Environment Testing
TestAmerica

# ANALYTICAL REPORT

Job Number: 180-93098-1

Job Description: JSF_STR_20190718_3B

For:
Environmental Standards Inc.
1140 Valley Forge Road
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Attention: Amanda Cover

Approved for release.
Jennifer L Rumble
Project Manager I
9/13/2019 4:24 PM

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09/13/2019

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# Definitions/Glossary

Client: Environmental Standards Inc.
Project/Site: JSF_STR_20190718_3B

Job ID: 180-93098-1

## Qualifiers

### Rad

| Qualifier | Qualifier Description |
|---|---|
| U | Result is less than the sample detection limit. |

## Glossary

| Abbreviation | These commonly used abbreviations may or may not be present in this report. |
|---|---|
| ¤ | Listed under the "D" column to designate that the result is reported on a dry weight basis |
| %R | Percent Recovery |
| CFL | Contains Free Liquid |
| CNF | Contains No Free Liquid |
| DER | Duplicate Error Ratio (normalized absolute difference) |
| Dil Fac | Dilution Factor |
| DL | Detection Limit (DoD/DOE) |
| DL, RA, RE, IN | Indicates a Dilution, Re-analysis, Re-extraction, or additional Initial metals/anion analysis of the sample |
| DLC | Decision Level Concentration (Radiochemistry) |
| EDL | Estimated Detection Limit (Dioxin) |
| LOD | Limit of Detection (DoD/DOE) |
| LOQ | Limit of Quantitation (DoD/DOE) |
| MDA | Minimum Detectable Activity (Radiochemistry) |
| MDC | Minimum Detectable Concentration (Radiochemistry) |
| MDL | Method Detection Limit |
| ML | Minimum Level (Dioxin) |
| NC | Not Calculated |
| ND | Not Detected at the reporting limit (or MDL or EDL if shown) |
| PQL | Practical Quantitation Limit |
| QC | Quality Control |
| RER | Relative Error Ratio (Radiochemistry) |
| RL | Reporting Limit or Requested Limit (Radiochemistry) |
| RPD | Relative Percent Difference, a measure of the relative difference between two points |
| TEF | Toxicity Equivalent Factor (Dioxin) |
| TEQ | Toxicity Equivalent Quotient (Dioxin) |

**Job Narrative**
**180-93098-1**

**Receipt**
The samples were received on 7/23/2019 9:20 AM; the samples arrived in good condition, properly preserved and on ice. The temperature of the cooler at receipt was 0.6º C.

**RAD**
Method 903.0: Ra-226 Prep Batch 160-436764
Any minimum detectable concentration (MDC), critical value (DLC), or Safe Drinking Water Act detection limit (SDWA DL) is sample-specific unless otherwise stated elsewhere in this narrative.

Radiochemistry sample results are reported with the count date/time applied as the Activity Reference Date.
JSF-STR-PB09-CC-SUR-20190718 ~ STR-PB09 (180-93098-1), JSF-STR-PB08-CC-SUR-20190718 ~ STR-PB08 (180-93098-2), JSF-STR-PB07-CC-SUR-20190718 ~ STR-PB07 (180-93098-3), JSF-STR-PB06-CC-SUR-20190718 ~ STR-PB06 (180-93098-4), (LCS 160-436764/1-A), (MB 160-436764/18-A), (180-93047-A-9-A) and (180-93047-C-9-A DU)

Method 904.0: Ra-228 Prep Batch 160-436768
Any minimum detectable concentration (MDC), critical value (DLC), or Safe Drinking Water Act detection limit (SDWA DL) is sample-specific unless otherwise stated elsewhere in this narrative.

Radiochemistry sample results are reported with the count date/time applied as the Activity Reference Date.
JSF-STR-PB09-CC-SUR-20190718 ~ STR-PB09 (180-93098-1), JSF-STR-PB08-CC-SUR-20190718 ~ STR-PB08 (180-93098-2), JSF-STR-PB07-CC-SUR-20190718 ~ STR-PB07 (180-93098-3), JSF-STR-PB06-CC-SUR-20190718 ~ STR-PB06 (180-93098-4), (LCS 160-436768/1-A), (MB 160-436768/18-A), (180-93047-A-9-B) and (180-93047-C-9-B DU)

No additional analytical or quality issues were noted, other than those described above or in the Definitions/Glossary page.

# Detection Summary

Client: Environmental Standards Inc.
Project/Site: JSF_STR_20190718_3B

Job ID: 180-93098-1

## Client Sample ID: JSF-STR-PB09-CC-SUR-20190718 ~ STR-PB09 — Lab Sample ID: 180-93098-1

No Detections.

## Client Sample ID: JSF-STR-PB08-CC-SUR-20190718 ~ STR-PB08 — Lab Sample ID: 180-93098-2

No Detections.

## Client Sample ID: JSF-STR-PB07-CC-SUR-20190718 ~ STR-PB07 — Lab Sample ID: 180-93098-3

No Detections.

## Client Sample ID: JSF-STR-PB06-CC-SUR-20190718 ~ STR-PB06 — Lab Sample ID: 180-93098-4

No Detections.

This Detection Summary does not include radiochemical test results.

# Client Sample Results

Client: Environmental Standards Inc.
Project/Site: JSF_STR_20190718_3B

Job ID: 180-93098-1

## Method: 903.0 - Radium-226 (GFPC)

**Client Sample ID: JSF-STR-PB09-CC-SUR-20190718 ~ STR-PB09**
**Date Collected: 07/18/19 13:45**
**Date Received: 07/23/19 09:20**

**Lab Sample ID: 180-93098-1**
**Matrix: Water**

| Analyte | Result | Qualifier | Count Uncert. (2σ+/-) | Total Uncert. (2σ+/-) | RL | MDC | Unit | Prepared | Analyzed | Dil Fac |
|---|---|---|---|---|---|---|---|---|---|---|
| Radium-226 | 0.160 | U | 0.184 | 0.184 | 1.00 | 0.298 | pCi/L | 07/26/19 13:33 | 08/31/19 17:52 | 1 |

| *Carrier* | *%Yield* | *Qualifier* | *Limits* | *Prepared* | *Analyzed* | *Dil Fac* |
|---|---|---|---|---|---|---|
| *Ba Carrier* | *74.3* | | *40 - 110* | *07/26/19 13:33* | *08/31/19 17:52* | *1* |

# Client Sample Results

Client: Environmental Standards Inc.
Project/Site: JSF_STR_20190718_3B

Job ID: 180-93098-1

## Method: 903.0 - Radium-226 (GFPC)

**Client Sample ID: JSF-STR-PB08-CC-SUR-20190718 ~ STR-PB08**
**Date Collected: 07/18/19 14:35**
**Date Received: 07/23/19 09:20**

**Lab Sample ID: 180-93098-2**
**Matrix: Water**

| Analyte | Result | Qualifier | Count Uncert. (2σ+/-) | Total Uncert. (2σ+/-) | RL | MDC | Unit | Prepared | Analyzed | Dil Fac |
|---|---|---|---|---|---|---|---|---|---|---|
| Radium-226 | -0.0419 | U | 0.0563 | 0.0564 | 1.00 | 0.138 | pCi/L | 07/26/19 13:33 | 09/08/19 19:00 | 1 |

| *Carrier* | *%Yield* | *Qualifier* | *Limits* | *Prepared* | *Analyzed* | *Dil Fac* |
|---|---|---|---|---|---|---|
| *Ba Carrier* | *80.8* | | *40 - 110* | *07/26/19 13:33* | *09/08/19 19:00* | *1* |

# Client Sample Results

Client: Environmental Standards Inc.
Project/Site: JSF_STR_20190718_3B

Job ID: 180-93098-1

## Method: 903.0 - Radium-226 (GFPC)

**Client Sample ID: JSF-STR-PB07-CC-SUR-20190718 ~ STR-PB07**
**Date Collected: 07/18/19 15:05**
**Date Received: 07/23/19 09:20**

**Lab Sample ID: 180-93098-3**
**Matrix: Water**

| Analyte | Result | Qualifier | Count Uncert. (2σ+/-) | Total Uncert. (2σ+/-) | RL | MDC | Unit | Prepared | Analyzed | Dil Fac |
|---|---|---|---|---|---|---|---|---|---|---|
| Radium-226 | -0.122 | U | 0.158 | 0.158 | 1.00 | 0.377 | pCi/L | 07/26/19 13:33 | 08/31/19 18:55 | 1 |

| *Carrier* | *%Yield* | *Qualifier* | *Limits* | *Prepared* | *Analyzed* | *Dil Fac* |
|---|---|---|---|---|---|---|
| *Ba Carrier* | *60.2* | | *40 - 110* | *07/26/19 13:33* | *08/31/19 18:55* | *1* |

# Client Sample Results

Client: Environmental Standards Inc.
Project/Site: JSF_STR_20190718_3B

Job ID: 180-93098-1

## Method: 903.0 - Radium-226 (GFPC)

**Client Sample ID: JSF-STR-PB06-CC-SUR-20190718 ~ STR-PB06**
**Date Collected: 07/18/19 15:45**
**Date Received: 07/23/19 09:20**

**Lab Sample ID: 180-93098-4**
**Matrix: Water**

| Analyte | Result | Qualifier | Count Uncert. (2σ+/-) | Total Uncert. (2σ+/-) | RL | MDC | Unit | Prepared | Analyzed | Dil Fac |
|---|---|---|---|---|---|---|---|---|---|---|
| Radium-226 | -0.0112 | U | 0.0652 | 0.0652 | 1.00 | 0.136 | pCi/L | 07/26/19 13:33 | 09/08/19 19:00 | 1 |

| *Carrier* | *%Yield* | *Qualifier* | *Limits* | *Prepared* | *Analyzed* | *Dil Fac* |
|---|---|---|---|---|---|---|
| *Ba Carrier* | *78.8* | | *40 - 110* | *07/26/19 13:33* | *09/08/19 19:00* | *1* |

# Client Sample Results

Client: Environmental Standards Inc.
Project/Site: JSF_STR_20190718_3B

Job ID: 180-93098-1

## Method: 904.0 - Radium-228 (GFPC)

**Client Sample ID: JSF-STR-PB09-CC-SUR-20190718 ~ STR-PB09**
**Date Collected: 07/18/19 13:45**
**Date Received: 07/23/19 09:20**

**Lab Sample ID: 180-93098-1**
**Matrix: Water**

| Analyte | Result | Qualifier | Count Uncert. (2σ+/-) | Total Uncert. (2σ+/-) | RL | MDC | Unit | Prepared | Analyzed | Dil Fac |
|---|---|---|---|---|---|---|---|---|---|---|
| Radium-228 | 0.217 | U | 0.327 | 0.327 | 1.00 | 0.548 | pCi/L | 07/26/19 14:09 | 08/30/19 14:47 | 1 |

| *Carrier* | *%Yield* | *Qualifier* | *Limits* | *Prepared* | *Analyzed* | *Dil Fac* |
|---|---|---|---|---|---|---|
| *Ba Carrier* | *74.3* | | *40 - 110* | *07/26/19 14:09* | *08/30/19 14:47* | *1* |
| *Y Carrier* | *89.7* | | *40 - 110* | *07/26/19 14:09* | *08/30/19 14:47* | *1* |

# Client Sample Results

Client: Environmental Standards Inc.
Project/Site: JSF_STR_20190718_3B

Job ID: 180-93098-1

## Method: 904.0 - Radium-228 (GFPC)

**Client Sample ID: JSF-STR-PB08-CC-SUR-20190718 ~ STR-PB08**
**Date Collected: 07/18/19 14:35**
**Date Received: 07/23/19 09:20**

**Lab Sample ID: 180-93098-2**
**Matrix: Water**

| Analyte | Result | Qualifier | Count Uncert. (2σ+/-) | Total Uncert. (2σ+/-) | RL | MDC | Unit | Prepared | Analyzed | Dil Fac |
|---|---|---|---|---|---|---|---|---|---|---|
| Radium-228 | 0.310 | U | 0.272 | 0.273 | 1.00 | 0.434 | pCi/L | 07/26/19 14:09 | 08/30/19 14:44 | 1 |

| *Carrier* | *%Yield* | *Qualifier* | *Limits* | *Prepared* | *Analyzed* | *Dil Fac* |
|---|---|---|---|---|---|---|
| *Ba Carrier* | *80.8* | | *40 - 110* | *07/26/19 14:09* | *08/30/19 14:44* | *1* |
| *Y Carrier* | *91.6* | | *40 - 110* | *07/26/19 14:09* | *08/30/19 14:44* | *1* |

# Client Sample Results

Client: Environmental Standards Inc.
Project/Site: JSF_STR_20190718_3B

Job ID: 180-93098-1

## Method: 904.0 - Radium-228 (GFPC)

**Client Sample ID: JSF-STR-PB07-CC-SUR-20190718 ~ STR-PB07**
**Date Collected: 07/18/19 15:05**
**Date Received: 07/23/19 09:20**

**Lab Sample ID: 180-93098-3**
**Matrix: Water**

| Analyte | Result | Qualifier | Count Uncert. (2σ+/-) | Total Uncert. (2σ+/-) | RL | MDC | Unit | Prepared | Analyzed | Dil Fac |
|---|---|---|---|---|---|---|---|---|---|---|
| Radium-228 | 0.224 | U | 0.382 | 0.383 | 1.00 | 0.646 | pCi/L | 07/26/19 14:09 | 08/30/19 14:44 | 1 |

| *Carrier* | *%Yield* | *Qualifier* | *Limits* | *Prepared* | *Analyzed* | *Dil Fac* |
|---|---|---|---|---|---|---|
| *Ba Carrier* | *60.2* | | *40 - 110* | *07/26/19 14:09* | *08/30/19 14:44* | *1* |
| *Y Carrier* | *90.1* | | *40 - 110* | *07/26/19 14:09* | *08/30/19 14:44* | *1* |

# Client Sample Results

Client: Environmental Standards Inc.
Project/Site: JSF_STR_20190718_3B

Job ID: 180-93098-1

## Method: 904.0 - Radium-228 (GFPC)

**Client Sample ID: JSF-STR-PB06-CC-SUR-20190718 ~ STR-PB06**
**Date Collected: 07/18/19 15:45**
**Date Received: 07/23/19 09:20**

**Lab Sample ID: 180-93098-4**
**Matrix: Water**

| Analyte | Result | Qualifier | Count Uncert. (2σ+/-) | Total Uncert. (2σ+/-) | RL | MDC | Unit | Prepared | Analyzed | Dil Fac |
|---|---|---|---|---|---|---|---|---|---|---|
| Radium-228 | 0.0653 | U | 0.273 | 0.274 | 1.00 | 0.480 | pCi/L | 07/26/19 14:09 | 08/30/19 14:44 | 1 |

| *Carrier* | *%Yield* | *Qualifier* | *Limits* | *Prepared* | *Analyzed* | *Dil Fac* |
|---|---|---|---|---|---|---|
| *Ba Carrier* | *78.8* | | *40 - 110* | *07/26/19 14:09* | *08/30/19 14:44* | *1* |
| *Y Carrier* | *90.5* | | *40 - 110* | *07/26/19 14:09* | *08/30/19 14:44* | *1* |

# Client Sample Results

Client: Environmental Standards Inc.
Project/Site: JSF_STR_20190718_3B

Job ID: 180-93098-1

## Method: Ra226_Ra228 Pos - Combined Radium-226 and Radium-228

**Client Sample ID: JSF-STR-PB09-CC-SUR-20190718 ~ STR-PB09**
**Date Collected: 07/18/19 13:45**
**Date Received: 07/23/19 09:20**

**Lab Sample ID: 180-93098-1**
**Matrix: Water**

| Analyte | Result | Qualifier | Count Uncert. (2σ+/-) | Total Uncert. (2σ+/-) | RL | MDC | Unit | Prepared | Analyzed | Dil Fac |
|---|---|---|---|---|---|---|---|---|---|---|
| Radium 226 and 228 | 0.376 | U | 0.375 | 0.375 | 5.00 | | pCi/L | | 09/13/19 14:36 | 1 |

# Client Sample Results

Client: Environmental Standards Inc.
Project/Site: JSF_STR_20190718_3B

Job ID: 180-93098-1

## Method: Ra226_Ra228 Pos - Combined Radium-226 and Radium-228

**Client Sample ID: JSF-STR-PB08-CC-SUR-20190718 ~ STR-PB08**
**Date Collected: 07/18/19 14:35**
**Date Received: 07/23/19 09:20**

**Lab Sample ID: 180-93098-2**
**Matrix: Water**

| Analyte | Result | Qualifier | Count Uncert. (2σ+/-) | Total Uncert. (2σ+/-) | RL | MDC | Unit | Prepared | Analyzed | Dil Fac |
|---|---|---|---|---|---|---|---|---|---|---|
| Radium 226 and 228 | 0.310 | U | 0.278 | 0.279 | 5.00 | | pCi/L | | 09/13/19 14:36 | 1 |

# Client Sample Results

Client: Environmental Standards Inc.
Project/Site: JSF_STR_20190718_3B

Job ID: 180-93098-1

## Method: Ra226_Ra228 Pos - Combined Radium-226 and Radium-228

**Client Sample ID: JSF-STR-PB07-CC-SUR-20190718 ~ STR-PB07**
**Date Collected: 07/18/19 15:05**
**Date Received: 07/23/19 09:20**

**Lab Sample ID: 180-93098-3**
**Matrix: Water**

| Analyte | Result | Qualifier | Count Uncert. (2σ+/-) | Total Uncert. (2σ+/-) | RL | MDC | Unit | Prepared | Analyzed | Dil Fac |
|---|---|---|---|---|---|---|---|---|---|---|
| Radium 226 and 228 | 0.224 | U | 0.413 | 0.414 | 5.00 | | pCi/L | | 09/13/19 14:36 | 1 |

# Client Sample Results

Client: Environmental Standards Inc.
Project/Site: JSF_STR_20190718_3B

Job ID: 180-93098-1

## Method: Ra226_Ra228 Pos - Combined Radium-226 and Radium-228

**Client Sample ID: JSF-STR-PB06-CC-SUR-20190718 ~ STR-PB06**
**Date Collected: 07/18/19 15:45**
**Date Received: 07/23/19 09:20**

**Lab Sample ID: 180-93098-4**
**Matrix: Water**

| Analyte | Result | Qualifier | Count Uncert. (2σ+/-) | Total Uncert. (2σ+/-) | RL | MDC | Unit | Prepared | Analyzed | Dil Fac |
|---|---|---|---|---|---|---|---|---|---|---|
| Radium 226 and 228 | 0.0653 | U | 0.281 | 0.282 | 5.00 | | pCi/L | | 09/13/19 14:36 | 1 |

# Tracer/Carrier Summary

Client: Environmental Standards Inc.
Project/Site: JSF_STR_20190718_3B

Job ID: 180-93098-1

## Method: 903.0 - Radium-226 (GFPC)

**Matrix: Water** **Prep Type: Total/NA**

| | | Percent Yield (Acceptance Limits) | | | | | | |
|---|---|---|---|---|---|---|---|---|
| Lab Sample ID | Client Sample ID | Ba Carrier (40-110) | | | | | | |
| 180-93047-C-9-A DU | Duplicate | 80.5 | | | | | | |
| 180-93098-1 | JSF-STR-PB09-CC-SUR-20190718 ~ STR-PB09 | 74.3 | | | | | | |
| 180-93098-2 | JSF-STR-PB08-CC-SUR-20190718 ~ STR-PB08 | 80.8 | | | | | | |
| 180-93098-3 | JSF-STR-PB07-CC-SUR-20190718 ~ STR-PB07 | 60.2 | | | | | | |
| 180-93098-4 | JSF-STR-PB06-CC-SUR-20190718 ~ STR-PB06 | 78.8 | | | | | | |
| LCS 160-436764/1-A | Lab Control Sample | 71.5 | | | | | | |
| MB 160-436764/18-A | Method Blank | 84.5 | | | | | | |

**Tracer/Carrier Legend**

Ba Carrier = Ba Carrier

## Method: 904.0 - Radium-228 (GFPC)

**Matrix: Water** **Prep Type: Total/NA**

| | | Percent Yield (Acceptance Limits) | | | | | | |
|---|---|---|---|---|---|---|---|---|
| Lab Sample ID | Client Sample ID | Ba Carrier (40-110) | Y Carrier (40-110) | | | | | |
| 180-93047-C-9-B DU | Duplicate | 80.5 | 81.9 | | | | | |
| 180-93098-1 | JSF-STR-PB09-CC-SUR-20190718 ~ STR-PB09 | 74.3 | 89.7 | | | | | |
| 180-93098-2 | JSF-STR-PB08-CC-SUR-20190718 ~ STR-PB08 | 80.8 | 91.6 | | | | | |
| 180-93098-3 | JSF-STR-PB07-CC-SUR-20190718 ~ STR-PB07 | 60.2 | 90.1 | | | | | |
| 180-93098-4 | JSF-STR-PB06-CC-SUR-20190718 ~ STR-PB06 | 78.8 | 90.5 | | | | | |
| LCS 160-436768/1-A | Lab Control Sample | 71.5 | 87.1 | | | | | |
| MB 160-436768/18-A | Method Blank | 84.5 | 89.3 | | | | | |

**Tracer/Carrier Legend**

Ba Carrier = Ba Carrier
Y Carrier = Y Carrier

# QC Sample Results

Client: Environmental Standards Inc.
Project/Site: JSF_STR_20190718_3B

Job ID: 180-93098-1

## Method: 903.0 - Radium-226 (GFPC)

**Lab Sample ID: MB 160-436764/18-A**
**Matrix: Water**
**Analysis Batch: 441511**

**Client Sample ID: Method Blank**
**Prep Type: Total/NA**
**Prep Batch: 436764**

| Analyte | MB Result | MB Qualifier | Count Uncert. (2σ+/-) | Total Uncert. (2σ+/-) | RL | MDC | Unit | Prepared | Analyzed | Dil Fac |
|---|---|---|---|---|---|---|---|---|---|---|
| Radium-226 | 0.03691 | U | 0.135 | 0.135 | 1.00 | 0.257 | pCi/L | 07/26/19 13:33 | 08/31/19 18:55 | 1 |

| *Carrier* | *MB %Yield* | *MB Qualifier* | *Limits* | *Prepared* | *Analyzed* | *Dil Fac* |
|---|---|---|---|---|---|---|
| *Ba Carrier* | *84.5* | | *40 - 110* | *07/26/19 13:33* | *08/31/19 18:55* | *1* |

**Lab Sample ID: LCS 160-436764/1-A**
**Matrix: Water**
**Analysis Batch: 442151**

**Client Sample ID: Lab Control Sample**
**Prep Type: Total/NA**
**Prep Batch: 436764**

| Analyte | | | Spike Added | LCS Result | LCS Qual | Total Uncert. (2σ+/-) | RL | MDC | Unit | %Rec | %Rec. Limits | | |
|---|---|---|---|---|---|---|---|---|---|---|---|---|---|
| Radium-226 | | | 11.4 | 10.21 | | 1.10 | 1.00 | 0.169 | pCi/L | 90 | 75 - 125 | | |

| *Carrier* | *LCS %Yield* | *LCS Qualifier* | *Limits* |
|---|---|---|---|
| *Ba Carrier* | *71.5* | | *40 - 110* |

**Lab Sample ID: 180-93047-C-9-A DU**
**Matrix: Water**
**Analysis Batch: 442471**

**Client Sample ID: Duplicate**
**Prep Type: Total/NA**
**Prep Batch: 436764**

| Analyte | Sample Result | Sample Qual | | DU Result | DU Qual | Total Uncert. (2σ+/-) | RL | MDC | Unit | | | RER | RER Limit |
|---|---|---|---|---|---|---|---|---|---|---|---|---|---|
| Radium-226 | -0.0357 | U | | 0.001595 | U | 0.0626 | 1.00 | 0.126 | pCi/L | | | 0.17 | 1 |

| *Carrier* | *DU %Yield* | *DU Qualifier* | *Limits* |
|---|---|---|---|
| *Ba Carrier* | *80.5* | | *40 - 110* |

## Method: 904.0 - Radium-228 (GFPC)

**Lab Sample ID: MB 160-436768/18-A**
**Matrix: Water**
**Analysis Batch: 441488**

**Client Sample ID: Method Blank**
**Prep Type: Total/NA**
**Prep Batch: 436768**

| Analyte | MB Result | MB Qualifier | Count Uncert. (2σ+/-) | Total Uncert. (2σ+/-) | RL | MDC | Unit | Prepared | Analyzed | Dil Fac |
|---|---|---|---|---|---|---|---|---|---|---|
| Radium-228 | -0.005172 | U | 0.258 | 0.258 | 1.00 | 0.464 | pCi/L | 07/26/19 14:09 | 08/30/19 14:44 | 1 |

| *Carrier* | *MB %Yield* | *MB Qualifier* | *Limits* | *Prepared* | *Analyzed* | *Dil Fac* |
|---|---|---|---|---|---|---|
| *Ba Carrier* | *84.5* | | *40 - 110* | *07/26/19 14:09* | *08/30/19 14:44* | *1* |
| *Y Carrier* | *89.3* | | *40 - 110* | *07/26/19 14:09* | *08/30/19 14:44* | *1* |

## Method: 904.0 - Radium-228 (GFPC) (Continued)

**Lab Sample ID: LCS 160-436768/1-A**
**Matrix: Water**
**Analysis Batch: 441488**

**Client Sample ID: Lab Control Sample**
**Prep Type: Total/NA**
**Prep Batch: 436768**

| Analyte | | | Spike Added | LCS Result | LCS Qual | Total Uncert. (2σ+/-) | RL | MDC | Unit | %Rec | %Rec. Limits | | |
|---|---|---|---|---|---|---|---|---|---|---|---|---|---|
| Radium-228 | | | 9.64 | 9.146 | | 1.18 | 1.00 | 0.609 | pCi/L | 95 | 75 - 125 | | |

| *Carrier* | *LCS %Yield* | *LCS Qualifier* | *Limits* |
|---|---|---|---|
| *Ba Carrier* | *71.5* | | *40 - 110* |
| *Y Carrier* | *87.1* | | *40 - 110* |

**Lab Sample ID: 180-93047-C-9-B DU**
**Matrix: Water**
**Analysis Batch: 441488**

**Client Sample ID: Duplicate**
**Prep Type: Total/NA**
**Prep Batch: 436768**

| Analyte | Sample Result | Sample Qual | | DU Result | DU Qual | Total Uncert. (2σ+/-) | RL | MDC | Unit | | | RER | RER Limit |
|---|---|---|---|---|---|---|---|---|---|---|---|---|---|
| Radium-228 | 0.296 | U | | 0.1213 | U | 0.338 | 1.00 | 0.582 | pCi/L | | | 0.23 | 1 |

| *Carrier* | *DU %Yield* | *DU Qualifier* | *Limits* |
|---|---|---|---|
| *Ba Carrier* | *80.5* | | *40 - 110* |
| *Y Carrier* | *81.9* | | *40 - 110* |

## Method: Ra226_Ra228 Pos - Combined Radium-226 and Radium-228

**Lab Sample ID: 180-93047-A-9 DU**
**Matrix: Water**
**Analysis Batch: 442871**

**Client Sample ID: Duplicate**
**Prep Type: Total/NA**

| Analyte | Sample Result | Sample Qual | | DU Result | DU Qual | Total Uncert. (2σ+/-) | RL | MDC | Unit | | | RER | RER Limit |
|---|---|---|---|---|---|---|---|---|---|---|---|---|---|
| Radium 226 and 228 | 0.296 | U | | 0.1229 | U | 0.344 | 5.00 | | pCi/L | | | 0.22 | |

# QC Association Summary

Client: Environmental Standards Inc.
Project/Site: JSF_STR_20190718_3B

Job ID: 180-93098-1

## Rad

### Prep Batch: 436764

| Lab Sample ID | Client Sample ID | Prep Type | Matrix | Method | Prep Batch |
|---|---|---|---|---|---|
| 180-93098-1 | JSF-STR-PB09-CC-SUR-20190718 ~ STR-PB09 | Total/NA | Water | PrecSep STD | |
| 180-93098-2 | JSF-STR-PB08-CC-SUR-20190718 ~ STR-PB08 | Total/NA | Water | PrecSep STD | |
| 180-93098-3 | JSF-STR-PB07-CC-SUR-20190718 ~ STR-PB07 | Total/NA | Water | PrecSep STD | |
| 180-93098-4 | JSF-STR-PB06-CC-SUR-20190718 ~ STR-PB06 | Total/NA | Water | PrecSep STD | |
| MB 160-436764/18-A | Method Blank | Total/NA | Water | PrecSep STD | |
| LCS 160-436764/1-A | Lab Control Sample | Total/NA | Water | PrecSep STD | |
| 180-93047-C-9-A DU | Duplicate | Total/NA | Water | PrecSep STD | |

### Prep Batch: 436768

| Lab Sample ID | Client Sample ID | Prep Type | Matrix | Method | Prep Batch |
|---|---|---|---|---|---|
| 180-93098-1 | JSF-STR-PB09-CC-SUR-20190718 ~ STR-PB09 | Total/NA | Water | PrecSep_0 | |
| 180-93098-2 | JSF-STR-PB08-CC-SUR-20190718 ~ STR-PB08 | Total/NA | Water | PrecSep_0 | |
| 180-93098-3 | JSF-STR-PB07-CC-SUR-20190718 ~ STR-PB07 | Total/NA | Water | PrecSep_0 | |
| 180-93098-4 | JSF-STR-PB06-CC-SUR-20190718 ~ STR-PB06 | Total/NA | Water | PrecSep_0 | |
| MB 160-436768/18-A | Method Blank | Total/NA | Water | PrecSep_0 | |
| LCS 160-436768/1-A | Lab Control Sample | Total/NA | Water | PrecSep_0 | |
| 180-93047-C-9-B DU | Duplicate | Total/NA | Water | PrecSep_0 | |

## Client Sample ID: JSF-STR-PB09-CC-SUR-20190718 ~ STR-PB09

## Lab Sample ID: 180-93098-1

**Date Collected: 07/18/19 13:45**
**Date Received: 07/23/19 09:20**

**Matrix: Water**

| Prep Type | Batch Type | Batch Method | Run | Dil Factor | Initial Amount | Final Amount | Batch Number | Prepared or Analyzed | Analyst | Lab |
|---|---|---|---|---|---|---|---|---|---|---|
| Total/NA | Prep | PrecSep STD | | | 1000.02 mL | 1.0 g | 436764 | 07/26/19 13:33 | ORM | TAL SL |
| Total/NA | Analysis | 903.0 | | 1 | 1.0 mL | 1.0 mL | 441511 | 08/31/19 17:52 | KLS | TAL SL |
| | Instrument ID: GFPCBLUE | | | | | | | | | |
| Total/NA | Prep | PrecSep_0 | | | 1000.02 mL | 1.0 g | 436768 | 07/26/19 14:09 | ORM | TAL SL |
| Total/NA | Analysis | 904.0 | | 1 | | | 441352 | 08/30/19 14:47 | KLS | TAL SL |
| | Instrument ID: GFPCPURPLE | | | | | | | | | |
| Total/NA | Analysis | Ra226_Ra228 Pos | | 1 | | | 442871 | 09/13/19 14:36 | SMP | TAL SL |
| | Instrument ID: NOEQUIP | | | | | | | | | |

## Client Sample ID: JSF-STR-PB08-CC-SUR-20190718 ~ STR-PB08

## Lab Sample ID: 180-93098-2

**Date Collected: 07/18/19 14:35**
**Date Received: 07/23/19 09:20**

**Matrix: Water**

| Prep Type | Batch Type | Batch Method | Run | Dil Factor | Initial Amount | Final Amount | Batch Number | Prepared or Analyzed | Analyst | Lab |
|---|---|---|---|---|---|---|---|---|---|---|
| Total/NA | Prep | PrecSep STD | | | 1000.19 mL | 1.0 g | 436764 | 07/26/19 13:33 | ORM | TAL SL |
| Total/NA | Analysis | 903.0 | | 1 | | | 442151 | 09/08/19 19:00 | CDR | TAL SL |
| | Instrument ID: GFPCBLUE | | | | | | | | | |
| Total/NA | Prep | PrecSep_0 | | | 1000.19 mL | 1.0 g | 436768 | 07/26/19 14:09 | ORM | TAL SL |
| Total/NA | Analysis | 904.0 | | 1 | | | 441488 | 08/30/19 14:44 | KLS | TAL SL |
| | Instrument ID: GFPCORANGE | | | | | | | | | |
| Total/NA | Analysis | Ra226_Ra228 Pos | | 1 | | | 442871 | 09/13/19 14:36 | SMP | TAL SL |
| | Instrument ID: NOEQUIP | | | | | | | | | |

## Client Sample ID: JSF-STR-PB07-CC-SUR-20190718 ~ STR-PB07

## Lab Sample ID: 180-93098-3

**Date Collected: 07/18/19 15:05**
**Date Received: 07/23/19 09:20**

**Matrix: Water**

| Prep Type | Batch Type | Batch Method | Run | Dil Factor | Initial Amount | Final Amount | Batch Number | Prepared or Analyzed | Analyst | Lab |
|---|---|---|---|---|---|---|---|---|---|---|
| Total/NA | Prep | PrecSep STD | | | 1000.04 mL | 1.0 g | 436764 | 07/26/19 13:33 | ORM | TAL SL |
| Total/NA | Analysis | 903.0 | | 1 | 1.0 mL | 1.0 mL | 441511 | 08/31/19 18:55 | KLS | TAL SL |
| | Instrument ID: GFPCBLUE | | | | | | | | | |
| Total/NA | Prep | PrecSep_0 | | | 1000.04 mL | 1.0 g | 436768 | 07/26/19 14:09 | ORM | TAL SL |
| Total/NA | Analysis | 904.0 | | 1 | | | 441488 | 08/30/19 14:44 | KLS | TAL SL |
| | Instrument ID: GFPCORANGE | | | | | | | | | |
| Total/NA | Analysis | Ra226_Ra228 Pos | | 1 | | | 442871 | 09/13/19 14:36 | SMP | TAL SL |
| | Instrument ID: NOEQUIP | | | | | | | | | |

# Lab Chronicle

Client: Environmental Standards Inc.
Project/Site: JSF_STR_20190718_3B

Job ID: 180-93098-1

## Client Sample ID: JSF-STR-PB06-CC-SUR-20190718 ~ STR-PB06

## Lab Sample ID: 180-93098-4

**Date Collected: 07/18/19 15:45**
**Date Received: 07/23/19 09:20**

**Matrix: Water**

| Prep Type | Batch Type | Batch Method | Run | Dil Factor | Initial Amount | Final Amount | Batch Number | Prepared or Analyzed | Analyst | Lab |
|---|---|---|---|---|---|---|---|---|---|---|
| Total/NA | Prep | PrecSep STD | | | 1000.63 mL | 1.0 g | 436764 | 07/26/19 13:33 | ORM | TAL SL |
| Total/NA | Analysis | 903.0 | | 1 | | | 442151 | 09/08/19 19:00 | CDR | TAL SL |
| | Instrument ID: GFPCBLUE | | | | | | | | | |
| Total/NA | Prep | PrecSep_0 | | | 1000.63 mL | 1.0 g | 436768 | 07/26/19 14:09 | ORM | TAL SL |
| Total/NA | Analysis | 904.0 | | 1 | | | 441488 | 08/30/19 14:44 | KLS | TAL SL |
| | Instrument ID: GFPCORANGE | | | | | | | | | |
| Total/NA | Analysis | Ra226_Ra228 Pos | | 1 | | | 442871 | 09/13/19 14:36 | SMP | TAL SL |
| | Instrument ID: NOEQUIP | | | | | | | | | |

