

US EPA ARCHIVE DOCUMENT

**ENGINEERING MANAGEMENT SUPPORT, INC.**

**West Lake OU-1**

**STANDARD LEVEL IV  
REPORT OF ANALYSIS**

**WORK ORDER #13-04105-OR**

**May 16, 2013**

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

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

MP-001-3

Eberline Services Work Order # 13-04105

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

| Date for Partial | Initials | Date    | Initials    | Checklist Items   |
|------------------|----------|---------|-------------|---|
|                  |          | 4/16/13 | KC          | Sample Log-In   |
|                  |          | 5/14/13 | KBS         | Data Compilation  |
|                  |          | 5-15-13 | MLT         | First Technical Data Review   |
|                  |          | 5/15/13 | MSL         | Second Technical Data Review  |
|                  |          | 5/15/13 | [Signature] | Data Entry/Electronic Deliverable   |
|                  |          | 5/15/13 | [Signature] | Case Narrative  |
|                  |          | 5/15/13 | KBS         | Electronic Deliverable Proof  |
|                  |          | 5/16/13 | MSL         | Samples Analyzed within Holding Time<br>Yes? <input checked="" type="checkbox"/> No? <input type="checkbox"/> |
|                  |          | 5/16/13 | MSL         | QA/QC Review  |
|                  |          |         |             | Client in Possession of Data<br>Electronic or Hard Copy   |
|                  |          |         |             | Invoiced by Laboratory  |

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

Date package approved by: [Signature] 5/16/13  
 Laboratory Manager Date

Copy No. \_\_\_\_\_

Radiochemistry Services

US EPA ARCHIVE DOCUMENT

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

13-04105

# Chain of Custody Record

No 1604

REC'D APR 16 2013

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



|                                     |   |
|-------------------------------------|---|
| Project Name: <u>West Lake OU-1</u> | Project Number:                           |
| Send Report To: <u>Paul Rosasco</u> | Sampler (Print Name): <u>John D Regan</u> |
| Address:                            | Sampler (Print Name):                     |
|                                     | Shipment Method: <u>Carrier</u>           |
|                                     | Airbill Number:                           |
| Phone:                              | Laboratory Receiving:                     |
| Fax:                                |   |

Analysis Requested  
Diss U-238, U-235, U-234  
Diss RA-226, Ra-228  
Tot Ther 232, 230, 228  
Tot U-238, 235, 234  
Tot RA 226, 228  
Tot Ther 232, 230, 228

Page 1 of 2  
Lab to filter for dissolved parameters.  
Purchase Order #:

| Field Sample ID | Sample Date | Sample Time | Sample Matrix | Number of Containers | Analysis Requested |   |   |   |   |   | Comments, Special Instructions, etc. | Lab Sample ID (to be completed by lab) |
|-----------------|-------------|-------------|---------------|----------------------|--------------------|---|---|---|---|---|--------------------------------------|--|
| PZ-103-SS       | 4/8/13      | 1115        | Aqueous       | 1                    | X                  | X | X | X | X | X |                                      |  |
| PZ-114-AS       |             | 1145        | ↑             | ↑                    | X                  | X | X | X | X | X |                                      |  |
| FBE PZ-201A-SS  |             | 1245        |               |                      | X                  | X | X | X | X | X |                                      |  |
| PZ-201A-SS      |             | 1322        |               |                      | X                  | X | X | X | X | X |                                      |  |
| PZ-204A-SS      |             | 1326        |               |                      | X                  | X | X | X | X | X |                                      |  |
| PZ-205-AS       |             | 1336        |               |                      | X                  | X | X | X | X | X |                                      |  |
| PZ-205-SS       |             | 1450        |               |                      | X                  | X | X | X | X | X |                                      |  |
| PZ-206-SS       | 4/8/13      | 1500        |               |                      | X                  | X | X | X | X | X |                                      |  |
| PZ-204-SS       | 4/9/13      | 0930        |               |                      | X                  | X | X | X | X | X |                                      |  |
| I-68            |             | 1044        |               |                      | X                  | X | X | X | X | X |                                      |  |
| D-87            |             | 1105        |               |                      | X                  | X | X | X | X | X |                                      |  |
| PZ-106-SD       |             | 1200        |               |                      | X                  | X | X | X | X | X |                                      |  |
| S-82            |             | 1227        |               |                      | X                  | X | X | X | X | X |                                      |  |
| PZ-106-SS       |             | 1256        |               |                      | X                  | X | X | X | X | X |                                      |  |
| I-9             |             | 1335        |               |                      | X                  | X | X | X | X | X |                                      |  |
| D-93            |             | 1428        | ↓             | ↓                    | X                  | X | X | X | X | X |                                      |  |
| PZ-111-KS       | 4/9/13      | 1535        | Aqueous       | 1                    | X                  | X | X | X | X | X |                                      |  |

4.5 -  
6.7 -  
8.9 -  
10, 11 -  
12, 13 -  
14, 15 -  
16, 17 -  
18, 19 -

|  |  |                  |               |   |                                  |                              |  |
|--|--|------------------|---------------|---|----------------------------------|------------------------------|--|
| Relinquished by: (Signature)<br><u>[Signature]</u> | Received by: (Signature)<br><u>[Signature]</u> | Date:<br>4/15/13 | Time:<br>0800 | Sample Custodian Remarks (Completed By Laboratory): |                                  |                              |  |
| Relinquished by: (Signature)                       | Received by: (Signature)<br><u>[Signature]</u> | Date:<br>4/16/13 | Time:<br>940  | QA/QC Level   | Turnaround                       | Sample Receipt               |  |
| Relinquished by: (Signature)                       | Received by: (Signature)                       | Date:            | Time:         | Level I <input type="checkbox"/>                    | Routine <input type="checkbox"/> | Total # Containers Received? |  |
|  |  |                  |               | Level II <input type="checkbox"/>                   | 24 Hour <input type="checkbox"/> | COC Seals Present?           |  |
|  |  |                  |               | Level III <input type="checkbox"/>                  | 1 Week <input type="checkbox"/>  | COC Seals Intact?            |  |
|  |  |                  |               | Other <input type="checkbox"/>                      | Other _____                      | Received Containers Intact?  |  |
|  |  |                  |               |   |                                  | Temperature?                 |  |



# Internal Chain of Custody

|               |                        |
|---------------|------------------------|
| Work Order #  | <b>13-04105</b>        |
| Lab Deadline  | <b>5/7/2013</b>        |
| Analysis      | <b>UIISO - Level 4</b> |
| Sample Matrix | <b>Water</b>           |

| Comments  | Sample Fraction | HP 210 / 270 Detector Activity | Storage Location |
|---|-----------------|--------------------------------|------------------|
| <p><b>Fxns 04, 06, 08, 10, 12, 14, 16 &amp; 18 are TOTAL</b></p> <p><b>Fxns 05, 07, 09, 11, 13, 15, 17 &amp; 19 are DISSOLVED</b></p> | 04              | 39                             | Q1.0             |
|   | 05              | 39                             | Q1.0             |
|   | 06              | 45                             | Q1.0             |
|   | 07              | 45                             | Q1.0             |
|   | 08              | 42                             | Q1.0             |
|   | 09              | 42                             | Q1.0             |
|   | 10              | 37                             | Q1.0             |
|   | 11              | 37                             | Q1.0             |
|   | 12              | 46                             | Q1.0             |
|   | 13              | 46                             | Q1.0             |
|   | 14              | 41                             | Q1.0             |
|   | 15              | 41                             | Q1.0             |
|   | 16              | 43                             | Q1.0             |
|   | 17              | 43                             | Q1.0             |
|   | 18              | 40                             | Q1.0             |
|   | 19              | 40                             | Q1.0             |

|                 | Location (circle one) |            |      |             |            | Initials    | Date            |
|-----------------|-----------------------|------------|------|-------------|------------|-------------|-----------------|
| Received by     | Sample Storage        | Rough Prep | Prep | Separations | Count Room | [Signature] | 4/24/13 0500    |
| Relinquished by | Sample Storage        | Rough Prep | Prep | Separations | Count Room | [Signature] | 4/25/13 0530    |
| Received by     | Sample Storage        | Rough Prep | Prep | Separations | Count Room | [Signature] | 4/25/13 0530 PM |
| Relinquished by | Sample Storage        | Rough Prep | Prep | Separations | Count Room | [Signature] | 4/29/13 0930 PM |
| Received by     | Sample Storage        | Rough Prep | Prep | Separations | Count Room | [Signature] | 4/29/13 0930    |
| Relinquished by | Sample Storage        | Rough Prep | Prep | Separations | Count Room | [Signature] | 4/29/13 1303    |
| 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 #  | <b>13-04105</b>        |
| Lab Deadline  | <b>5/7/2013</b>        |
| Analysis      | <b>ThISO - Level 4</b> |
| Sample Matrix | <b>Water</b>           |

| Comments  | Sample Fraction | HP 210 / 270 Detector Activity | Storage Location |
|---|-----------------|--------------------------------|------------------|
| <p><b>Fxns 04, 06, 08, 10, 12, 14, 16 &amp; 18 are TOTAL</b></p> <p><b>Fxns 05, 07, 09, 11, 13, 15, 17 &amp; 19 are DISSOLVED</b></p> | 04              | 39                             | Q1.0             |
|   | 05              | 39                             | Q1.0             |
|   | 06              | 45                             | Q1.0             |
|   | 07              | 45                             | Q1.0             |
|   | 08              | 42                             | Q1.0             |
|   | 09              | 42                             | Q1.0             |
|   | 10              | 37                             | Q1.0             |
|   | 11              | 37                             | Q1.0             |
|   | 12              | 46                             | Q1.0             |
|   | 13              | 46                             | Q1.0             |
|   | 14              | 41                             | Q1.0             |
|   | 15              | 41                             | Q1.0             |
|   | 16              | 43                             | Q1.0             |
|   | 17              | 43                             | Q1.0             |
|   | 18              | 40                             | Q1.0             |
|   | 19              | 40                             | Q1.0             |

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|                 | Location (circle one) |            |      |             |            |  | Initials | Date |
|-----------------|-----------------------|------------|------|-------------|------------|--|----------|------|
| Received by     | Sample Storage        | Rough Prep | Prep | Separations | Count Room |  |          |      |
| Relinquished by | Sample Storage        | Rough Prep | Prep | Separations | Count Room |  |          |      |
| Received by     | Sample Storage        | Rough Prep | Prep | Separations | Count Room |  |          |      |
| 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 |  |          |      |





**EBERLINE**  
SERVICES  
Oak Ridge Laboratory

# Internal Chain of Custody

|               |                        |
|---------------|------------------------|
| Work Order #  | <b>13-04105</b>        |
| Lab Deadline  | <b>5/7/2013</b>        |
| Analysis      | <b>Ra226 - Level 4</b> |
| Sample Matrix | <b>Water</b>           |

| Comments  | Sample Fraction | HP 210 / 270 Detector Activity | Storage Location |
|---|-----------------|--------------------------------|------------------|
| <p><b>Fxns 04, 06, 08, 10, 12, 14, 16 &amp; 18 are TOTAL</b></p> <p><b>Fxns 05, 07, 09, 11, 13, 15, 17 &amp; 19 are DISSOLVED</b></p> | 04              | 39                             | Q1.0             |
|   | 05              | 39                             | Q1.0             |
|   | 06              | 45                             | Q1.0             |
|   | 07              | 45                             | Q1.0             |
|   | 08              | 42                             | Q1.0             |
|   | 09              | 42                             | Q1.0             |
|   | 10              | 37                             | Q1.0             |
|   | 11              | 37                             | Q1.0             |
|   | 12              | 46                             | Q1.0             |
|   | 13              | 46                             | Q1.0             |
|   | 14              | 41                             | Q1.0             |
|   | 15              | 41                             | Q1.0             |
|   | 16              | 43                             | Q1.0             |
|   | 17              | 43                             | Q1.0             |
|   | 18              | 40                             | Q1.0             |
|   | 19              | 40                             | Q1.0             |

US EPA ARCHIVE DOCUMENT

|                 | Location (circle one) |            |      |             |            | Initials           | Date         |
|-----------------|-----------------------|------------|------|-------------|------------|--------------------|--------------|
| Received by     | Sample Storage        | Rough Prep | Prep | Separations | Count Room | <i>[Signature]</i> | 4/24/13 0500 |
| Relinquished by | Sample Storage        | Rough Prep | Prep | Separations | Count Room | <i>[Signature]</i> | 4/25/13 1822 |
| Received by     | Sample Storage        | Rough Prep | Prep | Separations | Count Room | <i>[Signature]</i> | 4-26-13 0524 |
| Relinquished by | Sample Storage        | Rough Prep | Prep | Separations | Count Room | <i>[Signature]</i> | 4-30-13 1380 |
| Received by     | Sample Storage        | Rough Prep | Prep | Separations | Count Room | <i>[Signature]</i> | 4/30/13 1351 |
| Relinquished by | Sample Storage        | Rough Prep | Prep | Separations | Count Room | <i>[Signature]</i> | 5/16/13 0825 |
| 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 #  | <b>13-04105</b>        |
| Lab Deadline  | <b>5/7/2013</b>        |
| Analysis      | <b>Ra228 - Level 4</b> |
| Sample Matrix | <b>Water</b>           |

| Comments  | Sample Fraction | HP 210 / 270 Detector Activity | Storage Location |
|---|-----------------|--------------------------------|------------------|
| <p>Fxns 04, 06, 08, 10, 12, 14, 16 &amp; 18 are TOTAL</p> <p>Fxns 05, 07, 09, 11, 13, 15, 17 &amp; 19 are DISSOLVED</p> | 04              | 39                             | Q1.0             |
|   | 05              | 39                             | Q1.0             |
|   | 06              | 45                             | Q1.0             |
|   | 07              | 45                             | Q1.0             |
|   | 08              | 42                             | Q1.0             |
|   | 09              | 42                             | Q1.0             |
|   | 10              | 37                             | Q1.0             |
|   | 11              | 37                             | Q1.0             |
|   | 12              | 46                             | Q1.0             |
|   | 13              | 46                             | Q1.0             |
|   | 14              | 41                             | Q1.0             |
|   | 15              | 41                             | Q1.0             |
|   | 16              | 43                             | Q1.0             |
|   | 17              | 43                             | Q1.0             |
|   | 18              | 40                             | Q1.0             |
|   | 19              | 40                             | Q1.0             |

|                 | Location (circle one) |            |      |             |            |  | Initials     | Date |
|-----------------|-----------------------|------------|------|-------------|------------|--|--------------|------|
| Received by     | Sample Storage        | Rough Prep | Prep | Separations | Count Room |  | 4/24/13 0500 |      |
| Relinquished by | Sample Storage        | Rough Prep | Prep | Separations | Count Room |  | 4/25/13 1822 |      |
| Received by     | Sample Storage        | Rough Prep | Prep | Separations | Count Room |  | 4/24/13 0500 |      |
| Relinquished by | Sample Storage        | Rough Prep | Prep | Separations | Count Room |  | 4/20/13 1350 |      |
| Received by     | Sample Storage        | Rough Prep | Prep | Separations | Count Room |  | 4/30/13 1351 |      |
| Relinquished by | Sample Storage        | Rough Prep | Prep | Separations | Count Room |  | 5/12/13 0878 |      |
| Received by     | Sample Storage        | Rough Prep | Prep | Separations | Count Room |  | 5/2/13 1300  |      |
| Relinquished by | Sample Storage        | Rough Prep | Prep | Separations | Count Room |  | 5-9-13 0A12  |      |
| Received by     | Sample Storage        | Rough Prep | Prep | Separations | Count Room |  | 5/11/2012    |      |
| Relinquished by | Sample Storage        | Rough Prep | Prep | Separations | Count Room |  | 5/9/13 1360  |      |
| Received by     | Sample Storage        | Rough Prep | Prep | Separations | Count Room |  |              |      |
| Relinquished by | Sample Storage        | Rough Prep | Prep | Separations | Count Room |  |              |      |

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**Sample Receiving Report**  
(Volumes, pH, & CPM)

Internal Work Order

**13-04105**

Received By

**KCOULSTON**

| FR | ClientID        | # Btls | Comments         | Matrix  | Storage  | Rec Vol Ttl | CPM Max |
|----|-----------------|--------|------------------|---------|----------|-------------|---------|
| 01 | LCS             | 0      |                  | WA      | Q1.0     |             |         |
| 02 | BLANK           | 0      |                  | WA      | Q1.0     |             |         |
| 03 | DUP             | 0      |                  | WA      | Q1.0     |             |         |
| 04 | PZ-204-SS TOT / | 1      |                  | WA      | Q1.0     | 9.50        | 39      |
|    |                 |        | Container Number | pH Orig | pH Final | Volume (L)  | CPM     |
|    |                 |        | 1                | 7       | 7        | 9.5000      | 39      |
| 05 | PZ-204-SS DIS / | 1      |                  | WA      | Q1.0     | 0.00        | 39      |
|    |                 |        | Container Number | pH Orig | pH Final | Volume (L)  | CPM     |
|    |                 |        | 1                |         |          |             | 39      |
| 06 | I-68 TOT /      | 1      |                  | WA      | Q1.0     | 9.50        | 45      |
|    |                 |        | Container Number | pH Orig | pH Final | Volume (L)  | CPM     |
|    |                 |        | 1                | 7       | 7        | 9.5000      | 45      |
| 07 | I-68 DIS /      | 1      |                  | WA      | Q1.0     | 0.00        | 45      |
|    |                 |        | Container Number | pH Orig | pH Final | Volume (L)  | CPM     |
|    |                 |        | 1                |         |          |             | 45      |
| 08 | D-87 TOT /      | 1      |                  | WA      | Q1.0     | 9.50        | 42      |
|    |                 |        | Container Number | pH Orig | pH Final | Volume (L)  | CPM     |
|    |                 |        | 1                | 7       | 7        | 9.5000      | 42      |
| 09 | D-87 DIS /      | 1      |                  | WA      | Q1.0     | 0.00        | 42      |
|    |                 |        | Container Number | pH Orig | pH Final | Volume (L)  | CPM     |
|    |                 |        | 1                |         |          |             | 42      |
| 10 | PZ-106-SD TOT / | 1      |                  | WA      | Q1.0     | 9.50        | 37      |
|    |                 |        | Container Number | pH Orig | pH Final | Volume (L)  | CPM     |
|    |                 |        | 1                | 7       | 7        | 9.5000      | 37      |
| 11 | PZ-106-SD DIS / | 1      |                  | WA      | Q1.0     | 0.00        | 37      |
|    |                 |        | Container Number | pH Orig | pH Final | Volume (L)  | CPM     |
|    |                 |        | 1                |         |          |             | 37      |
| 12 | S-82 TOT /      | 1      |                  | WA      | Q1.0     | 9.50        | 46      |
|    |                 |        | Container Number | pH Orig | pH Final | Volume (L)  | CPM     |
|    |                 |        | 1                | 7       | 7        | 9.5000      | 46      |
| 13 | S-82 DIS /      | 1      |                  | WA      | Q1.0     | 0.00        | 46      |
|    |                 |        | Container Number | pH Orig | pH Final | Volume (L)  | CPM     |
|    |                 |        | 1                |         |          |             | 46      |
| 14 | PZ-106-SS TOT / | 1      |                  | WA      | Q1.0     | 9.50        | 41      |
|    |                 |        | Container Number | pH Orig | pH Final | Volume (L)  | CPM     |
|    |                 |        | 1                | 7       | 7        | 9.5000      | 41      |
| 15 | PZ-106-SS DIS / | 1      |                  | WA      | Q1.0     | 0.00        | 41      |
|    |                 |        | Container Number | pH Orig | pH Final | Volume (L)  | CPM     |
|    |                 |        | 1                |         |          |             | 41      |
| 16 | I-9 TOT /       | 1      |                  | WA      | Q1.0     | 9.50        | 43      |
|    |                 |        | Container Number | pH Orig | pH Final | Volume (L)  | CPM     |
|    |                 |        | 1                | 7       | 7        | 9.5000      | 43      |
| 17 | I-9 DIS /       | 1      |                  | WA      | Q1.0     | 0.00        | 43      |
|    |                 |        | Container Number | pH Orig | pH Final | Volume (L)  | CPM     |
|    |                 |        | 1                |         |          |             | 43      |
| 18 | D-93 TOT /      | 1      |                  | WA      | Q1.0     | 9.50        | 40      |
|    |                 |        | Container Number | pH Orig | pH Final | Volume (L)  | CPM     |
|    |                 |        | 1                | 7       | 7        | 9.5000      | 40      |
| 19 | D-93 DIS /      | 1      |                  | WA      | Q1.0     | 0.00        | 40      |
|    |                 |        | Container Number | pH Orig | pH Final | Volume (L)  | CPM     |
|    |                 |        | 1                |         |          |             | 40      |

*V. J. 04/16/13*

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

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

0010

US EPA ARCHIVE DOCUMENT

**SECTION II**  
**SAMPLE ACKNOWLEDGEMENT**





**Eberline Services – Oak Ridge Laboratory**

**SAMPLE RECEIPT CHECKLIST**

MP-001-2

WORK ORDER # 13-04105

SAMPLE MATRIX/MATRICES:

(CIRCLE ONE OR BOTH)

AQUEOUS NON-AQUEOUS

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

WERE SAMPLES:

|                                |                                    |   |     |
|--------------------------------|------------------------------------|---|-----|
| Received in good condition?    | <input checked="" type="radio"/> Y | N |     |
| If aqueous, properly preserved | <input checked="" type="radio"/> Y | N | N/A |

WERE CHAIN OF CUSTODY SEALS:

|   |                                    |   |
|---|------------------------------------|---|
| Present on outside of package?                    | <input checked="" type="radio"/> Y | N |
| Unbroken on outside of package?                   | <input checked="" type="radio"/> Y | N |
| Present on samples?                               | <input checked="" type="radio"/> Y | N |
| Unbroken on samples?                              | <input checked="" type="radio"/> Y | N |
| Was chain of custody present upon sample receipt? | <input checked="" type="radio"/> Y | N |

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

REMARKS: \_\_\_\_\_  
\_\_\_\_\_  
\_\_\_\_\_  
\_\_\_\_\_

SIGNATURE: Christen Carleton DATE: 4/16/13

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**SECTION III  
CASE NARRATIVE**



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May 16, 2013

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

CASE NARRATIVE  
Work Order # 13-04105-OR

SAMPLE RECEIPT

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

| <u>CLIENT ID</u> | <u>LAB ID</u> | <u>CLIENT ID</u> | <u>LAB ID</u> |
|------------------|---------------|------------------|---------------|
| PZ-204-SS TOT    | 13-04105-04   | S-82 DIS         | 13-04105-13   |
| PZ-204-SS DIS    | 13-04105-05   | PZ-106-SS TOT    | 13-04105-14   |
| I-68 TOT         | 13-04105-06   | PZ-106-SS DIS    | 13-04105-15   |
| I-68 DIS         | 13-04105-07   | I-9 TOT          | 13-04105-16   |
| D-87 TOT         | 13-04105-08   | I-9 DIS          | 13-04105-17   |
| D-87 DIS         | 13-04105-09   | D-93 TOT         | 13-04105-18   |
| PZ-106-SD TOT    | 13-04105-10   | D-93 DIS         | 13-04105-19   |
| PZ-106-SD DIS    | 13-04105-11   |                  |               |
| S-82 TOT         | 13-04105-12   |                  |               |

ANALYTICAL METHODS

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

Laboratory qualifiers are as follows:

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

ANALYTICAL RESULTS

Combined Standard Uncertainty is reported at 2-sigma value.

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## ANALYTICAL RESULTS CONTINUED

### ISOTOPIC URANIUM

Samples were filtered to disassociate dissolved and total fractions. All samples were prepared by removing a representative aliquot followed by mixed acid digestions and dilutions as appropriate. Uranium was eluted, micro-precipitated and mounted on micro-porous filter media. Sample activities were then determined by alpha spectroscopy using energy specific regions of interest for Uranium-234, Uranium-235 and Uranium-238. Chemical recovery was determined by the use of a Uranium-232 tracer. Activity of the Uranium-232 tracer was determined by alpha spectroscopy using an energy specific region of interest.

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

### ISOTOPIC THORIUM

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

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

### RADIUM-226

Samples were filtered to disassociate dissolved and total fractions. All samples were prepared by mixed acid digestions and dilutions as appropriate. This was followed by selective sulfate precipitations of the Radium. Samples were then mounted by semi-micro-precipitations onto micro-porous filters. Samples were counted by alpha spectroscopy using an energy specific region of interest for Radium-226. Chemical recovery was calculated by the use of a Barium-133 tracer, which was determined by HPGe gamma spectroscopy.

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

ANALYTICAL RESULTS CONTINUED

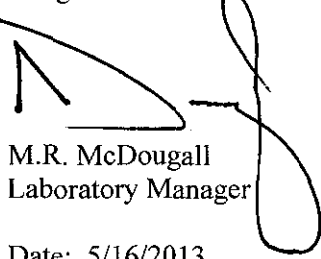
RADIUM-228

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

Samples demonstrated acceptable results for all Radium-228 analyses. Chemical recovery was acceptable for all samples. The Radium-228 method blank demonstrated acceptable results. Results for the Radium-228 duplicate demonstrated an acceptable relative percent difference and normalized difference. Results for the Radium-228 laboratory control sample demonstrated an acceptable percent recovery.

CERTIFICATION OF ACCURACY

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



M.R. McDougall  
Laboratory Manager

Date: 5/16/2013

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**SECTION IV  
ANALYTICAL RESULTS SUMMARY**

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Project: West Lake OU-1  
 SDG: 1304105  
 Received: 04/16/2013  
 Matrix: Water

Final Report of Analysis  
 Date: 5/16/2013  
 Page 1 of 5

| <u>Client Sample ID</u> | <u>Lab Sample ID</u> | <u>Analysis Date/Time</u> | <u>Analyte</u> | <u>Method</u>   | <u>Result</u> | <u>Error</u> | <u>MDA</u> | <u>Qualifier</u> | <u>Units</u> |
|-------------------------|----------------------|---------------------------|----------------|-----------------|---------------|--------------|------------|------------------|--------------|
| LCS13-04105-01          | 13-04105-01          | 05/01/2013 16:18:07       | Radium-226     | E903.0          | 10.35         | 1.15         | 0.23       |                  | pCi/l        |
| LCS13-04105-01          | 13-04105-01          | 05/09/2013 09:17:01       | Radium-228     | E904.0          | 9.90          | 1.03         | 1.26       |                  | pCi/l        |
| LCS13-04105-01          | 13-04105-01          | 04/30/2013 11:48:51       | Thorium-228    | HASL 300, 4.5.2 | 4.46          | 0.69         | 0.06       |                  | pCi/l        |
| LCS13-04105-01          | 13-04105-01          | 04/30/2013 11:48:51       | Thorium-230    | HASL 300, 4.5.2 | 4.36          | 0.67         | 0.06       |                  | pCi/l        |
| LCS13-04105-01          | 13-04105-01          | 04/30/2013 11:48:51       | Thorium-232    | HASL 300, 4.5.2 | 5.17          | 0.77         | 0.05       |                  | pCi/l        |
| LCS13-04105-01          | 13-04105-01          | 04/29/2013 09:59:25       | Uranium-234    | HASL 300, 4.5.2 | 7.93          | 1.02         | 0.08       |                  | pCi/l        |
| LCS13-04105-01          | 13-04105-01          | 04/29/2013 09:59:25       | Uranium-235    | HASL 300, 4.5.2 | 0.69          | 0.21         | 0.08       |                  | pCi/l        |
| LCS13-04105-01          | 13-04105-01          | 04/29/2013 09:59:25       | Uranium-238    | HASL 300, 4.5.2 | 7.57          | 0.98         | 0.06       |                  | pCi/l        |
| BLANK13-04105-02        | 13-04105-02          | 05/01/2013 16:18:08       | Radium-226     | E903.0          | 0.05          | 0.07         | 0.11       | U                | pCi/l        |
| BLANK13-04105-02        | 13-04105-02          | 05/09/2013 09:17:01       | Radium-228     | E904.0          | 0.57          | 0.42         | 0.82       | J                | pCi/l        |
| BLANK13-04105-02        | 13-04105-02          | 04/30/2013 11:48:53       | Thorium-228    | HASL 300, 4.5.2 | 0.05          | 0.05         | 0.05       | U                | pCi/l        |
| BLANK13-04105-02        | 13-04105-02          | 04/30/2013 11:48:53       | Thorium-230    | HASL 300, 4.5.2 | 0.14          | 0.09         | 0.06       | J                | pCi/l        |
| BLANK13-04105-02        | 13-04105-02          | 04/30/2013 11:48:53       | Thorium-232    | HASL 300, 4.5.2 | 0.00          | 0.04         | 0.08       | U                | pCi/l        |
| BLANK13-04105-02        | 13-04105-02          | 04/29/2013 09:59:26       | Uranium-234    | HASL 300, 4.5.2 | 0.02          | 0.04         | 0.07       | U                | pCi/l        |
| BLANK13-04105-02        | 13-04105-02          | 04/29/2013 09:59:26       | Uranium-235    | HASL 300, 4.5.2 | 0.07          | 0.07         | 0.08       | U                | pCi/l        |
| BLANK13-04105-02        | 13-04105-02          | 04/29/2013 09:59:26       | Uranium-238    | HASL 300, 4.5.2 | 0.02          | 0.03         | 0.05       | U                | pCi/l        |
| PZ-106-SS TOT DUP       | 13-04105-03          | 05/01/2013 16:18:09       | Radium-226     | E903.0          | 2.63          | 0.49         | 0.14       |                  | pCi/l        |
| PZ-106-SS TOT DUP       | 13-04105-03          | 05/09/2013 09:17:01       | Radium-228     | E904.0          | 0.89          | 0.46         | 0.88       | J                | pCi/l        |
| PZ-204-SS TOT DUP       | 13-04105-03          | 04/30/2013 11:49:02       | Thorium-228    | HASL 300, 4.5.2 | 0.31          | 0.13         | 0.06       |                  | pCi/l        |
| PZ-204-SS TOT DUP       | 13-04105-03          | 04/30/2013 11:49:02       | Thorium-230    | HASL 300, 4.5.2 | 0.16          | 0.09         | 0.06       |                  | pCi/l        |
| PZ-204-SS TOT DUP       | 13-04105-03          | 04/30/2013 11:49:02       | Thorium-232    | HASL 300, 4.5.2 | 0.12          | 0.08         | 0.06       | J                | pCi/l        |
| PZ-204-SS TOT DUP       | 13-04105-03          | 04/29/2013 09:59:21       | Uranium-234    | HASL 300, 4.5.2 | 2.92          | 0.45         | 0.08       |                  | pCi/l        |
| PZ-204-SS TOT DUP       | 13-04105-03          | 04/29/2013 09:59:21       | Uranium-235    | HASL 300, 4.5.2 | 0.20          | 0.10         | 0.07       |                  | pCi/l        |
| PZ-204-SS TOT DUP       | 13-04105-03          | 04/29/2013 09:59:21       | Uranium-238    | HASL 300, 4.5.2 | 1.92          | 0.33         | 0.07       |                  | pCi/l        |
| PZ-204-SS TOT           | 13-04105-04          | 05/01/2013 16:18:10       | Radium-226     | E903.0          | 1.26          | 0.36         | 0.16       |                  | pCi/l        |
| PZ-204-SS TOT           | 13-04105-04          | 05/09/2013 09:17:02       | Radium-228     | E904.0          | 1.16          | 0.43         | 0.78       | J                | pCi/l        |
| PZ-204-SS TOT           | 13-04105-04          | 04/30/2013 11:48:59       | Thorium-228    | HASL 300, 4.5.2 | 0.22          | 0.11         | 0.06       |                  | pCi/l        |
| PZ-204-SS TOT           | 13-04105-04          | 04/30/2013 11:48:59       | Thorium-230    | HASL 300, 4.5.2 | 0.22          | 0.11         | 0.07       |                  | pCi/l        |
| PZ-204-SS TOT           | 13-04105-04          | 04/30/2013 11:48:59       | Thorium-232    | HASL 300, 4.5.2 | 0.08          | 0.07         | 0.09       | J                | pCi/l        |
| PZ-204-SS TOT           | 13-04105-04          | 04/29/2013 09:59:22       | Uranium-234    | HASL 300, 4.5.2 | 3.20          | 0.51         | 0.06       |                  | pCi/l        |
| PZ-204-SS TOT           | 13-04105-04          | 04/29/2013 09:59:22       | Uranium-235    | HASL 300, 4.5.2 | 0.14          | 0.09         | 0.06       | J                | pCi/l        |
| PZ-204-SS TOT           | 13-04105-04          | 04/29/2013 09:59:22       | Uranium-238    | HASL 300, 4.5.2 | 2.47          | 0.42         | 0.05       |                  | pCi/l        |

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 Lakewood, CO 80235

Project: West Lake OU-1  
 SDG: 1304105  
 Received: 04/16/2013  
 Matrix: Water

Final Report of Analysis  
 Date: 5/16/2013  
 Page 2 of 5

| <u>Client Sample ID</u> | <u>Lab Sample ID</u> | <u>Analysis Date/Time</u> | <u>Analyte</u> | <u>Method</u>   | <u>Result</u> | <u>Error</u> | <u>MDA</u> | <u>Qualifier</u> | <u>Units</u> |
|-------------------------|----------------------|---------------------------|----------------|-----------------|---------------|--------------|------------|------------------|--------------|
| PZ-204-SS DIS           | 13-04105-05          | 05/01/2013 16:18:41       | Radium-226     | E903.0          | 0.87          | 0.32         | 0.22       |                  | pCi/l        |
| PZ-204-SS DIS           | 13-04105-05          | 05/09/2013 09:17:09       | Radium-228     | E904.0          | 0.74          | 0.47         | 0.91       | J                | pCi/l        |
| PZ-204-SS DIS           | 13-04105-05          | 04/30/2013 11:49:00       | Thorium-228    | HASL 300, 4.5.2 | 0.04          | 0.07         | 0.12       | U                | pCi/l        |
| PZ-204-SS DIS           | 13-04105-05          | 04/30/2013 11:49:00       | Thorium-230    | HASL 300, 4.5.2 | 0.10          | 0.09         | 0.11       | J                | pCi/l        |
| PZ-204-SS DIS           | 13-04105-05          | 04/30/2013 11:49:00       | Thorium-232    | HASL 300, 4.5.2 | 0.02          | 0.05         | 0.11       | U                | pCi/l        |
| PZ-204-SS DIS           | 13-04105-05          | 04/29/2013 09:59:23       | Uranium-234    | HASL 300, 4.5.2 | 3.50          | 0.51         | 0.06       |                  | pCi/l        |
| PZ-204-SS DIS           | 13-04105-05          | 04/29/2013 09:59:23       | Uranium-235    | HASL 300, 4.5.2 | 0.13          | 0.08         | 0.05       | J                | pCi/l        |
| PZ-204-SS DIS           | 13-04105-05          | 04/29/2013 09:59:23       | Uranium-238    | HASL 300, 4.5.2 | 1.76          | 0.32         | 0.05       |                  | pCi/l        |
| I-68 TOT                | 13-04105-06          | 05/01/2013 16:18:42       | Radium-226     | E903.0          | 3.34          | 0.78         | 0.35       |                  | pCi/l        |
| I-68 TOT                | 13-04105-06          | 05/09/2013 09:17:09       | Radium-228     | E904.0          | 1.97          | 0.64         | 1.16       |                  | pCi/l        |
| I-68 TOT                | 13-04105-06          | 04/30/2013 11:48:55       | Thorium-228    | HASL 300, 4.5.2 | 2.66          | 0.65         | 0.08       |                  | pCi/l        |
| I-68 TOT                | 13-04105-06          | 04/30/2013 11:48:55       | Thorium-230    | HASL 300, 4.5.2 | 4.14          | 0.93         | 0.08       |                  | pCi/l        |
| I-68 TOT                | 13-04105-06          | 04/30/2013 11:48:55       | Thorium-232    | HASL 300, 4.5.2 | 0.80          | 0.28         | 0.08       |                  | pCi/l        |
| I-68 TOT                | 13-04105-06          | 04/29/2013 09:59:24       | Uranium-234    | HASL 300, 4.5.2 | 2.73          | 0.56         | 0.10       |                  | pCi/l        |
| I-68 TOT                | 13-04105-06          | 04/29/2013 09:59:24       | Uranium-235    | HASL 300, 4.5.2 | 0.24          | 0.15         | 0.11       | J                | pCi/l        |
| I-68 TOT                | 13-04105-06          | 04/29/2013 09:59:24       | Uranium-238    | HASL 300, 4.5.2 | 2.42          | 0.51         | 0.12       |                  | pCi/l        |
| I-68 DIS                | 13-04105-07          | 05/01/2013 16:18:43       | Radium-226     | E903.0          | 0.67          | 0.28         | 0.14       |                  | pCi/l        |
| I-68 DIS                | 13-04105-07          | 05/09/2013 10:57:39       | Radium-228     | E904.0          | 1.37          | 0.53         | 0.97       | J                | pCi/l        |
| I-68 DIS                | 13-04105-07          | 04/30/2013 11:48:57       | Thorium-228    | HASL 300, 4.5.2 | 0.00          | 0.04         | 0.09       | U                | pCi/l        |
| I-68 DIS                | 13-04105-07          | 04/30/2013 11:48:57       | Thorium-230    | HASL 300, 4.5.2 | 0.11          | 0.09         | 0.09       | J                | pCi/l        |
| I-68 DIS                | 13-04105-07          | 04/30/2013 11:48:57       | Thorium-232    | HASL 300, 4.5.2 | 0.03          | 0.04         | 0.06       | U                | pCi/l        |
| I-68 DIS                | 13-04105-07          | 04/29/2013 09:59:59       | Uranium-234    | HASL 300, 4.5.2 | 2.58          | 0.50         | 0.09       |                  | pCi/l        |
| I-68 DIS                | 13-04105-07          | 04/29/2013 09:59:59       | Uranium-235    | HASL 300, 4.5.2 | 0.18          | 0.12         | 0.12       | J                | pCi/l        |
| I-68 DIS                | 13-04105-07          | 04/29/2013 09:59:59       | Uranium-238    | HASL 300, 4.5.2 | 2.23          | 0.45         | 0.12       |                  | pCi/l        |
| D-87 TOT                | 13-04105-08          | 05/01/2013 16:18:44       | Radium-226     | E903.0          | 1.33          | 0.42         | 0.21       |                  | pCi/l        |
| D-87 TOT                | 13-04105-08          | 05/09/2013 10:57:39       | Radium-228     | E904.0          | 2.99          | 0.59         | 0.94       |                  | pCi/l        |
| D-87 TOT                | 13-04105-08          | 04/30/2013 11:48:48       | Thorium-228    | HASL 300, 4.5.2 | 0.22          | 0.13         | 0.09       | J                | pCi/l        |
| D-87 TOT                | 13-04105-08          | 04/30/2013 11:48:48       | Thorium-230    | HASL 300, 4.5.2 | 0.40          | 0.17         | 0.09       |                  | pCi/l        |
| D-87 TOT                | 13-04105-08          | 04/30/2013 11:48:48       | Thorium-232    | HASL 300, 4.5.2 | 0.06          | 0.06         | 0.07       | U                | pCi/l        |
| D-87 TOT                | 13-04105-08          | 04/29/2013 10:00:00       | Uranium-234    | HASL 300, 4.5.2 | 0.40          | 0.20         | 0.14       |                  | pCi/l        |
| D-87 TOT                | 13-04105-08          | 04/29/2013 10:00:00       | Uranium-235    | HASL 300, 4.5.2 | 0.03          | 0.08         | 0.17       | U                | pCi/l        |
| D-87 TOT                | 13-04105-08          | 04/29/2013 10:00:00       | Uranium-238    | HASL 300, 4.5.2 | 0.10          | 0.10         | 0.12       | U                | pCi/l        |

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0020

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Project: West Lake OU-1  
 SDG: 1304105  
 Received: 04/16/2013  
 Matrix: Water

Final Report of Analysis  
 Date: 5/16/2013  
 Page 3 of 5

| <u>Client Sample ID</u> | <u>Lab Sample ID</u> | <u>Analysis Date/Time</u> | <u>Analyte</u> | <u>Method</u>   | <u>Result</u> | <u>Error</u> | <u>MDA</u> | <u>Qualifier</u> | <u>Units</u> |
|-------------------------|----------------------|---------------------------|----------------|-----------------|---------------|--------------|------------|------------------|--------------|
| D-87 DIS                | 13-04105-09          | 05/01/2013 16:18:45       | Radium-226     | E903.0          | 0.75          | 0.31         | 0.22       |                  | pCi/l        |
| D-87 DIS                | 13-04105-09          | 05/09/2013 10:57:40       | Radium-228     | E904.0          | 0.95          | 0.48         | 0.93       | J                | pCi/l        |
| D-87 DIS                | 13-04105-09          | 04/30/2013 11:48:49       | Thorium-228    | HASL 300, 4.5.2 | 0.07          | 0.07         | 0.08       | U                | pCi/l        |
| D-87 DIS                | 13-04105-09          | 04/30/2013 11:48:49       | Thorium-230    | HASL 300, 4.5.2 | 0.11          | 0.08         | 0.08       | J                | pCi/l        |
| D-87 DIS                | 13-04105-09          | 04/30/2013 11:48:49       | Thorium-232    | HASL 300, 4.5.2 | 0.01          | 0.04         | 0.08       | U                | pCi/l        |
| D-87 DIS                | 13-04105-09          | 04/29/2013 10:00:01       | Uranium-234    | HASL 300, 4.5.2 | 0.26          | 0.15         | 0.10       |                  | pCi/l        |
| D-87 DIS                | 13-04105-09          | 04/29/2013 10:00:01       | Uranium-235    | HASL 300, 4.5.2 | 0.02          | 0.05         | 0.12       | U                | pCi/l        |
| D-87 DIS                | 13-04105-09          | 04/29/2013 10:00:01       | Uranium-238    | HASL 300, 4.5.2 | 0.11          | 0.10         | 0.12       | J                | pCi/l        |
| PZ-106-SD TOT           | 13-04105-10          | 05/01/2013 16:18:46       | Radium-226     | E903.0          | 1.04          | 0.31         | 0.16       |                  | pCi/l        |
| PZ-106-SD TOT           | 13-04105-10          | 05/09/2013 10:57:41       | Radium-228     | E904.0          | 0.34          | 0.55         | 1.14       | U                | pCi/l        |
| PZ-106-SD TOT           | 13-04105-10          | 04/30/2013 12:43:33       | Thorium-228    | HASL 300, 4.5.2 | 0.21          | 0.11         | 0.10       | J                | pCi/l        |
| PZ-106-SD TOT           | 13-04105-10          | 04/30/2013 12:43:33       | Thorium-230    | HASL 300, 4.5.2 | 0.13          | 0.09         | 0.08       | J                | pCi/l        |
| PZ-106-SD TOT           | 13-04105-10          | 04/30/2013 12:43:33       | Thorium-232    | HASL 300, 4.5.2 | 0.14          | 0.09         | 0.09       | J                | pCi/l        |
| PZ-106-SD TOT           | 13-04105-10          | 04/29/2013 10:00:02       | Uranium-234    | HASL 300, 4.5.2 | 0.32          | 0.13         | 0.07       |                  | pCi/l        |
| PZ-106-SD TOT           | 13-04105-10          | 04/29/2013 10:00:02       | Uranium-235    | HASL 300, 4.5.2 | 0.06          | 0.06         | 0.07       | U                | pCi/l        |
| PZ-106-SD TOT           | 13-04105-10          | 04/29/2013 10:00:02       | Uranium-238    | HASL 300, 4.5.2 | 0.31          | 0.13         | 0.06       |                  | pCi/l        |
| PZ-106-SD DIS           | 13-04105-11          | 05/01/2013 16:19:52       | Radium-226     | E903.0          | 0.61          | 0.24         | 0.14       |                  | pCi/l        |
| PZ-106-SD DIS           | 13-04105-11          | 05/09/2013 10:57:44       | Radium-228     | E904.0          | 0.89          | 0.53         | 1.02       | J                | pCi/l        |
| PZ-106-SD DIS           | 13-04105-11          | 04/30/2013 12:43:34       | Thorium-228    | HASL 300, 4.5.2 | 0.00          | 0.06         | 0.14       | U                | pCi/l        |
| PZ-106-SD DIS           | 13-04105-11          | 04/30/2013 12:43:34       | Thorium-230    | HASL 300, 4.5.2 | 0.34          | 0.16         | 0.10       |                  | pCi/l        |
| PZ-106-SD DIS           | 13-04105-11          | 04/30/2013 12:43:34       | Thorium-232    | HASL 300, 4.5.2 | -0.01         | 0.03         | 0.10       | U                | pCi/l        |
| PZ-106-SD DIS           | 13-04105-11          | 04/29/2013 10:00:03       | Uranium-234    | HASL 300, 4.5.2 | 0.43          | 0.16         | 0.08       |                  | pCi/l        |
| PZ-106-SD DIS           | 13-04105-11          | 04/29/2013 10:00:03       | Uranium-235    | HASL 300, 4.5.2 | 0.03          | 0.05         | 0.08       | U                | pCi/l        |
| PZ-106-SD DIS           | 13-04105-11          | 04/29/2013 10:00:03       | Uranium-238    | HASL 300, 4.5.2 | 0.20          | 0.11         | 0.08       |                  | pCi/l        |
| S-82 TOT                | 13-04105-12          | 05/01/2013 16:19:55       | Radium-226     | E903.0          | 1.63          | 0.43         | 0.17       |                  | pCi/l        |
| S-82 TOT                | 13-04105-12          | 05/09/2013 10:57:44       | Radium-228     | E904.0          | 2.04          | 0.58         | 1.01       |                  | pCi/l        |
| S-82 TOT                | 13-04105-12          | 04/30/2013 12:43:35       | Thorium-228    | HASL 300, 4.5.2 | 0.12          | 0.10         | 0.12       | J                | pCi/l        |
| S-82 TOT                | 13-04105-12          | 04/30/2013 12:43:35       | Thorium-230    | HASL 300, 4.5.2 | 0.24          | 0.13         | 0.07       |                  | pCi/l        |
| S-82 TOT                | 13-04105-12          | 04/30/2013 12:43:35       | Thorium-232    | HASL 300, 4.5.2 | 0.11          | 0.09         | 0.10       | J                | pCi/l        |
| S-82 TOT                | 13-04105-12          | 04/29/2013 10:00:04       | Uranium-234    | HASL 300, 4.5.2 | 1.26          | 0.41         | 0.17       |                  | pCi/l        |
| S-82 TOT                | 13-04105-12          | 04/29/2013 10:00:04       | Uranium-235    | HASL 300, 4.5.2 | 0.12          | 0.13         | 0.17       | U                | pCi/l        |
| S-82 TOT                | 13-04105-12          | 04/29/2013 10:00:04       | Uranium-238    | HASL 300, 4.5.2 | 1.09          | 0.37         | 0.11       |                  | pCi/l        |

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

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

Project: West Lake OU-1  
 SDG: 1304105  
 Received: 04/16/2013  
 Matrix: Water

Final Report of Analysis  
 Date: 5/16/2013  
 Page 4 of 5

| <u>Client Sample ID</u> | <u>Lab Sample ID</u> | <u>Analysis Date/Time</u> | <u>Analyte</u> | <u>Method</u>   | <u>Result</u> | <u>Error</u> | <u>MDA</u> | <u>Qualifier</u> | <u>Units</u> |
|-------------------------|----------------------|---------------------------|----------------|-----------------|---------------|--------------|------------|------------------|--------------|
| S-82 DIS                | 13-04105-13          | 05/01/2013 16:19:48       | Radium-226     | E903.0          | 0.64          | 0.27         | 0.16       |                  | pCi/l        |
| S-82 DIS                | 13-04105-13          | 05/09/2013 10:57:44       | Radium-228     | E904.0          | 1.17          | 0.56         | 1.06       | J                | pCi/l        |
| S-82 DIS                | 13-04105-13          | 04/30/2013 12:43:36       | Thorium-228    | HASL 300, 4.5.2 | 0.00          | 0.03         | 0.08       | U                | pCi/l        |
| S-82 DIS                | 13-04105-13          | 04/30/2013 12:43:36       | Thorium-230    | HASL 300, 4.5.2 | 0.08          | 0.07         | 0.06       | J                | pCi/l        |
| S-82 DIS                | 13-04105-13          | 04/30/2013 12:43:36       | Thorium-232    | HASL 300, 4.5.2 | 0.00          | 0.02         | 0.06       | U                | pCi/l        |
| S-82 DIS                | 13-04105-13          | 04/29/2013 10:00:43       | Uranium-234    | HASL 300, 4.5.2 | 0.91          | 0.32         | 0.14       |                  | pCi/l        |
| S-82 DIS                | 13-04105-13          | 04/29/2013 10:00:43       | Uranium-235    | HASL 300, 4.5.2 | 0.02          | 0.06         | 0.12       | U                | pCi/l        |
| S-82 DIS                | 13-04105-13          | 04/29/2013 10:00:43       | Uranium-238    | HASL 300, 4.5.2 | 0.81          | 0.30         | 0.14       |                  | pCi/l        |
| PZ-106-SS TOT           | 13-04105-14          | 05/01/2013 16:19:50       | Radium-226     | E903.0          | 2.80          | 0.53         | 0.12       |                  | pCi/l        |
| PZ-106-SS TOT           | 13-04105-14          | 05/09/2013 10:57:45       | Radium-228     | E904.0          | 0.71          | 0.54         | 1.07       | J                | pCi/l        |
| PZ-106-SS TOT           | 13-04105-14          | 04/30/2013 12:43:37       | Thorium-228    | HASL 300, 4.5.2 | 0.04          | 0.06         | 0.10       | U                | pCi/l        |
| PZ-106-SS TOT           | 13-04105-14          | 04/30/2013 12:43:37       | Thorium-230    | HASL 300, 4.5.2 | 0.16          | 0.10         | 0.08       | J                | pCi/l        |
| PZ-106-SS TOT           | 13-04105-14          | 04/30/2013 12:43:37       | Thorium-232    | HASL 300, 4.5.2 | 0.02          | 0.04         | 0.07       | U                | pCi/l        |
| PZ-106-SS TOT           | 13-04105-14          | 04/29/2013 10:00:45       | Uranium-234    | HASL 300, 4.5.2 | 0.59          | 0.17         | 0.05       |                  | pCi/l        |
| PZ-106-SS TOT           | 13-04105-14          | 04/29/2013 10:00:45       | Uranium-235    | HASL 300, 4.5.2 | 0.05          | 0.05         | 0.06       | U                | pCi/l        |
| PZ-106-SS TOT           | 13-04105-14          | 04/29/2013 10:00:45       | Uranium-238    | HASL 300, 4.5.2 | 0.38          | 0.13         | 0.05       |                  | pCi/l        |
| PZ-106-SS DIS           | 13-04105-15          | 05/01/2013 16:20:04       | Radium-226     | E903.0          | 3.12          | 0.56         | 0.13       |                  | pCi/l        |
| PZ-106-SS DIS           | 13-04105-15          | 05/09/2013 10:57:37       | Radium-228     | E904.0          | 0.51          | 0.57         | 1.16       | U                | pCi/l        |
| PZ-106-SS DIS           | 13-04105-15          | 04/30/2013 12:43:38       | Thorium-228    | HASL 300, 4.5.2 | 0.01          | 0.05         | 0.12       | U                | pCi/l        |
| PZ-106-SS DIS           | 13-04105-15          | 04/30/2013 12:43:38       | Thorium-230    | HASL 300, 4.5.2 | 0.15          | 0.10         | 0.09       | J                | pCi/l        |
| PZ-106-SS DIS           | 13-04105-15          | 04/30/2013 12:43:38       | Thorium-232    | HASL 300, 4.5.2 | 0.01          | 0.04         | 0.09       | U                | pCi/l        |
| PZ-106-SS DIS           | 13-04105-15          | 04/29/2013 10:00:46       | Uranium-234    | HASL 300, 4.5.2 | 0.61          | 0.17         | 0.05       |                  | pCi/l        |
| PZ-106-SS DIS           | 13-04105-15          | 04/29/2013 10:00:46       | Uranium-235    | HASL 300, 4.5.2 | 0.12          | 0.08         | 0.05       | J                | pCi/l        |
| PZ-106-SS DIS           | 13-04105-15          | 04/29/2013 10:00:46       | Uranium-238    | HASL 300, 4.5.2 | 0.34          | 0.12         | 0.04       |                  | pCi/l        |
| I-9 TOT                 | 13-04105-16          | 05/01/2013 16:19:58       | Radium-226     | E903.0          | 1.48          | 0.43         | 0.20       |                  | pCi/l        |
| I-9 TOT                 | 13-04105-16          | 05/09/2013 10:57:37       | Radium-228     | E904.0          | 3.81          | 0.78         | 1.30       |                  | pCi/l        |
| I-9 TOT                 | 13-04105-16          | 04/30/2013 14:35:06       | Thorium-228    | HASL 300, 4.5.2 | 0.15          | 0.11         | 0.13       | J                | pCi/l        |
| I-9 TOT                 | 13-04105-16          | 04/30/2013 14:35:06       | Thorium-230    | HASL 300, 4.5.2 | 0.11          | 0.09         | 0.10       | J                | pCi/l        |
| I-9 TOT                 | 13-04105-16          | 04/30/2013 14:35:06       | Thorium-232    | HASL 300, 4.5.2 | -0.02         | 0.03         | 0.10       | U                | pCi/l        |
| I-9 TOT                 | 13-04105-16          | 04/29/2013 10:00:48       | Uranium-234    | HASL 300, 4.5.2 | 0.14          | 0.12         | 0.11       | J                | pCi/l        |
| I-9 TOT                 | 13-04105-16          | 04/29/2013 10:00:48       | Uranium-235    | HASL 300, 4.5.2 | 0.00          | 0.08         | 0.18       | U                | pCi/l        |
| I-9 TOT                 | 13-04105-16          | 04/29/2013 10:00:48       | Uranium-238    | HASL 300, 4.5.2 | 0.04          | 0.07         | 0.10       | U                | pCi/l        |

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

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 Engineering Management Support, Inc.  
 7220 West Jefferson Ave, Suite 406  
 Lakewood, CO 80235

Project: West Lake OU-1  
 SDG: 1304105  
 Received: 04/16/2013  
 Matrix: Water

Final Report of Analysis  
 Date: 5/16/2013  
 Page 5 of 5

| <u>Client Sample ID</u> | <u>Lab Sample ID</u> | <u>Analysis Date/Time</u> | <u>Analyte</u> | <u>Method</u>   | <u>Result</u> | <u>Error</u> | <u>MDA</u> | <u>Qualifier</u> | <u>Units</u> |
|-------------------------|----------------------|---------------------------|----------------|-----------------|---------------|--------------|------------|------------------|--------------|
| I-9 DIS                 | 13-04105-17          | 05/01/2013 16:20:01       | Radium-226     | E903.0          | 0.67          | 0.29         | 0.20       |                  | pCi/l        |
| I-9 DIS                 | 13-04105-17          | 05/09/2013 10:57:37       | Radium-228     | E904.0          | 1.49          | 0.60         | 1.12       | J                | pCi/l        |
| I-9 DIS                 | 13-04105-17          | 04/30/2013 14:35:07       | Thorium-228    | HASL 300, 4.5.2 | -0.01         | 0.11         | 0.28       | U                | pCi/l        |
| I-9 DIS                 | 13-04105-17          | 04/30/2013 14:35:07       | Thorium-230    | HASL 300, 4.5.2 | 0.15          | 0.15         | 0.18       | U                | pCi/l        |
| I-9 DIS                 | 13-04105-17          | 04/30/2013 14:35:07       | Thorium-232    | HASL 300, 4.5.2 | 0.10          | 0.12         | 0.16       | U                | pCi/l        |
| I-9 DIS                 | 13-04105-17          | 04/29/2013 10:00:50       | Uranium-234    | HASL 300, 4.5.2 | 0.20          | 0.12         | 0.07       |                  | pCi/l        |
| I-9 DIS                 | 13-04105-17          | 04/29/2013 10:00:50       | Uranium-235    | HASL 300, 4.5.2 | 0.10          | 0.09         | 0.09       | J                | pCi/l        |
| I-9 DIS                 | 13-04105-17          | 04/29/2013 10:00:50       | Uranium-238    | HASL 300, 4.5.2 | 0.19          | 0.11         | 0.07       |                  | pCi/l        |
|                         |                      |                           |                |                 |               |              |            |                  |              |
| D-93 TOT                | 13-04105-18          | 05/02/2013 05:32:48       | Radium-226     | E903.0          | 3.02          | 0.71         | 0.31       |                  | pCi/l        |
| D-93 TOT                | 13-04105-18          | 05/09/2013 10:57:37       | Radium-228     | E904.0          | 4.79          | 0.74         | 1.12       |                  | pCi/l        |
| D-93 TOT                | 13-04105-18          | 04/30/2013 14:35:03       | Thorium-228    | HASL 300, 4.5.2 | 0.16          | 0.11         | 0.13       | J                | pCi/l        |
| D-93 TOT                | 13-04105-18          | 04/30/2013 14:35:03       | Thorium-230    | HASL 300, 4.5.2 | 0.09          | 0.08         | 0.09       | J                | pCi/l        |
| D-93 TOT                | 13-04105-18          | 04/30/2013 14:35:03       | Thorium-232    | HASL 300, 4.5.2 | 0.01          | 0.04         | 0.09       | U                | pCi/l        |
| D-93 TOT                | 13-04105-18          | 04/29/2013 10:00:51       | Uranium-234    | HASL 300, 4.5.2 | 0.39          | 0.16         | 0.09       |                  | pCi/l        |
| D-93 TOT                | 13-04105-18          | 04/29/2013 10:00:51       | Uranium-235    | HASL 300, 4.5.2 | 0.03          | 0.05         | 0.10       | U                | pCi/l        |
| D-93 TOT                | 13-04105-18          | 04/29/2013 10:00:51       | Uranium-238    | HASL 300, 4.5.2 | 0.16          | 0.12         | 0.15       | J                | pCi/l        |
|                         |                      |                           |                |                 |               |              |            |                  |              |
| D-93 DIS                | 13-04105-19          | 05/02/2013 05:32:49       | Radium-226     | E903.0          | 1.93          | 0.48         | 0.21       |                  | pCi/l        |
| D-93 DIS                | 13-04105-19          | 05/09/2013 11:22:40       | Radium-228     | E904.0          | 2.89          | 0.59         | 0.97       |                  | pCi/l        |
| D-93 DIS                | 13-04105-19          | 04/30/2013 14:35:04       | Thorium-228    | HASL 300, 4.5.2 | 0.05          | 0.06         | 0.09       | U                | pCi/l        |
| D-93 DIS                | 13-04105-19          | 04/30/2013 14:35:04       | Thorium-230    | HASL 300, 4.5.2 | 0.16          | 0.09         | 0.05       |                  | pCi/l        |
| D-93 DIS                | 13-04105-19          | 04/30/2013 14:35:04       | Thorium-232    | HASL 300, 4.5.2 | 0.03          | 0.04         | 0.06       | U                | pCi/l        |
| D-93 DIS                | 13-04105-19          | 04/29/2013 10:00:53       | Uranium-234    | HASL 300, 4.5.2 | 0.30          | 0.14         | 0.08       |                  | pCi/l        |
| D-93 DIS                | 13-04105-19          | 04/29/2013 10:00:53       | Uranium-235    | HASL 300, 4.5.2 | 0.04          | 0.06         | 0.09       | U                | pCi/l        |
| D-93 DIS                | 13-04105-19          | 04/29/2013 10:00:53       | Uranium-238    | HASL 300, 4.5.2 | 0.15          | 0.10         | 0.07       | J                | pCi/l        |

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EBERLINE ANALYTICAL CORPORATION

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



**SECTION V  
ANALYTICAL STANDARDS**

U-8

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

# CERTIFICATE OF CALIBRATION ALPHA STANDARD SOLUTION

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

Customer: TMA EBERLINE  
P.O.No.: OR2778  
Reference Date: January 1 1995 12:00 PST.  
Contained Radioactivity: (Total U) 8.016  $\mu$ Ci  
Contained Radioactivity: (Total U) 297 kBq

Description of Solution  
a. Mass of solution: 65.2896 g in a 50 ml flame sealed ampoule  
b. Chemical form: Uranyl Nitrate in H<sub>2</sub>O  
c. Carrier content: None  
d. Density: Approximately 1.3202 g/ml @ 20°C.

Radioimpurities Refer to attached technical data sheet

Radioactive Daughters Refer to attached technical data sheet

Radionuclide Concentration (Total U) 0.1228  $\mu$ Ci/g.

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

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

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

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

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

*[Signature]*  
ERIC ALLAS  
QUALITY CONTROL

29 DECEMBER 1994  
Date Signed



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



**QUALITY CONTROL PROGRAM**  
MP-009

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

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

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

Principal Radionuclide **<sup>234, 235, 238</sup>U** Half Life, Years **4.468E+09** Half Life, Days **1.632E+12**

Radionuclide **<sup>234, 235, 238</sup>U** Reference Date **1/1/1995 0:00**  
Certified Activity **8.016E+00**  $\mu\text{Ci}$   
Certified Concentration **8.016E+00**  $\mu\text{Ci per gram}$

Ampoule /Solution Gross **97.6400** Weight, Grams  
Empty Ampoule **32.5020** Weight, Grams  
Solution Net **65.1380** Weight, Grams  
Total Activity in Ampoule **8.0160**  $\mu\text{Ci}$

**Chemical Composition of Standard Solution**  
**Uranyl nitrate in dilute HNO<sub>3</sub>**

Dilution Instructions: Dilution Solvent Used **1M HNO<sub>3</sub>**

Dilute to a volume of **1000.00** milliliters

Certified Total Activity of **8.0160**  $\mu\text{Ci}$  Which Equals **1.780E+07** dpm at the date listed above

And after dilution the activity of this solution is **1.77955E+04** dpm/ml  
This activity concentration is based on the original reference date listed above. All activities are corrected to the date and time of analysis by the laboratory data processing software.

Expiration Date: **September 6, 2013**

Verified & Approved By 

Date: **9/26/2012 0:00**

QC Approval 

Date: **9/26/12**

US EPA ARCHIVE DOCUMENT



QUALITY CONTROL PROGRAM  
MP-009

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

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

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

Principal Radionuclide <sup>234, 235, 238</sup>U Half Life, Years 4.468E+09 Half Life, Days 1.632E+12

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

Chemical Composition of Standard Solution  
Uranly Nitrate In 1M HNO<sub>3</sub>

Dilution Instructions: Dilution Solvent Used 1M HNO<sub>3</sub>

SECONDARY VOLUMETRIC DILUTION

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

NOTES:

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

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

Expiration Date: September 6, 2013

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

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

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# RECORD COPY

## Tracer Solution for Environmental Analysis & Disequilibrium Studies

### Product Description & Measurement Certificate

*Description* Principal radionuclide: uranium 232 (U-232) Product code: UDP10050  
Daughter Nuclide: Th-228 Batch Number: 92/232/67

*Measurement* Reference date: 01 March 2000  
Radioactive concentration U-232 6.739E+03 becquerels per gram of solution  
which is equivalent to 1.821E-01 microcuries per gram of solution  
Mass of solution 5.356 grams  
Volume of solution 5.035 millilitres  
Total activity of U-232 3.61E+04 becquerels  
which is equivalent to 9.76E-01 microcuries

*Accuracy* Method of measurement (see reverse of this certificate)  
Random uncertainty is:  $\pm 0.7\%$  Systematic uncertainty:  $\pm 0.5\%$   
Overall uncertainty in the radioactive concentration quoted above:  $\pm 1.7\%$   
Overall uncertainty is defined on the reverse of this certificate.

*Radionuclidic Purity* Any radioactive impurities measured are listed below, expressed as percentages of the activity of the principle radionuclide at the reference date .  
  
Th-228 and daughter activity removed 2 Feb 2000  
U-232 daughters activity will increase with time. By alpha 88% U-232, 12% daughters on 1/3/00

*Isotopic Purity* The isotopic composition, expressed as atom per cent at the reference date .  
  
Not measured

*Chemical Composition* Calculated weight of U-232, 4.42E-08 grams, as 2M HNO<sub>3</sub> solution in a flame sealed glass vial.  
This Tracer solution has been produced 'carrier free'.

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

*Remarks* For safety information and notes to ensure correct usage by all persons handling this radioactive Tracer solution please read the instructions accompanying the package.  
  
AEA Technology operates a quality management system which has been independently audited and approved to ISO 9001.

Approved  
Signatory



Roger Wiltshire

Project Ref. AE2315

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



# 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 # AEA/Amersham 92/232/67 CURRENT DATE 12/13/2012 0:00  
SOLUTION # U-10

Principal Radionuclide <sup>232</sup>U Half Life, Years 7.200E+01 Half Life, Days 2.630E+04

Radionuclide <sup>232</sup>U Reference Date 3/1/2000 0:00  
Certified Activity 9.760E-01  $\mu\text{Ci}$   
Certified Concentration                       $\mu\text{Ci per gram}$

Ampoule /Solution Gross                      Weight, Grams  
Empty Ampoule                      Weight, Grams  
Solution Net                      Weight, Grams  
Total Activity in Ampoule 0.9760  $\mu\text{Ci}$

Chemical Composition of Standard Solution  
<sup>232</sup>U(NO<sub>3</sub>)<sub>6</sub> in 2M HNO<sub>3</sub>


Dilution Instructions: Dilution Solvent Used 2M HNO<sub>3</sub>

Dilute to a volume of 1000.00 milliliters

Certified Total Activity of 0.9760  $\mu\text{Ci}$  Which Equals 2.167E+06 dpm at the date listed above

And after dilution the activity of this solution is 2.167E+03 dpm/ml This activity concentration is based on the original reference date listed above. All activities are corrected to the date and time of analysis by the laboratory data processing software.

Expiration Date: December 7, 2013

Verified & Approved By 

Date: 12/13/2012 0:00

QC Approval 

Date: 12/13/12

US EPA ARCHIVE DOCUMENT



QUALITY CONTROL PROGRAM

MP-009

Rev.8; 11/01/03

Title: Radioactive Reference Standards Solutions & Records

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

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

Principal Radionuclide <sup>232</sup>U Half Life, Years 7.200E+01 Half Life, Days 2.630E+04

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

Chemical Composition of Standard Solution  
<sup>232</sup>U(NO<sub>3</sub>)<sub>6</sub> in 2M HNO<sub>3</sub>

Dilution Instructions: Dilution Solvent Used 2M HNO<sub>3</sub>

SECONDARY VOLUMETRIC DILUTION

Vol. Parent Solution: 10.0000 ml  
Total Activity: 2.1670E+04 dpm Final Activity Concentration: 2.1670E+01 dpm/ml  
Final Volume: 1000.00 ml

NOTES:

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

Expiration Date: December 7, 2013

Verified & Approved By [Signature]

Date: 12/13/2012 0:00

QC Approval [Signature]

Date: 12/13/12

US EPA ARCHIVE DOCUMENT

QA/QC REVIEWED

Date: 10/14/91 Initials: wt

**CERTIFICATE OF CALIBRATION**  
**ALPHA STANDARD SOLUTION**

Received  
OCT 14 1991  
TMA/Eberline  
Oak Ridge Lab

|              |                                     |                          |                            |
|--------------|-------------------------------------|--------------------------|----------------------------|
| Radionuclide | Th-230                              | Customer:                | TMA EBERLINE               |
| Half Life:   | $(7.54 \pm 0.03) \times 10^4$ years | P.O.No.:                 | TT4944                     |
| Catalog No.: | 7230                                | Reference Date:          | November 1 1991 12:00 PST. |
| Source No.:  | 388-116                             | Contained Radioactivity: | 1.036 $\mu$ Ci.            |

**Description of Solution**

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

**Radioimpurities**

See attached technical data sheet

**Radioactive Daughters**

See attached technical data sheet

**Radionuclide Concentration**

0.207  $\mu$ Ci/gram.

**Method of Calibration**

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

**Uncertainty of Measurement**

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

**NIST Traceability**

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

**Notes**

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



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*[Signature]*  
**QUALITY CONTROL**





**QUALITY CONTROL PROGRAM**  
MP-009

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

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

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

| Principal Radionuclide | Half Life, Years | Half Life, Days |
|------------------------|------------------|-----------------|
| <sup>230</sup> Th      | 7.540E+04        | 2.754E+07       |

Radionuclide of Interest: <sup>230</sup>Thorium Reference Date: **11/1/1991 0:00**  
Parent Solution Conc. **2.30E+03** dpm/ml

**Chemical Composition of Standard Solution**  
<sup>230</sup>Th(NO<sub>3</sub>)<sub>4</sub> in 0.1N HNO<sub>3</sub>

Dilution Instructions: Dilution Solvent Used **0.1N HNO<sub>3</sub>**

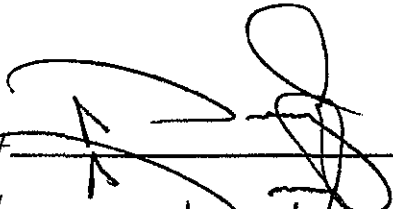
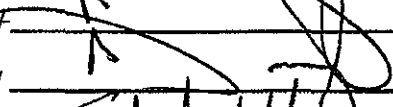
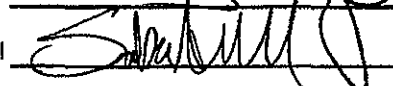
**SECONDARY VOLUMETRIC DILUTION**

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

**NOTES:**

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

Expiration Date: **March 4, 2014**

Recertified By:  Date: **3/21/2013 0:00**  
Verified & Approved By:  Date: **3/21/13**  
QC Approval:  Date: **3/21/13**

US EPA ARCHIVE DOCUMENT



# QUALITY CONTROL PROGRAM

MP-009

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

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

CURRENT DATE: 3/4/2013 0:00

SOLUTION REFERENCE #: IPL 388-116

SOLUTION #: Th-1

Principal Radionuclide

Half Life, Years

Half Life, Days

<sup>230</sup>Th

7.540E+04

2.754E+07

Radionuclide: <sup>230</sup>Thorium

Reference Date: 11/1/1991 0:00

Certified Activity: 1.036E+00  $\mu$ Ci

Certified Concentration:  $\mu$ Ci per gram

|                           |        |               |
|---------------------------|--------|---------------|
| Ampoule /Solution Gross   | 9.2660 | Weight, Grams |
| Empty Ampoule             | 4.6218 | Weight, Grams |
| Solution Net              | 4.6442 | Weight, Grams |
| Total Activity in Ampoule | 1.0360 | $\mu$ Ci      |

### Chemical Composition of Standard Solution

<sup>230</sup>Th(NO<sub>3</sub>)<sub>4</sub> in 0.1N HNO<sub>3</sub>

Dilution Instructions:

Dilution Solvent Used

0.1N HNO<sub>3</sub>

Dilute to a volume of 1000.00 milliliters

Certified Total Activity of 1.0360  $\mu$ Ci

Which Equals 2.300E+06 dpm at the date listed above

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

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

Expiration Date: March 4, 2014

Recertified By

Date: 3/21/2013 0:00

QC Approval

Date: 3/21/13

US EPA ARCHIVE DOCUMENT

# CERTIFICATE OF CALIBRATION ALPHA STANDARD SOLUTION

|               |  |                          |                            |
|---------------|--|--------------------------|----------------------------|
| Radionuclide: | Th-232                                   | Customer:                | TMA EBERLINE               |
| Half Life:    | $(1.405 \pm 0.006) \times 10^{10}$ years | P.O.No.:                 | VH1632                     |
| Catalog No.:  | 7232                                     | Reference Date:          | November 1 1993 12:00 PST. |
| Source No.:   | 435-104-2                                | Contained Radioactivity: | (Th-232) 0.0933 $\mu$ Ci.  |
|               |  | Contained Radioactivity: | (Th-232) 3.45 kBq.         |

### Description of Solution

- a. Mass of solution: 11.9712 g (in a 10 ml flame sealed ampoule)
- b. Chemical form: Th(NO<sub>3</sub>)<sub>4</sub> in water
- c. Carrier content: None added
- d. Density: Approx. 1.21 g/ml @ 20°C.

Radioimpurities: None detected (other than daughters).

### Radioactive Daughters

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

### Radionuclide Concentration

(Th-232) 0.00779  $\mu$ Ci/g.

### Method of Calibration

Activity calculations are based upon known specific activity and mass.

### Uncertainty of Measurement

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

### NIST Traceability

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

### Leak Test(s)

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

### Notes

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



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 Burbank, California 91504  
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*Anna U. Khan*  
 QUALITY CONTROL

*Nov. 8, 1993*  
 Date Signed



# QUALITY CONTROL PROGRAM

MP-009

Rev.8; 1/10/03

Title: Radioactive Reference Standards Solutions & Records

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

SOLUTION REFERENCE # IPL 435-104-2 CURRENT DATE 10/9/2012 0:00  
SOLUTION # Th-8

Principal Radionuclide <sup>232</sup>Th, <sup>228</sup>Th Half Life, Years 1.405E+10 Half Life, Days 5.132E+12

Radionuclide <sup>232</sup>Th, <sup>228</sup>Th Reference Date 11/1/1993 0:00  
Certified Activity 9.330E-02  $\mu\text{Ci}$   
Certified Concentration                       $\mu\text{Ci per gram}$

|                           |                |                |
|---------------------------|----------------|----------------|
| Ampoule /Solution Gross   | <u>18.8415</u> | Weight, Grams  |
| Empty Ampoule             | <u>6.9296</u>  | Weight, Grams  |
| Solution Net              | <u>11.9119</u> | Weight, Grams  |
| Total Activity in Ampoule | <u>0.0933</u>  | $\mu\text{Ci}$ |

Chemical Composition of Standard Solution  
Th(NO<sub>3</sub>)<sub>4</sub> in H<sub>2</sub>O

Dilution Instructions: Dilution Solvent Used 1% Nitric Acid

Dilute to a volume of 1000.00 milliliters

Certified Total Activity of 0.0933  $\mu\text{Ci}$  Which Equals 2.071E+05 dpm at the date listed above

And after dilution the activity of this solution is 2.071E+02 dpm/ml This activity concentration is based on the original reference date listed above. All activities are corrected to the date and time of analysis by the laboratory data processing software.

Expiration Date: October 9, 2013

Verified & Approved By [Signature]

Date: 10/9/2012 0:00

QC Approval [Signature]

Date: 11/12/12

US EPA ARCHIVE DOCUMENT



QUALITY CONTROL PROGRAM  
MP-009

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

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

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

Principal Radionuclide <sup>228</sup>Th Half Life, Years 1.405E+10 Half Life, Days 5.132E+12

Radionuclide of Interest <sup>228</sup>Th Reference Date 11/1/1993 0:00  
Parent Solution Conc. 2.07E+02 dpm/ml

Chemical Composition of Standard Solution  
Th(NO<sub>3</sub>)<sub>4</sub> in 1% HNO<sub>3</sub>

Dilution Instructions: Dilution Solvent Used 1% Nitric Acid

SECONDARY VOLUMETRIC DILUTION

Vol. Parent Solution: 600.0000 ml  
Total Activity: 1.0365E+05 dpm Final Activity Concentration: 1.0365E+02 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: October 9, 2013

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

Date: 11/9/2012 0:00  
Date: 11/12/12

US EPA ARCHIVE DOCUMENT



**Isotope Products  
Laboratories**

An Eckert & Ziegler Company

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Valencia, California 91355

Tel 661•309•1010  
Fax 661•257•8303

Th-18

## CERTIFICATE OF CALIBRATION ALPHA STANDARD SOLUTION

|                                    |  |
|------------------------------------|--|
| <b>Radionuclide:</b> Th-229        | <b>Customer:</b> EBERLINE SERVICES                                   |
| <b>Half-life:</b> 7340 ± 180 years | <b>P.O. No.:</b> 00009633  |
| <b>Catalog No.:</b> 7229           | <b>Reference Date:</b> 15-Jan-02 12:00 PST                           |
| <b>Source No.:</b> 867-54          | <b>Contained Radioactivity:</b> 1.013 μCi 37.48 kBq<br>(Th-229 only) |

**Physical Description:**

- A. Mass of solution: 5.0147 g in 5 mL flame-sealed ampoule
- B. Chemical form: Th(NO<sub>3</sub>)<sub>4</sub> in 0.1M HNO<sub>3</sub>
- C. Carrier content: 10μg Th/mL
- D. Density: 1.0016 g/mL @ 20°C.

**Radioimpurities:**

None detected (daughters in equilibrium)

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

**Method of Calibration:**

This source was prepared from a weighed aliquot of solution whose activity in μCi/g was determined using gamma ray spectrometry.  
 Peak energy used for integration: 193.5 keV  
 Branching ratio used: 0.0441 gammas per decay

**Uncertainty of Measurement:**

- A. Type A (random) uncertainty: ± 0.7 %
- B. Type B (systematic) uncertainty: ± 3.0 %
- C. Uncertainty in aliquot weighing: ± 0.0 %
- D. Total uncertainty at the 99% confidence level: ± 3.1 %

**Notes:**

- See reverse side for leak test(s) performed on this source.
- IPL participates in a NIST measurement assurance program to establish and maintain implicit traceability for a number of nuclides, based on the blind assay (and later NIST certification) of Standard Reference Materials (As in NRC Regulatory Guide 4.15).
- Nuclear data was taken from IAEA Technical Report Series No. 261.
- This solution has a working life of 5 years.

*Am U Khan*  
Quality Control

9-Jan-02  
Date Signed

IPL Ref. No.: 867-54

ISO 9001 CERTIFIED

Medical Imaging Laboratory  
24937 Avenue Tibbitts Valencia, California 91355

Industrial Gauging Laboratory  
1800 North Keystone Street Burbank, California 91504

0037

US EPA ARCHIVE DOCUMENT



QUALITY CONTROL PROGRAM

MP-009

Rev.8; 1/10/03

Title: Radioactive Reference Standards Solutions & Records

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

SOLUTION REFERENCE # IPL 867-54

CURRENT DATE 11/9/2012 0:00

SOLUTION # Th-18

Principal Radionuclide

Half Life, Years

Half Life, Days

<sup>229</sup>Th

7.340E+03

2.681E+06

Radionuclide

<sup>229</sup>Th

Reference Date

1/15/2002 0:00

Certified Activity 1.013E+00  $\mu$ Ci

Certified Concentration  $\mu$ Ci per gram

Ampoule /Solution Gross 8.7752 Weight, Grams

Empty Ampoule 3.7591 Weight, Grams

Solution Net 5.0161 Weight, Grams

Total Activity in Ampoule 1.0130  $\mu$ Ci

Chemical Composition of Standard Solution

<sup>229</sup>Th(NO<sub>3</sub>)<sub>4</sub> in 0.1M HNO<sub>3</sub>

Dilution Instructions:

Dilution Solvent Used

0.1M HNO<sub>3</sub>

Dilute to a volume of 1000.00 milliliters

Certified Total Activity of 1.0130  $\mu$ Ci

Which Equals 2.249E+06 dpm at the date listed above

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

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

Expiration Date: October 9, 2013

Verified & Approved By

Date: 11/9/2012 0:00

QC Approval

Date: 11/12/12

US EPA ARCHIVE DOCUMENT



QUALITY CONTROL PROGRAM

MP-009

Rev.7; 9/29/99

Title: Radioactive Reference Standards Solutions & Records

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

Solution Reference # **MP-009**  
**IPL 867-54**

Date **11/9/2012 0:00**  
Solution # **Th-18a**

Principal Radionuclide  
**<sup>228</sup>Th**

Half Life, Years  
**7.340E+03**

Half Life, Days  
**2.681E+06**

Radionuclide of Interest **<sup>228</sup>Th**  
Parent Solution Conc. **2.25E+03** dpm/ml

Reference Date **1/15/2002 0:00**

Chemical Composition of Standard Solution

**Th(NO<sub>3</sub>)<sub>4</sub> in 0.1M HNO<sub>3</sub>**

Dilution Instructions:

Dilution Solvent Used **0.1M HNO<sub>3</sub>**

SECONDARY VOLUMETRIC DILUTION

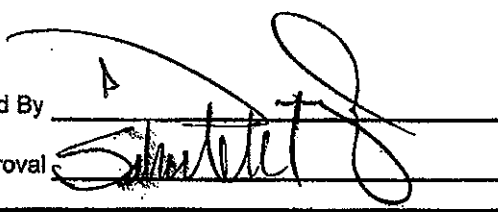
Vol. Parent Solution: **10.0000** ml  
Total Activity: **2.2490E+04** dpm  
Final Volume: **1000.00** ml

Final Activity Concentration: **2.2490E+01** dpm/ml

NOTES:

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

Expiration Date: **October 9, 2013**

Verified & Approved By 

Date: **11/9/2012 0:00**

QC Approval 

Date: **11/12/12**

US EPA ARCHIVE DOCUMENT





National Institute of Standards & Technology

# Certificate

Standard Reference Material 4251C  
Barium-133 Radioactivity Standard

Ba-6  
(#6a)

ORIGINAL

ORIGINAL

This Standard Reference Material (SRM) consists of radioactive barium-133 chloride, non-radioactive barium chloride, and hydrochloric acid dissolved in 5 mL of distilled water. The solution is contained in a flame-sealed NIST borosilicate-glass ampoule. The SRM is intended for the calibration of ionization chambers and solid-state gamma-ray spectrometry systems.

### Radiological Hazard

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

### Chemical Hazard

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

### Storage and Handling

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

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

### Preparation

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

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

Gaithersburg, Maryland 20899  
October 1994

Thomas E. Gills, Chief  
Standard Reference Materials Program



# QUALITY CONTROL PROGRAM

QCP-009

Rev.8; 11/10/03

Title: Radioactive Reference Standards Solutions & Records

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

SOLUTION REFERENCE # NIST SRM4251C

CURRENT DATE 9/20/2012 0:00

SOLUTION # Ba-6

Principal Radionuclide

Half Life, Years

Half Life, Days

<sup>133</sup>Barium

1.048E+01

3.828E+03

Radionuclide <sup>133</sup>Barium

Reference Date 9/17/1993 0:00

Certified Activity                       $\mu\text{Ci}$

Certified Concentration 1.318E+01  $\mu\text{Ci per gram}$

Ampoule /Solution Gross 9.3081 Weight, Grams

Empty Ampoule 4.2582 Weight, Grams

Solution Net 5.0499 Weight, Grams

Total Activity in Ampoule 66.5577  $\mu\text{Ci}$

### Chemical Composition of Standard Solution

<sup>133</sup>BaCl<sub>2</sub> in 1M HCl

Dilution Instructions:

Dilution Solvent Used

1M HCl

Dilute to a volume of 1000.00 milliliters

Certified Total Activity of 66.5577  $\mu\text{Ci}$

Which Equals 1.478E+08 dpm at the date listed above

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

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

Expiration Date: September 20, 2013

Verified & Approved By

Date: 9/27/12

QC Approval

Date: 9/27/12

US EPA ARCHIVE DOCUMENT



**QUALITY CONTROL PROGRAM**  
QCP-009

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

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

Solution Reference # QCP-009-1-A      Date 9/20/12  
NIST-SRM4251C      Solution # Ba-6a

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

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

**Chemical Composition of Standard Solution**  
<sup>133</sup>BaCl<sub>2</sub> in 1M HCl

Dilution Instructions:      Dilution Solvent Used: 1M HCl



**SECONDARY VOLUMETRIC DILUTION**

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

**NOTES:**

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

Expiration Date: September 20, 2013

Verified & Approved By:   
QC Approval: 

Date: 9/27/12

Date: 9/27/12

US EPA ARCHIVE DOCUMENT

# CERTIFICATE OF CALIBRATION ALPHA STANDARD SOLUTION

*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

*Anna H. Kwan*  
 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 11/9/2012 0:00  
SOLUTION # Ra-5

| Principal Radionuclide | Half Life, Years | Half Life, Days  |
|------------------------|------------------|------------------|
| <sup>226</sup> Radium  | <u>1.600E+03</u> | <u>5.844E+05</u> |

|                         |                                 |                |                      |
|-------------------------|---------------------------------|----------------|----------------------|
| Radionuclide            | <u><sup>226</sup>Radium</u>     | Reference Date | <u>2/1/1994 0:00</u> |
| Certified Activity      | <u>1.001E+00</u> $\mu\text{Ci}$ |                |                      |
| Certified Concentration | $\mu\text{Ci per gram}$         |                |                      |

|                           |                              |               |
|---------------------------|------------------------------|---------------|
| Ampoule /Solution Gross   |                              | Weight, Grams |
| Empty Ampoule             |                              | Weight, Grams |
| Solution Net              |                              | Weight, Grams |
| Total Activity in Ampoule | <u>1.0010</u> $\mu\text{Ci}$ |               |

**Chemical Composition of Standard Solution**  
<sup>226</sup>Ra(NO<sub>3</sub>)<sub>2</sub> in 1M HNO<sub>3</sub>

Dilution Instructions: Dilution Solvent Used 1M HNO<sub>3</sub>

Dilute to a volume of 1000.00 milliliters

Certified Total Activity of 1.0010  $\mu\text{Ci}$  Which Equals 2.222E+06 dpm at the date listed above

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

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

Expiration Date: November 9, 2013

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

Date: 11/9/2012

Date: 11/12/12

US EPA ARCHIVE DOCUMENT



QUALITY CONTROL PROGRAM

MP 009

Rev.8; 11/01/03

Title: Radioactive Reference Standards Solutions & Records

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

Solution Reference # MP 009  
IPL-453-26

Date 11/9/2012 0:00  
Solution # Ra-5b

Principal Radionuclide

Half Life, Years

Half Life, Days

<sup>226</sup>Radium

1.600E+03

5.844E+05

Radionuclide of Interest

<sup>226</sup>Radium

Reference Date

2/1/1994 0:00

Parent Solution Conc. 2.22E+03 dpm/ml

Chemical Composition of Standard Solution

<sup>226</sup>Ra(NO<sub>3</sub>)<sub>2</sub> in 1M HNO<sub>3</sub>

Dilution Instructions:

Dilution Solvent Used

1M HNO<sub>3</sub>

SECONDARY VOLUMETRIC DILUTION

Vol. Parent Solution: 20.0000 ml

Total Activity: 4.4440E+04 dpm

Final Volume: 1000.00 ml

Final Activity Concentration: 4.4440E+01 dpm/ml

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

NOTES:

Expiration Date: November 9, 2013

Verified & Approved By

Date: 11/9/2012 0:00

QC Approval

Date: 11/12/12

US EPA ARCHIVE DOCUMENT



ANALYTICS

RA-11

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

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

# CERTIFICATE OF CALIBRATION

## Standard Radionuclide Source

62680-416

Ra-228 5 mL Liquid in Flame Sealed Vial

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

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

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

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

\*99% Confidence Level

Impurities:  $\gamma$ -impurities (other than decay products) <0.1%

5.07198 grams 0.1M HCl solution with 50  $\mu$ g/g Ba carrier.

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

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

Q A APPROVED: *pcuat 11/7/01*

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



# QUALITY CONTROL PROGRAM

MP-009

Rev.8; 1/10/03

Title: Radioactive Reference Standards Solutions & Records

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

SOLUTION REFERENCE # Analytics 62680-416

CURRENT DATE 4/16/2012 0:00

SOLUTION # Ra-11

Principal Radionuclide

Half Life, Years

Half Life, Days

<sup>226</sup>Ra

5.750E+00

2.100E+03

Radionuclide <sup>226</sup>Ra

Reference Date 1/17/2001 0:00

Certified Activity 6.986E-02  $\mu\text{Ci}$

Certified Concentration           $\mu\text{Ci per gram}$

Ampoule /Solution Gross 9.4982 Weight, Grams

Empty Ampoule 4.4895 Weight, Grams

Solution Net 5.0087 Weight, Grams

Total Activity in Ampoule 0.0699  $\mu\text{Ci}$

### Chemical Composition of Standard Solution

<sup>226</sup>Ra(NO<sub>3</sub>)<sub>2</sub> in 0.5 M HCl

Dilution Instructions:

Dilution Solvent Used

0.5 M HCl

Dilute to a volume of 1000.00 milliliters

Certified Total Activity of 0.0699  $\mu\text{Ci}$

Which Equals 1.551E+05 dpm at the date listed above

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

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

Expiration Date: April 12, 2013

Recertified By [Signature]

Date: 4/16/12

Verified & Approved By [Signature]

Date:         

QC Approval [Signature]

Date: 4/16/12

US EPA ARCHIVE DOCUMENT



**SECTION VI**  
**QUALITY CONTROL SAMPLE RESULTS SUMMARY**

|                 |              |          |                |               |   |
|-----------------|--------------|----------|----------------|---------------|---|
| WO              | Analysis     | Run      | Activity Units | Aliquot Units | Client Name                                 |
| <b>13-04105</b> | <b>UIISO</b> | <b>1</b> | <b>pCi</b>     | <b>I</b>      | <b>Engineering Management Support, Inc.</b> |

**Laboratory Control Sample**

| Analyte | Normalized Difference | LCS Measured | CSU Measured | LCS Expected | Uncert. Expected | Known    | Known Error | Result   | CSU      | Standard ID | Standard ACT (dpm) | Standard Error | Standard Added (g) |
|---------|-----------------------|--------------|--------------|--------------|------------------|----------|-------------|----------|----------|-------------|--------------------|----------------|--------------------|
| U-234   | 0.36                  | 97.36%       | 14.71%       | 100.00%      | 3.60%            | 8.15E+00 | 2.93E-01    | 7.93E+00 | 1.17E+00 | U-8a        | 3.52E+01           | 3.60E+00       | 5.13E-01           |
| U-238   | 0.64                  | 95.30%       | 14.80%       | 100.00%      | 3.60%            | 7.94E+00 | 2.86E-01    | 7.57E+00 | 1.12E+00 | U-8a        | 3.44E+01           | 3.60E+00       | 5.13E-01           |
|         |                       |              |              |              |                  |          |             |          |          |             |                    |                |                    |

**Matrix Spike**

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

**Replicate Sample**

**QC Summary**

| Analyte | Normalized Difference | RPD   | Original Result | Original CSU | Replicate Result | Replicate CSU | LCS Relative Bias | LCS % R | LCS ND | MS % R | MS ND | Rep RPD | Rep ND |
|---------|-----------------------|-------|-----------------|--------------|------------------|---------------|-------------------|---------|--------|--------|-------|---------|--------|
| U-234   | 0.73                  | 9.10  | 3.20E+00        | 5.58E-01     | 2.92E+00         | 4.93E-01      | 0.97              | OK      | OK     |        |       | NA      | OK     |
| U-238   | 1.84                  | 24.95 | 2.47E+00        | 4.58E-01     | 1.92E+00         | 3.62E-01      | 0.95              | OK      | OK     |        |       | NA      | OK     |
| U-235   | 0.71                  | 29.73 | 1.45E-01        | 9.31E-02     | 1.95E-01         | 1.03E-01      |                   | OK      | OK     |        |       | NA      | OK     |

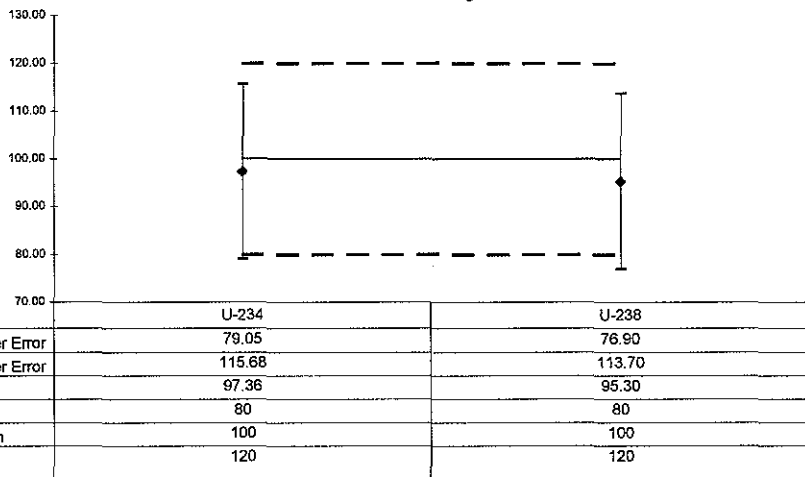
US EPA ARCHIVE DOCUMENT

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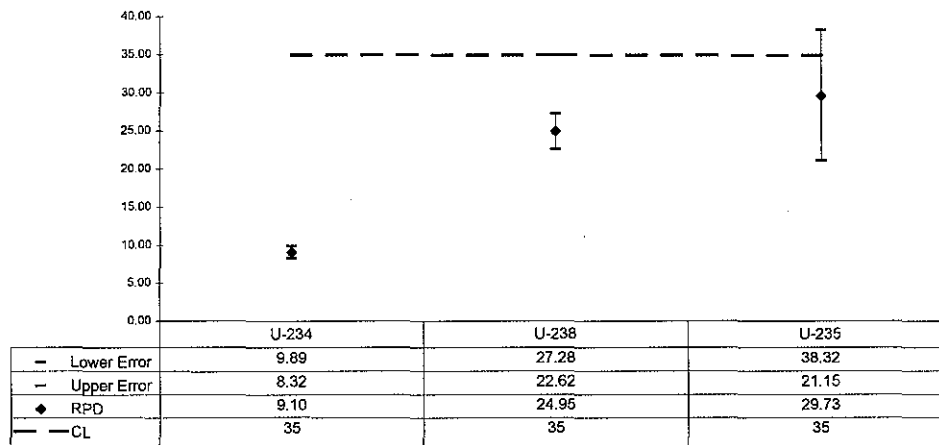
US EPA ARCHIVE DOCUMENT

| WO       | Analysis | Run | Activity Units | Aliquot Units | Client Name                          |
|----------|----------|-----|----------------|---------------|--------------------------------------|
| 13-04105 | UUISO    | 1   | pCi            | I             | Engineering Management Support, Inc. |

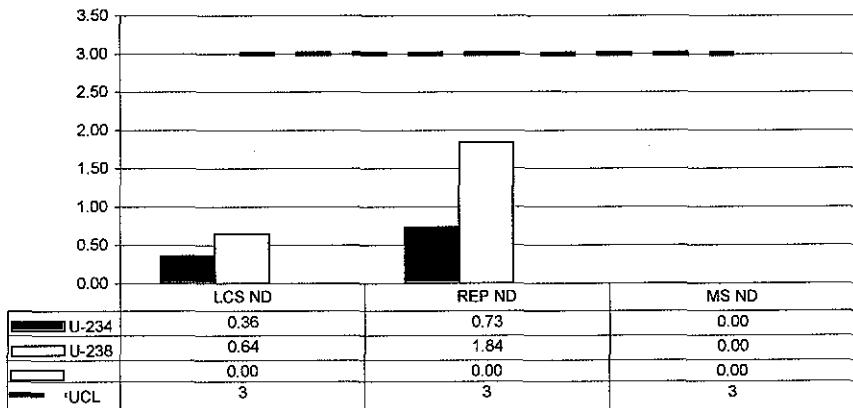
### LCS % Recovery



### Replicate Sample RPD



### Normalized Difference



### No Matrix Spike

| WO       | Analysis | Run | Activity Units | Aliquot Units | Client Name                          |
|----------|----------|-----|----------------|---------------|--------------------------------------|
| 13-04105 | ThISO    | 1   | pCi            | I             | Engineering Management Support, Inc. |

**Laboratory Control Sample**

| Analyte | Normalized Difference | LCS Measured | CSU Measured | LCS Expected | Uncert. Expected | Known    | Known Error | Result   | CSU      | Standard ID | Standard ACT (dpm) | Standard Error | Standard Added (g) |
|---------|-----------------------|--------------|--------------|--------------|------------------|----------|-------------|----------|----------|-------------|--------------------|----------------|--------------------|
| TH-228  | 0.84                  | 92.72%       | 18.03%       | 100.00%      | 3.60%            | 4.80E+00 | 1.73E-01    | 4.46E+00 | 8.03E-01 | Th-8b       | 1.04E+02           | 3.60E+00       | 1.03E-01           |
| TH-230  | 2.53                  | 79.52%       | 19.79%       | 100.00%      | 2.70%            | 5.49E+00 | 1.48E-01    | 4.36E+00 | 8.64E-01 | Th-1b       | 2.35E+01           | 2.70E+00       | 5.18E-01           |
| TH-232  | 0.80                  | 107.69%      | 17.31%       | 100.00%      | 3.60%            | 4.80E+00 | 1.73E-01    | 5.17E+00 | 8.96E-01 | Th-8b       | 1.04E+02           | 3.60E+00       | 1.03E-01           |

**Matrix Spike**

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

**Replicate Sample**

**QC Summary**

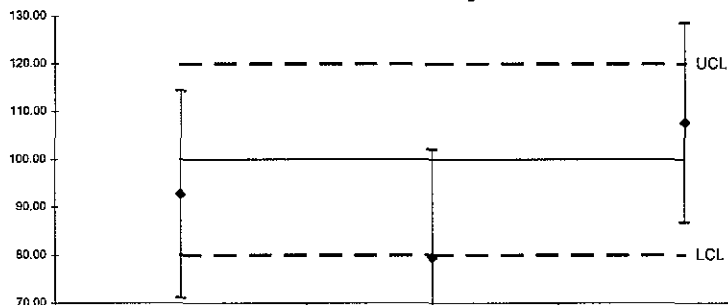
| Analyte | Normalized Difference | RPD   | Original Result | Original CSU | Replicate Result | Replicate CSU | LCS Relative Bias | LCS % R | LCS ND | MS % R | MS ND | Rep RPD | Rep ND |
|---------|-----------------------|-------|-----------------|--------------|------------------|---------------|-------------------|---------|--------|--------|-------|---------|--------|
| TH-228  | 1.06                  | 34.83 | 2.21E-01        | 1.09E-01     | 3.15E-01         | 1.35E-01      | 0.93              | OK      | OK     |        |       | NA      | OK     |
| TH-230  | 0.79                  | 30.21 | 2.23E-01        | 1.11E-01     | 1.64E-01         | 9.41E-02      | 0.80              | OK      | OK     |        |       | NA      | OK     |
| TH-232  | 0.69                  | 38.12 | 7.88E-02        | 7.10E-02     | 1.16E-01         | 7.74E-02      | 1.08              | OK      | OK     |        |       | NA      | OK     |

US EPA ARCHIVE DOCUMENT

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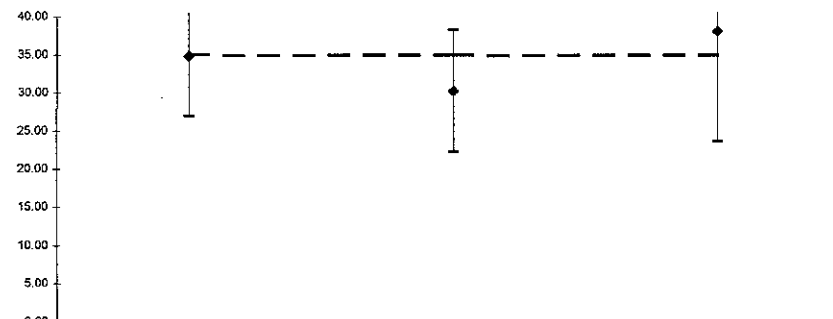
|                 |              |          |                |               |   |
|-----------------|--------------|----------|----------------|---------------|---|
| WO              | Analysis     | Run      | Activity Units | Aliquot Units | Client Name                                 |
| <b>13-04105</b> | <b>ThISO</b> | <b>1</b> | <b>pCi</b>     | <b>I</b>      | <b>Engineering Management Support, Inc.</b> |

### LCS % Recovery



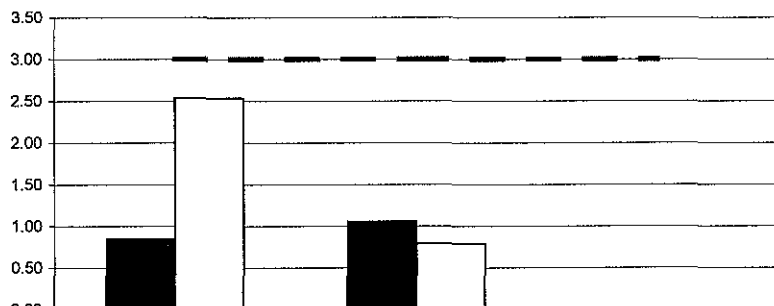
|               | TH-228 | TH-230 | TH-232 |
|---------------|--------|--------|--------|
| - Lower Error | 71.09  | 57.03  | 86.78  |
| - Upper Error | 114.36 | 102.01 | 128.60 |
| ◆ %R          | 92.72  | 79.52  | 107.69 |
| - LCL         | 80     | 80     | 80     |
| - Mean        | 100    | 100    | 100    |
| - UCL         | 120    | 120    | 120    |

### Replicate Sample RPD



|               | TH-228 | TH-230 | TH-232 |
|---------------|--------|--------|--------|
| - Lower Error | 42.76  | 38.22  | 52.64  |
| - Upper Error | 26.91  | 22.20  | 23.60  |
| ◆ RPD         | 34.83  | 30.21  | 38.12  |
| - CL          | 35     | 35     | 35     |

### Normalized Difference



|          | LCS ND | REP ND | MS ND |
|----------|--------|--------|-------|
| ■ TH-228 | 0.84   | 1.06   | 0.00  |
| □ TH-230 | 2.53   | 0.79   | 0.00  |
| - UCL    | 3      | 3      | 3     |

### No Matrix Spike

| WO       | Analysis | Run | Activity Units | Aliquot Units | Client Name                          |
|----------|----------|-----|----------------|---------------|--------------------------------------|
| 13-04105 | Ra226    | 1   | pCi            | 1             | Engineering Management Support, Inc. |

**Laboratory Control Sample**

| Analyte | Normalized Difference | LCS Measured | CSU Measured | LCS Expected | Uncert. Expected | Known    | Known Error | Result   | CSU      | Standard ID | Standard ACT (dpm) | Standard Error | Standard Added (g) |
|---------|-----------------------|--------------|--------------|--------------|------------------|----------|-------------|----------|----------|-------------|--------------------|----------------|--------------------|
| RA-226  | 0.09                  | 101.12%      | 23.90%       | 100.00%      | 4.60%            | 1.02E+01 | 4.71E-01    | 1.04E+01 | 2.47E+00 | Ra-5b       | 4.41E+01           | 4.60E+00       | 5.16E-01           |
|         |                       |              |              |              |                  |          |             |          |          |             |                    |                |                    |
|         |                       |              |              |              |                  |          |             |          |          |             |                    |                |                    |

**Matrix Spike**

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

**Replicate Sample**

**QC Summary**

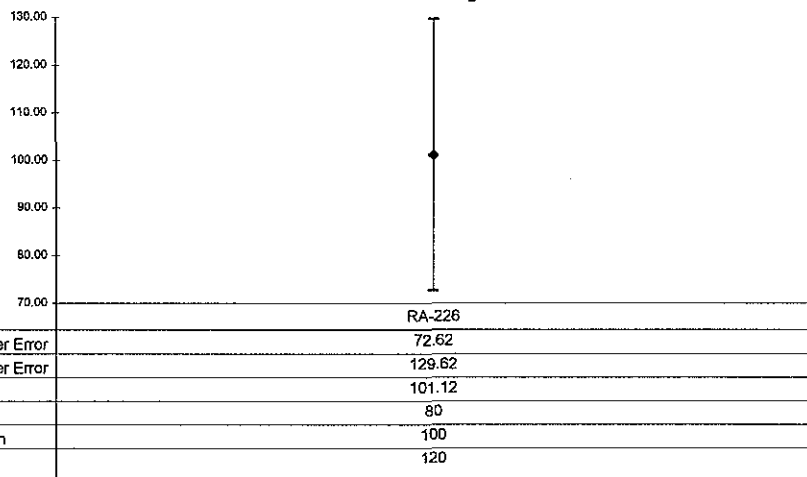
| Analyte | Normalized Difference | RPD  | Original Result | Original CSU | Replicate Result | Replicate CSU | LCS Relative Bias | LCS % R | LCS ND | MS % R | MS ND | Rep RPD | Rep ND |
|---------|-----------------------|------|-----------------|--------------|------------------|---------------|-------------------|---------|--------|--------|-------|---------|--------|
| RA-226  | 0.32                  | 6.44 | 2.80E+00        | 7.95E-01     | 2.63E+00         | 7.41E-01      | 1.01              | OK      | OK     |        |       | OK      | OK     |
|         |                       |      |                 |              |                  |               |                   |         |        |        |       |         |        |
|         |                       |      |                 |              |                  |               |                   |         |        |        |       |         |        |

US EPA ARCHIVE DOCUMENT

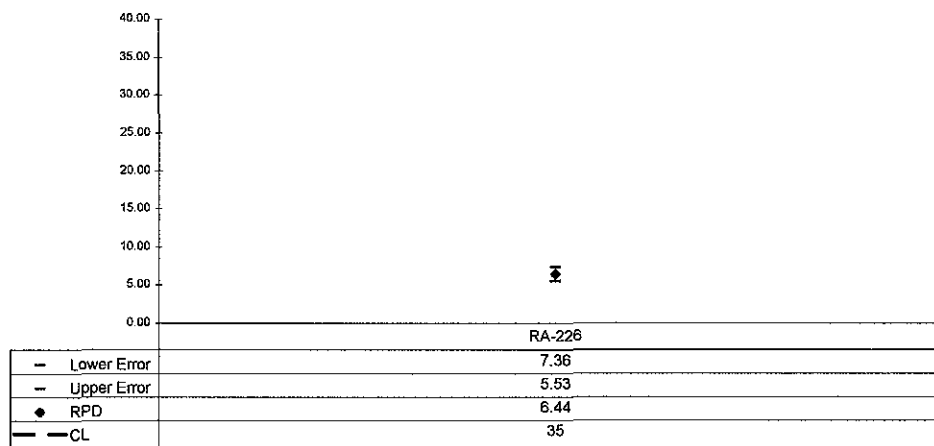
0553

|                 |              |          |                |               |   |
|-----------------|--------------|----------|----------------|---------------|---|
| WO              | Analysis     | Run      | Activity Units | Aliquot Units | Client Name                                 |
| <b>13-04105</b> | <b>Ra226</b> | <b>1</b> | <b>pCi</b>     | <b>I</b>      | <b>Engineering Management Support, Inc.</b> |

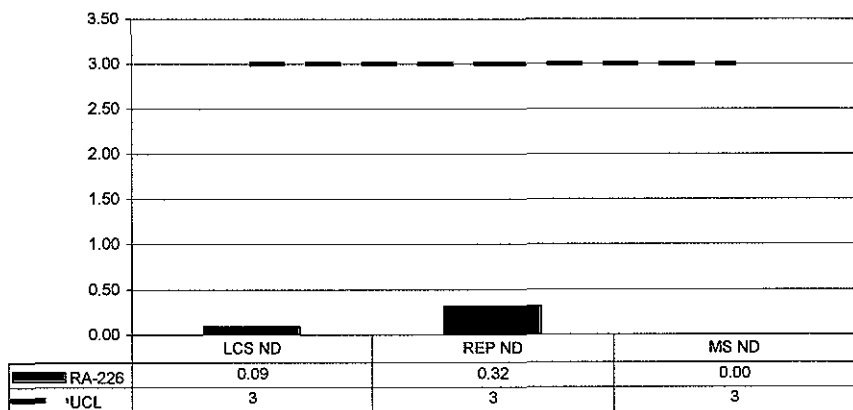
### LCS % Recovery



### Replicate Sample RPD



### Normalized Difference



### No Matrix Spike

US EPA ARCHIVE DOCUMENT

| WO       | Analysis | Run | Activity Units | Aliquot Units | Client Name                          |
|----------|----------|-----|----------------|---------------|--------------------------------------|
| 13-04105 | Ra228    | 1   | pCi            | 1             | Engineering Management Support, Inc. |

**Laboratory Control Sample**

| Analyte | Normalized Difference | LCS Measured | CSU Measured | LCS Expected | Uncert. Expected | Known    | Known Error | Result   | CSU      | Standard ID | Standard ACT (dpm) | Standard Error | Standard Added (g) |
|---------|-----------------------|--------------|--------------|--------------|------------------|----------|-------------|----------|----------|-------------|--------------------|----------------|--------------------|
| RA-228  | 0.75                  | 110.59%      | 24.93%       | 100.00%      | 5.10%            | 8.96E+00 | 4.57E-01    | 9.90E+00 | 2.47E+00 | Ra-11       | 3.90E+01           | 5.10E+00       | 5.10E-01           |
|         |                       |              |              |              |                  |          |             |          |          |             |                    |                |                    |
|         |                       |              |              |              |                  |          |             |          |          |             |                    |                |                    |

**Matrix Spike**

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

**Replicate Sample**

**QC Summary**

| Analyte | Normalized Difference | RPD   | Original Result | Original CSU | Replicate Result | Replicate CSU | LCS Relative Bias | LCS % R | LCS ND | MS % R | MS ND | Rep RPD | Rep ND |
|---------|-----------------------|-------|-----------------|--------------|------------------|---------------|-------------------|---------|--------|--------|-------|---------|--------|
| RA-228  | 0.46                  | 22.08 | 7.14E-01        | 5.63E-01     | 8.91E-01         | 5.00E-01      | 1.11              | OK      | OK     |        |       | NA      | OK     |
|         |                       |       |                 |              |                  |               |                   |         |        |        |       |         |        |
|         |                       |       |                 |              |                  |               |                   |         |        |        |       |         |        |

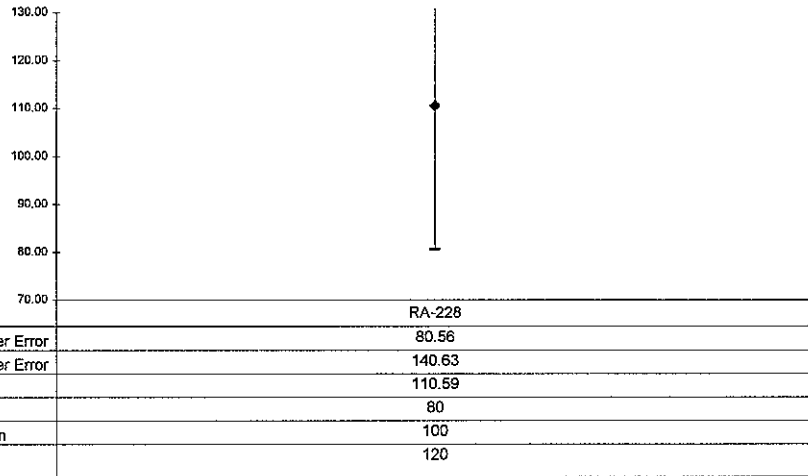
US EPA ARCHIVE DOCUMENT

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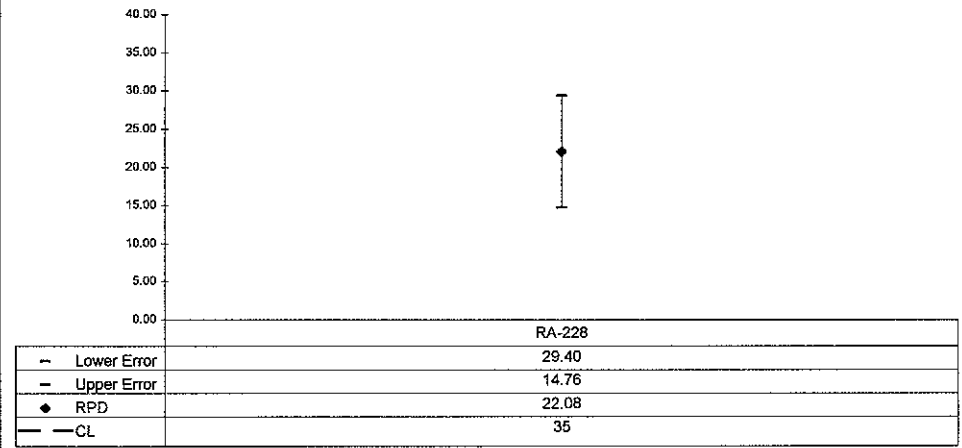


| WO       | Analysis | Run | Activity Units | Aliquot Units | Client Name                          |
|----------|----------|-----|----------------|---------------|--------------------------------------|
| 13-04105 | Ra228    | 1   | pCi            | I             | Engineering Management Support, Inc. |

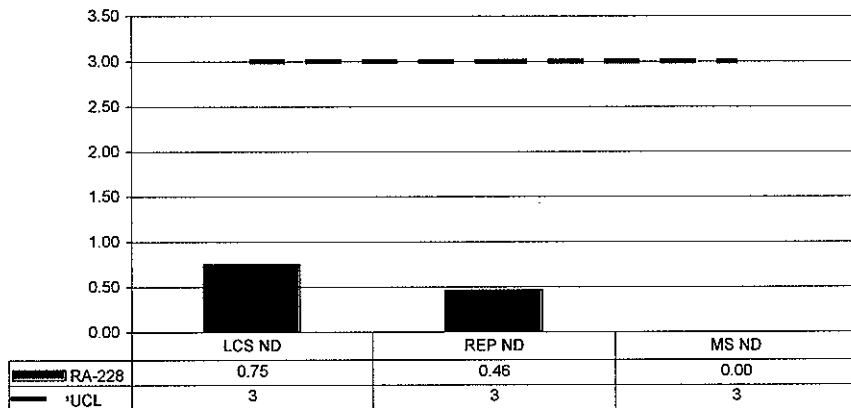
### LCS % Recovery



### Replicate Sample RPD



### Normalized Difference



### No Matrix Spike

**SECTION VII  
LABORATORY TECHNICIAN'S NOTES**


ISO U NOTES

|  |   |                     |          |
|--|---|---------------------|----------|
| <br><b>EBERLINE</b><br>SERVICES<br><b>Work Order Analysis Notes</b> | <b>Oak Ridge Laboratory</b><br>601 Scarboro Rd.<br>Oak Ridge, TN 37830<br>Voice: 865.481.0683<br>www.eberlineservices.com | Internal Work Order | 13-04105 |
|  |   | Analysis Code       | UUISO    |
|  |   | Run Number          | 1        |

| # | Date           | Dept | User     | Notes   |
|---|----------------|------|----------|---|
| 1 | 04/24/13 12:22 | PREP | JBARNARD | ALIQOTED AND FILTERED SAMPLES FOR DISSOLVED FRACTIONS- ADDED SPIKES AND TRACERS- PRESERVED SAMPLES WITH HNO3 AND DRIED SAMPLES DOWN |

*JB*  
*4/24/13*


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|  |   |                     |          |
|--|---|---------------------|----------|
|  <b>EBERLINE</b><br><small>SERVICES</small><br><b>Work Order Analysis Notes</b> | <b>Oak Ridge Laboratory</b><br>601 Scarboro Rd.<br>Oak Ridge, TN 37830<br>Voice: 865.481.0683<br>www.eberlineservices.com | Internal Work Order | 13-04105 |
|  |   | Analysis Code       | UUISO    |
|  |   | Run Number          | 1        |

| # | Date           | Dept | User     | Notes  |
|---|----------------|------|----------|--|
| 1 | 04/24/13 12:22 | PREP | JBARNARD | ALIQUOTED AND FILTERED SAMPLES FOR DISSOLVED FRACTIONS- ADDED SPIKES AND TRACERS- PRESERVED SAMPLES WITH HNO3 AND DRIED SAMPLES DOWN   |
| 2 | 04/26/13 17:24 | CHEM | JDEMELAS | Added concentrated HCl to sample beakers and heated to dryness; Added 20 ml 8N HCL to samples and transferred to new, labeled C-Tubes, rinsing with 8N HCl to bring volume to 35 ml; Preconditioned resin columns with 35 ml 8N HCl; Centrifuged samples and loaded onto columns; Rinsed C-Tubes with 20 ml 8N HCl, centrifuged as needed and loaded onto columns; Rinsed columns with 35 ml 8N HCl - 0.1N NH4I, 35 ml of 6.5N HCl - 0.04N HF, and 10 ml of 6.5N HCl; Eluted Uranium with 50 ml of 0.5N HCl into clean, labeled 100 ml beakers; Dried-down samples on hotplate; Dissolved samples in ~10 ml of concentrated HCl; Transferred to new, labeled C-Tubes with DI H2O. Set samples aside for later precipitation and filtering. |

*John Demelas*  
4/26/13

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|  |   |                     |          |
|--|---|---------------------|----------|
|  <b>EBERLINE</b><br><small>SERVICES</small><br><b>Work Order Analysis Notes</b> | <b>Oak Ridge Laboratory</b><br>601 Scarboro Rd.<br>Oak Ridge, TN 37830<br>Voice: 865.481.0683<br>www.eberlineservices.com | Internal Work Order | 13-04105 |
|  |   | Analysis Code       | UUISO    |
|  |   | Run Number          | 1        |

| # | Date           | Dept | User     | Notes  |
|---|----------------|------|----------|--|
| 1 | 04/24/13 12:22 | PREP | JBARNARD | ALIQUOTED AND FILTERED SAMPLES FOR DISSOLVED FRACTIONS- ADDED SPIKES AND TRACERS- PRESERVED SAMPLES WITH HNO3 AND DRIED SAMPLES DOWN   |
| 2 | 04/26/13 17:24 | CHEM | JDEMELAS | Added concentrated HCl to sample beakers and heated to dryness; Added 20 ml 8N HCL to samples and transferred to new, labeled C-Tubes, rinsing with 8N HCl to bring volume to 35 ml; Preconditioned resin columns with 35 ml 8N HCl; Centrifuged samples and loaded onto columns; Rinsed C-Tubes with 20 ml 8N HCl, centrifuged as needed and loaded onto columns; Rinsed columns with 35 ml 8N HCl - 0.1N NH4I, 35 ml of 6.5N HCl - 0.04N HF, and 10 ml of 6.5N HCl; Eluted Uranium with 50 ml of 0.5N HCl into clean, labeled 100 ml beakers; Dried-down samples on hotplate; Dissolved samples in ~10 ml of concentrated HCl; Transferred to new, labeled C-Tubes with DI H2O. Set samples aside for later precipitation and filtering. |
| 3 | 04/29/13 07:11 | CHEM | RMARTZ   | ADDED 0.1 ML NEODYMIUM CARRIER, 0.3 ML TITANOUS CHLORIDE, & 1 ML HF TO C-TUBES; LET SET SIT IN ICE BATH FOR ONE HOUR. SET UP FILTERS BY ADDING ALCOHOL & CARBON SUBSTRATE THEN ADDED SAMPLES; WHEN SAMPLES WERE THROUGH FILTERS, ADDED 10 ML DI H2O RINSES FROM C-TUBES, REMOVED FILTERS, LET DRY IN DESSICATOR, THEN SENT SET TO COUNT ROOM.  |

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*Jra/B*



Reagents Used in an Analysis

Internal Work Order

13-04105

Analysis Code

Run

UUISO

1

| Reagent ID | Reagent Name         | Reagent Concentration | Analyst ID | Date Recorded |
|------------|----------------------|-----------------------|------------|---------------|
| 013624P    | Nitric Acid          | Reagent Grade         | JBARNARD   | 4/24/2013     |
| 013666P    | Anion Exchange Resin | Reagent Grade         | JDEMELAS   | 4/26/2013     |
| 013794S    | HCl - HF             | 6.5N - 0.04N          | JDEMELAS   | 4/26/2013     |
| 013675D01  | Hydrochloric Acid    | 0.5N                  | JDEMELAS   | 4/26/2013     |
| 013791S    | Hydrochloric Acid    | 8N                    | JDEMELAS   | 4/26/2013     |
| 013675P    | Hydrochloric Acid    | Reagent Grade         | JDEMELAS   | 4/26/2013     |
| 013802S    | HCl - NH4I           | 8N - 0.1M             | JDEMELAS   | 4/26/2013     |
| 013734S    | Hydrochloric Acid    | 6.5N                  | JDEMELAS   | 4/26/2013     |
| 013246S    | Carbon substrate     | Solution              | RMARTZ     | 4/29/2013     |
| 012809P    | Ethyl Alcohol        | Reagent Grade         | RMARTZ     | 4/29/2013     |
| 013221P    | Hydrofluoric Acid    | Reagent Grade         | RMARTZ     | 4/29/2013     |
| 013191S    | Neodymium Carrier    | 1 mg/ml               | RMARTZ     | 4/29/2013     |
| 013434P    | Titanous Chloride    | Reagent Grade         | RMARTZ     | 4/29/2013     |

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Alpha Bank #12

| Date    | Sample #       | Client        | Insulation | CTO      | Analysis | Deal |
|---------|----------------|---------------|------------|----------|----------|------|
| 4/24/12 | 1704126A(7-12) | URBANCO       | 0143       | 2hr      | UR       | C    |
| 4/24/12 | 1704017A(7-8)  | Engl          | 0887       | 2hr      | UR       | C    |
| 4/24/12 | 1704017A(10-7) | Engl          | 1157       | 2hr      | UR       | C    |
| 4/25/12 | Daily Pulse    | UR            | 0122       | 1hr      | UR       | C    |
| 4/25/12 | 1704081A(24)   | United        | 0817       | 2hr      | UR       | C    |
| 4/25/12 | 1704081A(11-7) | United        | 0854       | 2hr      | Pulse    | C    |
| 4/25/13 | 1304103A(7-11) | Accubest      | 1156       | 2hr      | Roll     | KB   |
| 4/26/12 | Daily Pulse    | UR            | 0117       | 1hr      | UR       | C    |
| 4/26/12 | 1704117A(14)   | UR            | 0902       | 2hr      | UR       | C    |
| 4/26/12 | 1704117A(14)   | UR            | 0907       | 2hr      | UR       | C    |
| 4/26/12 | SECCAL         | UR            | 1202       | 2hr      | UR       | C    |
| 4/26/13 | System Bldg    | Lab           | 1458       | 1640 hrs | α        | KB   |
| 4/27/13 | Daily Pulse    | Lab           | 1028       | 10mins   | NA       | KB   |
| 4/27/13 | 1304104A(7-12) | Eng. Mang. Su | 1048       | 2hr      | UR       | KB   |
| 4/29/12 | Daily Pulse    | UR            | 0129       | 1hr      | UR       | C    |
| 4/29/12 | 1704107A(7-12) | Engl          | 1000       | 2hr      | UR       | C    |

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| Date    | Sample #        | Client       | Food Item | CT Item | Analysis | Result |
|---------|-----------------|--------------|-----------|---------|----------|--------|
| 4/24/13 | Daily Pulse     | VAB          | 0104      | 10m     | NA       | -      |
| 4/24/13 | 1704176A(1-6)   | URBANCO      | 0142      | 2hr     | UW30     | -      |
| 4/24/13 | 1704052A(1-7)   | Engma        | 0855      | 2hr     | Th30     | -      |
| 4/24/13 | 1704057A(1-7)   | MY PE        | 0856      | 2hr     | UW30     | -      |
| 4/24/13 | 1704057A(1-7)   | Engma        | 0857      | 2hr     | UW30     | -      |
| 4/24/13 | 1704057A(1-7)   | Engma        | 1157      | 2hr     | UW30     | -      |
| 4/24/13 | 1704174A(1-4)   | UWON         | 1156      | 2hr     | UW30     | -      |
| 4/24/13 | 1704053A(1)     | Engma        | 1156      | 2hr     | Th30     | -      |
| 4/24/13 | Daily Pulse     | UW           | 0102      | 10m     | NA       | -      |
| 4/25/13 | 1704050B(1-7)80 | Engma        | 0852      | 2hr     | UW30     | -      |
| 4/25/13 | 1704081A(1)     | United       | 0857      | 2hr     | UW30     | -      |
| 4/25/13 | 1304103A(1-6)   | Accutest     | 1156      | 2hr 30m | Rale     | KB     |
| 4/25/13 | 1304113A(1-4)   | UWON         | 1451      | 2hr 30m | Rale     | KB     |
| 4/26/13 | Daily Pulse     | UW           | 0117      | 10m     | NA       | -      |
| 4/26/13 | SECCAL          | UW           | 0119      | 2hr     | NA       | -      |
| 4/26/13 | 1704176A(1-4,8) | UWON         | 1055      | 2hr     | Pu30     | -      |
| 4/26/13 | 1704177A(1)     | UWON         | 1055      | 2hr     | Th30     | -      |
| 4/26/13 | System Bkgd     | Lab          | 1458      | 16.40hr | 2        | KB     |
| 4/27/13 | Daily Pulse     | Lab          | 1028      | 10mins  | NA       | KB     |
| 4/27/13 | 1304104A(1-6)   | Eng. Manager | 1047      | 2hr 30m | UW       | KB     |
| 4/29/13 | Daily Pulse     | UW           | 0129      | 10m     | NA       | -      |
| 4/29/13 | 1304105A(1-6)   | Engma        | 0855      | 2hr 30m | UW30     | -      |

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|  <b>EBERLINE</b><br><small>SERVICES</small><br><b>Work Order Analysis Notes</b> | <b>Oak Ridge Laboratory</b><br>601 Scarboro Rd.<br>Oak Ridge, TN 37830<br>Voice: 865.481.0683<br>www.eberlineservices.com | Internal Work Order | 13-04105 |
|  |   | Analysis Code       | ThISO    |
|  |   | Run Number          | 1        |

| # | Date           | Dept | User     | Notes   |
|---|----------------|------|----------|---|
| 1 | 04/24/13 12:22 | PREP | JBARNARD | ALIQUTED AND FILTERED SAMPLES FOR DISSOLVED FRACTIONS- ADDED SPIKES AND TRACERS- PRESERVED SAMPLES WITH HNO3 AND DRIED SAMPLES DOWN |

*JB*  
 4/24/13


US EPA ARCHIVE DOCUMENT

|  |   |                     |          |
|--|---|---------------------|----------|
|  <b>EBERLINE</b><br><small>SERVICES</small><br><b>Work Order Analysis Notes</b> | <b>Oak Ridge Laboratory</b><br>601 Scarboro Rd.<br>Oak Ridge, TN 37830<br>Voice: 865.481.0683<br>www.eberlineservices.com | Internal Work Order | 13-04105 |
|  |   | Analysis Code       | ThISO    |
|  |   | Run Number          | 1        |

| # | Date           | Dept | User     | Notes   |
|---|----------------|------|----------|---|
| 1 | 04/24/13 12:22 | PREP | JBARNARD | ALIQUTED AND FILTERED SAMPLES FOR DISSOLVED FRACTIONS- ADDED SPIKES AND TRACERS- PRESERVED SAMPLES WITH HNO3 AND DRIED SAMPLES DOWN   |
| 2 | 04/29/13 18:11 | CHEM | JDEMELAS | Added concentrated HNO3 to sample beakers and heated to dryness; Added 20 ml 8N HNO3 to samples and transferred to new, labeled C-Tubes, adding 8N HNO3 to bring volume to 35 ml; Preconditioned resin columns with 50 ml 8N HNO3; Centrifuged samples as needed, and passed through columns; Rinsed C-Tubes with 20 ml 8N HNO3; Centrifuged rinsates and loaded onto columns; Rinsed columns with 40 ml 8N HNO3; Eluted Thorium with 50 ml of 8N HCl into clean, labeled 100-ml beakers; Dried-down samples on hotplate; Dissolved samples in ~10 ml of concentrated HCl; Transferred to new, labeled C-Tubes with deionized water, bringing volume to ~15ml. Set samples aside for later precipitation and filtering. |

*John Demelas*  
 4/29/13

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|  |   |                     |          |
|--|---|---------------------|----------|
|  <b>EBERLINE</b><br><small>SERVICES</small><br><b>Work Order Analysis Notes</b> | <b>Oak Ridge Laboratory</b><br>601 Scarboro Rd.<br>Oak Ridge, TN 37830<br>Voice: 865.481.0683<br>www.eberlineservices.com | Internal Work Order | 13-04105 |
|  |   | Analysis Code       | ThISO    |
|  |   | Run Number          | 1        |

| # | Date           | Dept | User     | Notes   |
|---|----------------|------|----------|---|
| 1 | 04/24/13 12:22 | PREP | JBARNARD | ALIQUOTED AND FILTERED SAMPLES FOR DISSOLVED FRACTIONS- ADDED SPIKES AND TRACERS- PRESERVED SAMPLES WITH HNO3 AND DRIED SAMPLES DOWN  |
| 2 | 04/29/13 18:11 | CHEM | JDEMELAS | Added concentrated HNO3 to sample beakers and heated to dryness; Added 20 ml 8N HNO3 to samples and transferred to new, labeled C-Tubes, adding 8N HNO3 to bring volume to 35 ml; Preconditioned resin columns with 50 ml 8N HNO3; Centrifuged samples as needed, and passed through columns; Rinsed C-Tubes with 20 ml 8N HNO3; Centrifuged rinsates and loaded onto columns; Rinsed columns with 40 ml 8N HNO3; Eluted Thorium with 50 ml of 8N HCl into clean, labeled 100-ml beakers; Dried-down samples on hotplate; Dissolved samples in ~10 ml of concentrated HCl; Transferred to new, labeled C-Tubes with deionized water, bringing volume to ~15ml. Set samples aside for later precipitation and filtering. |
| 3 | 04/30/13 05:38 | CHEM | RMARTZ   | ADDED 0.75 ML 0.1MG/ML CERIUM CARRIER & 1 ML HF TO C-TUBES & LET SET SIT IN ICE BATH FOR ONE HOUR; SET UP FILTERS BY ADDING ALCOHOL & CARBON SUBSTRATE THEN ADDED SAMPLES; WHEN SAMPLES WERE THROUGH FILTERS, ADDED 10 ML DI H2O RINSES FROM C-TUBES, REMOVED FILTERS, LET DRY IN DESSICATOR, THEN SENT SET TO COUNT ROOM.  |

*Handwritten:*  
 RA  
 4/30/13

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Reagents Used in an Analysis

Internal Work Order

**13-04105**

Analysis Code

Run

**ThISO**

**1**

| Reagent ID | Reagent Name         | Reagent Concentration | Analyst ID | Date Recorded |
|------------|----------------------|-----------------------|------------|---------------|
| 013624P    | Nitric Acid          | Reagent Grade         | JBARNARD   | 4/24/2013     |
| 013721P    | Anion Exchange Resin | Reagent Grade         | JDEMELAS   | 4/29/2013     |
| 013675P    | Hydrochloric Acid    | Reagent Grade         | JDEMELAS   | 4/29/2013     |
| 013787S    | Nitric Acid          | 8N                    | JDEMELAS   | 4/29/2013     |
| 013624P    | Nitric Acid          | Reagent Grade         | JDEMELAS   | 4/29/2013     |
| 013800S    | Hydrochloric Acid    | 8N                    | JDEMELAS   | 4/29/2013     |
| 013246S    | Carbon substrate     | Solution              | RMARTZ     | 4/30/2013     |
| 013017S    | Cerrium Carrier      | 0.1mg/ml              | RMARTZ     | 4/30/2013     |
| 012809P    | Ethyl Alcohol        | Reagent Grade         | RMARTZ     | 4/30/2013     |
| 013221P    | Hydrofluoric Acid    | Reagent Grade         | RMARTZ     | 4/30/2013     |

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| Date    | Sample #        | Client            | Location   | CTD     | Analysis | Depth |
|---------|-----------------|-------------------|------------|---------|----------|-------|
| 4/27/13 | 1304104A(13-19) | Eng. Manag. Serv. | 1049       | 2hr 50m | UW       | ICB   |
| 4/27/13 | 1304113A(1-4)   | UWON              | 1049       | 2hr 50m | Np       | ICB   |
| 4/25/17 | Patly Pulse     | UW                | 0521       | 1m      | UW       | -     |
| 4/25/17 | 1304105A(17-19) | Eng. Manag. Serv. | 1020       | 2hr     | 4hr 20m  | -     |
| 4/25/17 | 1304104A(1-4)   | Eng. Manag. Serv. | 1020       | 2hr     | 7hr 30m  | -     |
| 4/29/13 | 1304104A(17-19) | Eng. Manag. Serv. | 1259       | 2hr 50m | TH       | ICB   |
| 4/29/13 | 1304113A(4)     | UWON              | 1700       | 2hr 50m | TH       | ICB   |
| 4/29/13 | 1304113A(4)     | UWON              | 1701       | 2hr 50m | THNT     | ICB   |
| 4/29/17 | 1704104A(1-6)   | Eng. Manag. Serv. | 1701       | 2hr     | Rub      | -     |
| 4/29/13 | 1304104A(13-19) | Eng. Manag. Serv. | KB 4/29/13 | 2hr 50m | Rub      | ICB   |
| 4/29/13 | 1304104A(13-19) | Eng. Manag. Serv. | 1620       | 2hr 50m | Rub      | ICB   |
| 4/17/17 | Patly Pulse     | UW                | 0521       | 1m      | UW       | -     |
| 4/17/17 | 1304116A(1-4)   | UWON              | 0848       | 2hr     | Au 20m   | -     |
| 4/17/17 | 1304121A(1-4)   | UWON              | 0849       | 2hr     | Au 24m   | -     |
| 4/17/17 | 1304121A(1-4)   | UWON              | 0849       | 2hr 50m | Au 24m   | -     |
| 4/17/17 | 1304121A(7)     | UWON              | 1147       | 2hr     | Pulse    | -     |
| 4/17/17 | 1704121A(4)     | UWON              | 1148       | 2hr     | Pulse    | -     |
| 4/17/17 | 1304105A(4-9)   | Eng. Manag. Serv. | 1149       | 2hr     | Th 30m   | -     |



# Alpha Bank #12

| Date    | Sample #        | Client          | Lead Time | CT Time   | Analysis | Cost |
|---------|-----------------|-----------------|-----------|-----------|----------|------|
| 4/24/13 | 1704126A(7-17)  | ULLEN CO        | 0849      | 2hr       | UWSS     | C    |
| 4/24/13 | 1704017A(7-8)   | Englman         | 0857      | 2hr       | UWSS     | C    |
| 4/24/13 | 1704057A(7-7)   | Englman         | 1157      | 2hr       | TLZ10    | C    |
| 4/25/13 | Daily Pulse     | US              | 0822      | 1hr       | NA       | C    |
| 4/25/13 | 1704081A(7-4)   | United          | 0817      | 2hr       | UWSS     | C    |
| 4/25/13 | 1704081A(1-7)   | United          | 0854      | 2hr       | Pulse    | C    |
| 4/25/13 | 1304103A(7-11)  | Accubest        | 1156      | 2hr50m    | Rate     | KB   |
| 4/26/13 | Daily Pulse     | US              | 0817      | 1hr       | NA       | C    |
| 4/26/13 | 1704117A(1-4)   | UWSS            | 0902      | 2hr       | UWSS     | C    |
| 4/26/13 | 1704117A(1-4)   | UWSS            | 0907      | 2hr       | UWSS     | C    |
| 4/26/13 | SECCAL          | US              | 1202      | 2hr       | NA       | C    |
| 4/26/13 | System Bkgd     | Lab             | 1458      | 16.40 hrs | α        | KB   |
| 4/27/13 | Daily Pulse     | Lab             | 1028      | 10mins    | NA       | KB   |
| 4/27/13 | 1304104A(7-12)  | Eng. Manag. Sci | 1048      | 2hr50m    | UW       | KB   |
| 4/29/13 | Daily Pulse     | US              | 0829      | 1hr       | NA       | C    |
| 4/29/13 | 1704107A(7-7)   | Englman         | 1000      | 2hr       | UWSS     | C    |
| 4/29/13 | 1304104A(1-16)  | Eng. Manag. Sci | 1258      | 2hr50m    | Th       | KB   |
| 4/29/13 | Daily Pulse     | US              | 0821      | 1hr       | NA       | C    |
| 4/29/13 | 1704166A(1-4)   | UWSS            | 0970      | 2hr       | MP272    | C    |
| 4/29/13 | 1704121A(1-2)   | UWSS            | 0971      | 2hr       | MP272    | C    |
| 4/30/13 | 1304105A(10-15) | Eng. Manag. Sci | 1243      | 2hr50m    | Th       | KB   |

Alpha #1

US EPA ARCHIVE DOCUMENT

| Date    | Sample #        | Client           | Location | CT Time  | Analysis | Result |
|---------|-----------------|------------------|----------|----------|----------|--------|
| 4/24/13 | Daily Pulse     | W3               | 0504     | 10       | NA       | -      |
| 4/24/13 | 1704176A(1-6)   | URBANCOR         | 0542     | 2hr      | UWZSO    | C      |
| 4/24/13 | 1704052A(1-12)  | Eng. Manag.      | 0855     | 2hr      | Th       | C      |
| 4/24/13 | 1704057A(4-7)   | HY PE            | 0856     | 2hr      | UWZSO    | C      |
| 4/24/13 | 1704057A(1-2)   | Eng. Manag.      | 0857     | 2hr      | UWZSO    | C      |
| 4/24/13 | 1304087A(3)     | Eng. Manag.      | 1157     | 2hr      | UWZSO    | C      |
| 4/24/13 | 1704174A(1-4)   | UWON             | 1156     | 2hr      | UWZSO    | C      |
| 4/24/13 | 1704053A(1)     | Eng. Manag.      | 1156     | 2hr      | Th       | C      |
| 4/24/13 | Daily Pulse     | W3               | 0522     | 10       | NA       | -      |
| 4/24/13 | 1704050B(1-78)  | Eng. Manag.      | 0852     | 2hr      | UWZSO    | C      |
| 4/24/13 | 1704081A(1)     | Unitech          | 0853     | 2hr      | UWZSO    | C      |
| 4/25/13 | 1304103A(1-6)   | Accutest         | 1156     | 2hr 50   | Rate     | KB     |
| 4/25/13 | 1304113A(1-4)   | UWON             | 1451     | 2hr 50   | Rate     | KB     |
| 4/24/13 | Daily Pulse     | W3               | 0517     | 10       | NA       | -      |
| 4/24/13 | SECCAL          | W3               | 0519     | 2hr      | NA       | C      |
| 4/24/13 | 1704102A(1-4,8) | UWON             | 1055     | 2hr      | Pulse    | C      |
| 4/24/13 | 1704117A(1)     | UWON             | 1055     | 2hr      | Th       | C      |
| 4/26/13 | System Bkgd     | Lab              | 1458     | 16.40 hr | 2        | KB     |
| 4/27/13 | Daily Pulse     | Lab              | 1029     | 10 mins  | NA       | KB     |
| 4/27/13 | 1304104A(1-6)   | Eng. Manag. Ser. | 1047     | 2hr 50   | UW       | KB     |
| 4/29/13 | Daily Pulse     | W3               | 0529     | 10       | NA       | -      |
| 4/29/13 | 1704105A(1-6)   | Eng. Manag.      | 0859     | 2hr      | UWZSO    | C      |
| 4/29/13 | 1304104A(5-10)  | Eng. Manag. Ser. | 1258     | 2hr 50   | Th       | KB     |
| 4/29/13 | 1304104A(7-12)  | Eng. Manag. Ser. | 1420     | 2hr 50   | Rate     | KB     |
| 4/29/13 | Daily Pulse     | W3               | 0521     | 10       | NA       | -      |
| 4/29/13 | 1704166A(1-4)   | UWON             | 0848     | 2hr      | APZAC    | C      |
| 4/29/13 | 1704166A(1-2)   | UWON             | 0848     | 2hr      | APZAC    | C      |
| 4/29/13 | 1704124A(1-5)   | UWON             | 1141     | 2hr      | APZAC    | C      |
| 4/29/13 | 1704124A(1-4)   | UWON             | 1142     | 2hr      | Pulse    | C      |
| 4/30/13 | 1304105A(16-19) | Eng. Manag. Ser. | 1435     | 2hr 50   | Th       | KB     |
| 4/30/13 | 1304104A(1-2)   | Eng. Manag. Ser. | 1436     | 2hr 50   | UW       | KB     |

**RA-226 NOTES**

|  |   |                     |          |
|--|---|---------------------|----------|
|  <b>EBERLINE</b><br><small>SERVICES</small><br><b>Work Order Analysis Notes</b> | <b>Oak Ridge Laboratory</b><br>601 Scarboro Rd.<br>Oak Ridge, TN 37830<br>Voice: 865.481.0683<br>www.eberlineservices.com | Internal Work Order | 13-04105 |
|  |   | Analysis Code       | Ra226    |
|  |   | Run Number          | 1        |

| # | Date           | Dept | User     | Notes  |
|---|----------------|------|----------|--|
| 1 | 04/24/13 12:21 | PREP | JBARNARD | ALIQUTED AND FILTERED SAMPLES FOR DISSOLVED FRACTIONS- ADDED SPIKES AND TRACERS- DRIED FRACTION 6 DOWN AND DIGESTED DUE TO SAMPLE BEING DIRTY- PH'D SAMPLES- PRECIPITATED WITH BA AND PB CARRIERS AND AMMONIUM SULFATE- DECANTED SAMPLES AND CENTRIFUGED- SUBMITTED RADIUM PRECIP TO SEPARATIONS |

*JB*  
 4/24/13

|  |   |                     |          |
|--|---|---------------------|----------|
|  <b>EBERLINE</b><br><small>SERVICES</small><br><b>Work Order Analysis Notes</b> | <b>Oak Ridge Laboratory</b><br>601 Scarboro Rd.<br>Oak Ridge, TN 37830<br>Voice: 865.481.0683<br>www.eberlineservices.com | Internal Work Order | 13-04105 |
|  |   | Analysis Code       | Ra226    |
|  |   | Run Number          | 1        |

| # | Date           | Dept | User     | Notes   |
|---|----------------|------|----------|---|
| 1 | 04/24/13 12:21 | PREP | JBARNARD | ALIQUOTED AND FILTERED SAMPLES FOR DISSOLVED FRACTIONS- ADDED SPIKES AND TRACERS- DRIED FRACTION 6 DOWN AND DIGESTED DUE TO SAMPLE BEING DIRTY- PH'D SAMPLES- PRECIPITATED WITH BA AND PB CARRIERS AND AMMONIUM SULFATE- DECANTED SAMPLES AND CENTRIFUGED- SUBMITTED RADIUM PRECIP TO SEPARATIONS |
| 2 | 04/30/13 13:36 | CHEM | TSMITH   | Followed steps 12.1 to 12.8 in AP-006 rev. 12. ( Sringe filtered samples. Precipitated and filtered samples, obtained final weights, and took to count room )   |

4-30-13  
TSM

US EPA ARCHIVE DOCUMENT



Reagents Used in an Analysis

Internal Work Order

13-04105

Analysis Code

Run

Ra226

1

| Reagent ID | Reagent Name       | Reagent Concentration | Analyst ID | Date Recorded |
|------------|--------------------|-----------------------|------------|---------------|
| 013376P    | Ammonium Hydroxide | Reagent Grade         | JBARNARD   | 4/24/2013     |
| 013575P    | Ammonium Sulfate   | Reagent Grade         | JBARNARD   | 4/24/2013     |
| 012766D14  | Barium Carrier     | 1 mg/ml               | JBARNARD   | 4/24/2013     |
| 012729D07  | Lead Carrier       | 166 mg/ml             | JBARNARD   | 4/24/2013     |
| 013624P    | Nitric Acid        | Reagent Grade         | JBARNARD   | 4/24/2013     |
| 013416P    | Perchloric Acid    | Reagent Grade         | JBARNARD   | 4/24/2013     |
| 009098P    | Sulfuric Acid      | Reagent Grade         | JBARNARD   | 4/24/2013     |
| 013788S    | EDTA               | 0.25M                 | TSMITH     | 4/26/2013     |
| 011383P    | Acetic Acid        | Reagent Grade         | TSMITH     | 4/30/2013     |
| 013751D01  | Ammonium Sulfate   | 200 mg/ml             | TSMITH     | 4/30/2013     |

