.80	2.77E-12	2.77E-12	0.00E+00	0.00E+00
MO-93	16.59	52.90	8.76E-06	8.76E-06	-9.77E-06	3.94E-06
	18.60	10.00	4.07E-04		3.61E-05	1.94E-04
NB-93M	16.57	9.43	4.84E-05	4.84E-05	-5.40E-05	2.17E-05
CD-109	88.03	3.72	3.38E+02	3.38E+02	-6.47E+02	1.60E+02
SN-113	255.12	1.93	1.51E+03	3.33E+01	-2.58E+02	6.79E+02
	391.69	61.90	3.33E+01		-1.02E+00	1.59E+01
SN-119M	23.87	16.10	7.51E-03	7.51E-03	1.52E-02	3.65E-03
	25.10	22.70	9.06E-03		1.51E-02	4.40E-03
I-125	35.49	6.49	1.39E+00	1.39E+00	1.40E+00	6.81E-01
I-129	29.78	57.00	4.72E-02	4.72E-02	1.97E-01	2.33E-02
	33.60	13.20	5.61E-01		4.63E-01	2.76E-01
	39.58	7.52	1.49E+00		-1.30E-02	7.15E-01
+ BA-133	30.80	* 97.60	3.71E-02	3.71E-02	6.66E-01	1.82E-02
	302.84	* 17.80	3.83E+02		6.44E+02	1.86E+02
	356.01	* 60.00	8.96E+01		5.53E+02	4.37E+01
CE-139	165.85	80.35	5.82E+01	5.82E+01	3.42E+00	2.70E+01
CE-144	133.54	10.80	3.03E+02	3.03E+02	-2.24E+02	1.40E+02
HG-203	279.19	77.30	5.44E+01	5.44E+01	2.03E+01	2.56E+01
PB-210	46.50	4.25	6.93E+00	6.93E+00	-8.40E-01	3.27E+00
+ PA-231	9.28	42.00	2.61E-10	2.61E-10	0.00E+00	0.00E+00
	10.11	20.20	2.08E-09		0.00E+00	0.00E+00
	283.67	1.60	1.90E+03		6.00E+02	8.73E+02
	302.67	* 2.30	2.97E+03		4.99E+03	1.44E+03
TH-231	25.64	14.70	1.59E-02	1.59E-02	-5.25E-03	7.67E-03
	84.21	6.40	2.73E+02		-5.44E+01	1.32E+02
PA-234M	9.89	89.00	3.36E-10	3.36E-10	0.00E+00	0.00E+00
	21.72	64.90	6.80E-04		1.85E-03	3.31E-04
	37.93	23.75	4.92E-01		3.80E-01	2.39E-01
	131.42	20.40	1.63E+02		-1.22E+01	7.58E+01
+ TH-234	63.29	* 3.80	2.06E+02	2.06E+02	3.16E+02	1.01E+02
NP-237	29.37	14.00	1.68E-01	1.68E-01	7.00E-01	8.28E-02
	86.50	12.60	1.03E+02		-2.26E+02	4.89E+01
U-237	97.08	16.30	1.04E+02	7.11E+01	-3.03E+01	4.88E+01
	101.07	26.30	7.11E+01		1.98E+01	3.33E+01
	114.00	12.30	3.78E+02		1.56E+02	1.82E+02
	208.01	22.00	2.47E+02		1.20E+02	1.15E+02
AM-241	59.54	35.90	7.26E+00	7.26E+00	2.06E+00	3.51E+00
AM-243	74.67	66.00	8.97E+00	8.97E+00	-1.45E+00	4.24E+00

+ = Nuclide identified during the nuclide identification

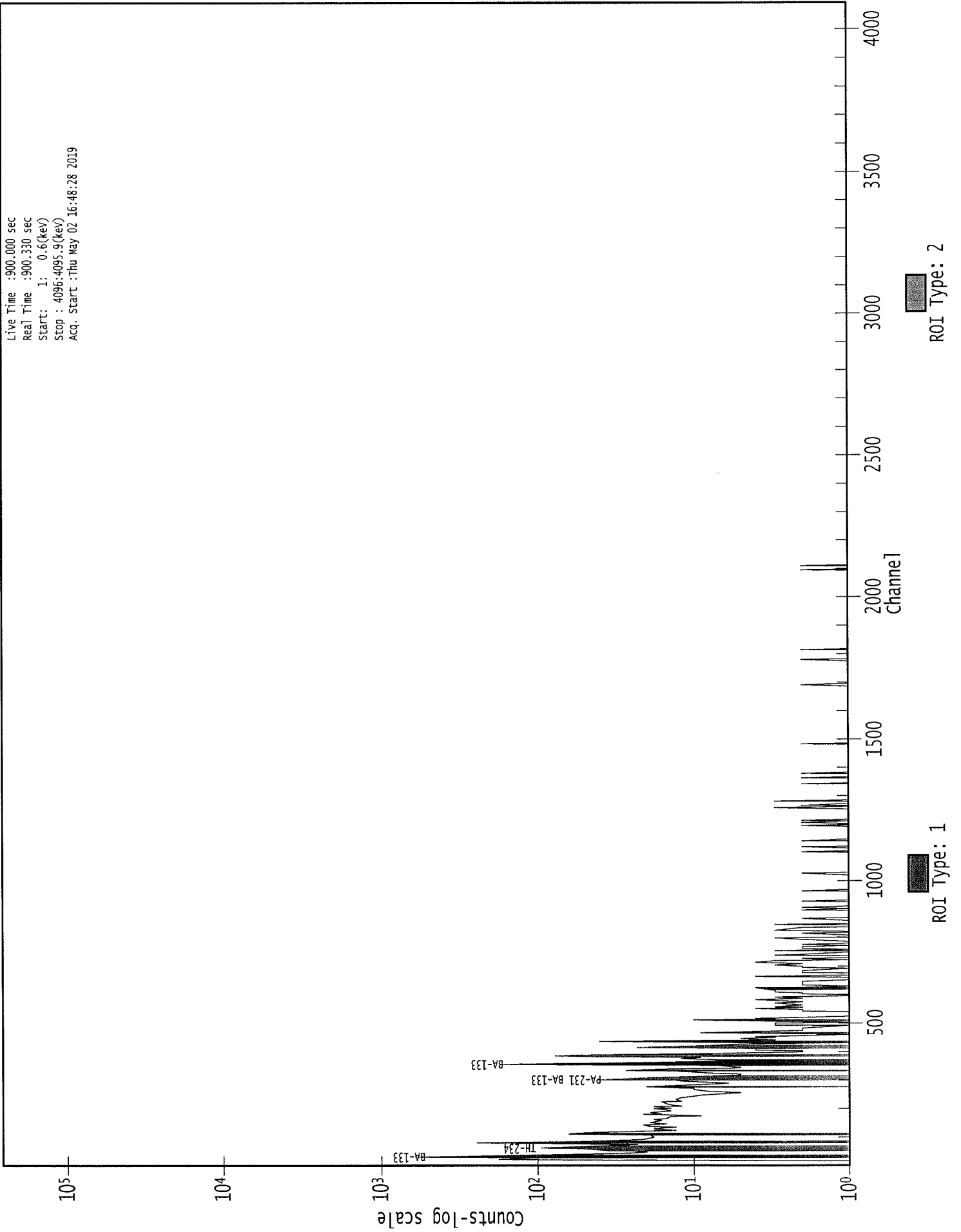
* = Energy line found in the spectrum

> = MDA value not calculated

@ = Half-life too short to be able to perform the decay correction

0000081246.CNF

Live Time :900.000 sec
Real Time :900.330 sec
Start : 1: 0.6(keV)
Stop : 4096:4095.9(keV)
Acq. Start :Thu May 02 16:48:28 2019



100
5/2/19

Analysis Report for 1904087-06

BC 26

GAMMA SPECTRUM ANALYSIS

Sample Identification : 1904087-06
 Sample Description : BC 26
 Sample Type : RA RECOVERY

 Sample Size : 1.000E+00 units
 Facility : Countroom

 Sample Taken On : 5/2/2019 8:38:59AM
 Acquisition Started : 5/2/2019 4:48:34PM

 Procedure : BAFIL
 Operator : Administrator
 Detector Name : GE2
 Geometry : BAFIL
 Live Time : 900.0 seconds
 Real Time : 900.2 seconds

 Dead Time : 0.03 %

 Peak Locate Threshold : 2.50
 Peak Locate Range (in channels) : 1 - 4096
 Peak Area Range (in channels) : 28 - 4096
 Identification Energy Tolerance : 1.000FWHM

 Energy Calibration Used Done On : 2/17/2018
 Efficiency Calibration Used Done On : 2/24/2018
 Efficiency Calibration Description :

 Sample Number : 81247

PEAK ANALYSIS REPORT

Peak Analysis Performed on : 5/2/2019 5:03:46PM

Peak Analysis From Channel : 1
 Peak Analysis To Channel : 4096

Peak No.	Energy (keV)	ROI start	ROI end	Peak Centroid	Net Peak Area	Net Area Uncertainty	Continuum Counts	FWHM (keV)
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Analysis Report for 1904087-06

BC 26

	Peak No.	Energy (keV)	ROI start	ROI end	Peak Centroid	Net Peak Area	Net Area Uncertainty	Continuum Counts	FWHM (keV)
	1	35.88	35 -	38	35.66	3.79E+02	58.07	3.45E+02	2.55
	2	53.98	50 -	57	53.75	5.67E+01	38.42	2.09E+02	1.98
M	3	62.44	58 -	68	62.21	2.07E+02	37.58	1.23E+02	1.65
m	4	66.36	58 -	68	66.13	9.15E+01	31.11	1.09E+02	1.67
M	5	81.59	77 -	86	81.35	8.20E+02	61.55	8.40E+01	1.42
M	6	112.35	109 -	121	112.10	1.89E+02	33.54	9.21E+01	1.82
m	7	116.55	109 -	121	116.29	2.85E+01	24.10	8.67E+01	1.83
	8	133.84	131 -	136	133.58	1.96E+01	24.21	1.01E+02	2.75
	9	160.71	157 -	163	160.44	4.39E+01	30.09	1.32E+02	1.48
	10	276.89	273 -	281	276.56	8.34E+01	24.46	4.13E+01	1.96
	11	303.35	301 -	305	303.01	1.34E+02	26.57	3.89E+01	1.26
	12	307.89	306 -	310	307.55	2.32E+01	16.80	4.16E+01	2.07
M	13	334.18	330 -	341	333.82	7.99E+01	23.64	4.23E+01	1.90
	14	356.51	352 -	360	356.14	5.45E+02	51.07	6.25E+01	1.43
M	15	384.34	381 -	389	383.95	1.04E+02	24.20	2.54E+01	1.79
m	16	387.27	381 -	389	386.88	1.98E+02	32.46	4.64E+01	1.52
	17	391.91	390 -	395	391.52	4.27E+01	17.89	2.05E+01	1.53
	18	415.05	411 -	417	414.65	2.10E+01	21.18	6.60E+01	1.13
	19	422.95	421 -	425	422.55	1.17E+01	12.27	2.06E+01	1.50
	20	437.45	433 -	440	437.04	9.00E+01	22.98	2.80E+01	1.32
	21	450.65	447 -	452	450.24	9.61E+00	9.11	8.79E+00	1.95
	22	468.03	463 -	469	467.60	8.00E+00	10.44	1.40E+01	1.57
	23	472.72	470 -	475	472.29	1.09E+01	8.37	4.15E+00	2.91
	24	481.00	478 -	483	480.57	7.00E+00	5.29	0.00E+00	3.00
	25	510.95	507 -	513	510.50	2.80E+01	10.58	0.00E+00	1.22
	26	538.25	535 -	540	537.79	7.72E+00	6.71	2.56E+00	2.64
	27	704.93	701 -	708	704.38	8.00E+00	5.66	0.00E+00	1.92

M = First peak in a multiplet region

m = Other peak in a multiplet region

F = Fitted singlet

Errors quoted at 2.000sigma

BACKGROUND SUBTRACT REPORT

Peak Analysis Performed on : 5/2/2019 5:03:46PM

Env. Background File : \\OR-GAMMA1\ApexRoot\Countroom\Data\0000080015.CNF

Peak No.	Energy (keV)	Original Area	Orig. Area Uncertainty	Ambient Background	Backgr. Uncert.	Subtracted Area	Subtracted Uncert.
1	35.88	3.79E+02	58.07			3.79E+02	5.81E+01
2	53.98	5.67E+01	38.42			5.67E+01	3.84E+01

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Analysis Report for 1904087-06

BC 26

	Peak No.	Energy (keV)	Original Area	Orig. Area Uncertainty	Ambient Background	Backgr. Uncert.	Subtracted Area	Subtracted Uncert.
M	3	62.44	2.07E+02	37.58			2.07E+02	3.76E+01
m	4	66.36	9.15E+01	31.11			9.15E+01	3.11E+01
M	5	81.59	8.20E+02	61.55			8.20E+02	6.15E+01
M	6	112.35	1.89E+02	33.54	8.57E-01	1.81E+00	1.88E+02	3.36E+01
m	7	116.55	2.85E+01	24.10			2.85E+01	2.41E+01
	8	133.84	1.96E+01	24.21			1.96E+01	2.42E+01
	9	160.71	4.39E+01	30.09			4.39E+01	3.01E+01
	10	276.89	8.34E+01	24.46			8.34E+01	2.45E+01
	11	303.35	1.34E+02	26.57			1.34E+02	2.66E+01
	12	307.89	2.32E+01	16.80			2.32E+01	1.68E+01
M	13	334.18	7.99E+01	23.64			7.99E+01	2.36E+01
	14	356.51	5.45E+02	51.07			5.45E+02	5.11E+01
M	15	384.34	1.04E+02	24.20			1.04E+02	2.42E+01
m	16	387.27	1.98E+02	32.46			1.98E+02	3.25E+01
	17	391.91	4.27E+01	17.89			4.27E+01	1.79E+01
	18	415.05	2.10E+01	21.18			2.10E+01	2.12E+01
	19	422.95	1.17E+01	12.27			1.17E+01	1.23E+01
	20	437.45	9.00E+01	22.98			9.00E+01	2.30E+01
	21	450.65	9.61E+00	9.11			9.61E+00	9.11E+00
	22	468.03	8.00E+00	10.44			8.00E+00	1.04E+01
	23	472.72	1.09E+01	8.37			1.09E+01	8.37E+00
	24	481.00	7.00E+00	5.29			7.00E+00	5.29E+00
	25	510.95	2.80E+01	10.58	2.04E+01	1.34E+00	7.65E+00	1.07E+01
	26	538.25	7.72E+00	6.71			7.72E+00	6.71E+00
	27	704.93	8.00E+00	5.66			8.00E+00	5.66E+00

M = First peak in a multiplet region
m = Other peak in a multiplet region
F = Fitted singlet
Errors quoted at 2.000sigma

NUCLIDE IDENTIFICATION REPORT

Nuclide Library Used : \\OR-GAMMA1\ApexRoot\Countroom\Library\WSRC.NLB

IDENTIFIED NUCLIDES

Nuclide Name	Id Confidence	Energy (keV)	Yield(%)	Activity (pCi/units)	Activity Uncertainty
SN-113	0.96	255.12	1.93		
		391.69 *	61.90	2.61E+01	1.11E+01
I-125	0.99	35.49 *	6.49	1.49E+01	2.29E+00
CE-144	0.99	133.54 *	10.80	1.31E+02	1.66E+02

0215

Analysis Report for 1904087-06

BC 26

Nuclide Name	Id Confidence	Energy (keV)	Yield(%)	Activity (pCi/units)	Activity Uncertainty
PA-231	1.00	9.28	42.00		
		10.11	20.20		
		283.67	1.60		
		302.67 *	2.30	3.92E+03	1.42E+03
TH-234	0.98	63.29 *	3.80	3.53E+02	6.49E+01

* = Energy line found in the spectrum.

- = Manually added nuclide.

? = Manually edited nuclide.

@ = Energy line not used for Weighted Mean Activity

Energy Tolerance : 2.000FWHM

Nuclide confidence index threshold = 0.30

Errors quoted at 2.000sigma

INTERFERENCE CORRECTED REPORT

Nuclide Name	Nuclide Id Confidence	Wt mean Activity (pCi/units)	Wt mean Activity Uncertainty	Comments
SN-113	0.966	2.61E+01	1.11E+01	
I-125	0.996	1.49E+01	2.29E+00	
CE-144	0.998	1.31E+02	1.66E+02	
PA-231	1.000	3.92E+03	1.42E+03	
TH-234	0.981	3.53E+02	6.49E+01	

? = nuclide is part of an undetermined solution

X = nuclide rejected by the interference analysis

@ = nuclide contains energy lines not used in Weighted Mean Activity

Errors quoted at 2.000sigma

Analysis Report for 1904087-06

BC 26

UNIDENTIFIED PEAKS

Peak Locate Performed on : 5/2/2019 5:03:46PM
 Peak Locate From Channel : 1
 Peak Locate To Channel : 4096

<i>Peak No.</i>	<i>Energy (keV)</i>	<i>Peak Size (CPS)</i>	<i>Peak CPS (%) Uncertainty</i>	<i>Peak Type</i>	<i>Tolerance Nuclide</i>
	2	53.98	6.29469E-02	33.91	
m	4	66.36	1.01667E-01	17.00	
M	5	81.59	9.11366E-01	3.75	
M	6	112.35	2.08955E-01	8.93	Tol. U-237
m	7	116.55	3.16330E-02	42.33	
	9	160.71	4.87677E-02	34.28	
	10	276.89	9.26229E-02	14.67	
	12	307.89	2.57955E-02	36.18	
M	13	334.18	8.87913E-02	14.79	
	14	356.51	6.05269E-01	4.69	
M	15	384.34	1.15723E-01	11.62	
m	16	387.27	2.19586E-01	8.21	
	18	415.05	2.33333E-02	50.44	
	19	422.95	1.29798E-02	52.51	
	20	437.45	1.00000E-01	12.77	Sum
	21	450.65	1.06746E-02	47.41	
	22	468.03	8.88889E-03	65.25	
	23	472.72	1.21368E-02	38.30	
	24	481.00	7.77778E-03	37.80	
	25	510.95	8.49664E-03	69.75	
	26	538.25	8.58025E-03	43.43	
	27	704.93	8.88889E-03	35.36	

M = First peak in a multiplet region
 m = Other peak in a multiplet region
 F = Fitted singlet
 Errors quoted at 2.000sigma

Analysis Report for 1904087-06

BC 26

NUCLIDE MDA REPORT

Nuclide Library Used : \\OR-GAMMA1\ApexRoot\Countroom\Library\WSRC.NLB

Nuclide Name	Energy (keV)	Yield(%)	Line MDA (pCi/units)	Nuclide MDA (pCi/units)	Activity (pCi/units)	Dec. Level (pCi/units)
FE-55	5.89	24.50	1.20E-10	1.20E-10	0.00E+00	0.00E+00
CO-57	122.06	85.51	2.34E+01	2.34E+01	7.87E+00	1.08E+01
	136.48	10.60	2.58E+02		-5.94E+00	1.20E+02
NI-59	6.92	29.80	9.43E-10	9.43E-10	0.00E+00	0.00E+00
MO-93	16.59	52.90	1.78E-05	1.78E-05	0.00E+00	0.00E+00
	18.60	10.00	2.91E-04		0.00E+00	0.00E+00
NB-93M	16.57	9.43	9.85E-05	9.85E-05	0.00E+00	0.00E+00
CD-109	88.03	3.72	2.51E+02	2.51E+02	1.02E+02	1.16E+02
+ SN-113	255.12	1.93	1.10E+03	1.39E+01	-6.94E+02	4.87E+02
	391.69	*	61.90	1.39E+01	2.61E+01	6.14E+00
SN-119M	23.87	16.10	1.78E-03	1.78E-03	0.00E+00	0.00E+00
	25.10	22.70	1.93E-03		0.00E+00	0.00E+00
+ I-125	35.49	*	6.49	6.47E+00	1.49E+01	3.18E+00
I-129	29.78	57.00	2.10E-01	2.10E-01	8.12E-01	1.03E-01
	33.60	13.20	1.57E+00		-1.48E+00	7.69E-01
	39.58	7.52	1.91E+00		6.29E-02	8.66E-01
BA-133	30.80	97.60	1.88E-01	1.88E-01	1.74E+00	9.27E-02
	302.84	17.80	2.31E+02		5.11E+02	1.10E+02
	356.01	60.00	9.10E+01		4.34E+02	4.44E+01
CE-139	165.85	80.35	4.45E+01	4.45E+01	1.95E+00	2.07E+01
+ CE-144	133.54	*	10.80	2.65E+02	1.31E+02	1.23E+02
HG-203	279.19	77.30	3.66E+01	3.66E+01	1.44E+01	1.70E+01
PB-210	46.50	4.25	1.02E+01	1.02E+01	8.68E-01	4.69E+00
+ PA-231	9.28	42.00	3.13E-08	3.13E-08	0.00E+00	0.00E+00
	10.11	20.20	1.87E-07		0.00E+00	0.00E+00
	283.67	1.60	9.47E+02		6.84E+01	4.10E+02
	302.67	*	2.30		3.92E+03	3.17E+02
TH-231	25.64	14.70	3.57E-03	3.57E-03	0.00E+00	0.00E+00
	84.21	6.40	3.32E+02		6.56E+02	1.62E+02
PA-234M	9.89	89.00	3.24E-08	3.24E-08	0.00E+00	0.00E+00
	21.72	64.90	1.91E-04		0.00E+00	0.00E+00
	37.93	23.75	6.58E-01		-8.41E-01	3.08E-01
	131.42	20.40	1.28E+02		-1.37E+00	5.95E+01
+ TH-234	63.29	*	3.80	1.20E+02	3.53E+02	5.78E+01
NP-237	29.37	14.00	3.06E-01	3.06E-01	-5.88E+00	1.47E-01
	86.50	12.60	7.79E+01		5.61E-01	3.64E+01
U-237	97.08	16.30	8.84E+01	6.19E+01	-5.68E+00	4.12E+01
	101.07	26.30	6.19E+01		1.46E+01	2.89E+01
	114.00	12.30	3.21E+02		4.23E+02	1.54E+02
	208.01	22.00	1.75E+02		6.99E+01	8.15E+01
AM-241	59.54	35.90	6.80E+00	6.80E+00	-4.50E+01	3.21E+00
AM-243	74.67	66.00	9.02E+00	9.02E+00	2.68E+00	4.22E+00

0218

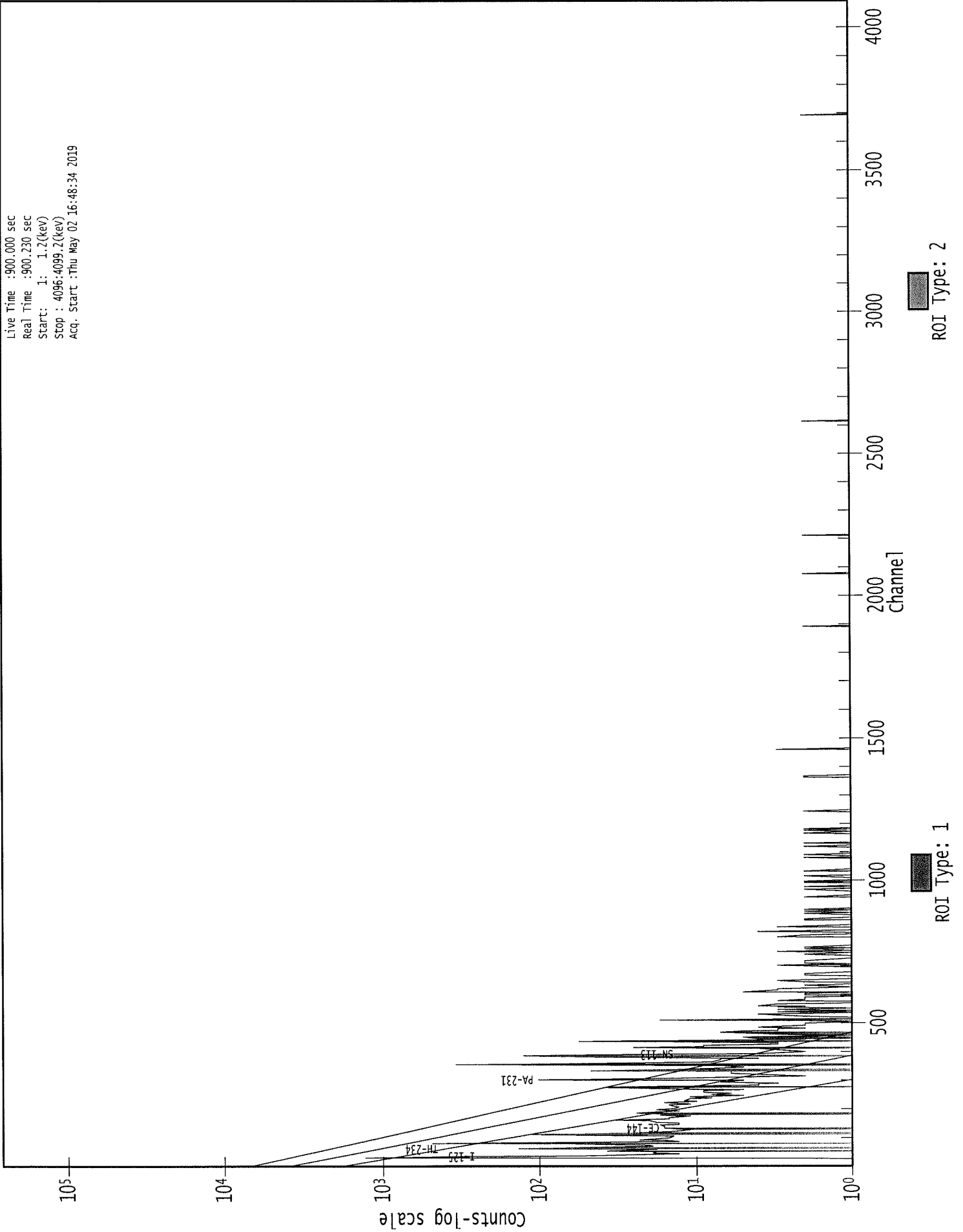
Analysis Report for 1904087-06

BC 26

- + = Nuclide identified during the nuclide identification
 - * = Energy line found in the spectrum
 - > = MDA value not calculated
 - @ = Half-life too short to be able to perform the decay correction
-

0000081247.CNF

Live Time :900.000 sec
Real Time :900.230 sec
Start: 1: 1.2(keV)
Stop : 4096:4099.2(keV)
Acq. Start :Thu May 02 16:48:34 2019



*WJ
5/2/19*

Analysis Report for 1904087-07
BC 11

GAMMA SPECTRUM ANALYSIS

Sample Identification : 1904087-07
 Sample Description : BC 11
 Sample Type : RA RECOVERY

Sample Size : 1.000E+00 units
 Facility : Countroom

Sample Taken On : 5/2/2019 8:39:06AM
 Acquisition Started : 5/2/2019 4:48:42PM

Procedure : BAFIL
 Operator : Administrator
 Detector Name : GE3
 Geometry : BAFIL
 Live Time : 900.0 seconds
 Real Time : 902.1 seconds

Dead Time : 0.24 %

Peak Locate Threshold : 2.50
 Peak Locate Range (in channels) : 1 - 4096
 Peak Area Range (in channels) : 10 - 4096
 Identification Energy Tolerance : 1.000FWHM

Energy Calibration Used Done On : 7/21/2018
 Efficiency Calibration Used Done On : 7/21/2018
 Efficiency Calibration Description :

Sample Number : 81248

PEAK ANALYSIS REPORT

Peak Analysis Performed on : 5/2/2019 5:03:59PM
 Peak Analysis From Channel : 1
 Peak Analysis To Channel : 4096

Peak No.	Energy (keV)	ROI start	ROI end	Peak Centroid	Net Peak Area	Net Area Uncertainty	Continuum Counts	FWHM (keV)
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Analysis Report for 1904087-07

BC 11

	Peak No.	Energy (keV)	ROI start	ROI end	Peak Centroid	Net Peak Area	Net Area Uncertainty	Continuum Counts	FWHM (keV)
M	1	21.15	18 -	40	21.52	1.28E+02	42.01	2.44E+02	2.18
m	2	30.97	18 -	40	31.34	2.63E+03	109.17	1.97E+02	1.86
m	3	35.23	18 -	40	35.59	6.97E+02	91.55	2.20E+02	2.19
	4	52.56	50 -	57	52.91	6.05E+01	44.50	2.93E+02	3.14
M	5	61.96	58 -	70	62.31	3.24E+02	53.56	2.87E+02	2.28
m	6	66.11	58 -	70	66.46	1.48E+02	48.10	2.46E+02	2.07
	7	81.17	77 -	86	81.51	1.06E+03	80.68	3.20E+02	2.13
M	8	111.85	106 -	120	112.17	2.97E+02	47.60	1.97E+02	2.22
m	9	116.23	106 -	120	116.55	7.26E+01	44.54	2.12E+02	2.57
	10	160.81	158 -	165	161.11	3.67E+01	35.55	1.83E+02	1.77
	11	219.15	216 -	223	219.43	4.63E+01	27.50	9.35E+01	2.17
	12	227.70	224 -	232	227.97	3.40E+01	30.97	1.28E+02	3.50
	13	256.65	251 -	261	256.92	5.08E+01	29.97	9.04E+01	6.81
	14	276.50	273 -	282	276.76	4.72E+01	37.67	1.78E+02	1.64
	15	302.74	297 -	307	302.99	1.15E+02	43.44	1.84E+02	1.83
	16	333.82	329 -	339	334.05	1.11E+02	38.97	1.45E+02	1.85
	17	356.13	352 -	362	356.35	6.04E+02	53.37	4.98E+01	2.22
	18	365.44	362 -	369	365.66	2.98E+01	16.97	2.83E+01	1.93
M	19	383.99	372 -	396	384.20	1.38E+02	34.96	3.99E+01	2.43
m	20	387.05	372 -	396	387.27	2.03E+02	37.34	2.78E+01	2.14
m	21	391.16	372 -	396	391.37	6.37E+01	33.80	3.06E+01	3.07
M	22	415.05	410 -	430	415.26	5.03E+01	19.30	9.00E+00	3.15
m	23	418.28	410 -	430	418.48	2.73E+01	19.29	8.00E+00	2.79
m	24	422.18	410 -	430	422.38	1.97E+01	15.51	9.00E+00	3.16
m	25	427.88	410 -	430	428.07	1.10E+01	9.19	7.00E+00	3.16
	26	436.83	432 -	440	437.03	1.21E+02	23.33	9.83E+00	1.87
	27	467.35	463 -	471	467.53	1.94E+01	17.61	3.53E+01	1.46
M	28	508.32	506 -	515	508.48	7.84E+00	8.37	9.28E+00	3.86
	29	588.03	585 -	590	588.17	6.00E+00	4.90	0.00E+00	2.74

M = First peak in a multiplet region

m = Other peak in a multiplet region

F = Fitted singlet

Errors quoted at 2.000sigma

BACKGROUND SUBTRACT REPORT

Peak Analysis Performed on : 5/2/2019 5:03:59PM

Env. Background File : \\OR-GAMMA1\ApexRoot\Countroom\Data\0000080016.CNF

Peak No.	Energy (keV)	Original Area	Orig. Area Uncertainty	Ambient Background	Backgr. Uncert.	Subtracted Area	Subtracted Uncert.
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0222

Analysis Report for 1904087-07

BC 11

	Peak No.	Energy (keV)	Original Area	Orig. Area Uncertainty	Ambient Background	Backgr. Uncert.	Subtracted Area	Subtracted Uncert.
M	1	21.15	1.28E+02	42.01			1.28E+02	4.20E+01
m	2	30.97	2.63E+03	109.17			2.63E+03	1.09E+02
m	3	35.23	6.97E+02	91.55			6.97E+02	9.15E+01
	4	52.56	6.05E+01	44.50			6.05E+01	4.45E+01
M	5	61.96	3.24E+02	53.56	1.56E+01	2.88E+00	3.09E+02	5.36E+01
m	6	66.11	1.48E+02	48.10			1.48E+02	4.81E+01
	7	81.17	1.06E+03	80.68			1.06E+03	8.07E+01
M	8	111.85	2.97E+02	47.60			2.97E+02	4.76E+01
m	9	116.23	7.26E+01	44.54			7.26E+01	4.45E+01
	10	160.81	3.67E+01	35.55			3.67E+01	3.56E+01
	11	219.15	4.63E+01	27.50			4.63E+01	2.75E+01
	12	227.70	3.40E+01	30.97			3.40E+01	3.10E+01
	13	256.65	5.08E+01	29.97			5.08E+01	3.00E+01
	14	276.50	4.72E+01	37.67			4.72E+01	3.77E+01
	15	302.74	1.15E+02	43.44			1.15E+02	4.34E+01
	16	333.82	1.11E+02	38.97			1.11E+02	3.90E+01
	17	356.13	6.04E+02	53.37			6.04E+02	5.34E+01
	18	365.44	2.98E+01	16.97			2.98E+01	1.70E+01
M	19	383.99	1.38E+02	34.96			1.38E+02	3.50E+01
m	20	387.05	2.03E+02	37.34			2.03E+02	3.73E+01
m	21	391.16	6.37E+01	33.80			6.37E+01	3.38E+01
M	22	415.05	5.03E+01	19.30			5.03E+01	1.93E+01
m	23	418.28	2.73E+01	19.29			2.73E+01	1.93E+01
m	24	422.18	1.97E+01	15.51			1.97E+01	1.55E+01
m	25	427.88	1.10E+01	9.19			1.10E+01	9.19E+00
	26	436.83	1.21E+02	23.33			1.21E+02	2.33E+01
	27	467.35	1.94E+01	17.61			1.94E+01	1.76E+01
M	28	508.32	7.84E+00	8.37			7.84E+00	8.37E+00
	29	588.03	6.00E+00	4.90			6.00E+00	4.90E+00

M = First peak in a multiplet region

m = Other peak in a multiplet region

F = Fitted singlet

Errors quoted at 2.000sigma

NUCLIDE IDENTIFICATION REPORT

Nuclide Library Used : \\OR-GAMMA1\ApexRoot\Countroom\Library\WSRC.NLB

IDENTIFIED NUCLIDES

Nuclide Name	Id Confidence	Energy (keV)	Yield(%)	Activity (pCi/units)	Activity Uncertainty
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0223

Analysis Report for 1904087-07

BC 11

Nuclide Name	Id Confidence	Energy (keV)		Yield(%)	Activity (pCi/units)	Activity Uncertainty
SN-113	0.99	255.12 *		1.93	2.08E+03	1.52E+03
		391.69 *		61.90	4.45E+01	2.40E+01
I-125	0.99	35.49 *		6.49	3.24E+01	4.26E+00
BA-133	1.00	30.80 *		97.60	3.51E+00	1.45E-01
		302.84 *		17.80	4.32E+02	2.27E+02
		356.01 *		60.00	5.24E+02	7.56E+01
TH-234	0.96	63.29 *		3.80	4.87E+02	8.62E+01

* = Energy line found in the spectrum.