**Laboratory References:**

TAL SL = Eurofins TestAmerica, St. Louis, 13715 Rider Trail North, Earth City, MO 63045, TEL (314)298-8566

**Analyst References:**

Lab: TAL SL

Batch Type: Prep

ORM = Octavia Moore

Batch Type: Analysis

CDR = Conrad Reuscher

KLS = Kody Saulters

SMP = Siobhan Perry

# Accreditation/Certification Summary

Client: Environmental Standards Inc.
Job ID: 180-93098-1
Project/Site: JSF_STR_20190718_3B

## Laboratory: Eurofins TestAmerica, Pittsburgh

All accreditations/certifications held by this laboratory are listed. Not all accreditations/certifications are applicable to this report.

| Authority | Program | Identification Number | Expiration Date |
|---|---|---|---|
| Arkansas DEQ | State | 19-033-0 | 06-27-20 |
| Arkansas DEQ | State Program | 88-0690 | 06-27-20 |
| California | State | 2891 | 04-30-20 |
| California | State Program | 2891 | 04-30-20 |
| Connecticut | State | PH-0688 | 09-30-20 |
| Connecticut | State Program | PH-0688 | 09-30-20 |
| Florida | NELAP | E871008 | 06-30-20 |
| Florida | NELAP | E871008 | 06-30-20 |
| Illinois | NELAP | 200005 | 06-30-20 |
| Illinois | NELAP | 004375 | 06-30-20 |
| Kansas | NELAP | E-10350 | 01-31-20 |
| Kansas | NELAP | E-10350 | 03-31-20 |
| Kentucky (UST) | State Program | 162013 | 04-30-20 |
| Kentucky (WW) | State | KY98043 | 12-31-19 |
| Kentucky (WW) | State Program | KY98043 | 12-31-19 |
| Louisiana | NELAP | 04041 | 06-30-20 |
| Minnesota | NELAP | 042-999-482 | 12-31-19 |
| Minnesota | NELAP | 042-999-482 | 12-31-19 |
| Nevada | State | PA00164 | 07-31-20 |
| Nevada | State Program | PA00164 | 07-31-20 |
| New Hampshire | NELAP | 2030 | 04-04-20 |
| New Jersey | NELAP | PA005 | 06-30-20 |
| New Jersey | NELAP | PA005 | 06-30-20 |
| New York | NELAP | 11182 | 03-31-20 |
| New York | NELAP | 11182 | 04-01-20 |
| North Carolina (WW/SW) | State Program | 434 | 12-31-19 |
| North Dakota | State | R-227 | 04-30-20 |
| North Dakota | State Program | R-227 | 04-30-20 |
| Oregon | NELAP | PA-2151 | 02-06-20 |
| Oregon | NELAP | PA-2151 | 02-06-20 |
| Pennsylvania | NELAP | 02-00416 | 04-30-20 |
| Pennsylvania | NELAP | 02-00416 | 04-30-20 |
| Rhode Island | State | LAO00362 | 12-30-19 |
| Rhode Island | State Program | LAO00362 | 12-30-19 |
| South Carolina | State Program | 89014 | 04-30-20 |
| Texas | NELAP | T104704528-15-2 | 03-31-20 |
| Texas | NELAP | T104704528 | 03-31-20 |
| US Fish & Wildlife | US Federal Programs | 058448 | 07-31-20 |
| USDA | Federal | P-Soil-01 | 06-26-22 |
| USDA | US Federal Programs | P330-16-00211 | 06-26-22 |
| Utah | NELAP | PA001462015-4 | 05-31-20 |
| Utah | NELAP | PA001462019-8 | 05-31-20 |
| Virginia | NELAP | 460189 | 09-14-19 |
| Virginia | NELAP | 10043 | 09-14-19 |
| West Virginia DEP | State | 142 | 01-31-20 |
| West Virginia DEP | State Program | 142 | 01-31-20 |
| Wisconsin | State | 998027800 | 08-31-20 |
| Wisconsin | State Program | 998027800 | 08-31-20 |

# Accreditation/Certification Summary

Client: Environmental Standards Inc.
Project/Site: JSF_STR_20190718_3B

Job ID: 180-93098-1

## Laboratory: Eurofins TestAmerica, St. Louis

All accreditations/certifications held by this laboratory are listed. Not all accreditations/certifications are applicable to this report.

| Authority | Program | Identification Number | Expiration Date |
|---|---|---|---|
| ANAB | Dept. of Defense ELAP | L2305 | 04-06-22 |
| ANAB | Dept. of Energy | L2305.01 | 04-06-22 |
| ANAB | DoD | L2305 | 04-06-22 |
| ANAB | DOE | L2305.01 | 04-06-22 |
| ANAB | ISO/IEC 17025 | L2305 | 04-06-22 |
| Arizona | State | AZ0813 | 12-08-19 |
| Arizona | State Program | AZ0813 | 12-08-19 |
| California | State | 2886 | 06-30-20 |
| California | State Program | 2886 | 06-30-20 |
| Connecticut | State | PH-0241 | 03-31-21 |
| Connecticut | State Program | PH-0241 | 03-31-21 |
| Florida | NELAP | E87689 | 06-30-20 |
| Florida | NELAP | E87689 | 06-30-20 |
| Hawaii | State Program | NA | 06-30-20 |
| HI - RadChem Recognition | State | n/a | 06-30-20 |
| Illinois | NELAP | 200023 | 11-30-19 |
| Illinois | NELAP | 004553 | 11-30-19 |
| Iowa | State Program | 373 | 12-01-20 |
| Kansas | NELAP | E-10236 | 10-31-19 |
| Kentucky (DW) | State | KY90125 | 12-31-19 |
| Kentucky (DW) | State Program | KY90125 | 12-31-19 |
| Louisiana | NELAP | 04080 | 06-30-20 |
| Louisiana (DW) | NELAP | LA011 | 12-31-19 |
| Louisiana (DW) | State | LA011 | 12-31-19 |
| Maryland | State | 310 | 09-30-20 |
| Maryland | State Program | 310 | 09-30-20 |
| MI - RadChem Recognition | State | 9005 | 06-30-20 |
| Michigan | State Program | 9005 | 06-30-20 |
| Missouri | State | 780 | 06-30-22 |
| Missouri | State Program | 780 | 06-30-20 |
| Nevada | State | MO000542020-1 | 07-31-20 |
| New Jersey | NELAP | MO002 | 06-30-20 |
| New Jersey | NELAP | MO002 | 06-30-20 |
| New York | NELAP | 11616 | 03-31-20 |
| New York | NELAP | 11616 | 04-01-20 |
| North Dakota | State | R-207 | 06-30-20 |
| North Dakota | State Program | R207 | 06-30-20 |
| NRC | NRC | 24-24817-01 | 12-31-22 |
| Oklahoma | State | 9997 | 08-31-20 |
| Oklahoma | State Program | 9997 | 08-31-20 |
| Pennsylvania | NELAP | 68-00540 | 02-28-20 |
| Pennsylvania | NELAP | 68-00540 | 02-28-20 |
| South Carolina | State Program | 85002001 | 06-30-20 |
| Texas | NELAP | T104704193-19-14 | 07-31-20 |
| Texas | NELAP | T104704193-19-13 | 07-31-20 |
| US Fish & Wildlife | Federal | 058448 | 07-31-20 |
| US Fish & Wildlife | US Federal Programs | 058448 | 07-31-20 |
| USDA | Federal | P330-17-0028 | 02-02-20 |
| USDA | US Federal Programs | P330-17-00028 | 02-02-20 |
| Utah | NELAP | MO000542019-11 | 07-31-20 |

## Laboratory: Eurofins TestAmerica, St. Louis (Continued)

All accreditations/certifications held by this laboratory are listed. Not all accreditations/certifications are applicable to this report.

| Authority | Program | Identification Number | Expiration Date |
|---|---|---|---|
| Virginia | NELAP | 460230 | 06-14-20 |
| Virginia | NELAP | 10310 | 06-14-20 |
| Washington | State Program | C592 | 08-30-19 * |
| West Virginia DEP | State Program | 381 | 08-31-19 * |

* Accreditation/Certification renewal pending - accreditation/certification considered valid.

# Method Summary

Client: Environmental Standards Inc.
Project/Site: JSF_STR_20190718_3B

Job ID: 180-93098-1

| Method | Method Description | Protocol | Laboratory |
|---|---|---|---|
| 903.0 | Radium-226 (GFPC) | EPA | TAL SL |
| 904.0 | Radium-228 (GFPC) | EPA | TAL SL |
| Ra226_Ra228 | Combined Radium-226 and Radium-228 | TAL-STL | TAL SL |
| Pos | | | |
| PrecSep STD | Preparation, Precipitate Separation (Standard In-Growth) | None | TAL SL |
| PrecSep_0 | Preparation, Precipitate Separation | None | TAL SL |

**Protocol References:**

EPA = US Environmental Protection Agency

None = None

TAL-STL = TestAmerica Laboratories, St. Louis, Facility Standard Operating Procedure.

**Laboratory References:**

TAL SL = Eurofins TestAmerica, St. Louis, 13715 Rider Trail North, Earth City, MO 63045, TEL (314)298-8566

# Sample Summary

Client: Environmental Standards Inc.
Project/Site: JSF_STR_20190718_3B

Job ID: 180-93098-1

| Lab Sample ID | Client Sample ID | Matrix | Collected | Received | Asset ID |
|---|---|---|---|---|---|
| 180-93098-1 | JSF-STR-PB09-CC-SUR-20190718 ~ STR-PB09 | Water | 07/18/19 13:45 | 07/23/19 09:20 | |
| 180-93098-2 | JSF-STR-PB08-CC-SUR-20190718 ~ STR-PB08 | Water | 07/18/19 14:35 | 07/23/19 09:20 | |
| 180-93098-3 | JSF-STR-PB07-CC-SUR-20190718 ~ STR-PB07 | Water | 07/18/19 15:05 | 07/23/19 09:20 | |
| 180-93098-4 | JSF-STR-PB06-CC-SUR-20190718 ~ STR-PB06 | Water | 07/18/19 15:45 | 07/23/19 09:20 | |

REAGENT TRACEABILITY SUMMARY

Lab Name: Eurofins TestAmerica, St. Louis Job No.: 180-93098-1

SDG No.:

| Reagent ID | Exp Date | Prep Date | Dilutant Used | Reagent Final Volume | Parent Reagent | | Analyte | Concentration |
|---|---|---|---|---|---|---|---|---|
| | | | | | Reagent ID | Volume Added | | |
| **AJ-8538_00001** | 03/28/67 | Eckert & Ziegler, Lot AJ-8538 | | | (Purchased Reagent) | | Sr-90 | 1.03 kBq/g |
| **AJ-9825_00001** | 05/02/67 | Eckert & Ziegler, Lot AJ-9825 | | | (Purchased Reagent) | | Sr-90 | 1.05 kBq/g |
| **AJ-9826_00001** | 05/02/67 | Eckert & Ziegler, Lot AJ-9826 | | | (Purchased Reagent) | | Sr-90 | 1.23 kBq/g |
| **AK-4186_00001** | 07/14/67 | Eckert & Ziegler, Lot AK-4186 | | | (Purchased Reagent) | | Sr-90 | 1.07 kBq/g |
| **AK-4187_00001** | 07/14/67 | Eckert & Ziegler, Lot AK-4187 | | | (Purchased Reagent) | | Sr-90 | 940 Bq |
| **Ba Carrier_00045** | 12/18/19 | CPI, Lot 10079154-4 | | | (Purchased Reagent) | | Ba Carrier | 20000 ug/mL |
| **Ra-226_00025** | 04/30/20 | 12/08/16 | 0.1M HCl, Lot N/A | 100 mL | Ra-226_00024 | 4.9774 g | Ra | 8409.79 dpm/mL |
| | | | | | | | Radium-226 | 8409.79 dpm/mL |
| | | | | | | | Rn-222 | 8409.79 dpm/mL |
| | | | | | | | Total Alpha Emitting Radium Isotopes | 8409.79 dpm/mL |
| .Ra-226_00024 | 12/05/66 | Eckert & Ziegler, Lot 104858 | | | (Purchased Reagent) | | Ra | 2815.99 Bq/g |
| | | | | | | | Radium-226 | 2815.99 Bq/g |
| | | | | | | | Rn-222 | 2815.99 Bq/g |
| | | | | | | | Total Alpha Emitting Radium Isotopes | 2815.99 Bq/g |
| **Ra-226_00029** | 04/30/20 | 04/10/19 | 0.1M HCl, Lot N/A | 1000 mL | Ra-226_00025 | 3 mL | Ra | 25.2294 dpm/mL |
| | | | | | | | Radium-226 | 25.2294 dpm/mL |
| | | | | | | | Rn-222 | 25.2294 dpm/mL |
| | | | | | | | Total Alpha Emitting Radium Isotopes | 25.2294 dpm/mL |
| .Ra-226_00025 | 04/30/20 | 12/08/16 | 0.1M HCl, Lot N/A | 100 mL | Ra-226_00024 | 4.9774 g | Ra | 8409.79 dpm/mL |
| | | | | | | | Radium-226 | 8409.79 dpm/mL |
| | | | | | | | Rn-222 | 8409.79 dpm/mL |
| | | | | | | | Total Alpha Emitting Radium Isotopes | 8409.79 dpm/mL |
| ..Ra-226_00024 | 12/05/66 | Eckert & Ziegler, Lot 104858 | | | (Purchased Reagent) | | Ra | 2815.99 Bq/g |
| | | | | | | | Radium-226 | 2815.99 Bq/g |
| | | | | | | | Rn-222 | 2815.99 Bq/g |
| | | | | | | | Total Alpha Emitting Radium Isotopes | 2815.99 Bq/g |
| **Ra-228_00037** | 07/11/20 | 06/06/19 | 0.1M HCl, Lot N/A | 100 mL | Ra-228_00035 | 4.984 g | Radium-228 | 221.287 dpm/mL |
| .Ra-228_00035 | 07/11/20 | Eckert & Ziegler, Lot D-K-19023-01-00 | | | (Purchased Reagent) | | Radium-228 | 73.999 Bq/g |
| **Sr-90_00004** | 09/17/59 | 06/21/11 | 0.1M HCL, Lot 0 | 100 mL | Sr-90_00001 | 5.0139 g | Gross Beta | 45120.6 dpm/mL |

REAGENT TRACEABILITY SUMMARY

Lab Name: Eurofins TestAmerica, St. Louis Job No.: 180-93098-1

SDG No.:

| Reagent ID | Exp Date | Prep Date | Dilutant Used | Reagent Final Volume | Parent Reagent | | Analyte | Concentration |
|---|---|---|---|---|---|---|---|---|
| | | | | | Reagent ID | Volume Added | | |
| | | | | | | | Sr | 22560.3 dpm/mL |
| | | | | | | | Sr-90 | 22560.3 dpm/mL |
| .Sr-90_00001 | 09/17/59 | Eckert & Ziegler, Lot 80573-334 | | | (Purchased Reagent) | | Gross Beta | 14998.5 Bq/g |
| | | | | | | | Sr | 7499.25 Bq/g |
| | | | | | | | Sr-90 | 7499.25 Bq/g |
| **Sr-90_00018** | 04/19/20 | 11/28/12 | 0.1M HCL, Lot 0 | 100 mL | Sr-90_00017 | 4.9997 g | Gross Beta | 44774.2 dpm/mL |
| | | | | | | | Sr-90 | 22387.1 dpm/mL |
| .Sr-90_00017 | 11/29/62 | Analytics, Lot 92352 | | | (Purchased Reagent) | | Gross Beta | 14925.6 Bq/g |
| | | | | | | | Sr-90 | 7462.82 Bq/g |
| **Th-230_00016** | 11/29/62 | 11/28/12 | 0.5M HNO3, Lot 0 | 100 mL | Th-230_00015 | 5.0489 g | Gross Alpha | 2374.49 dpm/mL |
| | | | | | | | Th-230 | 2374.49 dpm/mL |
| .Th-230_00015 | 11/29/62 | Analytics, Lot 92523 | | | (Purchased Reagent) | | Gross Alpha | 783.829 Bq/g |
| | | | | | | | Th-230 | 783.829 Bq/g |
| **Th-230_00019** | 10/15/19 | 08/13/13 | 1M HNO3, Lot n/a | 100 mL | Th-230_00018 | 5.0731 mL | Gross Alpha | 2228.23 dpm/mL |
| | | | | | | | Th-230 | 2228.23 dpm/mL |
| .Th-230_00018 | 08/08/63 | Eckert & Ziegler Analytics, Lot 92776 | | | (Purchased Reagent) | | Gross Alpha | 43922.5 dpm/g |
| | | | | | | | Th-230 | 43922.5 dpm/g |
| **Y Carrier_00037** | 03/31/20 | CPI, Lot 10064660-8 | | | (Purchased Reagent) | | Y Carrier | 50000 mg/L |

# Reagent

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# Ba Carrier_00045

1643431
ID: Ba Carrier_00046
Exp:12/18/19 Prpd:CLP Opn:12/18/18
Barium Carrier

CPI INTERNATIONAL

# REPORT OF ANALYSIS

Single-Element Aqueous RM

**Custom Barium Standard**

Matrix: 2% $HNO_3$

Product #: 4400-132859

Lot #: 10079154-5

| Element | Certified Concentration |
|---|---|
| **Ba** | **20,000 µg/mL** |

**Intended Use:** This solution is intended for use as a reference material (RM) or calibration standard for inductively coupled plasma optical emission spectroscopy (ICP-OES), inductively coupled plasma mass spectrometry (ICP-MS), flame or furnace atomic absorption spectroscopy (AA or GFAA), and other techniques for elemental analysis.

**Certification & Traceability:** This RM was manufactured, processed, and/or certified under a quality management system that is registered/accredited to **ISO 9001, ISO Guide 34**, and **ISO/IEC 17025**. This RM was prepared to a nominal concentration of 20,000 µg/mL by gravimetric methods using single-element concentrate dissolved in high purity nitric acid ($HNO_3$) and diluted with filtered (0.22 µm), 18 M-ohm deionized water. The balances used in the preparation of this RM are calibrated regularly with traceability to NIST, using a calibration provider that is accredited to ISO/IEC 17025 by a mutually recognized accreditation body. All volumetric dilutions are performed in Class A calibrated glassware. The certified concentration was determined based upon gravimetric procedures. Secondary verification of the certified concentration was performed using ICP-OES and is traceable to **NIST SRM 3104a**. The uncertainty associated with the certified concentration is ±0.5% relative, which is the sum of the estimated errors due to the purity of the raw materials, the gravimetric preparation of the solution, and transpiration through the container. This represents the expanded uncertainty at the 95% confidence level using a coverage factor of k=2.

**Instructions for Use:** We recommend that the solution be thoroughly mixed by repeated shaking or swirling of the bottle immediately prior to use. To achieve the highest accuracy, the analyst should: (1) use only pre-cleaned containers and transferware, (2) not pipette directly from the RM's original container, (3) never pour used product back into the original container, (4) make dilutions using calibrated balances or certified class A volumetric flasks and pipettes, (5) use a minimum sub-sample size of 500 µL, and (6) dilute with the same matrix as the original RM or other chemically suitable matrix. The solution should be kept tightly capped and stored under normal laboratory conditions. Do not freeze, heat, or immerse the bottle or its contents, and avoid exposure to direct sunlight or moisture.

**Period of Validity:** CPI International ensures the accuracy of this solution for **18 months** from the certification date shown below, provided the instructions for use are followed. During the period of validity, the purchaser will be notified if this product is recalled due to any significant changes in the stability of the solution.

Chuck Goudreau

**Chuck Goudreau, Certifying Officer**

December 4, 2018
**Certification Date**

CPI International waives all responsibility for any damages resulting from the usage and/or implementation of the products/data described herein.

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TestAmerica
THE LEADER IN ENVIRONMENTAL TESTING

Printed: 5/3/2019 1:52 PM

# Standardization of Carrier

## Ba Carrier_00045

**Carrier Reagent ID:** _____
ID from TALS or lot number

| # | Tare Wght (g) | Gross Wght (g) | Net Wght (g) | Z Score |
|---|---|---|---|---|
| 1 | 8.6367 | 8.6725 | **0.0358** | **0.8216** |
| 2 | 8.6119 | 8.6477 | **0.0358** | **0.8216** |
| 3 | 8.6016 | 8.6370 | **0.0354** | **0.0357** |
| 4 | 8.6506 | 8.6852 | **0.0346** | **1.7504** |
| 5 | 8.6583 | 8.6935 | **0.0352** | **0.4644** |
| 6 | 8.7082 | 8.7439 | **0.0357** | **0.6073** |

**Average:** 0.0354 Standardized value
**StDev:** 0.0005
**StDev %:** 1.32%

***Record the Reagent IDs of all chemicals used to create this carrier in the spaces below.***

***Reagent ID:*** _____
***Reagent ID:*** _____
***Reagent ID:*** _____
***Reagent ID:*** _____
***Reagent ID:*** _____
***Reagent ID:*** _____
***Reagent ID:*** _____

***SOP Reference:*** ST-RC-0040 Mod (Direct precipitation)
SOP reference containing prep procedure must be documented

***Minimum Criteria:***

- Z Score must be within 3 sigma (**2.58**) and no more than one score outside of 2 sigma (**1.96**)
- 4 points required
- Any criteria stipulated in the above referenced SOP must be satisfied in addition.

***Carrier:*** Ba Carrier_00045 ***Standardized Value:*** 0.0354 Carrier Reagent or Lot ID: *ID Required for Approval*

Approved By: *TJ Romanko* Date Approved: ***5/3/2019***



FORM: RAD-0079 Rev 06-19-2013

# Rad Worksheet

Batch Number: 160-426501
Method: PrecSep_0
Analyst: Romanko, Terry J

Date Open: May 02 2019 1:24PM
Batch End: May 03 2019 9:39AM

| Lab ID | Client ID | Method Chain | Basis | Initial weight/volume of sample | Tare Weight of Barium Planchette | Gross Weight of Barium Planchette | Barium Mass Added | Ingrowth/Decay Date1 | Native Ba Mass |
|---|---|---|---|---|---|---|---|---|---|
| 160-33859-A-1 | Ra-226_00029 | PrecSep_0, 903.0_TAR | T | 1 mL | 8.6367 g | 8.6725 g | 0.0354 g | 5/2/2019 13:00 | 0 g |
| 160-33859-A-1 | Ra-226_00029 | PrecSep_0, 903.0_TAR | T | 1 mL | 8.6119 g | 8.6477 g | 0.0354 g | 5/2/2019 13:00 | 0 g |
| 160-33859-A-1 | Ra-226_00029 | PrecSep_0, 903.0_TAR | T | 1 mL | 8.6016 g | 8.6370 g | 0.0354 g | 5/2/2019 13:00 | 0 g |
| MB~160-426501/4 | | | | 1 mL | 8.6506 g | 8.6852 g | 0.0354 g | | 0 g |
| MB~160-426501/5 | | | | 1 mL | 8.6583 g | 8.6935 g | 0.0354 g | | 0 g |
| MB~160-426501/6 | | | | 1 mL | 8.7082 g | 8.7439 g | 0.0354 g | | 0 g |

# Rad Worksheet

Batch Number: 160-426501
Method: PrecSep_0
Analyst: Romanko, Terry J

Date Open: May 02 2019 1:24PM
Batch End: May 03 2019 9:39AM

| Lab ID | Client ID | Method Chain | Basis | Ra-226_00029 |
|---|---|---|---|---|
| 160-33859-A-1 | Ra-226_00029 | PrecSep_0, 903.0_TAR | T | 1 mL |
| 160-33859-A-1 | Ra-226_00029 | PrecSep_0, 903.0_TAR | T | 1 mL |
| 160-33859-A-1 | Ra-226_00029 | PrecSep_0, 903.0_TAR | T | 1 mL |
| MB~160-426501/4 | | | | |
| MB~160-426501/5 | | | | |
| MB~160-426501/6 | | | | |

| | |
|---|---|
| Balance ID: | 0034150037 |
| Analyst ID - Reagent Drop: | TJR |
| Analyst ID - Reagent Drop Witness: | NA |
| Pipette ID: | RAD112 |
| SOP Number: | ST-RC-0040 Mod |

# Rad Worksheet

Batch Number: 160-426501
Method: PrecSep_0
Analyst: Romanko, Terry J

Date Open: May 02 2019 1:24PM
Batch End: May 03 2019 9:39AM

Comments

| Lab ID | Client ID | Method Chain | Basis | Analysis comment |
|---|---|---|---|---|
| 160-33859-A-1 | Ra-226_00029 | PrecSep_0, 903.0_TAR | T | H2SO4_00118 |
| 160-33859-A-1 | Ra-226_00029 | PrecSep_0, 903.0_TAR | T | H2SO4_00118 |
| 160-33859-A-1 | Ra-226_00029 | PrecSep_0, 903.0_TAR | T | H2SO4_00118 |
| MB~160-426501/4 | | | | |
| MB~160-426501/5 | | | | |
| MB~160-426501/6 | | | | |

Batch Comment: Direct H2SO4 precip

# PrecSep_0 Prep Worksheet

(Used for Collecting Prep Info)

Batch Number: 160-426501 | Analyst: Romanko, Terry J | Batch Open: 5/2/2019 1:24:00PM

Batch End: 5/3/2019 9:39:39AM

## Preparation, Precipitate Separation

| | Input Sample Lab ID | Input Sample Lab ID (Analytical Method) | SDG | Matrix | Initial Amount | Final Amount | Due Date | Analytical TAT | Div Rank | Comments |
|---|---|---|---|---|---|---|---|---|---|---|
| 1 | 160-33859-A-1 | 160-33859-A-1 (903.0_TAR) | N/A | Water | 1 mL | | 5/21/19 | 18_Days | N/A | H2SO4_00118 |
| 2 | 160-33859-A-1 | 160-33859-A-1 (903.0_TAR) | N/A | Water | 1 mL | | 5/21/19 | 18_Days | N/A | H2SO4_00118 |
| 3 | 160-33859-A-1 | 160-33859-A-1 (903.0_TAR) | N/A | Water | 1 mL | | 5/21/19 | 18_Days | N/A | H2SO4_00118 |
| 4 | MB 160-426501/4 | MB~160-426501/4 N/A | N/A | | 1 mL | | N/A | N/A | N/A | |
| | MB 160-426501/5 | MB~160-426501/5 N/A | N/A | | 1 mL | | N/A | N/A | N/A | |
| | MB 160-426501/6 | MB~160-426501/6 N/A | N/A | | 1 mL | | N/A | N/A | N/A | TPR 4/3/19 |

# PrecSep_0 Prep Worksheet

(Used for Collecting Prep Info)

Batch Number: 160-426501 | Analyst: Romanko, Terry J | Batch Open: 5/2/2019 1:24:00PM

Batch End: 5/3/2019 9:39:39AM

## Batch Notes

| | |
|---|---|
| Manually Enter Results? (0=NO, 1=YES) | Yes |
| EiChrom Used (Y/N)? | N |
| Radium Batch (Y/N)? | Y |
| Balance ID | 0034150037 |
| Analyst ID - Reagent Drop | TJR |
| Analyst ID - Reagent Drop Witness | NA |
| Pipette ID | RAD112 |
| SOP Number | ST-RC-0040 Mod |
| Carrier ID for Barium | Ba Carrier_00045 |
| Strontium Carrier ID | |
| Yttrium Carrier ID | |
| Batch Comment | Direct H2SO4 precip |

## Comments

# PrecSep_0 Prep Worksheet

(Used for Collecting Prep Info)

Batch Number: 160-426501 Analyst: Romanko, Terry J Batch Open: 5/2/2019 1:24:00PM

Batch End: 5/3/2019 9:39:39AM

## Reagent Additions Worksheet

| Lab ID | Reagent Code | Amount Added | Final Amount | By | Witness |
|---|---|---|---|---|---|
| 160-33859-A-1 | Ba Carrier_00045 | 1 mL | | | |
| 160-33859-A-1 | Ra-226_00029 | 1 mL | | | |
| 160-33859-A-1 | Ba Carrier_00045 | 1 mL | | | |
| 160-33859-A-1 | Ra-226_00029 | 1 mL | | | |
| 160-33859-A-1 | Ba Carrier_00045 | 1 mL | | | |
| 160-33859-A-1 | Ra-226_00029 | 1 mL | | | |
| MB 160-426501/4 | Ba Carrier_00045 | 1 mL | | | |
| MB 160-426501/5 | Ba Carrier_00045 | 1 mL | | | |
| MB 160-426501/6 | Ba Carrier_00045 | 1 mL | | | |

# PrecSep_0 Prep Worksheet

(Used for Collecting Prep Info)

Batch Number: 160-426501 Analyst: Romanko, Terry J Batch Open: 5/2/2019 1:24:00PM

Batch End: 5/3/2019 9:39:39AM

**Other Reagents:**

| Reagent | Amount/Units | Lot#: |
|---|---|---|
| | | |
| | | |
| | | |
| | | |
| | | |

# Reagent

# Ra-226_00024

Eckert & Ziegler
Analytics

1380 Seaboard Industrial Blvd.
Atlanta, Georgia 30318
Tel 404·352·8677
Fax 404·352·2837
www.ezag.com

# CERTIFICATE OF CALIBRATION
## Standard Reference Source

**SRS Number:** 104858
**Source Description:** 5 mL Liquid in Flame Sealed Vial
**Product Code:** 8226
**Customer:** TestAmerica St. Louis
**P.O. Number:** 2665998, Item 1

This standard radionuclide source was prepared gravimetrically from a master solution calibrated by Eckert & Ziegler Analytics (EZA) using a germanium gamma-ray spectrometer system. Radionuclide purity and calibration were checked by germanium gamma-ray spectrometry, liquid scintillation counting, and/or alpha spectrometry, as applicable. The nuclear decay rate and reference date for this source are given below. EZA maintains traceability to the National Institute of Standards and Technology (NIST) through a Measurements Assurance Program as described in USNRC Regulatory Guide 4.15, Revision 2, July 2007, and compliance with ANSI N42.22-1995, "Traceability of Radioactive Sources to NIST."

**Reference Date:** 05-December-2016 12:00 PM EST

| Isotope | Half-Life, d | Activity, Bq | Uncertainty $u_A$, % | $u_B$, % | $U$, %* | Calibration Method** |
|---|---|---|---|---|---|---|
| Ra-226 | 5.844E+05 | 1.408E+04 | 1.0 | 2.1 | 4.7 | HPGe |

***Uncertainty:** U - Relative expanded uncertainty, k = 2. See NIST Technical Note 1297, "Guidelines for Evaluating and Expressing the Uncertainty of NIST Measurement Results." ****Calibration Methods:** 4π LS - 4π Liquid Scintillation Counting, HPGe - High Purity Germanium Gamma-Ray Spectrometer, IC - Ionization Chamber.

(Certificate continued on reverse side)

**SRS Number:** 104858

**Comments:**

5.00002 g 0.1 M HCl solution with approximately 30 µg/g Ba carrier.

**Impurities:**

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

This source was wipe tested in its inactive areas with leak test results < 185 Bq (5 nCi) of removable activity per ISO 9978:1992.

Source Prepared by: _____

Z. Dimitrova, Radiochemist

QC Approved by: _____ Date: 05-DEC-16

J. Lahr, Spectroscopist

# Reagent

# Ra-226_00025

**SRS Number:** 104858

**Comments:**

5.00002 g 0.1 M HCl solution with approximately 30 µg/g Ba carrier.

**Impurities:**

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

This source was wipe tested in its inactive areas with leak test results < 185 Bq (5 nCi) of removable activity per ISO 9978:1992.

Source Prepared by: _____

Z. Dimitrova, Radiochemist

QC Approved by: _____ Date: 05-DEC-16

J. Lahr, Spectroscopist

Eckert & Ziegler
Analytics

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# CERTIFICATE OF CALIBRATION
## Standard Reference Source

**SRS Number:** 104858
**Source Description:** 5 mL Liquid in Flame Sealed Vial
**Product Code:** 8226
**Customer:** TestAmerica St. Louis
**P.O. Number:** 2665998, Item 1

This standard radionuclide source was prepared gravimetrically from a master solution calibrated by Eckert & Ziegler Analytics (EZA) using a germanium gamma-ray spectrometer system. Radionuclide purity and calibration were checked by germanium gamma-ray spectrometry, liquid scintillation counting, and/or alpha spectrometry, as applicable. The nuclear decay rate and reference date for this source are given below. EZA maintains traceability to the National Institute of Standards and Technology (NIST) through a Measurements Assurance Program as described in USNRC Regulatory Guide 4.15, Revision 2, July 2007, and compliance with ANSI N42.22-1995, "Traceability of Radioactive Sources to NIST."

**Reference Date:** 05-December-2016 12:00 PM EST

| Isotope | Half-Life, d | Activity, Bq | Uncertainty $u_A$, % | $u_B$, % | $U$, %* | Calibration Method** |
|---|---|---|---|---|---|---|
| Ra-226 | 5.844E+05 | 1.408E+04 | 1.0 | 2.1 | 4.7 | HPGe |

***Uncertainty:** U - Relative expanded uncertainty, k = 2. See NIST Technical Note 1297, "Guidelines for Evaluating and Expressing the Uncertainty of NIST Measurement Results." ****Calibration Methods:** 4π LS - 4π Liquid Scintillation Counting, HPGe - High Purity Germanium Gamma-Ray Spectrometer, IC - Ionization Chamber.