US EPA ARCHIVE DOCUMENT

| Date   | Sample #       | Client         | Location | C TO Fe | Analysis | Peak |
|--------|----------------|----------------|----------|---------|----------|------|
| 5/1/13 | 1304106A(1-6)  | Eng. Manag. Su | 1218     | 2hr50m  | TH       | KB   |
| 5/1/13 | 1304106A(19)   | Eng. Manag. Su | 1616     | 2hr50m  | TH       | KB   |
| 5/1/13 | 1304166A(4)    | UWR            | 1617     | 2hr50m  | PU       | KB   |
| 5/1/13 | 1304105A(1-4)  | Eng. Manag. Su | 1618     | 2hr50m  | Ray      | KB   |
| 5/2/13 | Daily Pulse    | UW             | 0615     | 1hr     | MT       | -    |
| 5/2/13 | 1304105A(181A) | Eng. Man       | 0712     | 2hr     | Rel      | c    |
| 5/2/13 | 1304108A(1-4)  | M/A            | 0712     | 2hr     | Rel      | c    |

# Alpha Bank #12

| Date    | Sample #        | Client         | Found | CT        | Analysis | Final |
|---------|-----------------|----------------|-------|-----------|----------|-------|
| 4/24/12 | 1704126A(7-12)  | UPLON CO       | 0743  | 2hr       | UW30     | C     |
| 4/24/12 | 1704013A(7-8)   | Eng. Man       | 0857  | 2hr       | UW30     | C     |
| 4/24/12 | 1704057A(7-7)   | Eng. Man       | 1157  | 2hr       | 7L30     | C     |
| 4/25/12 | Daily Pulse     | LAB            | 0722  | 10m       | NA       | C     |
| 4/25/12 | 1704081A(12)    | Unitech        | 0817  | 2hr       | UW30     | C     |
| 4/25/12 | 1704081A(11)    | Unitech        | 0814  | 2hr       | Puzzo    | C     |
| 4/25/13 | 1304103A(7-11)  | Accustest      | 1156  | 2hr 50m   | Rale     | KB    |
| 4/26/13 | Daily Pulse     | LAB            | 0717  | 10m       | NA       | C     |
| 4/26/13 | 1704117A(1-4)   | UW             | 0902  | 2hr       | Unitech  | C     |
| 4/26/13 | 1704117A(1-4)   | UW             | 0907  | 2hr       | Unitech  | C     |
| 4/26/13 | SECCAL          | LAB            | 1202  | 2hr       | NA       | C     |
| 4/26/13 | System Bkgd     | Lab            | 1458  | 16.40 hrs | d        | KB    |
| 4/27/13 | Daily Pulse     | Lab            | 1028  | 10mins    | NA       | KB    |
| 4/27/13 | 1304104A(7-12)  | Eng. Manag. Su | 1047  | 2hr 50m   | UU       | KB    |
| 4/28/13 | Daily Pulse     | LAB            | 0729  | 10m       | NA       | C     |
| 4/28/13 | 1704107A(7-12)  | Eng. Man       | 1000  | 2hr       | UW30     | C     |
| 4/29/13 | 1304104A(11-16) | Eng. Manag. Su | 1258  | 2hr 50m   | Th       | KB    |
| 4/29/13 | Daily Pulse     | LAB            | 0721  | 10m       | NA       | C     |
| 4/29/13 | 1704164A(1-4)   | UW             | 0970  | 2hr       | MP27     | C     |
| 4/29/13 | 1704121A(1-2)   | UW             | 0971  | 2hr       | MP27     | C     |
| 4/30/13 | 1304105A(10-15) | Eng. Manag. Su | 1243  | 2hr 50m   | Th       | KB    |
| 4/30/13 | 1304106A(14-19) | Eng. Manag. Su | 1624  | 2hr 50m   | UU       | KB    |
| 5/1/13  | Daily Pulse     | LAB            | 0726  | 10m       | NA       | C     |
| 5/1/13  | 1704166A(7-4)   | UW             | 0940  | 2hr       | Puzzo    | C     |
| 5/1/13  | 1704166A(1-4)   | UW             | 0940  | 2hr       | Puzzo    | C     |
| 5/1/13  | 1304166A(1-2)   | UW             | 0940  | 2hr       | Th       | C     |
| 5/1/13  | 1304104A(7-12)  | Eng. Manag. Su | 1249  | 2hr 50m   | Th       | KB    |
| 5/1/13  | 1304105A(5-10)  | Eng. Manag. Su | 1618  | 2hr 50m   | Rale     | KB    |

US EPA ARCHIVE DOCUMENT



# Alpha #3

| Date    | Sample #        | Client          | Facility   | CTOT      | Analysis | Spec |
|---------|-----------------|-----------------|------------|-----------|----------|------|
| 4/27/13 | 1304104A(13-19) | Eng. Manag. Sv. | 1049       | 2hr 50m   | Uu       | KB   |
| 4/27/13 | 1304113A(1-4)   | UCOR            | 1049       | 2hr 50m   | Np       | KB   |
| 4/29/13 | Daily Pulse     | Uu              | 0521       | 1m        | Uu       | -    |
| 4/29/13 | 1304105A(17-17) | Eng. Manag. Sv. | 1000       | 2hr       | Uu       | -    |
| 4/29/13 | 1304104A(1-4)   | Eng. Manag. Sv. | 1000       | 2hr       | Uu       | -    |
| 4/29/13 | 1304104A(17-19) | Eng. Manag. Sv. | 1259       | 2hr 50m   | Th       | KB   |
| 4/29/13 | 1304113A(4)     | UCOR            | 1700       | 2hr 50m   | Th       | KB   |
| 4/29/13 | 1304113A(4)     | UCOR            | 1701       | 2hr 50m   | THNT     | KB   |
| 4/29/13 | 1704104A(1-6)   | Eng. Manag. Sv. | 1701       | 2hr       | Rate     | -    |
| 4/29/13 | 1304104A(13)    | Eng. Manag. Sv. | KB 4/29/13 | 2hr 50m   | Rate     | KB   |
| 4/29/13 | 1304104A(13-19) | Eng. Manag. Sv. | 1620       | 2hr 50m   | Rate     | KB   |
| 4/29/13 | Daily Pulse     | Uu              | 0521       | 1m        | Uu       | -    |
| 4/29/13 | 1304116A(1-4)   | UCOR            | 0848       | 2hr       | Rate     | -    |
| 4/29/13 | 1304116A(1-4)   | UCOR            | 0848       | 2hr       | Rate     | -    |
| 4/29/13 | 1304121A(1-4)   | UCOR            | 0848       | 2hr       | Rate     | -    |
| 4/29/13 | 1304121A(7)     | UCOR            | 1147       | 2hr       | Rate     | -    |
| 4/29/13 | 1304121A(14)    | UCOR            | 1147       | 2hr       | Rate     | -    |
| 4/29/13 | 1304105A(4-9)   | Eng. Manag. Sv. | 1148       | 2hr       | Rate     | -    |
| 4/30/13 | 1304106A(3-13)  | Eng. Manag. Sv. | 1443       | 2hr 50m   | Uu       | KB   |
| 5/1/13  | Daily Pulse     | Uu              | 0526       | 1m        | Uu       | -    |
| 5/1/13  | 1704089A(1-4)   | UCOR            | 0854       | 2hr       | Rate     | -    |
| 5/1/13  | 1304106A(3-14)  | UCOR            | 0941       | 2hr       | Rate     | -    |
| 5/1/13  | 1304116A(1-4)   | UCOR            | 0941       | 2hr       | Rate     | -    |
| 5/1/13  | 1704121A(1-4)   | UCOR            | 0941       | 2hr       | Rate     | -    |
| 5/1/13  | 1304121A(1-4)   | UCOR            | 1206       | 2hr 50m   | Rate     | KB   |
| 5/1/13  | 1304089A(1)     | UCOR            | 1247       | 2hr 50m   | Rate     | KB   |
| 5/1/13  | 1304106A(13-17) | Eng. Manag. Sv. | 1249       | 2hr 50m   | Th       | KB   |
| 5/1/13  | 1304105A(11-17) | Eng. Manag. Sv. | 1619       | 2hr 50min | Rate     | KB   |
| 5/1/13  | 1304116A(1-4)   | UCOR            | 1619       | 2hr 50m   | Rate     | KB   |


**RA-228 NOTES**

|  |   |                     |          |
|--|---|---------------------|----------|
|  <b>EBERLINE</b><br><small>SERVICES</small><br><b>Work Order Analysis Notes</b> | <b>Oak Ridge Laboratory</b><br>601 Scarboro Rd.<br>Oak Ridge, TN 37830<br>Voice: 865.481.0683<br>www.eberlineservices.com | Internal Work Order | 13-04105 |
|  |   | Analysis Code       | Ra228    |
|  |   | Run Number          | 1        |

| # | Date           | Dept | User     | Notes  |
|---|----------------|------|----------|--|
| 1 | 04/24/13 12:21 | PREP | JBARNARD | ALIUQUOTED AND FILTERED SAMPLES FOR DISSOLVED FRACTIONS- ADDED SPIKES AND TRACERS- DRIED FRACTION 6 DOWN AND DIGESTED DUE TO SAMPLE BEING DIRTY- PH'D SAMPLES- PRECIPITATED WITH BA AND PB CARRIERS AND AMMONIUM SULFATE- DECANTED SAMPLES AND CENTRIFUGED- SUBMITTED RADIUM PRECIP TO SEPARATIONS |

*[Handwritten Signature]*  
 4/24/13


US EPA ARCHIVE DOCUMENT

|  |   |                     |          |
|--|---|---------------------|----------|
|  <b>EBERLINE</b><br><small>SERVICES</small><br><b>Work Order Analysis Notes</b> | <b>Oak Ridge Laboratory</b><br>601 Scarboro Rd.<br>Oak Ridge, TN 37830<br>Voice: 865.481.0683<br>www.eberlineservices.com | Internal Work Order | 13-04105 |
|  |   | Analysis Code       | Ra228    |
|  |   | Run Number          | 1        |


| # | Date           | Dept | User     | Notes  |
|---|----------------|------|----------|--|
| 1 | 04/24/13 12:21 | PREP | JBARNARD | ALIUQUOTED AND FILTERED SAMPLES FOR DISSOLVED FRACTIONS- ADDED SPIKES AND TRACERS- DRIED FRACTION 6 DOWN AND DIGESTED DUE TO SAMPLE BEING DIRTY- PH'D SAMPLES- PRECIPITATED WITH BA AND PB CARRIERS AND AMMONIUM SULFATE- DECANTED SAMPLES AND CENTRIFUGED- SUBMITTED RADIUM PRECIP TO SEPARATIONS |
| 2 | 04/26/13 11:44 | CHEM | TSMITH   | Dissolved samples from prep in EDTA.   |
| 3 | 05/02/13 13:12 | PREP | LWALKER  | RECEIVED FILTERS BACK FROM COUNT ROOM-PUT BACK INTO C-TUBES-ADDED EDTA AND SWIRLED-LET SIT OVERNIGHT TO DIGEST.  |
| 4 | 05/08/13 19:41 | PREP | LWALKER  | FOLLOWED STEPS 12.1 TO 12.7 IN AP-007 REV 17 (CHEMICAL CLEANUP FOR RA 228)   |

*J. Walker*  
 5/8/13

US EPA ARCHIVE DOCUMENT

|  |   |                     |          |
|--|---|---------------------|----------|
|  <b>EBERLINE</b><br><small>SERVICES</small><br><b>Work Order Analysis Notes</b> | <b>Oak Ridge Laboratory</b><br>601 Scarboro Rd.<br>Oak Ridge, TN 37830<br>Voice: 865.481.0683<br>www.eberlineservices.com | Internal Work Order | 13-04105 |
|  |   | Analysis Code       | Ra228    |
|  |   | Run Number          | 1        |

| # | Date           | Dept | User     | Notes   |
|---|----------------|------|----------|---|
| 1 | 04/24/13 12:21 | PREP | JBARNARD | ALIUQUOTED AND FILTERED SAMPLES FOR DISSOLVED FRACTIONS- ADDED SPIKES AND TRACERS- DRIED FRACTION 6 DOWN AND DIGESTED DUE TO SAMPLE BEING DIRTY- PH'D SAMPLES- PRECIPITATED WITH BA AND PB CARRIERS AND AMMONIUM SULFATE- DECANTED SAMPLES AND CENTRIFUGED- SUBMITTED RADIUM PRECIP TO SEPARATIONS  |
| 2 | 04/26/13 11:44 | CHEM | TSMITH   | Dissolved samples from prep in EDTA.  |
| 3 | 05/02/13 13:12 | PREP | LWALKER  | RECEIVED FILTERS BACK FROM COUNT ROOM-PUT BACK INTO C-TUBES-ADDED EDTA AND SWIRLED-LET SIT OVERNIGHT TO DIGEST.   |
| 4 | 05/08/13 19:41 | PREP | LWALKER  | FOLLOWED STEPS 12.1 TO 12.7 IN AP-007 REV 17 (CHEMICAL CLEANUP FOR RA 228)  |
| 5 | 05/09/13 08:07 | CHEM | TSMITH   | Followed steps 12.7 to 12.15 in AP-007 rev. 17. ( Precipitated samples, hot bathed, centrifuged, and discarded supernate. Dissolved precip, precipitated samples, hot bathed, centrifuged, and discarded supernate. Dissolved precip, precipitated and filtered samples, obtained final weights, covered with aluminum foil, and took to count room ) |

5-9-13  


US EPA ARCHIVE DOCUMENT



Reagents Used in an Analysis

Internal Work Order

13-04105

Analysis Code

Run

Ra228

1

| Reagent ID | Reagent Name       | Reagent Concentration | Analyst ID | Date Recorded |
|------------|--------------------|-----------------------|------------|---------------|
| 013376P    | Ammonium Hydroxide | Reagent Grade         | JBARNARD   | 4/24/2013     |
| 013575D01  | Ammonium Sulfate   | 200 mg/ml             | JBARNARD   | 4/24/2013     |
| 012766D14  | Barium Carrier     | 1 mg/ml               | JBARNARD   | 4/24/2013     |
| 012729D07  | Lead Carrier       | 166 mg/ml             | JBARNARD   | 4/24/2013     |
| 013624P    | Nitric Acid        | Reagent Grade         | JBARNARD   | 4/24/2013     |
| 013416P    | Perchloric Acid    | Reagent Grade         | JBARNARD   | 4/24/2013     |
| 009098P    | Sulfuric Acid      | Reagent Grade         | JBARNARD   | 4/24/2013     |
| 011504D22  | Ammonium Sulfide   | 2%                    | LWALKER    | 5/8/2013      |
| 012729D08  | Lead Carrier       | 1.5 mg/ml             | LWALKER    | 5/8/2013      |
| 013797P    | Nitric Acid        | Reagent Grade         | LWALKER    | 5/8/2013      |
| 013690S    | Sodium Hydroxide   | 10M                   | LWALKER    | 5/8/2013      |
| 013801S    | Yttrium Carrier    | 9 mg/ml               | LWALKER    | 5/8/2013      |
| 012717D04  | Ammonium Oxalate   | 5%                    | TSMITH     | 5/9/2013      |
| 013624D03  | Nitric Acid        | 1N                    | TSMITH     | 5/9/2013      |
| 013686S    | Nitric Acid        | 6N                    | TSMITH     | 5/9/2013      |
| 013690S    | Sodium Hydroxide   | 10M                   | TSMITH     | 5/9/2013      |
| 013065D04  | Sodium Hydroxide   | 18M                   | TSMITH     | 5/9/2013      |

LB4110 AED

| Date   | Sample #         | Client | Incident # | C/T | Analysis | Spec |
|--------|------------------|--------|------------|-----|----------|------|
| 5/9/10 | 1705017SN(14-46) | Udon   | 0840       | 2h  | SN202    | C    |
| 5/9/10 | 1704187SN(14)    | Unitah | 0840       | 2h  | SN207    | C    |
| 5/9/10 | 1705017SN(14-46) | Udon   | 1046       | 1h  | UP270    | C    |
| 5/9/10 | 1704470SN(14)    | Udon   | 1046       | 1h  | UP277    | C    |
| 5/9/10 | 1704105SN(17-18) | Engm   | 1111       | 2h  | R48      | C    |

| Date   | Sample #          | Client       | Insulin | CT Time | Analysis | Spec |
|--------|-------------------|--------------|---------|---------|----------|------|
| 5/6/17 | Nuencac           | US           | 0729    | 6m      | LAB      | S    |
| 5/6/17 | EFTec             | US           | 0672    | 7m      | LAB      | -    |
| 5/6/17 | 17040948N(12-4)   | NYPE         | 0824    | 2m      | SN907    | C    |
| 5/6/17 | 1704148N(14)      | MPA          | 1072    | 2L      | RAY      | C    |
| 5/7/17 | Nuencac           | US           | 0514    | 6m      | LAB      | S    |
| 5/7/17 | EFTec             | US           | 0619    | 7m      | LAB      | -    |
| 5/7/17 | 170419554(12-4)   | Udon         | 0746    | 2m      | SN904    | C    |
| 5/7/17 | 170417554(11)     | Udon         | 0746    | 7m      | SN904    | C    |
| 5/7/17 | 170417051(11)     | Berry Soil   | 0818    | 7m      | SN904    | C    |
| 5/7/17 | 1705001N(4.6)     | Udon         | 0857    | 2L      | RAY      | C    |
| 5/7/17 | 1704190N(11.4)    | Udon         | 0958    | 2L      | RAY      | C    |
| 5/7/17 | 1705014AB(11.2)   | Hudson       | 1100    | 70m     | LAB      | C    |
| 5/7/17 | 1705018AB(12.4)   | Hudson       | 1131    | 7m      | LAB      | C    |
| 5/7/17 | 1705110N(11.7)    | Engham       | 1777    | 2L      | RAY      | C    |
| 6/7/17 | Am 11Arec (15)    | Lab          | 1553    | 15mins  | αβ       | KB   |
| 5/8/17 | Nuencac           | US           | 0717    | 6m      | LAB      | C    |
| 5/8/17 | EFTec             | US           | 0618    | 7m      | LAB      | -    |
| 5/8/17 | 17041107AB(15-10) | Accutest     | 0820    | 2L      | LAB      | C    |
| 5/8/17 | 17041107AD(11)    | Accutest     | 1025    | 2L      | LAB      | C    |
| 5/8/17 | 17041107AD(11.4)  | univ & env   | 1049    | 2L      | LAB      | C    |
| 5/9/17 | Bilance           | US           | 0516    | 6m      | LAB      | S    |
| 5/9/17 | EFTec             | US           | 0620    | 7m      | LAB      | -    |
| 5/9/17 | 1705028AB(15)     | Udon         | 0757    | 18m     | LAB      | C    |
| 5/9/17 | 1705110N(11.6)    | Engham       | 0921    | 2L      | RAY      | C    |
| 5/9/17 | 1305030AB(1-4)    | Hudson Ranch | 1134    | 1hr     | αβ       | KB   |
| 5/9/17 | 17041105N(11.9)   | Engham       | 1136    | 2L      | RAY      | C    |

US EPA ARCHIVE DOCUMENT



**SECTION VIII  
ANALYTICAL DATA (ISOTOPIC URANIUM)**

US EPA ARCHIVE DOCUMENT

| Work Order           | 13-04105                             | Internal Fraction | Sample Desc | Client ID     | Login CPM | Sample Date    | Sample Aliquot |
|----------------------|--------------------------------------|-------------------|-------------|---------------|-----------|----------------|----------------|
| Analysis Code        | UUISO                                | 01                | LCS         | LCS           |           | 04/16/13 00:00 | 1.0000E+00     |
| Run                  | 1                                    | 02                | MBL         | BLANK         |           | 04/16/13 00:00 | 1.0000E+00     |
| Date Received        | 4/16/2013                            | 03                | DUP         | PZ-204-SS TOT | 39        | 04/09/13 09:30 | 1.0000E+00     |
| Lab Deadline         | 5/7/2013                             | 04                | DO          | PZ-204-SS TOT | 39        | 04/09/13 09:30 | 1.0000E+00     |
| Client               | Engineering Management Support, Inc. | 05                | TRG         | PZ-204-SS DIS | 39        | 04/09/13 09:30 | 1.0000E+00     |
| Project              | West Lake OU-1                       | 06                | TRG         | I-68 TOT      | 45        | 04/09/13 10:44 | 1.0000E+00     |
| Report Level         | 4                                    | 07                | TRG         | I-68 DIS      | 45        | 04/09/13 10:44 | 1.0000E+00     |
| Activity Units       | pCi                                  | 08                | TRG         | D-87 TOT      | 42        | 04/09/13 11:05 | 1.0000E+00     |
| Aliquot Units        | I                                    | 09                | TRG         | D-87 DIS      | 42        | 04/09/13 11:05 | 1.0000E+00     |
| Matrix               | WA                                   | 10                | TRG         | PZ-106-SD TOT | 37        | 04/09/13 12:00 | 1.0000E+00     |
| Method               | NAS NS-3050 Modified                 | 11                | TRG         | PZ-106-SD DIS | 37        | 04/09/13 12:00 | 1.0000E+00     |
| Instrument Type      | Alpha Spectroscopy                   | 12                | TRG         | S-82 TOT      | 46        | 04/09/13 12:27 | 1.0000E+00     |
| Radiometric Tracer   | U-232                                | 13                | TRG         | S-82 DIS      | 46        | 04/09/13 12:27 | 1.0000E+00     |
| Radiometric Sol#     | U-10a                                | 14                | TRG         | PZ-106-SS TOT | 41        | 04/09/13 12:56 | 1.0000E+00     |
| Tracer Act (dpm/g)   | 19.094                               | 15                | TRG         | PZ-106-SS DIS | 41        | 04/09/13 12:56 | 1.0000E+00     |
| Carrier              |                                      | 16                | TRG         | I-9 TOT       | 43        | 04/09/13 13:35 | 1.0000E+00     |
| Carrier Conc (mg/ml) |                                      | 17                | TRG         | I-9 DIS       | 43        | 04/09/13 13:35 | 1.0000E+00     |
|                      |                                      | 18                | TRG         | D-93 TOT      | 40        | 04/09/13 14:28 | 1.0000E+00     |
|                      |                                      | 19                | TRG         | D-93 DIS      | 40        | 04/09/13 14:28 | 1.0000E+00     |

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

| Internal Fraction | Sample Desc | Tracer Aliquot (g) | Tracer Total ACT (dpm) | Radiometric Tracer (pCi) | Radiometric % Rec | Grav Carrier Added (ml) | Grav Filter Tare (g) | Grav Filter Final (g) | Grav Filter Net (g) | Grav % Rec | Mean % Rec | SAF 1* | SAF 2* |
|-------------------|-------------|--------------------|------------------------|--------------------------|-------------------|-------------------------|----------------------|-----------------------|---------------------|------------|------------|--------|--------|
| 01                | LCS         | 0.6088             | 11.6                   |                          | 0.00              |                         |                      |                       |                     |            |            |        |        |
| 02                | MBL         | 0.6035             | 11.5                   |                          | 0.00              |                         |                      |                       |                     |            |            |        |        |
| 03                | DUP         | 0.6041             | 11.5                   |                          | 0.00              |                         |                      |                       |                     |            |            |        |        |
| 04                | DO          | 0.6007             | 11.5                   |                          | 0.00              |                         |                      |                       |                     |            |            |        |        |
| 05                | TRG         | 0.6027             | 11.5                   |                          | 0.00              |                         |                      |                       |                     |            |            |        |        |
| 06                | TRG         | 0.5969             | 11.4                   |                          | 0.00              |                         |                      |                       |                     |            |            |        |        |
| 07                | TRG         | 0.5996             | 11.4                   |                          | 0.00              |                         |                      |                       |                     |            |            |        |        |
| 08                | TRG         | 0.6002             | 11.5                   |                          | 0.00              |                         |                      |                       |                     |            |            |        |        |
| 09                | TRG         | 0.5968             | 11.4                   |                          | 0.00              |                         |                      |                       |                     |            |            |        |        |
| 10                | TRG         | 0.5962             | 11.4                   |                          | 0.00              |                         |                      |                       |                     |            |            |        |        |
| 11                | TRG         | 0.5965             | 11.4                   |                          | 0.00              |                         |                      |                       |                     |            |            |        |        |
| 12                | TRG         | 0.5969             | 11.4                   |                          | 0.00              |                         |                      |                       |                     |            |            |        |        |
| 13                | TRG         | 0.5661             | 10.8                   |                          | 0.00              |                         |                      |                       |                     |            |            |        |        |
| 14                | TRG         | 0.5968             | 11.4                   |                          | 0.00              |                         |                      |                       |                     |            |            |        |        |
| 15                | TRG         | 0.5965             | 11.4                   |                          | 0.00              |                         |                      |                       |                     |            |            |        |        |
| 16                | TRG         | 0.5985             | 11.4                   |                          | 0.00              |                         |                      |                       |                     |            |            |        |        |
| 17                | TRG         | 0.5943             | 11.3                   |                          | 0.00              |                         |                      |                       |                     |            |            |        |        |
| 18                | TRG         | 0.5968             | 11.4                   |                          | 0.00              |                         |                      |                       |                     |            |            |        |        |
| 19                | TRG         | 0.5949             | 11.4                   |                          | 0.00              |                         |                      |                       |                     |            |            |        |        |
|                   |             |                    |                        |                          |                   |                         |                      |                       |                     |            |            |        |        |

US EPA ARCHIVE DOCUMENT

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

| Internal Fraction | Sample Desc | Rough Prep Date | Rough Prep By | Prep Date      | Prep By  | Sep t0 Date/Time | Sep t0 By | Sep t1 Date/Time | Sep t1 By |
|-------------------|-------------|-----------------|---------------|----------------|----------|------------------|-----------|------------------|-----------|
| 01                | LCS         |                 |               | 04/24/13 12:02 | JBARNARD |                  |           |                  |           |
| 02                | MBL         |                 |               | 04/24/13 12:02 | JBARNARD |                  |           |                  |           |
| 03                | DUP         |                 |               | 04/24/13 12:02 | JBARNARD |                  |           |                  |           |
| 04                | DO          |                 |               | 04/24/13 12:02 | JBARNARD |                  |           |                  |           |
| 05                | TRG         |                 |               | 04/24/13 12:02 | JBARNARD |                  |           |                  |           |
| 06                | TRG         |                 |               | 04/24/13 12:02 | JBARNARD |                  |           |                  |           |
| 07                | TRG         |                 |               | 04/24/13 12:02 | JBARNARD |                  |           |                  |           |
| 08                | TRG         |                 |               | 04/24/13 12:02 | JBARNARD |                  |           |                  |           |
| 09                | TRG         |                 |               | 04/24/13 12:02 | JBARNARD |                  |           |                  |           |
| 10                | TRG         |                 |               | 04/24/13 12:02 | JBARNARD |                  |           |                  |           |
| 11                | TRG         |                 |               | 04/24/13 12:02 | JBARNARD |                  |           |                  |           |
| 12                | TRG         |                 |               | 04/24/13 12:02 | JBARNARD |                  |           |                  |           |
| 13                | TRG         |                 |               | 04/24/13 12:02 | JBARNARD |                  |           |                  |           |
| 14                | TRG         |                 |               | 04/24/13 12:02 | JBARNARD |                  |           |                  |           |
| 15                | TRG         |                 |               | 04/24/13 12:02 | JBARNARD |                  |           |                  |           |
| 16                | TRG         |                 |               | 04/24/13 12:02 | JBARNARD |                  |           |                  |           |
| 17                | TRG         |                 |               | 04/24/13 12:02 | JBARNARD |                  |           |                  |           |
| 18                | TRG         |                 |               | 04/24/13 12:02 | JBARNARD |                  |           |                  |           |
| 19                | TRG         |                 |               | 04/24/13 12:02 | JBARNARD |                  |           |                  |           |
|                   |             |                 |               |                |          |                  |           |                  |           |

US EPA ARCHIVE DOCUMENT

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

Preliminary Data Report & Analytical Calculations  
**Work Order: 13-04105-UUISO-1**

US EPA ARCHIVE DOCUMENT

|                              |                                      |       |
|------------------------------|--------------------------------------|-------|
|                              | Run                                  | 1     |
|                              | Analysis Code                        | UUISO |
| Eberline Services Work Order | 13-04105                             |       |
| Client                       | Engineering Management Support, Inc. |       |

| Lab Fraction | Nuclide | Sample Desc | Client Identification | Activity Units | Results  | Error Estimate | MDA      | LCS Known | LCS %R | LCS Flag | RPD Flag | MDA Flag | Blank Flag |
|--------------|---------|-------------|-----------------------|----------------|----------|----------------|----------|-----------|--------|----------|----------|----------|------------|
| 01           | U-234   | LCS         | LCS                   | pCi/l          | 7.93E+00 | 1.02E+00       | 8.42E-02 | 8.15E+00  | 97.36  | OK       |          | OK       |            |
| 02           | U-234   | MBL         | BLANK                 | pCi/l          | 2.34E-02 | 3.80E-02       | 6.53E-02 |           |        |          |          | OK       | OK         |
| 03           | U-234   | DUP         | PZ-204-SS TOT         | pCi/l          | 2.92E+00 | 4.47E-01       | 7.58E-02 |           |        |          | NA       | OK       |            |
| 04           | U-234   | DO          | PZ-204-SS TOT         | pCi/l          | 3.20E+00 | 5.09E-01       | 5.70E-02 |           |        |          |          | OK       |            |
| 05           | U-234   | TRG         | PZ-204-SS DIS         | pCi/l          | 3.50E+00 | 5.12E-01       | 5.50E-02 |           |        |          |          | OK       |            |
| 06           | U-234   | TRG         | I-68 TOT              | pCi/l          | 2.73E+00 | 5.55E-01       | 1.02E-01 |           |        |          |          | OK       |            |
| 07           | U-234   | TRG         | I-68 DIS              | pCi/l          | 2.58E+00 | 4.98E-01       | 8.85E-02 |           |        |          |          | OK       |            |
| 08           | U-234   | TRG         | D-87 TOT              | pCi/l          | 4.00E-01 | 2.03E-01       | 1.40E-01 |           |        |          |          | OK       |            |
| 09           | U-234   | TRG         | D-87 DIS              | pCi/l          | 2.60E-01 | 1.49E-01       | 9.82E-02 |           |        |          |          | OK       |            |
| 10           | U-234   | TRG         | PZ-106-SD TOT         | pCi/l          | 3.18E-01 | 1.33E-01       | 7.38E-02 |           |        |          |          | OK       |            |
| 11           | U-234   | TRG         | PZ-106-SD DIS         | pCi/l          | 4.31E-01 | 1.61E-01       | 8.27E-02 |           |        |          |          | OK       |            |
| 12           | U-234   | TRG         | S-82 TOT              | pCi/l          | 1.26E+00 | 4.10E-01       | 1.69E-01 |           |        |          |          | OK       |            |
| 13           | U-234   | TRG         | S-82 DIS              | pCi/l          | 9.07E-01 | 3.16E-01       | 1.40E-01 |           |        |          |          | OK       |            |
| 14           | U-234   | TRG         | PZ-106-SS TOT         | pCi/l          | 5.92E-01 | 1.70E-01       | 4.59E-02 |           |        |          |          | OK       |            |
| 15           | U-234   | TRG         | PZ-106-SS DIS         | pCi/l          | 6.05E-01 | 1.69E-01       | 5.11E-02 |           |        |          |          | OK       |            |
| 16           | U-234   | TRG         | I-9 TOT               | pCi/l          | 1.36E-01 | 1.17E-01       | 1.15E-01 |           |        |          |          | OK       |            |
| 17           | U-234   | TRG         | I-9 DIS               | pCi/l          | 2.04E-01 | 1.20E-01       | 7.21E-02 |           |        |          |          | OK       |            |
| 18           | U-234   | TRG         | D-93 TOT              | pCi/l          | 3.90E-01 | 1.62E-01       | 9.28E-02 |           |        |          |          | OK       |            |
| 19           | U-234   | TRG         | D-93 DIS              | pCi/l          | 2.99E-01 | 1.35E-01       | 7.65E-02 |           |        |          |          | OK       |            |


US EPA ARCHIVE DOCUMENT

| Lab Fraction | Nuclide | Sample Desc | Sample Date    | Sample Aliquot | Radiometric % Rec | Grav % Rec | Mean % Rec | SAF | Sep t0 Date/Time | Sep t1 Date/Time |
|--------------|---------|-------------|----------------|----------------|-------------------|------------|------------|-----|------------------|------------------|
| 01           | U-234   | LCS         | 04/16/13 00:00 | 1.00E+00       | 128.31            | 0.00       | 0.00       |     |                  |                  |
| 02           | U-234   | MBL         | 04/16/13 00:00 | 1.00E+00       | 125.47            | 0.00       | 0.00       |     |                  |                  |
| 03           | U-234   | DUP         | 04/09/13 09:30 | 1.00E+00       | 130.78            | 0.00       | 0.00       |     |                  |                  |
| 04           | U-234   | DO          | 04/09/13 09:30 | 1.00E+00       | 112.88            | 0.00       | 0.00       |     |                  |                  |
| 05           | U-234   | TRG         | 04/09/13 09:30 | 1.00E+00       | 135.45            | 0.00       | 0.00       |     |                  |                  |
| 06           | U-234   | TRG         | 04/09/13 10:44 | 1.00E+00       | 79.68             | 0.00       | 0.00       |     |                  |                  |
| 07           | U-234   | TRG         | 04/09/13 10:44 | 1.00E+00       | 95.31             | 0.00       | 0.00       |     |                  |                  |
| 08           | U-234   | TRG         | 04/09/13 11:05 | 1.00E+00       | 74.32             | 0.00       | 0.00       |     |                  |                  |
| 09           | U-234   | TRG         | 04/09/13 11:05 | 1.00E+00       | 75.58             | 0.00       | 0.00       |     |                  |                  |
| 10           | U-234   | TRG         | 04/09/13 12:00 | 1.00E+00       | 116.98            | 0.00       | 0.00       |     |                  |                  |
| 11           | U-234   | TRG         | 04/09/13 12:00 | 1.00E+00       | 111.20            | 0.00       | 0.00       |     |                  |                  |
| 12           | U-234   | TRG         | 04/09/13 12:27 | 1.00E+00       | 50.92             | 0.00       | 0.00       |     |                  |                  |
| 13           | U-234   | TRG         | 04/09/13 12:27 | 1.00E+00       | 62.54             | 0.00       | 0.00       |     |                  |                  |
| 14           | U-234   | TRG         | 04/09/13 12:56 | 1.00E+00       | 130.05            | 0.00       | 0.00       |     |                  |                  |
| 15           | U-234   | TRG         | 04/09/13 12:56 | 1.00E+00       | 136.18            | 0.00       | 0.00       |     |                  |                  |
| 16           | U-234   | TRG         | 04/09/13 13:35 | 1.00E+00       | 62.09             | 0.00       | 0.00       |     |                  |                  |
| 17           | U-234   | TRG         | 04/09/13 13:35 | 1.00E+00       | 80.90             | 0.00       | 0.00       |     |                  |                  |
| 18           | U-234   | TRG         | 04/09/13 14:28 | 1.00E+00       | 86.60             | 0.00       | 0.00       |     |                  |                  |
| 19           | U-234   | TRG         | 04/09/13 14:28 | 1.00E+00       | 98.70             | 0.00       | 0.00       |     |                  |                  |
|              |         |             |                |                |                   |            |            |     |                  |                  |

|   |                                      |       |
|---|--------------------------------------|-------|
| <br>Eberline Services Work Order<br><b>13-04105</b> | Analysis Code                        | UUISO |
|   | Run                                  | 1     |
| Client  | Engineering Management Support, Inc. |       |

Preliminary Data Report & Analytical Calculations  
**Work Order: 13-04105-UUISO-1**

US EPA ARCHIVE DOCUMENT

|   |                                      |
|---|--------------------------------------|
|  |                                      |
| Run   | <b>1</b>                             |
| Analysis Code   | <b>UUISO</b>                         |
| Eberline Services Work Order  | <b>13-04105</b>                      |
| Client  | Engineering Management Support, Inc. |

| Lab Fraction | Nuclide | Sample Desc | Counting Date/Time | Halflife (days) | Detect | Carrier   | Count Time | Counts    | Bkg CPM   | Eff  |
|--------------|---------|-------------|--------------------|-----------------|--------|-----------|------------|-----------|-----------|------|
| 01           | U-234   | LCS         | 04/29/13 09:59     |                 | A_Spec | Alpha_003 | 170.02     | 6.69 E+02 | 9.00 E-03 | 17.5 |
| 02           | U-234   | MBL         | 04/29/13 09:59     |                 | A_Spec | Alpha_004 | 170        | 2.15 E+00 | 5.00 E-03 | 19.4 |
| 03           | U-234   | DUP         | 04/29/13 09:59     |                 | A_Spec | Alpha_010 | 170.02     | 2.83 E+02 | 1.00 E-02 | 19.7 |
| 04           | U-234   | DO          | 04/29/13 09:59     |                 | A_Spec | Alpha_011 | 170.02     | 2.69 E+02 | 2.00 E-03 | 19.7 |
| 05           | U-234   | TRG         | 04/29/13 09:59     |                 | A_Spec | Alpha_013 | 170.02     | 3.33 E+02 | 3.00 E-03 | 18.7 |
| 06           | U-234   | TRG         | 04/29/13 09:59     |                 | A_Spec | Alpha_014 | 170        | 1.51 E+02 | 4.00 E-03 | 18.5 |
| 07           | U-234   | TRG         | 04/29/13 09:59     |                 | A_Spec | Alpha_018 | 170.02     | 1.64 E+02 | 4.00 E-03 | 17.8 |
| 08           | U-234   | TRG         | 04/29/13 10:00     |                 | A_Spec | Alpha_022 | 170        | 1.71 E+01 | 5.00 E-03 | 15.3 |
| 09           | U-234   | TRG         | 04/29/13 10:00     |                 | A_Spec | Alpha_024 | 170.02     | 1.27 E+01 | 2.00 E-03 | 17.1 |
| 10           | U-234   | TRG         | 04/29/13 10:00     |                 | A_Spec | Alpha_025 | 170        | 2.43 E+01 | 4.00 E-03 | 17.4 |
| 11           | U-234   | TRG         | 04/29/13 10:00     |                 | A_Spec | Alpha_027 | 170        | 3.11 E+01 | 5.00 E-03 | 17.3 |
| 12           | U-234   | TRG         | 04/29/13 10:00     |                 | A_Spec | Alpha_029 | 170        | 4.70 E+01 | 6.00 E-03 | 19.5 |
| 13           | U-234   | TRG         | 04/29/13 10:00     |                 | A_Spec | Alpha_033 | 170        | 3.90 E+01 | 0.00 E+00 | 18.2 |
| 14           | U-234   | TRG         | 04/29/13 10:00     |                 | A_Spec | Alpha_034 | 170        | 5.38 E+01 | 1.00 E-03 | 18.6 |
| 15           | U-234   | TRG         | 04/29/13 10:00     |                 | A_Spec | Alpha_035 | 170        | 5.67 E+01 | 2.00 E-03 | 18.3 |
| 16           | U-234   | TRG         | 04/29/13 10:00     |                 | A_Spec | Alpha_037 | 170        | 5.66 E+00 | 2.00 E-03 | 17.8 |
| 17           | U-234   | TRG         | 04/29/13 10:00     |                 | A_Spec | Alpha_040 | 170        | 1.18 E+01 | 1.00 E-03 | 19   |
| 18           | U-234   | TRG         | 04/29/13 10:00     |                 | A_Spec | Alpha_041 | 170        | 2.51 E+01 | 5.00 E-03 | 19.8 |
| 19           | U-234   | TRG         | 04/29/13 10:00     |                 | A_Spec | Alpha_042 | 170        | 2.05 E+01 | 3.00 E-03 | 18.5 |
|              |         |             |                    |                 |        |           |            |           |           |      |

Preliminary Data Report & Analytical Calculations  
**Work Order: 13-04105-UUISO-1**

US EPA ARCHIVE DOCUMENT

| Lab Fraction | Nuclide | Sample Desc | Client Identification | Activity Units | Results  | Error Estimate | MDA      | LCS Known | LCS %R | LCS Flag | RPD Flag | MDA Flag | Blank Flag |
|--------------|---------|-------------|-----------------------|----------------|----------|----------------|----------|-----------|--------|----------|----------|----------|------------|
| 01           | U-238   | LCS         | LCS                   | pCi/l          | 7.57E+00 | 9.81E-01       | 6.19E-02 | 7.94E+00  | 95.30  | OK       |          | OK       |            |
| 02           | U-238   | MBL         | BLANK                 | pCi/l          | 1.99E-02 | 3.04E-02       | 4.53E-02 |           |        |          |          | OK       | OK         |
| 03           | U-238   | DUP         | PZ-204-SS TOT         | pCi/l          | 1.92E+00 | 3.35E-01       | 6.77E-02 |           |        |          | NA       | OK       |            |
| 04           | U-238   | DO          | PZ-204-SS TOT         | pCi/l          | 2.47E+00 | 4.23E-01       | 4.95E-02 |           |        |          |          | OK       |            |
| 05           | U-238   | TRG         | PZ-204-SS DIS         | pCi/l          | 1.76E+00 | 3.18E-01       | 5.48E-02 |           |        |          |          | OK       |            |
| 06           | U-238   | TRG         | I-68 TOT              | pCi/l          | 2.42E+00 | 5.11E-01       | 1.18E-01 |           |        |          |          | OK       |            |
| 07           | U-238   | TRG         | I-68 DIS              | pCi/l          | 2.23E+00 | 4.53E-01       | 1.25E-01 |           |        |          |          | OK       |            |
| 08           | U-238   | TRG         | D-87 TOT              | pCi/l          | 1.04E-01 | 1.04E-01       | 1.22E-01 |           |        |          |          | OK       |            |
| 09           | U-238   | TRG         | D-87 DIS              | pCi/l          | 1.09E-01 | 1.00E-01       | 1.15E-01 |           |        |          |          | OK       |            |
| 10           | U-238   | TRG         | PZ-106-SD TOT         | pCi/l          | 3.08E-01 | 1.30E-01       | 6.23E-02 |           |        |          |          | OK       |            |
| 11           | U-238   | TRG         | PZ-106-SD DIS         | pCi/l          | 1.97E-01 | 1.07E-01       | 7.76E-02 |           |        |          |          | OK       |            |
| 12           | U-238   | TRG         | S-82 TOT              | pCi/l          | 1.09E+00 | 3.73E-01       | 1.11E-01 |           |        |          |          | OK       |            |
| 13           | U-238   | TRG         | S-82 DIS              | pCi/l          | 8.11E-01 | 2.96E-01       | 1.39E-01 |           |        |          |          | OK       |            |
| 14           | U-238   | TRG         | PZ-106-SS TOT         | pCi/l          | 3.80E-01 | 1.33E-01       | 5.24E-02 |           |        |          |          | OK       |            |
| 15           | U-238   | TRG         | PZ-106-SS DIS         | pCi/l          | 3.38E-01 | 1.23E-01       | 4.44E-02 |           |        |          |          | OK       |            |
| 16           | U-238   | TRG         | I-9 TOT               | pCi/l          | 4.37E-02 | 6.70E-02       | 9.97E-02 |           |        |          |          | OK       |            |
| 17           | U-238   | TRG         | I-9 DIS               | pCi/l          | 1.86E-01 | 1.14E-01       | 7.18E-02 |           |        |          |          | OK       |            |
| 18           | U-238   | TRG         | D-93 TOT              | pCi/l          | 1.56E-01 | 1.17E-01       | 1.50E-01 |           |        |          |          | OK       |            |
| 19           | U-238   | TRG         | D-93 DIS              | pCi/l          | 1.55E-01 | 9.62E-02       | 6.94E-02 |           |        |          |          | OK       |            |

|        |                                      |                              |          |               |       |     |   |
|--------|--------------------------------------|------------------------------|----------|---------------|-------|-----|---|
| Client | Engineering Management Support, Inc. | Eberline Services Work Order | 13-04105 | Analysis Code | UUISO | Run | 1 |
|        |                                      |                              |          |               |       |     |   |



US EPA ARCHIVE DOCUMENT

| Lab Fraction | Nuclide | Sample Desc | Sample Date    | Sample Aliquot | Radiometric % Rec | Grav % Rec | Mean % Rec | SAF | Sep t0 Date/Time | Sep t1 Date/Time |
|--------------|---------|-------------|----------------|----------------|-------------------|------------|------------|-----|------------------|------------------|
| 01           | U-238   | LCS         | 04/16/13 00:00 | 1.00E+00       | 128.31            | 0.00       | 0.00       |     |                  |                  |
| 02           | U-238   | MBL         | 04/16/13 00:00 | 1.00E+00       | 125.47            | 0.00       | 0.00       |     |                  |                  |
| 03           | U-238   | DUP         | 04/09/13 09:30 | 1.00E+00       | 130.78            | 0.00       | 0.00       |     |                  |                  |
| 04           | U-238   | DO          | 04/09/13 09:30 | 1.00E+00       | 112.88            | 0.00       | 0.00       |     |                  |                  |
| 05           | U-238   | TRG         | 04/09/13 09:30 | 1.00E+00       | 135.45            | 0.00       | 0.00       |     |                  |                  |
| 06           | U-238   | TRG         | 04/09/13 10:44 | 1.00E+00       | 79.68             | 0.00       | 0.00       |     |                  |                  |
| 07           | U-238   | TRG         | 04/09/13 10:44 | 1.00E+00       | 95.31             | 0.00       | 0.00       |     |                  |                  |
| 08           | U-238   | TRG         | 04/09/13 11:05 | 1.00E+00       | 74.32             | 0.00       | 0.00       |     |                  |                  |
| 09           | U-238   | TRG         | 04/09/13 11:05 | 1.00E+00       | 75.58             | 0.00       | 0.00       |     |                  |                  |
| 10           | U-238   | TRG         | 04/09/13 12:00 | 1.00E+00       | 116.98            | 0.00       | 0.00       |     |                  |                  |
| 11           | U-238   | TRG         | 04/09/13 12:00 | 1.00E+00       | 111.20            | 0.00       | 0.00       |     |                  |                  |
| 12           | U-238   | TRG         | 04/09/13 12:27 | 1.00E+00       | 50.92             | 0.00       | 0.00       |     |                  |                  |
| 13           | U-238   | TRG         | 04/09/13 12:27 | 1.00E+00       | 62.54             | 0.00       | 0.00       |     |                  |                  |
| 14           | U-238   | TRG         | 04/09/13 12:56 | 1.00E+00       | 130.05            | 0.00       | 0.00       |     |                  |                  |
| 15           | U-238   | TRG         | 04/09/13 12:56 | 1.00E+00       | 136.18            | 0.00       | 0.00       |     |                  |                  |
| 16           | U-238   | TRG         | 04/09/13 13:35 | 1.00E+00       | 62.09             | 0.00       | 0.00       |     |                  |                  |
| 17           | U-238   | TRG         | 04/09/13 13:35 | 1.00E+00       | 80.90             | 0.00       | 0.00       |     |                  |                  |
| 18           | U-238   | TRG         | 04/09/13 14:28 | 1.00E+00       | 86.60             | 0.00       | 0.00       |     |                  |                  |
| 19           | U-238   | TRG         | 04/09/13 14:28 | 1.00E+00       | 98.70             | 0.00       | 0.00       |     |                  |                  |

|        |                                      |                              |          |               |       |     |   |
|--------|--------------------------------------|------------------------------|----------|---------------|-------|-----|---|
| Client | Engineering Management Support, Inc. | Eberline Services Work Order | 13-04105 | Analysis Code | UUISO | Run | 1 |
|        |                                      |                              |          |               |       |     |   |

US EPA ARCHIVE DOCUMENT

|  |                                      |
|--|--------------------------------------|
|  |                                      |
| Run  | 1                                    |
| Analysis Code  | UUISO                                |
| Eberline Services Work Order   | 13-04105                             |
| Client   | Engineering Management Support, Inc. |

| Lab Fraction | Nuclide | Sample Desc | Counting Date/Time | Half-life (days) | Detect | Carrier   | Count Time | Counts    | Bkg CPM   | Eff  |
|--------------|---------|-------------|--------------------|------------------|--------|-----------|------------|-----------|-----------|------|
| 01           | U-238   | LCS         | 04/29/13 09:59     |                  | A_Spec | Alpha_003 | 170.02     | 6.41 E+02 | 3.00 E-03 | 17.5 |
| 02           | U-238   | MBL         | 04/29/13 09:59     |                  | A_Spec | Alpha_004 | 170        | 1.83 E+00 | 1.00 E-03 | 19.4 |
| 03           | U-238   | DUP         | 04/29/13 09:59     |                  | A_Spec | Alpha_010 | 170.02     | 1.87 E+02 | 7.00 E-03 | 19.7 |
| 04           | U-238   | DO          | 04/29/13 09:59     |                  | A_Spec | Alpha_011 | 170.02     | 2.08 E+02 | 1.00 E-03 | 19.7 |
| 05           | U-238   | TRG         | 04/29/13 09:59     |                  | A_Spec | Alpha_013 | 170.02     | 1.68 E+02 | 3.00 E-03 | 18.7 |
| 06           | U-238   | TRG         | 04/29/13 09:59     |                  | A_Spec | Alpha_014 | 170        | 1.35 E+02 | 7.00 E-03 | 18.5 |
| 07           | U-238   | TRG         | 04/29/13 09:59     |                  | A_Spec | Alpha_018 | 170.02     | 1.43 E+02 | 1.30 E-02 | 17.8 |
| 08           | U-238   | TRG         | 04/29/13 10:00     |                  | A_Spec | Alpha_022 | 170        | 4.49 E+00 | 3.00 E-03 | 15.3 |
| 09           | U-238   | TRG         | 04/29/13 10:00     |                  | A_Spec | Alpha_024 | 170.02     | 5.32 E+00 | 4.00 E-03 | 17.1 |
| 10           | U-238   | TRG         | 04/29/13 10:00     |                  | A_Spec | Alpha_025 | 170        | 2.37 E+01 | 2.00 E-03 | 17.4 |
| 11           | U-238   | TRG         | 04/29/13 10:00     |                  | A_Spec | Alpha_027 | 170        | 1.43 E+01 | 4.00 E-03 | 17.3 |
| 12           | U-238   | TRG         | 04/29/13 10:00     |                  | A_Spec | Alpha_029 | 170        | 4.08 E+01 | 1.00 E-03 | 19.5 |
| 13           | U-238   | TRG         | 04/29/13 10:00     |                  | A_Spec | Alpha_033 | 170        | 3.50 E+01 | 0.00 E+00 | 18.2 |
| 14           | U-238   | TRG         | 04/29/13 10:00     |                  | A_Spec | Alpha_034 | 170        | 3.47 E+01 | 2.00 E-03 | 18.6 |
| 15           | U-238   | TRG         | 04/29/13 10:00     |                  | A_Spec | Alpha_035 | 170        | 3.18 E+01 | 1.00 E-03 | 18.3 |
| 16           | U-238   | TRG         | 04/29/13 10:00     |                  | A_Spec | Alpha_037 | 170        | 1.83 E+00 | 1.00 E-03 | 17.8 |
| 17           | U-238   | TRG         | 04/29/13 10:00     |                  | A_Spec | Alpha_040 | 170        | 1.08 E+01 | 1.00 E-03 | 19   |
| 18           | U-238   | TRG         | 04/29/13 10:00     |                  | A_Spec | Alpha_041 | 170        | 1.01 E+01 | 2.30 E-02 | 19.8 |
| 19           | U-238   | TRG         | 04/29/13 10:00     |                  | A_Spec | Alpha_042 | 170        | 1.07 E+01 | 2.00 E-03 | 18.5 |
|              |         |             |                    |                  |        |           |            |           |           |      |

US EPA ARCHIVE DOCUMENT

| Lab Fraction | Nuclide | Sample Desc | Client Identification | Activity Units | Results  | Error Estimate | MDA      | LCS Known | LCS %R | LCS Flag | RPD Flag | MDA Flag | Blank Flag |
|--------------|---------|-------------|-----------------------|----------------|----------|----------------|----------|-----------|--------|----------|----------|----------|------------|
| 01           | U-235   | LCS         | LCS                   | pCi/l          | 6.92E-01 | 2.11E-01       | 8.24E-02 |           |        |          |          | OK       |            |
| 02           | U-235   | MBL         | BLANK                 | pCi/l          | 6.70E-02 | 6.59E-02       | 8.48E-02 |           |        |          |          | OK       | OK         |
| 03           | U-235   | DUP         | PZ-204-SS TOT         | pCi/l          | 1.95E-01 | 1.02E-01       | 7.18E-02 |           |        |          | NA       | OK       |            |
| 04           | U-235   | DO          | PZ-204-SS TOT         | pCi/l          | 1.45E-01 | 9.25E-02       | 6.14E-02 |           |        |          |          | OK       |            |
| 05           | U-235   | TRG         | PZ-204-SS DIS         | pCi/l          | 1.27E-01 | 8.13E-02       | 5.40E-02 |           |        |          |          | OK       |            |
| 06           | U-235   | TRG         | I-68 TOT              | pCi/l          | 2.37E-01 | 1.48E-01       | 1.06E-01 |           |        |          |          | OK       |            |
| 07           | U-235   | TRG         | I-68 DIS              | pCi/l          | 1.77E-01 | 1.23E-01       | 1.16E-01 |           |        |          |          | OK       |            |
| 08           | U-235   | TRG         | D-87 TOT              | pCi/l          | 3.31E-02 | 8.27E-02       | 1.72E-01 |           |        |          |          | OK       |            |
| 09           | U-235   | TRG         | D-87 DIS              | pCi/l          | 1.67E-02 | 5.11E-02       | 1.21E-01 |           |        |          |          | OK       |            |
| 10           | U-235   | TRG         | PZ-106-SD TOT         | pCi/l          | 6.18E-02 | 6.38E-02       | 6.73E-02 |           |        |          |          | OK       |            |
| 11           | U-235   | TRG         | PZ-106-SD DIS         | pCi/l          | 2.83E-02 | 4.80E-02       | 8.15E-02 |           |        |          |          | OK       |            |
| 12           | U-235   | TRG         | S-82 TOT              | pCi/l          | 1.15E-01 | 1.32E-01       | 1.74E-01 |           |        |          |          | OK       |            |
| 13           | U-235   | TRG         | S-82 DIS              | pCi/l          | 2.38E-02 | 5.72E-02       | 1.20E-01 |           |        |          |          | OK       |            |
| 14           | U-235   | TRG         | PZ-106-SS TOT         | pCi/l          | 4.97E-02 | 5.38E-02       | 6.49E-02 |           |        |          |          | OK       |            |
| 15           | U-235   | TRG         | PZ-106-SS DIS         | pCi/l          | 1.16E-01 | 7.85E-02       | 5.50E-02 |           |        |          |          | OK       |            |
| 16           | U-235   | TRG         | I-9 TOT               | pCi/l          | 0.00E+00 | 8.20E-02       | 1.77E-01 |           |        |          |          | OK       |            |
| 17           | U-235   | TRG         | I-9 DIS               | pCi/l          | 1.03E-01 | 9.45E-02       | 8.89E-02 |           |        |          |          | OK       |            |
| 18           | U-235   | TRG         | D-93 TOT              | pCi/l          | 2.85E-02 | 5.42E-02       | 1.00E-01 |           |        |          |          | OK       |            |
| 19           | U-235   | TRG         | D-93 DIS              | pCi/l          | 4.48E-02 | 6.21E-02       | 9.43E-02 |           |        |          |          | OK       |            |



Run

1

Analysis Code

UUISO

Eberline Services Work Order

13-04105

Client

Engineering Management Support, Inc.

Preliminary Data Report & Analytical Calculations  
**Work Order: 13-04105-UUISO-1**

US EPA ARCHIVE DOCUMENT

| 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           | U-235   | LCS         | 04/16/13 00:00 | 1.00E+00       | 128.31            | 0.00       | 0.00       |     |                  |                  |
| 02           | U-235   | MBL         | 04/16/13 00:00 | 1.00E+00       | 125.47            | 0.00       | 0.00       |     |                  |                  |
| 03           | U-235   | DUP         | 04/09/13 09:30 | 1.00E+00       | 130.78            | 0.00       | 0.00       |     |                  |                  |
| 04           | U-235   | DO          | 04/09/13 09:30 | 1.00E+00       | 112.88            | 0.00       | 0.00       |     |                  |                  |
| 05           | U-235   | TRG         | 04/09/13 09:30 | 1.00E+00       | 135.45            | 0.00       | 0.00       |     |                  |                  |
| 06           | U-235   | TRG         | 04/09/13 10:44 | 1.00E+00       | 79.68             | 0.00       | 0.00       |     |                  |                  |
| 07           | U-235   | TRG         | 04/09/13 10:44 | 1.00E+00       | 95.31             | 0.00       | 0.00       |     |                  |                  |
| 08           | U-235   | TRG         | 04/09/13 11:05 | 1.00E+00       | 74.32             | 0.00       | 0.00       |     |                  |                  |
| 09           | U-235   | TRG         | 04/09/13 11:05 | 1.00E+00       | 75.58             | 0.00       | 0.00       |     |                  |                  |
| 10           | U-235   | TRG         | 04/09/13 12:00 | 1.00E+00       | 116.98            | 0.00       | 0.00       |     |                  |                  |
| 11           | U-235   | TRG         | 04/09/13 12:00 | 1.00E+00       | 111.20            | 0.00       | 0.00       |     |                  |                  |
| 12           | U-235   | TRG         | 04/09/13 12:27 | 1.00E+00       | 50.92             | 0.00       | 0.00       |     |                  |                  |
| 13           | U-235   | TRG         | 04/09/13 12:27 | 1.00E+00       | 62.54             | 0.00       | 0.00       |     |                  |                  |
| 14           | U-235   | TRG         | 04/09/13 12:56 | 1.00E+00       | 130.05            | 0.00       | 0.00       |     |                  |                  |
| 15           | U-235   | TRG         | 04/09/13 12:56 | 1.00E+00       | 136.18            | 0.00       | 0.00       |     |                  |                  |
| 16           | U-235   | TRG         | 04/09/13 13:35 | 1.00E+00       | 62.09             | 0.00       | 0.00       |     |                  |                  |
| 17           | U-235   | TRG         | 04/09/13 13:35 | 1.00E+00       | 80.90             | 0.00       | 0.00       |     |                  |                  |
| 18           | U-235   | TRG         | 04/09/13 14:28 | 1.00E+00       | 86.60             | 0.00       | 0.00       |     |                  |                  |
| 19           | U-235   | TRG         | 04/09/13 14:28 | 1.00E+00       | 98.70             | 0.00       | 0.00       |     |                  |                  |
|              |         |             |                |                |                   |            |            |     |                  |                  |

|        |                                      |                              |          |               |       |     |   |
|--------|--------------------------------------|------------------------------|----------|---------------|-------|-----|---|
| Client | Engineering Management Support, Inc. | Eberline Services Work Order | 13-04105 | Analysis Code | UUISO | Run | 1 |
|        |                                      |                              |          |               |       |     |   |

US EPA ARCHIVE DOCUMENT

| Lab Fraction | Nuclide | Sample Desc | Counting Date/Time | Half-life (days) | Detect | Carrier   | Count Time | Counts    | Bkg CPM   | Eff  |
|--------------|---------|-------------|--------------------|------------------|--------|-----------|------------|-----------|-----------|------|
| 01           | U-235   | LCS         | 04/29/13 09:59     |                  | A_Spec | Alpha_003 | 170.02     | 4.73 E+01 | 4.00 E-03 | 17.5 |
| 02           | U-235   | MBL         | 04/29/13 09:59     |                  | A_Spec | Alpha_004 | 170        | 4.98 E+00 | 6.00 E-03 | 19.4 |
| 03           | U-235   | DUP         | 04/29/13 09:59     |                  | A_Spec | Alpha_010 | 170.02     | 1.53 E+01 | 4.00 E-03 | 19.7 |
| 04           | U-235   | DO          | 04/29/13 09:59     |                  | A_Spec | Alpha_011 | 170.02     | 9.83 E+00 | 1.00 E-03 | 19.7 |
| 05           | U-235   | TRG         | 04/29/13 09:59     |                  | A_Spec | Alpha_013 | 170.02     | 9.83 E+00 | 1.00 E-03 | 18.7 |
| 06           | U-235   | TRG         | 04/29/13 09:59     |                  | A_Spec | Alpha_014 | 170        | 1.07 E+01 | 2.00 E-03 | 18.5 |
| 07           | U-235   | TRG         | 04/29/13 09:59     |                  | A_Spec | Alpha_018 | 170.02     | 9.15 E+00 | 5.00 E-03 | 17.8 |
| 08           | U-235   | TRG         | 04/29/13 10:00     |                  | A_Spec | Alpha_022 | 170        | 1.15 E+00 | 5.00 E-03 | 15.3 |
| 09           | U-235   | TRG         | 04/29/13 10:00     |                  | A_Spec | Alpha_024 | 170.02     | 6.60 E-01 | 2.00 E-03 | 17.1 |
| 10           | U-235   | TRG         | 04/29/13 10:00     |                  | A_Spec | Alpha_025 | 170        | 3.83 E+00 | 1.00 E-03 | 17.4 |
| 11           | U-235   | TRG         | 04/29/13 10:00     |                  | A_Spec | Alpha_027 | 170        | 1.66 E+00 | 2.00 E-03 | 17.3 |
| 12           | U-235   | TRG         | 04/29/13 10:00     |                  | A_Spec | Alpha_029 | 170        | 3.49 E+00 | 3.00 E-03 | 19.5 |
| 13           | U-235   | TRG         | 04/29/13 10:00     |                  | A_Spec | Alpha_033 | 170        | 8.30 E-01 | 1.00 E-03 | 18.2 |
| 14           | U-235   | TRG         | 04/29/13 10:00     |                  | A_Spec | Alpha_034 | 170        | 3.66 E+00 | 2.00 E-03 | 18.6 |
| 15           | U-235   | TRG         | 04/29/13 10:00     |                  | A_Spec | Alpha_035 | 170        | 8.83 E+00 | 1.00 E-03 | 18.3 |
| 16           | U-235   | TRG         | 04/29/13 10:00     |                  | A_Spec | Alpha_037 | 170        | 1.00 E+00 | 0.00 E+00 | 17.8 |
| 17           | U-235   | TRG         | 04/29/13 10:00     |                  | A_Spec | Alpha_040 | 170        | 4.83 E+00 | 1.00 E-03 | 19   |
| 18           | U-235   | TRG         | 04/29/13 10:00     |                  | A_Spec | Alpha_041 | 170        | 1.49 E+00 | 3.00 E-03 | 19.8 |
| 19           | U-235   | TRG         | 04/29/13 10:00     |                  | A_Spec | Alpha_042 | 170        | 2.49 E+00 | 3.00 E-03 | 18.5 |
|              |         |             |                    |                  |        |           |            |           |           |      |



Run **1**  
Analysis Code **UUISO**

Eberline Services Work Order **13-04105**

Client **Engineering Management Support, Inc.**

*Handwritten signature*

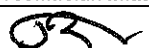
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| Internal Fraction | Sample Desc | Client ID     | Sample Date    | Sample Aliquot | Tracer Aliquot (g) | Tracer ACT (dpm) | Radiometric Tracer (pCi) | Radiometric % Rec | SAF 1* | SAF 2* |
|-------------------|-------------|---------------|----------------|----------------|--------------------|------------------|--------------------------|-------------------|--------|--------|
| 01 ✓              | LCS         | LCS           | 04/16/13 00:00 | 1.0000         | 0.6088             | 11.6244          |                          | 0.00              |        |        |
| 02                | MBL         | BLANK         | 04/16/13 00:00 | 1.0000         | 0.6035             | 11.5232          |                          | 0.00              |        |        |
| 03                | DUP         | PZ-204-SS TOT | 04/09/13 09:30 | 1.0000         | 0.6041             | 11.5347          |                          | 0.00              |        |        |
| 04                | DO          | PZ-204-SS TOT | 04/09/13 09:30 | 1.0000         | 0.6007             | 11.4698          |                          | 0.00              |        |        |
| 05                | TRG         | PZ-204-SS DIS | 04/09/13 09:30 | 1.0000         | 0.6027             | 11.5080          |                          | 0.00              |        |        |
| 06 14             | TRG         | I-68 TOT      | 04/09/13 10:44 | 1.0000         | 0.5969             | 11.3972          |                          | 0.00              |        |        |
| 07 18             | TRG         | I-68 DIS      | 04/09/13 10:44 | 1.0000         | 0.5996             | 11.4488          |                          | 0.00              |        |        |
| 08                | TRG         | D-87 TOT      | 04/09/13 11:05 | 1.0000         | 0.6002             | 11.4602          |                          | 0.00              |        |        |
| 09                | TRG         | D-87 DIS      | 04/09/13 11:05 | 1.0000         | 0.5968             | 11.3953          |                          | 0.00              |        |        |
| 10                | TRG         | PZ-106-SD TOT | 04/09/13 12:00 | 1.0000         | 0.5962             | 11.3838          |                          | 0.00              |        |        |
| 11                | TRG         | PZ-106-SD DIS | 04/09/13 12:00 | 1.0000         | 0.5965             | 11.3896          |                          | 0.00              |        |        |
| 12 29             | TRG         | S-82 TOT      | 04/09/13 12:27 | 1.0000         | 0.5969             | 11.3972          |                          | 0.00              |        |        |
| 13 7              | TRG         | S-82 DIS      | 04/09/13 12:27 | 1.0000         | 0.5661             | 10.8091          |                          | 0.00              |        |        |
| 14                | TRG         | PZ-106-SS TOT | 04/09/13 12:56 | 1.0000         | 0.5968             | 11.3953          |                          | 0.00              |        |        |
| 15                | TRG         | PZ-106-SS DIS | 04/09/13 12:56 | 1.0000         | 0.5965             | 11.3896          |                          | 0.00              |        |        |
| 16                | TRG         | I-9 TOT       | 04/09/13 13:35 | 1.0000         | 0.5985             | 11.4278          |                          | 0.00              |        |        |
| 17                | TRG         | I-9 DIS       | 04/09/13 13:35 | 1.0000         | 0.5943             | 11.3476          |                          | 0.00              |        |        |
| 18                | TRG         | D-93 TOT      | 04/09/13 14:28 | 1.0000         | 0.5968             | 11.3953          |                          | 0.00              |        |        |
| 19 4              | TRG         | D-93 DIS      | 04/09/13 14:28 | 1.0000         | 0.5949             | 11.3590          |                          | 0.00              |        |        |

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|                     |  |     |               |  |                 |            |  |   |  |                  |  |
|---------------------|--|-----|---------------|--|-----------------|------------|--|---|--|------------------|--|
| Internal Work Order |  | Run | Analysis Code |  | Date            | Technician |  | Technician Initials   |  | Witness Initials |  |
| 13-04105            |  | 1   | UUISO         |  | 4/24/2013 12:01 | JBARNARD   |  |  |  |                  |  |

| LCS & Matrix Spikes |       |                |               |                 | LCS             | MS              | LCSD            | MSD             | LCS       |                | MS        |                | LCSD      |                | MSD       |                |
|---------------------|-------|----------------|---------------|-----------------|-----------------|-----------------|-----------------|-----------------|-----------|----------------|-----------|----------------|-----------|----------------|-----------|----------------|
| Isotope             | Sol # | Activity dpm/g | Solution Date | Approx Addition | Volume Used (g) | Volume Used (g) | Volume Used (g) | Volume Used (g) | Known pCi | Error Estimate | Added pCi | Error Estimate | Known pCi | Error Estimate | Added pCi | Error Estimate |
| U-234               | U-8a  | 35.240         | 4/24/2013     | 0.500           | 0.5132          |                 |                 |                 | 8.15      | 0.293          | 0.00      | 0.000          | 0.00      | 0.000          | 0.00      | 0.000          |
| U-238               | U-8a  | 34.350         | 4/24/2013     | 0.500           | 0.5132          |                 |                 |                 | 7.94      | 0.286          | 0.00      | 0.000          | 0.00      | 0.000          | 0.00      | 0.000          |

| Tracers  |         |       |                |               |                 |                 | Balance Printer Tapes |  |  |  |  |          |  |  |  |  |
|----------|---------|-------|----------------|---------------|-----------------|-----------------|-----------------------|--|--|--|--|----------|--|--|--|--|
| fraction | Isotope | Sol # | Activity dpm/g | Solution Date | Volume Used (g) | Approx Addition | Tracer                |  |  |  |  | LCS      |  |  |  |  |
| 01       | U-232   | U-10a | 19.094         | 4/24/2013     | 0.6088          | 0.6300          |                       |  |  |  |  |          |  |  |  |  |
| 02       | U-232   | U-10a | 19.094         | 4/24/2013     | 0.6035          | 0.6300          |                       |  |  |  |  |          |  |  |  |  |
| 03       | U-232   | U-10a | 19.094         | 4/24/2013     | 0.6041          | 0.6300          | 0.6088 g              |  |  |  |  |          |  |  |  |  |
| 04       | U-232   | U-10a | 19.094         | 4/24/2013     | 0.6007          | 0.6300          | 0.6035 g              |  |  |  |  |          |  |  |  |  |
| 05       | U-232   | U-10a | 19.094         | 4/24/2013     | 0.6027          | 0.6300          | -0.6041 g             |  |  |  |  |          |  |  |  |  |
| 06       | U-232   | U-10a | 19.094         | 4/24/2013     | 0.5969          | 0.6300          | -0.6007 g             |  |  |  |  | 0.5132 g |  |  |  |  |
| 07       | U-232   | U-10a | 19.094         | 4/24/2013     | 0.5996          | 0.6300          | -0.6027 g             |  |  |  |  |          |  |  |  |  |
| 08       | U-232   | U-10a | 19.094         | 4/24/2013     | 0.6002          | 0.6300          | -0.5969 g             |  |  |  |  |          |  |  |  |  |
| 09       | U-232   | U-10a | 19.094         | 4/24/2013     | 0.5968          | 0.6300          | -0.5996 g             |  |  |  |  |          |  |  |  |  |
| 10       | U-232   | U-10a | 19.094         | 4/24/2013     | 0.5962          | 0.6300          | -0.6002 g             |  |  |  |  |          |  |  |  |  |
| 11       | U-232   | U-10a | 19.094         | 4/24/2013     | 0.5965          | 0.6300          | -0.5968 g             |  |  |  |  |          |  |  |  |  |
| 12       | U-232   | U-10a | 19.094         | 4/24/2013     | 0.5969          | 0.6300          | -0.5962 g             |  |  |  |  |          |  |  |  |  |
| 13       | U-232   | U-10a | 19.094         | 4/24/2013     | 0.5661          | 0.6300          | -0.5965 g             |  |  |  |  |          |  |  |  |  |
| 14       | U-232   | U-10a | 19.094         | 4/24/2013     | 0.5968          | 0.6300          | -0.5969 g             |  |  |  |  |          |  |  |  |  |
| 15       | U-232   | U-10a | 19.094         | 4/24/2013     | 0.5965          | 0.6300          | -0.5661 g             |  |  |  |  |          |  |  |  |  |
| 16       | U-232   | U-10a | 19.094         | 4/24/2013     | 0.5985          | 0.6300          | -0.5968 g             |  |  |  |  |          |  |  |  |  |
| 17       | U-232   | U-10a | 19.094         | 4/24/2013     | 0.5943          | 0.6300          | -0.5965 g             |  |  |  |  |          |  |  |  |  |
| 18       | U-232   | U-10a | 19.094         | 4/24/2013     | 0.5968          | 0.6300          | -0.5985 g             |  |  |  |  |          |  |  |  |  |
| 19       | U-232   | U-10a | 19.094         | 4/24/2013     | 0.5949          | 0.6300          | -0.5943 g             |  |  |  |  |          |  |  |  |  |
|          |         |       |                |               |                 |                 | -0.5968 g             |  |  |  |  |          |  |  |  |  |
|          |         |       |                |               |                 |                 | -0.5949 g             |  |  |  |  |          |  |  |  |  |

US EPA ARCHIVE DOCUMENT

0102

# Aliquot Worksheet

|                 |          |               |               |                 |                 |
|-----------------|----------|---------------|---------------|-----------------|-----------------|
| Work Order      | Run      | Analysis Code | Rpt Units     | Lab Deadline    | Technician      |
| <b>13-04105</b> | <b>1</b> | <b>UUISO</b>  | <b>liters</b> | <b>5/7/2013</b> | <b>JBARNARD</b> |

| Lab Fraction | Engineering Management Support, Inc.<br>Client ID | Sample<br>Type | Muffle Data       | Dilution Data |            |       | Aliquot Data |            | MS Aliquot Data |           | H-3 Solids Only     |                 |
|--------------|---|----------------|-------------------|---------------|------------|-------|--------------|------------|-----------------|-----------|---------------------|-----------------|
|              |   |                | Ratio<br>Post/Pre | No of Dils    | Dil Factor | Ratio | Aliquot      | Net Equiv  | Aliquot         | Net Equiv | Water Added<br>(ml) | H3 Dist<br>Aliq |
| 01           | LCS   | LCS            |                   |               |            |       | 1.0000E+00   | 1.0000E+00 |                 |           |                     |                 |
| 02           | BLANK   | MBL            |                   |               |            |       | 1.0000E+00   | 1.0000E+00 |                 |           |                     |                 |
| 03           | PZ-204-SS TOT                                     | DUP            |                   |               |            |       | 1.0000E+00   | 1.0000E+00 |                 |           |                     |                 |
| 04           | PZ-204-SS TOT                                     | DO             |                   |               |            |       | 1.0000E+00   | 1.0000E+00 |                 |           |                     |                 |
| 05           | PZ-204-SS DIS                                     | TRG            |                   |               |            |       | 1.0000E+00   | 1.0000E+00 |                 |           |                     |                 |
| 06           | I-68 TOT  | TRG            |                   |               |            |       | 1.0000E+00   | 1.0000E+00 |                 |           |                     |                 |
| 07           | I-68 DIS  | TRG            |                   |               |            |       | 1.0000E+00   | 1.0000E+00 |                 |           |                     |                 |
| 08           | D-87 TOT  | TRG            |                   |               |            |       | 1.0000E+00   | 1.0000E+00 |                 |           |                     |                 |
| 09           | D-87 DIS  | TRG            |                   |               |            |       | 1.0000E+00   | 1.0000E+00 |                 |           |                     |                 |
| 10           | PZ-106-SD TOT                                     | TRG            |                   |               |            |       | 1.0000E+00   | 1.0000E+00 |                 |           |                     |                 |
| 11           | PZ-106-SD DIS                                     | TRG            |                   |               |            |       | 1.0000E+00   | 1.0000E+00 |                 |           |                     |                 |
| 12           | S-82 TOT  | TRG            |                   |               |            |       | 1.0000E+00   | 1.0000E+00 |                 |           |                     |                 |
| 13           | S-82 DIS  | TRG            |                   |               |            |       | 1.0000E+00   | 1.0000E+00 |                 |           |                     |                 |
| 14           | PZ-106-SS TOT                                     | TRG            |                   |               |            |       | 1.0000E+00   | 1.0000E+00 |                 |           |                     |                 |
| 15           | PZ-106-SS DIS                                     | TRG            |                   |               |            |       | 1.0000E+00   | 1.0000E+00 |                 |           |                     |                 |
| 16           | I-9 TOT   | TRG            |                   |               |            |       | 1.0000E+00   | 1.0000E+00 |                 |           |                     |                 |
| 17           | I-9 DIS   | TRG            |                   |               |            |       | 1.0000E+00   | 1.0000E+00 |                 |           |                     |                 |
| 18           | D-93 TOT  | TRG            |                   |               |            |       | 1.0000E+00   | 1.0000E+00 |                 |           |                     |                 |
| 19           | D-93 DIS  | TRG            |                   |               |            |       | 1.0000E+00   | 1.0000E+00 |                 |           |                     |                 |

|          |  |
|----------|--|
| Comments |  |
|----------|--|

Technician: \_\_\_\_\_

*JB* Date: *4/24/13*



100  
4/29/13

# Apex-Alpha™

Sample Description: SPIKE  
 Spectrum File: \\OR-ALPHA1\Canberra\ApexAlpha\Root\Data\00000566  
 Batch Identification: 1304105A-UU  
 Sample Identification: 01  
 Sample Geometry: Shelf 2  
 Procedure Description: U iso

Detector Name: Alpha\_003  
 Chamber Serial Number:  
 Detector Serial Number: 3  
 Env. Background: System Bkgd 55734  
 Reagent Blank: <not performed>

Sample Size: 1.000E+000 +/- 0.000E+000 liter  
 Sample Date/Time: 4/29/2013 7:53:48 AM  
 Acquisition Date/Time: 4/29/2013 9:59:25 AM  
 Acquisition Live Time: 170.0 minutes  
 Acquisition Real Time: 170.0 minutes

Tracer Certificate: U232\_UU-10A  
 Tracer Quantity: 0.609 mL  
 Effective Efficiency: 0.2241 +/- 0.0119  
 Counting Efficiency: 0.1746 +/- 0.0033 on 12/15/2012 11:26:47 AM  
 Chem. Recovery Factor: 1.2831 +/- 0.0721

Control Certificate Name: NatU\_U-8A  
 Chem. Recov. of Control: U-238 0.928992 +/- 0.067449  
 Peak Match Tolerance: 0.150 MeV

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 PEAK AREA REPORT  
 -----

| Nuclide | Energy (MeV) | Net Pk Area | Pk Area Error % | Ambient Backgnd | Reagent Backgnd | FWHM (keV) |
|---------|--------------|-------------|-----------------|-----------------|-----------------|------------|
| U-232   | T 5.276      | 440.30      | 9.36            | 1.70            | 0.00E+000       | 6.8        |
| U-234   | 4.724        | 669.47      | 7.59            | 1.53            | 0.00E+000       | 26.8       |
| U-235   | 4.391        | 47.32       | 28.73           | 0.68            | 0.00E+000       | 6.0        |
| U-238   | 4.146        | 641.49      | 7.74            | 0.51            | 0.00E+000       | 22.7       |

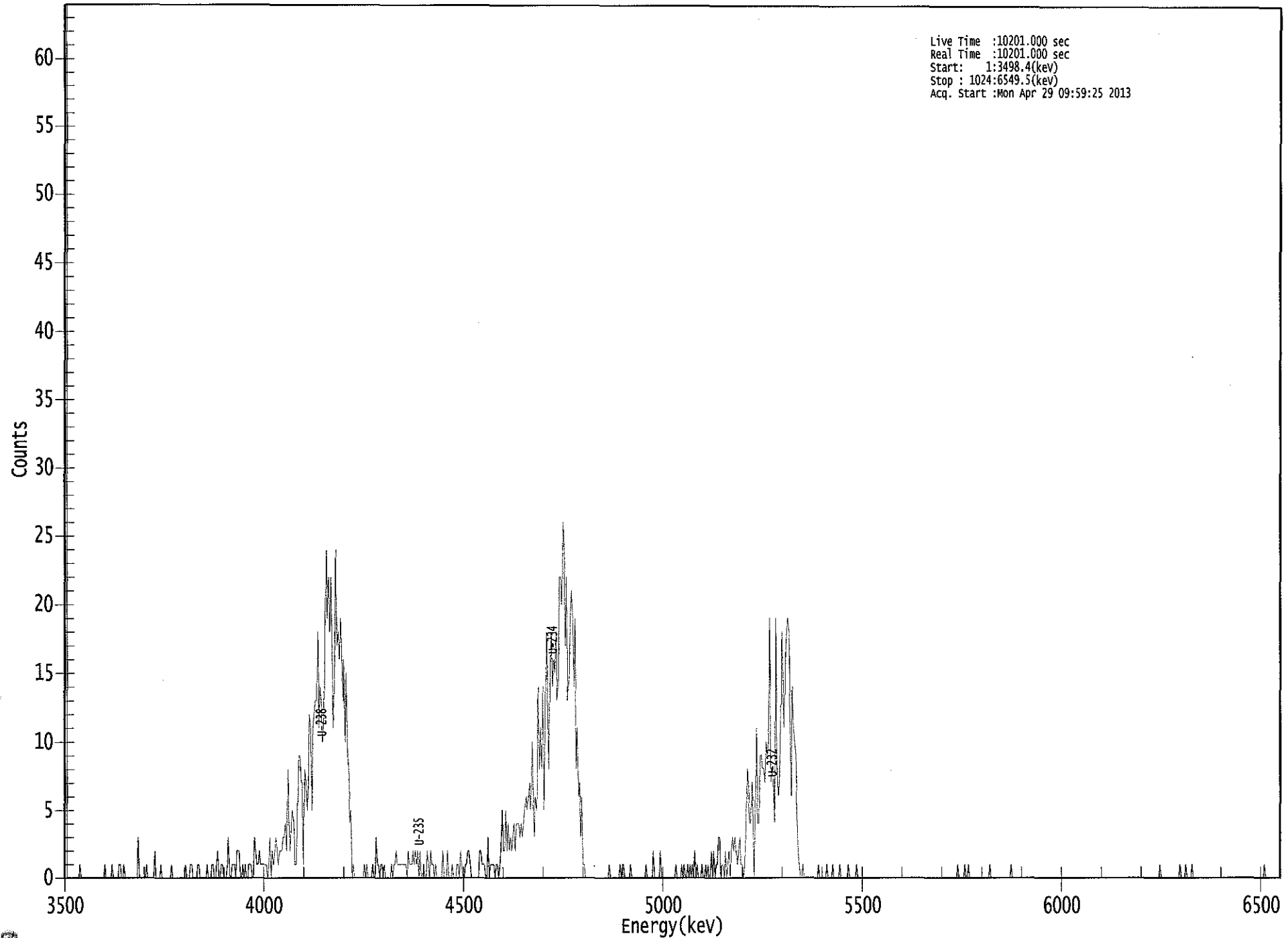
T = Tracer Peak used for Effective Efficiency

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 NUCLIDE ANALYSIS RESULTS  
 -----

| Nuclide | Id Conf. | Energy (keV) | Activity (pCi/liter )   | MDA (pCi/liter )        |
|---------|----------|--------------|-------------------------|-------------------------|
| U-232   | 0.995    | 5302.50*     | 5.22E+000 +/- 5.42E-001 | 8.70E-002 +/- 9.04E-003 |
| U-234   | 0.990    | 4761.50*     | 7.93E+000 +/- 1.02E+000 | 8.42E-002 +/- 8.75E-003 |
| U-235   | 1.000    | 4385.50*     | 6.92E-001 +/- 2.11E-001 | 8.24E-002 +/- 8.57E-003 |
| U-238   | 0.990    | 4184.40*     | 7.57E+000 +/- 9.81E-001 | 6.19E-002 +/- 6.43E-003 |

AG  
4/29/13

US EPA ARCHIVE DOCUMENT



Live Time :10201.000 sec  
Real Time :10201.000 sec  
Start: 1:3498.4(kev)  
Stop : 1024:6549.5(kev)  
Acq. Start :Mon Apr 29 09:59:25 2013

ROI Type: 1

ROI Type: 3

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

Sample Title: 01

Elapsed Live time: 10201

Elapsed Real Time: 10201

Table with 9 columns and 36 rows of channel data. Columns represent different time intervals or counts, and rows represent channel numbers from 1 to 361.

369: 5 2 2 5 2 4 2 3

Sample Title: 01

| Channel | 1  | 2  | 3  | 4  | 5  | 6  | 7  | 8  | 9 |
|---------|----|----|----|----|----|----|----|----|---|
| 377:    | 2  | 3  | 4  | 2  | 4  | 4  | 4  | 3  |   |
| 385:    | 4  | 3  | 4  | 5  | 6  | 5  | 6  | 7  |   |
| 393:    | 5  | 10 | 6  | 3  | 6  | 5  | 14 | 8  |   |
| 401:    | 11 | 8  | 14 | 5  | 12 | 18 | 13 | 8  |   |
| 409:    | 15 | 18 | 14 | 16 | 15 | 18 | 13 | 14 |   |
| 417:    | 22 | 22 | 20 | 26 | 24 | 17 | 22 | 13 |   |
| 425:    | 15 | 19 | 21 | 19 | 14 | 19 | 8  | 11 |   |
| 433:    | 6  | 7  | 3  | 6  | 1  | 1  | 0  | 0  |   |
| 441:    | 0  | 0  | 0  | 0  | 0  | 0  | 0  | 0  |   |
| 449:    | 0  | 0  | 0  | 0  | 0  | 0  | 0  | 0  |   |
| 457:    | 0  | 0  | 1  | 0  | 0  | 0  | 0  | 0  |   |
| 465:    | 0  | 0  | 0  | 1  | 0  | 1  | 1  | 0  |   |
| 473:    | 0  | 0  | 0  | 0  | 1  | 0  | 0  | 0  |   |
| 481:    | 0  | 0  | 0  | 0  | 0  | 0  | 0  | 0  |   |
| 489:    | 0  | 1  | 0  | 0  | 0  | 0  | 0  | 2  |   |
| 497:    | 0  | 0  | 0  | 0  | 0  | 2  | 0  | 0  |   |
| 505:    | 0  | 0  | 0  | 0  | 0  | 0  | 0  | 0  |   |
| 513:    | 0  | 0  | 1  | 0  | 0  | 0  | 0  | 1  |   |
| 521:    | 0  | 1  | 0  | 0  | 1  | 0  | 1  | 0  |   |
| 529:    | 1  | 0  | 2  | 0  | 1  | 0  | 0  | 0  |   |
| 537:    | 1  | 0  | 0  | 1  | 0  | 1  | 0  | 0  |   |
| 545:    | 2  | 0  | 2  | 0  | 1  | 1  | 3  | 3  |   |
| 553:    | 0  | 1  | 1  | 0  | 2  | 0  | 1  | 2  |   |
| 561:    | 0  | 2  | 3  | 2  | 3  | 2  | 1  | 2  |   |
| 569:    | 3  | 1  | 1  | 0  | 1  | 3  | 8  | 7  |   |
| 577:    | 4  | 4  | 7  | 5  | 0  | 5  | 11 | 4  |   |
| 585:    | 4  | 9  | 9  | 8  | 8  | 7  | 10 | 9  |   |
| 593:    | 10 | 19 | 7  | 8  | 7  | 4  | 19 | 9  |   |
| 601:    | 6  | 7  | 11 | 18 | 14 | 11 | 16 | 18 |   |
| 609:    | 19 | 18 | 12 | 6  | 14 | 11 | 10 | 9  |   |
| 617:    | 5  | 2  | 1  | 0  | 0  | 1  | 0  | 0  |   |
| 625:    | 0  | 0  | 0  | 0  | 0  | 0  | 0  | 0  |   |
| 633:    | 0  | 0  | 1  | 0  | 0  | 0  | 0  | 0  |   |
| 641:    | 0  | 1  | 0  | 0  | 0  | 0  | 1  | 0  |   |
| 649:    | 0  | 0  | 0  | 0  | 1  | 0  | 0  | 0  |   |
| 657:    | 0  | 0  | 0  | 1  | 0  | 0  | 0  | 0  |   |
| 665:    | 0  | 0  | 1  | 0  | 0  | 0  | 0  | 0  |   |
| 673:    | 0  | 0  | 0  | 0  | 0  | 0  | 0  | 0  |   |
| 681:    | 0  | 0  | 0  | 0  | 0  | 0  | 0  | 0  |   |
| 689:    | 0  | 0  | 0  | 0  | 0  | 0  | 0  | 0  |   |
| 697:    | 0  | 0  | 0  | 0  | 0  | 0  | 0  | 0  |   |
| 705:    | 0  | 0  | 0  | 0  | 0  | 0  | 0  | 0  |   |
| 713:    | 0  | 0  | 0  | 0  | 0  | 0  | 0  | 0  |   |
| 721:    | 0  | 0  | 0  | 0  | 0  | 0  | 0  | 0  |   |
| 729:    | 0  | 0  | 0  | 0  | 0  | 0  | 0  | 0  |   |
| 737:    | 0  | 0  | 0  | 0  | 0  | 0  | 0  | 0  |   |
| 745:    | 0  | 0  | 0  | 0  | 0  | 0  | 0  | 1  |   |
| 753:    | 0  | 0  | 0  | 0  | 0  | 1  | 0  | 0  |   |
| 761:    | 1  | 0  | 0  | 0  | 0  | 0  | 0  | 0  |   |
| 769:    | 0  | 0  | 0  | 0  | 0  | 0  | 0  | 0  |   |
| 777:    | 0  | 0  | 1  | 0  | 0  | 0  | 0  | 0  |   |
| 785:    | 0  | 0  | 0  | 0  | 0  | 0  | 0  | 0  |   |
| 793:    | 0  | 0  | 0  | 0  | 1  | 0  | 0  | 0  |   |

801: 0 0 0 0 0 0 0 0

Sample Title: 01

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

LCB  
4/29/13

# Apex-Alpha™

Sample Description: BLANK  
 Spectrum File: \\OR-ALPHA1\Canberra\ApexAlpha\Root\Data\00000566  
 Batch Identification: 1304105A-UU  
 Sample Identification: 02  
 Sample Geometry: Shelf 2  
 Procedure Description: U iso

Detector Name: Alpha\_004  
 Chamber Serial Number:  
 Detector Serial Number: 4  
 Env. Background: System Bkgd 55735  
 Reagent Blank: <not performed>

Sample Size: 1.000E+000 +/- 0.000E+000 liter  
 Sample Date/Time: 4/29/2013 7:53:48 AM  
 Acquisition Date/Time: 4/29/2013 9:59:26 AM  
 Acquisition Live Time: 170.0 minutes  
 Acquisition Real Time: 170.0 minutes

Tracer Certificate: U232\_UU-10A  
 Tracer Quantity: 0.604 mL  
 Effective Efficiency: 0.2434 +/- 0.0125  
 Counting Efficiency: 0.1940 +/- 0.0036 on 12/15/2012 11:26:46 AM  
 Chem. Recovery Factor: 1.2547 +/- 0.0685

Peak Match Tolerance: 0.150 MeV

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

| Nuclide | Energy (MeV) | Net Pk Area | Pk Area Error % | Ambient Backgnd | Reagent Backgnd | FWHM (keV) |
|---------|--------------|-------------|-----------------|-----------------|-----------------|------------|
| U-232   | T 5.277      | 474.15      | 9.01            | 0.85            | 0.00E+000       | 30.8       |
| U-234   | 4.764        | 2.15        | 161.66          | 0.85            | 0.00E+000       | 2.9        |
| U-235   | 4.410        | 4.98        | 97.79           | 1.02            | 0.00E+000       | 2.9        |
| U-238   | 4.190        | 1.83        | 152.56          | 0.17            | 0.00E+000       | 2.9        |

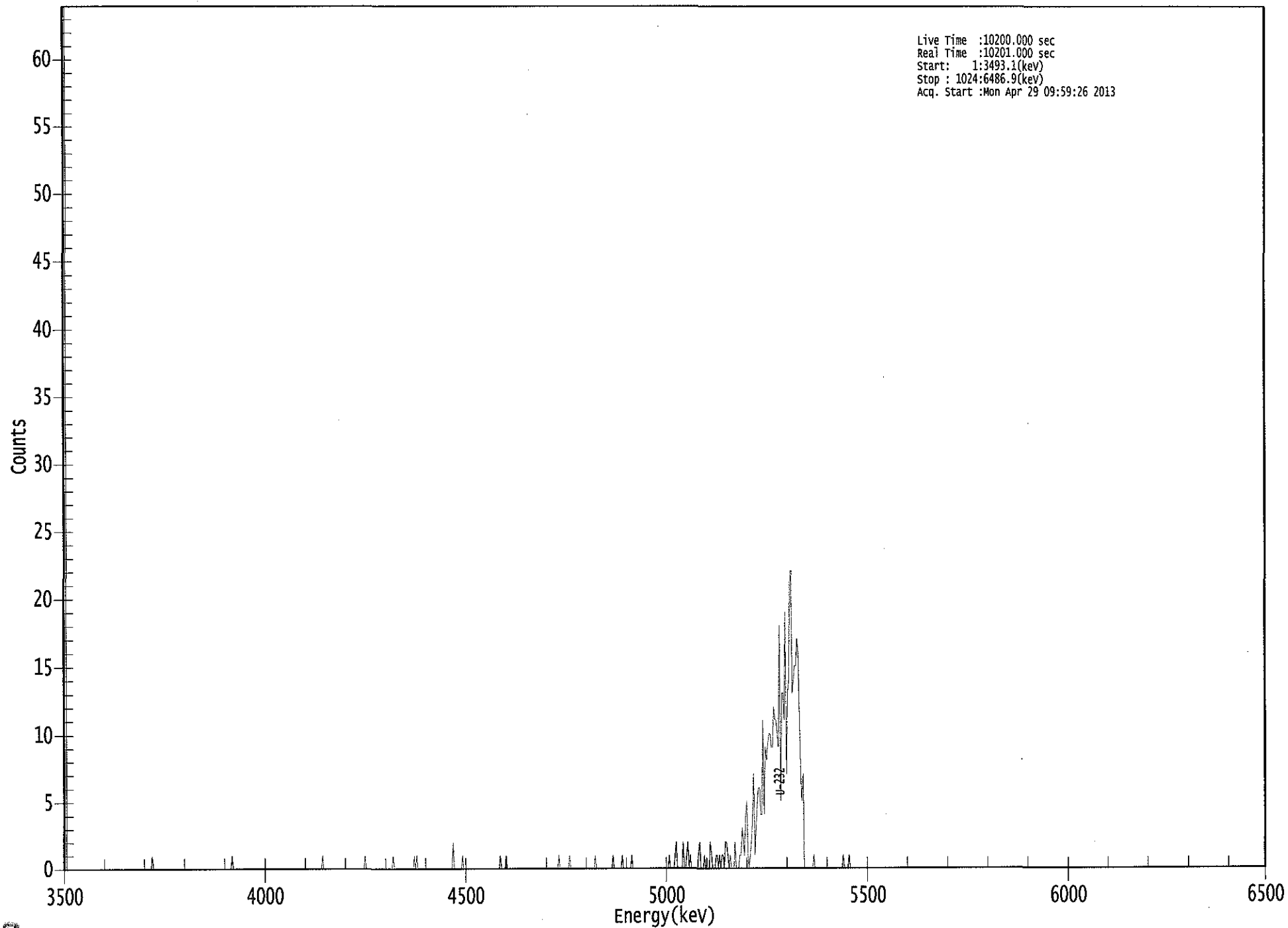
T = Tracer Peak used for Effective Efficiency

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

| Nuclide | Id Conf. | Energy (keV) | Activity (pCi/liter )   | MDA (pCi/liter )        |
|---------|----------|--------------|-------------------------|-------------------------|
| U-232   | 0.995    | 5302.50*     | 5.17E+000 +/- 5.21E-001 | 6.53E-002 +/- 6.58E-003 |
| U-234   | 1.000    | 4761.50*     | 2.34E-002 +/- 3.80E-002 | 6.53E-002 +/- 6.58E-003 |
| U-235   | 0.996    | 4385.50*     | 6.70E-002 +/- 6.59E-002 | 8.48E-002 +/- 8.54E-003 |
| U-238   | 1.000    | 4184.40*     | 1.99E-002 +/- 3.04E-002 | 4.53E-002 +/- 4.57E-003 |

AG  
4/29/13

US EPA ARCHIVE DOCUMENT



0110

ROI Type: 1

ROI Type: 3

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

Sample Title: 02

Elapsed Live time: 10200

Elapsed Real Time: 10201

| Channel | ----- | ----- | ----- | ----- | ----- | ----- | ----- |
|---------|-------|-------|-------|-------|-------|-------|-------|
| 1:      | 10201 | 10200 | 0     | 0     | 0     | 0     | 0     |
| 9:      | 0     | 0     | 0     | 0     | 0     | 0     | 0     |
| 17:     | 0     | 0     | 0     | 0     | 0     | 0     | 0     |
| 25:     | 0     | 0     | 0     | 0     | 0     | 0     | 0     |
| 33:     | 0     | 0     | 0     | 0     | 0     | 0     | 0     |
| 41:     | 0     | 0     | 0     | 0     | 0     | 0     | 0     |
| 49:     | 0     | 0     | 0     | 0     | 0     | 0     | 0     |
| 57:     | 0     | 0     | 0     | 0     | 0     | 0     | 0     |
| 65:     | 0     | 0     | 0     | 0     | 0     | 0     | 0     |
| 73:     | 0     | 0     | 0     | 1     | 0     | 0     | 0     |
| 81:     | 0     | 0     | 0     | 0     | 0     | 0     | 0     |
| 89:     | 0     | 0     | 0     | 0     | 0     | 0     | 0     |
| 97:     | 0     | 0     | 0     | 0     | 0     | 0     | 0     |
| 105:    | 0     | 0     | 0     | 0     | 0     | 0     | 0     |
| 113:    | 0     | 0     | 0     | 0     | 0     | 0     | 0     |
| 121:    | 0     | 0     | 0     | 0     | 0     | 0     | 0     |
| 129:    | 0     | 0     | 0     | 0     | 0     | 0     | 0     |
| 137:    | 0     | 0     | 0     | 0     | 0     | 0     | 1     |
| 145:    | 0     | 0     | 0     | 0     | 0     | 0     | 0     |
| 153:    | 0     | 0     | 0     | 0     | 0     | 0     | 0     |
| 161:    | 0     | 0     | 0     | 0     | 0     | 0     | 0     |
| 169:    | 0     | 0     | 0     | 0     | 0     | 0     | 0     |
| 177:    | 0     | 0     | 0     | 0     | 0     | 0     | 0     |
| 185:    | 0     | 0     | 0     | 0     | 0     | 0     | 0     |
| 193:    | 0     | 0     | 0     | 0     | 0     | 0     | 0     |
| 201:    | 0     | 0     | 0     | 0     | 0     | 0     | 0     |
| 209:    | 0     | 0     | 0     | 0     | 0     | 0     | 0     |
| 217:    | 0     | 0     | 0     | 0     | 1     | 0     | 0     |
| 225:    | 0     | 0     | 0     | 0     | 0     | 0     | 0     |
| 233:    | 0     | 0     | 0     | 0     | 0     | 0     | 0     |
| 241:    | 0     | 0     | 0     | 0     | 0     | 0     | 0     |
| 249:    | 0     | 0     | 0     | 0     | 0     | 0     | 0     |
| 257:    | 1     | 0     | 0     | 0     | 0     | 0     | 0     |
| 265:    | 0     | 0     | 0     | 0     | 0     | 0     | 0     |
| 273:    | 0     | 0     | 0     | 0     | 0     | 0     | 0     |
| 281:    | 1     | 0     | 0     | 0     | 0     | 0     | 0     |
| 289:    | 0     | 0     | 0     | 0     | 0     | 0     | 0     |
| 297:    | 0     | 0     | 1     | 0     | 1     | 0     | 0     |
| 305:    | 0     | 0     | 0     | 0     | 0     | 0     | 0     |
| 313:    | 0     | 0     | 0     | 0     | 0     | 0     | 0     |
| 321:    | 0     | 0     | 0     | 0     | 0     | 0     | 0     |
| 329:    | 0     | 0     | 0     | 2     | 0     | 0     | 0     |
| 337:    | 0     | 0     | 0     | 1     | 0     | 0     | 0     |
| 345:    | 0     | 0     | 0     | 0     | 0     | 0     | 0     |
| 353:    | 0     | 0     | 0     | 0     | 0     | 0     | 0     |
| 361:    | 0     | 0     | 0     | 0     | 0     | 0     | 0     |



369: 0 0 0 1 0 0 0 0

Sample Title: 02

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

801: 0 0 0 0 0 0 0 0

Sample Title: 02

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

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# Apex-Alpha™

Sample Description: PZ-204-SS TOT-DUP  
 Spectrum File: \\OR-ALPHA1\Canberra\ApexAlpha\Root\Data\00000566  
 Batch Identification: 1304105A-UU  
 Sample Identification: 03  
 Sample Geometry: Shelf 2  
 Procedure Description: U iso

Detector Name: Alpha\_010  
 Chamber Serial Number:  
 Detector Serial Number: 10  
 Env. Background: System Bkgd 55736  
 Reagent Blank: <not performed>

Sample Size: 1.000E+000 +/- 0.000E+000 liter  
 Sample Date/Time: 4/9/2013 7:53:48 AM  
 Acquisition Date/Time: 4/29/2013 9:59:21 AM  
 Acquisition Live Time: 170.0 minutes  
 Acquisition Real Time: 170.0 minutes

Tracer Certificate: U232\_UU-10A  
 Tracer Quantity: 0.604 mL  
 Effective Efficiency: 0.2573 +/- 0.0130  
 Counting Efficiency: 0.1967 +/- 0.0036 on 12/15/2012 11:26:40 AM  
 Chem. Recovery Factor: 1.3078 +/- 0.0700

Peak Match Tolerance: 0.150 MeV

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 PEAK AREA REPORT  
 -----

| Nuclide | Energy (MeV) | Net Pk Area | Pk Area Error % | Ambient Backgnd | Reagent Backgnd | FWHM (keV) |
|---------|--------------|-------------|-----------------|-----------------|-----------------|------------|
| U-232   | T 5.274      | 501.62      | 8.78            | 2.38            | 0.00E+000       | 9.9        |
| U-234   | 4.732        | 283.30      | 11.69           | 1.70            | 0.00E+000       | 17.0       |
| U-235   | 4.406        | 15.32       | 51.36           | 0.68            | 0.00E+000       | 4.4        |
| U-238   | 4.142        | 186.81      | 14.39           | 1.19            | 0.00E+000       | 7.3        |

T = Tracer Peak used for Effective Efficiency

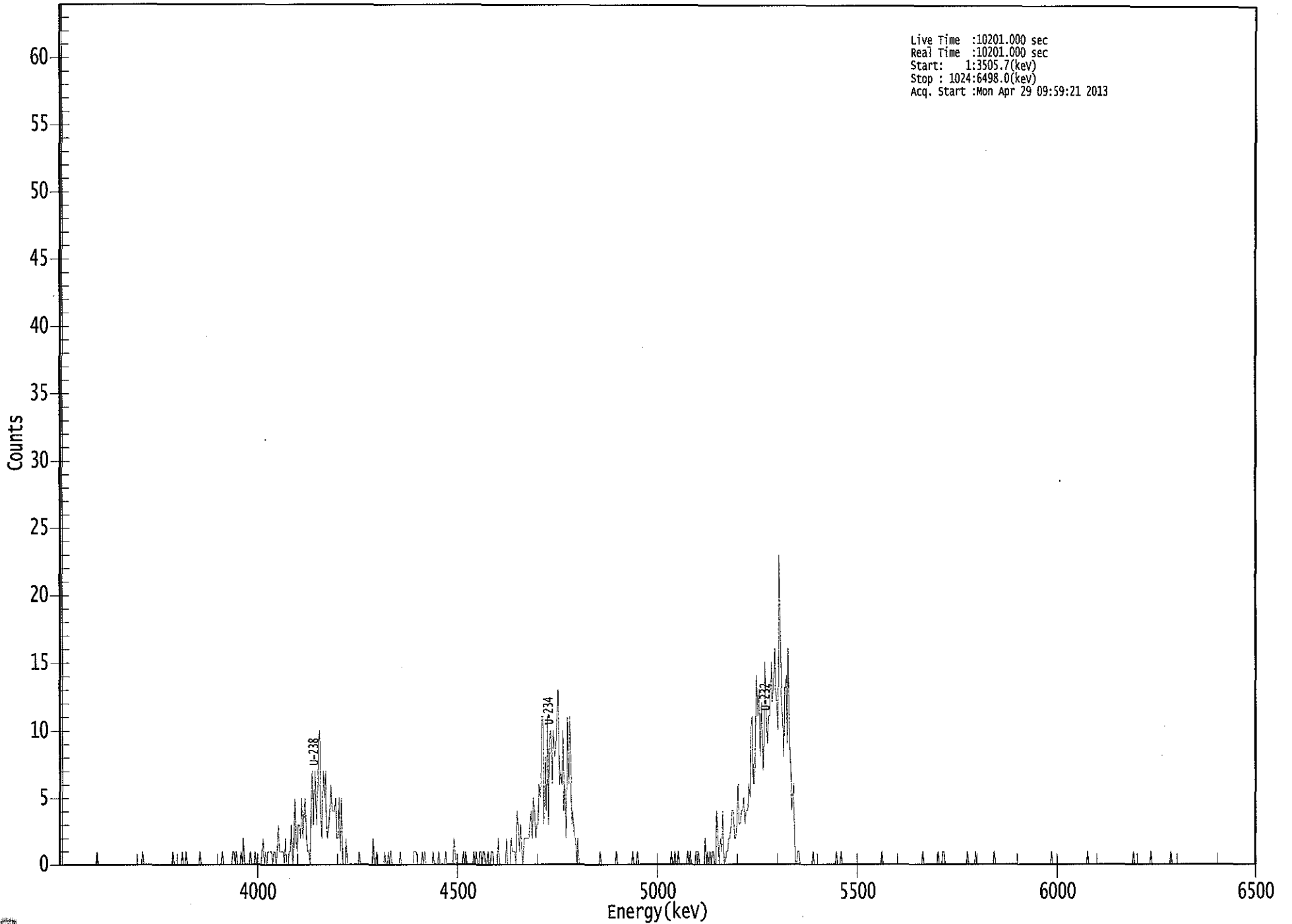
-----  
 NUCLIDE ANALYSIS RESULTS  
 -----

| Nuclide | Id Conf. | Energy (keV) | Activity (pCi/liter)    | MDA (pCi/liter)         |
|---------|----------|--------------|-------------------------|-------------------------|
| U-232   | 0.994    | 5302.50*     | 5.18E+000 +/- 5.11E-001 | 8.46E-002 +/- 8.35E-003 |
| U-234   | 0.994    | 4761.50*     | 2.92E+000 +/- 4.47E-001 | 7.58E-002 +/- 7.48E-003 |
| U-235   | 0.997    | 4385.50*     | 1.95E-001 +/- 1.02E-001 | 7.18E-002 +/- 7.08E-003 |
| U-238   | 0.987    | 4184.40*     | 1.92E+000 +/- 3.35E-001 | 6.77E-002 +/- 6.68E-003 |

AG  
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US EPA ARCHIVE DOCUMENT

0000056608.CNF



Live Time :10201.000 sec  
Real Time :10201.000 sec  
Start : 1:3505.7(keV)  
Stop : 1024:6498.0(keV)  
Acq. Start :Mon Apr 29 09:59:21 2013

ROI Type: 1

ROI Type: 3

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

Sample Title: 03

Elapsed Live time: 10201

Elapsed Real Time: 10201

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

369: 0 1 1 0 0 0 0 2

Sample Title: 03

| Channel | 1  | 2  | 3  | 4  | 5  | 6  | 7  | 8  |
|---------|----|----|----|----|----|----|----|----|
| 377:    | 0  | 0  | 0  | 0  | 0  | 0  | 2  | 0  |
| 385:    | 0  | 0  | 2  | 1  | 1  | 1  | 0  | 4  |
| 393:    | 3  | 1  | 3  | 1  | 0  | 2  | 2  | 2  |
| 401:    | 2  | 2  | 3  | 4  | 2  | 5  | 4  | 2  |
| 409:    | 3  | 3  | 6  | 5  | 11 | 11 | 3  | 8  |
| 417:    | 4  | 11 | 3  | 10 | 10 | 6  | 10 | 8  |
| 425:    | 9  | 11 | 13 | 6  | 7  | 6  | 10 | 4  |
| 433:    | 6  | 2  | 11 | 6  | 11 | 7  | 3  | 4  |
| 441:    | 2  | 2  | 0  | 2  | 0  | 0  | 0  | 0  |
| 449:    | 0  | 0  | 0  | 0  | 0  | 0  | 0  | 0  |
| 457:    | 0  | 0  | 0  | 0  | 0  | 0  | 1  | 0  |
| 465:    | 0  | 0  | 0  | 0  | 0  | 0  | 0  | 0  |
| 473:    | 0  | 0  | 0  | 0  | 1  | 0  | 0  | 0  |
| 481:    | 0  | 0  | 0  | 0  | 0  | 0  | 0  | 0  |
| 489:    | 0  | 0  | 1  | 0  | 0  | 0  | 1  | 0  |
| 497:    | 0  | 0  | 0  | 0  | 0  | 0  | 0  | 0  |
| 505:    | 0  | 0  | 0  | 0  | 0  | 0  | 0  | 0  |
| 513:    | 0  | 0  | 0  | 0  | 0  | 0  | 0  | 0  |
| 521:    | 0  | 0  | 0  | 1  | 0  | 0  | 1  | 0  |
| 529:    | 0  | 1  | 0  | 0  | 0  | 0  | 0  | 0  |
| 537:    | 0  | 1  | 0  | 1  | 0  | 0  | 0  | 0  |
| 545:    | 1  | 1  | 1  | 0  | 0  | 0  | 0  | 0  |
| 553:    | 2  | 0  | 1  | 0  | 1  | 0  | 1  | 1  |
| 561:    | 0  | 0  | 4  | 2  | 0  | 2  | 1  | 4  |
| 569:    | 0  | 0  | 1  | 1  | 2  | 2  | 3  | 4  |
| 577:    | 4  | 2  | 2  | 3  | 6  | 3  | 3  | 4  |
| 585:    | 4  | 5  | 3  | 4  | 4  | 6  | 5  | 10 |
| 593:    | 11 | 6  | 6  | 10 | 14 | 11 | 13 | 8  |
| 601:    | 12 | 7  | 9  | 15 | 11 | 9  | 11 | 11 |
| 609:    | 15 | 12 | 13 | 16 | 13 | 12 | 10 | 23 |
| 617:    | 17 | 12 | 11 | 8  | 13 | 14 | 9  | 16 |
| 625:    | 9  | 7  | 4  | 6  | 4  | 0  | 0  | 1  |
| 633:    | 1  | 0  | 0  | 0  | 0  | 0  | 0  | 0  |
| 641:    | 0  | 0  | 0  | 0  | 1  | 0  | 0  | 0  |
| 649:    | 0  | 0  | 0  | 0  | 0  | 0  | 0  | 0  |
| 657:    | 0  | 0  | 0  | 0  | 0  | 0  | 0  | 0  |
| 665:    | 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  | 0  | 0  | 0  | 0  | 0  | 0  | 0  |
| 697:    | 0  | 0  | 0  | 0  | 0  | 0  | 0  | 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  | 1  | 0  | 0  | 0  | 0  | 0  |
| 745:    | 0  | 0  | 0  | 0  | 0  | 0  | 0  | 1  |
| 753:    | 0  | 0  | 0  | 1  | 1  | 0  | 0  | 0  |
| 761:    | 0  | 0  | 0  | 0  | 0  | 0  | 0  | 0  |
| 769:    | 0  | 0  | 0  | 0  | 0  | 0  | 0  | 0  |
| 777:    | 1  | 0  | 0  | 0  | 0  | 0  | 0  | 1  |
| 785:    | 0  | 0  | 0  | 0  | 0  | 0  | 0  | 0  |
| 793:    | 0  | 0  | 0  | 0  | 0  | 0  | 0  | 1  |

801: 0 0 0 0 0 0 0 0

Sample Title: 03

| Channel | 1 | 2 | 3 | 4 | 5 | 6 | 7 | 8 |
|---------|---|---|---|---|---|---|---|---|
| 809:    | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 |
| 817:    | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 |
| 825:    | 0 | 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 | 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 | 0 | 0 | 0 | 0 | 0 | 0 | 0 |
| 913:    | 0 | 0 | 0 | 0 | 0 | 0 | 1 | 0 |
| 921:    | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 |
| 929:    | 0 | 0 | 0 | 0 | 0 | 1 | 0 | 0 |
| 937:    | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 |
| 945:    | 0 | 0 | 0 | 0 | 0 | 0 | 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 | 0 |

ICIS  
4/29/13

# Apex-Alpha™

Sample Description: PZ-204-SS TOT  
 Spectrum File: \\OR-ALPHA1\Canberra\ApexAlpha\Root\Data\00000566  
 Batch Identification: 1304105A-UU  
 Sample Identification: 04  
 Sample Geometry: Shelf 2  
 Procedure Description: U iso

Detector Name: Alpha\_011  
 Chamber Serial Number:  
 Detector Serial Number: 11  
 Env. Background: System Bkgd 55737  
 Reagent Blank: <not performed>

Sample Size: 1.000E+000 +/- 0.000E+000 liter  
 Sample Date/Time: 4/9/2013 7:53:48 AM  
 Acquisition Date/Time: 4/29/2013 9:59:22 AM  
 Acquisition Live Time: 170.0 minutes  
 Acquisition Real Time: 170.0 minutes

Tracer Certificate: U232\_UU-10A  
 Tracer Quantity: 0.601 mL  
 Effective Efficiency: 0.2227 +/- 0.0119  
 Counting Efficiency: 0.1973 +/- 0.0042 on 12/15/2012 11:28:06 AM  
 Chem. Recovery Factor: 1.1288 +/- 0.0647

Peak Match Tolerance: 0.150 MeV

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 PEAK AREA REPORT  
 -----

| Nuclide | Energy (MeV) | Net Pk Area | Pk Area Error % | Ambient Backgnd | Reagent Backgnd | FWHM (keV) |
|---------|--------------|-------------|-----------------|-----------------|-----------------|------------|
| U-232   | T 5.276      | 431.83      | 9.43            | 0.17            | 0.00E+000       | 9.7        |
| U-234   | 4.725        | 268.66      | 11.97           | 0.34            | 0.00E+000       | 5.9        |
| U-235   | 4.365        | 9.83        | 63.14           | 0.17            | 0.00E+000       | 2.7        |
| U-238   | 4.141        | 207.83      | 13.60           | 0.17            | 0.00E+000       | 7.1        |

T = Tracer Peak used for Effective Efficiency

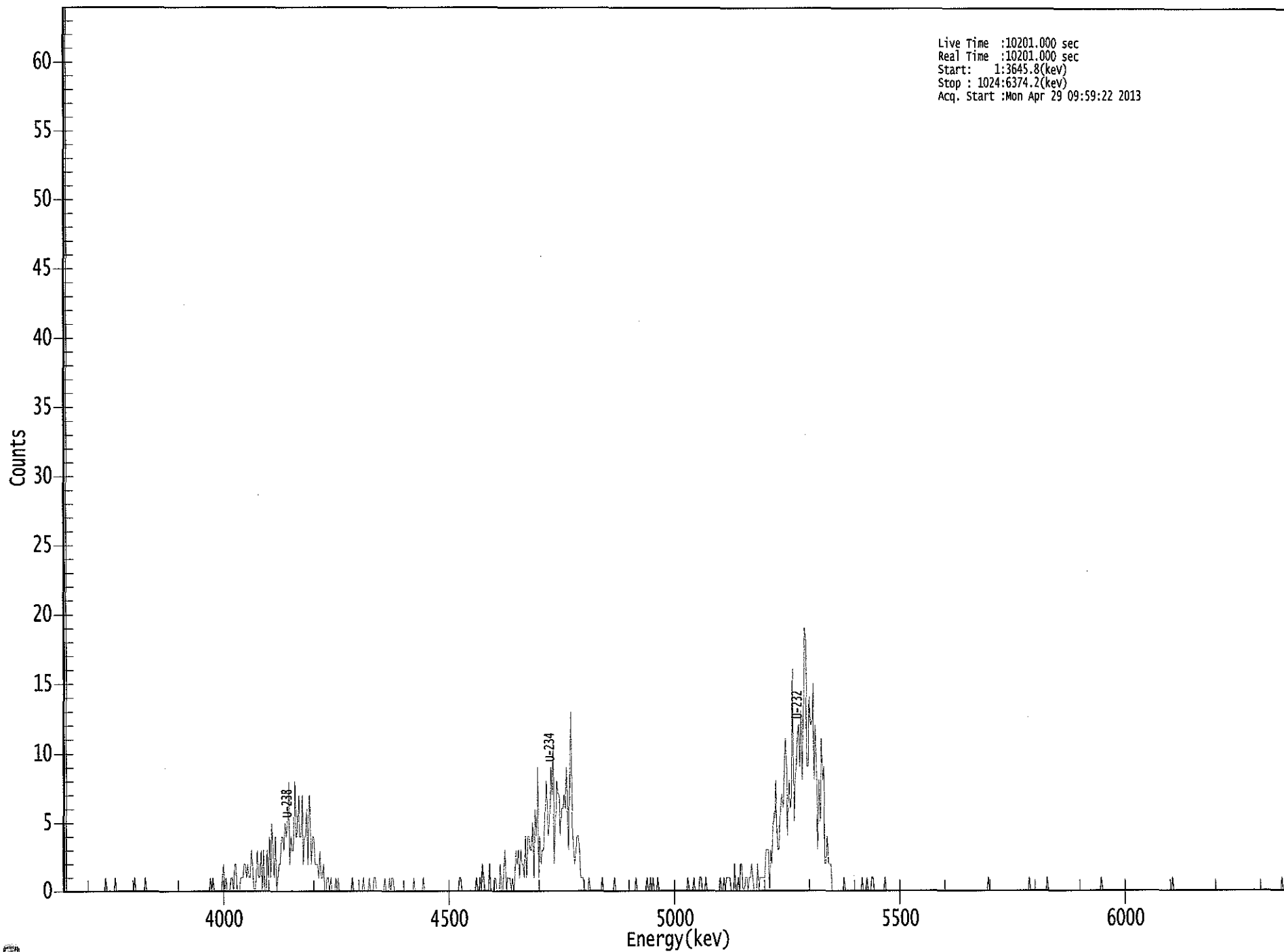
-----  
 NUCLIDE ANALYSIS RESULTS  
 -----

| Nuclide | Id Conf. | Energy (keV) | Activity (pCi/liter)    | MDA (pCi/liter)         |
|---------|----------|--------------|-------------------------|-------------------------|
| U-232   | 0.995    | 5302.50*     | 5.15E+000 +/- 5.39E-001 | 4.98E-002 +/- 5.20E-003 |
| U-234   | 0.990    | 4761.50*     | 3.20E+000 +/- 5.09E-001 | 5.70E-002 +/- 5.96E-003 |
| U-235   | 0.997    | 4385.50*     | 1.45E-001 +/- 9.25E-002 | 6.14E-002 +/- 6.42E-003 |
| U-238   | 0.987    | 4184.40*     | 2.47E+000 +/- 4.23E-001 | 4.95E-002 +/- 5.18E-003 |

AG  
4/29/13

US EPA ARCHIVE DOCUMENT





Live Time :10201.000 sec  
Real Time :10201.000 sec  
Start: 1:3645.8(keV)  
Stop : 1024:6374.2(keV)  
Acq. Start :Mon Apr 29 09:59:22 2013

ROI Type: 1

ROI Type: 3

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

Sample Title: 04

Elapsed Live time: 10201

Elapsed Real Time: 10201

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

369: 0 1 1 1 0 1 0 1

Sample Title: 04

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

801: 0 0 0 1 0 0 0 0

Sample Title: 04

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

103  
4/29/13

# Apex-Alpha™

Sample Description: PZ-204-SS DIS  
 Spectrum File: \\OR-ALPHA1\Canberra\ApexAlpha\Root\Data\00000566  
 Batch Identification: 1304105A-UU  
 Sample Identification: 05  
 Sample Geometry: Shelf 2  
 Procedure Description: U iso

Detector Name: Alpha\_013  
 Chamber Serial Number:  
 Detector Serial Number: 13  
 Env. Background: System Bkgd 55738  
 Reagent Blank: <not performed>

Sample Size: 1.000E+000 +/- 0.000E+000 liter  
 Sample Date/Time: 4/9/2013 7:53:48 AM  
 Acquisition Date/Time: 4/29/2013 9:59:23 AM  
 Acquisition Live Time: 170.0 minutes  
 Acquisition Real Time: 170.0 minutes

Tracer Certificate: U232\_UU-10A  
 Tracer Quantity: 0.603 mL  
 Effective Efficiency: 0.2532 +/- 0.0128  
 Counting Efficiency: 0.1869 +/- 0.0035 on 12/15/2012 11:26:45 AM  
 Chem. Recovery Factor: 1.3545 +/- 0.0731

Peak Match Tolerance: 0.150 MeV

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 PEAK AREA REPORT  
 -----

| Nuclide | Energy (MeV) | Net Pk Area | Pk Area Error % | Ambient Backgnd | Reagent Backgnd | FWHM (keV) |
|---------|--------------|-------------|-----------------|-----------------|-----------------|------------|
| U-232   | T 5.287      | 492.47      | 8.85            | 1.53            | 0.00E+000       | 32.0       |
| U-234   | 4.743        | 333.49      | 10.74           | 0.51            | 0.00E+000       | 12.8       |
| U-235   | 4.433        | 9.83        | 63.14           | 0.17            | 0.00E+000       | 2.8        |
| U-238   | 4.157        | 168.49      | 15.13           | 0.51            | 0.00E+000       | 19.2       |

T = Tracer Peak used for Effective Efficiency

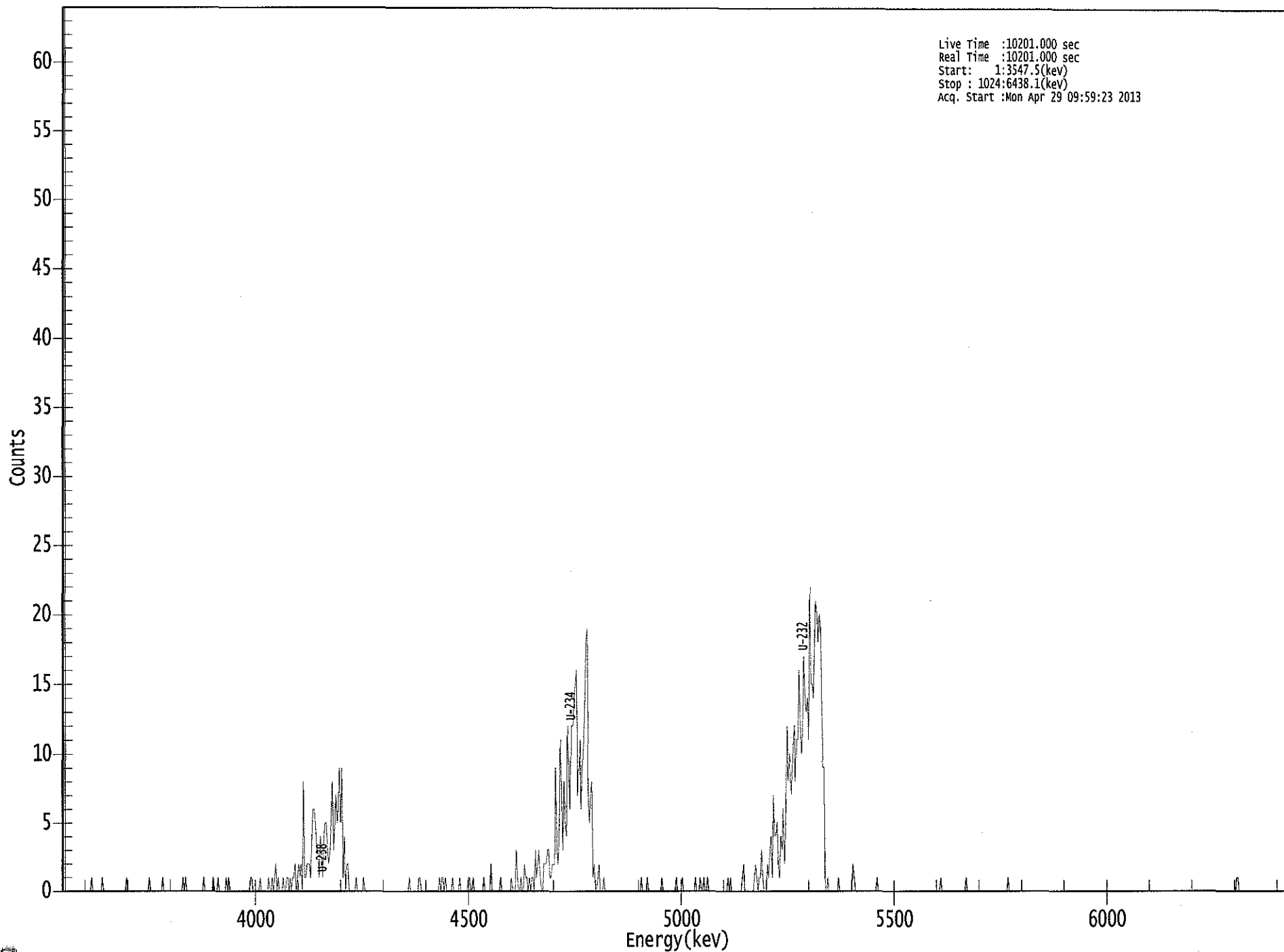
-----  
 NUCLIDE ANALYSIS RESULTS  
 -----

| Nuclide | Id Conf. | Energy (keV) | Activity (pCi/liter)    | MDA (pCi/liter)         |
|---------|----------|--------------|-------------------------|-------------------------|
| U-232   | 0.998    | 5302.50*     | 5.17E+000 +/- 5.13E-001 | 7.46E-002 +/- 7.41E-003 |
| U-234   | 0.998    | 4761.50*     | 3.50E+000 +/- 5.12E-001 | 5.50E-002 +/- 5.47E-003 |
| U-235   | 0.984    | 4385.50*     | 1.27E-001 +/- 8.13E-002 | 5.40E-002 +/- 5.36E-003 |
| U-238   | 0.995    | 4184.40*     | 1.76E+000 +/- 3.18E-001 | 5.48E-002 +/- 5.44E-003 |

AG  
 4/29/13

US EPA ARCHIVE DOCUMENT

0000056610.CNF



Live Time :10201.000 sec  
Real Time :10201.000 sec  
Start: 1:3547.5(keV)  
Stop : 1024:6438.1(keV)  
Acq. Start :Mon Apr 29 09:59:23 2013

ROI Type: 1

ROI Type: 3

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

Sample Title: 05

Elapsed Live time: 10201

Elapsed Real Time: 10201

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

369: 0 0 0 0 0 1 0 0

Sample Title: 05

| Channel | 1  | 2  | 3  | 4  | 5  | 6  | 7  | 8  |
|---------|----|----|----|----|----|----|----|----|
| 377:    | 0  | 3  | 1  | 0  | 0  | 1  | 0  | 0  |
| 385:    | 2  | 1  | 1  | 0  | 1  | 0  | 1  | 1  |
| 393:    | 0  | 3  | 1  | 2  | 3  | 1  | 0  | 0  |
| 401:    | 2  | 2  | 2  | 3  | 3  | 1  | 1  | 2  |
| 409:    | 2  | 2  | 9  | 3  | 2  | 5  | 11 | 7  |
| 417:    | 3  | 8  | 5  | 4  | 12 | 9  | 6  | 12 |
| 425:    | 12 | 14 | 15 | 16 | 7  | 9  | 11 | 6  |
| 433:    | 9  | 11 | 14 | 18 | 19 | 7  | 5  | 7  |
| 441:    | 8  | 1  | 2  | 0  | 0  | 1  | 2  | 0  |
| 449:    | 0  | 0  | 1  | 0  | 0  | 0  | 0  | 0  |
| 457:    | 0  | 0  | 0  | 0  | 0  | 0  | 0  | 0  |
| 465:    | 0  | 0  | 0  | 0  | 0  | 0  | 0  | 0  |
| 473:    | 0  | 0  | 0  | 0  | 0  | 0  | 0  | 0  |
| 481:    | 0  | 1  | 0  | 0  | 0  | 0  | 1  | 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  | 1  | 0  |
| 513:    | 0  | 0  | 0  | 1  | 0  | 0  | 0  | 0  |
| 521:    | 0  | 0  | 0  | 0  | 0  | 0  | 1  | 0  |
| 529:    | 0  | 0  | 1  | 0  | 0  | 1  | 0  | 0  |
| 537:    | 1  | 0  | 0  | 0  | 0  | 0  | 0  | 0  |
| 545:    | 0  | 0  | 0  | 0  | 0  | 0  | 0  | 0  |
| 553:    | 0  | 1  | 0  | 1  | 0  | 0  | 0  | 0  |
| 561:    | 0  | 0  | 0  | 0  | 0  | 1  | 2  | 0  |
| 569:    | 0  | 0  | 0  | 0  | 0  | 0  | 0  | 1  |
| 577:    | 2  | 1  | 0  | 1  | 1  | 3  | 1  | 0  |
| 585:    | 0  | 0  | 2  | 1  | 3  | 4  | 1  | 7  |
| 593:    | 4  | 4  | 5  | 2  | 1  | 4  | 3  | 6  |
| 601:    | 2  | 5  | 12 | 8  | 10 | 8  | 7  | 11 |
| 609:    | 12 | 8  | 11 | 11 | 16 | 12 | 10 | 12 |
| 617:    | 17 | 14 | 13 | 14 | 11 | 22 | 15 | 15 |
| 625:    | 14 | 18 | 21 | 20 | 18 | 20 | 19 | 12 |
| 633:    | 9  | 9  | 0  | 0  | 1  | 0  | 0  | 0  |
| 641:    | 0  | 0  | 0  | 0  | 0  | 1  | 0  | 0  |
| 649:    | 0  | 0  | 0  | 0  | 0  | 0  | 0  | 0  |
| 657:    | 0  | 2  | 1  | 0  | 0  | 0  | 0  | 0  |
| 665:    | 0  | 0  | 0  | 0  | 0  | 0  | 0  | 0  |
| 673:    | 0  | 0  | 0  | 0  | 0  | 1  | 0  | 0  |
| 681:    | 0  | 0  | 0  | 0  | 0  | 0  | 0  | 0  |
| 689:    | 0  | 0  | 0  | 0  | 0  | 0  | 0  | 0  |
| 697:    | 0  | 0  | 0  | 0  | 0  | 0  | 0  | 0  |
| 705:    | 0  | 0  | 0  | 0  | 0  | 0  | 0  | 0  |
| 713:    | 0  | 0  | 0  | 0  | 0  | 0  | 0  | 0  |
| 721:    | 0  | 0  | 0  | 0  | 0  | 0  | 0  | 0  |
| 729:    | 0  | 0  | 1  | 0  | 0  | 0  | 0  | 0  |
| 737:    | 0  | 0  | 0  | 0  | 0  | 0  | 0  | 0  |
| 745:    | 0  | 0  | 0  | 0  | 0  | 0  | 0  | 1  |
| 753:    | 0  | 0  | 0  | 0  | 0  | 0  | 0  | 0  |
| 761:    | 0  | 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  | 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: 05

| Channel |   |   |   |   |   |   |   |   |
|---------|---|---|---|---|---|---|---|---|
| 809:    | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 |
| 817:    | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 |
| 825:    | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 |
| 833:    | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 |
| 841:    | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 |
| 849:    | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 |
| 857:    | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 |
| 865:    | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 |
| 873:    | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 |
| 881:    | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 |
| 889:    | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 |
| 897:    | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 |
| 905:    | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 |
| 913:    | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 |
| 921:    | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 |
| 929:    | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 |
| 937:    | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 |
| 945:    | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 |
| 953:    | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 |
| 961:    | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 |
| 969:    | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 |
| 977:    | 1 | 1 | 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™

ICB  
4/29/13

Sample Description: I-68 TOT  
 Spectrum File: \\OR-ALPHA1\Canberra\ApexAlpha\Root\Data\00000566  
 Batch Identification: 1304105A-UU  
 Sample Identification: 06  
 Sample Geometry: Shelf 2  
 Procedure Description: U iso

Detector Name: Alpha\_014  
 Chamber Serial Number:  
 Detector Serial Number: 14  
 Env. Background: System Bkgd 55739  
 Reagent Blank: <not performed>

Sample Size: 1.000E+000 +/- 0.000E+000 liter  
 Sample Date/Time: 4/9/2013 7:53:48 AM  
 Acquisition Date/Time: 4/29/2013 9:59:24 AM  
 Acquisition Live Time: 170.0 minutes  
 Acquisition Real Time: 170.0 minutes

Tracer Certificate: U232\_UU-10A  
 Tracer Quantity: 0.597 mL  
 Effective Efficiency: 0.1471 +/- 0.0094  
 Counting Efficiency: 0.1846 +/- 0.0034 on 12/15/2012 11:26:44 AM  
 Chem. Recovery Factor: 0.7968 +/- 0.0531

Peak Match Tolerance: 0.150 MeV

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

| Nuclide | Energy (MeV) | Net Pk Area | Pk Area Error % | Ambient Backgnd | Reagent Backgnd | FWHM (keV) |
|---------|--------------|-------------|-----------------|-----------------|-----------------|------------|
| U-232   | T 5.277      | 283.28      | 11.71           | 2.72            | 0.00E+000       | 14.4       |
| U-234   | 4.723        | 151.32      | 15.98           | 0.68            | 0.00E+000       | 7.2        |
| U-235   | 4.357        | 10.66       | 61.14           | 0.34            | 0.00E+000       | 2.9        |
| U-238   | 4.151        | 134.81      | 16.97           | 1.19            | 0.00E+000       | 6.4        |

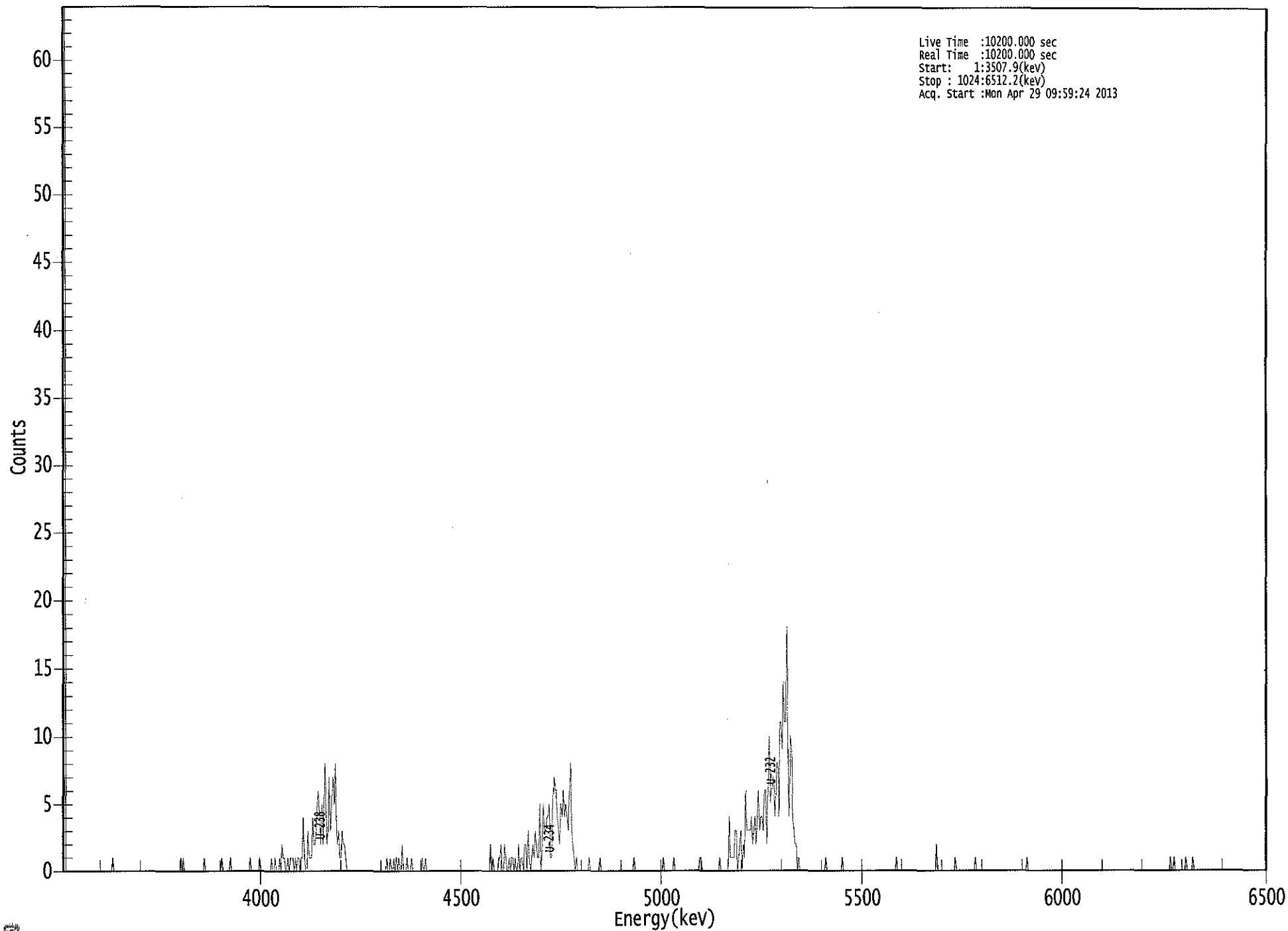
T = Tracer Peak used for Effective Efficiency

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

| Nuclide | Id Conf. | Energy (keV) | Activity (pCi/liter)    | MDA (pCi/liter)         |
|---------|----------|--------------|-------------------------|-------------------------|
| U-232   | 0.995    | 5302.50*     | 5.12E+000 +/- 6.42E-001 | 1.55E-001 +/- 1.94E-002 |
| U-234   | 0.990    | 4761.50*     | 2.73E+000 +/- 5.55E-001 | 1.02E-001 +/- 1.28E-002 |
| U-235   | 0.994    | 4385.50*     | 2.37E-001 +/- 1.48E-001 | 1.06E-001 +/- 1.34E-002 |
| U-238   | 0.992    | 4184.40*     | 2.42E+000 +/- 5.11E-001 | 1.18E-001 +/- 1.49E-002 |

AG  
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ROI Type: 1

ROI Type: 3

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

Sample Title: 06

Elapsed Live time: 10200

Elapsed Real Time: 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     | 1     | 0     | 0     | 0     | 0     | 0     |
| 49:     | 0     | 0     | 0     | 0     | 0     | 0     | 0     | 0     |
| 57:     | 0     | 0     | 0     | 0     | 0     | 0     | 0     | 0     |
| 65:     | 0     | 0     | 0     | 0     | 0     | 0     | 0     | 0     |
| 73:     | 0     | 0     | 0     | 0     | 0     | 0     | 0     | 0     |
| 81:     | 0     | 0     | 0     | 0     | 0     | 0     | 0     | 0     |
| 89:     | 0     | 0     | 0     | 0     | 0     | 0     | 0     | 0     |
| 97:     | 0     | 0     | 0     | 0     | 1     | 0     | 1     | 0     |
| 105:    | 0     | 0     | 0     | 0     | 0     | 0     | 0     | 0     |
| 113:    | 0     | 0     | 0     | 0     | 0     | 0     | 0     | 0     |
| 121:    | 1     | 0     | 0     | 0     | 0     | 0     | 0     | 0     |
| 129:    | 0     | 0     | 0     | 0     | 0     | 0     | 0     | 1     |
| 137:    | 0     | 0     | 0     | 0     | 0     | 0     | 1     | 0     |
| 145:    | 0     | 0     | 0     | 0     | 0     | 0     | 0     | 0     |
| 153:    | 0     | 0     | 0     | 0     | 0     | 0     | 0     | 1     |
| 161:    | 0     | 0     | 0     | 0     | 0     | 0     | 0     | 1     |
| 169:    | 0     | 0     | 0     | 0     | 0     | 0     | 0     | 0     |
| 177:    | 0     | 1     | 0     | 0     | 1     | 0     | 0     | 0     |
| 185:    | 1     | 0     | 2     | 1     | 1     | 0     | 0     | 1     |
| 193:    | 0     | 1     | 1     | 1     | 0     | 1     | 0     | 1     |
| 201:    | 1     | 0     | 1     | 1     | 4     | 1     | 0     | 0     |
| 209:    | 3     | 1     | 1     | 1     | 4     | 2     | 2     | 3     |
| 217:    | 5     | 6     | 4     | 2     | 5     | 2     | 8     | 6     |
| 225:    | 2     | 3     | 7     | 3     | 5     | 7     | 5     | 8     |
| 233:    | 4     | 2     | 3     | 1     | 1     | 3     | 2     | 2     |
| 241:    | 1     | 0     | 0     | 0     | 0     | 0     | 0     | 0     |
| 249:    | 0     | 0     | 0     | 0     | 0     | 0     | 0     | 0     |
| 257:    | 0     | 0     | 0     | 0     | 0     | 0     | 0     | 0     |
| 265:    | 0     | 0     | 0     | 0     | 0     | 0     | 0     | 0     |
| 273:    | 0     | 0     | 0     | 1     | 0     | 0     | 1     | 0     |
| 281:    | 0     | 1     | 0     | 1     | 0     | 1     | 0     | 0     |
| 289:    | 2     | 0     | 0     | 0     | 1     | 0     | 0     | 0     |
| 297:    | 1     | 0     | 0     | 0     | 0     | 0     | 0     | 0     |
| 305:    | 0     | 1     | 0     | 0     | 1     | 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     | 2     | 0     | 1     | 0     | 0     |