- = Manually added nuclide.

? = Manually edited nuclide.

@ = Energy line not used for Weighted Mean Activity

Energy Tolerance : 2.000FWHM

Nuclide confidence index threshold = 0.30

Errors quoted at 2.000sigma

INTERFERENCE CORRECTED REPORT

	Nuclide Name	Nuclide Id Confidence	Wt mean Activity (pCi/units)	Wt mean Activity Uncertainty	Comments
	SN-113	0.994	4.50E+01	2.40E+01	
	I-125	0.999	3.24E+01	4.26E+00	
X	I-129	0.903			
	BA-133	1.000	3.51E+00	1.45E-01	
	TH-234	0.969	4.87E+02	8.62E+01	
X	NP-237	0.886			

? = nuclide is part of an undetermined solution

X = nuclide rejected by the interference analysis

@ = nuclide contains energy lines not used in Weighted Mean Activity

Errors quoted at 2.000sigma

Analysis Report for 1904087-07

BC 11

UNIDENTIFIED PEAKS

Peak Locate Performed on : 5/2/2019 5:03:59PM
 Peak Locate From Channel : 1
 Peak Locate To Channel : 4096

<i>Peak No.</i>	<i>Energy (keV)</i>	<i>Peak Size (CPS)</i>	<i>Peak CPS (%) Uncertainty</i>	<i>Peak Type</i>	<i>Tolerance Nuclide</i>	
M	1	21.15	1.42207E-01	16.41	Tol.	PA-234M
	4	52.56	6.72088E-02	36.78		
m	6	66.11	1.64798E-01	16.22	Sum	
	7	81.17	1.17243E+00	3.82		
M	8	111.85	3.29650E-01	8.02		
m	9	116.23	8.06891E-02	30.67		
	10	160.81	4.08160E-02	48.39		
	11	219.15	5.14098E-02	29.71		
	12	227.70	3.78005E-02	45.51		
	14	276.50	5.24796E-02	39.88		
	16	333.82	1.23027E-01	17.60	Sum	
	18	365.44	3.31439E-02	28.45	Sum	
M	19	383.99	1.53849E-01	12.63		
m	20	387.05	2.25978E-01	9.18	Sum	
M	22	415.05	5.58825E-02	19.19		
m	23	418.28	3.03863E-02	35.26	Sum	
m	24	422.18	2.19325E-02	39.28	Sum	
m	25	427.88	1.22124E-02	41.82	Sum	
	26	436.83	1.34541E-01	9.64		
	27	467.35	2.15015E-02	45.49		
M	28	508.32	8.71169E-03	53.35		
	29	588.03	6.66667E-03	40.82		

M = First peak in a multiplet region
 m = Other peak in a multiplet region
 F = Fitted singlet
 Errors quoted at 2.000sigma

Analysis Report for 1904087-07

BC 11

NUCLIDE MDA REPORT

Nuclide Library Used : \\OR-GAMMA1\ApexRoot\Countroom\Library\WSRC.NLB

Nuclide Name	Energy (keV)	Yield(%)	Line MDA (pCi/units)	Nuclide MDA (pCi/units)	Activity (pCi/units)	Dec. Level (pCi/units)
FE-55	5.89	24.50	1.57E-09	1.57E-09	0.00E+00	0.00E+00
CO-57	122.06	85.51	2.59E+01	2.59E+01	8.71E-01	1.22E+01
	136.48	10.60	2.84E+02		-4.67E+01	1.34E+02
NI-59	6.92	29.80	1.13E-07	1.13E-07	5.17E-08	5.20E-08
MO-93	16.59	52.90	1.07E-03	1.07E-03	1.34E-04	5.08E-04
	18.60	10.00	1.94E-02		1.61E-03	9.36E-03
NB-93M	16.57	9.43	5.92E-03	5.92E-03	7.44E-04	2.82E-03
CD-109	88.03	3.72	2.79E+02	2.79E+02	-1.15E+02	1.31E+02
+ SN-113	255.12 *	1.93	1.88E+03	4.82E+01	2.08E+03	8.86E+02
	391.69 *	61.90	4.82E+01		4.45E+01	2.32E+01
SN-119M	23.87	16.10	9.75E-02	9.41E-02	1.53E-02	4.71E-02
	25.10	22.70	9.41E-02		-9.74E-01	4.53E-02
+ I-125	35.49 *	6.49	7.45E+00	7.45E+00	3.24E+01	3.66E+00
I-129	29.78 *	57.00	3.64E-01	3.64E-01	6.01E+00	1.79E-01
	33.60 *	13.20	3.65E+00		1.59E+01	1.79E+00
	39.58 *	7.52	5.53E+00		-5.28E-01	2.65E+00
+ BA-133	30.80 *	97.60	2.13E-01	2.13E-01	3.51E+00	1.05E-01
	302.84 *	17.80	2.44E+02		4.32E+02	1.17E+02
	356.01 *	60.00	3.20E+01		5.24E+02	1.48E+01
CE-139	165.85	80.35	4.31E+01	4.31E+01	5.52E+00	2.03E+01
CE-144	133.54	10.80	2.80E+02	2.80E+02	7.69E+01	1.33E+02
HG-203	279.19	77.30	4.95E+01	4.95E+01	6.09E+01	2.35E+01
PB-210	46.50	4.25	2.00E+01	2.00E+01	6.62E+00	9.51E+00
PA-231	9.28	42.00	3.81E-06	3.81E-06	4.42E-06	1.81E-06
	10.11	20.20	2.00E-05		2.32E-05	9.51E-06
	283.67	1.60	1.51E+03		-4.53E+02	6.96E+02
	302.67	2.30	1.91E+03		3.35E+03	9.14E+02
TH-231	25.64	14.70	1.68E-01	1.68E-01	-6.37E+00	8.07E-02
	84.21	6.40	3.53E+02		9.31E+00	1.72E+02
PA-234M	9.89	89.00	3.59E-06	3.59E-06	4.16E-06	1.70E-06
	21.72	64.90	1.11E-02		9.69E-03	5.35E-03
	37.93	23.75	2.55E+00		1.00E+01	1.25E+00
	131.42	20.40	1.42E+02		4.41E+01	6.74E+01
+ TH-234	63.29 *	3.80	1.71E+02	1.71E+02	4.87E+02	8.31E+01
NP-237	29.37 *	14.00	1.48E+00	1.48E+00	2.45E+01	7.29E-01
	86.50	12.60	8.30E+01		2.18E+01	3.93E+01
U-237	97.08	16.30	1.03E+02	6.96E+01	-7.68E+00	4.89E+01
	101.07	26.30	6.96E+01		2.06E+01	3.31E+01
	114.00	12.30	3.65E+02		1.24E+03	1.77E+02
	208.01	22.00	1.87E+02		1.67E+01	8.83E+01
AM-241	59.54	35.90	1.40E+01	1.40E+01	3.60E+01	6.82E+00
AM-243	74.67	66.00	1.08E+01	1.08E+01	2.63E-01	5.16E+00

Analysis Report for 1904087-07

BC 11

- + = Nuclide identified during the nuclide identification
 - * = Energy line found in the spectrum
 - > = MDA value not calculated
 - @ = Half-life too short to be able to perform the decay correction
-

*KB
5/2/19*

Analysis Report for 1904087-08

BC 12

GAMMA SPECTRUM ANALYSIS

Sample Identification : 1904087-08
 Sample Description : BC 12
 Sample Type : RA RECOVERY

 Sample Size : 1.000E+00 units
 Facility : Countroom

 Sample Taken On : 5/2/2019 8:39:14AM
 Acquisition Started : 5/2/2019 4:48:49PM

 Procedure : BAFIL
 Operator : Administrator
 Detector Name : GE4
 Geometry : BAFIL
 Live Time : 900.0 seconds
 Real Time : 906.4 seconds

 Dead Time : 0.70 %

 Peak Locate Threshold : 2.50
 Peak Locate Range (in channels) : 1 - 4096
 Peak Area Range (in channels) : 9 - 4096
 Identification Energy Tolerance : 1.000FWHM

 Energy Calibration Used Done On : 2/24/2018
 Efficiency Calibration Used Done On : 11/9/2014
 Efficiency Calibration Description :

 Sample Number : 81249

PEAK ANALYSIS REPORT

Peak Analysis Performed on : 5/2/2019 5:04:11PM

Peak Analysis From Channel : 1
 Peak Analysis To Channel : 4096

Peak No.	Energy (keV)	ROI start	ROI end	Peak Centroid	Net Peak Area	Net Area Uncertainty	Continuum Counts	FWHM (keV)
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Analysis Report for 1904087-08

BC 12

	Peak No.	Energy (keV)	ROI start	ROI end	Peak Centroid	Net Peak Area	Net Area Uncertainty	Continuum Counts	FWHM (keV)
	1	20.91	15 -	23	19.97	9.61E+01	55.05	4.22E+02	2.05
M	2	30.87	24 -	39	29.93	2.52E+03	106.94	1.80E+02	2.20
m	3	35.23	24 -	39	34.29	5.84E+02	75.01	1.33E+02	2.14
	4	53.47	48 -	56	52.55	5.58E+01	47.04	3.06E+02	2.25
M	5	61.78	57 -	69	60.87	2.18E+02	43.30	2.04E+02	2.12
m	6	65.70	57 -	69	64.79	1.06E+02	47.97	2.30E+02	2.32
	7	81.12	76 -	85	80.22	1.05E+03	75.87	2.24E+02	2.13
	8	101.45	98 -	104	100.56	2.36E+01	27.87	1.27E+02	1.49
	9	111.63	105 -	116	110.76	2.51E+02	61.19	3.43E+02	1.95
	10	192.81	188 -	195	192.00	3.32E+01	32.62	1.54E+02	2.11
	11	225.03	221 -	228	224.24	2.13E+01	25.30	9.35E+01	3.52
	12	276.52	271 -	280	275.77	5.60E+01	26.72	7.00E+01	1.60
	13	302.89	296 -	307	302.16	1.46E+02	40.45	1.29E+02	2.11
M	14	333.93	329 -	348	333.23	5.83E+01	24.17	6.81E+01	2.55
m	15	337.93	329 -	348	337.23	2.63E+01	24.33	5.43E+01	2.55
	16	356.21	351 -	359	355.53	4.71E+02	46.63	4.50E+01	2.22
	17	370.57	365 -	374	369.91	1.88E+01	19.42	3.84E+01	5.66
M	18	384.03	379 -	396	383.38	1.07E+02	33.60	2.45E+01	2.83
m	19	386.97	379 -	396	386.32	1.58E+02	31.89	1.48E+01	2.04
m	20	391.08	379 -	396	390.43	3.72E+01	31.64	2.17E+01	3.44
	21	416.77	410 -	422	416.14	4.95E+01	23.01	3.90E+01	2.31
	22	437.12	431 -	442	436.51	6.23E+01	24.17	4.15E+01	1.88
	23	511.50	504 -	518	510.96	2.40E+01	9.80	0.00E+00	4.00

M = First peak in a multiplet region
m = Other peak in a multiplet region
F = Fitted singlet
Errors quoted at 2.000sigma

BACKGROUND SUBTRACT REPORT

Peak Analysis Performed on : 5/2/2019 5:04:11PM

Env. Background File : \\OR-GAMMA1\ApexRoot\Countroom\Data\0000080017.CNF

	Peak No.	Energy (keV)	Original Area	Orig. Area Uncertainty	Ambient Background	Backgr. Uncert.	Subtracted Area	Subtracted Uncert.
	1	20.91	9.61E+01	55.05			9.61E+01	5.50E+01
M	2	30.87	2.52E+03	106.94			2.52E+03	1.07E+02
m	3	35.23	5.84E+02	75.01			5.84E+02	7.50E+01
	4	53.47	5.58E+01	47.04			5.58E+01	4.70E+01
M	5	61.78	2.18E+02	43.30	1.28E+01	1.96E+00	2.06E+02	4.33E+01
m	6	65.70	1.06E+02	47.97			1.06E+02	4.80E+01

Analysis Report for 1904087-08

BC 12

Peak No.	Energy (keV)	Original Area	Orig. Area Uncertainty	Ambient Background	Backgr. Uncert.	Subtracted Area	Subtracted Uncert.
7	81.12	1.05E+03	75.87			1.05E+03	7.59E+01
8	101.45	2.36E+01	27.87			2.36E+01	2.79E+01
9	111.63	2.51E+02	61.19			2.51E+02	6.12E+01
10	192.81	3.32E+01	32.62			3.32E+01	3.26E+01
11	225.03	2.13E+01	25.30			2.13E+01	2.53E+01
12	276.52	5.60E+01	26.72			5.60E+01	2.67E+01
13	302.89	1.46E+02	40.45			1.46E+02	4.04E+01
M 14	333.93	5.83E+01	24.17			5.83E+01	2.42E+01
m 15	337.93	2.63E+01	24.33			2.63E+01	2.43E+01
16	356.21	4.71E+02	46.63			4.71E+02	4.66E+01
17	370.57	1.88E+01	19.42			1.88E+01	1.94E+01
M 18	384.03	1.07E+02	33.60			1.07E+02	3.36E+01
m 19	386.97	1.58E+02	31.89			1.58E+02	3.19E+01
m 20	391.08	3.72E+01	31.64			3.72E+01	3.16E+01
21	416.77	4.95E+01	23.01			4.95E+01	2.30E+01
22	437.12	6.23E+01	24.17			6.23E+01	2.42E+01
23	511.50	2.40E+01	9.80	1.18E+01	1.36E+00	1.22E+01	9.89E+00

M = First peak in a multiplet region
m = Other peak in a multiplet region
F = Fitted singlet
Errors quoted at 2.000sigma

NUCLIDE IDENTIFICATION REPORT

Nuclide Library Used : \\OR-GAMMA1\ApexRoot\Countroom\Library\WSRC.NLB

IDENTIFIED NUCLIDES

Nuclide Name	Id Confidence	Energy (keV)	Yield(%)	Activity (pCi/units)	Activity Uncertainty
SN-113	0.94	255.12	1.93		
		391.69	*	61.90	5.86E+01
I-125	0.99	35.49	*	6.49	5.22E+02
BA-133	1.00	30.80	*	97.60	1.13E+02
		302.84	*	17.80	7.20E+02
		356.01	*	60.00	7.38E+02
TH-234	0.95	63.29	*	3.80	8.73E+02
					1.21E+02
					1.94E+02

Analysis Report for 1904087-08

BC 12

* = Energy line found in the spectrum.
 - = Manually added nuclide.
 ? = Manually edited nuclide.
 @ = Energy line not used for Weighted Mean Activity
 Energy Tolerance : 2.000FWHM
 Nuclide confidence index threshold = 0.30
 Errors quoted at 2.000sigma

INTERFERENCE CORRECTED REPORT

	Nuclide Name	Nuclide Id Confidence	Wt mean Activity (pCi/units)	Wt mean Activity Uncertainty	Comments
	SN-113	0.940	5.86E+01	5.05E+01	
	I-125	0.999	5.22E+02	6.83E+01	
X	I-129	0.854			
	BA-133	1.000	1.15E+02	5.26E+00	
	TH-234	0.957	8.73E+02	1.94E+02	
X	NP-237	0.567			

? = nuclide is part of an undetermined solution
 X = nuclide rejected by the interference analysis
 @ = nuclide contains energy lines not used in Weighted Mean Activity

Errors quoted at 2.000sigma

Analysis Report for 1904087-08

BC 12

UNIDENTIFIED PEAKS

Peak Locate Performed on : 5/2/2019 5:04:11PM

Peak Locate From Channel : 1

Peak Locate To Channel : 4096

Peak No.	Energy (keV)	Peak Size (CPS)	Peak CPS (%) Uncertainty	Peak Type	Tolerance Nuclide	
	1	20.91	1.06774E-01	28.64	Tol.	PA-234M
	4	53.47	6.20016E-02	42.15		
m	6	65.70	1.18085E-01	22.57	Sum	
	7	81.12	1.16208E+00	3.63		U-237
	8	101.45	2.62197E-02	59.05	Tol.	
	9	111.63	2.79291E-01	12.17		
	10	192.81	3.69192E-02	49.08		
	11	225.03	2.36356E-02	59.46		
M	12	276.52	6.22222E-02	23.86		
	14	333.93	6.47580E-02	20.73	Sum	
m	15	337.93	2.92042E-02	46.29	Sum	
	17	370.57	2.09064E-02	51.60		
M	18	384.03	1.19158E-01	15.67		
m	19	386.97	1.76019E-01	10.07	Sum	
	21	416.77	5.50000E-02	23.24	Sum	
	22	437.12	6.91767E-02	19.41		
	23	511.50	1.35103E-02	40.68		

M = First peak in a multiplet region

m = Other peak in a multiplet region

F = Fitted singlet

Errors quoted at 2.000sigma

NUCLIDE MDA REPORT

Nuclide Library Used : \\OR-GAMMA1\ApexRoot\Countroom\Library\WSRC.NLB

Analysis Report for 1904087-08

BC 12

Nuclide Name	Energy (keV)	Yield(%)	Line MDA (pCi/units)	Nuclide MDA (pCi/units)	Activity (pCi/units)	Dec. Level (pCi/units)
FE-55	5.89	24.50	5.43E-03	5.43E-03	0.00E+00	0.00E+00
CO-57	122.06	85.51	1.76E+01	1.76E+01	-2.44E+01	8.15E+00
	136.48	10.60	1.86E+02		-1.45E+02	8.69E+01
NI-59	6.92	29.80	4.18E-02	4.18E-02	-6.96E-02	1.71E-02
MO-93	16.59	52.90	1.34E+00	1.34E+00	5.28E-02	6.45E-01
	18.60	10.00	1.09E+01		1.54E+01	5.25E+00
NB-93M	16.57	9.43	7.51E+00	7.51E+00	2.95E-01	3.61E+00
CD-109	88.03	3.72	3.64E+02	3.64E+02	-1.29E+02	1.72E+02
+ SN-113	255.12	1.93	1.39E+03	5.91E+01	3.16E+02	6.38E+02
	391.69	*	61.90	5.91E+01	5.86E+01	2.74E+01
SN-119M	23.87	16.10	1.14E+01	8.30E+00	-4.15E+01	5.49E+00
	25.10	22.70	8.30E+00		-1.90E+02	3.98E+00
+ I-125	35.49	*	6.49	8.98E+01	5.22E+02	4.37E+01
I-129	29.78	*	57.00	7.84E+00	1.94E+02	3.81E+00
	33.60	*	13.20	4.40E+01	2.55E+02	2.14E+01
	39.58	*	7.52	5.52E+01	-3.25E+00	2.63E+01
+ BA-133	30.80	*	97.60	4.58E+00	1.13E+02	2.23E+00
	302.84	*	17.80	2.76E+02	7.20E+02	1.31E+02
	356.01	*	60.00	4.84E+01	7.38E+02	2.21E+01
CE-139	165.85	80.35	3.38E+01	3.38E+01	-2.58E+00	1.60E+01
CE-144	133.54	10.80	1.93E+02	1.93E+02	1.24E+02	9.07E+01
HG-203	279.19	77.30	4.61E+01	4.61E+01	5.63E+01	2.16E+01
PB-210	46.50	4.25	1.11E+02	1.11E+02	-5.49E+00	5.24E+01
PA-231	9.28	42.00	2.04E-01	2.04E-01	1.58E-01	9.56E-02
	10.11	20.20	6.18E-01		3.97E-01	2.91E-01
	283.67	1.60	1.22E+03		-6.77E+02	5.37E+02
	302.67	2.30	2.49E+03		5.28E+03	1.20E+03
TH-231	25.64	14.70	1.61E+01	1.61E+01	-4.51E+02	7.80E+00
	84.21	6.40	5.79E+02		3.01E+03	2.84E+02
PA-234M	9.89	89.00	1.32E-01	1.32E-01	8.45E-02	6.20E-02
	21.72	64.90	2.37E+00		2.43E+00	1.14E+00
	37.93	23.75	3.22E+01		1.19E+02	1.57E+01
	131.42	20.40	9.91E+01		4.51E+01	4.66E+01
+ TH-234	63.29	*	3.80	4.12E+02	8.73E+02	2.00E+02
NP-237	29.37	*	14.00	3.19E+01	7.89E+02	1.55E+01
	86.50	12.60	1.02E+02		-6.56E+01	4.80E+01
U-237	97.08	16.30	8.73E+01	6.00E+01	-1.44E+01	4.09E+01
	101.07	26.30	6.00E+01		2.20E+01	2.82E+01
	114.00	12.30	2.83E+02		7.48E+02	1.37E+02
	208.01	22.00	1.42E+02		3.73E+01	6.64E+01
AM-241	59.54	35.90	3.66E+01	3.66E+01	5.09E+01	1.77E+01
AM-243	74.67	66.00	1.72E+01	1.72E+01	-4.39E+00	8.17E+00

+ = Nuclide identified during the nuclide identification

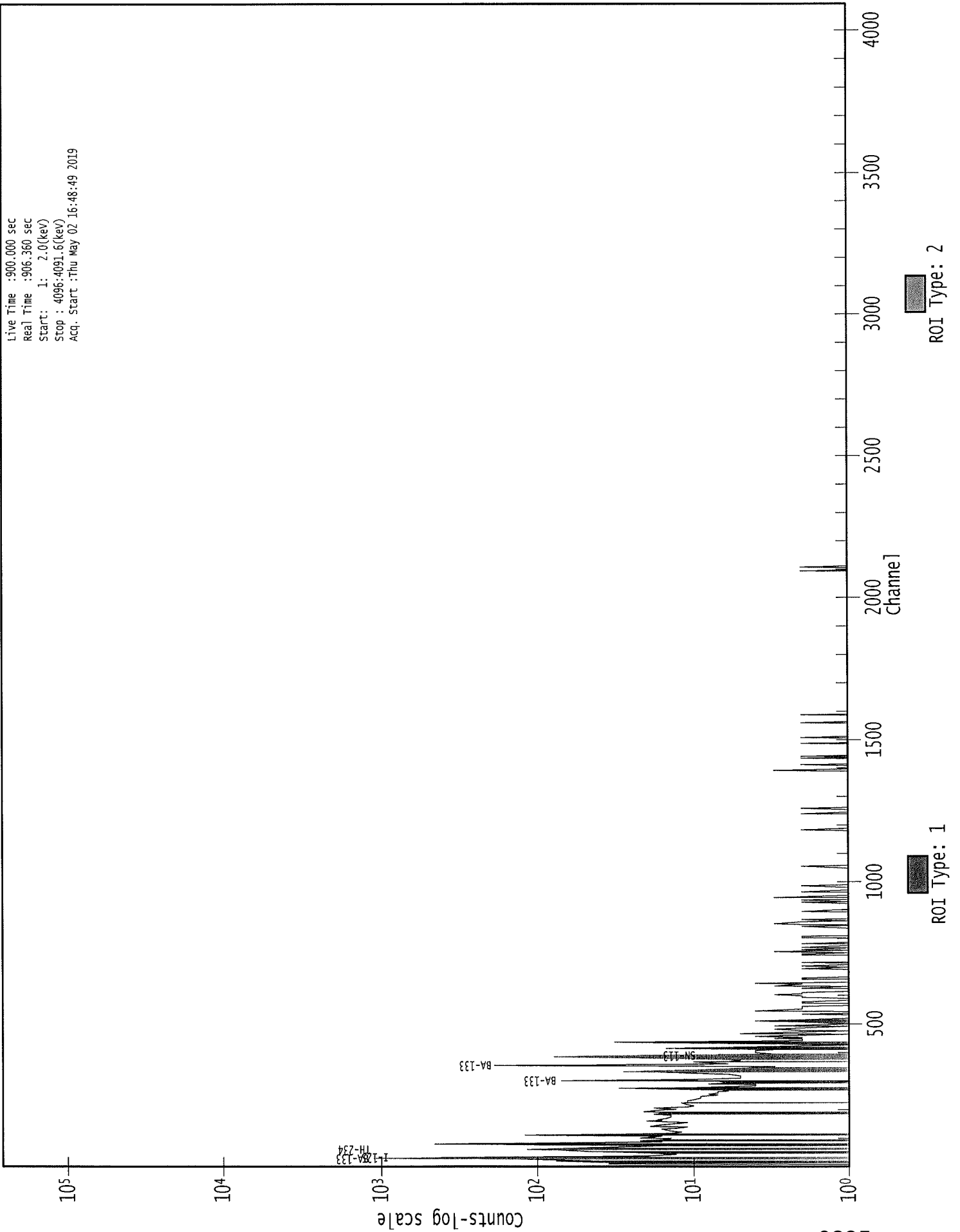
* = Energy line found in the spectrum

> = MDA value not calculated

@ = Half-life too short to be able to perform the decay correction

0000081249.CNF

Live Time : 900.000 sec
Real Time : 906.360 sec
Start : 1: 2.0(keV)
Stop : 4096:4091.6(keV)
Acq. Start : Thu May 02 16:48:49 2019



Analysis Report for 1904087-09
BC 24A

GAMMA SPECTRUM ANALYSIS

Sample Identification : 1904087-09
 Sample Description : BC 24A
 Sample Type : RA RECOVERY

 Sample Size : 1.000E+00 units
 Facility : Countroom

 Sample Taken On : 5/2/2019 8:39:23AM
 Acquisition Started : 5/2/2019 5:07:10PM

 Procedure : BAFIL
 Operator : Administrator
 Detector Name : GE1
 Geometry : BAFIL
 Live Time : 900.0 seconds
 Real Time : 900.3 seconds

 Dead Time : 0.03 %

 Peak Locate Threshold : 2.50
 Peak Locate Range (in channels) : 1 - 4096
 Peak Area Range (in channels) : 18 - 4096
 Identification Energy Tolerance : 1.000FWHM

 Energy Calibration Used Done On : 6/16/2018
 Efficiency Calibration Used Done On : 2/17/2018
 Efficiency Calibration Description :

 Sample Number : 81251

PEAK ANALYSIS REPORT

Peak Analysis Performed on : 5/2/2019 5:22:13PM

Peak Analysis From Channel : 1
 Peak Analysis To Channel : 4096

Peak No.	Energy (keV)	ROI start	ROI end	Peak Centroid	Net Peak Area	Net Area Uncertainty	Continuum Counts	FWHM (keV)
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Analysis Report for 1904087-09

BC 24A

Peak No.	Energy (keV)	ROI start	ROI end	Peak Centroid	Net Peak Area	Net Area Uncertainty	Continuum Counts	FWHM (keV)
1	31.62	26 -	40	32.00	2.45E+03	132.98	7.98E+02	4.05
2	52.46	49 -	56	52.83	6.13E+01	41.95	2.53E+02	5.09
3	63.23	57 -	72	63.60	4.17E+02	79.77	4.61E+02	5.52
4	81.25	76 -	90	81.61	8.29E+02	88.52	4.59E+02	4.05
M	5	107 -	122	112.33	2.19E+02	50.80	2.30E+02	4.10
m	6	107 -	122	116.48	4.18E+01	35.17	1.27E+02	2.11
7	160.70	156 -	165	161.05	4.63E+01	37.56	1.75E+02	4.14
8	258.55	256 -	262	258.87	1.83E+01	16.20	3.34E+01	4.01
9	276.41	271 -	281	276.72	5.22E+01	29.46	8.77E+01	2.99
M	10	297 -	312	302.77	1.56E+02	35.03	6.34E+01	3.68
m	11	297 -	312	306.71	4.06E+01	35.65	7.06E+01	3.70
12	333.59	329 -	338	333.89	3.87E+01	36.63	1.69E+02	3.41
M	13	350 -	374	356.30	6.11E+02	52.42	3.93E+01	4.15
m	14	350 -	374	362.33	2.32E+01	29.93	3.76E+01	2.83
M	15	380 -	390	383.68	9.50E+01	43.59	1.45E+02	3.45
m	16	380 -	390	386.39	1.54E+02	51.70	2.49E+02	3.45
17	417.70	411 -	424	417.98	8.48E+01	30.08	6.24E+01	4.85
18	436.91	432 -	445	437.19	1.11E+02	28.67	4.20E+01	3.21
19	467.94	464 -	473	468.21	2.70E+01	13.34	1.00E+01	5.98
20	533.26	531 -	537	533.52	8.08E+00	8.51	7.83E+00	1.34
21	570.65	569 -	573	570.90	7.06E+00	6.18	1.88E+00	2.81
22	584.64	581 -	588	584.89	8.75E+00	8.94	6.50E+00	2.64

M = First peak in a multiplet region
m = Other peak in a multiplet region
F = Fitted singlet
Errors quoted at 2.000sigma

BACKGROUND SUBTRACT REPORT

Peak Analysis Performed on : 5/2/2019 5:22:13PM

Env. Background File : \\OR-GAMMA1\ApexRoot\Countroom\Data\0000080014.CNF

Peak No.	Energy (keV)	Original Area	Orig. Area Uncertainty	Ambient Background	Backgr. Uncert.	Subtracted Area	Subtracted Uncert.
1	31.62	2.45E+03	132.98			2.45E+03	1.33E+02
2	52.46	6.13E+01	41.95			6.13E+01	4.20E+01
3	63.23	4.17E+02	79.77	2.07E+01	2.02E+00	3.96E+02	7.98E+01
4	81.25	8.29E+02	88.52			8.29E+02	8.85E+01
M	5	2.19E+02	50.80			2.19E+02	5.08E+01
m	6	4.18E+01	35.17			4.18E+01	3.52E+01
7	160.70	4.63E+01	37.56			4.63E+01	3.76E+01