(Certificate continued on reverse side)

# Reagent

# Ra-226_00029

St. Louis Radiological Standard Verification

Printed: 5/3/2019 2:10 PM

Standard ID Number: Ra-226_00029
True Value = 11353 pCi/L or g
Date Analyzed: 4/30/2019

Radionuclide: Ra-226

| | Replicates | |
|---|---|---|
| #1 | 10640 | pCi/L or g |
| #2 | 11650 | pCi/L or g |
| #3 | 11150 | pCi/L or g |

Mean = 11146.667

1 sigma = 505.00825

1.96 sigma = 989.8162

True Value minus 5% = 10785.35 (True Value - 5%)
True Value plus 5% = 11920.65 (True Value + 5%)

**Accuracy:**
**Mean value within 5% of Certified (True) Value?** **Yes** **(Acceptance Criteria)**

**Precision:**
**1.96 sigma Value Within 10% of Mean Value?** **Yes** **(Acceptance Criteria)**

**Standard Reverification Acceptable?** **Yes**

Note: Criteria for reverification of radiological standards is taken from the DoD/DOE Consolidated QSM and LANL Statements of Work

1st Reviewed By/Date: TJR 5/3/2019

2nd Reviewed By/Date: gw 5/3/19

# Decay Calculations

**Raw Sample/Standard Information**

| | | | | |
|---|---|---|---|---|
| **Initial Date/Time ($t_0$):** | 12/5/2016 0:00 | | | |
| **Decayto Date/Time (t):** | 4/30/19 0:00 | | | |
| **Initial Activity ($A_0$):** | 25.23 | dpm | | |
| **Initial Aliquot:** | 1 | mL | | |
| **Initial Conc:** | 25.229 | dpm/mL | | |
| ***Soln. Density:** | 1 | g/mL | | |
| **Nuclide:** | Ra-226 | | | |
| **Half-Life (days):** | 584400 | | decay days | fraction |
| ****Decay Factor:** | 0.9990 | | 876.00 | 0.00150 |
| **Decay Corr Activity:** | 2.5203E+01 | dpm | | |
| **Decay Corr Conc:** | 2.5203E+01 | dpm/mL | | |

**Conversion/Calculations**

| | | |
|---|---|---|
| **Final Activity Unit:** | pCi | |
| **Activity Unit Factor:** | 0.45045 | |
| **Final Volume Unit:** | L | |
| **Volume Unit Factor:** | 0.001 | |
| **Final Concentration:** | 1.1353E+04 | pCi/L |
| **Aliquot Volume:** | 1.0000E+00 | L |
| **Final Activity (A):** | 1.1353E+04 | pCi |

** Uses basic decay equation: $A = A_0 * \exp(-\ln(2)*(t-t_0)/(\text{half-life})$

* Soln. Density to be used when converting from liquid expressed in mass (g) units to liquid units (mL), and is only applied in that case.

eurofins Environment Testing TestAmerica

# Analysis Report for Total Alpha-Emitting Radium

**Batch:** 425512 **Operator:**

| SampID / Analyte | WRKNO | Ts | Aliquot Tb | Cs | Ba Mass Cb | Ba Yield CPMs | Trunc Yield CPMb | Ingrowth Activity | Ba Precip Time UncCount | InstrID UncTotal | Eff MDA | Cal Type DLC | Cnt Date Time MQO | Sigma |
|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|
| 160-33859-A-1-A | 160-33859-A-1- | | 1.0000mL | | 0.0295 | 83.33% | False | 1.4639 | 4/29/19 16:30 | Orange9 | 0.1986 | 2 | 4/30/19 13:54 | 1.00 |
| Total Alpha | | 100.00 | 1000.00 | 578 | 56 | 5.78 | 0.06 | 1.064E+004pCi/L | 4.472E+002 | 6.552E+002 | 2.076E+002 | 7.590E+001 | 655.1927 | |
| 160-33859-A-1-B | 160-33859-A-1- | | 1.0000mL | | 0.0225 | 63.56% | False | 1.4639 | 4/29/19 16:30 | Orange11 | 0.2097 | 2 | 4/30/19 13:54 | 1.00 |
| Total Alpha | | 100.00 | 1000.00 | 515 | 104 | 5.15 | 0.10 | 1.165E+004pCi/L | 5.245E+002 | 7.416E+002 | 3.262E+002 | 1.285E+002 | 741.6337 | |
| 160-33859-A-1-C | 160-33859-A-1- | | 1.0000mL | | 0.0301 | 85.03% | False | 1.4640 | 4/29/19 16:30 | Orange12 | 0.1964 | 2 | 4/30/19 13:54 | 1.00 |
| Total Alpha | | 100.00 | 1000.00 | 614 | 85 | 6.14 | 0.09 | 1.115E+004pCi/L | 4.568E+002 | 6.787E+002 | 2.406E+002 | 9.267E+001 | 678.7122 | |

## Laboratory Control Sample Information

| SampID | WRKNO | Analyte | Activity | StdAdded | Recovery % | LCL | UCL | ZFactor |
|---|---|---|---|---|---|---|---|---|

## Sample Duplicate Information

| SampID | SampDupID | Analyte | Activity | DupActivity | RPD | RER | DER | ZFactor |
|---|---|---|---|---|---|---|---|---|

## Matrix Spike Information

| SampID | SampMSID | WRKNO | Analyte | Activity | MSActivity | StdAdded | Recovery | ZFactor |
|---|---|---|---|---|---|---|---|---|

## Blanks Information

| SampID | WRKNO | Analyte | Activity | UncTotal |
|---|---|---|---|---|

# PrecSep_0 Analysis Sheet

(To Accompany Samples to Instruments)

Batch Number: 160-425512

Analyst: Mazariegos, Chelsea M

Batch Open: 4/25/2019 11:21:00AM

Batch End:

## Preparation, Precipitate Separation

| | Input Sample Lab ID (Analytical Method) | SDG (Job #) | Matrix | Initial Amount | Final Amount | Due Date | Analytical TAT | Div Rank | Comments Orange | Output Sample Lab ID |
|---|---|---|---|---|---|---|---|---|---|---|
| 1 | 160-33859-A-1 (903.0_TAR) | N/A (160-33859-1) | Water | 1 mL | | 5/21/19 | 18_Days | 2 | 9 | 160-33859-A-1-A |
| 2 | 160-33859-A-1 (903.0_TAR) | N/A (160-33859-1) | Water | 1 mL | | 5/21/19 | 18_Days | 2 | 11 | 160-33859-A-1-B |
| 3 | 160-33859-A-1 (903.0_TAR) | N/A (160-33859-1) | Water | 1 mL | | 5/21/19 | 18_Days | 2 | 12 | 160-33859-A-1-C |

# PrecSep_0 Analysis Sheet

(To Accompany Samples to Instruments)

Batch Number: 160-425512

Analyst: Mazariegos, Chelsea M

Batch Open: 4/25/2019 11:21:00AM

Batch End:

## Total Alpha Radium (GFPC)

| | Input Sample Lab ID (Analytical Method) | (Sub-List) | Analytes |
|---|---|---|---|
| 1 | 160-33859-A-1 (903.0_TAR) | (Standard Target List) | Ba, Total Alpha Emitting Radium Isotopes |
| 2 | 160-33859-A-1 (903.0_TAR) | (Standard Target List) | Ba, Total Alpha Emitting Radium Isotopes |
| 3 | 160-33859-A-1 (903.0_TAR) | (Standard Target List) | Ba, Total Alpha Emitting Radium Isotopes |

Analytes that are not being reported with be displayed in [...] brackets. Analytes that are not being reported but are on the spike list with be displayed in (...) parentheses.

# PrecSep_0 Analysis Sheet

(To Accompany Samples to Instruments)

Batch Number: 160-425512 | Analyst: Mazariegos, Chelsea M | Batch Open: 4/25/2019 11:21:00AM

Batch End:

## Batch Notes

| | |
|---|---|
| Manually Enter Results? (0=NO, 1=YES) | No |
| EiChrom Used (Y/N)? | N |
| Radium Batch (Y/N)? | Y |
| Balance ID | 1122021820, 1125330898 |
| Analyst ID - Reagent Drop | HET per LMA |
| Analyst ID - Reagent Drop Witness | LMA |
| Pipette ID | Rad 112, Rad 038 |
| SOP Number | ST-RC-0002, ST-RC-0040 |
| Carrier ID for Barium | Ba |
| Strontium Carrier ID | |
| Yttrium Carrier ID | |
| Batch Comment | In- CPR, OUT-PMS |

## Comments

# PrecSep_0 Analysis Sheet

(To Accompany Samples to Instruments)

Batch Number: 160-425512 | Analyst: Mazariegos, Chelsea M | Batch Open: 4/25/2019 11:21:00AM

Batch End:

## Reagent Additions Worksheet

| Lab ID | Reagent Code | Amount Added | Final Amount | By | Witness |
|---|---|---|---|---|---|
| 160-33859-A-1 | Ba Carrier_00045 | 1 mL | | | |
| 160-33859-A-1 | Ra-226_00029 | 1 mL | | | |
| 160-33859-A-1 | Ba Carrier_00045 | 1 mL | | | |
| 160-33859-A-1 | Ra-226_00029 | 1 mL | | | |
| 160-33859-A-1 | Ba Carrier_00045 | 1 mL | | | |
| 160-33859-A-1 | Ra-226_00029 | 1 mL | | | |

### Other Reagents:

| Reagent | Amount/Units | Lot#: |
|---|---|---|
| | | |
| | | |
| | | |
| | | |
| | | |

# CHECKLIST FOR TOTAL ALPHA RADIUM – LIQUIDS & SOLIDS

| BATCH NUMBER |
|---|
| |
| (TAR) 425512 |
| |

| # SAMPS | # LCS |
|---|---|
| 0 | 3 |

| DUE DATE |
|---|
| ASAP, |

| REAGENTS | CHECK | INITIALS | VERIFIED BY | DATE OF SPIKES |
|---|---|---|---|---|
| A. METHYL ORANGE INDICATOR | ✓ | | | |
| B. ADD HNO3 to MB/LCS/LCSD | ✓ | | | |
| C. BARIUM STD CARRIER 1.0 mL | ✓ | HET | WA | 4/26/2019 |
| D. SPIKE LCS x3 | ✓ | HET | WA | |
| ~~E. SPIKE MS~~ | | | | |
| | | | | |
| F. 1M CITRIC ACID 5.0 mL/L | ✓ | | | |
| G. 15 mg/mL LEAD CARRIER 2.5 mL | ✓ | | | |
| MIX THEN HEAT | ✓ | | | |
| H. 15N AMMONIUM HYDROXIDE | ✓ | | | |
| I. 18N SULFURIC ACID, 10.0 mL | ✓ | | | |
| J. AMMONIUM SULFATE 5.0 mL | ✓ | | | |
| LEAD CLEANUP | ✓ | | | |

Ra-224_00029 verification

| | TIME (T) | DATE |
|---|---|---|
| T 1 | 12:26 | 04/29/2019 |
| T 3 | 16:30 | 04/29/2019 |

| | BARIUM CARRIER TRACER | RADIUM-226 SPIKE |
|---|---|---|
| STANDARD SOLUTION NUMBER | Ba Carrier_00045 | Ra-226_00028 |
| VOLUME (mL) | 1.0 | 1.0 |
| REF. ACTIVITY / CONCENTRATION | 0.0339 g | 25.229 dpm/mL |
| ACTIVITY REFERENCE DATE | N/A | 12/05/2016 |

| | |
|---|---|
| RE-EXTRACT ? | YES / NO |
| NCM NUMBER (IF APPLICABLE) | |

| | |
|---|---|
| K. LEAD CARRIER 1.5 mg/ml 1.0 mL | CPR |

TestAmerica
THE LEADER IN ENVIRONMENTAL TESTING

# Batch Reagent/Chemical IDs

**Printed:** 4/17/2019 11:10 AM
**Form:** QA-0093 Ra Water (Rev 12-27-18)

**Batch number:** 425572 Radium Waters

**Date:** _____

**Analyst:** _____

## Reagent IDs used:

| | | |
|---|---|---|
| 01 | Concentrated Nitric Acid | 1502038, 1714321 |
| 02 | Methyl Orange Indicator | 1701455 |
| 03 | Citric Acid | 1713835 |
| 04 | 15 mg/mL Lead Carrier | 1704868 |
| 05 | ~~10 mg/mL Strontium Carrier~~ | ~~1707215~~ CPR 4/29/19 |
| 06 | ~~9 mg/mL Yttrium Carrier~~ | ~~1715459~~ CPR 4/29/19 |
| 07 | 15N Ammonium Hydroxide | 1709964 |
| 08 | 18N Sulfuric Acid | 1708031 |
| 09 | 200 mg/mL Ammonium sulfate | 1708030, 1710775 |
| 10 | ~~Strontium/Yttrium Mixed Carrier~~ | ~~1711121~~ CPR 4/29/19 |
| 11 | EDTA | 1694178 |
| 12 | 17.4N Glacial Acetic Acid | 1710760 |
| 13 | Ammonium Sulfide | 1702595 |
| 14 | 10N Sodium Hydroxide | 1714294 |
| 15 | 1.5 mg/mL Lead Carrier | 1622245 |
| 16 | ~~Sodium Hydroxide Pellets (18N NaOH)~~ | PMS 04/29/19 |
| 17 | 6N Nitric Acid | |
| 18 | 2N Nitric Acid | |
| 19 | 5% Ammonium Oxalate | |
| 20 | ~~pH strip lot~~ | |
| 21 | syringr filter lot | 16919151 |
| 22 | centrifuge tube lot | 35018162 |

# Reagent

# Ra-228_00035

Eckert & Ziegler Analytics, Inc.
1380 Seaboard Industrial Blvd.
Atlanta, GA 30318, USA
Tel 1-404-352-8677
Fax 1-404-352-2837

Eckert & Ziegler
Analytics

#2

akkreditiert durch die / *accredited by the*

## Deutsche Akkreditierungsstelle GmbH

als Kalibrierlaboratorium im / *as calibration laboratory in the*

## Deutschen Kalibrierdienst DKD

DAkkS Deutsche Akkreditierungsstelle D-K-19023-01-00

Kalibrierschein
*Calibration certificate*

Kalibrierzeichen
*Calibration mark*

| |
|---|
| 000891 |
| D-K-19023-01-00 |
| 2019-05 |

| | |
|---|---|
| Gegenstand<br>*Object* | **5 mL Liquid in Flame Sealed Ampoule** |
| Hersteller<br>*Manufacturer* | **Eckert & Ziegler Analytics, Inc.** |
| Typ<br>*Type* | **8328-5FSA-370BQ-D** |
| Fabrikat/Serien-Nr.<br>*Serial number* | **112495** |
| Auftraggeber<br>*Customer* | **TestAmerica Laboratories - St. Louis** |
| Auftragsnummer<br>*Order No.* | **42950** |
| Anzahl der Seiten des Kalibrierscheines<br>*Number of pages of the certificate* | **2** |
| Datum der Kalibrierung<br>*Date of calibration* | **20-May-2019 1200 EST (1700 UTC)** |

Dieser Kalibrierschein dokumentiert die Rückführung auf nationale Normale zur Darstellung der Einheiten in Übereinstimmung mit dem Internationalen Einheitensystem (SI).
Die DAkkS ist Unterzeichner der multilateralen Übereinkommen der European co-operation for Accreditation (EA) und der International Laboratory Accreditation Cooperation (ILAC) zur gegenseitigen Anerkennung der Kalibrierscheine.
Für die Einhaltung einer angemessenen Frist zur Wiederholung der Kalibrierung ist der Benutzer verantwortlich.
*This calibration certificate documents the traceability to national standards, which realize the units of measurement according to the International System of Units (SI).*
*The DAkkS is signatory to the multilateral agreements of the European co-operation for Accreditation (EA) and of the International Laboratory Accreditation Cooperation (ILAC) for the mutual recognition of calibration certificates.*
*The user is obliged to have the object recalibrated at appropriate intervals.*

Dieser Kalibrierschein darf nur vollständig und unverändert weiterverbreitet werden. Auszüge oder Änderungen bedürfen der Genehmigung sowohl der Deutschen Akkreditierungsstelle GmbH als auch des ausstellenden Kalibrierlaboratoriums. Kalibrierscheine ohne Unterschrift haben keine Gültigkeit.
*This calibration certificate may not be reproduced other than in full except with the permission of both the Deutsche Akkreditierungsstelle GmbH and the issuing laboratory. Calibration certificates without signature are not valid.*

| Datum<br>*Date* | Stellv. Leiter des Kalibrierlaboratoriums<br>*Deputy Head of the calibration laboratory* | Bearbeiter<br>*Person in charge* |
|---|---|---|
| 16-May-19 | Jeffrey Lahr | for<br>Anthony Chirillo |

- **Customer Purchase Order No.:**
  3033290, Item 1

- **Calibration Results:**

| Nuclide | Half-Life, d | Activity, Bq | Uncertainty, % | Calibration Method |
|---|---|---|---|---|
| Ra-228 | 2.100E+03 | 3.706E+02 | 4.9 | HPGe |

- **Calibration Method(s):**
  This standard radionuclide source was prepared gravimetrically from a master solution calibrated by Eckert & Ziegler Analytics using a germanium gamma-ray spectrometer system (HPGe).

- **Uncertainty:**
  The uncertainty stated is the expanded uncertainty obtained by multiplying the standard uncertainty by the coverage factor $k = 2$. It has been determined in accordance with DAkkS-DKD-3. The value of the measurand lies within the assigned range of values with a probability of approximately 95%. See NIST Technical Note 1297, "Guidelines for Evaluating and Expressing the Uncertainty of NIST Measurement Results."

- **Traceability:**
  Eckert & Ziegler Analytics (EZA) maintains traceability to the National Institute of Standards and Technology through a Measurements Assurance Program as described in USNRC Regulatory Guide 4.15, Revision 2, July 2007, and compliance with ANSI N42.22-1995, "Traceability of Radioactive Sources to NIST."

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

- **Expiration Date:**
  No expiration date has been given for this source.

- **Wipe Test:**
  This source was wipe tested in its inactive areas with leak test results < 185 Bq (5 nCi) of removable activity per ISO 9978:1992.

- **Additional Information:**
  - 5.00817 g of 0.1 M HCl solution with approximately 30 µg/g Ba carrier.
  - Separation date: 01-March-2018
  - Date of Calibration corresponds to Reference Date for this source.
  - Expiration Date refers to useful life of this source.

**End of Certificate**

# Reagent

# Ra-228_00037

Standard ID Number: Ra-228_00037
True Value = 97982 DPM/L
Date Analyzed: 7/11/2019

Radionuclide: Ra-228

| | Replicates | |
|---|---|---|
| #1 | 96390 | pCi/L or g |
| #2 | 98490 | pCi/L or g |
| #3 | 91950 | pCi/L or g |

Mean = 95610

1 sigma = 3339.04178

1.96 sigma = 6544.522

True Value minus 5% = 93082.9 (True Value - 5%)
True Value plus 5% = 102881.1 (True Value + 5%)

**Accuracy:**
**Mean value within 5% of Certified (True) Value?** **Yes** **(Acceptance Criteria)**

**Precision:**
**1.96 sigma Value Within 10% of Mean Value?** **Yes** **(Acceptance Criteria)**

**Standard Reverification Acceptable?** **Yes**

Note: Criteria for reverification of radiological standards is taken from the DoD/DOE Consolidated QSM and LANL Statements of Work

1st Reviewed By/Date: Jody Watson 11/7/19

2nd Reviewed By/Date: _____

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# Analysis Report for Radium 228

**Batch:** 434091 **Operator:**

| SampID | WRKNO / Analyte | Aliquot / SampCntD | TruncYields / BkgCntDur | TruncYields / SampCnt | BaYield / BkgCnt | YYield / Activity | InstrID | Eff / UncCount | Y Ingrowth Time / UncTotal | Y Precip Time / MDA | Y Precip Time / DLC | CountDateTime / MQO | Sigma | CalType |
|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|
| 160-34818-A-1-A | 160-34818-A-1-A | 0.1000mL | False | | 99.15% | 73.64% | Orange0 | 0.4495 | 7/9/19 11:56 | 7/11/19 10:10 | | 7/11/19 12:48 | 1.00 | 1 |
| | Ra-228 | 200.00 | 1000.00 | 903 | 424 | 9.121E+004 | pCi/L | 3.381E+003 | 5.389E+003 | 4.034E+003 | 1.850E+003 | 5388.6219 | | |
| 160-34818-A-1-B | 160-34818-A-1-B | 0.1000mL | False | | 104.52% | 84.86% | Orange1 | 0.4386 | 7/9/19 11:56 | 7/11/19 10:10 | | 7/11/19 12:48 | 1.00 | 1 |
| | Ra-228 | 200.00 | 1000.00 | 981 | 338 | 8.594E+004 | pCi/L | 2.967E+003 | 4.943E+003 | 3.070E+003 | 1.394E+003 | 4942.6783 | | |
| 160-34818-A-1-C | 160-34818-A-1-C | 0.1000mL | False | | 94.35% | 78.88% | Orange2 | 0.4424 | 7/9/19 11:56 | 7/11/19 10:10 | | 7/11/19 12:48 | 1.00 | 1 |
| | Ra-228 | 200.00 | 1000.00 | 854 | 326 | 8.769E+004 | pCi/L | 3.273E+003 | 5.195E+003 | 3.569E+003 | 1.618E+003 | 5194.8180 | | |
| 160-34818-A-2-A | 160-34818-A-2-A | 0.1000mL | False | | 98.31% | 80.75% | Orange3 | 0.4417 | 7/9/19 11:56 | 7/11/19 10:10 | | 7/11/19 12:48 | 1.00 | 1 |
| | Ra-228 | 200.00 | 1000.00 | 1032 | 545 | 9.639E+004 | pCi/L | 3.390E+003 | 5.582E+003 | 4.243E+003 | 1.965E+003 | 5581.6979 | | |
| 160-34818-A-2-B | 160-34818-A-2-B | 0.1000mL | False | | 81.92% | 80.75% | Orange5 | 0.4352 | 7/9/19 11:56 | 7/11/19 10:10 | | 7/11/19 12:49 | 1.00 | 1 |
| | Ra-228 | 200.00 | 1000.00 | 850 | 378 | 9.849E+004 | pCi/L | 3.741E+003 | 5.876E+003 | 4.367E+003 | 1.993E+003 | 5875.5255 | | |
| 160-34818-A-2-C | 160-34818-A-2-C | 0.1000mL | True | | 107.91% | 74.77% | Orange6 | 0.4429 | 7/9/19 11:56 | 7/11/19 10:10 | | 7/11/19 12:49 | 1.00 | 1 |
| | Ra-228 | 200.00 | 1000.00 | 913 | 408 | 9.195E+004 | pCi/L | 3.371E+003 | 5.409E+003 | 3.932E+003 | 1.800E+003 | 5408.8934 | | |

## Laboratory Control Sample Information

| SampID | WRKNO | ComponentName | Activity | StdAdded | Recovery % | LCL | UCL | ZFactor |
|---|---|---|---|---|---|---|---|---|

## Sample Duplicate Information

| SampID | SampDupID | Analyte | Activity | DupActivity | RPD | RER | DER | ZFactor |
|---|---|---|---|---|---|---|---|---|

## Matrix Spike Information

| SampID | SampMSID | Analyte | Sample Activity | MS Activity | StdAdded | MSRecovery % | ZFactor |
|---|---|---|---|---|---|---|---|

## Blanks Information

| SampID | WRKNO | Analyte | Activity | UncTotal | ZFactor |
|---|---|---|---|---|---|

# Decay Calculations

**Raw Sample/Standard Information**

| | | | |
|---|---|---|---|
| **Initial Date/Time ($t_0$):** | 5/20/2019 0:00 | | |
| **Decayto Date/Time (t):** | 7/11/19 0:00 | | |
| **Initial Activity ($A_0$):** | 221.29 dpm | | |
| **Initial Aliquot:** | 1 mL | | |
| **Initial Conc:** | 221.2866 dpm/mL | | |
| ***Soln. Density:** | 1 g/mL | | |
| **Nuclide:** | Ra-228 | | |
| **Half-Life (days):** | 2100.1875 | decay days | fraction |
| ****Decay Factor:** | 0.9830 | 52.00 | 0.02476 |
| **Decay Corr Activity:** | 2.1752E+02 dpm | | |
| **Decay Corr Conc:** | 2.1752E+02 dpm/mL | | |

**Conversion/Calculations**

| | |
|---|---|
| **Final Activity Unit:** | pCi |
| **Activity Unit Factor:** | 0.45045 |
| **Final Volume Unit:** | L |
| **Volume Unit Factor:** | 0.001 |
| **Final Concentration:** | 9.7982E+04 pCi/L |
| **Aliquot Volume:** | 1.0000E+00 L |
| **Final Activity (A):** | 9.7982E+04 pCi |

** Uses basic decay equation: $A = A_0 * \exp(-\ln(2)*(t-t_0)/(\text{half-life})$

* Soln. Density to be used when converting from liquid expressed in mass (g) units to liquid units (mL), and is only applied in that case.

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# Analysis Report for Radium 228

**Batch:** 434091 **Operator:**

| SampID | WRKNO / Analyte | Aliquot / SampCntD | TruncYields: BkgCntDur | TruncYields: SampCnt | BaYield / BkgCnt | YYield / Activity | InstrID | Eff / UncCount | Y Ingrowth Time / UncTotal | Y Precip Time / MDA | DLC | CountDateTime / MQO | Sigma | CalType |
|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|
| 160-34818-A-1-A | 160-34818-A-1-A | 0.1000mL | False | | 99.15% | 73.64% | Orange0 | 0.4495 | 7/9/19 11:56 | 7/11/19 10:10 | | 7/11/19 12:48 | 1.00 | 1 |
| | Ra-228 | 200.00 | 1000.00 | 903 | 424 | 9.121E+004 | pCi/L | 3.381E+003 | 5.389E+003 | 4.034E+003 | 1.850E+003 | 5388.6219 | | |
| 160-34818-A-1-B | 160-34818-A-1-B | 0.1000mL | False | | 104.52% | 84.86% | Orange1 | 0.4386 | 7/9/19 11:56 | 7/11/19 10:10 | | 7/11/19 12:48 | 1.00 | 1 |
| | Ra-228 | 200.00 | 1000.00 | 981 | 338 | 8.594E+004 | pCi/L | 2.967E+003 | 4.943E+003 | 3.070E+003 | 1.394E+003 | 4942.6783 | | |
| 160-34818-A-1-C | 160-34818-A-1-C | 0.1000mL | False | | 94.35% | 78.88% | Orange2 | 0.4424 | 7/9/19 11:56 | 7/11/19 10:10 | | 7/11/19 12:48 | 1.00 | 1 |
| | Ra-228 | 200.00 | 1000.00 | 854 | 326 | 8.769E+004 | pCi/L | 3.273E+003 | 5.195E+003 | 3.569E+003 | 1.618E+003 | 5194.8180 | | |
| 160-34818-A-2-A | 160-34818-A-2-A | 0.1000mL | False | | 98.31% | 80.75% | Orange3 | 0.4417 | 7/9/19 11:56 | 7/11/19 10:10 | | 7/11/19 12:48 | 1.00 | 1 |
| | Ra-228 | 200.00 | 1000.00 | 1032 | 545 | 9.639E+004 | pCi/L | 3.390E+003 | 5.582E+003 | 4.243E+003 | 1.965E+003 | 5581.6979 | | |
| 160-34818-A-2-B | 160-34818-A-2-B | 0.1000mL | False | | 81.92% | 80.75% | Orange5 | 0.4352 | 7/9/19 11:56 | 7/11/19 10:10 | | 7/11/19 12:49 | 1.00 | 1 |
| | Ra-228 | 200.00 | 1000.00 | 850 | 378 | 9.849E+004 | pCi/L | 3.741E+003 | 5.876E+003 | 4.367E+003 | 1.993E+003 | 5875.5255 | | |
| 160-34818-A-2-C | 160-34818-A-2-C | 0.1000mL | False | | 107.91% | 74.77% | Orange6 | 0.4429 | 7/9/19 11:56 | 7/11/19 10:10 | | 7/11/19 12:49 | 1.00 | 1 |
| | Ra-228 | 200.00 | 1000.00 | 913 | 408 | 8.521E+004 | pCi/L | 3.124E+003 | 5.012E+003 | 3.644E+003 | 1.668E+003 | 5012.4300 | | |

## Laboratory Control Sample Information

| SampID | WRKNO | ComponentName | Activity | StdAdded | Recovery % | LCL | UCL | ZFactor |
|---|---|---|---|---|---|---|---|---|

## Sample Duplicate Information

| SampID | SampDupID | Analyte | Activity | DupActivity | RPD | RER | DER | ZFactor |
|---|---|---|---|---|---|---|---|---|

## Matrix Spike Information

| SampID | SampMSID | Analyte | Sample Activity | MS Activity | StdAdded | MSRecovery % | ZFactor |
|---|---|---|---|---|---|---|---|

## Blanks Information

| SampID | WRKNO | Analyte | Activity | UncTotal | ZFactor |
|---|---|---|---|---|---|

# PrecSep_0 Analysis Sheet

(To Accompany Samples to Instruments)

Batch Number: 160-434091

Analyst: Mazariegos, Chelsea M

Batch Open: 7/8/2019 12:35:00PM

Batch End: 7/11/2019 12:21:00PM

## Preparation, Precipitate Separation

| | Input Sample Lab ID (Analytical Method) | SDG (Job #) | Matrix | Initial Amount | Final Amount | Due Date | Analytical TAT | Div Rank | Comments | Output Sample Lab ID |
|---|---|---|---|---|---|---|---|---|---|---|
| 1 | 160-34818-A-1 (904.0) | (160-34818-1) | Water | 0.1 mL | | 8/1/19 | 18_Days | 2 | Orange 0 | 160-34818-A-1-A |
| 2 | 160-34818-A-1 (904.0) | (160-34818-1) | Water | 0.1 mL | | 8/1/19 | 18_Days | 2 | 1 | 160-34818-A-1-B |
| 3 | 160-34818-A-1 (904.0) | (160-34818-1) | Water | 0.1 mL | | 8/1/19 | 18_Days | 2 | 2 | 160-34818-A-1-C |
| 4 | 160-34818-A-2 (904.0) | (160-34818-1) | Water | 0.1 mL | | 8/1/19 | 18_Days | 2 | 3 | 160-34818-A-2-A |
| 5 | 160-34818-A-2 (904.0) | (160-34818-1) | Water | 0.1 mL | | 8/1/19 | 18_Days | 2 | 5 | 160-34818-A-2-B |
| 6 | 160-34818-A-2 (904.0) | (160-34818-1) | Water | 0.1 mL | | 8/1/19 | 18_Days | 2 | 6 | 160-34818-A-2-C |

CR-
we are out
of spike need
results ASAP!!

INTO IG
7/9
TO CR
7/10

TR In TALS,
email Reviewed

# PrecSep_0 Analysis Sheet

(To Accompany Samples to Instruments)

Batch Number: 160-434091

Analyst: Mazariegos, Chelsea M

Batch Open: 7/8/2019 12:35:00PM

Batch End: 7/11/2019 12:21:00PM

## Radium-228 (GFPC)

| | Input Sample Lab ID (Analytical Method) | (Sub-List) | Analytes |
|---|---|---|---|
| 1 | 160-34818-A-1 (904.0) | (Standard Target List) | Ba, Ra-228, Y |
| 2 | 160-34818-A-1 (904.0) | (Standard Target List) | Ba, Ra-228, Y |
| 3 | 160-34818-A-1 (904.0) | (Standard Target List) | Ba, Ra-228, Y |
| 4 | 160-34818-A-2 (904.0) | (Standard Target List) | Ba, Ra-228, Y |
| 5 | 160-34818-A-2 (904.0) | (Standard Target List) | Ba, Ra-228, Y |
| 6 | 160-34818-A-2 (904.0) | (Standard Target List) | Ba, Ra-228, Y |

Analytes that are not being reported with be displayed in [...] brackets. Analytes that are not being reported but are on the spike list with be displayed in (...) parentheses.