369: 0 0 1 1 2 0 0 2

Sample Title: 06

| Channel | 1  | 2  | 3  | 4 | 5  | 6  | 7  | 8  |
|---------|----|----|----|---|----|----|----|----|
| 377:    | 1  | 0  | 0  | 1 | 0  | 1  | 1  | 0  |
| 385:    | 1  | 0  | 0  | 2 | 0  | 1  | 1  | 0  |
| 393:    | 2  | 2  | 0  | 3 | 1  | 0  | 1  | 2  |
| 401:    | 1  | 3  | 2  | 1 | 1  | 5  | 0  | 2  |
| 409:    | 5  | 3  | 3  | 4 | 4  | 5  | 1  | 1  |
| 417:    | 5  | 7  | 6  | 6 | 4  | 3  | 2  | 5  |
| 425:    | 4  | 6  | 4  | 5 | 4  | 3  | 6  | 8  |
| 433:    | 3  | 2  | 1  | 0 | 1  | 0  | 0  | 0  |
| 441:    | 0  | 0  | 0  | 0 | 0  | 0  | 0  | 1  |
| 449:    | 0  | 0  | 0  | 0 | 0  | 0  | 0  | 0  |
| 457:    | 1  | 0  | 0  | 0 | 0  | 0  | 0  | 0  |
| 465:    | 0  | 0  | 0  | 0 | 0  | 0  | 0  | 0  |
| 473:    | 0  | 0  | 0  | 0 | 0  | 0  | 0  | 0  |
| 481:    | 0  | 0  | 0  | 0 | 0  | 1  | 0  | 0  |
| 489:    | 0  | 0  | 0  | 0 | 0  | 0  | 0  | 0  |
| 497:    | 0  | 0  | 0  | 0 | 0  | 0  | 0  | 0  |
| 505:    | 0  | 0  | 0  | 0 | 0  | 0  | 1  | 0  |
| 513:    | 0  | 0  | 0  | 0 | 0  | 0  | 0  | 1  |
| 521:    | 0  | 0  | 0  | 0 | 0  | 0  | 0  | 0  |
| 529:    | 0  | 0  | 0  | 0 | 0  | 0  | 0  | 0  |
| 537:    | 0  | 0  | 0  | 0 | 0  | 1  | 1  | 0  |
| 545:    | 0  | 0  | 0  | 0 | 0  | 0  | 0  | 0  |
| 553:    | 0  | 0  | 0  | 0 | 0  | 0  | 1  | 0  |
| 561:    | 0  | 0  | 0  | 0 | 0  | 0  | 4  | 1  |
| 569:    | 1  | 1  | 1  | 3 | 3  | 0  | 1  | 2  |
| 577:    | 3  | 0  | 2  | 1 | 6  | 3  | 3  | 3  |
| 585:    | 3  | 4  | 2  | 3 | 4  | 2  | 4  | 6  |
| 593:    | 3  | 4  | 4  | 3 | 6  | 6  | 2  | 6  |
| 601:    | 10 | 5  | 6  | 7 | 6  | 4  | 8  | 8  |
| 609:    | 4  | 11 | 11 | 9 | 14 | 11 | 11 | 18 |
| 617:    | 8  | 4  | 10 | 9 | 4  | 3  | 2  | 2  |
| 625:    | 0  | 1  | 0  | 0 | 0  | 0  | 0  | 0  |
| 633:    | 0  | 0  | 0  | 0 | 0  | 0  | 0  | 0  |
| 641:    | 0  | 0  | 0  | 0 | 0  | 0  | 0  | 0  |
| 649:    | 1  | 0  | 0  | 0 | 0  | 0  | 0  | 0  |
| 657:    | 0  | 0  | 0  | 0 | 0  | 0  | 1  | 0  |
| 665:    | 0  | 0  | 0  | 0 | 0  | 0  | 0  | 0  |
| 673:    | 0  | 0  | 0  | 0 | 0  | 0  | 0  | 0  |
| 681:    | 0  | 0  | 0  | 0 | 0  | 0  | 0  | 0  |
| 689:    | 0  | 0  | 0  | 0 | 0  | 0  | 0  | 0  |
| 697:    | 0  | 0  | 0  | 0 | 0  | 0  | 0  | 0  |
| 705:    | 0  | 0  | 0  | 0 | 1  | 0  | 0  | 0  |
| 713:    | 0  | 0  | 0  | 0 | 0  | 0  | 0  | 0  |
| 721:    | 0  | 0  | 0  | 0 | 0  | 0  | 0  | 0  |
| 729:    | 0  | 0  | 0  | 0 | 0  | 0  | 0  | 0  |
| 737:    | 0  | 0  | 0  | 0 | 0  | 0  | 2  | 0  |
| 745:    | 0  | 0  | 0  | 0 | 0  | 0  | 0  | 0  |
| 753:    | 0  | 0  | 0  | 0 | 0  | 0  | 1  | 0  |
| 761:    | 0  | 0  | 0  | 0 | 0  | 0  | 0  | 0  |
| 769:    | 0  | 0  | 0  | 0 | 0  | 0  | 0  | 1  |
| 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: 06

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

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4/29/13

# Apex-Alpha™

Sample Description: I-68 DIS  
 Spectrum File: \\OR-ALPHA1\Canberra\ApexAlpha\Root\Data\00000566  
 Batch Identification: 1304105A-UU  
 Sample Identification: 07  
 Sample Geometry: Shelf 2  
 Procedure Description: U iso

Detector Name: Alpha\_018  
 Chamber Serial Number:  
 Detector Serial Number: 18  
 Env. Background: System Bkgd 55740  
 Reagent Blank: <not performed>

Sample Size: 1.000E+000 +/- 0.000E+000 liter  
 Sample Date/Time: 4/9/2013 7:53:48 AM  
 Acquisition Date/Time: 4/29/2013 9:59:59 AM  
 Acquisition Live Time: 170.0 minutes  
 Acquisition Real Time: 170.0 minutes

Tracer Certificate: U232\_UU-10A  
 Tracer Quantity: 0.600 mL  
 Effective Efficiency: 0.1693 +/- 0.0102  
 Counting Efficiency: 0.1776 +/- 0.0033 on 12/15/2012 1:57:26 PM  
 Chem. Recovery Factor: 0.9531 +/- 0.0598

Peak Match Tolerance: 0.150 MeV

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

| Nuclide | Energy (MeV) | Net Pk Area | Pk Area Error % | Ambient Backgnd | Reagent Backgnd | FWHM (keV) |
|---------|--------------|-------------|-----------------|-----------------|-----------------|------------|
| U-232   | T 5.277      | 327.64      | 10.85           | 1.36            | 0.00E+000       | 23.5       |
| U-234   | 4.730        | 164.32      | 15.33           | 0.68            | 0.00E+000       | 12.5       |
| U-235   | 4.395        | 9.15        | 68.23           | 0.85            | 0.00E+000       | 3.1        |
| U-238   | 4.149        | 142.79      | 16.55           | 2.21            | 0.00E+000       | 34.4       |

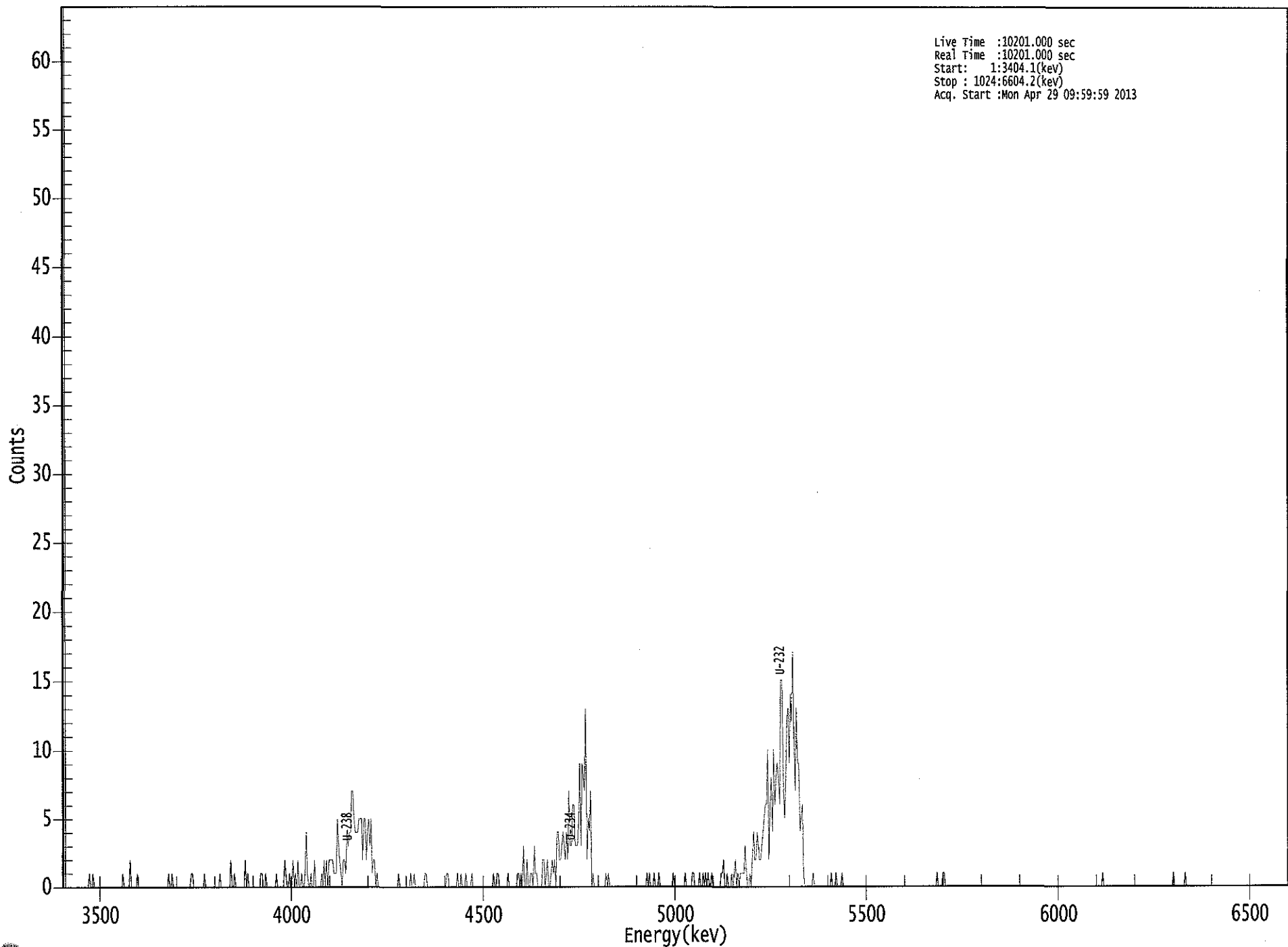
T = Tracer Peak used for Effective Efficiency

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 NUCLIDE ANALYSIS RESULTS  
 -----

| Nuclide | Id Conf. | Energy (keV) | Activity (pCi/liter)    | MDA (pCi/liter)         |
|---------|----------|--------------|-------------------------|-------------------------|
| U-232   | 0.995    | 5302.50*     | 5.14E+000 +/- 6.04E-001 | 1.08E-001 +/- 1.26E-002 |
| U-234   | 0.993    | 4761.50*     | 2.58E+000 +/- 4.98E-001 | 8.85E-002 +/- 1.04E-002 |
| U-235   | 0.999    | 4385.50*     | 1.77E-001 +/- 1.23E-001 | 1.16E-001 +/- 1.36E-002 |
| U-238   | 0.991    | 4184.40*     | 2.23E+000 +/- 4.53E-001 | 1.25E-001 +/- 1.47E-002 |

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US EPA ARCHIVE DOCUMENT



Live Time : 10201.000 sec  
Real Time : 10201.000 sec  
Start : 1:3404.1(keV)  
Stop : 1024:6604.2(keV)  
Acq. Start : Mon Apr 29 09:59:59 2013

ROI Type: 1

ROI Type: 3



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

Sample Title: 07

Elapsed Live time: 10201

Elapsed Real Time: 10201

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

369: 0 0 0 1 0 0 0 0

Sample Title: 07

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

801: 0 0 0 0 0 0 0 0

Sample Title: 07

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

148  
4/29/13

# Apex-Alpha™

Sample Description: D-87 TOT  
 Spectrum File: \\OR-ALPHA1\Canberra\ApexAlpha\Root\Data\00000566  
 Batch Identification: 1304105A-UU  
 Sample Identification: 08  
 Sample Geometry: Shelf 2  
 Procedure Description: U iso

Detector Name: Alpha\_022  
 Chamber Serial Number:  
 Detector Serial Number: 22  
 Env. Background: System Bkgd 55741  
 Reagent Blank: <not performed>

Sample Size: 1.000E+000 +/- 0.000E+000 liter  
 Sample Date/Time: 4/9/2013 7:53:48 AM  
 Acquisition Date/Time: 4/29/2013 10:00:00 AM  
 Acquisition Live Time: 170.0 minutes  
 Acquisition Real Time: 170.0 minutes

Tracer Certificate: U232\_UU-10A  
 Tracer Quantity: 0.600 mL  
 Effective Efficiency: 0.1138 +/- 0.0081  
 Counting Efficiency: 0.1531 +/- 0.0029 on 12/15/2012 1:57:26 PM  
 Chem. Recovery Factor: 0.7432 +/- 0.0549

Peak Match Tolerance: 0.150 MeV

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 PEAK AREA REPORT  
 -----

| Nuclide | Energy (MeV) | Net Pk Area | Pk Area Error % | Ambient Backgnd | Reagent Backgnd | FWHM (keV) |
|---------|--------------|-------------|-----------------|-----------------|-----------------|------------|
| U-232   | T 5.254      | 220.47      | 13.25           | 1.53            | 0.00E+000       | 5.8        |
| U-234   | 4.710        | 17.15       | 48.68           | 0.85            | 0.00E+000       | 3.1        |
| U-235   | 4.429        | 1.15        | 249.59          | 0.85            | 0.00E+000       | 3.1        |
| U-238   | 4.070        | 4.49        | 98.45           | 0.51            | 0.00E+000       | 3.1        |

T = Tracer Peak used for Effective Efficiency

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 NUCLIDE ANALYSIS RESULTS  
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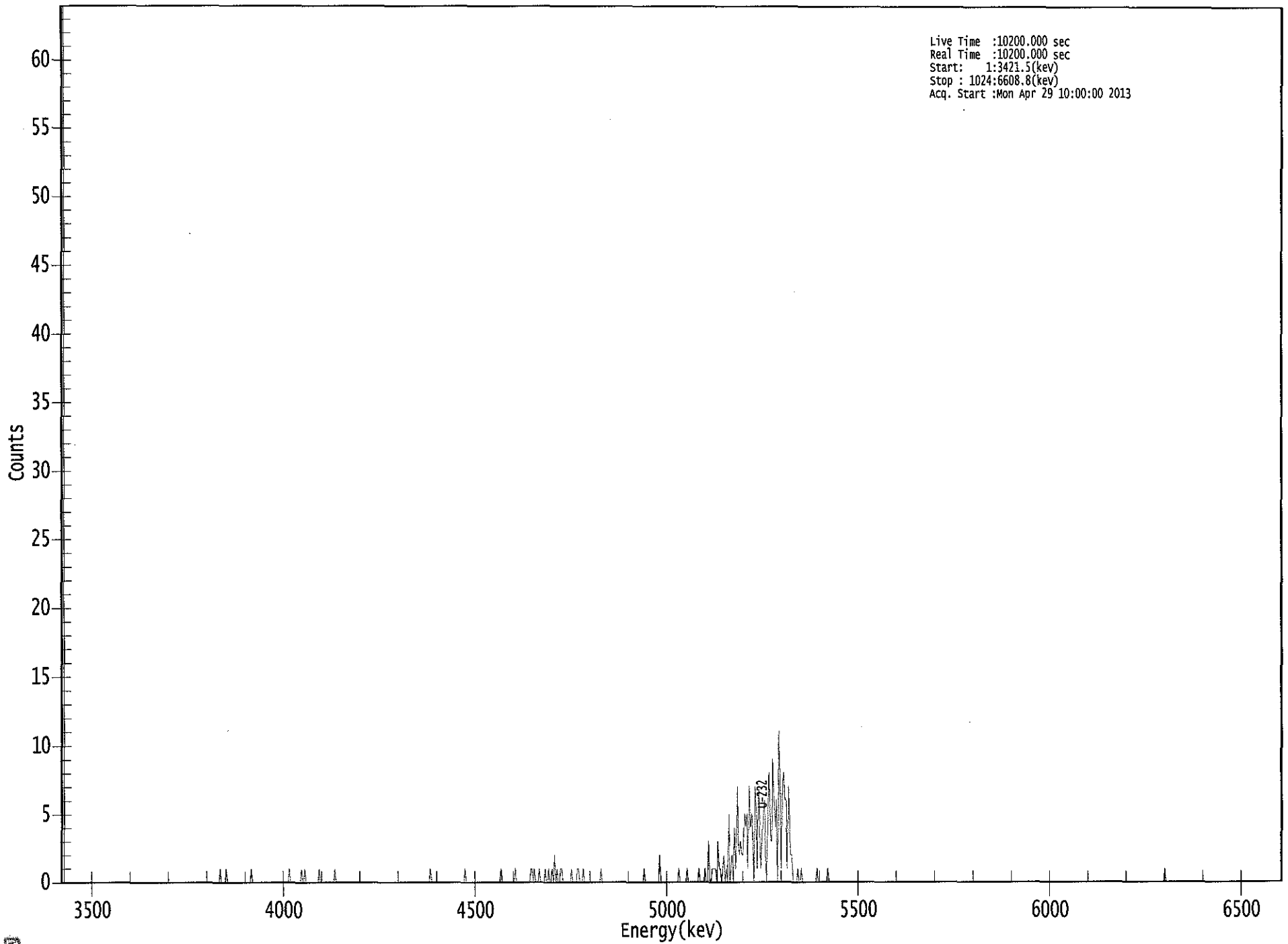
| Nuclide | Id Conf. | Energy (keV) | Activity (pCi/liter)    | MDA (pCi/liter)         |
|---------|----------|--------------|-------------------------|-------------------------|
| U-232   | 0.984    | 5302.50*     | 5.15E+000 +/- 7.20E-001 | 1.66E-001 +/- 2.32E-002 |
| U-234   | 0.982    | 4761.50*     | 4.00E-001 +/- 2.03E-001 | 1.40E-001 +/- 1.96E-002 |
| U-235   | 0.986    | 4385.50*     | 3.31E-002 +/- 8.27E-002 | 1.72E-001 +/- 2.41E-002 |
| U-238   | 0.911    | 4184.40*     | 1.04E-001 +/- 1.04E-001 | 1.22E-001 +/- 1.71E-002 |

AG  
 4/29/13

US EPA ARCHIVE DOCUMENT

0000056615.CNF

Live Time :10200.000 sec  
Real Time :10200.000 sec  
Start : 1:3421.5(kev)  
Stop : 1024:6608.8(kev)  
Acq. Start :Mon Apr 29 10:00:00 2013



US EPA ARCHIVE DOCUMENT

0170

ROI Type: 1

ROI Type: 3

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

Sample Title: 08

Elapsed Live time: 10200

Elapsed Real Time: 10200

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

369: 1 0 0 0 0 0 0 0 0

Sample Title: 08

| Channel | 1 | 2  | 3 | 4 | 5 | 6 | 7 | 8 |
|---------|---|----|---|---|---|---|---|---|
| 377:    | 0 | 0  | 0 | 0 | 1 | 0 | 0 | 0 |
| 385:    | 0 | 0  | 0 | 0 | 0 | 0 | 0 | 0 |
| 393:    | 0 | 1  | 1 | 0 | 1 | 0 | 0 | 0 |
| 401:    | 1 | 0  | 0 | 0 | 0 | 1 | 0 | 0 |
| 409:    | 1 | 0  | 0 | 1 | 0 | 2 | 0 | 1 |
| 417:    | 0 | 0  | 1 | 1 | 0 | 0 | 0 | 0 |
| 425:    | 0 | 0  | 0 | 1 | 0 | 0 | 0 | 0 |
| 433:    | 1 | 1  | 0 | 0 | 0 | 1 | 0 | 0 |
| 441:    | 0 | 0  | 0 | 0 | 0 | 0 | 0 | 0 |
| 449:    | 0 | 0  | 0 | 0 | 1 | 0 | 0 | 0 |
| 457:    | 0 | 0  | 0 | 0 | 0 | 0 | 0 | 0 |
| 465:    | 0 | 0  | 0 | 0 | 0 | 0 | 0 | 0 |
| 473:    | 0 | 0  | 0 | 0 | 0 | 0 | 0 | 0 |
| 481:    | 0 | 0  | 0 | 0 | 0 | 0 | 0 | 0 |
| 489:    | 1 | 0  | 0 | 0 | 0 | 0 | 0 | 0 |
| 497:    | 0 | 0  | 0 | 0 | 0 | 2 | 0 | 0 |
| 505:    | 0 | 0  | 0 | 0 | 0 | 0 | 0 | 0 |
| 513:    | 0 | 0  | 0 | 0 | 0 | 1 | 0 | 0 |
| 521:    | 0 | 0  | 0 | 0 | 1 | 0 | 0 | 0 |
| 529:    | 0 | 0  | 0 | 0 | 0 | 0 | 1 | 0 |
| 537:    | 0 | 0  | 0 | 1 | 0 | 0 | 3 | 0 |
| 545:    | 0 | 1  | 1 | 1 | 1 | 0 | 3 | 1 |
| 553:    | 1 | 0  | 1 | 2 | 0 | 1 | 0 | 5 |
| 561:    | 0 | 1  | 2 | 0 | 4 | 1 | 7 | 3 |
| 569:    | 2 | 3  | 2 | 2 | 5 | 4 | 5 | 1 |
| 577:    | 7 | 4  | 5 | 4 | 0 | 7 | 5 | 1 |
| 585:    | 7 | 4  | 1 | 3 | 5 | 6 | 2 | 0 |
| 593:    | 6 | 8  | 3 | 3 | 9 | 6 | 4 | 6 |
| 601:    | 0 | 11 | 8 | 1 | 7 | 8 | 6 | 6 |
| 609:    | 1 | 7  | 4 | 2 | 2 | 0 | 0 | 0 |
| 617:    | 0 | 1  | 0 | 0 | 1 | 0 | 0 | 0 |
| 625:    | 0 | 0  | 0 | 0 | 0 | 0 | 0 | 0 |
| 633:    | 0 | 1  | 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 0

Sample Title: 08

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



10/8  
4/29/13

# Apex-Alpha™

Sample Description: D-87 DIS  
 Spectrum File: \\OR-ALPHA1\Canberra\ApexAlpha\Root\Data\00000566  
 Batch Identification: 1304105A-UU  
 Sample Identification: 09  
 Sample Geometry: Shelf 2  
 Procedure Description: U iso

Detector Name: Alpha\_024  
 Chamber Serial Number:  
 Detector Serial Number: 24  
 Env. Background: System Bkgd 55742  
 Reagent Blank: <not performed>

Sample Size: 1.000E+000 +/- 0.000E+000 liter  
 Sample Date/Time: 4/9/2013 7:53:48 AM  
 Acquisition Date/Time: 4/29/2013 10:00:01 AM  
 Acquisition Live Time: 170.0 minutes  
 Acquisition Real Time: 170.0 minutes

Tracer Certificate: U232\_UU-10A  
 Tracer Quantity: 0.597 mL  
 Effective Efficiency: 0.1293 +/- 0.0087  
 Counting Efficiency: 0.1710 +/- 0.0032 on 12/15/2012 2:02:15 PM  
 Chem. Recovery Factor: 0.7558 +/- 0.0530

Peak Match Tolerance: 0.150 MeV

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

| Nuclide | Energy (MeV) | Net Pk Area | Pk Area Error % | Ambient Backgnd | Reagent Backgnd | FWHM (keV) |
|---------|--------------|-------------|-----------------|-----------------|-----------------|------------|
| U-232   | T 5.255      | 248.98      | 12.45           | 1.02            | 0.00E+000       | 12.3       |
| U-234   | 4.716        | 12.66       | 55.94           | 0.34            | 0.00E+000       | 3.1        |
| U-235   | 4.495        | 0.66        | 305.45          | 0.34            | 0.00E+000       | 3.1        |
| U-238   | 4.144        | 5.32        | 91.11           | 0.68            | 0.00E+000       | 3.1        |

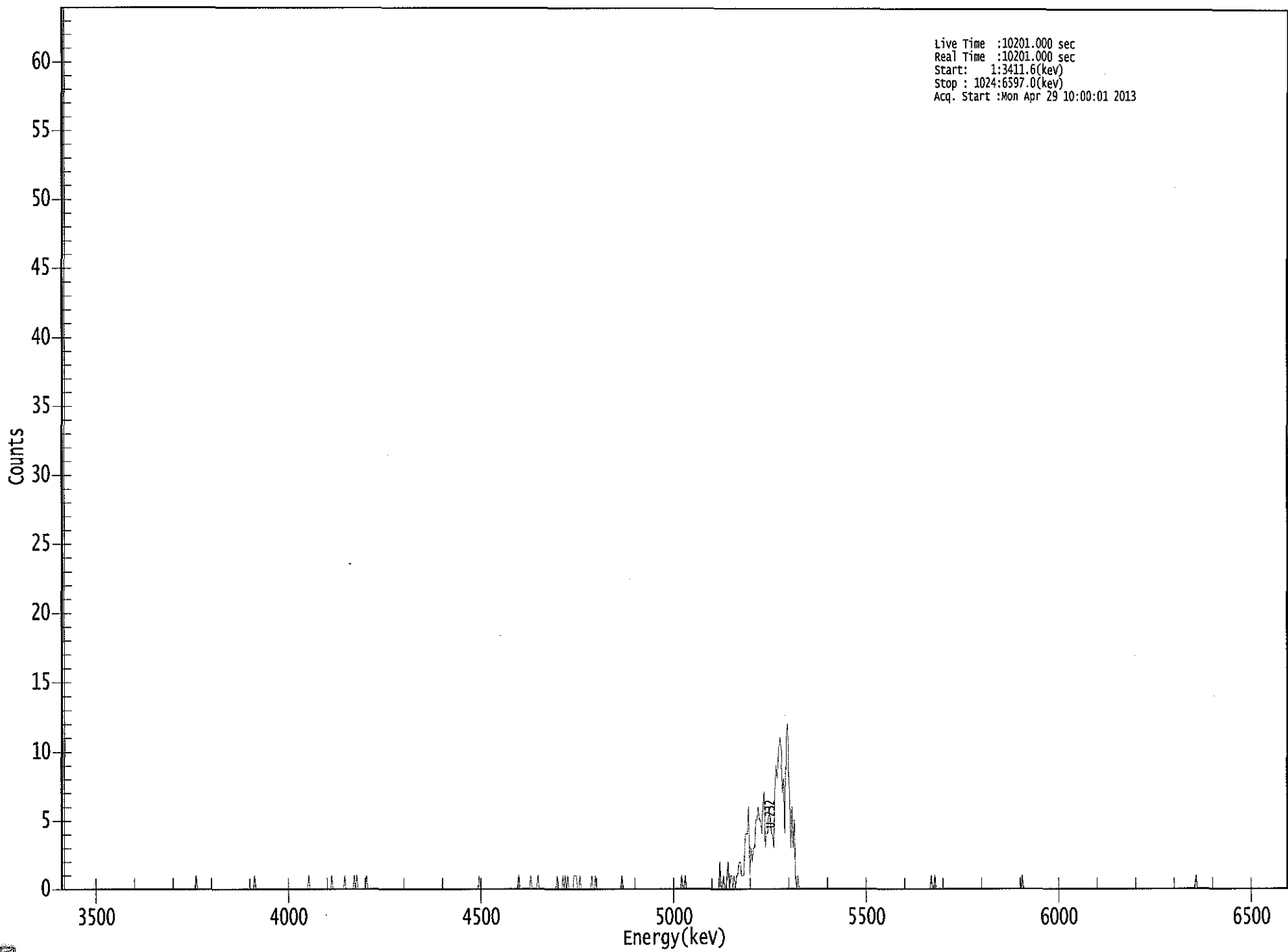
T = Tracer Peak used for Effective Efficiency

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 ----- NUCLIDE ANALYSIS RESULTS -----  
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| Nuclide | Id Conf. | Energy (keV) | Activity (pCi/liter )   | MDA (pCi/liter )        |
|---------|----------|--------------|-------------------------|-------------------------|
| U-232   | 0.984    | 5302.50*     | 5.12E+000 +/- 6.78E-001 | 1.29E-001 +/- 1.71E-002 |
| U-234   | 0.985    | 4761.50*     | 2.60E-001 +/- 1.49E-001 | 9.82E-002 +/- 1.30E-002 |
| U-235   | 0.918    | 4385.50*     | 1.67E-002 +/- 5.11E-002 | 1.21E-001 +/- 1.60E-002 |
| U-238   | 0.988    | 4184.40*     | 1.09E-001 +/- 1.00E-001 | 1.15E-001 +/- 1.53E-002 |

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US EPA ARCHIVE DOCUMENT



ROI Type: 1

ROI Type: 3

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

Sample Title: 09

Elapsed Live time: 10201

Elapsed Real Time: 10201

| Channel | ----- | ----- | ----- | ----- | ----- | ----- | ----- | ----- |
|---------|-------|-------|-------|-------|-------|-------|-------|-------|
| 1:      | 10201 | 10201 | 0     | 0     | 0     | 0     | 0     | 0     |
| 9:      | 0     | 0     | 0     | 0     | 0     | 0     | 0     | 0     |
| 17:     | 0     | 0     | 0     | 0     | 0     | 0     | 0     | 0     |
| 25:     | 0     | 0     | 0     | 0     | 0     | 0     | 0     | 0     |
| 33:     | 0     | 0     | 0     | 0     | 0     | 0     | 0     | 0     |
| 41:     | 0     | 0     | 0     | 0     | 0     | 0     | 0     | 0     |
| 49:     | 0     | 0     | 0     | 0     | 0     | 0     | 0     | 0     |
| 57:     | 0     | 0     | 0     | 0     | 0     | 0     | 0     | 0     |
| 65:     | 0     | 0     | 0     | 0     | 0     | 0     | 0     | 0     |
| 73:     | 0     | 0     | 0     | 0     | 0     | 0     | 0     | 0     |
| 81:     | 0     | 0     | 0     | 0     | 0     | 0     | 0     | 0     |
| 89:     | 0     | 0     | 0     | 0     | 0     | 0     | 0     | 0     |
| 97:     | 0     | 0     | 0     | 0     | 0     | 0     | 0     | 0     |
| 105:    | 0     | 0     | 0     | 0     | 0     | 0     | 0     | 0     |
| 113:    | 1     | 0     | 0     | 0     | 0     | 0     | 0     | 0     |
| 121:    | 0     | 0     | 0     | 0     | 0     | 0     | 0     | 0     |
| 129:    | 0     | 0     | 0     | 0     | 0     | 0     | 0     | 0     |
| 137:    | 0     | 0     | 0     | 0     | 0     | 0     | 0     | 0     |
| 145:    | 0     | 0     | 0     | 0     | 0     | 0     | 0     | 0     |
| 153:    | 0     | 0     | 0     | 0     | 0     | 0     | 0     | 0     |
| 161:    | 0     | 1     | 0     | 0     | 0     | 0     | 0     | 0     |
| 169:    | 0     | 0     | 0     | 0     | 0     | 0     | 0     | 0     |
| 177:    | 0     | 0     | 0     | 0     | 0     | 0     | 0     | 0     |
| 185:    | 0     | 0     | 0     | 0     | 0     | 0     | 0     | 0     |
| 193:    | 0     | 0     | 0     | 0     | 0     | 0     | 0     | 0     |
| 201:    | 0     | 0     | 0     | 0     | 0     | 0     | 1     | 0     |
| 209:    | 0     | 0     | 0     | 0     | 0     | 0     | 0     | 0     |
| 217:    | 0     | 0     | 0     | 0     | 0     | 0     | 0     | 0     |
| 225:    | 0     | 1     | 0     | 0     | 0     | 0     | 0     | 0     |
| 233:    | 0     | 0     | 0     | 0     | 1     | 0     | 0     | 0     |
| 241:    | 0     | 0     | 0     | 0     | 1     | 0     | 1     | 0     |
| 249:    | 0     | 0     | 0     | 0     | 0     | 0     | 1     | 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     | 1     | 0     | 0     | 0     |
| 353:    | 0     | 0     | 0     | 0     | 0     | 0     | 0     | 0     |
| 361:    | 0     | 0     | 0     | 0     | 0     | 0     | 0     | 0     |

369: 0 0 0 0 0 0 0 0 0

Sample Title: 09

| Channel | ----- | ----- | ----- | ----- | ----- | ----- | ----- | ----- |
|---------|-------|-------|-------|-------|-------|-------|-------|-------|
| 377:    | 0     | 0     | 0     | 0     | 0     | 1     | 0     | 0     |
| 385:    | 0     | 0     | 0     | 0     | 0     | 0     | 0     | 1     |
| 393:    | 0     | 0     | 0     | 0     | 0     | 1     | 0     | 0     |
| 401:    | 0     | 0     | 0     | 0     | 0     | 0     | 0     | 0     |
| 409:    | 0     | 0     | 0     | 0     | 0     | 1     | 0     | 0     |
| 417:    | 0     | 0     | 1     | 0     | 1     | 0     | 1     | 0     |
| 425:    | 0     | 0     | 0     | 1     | 1     | 1     | 0     | 0     |
| 433:    | 1     | 0     | 0     | 0     | 0     | 0     | 0     | 0     |
| 441:    | 0     | 0     | 1     | 0     | 0     | 1     | 0     | 0     |
| 449:    | 0     | 0     | 0     | 0     | 0     | 0     | 0     | 0     |
| 457:    | 0     | 0     | 0     | 0     | 0     | 0     | 0     | 0     |
| 465:    | 0     | 0     | 0     | 1     | 0     | 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     | 1     | 0     | 0     |
| 521:    | 1     | 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     | 2     | 0     | 0     |
| 553:    | 1     | 0     | 0     | 1     | 2     | 0     | 1     | 1     |
| 561:    | 0     | 1     | 0     | 1     | 1     | 2     | 2     | 1     |
| 569:    | 1     | 1     | 4     | 4     | 4     | 6     | 1     | 3     |
| 577:    | 2     | 3     | 3     | 5     | 5     | 6     | 5     | 5     |
| 585:    | 4     | 6     | 7     | 3     | 4     | 4     | 6     | 5     |
| 593:    | 4     | 4     | 3     | 7     | 9     | 8     | 10    | 11    |
| 601:    | 10    | 7     | 8     | 4     | 11    | 12    | 9     | 7     |
| 609:    | 3     | 6     | 3     | 5     | 1     | 0     | 1     | 0     |
| 617:    | 0     | 0     | 0     | 0     | 0     | 0     | 0     | 0     |
| 625:    | 0     | 0     | 0     | 0     | 0     | 0     | 0     | 0     |
| 633:    | 0     | 0     | 0     | 0     | 0     | 0     | 0     | 0     |
| 641:    | 0     | 0     | 0     | 0     | 0     | 0     | 0     | 0     |
| 649:    | 0     | 0     | 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     | 1     | 0     | 0     |
| 729:    | 1     | 0     | 0     | 0     | 0     | 0     | 0     | 0     |
| 737:    | 0     | 0     | 0     | 0     | 0     | 0     | 0     | 0     |
| 745:    | 0     | 0     | 0     | 0     | 0     | 0     | 0     | 0     |
| 753:    | 0     | 0     | 0     | 0     | 0     | 0     | 0     | 0     |
| 761:    | 0     | 0     | 0     | 0     | 0     | 0     | 0     | 0     |
| 769:    | 0     | 0     | 0     | 0     | 0     | 0     | 0     | 0     |
| 777:    | 0     | 0     | 0     | 0     | 0     | 0     | 0     | 0     |
| 785:    | 0     | 0     | 0     | 0     | 0     | 0     | 0     | 0     |
| 793:    | 0     | 0     | 0     | 0     | 0     | 0     | 0     | 0     |

801: 0 1 0 0 0 0 0 0

Sample Title: 09

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

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# Apex-Alpha™

Sample Description: PZ-106-SD TOT  
 Spectrum File: \\OR-ALPHA1\Canberra\ApexAlpha\Root\Data\00000566  
 Batch Identification: 1304105A-UU  
 Sample Identification: 10  
 Sample Geometry: Shelf 2  
 Procedure Description: U iso

Detector Name: Alpha\_025  
 Chamber Serial Number:  
 Detector Serial Number: 25  
 Env. Background: System Bkgd 55743  
 Reagent Blank: <not performed>

Sample Size: 1.000E+000 +/- 0.000E+000 liter  
 Sample Date/Time: 4/9/2013 7:53:48 AM  
 Acquisition Date/Time: 4/29/2013 10:00:02 AM  
 Acquisition Live Time: 170.0 minutes  
 Acquisition Real Time: 170.0 minutes

Tracer Certificate: U232\_UU-10A  
 Tracer Quantity: 0.596 mL  
 Effective Efficiency: 0.2030 +/- 0.0113  
 Counting Efficiency: 0.1736 +/- 0.0032 on 12/15/2012 1:57:27 PM  
 Chem. Recovery Factor: 1.1698 +/- 0.0686

Peak Match Tolerance: 0.150 MeV

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

| Nuclide | Energy (MeV) | Net Pk Area | Pk Area Error % | Ambient Backgnd | Reagent Backgnd | FWHM (keV) |
|---------|--------------|-------------|-----------------|-----------------|-----------------|------------|
| U-232   | T 5.282      | 390.66      | 9.92            | 0.34            | 0.00E+000       | 7.8        |
| U-234   | 4.715        | 24.32       | 40.39           | 0.68            | 0.00E+000       | 3.1        |
| U-235   | 4.395        | 3.83        | 102.72          | 0.17            | 0.00E+000       | 3.1        |
| U-238   | 4.181        | 23.66       | 40.63           | 0.34            | 0.00E+000       | 4.7        |

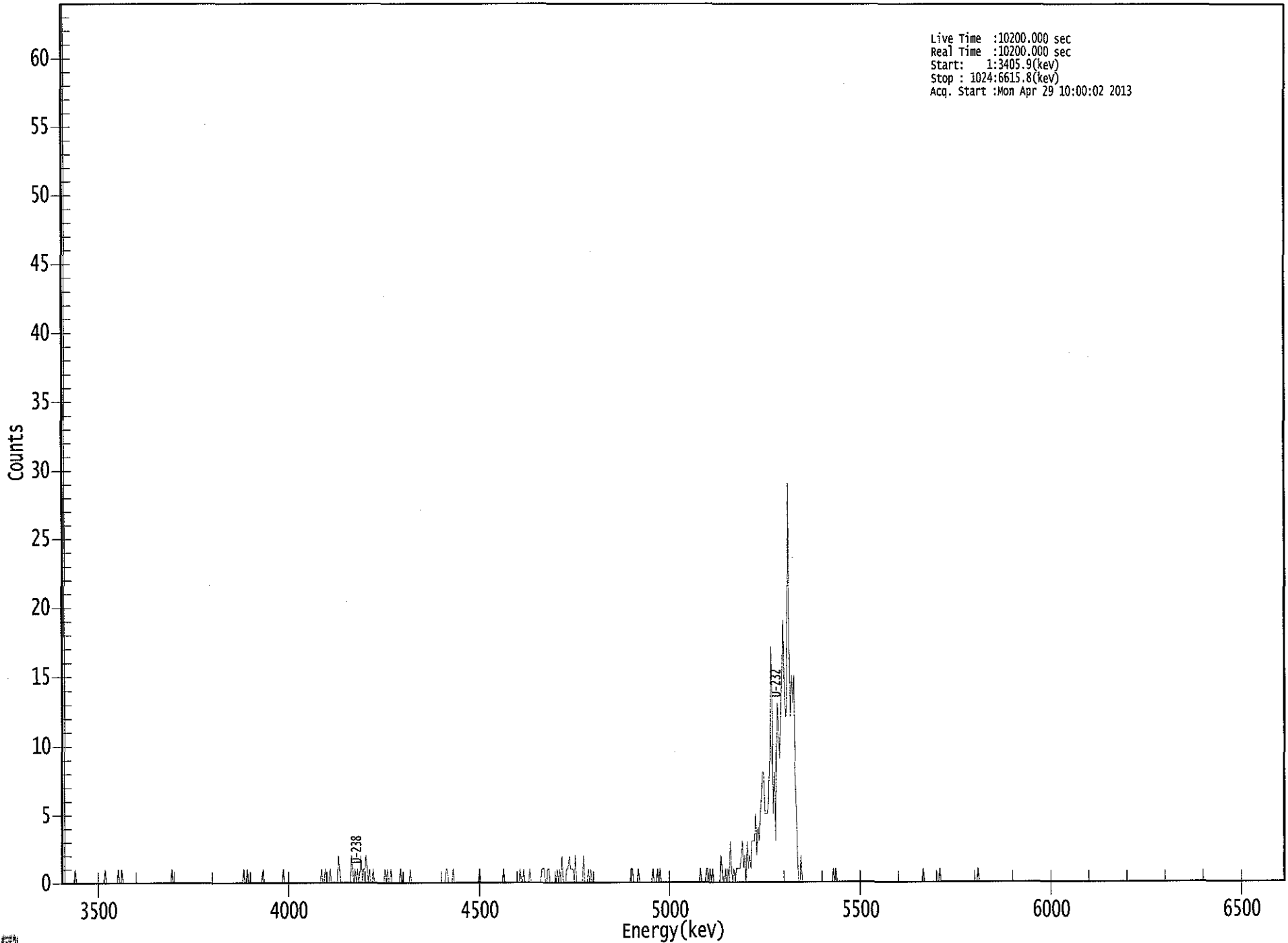
T = Tracer Peak used for Effective Efficiency

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 NUCLIDE ANALYSIS RESULTS  
 -----

| Nuclide | Id Conf. | Energy (keV) | Activity (pCi/liter)    | MDA (pCi/liter)         |
|---------|----------|--------------|-------------------------|-------------------------|
| U-232   | 0.997    | 5302.50*     | 5.11E+000 +/- 5.57E-001 | 6.26E-002 +/- 6.82E-003 |
| U-234   | 0.985    | 4761.50*     | 3.18E-001 +/- 1.33E-001 | 7.38E-002 +/- 8.04E-003 |
| U-235   | 0.999    | 4385.50*     | 6.18E-002 +/- 6.38E-002 | 6.73E-002 +/- 7.34E-003 |
| U-238   | 1.000    | 4184.40*     | 3.08E-001 +/- 1.30E-001 | 6.23E-002 +/- 6.78E-003 |

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US EPA ARCHIVE DOCUMENT



Live Time :10200.000 sec  
Real Time :10200.000 sec  
Start: 1:3405.9(keV)  
Stop : 1024:6615.8(keV)  
Acq. Start :Mon Apr 29 10:00:02 2013

ROI Type: 1

ROI Type: 3

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

Sample Title: 10

Elapsed Live time: 10200

Elapsed Real Time: 10200

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



369: 0 1 0 0 0 0 0 0

Sample Title: 10

| Channel | 1  | 2  | 3  | 4  | 5  | 6  | 7  | 8  |
|---------|----|----|----|----|----|----|----|----|
| 377:    | 0  | 0  | 0  | 0  | 0  | 0  | 0  | 1  |
| 385:    | 0  | 0  | 1  | 0  | 0  | 0  | 0  | 1  |
| 393:    | 0  | 0  | 0  | 0  | 0  | 0  | 0  | 0  |
| 401:    | 0  | 1  | 1  | 1  | 0  | 0  | 1  | 1  |
| 409:    | 0  | 0  | 0  | 0  | 0  | 0  | 1  | 0  |
| 417:    | 1  | 0  | 2  | 0  | 0  | 0  | 1  | 1  |
| 425:    | 2  | 1  | 1  | 1  | 0  | 2  | 0  | 0  |
| 433:    | 0  | 0  | 0  | 0  | 2  | 0  | 0  | 0  |
| 441:    | 1  | 0  | 1  | 0  | 0  | 0  | 0  | 0  |
| 449:    | 0  | 0  | 0  | 0  | 0  | 0  | 0  | 0  |
| 457:    | 0  | 0  | 0  | 0  | 0  | 0  | 0  | 0  |
| 465:    | 0  | 0  | 0  | 0  | 0  | 0  | 0  | 0  |
| 473:    | 0  | 0  | 0  | 0  | 1  | 1  | 0  | 0  |
| 481:    | 0  | 0  | 1  | 0  | 0  | 0  | 0  | 0  |
| 489:    | 0  | 0  | 0  | 0  | 0  | 0  | 1  | 0  |
| 497:    | 0  | 0  | 1  | 0  | 1  | 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  | 1  | 0  |
| 537:    | 0  | 0  | 0  | 1  | 1  | 0  | 1  | 0  |
| 545:    | 1  | 0  | 0  | 0  | 0  | 0  | 0  | 2  |
| 553:    | 1  | 0  | 0  | 1  | 0  | 1  | 0  | 3  |
| 561:    | 1  | 0  | 1  | 0  | 1  | 1  | 1  | 1  |
| 569:    | 2  | 3  | 1  | 2  | 0  | 3  | 1  | 2  |
| 577:    | 1  | 3  | 3  | 3  | 5  | 2  | 4  | 3  |
| 585:    | 5  | 6  | 8  | 8  | 5  | 5  | 5  | 6  |
| 593:    | 9  | 17 | 12 | 5  | 8  | 3  | 13 | 12 |
| 601:    | 9  | 13 | 15 | 19 | 14 | 12 | 13 | 29 |
| 609:    | 18 | 12 | 15 | 13 | 15 | 8  | 6  | 2  |
| 617:    | 0  | 0  | 2  | 0  | 0  | 0  | 0  | 0  |
| 625:    | 0  | 0  | 0  | 0  | 0  | 0  | 0  | 0  |
| 633:    | 0  | 0  | 0  | 0  | 0  | 0  | 0  | 0  |
| 641:    | 0  | 0  | 0  | 0  | 0  | 1  | 0  | 1  |
| 649:    | 0  | 0  | 0  | 0  | 0  | 0  | 0  | 0  |
| 657:    | 0  | 0  | 0  | 0  | 0  | 0  | 0  | 0  |
| 665:    | 0  | 0  | 0  | 0  | 0  | 0  | 0  | 0  |
| 673:    | 0  | 0  | 0  | 0  | 0  | 0  | 0  | 0  |
| 681:    | 0  | 0  | 0  | 0  | 0  | 0  | 0  | 0  |
| 689:    | 0  | 0  | 0  | 0  | 0  | 0  | 0  | 0  |
| 697:    | 0  | 0  | 0  | 0  | 0  | 0  | 0  | 0  |
| 705:    | 0  | 0  | 0  | 0  | 0  | 0  | 0  | 0  |
| 713:    | 0  | 0  | 0  | 0  | 0  | 0  | 0  | 0  |
| 721:    | 1  | 0  | 0  | 0  | 0  | 0  | 0  | 0  |
| 729:    | 0  | 0  | 0  | 0  | 0  | 0  | 1  | 0  |
| 737:    | 0  | 0  | 0  | 0  | 0  | 0  | 0  | 0  |
| 745:    | 0  | 0  | 0  | 0  | 0  | 0  | 0  | 0  |
| 753:    | 0  | 0  | 0  | 0  | 0  | 0  | 0  | 0  |
| 761:    | 0  | 0  | 0  | 0  | 0  | 0  | 1  | 0  |
| 769:    | 0  | 0  | 0  | 0  | 0  | 0  | 0  | 0  |
| 777:    | 0  | 0  | 0  | 0  | 0  | 0  | 0  | 0  |
| 785:    | 0  | 0  | 0  | 0  | 0  | 0  | 0  | 0  |
| 793:    | 0  | 0  | 0  | 0  | 0  | 0  | 0  | 0  |

801: 0 0 0 0 0 0 0 0

Sample Title: 10

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

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4/29/13

# Apex-Alpha™

Sample Description: PZ-106-SD DIS  
 Spectrum File: \\OR-ALPHA1\Canberra\ApexAlpha\Root\Data\00000566  
 Batch Identification: 1304105A-UU  
 Sample Identification: 11  
 Sample Geometry: Shelf 2  
 Procedure Description: U iso

Detector Name: Alpha\_027  
 Chamber Serial Number:  
 Detector Serial Number: 27  
 Env. Background: System Bkgd 55744  
 Reagent Blank: <not performed>

Sample Size: 1.000E+000 +/- 0.000E+000 liter  
 Sample Date/Time: 4/9/2013 7:53:48 AM  
 Acquisition Date/Time: 4/29/2013 10:00:03 AM  
 Acquisition Live Time: 170.0 minutes  
 Acquisition Real Time: 170.0 minutes

Tracer Certificate: U232\_UU-10A  
 Tracer Quantity: 0.596 mL  
 Effective Efficiency: 0.1921 +/- 0.0109  
 Counting Efficiency: 0.1728 +/- 0.0032 on 12/15/2012 2:27:41 PM  
 Chem. Recovery Factor: 1.1120 +/- 0.0667

Peak Match Tolerance: 0.150 MeV

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 ----- PEAK AREA REPORT -----  
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| Nuclide | Energy (MeV) | Net Pk Area | Pk Area Error % | Ambient Backgnd | Reagent Backgnd | FWHM (keV) |
|---------|--------------|-------------|-----------------|-----------------|-----------------|------------|
| U-232   | T 5.280      | 369.81      | 10.21           | 1.19            | 0.00E+000       | 5.0        |
| U-234   | 4.726        | 31.15       | 35.67           | 0.85            | 0.00E+000       | 4.0        |
| U-235   | 4.440        | 1.66        | 169.38          | 0.34            | 0.00E+000       | 3.2        |
| U-238   | 4.108        | 14.32       | 53.21           | 0.68            | 0.00E+000       | 4.8        |

T = Tracer Peak used for Effective Efficiency

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 ----- NUCLIDE ANALYSIS RESULTS -----  
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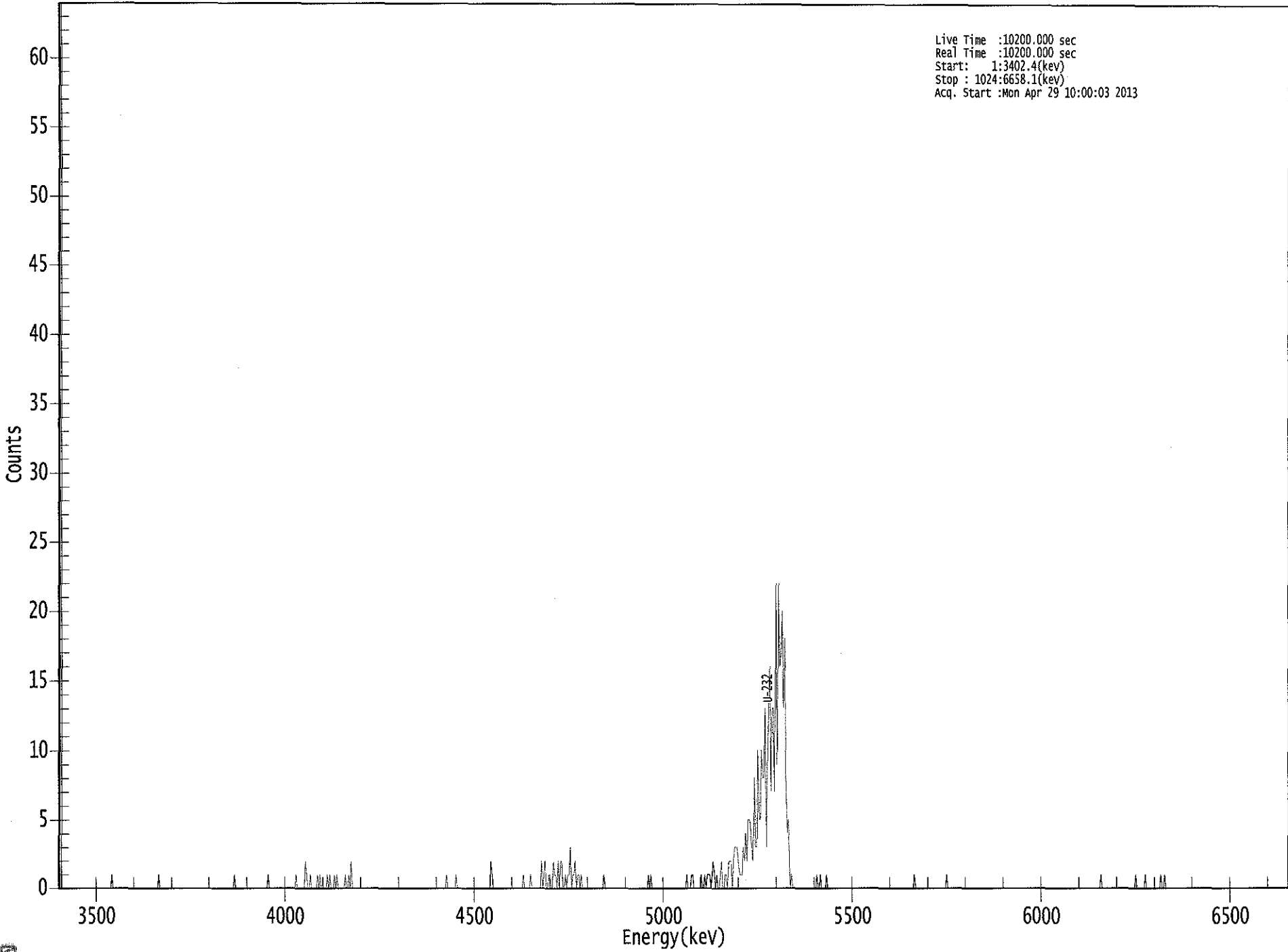
| Nuclide | Id Conf. | Energy (keV) | Activity (pCi/liter)    | MDA (pCi/liter)         |
|---------|----------|--------------|-------------------------|-------------------------|
| U-232   | 0.996    | 5302.50*     | 5.11E+000 +/- 5.71E-001 | 9.11E-002 +/- 1.02E-002 |
| U-234   | 0.991    | 4761.50*     | 4.31E-001 +/- 1.61E-001 | 8.27E-002 +/- 9.24E-003 |
| U-235   | 0.979    | 4385.50*     | 2.83E-002 +/- 4.80E-002 | 8.15E-002 +/- 9.10E-003 |
| U-238   | 0.960    | 4184.40*     | 1.97E-001 +/- 1.07E-001 | 7.76E-002 +/- 8.67E-003 |

AG  
4/29/13

US EPA ARCHIVE DOCUMENT

0000056618.CNF

Live Time :10200.000 sec  
Real Time :10200.000 sec  
Start: 1:3402.4(kev)  
Stop : 1024:6658.1(kev)  
Acq. Start :Mon Apr 29 10:00:03 2013



ROI Type: 1

ROI Type: 3

US EPA ARCHIVE DOCUMENT

0155

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

Sample Title: 11

Elapsed Live time: 10200

Elapsed Real Time: 10200

| Channel | ----- | ----- | ----- | ----- | ----- | ----- | ----- | ----- |
|---------|-------|-------|-------|-------|-------|-------|-------|-------|
| 1:      | 10200 | 10200 | 0     | 0     | 0     | 0     | 0     | 0     |
| 9:      | 0     | 0     | 0     | 0     | 0     | 0     | 0     | 0     |
| 17:     | 0     | 0     | 0     | 0     | 0     | 0     | 0     | 0     |
| 25:     | 0     | 0     | 0     | 0     | 0     | 0     | 0     | 0     |
| 33:     | 0     | 0     | 0     | 0     | 0     | 0     | 0     | 0     |
| 41:     | 0     | 0     | 0     | 0     | 1     | 0     | 0     | 0     |
| 49:     | 0     | 0     | 0     | 0     | 0     | 0     | 0     | 0     |
| 57:     | 0     | 0     | 0     | 0     | 0     | 0     | 0     | 0     |
| 65:     | 0     | 0     | 0     | 0     | 0     | 0     | 0     | 0     |
| 73:     | 0     | 0     | 0     | 0     | 0     | 0     | 0     | 0     |
| 81:     | 0     | 0     | 0     | 1     | 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     | 1     | 0     | 0     | 0     | 0     | 0     |
| 153:    | 0     | 0     | 0     | 0     | 0     | 0     | 0     | 0     |
| 161:    | 0     | 0     | 0     | 0     | 0     | 0     | 0     | 0     |
| 169:    | 0     | 0     | 0     | 0     | 0     | 0     | 1     | 0     |
| 177:    | 0     | 0     | 0     | 0     | 0     | 0     | 0     | 0     |
| 185:    | 0     | 0     | 0     | 0     | 0     | 0     | 0     | 0     |
| 193:    | 0     | 0     | 0     | 0     | 0     | 1     | 0     | 0     |
| 201:    | 0     | 0     | 0     | 0     | 0     | 2     | 1     | 0     |
| 209:    | 0     | 1     | 0     | 0     | 0     | 0     | 0     | 1     |
| 217:    | 0     | 1     | 0     | 0     | 0     | 0     | 0     | 1     |
| 225:    | 0     | 1     | 0     | 0     | 0     | 1     | 0     | 1     |
| 233:    | 0     | 0     | 0     | 0     | 0     | 0     | 1     | 0     |
| 241:    | 0     | 1     | 0     | 2     | 0     | 0     | 0     | 0     |
| 249:    | 0     | 0     | 0     | 0     | 0     | 0     | 0     | 0     |
| 257:    | 0     | 0     | 0     | 0     | 0     | 0     | 0     | 0     |
| 265:    | 0     | 0     | 0     | 0     | 0     | 0     | 0     | 0     |
| 273:    | 0     | 0     | 0     | 0     | 0     | 0     | 0     | 0     |
| 281:    | 0     | 0     | 0     | 0     | 0     | 0     | 0     | 0     |
| 289:    | 0     | 0     | 0     | 0     | 0     | 0     | 0     | 0     |
| 297:    | 0     | 0     | 0     | 0     | 0     | 0     | 0     | 0     |
| 305:    | 0     | 0     | 0     | 0     | 0     | 0     | 0     | 0     |
| 313:    | 0     | 0     | 0     | 0     | 0     | 0     | 0     | 0     |
| 321:    | 0     | 0     | 1     | 0     | 0     | 0     | 0     | 0     |
| 329:    | 0     | 0     | 1     | 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     | 2     |
| 361:    | 1     | 0     | 0     | 0     | 0     | 0     | 0     | 0     |

369: 0 0 0 0 0 0 0 0 0

Sample Title: 11

| Channel | 1  | 2  | 3  | 4  | 5  | 6  | 7  | 8  | 9  |
|---------|----|----|----|----|----|----|----|----|----|
| 377:    | 0  | 0  | 0  | 0  | 0  | 0  | 0  | 0  | 0  |
| 385:    | 0  | 0  | 1  | 0  | 0  | 0  | 0  | 0  | 0  |
| 393:    | 1  | 0  | 0  | 0  | 0  | 0  | 0  | 0  | 0  |
| 401:    | 0  | 2  | 0  | 1  | 2  | 0  | 0  | 1  | 1  |
| 409:    | 1  | 0  | 0  | 2  | 1  | 1  | 0  | 2  | 2  |
| 417:    | 0  | 2  | 2  | 0  | 0  | 1  | 0  | 1  | 1  |
| 425:    | 1  | 3  | 0  | 1  | 1  | 2  | 0  | 1  | 1  |
| 433:    | 1  | 0  | 1  | 0  | 0  | 0  | 0  | 0  | 0  |
| 441:    | 0  | 0  | 0  | 0  | 0  | 0  | 0  | 0  | 0  |
| 449:    | 0  | 0  | 0  | 0  | 0  | 1  | 0  | 0  | 0  |
| 457:    | 0  | 0  | 0  | 0  | 0  | 0  | 0  | 0  | 0  |
| 465:    | 0  | 0  | 0  | 0  | 0  | 0  | 0  | 0  | 0  |
| 473:    | 0  | 0  | 0  | 0  | 0  | 0  | 0  | 0  | 0  |
| 481:    | 0  | 0  | 0  | 0  | 0  | 0  | 0  | 0  | 0  |
| 489:    | 0  | 0  | 1  | 0  | 1  | 0  | 0  | 0  | 0  |
| 497:    | 0  | 0  | 0  | 0  | 0  | 0  | 0  | 0  | 0  |
| 505:    | 0  | 0  | 0  | 0  | 0  | 0  | 0  | 0  | 0  |
| 513:    | 0  | 0  | 0  | 0  | 0  | 0  | 0  | 0  | 0  |
| 521:    | 0  | 0  | 1  | 0  | 0  | 0  | 1  | 1  | 1  |
| 529:    | 0  | 0  | 0  | 0  | 0  | 0  | 1  | 0  | 0  |
| 537:    | 0  | 1  | 0  | 1  | 1  | 1  | 0  | 1  | 1  |
| 545:    | 2  | 1  | 0  | 1  | 0  | 0  | 1  | 2  | 2  |
| 553:    | 0  | 0  | 1  | 1  | 0  | 2  | 2  | 2  | 2  |
| 561:    | 0  | 2  | 3  | 3  | 3  | 2  | 1  | 1  | 1  |
| 569:    | 1  | 3  | 2  | 4  | 2  | 5  | 5  | 4  | 4  |
| 577:    | 3  | 2  | 8  | 3  | 3  | 10 | 5  | 5  | 5  |
| 585:    | 10 | 8  | 8  | 13 | 3  | 10 | 13 | 16 | 16 |
| 593:    | 7  | 13 | 13 | 7  | 22 | 9  | 22 | 16 | 16 |
| 601:    | 17 | 20 | 13 | 18 | 9  | 4  | 5  | 3  | 3  |
| 609:    | 0  | 1  | 0  | 0  | 0  | 0  | 0  | 0  | 0  |
| 617:    | 0  | 0  | 0  | 0  | 0  | 0  | 0  | 0  | 0  |
| 625:    | 0  | 0  | 0  | 0  | 0  | 0  | 1  | 0  | 0  |
| 633:    | 0  | 1  | 0  | 0  | 0  | 0  | 1  | 0  | 0  |
| 641:    | 0  | 0  | 0  | 0  | 0  | 0  | 0  | 0  | 0  |
| 649:    | 0  | 0  | 0  | 0  | 0  | 0  | 0  | 0  | 0  |
| 657:    | 0  | 0  | 0  | 0  | 0  | 0  | 0  | 0  | 0  |
| 665:    | 0  | 0  | 0  | 0  | 0  | 0  | 0  | 0  | 0  |
| 673:    | 0  | 0  | 0  | 0  | 0  | 0  | 0  | 0  | 0  |
| 681:    | 0  | 0  | 0  | 0  | 0  | 0  | 0  | 0  | 0  |
| 689:    | 0  | 0  | 0  | 0  | 0  | 0  | 0  | 0  | 0  |
| 697:    | 0  | 0  | 0  | 0  | 0  | 0  | 0  | 0  | 0  |
| 705:    | 0  | 0  | 0  | 0  | 0  | 0  | 0  | 1  | 1  |
| 713:    | 0  | 0  | 0  | 0  | 0  | 0  | 0  | 0  | 0  |
| 721:    | 0  | 0  | 0  | 0  | 0  | 0  | 0  | 0  | 0  |
| 729:    | 0  | 0  | 0  | 0  | 0  | 0  | 0  | 0  | 0  |
| 737:    | 0  | 0  | 1  | 0  | 0  | 0  | 0  | 0  | 0  |
| 745:    | 0  | 0  | 0  | 0  | 0  | 0  | 0  | 0  | 0  |
| 753:    | 0  | 0  | 0  | 0  | 0  | 0  | 0  | 0  | 0  |
| 761:    | 0  | 0  | 0  | 0  | 0  | 0  | 0  | 0  | 0  |
| 769:    | 0  | 0  | 0  | 0  | 0  | 0  | 0  | 0  | 0  |
| 777:    | 0  | 0  | 0  | 0  | 0  | 0  | 0  | 0  | 0  |
| 785:    | 0  | 0  | 0  | 0  | 0  | 0  | 0  | 0  | 0  |
| 793:    | 0  | 0  | 0  | 0  | 0  | 0  | 0  | 0  | 0  |

801: 0 0 0 0 0 0 0 0 0

Sample Title: 11

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

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4/29/13

# Apex-Alpha™

Sample Description: S-82 TOT  
 Spectrum File: \\OR-ALPHA1\Canberra\ApexAlpha\Root\Data\00000566  
 Batch Identification: 1304105A-UU  
 Sample Identification: 12  
 Sample Geometry: Shelf 2  
 Procedure Description: U iso

Detector Name: Alpha\_029  
 Chamber Serial Number:  
 Detector Serial Number: 29  
 Env. Background: System Bkgd 55745  
 Reagent Blank: <not performed>

Sample Size: 1.000E+000 +/- 0.000E+000 liter  
 Sample Date/Time: 4/9/2013 7:53:48 AM  
 Acquisition Date/Time: 4/29/2013 10:00:04 AM  
 Acquisition Live Time: 170.0 minutes  
 Acquisition Real Time: 170.0 minutes

Tracer Certificate: U232\_UU-10A  
 Tracer Quantity: 0.597 mL  
 Effective Efficiency: 0.0991 +/- 0.0075  
 Counting Efficiency: 0.1945 +/- 0.0036 on 12/15/2012 2:30:02 PM  
 Chem. Recovery Factor: 0.5092 +/- 0.0399

Peak Match Tolerance: 0.150 MeV

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 PEAK AREA REPORT  
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| Nuclide | Energy (MeV) | Net Pk Area | Pk Area Error % | Ambient Backgnd | Reagent Backgnd | FWHM (keV) |
|---------|--------------|-------------|-----------------|-----------------|-----------------|------------|
| U-232   | T 5.271      | 190.81      | 14.24           | 1.19            | 0.00E+000       | 4.9        |
| U-234   | 4.719        | 46.98       | 28.96           | 1.02            | 0.00E+000       | 5.6        |
| U-235   | 4.367        | 3.49        | 113.53          | 0.51            | 0.00E+000       | 3.1        |
| U-238   | 4.140        | 40.83       | 30.75           | 0.17            | 0.00E+000       | 3.9        |

T = Tracer Peak used for Effective Efficiency

-----  
 NUCLIDE ANALYSIS RESULTS  
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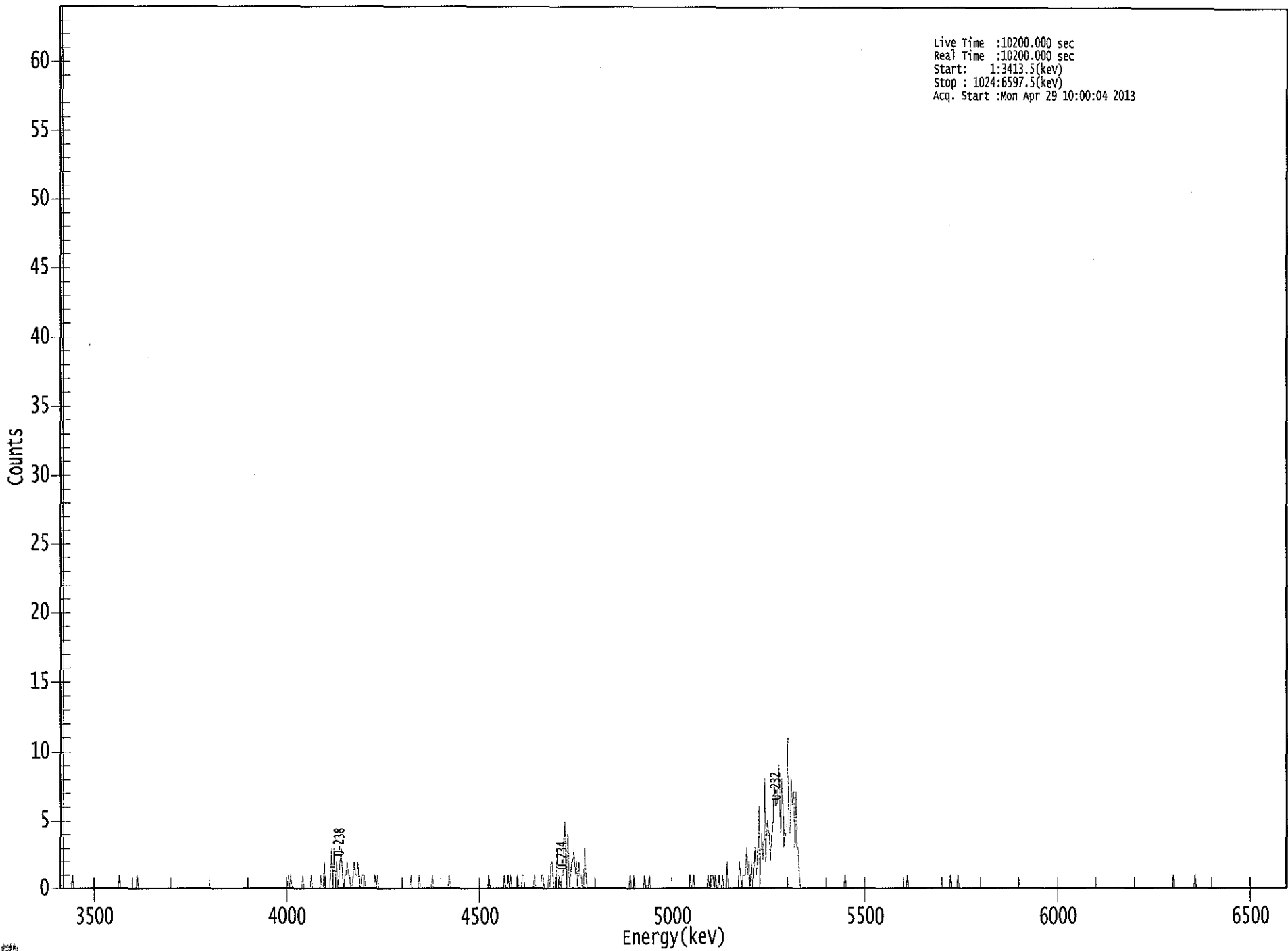
| Nuclide | Id Conf. | Energy (keV) | Activity (pCi/liter)    | MDA (pCi/liter)         |
|---------|----------|--------------|-------------------------|-------------------------|
| U-232   | 0.993    | 5302.50*     | 5.12E+000 +/- 7.64E-001 | 1.77E-001 +/- 2.64E-002 |
| U-234   | 0.987    | 4761.50*     | 1.26E+000 +/- 4.10E-001 | 1.69E-001 +/- 2.52E-002 |
| U-235   | 0.997    | 4385.50*     | 1.15E-001 +/- 1.32E-001 | 1.74E-001 +/- 2.59E-002 |
| U-238   | 0.986    | 4184.40*     | 1.09E+000 +/- 3.73E-001 | 1.11E-001 +/- 1.66E-002 |

AG  
 4/29/13

US EPA ARCHIVE DOCUMENT



0000056619.CNF



Live Time :10200.000 sec  
Real Time :10200.000 sec  
Start: 1:3413.5(keV)  
Stop : 1024:6597.5(keV)  
Acq. Start :Mon Apr 29 10:00:04 2013

ROI Type: 1

ROI Type: 3

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

Sample Title: 12

Elapsed Live time: 10200

Elapsed Real Time: 10200

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

369: 0 0 1 0 0 1 0 1

Sample Title: 12

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

801: 0 0 0 0 0 0 0 0

Sample Title: 12

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

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4/29/13

# Apex-Alpha™

Sample Description: S-82 DIS  
 Spectrum File: \\OR-ALPHA1\Canberra\ApexAlpha\Root\Data\00000566  
 Batch Identification: 1304105A-UU  
 Sample Identification: 13  
 Sample Geometry: Shelf 2  
 Procedure Description: U iso

Detector Name: Alpha\_033  
 Chamber Serial Number: 04026479A  
 Detector Serial Number: 91132  
 Env. Background: System Bkgd 55746  
 Reagent Blank: <not performed>

Sample Size: 1.000E+000 +/- 0.000E+000 liter  
 Sample Date/Time: 4/9/2013 7:53:48 AM  
 Acquisition Date/Time: 4/29/2013 10:00:43 AM  
 Acquisition Live Time: 170.0 minutes  
 Acquisition Real Time: 170.0 minutes

Tracer Certificate: U232\_UU-10A  
 Tracer Quantity: 0.566 mL  
 Effective Efficiency: 0.1141 +/- 0.0083  
 Counting Efficiency: 0.1825 +/- 0.0032 on 12/16/2012 5:49:18 PM  
 Chem. Recovery Factor: 0.6254 +/- 0.0470

Peak Match Tolerance: 0.150 MeV

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 PEAK AREA REPORT  
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| Nuclide | Energy (MeV) | Net Pk Area | Pk Area Error % | Ambient Backgnd | Reagent Backgnd | FWHM (keV) |
|---------|--------------|-------------|-----------------|-----------------|-----------------|------------|
| U-232   | T 5.281      | 208.49      | 13.59           | 0.51            | 0.00E+000       | 18.6       |
| U-234   | 4.741        | 39.00       | 31.78           | 0.00            | 0.00E+000       | 3.5        |
| U-235   | 4.428        | 0.83        | 239.53          | 0.17            | 0.00E+000       | 3.0        |
| U-238   | 4.160        | 35.00       | 33.60           | 0.00            | 0.00E+000       | 4.9        |

T = Tracer Peak used for Effective Efficiency

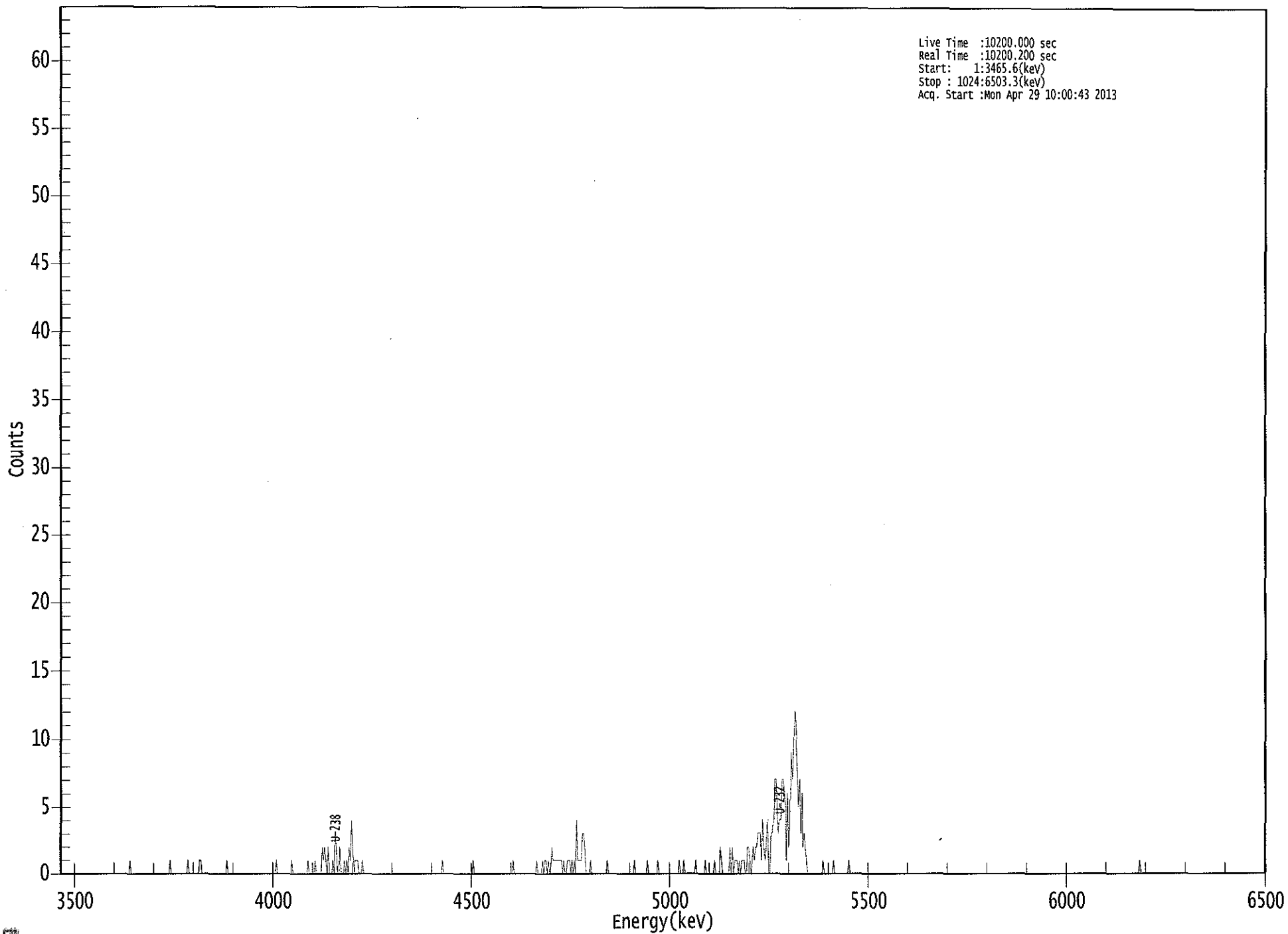
-----  
 NUCLIDE ANALYSIS RESULTS  
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| Nuclide | Id Conf. | Energy (keV) | Activity (pCi/liter)    | MDA (pCi/liter)         |
|---------|----------|--------------|-------------------------|-------------------------|
| U-232   | 0.997    | 5302.50*     | 4.85E+000 +/- 6.95E-001 | 1.22E-001 +/- 1.75E-002 |
| U-234   | 0.997    | 4761.50*     | 9.07E-001 +/- 3.16E-001 | 1.40E-001 +/- 2.00E-002 |
| U-235   | 0.987    | 4385.50*     | 2.38E-002 +/- 5.72E-002 | 1.20E-001 +/- 1.72E-002 |
| U-238   | 0.996    | 4184.40*     | 8.11E-001 +/- 2.96E-001 | 1.39E-001 +/- 1.99E-002 |

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US EPA ARCHIVE DOCUMENT

Live Time :10200.000 sec  
Real Time :10200.200 sec  
Start: 1:3465.6(keV)  
Stop : 1024:6503.3(keV)  
Acq. Start :Mon Apr 29 10:00:43 2013



ROI Type: 1

ROI Type: 3

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

Sample Title: 13

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 | 1 | 0 | 0 | 0 | 0 | 0 |
| 65:     | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 |
| 73:     | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 |
| 81:     | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 |
| 89:     | 0 | 0 | 0 | 0 | 0 | 1 | 0 | 0 | 0 |
| 97:     | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 |
| 105:    | 0 | 0 | 0 | 0 | 1 | 0 | 0 | 0 | 0 |
| 113:    | 0 | 0 | 0 | 0 | 0 | 0 | 1 | 1 | 1 |
| 121:    | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 |
| 129:    | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 |
| 137:    | 0 | 0 | 0 | 0 | 0 | 1 | 0 | 0 | 0 |
| 145:    | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 |
| 153:    | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 |
| 161:    | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 |
| 169:    | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 |
| 177:    | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 1 |
| 185:    | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 |
| 193:    | 0 | 0 | 0 | 0 | 1 | 0 | 0 | 0 | 0 |
| 201:    | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 |
| 209:    | 0 | 0 | 1 | 0 | 0 | 0 | 0 | 0 | 0 |
| 217:    | 1 | 0 | 0 | 0 | 0 | 0 | 2 | 1 | 1 |
| 225:    | 2 | 1 | 0 | 2 | 0 | 0 | 0 | 0 | 1 |
| 233:    | 0 | 3 | 2 | 0 | 0 | 2 | 0 | 0 | 0 |
| 241:    | 0 | 1 | 0 | 1 | 0 | 2 | 1 | 4 | 4 |
| 249:    | 2 | 0 | 1 | 1 | 1 | 0 | 0 | 0 | 0 |
| 257:    | 1 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 |
| 265:    | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 |
| 273:    | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 |
| 281:    | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 |
| 289:    | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 |
| 297:    | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 |
| 305:    | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 |
| 313:    | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 |
| 321:    | 0 | 0 | 0 | 0 | 1 | 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 | 1 | 0 | 0 |
| 353:    | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 |
| 361:    | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 |

369: 0 0 0 0 0 0 0 0 0

Sample Title: 13

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



801: 0 0 0 0 0 0 0 0

Sample Title: 13

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

100  
4/29/13

# Apex-Alpha™

Sample Description: PZ-106-SS TOT  
 Spectrum File: \\OR-ALPHA1\Canberra\ApexAlpha\Root\Data\00000566  
 Batch Identification: 1304105A-UU  
 Sample Identification: 14  
 Sample Geometry: Shelf 2  
 Procedure Description: U iso

Detector Name: Alpha\_034  
 Chamber Serial Number: 04026479B  
 Detector Serial Number: 91136  
 Env. Background: System Bkgd 55747  
 Reagent Blank: <not performed>

Sample Size: 1.000E+000 +/- 0.000E+000 liter  
 Sample Date/Time: 4/9/2013 7:53:48 AM  
 Acquisition Date/Time: 4/29/2013 10:00:45 AM  
 Acquisition Live Time: 170.0 minutes  
 Acquisition Real Time: 170.0 minutes

Tracer Certificate: U232\_UU-10A  
 Tracer Quantity: 0.597 mL  
 Effective Efficiency: 0.2413 +/- 0.0125  
 Counting Efficiency: 0.1856 +/- 0.0032 on 12/16/2012 5:49:43 PM  
 Chem. Recovery Factor: 1.3005 +/- 0.0711

Peak Match Tolerance: 0.150 MeV

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

| Nuclide | Energy (MeV) | Net Pk Area | Pk Area Error % | Ambient Backgnd | Reagent Backgnd | FWHM (keV) |
|---------|--------------|-------------|-----------------|-----------------|-----------------|------------|
| U-232   | T 5.282      | 464.83      | 9.09            | 0.17            | 0.00E+000       | 54.8       |
| U-234   | 4.737        | 53.83       | 26.76           | 0.17            | 0.00E+000       | 3.0        |
| U-235   | 4.405        | 3.66        | 107.87          | 0.34            | 0.00E+000       | 3.0        |
| U-238   | 4.162        | 34.66       | 33.48           | 0.34            | 0.00E+000       | 5.2        |

T = Tracer Peak used for Effective Efficiency

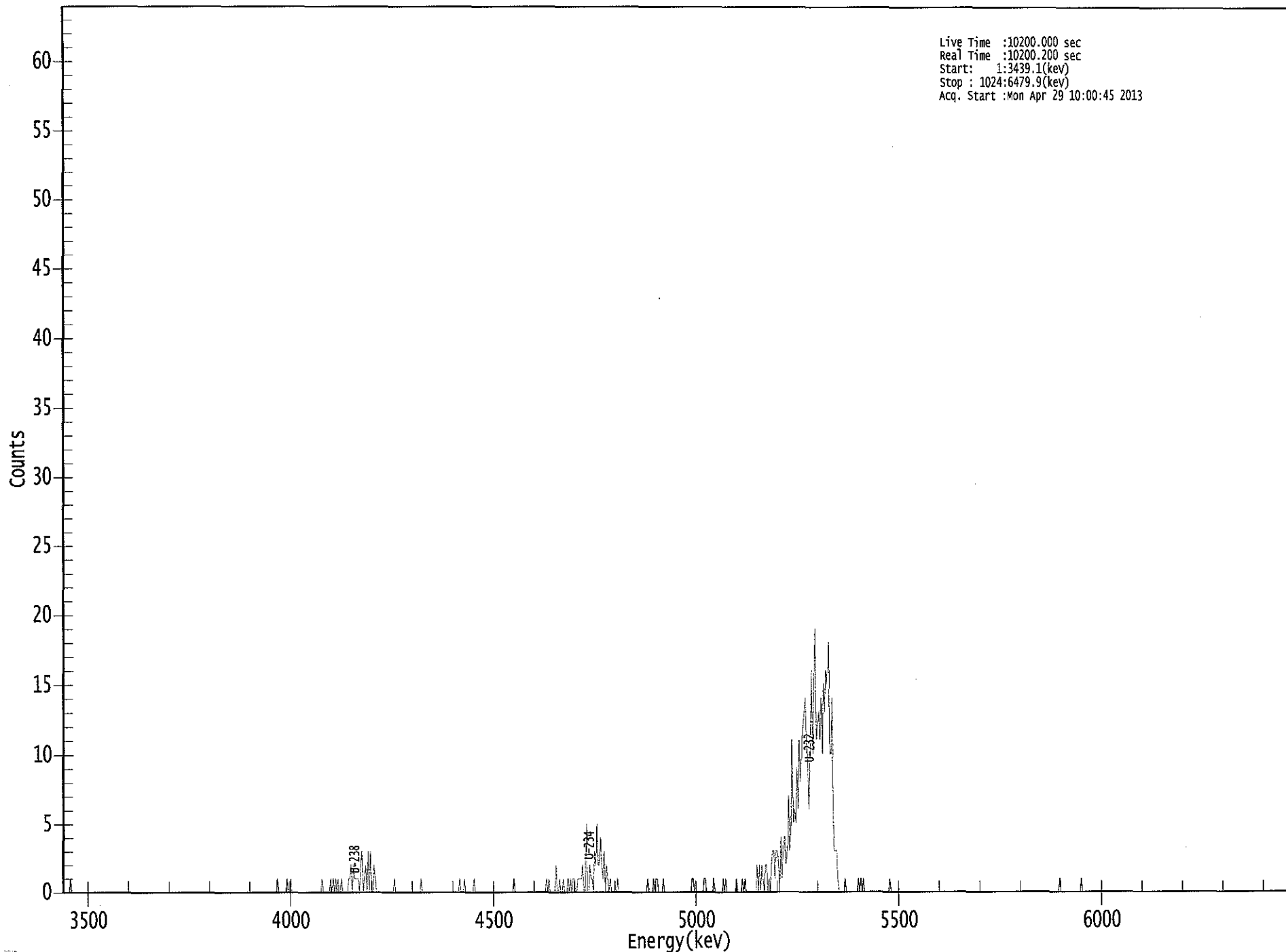
-----  
 NUCLIDE ANALYSIS RESULTS  
 -----

| Nuclide | Id Conf. | Energy (keV) | Activity (pCi/liter)    | MDA (pCi/liter)         |
|---------|----------|--------------|-------------------------|-------------------------|
| U-232   | 0.997    | 5302.50*     | 5.12E+000 +/- 5.19E-001 | 4.59E-002 +/- 4.66E-003 |
| U-234   | 0.996    | 4761.50*     | 5.92E-001 +/- 1.70E-001 | 4.59E-002 +/- 4.66E-003 |
| U-235   | 0.997    | 4385.50*     | 4.97E-002 +/- 5.38E-002 | 6.49E-002 +/- 6.59E-003 |
| U-238   | 0.996    | 4184.40*     | 3.80E-001 +/- 1.33E-001 | 5.24E-002 +/- 5.32E-003 |

AG  
4/29/13

US EPA ARCHIVE DOCUMENT

0000056624.CNF



Live Time : 10200.000 sec  
Real Time : 10200.200 sec  
Start : 1:3439.1(kev)  
Stop : 1024:6479.9(kev)  
Acq. Start : Mon Apr 29 10:00:45 2013

ROI Type: 1

ROI Type: 3

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

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

369: 0 0 0 0 0 0 0 1 0

Sample Title: 14

| Channel | 1  | 2  | 3  | 4  | 5  | 6  | 7  | 8  | 9  |
|---------|----|----|----|----|----|----|----|----|----|
| 377:    | 0  | 0  | 0  | 0  | 0  | 0  | 0  | 0  | 0  |
| 385:    | 0  | 0  | 0  | 0  | 0  | 0  | 0  | 0  | 0  |
| 393:    | 0  | 0  | 0  | 0  | 0  | 0  | 0  | 0  | 0  |
| 401:    | 0  | 1  | 0  | 1  | 0  | 0  | 0  | 0  | 0  |
| 409:    | 0  | 2  | 0  | 0  | 1  | 0  | 0  | 0  | 1  |
| 417:    | 0  | 0  | 0  | 1  | 0  | 1  | 0  | 0  | 1  |
| 425:    | 1  | 0  | 0  | 1  | 1  | 1  | 1  | 1  | 2  |
| 433:    | 0  | 0  | 5  | 0  | 0  | 2  | 1  | 1  | 1  |
| 441:    | 0  | 3  | 2  | 5  | 2  | 2  | 4  | 2  | 2  |
| 449:    | 1  | 3  | 0  | 2  | 1  | 0  | 1  | 0  | 0  |
| 457:    | 0  | 0  | 0  | 0  | 1  | 0  | 0  | 0  | 0  |
| 465:    | 0  | 0  | 0  | 0  | 0  | 0  | 0  | 0  | 0  |
| 473:    | 0  | 0  | 0  | 0  | 0  | 0  | 0  | 0  | 0  |
| 481:    | 0  | 0  | 0  | 0  | 0  | 1  | 0  | 0  | 0  |
| 489:    | 0  | 0  | 1  | 0  | 1  | 1  | 0  | 0  | 0  |
| 497:    | 0  | 0  | 1  | 0  | 0  | 0  | 0  | 0  | 0  |
| 505:    | 0  | 0  | 0  | 0  | 0  | 0  | 0  | 0  | 0  |
| 513:    | 0  | 0  | 0  | 0  | 0  | 0  | 0  | 0  | 0  |
| 521:    | 0  | 0  | 1  | 1  | 0  | 0  | 0  | 0  | 0  |
| 529:    | 0  | 0  | 0  | 0  | 1  | 1  | 0  | 0  | 0  |
| 537:    | 0  | 0  | 0  | 0  | 1  | 0  | 0  | 0  | 0  |
| 545:    | 0  | 0  | 0  | 0  | 1  | 0  | 1  | 0  | 0  |
| 553:    | 0  | 0  | 0  | 0  | 0  | 0  | 0  | 0  | 1  |
| 561:    | 0  | 0  | 0  | 0  | 1  | 0  | 1  | 0  | 0  |
| 569:    | 0  | 0  | 0  | 0  | 0  | 0  | 0  | 0  | 0  |
| 577:    | 2  | 0  | 2  | 0  | 2  | 1  | 0  | 0  | 2  |
| 585:    | 2  | 0  | 1  | 0  | 2  | 3  | 3  | 1  | 1  |
| 593:    | 3  | 3  | 2  | 0  | 4  | 1  | 4  | 4  | 4  |
| 601:    | 2  | 3  | 7  | 3  | 5  | 11 | 5  | 6  | 6  |
| 609:    | 5  | 9  | 6  | 11 | 8  | 11 | 12 | 13 | 13 |
| 617:    | 14 | 10 | 10 | 6  | 9  | 16 | 10 | 15 | 15 |
| 625:    | 19 | 11 | 12 | 13 | 11 | 14 | 10 | 15 | 15 |
| 633:    | 13 | 16 | 15 | 18 | 10 | 10 | 14 | 5  | 5  |
| 641:    | 3  | 3  | 3  | 1  | 0  | 0  | 0  | 0  | 0  |
| 649:    | 0  | 1  | 0  | 0  | 0  | 0  | 0  | 0  | 0  |
| 657:    | 0  | 0  | 0  | 0  | 1  | 0  | 1  | 0  | 0  |
| 665:    | 1  | 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  | 1  | 0  | 0  |
| 689:    | 0  | 0  | 0  | 0  | 0  | 0  | 0  | 0  | 0  |
| 697:    | 0  | 0  | 0  | 0  | 0  | 0  | 0  | 0  | 0  |
| 705:    | 0  | 0  | 0  | 0  | 0  | 0  | 0  | 0  | 0  |
| 713:    | 0  | 0  | 0  | 0  | 0  | 0  | 0  | 0  | 0  |
| 721:    | 0  | 0  | 0  | 0  | 0  | 0  | 0  | 0  | 0  |
| 729:    | 0  | 0  | 0  | 0  | 0  | 0  | 0  | 0  | 0  |
| 737:    | 0  | 0  | 0  | 0  | 0  | 0  | 0  | 0  | 0  |
| 745:    | 0  | 0  | 0  | 0  | 0  | 0  | 0  | 0  | 0  |
| 753:    | 0  | 0  | 0  | 0  | 0  | 0  | 0  | 0  | 0  |
| 761:    | 0  | 0  | 0  | 0  | 0  | 0  | 0  | 0  | 0  |
| 769:    | 0  | 0  | 0  | 0  | 0  | 0  | 0  | 0  | 0  |
| 777:    | 0  | 0  | 0  | 0  | 0  | 0  | 0  | 0  | 0  |
| 785:    | 0  | 0  | 0  | 0  | 0  | 0  | 0  | 0  | 0  |
| 793:    | 0  | 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     | 1     | 0     | 0     | 0     | 0     |
| 833:    | 0     | 0     | 0     | 0     | 0     | 0     | 0     | 0     |
| 841:    | 0     | 0     | 0     | 0     | 0     | 1     | 0     | 0     |
| 849:    | 0     | 0     | 0     | 0     | 0     | 0     | 0     | 0     |
| 857:    | 0     | 0     | 0     | 0     | 0     | 0     | 0     | 0     |
| 865:    | 0     | 0     | 0     | 0     | 0     | 0     | 0     | 0     |
| 873:    | 0     | 0     | 0     | 0     | 0     | 0     | 0     | 0     |
| 881:    | 0     | 0     | 0     | 0     | 0     | 0     | 0     | 0     |
| 889:    | 0     | 0     | 0     | 0     | 0     | 0     | 0     | 0     |
| 897:    | 0     | 0     | 0     | 0     | 0     | 0     | 0     | 0     |
| 905:    | 0     | 0     | 0     | 0     | 0     | 0     | 0     | 0     |
| 913:    | 0     | 0     | 0     | 0     | 0     | 0     | 0     | 0     |
| 921:    | 0     | 0     | 0     | 0     | 0     | 0     | 0     | 0     |
| 929:    | 0     | 0     | 0     | 0     | 0     | 0     | 0     | 0     |
| 937:    | 0     | 0     | 0     | 0     | 0     | 0     | 0     | 0     |
| 945:    | 0     | 0     | 0     | 0     | 0     | 0     | 0     | 0     |
| 953:    | 0     | 0     | 0     | 0     | 0     | 0     | 0     | 0     |
| 961:    | 0     | 0     | 0     | 0     | 0     | 0     | 0     | 0     |
| 969:    | 0     | 0     | 0     | 0     | 0     | 0     | 0     | 0     |
| 977:    | 0     | 0     | 0     | 0     | 0     | 0     | 0     | 0     |
| 985:    | 0     | 0     | 0     | 0     | 0     | 0     | 0     | 0     |
| 993:    | 0     | 0     | 0     | 0     | 0     | 0     | 0     | 0     |
| 1001:   | 0     | 0     | 0     | 0     | 0     | 0     | 0     | 0     |
| 1009:   | 0     | 0     | 0     | 0     | 0     | 0     | 0     | 0     |
| 1017:   | 0     | 0     | 0     | 0     | 0     | 0     | 0     | 0     |

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4/29/13

# Apex-Alpha™

Sample Description: PZ-106-SS DIS  
 Spectrum File: \\OR-ALPHA1\Canberra\ApexAlpha\Root\Data\00000566  
 Batch Identification: 1304105A-UU  
 Sample Identification: 15  
 Sample Geometry: Shelf 2  
 Procedure Description: U iso

Detector Name: Alpha\_035  
 Chamber Serial Number: 04026477A  
 Detector Serial Number: 58771  
 Env. Background: System Bkgd 55748  
 Reagent Blank: <not performed>

Sample Size: 1.000E+000 +/- 0.000E+000 liter  
 Sample Date/Time: 4/9/2013 7:53:48 AM  
 Acquisition Date/Time: 4/29/2013 10:00:46 AM  
 Acquisition Live Time: 170.0 minutes  
 Acquisition Real Time: 170.0 minutes

Tracer Certificate: U232\_UU-10A  
 Tracer Quantity: 0.596 mL  
 Effective Efficiency: 0.2486 +/- 0.0127  
 Counting Efficiency: 0.1826 +/- 0.0032 on 12/16/2012 5:49:42 PM  
 Chem. Recovery Factor: 1.3618 +/- 0.0737

Peak Match Tolerance: 0.150 MeV

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

| Nuclide | Energy (MeV) | Net Pk Area | Pk Area Error % | Ambient Backgnd | Reagent Backgnd | FWHM (keV) |
|---------|--------------|-------------|-----------------|-----------------|-----------------|------------|
| U-232   | T 5.299      | 478.66      | 8.96            | 0.34            | 0.00E+000       | 42.6       |
| U-234   | 4.744        | 56.66       | 26.13           | 0.34            | 0.00E+000       | 3.9        |
| U-235   | 4.395        | 8.83        | 66.70           | 0.17            | 0.00E+000       | 2.9        |
| U-238   | 4.168        | 31.83       | 34.85           | 0.17            | 0.00E+000       | 3.7        |

T = Tracer Peak used for Effective Efficiency

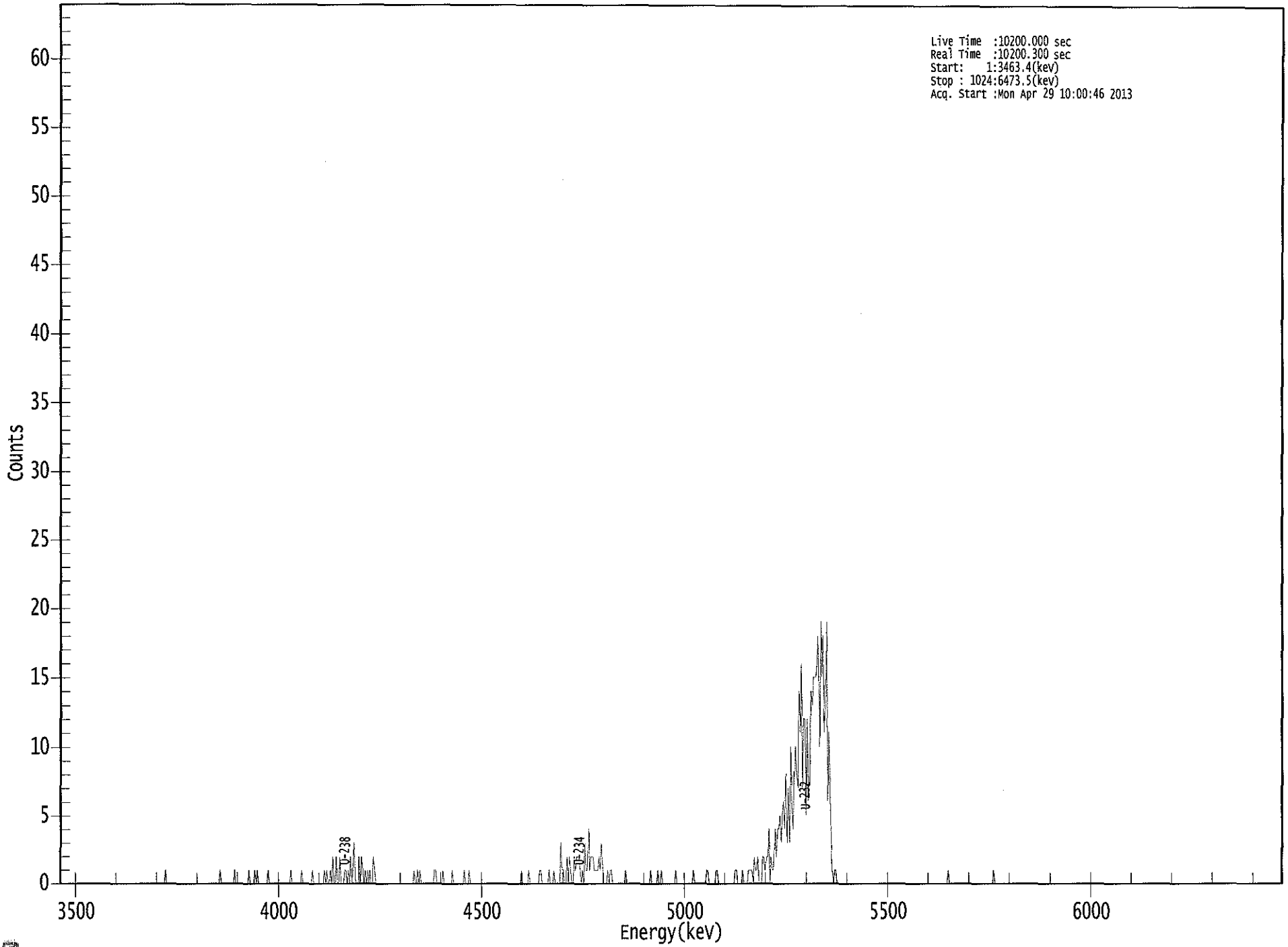
-----  
 ----- NUCLIDE ANALYSIS RESULTS -----  
 -----

| Nuclide | Id Conf. | Energy (keV) | Activity (pCi/liter)    | MDA (pCi/liter)         |
|---------|----------|--------------|-------------------------|-------------------------|
| U-232   | 1.000    | 5302.50*     | 5.11E+000 +/- 5.13E-001 | 5.11E-002 +/- 5.13E-003 |
| U-234   | 0.998    | 4761.50*     | 6.05E-001 +/- 1.69E-001 | 5.11E-002 +/- 5.12E-003 |
| U-235   | 0.999    | 4385.50*     | 1.16E-001 +/- 7.85E-002 | 5.50E-002 +/- 5.52E-003 |
| U-238   | 0.998    | 4184.40*     | 3.38E-001 +/- 1.23E-001 | 4.44E-002 +/- 4.45E-003 |

AEA  
4/29/13

US EPA ARCHIVE DOCUMENT

Live Time :10200.000 sec  
Real Time :10200.300 sec  
Start: 1:3463.4(kev)  
Stop : 1024:6473.5(kev)  
Acq. Start :Mon Apr 29 10:00:46 2013



ROI Type: 1

ROI Type: 3



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

Sample Title: 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 | 0 | 0 |
| 73:     | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 |
| 81:     | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 |
| 89:     | 1 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 |
| 97:     | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 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 | 1 | 0 | 0 |
| 137:    | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 |
| 145:    | 0 | 0 | 1 | 0 | 0 | 0 | 0 | 0 | 0 |
| 153:    | 0 | 0 | 0 | 0 | 0 | 0 | 1 | 0 | 0 |
| 161:    | 0 | 0 | 0 | 1 | 0 | 1 | 0 | 0 | 0 |
| 169:    | 0 | 0 | 0 | 0 | 0 | 0 | 1 | 0 | 0 |
| 177:    | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 |
| 185:    | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 |
| 193:    | 0 | 1 | 0 | 0 | 0 | 0 | 0 | 0 | 0 |
| 201:    | 0 | 0 | 1 | 0 | 0 | 0 | 0 | 0 | 0 |
| 209:    | 0 | 0 | 0 | 1 | 0 | 0 | 0 | 0 | 0 |
| 217:    | 0 | 0 | 0 | 0 | 0 | 1 | 0 | 1 | 0 |
| 225:    | 0 | 0 | 1 | 0 | 2 | 0 | 0 | 2 | 0 |
| 233:    | 0 | 0 | 2 | 0 | 0 | 0 | 1 | 1 | 0 |
| 241:    | 0 | 1 | 0 | 2 | 0 | 1 | 3 | 0 | 0 |
| 249:    | 0 | 0 | 2 | 0 | 2 | 1 | 0 | 1 | 0 |
| 257:    | 0 | 1 | 0 | 1 | 0 | 0 | 2 | 1 | 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:    | 1 | 0 | 0 | 1 | 0 | 1 | 0 | 0 | 0 |
| 305:    | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 |
| 313:    | 0 | 1 | 1 | 0 | 0 | 0 | 0 | 0 | 0 |
| 321:    | 1 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 |
| 329:    | 1 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 |
| 337:    | 0 | 0 | 1 | 0 | 0 | 0 | 1 | 0 | 0 |
| 345:    | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 |
| 353:    | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 |
| 361:    | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 |

369: 0 0 0 0 0 0 0 0 0

Sample Title: 15

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

Sample Title: 15

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

105  
4/29/13

# Apex-Alpha™

Sample Description: I-9 TOT  
 Spectrum File: \\OR-ALPHA1\Canberra\ApexAlpha\Root\Data\00000566  
 Batch Identification: 1304105A-UU  
 Sample Identification: 16  
 Sample Geometry: Shelf 2  
 Procedure Description: U iso

Detector Name: Alpha\_037  
 Chamber Serial Number: 04026478A  
 Detector Serial Number: 91133  
 Env. Background: System Bkgd 55750  
 Reagent Blank: <not performed>

Sample Size: 1.000E+000 +/- 0.000E+000 liter  
 Sample Date/Time: 4/9/2013 7:53:48 AM  
 Acquisition Date/Time: 4/29/2013 10:00:48 AM  
 Acquisition Live Time: 170.0 minutes  
 Acquisition Real Time: 170.0 minutes

Tracer Certificate: U232\_UU-10A  
 Tracer Quantity: 0.599 mL  
 Effective Efficiency: 0.1107 +/- 0.0080  
 Counting Efficiency: 0.1783 +/- 0.0033 on 1/26/2013 3:28:25 PM  
 Chem. Recovery Factor: 0.6209 +/- 0.0463

Peak Match Tolerance: 0.150 MeV

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

| Nuclide | Energy (MeV) | Net Pk Area | Pk Area Error % | Ambient Backgnd | Reagent Backgnd | FWHM (keV) |
|---------|--------------|-------------|-----------------|-----------------|-----------------|------------|
| U-232   | T 5.286      | 213.83      | 13.41           | 0.17            | 0.00E+000       | 14.0       |
| U-234   | 4.731        | 5.66        | 85.23           | 0.34            | 0.00E+000       | 2.9        |
| U-235   | 4.398        | 0.00        | 1960.0          | 0.00            | 0.00E+000       | 0.0        |
| U-238   | 4.171        | 1.83        | 152.56          | 0.17            | 0.00E+000       | 2.9        |

T = Tracer Peak used for Effective Efficiency

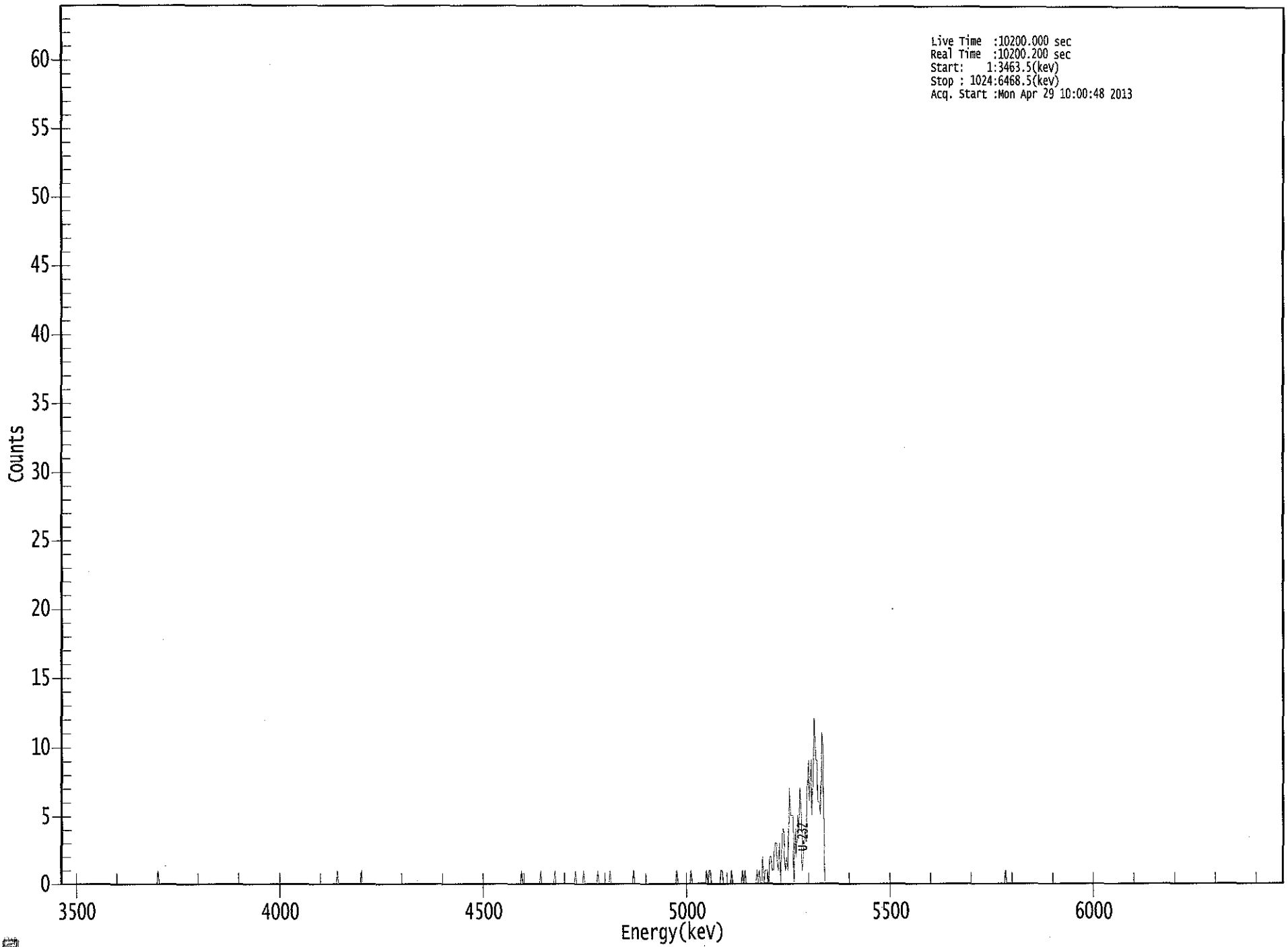
-----  
 NUCLIDE ANALYSIS RESULTS  
 -----

| Nuclide | Id Conf. | Energy (keV) | Activity (pCi/liter)    | MDA (pCi/liter)         |
|---------|----------|--------------|-------------------------|-------------------------|
| U-232   | 0.998    | 5302.50*     | 5.13E+000 +/- 7.26E-001 | 1.00E-001 +/- 1.42E-002 |
| U-234   | 0.993    | 4761.50*     | 1.36E-001 +/- 1.17E-001 | 1.15E-001 +/- 1.62E-002 |
| U-235   | 0.999    | 4385.50*     | 0.00E+000 +/- 8.20E-002 | 1.77E-001 +/- 2.51E-002 |
| U-238   | 0.999    | 4184.40*     | 4.37E-002 +/- 6.70E-002 | 9.97E-002 +/- 1.41E-002 |

AG  
 4/29/13

US EPA ARCHIVE DOCUMENT

Live Time :10200.000 sec  
Real Time :10200.200 sec  
Start: 1:3463.5(kev)  
Stop : 1024:6468.5(kev)  
Acq. Start :Mon Apr 29 10:00:48 2013



ROI Type: 1

ROI Type: 3

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

Sample Title: 16

Elapsed Live time: 10200

Elapsed Real Time: 10200

| Channel | ----- | ----- | ----- | ----- | ----- | ----- | ----- | ----- |
|---------|-------|-------|-------|-------|-------|-------|-------|-------|
| 1:      | 0     | 0     | 0     | 0     | 0     | 0     | 0     | 0     |
| 9:      | 0     | 0     | 0     | 0     | 0     | 0     | 0     | 0     |
| 17:     | 0     | 0     | 0     | 0     | 0     | 0     | 0     | 0     |
| 25:     | 0     | 0     | 0     | 0     | 0     | 0     | 0     | 0     |
| 33:     | 0     | 0     | 0     | 0     | 0     | 0     | 0     | 0     |
| 41:     | 0     | 0     | 0     | 0     | 0     | 0     | 0     | 0     |
| 49:     | 0     | 0     | 0     | 0     | 0     | 0     | 0     | 0     |
| 57:     | 0     | 0     | 0     | 0     | 0     | 0     | 0     | 0     |
| 65:     | 0     | 0     | 0     | 0     | 0     | 0     | 0     | 0     |
| 73:     | 0     | 0     | 0     | 0     | 0     | 0     | 0     | 0     |
| 81:     | 0     | 1     | 0     | 0     | 0     | 0     | 0     | 0     |
| 89:     | 0     | 0     | 0     | 0     | 0     | 0     | 0     | 0     |
| 97:     | 0     | 0     | 0     | 0     | 0     | 0     | 0     | 0     |
| 105:    | 0     | 0     | 0     | 0     | 0     | 0     | 0     | 0     |
| 113:    | 0     | 0     | 0     | 0     | 0     | 0     | 0     | 0     |
| 121:    | 0     | 0     | 0     | 0     | 0     | 0     | 0     | 0     |
| 129:    | 0     | 0     | 0     | 0     | 0     | 0     | 0     | 0     |
| 137:    | 0     | 0     | 0     | 0     | 0     | 0     | 0     | 0     |
| 145:    | 0     | 0     | 0     | 0     | 0     | 0     | 0     | 0     |
| 153:    | 0     | 0     | 0     | 0     | 0     | 0     | 0     | 0     |
| 161:    | 0     | 0     | 0     | 0     | 0     | 0     | 0     | 0     |
| 169:    | 0     | 0     | 0     | 0     | 0     | 0     | 0     | 0     |
| 177:    | 0     | 0     | 0     | 0     | 0     | 0     | 0     | 0     |
| 185:    | 0     | 0     | 0     | 0     | 0     | 0     | 0     | 0     |
| 193:    | 0     | 0     | 0     | 0     | 0     | 0     | 0     | 0     |
| 201:    | 0     | 0     | 0     | 0     | 0     | 0     | 0     | 0     |
| 209:    | 0     | 0     | 0     | 0     | 0     | 0     | 0     | 0     |
| 217:    | 0     | 0     | 0     | 0     | 0     | 0     | 0     | 0     |
| 225:    | 0     | 0     | 0     | 0     | 0     | 0     | 0     | 1     |
| 233:    | 0     | 0     | 0     | 0     | 0     | 0     | 0     | 0     |
| 241:    | 0     | 0     | 0     | 0     | 0     | 0     | 0     | 0     |
| 249:    | 0     | 0     | 0     | 1     | 0     | 0     | 0     | 0     |
| 257:    | 0     | 0     | 0     | 0     | 0     | 0     | 0     | 0     |
| 265:    | 0     | 0     | 0     | 0     | 0     | 0     | 0     | 0     |
| 273:    | 0     | 0     | 0     | 0     | 0     | 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 0

Sample Title: 16

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

801: 0 0 0 0 0 0 0 0

Sample Title: 16

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



UGS  
4/29/13

# Apex-Alpha™

Sample Description: I-9 DIS  
 Spectrum File: \\OR-ALPHA1\Canberra\ApexAlpha\Root\Data\00000566  
 Batch Identification: 1304105A-UU  
 Sample Identification: 17  
 Sample Geometry: Shelf 2  
 Procedure Description: U iso

Detector Name: Alpha\_040  
 Chamber Serial Number: 06027396B  
 Detector Serial Number: 91135  
 Env. Background: System Bkgd 55752  
 Reagent Blank: <not performed>

Sample Size: 1.000E+000 +/- 0.000E+000 liter  
 Sample Date/Time: 4/9/2013 7:53:48 AM  
 Acquisition Date/Time: 4/29/2013 10:00:50 AM  
 Acquisition Live Time: 170.0 minutes  
 Acquisition Real Time: 170.0 minutes

Tracer Certificate: U232\_UU-10A  
 Tracer Quantity: 0.594 mL  
 Effective Efficiency: 0.1537 +/- 0.0096  
 Counting Efficiency: 0.1900 +/- 0.0033 on 12/16/2012 5:49:33 PM  
 Chem. Recovery Factor: 0.8090 +/- 0.0526

Peak Match Tolerance: 0.150 MeV

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 PEAK AREA REPORT  
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| Nuclide | Energy (MeV) | Net Pk Area | Pk Area Error % | Ambient Backgnd | Reagent Backgnd | FWHM (keV) |
|---------|--------------|-------------|-----------------|-----------------|-----------------|------------|
| U-232   | T 5.274      | 294.83      | 11.42           | 0.17            | 0.00E+000       | 16.1       |
| U-234   | 4.706        | 11.83       | 57.46           | 0.17            | 0.00E+000       | 3.0        |
| U-235   | 4.387        | 4.83        | 91.00           | 0.17            | 0.00E+000       | 3.0        |
| U-238   | 4.179        | 10.83       | 60.10           | 0.17            | 0.00E+000       | 5.9        |

T = Tracer Peak used for Effective Efficiency

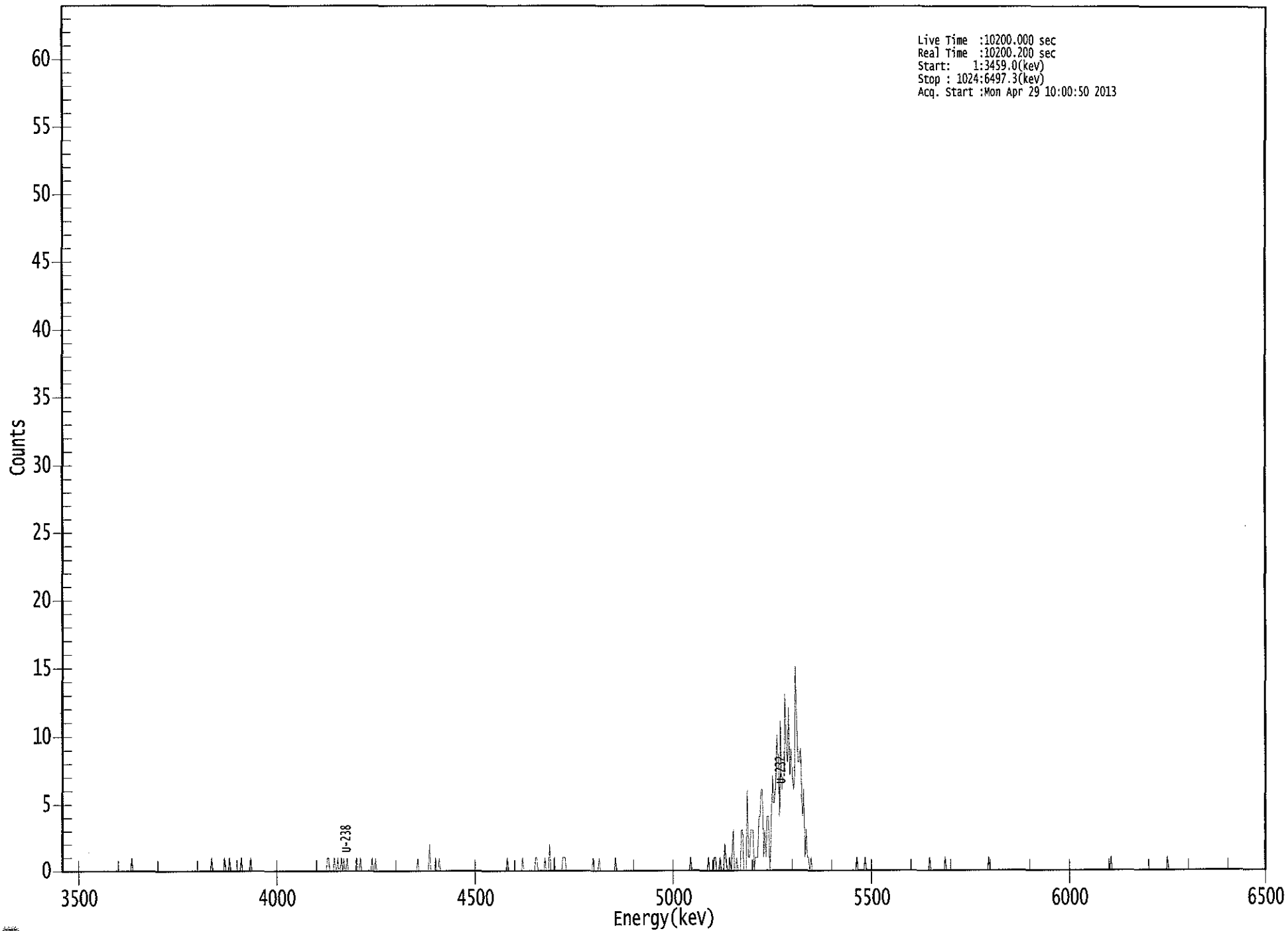
-----  
 NUCLIDE ANALYSIS RESULTS  
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| Nuclide | Id Conf. | Energy (keV) | Activity (pCi/liter )   | MDA (pCi/liter )        |
|---------|----------|--------------|-------------------------|-------------------------|
| U-232   | 0.994    | 5302.50*     | 5.10E+000 +/- 6.26E-001 | 7.21E-002 +/- 8.85E-003 |
| U-234   | 0.978    | 4761.50*     | 2.04E-001 +/- 1.20E-001 | 7.21E-002 +/- 8.85E-003 |
| U-235   | 1.000    | 4385.50*     | 1.03E-001 +/- 9.45E-002 | 8.89E-002 +/- 1.09E-002 |
| U-238   | 1.000    | 4184.40*     | 1.86E-001 +/- 1.14E-001 | 7.18E-002 +/- 8.81E-003 |

AG  
 4/29/13

US EPA ARCHIVE DOCUMENT

0000056626.CNF



Live Time :10200.000 sec  
Real Time :10200.200 sec  
Start: 1:3459.0(kev)  
Stop : 1024:6497.3(kev)  
Acq. Start :Mon Apr 29 10:00:50 2013

ROI Type: 1

ROI Type: 3

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

Sample Title: 17

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 | 1 | 0 | 0 | 0 | 0 | 0 |
| 65:     | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 |
| 73:     | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 |
| 81:     | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 |
| 89:     | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 |
| 97:     | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 |
| 105:    | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 |
| 113:    | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 |
| 121:    | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 1 |
| 129:    | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 |
| 137:    | 0 | 0 | 1 | 0 | 0 | 0 | 1 | 0 | 0 |
| 145:    | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 |
| 153:    | 1 | 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 | 0 |
| 185:    | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 |
| 193:    | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 |
| 201:    | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 |
| 209:    | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 |
| 217:    | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 |
| 225:    | 0 | 1 | 1 | 0 | 0 | 0 | 0 | 1 | 0 |
| 233:    | 0 | 0 | 1 | 0 | 0 | 1 | 0 | 0 | 1 |
| 241:    | 0 | 0 | 1 | 0 | 0 | 0 | 0 | 0 | 0 |
| 249:    | 0 | 0 | 1 | 0 | 0 | 1 | 0 | 0 | 0 |
| 257:    | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 1 |
| 265:    | 0 | 0 | 1 | 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 | 1 | 0 | 0 |
| 305:    | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 |
| 313:    | 2 | 0 | 0 | 0 | 0 | 1 | 0 | 0 | 0 |
| 321:    | 1 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 |
| 329:    | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 |
| 337:    | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 |
| 345:    | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 |
| 353:    | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 |
| 361:    | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 |

369: 0 0 0 0 0 0 0 0 0

Sample Title: 17

| Channel | ----- | ----- | ----- | ----- | ----- | ----- | ----- | ----- |
|---------|-------|-------|-------|-------|-------|-------|-------|-------|
| 377:    | 0     | 0     | 1     | 0     | 0     | 0     | 0     | 0     |
| 385:    | 0     | 0     | 0     | 0     | 0     | 0     | 0     | 1     |
| 393:    | 0     | 0     | 0     | 0     | 0     | 0     | 0     | 0     |
| 401:    | 0     | 0     | 1     | 1     | 0     | 0     | 0     | 0     |
| 409:    | 0     | 0     | 1     | 0     | 0     | 0     | 2     | 0     |
| 417:    | 0     | 0     | 1     | 0     | 0     | 0     | 0     | 0     |
| 425:    | 0     | 1     | 1     | 1     | 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     | 1     | 0     | 0     | 0     | 0     |
| 457:    | 1     | 0     | 0     | 0     | 0     | 0     | 0     | 0     |
| 465:    | 0     | 0     | 0     | 0     | 0     | 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     | 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     | 1     | 0     |
| 537:    | 0     | 0     | 0     | 0     | 0     | 0     | 0     | 0     |
| 545:    | 0     | 0     | 0     | 0     | 0     | 1     | 0     | 0     |
| 553:    | 0     | 0     | 1     | 1     | 0     | 0     | 0     | 1     |
| 561:    | 0     | 0     | 0     | 2     | 1     | 0     | 0     | 1     |
| 569:    | 0     | 1     | 3     | 0     | 0     | 1     | 0     | 0     |
| 577:    | 0     | 3     | 3     | 0     | 0     | 0     | 6     | 1     |
| 585:    | 1     | 3     | 3     | 3     | 0     | 1     | 1     | 1     |
| 593:    | 4     | 4     | 6     | 6     | 1     | 3     | 1     | 4     |
| 601:    | 4     | 0     | 2     | 7     | 5     | 5     | 7     | 10    |
| 609:    | 8     | 4     | 11    | 6     | 7     | 7     | 13    | 9     |
| 617:    | 8     | 12    | 7     | 9     | 7     | 6     | 7     | 15    |
| 625:    | 11    | 8     | 8     | 9     | 6     | 4     | 6     | 1     |
| 633:    | 3     | 1     | 1     | 0     | 1     | 0     | 0     | 0     |
| 641:    | 0     | 0     | 0     | 0     | 0     | 0     | 0     | 0     |
| 649:    | 0     | 0     | 0     | 0     | 0     | 0     | 0     | 0     |
| 657:    | 0     | 0     | 0     | 0     | 0     | 0     | 0     | 0     |
| 665:    | 0     | 0     | 0     | 0     | 0     | 0     | 0     | 0     |
| 673:    | 0     | 0     | 0     | 1     | 0     | 0     | 0     | 0     |
| 681:    | 0     | 0     | 1     | 0     | 0     | 0     | 0     | 0     |
| 689:    | 0     | 0     | 0     | 0     | 0     | 0     | 0     | 0     |
| 697:    | 0     | 0     | 0     | 0     | 0     | 0     | 0     | 0     |
| 705:    | 0     | 0     | 0     | 0     | 0     | 0     | 0     | 0     |
| 713:    | 0     | 0     | 0     | 0     | 0     | 0     | 0     | 0     |
| 721:    | 0     | 0     | 0     | 0     | 0     | 0     | 0     | 0     |
| 729:    | 0     | 0     | 0     | 0     | 0     | 0     | 0     | 0     |
| 737:    | 0     | 1     | 0     | 0     | 0     | 0     | 0     | 0     |
| 745:    | 0     | 0     | 0     | 0     | 0     | 0     | 1     | 0     |
| 753:    | 0     | 0     | 0     | 0     | 0     | 0     | 0     | 0     |
| 761:    | 0     | 0     | 0     | 0     | 0     | 0     | 0     | 0     |
| 769:    | 0     | 0     | 0     | 0     | 0     | 0     | 0     | 0     |
| 777:    | 0     | 0     | 0     | 0     | 0     | 0     | 0     | 0     |
| 785:    | 0     | 0     | 0     | 1     | 0     | 0     | 0     | 0     |
| 793:    | 0     | 0     | 0     | 0     | 0     | 0     | 0     | 0     |

801: 0 0 0 0 0 0 0 0 0

Sample Title: 17

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

KS  
4/29/13

# Apex-Alpha™

Sample Description: D-93 TOT  
 Spectrum File: \\OR-ALPHA1\Canberra\ApexAlpha\Root\Data\00000566  
 Batch Identification: 1304105A-UU  
 Sample Identification: 18  
 Sample Geometry: Shelf 2  
 Procedure Description: U iso

Detector Name: Alpha\_041  
 Chamber Serial Number: 05026930A  
 Detector Serial Number: 91087  
 Env. Background: System Bkgd 55753  
 Reagent Blank: <not performed>

Sample Size: 1.000E+000 +/- 0.000E+000 liter  
 Sample Date/Time: 4/9/2013 7:53:48 AM  
 Acquisition Date/Time: 4/29/2013 10:00:51 AM  
 Acquisition Live Time: 170.0 minutes  
 Acquisition Real Time: 170.0 minutes

Tracer Certificate: U232\_UU-10A  
 Tracer Quantity: 0.597 mL  
 Effective Efficiency: 0.1713 +/- 0.0102  
 Counting Efficiency: 0.1978 +/- 0.0034 on 12/16/2012 5:49:31 PM  
 Chem. Recovery Factor: 0.8660 +/- 0.0539

Peak Match Tolerance: 0.150 MeV

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 PEAK AREA REPORT  
 -----

| Nuclide | Energy (MeV) | Net Pk Area | Pk Area Error % | Ambient Backgnd | Reagent Backgnd | FWHM (keV) |
|---------|--------------|-------------|-----------------|-----------------|-----------------|------------|
| U-232   | T 5.284      | 330.00      | 10.81           | 0.00            | 0.00E+000       | 33.3       |
| U-234   | 4.725        | 25.15       | 39.85           | 0.85            | 0.00E+000       | 4.5        |
| U-235   | 4.378        | 1.49        | 190.02          | 0.51            | 0.00E+000       | 3.0        |
| U-238   | 4.141        | 10.09       | 74.39           | 3.91            | 0.00E+000       | 4.5        |

T = Tracer Peak used for Effective Efficiency

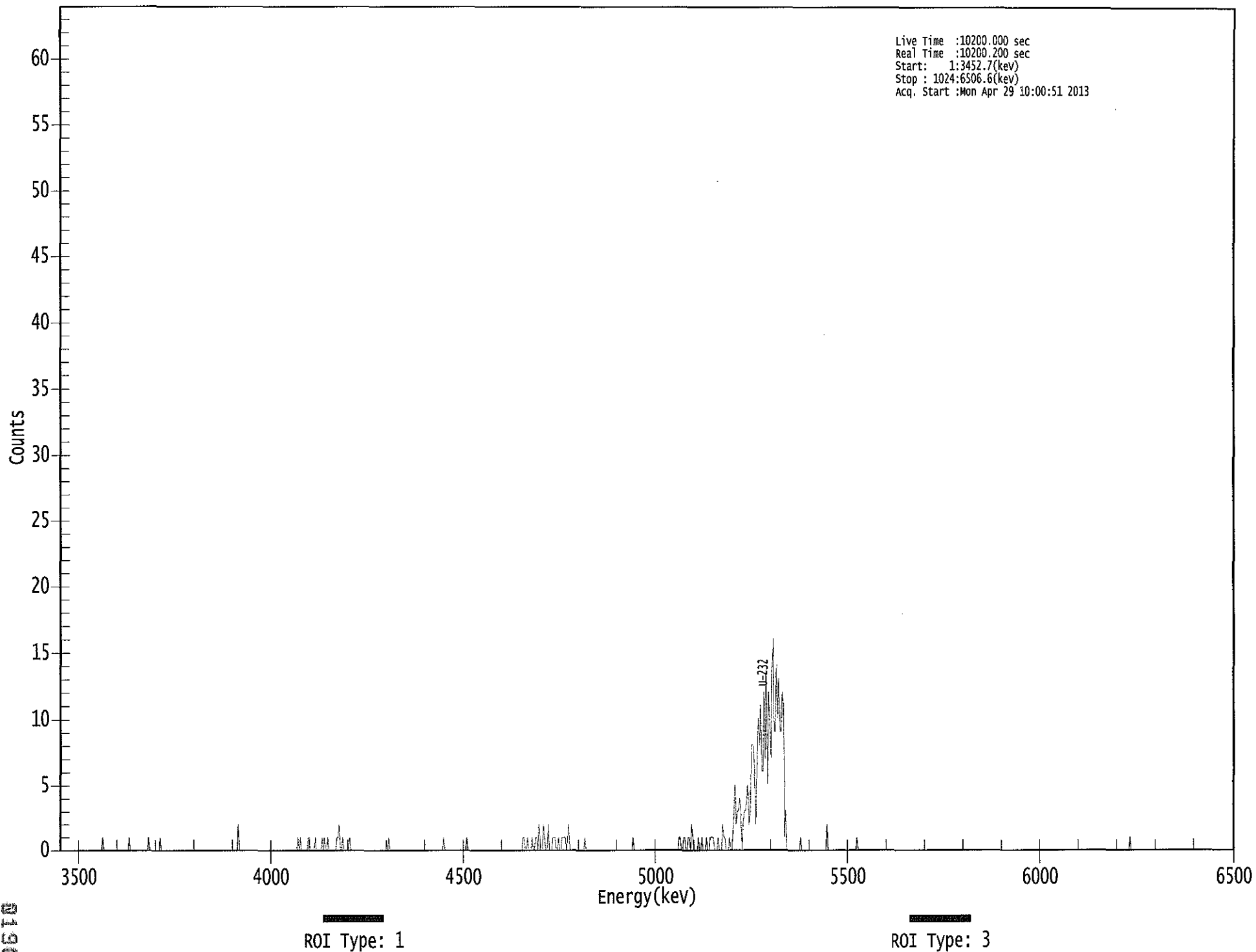
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 NUCLIDE ANALYSIS RESULTS  
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| Nuclide | Id Conf. | Energy (keV) | Activity (pCi/liter)    | MDA (pCi/liter)         |
|---------|----------|--------------|-------------------------|-------------------------|
| U-232   | 0.997    | 5302.50*     | 5.12E+000 +/- 5.99E-001 | 9.30E-002 +/- 1.09E-002 |
| U-234   | 0.991    | 4761.50*     | 3.90E-001 +/- 1.62E-001 | 9.28E-002 +/- 1.09E-002 |
| U-235   | 1.000    | 4385.50*     | 2.85E-002 +/- 5.42E-002 | 1.00E-001 +/- 1.17E-002 |
| U-238   | 0.987    | 4184.40*     | 1.56E-001 +/- 1.17E-001 | 1.50E-001 +/- 1.76E-002 |

AG  
 4/29/13

US EPA ARCHIVE DOCUMENT

0000056627.CNF



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

Sample Title: 18

Elapsed Live time: 10200

Elapsed Real Time: 10200

| Channel | ----- | ----- | ----- | ----- | ----- | ----- | ----- | ----- |
|---------|-------|-------|-------|-------|-------|-------|-------|-------|
| 1:      | 0     | 0     | 0     | 0     | 0     | 0     | 0     | 0     |
| 9:      | 0     | 0     | 0     | 0     | 0     | 0     | 0     | 0     |
| 17:     | 0     | 0     | 0     | 0     | 0     | 0     | 0     | 0     |
| 25:     | 0     | 0     | 0     | 0     | 0     | 0     | 0     | 0     |
| 33:     | 0     | 0     | 0     | 0     | 0     | 1     | 0     | 0     |
| 41:     | 0     | 0     | 0     | 0     | 0     | 0     | 0     | 0     |
| 49:     | 0     | 0     | 0     | 0     | 0     | 0     | 0     | 0     |
| 57:     | 0     | 0     | 0     | 0     | 1     | 0     | 0     | 0     |
| 65:     | 0     | 0     | 0     | 0     | 0     | 0     | 0     | 0     |
| 73:     | 0     | 0     | 0     | 0     | 0     | 1     | 0     | 0     |
| 81:     | 0     | 0     | 0     | 0     | 0     | 0     | 0     | 1     |
| 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     | 2     | 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     | 1     |
| 209:    | 0     | 1     | 0     | 0     | 0     | 0     | 0     | 0     |
| 217:    | 1     | 1     | 0     | 0     | 0     | 0     | 1     | 0     |
| 225:    | 0     | 0     | 0     | 0     | 1     | 0     | 1     | 0     |
| 233:    | 0     | 1     | 0     | 0     | 0     | 0     | 0     | 0     |
| 241:    | 0     | 1     | 1     | 2     | 0     | 0     | 1     | 0     |
| 249:    | 0     | 0     | 0     | 0     | 1     | 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     | 1     | 0     |
| 289:    | 0     | 0     | 0     | 0     | 0     | 0     | 0     | 0     |
| 297:    | 0     | 0     | 0     | 0     | 0     | 0     | 0     | 0     |
| 305:    | 0     | 0     | 0     | 0     | 0     | 0     | 0     | 0     |
| 313:    | 0     | 0     | 0     | 0     | 0     | 0     | 0     | 0     |
| 321:    | 0     | 0     | 0     | 0     | 0     | 0     | 0     | 0     |
| 329:    | 0     | 0     | 0     | 0     | 0     | 0     | 1     | 0     |
| 337:    | 0     | 0     | 0     | 0     | 0     | 0     | 0     | 0     |
| 345:    | 0     | 0     | 0     | 0     | 0     | 0     | 0     | 0     |
| 353:    | 0     | 0     | 1     | 0     | 0     | 0     | 0     | 0     |
| 361:    | 0     | 0     | 0     | 0     | 0     | 0     | 0     | 0     |



369: 0 0 0 0 0 0 0 0 0

Sample Title: 18

| Channel | 1  | 2  | 3  | 4 | 5  | 6  | 7  | 8  | 9  |
|---------|----|----|----|---|----|----|----|----|----|
| 377:    | 0  | 0  | 0  | 0 | 0  | 0  | 0  | 0  | 0  |
| 385:    | 0  | 0  | 0  | 0 | 0  | 0  | 0  | 0  | 0  |
| 393:    | 0  | 0  | 0  | 0 | 0  | 0  | 0  | 0  | 0  |
| 401:    | 0  | 0  | 0  | 1 | 1  | 0  | 0  | 1  | 1  |
| 409:    | 0  | 0  | 0  | 1 | 0  | 0  | 1  | 1  | 1  |
| 417:    | 0  | 2  | 1  | 0 | 0  | 2  | 1  | 0  | 0  |
| 425:    | 0  | 2  | 0  | 0 | 0  | 1  | 1  | 1  | 1  |
| 433:    | 0  | 0  | 1  | 0 | 0  | 1  | 1  | 1  | 1  |
| 441:    | 1  | 0  | 1  | 2 | 0  | 0  | 0  | 0  | 0  |
| 449:    | 0  | 0  | 0  | 0 | 0  | 0  | 0  | 0  | 0  |
| 457:    | 0  | 1  | 0  | 0 | 0  | 0  | 0  | 0  | 0  |
| 465:    | 0  | 0  | 0  | 0 | 0  | 0  | 0  | 0  | 0  |
| 473:    | 0  | 0  | 0  | 0 | 0  | 0  | 0  | 0  | 0  |
| 481:    | 0  | 0  | 0  | 0 | 0  | 0  | 0  | 0  | 0  |
| 489:    | 0  | 0  | 0  | 0 | 0  | 0  | 0  | 0  | 0  |
| 497:    | 0  | 0  | 0  | 1 | 0  | 0  | 0  | 0  | 0  |
| 505:    | 0  | 0  | 0  | 0 | 0  | 0  | 0  | 0  | 0  |
| 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  | 1 | 1  | 0  | 0  | 1  | 1  |
| 545:    | 1  | 0  | 0  | 1 | 1  | 0  | 2  | 1  | 1  |
| 553:    | 0  | 0  | 0  | 0 | 1  | 0  | 0  | 1  | 1  |
| 561:    | 0  | 0  | 0  | 1 | 0  | 0  | 1  | 1  | 1  |
| 569:    | 1  | 1  | 0  | 0 | 0  | 1  | 0  | 0  | 0  |
| 577:    | 0  | 2  | 1  | 1 | 0  | 0  | 0  | 1  | 1  |
| 585:    | 0  | 0  | 1  | 3 | 5  | 2  | 3  | 3  | 3  |
| 593:    | 4  | 3  | 0  | 2 | 3  | 3  | 4  | 5  | 5  |
| 601:    | 2  | 3  | 8  | 8 | 7  | 5  | 2  | 8  | 8  |
| 609:    | 10 | 8  | 11 | 6 | 6  | 12 | 7  | 14 | 14 |
| 617:    | 5  | 12 | 10 | 7 | 14 | 16 | 9  | 9  | 9  |
| 625:    | 14 | 10 | 13 | 9 | 9  | 12 | 11 | 1  | 1  |
| 633:    | 3  | 0  | 0  | 0 | 0  | 0  | 0  | 0  | 0  |
| 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 | 2  | 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  | 1  | 0  | 0  |
| 697:    | 0  | 0  | 0  | 0 | 0  | 0  | 0  | 0  | 0  |
| 705:    | 0  | 0  | 0  | 0 | 0  | 0  | 0  | 0  | 0  |
| 713:    | 0  | 0  | 0  | 0 | 0  | 0  | 0  | 0  | 0  |
| 721:    | 0  | 0  | 0  | 0 | 0  | 0  | 0  | 0  | 0  |
| 729:    | 0  | 0  | 0  | 0 | 0  | 0  | 0  | 0  | 0  |
| 737:    | 0  | 0  | 0  | 0 | 0  | 0  | 0  | 0  | 0  |
| 745:    | 0  | 0  | 0  | 0 | 0  | 0  | 0  | 0  | 0  |
| 753:    | 0  | 0  | 0  | 0 | 0  | 0  | 0  | 0  | 0  |
| 761:    | 0  | 0  | 0  | 0 | 0  | 0  | 0  | 0  | 0  |
| 769:    | 0  | 0  | 0  | 0 | 0  | 0  | 0  | 0  | 0  |
| 777:    | 0  | 0  | 0  | 0 | 0  | 0  | 0  | 0  | 0  |
| 785:    | 0  | 0  | 0  | 0 | 0  | 0  | 0  | 0  | 0  |
| 793:    | 0  | 0  | 0  | 0 | 0  | 0  | 0  | 0  | 0  |

801: 0 0 0 0 0 0 0 0 0

Sample Title: 18

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

ICB  
4/29/13

# Apex-Alpha™

Sample Description: D-93 DIS  
 Spectrum File: \\OR-ALPHA1\Canberra\ApexAlpha\Root\Data\00000566  
 Batch Identification: 1304105A-UU  
 Sample Identification: 19  
 Sample Geometry: Shelf 2  
 Procedure Description: U iso

Detector Name: Alpha\_042  
 Chamber Serial Number: 05026930B  
 Detector Serial Number: 84185  
 Env. Background: System Bkgd 55754  
 Reagent Blank: <not performed>

Sample Size: 1.000E+000 +/- 0.000E+000 liter  
 Sample Date/Time: 4/9/2013 7:53:48 AM  
 Acquisition Date/Time: 4/29/2013 10:00:53 AM  
 Acquisition Live Time: 170.0 minutes  
 Acquisition Real Time: 170.0 minutes

Tracer Certificate: U232\_UU-10A  
 Tracer Quantity: 0.595 mL  
 Effective Efficiency: 0.1822 +/- 0.0106  
 Counting Efficiency: 0.1846 +/- 0.0032 on 12/16/2012 5:49:29 PM  
 Chem. Recovery Factor: 0.9870 +/- 0.0600

Peak Match Tolerance: 0.150 MeV

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

| Nuclide | Energy (MeV) | Net Pk Area | Pk Area Error % | Ambient Backgnd | Reagent Backgnd | FWHM (keV) |
|---------|--------------|-------------|-----------------|-----------------|-----------------|------------|
| U-232   | T 5.281      | 349.83      | 10.48           | 0.17            | 0.00E+000       | 40.5       |
| U-234   | 4.751        | 20.49       | 43.93           | 0.51            | 0.00E+000       | 3.0        |
| U-235   | 4.366        | 2.49        | 138.29          | 0.51            | 0.00E+000       | 3.0        |
| U-238   | 4.176        | 10.66       | 61.14           | 0.34            | 0.00E+000       | 3.0        |