0237

Analysis Report for 1904087-09

BC 24A

Peak No.	Energy (keV)	Original Area	Orig. Area Uncertainty	Ambient Background	Backgr. Uncert.	Subtracted Area	Subtracted Uncert.
	8	258.55	1.83E+01	16.20		1.83E+01	1.62E+01
	9	276.41	5.22E+01	29.46		5.22E+01	2.95E+01
M	10	302.46	1.56E+02	35.03		1.56E+02	3.50E+01
m	11	306.40	4.06E+01	35.65		4.06E+01	3.57E+01
	12	333.59	3.87E+01	36.63		3.87E+01	3.66E+01
M	13	356.00	6.11E+02	52.42		6.11E+02	5.24E+01
m	14	362.04	2.32E+01	29.93		2.32E+01	2.99E+01
M	15	383.39	9.50E+01	43.59		9.50E+01	4.36E+01
m	16	386.10	1.54E+02	51.70		1.54E+02	5.17E+01
	17	417.70	8.48E+01	30.08		8.48E+01	3.01E+01
	18	436.91	1.11E+02	28.67		1.11E+02	2.87E+01
	19	467.94	2.70E+01	13.34		2.70E+01	1.33E+01
	20	533.26	8.08E+00	8.51		8.08E+00	8.51E+00
	21	570.65	7.06E+00	6.18		7.06E+00	6.18E+00
	22	584.64	8.75E+00	8.94		8.75E+00	8.94E+00

M = First peak in a multiplet region

m = Other peak in a multiplet region

F = Fitted singlet

Errors quoted at 2.000sigma

NUCLIDE IDENTIFICATION REPORT

Nuclide Library Used : \\OR-GAMMA1\ApexRoot\Countroom\Library\WSRC.NLB

IDENTIFIED NUCLIDES

Nuclide Name	Id Confidence	Energy (keV)	Yield(%)	Activity (pCi/units)	Activity Uncertainty
BA-133	0.98	30.80 *	97.60	5.85E-01	3.18E-02
		302.84 *	17.80	6.94E+02	3.43E+02
		356.01 *	60.00	5.16E+02	7.17E+01
PA-231	1.00	9.28	42.00		
		10.11	20.20		
		283.67	1.60		
TH-234	1.00	302.67 *	2.30	5.37E+03	2.65E+03
		63.29 *	3.80	4.99E+02	1.02E+02

Analysis Report for 1904087-09

BC 24A

* = Energy line found in the spectrum.
 - = Manually added nuclide.
 ? = Manually edited nuclide.
 @ = Energy line not used for Weighted Mean Activity
 Energy Tolerance : 2.000FWHM
 Nuclide confidence index threshold = 0.30
 Errors quoted at 2.000sigma

INTERFERENCE CORRECTED REPORT

Nuclide Name	Nuclide Id Confidence	Wt mean Activity (pCi/units)	Wt mean Activity Uncertainty	Comments
BA-133	0.988	5.85E-01	3.18E-02	
PA-231	1.000	5.36E+03	2.65E+03	
TH-234	1.000	4.99E+02	1.02E+02	

? = nuclide is part of an undetermined solution
 X = nuclide rejected by the interference analysis
 @ = nuclide contains energy lines not used in Weighted Mean Activity

Errors quoted at 2.000sigma

Analysis Report for 1904087-09

BC 24A

UNIDENTIFIED PEAKS

Peak Locate Performed on : 5/2/2019 5:22:13PM

Peak Locate From Channel : 1

Peak Locate To Channel : 4096

<i>Peak No.</i>	<i>Energy (keV)</i>	<i>Peak Size (CPS)</i>	<i>Peak CPS (%) Uncertainty</i>	<i>Peak Type</i>	<i>Tolerance Nuclide</i>
	2	52.46	6.81649E-02	34.19	
	4	81.25	9.21542E-01	5.34	
M	5	111.97	2.43300E-01	11.60	
m	6	116.12	4.64816E-02	42.04	
	7	160.70	5.14635E-02	40.55	
	8	258.55	2.03175E-02	44.30	
	9	276.41	5.79630E-02	28.24	
m	11	306.40	4.51528E-02	43.86	
	12	333.59	4.30352E-02	47.29	Sum
m	14	362.04	2.58090E-02	64.43	
M	15	383.39	1.05579E-01	22.94	
m	16	386.10	1.71437E-01	16.75	Sum
	17	417.70	9.42337E-02	17.74	Sum
	18	436.91	1.23333E-01	12.91	
	19	467.94	3.00000E-02	24.71	
	20	533.26	8.98148E-03	52.67	
	21	570.65	7.84722E-03	43.79	
	22	584.64	9.72222E-03	51.11	

M = First peak in a multiplet region

m = Other peak in a multiplet region

F = Fitted singlet

Errors quoted at 2.000sigma

NUCLIDE MDA REPORT

Nuclide Library Used : \\OR-GAMMA1\ApexRoot\Countroom\Library\WSRC.NLB

Analysis Report for 1904087-09

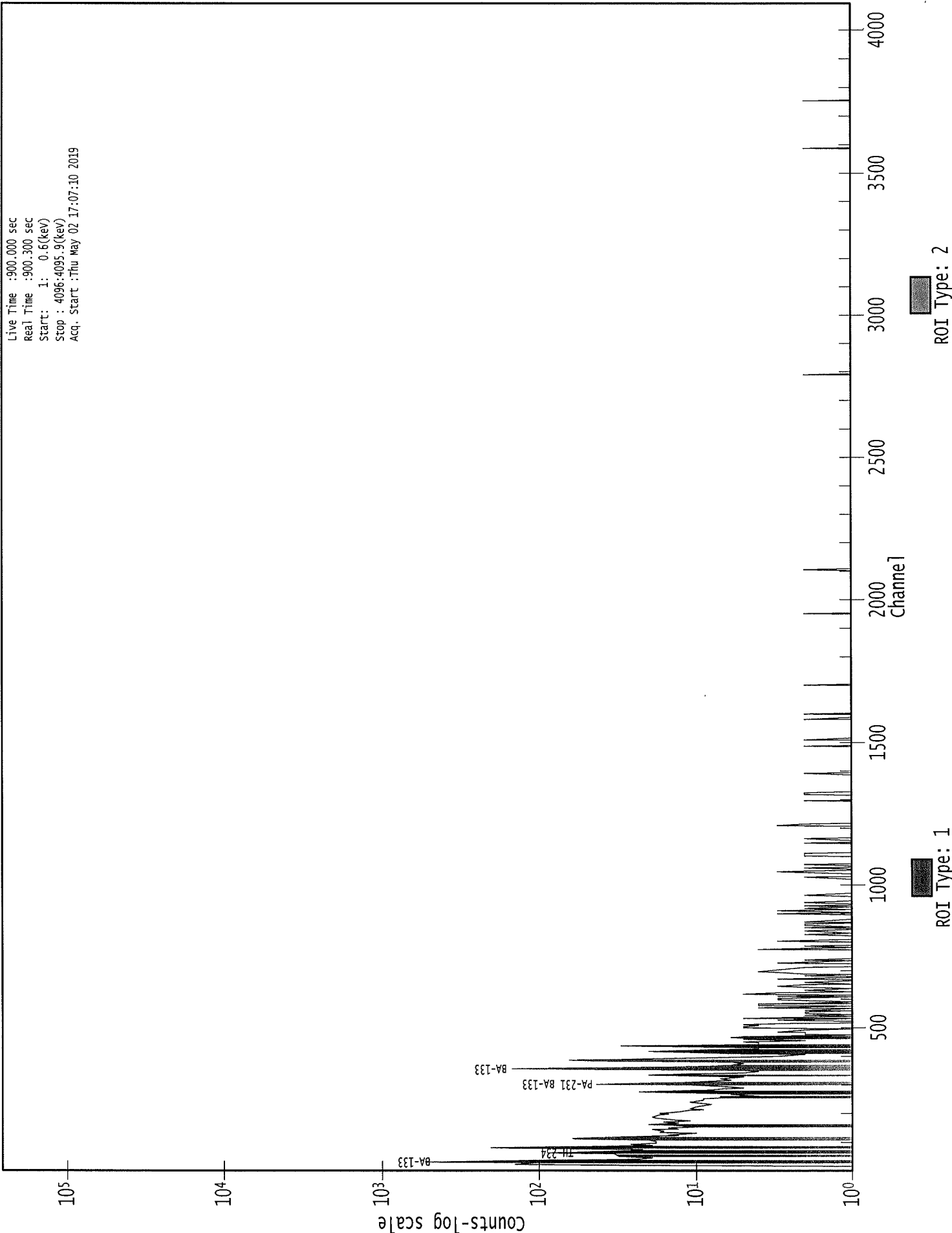
BC 24A

Nuclide Name	Energy (keV)	Yield(%)	Line MDA (pCi/units)	Nuclide MDA (pCi/units)	Activity (pCi/units)	Dec. Level (pCi/units)
FE-55	5.89	24.50	1.90E-13	1.90E-13	0.00E+00	0.00E+00
CO-57	122.06	85.51	3.22E+01	3.22E+01	-1.32E-01	1.49E+01
	136.48	10.60	3.49E+02		-1.00E+02	1.63E+02
NI-59	6.92	29.80	2.77E-12	2.77E-12	0.00E+00	0.00E+00
MO-93	16.59	52.90	1.02E-05	1.02E-05	-2.67E-06	4.67E-06
	18.60	10.00	4.01E-04		-3.49E-05	1.91E-04
NB-93M	16.57	9.43	5.65E-05	5.65E-05	-1.47E-05	2.58E-05
CD-109	88.03	3.72	3.04E+02	3.04E+02	-4.93E+02	1.43E+02
SN-113	255.12	1.93	1.79E+03	3.07E+01	1.16E+02	8.17E+02
	391.69	61.90	3.07E+01		-5.54E+00	1.45E+01
SN-119M	23.87	16.10	7.06E-03	7.06E-03	9.98E-03	3.42E-03
	25.10	22.70	8.28E-03		8.58E-03	4.00E-03
I-125	35.49	6.49	1.27E+00	1.27E+00	7.04E-01	6.22E-01
I-129	29.78	57.00	4.52E-02	4.52E-02	1.96E-01	2.23E-02
	33.60	13.20	5.25E-01		5.18E-01	2.58E-01
	39.58	7.52	1.35E+00		-1.91E-01	6.46E-01
+ BA-133	30.80	* 97.60	3.56E-02	3.56E-02	5.85E-01	1.75E-02
	302.84	* 17.80	2.30E+02		6.94E+02	1.09E+02
	356.01	* 60.00	4.99E+01		5.16E+02	2.38E+01
CE-139	165.85	80.35	5.67E+01	5.67E+01	-1.12E+01	2.63E+01
CE-144	133.54	10.80	3.29E+02	3.29E+02	8.84E+01	1.53E+02
HG-203	279.19	77.30	4.81E+01	4.81E+01	3.47E+00	2.24E+01
PB-210	46.50	4.25	6.38E+00	6.38E+00	2.23E-01	3.00E+00
+ PA-231	9.28	42.00	2.61E-10	2.61E-10	0.00E+00	0.00E+00
	10.11	20.20	2.08E-09		0.00E+00	0.00E+00
	283.67	1.60	1.75E+03		7.32E+02	8.01E+02
	302.67	* 2.30	1.78E+03		5.37E+03	8.45E+02
TH-231	25.64	14.70	1.50E-02	1.50E-02	-9.19E-03	7.26E-03
	84.21	6.40	2.64E+02		2.74E+01	1.28E+02
PA-234M	9.89	89.00	3.36E-10	3.36E-10	0.00E+00	0.00E+00
	21.72	64.90	6.26E-04		1.23E-03	3.03E-04
	37.93	23.75	4.57E-01		4.09E-01	2.21E-01
	131.42	20.40	1.57E+02		-1.01E+01	7.25E+01
+ TH-234	63.29	* 3.80	1.47E+02	1.47E+02	4.99E+02	7.18E+01
NP-237	29.37	14.00	1.60E-01	1.60E-01	6.97E-01	7.91E-02
	86.50	12.60	9.73E+01		-1.74E+02	4.61E+01
U-237	97.08	16.30	1.00E+02	7.34E+01	-2.35E+01	4.70E+01
	101.07	26.30	7.34E+01		1.34E+01	3.44E+01
	114.00	12.30	3.67E+02		2.64E+02	1.77E+02
	208.01	22.00	2.07E+02		-5.49E+01	9.52E+01
AM-241	59.54	35.90	7.07E+00	7.07E+00	4.14E+00	3.41E+00
AM-243	74.67	66.00	8.01E+00	8.01E+00	-9.32E-01	3.76E+00

- + = Nuclide identified during the nuclide identification
* = Energy line found in the spectrum
> = MDA value not calculated
@ = Half-life too short to be able to perform the decay correction

0000081251.CNF

Live Time : 900.000 sec
Real Time : 900.300 sec
Start : 1: 0.6(keV)
Stop : 4096.4095.9(keV)
Acq. Start : Thu May 02 17:07:10 2019



Analysis Report for 1904087-10
BC 24B

GAMMA SPECTRUM ANALYSIS

Sample Identification : 1904087-10
 Sample Description : BC 24B
 Sample Type : RA RECOVERY

 Sample Size : 1.000E+00 units
 Facility : Countroom

 Sample Taken On : 5/2/2019 8:39:34AM
 Acquisition Started : 5/2/2019 5:07:17PM

 Procedure : BAFIL
 Operator : Administrator
 Detector Name : GE2
 Geometry : BAFIL
 Live Time : 900.0 seconds
 Real Time : 900.2 seconds

 Dead Time : 0.03 %

 Peak Locate Threshold : 2.50
 Peak Locate Range (in channels) : 1 - 4096
 Peak Area Range (in channels) : 28 - 4096
 Identification Energy Tolerance : 1.000FWHM

 Energy Calibration Used Done On : 2/17/2018
 Efficiency Calibration Used Done On : 2/24/2018
 Efficiency Calibration Description :

 Sample Number : 81252

PEAK ANALYSIS REPORT

Peak Analysis Performed on : 5/2/2019 5:22:29PM

Peak Analysis From Channel : 1
 Peak Analysis To Channel : 4096

Peak No.	Energy (keV)	ROI start	ROI end	Peak Centroid	Net Peak Area	Net Area Uncertainty	Continuum Counts	FWHM (keV)
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Analysis Report for 1904087-10

BC 24B

Peak No.	Energy (keV)	ROI start	ROI end	Peak Centroid	Net Peak Area	Net Area Uncertainty	Continuum Counts	FWHM (keV)
1	35.84	35 -	39	35.62	4.24E+02	66.17	3.10E+02	2.53
2	53.26	49 -	57	53.04	5.61E+01	40.05	2.14E+02	2.14
3	62.05	58 -	65	61.81	9.23E+01	54.26	4.31E+02	1.19
4	81.52	78 -	84	81.28	8.02E+02	65.44	1.95E+02	1.69
5	112.31	108 -	115	112.06	1.05E+02	41.76	2.22E+02	1.40
6	158.72	149 -	169	158.44	1.28E+02	57.19	2.22E+02	14.51
7	263.12	259 -	268	262.79	2.30E+01	21.02	5.00E+01	1.90
8	276.78	273 -	279	276.45	6.04E+01	23.84	5.92E+01	1.89
M	9	299 -	323	302.98	1.53E+02	27.74	3.89E+01	1.51
m	10	299 -	323	307.01	2.21E+01	20.47	4.10E+01	1.86
M	11	330 -	341	333.99	5.78E+01	19.04	2.54E+01	1.57
m	12	330 -	341	337.95	2.16E+01	13.51	1.71E+01	1.57
13	356.48	352 -	360	356.11	5.31E+02	49.42	4.73E+01	1.50
M	14	380 -	395	383.93	1.12E+02	23.95	1.17E+01	1.62
m	15	380 -	395	387.05	1.36E+02	27.74	1.68E+01	1.63
m	16	380 -	395	391.09	2.81E+01	14.47	1.94E+01	1.63
M	17	411 -	429	415.18	2.65E+01	15.52	9.19E+00	2.20
m	18	411 -	429	418.30	1.71E+01	15.90	1.13E+01	2.21
19	437.42	433 -	441	437.01	8.20E+01	18.87	3.98E+00	1.50
20	457.62	454 -	460	457.20	9.50E+00	7.50	3.00E+00	4.39
21	468.05	464 -	470	467.63	1.50E+01	11.70	1.40E+01	1.27
22	637.51	634 -	639	637.00	6.00E+00	4.90	0.00E+00	2.88
23	837.12	833 -	839	836.50	8.00E+00	5.66	0.00E+00	2.98
24	851.63	848 -	853	851.00	5.00E+00	4.47	0.00E+00	1.50

M = First peak in a multiplet region
m = Other peak in a multiplet region
F = Fitted singlet
Errors quoted at 2.000sigma

BACKGROUND SUBTRACT REPORT

Peak Analysis Performed on : 5/2/2019 5:22:29PM

Env. Background File : \\OR-GAMMA1\ApexRoot\Countroom\Data\0000080015.CNF

Peak No.	Energy (keV)	Original Area	Orig. Area Uncertainty	Ambient Background	Backgr. Uncert.	Subtracted Area	Subtracted Uncert.
1	35.84	4.24E+02	66.17			4.24E+02	6.62E+01
2	53.26	5.61E+01	40.05			5.61E+01	4.00E+01
3	62.05	9.23E+01	54.26			9.23E+01	5.43E+01
4	81.52	8.02E+02	65.44			8.02E+02	6.54E+01
5	112.31	1.05E+02	41.76	8.57E-01	1.81E+00	1.04E+02	4.18E+01

0244

Analysis Report for 1904087-10

BC 24B

Peak No.	Energy (keV)	Original Area	Orig. Area Uncertainty	Ambient Background	Backgr. Uncert.	Subtracted Area	Subtracted Uncert.
	6	158.72	1.28E+02	57.19		1.28E+02	5.72E+01
	7	263.12	2.30E+01	21.02		2.30E+01	2.10E+01
	8	276.78	6.04E+01	23.84		6.04E+01	2.38E+01
M	9	303.33	1.53E+02	27.74		1.53E+02	2.77E+01
m	10	307.36	2.21E+01	20.47		2.21E+01	2.05E+01
M	11	334.35	5.78E+01	19.04		5.78E+01	1.90E+01
m	12	338.31	2.16E+01	13.51	7.39E-01 1.27E+00	2.08E+01	1.36E+01
	13	356.48	5.31E+02	49.42		5.31E+02	4.94E+01
M	14	384.31	1.12E+02	23.95		1.12E+02	2.39E+01
m	15	387.43	1.36E+02	27.74		1.36E+02	2.77E+01
m	16	391.48	2.81E+01	14.47		2.81E+01	1.45E+01
M	17	415.58	2.65E+01	15.52		2.65E+01	1.55E+01
m	18	418.70	1.71E+01	15.90		1.71E+01	1.59E+01
	19	437.42	8.20E+01	18.87		8.20E+01	1.89E+01
	20	457.62	9.50E+00	7.50		9.50E+00	7.50E+00
	21	468.05	1.50E+01	11.70		1.50E+01	1.17E+01
	22	637.51	6.00E+00	4.90		6.00E+00	4.90E+00
	23	837.12	8.00E+00	5.66		8.00E+00	5.66E+00
	24	851.63	5.00E+00	4.47		5.00E+00	4.47E+00

M = First peak in a multiplet region
 m = Other peak in a multiplet region
 F = Fitted singlet
 Errors quoted at 2.000sigma

NUCLIDE IDENTIFICATION REPORT

Nuclide Library Used : \\OR-GAMMA1\ApexRoot\Countroom\Library\WSRC.NLB

IDENTIFIED NUCLIDES

Nuclide Name	Id Confidence	Energy (keV)	Yield(%)	Activity (pCi/units)	Activity Uncertainty
SN-113	0.96	255.12	1.93		
		391.69 *	61.90	1.72E+01	8.98E+00
I-125	0.99	35.49 *	6.49	1.66E+01	2.58E+00
PA-231	1.00	9.28	42.00		
		10.11	20.20		
		283.67	1.60		
		302.67 *	2.30	4.50E+03	1.59E+03

Analysis Report for 1904087-10

BC 24B

* = Energy line found in the spectrum.
 - = Manually added nuclide.
 ? = Manually edited nuclide.
 @ = Energy line not used for Weighted Mean Activity
 Energy Tolerance : 2.000FWHM
 Nuclide confidence index threshold = 0.30
 Errors quoted at 2.000sigma

INTERFERENCE CORRECTED REPORT

<i>Nuclide Name</i>	<i>Nuclide Id Confidence</i>	<i>Wt mean Activity (pCi/units)</i>	<i>Wt mean Activity Uncertainty</i>	<i>Comments</i>
SN-113	0.966	1.72E+01	8.98E+00	
I-125	0.997	1.66E+01	2.58E+00	
PA-231	1.000	4.50E+03	1.59E+03	

? = nuclide is part of an undetermined solution
 X = nuclide rejected by the interference analysis
 @ = nuclide contains energy lines not used in Weighted Mean Activity

Errors quoted at 2.000sigma

Analysis Report for 1904087-10

BC 24B

UNIDENTIFIED PEAKS

Peak Locate Performed on : 5/2/2019 5:22:29PM
 Peak Locate From Channel : 1
 Peak Locate To Channel : 4096

Peak No.	Energy (keV)	Peak Size (CPS)	Peak CPS (%) Uncertainty	Peak Type	Tolerance Nuclide
2	53.26	6.22870E-02	35.72		
3	62.05	1.02532E-01	29.40	Tol.	TH-234
4	81.52	8.90570E-01	4.08		
5	112.31	1.15701E-01	20.07	Tol.	U-237
6	158.72	1.42169E-01	22.35		
7	263.12	2.55556E-02	45.70		
8	276.78	6.70926E-02	19.74		
m 10	307.36	2.45558E-02	46.31		
M 11	334.35	6.42690E-02	16.46		
m 12	338.31	2.31456E-02	32.57	Sum	
13	356.48	5.90370E-01	4.65	Tol.	BA-133
M 14	384.31	1.24942E-01	10.65		
m 15	387.43	1.51093E-01	10.20		
M 17	415.58	2.94561E-02	29.26		
m 18	418.70	1.89635E-02	46.58		
19	437.42	9.11243E-02	11.51		
20	457.62	1.05556E-02	39.47		
21	468.05	1.66667E-02	39.02		
22	637.51	6.66667E-03	40.82		
23	837.12	8.88889E-03	35.36		
24	851.63	5.55556E-03	44.72		

M = First peak in a multiplet region
 m = Other peak in a multiplet region
 F = Fitted singlet
 Errors quoted at 2.000sigma

NUCLIDE MDA REPORT

Nuclide Library Used : \\OR-GAMMA1\ApexRoot\Countroom\Library\WSRC.NLB

0247

Analysis Report for 1904087-10

BC 24B

Nuclide Name	Energy (keV)	Yield(%)	Line MDA (pCi/units)	Nuclide MDA (pCi/units)	Activity (pCi/units)	Dec. Level (pCi/units)
FE-55	5.89	24.50	1.20E-10	1.20E-10	0.00E+00	0.00E+00
CO-57	122.06	85.51	2.76E+01	2.76E+01	4.03E+00	1.29E+01
	136.48	10.60	2.62E+02		-1.11E+02	1.22E+02
NI-59	6.92	29.80	9.43E-10	9.43E-10	0.00E+00	0.00E+00
MO-93	16.59	52.90	1.78E-05	1.78E-05	0.00E+00	0.00E+00
	18.60	10.00	2.91E-04		0.00E+00	0.00E+00
NB-93M	16.57	9.43	9.85E-05	9.85E-05	0.00E+00	0.00E+00
CD-109	88.03	3.72	2.74E+02	2.74E+02	3.87E+01	1.28E+02
+ SN-113	255.12	1.93	1.28E+03	2.24E+01	6.37E+02	5.79E+02
	391.69	* 61.90	2.24E+01		1.72E+01	1.04E+01
SN-119M	23.87	16.10	1.78E-03	1.78E-03	0.00E+00	0.00E+00
	25.10	22.70	1.93E-03		0.00E+00	0.00E+00
+ I-125	35.49	* 6.49	7.24E+00	7.24E+00	1.66E+01	3.57E+00
I-129	29.78	57.00	2.04E-01	2.04E-01	7.99E-01	1.01E-01
	33.60	13.20	1.55E+00		-3.11E+00	7.57E-01
	39.58	7.52	1.94E+00		-1.93E+00	8.79E-01
BA-133	30.80	97.60	1.83E-01	1.83E-01	1.64E+00	9.03E-02
	302.84	17.80	2.41E+02		5.70E+02	1.15E+02
	356.01	60.00	8.96E+01		4.19E+02	4.37E+01
CE-139	165.85	80.35	4.41E+01	4.41E+01	1.66E+01	2.05E+01
CE-144	133.54	10.80	2.47E+02	2.47E+02	-7.89E+01	1.14E+02
HG-203	279.19	77.30	3.63E+01	3.63E+01	-2.00E+00	1.68E+01
PB-210	46.50	4.25	7.97E+00	7.97E+00	-1.48E+00	3.55E+00
+ PA-231	9.28	42.00	3.13E-08	3.13E-08	0.00E+00	0.00E+00
	10.11	20.20	1.87E-07		0.00E+00	0.00E+00
	283.67	1.60	1.24E+03		9.41E+01	5.58E+02
	302.67	* 2.30	2.46E+03		4.50E+03	1.19E+03
TH-231	25.64	14.70	3.57E-03	3.57E-03	0.00E+00	0.00E+00
	84.21	6.40	3.07E+02		2.42E+01	1.49E+02
PA-234M	9.89	89.00	3.24E-08	3.24E-08	0.00E+00	0.00E+00
	21.72	64.90	1.91E-04		0.00E+00	0.00E+00
	37.93	23.75	6.26E-01		-1.34E+00	2.92E-01
	131.42	20.40	1.29E+02		4.75E+01	6.00E+01
TH-234	63.29	3.80	1.41E+02	1.41E+02	7.64E+01	6.82E+01
NP-237	29.37	14.00	2.78E-01	2.78E-01	-5.94E+00	1.34E-01
	86.50	12.60	7.34E+01		-3.08E+01	3.41E+01
U-237	97.08	16.30	8.18E+01	5.53E+01	-5.91E+00	3.79E+01
	101.07	26.30	5.53E+01		-1.81E+00	2.56E+01
	114.00	12.30	2.94E+02		3.09E+02	1.41E+02
	208.01	22.00	1.55E+02		-9.30E+01	7.11E+01
AM-241	59.54	35.90	7.17E+00	7.17E+00	-3.41E+01	3.39E+00
AM-243	74.67	66.00	8.02E+00	8.02E+00	-9.71E+00	3.72E+00

+ = Nuclide identified during the nuclide identification

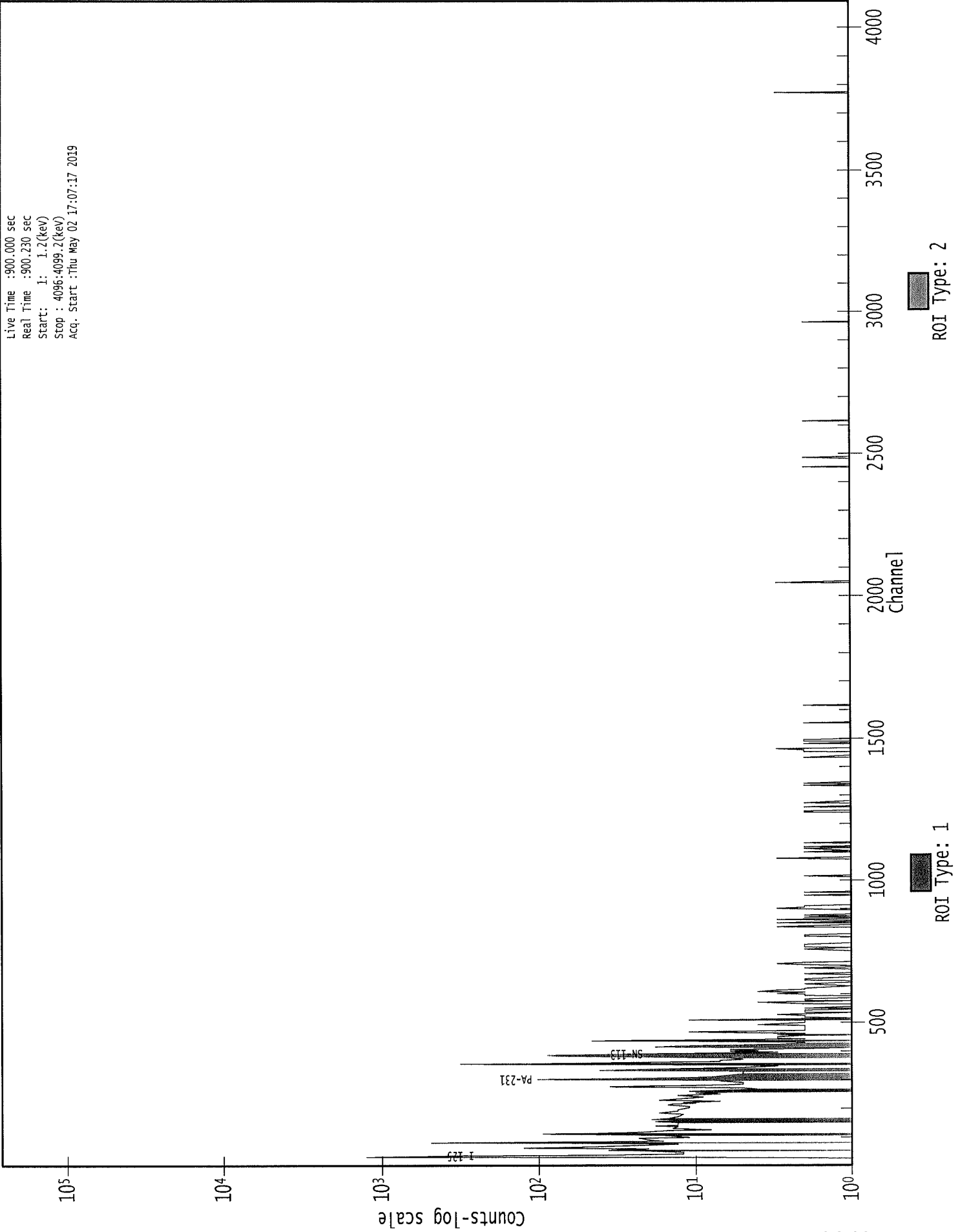
* = Energy line found in the spectrum

> = MDA value not calculated

@ = Half-life too short to be able to perform the decay correction

0000081252.CNF

Live Time :900.000 sec
Real Time :900.230 sec
Start: 1: 1.2(keV)
Stop : 4096:4099.2(keV)
Acq. Start :Thu May 02 17:07:17 2019



Analysis Report for 1904087-11
BC 21B

GAMMA SPECTRUM ANALYSIS

Sample Identification : 1904087-11
 Sample Description : BC 21B
 Sample Type : RA RECOVERY

 Sample Size : 1.000E+00 units
 Facility : Countroom

 Sample Taken On : 5/2/2019 8:39:43AM
 Acquisition Started : 5/2/2019 5:07:24PM

 Procedure : BAFIL
 Operator : Administrator
 Detector Name : GE3
 Geometry : BAFIL
 Live Time : 900.0 seconds
 Real Time : 902.3 seconds

 Dead Time : 0.26 %

 Peak Locate Threshold : 2.50
 Peak Locate Range (in channels) : 1 - 4096
 Peak Area Range (in channels) : 9 - 4096
 Identification Energy Tolerance : 1.000FWHM

 Energy Calibration Used Done On : 7/21/2018
 Efficiency Calibration Used Done On : 7/21/2018
 Efficiency Calibration Description :

 Sample Number : 81253

PEAK ANALYSIS REPORT

Peak Analysis Performed on : 5/2/2019 5:22:41PM
 Peak Analysis From Channel : 1
 Peak Analysis To Channel : 4096

Peak No.	Energy (keV)	ROI start	ROI end	Peak Centroid	Net Peak Area	Net Area Uncertainty	Continuum Counts	FWHM (keV)
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Analysis Report for 1904087-11