# PrecSep_0 Analysis Sheet

(To Accompany Samples to Instruments)

Batch Number: 160-434091

Analyst: Mazariegos, Chelsea M

Batch Open: 7/8/2019 12:35:00PM

Batch End: 7/11/2019 12:21:00PM

## Batch Notes

| | |
|---|---|
| Manually Enter Results? (0=NO, 1=YES) | No |
| EiChrom Used (Y/N)? | N |
| Radium Batch (Y/N)? | Y |
| Balance ID | 1121470622, 1125330898 |
| Analyst ID - Reagent Drop | JLC Per KAW, CPR |
| Analyst ID - Reagent Drop Witness | KAW, SEC per CPR |
| Pipette ID | RAD038, SEP005 |
| SOP Number | ST-RC-0002, ST-RC-0041 |
| Carrier ID for Barium | Ba |
| Strontium Carrier ID | |
| Yttrium Carrier ID | Y |
| Batch Comment | In CPR, OUT-PMS |

## Comments

(To Accompany Samples to Instruments)

Batch Number: 160-434091

Analyst: Mazariegos, Chelsea M

Batch Open: 7/8/2019 12:35:00PM

Batch End: 7/11/2019 12:21:00PM

## Reagent Additions Worksheet

| Lab ID | Reagent Code | Amount Added | Final Amount | By | Witness |
|---|---|---|---|---|---|
| 160-34818-A-1 | Ba Carrier_00045 | 1 mL | | | |
| 160-34818-A-1 | Ra-228_00036 | 0.1 mL | | | |
| 160-34818-A-1 | Y Carrier_00037 | 0.2 mL | | | |
| 160-34818-A-1 | Ba Carrier_00045 | 1 mL | | | |
| 160-34818-A-1 | Ra-228_00036 | 0.1 mL | | | |
| 160-34818-A-1 | Y Carrier_00037 | 0.2 mL | | | |
| 160-34818-A-1 | Ba Carrier_00045 | 1 mL | | | |
| 160-34818-A-1 | Ra-228_00036 | 0.1 mL | | | |
| 160-34818-A-1 | Y Carrier_00037 | 0.2 mL | | | |
| 160-34818-A-2 | Ba Carrier_00045 | 1 mL | | | |
| 160-34818-A-2 | Ra-228_00037 | 0.1 mL | | | |
| 160-34818-A-2 | Y Carrier_00037 | 0.2 mL | | | |
| 160-34818-A-2 | Ba Carrier_00045 | 1 mL | | | |
| 160-34818-A-2 | Ra-228_00037 | 0.1 mL | | | |
| 160-34818-A-2 | Y Carrier_00037 | 0.2 mL | | | |
| 160-34818-A-2 | Ba Carrier_00045 | 1 mL | | | |
| 160-34818-A-2 | Ra-228_00037 | 0.1 mL | | | |

# PrecSep_0 Analysis Sheet

(To Accompany Samples to Instruments)

Batch Number: 160-434091

Analyst: Mazariegos, Chelsea M

Batch Open: 7/8/2019 12:35:00PM

Batch End: 7/11/2019 12:21:00PM

| | | | | | |
|---|---|---|---|---|---|
| 160-34818-A-2 | Y Carrier_00037 | 0.2 mL | | | |

**Other Reagents:**

| Reagent | Amount/Units | Lot#: |
|---|---|---|
| | | |
| | | |
| | | |
| | | |
| | | |

# Rad Worksheet

Batch Number: 160-434091
Method: PrecSep_0
Analyst: Mazariegos, Chelsea M

Date Open: Jul 08 2019 12:35PM
Batch End: Jul 11 2019 12:21PM

| Lab ID | Client ID | Method Chain | Basis | Initial weight/volume of sample | Tare Weight of Barium Planchette | Barium Mass Added | Tare Weight of Yttrium Planchette | Gross Weight of Yttrium Planchette | Yttrium Mass added |
|---|---|---|---|---|---|---|---|---|---|
| 160-34818-A-1 | Ra-228 STD Verify 1 | PrecSep_0, 904.0 | T | 0.1 mL | 8.7377 g | 0.0354 g | 8.7528 g | 8.7725 g | 0.0268 g |
| 160-34818-A-1 | Ra-228 STD Verify 1 | PrecSep_0, 904.0 | T | 0.1 mL | 8.7779 g | 0.0354 g | 8.7501 g | 8.7728 g | 0.0268 g |
| 160-34818-A-1 | Ra-228 STD Verify 1 | PrecSep_0, 904.0 | T | 0.1 mL | 8.6946 g | 0.0354 g | 8.7399 g | 8.7610 g | 0.0268 g |
| 160-34818-A-2 | Ra-228 STD Verify 2 | PrecSep_0, 904.0 | T | 0.1 mL | 8.7474 g | 0.0354 g | 8.7290 g | 8.7506 g | 0.0268 g |
| 160-34818-A-2 | Ra-228 STD Verify 2 | PrecSep_0, 904.0 | T | 0.1 mL | 8.7033 g | 0.0354 g | 8.6996 g | 8.7212 g | 0.0268 g |
| 160-34818-A-2 | Ra-228 STD Verify 2 | PrecSep_0, 904.0 | T | 0.1 mL | 8.6726 g | 0.0354 g | 8.6931 g | 8.7131 g | 0.0268 g |

# Rad Worksheet

Batch Number: 160-434091
Method: PrecSep_0
Analyst: Mazariegos, Chelsea M

Date Open: Jul 08 2019 12:35PM
Batch End: Jul 11 2019 12:21PM

| Lab ID | Client ID | Method Chain | Basis | Ingrowth/Decay Date1 | Ingrowth/Decay Date2 | Native Y Mass | Ba Carrier_00045 | Ra-228_00036 | Ra-228_00037 |
|---|---|---|---|---|---|---|---|---|---|
| 160-34818-A-1 | Ra-228 STD Verify 1 | PrecSep_0, 904.0 | T | 07/09/2019 11:56 | 07/11/2019 10:10 | 0 g | 1 mL | 0.1 mL | |
| 160-34818-A-1 | Ra-228 STD Verify 1 | PrecSep_0, 904.0 | T | 07/09/2019 11:56 | 07/11/2019 10:10 | 0 g | 1 mL | 0.1 mL | |
| 160-34818-A-1 | Ra-228 STD Verify 1 | PrecSep_0, 904.0 | T | 07/09/2019 11:56 | 07/11/2019 10:10 | 0 g | 1 mL | 0.1 mL | |
| 160-34818-A-2 | Ra-228 STD Verify 2 | PrecSep_0, 904.0 | T | 07/09/2019 11:56 | 07/11/2019 10:10 | 0 g | 1 mL | | 0.1 mL |
| 160-34818-A-2 | Ra-228 STD Verify 2 | PrecSep_0, 904.0 | T | 07/09/2019 11:56 | 07/11/2019 10:10 | 0 g | 1 mL | | 0.1 mL |
| 160-34818-A-2 | Ra-228 STD Verify 2 | PrecSep_0, 904.0 | T | 07/09/2019 11:56 | 07/11/2019 10:10 | 0 g | 1 mL | | 0.1 mL |

# Rad Worksheet

Batch Number: 160-434091
Method: PrecSep_0
Analyst: Mazariegos, Chelsea M

Date Open: Jul 08 2019 12:35PM
Batch End: Jul 11 2019 12:21PM

| Lab ID | Client ID | Method Chain | Basis | Y Carrier_00037 |
|---|---|---|---|---|
| 160-34818-A-1 | Ra-228 STD Verify 1 | PrecSep_0, 904.0 | T | 0.2 mL |
| 160-34818-A-1 | Ra-228 STD Verify 1 | PrecSep_0, 904.0 | T | 0.2 mL |
| 160-34818-A-1 | Ra-228 STD Verify 1 | PrecSep_0, 904.0 | T | 0.2 mL |
| 160-34818-A-2 | Ra-228 STD Verify 2 | PrecSep_0, 904.0 | T | 0.2 mL |
| 160-34818-A-2 | Ra-228 STD Verify 2 | PrecSep_0, 904.0 | T | 0.2 mL |
| 160-34818-A-2 | Ra-228 STD Verify 2 | PrecSep_0, 904.0 | T | 0.2 mL |

Balance ID: 1121470622, 1125330898
Analyst ID - Reagent Drop: JLC Per KAW, CPR
Analyst ID - Reagent Drop Witness: KAW, SEC per CPR
Pipette ID: RAD038, SEP005
SOP Number: ST-RC-0002, ST-RC-0041

# Rad Worksheet

Batch Number: 160-434091
Method: PrecSep_0
Analyst: Mazariegos, Chelsea M

Date Open: Jul 08 2019 12:35PM
Batch End: Jul 11 2019 12:21PM

| Lab ID | Client ID | Method Chain | Basis | Analysis comment | Comments |
|---|---|---|---|---|---|
| 160-34818-A-1 | Ra-228 STD Verify 1 | PrecSep_0, 904.0 | T | | |
| 160-34818-A-1 | Ra-228 STD Verify 1 | PrecSep_0, 904.0 | T | | |
| 160-34818-A-1 | Ra-228 STD Verify 1 | PrecSep_0, 904.0 | T | | |
| 160-34818-A-2 | Ra-228 STD Verify 2 | PrecSep_0, 904.0 | T | | |
| 160-34818-A-2 | Ra-228 STD Verify 2 | PrecSep_0, 904.0 | T | | |
| 160-34818-A-2 | Ra-228 STD Verify 2 | PrecSep_0, 904.0 | T | | |

Batch Comment: In CPR, OUT-PMS

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# Radiochemistry Data Review Checklist

**Batch:** 434091 **Analysis:** Radium-228

| Review Item | Yes | No | N/A | 2 Rvw |
|---|---|---|---|---|
| ***Rad Prep*** | | | | |
| 1 Are all samples on batch sheet present or removed from batch? | ☑ | ☐ | ☐ | ☐ |
| 2 Are all samples, QC and methods in compliance with client requirements? | ☑ | ☐ | ☐ | ☐ |
| 3 Were forms checked for transcription errors? | ☑ | ☐ | ☐ | ☐ |
| 4 Are all TALS entries complete? (End Dates and appropriate worksheet fields completed) | ☑ | ☐ | ☐ | ☐ |
| 5 Are all problems and deviations documented? (NCM printed and attached with paperwork) | ☐ | ☐ | ☑ | ☐ |
| 6 Does this batch contain re-extracts? | ☐ | ☑ | ☐ | ☐ |
| ***Sample Analysis*** | | | | |
| 1 Are carrier/tracer yields within acceptance limits? | ☐ | ☐ | ☐ | ☐ |
| 2 Were all sample holding times met? | ☐ | ☐ | ☐ | ☐ |
| 3 If alpha or LSC, were samples analyzed using normal ROI's, and were spectra evaluated for interferences? | ☐ | ☐ | ☐ | ☐ |
| ***QC Samples*** | | | | |
| 1 Is the blank activity <= MDA | ☐ | ☐ | ☐ | ☐ |
| 2 Is the blank activity <= client CRDL? | ☐ | ☐ | ☐ | ☐ |
| 3 If blank activity exceeds limit, is sample activity >= 5X blank activity? | ☐ | ☐ | ☐ | ☐ |
| 4 Is LCS recovery within acceptance limits? | ☐ | ☐ | ☐ | ☐ |
| 5 Is duplicate precision (e.g. RPD/RER/DER/z-score) within acceptance limits? | ☐ | ☐ | ☐ | ☐ |
| 6 Is MS/MSD recovery within acceptance limits? | ☐ | ☐ | ☐ | ☐ |
| 7 Do samples meet CRDL? | ☐ | ☐ | ☐ | ☐ |
| 8 Is the absolute value of any negative result < 3sigma uncert.? | ☐ | ☐ | ☐ | ☐ |
| ***Other*** | | | | |
| 1 Are all nonconformances documented and noted? | ☐ | ☐ | ☐ | ☐ |
| 2 Were data entries checked? | ☐ | ☐ | ☐ | ☐ |
| 3 Were manual calculations checked? | ☐ | ☐ | ☐ | ☐ |
| 4 Were forms checked for transcription errors? | ☐ | ☐ | ☐ | ☐ |
| 5 Are reporting units correct? | ☐ | ☐ | ☐ | ☐ |
| ***Data Packaging*** | | | | |
| 1 Run logs included? | ☐ | ☐ | ☐ | ☐ |
| 2 Daily checks included? | ☐ | ☐ | ☐ | ☐ |
| 3 Backgrounds included? | ☐ | ☐ | ☐ | ☐ |
| 4 Calibrations included? | ☐ | ☐ | ☐ | ☐ |

| Lot Number | Analytical Due Date |
|---|---|
| 160-34818-A-1-A | |
| 160-34818-A-1-B | |
| 160-34818-A-1-C | |
| 160-34818-A-2-A | |
| 160-34818-A-2-B | |
| 160-34818-A-2-C | |

**Batch:** 434091 **Analysis:** Radium-228

Comments:

Prep Analyst: PMS Date: 07/11/2019

Analyst: Date:

Second Level Reviewer Date:

Date Uploaded:

Date Verified:

Date Review Released:

# CHECKLIST FOR RADIUM 226 / 228 – LIQUIDS & SOLIDS

| REAGENTS | CHECK |
|---|---|
| A. METHYL ORANGE INDICATOR | ✓ |
| B. ADD HNO3 to MB, LCS, and LCSD | ✓ |
| C. BARIUM STD CARRIER 1.0 mL | ✓ |
| D. SPIKE LCS | ✓ |
| E. SPIKE MS | |
| F. 1M CITRIC ACID 5.0 mL/L | ✓ |
| G. 15 mg/mL LEAD CARRIER 2.5 mL | ✓ |
| H. 9 mg/mL Sr CARRIER 2.0 mL | ✓ |
| I. 9mg/mL Y CARRIER 1.0 mL | ✓ |
| MIX THEN HEAT | ✓ |
| J. NH4OH TO YELLOW ENDPOINT | ✓ |
| K. 18 N SULFURIC ACID, 10.0 mL | ✓ |
| L. AMMONIUM SULFATE, 5.0 mL | ✓ |
| LEAD CLEANUP | ✓ |

| BATCH NUMBERS |
|---|
| (228) 434091 |
| ~~(226)~~ |
| JLC 7/8/19 |

| # SAMPS | # LCS |
|---|---|
| 6 | 0 |

| DUE DATE |
|---|
| ASAP |

| INITIALS | VERIFIED BY | DATE OF SPIKE |
|---|---|---|
| JLC | UJW | 07/08/2019 |
| JLC | | |
| | | JLC 7/8/19 |

| DATE OUT OF INGROWTH |
|---|
| 07 / 11 / 2019 |

| DAYS IN INGROWTH | 2 | 14 | 21 |
|---|---|---|---|

Ra-228_00036
Ra-228_00037

| | TIME (T) | DATE |
|---|---|---|
| T 1 | 11:56 | 07 / 09 / 2019 |
| T 2 | 10:10 | 07 / 11 / 2019 |
| T 3 | | |

| | BARIUM CARRIER STD | RADIUM-226 SPIKE | RADIUM-228 SPIKE | Y CARRIER STD |
|---|---|---|---|---|
| STANDARD ID | Ba Carrier_00045 | Ra-226_00029 | Ra-228_00031 | Y Carrier_00037 |
| VOLUME (mL) | 1.0 | 1.0 | 0.1 | 0.2 |
| REF. ACTIVITY OR MASS | 0.0354 | 25.229 dpm/mL | 229.5014 dpm/mL | 0.02675 |
| ACTIVITY REFERENCE DATE | N/A | 12/05/2016 | 05/29/2018 | N/A |

| | INITIALS | Verified By | DATE |
|---|---|---|---|
| M. Y STD CARRIER | CPR | SEC | 7/9/19 |

| | |
|---|---|
| N. LEAD CARRIER 1.5 mg/ml 1.0 mL | CPR |

| | |
|---|---|
| RE-EXTRACT ? | YES / NO |
| NCM NUMBER (IF APPLICABLE) | |

RAD-0066 Rev 3 2/25/19
Page 1 of 1

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# Batch Reagent/Chemical IDs

Printed: 6/25/2019 7:08 PM
Form: QA-0093 Ra Water (Rev 12-27-18)

**Batch number:** 434091 Radium Waters

**Date:**

**Analyst:** PMS

## Reagent IDs used:

| | | |
|---|---|---|
| 01 | Concentrated Nitric Acid | 173,2777, 1760705 |
| 02 | Methyl Orange Indicator | 1757906 |
| 03 | Citric Acid | 1745445 |
| 04 | 15 mg/mL Lead Carrier | 1732808 |
| 05 | 10 mg/mL Strontium Carrier | 1732807 |
| 06 | 9 mg/mL Yttrium Carrier | 1732812 |
| 07 | 15N Ammonium Hydroxide | 1752057 |
| 08 | 18N Sulfuric Acid | 1751128 |
| 09 | 200 mg/mL Ammonium sulfate | 1753834 |
| 10 | Strontium/Yttrium Mixed Carrier | 1711121 |
| 11 | EDTA | 1756831 |
| 12 | 17.4N Glacial Acetic Acid | 1756822 |
| 13 | Ammonium Sulfide | 1728052 |
| 14 | 10N Sodium Hydroxide | 1726499 |
| 15 | 1.5 mg/mL Lead Carrier | 1755176 |
| 16 | Sodium Hydroxide Pellets (18N NaOH) | 1762870 |
| 17 | 6N Nitric Acid | 1718025 |
| 18 | 2N Nitric Acid | 1684237 |
| 19 | 5% Ammonium Oxalate | 1762872 |
| ~~20~~ | ~~pH strip lot~~ | PMS 07/11/2019 |
| 21 | syringr filter lot | 1619151 |
| 22 | centrifuge tube lot | 02119093 |

# Reagent

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# Sr-90_00001

Eckert & Ziegler
Analytics

1380 Seaboard Industrial Blvd.
Atlanta, Georgia 30318
Tel 404·352·8677
Fax 404·352·2837
www.analyticsinc.com

# CERTIFICATE OF CALIBRATION

## Standard Radionuclide Source

80573-334

5 mL Liquid in Flame Sealed Vial

**Customer:** Test America St. Louis
**P.O. No.:** 2324797, Item 1

This standard radionuclide source was prepared gravimetrically from a calibrated master solution. The master solution was calibrated by liquid scintillation counting. Radionuclide purity and calibration were checked by germanium gamma-ray spectrometry and liquid scintillation counting. The nuclear decay rate and assay date for this source are given below. Eckert & Ziegler Analytics (EZA) maintains traceability to the National Institute of Standards and Technology through a Measurements Assurance Program as described in USNRC Regulatory Guide 4.15, Revision 1, February, 1979, and compliance with ANSI N42.22-1995, "Traceability of Radioactive Sources to NIST." EZA is accredited by the Health Physics Society (HPS) for the production of NIST-traceable sources, and this source was produced in accordance with the HPS accreditation requirements. Customers may report any concerns with the accreditation program to the HPS Secretariat, 1313 Dolley Madison Blvd., Ste. 402, McLean, VA 22101.

| Isotope | Half-Life, Days | Activity (Bq) | Uncertainty*, % Type $u_A$ | $u_B$ | U | Reference Date (12:00 PM EST) |
|---|---|---|---|---|---|---|
| Sr-90 | 10515.5 | 3.782E+04 | 0.1 | 0.9 | 1.8 | 09/17/2009 |

*Uncertainty: U - Relative expanded uncertainty, k = 2. See NIST Technical Note 1297, "Guidelines for Evaluating and Expressing the Uncertainty of NIST Measurement Results."

**Comments:**
Impurities: γ-impurities <0.1%. 5.04317 grams 0.1M HCl solution with approximately 30 microg/g each of Sr and Y carriers. NOTE: This source also contains Y-90 in secular equilibrium with Sr-90. The Y-90 activity is equal to the Sr-90 activity. Since Sr-90 and Y-90 both decay 100% by beta emission, the total beta emission rate for the source is twice the certified Sr-90 activity. The half-life for Y-90 is 64.08 hours.

Source Prepared by: _____
W. Mao, Radiochemist

QA Approved: _____ Date: 9-22-09
D. M. Montgomery, QA Manager

ACCREDITED SOURCE CALIBRATION LABORATORY
HEALTH PHYSICS SOCIETY
FOUNDED 1958



Corporate Office
Laboratory
1380 Seaboard Industrial Blvd., Atlanta, Georgia 30318

# Reagent

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# Sr-90_00017

Eckert & Ziegler
Analytics

1380 Seaboard Industrial Blvd.
Atlanta, Georgia 30318
Tel 404•352•8677
Fax 404•352•2837
www.analyticsinc.com

# CERTIFICATE OF CALIBRATION

## Standard Radionuclide Source

92352

Sr-90 5 mL Liquid in Flame Sealed Vial

**Customer:** TestAmerica St. Louis
**P.O. No.:** 2502682, Item 1 Product Code: 8090-5FSA-37kBq

This standard radionuclide source was prepared gravimetrically from a master solution, calibrated by Eckert & Ziegler Analytics. The master solution was calibrated by liquid scintillation counting. Radionuclide calibration and purity were checked by germanium gamma-ray spectrometry, liquid scintillation counting, and/or alpha spectrometry, as applicable. The nuclear decay rate and reference date for this source are given below. Eckert & Ziegler Analytics (EZA) maintains traceability to the National Institute of Standards and Technology through a Measurements Assurance Program as described in USNRC Regulatory Guide 4.15, Revision 2, July 2007, and compliance with ANSI N42.22-1995, "Traceability of Radioactive Sources to NIST." EZA is accredited by the Health Physics Society (HPS) for the production of NIST-traceable sources, and this source was produced in accordance with the HPS accreditation requirements. Customers may report any concerns with the accreditation program to the HPS Secretariat, 1313 Dolley Madison Blvd., Ste. 402, McLean, VA 22101.

| Isotope | Half-Life, Days | Activity (Bq) | Uncertainty*, % Type $u_A$ | $u_B$ | U | Reference Date (12:00 PM EST) |
|---|---|---|---|---|---|---|
| Sr-90 | 1.052E+04 | 3.749E+04 | 0.1 | 0.9 | 1.8 | 11/29/2012 |

***Uncertainty:** U - Relative expanded uncertainty, k = 2. See NIST Technical Note 1297, "Guidelines for Evaluating and Expressing the Uncertainty of NIST Measurement Results."

**Comments:**
Impurities: γ-impurities<0.1%.
5.02357 g 0.1M HCl solution with approximately 30 μg/g each Sr and Y carriers.

NOTE: This source also contains Y-90 in secular equilibrium with Sr-90. The Y-90 activity is equal to the Sr-90 activity. Since Sr-90 and Y-90 both decay 100% by beta emission, the total activity for the source is twice the certified Sr-90 activity. The half-life for Y-90 is 64.08 hours.

Source Prepared by: _____
Z. Dimitrova, Radiochemist

QA Approved: _____ Date: 26 NOV 12
J.D. McCorvey, Counting Room Manager

ACCREDITED SOURCE CALIBRATION LABORATORY HEALTH PHYSICS SOCIETY FOUNDED 1956

RAD12-0042
Sr-90
hursts
None
Prep/Opened: 11/28/2012
Exp(1): 11/29/2062
Exp(2): 11/29/2062

51511
ID Sr-90_00017
Sr-90 Ampoule

Single Isotope Certificate Rev 3, 23 August 2012



**Corporate Office**
24937 Avenue Tibbitts Valencia, California 91355

**Laboratory**
1380 Seaboard Industrial Blvd. Atlanta, Georgia, 30318

# Reagent

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# Sr-90_00018

TestAmerica
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Sr-90_00018

# Reagent ID: Sr-90_00018

| | | | |
|---|---|---|---|
| | | Expiration Date: | 11/29/2062 |
| Description: | Sr-90 Calibration STD | Laboratory: | TestAmerica St. Louis |
| No. of Bottles: | 1 | Prepared By: | Hurst, Sarah |
| Storage Location: | RAD Separations Reagents - 1 | Solvent: | 0.1M HCL |
| Reagent Volume: | 100.000 mL | Solvent Lot: | 0 |
| Creation Date: | 11/28/2012 | | |
| Container(s): | 51512 | | |
| Comment: | Rad12-0043 | | |

## Reagent Analyte Information

| Analyte | Source ID | Source Exp. Date | Source Conc. | Source Conc. Units | Final Conc. | Final Conc. Units |
|---|---|---|---|---|---|---|
| Gross Beta | Sr-90_00017 | 11/29/2062 | 14925.64000 | Bq/g | 44774.23338 | dpm/mL |
| Sr-90 | Sr-90_00017 | 11/29/2062 | 7462.82000 | Bq/g | 22387.11669 | dpm/mL |

## Source Reagents

| Reagent | Description | Type | Expiration | Vendor | Vendor Lot # | Vendor Cat Lot # | Volume Used | Volume Units |
|---|---|---|---|---|---|---|---|---|
| Sr-90_00017 | Sr-90 Ampoule | ASTD | 11/29/62 | Analytics | 92352 | | 4.99970 | g |

## St. Louis Radiological Standard Reverification Form

Standard ID Number: Sr-90_00018 (51512)
True Value = 1976.75 pCi/sample or g
Date Analyzed: 2/10/2014

Radionuclide: Sr-90 (Low mass)

| | Replicates | |
|---|---|---|
| #1 | 1935 | pCi/sample or g |
| #2 | 1941 | pCi/sample or g |
| #3 | 1924 | pCi/sample or g |

Mean = 1933.333

1 sigma = 8.621678 1.96 sigma = 16.89849

True Value minus 5% = 1877.913 (True Value - 5%)
True Value plus 5% = 2075.588 (True Value + 5%)

**Accuracy:**
**Mean value within 5% of Certified (True) Value?** **Yes** **(Acceptance Criteria)**

**Precision:**
**1.96 sigma Value Within 10% of Mean Value?** **Yes** **(Acceptance Criteria)**

**Standard Reverification Acceptable?** **Yes**

Note: Criteria for reverification of radiological standards is taken from the DOE QSAS and LANL Statements of Work

Reviewed By/Date: Jody Watson 2/10/14

SOP Reference: STL-QA-0002, Current Revision

## St. Louis Radiological Standard Reverification Form

Standard ID Number: Sr-90_00018 (51512)
True Value = 1948.75 pCi/sample or g
Date Analyzed: 2/10/2014

Radionuclide: Sr-90 (Medium mass)

| | Replicates | |
|---|---|---|
| #1 | 1911 | pCi/sample or g |
| #2 | 1945 | pCi/sample or g |
| #3 | 1893 | pCi/sample or g |

Mean = 1916.333

1 sigma = 26.40707 1.96 sigma = 51.75786

True Value minus 5% = 1851.313 (True Value - 5%)
True Value plus 5% = 2046.188 (True Value + 5%)

**Accuracy:**
**Mean value within 5% of Certified (True) Value?** **Yes** **(Acceptance Criteria)**

**Precision:**
**1.96 sigma Value Within 10% of Mean Value?** **Yes** **(Acceptance Criteria)**

**Standard Reverification Acceptable?** **Yes**

Note: Criteria for reverification of radiological standards is taken from the DOE QSAS and LANL Statements of Work

Reviewed By/Date: Jody Watson 2/10/14

SOP Reference: STL-QA-0002, Current Revision

## St. Louis Radiological Standard Reverification Form

Standard ID Number: Sr-90_00018 (51512)
True Value = 1992 pCi/sample or g
Date Analyzed: 2/10/2014

Radionuclide: Sr-90 (High mass)

| | Replicates | |
|---|---|---|
| #1 | 1907 | pCi/sample or g |
| #2 | 1930 | pCi/sample or g |
| #3 | 1937 | pCi/sample or g |

Mean = 1924.667

1 sigma = 15.69501 1.96 sigma = 30.76222

True Value minus 5% = 1892.4 (True Value - 5%)
True Value plus 5% = 2091.6 (True Value + 5%)

**Accuracy:**
**Mean value within 5% of Certified (True) Value?** **Yes** **(Acceptance Criteria)**

**Precision:**
**1.96 sigma Value Within 10% of Mean Value?** **Yes** **(Acceptance Criteria)**

**Standard Reverification Acceptable?** **Yes**

Note: Criteria for reverification of radiological standards is taken from the DOE QSAS and LANL Statements of Work

Reviewed By/Date: Jody Watson 2/10/14

SOP Reference: STL-QA-0002, Current Revision

| Protean Beta ICV-ACV recoveries from March 2013 | | | |
|---|---|---|---|
| **Protean Detector** | **Low** pCi/sample | **Medium** pCi/sample | **High** pCi/sample |
| 0 | 1962 | 1945 | 1971 |
| 1 | 2003 | 1947 | 1995 |
| 2 | 1960 | 1965 | 1998 |
| 3 | 1988 | 1942 | 1995 |
| 4 | 1977 | 1940 | 1997 |
| 5 | 1969 | 1949 | 2013 |
| 6 | 1986 | 1938 | 1986 |
| 7 | 1969 | 1964 | 1981 |
| **Average** pCi/sample | 1976.75 | 1948.75 | 1992 |

| Protean Beta ICV-ACV recoveries from February 2014 | | | |
|---|---|---|---|
| **Protean Detector** | **Low** pCi/sample | **Medium** pCi/sample | **High** pCi/sample |
| 4 | 1935 | 1911 | 1907 |
| 5 | 1941 | 1945 | 1930 |
| 6 | 1924 | 1893 | 1937 |
| **Average** pCi/sample | 1933.33 | 1916.33 | 1924.67 |

**Standard ID**
Strontium 90
Sr-90_00018 #51512
Cert# 92352 Ref. date 11/29/12

TestAmerica

THE LEADER IN ENVIRONMENTAL TESTING

# Analysis Report for Gross Alpha/Beta

**Batch:** M122640 **Operator:** 63903

| Sample ID | WRKNO / Analyte | Aliquot Cs | Aliquot Cb | Mass XT | Instr ID CPMs | CountTime CPMb | CountTime Eff | Activity | Ts | Tb UncTot | Dilution UncCnt | Sigma MDA | DLC |
|---|---|---|---|---|---|---|---|---|---|---|---|---|---|
| ICVABT-51512;B1 | NA | 1.000E+000 | sample | 0.0513 g | Protean4 | 2/10/14 22:54 | | | 5.00 | 1000.00 | 1.00 | 2.00 | |
| | Gross Alpha | 0 | 49 | 0.00 | 0.000E+000 | 4.900E-002 | 0.1157 | **-1.908E-001**pCi/sample | | 5.869E-002 | 5.452E-002 | 3.382E+000 | 8.968E-001 |
| | Gross Beta | 9072 | 417 | 0.00 | 1.814E+003 | 4.170E-001 | 0.4224 | **1.935E+003**pCi/sample | | 1.977E+002 | 4.063E+001 | 1.594E+000 | 7.165E-001 |
| ICVABT-51512;B2 | NA | 1.000E+000 | sample | 0.1114 g | Protean4 | 2/10/14 23:19 | | | 5.00 | 1000.00 | 1.00 | 2.00 | |
| | Gross Alpha | 1 | 49 | 0.00 | 2.000E-001 | 4.900E-002 | 0.0830 | **8.194E-001**pCi/sample | | 2.174E+000 | 2.172E+000 | 4.713E+000 | 1.250E+000 |
| | Gross Beta | 8432 | 417 | 0.00 | 1.686E+003 | 4.170E-001 | 0.3973 | **1.911E+003**pCi/sample | | 1.956E+002 | 4.164E+001 | 1.694E+000 | 7.616E-001 |
| ICVABT-51512;B3 | NA | 1.000E+000 | sample | 0.1813 g | Protean4 | 2/10/14 23:04 | | | 5.00 | 1000.00 | 1.00 | 2.00 | |
| | Gross Alpha | 1 | 49 | 0.00 | 2.000E-001 | 4.900E-002 | 0.0540 | **1.260E+000**pCi/sample | | 3.343E+000 | 3.340E+000 | 7.248E+000 | 1.922E+000 |
| | Gross Beta | 8054 | 417 | 0.00 | 1.611E+003 | 4.170E-001 | 0.3804 | **1.907E+003**pCi/sample | | 1.954E+002 | 4.251E+001 | 1.770E+000 | 7.956E-001 |

## Laboratory Control Sample Information

| SampID | WRKNO | Analyte | Activity | StdAdded | Recovery % | LCL | UCL | ZFactor |
|---|---|---|---|---|---|---|---|---|

## Sample Duplicate Information

| Sample ID | Dup Sample ID | Analyte | Sample Activity | Dup Activity | RPD | RER | DER | ZFactor |
|---|---|---|---|---|---|---|---|---|

## Matrix Spike Information

| SampID | SampMSID | Analyte | Sample Activity | MS Activity | StdAdded | MSRecovery % | ZFactor |
|---|---|---|---|---|---|---|---|

## Blanks Information

| SampID | WRKNO | Analyte | Activity | UncTotal | ZFactor |
|---|---|---|---|---|---|

TestAmerica

THE LEADER IN ENVIRONMENTAL TESTING

# Analysis Report for Gross Alpha/Beta

**Batch:** M122640 **Operator:** 63903

| Sample ID | WRKNO / Analyte | Aliquot Cs | Aliquot Cb | Mass XT | Instr ID CPMs | CountTime CPMb | CountTime Eff | Activity | Ts | Tb UncTot | Dilution UncCnt | Sigma MDA | DLC |
|---|---|---|---|---|---|---|---|---|---|---|---|---|---|
| ICVABT-51512;B1 | NA | 1.000E+000 | sample | 0.0513 g | Protean5 | 2/10/14 23:04 | | | 5.00 | 1000.00 | 1.00 | 2.00 | |
| | Gross Alpha | 0 | 43 | 0.00 | 0.000E+000 | 4.300E-002 | 0.1145 | **-1.692E-001**pCi/sample | | 5.510E-002 | 5.161E-002 | 3.337E+000 | 8.490E-001 |
| | Gross Beta | 9111 | 398 | 0.00 | 1.822E+003 | 3.980E-001 | 0.4228 | **1.941E+003**pCi/sample | | 1.983E+002 | 4.068E+001 | 1.569E+000 | 6.992E-001 |
| ICVABT-51512;B2 | NA | 1.000E+000 | sample | 0.1114 g | Protean5 | 2/10/14 22:54 | | | 5.00 | 1000.00 | 1.00 | 2.00 | |
| | Gross Alpha | 0 | 43 | 0.00 | 0.000E+000 | 4.300E-002 | 0.0823 | **-2.353E-001**pCi/sample | | 7.661E-002 | 7.176E-002 | 4.639E+000 | 1.180E+000 |
| | Gross Beta | 8552 | 398 | 0.00 | 1.710E+003 | 3.980E-001 | 0.3960 | **1.945E+003**pCi/sample | | 1.990E+002 | 4.207E+001 | 1.675E+000 | 7.465E-001 |
| ICVABT-51512;B3 | NA | 1.000E+000 | sample | 0.1813 g | Protean5 | 2/10/14 23:19 | | | 5.00 | 1000.00 | 1.00 | 2.00 | |
| | Gross Alpha | 2 | 43 | 0.00 | 4.000E-001 | 4.300E-002 | 0.0532 | **3.022E+000**pCi/sample | | 4.802E+000 | 4.790E+000 | 7.178E+000 | 1.826E+000 |
| | Gross Beta | 8046 | 398 | 0.00 | 1.609E+003 | 3.980E-001 | 0.3755 | **1.930E+003**pCi/sample | | 1.977E+002 | 4.304E+001 | 1.766E+000 | 7.873E-001 |

## Laboratory Control Sample Information

| SampID | WRKNO | Analyte | Activity | StdAdded | Recovery % | LCL | UCL | ZFactor |
|---|---|---|---|---|---|---|---|---|

## Sample Duplicate Information

| Sample ID | Dup Sample ID | Analyte | Sample Activity | Dup Activity | RPD | RER | DER | ZFactor |
|---|---|---|---|---|---|---|---|---|

## Matrix Spike Information

| SampID | SampMSID | Analyte | Sample Activity | MS Activity | StdAdded | MSRecovery % | ZFactor |
|---|---|---|---|---|---|---|---|

## Blanks Information

| SampID | WRKNO | Analyte | Activity | UncTotal | ZFactor |
|---|---|---|---|---|---|

TestAmerica

THE LEADER IN ENVIRONMENTAL TESTING

# Analysis Report for Gross Alpha/Beta

**Batch:** M122640 **Operator:** 63903

| Sample ID | WRKNO / Analyte | Aliquot Cs | Cb | Mass XT | Instr ID CPMs | CountTime CPMb | Eff | Activity | Ts | Tb UncTot | Dilution UncCnt | Sigma MDA | DLC |
|---|---|---|---|---|---|---|---|---|---|---|---|---|---|
| ICVABT-51512;B1 | NA | 1.000E+000 | sample | 0.0513 g | Protean6 | 2/10/14 23:19 | | | 5.00 | 1000.00 | 1.00 | 2.00 | |
| | Gross Alpha | 0 | 87 | 0.00 | 0.000E+000 | 8.700E-002 | 0.1165 | -3.362E-001 pCi/sample | | 8.166E-002 | 7.210E-002 | 3.776E+000 | 1.186E+000 |
| | Gross Beta | 8992 | 520 | 0.00 | 1.798E+003 | 5.200E-001 | 0.4209 | 1.924E+003 pCi/sample | | 1.966E+002 | 4.059E+001 | 1.718E+000 | 8.029E-001 |
| ICVABT-51512;B2 | NA | 1.000E+000 | sample | 0.1114 g | Protean6 | 2/10/14 23:04 | | | 5.00 | 1000.00 | 1.00 | 2.00 | |
| | Gross Alpha | 0 | 87 | 0.00 | 0.000E+000 | 8.700E-002 | 0.0842 | -4.657E-001 pCi/sample | | 1.131E-001 | 9.985E-002 | 5.230E+000 | 1.642E+000 |
| | Gross Beta | 8356 | 520 | 0.00 | 1.671E+003 | 5.200E-001 | 0.3976 | 1.893E+003 pCi/sample | | 1.937E+002 | 4.142E+001 | 1.819E+000 | 8.499E-001 |
| ICVABT-51512;B3 | NA | 1.000E+000 | sample | 0.1813 g | Protean6 | 2/10/14 22:54 | | | 5.00 | 1000.00 | 1.00 | 2.00 | |
| | Gross Alpha | 0 | 87 | 0.00 | 0.000E+000 | 8.700E-002 | 0.0559 | -7.014E-001 pCi/sample | | 1.703E-001 | 1.504E-001 | 7.877E+000 | 2.474E+000 |
| | Gross Beta | 8127 | 520 | 0.00 | 1.625E+003 | 5.200E-001 | 0.3778 | 1.937E+003 pCi/sample | | 1.985E+002 | 4.300E+001 | 1.914E+000 | 8.945E-001 |

## Laboratory Control Sample Information

| SampID | WRKNO | Analyte | Activity | StdAdded | Recovery % | LCL | UCL | ZFactor |
|---|---|---|---|---|---|---|---|---|