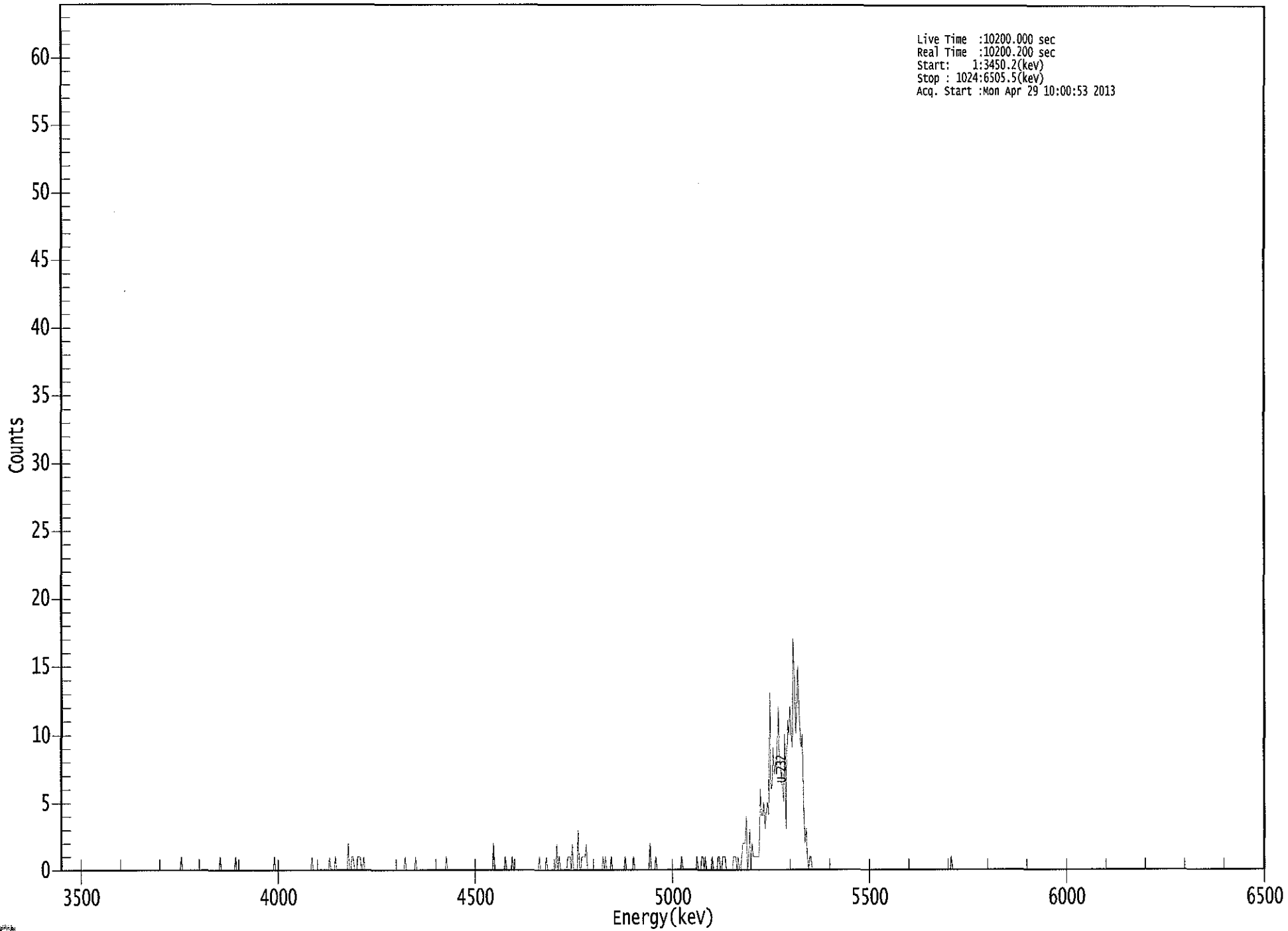
T = Tracer Peak used for Effective Efficiency

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

| Nuclide | Id Conf. | Energy (keV) | Activity (pCi/liter )   | MDA (pCi/liter )        |
|---------|----------|--------------|-------------------------|-------------------------|
| U-232   | 0.997    | 5302.50*     | 5.10E+000 +/- 5.82E-001 | 6.08E-002 +/- 6.94E-003 |
| U-234   | 0.999    | 4761.50*     | 2.99E-001 +/- 1.35E-001 | 7.65E-002 +/- 8.73E-003 |
| U-235   | 0.997    | 4385.50*     | 4.48E-002 +/- 6.21E-002 | 9.43E-002 +/- 1.08E-002 |
| U-238   | 0.999    | 4184.40*     | 1.55E-001 +/- 9.62E-002 | 6.94E-002 +/- 7.92E-003 |

AG  
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ROI Type: 1

ROI Type: 3

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

Sample Title: 19

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

369: 0 0 0 0 0 0 0 0 0

Sample Title: 19

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

801: 0 0 0 0 0 0 0 0 0

Sample Title: 19

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



## QA SUMMARY REPORT

### Review Of QA Results - Pulser Check

Date : 4/29/2013

Time : 5:51:06 AM

| CHAMBER   | DEVICE             | PARAMETER | FLAG     | DATE                 |
|-----------|--------------------|-----------|----------|----------------------|
| Alpha 001 | 21f                | ALL       | Not Done |                      |
| Alpha 002 | 21f                | ALL       | Not Done |                      |
| Alpha 003 | 21f                | ALL       | Passed   | 4/29/2013 5:29:44 AM |
| Alpha 004 | 21f                | ALL       | Passed   | 4/29/2013 5:29:45 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   | 4/29/2013 5:29:45 AM |
| Alpha 011 | 21f                | ALL       | Passed   | 4/29/2013 5:29:46 AM |
| Alpha 012 | 21f                | ALL       | Not Done |                      |
| Alpha 013 | 21f                | ALL       | Passed   | 4/29/2013 5:29:47 AM |
| Alpha 014 | 21f                | ALL       | Passed   | 4/29/2013 5:29:48 AM |
| Alpha 015 | 21f                | ALL       | Not Done |                      |
| Alpha 016 | 21f                | ALL       | Not Done |                      |
| Alpha 017 | AIM730             | ALL       | Not Done |                      |
| Alpha 018 | AIM730             | ALL       | Passed   | 4/29/2013 5:29:49 AM |
| Alpha 019 | AIM730             | ALL       | Not Done |                      |
| Alpha 020 | AIM730             | ALL       | Not Done |                      |
| Alpha 021 | AIM730             | ALL       | Not Done |                      |
| Alpha 022 | AIM730             | ALL       | Passed   | 4/29/2013 5:29:50 AM |
| Alpha 023 | AIM730             | ALL       | Not Done |                      |
| Alpha 024 | AIM730             | ALL       | Passed   | 4/29/2013 5:29:51 AM |
| Alpha 025 | AIM730             | ALL       | Passed   | 4/29/2013 5:29:52 AM |
| Alpha 026 | AIM730             | ALL       | Not Done |                      |
| Alpha 027 | AIM730             | ALL       | Passed   | 4/29/2013 5:29:53 AM |
| Alpha 028 | AIM730             | ALL       | Not Done |                      |
| Alpha 029 | AIM730             | ALL       | Passed   | 4/29/2013 5:29:53 AM |
| Alpha 030 | AIM730             | ALL       | Not Done |                      |
| Alpha 031 | AIM730             | ALL       | Not Done |                      |
| Alpha 032 | AIM730             | ALL       | Not Done |                      |
| Alpha 033 | Alpha Analyst100DC | ALL       | Passed   | 4/29/2013 5:29:55 AM |
| Alpha 034 | Alpha Analyst100DC | ALL       | Passed   | 4/29/2013 5:29:56 AM |
| Alpha 035 | Alpha Analyst100DC | ALL       | Passed   | 4/29/2013 5:29:58 AM |
| Alpha 036 | Alpha Analyst100DC | ALL       | Passed   | 4/29/2013 5:29:59 AM |
| Alpha 037 | Alpha Analyst100DC | ALL       | Passed   | 4/29/2013 5:30:01 AM |
| Alpha 038 | Alpha Analyst100DC | ALL       | Not Done |                      |
| Alpha 039 | Alpha Analyst100DC | ALL       | Passed   | 4/29/2013 5:30:03 AM |
| Alpha 040 | Alpha Analyst100DC | ALL       | Passed   | 4/29/2013 5:30:04 AM |
| Alpha 041 | Alpha Analyst100DC | ALL       | Passed   | 4/29/2013 5:30:06 AM |
| Alpha 042 | Alpha Analyst100DC | ALL       | Passed   | 4/29/2013 5:30:07 AM |

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| CHAMBER   | DEVICE             | PARAMETER | FLAG     | DATE                 |
|-----------|--------------------|-----------|----------|----------------------|
| Alpha 043 | Alpha Analyst100DC | ALL       | Passed   | 4/29/2013 5:30:09 AM |
| Alpha 044 | Alpha Analyst100DC | ALL       | Passed   | 4/29/2013 5:30:11 AM |
| Alpha 045 | Alpha Analyst100DC | ALL       | Not Done |                      |
| Alpha 046 | Alpha Analyst100DC | ALL       | Passed   | 4/29/2013 5:30:13 AM |
| Alpha 047 | Alpha Analyst100DC | ALL       | Passed   | 4/29/2013 5:30:15 AM |
| Alpha 048 | Alpha Analyst100DC | ALL       | Passed   | 4/29/2013 5:30:17 AM |

APPROVED BY: \_\_\_\_\_

APPROVAL DATE: \_\_\_\_\_

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

Nuclide Library Title: Uranium

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

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

\* = key line

TOTALS: 4 Nuclides 4 Energy Lines

**SECTION IX  
ANALYTICAL DATA (ISOTOPIC THORIUM)**

US EPA ARCHIVE DOCUMENT

| Work Order           | 13-04105                             | Internal Fraction | Sample Desc | Client ID     | Login CPM | Sample Date    | Sample Aliquot |
|----------------------|--------------------------------------|-------------------|-------------|---------------|-----------|----------------|----------------|
| Analysis Code        | ThISO                                | 01                | LCS         | LCS           |           | 04/16/13 00:00 | 1.0000E+00     |
| Run                  | 1                                    | 02                | MBL         | BLANK         |           | 04/16/13 00:00 | 1.0000E+00     |
| Date Received        | 4/16/2013                            | 03                | DUP         | PZ-204-SS TOT | 39        | 04/09/13 09:30 | 1.0000E+00     |
| Lab Deadline         | 5/7/2013                             | 04                | DO          | PZ-204-SS TOT | 39        | 04/09/13 09:30 | 1.0000E+00     |
| Client               | Engineering Management Support, Inc. | 05                | TRG         | PZ-204-SS DIS | 39        | 04/09/13 09:30 | 1.0000E+00     |
| Project              | West Lake OU-1                       | 06                | TRG         | I-68 TOT      | 45        | 04/09/13 10:44 | 1.0000E+00     |
| Report Level         | 4                                    | 07                | TRG         | I-68 DIS      | 45        | 04/09/13 10:44 | 1.0000E+00     |
| Activity Units       | pCi                                  | 08                | TRG         | D-87 TOT      | 42        | 04/09/13 11:05 | 1.0000E+00     |
| Aliquot Units        | I                                    | 09                | TRG         | D-87 DIS      | 42        | 04/09/13 11:05 | 1.0000E+00     |
| Matrix               | WA                                   | 10                | TRG         | PZ-106-SD TOT | 37        | 04/09/13 12:00 | 1.0000E+00     |
| Method               | NAS NS-3004 Modified                 | 11                | TRG         | PZ-106-SD DIS | 37        | 04/09/13 12:00 | 1.0000E+00     |
| Instrument Type      | Alpha Spectroscopy                   | 12                | TRG         | S-82 TOT      | 46        | 04/09/13 12:27 | 1.0000E+00     |
| Radiometric Tracer   | Th-229                               | 13                | TRG         | S-82 DIS      | 46        | 04/09/13 12:27 | 1.0000E+00     |
| Radiometric Sol#     | Th-18a                               | 14                | TRG         | PZ-106-SS TOT | 41        | 04/09/13 12:56 | 1.0000E+00     |
| Tracer Act (dpm/g)   | 22.467                               | 15                | TRG         | PZ-106-SS DIS | 41        | 04/09/13 12:56 | 1.0000E+00     |
| Carrier              |                                      | 16                | TRG         | I-9 TOT       | 43        | 04/09/13 13:35 | 1.0000E+00     |
| Carrier Conc (mg/ml) |                                      | 17                | TRG         | I-9 DIS       | 43        | 04/09/13 13:35 | 1.0000E+00     |
|                      |                                      | 18                | TRG         | D-93 TOT      | 40        | 04/09/13 14:28 | 1.0000E+00     |
|                      |                                      | 19                | TRG         | D-93 DIS      | 40        | 04/09/13 14:28 | 1.0000E+00     |

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

ThISO  
Run 1

| Internal Fraction | Sample Desc | Tracer Aliquot (g) | Tracer Total ACT (dpm) | Radiometric Tracer (pCi) | Radiometric % Rec | Grav Carrier Added (ml) | Grav Filter Tare (g) | Grav Filter Final (g) | Grav Filter Net (g) | Grav % Rec | Mean % Rec | SAF 1* | SAF 2* |
|-------------------|-------------|--------------------|------------------------|--------------------------|-------------------|-------------------------|----------------------|-----------------------|---------------------|------------|------------|--------|--------|
| 01                | LCS         | 0.4757             | 10.7                   |                          | 0.00              |                         |                      |                       |                     |            |            |        |        |
| 02                | MBL         | 0.2361             | 5.3                    |                          | 0.00              |                         |                      |                       |                     |            |            |        |        |
| 03                | DUP         | 0.2355             | 5.3                    |                          | 0.00              |                         |                      |                       |                     |            |            |        |        |
| 04                | DO          | 0.2316             | 5.2                    |                          | 0.00              |                         |                      |                       |                     |            |            |        |        |
| 05                | TRG         | 0.2318             | 5.2                    |                          | 0.00              |                         |                      |                       |                     |            |            |        |        |
| 06                | TRG         | 0.2322             | 5.2                    |                          | 0.00              |                         |                      |                       |                     |            |            |        |        |
| 07                | TRG         | 0.2321             | 5.2                    |                          | 0.00              |                         |                      |                       |                     |            |            |        |        |
| 08                | TRG         | 0.2326             | 5.2                    |                          | 0.00              |                         |                      |                       |                     |            |            |        |        |
| 09                | TRG         | 0.2312             | 5.2                    |                          | 0.00              |                         |                      |                       |                     |            |            |        |        |
| 10                | TRG         | 0.2302             | 5.2                    |                          | 0.00              |                         |                      |                       |                     |            |            |        |        |
| 11                | TRG         | 0.2314             | 5.2                    |                          | 0.00              |                         |                      |                       |                     |            |            |        |        |
| 12                | TRG         | 0.2318             | 5.2                    |                          | 0.00              |                         |                      |                       |                     |            |            |        |        |
| 13                | TRG         | 0.2312             | 5.2                    |                          | 0.00              |                         |                      |                       |                     |            |            |        |        |
| 14                | TRG         | 0.2309             | 5.2                    |                          | 0.00              |                         |                      |                       |                     |            |            |        |        |
| 15                | TRG         | 0.2301             | 5.2                    |                          | 0.00              |                         |                      |                       |                     |            |            |        |        |
| 16                | TRG         | 0.2301             | 5.2                    |                          | 0.00              |                         |                      |                       |                     |            |            |        |        |
| 17                | TRG         | 0.2307             | 5.2                    |                          | 0.00              |                         |                      |                       |                     |            |            |        |        |
| 18                | TRG         | 0.2310             | 5.2                    |                          | 0.00              |                         |                      |                       |                     |            |            |        |        |
| 19                | TRG         | 0.2290             | 5.1                    |                          | 0.00              |                         |                      |                       |                     |            |            |        |        |
|                   |             |                    |                        |                          |                   |                         |                      |                       |                     |            |            |        |        |

US EPA ARCHIVE DOCUMENT

0204

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

US EPA ARCHIVE DOCUMENT

| 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         |                 |               | 04/24/13 11:57 | JBARNARD |                  |           |                  |           |
| 02                | MBL         |                 |               | 04/24/13 11:57 | JBARNARD |                  |           |                  |           |
| 03                | DUP         |                 |               | 04/24/13 11:57 | JBARNARD |                  |           |                  |           |
| 04                | DO          |                 |               | 04/24/13 11:57 | JBARNARD |                  |           |                  |           |
| 05                | TRG         |                 |               | 04/24/13 11:57 | JBARNARD |                  |           |                  |           |
| 06                | TRG         |                 |               | 04/24/13 11:57 | JBARNARD |                  |           |                  |           |
| 07                | TRG         |                 |               | 04/24/13 11:57 | JBARNARD |                  |           |                  |           |
| 08                | TRG         |                 |               | 04/24/13 11:57 | JBARNARD |                  |           |                  |           |
| 09                | TRG         |                 |               | 04/24/13 11:57 | JBARNARD |                  |           |                  |           |
| 10                | TRG         |                 |               | 04/24/13 11:57 | JBARNARD |                  |           |                  |           |
| 11                | TRG         |                 |               | 04/24/13 11:57 | JBARNARD |                  |           |                  |           |
| 12                | TRG         |                 |               | 04/24/13 11:57 | JBARNARD |                  |           |                  |           |
| 13                | TRG         |                 |               | 04/24/13 11:57 | JBARNARD |                  |           |                  |           |
| 14                | TRG         |                 |               | 04/24/13 11:57 | JBARNARD |                  |           |                  |           |
| 15                | TRG         |                 |               | 04/24/13 11:57 | JBARNARD |                  |           |                  |           |
| 16                | TRG         |                 |               | 04/24/13 11:57 | JBARNARD |                  |           |                  |           |
| 17                | TRG         |                 |               | 04/24/13 11:57 | JBARNARD |                  |           |                  |           |
| 18                | TRG         |                 |               | 04/24/13 11:57 | JBARNARD |                  |           |                  |           |
| 19                | TRG         |                 |               | 04/24/13 11:57 | JBARNARD |                  |           |                  |           |
|                   |             |                 |               |                |          |                  |           |                  |           |

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

Preliminary Data Report & Analytical Calculations  
**Work Order: 13-04105-THISO-1**

US EPA ARCHIVE DOCUMENT

| Lab Fraction | Nuclide | Sample Desc | Client Identification | Activity Units | Results   | Error Estimate | MDA      | LCS Known | LCS %R | LCS Flag | RPD Flag | MDA Flag | Blank Flag |
|--------------|---------|-------------|-----------------------|----------------|-----------|----------------|----------|-----------|--------|----------|----------|----------|------------|
| 01           | TH-228  | LCS         | LCS                   | pCi/l          | 4.46E+00  | 6.85E-01       | 5.75E-02 | 4.80E+00  | 92.72  | OK       |          | OK       |            |
| 02           | TH-228  | MBL         | BLANK                 | pCi/l          | 5.03E-02  | 5.23E-02       | 5.48E-02 |           |        |          |          | OK       | OK         |
| 03           | TH-228  | DUP         | PZ-204-SS TOT         | pCi/l          | 3.15E-01  | 1.32E-01       | 5.87E-02 |           |        |          | NA       | OK       |            |
| 04           | TH-228  | DO          | PZ-204-SS TOT         | pCi/l          | 2.21E-01  | 1.07E-01       | 5.67E-02 |           |        |          |          | OK       |            |
| 05           | TH-228  | TRG         | PZ-204-SS DIS         | pCi/l          | 3.81E-02  | 6.75E-02       | 1.21E-01 |           |        |          |          | OK       |            |
| 06           | TH-228  | TRG         | I-68 TOT              | pCi/l          | 2.66E+00  | 6.55E-01       | 7.78E-02 |           |        |          |          | OK       |            |
| 07           | TH-228  | TRG         | I-68 DIS              | pCi/l          | 0.00E+00  | 4.26E-02       | 9.23E-02 |           |        |          |          | OK       |            |
| 08           | TH-228  | TRG         | D-87 TOT              | pCi/l          | 2.17E-01  | 1.26E-01       | 9.18E-02 |           |        |          |          | OK       |            |
| 09           | TH-228  | TRG         | D-87 DIS              | pCi/l          | 7.21E-02  | 6.91E-02       | 8.39E-02 |           |        |          |          | OK       |            |
| 10           | TH-228  | TRG         | PZ-106-SD TOT         | pCi/l          | 2.11E-01  | 1.13E-01       | 1.01E-01 |           |        |          |          | OK       |            |
| 11           | TH-228  | TRG         | PZ-106-SD DIS         | pCi/l          | -9.20E-04 | 5.64E-02       | 1.37E-01 |           |        |          |          | OK       |            |
| 12           | TH-228  | TRG         | S-82 TOT              | pCi/l          | 1.24E-01  | 1.01E-01       | 1.22E-01 |           |        |          |          | OK       |            |
| 13           | TH-228  | TRG         | S-82 DIS              | pCi/l          | -4.23E-03 | 2.56E-02       | 8.06E-02 |           |        |          |          | OK       |            |
| 14           | TH-228  | TRG         | PZ-106-SS TOT         | pCi/l          | 3.55E-02  | 5.81E-02       | 1.02E-01 |           |        |          |          | OK       |            |
| 15           | TH-228  | TRG         | PZ-106-SS DIS         | pCi/l          | 9.24E-03  | 5.39E-02       | 1.22E-01 |           |        |          |          | OK       |            |
| 16           | TH-228  | TRG         | I-9 TOT               | pCi/l          | 1.47E-01  | 1.09E-01       | 1.32E-01 |           |        |          |          | OK       |            |
| 17           | TH-228  | TRG         | I-9 DIS               | pCi/l          | -7.05E-03 | 1.13E-01       | 2.78E-01 |           |        |          |          | OK       |            |
| 18           | TH-228  | TRG         | D-93 TOT              | pCi/l          | 1.60E-01  | 1.10E-01       | 1.33E-01 |           |        |          |          | OK       |            |
| 19           | TH-228  | TRG         | D-93 DIS              | pCi/l          | 5.45E-02  | 5.89E-02       | 8.56E-02 |           |        |          |          | OK       |            |

|                                      |                              |               |     |
|--------------------------------------|------------------------------|---------------|-----|
| Client                               | Eberline Services Work Order | Analysis Code | Run |
| Engineering Management Support, Inc. | 13-04105                     | THISO         | 1   |

Preliminary Data Report & Analytical Calculations  
**Work Order: 13-04105-THISO-1**

US EPA ARCHIVE DOCUMENT

| Lab Fraction | Nuclide | Sample Desc | Sample Date    | Sample Aliquot | Radiometric % Rec | Grav % Rec | Mean % Rec | SAF | Sep t0 Date/Time | Sep t1 Date/Time |
|--------------|---------|-------------|----------------|----------------|-------------------|------------|------------|-----|------------------|------------------|
| 01           | TH-228  | LCS         | 04/16/13 00:00 | 1.00E+00       | 120.84            | 0.00       | 0.00       |     |                  |                  |
| 02           | TH-228  | MBL         | 04/16/13 00:00 | 1.00E+00       | 113.21            | 0.00       | 0.00       |     |                  |                  |
| 03           | TH-228  | DUP         | 04/09/13 09:30 | 1.00E+00       | 116.15            | 0.00       | 0.00       |     |                  |                  |
| 04           | TH-228  | DO          | 04/09/13 09:30 | 1.00E+00       | 115.33            | 0.00       | 0.00       |     |                  |                  |
| 05           | TH-228  | TRG         | 04/09/13 09:30 | 1.00E+00       | 76.27             | 0.00       | 0.00       |     |                  |                  |
| 06           | TH-228  | TRG         | 04/09/13 10:44 | 1.00E+00       | 76.39             | 0.00       | 0.00       |     |                  |                  |
| 07           | TH-228  | TRG         | 04/09/13 10:44 | 1.00E+00       | 98.35             | 0.00       | 0.00       |     |                  |                  |
| 08           | TH-228  | TRG         | 04/09/13 11:05 | 1.00E+00       | 91.35             | 0.00       | 0.00       |     |                  |                  |
| 09           | TH-228  | TRG         | 04/09/13 11:05 | 1.00E+00       | 115.06            | 0.00       | 0.00       |     |                  |                  |
| 10           | TH-228  | TRG         | 04/09/13 12:00 | 1.00E+00       | 121.12            | 0.00       | 0.00       |     |                  |                  |
| 11           | TH-228  | TRG         | 04/09/13 12:00 | 1.00E+00       | 115.36            | 0.00       | 0.00       |     |                  |                  |
| 12           | TH-228  | TRG         | 04/09/13 12:27 | 1.00E+00       | 101.49            | 0.00       | 0.00       |     |                  |                  |
| 13           | TH-228  | TRG         | 04/09/13 12:27 | 1.00E+00       | 132.78            | 0.00       | 0.00       |     |                  |                  |
| 14           | TH-228  | TRG         | 04/09/13 12:56 | 1.00E+00       | 123.17            | 0.00       | 0.00       |     |                  |                  |
| 15           | TH-228  | TRG         | 04/09/13 12:56 | 1.00E+00       | 93.37             | 0.00       | 0.00       |     |                  |                  |
| 16           | TH-228  | TRG         | 04/09/13 13:35 | 1.00E+00       | 104.89            | 0.00       | 0.00       |     |                  |                  |
| 17           | TH-228  | TRG         | 04/09/13 13:35 | 1.00E+00       | 45.61             | 0.00       | 0.00       |     |                  |                  |
| 18           | TH-228  | TRG         | 04/09/13 14:28 | 1.00E+00       | 102.73            | 0.00       | 0.00       |     |                  |                  |
| 19           | TH-228  | TRG         | 04/09/13 14:28 | 1.00E+00       | 124.85            | 0.00       | 0.00       |     |                  |                  |
|              |         |             |                |                |                   |            |            |     |                  |                  |

|                              |                                      |
|------------------------------|--------------------------------------|
| Client                       | Engineering Management Support, Inc. |
|                              | 13-04105                             |
| Eberline Services Work Order | THISO                                |
| Analysis Code                | 1                                    |
| Run                          |                                      |



US EPA ARCHIVE DOCUMENT

|   |                                      |       |
|---|--------------------------------------|-------|
|  | Run                                  | 1     |
|   | Analysis Code                        | THISO |
| Eberline Services Work Order  | 13-04105                             |       |
| Client  | Engineering Management Support, Inc. |       |

| Lab Fraction | Nuclide | Sample Desc | Counting Date/Time | Half-life (days) | Detect | Carrier   | Count Time | Counts     | Bkg CPM   | Eff  |
|--------------|---------|-------------|--------------------|------------------|--------|-----------|------------|------------|-----------|------|
| 01           | TH-228  | LCS         | 04/30/13 11:48     |                  | A_Spec | Alpha_035 | 170        | 3.71 E+02  | 2.00 E-03 | 18.3 |
| 02           | TH-228  | MBL         | 04/30/13 11:48     |                  | A_Spec | Alpha_037 | 170        | 3.83 E+00  | 1.00 E-03 | 17.8 |
| 03           | TH-228  | DUP         | 04/30/13 11:49     |                  | A_Spec | Alpha_040 | 170        | 2.57 E+01  | 2.00 E-03 | 19   |
| 04           | TH-228  | DO          | 04/30/13 11:48     |                  | A_Spec | Alpha_041 | 170        | 1.87 E+01  | 2.00 E-03 | 19.8 |
| 05           | TH-228  | TRG         | 04/30/13 11:49     |                  | A_Spec | Alpha_042 | 170        | 1.98 E+00  | 6.00 E-03 | 18.5 |
| 06           | TH-228  | TRG         | 04/30/13 11:48     |                  | A_Spec | Alpha_044 | 170        | 1.43 E+02  | 1.00 E-03 | 19   |
| 07           | TH-228  | TRG         | 04/30/13 11:48     |                  | A_Spec | Alpha_046 | 170        | 1.00 E+00  | 0.00 E+00 | 17.9 |
| 08           | TH-228  | TRG         | 04/30/13 11:48     |                  | A_Spec | Alpha_047 | 170        | 1.33 E+01  | 4.00 E-03 | 18.2 |
| 09           | TH-228  | TRG         | 04/30/13 11:48     |                  | A_Spec | Alpha_048 | 170        | 5.15 E+00  | 5.00 E-03 | 16.8 |
| 10           | TH-228  | TRG         | 04/30/13 12:43     |                  | A_Spec | Alpha_018 | 170        | 1.68 E+01  | 1.30 E-02 | 17.8 |
| 11           | TH-228  | TRG         | 04/30/13 12:43     |                  | A_Spec | Alpha_022 | 170        | -6.00 E-02 | 1.80 E-02 | 15.3 |
| 12           | TH-228  | TRG         | 04/30/13 12:43     |                  | A_Spec | Alpha_024 | 170        | 7.96 E+00  | 1.20 E-02 | 17.1 |
| 13           | TH-228  | TRG         | 04/30/13 12:43     |                  | A_Spec | Alpha_025 | 170        | -3.60 E-01 | 8.00 E-03 | 17.4 |
| 14           | TH-228  | TRG         | 04/30/13 12:43     |                  | A_Spec | Alpha_027 | 170        | 2.79 E+00  | 1.30 E-02 | 17.3 |
| 15           | TH-228  | TRG         | 04/30/13 12:43     |                  | A_Spec | Alpha_029 | 170.02     | 6.20 E-01  | 1.40 E-02 | 19.5 |
| 16           | TH-228  | TRG         | 04/30/13 14:35     |                  | A_Spec | Alpha_003 | 170.02     | 9.94 E+00  | 1.80 E-02 | 17.5 |
| 17           | TH-228  | TRG         | 04/30/13 14:35     |                  | A_Spec | Alpha_004 | 170.02     | -2.30 E-01 | 1.90 E-02 | 19.4 |
| 18           | TH-228  | TRG         | 04/30/13 14:35     |                  | A_Spec | Alpha_010 | 170.02     | 1.19 E+01  | 2.40 E-02 | 19.7 |
| 19           | TH-228  | TRG         | 04/30/13 14:35     |                  | A_Spec | Alpha_011 | 170.02     | 4.96 E+00  | 1.20 E-02 | 19.7 |
|              |         |             |                    |                  |        |           |            |            |           |      |

Preliminary Data Report & Analytical Calculations  
**Work Order: 13-04105-THISO-1**

US EPA ARCHIVE DOCUMENT

| Lab Fraction | Nuclide | Sample Desc | Client Identification | Activity Units | Results  | Error Estimate | MDA      | LCS Known | LCS %R | LCS Flag | RPD Flag | MDA Flag | Blank Flag |
|--------------|---------|-------------|-----------------------|----------------|----------|----------------|----------|-----------|--------|----------|----------|----------|------------|
| 01           | TH-230  | LCS         | LCS                   | pCi/l          | 4.36E+00 | 6.74E-01       | 5.75E-02 | 5.49E+00  | 79.52  | OK       |          | OK       |            |
| 02           | TH-230  | MBL         | BLANK                 | pCi/l          | 1.40E-01 | 8.85E-02       | 6.29E-02 |           |        |          |          | OK       | OK         |
| 03           | TH-230  | DUP         | PZ-204-SS TOT         | pCi/l          | 1.64E-01 | 9.19E-02       | 5.75E-02 |           |        |          | NA       | OK       |            |
| 04           | TH-230  | DO          | PZ-204-SS TOT         | pCi/l          | 2.23E-01 | 1.08E-01       | 6.96E-02 |           |        |          |          | OK       |            |
| 05           | TH-230  | TRG         | PZ-204-SS DIS         | pCi/l          | 9.71E-02 | 9.34E-02       | 1.13E-01 |           |        |          |          | OK       |            |
| 06           | TH-230  | TRG         | I-68 TOT              | pCi/l          | 4.14E+00 | 9.31E-01       | 7.63E-02 |           |        |          |          | OK       |            |
| 07           | TH-230  | TRG         | I-68 DIS              | pCi/l          | 1.06E-01 | 8.55E-02       | 9.04E-02 |           |        |          |          | OK       |            |
| 08           | TH-230  | TRG         | D-87 TOT              | pCi/l          | 4.04E-01 | 1.74E-01       | 9.00E-02 |           |        |          |          | OK       |            |
| 09           | TH-230  | TRG         | D-87 DIS              | pCi/l          | 1.10E-01 | 8.27E-02       | 8.24E-02 |           |        |          |          | OK       |            |
| 10           | TH-230  | TRG         | PZ-106-SD TOT         | pCi/l          | 1.33E-01 | 8.70E-02       | 8.13E-02 |           |        |          |          | OK       |            |
| 11           | TH-230  | TRG         | PZ-106-SD DIS         | pCi/l          | 3.40E-01 | 1.56E-01       | 1.03E-01 |           |        |          |          | OK       |            |
| 12           | TH-230  | TRG         | S-82 TOT              | pCi/l          | 2.39E-01 | 1.27E-01       | 7.31E-02 |           |        |          |          | OK       |            |
| 13           | TH-230  | TRG         | S-82 DIS              | pCi/l          | 8.43E-02 | 6.56E-02       | 6.50E-02 |           |        |          |          | OK       |            |
| 14           | TH-230  | TRG         | PZ-106-SS TOT         | pCi/l          | 1.62E-01 | 9.55E-02       | 7.86E-02 |           |        |          |          | OK       |            |
| 15           | TH-230  | TRG         | PZ-106-SS DIS         | pCi/l          | 1.48E-01 | 9.88E-02       | 8.75E-02 |           |        |          |          | OK       |            |
| 16           | TH-230  | TRG         | I-9 TOT               | pCi/l          | 1.11E-01 | 8.82E-02       | 9.94E-02 |           |        |          |          | OK       |            |
| 17           | TH-230  | TRG         | I-9 DIS               | pCi/l          | 1.54E-01 | 1.50E-01       | 1.80E-01 |           |        |          |          | OK       |            |
| 18           | TH-230  | TRG         | D-93 TOT              | pCi/l          | 8.72E-02 | 7.52E-02       | 9.01E-02 |           |        |          |          | OK       |            |
| 19           | TH-230  | TRG         | D-93 DIS              | pCi/l          | 1.58E-01 | 8.52E-02       | 5.15E-02 |           |        |          |          | OK       |            |

|                              |                                      |
|------------------------------|--------------------------------------|
| Run                          | 1                                    |
|                              | THISO                                |
| Analysis Code                | THISO                                |
|                              | 13-04105                             |
| Eberline Services Work Order | 13-04105                             |
| Client                       | Engineering Management Support, Inc. |

| Lab Fraction | Nuclide | Sample Desc | Sample Date    | Sample Aliquot | Radiometric % Rec | Grav % Rec | Mean % Rec | SAF | Sep t0 Date/Time | Sep t1 Date/Time |
|--------------|---------|-------------|----------------|----------------|-------------------|------------|------------|-----|------------------|------------------|
| 01           | TH-230  | LCS         | 04/16/13 00:00 | 1.00E+00       | 120.84            | 0.00       | 0.00       |     |                  |                  |
| 02           | TH-230  | MBL         | 04/16/13 00:00 | 1.00E+00       | 113.21            | 0.00       | 0.00       |     |                  |                  |
| 03           | TH-230  | DUP         | 04/09/13 09:30 | 1.00E+00       | 116.15            | 0.00       | 0.00       |     |                  |                  |
| 04           | TH-230  | DO          | 04/09/13 09:30 | 1.00E+00       | 115.33            | 0.00       | 0.00       |     |                  |                  |
| 05           | TH-230  | TRG         | 04/09/13 09:30 | 1.00E+00       | 76.27             | 0.00       | 0.00       |     |                  |                  |
| 06           | TH-230  | TRG         | 04/09/13 10:44 | 1.00E+00       | 76.39             | 0.00       | 0.00       |     |                  |                  |
| 07           | TH-230  | TRG         | 04/09/13 10:44 | 1.00E+00       | 98.35             | 0.00       | 0.00       |     |                  |                  |
| 08           | TH-230  | TRG         | 04/09/13 11:05 | 1.00E+00       | 91.35             | 0.00       | 0.00       |     |                  |                  |
| 09           | TH-230  | TRG         | 04/09/13 11:05 | 1.00E+00       | 115.06            | 0.00       | 0.00       |     |                  |                  |
| 10           | TH-230  | TRG         | 04/09/13 12:00 | 1.00E+00       | 121.12            | 0.00       | 0.00       |     |                  |                  |
| 11           | TH-230  | TRG         | 04/09/13 12:00 | 1.00E+00       | 115.36            | 0.00       | 0.00       |     |                  |                  |
| 12           | TH-230  | TRG         | 04/09/13 12:27 | 1.00E+00       | 101.49            | 0.00       | 0.00       |     |                  |                  |
| 13           | TH-230  | TRG         | 04/09/13 12:27 | 1.00E+00       | 132.78            | 0.00       | 0.00       |     |                  |                  |
| 14           | TH-230  | TRG         | 04/09/13 12:56 | 1.00E+00       | 123.17            | 0.00       | 0.00       |     |                  |                  |
| 15           | TH-230  | TRG         | 04/09/13 12:56 | 1.00E+00       | 93.37             | 0.00       | 0.00       |     |                  |                  |
| 16           | TH-230  | TRG         | 04/09/13 13:35 | 1.00E+00       | 104.89            | 0.00       | 0.00       |     |                  |                  |
| 17           | TH-230  | TRG         | 04/09/13 13:35 | 1.00E+00       | 45.61             | 0.00       | 0.00       |     |                  |                  |
| 18           | TH-230  | TRG         | 04/09/13 14:28 | 1.00E+00       | 102.73            | 0.00       | 0.00       |     |                  |                  |
| 19           | TH-230  | TRG         | 04/09/13 14:28 | 1.00E+00       | 124.85            | 0.00       | 0.00       |     |                  |                  |
|              |         |             |                |                |                   |            |            |     |                  |                  |

|        |                              |               |                                      |
|--------|------------------------------|---------------|--------------------------------------|
|        | Run                          | Analysis Code | THISO                                |
| Client | Eberline Services Work Order | 13-04105      | Engineering Management Support, Inc. |

Preliminary Data Report & Analytical Calculations  
**Work Order: 13-04105-THISO-1**

US EPA ARCHIVE DOCUMENT

|   |                                      |
|---|--------------------------------------|
|  |                                      |
| Run   | 1                                    |
| Analysis Code   | THISO                                |
| Eberline Services Work Order  | 13-04105                             |
| Client  | Engineering Management Support, Inc. |

| Lab Fraction | Nuclide | Sample Desc | Counting Date/Time | Half-life (days) | Detect | Carrier   | Count Time | Counts    | Bkg CPM   | Eff  |
|--------------|---------|-------------|--------------------|------------------|--------|-----------|------------|-----------|-----------|------|
| 01           | TH-230  | LCS         | 04/30/13 11:48     |                  | A_Spec | Alpha_035 | 170        | 3.63 E+02 | 2.00 E-03 | 18.3 |
| 02           | TH-230  | MBL         | 04/30/13 11:48     |                  | A_Spec | Alpha_037 | 170        | 1.07 E+01 | 2.00 E-03 | 17.8 |
| 03           | TH-230  | DUP         | 04/30/13 11:49     |                  | A_Spec | Alpha_040 | 170        | 1.37 E+01 | 2.00 E-03 | 19   |
| 04           | TH-230  | DO          | 04/30/13 11:48     |                  | A_Spec | Alpha_041 | 170        | 1.91 E+01 | 5.00 E-03 | 19.8 |
| 05           | TH-230  | TRG         | 04/30/13 11:49     |                  | A_Spec | Alpha_042 | 170        | 5.15 E+00 | 5.00 E-03 | 18.5 |
| 06           | TH-230  | TRG         | 04/30/13 11:48     |                  | A_Spec | Alpha_044 | 170        | 2.27 E+02 | 1.00 E-03 | 19   |
| 07           | TH-230  | TRG         | 04/30/13 11:48     |                  | A_Spec | Alpha_046 | 170        | 7.00 E+00 | 0.00 E+00 | 17.9 |
| 08           | TH-230  | TRG         | 04/30/13 11:48     |                  | A_Spec | Alpha_047 | 170        | 2.53 E+01 | 4.00 E-03 | 18.2 |
| 09           | TH-230  | TRG         | 04/30/13 11:48     |                  | A_Spec | Alpha_048 | 170        | 8.00 E+00 | 0.00 E+00 | 16.8 |
| 10           | TH-230  | TRG         | 04/30/13 12:43     |                  | A_Spec | Alpha_018 | 170        | 1.08 E+01 | 7.00 E-03 | 17.8 |
| 11           | TH-230  | TRG         | 04/30/13 12:43     |                  | A_Spec | Alpha_022 | 170        | 2.26 E+01 | 8.00 E-03 | 15.3 |
| 12           | TH-230  | TRG         | 04/30/13 12:43     |                  | A_Spec | Alpha_024 | 170        | 1.57 E+01 | 2.00 E-03 | 17.1 |
| 13           | TH-230  | TRG         | 04/30/13 12:43     |                  | A_Spec | Alpha_025 | 170        | 7.32 E+00 | 4.00 E-03 | 17.4 |
| 14           | TH-230  | TRG         | 04/30/13 12:43     |                  | A_Spec | Alpha_027 | 170        | 1.30 E+01 | 6.00 E-03 | 17.3 |
| 15           | TH-230  | TRG         | 04/30/13 12:43     |                  | A_Spec | Alpha_029 | 170.02     | 1.01 E+01 | 5.00 E-03 | 19.5 |
| 16           | TH-230  | TRG         | 04/30/13 14:35     |                  | A_Spec | Alpha_003 | 170.02     | 7.64 E+00 | 8.00 E-03 | 17.5 |
| 17           | TH-230  | TRG         | 04/30/13 14:35     |                  | A_Spec | Alpha_004 | 170.02     | 5.15 E+00 | 5.00 E-03 | 19.4 |
| 18           | TH-230  | TRG         | 04/30/13 14:35     |                  | A_Spec | Alpha_010 | 170.02     | 6.64 E+00 | 8.00 E-03 | 19.7 |
| 19           | TH-230  | TRG         | 04/30/13 14:35     |                  | A_Spec | Alpha_011 | 170.02     | 1.47 E+01 | 2.00 E-03 | 19.7 |
|              |         |             |                    |                  |        |           |            |           |           |      |

Preliminary Data Report & Analytical Calculations  
**Work Order: 13-04105-ThISO-1**

US EPA ARCHIVE DOCUMENT

| Lab Fraction | Nuclide | Sample Desc | Client Identification | Activity Units | Results   | Error Estimate | MDA      | LCS Known | LCS %R | LCS Flag | RPD Flag | MDA Flag | Blank Flag |
|--------------|---------|-------------|-----------------------|----------------|-----------|----------------|----------|-----------|--------|----------|----------|----------|------------|
| 01           | TH-232  | LCS         | LCS                   | pCi/l          | 5.17E+00  | 7.71E-01       | 5.01E-02 | 4.80E+00  | 107.69 | OK       |          | OK       |            |
| 02           | TH-232  | MBL         | BLANK                 | pCi/l          | 0.00E+00  | 3.64E-02       | 7.87E-02 |           |        |          |          | OK       | OK         |
| 03           | TH-232  | DUP         | PZ-204-SS TOT         | pCi/l          | 1.16E-01  | 7.67E-02       | 5.74E-02 |           |        |          | NA       | OK       |            |
| 04           | TH-232  | DO          | PZ-204-SS TOT         | pCi/l          | 7.88E-02  | 7.07E-02       | 9.29E-02 |           |        |          |          | OK       |            |
| 05           | TH-232  | TRG         | PZ-204-SS DIS         | pCi/l          | 2.48E-02  | 5.38E-02       | 1.06E-01 |           |        |          |          | OK       |            |
| 06           | TH-232  | TRG         | I-68 TOT              | pCi/l          | 7.99E-01  | 2.79E-01       | 7.61E-02 |           |        |          |          | OK       |            |
| 07           | TH-232  | TRG         | I-68 DIS              | pCi/l          | 2.76E-02  | 4.23E-02       | 6.28E-02 |           |        |          |          | OK       |            |
| 08           | TH-232  | TRG         | D-87 TOT              | pCi/l          | 6.10E-02  | 6.35E-02       | 6.64E-02 |           |        |          |          | OK       |            |
| 09           | TH-232  | TRG         | D-87 DIS              | pCi/l          | 1.37E-02  | 3.81E-02       | 8.22E-02 |           |        |          |          | OK       |            |
| 10           | TH-232  | TRG         | PZ-106-SD TOT         | pCi/l          | 1.41E-01  | 9.06E-02       | 8.75E-02 |           |        |          |          | OK       |            |
| 11           | TH-232  | TRG         | PZ-106-SD DIS         | pCi/l          | -5.40E-03 | 3.26E-02       | 1.03E-01 |           |        |          |          | OK       |            |
| 12           | TH-232  | TRG         | S-82 TOT              | pCi/l          | 1.07E-01  | 8.74E-02       | 9.62E-02 |           |        |          |          | OK       |            |
| 13           | TH-232  | TRG         | S-82 DIS              | pCi/l          | 3.68E-03  | 2.38E-02       | 6.49E-02 |           |        |          |          | OK       |            |
| 14           | TH-232  | TRG         | PZ-106-SS TOT         | pCi/l          | 1.64E-02  | 3.56E-02       | 7.02E-02 |           |        |          |          | OK       |            |
| 15           | TH-232  | TRG         | PZ-106-SS DIS         | pCi/l          | 1.46E-02  | 4.05E-02       | 8.75E-02 |           |        |          |          | OK       |            |
| 16           | TH-232  | TRG         | I-9 TOT               | pCi/l          | -1.72E-02 | 3.12E-02       | 9.53E-02 |           |        |          |          | OK       |            |
| 17           | TH-232  | TRG         | I-9 DIS               | pCi/l          | 1.04E-01  | 1.21E-01       | 1.57E-01 |           |        |          |          | OK       |            |
| 18           | TH-232  | TRG         | D-93 TOT              | pCi/l          | 1.06E-02  | 3.82E-02       | 8.64E-02 |           |        |          |          | OK       |            |
| 19           | TH-232  | TRG         | D-93 DIS              | pCi/l          | 2.68E-02  | 3.72E-02       | 5.64E-02 |           |        |          |          | OK       |            |

Run

1

Analysis Code

ThISO

Eberline Services Work Order

13-04105

Client

Engineering Management Support, Inc.

Preliminary Data Report & Analytical Calculations  
**Work Order: 13-04105-THISO-1**

US EPA ARCHIVE DOCUMENT

| Lab Fraction | Nuclide | Sample Desc | Sample Date    | Sample Allotment | Radiometric % Rec | Grav % Rec | Mean % Rec | SAF | Sep 10 Date/Time | Sep 11 Date/Time |
|--------------|---------|-------------|----------------|------------------|-------------------|------------|------------|-----|------------------|------------------|
| 01           | TH-232  | LCS         | 04/16/13 00:00 | 1.00E+00         | 120.84            | 0.00       | 0.00       |     |                  |                  |
| 02           | TH-232  | MBL         | 04/16/13 00:00 | 1.00E+00         | 113.21            | 0.00       | 0.00       |     |                  |                  |
| 03           | TH-232  | DUP         | 04/09/13 09:30 | 1.00E+00         | 116.15            | 0.00       | 0.00       |     |                  |                  |
| 04           | TH-232  | DO          | 04/09/13 09:30 | 1.00E+00         | 115.33            | 0.00       | 0.00       |     |                  |                  |
| 05           | TH-232  | TRG         | 04/09/13 09:30 | 1.00E+00         | 76.27             | 0.00       | 0.00       |     |                  |                  |
| 06           | TH-232  | TRG         | 04/09/13 10:44 | 1.00E+00         | 76.39             | 0.00       | 0.00       |     |                  |                  |
| 07           | TH-232  | TRG         | 04/09/13 10:44 | 1.00E+00         | 98.35             | 0.00       | 0.00       |     |                  |                  |
| 08           | TH-232  | TRG         | 04/09/13 11:05 | 1.00E+00         | 91.35             | 0.00       | 0.00       |     |                  |                  |
| 09           | TH-232  | TRG         | 04/09/13 11:05 | 1.00E+00         | 115.06            | 0.00       | 0.00       |     |                  |                  |
| 10           | TH-232  | TRG         | 04/09/13 12:00 | 1.00E+00         | 121.12            | 0.00       | 0.00       |     |                  |                  |
| 11           | TH-232  | TRG         | 04/09/13 12:00 | 1.00E+00         | 115.36            | 0.00       | 0.00       |     |                  |                  |
| 12           | TH-232  | TRG         | 04/09/13 12:27 | 1.00E+00         | 101.49            | 0.00       | 0.00       |     |                  |                  |
| 13           | TH-232  | TRG         | 04/09/13 12:27 | 1.00E+00         | 132.78            | 0.00       | 0.00       |     |                  |                  |
| 14           | TH-232  | TRG         | 04/09/13 12:56 | 1.00E+00         | 123.17            | 0.00       | 0.00       |     |                  |                  |
| 15           | TH-232  | TRG         | 04/09/13 12:56 | 1.00E+00         | 93.37             | 0.00       | 0.00       |     |                  |                  |
| 16           | TH-232  | TRG         | 04/09/13 13:35 | 1.00E+00         | 104.89            | 0.00       | 0.00       |     |                  |                  |
| 17           | TH-232  | TRG         | 04/09/13 13:35 | 1.00E+00         | 45.61             | 0.00       | 0.00       |     |                  |                  |
| 18           | TH-232  | TRG         | 04/09/13 14:28 | 1.00E+00         | 102.73            | 0.00       | 0.00       |     |                  |                  |
| 19           | TH-232  | TRG         | 04/09/13 14:28 | 1.00E+00         | 124.85            | 0.00       | 0.00       |     |                  |                  |
|              |         |             |                |                  |                   |            |            |     |                  |                  |

|     |   |               |       |                              |          |        |                                      |
|-----|---|---------------|-------|------------------------------|----------|--------|--------------------------------------|
| Run | 1 | Analysis Code | THISO | Eberline Services Work Order | 13-04105 | Client | Engineering Management Support, Inc. |
|     |   |               |       |                              |          |        |                                      |

| Lab Fraction | Nuclide | Sample Desc | Counting Date/Time | Half-life (days) | Detect | Carrier   | Count Time | Counts     | Bkg CPM   | Eff  |
|--------------|---------|-------------|--------------------|------------------|--------|-----------|------------|------------|-----------|------|
| 01           | TH-232  | LCS         | 04/30/13 11:48     |                  | A_Spec | Alpha_035 | 170        | 4.31 E+02  | 1.00 E-03 | 18.3 |
| 02           | TH-232  | MBL         | 04/30/13 11:48     |                  | A_Spec | Alpha_037 | 170        | 1.00 E+00  | 0.00 E+00 | 17.8 |
| 03           | TH-232  | DUP         | 04/30/13 11:49     |                  | A_Spec | Alpha_040 | 170        | 9.66 E+00  | 2.00 E-03 | 19   |
| 04           | TH-232  | DO          | 04/30/13 11:48     |                  | A_Spec | Alpha_041 | 170        | 6.79 E+00  | 1.30 E-02 | 19.8 |
| 05           | TH-232  | TRG         | 04/30/13 11:49     |                  | A_Spec | Alpha_042 | 170        | 1.32 E+00  | 4.00 E-03 | 18.5 |
| 06           | TH-232  | TRG         | 04/30/13 11:48     |                  | A_Spec | Alpha_044 | 170        | 4.38 E+01  | 1.00 E-03 | 19   |
| 07           | TH-232  | TRG         | 04/30/13 11:48     |                  | A_Spec | Alpha_046 | 170        | 1.83 E+00  | 1.00 E-03 | 17.9 |
| 08           | TH-232  | TRG         | 04/30/13 11:48     |                  | A_Spec | Alpha_047 | 170        | 3.83 E+00  | 1.00 E-03 | 18.2 |
| 09           | TH-232  | TRG         | 04/30/13 11:48     |                  | A_Spec | Alpha_048 | 170        | 1.00 E+00  | 0.00 E+00 | 16.8 |
| 10           | TH-232  | TRG         | 04/30/13 12:43     |                  | A_Spec | Alpha_018 | 170        | 1.15 E+01  | 9.00 E-03 | 17.8 |
| 11           | TH-232  | TRG         | 04/30/13 12:43     |                  | A_Spec | Alpha_022 | 170        | -3.60 E-01 | 8.00 E-03 | 15.3 |
| 12           | TH-232  | TRG         | 04/30/13 12:43     |                  | A_Spec | Alpha_024 | 170        | 6.98 E+00  | 6.00 E-03 | 17.1 |
| 13           | TH-232  | TRG         | 04/30/13 12:43     |                  | A_Spec | Alpha_025 | 170        | 3.20 E-01  | 4.00 E-03 | 17.4 |
| 14           | TH-232  | TRG         | 04/30/13 12:43     |                  | A_Spec | Alpha_027 | 170        | 1.32 E+00  | 4.00 E-03 | 17.3 |
| 15           | TH-232  | TRG         | 04/30/13 12:43     |                  | A_Spec | Alpha_029 | 170.02     | 1.00 E+00  | 0.00 E+00 | 19.5 |
| 16           | TH-232  | TRG         | 04/30/13 14:35     |                  | A_Spec | Alpha_003 | 170.02     | -1.19 E+00 | 7.00 E-03 | 17.5 |
| 17           | TH-232  | TRG         | 04/30/13 14:35     |                  | A_Spec | Alpha_004 | 170.02     | 3.49 E+00  | 3.00 E-03 | 19.4 |
| 18           | TH-232  | TRG         | 04/30/13 14:35     |                  | A_Spec | Alpha_010 | 170.02     | 8.10 E-01  | 7.00 E-03 | 19.7 |
| 19           | TH-232  | TRG         | 04/30/13 14:35     |                  | A_Spec | Alpha_011 | 170.02     | 2.49 E+00  | 3.00 E-03 | 19.7 |

|                              |                                      |
|------------------------------|--------------------------------------|
| Run                          | 1                                    |
|                              | THISO                                |
| Analysis Code                | THISO                                |
| Eberline Services Work Order | 13-04105                             |
| Client                       | Engineering Management Support, Inc. |

*215*

| Internal Fraction | Sample Desc | Client ID     | Sample Date    | Sample Aliquot | Tracer Aliquot (g) | Tracer ACT (dpm) | Radiometric Tracer (pCi) | Radiometric % Rec | SAF 1* | SAF 2* |
|-------------------|-------------|---------------|----------------|----------------|--------------------|------------------|--------------------------|-------------------|--------|--------|
| 01                | LCS         | LCS           | 04/16/13 00:00 | 1.0000         | 0.4757             | 10.6876          |                          | 0.00              |        |        |
| 02                | MBL         | BLANK         | 04/16/13 00:00 | 1.0000         | 0.2361             | 5.3045           |                          | 0.00              |        |        |
| 03                | DUP         | PZ-204-SS TOT | 04/09/13 09:30 | 1.0000         | 0.2355             | 5.2910           |                          | 0.00              |        |        |
| 04                | DO          | PZ-204-SS TOT | 04/09/13 09:30 | 1.0000         | 0.2316             | 5.2034           |                          | 0.00              |        |        |
| 05                | TRG         | PZ-204-SS DIS | 04/09/13 09:30 | 1.0000         | 0.2318             | 5.2079           |                          | 0.00              |        |        |
| 06                | TRG         | I-68 TOT      | 04/09/13 10:44 | 1.0000         | 0.2322             | 5.2168           |                          | 0.00              |        |        |
| 07                | TRG         | I-68 DIS      | 04/09/13 10:44 | 1.0000         | 0.2321             | 5.2146           |                          | 0.00              |        |        |
| 08                | TRG         | D-87 TOT      | 04/09/13 11:05 | 1.0000         | 0.2326             | 5.2258           |                          | 0.00              |        |        |
| 09                | TRG         | D-87 DIS      | 04/09/13 11:05 | 1.0000         | 0.2312             | 5.1944           |                          | 0.00              |        |        |
| 10                | TRG         | PZ-106-SD TOT | 04/09/13 12:00 | 1.0000         | 0.2302             | 5.1719           |                          | 0.00              |        |        |
| 11                | TRG         | PZ-106-SD DIS | 04/09/13 12:00 | 1.0000         | 0.2314             | 5.1989           |                          | 0.00              |        |        |
| 12                | TRG         | S-82 TOT      | 04/09/13 12:27 | 1.0000         | 0.2318             | 5.2079           |                          | 0.00              |        |        |
| 13                | TRG         | S-82 DIS      | 04/09/13 12:27 | 1.0000         | 0.2312             | 5.1944           |                          | 0.00              |        |        |
| 14                | TRG         | PZ-106-SS TOT | 04/09/13 12:56 | 1.0000         | 0.2309             | 5.1876           |                          | 0.00              |        |        |
| 15                | TRG         | PZ-106-SS DIS | 04/09/13 12:56 | 1.0000         | 0.2301             | 5.1697           |                          | 0.00              |        |        |
| 16                | TRG         | I-9 TOT       | 04/09/13 13:35 | 1.0000         | 0.2301             | 5.1697           |                          | 0.00              |        |        |
| 17                | TRG         | I-9 DIS       | 04/09/13 13:35 | 1.0000         | 0.2307             | 5.1831           |                          | 0.00              |        |        |
| 18                | TRG         | D-93 TOT      | 04/09/13 14:28 | 1.0000         | 0.2310             | 5.1899           |                          | 0.00              |        |        |
| 19                | TRG         | D-93 DIS      | 04/09/13 14:28 | 1.0000         | 0.2290             | 5.1449           |                          | 0.00              |        |        |

*2-29*

*3-1*



| Internal Work Order |       |                |               |                 | Run             | Analysis Code   |                 | Date            | Technician |                |           |                | Technician Initials |                | Witness Initials |                |
|---------------------|-------|----------------|---------------|-----------------|-----------------|-----------------|-----------------|-----------------|------------|----------------|-----------|----------------|---------------------|----------------|------------------|----------------|
| 13-04105            |       |                |               |                 | 1               | THISO           |                 | 4/24/2013 11:52 | JBARNARD   |                |           |                |                     |                |                  |                |
| LCS & Matrix Spikes |       |                |               |                 | LCS             | MS              | LCSD            | MSD             | LCS        |                | MS        |                | LCSD                |                | MSD              |                |
| Isotope             | Sol # | Activity dpm/g | Solution Date | Approx Addition | Volume Used (g) | Volume Used (g) | Volume Used (g) | Volume Used (g) | Known pCi  | Error Estimate | Added pCi | Error Estimate | Known pCi           | Error Estimate | Added pCi        | Error Estimate |
| Th-228              | Th-8b | 103.560        | 4/24/2013     | 0.100           | 0.1030          |                 |                 |                 | 4.80       | 0.173          | 0.00      | 0.000          | 0.00                | 0.000          | 0.00             | 0.000          |
| Th-230              | Th-1b | 23.525         | 4/24/2013     | 0.500           | 0.5178          |                 |                 |                 | 5.49       | 0.148          | 0.00      | 0.000          | 0.00                | 0.000          | 0.00             | 0.000          |
| Th-232              | Th-8b | 103.560        | 4/24/2013     | 0.100           | 0.1030          |                 |                 |                 | 4.80       | 0.173          | 0.00      | 0.000          | 0.00                | 0.000          | 0.00             | 0.000          |

| Tracers  |         |        |                |               |                 |                 | Balance Printer Tapes |  |  |  |  |     |  |  |  |  |
|----------|---------|--------|----------------|---------------|-----------------|-----------------|-----------------------|--|--|--|--|-----|--|--|--|--|
| fraction | Isotope | Sol #  | Activity dpm/g | Solution Date | Volume Used (g) | Approx Addition | Tracer                |  |  |  |  | LCS |  |  |  |  |
| 01       | Th-229  | Th-18a | 22.467         | 4/24/2013     | 0.4757          | 0.2200          |                       |  |  |  |  |     |  |  |  |  |
| 02       | Th-229  | Th-18a | 22.467         | 4/24/2013     | 0.2361          | 0.2200          |                       |  |  |  |  |     |  |  |  |  |
| 03       | Th-229  | Th-18a | 22.467         | 4/24/2013     | 0.2355          | 0.2200          |                       |  |  |  |  |     |  |  |  |  |
| 04       | Th-229  | Th-18a | 22.467         | 4/24/2013     | 0.2316          | 0.2200          |                       |  |  |  |  |     |  |  |  |  |
| 05       | Th-229  | Th-18a | 22.467         | 4/24/2013     | 0.2318          | 0.2200          |                       |  |  |  |  |     |  |  |  |  |
| 06       | Th-229  | Th-18a | 22.467         | 4/24/2013     | 0.2322          | 0.2200          |                       |  |  |  |  |     |  |  |  |  |
| 07       | Th-229  | Th-18a | 22.467         | 4/24/2013     | 0.2321          | 0.2200          |                       |  |  |  |  |     |  |  |  |  |
| 08       | Th-229  | Th-18a | 22.467         | 4/24/2013     | 0.2326          | 0.2200          |                       |  |  |  |  |     |  |  |  |  |
| 09       | Th-229  | Th-18a | 22.467         | 4/24/2013     | 0.2312          | 0.2200          |                       |  |  |  |  |     |  |  |  |  |
| 10       | Th-229  | Th-18a | 22.467         | 4/24/2013     | 0.2302          | 0.2200          |                       |  |  |  |  |     |  |  |  |  |
| 11       | Th-229  | Th-18a | 22.467         | 4/24/2013     | 0.2314          | 0.2200          |                       |  |  |  |  |     |  |  |  |  |
| 12       | Th-229  | Th-18a | 22.467         | 4/24/2013     | 0.2318          | 0.2200          |                       |  |  |  |  |     |  |  |  |  |
| 13       | Th-229  | Th-18a | 22.467         | 4/24/2013     | 0.2312          | 0.2200          |                       |  |  |  |  |     |  |  |  |  |
| 14       | Th-229  | Th-18a | 22.467         | 4/24/2013     | 0.2309          | 0.2200          |                       |  |  |  |  |     |  |  |  |  |
| 15       | Th-229  | Th-18a | 22.467         | 4/24/2013     | 0.2301          | 0.2200          |                       |  |  |  |  |     |  |  |  |  |
| 16       | Th-229  | Th-18a | 22.467         | 4/24/2013     | 0.2301          | 0.2200          |                       |  |  |  |  |     |  |  |  |  |
| 17       | Th-229  | Th-18a | 22.467         | 4/24/2013     | 0.2307          | 0.2200          |                       |  |  |  |  |     |  |  |  |  |
| 18       | Th-229  | Th-18a | 22.467         | 4/24/2013     | 0.2310          | 0.2200          |                       |  |  |  |  |     |  |  |  |  |
| 19       | Th-229  | Th-18a | 22.467         | 4/24/2013     | 0.2290          | 0.2200          |                       |  |  |  |  |     |  |  |  |  |
|          |         |        |                |               |                 |                 |                       |  |  |  |  |     |  |  |  |  |

US EPA ARCHIVE DOCUMENT

# Aliquot Worksheet

US EPA ARCHIVE DOCUMENT

|                 |          |               |               |                 |                 |
|-----------------|----------|---------------|---------------|-----------------|-----------------|
| Work Order      | Run      | Analysis Code | Rpt Units     | Lab Deadline    | Technician      |
| <b>13-04105</b> | <b>1</b> | <b>ThISO</b>  | <b>liters</b> | <b>5/7/2013</b> | <b>JBARNARD</b> |

| Lab Fraction | Engineering Management Support, Inc.<br>Client ID | Sample<br>Type | Muffle Data    | Dilution Data |            |       | Aliquot Data |            | MS Aliquot Data |           | H-3 Solids Only  |              |
|--------------|---|----------------|----------------|---------------|------------|-------|--------------|------------|-----------------|-----------|------------------|--------------|
|              |   |                | Ratio Post/Pre | No of Dils    | Dil Factor | Ratio | Aliquot      | Net Equiv  | Aliquot         | Net Equiv | Water Added (ml) | H3 Dist Aliq |
| 01           | LCS   | LCS            |                |               |            |       | 1.0000E+00   | 1.0000E+00 |                 |           |                  |              |
| 02           | BLANK   | MBL            |                |               |            |       | 1.0000E+00   | 1.0000E+00 |                 |           |                  |              |
| 03           | PZ-204-SS TOT                                     | DUP            |                |               |            |       | 1.0000E+00   | 1.0000E+00 |                 |           |                  |              |
| 04           | PZ-204-SS TOT                                     | DO             |                |               |            |       | 1.0000E+00   | 1.0000E+00 |                 |           |                  |              |
| 05           | PZ-204-SS DIS                                     | TRG            |                |               |            |       | 1.0000E+00   | 1.0000E+00 |                 |           |                  |              |
| 06           | I-68 TOT  | TRG            |                |               |            |       | 1.0000E+00   | 1.0000E+00 |                 |           |                  |              |
| 07           | I-68 DIS  | TRG            |                |               |            |       | 1.0000E+00   | 1.0000E+00 |                 |           |                  |              |
| 08           | D-87 TOT  | TRG            |                |               |            |       | 1.0000E+00   | 1.0000E+00 |                 |           |                  |              |
| 09           | D-87 DIS  | TRG            |                |               |            |       | 1.0000E+00   | 1.0000E+00 |                 |           |                  |              |
| 10           | PZ-106-SD TOT                                     | TRG            |                |               |            |       | 1.0000E+00   | 1.0000E+00 |                 |           |                  |              |
| 11           | PZ-106-SD DIS                                     | TRG            |                |               |            |       | 1.0000E+00   | 1.0000E+00 |                 |           |                  |              |
| 12           | S-82 TOT  | TRG            |                |               |            |       | 1.0000E+00   | 1.0000E+00 |                 |           |                  |              |
| 13           | S-82 DIS  | TRG            |                |               |            |       | 1.0000E+00   | 1.0000E+00 |                 |           |                  |              |
| 14           | PZ-106-SS TOT                                     | TRG            |                |               |            |       | 1.0000E+00   | 1.0000E+00 |                 |           |                  |              |
| 15           | PZ-106-SS DIS                                     | TRG            |                |               |            |       | 1.0000E+00   | 1.0000E+00 |                 |           |                  |              |
| 16           | I-9 TOT   | TRG            |                |               |            |       | 1.0000E+00   | 1.0000E+00 |                 |           |                  |              |
| 17           | I-9 DIS   | TRG            |                |               |            |       | 1.0000E+00   | 1.0000E+00 |                 |           |                  |              |
| 18           | D-93 TOT  | TRG            |                |               |            |       | 1.0000E+00   | 1.0000E+00 |                 |           |                  |              |
| 19           | D-93 DIS  | TRG            |                |               |            |       | 1.0000E+00   | 1.0000E+00 |                 |           |                  |              |

|          |  |
|----------|--|
| Comments |  |
|----------|--|

Technician: BT Date: 4/24/13

KBS  
4/30/13

# Apex-Alpha™

Sample Description: SPIKE  
 Spectrum File: \\OR-ALPHA1\Canberra\ApexAlpha\Root\Data\00000567  
 Batch Identification: 1304105A-TH  
 Sample Identification: 01  
 Sample Geometry: Shelf 2  
 Procedure Description: Th iso

Detector Name: Alpha\_035  
 Chamber Serial Number: 04026477A  
 Detector Serial Number: 58771  
 Env. Background: System Bkgd 55748  
 Reagent Blank: <not performed>

Sample Size: 1.000E+000 +/- 0.000E+000 liter  
 Sample Date/Time: 4/30/2013 7:24:51 AM  
 Acquisition Date/Time: 4/30/2013 11:48:51 AM  
 Acquisition Live Time: 170.0 minutes  
 Acquisition Real Time: 170.8 minutes

Tracer Certificate: Th229\_TH-18A  
 Tracer Quantity: 0.476 mL  
 Effective Efficiency: 0.2206 +/- 0.0130  
 Counting Efficiency: 0.1826 +/- 0.0032 on 12/16/2012 5:49:42 PM  
 Chem. Recovery Factor: 1.2084 +/- 0.0741

Control Certificate Name: NatTh\_Th-8  
 Chem. Recov. of Control: TH-232 1.076885 +/- 0.088010  
 Peak Match Tolerance: 0.175 MeV

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

| Nuclide  | Energy (MeV) | Net Pk Area | Pk Area Error % | Ambient Backgnd | Reagent Backgnd | FWHM (keV) |
|----------|--------------|-------------|-----------------|-----------------|-----------------|------------|
| TH-227   | 5.713        | 27.32       | 38.04           | 0.68            | 0.00E+000       | 12.5       |
| TH-228   | 5.397        | 370.66      | 10.19           | 0.34            | 0.00E+000       | 15.4       |
| TH-229 T | 4.892        | 400.83      | 9.79            | 0.17            | 0.00E+000       | 4.6        |
| TH-230   | 4.660        | 362.66      | 10.30           | 0.34            | 0.00E+000       | 18.0       |
| TH-232   | 3.990        | 430.83      | 9.45            | 0.17            | 0.00E+000       | 22.6       |

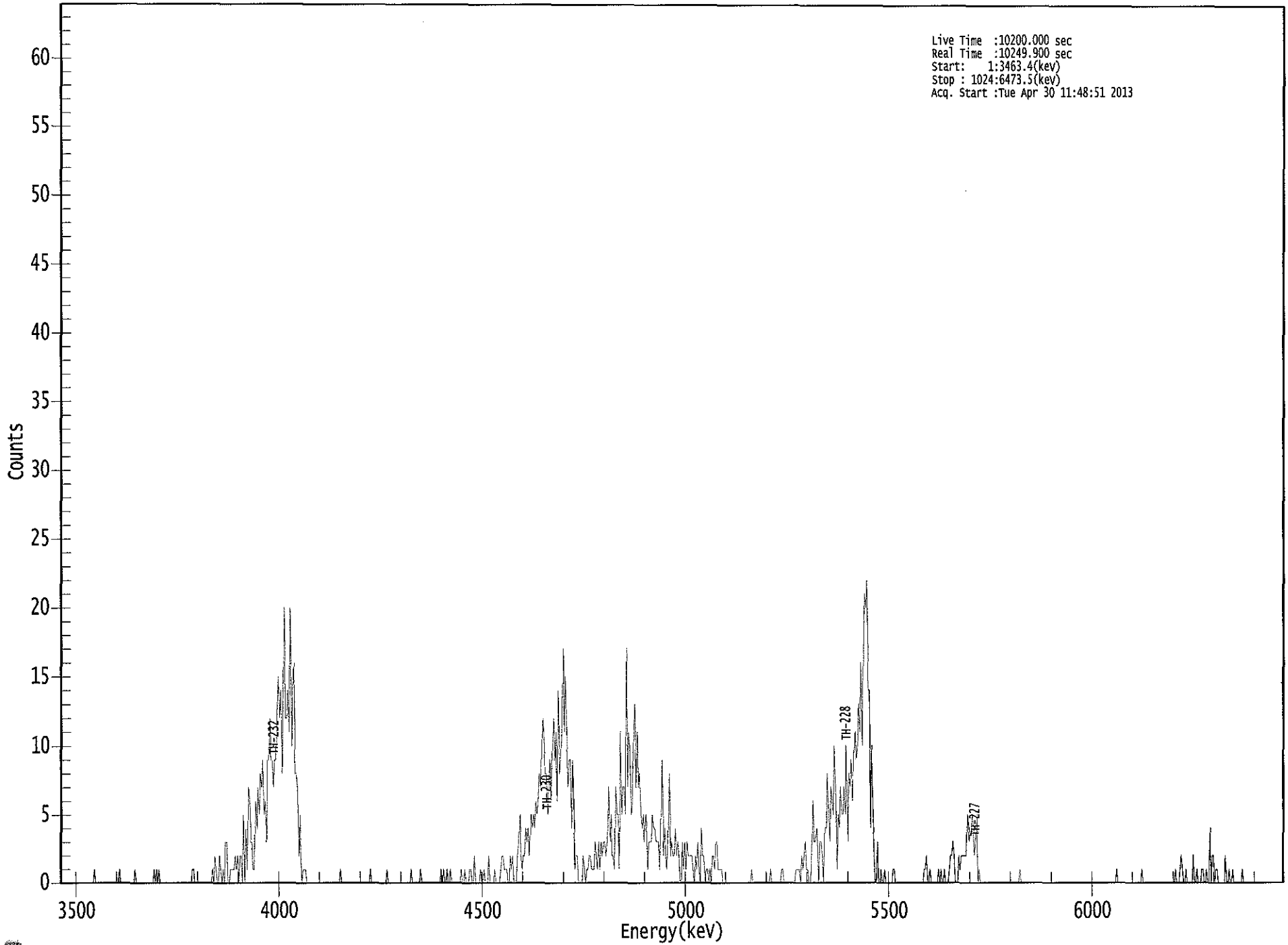
T = Tracer Peak used for Effective Efficiency

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

| Nuclide | Id Conf. | Energy (keV) | Activity (pCi/liter)    | MDA (pCi/liter)         |
|---------|----------|--------------|-------------------------|-------------------------|
| TH-227  | 0.907    | 5850.00*     | 3.37E-001 +/- 1.34E-001 | 6.95E-002 +/- 8.01E-003 |
| TH-228  | 1.000    | 5400.00*     | 4.46E+000 +/- 6.85E-001 | 5.75E-002 +/- 6.62E-003 |
| TH-229  | 0.998    | 4872.00*     | 4.84E+000 +/- 5.57E-001 | 5.04E-002 +/- 5.80E-003 |
| TH-230  | 0.999    | 4672.00*     | 4.36E+000 +/- 6.74E-001 | 5.75E-002 +/- 6.63E-003 |
| TH-232  | 1.000    | 3997.00*     | 5.17E+000 +/- 7.71E-001 | 5.01E-002 +/- 5.78E-003 |

AG  
5/1/13

US EPA ARCHIVE DOCUMENT



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

Sample Title: 01

Elapsed Live time: 10200

Elapsed Real Time: 10250

| 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  | 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  | 1  | 0  | 0  | 0  | 0  | 0  | 0  | 0  |
| 57:     | 0  | 0  | 0  | 0  | 0  | 0  | 1  | 0  | 0  |
| 65:     | 0  | 0  | 0  | 0  | 0  | 0  | 0  | 0  | 0  |
| 73:     | 0  | 0  | 0  | 0  | 0  | 0  | 1  | 0  | 0  |
| 81:     | 1  | 0  | 1  | 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  | 1  | 1  | 1  |
| 113:    | 0  | 0  | 0  | 0  | 0  | 0  | 0  | 0  | 0  |
| 121:    | 0  | 0  | 0  | 0  | 0  | 0  | 0  | 0  | 1  |
| 129:    | 0  | 2  | 1  | 0  | 0  | 2  | 1  | 0  | 0  |
| 137:    | 1  | 0  | 3  | 3  | 0  | 0  | 1  | 1  | 1  |
| 145:    | 1  | 1  | 2  | 1  | 2  | 0  | 2  | 2  | 2  |
| 153:    | 0  | 5  | 0  | 4  | 1  | 7  | 6  | 3  | 3  |
| 161:    | 3  | 1  | 1  | 6  | 4  | 7  | 5  | 8  | 8  |
| 169:    | 7  | 9  | 5  | 6  | 3  | 9  | 9  | 12 | 12 |
| 177:    | 9  | 9  | 7  | 9  | 9  | 13 | 15 | 12 | 12 |
| 185:    | 14 | 8  | 14 | 20 | 12 | 12 | 14 | 11 | 11 |
| 193:    | 20 | 10 | 14 | 16 | 8  | 8  | 7  | 2  | 2  |
| 201:    | 5  | 2  | 0  | 1  | 1  | 1  | 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  | 1  | 0  | 0  | 0  | 0  | 0  | 0  |
| 241:    | 0  | 0  | 0  | 0  | 0  | 0  | 0  | 0  | 0  |
| 249:    | 0  | 0  | 0  | 0  | 0  | 0  | 0  | 0  | 0  |
| 257:    | 0  | 0  | 0  | 1  | 0  | 0  | 0  | 0  | 0  |
| 265:    | 0  | 0  | 0  | 0  | 0  | 0  | 0  | 0  | 0  |
| 273:    | 0  | 1  | 0  | 0  | 0  | 0  | 0  | 0  | 0  |
| 281:    | 0  | 0  | 0  | 0  | 0  | 0  | 0  | 0  | 0  |
| 289:    | 0  | 0  | 0  | 0  | 0  | 1  | 0  | 0  | 0  |
| 297:    | 0  | 0  | 0  | 0  | 0  | 1  | 0  | 0  | 0  |
| 305:    | 0  | 0  | 0  | 0  | 0  | 0  | 0  | 0  | 0  |
| 313:    | 0  | 0  | 0  | 0  | 0  | 0  | 1  | 0  | 0  |
| 321:    | 1  | 0  | 0  | 1  | 0  | 0  | 1  | 0  | 0  |
| 329:    | 0  | 0  | 0  | 0  | 0  | 0  | 0  | 1  | 1  |
| 337:    | 0  | 0  | 1  | 0  | 0  | 0  | 1  | 1  | 1  |
| 345:    | 0  | 0  | 2  | 0  | 0  | 0  | 0  | 1  | 1  |
| 353:    | 0  | 0  | 1  | 0  | 0  | 0  | 2  | 0  | 0  |
| 361:    | 0  | 0  | 0  | 1  | 0  | 0  | 0  | 0  | 0  |

369: 1 2 2 1 1 1 0 0

Sample Title: 01

| Channel | 1  | 2  | 3  | 4  | 5  | 6  | 7  | 8  |
|---------|----|----|----|----|----|----|----|----|
| 377:    | 2  | 1  | 2  | 0  | 0  | 0  | 2  | 3  |
| 385:    | 5  | 2  | 1  | 2  | 2  | 4  | 3  | 4  |
| 393:    | 2  | 5  | 4  | 5  | 4  | 6  | 5  | 6  |
| 401:    | 8  | 7  | 10 | 12 | 10 | 8  | 8  | 5  |
| 409:    | 7  | 9  | 6  | 10 | 12 | 9  | 11 | 6  |
| 417:    | 14 | 8  | 9  | 12 | 17 | 11 | 15 | 11 |
| 425:    | 7  | 9  | 9  | 4  | 9  | 5  | 1  | 2  |
| 433:    | 2  | 0  | 0  | 0  | 0  | 2  | 1  | 0  |
| 441:    | 1  | 1  | 2  | 2  | 1  | 1  | 1  | 3  |
| 449:    | 2  | 1  | 3  | 1  | 3  | 2  | 3  | 3  |
| 457:    | 2  | 3  | 7  | 3  | 5  | 2  | 2  | 1  |
| 465:    | 7  | 5  | 5  | 1  | 11 | 5  | 7  | 7  |
| 473:    | 5  | 17 | 7  | 11 | 10 | 5  | 6  | 11 |
| 481:    | 13 | 7  | 11 | 7  | 8  | 5  | 4  | 5  |
| 489:    | 3  | 5  | 4  | 1  | 3  | 3  | 3  | 5  |
| 497:    | 4  | 4  | 3  | 3  | 3  | 1  | 5  | 9  |
| 505:    | 2  | 4  | 2  | 1  | 4  | 8  | 2  | 3  |
| 513:    | 2  | 2  | 4  | 2  | 3  | 2  | 0  | 0  |
| 521:    | 3  | 1  | 3  | 1  | 3  | 2  | 2  | 2  |
| 529:    | 2  | 1  | 0  | 2  | 1  | 3  | 1  | 0  |
| 537:    | 4  | 2  | 2  | 0  | 1  | 1  | 0  | 1  |
| 545:    | 0  | 2  | 2  | 1  | 3  | 3  | 1  | 1  |
| 553:    | 1  | 1  | 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  | 1  | 0  | 0  | 0  | 0  | 0  |
| 585:    | 0  | 0  | 0  | 0  | 0  | 0  | 0  | 0  |
| 593:    | 0  | 0  | 1  | 0  | 0  | 0  | 0  | 0  |
| 601:    | 0  | 0  | 0  | 1  | 1  | 0  | 0  | 0  |
| 609:    | 0  | 0  | 0  | 0  | 0  | 0  | 0  | 1  |
| 617:    | 1  | 1  | 1  | 0  | 2  | 1  | 2  | 3  |
| 625:    | 1  | 1  | 0  | 0  | 1  | 6  | 3  | 3  |
| 633:    | 4  | 3  | 0  | 3  | 3  | 2  | 0  | 4  |
| 641:    | 4  | 8  | 5  | 3  | 7  | 6  | 5  | 10 |
| 649:    | 7  | 1  | 5  | 4  | 7  | 5  | 5  | 7  |
| 657:    | 5  | 10 | 3  | 8  | 7  | 9  | 6  | 9  |
| 665:    | 11 | 9  | 10 | 13 | 11 | 16 | 10 | 18 |
| 673:    | 21 | 20 | 22 | 14 | 14 | 4  | 10 | 5  |
| 681:    | 3  | 0  | 0  | 3  | 0  | 0  | 1  | 0  |
| 689:    | 0  | 1  | 0  | 0  | 0  | 0  | 0  | 0  |
| 697:    | 1  | 1  | 0  | 0  | 0  | 0  | 0  | 0  |
| 705:    | 0  | 0  | 0  | 0  | 0  | 0  | 0  | 0  |
| 713:    | 0  | 0  | 0  | 0  | 0  | 0  | 0  | 0  |
| 721:    | 0  | 0  | 1  | 1  | 2  | 0  | 0  | 1  |
| 729:    | 0  | 0  | 0  | 0  | 0  | 0  | 1  | 0  |
| 737:    | 1  | 0  | 0  | 1  | 0  | 0  | 0  | 1  |
| 745:    | 2  | 2  | 3  | 2  | 0  | 0  | 0  | 2  |
| 753:    | 1  | 2  | 2  | 2  | 2  | 2  | 5  | 4  |
| 761:    | 3  | 4  | 5  | 4  | 2  | 3  | 5  | 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 1 0 0 0 0 0

Sample Title: 01

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

KS  
4/30/13

# Apex-Alpha™

Sample Description: BLANK  
 Spectrum File: \\OR-ALPHA1\Canberra\ApexAlpha\Root\Data\00000567  
 Batch Identification: 1304105A-TH  
 Sample Identification: 02  
 Sample Geometry: Shelf 2  
 Procedure Description: Th iso

Detector Name: Alpha\_037  
 Chamber Serial Number: 04026478A  
 Detector Serial Number: 91133  
 Env. Background: System Bkgd 55750  
 Reagent Blank: <not performed>

Sample Size: 1.000E+000 +/- 0.000E+000 liter  
 Sample Date/Time: 4/30/2013 7:24:51 AM  
 Acquisition Date/Time: 4/30/2013 11:48:53 AM  
 Acquisition Live Time: 170.0 minutes  
 Acquisition Real Time: 170.8 minutes

Tracer Certificate: Th229\_TH-18A  
 Tracer Quantity: 0.236 mL  
 Effective Efficiency: 0.2018 +/- 0.0163  
 Counting Efficiency: 0.1783 +/- 0.0033 on 1/26/2013 3:28:25 PM  
 Chem. Recovery Factor: 1.1321 +/- 0.0936

Peak Match Tolerance: 0.175 MeV

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

| Nuclide  | Energy (MeV) | Net Pk Area | Pk Area Error % | Ambient Backgnd | Reagent Backgnd | FWHM (keV) |
|----------|--------------|-------------|-----------------|-----------------|-----------------|------------|
| TH-227   | 5.872        | -0.68       | 304.44          | 0.68            | 0.00E+000       | 0.0        |
| TH-228   | 5.308        | 3.83        | 102.72          | 0.17            | 0.00E+000       | 5.9        |
| TH-229 T | 4.876        | 182.00      | 14.57           | 0.00            | 0.00E+000       | 8.1        |
| TH-230   | 4.652        | 10.66       | 61.14           | 0.34            | 0.00E+000       | 4.4        |
| TH-232   | 3.948        | 0.00        | 1960.0          | 0.00            | 0.00E+000       | 0.0        |

T = Tracer Peak used for Effective Efficiency

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 ----- NUCLIDE ANALYSIS RESULTS -----  
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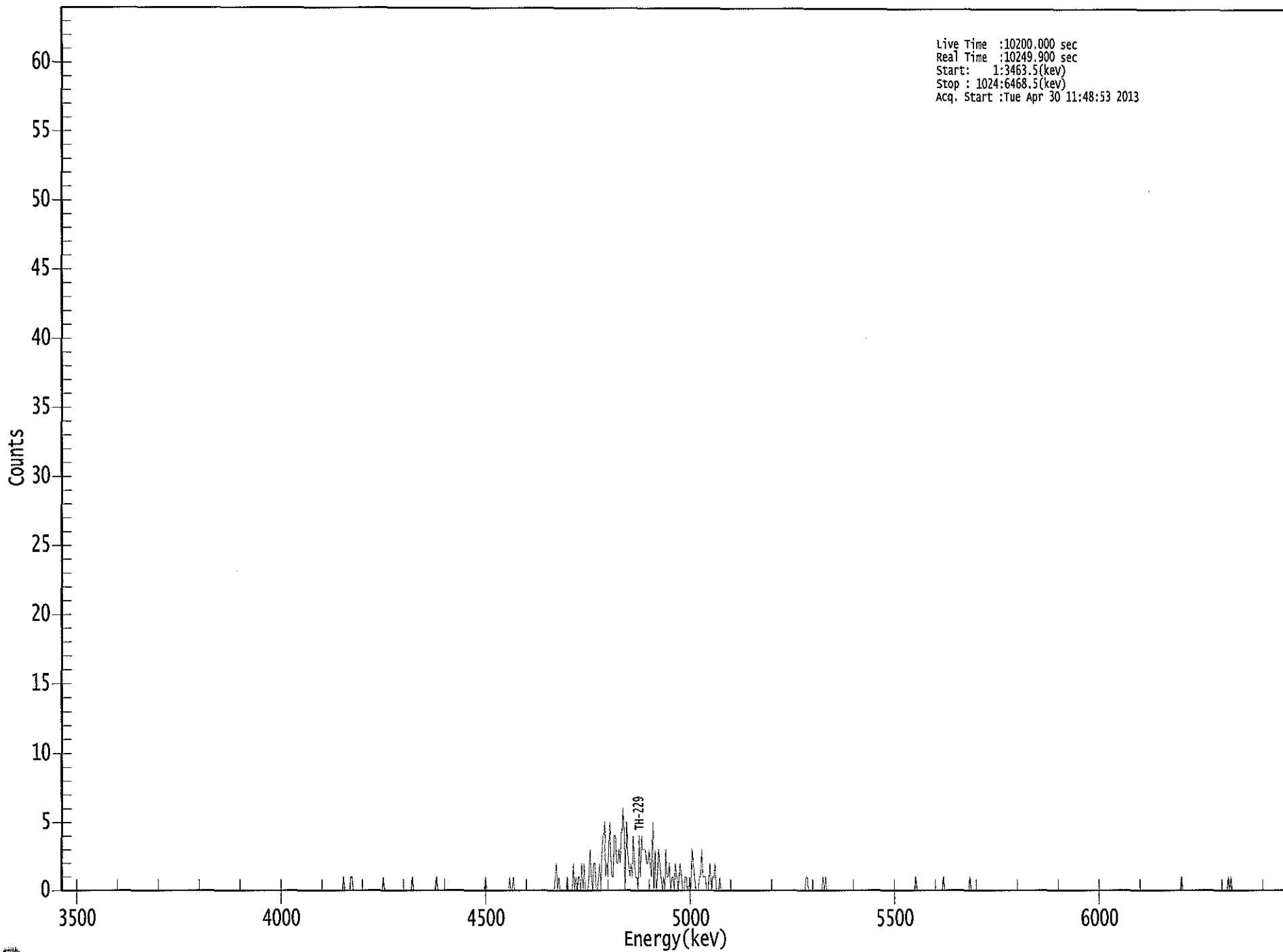
| Nuclide | Id Conf. | Energy (keV) | Activity (pCi/liter)     | MDA (pCi/liter)         |
|---------|----------|--------------|--------------------------|-------------------------|
| TH-227  | 0.997    | 5850.00*     | -9.16E-003 +/- 2.79E-002 | 7.59E-002 +/- 1.20E-002 |
| TH-228  | 0.956    | 5400.00*     | 5.03E-002 +/- 5.23E-002  | 5.48E-002 +/- 8.65E-003 |
| TH-229  | 1.000    | 4872.00*     | 2.40E+000 +/- 3.79E-001  | 7.91E-002 +/- 1.25E-002 |
| TH-230  | 0.998    | 4672.00*     | 1.40E-001 +/- 8.85E-002  | 6.29E-002 +/- 9.93E-003 |
| TH-232  | 0.988    | 3997.00*     | 0.00E+000 +/- 3.64E-002  | 7.87E-002 +/- 1.24E-002 |

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5/1/13

US EPA ARCHIVE DOCUMENT



0000056735.CNF



ROI Type: 1

ROI Type: 3

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

Sample Title: 02

Elapsed Live time: 10200

Elapsed Real Time: 10250

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

369: 0 0 0 0 0 1 0 0

Sample Title: 02

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

801: 0 0 0 0 0 0 0 0

Sample Title: 02

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

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4/30/13

# Apex-Alpha™

Sample Description: PZ-204-SS TOT-DUP  
 Spectrum File: \\OR-ALPHA1\Canberra\ApexAlpha\Root\Data\00000567  
 Batch Identification: 1304105A-TH  
 Sample Identification: 03  
 Sample Geometry: Shelf 2  
 Procedure Description: Th iso

Detector Name: Alpha\_040  
 Chamber Serial Number: 06027396B  
 Detector Serial Number: 91135  
 Env. Background: System Bkgd 55752  
 Reagent Blank: <not performed>

Sample Size: 1.000E+000 +/- 0.000E+000 liter  
 Sample Date/Time: 4/9/2013 7:24:51 AM  
 Acquisition Date/Time: 4/30/2013 11:49:02 AM  
 Acquisition Live Time: 170.0 minutes  
 Acquisition Real Time: 170.8 minutes

Tracer Certificate: Th229\_TH-18A  
 Tracer Quantity: 0.235 mL  
 Effective Efficiency: 0.2207 +/- 0.0171  
 Counting Efficiency: 0.1900 +/- 0.0033 on 12/16/2012 5:49:33 PM  
 Chem. Recovery Factor: 1.1615 +/- 0.0923

Peak Match Tolerance: 0.175 MeV

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

| Nuclide  | Energy (MeV) | Net Pk Area | Pk Area Error % | Ambient Backgnd | Reagent Backgnd | FWHM (keV) |
|----------|--------------|-------------|-----------------|-----------------|-----------------|------------|
| TH-227   | 5.825        | 3.66        | 107.87          | 0.34            | 0.00E+000       | 3.0        |
| TH-228   | 5.389        | 25.66       | 38.99           | 0.34            | 0.00E+000       | 5.9        |
| TH-229 T | 4.872        | 198.49      | 13.93           | 0.51            | 0.00E+000       | 16.3       |
| TH-230   | 4.671        | 13.66       | 53.80           | 0.34            | 0.00E+000       | 3.0        |
| TH-232   | 3.988        | 9.66        | 64.35           | 0.34            | 0.00E+000       | 4.5        |

T = Tracer Peak used for Effective Efficiency

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 NUCLIDE ANALYSIS RESULTS  
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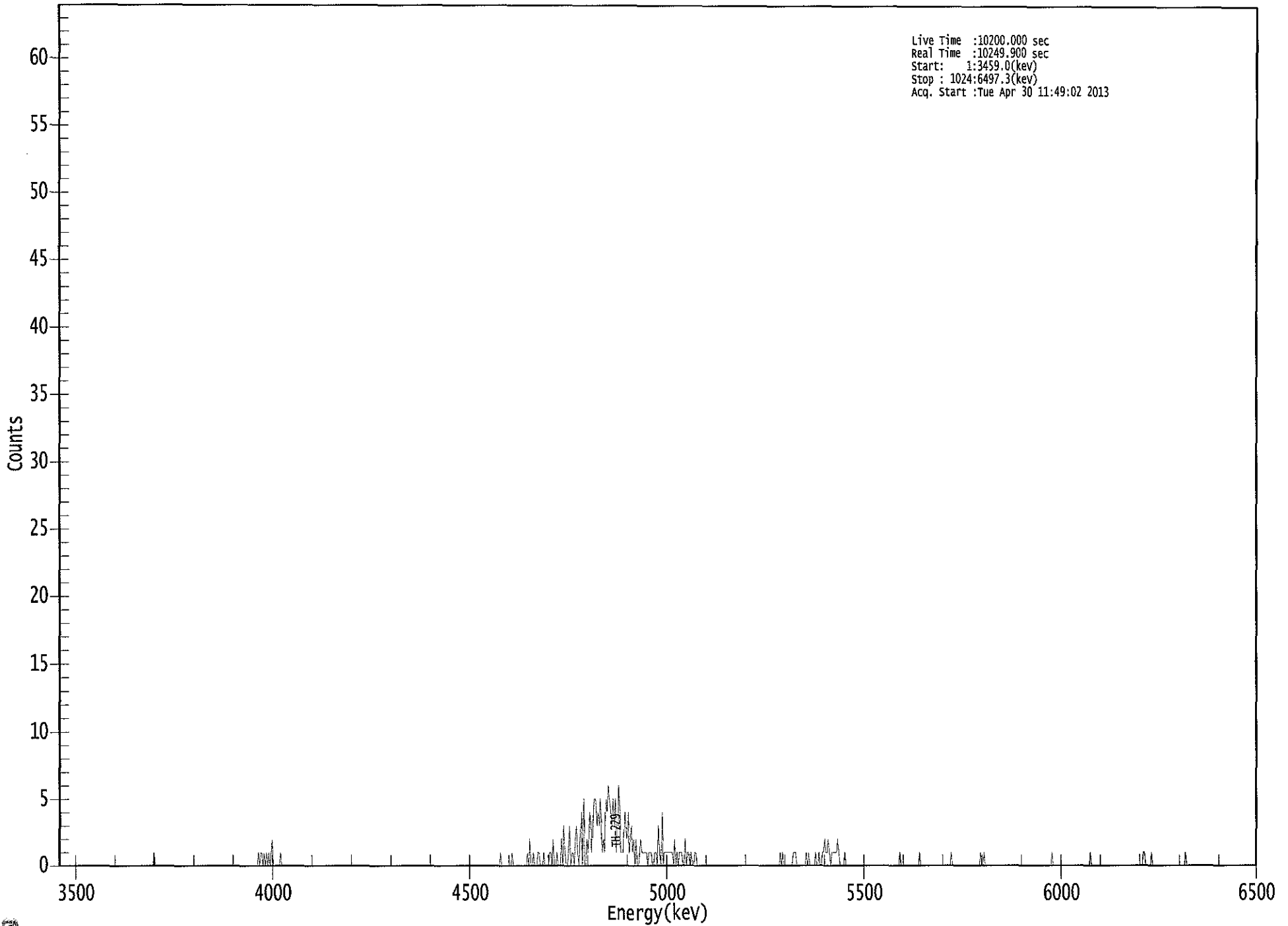
| Nuclide | Id Conf. | Energy (keV) | Activity (pCi/liter)    | MDA (pCi/liter)         |
|---------|----------|--------------|-------------------------|-------------------------|
| TH-227  | 0.997    | 5850.00*     | 4.52E-002 +/- 4.92E-002 | 5.90E-002 +/- 8.97E-003 |
| TH-228  | 0.999    | 5400.00*     | 3.15E-001 +/- 1.32E-001 | 5.87E-002 +/- 8.92E-003 |
| TH-229  | 1.000    | 4872.00*     | 2.39E+000 +/- 3.64E-001 | 6.33E-002 +/- 9.62E-003 |
| TH-230  | 1.000    | 4672.00*     | 1.64E-001 +/- 9.19E-002 | 5.75E-002 +/- 8.74E-003 |
| TH-232  | 1.000    | 3997.00*     | 1.16E-001 +/- 7.67E-002 | 5.74E-002 +/- 8.73E-003 |

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5/1/13

US EPA ARCHIVE DOCUMENT

0000056738.CNF

Live Time :10200.000 sec  
Real Time :10249.900 sec  
Start : 1:3459.0(kev)  
Stop : 1024:6497.3(kev)  
Acq. Start :Tue Apr 30 11:49:02 2013



ROI Type: 1

ROI Type: 3

US EPA ARCHIVE DOCUMENT

0229

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 \*\*\*\*\* S P E C T R A L D A T A R E P O R T \*\*\*\*\*  
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Sample Title: 03

Elapsed Live time: 10200  
 Elapsed Real Time: 10250

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

369: 0 0 0 0 0 0 0 0 0

Sample Title: 03

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



801: 0 0 0 0 0 0 0 0

Sample Title: 03

| Channel | ----- | ----- | ----- | ----- | ----- | ----- | ----- | ----- |
|---------|-------|-------|-------|-------|-------|-------|-------|-------|
| 809:    | 0     | 0     | 0     | 0     | 0     | 0     | 0     | 0     |
| 817:    | 0     | 0     | 0     | 0     | 0     | 0     | 0     | 0     |
| 825:    | 0     | 0     | 0     | 0     | 0     | 0     | 0     | 0     |
| 833:    | 0     | 0     | 0     | 0     | 0     | 0     | 0     | 0     |
| 841:    | 0     | 0     | 0     | 0     | 0     | 0     | 0     | 0     |
| 849:    | 1     | 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     | 1     | 0     | 0     | 0     | 0     | 0     | 0     |
| 889:    | 0     | 0     | 0     | 0     | 0     | 0     | 0     | 0     |
| 897:    | 0     | 0     | 0     | 0     | 0     | 0     | 0     | 0     |
| 905:    | 0     | 0     | 0     | 0     | 0     | 0     | 0     | 0     |
| 913:    | 0     | 0     | 0     | 0     | 0     | 0     | 0     | 0     |
| 921:    | 0     | 0     | 0     | 0     | 0     | 0     | 1     | 1     |
| 929:    | 0     | 0     | 0     | 0     | 0     | 1     | 0     | 0     |
| 937:    | 0     | 0     | 0     | 0     | 0     | 0     | 0     | 0     |
| 945:    | 0     | 0     | 0     | 0     | 0     | 0     | 0     | 0     |
| 953:    | 0     | 0     | 0     | 0     | 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     | 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     |

K13  
4/30/13

# Apex-Alpha™

Sample Description: PZ-204-SS TOT  
 Spectrum File: \\OR-ALPHA1\Canberra\ApexAlpha\Root\Data\00000567  
 Batch Identification: 1304105A-TH  
 Sample Identification: 04  
 Sample Geometry: Shelf 2  
 Procedure Description: Th iso

Detector Name: Alpha\_041  
 Chamber Serial Number: 05026930A  
 Detector Serial Number: 91087  
 Env. Background: System Bkgd 55753  
 Reagent Blank: <not performed>

Sample Size: 1.000E+000 +/- 0.000E+000 liter  
 Sample Date/Time: 4/9/2013 7:24:51 AM  
 Acquisition Date/Time: 4/30/2013 11:48:59 AM  
 Acquisition Live Time: 170.0 minutes  
 Acquisition Real Time: 170.8 minutes

Tracer Certificate: Th229\_TH-18A  
 Tracer Quantity: 0.232 mL  
 Effective Efficiency: 0.2282 +/- 0.0176  
 Counting Efficiency: 0.1978 +/- 0.0034 on 12/16/2012 5:49:31 PM  
 Chem. Recovery Factor: 1.1533 +/- 0.0910

Peak Match Tolerance: 0.175 MeV

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

| Nuclide  | Energy (MeV) | Net Pk Area | Pk Area Error % | Ambient Backgnd | Reagent Backgnd | FWHM (keV) |
|----------|--------------|-------------|-----------------|-----------------|-----------------|------------|
| TH-227   | 5.820        | 0.15        | 1397.8          | 0.85            | 0.00E+000       | 3.0        |
| TH-228   | 5.379        | 18.66       | 45.85           | 0.34            | 0.00E+000       | 3.0        |
| TH-229 T | 4.878        | 201.83      | 13.80           | 0.17            | 0.00E+000       | 10.3       |
| TH-230   | 4.645        | 19.15       | 45.94           | 0.85            | 0.00E+000       | 3.0        |
| TH-232   | 3.957        | 6.79        | 88.39           | 2.21            | 0.00E+000       | 4.5        |

T = Tracer Peak used for Effective Efficiency

-----  
 NUCLIDE ANALYSIS RESULTS  
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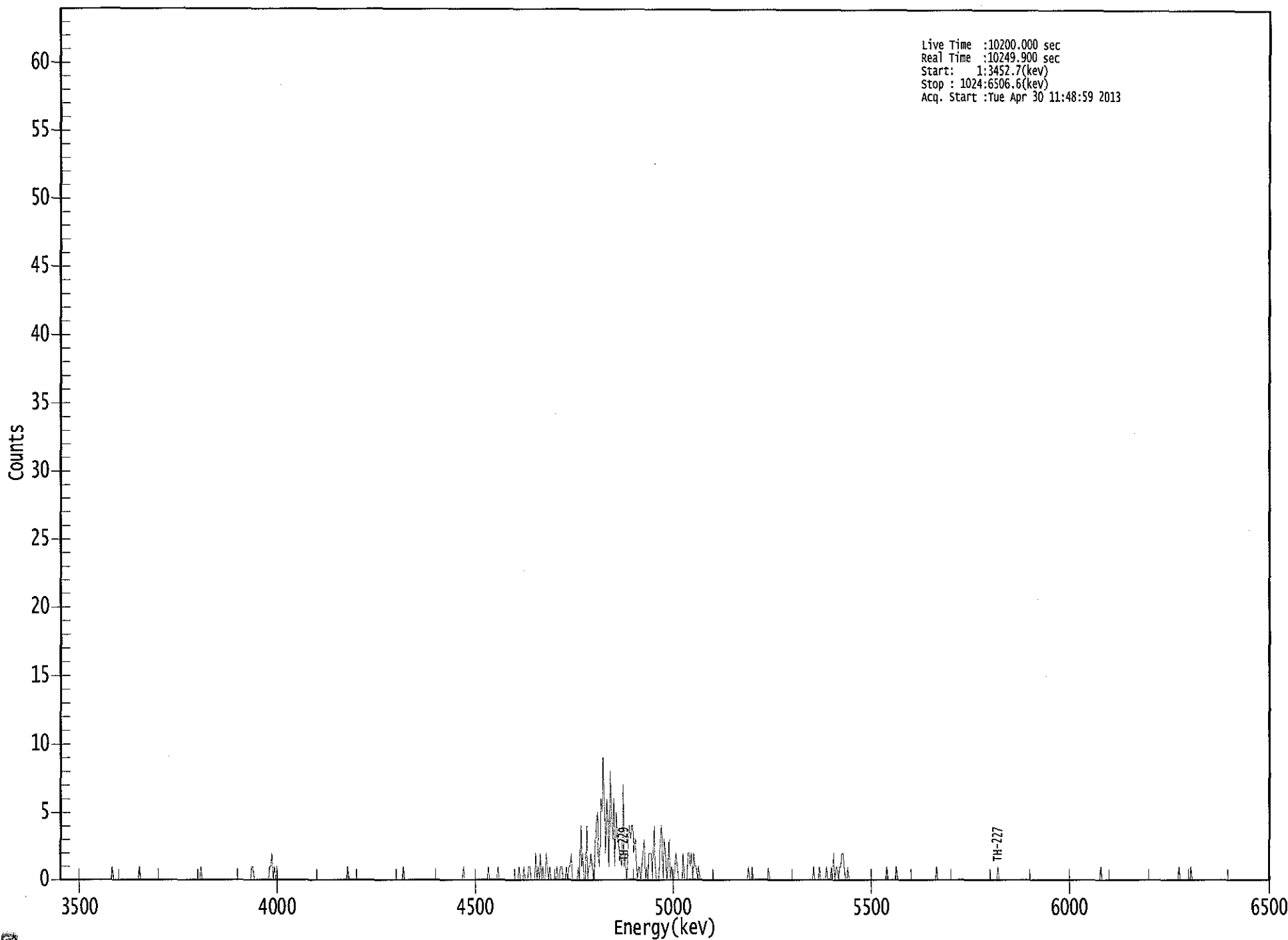
| Nuclide | Id Conf. | Energy (keV) | Activity (pCi/liter)    | MDA (pCi/liter)         |
|---------|----------|--------------|-------------------------|-------------------------|
| TH-227  | 0.995    | 5850.00*     | 1.79E-003 +/- 2.50E-002 | 7.14E-002 +/- 1.08E-002 |
| TH-228  | 0.998    | 5400.00*     | 2.21E-001 +/- 1.07E-001 | 5.67E-002 +/- 8.56E-003 |
| TH-229  | 1.000    | 4872.00*     | 2.36E+000 +/- 3.55E-001 | 4.87E-002 +/- 7.34E-003 |
| TH-230  | 0.996    | 4672.00*     | 2.23E-001 +/- 1.08E-001 | 6.96E-002 +/- 1.05E-002 |
| TH-232  | 0.992    | 3997.00*     | 7.88E-002 +/- 7.07E-002 | 9.29E-002 +/- 1.40E-002 |

AG  
 5/1/13

US EPA ARCHIVE DOCUMENT

0000056739.CNF

Live Time :10200.000 sec  
Real Time :10249.900 sec  
Start: 1:3452.7(kev)  
Stop : 1024:6506.6(kev)  
Acq. Start :Tue Apr 30 11:48:59 2013



US EPA ARCHIVE DOCUMENT

0234

ROI Type: 1

ROI Type: 3

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

Sample Title: 04

Elapsed Live time: 10200

Elapsed Real Time: 10250

| 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 | 1 | 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 | 1 | 0 | 0 | 0 | 0 | 0 |
| 73:     | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 |
| 81:     | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 |
| 89:     | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 |
| 97:     | 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 | 1 |
| 121:    | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 |
| 129:    | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 |
| 137:    | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 |
| 145:    | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 |
| 153:    | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 |
| 161:    | 0 | 0 | 1 | 1 | 0 | 0 | 0 | 0 | 0 |
| 169:    | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 |
| 177:    | 0 | 1 | 1 | 2 | 0 | 1 | 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 | 1 | 0 | 0 | 0 | 0 | 0 |
| 249:    | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 |
| 257:    | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 |
| 265:    | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 |
| 273:    | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 |
| 281:    | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 |
| 289:    | 0 | 0 | 1 | 0 | 0 | 0 | 0 | 0 | 0 |
| 297:    | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 |
| 305:    | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 |
| 313:    | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 |
| 321:    | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 |
| 329:    | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 |
| 337:    | 0 | 0 | 0 | 0 | 0 | 1 | 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 | 1 | 0 | 0 | 0 | 0 | 0 | 0 |

369: 0 0 1 0 0 0 0 0

Sample Title: 04

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

801: 0 0 0 0 0 0 0 0

Sample Title: 04

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

103  
4/30/13

Sample Description: PZ-204-SS DIS  
 Spectrum File: \\OR-ALPHA1\Canberra\ApexAlpha\Root\Data\00000567  
 Batch Identification: 1304105A-TH  
 Sample Identification: 05  
 Sample Geometry: Shelf 2  
 Procedure Description: Th iso

Detector Name: Alpha\_042  
 Chamber Serial Number: 05026930B  
 Detector Serial Number: 84185  
 Env. Background: System Bkgd 55754  
 Reagent Blank: <not performed>

Sample Size: 1.000E+000 +/- 0.000E+000 liter  
 Sample Date/Time: 4/9/2013 7:24:51 AM  
 Acquisition Date/Time: 4/30/2013 11:49:00 AM  
 Acquisition Live Time: 170.0 minutes  
 Acquisition Real Time: 170.8 minutes

Tracer Certificate: Th229\_TH-18A  
 Tracer Quantity: 0.232 mL  
 Effective Efficiency: 0.1408 +/- 0.0134  
 Counting Efficiency: 0.1846 +/- 0.0032 on 12/16/2012 5:49:29 PM  
 Chem. Recovery Factor: 0.7627 +/- 0.0736

Peak Match Tolerance: 0.175 MeV

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

| Nuclide  | Energy (MeV) | Net Pk Area | Pk Area Error % | Ambient Backgnd | Reagent Backgnd | FWHM (keV) |
|----------|--------------|-------------|-----------------|-----------------|-----------------|------------|
| TH-227   | 5.728        | 2.32        | 149.12          | 0.68            | 0.00E+000       | 3.0        |
| TH-228   | 5.268        | 1.98        | 176.34          | 1.02            | 0.00E+000       | 3.0        |
| TH-229 T | 4.874        | 124.66      | 17.58           | 0.34            | 0.00E+000       | 4.5        |
| TH-230   | 4.590        | 5.15        | 94.34           | 0.85            | 0.00E+000       | 3.0        |
| TH-232   | 3.988        | 1.32        | 215.97          | 0.68            | 0.00E+000       | 3.0        |

T = Tracer Peak used for Effective Efficiency

-----  
 NUCLIDE ANALYSIS RESULTS  
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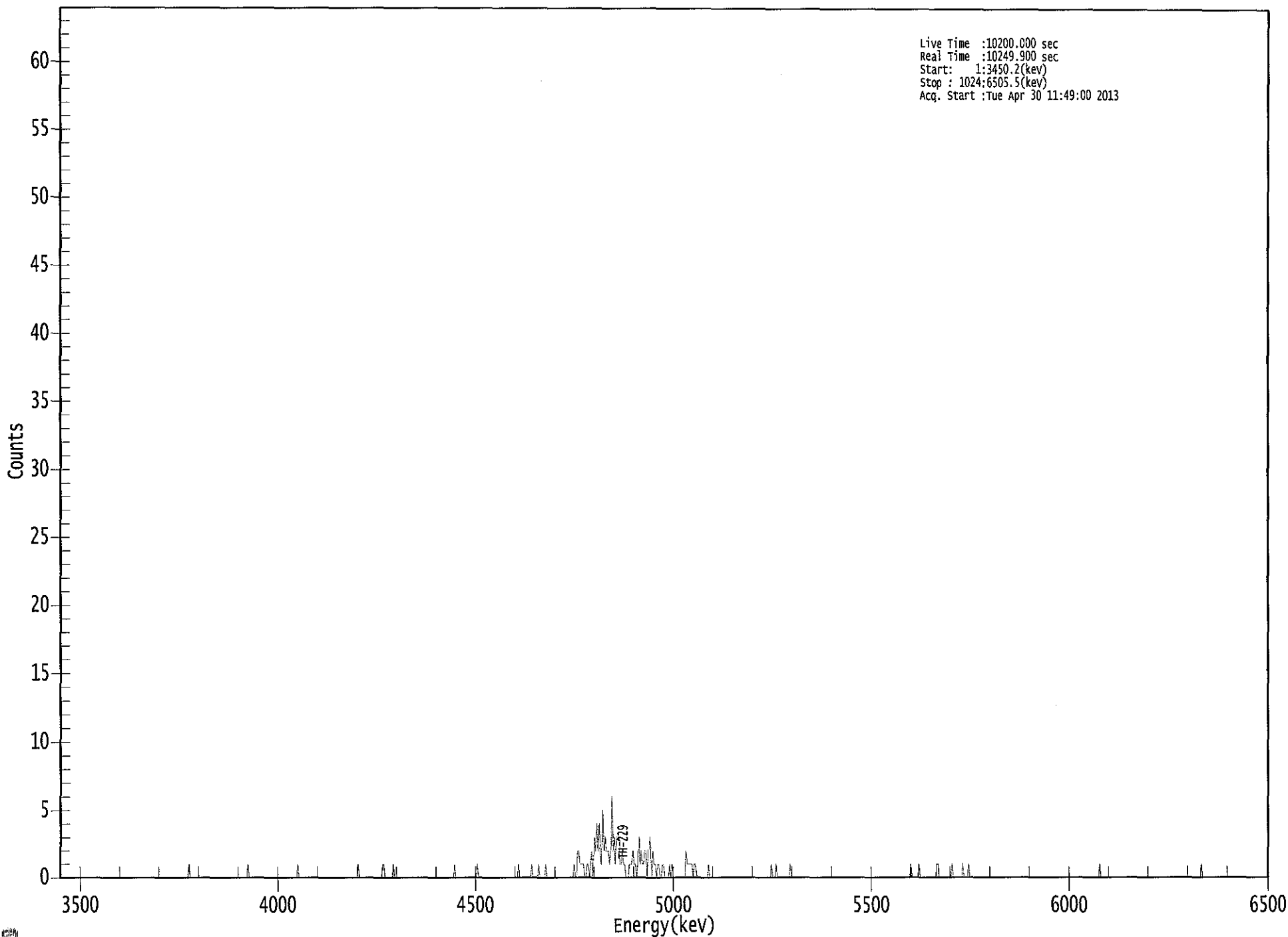
| Nuclide | Id Conf. | Energy (keV) | Activity (pCi/liter)    | MDA (pCi/liter)         |
|---------|----------|--------------|-------------------------|-------------------------|
| TH-227  | 0.925    | 5850.00*     | 4.49E-002 +/- 6.74E-002 | 1.09E-001 +/- 2.03E-002 |
| TH-228  | 0.913    | 5400.00*     | 3.81E-002 +/- 6.75E-002 | 1.21E-001 +/- 2.25E-002 |
| TH-229  | 1.000    | 4872.00*     | 2.36E+000 +/- 4.38E-001 | 9.04E-002 +/- 1.68E-002 |
| TH-230  | 0.966    | 4672.00*     | 9.71E-002 +/- 9.34E-002 | 1.13E-001 +/- 2.10E-002 |
| TH-232  | 1.000    | 3997.00*     | 2.48E-002 +/- 5.38E-002 | 1.06E-001 +/- 1.97E-002 |

AG  
5/1/13

US EPA ARCHIVE DOCUMENT

0000056740.CNF

Live Time :10200.000 sec  
Real Time :10249.900 sec  
Start: 1:3450.2(kev)  
Stop : 1024:6505.5(kev)  
Acq. Start :Tue Apr 30 11:49:00 2013



US EPA ARCHIVE DOCUMENT

6629

ROI Type: 1

ROI Type: 3



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

Sample Title: 05

Elapsed Live time: 10200

Elapsed Real Time: 10250

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

369: 0 0 0 0 0 0 0 0 0

Sample Title: 05

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

801: 0 0 0 0 0 0 0 0 0

Sample Title: 05

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

K13  
4/30/13

# Apex-Alpha™

Sample Description: I-68 TOT  
 Spectrum File: \\OR-ALPHA1\Canberra\ApexAlpha\Root\Data\00000567  
 Batch Identification: 1304105A-TH  
 Sample Identification: 06  
 Sample Geometry: Shelf 2  
 Procedure Description: Th iso

Detector Name: Alpha\_044  
 Chamber Serial Number: 04026481B  
 Detector Serial Number: 84168  
 Env. Background: System Bkgd 55756  
 Reagent Blank: <not performed>

Sample Size: 1.000E+000 +/- 0.000E+000 liter  
 Sample Date/Time: 4/9/2013 7:24:51 AM  
 Acquisition Date/Time: 4/30/2013 11:48:55 AM  
 Acquisition Live Time: 170.0 minutes  
 Acquisition Real Time: 170.8 minutes

Tracer Certificate: Th229\_TH-18A  
 Tracer Quantity: 0.232 mL  
 Effective Efficiency: 0.1453 +/- 0.0136  
 Counting Efficiency: 0.1902 +/- 0.0033 on 12/16/2012 5:49:26 PM  
 Chem. Recovery Factor: 0.7639 +/- 0.0726

Peak Match Tolerance: 0.175 MeV

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

| Nuclide  | Energy (MeV) | Net Pk Area | Pk Area Error % | Ambient Backgnd | Reagent Backgnd | FWHM (keV) |
|----------|--------------|-------------|-----------------|-----------------|-----------------|------------|
| TH-227   | 5.878        | 14.83       | 51.24           | 0.17            | 0.00E+000       | 5.9        |
| TH-228   | 5.278        | 142.83      | 16.41           | 0.17            | 0.00E+000       | 4.8        |
| TH-229 T | 4.870        | 128.83      | 17.28           | 0.17            | 0.00E+000       | 3.2        |
| TH-230   | 4.578        | 226.83      | 13.02           | 0.17            | 0.00E+000       | 5.3        |
| TH-232   | 3.898        | 43.83       | 29.67           | 0.17            | 0.00E+000       | 4.5        |

T = Tracer Peak used for Effective Efficiency

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

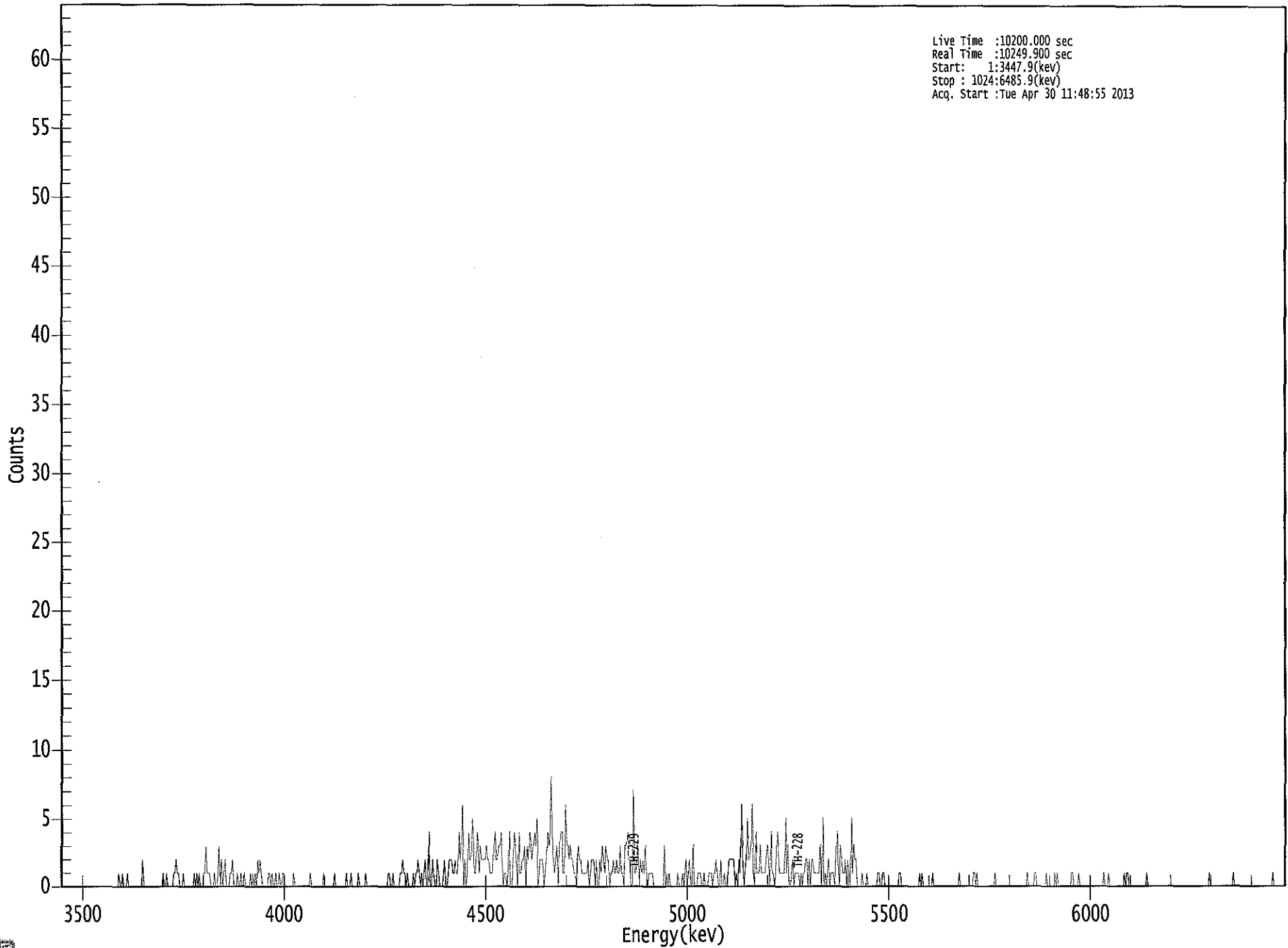
| Nuclide | Id Conf. | Energy (keV) | Activity (pCi/liter)    | MDA (pCi/liter)         |
|---------|----------|--------------|-------------------------|-------------------------|
| TH-227  | 0.996    | 5850.00*     | 2.78E-001 +/- 1.51E-001 | 7.82E-002 +/- 1.43E-002 |
| TH-228  | 0.925    | 5400.00*     | 2.66E+000 +/- 6.55E-001 | 7.78E-002 +/- 1.42E-002 |
| TH-229  | 1.000    | 4872.00*     | 2.36E+000 +/- 4.33E-001 | 7.65E-002 +/- 1.40E-002 |
| TH-230  | 0.955    | 4672.00*     | 4.14E+000 +/- 9.31E-001 | 7.63E-002 +/- 1.40E-002 |
| TH-232  | 0.950    | 3997.00*     | 7.99E-001 +/- 2.79E-001 | 7.61E-002 +/- 1.39E-002 |

AG  
5/1/13

US EPA ARCHIVE DOCUMENT

0000056736.CNF

Live Time :10200.000 sec  
Real Time :10249.900 sec  
Start : 1:3447.9(kev)  
Stop : 1024:6485.9(kev)  
Acq. Start :Tue Apr 30 11:48:55 2013



US EPA ARCHIVE DOCUMENT

0244  
7720

ROI Type: 1

ROI Type: 3

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

Sample Title: 06

Elapsed Live time: 10200

Elapsed Real Time: 10250

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

369: 2 0 1 1 0 1 4 0

Sample Title: 06

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

801: 0 0 0 0 0 0 0 0 1

Sample Title: 06

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



K3  
4/30/13

# Apex-Alpha™

Sample Description: I-68 DIS  
 Spectrum File: \\OR-ALPHA1\Canberra\ApexAlpha\Root\Data\00000567  
 Batch Identification: 1304105A-TH  
 Sample Identification: 07  
 Sample Geometry: Shelf 2  
 Procedure Description: Th iso

Detector Name: Alpha\_046  
 Chamber Serial Number: 04026482B  
 Detector Serial Number: 58762  
 Env. Background: System Bkgd 55757  
 Reagent Blank: <not performed>

Sample Size: 1.000E+000 +/- 0.000E+000 liter  
 Sample Date/Time: 4/9/2013 7:24:51 AM  
 Acquisition Date/Time: 4/30/2013 11:48:57 AM  
 Acquisition Live Time: 170.0 minutes  
 Acquisition Real Time: 170.0 minutes

Tracer Certificate: Th229\_TH-18A  
 Tracer Quantity: 0.232 mL  
 Effective Efficiency: 0.1760 +/- 0.0152  
 Counting Efficiency: 0.1789 +/- 0.0031 on 12/16/2012 5:49:23 PM  
 Chem. Recovery Factor: 0.9835 +/- 0.0864

Peak Match Tolerance: 0.175 MeV

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

| Nuclide  | Energy (MeV) | Net Pk Area | Pk Area Error % | Ambient Backgnd | Reagent Backgnd | FWHM (keV) |
|----------|--------------|-------------|-----------------|-----------------|-----------------|------------|
| TH-227   | 5.794        | 3.00        | 130.67          | 0.00            | 0.00E+000       | 3.0        |
| TH-228   | 5.297        | 0.00        | 1960.0          | 0.00            | 0.00E+000       | 0.0        |
| TH-229 T | 4.868        | 156.00      | 15.74           | 0.00            | 0.00E+000       | 6.0        |
| TH-230   | 4.676        | 7.00        | 79.20           | 0.00            | 0.00E+000       | 3.0        |
| TH-232   | 3.952        | 1.83        | 152.56          | 0.17            | 0.00E+000       | 3.0        |

T = Tracer Peak used for Effective Efficiency

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

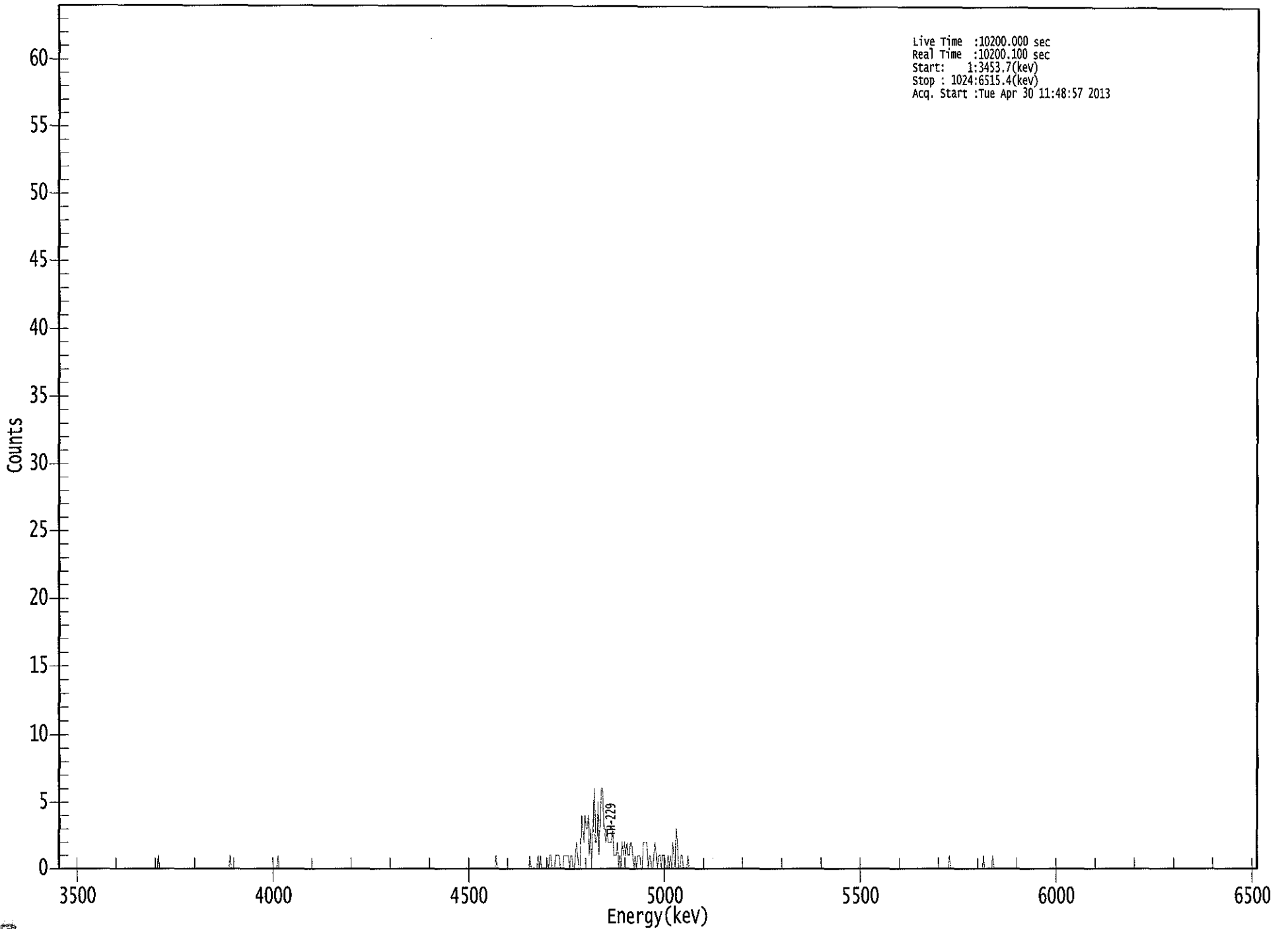
| Nuclide | Id Conf. | Energy (keV) | Activity (pCi/liter)    | MDA (pCi/liter)         |
|---------|----------|--------------|-------------------------|-------------------------|
| TH-227  | 0.984    | 5850.00*     | 4.64E-002 +/- 6.11E-002 | 9.28E-002 +/- 1.57E-002 |
| TH-228  | 0.946    | 5400.00*     | 0.00E+000 +/- 4.26E-002 | 9.23E-002 +/- 1.56E-002 |
| TH-229  | 1.000    | 4872.00*     | 2.36E+000 +/- 3.98E-001 | 9.07E-002 +/- 1.53E-002 |
| TH-230  | 1.000    | 4672.00*     | 1.06E-001 +/- 8.55E-002 | 9.04E-002 +/- 1.53E-002 |
| TH-232  | 0.989    | 3997.00*     | 2.76E-002 +/- 4.23E-002 | 6.28E-002 +/- 1.06E-002 |

AC  
5/1/13

US EPA ARCHIVE DOCUMENT

0000056732.CNF

Live Time :10200.000 sec  
Real Time :10200.100 sec  
Start: 1:3453.7(kev)  
Stop : 1024:6515.4(kev)  
Acq. Start :Tue Apr 30 11:48:57 2013



US EPA ARCHIVE DOCUMENT

0249

ROI Type: 1

ROI Type: 3

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

Sample Title: 07

Elapsed Live time: 10200  
 Elapsed Real Time: 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 | 0 | 0 |
| 73:     | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 |
| 81:     | 0 | 0 | 0 | 0 | 0 | 0 | 1 | 0 | 0 |
| 89:     | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 |
| 97:     | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 |
| 105:    | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 |
| 113:    | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 |
| 121:    | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 |
| 129:    | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 |
| 137:    | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 |
| 145:    | 0 | 0 | 1 | 0 | 0 | 0 | 0 | 0 | 0 |
| 153:    | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 |
| 161:    | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 |
| 169:    | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 |
| 177:    | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 |
| 185:    | 0 | 0 | 0 | 1 | 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 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 |
| 257:    | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 |
| 265:    | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 |
| 273:    | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 |
| 281:    | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 |
| 289:    | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 |
| 297:    | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 |
| 305:    | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 |
| 313:    | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 |
| 321:    | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 |
| 329:    | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 |
| 337:    | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 |
| 345:    | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 |
| 353:    | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 |
| 361:    | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 |

369: 0 0 0 0 0 1 0 0

Sample Title: 07

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

801: 0 0 0 0 0 0 0 0

Sample Title: 07

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

LAB  
4/30/13

Sample Description: D-87 TOT  
 Spectrum File: \\OR-ALPHA1\Canberra\ApexAlpha\Root\Data\00000567  
 Batch Identification: 1304105A-TH  
 Sample Identification: 08  
 Sample Geometry: Shelf 2  
 Procedure Description: Th iso

Detector Name: Alpha\_047  
 Chamber Serial Number: 02030596A  
 Detector Serial Number: 91086  
 Env. Background: System Bkgd 55758  
 Reagent Blank: <not performed>

Sample Size: 1.000E+000 +/- 0.000E+000 liter  
 Sample Date/Time: 4/9/2013 7:24:51 AM  
 Acquisition Date/Time: 4/30/2013 11:48:48 AM  
 Acquisition Live Time: 170.0 minutes  
 Acquisition Real Time: 170.0 minutes

Tracer Certificate: Th229\_TH-18A  
 Tracer Quantity: 0.233 mL  
 Effective Efficiency: 0.1664 +/- 0.0146  
 Counting Efficiency: 0.1822 +/- 0.0032 on 12/16/2012 5:49:21 PM  
 Chem. Recovery Factor: 0.9135 +/- 0.0819

Peak Match Tolerance: 0.175 MeV

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

| Nuclide  | Energy (MeV) | Net Pk Area | Pk Area Error % | Ambient Backgnd | Reagent Backgnd | FWHM (keV) |
|----------|--------------|-------------|-----------------|-----------------|-----------------|------------|
| TH-227   | 5.967        | 0.32        | 646.93          | 0.68            | 0.00E+000       | 2.9        |
| TH-228   | 5.325        | 13.32       | 55.28           | 0.68            | 0.00E+000       | 2.9        |
| TH-229 T | 4.875        | 147.83      | 16.13           | 0.17            | 0.00E+000       | 5.7        |
| TH-230   | 4.633        | 25.32       | 39.56           | 0.68            | 0.00E+000       | 2.9        |
| TH-232   | 3.948        | 3.83        | 102.72          | 0.17            | 0.00E+000       | 2.9        |

T = Tracer Peak used for Effective Efficiency

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

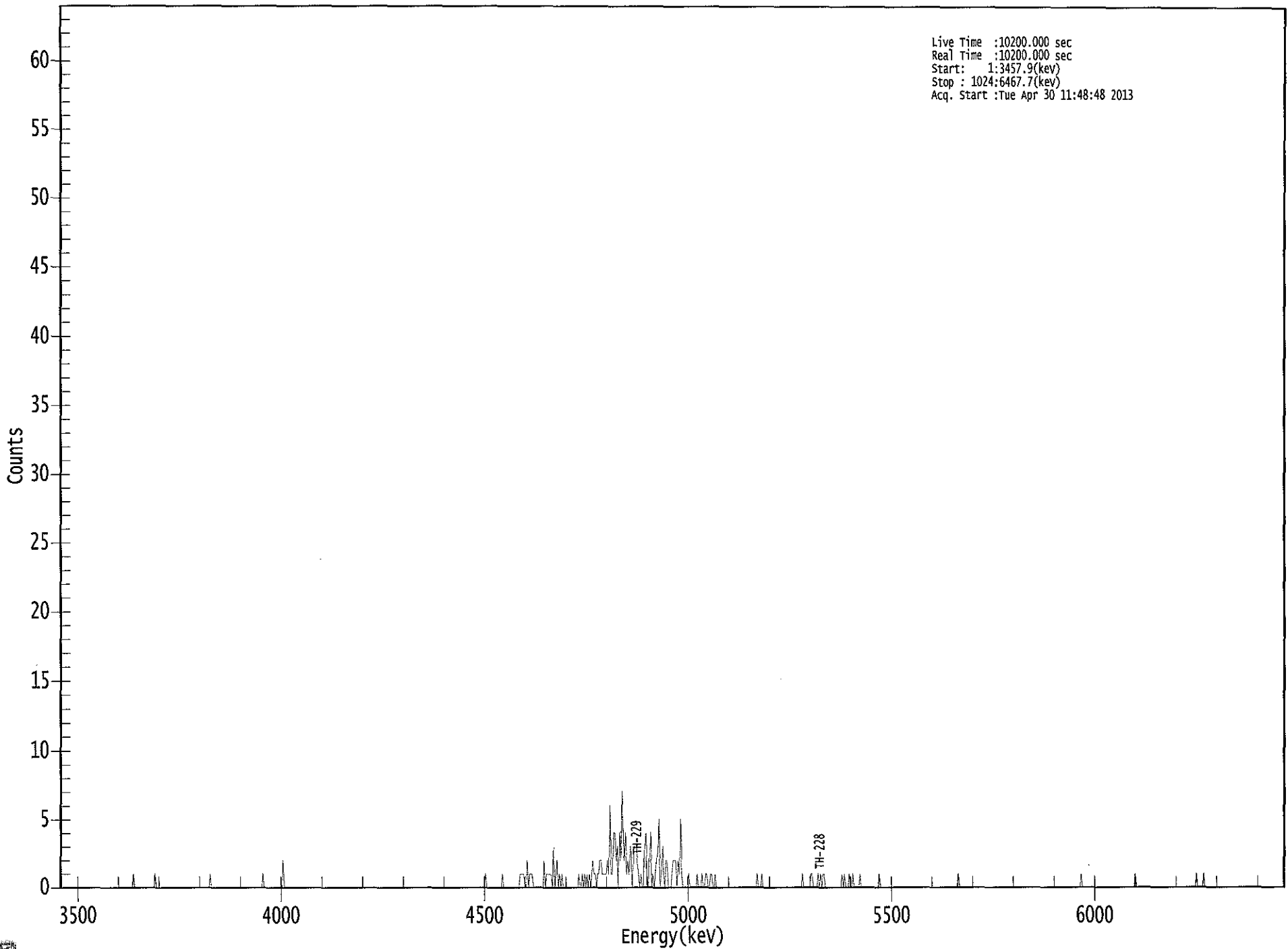
| Nuclide | Id Conf. | Energy (keV) | Activity (pCi/liter)    | MDA (pCi/liter)         |
|---------|----------|--------------|-------------------------|-------------------------|
| TH-227  | 0.930    | 5850.00*     | 5.24E-003 +/- 3.39E-002 | 9.23E-002 +/- 1.59E-002 |
| TH-228  | 0.971    | 5400.00*     | 2.17E-001 +/- 1.26E-001 | 9.18E-002 +/- 1.58E-002 |
| TH-229  | 1.000    | 4872.00*     | 2.37E+000 +/- 4.08E-001 | 6.68E-002 +/- 1.15E-002 |
| TH-230  | 0.992    | 4672.00*     | 4.04E-001 +/- 1.74E-001 | 9.00E-002 +/- 1.55E-002 |
| TH-232  | 0.987    | 3997.00*     | 6.10E-002 +/- 6.35E-002 | 6.64E-002 +/- 1.15E-002 |

AG  
5/1/13

US EPA ARCHIVE DOCUMENT

0000056733.CNF

Live Time :10200.000 sec  
Real Time :10200.000 sec  
Start: 1:3457.9(kev)  
Stop : 1024:6467.7(kev)  
Acq. Start :Tue Apr 30 11:48:48 2013



ROI Type: 1

ROI Type: 3

US EPA ARCHIVE DOCUMENT

0254

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

Sample Title: 08

Elapsed Live time: 10200

Elapsed Real Time: 10200

| Channel | ----- | ----- | ----- | ----- | ----- | ----- | ----- | ----- |
|---------|-------|-------|-------|-------|-------|-------|-------|-------|
| 1:      | 0     | 0     | 0     | 0     | 0     | 0     | 0     | 0     |
| 9:      | 0     | 0     | 0     | 0     | 0     | 0     | 0     | 0     |
| 17:     | 0     | 0     | 0     | 0     | 0     | 0     | 0     | 0     |
| 25:     | 0     | 0     | 0     | 0     | 0     | 0     | 0     | 0     |
| 33:     | 0     | 0     | 0     | 0     | 0     | 0     | 0     | 0     |
| 41:     | 0     | 0     | 0     | 0     | 0     | 0     | 0     | 0     |
| 49:     | 0     | 0     | 0     | 0     | 0     | 0     | 0     | 0     |
| 57:     | 0     | 0     | 0     | 0     | 0     | 1     | 0     | 0     |
| 65:     | 0     | 0     | 0     | 0     | 0     | 0     | 0     | 0     |
| 73:     | 0     | 0     | 0     | 0     | 0     | 0     | 0     | 1     |
| 81:     | 0     | 0     | 0     | 0     | 0     | 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     | 1     | 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     | 1     | 0     | 0     | 0     | 0     | 0     | 0     |
| 177:    | 0     | 0     | 0     | 0     | 0     | 0     | 0     | 0     |
| 185:    | 0     | 0     | 2     | 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     | 1     | 0     | 0     | 0     | 0     |
| 361:    | 0     | 0     | 0     | 0     | 0     | 0     | 0     | 0     |



369: 0 1 0 0 0 0 0 0 0

Sample Title: 08

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

801: 0 0 0 0 0 0 0 0

Sample Title: 08

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

KS  
4/30/13

# Apex-Alpha™

Sample Description: D-87 DIS  
 Spectrum File: \\OR-ALPHA1\Canberra\ApexAlpha\Root\Data\00000567  
 Batch Identification: 1304105A-TH  
 Sample Identification: 09  
 Sample Geometry: Shelf 2  
 Procedure Description: Th iso

Detector Name: Alpha\_048  
 Chamber Serial Number: 02030596B  
 Detector Serial Number: 83111  
 Env. Background: System Bkgd 55759  
 Reagent Blank: <not performed>

Sample Size: 1.000E+000 +/- 0.000E+000 liter  
 Sample Date/Time: 4/9/2013 7:24:51 AM  
 Acquisition Date/Time: 4/30/2013 11:48:49 AM  
 Acquisition Live Time: 170.0 minutes  
 Acquisition Real Time: 170.0 minutes

Tracer Certificate: Th229\_TH-18A  
 Tracer Quantity: 0.231 mL  
 Effective Efficiency: 0.1933 +/- 0.0160  
 Counting Efficiency: 0.1680 +/- 0.0030 on 12/16/2012 5:49:20 PM  
 Chem. Recovery Factor: 1.1506 +/- 0.0973

Peak Match Tolerance: 0.175 MeV

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

| Nuclide  | Energy (MeV) | Net Pk Area | Pk Area Error % | Ambient Backgnd | Reagent Backgnd | FWHM (keV) |
|----------|--------------|-------------|-----------------|-----------------|-----------------|------------|
| TH-227   | 5.962        | 1.00        | 277.19          | 0.00            | 0.00E+000       | 3.0        |
| TH-228   | 5.326        | 5.15        | 94.34           | 0.85            | 0.00E+000       | 3.0        |
| TH-229 T | 4.878        | 170.66      | 15.02           | 0.34            | 0.00E+000       | 12.4       |
| TH-230   | 4.649        | 8.00        | 73.50           | 0.00            | 0.00E+000       | 3.0        |
| TH-232   | 4.011        | 1.00        | 277.19          | 0.00            | 0.00E+000       | 3.0        |

T = Tracer Peak used for Effective Efficiency

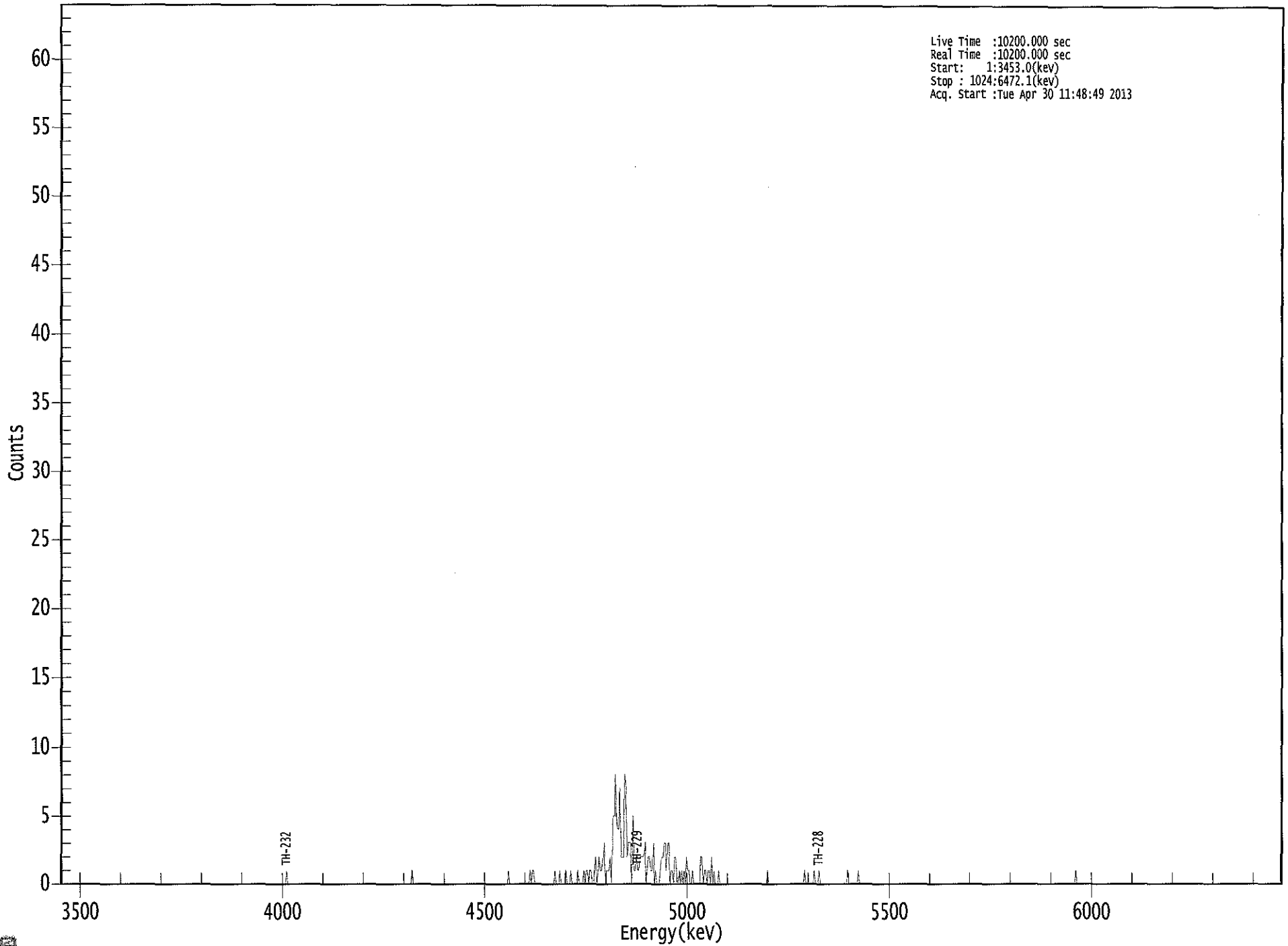
-----  
 ----- NUCLIDE ANALYSIS RESULTS -----  
 -----

| Nuclide | Id Conf. | Energy (keV) | Activity (pCi/liter)    | MDA (pCi/liter)         |
|---------|----------|--------------|-------------------------|-------------------------|
| TH-227  | 0.937    | 5850.00*     | 1.41E-002 +/- 3.91E-002 | 8.45E-002 +/- 1.37E-002 |
| TH-228  | 0.972    | 5400.00*     | 7.21E-002 +/- 6.91E-002 | 8.39E-002 +/- 1.36E-002 |
| TH-229  | 1.000    | 4872.00*     | 2.35E+000 +/- 3.81E-001 | 6.59E-002 +/- 1.07E-002 |
| TH-230  | 0.997    | 4672.00*     | 1.10E-001 +/- 8.27E-002 | 8.24E-002 +/- 1.33E-002 |
| TH-232  | 0.999    | 3997.00*     | 1.37E-002 +/- 3.81E-002 | 8.22E-002 +/- 1.33E-002 |