BC 21B

	Peak No.	Energy (keV)	ROI start	ROI end	Peak Centroid	Net Peak Area	Net Area Uncertainty	Continuum Counts	FWHM (keV)
M	1	20.90	18 -	40	21.27	1.35E+02	39.97	1.76E+02	2.38
m	2	30.98	18 -	40	31.35	2.42E+03	104.38	1.66E+02	1.84
m	3	35.22	18 -	40	35.58	5.51E+02	84.37	1.76E+02	2.10
M	4	53.20	49 -	74	53.55	7.65E+01	44.00	2.05E+02	3.28
m	5	61.84	49 -	74	62.19	3.31E+02	45.74	1.31E+02	2.06
m	6	66.11	49 -	74	66.45	1.76E+02	55.13	2.08E+02	2.87
	7	81.06	75 -	92	81.40	8.65E+02	99.32	6.11E+02	2.13
	8	112.31	107 -	118	112.64	2.41E+02	62.77	3.73E+02	2.14
	9	161.08	158 -	165	161.39	3.94E+01	35.55	1.77E+02	2.24
M	10	271.55	270 -	281	271.81	9.86E+00	11.49	2.83E+01	3.96
m	11	276.41	270 -	281	276.66	7.13E+01	24.24	5.26E+01	2.32
M	12	302.83	298 -	317	303.08	1.71E+02	32.26	7.06E+01	2.22
m	13	306.75	298 -	317	307.00	4.16E+01	32.98	6.22E+01	2.53
	14	323.03	319 -	326	323.27	1.75E+01	19.49	5.10E+01	1.34
M	15	333.60	330 -	341	333.83	7.09E+01	23.92	5.60E+01	2.46
m	16	338.05	330 -	341	338.28	2.11E+01	25.53	6.40E+01	2.78
	17	356.05	351 -	361	356.27	5.47E+02	50.18	4.44E+01	2.06
	18	376.30	373 -	379	376.52	1.48E+01	15.17	3.04E+01	2.38
M	19	384.16	380 -	394	384.38	1.34E+02	37.85	2.16E+01	2.84
m	20	387.06	380 -	394	387.28	1.88E+02	35.61	1.13E+01	1.93
m	21	391.13	380 -	394	391.34	5.58E+01	24.10	7.98E+00	2.37
M	22	415.36	410 -	426	415.56	5.13E+01	22.38	2.75E+01	3.20
m	23	418.51	410 -	426	418.71	2.61E+01	21.94	1.87E+01	3.12
m	24	422.59	410 -	426	422.78	1.31E+01	16.89	1.17E+01	3.16
	25	428.72	427 -	431	428.92	1.01E+01	7.09	1.82E+00	3.04
	26	437.17	433 -	441	437.36	9.55E+01	20.99	9.00E+00	2.60
	27	468.86	463 -	474	469.04	2.50E+01	17.09	2.40E+01	1.35
	28	533.46	531 -	536	533.62	5.36E+00	6.08	3.29E+00	1.24
	29	893.97	890 -	896	894.00	5.00E+00	4.47	0.00E+00	2.98
	30	942.98	940 -	945	943.00	7.00E+00	5.29	0.00E+00	2.50

M = First peak in a multiplet region

m = Other peak in a multiplet region

F = Fitted singlet

Errors quoted at 2.000sigma

BACKGROUND SUBTRACT REPORT

Peak Analysis Performed on : 5/2/2019 5:22:41PM

Env. Background File : \\OR-GAMMA1\ApexRoot\Countroom\Data\0000080016.CNF

0251

Analysis Report for 1904087-11

BC 21B

	Peak No.	Energy (keV)	Original Area	Orig. Area Uncertainty	Ambient Background	Backgr. Uncert.	Subtracted Area	Subtracted Uncert.
M	1	20.90	1.35E+02	39.97			1.35E+02	4.00E+01
m	2	30.98	2.42E+03	104.38			2.42E+03	1.04E+02
m	3	35.22	5.51E+02	84.37			5.51E+02	8.44E+01
M	4	53.20	7.65E+01	44.00			7.65E+01	4.40E+01
m	5	61.84	3.31E+02	45.74	1.56E+01	2.88E+00	3.16E+02	4.58E+01
m	6	66.11	1.76E+02	55.13			1.76E+02	5.51E+01
	7	81.06	8.65E+02	99.32			8.65E+02	9.93E+01
	8	112.31	2.41E+02	62.77			2.41E+02	6.28E+01
	9	161.08	3.94E+01	35.55			3.94E+01	3.56E+01
M	10	271.55	9.86E+00	11.49			9.86E+00	1.15E+01
m	11	276.41	7.13E+01	24.24			7.13E+01	2.42E+01
M	12	302.83	1.71E+02	32.26			1.71E+02	3.23E+01
m	13	306.75	4.16E+01	32.98			4.16E+01	3.30E+01
	14	323.03	1.75E+01	19.49			1.75E+01	1.95E+01
M	15	333.60	7.09E+01	23.92			7.09E+01	2.39E+01
m	16	338.05	2.11E+01	25.53			2.11E+01	2.55E+01
	17	356.05	5.47E+02	50.18			5.47E+02	5.02E+01
	18	376.30	1.48E+01	15.17			1.48E+01	1.52E+01
M	19	384.16	1.34E+02	37.85			1.34E+02	3.79E+01
m	20	387.06	1.88E+02	35.61			1.88E+02	3.56E+01
m	21	391.13	5.58E+01	24.10			5.58E+01	2.41E+01
M	22	415.36	5.13E+01	22.38			5.13E+01	2.24E+01
m	23	418.51	2.61E+01	21.94			2.61E+01	2.19E+01
m	24	422.59	1.31E+01	16.89			1.31E+01	1.69E+01
	25	428.72	1.01E+01	7.09			1.01E+01	7.09E+00
	26	437.17	9.55E+01	20.99			9.55E+01	2.10E+01
	27	468.86	2.50E+01	17.09			2.50E+01	1.71E+01
	28	533.46	5.36E+00	6.08			5.36E+00	6.08E+00
	29	893.97	5.00E+00	4.47			5.00E+00	4.47E+00
	30	942.98	7.00E+00	5.29			7.00E+00	5.29E+00

M = First peak in a multiplet region

m = Other peak in a multiplet region

F = Fitted singlet

Errors quoted at 2.000sigma

NUCLIDE IDENTIFICATION REPORT

Nuclide Library Used : \\OR-GAMMA1\ApexRoot\Countroom\Library\WSRC.NLB

IDENTIFIED NUCLIDES

Analysis Report for 1904087-11

BC 21B

Nuclide Name	Id Confidence	Energy (keV)	Yield(%)	Activity (pCi/units)	Activity Uncertainty
SN-113	0.95	255.12	1.93		
		391.69 *	61.90	3.90E+01	1.72E+01
I-125	0.99	35.49 *	6.49	2.56E+01	3.92E+00
BA-133	1.00	30.80 *	97.60	3.23E+00	1.39E-01
		302.84 *	17.80	6.42E+02	2.63E+02
		356.01 *	60.00	4.75E+02	6.95E+01
TH-234	0.96	63.29 *	3.80	4.94E+02	7.36E+01

* = Energy line found in the spectrum.

- = Manually added nuclide.

? = Manually edited nuclide.

@ = Energy line not used for Weighted Mean Activity

Energy Tolerance : 2.000FWHM

Nuclide confidence index threshold = 0.30

Errors quoted at 2.000sigma

INTERFERENCE CORRECTED REPORT

Nuclide Name	Nuclide Id Confidence	Wt mean Activity (pCi/units)	Wt mean Activity Uncertainty	Comments
SN-113	0.959	3.90E+01	1.72E+01	
I-125	0.999	2.56E+01	3.92E+00	
X I-129	0.903			
BA-133	1.000	3.23E+00	1.39E-01	
TH-234	0.963	4.94E+02	7.36E+01	
X NP-237	0.886			

? = nuclide is part of an undetermined solution

X = nuclide rejected by the interference analysis

@ = nuclide contains energy lines not used in Weighted Mean Activity

Errors quoted at 2.000sigma

Analysis Report for 1904087-11

BC 21B

UNIDENTIFIED PEAKS

Peak Locate Performed on : 5/2/2019 5:22:41PM
 Peak Locate From Channel : 1
 Peak Locate To Channel : 4096

<i>Peak No.</i>	<i>Energy (keV)</i>	<i>Peak Size (CPS)</i>	<i>Peak CPS (%) Uncertainty</i>	<i>Peak Type</i>	<i>Tolerance Nuclide</i>	
M	1	20.90	1.50089E-01	14.80	Tol.	PA-234M
M	4	53.20	8.50271E-02	28.75		
m	6	66.11	1.95797E-01	15.64	Sum	
	7	81.06	9.60802E-01	5.74		
	8	112.31	2.67390E-01	13.04		
	9	161.08	4.37587E-02	45.14		
M	10	271.55	1.09600E-02	58.24		
m	11	276.41	7.92579E-02	16.99		
m	13	306.75	4.62694E-02	39.60		
	14	323.03	1.94315E-02	55.73		
M	15	333.60	7.87556E-02	16.87	Sum	
m	16	338.05	2.34845E-02	60.40	Sum	
	18	376.30	1.64444E-02	51.26		
M	19	384.16	1.48917E-01	14.12		
m	20	387.06	2.09226E-01	9.46	Sum	
M	22	415.36	5.69928E-02	21.82		
m	23	418.51	2.89881E-02	42.04	Sum	
m	24	422.59	1.45673E-02	64.41	Sum	
	25	428.72	1.12121E-02	35.12		
	26	437.17	1.06111E-01	10.99		
	27	468.86	2.77778E-02	34.18		
	28	533.46	5.95238E-03	56.77		
	29	893.97	5.55556E-03	44.72		
	30	942.98	7.77778E-03	37.80		

M = First peak in a multiplet region
 m = Other peak in a multiplet region
 F = Fitted singlet
 Errors quoted at 2.000sigma

Analysis Report for 1904087-11

BC 21B

NUCLIDE MDA REPORT

Nuclide Library Used : \\OR-GAMMA1\ApexRoot\Countroom\Library\WSRC.NLB

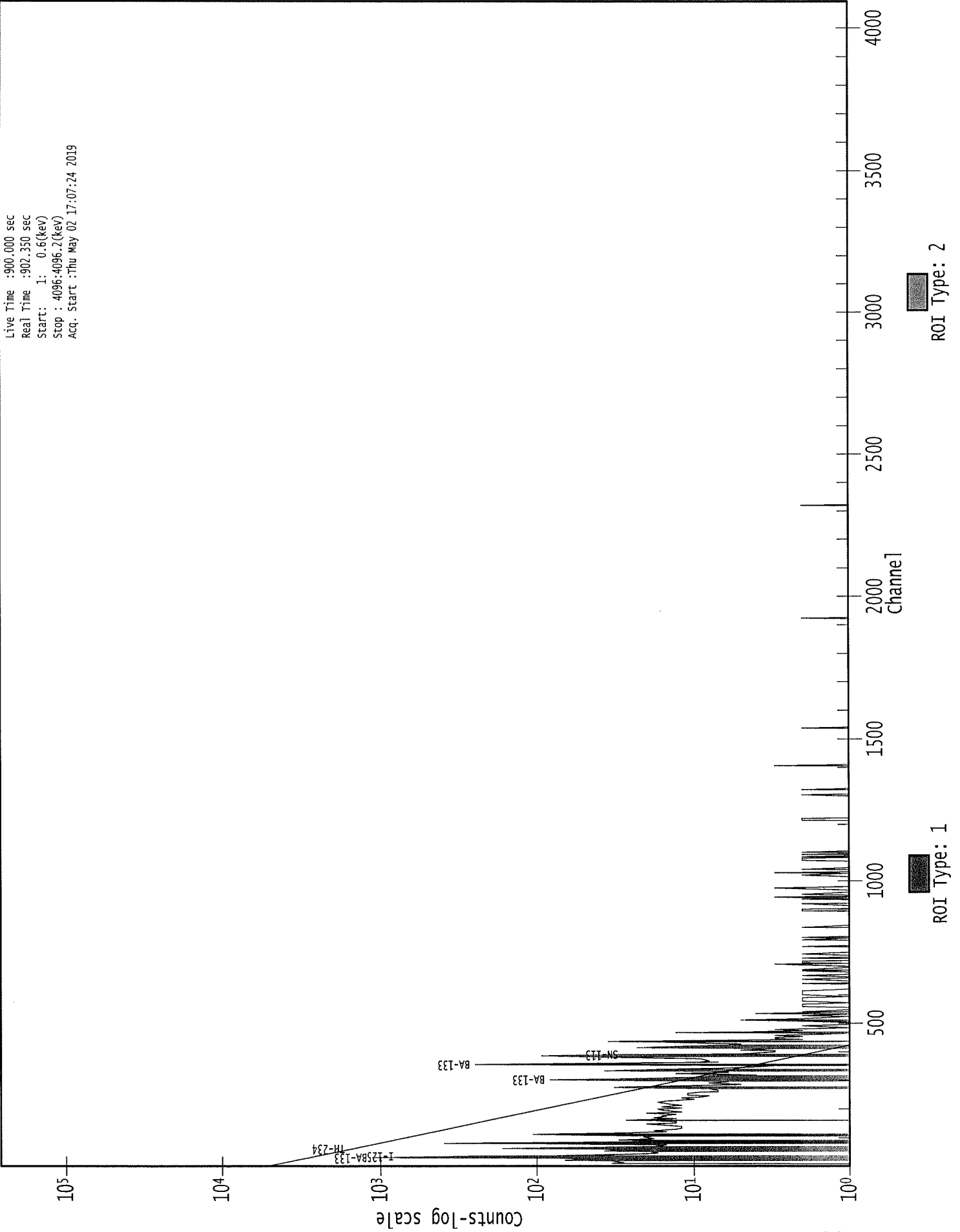
Nuclide Name	Energy (keV)	Yield(%)	Line MDA (pCi/units)	Nuclide MDA (pCi/units)	Activity (pCi/units)	Dec. Level (pCi/units)
FE-55	5.89	24.50	4.26E-09	4.26E-09	-1.74E-08	1.35E-09
CO-57	122.06	85.51	2.80E+01	2.80E+01	-4.05E+00	1.32E+01
	136.48	10.60	2.37E+02		-9.41E+01	1.11E+02
NI-59	6.92	29.80	9.72E-08	9.72E-08	-1.67E-09	4.39E-08
MO-93	16.59	52.90	1.12E-03	1.12E-03	1.52E-04	5.35E-04
	18.60	10.00	1.95E-02		1.29E-03	9.40E-03
NB-93M	16.57	9.43	6.21E-03	6.21E-03	8.43E-04	2.97E-03
CD-109	88.03	3.72	2.98E+02	2.98E+02	-6.52E+02	1.41E+02
+ SN-113	255.12	1.93	1.35E+03	1.97E+01	3.60E+02	6.18E+02
	391.69	*	61.90	1.97E+01	3.90E+01	8.92E+00
SN-119M	23.87	16.10	9.17E-02	9.15E-02	-1.32E-01	4.42E-02
	25.10	22.70	9.15E-02		-8.63E-01	4.40E-02
+ I-125	35.49	*	6.49	6.80E+00	2.56E+01	3.34E+00
I-129	29.78	*	57.00	3.34E-01	5.52E+00	1.64E-01
	33.60	*	13.20	3.33E+00	1.25E+01	1.63E+00
	39.58	*	7.52	5.31E+00	7.86E-02	2.54E+00
+ BA-133	30.80	*	97.60	1.95E-01	3.23E+00	9.58E-02
	302.84	*	17.80	2.90E+02	6.42E+02	1.40E+02
	356.01	*	60.00	2.83E+01	4.75E+02	1.30E+01
CE-139	165.85	80.35	4.22E+01	4.22E+01	8.86E+00	1.98E+01
CE-144	133.54	10.80	2.27E+02	2.27E+02	1.57E+00	1.06E+02
HG-203	279.19	77.30	4.63E+01	4.63E+01	4.91E+01	2.19E+01
PB-210	46.50	4.25	1.70E+01	1.70E+01	2.17E+00	8.04E+00
PA-231	9.28	42.00	3.78E-06	3.78E-06	3.95E-06	1.79E-06
	10.11	20.20	1.99E-05		2.08E-05	9.43E-06
	283.67	1.60	1.35E+03		8.09E+01	6.12E+02
	302.67	2.30	2.00E+03		3.33E+03	9.63E+02
TH-231	25.64	14.70	1.68E-01	1.68E-01	-5.17E+00	8.09E-02
	84.21	6.40	3.33E+02		8.79E+02	1.62E+02
PA-234M	9.89	89.00	3.56E-06	3.56E-06	3.73E-06	1.69E-06
	21.72	64.90	1.11E-02		1.54E-02	5.34E-03
	37.93	23.75	2.36E+00		8.03E+00	1.15E+00
	131.42	20.40	1.22E+02		1.23E+01	5.74E+01
+ TH-234	63.29	*	3.80	2.31E+02	4.94E+02	1.13E+02
NP-237	29.37	*	14.00	1.36E+00	2.25E+01	6.68E-01
	86.50	12.60	8.55E+01		-8.19E+02	4.05E+01
U-237	97.08	16.30	9.25E+01	6.64E+01	-4.00E+01	4.37E+01
	101.07	26.30	6.64E+01		5.03E+00	3.15E+01
	114.00	12.30	3.21E+02		7.67E+02	1.55E+02
	208.01	22.00	1.75E+02		-1.55E+01	8.20E+01
AM-241	59.54	35.90	1.37E+01	1.37E+01	3.16E+01	6.65E+00
AM-243	74.67	66.00	9.57E+00	9.57E+00	-3.37E+01	4.53E+00

Analysis Report for 1904087-11

BC 21B

- + = Nuclide identified during the nuclide identification
 - * = Energy line found in the spectrum
 - > = MDA value not calculated
 - @ = Half-life too short to be able to perform the decay correction
-

Live Time :900.000 sec
Real Time :902.350 sec
Start: 1: 0.6(keV)
Stop : 4096:4096.2(keV)
Acq. Start :Thu May 02 17:07:24 2019



Analysis Report for 1904087-12
BC 21A

GAMMA SPECTRUM ANALYSIS

Sample Identification : 1904087-12
 Sample Description : BC 21A
 Sample Type : RA RECOVERY

 Sample Size : 1.000E+00 units
 Facility : Countroom

 Sample Taken On : 5/2/2019 8:39:53AM
 Acquisition Started : 5/2/2019 5:07:33PM

 Procedure : BAFIL
 Operator : Administrator
 Detector Name : GE4
 Geometry : BAFIL
 Live Time : 900.0 seconds
 Real Time : 915.8 seconds

 Dead Time : 1.73 %

 Peak Locate Threshold : 2.50
 Peak Locate Range (in channels) : 1 - 4096
 Peak Area Range (in channels) : 9 - 4096
 Identification Energy Tolerance : 1.000FWHM

 Energy Calibration Used Done On : 2/24/2018
 Efficiency Calibration Used Done On : 11/9/2014
 Efficiency Calibration Description :

 Sample Number : 81254

PEAK ANALYSIS REPORT

Peak Analysis Performed on : 5/2/2019 5:22:54PM
 Peak Analysis From Channel : 1
 Peak Analysis To Channel : 4096

Peak No.	Energy (keV)	ROI start	ROI end	Peak Centroid	Net Peak Area	Net Area Uncertainty	Continuum Counts	FWHM (keV)
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Analysis Report for 1904087-12

BC 21A

	Peak No.	Energy (keV)	ROI start	ROI end	Peak Centroid	Net Peak Area	Net Area Uncertainty	Continuum Counts	FWHM (keV)
	1	20.74	14 -	23	19.80	1.01E+02	58.11	4.24E+02	2.07
M	2	30.94	24 -	38	29.99	2.31E+03	105.53	2.35E+02	2.26
m	3	35.14	24 -	38	34.21	5.01E+02	74.56	1.89E+02	2.03
M	4	61.71	48 -	71	60.79	2.43E+02	46.03	2.03E+02	2.31
m	5	65.87	48 -	71	64.95	1.12E+02	47.15	2.26E+02	2.32
	6	81.07	76 -	85	80.16	9.40E+02	74.09	2.52E+02	2.15
M	7	111.81	104 -	122	110.93	2.00E+02	40.64	1.36E+02	2.58
m	8	116.33	104 -	122	115.45	6.83E+01	34.12	1.19E+02	2.45
	9	160.48	156 -	163	159.64	5.53E+01	31.05	1.23E+02	2.39
	10	276.75	271 -	278	276.01	5.80E+01	25.38	7.01E+01	2.87
M	11	302.95	298 -	309	302.23	1.24E+02	25.88	2.52E+01	2.28
m	12	307.59	298 -	309	306.87	2.44E+01	14.66	1.33E+01	2.13
	13	339.39	337 -	341	338.69	1.57E+01	17.13	4.67E+01	2.71
	14	356.14	351 -	361	355.47	4.56E+02	44.60	2.20E+01	2.27
M	15	380.66	379 -	395	380.00	1.36E+01	2.12	1.00E+00	2.35
m	16	385.91	379 -	395	385.26	2.43E+02	34.81	1.20E+01	4.16
	17	415.10	410 -	421	414.47	2.64E+01	25.22	6.72E+01	2.41
	18	437.01	431 -	439	436.40	8.32E+01	20.61	1.55E+01	2.34

M = First peak in a multiplet region

m = Other peak in a multiplet region

F = Fitted singlet

Errors quoted at 2.000sigma

BACKGROUND SUBTRACT REPORT

Peak Analysis Performed on : 5/2/2019 5:22:54PM

Env. Background File : \\OR-GAMMA1\ApexRoot\Countroom\Data\0000080017.CNF

	Peak No.	Energy (keV)	Original Area	Orig. Area Uncertainty	Ambient Background	Backgr. Uncert.	Subtracted Area	Subtracted Uncert.
	1	20.74	1.01E+02	58.11			1.01E+02	5.81E+01
M	2	30.94	2.31E+03	105.53			2.31E+03	1.06E+02
m	3	35.14	5.01E+02	74.56			5.01E+02	7.46E+01
M	4	61.71	2.43E+02	46.03	1.28E+01	1.96E+00	2.30E+02	4.61E+01
m	5	65.87	1.12E+02	47.15			1.12E+02	4.71E+01
	6	81.07	9.40E+02	74.09			9.40E+02	7.41E+01
M	7	111.81	2.00E+02	40.64			2.00E+02	4.06E+01
m	8	116.33	6.83E+01	34.12			6.83E+01	3.41E+01
	9	160.48	5.53E+01	31.05			5.53E+01	3.10E+01
	10	276.75	5.80E+01	25.38			5.80E+01	2.54E+01
M	11	302.95	1.24E+02	25.88			1.24E+02	2.59E+01

0259

Analysis Report for 1904087-12

BC 21A

	Peak No.	Energy (keV)	Original Area	Orig. Area Uncertainty	Ambient Background	Backgr. Uncert.	Subtracted Area	Subtracted Uncert.
m	12	307.59	2.44E+01	14.66			2.44E+01	1.47E+01
	13	339.39	1.57E+01	17.13			1.57E+01	1.71E+01
	14	356.14	4.56E+02	44.60			4.56E+02	4.46E+01
M	15	380.66	1.36E+01	2.12	0.00E+00	0.00E+00	1.36E+01	2.12E+00
m	16	385.91	2.43E+02	34.81			2.43E+02	3.48E+01
	17	415.10	2.64E+01	25.22			2.64E+01	2.52E+01
	18	437.01	8.32E+01	20.61			8.32E+01	2.06E+01

M = First peak in a multiplet region
m = Other peak in a multiplet region
F = Fitted singlet
Errors quoted at 2.000sigma

NUCLIDE IDENTIFICATION REPORT

Nuclide Library Used : \\OR-GAMMA1\ApexRoot\Countroom\Library\WSRC.NLB

IDENTIFIED NUCLIDES

Nuclide Name	Id Confidence	Energy (keV)	Yield(%)	Activity (pCi/units)	Activity Uncertainty
I-125	0.99	35.49 *	6.49	4.46E+02	6.72E+01
BA-133	1.00	30.80 *	97.60	1.05E+02	5.17E+00
		302.84 *	17.80	6.09E+02	2.27E+02
		356.01 *	60.00	7.16E+02	1.17E+02
TH-234	0.95	63.29 *	3.80	9.77E+02	2.07E+02

* = Energy line found in the spectrum.
- = Manually added nuclide.
? = Manually edited nuclide.
@ = Energy line not used for Weighted Mean Activity
Energy Tolerance : 2.000FWHM
Nuclide confidence index threshold = 0.30
Errors quoted at 2.000sigma

Analysis Report for 1904087-12

BC 21A

INTERFERENCE CORRECTED REPORT

	Nuclide Name	Nuclide Id Confidence	Wt mean Activity (pCi/units)	Wt mean Activity Uncertainty	Comments
	I-125	0.998	4.46E+02	6.72E+01	
X	I-129	0.853			
	BA-133	1.000	1.06E+02	5.16E+00	
	TH-234	0.953	9.77E+02	2.07E+02	
X	NP-237	0.565			

- ? = nuclide is part of an undetermined solution
X = nuclide rejected by the interference analysis
@ = nuclide contains energy lines not used in Weighted Mean Activity

Errors quoted at 2.00sigma

Analysis Report for 1904087-12

BC 21A

UNIDENTIFIED PEAKS

Peak Locate Performed on : 5/2/2019 5:22:54PM
 Peak Locate From Channel : 1
 Peak Locate To Channel : 4096

Peak No.	Energy (keV)	Peak Size (CPS)	Peak CPS (%) Uncertainty	Peak Type	Tolerance Nuclide	
	1	20.74	1.12428E-01	28.72	Tol.	PA-234M
m	5	65.87	1.24058E-01	21.11	Sum	
	6	81.07	1.04453E+00	3.94		
M	7	111.81	2.21723E-01	10.18		
m	8	116.33	7.59245E-02	24.97		
	9	160.48	6.13960E-02	28.09		
	10	276.75	6.43907E-02	21.90		
m	12	307.59	2.71378E-02	30.02		
	13	339.39	1.73932E-02	54.72	Sum	
M	15	380.66	1.51640E-02	7.77		
m	16	385.91	2.70355E-01	7.15	Sum	
	17	415.10	2.93519E-02	47.73		
	18	437.01	9.24847E-02	12.38		

M = First peak in a multiplet region
 m = Other peak in a multiplet region
 F = Fitted singlet
 Errors quoted at 2.000sigma

NUCLIDE MDA REPORT

Nuclide Library Used : \\OR-GAMMA1\ApexRoot\Countroom\Library\WSRC.NLB

Nuclide Name	Energy (keV)	Yield(%)	Line MDA (pCi/units)	Nuclide MDA (pCi/units)	Activity (pCi/units)	Dec. Level (pCi/units)
FE-55	5.89	24.50	5.43E-03	5.43E-03	0.00E+00	0.00E+00
CO-57	122.06	85.51	2.06E+01	2.06E+01	4.20E+00	9.66E+00
	136.48	10.60	1.87E+02		-4.98E+01	8.76E+01

0262

Analysis Report for 1904087-12

BC 21A

Nuclide Name	Energy (keV)	Yield(%)	Line MDA (pCi/units)	Nuclide MDA (pCi/units)	Activity (pCi/units)	Dec. Level (pCi/units)
NI-59	6.92	29.80	4.64E-02	4.64E-02	-4.04E-02	1.94E-02
MO-93	16.59	52.90	1.28E+00	1.28E+00	-2.21E+00	6.15E-01
	18.60	10.00	1.05E+01		1.34E+01	5.06E+00
NB-93M	16.57	9.43	7.17E+00	7.17E+00	-1.23E+01	3.44E+00
CD-109	88.03	3.72	3.59E+02	3.59E+02	-1.98E+02	1.69E+02
SN-113	255.12	1.93	1.34E+03	7.98E+01	-2.83E+02	6.16E+02
	391.69	61.90	7.98E+01		3.92E+01	3.77E+01
SN-119M	23.87	16.10	1.13E+01	8.72E+00	-3.94E+01	5.46E+00
	25.10	22.70	8.72E+00		-1.56E+02	4.19E+00
+ I-125	35.49	* 6.49	9.66E+01	9.66E+01	4.46E+02	4.71E+01
I-129	29.78	* 57.00	8.50E+00	8.50E+00	1.79E+02	4.14E+00
	33.60	* 13.20	4.73E+01		2.18E+02	2.31E+01
	39.58	7.52	5.03E+01		1.54E+01	2.38E+01
+ BA-133	30.80	* 97.60	4.96E+00	4.96E+00	1.05E+02	2.42E+00
	302.84	* 17.80	1.54E+02		6.09E+02	7.04E+01
	356.01	* 60.00	3.74E+01		7.16E+02	1.66E+01
CE-139	165.85	80.35	3.02E+01	3.02E+01	1.39E+01	1.41E+01
CE-144	133.54	10.80	1.76E+02	1.76E+02	-3.21E+01	8.22E+01
HG-203	279.19	77.30	5.03E+01	5.03E+01	-1.29E+01	2.37E+01
PB-210	46.50	4.25	1.04E+02	1.04E+02	2.94E+00	4.89E+01
PA-231	9.28	42.00	1.83E-01	1.83E-01	2.99E-02	8.49E-02
	10.11	20.20	5.95E-01		4.21E-01	2.80E-01
	283.67	1.60	1.54E+03		4.80E+02	6.97E+02
	302.67	2.30	2.24E+03		3.73E+03	1.07E+03
TH-231	25.64	14.70	1.62E+01	1.62E+01	-4.29E+02	7.83E+00
	84.21	6.40	5.53E+02		2.70E+03	2.71E+02
PA-234M	9.89	89.00	1.27E-01	1.27E-01	8.96E-02	5.96E-02
	21.72	64.90	2.33E+00		2.02E+00	1.12E+00
	37.93	23.75	3.04E+01		5.88E+00	1.48E+01
	131.42	20.40	9.14E+01		-4.79E+00	4.27E+01
+ TH-234	63.29	* 3.80	6.71E+02	6.71E+02	9.77E+02	3.30E+02
NP-237	29.37	* 14.00	3.46E+01	3.46E+01	7.29E+02	1.69E+01
	86.50	12.60	1.08E+02		-3.50E+00	5.10E+01
U-237	97.08	16.30	9.35E+01	5.87E+01	-2.67E+01	4.40E+01
	101.07	26.30	5.87E+01		1.05E+01	2.76E+01
	114.00	12.30	2.70E+02		6.37E+02	1.30E+02
	208.01	22.00	1.27E+02		1.46E+01	5.92E+01
AM-241	59.54	35.90	3.76E+01	3.76E+01	7.35E+01	1.82E+01
AM-243	74.67	66.00	1.74E+01	1.74E+01	3.63E+00	8.24E+00

+ = Nuclide identified during the nuclide identification

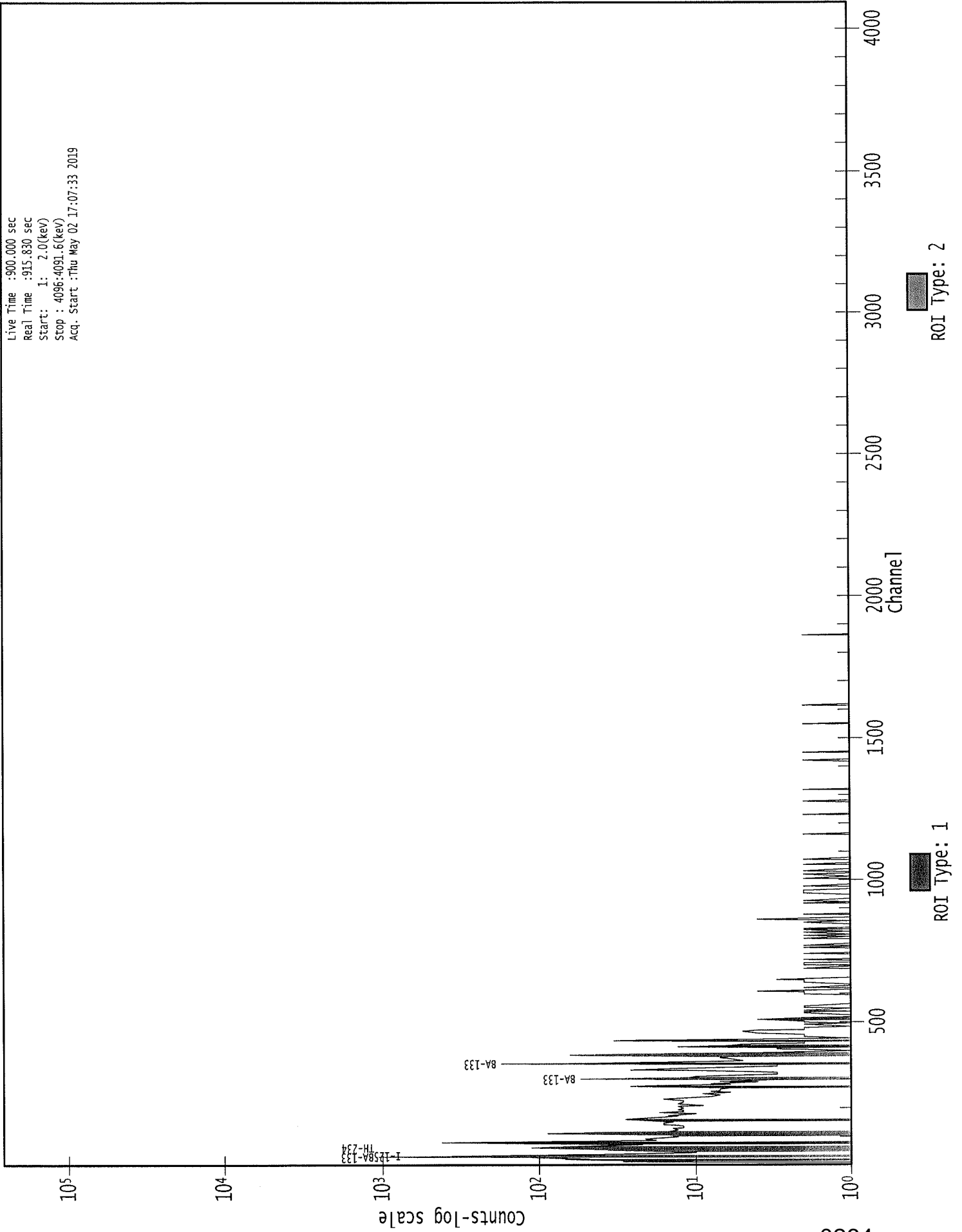
* = Energy line found in the spectrum

> = MDA value not calculated

@ = Half-life too short to be able to perform the decay correction

0000081254.CNF

Live Time : 900.000 sec
Real Time : 915.830 sec
Start : 1: 2.0(keV)
Stop : 4096:4091.6(keV)
Acq. Start : Thu May 02 17:07:33 2019