## Sample Duplicate Information

| Sample ID | Dup Sample ID | Analyte | Sample Activity | Dup Activity | RPD | RER | DER | ZFactor |
|---|---|---|---|---|---|---|---|---|

## Matrix Spike Information

| SampID | SampMSID | Analyte | Sample Activity | MS Activity | StdAdded | MSRecovery % | ZFactor |
|---|---|---|---|---|---|---|---|

## Blanks Information

| SampID | WRKNO | Analyte | Activity | UncTotal | ZFactor |
|---|---|---|---|---|---|

# TestAmerica St. Louis

## Standards Preparation Logbook Record

Nov-28-2012

Logbook: \\Qstlmo01\Stdslog\RAD_STD.std

RAD12-0042, Sr-90 Sr-90-00017 #51511 Analyst: hursts

Vendor: Analytics Lot No.: 92352
Solvent: None
Date Prep./Opened: 11-28-2012
Date Expires(1): 11-29-2062 (50 Years)
Date Expires(2): 11-29-2062 (50 Years)
Cert: 92352 Activity: 37490Bq Mass: 5.02357 Ref. Date: 11/29/12

| Component | Initial Conc (dpm/g) | Final Conc (dpm/g) |
|---|---|---|
| Sr-90 | 447,769 | 447,769 |

RAD12-0043, Sr-90 Calibration STD Sr-90-00018 #51512 Analyst: hursts

Solvent: None Volume (ml): 100.00
Date Prep./Opened: 11-28-2012
Date Expires(1): 11-29-2062 (50 Years)
Date Expires(2): 11-29-2062 (50 Years)

Parent Std No.: RAD12-0042, Sr-90 Aliquot Amount (g): 4.9997
Parent Date Expires(1): 11-29-2062 Parent Date Expires(2): 11-29-2062

| Component | Initial Conc (dpm/g) | Final Conc (dpm/mL) |
|---|---|---|
| Sr-90 | 447,769 | 22,387 |

Reviewed By: SB

Page 1 of 1

## St. Louis Radiological Standard Reverification Form

Standard ID Number: Rad12-0043
True Value = 2016.7 pCi/L or g
Date Analyzed: 11/30/2012

Radionuclide: Sr90

| | Replicates | |
|---|---|---|
| #1 | 1964 | pCi/L or g |
| #2 | 1958 | pCi/L or g |
| #3 | 2015 | pCi/L or g |

Mean = 1979

1 sigma = 31.32092 1.96 sigma = 61.389

True Value minus 5% = 1915.865 (True Value - 5%)
True Value plus 5% = 2117.535 (True Value + 5%)

**Accuracy:**
**Mean value within 5% of Certified (True) Value?** **Yes** **(Acceptance Criteria)**

**Precision:**
**1.96 sigma Value Within 10% of Mean Value?** **Yes** **(Acceptance Criteria)**

**Standard Reverification Acceptable?** **Yes**

Note: Criteria for reverification of radiological standards is taken from the DOE QSAS and LANL Statements of Work

Reviewed By/Date: 11/30/12

SOP Reference: STL-QA-0002, Current Revision

TestAmerica

THE LEADER IN ENVIRONMENTAL TESTING

# Analysis Report for Gross Alpha/Beta

**Batch:** M122629 **Operator:** 63903

| Sample ID | WRKNO / Analyte | Aliquot / Cs | Cb | Mass / XT | | Instr ID / CPMs | CountTime / CPMb | Eff | Ts / Activity | Tb / UncTot | Dilution / UncCnt | Sigma / MDA | DLC |
|---|---|---|---|---|---|---|---|---|---|---|---|---|---|
| verification-1b | NA | 1.000E+000 | sample | 0.0536 | g | Purple16 | 11/30/12 10:42 | | 8.00 | 1000.00 | 1.00 | 1.00 | |
| | Gross Alpha | 123 | 175 | 0.00 | 1.538E+001 | 1.750E-001 | 0.4314 | | **1.587E+001**pCi/sample | 1.707E+000 | 1.448E+000 | 8.638E-001 | 3.593E-001 |
| | Gross Beta | 14954 | 485 | 0.00 | 1.869E+003 | 4.850E-001 | 0.4285 | | **1.964E+003**pCi/sample | 9.953E+001 | 1.607E+001 | 1.211E+000 | 6.021E-001 |
| verification-2b | NA | 1.000E+000 | sample | 0.0529 | g | Purple17 | 11/30/12 10:43 | | 8.00 | 1000.00 | 1.00 | 1.00 | |
| | Gross Alpha | 53 | 87 | 0.00 | 6.625E+000 | 8.700E-002 | 0.1306 | | **2.254E+001**pCi/sample | 3.391E+000 | 3.138E+000 | 2.356E+000 | 8.365E-001 |
| | Gross Beta | 15152 | 362 | 0.00 | 1.894E+003 | 3.620E-001 | 0.4356 | | **1.958E+003**pCi/sample | 9.919E+001 | 1.591E+001 | 1.077E+000 | 5.117E-001 |
| verification-3b | NA | 1.000E+000 | sample | 0.0528 | g | Purple18 | 11/30/12 10:43 | | 8.00 | 1000.00 | 1.00 | 1.00 | |
| | Gross Alpha | 85 | 62 | 0.00 | 1.063E+001 | 6.200E-002 | 0.1313 | | **3.624E+001**pCi/sample | 4.462E+000 | 3.954E+000 | 2.160E+000 | 7.027E-001 |
| | Gross Beta | 15378 | 395 | 0.00 | 1.922E+003 | 3.950E-001 | 0.4296 | | **2.015E+003**pCi/sample | 1.020E+002 | 1.625E+001 | 1.125E+000 | 5.420E-001 |

## Laboratory Control Sample Information

| SampID | WRKNO | Analyte | Activity | StdAdded | Recovery % | LCL | UCL | ZFactor |
|---|---|---|---|---|---|---|---|---|

## Sample Duplicate Information

| Sample ID | Dup Sample ID | Analyte | Sample Activity | Dup Activity | RPD | RER | DER | ZFactor |
|---|---|---|---|---|---|---|---|---|

## Matrix Spike Information

| SampID | SampMSID | Analyte | Sample Activity | MS Activity | StdAdded | MSRecovery % | ZFactor |
|---|---|---|---|---|---|---|---|

## Blanks Information

| SampID | WRKNO | Analyte | Activity | UncTotal | ZFactor |
|---|---|---|---|---|---|

TestAmerica

THE LEADER IN ENVIRONMENTAL TESTING

## *Prep Report for Gross Alpha/Beta*

**Batch:** M122629 **Prep Analyst:** 250

| SampID | WRKNO | Aliquot | | Gross | Tare | Mass | Dilution |
|---|---|---|---|---|---|---|---|
| verification-1b | NA | 1.000E+000 | sample purple 16 | 8.7067 g | 8.6531 g | 0.0536 g | 1.00 |
| verification-2b | NA | 1.000E+000 | sample 17 | 8.6615 g | 8.6086 g | 0.0529 g | 1.00 |
| verification-3b | NA | 1.000E+000 | sample 18 | 8.6935 g | 8.6407 g | 0.0528 g | 1.00 |

## *Spike Information*

| Sample ID | Standard ID | Analyte | Std Conc | Aliquot | Ref Date | StdAdded |
|---|---|---|---|---|---|---|
| | Rad12-0043 | SR-90 | 22.387 dpm/mL | 0.1 mL | 11-29-12 | |

MS — Spiked By

LM — Spike Verified By

11-28-12 — Spike Date

## *Standard Operating Procedures*

| SOPNumber | Title | Revision |
|---|---|---|
| | | |

Reviewed By — 11/30/12 Review Date

MS — Analyst/Relenquished By — 11/28/12 Release Date

Received By — 11/28/12 Receipt Date

MS 11-30-12 ~~112~~ 1123433897/MS/11-28-12

Balance ID / Initials / Date

# Reagent

# Th-230_00015

Eckert & Ziegler
Analytics

1380 Seaboard Industrial Blvd.
Atlanta, Georgia 30318
Tel 404•352•8677
Fax 404•352•2837
www.analyticsinc.com

# CERTIFICATE OF CALIBRATION

## Standard Radionuclide Source

92523

Th-230 5 mL Liquid in Flame Sealed Vial

**Customer:** TestAmerica St. Louis
**P.O. No.:** 2502650, Item 2 Product Code: 8230-5FSA-4kBq

This standard radionuclide source was prepared gravimetrically from a master solution, calibrated by Eckert & Ziegler Analytics. The master solution was calibrated by liquid scintillation counting. Radionuclide calibration and purity were checked by germanium gamma-ray spectrometry, liquid scintillation counting, and/or alpha spectrometry, as applicable. The nuclear decay rate and reference date for this source are given below. Eckert & Ziegler Analytics (EZA) maintains traceability to the National Institute of Standards and Technology through a Measurements Assurance Program as described in USNRC Regulatory Guide 4.15, Revision 2, July 2007, and compliance with ANSI N42.22-1995, "Traceability of Radioactive Sources to NIST." EZA is accredited by the Health Physics Society (HPS) for the production of NIST-traceable sources, and this source was produced in accordance with the HPS accreditation requirements. Customers may report any concerns with the accreditation program to the HPS Secretariat, 1313 Dolley Madison Blvd., Ste. 402, McLean, VA 22101.

| Isotope | Half-Life, Days | Activity (Bq) | Uncertainty*, % Type $u_A$ | $u_B$ | U | Reference Date (12:00 PM EST) |
|---|---|---|---|---|---|---|
| Th-230 | 2.753E+07 | 3.979E+03 | 0.1 | 0.9 | 1.8 | 11/29/2012 |

***Uncertainty:** U - Relative expanded uncertainty, k = 2. See NIST Technical Note 1297, "Guidelines for Evaluating and Expressing the Uncertainty of NIST Measurement Results."

**Comments:**
Impurities: α-impurities 1.5915 Bq; γ-impurities (other than decay products)<0.1%.
5.07636 g 0.5M HNO3 solution. Carrier free.

Source Prepared by: MTaskaeva
M. I. Taskaeva, Radiochemist

QA Approved: 
J.D. McCorvey, Counting Room Manager

Date: 27 NOV 12

51464
ID Th-230_00015
Th-230 Ampoule

RAD12-0040
Th-230 Ampoule
hursts
None
Prep/Opened: 11/28/2012
Exp(1): 11/28/2062
Exp(2): 11/28/2062

ACCREDITED SOURCE CALIBRATION LABORATORY HEALTH PHYSICS SOCIETY FOUNDED 1956

Single Isotope Certificate Rev 3, 23 August 2012

# Reagent

# Th-230_00016

Eckert & Ziegler
Analytics

1380 Seaboard Industrial Blvd.
Atlanta, Georgia 30318
Tel 404·352·8677
Fax 404·352·2837
www.analyticsinc.com

# CERTIFICATE OF CALIBRATION

## Standard Radionuclide Source

92523

Th-230 5 mL Liquid in Flame Sealed Vial

**Customer:** TestAmerica St. Louis
**P.O. No.:** 2502650, Item 2 Product Code: 8230-5FSA-4kBq

This standard radionuclide source was prepared gravimetrically from a master solution, calibrated by Eckert & Ziegler Analytics. The master solution was calibrated by liquid scintillation counting. Radionuclide calibration and purity were checked by germanium gamma-ray spectrometry, liquid scintillation counting, and/or alpha spectrometry, as applicable. The nuclear decay rate and reference date for this source are given below. Eckert & Ziegler Analytics (EZA) maintains traceability to the National Institute of Standards and Technology through a Measurements Assurance Program as described in USNRC Regulatory Guide 4.15, Revision 2, July 2007, and compliance with ANSI N42.22-1995, "Traceability of Radioactive Sources to NIST." EZA is accredited by the Health Physics Society (HPS) for the production of NIST-traceable sources, and this source was produced in accordance with the HPS accreditation requirements. Customers may report any concerns with the accreditation program to the HPS Secretariat, 1313 Dolley Madison Blvd., Ste. 402, McLean, VA 22101.

| Isotope | Half-Life, Days | Activity (Bq) | Uncertainty*, % Type $u_A$ | $u_B$ | U | Reference Date (12:00 PM EST) |
|---|---|---|---|---|---|---|
| Th-230 | 2.753E+07 | 3.979E+03 | 0.1 | 0.9 | 1.8 | 11/29/2012 |

*Uncertainty: U - Relative expanded uncertainty, k = 2. See NIST Technical Note 1297, "Guidelines for Evaluating and Expressing the Uncertainty of NIST Measurement Results."

**Comments:**
Impurities: α-impurities 1.5915 Bq; γ-impurities (other than decay products)<0.1%.
5.07636 g 0.5M HNO3 solution. Carrier free.

Source Prepared by: M. I. Taskaeva, Radiochemist

QA Approved: J.D. McCorvey, Counting Room Manager

Date: 27 NOV 12

51464
ID Th-230_00015
Th-230 Ampoule

RAD12-0040
Th-230 Ampoule
hursts
None
Prep/Opened: 11/28/2012
Exp(1): 11/28/2062
Exp(2): 11/28/2062

ACCREDITED SOURCE CALIBRATION LABORATORY HEALTH PHYSICS SOCIETY FOUNDED 1958

Single Isotope Certificate Rev 3, 23 August 2012

# TestAmerica St. Louis

## Standards Preparation Logbook Record

Nov-28-2012

Logbook: \\Qstlmo01\Stdslog\RAD_STD.std

RAD12-0040, Th-230 Ampoule Th-230_00015 # 51464 Analyst: hursts

Vendor: Analytics Lot No.: 92523
Solvent: None
Date Prep./Opened: 11-28-2012 Date Consumed: 11-28-2012
Date Expires(1): 11-28-2062 (50 Years)
Date Expires(2): 11-28-2062 (50 Years)
Cert: 92523 Activity: 3979Bq Reference Date: 11/29/12 Mass: 5.07636

| Component | Initial Conc (dpm/g) | Final Conc (dpm/g) |
|---|---|---|
| Th-230 | 47,030 | 47,030 |

RAD12-0041, Th-230 Calibration Standard Th-230_00016 # 51465 Analyst: hursts

Solvent: 0.5M HNO3 Volume (ml): 100.00
Date Prep./Opened: 11-28-2012
Date Expires(1): 11-29-2062 (50 Years)
Date Expires(2): 11-29-2062 (50 Years)

Parent Std No.: RAD12-0040, Th-230 Ampoule Aliquot Amount (g): 5.0489
Parent Date Expires(1): 11-28-2062 Parent Date Expires(2): 11-28-2062

| Component | Initial Conc (dpm/g) | Final Conc (dpm/mL) |
|---|---|---|
| Th-230 | 47,030 | 2,374.5 |

Reviewed By: SH

Page 1 of 1

## St. Louis Radiological Standard Reverification Form

Standard ID Number: Rad12-0041
True Value = 1069.59 pCi/mL
Date Analyzed: 11/30/2012

Radionuclide: Th-230 Gross Alpha

| | Replicates | |
|---|---|---|
| #1 | 1071 | pCi/mL |
| #2 | 1027 | pCi/mL |
| #3 | 1085 | pCi/mL |

Mean = 1061

1 sigma = 30.26549 1.96 sigma = 59.32036

True Value minus 5% = 1016.111 (True Value - 5%)
True Value plus 5% = 1123.07 (True Value + 5%)

**Accuracy:**
**Mean value within 5% of Certified (True) Value?** Yes **(Acceptance Criteria)**

**Precision:**
**1.96 sigma Value Within 10% of Mean Value?** Yes **(Acceptance Criteria)**

**Standard Reverification Acceptable?** Yes

Note: Criteria for reverification of radiological standards is taken from the DOE QSAS and LANL Statements of Work

Reviewed By/Date: JN 11/30/12

SOP Reference: STL-QA-0002, Current Revision

TestAmerica

THE LEADER IN ENVIRONMENTAL TESTING

# Analysis Report for Gross Alpha/Beta

**Batch:** M122628 **Operator:** 63903

| Sample ID | WRKNO | Aliquot | | Mass | Instr ID | CountTime | | Ts | Tb | Dilution | Sigma | |
|---|---|---|---|---|---|---|---|---|---|---|---|---|
| | Analyte | Cs | Cb | XT | CPMs | CPMb | Eff | Activity | UncTot | UncCnt | MDA | DLC |
| verification 1a | NA | 1.000E+000mL | | 0.0546 g | Purple16 | 11/30/12 13:03 | | 8.00 | 1000.00 | 1.00 | 1.00 | |
| | Gross Alpha | 2528 | 175 | 0.00 | 3.160E+002 | 1.750E-001 | 0.1328 | 1.071E+006pCi/L | 6.469E+004 | 2.132E+004 | 2.807E+003 | 1.167E+003 |
| | Gross Beta | 792 | 485 | 0.00 | 9.900E+001 | 4.850E-001 | 0.4280 | 1.037E+005pCi/L | 6.370E+003 | 3.702E+003 | 1.212E+003 | 6.028E+002 |
| verification 2a | NA | 1.000E+000mL | | 0.0536 g | Purple17 | 11/30/12 13:03 | | 8.00 | 1000.00 | 1.00 | 1.00 | |
| | Gross Alpha | 2364 | 87 | 0.00 | 2.955E+002 | 8.700E-002 | 0.1295 | 1.027E+006pCi/L | 6.225E+004 | 2.113E+004 | 2.376E+003 | 8.436E+002 |
| | Gross Beta | 764 | 362 | 0.00 | 9.550E+001 | 3.620E-001 | 0.4353 | 9.846E+004pCi/L | 6.084E+003 | 3.576E+003 | 1.078E+003 | 5.121E+002 |
| verification 3a | NA | 1.000E+000mL | | 0.0531 g | Purple18 | 11/30/12 13:04 | | 8.00 | 1000.00 | 1.00 | 1.00 | |
| | Gross Alpha | 2521 | 62 | 0.00 | 3.151E+002 | 6.200E-002 | 0.1308 | 1.085E+006pCi/L | 6.551E+004 | 2.161E+004 | 2.168E+003 | 7.052E+002 |
| | Gross Beta | 788 | 395 | 0.00 | 9.850E+001 | 3.950E-001 | 0.4295 | 1.029E+005pCi/L | 6.325E+003 | 3.680E+003 | 1.125E+003 | 5.421E+002 |

## Laboratory Control Sample Information

| SampID | WRKNO | Analyte | Activity | StdAdded | Recovery % | LCL | UCL | ZFactor |
|---|---|---|---|---|---|---|---|---|

## Sample Duplicate Information

| Sample ID | Dup Sample ID | Analyte | Sample Activity | Dup Activity | RPD | RER | DER | ZFactor |
|---|---|---|---|---|---|---|---|---|

## Matrix Spike Information

| SampID | SampMSID | Analyte | Sample Activity | MS Activity | StdAdded | MSRecovery % | ZFactor |
|---|---|---|---|---|---|---|---|

## Blanks Information

| SampID | WRKNO | Analyte | Activity | UncTotal | ZFactor |
|---|---|---|---|---|---|

TestAmerica

THE LEADER IN ENVIRONMENTAL TESTING

## *Prep Report for Gross Alpha/Beta*

**Batch:** M122628 **Prep Analyst:** 250

| SampID | WRKNO | Aliquot | Gross | Tare | Mass | Dilution |
|---|---|---|---|---|---|---|
| verification 1a | NA | 6.500E-001 mL | 8.6982 g | 8.6436 g | 0.0546 g | 1.00 |
| | | orange 5 | protean 14 | | 16 | |
| verification 2a | NA | 6.500E-001 mL | 8.6698 g | 8.6162 g | 0.0536 g | 1.00 |
| | | 7 | 15 | | 17 | |
| verification 3a | NA | 6.500E-001 mL | 8.6466 g | 8.5935 g | 0.0531 g | 1.00 |
| | | 8 | | | 18 | |

## *Spike Information*

| Sample ID | Standard ID | Analyte | Std Conc | Aliquot | Ref Date | StdAdded |
|---|---|---|---|---|---|---|
| | Rad12-0041 | Th-230 | 2374.5 dpm/mL | 1.00 mL | 11-29-12 | |

MS — Spiked By

LM per MS — Spike Verified By

11-28-12 — Spike Date

## *Standard Operating Procedures*

| SOPNumber | Title | Revision |
|---|---|---|
| ☐ | | |

Reviewed By: [signature] — Review Date: 11/30/12

Analyst/Relenquished By: MS — Release Date: 11-28-12

Received By: [signature] — Receipt Date: 11/28/12

1123433897/MS/11-28-12

Balance ID / Initials / Date

# Reagent

# Th-230_00019

# TestAmerica St. Louis

## Standards Preparation Logbook Record

Aug-13-2013

Logbook: \\Qstlmo01\Stdslog\RAD_STD.std

RAD13-0028, Th-230 Ampoule — Analyst: marrss

Vendor: Analytics — Lot No.: 92776
Solvent: None
Date Prep./Opened: 08-13-2013
Date Expires(1): 08-08-2063 (50 Years)
Date Expires(2): 08-08-2063 (50 Years)
Activity: 3.728 E+03 Bq, Ref date: 08/08/2013, Solution mass: 5.09261g, Source ID: 92776

| Component | Initial Conc (dpm/g) | Final Conc (dpm/g) |
|---|---|---|
| Th-230 | 43,922 | 43,922 |

Th-230-00019
#181198

RAD13-0029, Th-230 Parent — Analyst: marrss

Solvent: ~~None~~ 1M HNO3 SUB 8/13/13 — Volume (ml): 100.00
Date Prep./Opened: 08-13-2013
Date Expires(1): 08-08-2063 (50 Years)
Date Expires(2): 08-08-2063 (50 Years)

Parent Std No.: RAD13-0028, Th-230 Ampoule — Aliquot Amount (g): 5.0731
Parent Date Expires(1): 08-08-2063 — Parent Date Expires(2): 08-08-2063

| Component | Initial Conc (dpm/g) | Final Conc (dpm/mL) |
|---|---|---|
| Th-230 | 43,922 | 2,228.2 |

Reviewed By: SUB

Th-230 Parent

TestAmerica
THE LEADER IN ENVIRONMENTAL TESTING

Th - 230 _ 00019

# Reagent ID: Th-230_00019

| | | | |
|---|---|---|---|
| | | Expiration Date: | 08/08/2063 |
| Description: | Th-230 Parent | Laboratory: | TestAmerica St. Louis |
| No. of Bottles: | 1 | Prepared By: | Bernsen, Sarah C |
| Storage Location: | RAD Actinide STDs | Solvent: | 1M HNO3 |
| Reagent Volume: | 100.000 mL | Solvent Lot: | n/a |
| Creation Date: | 08/13/2013 | | |
| Container(s): | 181198 | | |
| Comment: | | | |

## Reagent Analyte Information

| Analyte | Source ID | Source Expiration Date | Source Conc. | Source Conc. Units | Final Conc. | Final Conc. Units |
|---|---|---|---|---|---|---|
| Th-230 | Th-230_00018 | 08/08/2063 | 43922.46 | dpm/g | 2228.23072 | dpm/mL |

## Source Reagents

| Reagent | Description | Type | Expiration | Vendor | Vendor Lot # | Vendor Cat Lot # | Volume Used | Volume Units |
|---|---|---|---|---|---|---|---|---|
| Th-230_00018 | Th-230 Ampoule | ASTD | 08/08/63 | Eckert & Ziegler | 92776 | | 5.07310 | mL |

Eckert & Ziegler
Analytics

1380 Seaboard Industrial Blvd.
Atlanta, Georgia 30318
Tel 404•352•8677
Fax 404•352•2837
www.analyticsinc.com

# CERTIFICATE OF CALIBRATION

## Standard Radionuclide Source

92776

Th-230 5 mL Liquid in Flame Sealed Vial

**Customer:** TestAmerica
**P.O. No.:** 2532686, Item 1 Product Code: 8230-5FSA-4kBq

This standard radionuclide source was prepared gravimetrically from a master solution, calibrated by Eckert & Ziegler Analytics. The master solution was calibrated by liquid scintillation counting. Radionuclide calibration and purity were checked by germanium gamma-ray spectrometry, liquid scintillation counting, and/or alpha spectrometry, as applicable. The nuclear decay rate and reference date for this source are given below. Eckert & Ziegler Analytics (EZA) maintains traceability to the National Institute of Standards and Technology through a Measurements Assurance Program as described in USNRC Regulatory Guide 4.15, Revision 2, July 2007, and compliance with ANSI N42.22-1995, "Traceability of Radioactive Sources to NIST." EZA is accredited by the Health Physics Society (HPS) for the production of NIST-traceable sources, and this source was produced in accordance with the HPS accreditation requirements. Customers may report any concerns with the accreditation program to the HPS Secretariat, 1313 Dolley Madison Blvd., Ste. 402, McLean, VA 22101.

| Isotope | Half-Life, Days | Activity (Bq) | Uncertainty*, % Type $u_A$ | $u_B$ | U | Reference Date (12:00 PM EST) |
|---|---|---|---|---|---|---|
| Th-230 | 2.753E+07 | 3.728E+03 | 0.1 | 0.9 | 1.8 | 08/08/2013 |

***Uncertainty:** U - Relative expanded uncertainty, k = 2. See NIST Technical Note 1297, "Guidelines for Evaluating and Expressing the Uncertainty of NIST Measurement Results."

**Comments:**
Impurities: α-impurities 0.04%; γ-impurities (other than decay products)<0.1%.
5.09261 g 0.5M HNO3 solution. Carrier free.

Source Prepared by: R. Ormsby, Radiochemist

QA Approved: J.D. McCorvey, Counting Room Manager

Date: 6 AUG 13

RAD13-0029
Th-230 Parent
marrss
None
Prep/Opened: 8/13/2013
Exp(1): 8/8/2063
Exp(2): 8/8/2063

181198
ID: Th-230_00019
Exp: 08/08/63 Prpd: SH Cfl. 08/13/13
Th-230 Parent

ACCREDITED SOURCE CALIBRATION LABORATORY HEALTH PHYSICS SOCIETY FOUNDED 1956

Single Isotope Certificate Rev 3, 23 August 2012



**Corporate Office**
24937 Avenue Tibbitts Valencia, California 91355

**Laboratory**
1380 Seaboard Industrial Blvd. Atlanta, Georgia, 30318

# Reagent

---

# Y Carrier_00037

# REPORT OF ANALYSIS

Single-Element Aqueous RM

**Yttrium Oxide** Product #: Z-067074-05-1L

Matrix: 10% $HNO_3$ Lot #: 10064660-8

| Analyte | Certified Concentration |
|---|---|
| $Y_2O_3$ | **50,000 µg/mL** |

**Intended Use:** This solution is intended for use as a reference material (RM) or calibration standard for inductively coupled plasma optical emission spectroscopy (ICP-OES), inductively coupled plasma mass spectrometry (ICP-MS), flame or furnace atomic absorption spectroscopy (AA or GFAA), and other techniques for elemental analysis.

**Certification & Traceability:** This RM was manufactured, processed, and/or certified under a quality management system that is registered/accredited to **ISO 9001**, **ISO Guide 34**, and **ISO/IEC 17025**. This RM was prepared to a nominal concentration of 50,000 µg/mL by gravimetric methods using single-element concentrate dissolved in high purity nitric acid ($HNO_3$) and diluted with filtered (0.22 µm), 18 M-ohm deionized water. The balances used in the preparation of this RM are calibrated regularly with traceability to NIST, using a calibration provider that is accredited to ISO/IEC 17025 by a mutually recognized accreditation body. All volumetric dilutions are performed in Class A calibrated glassware. The certified concentration was determined based upon gravimetric procedures. Secondary verification of the certified concentration was performed using ICP-OES and is traceable to **NIST SRM 3167a**. The uncertainty associated with the certified concentration is ±0.5% relative, which is the sum of the estimated errors due to the purity of the raw materials, the gravimetric preparation of the solution, and transpiration through the container. This represents the expanded uncertainty at the 95% confidence level using a coverage factor of k=2.

**Instructions for Use:** We recommend that the solution be thoroughly mixed by repeated shaking or swirling of the bottle immediately prior to use. To achieve the highest accuracy, the analyst should: (1) use only pre-cleaned containers and transferware, (2) not pipette directly from the RM's original container, (3) never pour used product back into the original container, (4) make dilutions using calibrated balances or certified class A volumetric flasks and pipettes, (5) use a minimum sub-sample size of 500 µL, and (6) dilute with the same matrix as the original RM or other chemically suitable matrix. The solution should be kept tightly capped and stored under normal laboratory conditions. Do not freeze, heat, or immerse the bottle or its contents, and avoid exposure to direct sunlight or moisture.

**Period of Validity:** CPI International ensures the accuracy of this solution for **18 months** from the certification date shown below, provided the instructions for use are followed. During the period of validity, the purchaser will be notified if this product is recalled due to any significant changes in the stability of the solution.

Chuck Goudreau

**Chuck Goudreau, Certifying Officer**

March 13, 2019
**Certification Date**

CPI International waives all responsibility for any damages resulting from the usage and/or implementation of the products/data described herein.

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1013BG Amsterdam F: +31 20 420 28 36
The Netherlands

# GAS FLOW PROPORTIONAL COUNTER

# Method 903.0

## Radium-226 (GFPC) by Method 903.0

# Prep Batch: 436764

## Preparation, Precipitate Separation (Standard In-Growth)

# Gas Flow Proportional Counter Analysis Detail Report
# Prep Batch: 436764

Lab Id: LCS 160-436764/1-A | Analyzed: 09/08/19 19:02 | Decay Corrected: No | Ts: 100
Client ID: | Detector: Blue1 | Yield Truncated: No | Tb: 1000
Sigma: 2 | Dil Fac: 1 | Calibration Type: 2

| Analyte | LCS Result | Count Unc | Total Unc | Qualifier | Unit | RL | MDC | Cs | Cb | X Talk | Decay | Eff | I | A | Anly Batch |
|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|
| Radium-226 | 10.21 | 0.614 | 1.10 | | pCi/L | 1.00 | 0.169 | 1148 | 205 | . | 1. | 0.20258 | 3.4368 | 1. | 442151 |

| Carrier | LCS Result | Count Unc | Total Unc | Qualifier | Unit | MDC | Spike Added | % Rec | % Rec Limits |
|---|---|---|---|---|---|---|---|---|---|
| Ba Carrier | 0.02530 | | | | g | | 0.0354 | 71.5 | 40 - 110 |

Lab Id: 180-93047-C-9-A DU | Analyzed: 09/09/19 22:22 | Decay Corrected: No | Ts: 100
Client ID: | Detector: Blue9 | Yield Truncated: No | Tb: 1000
Sigma: 2 | Dil Fac: 1 | Calibration Type: 2

| Analyte | DU Result | Count Unc | Total Unc | Qualifier | Unit | RL | MDC | Cs | Cb | X Talk | Decay | Eff | I | A | Anly Batch |
|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|
| Radium-226 | 0.001595 | 0.0626 | 0.0626 | U | pCi/L | 1.00 | 0.126 | 14 | 138 | . | 1. | 0.19794 | 3.5419 | 1. | 442471 |

| Carrier | DU Result | Count Unc | Total Unc | Qualifier | Unit | MDC | Spike Added | % Rec | % Rec Limits |
|---|---|---|---|---|---|---|---|---|---|
| Ba Carrier | 0.02850 | | | | g | | 0.0354 | 80.5 | 40 - 110 |

Lab Id: 180-93098-1 | Analyzed: 08/31/19 17:52 | Decay Corrected: No | Ts: 100
Client ID: JSF-STR-PB09-CC-SUR-201 90718 ~ STR-PB09 | Detector: Blue15 | Yield Truncated: No | Tb: 1000
Sigma: 2 | Dil Fac: 1 | Calibration Type: 2

| Analyte | Result | Count Unc | Total Unc | Qualifier | Unit | RL | MDC | Cs | Cb | X Talk | Decay | Eff | I | A | Anly Batch |
|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|
| Radium-226 | 0.160 | 0.184 | 0.184 | U | pCi/L | 1.00 | 0.298 | 20 | 120 | . | 1. | 0.19259 | 1.5775 | 1. | 441511 |

| Carrier | Result | Count Unc | Total Unc | Qualifier | Unit | MDC | Spike Added | % Rec | % Rec Limits |
|---|---|---|---|---|---|---|---|---|---|
| Ba Carrier | 0.0263 | | | | g | | 0.0354 | 74.3 | 40 - 110 |

Lab Id: 180-93098-2 | Analyzed: 09/08/19 19:00 | Decay Corrected: No | Ts: 100
Client ID: JSF-STR-PB08-CC-SUR-201 90718 ~ STR-PB08 | Detector: Blue12 | Yield Truncated: No | Tb: 1000
Sigma: 2 | Dil Fac: 1 | Calibration Type: 2

| Analyte | Result | Count Unc | Total Unc | Qualifier | Unit | RL | MDC | Cs | Cb | X Talk | Decay | Eff | I | A | Anly Batch |
|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|
| Radium-226 | -0.0419 | 0.0563 | 0.0564 | U | pCi/L | 1.00 | 0.138 | 9 | 138 | . | 1. | 0.18574 | 3.4367 | 1. | 442151 |

| Carrier | Result | Count Unc | Total Unc | Qualifier | Unit | MDC | Spike Added | % Rec | % Rec Limits |
|---|---|---|---|---|---|---|---|---|---|
| Ba Carrier | 0.0286 | | | | g | | 0.0354 | 80.8 | 40 - 110 |

# Gas Flow Proportional Counter Analysis Detail Report
# Prep Batch: 436764

Lab Id: 180-93098-3 | Analyzed: 08/31/19 18:55 | Decay Corrected: No | Ts: 100
Client ID: JSF-STR-PB07-CC-SUR-201 90718 ~ STR-PB07 | Detector: Blue0 | Yield Truncated: No | Tb: 1000
Sigma: 2 | Dil Fac: 1 | Calibration Type: 2

| Analyte | Result | Count Unc | Total Unc | Qualifier | Unit | RL | MDC | Cs | Cb | X Talk | Decay | Eff | I | A | Anly Batch |
|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|
| Radium-226 | -0.122 | 0.158 | 0.158 | U | pCi/L | 1.00 | 0.377 | 11 | 165 | . | 1. | 0.21134 | 1.5967 | 1. | 441511 |

| Carrier | Result | Count Unc | Total Unc | Qualifier | Unit | MDC | Spike Added | % Rec | % Rec Limits |
|---|---|---|---|---|---|---|---|---|---|
| Ba Carrier | 0.0213 | | | | g | | 0.0354 | 60.2 | 40 - 110 |

Lab Id: 180-93098-4 | Analyzed: 09/08/19 19:00 | Decay Corrected: No | Ts: 100
Client ID: JSF-STR-PB06-CC-SUR-201 90718 ~ STR-PB06 | Detector: Blue13 | Yield Truncated: No | Tb: 1000
Sigma: 2 | Dil Fac: 1 | Calibration Type: 2

| Analyte | Result | Count Unc | Total Unc | Qualifier | Unit | RL | MDC | Cs | Cb | X Talk | Decay | Eff | I | A | Anly Batch |
|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|
| Radium-226 | -0.0112 | 0.0652 | 0.0652 | U | pCi/L | 1.00 | 0.136 | 15 | 164 | . | 1. | 0.20787 | 3.4367 | 1. | 442151 |

| Carrier | Result | Count Unc | Total Unc | Qualifier | Unit | MDC | Spike Added | % Rec | % Rec Limits |
|---|---|---|---|---|---|---|---|---|---|
| Ba Carrier | 0.0279 | | | | g | | 0.0354 | 78.8 | 40 - 110 |