AG  
5/1/13

US EPA ARCHIVE DOCUMENT

Live Time :10200.000 sec  
Real Time :10200.000 sec  
Start : 1:3453.0(kev)  
Stop : 1024:6472.1(kev)  
Acq. Start :Tue Apr 30 11:48:49 2013



ROI Type: 1

ROI Type: 3

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

Sample Title: 09

Elapsed Live time: 10200  
Elapsed Real Time: 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 | 0 | 0 |
| 73:     | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 |
| 81:     | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 |
| 89:     | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 |
| 97:     | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 |
| 105:    | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 |
| 113:    | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 |
| 121:    | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 |
| 129:    | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 |
| 137:    | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 |
| 145:    | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 |
| 153:    | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 |
| 161:    | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 |
| 169:    | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 |
| 177:    | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 |
| 185:    | 0 | 0 | 0 | 0 | 0 | 0 | 1 | 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 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 |
| 257:    | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 |
| 265:    | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 |
| 273:    | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 |
| 281:    | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 |
| 289:    | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 1 | 0 |
| 297:    | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 |
| 305:    | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 |
| 313:    | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 |
| 321:    | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 |
| 329:    | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 |
| 337:    | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 |
| 345:    | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 |
| 353:    | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 |
| 361:    | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 |

369: 0 0 0 0 0 0 0 0 1

Sample Title: 09

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

801: 0 0 0 0 0 0 0 0

Sample Title: 09

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

KBS  
4/30/13

# Apex-Alpha™

Sample Description: PZ-106-SD TOT  
 Spectrum File: \\OR-ALPHA1\Canberra\ApexAlpha\Root\Data\00000567  
 Batch Identification: 1304105A-TH  
 Sample Identification: 10  
 Sample Geometry: Shelf 2  
 Procedure Description: Th iso

Detector Name: Alpha\_018  
 Chamber Serial Number:  
 Detector Serial Number: 18  
 Env. Background: System Bkgd 55740  
 Reagent Blank: <not performed>

Sample Size: 1.000E+000 +/- 0.000E+000 liter  
 Sample Date/Time: 4/9/2013 7:24:51 AM  
 Acquisition Date/Time: 4/30/2013 12:43:33 PM  
 Acquisition Live Time: 170.0 minutes  
 Acquisition Real Time: 170.0 minutes

Tracer Certificate: Th229\_TH-18A  
 Tracer Quantity: 0.230 mL  
 Effective Efficiency: 0.2151 +/- 0.0170  
 Counting Efficiency: 0.1776 +/- 0.0033 on 12/15/2012 1:57:26 PM  
 Chem. Recovery Factor: 1.2112 +/- 0.0986

Peak Match Tolerance: 0.175 MeV

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 PEAK AREA REPORT  
 -----

| Nuclide  | Energy (MeV) | Net Pk Area | Pk Area Error % | Ambient Backgnd | Reagent Backgnd | FWHM (keV) |
|----------|--------------|-------------|-----------------|-----------------|-----------------|------------|
| TH-227   | 5.771        | 0.94        | 443.31          | 3.06            | 0.00E+000       | 3.1        |
| TH-228   | 5.358        | 16.79       | 51.38           | 2.21            | 0.00E+000       | 3.1        |
| TH-229 T | 4.873        | 189.15      | 14.29           | 0.85            | 0.00E+000       | 9.4        |
| TH-230   | 4.642        | 10.81       | 63.34           | 1.19            | 0.00E+000       | 4.7        |
| TH-232   | 3.970        | 11.47       | 62.23           | 1.53            | 0.00E+000       | 3.1        |

T = Tracer Peak used for Effective Efficiency

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

| Nuclide | Id Conf. | Energy (keV) | Activity (pCi/liter)    | MDA (pCi/liter)         |
|---------|----------|--------------|-------------------------|-------------------------|
| TH-227  | 0.968    | 5850.00*     | 1.19E-002 +/- 5.28E-002 | 1.13E-001 +/- 1.75E-002 |
| TH-228  | 0.991    | 5400.00*     | 2.11E-001 +/- 1.13E-001 | 1.01E-001 +/- 1.56E-002 |
| TH-229  | 1.000    | 4872.00*     | 2.34E+000 +/- 3.63E-001 | 7.41E-002 +/- 1.15E-002 |
| TH-230  | 0.995    | 4672.00*     | 1.33E-001 +/- 8.70E-002 | 8.13E-002 +/- 1.26E-002 |
| TH-232  | 0.996    | 3997.00*     | 1.41E-001 +/- 9.06E-002 | 8.75E-002 +/- 1.36E-002 |

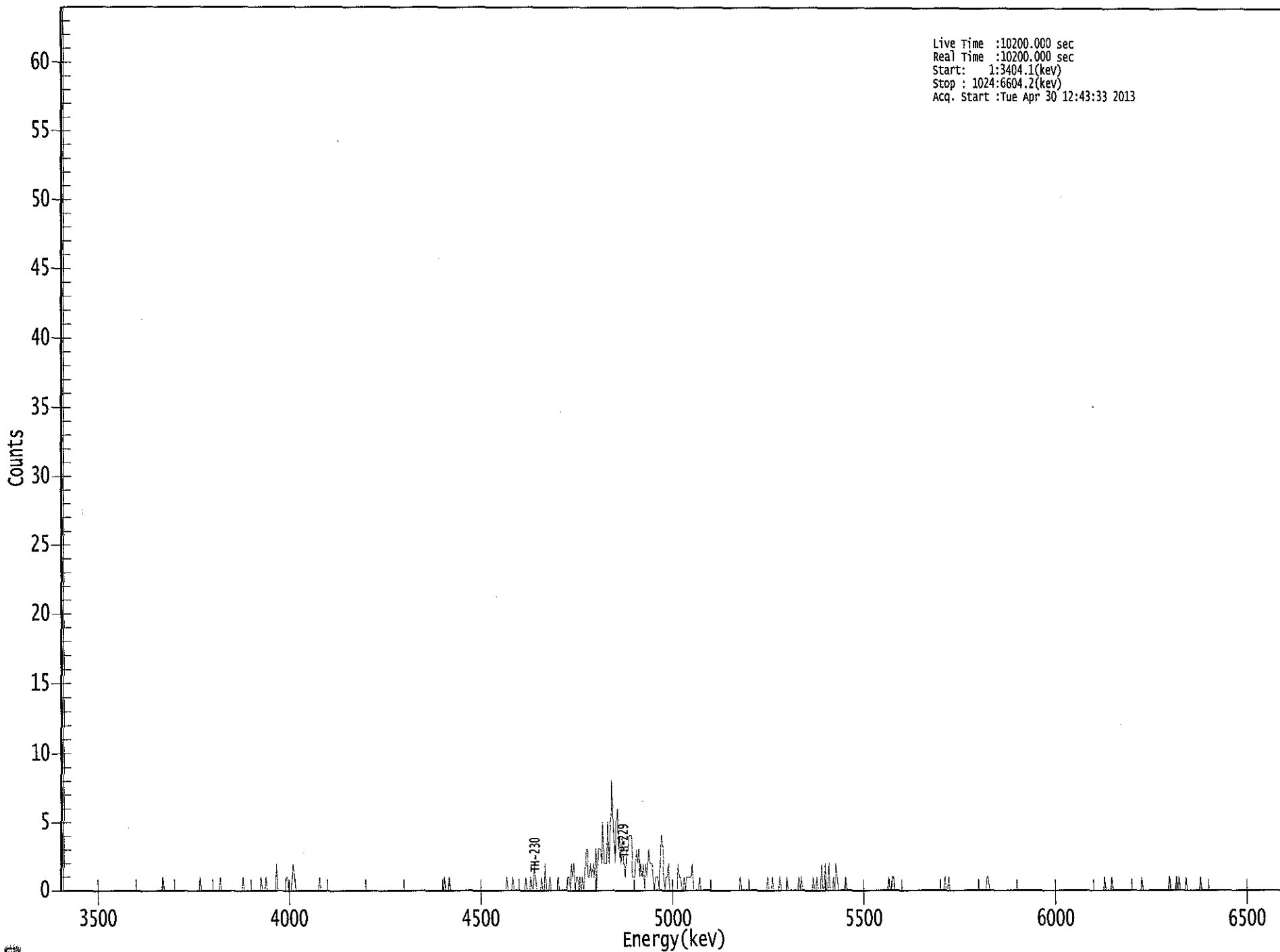
AG  
5/1/13

US EPA ARCHIVE DOCUMENT



0000056741.CNF

Live Time :10200.000 sec  
Real Time :10200.000 sec  
Start: 1:3404.1(kev)  
Stop : 1024:6604.2(kev)  
Acq. Start :Tue Apr 30 12:43:33 2013



ROI Type: 1

ROI Type: 3

US EPA ARCHIVE DOCUMENT

0264

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

Sample Title: 10

Elapsed Live time: 10200

Elapsed Real Time: 10200

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

369: 0 0 0 0 1 0 0 0

Sample Title: 10

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

801: 0 0 0 0 0 0 0 0

Sample Title: 10

| Channel | ----- | ----- | ----- | ----- | ----- | ----- | ----- | ----- |
|---------|-------|-------|-------|-------|-------|-------|-------|-------|
| 809:    | 0     | 0     | 0     | 0     | 0     | 0     | 0     | 0     |
| 817:    | 0     | 0     | 0     | 0     | 0     | 0     | 0     | 0     |
| 825:    | 0     | 0     | 0     | 0     | 0     | 0     | 0     | 0     |
| 833:    | 0     | 0     | 0     | 0     | 0     | 0     | 0     | 0     |
| 841:    | 0     | 0     | 0     | 0     | 0     | 0     | 0     | 0     |
| 849:    | 0     | 0     | 0     | 0     | 0     | 0     | 0     | 0     |
| 857:    | 0     | 0     | 0     | 0     | 0     | 0     | 0     | 0     |
| 865:    | 0     | 0     | 0     | 0     | 0     | 0     | 0     | 1     |
| 873:    | 0     | 0     | 0     | 0     | 0     | 1     | 0     | 0     |
| 881:    | 0     | 0     | 0     | 0     | 0     | 0     | 0     | 0     |
| 889:    | 0     | 0     | 0     | 0     | 0     | 0     | 0     | 0     |
| 897:    | 0     | 0     | 0     | 0     | 0     | 0     | 1     | 0     |
| 905:    | 0     | 0     | 0     | 0     | 0     | 0     | 0     | 0     |
| 913:    | 0     | 0     | 0     | 0     | 0     | 0     | 0     | 0     |
| 921:    | 0     | 0     | 0     | 0     | 0     | 1     | 0     | 0     |
| 929:    | 0     | 0     | 0     | 1     | 0     | 1     | 0     | 0     |
| 937:    | 0     | 0     | 0     | 1     | 0     | 0     | 0     | 0     |
| 945:    | 0     | 0     | 0     | 0     | 0     | 0     | 0     | 1     |
| 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     |

10/3  
4/30/13

# Apex-Alpha™

Sample Description: PZ-106-SD DIS  
 Spectrum File: \\OR-ALPHA1\Canberra\ApexAlpha\Root\Data\00000567  
 Batch Identification: 1304105A-TH  
 Sample Identification: 11  
 Sample Geometry: Shelf 2  
 Procedure Description: Th iso

Detector Name: Alpha\_022  
 Chamber Serial Number:  
 Detector Serial Number: 22  
 Env. Background: System Bkgd 55741  
 Reagent Blank: <not performed>

Sample Size: 1.000E+000 +/- 0.000E+000 liter  
 Sample Date/Time: 4/9/2013 7:24:51 AM  
 Acquisition Date/Time: 4/30/2013 12:43:34 PM  
 Acquisition Live Time: 170.0 minutes  
 Acquisition Real Time: 170.0 minutes

Tracer Certificate: Th229\_TH-18A  
 Tracer Quantity: 0.231 mL  
 Effective Efficiency: 0.1767 +/- 0.0153  
 Counting Efficiency: 0.1531 +/- 0.0029 on 12/15/2012 1:57:26 PM  
 Chem. Recovery Factor: 1.1536 +/- 0.1020

Peak Match Tolerance: 0.175 MeV

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

| Nuclide  | Energy (MeV) | Net Pk Area | Pk Area Error % | Ambient Backgnd | Reagent Backgnd | FWHM (keV) |
|----------|--------------|-------------|-----------------|-----------------|-----------------|------------|
| TH-227   | 5.794        | 1.98        | 176.34          | 1.02            | 0.00E+000       | 3.1        |
| TH-228   | 5.351        | -0.06       | 6128.9          | 3.06            | 0.00E+000       | 3.1        |
| TH-229 T | 4.850        | 156.13      | 15.80           | 1.87            | 0.00E+000       | 3.4        |
| TH-230   | 4.646        | 22.64       | 42.62           | 1.36            | 0.00E+000       | 4.7        |
| TH-232   | 4.091        | -0.36       | 604.11          | 1.36            | 0.00E+000       | 3.1        |

T = Tracer Peak used for Effective Efficiency

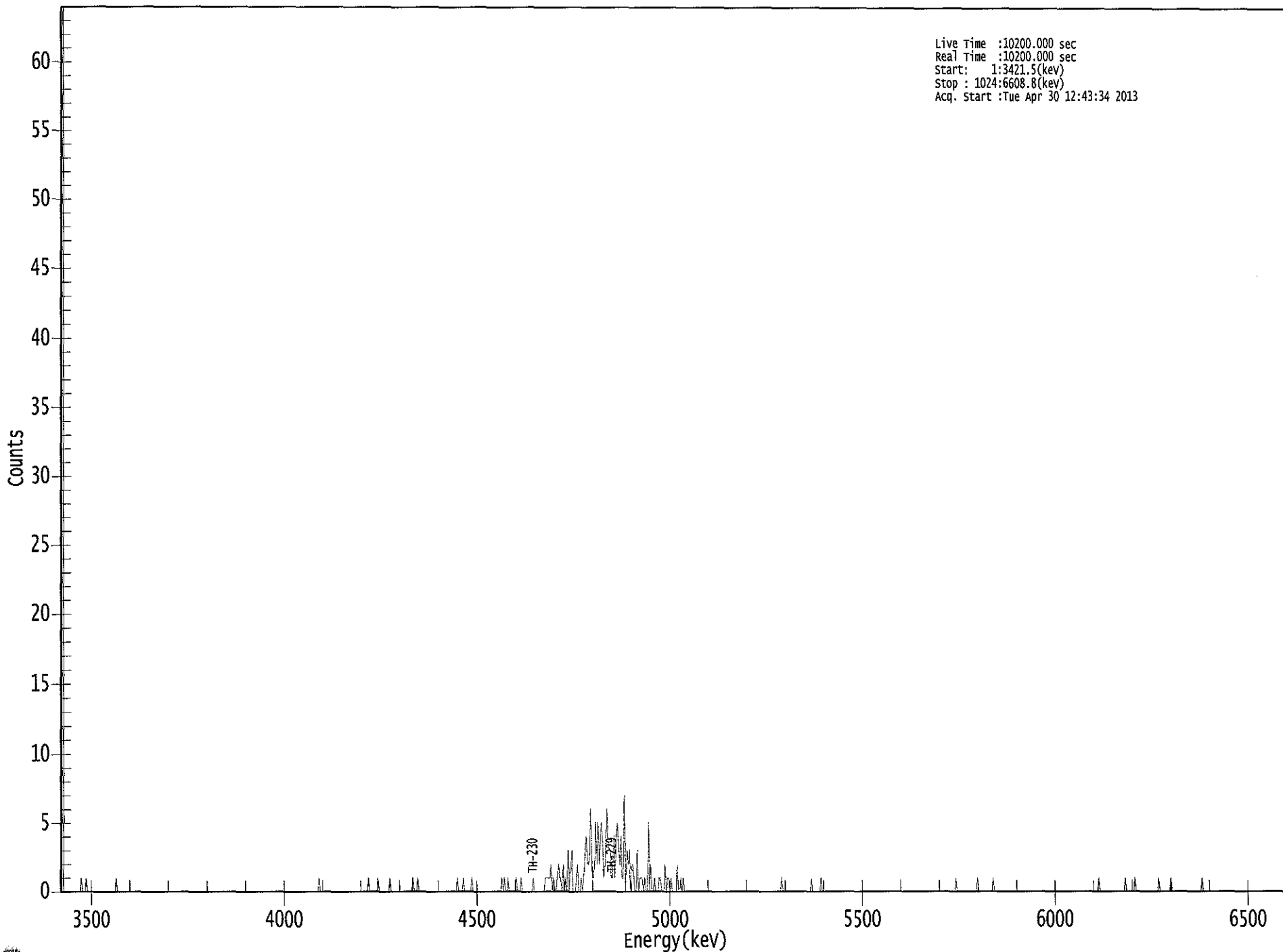
-----  
 NUCLIDE ANALYSIS RESULTS  
 -----

| Nuclide | Id Conf. | Energy (keV) | Activity (pCi/liter)     | MDA (pCi/liter)         |
|---------|----------|--------------|--------------------------|-------------------------|
| TH-227  | 0.983    | 5850.00*     | 3.05E-002 +/- 5.41E-002  | 9.71E-002 +/- 1.64E-002 |
| TH-228  | 0.988    | 5400.00*     | -9.20E-004 +/- 5.64E-002 | 1.37E-001 +/- 2.32E-002 |
| TH-229  | 0.998    | 4872.00*     | 2.35E+000 +/- 3.98E-001  | 1.14E-001 +/- 1.93E-002 |
| TH-230  | 0.996    | 4672.00*     | 3.40E-001 +/- 1.56E-001  | 1.03E-001 +/- 1.74E-002 |
| TH-232  | 0.955    | 3997.00*     | -5.40E-003 +/- 3.26E-002 | 1.03E-001 +/- 1.74E-002 |

AG  
451113

US EPA ARCHIVE DOCUMENT

0000056742.CNF



ROI Type: 1

ROI Type: 3

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

Sample Title: 11

Elapsed Live time: 10200

Elapsed Real Time: 10200

| Channel | ----- | ----- | ----- | ----- | ----- | ----- | ----- | ----- |
|---------|-------|-------|-------|-------|-------|-------|-------|-------|
| 1:      | 10200 | 10200 | 0     | 0     | 0     | 0     | 0     | 0     |
| 9:      | 0     | 0     | 0     | 0     | 0     | 0     | 0     | 0     |
| 17:     | 0     | 1     | 0     | 0     | 0     | 1     | 0     | 0     |
| 25:     | 0     | 0     | 0     | 0     | 0     | 0     | 0     | 0     |
| 33:     | 0     | 0     | 0     | 0     | 0     | 0     | 0     | 0     |
| 41:     | 0     | 0     | 0     | 0     | 0     | 0     | 1     | 0     |
| 49:     | 0     | 0     | 0     | 0     | 0     | 0     | 0     | 0     |
| 57:     | 0     | 0     | 0     | 0     | 0     | 0     | 0     | 0     |
| 65:     | 0     | 0     | 0     | 0     | 0     | 0     | 0     | 0     |
| 73:     | 0     | 0     | 0     | 0     | 0     | 0     | 0     | 0     |
| 81:     | 0     | 0     | 0     | 0     | 0     | 0     | 0     | 0     |
| 89:     | 0     | 0     | 0     | 0     | 0     | 0     | 0     | 0     |
| 97:     | 0     | 0     | 0     | 0     | 0     | 0     | 0     | 0     |
| 105:    | 0     | 0     | 0     | 0     | 0     | 0     | 0     | 0     |
| 113:    | 0     | 0     | 0     | 0     | 0     | 0     | 0     | 0     |
| 121:    | 0     | 0     | 0     | 0     | 0     | 0     | 0     | 0     |
| 129:    | 0     | 0     | 0     | 0     | 0     | 0     | 0     | 0     |
| 137:    | 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     | 1     |
| 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:    | 1     | 0     | 0     | 0     | 0     | 0     | 0     | 0     |
| 265:    | 1     | 0     | 0     | 0     | 0     | 0     | 0     | 0     |
| 273:    | 0     | 0     | 1     | 0     | 0     | 0     | 0     | 0     |
| 281:    | 0     | 0     | 0     | 0     | 0     | 0     | 0     | 0     |
| 289:    | 0     | 0     | 0     | 0     | 0     | 1     | 0     | 0     |
| 297:    | 0     | 1     | 0     | 0     | 0     | 0     | 0     | 0     |
| 305:    | 0     | 0     | 0     | 0     | 0     | 0     | 0     | 0     |
| 313:    | 0     | 0     | 0     | 0     | 0     | 0     | 0     | 0     |
| 321:    | 0     | 0     | 0     | 0     | 0     | 0     | 0     | 0     |
| 329:    | 0     | 0     | 1     | 0     | 0     | 0     | 0     | 1     |
| 337:    | 0     | 0     | 0     | 0     | 0     | 0     | 1     | 0     |
| 345:    | 0     | 0     | 0     | 0     | 0     | 0     | 0     | 0     |
| 353:    | 0     | 0     | 0     | 0     | 0     | 0     | 0     | 0     |
| 361:    | 0     | 0     | 0     | 0     | 0     | 0     | 0     | 1     |

369: 0 1 0 0 1 0 0 0

Sample Title: 11

| Channel | 1 | 2 | 3 | 4 | 5 | 6 | 7 | 8 |
|---------|---|---|---|---|---|---|---|---|
| 377:    | 0 | 0 | 0 | 1 | 0 | 0 | 0 | 1 |
| 385:    | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 |
| 393:    | 0 | 1 | 0 | 0 | 0 | 0 | 0 | 0 |
| 401:    | 0 | 0 | 0 | 1 | 1 | 1 | 1 | 1 |
| 409:    | 2 | 0 | 1 | 0 | 0 | 1 | 2 | 1 |
| 417:    | 1 | 0 | 2 | 0 | 1 | 0 | 3 | 0 |
| 425:    | 2 | 3 | 0 | 0 | 0 | 1 | 2 | 0 |
| 433:    | 0 | 1 | 0 | 1 | 3 | 4 | 2 | 2 |
| 441:    | 3 | 6 | 1 | 1 | 2 | 5 | 2 | 5 |
| 449:    | 2 | 4 | 5 | 3 | 1 | 2 | 6 | 4 |
| 457:    | 3 | 3 | 1 | 1 | 4 | 1 | 4 | 5 |
| 465:    | 3 | 2 | 4 | 1 | 1 | 7 | 0 | 3 |
| 473:    | 2 | 3 | 0 | 2 | 2 | 1 | 0 | 0 |
| 481:    | 3 | 0 | 1 | 1 | 1 | 0 | 1 | 0 |
| 489:    | 0 | 5 | 0 | 2 | 0 | 0 | 1 | 0 |
| 497:    | 0 | 0 | 1 | 1 | 0 | 0 | 0 | 2 |
| 505:    | 0 | 1 | 1 | 0 | 1 | 0 | 0 | 0 |
| 513:    | 0 | 2 | 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 | 0 |
| 545:    | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 |
| 553:    | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 |
| 561:    | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 |
| 569:    | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 |
| 577:    | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 |
| 585:    | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 |
| 593:    | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 |
| 601:    | 1 | 0 | 0 | 0 | 0 | 0 | 0 | 0 |
| 609:    | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 |
| 617:    | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 |
| 625:    | 0 | 1 | 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 | 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 | 1 | 0 | 0 | 0 | 0 | 0 | 0 |
| 753:    | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 |
| 761:    | 0 | 0 | 0 | 1 | 0 | 0 | 0 | 0 |
| 769:    | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 |
| 777:    | 1 | 0 | 0 | 0 | 0 | 0 | 0 | 0 |
| 785:    | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 |
| 793:    | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 |



801: 0 0 0 0 0 0 0 0 0

Sample Title: 11

| Channel | ----- | ----- | ----- | ----- | ----- | ----- | ----- | ----- |
|---------|-------|-------|-------|-------|-------|-------|-------|-------|
| 809:    | 0     | 0     | 0     | 0     | 0     | 0     | 0     | 0     |
| 817:    | 0     | 0     | 0     | 0     | 0     | 0     | 0     | 0     |
| 825:    | 0     | 0     | 0     | 0     | 0     | 0     | 0     | 0     |
| 833:    | 0     | 0     | 0     | 0     | 0     | 0     | 0     | 0     |
| 841:    | 0     | 0     | 0     | 0     | 0     | 0     | 0     | 0     |
| 849:    | 0     | 0     | 0     | 0     | 0     | 0     | 0     | 0     |
| 857:    | 0     | 0     | 0     | 0     | 0     | 0     | 0     | 0     |
| 865:    | 1     | 0     | 0     | 0     | 0     | 0     | 0     | 0     |
| 873:    | 0     | 0     | 0     | 0     | 0     | 0     | 0     | 0     |
| 881:    | 0     | 0     | 0     | 0     | 0     | 0     | 1     | 0     |
| 889:    | 0     | 0     | 0     | 0     | 0     | 0     | 1     | 0     |
| 897:    | 0     | 0     | 0     | 0     | 0     | 0     | 0     | 0     |
| 905:    | 0     | 0     | 0     | 0     | 0     | 0     | 0     | 0     |
| 913:    | 0     | 0     | 1     | 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     | 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     | 0     |

148  
4/30/13

# Apex-Alpha™

Sample Description: S-82 TOT  
 Spectrum File: \\OR-ALPHA1\Canberra\ApexAlpha\Root\Data\00000567  
 Batch Identification: 1304105A-TH  
 Sample Identification: 12  
 Sample Geometry: Shelf 2  
 Procedure Description: Th iso

Detector Name: Alpha\_024  
 Chamber Serial Number:  
 Detector Serial Number: 24  
 Env. Background: System Bkgd 55742  
 Reagent Blank: <not performed>

Sample Size: 1.000E+000 +/- 0.000E+000 liter  
 Sample Date/Time: 4/9/2013 7:24:51 AM  
 Acquisition Date/Time: 4/30/2013 12:43:35 PM  
 Acquisition Live Time: 170.0 minutes  
 Acquisition Real Time: 170.0 minutes

Tracer Certificate: Th229\_TH-18A  
 Tracer Quantity: 0.232 mL  
 Effective Efficiency: 0.1736 +/- 0.0150  
 Counting Efficiency: 0.1710 +/- 0.0032 on 12/15/2012 2:02:15 PM  
 Chem. Recovery Factor: 1.0149 +/- 0.0898

Peak Match Tolerance: 0.175 MeV

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

| Nuclide  | Energy (MeV) | Net Pk Area | Pk Area Error % | Ambient Backgnd | Reagent Backgnd | FWHM (keV) |
|----------|--------------|-------------|-----------------|-----------------|-----------------|------------|
| TH-227   | 5.789        | -0.89       | 347.60          | 2.89            | 0.00E+000       | 3.1        |
| TH-228   | 5.355        | 7.96        | 79.20           | 2.04            | 0.00E+000       | 3.1        |
| TH-229 T | 4.855        | 153.66      | 15.83           | 0.34            | 0.00E+000       | 4.4        |
| TH-230   | 4.621        | 15.66       | 50.15           | 0.34            | 0.00E+000       | 3.1        |
| TH-232   | 3.944        | 6.98        | 80.28           | 1.02            | 0.00E+000       | 3.1        |

T = Tracer Peak used for Effective Efficiency

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

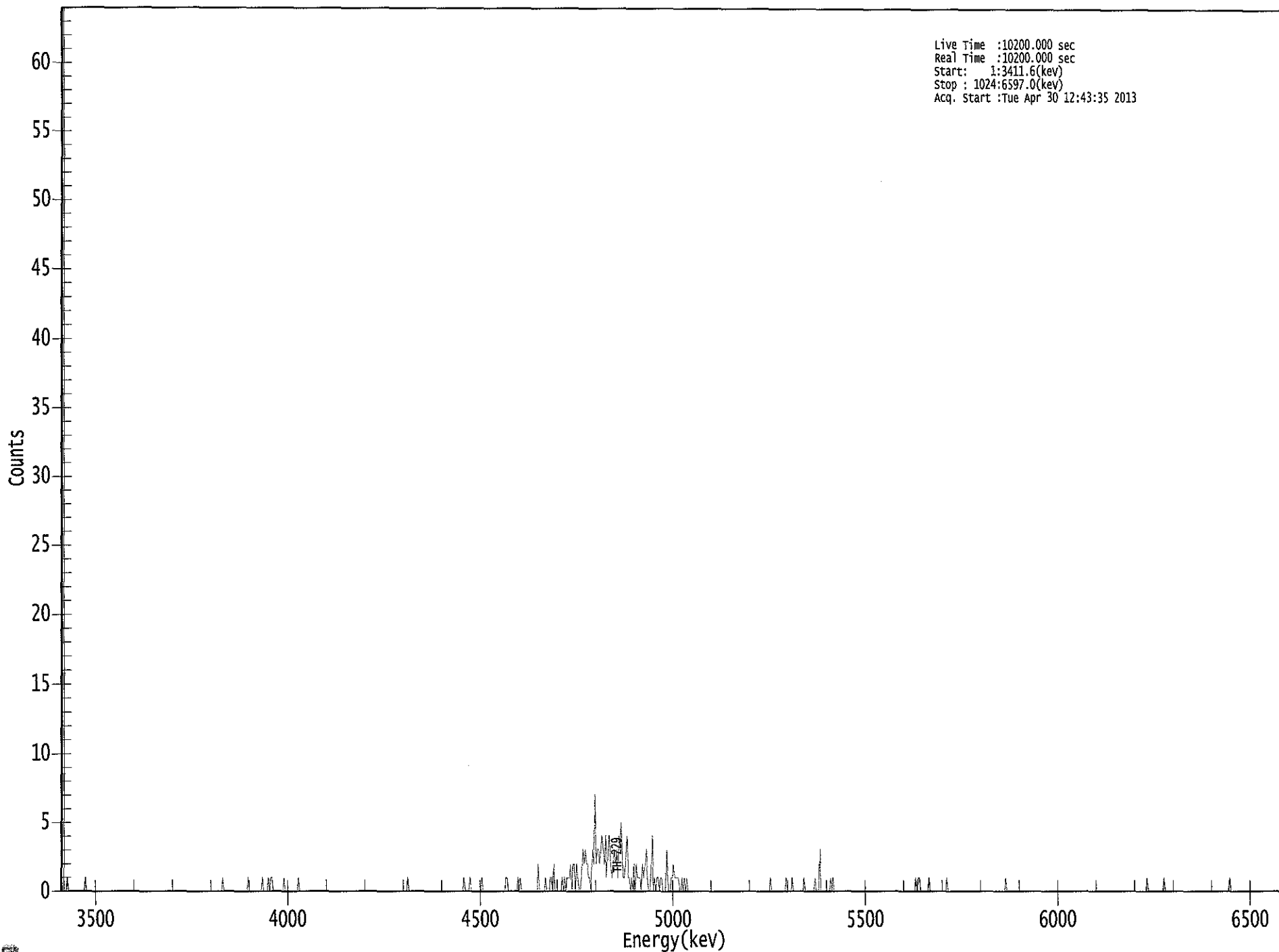
| Nuclide | Id Conf. | Energy (keV) | Activity (pCi/liter)     | MDA (pCi/liter)         |
|---------|----------|--------------|--------------------------|-------------------------|
| TH-227  | 0.981    | 5850.00*     | -1.40E-002 +/- 4.86E-002 | 1.37E-001 +/- 2.33E-002 |
| TH-228  | 0.989    | 5400.00*     | 1.24E-001 +/- 1.01E-001  | 1.22E-001 +/- 2.06E-002 |
| TH-229  | 0.998    | 4872.00*     | 2.36E+000 +/- 4.00E-001  | 7.33E-002 +/- 1.24E-002 |
| TH-230  | 0.986    | 4672.00*     | 2.39E-001 +/- 1.27E-001  | 7.31E-002 +/- 1.24E-002 |
| TH-232  | 0.985    | 3997.00*     | 1.07E-001 +/- 8.74E-002  | 9.62E-002 +/- 1.63E-002 |

AG  
5/1/13

US EPA ARCHIVE DOCUMENT

0000056743.CNF

Live Time :10200.000 sec  
Real Time :10200.000 sec  
Start: 1:3411.6(kev)  
Stop : 1024:6597.0(kev)  
Acq. Start :Tue Apr 30 12:43:35 2013



ROI Type: 1

ROI Type: 3

US EPA ARCHIVE DOCUMENT

0274

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 \*\*\*\*\* 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 | 10200 | 10200 | 0 | 0 | 0 | 1 | 0 | 0 |
|---------|-------|-------|---|---|---|---|---|---|
| 1:      | 10200 | 10200 | 0 | 0 | 0 | 1 | 0 | 0 |
| 9:      | 0     | 0     | 0 | 0 | 0 | 0 | 0 | 0 |
| 17:     | 0     | 0     | 0 | 0 | 1 | 0 | 0 | 0 |
| 25:     | 0     | 0     | 0 | 0 | 0 | 0 | 0 | 0 |
| 33:     | 0     | 0     | 0 | 0 | 0 | 0 | 0 | 0 |
| 41:     | 0     | 0     | 0 | 0 | 0 | 0 | 0 | 0 |
| 49:     | 0     | 0     | 0 | 0 | 0 | 0 | 0 | 0 |
| 57:     | 0     | 0     | 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 | 1 |
| 137:    | 0     | 0     | 0 | 0 | 0 | 0 | 0 | 0 |
| 145:    | 0     | 0     | 0 | 0 | 0 | 0 | 0 | 0 |
| 153:    | 0     | 0     | 0 | 0 | 1 | 0 | 0 | 0 |
| 161:    | 0     | 0     | 0 | 0 | 0 | 0 | 0 | 0 |
| 169:    | 1     | 0     | 0 | 0 | 0 | 1 | 0 | 1 |
| 177:    | 1     | 0     | 0 | 0 | 0 | 0 | 0 | 0 |
| 185:    | 0     | 0     | 1 | 0 | 0 | 0 | 0 | 0 |
| 193:    | 0     | 0     | 0 | 0 | 0 | 0 | 1 | 0 |
| 201:    | 0     | 0     | 0 | 0 | 0 | 0 | 0 | 0 |
| 209:    | 0     | 0     | 0 | 0 | 0 | 0 | 0 | 0 |
| 217:    | 0     | 0     | 0 | 0 | 0 | 0 | 0 | 0 |
| 225:    | 0     | 0     | 0 | 0 | 0 | 0 | 0 | 0 |
| 233:    | 0     | 0     | 0 | 0 | 0 | 0 | 0 | 0 |
| 241:    | 0     | 0     | 0 | 0 | 0 | 0 | 0 | 0 |
| 249:    | 0     | 0     | 0 | 0 | 0 | 0 | 0 | 0 |
| 257:    | 0     | 0     | 0 | 0 | 0 | 0 | 0 | 0 |
| 265:    | 0     | 0     | 0 | 0 | 0 | 0 | 0 | 0 |
| 273:    | 0     | 0     | 0 | 0 | 0 | 0 | 0 | 0 |
| 281:    | 0     | 0     | 0 | 0 | 0 | 0 | 0 | 0 |
| 289:    | 0     | 1     | 0 | 0 | 0 | 0 | 0 | 0 |
| 297:    | 0     | 0     | 0 | 0 | 0 | 0 | 0 | 0 |
| 305:    | 0     | 0     | 0 | 0 | 0 | 0 | 0 | 0 |
| 313:    | 0     | 0     | 0 | 0 | 0 | 0 | 0 | 0 |
| 321:    | 0     | 0     | 0 | 0 | 0 | 0 | 0 | 0 |
| 329:    | 0     | 0     | 0 | 0 | 0 | 0 | 0 | 0 |
| 337:    | 1     | 0     | 0 | 0 | 0 | 1 | 0 | 0 |
| 345:    | 0     | 0     | 0 | 0 | 0 | 0 | 0 | 1 |
| 353:    | 0     | 0     | 0 | 0 | 0 | 0 | 0 | 0 |
| 361:    | 0     | 0     | 0 | 0 | 0 | 0 | 0 | 0 |

369: 0 0 0 1 1 0 0 0

Sample Title: 12

| Channel | ----- | ----- | ----- | ----- | ----- | ----- | ----- | ----- |
|---------|-------|-------|-------|-------|-------|-------|-------|-------|
| 377:    | 0     | 0     | 0     | 0     | 0     | 1     | 0     | 1     |
| 385:    | 0     | 0     | 0     | 0     | 0     | 0     | 0     | 0     |
| 393:    | 0     | 0     | 0     | 0     | 0     | 0     | 2     | 0     |
| 401:    | 0     | 0     | 0     | 0     | 1     | 0     | 0     | 0     |
| 409:    | 1     | 1     | 0     | 2     | 0     | 0     | 0     | 0     |
| 417:    | 0     | 0     | 1     | 0     | 1     | 0     | 1     | 1     |
| 425:    | 1     | 2     | 0     | 2     | 2     | 0     | 2     | 1     |
| 433:    | 0     | 0     | 1     | 3     | 2     | 3     | 2     | 2     |
| 441:    | 1     | 1     | 0     | 3     | 2     | 7     | 2     | 3     |
| 449:    | 3     | 2     | 3     | 4     | 3     | 2     | 4     | 1     |
| 457:    | 3     | 4     | 2     | 1     | 2     | 3     | 2     | 3     |
| 465:    | 1     | 4     | 3     | 5     | 2     | 1     | 1     | 3     |
| 473:    | 4     | 1     | 1     | 0     | 1     | 0     | 2     | 0     |
| 481:    | 2     | 1     | 1     | 1     | 0     | 2     | 1     | 2     |
| 489:    | 3     | 1     | 0     | 0     | 1     | 4     | 0     | 1     |
| 497:    | 0     | 1     | 1     | 0     | 1     | 1     | 0     | 0     |
| 505:    | 0     | 3     | 1     | 0     | 0     | 1     | 1     | 2     |
| 513:    | 1     | 1     | 1     | 1     | 0     | 0     | 1     | 0     |
| 521:    | 1     | 0     | 1     | 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:    | 1     | 0     | 0     | 0     | 0     | 0     | 0     | 0     |
| 601:    | 0     | 0     | 0     | 0     | 0     | 1     | 0     | 0     |
| 609:    | 0     | 0     | 1     | 0     | 0     | 0     | 0     | 0     |
| 617:    | 0     | 0     | 0     | 0     | 1     | 0     | 0     | 0     |
| 625:    | 0     | 0     | 0     | 0     | 0     | 1     | 0     | 0     |
| 633:    | 0     | 3     | 0     | 0     | 0     | 0     | 0     | 0     |
| 641:    | 0     | 0     | 1     | 0     | 1     | 0     | 0     | 0     |
| 649:    | 0     | 0     | 0     | 0     | 0     | 0     | 0     | 0     |
| 657:    | 0     | 0     | 0     | 0     | 0     | 0     | 0     | 0     |
| 665:    | 0     | 0     | 0     | 0     | 0     | 0     | 0     | 0     |
| 673:    | 0     | 0     | 0     | 0     | 0     | 0     | 0     | 0     |
| 681:    | 0     | 0     | 0     | 0     | 0     | 0     | 0     | 0     |
| 689:    | 0     | 0     | 0     | 0     | 0     | 0     | 0     | 0     |
| 697:    | 0     | 0     | 0     | 0     | 0     | 0     | 0     | 0     |
| 705:    | 0     | 0     | 0     | 0     | 0     | 0     | 0     | 0     |
| 713:    | 0     | 1     | 0     | 1     | 1     | 0     | 0     | 0     |
| 721:    | 0     | 0     | 0     | 0     | 1     | 0     | 0     | 0     |
| 729:    | 0     | 0     | 0     | 0     | 0     | 0     | 0     | 0     |
| 737:    | 0     | 0     | 0     | 1     | 0     | 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     | 1     | 0     | 0     | 0     |
| 793:    | 0     | 0     | 0     | 0     | 0     | 0     | 0     | 0     |

801: 0 0 0 0 0 0 0 0

Sample Title: 12

| Channel |   |   |   |   |   |   |   |   |
|---------|---|---|---|---|---|---|---|---|
| 809:    | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 |
| 817:    | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 |
| 825:    | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 |
| 833:    | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 |
| 841:    | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 |
| 849:    | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 |
| 857:    | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 |
| 865:    | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 |
| 873:    | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 |
| 881:    | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 |
| 889:    | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 |
| 897:    | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 |
| 905:    | 0 | 0 | 1 | 0 | 0 | 0 | 0 | 0 |
| 913:    | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 |
| 921:    | 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:    | 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 |

KBS  
4/30/13

# Apex-Alpha™

Sample Description: S-82 DIS  
 Spectrum File: \\OR-ALPHA1\Canberra\ApexAlpha\Root\Data\00000567  
 Batch Identification: 1304105A-TH  
 Sample Identification: 13  
 Sample Geometry: Shelf 2  
 Procedure Description: Th iso

Detector Name: Alpha\_025  
 Chamber Serial Number:  
 Detector Serial Number: 25  
 Env. Background: System Bkgd 55743  
 Reagent Blank: <not performed>

Sample Size: 1.000E+000 +/- 0.000E+000 liter  
 Sample Date/Time: 4/9/2013 7:24:51 AM  
 Acquisition Date/Time: 4/30/2013 12:43:36 PM  
 Acquisition Live Time: 170.0 minutes  
 Acquisition Real Time: 170.0 minutes

Tracer Certificate: Th229\_TH-18A  
 Tracer Quantity: 0.231 mL  
 Effective Efficiency: 0.2305 +/- 0.0177  
 Counting Efficiency: 0.1736 +/- 0.0032 on 12/15/2012 1:57:27 PM  
 Chem. Recovery Factor: 1.3278 +/- 0.1049

Peak Match Tolerance: 0.175 MeV

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 PEAK AREA REPORT  
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| Nuclide  | Energy (MeV) | Net Pk Area | Pk Area Error % | Ambient Backgnd | Reagent Backgnd | FWHM (keV) |
|----------|--------------|-------------|-----------------|-----------------|-----------------|------------|
| TH-227   | 5.883        | 1.98        | 176.34          | 1.02            | 0.00E+000       | 3.1        |
| TH-228   | 5.411        | -0.36       | 604.11          | 1.36            | 0.00E+000       | 3.1        |
| TH-229 T | 4.882        | 203.49      | 13.76           | 0.51            | 0.00E+000       | 10.2       |
| TH-230   | 4.642        | 7.32        | 76.28           | 0.68            | 0.00E+000       | 3.1        |
| TH-232   | 4.074        | 0.32        | 646.93          | 0.68            | 0.00E+000       | 3.1        |

T = Tracer Peak used for Effective Efficiency

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 NUCLIDE ANALYSIS RESULTS  
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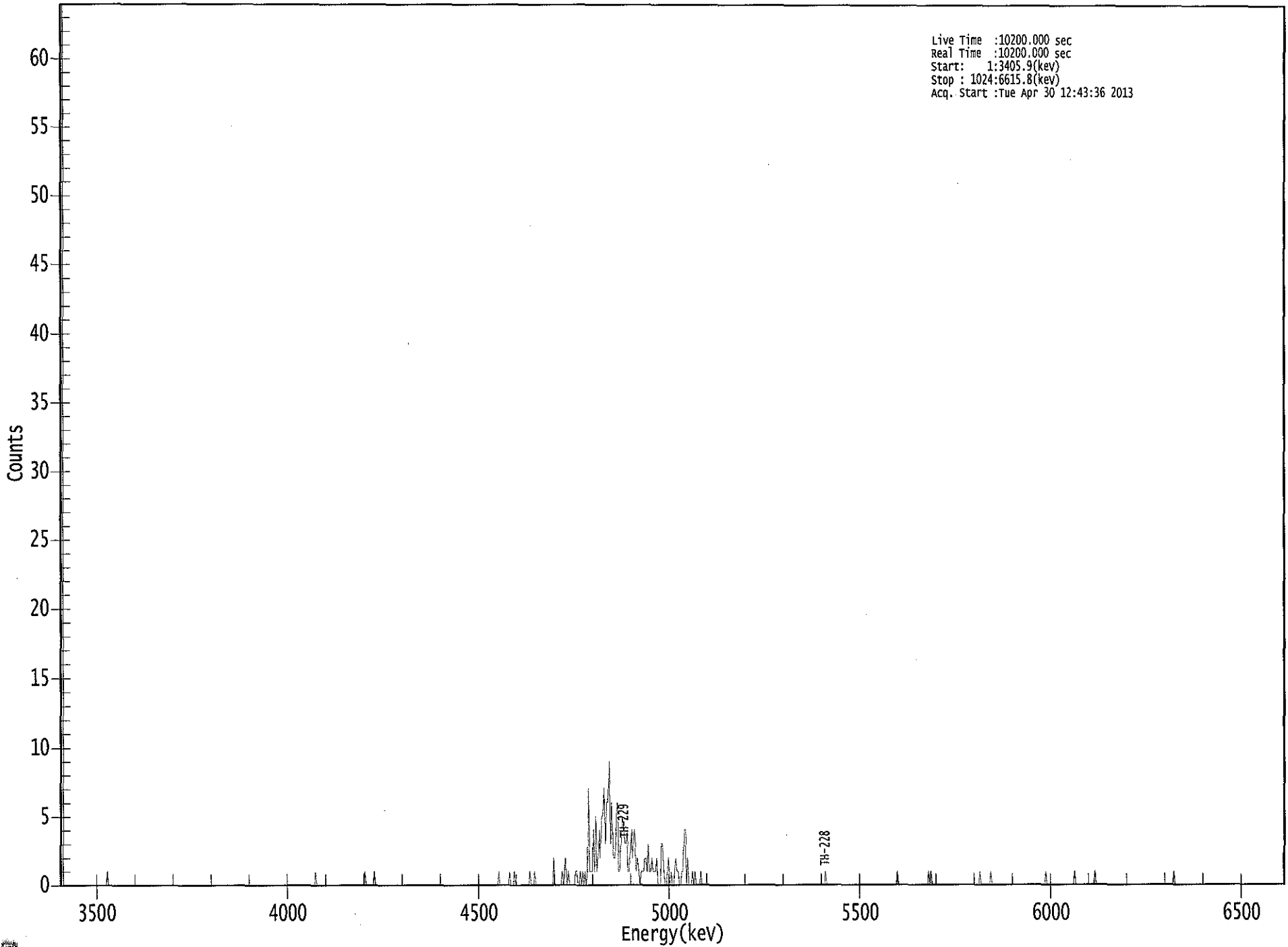
| Nuclide | Id Conf. | Energy (keV) | Activity (pCi/liter)     | MDA (pCi/liter)         |
|---------|----------|--------------|--------------------------|-------------------------|
| TH-227  | 0.994    | 5850.00*     | 2.34E-002 +/- 4.14E-002  | 7.44E-002 +/- 1.12E-002 |
| TH-228  | 0.999    | 5400.00*     | -4.23E-003 +/- 2.56E-002 | 8.06E-002 +/- 1.21E-002 |
| TH-229  | 0.999    | 4872.00*     | 2.35E+000 +/- 3.54E-001  | 6.06E-002 +/- 9.12E-003 |
| TH-230  | 0.995    | 4672.00*     | 8.43E-002 +/- 6.56E-002  | 6.50E-002 +/- 9.77E-003 |
| TH-232  | 0.969    | 3997.00*     | 3.68E-003 +/- 2.38E-002  | 6.49E-002 +/- 9.76E-003 |

AG  
5/1/13

US EPA ARCHIVE DOCUMENT

0000056744.CNF

Live Time :10200.000 sec  
Real Time :10200.000 sec  
Start : 1:3405.9(kev)  
Stop : 1024:6615.8(kev)  
Acq. Start :Tue Apr 30 12:43:36 2013



US EPA ARCHIVE DOCUMENT

0279

ROI Type: 1

ROI Type: 3



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 \*\*\*\*\* S P E C T R A L D A T A R E P O R T \*\*\*\*\*  
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Sample Title: 13

Elapsed Live time: 10200

Elapsed Real Time: 10200

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

369: 0 0 0 0 0 0 0 0 1

Sample Title: 13

| Channel |   |   |   |   |   |   |   |   |
|---------|---|---|---|---|---|---|---|---|
| 377:    | 0 | 0 | 0 | 1 | 0 | 0 | 0 | 0 |
| 385:    | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 |
| 393:    | 1 | 0 | 0 | 0 | 1 | 0 | 0 | 0 |
| 401:    | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 |
| 409:    | 0 | 0 | 0 | 0 | 2 | 0 | 0 | 0 |
| 417:    | 0 | 0 | 0 | 1 | 0 | 1 | 2 | 0 |
| 425:    | 1 | 0 | 0 | 0 | 0 | 0 | 1 | 1 |
| 433:    | 0 | 0 | 1 | 0 | 1 | 0 | 1 | 0 |
| 441:    | 1 | 7 | 1 | 1 | 1 | 4 | 1 | 5 |
| 449:    | 1 | 2 | 4 | 2 | 5 | 5 | 7 | 3 |
| 457:    | 6 | 6 | 9 | 3 | 6 | 3 | 2 | 2 |
| 465:    | 5 | 6 | 1 | 1 | 3 | 5 | 4 | 3 |
| 473:    | 3 | 4 | 1 | 1 | 3 | 4 | 2 | 4 |
| 481:    | 3 | 1 | 2 | 1 | 0 | 1 | 1 | 1 |
| 489:    | 2 | 2 | 1 | 3 | 1 | 1 | 2 | 1 |
| 497:    | 1 | 1 | 2 | 0 | 0 | 0 | 3 | 3 |
| 505:    | 1 | 0 | 0 | 1 | 2 | 0 | 1 | 0 |
| 513:    | 0 | 1 | 2 | 1 | 1 | 0 | 0 | 1 |
| 521:    | 1 | 4 | 4 | 0 | 2 | 0 | 0 | 0 |
| 529:    | 1 | 0 | 1 | 0 | 0 | 0 | 0 | 1 |
| 537:    | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 |
| 545:    | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 |
| 553:    | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 |
| 561:    | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 |
| 569:    | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 |
| 577:    | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 |
| 585:    | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 |
| 593:    | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 |
| 601:    | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 |
| 609:    | 0 | 0 | 0 | 0 | 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 | 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 | 1 | 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 | 1 | 0 | 1 |
| 729:    | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 |
| 737:    | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 |
| 745:    | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 |
| 753:    | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 |
| 761:    | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 |
| 769:    | 1 | 0 | 0 | 0 | 0 | 0 | 0 | 0 |
| 777:    | 0 | 1 | 0 | 0 | 0 | 0 | 0 | 0 |
| 785:    | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 |
| 793:    | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 |

801: 0 0 0 0 0 0 0 0 0

Sample Title: 13

| Channel | ----- | ----- | ----- | ----- | ----- | ----- | ----- | ----- |
|---------|-------|-------|-------|-------|-------|-------|-------|-------|
| 809:    | 0     | 0     | 0     | 0     | 0     | 0     | 0     | 0     |
| 817:    | 0     | 0     | 0     | 0     | 0     | 0     | 0     | 1     |
| 825:    | 0     | 0     | 0     | 0     | 0     | 0     | 0     | 0     |
| 833:    | 0     | 0     | 0     | 0     | 0     | 0     | 0     | 0     |
| 841:    | 0     | 0     | 0     | 0     | 0     | 0     | 0     | 1     |
| 849:    | 0     | 0     | 0     | 0     | 0     | 0     | 0     | 0     |
| 857:    | 0     | 0     | 0     | 0     | 0     | 0     | 0     | 0     |
| 865:    | 1     | 0     | 0     | 0     | 0     | 0     | 0     | 0     |
| 873:    | 0     | 0     | 0     | 0     | 0     | 0     | 0     | 0     |
| 881:    | 0     | 0     | 0     | 0     | 0     | 0     | 0     | 0     |
| 889:    | 0     | 0     | 0     | 0     | 0     | 0     | 0     | 0     |
| 897:    | 0     | 0     | 0     | 0     | 0     | 0     | 0     | 0     |
| 905:    | 0     | 0     | 0     | 0     | 0     | 0     | 0     | 0     |
| 913:    | 0     | 0     | 0     | 0     | 0     | 0     | 0     | 0     |
| 921:    | 0     | 0     | 0     | 0     | 0     | 0     | 0     | 0     |
| 929:    | 0     | 0     | 1     | 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     |

10/5  
4/30/13

Sample Description: PZ-106-SS TOT  
 Spectrum File: \\OR-ALPHA1\Canberra\ApexAlpha\Root\Data\00000567  
 Batch Identification: 1304105A-TH  
 Sample Identification: 14  
 Sample Geometry: Shelf 2  
 Procedure Description: Th iso

Detector Name: Alpha\_027  
 Chamber Serial Number:  
 Detector Serial Number: 27  
 Env. Background: System Bkgd 55744  
 Reagent Blank: <not performed>

Sample Size: 1.000E+000 +/- 0.000E+000 liter  
 Sample Date/Time: 4/9/2013 7:24:51 AM  
 Acquisition Date/Time: 4/30/2013 12:43:37 PM  
 Acquisition Live Time: 170.0 minutes  
 Acquisition Real Time: 170.0 minutes

Tracer Certificate: Th229\_TH-18A  
 Tracer Quantity: 0.231 mL  
 Effective Efficiency: 0.2128 +/- 0.0169  
 Counting Efficiency: 0.1728 +/- 0.0032 on 12/15/2012 2:27:41 PM  
 Chem. Recovery Factor: 1.2317 +/- 0.1007

Peak Match Tolerance: 0.175 MeV

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

| Nuclide  | Energy (MeV) | Net Pk Area | Pk Area Error % | Ambient Backgnd | Reagent Backgnd | FWHM (keV) |
|----------|--------------|-------------|-----------------|-----------------|-----------------|------------|
| TH-227   | 5.823        | 3.15        | 126.67          | 0.85            | 0.00E+000       | 3.2        |
| TH-228   | 5.371        | 2.79        | 162.88          | 2.21            | 0.00E+000       | 3.2        |
| TH-229 T | 4.879        | 187.64      | 14.37           | 1.36            | 0.00E+000       | 13.9       |
| TH-230   | 4.672        | 12.98       | 56.85           | 1.02            | 0.00E+000       | 3.2        |
| TH-232   | 3.942        | 1.32        | 215.97          | 0.68            | 0.00E+000       | 3.2        |

T = Tracer Peak used for Effective Efficiency

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 ----- NUCLIDE ANALYSIS RESULTS -----  
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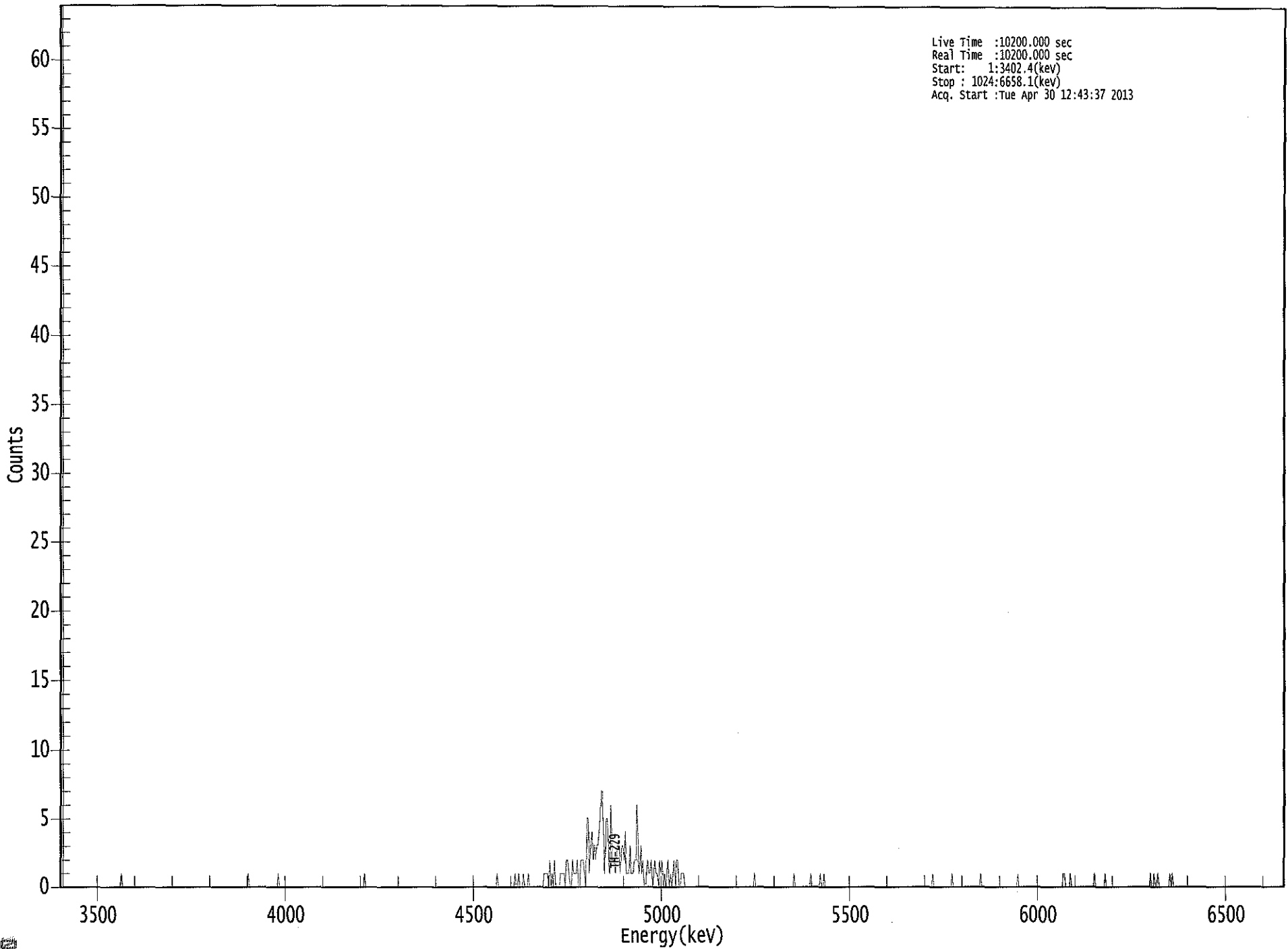
| Nuclide | Id Conf. | Energy (keV) | Activity (pCi/liter)    | MDA (pCi/liter)         |
|---------|----------|--------------|-------------------------|-------------------------|
| TH-227  | 0.996    | 5850.00*     | 4.03E-002 +/- 5.14E-002 | 7.66E-002 +/- 1.20E-002 |
| TH-228  | 0.996    | 5400.00*     | 3.55E-002 +/- 5.81E-002 | 1.02E-001 +/- 1.59E-002 |
| TH-229  | 1.000    | 4872.00*     | 2.35E+000 +/- 3.66E-001 | 8.58E-002 +/- 1.34E-002 |
| TH-230  | 1.000    | 4672.00*     | 1.62E-001 +/- 9.55E-002 | 7.86E-002 +/- 1.23E-002 |
| TH-232  | 0.984    | 3997.00*     | 1.64E-002 +/- 3.56E-002 | 7.02E-002 +/- 1.10E-002 |

AG  
5/1/13

US EPA ARCHIVE DOCUMENT

0000056745.CNF

Live Time :10200.000 sec  
Real Time :10200.000 sec  
Start : 1:3402.4(kev)  
Stop : 1024:6658.1(kev)  
Acq. Start :Tue Apr 30 12:43:37 2013



ROI Type: 1

ROI Type: 3

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

Sample Title: 14

Elapsed Live time: 10200

Elapsed Real Time: 10200

| Channel | ----- | ----- | ----- | ----- | ----- | ----- | ----- | ----- |
|---------|-------|-------|-------|-------|-------|-------|-------|-------|
| 1:      | 10200 | 10200 | 0     | 0     | 0     | 0     | 0     | 0     |
| 9:      | 0     | 0     | 0     | 0     | 0     | 0     | 0     | 0     |
| 17:     | 0     | 0     | 0     | 0     | 0     | 0     | 0     | 0     |
| 25:     | 0     | 0     | 0     | 0     | 0     | 0     | 0     | 0     |
| 33:     | 0     | 0     | 0     | 0     | 0     | 0     | 0     | 0     |
| 41:     | 0     | 0     | 0     | 0     | 0     | 0     | 0     | 0     |
| 49:     | 0     | 0     | 0     | 1     | 0     | 0     | 0     | 0     |
| 57:     | 0     | 0     | 0     | 0     | 0     | 0     | 0     | 0     |
| 65:     | 0     | 0     | 0     | 0     | 0     | 0     | 0     | 0     |
| 73:     | 0     | 0     | 0     | 0     | 0     | 0     | 0     | 0     |
| 81:     | 0     | 0     | 0     | 0     | 0     | 0     | 0     | 0     |
| 89:     | 0     | 0     | 0     | 0     | 0     | 0     | 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     | 1     | 0     | 0     |
| 161:    | 0     | 0     | 0     | 0     | 0     | 0     | 0     | 0     |
| 169:    | 0     | 0     | 0     | 0     | 0     | 0     | 0     | 0     |
| 177:    | 0     | 0     | 0     | 0     | 0     | 0     | 1     | 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     | 1     | 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     | 1     | 0     | 0     |

369: 0 0 0 0 0 0 0 0

Sample Title: 14

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

801: 1 0 0 0 0 0 0 0 0

Sample Title: 14

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



103  
4/30/13

# Apex-Alpha™

Sample Description: PZ-106-SS DIS  
 Spectrum File: \\OR-ALPHA1\Canberra\ApexAlpha\Root\Data\00000567  
 Batch Identification: 1304105A-TH  
 Sample Identification: 15  
 Sample Geometry: Shelf 2  
 Procedure Description: Th iso

Detector Name: Alpha\_029  
 Chamber Serial Number:  
 Detector Serial Number: 29  
 Env. Background: System Bkgd 55745  
 Reagent Blank: <not performed>

Sample Size: 1.000E+000 +/- 0.000E+000 liter  
 Sample Date/Time: 4/9/2013 7:24:51 AM  
 Acquisition Date/Time: 4/30/2013 12:43:38 PM  
 Acquisition Live Time: 170.0 minutes  
 Acquisition Real Time: 170.0 minutes

Tracer Certificate: Th229\_TH-18A  
 Tracer Quantity: 0.230 mL  
 Effective Efficiency: 0.1816 +/- 0.0155  
 Counting Efficiency: 0.1945 +/- 0.0036 on 12/15/2012 2:30:02 PM  
 Chem. Recovery Factor: 0.9337 +/- 0.0815

Peak Match Tolerance: 0.175 MeV

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 PEAK AREA REPORT  
 -----

| Nuclide  | Energy (MeV) | Net Pk Area | Pk Area Error % | Ambient Backgnd | Reagent Backgnd | FWHM (keV) |
|----------|--------------|-------------|-----------------|-----------------|-----------------|------------|
| TH-227   | 5.796        | 4.64        | 105.45          | 1.36            | 0.00E+000       | 3.1        |
| TH-228   | 5.335        | 0.62        | 583.53          | 2.38            | 0.00E+000       | 3.1        |
| TH-229 T | 4.884        | 159.64      | 15.59           | 1.36            | 0.00E+000       | 10.1       |
| TH-230   | 4.651        | 10.15       | 64.47           | 0.85            | 0.00E+000       | 3.1        |
| TH-232   | 3.840        | 1.00        | 277.19          | 0.00            | 0.00E+000       | 3.1        |

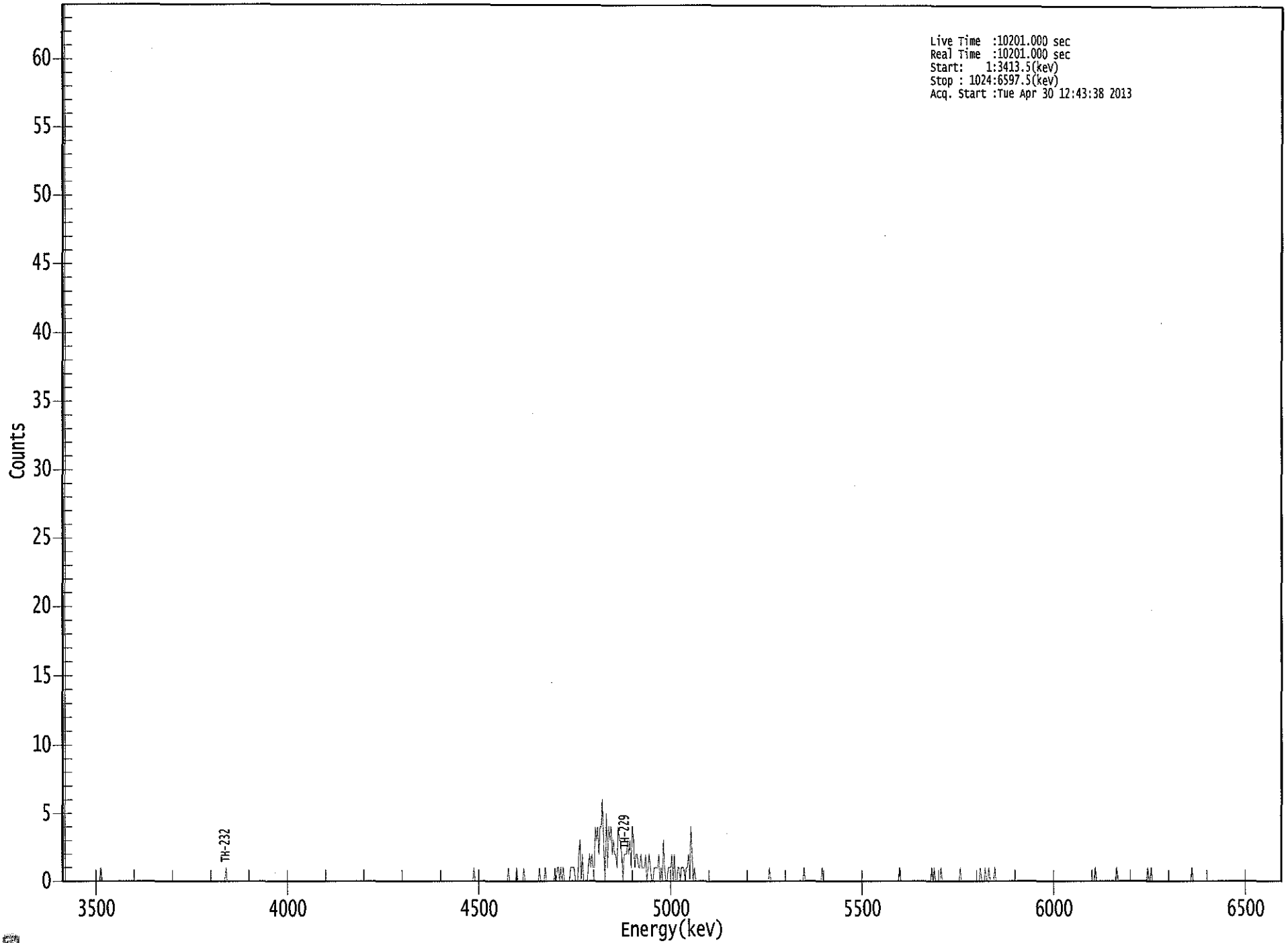
T = Tracer Peak used for Effective Efficiency

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

| Nuclide | Id Conf. | Energy (keV) | Activity (pCi/liter)    | MDA (pCi/liter)         |
|---------|----------|--------------|-------------------------|-------------------------|
| TH-227  | 0.985    | 5850.00*     | 6.95E-002 +/- 7.42E-002 | 1.03E-001 +/- 1.72E-002 |
| TH-228  | 0.978    | 5400.00*     | 9.24E-003 +/- 5.39E-002 | 1.22E-001 +/- 2.04E-002 |
| TH-229  | 0.999    | 4872.00*     | 2.34E+000 +/- 3.91E-001 | 1.00E-001 +/- 1.68E-002 |
| TH-230  | 0.998    | 4672.00*     | 1.48E-001 +/- 9.88E-002 | 8.75E-002 +/- 1.46E-002 |
| TH-232  | 0.879    | 3997.00*     | 1.46E-002 +/- 4.05E-002 | 8.75E-002 +/- 1.46E-002 |

AG  
5/1/13

US EPA ARCHIVE DOCUMENT



0289

ROI Type: 1

ROI Type: 3

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

Sample Title: 15

Elapsed Live time: 10201  
 Elapsed Real Time: 10201

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

369: 0 0 0 0 0 0 1 0

Sample Title: 15

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

801: 0 0 0 0 0 0 0 0 0

Sample Title: 15

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

105  
4/30/13

# Apex-Alpha™

Sample Description: I-9 TOT  
 Spectrum File: \\OR-ALPHA1\Canberra\ApexAlpha\Root\Data\00000567  
 Batch Identification: 1304105A-TH  
 Sample Identification: 16  
 Sample Geometry: Shelf 2  
 Procedure Description: Th iso

Detector Name: Alpha\_003  
 Chamber Serial Number:  
 Detector Serial Number: 3  
 Env. Background: System Bkgd 55734  
 Reagent Blank: <not performed>

Sample Size: 1.000E+000 +/- 0.000E+000 liter  
 Sample Date/Time: 4/9/2013 7:24:51 AM  
 Acquisition Date/Time: 4/30/2013 2:35:06 PM  
 Acquisition Live Time: 170.0 minutes  
 Acquisition Real Time: 170.0 minutes

Tracer Certificate: Th229\_TH-18A  
 Tracer Quantity: 0.230 mL  
 Effective Efficiency: 0.1832 +/- 0.0156  
 Counting Efficiency: 0.1746 +/- 0.0033 on 12/15/2012 11:26:47 AM  
 Chem. Recovery Factor: 1.0489 +/- 0.0912

Peak Match Tolerance: 0.175 MeV

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 PEAK AREA REPORT  
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| Nuclide  | Energy (MeV) | Net Pk Area | Pk Area Error % | Ambient Backgnd | Reagent Backgnd | FWHM (keV) |
|----------|--------------|-------------|-----------------|-----------------|-----------------|------------|
| TH-227   | 5.740        | 1.79        | 229.07          | 2.21            | 0.00E+000       | 3.0        |
| TH-228   | 5.342        | 9.94        | 72.51           | 3.06            | 0.00E+000       | 3.0        |
| TH-229 T | 4.869        | 160.98      | 15.51           | 1.02            | 0.00E+000       | 4.7        |
| TH-230   | 4.630        | 7.64        | 77.95           | 1.36            | 0.00E+000       | 3.0        |
| TH-232   | 3.949        | -1.19       | 180.59          | 1.19            | 0.00E+000       | 0.0        |

T = Tracer Peak used for Effective Efficiency

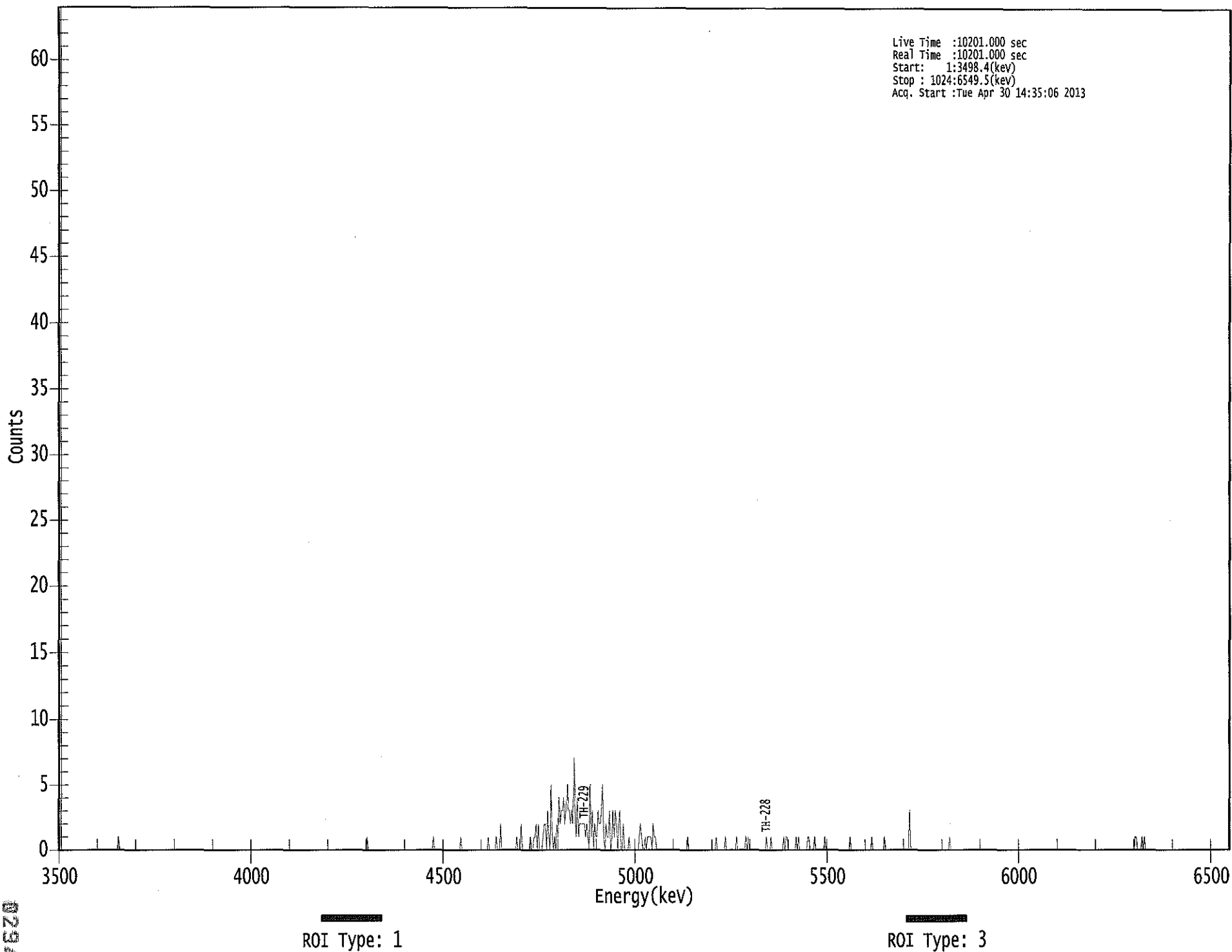
-----  
 NUCLIDE ANALYSIS RESULTS  
 -----

| Nuclide | Id Conf. | Energy (keV) | Activity (pCi/liter)     | MDA (pCi/liter)         |
|---------|----------|--------------|--------------------------|-------------------------|
| TH-227  | 0.939    | 5850.00*     | 2.66E-002 +/- 6.11E-002  | 1.19E-001 +/- 1.98E-002 |
| TH-228  | 0.983    | 5400.00*     | 1.47E-001 +/- 1.09E-001  | 1.32E-001 +/- 2.20E-002 |
| TH-229  | 1.000    | 4872.00*     | 2.34E+000 +/- 3.90E-001  | 9.16E-002 +/- 1.52E-002 |
| TH-230  | 0.991    | 4672.00*     | 1.11E-001 +/- 8.82E-002  | 9.94E-002 +/- 1.65E-002 |
| TH-232  | 0.988    | 3997.00*     | -1.72E-002 +/- 3.12E-002 | 9.53E-002 +/- 1.59E-002 |

AG  
5/1/13

US EPA ARCHIVE DOCUMENT

0000056747.CNF



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 \*\*\*\*\* S P E C T R A L D A T A R E P O R T \*\*\*\*\*  
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Sample Title: 16

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     | 1     | 0     | 0     | 0     |
| 57:     | 0     | 0     | 0     | 0     | 0     | 0     | 0     | 0     |
| 65:     | 0     | 0     | 0     | 0     | 0     | 0     | 0     | 0     |
| 73:     | 0     | 0     | 0     | 0     | 0     | 0     | 0     | 0     |
| 81:     | 0     | 0     | 0     | 0     | 0     | 0     | 0     | 0     |
| 89:     | 0     | 0     | 0     | 0     | 0     | 0     | 0     | 0     |
| 97:     | 0     | 0     | 0     | 0     | 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     | 1     | 0     | 0     |
| 273:    | 0     | 0     | 0     | 0     | 0     | 0     | 0     | 0     |
| 281:    | 0     | 0     | 0     | 0     | 0     | 0     | 0     | 0     |
| 289:    | 0     | 0     | 0     | 0     | 0     | 0     | 0     | 0     |
| 297:    | 0     | 0     | 0     | 0     | 0     | 0     | 0     | 0     |
| 305:    | 0     | 0     | 0     | 0     | 0     | 0     | 0     | 0     |
| 313:    | 0     | 0     | 0     | 0     | 0     | 0     | 0     | 0     |
| 321:    | 0     | 0     | 0     | 0     | 0     | 0     | 0     | 1     |
| 329:    | 0     | 0     | 0     | 0     | 0     | 0     | 0     | 0     |
| 337:    | 0     | 0     | 0     | 0     | 0     | 0     | 0     | 0     |
| 345:    | 0     | 0     | 0     | 0     | 0     | 0     | 0     | 1     |
| 353:    | 0     | 0     | 0     | 0     | 0     | 0     | 0     | 0     |
| 361:    | 0     | 0     | 0     | 0     | 0     | 0     | 0     | 0     |



369: 0 0 0 0 0 0 0 0 1

Sample Title: 16

| Channel | ----- | ----- | ----- | ----- | ----- | ----- | ----- | ----- |
|---------|-------|-------|-------|-------|-------|-------|-------|-------|
| 377:    | 0     | 0     | 0     | 0     | 0     | 0     | 1     | 0     |
| 385:    | 0     | 0     | 2     | 0     | 0     | 0     | 0     | 0     |
| 393:    | 0     | 0     | 0     | 0     | 0     | 0     | 0     | 0     |
| 401:    | 1     | 0     | 0     | 0     | 2     | 0     | 0     | 0     |
| 409:    | 0     | 0     | 0     | 0     | 1     | 0     | 0     | 1     |
| 417:    | 1     | 2     | 0     | 2     | 0     | 0     | 0     | 1     |
| 425:    | 2     | 2     | 0     | 3     | 1     | 0     | 5     | 1     |
| 433:    | 0     | 1     | 0     | 2     | 1     | 4     | 2     | 3     |
| 441:    | 3     | 4     | 2     | 3     | 5     | 3     | 3     | 2     |
| 449:    | 3     | 2     | 7     | 3     | 1     | 4     | 1     | 2     |
| 457:    | 2     | 2     | 2     | 2     | 1     | 2     | 1     | 0     |
| 465:    | 5     | 1     | 3     | 0     | 2     | 1     | 1     | 3     |
| 473:    | 2     | 2     | 3     | 5     | 1     | 0     | 2     | 1     |
| 481:    | 1     | 3     | 0     | 1     | 3     | 1     | 3     | 2     |
| 489:    | 0     | 2     | 3     | 0     | 0     | 2     | 0     | 0     |
| 497:    | 0     | 0     | 1     | 0     | 0     | 0     | 0     | 0     |
| 505:    | 0     | 0     | 0     | 1     | 2     | 1     | 0     | 0     |
| 513:    | 1     | 0     | 1     | 1     | 1     | 1     | 0     | 2     |
| 521:    | 1     | 1     | 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     | 1     | 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     | 0     | 0     | 0     | 1     | 0     |
| 585:    | 0     | 0     | 0     | 0     | 0     | 0     | 0     | 0     |
| 593:    | 1     | 0     | 0     | 0     | 0     | 0     | 0     | 0     |
| 601:    | 1     | 0     | 1     | 0     | 0     | 0     | 0     | 0     |
| 609:    | 0     | 0     | 0     | 0     | 0     | 0     | 0     | 0     |
| 617:    | 0     | 0     | 1     | 0     | 0     | 0     | 1     | 0     |
| 625:    | 0     | 0     | 0     | 0     | 0     | 0     | 0     | 0     |
| 633:    | 0     | 1     | 0     | 1     | 1     | 0     | 0     | 0     |
| 641:    | 0     | 0     | 0     | 0     | 1     | 0     | 1     | 0     |
| 649:    | 0     | 0     | 0     | 0     | 0     | 0     | 1     | 1     |
| 657:    | 0     | 0     | 0     | 0     | 1     | 0     | 0     | 0     |
| 665:    | 0     | 0     | 0     | 0     | 0     | 1     | 0     | 0     |
| 673:    | 0     | 0     | 0     | 0     | 0     | 0     | 0     | 0     |
| 681:    | 0     | 0     | 0     | 0     | 0     | 0     | 0     | 0     |
| 689:    | 0     | 0     | 0     | 1     | 0     | 0     | 0     | 0     |
| 697:    | 0     | 0     | 0     | 0     | 0     | 0     | 0     | 0     |
| 705:    | 0     | 0     | 0     | 0     | 0     | 0     | 1     | 0     |
| 713:    | 0     | 0     | 0     | 0     | 0     | 0     | 0     | 0     |
| 721:    | 0     | 1     | 0     | 0     | 0     | 0     | 0     | 0     |
| 729:    | 0     | 0     | 0     | 0     | 0     | 0     | 0     | 0     |
| 737:    | 0     | 0     | 0     | 0     | 0     | 0     | 0     | 3     |
| 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     | 1     | 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: 16

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

1075  
4/30/13

# Apex-Alpha™

Sample Description: I-9 DIS  
 Spectrum File: \\OR-ALPHA1\Canberra\ApexAlpha\Root\Data\00000567  
 Batch Identification: 1304105A-TH  
 Sample Identification: 17  
 Sample Geometry: Shelf 2  
 Procedure Description: Th iso

Detector Name: Alpha\_004  
 Chamber Serial Number:  
 Detector Serial Number: 4  
 Env. Background: System Bkgd 55735  
 Reagent Blank: <not performed>

Sample Size: 1.000E+000 +/- 0.000E+000 liter  
 Sample Date/Time: 4/9/2013 7:24:51 AM  
 Acquisition Date/Time: 4/30/2013 2:35:07 PM  
 Acquisition Live Time: 170.0 minutes  
 Acquisition Real Time: 170.0 minutes

Tracer Certificate: Th229\_TH-18A  
 Tracer Quantity: 0.231 mL  
 Effective Efficiency: 0.0885 +/- 0.0105  
 Counting Efficiency: 0.1940 +/- 0.0036 on 12/15/2012 11:26:46 AM  
 Chem. Recovery Factor: 0.4561 +/- 0.0546

Peak Match Tolerance: 0.175 MeV

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 PEAK AREA REPORT  
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| Nuclide  | Energy (MeV) | Net Pk Area | Pk Area Error % | Ambient Backgnd | Reagent Backgnd | FWHM (keV) |
|----------|--------------|-------------|-----------------|-----------------|-----------------|------------|
| TH-227   | 5.760        | -0.38       | 799.43          | 2.38            | 0.00E+000       | 2.9        |
| TH-228   | 5.309        | -0.23       | 1603.6          | 3.23            | 0.00E+000       | 2.9        |
| TH-229 T | 4.882        | 77.98       | 22.36           | 1.02            | 0.00E+000       | 6.8        |
| TH-230   | 4.577        | 5.15        | 94.34           | 0.85            | 0.00E+000       | 5.9        |
| TH-232   | 3.948        | 3.49        | 113.53          | 0.51            | 0.00E+000       | 5.9        |

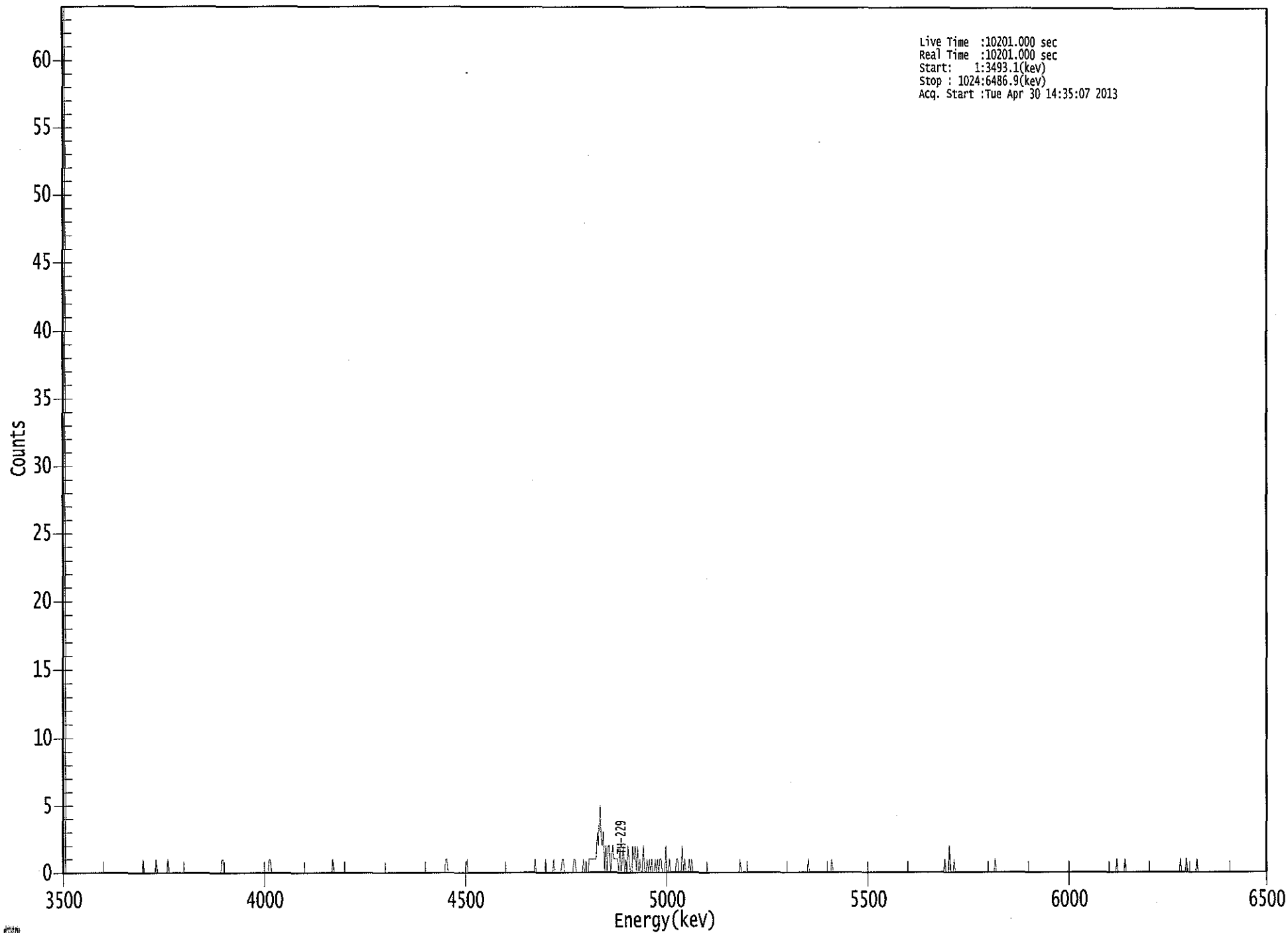
T = Tracer Peak used for Effective Efficiency

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 NUCLIDE ANALYSIS RESULTS  
 -----

| Nuclide | Id Conf. | Energy (keV) | Activity (pCi/liter)     | MDA (pCi/liter)         |
|---------|----------|--------------|--------------------------|-------------------------|
| TH-227  | 0.958    | 5850.00*     | -1.17E-002 +/- 9.35E-002 | 2.52E-001 +/- 5.84E-002 |
| TH-228  | 0.957    | 5400.00*     | -7.05E-003 +/- 1.13E-001 | 2.78E-001 +/- 6.45E-002 |
| TH-229  | 0.999    | 4872.00*     | 2.35E+000 +/- 5.44E-001  | 1.90E-001 +/- 4.39E-002 |
| TH-230  | 0.954    | 4672.00*     | 1.54E-001 +/- 1.50E-001  | 1.80E-001 +/- 4.16E-002 |
| TH-232  | 0.988    | 3997.00*     | 1.04E-001 +/- 1.21E-001  | 1.57E-001 +/- 3.64E-002 |

AG  
5/1/13

US EPA ARCHIVE DOCUMENT



Live Time :10201.000 sec  
Real Time :10201.000 sec  
Start: 1:3493.1(keV)  
Stop : 1024:6486.9(keV)  
Acq. Start :Tue Apr 30 14:35:07 2013

ROI Type: 1

ROI Type: 3

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

Sample Title: 17

Elapsed Live time: 10201

Elapsed Real Time: 10201

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

369: 0 0 0 0 0 0 0 0 0

Sample Title: 17

| Channel | ----- | ----- | ----- | ----- | ----- | ----- | ----- | ----- |
|---------|-------|-------|-------|-------|-------|-------|-------|-------|
| 377:    | 0     | 0     | 0     | 0     | 0     | 0     | 0     | 0     |
| 385:    | 0     | 0     | 0     | 0     | 0     | 0     | 0     | 0     |
| 393:    | 0     | 0     | 0     | 0     | 0     | 0     | 0     | 0     |
| 401:    | 0     | 1     | 0     | 0     | 0     | 0     | 0     | 0     |
| 409:    | 0     | 0     | 1     | 0     | 0     | 0     | 0     | 0     |
| 417:    | 0     | 1     | 0     | 0     | 0     | 0     | 0     | 0     |
| 425:    | 1     | 1     | 0     | 0     | 0     | 0     | 0     | 0     |
| 433:    | 0     | 0     | 1     | 1     | 0     | 0     | 0     | 0     |
| 441:    | 0     | 0     | 1     | 0     | 0     | 0     | 0     | 1     |
| 449:    | 1     | 1     | 1     | 1     | 1     | 1     | 3     | 2     |
| 457:    | 5     | 3     | 2     | 3     | 0     | 2     | 0     | 2     |
| 465:    | 2     | 0     | 1     | 2     | 1     | 1     | 1     | 1     |
| 473:    | 0     | 2     | 0     | 1     | 2     | 0     | 1     | 0     |
| 481:    | 2     | 1     | 0     | 0     | 2     | 1     | 2     | 0     |
| 489:    | 2     | 0     | 1     | 0     | 0     | 2     | 0     | 0     |
| 497:    | 1     | 0     | 1     | 0     | 1     | 0     | 0     | 1     |
| 505:    | 0     | 1     | 0     | 1     | 1     | 0     | 0     | 0     |
| 513:    | 2     | 0     | 0     | 1     | 0     | 0     | 0     | 0     |
| 521:    | 0     | 1     | 1     | 0     | 0     | 0     | 2     | 0     |
| 529:    | 1     | 0     | 0     | 0     | 1     | 0     | 1     | 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     | 1     |
| 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     | 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     | 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     | 1     | 0     | 0     |
| 753:    | 0     | 2     | 0     | 0     | 0     | 1     | 0     | 0     |
| 761:    | 0     | 0     | 0     | 0     | 0     | 0     | 0     | 0     |
| 769:    | 0     | 0     | 0     | 0     | 0     | 0     | 0     | 0     |
| 777:    | 0     | 0     | 0     | 0     | 0     | 0     | 0     | 0     |
| 785:    | 0     | 0     | 0     | 0     | 0     | 0     | 0     | 0     |
| 793:    | 1     | 0     | 0     | 0     | 0     | 0     | 0     | 0     |

801: 0 0 0 0 0 0 0 0

Sample Title: 17

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

K13  
4/30/13

# Apex-Alpha™

Sample Description: D-93 TOT  
 Spectrum File: \\OR-ALPHA1\Canberra\ApexAlpha\Root\Data\00000567  
 Batch Identification: 1304105A-TH  
 Sample Identification: 18  
 Sample Geometry: Shelf 2  
 Procedure Description: Th iso

Detector Name: Alpha\_010  
 Chamber Serial Number:  
 Detector Serial Number: 10  
 Env. Background: System Bkgd 55736  
 Reagent Blank: <not performed>

Sample Size: 1.000E+000 +/- 0.000E+000 liter  
 Sample Date/Time: 4/9/2013 7:24:51 AM  
 Acquisition Date/Time: 4/30/2013 2:35:03 PM  
 Acquisition Live Time: 170.0 minutes  
 Acquisition Real Time: 170.0 minutes

Tracer Certificate: Th229\_TH-18A  
 Tracer Quantity: 0.231 mL  
 Effective Efficiency: 0.2021 +/- 0.0165  
 Counting Efficiency: 0.1967 +/- 0.0036 on 12/15/2012 11:26:40 AM  
 Chem. Recovery Factor: 1.0273 +/- 0.0857

Peak Match Tolerance: 0.175 MeV

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 PEAK AREA REPORT  
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| Nuclide  | Energy (MeV) | Net Pk Area | Pk Area Error % | Ambient Backgnd | Reagent Backgnd | FWHM (keV) |
|----------|--------------|-------------|-----------------|-----------------|-----------------|------------|
| TH-227   | 5.770        | 2.11        | 217.70          | 2.89            | 0.00E+000       | 2.9        |
| TH-228   | 5.375        | 11.92       | 67.18           | 4.08            | 0.00E+000       | 2.9        |
| TH-229 T | 4.874        | 178.30      | 14.76           | 1.70            | 0.00E+000       | 3.9        |
| TH-230   | 4.658        | 6.64        | 84.69           | 1.36            | 0.00E+000       | 2.9        |
| TH-232   | 3.905        | 0.81        | 359.14          | 1.19            | 0.00E+000       | 5.9        |

T = Tracer Peak used for Effective Efficiency

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 NUCLIDE ANALYSIS RESULTS  
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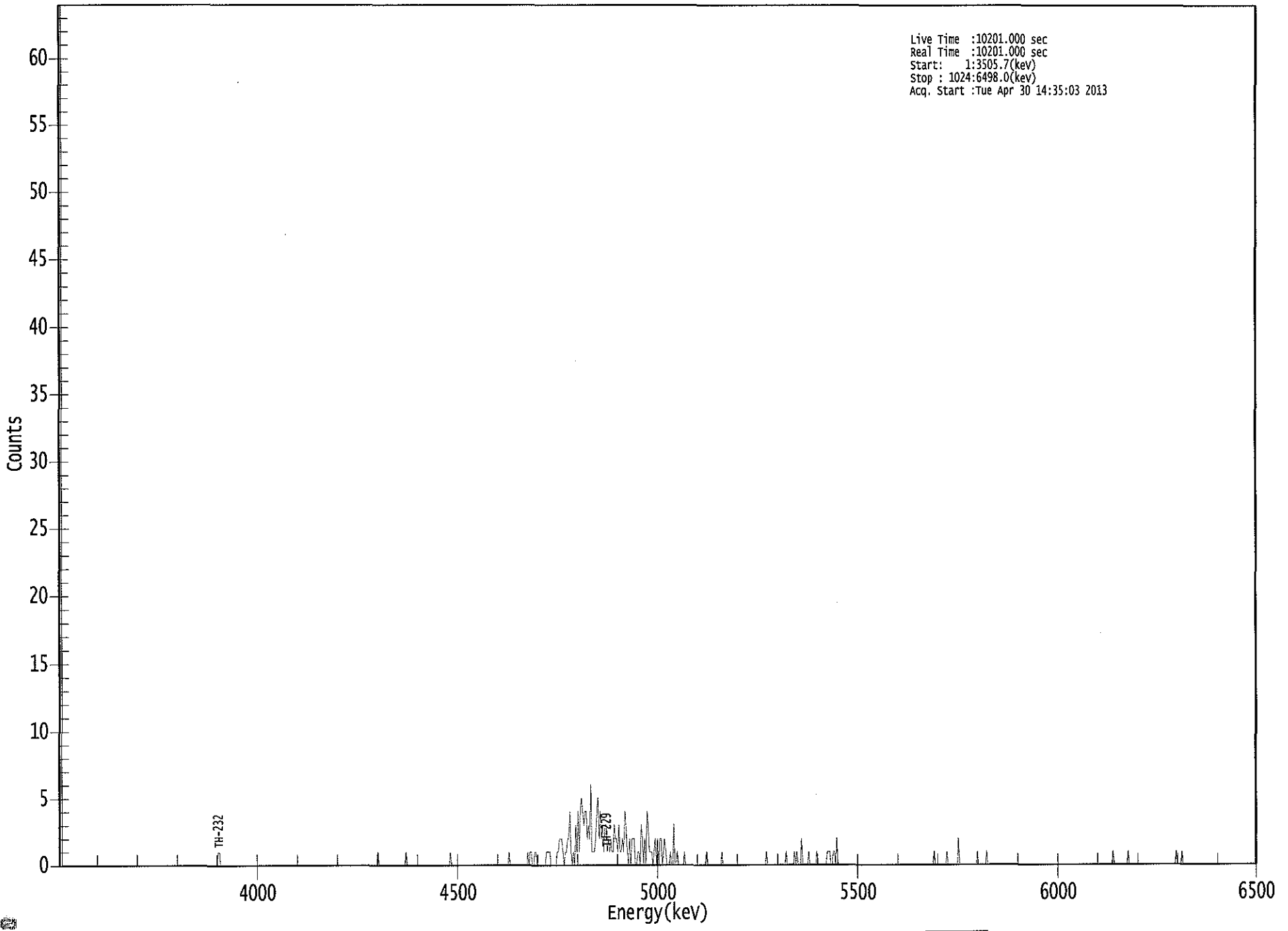
| Nuclide | Id Conf. | Energy (keV) | Activity (pCi/liter )   | MDA (pCi/liter )        |
|---------|----------|--------------|-------------------------|-------------------------|
| TH-227  | 0.967    | 5850.00*     | 2.84E-002 +/- 6.20E-002 | 1.18E-001 +/- 1.88E-002 |
| TH-228  | 0.997    | 5400.00*     | 1.60E-001 +/- 1.10E-001 | 1.33E-001 +/- 2.12E-002 |
| TH-229  | 1.000    | 4872.00*     | 2.35E+000 +/- 3.75E-001 | 9.68E-002 +/- 1.54E-002 |
| TH-230  | 0.999    | 4672.00*     | 8.72E-002 +/- 7.52E-002 | 9.01E-002 +/- 1.44E-002 |
| TH-232  | 0.957    | 3997.00*     | 1.06E-002 +/- 3.82E-002 | 8.64E-002 +/- 1.38E-002 |

AG  
5/1/13



0000056749.CNF

Live Time :10201.000 sec  
Real Time :10201.000 sec  
Start: 1:3505.7(keV)  
Stop : 1024:6498.0(keV)  
Acq. Start :Tue Apr 30 14:35:03 2013



US EPA ARCHIVE DOCUMENT

7030

ROI Type: 1

ROI Type: 3

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

Sample Title: 18

Elapsed Live time: 10201

Elapsed Real Time: 10201

| Channel | ----- | ----- | ----- | ----- | ----- | ----- | ----- | ----- |
|---------|-------|-------|-------|-------|-------|-------|-------|-------|
| 1:      | 10201 | 10201 | 0     | 0     | 0     | 0     | 0     | 0     |
| 9:      | 0     | 0     | 0     | 0     | 0     | 0     | 0     | 0     |
| 17:     | 0     | 0     | 0     | 0     | 0     | 0     | 0     | 0     |
| 25:     | 0     | 0     | 0     | 0     | 0     | 0     | 0     | 0     |
| 33:     | 0     | 0     | 0     | 0     | 0     | 0     | 0     | 0     |
| 41:     | 0     | 0     | 0     | 0     | 0     | 0     | 0     | 0     |
| 49:     | 0     | 0     | 0     | 0     | 0     | 0     | 0     | 0     |
| 57:     | 0     | 0     | 0     | 0     | 0     | 0     | 0     | 0     |
| 65:     | 0     | 0     | 0     | 0     | 0     | 0     | 0     | 0     |
| 73:     | 0     | 0     | 0     | 0     | 0     | 0     | 0     | 0     |
| 81:     | 0     | 0     | 0     | 0     | 0     | 0     | 0     | 0     |
| 89:     | 0     | 0     | 0     | 0     | 0     | 0     | 0     | 0     |
| 97:     | 0     | 0     | 0     | 0     | 0     | 0     | 0     | 0     |
| 105:    | 0     | 0     | 0     | 0     | 0     | 0     | 0     | 0     |
| 113:    | 0     | 0     | 0     | 0     | 0     | 0     | 0     | 0     |
| 121:    | 0     | 0     | 0     | 0     | 0     | 0     | 0     | 0     |
| 129:    | 0     | 0     | 0     | 0     | 0     | 0     | 0     | 0     |
| 137:    | 1     | 1     | 0     | 0     | 0     | 0     | 0     | 0     |
| 145:    | 0     | 0     | 0     | 0     | 0     | 0     | 0     | 0     |
| 153:    | 0     | 0     | 0     | 0     | 0     | 0     | 0     | 0     |
| 161:    | 0     | 0     | 0     | 0     | 0     | 0     | 0     | 0     |
| 169:    | 0     | 0     | 0     | 0     | 0     | 0     | 0     | 0     |
| 177:    | 0     | 0     | 0     | 0     | 0     | 0     | 0     | 0     |
| 185:    | 0     | 0     | 0     | 0     | 0     | 0     | 0     | 0     |
| 193:    | 0     | 0     | 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:    | 1     | 0     | 0     | 0     | 0     | 0     | 0     | 0     |
| 281:    | 0     | 0     | 0     | 0     | 0     | 0     | 0     | 0     |
| 289:    | 0     | 0     | 0     | 0     | 0     | 0     | 0     | 0     |
| 297:    | 1     | 0     | 0     | 0     | 0     | 0     | 0     | 0     |
| 305:    | 0     | 0     | 0     | 0     | 0     | 0     | 0     | 0     |
| 313:    | 0     | 0     | 0     | 0     | 0     | 0     | 0     | 0     |
| 321:    | 0     | 0     | 0     | 0     | 0     | 0     | 0     | 0     |
| 329:    | 0     | 0     | 0     | 0     | 0     | 0     | 1     | 0     |
| 337:    | 0     | 0     | 0     | 0     | 0     | 0     | 0     | 0     |
| 345:    | 0     | 0     | 0     | 0     | 0     | 0     | 0     | 0     |
| 353:    | 0     | 0     | 0     | 0     | 0     | 0     | 0     | 0     |
| 361:    | 0     | 0     | 0     | 0     | 0     | 0     | 0     | 0     |

369: 0 0 0 0 0 0 0 0 0

Sample Title: 18

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

801: 0 0 0 0 0 0 0 0 0

Sample Title: 18

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

10/3  
4/30/13

# Apex-Alpha™

Sample Description: D-93 DIS  
 Spectrum File: \\OR-ALPHA1\Canberra\ApexAlpha\Root\Data\00000567  
 Batch Identification: 1304105A-TH  
 Sample Identification: 19  
 Sample Geometry: Shelf 2  
 Procedure Description: Th iso

Detector Name: Alpha\_011  
 Chamber Serial Number:  
 Detector Serial Number: 11  
 Env. Background: System Bkgd 55737  
 Reagent Blank: <not performed>

Sample Size: 1.000E+000 +/- 0.000E+000 liter  
 Sample Date/Time: 4/9/2013 7:24:51 AM  
 Acquisition Date/Time: 4/30/2013 2:35:04 PM  
 Acquisition Live Time: 170.0 minutes  
 Acquisition Real Time: 170.0 minutes

Tracer Certificate: Th229\_TH-18A  
 Tracer Quantity: 0.229 mL  
 Effective Efficiency: 0.2463 +/- 0.0185  
 Counting Efficiency: 0.1973 +/- 0.0042 on 12/15/2012 11:28:06 AM  
 Chem. Recovery Factor: 1.2485 +/- 0.0974

Peak Match Tolerance: 0.175 MeV

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 PEAK AREA REPORT  
 -----

| Nuclide  | Energy (MeV) | Net Pk Area | Pk Area Error % | Ambient Backgnd | Reagent Backgnd | FWHM (keV) |
|----------|--------------|-------------|-----------------|-----------------|-----------------|------------|
| TH-227   | 5.865        | 0.13        | 2298.1          | 1.87            | 0.00E+000       | 2.7        |
| TH-228   | 5.362        | 4.96        | 107.11          | 2.04            | 0.00E+000       | 2.7        |
| TH-229 T | 4.850        | 215.47      | 13.41           | 1.53            | 0.00E+000       | 3.4        |
| TH-230   | 4.629        | 14.66       | 51.88           | 0.34            | 0.00E+000       | 2.7        |
| TH-232   | 3.981        | 2.49        | 138.30          | 0.51            | 0.00E+000       | 2.7        |

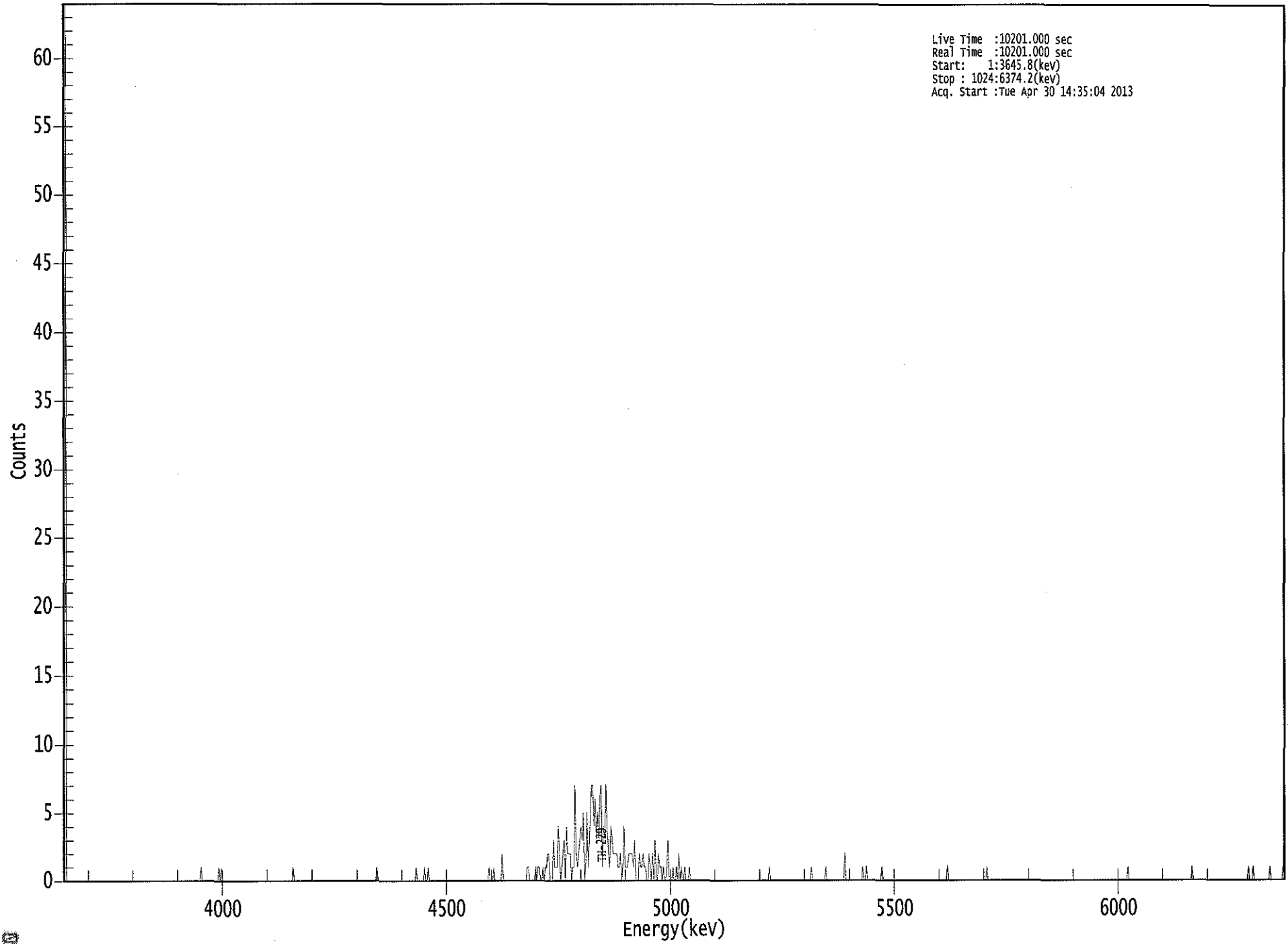
T = Tracer Peak used for Effective Efficiency

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 NUCLIDE ANALYSIS RESULTS  
 -----

| Nuclide | Id Conf. | Energy (keV) | Activity (pCi/liter)    | MDA (pCi/liter)         |
|---------|----------|--------------|-------------------------|-------------------------|
| TH-227  | 0.999    | 5850.00*     | 1.43E-003 +/- 3.30E-002 | 8.37E-002 +/- 1.23E-002 |
| TH-228  | 0.992    | 5400.00*     | 5.45E-002 +/- 5.89E-002 | 8.56E-002 +/- 1.26E-002 |
| TH-229  | 0.997    | 4872.00*     | 2.33E+000 +/- 3.43E-001 | 7.68E-002 +/- 1.13E-002 |
| TH-230  | 0.990    | 4672.00*     | 1.58E-001 +/- 8.52E-002 | 5.15E-002 +/- 7.58E-003 |
| TH-232  | 0.999    | 3997.00*     | 2.68E-002 +/- 3.72E-002 | 5.64E-002 +/- 8.31E-003 |

AG  
 5/1/13

US EPA ARCHIVE DOCUMENT



60309

ROI Type: 1

ROI Type: 3

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

Sample Title: 19

Elapsed Live time: 10201

Elapsed Real Time: 10201

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

369: 0 0 0 0 0 0 0 0 0

Sample Title: 19

| Channel | ----- | ----- | ----- | ----- | ----- | ----- | ----- | ----- |
|---------|-------|-------|-------|-------|-------|-------|-------|-------|
| 377:    | 0     | 0     | 0     | 0     | 0     | 0     | 0     | 0     |
| 385:    | 0     | 0     | 0     | 0     | 1     | 1     | 0     | 0     |
| 393:    | 0     | 0     | 0     | 1     | 0     | 1     | 1     | 0     |
| 401:    | 0     | 1     | 0     | 1     | 1     | 2     | 2     | 0     |
| 409:    | 0     | 0     | 3     | 1     | 1     | 1     | 4     | 2     |
| 417:    | 0     | 1     | 2     | 3     | 0     | 4     | 2     | 2     |
| 425:    | 2     | 0     | 1     | 1     | 7     | 2     | 1     | 2     |
| 433:    | 3     | 4     | 3     | 5     | 0     | 1     | 5     | 1     |
| 441:    | 3     | 5     | 7     | 7     | 4     | 6     | 3     | 5     |
| 449:    | 3     | 6     | 7     | 1     | 4     | 3     | 7     | 4     |
| 457:    | 2     | 1     | 4     | 3     | 2     | 2     | 2     | 2     |
| 465:    | 1     | 1     | 2     | 0     | 1     | 4     | 1     | 1     |
| 473:    | 1     | 2     | 2     | 2     | 2     | 1     | 3     | 0     |
| 481:    | 0     | 0     | 2     | 1     | 1     | 2     | 1     | 1     |
| 489:    | 0     | 0     | 2     | 1     | 0     | 2     | 0     | 3     |
| 497:    | 0     | 0     | 2     | 1     | 1     | 0     | 1     | 0     |
| 505:    | 0     | 1     | 3     | 0     | 0     | 0     | 1     | 0     |
| 513:    | 0     | 1     | 0     | 2     | 0     | 1     | 0     | 0     |
| 521:    | 1     | 0     | 0     | 0     | 1     | 0     | 0     | 0     |
| 529:    | 0     | 0     | 0     | 0     | 0     | 0     | 0     | 0     |
| 537:    | 0     | 0     | 0     | 0     | 0     | 0     | 0     | 0     |
| 545:    | 0     | 0     | 0     | 0     | 0     | 0     | 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     | 1     |
| 593:    | 0     | 0     | 0     | 0     | 0     | 0     | 0     | 0     |
| 601:    | 0     | 0     | 0     | 0     | 0     | 0     | 0     | 0     |
| 609:    | 0     | 0     | 0     | 0     | 0     | 0     | 0     | 0     |
| 617:    | 0     | 0     | 0     | 0     | 0     | 0     | 0     | 0     |
| 625:    | 0     | 0     | 1     | 0     | 0     | 0     | 0     | 0     |
| 633:    | 0     | 0     | 0     | 0     | 0     | 0     | 1     | 0     |
| 641:    | 0     | 0     | 0     | 0     | 0     | 0     | 0     | 0     |
| 649:    | 0     | 0     | 0     | 0     | 0     | 0     | 2     | 0     |
| 657:    | 0     | 0     | 0     | 0     | 0     | 0     | 0     | 0     |
| 665:    | 0     | 0     | 0     | 0     | 0     | 1     | 0     | 0     |
| 673:    | 1     | 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     | 0     |
| 729:    | 0     | 0     | 0     | 0     | 0     | 0     | 0     | 0     |
| 737:    | 0     | 0     | 0     | 0     | 1     | 0     | 0     | 0     |
| 745:    | 0     | 0     | 0     | 0     | 0     | 0     | 0     | 0     |
| 753:    | 0     | 0     | 0     | 0     | 0     | 0     | 0     | 0     |
| 761:    | 0     | 0     | 0     | 0     | 0     | 0     | 0     | 0     |
| 769:    | 0     | 0     | 0     | 0     | 0     | 1     | 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: 19

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



## QA SUMMARY REPORT

### Review Of QA Results - Pulser Check

Date : 4/30/2013  
Time : 5:44:34 AM

| CHAMBER   | DEVICE             | PARAMETER | FLAG     | DATE                 |
|-----------|--------------------|-----------|----------|----------------------|
| Alpha 001 | 21f                | ALL       | Not Done |                      |
| Alpha 002 | 21f                | ALL       | Not Done |                      |
| Alpha 003 | 21f                | ALL       | Passed   | 4/30/2013 5:21:25 AM |
| Alpha 004 | 21f                | ALL       | Passed   | 4/30/2013 5:21:26 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   | 4/30/2013 5:21:27 AM |
| Alpha 011 | 21f                | ALL       | Passed   | 4/30/2013 5:21:28 AM |
| Alpha 012 | 21f                | ALL       | Not Done |                      |
| Alpha 013 | 21f                | ALL       | Passed   | 4/30/2013 5:21:29 AM |
| Alpha 014 | 21f                | ALL       | Passed   | 4/30/2013 5:21:30 AM |
| Alpha 015 | 21f                | ALL       | Not Done |                      |
| Alpha 016 | 21f                | ALL       | Not Done |                      |
| Alpha 017 | AIM730             | ALL       | Not Done |                      |
| Alpha 018 | AIM730             | ALL       | Passed   | 4/30/2013 5:21:30 AM |
| Alpha 019 | AIM730             | ALL       | Not Done |                      |
| Alpha 020 | AIM730             | ALL       | Not Done |                      |
| Alpha 021 | AIM730             | ALL       | Not Done |                      |
| Alpha 022 | AIM730             | ALL       | Passed   | 4/30/2013 5:21:31 AM |
| Alpha 023 | AIM730             | ALL       | Not Done |                      |
| Alpha 024 | AIM730             | ALL       | Passed   | 4/30/2013 5:21:32 AM |
| Alpha 025 | AIM730             | ALL       | Passed   | 4/30/2013 5:21:33 AM |
| Alpha 026 | AIM730             | ALL       | Not Done |                      |
| Alpha 027 | AIM730             | ALL       | Passed   | 4/30/2013 5:21:34 AM |
| Alpha 028 | AIM730             | ALL       | Not Done |                      |
| Alpha 029 | AIM730             | ALL       | Passed   | 4/30/2013 5:21:35 AM |
| Alpha 030 | AIM730             | ALL       | Not Done |                      |
| Alpha 031 | AIM730             | ALL       | Not Done |                      |
| Alpha 032 | AIM730             | ALL       | Not Done |                      |
| Alpha 033 | Alpha Analyst100DC | ALL       | Passed   | 4/30/2013 5:21:36 AM |
| Alpha 034 | Alpha Analyst100DC | ALL       | Passed   | 4/30/2013 5:21:38 AM |
| Alpha 035 | Alpha Analyst100DC | ALL       | Passed   | 4/30/2013 5:21:39 AM |
| Alpha 036 | Alpha Analyst100DC | ALL       | Passed   | 4/29/2013 5:29:59 AM |
| Alpha 037 | Alpha Analyst100DC | ALL       | Passed   | 4/30/2013 5:21:40 AM |
| Alpha 038 | Alpha Analyst100DC | ALL       | Not Done |                      |
| Alpha 039 | Alpha Analyst100DC | ALL       | Passed   | 4/29/2013 5:30:03 AM |
| Alpha 040 | Alpha Analyst100DC | ALL       | Passed   | 4/30/2013 5:21:42 AM |
| Alpha 041 | Alpha Analyst100DC | ALL       | Passed   | 4/30/2013 5:21:43 AM |
| Alpha 042 | Alpha Analyst100DC | ALL       | Passed   | 4/30/2013 5:21:45 AM |

| CHAMBER   | DEVICE             | PARAMETER | FLAG     | DATE                 |
|-----------|--------------------|-----------|----------|----------------------|
| Alpha 043 | Alpha Analyst100DC | ALL       | Passed   | 4/29/2013 5:30:09 AM |
| Alpha 044 | Alpha Analyst100DC | ALL       | Passed   | 4/30/2013 5:21:47 AM |
| Alpha 045 | Alpha Analyst100DC | ALL       | Not Done |                      |
| Alpha 046 | Alpha Analyst100DC | ALL       | Passed   | 4/30/2013 5:21:48 AM |
| Alpha 047 | Alpha Analyst100DC | ALL       | Passed   | 4/30/2013 5:21:50 AM |
| Alpha 048 | Alpha Analyst100DC | ALL       | Passed   | 4/30/2013 5:21:52 AM |

APPROVED BY:           C          

APPROVAL DATE:           4/17/11          

US EPA ARCHIVE DOCUMENT

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

Nuclide Library Title: Thorium

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

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

\* = key line

TOTALS: 5 Nuclides 5 Energy Lines

US EPA ARCHIVE DOCUMENT

**SECTION X**  
**ANALYTICAL DATA (RADIUM-226)**

US EPA ARCHIVE DOCUMENT

| Work Order           | 13-04105                             | Internal Fraction | Sample Desc | Client ID     | Login CPM | Sample Date    | Sample Aliquot |
|----------------------|--------------------------------------|-------------------|-------------|---------------|-----------|----------------|----------------|
| Analysis Code        | Ra226                                | 01                | LCS         | LCS           |           | 04/16/13 00:00 | 1.0000E+00     |
| Run                  | 1                                    | 02                | MBL         | BLANK         |           | 04/16/13 00:00 | 1.5000E+00     |
| Date Received        | 4/16/2013                            | 03                | DUP         | PZ-106-SS TOT | 41        | 04/09/13 12:56 | 1.5000E+00     |
| Lab Deadline         | 5/7/2013                             | 04                | TRG         | PZ-204-SS TOT | 39        | 04/09/13 09:30 | 1.5000E+00     |
| Client               | Engineering Management Support, Inc. | 05                | TRG         | PZ-204-SS DIS | 39        | 04/09/13 09:30 | 1.5000E+00     |
| Project              | West Lake OU-1                       | 06                | TRG         | I-68 TOT      | 45        | 04/09/13 10:44 | 1.5000E+00     |
| Report Level         | 4                                    | 07                | TRG         | I-68 DIS      | 45        | 04/09/13 10:44 | 1.5000E+00     |
| Activity Units       | pCi                                  | 08                | TRG         | D-87 TOT      | 42        | 04/09/13 11:05 | 1.5000E+00     |
| Aliquot Units        | I                                    | 09                | TRG         | D-87 DIS      | 42        | 04/09/13 11:05 | 1.5000E+00     |
| Matrix               | WA                                   | 10                | TRG         | PZ-106-SD TOT | 37        | 04/09/13 12:00 | 1.5000E+00     |
| Method               | EPA 903.0 Modified                   | 11                | TRG         | PZ-106-SD DIS | 37        | 04/09/13 12:00 | 1.5000E+00     |
| Instrument Type      | Alpha Spectroscopy                   | 12                | TRG         | S-82 TOT      | 46        | 04/09/13 12:27 | 1.5000E+00     |
| Radiometric Tracer   | Ba-133                               | 13                | TRG         | S-82 DIS      | 46        | 04/09/13 12:27 | 1.5000E+00     |
| Radiometric Sol#     | Ba-6a                                | 14                | DO          | PZ-106-SS TOT | 41        | 04/09/13 12:56 | 1.5000E+00     |
| Tracer Act (dpm/g)   | 1009.23                              | 15                | TRG         | PZ-106-SS DIS | 41        | 04/09/13 12:56 | 1.5000E+00     |
| Carrier              |                                      | 16                | TRG         | I-9 TOT       | 43        | 04/09/13 13:35 | 1.5000E+00     |
| Carrier Conc (mg/ml) |                                      | 17                | TRG         | I-9 DIS       | 43        | 04/09/13 13:35 | 1.5000E+00     |
|                      |                                      | 18                | TRG         | D-93 TOT      | 40        | 04/09/13 14:28 | 1.5000E+00     |
|                      |                                      | 19                | TRG         | D-93 DIS      | 40        | 04/09/13 14:28 | 1.5000E+00     |
|                      |                                      |                   |             |               |           |                |                |

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

Ra226

Run 1

| Internal Fraction | Sample Desc | Tracer Aliquot (g) | Tracer Total ACT (dpm) | Radiometric Tracer (pCi) | Radiometric % Rec | Grav Carrier Added (ml) | Grav Filter Tare (g) | Grav Filter Final (g) | Grav Filter Net (g) | Grav % Rec | Mean % Rec | SAF 1* | SAF 2* |
|-------------------|-------------|--------------------|------------------------|--------------------------|-------------------|-------------------------|----------------------|-----------------------|---------------------|------------|------------|--------|--------|
| 01                | LCS         | 0.9100             | 918.4                  | 372.6                    | 90.07             |                         | 0.0226               | 0.0282                | 0.0056              |            | 90.07      | 2.00   | 1.00   |
| 02                | MBL         | 0.9078             | 916.2                  | 397.2                    | 96.25             |                         | 0.0226               | 0.0287                | 0.0061              |            | 96.25      | 2.20   | 1.00   |
| 03                | DUP         | 0.9020             | 910.3                  | 397.5                    | 96.94             |                         | 0.0228               | 0.0293                | 0.0065              |            | 96.94      | 2.34   | 1.00   |
| 04                | TRG         | 0.9022             | 910.5                  | 390.2                    | 95.14             |                         | 0.0224               | 0.0294                | 0.0070              |            | 95.14      | 2.50   | 1.00   |
| 05                | TRG         | 0.8999             | 908.2                  | 353.2                    | 86.34             |                         | 0.0222               | 0.0292                | 0.0070              |            | 86.34      | 2.50   | 1.00   |
| 06                | TRG         | 0.8974             | 905.7                  | 303.2                    | 74.32             |                         | 0.0224               | 0.0310                | 0.0086              |            | 74.32      | 2.91   | 1.00   |
| 07                | TRG         | 0.9000             | 908.3                  | 396.1                    | 96.81             |                         | 0.0228               | 0.0308                | 0.0080              |            | 96.81      | 2.77   | 1.00   |
| 08                | TRG         | 0.9039             | 912.2                  | 435.9                    | 106.08            |                         | 0.0224               | 0.0321                | 0.0097              |            | 106.08     | 3.20   | 1.00   |
| 09                | TRG         | 0.9018             | 910.1                  | 461.4                    | 112.55            |                         | 0.0224               | 0.0314                | 0.0090              |            | 110.00     | 3.01   | 1.00   |
| 10                | TRG         | 0.9010             | 909.3                  | 393.0                    | 95.95             |                         | 0.0226               | 0.0293                | 0.0067              |            | 95.95      | 2.40   | 1.00   |
| 11                | TRG         | 0.8990             | 907.3                  | 395.2                    | 96.70             |                         | 0.0227               | 0.0294                | 0.0067              |            | 96.70      | 2.40   | 1.00   |
| 12                | TRG         | 0.8983             | 906.6                  | 409.3                    | 100.23            |                         | 0.0229               | 0.0316                | 0.0087              |            | 100.23     | 2.94   | 1.00   |
| 13                | TRG         | 0.8988             | 907.1                  | 347.9                    | 85.14             |                         | 0.0228               | 0.0302                | 0.0074              |            | 85.14      | 2.61   | 1.00   |
| 14                | DO          | 0.8986             | 906.9                  | 398.4                    | 97.52             |                         | 0.0225               | 0.0294                | 0.0069              |            | 97.52      | 2.47   | 1.00   |
| 15                | TRG         | 0.8996             | 907.9                  | 376.6                    | 92.09             |                         | 0.0228               | 0.0298                | 0.0070              |            | 92.09      | 2.50   | 1.00   |
| 16                | TRG         | 0.9039             | 912.2                  | 385.6                    | 93.84             |                         | 0.0229               | 0.0328                | 0.0099              |            | 93.84      | 3.25   | 1.00   |
| 17                | TRG         | 0.8980             | 906.3                  | 364.7                    | 89.34             |                         | 0.0222               | 0.0310                | 0.0088              |            | 89.34      | 2.96   | 1.00   |
| 18                | TRG         | 0.8796             | 887.7                  | 369.7                    | 92.45             |                         | 0.0223               | 0.0337                | 0.0114              |            | 92.45      | 3.77   | 1.00   |
| 19                | TRG         | 0.8995             | 907.8                  | 423.1                    | 103.47            |                         | 0.0226               | 0.0326                | 0.0100              |            | 103.47     | 3.28   | 1.00   |
|                   |             |                    |                        |                          |                   |                         |                      |                       |                     |            |            |        |        |

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

0313

| 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         |                 |               | 04/24/13 11:50 | JBARNARD | 04/30/13 11:38   | TSMITH    |                  |           |
| 02                | MBL         |                 |               | 04/24/13 11:50 | JBARNARD | 04/30/13 11:38   | TSMITH    |                  |           |
| 03                | DUP         |                 |               | 04/24/13 11:50 | JBARNARD | 04/30/13 11:38   | TSMITH    |                  |           |
| 04                | TRG         |                 |               | 04/24/13 11:50 | JBARNARD | 04/30/13 11:38   | TSMITH    |                  |           |
| 05                | TRG         |                 |               | 04/24/13 11:50 | JBARNARD | 04/30/13 11:38   | TSMITH    |                  |           |
| 06                | TRG         |                 |               | 04/24/13 11:50 | JBARNARD | 04/30/13 11:38   | TSMITH    |                  |           |
| 07                | TRG         |                 |               | 04/24/13 11:50 | JBARNARD | 04/30/13 11:38   | TSMITH    |                  |           |
| 08                | TRG         |                 |               | 04/24/13 11:50 | JBARNARD | 04/30/13 11:38   | TSMITH    |                  |           |
| 09                | TRG         |                 |               | 04/24/13 11:50 | JBARNARD | 04/30/13 11:38   | TSMITH    |                  |           |
| 10                | TRG         |                 |               | 04/24/13 11:50 | JBARNARD | 04/30/13 11:38   | TSMITH    |                  |           |
| 11                | TRG         |                 |               | 04/24/13 11:50 | JBARNARD | 04/30/13 11:38   | TSMITH    |                  |           |
| 12                | TRG         |                 |               | 04/24/13 11:50 | JBARNARD | 04/30/13 11:38   | TSMITH    |                  |           |
| 13                | TRG         |                 |               | 04/24/13 11:50 | JBARNARD | 04/30/13 11:38   | TSMITH    |                  |           |
| 14                | DO          |                 |               | 04/24/13 11:50 | JBARNARD | 04/30/13 11:38   | TSMITH    |                  |           |
| 15                | TRG         |                 |               | 04/24/13 11:50 | JBARNARD | 04/30/13 11:38   | TSMITH    |                  |           |
| 16                | TRG         |                 |               | 04/24/13 11:50 | JBARNARD | 04/30/13 11:38   | TSMITH    |                  |           |
| 17                | TRG         |                 |               | 04/24/13 11:50 | JBARNARD | 04/30/13 11:38   | TSMITH    |                  |           |
| 18                | TRG         |                 |               | 04/24/13 11:50 | JBARNARD | 04/30/13 11:38   | TSMITH    |                  |           |
| 19                | TRG         |                 |               | 04/24/13 11:50 | JBARNARD | 04/30/13 11:38   | TSMITH    |                  |           |
|                   |             |                 |               |                |          |                  |           |                  |           |

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

0010



Preliminary Data Report & Analytical Calculations  
**Work Order: 13-04105-Ra226-1**

| Lab Fraction | Nuclide | Sample Desc | Client Identification | Activity Units | Results  | Error Estimate | MDA      | LCS Known | LCS %R | LCS Flag | RPD Flag | MDA Flag | Blank Flag |
|--------------|---------|-------------|-----------------------|----------------|----------|----------------|----------|-----------|--------|----------|----------|----------|------------|
| 01           | RA-226  | LCS         | LCS                   | pCi/l          | 1.04E+01 | 1.15E+00       | 2.26E-01 | 1.02E+01  | 101.12 | OK       |          | OK       |            |
| 02           | RA-226  | MBL         | BLANK                 | pCi/l          | 5.10E-02 | 7.05E-02       | 1.07E-01 |           |        |          |          | OK       | OK         |
| 03           | RA-226  | DUP         | PZ-106-SS TOT         | pCi/l          | 2.63E+00 | 4.91E-01       | 1.37E-01 |           |        |          | OK       | OK       |            |
| 04           | RA-226  | TRG         | PZ-204-SS TOT         | pCi/l          | 1.26E+00 | 3.56E-01       | 1.58E-01 |           |        |          |          | OK       |            |
| 05           | RA-226  | TRG         | PZ-204-SS DIS         | pCi/l          | 8.68E-01 | 3.22E-01       | 2.18E-01 |           |        |          |          | OK       |            |
| 06           | RA-226  | TRG         | I-68 TOT              | pCi/l          | 3.34E+00 | 7.83E-01       | 3.52E-01 |           |        |          |          | OK       |            |
| 07           | RA-226  | TRG         | I-68 DIS              | pCi/l          | 6.70E-01 | 2.79E-01       | 1.41E-01 |           |        |          |          | OK       |            |
| 08           | RA-226  | TRG         | D-87 TOT              | pCi/l          | 1.33E+00 | 4.17E-01       | 2.05E-01 |           |        |          |          | OK       |            |
| 09           | RA-226  | TRG         | D-87 DIS              | pCi/l          | 7.53E-01 | 3.10E-01       | 2.19E-01 |           |        |          |          | OK       |            |
| 10           | RA-226  | TRG         | PZ-106-SD TOT         | pCi/l          | 1.04E+00 | 3.08E-01       | 1.56E-01 |           |        |          |          | OK       |            |
| 11           | RA-226  | TRG         | PZ-106-SD DIS         | pCi/l          | 6.08E-01 | 2.42E-01       | 1.36E-01 |           |        |          |          | OK       |            |
| 12           | RA-226  | TRG         | S-82 TOT              | pCi/l          | 1.63E+00 | 4.25E-01       | 1.68E-01 |           |        |          |          | OK       |            |
| 13           | RA-226  | TRG         | S-82 DIS              | pCi/l          | 6.37E-01 | 2.74E-01       | 1.56E-01 |           |        |          |          | OK       |            |
| 14           | RA-226  | DO          | PZ-106-SS TOT         | pCi/l          | 2.80E+00 | 5.31E-01       | 1.20E-01 |           |        |          |          | OK       |            |
| 15           | RA-226  | TRG         | PZ-106-SS DIS         | pCi/l          | 3.12E+00 | 5.61E-01       | 1.32E-01 |           |        |          |          | OK       |            |
| 16           | RA-226  | TRG         | I-9 TOT               | pCi/l          | 1.48E+00 | 4.28E-01       | 2.04E-01 |           |        |          |          | OK       |            |
| 17           | RA-226  | TRG         | I-9 DIS               | pCi/l          | 6.65E-01 | 2.93E-01       | 2.00E-01 |           |        |          |          | OK       |            |
| 18           | RA-226  | TRG         | D-93 TOT              | pCi/l          | 3.02E+00 | 7.10E-01       | 3.12E-01 |           |        |          |          | OK       |            |
| 19           | RA-226  | TRG         | D-93 DIS              | pCi/l          | 1.93E+00 | 4.81E-01       | 2.12E-01 |           |        |          |          | OK       |            |

|  |                                      |       |
|--|--------------------------------------|-------|
|  | Run                                  | 1     |
|  | Analysis Code                        | Ra226 |
| Eberline Services Work Order   | 13-04105                             |       |
| Client   | Engineering Management Support, Inc. |       |

Preliminary Data Report & Analytical Calculations  
**Work Order: 13-04105-Ra226-1**

| Lab Fraction | Nuclide | Sample Desc | Sample Date    | Sample Aliquot | Radiometric % Rec | Grav % Rec | Mean % Rec | SAF | Sep t0 Date/Time | Sep t1 Date/Time |
|--------------|---------|-------------|----------------|----------------|-------------------|------------|------------|-----|------------------|------------------|
| 01           | RA-226  | LCS         | 04/16/13 00:00 | 1.00E+00       | 90.07             | 0.00       | 90.07      |     | 4/30/2013 11:38  |                  |
| 02           | RA-226  | MBL         | 04/16/13 00:00 | 1.50E+00       | 96.25             | 0.00       | 96.25      |     | 4/30/2013 11:38  |                  |
| 03           | RA-226  | DUP         | 04/09/13 12:56 | 1.50E+00       | 96.94             | 0.00       | 96.94      |     | 4/30/2013 11:38  |                  |
| 04           | RA-226  | TRG         | 04/09/13 09:30 | 1.50E+00       | 95.14             | 0.00       | 95.14      |     | 4/30/2013 11:38  |                  |
| 05           | RA-226  | TRG         | 04/09/13 09:30 | 1.50E+00       | 86.34             | 0.00       | 86.34      |     | 4/30/2013 11:38  |                  |
| 06           | RA-226  | TRG         | 04/09/13 10:44 | 1.50E+00       | 74.32             | 0.00       | 74.32      |     | 4/30/2013 11:38  |                  |
| 07           | RA-226  | TRG         | 04/09/13 10:44 | 1.50E+00       | 96.81             | 0.00       | 96.81      |     | 4/30/2013 11:38  |                  |
| 08           | RA-226  | TRG         | 04/09/13 11:05 | 1.50E+00       | 100.00            | 0.00       | 106.08     |     | 4/30/2013 11:38  |                  |
| 09           | RA-226  | TRG         | 04/09/13 11:05 | 1.50E+00       | 100.00            | 0.00       | 110.00     |     | 4/30/2013 11:38  |                  |
| 10           | RA-226  | TRG         | 04/09/13 12:00 | 1.50E+00       | 95.95             | 0.00       | 95.95      |     | 4/30/2013 11:38  |                  |
| 11           | RA-226  | TRG         | 04/09/13 12:00 | 1.50E+00       | 96.70             | 0.00       | 96.70      |     | 4/30/2013 11:38  |                  |
| 12           | RA-226  | TRG         | 04/09/13 12:27 | 1.50E+00       | 100.00            | 0.00       | 100.23     |     | 4/30/2013 11:38  |                  |
| 13           | RA-226  | TRG         | 04/09/13 12:27 | 1.50E+00       | 85.14             | 0.00       | 85.14      |     | 4/30/2013 11:38  |                  |
| 14           | RA-226  | DO          | 04/09/13 12:56 | 1.50E+00       | 97.52             | 0.00       | 97.52      |     | 4/30/2013 11:38  |                  |
| 15           | RA-226  | TRG         | 04/09/13 12:56 | 1.50E+00       | 92.09             | 0.00       | 92.09      |     | 4/30/2013 11:38  |                  |
| 16           | RA-226  | TRG         | 04/09/13 13:35 | 1.50E+00       | 93.84             | 0.00       | 93.84      |     | 4/30/2013 11:38  |                  |
| 17           | RA-226  | TRG         | 04/09/13 13:35 | 1.50E+00       | 89.34             | 0.00       | 89.34      |     | 4/30/2013 11:38  |                  |
| 18           | RA-226  | TRG         | 04/09/13 14:28 | 1.50E+00       | 92.45             | 0.00       | 92.45      |     | 4/30/2013 11:38  |                  |
| 19           | RA-226  | TRG         | 04/09/13 14:28 | 1.50E+00       | 100.00            | 0.00       | 103.47     |     | 4/30/2013 11:38  |                  |

|        |                                      |                              |          |               |       |     |   |
|--------|--------------------------------------|------------------------------|----------|---------------|-------|-----|---|
| Client | Engineering Management Support, Inc. | Eberline Services Work Order | 13-04105 | Analysis Code | Ra226 | Run | 1 |
|        |                                      |                              |          |               |       |     |   |

Preliminary Data Report & Analytical Calculations  
**Work Order: 13-04105-Ra226-1**

|   |                                      |       |
|---|--------------------------------------|-------|
|  | Run                                  | 1     |
|   | Analysis Code                        | Ra226 |
| Eberline Services Work Order  | 13-04105                             |       |
| Client  | Engineering Management Support, Inc. |       |

| Lab Fraction | Nuclide | Sample Desc | Counting Date/Time | Half-life (days) | Detect | Carrier   | Count Time | Counts    | Bkg CPM   | Eff  |
|--------------|---------|-------------|--------------------|------------------|--------|-----------|------------|-----------|-----------|------|
| 01           | RA-226  | LCS         | 05/01/13 16:18     |                  | A_Spec | Alpha_010 | 170        | 3.46 E+02 | 1.10 E-02 | 19.7 |
| 02           | RA-226  | MBL         | 05/01/13 16:18     |                  | A_Spec | Alpha_011 | 170        | 2.49 E+00 | 3.00 E-03 | 19.7 |
| 03           | RA-226  | DUP         | 05/01/13 16:18     |                  | A_Spec | Alpha_013 | 170        | 1.15 E+02 | 5.00 E-03 | 18.7 |
| 04           | RA-226  | TRG         | 05/01/13 16:18     |                  | A_Spec | Alpha_014 | 170        | 5.00 E+01 | 6.00 E-03 | 18.5 |
| 05           | RA-226  | TRG         | 05/01/13 16:18     |                  | A_Spec | Alpha_018 | 170        | 3.01 E+01 | 1.10 E-02 | 17.8 |
| 06           | RA-226  | TRG         | 05/01/13 16:18     |                  | A_Spec | Alpha_022 | 170        | 7.40 E+01 | 1.20 E-02 | 15.3 |
| 07           | RA-226  | TRG         | 05/01/13 16:18     |                  | A_Spec | Alpha_024 | 170        | 2.27 E+01 | 2.00 E-03 | 17.1 |
| 08           | RA-226  | TRG         | 05/01/13 16:18     |                  | A_Spec | Alpha_025 | 170.02     | 4.10 E+01 | 6.00 E-03 | 17.4 |
| 09           | RA-226  | TRG         | 05/01/13 16:18     |                  | A_Spec | Alpha_027 | 170        | 2.45 E+01 | 9.00 E-03 | 17.3 |
| 10           | RA-226  | TRG         | 05/01/13 16:18     |                  | A_Spec | Alpha_029 | 170        | 4.56 E+01 | 8.00 E-03 | 19.5 |
| 11           | RA-226  | TRG         | 05/01/13 16:19     |                  | A_Spec | Alpha_033 | 170        | 2.53 E+01 | 4.00 E-03 | 18.2 |
| 12           | RA-226  | TRG         | 05/01/13 16:19     |                  | A_Spec | Alpha_034 | 170        | 5.82 E+01 | 5.00 E-03 | 18.6 |
| 13           | RA-226  | TRG         | 05/01/13 16:19     |                  | A_Spec | Alpha_035 | 170        | 2.15 E+01 | 3.00 E-03 | 18.3 |
| 14           | RA-226  | DO          | 05/01/13 16:19     |                  | A_Spec | Alpha_037 | 170        | 1.12 E+02 | 2.00 E-03 | 17.8 |
| 15           | RA-226  | TRG         | 05/01/13 16:20     |                  | A_Spec | Alpha_040 | 170        | 1.23 E+02 | 3.00 E-03 | 19   |
| 16           | RA-226  | TRG         | 05/01/13 16:19     |                  | A_Spec | Alpha_041 | 170        | 4.78 E+01 | 7.00 E-03 | 19.8 |
| 17           | RA-226  | TRG         | 05/01/13 16:20     |                  | A_Spec | Alpha_042 | 170        | 2.10 E+01 | 6.00 E-03 | 18.5 |
| 18           | RA-226  | TRG         | 05/02/13 05:32     |                  | A_Spec | Alpha_003 | 170        | 7.31 E+01 | 1.10 E-02 | 17.5 |
| 19           | RA-226  | TRG         | 05/02/13 05:32     |                  | A_Spec | Alpha_004 | 170        | 6.45 E+01 | 9.00 E-03 | 19.4 |