Analysis Report for 1904087-13
BC 13

GAMMA SPECTRUM ANALYSIS

Sample Identification : 1904087-13
 Sample Description : BC 13
 Sample Type : RA RECOVERY

 Sample Size : 1.000E+00 units
 Facility : Countroom

 Sample Taken On : 5/2/2019 8:40:01AM
 Acquisition Started : 5/3/2019 5:45:20AM

 Procedure : BAFIL
 Operator : Administrator
 Detector Name : GE1
 Geometry : BAFIL
 Live Time : 900.0 seconds
 Real Time : 900.3 seconds

 Dead Time : 0.04 %

 Peak Locate Threshold : 2.50
 Peak Locate Range (in channels) : 1 - 4096
 Peak Area Range (in channels) : 18 - 4096
 Identification Energy Tolerance : 1.000FWHM

 Energy Calibration Used Done On : 6/16/2018
 Efficiency Calibration Used Done On : 2/17/2018
 Efficiency Calibration Description :

 Sample Number : 81266

PEAK ANALYSIS REPORT

Peak Analysis Performed on : 5/3/2019 6:00:23AM
 Peak Analysis From Channel : 1
 Peak Analysis To Channel : 4096

Peak No.	Energy (keV)	ROI start	ROI end	Peak Centroid	Net Peak Area	Net Area Uncertainty	Continuum Counts	FWHM (keV)
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Analysis Report for 1904087-13

BC 13

	Peak No.	Energy (keV)	ROI start	ROI end	Peak Centroid	Net Peak Area	Net Area Uncertainty	Continuum Counts	FWHM (keV)
	1	31.67	26 -	42	32.04	2.89E+03	145.56	8.69E+02	4.82
	2	63.03	55 -	69	63.39	3.12E+02	90.76	7.37E+02	2.92
	3	81.12	76 -	88	81.49	9.38E+02	90.05	5.11E+02	3.92
M	4	112.05	106 -	119	112.40	1.69E+02	55.60	3.11E+02	3.39
m	5	115.93	106 -	119	116.28	4.22E+01	41.23	2.37E+02	2.48
	6	143.18	140 -	146	143.53	4.27E+01	29.62	1.27E+02	1.46
	7	161.28	158 -	165	161.63	2.90E+01	35.61	1.92E+02	1.31
M	8	276.35	270 -	285	276.66	8.06E+01	42.90	1.51E+02	5.41
m	9	303.10	297 -	315	303.41	1.73E+02	42.50	1.15E+02	4.47
	10	309.58	297 -	315	309.89	3.10E+01	26.53	5.32E+01	2.78
	11	333.68	329 -	339	333.98	6.49E+01	42.32	2.06E+02	3.23
	12	356.01	351 -	364	356.30	7.11E+02	69.25	2.15E+02	4.11
M	13	381.27	380 -	390	381.56	1.63E+01	21.91	5.84E+01	2.59
m	14	384.25	380 -	390	384.54	1.01E+02	48.74	2.01E+02	2.59
m	15	386.68	380 -	390	386.97	1.54E+02	49.92	2.63E+02	2.59
M	16	414.73	410 -	426	415.02	3.46E+01	16.03	1.64E+01	2.16
m	17	418.02	410 -	426	418.30	2.19E+01	18.25	1.47E+01	2.16
m	18	420.72	410 -	426	421.00	1.88E+01	14.94	1.12E+01	1.79
	19	437.04	431 -	443	437.32	1.41E+02	28.97	3.27E+01	2.56
	20	470.68	464 -	479	470.95	2.93E+01	24.17	4.14E+01	3.34
	21	498.14	495 -	502	498.40	7.80E+00	7.48	4.40E+00	1.62
	22	550.35	547 -	553	550.61	6.31E+00	6.65	3.38E+00	3.02
	23	607.72	605 -	610	607.96	8.00E+00	7.87	6.00E+00	1.57
	24	687.53	684 -	690	687.76	6.25E+00	6.65	3.50E+00	1.91
	25	814.40	812 -	816	814.60	5.00E+00	4.47	0.00E+00	1.70

M = First peak in a multiplet region

m = Other peak in a multiplet region

F = Fitted singlet

Errors quoted at 2.000sigma

BACKGROUND SUBTRACT REPORT

Peak Analysis Performed on : 5/3/2019 6:00:23AM

Env. Background File : \\OR-GAMMA1\ApexRoot\Countroom\Data\0000080014.CNF

	Peak No.	Energy (keV)	Original Area	Orig. Area Uncertainty	Ambient Background	Backgr. Uncert.	Subtracted Area	Subtracted Uncert.
	1	31.67	2.89E+03	145.56			2.89E+03	1.46E+02
	2	63.03	3.12E+02	90.76	2.07E+01	2.02E+00	2.92E+02	9.08E+01
	3	81.12	9.38E+02	90.05			9.38E+02	9.01E+01
M	4	112.05	1.69E+02	55.60			1.69E+02	5.56E+01

0266

Analysis Report for 1904087-13

BC 13

	Peak No.	Energy (keV)	Original Area	Orig. Area Uncertainty	Ambient Background	Backgr. Uncert.	Subtracted Area	Subtracted Uncert.
m	5	115.93	4.22E+01	41.23			4.22E+01	4.12E+01
	6	143.18	4.27E+01	29.62			4.27E+01	2.96E+01
	7	161.28	2.90E+01	35.61			2.90E+01	3.56E+01
	8	276.35	8.06E+01	42.90			8.06E+01	4.29E+01
M	9	303.10	1.73E+02	42.50			1.73E+02	4.25E+01
m	10	309.58	3.10E+01	26.53			3.10E+01	2.65E+01
	11	333.68	6.49E+01	42.32			6.49E+01	4.23E+01
	12	356.01	7.11E+02	69.25			7.11E+02	6.92E+01
M	13	381.27	1.63E+01	21.91			1.63E+01	2.19E+01
m	14	384.25	1.01E+02	48.74			1.01E+02	4.87E+01
m	15	386.68	1.54E+02	49.92			1.54E+02	4.99E+01
M	16	414.73	3.46E+01	16.03			3.46E+01	1.60E+01
m	17	418.02	2.19E+01	18.25			2.19E+01	1.82E+01
m	18	420.72	1.88E+01	14.94			1.88E+01	1.49E+01
	19	437.04	1.41E+02	28.97			1.41E+02	2.90E+01
	20	470.68	2.93E+01	24.17			2.93E+01	2.42E+01
	21	498.14	7.80E+00	7.48			7.80E+00	7.48E+00
	22	550.35	6.31E+00	6.65			6.31E+00	6.65E+00
	23	607.72	8.00E+00	7.87			8.00E+00	7.87E+00
	24	687.53	6.25E+00	6.65			6.25E+00	6.65E+00
	25	814.40	5.00E+00	4.47			5.00E+00	4.47E+00

M = First peak in a multiplet region

m = Other peak in a multiplet region

F = Fitted singlet

Errors quoted at 2.000sigma

NUCLIDE IDENTIFICATION REPORT

Nuclide Library Used : \\OR-GAMMA1\ApexRoot\Countroom\Library\WSRC.NLB

IDENTIFIED NUCLIDES

Nuclide Name	Id Confidence	Energy (keV)	Yield(%)	Activity (pCi/units)	Activity Uncertainty
BA-133	0.98	30.80 *	97.60	7.02E-01	3.53E-02
		302.84 *	17.80	7.64E+02	3.83E+02
		356.01 *	60.00	6.01E+02	8.80E+01
PA-231	1.00	9.28	42.00		
		10.11	20.20		
		283.67	1.60		
TH-234	0.99	302.67 *	2.30	5.91E+03	2.97E+03
		63.29 *	3.80	3.61E+02	1.13E+02

0267

Analysis Report for 1904087-13

BC 13

* = Energy line found in the spectrum.
 - = Manually added nuclide.
 ? = Manually edited nuclide.
 @ = Energy line not used for Weighted Mean Activity
 Energy Tolerance : 2.000FWHM
 Nuclide confidence index threshold = 0.30
 Errors quoted at 2.000sigma

INTERFERENCE CORRECTED REPORT

<i>Nuclide Name</i>	<i>Nuclide Id Confidence</i>	<i>Wt mean Activity (pCi/units)</i>	<i>Wt mean Activity Uncertainty</i>	<i>Comments</i>
BA-133	0.987	7.02E-01	3.53E-02	
PA-231	1.000	5.90E+03	2.97E+03	
TH-234	0.998	3.61E+02	1.13E+02	

? = nuclide is part of an undetermined solution
 X = nuclide rejected by the interference analysis
 @ = nuclide contains energy lines not used in Weighted Mean Activity

Errors quoted at 2.000sigma

Analysis Report for 1904087-13

BC 13

UNIDENTIFIED PEAKS

Peak Locate Performed on : 5/3/2019 6:00:23AM
 Peak Locate From Channel : 1
 Peak Locate To Channel : 4096

	<i>Peak No.</i>	<i>Energy (keV)</i>	<i>Peak Size (CPS)</i>	<i>Peak CPS (%) Uncertainty</i>	<i>Peak Type</i>	<i>Tolerance Nuclide</i>
	3	81.12	1.04180E+00	4.80		
M	4	112.05	1.88038E-01	16.43	Tol.	U-237
m	5	115.93	4.68717E-02	48.87	Tol.	U-237
	6	143.18	4.74843E-02	34.65		
	7	161.28	3.22222E-02	61.39		
	8	276.35	8.95406E-02	26.61		
m	10	309.58	3.44284E-02	42.82		
	11	333.68	7.21065E-02	32.61	Sum	
M	13	381.27	1.80675E-02	67.37		
m	14	384.25	1.12548E-01	24.06		
m	15	386.68	1.71445E-01	16.18	Sum	
M	16	414.73	3.84633E-02	23.16		
m	17	418.02	2.43124E-02	41.70	Sum	
m	18	420.72	2.09139E-02	39.69	Sum	
	19	437.04	1.56295E-01	10.30		
	20	470.68	3.25778E-02	41.21		
	21	498.14	8.66667E-03	47.97		
	22	550.35	7.01389E-03	52.69		
	23	607.72	8.88889E-03	49.21	Sum	
	24	687.53	6.94444E-03	53.22		
	25	814.40	5.55556E-03	44.72		

M = First peak in a multiplet region
 m = Other peak in a multiplet region
 F = Fitted singlet
 Errors quoted at 2.000sigma

NUCLIDE MDA REPORT

Nuclide Library Used : \\OR-GAMMA1\ApexRoot\Countroom\Library\WSRC.NLB

0269

Analysis Report for 1904087-13

BC 13

Nuclide Name	Energy (keV)	Yield(%)	Line MDA (pCi/units)	Nuclide MDA (pCi/units)	Activity (pCi/units)	Dec. Level (pCi/units)
FE-55	5.89	24.50	1.90E-13	1.90E-13	0.00E+00	0.00E+00
CO-57	122.06	85.51	3.31E+01	3.31E+01	-3.36E-01	1.54E+01
	136.48	10.60	3.70E+02		-6.35E-01	1.73E+02
NI-59	6.92	29.80	2.77E-12	2.77E-12	0.00E+00	0.00E+00
MO-93	16.59	52.90	8.61E-06	8.61E-06	-5.56E-06	3.86E-06
	18.60	10.00	3.72E-04		-1.01E-04	1.76E-04
NB-93M	16.57	9.43	4.76E-05	4.76E-05	-3.07E-05	2.13E-05
CD-109	88.03	3.72	3.55E+02	3.55E+02	-4.21E+01	1.68E+02
SN-113	255.12	1.93	2.03E+03	3.24E+01	3.58E+02	9.37E+02
	391.69	61.90	3.24E+01		1.67E+01	1.54E+01
SN-119M	23.87	16.10	6.97E-03	6.97E-03	9.37E-03	3.37E-03
	25.10	22.70	8.34E-03		7.93E-03	4.04E-03
I-125	35.49	6.49	1.41E+00	1.41E+00	1.12E+00	6.91E-01
I-129	29.78	57.00	4.78E-02	4.78E-02	2.04E-01	2.36E-02
	33.60	13.20	5.69E-01		9.67E-01	2.80E-01
	39.58	7.52	1.49E+00		-1.26E+00	7.15E-01
+ BA-133	30.80	* 97.60	3.98E-02	3.98E-02	7.02E-01	1.96E-02
	302.84	* 17.80	3.17E+02		7.64E+02	1.53E+02
	356.01	* 60.00	6.37E+01		6.01E+02	3.07E+01
CE-139	165.85	80.35	6.15E+01	6.15E+01	-6.84E-01	2.87E+01
CE-144	133.54	10.80	3.55E+02	3.55E+02	-5.09E+01	1.66E+02
HG-203	279.19	77.30	5.29E+01	5.29E+01	3.27E+01	2.48E+01
PB-210	46.50	4.25	5.99E+00	5.99E+00	-3.14E+00	2.80E+00
+ PA-231	9.28	42.00	2.61E-10	2.61E-10	0.00E+00	0.00E+00
	10.11	20.20	2.08E-09		0.00E+00	0.00E+00
	283.67	1.60	1.71E+03		2.22E+02	7.79E+02
	302.67	* 2.30	2.45E+03		5.91E+03	1.18E+03
TH-231	25.64	14.70	1.64E-02	1.64E-02	-9.28E-03	7.92E-03
	84.21	6.40	2.90E+02		7.32E+01	1.41E+02
PA-234M	9.89	89.00	3.36E-10	3.36E-10	0.00E+00	0.00E+00
	21.72	64.90	6.13E-04		1.40E-03	2.97E-04
	37.93	23.75	5.02E-01		6.45E-01	2.44E-01
	131.42	20.40	1.81E+02		4.01E+01	8.45E+01
+ TH-234	63.29	* 3.80	1.75E+02	1.75E+02	3.61E+02	8.57E+01
NP-237	29.37	14.00	1.70E-01	1.70E-01	7.25E-01	8.38E-02
	86.50	12.60	1.06E+02		-2.39E+02	5.06E+01
U-237	97.08	16.30	1.11E+02	8.16E+01	3.23E+00	5.22E+01
	101.07	26.30	8.16E+01		4.02E+01	3.84E+01
	114.00	12.30	4.04E+02		4.83E+02	1.95E+02
	208.01	22.00	2.40E+02		-1.36E+02	1.11E+02
AM-241	59.54	35.90	6.96E+00	6.96E+00	-1.56E+00	3.36E+00
AM-243	74.67	66.00	9.01E+00	9.01E+00	-2.74E+00	4.26E+00

+ = Nuclide identified during the nuclide identification

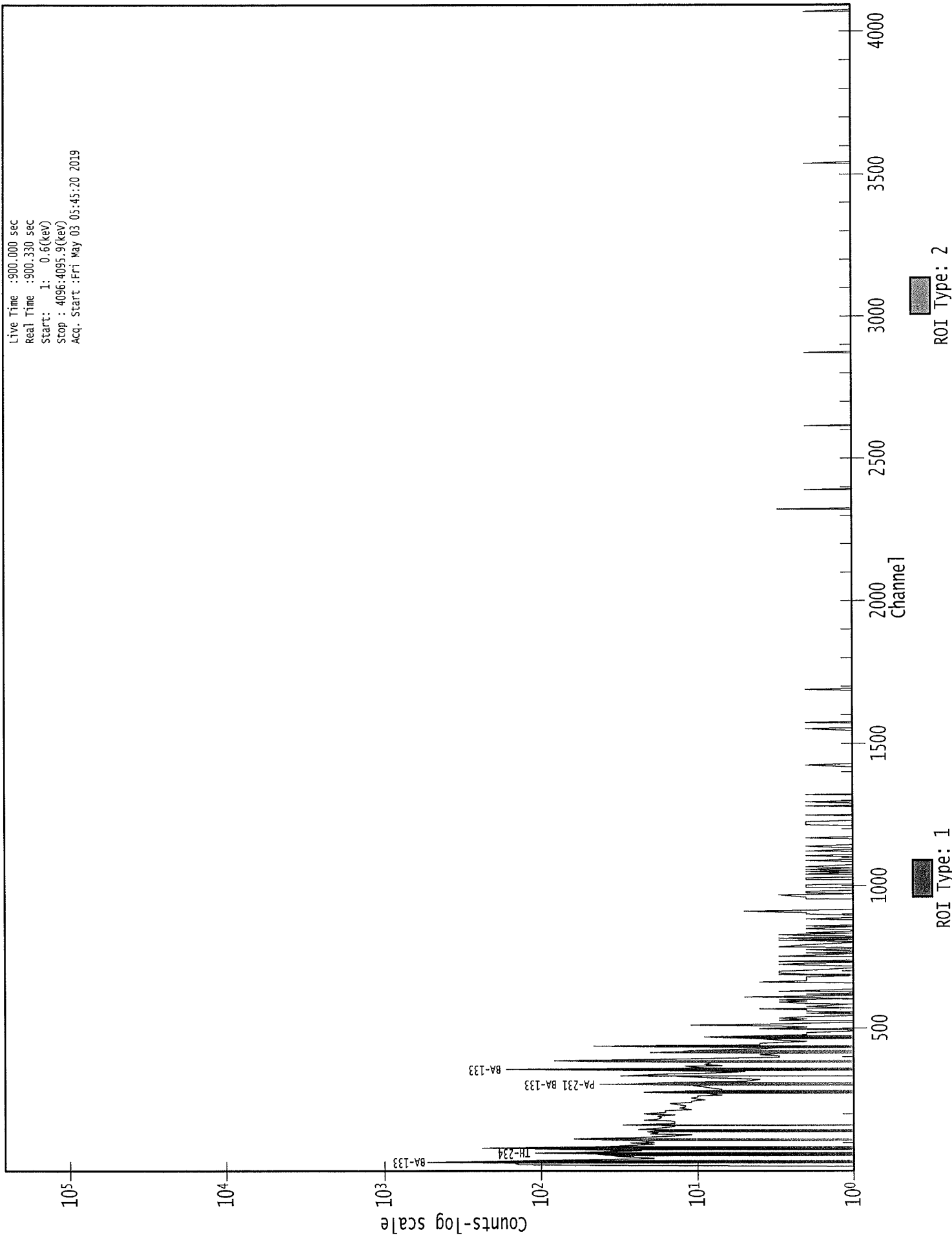
* = Energy line found in the spectrum

> = MDA value not calculated

@ = Half-life too short to be able to perform the decay correction

0000081266.CNF

Live Time : 900.000 sec
Real Time : 900.330 sec
Start : 1: 0.6(keV)
Stop : 4096:4095.9(keV)
Acq. Start : Fri May 03 05:45:20 2019



Analysis Report for 1904087-14
BC 14

GAMMA SPECTRUM ANALYSIS

Sample Identification : 1904087-14
 Sample Description : BC 14
 Sample Type : RA RECOVERY

 Sample Size : 1.000E+00 units
 Facility : Countroom

 Sample Taken On : 5/2/2019 8:40:11AM
 Acquisition Started : 5/3/2019 5:45:27AM

 Procedure : BAFIL
 Operator : Administrator
 Detector Name : GE2
 Geometry : BAFIL
 Live Time : 900.0 seconds
 Real Time : 900.2 seconds

 Dead Time : 0.03 %

 Peak Locate Threshold : 2.50
 Peak Locate Range (in channels) : 1 - 4096
 Peak Area Range (in channels) : 28 - 4096
 Identification Energy Tolerance : 1.000FWHM

 Energy Calibration Used Done On : 2/17/2018
 Efficiency Calibration Used Done On : 2/24/2018
 Efficiency Calibration Description :

 Sample Number : 81267

PEAK ANALYSIS REPORT

Peak Analysis Performed on : 5/3/2019 6:00:38AM
 Peak Analysis From Channel : 1
 Peak Analysis To Channel : 4096

Peak No.	Energy (keV)	ROI start	ROI end	Peak Centroid	Net Peak Area	Net Area Uncertainty	Continuum Counts	FWHM (keV)
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Analysis Report for 1904087-14

BC 14

Peak No.	Energy (keV)	ROI start	ROI end	Peak Centroid	Net Peak Area	Net Area Uncertainty	Continuum Counts	FWHM (keV)
1	35.89	35 -	39	35.68	3.82E+02	64.13	3.30E+02	2.56
2	53.34	49 -	57	53.11	6.83E+01	38.45	1.88E+02	1.90
3	62.04	58 -	64	61.81	2.34E+02	47.93	2.45E+02	1.32
4	66.75	65 -	69	66.52	1.25E+02	35.49	1.58E+02	2.01
5	81.49	78 -	83	81.25	8.22E+02	62.25	1.18E+02	1.68
M	6	112.21	107 - 120	111.96	1.65E+02	33.11	7.15E+01	1.37
m	7	116.14	107 - 120	115.89	2.32E+01	21.26	8.32E+01	1.25
8	159.96	157 -	162	159.69	2.20E+01	26.55	1.24E+02	1.16
9	218.40	215 -	222	218.10	2.27E+01	27.20	1.09E+02	3.72
10	276.66	271 -	281	276.33	6.79E+01	31.15	9.21E+01	2.07
M	11	303.29	299 - 314	302.95	1.78E+02	27.93	1.94E+01	1.43
m	12	307.57	299 - 314	307.23	3.98E+01	19.52	2.17E+01	2.04
m	13	312.00	299 - 314	311.65	1.47E+01	14.32	1.88E+01	2.05
M	14	333.88	329 - 344	333.52	5.07E+01	18.52	2.46E+01	2.14
m	15	338.32	329 - 344	337.96	2.34E+01	14.93	1.56E+01	2.09
16	356.43	352 -	360	356.07	5.52E+02	51.42	6.51E+01	1.42
M	17	381.38	380 - 395	381.00	6.23E+00	6.08	8.02E+00	1.47
m	18	387.24	380 - 395	386.85	1.64E+02	33.89	2.27E+01	1.63
m	19	391.40	380 - 395	391.01	3.66E+01	16.86	2.46E+01	1.63
M	20	415.50	411 - 426	415.10	2.34E+01	18.30	4.01E+01	2.42
m	21	419.40	411 - 426	419.00	8.57E+00	13.14	2.66E+01	1.51
22	437.30	433 -	439	436.89	8.30E+01	20.22	1.40E+01	1.75
23	468.00	463 -	470	467.58	1.62E+01	13.56	1.97E+01	1.94
24	512.05	507 -	517	511.60	3.46E+01	14.71	8.87E+00	3.30
25	722.62	719 -	724	722.06	5.13E+00	7.07	5.75E+00	2.79
26	803.27	800 -	805	802.67	6.00E+00	4.90	0.00E+00	1.92
27	1460.60	1456 -	1461	1459.60	5.00E+00	4.47	0.00E+00	1.70

M = First peak in a multiplet region

m = Other peak in a multiplet region

F = Fitted singlet

Errors quoted at 2.000sigma

BACKGROUND SUBTRACT REPORT

Peak Analysis Performed on : 5/3/2019 6:00:38AM

Env. Background File : \\OR-GAMMA1\ApexRoot\Countroom\Data\0000080015.CNF

Peak No.	Energy (keV)	Original Area	Orig. Area Uncertainty	Ambient Background	Backgr. Uncert.	Subtracted Area	Subtracted Uncert.
1	35.89	3.82E+02	64.13			3.82E+02	6.41E+01
2	53.34	6.83E+01	38.45			6.83E+01	3.84E+01

0273

Analysis Report for 1904087-14

BC 14

Peak No.	Energy (keV)	Original Area	Orig. Area Uncertainty	Ambient Background	Backgr. Uncert.	Subtracted Area	Subtracted Uncert.	
	3	62.04	2.34E+02	47.93		2.34E+02	4.79E+01	
	4	66.75	1.25E+02	35.49		1.25E+02	3.55E+01	
	5	81.49	8.22E+02	62.25		8.22E+02	6.22E+01	
M	6	112.21	1.65E+02	33.11	8.57E-01	1.81E+00	1.64E+02	3.32E+01
m	7	116.14	2.32E+01	21.26		2.32E+01	2.13E+01	
	8	159.96	2.20E+01	26.55		2.20E+01	2.66E+01	
	9	218.40	2.27E+01	27.20		2.27E+01	2.72E+01	
	10	276.66	6.79E+01	31.15		6.79E+01	3.11E+01	
M	11	303.29	1.78E+02	27.93		1.78E+02	2.79E+01	
m	12	307.57	3.98E+01	19.52		3.98E+01	1.95E+01	
m	13	312.00	1.47E+01	14.32		1.47E+01	1.43E+01	
M	14	333.88	5.07E+01	18.52		5.07E+01	1.85E+01	
m	15	338.32	2.34E+01	14.93	7.39E-01	1.27E+00	2.27E+01	1.50E+01
	16	356.43	5.52E+02	51.42		5.52E+02	5.14E+01	
M	17	381.38	6.23E+00	6.08		6.23E+00	6.08E+00	
m	18	387.24	1.64E+02	33.89		1.64E+02	3.39E+01	
m	19	391.40	3.66E+01	16.86		3.66E+01	1.69E+01	
M	20	415.50	2.34E+01	18.30		2.34E+01	1.83E+01	
m	21	419.40	8.57E+00	13.14		8.57E+00	1.31E+01	
	22	437.30	8.30E+01	20.22		8.30E+01	2.02E+01	
	23	468.00	1.62E+01	13.56		1.62E+01	1.36E+01	
	24	512.05	3.46E+01	14.71	2.04E+01	1.34E+00	1.42E+01	1.48E+01
	25	722.62	5.13E+00	7.07		5.13E+00	7.07E+00	
	26	803.27	6.00E+00	4.90	6.92E-01	6.67E-01	5.31E+00	4.94E+00
	27	1460.60	5.00E+00	4.47	1.31E+00	6.07E-01	3.69E+00	4.51E+00

M = First peak in a multiplet region

m = Other peak in a multiplet region

F = Fitted singlet

Errors quoted at 2.000sigma

NUCLIDE IDENTIFICATION REPORT

Nuclide Library Used : \\OR-GAMMA1\ApexRoot\Countroom\Library\WSRC.NLB

IDENTIFIED NUCLIDES

Nuclide Name	Id Confidence	Energy (keV)	Yield(%)	Activity (pCi/units)	Activity Uncertainty
SN-113	0.96	255.12	1.93		
		391.69	*	61.90	2.25E+01
I-125	0.99	35.49	*	6.49	1.52E+01
PA-231	1.00	9.28	42.00		1.05E+01
					2.55E+00

0274

Analysis Report for 1904087-14

BC 14

Nuclide Name	Id Confidence	Energy (keV)	Yield(%)	Activity (pCi/units)	Activity Uncertainty
PA-231	1.00	10.11	20.20		
		283.67	1.60		
		302.67 *	2.30	5.23E+03	1.78E+03

* = Energy line found in the spectrum.

- = Manually added nuclide.

? = Manually edited nuclide.