Lab Id: MB 160-436764/18-A | Analyzed: 08/31/19 18:55 | Decay Corrected: No | Ts: 100
Client ID: | Detector: Blue3 | Yield Truncated: No | Tb: 1000
Sigma: 2 | Dil Fac: 1 | Calibration Type: 2

| Analyte | MB Result | Count Unc | Total Unc | Qualifier | Unit | RL | MDC | Cs | Cb | X Talk | Decay | Eff | I | A | Anly Batch |
|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|
| Radium-226 | 0.03691 | 0.135 | 0.135 | U | pCi/L | 1.00 | 0.257 | 15 | 128 | . | 1. | 0.19905 | 1.5968 | 1. | 441511 |

| Carrier | MB Result | Count Unc | Total Unc | Qualifier | Unit | MDC | Spike Added | % Rec | % Rec Limits |
|---|---|---|---|---|---|---|---|---|---|
| Ba Carrier | 0.02990 | | | | g | | 0.0354 | 84.5 | 40 - 110 |

## Quality Control Summary

| Method Blank ID: | Analyte | Parent Result | Spike Added | MB Result | Qualifier | Unit | % Rec | % Rec Limits | RPD | RER | DER | RER Limit | Z Factor |
|---|---|---|---|---|---|---|---|---|---|---|---|---|---|
| MB 160-436764/18-A | Radium-226 | | | 0.03691 | U | pCi/L | | | | | | | .5451 |
| **Lab Control Sample ID:** | **Analyte** | **Parent Result** | **Spike Added** | **LCS Result** | **Qualifier** | **Unit** | **% Rec** | **% Rec Limits** | **RPD** | **RER** | **DER** | **RER Limit** | **Z Factor** |
| LCS 160-436764/1-A | Radium-226 | | 11.4 | 10.21 | | pCi/L | 90 | 75 - 125 | | | | | -1.8258 |
| **Duplicate ID:** | **Analyte** | **Parent Result** | **Spike Added** | **DU Result** | **Qualifier** | **Unit** | **% Rec** | **% Rec Limits** | **RPD** | **RER** | **DER** | **RER Limit** | **Z Factor** |
| 180-93047-C-9-A DU | Radium-226 | -0.0357 | | 0.001595 | U | pCi/L | | | 219 | 0.17 | 0.44 | 1 | .4376 |

# Gas Flow Proportional Counter Analysis Detail Report
# Prep Batch: 436764

Glossary:

- Ts = Count Duration, Sample
- Tb = Count Duration, Background
- Cs = Total Counts, Sample
- Cb = Total Counts, Background
- X Talk = Crosstalk
- Decay = Decay Factor
- Eff = Efficiency
- I = Ingrowth Factor
- A = Abundance

GAS FLOW PROPORTIONAL COUNTER BATCH WORKSHEET

Lab Name: Eurofins TestAmerica, St. Loui Job No.: 180-93098-1

SDG No.:

Batch Number: 436764 Batch Start Date: 07/26/19 13:33 Batch Analyst: Moore, Octavia R

Batch Method: PrecSep STD Batch End Date: 08/30/19 17:34

| Lab Sample ID | Client Sample ID | Method Chain | Basis | InitialAmount | Ba_TareWt | Ba_GrossWt | Ba_Mass | Ba_Yield | IngDecDate1 |
|---|---|---|---|---|---|---|---|---|---|
| LCS 160-436764/1 | | PrecSep STD, 903.0 | | 1000 mL | 8.7652 g | 8.7905 g | 0.0354 g | 71.468926553671 5 % | 07/29/2019 12:20 |
| 180-93047-C-9 DU | | PrecSep STD, 903.0 | T | 1000.43 mL | 8.7614 g | 8.7899 g | 0.0354 g | 80.508474576269 2 % | 07/29/2019 12:20 |
| 180-93098-B-1 | JSF-STR-PB09-CC-SUR-20190718 ~ STR-PB09 | PrecSep STD, 903.0 | T | 1000.02 mL | 8.8294 g | 8.8557 g | 0.0354 g | 74.293785310737 % | 07/29/2019 12:20 |
| 180-93098-A-2 | JSF-STR-PB08-CC-SUR-20190718 ~ STR-PB08 | PrecSep STD, 903.0 | T | 1000.19 mL | 8.7890 g | 8.8176 g | 0.0354 g | 80.790960451979 7 % | 07/29/2019 12:20 |
| 180-93098-B-3 | JSF-STR-PB07-CC-SUR-20190718 ~ STR-PB07 | PrecSep STD, 903.0 | T | 1000.04 mL | 8.8261 g | 8.8474 g | 0.0354 g | 60.169491525424 % | 07/29/2019 12:20 |
| 180-93098-C-4 | JSF-STR-PB06-CC-SUR-20190718 ~ STR-PB06 | PrecSep STD, 903.0 | T | 1000.63 mL | 8.8260 g | 8.8539 g | 0.0354 g | 78.813559322030 8 % | 07/29/2019 12:20 |
| MB 160-436764/18 | | PrecSep STD, 903.0 | | 1000 mL | 8.8107 g | 8.8406 g | 0.0354 g | 84.463276836157 1 % | 07/29/2019 12:20 |

| Lab Sample ID | Client Sample ID | Method Chain | Basis | IngDecDate2 | IngDecDate3 | Ba Carrier 00045 | Ra-226 00029 | | |
|---|---|---|---|---|---|---|---|---|---|
| LCS 160-436764/1 | | PrecSep STD, 903.0 | | 08/30/19 14:24 | 08/19/2019 | 1 mL | 1 mL | | |
| 180-93047-C-9 DU | | PrecSep STD, 903.0 | T | 08/30/19 14:24 | 08/19/2019 | 1 mL | | | |
| 180-93098-B-1 | JSF-STR-PB09-CC-SUR-20190718 ~ STR-PB09 | PrecSep STD, 903.0 | T | 08/30/19 14:24 | 08/19/2019 | 1 mL | | | |
| 180-93098-A-2 | JSF-STR-PB08-CC-SUR-20190718 ~ STR-PB08 | PrecSep STD, 903.0 | T | 08/30/19 14:24 | 08/19/2019 | 1 mL | | | |
| 180-93098-B-3 | JSF-STR-PB07-CC-SUR-20190718 ~ STR-PB07 | PrecSep STD, 903.0 | T | 08/30/19 14:24 | 08/19/2019 | 1 mL | | | |
| 180-93098-C-4 | JSF-STR-PB06-CC-SUR-20190718 ~ STR-PB06 | PrecSep STD, 903.0 | T | 08/30/19 14:24 | 08/19/2019 | 1 mL | | | |
| MB 160-436764/18 | | PrecSep STD, 903.0 | | 08/30/19 14:24 | 08/19/2019 | 1 mL | | | |

The pound sign (#) in the amount added field denotes that the reagent was used undiluted. All calculations are performed using the stated concentration for this reagent.

# GAS FLOW PROPORTIONAL COUNTER BATCH WORKSHEET

Lab Name: Eurofins TestAmerica, St. Loui  Job No.: 180-93098-1

SDG No.:

Batch Number: 436764  Batch Start Date: 07/26/19 13:33  Batch Analyst: Moore, Octavia R

Batch Method: PrecSep STD  Batch End Date: 08/30/19 17:34

| Batch Notes | |
|---|---|
| Carrier ID for Barium | Ba |
| Balance ID | 1122021820, 1125330898 |
| Batch Comment | In SEC, out jjj |
| EiChrom Used (Y/N)? | N |
| Radium Batch (Y/N)? | Y |
| Pipette ID | RAD112, RAD038 |
| Analyst ID - Reagent Drop Witness | HET |
| Analyst ID - Reagent Drop | ORM per HET |
| SOP Number | ST-RC-0041, ST-RC-0002 |

| Basis | Basis Description |
|---|---|
| T | Total/NA |

The pound sign (#) in the amount added field denotes that the reagent was used undiluted. All calculations are performed using the stated concentration for this reagent.

# Alpha Count Results

## Sample Activity Report

## Blue 0-3 - B

**Addr:** 1

**Sample ID** LCS 160-436764/1-A

**Repeat** 2

**Carrier No.** 0

**Batch ID** 436764

**Count Method** Gross Alpha Beta

**Detector Volts** 1515

**Sample Qty** 0 ***Sample*** **sd** 0 ***Sample***

**Residual Wt** 0 ***mg*** **sd** 0 ***mg***

**Count Began** 9/8/2019 7:02:06 PM **Collection Date 1** 1/1/1900 **Half Life** 0.00 ***days***

**Count Ended** 9/8/2019 8:42:19 PM **Collection Date 2** 1/1/1900 **Decay Factor** 1.000

**Sample Count Time** 100.00 ***mins*** **Background Count Time** 1,000.00 ***mins***

| | Efficiency % | Attenuation Factor | Activity Divisor | Background cpm | Gross counts | Gross cpm | Net cpm |
|---|---|---|---|---|---|---|---|
| **Alpha** | 0.000 | 1.000 | 1.000 | 0.205 | 1,148 | 11.480 | 11.275 |
| **sd** | 0.000 | | | 0.014 | 33.882 | 0.339 | 0.339 |

| | Net Activity dpm | LLD dpm | MDC DPM | MPC DPM | Net Concentration * DPM | Conc / MPC Ratio |
|---|---|---|---|---|---|---|
| **Alpha** | 0.000 | 0.000 | 0.000 | 0.000 | 0.000 ± 0.000 | 0.000 |
| **sd** | 0.000 | | | | 0.000 | |

*** Note: Decay Corrected** **MDC Method** Currie **Error =** .00 **x sd**

# Alpha/Beta Count Results

## Sample Activity Report

## Blue 8-11 - B

**Addr:** 9

**Sample ID** 180-93047-C-9-A DU

**Repeat** 4

**Carrier No.** 0

**Batch ID** 436764

**Count Method** Gross Alpha Beta

**Detector Volts** 1515

**Sample Qty** 0 ***Sample*** **sd** 0 ***Sample***

**Residual Wt** 0 ***mg*** **sd** 0 ***mg***

**Count Began** 9/9/2019 10:22:22 PM **Collection Date 1** 1/1/1900 **Half Life** 0.00 ***days***

**Count Ended** 9/10/2019 12:02:33 AM **Collection Date 2** 1/1/1900 **Decay Factor** 1.000

**Sample Count Time** 100.00 ***mins*** **Background Count Time** 1,000.00 ***mins***

| | Efficiency % | Attenuation Factor | Activity Divisor | Background cpm | Gross counts | Gross cpm | Net cpm |
|---|---|---|---|---|---|---|---|
| **Alpha** | 0.000 | 1.000 | 1.000 | 0.138 | 14 | 0.140 | 0.002 |
| **sd** | 0.000 | | | 0.012 | 3.742 | 0.037 | 0.039 |
| **A to B** | 0.000 | 1.000 | | | | 0.000 | |
| **sd** | 0.000 | | | | | 0.000 | |
| **Beta** | 0.000 | 1.000 | 1.000 | 0.404 | 42 | 0.420 | 0.016 |
| **sd** | 0.000 | | | 0.020 | 6.481 | 0.065 | 0.068 |

| | Net Activity dpm | LLD dpm | MDC DPM | MPC DPM | Net Concentration * DPM | Conc / MPC Ratio |
|---|---|---|---|---|---|---|
| **Alpha** | 0.000 | 0.000 | 0.000 | 0.000 | 0.000 ± 0.000 | 0.000 |
| **sd** | 0.000 | | | | 0.000 | |
| **Beta** | 0.000 | 0.000 | 0.000 | 0.000 | 0.000 ± 0.000 | 0.000 |
| **sd** | 0.000 | | | | 0.000 | |

*** Note: Decay Corrected** **MDC Method** Currie **Error =** .00 **x sd**

# Alpha/Beta Count Results

## Sample Activity Report

## Blue 12-15 - D

**Addr:** 15

**Sample ID** 180-93098-B-1-A

**Repeat** 1

**Carrier No.** 0

**Batch ID** 436764

**Count Method** Gross Alpha Beta

**Detector Volts** 1515

**Sample Qty** 0 ***Sample*** **sd** 0 ***Sample***

**Residual Wt** 0 ***mg*** **sd** 0 ***mg***

**Count Began** 8/31/2019 5:52:25 PM **Collection Date 1** 1/1/1900 **Half Life** 0.00 ***days***

**Count Ended** 8/31/2019 7:32:36 PM **Collection Date 2** 1/1/1900 **Decay Factor** 1.000

**Sample Count Time** 100.00 ***mins*** **Background Count Time** 1,000.00 ***mins***

| | Efficiency % | Attenuation Factor | Activity Divisor | Background cpm | Gross counts | Gross cpm | Net cpm |
|---|---|---|---|---|---|---|---|
| **Alpha** | 0.000 | 1.000 | 1.000 | 0.120 | 20 | 0.200 | 0.080 |
| **sd** | 0.000 | | | 0.011 | 4.472 | 0.045 | 0.046 |
| **A to B** | 0.000 | 1.000 | | | | 0.000 | |
| **sd** | 0.000 | | | | | 0.000 | |
| **Beta** | 0.000 | 1.000 | 1.000 | 0.424 | 47 | 0.470 | 0.046 |
| **sd** | 0.000 | | | 0.021 | 6.856 | 0.069 | 0.072 |

| | Net Activity dpm | LLD dpm | MDC DPM | MPC DPM | Net Concentration * DPM | Conc / MPC Ratio |
|---|---|---|---|---|---|---|
| **Alpha** | 0.000 | 0.000 | 0.000 | 0.000 | 0.000 ± 0.000 | 0.000 |
| **sd** | 0.000 | | | | 0.000 | |
| **Beta** | 0.000 | 0.000 | 0.000 | 0.000 | 0.000 ± 0.000 | 0.000 |
| **sd** | 0.000 | | | | 0.000 | |

*** Note: Decay Corrected** **MDC Method** Currie **Error =** .00 **x sd**

# Alpha Count Results

## Sample Activity Report

## Blue 12-15 - A

**Addr:** 12

**Sample ID** 180-93098-A-2-A

**Repeat** 3

**Carrier No.** 0

**Batch ID** 436764

**Count Method** Gross Alpha Beta

**Detector Volts** 1515

**Sample Qty** 0 ***Sample*** **sd** 0 ***Sample***

**Residual Wt** 0 ***mg*** **sd** 0 ***mg***

**Count Began** 9/8/2019 7:00:20 PM **Collection Date 1** 1/1/1900 **Half Life** 0.00 ***days***

**Count Ended** 9/8/2019 8:40:30 PM **Collection Date 2** 1/1/1900 **Decay Factor** 1.000

**Sample Count Time** 100.00 ***mins*** **Background Count Time** 1,000.00 ***mins***

| | Efficiency % | Attenuation Factor | Activity Divisor | Background cpm | Gross counts | Gross cpm | Net cpm |
|---|---|---|---|---|---|---|---|
| **Alpha** | 0.000 | 1.000 | 1.000 | 0.138 | 9 | 0.090 | -0.048 |
| **sd** | 0.000 | | | 0.012 | 3.000 | 0.030 | 0.045 |

| | Net Activity dpm | LLD dpm | MDC DPM | MPC DPM | Net Concentration * DPM | Conc / MPC Ratio |
|---|---|---|---|---|---|---|
| **Alpha** | 0.000 | 0.000 | 0.000 | 0.000 | 0.000 ± 0.000 | 0.000 |
| **sd** | 0.000 | | | | 0.000 | |

*** Note: Decay Corrected** **MDC Method** Currie **Error =** .00 **x sd**

# Alpha/Beta Count Results

## Sample Activity Report

## Blue 0-3 - A

**Addr:** 0

**Sample ID** 180-93098-B-3-A

**Repeat** 1

**Carrier No.** 0

**Batch ID** 436764

**Count Method** Gross Alpha Beta

**Detector Volts** 1515

**Sample Qty** 0 ***Sample*** **sd** 0 ***Sample***

**Residual Wt** 0 ***mg*** **sd** 0 ***mg***

**Count Began** 8/31/2019 6:55:40 PM **Collection Date 1** 1/1/1900 **Half Life** 0.00 ***days***

**Count Ended** 8/31/2019 8:35:48 PM **Collection Date 2** 1/1/1900 **Decay Factor** 1.000

**Sample Count Time** 100.00 ***mins*** **Background Count Time** 1,000.00 ***mins***

| | Efficiency % | Attenuation Factor | Activity Divisor | Background cpm | Gross counts | Gross cpm | Net cpm |
|---|---|---|---|---|---|---|---|
| **Alpha** | 0.000 | 1.000 | 1.000 | 0.165 | 11 | 0.110 | -0.055 |
| **sd** | 0.000 | | | 0.013 | 3.317 | 0.033 | 0.049 |
| **A to B** | 0.000 | 1.000 | | | | 0.000 | |
| **sd** | 0.000 | | | | | 0.000 | |
| **Beta** | 0.000 | 1.000 | 1.000 | 0.515 | 48 | 0.480 | -0.035 |
| **sd** | 0.000 | | | 0.023 | 6.928 | 0.069 | 0.078 |

| | Net Activity dpm | LLD dpm | MDC DPM | MPC DPM | Net Concentration * DPM | Conc / MPC Ratio |
|---|---|---|---|---|---|---|
| **Alpha** | 0.000 | 0.000 | 0.000 | 0.000 | 0.000 ± 0.000 | 0.000 |
| **sd** | 0.000 | | | | 0.000 | |
| **Beta** | 0.000 | 0.000 | 0.000 | 0.000 | 0.000 ± 0.000 | 0.000 |
| **sd** | 0.000 | | | | 0.000 | |

*** Note: Decay Corrected** **MDC Method** Currie **Error =** .00 **x sd**

# Alpha Count Results

## Sample Activity Report

## Blue 12-15 - B

**Addr:** 13

**Sample ID** 180-93098-C-4-A

**Repeat** 3

**Carrier No.** 0

**Batch ID** 436764

**Count Method** Gross Alpha Beta

**Detector Volts** 1515

**Sample Qty** 0 ***Sample*** **sd** 0 ***Sample***

**Residual Wt** 0 ***mg*** **sd** 0 ***mg***

**Count Began** 9/8/2019 7:00:06 PM **Collection Date 1** 1/1/1900 **Half Life** 0.00 ***days***

**Count Ended** 9/8/2019 8:40:16 PM **Collection Date 2** 1/1/1900 **Decay Factor** 1.000

**Sample Count Time** 100.00 ***mins*** **Background Count Time** 1,000.00 ***mins***

| | Efficiency % | Attenuation Factor | Activity Divisor | Background cpm | Gross counts | Gross cpm | Net cpm |
|---|---|---|---|---|---|---|---|
| **Alpha** | 0.000 | 1.000 | 1.000 | 0.164 | 15 | 0.150 | -0.014 |
| **sd** | 0.000 | | | 0.013 | 3.873 | 0.039 | 0.044 |

| | Net Activity dpm | LLD dpm | MDC DPM | MPC DPM | Net Concentration * DPM | Conc / MPC Ratio |
|---|---|---|---|---|---|---|
| **Alpha** | 0.000 | 0.000 | 0.000 | 0.000 | 0.000 ± 0.000 | 0.000 |
| **sd** | 0.000 | | | | 0.000 | |

*** Note: Decay Corrected** **MDC Method** Currie **Error =** .00 **x sd**

# Alpha/Beta Count Results

## Sample Activity Report

## Blue 0-3 - D

**Addr:** 3

**Sample ID** MB 160-436764/18-A

**Repeat** 1

**Carrier No.** 0

**Batch ID** 436764

**Count Method** Gross Alpha Beta

**Detector Volts** 1515

**Sample Qty** 0 ***Sample*** **sd** 0 ***Sample***

**Residual Wt** 0 ***mg*** **sd** 0 ***mg***

**Count Began** 8/31/2019 6:55:56 PM **Collection Date 1** 1/1/1900 **Half Life** 0.00 ***days***

**Count Ended** 8/31/2019 8:36:09 PM **Collection Date 2** 1/1/1900 **Decay Factor** 1.000

**Sample Count Time** 100.00 ***mins*** **Background Count Time** 1,000.00 ***mins***

| | Efficiency % | Attenuation Factor | Activity Divisor | Background cpm | Gross counts | Gross cpm | Net cpm |
|---|---|---|---|---|---|---|---|
| **Alpha** | 0.000 | 1.000 | 1.000 | 0.128 | 15 | 0.150 | 0.022 |
| **sd** | 0.000 | | | 0.011 | 3.873 | 0.039 | 0.040 |
| **A to B** | 0.000 | 1.000 | | | | 0.000 | |
| **sd** | 0.000 | | | | | 0.000 | |
| **Beta** | 0.000 | 1.000 | 1.000 | 0.457 | 49 | 0.490 | 0.033 |
| **sd** | 0.000 | | | 0.021 | 7.000 | 0.070 | 0.073 |

| | Net Activity dpm | LLD dpm | MDC DPM | MPC DPM | Net Concentration * DPM | Conc / MPC Ratio |
|---|---|---|---|---|---|---|
| **Alpha** | 0.000 | 0.000 | 0.000 | 0.000 | 0.000 ± 0.000 | 0.000 |
| **sd** | 0.000 | | | | 0.000 | |
| **Beta** | 0.000 | 0.000 | 0.000 | 0.000 | 0.000 ± 0.000 | 0.000 |
| **sd** | 0.000 | | | | 0.000 | |

*** Note: Decay Corrected** **MDC Method** Currie **Error =** .00 **x sd**

# Method 904.0

## Radium-228 (GFPC) by Method 904.0

# Prep Batch: 436768

## Preparation, Precipitate Separation

# Gas Flow Proportional Counter Analysis Detail Report
# Prep Batch: 436768

Lab Id: LCS 160-436768/1-A | Analyzed: 08/30/19 14:41 | Decay Corrected: No | Ts: 200
Client ID: | Detector: Orange0 | Yield Truncated: No | Tb: 1000
Sigma: 2 | Dil Fac: 1 | Calibration Type: 1

| Analyte | LCS Result | Count Unc | Total Unc | Qualifier | Unit | RL | MDC | Cs | Cb | X Talk | Decay | Eff | I | A | Anly Batch |
|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|
| Radium-228 | 9.146 | 0.823 | 1.18 | | pCi/L | 1.00 | 0.609 | 701 | 520 | . | .6328 | 0.44771 | .8336 | 1. | 441488 |

| Carrier | LCS Result | Count Unc | Total Unc | Qualifier | Unit | MDC | Spike Added | % Rec | % Rec Limits |
|---|---|---|---|---|---|---|---|---|---|
| Ba Carrier | 0.02530 | | | | g | | 0.0354 | 71.5 | 40 - 110 |
| Y Carrier | 0.02330 | | | | g | | 0.0268 | 87.1 | 40 - 110 |

Lab Id: 180-93047-C-9-B DU | Analyzed: 08/30/19 14:43 | Decay Corrected: No | Ts: 200
Client ID: | Detector: Orange14 | Yield Truncated: No | Tb: 1000
Sigma: 2 | Dil Fac: 1 | Calibration Type: 1

| Analyte | DU Result | Count Unc | Total Unc | Qualifier | Unit | RL | MDC | Cs | Cb | X Talk | Decay | Eff | I | A | Anly Batch |
|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|
| Radium-228 | 0.1213 | 0.338 | 0.338 | U | pCi/L | 1.00 | 0.582 | 110 | 509 | . | .6302 | 0.43942 | .8336 | 1. | 441488 |

| Carrier | DU Result | Count Unc | Total Unc | Qualifier | Unit | MDC | Spike Added | % Rec | % Rec Limits |
|---|---|---|---|---|---|---|---|---|---|
| Ba Carrier | 0.02850 | | | | g | | 0.0354 | 80.5 | 40 - 110 |
| Y Carrier | 0.02190 | | | | g | | 0.0268 | 81.9 | 40 - 110 |

Lab Id: 180-93098-1 | Analyzed: 08/30/19 14:47 | Decay Corrected: No | Ts: 200
Client ID: JSF-STR-PB09-CC-SUR-201 90718 ~ STR-PB09 | Detector: Purple0 | Yield Truncated: No | Tb: 1000
Sigma: 2 | Dil Fac: 1 | Calibration Type: 1

| Analyte | Result | Count Unc | Total Unc | Qualifier | Unit | RL | MDC | Cs | Cb | X Talk | Decay | Eff | I | A | Anly Batch |
|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|
| Radium-228 | 0.217 | 0.327 | 0.327 | U | pCi/L | 1.00 | 0.548 | 109 | 470 | . | .6262 | 0.44805 | .8336 | 1. | 441352 |

| Carrier | Result | Count Unc | Total Unc | Qualifier | Unit | MDC | Spike Added | % Rec | % Rec Limits |
|---|---|---|---|---|---|---|---|---|---|
| Ba Carrier | 0.0263 | | | | g | | 0.0354 | 74.3 | 40 - 110 |
| Y Carrier | 0.0240 | | | | g | | 0.0268 | 89.7 | 40 - 110 |

Lab Id: 180-93098-2 | Analyzed: 08/30/19 14:44 | Decay Corrected: No | Ts: 200
Client ID: JSF-STR-PB08-CC-SUR-201 90718 ~ STR-PB08 | Detector: Orange18 | Yield Truncated: No | Tb: 1000
Sigma: 2 | Dil Fac: 1 | Calibration Type: 1

| Analyte | Result | Count Unc | Total Unc | Qualifier | Unit | RL | MDC | Cs | Cb | X Talk | Decay | Eff | I | A | Anly Batch |
|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|
| Radium-228 | 0.310 | 0.272 | 0.273 | U | pCi/L | 1.00 | 0.434 | 93 | 347 | . | .6295 | 0.44135 | .8336 | 1. | 441488 |

| Carrier | Result | Count Unc | Total Unc | Qualifier | Unit | MDC | Spike Added | % Rec | % Rec Limits |
|---|---|---|---|---|---|---|---|---|---|
| Ba Carrier | 0.0286 | | | | g | | 0.0354 | 80.8 | 40 - 110 |
| Y Carrier | 0.0245 | | | | g | | 0.0268 | 91.6 | 40 - 110 |

# Gas Flow Proportional Counter Analysis Detail Report
# Prep Batch: 436768

Lab Id: 180-93098-3 | Analyzed: 08/30/19 14:44 | Decay Corrected: No | Ts: 200
Client ID: JSF-STR-PB07-CC-SUR-201 90718 ~ STR-PB07 | Detector: Orange19 | Yield Truncated: No | Tb: 1000
Sigma: 2 | Dil Fac: 1 | Calibration Type: 1

| Analyte | Result | Count Unc | Total Unc | Qualifier | Unit | RL | MDC | Cs | Cb | X Talk | Decay | Eff | I | A | Anly Batch |
|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|
| Radium-228 | 0.224 | 0.382 | 0.383 | U | pCi/L | 1.00 | 0.646 | 98 | 427 | . | .6293 | 0.44485 | .8336 | 1. | 441488 |

| Carrier | Result | Count Unc | Total Unc | Qualifier | Unit | MDC | Spike Added | % Rec | % Rec Limits |
|---|---|---|---|---|---|---|---|---|---|
| Ba Carrier | 0.0213 | | | | g | | 0.0354 | 60.2 | 40 - 110 |
| Y Carrier | 0.0241 | | | | g | | 0.0268 | 90.1 | 40 - 110 |

Lab Id: 180-93098-4 | Analyzed: 08/30/19 14:44 | Decay Corrected: No | Ts: 200
Client ID: JSF-STR-PB06-CC-SUR-201 90718 ~ STR-PB06 | Detector: Orange22 | Yield Truncated: No | Tb: 1000
Sigma: 2 | Dil Fac: 1 | Calibration Type: 1

| Analyte | Result | Count Unc | Total Unc | Qualifier | Unit | RL | MDC | Cs | Cb | X Talk | Decay | Eff | I | A | Anly Batch |
|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|
| Radium-228 | 0.0653 | 0.273 | 0.274 | U | pCi/L | 1.00 | 0.480 | 85 | 401 | . | .6291 | 0.44252 | .8336 | 1. | 441488 |

| Carrier | Result | Count Unc | Total Unc | Qualifier | Unit | MDC | Spike Added | % Rec | % Rec Limits |
|---|---|---|---|---|---|---|---|---|---|
| Ba Carrier | 0.0279 | | | | g | | 0.0354 | 78.8 | 40 - 110 |
| Y Carrier | 0.0242 | | | | g | | 0.0268 | 90.5 | 40 - 110 |

Lab Id: MB 160-436768/18-A | Analyzed: 08/30/19 14:44 | Decay Corrected: No | Ts: 200
Client ID: | Detector: Orange23 | Yield Truncated: No | Tb: 1000
Sigma: 2 | Dil Fac: 1 | Calibration Type: 1

| Analyte | MB Result | Count Unc | Total Unc | Qualifier | Unit | RL | MDC | Cs | Cb | X Talk | Decay | Eff | I | A | Anly Batch |
|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|
| Radium-228 | -0.005172 | 0.258 | 0.258 | U | pCi/L | 1.00 | 0.464 | 83 | 417 | . | .6289 | 0.44024 | .8336 | 1. | 441488 |

| Carrier | MB Result | Count Unc | Total Unc | Qualifier | Unit | MDC | Spike Added | % Rec | % Rec Limits |
|---|---|---|---|---|---|---|---|---|---|
| Ba Carrier | 0.02990 | | | | g | | 0.0354 | 84.5 | 40 - 110 |
| Y Carrier | 0.02390 | | | | g | | 0.0268 | 89.3 | 40 - 110 |

## Quality Control Summary

| Method Blank ID: | Analyte | Parent Result | Spike Added | MB Result | Qualifier | Unit | % Rec | % Rec Limits | RPD | RER | DER | RER Limit | Z Factor |
|---|---|---|---|---|---|---|---|---|---|---|---|---|---|
| MB 160-436768/18-A | Radium-228 | | | -0.005172 | U | pCi/L | | | | | | | -.0401 |
| **Lab Control Sample ID:** | **Analyte** | **Parent Result** | **Spike Added** | **LCS Result** | **Qualifier** | **Unit** | **% Rec** | **% Rec Limits** | **RPD** | **RER** | **DER** | **RER Limit** | **Z Factor** |
| LCS 160-436768/1-A | Radium-228 | | 9.64 | 9.146 | | pCi/L | 95 | 75 - 125 | | | | | -.6492 |
| **Duplicate ID:** | **Analyte** | **Parent Result** | **Spike Added** | **DU Result** | **Qualifier** | **Unit** | **% Rec** | **% Rec Limits** | **RPD** | **RER** | **DER** | **RER Limit** | **Z Factor** |
| 180-93047-C-9-B DU | Radium-228 | 0.296 | | 0.1213 | U | pCi/L | | | 84 | 0.23 | 0.65 | 1 | .6546 |

# Gas Flow Proportional Counter Analysis Detail Report
# Prep Batch: 436768

Glossary:

- Ts = Count Duration, Sample
- Tb = Count Duration, Background
- Cs = Total Counts, Sample
- Cb = Total Counts, Background
- X Talk = Crosstalk
- Decay = Decay Factor
- Eff = Efficiency
- I = Ingrowth Factor
- A = Abundance

# GAS FLOW PROPORTIONAL COUNTER BATCH WORKSHEET

Lab Name: Eurofins TestAmerica, St. Loui  Job No.: 180-93098-1

SDG No.:

Batch Number: 436768  Batch Start Date: 07/26/19 14:09  Batch Analyst: Moore, Octavia R

Batch Method: PrecSep_0  Batch End Date: 08/30/19 14:11

| Lab Sample ID | Client Sample ID | Method Chain | Basis | InitialAmount | Ba_TareWt | Ba_GrossWt | Ba_Mass | Y_TareWt | Y_GrossWt |
|---|---|---|---|---|---|---|---|---|---|
| LCS 160-436768/1 | | PrecSep_0, 904.0 | | 1000 mL | 8.7652 g | 8.7905 g | 0.0354 g | 8.8110 g | 8.8343 g |
| 180-93047-C-9 DU | | PrecSep_0, 904.0 | T | 1000.43 mL | 8.7614 g | 8.7899 g | 0.0354 g | 8.7542 g | 8.7761 g |
| 180-93098-B-1 | JSF-STR-PB09-CC-SUR-20190718 ~ STR-PB09 | PrecSep_0, 904.0 | T | 1000.02 mL | 8.8294 g | 8.8557 g | 0.0354 g | 8.7769 g | 8.8009 g |
| 180-93098-A-2 | JSF-STR-PB08-CC-SUR-20190718 ~ STR-PB08 | PrecSep_0, 904.0 | T | 1000.19 mL | 8.7890 g | 8.8176 g | 0.0354 g | 8.7597 g | 8.7842 g |
| 180-93098-B-3 | JSF-STR-PB07-CC-SUR-20190718 ~ STR-PB07 | PrecSep_0, 904.0 | T | 1000.04 mL | 8.8261 g | 8.8474 g | 0.0354 g | 8.7725 g | 8.7966 g |
| 180-93098-C-4 | JSF-STR-PB06-CC-SUR-20190718 ~ STR-PB06 | PrecSep_0, 904.0 | T | 1000.63 mL | 8.8260 g | 8.8539 g | 0.0354 g | 8.8007 g | 8.8249 g |
| MB 160-436768/18 | | PrecSep_0, 904.0 | | 1000 mL | 8.8107 g | 8.8406 g | 0.0354 g | 8.7766 g | 8.8005 g |

| Lab Sample ID | Client Sample ID | Method Chain | Basis | Y_Mass | IngDecDate1 | IngDecDate2 | NativeMassBa | NativeMassY | Ba Carrier 00045 |
|---|---|---|---|---|---|---|---|---|---|
| LCS 160-436768/1 | | PrecSep_0, 904.0 | | 0.02675 g | 07/29/2019 12:20 | 08/30/2019 10:38 | 0 g | 0 g | 1 mL |
| 180-93047-C-9 DU | | PrecSep_0, 904.0 | T | 0.02675 g | 07/29/2019 12:20 | 08/30/2019 10:38 | 0 g | 0 g | 1 mL |
| 180-93098-B-1 | JSF-STR-PB09-CC-SUR-20190718 ~ STR-PB09 | PrecSep_0, 904.0 | T | 0.02675 g | 07/29/2019 12:20 | 08/30/2019 10:38 | 0 g | 0 g | 1 mL |
| 180-93098-A-2 | JSF-STR-PB08-CC-SUR-20190718 ~ STR-PB08 | PrecSep_0, 904.0 | T | 0.02675 g | 07/29/2019 12:20 | 08/30/2019 10:38 | 0 g | 0 g | 1 mL |
| 180-93098-B-3 | JSF-STR-PB07-CC-SUR-20190718 ~ STR-PB07 | PrecSep_0, 904.0 | T | 0.02675 g | 07/29/2019 12:20 | 08/30/2019 10:38 | 0 g | 0 g | 1 mL |
| 180-93098-C-4 | JSF-STR-PB06-CC-SUR-20190718 ~ STR-PB06 | PrecSep_0, 904.0 | T | 0.02675 g | 07/29/2019 12:20 | 08/30/2019 10:38 | 0 g | 0 g | 1 mL |
| MB 160-436768/18 | | PrecSep_0, 904.0 | | 0.02675 g | 07/29/2019 12:20 | 08/30/2019 10:38 | 0 g | 0 g | 1 mL |

| Lab Sample ID | Client Sample ID | Method Chain | Basis | Ra-228 00037 | Y Carrier 00037 | | | | |
|---|---|---|---|---|---|---|---|---|---|

The pound sign (#) in the amount added field denotes that the reagent was used undiluted. All calculations are performed using the stated concentration for this reagent.