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| Internal Fraction | Sample Desc | Client ID     | Sample Date    | Sample Aliquot | Tracer Aliquot (g) | Tracer ACT (dpm) | Radiometric Tracer (pCi) | Radiometric % Rec | SAF 1* | SAF 2* |
|-------------------|-------------|---------------|----------------|----------------|--------------------|------------------|--------------------------|-------------------|--------|--------|
| 01                | LCS         | LCS           | 04/16/13 00:00 | 1.0000         | 0.9100             | 918.3993         | 372.6000                 | 90.07             | 2.00   | 1.00   |
| 02                | MBL         | BLANK         | 04/16/13 00:00 | 1.5000         | 0.9078             | 916.1790         | 397.2000                 | 96.25             | 2.20   | 1.00   |
| 03                | DUP         | PZ-106-SS TOT | 04/09/13 12:56 | 1.5000         | 0.9020             | 910.3255         | 397.5000                 | 96.94             | 2.34   | 1.00   |
| 04                | TRG         | PZ-204-SS TOT | 04/09/13 09:30 | 1.5000         | 0.9022             | 910.5273         | 390.2000                 | 95.14             | 2.50   | 1.00   |
| 05                | TRG         | PZ-204-SS DIS | 04/09/13 09:30 | 1.5000         | 0.8999             | 908.2061         | 353.2000                 | 86.34             | 2.50   | 1.00   |
| 06                | TRG         | I-68 TOT      | 04/09/13 10:44 | 1.5000         | 0.8974             | 905.6830         | 303.2000                 | 74.32             | 2.91   | 1.00   |
| 07                | TRG         | I-68 DIS      | 04/09/13 10:44 | 1.5000         | 0.9000             | 908.3070         | 396.1000                 | 96.81             | 2.77   | 1.00   |
| 08                | TRG         | D-87 TOT      | 04/09/13 11:05 | 1.5000         | 0.9039             | 912.2430         | 435.9000                 | 106.08            | 3.20   | 1.00   |
| 09                | TRG         | D-87 DIS      | 04/09/13 11:05 | 1.5000         | 0.9018             | 910.1236         | 461.4000                 | 112.55            | 3.01   | 1.00   |
| 10                | TRG         | PZ-106-SD TOT | 04/09/13 12:00 | 1.5000         | 0.9010             | 909.3162         | 393.0000                 | 95.95             | 2.40   | 1.00   |
| 11                | TRG         | PZ-106-SD DIS | 04/09/13 12:00 | 1.5000         | 0.8990             | 907.2978         | 395.2000                 | 96.70             | 2.40   | 1.00   |
| 12                | TRG         | S-82 TOT      | 04/09/13 12:27 | 1.5000         | 0.8983             | 906.5913         | 409.3000                 | 100.23            | 2.94   | 1.00   |
| 13                | TRG         | S-82 DIS      | 04/09/13 12:27 | 1.5000         | 0.8988             | 907.0959         | 347.9000                 | 85.14             | 2.61   | 1.00   |
| 14                | DO          | PZ-106-SS TOT | 04/09/13 12:56 | 1.5000         | 0.8986             | 906.8941         | 398.4000                 | 97.52             | 2.47   | 1.00   |
| 15                | TRG         | PZ-106-SS DIS | 04/09/13 12:56 | 1.5000         | 0.8996             | 907.9033         | 376.6000                 | 92.09             | 2.50   | 1.00   |
| 16                | TRG         | I-9 TOT       | 04/09/13 13:35 | 1.5000         | 0.9039             | 912.2430         | 385.6000                 | 93.84             | 3.25   | 1.00   |
| 17                | TRG         | I-9 DIS       | 04/09/13 13:35 | 1.5000         | 0.8980             | 906.2885         | 364.7000                 | 89.34             | 2.96   | 1.00   |
| 18                | TRG         | D-93 TOT      | 04/09/13 14:28 | 1.5000         | 0.8796             | 887.7187         | 369.7000                 | 92.45             | 3.77   | 1.00   |
| 19                | TRG         | D-93 DIS      | 04/09/13 14:28 | 1.5000         | 0.8995             | 907.8024         | 423.1000                 | 103.47            | 3.28   | 1.00   |
|                   |             |               |                |                |                    |                  |                          |                   |        |        |

| Internal Work Order |       |                |               |                 | Run             | Analysis Code   |                 |                 | Date            | Technician     |           |                | Technician Initials |                | Witness Initials |                |
|---------------------|-------|----------------|---------------|-----------------|-----------------|-----------------|-----------------|-----------------|-----------------|----------------|-----------|----------------|---------------------|----------------|------------------|----------------|
| 13-04105            |       |                |               |                 | 1               | Ra226           |                 |                 | 4/24/2013 11:48 | JBARNARD       |           |                |                     |                |                  |                |
| LCS & Matrix Spikes |       |                |               |                 | LCS             | MS              | LCSD            | MSD             | LCS             |                | MS        |                | LCSD                |                | MSD              |                |
| Isotope             | Sol # | Activity dpm/g | Solution Date | Approx Addition | Volume Used (g) | Volume Used (g) | Volume Used (g) | Volume Used (g) | Known pCi       | Error Estimate | Added pCi | Error Estimate | Known pCi           | Error Estimate | Added pCi        | Error Estimate |
| Ra-226              | Ra-5b | 44.071         | 4/24/2013     | 0.500           | 0.5157          |                 |                 |                 | 10.24           | 0.471          | 0.00      | 0.000          | 0.00                | 0.000          | 0.00             | 0.000          |

| Tracers  |         |       |                |               |                 |                 | Balance Printer Tapes |  |  |  |  |     |  |  |  |
|----------|---------|-------|----------------|---------------|-----------------|-----------------|-----------------------|--|--|--|--|-----|--|--|--|
| fraction | Isotope | Sol # | Activity dpm/g | Solution Date | Volume Used (g) | Approx Addition | Tracer                |  |  |  |  | LCS |  |  |  |
| 01       | Ba-133  | Ba-6a | 1009.230       | 4/24/2013     | 0.9100          | 1.0000          |                       |  |  |  |  |     |  |  |  |
| 02       | Ba-133  | Ba-6a | 1009.230       | 4/24/2013     | 0.9078          | 1.0000          |                       |  |  |  |  |     |  |  |  |
| 03       | Ba-133  | Ba-6a | 1009.230       | 4/24/2013     | 0.9020          | 1.0000          |                       |  |  |  |  |     |  |  |  |
| 04       | Ba-133  | Ba-6a | 1009.230       | 4/24/2013     | 0.9022          | 1.0000          |                       |  |  |  |  |     |  |  |  |
| 05       | Ba-133  | Ba-6a | 1009.230       | 4/24/2013     | 0.8999          | 1.0000          |                       |  |  |  |  |     |  |  |  |
| 06       | Ba-133  | Ba-6a | 1009.230       | 4/24/2013     | 0.8974          | 1.0000          |                       |  |  |  |  |     |  |  |  |
| 07       | Ba-133  | Ba-6a | 1009.230       | 4/24/2013     | 0.9000          | 1.0000          |                       |  |  |  |  |     |  |  |  |
| 08       | Ba-133  | Ba-6a | 1009.230       | 4/24/2013     | 0.9039          | 1.0000          |                       |  |  |  |  |     |  |  |  |
| 09       | Ba-133  | Ba-6a | 1009.230       | 4/24/2013     | 0.9018          | 1.0000          |                       |  |  |  |  |     |  |  |  |
| 10       | Ba-133  | Ba-6a | 1009.230       | 4/24/2013     | 0.9010          | 1.0000          |                       |  |  |  |  |     |  |  |  |
| 11       | Ba-133  | Ba-6a | 1009.230       | 4/24/2013     | 0.8990          | 1.0000          |                       |  |  |  |  |     |  |  |  |
| 12       | Ba-133  | Ba-6a | 1009.230       | 4/24/2013     | 0.8983          | 1.0000          |                       |  |  |  |  |     |  |  |  |
| 13       | Ba-133  | Ba-6a | 1009.230       | 4/24/2013     | 0.8988          | 1.0000          |                       |  |  |  |  |     |  |  |  |
| 14       | Ba-133  | Ba-6a | 1009.230       | 4/24/2013     | 0.8986          | 1.0000          |                       |  |  |  |  |     |  |  |  |
| 15       | Ba-133  | Ba-6a | 1009.230       | 4/24/2013     | 0.8996          | 1.0000          |                       |  |  |  |  |     |  |  |  |
| 16       | Ba-133  | Ba-6a | 1009.230       | 4/24/2013     | 0.9039          | 1.0000          |                       |  |  |  |  |     |  |  |  |
| 17       | Ba-133  | Ba-6a | 1009.230       | 4/24/2013     | 0.8980          | 1.0000          |                       |  |  |  |  |     |  |  |  |
| 18       | Ba-133  | Ba-6a | 1009.230       | 4/24/2013     | 0.8796          | 1.0000          |                       |  |  |  |  |     |  |  |  |
| 19       | Ba-133  | Ba-6a | 1009.230       | 4/24/2013     | 0.8995          | 1.0000          |                       |  |  |  |  |     |  |  |  |

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0324


# Aliquot Worksheet

|                 |          |               |               |                 |                 |
|-----------------|----------|---------------|---------------|-----------------|-----------------|
| Work Order      | Run      | Analysis Code | Rpt Units     | Lab Deadline    | Technician      |
| <b>13-04105</b> | <b>1</b> | <b>Ra226</b>  | <b>liters</b> | <b>5/7/2013</b> | <b>JBARNARD</b> |

| Lab Fraction | Engineering Management Support, Inc.<br>Client ID | Sample Type | Muffle Data    |            |            | Dilution Data |            |            | Aliquot Data |           | MS Aliquot Data  |              | H-3 Solids Only |  |
|--------------|---|-------------|----------------|------------|------------|---------------|------------|------------|--------------|-----------|------------------|--------------|-----------------|--|
|              |   |             | Ratio Post/Pre | No of Dils | Dil Factor | Ratio         | Aliquot    | Net Equiv  | Aliquot      | Net Equiv | Water Added (ml) | H3 Dist Aliq |                 |  |
| 01           | LCS   | LCS         |                |            |            |               | 1.0000E+00 | 1.0000E+00 |              |           |                  |              |                 |  |
| 02           | BLANK   | MBL         |                |            |            |               | 1.5000E+00 | 1.5000E+00 |              |           |                  |              |                 |  |
| 03           | PZ-106-SS TOT                                     | DUP         |                |            |            |               | 1.5000E+00 | 1.5000E+00 |              |           |                  |              |                 |  |
| 04           | PZ-204-SS TOT                                     | TRG         |                |            |            |               | 1.5000E+00 | 1.5000E+00 |              |           |                  |              |                 |  |
| 05           | PZ-204-SS DIS                                     | TRG         |                |            |            |               | 1.5000E+00 | 1.5000E+00 |              |           |                  |              |                 |  |
| 06           | I-68 TOT  | TRG         |                |            |            |               | 1.5000E+00 | 1.5000E+00 |              |           |                  |              |                 |  |
| 07           | I-68 DIS  | TRG         |                |            |            |               | 1.5000E+00 | 1.5000E+00 |              |           |                  |              |                 |  |
| 08           | D-87 TOT  | TRG         |                |            |            |               | 1.5000E+00 | 1.5000E+00 |              |           |                  |              |                 |  |
| 09           | D-87 DIS  | TRG         |                |            |            |               | 1.5000E+00 | 1.5000E+00 |              |           |                  |              |                 |  |
| 10           | PZ-106-SD TOT                                     | TRG         |                |            |            |               | 1.5000E+00 | 1.5000E+00 |              |           |                  |              |                 |  |
| 11           | PZ-106-SD DIS                                     | TRG         |                |            |            |               | 1.5000E+00 | 1.5000E+00 |              |           |                  |              |                 |  |
| 12           | S-82 TOT  | TRG         |                |            |            |               | 1.5000E+00 | 1.5000E+00 |              |           |                  |              |                 |  |
| 13           | S-82 DIS  | TRG         |                |            |            |               | 1.5000E+00 | 1.5000E+00 |              |           |                  |              |                 |  |
| 14           | PZ-106-SS TOT                                     | DO          |                |            |            |               | 1.5000E+00 | 1.5000E+00 |              |           |                  |              |                 |  |
| 15           | PZ-106-SS DIS                                     | TRG         |                |            |            |               | 1.5000E+00 | 1.5000E+00 |              |           |                  |              |                 |  |
| 16           | I-9 TOT   | TRG         |                |            |            |               | 1.5000E+00 | 1.5000E+00 |              |           |                  |              |                 |  |
| 17           | I-9 DIS   | TRG         |                |            |            |               | 1.5000E+00 | 1.5000E+00 |              |           |                  |              |                 |  |
| 18           | D-93 TOT  | TRG         |                |            |            |               | 1.5000E+00 | 1.5000E+00 |              |           |                  |              |                 |  |
| 19           | D-93 DIS  | TRG         |                |            |            |               | 1.5000E+00 | 1.5000E+00 |              |           |                  |              |                 |  |

|          |  |
|----------|--|
| Comments |  |
|----------|--|

Technician: \_\_\_\_\_

 Date: 4/24/13

US EPA ARCHIVE DOCUMENT

# Gravimetric Worksheet

| Work Order      | Run      | Analysis Code | Gravimetric Carrier | Carrier Conc (mg/ml) | Technician    |
|-----------------|----------|---------------|---------------------|----------------------|---------------|
| <b>13-04105</b> | <b>1</b> | <b>Ra226</b>  |                     |                      | <b>TSMITH</b> |

| TRetec<br>Fraction | Engineering Management Support, Inc.<br>Client ID | Sample<br>Type | Carrier Data       | Filter Data     |                  |                | Gravimetric |
|--------------------|---|----------------|--------------------|-----------------|------------------|----------------|-------------|
|                    |   |                | Carrier Added (ml) | Filter Tare (g) | Filter Final (g) | Filter Net (g) | % Recovery  |
| 01                 | LCS   | LCS            |                    | 0.0226          | 0.0282           | 0.0056         |             |
| 02                 | BLANK   | MBL            |                    | 0.0226          | 0.0287           | 0.0061         |             |
| 03                 | DUP   | DUP            |                    | 0.0228          | 0.0293           | 0.0065         |             |
| 04                 | PZ-204-SS TOT                                     | TRG            |                    | 0.0224          | 0.0294           | 0.0070         |             |
| 05                 | PZ-204-SS DIS                                     | TRG            |                    | 0.0222          | 0.0292           | 0.0070         |             |
| 06                 | I-68 TOT  | TRG            |                    | 0.0224          | 0.0310           | 0.0086         |             |
| 07                 | I-68 DIS  | TRG            |                    | 0.0228          | 0.0308           | 0.0080         |             |
| 08                 | D-87 TOT  | TRG            |                    | 0.0224          | 0.0321           | 0.0097         |             |
| 09                 | D-87 DIS  | TRG            |                    | 0.0224          | 0.0314           | 0.0090         |             |
| 10                 | PZ-106-SD TOT                                     | TRG            |                    | 0.0226          | 0.0293           | 0.0067         |             |
| 11                 | PZ-106-SD DIS                                     | TRG            |                    | 0.0227          | 0.0294           | 0.0067         |             |
| 12                 | S-82 TOT  | TRG            |                    | 0.0229          | 0.0316           | 0.0087         |             |
| 13                 | S-82 DIS  | TRG            |                    | 0.0228          | 0.0302           | 0.0074         |             |
| 14                 | PZ-106-SS TOT                                     | DO             |                    | 0.0225          | 0.0294           | 0.0069         |             |
| 15                 | PZ-106-SS DIS                                     | TRG            |                    | 0.0228          | 0.0298           | 0.0070         |             |
| 16                 | I-9 TOT   | TRG            |                    | 0.0229          | 0.0328           | 0.0099         |             |
| 17                 | I-9 DIS   | TRG            |                    | 0.0222          | 0.0310           | 0.0088         |             |
| 18                 | D-93 TOT  | TRG            |                    | 0.0223          | 0.0337           | 0.0114         |             |
| 19                 | D-93 DIS  | TRG            |                    | 0.0226          | 0.0326           | 0.0100         |             |

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*TSMITH*

Technician: \_\_\_\_\_

Date: \_\_\_\_\_

4/30/13



Sample Description: SPIKE  
 Spectrum File: \\OR-ALPHA1\Canberra\ApexAlpha\Root\Data\00000569  
 Batch Identification: 1304105A-RA  
 Sample Identification: 01  
 Sample Geometry: Shelf 2  
 Procedure Description: Ra

Detector Name: Alpha\_010  
 Chamber Serial Number:  
 Detector Serial Number: 10  
 Env. Background: System Bkgd 55736  
 Reagent Blank: <not performed>

Sample Size: 1.000E+000 +/- 0.000E+000 liter  
 Generic Mult. Factor: 2.000E+000 Generic Div. Factor: 1.000E+000  
 Sample Date/Time: 5/1/2013 11:38:01 AM  
 Acquisition Date/Time: 5/1/2013 4:18:07 PM  
 Acquisition Live Time: 170.0 minutes  
 Acquisition Real Time: 170.0 minutes

Chem. Recovery Factor: 0.9007 +/- 0.0000  
 Counting Efficiency: 0.1967 +/- 0.0036 on 12/15/2012 11:26:40 AM  
 Effective Efficiency: 0.1772 +/- 0.0032

Control Certificate Name: Ra226\_Ra-5b  
 Chem. Recov. of Control: RA-226 0.505592 +/- 0.032530  
 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  | 5.531        | 448.26      | 9.30            | 3.74            | 0.00E+000       | 16.3       |
| RA-226  | 4.682        | 346.13      | 10.57           | 1.87            | 0.00E+000       | 6.4        |

-----  
 ----- NUCLIDE ANALYSIS RESULTS -----  
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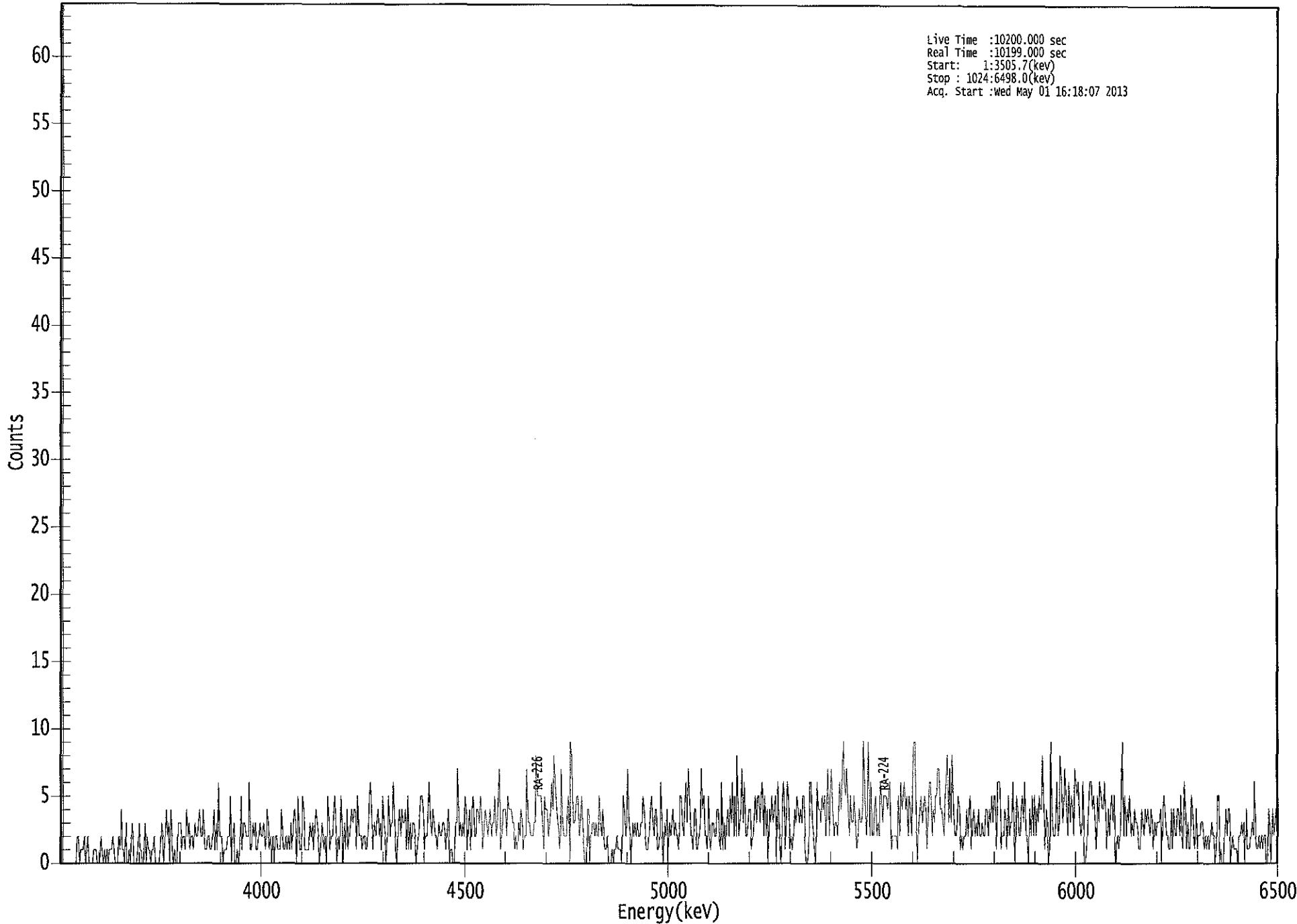
| Nuclide | Id Conf. | Energy (keV) | Activity (pCi/liter )   | MDA (pCi/liter )        |
|---------|----------|--------------|-------------------------|-------------------------|
| RA-224  | 0.969    | 5685.50*     | 1.46E+001 +/- 7.38E+002 | 3.13E-001 +/- 1.58E+001 |
| RA-226  | 0.986    | 4785.00*     | 1.04E+001 +/- 1.15E+000 | 2.26E-001 +/- 8.09E-003 |

AG  
5/2/13

US EPA ARCHIVE DOCUMENT



Live Time :10200.000 sec  
Real Time :10199.000 sec  
Start: 1:3505.7(kev)  
Stop : 1024:6498.0(kev)  
Acq. Start :wed May 01 16:18:07 2013



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: 10199

| Channel | 10199 | 10200 |   |   |   |   |   |   |   |
|---------|-------|-------|---|---|---|---|---|---|---|
| 1:      | 10199 | 10200 | 0 | 0 | 0 | 0 | 0 | 0 | 0 |
| 9:      | 0     | 0     | 0 | 0 | 0 | 0 | 2 | 2 |   |
| 17:     | 0     | 1     | 1 | 1 | 2 | 0 | 1 | 2 |   |
| 25:     | 0     | 0     | 0 | 0 | 1 | 1 | 1 | 0 |   |
| 33:     | 0     | 0     | 2 | 1 | 0 | 1 | 0 | 1 |   |
| 41:     | 0     | 1     | 1 | 1 | 2 | 1 | 0 | 0 |   |
| 49:     | 0     | 2     | 1 | 4 | 1 | 1 | 0 | 3 |   |
| 57:     | 0     | 0     | 1 | 0 | 3 | 2 | 0 | 0 |   |
| 65:     | 0     | 1     | 3 | 1 | 1 | 0 | 0 | 3 |   |
| 73:     | 0     | 2     | 1 | 1 | 0 | 1 | 1 | 2 |   |
| 81:     | 0     | 0     | 0 | 0 | 1 | 3 | 2 | 0 |   |
| 89:     | 2     | 4     | 2 | 3 | 0 | 4 | 1 | 0 |   |
| 97:     | 1     | 0     | 0 | 3 | 3 | 3 | 1 | 2 |   |
| 105:    | 2     | 1     | 4 | 2 | 3 | 1 | 2 | 2 |   |
| 113:    | 1     | 3     | 2 | 2 | 3 | 4 | 2 | 2 |   |
| 121:    | 4     | 2     | 1 | 1 | 2 | 2 | 1 | 1 |   |
| 129:    | 2     | 4     | 1 | 3 | 1 | 6 | 2 | 2 |   |
| 137:    | 2     | 0     | 1 | 1 | 1 | 2 | 2 | 5 |   |
| 145:    | 0     | 2     | 3 | 0 | 0 | 1 | 0 | 1 |   |
| 153:    | 5     | 1     | 3 | 3 | 2 | 2 | 2 | 6 |   |
| 161:    | 1     | 1     | 3 | 2 | 3 | 1 | 1 | 2 |   |
| 169:    | 3     | 2     | 2 | 3 | 2 | 1 | 4 | 3 |   |
| 177:    | 1     | 2     | 0 | 2 | 0 | 2 | 2 | 1 |   |
| 185:    | 1     | 1     | 4 | 2 | 1 | 1 | 2 | 1 |   |
| 193:    | 2     | 1     | 3 | 1 | 3 | 4 | 3 | 0 |   |
| 201:    | 5     | 2     | 1 | 1 | 5 | 4 | 1 | 1 |   |
| 209:    | 1     | 1     | 3 | 2 | 3 | 1 | 3 | 4 |   |
| 217:    | 3     | 2     | 0 | 1 | 3 | 2 | 1 | 2 |   |
| 225:    | 0     | 5     | 3 | 1 | 2 | 2 | 4 | 5 |   |
| 233:    | 2     | 0     | 2 | 1 | 5 | 3 | 0 | 3 |   |
| 241:    | 1     | 4     | 1 | 2 | 3 | 4 | 3 | 4 |   |
| 249:    | 4     | 1     | 5 | 2 | 2 | 2 | 1 | 2 |   |
| 257:    | 2     | 1     | 1 | 3 | 5 | 6 | 3 | 1 |   |
| 265:    | 3     | 2     | 3 | 4 | 2 | 3 | 1 | 5 |   |
| 273:    | 3     | 2     | 0 | 2 | 5 | 2 | 3 | 3 |   |
| 281:    | 6     | 3     | 1 | 0 | 3 | 4 | 2 | 4 |   |
| 289:    | 3     | 3     | 4 | 1 | 5 | 1 | 3 | 1 |   |
| 297:    | 3     | 3     | 2 | 0 | 1 | 2 | 4 | 5 |   |
| 305:    | 5     | 4     | 1 | 2 | 2 | 4 | 6 | 3 |   |
| 313:    | 2     | 4     | 3 | 2 | 2 | 1 | 3 | 2 |   |
| 321:    | 2     | 3     | 3 | 2 | 1 | 3 | 4 | 0 |   |
| 329:    | 1     | 1     | 0 | 0 | 3 | 3 | 7 | 2 |   |
| 337:    | 3     | 2     | 3 | 2 | 5 | 4 | 1 | 3 |   |
| 345:    | 4     | 1     | 4 | 5 | 2 | 2 | 4 | 4 |   |
| 353:    | 3     | 5     | 3 | 1 | 3 | 4 | 3 | 2 |   |
| 361:    | 3     | 4     | 2 | 3 | 3 | 5 | 2 | 3 |   |

369: 5 7 1 2 4 4 4 2

Sample Title: 01

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

801: 6 2 0 5 4 2 2 4

Sample Title: 01

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



C  
5/2/13

Sample Description: BLANK  
 Spectrum File: \\OR-ALPHA1\Canberra\ApexAlpha\Root\Data\00000568  
 Batch Identification: 1304105A-RA  
 Sample Identification: 02  
 Sample Geometry: Shelf 2  
 Procedure Description: Ra

Detector Name: Alpha\_011  
 Chamber Serial Number:  
 Detector Serial Number: 11  
 Env. Background: System Bkgd 55737  
 Reagent Blank: <not performed>

Sample Size: 1.500E+000 +/- 0.000E+000 liter  
 Generic Mult. Factor: 2.200E+000 Generic Div. Factor: 1.000E+000  
 Sample Date/Time: 5/1/2013 11:38:01 AM  
 Acquisition Date/Time: 5/1/2013 4:18:08 PM  
 Acquisition Live Time: 170.0 minutes  
 Acquisition Real Time: 170.0 minutes

Chem. Recovery Factor: 0.9625 +/- 0.0000  
 Counting Efficiency: 0.1973 +/- 0.0042 on 12/15/2012 11:28:06 AM  
 Effective Efficiency: 0.1899 +/- 0.0040

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        | -0.40       | 926.99          | 3.40            | 0.00E+000       | 2.7        |
| RA-226  | 4.651        | 2.49        | 138.29          | 0.51            | 0.00E+000       | 2.7        |

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 NUCLIDE ANALYSIS RESULTS  
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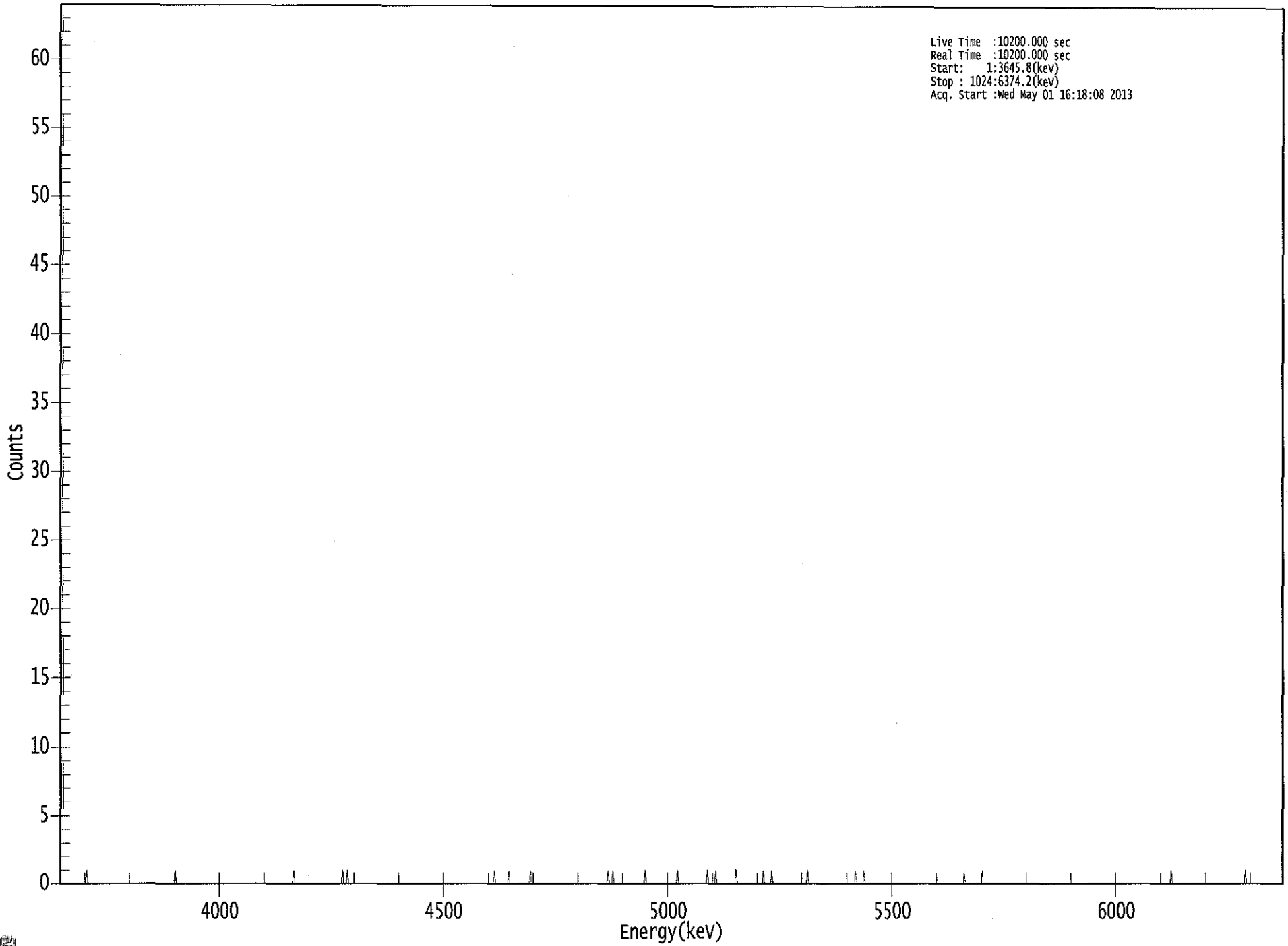
| Nuclide | Id Conf. | Energy (keV) | Activity (pCi/liter)     | MDA (pCi/liter)         |
|---------|----------|--------------|--------------------------|-------------------------|
| RA-224  | 0.959    | 5685.50*     | -8.93E-003 +/- 4.58E-001 | 2.07E-001 +/- 1.04E+001 |
| RA-226  | 0.977    | 4785.00*     | 5.10E-002 +/- 7.05E-002  | 1.07E-001 +/- 4.43E-003 |

AG  
5/2/13

US EPA ARCHIVE DOCUMENT

0000056843.CNF

Live Time :10200.000 sec  
Real Time :10200.000 sec  
Start: 1:3645.8(keV)  
Stop : 1024:6374.2(keV)  
Acq. Start :wed May 01 16:18:08 2013



US EPA ARCHIVE DOCUMENT

0333

ROI Type: 1

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

Sample Title:    02

Elapsed Live time:        10200

Elapsed Real Time:        10200

| Channel | ----- | ----- | ----- | ----- | ----- | ----- | ----- | ----- |
|---------|-------|-------|-------|-------|-------|-------|-------|-------|
| 1:      | 10200 | 10200 | 0     | 0     | 0     | 0     | 0     | 0     |
| 9:      | 0     | 0     | 0     | 0     | 0     | 0     | 0     | 0     |
| 17:     | 0     | 0     | 0     | 0     | 0     | 0     | 1     | 0     |
| 25:     | 0     | 0     | 0     | 0     | 0     | 0     | 0     | 0     |
| 33:     | 0     | 0     | 0     | 0     | 0     | 0     | 0     | 0     |
| 41:     | 0     | 0     | 0     | 0     | 0     | 0     | 0     | 0     |
| 49:     | 0     | 0     | 0     | 0     | 0     | 0     | 0     | 0     |
| 57:     | 0     | 0     | 0     | 0     | 0     | 0     | 0     | 0     |
| 65:     | 0     | 0     | 0     | 0     | 0     | 0     | 0     | 0     |
| 73:     | 0     | 0     | 0     | 0     | 0     | 0     | 0     | 0     |
| 81:     | 0     | 0     | 0     | 0     | 0     | 0     | 0     | 0     |
| 89:     | 0     | 0     | 0     | 0     | 0     | 0     | 0     | 0     |
| 97:     | 1     | 0     | 0     | 0     | 0     | 0     | 0     | 0     |
| 105:    | 0     | 0     | 0     | 0     | 0     | 0     | 0     | 0     |
| 113:    | 0     | 0     | 0     | 0     | 0     | 0     | 0     | 0     |
| 121:    | 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     | 1     | 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     | 1     | 0     | 0     | 0     |
| 241:    | 1     | 0     | 0     | 0     | 0     | 0     | 0     | 0     |
| 249:    | 0     | 0     | 0     | 0     | 0     | 0     | 0     | 0     |
| 257:    | 0     | 0     | 0     | 0     | 0     | 0     | 0     | 0     |
| 265:    | 0     | 0     | 0     | 0     | 0     | 0     | 0     | 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     | 1     | 0     | 0     | 0     | 0     |

369: 0 0 0 0 0 0 0 0 1

Sample Title: 02

| Channel | 1 | 2 | 3 | 4 | 5 | 6 | 7 | 8 |
|---------|---|---|---|---|---|---|---|---|
| 377:    | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 |
| 385:    | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 |
| 393:    | 0 | 1 | 0 | 0 | 0 | 0 | 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 | 1 | 0 | 0 | 0 | 1 | 0 |
| 465:    | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 |
| 473:    | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 |
| 481:    | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 |
| 489:    | 0 | 1 | 0 | 0 | 0 | 0 | 0 | 0 |
| 497:    | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 |
| 505:    | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 |
| 513:    | 0 | 0 | 0 | 0 | 1 | 0 | 0 | 0 |
| 521:    | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 |
| 529:    | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 |
| 537:    | 0 | 0 | 0 | 0 | 0 | 1 | 0 | 0 |
| 545:    | 0 | 0 | 0 | 0 | 1 | 0 | 0 | 0 |
| 553:    | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 |
| 561:    | 0 | 0 | 0 | 0 | 0 | 1 | 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 | 1 | 0 | 0 | 0 |
| 593:    | 0 | 0 | 0 | 1 | 0 | 0 | 0 | 0 |
| 601:    | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 |
| 609:    | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 |
| 617:    | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 |
| 625:    | 0 | 1 | 0 | 0 | 0 | 0 | 0 | 0 |
| 633:    | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 |
| 641:    | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 |
| 649:    | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 |
| 657:    | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 |
| 665:    | 0 | 1 | 0 | 0 | 0 | 0 | 0 | 0 |
| 673:    | 1 | 0 | 0 | 0 | 0 | 0 | 0 | 0 |
| 681:    | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 |
| 689:    | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 |
| 697:    | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 |
| 705:    | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 |
| 713:    | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 |
| 721:    | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 |
| 729:    | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 |
| 737:    | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 |
| 745:    | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 |
| 753:    | 0 | 0 | 0 | 0 | 1 | 0 | 0 | 0 |
| 761:    | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 |
| 769:    | 0 | 0 | 0 | 1 | 0 | 0 | 0 | 0 |
| 777:    | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 |
| 785:    | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 |
| 793:    | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 |



801: 0 0 0 0 0 0 0 0

Sample Title: 02

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



e  
5/2/13

Sample Description: PZ-106-SS TOT-DUP  
 Spectrum File: \\OR-ALPHA1\Canberra\ApexAlpha\Root\Data\00000568  
 Batch Identification: 1304105A-RA  
 Sample Identification: 03  
 Sample Geometry: Shelf 2  
 Procedure Description: Ra

Detector Name: Alpha\_013  
 Chamber Serial Number:  
 Detector Serial Number: 13  
 Env. Background: System Bkgd 55738  
 Reagent Blank: <not performed>

Sample Size: 1.500E+000 +/- 0.000E+000 liter  
 Generic Mult. Factor: 2.340E+000 Generic Div. Factor: 1.000E+000  
 Sample Date/Time: 4/30/2013 11:38:01 AM  
 Acquisition Date/Time: 5/1/2013 4:18:09 PM  
 Acquisition Live Time: 170.0 minutes  
 Acquisition Real Time: 170.0 minutes

Chem. Recovery Factor: 0.9694 +/- 0.0000  
 Counting Efficiency: 0.1869 +/- 0.0035 on 12/15/2012 11:26:45 AM  
 Effective Efficiency: 0.1812 +/- 0.0033

Peak Match Tolerance: 0.350 MeV

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 PEAK AREA REPORT  
 -----

| Nuclide | Energy (MeV) | Net Pk Area | Pk Area Error % | Ambient Backgnd | Reagent Backgnd | FWHM (keV) |
|---------|--------------|-------------|-----------------|-----------------|-----------------|------------|
| RA-224  | 5.503        | 29.43       | 38.61           | 3.57            | 0.00E+000       | 2.8        |
| RA-226  | 4.552        | 115.15      | 18.34           | 0.85            | 0.00E+000       | 2.8        |

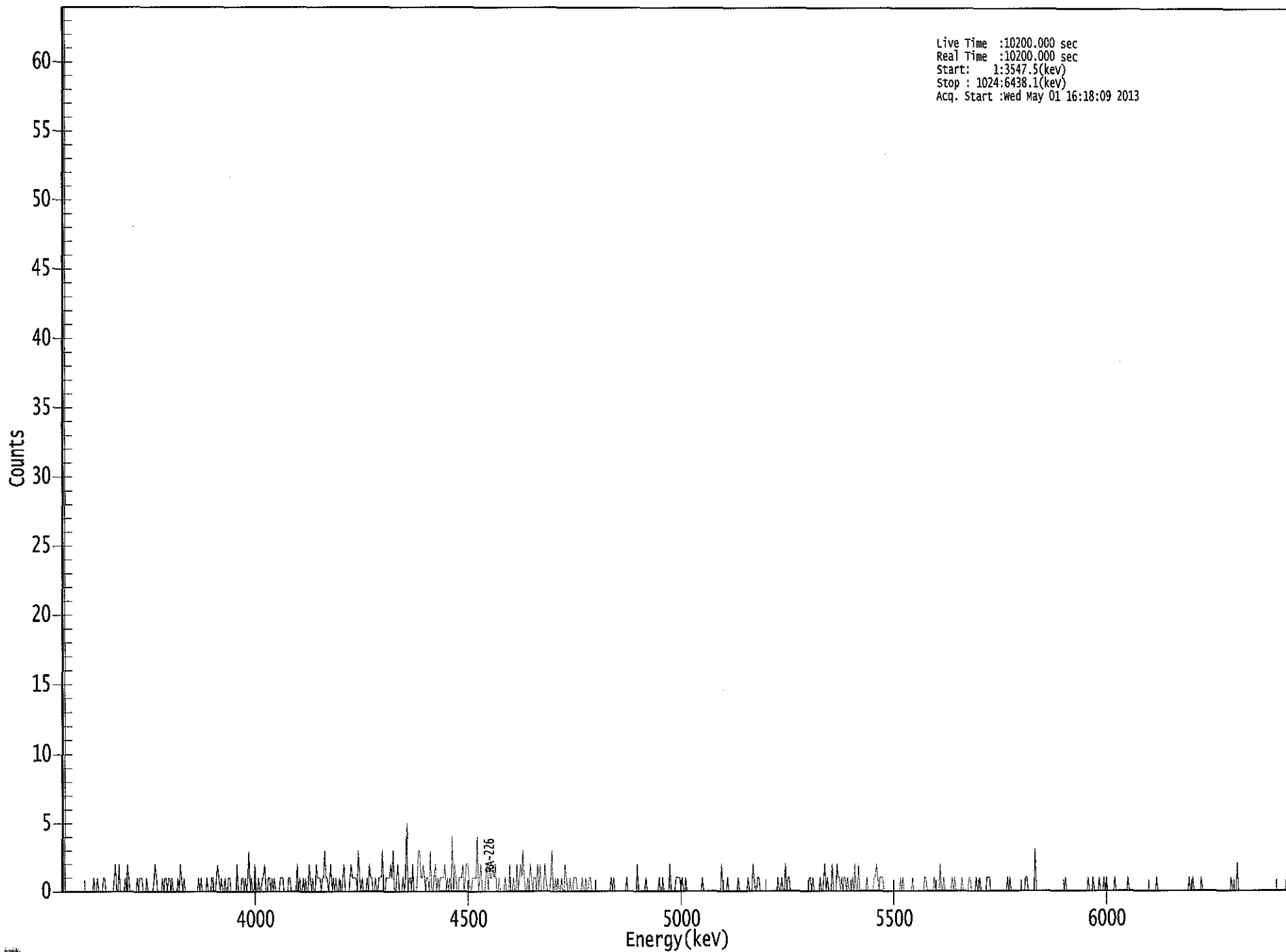
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 NUCLIDE ANALYSIS RESULTS  
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| Nuclide | Id Conf. | Energy (keV) | Activity (pCi/liter)    | MDA (pCi/liter)         |
|---------|----------|--------------|-------------------------|-------------------------|
| RA-224  | 0.957    | 5685.50*     | 8.85E-001 +/- 2.74E+002 | 2.84E-001 +/- 8.79E+001 |
| RA-226  | 0.932    | 4785.00*     | 2.63E+000 +/- 4.91E-001 | 1.37E-001 +/- 4.95E-003 |

AG  
5/2/13

US EPA ARCHIVE DOCUMENT

Live Time :10200.000 sec  
Real Time :10200.000 sec  
Start: 1:3547.5(kev)  
Stop : 1024:6438.1(kev)  
Acq. Start :wed May 01 16:18:09 2013



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

369: 1 0 0 0 2 0 0 1

Sample Title: 03

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

801: 0 1 1 0 0 0 0 0

Sample Title: 03

| Channel | ----- | ----- | ----- | ----- | ----- | ----- | ----- | ----- |
|---------|-------|-------|-------|-------|-------|-------|-------|-------|
| 809:    | 0     | 3     | 0     | 0     | 0     | 0     | 0     | 0     |
| 817:    | 0     | 0     | 0     | 0     | 0     | 0     | 0     | 0     |
| 825:    | 0     | 0     | 0     | 0     | 0     | 0     | 0     | 0     |
| 833:    | 0     | 0     | 1     | 0     | 0     | 0     | 0     | 0     |
| 841:    | 0     | 0     | 0     | 0     | 0     | 0     | 0     | 0     |
| 849:    | 0     | 0     | 0     | 0     | 0     | 1     | 0     | 0     |
| 857:    | 0     | 1     | 0     | 0     | 0     | 0     | 1     | 0     |
| 865:    | 0     | 0     | 1     | 0     | 1     | 0     | 0     | 0     |
| 873:    | 0     | 0     | 0     | 1     | 0     | 0     | 0     | 0     |
| 881:    | 0     | 0     | 0     | 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     | 1     | 0     |
| 913:    | 0     | 0     | 0     | 0     | 0     | 0     | 0     | 0     |
| 921:    | 0     | 0     | 0     | 0     | 0     | 0     | 0     | 0     |
| 929:    | 0     | 0     | 0     | 0     | 0     | 0     | 0     | 0     |
| 937:    | 0     | 1     | 0     | 0     | 1     | 0     | 0     | 0     |
| 945:    | 0     | 0     | 0     | 1     | 0     | 0     | 0     | 0     |
| 953:    | 0     | 0     | 0     | 0     | 0     | 0     | 0     | 0     |
| 961:    | 0     | 0     | 0     | 0     | 0     | 0     | 0     | 0     |
| 969:    | 0     | 0     | 0     | 0     | 1     | 0     | 0     | 0     |
| 977:    | 0     | 2     | 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     | 1     | 0     | 0     | 0     | 0     | 0     |



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Sample Description: PZ-204-SS TOT  
 Spectrum File: \\OR-ALPHA1\Canberra\ApexAlpha\Root\Data\00000568  
 Batch Identification: 1304105A-RA  
 Sample Identification: 04  
 Sample Geometry: Shelf 2  
 Procedure Description: Ra

Detector Name: Alpha\_014  
 Chamber Serial Number:  
 Detector Serial Number: 14  
 Env. Background: System Bkgd 55739  
 Reagent Blank: <not performed>

Sample Size: 1.500E+000 +/- 0.000E+000 liter  
 Generic Mult. Factor: 2.500E+000 Generic Div. Factor: 1.000E+000  
 Sample Date/Time: 4/30/2013 11:38:01 AM  
 Acquisition Date/Time: 5/1/2013 4:18:10 PM  
 Acquisition Live Time: 170.0 minutes  
 Acquisition Real Time: 170.0 minutes

Chem. Recovery Factor: 0.9514 +/- 0.0000  
 Counting Efficiency: 0.1846 +/- 0.0034 on 12/15/2012 11:26:44 AM  
 Effective Efficiency: 0.1756 +/- 0.0033

Peak Match Tolerance: 0.350 MeV

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

| Nuclide | Energy (MeV) | Net Pk Area | Pk Area Error % | Ambient Backgnd | Reagent Backgnd | FWHM (keV) |
|---------|--------------|-------------|-----------------|-----------------|-----------------|------------|
| RA-224  | 5.547        | 13.43       | 61.24           | 3.57            | 0.00E+000       | 2.9        |
| RA-226  | 4.585        | 49.98       | 28.05           | 1.02            | 0.00E+000       | 2.9        |

-----  
 NUCLIDE ANALYSIS RESULTS  
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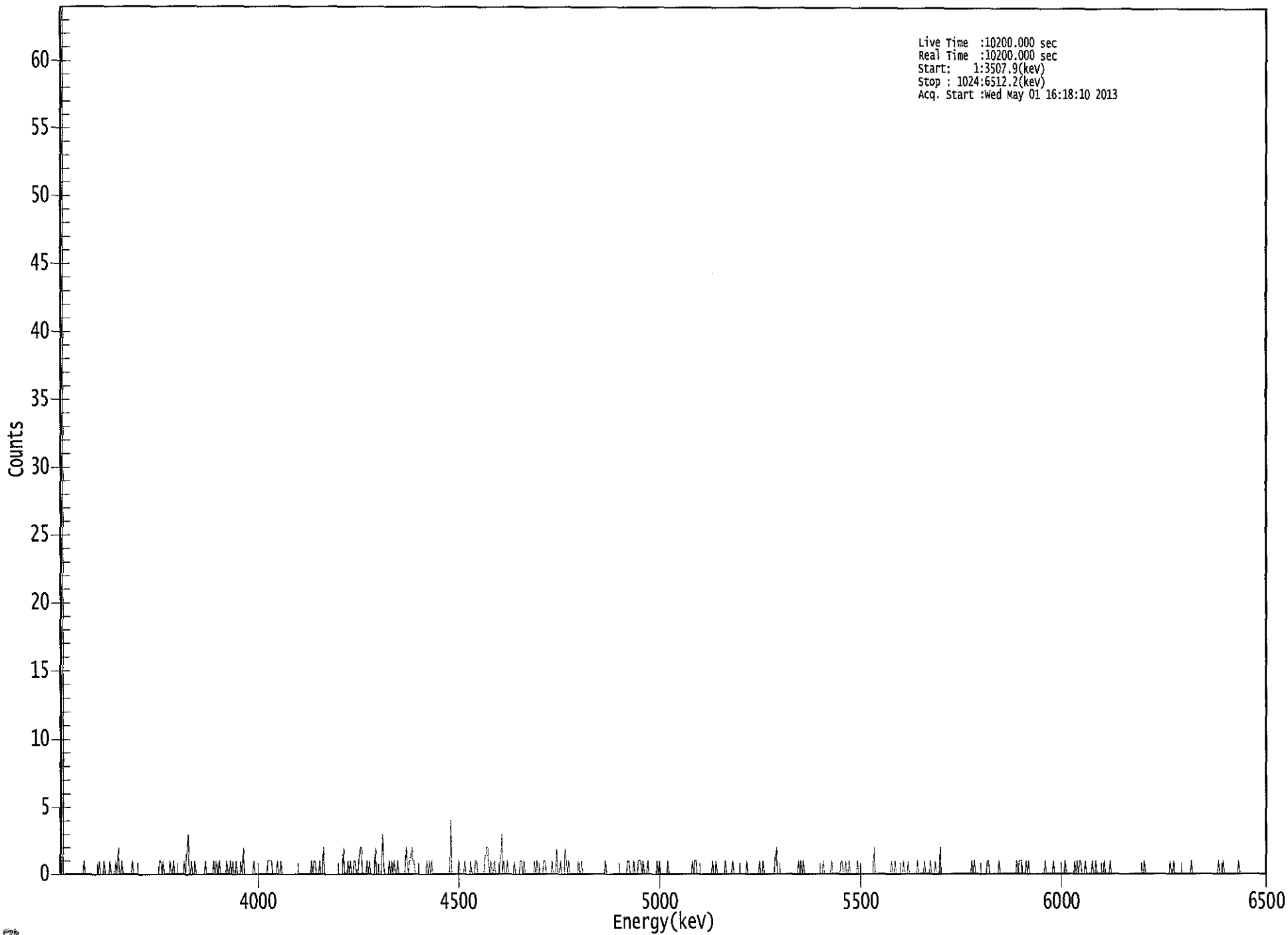
| Nuclide | Id Conf. | Energy (keV) | Activity (pCi/liter )   | MDA (pCi/liter )        |
|---------|----------|--------------|-------------------------|-------------------------|
| RA-224  | 0.975    | 5685.50*     | 4.45E-001 +/- 1.38E+002 | 3.13E-001 +/- 9.69E+001 |
| RA-226  | 0.949    | 4785.00*     | 1.26E+000 +/- 3.56E-001 | 1.58E-001 +/- 5.76E-003 |

AG  
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US EPA ARCHIVE DOCUMENT

0000056845.CNF

Live Time :10200.000 sec  
Real Time :10200.000 sec  
Start: 1:3507.9(kev)  
Stop : 1024:6512.2(kev)  
Acq. Start :wed May 01 16:18:10 2013



US EPA ARCHIVE DOCUMENT

6343

ROI Type: 1



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

Sample Title: 04

Elapsed Live time: 10200  
 Elapsed Real Time: 10200

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

369: 1 0 0 0 0 1 3 0

Sample Title: 04

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

801: 0 0 0 0 0 0 0 0

Sample Title: 04

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



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5/2/13

Sample Description: PZ-204-SS DIS  
 Spectrum File: \\OR-ALPHA1\Canberra\ApexAlpha\Root\Data\00000568  
 Batch Identification: 1304105A-RA  
 Sample Identification: 05  
 Sample Geometry: Shelf 2  
 Procedure Description: Ra

Detector Name: Alpha\_018  
 Chamber Serial Number:  
 Detector Serial Number: 18  
 Env. Background: System Bkgd 55740  
 Reagent Blank: <not performed>

Sample Size: 1.500E+000 +/- 0.000E+000 liter  
 Generic Mult. Factor: 2.500E+000 Generic Div. Factor: 1.000E+000  
 Sample Date/Time: 4/30/2013 11:38:01 AM  
 Acquisition Date/Time: 5/1/2013 4:18:41 PM  
 Acquisition Live Time: 170.0 minutes  
 Acquisition Real Time: 170.0 minutes

Chem. Recovery Factor: 0.8634 +/- 0.0000  
 Counting Efficiency: 0.1776 +/- 0.0033 on 12/15/2012 1:57:26 PM  
 Effective Efficiency: 0.1534 +/- 0.0029

Peak Match Tolerance: 0.350 MeV

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

| Nuclide | Energy (MeV) | Net Pk Area | Pk Area Error % | Ambient Backgnd | Reagent Backgnd | FWHM (keV) |
|---------|--------------|-------------|-----------------|-----------------|-----------------|------------|
| RA-224  | 5.498        | 11.30       | 63.23           | 1.70            | 0.00E+000       | 3.1        |
| RA-226  | 4.618        | 30.13       | 36.98           | 1.87            | 0.00E+000       | 3.1        |

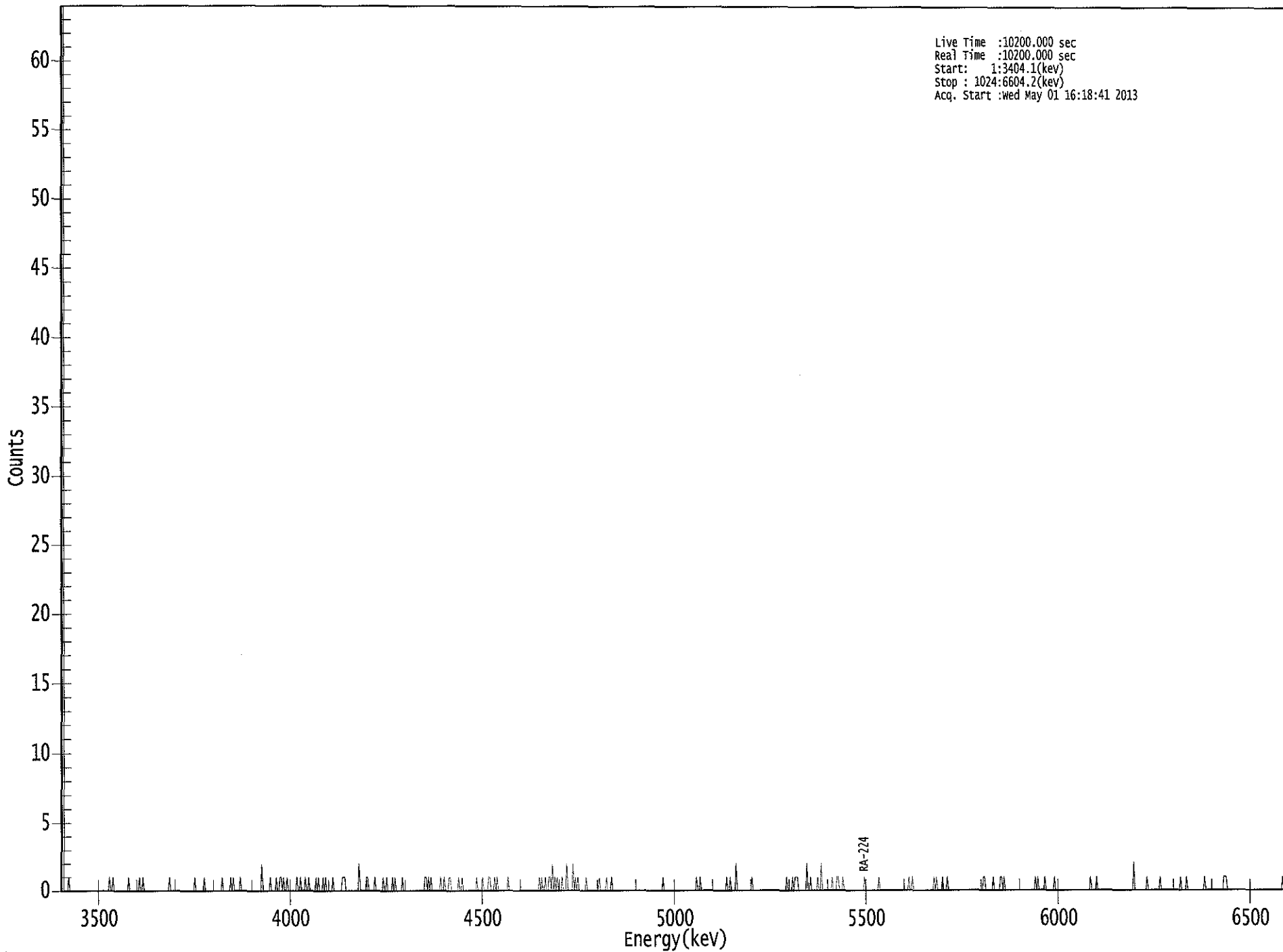
-----  
 ----- NUCLIDE ANALYSIS RESULTS -----  
 -----

| Nuclide | Id Conf. | Energy (keV) | Activity (pCi/liter )   | MDA (pCi/liter )        |
|---------|----------|--------------|-------------------------|-------------------------|
| RA-224  | 0.955    | 5685.50*     | 4.29E-001 +/- 1.33E+002 | 2.79E-001 +/- 8.64E+001 |
| RA-226  | 0.964    | 4785.00*     | 8.68E-001 +/- 3.22E-001 | 2.18E-001 +/- 7.94E-003 |

AG  
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US EPA ARCHIVE DOCUMENT

Live Time :10200.000 sec  
Real Time :10200.000 sec  
Start: 1:3404.1(kev)  
Stop : 1024:6604.2(kev)  
Acq. Start :wed May 01 16:18:41 2013



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

Sample Title: 05

Elapsed Live time: 10200  
 Elapsed Real Time: 10200

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

369: 0 0 0 0 1 0 0 0

Sample Title: 05

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

801: 0 0 0 0 0 0 0 0

Sample Title: 05

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





C  
5/2/13

Sample Description: I-68 TOT  
 Spectrum File: \\OR-ALPHA1\Canberra\ApexAlpha\Root\Data\00000568  
 Batch Identification: 1304105A-RA  
 Sample Identification: 06  
 Sample Geometry: Shelf 2  
 Procedure Description: Ra

Detector Name: Alpha\_022  
 Chamber Serial Number:  
 Detector Serial Number: 22  
 Env. Background: System Bkgd 55741  
 Reagent Blank: <not performed>

Sample Size: 1.500E+000 +/- 0.000E+000 liter  
 Generic Mult. Factor: 2.910E+000 Generic Div. Factor: 1.000E+000  
 Sample Date/Time: 4/30/2013 11:38:01 AM  
 Acquisition Date/Time: 5/1/2013 4:18:42 PM  
 Acquisition Live Time: 170.0 minutes  
 Acquisition Real Time: 170.0 minutes

Chem. Recovery Factor: 0.7432 +/- 0.0000  
 Counting Efficiency: 0.1531 +/- 0.0029 on 12/15/2012 1:57:26 PM  
 Effective Efficiency: 0.1138 +/- 0.0022

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  | 5.533        | 46.45       | 29.67           | 2.55            | 0.00E+000       | 5.5        |
| RA-226  | 4.626        | 73.96       | 23.16           | 2.04            | 0.00E+000       | 4.7        |

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

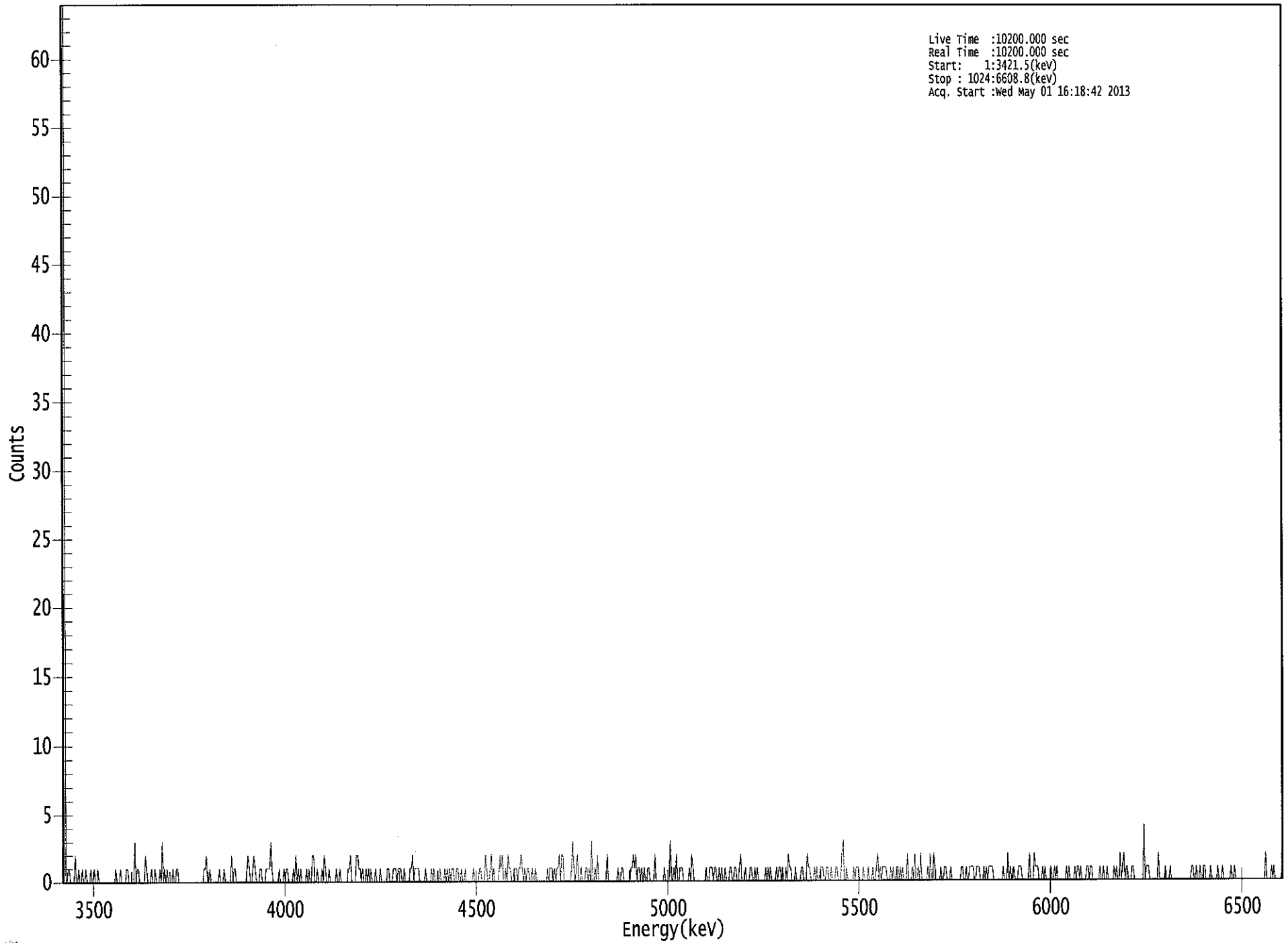
| Nuclide | Id Conf. | Energy (keV) | Activity (pCi/liter)    | MDA (pCi/liter)         |
|---------|----------|--------------|-------------------------|-------------------------|
| RA-224  | 0.969    | 5685.50*     | 2.77E+000 +/- 8.57E+002 | 5.00E-001 +/- 1.55E+002 |
| RA-226  | 0.967    | 4785.00*     | 3.34E+000 +/- 7.83E-001 | 3.52E-001 +/- 1.31E-002 |

AG  
5/2/13

US EPA ARCHIVE DOCUMENT

0000056847.CNF

Live Time :10200.000 sec  
Real Time :10200.000 sec  
Start: 1:3421.5(kev)  
Stop : 1024:6608.8(kev)  
Acq. Start :Wed May 01 16:18:42 2013



US EPA ARCHIVE DOCUMENT

0000056847.CNF

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: 10200  
 Elapsed Real Time: 10200

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

369: 2 0 0 1 0 2 1 1

Sample Title: 06

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

801: 0 1 1 1 0 0 0 0

Sample Title: 06

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



c  
JPM

Sample Description: I-68 DIS  
 Spectrum File: \\OR-ALPHA1\Canberra\ApexAlpha\Root\Data\00000568  
 Batch Identification: 1304105A-RA  
 Sample Identification: 07  
 Sample Geometry: Shelf 2  
 Procedure Description: Ra

Detector Name: Alpha\_024  
 Chamber Serial Number:  
 Detector Serial Number: 24  
 Env. Background: System Bkgd 55742  
 Reagent Blank: <not performed>

Sample Size: 1.500E+000 +/- 0.000E+000 liter  
 Generic Mult. Factor: 2.770E+000 Generic Div. Factor: 1.000E+000  
 Sample Date/Time: 4/30/2013 11:38:01 AM  
 Acquisition Date/Time: 5/1/2013 4:18:43 PM  
 Acquisition Live Time: 170.0 minutes  
 Acquisition Real Time: 170.0 minutes

Chem. Recovery Factor: 0.9681 +/- 0.0000  
 Counting Efficiency: 0.1710 +/- 0.0032 on 12/15/2012 2:02:15 PM  
 Effective Efficiency: 0.1656 +/- 0.0031

Peak Match Tolerance: 0.350 MeV

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

| Nuclide | Energy (MeV) | Net Pk Area | Pk Area Error % | Ambient Backgnd | Reagent Backgnd | FWHM (keV) |
|---------|--------------|-------------|-----------------|-----------------|-----------------|------------|
| RA-224  | 5.549        | 6.43        | 99.27           | 3.57            | 0.00E+000       | 3.1        |
| RA-226  | 4.582        | 22.66       | 41.53           | 0.34            | 0.00E+000       | 4.7        |

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 ----- NUCLIDE ANALYSIS RESULTS -----  
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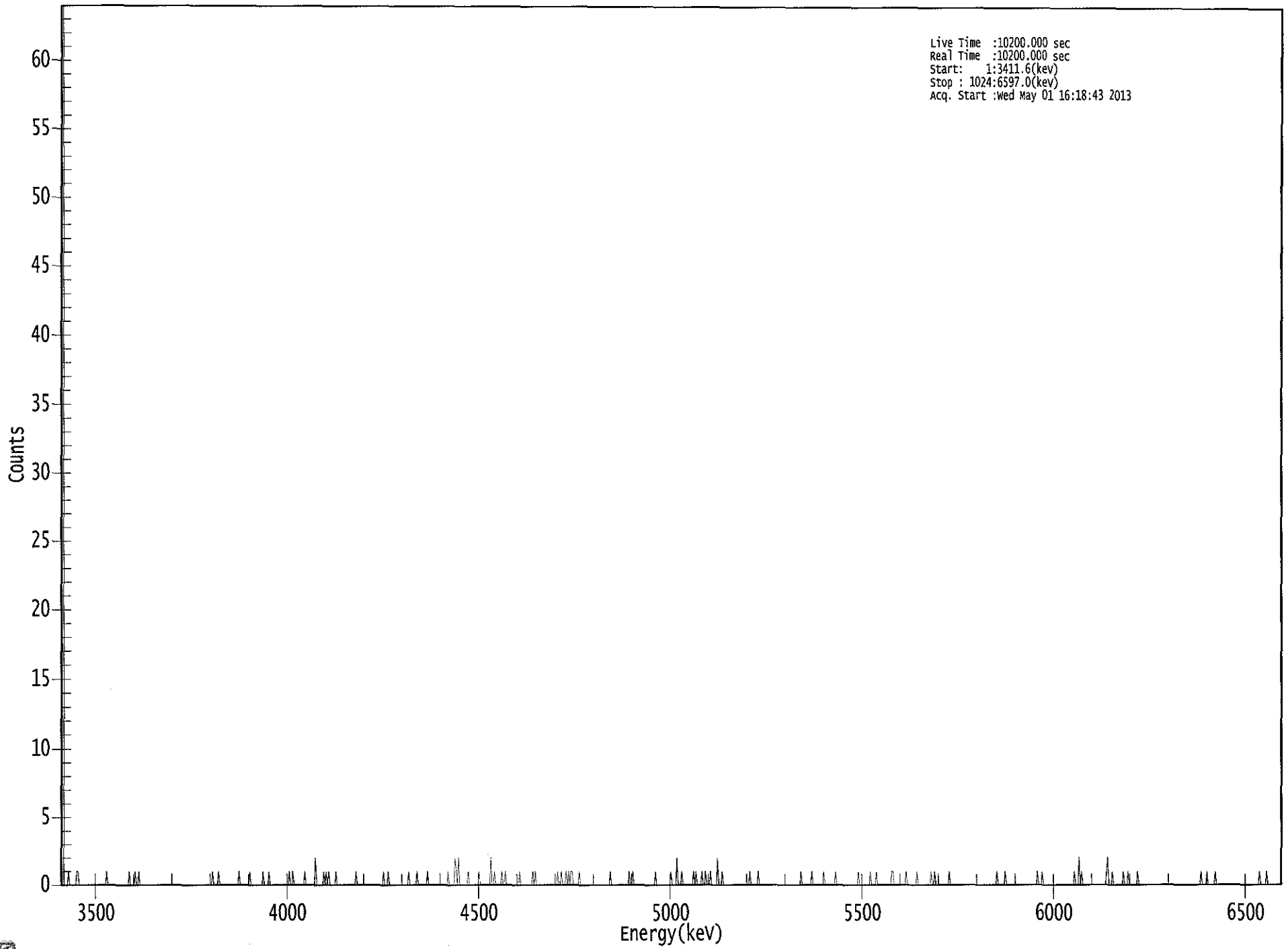
| Nuclide | Id Conf. | Energy (keV) | Activity (pCi/liter )   | MDA (pCi/liter )        |
|---------|----------|--------------|-------------------------|-------------------------|
| RA-224  | 0.975    | 5685.50*     | 2.51E-001 +/- 7.76E+001 | 3.67E-001 +/- 1.14E+002 |
| RA-226  | 0.948    | 4785.00*     | 6.70E-001 +/- 2.79E-001 | 1.41E-001 +/- 5.17E-003 |

AG  
5/2/13

US EPA ARCHIVE DOCUMENT

0000056848.CNF

Live Time :10200.000 sec  
Real Time :10200.000 sec  
Start: 1:3411.6(kev)  
Stop : 1024:6597.0(kev)  
Acq. Start :Wed May 01 16:18:43 2013



0358

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



369: 0 1 0 0 1 0 0 0

Sample Title: 07

| Channel | 1 | 2 | 3 | 4 | 5 | 6 | 7 | 8 |
|---------|---|---|---|---|---|---|---|---|
| 377:    | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 |
| 385:    | 1 | 0 | 0 | 0 | 0 | 0 | 0 | 0 |
| 393:    | 0 | 0 | 0 | 1 | 0 | 1 | 0 | 0 |
| 401:    | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 |
| 409:    | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 |
| 417:    | 1 | 0 | 0 | 1 | 0 | 0 | 0 | 1 |
| 425:    | 0 | 1 | 0 | 1 | 1 | 0 | 0 | 0 |
| 433:    | 0 | 0 | 1 | 0 | 0 | 0 | 0 | 0 |
| 441:    | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 |
| 449:    | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 |
| 457:    | 0 | 0 | 0 | 0 | 1 | 0 | 0 | 0 |
| 465:    | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 |
| 473:    | 0 | 0 | 0 | 0 | 1 | 0 | 0 | 1 |
| 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 | 2 | 0 | 0 | 0 |
| 521:    | 1 | 0 | 0 | 0 | 0 | 0 | 0 | 0 |
| 529:    | 0 | 0 | 1 | 0 | 1 | 0 | 0 | 0 |
| 537:    | 0 | 1 | 0 | 0 | 1 | 0 | 0 | 0 |
| 545:    | 1 | 0 | 0 | 0 | 0 | 0 | 2 | 0 |
| 553:    | 0 | 0 | 1 | 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 | 1 | 0 | 0 | 0 | 0 | 0 | 0 |
| 585:    | 1 | 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 | 1 | 0 | 0 | 0 |
| 625:    | 0 | 0 | 0 | 0 | 0 | 1 | 0 | 0 |
| 633:    | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 1 |
| 641:    | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 |
| 649:    | 0 | 1 | 0 | 0 | 0 | 0 | 0 | 0 |
| 657:    | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 |
| 665:    | 0 | 0 | 0 | 0 | 1 | 0 | 0 | 0 |
| 673:    | 0 | 0 | 0 | 0 | 0 | 0 | 1 | 0 |
| 681:    | 0 | 0 | 0 | 1 | 0 | 0 | 0 | 0 |
| 689:    | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 |
| 697:    | 1 | 1 | 0 | 0 | 0 | 0 | 0 | 0 |
| 705:    | 0 | 0 | 0 | 0 | 1 | 0 | 0 | 0 |
| 713:    | 0 | 0 | 0 | 0 | 0 | 1 | 0 | 0 |
| 721:    | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 |
| 729:    | 0 | 1 | 0 | 0 | 1 | 0 | 0 | 0 |
| 737:    | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 |
| 745:    | 1 | 0 | 0 | 0 | 0 | 0 | 0 | 0 |
| 753:    | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 |
| 761:    | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 |
| 769:    | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 |
| 777:    | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 |
| 785:    | 1 | 0 | 0 | 0 | 0 | 0 | 0 | 1 |
| 793:    | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 |

801: 0 0 0 0 0 0 0 0 0

Sample Title: 07

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



*S*  
*8/2/13*

Sample Description: D-87 TOT  
 Spectrum File: \\OR-ALPHA1\Canberra\ApexAlpha\Root\Data\00000568  
 Batch Identification: 1304105A-RA  
 Sample Identification: 08  
 Sample Geometry: Shelf 2  
 Procedure Description: Ra

Detector Name: Alpha\_025  
 Chamber Serial Number:  
 Detector Serial Number: 25  
 Env. Background: System Bkgd 55743  
 Reagent Blank: <not performed>

Sample Size: 1.500E+000 +/- 0.000E+000 liter  
 Generic Mult. Factor: 3.200E+000 Generic Div. Factor: 1.000E+000  
 Sample Date/Time: 4/30/2013 11:38:01 AM  
 Acquisition Date/Time: 5/1/2013 4:18:44 PM  
 Acquisition Live Time: 170.0 minutes  
 Acquisition Real Time: 170.0 minutes

Chem. Recovery Factor: 1.0000 +/- 0.0000  
 Counting Efficiency: 0.1736 +/- 0.0032 on 12/15/2012 1:57:27 PM  
 Effective Efficiency: 0.1736 +/- 0.0032

Peak Match Tolerance: 0.350 MeV

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

| Nuclide | Energy (MeV) | Net Pk Area | Pk Area Error % | Ambient Backgnd | Reagent Backgnd | FWHM (keV) |
|---------|--------------|-------------|-----------------|-----------------|-----------------|------------|
| RA-224  | 5.549        | 19.13       | 47.31           | 1.87            | 0.00E+000       | 3.1        |
| RA-226  | 4.561        | 40.98       | 31.06           | 1.02            | 0.00E+000       | 3.1        |

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 ----- NUCLIDE ANALYSIS RESULTS -----  
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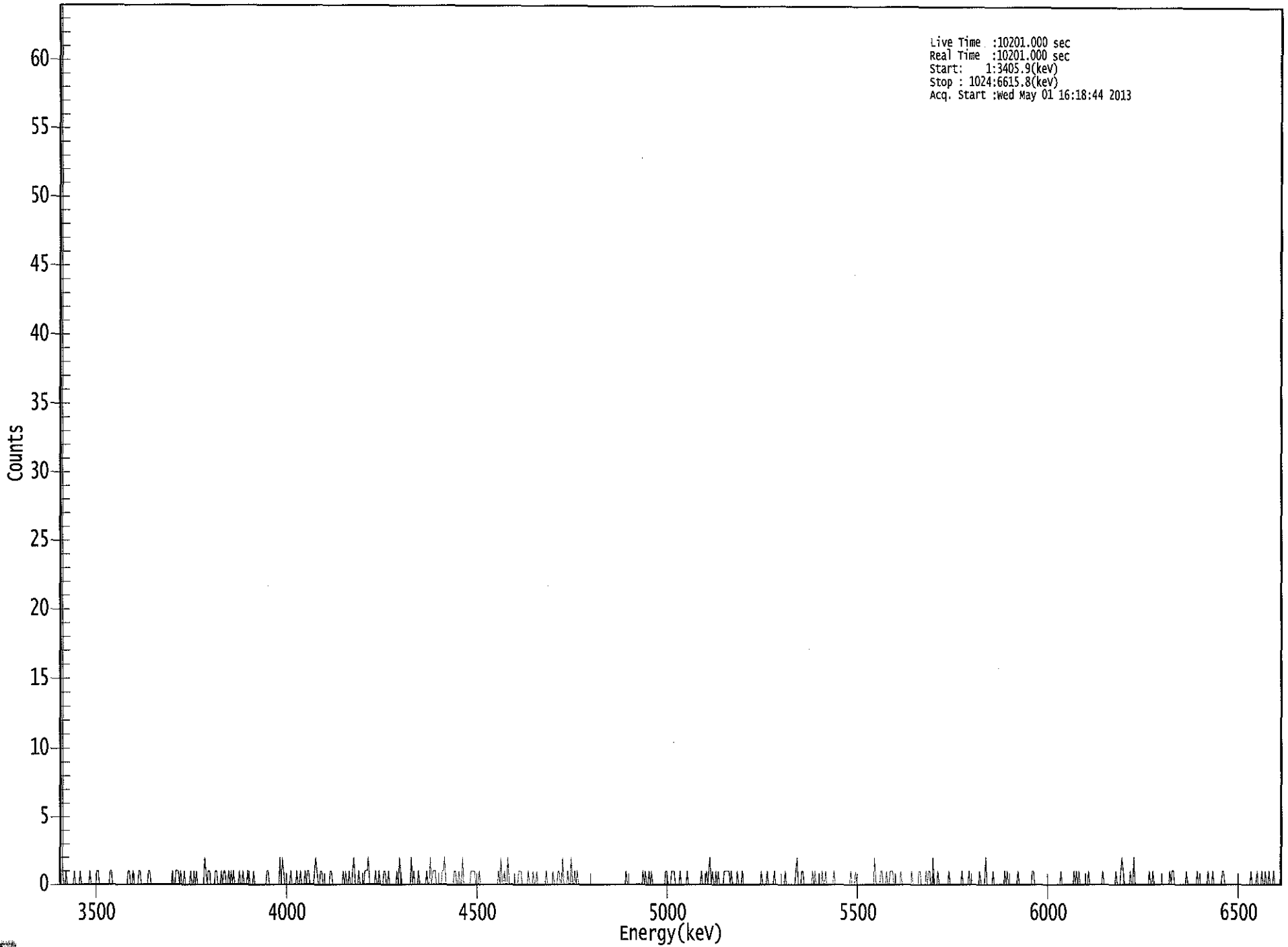
| Nuclide | Id Conf. | Energy (keV) | Activity (pCi/liter)    | MDA (pCi/liter)         |
|---------|----------|--------------|-------------------------|-------------------------|
| RA-224  | 0.975    | 5685.50*     | 8.21E-001 +/- 2.55E+002 | 3.25E-001 +/- 1.01E+002 |
| RA-226  | 0.936    | 4785.00*     | 1.33E+000 +/- 4.17E-001 | 2.05E-001 +/- 7.50E-003 |

*AG*  
*5/2/13*

US EPA ARCHIVE DOCUMENT

0000056849.CNF

Live Time :10201.000 sec  
Real Time :10201.000 sec  
Start: 1:3405.9(kev)  
Stop : 1024:6615.8(kev)  
Acq. Start :Wed May 01 16:18:44 2013



0363

ROI Type: 1

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

Sample Title: 08

Elapsed Live time: 10201  
 Elapsed Real Time: 10201

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

369: 0 2 0 0 1 0 0 2

Sample Title: 08

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

801: 0 0 1 0 0 0 0 0

Sample Title: 08

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



*8/26*

Sample Description: D-87 DIS  
 Spectrum File: \\OR-ALPHA1\Canberra\ApexAlpha\Root\Data\00000568  
 Batch Identification: 1304105A-RA  
 Sample Identification: 09  
 Sample Geometry: Shelf 2  
 Procedure Description: Ra

Detector Name: Alpha\_027  
 Chamber Serial Number:  
 Detector Serial Number: 27  
 Env. Background: System Bkgd 55744  
 Reagent Blank: <not performed>

Sample Size: 1.500E+000 +/- 0.000E+000 liter  
 Generic Mult. Factor: 3.010E+000 Generic Div. Factor: 1.000E+000  
 Sample Date/Time: 4/30/2013 11:38:01 AM  
 Acquisition Date/Time: 5/1/2013 4:18:45 PM  
 Acquisition Live Time: 170.0 minutes  
 Acquisition Real Time: 170.0 minutes

Chem. Recovery Factor: 1.0000 +/- 0.0000  
 Counting Efficiency: 0.1728 +/- 0.0032 on 12/15/2012 2:27:41 PM  
 Effective Efficiency: 0.1728 +/- 0.0032

Peak Match Tolerance: 0.350 MeV

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

| Nuclide | Energy (MeV) | Net Pk Area | Pk Area Error % | Ambient Backgnd | Reagent Backgnd | FWHM (keV) |
|---------|--------------|-------------|-----------------|-----------------|-----------------|------------|
| RA-224  | 5.507        | 8.30        | 75.75           | 1.70            | 0.00E+000       | 3.2        |
| RA-226  | 4.573        | 24.47       | 41.05           | 1.53            | 0.00E+000       | 3.2        |

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

| Nuclide | Id Conf. | Energy (keV) | Activity (pCi/liter)    | MDA (pCi/liter)         |
|---------|----------|--------------|-------------------------|-------------------------|
| RA-224  | 0.959    | 5685.50*     | 3.37E-001 +/- 1.04E+002 | 2.98E-001 +/- 9.24E+001 |
| RA-226  | 0.943    | 4785.00*     | 7.53E-001 +/- 3.10E-001 | 2.19E-001 +/- 8.04E-003 |

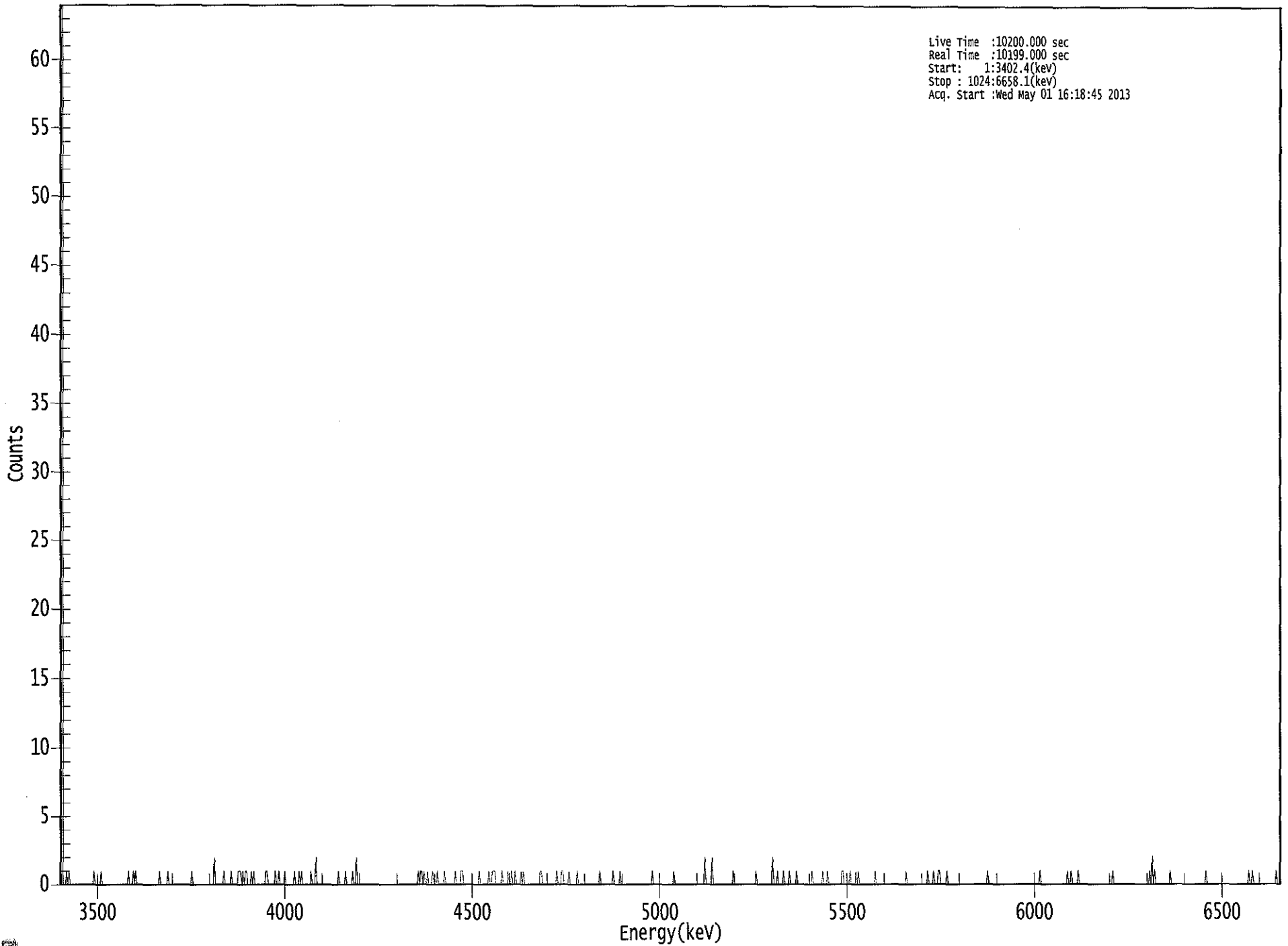
*AG*  
*8/5/2/13*

US EPA ARCHIVE DOCUMENT



0000056850.CNF

Live Time :10200.000 sec  
Real Time :10199.000 sec  
Start: 1:3402.4(kev)  
Stop : 1024:6658.1(kev)  
Acq. Start :Wed May 01 16:18:45 2013



US EPA ARCHIVE DOCUMENT

8950

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: 10199

| Channel | ----- | ----- | ----- | ----- | ----- | ----- | ----- | ----- |
|---------|-------|-------|-------|-------|-------|-------|-------|-------|
| 1:      | 10199 | 10200 | 0     | 0     | 0     | 1     | 0     | 1     |
| 9:      | 0     | 0     | 0     | 0     | 0     | 0     | 0     | 0     |
| 17:     | 0     | 0     | 0     | 0     | 0     | 0     | 0     | 0     |
| 25:     | 0     | 0     | 0     | 0     | 1     | 0     | 0     | 0     |
| 33:     | 0     | 0     | 1     | 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     | 1     | 0     | 1     |
| 65:     | 0     | 0     | 0     | 0     | 0     | 0     | 0     | 0     |
| 73:     | 0     | 0     | 0     | 0     | 0     | 0     | 0     | 0     |
| 81:     | 0     | 0     | 0     | 1     | 0     | 0     | 0     | 0     |
| 89:     | 0     | 0     | 1     | 0     | 0     | 0     | 0     | 0     |
| 97:     | 0     | 0     | 0     | 0     | 0     | 0     | 0     | 0     |
| 105:    | 0     | 0     | 0     | 0     | 0     | 0     | 1     | 0     |
| 113:    | 0     | 0     | 0     | 0     | 0     | 0     | 0     | 0     |
| 121:    | 0     | 0     | 0     | 0     | 0     | 0     | 0     | 0     |
| 129:    | 0     | 2     | 0     | 0     | 0     | 0     | 0     | 0     |
| 137:    | 0     | 1     | 0     | 0     | 0     | 0     | 0     | 1     |
| 145:    | 0     | 0     | 0     | 0     | 0     | 1     | 1     | 1     |
| 153:    | 0     | 1     | 0     | 1     | 1     | 0     | 0     | 0     |
| 161:    | 1     | 0     | 1     | 0     | 0     | 0     | 0     | 0     |
| 169:    | 0     | 0     | 0     | 0     | 1     | 1     | 0     | 0     |
| 177:    | 0     | 0     | 0     | 0     | 1     | 0     | 0     | 1     |
| 185:    | 0     | 0     | 0     | 0     | 1     | 0     | 0     | 0     |
| 193:    | 0     | 0     | 0     | 0     | 1     | 0     | 0     | 0     |
| 201:    | 1     | 0     | 1     | 0     | 0     | 0     | 0     | 0     |
| 209:    | 0     | 0     | 1     | 0     | 0     | 0     | 2     | 0     |
| 217:    | 0     | 0     | 0     | 0     | 0     | 0     | 0     | 0     |
| 225:    | 0     | 0     | 0     | 0     | 0     | 0     | 0     | 0     |
| 233:    | 0     | 1     | 0     | 0     | 0     | 0     | 0     | 1     |
| 241:    | 0     | 0     | 0     | 0     | 0     | 1     | 0     | 0     |
| 249:    | 2     | 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     | 1     | 0     | 1     | 1     |
| 305:    | 0     | 1     | 0     | 0     | 1     | 0     | 0     | 0     |
| 313:    | 1     | 0     | 0     | 0     | 1     | 0     | 0     | 0     |
| 321:    | 0     | 0     | 1     | 0     | 0     | 0     | 0     | 0     |
| 329:    | 0     | 0     | 0     | 1     | 0     | 0     | 0     | 0     |
| 337:    | 1     | 1     | 0     | 0     | 0     | 0     | 0     | 0     |
| 345:    | 0     | 0     | 0     | 0     | 0     | 0     | 0     | 1     |
| 353:    | 0     | 0     | 0     | 0     | 0     | 0     | 0     | 1     |
| 361:    | 0     | 0     | 1     | 1     | 1     | 0     | 0     | 0     |

369: 0 0 1 0 0 0 0 1

Sample Title: 09

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

801: 0 0 0 0 0 0 0 0

Sample Title: 09

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



*Handwritten signature*

Sample Description: PZ-106-SD TOT  
 Spectrum File: \\OR-ALPHA1\Canberra\ApexAlpha\Root\Data\00000568  
 Batch Identification: 1304105A-RA  
 Sample Identification: 10  
 Sample Geometry: Shelf 2  
 Procedure Description: Ra

Detector Name: Alpha\_029  
 Chamber Serial Number:  
 Detector Serial Number: 29  
 Env. Background: System Bkgd 55745  
 Reagent Blank: <not performed>

Sample Size: 1.500E+000 +/- 0.000E+000 liter  
 Generic Mult. Factor: 2.400E+000 Generic Div. Factor: 1.000E+000  
 Sample Date/Time: 4/30/2013 11:38:01 AM  
 Acquisition Date/Time: 5/1/2013 4:18:46 PM  
 Acquisition Live Time: 170.0 minutes  
 Acquisition Real Time: 170.0 minutes

Chem. Recovery Factor: 0.9595 +/- 0.0000  
 Counting Efficiency: 0.1945 +/- 0.0036 on 12/15/2012 2:30:02 PM  
 Effective Efficiency: 0.1867 +/- 0.0034

Peak Match Tolerance: 0.350 MeV

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

| Nuclide | Energy (MeV) | Net Pk Area | Pk Area Error % | Ambient Backgnd | Reagent Backgnd | FWHM (keV) |
|---------|--------------|-------------|-----------------|-----------------|-----------------|------------|
| RA-224  | 5.545        | 21.13       | 44.79           | 1.87            | 0.00E+000       | 3.1        |
| RA-226  | 4.567        | 45.64       | 29.51           | 1.36            | 0.00E+000       | 3.1        |

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

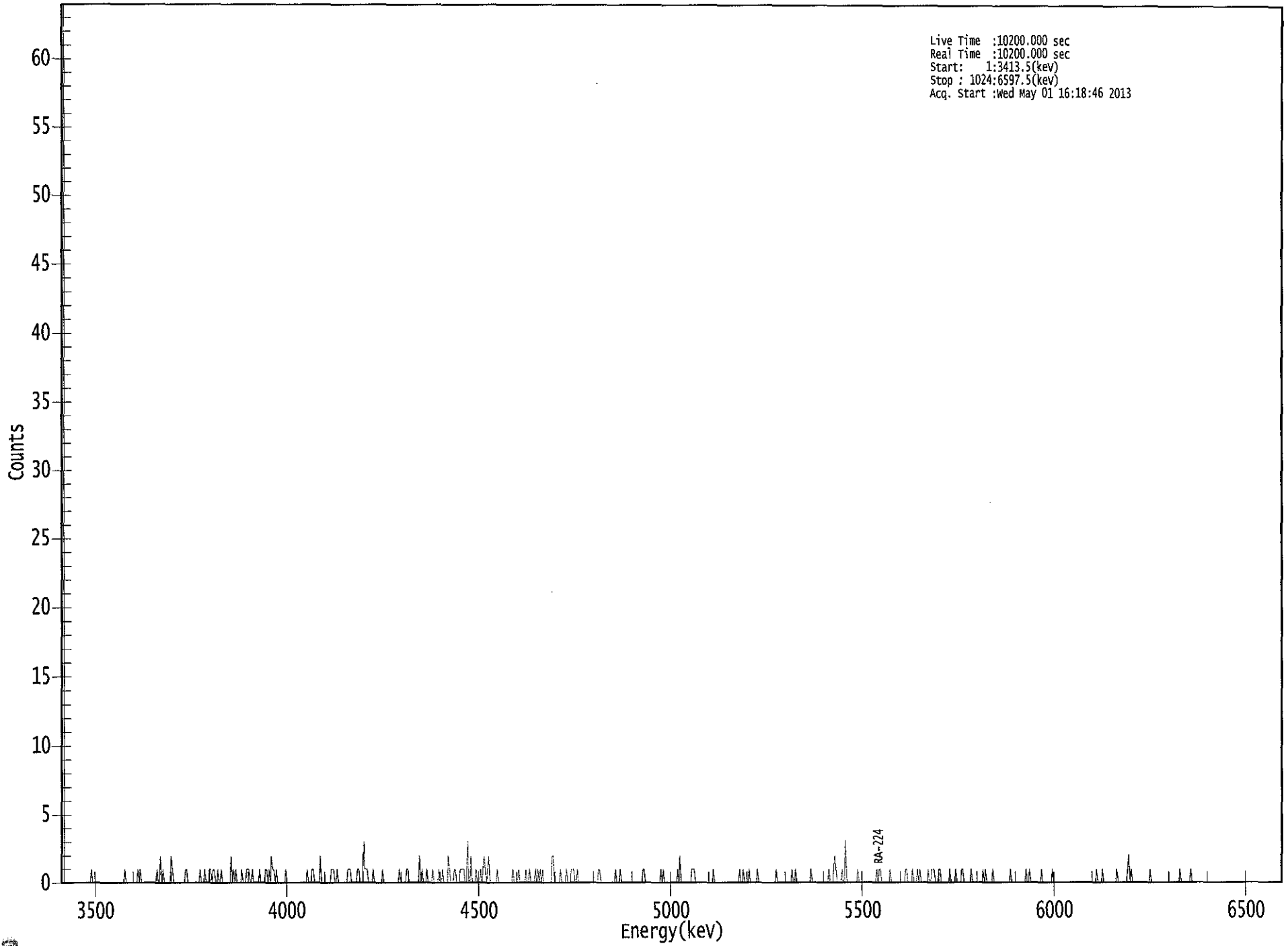
| Nuclide | Id Conf. | Energy (keV) | Activity (pCi/liter)    | MDA (pCi/liter)         |
|---------|----------|--------------|-------------------------|-------------------------|
| RA-224  | 0.974    | 5685.50*     | 6.33E-001 +/- 1.96E+002 | 2.27E-001 +/- 7.03E+001 |
| RA-226  | 0.940    | 4785.00*     | 1.04E+000 +/- 3.08E-001 | 1.56E-001 +/- 5.61E-003 |

*AG*  
*5/2/13*

US EPA ARCHIVE DOCUMENT

0000056851.CNF

Live Time :10200.000 sec  
Real Time :10200.000 sec  
Start : 1:3413.5(kev)  
Stop : 1024:6597.5(kev)  
Acq. Start :wed May 01 16:18:46 2013



US EPA ARCHIVE DOCUMENT

0373

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

369: 0 0 0 0 0 0 0 0

Sample Title: 10

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



801: 0 0 0 0 0 0 0 0 0

Sample Title: 10

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



8/12/17

Sample Description: PZ-106-SD DIS  
 Spectrum File: \\OR-ALPHA1\Canberra\ApexAlpha\Root\Data\00000568  
 Batch Identification: 1304105A-RA  
 Sample Identification: 11  
 Sample Geometry: Shelf 2  
 Procedure Description: Ra

Detector Name: Alpha\_033  
 Chamber Serial Number: 04026479A  
 Detector Serial Number: 91132  
 Env. Background: System Bkgd 55746  
 Reagent Blank: <not performed>

Sample Size: 1.500E+000 +/- 0.000E+000 liter  
 Generic Mult. Factor: 2.400E+000 Generic Div. Factor: 1.000E+000  
 Sample Date/Time: 4/30/2013 11:38:01 AM  
 Acquisition Date/Time: 5/1/2013 4:19:52 PM  
 Acquisition Live Time: 170.0 minutes  
 Acquisition Real Time: 170.0 minutes

Chem. Recovery Factor: 0.9670 +/- 0.0000  
 Counting Efficiency: 0.1825 +/- 0.0032 on 12/16/2012 5:49:18 PM  
 Effective Efficiency: 0.1765 +/- 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  | 5.513        | 6.66        | 78.18           | 0.34            | 0.00E+000       | 3.0        |
| RA-226  | 4.596        | 25.32       | 39.56           | 0.68            | 0.00E+000       | 3.0        |

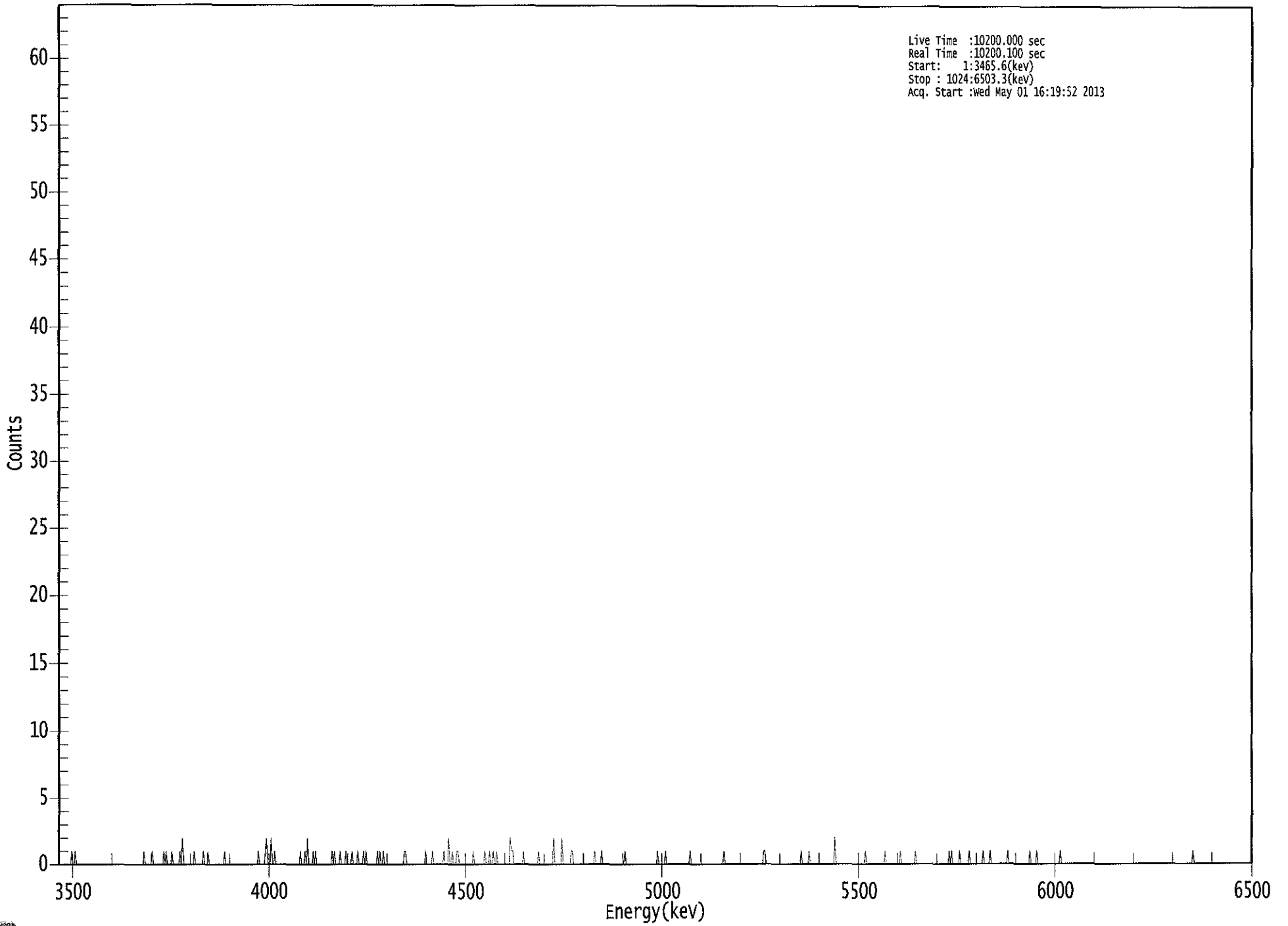
-----  
 NUCLIDE ANALYSIS RESULTS  
 -----

| Nuclide | Id Conf. | Energy (keV) | Activity (pCi/liter )   | MDA (pCi/liter )        |
|---------|----------|--------------|-------------------------|-------------------------|
| RA-224  | 0.961    | 5685.50*     | 2.11E-001 +/- 6.54E+001 | 1.51E-001 +/- 4.70E+001 |
| RA-226  | 0.954    | 4785.00*     | 6.08E-001 +/- 2.42E-001 | 1.36E-001 +/- 4.67E-003 |

AG  
5/2/13

US EPA ARCHIVE DOCUMENT

0000056853.CNF



US EPA ARCHIVE DOCUMENT

0378

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

369: 0 1 0 0 1 0 0 1

Sample Title: 11

| Channel | 1 | 2 | 3 | 4 | 5 | 6 | 7 | 8 |
|---------|---|---|---|---|---|---|---|---|
| 377:    | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 |
| 385:    | 0 | 0 | 0 | 2 | 1 | 1 | 0 | 0 |
| 393:    | 0 | 0 | 0 | 0 | 0 | 0 | 1 | 0 |
| 401:    | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 |
| 409:    | 0 | 0 | 0 | 1 | 0 | 0 | 0 | 0 |
| 417:    | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 |
| 425:    | 2 | 0 | 0 | 0 | 0 | 0 | 0 | 2 |
| 433:    | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 1 |
| 441:    | 1 | 0 | 0 | 0 | 0 | 0 | 0 | 0 |
| 449:    | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 |
| 457:    | 0 | 0 | 0 | 1 | 0 | 0 | 0 | 0 |
| 465:    | 0 | 1 | 0 | 0 | 0 | 0 | 0 | 0 |
| 473:    | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 |
| 481:    | 0 | 0 | 0 | 0 | 0 | 1 | 0 | 0 |
| 489:    | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 |
| 497:    | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 |
| 505:    | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 |
| 513:    | 0 | 1 | 0 | 0 | 0 | 0 | 0 | 0 |
| 521:    | 1 | 0 | 0 | 0 | 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 | 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 | 1 | 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 | 1 | 1 | 0 | 0 |
| 609:    | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 |
| 617:    | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 |
| 625:    | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 |
| 633:    | 0 | 0 | 0 | 0 | 1 | 0 | 0 | 0 |
| 641:    | 0 | 0 | 0 | 1 | 0 | 0 | 0 | 0 |
| 649:    | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 |
| 657:    | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 |
| 665:    | 0 | 2 | 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 | 1 | 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 | 1 | 0 | 0 | 0 | 0 | 0 | 0 |
| 729:    | 0 | 0 | 0 | 0 | 0 | 0 | 1 | 0 |
| 737:    | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 |
| 745:    | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 |
| 753:    | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 |
| 761:    | 0 | 0 | 0 | 1 | 0 | 1 | 0 | 0 |
| 769:    | 0 | 0 | 0 | 0 | 1 | 0 | 0 | 0 |
| 777:    | 0 | 0 | 0 | 0 | 1 | 0 | 0 | 0 |
| 785:    | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 |
| 793:    | 1 | 0 | 0 | 0 | 0 | 0 | 1 | 0 |

801: 0 0 0 0 0 0 0 0

Sample Title: 11

| Channel |   |   |   |   |   |   |   |   |
|---------|---|---|---|---|---|---|---|---|
| 809:    | 0 | 0 | 0 | 0 | 0 | 1 | 0 | 0 |
| 817:    | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 |
| 825:    | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 |
| 833:    | 1 | 0 | 0 | 0 | 0 | 0 | 1 | 0 |
| 841:    | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 |
| 849:    | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 |
| 857:    | 0 | 0 | 1 | 0 | 0 | 0 | 0 | 0 |
| 865:    | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 |
| 873:    | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 |
| 881:    | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 |
| 889:    | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 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 | 1 | 0 | 0 | 0 |
| 977:    | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 |
| 985:    | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 |
| 993:    | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 |
| 1001:   | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 |
| 1009:   | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 |
| 1017:   | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 |



5/12/13

Sample Description: S-82 TOT  
 Spectrum File: \\OR-ALPHA1\Canberra\ApexAlpha\Root\Data\00000568  
 Batch Identification: 1304105A-RA  
 Sample Identification: 12  
 Sample Geometry: Shelf 2  
 Procedure Description: Ra

Detector Name: Alpha\_034  
 Chamber Serial Number: 04026479B  
 Detector Serial Number: 91136  
 Env. Background: System Bkgd 55747  
 Reagent Blank: <not performed>

Sample Size: 1.500E+000 +/- 0.000E+000 liter  
 Generic Mult. Factor: 2.940E+000 Generic Div. Factor: 1.000E+000  
 Sample Date/Time: 4/30/2013 11:38:01 AM  
 Acquisition Date/Time: 5/1/2013 4:19:55 PM  
 Acquisition Live Time: 170.0 minutes  
 Acquisition Real Time: 170.0 minutes

Chem. Recovery Factor: 1.0000 +/- 0.0000  
 Counting Efficiency: 0.1856 +/- 0.0032 on 12/16/2012 5:49:43 PM  
 Effective Efficiency: 0.1856 +/- 0.0032

Peak Match Tolerance: 0.350 MeV

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 PEAK AREA REPORT  
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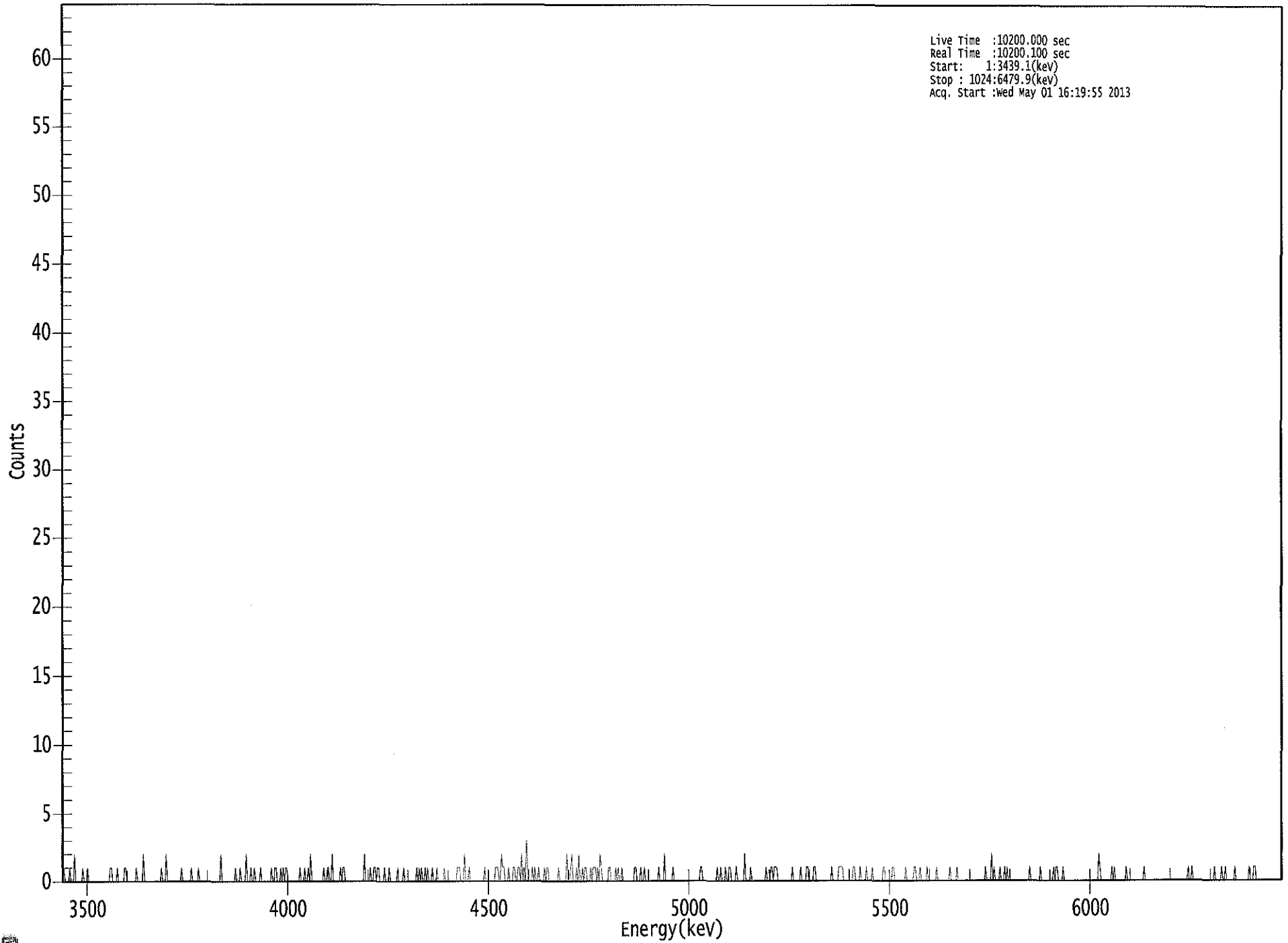
| Nuclide | Energy (MeV) | Net Pk Area | Pk Area Error % | Ambient Backgnd | Reagent Backgnd | FWHM (keV) |
|---------|--------------|-------------|-----------------|-----------------|-----------------|------------|
| RA-224  | 5.497        | 20.83       | 43.15           | 0.17            | 0.00E+000       | 11.9       |
| RA-226  | 4.630        | 58.15       | 25.92           | 0.85            | 0.00E+000       | 3.7        |

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 NUCLIDE ANALYSIS RESULTS  
 -----

| Nuclide | Id Conf. | Energy (keV) | Activity (pCi/liter)    | MDA (pCi/liter)         |
|---------|----------|--------------|-------------------------|-------------------------|
| RA-224  | 0.954    | 5685.50*     | 7.69E-001 +/- 2.38E+002 | 1.54E-001 +/- 4.78E+001 |
| RA-226  | 0.969    | 4785.00*     | 1.63E+000 +/- 4.25E-001 | 1.68E-001 +/- 5.72E-003 |

AG  
5/2/13

US EPA ARCHIVE DOCUMENT



0303

ROI Type: 1



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 \*\*\*\*\* S P E C T R A L   D A T A   R E P O R T   \*\*\*\*\*  
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Sample Title: 12

Elapsed Live time: 10200

Elapsed Real Time: 10200

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

369: 2 1 1 0 0 0 1 0

Sample Title: 12

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

801: 0 0 0 0 0 0 0 0 0

Sample Title: 12

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

*c  
Yru*

Sample Description: S-82 DIS  
 Spectrum File: \\OR-ALPHA1\Canberra\ApexAlpha\Root\Data\00000568  
 Batch Identification: 1304105A-RA  
 Sample Identification: 13  
 Sample Geometry: Shelf 2  
 Procedure Description: Ra

Detector Name: Alpha\_035  
 Chamber Serial Number: 04026477A  
 Detector Serial Number: 58771  
 Env. Background: System Bkgd 55748  
 Reagent Blank: <not performed>

Sample Size: 1.500E+000 +/- 0.000E+000 liter  
 Generic Mult. Factor: 2.610E+000 Generic Div. Factor: 1.000E+000  
 Sample Date/Time: 4/30/2013 11:38:01 AM  
 Acquisition Date/Time: 5/1/2013 4:19:48 PM  
 Acquisition Live Time: 170.0 minutes  
 Acquisition Real Time: 170.0 minutes

Chem. Recovery Factor: 0.8514 +/- 0.0000  
 Counting Efficiency: 0.1826 +/- 0.0032 on 12/16/2012 5:49:42 PM  
 Effective Efficiency: 0.1554 +/- 0.0027

Peak Match Tolerance: 0.350 MeV

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 PEAK AREA REPORT  
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| Nuclide | Energy (MeV) | Net Pk Area | Pk Area Error % | Ambient Backgnd | Reagent Backgnd | FWHM (keV) |
|---------|--------------|-------------|-----------------|-----------------|-----------------|------------|
| RA-224  | 5.479        | 7.66        | 72.63           | 0.34            | 0.00E+000       | 2.9        |
| RA-226  | 4.617        | 21.49       | 42.86           | 0.51            | 0.00E+000       | 2.9        |

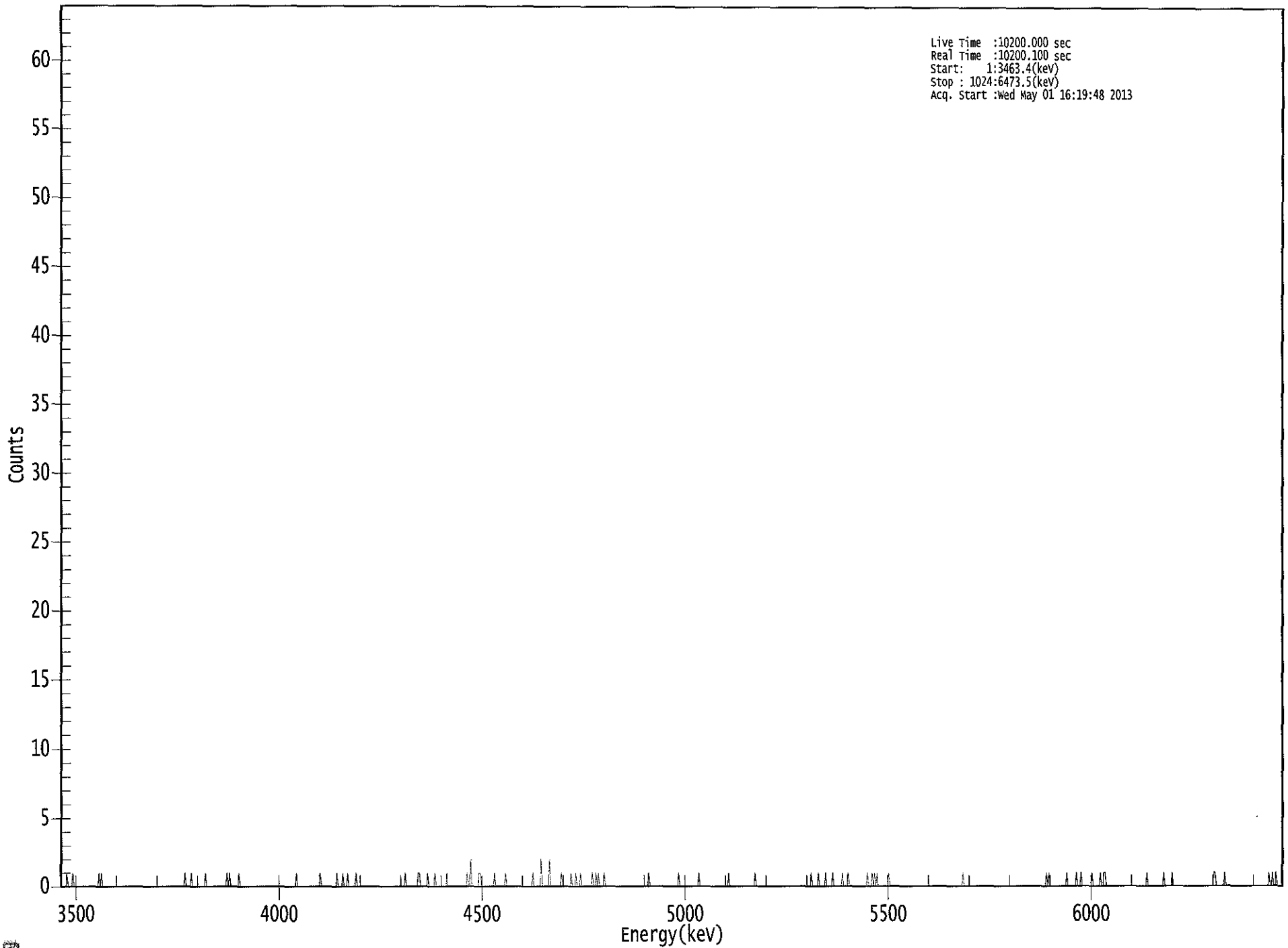
-----  
 NUCLIDE ANALYSIS RESULTS  
 -----

| Nuclide | Id Conf. | Energy (keV) | Activity (pCi/liter )   | MDA (pCi/liter )        |
|---------|----------|--------------|-------------------------|-------------------------|
| RA-224  | 0.945    | 5685.50*     | 3.00E-001 +/- 9.29E+001 | 1.87E-001 +/- 5.80E+001 |
| RA-226  | 0.964    | 4785.00*     | 6.37E-001 +/- 2.74E-001 | 1.56E-001 +/- 5.33E-003 |

*AG  
5/2/13*

0000056855.CNF

Live Time :10200.000 sec  
Real Time :10200.100 sec  
Start: 1:3463.4(kev)  
Stop : 1024:6473.5(kev)  
Acq. Start :Wed May 01 16:19:48 2013



US EPA ARCHIVE DOCUMENT

0388

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

369: 0 0 0 0 1 0 0 0

Sample Title: 13

| Channel | 1 | 2 | 3 | 4 | 5 | 6 | 7 | 8 |
|---------|---|---|---|---|---|---|---|---|
| 377:    | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 |
| 385:    | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 |
| 393:    | 0 | 0 | 0 | 1 | 0 | 0 | 0 | 0 |
| 401:    | 0 | 0 | 2 | 0 | 0 | 0 | 0 | 0 |
| 409:    | 0 | 2 | 0 | 0 | 0 | 0 | 0 | 0 |
| 417:    | 0 | 0 | 0 | 1 | 0 | 0 | 0 | 0 |
| 425:    | 0 | 0 | 0 | 1 | 0 | 0 | 0 | 1 |
| 433:    | 0 | 0 | 0 | 1 | 0 | 0 | 0 | 0 |
| 441:    | 0 | 0 | 0 | 0 | 0 | 1 | 0 | 0 |
| 449:    | 1 | 0 | 1 | 0 | 0 | 0 | 0 | 1 |
| 457:    | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 |
| 465:    | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 |
| 473:    | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 |
| 481:    | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 |
| 489:    | 0 | 0 | 0 | 0 | 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 | 1 | 0 | 0 |
| 521:    | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 |
| 529:    | 0 | 0 | 0 | 0 | 0 | 0 | 1 | 0 |
| 537:    | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 |
| 545:    | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 |
| 553:    | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 1 |
| 561:    | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 |
| 569:    | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 |
| 577:    | 0 | 0 | 0 | 0 | 0 | 1 | 0 | 0 |
| 585:    | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 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 | 1 | 0 | 0 | 0 |
| 633:    | 0 | 0 | 1 | 0 | 0 | 0 | 0 | 0 |
| 641:    | 1 | 0 | 0 | 0 | 0 | 0 | 1 | 0 |
| 649:    | 0 | 0 | 0 | 0 | 0 | 0 | 1 | 0 |
| 657:    | 0 | 0 | 0 | 1 | 0 | 0 | 0 | 0 |
| 665:    | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 |
| 673:    | 0 | 0 | 0 | 1 | 0 | 0 | 0 | 1 |
| 681:    | 0 | 1 | 0 | 1 | 0 | 0 | 0 | 0 |
| 689:    | 0 | 0 | 0 | 0 | 0 | 1 | 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 | 1 | 0 | 0 | 0 | 0 |
| 761:    | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 |
| 769:    | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 |
| 777:    | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 |
| 785:    | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 |
| 793:    | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 |

801: 0 0 0 0 0 0 0 0

Sample Title: 13

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



*C*  
*5/1/13*

Sample Description: PZ-106-SS TOT  
 Spectrum File: \\OR-ALPHA1\Canberra\ApexAlpha\Root\Data\00000568  
 Batch Identification: 1304105A-RA  
 Sample Identification: 14  
 Sample Geometry: Shelf 2  
 Procedure Description: Ra

Detector Name: Alpha\_037  
 Chamber Serial Number: 04026478A  
 Detector Serial Number: 91133  
 Env. Background: System Bkgd 55750  
 Reagent Blank: <not performed>

Sample Size: 1.500E+000 +/- 0.000E+000 liter  
 Generic Mult. Factor: 2.470E+000 Generic Div. Factor: 1.000E+000  
 Sample Date/Time: 4/30/2013 11:38:01 AM  
 Acquisition Date/Time: 5/1/2013 4:19:50 PM  
 Acquisition Live Time: 170.0 minutes  
 Acquisition Real Time: 170.0 minutes

Chem. Recovery Factor: 0.9752 +/- 0.0000  
 Counting Efficiency: 0.1783 +/- 0.0033 on 1/26/2013 3:28:25 PM  
 Effective Efficiency: 0.1739 +/- 0.0032

Peak Match Tolerance: 0.350 MeV

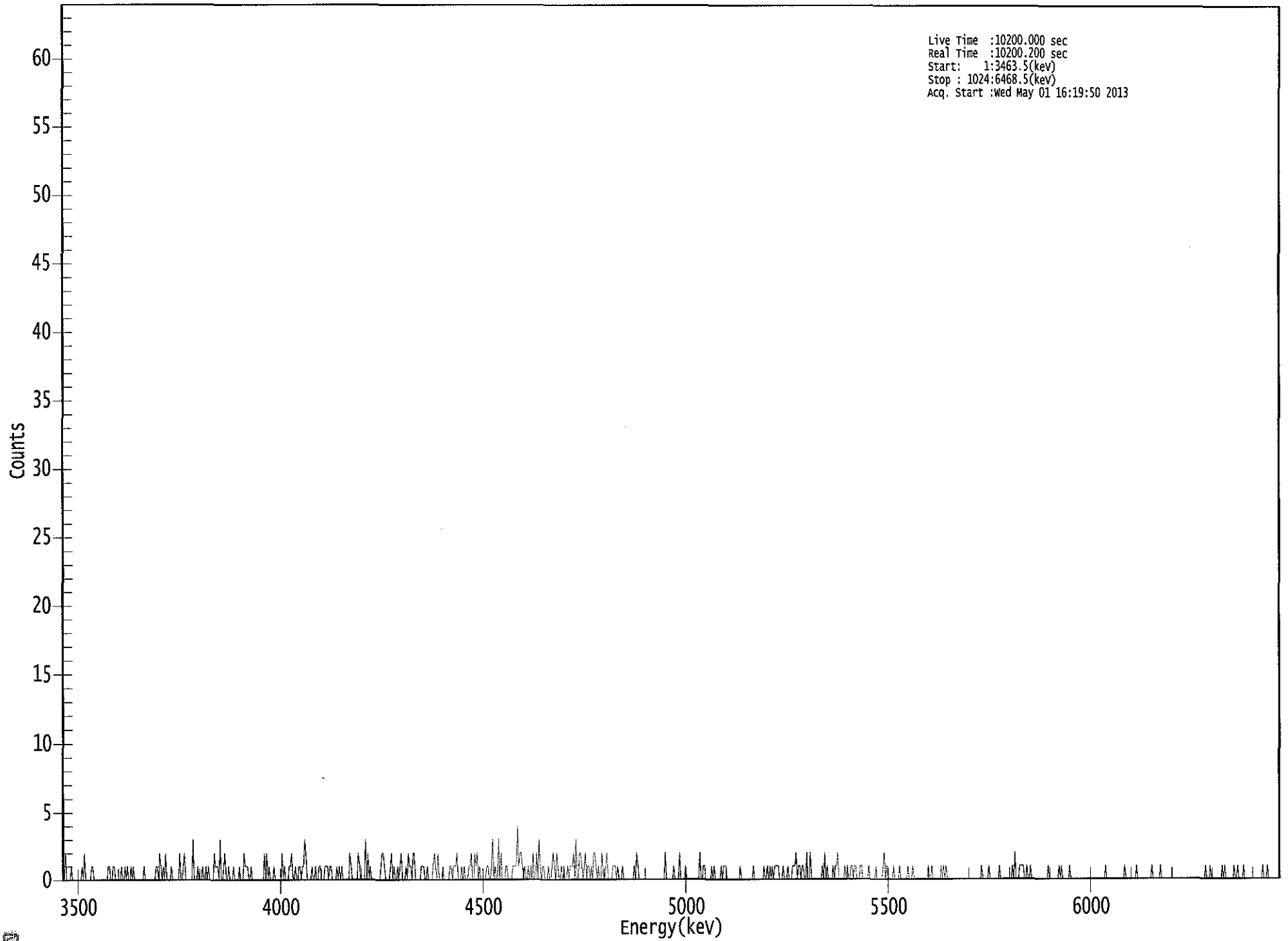
-----  
 PEAK AREA REPORT  
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| Nuclide | Energy (MeV) | Net Pk Area | Pk Area Error % | Ambient Backgnd | Reagent Backgnd | FWHM (keV) |
|---------|--------------|-------------|-----------------|-----------------|-----------------|------------|
| RA-224  | 5.485        | 26.83       | 37.98           | 0.17            | 0.00E+000       | 4.4        |
| RA-226  | 4.614        | 111.66      | 18.58           | 0.34            | 0.00E+000       | 3.9        |

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 NUCLIDE ANALYSIS RESULTS  
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| Nuclide | Id Conf. | Energy (keV) | Activity (pCi/liter )   | MDA (pCi/liter )        |
|---------|----------|--------------|-------------------------|-------------------------|
| RA-224  | 0.948    | 5685.50*     | 8.88E-001 +/- 2.75E+002 | 1.38E-001 +/- 4.28E+001 |
| RA-226  | 0.963    | 4785.00*     | 2.80E+000 +/- 5.31E-001 | 1.20E-001 +/- 4.37E-003 |

*AG*  
*5/2/13*



0393

ROI Type: 1

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 \*\*\*\*\* S P E C T R A L D A T A R E P O R T \*\*\*\*\*  
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Sample Title: 14

Elapsed Live time: 10200

Elapsed Real Time: 10200

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

369: 2 0 0 0 1 1 0 0

Sample Title: 14

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

801: 2 0 0 0 1 1 1 1

Sample Title: 14

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



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Sample Description: PZ-106-SS DIS  
 Spectrum File: \\OR-ALPHA1\Canberra\ApexAlpha\Root\Data\00000568  
 Batch Identification: 1304105A-RA  
 Sample Identification: 15  
 Sample Geometry: Shelf 2  
 Procedure Description: Ra

Detector Name: Alpha\_040  
 Chamber Serial Number: 06027396B  
 Detector Serial Number: 91135  
 Env. Background: System Bkgd 55752  
 Reagent Blank: <not performed>

Sample Size: 1.500E+000 +/- 0.000E+000 liter  
 Generic Mult. Factor: 2.500E+000 Generic Div. Factor: 1.000E+000  
 Sample Date/Time: 4/30/2013 11:38:01 AM  
 Acquisition Date/Time: 5/1/2013 4:20:04 PM  
 Acquisition Live Time: 170.0 minutes  
 Acquisition Real Time: 170.0 minutes

Chem. Recovery Factor: 0.9209 +/- 0.0000  
 Counting Efficiency: 0.1900 +/- 0.0033 on 12/16/2012 5:49:33 PM  
 Effective Efficiency: 0.1750 +/- 0.0030

Peak Match Tolerance: 0.350 MeV

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 ----- PEAK AREA REPORT -----  
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| Nuclide | Energy (MeV) | Net Pk Area | Pk Area Error % | Ambient Backgnd | Reagent Backgnd | FWHM (keV) |
|---------|--------------|-------------|-----------------|-----------------|-----------------|------------|
| RA-224  | 5.500        | 28.32       | 37.34           | 0.68            | 0.00E+000       | 3.0        |
| RA-226  | 4.599        | 123.49      | 17.68           | 0.51            | 0.00E+000       | 4.9        |

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 ----- NUCLIDE ANALYSIS RESULTS -----  
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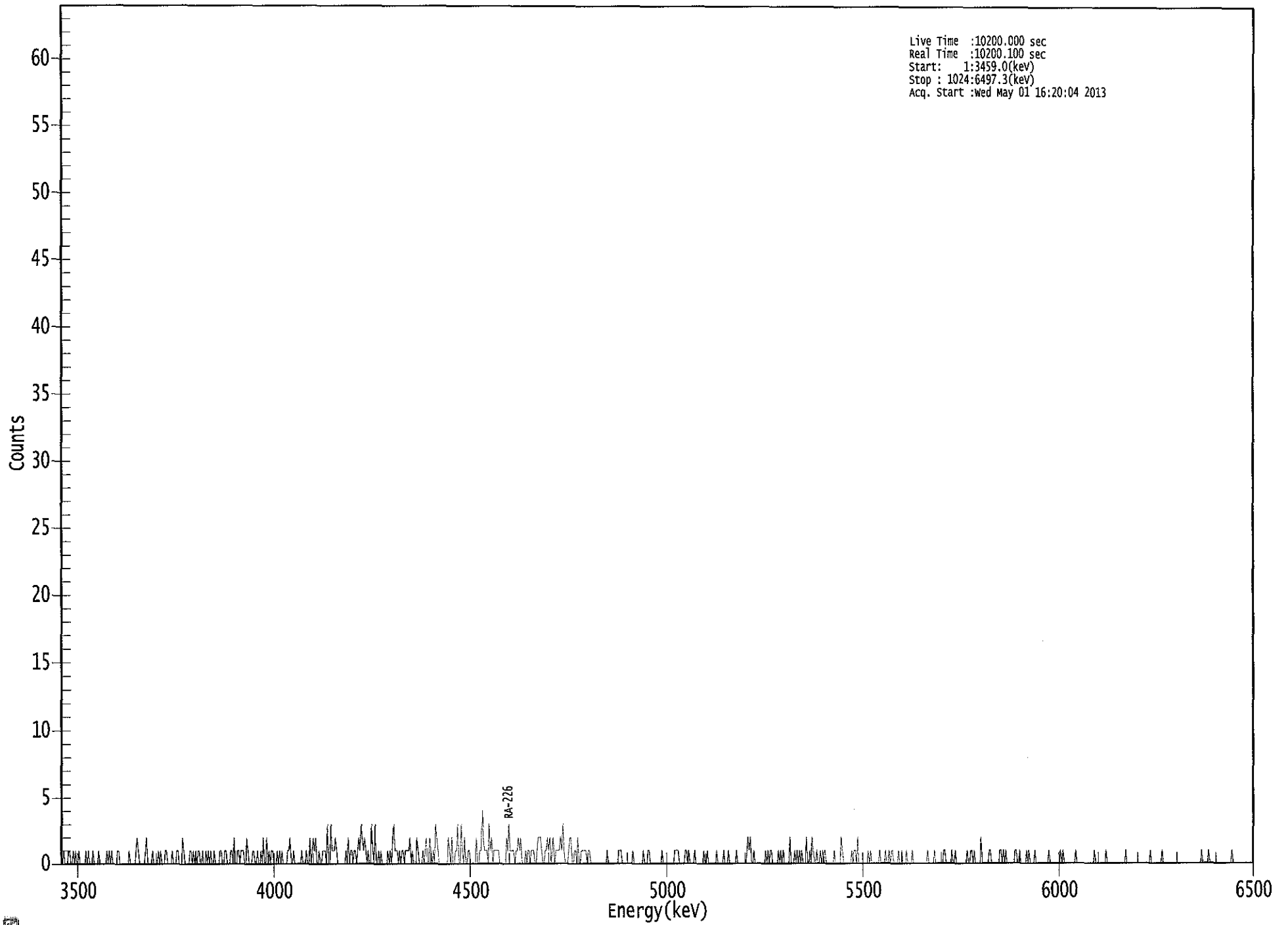
| Nuclide | Id Conf. | Energy (keV) | Activity (pCi/liter)    | MDA (pCi/liter)         |
|---------|----------|--------------|-------------------------|-------------------------|
| RA-224  | 0.956    | 5685.50*     | 9.43E-001 +/- 2.92E+002 | 1.88E-001 +/- 5.82E+001 |
| RA-226  | 0.956    | 4785.00*     | 3.12E+000 +/- 5.61E-001 | 1.32E-001 +/- 4.50E-003 |

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US EPA ARCHIVE DOCUMENT

0000056857.CNF

Live Time :10200.000 sec  
Real Time :10200.100 sec  
Start: 1:3459.0(kev)  
Stop : 1024:6497.3(kev)  
Acq. Start :Wed May 01 16:20:04 2013



0398

ROI Type: 1

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

Sample Title: 15

Elapsed Live time: 10200

Elapsed Real Time: 10200

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



369: 1 2 0 1 1 1 1 1

Sample Title: 15

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

801: 0 0 0 0 0 1 1 0

Sample Title: 15

| Channel | 1 | 2 | 3 | 4 | 5 | 6 | 7 | 8 |
|---------|---|---|---|---|---|---|---|---|
| 809:    | 1 | 0 | 1 | 0 | 0 | 0 | 0 | 0 |
| 817:    | 0 | 0 | 1 | 1 | 0 | 0 | 1 | 0 |
| 825:    | 0 | 0 | 0 | 0 | 1 | 0 | 1 | 0 |
| 833:    | 0 | 0 | 0 | 1 | 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 | 1 | 0 | 0 | 0 | 0 |
| 865:    | 0 | 0 | 0 | 0 | 0 | 0 | 1 | 0 |
| 873:    | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 |
| 881:    | 0 | 0 | 0 | 0 | 0 | 0 | 1 | 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 | 1 | 0 | 0 | 0 | 0 | 0 | 0 |
| 921:    | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 |
| 929:    | 0 | 0 | 0 | 0 | 0 | 0 | 1 | 0 |
| 937:    | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 |
| 945:    | 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 | 1 | 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 | 1 | 0 | 0 | 0 |
| 1009:   | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 |
| 1017:   | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 |



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Sample Description: I-9 TOT  
 Spectrum File: \\OR-ALPHA1\Canberra\ApexAlpha\Root\Data\00000568  
 Batch Identification: 1304105A-RA  
 Sample Identification: 16  
 Sample Geometry: Shelf 2  
 Procedure Description: Ra

Detector Name: Alpha\_041  
 Chamber Serial Number: 05026930A  
 Detector Serial Number: 91087  
 Env. Background: System Bkgd 55753  
 Reagent Blank: <not performed>

Sample Size: 1.500E+000 +/- 0.000E+000 liter  
 Generic Mult. Factor: 3.250E+000 Generic Div. Factor: 1.000E+000  
 Sample Date/Time: 4/30/2013 11:38:01 AM  
 Acquisition Date/Time: 5/1/2013 4:19:58 PM  
 Acquisition Live Time: 170.0 minutes  
 Acquisition Real Time: 170.0 minutes

Chem. Recovery Factor: 0.9384 +/- 0.0000  
 Counting Efficiency: 0.1978 +/- 0.0034 on 12/16/2012 5:49:31 PM  
 Effective Efficiency: 0.1857 +/- 0.0032

Peak Match Tolerance: 0.350 MeV

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 PEAK AREA REPORT  
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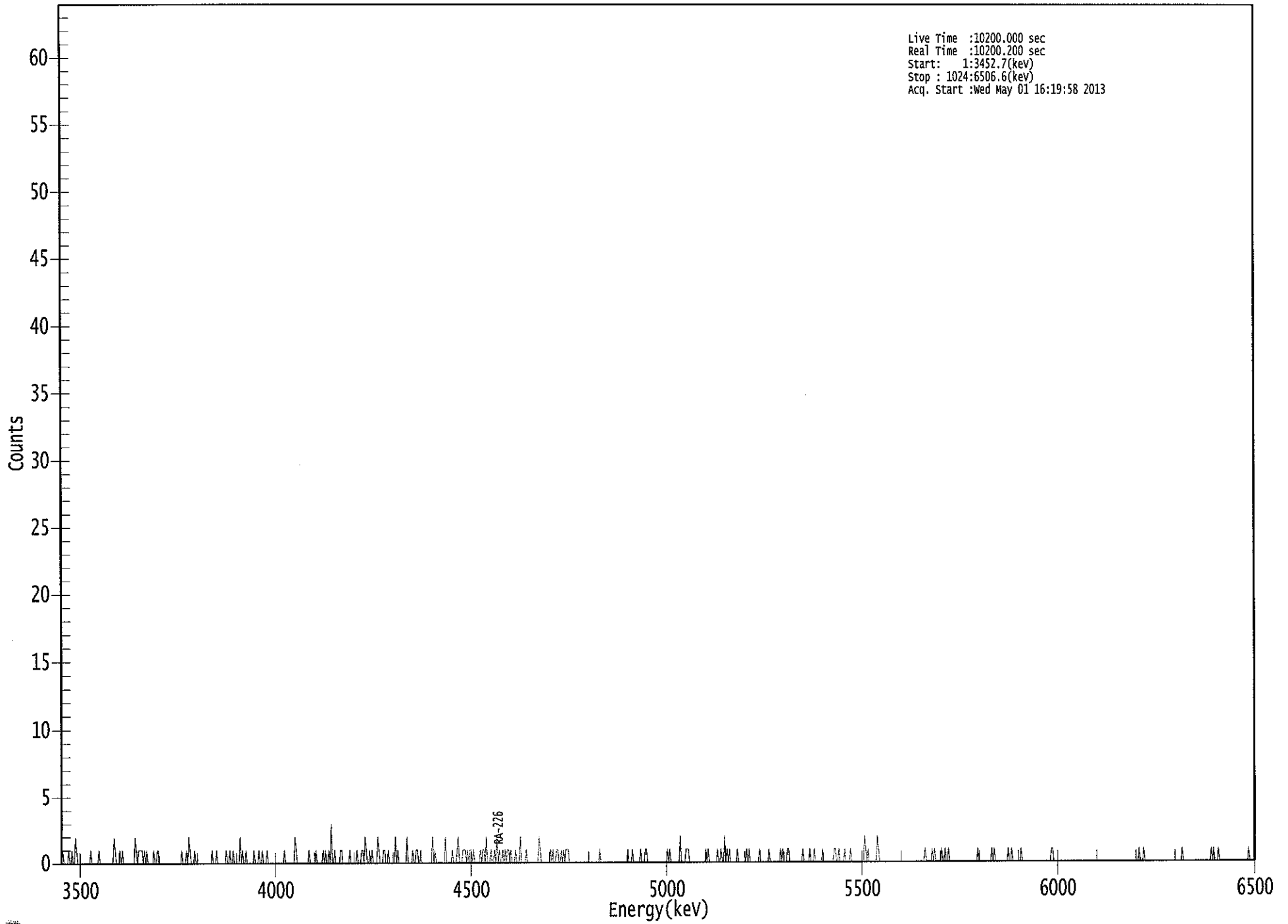
| Nuclide | Energy (MeV) | Net Pk Area | Pk Area Error % | Ambient Backgnd | Reagent Backgnd | FWHM (keV) |
|---------|--------------|-------------|-----------------|-----------------|-----------------|------------|
| RA-224  | 5.511        | 16.66       | 48.59           | 0.34            | 0.00E+000       | 4.5        |
| RA-226  | 4.574        | 47.81       | 28.76           | 1.19            | 0.00E+000       | 3.0        |

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 NUCLIDE ANALYSIS RESULTS  
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| Nuclide | Id Conf. | Energy (keV) | Activity (pCi/liter)    | MDA (pCi/liter)         |
|---------|----------|--------------|-------------------------|-------------------------|
| RA-224  | 0.961    | 5685.50*     | 6.79E-001 +/- 2.11E+002 | 1.95E-001 +/- 6.05E+001 |
| RA-226  | 0.943    | 4785.00*     | 1.48E+000 +/- 4.28E-001 | 2.04E-001 +/- 6.90E-003 |

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*5/2/13*

US EPA ARCHIVE DOCUMENT



5070

ROI Type: 1

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 \*\*\*\*\* S P E C T R A L D A T A R E P O R T \*\*\*\*\*  
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Sample Title: 16

Elapsed Live time: 10200

Elapsed Real Time: 10200

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

369: 1 0 0 1 0 2 0 1

Sample Title: 16

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

801: 0 0 0 0 0 0 0 0

Sample Title: 16

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



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5/2/13

Sample Description: I-9 DIS  
 Spectrum File: \\OR-ALPHA1\Canberra\ApexAlpha\Root\Data\00000568  
 Batch Identification: 1304105A-RA  
 Sample Identification: 17  
 Sample Geometry: Shelf 2  
 Procedure Description: Ra

Detector Name: Alpha\_042  
 Chamber Serial Number: 05026930B  
 Detector Serial Number: 84185  
 Env. Background: System Bkgd 55754  
 Reagent Blank: <not performed>

Sample Size: 1.500E+000 +/- 0.000E+000 liter  
 Generic Mult. Factor: 2.960E+000 Generic Div. Factor: 1.000E+000  
 Sample Date/Time: 4/30/2013 11:38:01 AM  
 Acquisition Date/Time: 5/1/2013 4:20:01 PM  
 Acquisition Live Time: 170.0 minutes  
 Acquisition Real Time: 170.0 minutes

Chem. Recovery Factor: 0.8934 +/- 0.0000  
 Counting Efficiency: 0.1846 +/- 0.0032 on 12/16/2012 5:49:29 PM  
 Effective Efficiency: 0.1649 +/- 0.0029

Peak Match Tolerance: 0.350 MeV

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 PEAK AREA REPORT  
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| Nuclide | Energy (MeV) | Net Pk Area | Pk Area Error % | Ambient Backgnd | Reagent Backgnd | FWHM (keV) |
|---------|--------------|-------------|-----------------|-----------------|-----------------|------------|
| RA-224  | 5.528        | 11.15       | 61.26           | 0.85            | 0.00E+000       | 3.0        |
| RA-226  | 4.604        | 20.98       | 43.99           | 1.02            | 0.00E+000       | 3.0        |