@ = Energy line not used for Weighted Mean Activity

Energy Tolerance : 2.000FWHM

Nuclide confidence index threshold = 0.30

Errors quoted at 2.000sigma

INTERFERENCE CORRECTED REPORT

Nuclide Name	Nuclide Id Confidence	Wt mean Activity (pCi/units)	Wt mean Activity Uncertainty	Comments
SN-113	0.965	2.25E+01	1.05E+01	
I-125	0.996	1.52E+01	2.55E+00	
PA-231	1.000	5.23E+03	1.78E+03	

? = nuclide is part of an undetermined solution

X = nuclide rejected by the interference analysis

@ = nuclide contains energy lines not used in Weighted Mean Activity

Errors quoted at 2.000sigma

Analysis Report for 1904087-14

BC 14

UNIDENTIFIED PEAKS

Peak Locate Performed on : 5/3/2019 6:00:38AM
 Peak Locate From Channel : 1
 Peak Locate To Channel : 4096

Peak No.	Energy (keV)	Peak Size (CPS)	Peak CPS (%) Uncertainty	Peak Type	Tolerance Nuclide
	2	53.34	7.58333E-02	28.17	
	3	62.04	2.60425E-01	10.23	
	4	66.75	1.38636E-01	14.22	
	5	81.49	9.13556E-01	3.79	
M	6	112.21	1.82370E-01	10.10	Tol. U-237
m	7	116.14	2.58089E-02	45.76	
	8	159.96	2.44444E-02	60.35	
	9	218.40	2.52453E-02	59.86	
	10	276.66	7.54971E-02	22.92	
m	12	307.57	4.41983E-02	24.53	
m	13	312.00	1.62875E-02	48.84	
M	14	333.88	5.63540E-02	18.26	
m	15	338.32	2.52147E-02	33.02	Sum
	16	356.43	6.13822E-01	4.65	
M	17	381.38	6.91729E-03	48.85	
m	18	387.24	1.81965E-01	10.35	
M	20	415.50	2.60077E-02	39.08	
m	21	419.40	9.51674E-03	76.73	
	22	437.30	9.22222E-02	12.18	
	23	468.00	1.79701E-02	41.94	
	24	512.05	1.57901E-02	51.98	
	25	722.62	5.69444E-03	68.99	
	26	803.27	5.89800E-03	46.57	
	27	1460.60	4.10296E-03	61.11	

M = First peak in a multiplet region
 m = Other peak in a multiplet region
 F = Fitted singlet
 Errors quoted at 2.000sigma

Analysis Report for 1904087-14

BC 14

NUCLIDE MDA REPORT

Nuclide Library Used : \\OR-GAMMA1\ApexRoot\Countroom\Library\WSRC.NLB

Nuclide Name	Energy (keV)	Yield(%)	Line MDA (pCi/units)	Nuclide MDA (pCi/units)	Activity (pCi/units)	Dec. Level (pCi/units)
FE-55	5.89	24.50	1.20E-10	1.20E-10	0.00E+00	0.00E+00
CO-57	122.06	85.51	2.68E+01	2.68E+01	4.27E+00	1.24E+01
	136.48	10.60	2.54E+02		-6.49E+01	1.17E+02
NI-59	6.92	29.80	9.43E-10	9.43E-10	0.00E+00	0.00E+00
MO-93	16.59	52.90	1.78E-05	1.78E-05	0.00E+00	0.00E+00
	18.60	10.00	2.91E-04		0.00E+00	0.00E+00
NB-93M	16.57	9.43	9.85E-05	9.85E-05	0.00E+00	0.00E+00
CD-109	88.03	3.72	2.51E+02	2.51E+02	-1.13E+02	1.16E+02
+ SN-113	255.12	1.93	1.24E+03	2.70E+01	3.00E+02	5.61E+02
	391.69	*	61.90	2.70E+01	2.25E+01	1.27E+01
SN-119M	23.87	16.10	1.78E-03	1.78E-03	0.00E+00	0.00E+00
	25.10	22.70	1.94E-03		0.00E+00	0.00E+00
+ I-125	35.49	*	6.49	7.27E+00	1.52E+01	3.58E+00
I-129	29.78	57.00	2.13E-01	2.13E-01	9.34E-01	1.05E-01
	33.60	13.20	1.53E+00		-2.64E+00	7.49E-01
	39.58	7.52	2.09E+00		-2.19E+00	9.56E-01
BA-133	30.80	97.60	1.88E-01	1.88E-01	1.74E+00	9.27E-02
	302.84	17.80	2.56E+02		7.23E+02	1.23E+02
	356.01	60.00	9.18E+01		4.43E+02	4.48E+01
CE-139	165.85	80.35	4.43E+01	4.43E+01	2.44E+00	2.06E+01
CE-144	133.54	10.80	2.63E+02	2.63E+02	2.85E+00	1.23E+02
HG-203	279.19	77.30	3.53E+01	3.53E+01	2.65E+00	1.63E+01
PB-210	46.50	4.25	9.75E+00	9.75E+00	2.73E+00	4.45E+00
+ PA-231	9.28	42.00	3.13E-08	3.13E-08	0.00E+00	0.00E+00
	10.11	20.20	1.87E-07		0.00E+00	0.00E+00
	283.67	1.60	1.03E+03		9.41E+01	4.51E+02
	302.67	*	2.30	1.28E+03	5.23E+03	5.99E+02
TH-231	25.64	14.70	3.57E-03	3.57E-03	0.00E+00	0.00E+00
	84.21	6.40	3.06E+02		5.54E+01	1.48E+02
PA-234M	9.89	89.00	3.24E-08	3.24E-08	0.00E+00	0.00E+00
	21.72	64.90	1.91E-04		0.00E+00	0.00E+00
	37.93	23.75	6.99E-01		-7.01E-01	3.28E-01
	131.42	20.40	1.40E+02		6.43E+01	6.56E+01
TH-234	63.29	3.80	1.58E+02	1.58E+02	5.85E+01	7.64E+01
NP-237	29.37	14.00	2.84E-01	2.84E-01	-7.01E+00	1.36E-01
	86.50	12.60	7.57E+01		3.40E+01	3.52E+01
U-237	97.08	16.30	9.14E+01	5.89E+01	-2.57E+00	4.25E+01
	101.07	26.30	5.89E+01		-1.05E+01	2.73E+01
	114.00	12.30	3.52E+02		6.04E+02	1.70E+02
	208.01	22.00	1.60E+02		-5.90E+00	7.33E+01
AM-241	59.54	35.90	7.59E+00	7.59E+00	-4.36E+01	3.60E+00
AM-243	74.67	66.00	8.54E+00	8.54E+00	-1.04E+00	3.98E+00

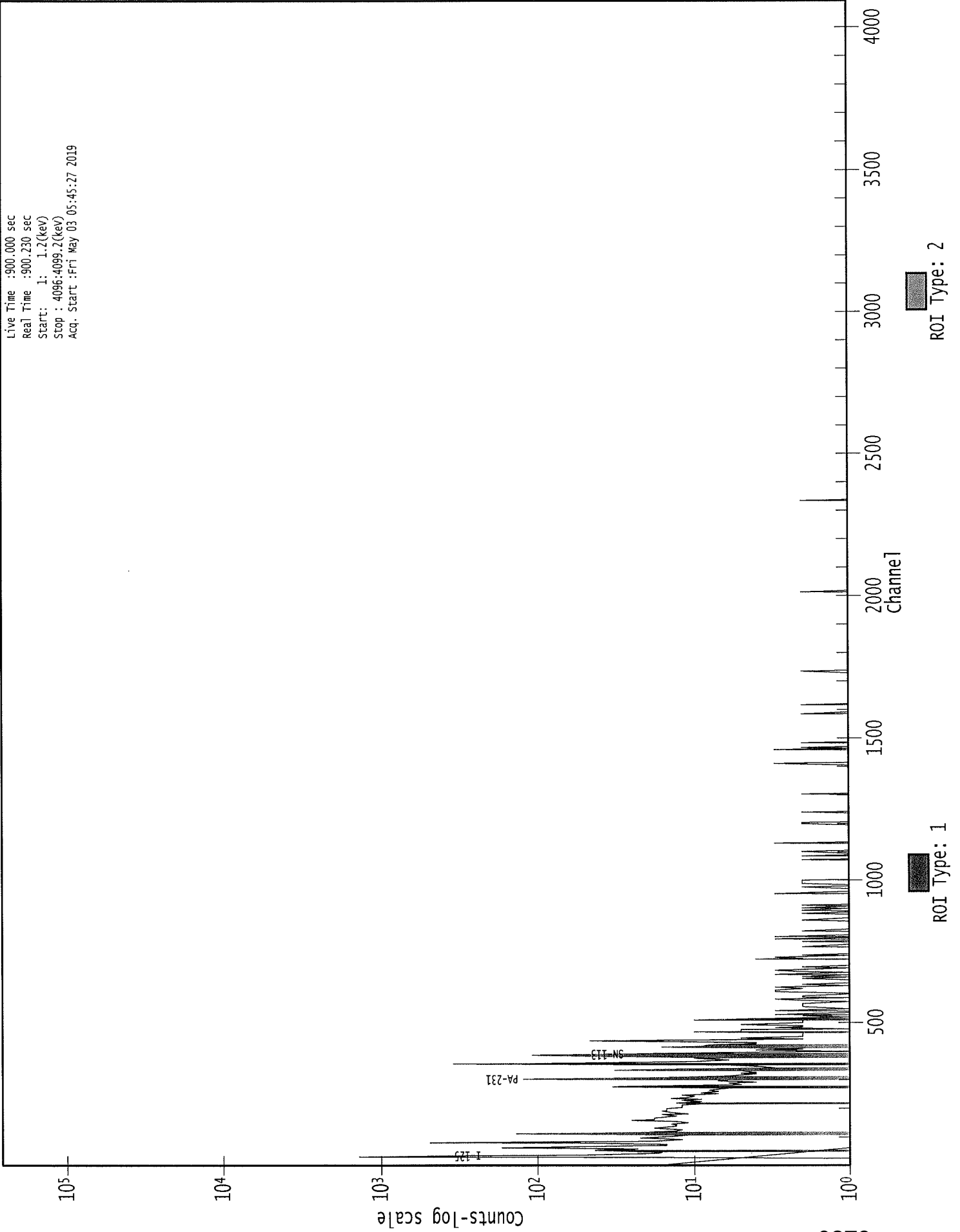
Analysis Report for 1904087-14

BC 14

- + = Nuclide identified during the nuclide identification
 - * = Energy line found in the spectrum
 - > = MDA value not calculated
 - @ = Half-life too short to be able to perform the decay correction
-

0000081267.CNF

Live Time :900.000 sec
Real Time :900.230 sec
Start: 1: 1.2(keV)
Stop : 4096:4099.2(keV)
Acq. Start :Fri May 03 05:45:27 2019



0279

Analysis Report for 1904087-15
BC 28B

GAMMA SPECTRUM ANALYSIS

Sample Identification : 1904087-15
 Sample Description : BC 28B
 Sample Type : RA RECOVERY

 Sample Size : 1.000E+00 units
 Facility : Countroom

 Sample Taken On : 5/2/2019 8:40:19AM
 Acquisition Started : 5/3/2019 5:45:36AM

 Procedure : BAFIL
 Operator : Administrator
 Detector Name : GE4
 Geometry : BAFIL
 Live Time : 900.0 seconds
 Real Time : 902.3 seconds

 Dead Time : 0.25 %

 Peak Locate Threshold : 2.50
 Peak Locate Range (in channels) : 1 - 4096
 Peak Area Range (in channels) : 9 - 4096
 Identification Energy Tolerance : 1.000FWHM

 Energy Calibration Used Done On : 2/24/2018
 Efficiency Calibration Used Done On : 11/9/2014
 Efficiency Calibration Description :

 Sample Number : 81268

PEAK ANALYSIS REPORT

Peak Analysis Performed on : 5/3/2019 6:00:50AM

Peak Analysis From Channel : 1
 Peak Analysis To Channel : 4096

Peak No.	Energy (keV)	ROI start	ROI end	Peak Centroid	Net Peak Area	Net Area Uncertainty	Continuum Counts	FWHM (keV)
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Analysis Report for 1904087-15

BC 28B

	Peak No.	Energy (keV)	ROI start	ROI end	Peak Centroid	Net Peak Area	Net Area Uncertainty	Continuum Counts	FWHM (keV)
	1	20.67	16 -	23	19.72	6.76E+01	50.64	3.79E+02	2.11
M	2	30.90	24 -	37	29.96	2.46E+03	107.58	2.39E+02	2.19
m	3	35.17	24 -	37	34.23	5.38E+02	75.68	1.61E+02	2.13
	4	52.23	47 -	55	51.30	6.41E+01	42.20	2.36E+02	4.34
M	5	61.81	56 -	71	60.89	2.33E+02	44.73	1.88E+02	2.31
m	6	66.03	56 -	71	65.11	1.23E+02	41.09	1.57E+02	2.32
	7	81.13	75 -	85	80.23	9.78E+02	78.54	2.96E+02	1.90
M	8	112.03	105 -	122	111.16	2.23E+02	41.85	1.73E+02	2.47
m	9	116.06	105 -	122	115.19	4.28E+01	43.68	1.59E+02	2.62
	10	169.61	165 -	172	168.78	3.06E+01	29.73	1.25E+02	3.39
	11	277.29	270 -	284	276.55	6.94E+01	40.41	1.43E+02	2.65
	12	303.46	296 -	309	302.74	1.47E+02	39.95	1.12E+02	2.36
	13	334.25	328 -	339	333.55	7.06E+01	27.64	6.08E+01	2.56
	14	356.21	351 -	361	355.53	4.48E+02	46.97	5.68E+01	2.09
M	15	384.05	380 -	394	383.39	1.11E+02	24.60	1.30E+01	2.71
m	16	387.00	380 -	394	386.35	1.62E+02	33.42	1.52E+01	2.03
m	17	391.00	380 -	394	390.35	3.97E+01	32.63	2.85E+01	3.26
	18	436.92	432 -	441	436.31	9.10E+01	22.45	2.00E+01	2.27
	19	444.48	442 -	446	443.87	7.33E+00	6.96	3.33E+00	2.91
	20	468.35	464 -	472	467.77	1.30E+01	13.90	2.00E+01	2.48
	21	598.62	596 -	600	598.15	5.70E+00	8.06	8.60E+00	0.86
	22	704.58	701 -	707	704.21	8.15E+00	7.23	3.70E+00	4.24

M = First peak in a multiplet region
 m = Other peak in a multiplet region
 F = Fitted singlet
 Errors quoted at 2.000sigma

BACKGROUND SUBTRACT REPORT

Peak Analysis Performed on : 5/3/2019 6:00:50AM

Env. Background File : \\OR-GAMMA1\ApexRoot\Countroom\Data\0000080017.CNF

	Peak No.	Energy (keV)	Original Area	Orig. Area Uncertainty	Ambient Background	Backgr. Uncert.	Subtracted Area	Subtracted Uncert.
	1	20.67	6.76E+01	50.64			6.76E+01	5.06E+01
M	2	30.90	2.46E+03	107.58			2.46E+03	1.08E+02
m	3	35.17	5.38E+02	75.68			5.38E+02	7.57E+01
	4	52.23	6.41E+01	42.20			6.41E+01	4.22E+01
M	5	61.81	2.33E+02	44.73	1.28E+01	1.96E+00	2.20E+02	4.48E+01
m	6	66.03	1.23E+02	41.09			1.23E+02	4.11E+01
	7	81.13	9.78E+02	78.54			9.78E+02	7.85E+01

Analysis Report for 1904087-15

BC 28B

	Peak No.	Energy (keV)	Original Area	Orig. Area Uncertainty	Ambient Background	Backgr. Uncert.	Subtracted Area	Subtracted Uncert.
M	8	112.03	2.23E+02	41.85			2.23E+02	4.19E+01
m	9	116.06	4.28E+01	43.68			4.28E+01	4.37E+01
	10	169.61	3.06E+01	29.73			3.06E+01	2.97E+01
	11	277.29	6.94E+01	40.41			6.94E+01	4.04E+01
	12	303.46	1.47E+02	39.95			1.47E+02	3.99E+01
	13	334.25	7.06E+01	27.64			7.06E+01	2.76E+01
	14	356.21	4.48E+02	46.97			4.48E+02	4.70E+01
M	15	384.05	1.11E+02	24.60			1.11E+02	2.46E+01
m	16	387.00	1.62E+02	33.42			1.62E+02	3.34E+01
m	17	391.00	3.97E+01	32.63			3.97E+01	3.26E+01
	18	436.92	9.10E+01	22.45			9.10E+01	2.24E+01
	19	444.48	7.33E+00	6.96			7.33E+00	6.96E+00
	20	468.35	1.30E+01	13.90			1.30E+01	1.39E+01
	21	598.62	5.70E+00	8.06			5.70E+00	8.06E+00
	22	704.58	8.15E+00	7.23			8.15E+00	7.23E+00

M = First peak in a multiplet region
m = Other peak in a multiplet region
F = Fitted singlet
Errors quoted at 2.000sigma

NUCLIDE IDENTIFICATION REPORT

Nuclide Library Used : \\OR-GAMMA1\ApexRoot\Countroom\Library\WSRC.NLB

IDENTIFIED NUCLIDES

Nuclide Name	Id Confidence	Energy (keV)	Yield(%)	Activity (pCi/units)	Activity Uncertainty
SN-113	0.93	255.12	1.93		
		391.69 *	61.90	6.27E+01	5.23E+01
I-125	0.99	35.49 *	6.49	4.82E+02	6.89E+01
BA-133	0.99	30.80 *	97.60	1.11E+02	5.29E+00
		302.84 *	17.80	7.25E+02	2.97E+02
		356.01 *	60.00	7.03E+02	1.18E+02
HG-203	0.93	279.19 *	77.30	7.61E+01	4.99E+01
TH-234	0.95	63.29 *	3.80	9.35E+02	2.01E+02

Analysis Report for 1904087-15

BC 28B

* = Energy line found in the spectrum.
 - = Manually added nuclide.
 ? = Manually edited nuclide.
 @ = Energy line not used for Weighted Mean Activity
 Energy Tolerance : 2.000FWHM
 Nuclide confidence index threshold = 0.30
 Errors quoted at 2.000sigma

INTERFERENCE CORRECTED REPORT

<i>Nuclide Name</i>	<i>Nuclide Id Confidence</i>	<i>Wt mean Activity (pCi/units)</i>	<i>Wt mean Activity Uncertainty</i>	<i>Comments</i>
SN-113	0.938	6.27E+01	5.23E+01	
I-125	0.998	4.82E+02	6.89E+01	
X I-129	0.853			
BA-133	0.999	1.12E+02	5.28E+00	
HG-203	0.933	7.61E+01	4.99E+01	
TH-234	0.959	9.35E+02	2.01E+02	
X NP-237	0.566			

? = nuclide is part of an undetermined solution
 X = nuclide rejected by the interference analysis
 @ = nuclide contains energy lines not used in Weighted Mean Activity

Errors quoted at 2.000sigma

Analysis Report for 1904087-15

BC 28B

UNIDENTIFIED PEAKS

Peak Locate Performed on : 5/3/2019 6:00:50AM
 Peak Locate From Channel : 1
 Peak Locate To Channel : 4096

Peak No.	Energy (keV)	Peak Size (CPS)	Peak CPS (%) Uncertainty	Peak Type	Tolerance Nuclide
1	20.67	7.50973E-02	37.46	Tol.	PA-234M
4	52.23	7.11722E-02	32.94		
m 6	66.03	1.36292E-01	16.75	Sum	
7	81.13	1.08674E+00	4.01		
M 8	112.03	2.48046E-01	9.37	Tol.	U-237
m 9	116.06	4.75064E-02	51.08		
10	169.61	3.40143E-02	48.56		
13	334.25	7.84268E-02	19.58	Sum	
M 15	384.05	1.23071E-01	11.10		
m 16	387.00	1.79767E-01	10.33	Sum	
18	436.92	1.01111E-01	12.34		
19	444.48	8.14815E-03	47.48		
20	468.35	1.44686E-02	53.38		
21	598.62	6.33333E-03	70.72		
22	704.58	9.05555E-03	44.35		

M = First peak in a multiplet region
 m = Other peak in a multiplet region
 F = Fitted singlet
 Errors quoted at 2.000sigma

NUCLIDE MDA REPORT

Nuclide Library Used : \\OR-GAMMA1\ApexRoot\Countroom\Library\WSRC.NLB

Nuclide Name	Energy (keV)	Yield(%)	Line MDA (pCi/units)	Nuclide MDA (pCi/units)	Activity (pCi/units)	Dec. Level (pCi/units)
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Analysis Report for 1904087-15

BC 28B

Nuclide Name	Energy (keV)	Yield(%)	Line MDA (pCi/units)	Nuclide MDA (pCi/units)	Activity (pCi/units)	Dec. Level (pCi/units)
FE-55	5.89	24.50	5.43E-03	5.43E-03	0.00E+00	0.00E+00
CO-57	122.06	85.51	1.94E+01	1.94E+01	-1.18E+00	9.06E+00
	136.48	10.60	1.79E+02		-1.80E+01	8.33E+01
NI-59	6.92	29.80	2.58E-02	2.58E-02	-7.51E-02	9.16E-03
MO-93	16.59	52.90	1.33E+00	1.33E+00	7.26E-03	6.37E-01
	18.60	10.00	1.04E+01		1.53E+01	5.03E+00
NB-93M	16.57	9.43	7.42E+00	7.42E+00	4.06E-02	3.56E+00
CD-109	88.03	3.72	3.43E+02	3.43E+02	-5.36E+01	1.61E+02
+ SN-113	255.12	1.93	1.35E+03	5.21E+01	1.73E+02	6.18E+02
	391.69	* 61.90	5.21E+01		6.27E+01	2.39E+01
SN-119M	23.87	16.10	1.08E+01	8.33E+00	-4.35E+01	5.18E+00
	25.10	22.70	8.33E+00		-1.67E+02	4.00E+00
+ I-125	35.49	* 6.49	9.15E+01	9.15E+01	4.82E+02	4.45E+01
I-129	29.78	* 57.00	8.05E+00	8.05E+00	1.90E+02	3.92E+00
	33.60	* 13.20	4.45E+01		2.34E+02	2.17E+01
	39.58	7.52	5.24E+01		-3.26E+01	2.49E+01
+ BA-133	30.80	* 97.60	4.70E+00	4.70E+00	1.11E+02	2.29E+00
	302.84	* 17.80	2.71E+02		7.25E+02	1.29E+02
	356.01	* 60.00	5.69E+01		7.03E+02	2.63E+01
CE-139	165.85	80.35	3.05E+01	3.05E+01	-4.65E+00	1.43E+01
CE-144	133.54	10.80	1.65E+02	1.65E+02	-1.60E+01	7.67E+01
+ HG-203	279.19	* 77.30	6.94E+01	6.94E+01	7.61E+01	3.32E+01
PB-210	46.50	4.25	1.14E+02	1.14E+02	1.30E+01	5.40E+01
PA-231	9.28	42.00	1.89E-01	1.89E-01	1.32E-01	8.79E-02
	10.11	20.20	5.95E-01		5.38E-01	2.80E-01
	283.67	1.60	1.78E+03		-1.27E+02	8.17E+02
	302.67	2.30	2.24E+03		2.99E+03	1.07E+03
TH-231	25.64	14.70	1.61E+01	1.61E+01	-4.37E+02	7.79E+00
	84.21	6.40	5.64E+02		2.82E+03	2.77E+02
PA-234M	9.89	89.00	1.27E-01	1.27E-01	1.15E-01	5.96E-02
	21.72	64.90	2.30E+00		2.16E+00	1.11E+00
	37.93	23.75	3.06E+01		-4.46E+00	1.49E+01
	131.42	20.40	8.43E+01		-5.75E+01	3.92E+01
+ TH-234	63.29	* 3.80	4.33E+02	4.33E+02	9.35E+02	2.11E+02
NP-237	29.37	* 14.00	3.28E+01	3.28E+01	7.73E+02	1.60E+01
	86.50	12.60	1.06E+02		3.03E+01	5.00E+01
U-237	97.08	16.30	9.22E+01	6.13E+01	-5.24E+01	4.33E+01
	101.07	26.30	6.13E+01		-1.72E+01	2.88E+01
	114.00	12.30	2.95E+02		7.79E+02	1.43E+02
	208.01	22.00	1.29E+02		-2.35E+01	5.99E+01
AM-241	59.54	35.90	3.72E+01	3.72E+01	7.60E+01	1.80E+01
AM-243	74.67	66.00	1.68E+01	1.68E+01	2.22E+00	7.95E+00

+ = Nuclide identified during the nuclide identification

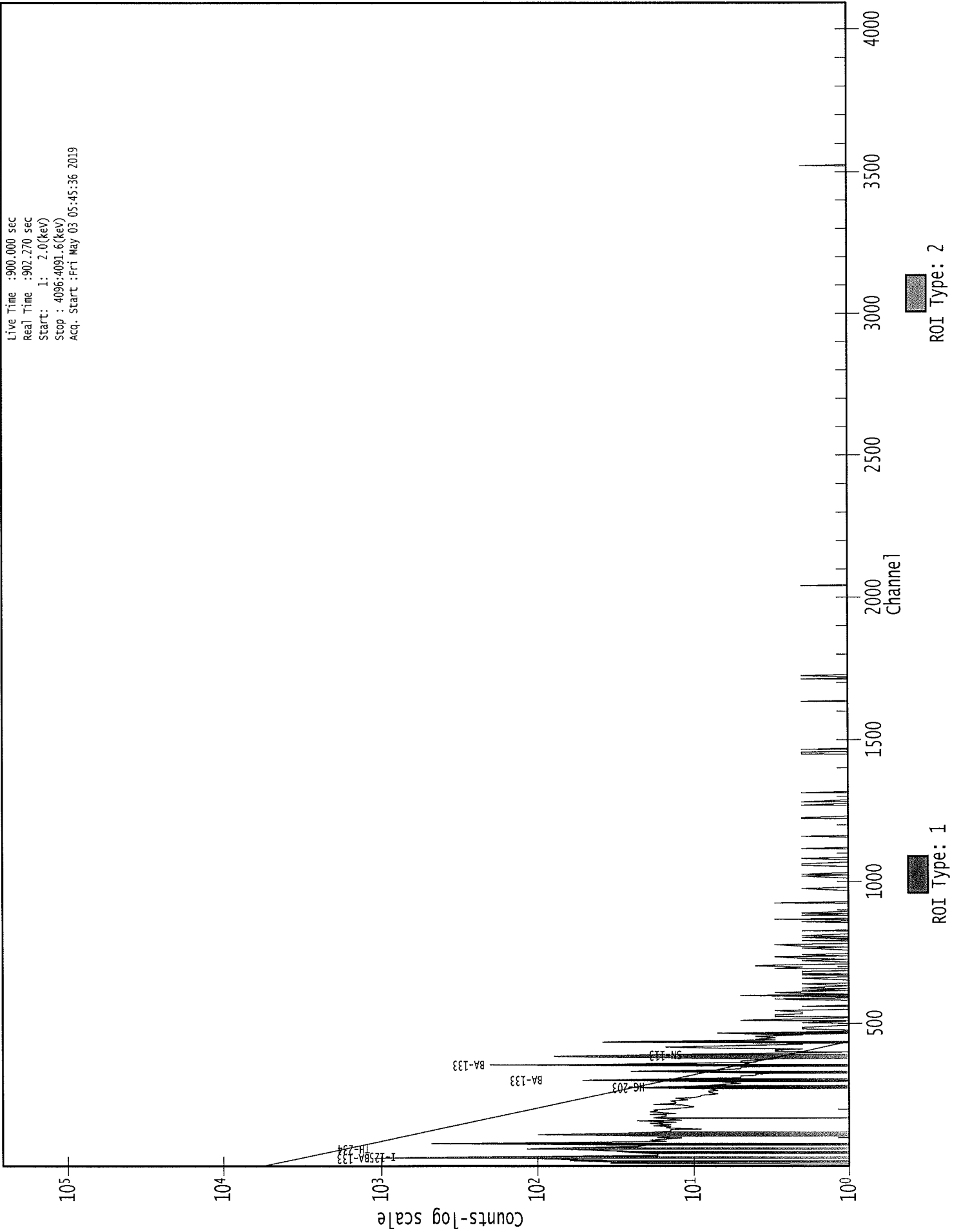
* = Energy line found in the spectrum

> = MDA value not calculated

@ = Half-life too short to be able to perform the decay correction

0000081268.CNF

Live Time : 900.000 sec
Real Time : 902.270 sec
Start : 1: 2.0(keV)
Stop : 4096:4091.6(keV)
Acq. Start : Fri May 03 05:45:36 2019



Analysis Report for 1904087-16
BC 28A

GAMMA SPECTRUM ANALYSIS

Sample Identification : 1904087-16
 Sample Description : BC 28A
 Sample Type : RA RECOVERY

 Sample Size : 1.000E+00 units
 Facility : Countroom

 Sample Taken On : 5/2/2019 8:40:28AM
 Acquisition Started : 5/3/2019 6:01:24AM

 Procedure : BAFIL
 Operator : Administrator
 Detector Name : GE1
 Geometry : BAFIL
 Live Time : 900.0 seconds
 Real Time : 900.3 seconds

 Dead Time : 0.04 %

 Peak Locate Threshold : 2.50
 Peak Locate Range (in channels) : 1 - 4096
 Peak Area Range (in channels) : 19 - 4096
 Identification Energy Tolerance : 1.000FWHM

 Energy Calibration Used Done On : 6/16/2018
 Efficiency Calibration Used Done On : 2/17/2018
 Efficiency Calibration Description :

 Sample Number : 81271

PEAK ANALYSIS REPORT

Peak Analysis Performed on : 5/3/2019 6:16:28AM
 Peak Analysis From Channel : 1
 Peak Analysis To Channel : 4096

Peak No.	Energy (keV)	ROI start	ROI end	Peak Centroid	Net Peak Area	Net Area Uncertainty	Continuum Counts	FWHM (keV)
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Analysis Report for 1904087-16

BC 28A

Peak No.	Energy (keV)	ROI start	ROI end	Peak Centroid	Net Peak Area	Net Area Uncertainty	Continuum Counts	FWHM (keV)
1	31.79	26 -	43	32.17	2.98E+03	146.65	7.84E+02	4.29
2	52.67	49 -	56	53.04	7.26E+01	41.90	2.45E+02	4.13
3	63.44	57 -	74	63.80	4.93E+02	92.82	6.07E+02	5.44
4	81.08	76 -	88	81.44	9.59E+02	89.40	4.94E+02	4.21
5	112.28	108 -	119	112.63	2.71E+02	65.57	4.01E+02	4.96
6	222.11	217 -	225	222.44	2.42E+01	29.71	1.20E+02	3.87
7	276.18	272 -	281	276.49	7.65E+01	31.22	9.70E+01	2.73
8	303.08	297 -	310	303.39	1.49E+02	49.24	2.03E+02	3.72
9	334.48	329 -	343	334.78	1.25E+02	41.43	1.31E+02	3.12
M 10	356.13	350 -	364	356.43	5.57E+02	57.52	1.03E+02	3.42
m 11	359.28	350 -	364	359.58	6.58E+01	47.93	8.07E+01	2.22
M 12	383.66	380 -	396	383.95	1.06E+02	40.89	8.99E+01	3.54
m 13	386.35	380 -	396	386.64	1.88E+02	44.64	9.06E+01	3.45
14	418.57	410 -	429	418.85	1.06E+02	38.57	8.16E+01	9.81
15	437.27	431 -	444	437.54	1.25E+02	27.35	2.68E+01	4.00
16	468.79	461 -	477	469.06	3.64E+01	26.03	4.92E+01	3.82
17	492.07	489 -	494	492.33	6.00E+00	4.90	0.00E+00	1.92
18	827.00	825 -	829	827.20	5.00E+00	4.47	0.00E+00	1.16

M = First peak in a multiplet region

m = Other peak in a multiplet region

F = Fitted singlet

Errors quoted at 2.000sigma

BACKGROUND SUBTRACT REPORT

Peak Analysis Performed on : 5/3/2019 6:16:28AM

Env. Background File : \\OR-GAMMA1\ApexRoot\Countroom\Data\0000080014.CNF

Peak No.	Energy (keV)	Original Area	Orig. Area Uncertainty	Ambient Background	Backgr. Uncert.	Subtracted Area	Subtracted Uncert.
1	31.79	2.98E+03	146.65			2.98E+03	1.47E+02
2	52.67	7.26E+01	41.90			7.26E+01	4.19E+01
3	63.44	4.93E+02	92.82	2.07E+01	2.02E+00	4.73E+02	9.28E+01
4	81.08	9.59E+02	89.40			9.59E+02	8.94E+01
5	112.28	2.71E+02	65.57			2.71E+02	6.56E+01
6	222.11	2.42E+01	29.71			2.42E+01	2.97E+01
7	276.18	7.65E+01	31.22			7.65E+01	3.12E+01
8	303.08	1.49E+02	49.24			1.49E+02	4.92E+01
9	334.48	1.25E+02	41.43			1.25E+02	4.14E+01
M 10	356.13	5.57E+02	57.52			5.57E+02	5.75E+01
m 11	359.28	6.58E+01	47.93			6.58E+01	4.79E+01

0288

Analysis Report for 1904087-16

BC 28A

	Peak No.	Energy (keV)	Original Area	Orig. Area Uncertainty	Ambient Background	Backgr. Uncert.	Subtracted Area	Subtracted Uncert.
M	12	383.66	1.06E+02	40.89			1.06E+02	4.09E+01
m	13	386.35	1.88E+02	44.64			1.88E+02	4.46E+01
	14	418.57	1.06E+02	38.57			1.06E+02	3.86E+01
	15	437.27	1.25E+02	27.35			1.25E+02	2.73E+01
	16	468.79	3.64E+01	26.03			3.64E+01	2.60E+01
	17	492.07	6.00E+00	4.90			6.00E+00	4.90E+00
	18	827.00	5.00E+00	4.47			5.00E+00	4.47E+00

M = First peak in a multiplet region
m = Other peak in a multiplet region
F = Fitted singlet
Errors quoted at 2.000sigma

NUCLIDE IDENTIFICATION REPORT

Nuclide Library Used : \\OR-GAMMA1\ApexRoot\Countroom\Library\WSRC.NLB

IDENTIFIED NUCLIDES

Nuclide Name	Id Confidence	Energy (keV)	Yield(%)	Activity (pCi/units)	Activity Uncertainty
BA-133	0.98	30.80 *	97.60	7.50E-01	3.69E-02
		302.84 *	17.80	6.59E+02	3.61E+02
		356.01 *	60.00	4.70E+02	7.06E+01
PA-231	1.00	9.28	42.00		
		10.11	20.20		
		283.67	1.60		
TH-234	0.99	302.67 *	2.30	5.10E+03	2.80E+03
		63.29 *	3.80	6.08E+02	1.20E+02

* = Energy line found in the spectrum.
- = Manually added nuclide.
? = Manually edited nuclide.
@ = Energy line not used for Weighted Mean Activity
Energy Tolerance : 2.000FWHM
Nuclide confidence index threshold = 0.30
Errors quoted at 2.000sigma

Analysis Report for 1904087-16

BC 28A

INTERFERENCE CORRECTED REPORT

Nuclide Name	Nuclide Id Confidence	Wt mean Activity (pCi/units)	Wt mean Activity Uncertainty	Comments
BA-133	0.983	7.50E-01	3.69E-02	
PA-231	1.000	5.10E+03	2.80E+03	
TH-234	0.999	6.08E+02	1.20E+02	

- ? = nuclide is part of an undetermined solution
X = nuclide rejected by the interference analysis
@ = nuclide contains energy lines not used in Weighted Mean Activity

Errors quoted at 2.000sigma

Analysis Report for 1904087-16

BC 28A

UNIDENTIFIED PEAKS

Peak Locate Performed on : 5/3/2019 6:16:28AM
 Peak Locate From Channel : 1
 Peak Locate To Channel : 4096

Peak No.	Energy (keV)	Peak Size (CPS)	Peak CPS (%) Uncertainty	Peak Type	Tolerance Nuclide
2	52.67	8.07094E-02	28.84		
4	81.08	1.06554E+00	4.66		
5	112.28	3.01656E-01	12.08	Tol.	U-237
6	222.11	2.68981E-02	61.37		
7	276.18	8.49911E-02	20.41		
9	334.48	1.38427E-01	16.63	Sum	
m 11	359.28	7.31088E-02	36.42		
M 12	383.66	1.17941E-01	19.26		
m 13	386.35	2.09336E-01	11.85	Sum	
14	418.57	1.17982E-01	18.16	Sum	
15	437.27	1.38446E-01	10.97		
16	468.79	4.04554E-02	35.74		
17	492.07	6.66667E-03	40.82		
18	827.00	5.55556E-03	44.72		

M = First peak in a multiplet region
 m = Other peak in a multiplet region
 F = Fitted singlet
 Errors quoted at 2.000sigma