GAS FLOW PROPORTIONAL COUNTER BATCH WORKSHEET

Lab Name: Eurofins TestAmerica, St. Loui Job No.: 180-93098-1

SDG No.:

Batch Number: 436768 Batch Start Date: 07/26/19 14:09 Batch Analyst: Moore, Octavia R

Batch Method: PrecSep_0 Batch End Date: 08/30/19 14:11

| Lab Sample ID | Client Sample ID | Method Chain | Basis | Ra-228 00037 | Y Carrier 00037 | | | | |
|---|---|---|---|---|---|---|---|---|---|
| LCS 160-436768/1 | | PrecSep_0, 904.0 | | 0.1 mL | 0.2 mL | | | | |
| 180-93047-C-9 DU | | PrecSep_0, 904.0 | T | | 0.2 mL | | | | |
| 180-93098-B-1 | JSF-STR-PB09-CC-SUR-20190718 ~ STR-PB09 | PrecSep_0, 904.0 | T | | 0.2 mL | | | | |
| 180-93098-A-2 | JSF-STR-PB08-CC-SUR-20190718 ~ STR-PB08 | PrecSep_0, 904.0 | T | | 0.2 mL | | | | |
| 180-93098-B-3 | JSF-STR-PB07-CC-SUR-20190718 ~ STR-PB07 | PrecSep_0, 904.0 | T | | 0.2 mL | | | | |
| 180-93098-C-4 | JSF-STR-PB06-CC-SUR-20190718 ~ STR-PB06 | PrecSep_0, 904.0 | T | | 0.2 mL | | | | |
| MB 160-436768/18 | | PrecSep_0, 904.0 | | | 0.2 mL | | | | |

| Batch Notes | |
|---|---|
| Balance ID | 1122021820, 1125330898 |
| Batch Comment | In SEC, out jjj |
| Pipette ID | RAD112, RAD038, SEP005 |
| Analyst ID - Reagent Drop Witness | HET, PMS per SEC |
| Analyst ID - Reagent Drop | ORM per HET, SEC |
| SOP Number | ST-RC-0041, ST-RC-0002 |

| Basis | Basis Description |
|---|---|
| T | Total/NA |

The pound sign (#) in the amount added field denotes that the reagent was used undiluted. All calculations are performed using the stated concentration for this reagent.

# Alpha/Beta Count Results

## Sample Activity Report

## Orange 0-3 - A

**Addr:** 0

**Sample ID** LCS 160-436768/1-A

**Repeat** 1

**Carrier No.** 0

**Batch ID** 436768

**Count Method** Gross Alpha Beta

**Detector Volts** 1515

**Count Began** 8/30/2019 2:41:41 PM

**Count Ended** 8/30/2019 6:01:59 PM

**Sample Count Time** 200.00 ***mins*** **Background Count Time** 1,000.00 ***mins***

| | Background cpm | Gross counts | Gross cpm | Net cpm |
|---|---|---|---|---|
| **Alpha** | 0.126 | 42 | 0.210 | 0.084 |
| **sd** | 0.011 | 6.481 | 0.032 | 0.034 |
| **Beta** | 0.520 | 701 | 3.505 | 2.985 |
| **sd** | 0.023 | 26.476 | 0.132 | 0.134 |

# Alpha/Beta Count Results

## Sample Activity Report

## Orange 12-15 - C

**Addr:** 14

**Sample ID** 180-93047-C-9-B DU

**Repeat** 1

**Carrier No.** 0

**Batch ID** 436768

**Count Method** Gross Alpha Beta

**Detector Volts** 1515

**Count Began** 8/30/2019 2:43:51 PM

**Count Ended** 8/30/2019 6:04:06 PM

**Sample Count Time** 200.00 ***mins*** **Background Count Time** 1,000.00 ***mins***

| | Background cpm | Gross counts | Gross cpm | Net cpm |
|---|---|---|---|---|
| **Alpha** | 0.120 | 34 | 0.170 | 0.050 |
| **sd** | 0.011 | 5.831 | 0.029 | 0.031 |
| **Beta** | 0.509 | 110 | 0.550 | 0.041 |
| **sd** | 0.023 | 10.488 | 0.052 | 0.057 |

# Alpha/Beta Count Results

## Sample Activity Report

## Purple 0-3 - A

**Addr:** 0

**Sample ID** 180-93098-B-1-B

**Repeat** 1

**Carrier No.** 0

**Batch ID** 436768

**Count Method** Gross Alpha Beta

**Detector Volts** 1515

**Count Began** 8/30/2019 2:47:13 PM

**Count Ended** 8/30/2019 6:07:29 PM

**Sample Count Time** 200.00 ***mins*** **Background Count Time** 1,000.00 ***mins***

| | Background cpm | Gross counts | Gross cpm | Net cpm |
|---|---|---|---|---|
| **Alpha** | 0.170 | 48 | 0.240 | 0.070 |
| **sd** | 0.013 | 6.928 | 0.035 | 0.037 |
| **Beta** | 0.470 | 109 | 0.545 | 0.075 |
| **sd** | 0.022 | 10.440 | 0.052 | 0.057 |

# Alpha/Beta Count Results

## Sample Activity Report

## Orange 16-19 - C

**Addr:** 18

**Sample ID** 180-93098-A-2-B

**Repeat** 1

**Carrier No.** 0

**Batch ID** 436768

**Count Method** Gross Alpha Beta

**Detector Volts** 1515

**Count Began** 8/30/2019 2:44:29 PM

**Count Ended** 8/30/2019 6:04:42 PM

**Sample Count Time** 200.00 ***mins*** **Background Count Time** 1,000.00 ***mins***

| | Background cpm | Gross counts | Gross cpm | Net cpm |
|---|---|---|---|---|
| **Alpha** | 0.111 | 16 | 0.080 | -0.031 |
| **sd** | 0.011 | 4.000 | 0.020 | 0.029 |
| **Beta** | 0.347 | 93 | 0.465 | 0.118 |
| **sd** | 0.019 | 9.644 | 0.048 | 0.052 |

# Alpha/Beta Count Results

## Sample Activity Report

## Orange 16-19 - D

**Addr:** 19

**Sample ID** 180-93098-B-3-B

**Repeat** 1

**Carrier No.** 0

**Batch ID** 436768

**Count Method** Gross Alpha Beta

**Detector Volts** 1515

**Count Began** 8/30/2019 2:44:38 PM

**Count Ended** 8/30/2019 6:04:56 PM

**Sample Count Time** 200.00 ***mins***

**Background Count Time** 1,000.00 ***mins***

| | Background cpm | Gross counts | Gross cpm | Net cpm |
|---|---|---|---|---|
| **Alpha** | 0.136 | 18 | 0.090 | -0.046 |
| **sd** | 0.012 | 4.243 | 0.021 | 0.032 |
| **Beta** | 0.427 | 98 | 0.490 | 0.063 |
| **sd** | 0.021 | 9.899 | 0.049 | 0.054 |

# Alpha/Beta Count Results

## Sample Activity Report

## Orange 20-23 - C

**Addr:** 22

**Sample ID** 180-93098-C-4-B

**Repeat** 1

**Carrier No.** 0

**Batch ID** 436768

**Count Method** Gross Alpha Beta

**Detector Volts** 1515

**Count Began** 8/30/2019 2:44:46 PM

**Count Ended** 8/30/2019 6:05:03 PM

**Sample Count Time** 200.00 ***mins*** **Background Count Time** 1,000.00 ***mins***

| | Background cpm | Gross counts | Gross cpm | Net cpm |
|---|---|---|---|---|
| **Alpha** | 0.105 | 12 | 0.060 | -0.045 |
| **sd** | 0.010 | 3.464 | 0.017 | 0.029 |
| **Beta** | 0.401 | 85 | 0.425 | 0.024 |
| **sd** | 0.020 | 9.220 | 0.046 | 0.050 |

# Alpha/Beta Count Results

## Sample Activity Report

## Orange 20-23 - D

**Addr:** 23

**Sample ID** MB 160-436768/18-A

**Repeat** 1

**Carrier No.** 0

**Batch ID** 436768

**Count Method** Gross Alpha Beta

**Detector Volts** 1515

**Count Began** 8/30/2019 2:44:55 PM

**Count Ended** 8/30/2019 6:05:10 PM

**Sample Count Time** 200.00 ***mins*** **Background Count Time** 1,000.00 ***mins***

| | Background cpm | Gross counts | Gross cpm | Net cpm |
|---|---|---|---|---|
| **Alpha** | 0.103 | 14 | 0.070 | -0.033 |
| **sd** | 0.010 | 3.742 | 0.019 | 0.028 |
| **Beta** | 0.417 | 83 | 0.415 | -0.002 |
| **sd** | 0.020 | 9.110 | 0.046 | 0.050 |

# Daily Checks

**APPROVED**
*By Kody Saulters at 12:31 pm, Sep 03, 2019*

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# Gas Proportional Counter Daily Quality Control Checks

***Instrument: Blue***

| | Alpha CPM | Alpha Mean | Alpha +/- limit | Alpha Deviation | Alpha Flag | A>>B XT CPM | A>>B XT Mean | A>>B XT +/- limit | A>>B XT Deviation | A>>B XT Flag |
|---|---|---|---|---|---|---|---|---|---|---|
| **Check Type = Alpha** | | | | | | | | | | |
| **Detector 0** | | | | | | | | | | |
| **8/30/2019 12:37:00 AM** | 11634.50 | 11687.23 | 350.62 | -52.72 | Pass | 4410.50 | 4369.78 | 44.00 | 40.725 | Pass |
| **8/31/2019 8:47:00 AM** | 11581.05 | 11687.23 | 350.62 | -106.18 | Pass | 4399.00 | 4369.78 | 44.00 | 29.225 | Pass |
| **Detector 1** | | | | | | | | | | |
| **8/30/2019 12:37:00 AM** | 12621.59 | 12660.45 | 379.81 | -38.86 | Pass | 4484.00 | 4639.33 | 62.38 | -155.325 | **WARNING** |
| **8/31/2019 8:47:00 AM** | 12560.14 | 12660.45 | 379.81 | -100.31 | Pass | 4613.00 | 4639.33 | 62.38 | -26.325 | Pass |
| **Detector 2** | | | | | | | | | | |
| **8/30/2019 12:37:00 AM** | 12818.11 | 12819.28 | 384.58 | -1.17 | Pass | 4652.00 | 4776.73 | 60.67 | -124.725 | **WARNING** |
| **8/31/2019 8:47:00 AM** | 12730.65 | 12819.28 | 384.58 | -88.62 | Pass | 4810.00 | 4776.73 | 60.67 | 33.275 | Pass |
| **Detector 3** | | | | | | | | | | |
| **8/30/2019 12:38:00 AM** | 12688.08 | 12695.28 | 380.86 | -7.20 | Pass | 4562.50 | 4545.10 | 50.19 | 17.400 | Pass |
| **8/31/2019 8:47:00 AM** | 12667.13 | 12695.28 | 380.86 | -28.14 | Pass | 4513.00 | 4545.10 | 50.19 | -32.100 | Pass |
| **Detector 4** | | | | | | | | | | |
| **8/30/2019 12:38:00 AM** | 15821.85 | 15947.40 | 478.42 | -125.55 | Pass | 6279.00 | 6010.63 | 170.60 | 268.375 | Pass |
| **8/31/2019 8:47:00 AM** | 15829.92 | 15947.40 | 478.42 | -117.48 | Pass | 6219.00 | 6010.63 | 170.60 | 208.375 | Pass |
| **Detector 5** | | | | | | | | | | |
| **8/30/2019 12:38:00 AM** | 16192.88 | 16232.73 | 486.98 | -39.84 | Pass | 5846.50 | 5886.28 | 70.81 | -39.775 | Pass |
| **8/31/2019 8:47:00 AM** | 16057.94 | 16232.73 | 486.98 | -174.78 | Pass | 5979.50 | 5886.28 | 70.81 | 93.225 | Pass |
| **Detector 6** | | | | | | | | | | |
| **8/30/2019 12:38:00 AM** | 14560.23 | 14681.80 | 440.45 | -121.57 | Pass | 5416.50 | 5388.75 | 56.94 | 27.750 | Pass |
| **8/31/2019 8:47:00 AM** | 14449.78 | 14681.80 | 440.45 | -232.02 | Pass | 5376.00 | 5388.75 | 56.94 | -12.750 | Pass |
| **Detector 7** | | | | | | | | | | |
| **8/30/2019 12:38:00 AM** | 14911.27 | 14832.35 | 444.97 | 78.92 | Pass | 5358.50 | 5352.95 | 57.41 | 5.550 | Pass |
| **8/31/2019 8:47:00 AM** | 14682.31 | 14832.35 | 444.97 | -150.04 | Pass | 5410.50 | 5352.95 | 57.41 | 57.550 | Pass |
| **Detector 8** | | | | | | | | | | |
| **8/30/2019 12:40:00 AM** | 11604.48 | 11576.25 | 347.29 | 28.23 | Pass | 4372.50 | 4391.63 | 40.19 | -19.125 | Pass |
| **8/31/2019 8:50:00 AM** | 11461.02 | 11576.25 | 347.29 | -115.23 | Pass | 4450.00 | 4391.63 | 40.19 | 58.375 | Pass |
| **Detector 9** | | | | | | | | | | |
| **8/30/2019 12:40:00 AM** | 12490.06 | 12556.93 | 376.71 | -66.87 | Pass | 4812.00 | 4786.65 | 49.55 | 25.350 | Pass |
| **8/31/2019 8:50:00 AM** | 12440.61 | 12556.93 | 376.71 | -116.32 | Pass | 4806.50 | 4786.65 | 49.55 | 19.850 | Pass |
| **Detector 10** | | | | | | | | | | |
| **8/30/2019 12:40:00 AM** | 12762.58 | 12963.10 | 388.89 | -200.52 | Pass | 4699.50 | 4837.70 | 61.92 | -138.200 | **WARNING** |
| **8/31/2019 8:50:00 AM** | 12935.15 | 12963.10 | 388.89 | -27.95 | Pass | 4909.00 | 4837.70 | 61.92 | 71.300 | Pass |

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# Gas Proportional Counter Daily Quality Control Checks

## *Instrument: Blue*

| | Alpha CPM | Alpha Mean | Alpha +/- limit | Alpha Deviation | Alpha Flag | A>>B XT CPM | A>>B XT Mean | A>>B XT +/- limit | A>>B XT Deviation | A>>B XT Flag |
|---|---|---|---|---|---|---|---|---|---|---|
| **Detector 11** | | | | | | | | | | |
| **8/30/2019 12:40:00 AM** | 12689.58 | 12659.60 | 379.79 | 29.98 | Pass | 4628.00 | 4751.65 | 71.92 | -123.650 | Pass |
| **8/31/2019 8:50:00 AM** | 12602.13 | 12659.60 | 379.79 | -57.47 | Pass | 4767.50 | 4751.65 | 71.92 | 15.850 | Pass |
| **Detector 12** | | | | | | | | | | |
| **8/30/2019 12:41:00 AM** | 15664.83 | 15436.53 | 463.10 | 228.30 | Pass | 6778.50 | 6853.73 | 91.51 | -75.225 | Pass |
| **8/31/2019 8:51:00 AM** | 15166.35 | 15436.53 | 463.10 | -270.17 | Pass | 6969.50 | 6853.73 | 91.51 | 115.775 | Pass |
| **Detector 13** | | | | | | | | | | |
| **8/30/2019 12:41:00 AM** | 16733.42 | 16942.28 | 508.27 | -208.86 | Pass | 5318.00 | 5324.63 | 67.75 | -6.625 | Pass |
| **8/31/2019 8:51:00 AM** | 16749.49 | 16942.28 | 508.27 | -192.78 | Pass | 5398.50 | 5324.63 | 67.75 | 73.875 | Pass |
| **Detector 14** | | | | | | | | | | |
| **8/30/2019 12:41:00 AM** | 13824.67 | 14060.75 | 421.82 | -236.08 | Pass | 6085.00 | 6110.60 | 310.42 | -25.600 | Pass |
| **8/31/2019 8:51:00 AM** | 13775.73 | 14060.75 | 421.82 | -285.02 | Pass | 6271.50 | 6110.60 | 310.42 | 160.900 | Pass |
| **Detector 15** | | | | | | | | | | |
| **8/30/2019 12:41:00 AM** | 14183.70 | 14067.33 | 422.02 | 116.38 | Pass | 6043.00 | 5856.58 | 128.86 | 186.425 | Pass |
| **8/31/2019 8:51:00 AM** | 14090.26 | 14067.33 | 422.02 | 22.93 | Pass | 6101.00 | 5856.58 | 128.86 | 244.425 | Pass |
| **Detector 16** | | | | | | | | | | |
| **8/30/2019 12:44:00 AM** | 11621.98 | 11644.40 | 349.33 | -22.42 | Pass | 4397.50 | 4442.73 | 57.31 | -45.225 | Pass |
| **8/31/2019 8:55:00 AM** | 11598.53 | 11644.40 | 349.33 | -45.87 | Pass | 4470.00 | 4442.73 | 57.31 | 27.275 | Pass |
| **Detector 17** | | | | | | | | | | |
| **8/30/2019 12:44:00 AM** | 12622.07 | 12769.60 | 383.09 | -147.53 | Pass | 4643.00 | 4694.90 | 44.72 | -51.900 | Pass |
| **8/31/2019 8:55:00 AM** | 12569.62 | 12769.60 | 383.09 | -199.98 | Pass | 4668.00 | 4694.90 | 44.72 | -26.900 | Pass |
| **Detector 18** | | | | | | | | | | |
| **8/30/2019 12:44:00 AM** | 13187.62 | 13168.68 | 395.06 | 18.94 | Pass | 4626.00 | 4634.05 | 64.62 | -8.050 | Pass |
| **8/31/2019 8:55:00 AM** | 12879.65 | 13168.68 | 395.06 | -289.03 | Pass | 4720.00 | 4634.05 | 64.62 | 85.950 | Pass |
| **Detector 19** | | | | | | | | | | |
| **8/30/2019 12:44:00 AM** | 12576.56 | 12692.53 | 380.78 | -115.97 | Pass | 4789.50 | 4577.53 | 110.81 | 211.975 | Pass |
| **8/31/2019 8:55:00 AM** | 12688.62 | 12692.53 | 380.78 | -3.90 | Pass | 4681.00 | 4577.53 | 110.81 | 103.475 | Pass |
| **Detector 20** | | | | | | | | | | |
| **8/30/2019 12:44:00 AM** | 15437.29 | 15429.63 | 462.89 | 7.66 | Pass | 6900.00 | 7112.73 | 112.02 | -212.725 | Pass |
| **8/31/2019 8:55:00 AM** | 15016.82 | 15429.63 | 462.89 | -412.81 | Pass | 7414.50 | 7112.73 | 112.02 | 301.775 | **WARNING** |
| **Detector 21** | | | | | | | | | | |
| **8/30/2019 12:44:00 AM** | 15796.32 | 15659.78 | 469.79 | 136.54 | Pass | 6497.00 | 6551.25 | 94.85 | -54.250 | Pass |
| **8/31/2019 8:55:00 AM** | 15479.36 | 15659.78 | 469.79 | -180.42 | Pass | 6707.50 | 6551.25 | 94.85 | 156.250 | Pass |

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# Gas Proportional Counter Daily Quality Control Checks

***Instrument: Blue***

| | Alpha CPM | Alpha Mean | Alpha +/- limit | Alpha Deviation | Alpha Flag | A>>B XT CPM | A>>B XT Mean | A>>B XT +/- limit | A>>B XT Deviation | A>>B XT Flag |
|---|---|---|---|---|---|---|---|---|---|---|
| **Detector 22** | | | | | | | | | | |
| **8/30/2019 12:44:00 AM** | 13952.16 | 13972.80 | 419.18 | -20.64 | Pass | 6278.50 | 6401.03 | 87.63 | -122.525 | Pass |
| **8/31/2019 8:55:00 AM** | 13766.21 | 13972.80 | 419.18 | -206.59 | Pass | 6574.00 | 6401.03 | 87.63 | 172.975 | Pass |
| **Detector 23** | | | | | | | | | | |
| **8/30/2019 12:44:00 AM** | 14151.56 | 14123.95 | 423.72 | 27.61 | Pass | 6492.50 | 6632.90 | 79.57 | -140.400 | Pass |
| **8/31/2019 8:55:00 AM** | 13853.60 | 14123.95 | 423.72 | -270.35 | Pass | 6684.50 | 6632.90 | 79.57 | 51.600 | Pass |

# Gas Proportional Counter Daily Quality Control Checks

***Instrument: Blue***

| | Beta CPM | Beta Mean | Beta +/- limit | Beta Deviation | Beta Flag | B>>A XT CPM | B>>A XT Mean | B>>A XT +/- limit | B>>A XT Deviation | B>>A XT Flag |
|---|---|---|---|---|---|---|---|---|---|---|
| **Check Type = Beta** | | | | | | | | | | |
| **Detector 0** | | | | | | | | | | |
| **8/30/2019 12:28:00 AM** | 50039.73 | 50552.05 | 1516.56 | -512.32 | Pass | NA | NA | NA | NA | NA |
| **8/31/2019 8:28:00 AM** | 50261.47 | 50552.05 | 1516.56 | -290.58 | Pass | NA | NA | NA | NA | NA |
| **Detector 1** | | | | | | | | | | |
| **8/30/2019 12:26:00 AM** | 48468.99 | 47641.23 | 1429.24 | 827.77 | Pass | NA | NA | NA | NA | NA |
| **8/31/2019 8:28:00 AM** | 48402.34 | 47641.23 | 1429.24 | 761.11 | Pass | NA | NA | NA | NA | NA |
| **Detector 2** | | | | | | | | | | |
| **8/30/2019 12:26:00 AM** | 49992.15 | 49734.44 | 1492.03 | 257.71 | Pass | NA | NA | NA | NA | NA |
| **8/31/2019 8:28:00 AM** | 49756.15 | 49734.44 | 1492.03 | 21.71 | Pass | NA | NA | NA | NA | NA |
| **Detector 3** | | | | | | | | | | |
| **8/30/2019 12:26:00 AM** | 59767.67 | 60167.98 | 1805.04 | -400.31 | Pass | NA | NA | NA | NA | NA |
| **8/31/2019 8:28:00 AM** | 59592.80 | 60167.98 | 1805.04 | -575.18 | Pass | NA | NA | NA | NA | NA |
| **Detector 4** | | | | | | | | | | |
| **8/30/2019 12:25:00 AM** | 54279.45 | 55277.35 | 1658.32 | -997.90 | Pass | NA | NA | NA | NA | NA |
| **8/31/2019 8:29:00 AM** | 54256.45 | 55277.35 | 1658.32 | -1020.90 | Pass | NA | NA | NA | NA | NA |
| **Detector 5** | | | | | | | | | | |
| **8/30/2019 12:25:00 AM** | 54831.99 | 55004.03 | 1650.12 | -172.03 | Pass | NA | NA | NA | NA | NA |
| **8/31/2019 8:29:00 AM** | 55110.87 | 55004.03 | 1650.12 | 106.84 | Pass | NA | NA | NA | NA | NA |
| **Detector 6** | | | | | | | | | | |
| **8/30/2019 12:25:00 AM** | 51637.55 | 52072.68 | 1562.18 | -435.12 | Pass | NA | NA | NA | NA | NA |
| **8/31/2019 8:29:00 AM** | 52105.36 | 52072.68 | 1562.18 | 32.68 | Pass | NA | NA | NA | NA | NA |
| **Detector 7** | | | | | | | | | | |
| **8/30/2019 12:25:00 AM** | 45538.35 | 44302.58 | 1329.08 | 1235.77 | Pass | NA | NA | NA | NA | NA |
| **8/31/2019 8:29:00 AM** | 45244.38 | 44302.58 | 1329.08 | 941.81 | Pass | NA | NA | NA | NA | NA |
| **Detector 8** | | | | | | | | | | |
| **8/30/2019 12:31:00 AM** | 50063.75 | 49959.33 | 1498.78 | 104.42 | Pass | NA | NA | NA | NA | NA |
| **8/31/2019 8:22:00 AM** | 50280.26 | 49959.33 | 1498.78 | 320.94 | Pass | NA | NA | NA | NA | NA |
| **Detector 9** | | | | | | | | | | |
| **8/30/2019 12:31:00 AM** | 48935.82 | 47696.08 | 1430.88 | 1239.74 | Pass | NA | NA | NA | NA | NA |
| **8/31/2019 8:22:00 AM** | 48698.72 | 47696.08 | 1430.88 | 1002.64 | Pass | NA | NA | NA | NA | NA |
| **Detector 10** | | | | | | | | | | |
| **8/30/2019 12:31:00 AM** | 50504.01 | 50136.65 | 1504.10 | 367.36 | Pass | NA | NA | NA | NA | NA |
| **8/31/2019 8:22:00 AM** | 50619.94 | 50136.65 | 1504.10 | 483.29 | Pass | NA | NA | NA | NA | NA |

# Gas Proportional Counter Daily Quality Control Checks

## *Instrument: Blue*

| | Beta CPM | Beta Mean | Beta +/- limit | Beta Deviation | Beta Flag | B>>A XT CPM | B>>A XT Mean | B>>A XT +/- limit | B>>A XT Deviation | B>>A XT Flag |
|---|---|---|---|---|---|---|---|---|---|---|
| **Detector 11** | | | | | | | | | | |
| **8/30/2019 12:32:00 AM** | 59844.47 | 59951.55 | 1798.55 | -107.08 | Pass | NA | NA | NA | NA | NA |
| **8/31/2019 8:22:00 AM** | 59667.53 | 59951.55 | 1798.55 | -284.02 | Pass | NA | NA | NA | NA | NA |
| **Detector 12** | | | | | | | | | | |
| **8/30/2019 12:32:00 AM** | 56298.14 | 56070.40 | 1682.11 | 227.74 | Pass | NA | NA | NA | NA | NA |
| **8/31/2019 8:23:00 AM** | 55833.72 | 56070.40 | 1682.11 | -236.68 | Pass | NA | NA | NA | NA | NA |
| **Detector 13** | | | | | | | | | | |
| **8/30/2019 12:32:00 AM** | 55277.32 | 55607.20 | 1668.22 | -329.88 | Pass | NA | NA | NA | NA | NA |
| **8/31/2019 8:23:00 AM** | 55065.20 | 55607.20 | 1668.22 | -542.00 | Pass | NA | NA | NA | NA | NA |
| **Detector 14** | | | | | | | | | | |
| **8/30/2019 12:32:00 AM** | 50760.54 | 50580.03 | 1517.40 | 180.52 | Pass | NA | NA | NA | NA | NA |
| **8/31/2019 8:23:00 AM** | 50966.23 | 50580.03 | 1517.40 | 386.21 | Pass | NA | NA | NA | NA | NA |
| **Detector 15** | | | | | | | | | | |
| **8/30/2019 12:32:00 AM** | 45086.00 | 45674.43 | 1370.23 | -588.42 | Pass | NA | NA | NA | NA | NA |
| **8/31/2019 8:23:00 AM** | 44950.83 | 45674.43 | 1370.23 | -723.60 | Pass | NA | NA | NA | NA | NA |
| **Detector 16** | | | | | | | | | | |
| **8/30/2019 12:35:00 AM** | 50062.16 | 49653.23 | 1489.60 | 408.94 | Pass | NA | NA | NA | NA | NA |
| **8/31/2019 8:15:00 AM** | 49868.49 | 49653.23 | 1489.60 | 215.27 | Pass | NA | NA | NA | NA | NA |
| **Detector 17** | | | | | | | | | | |
| **8/30/2019 12:35:00 AM** | 48699.45 | 48166.13 | 1444.98 | 533.32 | Pass | NA | NA | NA | NA | NA |
| **8/31/2019 8:15:00 AM** | 48556.69 | 48166.13 | 1444.98 | 390.57 | Pass | NA | NA | NA | NA | NA |
| **Detector 18** | | | | | | | | | | |
| **8/30/2019 12:35:00 AM** | 50074.87 | 49957.23 | 1498.72 | 117.65 | Pass | NA | NA | NA | NA | NA |
| **8/31/2019 8:16:00 AM** | 50018.46 | 49957.23 | 1498.72 | 61.24 | Pass | NA | NA | NA | NA | NA |
| **Detector 19** | | | | | | | | | | |
| **8/30/2019 12:35:00 AM** | 59878.87 | 59167.80 | 1775.03 | 711.07 | Pass | NA | NA | NA | NA | NA |
| **8/31/2019 8:16:00 AM** | 59524.69 | 59167.80 | 1775.03 | 356.89 | Pass | NA | NA | NA | NA | NA |
| **Detector 20** | | | | | | | | | | |
| **8/30/2019 12:36:00 AM** | 56998.42 | 57321.08 | 1719.63 | -322.66 | Pass | NA | NA | NA | NA | NA |
| **8/31/2019 8:16:00 AM** | 56725.40 | 57321.08 | 1719.63 | -595.67 | Pass | NA | NA | NA | NA | NA |
| **Detector 21** | | | | | | | | | | |
| **8/30/2019 12:36:00 AM** | 54931.45 | 55281.80 | 1658.45 | -350.35 | Pass | NA | NA | NA | NA | NA |
| **8/31/2019 8:16:00 AM** | 54682.97 | 55281.80 | 1658.45 | -598.83 | Pass | NA | NA | NA | NA | NA |

# Gas Proportional Counter Daily Quality Control Checks

***Instrument: Blue***

| | Beta CPM | Beta Mean | Beta +/- limit | Beta Deviation | Beta Flag | B>>A XT CPM | B>>A XT Mean | B>>A XT +/- limit | B>>A XT Deviation | B>>A XT Flag |
|---|---|---|---|---|---|---|---|---|---|---|
| **Detector 22** | | | | | | | | | | |
| **8/30/2019 12:36:00 AM** | 52111.35 | 52477.75 | 1574.33 | -366.40 | Pass | NA | NA | NA | NA | NA |
| **8/31/2019 8:16:00 AM** | 52002.04 | 52477.75 | 1574.33 | -475.71 | Pass | NA | NA | NA | NA | NA |
| **Detector 23** | | | | | | | | | | |
| **8/30/2019 12:36:00 AM** | 45765.50 | 46160.75 | 1384.82 | -395.25 | Pass | NA | NA | NA | NA | NA |
| **8/31/2019 8:17:00 AM** | 45400.41 | 46160.75 | 1384.82 | -760.34 | Pass | NA | NA | NA | NA | NA |

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# Gas Proportional Counter Daily Quality Control Checks

***Instrument: Blue***

| | AlphaBKG CPM | BKG Mean | BKG +/- limit | BKG Deviation | BKG Flag | BetaBKG CPM | BetaBKG Mean | BetaBKG +/- limit | BetaBKG Deviation | BetaBKG Flag |
|---|---|---|---|---|---|---|---|---|---|---|
| **Check Type = BKG** | | | | | | | | | | |
| **Detector 0** | | | | | | | | | | |
| **8/30/2019 4:52:00 AM** | 0.22 | 0.14 | 0.03 | 0.08 | Pass | 0.58 | 0.49 | 0.08 | 0.081 | Pass |
| **8/31/2019 12:36:00 PM** | 0.12 | 0.14 | 0.03 | -0.02 | Pass | 0.41 | 0.49 | 0.08 | -0.084 | Pass |
| **Detector 1** | | | | | | | | | | |
| **8/30/2019 4:52:00 AM** | 0.27 | 0.15 | 0.02 | 0.12 | **FAIL** | 0.49 | 0.44 | 0.07 | 0.052 | Pass |
| **8/30/2019 8:43:00 AM** | 0.18 | 0.15 | 0.02 | 0.03 | Pass | 0.45 | 0.44 | 0.07 | 0.012 | Pass |
| **8/31/2019 12:36:00 PM** | 0.17 | 0.15 | 0.02 | 0.02 | Pass | 0.33 | 0.44 | 0.07 | -0.108 | Pass |
| **Detector 2** | | | | | | | | | | |
| **8/30/2019 4:53:00 AM** | 0.23 | 0.08 | 0.05 | 0.15 | Pass | 0.46 | 0.42 | 0.08 | 0.036 | Pass |
| **8/31/2019 12:36:00 PM** | 0.28 | 0.08 | 0.05 | 0.20 | **FAIL** | 0.46 | 0.42 | 0.08 | 0.031 | Pass |
| **Detector 3** | | | | | | | | | | |
| **8/30/2019 4:53:00 AM** | 0.15 | 0.06 | 0.04 | 0.09 | Pass | 0.53 | 0.41 | 0.08 | 0.119 | Pass |
| **8/31/2019 12:36:00 PM** | 0.14 | 0.06 | 0.04 | 0.07 | Pass | 0.52 | 0.41 | 0.08 | 0.109 | Pass |
| **Detector 4** | | | | | | | | | | |
| **8/30/2019 4:53:00 AM** | 0.22 | 0.11 | 0.04 | 0.10 | Pass | 0.43 | 0.40 | 0.08 | 0.025 | Pass |
| **8/31/2019 12:36:00 PM** | 0.29 | 0.11 | 0.04 | 0.17 | **FAIL** | 0.46 | 0.40 | 0.08 | 0.055 | Pass |
| **Detector 5** | | | | | | | | | | |
| **8/30/2019 4:53:00 AM** | 0.30 | 0.11 | 0.04 | 0.19 | **FAIL** | 0.38 | 0.41 | 0.08 | -0.039 | Pass |
| **8/31/2019 12:36:00 PM** | 0.20 | 0.11 | 0.04 | 0.09 | Pass | 0.26 | 0.41 | 0.08 | -0.154 | Pass |
| **Detector 6** | | | | | | | | | | |
| **8/30/2019 4:53:00 AM** | 0.12 | 0.14 | 0.04 | -0.03 | Pass | 0.36 | 0.42 | 0.05 | -0.059 | Pass |
| **8/31/2019 12:36:00 PM** | 0.16 | 0.14 | 0.04 | 0.01 | Pass | 0.32 | 0.42 | 0.05 | -0.099 | Pass |
| **Detector 7** | | | | | | | | | | |
| **8/30/2019 4:53:00 AM** | 0.34 | 0.10 | 0.04 | 0.24 | **FAIL** | 0.62 | 0.49 | 0.12 | 0.129 | Pass |
| **8/30/2019 8:43:00 AM** | 0.23 | 0.10 | 0.04 | 0.13 | Pass | 0.58 | 0.49 | 0.12 | 0.089 | Pass |
| **8/31/2019 12:36:00 PM** | 0.11 | 0.10 | 0.04 | 0.01 | Pass | 0.47 | 0.49 | 0.12 | -0.016 | Pass |
| **Detector 8** | | | | | | | | | | |
| **8/30/2019 4:53:00 AM** | 0.14 | 0.09 | 0.04 | 0.04 | Pass | 0.47 | 0.44 | 0.08 | 0.026 | Pass |
| **8/31/2019 12:36:00 PM** | 0.17 | 0.09 | 0.04 | 0.08 | Pass | 0.40 | 0.44 | 0.08 | -0.049 | Pass |
| **Detector 9** | | | | | | | | | | |
| **8/30/2019 4:53:00 AM** | 0.13 | 0.10 | 0.04 | 0.03 | Pass | 0.33 | 0.39 | 0.06 | -0.065 | Pass |
| **8/31/2019 12:36:00 PM** | 0.15 | 0.10 | 0.04 | 0.05 | Pass | 0.40 | 0.39 | 0.06 | 0.006 | Pass |