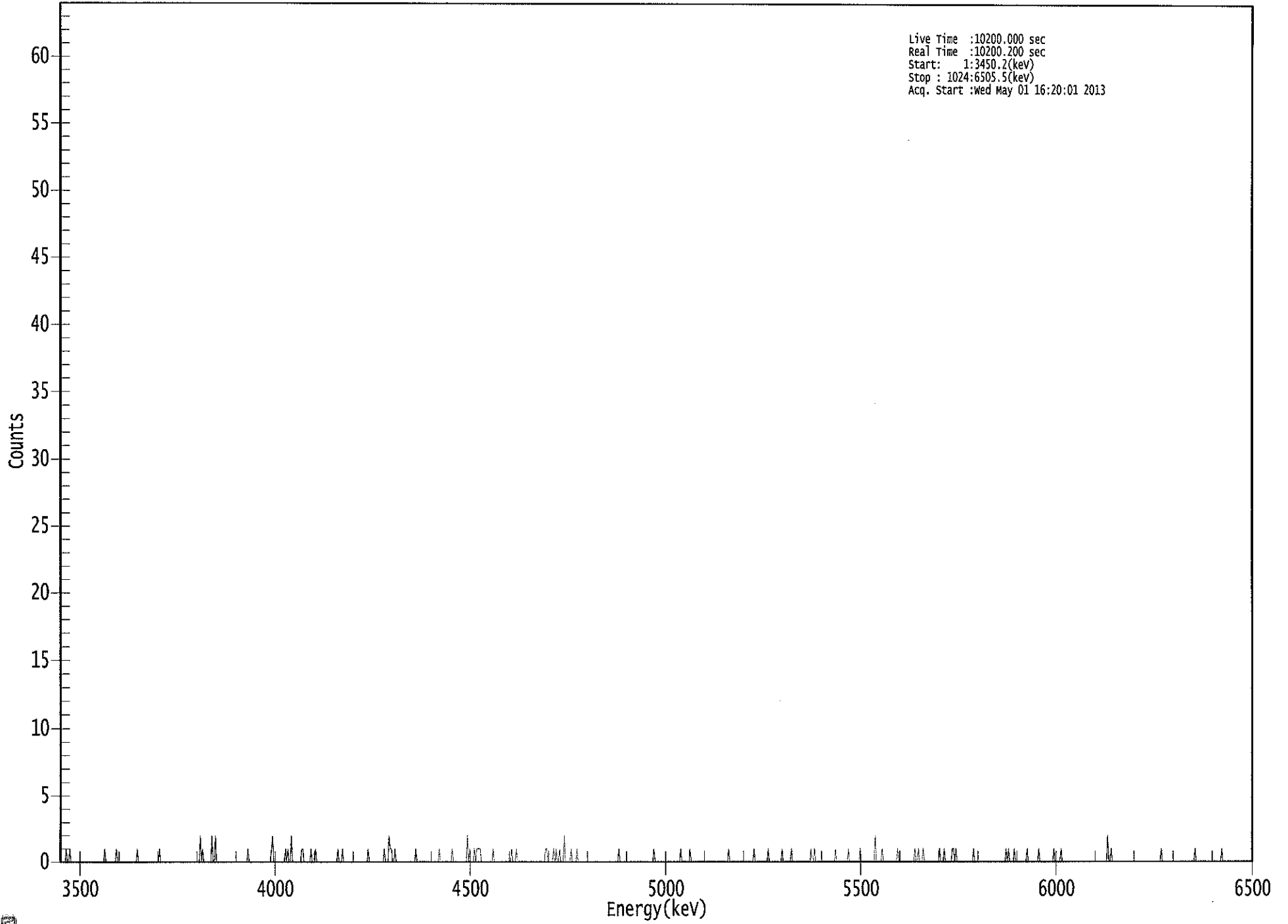
-----  
 NUCLIDE ANALYSIS RESULTS  
 -----

| Nuclide | Id Conf. | Energy (keV) | Activity (pCi/liter)    | MDA (pCi/liter)         |
|---------|----------|--------------|-------------------------|-------------------------|
| RA-224  | 0.968    | 5685.50*     | 4.66E-001 +/- 1.45E+002 | 2.50E-001 +/- 7.76E+001 |
| RA-226  | 0.958    | 4785.00*     | 6.65E-001 +/- 2.93E-001 | 2.00E-001 +/- 6.81E-003 |

AG  
5/2/13

US EPA ARCHIVE DOCUMENT





0408

ROI Type: 1

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 \*\*\*\*\* S P E C T R A L D A T A R E P O R T \*\*\*\*\*  
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Sample Title: 17

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

369: 0 0 0 1 0 0 0 0

Sample Title: 17

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

801: 0 0 0 0 0 0 0 0

Sample Title: 17

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

*Handwritten initials*

Sample Description: D-93 TOT  
 Spectrum File: \\OR-ALPHA1\Canberra\ApexAlpha\Root\Data\00000568  
 Batch Identification: 1304105A-RA  
 Sample Identification: 18  
 Sample Geometry: Shelf 2  
 Procedure Description: Ra

Detector Name: Alpha\_003  
 Chamber Serial Number:  
 Detector Serial Number: 3  
 Env. Background: System Bkgd 55734  
 Reagent Blank: <not performed>

Sample Size: 1.500E+000 +/- 0.000E+000 liter  
 Generic Mult. Factor: 3.770E+000 Generic Div. Factor: 1.000E+000  
 Sample Date/Time: 4/30/2013 11:38:01 AM  
 Acquisition Date/Time: 5/2/2013 5:32:48 AM  
 Acquisition Live Time: 170.0 minutes  
 Acquisition Real Time: 170.0 minutes

Chem. Recovery Factor: 0.9245 +/- 0.0000  
 Counting Efficiency: 0.1746 +/- 0.0033 on 12/15/2012 11:26:47 AM  
 Effective Efficiency: 0.1614 +/- 0.0030

Peak Match Tolerance: 0.350 MeV

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

| Nuclide | Energy (MeV) | Net Pk Area | Pk Area Error % | Ambient Backgnd | Reagent Backgnd | FWHM (keV) |
|---------|--------------|-------------|-----------------|-----------------|-----------------|------------|
| RA-224  | 5.530        | 28.62       | 38.38           | 2.38            | 0.00E+000       | 6.0        |
| RA-226  | 4.561        | 73.13       | 23.26           | 1.87            | 0.00E+000       | 4.5        |

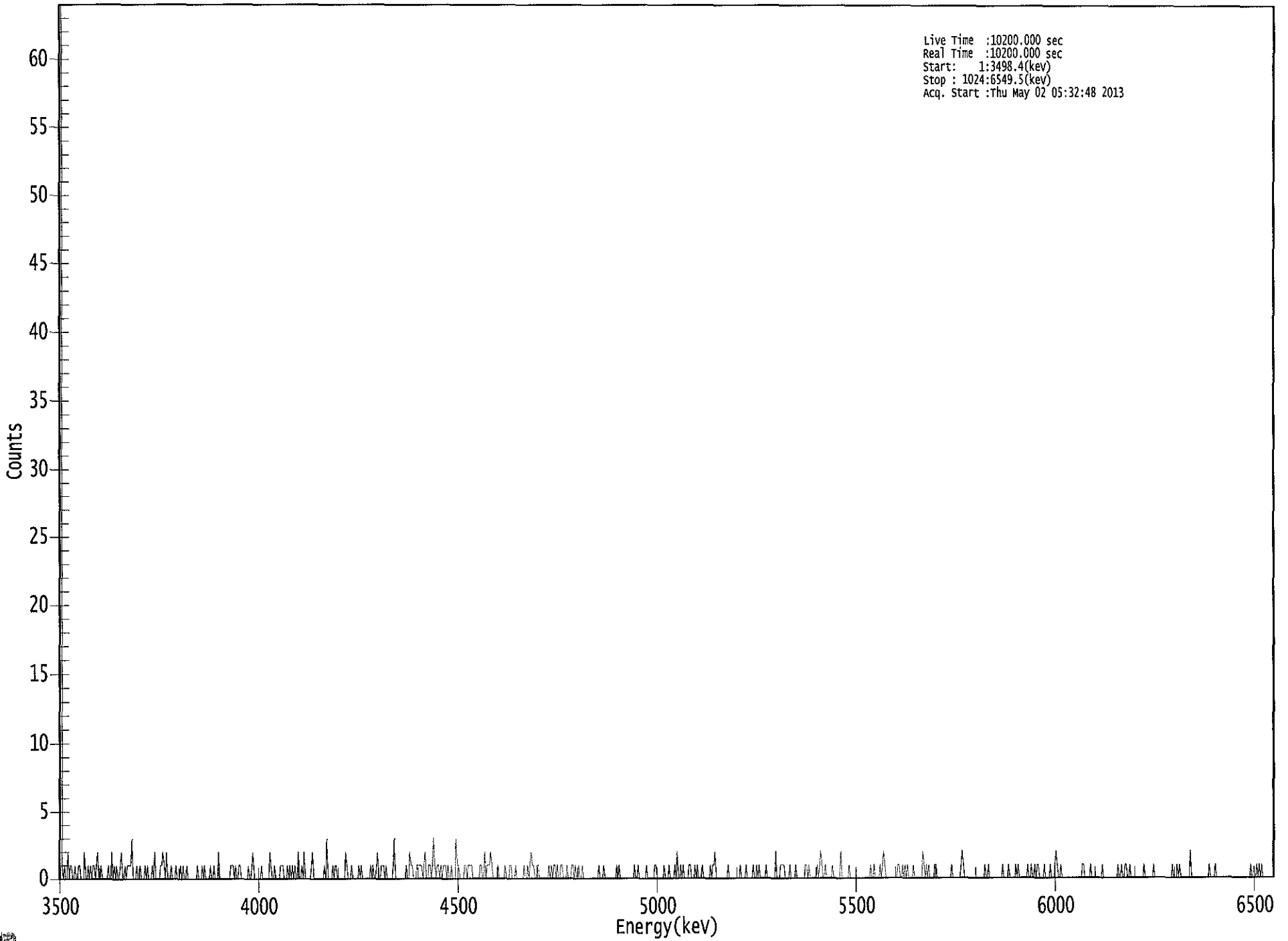
-----  
 ----- NUCLIDE ANALYSIS RESULTS -----  
 -----

| Nuclide | Id Conf. | Energy (keV) | Activity (pCi/liter)    | MDA (pCi/liter)         |
|---------|----------|--------------|-------------------------|-------------------------|
| RA-224  | 0.968    | 5685.50*     | 1.73E+000 +/- 7.82E+002 | 4.95E-001 +/- 2.24E+002 |
| RA-226  | 0.937    | 4785.00*     | 3.02E+000 +/- 7.10E-001 | 3.12E-001 +/- 1.14E-002 |

*AG*  
*5/2/13*

0000056890.CNF

Live Time :10200.000 sec  
Real Time :10200.000 sec  
Start: 1:3498.4(kev)  
Stop : 1024:6549.5(kev)  
Acq. Start :Thu May 02 05:32:48 2013



US EPA ARCHIVE DOCUMENT

5176

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: 10200

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

369: 0 1 0 0 0 0 0 0 1

Sample Title: 18

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



801: 0 0 0 0 0 1 0 1

Sample Title: 18

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

2  
J12417

Sample Description: D-93 DIS  
 Spectrum File: \\OR-ALPHA1\Canberra\ApexAlpha\Root\Data\00000568  
 Batch Identification: 1304105A-RA  
 Sample Identification: 19  
 Sample Geometry: Shelf 2  
 Procedure Description: Ra

Detector Name: Alpha\_004  
 Chamber Serial Number:  
 Detector Serial Number: 4  
 Env. Background: System Bkgd 55735  
 Reagent Blank: <not performed>

Sample Size: 1.500E+000 +/- 0.000E+000 liter  
 Generic Mult. Factor: 3.280E+000 Generic Div. Factor: 1.000E+000  
 Sample Date/Time: 4/30/2013 11:38:01 AM  
 Acquisition Date/Time: 5/2/2013 5:32:49 AM  
 Acquisition Live Time: 170.0 minutes  
 Acquisition Real Time: 170.0 minutes

Chem. Recovery Factor: 1.0000 +/- 0.0000  
 Counting Efficiency: 0.1940 +/- 0.0036 on 12/15/2012 11:26:46 AM  
 Effective Efficiency: 0.1940 +/- 0.0036

Peak Match Tolerance: 0.350 MeV

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

| Nuclide | Energy (MeV) | Net Pk Area | Pk Area Error % | Ambient Backgnd | Reagent Backgnd | FWHM (keV) |
|---------|--------------|-------------|-----------------|-----------------|-----------------|------------|
| RA-224  | 5.551        | 16.11       | 53.71           | 2.89            | 0.00E+000       | 2.9        |
| RA-226  | 4.612        | 64.47       | 24.75           | 1.53            | 0.00E+000       | 2.9        |

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 ----- NUCLIDE ANALYSIS RESULTS -----  
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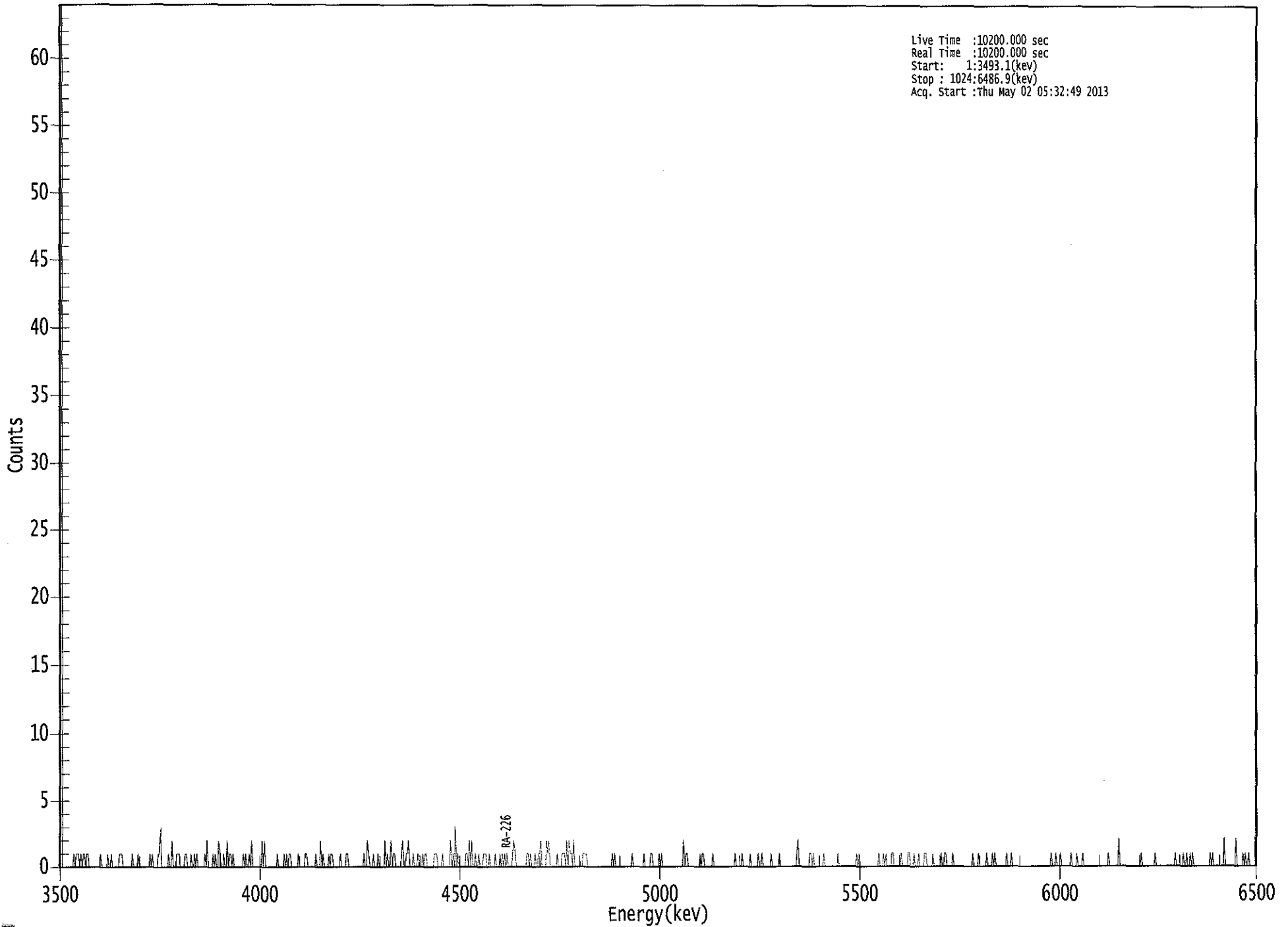
| Nuclide | Id Conf. | Energy (keV) | Activity (pCi/liter)    | MDA (pCi/liter)         |
|---------|----------|--------------|-------------------------|-------------------------|
| RA-224  | 0.976    | 5685.50*     | 7.04E-001 +/- 3.19E+002 | 3.83E-001 +/- 1.73E+002 |
| RA-226  | 0.962    | 4785.00*     | 1.93E+000 +/- 4.81E-001 | 2.12E-001 +/- 7.64E-003 |

AG  
5/2/13

US EPA ARCHIVE DOCUMENT

0000056891.CNF

Live Time :10200.000 sec  
Real Time :10200.000 sec  
Start : 1:3493.1(kev)  
Stop : 1024:6486.9(kev)  
Acq. Start :Thu May 02 05:32:49 2013



US EPA ARCHIVE DOCUMENT

0419

ROI Type: 1

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

Sample Title: 19

Elapsed Live time: 10200

Elapsed Real Time: 10200

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

369: 0 0 0 0 1 0 0 0

Sample Title: 19

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

801: 0 0 0 0 0 0 0 0

Sample Title: 19

| Channel | ----- | ----- | ----- | ----- | ----- | ----- | ----- | ----- |
|---------|-------|-------|-------|-------|-------|-------|-------|-------|
| 809:    | 0     | 1     | 0     | 0     | 0     | 1     | 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     | 1     |
| 849:    | 0     | 0     | 0     | 1     | 0     | 0     | 0     | 1     |
| 857:    | 0     | 0     | 0     | 0     | 0     | 0     | 0     | 0     |
| 865:    | 1     | 0     | 0     | 0     | 0     | 1     | 0     | 0     |
| 873:    | 0     | 0     | 1     | 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     | 2     | 0     | 0     | 0     | 0     | 0     | 0     |
| 913:    | 0     | 0     | 0     | 0     | 0     | 0     | 0     | 0     |
| 921:    | 0     | 0     | 0     | 0     | 1     | 0     | 0     | 0     |
| 929:    | 0     | 0     | 0     | 0     | 0     | 0     | 0     | 0     |
| 937:    | 1     | 0     | 0     | 0     | 0     | 0     | 0     | 0     |
| 945:    | 0     | 0     | 0     | 0     | 0     | 0     | 0     | 0     |
| 953:    | 0     | 1     | 0     | 0     | 0     | 0     | 0     | 0     |
| 961:    | 1     | 0     | 0     | 1     | 0     | 0     | 1     | 0     |
| 969:    | 1     | 0     | 0     | 0     | 0     | 0     | 0     | 0     |
| 977:    | 0     | 0     | 0     | 0     | 0     | 0     | 0     | 1     |
| 985:    | 0     | 1     | 0     | 0     | 0     | 0     | 0     | 0     |
| 993:    | 0     | 0     | 0     | 2     | 0     | 0     | 0     | 0     |
| 1001:   | 0     | 0     | 0     | 0     | 0     | 2     | 0     | 0     |
| 1009:   | 0     | 0     | 0     | 1     | 0     | 1     | 0     | 0     |
| 1017:   | 1     | 0     | 0     | 0     | 0     | 0     | 0     | 0     |




QA SUMMARY REPORT  
Review Of QA Results - Pulser Check

Date : 5/1/2013  
Time : 5:42:12 AM

| CHAMBER   | DEVICE             | PARAMETER | FLAG     | DATE                 |
|-----------|--------------------|-----------|----------|----------------------|
| Alpha 001 | 21f                | ALL       | Not Done |                      |
| Alpha 002 | 21f                | ALL       | Not Done |                      |
| Alpha 003 | 21f                | ALL       | Passed   | 5/1/2013 5:26:43 AM  |
| Alpha 004 | 21f                | ALL       | Passed   | 5/1/2013 5:26:44 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   | 5/1/2013 5:26:45 AM  |
| Alpha 011 | 21f                | ALL       | Passed   | 5/1/2013 5:26:45 AM  |
| Alpha 012 | 21f                | ALL       | Not Done |                      |
| Alpha 013 | 21f                | ALL       | Passed   | 5/1/2013 5:26:46 AM  |
| Alpha 014 | 21f                | ALL       | Passed   | 5/1/2013 5:26:47 AM  |
| Alpha 015 | 21f                | ALL       | Not Done |                      |
| Alpha 016 | 21f                | ALL       | Not Done |                      |
| Alpha 017 | AIM730             | ALL       | Not Done |                      |
| Alpha 018 | AIM730             | ALL       | Passed   | 5/1/2013 5:26:48 AM  |
| Alpha 019 | AIM730             | ALL       | Not Done |                      |
| Alpha 020 | AIM730             | ALL       | Not Done |                      |
| Alpha 021 | AIM730             | ALL       | Not Done |                      |
| Alpha 022 | AIM730             | ALL       | Passed   | 5/1/2013 5:26:49 AM  |
| Alpha 023 | AIM730             | ALL       | Not Done |                      |
| Alpha 024 | AIM730             | ALL       | Passed   | 5/1/2013 5:26:50 AM  |
| Alpha 025 | AIM730             | ALL       | Passed   | 5/1/2013 5:26:51 AM  |
| Alpha 026 | AIM730             | ALL       | Not Done |                      |
| Alpha 027 | AIM730             | ALL       | Passed   | 5/1/2013 5:26:51 AM  |
| Alpha 028 | AIM730             | ALL       | Not Done |                      |
| Alpha 029 | AIM730             | ALL       | Passed   | 5/1/2013 5:26:52 AM  |
| Alpha 030 | AIM730             | ALL       | Not Done |                      |
| Alpha 031 | AIM730             | ALL       | Not Done |                      |
| Alpha 032 | AIM730             | ALL       | Not Done |                      |
| Alpha 033 | Alpha Analyst100DC | ALL       | Passed   | 5/1/2013 5:26:53 AM  |
| Alpha 034 | Alpha Analyst100DC | ALL       | Passed   | 5/1/2013 5:26:55 AM  |
| Alpha 035 | Alpha Analyst100DC | ALL       | Passed   | 5/1/2013 5:26:56 AM  |
| Alpha 036 | Alpha Analyst100DC | ALL       | Passed   | 4/29/2013 5:29:59 AM |
| Alpha 037 | Alpha Analyst100DC | ALL       | Passed   | 5/1/2013 5:26:58 AM  |
| Alpha 038 | Alpha Analyst100DC | ALL       | Not Done |                      |
| Alpha 039 | Alpha Analyst100DC | ALL       | Passed   | 4/29/2013 5:30:03 AM |
| Alpha 040 | Alpha Analyst100DC | ALL       | Passed   | 5/1/2013 5:26:59 AM  |
| Alpha 041 | Alpha Analyst100DC | ALL       | Passed   | 5/1/2013 5:27:01 AM  |
| Alpha 042 | Alpha Analyst100DC | ALL       | Passed   | 5/1/2013 5:27:02 AM  |

| CHAMBER   | DEVICE             | PARAMETER | FLAG     | DATE                 |
|-----------|--------------------|-----------|----------|----------------------|
| Alpha 043 | Alpha Analyst100DC | ALL       | Passed   | 4/29/2013 5:30:09 AM |
| Alpha 044 | Alpha Analyst100DC | ALL       | Passed   | 5/1/2013 5:27:04 AM  |
| Alpha 045 | Alpha Analyst100DC | ALL       | Not Done |                      |
| Alpha 046 | Alpha Analyst100DC | ALL       | Passed   | 5/1/2013 5:27:06 AM  |
| Alpha 047 | Alpha Analyst100DC | ALL       | Passed   | 5/1/2013 5:27:08 AM  |
| Alpha 048 | Alpha Analyst100DC | ALL       | Passed   | 5/1/2013 5:27:09 AM  |

APPROVED BY: \_\_\_\_\_ 

APPROVAL DATE: \_\_\_\_\_ 5/1/13





QA SUMMARY REPORT  
Review Of QA Results - Pulser Check

Date : 5/2/2013

Time : 5:59:41 AM

| CHAMBER   | DEVICE             | PARAMETER | FLAG     | DATE                 |
|-----------|--------------------|-----------|----------|----------------------|
| Alpha 001 | 21f                | ALL       | Not Done |                      |
| Alpha 002 | 21f                | ALL       | Not Done |                      |
| Alpha 003 | 21f                | ALL       | Passed   | 5/2/2013 5:15:45 AM  |
| Alpha 004 | 21f                | ALL       | Passed   | 5/2/2013 5:15:46 AM  |
| Alpha 005 | 21f                | ALL       | Not Done |                      |
| Alpha 006 | 21f                | ALL       | Not Done |                      |
| Alpha 007 | 21f                | ALL       | Not Done |                      |
| Alpha 008 | 21f                | ALL       | Not Done |                      |
| Alpha 009 | 21f                | ALL       | Not Done |                      |
| Alpha 010 | 21f                | ALL       | Passed   | 5/2/2013 5:15:47 AM  |
| Alpha 011 | 21f                | ALL       | Passed   | 5/2/2013 5:15:48 AM  |
| Alpha 012 | 21f                | ALL       | Not Done |                      |
| Alpha 013 | 21f                | ALL       | Passed   | 5/2/2013 5:15:49 AM  |
| Alpha 014 | 21f                | ALL       | Passed   | 5/2/2013 5:15:49 AM  |
| Alpha 015 | 21f                | ALL       | Not Done |                      |
| Alpha 016 | 21f                | ALL       | Not Done |                      |
| Alpha 017 | AIM730             | ALL       | Not Done |                      |
| Alpha 018 | AIM730             | ALL       | Passed   | 5/2/2013 5:15:50 AM  |
| Alpha 019 | AIM730             | ALL       | Not Done |                      |
| Alpha 020 | AIM730             | ALL       | Not Done |                      |
| Alpha 021 | AIM730             | ALL       | Not Done |                      |
| Alpha 022 | AIM730             | ALL       | Passed   | 5/2/2013 5:15:51 AM  |
| Alpha 023 | AIM730             | ALL       | Not Done |                      |
| Alpha 024 | AIM730             | ALL       | Passed   | 5/2/2013 5:15:52 AM  |
| Alpha 025 | AIM730             | ALL       | Passed   | 5/2/2013 5:15:53 AM  |
| Alpha 026 | AIM730             | ALL       | Not Done |                      |
| Alpha 027 | AIM730             | ALL       | Passed   | 5/2/2013 5:15:54 AM  |
| Alpha 028 | AIM730             | ALL       | Not Done |                      |
| Alpha 029 | AIM730             | ALL       | Passed   | 5/2/2013 5:15:54 AM  |
| Alpha 030 | AIM730             | ALL       | Not Done |                      |
| Alpha 031 | AIM730             | ALL       | Not Done |                      |
| Alpha 032 | AIM730             | ALL       | Not Done |                      |
| Alpha 033 | Alpha Analyst100DC | ALL       | Passed   | 5/2/2013 5:15:56 AM  |
| Alpha 034 | Alpha Analyst100DC | ALL       | Passed   | 5/2/2013 5:15:57 AM  |
| Alpha 035 | Alpha Analyst100DC | ALL       | Passed   | 5/2/2013 5:15:59 AM  |
| Alpha 036 | Alpha Analyst100DC | ALL       | Passed   | 4/29/2013 5:29:59 AM |
| Alpha 037 | Alpha Analyst100DC | ALL       | Passed   | 5/2/2013 5:16:01 AM  |
| Alpha 038 | Alpha Analyst100DC | ALL       | Not Done |                      |
| Alpha 039 | Alpha Analyst100DC | ALL       | Passed   | 4/29/2013 5:30:03 AM |
| Alpha 040 | Alpha Analyst100DC | ALL       | Passed   | 5/2/2013 5:16:03 AM  |
| Alpha 041 | Alpha Analyst100DC | ALL       | Passed   | 5/2/2013 5:16:04 AM  |
| Alpha 042 | Alpha Analyst100DC | ALL       | Passed   | 5/2/2013 5:16:06 AM  |



\*\*\*\*\*  
\*\*\*\*\* LIBRARY LISTING REPORT \*\*\*\*\*  
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Nuclide Library Title: Radium

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

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

\* = key line

TOTALS: 3 Nuclides 3 Energy Lines

US EPA ARCHIVE DOCUMENT

SECTION XI  
ANALYTICAL DATA (RADIUM-228)

US EPA ARCHIVE DOCUMENT

| Work Order           | 13-04105                             | Internal Fraction | Sample Desc | Client ID     | Login CPM | Sample Date    | Sample Aliquot |
|----------------------|--------------------------------------|-------------------|-------------|---------------|-----------|----------------|----------------|
| Analysis Code        | Ra228                                | 01                | LCS         | LCS           |           | 04/16/13 00:00 | 1.0000E+00     |
| Run                  | 1                                    | 02                | MBL         | BLANK         |           | 04/16/13 00:00 | 1.5000E+00     |
| Date Received        | 4/16/2013                            | 03                | DUP         | PZ-106-SS TOT | 41        | 04/09/13 12:56 | 1.5000E+00     |
| Lab Deadline         | 5/7/2013                             | 04                | TRG         | PZ-204-SS TOT | 39        | 04/09/13 09:30 | 1.5000E+00     |
| Client               | Engineering Management Support, Inc. | 05                | TRG         | PZ-204-SS DIS | 39        | 04/09/13 09:30 | 1.5000E+00     |
| Project              | West Lake OU-1                       | 06                | TRG         | I-68 TOT      | 45        | 04/09/13 10:44 | 1.5000E+00     |
| Report Level         | 4                                    | 07                | TRG         | I-68 DIS      | 45        | 04/09/13 10:44 | 1.5000E+00     |
| Activity Units       | pCi                                  | 08                | TRG         | D-87 TOT      | 42        | 04/09/13 11:05 | 1.5000E+00     |
| Aliquot Units        | I                                    | 09                | TRG         | D-87 DIS      | 42        | 04/09/13 11:05 | 1.5000E+00     |
| Matrix               | WA                                   | 10                | TRG         | PZ-106-SD TOT | 37        | 04/09/13 12:00 | 1.5000E+00     |
| Method               | EPA 904.0 Modified                   | 11                | TRG         | PZ-106-SD DIS | 37        | 04/09/13 12:00 | 1.5000E+00     |
| Instrument Type      | Alpha/Beta GPC                       | 12                | TRG         | S-82 TOT      | 46        | 04/09/13 12:27 | 1.5000E+00     |
| Radiometric Tracer   | Ba-133                               | 13                | TRG         | S-82 DIS      | 46        | 04/09/13 12:27 | 1.5000E+00     |
| Radiometric Sol#     | Ba-6a                                | 14                | DO          | PZ-106-SS TOT | 41        | 04/09/13 12:56 | 1.5000E+00     |
| Tracer Act (dpm/g)   | 1009.23                              | 15                | TRG         | PZ-106-SS DIS | 41        | 04/09/13 12:56 | 1.5000E+00     |
| Carrier              | Yttrium                              | 16                | TRG         | I-9 TOT       | 43        | 04/09/13 13:35 | 1.5000E+00     |
| Carrier Conc (mg/ml) | 34                                   | 17                | TRG         | I-9 DIS       | 43        | 04/09/13 13:35 | 1.5000E+00     |
|                      |                                      | 18                | TRG         | D-93 TOT      | 40        | 04/09/13 14:28 | 1.5000E+00     |
|                      |                                      | 19                | TRG         | D-93 DIS      | 40        | 04/09/13 14:28 | 1.5000E+00     |

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

| Internal Fraction | Sample Desc | Tracer Aliquot (g) | Tracer Total ACT (dpm) | Radiometric Tracer (pCi) | Radiometric % Rec | Grav Carrier Added (ml) | Grav Filter Tare (g) | Grav Filter Final (g) | Grav Filter Net (g) | Grav % Rec | Mean % Rec | SAF 1* | SAF 2* |
|-------------------|-------------|--------------------|------------------------|--------------------------|-------------------|-------------------------|----------------------|-----------------------|---------------------|------------|------------|--------|--------|
| 01                | LCS         | 0.9100             | 918.4                  | 372.6                    | 90.07             | 2.000                   | 0.0929               | 0.1474                | 0.0545              | 80.15      | 72.19      | 1.00   | 1.00   |
| 02                | MBL         | 0.9078             | 916.2                  | 397.2                    | 96.25             | 2.000                   | 0.0923               | 0.1457                | 0.0534              | 78.53      | 75.58      | 1.00   | 1.00   |
| 03                | DUP         | 0.9020             | 910.3                  | 397.5                    | 96.94             | 2.000                   | 0.0921               | 0.1432                | 0.0511              | 75.15      | 72.85      | 1.00   | 1.00   |
| 04                | TRG         | 0.9022             | 910.5                  | 390.2                    | 95.14             | 2.000                   | 0.0918               | 0.1483                | 0.0565              | 83.09      | 79.05      | 1.00   | 1.00   |
| 05                | TRG         | 0.8999             | 908.2                  | 353.2                    | 86.34             | 2.000                   | 0.0914               | 0.1477                | 0.0563              | 82.79      | 71.48      | 1.00   | 1.00   |
| 06                | TRG         | 0.8974             | 905.7                  | 303.2                    | 74.32             | 2.000                   | 0.0914               | 0.1482                | 0.0568              | 83.53      | 62.08      | 1.00   | 1.00   |
| 07                | TRG         | 0.9000             | 908.3                  | 396.1                    | 96.81             | 2.000                   | 0.0902               | 0.1440                | 0.0538              | 79.12      | 76.59      | 1.00   | 1.00   |
| 08                | TRG         | 0.9039             | 912.2                  | 435.9                    | 106.08            | 2.000                   | 0.0908               | 0.1434                | 0.0526              | 77.35      | 82.06      | 1.00   | 1.00   |
| 09                | TRG         | 0.9018             | 910.1                  | 461.4                    | 112.55            | 2.000                   | 0.0926               | 0.1455                | 0.0529              | 77.79      | 85.57      | 1.00   | 1.00   |
| 10                | TRG         | 0.9010             | 909.3                  | 393.0                    | 95.95             | 2.000                   | 0.0905               | 0.1436                | 0.0531              | 78.09      | 74.92      | 1.00   | 1.00   |
| 11                | TRG         | 0.8990             | 907.3                  | 395.2                    | 96.70             | 2.000                   | 0.0908               | 0.1432                | 0.0524              | 77.06      | 74.51      | 1.00   | 1.00   |
| 12                | TRG         | 0.8983             | 906.6                  | 409.3                    | 100.23            | 2.000                   | 0.0925               | 0.1432                | 0.0507              | 74.56      | 74.73      | 1.00   | 1.00   |
| 13                | TRG         | 0.8988             | 907.1                  | 347.9                    | 85.14             | 2.000                   | 0.0902               | 0.1442                | 0.0540              | 79.41      | 67.61      | 1.00   | 1.00   |
| 14                | DO          | 0.8986             | 906.9                  | 398.4                    | 97.52             | 2.000                   | 0.0909               | 0.1429                | 0.0520              | 76.49      | 74.59      | 1.00   | 1.00   |
| 15                | TRG         | 0.8996             | 907.9                  | 376.6                    | 92.09             | 2.000                   | 0.0928               | 0.1458                | 0.0530              | 77.94      | 71.77      | 1.00   | 1.00   |
| 16                | TRG         | 0.9039             | 912.2                  | 385.6                    | 93.84             | 2.000                   | 0.0904               | 0.1410                | 0.0506              | 74.41      | 69.83      | 1.00   | 1.00   |
| 17                | TRG         | 0.8980             | 906.3                  | 364.7                    | 89.34             | 2.000                   | 0.0905               | 0.1467                | 0.0562              | 82.65      | 73.83      | 1.00   | 1.00   |
| 18                | TRG         | 0.8796             | 887.7                  | 369.7                    | 92.45             | 2.000                   | 0.0928               | 0.1468                | 0.0540              | 79.41      | 73.42      | 1.00   | 1.00   |
| 19                | TRG         | 0.8995             | 907.8                  | 423.1                    | 103.47            | 2.000                   | 0.0906               | 0.1466                | 0.0560              | 82.35      | 85.21      | 1.00   | 1.00   |
|                   |             |                    |                        |                          |                   |                         |                      |                       |                     |            |            |        |        |

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

US EPA ARCHIVE DOCUMENT

0429

| 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         |                 |               | 04/24/13 11:51 | JBARNARD | 04/30/13 11:38   | TSMITH    | 05/09/13 05:32   | TSMITH    |
| 02                | MBL         |                 |               | 04/24/13 11:51 | JBARNARD | 04/30/13 11:38   | TSMITH    | 05/09/13 05:32   | TSMITH    |
| 03                | DUP         |                 |               | 04/24/13 11:51 | JBARNARD | 04/30/13 11:38   | TSMITH    | 05/09/13 05:32   | TSMITH    |
| 04                | TRG         |                 |               | 04/24/13 11:51 | JBARNARD | 04/30/13 11:38   | TSMITH    | 05/09/13 05:32   | TSMITH    |
| 05                | TRG         |                 |               | 04/24/13 11:51 | JBARNARD | 04/30/13 11:38   | TSMITH    | 05/09/13 05:32   | TSMITH    |
| 06                | TRG         |                 |               | 04/24/13 11:51 | JBARNARD | 04/30/13 11:38   | TSMITH    | 05/09/13 05:32   | TSMITH    |
| 07                | TRG         |                 |               | 04/24/13 11:51 | JBARNARD | 04/30/13 11:38   | TSMITH    | 05/09/13 05:32   | TSMITH    |
| 08                | TRG         |                 |               | 04/24/13 11:51 | JBARNARD | 04/30/13 11:38   | TSMITH    | 05/09/13 05:32   | TSMITH    |
| 09                | TRG         |                 |               | 04/24/13 11:51 | JBARNARD | 04/30/13 11:38   | TSMITH    | 05/09/13 05:32   | TSMITH    |
| 10                | TRG         |                 |               | 04/24/13 11:51 | JBARNARD | 04/30/13 11:38   | TSMITH    | 05/09/13 05:32   | TSMITH    |
| 11                | TRG         |                 |               | 04/24/13 11:51 | JBARNARD | 04/30/13 11:38   | TSMITH    | 05/09/13 05:32   | TSMITH    |
| 12                | TRG         |                 |               | 04/24/13 11:51 | JBARNARD | 04/30/13 11:38   | TSMITH    | 05/09/13 05:32   | TSMITH    |
| 13                | TRG         |                 |               | 04/24/13 11:51 | JBARNARD | 04/30/13 11:38   | TSMITH    | 05/09/13 05:32   | TSMITH    |
| 14                | DO          |                 |               | 04/24/13 11:51 | JBARNARD | 04/30/13 11:38   | TSMITH    | 05/09/13 05:32   | TSMITH    |
| 15                | TRG         |                 |               | 04/24/13 11:51 | JBARNARD | 04/30/13 11:38   | TSMITH    | 05/09/13 05:32   | TSMITH    |
| 16                | TRG         |                 |               | 04/24/13 11:51 | JBARNARD | 04/30/13 11:38   | TSMITH    | 05/09/13 05:32   | TSMITH    |
| 17                | TRG         |                 |               | 04/24/13 11:51 | JBARNARD | 04/30/13 11:38   | TSMITH    | 05/09/13 05:32   | TSMITH    |
| 18                | TRG         |                 |               | 04/24/13 11:51 | JBARNARD | 04/30/13 11:38   | TSMITH    | 05/09/13 05:32   | TSMITH    |
| 19                | TRG         |                 |               | 04/24/13 11:51 | JBARNARD | 04/30/13 11:38   | TSMITH    | 05/09/13 05:32   | TSMITH    |
|                   |             |                 |               |                |          |                  |           |                  |           |

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

Preliminary Data Report & Analytical Calculations  
**Work Order: 13-04105-Ra228-1**

US EPA ARCHIVE DOCUMENT

| 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          | 9.90E+00 | 1.03E+00       | 1.26E+00 | 8.96E+00  | 110.59 | OK       |          | OK       |            |
| 02           | RA-228  | MBL         | BLANK                 | pCi/l          | 5.71E-01 | 4.17E-01       | 8.25E-01 |           |        |          |          | OK       | OK         |
| 03           | RA-228  | DUP         | PZ-106-SS TOT         | pCi/l          | 8.91E-01 | 4.58E-01       | 8.77E-01 |           |        |          | NA       | OK       |            |
| 04           | RA-228  | TRG         | PZ-204-SS TOT         | pCi/l          | 1.16E+00 | 4.26E-01       | 7.75E-01 |           |        |          |          | OK       |            |
| 05           | RA-228  | TRG         | PZ-204-SS DIS         | pCi/l          | 7.44E-01 | 4.65E-01       | 9.10E-01 |           |        |          |          | OK       |            |
| 06           | RA-228  | TRG         | I-68 TOT              | pCi/l          | 1.97E+00 | 6.36E-01       | 1.16E+00 |           |        |          |          | OK       |            |
| 07           | RA-228  | TRG         | I-68 DIS              | pCi/l          | 1.37E+00 | 5.28E-01       | 9.71E-01 |           |        |          |          | OK       |            |
| 08           | RA-228  | TRG         | D-87 TOT              | pCi/l          | 2.99E+00 | 5.88E-01       | 9.41E-01 |           |        |          |          | OK       |            |
| 09           | RA-228  | TRG         | D-87 DIS              | pCi/l          | 9.45E-01 | 4.83E-01       | 9.29E-01 |           |        |          |          | OK       |            |
| 10           | RA-228  | TRG         | PZ-106-SD TOT         | pCi/l          | 3.36E-01 | 5.49E-01       | 1.14E+00 |           |        |          |          | OK       |            |
| 11           | RA-228  | TRG         | PZ-106-SD DIS         | pCi/l          | 8.93E-01 | 5.27E-01       | 1.02E+00 |           |        |          |          | OK       |            |
| 12           | RA-228  | TRG         | S-82 TOT              | pCi/l          | 2.04E+00 | 5.82E-01       | 1.01E+00 |           |        |          |          | OK       |            |
| 13           | RA-228  | TRG         | S-82 DIS              | pCi/l          | 1.17E+00 | 5.63E-01       | 1.06E+00 |           |        |          |          | OK       |            |
| 14           | RA-228  | DO          | PZ-106-SS TOT         | pCi/l          | 7.14E-01 | 5.39E-01       | 1.07E+00 |           |        |          |          | OK       |            |
| 15           | RA-228  | TRG         | PZ-106-SS DIS         | pCi/l          | 5.07E-01 | 5.69E-01       | 1.16E+00 |           |        |          |          | OK       |            |
| 16           | RA-228  | TRG         | I-9 TOT               | pCi/l          | 3.81E+00 | 7.75E-01       | 1.30E+00 |           |        |          |          | OK       |            |
| 17           | RA-228  | TRG         | I-9 DIS               | pCi/l          | 1.49E+00 | 6.01E-01       | 1.12E+00 |           |        |          |          | OK       |            |
| 18           | RA-228  | TRG         | D-93 TOT              | pCi/l          | 4.79E+00 | 7.41E-01       | 1.12E+00 |           |        |          |          | OK       |            |
| 19           | RA-228  | TRG         | D-93 DIS              | pCi/l          | 2.89E+00 | 5.95E-01       | 9.66E-01 |           |        |          |          | OK       |            |

|        |                                      |                              |          |               |       |     |   |
|--------|--------------------------------------|------------------------------|----------|---------------|-------|-----|---|
| Client | Engineering Management Support, Inc. | Eberline Services Work Order | 13-04105 | Analysis Code | Ra228 | Run | 1 |
|        |                                      |                              |          |               |       |     |   |



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| Lab Fraction | Nuclide | Sample Desc | Sample Date    | Sample Aliquot | Radiometric % Rec | Grav % Rec | Mean % Rec | SAF  | Sep t0 Date/Time | Sep t1 Date/Time |
|--------------|---------|-------------|----------------|----------------|-------------------|------------|------------|------|------------------|------------------|
| 01           | RA-228  | LCS         | 04/16/13 00:00 | 1.00E+00       | 90.07             | 80.15      | 72.19      | 1.00 | 4/30/2013 11:38  | 5/9/2013 5:32    |
| 02           | RA-228  | MBL         | 04/16/13 00:00 | 1.50E+00       | 96.25             | 78.53      | 75.58      | 1.00 | 4/30/2013 11:38  | 5/9/2013 5:32    |
| 03           | RA-228  | DUP         | 04/09/13 12:56 | 1.50E+00       | 96.94             | 75.15      | 72.85      | 1.00 | 4/30/2013 11:38  | 5/9/2013 5:32    |
| 04           | RA-228  | TRG         | 04/09/13 09:30 | 1.50E+00       | 95.14             | 83.09      | 79.05      | 1.00 | 4/30/2013 11:38  | 5/9/2013 5:32    |
| 05           | RA-228  | TRG         | 04/09/13 09:30 | 1.50E+00       | 86.34             | 82.79      | 71.48      | 1.00 | 4/30/2013 11:38  | 5/9/2013 5:32    |
| 06           | RA-228  | TRG         | 04/09/13 10:44 | 1.50E+00       | 74.32             | 83.53      | 62.08      | 1.00 | 4/30/2013 11:38  | 5/9/2013 5:32    |
| 07           | RA-228  | TRG         | 04/09/13 10:44 | 1.50E+00       | 96.81             | 79.12      | 76.59      | 1.00 | 4/30/2013 11:38  | 5/9/2013 5:32    |
| 08           | RA-228  | TRG         | 04/09/13 11:05 | 1.50E+00       | 106.08            | 77.35      | 82.06      | 1.00 | 4/30/2013 11:38  | 5/9/2013 5:32    |
| 09           | RA-228  | TRG         | 04/09/13 11:05 | 1.50E+00       | 112.55            | 77.79      | 85.57      | 1.00 | 4/30/2013 11:38  | 5/9/2013 5:32    |
| 10           | RA-228  | TRG         | 04/09/13 12:00 | 1.50E+00       | 95.95             | 78.09      | 74.92      | 1.00 | 4/30/2013 11:38  | 5/9/2013 5:32    |
| 11           | RA-228  | TRG         | 04/09/13 12:00 | 1.50E+00       | 96.70             | 77.06      | 74.51      | 1.00 | 4/30/2013 11:38  | 5/9/2013 5:32    |
| 12           | RA-228  | TRG         | 04/09/13 12:27 | 1.50E+00       | 100.23            | 74.56      | 74.73      | 1.00 | 4/30/2013 11:38  | 5/9/2013 5:32    |
| 13           | RA-228  | TRG         | 04/09/13 12:27 | 1.50E+00       | 85.14             | 79.41      | 67.61      | 1.00 | 4/30/2013 11:38  | 5/9/2013 5:32    |
| 14           | RA-228  | DO          | 04/09/13 12:56 | 1.50E+00       | 97.52             | 76.49      | 74.59      | 1.00 | 4/30/2013 11:38  | 5/9/2013 5:32    |
| 15           | RA-228  | TRG         | 04/09/13 12:56 | 1.50E+00       | 92.09             | 77.94      | 71.77      | 1.00 | 4/30/2013 11:38  | 5/9/2013 5:32    |
| 16           | RA-228  | TRG         | 04/09/13 13:35 | 1.50E+00       | 93.84             | 74.41      | 69.83      | 1.00 | 4/30/2013 11:38  | 5/9/2013 5:32    |
| 17           | RA-228  | TRG         | 04/09/13 13:35 | 1.50E+00       | 89.34             | 82.65      | 73.83      | 1.00 | 4/30/2013 11:38  | 5/9/2013 5:32    |
| 18           | RA-228  | TRG         | 04/09/13 14:28 | 1.50E+00       | 92.45             | 79.41      | 73.42      | 1.00 | 4/30/2013 11:38  | 5/9/2013 5:32    |
| 19           | RA-228  | TRG         | 04/09/13 14:28 | 1.50E+00       | 103.47            | 82.35      | 85.21      | 1.00 | 4/30/2013 11:38  | 5/9/2013 5:32    |
|              |         |             |                |                |                   |            |            |      |                  |                  |

|     |   |               |       |                              |          |        |                                      |
|-----|---|---------------|-------|------------------------------|----------|--------|--------------------------------------|
| Run | 1 | Analysis Code | Ra228 | Eberline Services Work Order | 13-04105 | Client | Engineering Management Support, Inc. |
|     |   |               |       |                              |          |        |                                      |

Preliminary Data Report & Analytical Calculations  
**Work Order: 13-04105-Ra228-1**

US EPA ARCHIVE DOCUMENT

|   |   |
|---|---|
|  |   |
| Run   | <b>1</b>                                    |
| Analysis Code   | <b>Ra228</b>                                |
| Eberline Services Work Order  | <b>13-04105</b>                             |
| Client  | <b>Engineering Management Support, Inc.</b> |

| Lab Fraction | Nuclide | Sample Desc | Counting Date/Time | Half-life (days) | Detect  | Carrier | Count Time | Counts | Bkg CPM     | Eff    |
|--------------|---------|-------------|--------------------|------------------|---------|---------|------------|--------|-------------|--------|
| 01           | RA-228  | LCS         | 05/09/13 09:17     |                  | LB4110A | C1      | 120        | 640    | 1.016666667 | 0.4667 |
| 02           | RA-228  | MBL         | 05/09/13 09:17     |                  | LB4110A | C2      | 120        | 170    | 1.033333333 | 0.4578 |
| 03           | RA-228  | DUP         | 05/09/13 09:17     |                  | LB4110A | C3      | 120        | 209    | 1.15        | 0.4699 |
| 04           | RA-228  | TRG         | 05/09/13 09:17     |                  | LB4110A | C4      | 120        | 226    | 1.05        | 0.4692 |
| 05           | RA-228  | TRG         | 05/09/13 09:17     |                  | LB4110A | D2      | 120        | 200    | 1.183333333 | 0.4682 |
| 06           | RA-228  | TRG         | 05/09/13 09:17     |                  | LB4110A | D4      | 120        | 315    | 1.5         | 0.4741 |
| 07           | RA-228  | TRG         | 05/09/13 10:57     |                  | LB4110R | A1      | 120        | 229    | 1.1         | 0.4776 |
| 08           | RA-228  | TRG         | 05/09/13 10:57     |                  | LB4110R | A2      | 120        | 360    | 1.15        | 0.4699 |
| 09           | RA-228  | TRG         | 05/09/13 10:57     |                  | LB4110R | A3      | 120        | 229    | 1.283333333 | 0.4809 |
| 10           | RA-228  | TRG         | 05/09/13 10:57     |                  | LB4110R | A4      | 120        | 195    | 1.433333333 | 0.4732 |
| 11           | RA-228  | TRG         | 05/09/13 10:57     |                  | LB4110R | B1      | 120        | 199    | 1.15        | 0.4754 |
| 12           | RA-228  | TRG         | 05/09/13 10:57     |                  | LB4110R | B2      | 120        | 267    | 1.083333333 | 0.4658 |
| 13           | RA-228  | TRG         | 05/09/13 10:57     |                  | LB4110R | B3      | 120        | 192    | 1           | 0.4713 |
| 14           | RA-228  | DO          | 05/09/13 10:57     |                  | LB4110R | B4      | 120        | 203    | 1.283333333 | 0.4773 |
| 15           | RA-228  | TRG         | 05/09/13 10:57     |                  | LB4110R | C1      | 120        | 195    | 1.35        | 0.4705 |
| 16           | RA-228  | TRG         | 05/09/13 10:57     |                  | LB4110R | C2      | 120        | 430    | 1.583333333 | 0.4676 |
| 17           | RA-228  | TRG         | 05/09/13 10:57     |                  | LB4110R | C3      | 120        | 252    | 1.283333333 | 0.4614 |
| 18           | RA-228  | TRG         | 05/09/13 10:57     |                  | LB4110R | C4      | 120        | 478    | 1.316666667 | 0.4714 |
| 19           | RA-228  | TRG         | 05/09/13 11:22     |                  | LB4110A | D2      | 120        | 354    | 1.183333333 | 0.4682 |
|              |         |             |                    |                  |         |         |            |        |             |        |

| Internal Fraction | Sample Desc | Client ID     | Sample Date    | Sample Aliquot | Tracer Aliquot (g) | Tracer ACT (dpm) | Radiometric Tracer (pCi) | Radiometric % Rec | SAF 1* | SAF 2* |
|-------------------|-------------|---------------|----------------|----------------|--------------------|------------------|--------------------------|-------------------|--------|--------|
| 01                | LCS         | LCS           | 04/16/13 00:00 | 1.0000         | 0.9100             | 918.3993         | 372.6000                 | 90.07             | 1.00   | 1.00   |
| 02                | MBL         | BLANK         | 04/16/13 00:00 | 1.5000         | 0.9078             | 916.1790         | 397.2000                 | 96.25             | 1.00   | 1.00   |
| 03                | DUP         | PZ-106-SS TOT | 04/09/13 12:56 | 1.5000         | 0.9020             | 910.3255         | 397.5000                 | 96.94             | 1.00   | 1.00   |
| 04                | TRG         | PZ-204-SS TOT | 04/09/13 09:30 | 1.5000         | 0.9022             | 910.5273         | 390.2000                 | 95.14             | 1.00   | 1.00   |
| 05                | TRG         | PZ-204-SS DIS | 04/09/13 09:30 | 1.5000         | 0.8999             | 908.2061         | 353.2000                 | 86.34             | 1.00   | 1.00   |
| 06                | TRG         | I-68 TOT      | 04/09/13 10:44 | 1.5000         | 0.8974             | 905.6830         | 303.2000                 | 74.32             | 1.00   | 1.00   |
| 07                | TRG         | I-68 DIS      | 04/09/13 10:44 | 1.5000         | 0.9000             | 908.3070         | 396.1000                 | 96.81             | 1.00   | 1.00   |
| 08                | TRG         | D-87 TOT      | 04/09/13 11:05 | 1.5000         | 0.9039             | 912.2430         | 435.9000                 | 106.08            | 1.00   | 1.00   |
| 09                | TRG         | D-87 DIS      | 04/09/13 11:05 | 1.5000         | 0.9018             | 910.1236         | 461.4000                 | 112.55            | 1.00   | 1.00   |
| 10                | TRG         | PZ-106-SD TOT | 04/09/13 12:00 | 1.5000         | 0.9010             | 909.3162         | 393.0000                 | 95.95             | 1.00   | 1.00   |
| 11                | TRG         | PZ-106-SD DIS | 04/09/13 12:00 | 1.5000         | 0.8990             | 907.2978         | 395.2000                 | 96.70             | 1.00   | 1.00   |
| 12                | TRG         | S-82 TOT      | 04/09/13 12:27 | 1.5000         | 0.8983             | 906.5913         | 409.3000                 | 100.23            | 1.00   | 1.00   |
| 13                | TRG         | S-82 DIS      | 04/09/13 12:27 | 1.5000         | 0.8988             | 907.0959         | 347.9000                 | 85.14             | 1.00   | 1.00   |
| 14                | DO          | PZ-106-SS TOT | 04/09/13 12:56 | 1.5000         | 0.8986             | 906.8941         | 398.4000                 | 97.52             | 1.00   | 1.00   |
| 15                | TRG         | PZ-106-SS DIS | 04/09/13 12:56 | 1.5000         | 0.8996             | 907.9033         | 376.6000                 | 92.09             | 1.00   | 1.00   |
| 16                | TRG         | I-9 TOT       | 04/09/13 13:35 | 1.5000         | 0.9039             | 912.2430         | 385.6000                 | 93.84             | 1.00   | 1.00   |
| 17                | TRG         | I-9 DIS       | 04/09/13 13:35 | 1.5000         | 0.8980             | 906.2885         | 364.7000                 | 89.34             | 1.00   | 1.00   |
| 18                | TRG         | D-93 TOT      | 04/09/13 14:28 | 1.5000         | 0.8796             | 887.7187         | 369.7000                 | 92.45             | 1.00   | 1.00   |
| 19                | TRG         | D-93 DIS      | 04/09/13 14:28 | 1.5000         | 0.8995             | 907.8024         | 423.1000                 | 103.47            | 1.00   | 1.00   |
|                   |             |               |                |                |                    |                  |                          |                   |        |        |

|                     |  |     |               |  |                 |            |  |                     |  |                  |  |
|---------------------|--|-----|---------------|--|-----------------|------------|--|---------------------|--|------------------|--|
| Internal Work Order |  | Run | Analysis Code |  | Date            | Technician |  | Technician Initials |  | Witness Initials |  |
| 13-04105            |  | 1   | Ra228         |  | 4/24/2013 11:50 | JBARNARD   |  | S                   |  |                  |  |

| LCS & Matrix Spikes |       |                |               |                 | LCS             | MS              | LCSD            | MSD             | LCS       |                | MS        |                | LCSD      |                | MSD       |                |
|---------------------|-------|----------------|---------------|-----------------|-----------------|-----------------|-----------------|-----------------|-----------|----------------|-----------|----------------|-----------|----------------|-----------|----------------|
| Isotope             | Sol # | Activity dpm/g | Solution Date | Approx Addition | Volume Used (g) | Volume Used (g) | Volume Used (g) | Volume Used (g) | Known pCi | Error Estimate | Added pCi | Error Estimate | Known pCi | Error Estimate | Added pCi | Error Estimate |
| Ra-228              | Ra-11 | 38.955         | 4/24/2013     | 0.510           | 0.5104          |                 |                 |                 | 8.96      | 0.457          | 0.00      | 0.000          | 0.00      | 0.000          | 0.00      | 0.000          |
|                     |       |                |               |                 |                 |                 |                 |                 |           |                |           |                |           |                |           |                |

| Tracers  |         |       |                |               |                 |                 | Balance Printer Tapes |  |              |
|----------|---------|-------|----------------|---------------|-----------------|-----------------|-----------------------|--|--------------|
| fraction | Isotope | Sol # | Activity dpm/g | Solution Date | Volume Used (g) | Approx Addition | Tracer                |  | LCS          |
| 01       | Ba-133  | Ba-6a | 1009.230       | 4/24/2013     | 0.9100          | 1.0000          |                       |  |              |
| 02       | Ba-133  | Ba-6a | 1009.230       | 4/24/2013     | 0.9078          | 1.0000          |                       |  |              |
| 03       | Ba-133  | Ba-6a | 1009.230       | 4/24/2013     | 0.9020          | 1.0000          |                       |  |              |
| 04       | Ba-133  | Ba-6a | 1009.230       | 4/24/2013     | 0.9022          | 1.0000          |                       |  |              |
| 05       | Ba-133  | Ba-6a | 1009.230       | 4/24/2013     | 0.8999          | 1.0000          |                       |  |              |
| 06       | Ba-133  | Ba-6a | 1009.230       | 4/24/2013     | 0.8974          | 1.0000          |                       |  |              |
| 07       | Ba-133  | Ba-6a | 1009.230       | 4/24/2013     | 0.9000          | 1.0000          |                       |  |              |
| 08       | Ba-133  | Ba-6a | 1009.230       | 4/24/2013     | 0.9039          | 1.0000          |                       |  |              |
| 09       | Ba-133  | Ba-6a | 1009.230       | 4/24/2013     | 0.9018          | 1.0000          |                       |  |              |
| 10       | Ba-133  | Ba-6a | 1009.230       | 4/24/2013     | 0.9010          | 1.0000          |                       |  |              |
| 11       | Ba-133  | Ba-6a | 1009.230       | 4/24/2013     | 0.8990          | 1.0000          |                       |  |              |
| 12       | Ba-133  | Ba-6a | 1009.230       | 4/24/2013     | 0.8983          | 1.0000          |                       |  |              |
| 13       | Ba-133  | Ba-6a | 1009.230       | 4/24/2013     | 0.8988          | 1.0000          |                       |  |              |
| 14       | Ba-133  | Ba-6a | 1009.230       | 4/24/2013     | 0.8986          | 1.0000          |                       |  |              |
| 15       | Ba-133  | Ba-6a | 1009.230       | 4/24/2013     | 0.8996          | 1.0000          |                       |  |              |
| 16       | Ba-133  | Ba-6a | 1009.230       | 4/24/2013     | 0.9039          | 1.0000          |                       |  |              |
| 17       | Ba-133  | Ba-6a | 1009.230       | 4/24/2013     | 0.8980          | 1.0000          |                       |  |              |
| 18       | Ba-133  | Ba-6a | 1009.230       | 4/24/2013     | 0.8796          | 1.0000          |                       |  |              |
| 19       | Ba-133  | Ba-6a | 1009.230       | 4/24/2013     | 0.8995          | 1.0000          |                       |  |              |
|          |         |       |                |               |                 |                 |                       |  | Matrix Spike |

US EPA ARCHIVE DOCUMENT

# Aliquot Worksheet

|                 |          |               |               |                 |                 |
|-----------------|----------|---------------|---------------|-----------------|-----------------|
| Work Order      | Run      | Analysis Code | Rpt Units     | Lab Deadline    | Technician      |
| <b>13-04105</b> | <b>1</b> | <b>Ra228</b>  | <b>liters</b> | <b>5/7/2013</b> | <b>JBARNARD</b> |

| Lab Fraction | Engineering Management Support, Inc.<br>Client ID | Sample Type | Muffle Data    | Dilution Data |            |       | Aliquot Data |            | MS Aliquot Data |           | H-3 Solids Only  |              |
|--------------|---|-------------|----------------|---------------|------------|-------|--------------|------------|-----------------|-----------|------------------|--------------|
|              |   |             | Ratio Post/Pre | No of Dils    | Dil Factor | Ratio | Aliquot      | Net Equiv  | Aliquot         | Net Equiv | Water Added (ml) | H3 Dist Aliq |
| 01           | LCS   | LCS         |                |               |            |       | 1.0000E+00   | 1.0000E+00 |                 |           |                  |              |
| 02           | BLANK   | MBL         |                |               |            |       | 1.5000E+00   | 1.5000E+00 |                 |           |                  |              |
| 03           | PZ-106-SS TOT                                     | DUP         |                |               |            |       | 1.5000E+00   | 1.5000E+00 |                 |           |                  |              |
| 04           | PZ-204-SS TOT                                     | TRG         |                |               |            |       | 1.5000E+00   | 1.5000E+00 |                 |           |                  |              |
| 05           | PZ-204-SS DIS                                     | TRG         |                |               |            |       | 1.5000E+00   | 1.5000E+00 |                 |           |                  |              |
| 06           | I-68 TOT  | TRG         |                |               |            |       | 1.5000E+00   | 1.5000E+00 |                 |           |                  |              |
| 07           | I-68 DIS  | TRG         |                |               |            |       | 1.5000E+00   | 1.5000E+00 |                 |           |                  |              |
| 08           | D-87 TOT  | TRG         |                |               |            |       | 1.5000E+00   | 1.5000E+00 |                 |           |                  |              |
| 09           | D-87 DIS  | TRG         |                |               |            |       | 1.5000E+00   | 1.5000E+00 |                 |           |                  |              |
| 10           | PZ-106-SD TOT                                     | TRG         |                |               |            |       | 1.5000E+00   | 1.5000E+00 |                 |           |                  |              |
| 11           | PZ-106-SD DIS                                     | TRG         |                |               |            |       | 1.5000E+00   | 1.5000E+00 |                 |           |                  |              |
| 12           | S-82 TOT  | TRG         |                |               |            |       | 1.5000E+00   | 1.5000E+00 |                 |           |                  |              |
| 13           | S-82 DIS  | TRG         |                |               |            |       | 1.5000E+00   | 1.5000E+00 |                 |           |                  |              |
| 14           | PZ-106-SS TOT                                     | DO          |                |               |            |       | 1.5000E+00   | 1.5000E+00 |                 |           |                  |              |
| 15           | PZ-106-SS DIS                                     | TRG         |                |               |            |       | 1.5000E+00   | 1.5000E+00 |                 |           |                  |              |
| 16           | I-9 TOT   | TRG         |                |               |            |       | 1.5000E+00   | 1.5000E+00 |                 |           |                  |              |
| 17           | I-9 DIS   | TRG         |                |               |            |       | 1.5000E+00   | 1.5000E+00 |                 |           |                  |              |
| 18           | D-93 TOT  | TRG         |                |               |            |       | 1.5000E+00   | 1.5000E+00 |                 |           |                  |              |
| 19           | D-93 DIS  | TRG         |                |               |            |       | 1.5000E+00   | 1.5000E+00 |                 |           |                  |              |

|          |
|----------|
| Comments |
|----------|

Technician: \_\_\_\_\_



Date: \_\_\_\_\_

4/24/13

# Gravimetric Worksheet

| Work Order      | Run      | Analysis Code | Gravimetric Carrier | Carrier Conc (mg/ml) | Technician    |
|-----------------|----------|---------------|---------------------|----------------------|---------------|
| <b>13-04105</b> | <b>1</b> | <b>Ra228</b>  | <b>Yttirum</b>      | <b>34.0000</b>       | <b>TSMITH</b> |

| TRetec Fraction | Engineering Management Support, Inc. Client ID | Sample Type | Carrier Data       |                 | Filter Data      |                |       | Gravimetric % Recovery |
|-----------------|--|-------------|--------------------|-----------------|------------------|----------------|-------|------------------------|
|                 |  |             | Carrier Added (ml) | Filter Tare (g) | Filter Final (g) | Filter Net (g) |       |                        |
| 01              | LCS  | LCS         | 2.0000             | 0.0929          | 0.1474           | 0.0545         | 80.15 |                        |
| 02              | BLANK  | MBL         | 2.0000             | 0.0923          | 0.1457           | 0.0534         | 78.53 |                        |
| 03              | DUP  | DUP         | 2.0000             | 0.0921          | 0.1432           | 0.0511         | 75.15 |                        |
| 04              | PZ-204-SS TOT                                  | TRG         | 2.0000             | 0.0918          | 0.1483           | 0.0565         | 83.09 |                        |
| 05              | PZ-204-SS DIS                                  | TRG         | 2.0000             | 0.0914          | 0.1477           | 0.0563         | 82.79 |                        |
| 06              | I-68 TOT                                       | TRG         | 2.0000             | 0.0914          | 0.1482           | 0.0568         | 83.53 |                        |
| 07              | I-68 DIS                                       | TRG         | 2.0000             | 0.0902          | 0.1440           | 0.0538         | 79.12 |                        |
| 08              | D-87 TOT                                       | TRG         | 2.0000             | 0.0908          | 0.1434           | 0.0526         | 77.35 |                        |
| 09              | D-87 DIS                                       | TRG         | 2.0000             | 0.0926          | 0.1455           | 0.0529         | 77.79 |                        |
| 10              | PZ-106-SD TOT                                  | TRG         | 2.0000             | 0.0905          | 0.1436           | 0.0531         | 78.09 |                        |
| 11              | PZ-106-SD DIS                                  | TRG         | 2.0000             | 0.0908          | 0.1432           | 0.0524         | 77.06 |                        |
| 12              | S-82 TOT                                       | TRG         | 2.0000             | 0.0925          | 0.1432           | 0.0507         | 74.56 |                        |
| 13              | S-82 DIS                                       | TRG         | 2.0000             | 0.0902          | 0.1442           | 0.0540         | 79.41 |                        |
| 14              | PZ-106-SS TOT                                  | DO          | 2.0000             | 0.0909          | 0.1429           | 0.0520         | 76.49 |                        |
| 15              | PZ-106-SS DIS                                  | TRG         | 2.0000             | 0.0928          | 0.1458           | 0.0530         | 77.94 |                        |
| 16              | I-9 TOT  | TRG         | 2.0000             | 0.0904          | 0.1410           | 0.0506         | 74.41 |                        |
| 17              | I-9 DIS  | TRG         | 2.0000             | 0.0905          | 0.1467           | 0.0562         | 82.65 |                        |
| 18              | D-93 TOT                                       | TRG         | 2.0000             | 0.0928          | 0.1468           | 0.0540         | 79.41 |                        |
| 19              | D-93 DIS                                       | TRG         | 2.0000             | 0.0906          | 0.1466           | 0.0560         | 82.35 |                        |

Technician: \_\_\_\_\_

*T Smith*

Date: \_\_\_\_\_

5 / 9 / 13

(A)  
5/9/13  
DB

| Detector ID | Sample ID  | Alpha | Beta | Count Time | Voltage | TOD          |
|-------------|------------|-------|------|------------|---------|--------------|
| D2          | 1304105-19 | 22    | 354  | 120        | 1400    | 5/9/13 13:22 |

C  
5/9/13  
A

| Detector ID | Sample ID  | Alpha | Beta | Count Time | Voltage | TOD          |
|-------------|------------|-------|------|------------|---------|--------------|
| C1          | 1304105-01 | 23    | 640  | 120        | 1400    | 5/9/13 11:17 |
| C2          | 1304105-02 | 21    | 170  | 120        | 1400    | 5/9/13 11:17 |
| C3          | 1304105-03 | 12    | 209  | 120        | 1400    | 5/9/13 11:17 |
| C4          | 1304105-04 | 13    | 226  | 120        | 1400    | 5/9/13 11:17 |
| D2          | 1304105-05 | 14    | 200  | 120        | 1400    | 5/9/13 11:17 |
| D4          | 1304105-06 | 21    | 315  | 120        | 1400    | 5/9/13 11:17 |



C  
5/9/13  
A

| Detector ID | Sample ID  | Alpha | Beta | Count Time | Voltage | TOD          |
|-------------|------------|-------|------|------------|---------|--------------|
| C1          | 1304105-15 | 6     | 195  | 120        | 1400    | 5/9/13 12:57 |
| C2          | 1304105-16 | 23    | 430  | 120        | 1400    | 5/9/13 12:57 |
| C3          | 1304105-17 | 7     | 252  | 120        | 1400    | 5/9/13 12:57 |
| C4          | 1304105-18 | 20    | 478  | 120        | 1400    | 5/9/13 12:57 |
| A1          | 1304105-07 | 27    | 229  | 120        | 1400    | 5/9/13 12:57 |
| A2          | 1304105-08 | 18    | 360  | 120        | 1400    | 5/9/13 12:57 |
| A3          | 1304105-09 | 16    | 229  | 120        | 1400    | 5/9/13 12:57 |
| A4          | 1304105-10 | 19    | 195  | 120        | 1400    | 5/9/13 12:57 |
| B1          | 1304105-11 | 16    | 199  | 120        | 1400    | 5/9/13 12:57 |
| B2          | 1304105-12 | 9     | 267  | 120        | 1400    | 5/9/13 12:57 |
| B3          | 1304105-13 | 16    | 192  | 120        | 1400    | 5/9/13 12:57 |
| B4          | 1304105-14 | 16    | 203  | 120        | 1400    | 5/9/13 12:57 |

GPC Detector Report  
(ALL Backgrounds)

519112

| Detector     | Alpha/Beta | Calibration Date | Count Date | Bkg CPM  | PFW | LCL       | Mean     | UCL      |
|--------------|------------|------------------|------------|----------|-----|-----------|----------|----------|
| LB4110A - A1 | Alpha      | 11/18/2007       | 5/9/2013   | 3.33E-02 | P   | -2.18E+01 | 2.93E-01 | 2.24E+01 |
| LB4110A - A2 | Alpha      | 11/18/2007       | 5/9/2013   | 5.00E-02 | P   | -1.85E+01 | 2.62E-01 | 1.90E+01 |
| LB4110A - A3 | Alpha      | 11/18/2007       | 5/9/2013   | 3.33E-02 | P   | -1.80E+01 | 2.24E-01 | 1.85E+01 |
| LB4110A - A4 | Alpha      | 11/18/2007       | 5/9/2013   | 3.33E-02 | P   | -1.91E+01 | 2.45E-01 | 1.96E+01 |
| LB4110A - B1 | Alpha      | 11/18/2007       | 5/9/2013   | 6.67E-02 | P   | -9.88E-02 | 7.51E-02 | 2.49E-01 |
| LB4110A - B2 | Alpha      | 11/18/2007       | 5/9/2013   | 6.67E-02 | P   | -7.93E-02 | 7.27E-02 | 2.25E-01 |
| LB4110A - B3 | Alpha      | 11/18/2007       | 5/9/2013   | 1.67E-02 | P   | -6.39E-02 | 5.32E-02 | 1.70E-01 |
| LB4110A - B4 | Alpha      | 11/18/2007       | 5/9/2013   | 1.33E-01 | P   | -1.44E-01 | 7.92E-02 | 3.02E-01 |
| LB4110A - C1 | Alpha      | 11/18/2007       | 5/9/2013   | 1.33E-01 | P   | -1.53E-01 | 8.92E-02 | 3.31E-01 |
| LB4110A - C2 | Alpha      | 11/18/2007       | 5/9/2013   | 3.33E-02 | P   | -1.80E-01 | 8.82E-02 | 3.56E-01 |
| LB4110A - C3 | Alpha      | 11/18/2007       | 5/9/2013   | 8.33E-02 | P   | -1.76E-01 | 1.01E-01 | 3.78E-01 |
| LB4110A - C4 | Alpha      | 11/18/2007       | 5/9/2013   | 3.33E-02 | P   | -6.28E-02 | 6.88E-02 | 2.00E-01 |
| LB4110A - D1 | Alpha      | 11/18/2007       | 5/9/2013   | 3.33E-02 | P   | -5.36E-02 | 8.41E-02 | 2.22E-01 |
| LB4110A - D2 | Alpha      | 11/18/2007       | 5/9/2013   | 3.33E-02 | P   | -7.03E-02 | 6.04E-02 | 1.91E-01 |
| LB4110A - D3 | Alpha      | 11/18/2007       | 5/9/2013   | 5.00E-02 | P   | -4.75E-02 | 7.19E-02 | 1.91E-01 |
| LB4110A - D4 | Alpha      | 11/18/2007       | 5/9/2013   | 1.00E-01 | P   | -5.74E-02 | 7.09E-02 | 1.99E-01 |
| LB4110R - A1 | Alpha      | 11/24/2006       | 5/9/2013   | 8.33E-02 | P   | -1.01E-01 | 1.01E-01 | 3.03E-01 |
| LB4110R - A2 | Alpha      | 11/24/2006       | 5/9/2013   | 8.33E-02 | P   | -9.01E-02 | 7.74E-02 | 2.45E-01 |
| LB4110R - A3 | Alpha      | 11/24/2006       | 5/9/2013   | 6.67E-02 | P   | -7.36E-02 | 7.68E-02 | 2.27E-01 |
| LB4110R - A4 | Alpha      | 11/24/2006       | 5/9/2013   | 1.17E-01 | P   | -5.30E-02 | 7.17E-02 | 1.96E-01 |
| LB4110R - B1 | Alpha      | 11/24/2006       | 5/9/2013   | 5.00E-02 | P   | -9.58E-02 | 6.20E-02 | 2.20E-01 |
| LB4110R - B2 | Alpha      | 11/24/2006       | 5/9/2013   | 1.67E-02 | P   | -6.94E-02 | 6.44E-02 | 1.98E-01 |
| LB4110R - B3 | Alpha      | 11/24/2006       | 5/9/2013   | 5.00E-02 | P   | -6.53E-02 | 7.01E-02 | 2.05E-01 |
| LB4110R - B4 | Alpha      | 11/24/2006       | 5/9/2013   | 5.00E-02 | P   | -6.48E-02 | 7.08E-02 | 2.06E-01 |
| LB4110R - C1 | Alpha      | 11/24/2006       | 5/9/2013   | 6.67E-02 | P   | -7.79E-02 | 7.44E-02 | 2.27E-01 |
| LB4110R - C2 | Alpha      | 11/24/2006       | 5/9/2013   | 1.67E-02 | P   | -7.54E-02 | 7.22E-02 | 2.20E-01 |
| LB4110R - C3 | Alpha      | 11/24/2006       | 5/9/2013   | 8.33E-02 | P   | -8.90E-02 | 8.48E-02 | 2.59E-01 |
| LB4110R - C4 | Alpha      | 11/24/2006       | 5/9/2013   | 1.67E-02 | P   | -6.23E-02 | 8.20E-02 | 2.26E-01 |
| LB4110R - D1 | Alpha      | 11/24/2006       | 5/9/2013   | 0.00E+00 | P   | -9.93E-02 | 7.30E-02 | 2.45E-01 |
| LB4110R - D2 | Alpha      | 11/24/2006       | 5/9/2013   | 0.00E+00 | P   | -7.34E-02 | 7.24E-02 | 2.18E-01 |
| LB4110R - D3 | Alpha      | 11/24/2006       | 5/9/2013   | 0.00E+00 | P   | -7.87E-02 | 7.22E-02 | 2.23E-01 |
| LB4110R - D4 | Alpha      | 11/24/2006       | 5/9/2013   | 0.00E+00 | P   | -7.01E-02 | 7.71E-02 | 2.24E-01 |
| LB5100 - 1   | Alpha      | 7/10/2006        | 10/26/2007 | 5.00E-02 | P   | -1.56E-02 | 9.58E-02 | 2.07E-01 |

GPC Detector Report  
(ALL Backgrounds)

C  
J18117

| Detector     | Alpha/Beta | Calibration Date | Count Date | Bkg CPM  | PFW | LCL       | Mean     | UCL      |
|--------------|------------|------------------|------------|----------|-----|-----------|----------|----------|
| LB4110A - A1 | Beta       | 11/18/2007       | 5/9/2013   | 7.62E+00 | P   | -2.96E+02 | 7.63E+00 | 3.11E+02 |
| LB4110A - A2 | Beta       | 11/18/2007       | 5/9/2013   | 3.63E+00 | P   | -3.11E+01 | 2.55E+00 | 3.62E+01 |
| LB4110A - A3 | Beta       | 11/18/2007       | 5/9/2013   | 1.17E+00 | P   | -5.13E+01 | 2.67E+00 | 5.66E+01 |
| LB4110A - A4 | Beta       | 11/18/2007       | 5/9/2013   | 7.12E+00 | P   | -3.33E+01 | 3.03E+00 | 3.94E+01 |
| LB4110A - B1 | Beta       | 11/18/2007       | 5/9/2013   | 1.65E+00 | P   | -1.04E+01 | 3.26E+00 | 1.70E+01 |
| LB4110A - B2 | Beta       | 11/18/2007       | 5/9/2013   | 1.38E+00 | P   | -7.55E+00 | 1.99E+00 | 1.15E+01 |
| LB4110A - B3 | Beta       | 11/18/2007       | 5/9/2013   | 2.25E+00 | P   | 1.06E-01  | 1.36E+00 | 2.62E+00 |
| LB4110A - B4 | Beta       | 11/18/2007       | 5/9/2013   | 1.92E+00 | P   | -7.61E+00 | 1.97E+00 | 1.15E+01 |
| LB4110A - C1 | Beta       | 11/18/2007       | 5/9/2013   | 1.02E+00 | P   | -5.50E+00 | 2.15E+00 | 9.81E+00 |
| LB4110A - C2 | Beta       | 11/18/2007       | 5/9/2013   | 1.03E+00 | P   | 3.80E-01  | 1.27E+00 | 2.16E+00 |
| LB4110A - C3 | Beta       | 11/18/2007       | 5/9/2013   | 1.15E+00 | P   | 4.69E-01  | 1.47E+00 | 2.47E+00 |
| LB4110A - C4 | Beta       | 11/18/2007       | 5/9/2013   | 1.05E+00 | P   | -1.77E+00 | 2.14E+00 | 6.05E+00 |
| LB4110A - D1 | Beta       | 11/18/2007       | 5/9/2013   | 2.13E+00 | P   | -2.38E+00 | 2.59E+00 | 7.56E+00 |
| LB4110A - D2 | Beta       | 11/18/2007       | 5/9/2013   | 1.18E+00 | P   | -6.81E-01 | 1.57E+00 | 3.81E+00 |
| LB4110A - D3 | Beta       | 11/18/2007       | 5/9/2013   | 4.55E+00 | P   | 1.22E+00  | 4.47E+00 | 7.73E+00 |
| LB4110A - D4 | Beta       | 11/18/2007       | 5/9/2013   | 1.50E+00 | P   | -4.51E-01 | 1.37E+00 | 3.20E+00 |
| LB4110R - A1 | Beta       | 11/24/2006       | 5/9/2013   | 1.10E+00 | P   | -6.20E+01 | 3.77E+00 | 6.95E+01 |
| LB4110R - A2 | Beta       | 11/24/2006       | 5/9/2013   | 1.15E+00 | P   | -4.92E+01 | 2.05E+00 | 5.34E+01 |
| LB4110R - A3 | Beta       | 11/24/2006       | 5/9/2013   | 1.28E+00 | P   | -4.56E+01 | 2.80E+00 | 5.12E+01 |
| LB4110R - A4 | Beta       | 11/24/2006       | 5/9/2013   | 1.43E+00 | P   | -4.55E+01 | 2.02E+00 | 4.95E+01 |
| LB4110R - B1 | Beta       | 11/24/2006       | 5/9/2013   | 1.15E+00 | P   | -4.79E+01 | 2.05E+00 | 5.20E+01 |
| LB4110R - B2 | Beta       | 11/24/2006       | 5/9/2013   | 1.08E+00 | P   | -4.78E+01 | 2.08E+00 | 5.20E+01 |
| LB4110R - B3 | Beta       | 11/24/2006       | 5/9/2013   | 1.00E+00 | P   | -4.76E+01 | 2.71E+00 | 5.30E+01 |
| LB4110R - B4 | Beta       | 11/24/2006       | 5/9/2013   | 1.28E+00 | P   | -4.80E+01 | 1.95E+00 | 5.19E+01 |
| LB4110R - C1 | Beta       | 11/24/2006       | 5/9/2013   | 1.35E+00 | P   | -4.77E+01 | 3.03E+00 | 5.38E+01 |
| LB4110R - C2 | Beta       | 11/24/2006       | 5/9/2013   | 1.58E+00 | P   | -4.77E+01 | 2.75E+00 | 5.32E+01 |
| LB4110R - C3 | Beta       | 11/24/2006       | 5/9/2013   | 1.28E+00 | P   | -4.82E+01 | 2.56E+00 | 5.33E+01 |
| LB4110R - C4 | Beta       | 11/24/2006       | 5/9/2013   | 1.32E+00 | P   | -5.44E+01 | 2.99E+00 | 6.04E+01 |
| LB4110R - D1 | Beta       | 11/24/2006       | 5/9/2013   | 0.00E+00 | P   | -4.51E+01 | 5.78E+00 | 5.67E+01 |
| LB4110R - D2 | Beta       | 11/24/2006       | 5/9/2013   | 0.00E+00 | P   | -4.87E+01 | 1.95E+00 | 5.26E+01 |
| LB4110R - D3 | Beta       | 11/24/2006       | 5/9/2013   | 0.00E+00 | P   | -5.20E+01 | 5.75E+00 | 6.35E+01 |
| LB4110R - D4 | Beta       | 11/24/2006       | 5/9/2013   | 0.00E+00 | P   | -4.83E+01 | 2.32E+00 | 5.30E+01 |
| LB5100 - 1   | Beta       | 7/10/2006        | 10/26/2007 | 4.52E+00 | F   | -3.19E-01 | 1.58E+00 | 3.48E+00 |

C  
5/9/13

| Detector     | Alpha/Beta | Calibration Date | Count Date | Eff    | PFW | LCL     | Mean   | UCL    |
|--------------|------------|------------------|------------|--------|-----|---------|--------|--------|
| LB4110A - A1 | Alpha      | 11/18/2007       | 5/9/2013   | 0.2393 | P   | -0.0188 | 0.2147 | 0.4482 |
| LB4110A - A2 | Alpha      | 11/18/2007       | 5/9/2013   | 0.2070 | P   | -0.0562 | 0.1725 | 0.4013 |
| LB4110A - A3 | Alpha      | 11/18/2007       | 5/9/2013   | 0.2093 | P   | -0.0799 | 0.1614 | 0.4027 |
| LB4110A - A4 | Alpha      | 11/18/2007       | 5/9/2013   | 0.2196 | P   | -0.0583 | 0.1803 | 0.4190 |
| LB4110A - B1 | Alpha      | 11/18/2007       | 5/9/2013   | 0.2164 | P   | 0.1943  | 0.2246 | 0.2550 |
| LB4110A - B2 | Alpha      | 11/18/2007       | 5/9/2013   | 0.2036 | P   | 0.1929  | 0.2218 | 0.2507 |
| LB4110A - B3 | Alpha      | 11/18/2007       | 5/9/2013   | 0.2319 | P   | 0.1293  | 0.2326 | 0.3359 |
| LB4110A - B4 | Alpha      | 11/18/2007       | 5/9/2013   | 0.2248 | P   | 0.2090  | 0.2367 | 0.2644 |
| LB4110A - C1 | Alpha      | 11/18/2007       | 5/9/2013   | 0.2168 | P   | 0.1973  | 0.2208 | 0.2444 |
| LB4110A - C2 | Alpha      | 11/18/2007       | 5/9/2013   | 0.2220 | P   | 0.1966  | 0.2252 | 0.2538 |
| LB4110A - C3 | Alpha      | 11/18/2007       | 5/9/2013   | 0.2514 | P   | 0.2228  | 0.2494 | 0.2759 |
| LB4110A - C4 | Alpha      | 11/18/2007       | 5/9/2013   | 0.2144 | P   | 0.1965  | 0.2258 | 0.2550 |
| LB4110A - D1 | Alpha      | 11/18/2007       | 5/9/2013   | 0.2272 | P   | 0.2036  | 0.2334 | 0.2632 |
| LB4110A - D2 | Alpha      | 11/18/2007       | 5/9/2013   | 0.2542 | P   | 0.2278  | 0.2584 | 0.2890 |
| LB4110A - D3 | Alpha      | 11/18/2007       | 5/9/2013   | 0.2680 | P   | 0.2315  | 0.2639 | 0.2963 |
| LB4110A - D4 | Alpha      | 11/18/2007       | 5/9/2013   | 0.1888 | P   | 0.1651  | 0.1999 | 0.2347 |
| LB4110R - A1 | Alpha      | 11/24/2006       | 5/9/2013   | 0.2423 | P   | 0.2031  | 0.2389 | 0.2747 |
| LB4110R - A2 | Alpha      | 11/24/2006       | 5/9/2013   | 0.2051 | P   | 0.1899  | 0.2207 | 0.2514 |
| LB4110R - A3 | Alpha      | 11/24/2006       | 5/9/2013   | 0.2194 | P   | 0.1963  | 0.2249 | 0.2534 |
| LB4110R - A4 | Alpha      | 11/24/2006       | 5/9/2013   | 0.2443 | P   | 0.2159  | 0.2457 | 0.2755 |
| LB4110R - B1 | Alpha      | 11/24/2006       | 5/9/2013   | 0.2226 | P   | 0.1877  | 0.2261 | 0.2645 |
| LB4110R - B2 | Alpha      | 11/24/2006       | 5/9/2013   | 0.2094 | P   | 0.1801  | 0.2176 | 0.2550 |
| LB4110R - B3 | Alpha      | 11/24/2006       | 5/9/2013   | 0.2429 | P   | 0.2067  | 0.2440 | 0.2813 |
| LB4110R - B4 | Alpha      | 11/24/2006       | 5/9/2013   | 0.2205 | P   | 0.1938  | 0.2320 | 0.2702 |
| LB4110R - C1 | Alpha      | 11/24/2006       | 5/9/2013   | 0.2104 | P   | 0.1861  | 0.2153 | 0.2445 |
| LB4110R - C2 | Alpha      | 11/24/2006       | 5/9/2013   | 0.2201 | P   | 0.1963  | 0.2248 | 0.2533 |
| LB4110R - C3 | Alpha      | 11/24/2006       | 5/9/2013   | 0.2307 | P   | 0.2064  | 0.2398 | 0.2731 |
| LB4110R - C4 | Alpha      | 11/24/2006       | 5/9/2013   | 0.2066 | P   | 0.1859  | 0.2229 | 0.2600 |
| LB4110R - D1 | Alpha      | 11/24/2006       | 5/9/2013   | 0.0000 | F   | 0.0383  | 0.2074 | 0.3764 |
| LB4110R - D2 | Alpha      | 11/24/2006       | 5/9/2013   | 0.0000 | F   | 0.0443  | 0.2358 | 0.4272 |
| LB4110R - D3 | Alpha      | 11/24/2006       | 5/9/2013   | 0.0000 | F   | 0.0436  | 0.2316 | 0.4197 |
| LB4110R - D4 | Alpha      | 11/24/2006       | 5/9/2013   | 0.0000 | F   | 0.0334  | 0.1867 | 0.3399 |
| LB5100 - 1   | Alpha      | 7/10/2006        | 10/26/2007 | 0.3368 | P   | 0.3332  | 0.3455 | 0.3578 |

0443

C  
5/9/13

| Detector     | Alpha/Beta | Calibration Date | Count Date | Eff    | PFW | LCL    | Mean   | UCL    |
|--------------|------------|------------------|------------|--------|-----|--------|--------|--------|
| LB4110A - A1 | Beta       | 11/18/2007       | 5/9/2013   | 0.5612 | P   | 0.2034 | 0.5628 | 0.9222 |
| LB4110A - A2 | Beta       | 11/18/2007       | 5/9/2013   | 0.4889 | P   | 0.1542 | 0.4633 | 0.7724 |
| LB4110A - A3 | Beta       | 11/18/2007       | 5/9/2013   | 0.4808 | P   | 0.0815 | 0.4570 | 0.8326 |
| LB4110A - A4 | Beta       | 11/18/2007       | 5/9/2013   | 0.5300 | P   | 0.1339 | 0.4877 | 0.8416 |
| LB4110A - B1 | Beta       | 11/18/2007       | 5/9/2013   | 0.5094 | P   | 0.4637 | 0.5306 | 0.5974 |
| LB4110A - B2 | Beta       | 11/18/2007       | 5/9/2013   | 0.5039 | P   | 0.4639 | 0.5276 | 0.5914 |
| LB4110A - B3 | Beta       | 11/18/2007       | 5/9/2013   | 0.5356 | P   | 0.3190 | 0.5321 | 0.7451 |
| LB4110A - B4 | Beta       | 11/18/2007       | 5/9/2013   | 0.5363 | P   | 0.4922 | 0.5546 | 0.6171 |
| LB4110A - C1 | Beta       | 11/18/2007       | 5/9/2013   | 0.4933 | P   | 0.4501 | 0.5027 | 0.5552 |
| LB4110A - C2 | Beta       | 11/18/2007       | 5/9/2013   | 0.4844 | P   | 0.4279 | 0.5011 | 0.5744 |
| LB4110A - C3 | Beta       | 11/18/2007       | 5/9/2013   | 0.5926 | P   | 0.5277 | 0.5901 | 0.6526 |
| LB4110A - C4 | Beta       | 11/18/2007       | 5/9/2013   | 0.5054 | P   | 0.4567 | 0.5251 | 0.5934 |
| LB4110A - D1 | Beta       | 11/18/2007       | 5/9/2013   | 0.5297 | P   | 0.4798 | 0.5543 | 0.6287 |
| LB4110A - D2 | Beta       | 11/18/2007       | 5/9/2013   | 0.5559 | P   | 0.4905 | 0.5888 | 0.6871 |
| LB4110A - D3 | Beta       | 11/18/2007       | 5/9/2013   | 0.6119 | P   | 0.5368 | 0.6156 | 0.6943 |
| LB4110A - D4 | Beta       | 11/18/2007       | 5/9/2013   | 0.4462 | P   | 0.3864 | 0.4735 | 0.5605 |
| LB4110R - A1 | Beta       | 11/24/2006       | 5/9/2013   | 0.5712 | P   | 0.4813 | 0.5680 | 0.6546 |
| LB4110R - A2 | Beta       | 11/24/2006       | 5/9/2013   | 0.4969 | P   | 0.4209 | 0.5089 | 0.5969 |
| LB4110R - A3 | Beta       | 11/24/2006       | 5/9/2013   | 0.5238 | P   | 0.4580 | 0.5398 | 0.6216 |
| LB4110R - A4 | Beta       | 11/24/2006       | 5/9/2013   | 0.6035 | P   | 0.5100 | 0.5917 | 0.6735 |
| LB4110R - B1 | Beta       | 11/24/2006       | 5/9/2013   | 0.5280 | P   | 0.4535 | 0.5428 | 0.6321 |
| LB4110R - B2 | Beta       | 11/24/2006       | 5/9/2013   | 0.5123 | P   | 0.4312 | 0.5203 | 0.6093 |
| LB4110R - B3 | Beta       | 11/24/2006       | 5/9/2013   | 0.6008 | P   | 0.5016 | 0.5913 | 0.6810 |
| LB4110R - B4 | Beta       | 11/24/2006       | 5/9/2013   | 0.5220 | P   | 0.4623 | 0.5500 | 0.6377 |
| LB4110R - C1 | Beta       | 11/24/2006       | 5/9/2013   | 0.4682 | P   | 0.4242 | 0.5033 | 0.5824 |
| LB4110R - C2 | Beta       | 11/24/2006       | 5/9/2013   | 0.5117 | P   | 0.4503 | 0.5292 | 0.6082 |
| LB4110R - C3 | Beta       | 11/24/2006       | 5/9/2013   | 0.5612 | P   | 0.4813 | 0.5713 | 0.6613 |
| LB4110R - C4 | Beta       | 11/24/2006       | 5/9/2013   | 0.4873 | P   | 0.4324 | 0.5265 | 0.6206 |
| LB4110R - D1 | Beta       | 11/24/2006       | 5/9/2013   | 0.0000 | F   | 0.0907 | 0.4959 | 0.9010 |
| LB4110R - D2 | Beta       | 11/24/2006       | 5/9/2013   | 0.0000 | F   | 0.1026 | 0.5572 | 1.0117 |
| LB4110R - D3 | Beta       | 11/24/2006       | 5/9/2013   | 0.0000 | F   | 0.0996 | 0.5412 | 0.9827 |
| LB4110R - D4 | Beta       | 11/24/2006       | 5/9/2013   | 0.0000 | F   | 0.0785 | 0.4455 | 0.8124 |
| LB5100 - 1   | Beta       | 7/10/2006        | 10/26/2007 | 0.4428 | F   | 0.4555 | 0.4731 | 0.4906 |

0444

**SECTION XII**  
**BARIUM-133 ANALYTICAL TRACER DATA**

*5/11/13*

Configuration : DKA100:[GAMMA.SCUSR.ARCHIVE]SMP\_130410501\_GE3\_BAFIL\_191136.CN  
 Analyses by : PEAK V16.9 PEAKEFF V2.2  
 Client ID : SPIKE  
 Deposition Date :  
 Sample Date : 1-MAY-2013 00:00:00. Acquisition date : 1-MAY-2013 07:11:58.  
 Sample ID : 1304105-01 Sample Quantity : 1.00000E+00 filter  
 Sample type : FILTER Sample Geometry : 0  
 Detector name : GE3 Detector Geometry: BAFIL  
 Elapsed live time: 0 00:15:00.00 Elapsed real time: 0 00:15:03.90 0.4%  
 Start channel : 25 End channel : 4096  
 Sensitivity : 3.00000 Gaussian : 10.00000  
 Critical level : No

| Pk | It | Energy | Area | Bkgnd | FWHM | Channel | Left | Pw | Cts/Sec  | %Err | Fit      |
|----|----|--------|------|-------|------|---------|------|----|----------|------|----------|
| 1  | 3  | 27.94  | 32   | 116   | 1.73 | 28.26   | 26   | 15 | 3.51E-02 | 70.0 | 9.68E+00 |
| 2  | 3  | 30.78  | 1901 | 85    | 1.41 | 31.10   | 26   | 15 | 2.11E+00 | 2.4  |          |
| 3  | 3  | 34.85  | 496  | 93    | 1.75 | 35.17   | 26   | 15 | 5.51E-01 | 5.4  |          |
| 4  | 9  | 52.46  | 99   | 69    | 2.74 | 52.78   | 50   | 22 | 1.10E-01 | 16.4 | 5.38E+00 |
| 5  | 9  | 56.95  | 20   | 68    | 1.99 | 57.27   | 50   | 22 | 2.25E-02 | 74.7 |          |
| 6  | 9  | 61.58  | 287  | 67    | 1.94 | 61.90   | 50   | 22 | 3.19E-01 | 7.6  |          |
| 7  | 9  | 65.80  | 161  | 78    | 2.33 | 66.12   | 50   | 22 | 1.79E-01 | 12.7 |          |
| 8  | 2  | 80.95  | 777  | 89    | 1.51 | 81.27   | 76   | 15 | 8.64E-01 | 4.0  | 3.12E+00 |
| 9  | 2  | 84.54  | 39   | 73    | 1.55 | 84.86   | 76   | 15 | 4.29E-02 | 39.8 |          |
| 10 | 2  | 87.53  | 20   | 72    | 1.71 | 87.85   | 76   | 15 | 2.25E-02 | 74.1 |          |
| 11 | 0  | 92.11  | 25   | 73    | 1.02 | 92.43   | 91   | 5  | 2.76E-02 | 55.2 |          |
| 12 | 3  | 111.75 | 244  | 72    | 1.89 | 112.07  | 108  | 16 | 2.72E-01 | 8.4  | 8.67E-01 |
| 13 | 3  | 115.98 | 58   | 65    | 1.93 | 116.30  | 108  | 16 | 6.41E-02 | 29.9 |          |
| 14 | 0  | 192.27 | 23   | 101   | 6.61 | 192.58  | 189  | 10 | 2.51E-02 | 85.6 |          |
| 15 | 0  | 241.12 | 32   | 47    | 4.80 | 241.43  | 237  | 8  | 3.55E-02 | 41.9 |          |
| 16 | 0  | 277.12 | 36   | 45    | 2.19 | 277.43  | 272  | 11 | 4.00E-02 | 39.5 |          |
| 17 | 1  | 282.85 | 15   | 4     | 1.71 | 283.16  | 282  | 7  | 1.68E-02 | 30.3 | 5.29E+00 |
| 18 | 1  | 285.53 | 10   | 10    | 1.79 | 285.84  | 282  | 7  | 1.07E-02 | 67.3 |          |
| 19 | 0  | 295.56 | 24   | 14    | 3.46 | 295.87  | 292  | 9  | 2.66E-02 | 35.8 |          |
| 20 | 1  | 302.85 | 121  | 13    | 1.57 | 303.16  | 300  | 11 | 1.34E-01 | 10.1 | 4.74E-01 |
| 21 | 1  | 307.61 | 19   | 18    | 1.81 | 307.92  | 300  | 11 | 2.13E-02 | 38.7 |          |
| 22 | 0  | 324.89 | 19   | 25    | 1.81 | 325.19  | 321  | 9  | 2.08E-02 | 54.7 |          |
| 23 | 0  | 333.70 | 60   | 42    | 1.36 | 334.00  | 330  | 8  | 6.62E-02 | 22.9 |          |
| 24 | 5  | 352.38 | 21   | 4     | 2.68 | 352.69  | 351  | 12 | 2.32E-02 | 28.3 | 9.17E-01 |
| 25 | 5  | 356.13 | 497  | 12    | 1.57 | 356.43  | 351  | 12 | 5.52E-01 | 4.6  |          |
| 26 | 0  | 377.03 | 24   | 8     | 1.56 | 377.34  | 374  | 7  | 2.69E-02 | 28.4 |          |
| 27 | 4  | 384.07 | 94   | 12    | 2.49 | 384.37  | 381  | 9  | 1.05E-01 | 17.1 | 4.41E+00 |
| 28 | 4  | 387.07 | 169  | 13    | 1.37 | 387.37  | 381  | 9  | 1.88E-01 | 9.0  |          |
| 29 | 1  | 414.53 | 22   | 10    | 1.89 | 414.83  | 412  | 15 | 2.48E-02 | 32.5 | 3.58E+00 |
| 30 | 1  | 417.87 | 22   | 10    | 1.90 | 418.17  | 412  | 15 | 2.46E-02 | 39.1 |          |
| 31 | 1  | 421.53 | 16   | 12    | 1.90 | 421.83  | 412  | 15 | 1.82E-02 | 44.7 |          |
| 32 | 0  | 436.98 | 104  | 3     | 2.01 | 437.28  | 431  | 11 | 1.15E-01 | 10.3 |          |
| 33 | 0  | 478.29 | 9    | 1     | 2.85 | 478.59  | 476  | 6  | 9.78E-03 | 39.8 |          |
| 34 | 0  | 511.06 | 17   | 10    | 2.79 | 511.35  | 506  | 10 | 1.89E-02 | 42.4 |          |
| 35 | 0  | 583.49 | 10   | 1     | 1.65 | 583.79  | 581  | 7  | 1.08E-02 | 38.6 |          |
| 36 | 0  | 609.36 | 10   | 5     | 1.21 | 609.66  | 606  | 7  | 1.11E-02 | 49.3 |          |

Summary of Nuclide Activity

Sample ID : 1304105-01

Acquisition date : 1-MAY-2013 07:11:58

Total number of lines in spectrum 36  
 Number of unidentified lines 30  
 Number of lines tentatively identified by NID 6 16.67%

Nuclide Type : FISSION

| Nuclide          | Hlife     | Decay | Wtd Mean                  | Wtd Mean                 | Decay Corr<br>2-Sigma Error | 2-Sigma<br>%Error | Flags |
|------------------|-----------|-------|---------------------------|--------------------------|-----------------------------|-------------------|-------|
|                  |           |       | Uncorrected<br>pCi/filter | Decay Corr<br>pCi/filter |                             |                   |       |
| CD-109           | 464.00D   | 1.00  | 9.565E+01                 | 9.569E+01                | 14.21E+01                   | 148.48            |       |
| BA-133           | 10.50Y    | 1.00  | 3.726E+02                 | 3.726E+02                | 0.660E+02                   | 17.72             |       |
| NP-237           | 2.14E+06Y | 1.00  | 2.764E+01                 | 2.764E+01                | 4.104E+01                   | 148.47            |       |
| Total Activity : |           |       | 4.959E+02                 | 4.960E+02                |                             |                   |       |

Nuclide Type : NATURAL

| Nuclide          | Hlife     | Decay | Wtd Mean                  | Wtd Mean                 | Decay Corr<br>2-Sigma Error | 2-Sigma<br>%Error | Flags |
|------------------|-----------|-------|---------------------------|--------------------------|-----------------------------|-------------------|-------|
|                  |           |       | Uncorrected<br>pCi/filter | Decay Corr<br>pCi/filter |                             |                   |       |
| PA-231           | 3.28E+04Y | 1.00  | 2.533E+03                 | 2.533E+03                | 0.685E+03                   | 27.05             |       |
| TH-234           | 4.47E+09Y | 1.00  | 8.557E+02                 | 8.557E+02                | 1.417E+02                   | 16.56             |       |
| Total Activity : |           |       | 3.388E+03                 | 3.388E+03                |                             |                   |       |

Grand Total Activity : 3.884E+03 3.884E+03

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

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



Nuclide Type: FISSION

| Nuclide | Energy | %Abn  | %Eff      | Uncorrected pCi/filter | Decay Corr pCi/filter | 2-Sigma %Error | Status |
|---------|--------|-------|-----------|------------------------|-----------------------|----------------|--------|
| CD-109  | 88.03  | 3.72* | 1.712E+01 | 9.565E+01              | 9.569E+01             | 148.48         | OK     |

Final Mean for 1 Valid Peaks = 9.569E+01 +/- 1.421E+02 (148.48%)

|        |        |        |           |           |           |       |    |
|--------|--------|--------|-----------|-----------|-----------|-------|----|
| BA-133 | 81.00  | 33.00* | 1.899E+01 | 3.726E+02 | 3.726E+02 | 17.72 | OK |
|        | 302.84 | 17.80  | 6.222E+00 | 3.273E+02 | 3.273E+02 | 28.87 | OK |
|        | 356.01 | 60.00  | 5.860E+00 | 4.242E+02 | 4.243E+02 | 16.47 | OK |

Final Mean for 3 Valid Peaks = 3.726E+02 +/- 6.602E+01 ( 17.72%)

|        |       |        |           |           |           |        |    |
|--------|-------|--------|-----------|-----------|-----------|--------|----|
| NP-237 | 86.50 | 12.60* | 1.749E+01 | 2.764E+01 | 2.764E+01 | 148.47 | OK |
|--------|-------|--------|-----------|-----------|-----------|--------|----|

Final Mean for 1 Valid Peaks = 2.764E+01 +/- 4.104E+01 (148.47%)

Nuclide Type: NATURAL

| Nuclide | Energy | %Abn   | %Eff      | Uncorrected pCi/filter | Decay Corr pCi/filter | 2-Sigma %Error | Status |
|---------|--------|--------|-----------|------------------------|-----------------------|----------------|--------|
| PA-231  | 9.28   | 42.00* | 1.000E+02 | -----                  | Line Out Of Range     | ----           | Absent |
|         | 10.11  | 20.20  | 1.000E+02 | -----                  | Line Out Of Range     | ----           | Absent |
|         | 283.67 | 1.60   | 6.406E+00 | 4.421E+02              | 4.421E+02             | 63.24          | OK     |
|         | 302.67 | 2.30   | 6.224E+00 | 2.533E+03              | 2.533E+03             | 27.05          | OK     |

Final Mean for 2 Valid Peaks = 2.533E+03 +/- 6.850E+02 ( 27.05%)

|        |       |       |           |           |           |       |    |
|--------|-------|-------|-----------|-----------|-----------|-------|----|
| TH-234 | 63.29 | 3.80* | 2.648E+01 | 8.557E+02 | 8.557E+02 | 16.56 | OK |
|--------|-------|-------|-----------|-----------|-----------|-------|----|

Final Mean for 1 Valid Peaks = 8.557E+02 +/- 1.417E+02 ( 16.56%)

Flag: "\*" = Keyline

---- Identified Nuclides ----

| Nuclide | Activity<br>(pCi/filter) | Act error | MDA<br>(pCi/filter) | MDA error | Act/MDA |
|---------|--------------------------|-----------|---------------------|-----------|---------|
| CD-109  | 9.569E+01                | 1.421E+02 | 2.131E+02           | 1.757E+01 | 0.449   |
| BA-133  | 3.726E+02                | 6.602E+01 | 2.157E+01           | 3.299E+00 | 17.276  |
| PA-231  | 2.533E+03                | 6.850E+02 | 3.138E+00           | 4.463E-02 | 807.113 |
| TH-234  | 8.557E+02                | 1.417E+02 | 1.153E+02           | 6.195E+00 | 7.419   |
| NP-237  | 2.764E+01                | 4.104E+01 | 6.150E+01           | 4.971E+00 | 0.449   |

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

| Nuclide | Key-Line<br>Activity K.L.<br>(pCi/filter) Ided | Act error | MDA<br>(pCi/filter) | MDA error | Act/MDA |
|---------|--|-----------|---------------------|-----------|---------|
| CO-57   | -9.699E-02                                     | 6.610E+00 | 1.058E+01           | 1.208E+00 | -0.009  |
| PA-234  | 2.396E+00                                      | 1.518E+00 | 2.730E+00           | 3.883E-02 | 0.878   |
| AM-241  | 4.013E+01                                      | 9.652E+00 | 1.971E+01           | 9.693E-01 | 2.036   |

*C*  
*51117*

Configuration : DKA100:[GAMMA.SCUSR.ARCHIVE]SMP\_130410502\_GE3\_BAFIL\_191138.CN  
 Analyses by : PEAK V16.9 PEAKEFF V2.2  
 Client ID : BLANK  
 Deposition Date :  
 Sample Date : 1-MAY-2013 00:00:00. Acquisition date : 1-MAY-2013 07:30:54.  
 Sample ID : 1304105-02 Sample Quantity : 1.00000E+00 filter  
 Sample type : FILTER Sample Geometry : 0  
 Detector name : GE3 Detector Geometry: BAFIL  
 Elapsed live time: 0 00:15:00.00 Elapsed real time: 0 00:15:03.99 0.4%  
 Start channel : 25 End channel : 4096  
 Sensitivity : 3.00000 Gaussian : 10.00000  
 Critical level : No

| Pk | It | Energy | Area | Bkgnd | FWHM | Channel | Left | Pw | Cts/Sec  | %Err  | Fit      |
|----|----|--------|------|-------|------|---------|------|----|----------|-------|----------|
| 1  | 2  | 27.95  | 53   | 67    | 1.57 | 28.27   | 27   | 13 | 5.88E-02 | 23.7  | 1.85E+01 |
| 2  | 2  | 30.77  | 2118 | 78    | 1.39 | 31.09   | 27   | 13 | 2.35E+00 | 2.2   |          |
| 3  | 2  | 34.82  | 510  | 79    | 1.59 | 35.14   | 27   | 13 | 5.66E-01 | 5.4   |          |
| 4  | 0  | 53.51  | 73   | 127   | 4.01 | 53.83   | 50   | 8  | 8.17E-02 | 28.9  |          |
| 5  | 2  | 58.97  | 29   | 49    | 1.65 | 59.29   | 58   | 16 | 3.22E-02 | 33.9  | 6.22E+00 |
| 6  | 2  | 61.81  | 247  | 77    | 1.66 | 62.13   | 58   | 16 | 2.75E-01 | 8.6   |          |
| 7  | 2  | 65.45  | 116  | 72    | 1.67 | 65.77   | 58   | 16 | 1.29E-01 | 16.4  |          |
| 8  | 2  | 69.68  | 21   | 55    | 1.38 | 70.00   | 58   | 16 | 2.33E-02 | 55.9  |          |
| 9  | 0  | 80.94  | 829  | 167   | 1.48 | 81.26   | 76   | 10 | 9.21E-01 | 4.5   |          |
| 10 | 0  | 92.73  | 21   | 119   | 1.83 | 93.05   | 90   | 7  | 2.33E-02 | 88.9  |          |
| 11 | 1  | 111.76 | 232  | 51    | 1.59 | 112.07  | 107  | 20 | 2.58E-01 | 8.3   | 3.22E+00 |
| 12 | 1  | 115.83 | 56   | 37    | 1.60 | 116.15  | 107  | 20 | 6.26E-02 | 24.3  |          |
| 13 | 0  | 142.29 | 18   | 102   | 2.61 | 142.60  | 138  | 9  | 2.01E-02 | 103.0 |          |
| 14 | 0  | 160.73 | 25   | 98    | 1.91 | 161.04  | 158  | 9  | 2.75E-02 | 75.1  |          |
| 15 | 0  | 216.19 | 24   | 45    | 1.16 | 216.50  | 213  | 7  | 2.66E-02 | 50.9  |          |
| 16 | 0  | 276.46 | 71   | 26    | 1.76 | 276.77  | 273  | 7  | 7.87E-02 | 16.9  |          |
| 17 | 0  | 295.99 | 18   | 28    | 1.41 | 296.30  | 292  | 9  | 1.97E-02 | 60.9  |          |
| 18 | 0  | 302.93 | 141  | 26    | 1.30 | 303.23  | 300  | 6  | 1.56E-01 | 10.2  |          |
| 19 | 3  | 333.83 | 63   | 16    | 1.86 | 334.14  | 329  | 16 | 7.01E-02 | 16.1  | 2.38E+00 |
| 20 | 3  | 338.15 | 20   | 11    | 2.22 | 338.45  | 329  | 16 | 2.24E-02 | 44.2  |          |
| 21 | 0  | 356.05 | 534  | 27    | 1.80 | 356.36  | 351  | 11 | 5.93E-01 | 4.7   |          |
| 22 | 0  | 365.02 | 12   | 18    | 2.56 | 365.33  | 362  | 6  | 1.37E-02 | 56.2  |          |
| 23 | 1  | 383.79 | 147  | 11    | 1.87 | 384.09  | 381  | 18 | 1.63E-01 | 9.4   | 1.38E+01 |
| 24 | 1  | 386.87 | 251  | 9     | 1.87 | 387.17  | 381  | 18 | 2.79E-01 | 7.9   |          |
| 25 | 1  | 390.87 | 46   | 7     | 1.88 | 391.17  | 381  | 18 | 5.16E-02 | 26.9  |          |
| 26 | 1  | 414.53 | 39   | 18    | 1.89 | 414.83  | 411  | 11 | 4.31E-02 | 24.0  | 5.18E+00 |
| 27 | 1  | 417.87 | 29   | 28    | 1.90 | 418.17  | 411  | 11 | 3.19E-02 | 36.4  |          |
| 28 | 0  | 437.29 | 108  | 13    | 1.97 | 437.60  | 433  | 11 | 1.20E-01 | 11.9  |          |
| 29 | 0  | 468.31 | 17   | 14    | 1.86 | 468.61  | 464  | 8  | 1.86E-02 | 45.9  |          |
| 30 | 0  | 511.66 | 15   | 12    | 2.21 | 511.95  | 508  | 11 | 1.65E-02 | 51.0  |          |

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

Nuclide Type : FISSION

| Nuclide          | Hlife  | Decay | Wtd Mean                  | Wtd Mean                 | Decay Corr<br>2-Sigma Error | 2-Sigma<br>%Error | Flags |
|------------------|--------|-------|---------------------------|--------------------------|-----------------------------|-------------------|-------|
|                  |        |       | Uncorrected<br>pCi/filter | Decay Corr<br>pCi/filter |                             |                   |       |
| BA-133           | 10.50Y | 1.00  | 3.972E+02                 | 3.972E+02                | 0.724E+02                   | 18.23             |       |
| Total Activity : |        |       | 3.972E+02                 | 3.972E+02                |                             |                   |       |

Nuclide Type : NATURAL

| Nuclide          | Hlife     | Decay | Wtd Mean                  | Wtd Mean                 | Decay Corr<br>2-Sigma Error | 2-Sigma<br>%Error | Flags |
|------------------|-----------|-------|---------------------------|--------------------------|-----------------------------|-------------------|-------|
|                  |           |       | Uncorrected<br>pCi/filter | Decay Corr<br>pCi/filter |                             |                   |       |
| TH-234           | 4.47E+09Y | 1.00  | 7.376E+02                 | 7.376E+02                | 1.359E+02                   | 18.42             |       |
| AM-241           | 432.20Y   | 1.00  | 8.388E+00                 | 8.388E+00                | 5.714E+00                   | 68.12             |       |
| Total Activity : |           |       | 7.460E+02                 | 7.460E+02                |                             |                   |       |

Grand Total Activity : 1.143E+03 1.143E+03

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

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

Nuclide Type: FISSION

| Nuclide | Energy | %Abn   | %Eff      | Uncorrected pCi/filter | Decay Corr pCi/filter | 2-Sigma %Error | Status |
|---------|--------|--------|-----------|------------------------|-----------------------|----------------|--------|
| BA-133  | 81.00  | 33.00* | 1.899E+01 | 3.972E+02              | 3.972E+02             | 18.23          | OK     |
|         | 302.84 | 17.80  | 6.222E+00 | 3.813E+02              | 3.813E+02             | 29.05          | OK     |
|         | 356.01 | 60.00  | 5.860E+00 | 4.558E+02              | 4.558E+02             | 16.60          | OK     |

Final Mean for 3 Valid Peaks = 3.972E+02 +/- 7.240E+01 ( 18.23%)

Nuclide Type: NATURAL

| Nuclide | Energy | %Abn  | %Eff      | Uncorrected pCi/filter | Decay Corr pCi/filter | 2-Sigma %Error | Status |
|---------|--------|-------|-----------|------------------------|-----------------------|----------------|--------|
| TH-234  | 63.29  | 3.80* | 2.648E+01 | 7.376E+02              | 7.376E+02             | 18.42          | OK     |

Final Mean for 1 Valid Peaks = 7.376E+02 +/- 1.359E+02 ( 18.42%)

|        |       |        |           |           |           |       |    |
|--------|-------|--------|-----------|-----------|-----------|-------|----|
| AM-241 | 59.54 | 35.90* | 2.893E+01 | 8.388E+00 | 8.388E+00 | 68.12 | OK |
|--------|-------|--------|-----------|-----------|-----------|-------|----|

Final Mean for 1 Valid Peaks = 8.388E+00 +/- 5.714E+00 ( 68.12%)

Flag: "\*" = Keyline

---- Identified Nuclides ----

| Nuclide | Activity<br>(pCi/filter) | Act error | MDA<br>(pCi/filter) | MDA error | Act/MDA |
|---------|--------------------------|-----------|---------------------|-----------|---------|
| BA-133  | 3.972E+02                | 7.240E+01 | 2.083E+01           | 3.185E+00 | 19.072  |
| TH-234  | 7.376E+02                | 1.359E+02 | 1.298E+02           | 6.970E+00 | 5.684   |
| AM-241  | 8.388E+00                | 5.714E+00 | 1.255E+01           | 6.168E-01 | 0.669   |

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

| Nuclide | Key-Line<br>Activity K.L.<br>(pCi/filter) Ided | Act error | MDA<br>(pCi/filter) | MDA error | Act/MDA |
|---------|--|-----------|---------------------|-----------|---------|
| CO-57   | -1.391E+00                                     | 5.862E+00 | 9.960E+00           | 1.138E+00 | -0.140  |
| CD-109  | -9.210E+01                                     | 1.576E+02 | 2.038E+02           | 1.681E+01 | -0.452  |
| PA-231  | 3.365E+00                                      | 1.698E+00 | 3.438E+00           | 4.890E-02 | 0.979   |
| PA-234  | 3.345E+00                                      | 1.463E+00 | 2.861E+00           | 4.068E-02 | 1.169   |
| NP-237  | 3.833E+01                                      | 3.737E+01 | 5.998E+01           | 4.848E+00 | 0.639   |

*C  
51111*

Configuration : DKA100:[GAMMA.SCUSR.ARCHIVE]SMP\_130410503\_GE3\_BAFIL\_191139.CN  
 Analyses by : PEAK V16.9 PEAKEFF V2.2  
 Client ID : PZ-106-SS TOT  
 Deposition Date :  
 Sample Date : 1-MAY-2013 00:00:00. Acquisition date : 1-MAY-2013 07:54:44.  
 Sample ID : 1304105-03 Sample Quantity : 1.00000E+00 filter  
 Sample type : FILTER Sample Geometry : 0  
 Detector name : GE3 Detector Geometry: BAFIL  
 Elapsed live time: 0 00:15:00.00 Elapsed real time: 0 00:15:03.45 0.4%  
 Start channel : 25 End channel : 4096  
 Sensitivity : 3.00000 Gaussian : 10.00000  
 Critical level : No

| Pk | It | Energy | Area | Bkgnd | FWHM | Channel | Left | Pw | Cts/Sec  | %Err | Fit      |
|----|----|--------|------|-------|------|---------|------|----|----------|------|----------|
| 1  | 3  | 27.88  | 30   | 129   | 1.73 | 28.20   | 26   | 14 | 3.31E-02 | 77.4 | 9.94E+00 |
| 2  | 3  | 30.74  | 1955 | 86    | 1.40 | 31.06   | 26   | 14 | 2.17E+00 | 2.4  |          |
| 3  | 3  | 34.85  | 490  | 78    | 1.75 | 35.17   | 26   | 14 | 5.45E-01 | 5.3  |          |
| 4  | 5  | 53.35  | 45   | 99    | 2.18 | 53.67   | 48   | 22 | 5.04E-02 | 41.1 | 2.63E+00 |
| 5  | 5  | 59.35  | 31   | 99    | 2.20 | 59.67   | 48   | 22 | 3.45E-02 | 74.9 |          |
| 6  | 5  | 61.64  | 268  | 72    | 1.61 | 61.96   | 48   | 22 | 2.98E-01 | 7.9  |          |
| 7  | 5  | 65.60  | 126  | 101   | 2.22 | 65.92   | 48   | 22 | 1.40E-01 | 16.5 |          |
| 8  | 0  | 80.93  | 829  | 136   | 1.57 | 81.25   | 77   | 7  | 9.22E-01 | 4.2  |          |
| 9  | 0  | 111.47 | 222  | 130   | 1.35 | 111.78  | 109  | 7  | 2.47E-01 | 10.8 |          |
| 10 | 0  | 160.61 | 28   | 90    | 2.16 | 160.93  | 158  | 8  | 3.14E-02 | 60.6 |          |
| 11 | 0  | 276.78 | 47   | 27    | 1.16 | 277.09  | 275  | 6  | 5.19E-02 | 23.4 |          |
| 12 | 1  | 302.85 | 176  | 18    | 1.60 | 303.16  | 293  | 27 | 1.96E-01 | 8.1  | 2.52E+00 |
| 13 | 1  | 306.86 | 27   | 13    | 1.81 | 307.16  | 293  | 27 | 2.96E-02 | 39.3 |          |
| 14 | 1  | 311.53 | 15   | 11    | 1.81 | 311.84  | 293  | 27 | 1.69E-02 | 44.5 |          |
| 15 | 0  | 324.16 | 19   | 20    | 1.61 | 324.46  | 320  | 8  | 2.09E-02 | 47.4 |          |
| 16 | 1  | 333.86 | 85   | 15    | 1.83 | 334.17  | 330  | 13 | 9.48E-02 | 12.7 | 8.04E-01 |
| 17 | 1  | 337.81 | 21   | 11    | 1.83 | 338.12  | 330  | 13 | 2.29E-02 | 43.4 |          |
| 18 | 0  | 356.06 | 519  | 25    | 1.93 | 356.37  | 351  | 11 | 5.77E-01 | 4.8  |          |
| 19 | 2  | 383.69 | 124  | 18    | 2.06 | 383.99  | 380  | 18 | 1.38E-01 | 10.6 | 4.01E+00 |
| 20 | 2  | 387.05 | 197  | 10    | 1.80 | 387.36  | 380  | 18 | 2.19E-01 | 8.0  |          |
| 21 | 2  | 391.06 | 46   | 8     | 2.06 | 391.36  | 380  | 18 | 5.08E-02 | 26.7 |          |
| 22 | 6  | 412.70 | 8    | 1     | 1.72 | 413.00  | 411  | 15 | 9.21E-03 | 35.3 | 4.89E+00 |
| 23 | 6  | 416.56 | 28   | 3     | 3.05 | 416.86  | 411  | 15 | 3.15E-02 | 30.4 |          |
| 24 | 6  | 422.04 | 19   | 0     | 2.53 | 422.34  | 411  | 15 | 2.14E-02 | 26.1 |          |
| 25 | 0  | 437.09 | 88   | 15    | 1.98 | 437.39  | 432  | 10 | 9.77E-02 | 13.5 |          |
| 26 | 0  | 467.29 | 23   | 5     | 1.44 | 467.59  | 464  | 7  | 2.53E-02 | 26.8 |          |
| 27 | 0  | 512.27 | 12   | 13    | 2.02 | 512.57  | 508  | 8  | 1.33E-02 | 58.5 |          |
| 28 | 0  | 535.56 | 7    | 0     | 2.70 | 535.86  | 533  | 6  | 7.78E-03 | 37.8 |          |
| 29 | 0  | 610.02 | 11   | 5     | 1.35 | 610.32  | 607  | 6  | 1.27E-02 | 41.7 |          |

Total number of lines in spectrum 29  
 Number of unidentified lines 24  
 Number of lines tentatively identified by NID 5 17.24%

Nuclide Type : FISSION

| Nuclide          | Hlife  | Decay | Wtd Mean                  | Wtd Mean                 | Decay Corr<br>2-Sigma Error | 2-Sigma<br>%Error | Flags |
|------------------|--------|-------|---------------------------|--------------------------|-----------------------------|-------------------|-------|
|                  |        |       | Uncorrected<br>pCi/filter | Decay Corr<br>pCi/filter |                             |                   |       |
| BA-133           | 10.50Y | 1.00  | 3.975E+02                 | 3.975E+02                | 0.711E+02                   | 17.88             |       |
| Total Activity : |        |       | 3.975E+02                 | 3.975E+02                |                             |                   |       |

Nuclide Type : NATURAL

| Nuclide          | Hlife     | Decay | Wtd Mean                  | Wtd Mean                 | Decay Corr<br>2-Sigma Error | 2-Sigma<br>%Error | Flags |
|------------------|-----------|-------|---------------------------|--------------------------|-----------------------------|-------------------|-------|
|                  |           |       | Uncorrected<br>pCi/filter | Decay Corr<br>pCi/filter |                             |                   |       |
| TH-234           | 4.47E+09Y | 1.00  | 8.007E+02                 | 8.007E+02                | 1.379E+02                   | 17.22             |       |
| AM-241           | 432.20Y   | 1.00  | 8.977E+00                 | 8.977E+00                | 13.46E+00                   | 149.92            |       |
| Total Activity : |           |       | 8.097E+02                 | 8.097E+02                |                             |                   |       |

Grand Total Activity : 1.207E+03 1.207E+03

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

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



Nuclide Type: FISSION

| Nuclide | Energy | %Abn   | %Eff      | Uncorrected<br>pCi/filter | Decay Corr<br>pCi/filter | 2-Sigma<br>%Error | Status |
|---------|--------|--------|-----------|---------------------------|--------------------------|-------------------|--------|
| BA-133  | 81.00  | 33.00* | 1.899E+01 | 3.975E+02                 | 3.975E+02                | 17.88             | OK     |
|         | 302.84 | 17.80  | 6.222E+00 | 4.779E+02                 | 4.779E+02                | 26.23             | OK     |
|         | 356.01 | 60.00  | 5.860E+00 | 4.434E+02                 | 4.435E+02                | 16.64             | OK     |

Final Mean for 3 Valid Peaks = 3.975E+02 +/- 7.108E+01 ( 17.88%)

Nuclide Type: NATURAL

| Nuclide | Energy | %Abn  | %Eff      | Uncorrected<br>pCi/filter | Decay Corr<br>pCi/filter | 2-Sigma<br>%Error | Status |
|---------|--------|-------|-----------|---------------------------|--------------------------|-------------------|--------|
| TH-234  | 63.29  | 3.80* | 2.648E+01 | 8.007E+02                 | 8.007E+02                | 17.22             | OK     |

Final Mean for 1 Valid Peaks = 8.007E+02 +/- 1.379E+02 ( 17.22%)

|        |       |        |           |           |           |        |    |
|--------|-------|--------|-----------|-----------|-----------|--------|----|
| AM-241 | 59.54 | 35.90* | 2.893E+01 | 8.977E+00 | 8.977E+00 | 149.92 | OK |
|--------|-------|--------|-----------|-----------|-----------|--------|----|

Final Mean for 1 Valid Peaks = 8.977E+00 +/- 1.346E+01 (149.92%)

Flag: "\*" = Keyline

---- Identified Nuclides ----

| Nuclide | Activity<br>(pCi/filter) | Act error | MDA<br>(pCi/filter) | MDA error | Act/MDA |
|---------|--------------------------|-----------|---------------------|-----------|---------|
| BA-133  | 3.975E+02                | 7.108E+01 | 2.286E+01           | 3.496E+00 | 17.389  |
| TH-234  | 8.007E+02                | 1.379E+02 | 1.292E+02           | 6.941E+00 | 6.196   |
| AM-241  | 8.977E+00                | 1.346E+01 | 1.249E+01           | 6.142E-01 | 0.719   |

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

| Nuclide | Key-Line<br>Activity K.L.<br>(pCi/filter) Ided | Act error | MDA<br>(pCi/filter) | MDA error | Act/MDA |
|---------|--|-----------|---------------------|-----------|---------|
| CO-57   | -8.215E-01                                     | 6.182E+00 | 1.059E+01           | 1.210E+00 | -0.078  |
| CD-109  | -6.769E+01                                     | 1.244E+02 | 2.050E+02           | 1.690E+01 | -0.330  |
| PA-231  | 1.746E+00                                      | 1.562E+00 | 3.044E+00           | 4.330E-02 | 0.573   |
| PA-234  | 2.886E+00                                      | 1.458E+00 | 2.699E+00           | 3.838E-02 | 1.069   |
| NP-237  | 4.342E+00                                      | 3.924E+01 | 6.307E+01           | 5.099E+00 | 0.069   |

*51111*

Configuration : DKA100: [GAMMA.SCUSR.ARCHIVE] SMP\_130410504\_GE3\_BAFIL\_191142.CN  
 Analyses by : PEAK V16.9 PEAKEFF V2.2  
 Client ID : PZ-204-SS TOT  
 Deposition Date :  
 Sample Date : 1-MAY-2013 00:00:00. Acquisition date : 1-MAY-2013 08:12:59.  
 Sample ID : 1304105-04 Sample Quantity : 1.00000E+00 filter  
 Sample type : FILTER Sample Geometry : 0  
 Detector name : GE3 Detector Geometry: BAFIL  
 Elapsed live time: 0 00:15:00.00 Elapsed real time: 0 00:15:03.54 0.4%  
 Start channel : 25 End channel : 4096  
 Sensitivity : 3.00000 Gaussian : 10.00000  
 Critical level : No

| Pk | It | Energy | Area | Bkgnd | FWHM | Channel | Left | Pw | Cts/Sec  | %Err  | Fit      |
|----|----|--------|------|-------|------|---------|------|----|----------|-------|----------|
| 1  | 2  | 30.72  | 1935 | 87    | 1.29 | 31.04   | 27   | 22 | 2.15E+00 | 2.4   | 2.94E+00 |
| 2  | 2  | 34.92  | 499  | 64    | 1.59 | 35.24   | 27   | 22 | 5.54E-01 | 5.2   |          |
| 3  | 2  | 45.81  | 25   | 51    | 1.62 | 46.13   | 27   | 22 | 2.75E-02 | 56.9  |          |
| 4  | 0  | 52.11  | 86   | 98    | 2.24 | 52.43   | 49   | 8  | 9.60E-02 | 22.4  |          |
| 5  | 2  | 61.57  | 244  | 74    | 1.66 | 61.89   | 57   | 17 | 2.71E-01 | 8.6   | 1.15E+00 |
| 6  | 2  | 65.75  | 130  | 81    | 1.67 | 66.07   | 57   | 17 | 1.45E-01 | 13.7  |          |
| 7  | 2  | 80.95  | 814  | 69    | 1.41 | 81.26   | 77   | 13 | 9.05E-01 | 3.8   | 1.68E+00 |
| 8  | 2  | 84.52  | 25   | 60    | 1.70 | 84.84   | 77   | 13 | 2.83E-02 | 84.2  |          |
| 9  | 0  | 92.33  | 38   | 89    | 1.28 | 92.65   | 90   | 7  | 4.22E-02 | 44.0  |          |
| 10 | 0  | 111.70 | 197  | 130   | 1.27 | 112.02  | 108  | 7  | 2.19E-01 | 11.9  |          |
| 11 | 0  | 190.90 | 21   | 57    | 1.24 | 191.21  | 189  | 6  | 2.37E-02 | 59.6  |          |
| 12 | 3  | 302.86 | 132  | 15    | 1.53 | 303.17  | 299  | 12 | 1.46E-01 | 9.5   | 3.67E+00 |
| 13 | 3  | 307.15 | 29   | 21    | 2.19 | 307.46  | 299  | 12 | 3.19E-02 | 38.3  |          |
| 14 | 3  | 333.83 | 93   | 13    | 1.81 | 334.14  | 328  | 14 | 1.03E-01 | 11.9  | 3.25E+00 |
| 15 | 3  | 338.14 | 21   | 26    | 2.22 | 338.45  | 328  | 14 | 2.38E-02 | 50.2  |          |
| 16 | 0  | 356.06 | 478  | 30    | 1.89 | 356.36  | 351  | 11 | 5.32E-01 | 5.1   |          |
| 17 | 1  | 383.62 | 145  | 8     | 1.87 | 383.93  | 381  | 18 | 1.61E-01 | 8.8   | 2.21E+01 |
| 18 | 1  | 386.87 | 222  | 6     | 1.87 | 387.17  | 381  | 18 | 2.47E-01 | 8.4   |          |
| 19 | 1  | 391.54 | 62   | 4     | 1.88 | 391.84  | 381  | 18 | 6.92E-02 | 15.0  |          |
| 20 | 3  | 414.92 | 57   | 8     | 2.29 | 415.23  | 409  | 16 | 6.29E-02 | 18.0  | 1.86E+00 |
| 21 | 3  | 418.20 | 31   | 5     | 2.29 | 418.51  | 409  | 16 | 3.40E-02 | 33.5  |          |
| 22 | 3  | 421.54 | 11   | 4     | 2.30 | 421.85  | 409  | 16 | 1.28E-02 | 67.6  |          |
| 23 | 0  | 437.20 | 92   | 10    | 1.98 | 437.50  | 432  | 10 | 1.02E-01 | 12.2  |          |
| 24 | 1  | 467.88 | 30   | 6     | 1.93 | 468.18  | 463  | 14 | 3.33E-02 | 20.2  | 1.22E+00 |
| 25 | 1  | 472.52 | 13   | 1     | 1.94 | 472.82  | 463  | 14 | 1.42E-02 | 39.6  |          |
| 26 | 0  | 511.23 | 19   | 12    | 1.98 | 511.52  | 506  | 10 | 2.08E-02 | 42.2  |          |
| 27 | 0  | 559.41 | 3    | 5     | 1.10 | 559.70  | 556  | 6  | 3.06E-03 | 139.7 |          |
| 28 | 0  | 609.78 | 6    | 3     | 2.04 | 610.07  | 606  | 7  | 6.67E-03 | 64.8  |          |

Total number of lines in spectrum 28  
 Number of unidentified lines 23  
 Number of lines tentatively identified by NID 5 17.86%

Nuclide Type : FISSION

| Nuclide          | Hlife     | Decay | Wtd Mean    | Wtd Mean   | Decay Corr    | 2-Sigma | Flags |
|------------------|-----------|-------|-------------|------------|---------------|---------|-------|
|                  |           |       | Uncorrected | Decay Corr |               |         |       |
|                  |           |       | pCi/filter  | pCi/filter | 2-Sigma Error | %Error  |       |
| BA-133           | 10.50Y    | 1.00  | 3.902E+02   | 3.902E+02  | 0.683E+02     | 17.51   |       |
| NP-237           | 2.14E+06Y | 1.00  | 3.467E+01   | 3.467E+01  | 5.844E+01     | 168.57  |       |
| Total Activity : |           |       | 4.249E+02   | 4.249E+02  |               |         |       |

Nuclide Type : NATURAL

| Nuclide          | Hlife     | Decay | Wtd Mean    | Wtd Mean   | Decay Corr    | 2-Sigma | Flags |
|------------------|-----------|-------|-------------|------------|---------------|---------|-------|
|                  |           |       | Uncorrected | Decay Corr |               |         |       |
|                  |           |       | pCi/filter  | pCi/filter | 2-Sigma Error | %Error  |       |
| TH-234           | 4.47E+09Y | 1.00  | 7.291E+02   | 7.291E+02  | 1.341E+02     | 18.39   |       |
| Total Activity : |           |       | 7.291E+02   | 7.291E+02  |               |         |       |

Grand Total Activity : 1.154E+03 1.154E+03

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

Nuclide Type: FISSION

| Nuclide | Energy | %Abn   | %Eff      | Uncorrected pCi/filter | Decay Corr pCi/filter | 2-Sigma %Error | Status |
|---------|--------|--------|-----------|------------------------|-----------------------|----------------|--------|
| BA-133  | 81.00  | 33.00* | 1.899E+01 | 3.902E+02              | 3.902E+02             | 17.51          | OK     |
|         | 302.84 | 17.80  | 6.222E+00 | 3.570E+02              | 3.570E+02             | 28.08          | OK     |
|         | 356.01 | 60.00  | 5.860E+00 | 4.086E+02              | 4.086E+02             | 17.02          | OK     |

Final Mean for 3 Valid Peaks = 3.902E+02 +/- 6.832E+01 ( 17.51%)

|        |       |        |           |           |           |        |    |
|--------|-------|--------|-----------|-----------|-----------|--------|----|
| NP-237 | 86.50 | 12.60* | 1.749E+01 | 3.467E+01 | 3.467E+01 | 168.57 | OK |
|--------|-------|--------|-----------|-----------|-----------|--------|----|

Final Mean for 1 Valid Peaks = 3.467E+01 +/- 5.844E+01 (168.57%)

Nuclide Type: NATURAL

| Nuclide | Energy | %Abn  | %Eff      | Uncorrected pCi/filter | Decay Corr pCi/filter | 2-Sigma %Error | Status |
|---------|--------|-------|-----------|------------------------|-----------------------|----------------|--------|
| TH-234  | 63.29  | 3.80* | 2.648E+01 | 7.291E+02              | 7.291E+02             | 18.39          | OK     |

Final Mean for 1 Valid Peaks = 7.291E+02 +/- 1.341E+02 ( 18.39%)

Flag: "\*" = Keyline

---- Identified Nuclides ----

| Nuclide | Activity<br>(pCi/filter) | Act error | MDA<br>(pCi/filter) | MDA error | Act/MDA |
|---------|--------------------------|-----------|---------------------|-----------|---------|
| BA-133  | 3.902E+02                | 6.832E+01 | 2.157E+01           | 3.299E+00 | 18.091  |
| TH-234  | 7.291E+02                | 1.341E+02 | 1.253E+02           | 6.732E+00 | 5.817   |
| NP-237  | 3.467E+01                | 5.844E+01 | 6.150E+01           | 4.971E+00 | 0.564   |

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

| Nuclide | Key-Line<br>Activity K.L.<br>(pCi/filter) Ided | Act error | MDA<br>(pCi/filter) | MDA error | Act/MDA |
|---------|--|-----------|---------------------|-----------|---------|
| CO-57   | -3.625E+00                                     | 6.123E+00 | 9.971E+00           | 1.139E+00 | -0.364  |
| CD-109  | 7.903E+01                                      | 1.204E+02 | 1.874E+02           | 1.545E+01 | 0.422   |
| PA-231  | 1.878E+00                                      | 1.551E+00 | 3.044E+00           | 4.330E-02 | 0.617   |
| PA-234  | 2.894E+00                                      | 1.421E+00 | 2.760E+00           | 3.925E-02 | 1.049   |
| AM-241  | 3.747E+01                                      | 1.026E+01 | 1.983E+01           | 9.749E-01 | 1.890   |

*Fullin*

Configuration : DKA100: [GAMMA.SCUSR.ARCHIVE] SMP\_130410505\_GE3\_BAFIL\_191144.CN  
 Analyses by : PEAK V16.9 PEAKEFF V2.2  
 Client ID : PZ-204-SS DIS  
 Deposition Date :  
 Sample Date : 1-MAY-2013 00:00:00. Acquisition date : 1-MAY-2013 08:31:09.  
 Sample ID : 1304105-05 Sample Quantity : 1.00000E+00 filter  
 Sample type : FILTER Sample Geometry : 0  
 Detector name : GE3 Detector Geometry: BAFIL  
 Elapsed live time: 0 00:15:00.00 Elapsed real time: 0 00:15:03.67 0.4%  
 Start channel : 25 End channel : 4096  
 Sensitivity : 3.00000 Gaussian : 10.00000  
 Critical level : No

| Pk | It | Energy | Area | Bkgnd | FWHM | Channel | Left | Pw | Cts/Sec  | %Err | Fit      |
|----|----|--------|------|-------|------|---------|------|----|----------|------|----------|
| 1  | 2  | 27.95  | 56   | 129   | 1.57 | 28.27   | 26   | 15 | 6.18E-02 | 41.8 | 7.46E+00 |
| 2  | 2  | 30.73  | 1970 | 84    | 1.37 | 31.05   | 26   | 15 | 2.19E+00 | 2.4  |          |
| 3  | 2  | 34.89  | 465  | 72    | 1.59 | 35.21   | 26   | 15 | 5.17E-01 | 5.8  |          |
| 4  | 0  | 51.95  | 54   | 142   | 2.34 | 52.26   | 49   | 8  | 6.00E-02 | 40.4 |          |
| 5  | 1  | 61.79  | 276  | 105   | 1.51 | 62.11   | 58   | 11 | 3.07E-01 | 8.2  | 6.14E+00 |
| 6  | 1  | 65.54  | 103  | 86    | 1.52 | 65.86   | 58   | 11 | 1.14E-01 | 17.7 |          |
| 7  | 0  | 80.93  | 737  | 166   | 1.50 | 81.25   | 77   | 7  | 8.19E-01 | 4.7  |          |
| 8  | 1  | 111.74 | 238  | 74    | 1.59 | 112.06  | 107  | 14 | 2.64E-01 | 8.6  | 1.94E+00 |
| 9  | 1  | 115.83 | 37   | 62    | 1.60 | 116.15  | 107  | 14 | 4.16E-02 | 38.7 |          |
| 10 | 0  | 205.26 | 26   | 76    | 1.27 | 205.57  | 202  | 8  | 2.85E-02 | 62.6 |          |
| 11 | 0  | 224.01 | 36   | 68    | 5.28 | 224.32  | 220  | 10 | 4.03E-02 | 45.6 |          |
| 12 | 0  | 295.30 | 23   | 14    | 2.10 | 295.61  | 292  | 7  | 2.56E-02 | 34.1 |          |
| 13 | 0  | 302.87 | 114  | 24    | 1.44 | 303.18  | 300  | 7  | 1.27E-01 | 11.7 |          |
| 14 | 0  | 308.51 | 21   | 28    | 1.21 | 308.82  | 307  | 6  | 2.33E-02 | 45.6 |          |
| 15 | 4  | 333.95 | 86   | 17    | 1.91 | 334.25  | 328  | 17 | 9.56E-02 | 13.4 | 1.64E+00 |
| 16 | 4  | 338.26 | 33   | 14    | 2.44 | 338.56  | 328  | 17 | 3.65E-02 | 31.7 |          |
| 17 | 0  | 356.10 | 516  | 33    | 1.87 | 356.40  | 351  | 11 | 5.73E-01 | 4.9  |          |
| 18 | 1  | 373.87 | 9    | 0     | 1.86 | 374.17  | 373  | 8  | 9.71E-03 | 26.2 | 1.55E+00 |
| 19 | 1  | 376.87 | 22   | 2     | 1.86 | 377.17  | 373  | 8  | 2.50E-02 | 26.0 |          |
| 20 | 9  | 383.68 | 107  | 4     | 1.97 | 383.99  | 381  | 17 | 1.19E-01 | 11.8 | 4.82E+00 |
| 21 | 9  | 386.98 | 224  | 7     | 1.80 | 387.29  | 381  | 17 | 2.48E-01 | 7.4  |          |
| 22 | 9  | 391.58 | 50   | 9     | 1.79 | 391.88  | 381  | 17 | 5.58E-02 | 17.1 |          |
| 23 | 2  | 414.72 | 36   | 11    | 2.08 | 415.02  | 410  | 17 | 4.00E-02 | 23.7 | 1.11E+00 |
| 24 | 2  | 418.06 | 23   | 13    | 2.09 | 418.36  | 410  | 17 | 2.56E-02 | 41.0 |          |
| 25 | 0  | 437.31 | 93   | 27    | 1.89 | 437.61  | 433  | 11 | 1.03E-01 | 14.8 |          |
| 26 | 0  | 468.28 | 19   | 7     | 1.42 | 468.58  | 464  | 7  | 2.08E-02 | 33.0 |          |
| 27 | 0  | 511.35 | 13   | 2     | 1.40 | 511.65  | 509  | 7  | 1.44E-02 | 32.9 |          |
| 28 | 0  | 523.48 | 9    | 0     | 1.33 | 523.78  | 520  | 8  | 1.00E-02 | 33.3 |          |

Summary of Nuclide Activity

Sample ID : 1304105-05

Acquisition date : 1-MAY-2013 08:31:09

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

Nuclide Type : FISSION

| Nuclide          | Hlife  | Decay | Wtd Mean                  | Wtd Mean                 | Decay Corr<br>2-Sigma Error | 2-Sigma<br>%Error | Flags |
|------------------|--------|-------|---------------------------|--------------------------|-----------------------------|-------------------|-------|
|                  |        |       | Uncorrected<br>pCi/filter | Decay Corr<br>pCi/filter |                             |                   |       |
| BA-133           | 10.50Y | 1.00  | 3.532E+02                 | 3.532E+02                | 0.649E+02                   | 18.37             |       |
| Total Activity : |        |       | 3.532E+02                 | 3.532E+02                |                             |                   |       |

Nuclide Type : NATURAL

| Nuclide          | Hlife     | Decay | Wtd Mean                  | Wtd Mean                 | Decay Corr<br>2-Sigma Error | 2-Sigma<br>%Error | Flags |
|------------------|-----------|-------|---------------------------|--------------------------|-----------------------------|-------------------|-------|
|                  |           |       | Uncorrected<br>pCi/filter | Decay Corr<br>pCi/filter |                             |                   |       |
| TH-234           | 4.47E+09Y | 1.00  | 8.249E+02                 | 8.249E+02                | 1.458E+02                   | 17.68             |       |
| Total Activity : |           |       | 8.249E+02                 | 8.249E+02                |                             |                   |       |