NUCLIDE MDA REPORT

Nuclide Library Used : \\OR-GAMMA1\ApexRoot\Countroom\Library\WSRC.NLB

Nuclide Name	Energy (keV)	Yield(%)	Line MDA (pCi/units)	Nuclide MDA (pCi/units)	Activity (pCi/units)	Dec. Level (pCi/units)
FE-55	5.89	24.50	1.90E-13	1.90E-13	0.00E+00	0.00E+00
CO-57	122.06	85.51	3.70E+01	3.70E+01	5.93E+00	1.73E+01

0291

Analysis Report for 1904087-16

BC 28A

Nuclide Name	Energy (keV)	Yield(%)	Line MDA (pCi/units)	Nuclide MDA (pCi/units)	Activity (pCi/units)	Dec. Level (pCi/units)
CO-57	136.48	10.60	3.55E+02	3.70E+01	-4.36E+01	1.65E+02
NI-59	6.92	29.80	2.77E-12	2.77E-12	0.00E+00	0.00E+00
MO-93	16.59	52.90	1.01E-05	1.01E-05	-4.56E-06	4.61E-06
	18.60	10.00	4.03E-04		-3.50E-04	1.92E-04
NB-93M	16.57	9.43	5.58E-05	5.58E-05	-2.52E-05	2.55E-05
CD-109	88.03	3.72	3.37E+02	3.37E+02	2.33E+01	1.59E+02
SN-113	255.12	1.93	2.01E+03	3.37E+01	8.91E+02	9.28E+02
	391.69	61.90	3.37E+01		1.58E+01	1.60E+01
SN-119M	23.87	16.10	7.45E-03	7.45E-03	1.53E-02	3.62E-03
	25.10	22.70	8.76E-03		1.11E-02	4.24E-03
I-125	35.49	6.49	1.41E+00	1.41E+00	1.51E+00	6.92E-01
I-129	29.78	57.00	4.82E-02	4.82E-02	2.17E-01	2.38E-02
	33.60	13.20	5.79E-01		1.19E+00	2.85E-01
	39.58	7.52	1.49E+00		-9.83E-01	7.13E-01
+ BA-133	30.80	* 97.60	4.12E-02	4.12E-02	7.50E-01	2.03E-02
	302.84	* 17.80	3.23E+02		6.59E+02	1.55E+02
	356.01	* 60.00	5.40E+01		4.70E+02	2.59E+01
CE-139	165.85	80.35	6.66E+01	6.66E+01	-1.38E+01	3.12E+01
CE-144	133.54	10.80	3.66E+02	3.66E+02	2.00E+02	1.72E+02
HG-203	279.19	77.30	5.49E+01	5.49E+01	6.73E+00	2.58E+01
PB-210	46.50	4.25	6.38E+00	6.38E+00	-1.50E-01	3.00E+00
+ PA-231	9.28	42.00	2.61E-10	2.61E-10	0.00E+00	0.00E+00
	10.11	20.20	2.08E-09		0.00E+00	0.00E+00
	283.67	1.60	1.73E+03		-1.77E+02	7.90E+02
	302.67	* 2.30	2.50E+03		5.10E+03	1.20E+03
TH-231	25.64	14.70	1.67E-02	1.67E-02	-8.16E-03	8.07E-03
	84.21	6.40	2.98E+02		2.14E+02	1.44E+02
PA-234M	9.89	89.00	3.36E-10	3.36E-10	0.00E+00	0.00E+00
	21.72	64.90	6.60E-04		1.42E-03	3.20E-04
	37.93	23.75	4.96E-01		5.01E-01	2.41E-01
	131.42	20.40	1.76E+02		-3.61E+01	8.21E+01
+ TH-234	63.29	* 3.80	1.77E+02	1.77E+02	6.08E+02	8.68E+01
NP-237	29.37	14.00	1.71E-01	1.71E-01	7.69E-01	8.45E-02
	86.50	12.60	1.06E+02		-2.51E+02	5.06E+01
U-237	97.08	16.30	1.13E+02	7.66E+01	-4.59E+01	5.32E+01
	101.07	26.30	7.66E+01		-1.71E+01	3.59E+01
	114.00	12.30	4.30E+02		5.91E+02	2.07E+02
	208.01	22.00	2.57E+02		1.93E+01	1.20E+02
AM-241	59.54	35.90	7.26E+00	7.26E+00	1.78E+00	3.51E+00
AM-243	74.67	66.00	9.13E+00	9.13E+00	-2.63E+01	4.32E+00

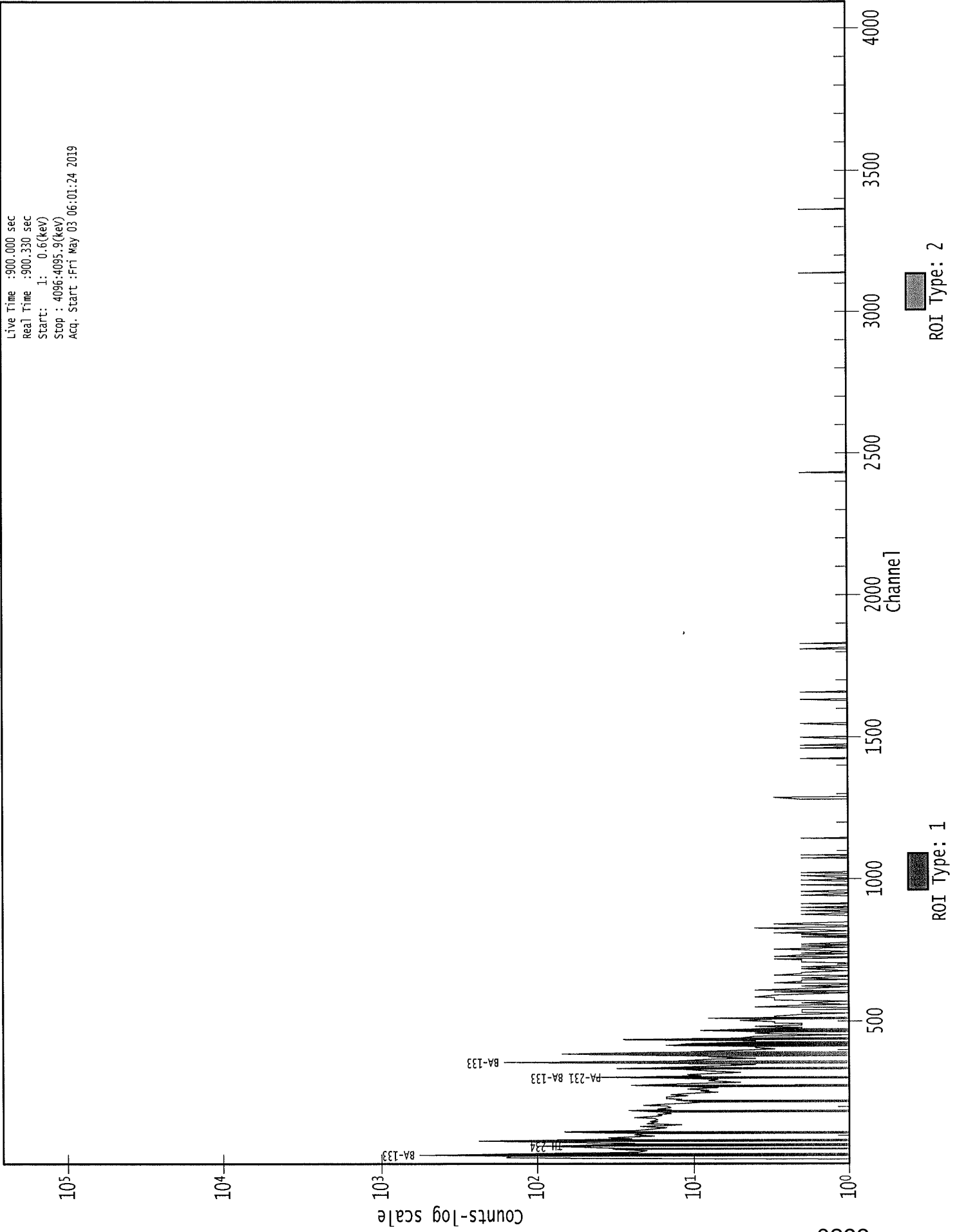
+ = Nuclide identified during the nuclide identification

* = Energy line found in the spectrum

> = MDA value not calculated

@ = Half-life too short to be able to perform the decay correction

0000081271.CNF



Analysis Report for 1904087-17
BC 16

GAMMA SPECTRUM ANALYSIS

Sample Identification : 1904087-17
 Sample Description : BC 16
 Sample Type : RA RECOVERY

 Sample Size : 1.000E+00 units
 Facility : Countroom

 Sample Taken On : 5/2/2019 8:40:36AM
 Acquisition Started : 5/3/2019 6:01:31AM

 Procedure : BAFIL
 Operator : Administrator
 Detector Name : GE2
 Geometry : BAFIL
 Live Time : 900.0 seconds
 Real Time : 900.3 seconds

 Dead Time : 0.03 %

 Peak Locate Threshold : 2.50
 Peak Locate Range (in channels) : 1 - 4096
 Peak Area Range (in channels) : 28 - 4096
 Identification Energy Tolerance : 1.000FWHM

 Energy Calibration Used Done On : 2/17/2018
 Efficiency Calibration Used Done On : 2/24/2018
 Efficiency Calibration Description :

 Sample Number : 81272

PEAK ANALYSIS REPORT

Peak Analysis Performed on : 5/3/2019 6:16:40AM
 Peak Analysis From Channel : 1
 Peak Analysis To Channel : 4096

Peak No.	Energy (keV)	ROI start	ROI end	Peak Centroid	Net Peak Area	Net Area Uncertainty	Continuum Counts	FWHM (keV)
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Analysis Report for 1904087-17

BC 16

	Peak No.	Energy (keV)	ROI start	ROI end	Peak Centroid	Net Peak Area	Net Area Uncertainty	Continuum Counts	FWHM (keV)
	1	35.83	35 -	38	35.61	4.87E+02	66.81	4.53E+02	2.52
	2	53.51	50 -	57	53.28	9.57E+01	39.50	1.97E+02	1.94
M	3	62.31	58 -	73	62.08	3.03E+02	44.03	1.44E+02	1.95
m	4	66.41	58 -	73	66.18	1.35E+02	39.23	1.38E+02	2.02
	5	81.52	77 -	85	81.28	1.02E+03	76.63	2.75E+02	1.57
M	6	112.26	107 -	124	112.01	1.90E+02	34.87	1.09E+02	1.37
m	7	116.45	107 -	124	116.19	3.52E+01	24.66	9.84E+01	1.38
	8	142.40	138 -	146	142.13	4.70E+01	35.23	1.62E+02	3.50
	9	162.81	157 -	167	162.53	5.64E+01	46.37	2.51E+02	6.02
	10	180.71	178 -	183	180.42	2.11E+01	24.90	1.06E+02	3.03
	11	204.33	201 -	207	204.03	2.61E+01	28.73	1.28E+02	2.44
	12	276.67	272 -	280	276.34	7.91E+01	29.06	8.18E+01	1.97
M	13	303.28	299 -	314	302.94	1.96E+02	29.46	2.46E+01	1.47
m	14	307.44	299 -	314	307.10	4.16E+01	20.86	1.93E+01	1.86
M	15	334.15	329 -	342	333.79	8.55E+01	22.28	2.42E+01	1.72
m	16	338.41	329 -	342	338.05	2.76E+01	15.63	1.77E+01	1.73
	17	356.42	352 -	359	356.05	6.70E+02	55.79	7.21E+01	1.30
M	18	384.31	381 -	389	383.93	1.21E+02	26.32	4.67E+01	1.79
m	19	387.32	381 -	389	386.94	2.27E+02	34.42	5.25E+01	1.57
	20	391.76	390 -	395	391.37	4.50E+01	18.57	2.40E+01	1.50
M	21	415.20	411 -	426	414.80	3.56E+01	18.39	2.57E+01	2.20
m	22	418.75	411 -	426	418.35	2.72E+01	20.06	3.40E+01	2.21
	23	437.38	432 -	441	436.97	1.10E+02	25.50	2.90E+01	1.42
	24	468.41	463 -	473	467.98	2.02E+01	16.95	2.76E+01	1.92
	25	634.92	631 -	638	634.41	7.80E+00	7.48	4.40E+00	3.56
	26	718.64	714 -	721	718.08	9.31E+00	9.17	7.38E+00	2.32
	27	770.63	767 -	772	770.04	5.57E+00	6.08	2.86E+00	1.44
	28	832.10	829 -	833	831.48	4.75E+00	5.50	2.50E+00	1.79
	29	1461.50	1457 -	1463	1460.50	6.00E+00	4.90	0.00E+00	1.16

M = First peak in a multiplet region

m = Other peak in a multiplet region

F = Fitted singlet

Errors quoted at 2.000sigma

BACKGROUND SUBTRACT REPORT

Peak Analysis Performed on : 5/3/2019 6:16:40AM

Env. Background File : \\OR-GAMMA1\ApexRoot\Countroom\Data\0000080015.CNF

Peak No.	Energy (keV)	Original Area	Orig. Area Uncertainty	Ambient Background	Backgr. Uncert.	Subtracted Area	Subtracted Uncert.
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0295

Analysis Report for 1904087-17

BC 16

	Peak No.	Energy (keV)	Original Area	Orig. Area Uncertainty	Ambient Background	Backgr. Uncert.	Subtracted Area	Subtracted Uncert.
	1	35.83	4.87E+02	66.81			4.87E+02	6.68E+01
	2	53.51	9.57E+01	39.50			9.57E+01	3.95E+01
M	3	62.31	3.03E+02	44.03			3.03E+02	4.40E+01
m	4	66.41	1.35E+02	39.23			1.35E+02	3.92E+01
	5	81.52	1.02E+03	76.63			1.02E+03	7.66E+01
M	6	112.26	1.90E+02	34.87	8.57E-01	1.81E+00	1.89E+02	3.49E+01
m	7	116.45	3.52E+01	24.66			3.52E+01	2.47E+01
	8	142.40	4.70E+01	35.23			4.70E+01	3.52E+01
	9	162.81	5.64E+01	46.37			5.64E+01	4.64E+01
	10	180.71	2.11E+01	24.90			2.11E+01	2.49E+01
	11	204.33	2.61E+01	28.73			2.61E+01	2.87E+01
	12	276.67	7.91E+01	29.06			7.91E+01	2.91E+01
M	13	303.28	1.96E+02	29.46			1.96E+02	2.95E+01
m	14	307.44	4.16E+01	20.86			4.16E+01	2.09E+01
M	15	334.15	8.55E+01	22.28			8.55E+01	2.23E+01
m	16	338.41	2.76E+01	15.63	7.39E-01	1.27E+00	2.68E+01	1.57E+01
	17	356.42	6.70E+02	55.79			6.70E+02	5.58E+01
M	18	384.31	1.21E+02	26.32			1.21E+02	2.63E+01
m	19	387.32	2.27E+02	34.42			2.27E+02	3.44E+01
	20	391.76	4.50E+01	18.57			4.50E+01	1.86E+01
M	21	415.20	3.56E+01	18.39			3.56E+01	1.84E+01
m	22	418.75	2.72E+01	20.06			2.72E+01	2.01E+01
	23	437.38	1.10E+02	25.50			1.10E+02	2.55E+01
	24	468.41	2.02E+01	16.95			2.02E+01	1.69E+01
	25	634.92	7.80E+00	7.48			7.80E+00	7.48E+00
	26	718.64	9.31E+00	9.17			9.31E+00	9.17E+00
	27	770.63	5.57E+00	6.08			5.57E+00	6.08E+00
	28	832.10	4.75E+00	5.50			4.75E+00	5.50E+00
	29	1461.50	6.00E+00	4.90	1.31E+00	6.07E-01	4.69E+00	4.94E+00

M = First peak in a multiplet region

m = Other peak in a multiplet region

F = Fitted singlet

Errors quoted at 2.000sigma

NUCLIDE IDENTIFICATION REPORT

Nuclide Library Used : \\OR-GAMMA1\ApexRoot\Countroom\Library\WSRC.NLB

IDENTIFIED NUCLIDES

Nuclide Name	Id Confidence	Energy (keV)	Yield(%)	Activity (pCi/units)	Activity Uncertainty
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Analysis Report for 1904087-17

BC 16

Nuclide Name	Id Confidence	Energy (keV)	Yield(%)	Activity (pCi/units)	Activity Uncertainty
SN-113	0.96	255.12	1.93		
		391.69 *	61.90	2.77E+01	1.16E+01
I-125	0.99	35.49 *	6.49	1.91E+01	2.62E+00
PA-231	1.00	9.28	42.00		
		10.11	20.20		
		283.67	1.60		
		302.67 *	2.30	5.77E+03	1.95E+03
TH-234	0.97	63.29 *	3.80	5.12E+02	7.58E+01

* = Energy line found in the spectrum.

- = Manually added nuclide.

? = Manually edited nuclide.

@ = Energy line not used for Weighted Mean Activity

Energy Tolerance : 2.000FWHM

Nuclide confidence index threshold = 0.30

Errors quoted at 2.000sigma

INTERFERENCE CORRECTED REPORT

Nuclide Name	Nuclide Id Confidence	Wt mean Activity (pCi/units)	Wt mean Activity Uncertainty	Comments
SN-113	0.967	2.77E+01	1.16E+01	
I-125	0.997	1.91E+01	2.62E+00	
PA-231	1.000	5.77E+03	1.95E+03	
TH-234	0.975	5.12E+02	7.58E+01	

? = nuclide is part of an undetermined solution

X = nuclide rejected by the interference analysis

@ = nuclide contains energy lines not used in Weighted Mean Activity

Errors quoted at 2.000sigma

Analysis Report for 1904087-17

BC 16

UNIDENTIFIED PEAKS

Peak Locate Performed on : 5/3/2019 6:16:40AM
 Peak Locate From Channel : 1
 Peak Locate To Channel : 4096

<i>Peak No.</i>	<i>Energy (keV)</i>	<i>Peak Size (CPS)</i>	<i>Peak CPS (%) Uncertainty</i>	<i>Peak Type</i>	<i>Tolerance Nuclide</i>
	2	53.51	1.06337E-01	20.63	
m	4	66.41	1.49448E-01	14.58	
	5	81.52	1.12919E+00	3.77	
M	6	112.26	2.10159E-01	9.23	Tol. U-237
m	7	116.45	3.91485E-02	34.99	
	8	142.40	5.22222E-02	37.48	
	9	162.81	6.26587E-02	41.11	
	10	180.71	2.34535E-02	58.98	
	11	204.33	2.89753E-02	55.09	
	12	276.67	8.78704E-02	18.37	
m	14	307.44	4.62261E-02	25.07	
M	15	334.15	9.49757E-02	13.03	
m	16	338.41	2.98020E-02	29.23	Sum
	17	356.42	7.44407E-01	4.16	Tol. BA-133
M	18	384.31	1.34900E-01	10.84	
m	19	387.32	2.52338E-01	7.58	
M	21	415.20	3.95370E-02	25.84	
m	22	418.75	3.02404E-02	36.85	
	23	437.38	1.22773E-01	11.54	
	24	468.41	2.24346E-02	41.97	
	25	634.92	8.66667E-03	47.97	
	26	718.64	1.03419E-02	49.23	
	27	770.63	6.19048E-03	54.59	
	28	832.10	5.27778E-03	57.89	
	29	1461.50	5.21407E-03	52.60	

M = First peak in a multiplet region

m = Other peak in a multiplet region

F = Fitted singlet

Errors quoted at 2.000sigma

Analysis Report for 1904087-17

BC 16

NUCLIDE MDA REPORT

Nuclide Library Used : \\OR-GAMMA1\ApexRoot\Countroom\Library\WSRC.NLB

Nuclide Name	Energy (keV)	Yield(%)	Line MDA (pCi/units)	Nuclide MDA (pCi/units)	Activity (pCi/units)	Dec. Level (pCi/units)
FE-55	5.89	24.50	1.20E-10	1.20E-10	0.00E+00	0.00E+00
CO-57	122.06	85.51	2.37E+01	2.37E+01	-1.95E+01	1.09E+01
	136.48	10.60	2.47E+02		8.72E+01	1.14E+02
NI-59	6.92	29.80	9.43E-10	9.43E-10	0.00E+00	0.00E+00
MO-93	16.59	52.90	1.78E-05	1.78E-05	0.00E+00	0.00E+00
	18.60	10.00	2.91E-04		0.00E+00	0.00E+00
NB-93M	16.57	9.43	9.85E-05	9.85E-05	0.00E+00	0.00E+00
CD-109	88.03	3.72	2.66E+02	2.66E+02	-1.75E+02	1.24E+02
+ SN-113	255.12	1.93	1.37E+03	1.46E+01	5.38E+02	6.25E+02
	391.69	* 61.90	1.46E+01		2.77E+01	6.49E+00
SN-119M	23.87	16.10	1.78E-03	1.78E-03	0.00E+00	0.00E+00
	25.10	22.70	1.94E-03		0.00E+00	0.00E+00
+ I-125	35.49	* 6.49	9.94E+00	9.94E+00	1.91E+01	4.91E+00
I-129	29.78	57.00	2.32E-01	2.32E-01	1.07E+00	1.15E-01
	33.60	13.20	1.70E+00		-3.38E+00	8.31E-01
	39.58	7.52	2.19E+00		-1.29E-01	1.00E+00
BA-133	30.80	97.60	2.08E-01	2.08E-01	2.17E+00	1.03E-01
	302.84	17.80	2.68E+02		7.31E+02	1.29E+02
	356.01	60.00	1.01E+02		5.41E+02	4.94E+01
CE-139	165.85	80.35	4.73E+01	4.73E+01	-1.94E+01	2.21E+01
CE-144	133.54	10.80	2.30E+02	2.30E+02	-6.64E+01	1.06E+02
HG-203	279.19	77.30	3.97E+01	3.97E+01	3.94E+00	1.85E+01
PB-210	46.50	4.25	9.88E+00	9.88E+00	-7.12E+00	4.51E+00
+ PA-231	9.28	42.00	3.13E-08	3.13E-08	0.00E+00	0.00E+00
	10.11	20.20	1.87E-07		0.00E+00	0.00E+00
	283.67	1.60	1.15E+03		-2.35E+02	5.13E+02
	302.67	* 2.30	1.41E+03		5.77E+03	6.64E+02
TH-231	25.64	14.70	3.57E-03	3.57E-03	0.00E+00	0.00E+00
	84.21	6.40	3.30E+02		3.66E+02	1.60E+02
PA-234M	9.89	89.00	3.24E-08	3.24E-08	0.00E+00	0.00E+00
	21.72	64.90	1.91E-04		0.00E+00	0.00E+00
	37.93	23.75	7.46E-01		-1.28E+00	3.52E-01
	131.42	20.40	1.28E+02		4.80E+01	5.95E+01
+ TH-234	63.29	* 3.80	1.64E+02	1.64E+02	5.12E+02	7.98E+01
NP-237	29.37	14.00	3.12E-01	3.12E-01	-7.58E+00	1.50E-01
	86.50	12.60	8.06E+01		-1.54E+01	3.77E+01
U-237	97.08	16.30	1.04E+02	6.73E+01	7.27E+01	4.91E+01
	101.07	26.30	6.73E+01		1.34E+01	3.15E+01
	114.00	12.30	3.72E+02		5.99E+02	1.80E+02
	208.01	22.00	1.67E+02		-4.87E+00	7.68E+01
AM-241	59.54	35.90	7.86E+00	7.86E+00	-4.87E+01	3.74E+00
AM-243	74.67	66.00	1.01E+01	1.01E+01	1.90E+00	4.74E+00

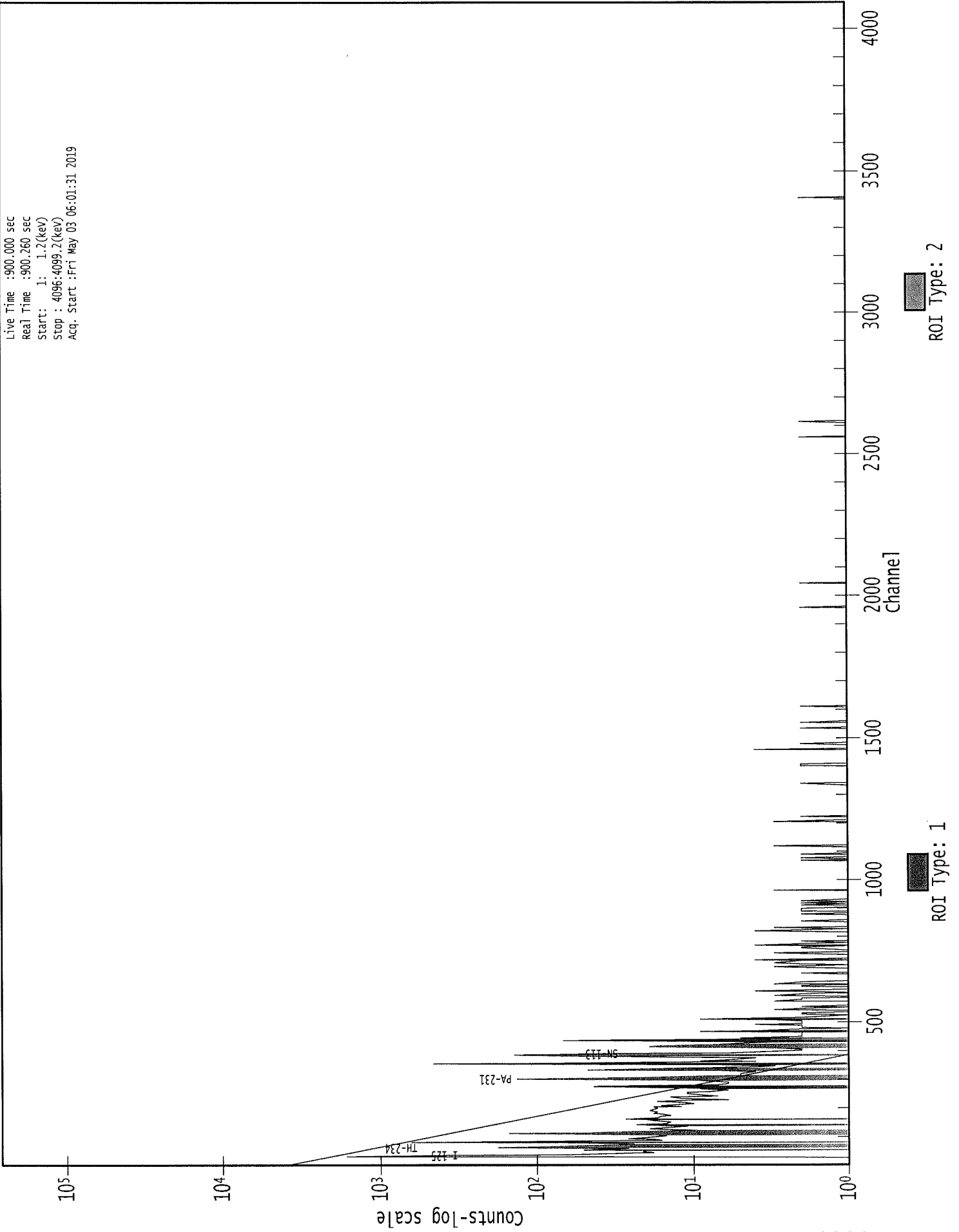
Analysis Report for 1904087-17

BC 16

- + = Nuclide identified during the nuclide identification
 - * = Energy line found in the spectrum
 - > = MDA value not calculated
 - @ = Half-life too short to be able to perform the decay correction
-

0000081272.CNF

Live Time :900.000 sec
Real Time :900.260 sec
Start : 1: 1.2(keV)
Stop : 4096:4099.2(keV)
Acq. Start :Fri May 03 06:01:31 2019



0301

Analysis Report for 1904087-18
BC 15

GAMMA SPECTRUM ANALYSIS

Sample Identification : 1904087-18
 Sample Description : BC 15
 Sample Type : RA RECOVERY

 Sample Size : 1.000E+00 units
 Facility : Countroom

 Sample Taken On : 5/2/2019 8:40:44AM
 Acquisition Started : 5/3/2019 6:01:41AM

 Procedure : BAFIL
 Operator : Administrator
 Detector Name : GE4
 Geometry : BAFIL
 Live Time : 900.0 seconds
 Real Time : 902.2 seconds

 Dead Time : 0.24 %

 Peak Locate Threshold : 2.50
 Peak Locate Range (in channels) : 1 - 4096
 Peak Area Range (in channels) : 9 - 4096
 Identification Energy Tolerance : 1.000FWHM

 Energy Calibration Used Done On : 2/24/2018
 Efficiency Calibration Used Done On : 11/9/2014
 Efficiency Calibration Description :

 Sample Number : 81273

PEAK ANALYSIS REPORT

Peak Analysis Performed on : 5/3/2019 6:16:52AM
 Peak Analysis From Channel : 1
 Peak Analysis To Channel : 4096

Peak No.	Energy (keV)	ROI start	ROI end	Peak Centroid	Net Peak Area	Net Area Uncertainty	Continuum Counts	FWHM (keV)
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Analysis Report for 1904087-18

BC 15

	Peak No.	Energy (keV)	ROI start	ROI end	Peak Centroid	Net Peak Area	Net Area Uncertainty	Continuum Counts	FWHM (keV)
	1	21.02	16 -	22	20.07	6.81E+01	46.79	3.46E+02	2.52
M	2	26.37	24 -	38	25.43	4.84E+01	23.73	1.55E+02	2.47
m	3	30.89	24 -	38	29.95	2.60E+03	108.24	2.40E+02	2.06
m	4	35.20	24 -	38	34.27	6.76E+02	81.28	1.88E+02	2.31
	5	52.92	49 -	56	52.00	8.02E+01	42.71	2.56E+02	2.90
M	6	61.66	57 -	68	60.74	2.86E+02	56.43	3.48E+02	2.60
m	7	66.07	57 -	68	65.16	9.41E+01	47.60	3.17E+02	2.24
	8	81.08	74 -	86	80.18	1.04E+03	85.81	3.72E+02	2.26
M	9	111.86	105 -	118	110.98	2.18E+02	44.45	1.60E+02	2.61
m	10	116.33	105 -	118	115.45	4.96E+01	34.79	1.40E+02	2.41
	11	208.13	205 -	209	207.32	2.33E+01	22.48	8.74E+01	1.21
	12	276.50	274 -	280	275.76	5.43E+01	25.96	8.15E+01	1.75
M	13	302.90	296 -	311	302.18	1.56E+02	30.13	5.76E+01	2.24
m	14	307.95	296 -	311	307.23	2.97E+01	26.31	4.58E+01	2.53
	15	323.49	319 -	327	322.79	1.85E+01	14.87	2.31E+01	2.22
	16	335.58	328 -	342	334.88	1.22E+02	27.73	2.85E+01	2.79
	17	356.28	350 -	361	355.60	5.18E+02	51.85	7.47E+01	2.30
M	18	383.89	378 -	394	383.23	1.13E+02	30.33	2.62E+01	2.58
m	19	386.89	378 -	394	386.24	1.47E+02	31.83	1.38E+01	2.14
m	20	390.42	378 -	394	389.76	3.80E+01	28.07	1.06E+01	2.59
	21	415.61	409 -	421	414.98	5.15E+01	23.18	3.90E+01	6.84
	22	436.90	432 -	441	436.29	7.84E+01	21.35	2.12E+01	2.19
	23	468.03	462 -	470	467.45	1.31E+01	10.61	9.78E+00	2.80
	24	483.28	480 -	485	482.71	7.00E+00	5.29	0.00E+00	3.31
m	25	514.74	506 -	519	514.20	8.69E+00	12.88	1.00E+01	3.21

M = First peak in a multiplet region
m = Other peak in a multiplet region
F = Fitted singlet
Errors quoted at 2.000sigma

BACKGROUND SUBTRACT REPORT

Peak Analysis Performed on : 5/3/2019 6:16:52AM

Env. Background File : \\OR-GAMMA1\ApexRoot\Countroom\Data\0000080017.CNF

	Peak No.	Energy (keV)	Original Area	Orig. Area Uncertainty	Ambient Background	Backgr. Uncert.	Subtracted Area	Subtracted Uncert.
	1	21.02	6.81E+01	46.79			6.81E+01	4.68E+01
M	2	26.37	4.84E+01	23.73			4.84E+01	2.37E+01
m	3	30.89	2.60E+03	108.24			2.60E+03	1.08E+02
m	4	35.20	6.76E+02	81.28			6.76E+02	8.13E+01

Analysis Report for 1904087-18

BC 15

	Peak No.	Energy (keV)	Original Area	Orig. Area Uncertainty	Ambient Background	Backgr. Uncert.	Subtracted Area	Subtracted Uncert.
	5	52.92	8.02E+01	42.71			8.02E+01	4.27E+01
M	6	61.66	2.86E+02	56.43	1.28E+01	1.96E+00	2.74E+02	5.65E+01
m	7	66.07	9.41E+01	47.60			9.41E+01	4.76E+01
	8	81.08	1.04E+03	85.81			1.04E+03	8.58E+01
M	9	111.86	2.18E+02	44.45			2.18E+02	4.45E+01
m	10	116.33	4.96E+01	34.79			4.96E+01	3.48E+01
	11	208.13	2.33E+01	22.48			2.33E+01	2.25E+01
	12	276.50	5.43E+01	25.96			5.43E+01	2.60E+01
M	13	302.90	1.56E+02	30.13			1.56E+02	3.01E+01
m	14	307.95	2.97E+01	26.31			2.97E+01	2.63E+01
	15	323.49	1.85E+01	14.87			1.85E+01	1.49E+01
	16	335.58	1.22E+02	27.73			1.22E+02	2.77E+01
	17	356.28	5.18E+02	51.85			5.18E+02	5.18E+01
M	18	383.89	1.13E+02	30.33			1.13E+02	3.03E+01
m	19	386.89	1.47E+02	31.83			1.47E+02	3.18E+01
m	20	390.42	3.80E+01	28.07			3.80E+01	2.81E+01
	21	415.61	5.15E+01	23.18			5.15E+01	2.32E+01
	22	436.90	7.84E+01	21.35			7.84E+01	2.14E+01
	23	468.03	1.31E+01	10.61			1.31E+01	1.06E+01
	24	483.28	7.00E+00	5.29			7.00E+00	5.29E+00
m	25	514.74	8.69E+00	12.88			8.69E+00	1.29E+01

M = First peak in a multiplet region
m = Other peak in a multiplet region
F = Fitted singlet
Errors quoted at 2.000sigma

NUCLIDE IDENTIFICATION REPORT

Nuclide Library Used : \\OR-GAMMA1\ApexRoot\Countroom\Library\WSRC.NLB

IDENTIFIED NUCLIDES

Nuclide Name	Id Confidence	Energy (keV)	Yield(%)	Activity (pCi/units)	Activity Uncertainty
SN-113	0.91	255.12	1.93		
		391.69	*	61.90	4.51E+01
I-125	0.99	35.49	*	6.49	7.45E+01
BA-133	0.99	30.80	*	97.60	5.36E+00
		302.84	*	17.80	2.79E+02
		356.01	*	60.00	8.13E+02
TH-231	0.78	25.64	*	14.70	1.34E+02
		84.21	*	6.40	5.03E+00

0304

Analysis Report for 1904087-18

BC 15

Nuclide Name	Id Confidence	Energy (keV)	Yield(%)	Activity (pCi/units)	Activity Uncertainty
TH-234	0.95	63.29 *	3.80	1.16E+03	2.52E+02

* = Energy line found in the spectrum.

- = Manually added nuclide.

? = Manually edited nuclide.

@ = Energy line not used for Weighted Mean Activity

Energy Tolerance : 2.000FWHM

Nuclide confidence index threshold = 0.30

Errors quoted at 2.000sigma

INTERFERENCE CORRECTED REPORT

	Nuclide Name	Nuclide Id Confidence	Wt mean Activity (pCi/units)	Wt mean Activity Uncertainty	Comments
	SN-113	0.917	6.01E+01	4.51E+01	
	I-125	0.998	6.07E+02	7.45E+01	
X	I-129	0.853			
	BA-133	0.999	1.18E+02	5.36E+00	
	TH-231	0.788	1.03E+01	5.03E+00	
	TH-234	0.950	1.16E+03	2.52E+02	
X	NP-237	0.566			

? = nuclide is part of an undetermined solution

X = nuclide rejected by the interference analysis

@ = nuclide contains energy lines not used in Weighted Mean Activity

Errors quoted at 2.000sigma

Analysis Report for 1904087-18

BC 15

UNIDENTIFIED PEAKS

Peak Locate Performed on : 5/3/2019 6:16:52AM
 Peak Locate From Channel : 1
 Peak Locate To Channel : 4096

<i>Peak No.</i>	<i>Energy (keV)</i>	<i>Peak Size (CPS)</i>	<i>Peak CPS (%) Uncertainty</i>	<i>Peak Type</i>	<i>Tolerance Nuclide</i>	
	1	21.02	7.56408E-02	34.36	Tol.	PA-234M
	5	52.92	8.91026E-02	26.63	Sum	
m	7	66.07	1.04500E-01	25.31	Sum	
	8	81.08	1.15792E+00	4.12		
M	9	111.86	2.42006E-01	10.20		
m	10	116.33	5.51215E-02	35.06		
	11	208.13	2.58955E-02	48.24	Tol.	U-237
	12	276.50	6.02982E-02	23.92		
m	14	307.95	3.29903E-02	44.30		
	15	323.49	2.05185E-02	40.27		
	16	335.58	1.35286E-01	11.39	Sum	
M	18	383.89	1.25259E-01	13.45	Sum	
m	19	386.89	1.63144E-01	10.84	Sum	
	21	415.61	5.72457E-02	22.50	Sum	
	22	436.90	8.70911E-02	13.62		
	23	468.03	1.45679E-02	40.45		
	24	483.28	7.77778E-03	37.80		
m	25	514.74	9.65679E-03	74.12		

M = First peak in a multiplet region
 m = Other peak in a multiplet region
 F = Fitted singlet
 Errors quoted at 2.000sigma

NUCLIDE MDA REPORT

Nuclide Library Used : \\OR-GAMMA1\ApexRoot\Countroom\Library\WSRC.NLB

Analysis Report for 1904087-18

BC 15

Nuclide Name	Energy (keV)	Yield(%)	Line MDA (pCi/units)	Nuclide MDA (pCi/units)	Activity (pCi/units)	Dec. Level (pCi/units)
FE-55	5.89	24.50	5.43E-03	5.43E-03	0.00E+00	0.00E+00
CO-57	122.06	85.51	2.17E+01	2.17E+01	-1.25E+00	1.02E+01
	136.48	10.60	1.92E+02		-6.03E+01	9.01E+01
NI-59	6.92	29.80	4.85E-02	4.85E-02	-5.15E-02	2.05E-02
MO-93	16.59	52.90	1.31E+00	1.31E+00	-1.02E-01	6.28E-01
	18.60	10.00	1.05E+01		1.47E+01	5.09E+00
NB-93M	16.57	9.43	7.31E+00	7.31E+00	-5.70E-01	3.51E+00
CD-109	88.03	3.72	3.59E+02	3.59E+02	-9.41E+01	1.70E+02
+ SN-113	255.12	1.93	1.30E+03	5.51E+01	4.48E+02	5.95E+02
	391.69	*	61.90	5.51E+01	6.01E+01	2.54E+01
SN-119M	23.87	16.10	1.17E+01	9.24E+00	-3.93E+01	5.63E+00
	25.10	22.70	9.24E+00		-1.76E+02	4.45E+00
+ I-125	35.49	*	6.49	1.03E+02	6.07E+02	5.04E+01
I-129	29.78	*	57.00	8.96E+00	2.00E+02	4.38E+00
	33.60	*	13.20	5.02E+01	2.95E+02	2.45E+01
	39.58	*	7.52	5.69E+01	1.95E+01	2.71E+01
+ BA-133	30.80	*	97.60	5.24E+00	1.17E+02	2.56E+00
	302.84	*	17.80	2.87E+02	7.67E+02	1.37E+02
	356.01	*	60.00	6.84E+01	8.13E+02	3.21E+01
CE-139	165.85	80.35	3.25E+01	3.25E+01	-2.12E+01	1.53E+01
CE-144	133.54	10.80	1.89E+02	1.89E+02	-2.07E+01	8.86E+01
HG-203	279.19	77.30	5.21E+01	5.21E+01	6.90E+01	2.46E+01
PB-210	46.50	4.25	1.08E+02	1.08E+02	-2.41E+01	5.10E+01
PA-231	9.28	42.00	1.99E-01	1.99E-01	1.19E-01	9.29E-02
	10.11	20.20	6.15E-01		5.55E-01	2.90E-01
	283.67	1.60	1.42E+03		-4.02E+02	6.40E+02
	302.67	2.30	2.47E+03		4.46E+03	1.18E+03
+ TH-231	25.64	*	14.70	2.42E+01	1.03E+01	1.18E+01
	84.21	6.40	5.70E+02		2.90E+03	2.79E+02
PA-234M	9.89	89.00	1.31E-01	1.31E-01	1.18E-01	6.17E-02
	21.72	64.90	2.29E+00		2.93E-01	1.10E+00
	37.93	23.75	3.36E+01		-1.04E+00	1.64E+01
	131.42	20.40	1.01E+02		2.21E+01	4.74E+01
+ TH-234	63.29	*	3.80	4.47E+02	1.16E+03	2.18E+02
NP-237	29.37	*	14.00	3.65E+01	8.16E+02	1.78E+01
	86.50	12.60	1.04E+02		-3.77E+01	4.90E+01
U-237	97.08	16.30	9.56E+01	6.10E+01	-2.20E+01	4.50E+01
	101.07	26.30	6.10E+01		-2.92E+00	2.86E+01
	114.00	12.30	2.92E+02		6.79E+02	1.41E+02
	208.01	22.00	1.58E+02		2.23E+01	7.43E+01
AM-241	59.54	35.90	4.06E+01	4.06E+01	9.47E+01	1.97E+01
AM-243	74.67	66.00	1.79E+01	1.79E+01	-3.19E+00	8.48E+00

+ = Nuclide identified during the nuclide identification

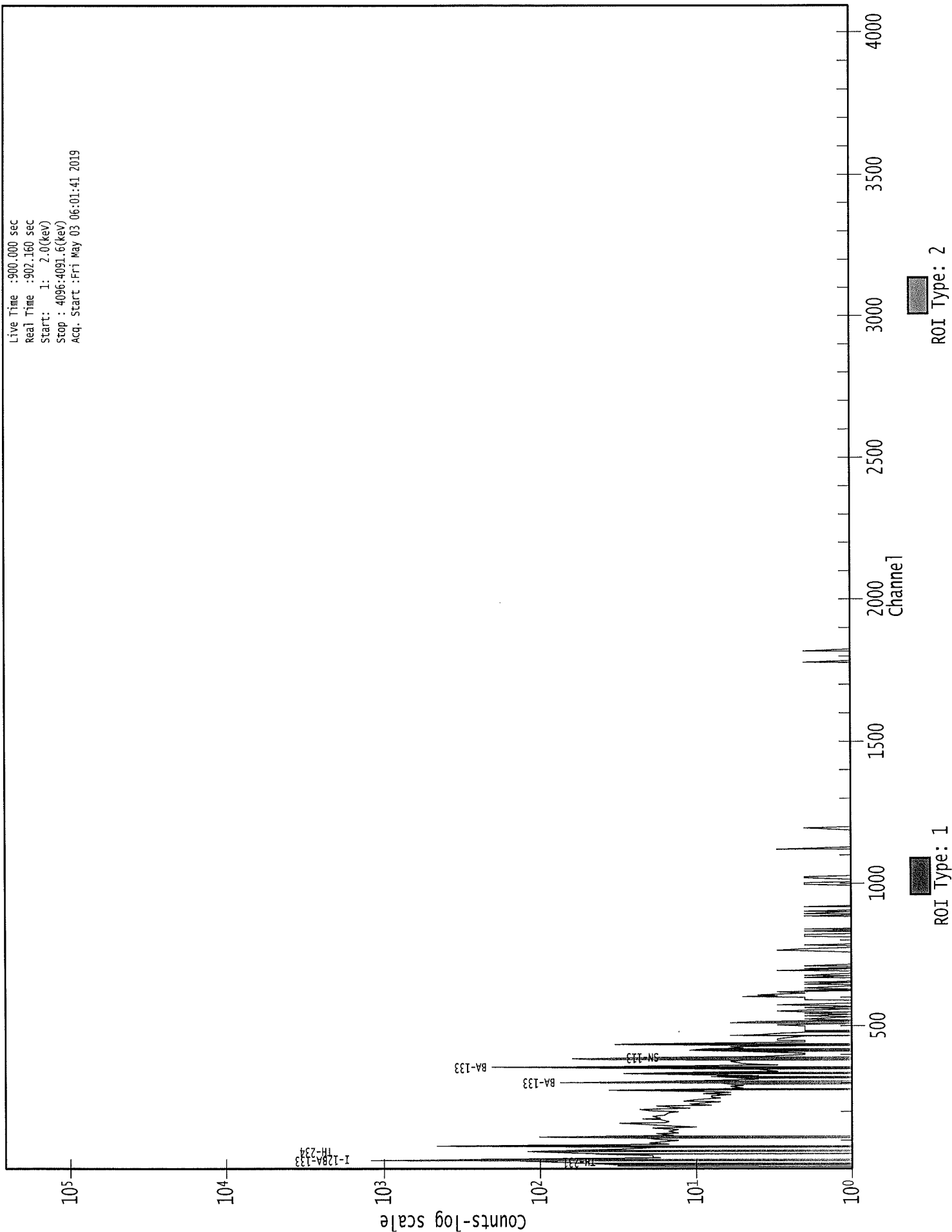
* = Energy line found in the spectrum

> = MDA value not calculated

@ = Half-life too short to be able to perform the decay correction

0000081273.CNF

Live Time : 900.000 sec
Real Time : 902.160 sec
Start: 1: 7.0(keV)
Stop : 4096:4091.6(keV)
Acq. Start : Fri May 03 06:01:41 2019



Analysis Report for 1904087-19
BC 22A

GAMMA SPECTRUM ANALYSIS

Sample Identification : 1904087-19
 Sample Description : BC 22A
 Sample Type : RA RECOVERY

 Sample Size : 1.000E+00 units
 Facility : Countroom

 Sample Taken On : 5/2/2019 8:40:52AM
 Acquisition Started : 5/3/2019 6:17:09AM

 Procedure : BAFIL
 Operator : Administrator
 Detector Name : GE4
 Geometry : BAFIL
 Live Time : 900.0 seconds
 Real Time : 901.9 seconds

 Dead Time : 0.21 %

 Peak Locate Threshold : 2.50
 Peak Locate Range (in channels) : 1 - 4096
 Peak Area Range (in channels) : 9 - 4096
 Identification Energy Tolerance : 1.000FWHM

 Energy Calibration Used Done On : 2/24/2018
 Efficiency Calibration Used Done On : 11/9/2014
 Efficiency Calibration Description :

 Sample Number : 81274

PEAK ANALYSIS REPORT

Peak Analysis Performed on : 5/3/2019 6:32:14AM
 Peak Analysis From Channel : 1
 Peak Analysis To Channel : 4096

Peak No.	Energy (keV)	ROI start	ROI end	Peak Centroid	Net Peak Area	Net Area Uncertainty	Continuum Counts	FWHM (keV)
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Analysis Report for 1904087-19

BC 22A

	Peak No.	Energy (keV)	ROI start	ROI end	Peak Centroid	Net Peak Area	Net Area Uncertainty	Continuum Counts	FWHM (keV)
	1	20.66	17 -	23	19.71	9.40E+01	43.54	2.76E+02	2.17
M	2	30.95	24 -	44	30.01	2.30E+03	103.84	2.10E+02	2.26
m	3	35.14	24 -	44	34.21	5.04E+02	75.44	1.56E+02	2.27
	4	52.38	47 -	55	51.45	6.15E+01	42.06	2.35E+02	1.51
M	5	61.81	56 -	68	60.89	2.45E+02	45.59	2.01E+02	2.45
m	6	66.12	56 -	68	65.20	1.09E+02	41.98	2.08E+02	2.41
	7	81.06	75 -	86	80.16	9.44E+02	80.65	3.38E+02	2.29
	8	112.67	107 -	118	111.79	2.63E+02	51.85	2.06E+02	2.26
	9	162.42	156 -	166	161.58	3.66E+01	41.81	2.11E+02	2.16
M	10	272.98	271 -	282	272.23	1.07E+01	6.86	1.01E+01	2.51
m	11	276.52	271 -	282	275.77	6.74E+01	23.58	4.41E+01	2.51
	12	293.06	288 -	296	292.32	2.33E+01	19.66	4.54E+01	4.58
M	13	299.50	297 -	310	298.77	1.26E+01	11.66	2.43E+01	2.53
m	14	302.97	297 -	310	302.25	1.66E+02	29.77	4.08E+01	2.01
m	15	307.98	297 -	310	307.26	3.37E+01	26.38	6.22E+01	2.79
	16	333.44	328 -	337	332.74	2.76E+01	34.51	1.53E+02	2.63
	17	356.25	351 -	361	355.57	4.22E+02	47.09	6.87E+01	2.18
M	18	384.47	378 -	393	383.82	1.28E+02	32.14	2.50E+01	3.02
m	19	387.04	378 -	393	386.39	1.04E+02	30.53	1.03E+01	2.10
m	20	391.13	378 -	393	390.48	5.01E+01	16.73	1.65E+00	2.56
M	21	414.79	409 -	424	414.16	3.11E+01	17.47	2.72E+01	3.10
m	22	418.55	409 -	424	417.92	2.26E+01	15.01	1.38E+01	2.25
m	23	422.42	409 -	424	421.80	1.27E+01	13.46	9.33E+00	2.48
	24	437.19	432 -	441	436.58	8.17E+01	20.76	1.45E+01	2.28
M	25	467.65	464 -	475	467.06	1.63E+01	8.54	1.40E+00	2.76
m	26	473.08	464 -	475	472.50	1.14E+01	8.50	5.43E+00	2.89
	27	631.86	628 -	634	631.43	7.00E+00	5.29	0.00E+00	1.12
	28	696.91	693 -	699	696.54	5.50E+00	7.78	7.00E+00	2.37

M = First peak in a multiplet region

m = Other peak in a multiplet region

F = Fitted singlet

Errors quoted at 2.000sigma

BACKGROUND SUBTRACT REPORT

Peak Analysis Performed on : 5/3/2019 6:32:14AM

Env. Background File : \\OR-GAMMA1\ApexRoot\Countroom\Data\0000080017.CNF

Peak No.	Energy (keV)	Original Area	Orig. Area Uncertainty	Ambient Background	Backgr. Uncert.	Subtracted Area	Subtracted Uncert.
1	20.66	9.40E+01	43.54			9.40E+01	4.35E+01

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Analysis Report for 1904087-19

BC 22A

	Peak No.	Energy (keV)	Original Area	Orig. Area Uncertainty	Ambient Background	Backgr. Uncert.	Subtracted Area	Subtracted Uncert.
M	2	30.95	2.30E+03	103.84			2.30E+03	1.04E+02
m	3	35.14	5.04E+02	75.44			5.04E+02	7.54E+01
	4	52.38	6.15E+01	42.06			6.15E+01	4.21E+01
M	5	61.81	2.45E+02	45.59	1.28E+01	1.96E+00	2.32E+02	4.56E+01
m	6	66.12	1.09E+02	41.98			1.09E+02	4.20E+01
	7	81.06	9.44E+02	80.65			9.44E+02	8.06E+01
	8	112.67	2.63E+02	51.85			2.63E+02	5.18E+01
	9	162.42	3.66E+01	41.81			3.66E+01	4.18E+01
M	10	272.98	1.07E+01	6.86			1.07E+01	6.86E+00
m	11	276.52	6.74E+01	23.58			6.74E+01	2.36E+01
	12	293.06	2.33E+01	19.66			2.33E+01	1.97E+01
M	13	299.50	1.26E+01	11.66			1.26E+01	1.17E+01
m	14	302.97	1.66E+02	29.77			1.66E+02	2.98E+01
m	15	307.98	3.37E+01	26.38			3.37E+01	2.64E+01
	16	333.44	2.76E+01	34.51			2.76E+01	3.45E+01
	17	356.25	4.22E+02	47.09			4.22E+02	4.71E+01
M	18	384.47	1.28E+02	32.14			1.28E+02	3.21E+01
m	19	387.04	1.04E+02	30.53			1.04E+02	3.05E+01
m	20	391.13	5.01E+01	16.73			5.01E+01	1.67E+01
M	21	414.79	3.11E+01	17.47			3.11E+01	1.75E+01
m	22	418.55	2.26E+01	15.01			2.26E+01	1.50E+01
m	23	422.42	1.27E+01	13.46			1.27E+01	1.35E+01
	24	437.19	8.17E+01	20.76			8.17E+01	2.08E+01
M	25	467.65	1.63E+01	8.54			1.63E+01	8.54E+00
m	26	473.08	1.14E+01	8.50			1.14E+01	8.50E+00
	27	631.86	7.00E+00	5.29			7.00E+00	5.29E+00
	28	696.91	5.50E+00	7.78			5.50E+00	7.78E+00

M = First peak in a multiplet region
m = Other peak in a multiplet region
F = Fitted singlet
Errors quoted at 2.000sigma

NUCLIDE IDENTIFICATION REPORT

Nuclide Library Used : \\OR-GAMMA1\ApexRoot\Countroom\Library\WSRC.NLB

IDENTIFIED NUCLIDES

Nuclide Name	Id Confidence	Energy (keV)	Yield(%)	Activity (pCi/units)	Activity Uncertainty
SN-113	0.94	255.12	1.93		
		391.69 *	61.90	7.92E+01	2.85E+01

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Analysis Report for 1904087-19

BC 22A

Nuclide Name	Id Confidence	Energy (keV)	Yield(%)	Activity (pCi/units)	Activity Uncertainty
I-125	0.99	35.49 *	6.49	4.51E+02	6.84E+01
BA-133	0.99	30.80 *	97.60	1.04E+02	5.10E+00
		302.84 *	17.80	8.17E+02	2.91E+02
		356.01 *	60.00	6.62E+02	1.14E+02
TH-234	0.95	63.29 *	3.80	9.85E+02	2.06E+02

* = Energy line found in the spectrum.

- = Manually added nuclide.

? = Manually edited nuclide.

@ = Energy line not used for Weighted Mean Activity

Energy Tolerance : 2.000FWHM

Nuclide confidence index threshold = 0.30

Errors quoted at 2.000sigma

INTERFERENCE CORRECTED REPORT

Nuclide Name	Nuclide Id Confidence	Wt mean Activity (pCi/units)	Wt mean Activity Uncertainty	Comments
SN-113	0.941	7.92E+01	2.85E+01	
I-125	0.998	4.51E+02	6.84E+01	
X I-129	0.852			
BA-133	0.999	1.06E+02	5.10E+00	
TH-234	0.959	9.85E+02	2.06E+02	
X NP-237	0.564			

? = nuclide is part of an undetermined solution

X = nuclide rejected by the interference analysis

@ = nuclide contains energy lines not used in Weighted Mean Activity

Errors quoted at 2.000sigma

Analysis Report for 1904087-19

BC 22A

 UNIDENTIFIED PEAKS

Peak Locate Performed on : 5/3/2019 6:32:14AM
 Peak Locate From Channel : 1
 Peak Locate To Channel : 4096

<i>Peak No.</i>	<i>Energy (keV)</i>	<i>Peak Size (CPS)</i>	<i>Peak CPS (%) Uncertainty</i>	<i>Peak Type</i>	<i>Tolerance Nuclide</i>	
	1	20.66	1.04485E-01	23.15	Tol.	PA-234M
	4	52.38	6.82992E-02	34.21		
m	6	66.12	1.21537E-01	19.19	Sum	
	7	81.06	1.04902E+00	4.27		
	8	112.67	2.92234E-01	9.86	Tol.	U-237
	9	162.42	4.06651E-02	57.11		
M	10	272.98	1.18590E-02	32.12		
m	11	276.52	7.49178E-02	17.49		
	12	293.06	2.58937E-02	42.18		
M	13	299.50	1.40082E-02	46.25		
m	15	307.98	3.74495E-02	39.14		
	16	333.44	3.06464E-02	62.56	Sum	
M	18	384.47	1.41962E-01	12.58		
m	19	387.04	1.16093E-01	14.61	Sum	
M	21	414.79	3.45695E-02	28.08		
m	22	418.55	2.50672E-02	33.26	Sum	
m	23	422.42	1.41618E-02	52.81	Sum	
	24	437.19	9.08302E-02	12.70		
M	25	467.65	1.80752E-02	26.26		
m	26	473.08	1.27123E-02	37.15		
	27	631.86	7.77778E-03	37.80		
	28	696.91	6.11111E-03	70.71		

M = First peak in a multiplet region
 m = Other peak in a multiplet region
 F = Fitted singlet
 Errors quoted at 2.000sigma

Analysis Report for 1904087-19

BC 22A

NUCLIDE MDA REPORT

Nuclide Library Used : \\OR-GAMMA1\ApexRoot\Countroom\Library\WSRC.NLB

Nuclide Name	Energy (keV)	Yield(%)	Line MDA (pCi/units)	Nuclide MDA (pCi/units)	Activity (pCi/units)	Dec. Level (pCi/units)
FE-55	5.89	24.50	5.43E-03	5.43E-03	0.00E+00	0.00E+00
CO-57	122.06	85.51	2.05E+01	2.05E+01	7.43E+00	9.61E+00
	136.48	10.60	1.97E+02		-7.99E+01	9.24E+01
NI-59	6.92	29.80	5.60E-02	5.60E-02	-2.64E-02	2.42E-02
MO-93	16.59	52.90	1.32E+00	1.32E+00	4.43E-01	6.32E-01
	18.60	10.00	1.05E+01		2.85E+00	5.08E+00
NB-93M	16.57	9.43	7.37E+00	7.37E+00	2.48E+00	3.54E+00
CD-109	88.03	3.72	3.64E+02	3.64E+02	-1.37E+01	1.72E+02
+ SN-113	255.12	1.93	1.25E+03	4.61E+01	-1.87E+02	5.71E+02
	391.69	*	61.90	4.61E+01	7.92E+01	2.09E+01
SN-119M	23.87	16.10	1.10E+01	8.41E+00	-3.74E+01	5.29E+00
	25.10	22.70	8.41E+00		-1.49E+02	4.04E+00
+ I-125	35.49	*	6.49	1.24E+02	4.51E+02	6.08E+01
I-129	29.78	*	57.00	1.08E+01	1.79E+02	5.30E+00
	33.60	*	13.20	6.03E+01	2.19E+02	2.96E+01
	39.58	*	7.52	5.52E+01	-2.56E+02	2.63E+01
+ BA-133	30.80	*	97.60	6.32E+00	6.32E+00	1.04E+02
	302.84	*	17.80	2.38E+02	8.17E+02	1.12E+02
	356.01	*	60.00	6.37E+01	6.62E+02	2.97E+01
CE-139	165.85	80.35	3.12E+01	3.12E+01	1.44E+00	1.47E+01
CE-144	133.54	10.80	1.98E+02	1.98E+02	5.47E+01	9.35E+01
HG-203	279.19	77.30	5.05E+01	5.05E+01	6.81E+01	2.38E+01
PB-210	46.50	4.25	1.03E+02	1.03E+02	2.79E+00	4.83E+01
PA-231	9.28	42.00	1.90E-01	1.90E-01	1.41E-01	8.86E-02
	10.11	20.20	5.68E-01		3.27E-01	2.66E-01
	283.67	1.60	1.32E+03		2.27E+02	5.91E+02
	302.67	2.30	2.58E+03		4.91E+03	1.24E+03
TH-231	25.64	14.70	1.58E+01	1.58E+01	-4.25E+02	7.63E+00
	84.21	6.40	5.48E+02		2.56E+03	2.68E+02
PA-234M	9.89	89.00	1.21E-01	1.21E-01	6.96E-02	5.67E-02
	21.72	64.90	2.30E+00		1.88E+00	1.11E+00
	37.93	23.75	3.02E+01		9.31E+01	1.47E+01
	131.42	20.40	1.05E+02		5.56E+01	4.93E+01
+ TH-234	63.29	*	3.80	3.88E+02	3.88E+02	9.85E+02
NP-237	29.37	*	14.00	4.40E+01	4.40E+01	7.27E+02
	86.50	12.60	1.05E+02		-2.23E+01	4.98E+01
U-237	97.08	16.30	9.73E+01	6.56E+01	-3.68E+01	4.58E+01
	101.07	26.30	6.56E+01		-2.64E+00	3.09E+01
	114.00	12.30	2.91E+02		8.27E+02	1.41E+02
	208.01	22.00	1.52E+02		2.07E+01	7.13E+01
AM-241	59.54	35.90	3.67E+01	3.67E+01	7.26E+01	1.78E+01
AM-243	74.67	66.00	1.76E+01	1.76E+01	1.31E-01	8.38E+00

Analysis Report for 1904087-19

BC 22A

- + = Nuclide identified during the nuclide identification
 - * = Energy line found in the spectrum
 - > = MDA value not calculated
 - @ = Half-life too short to be able to perform the decay correction
-

SECTION XI

ANALYTICAL DATA (TOTAL DISSOLVED SOLIDS)

TDS / TSS Worksheet

Work Order	Run	Analysis Code	Technician
19-04087	1	TDS	JPACHELLA

TRetec Fraction	Client ID	Aliquot ml	Filter Data			Filter Net (g)	TDS/TSS (mg/L)	Maximum Aliq (mL)
			Filter Tare (g)	Filter Final (g)	Filter Net (g)			
04	BC 27A	100.0000	94.8811	98.3007	3.4196	34196.0000	2.92	
05	BC 27B	100.0000	124.1707	125.1361	0.9654	9654.0000	10.36	
06	BC 26	100.0000	114.8560	119.3071	4.4511	44511.0000	2.25	
07	BC 11	100.0000	93.2730	94.9666	1.6936	16936.0000	5.90	
08	BC 12	100.0000	121.7933	121.9831	0.1898	1898.0000	52.69	
09	BC 24A	100.0000	116.5782	119.0565	2.4783	24783.0000	4.04	
10	BC 24B	100.0000	116.9099	118.9019	1.9920	19920.0000	5.02	
11	BC 21B	100.0000	123.9325	135.1702	11.2377	112377.0000	0.89	
12	BC 21A	100.0000	124.1813	125.7515	1.5702	15702.0000	6.37	
13	BC 13	100.0000	100.8466	108.5662	7.7196	77196.0000	1.30	
14	BC 14	100.0000	116.8845	117.6292	0.7447	7447.0000	13.43	
15	BC 28B	100.0000	116.8306	117.1275	0.2969	2969.0000	33.68	
16	BC 28A	100.0000	114.7883	118.0321	3.2438	32438.0000	3.08	
17	BC 16	100.0000	115.3343	126.2558	10.9215	109215.0000	0.92	
18	BC 15	100.0000	118.2092	125.2068	6.9976	69976.0000	1.43	
19	BC 22A	100.0000	122.6539	128.8970	6.2431	62431.0000	1.60	

Technician: JPachella Date: 4/23/19

Aliquot Worksheet

Work Order		Run	Analysis Code	Rpt Units	Lab Deadline	Technician							
19-04087		1	TDS	liters	4/30/2019	JPACHELLA							
Lab Fraction	Client ID	Sample Type	Muffle Data		Dilution Data			Aliquot Data		MS Aliquot Data		H-3 Solids Only	
			Ratio Post/Pre	Ratio	No of Dils	Dil Factor	Ratio	Aliquot	Net Equiv	Aliquot	Net Equiv	Water Added (ml)	H3 Dist
01	LCS	LCS						1.0000E+00	1.0000E+00				
02	BLANK	MBL						1.0000E+00	1.0000E+00				
03	DUP	DUP						1.0000E-01	1.0000E-01				
04	BC 27A	TRG						1.0000E-01	1.0000E-01				
05	BC 27B	TRG						1.0000E-01	1.0000E-01				
06	BC 26	TRG						1.0000E-01	1.0000E-01				
07	BC 11	TRG						1.0000E-01	1.0000E-01				
08	BC 12	TRG						1.0000E-01	1.0000E-01				
09	BC 24A	TRG						1.0000E-01	1.0000E-01				
10	BC 24B	TRG						1.0000E-01	1.0000E-01				
11	BC 21B	TRG						1.0000E-01	1.0000E-01				
12	BC 21A	TRG						1.0000E-01	1.0000E-01				
13	BC 13	TRG						1.0000E-01	1.0000E-01				
14	BC 14	TRG						1.0000E-01	1.0000E-01				
15	BC 28B	TRG						1.0000E-01	1.0000E-01				
16	BC 28A	TRG						1.0000E-01	1.0000E-01				
17	BC 16	TRG						1.0000E-01	1.0000E-01				
18	BC 15	TRG						1.0000E-01	1.0000E-01				
19	BC 22A	TRG						1.0000E-01	1.0000E-01				

Comments

Technician: JPachella Date: 4/22/19