Grand Total Activity : 1.178E+03 1.178E+03

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

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



Nuclide Type: FISSION

| Nuclide | Energy | %Abn   | %Eff      | Uncorrected<br>pCi/filter | Decay Corr<br>pCi/filter | 2-Sigma<br>%Error | Status |
|---------|--------|--------|-----------|---------------------------|--------------------------|-------------------|--------|
| BA-133  | 81.00  | 33.00* | 1.899E+01 | 3.532E+02                 | 3.532E+02                | 18.37             | OK     |
|         | 302.84 | 17.80  | 6.222E+00 | 3.088E+02                 | 3.089E+02                | 31.18             | OK     |
|         | 356.01 | 60.00  | 5.860E+00 | 4.408E+02                 | 4.409E+02                | 16.80             | OK     |

Final Mean for 3 Valid Peaks = 3.532E+02+/- 6.490E+01 ( 18.37%)

Nuclide Type: NATURAL

| Nuclide | Energy | %Abn  | %Eff      | Uncorrected<br>pCi/filter | Decay Corr<br>pCi/filter | 2-Sigma<br>%Error | Status |
|---------|--------|-------|-----------|---------------------------|--------------------------|-------------------|--------|
| TH-234  | 63.29  | 3.80* | 2.648E+01 | 8.249E+02                 | 8.249E+02                | 17.68             | OK     |

Final Mean for 1 Valid Peaks = 8.249E+02+/- 1.458E+02 ( 17.68%)

Flag: "\*" = Keyline

---- Identified Nuclides ----

| Nuclide | Activity<br>(pCi/filter) | Act error | MDA<br>(pCi/filter) | MDA error | Act/MDA |
|---------|--------------------------|-----------|---------------------|-----------|---------|
| BA-133  | 3.532E+02                | 6.490E+01 | 2.346E+01           | 3.588E+00 | 15.058  |
| TH-234  | 8.249E+02                | 1.458E+02 | 1.470E+02           | 7.897E+00 | 5.610   |

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

| Nuclide | Key-Line<br>Activity K.L.<br>(pCi/filter) Ided | Act error | MDA<br>(pCi/filter) | MDA error | Act/MDA |
|---------|--|-----------|---------------------|-----------|---------|
| CO-57   | 1.309E+00                                      | 6.355E+00 | 1.047E+01           | 1.197E+00 | 0.125   |
| CD-109  | -7.455E+01                                     | 1.301E+02 | 2.136E+02           | 1.761E+01 | -0.349  |
| PA-231  | 1.002E+00                                      | 1.750E+00 | 3.248E+00           | 4.620E-02 | 0.308   |
| PA-234  | 3.451E+00                                      | 1.569E+00 | 2.904E+00           | 4.130E-02 | 1.188   |
| NP-237  | 1.150E+01                                      | 3.943E+01 | 6.436E+01           | 5.203E+00 | 0.179   |
| AM-241  | 2.972E+01                                      | 1.081E+01 | 1.992E+01           | 9.793E-01 | 1.492   |

*Handwritten:* C  
51116

Configuration : DKA100: [GAMMA.SCUSR.ARCHIVE] SMP\_130410506\_GE3\_BAFIL\_191146.CN  
 Analyses by : PEAK V16.9 PEAKEFF V2.2  
 Client ID : I-68 TOT  
 Deposition Date :  
 Sample Date : 1-MAY-2013 00:00:00. Acquisition date : 1-MAY-2013 08:47:08.  
 Sample ID : 1304105-06 Sample Quantity : 1.00000E+00 filter  
 Sample type : FILTER Sample Geometry : 0  
 Detector name : GE3 Detector Geometry: BAFIL  
 Elapsed live time: 0 00:15:00.00 Elapsed real time: 0 00:15:03.47 0.4%  
 Start channel : 25 End channel : 4096  
 Sensitivity : 3.00000 Gaussian : 10.00000  
 Critical level : No

| Pk | It | Energy | Area | Bkgnd | FWHM | Channel | Left | Pw | Cts/Sec  | %Err | Fit      |
|----|----|--------|------|-------|------|---------|------|----|----------|------|----------|
| 1  | 2  | 30.72  | 1662 | 63    | 1.41 | 31.04   | 26   | 13 | 1.85E+00 | 2.5  | 5.63E+00 |
| 2  | 2  | 34.94  | 441  | 51    | 1.59 | 35.26   | 26   | 13 | 4.90E-01 | 5.5  |          |
| 3  | 0  | 52.14  | 41   | 170   | 3.21 | 52.46   | 48   | 10 | 4.50E-02 | 62.2 |          |
| 4  | 2  | 61.81  | 206  | 83    | 1.66 | 62.13   | 58   | 15 | 2.29E-01 | 9.7  | 2.11E+00 |
| 5  | 2  | 65.75  | 84   | 78    | 1.67 | 66.06   | 58   | 15 | 9.36E-02 | 20.5 |          |
| 6  | 1  | 80.82  | 633  | 78    | 1.54 | 81.14   | 77   | 10 | 7.03E-01 | 4.6  | 5.77E+00 |
| 7  | 1  | 83.68  | 18   | 48    | 1.41 | 84.00   | 77   | 10 | 2.03E-02 | 99.6 |          |
| 8  | 1  | 111.67 | 171  | 56    | 1.59 | 111.99  | 107  | 13 | 1.90E-01 | 10.5 | 3.59E+00 |
| 9  | 1  | 115.54 | 49   | 51    | 1.60 | 115.85  | 107  | 13 | 5.44E-02 | 30.6 |          |
| 10 | 1  | 142.57 | 23   | 39    | 1.63 | 142.88  | 140  | 16 | 2.50E-02 | 46.2 | 1.31E+00 |
| 11 | 1  | 146.83 | 22   | 36    | 1.64 | 147.15  | 140  | 16 | 2.40E-02 | 47.4 |          |
| 12 | 0  | 159.82 | 29   | 42    | 1.62 | 160.13  | 157  | 6  | 3.27E-02 | 39.6 |          |
| 13 | 0  | 276.92 | 53   | 26    | 1.25 | 277.23  | 273  | 8  | 5.91E-02 | 21.5 |          |
| 14 | 1  | 299.69 | 10   | 16    | 1.64 | 300.00  | 299  | 12 | 1.08E-02 | 57.8 | 1.48E+01 |
| 15 | 1  | 302.86 | 128  | 25    | 1.80 | 303.16  | 299  | 12 | 1.42E-01 | 10.5 |          |
| 16 | 1  | 306.69 | 21   | 21    | 1.64 | 307.00  | 299  | 12 | 2.29E-02 | 40.8 |          |
| 17 | 0  | 311.96 | 16   | 13    | 1.78 | 312.27  | 310  | 6  | 1.77E-02 | 44.1 |          |
| 18 | 0  | 324.08 | 19   | 12    | 2.83 | 324.38  | 320  | 8  | 2.06E-02 | 41.4 |          |
| 19 | 2  | 333.97 | 63   | 4     | 2.01 | 334.28  | 328  | 21 | 6.96E-02 | 14.8 | 1.59E+00 |
| 20 | 2  | 337.71 | 24   | 5     | 2.02 | 338.02  | 328  | 21 | 2.66E-02 | 34.1 |          |
| 21 | 0  | 356.27 | 402  | 26    | 1.84 | 356.57  | 353  | 10 | 4.47E-01 | 5.6  |          |
| 22 | 0  | 369.71 | 26   | 4     | 3.60 | 370.01  | 367  | 7  | 2.87E-02 | 24.2 |          |
| 23 | 0  | 377.20 | 24   | 5     | 1.54 | 377.50  | 374  | 7  | 2.62E-02 | 26.2 |          |
| 24 | 2  | 383.71 | 99   | 19    | 2.06 | 384.02  | 381  | 10 | 1.10E-01 | 13.6 | 9.38E+00 |
| 25 | 2  | 386.98 | 180  | 47    | 1.85 | 387.29  | 381  | 10 | 2.00E-01 | 9.4  |          |
| 26 | 1  | 414.53 | 59   | 1     | 1.89 | 414.83  | 410  | 15 | 6.57E-02 | 12.6 | 9.29E+00 |
| 27 | 1  | 417.87 | 26   | 2     | 1.90 | 418.17  | 410  | 15 | 2.94E-02 | 31.2 |          |
| 28 | 1  | 421.61 | 12   | 3     | 1.90 | 421.91  | 410  | 15 | 1.31E-02 | 45.7 |          |
| 29 | 0  | 437.04 | 99   | 5     | 1.74 | 437.35  | 433  | 9  | 1.09E-01 | 10.8 |          |
| 30 | 0  | 458.38 | 9    | 1     | 1.67 | 458.68  | 456  | 5  | 9.78E-03 | 38.6 |          |
| 31 | 0  | 468.09 | 26   | 6     | 1.41 | 468.38  | 465  | 6  | 2.89E-02 | 24.6 |          |
| 32 | 0  | 472.32 | 15   | 2     | 2.63 | 472.62  | 471  | 5  | 1.72E-02 | 29.0 |          |
| 33 | 0  | 511.02 | 22   | 0     | 3.08 | 511.32  | 507  | 10 | 2.44E-02 | 21.3 |          |

Summary of Nuclide Activity

Sample ID : 1304105-06

Acquisition date : 1-MAY-2013 08:47:08

Total number of lines in spectrum 33  
 Number of unidentified lines 29  
 Number of lines tentatively identified by NID 4 12.12%

Nuclide Type : FISSION

| Nuclide          | Hlife  | Decay | Wtd Mean    |            | Decay Corr | 2-Sigma Error | 2-Sigma | Flags |
|------------------|--------|-------|-------------|------------|------------|---------------|---------|-------|
|                  |        |       | Uncorrected | Decay Corr |            |               |         |       |
| BA-133           | 10.50Y | 1.00  | 3.032E+02   | 3.032E+02  | 0.553E+02  | 18.24         |         |       |
| Total Activity : |        |       | 3.032E+02   | 3.032E+02  |            |               |         |       |

Nuclide Type : NATURAL

| Nuclide          | Hlife     | Decay | Wtd Mean    |            | Decay Corr | 2-Sigma Error | 2-Sigma | Flags |
|------------------|-----------|-------|-------------|------------|------------|---------------|---------|-------|
|                  |           |       | Uncorrected | Decay Corr |            |               |         |       |
| TH-234           | 4.47E+09Y | 1.00  | 6.155E+02   | 6.155E+02  | 1.261E+02  | 20.49         |         |       |
| Total Activity : |           |       | 6.155E+02   | 6.155E+02  |            |               |         |       |

Grand Total Activity : 9.187E+02 9.187E+02

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

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

Nuclide Type: FISSION

| Nuclide | Energy | %Abn   | %Eff      | Uncorrected<br>pCi/filter | Decay Corr<br>pCi/filter | 2-Sigma<br>%Error | Status |
|---------|--------|--------|-----------|---------------------------|--------------------------|-------------------|--------|
| BA-133  | 81.00  | 33.00* | 1.899E+01 | 3.032E+02                 | 3.032E+02                | 18.24             | OK     |
|         | 302.84 | 17.80  | 6.222E+00 | 3.467E+02                 | 3.467E+02                | 29.35             | OK     |
|         | 356.01 | 60.00  | 5.860E+00 | 3.435E+02                 | 3.435E+02                | 17.71             | OK     |

Final Mean for 3 Valid Peaks = 3.032E+02 +/- 5.532E+01 ( 18.24%)

Nuclide Type: NATURAL

| Nuclide | Energy | %Abn  | %Eff      | Uncorrected<br>pCi/filter | Decay Corr<br>pCi/filter | 2-Sigma<br>%Error | Status |
|---------|--------|-------|-----------|---------------------------|--------------------------|-------------------|--------|
| TH-234  | 63.29  | 3.80* | 2.648E+01 | 6.155E+02                 | 6.155E+02                | 20.49             | OK     |

Final Mean for 1 Valid Peaks = 6.155E+02 +/- 1.261E+02 ( 20.49%)

Flag: "\*" = Keyline

---- Identified Nuclides ----

| Nuclide | Activity<br>(pCi/filter) | Act error | MDA<br>(pCi/filter) | MDA error | Act/MDA |
|---------|--------------------------|-----------|---------------------|-----------|---------|
| BA-133  | 3.032E+02                | 5.532E+01 | 1.973E+01           | 3.017E+00 | 15.372  |
| TH-234  | 6.155E+02                | 1.261E+02 | 1.196E+02           | 6.422E+00 | 5.148   |

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

| Nuclide | Key-Line<br>Activity K.L.<br>(pCi/filter) Ided | Act error | MDA<br>(pCi/filter) | MDA error | Act/MDA |
|---------|--|-----------|---------------------|-----------|---------|
| CO-57   | 3.123E+00                                      | 5.602E+00 | 9.768E+00           | 1.116E+00 | 0.320   |
| CD-109  | 2.218E+01                                      | 1.121E+02 | 1.844E+02           | 1.521E+01 | 0.120   |
| PA-231  | 5.401E-01                                      | 1.446E+00 | 2.696E+00           | 3.835E-02 | 0.200   |
| PA-234  | 3.799E+00                                      | 1.371E+00 | 2.680E+00           | 3.812E-02 | 1.417   |
| NP-237  | 3.114E+00                                      | 3.126E+01 | 5.106E+01           | 4.128E+00 | 0.061   |
| AM-241  | 2.656E+01                                      | 9.187E+00 | 1.758E+01           | 8.644E-01 | 1.511   |

*C*  
*5/11/13*

Configuration : DKA100: [GAMMA.SCUSR.ARCHIVE] SMP\_130410507\_GE3\_BAFIL\_191150.CN  
 Analyses by : PEAK V16.9 PEAKEFF V2.2  
 Client ID : I-68 DIS  
 Deposition Date :  
 Sample Date : 1-MAY-2013 00:00:00. Acquisition date : 1-MAY-2013 09:06:04.  
 Sample ID : 1304105-07 Sample Quantity : 1.00000E+00 filter  
 Sample type : FILTER Sample Geometry : 0  
 Detector name : GE3 Detector Geometry: BAFIL  
 Elapsed live time: 0 00:15:00.00 Elapsed real time: 0 00:15:03.71 0.4%  
 Start channel : 25 End channel : 4096  
 Sensitivity : 3.00000 Gaussian : 10.00000  
 Critical level : No

| Pk | It | Energy | Area | Bkgnd | FWHM | Channel | Left | Pw | Cts/Sec  | %Err | Fit      |
|----|----|--------|------|-------|------|---------|------|----|----------|------|----------|
| 1  | 2  | 27.95  | 40   | 138   | 1.57 | 28.27   | 26   | 15 | 4.49E-02 | 57.9 | 7.72E+00 |
| 2  | 2  | 30.74  | 1971 | 88    | 1.41 | 31.06   | 26   | 15 | 2.19E+00 | 2.3  |          |
| 3  | 2  | 34.92  | 438  | 71    | 1.59 | 35.24   | 26   | 15 | 4.87E-01 | 6.1  |          |
| 4  | 0  | 52.66  | 88   | 134   | 2.68 | 52.98   | 50   | 8  | 9.77E-02 | 25.0 |          |
| 5  | 1  | 61.75  | 227  | 99    | 1.51 | 62.06   | 58   | 12 | 2.52E-01 | 9.6  | 4.11E+00 |
| 6  | 1  | 65.65  | 135  | 94    | 1.52 | 65.97   | 58   | 12 | 1.50E-01 | 14.4 |          |
| 7  | 0  | 80.84  | 827  | 187   | 1.55 | 81.16   | 76   | 10 | 9.18E-01 | 4.7  |          |
| 8  | 0  | 111.55 | 201  | 133   | 1.49 | 111.86  | 107  | 8  | 2.23E-01 | 12.2 |          |
| 9  | 0  | 277.56 | 40   | 56    | 1.48 | 277.87  | 273  | 9  | 4.48E-02 | 37.0 |          |
| 10 | 0  | 282.28 | 10   | 11    | 1.12 | 282.59  | 281  | 5  | 1.16E-02 | 54.1 |          |
| 11 | 3  | 302.82 | 135  | 21    | 1.51 | 303.13  | 297  | 14 | 1.50E-01 | 9.8  | 2.25E+00 |
| 12 | 3  | 307.13 | 15   | 28    | 2.19 | 307.44  | 297  | 14 | 1.68E-02 | 74.9 |          |
| 13 | 3  | 333.83 | 74   | 23    | 2.21 | 334.14  | 330  | 11 | 8.17E-02 | 16.0 | 8.08E+00 |
| 14 | 3  | 337.25 | 19   | 12    | 2.02 | 337.55  | 330  | 11 | 2.10E-02 | 51.0 |          |
| 15 | 0  | 356.04 | 534  | 29    | 1.77 | 356.35  | 352  | 9  | 5.93E-01 | 4.7  |          |
| 16 | 0  | 364.35 | 15   | 12    | 1.62 | 364.65  | 362  | 5  | 1.70E-02 | 42.7 |          |
| 17 | 3  | 383.69 | 141  | 37    | 2.26 | 384.00  | 381  | 9  | 1.56E-01 | 13.3 | 4.99E+01 |
| 18 | 3  | 386.89 | 194  | 32    | 1.55 | 387.19  | 381  | 9  | 2.16E-01 | 8.8  |          |
| 19 | 2  | 415.01 | 36   | 7     | 2.08 | 415.31  | 412  | 13 | 4.04E-02 | 20.8 | 1.93E+00 |
| 20 | 2  | 418.87 | 25   | 8     | 1.90 | 419.17  | 412  | 13 | 2.74E-02 | 33.0 |          |
| 21 | 1  | 433.63 | 7    | 8     | 1.91 | 433.93  | 432  | 12 | 8.20E-03 | 54.2 | 8.80E+00 |
| 22 | 1  | 436.87 | 98   | 9     | 1.91 | 437.17  | 432  | 12 | 1.08E-01 | 11.8 |          |
| 23 | 0  | 467.35 | 36   | 4     | 1.64 | 467.65  | 463  | 8  | 4.00E-02 | 19.2 |          |
| 24 | 0  | 510.82 | 21   | 4     | 1.50 | 511.12  | 507  | 8  | 2.33E-02 | 27.4 |          |
| 25 | 0  | 609.98 | 11   | 0     | 2.88 | 610.27  | 606  | 9  | 1.22E-02 | 30.2 |          |

Total number of lines in spectrum 25  
 Number of unidentified lines 20  
 Number of lines tentatively identified by NID 5 20.00%

Nuclide Type : FISSION

| Nuclide          | Hlife  | Decay | Wtd Mean                  | Wtd Mean                 | Decay Corr<br>2-Sigma Error | 2-Sigma<br>%Error | Flags |
|------------------|--------|-------|---------------------------|--------------------------|-----------------------------|-------------------|-------|
|                  |        |       | Uncorrected<br>pCi/filter | Decay Corr<br>pCi/filter |                             |                   |       |
| BA-133           | 10.50Y | 1.00  | 3.961E+02                 | 3.961E+02                | 0.727E+02                   | 18.35             |       |
| Total Activity : |        |       | 3.961E+02                 | 3.961E+02                |                             |                   |       |

Nuclide Type : NATURAL

| Nuclide          | Hlife     | Decay | Wtd Mean                  | Wtd Mean                 | Decay Corr<br>2-Sigma Error | 2-Sigma<br>%Error | Flags |
|------------------|-----------|-------|---------------------------|--------------------------|-----------------------------|-------------------|-------|
|                  |           |       | Uncorrected<br>pCi/filter | Decay Corr<br>pCi/filter |                             |                   |       |
| PA-231           | 3.28E+04Y | 1.00  | 2.838E+03                 | 2.838E+03                | 0.754E+03                   | 26.56             |       |
| TH-234           | 4.47E+09Y | 1.00  | 6.780E+02                 | 6.780E+02                | 1.374E+02                   | 20.26             |       |
| Total Activity : |           |       | 3.516E+03                 | 3.516E+03                |                             |                   |       |

Grand Total Activity : 3.913E+03 3.913E+03

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

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



Nuclide Type: FISSION

| Nuclide | Energy | %Abn   | %Eff      | Uncorrected<br>pCi/filter | Decay Corr<br>pCi/filter | 2-Sigma<br>%Error | Status |
|---------|--------|--------|-----------|---------------------------|--------------------------|-------------------|--------|
| BA-133  | 81.00  | 33.00* | 1.899E+01 | 3.961E+02                 | 3.961E+02                | 18.35             | OK     |
|         | 302.84 | 17.80  | 6.222E+00 | 3.669E+02                 | 3.669E+02                | 28.42             | OK     |
|         | 356.01 | 60.00  | 5.860E+00 | 4.562E+02                 | 4.562E+02                | 16.56             | OK     |

Final Mean for 3 Valid Peaks = 3.961E+02+/- 7.269E+01 ( 18.35%)

Nuclide Type: NATURAL

| Nuclide | Energy | %Abn   | %Eff      | Uncorrected<br>pCi/filter | Decay Corr<br>pCi/filter | 2-Sigma<br>%Error | Status |
|---------|--------|--------|-----------|---------------------------|--------------------------|-------------------|--------|
| PA-231  | 9.28   | 42.00* | 1.000E+02 | -----                     | Line Out Of Range        | ----              | Absent |
|         | 10.11  | 20.20  | 1.000E+02 | -----                     | Line Out Of Range        | ----              | Absent |
|         | 283.67 | 1.60   | 6.406E+00 | 3.060E+02                 | 3.060E+02                | 109.69            | OK     |
|         | 302.67 | 2.30   | 6.224E+00 | 2.838E+03                 | 2.838E+03                | 26.56             | OK     |

Final Mean for 2 Valid Peaks = 2.838E+03+/- 7.540E+02 ( 26.56%)

|        |       |       |           |           |           |       |    |
|--------|-------|-------|-----------|-----------|-----------|-------|----|
| TH-234 | 63.29 | 3.80* | 2.648E+01 | 6.780E+02 | 6.780E+02 | 20.26 | OK |
|--------|-------|-------|-----------|-----------|-----------|-------|----|

Final Mean for 1 Valid Peaks = 6.780E+02+/- 1.374E+02 ( 20.26%)

Flag: "\*" = Keyline

---- Identified Nuclides ----

| Nuclide | Activity<br>(pCi/filter) | Act error | MDA<br>(pCi/filter) | MDA error | Act/MDA |
|---------|--------------------------|-----------|---------------------|-----------|---------|
| BA-133  | 3.961E+02                | 7.269E+01 | 1.944E+01           | 2.973E+00 | 20.378  |
| PA-231  | 2.838E+03                | 7.540E+02 | 3.354E+00           | 4.771E-02 | 846.211 |
| TH-234  | 6.780E+02                | 1.374E+02 | 1.402E+02           | 7.530E+00 | 4.836   |

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

| Nuclide | Key-Line<br>Activity K.L.<br>(pCi/filter) Ided | Act error | MDA<br>(pCi/filter) | MDA error | Act/MDA |
|---------|--|-----------|---------------------|-----------|---------|
| CO-57   | 1.951E+00                                      | 5.996E+00 | 1.075E+01           | 1.229E+00 | 0.181   |
| CD-109  | 3.935E+01                                      | 1.175E+02 | 1.951E+02           | 1.609E+01 | 0.202   |
| PA-234  | 3.518E+00                                      | 1.458E+00 | 2.763E+00           | 3.930E-02 | 1.273   |
| NP-237  | 3.811E+00                                      | 3.513E+01 | 5.690E+01           | 4.599E+00 | 0.067   |
| AM-241  | 2.887E+01                                      | 1.040E+01 | 1.932E+01           | 9.498E-01 | 1.494   |

5/11/13

Configuration : DKA100: [GAMMA.SCUSR.ARCHIVE] SMP\_130410508\_GE5\_BAFIL\_191140.CN  
 Analyses by : PEAK V16.9 PEAKEFF V2.2  
 Client ID : D-87 TOT  
 Deposition Date :  
 Sample Date : 1-MAY-2013 00:00:00. Acquisition date : 1-MAY-2013 07:55:22.  
 Sample ID : 1304105-08 Sample Quantity : 1.00000E+00 filter  
 Sample type : FILTER Sample Geometry : 0  
 Detector name : GE5 Detector Geometry: BAFIL  
 Elapsed live time: 0 00:15:00.00 Elapsed real time: 0 00:15:01.16 0.1%  
 Start channel : 25 End channel : 4096  
 Sensitivity : 3.00000 Gaussian : 10.00000  
 Critical level : No

| Pk | It | Energy | Area | Bkgnd | FWHM | Channel | Left | Pw | Cts/Sec  | %Err  | Fit      |
|----|----|--------|------|-------|------|---------|------|----|----------|-------|----------|
| 1  | 3  | 19.08  | 15   | 13    | 0.66 | 188.48  | 182  | 34 | 1.64E-02 | 49.3  | 1.24E+00 |
| 2  | 3  | 20.03  | 21   | 17    | 0.67 | 197.59  | 182  | 34 | 2.38E-02 | 53.8  |          |
| 3  | 3  | 21.12  | 84   | 10    | 0.51 | 208.00  | 182  | 34 | 9.33E-02 | 14.7  |          |
| 4  | 3  | 28.57  | 29   | 31    | 0.72 | 279.57  | 268  | 52 | 3.26E-02 | 49.5  | 1.71E+00 |
| 5  | 3  | 29.56  | 31   | 23    | 0.54 | 289.00  | 268  | 52 | 3.40E-02 | 44.8  |          |
| 6  | 3  | 31.08  | 1914 | 20    | 0.73 | 303.58  | 268  | 52 | 2.13E+00 | 2.4   |          |
| 7  | 1  | 35.19  | 384  | 44    | 0.61 | 343.09  | 333  | 26 | 4.27E-01 | 6.6   | 6.95E-01 |
| 8  | 1  | 36.07  | 102  | 23    | 0.62 | 351.46  | 333  | 26 | 1.13E-01 | 21.9  |          |
| 9  | 2  | 53.52  | 48   | 20    | 0.76 | 518.94  | 511  | 18 | 5.34E-02 | 24.5  | 3.68E+00 |
| 10 | 2  | 54.23  | 12   | 5     | 0.51 | 525.79  | 511  | 18 | 1.34E-02 | 47.1  |          |
| 11 | 0  | 61.94  | 230  | 33    | 0.95 | 599.77  | 588  | 21 | 2.56E-01 | 8.4   |          |
| 12 | 0  | 66.33  | 118  | 36    | 1.35 | 641.91  | 629  | 28 | 1.31E-01 | 15.4  |          |
| 13 | 1  | 79.73  | 40   | 6     | 0.76 | 770.45  | 761  | 38 | 4.41E-02 | 27.9  | 1.20E+00 |
| 14 | 1  | 81.19  | 863  | 14    | 0.69 | 784.49  | 761  | 38 | 9.59E-01 | 3.5   |          |
| 15 | 0  | 84.62  | 10   | 27    | 0.27 | 817.36  | 799  | 23 | 1.15E-02 | 114.2 |          |
| 16 | 0  | 88.17  | 12   | 11    | 0.45 | 851.41  | 843  | 13 | 1.38E-02 | 55.0  |          |
| 17 | 5  | 111.31 | 23   | 22    | 0.50 | 1073.49 | 1069 | 29 | 2.51E-02 | 34.3  | 4.08E+00 |
| 18 | 5  | 112.09 | 163  | 32    | 0.77 | 1081.00 | 1069 | 29 | 1.81E-01 | 11.4  |          |
| 19 | 5  | 112.51 | 58   | 21    | 0.77 | 1085.00 | 1069 | 29 | 6.41E-02 | 31.7  |          |
| 20 | 0  | 160.72 | 25   | 12    | 0.78 | 1547.59 | 1536 | 19 | 2.82E-02 | 31.8  |          |
| 21 | 4  | 276.23 | 43   | 9     | 1.03 | 2656.00 | 2647 | 22 | 4.79E-02 | 18.0  | 1.88E+00 |
| 22 | 4  | 276.91 | 21   | 3     | 0.78 | 2662.57 | 2647 | 22 | 2.31E-02 | 35.0  |          |
| 23 | 0  | 303.09 | 96   | 12    | 0.72 | 2913.76 | 2897 | 28 | 1.07E-01 | 12.3  |          |
| 24 | 0  | 307.38 | 33   | 0     | 0.21 | 2954.94 | 2941 | 24 | 3.67E-02 | 17.4  |          |
| 25 | 0  | 333.83 | 39   | 12    | 0.98 | 3208.77 | 3193 | 23 | 4.33E-02 | 22.6  |          |
| 26 | 0  | 356.15 | 351  | 6     | 0.96 | 3422.94 | 3406 | 31 | 3.90E-01 | 5.5   |          |
| 27 | 0  | 383.98 | 84   | 4     | 1.03 | 3689.96 | 3675 | 25 | 9.33E-02 | 11.9  |          |
| 28 | 0  | 386.91 | 151  | 14    | 1.00 | 3718.02 | 3703 | 29 | 1.67E-01 | 9.6   |          |
| 29 | 0  | 391.27 | 32   | 9     | 1.18 | 3759.86 | 3745 | 26 | 3.56E-02 | 25.8  |          |

Total number of lines in spectrum 29  
 Number of unidentified lines 22  
 Number of lines tentatively identified by NID 7 24.14%

Nuclide Type : FISSION

| Nuclide          | Hlife     | Decay | Wtd Mean    |            | Decay Corr | 2-Sigma Error | 2-Sigma | Flags |
|------------------|-----------|-------|-------------|------------|------------|---------------|---------|-------|
|                  |           |       | Uncorrected | Decay Corr |            |               |         |       |
| CD-109           | 464.00D   | 1.00  | 8.685E+01   | 8.690E+01  | 9.593E+01  | 110.39        |         |       |
| BA-133           | 10.50Y    | 1.00  | 4.359E+02   | 4.359E+02  | 0.733E+02  | 16.82         |         |       |
| NP-237           | 2.14E+06Y | 1.00  | 2.343E+01   | 2.343E+01  | 2.585E+01  | 110.33        |         |       |
| Total Activity : |           |       | 5.462E+02   | 5.463E+02  |            |               |         |       |

Nuclide Type : NATURAL

| Nuclide          | Hlife     | Decay | Wtd Mean    |            | Decay Corr | 2-Sigma Error | 2-Sigma | Flags |
|------------------|-----------|-------|-------------|------------|------------|---------------|---------|-------|
|                  |           |       | Uncorrected | Decay Corr |            |               |         |       |
| TH-234           | 4.47E+09Y | 1.00  | 2.081E+02   | 2.081E+02  | 0.360E+02  | 17.29         |         |       |
| Total Activity : |           |       | 2.081E+02   | 2.081E+02  |            |               |         |       |

Grand Total Activity : 7.543E+02 7.543E+02

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

Nuclide Type: FISSION

| Nuclide | Energy | %Abn  | %Eff      | Uncorrected<br>pCi/filter | Decay Corr<br>pCi/filter | 2-Sigma<br>%Error | Status |
|---------|--------|-------|-----------|---------------------------|--------------------------|-------------------|--------|
| CD-109  | 88.03  | 3.72* | 1.153E+01 | 8.685E+01                 | 8.690E+01                | 110.39            | OK     |

Final Mean for 1 Valid Peaks = 8.690E+01+/- 9.593E+01 (110.39%)

|        |        |        |           |           |           |       |    |
|--------|--------|--------|-----------|-----------|-----------|-------|----|
| BA-133 | 81.00  | 33.00* | 1.802E+01 | 4.359E+02 | 4.359E+02 | 16.82 | OK |
|        | 302.84 | 17.80  | 2.575E+00 | 6.290E+02 | 6.291E+02 | 36.08 | OK |
|        | 356.01 | 60.00  | 4.312E+00 | 4.079E+02 | 4.079E+02 | 18.19 | OK |

Final Mean for 3 Valid Peaks = 4.359E+02+/- 7.331E+01 ( 16.82%)

|        |       |        |           |           |           |        |    |
|--------|-------|--------|-----------|-----------|-----------|--------|----|
| NP-237 | 86.50 | 12.60* | 1.262E+01 | 2.343E+01 | 2.343E+01 | 110.33 | OK |
|--------|-------|--------|-----------|-----------|-----------|--------|----|

Final Mean for 1 Valid Peaks = 2.343E+01+/- 2.585E+01 (110.33%)

Nuclide Type: NATURAL

| Nuclide | Energy | %Abn  | %Eff      | Uncorrected<br>pCi/filter | Decay Corr<br>pCi/filter | 2-Sigma<br>%Error | Status |
|---------|--------|-------|-----------|---------------------------|--------------------------|-------------------|--------|
| TH-234  | 63.29  | 3.80* | 8.750E+01 | 2.081E+02                 | 2.081E+02                | 17.29             | OK     |

Final Mean for 1 Valid Peaks = 2.081E+02+/- 3.598E+01 ( 17.29%)

Flag: "\*" = Keyline

---- Identified Nuclides ----

| Nuclide | Activity<br>(pCi/filter) | Act error | MDA<br>(pCi/filter) | MDA error | Act/MDA |
|---------|--------------------------|-----------|---------------------|-----------|---------|
| CD-109  | 8.690E+01                | 9.593E+01 | 1.590E+02           | 1.530E+01 | 0.547   |
| BA-133  | 4.359E+02                | 7.331E+01 | 1.365E+01           | 2.009E+00 | 31.945  |
| TH-234  | 2.081E+02                | 3.598E+01 | 2.626E+01           | 3.379E-01 | 7.923   |
| NP-237  | 2.343E+01                | 2.585E+01 | 4.950E+01           | 4.366E+00 | 0.473   |

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

| Nuclide | Key-Line<br>Activity<br>(pCi/filter) | K.L.<br>Ided | Act error | MDA<br>(pCi/filter) | MDA error | Act/MDA |
|---------|--------------------------------------|--------------|-----------|---------------------|-----------|---------|
| CO-57   | -7.309E+00                           |              | 1.474E+01 | 2.479E+01           | 8.405E+00 | -0.295  |
| PA-231  | 2.541E-02                            |              | 8.707E-01 | 1.613E+00           | 1.816E-02 | 0.016   |
| PA-234  | 3.887E+00                            | +            | 1.153E+00 | 2.154E+00           | 2.424E-02 | 1.805   |
| AM-241  | 1.917E+00                            |              | 1.505E+00 | 2.783E+00           | 3.133E-02 | 0.689   |

*C  
TWIN*

Configuration : DKA100: [GAMMA.SCUSR.ARCHIVE] SMP\_130410509\_GE5\_BAFIL\_191143.CN  
 Analyses by : PEAK V16.9 PEAKEFF V2.2  
 Client ID : D-87 DIS  
 Deposition Date :  
 Sample Date : 1-MAY-2013 00:00:00. Acquisition date : 1-MAY-2013 08:13:33.  
 Sample ID : 1304105-09 Sample Quantity : 1.00000E+00 filter  
 Sample type : FILTER Sample Geometry : 0  
 Detector name : GE5 Detector Geometry: BAFIL  
 Elapsed live time: 0 00:15:00.00 Elapsed real time: 0 00:15:01.17 0.1%  
 Start channel : 25 End channel : 4096  
 Sensitivity : 3.00000 Gaussian : 10.00000  
 Critical level : No

| Pk | It | Energy | Area | Bkgnd | FWHM | Channel | Left | Pw | Cts/Sec  | %Err  | Fit      |
|----|----|--------|------|-------|------|---------|------|----|----------|-------|----------|
| 1  | 0  | 4.09   | 11   | 29    | 0.27 | 44.65   | 41   | 7  | 1.27E-02 | 85.4  |          |
| 2  | 0  | 21.17  | 97   | 16    | 0.64 | 208.54  | 201  | 18 | 1.07E-01 | 14.4  |          |
| 3  | 0  | 31.05  | 2030 | 100   | 0.71 | 303.35  | 290  | 27 | 2.26E+00 | 2.6   |          |
| 4  | 4  | 35.18  | 431  | 29    | 0.70 | 342.95  | 334  | 27 | 4.79E-01 | 5.8   | 2.29E+00 |
| 5  | 4  | 36.14  | 88   | 41    | 0.76 | 352.20  | 334  | 27 | 9.74E-02 | 25.6  |          |
| 6  | 0  | 45.68  | 9    | 8     | 0.13 | 443.71  | 433  | 15 | 9.44E-03 | 78.1  |          |
| 7  | 0  | 53.59  | 39   | 31    | 0.51 | 519.58  | 509  | 19 | 4.36E-02 | 33.3  |          |
| 8  | 0  | 61.88  | 277  | 27    | 0.98 | 599.20  | 585  | 33 | 3.08E-01 | 7.7   |          |
| 9  | 0  | 66.18  | 101  | 45    | 0.28 | 640.46  | 628  | 29 | 1.12E-01 | 18.7  |          |
| 10 | 1  | 79.72  | 56   | 21    | 0.76 | 770.34  | 759  | 36 | 6.24E-02 | 24.2  | 1.20E+00 |
| 11 | 1  | 81.21  | 914  | 10    | 0.72 | 784.66  | 759  | 36 | 1.02E+00 | 3.4   |          |
| 12 | 0  | 87.64  | 46   | 18    | 2.27 | 846.31  | 829  | 37 | 5.07E-02 | 29.2  |          |
| 13 | 0  | 112.07 | 187  | 68    | 0.46 | 1080.77 | 1069 | 20 | 2.08E-01 | 11.7  |          |
| 14 | 0  | 116.25 | 46   | 30    | 0.99 | 1120.86 | 1108 | 20 | 5.16E-02 | 28.6  |          |
| 15 | 0  | 159.03 | 6    | 15    | 0.19 | 1531.41 | 1519 | 19 | 6.89E-03 | 119.4 |          |
| 16 | 0  | 160.92 | 25   | 13    | 0.29 | 1549.51 | 1539 | 18 | 2.76E-02 | 33.3  |          |
| 17 | 0  | 276.58 | 43   | 5     | 0.38 | 2659.40 | 2645 | 25 | 4.73E-02 | 19.3  |          |
| 18 | 0  | 303.05 | 106  | 5     | 0.66 | 2913.38 | 2898 | 27 | 1.18E-01 | 10.5  |          |
| 19 | 0  | 307.34 | 30   | 0     | 0.64 | 2954.50 | 2940 | 25 | 3.33E-02 | 18.3  |          |
| 20 | 0  | 333.91 | 51   | 5     | 0.39 | 3209.50 | 3194 | 26 | 5.64E-02 | 16.4  |          |
| 21 | 0  | 356.18 | 364  | 16    | 0.74 | 3423.18 | 3407 | 30 | 4.04E-01 | 5.7   |          |
| 22 | 0  | 384.08 | 62   | 10    | 0.83 | 3690.88 | 3675 | 27 | 6.87E-02 | 16.3  |          |
| 23 | 0  | 387.16 | 142  | 12    | 0.97 | 3720.46 | 3705 | 29 | 1.58E-01 | 9.6   |          |

Total number of lines in spectrum 23  
 Number of unidentified lines 16  
 Number of lines tentatively identified by NID 7 30.43%

Nuclide Type : FISSION

| Nuclide          | Hlife     | Decay | Wtd Mean                  |                          | Decay Corr<br>2-Sigma Error | 2-Sigma<br>%Error | Flags |
|------------------|-----------|-------|---------------------------|--------------------------|-----------------------------|-------------------|-------|
|                  |           |       | Uncorrected<br>pCi/filter | Decay Corr<br>pCi/filter |                             |                   |       |
| CD-109           | 464.00D   | 1.00  | 3.194E+02                 | 3.196E+02                | 1.899E+02                   | 59.42             |       |
| BA-133           | 10.50Y    | 1.00  | 4.614E+02                 | 4.614E+02                | 0.771E+02                   | 16.71             |       |
| NP-237           | 2.14E+06Y | 1.00  | 8.617E+01                 | 8.617E+01                | 5.109E+01                   | 59.29             |       |
| Total Activity : |           |       | 8.670E+02                 | 8.672E+02                |                             |                   |       |

Nuclide Type : NATURAL

| Nuclide          | Hlife     | Decay | Wtd Mean                  |                          | Decay Corr<br>2-Sigma Error | 2-Sigma<br>%Error | Flags |
|------------------|-----------|-------|---------------------------|--------------------------|-----------------------------|-------------------|-------|
|                  |           |       | Uncorrected<br>pCi/filter | Decay Corr<br>pCi/filter |                             |                   |       |
| TH-234           | 4.47E+09Y | 1.00  | 2.504E+02                 | 2.504E+02                | 0.400E+02                   | 15.95             |       |
| Total Activity : |           |       | 2.504E+02                 | 2.504E+02                |                             |                   |       |

Grand Total Activity : 1.117E+03 1.118E+03

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

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



Nuclide Type: FISSION

| Nuclide | Energy | %Abn  | %Eff      | Uncorrected<br>pCi/filter | Decay Corr<br>pCi/filter | 2-Sigma<br>%Error | Status |
|---------|--------|-------|-----------|---------------------------|--------------------------|-------------------|--------|
| CD-109  | 88.03  | 3.72* | 1.153E+01 | 3.194E+02                 | 3.196E+02                | 59.42             | OK     |

Final Mean for 1 Valid Peaks = 3.196E+02+/- 1.899E+02 ( 59.42%)

|        |        |        |           |           |           |       |    |
|--------|--------|--------|-----------|-----------|-----------|-------|----|
| BA-133 | 81.00  | 33.00* | 1.802E+01 | 4.614E+02 | 4.614E+02 | 16.71 | OK |
|        | 302.84 | 17.80  | 2.575E+00 | 6.968E+02 | 6.968E+02 | 33.78 | OK |
|        | 356.01 | 60.00  | 4.312E+00 | 4.220E+02 | 4.221E+02 | 18.45 | OK |

Final Mean for 3 Valid Peaks = 4.614E+02+/- 7.708E+01 ( 16.71%)

|        |       |        |           |           |           |       |    |
|--------|-------|--------|-----------|-----------|-----------|-------|----|
| NP-237 | 86.50 | 12.60* | 1.262E+01 | 8.617E+01 | 8.617E+01 | 59.29 | OK |
|--------|-------|--------|-----------|-----------|-----------|-------|----|

Final Mean for 1 Valid Peaks = 8.617E+01+/- 5.109E+01 ( 59.29%)

Nuclide Type: NATURAL

| Nuclide | Energy | %Abn  | %Eff      | Uncorrected<br>pCi/filter | Decay Corr<br>pCi/filter | 2-Sigma<br>%Error | Status |
|---------|--------|-------|-----------|---------------------------|--------------------------|-------------------|--------|
| TH-234  | 63.29  | 3.80* | 8.750E+01 | 2.504E+02                 | 2.504E+02                | 15.95             | OK     |

Final Mean for 1 Valid Peaks = 2.504E+02+/- 3.995E+01 ( 15.95%)

Flag: "\*" = Keyline

---- Identified Nuclides ----

| Nuclide | Activity<br>(pCi/filter) | Act error | MDA<br>(pCi/filter) | MDA error | Act/MDA |
|---------|--------------------------|-----------|---------------------|-----------|---------|
| CD-109  | 3.196E+02                | 1.899E+02 | 1.551E+02           | 1.492E+01 | 2.061   |
| BA-133  | 4.614E+02                | 7.708E+01 | 1.077E+01           | 1.586E+00 | 42.834  |
| TH-234  | 2.504E+02                | 3.995E+01 | 2.707E+01           | 3.483E-01 | 9.250   |
| NP-237  | 8.617E+01                | 5.109E+01 | 4.827E+01           | 4.258E+00 | 1.785   |

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

| Nuclide | Key-Line<br>Activity<br>(pCi/filter) | K.L.<br>Ided | Act error | MDA<br>(pCi/filter) | MDA error | Act/MDA |
|---------|--------------------------------------|--------------|-----------|---------------------|-----------|---------|
| CO-57   | -3.570E+00                           |              | 1.441E+01 | 2.557E+01           | 8.667E+00 | -0.140  |
| PA-231  | -2.024E-02                           |              | 9.368E-01 | 1.708E+00           | 1.923E-02 | -0.012  |
| PA-234  | 4.474E+00                            | +            | 1.302E+00 | 2.012E+00           | 2.265E-02 | 2.223   |
| AM-241  | 1.151E+00                            |              | 1.308E+00 | 2.370E+00           | 2.668E-02 | 0.486   |

*C 5447*

Configuration : DKA100: [GAMMA.SCUSR.ARCHIVE] SMP\_130410510\_GE5\_BAFIL\_191145.CN  
 Analyses by : PEAK V16.9 PEAKEFF V2.2  
 Client ID : PZ-106-SD TOT  
 Deposition Date :  
 Sample Date : 1-MAY-2013 00:00:00. Acquisition date : 1-MAY-2013 08:31:44.  
 Sample ID : 1304105-10 Sample Quantity : 1.00000E+00 filter  
 Sample type : FILTER Sample Geometry : 0  
 Detector name : GE5 Detector Geometry: BAFIL  
 Elapsed live time: 0 00:15:00.00 Elapsed real time: 0 00:15:01.14 0.1%  
 Start channel : 25 End channel : 4096  
 Sensitivity : 3.00000 Gaussian : 10.00000  
 Critical level : No

| Pk | It | Energy | Area | Bkgnd | FWHM | Channel | Left | Pw | Cts/Sec  | %Err  | Fit      |
|----|----|--------|------|-------|------|---------|------|----|----------|-------|----------|
| 1  | 0  | 10.97  | 15   | 12    | 0.89 | 110.62  | 104  | 13 | 1.69E-02 | 54.9  |          |
| 2  | 0  | 13.87  | 14   | 3     | 1.09 | 138.45  | 131  | 14 | 1.52E-02 | 39.6  |          |
| 3  | 0  | 18.79  | 12   | 11    | 0.12 | 185.70  | 175  | 16 | 1.38E-02 | 67.8  |          |
| 4  | 0  | 20.20  | 13   | 14    | 0.37 | 199.20  | 193  | 9  | 1.39E-02 | 60.1  |          |
| 5  | 0  | 21.18  | 66   | 19    | 0.57 | 208.66  | 202  | 13 | 7.28E-02 | 18.6  |          |
| 6  | 0  | 31.06  | 2020 | 117   | 0.80 | 303.40  | 292  | 25 | 2.24E+00 | 2.7   |          |
| 7  | 2  | 35.21  | 425  | 21    | 0.68 | 343.24  | 330  | 29 | 4.72E-01 | 5.9   | 1.16E+00 |
| 8  | 2  | 36.12  | 95   | 9     | 0.57 | 352.00  | 330  | 29 | 1.05E-01 | 18.3  |          |
| 9  | 0  | 47.30  | 10   | 6     | 0.18 | 459.26  | 453  | 11 | 1.06E-02 | 57.8  |          |
| 10 | 0  | 53.36  | 50   | 17    | 0.65 | 517.38  | 508  | 17 | 5.56E-02 | 21.5  |          |
| 11 | 0  | 58.54  | 9    | 14    | 0.46 | 567.10  | 559  | 14 | 1.04E-02 | 79.8  |          |
| 12 | 0  | 61.98  | 222  | 57    | 0.75 | 600.17  | 587  | 26 | 2.46E-01 | 10.5  |          |
| 13 | 4  | 65.92  | 81   | 30    | 0.96 | 637.93  | 625  | 28 | 9.00E-02 | 19.8  | 8.18E-01 |
| 14 | 4  | 67.01  | 20   | 12    | 0.60 | 648.42  | 625  | 28 | 2.23E-02 | 32.5  |          |
| 15 | 2  | 79.77  | 54   | 15    | 0.75 | 770.81  | 759  | 37 | 6.02E-02 | 28.1  | 7.57E-01 |
| 16 | 2  | 81.20  | 778  | 13    | 0.70 | 784.54  | 759  | 37 | 8.65E-01 | 3.7   |          |
| 17 | 0  | 112.10 | 183  | 43    | 0.47 | 1081.07 | 1070 | 23 | 2.03E-01 | 11.0  |          |
| 18 | 0  | 276.57 | 37   | 11    | 0.72 | 2659.26 | 2645 | 24 | 4.08E-02 | 24.9  |          |
| 19 | 0  | 303.06 | 112  | 13    | 0.51 | 2913.46 | 2898 | 27 | 1.24E-01 | 11.4  |          |
| 20 | 0  | 307.32 | 40   | 2     | 0.80 | 2954.38 | 2940 | 24 | 4.45E-02 | 17.2  |          |
| 21 | 0  | 333.83 | 46   | 8     | 0.14 | 3208.72 | 3197 | 21 | 5.07E-02 | 18.6  |          |
| 22 | 4  | 356.17 | 335  | 12    | 0.90 | 3423.13 | 3409 | 26 | 3.72E-01 | 6.0   | 6.92E-01 |
| 23 | 4  | 356.65 | 14   | 9     | 1.24 | 3427.72 | 3409 | 26 | 1.54E-02 | 127.1 |          |
| 24 | 3  | 383.78 | 79   | 6     | 1.16 | 3688.00 | 3674 | 28 | 8.75E-02 | 13.2  | 1.73E+00 |
| 25 | 3  | 384.54 | 29   | 6     | 0.84 | 3695.28 | 3674 | 28 | 3.26E-02 | 29.7  |          |
| 26 | 3  | 387.01 | 90   | 16    | 1.16 | 3719.00 | 3704 | 26 | 9.96E-02 | 15.4  | 1.82E+00 |
| 27 | 3  | 387.65 | 31   | 8     | 0.85 | 3725.15 | 3704 | 26 | 3.43E-02 | 30.4  |          |

Summary of Nuclide Activity

Sample ID : 1304105-10

Acquisition date : 1-MAY-2013 08:31:44

Total number of lines in spectrum 27  
 Number of unidentified lines 19  
 Number of lines tentatively identified by NID 8 29.63%

Nuclide Type : FISSION

| Nuclide          | Hlife  | Decay | Wtd Mean                  |                          | Decay Corr<br>2-Sigma Error | 2-Sigma<br>%Error | Flags |
|------------------|--------|-------|---------------------------|--------------------------|-----------------------------|-------------------|-------|
|                  |        |       | Uncorrected<br>pCi/filter | Decay Corr<br>pCi/filter |                             |                   |       |
| BA-133           | 10.50Y | 1.00  | 3.930E+02                 | 3.930E+02                | 0.668E+02                   | 16.98             |       |
| Total Activity : |        |       | 3.930E+02                 | 3.930E+02                |                             |                   |       |

Nuclide Type : NATURAL

| Nuclide          | Hlife     | Decay | Wtd Mean                  |                          | Decay Corr<br>2-Sigma Error | 2-Sigma<br>%Error | Flags |
|------------------|-----------|-------|---------------------------|--------------------------|-----------------------------|-------------------|-------|
|                  |           |       | Uncorrected<br>pCi/filter | Decay Corr<br>pCi/filter |                             |                   |       |
| PA-231           | 3.28E+04Y | 1.00  | 1.084E+00                 | 1.084E+00                | 1.191E+00                   | 109.81            |       |
| PA-234           | 4.47E+09Y | 1.00  | 3.034E+00                 | 3.034E+00                | 1.134E+00                   | 37.39             |       |
| TH-234           | 4.47E+09Y | 1.00  | 2.001E+02                 | 2.001E+02                | 0.429E+02                   | 21.43             |       |
| AM-241           | 432.20Y   | 1.00  | 7.819E-01                 | 7.819E-01                | 12.49E-01                   | 159.68            |       |
| Total Activity : |           |       | 2.050E+02                 | 2.050E+02                |                             |                   |       |

Grand Total Activity : 5.980E+02 5.980E+02

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

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

Nuclide Type: FISSION

| Nuclide | Energy | %Abn   | %Eff      | Uncorrected<br>pCi/filter | Decay Corr<br>pCi/filter | 2-Sigma<br>%Error | Status |
|---------|--------|--------|-----------|---------------------------|--------------------------|-------------------|--------|
| BA-133  | 81.00  | 33.00* | 1.802E+01 | 3.930E+02                 | 3.930E+02                | 16.98             | OK     |
|         | 302.84 | 17.80  | 2.575E+00 | 7.326E+02                 | 7.327E+02                | 34.83             | OK     |
|         | 356.01 | 60.00  | 4.312E+00 | 3.886E+02                 | 3.886E+02                | 18.80             | OK     |

Final Mean for 3 Valid Peaks = 3.930E+02 +/- 6.675E+01 ( 16.98%)

Nuclide Type: NATURAL

| Nuclide | Energy | %Abn   | %Eff      | Uncorrected<br>pCi/filter | Decay Corr<br>pCi/filter | 2-Sigma<br>%Error | Status |
|---------|--------|--------|-----------|---------------------------|--------------------------|-------------------|--------|
| PA-231  | 9.28   | 42.00* | 1.000E+02 | 1.084E+00                 | 1.084E+00                | 109.81            | OK     |
|         | 10.11  | 20.20  | 1.000E+02 | 2.255E+00                 | 2.255E+00                | 109.81            | OK     |
|         | 283.67 | 1.60   | 2.191E+00 | -----                     | Line Not Found           | -----             | Absent |
|         | 302.67 | 2.30   | 2.572E+00 | 5.678E+03                 | 5.678E+03                | 33.37             | OK     |

Final Mean for 3 Valid Peaks = 1.084E+00 +/- 1.191E+00 (109.81%)

|        |        |        |           |           |                |        |        |
|--------|--------|--------|-----------|-----------|----------------|--------|--------|
| PA-234 | 9.89   | 89.00  | 1.000E+02 | 5.117E-01 | 5.117E-01      | 109.81 | OK     |
|        | 21.72  | 64.90* | 1.000E+02 | 3.034E+00 | 3.034E+00      | 37.39  | OK     |
|        | 37.93  | 23.75  | 1.000E+02 | 1.197E+01 | 1.197E+01      | 36.83  | OK     |
|        | 131.42 | 20.40  | 2.473E+00 | -----     | Line Not Found | -----  | Absent |

Final Mean for 3 Valid Peaks = 3.034E+00 +/- 1.134E+00 ( 37.39%)

|        |       |       |           |           |           |       |    |
|--------|-------|-------|-----------|-----------|-----------|-------|----|
| TH-234 | 63.29 | 3.80* | 8.750E+01 | 2.001E+02 | 2.001E+02 | 21.43 | OK |
|--------|-------|-------|-----------|-----------|-----------|-------|----|

Final Mean for 1 Valid Peaks = 2.001E+02 +/- 4.288E+01 ( 21.43%)

|        |       |        |           |           |           |        |    |
|--------|-------|--------|-----------|-----------|-----------|--------|----|
| AM-241 | 59.54 | 35.90* | 1.000E+02 | 7.819E-01 | 7.819E-01 | 159.68 | OK |
|--------|-------|--------|-----------|-----------|-----------|--------|----|

Final Mean for 1 Valid Peaks = 7.819E-01 +/- 1.249E+00 (159.68%)

Flag: "\*" = Keyline

---- Identified Nuclides ----

| Nuclide | Activity<br>(pCi/filter) | Act error | MDA<br>(pCi/filter) | MDA error | Act/MDA |
|---------|--------------------------|-----------|---------------------|-----------|---------|
| BA-133  | 3.930E+02                | 6.675E+01 | 1.240E+01           | 1.825E+00 | 31.707  |
| PA-231  | 1.084E+00                | 1.191E+00 | 1.514E+00           | 1.705E-02 | 0.716   |
| PA-234  | 3.034E+00                | 1.134E+00 | 1.134E+00           | 1.276E-02 | 2.676   |
| TH-234  | 2.001E+02                | 4.288E+01 | 2.593E+01           | 3.336E-01 | 7.717   |
| AM-241  | 7.819E-01                | 1.249E+00 | 2.590E+00           | 2.915E-02 | 0.302   |

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

| Nuclide | Key-Line<br>Activity K.L.<br>(pCi/filter) Ided | Act error | MDA<br>(pCi/filter) | MDA error | Act/MDA |
|---------|--|-----------|---------------------|-----------|---------|
| CO-57   | -4.092E+00                                     | 1.395E+01 | 2.460E+01           | 8.338E+00 | -0.166  |
| CD-109  | 1.109E+02                                      | 1.049E+02 | 2.126E+02           | 2.046E+01 | 0.522   |
| NP-237  | -3.808E+01                                     | 3.010E+01 | 4.509E+01           | 3.977E+00 | -0.845  |

*Fluor*

Configuration : DKA100: [GAMMA.SCUSR.ARCHIVE] SMP\_130410511\_GE5\_BAFIL\_191147.CN  
 Analyses by : PEAK V16.9 PEAKEFF V2.2  
 Client ID : PZ-106-SD DIS  
 Deposition Date :  
 Sample Date : 1-MAY-2013 00:00:00. Acquisition date : 1-MAY-2013 08:47:48.  
 Sample ID : 1304105-11 Sample Quantity : 1.00000E+00 filter  
 Sample type : FILTER Sample Geometry : 0  
 Detector name : GE5 Detector Geometry: BAFIL  
 Elapsed live time: 0 00:15:00.00 Elapsed real time: 0 00:15:01.09 0.1%  
 Start channel : 25 End channel : 4096  
 Sensitivity : 3.00000 Gaussian : 10.00000  
 Critical level : No

| Pk | It | Energy | Area | Bkgnd | FWHM | Channel | Left | Pw | Cts/Sec  | %Err  | Fit      |
|----|----|--------|------|-------|------|---------|------|----|----------|-------|----------|
| 1  | 0  | 20.93  | 141  | 7     | 1.41 | 206.22  | 188  | 33 | 1.56E-01 | 10.4  |          |
| 2  | 0  | 28.63  | 26   | 24    | 0.69 | 280.07  | 273  | 12 | 2.94E-02 | 41.7  |          |
| 3  | 0  | 31.05  | 1982 | 140   | 0.68 | 303.35  | 286  | 28 | 2.20E+00 | 2.8   |          |
| 4  | 3  | 35.20  | 410  | 48    | 0.70 | 343.16  | 329  | 32 | 4.55E-01 | 6.5   | 2.14E+00 |
| 5  | 3  | 36.02  | 71   | 19    | 0.61 | 351.05  | 329  | 32 | 7.89E-02 | 33.4  |          |
| 6  | 0  | 45.35  | 8    | 10    | 0.20 | 440.52  | 429  | 16 | 8.89E-03 | 101.6 |          |
| 7  | 0  | 46.45  | 4    | 5     | 0.11 | 451.14  | 444  | 9  | 3.89E-03 | 121.6 |          |
| 8  | 0  | 53.35  | 48   | 6     | 0.56 | 517.31  | 511  | 15 | 5.34E-02 | 18.9  |          |
| 9  | 2  | 61.65  | 135  | 33    | 0.75 | 596.94  | 587  | 22 | 1.50E-01 | 14.2  | 1.65E+00 |
| 10 | 2  | 62.24  | 126  | 20    | 0.62 | 602.62  | 587  | 22 | 1.40E-01 | 11.9  |          |
| 11 | 0  | 66.23  | 104  | 68    | 0.73 | 640.89  | 628  | 28 | 1.16E-01 | 21.5  |          |
| 12 | 5  | 79.70  | 47   | 16    | 0.90 | 770.18  | 762  | 32 | 5.20E-02 | 20.8  | 1.53E+00 |
| 13 | 5  | 80.14  | 15   | 22    | 0.84 | 774.40  | 762  | 32 | 1.62E-02 | 170.9 |          |
| 14 | 5  | 81.23  | 783  | 12    | 0.65 | 784.80  | 762  | 32 | 8.70E-01 | 3.7   |          |
| 15 | 0  | 112.14 | 182  | 45    | 0.71 | 1081.46 | 1069 | 22 | 2.02E-01 | 10.8  |          |
| 16 | 7  | 115.57 | 8    | 9     | 0.37 | 1114.33 | 1112 | 16 | 9.39E-03 | 54.3  | 3.17E+00 |
| 17 | 7  | 116.22 | 35   | 35    | 0.77 | 1120.57 | 1112 | 16 | 3.85E-02 | 35.6  |          |
| 18 | 0  | 160.69 | 26   | 14    | 0.91 | 1547.32 | 1536 | 18 | 2.89E-02 | 33.4  |          |
| 19 | 0  | 276.41 | 61   | 0     | 0.60 | 2657.74 | 2645 | 25 | 6.78E-02 | 12.8  |          |
| 20 | 5  | 302.98 | 128  | 7     | 1.27 | 2912.73 | 2897 | 28 | 1.42E-01 | 9.8   | 1.30E+00 |
| 21 | 5  | 303.96 | 17   | 2     | 0.70 | 2922.10 | 2897 | 28 | 1.85E-02 | 24.1  |          |
| 22 | 0  | 307.45 | 26   | 5     | 0.42 | 2955.55 | 2942 | 23 | 2.93E-02 | 24.4  |          |
| 23 | 0  | 334.02 | 63   | 7     | 0.63 | 3210.58 | 3196 | 25 | 6.98E-02 | 15.0  |          |
| 24 | 0  | 356.15 | 409  | 9     | 0.83 | 3422.88 | 3404 | 34 | 4.54E-01 | 5.2   |          |
| 25 | 1  | 383.99 | 115  | 2     | 1.16 | 3690.00 | 3674 | 28 | 1.28E-01 | 8.4   | 6.20E+00 |
| 26 | 1  | 384.51 | 12   | 2     | 1.16 | 3695.00 | 3674 | 28 | 1.31E-02 | 74.6  |          |
| 27 | 1  | 387.12 | 117  | 10    | 1.28 | 3720.11 | 3706 | 24 | 1.30E-01 | 10.0  | 1.22E+00 |
| 28 | 1  | 387.63 | 12   | 6     | 1.16 | 3725.00 | 3706 | 24 | 1.31E-02 | 77.2  |          |

Summary of Nuclide Activity

Sample ID : 1304105-11

Acquisition date : 1-MAY-2013 08:47:48

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

Nuclide Type : FISSION

| Nuclide          | Hlife  | Decay | Wtd Mean    | Wtd Mean   | Decay Corr    | 2-Sigma | Flags |
|------------------|--------|-------|-------------|------------|---------------|---------|-------|
|                  |        |       | Uncorrected | Decay Corr |               |         |       |
|                  |        |       | pCi/filter  | pCi/filter | 2-Sigma Error | %Error  |       |
| BA-133           | 10.50Y | 1.00  | 3.952E+02   | 3.952E+02  | 0.671E+02     | 16.98   |       |
| Total Activity : |        |       | 3.952E+02   | 3.952E+02  |               |         |       |

Nuclide Type : NATURAL

| Nuclide          | Hlife     | Decay | Wtd Mean    | Wtd Mean   | Decay Corr    | 2-Sigma | Flags |
|------------------|-----------|-------|-------------|------------|---------------|---------|-------|
|                  |           |       | Uncorrected | Decay Corr |               |         |       |
|                  |           |       | pCi/filter  | pCi/filter | 2-Sigma Error | %Error  |       |
| TH-234           | 4.47E+09Y | 1.00  | 1.137E+02   | 1.137E+02  | 0.275E+02     | 24.19   |       |
| Total Activity : |           |       | 1.137E+02   | 1.137E+02  |               |         |       |

Grand Total Activity : 5.089E+02 5.089E+02

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

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



Nuclide Type: FISSION

| Nuclide | Energy | %Abn   | %Eff      | Uncorrected<br>pCi/filter | Decay Corr<br>pCi/filter | 2-Sigma<br>%Error | Status |
|---------|--------|--------|-----------|---------------------------|--------------------------|-------------------|--------|
| BA-133  | 81.00  | 33.00* | 1.802E+01 | 3.952E+02                 | 3.952E+02                | 16.98             | OK     |
|         | 302.84 | 17.80  | 2.575E+00 | 8.379E+02                 | 8.380E+02                | 32.87             | OK     |
|         | 356.01 | 60.00  | 4.312E+00 | 4.747E+02                 | 4.748E+02                | 17.82             | OK     |

Final Mean for 3 Valid Peaks = 3.952E+02+/- 6.709E+01 ( 16.98%)

Nuclide Type: NATURAL

| Nuclide | Energy | %Abn  | %Eff      | Uncorrected<br>pCi/filter | Decay Corr<br>pCi/filter | 2-Sigma<br>%Error | Status |
|---------|--------|-------|-----------|---------------------------|--------------------------|-------------------|--------|
| TH-234  | 63.29  | 3.80* | 8.750E+01 | 1.137E+02                 | 1.137E+02                | 24.19             | OK     |

Final Mean for 1 Valid Peaks = 1.137E+02+/- 2.751E+01 ( 24.19%)

Flag: "\*" = Keyline

---- Identified Nuclides ----

| Nuclide | Activity<br>(pCi/filter) | Act error | MDA<br>(pCi/filter) | MDA error | Act/MDA |
|---------|--------------------------|-----------|---------------------|-----------|---------|
| BA-133  | 3.952E+02                | 6.709E+01 | 1.403E+01           | 2.066E+00 | 28.169  |
| TH-234  | 1.137E+02                | 2.751E+01 | 3.121E+01           | 4.015E-01 | 3.644   |

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

| Nuclide | Key-Line<br>Activity<br>(pCi/filter) | K.L.<br>Ided | Act error | MDA<br>(pCi/filter) | MDA error | Act/MDA |
|---------|--------------------------------------|--------------|-----------|---------------------|-----------|---------|
| CO-57   | 2.930E+00                            |              | 1.540E+01 | 2.893E+01           | 9.807E+00 | 0.101   |
| CD-109  | 7.598E+00                            |              | 8.934E+01 | 1.668E+02           | 1.605E+01 | 0.046   |
| PA-231  | -3.816E-02                           |              | 7.505E-01 | 1.399E+00           | 1.575E-02 | -0.027  |
| PA-234  | 6.510E+00                            | +            | 1.387E+00 | 2.150E+00           | 2.420E-02 | 3.028   |
| NP-237  | -2.951E+01                           |              | 2.472E+01 | 3.677E+01           | 3.243E+00 | -0.803  |
| AM-241  | 2.060E+00                            |              | 1.369E+00 | 2.668E+00           | 3.003E-02 | 0.772   |

*5/11/13*

Configuration : DKA100: [GAMMA.SCUSR.ARCHIVE] SMP\_130410512\_GE5\_BAFIL\_191151.CN  
 Analyses by : PEAK V16.9 PEAKEFF V2.2  
 Client ID : S-82 TOT  
 Deposition Date :  
 Sample Date : 1-MAY-2013 00:00:00. Acquisition date : 1-MAY-2013 09:06:49.  
 Sample ID : 1304105-12 Sample Quantity : 1.00000E+00 filter  
 Sample type : FILTER Sample Geometry : 0  
 Detector name : GE5 Detector Geometry: BAFIL  
 Elapsed live time: 0 00:15:00.00 Elapsed real time: 0 00:15:01.13 0.1%  
 Start channel : 25 End channel : 4096  
 Sensitivity : 3.00000 Gaussian : 10.00000  
 Critical level : No

| Pk | It | Energy | Area | Bkgnd | FWHM | Channel | Left | Pw | Cts/Sec  | %Err  | Fit      |
|----|----|--------|------|-------|------|---------|------|----|----------|-------|----------|
| 1  | 0  | 21.27  | 70   | 15    | 0.71 | 209.50  | 203  | 14 | 7.80E-02 | 17.2  |          |
| 2  | 0  | 25.29  | 9    | 15    | 0.88 | 248.07  | 239  | 12 | 9.86E-03 | 93.6  |          |
| 3  | 0  | 26.02  | 12   | 6     | 0.34 | 255.05  | 251  | 8  | 1.36E-02 | 44.7  |          |
| 4  | 4  | 28.56  | 21   | 39    | 0.79 | 279.39  | 273  | 42 | 2.33E-02 | 64.7  | 1.29E+00 |
| 5  | 4  | 29.66  | 22   | 48    | 0.54 | 290.00  | 273  | 42 | 2.45E-02 | 84.0  |          |
| 6  | 4  | 31.05  | 1950 | 69    | 0.80 | 303.37  | 273  | 42 | 2.17E+00 | 2.5   |          |
| 7  | 1  | 35.19  | 356  | 19    | 0.62 | 343.08  | 332  | 26 | 3.96E-01 | 6.3   | 8.57E-01 |
| 8  | 1  | 36.07  | 74   | 7     | 0.55 | 351.46  | 332  | 26 | 8.27E-02 | 17.5  |          |
| 9  | 0  | 53.34  | 34   | 20    | 0.47 | 517.20  | 509  | 15 | 3.81E-02 | 29.8  |          |
| 10 | 1  | 61.41  | 52   | 18    | 0.71 | 594.62  | 585  | 29 | 5.80E-02 | 30.6  | 1.53E+00 |
| 11 | 1  | 61.97  | 125  | 19    | 0.65 | 600.00  | 585  | 29 | 1.39E-01 | 14.0  |          |
| 12 | 1  | 62.45  | 33   | 17    | 0.58 | 604.59  | 585  | 29 | 3.62E-02 | 48.0  |          |
| 13 | 1  | 65.72  | 35   | 31    | 0.66 | 636.00  | 626  | 28 | 3.91E-02 | 40.3  | 1.17E+00 |
| 14 | 1  | 66.66  | 52   | 24    | 0.66 | 645.00  | 626  | 28 | 5.83E-02 | 27.2  |          |
| 15 | 1  | 79.65  | 44   | 6     | 0.76 | 769.67  | 761  | 35 | 4.87E-02 | 22.1  | 9.94E-01 |
| 16 | 1  | 81.21  | 811  | 6     | 0.68 | 784.63  | 761  | 35 | 9.01E-01 | 3.6   |          |
| 17 | 5  | 110.93 | 30   | 5     | 0.89 | 1069.81 | 1063 | 38 | 3.38E-02 | 28.6  | 8.19E-01 |
| 18 | 5  | 112.06 | 222  | 13    | 0.92 | 1080.69 | 1063 | 38 | 2.46E-01 | 8.0   |          |
| 19 | 0  | 116.29 | 57   | 7     | 1.07 | 1121.29 | 1110 | 22 | 6.30E-02 | 16.8  |          |
| 20 | 0  | 170.35 | 16   | 11    | 1.00 | 1640.03 | 1626 | 22 | 1.79E-02 | 46.9  |          |
| 21 | 0  | 276.66 | 38   | 3     | 0.78 | 2660.10 | 2646 | 24 | 4.28E-02 | 18.4  |          |
| 22 | 5  | 302.99 | 80   | 9     | 1.15 | 2912.80 | 2897 | 27 | 8.90E-02 | 13.9  | 2.88E+00 |
| 23 | 5  | 303.43 | 47   | 5     | 1.06 | 2917.00 | 2897 | 27 | 5.19E-02 | 19.3  |          |
| 24 | 0  | 333.88 | 54   | 5     | 0.53 | 3209.21 | 3193 | 26 | 5.98E-02 | 15.8  |          |
| 25 | 2  | 355.43 | 11   | 1     | 1.12 | 3416.00 | 3406 | 32 | 1.27E-02 | 139.6 | 9.48E-01 |
| 26 | 2  | 356.26 | 295  | 3     | 1.02 | 3423.94 | 3406 | 32 | 3.28E-01 | 6.6   |          |
| 27 | 0  | 384.04 | 71   | 7     | 1.09 | 3690.52 | 3677 | 25 | 7.92E-02 | 13.8  |          |
| 28 | 1  | 386.49 | 12   | 11    | 1.16 | 3714.00 | 3704 | 27 | 1.31E-02 | 95.4  | 1.25E+00 |
| 29 | 1  | 387.04 | 141  | 14    | 1.14 | 3719.35 | 3704 | 27 | 1.57E-01 | 9.4   |          |
| 30 | 4  | 414.52 | 12   | 4     | 1.19 | 3983.00 | 3969 | 29 | 1.35E-02 | 58.8  | 1.30E+00 |
| 31 | 4  | 415.07 | 54   | 4     | 1.31 | 3988.27 | 3969 | 29 | 5.98E-02 | 12.2  |          |

Summary of Nuclide Activity

Sample ID : 1304105-12

Acquisition date : 1-MAY-2013 09:06:49

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

Nuclide Type : FISSION

| Nuclide          | Hlife  | Decay | Wtd Mean                  | Wtd Mean                 | Decay Corr<br>2-Sigma Error | 2-Sigma<br>%Error | Flags |
|------------------|--------|-------|---------------------------|--------------------------|-----------------------------|-------------------|-------|
|                  |        |       | Uncorrected<br>pCi/filter | Decay Corr<br>pCi/filter |                             |                   |       |
| BA-133           | 10.50Y | 1.00  | 4.093E+02                 | 4.093E+02                | 0.690E+02                   | 16.85             |       |
| Total Activity : |        |       | 4.093E+02                 | 4.093E+02                |                             |                   |       |

Nuclide Type : NATURAL

| Nuclide          | Hlife     | Decay | Wtd Mean                  | Wtd Mean                 | Decay Corr<br>2-Sigma Error | 2-Sigma<br>%Error | Flags |
|------------------|-----------|-------|---------------------------|--------------------------|-----------------------------|-------------------|-------|
|                  |           |       | Uncorrected<br>pCi/filter | Decay Corr<br>pCi/filter |                             |                   |       |
| TH-234           | 4.47E+09Y | 1.00  | 2.943E+01                 | 2.943E+01                | 2.831E+01                   | 96.18             |       |
| AM-241           | 432.20Y   | 1.00  | 4.368E+00                 | 4.368E+00                | 2.678E+00                   | 61.31             |       |
| Total Activity : |           |       | 3.380E+01                 | 3.380E+01                |                             |                   |       |

Grand Total Activity : 4.431E+02 4.431E+02

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

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

Nuclide Type: FISSION

| Nuclide | Energy | %Abn   | %Eff      | Uncorrected<br>pCi/filter | Decay Corr<br>pCi/filter | 2-Sigma<br>%Error | Status |
|---------|--------|--------|-----------|---------------------------|--------------------------|-------------------|--------|
| BA-133  | 81.00  | 33.00* | 1.802E+01 | 4.093E+02                 | 4.093E+02                | 16.85             | OK     |
|         | 302.84 | 17.80  | 2.575E+00 | 5.247E+02                 | 5.248E+02                | 38.35             | OK     |
|         | 356.01 | 60.00  | 4.312E+00 | 3.426E+02                 | 3.426E+02                | 19.59             | OK     |

Final Mean for 3 Valid Peaks = 4.093E+02+/- 6.898E+01 ( 16.85%)

Nuclide Type: NATURAL

| Nuclide | Energy | %Abn  | %Eff      | Uncorrected<br>pCi/filter | Decay Corr<br>pCi/filter | 2-Sigma<br>%Error | Status |
|---------|--------|-------|-----------|---------------------------|--------------------------|-------------------|--------|
| TH-234  | 63.29  | 3.80* | 8.750E+01 | 2.943E+01                 | 2.943E+01                | 96.18             | OK     |

Final Mean for 1 Valid Peaks = 2.943E+01+/- 2.831E+01 ( 96.18%)

|        |       |        |           |           |           |       |    |
|--------|-------|--------|-----------|-----------|-----------|-------|----|
| AM-241 | 59.54 | 35.90* | 1.000E+02 | 4.368E+00 | 4.368E+00 | 61.31 | OK |
|--------|-------|--------|-----------|-----------|-----------|-------|----|

Final Mean for 1 Valid Peaks = 4.368E+00+/- 2.678E+00 ( 61.31%)

Flag: "\*" = Keyline

---- Identified Nuclides ----

| Nuclide | Activity<br>(pCi/filter) | Act error | MDA<br>(pCi/filter) | MDA error | Act/MDA |
|---------|--------------------------|-----------|---------------------|-----------|---------|
| BA-133  | 4.093E+02                | 6.898E+01 | 1.312E+01           | 1.932E+00 | 31.189  |
| TH-234  | 2.943E+01                | 2.831E+01 | 3.121E+01           | 4.015E-01 | 0.943   |
| AM-241  | 4.368E+00                | 2.678E+00 | 1.721E+00           | 1.937E-02 | 2.538   |

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

| Nuclide | Key-Line<br>Activity<br>(pCi/filter) | K.L.<br>Ided | Act error | MDA<br>(pCi/filter) | MDA error | Act/MDA |
|---------|--------------------------------------|--------------|-----------|---------------------|-----------|---------|
| CO-57   | 3.129E+00                            |              | 1.309E+01 | 2.533E+01           | 8.587E+00 | 0.124   |
| CD-109  | 1.741E+01                            |              | 7.884E+01 | 1.527E+02           | 1.470E+01 | 0.114   |
| PA-231  | 3.957E-01                            |              | 9.760E-01 | 1.873E+00           | 2.109E-02 | 0.211   |
| PA-234  | 3.249E+00                            | +            | 1.127E+00 | 1.975E+00           | 2.223E-02 | 1.645   |
| NP-237  | 3.246E+00                            |              | 2.479E+01 | 4.645E+01           | 4.097E+00 | 0.070   |

C  
57117

Configuration : DKA100: [GAMMA.SCUSR.ARCHIVE] SMP\_130410513\_GE5\_BAFIL\_191153.CN  
 Analyses by : PEAK V16.9 PEAKEFF V2.2  
 Client ID : S-82 DIS  
 Deposition Date :  
 Sample Date : 1-MAY-2013 00:00:00. Acquisition date : 1-MAY-2013 09:26:05.  
 Sample ID : 1304105-13 Sample Quantity : 1.00000E+00 filter  
 Sample type : FILTER Sample Geometry : 0  
 Detector name : GE5 Detector Geometry: BAFIL  
 Elapsed live time: 0 00:15:00.00 Elapsed real time: 0 00:15:01.14 0.1%  
 Start channel : 25 End channel : 4096  
 Sensitivity : 3.00000 Gaussian : 10.00000  
 Critical level : No

| Pk | It | Energy | Area | Bkgnd | FWHM | Channel | Left | Pw | Cts/Sec  | %Err  | Fit      |
|----|----|--------|------|-------|------|---------|------|----|----------|-------|----------|
| 1  | 0  | 14.56  | 9    | 2     | 0.33 | 145.13  | 141  | 8  | 1.00E-02 | 43.0  |          |
| 2  | 0  | 21.15  | 101  | 13    | 0.55 | 208.30  | 199  | 18 | 1.12E-01 | 13.2  |          |
| 3  | 0  | 25.16  | 22   | 12    | 0.31 | 246.80  | 236  | 17 | 2.41E-02 | 43.3  |          |
| 4  | 0  | 31.04  | 1789 | 150   | 0.76 | 303.25  | 292  | 25 | 1.99E+00 | 3.0   |          |
| 5  | 0  | 35.34  | 433  | 20    | 0.59 | 344.48  | 334  | 25 | 4.81E-01 | 5.5   |          |
| 6  | 0  | 41.75  | 6    | 7     | 0.80 | 405.99  | 395  | 15 | 6.15E-03 | 115.8 |          |
| 7  | 0  | 47.06  | 6    | 7     | 0.93 | 456.92  | 448  | 14 | 6.15E-03 | 110.6 |          |
| 8  | 0  | 53.56  | 33   | 18    | 0.66 | 519.28  | 510  | 15 | 3.72E-02 | 29.1  |          |
| 9  | 0  | 61.91  | 230  | 14    | 0.76 | 599.44  | 586  | 28 | 2.56E-01 | 7.6   |          |
| 10 | 0  | 66.20  | 102  | 26    | 0.65 | 640.65  | 630  | 24 | 1.13E-01 | 15.2  |          |
| 11 | 0  | 81.21  | 689  | 72    | 0.61 | 784.69  | 772  | 23 | 7.66E-01 | 4.6   |          |
| 12 | 0  | 112.05 | 138  | 31    | 0.65 | 1080.59 | 1069 | 20 | 1.53E-01 | 11.9  |          |
| 13 | 0  | 116.31 | 27   | 22    | 0.32 | 1121.47 | 1111 | 17 | 2.96E-02 | 40.0  |          |
| 14 | 0  | 276.67 | 48   | 0     | 0.45 | 2660.23 | 2646 | 26 | 5.33E-02 | 14.4  |          |
| 15 | 0  | 303.05 | 93   | 0     | 0.81 | 2913.35 | 2897 | 27 | 1.03E-01 | 10.4  |          |
| 16 | 0  | 307.46 | 22   | 5     | 0.56 | 2955.66 | 2939 | 24 | 2.47E-02 | 28.0  |          |
| 17 | 1  | 333.86 | 23   | 2     | 1.10 | 3209.00 | 3191 | 28 | 2.60E-02 | 32.0  | 7.26E-01 |
| 18 | 1  | 334.53 | 22   | 1     | 0.99 | 3215.44 | 3191 | 28 | 2.42E-02 | 19.2  |          |
| 19 | 0  | 356.23 | 351  | 20    | 0.92 | 3423.63 | 3406 | 29 | 3.90E-01 | 6.0   |          |
| 20 | 0  | 384.11 | 64   | 12    | 0.76 | 3691.19 | 3674 | 30 | 7.11E-02 | 16.5  |          |
| 21 | 1  | 386.80 | 127  | 15    | 1.16 | 3717.00 | 3705 | 28 | 1.41E-01 | 10.3  | 4.89E+00 |
| 22 | 1  | 387.42 | 67   | 12    | 1.16 | 3723.00 | 3705 | 28 | 7.47E-02 | 19.1  |          |
| 23 | 0  | 391.27 | 30   | 2     | 1.49 | 3759.89 | 3747 | 24 | 3.30E-02 | 20.7  |          |

Summary of Nuclide Activity

Sample ID : 1304105-13

Acquisition date : 1-MAY-2013 09:26:05

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

Nuclide Type : FISSION

| Nuclide          | Hlife  | Decay | Wtd Mean<br>Uncorrected<br>pCi/filter | Wtd Mean<br>Decay Corr<br>pCi/filter | Decay Corr<br>2-Sigma Error | 2-Sigma<br>%Error | Flags |
|------------------|--------|-------|---------------------------------------|--------------------------------------|-----------------------------|-------------------|-------|
| BA-133           | 10.50Y | 1.00  | 3.479E+02                             | 3.479E+02                            | 0.622E+02                   | 17.87             |       |
| Total Activity : |        |       | 3.479E+02                             | 3.479E+02                            |                             |                   |       |

Nuclide Type : NATURAL

| Nuclide          | Hlife     | Decay | Wtd Mean<br>Uncorrected<br>pCi/filter | Wtd Mean<br>Decay Corr<br>pCi/filter | Decay Corr<br>2-Sigma Error | 2-Sigma<br>%Error | Flags |
|------------------|-----------|-------|---------------------------------------|--------------------------------------|-----------------------------|-------------------|-------|
| TH-234           | 4.47E+09Y | 1.00  | 2.079E+02                             | 2.079E+02                            | 0.330E+02                   | 15.85             |       |
| Total Activity : |           |       | 2.079E+02                             | 2.079E+02                            |                             |                   |       |

Grand Total Activity : 5.558E+02 5.559E+02

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

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



Nuclide Type: FISSION

| Nuclide | Energy | %Abn   | %Eff      | Uncorrected<br>pCi/filter | Decay Corr<br>pCi/filter | 2-Sigma<br>%Error | Status |
|---------|--------|--------|-----------|---------------------------|--------------------------|-------------------|--------|
| BA-133  | 81.00  | 33.00* | 1.802E+01 | 3.479E+02                 | 3.479E+02                | 17.87             | OK     |
|         | 302.84 | 17.80  | 2.575E+00 | 6.092E+02                 | 6.093E+02                | 33.57             | OK     |
|         | 356.01 | 60.00  | 4.312E+00 | 4.071E+02                 | 4.072E+02                | 18.83             | OK     |

Final Mean for 3 Valid Peaks = 3.479E+02 +/- 6.215E+01 ( 17.87%)

Nuclide Type: NATURAL

| Nuclide | Energy | %Abn  | %Eff      | Uncorrected<br>pCi/filter | Decay Corr<br>pCi/filter | 2-Sigma<br>%Error | Status |
|---------|--------|-------|-----------|---------------------------|--------------------------|-------------------|--------|
| TH-234  | 63.29  | 3.80* | 8.750E+01 | 2.079E+02                 | 2.079E+02                | 15.85             | OK     |

Final Mean for 1 Valid Peaks = 2.079E+02 +/- 3.295E+01 ( 15.85%)

Flag: "\*" = Keyline

---- Identified Nuclides ----

| Nuclide | Activity<br>(pCi/filter) | Act error | MDA<br>(pCi/filter) | MDA error | Act/MDA |
|---------|--------------------------|-----------|---------------------|-----------|---------|
| BA-133  | 3.479E+02                | 6.215E+01 | 1.624E+01           | 2.391E+00 | 21.424  |
| TH-234  | 2.079E+02                | 3.295E+01 | 2.063E+01           | 2.655E-01 | 10.078  |

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

| Nuclide | Key-Line<br>Activity K.L.<br>(pCi/filter) Ided | Act error | MDA<br>(pCi/filter) | MDA error | Act/MDA |
|---------|--|-----------|---------------------|-----------|---------|
| CO-57   | -6.282E-01                                     | 1.444E+01 | 2.653E+01           | 8.992E+00 | -0.024  |
| CD-109  | -5.454E+01                                     | 7.386E+01 | 1.203E+02           | 1.158E+01 | -0.453  |
| PA-231  | 3.979E-01                                      | 8.296E-01 | 1.652E+00           | 1.859E-02 | 0.241   |
| PA-234  | 4.651E+00 +                                    | 1.239E+00 | 2.096E+00           | 2.360E-02 | 2.219   |
| NP-237  | 1.070E+01                                      | 2.290E+01 | 4.535E+01           | 4.000E+00 | 0.236   |
| AM-241  | 5.611E-01                                      | 1.344E+00 | 2.248E+00           | 2.531E-02 | 0.250   |

C  
571117

Configuration : DKA100: [GAMMA.SCUSR.ARCHIVE] SMP\_130410514\_GE5\_BAFIL\_191155.CN  
 Analyses by : PEAK V16.9 PEAKEFF V2.2  
 Client ID : PZ-106-SS TOT  
 Deposition Date :  
 Sample Date : 1-MAY-2013 00:00:00. Acquisition date : 1-MAY-2013 09:45:33.  
 Sample ID : 1304105-14 Sample Quantity : 1.00000E+00 filter  
 Sample type : FILTER Sample Geometry : 0  
 Detector name : GE5 Detector Geometry: BAFIL  
 Elapsed live time: 0 00:15:00.00 Elapsed real time: 0 00:15:01.12 0.1%  
 Start channel : 25 End channel : 4096  
 Sensitivity : 3.00000 Gaussian : 10.00000  
 Critical level : No

| Pk | It | Energy | Area | Bkgnd | FWHM | Channel | Left | Pw | Cts/Sec  | %Err  | Fit      |
|----|----|--------|------|-------|------|---------|------|----|----------|-------|----------|
| 1  | 0  | 21.11  | 97   | 29    | 1.02 | 207.93  | 197  | 18 | 1.08E-01 | 16.2  |          |
| 2  | 0  | 25.69  | 6    | 24    | 0.34 | 251.90  | 243  | 11 | 6.37E-03 | 172.7 |          |
| 3  | 4  | 29.51  | 33   | 17    | 0.60 | 288.52  | 273  | 45 | 3.72E-02 | 39.6  | 1.49E+00 |
| 4  | 4  | 31.04  | 2075 | 16    | 0.77 | 303.24  | 273  | 45 | 2.31E+00 | 2.3   |          |
| 5  | 2  | 35.19  | 399  | 11    | 0.68 | 343.07  | 330  | 31 | 4.44E-01 | 5.9   | 1.20E+00 |
| 6  | 2  | 36.02  | 126  | 3     | 0.57 | 351.00  | 330  | 31 | 1.39E-01 | 15.5  |          |
| 7  | 0  | 48.51  | 13   | 3     | 0.76 | 470.85  | 465  | 13 | 1.49E-02 | 38.4  |          |
| 8  | 0  | 53.11  | 69   | 28    | 0.63 | 514.99  | 503  | 25 | 7.69E-02 | 21.4  |          |
| 9  | 0  | 61.84  | 249  | 34    | 0.79 | 598.74  | 587  | 23 | 2.76E-01 | 8.2   |          |
| 10 | 2  | 65.40  | 43   | 8     | 0.65 | 632.94  | 627  | 31 | 4.75E-02 | 24.3  | 1.52E+00 |
| 11 | 2  | 66.17  | 52   | 27    | 0.80 | 640.33  | 627  | 31 | 5.78E-02 | 31.2  |          |
| 12 | 5  | 79.79  | 52   | 9     | 0.78 | 771.00  | 764  | 30 | 5.75E-02 | 17.8  | 4.59E-01 |
| 13 | 5  | 81.19  | 789  | 12    | 0.69 | 784.41  | 764  | 30 | 8.77E-01 | 3.7   |          |
| 14 | 2  | 111.09 | 28   | 18    | 0.78 | 1071.35 | 1067 | 27 | 3.16E-02 | 23.1  | 4.49E+00 |
| 15 | 2  | 111.89 | 181  | 34    | 0.93 | 1079.07 | 1067 | 27 | 2.01E-01 | 10.3  |          |
| 16 | 0  | 116.30 | 31   | 25    | 0.52 | 1121.41 | 1111 | 21 | 3.48E-02 | 38.1  |          |
| 17 | 0  | 160.95 | 26   | 9     | 0.14 | 1549.81 | 1539 | 18 | 2.89E-02 | 28.6  |          |
| 18 | 0  | 276.89 | 31   | 13    | 0.82 | 2662.34 | 2645 | 25 | 3.39E-02 | 29.7  |          |
| 19 | 0  | 303.12 | 117  | 3     | 0.93 | 2914.04 | 2898 | 29 | 1.30E-01 | 9.7   |          |
| 20 | 0  | 333.92 | 45   | 5     | 0.67 | 3209.61 | 3193 | 27 | 4.96E-02 | 18.0  |          |
| 21 | 0  | 356.20 | 361  | 23    | 0.76 | 3423.33 | 3407 | 29 | 4.02E-01 | 5.9   |          |
| 22 | 0  | 384.22 | 52   | 23    | 0.78 | 3692.27 | 3680 | 25 | 5.82E-02 | 21.9  |          |
| 23 | 0  | 387.01 | 133  | 17    | 0.94 | 3719.03 | 3706 | 24 | 1.48E-01 | 10.4  |          |

Summary of Nuclide Activity

Sample ID : 1304105-14

Acquisition date : 1-MAY-2013 09:45:33

Total number of lines in spectrum 23  
 Number of unidentified lines 17  
 Number of lines tentatively identified by NID 6 26.09%

Nuclide Type : FISSION

| Nuclide          | Hlife  | Decay | Wtd Mean                  | Wtd Mean                 | Decay Corr<br>2-Sigma Error | 2-Sigma<br>%Error | Flags |
|------------------|--------|-------|---------------------------|--------------------------|-----------------------------|-------------------|-------|
|                  |        |       | Uncorrected<br>pCi/filter | Decay Corr<br>pCi/filter |                             |                   |       |
| BA-133           | 10.50Y | 1.00  | 3.983E+02                 | 3.984E+02                | 0.674E+02                   | 16.92             |       |
| Total Activity : |        |       | 3.983E+02                 | 3.984E+02                |                             |                   |       |

Nuclide Type : NATURAL

| Nuclide          | Hlife     | Decay | Wtd Mean                  | Wtd Mean                 | Decay Corr<br>2-Sigma Error | 2-Sigma<br>%Error | Flags |
|------------------|-----------|-------|---------------------------|--------------------------|-----------------------------|-------------------|-------|
|                  |           |       | Uncorrected<br>pCi/filter | Decay Corr<br>pCi/filter |                             |                   |       |
| TH-234           | 4.47E+09Y | 1.00  | 2.245E+02                 | 2.245E+02                | 0.380E+02                   | 16.93             |       |
| Total Activity : |           |       | 2.245E+02                 | 2.245E+02                |                             |                   |       |

Grand Total Activity : 6.228E+02 6.228E+02

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

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

Nuclide Type: FISSION

| Nuclide | Energy | %Abn   | %Eff      | Uncorrected<br>pCi/filter | Decay Corr<br>pCi/filter | 2-Sigma<br>%Error | Status |
|---------|--------|--------|-----------|---------------------------|--------------------------|-------------------|--------|
| BA-133  | 81.00  | 33.00* | 1.802E+01 | 3.983E+02                 | 3.984E+02                | 16.92             | OK     |
|         | 302.84 | 17.80  | 2.575E+00 | 7.654E+02                 | 7.654E+02                | 32.76             | OK     |
|         | 356.01 | 60.00  | 4.312E+00 | 4.195E+02                 | 4.196E+02                | 18.71             | OK     |

Final Mean for 3 Valid Peaks = 3.984E+02+/- 6.742E+01 ( 16.92%)

Nuclide Type: NATURAL

| Nuclide | Energy | %Abn  | %Eff      | Uncorrected<br>pCi/filter | Decay Corr<br>pCi/filter | 2-Sigma<br>%Error | Status |
|---------|--------|-------|-----------|---------------------------|--------------------------|-------------------|--------|
| TH-234  | 63.29  | 3.80* | 8.750E+01 | 2.245E+02                 | 2.245E+02                | 16.93             | OK     |

Final Mean for 1 Valid Peaks = 2.245E+02+/- 3.800E+01 ( 16.93%)

Flag: "\*" = Keyline

---- Identified Nuclides ----

| Nuclide | Activity<br>(pCi/filter) | Act error | MDA<br>(pCi/filter) | MDA error | Act/MDA |
|---------|--------------------------|-----------|---------------------|-----------|---------|
| BA-133  | 3.984E+02                | 6.742E+01 | 1.312E+01           | 1.932E+00 | 30.354  |
| TH-234  | 2.245E+02                | 3.800E+01 | 2.063E+01           | 2.655E-01 | 10.879  |

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

| Nuclide | Key-Line<br>Activity K.L.<br>(pCi/filter) Ided | Act error | MDA<br>(pCi/filter) | MDA error | Act/MDA |
|---------|--|-----------|---------------------|-----------|---------|
| CO-57   | -2.167E-01                                     | 1.372E+01 | 2.545E+01           | 8.629E+00 | -0.009  |
| CD-109  | 3.272E+01                                      | 7.639E+01 | 1.532E+02           | 1.475E+01 | 0.214   |
| PA-231  | 1.834E-01                                      | 7.917E-01 | 1.533E+00           | 1.726E-02 | 0.120   |
| PA-234  | 4.505E+00 +                                    | 1.468E+00 | 2.096E+00           | 2.359E-02 | 2.150   |
| NP-237  | -2.278E+01                                     | 2.566E+01 | 4.084E+01           | 3.603E+00 | -0.558  |
| AM-241  | 1.173E+00                                      | 1.366E+00 | 2.443E+00           | 2.750E-02 | 0.480   |

*C*  
*5117*

Configuration : DKA100: [GAMMA.SCUSR.ARCHIVE] SMP\_130410515\_GE3\_BAFIL\_191152.CN  
 Analyses by : PEAK V16.9 PEAKEFF V2.2  
 Client ID : PZ-106-SS DIS  
 Deposition Date :  
 Sample Date : 1-MAY-2013 00:00:00. Acquisition date : 1-MAY-2013 09:25:15.  
 Sample ID : 1304105-15 Sample Quantity : 1.00000E+00 filter  
 Sample type : FILTER Sample Geometry : 0  
 Detector name : GE3 Detector Geometry: BAFIL  
 Elapsed live time: 0 00:15:00.00 Elapsed real time: 0 00:15:03.59 0.4%  
 Start channel : 25 End channel : 4096  
 Sensitivity : 3.00000 Gaussian : 10.00000  
 Critical level : No

| Pk | It | Energy | Area | Bkgnd | FWHM | Channel | Left | Pw | Cts/Sec  | %Err | Fit      |
|----|----|--------|------|-------|------|---------|------|----|----------|------|----------|
| 1  | 3  | 27.97  | 36   | 139   | 1.73 | 28.29   | 26   | 14 | 4.02E-02 | 65.4 | 2.40E+01 |
| 2  | 3  | 30.73  | 2032 | 94    | 1.36 | 31.05   | 26   | 14 | 2.26E+00 | 2.3  |          |
| 3  | 3  | 34.81  | 500  | 89    | 1.75 | 35.13   | 26   | 14 | 5.55E-01 | 5.3  |          |
| 4  | 0  | 46.02  | 25   | 98    | 2.53 | 46.34   | 44   | 7  | 2.77E-02 | 68.4 |          |
| 5  | 1  | 52.62  | 60   | 56    | 1.49 | 52.94   | 50   | 20 | 6.65E-02 | 24.5 | 5.13E+00 |
| 6  | 1  | 61.65  | 232  | 99    | 1.51 | 61.96   | 50   | 20 | 2.58E-01 | 9.4  |          |
| 7  | 1  | 65.54  | 112  | 119   | 1.52 | 65.86   | 50   | 20 | 1.24E-01 | 16.6 |          |
| 8  | 0  | 80.90  | 786  | 172   | 1.59 | 81.22   | 76   | 8  | 8.73E-01 | 4.6  |          |
| 9  | 0  | 92.73  | 45   | 146   | 2.29 | 93.05   | 89   | 9  | 4.95E-02 | 51.2 |          |
| 10 | 0  | 111.64 | 196  | 129   | 1.33 | 111.95  | 108  | 7  | 2.18E-01 | 12.0 |          |
| 11 | 0  | 116.28 | 51   | 70    | 1.97 | 116.60  | 115  | 6  | 5.70E-02 | 30.6 |          |
| 12 | 0  | 239.23 | 14   | 42    | 2.56 | 239.54  | 235  | 6  | 1.52E-02 | 81.2 |          |
| 13 | 0  | 276.44 | 45   | 32    | 1.51 | 276.75  | 272  | 8  | 5.00E-02 | 26.4 |          |
| 14 | 4  | 295.45 | 13   | 15    | 2.39 | 295.76  | 293  | 20 | 1.49E-02 | 53.2 | 1.93E+00 |
| 15 | 4  | 303.04 | 149  | 20    | 1.87 | 303.35  | 293  | 20 | 1.66E-01 | 9.3  |          |
| 16 | 4  | 307.04 | 28   | 21    | 1.99 | 307.34  | 293  | 20 | 3.14E-02 | 40.1 |          |
| 17 | 4  | 333.78 | 61   | 29    | 1.84 | 334.08  | 329  | 14 | 6.83E-02 | 18.4 | 1.80E+00 |
| 18 | 4  | 338.35 | 23   | 17    | 2.44 | 338.66  | 329  | 14 | 2.60E-02 | 45.2 |          |
| 19 | 3  | 351.14 | 12   | 3     | 2.23 | 351.45  | 351  | 13 | 1.34E-02 | 18.2 | 2.52E+00 |
| 20 | 3  | 356.12 | 485  | 16    | 1.53 | 356.42  | 351  | 13 | 5.39E-01 | 4.7  |          |
| 21 | 0  | 365.00 | 15   | 11    | 1.20 | 365.30  | 363  | 6  | 1.66E-02 | 43.1 |          |
| 22 | 0  | 377.86 | 12   | 14    | 2.26 | 378.17  | 374  | 7  | 1.33E-02 | 59.2 |          |
| 23 | 1  | 383.60 | 128  | 13    | 1.87 | 383.91  | 380  | 19 | 1.42E-01 | 10.2 | 5.84E+00 |
| 24 | 1  | 386.87 | 204  | 9     | 1.83 | 387.17  | 380  | 19 | 2.27E-01 | 8.7  |          |
| 25 | 1  | 390.84 | 52   | 7     | 1.88 | 391.14  | 380  | 19 | 5.74E-02 | 24.2 |          |
| 26 | 2  | 414.72 | 43   | 7     | 2.08 | 415.02  | 410  | 12 | 4.79E-02 | 19.6 | 2.81E+00 |
| 27 | 2  | 417.34 | 30   | 12    | 2.09 | 417.64  | 410  | 12 | 3.34E-02 | 31.8 |          |
| 28 | 0  | 437.31 | 99   | 14    | 1.91 | 437.61  | 434  | 7  | 1.10E-01 | 11.8 |          |
| 29 | 0  | 468.01 | 20   | 9     | 1.30 | 468.31  | 464  | 8  | 2.23E-02 | 34.9 |          |
| 30 | 0  | 511.29 | 19   | 5     | 1.80 | 511.59  | 506  | 12 | 2.12E-02 | 34.0 |          |
| 31 | 0  | 609.20 | 7    | 1     | 1.05 | 609.49  | 606  | 6  | 7.36E-03 | 48.3 |          |

Summary of Nuclide Activity

Sample ID : 1304105-15

Acquisition date : 1-MAY-2013 09:25:15

Total number of lines in spectrum 31  
 Number of unidentified lines 27  
 Number of lines tentatively identified by NID 4 12.90%

Nuclide Type : FISSION

| Nuclide          | Hlife  | Decay | Wtd Mean<br>Uncorrected<br>pCi/filter | Wtd Mean<br>Decay Corr<br>pCi/filter | Decay Corr<br>2-Sigma Error | 2-Sigma<br>%Error | Flags |
|------------------|--------|-------|---------------------------------------|--------------------------------------|-----------------------------|-------------------|-------|
| BA-133           | 10.50Y | 1.00  | 3.766E+02                             | 3.766E+02                            | 0.688E+02                   | 18.28             |       |
| Total Activity : |        |       | 3.766E+02                             | 3.766E+02                            |                             |                   |       |

Nuclide Type : NATURAL

| Nuclide          | Hlife     | Decay | Wtd Mean<br>Uncorrected<br>pCi/filter | Wtd Mean<br>Decay Corr<br>pCi/filter | Decay Corr<br>2-Sigma Error | 2-Sigma<br>%Error | Flags |
|------------------|-----------|-------|---------------------------------------|--------------------------------------|-----------------------------|-------------------|-------|
| TH-234           | 4.47E+09Y | 1.00  | 6.924E+02                             | 6.924E+02                            | 1.387E+02                   | 20.03             |       |
| Total Activity : |           |       | 6.924E+02                             | 6.924E+02                            |                             |                   |       |

Grand Total Activity : 1.069E+03 1.069E+03

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

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



Nuclide Type: FISSION

| Nuclide | Energy | %Abn   | %Eff      | Uncorrected<br>pCi/filter | Decay Corr<br>pCi/filter | 2-Sigma<br>%Error | Status |
|---------|--------|--------|-----------|---------------------------|--------------------------|-------------------|--------|
| BA-133  | 81.00  | 33.00* | 1.899E+01 | 3.766E+02                 | 3.766E+02                | 18.28             | OK     |
|         | 302.84 | 17.80  | 6.222E+00 | 4.049E+02                 | 4.049E+02                | 27.73             | OK     |
|         | 356.01 | 60.00  | 5.860E+00 | 4.141E+02                 | 4.141E+02                | 16.56             | OK     |

Final Mean for 3 Valid Peaks = 3.766E+02 +/- 6.883E+01 ( 18.28%)

Nuclide Type: NATURAL

| Nuclide | Energy | %Abn  | %Eff      | Uncorrected<br>pCi/filter | Decay Corr<br>pCi/filter | 2-Sigma<br>%Error | Status |
|---------|--------|-------|-----------|---------------------------|--------------------------|-------------------|--------|
| TH-234  | 63.29  | 3.80* | 2.648E+01 | 6.924E+02                 | 6.924E+02                | 20.03             | OK     |

Final Mean for 1 Valid Peaks = 6.924E+02 +/- 1.387E+02 ( 20.03%)

Flag: "\*" = Keyline

---- Identified Nuclides ----

| Nuclide | Activity<br>(pCi/filter) | Act error | MDA<br>(pCi/filter) | MDA error | Act/MDA |
|---------|--------------------------|-----------|---------------------|-----------|---------|
| BA-133  | 3.766E+02                | 6.883E+01 | 2.393E+01           | 3.659E+00 | 15.741  |
| TH-234  | 6.924E+02                | 1.387E+02 | 1.451E+02           | 7.794E+00 | 4.772   |

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

| Nuclide | Key-Line<br>Activity K.L.<br>(pCi/filter) Ided | Act error | MDA<br>(pCi/filter) | MDA error | Act/MDA |
|---------|--|-----------|---------------------|-----------|---------|
| CO-57   | -8.043E-01                                     | 5.733E+00 | 9.114E+00           | 1.041E+00 | -0.088  |
| CD-109  | -1.527E+02                                     | 1.363E+02 | 1.917E+02           | 1.581E+01 | -0.796  |
| PA-231  | 5.781E-01                                      | 1.582E+00 | 2.923E+00           | 4.157E-02 | 0.198   |
| PA-234  | 3.270E+00                                      | 1.458E+00 | 2.738E+00           | 3.895E-02 | 1.194   |
| NP-237  | -3.762E+01                                     | 4.593E+01 | 5.740E+01           | 4.640E+00 | -0.655  |
| AM-241  | 2.776E+01                                      | 1.058E+01 | 1.946E+01           | 9.570E-01 | 1.426   |

5/11/13

Configuration : DKA100: [GAMMA.SCUSR.ARCHIVE] SMP\_130410516\_GE3\_BAFIL\_191154.CN  
 Analyses by : PEAK V16.9 PEAKEFF V2.2  
 Client ID : I-9 TOT  
 Deposition Date :  
 Sample Date : 1-MAY-2013 00:00:00. Acquisition date : 1-MAY-2013 09:44:28.  
 Sample ID : 1304105-16 Sample Quantity : 1.00000E+00 filter  
 Sample type : FILTER Sample Geometry : 0  
 Detector name : GE3 Detector Geometry: BAFIL  
 Elapsed live time: 0 00:15:00.00 Elapsed real time: 0 00:15:03.68 0.4%  
 Start channel : 25 End channel : 4096  
 Sensitivity : 3.00000 Gaussian : 10.00000  
 Critical level : No

| Pk | It | Energy | Area | Bkgnd | FWHM | Channel | Left | Pw | Cts/Sec  | %Err | Fit      |
|----|----|--------|------|-------|------|---------|------|----|----------|------|----------|
| 1  | 3  | 30.70  | 1986 | 90    | 1.34 | 31.02   | 26   | 14 | 2.21E+00 | 2.3  | 4.38E+00 |
| 2  | 3  | 34.98  | 467  | 94    | 1.57 | 35.30   | 26   | 14 | 5.19E-01 | 5.6  |          |
| 3  | 0  | 52.76  | 42   | 108   | 2.34 | 53.08   | 50   | 6  | 4.66E-02 | 42.2 |          |
| 4  | 3  | 61.69  | 259  | 76    | 1.52 | 62.01   | 58   | 17 | 2.87E-01 | 8.0  | 1.54E+00 |
| 5  | 3  | 65.92  | 135  | 92    | 1.83 | 66.24   | 58   | 17 | 1.50E-01 | 15.2 |          |
| 6  | 0  | 80.88  | 805  | 187   | 1.43 | 81.20   | 76   | 10 | 8.94E-01 | 4.8  |          |
| 7  | 0  | 92.40  | 16   | 78    | 1.97 | 92.72   | 91   | 6  | 1.72E-02 | 94.1 |          |
| 8  | 0  | 111.52 | 203  | 153   | 1.47 | 111.84  | 108  | 8  | 2.26E-01 | 12.7 |          |
| 9  | 0  | 160.42 | 25   | 98    | 1.08 | 160.74  | 158  | 7  | 2.76E-02 | 69.4 |          |
| 10 | 2  | 274.03 | 10   | 8     | 1.95 | 274.34  | 272  | 10 | 1.11E-02 | 51.1 | 5.19E+00 |
| 11 | 2  | 276.55 | 64   | 15    | 1.96 | 276.85  | 272  | 10 | 7.12E-02 | 15.9 |          |
| 12 | 0  | 302.94 | 120  | 31    | 1.46 | 303.25  | 299  | 7  | 1.34E-01 | 12.0 |          |
| 13 | 0  | 334.16 | 59   | 41    | 1.31 | 334.47  | 331  | 7  | 6.58E-02 | 21.8 |          |
| 14 | 0  | 338.46 | 20   | 16    | 1.75 | 338.76  | 337  | 5  | 2.24E-02 | 37.2 |          |
| 15 | 6  | 352.60 | 18   | 4     | 2.51 | 352.90  | 351  | 10 | 2.01E-02 | 28.1 | 2.78E+00 |
| 16 | 6  | 356.17 | 491  | 5     | 1.54 | 356.48  | 351  | 10 | 5.45E-01 | 4.6  |          |
| 17 | 5  | 383.89 | 88   | 16    | 2.16 | 384.19  | 381  | 18 | 9.83E-02 | 14.5 | 5.67E+00 |
| 18 | 5  | 387.02 | 207  | 10    | 1.85 | 387.32  | 381  | 18 | 2.30E-01 | 7.9  |          |
| 19 | 5  | 391.20 | 49   | 7     | 2.07 | 391.51  | 381  | 18 | 5.39E-02 | 25.7 |          |
| 20 | 4  | 414.83 | 29   | 13    | 2.47 | 415.13  | 409  | 20 | 3.17E-02 | 28.8 | 1.47E+00 |
| 21 | 4  | 418.50 | 27   | 14    | 2.52 | 418.80  | 409  | 20 | 3.00E-02 | 37.4 |          |
| 22 | 4  | 421.90 | 18   | 13    | 2.53 | 422.20  | 409  | 20 | 2.04E-02 | 50.4 |          |
| 23 | 0  | 437.19 | 107  | 7     | 1.95 | 437.50  | 434  | 7  | 1.19E-01 | 10.5 |          |
| 24 | 3  | 468.12 | 17   | 5     | 2.34 | 468.42  | 464  | 12 | 1.87E-02 | 36.6 | 1.01E+00 |
| 25 | 3  | 471.65 | 7    | 2     | 2.34 | 471.95  | 464  | 12 | 7.88E-03 | 82.5 |          |
| 26 | 0  | 510.86 | 26   | 0     | 4.66 | 511.15  | 508  | 8  | 2.89E-02 | 19.6 |          |
| 27 | 0  | 610.06 | 7    | 1     | 1.40 | 610.35  | 608  | 5  | 7.71E-03 | 44.6 |          |

Total number of lines in spectrum 27  
Number of unidentified lines 23  
Number of lines tentatively identified by NID 4 14.81%

Nuclide Type : FISSION

| Nuclide          | Hlife  | Decay | Wtd Mean<br>Uncorrected<br>pCi/filter | Wtd Mean<br>Decay Corr<br>pCi/filter | Decay Corr<br>2-Sigma Error | 2-Sigma<br>%Error | Flags |
|------------------|--------|-------|---------------------------------------|--------------------------------------|-----------------------------|-------------------|-------|
| BA-133           | 10.50Y | 1.00  | 3.856E+02                             | 3.856E+02                            | 0.711E+02                   | 18.44             |       |
| Total Activity : |        |       | 3.856E+02                             | 3.856E+02                            |                             |                   |       |

Nuclide Type : NATURAL

| Nuclide          | Hlife     | Decay | Wtd Mean<br>Uncorrected<br>pCi/filter | Wtd Mean<br>Decay Corr<br>pCi/filter | Decay Corr<br>2-Sigma Error | 2-Sigma<br>%Error | Flags |
|------------------|-----------|-------|---------------------------------------|--------------------------------------|-----------------------------|-------------------|-------|
| TH-234           | 4.47E+09Y | 1.00  | 7.715E+02                             | 7.715E+02                            | 1.338E+02                   | 17.34             |       |
| Total Activity : |           |       | 7.715E+02                             | 7.715E+02                            |                             |                   |       |

Grand Total Activity : 1.157E+03 1.157E+03

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

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

Nuclide Type: FISSION

| Nuclide | Energy | %Abn   | %Eff      | Uncorrected<br>pCi/filter | Decay Corr<br>pCi/filter | 2-Sigma<br>%Error | Status |
|---------|--------|--------|-----------|---------------------------|--------------------------|-------------------|--------|
| BA-133  | 81.00  | 33.00* | 1.899E+01 | 3.856E+02                 | 3.856E+02                | 18.44             | OK     |
|         | 302.84 | 17.80  | 6.222E+00 | 3.263E+02                 | 3.264E+02                | 31.65             | OK     |
|         | 356.01 | 60.00  | 5.860E+00 | 4.189E+02                 | 4.190E+02                | 16.42             | OK     |

Final Mean for 3 Valid Peaks = 3.856E+02+/- 7.112E+01 ( 18.44%)

Nuclide Type: NATURAL

| Nuclide | Energy | %Abn  | %Eff      | Uncorrected<br>pCi/filter | Decay Corr<br>pCi/filter | 2-Sigma<br>%Error | Status |
|---------|--------|-------|-----------|---------------------------|--------------------------|-------------------|--------|
| TH-234  | 63.29  | 3.80* | 2.648E+01 | 7.715E+02                 | 7.715E+02                | 17.34             | OK     |

Final Mean for 1 Valid Peaks = 7.715E+02+/- 1.338E+02 ( 17.34%)

Flag: "\*" = Keyline

---- Identified Nuclides ----

| Nuclide | Activity<br>(pCi/filter) | Act error | MDA<br>(pCi/filter) | MDA error | Act/MDA |
|---------|--------------------------|-----------|---------------------|-----------|---------|
| BA-133  | 3.856E+02                | 7.112E+01 | 1.958E+01           | 2.995E+00 | 19.691  |
| TH-234  | 7.715E+02                | 1.338E+02 | 1.340E+02           | 7.200E+00 | 5.756   |

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

| Nuclide | Key-Line<br>Activity K.L.<br>(pCi/filter) Ided | Act error | MDA<br>(pCi/filter) | MDA error | Act/MDA |
|---------|--|-----------|---------------------|-----------|---------|
| CO-57   | -2.681E+00                                     | 5.808E+00 | 9.620E+00           | 1.099E+00 | -0.279  |
| CD-109  | 1.266E+01                                      | 1.247E+02 | 1.795E+02           | 1.480E+01 | 0.071   |
| PA-231  | 1.372E+00                                      | 1.675E+00 | 3.173E+00           | 4.514E-02 | 0.432   |
| PA-234  | 3.729E+00                                      | 1.538E+00 | 2.890E+00           | 4.110E-02 | 1.290   |
| NP-237  | -2.899E+01                                     | 4.253E+01 | 5.413E+01           | 4.376E+00 | -0.535  |
| AM-241  | 2.740E+01                                      | 9.981E+00 | 1.866E+01           | 9.174E-01 | 1.468   |

8/11/13

Configuration : DKA100:[GAMMA.SCUSR.ARCHIVE]SMP\_130410517\_GE3\_BAFIL\_191158.CN  
 Analyses by : PEAK V16.9 PEAKEFF V2.2  
 Client ID : I-9 DIS  
 Deposition Date :  
 Sample Date : 1-MAY-2013 00:00:00. Acquisition date : 1-MAY-2013 10:07:45.  
 Sample ID : 1304105-17 Sample Quantity : 1.00000E+00 filter  
 Sample type : FILTER Sample Geometry : 0  
 Detector name : GE3 Detector Geometry: BAFIL  
 Elapsed live time: 0 00:15:00.00 Elapsed real time: 0 00:15:03.64 0.4%  
 Start channel : 25 End channel : 4096  
 Sensitivity : 3.00000 Gaussian : 10.00000  
 Critical level : No

| Pk | It | Energy | Area | Bkgnd | FWHM | Channel | Left | Pw | Cts/Sec  | %Err | Fit      |
|----|----|--------|------|-------|------|---------|------|----|----------|------|----------|
| 1  | 3  | 30.73  | 1994 | 85    | 1.44 | 31.05   | 26   | 13 | 2.22E+00 | 2.3  | 7.94E+00 |
| 2  | 3  | 34.98  | 459  | 82    | 1.58 | 35.30   | 26   | 13 | 5.10E-01 | 5.7  |          |
| 3  | 0  | 53.43  | 28   | 153   | 1.66 | 53.75   | 50   | 7  | 3.14E-02 | 74.9 |          |
| 4  | 1  | 61.68  | 247  | 105   | 1.51 | 62.00   | 58   | 12 | 2.74E-01 | 9.2  | 6.94E+00 |
| 5  | 1  | 65.54  | 100  | 114   | 1.52 | 65.86   | 58   | 12 | 1.11E-01 | 18.5 |          |
| 6  | 1  | 80.82  | 761  | 78    | 1.54 | 81.14   | 77   | 10 | 8.45E-01 | 4.1  | 1.18E+01 |
| 7  | 1  | 83.68  | 23   | 48    | 1.41 | 84.00   | 77   | 10 | 2.51E-02 | 87.9 |          |
| 8  | 0  | 111.47 | 245  | 115   | 1.44 | 111.78  | 108  | 7  | 2.72E-01 | 9.7  |          |
| 9  | 0  | 161.76 | 44   | 88    | 1.70 | 162.07  | 158  | 9  | 4.89E-02 | 41.3 |          |
| 10 | 0  | 193.05 | 25   | 90    | 3.21 | 193.37  | 188  | 9  | 2.77E-02 | 72.1 |          |
| 11 | 0  | 276.77 | 62   | 47    | 1.48 | 277.08  | 273  | 9  | 6.84E-02 | 23.9 |          |
| 12 | 2  | 302.90 | 156  | 21    | 1.56 | 303.21  | 299  | 19 | 1.73E-01 | 8.9  | 1.96E+00 |
| 13 | 2  | 307.47 | 37   | 17    | 1.99 | 307.78  | 299  | 19 | 4.07E-02 | 25.5 |          |
| 14 | 2  | 311.59 | 13   | 14    | 1.99 | 311.89  | 299  | 19 | 1.48E-02 | 60.5 |          |
| 15 | 2  | 333.79 | 74   | 8     | 2.01 | 334.10  | 330  | 15 | 8.24E-02 | 13.6 | 1.07E+00 |
| 16 | 2  | 337.62 | 32   | 7     | 2.02 | 337.93  | 330  | 15 | 3.53E-02 | 27.3 |          |
| 17 | 2  | 341.05 | 12   | 6     | 2.02 | 341.35  | 330  | 15 | 1.34E-02 | 64.4 |          |
| 18 | 0  | 356.13 | 501  | 17    | 1.90 | 356.44  | 353  | 9  | 5.56E-01 | 4.7  |          |
| 19 | 0  | 364.50 | 11   | 17    | 1.47 | 364.80  | 362  | 6  | 1.19E-02 | 67.6 |          |
| 20 | 2  | 383.72 | 110  | 10    | 2.06 | 384.02  | 381  | 17 | 1.22E-01 | 11.5 | 4.68E+00 |
| 21 | 2  | 386.99 | 209  | 13    | 1.83 | 387.29  | 381  | 17 | 2.32E-01 | 7.9  |          |
| 22 | 2  | 391.38 | 52   | 14    | 2.06 | 391.68  | 381  | 17 | 5.74E-02 | 18.7 |          |
| 23 | 2  | 415.05 | 29   | 18    | 2.08 | 415.35  | 411  | 15 | 3.22E-02 | 29.7 | 1.98E+00 |
| 24 | 2  | 418.34 | 22   | 12    | 2.09 | 418.64  | 411  | 15 | 2.41E-02 | 40.5 |          |
| 25 | 0  | 437.05 | 109  | 5     | 1.91 | 437.35  | 432  | 10 | 1.21E-01 | 10.3 |          |
| 26 | 0  | 467.78 | 28   | 2     | 2.01 | 468.08  | 463  | 8  | 3.07E-02 | 21.1 |          |
| 27 | 4  | 509.11 | 6    | 5     | 2.37 | 509.41  | 506  | 11 | 6.71E-03 | 81.5 | 1.07E+00 |
| 28 | 4  | 512.15 | 11   | 7     | 2.61 | 512.45  | 506  | 11 | 1.22E-02 | 52.3 |          |

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

Nuclide Type : FISSION

| Nuclide          | Hlife  | Decay | Wtd Mean               | Wtd Mean              | Decay Corr | 2-Sigma Error | 2-Sigma | Flags |
|------------------|--------|-------|------------------------|-----------------------|------------|---------------|---------|-------|
|                  |        |       | Uncorrected pCi/filter | Decay Corr pCi/filter |            |               |         |       |
| BA-133           | 10.50Y | 1.00  | 3.646E+02              | 3.647E+02             | 0.650E+02  | 17.82         |         |       |
| Total Activity : |        |       | 3.646E+02              | 3.647E+02             |            |               |         |       |

Nuclide Type : NATURAL

| Nuclide          | Hlife     | Decay | Wtd Mean               | Wtd Mean              | Decay Corr | 2-Sigma Error | 2-Sigma | Flags |
|------------------|-----------|-------|------------------------|-----------------------|------------|---------------|---------|-------|
|                  |           |       | Uncorrected pCi/filter | Decay Corr pCi/filter |            |               |         |       |
| TH-234           | 4.47E+09Y | 1.00  | 7.366E+02              | 7.366E+02             | 1.447E+02  | 19.65         |         |       |
| Total Activity : |           |       | 7.366E+02              | 7.366E+02             |            |               |         |       |

Grand Total Activity : 1.101E+03 1.101E+03

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

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



Nuclide Type: FISSION

| Nuclide | Energy | %Abn   | %Eff      | Uncorrected<br>pCi/filter | Decay Corr<br>pCi/filter | 2-Sigma<br>%Error | Status |
|---------|--------|--------|-----------|---------------------------|--------------------------|-------------------|--------|
| BA-133  | 81.00  | 33.00* | 1.899E+01 | 3.646E+02                 | 3.647E+02                | 17.82             | OK     |
|         | 302.84 | 17.80  | 6.222E+00 | 4.221E+02                 | 4.222E+02                | 27.27             | OK     |
|         | 356.01 | 60.00  | 5.860E+00 | 4.275E+02                 | 4.275E+02                | 16.62             | OK     |

Final Mean for 3 Valid Peaks = 3.647E+02+/- 6.497E+01 ( 17.82%)

Nuclide Type: NATURAL

| Nuclide | Energy | %Abn  | %Eff      | Uncorrected<br>pCi/filter | Decay Corr<br>pCi/filter | 2-Sigma<br>%Error | Status |
|---------|--------|-------|-----------|---------------------------|--------------------------|-------------------|--------|
| TH-234  | 63.29  | 3.80* | 2.648E+01 | 7.366E+02                 | 7.366E+02                | 19.65             | OK     |

Final Mean for 1 Valid Peaks = 7.366E+02+/- 1.447E+02 ( 19.65%)

Flag: "\*" = Keyline

---- Identified Nuclides ----

| Nuclide | Activity<br>(pCi/filter) | Act error | MDA<br>(pCi/filter) | MDA error | Act/MDA |
|---------|--------------------------|-----------|---------------------|-----------|---------|
| BA-133  | 3.647E+02                | 6.497E+01 | 2.298E+01           | 3.515E+00 | 15.868  |
| TH-234  | 7.366E+02                | 1.447E+02 | 1.544E+02           | 8.295E+00 | 4.769   |

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

| Nuclide | Key-Line<br>Activity K.L.<br>(pCi/filter) Ided | Act error | MDA<br>(pCi/filter) | MDA error | Act/MDA |
|---------|--|-----------|---------------------|-----------|---------|
| CO-57   | -1.815E+00                                     | 6.411E+00 | 1.079E+01           | 1.233E+00 | -0.168  |
| CD-109  | -4.389E+01                                     | 1.236E+02 | 1.905E+02           | 1.570E+01 | -0.230  |
| PA-231  | 5.828E-01                                      | 1.412E+00 | 2.647E+00           | 3.765E-02 | 0.220   |
| PA-234  | 2.995E+00                                      | 1.548E+00 | 2.832E+00           | 4.027E-02 | 1.058   |
| NP-237  | 1.250E+01                                      | 3.400E+01 | 5.664E+01           | 4.579E+00 | 0.221   |
| AM-241  | 3.031E+01                                      | 1.124E+01 | 2.052E+01           | 1.009E+00 | 1.477   |

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Configuration : DKA100: [GAMMA.SCUSR.ARCHIVE] SMP\_130410518\_GE5\_BAFIL\_191159.CN  
 Analyses by : PEAK V16.9 PEAKEFF V2.2  
 Client ID : D-93 TOT  
 Deposition Date :  
 Sample Date : 1-MAY-2013 00:00:00. Acquisition date : 1-MAY-2013 10:08:21.  
 Sample ID : 1304105-18 Sample Quantity : 1.00000E+00 filter  
 Sample type : FILTER Sample Geometry : 0  
 Detector name : GE5 Detector Geometry: BAFIL  
 Elapsed live time: 0 00:15:00.00 Elapsed real time: 0 00:15:01.12 0.1%  
 Start channel : 25 End channel : 4096  
 Sensitivity : 3.00000 Gaussian : 10.00000  
 Critical level : No

| Pk | It | Energy | Area | Bkgnd | FWHM | Channel | Left | Pw | Cts/Sec  | %Err  | Fit      |
|----|----|--------|------|-------|------|---------|------|----|----------|-------|----------|
| 1  | 0  | 21.09  | 94   | 24    | 0.81 | 207.76  | 197  | 18 | 1.05E-01 | 15.7  |          |
| 2  | 4  | 29.66  | 23   | 62    | 0.54 | 290.00  | 281  | 38 | 2.51E-02 | 74.6  | 1.17E+00 |
| 3  | 4  | 31.06  | 1880 | 49    | 0.77 | 303.38  | 281  | 38 | 2.09E+00 | 2.5   |          |
| 4  | 5  | 35.15  | 356  | 40    | 0.72 | 342.71  | 333  | 28 | 3.95E-01 | 7.1   | 1.89E+00 |
| 5  | 5  | 36.11  | 104  | 30    | 0.69 | 351.86  | 333  | 28 | 1.16E-01 | 21.3  |          |
| 6  | 0  | 39.45  | 10   | 8     | 1.33 | 383.90  | 373  | 16 | 1.11E-02 | 70.7  |          |
| 7  | 0  | 53.40  | 43   | 35    | 0.36 | 517.84  | 502  | 23 | 4.75E-02 | 33.9  |          |
| 8  | 0  | 62.03  | 225  | 43    | 0.91 | 600.56  | 588  | 34 | 2.50E-01 | 9.9   |          |
| 9  | 6  | 66.00  | 118  | 11    | 0.95 | 638.69  | 629  | 28 | 1.32E-01 | 11.2  | 1.45E+00 |
| 10 | 6  | 66.68  | 21   | 8     | 0.35 | 645.26  | 629  | 28 | 2.33E-02 | 43.5  |          |
| 11 | 6  | 67.41  | 15   | 10    | 0.62 | 652.22  | 629  | 28 | 1.67E-02 | 39.5  |          |
| 12 | 3  | 79.73  | 48   | 23    | 0.92 | 770.40  | 759  | 35 | 5.33E-02 | 34.1  | 1.33E+00 |
| 13 | 3  | 81.19  | 732  | 20    | 0.70 | 784.48  | 759  | 35 | 8.14E-01 | 3.9   |          |
| 14 | 0  | 92.75  | 14   | 9     | 1.22 | 895.38  | 884  | 18 | 1.56E-02 | 50.5  |          |
| 15 | 1  | 111.78 | 134  | 34    | 0.77 | 1078.00 | 1069 | 22 | 1.49E-01 | 13.2  | 4.43E+00 |
| 16 | 1  | 112.41 | 88   | 16    | 0.77 | 1084.00 | 1069 | 22 | 9.83E-02 | 17.9  |          |
| 17 | 1  | 115.95 | 28   | 10    | 0.77 | 1118.00 | 1105 | 32 | 3.13E-02 | 36.4  | 7.86E-01 |
| 18 | 1  | 116.47 | 27   | 12    | 0.77 | 1123.00 | 1105 | 32 | 3.00E-02 | 38.4  |          |
| 19 | 0  | 143.13 | 5    | 8     | 0.48 | 1378.80 | 1368 | 12 | 5.56E-03 | 107.7 |          |
| 20 | 0  | 151.21 | 14   | 11    | 0.10 | 1456.34 | 1440 | 22 | 1.53E-02 | 54.0  |          |
| 21 | 1  | 276.33 | 35   | 11    | 1.03 | 2657.00 | 2643 | 28 | 3.87E-02 | 28.4  | 1.10E+00 |
| 22 | 1  | 276.96 | 37   | 5     | 1.03 | 2663.00 | 2643 | 28 | 4.08E-02 | 22.1  |          |
| 23 | 1  | 302.60 | 93   | 11    | 1.06 | 2909.00 | 2898 | 25 | 1.04E-01 | 12.2  | 6.51E+00 |
| 24 | 1  | 303.32 | 70   | 3     | 1.06 | 2916.00 | 2898 | 25 | 7.81E-02 | 13.3  |          |
| 25 | 0  | 333.74 | 49   | 0     | 1.30 | 3207.90 | 3192 | 26 | 5.44E-02 | 14.3  |          |
| 26 | 0  | 356.19 | 376  | 8     | 0.88 | 3423.31 | 3407 | 29 | 4.18E-01 | 5.4   |          |
| 27 | 1  | 383.78 | 81   | 2     | 1.16 | 3688.00 | 3676 | 25 | 9.04E-02 | 10.7  | 4.16E-01 |
| 28 | 1  | 384.19 | 12   | 2     | 1.16 | 3692.00 | 3676 | 25 | 1.31E-02 | 73.9  |          |
| 29 | 0  | 386.95 | 114  | 18    | 0.78 | 3718.44 | 3704 | 27 | 1.27E-01 | 11.8  |          |
| 30 | 6  | 391.08 | 35   | 5     | 1.28 | 3758.08 | 3746 | 24 | 3.93E-02 | 20.3  | 7.96E-01 |
| 31 | 6  | 392.02 | 12   | 0     | 0.62 | 3767.06 | 3746 | 24 | 1.34E-02 | 24.5  |          |

Total number of lines in spectrum 31  
 Number of unidentified lines 25  
 Number of lines tentatively identified by NID 6 19.35%

Nuclide Type : FISSION

| Nuclide          | Hlife  | Decay | Wtd Mean                  |                          | Decay Corr<br>2-Sigma Error | 2-Sigma<br>%Error | Flags |
|------------------|--------|-------|---------------------------|--------------------------|-----------------------------|-------------------|-------|
|                  |        |       | Uncorrected<br>pCi/filter | Decay Corr<br>pCi/filter |                             |                   |       |
| BA-133           | 10.50Y | 1.00  | 3.697E+02                 | 3.697E+02                | 0.634E+02                   | 17.14             |       |
| Total Activity : |        |       | 3.697E+02                 | 3.697E+02                |                             |                   |       |

Nuclide Type : NATURAL

| Nuclide          | Hlife     | Decay | Wtd Mean                  |                          | Decay Corr<br>2-Sigma Error | 2-Sigma<br>%Error | Flags |
|------------------|-----------|-------|---------------------------|--------------------------|-----------------------------|-------------------|-------|
|                  |           |       | Uncorrected<br>pCi/filter | Decay Corr<br>pCi/filter |                             |                   |       |
| TH-234           | 4.47E+09Y | 1.00  | 2.030E+02                 | 2.030E+02                | 0.410E+02                   | 20.20             |       |
| Total Activity : |           |       | 2.030E+02                 | 2.030E+02                |                             |                   |       |

Grand Total Activity : 5.726E+02 5.727E+02

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

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

Nuclide Type: FISSION

| Nuclide | Energy | %Abn   | %Eff      | Uncorrected<br>pCi/filter | Decay Corr<br>pCi/filter | 2-Sigma<br>%Error | Status |
|---------|--------|--------|-----------|---------------------------|--------------------------|-------------------|--------|
| BA-133  | 81.00  | 33.00* | 1.802E+01 | 3.697E+02                 | 3.697E+02                | 17.14             | OK     |
|         | 302.84 | 17.80  | 2.575E+00 | 6.124E+02                 | 6.125E+02                | 35.89             | OK     |
|         | 356.01 | 60.00  | 4.312E+00 | 4.369E+02                 | 4.370E+02                | 18.02             | OK     |

Final Mean for 3 Valid Peaks = 3.697E+02+/- 6.337E+01 ( 17.14%)

Nuclide Type: NATURAL

| Nuclide | Energy | %Abn  | %Eff      | Uncorrected<br>pCi/filter | Decay Corr<br>pCi/filter | 2-Sigma<br>%Error | Status |
|---------|--------|-------|-----------|---------------------------|--------------------------|-------------------|--------|
| TH-234  | 63.29  | 3.80* | 8.750E+01 | 2.030E+02                 | 2.030E+02                | 20.20             | OK     |

Final Mean for 1 Valid Peaks = 2.030E+02+/- 4.100E+01 ( 20.20%)

Flag: "\*" = Keyline

---- Identified Nuclides ----

| Nuclide | Activity<br>(pCi/filter) | Act error | MDA<br>(pCi/filter) | MDA error | Act/MDA |
|---------|--------------------------|-----------|---------------------|-----------|---------|
| BA-133  | 3.697E+02                | 6.337E+01 | 1.381E+01           | 2.033E+00 | 26.771  |
| TH-234  | 2.030E+02                | 4.100E+01 | 2.626E+01           | 3.379E-01 | 7.729   |

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

| Nuclide | Key-Line<br>Activity<br>(pCi/filter) | K.L.<br>Ided | Act error | MDA<br>(pCi/filter) | MDA error | Act/MDA |
|---------|--------------------------------------|--------------|-----------|---------------------|-----------|---------|
| CO-57   | 3.663E+00                            |              | 1.402E+01 | 2.691E+01           | 9.123E+00 | 0.136   |
| CD-109  | -4.130E+01                           |              | 8.630E+01 | 1.479E+02           | 1.424E+01 | -0.279  |
| PA-231  | -4.152E-02                           |              | 8.336E-01 | 1.534E+00           | 1.727E-02 | -0.027  |
| PA-234  | 4.361E+00                            | +            | 1.382E+00 | 2.028E+00           | 2.283E-02 | 2.150   |
| NP-237  | 3.819E+00                            |              | 2.428E+01 | 4.577E+01           | 4.037E+00 | 0.083   |
| AM-241  | 1.210E+00                            |              | 1.523E+00 | 2.638E+00           | 2.970E-02 | 0.458   |

Configuration : DKA100: [GAMMA.SCUSR.ARCHIVE] SMP\_130410519\_GE5\_BAFIL\_191161.CN  
 Analyses by : PEAK V16.9 PEAKEFF V2.2  
 Client ID : D-93 DIS  
 Deposition Date :  
 Sample Date : 1-MAY-2013 00:00:00. Acquisition date : 1-MAY-2013 10:25:44.  
 Sample ID : 1304105-19 Sample Quantity : 1.00000E+00 filter  
 Sample type : FILTER Sample Geometry : 0  
 Detector name : GE5 Detector Geometry: BAFIL  
 Elapsed live time: 0 00:15:00.00 Elapsed real time: 0 00:15:01.17 0.1%  
 Start channel : 25 End channel : 4096  
 Sensitivity : 3.00000 Gaussian : 10.00000  
 Critical level : No

| Pk | It | Energy | Area | Bkgnd | FWHM | Channel | Left | Pw | Cts/Sec  | %Err  | Fit      |
|----|----|--------|------|-------|------|---------|------|----|----------|-------|----------|
| 1  | 0  | 21.23  | 82   | 46    | 0.74 | 209.12  | 198  | 20 | 9.07E-02 | 23.8  |          |
| 2  | 0  | 31.04  | 2131 | 78    | 0.67 | 303.24  | 292  | 25 | 2.37E+00 | 2.4   |          |
| 3  | 0  | 35.40  | 539  | 49    | 0.64 | 345.03  | 331  | 30 | 5.99E-01 | 5.8   |          |
| 4  | 0  | 49.32  | 10   | 9     | 0.79 | 478.60  | 469  | 15 | 1.08E-02 | 80.8  |          |
| 5  | 0  | 53.38  | 48   | 11    | 0.62 | 517.57  | 509  | 16 | 5.29E-02 | 21.7  |          |
| 6  | 0  | 56.28  | 24   | 11    | 0.18 | 545.41  | 537  | 16 | 2.70E-02 | 32.7  |          |
| 7  | 1  | 61.45  | 115  | 5     | 0.65 | 595.00  | 588  | 25 | 1.28E-01 | 13.0  | 3.31E+00 |
| 8  | 1  | 62.28  | 135  | 6     | 0.65 | 603.00  | 588  | 25 | 1.50E-01 | 12.1  |          |
| 9  | 0  | 66.20  | 128  | 39    | 0.67 | 640.64  | 626  | 29 | 1.43E-01 | 14.7  |          |
| 10 | 1  | 79.73  | 42   | 12    | 0.76 | 770.42  | 761  | 33 | 4.72E-02 | 24.0  | 7.66E-01 |
| 11 | 1  | 81.20  | 838  | 12    | 0.69 | 784.59  | 761  | 33 | 9.31E-01 | 3.5   |          |
| 12 | 0  | 112.02 | 226  | 23    | 0.69 | 1080.31 | 1071 | 24 | 2.51E-01 | 8.4   |          |
| 13 | 0  | 194.28 | 6    | 10    | 0.19 | 1869.67 | 1857 | 16 | 6.42E-03 | 103.8 |          |
| 14 | 1  | 276.02 | 13   | 5     | 1.03 | 2654.00 | 2645 | 24 | 1.39E-02 | 58.1  | 6.47E-01 |
| 15 | 1  | 276.65 | 45   | 5     | 1.03 | 2660.00 | 2645 | 24 | 5.02E-02 | 17.3  |          |
| 16 | 1  | 302.80 | 123  | 3     | 1.06 | 2911.00 | 2898 | 26 | 1.37E-01 | 9.3   | 2.38E+00 |
| 17 | 1  | 303.43 | 11   | 0     | 1.06 | 2917.00 | 2898 | 26 | 1.20E-02 | 87.1  |          |
| 18 | 0  | 307.15 | 30   | 6     | 0.56 | 2952.74 | 2938 | 25 | 3.32E-02 | 24.8  |          |
| 19 | 0  | 333.75 | 60   | 6     | 0.37 | 3207.92 | 3191 | 28 | 6.71E-02 | 15.0  |          |
| 20 | 0  | 356.19 | 399  | 3     | 0.98 | 3423.32 | 3406 | 31 | 4.43E-01 | 5.1   |          |
| 21 | 1  | 383.36 | 12   | 3     | 1.16 | 3684.00 | 3673 | 30 | 1.31E-02 | 77.1  | 2.65E+00 |
| 22 | 1  | 383.99 | 102  | 8     | 1.16 | 3690.00 | 3673 | 30 | 1.13E-01 | 10.1  |          |
| 23 | 0  | 387.08 | 143  | 26    | 0.71 | 3719.67 | 3703 | 28 | 1.59E-01 | 10.8  |          |

Total number of lines in spectrum 23  
 Number of unidentified lines 17  
 Number of lines tentatively identified by NID 6 26.09%

Nuclide Type : FISSION

| Nuclide          | Hlife  | Decay | Wtd Mean               | Wtd Mean              | Decay Corr | 2-Sigma Error | 2-Sigma | Flags |
|------------------|--------|-------|------------------------|-----------------------|------------|---------------|---------|-------|
|                  |        |       | Uncorrected pCi/filter | Decay Corr pCi/filter |            |               |         |       |
| BA-133           | 10.50Y | 1.00  | 4.230E+02              | 4.231E+02             | 0.712E+02  | 16.83         |         |       |
| Total Activity : |        |       | 4.230E+02              | 4.231E+02             |            |               |         |       |

Nuclide Type : NATURAL

| Nuclide          | Hlife     | Decay | Wtd Mean               | Wtd Mean              | Decay Corr | 2-Sigma Error | 2-Sigma | Flags |
|------------------|-----------|-------|------------------------|-----------------------|------------|---------------|---------|-------|
|                  |           |       | Uncorrected pCi/filter | Decay Corr pCi/filter |            |               |         |       |
| TH-234           | 4.47E+09Y | 1.00  | 1.222E+02              | 1.222E+02             | 0.299E+02  | 24.48         |         |       |
| AM-241           | 432.20Y   | 1.00  | 9.606E+00              | 9.606E+00             | 2.522E+00  | 26.25         |         |       |
| Total Activity : |           |       | 1.318E+02              | 1.318E+02             |            |               |         |       |

Grand Total Activity : 5.548E+02 5.548E+02

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

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



Nuclide Type: FISSION

| Nuclide | Energy | %Abn   | %Eff      | Uncorrected pCi/filter | Decay Corr pCi/filter | 2-Sigma %Error | Status |
|---------|--------|--------|-----------|------------------------|-----------------------|----------------|--------|
| BA-133  | 81.00  | 33.00* | 1.802E+01 | 4.230E+02              | 4.231E+02             | 16.83          | OK     |
|         | 302.84 | 17.80  | 2.575E+00 | 8.076E+02              | 8.076E+02             | 32.33          | OK     |
|         | 356.01 | 60.00  | 4.312E+00 | 4.626E+02              | 4.627E+02             | 17.69          | OK     |

Final Mean for 3 Valid Peaks = 4.231E+02 +/- 7.118E+01 ( 16.83%)

Nuclide Type: NATURAL

| Nuclide | Energy | %Abn  | %Eff      | Uncorrected pCi/filter | Decay Corr pCi/filter | 2-Sigma %Error | Status |
|---------|--------|-------|-----------|------------------------|-----------------------|----------------|--------|
| TH-234  | 63.29  | 3.80* | 8.750E+01 | 1.222E+02              | 1.222E+02             | 24.48          | OK     |

Final Mean for 1 Valid Peaks = 1.222E+02 +/- 2.991E+01 ( 24.48%)

|        |       |        |           |           |           |       |    |
|--------|-------|--------|-----------|-----------|-----------|-------|----|
| AM-241 | 59.54 | 35.90* | 1.000E+02 | 9.606E+00 | 9.606E+00 | 26.25 | OK |
|--------|-------|--------|-----------|-----------|-----------|-------|----|

Final Mean for 1 Valid Peaks = 9.606E+00 +/- 2.522E+00 ( 26.25%)

Flag: "\*" = Keyline

---- Identified Nuclides ----

| Nuclide | Activity<br>(pCi/filter) | Act error | MDA<br>(pCi/filter) | MDA error | Act/MDA |
|---------|--------------------------|-----------|---------------------|-----------|---------|
| BA-133  | 4.231E+02                | 7.118E+01 | 1.016E+01           | 1.497E+00 | 41.622  |
| TH-234  | 1.222E+02                | 2.991E+01 | 2.651E+01           | 3.410E-01 | 4.608   |
| AM-241  | 9.606E+00                | 2.522E+00 | 1.812E+00           | 2.039E-02 | 5.302   |

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

| Nuclide | Key-Line<br>Activity<br>(pCi/filter) | K.L.<br>Ided | Act error | MDA<br>(pCi/filter) | MDA error | Act/MDA |
|---------|--------------------------------------|--------------|-----------|---------------------|-----------|---------|
| CO-57   | 1.702E+00                            |              | 1.405E+01 | 2.650E+01           | 8.985E+00 | 0.064   |
| CD-109  | 4.169E+01                            |              | 9.022E+01 | 1.766E+02           | 1.699E+01 | 0.236   |
| PA-231  | 6.541E-01                            |              | 8.472E-01 | 1.745E+00           | 1.964E-02 | 0.375   |
| PA-234  | 3.778E+00                            | +            | 1.806E+00 | 2.032E+00           | 2.288E-02 | 1.859   |
| NP-237  | 1.041E+01                            |              | 2.699E+01 | 5.157E+01           | 4.549E+00 | 0.202   |