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# Gas Proportional Counter Daily Quality Control Checks

***Instrument: Blue***

| | AlphaBKG CPM | BKG Mean | BKG +/- limit | BKG Deviation | BKG Flag | BetaBKG CPM | BetaBKG Mean | BetaBKG +/- limit | BetaBKG Deviation | BetaBKG Flag |
|---|---|---|---|---|---|---|---|---|---|---|
| **Detector 10** | | | | | | | | | | |
| **8/30/2019 4:53:00 AM** | 0.16 | 0.09 | 0.04 | 0.06 | Pass | 0.29 | 0.33 | 0.08 | -0.041 | Pass |
| **8/31/2019 12:36:00 PM** | 0.24 | 0.09 | 0.04 | 0.14 | **FAIL** | 0.33 | 0.33 | 0.08 | -0.001 | Pass |
| **Detector 11** | | | | | | | | | | |
| **8/30/2019 4:53:00 AM** | 0.17 | 0.09 | 0.04 | 0.08 | Pass | 0.39 | 0.45 | 0.10 | -0.057 | Pass |
| **8/31/2019 12:36:00 PM** | 0.13 | 0.09 | 0.04 | 0.04 | Pass | 0.42 | 0.45 | 0.10 | -0.032 | Pass |
| **Detector 12** | | | | | | | | | | |
| **8/30/2019 4:53:00 AM** | 0.13 | 0.11 | 0.03 | 0.01 | Pass | 0.43 | 0.44 | 0.11 | -0.020 | Pass |
| **8/31/2019 12:36:00 PM** | 0.14 | 0.11 | 0.03 | 0.02 | Pass | 0.33 | 0.44 | 0.11 | -0.115 | Pass |
| **Detector 13** | | | | | | | | | | |
| **8/30/2019 4:53:00 AM** | 0.23 | 0.09 | 0.05 | 0.14 | **FAIL** | 0.42 | 0.40 | 0.09 | 0.020 | Pass |
| **8/30/2019 8:43:00 AM** | 0.10 | 0.09 | 0.05 | 0.01 | Pass | 0.34 | 0.40 | 0.09 | -0.060 | Pass |
| **8/31/2019 12:37:00 PM** | 0.12 | 0.09 | 0.05 | 0.03 | Pass | 0.35 | 0.40 | 0.09 | -0.045 | Pass |
| **Detector 14** | | | | | | | | | | |
| **8/30/2019 4:53:00 AM** | 0.21 | 0.10 | 0.04 | 0.11 | Pass | 0.58 | 0.39 | 0.08 | 0.189 | Pass |
| **8/31/2019 12:37:00 PM** | 0.12 | 0.10 | 0.04 | 0.02 | Pass | 0.37 | 0.39 | 0.08 | -0.016 | Pass |
| **Detector 15** | | | | | | | | | | |
| **8/30/2019 4:53:00 AM** | 0.21 | 0.09 | 0.04 | 0.12 | Pass | 0.37 | 0.44 | 0.07 | -0.070 | Pass |
| **8/31/2019 12:37:00 PM** | 0.21 | 0.09 | 0.04 | 0.12 | Pass | 0.37 | 0.44 | 0.07 | -0.070 | Pass |
| **Detector 16** | | | | | | | | | | |
| **8/30/2019 4:53:00 AM** | 0.14 | 0.10 | 0.05 | 0.03 | Pass | 3.65 | 1.85 | 2.38 | 1.800 | Pass |
| **8/31/2019 12:37:00 PM** | 0.21 | 0.10 | 0.05 | 0.11 | Pass | 5.45 | 1.85 | 2.38 | 3.600 | Pass |
| **Detector 17** | | | | | | | | | | |
| **8/30/2019 4:53:00 AM** | 0.28 | 0.08 | 0.05 | 0.20 | **FAIL** | 0.36 | 0.43 | 0.08 | -0.068 | Pass |
| **8/31/2019 12:37:00 PM** | 0.13 | 0.08 | 0.05 | 0.05 | Pass | 0.36 | 0.43 | 0.08 | -0.073 | Pass |
| **Detector 18** | | | | | | | | | | |
| **8/30/2019 4:53:00 AM** | 0.94 | 0.05 | 0.03 | 0.89 | **FAIL** | 1.18 | 0.62 | 0.09 | 0.560 | **FAIL** |
| **8/31/2019 12:37:00 PM** | 0.91 | 0.05 | 0.03 | 0.85 | **FAIL** | 1.28 | 0.62 | 0.09 | 0.655 | **FAIL** |
| **Detector 19** | | | | | | | | | | |
| **8/30/2019 4:53:00 AM** | 0.19 | 0.10 | 0.03 | 0.09 | Pass | 0.47 | 0.49 | 0.10 | -0.022 | Pass |
| **8/31/2019 12:37:00 PM** | 0.23 | 0.10 | 0.03 | 0.12 | **FAIL** | 0.49 | 0.49 | 0.10 | -0.007 | Pass |
| **Detector 20** | | | | | | | | | | |
| **8/30/2019 4:54:00 AM** | 0.21 | 0.05 | 0.04 | 0.16 | **FAIL** | 0.51 | 0.42 | 0.12 | 0.093 | Pass |
| **8/31/2019 12:37:00 PM** | 0.20 | 0.05 | 0.04 | 0.15 | **FAIL** | 0.45 | 0.42 | 0.12 | 0.028 | Pass |

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# Gas Proportional Counter Daily Quality Control Checks

***Instrument: Blue***

| | AlphaBKG CPM | BKG Mean | BKG +/- limit | BKG Deviation | BKG Flag | BetaBKG CPM | BetaBKG Mean | BetaBKG +/- limit | BetaBKG Deviation | BetaBKG Flag |
|---|---|---|---|---|---|---|---|---|---|---|
| **Detector 21** | | | | | | | | | | |
| **8/30/2019 4:54:00 AM** | 0.27 | 0.05 | 0.03 | 0.22 | FAIL | 0.49 | 0.34 | 0.12 | 0.147 | Pass |
| **8/31/2019 12:37:00 PM** | 0.37 | 0.05 | 0.03 | 0.32 | FAIL | 0.51 | 0.34 | 0.12 | 0.162 | Pass |
| **Detector 22** | | | | | | | | | | |
| **8/30/2019 4:54:00 AM** | 0.27 | 0.07 | 0.04 | 0.20 | FAIL | 0.69 | 0.40 | 0.06 | 0.284 | FAIL |
| **8/30/2019 8:43:00 AM** | 0.23 | 0.07 | 0.04 | 0.15 | FAIL | 0.28 | 0.40 | 0.06 | -0.121 | Pass |
| **8/31/2019 12:37:00 PM** | 0.25 | 0.07 | 0.04 | 0.18 | FAIL | 0.50 | 0.40 | 0.06 | 0.094 | Pass |
| **Detector 23** | | | | | | | | | | |
| **8/30/2019 4:54:00 AM** | 0.54 | 0.05 | 0.02 | 0.49 | FAIL | 1.02 | 0.47 | 0.10 | 0.552 | FAIL |
| **8/30/2019 8:43:00 AM** | 0.44 | 0.05 | 0.02 | 0.39 | FAIL | 0.58 | 0.47 | 0.10 | 0.112 | Pass |
| **8/31/2019 12:38:00 PM** | 0.52 | 0.05 | 0.02 | 0.47 | FAIL | 0.88 | 0.47 | 0.10 | 0.412 | FAIL |

**The Alpha and Beta +/- limit are based upon initial 20-point population.**

**The Alpha and Beta +/- limit for Efficiency is stated at 3%. Flags are "FAIL" > 3%.**

**The Alpha and Beta +/- limit for Background is stated at 1 StDev. Flags are "FAIL" > 3 StDev.**

**The Alpha +/- limit for Crosstalk is stated at 1 StDev. Flags are "Warning > 2 StDev and "DOEF" > 3 StDev. Beta is negligible, for trend only ("NA").**

**Times shown reflect the end of the count duration.**

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# Gas Proportional Counter Daily Quality Control Checks

***Instrument: Orange***

| | Alpha CPM | Alpha Mean | Alpha +/- limit | Alpha Deviation | Alpha Flag | A>>B XT CPM | A>>B XT Mean | A>>B XT +/- limit | A>>B XT Deviation | A>>B XT Flag |
|---|---|---|---|---|---|---|---|---|---|---|
| **Check Type = Alpha** | | | | | | | | | | |
| **Detector 0** | | | | | | | | | | |
| **8/30/2019 12:15:00 AM** | 11892.07 | 12672.50 | 380.18 | -780.43 | FAIL | 4112.50 | 4296.38 | 82.77 | -183.875 | WARNING |
| **8/31/2019 8:12:00 AM** | 11826.99 | 12672.50 | 380.18 | -845.51 | FAIL | 4048.50 | 4296.38 | 82.77 | -247.875 | WARNING |
| **Detector 1** | | | | | | | | | | |
| **8/30/2019 12:15:00 AM** | 12684.25 | 13470.00 | 404.10 | -785.75 | FAIL | 4416.50 | 4380.30 | 175.16 | 36.200 | Pass |
| **8/31/2019 8:12:00 AM** | 12603.63 | 13470.00 | 404.10 | -866.37 | FAIL | 4266.50 | 4380.30 | 175.16 | -113.800 | Pass |
| **Detector 2** | | | | | | | | | | |
| **8/30/2019 12:15:00 AM** | 13067.75 | 14052.18 | 421.57 | -984.42 | FAIL | 4379.50 | 4507.15 | 164.48 | -127.650 | Pass |
| **8/31/2019 8:12:00 AM** | 12890.43 | 14052.18 | 421.57 | -1161.74 | FAIL | 4337.00 | 4507.15 | 164.48 | -170.150 | Pass |
| **Detector 3** | | | | | | | | | | |
| **8/30/2019 12:15:00 AM** | 12704.88 | 13117.55 | 393.53 | -412.67 | FAIL | 4226.50 | 4304.23 | 107.14 | -77.725 | Pass |
| **8/31/2019 8:12:00 AM** | 12698.92 | 13117.55 | 393.53 | -418.63 | FAIL | 4190.50 | 4304.23 | 107.14 | -113.725 | Pass |
| **Detector 4** | | | | | | | | | | |
| **8/30/2019 12:15:00 AM** | 15661.66 | 16081.68 | 482.45 | -420.02 | Pass | 6160.50 | 6277.50 | 110.70 | -117.000 | Pass |
| **8/30/2019 1:23:00 AM** | 15543.91 | 16081.68 | 482.45 | -537.77 | FAIL | 6247.00 | 6277.50 | 110.70 | -30.500 | Pass |
| **8/31/2019 8:12:00 AM** | 15439.76 | 16081.68 | 482.45 | -641.92 | FAIL | 6202.50 | 6277.50 | 110.70 | -75.000 | Pass |
| **Detector 5** | | | | | | | | | | |
| **8/30/2019 12:15:00 AM** | 16122.34 | 16223.20 | 486.70 | -100.86 | Pass | 6386.50 | 6745.73 | 1761.29 | -359.225 | Pass |
| **8/31/2019 8:13:00 AM** | 15732.58 | 16223.20 | 486.70 | -490.62 | FAIL | 6371.50 | 6745.73 | 1761.29 | -374.225 | Pass |
| **Detector 6** | | | | | | | | | | |
| **8/30/2019 12:15:00 AM** | 11992.46 | 14588.50 | 437.66 | -2596.04 | FAIL | 8040.00 | 6496.20 | 551.68 | 1543.800 | WARNING |
| **8/31/2019 8:13:00 AM** | 11518.34 | 14588.50 | 437.66 | -3070.16 | FAIL | 8448.50 | 6496.20 | 551.68 | 1952.300 | DOEF |
| **Detector 7** | | | | | | | | | | |
| **8/30/2019 12:15:00 AM** | 14822.52 | 15629.53 | 468.89 | -807.01 | FAIL | 5633.50 | 5742.78 | 47.80 | -109.275 | WARNING |
| **8/31/2019 8:13:00 AM** | 14642.13 | 15629.53 | 468.89 | -987.39 | FAIL | 5522.50 | 5742.78 | 47.80 | -220.275 | DOEF |
| **Detector 8** | | | | | | | | | | |
| **8/30/2019 12:19:00 AM** | 11762.87 | 12479.00 | 374.37 | -716.13 | FAIL | 4104.50 | 4244.75 | 69.84 | -140.250 | WARNING |
| **8/31/2019 8:18:00 AM** | 11566.43 | 12479.00 | 374.37 | -912.57 | FAIL | 4180.00 | 4244.75 | 69.84 | -64.750 | Pass |
| **Detector 9** | | | | | | | | | | |
| **8/30/2019 12:19:00 AM** | 12921.20 | 13598.65 | 407.96 | -677.45 | FAIL | 4586.50 | 4590.98 | 94.06 | -4.475 | Pass |
| **8/31/2019 8:18:00 AM** | 12749.33 | 13598.65 | 407.96 | -849.32 | FAIL | 4532.50 | 4590.98 | 94.06 | -58.475 | Pass |

# Gas Proportional Counter Daily Quality Control Checks

***Instrument: Orange***

| | Alpha CPM | Alpha Mean | Alpha +/- limit | Alpha Deviation | Alpha Flag | A>>B XT CPM | A>>B XT Mean | A>>B XT +/- limit | A>>B XT Deviation | A>>B XT Flag |
|---|---|---|---|---|---|---|---|---|---|---|
| **Detector 10** | | | | | | | | | | |
| **8/30/2019 12:19:00 AM** | 10848.96 | 11579.50 | 347.39 | -730.54 | **FAIL** | 6929.50 | 7562.65 | 208.99 | -633.150 | **DOEF** |
| **8/31/2019 8:18:00 AM** | 10561.90 | 11579.50 | 347.39 | -1017.60 | **FAIL** | 7048.50 | 7562.65 | 208.99 | -514.150 | **WARNING** |
| **Detector 11** | | | | | | | | | | |
| **8/30/2019 12:19:00 AM** | 12817.00 | 13398.55 | 401.96 | -581.55 | **FAIL** | 4473.00 | 4216.58 | 69.06 | 256.425 | **DOEF** |
| **8/31/2019 8:18:00 AM** | 12829.09 | 13398.55 | 401.96 | -569.46 | **FAIL** | 4299.00 | 4216.58 | 69.06 | 82.425 | Pass |
| **Detector 12** | | | | | | | | | | |
| **8/30/2019 12:19:00 AM** | 17089.53 | 16917.10 | 507.51 | 172.43 | Pass | 6007.00 | 5738.50 | 103.00 | 268.500 | **WARNING** |
| **8/30/2019 1:26:00 AM** | 17181.76 | 16917.10 | 507.51 | 264.66 | Pass | 6021.50 | 5738.50 | 103.00 | 283.000 | **WARNING** |
| **8/31/2019 8:19:00 AM** | 17145.75 | 16917.10 | 507.51 | 228.65 | Pass | 6121.50 | 5738.50 | 103.00 | 383.000 | **DOEF** |
| **Detector 13** | | | | | | | | | | |
| **8/30/2019 12:19:00 AM** | 16700.07 | 17051.55 | 511.55 | -351.48 | Pass | 5276.50 | 5209.90 | 107.08 | 66.600 | Pass |
| **8/31/2019 8:19:00 AM** | 16528.21 | 17051.55 | 511.55 | -523.34 | **FAIL** | 5332.00 | 5209.90 | 107.08 | 122.100 | Pass |
| **8/31/2019 9:24:00 AM** | 16584.35 | 17051.55 | 511.55 | -467.20 | Pass | 5238.50 | 5209.90 | 107.08 | 28.600 | Pass |
| **8/31/2019 9:27:00 AM** | 16627.96 | 17051.55 | 511.55 | -423.59 | Pass | 5090.50 | 5209.90 | 107.08 | -119.400 | Pass |
| **Detector 14** | | | | | | | | | | |
| **8/30/2019 12:19:00 AM** | 15020.45 | 15840.60 | 475.22 | -820.15 | **FAIL** | 4497.50 | 4992.58 | 237.19 | -495.075 | **WARNING** |
| **8/31/2019 8:19:00 AM** | 14799.55 | 15840.60 | 475.22 | -1041.05 | **FAIL** | 4561.00 | 4992.58 | 237.19 | -431.575 | Pass |
| **Detector 15** | | | | | | | | | | |
| **8/30/2019 12:19:00 AM** | 15044.46 | 15402.33 | 462.07 | -357.87 | Pass | 4891.00 | 5238.48 | 99.26 | -347.475 | **DOEF** |
| **8/31/2019 8:19:00 AM** | 14872.66 | 15402.33 | 462.07 | -529.67 | **FAIL** | 4930.00 | 5238.48 | 99.26 | -308.475 | **DOEF** |
| **8/31/2019 9:24:00 AM** | 14946.82 | 15402.33 | 462.07 | -455.51 | Pass | 4879.00 | 5238.48 | 99.26 | -359.475 | **DOEF** |
| **8/31/2019 9:27:00 AM** | 14851.62 | 15402.33 | 462.07 | -550.71 | **FAIL** | 4779.00 | 5238.48 | 99.26 | -459.475 | **DOEF** |
| **Detector 16** | | | | | | | | | | |
| **8/30/2019 12:24:00 AM** | 11930.85 | 12627.03 | 378.81 | -696.18 | **FAIL** | 4158.50 | 4414.55 | 41.62 | -256.050 | **DOEF** |
| **8/31/2019 8:24:00 AM** | 11688.30 | 12627.03 | 378.81 | -938.73 | **FAIL** | 4229.00 | 4414.55 | 41.62 | -185.550 | **DOEF** |
| **Detector 17** | | | | | | | | | | |
| **8/30/2019 12:24:00 AM** | 12607.52 | 13433.43 | 403.00 | -825.90 | **FAIL** | 4842.00 | 4784.03 | 106.71 | 57.975 | Pass |
| **8/31/2019 8:24:00 AM** | 12579.01 | 13433.43 | 403.00 | -854.42 | **FAIL** | 4832.50 | 4784.03 | 106.71 | 48.475 | Pass |
| **Detector 18** | | | | | | | | | | |
| **8/30/2019 12:24:00 AM** | 13254.12 | 14158.50 | 424.76 | -904.38 | **FAIL** | 4774.50 | 4572.70 | 56.75 | 201.800 | **DOEF** |
| **8/31/2019 8:24:00 AM** | 13299.29 | 14158.50 | 424.76 | -859.21 | **FAIL** | 4752.50 | 4572.70 | 56.75 | 179.800 | **DOEF** |
| **Detector 19** | | | | | | | | | | |
| **8/30/2019 12:24:00 AM** | 12966.61 | 13416.05 | 402.48 | -449.44 | **FAIL** | 4386.00 | 4519.53 | 68.19 | -133.525 | Pass |
| **8/31/2019 8:25:00 AM** | 12982.70 | 13416.05 | 402.48 | -433.35 | **FAIL** | 4528.00 | 4519.53 | 68.19 | 8.475 | Pass |

# Gas Proportional Counter Daily Quality Control Checks

***Instrument: Orange***

| | Alpha CPM | Alpha Mean | Alpha +/- limit | Alpha Deviation | Alpha Flag | A>>B XT CPM | A>>B XT Mean | A>>B XT +/- limit | A>>B XT Deviation | A>>B XT Flag |
|---|---|---|---|---|---|---|---|---|---|---|
| **Detector 20** | | | | | | | | | | |
| **8/30/2019 12:24:00 AM** | 16505.57 | 16878.00 | 506.34 | -372.43 | Pass | 5656.50 | 5700.48 | 42.88 | -43.975 | Pass |
| **8/31/2019 8:25:00 AM** | 16363.79 | 16878.00 | 506.34 | -514.21 | **FAIL** | 5700.50 | 5700.48 | 42.88 | 0.025 | Pass |
| **8/31/2019 9:24:00 AM** | 16408.90 | 16878.00 | 506.34 | -469.10 | Pass | 5679.50 | 5700.48 | 42.88 | -20.975 | Pass |
| **8/31/2019 9:27:00 AM** | 16394.86 | 16878.00 | 506.34 | -483.14 | Pass | 5617.50 | 5700.48 | 42.88 | -82.975 | Pass |
| **Detector 21** | | | | | | | | | | |
| **8/30/2019 12:24:00 AM** | 16705.19 | 16936.60 | 508.10 | -231.41 | Pass | 5629.50 | 5744.13 | 61.40 | -114.625 | Pass |
| **8/31/2019 8:25:00 AM** | 16566.47 | 16936.60 | 508.10 | -370.13 | Pass | 5677.50 | 5744.13 | 61.40 | -66.625 | Pass |
| **Detector 22** | | | | | | | | | | |
| **8/30/2019 12:24:00 AM** | 14760.28 | 15510.45 | 465.31 | -750.17 | **FAIL** | 5405.00 | 5610.13 | 63.22 | -205.125 | **DOEF** |
| **8/31/2019 8:25:00 AM** | 14494.68 | 15510.45 | 465.31 | -1015.77 | **FAIL** | 5481.50 | 5610.13 | 63.22 | -128.625 | **WARNING** |
| **Detector 23** | | | | | | | | | | |
| **8/30/2019 12:24:00 AM** | 14486.60 | 15430.00 | 462.90 | -943.40 | **FAIL** | 5441.50 | 5503.28 | 61.42 | -61.775 | Pass |
| **8/31/2019 8:25:00 AM** | 14446.56 | 15430.00 | 462.90 | -983.44 | **FAIL** | 5572.50 | 5503.28 | 61.42 | 69.225 | Pass |

# Gas Proportional Counter Daily Quality Control Checks

***Instrument: Orange***

| | Beta CPM | Beta Mean | Beta +/- limit | Beta Deviation | Beta Flag | B>>A XT CPM | B>>A XT Mean | B>>A XT +/- limit | B>>A XT Deviation | B>>A XT Flag |
|---|---|---|---|---|---|---|---|---|---|---|
| **Check Type = Beta** | | | | | | | | | | |
| **Detector 0** | | | | | | | | | | |
| **8/30/2019 12:38:00 AM** | 49390.72 | 49935.03 | 1498.05 | -544.30 | Pass | NA | NA | NA | NA | NA |
| **8/31/2019 9:01:00 AM** | 49223.49 | 49935.03 | 1498.05 | -711.53 | Pass | NA | NA | NA | NA | NA |
| **Detector 1** | | | | | | | | | | |
| **8/30/2019 12:38:00 AM** | 47584.20 | 48521.48 | 1455.64 | -937.27 | Pass | NA | NA | NA | NA | NA |
| **8/31/2019 9:01:00 AM** | 47218.68 | 48521.48 | 1455.64 | -1302.79 | Pass | NA | NA | NA | NA | NA |
| **Detector 2** | | | | | | | | | | |
| **8/30/2019 12:38:00 AM** | 49613.80 | 49918.95 | 1497.57 | -305.15 | Pass | NA | NA | NA | NA | NA |
| **8/31/2019 9:01:00 AM** | 49590.03 | 49918.95 | 1497.57 | -328.92 | Pass | NA | NA | NA | NA | NA |
| **Detector 3** | | | | | | | | | | |
| **8/30/2019 12:38:00 AM** | 58755.42 | 59069.20 | 1772.08 | -313.78 | Pass | NA | NA | NA | NA | NA |
| **8/31/2019 9:02:00 AM** | 58507.13 | 59069.20 | 1772.08 | -562.07 | Pass | NA | NA | NA | NA | NA |
| **Detector 4** | | | | | | | | | | |
| **8/30/2019 12:39:00 AM** | 56159.77 | 55962.22 | 1678.87 | 197.55 | Pass | NA | NA | NA | NA | NA |
| **8/31/2019 9:02:00 AM** | 55858.09 | 55962.22 | 1678.87 | -104.13 | Pass | NA | NA | NA | NA | NA |
| **Detector 5** | | | | | | | | | | |
| **8/30/2019 12:39:00 AM** | 54085.31 | 54077.08 | 1622.31 | 8.24 | Pass | NA | NA | NA | NA | NA |
| **8/31/2019 9:02:00 AM** | 53494.03 | 54077.08 | 1622.31 | -583.05 | Pass | NA | NA | NA | NA | NA |
| **Detector 6** | | | | | | | | | | |
| **8/30/2019 12:39:00 AM** | 47525.85 | 49736.35 | 1492.09 | -2210.50 | **FAIL** | NA | NA | NA | NA | NA |
| **8/31/2019 9:02:00 AM** | 46275.64 | 49736.35 | 1492.09 | -3460.71 | **FAIL** | NA | NA | NA | NA | NA |
| **Detector 7** | | | | | | | | | | |
| **8/30/2019 12:39:00 AM** | 45583.56 | 45414.23 | 1362.43 | 169.33 | Pass | NA | NA | NA | NA | NA |
| **8/31/2019 9:02:00 AM** | 45107.70 | 45414.23 | 1362.43 | -306.52 | Pass | NA | NA | NA | NA | NA |
| **Detector 8** | | | | | | | | | | |
| **8/30/2019 12:42:00 AM** | 49698.73 | 49452.15 | 1483.56 | 246.58 | Pass | NA | NA | NA | NA | NA |
| **8/31/2019 8:57:00 AM** | 49830.34 | 49452.15 | 1483.56 | 378.19 | Pass | NA | NA | NA | NA | NA |
| **Detector 9** | | | | | | | | | | |
| **8/30/2019 12:42:00 AM** | 49147.86 | 48747.90 | 1462.44 | 399.96 | Pass | NA | NA | NA | NA | NA |
| **8/31/2019 8:57:00 AM** | 48568.98 | 48747.90 | 1462.44 | -178.92 | Pass | NA | NA | NA | NA | NA |
| **Detector 10** | | | | | | | | | | |
| **8/30/2019 12:42:00 AM** | 50387.42 | 50054.68 | 1501.64 | 332.74 | Pass | NA | NA | NA | NA | NA |
| **8/31/2019 8:57:00 AM** | 50054.83 | 50054.68 | 1501.64 | 0.15 | Pass | NA | NA | NA | NA | NA |

# Gas Proportional Counter Daily Quality Control Checks

## *Instrument: Orange*

| | Beta CPM | Beta Mean | Beta +/- limit | Beta Deviation | Beta Flag | B>>A XT CPM | B>>A XT Mean | B>>A XT +/- limit | B>>A XT Deviation | B>>A XT Flag |
|---|---|---|---|---|---|---|---|---|---|---|
| **Detector 11** | | | | | | | | | | |
| **8/30/2019 12:42:00 AM** | 59726.47 | 59142.43 | 1774.27 | 584.04 | Pass | NA | NA | NA | NA | NA |
| **8/31/2019 8:57:00 AM** | 59332.95 | 59142.43 | 1774.27 | 190.53 | Pass | NA | NA | NA | NA | NA |
| **Detector 12** | | | | | | | | | | |
| **8/30/2019 12:42:00 AM** | 59079.20 | 56886.15 | 1706.58 | 2193.05 | **FAIL** | NA | NA | NA | NA | NA |
| **8/31/2019 8:57:00 AM** | 58937.58 | 56886.15 | 1706.58 | 2051.43 | **FAIL** | NA | NA | NA | NA | NA |
| **Detector 13** | | | | | | | | | | |
| **8/30/2019 1:25:00 AM** | 55351.02 | 55204.43 | 1656.13 | 146.60 | Pass | NA | NA | NA | NA | NA |
| **8/31/2019 8:58:00 AM** | 55205.50 | 55204.43 | 1656.13 | 1.07 | Pass | NA | NA | NA | NA | NA |
| **Detector 14** | | | | | | | | | | |
| **8/30/2019 12:42:00 AM** | 50834.76 | 51681.73 | 1550.45 | -846.96 | Pass | NA | NA | NA | NA | NA |
| **8/31/2019 8:58:00 AM** | 51140.48 | 51681.73 | 1550.45 | -541.25 | Pass | NA | NA | NA | NA | NA |
| **Detector 15** | | | | | | | | | | |
| **8/30/2019 12:42:00 AM** | 45604.25 | 44769.68 | 1343.09 | 834.57 | Pass | NA | NA | NA | NA | NA |
| **8/31/2019 8:58:00 AM** | 45307.86 | 44769.68 | 1343.09 | 538.18 | Pass | NA | NA | NA | NA | NA |
| **Detector 16** | | | | | | | | | | |
| **8/30/2019 12:44:00 AM** | 49857.18 | 49427.80 | 1482.83 | 429.38 | Pass | NA | NA | NA | NA | NA |
| **8/31/2019 8:53:00 AM** | 49941.33 | 49427.80 | 1482.83 | 513.53 | Pass | NA | NA | NA | NA | NA |
| **Detector 17** | | | | | | | | | | |
| **8/30/2019 12:44:00 AM** | 48302.67 | 48123.48 | 1443.70 | 179.19 | Pass | NA | NA | NA | NA | NA |
| **8/31/2019 8:53:00 AM** | 48041.40 | 48123.48 | 1443.70 | -82.07 | Pass | NA | NA | NA | NA | NA |
| **Detector 18** | | | | | | | | | | |
| **8/30/2019 12:44:00 AM** | 50120.45 | 49818.00 | 1494.54 | 302.45 | Pass | NA | NA | NA | NA | NA |
| **8/31/2019 8:53:00 AM** | 50324.24 | 49818.00 | 1494.54 | 506.24 | Pass | NA | NA | NA | NA | NA |
| **Detector 19** | | | | | | | | | | |
| **8/30/2019 12:45:00 AM** | 60168.53 | 60133.55 | 1804.01 | 34.98 | Pass | NA | NA | NA | NA | NA |
| **8/31/2019 8:53:00 AM** | 60094.78 | 60133.55 | 1804.01 | -38.77 | Pass | NA | NA | NA | NA | NA |
| **Detector 20** | | | | | | | | | | |
| **8/30/2019 12:45:00 AM** | 56201.55 | 56390.63 | 1691.72 | -189.08 | Pass | NA | NA | NA | NA | NA |
| **8/31/2019 8:53:00 AM** | 56230.82 | 56390.63 | 1691.72 | -159.81 | Pass | NA | NA | NA | NA | NA |
| **Detector 21** | | | | | | | | | | |
| **8/30/2019 12:45:00 AM** | 55340.50 | 55234.63 | 1657.04 | 105.87 | Pass | NA | NA | NA | NA | NA |
| **8/31/2019 8:53:00 AM** | 55618.01 | 55234.63 | 1657.04 | 383.39 | Pass | NA | NA | NA | NA | NA |

# Gas Proportional Counter Daily Quality Control Checks

***Instrument: Orange***

| | Beta CPM | Beta Mean | Beta +/- limit | Beta Deviation | Beta Flag | B>>A XT CPM | B>>A XT Mean | B>>A XT +/- limit | B>>A XT Deviation | B>>A XT Flag |
|---|---|---|---|---|---|---|---|---|---|---|
| **Detector 22** | | | | | | | | | | |
| **8/30/2019 12:45:00 AM** | 52040.00 | 52617.68 | 1578.53 | -577.68 | Pass | NA | NA | NA | NA | NA |
| **8/31/2019 8:53:00 AM** | 51942.76 | 52617.68 | 1578.53 | -674.91 | Pass | NA | NA | NA | NA | NA |
| **Detector 23** | | | | | | | | | | |
| **8/30/2019 12:45:00 AM** | 44687.26 | 45356.30 | 1360.69 | -669.04 | Pass | NA | NA | NA | NA | NA |
| **8/31/2019 8:53:00 AM** | 44748.13 | 45356.30 | 1360.69 | -608.17 | Pass | NA | NA | NA | NA | NA |

# Gas Proportional Counter Daily Quality Control Checks

***Instrument: Orange***

| | AlphaBKG CPM | BKG Mean | BKG +/- limit | BKG Deviation | BKG Flag | BetaBKG CPM | BetaBKG Mean | BetaBKG +/- limit | BetaBKG Deviation | BetaBKG Flag |
|---|---|---|---|---|---|---|---|---|---|---|
| **Check Type = BKG** | | | | | | | | | | |
| **Detector 0** | | | | | | | | | | |
| **8/30/2019 4:53:00 AM** | 0.24 | 0.10 | 0.04 | 0.14 | FAIL | 0.53 | 0.50 | 0.10 | 0.026 | Pass |
| **8/31/2019 12:48:00 PM** | 0.20 | 0.10 | 0.04 | 0.10 | Pass | 0.46 | 0.50 | 0.10 | -0.040 | Pass |
| **Detector 1** | | | | | | | | | | |
| **8/30/2019 4:53:00 AM** | 0.18 | 0.08 | 0.03 | 0.10 | FAIL | 0.26 | 0.38 | 0.06 | -0.122 | Pass |
| **8/31/2019 12:48:00 PM** | 0.13 | 0.08 | 0.03 | 0.05 | Pass | 0.51 | 0.38 | 0.06 | 0.128 | Pass |
| **Detector 2** | | | | | | | | | | |
| **8/30/2019 4:53:00 AM** | 0.12 | 0.09 | 0.03 | 0.02 | Pass | 0.50 | 0.41 | 0.05 | 0.087 | Pass |
| **8/31/2019 12:48:00 PM** | 0.15 | 0.09 | 0.03 | 0.05 | Pass | 0.46 | 0.41 | 0.05 | 0.052 | Pass |
| **Detector 3** | | | | | | | | | | |
| **8/30/2019 4:53:00 AM** | 0.16 | 0.10 | 0.02 | 0.05 | Pass | 0.70 | 0.60 | 0.10 | 0.094 | Pass |
| **8/31/2019 12:48:00 PM** | 0.19 | 0.10 | 0.02 | 0.08 | FAIL | 0.56 | 0.60 | 0.10 | -0.041 | Pass |
| **Detector 4** | | | | | | | | | | |
| **8/30/2019 4:53:00 AM** | 0.15 | 0.10 | 0.03 | 0.04 | Pass | 0.57 | 0.46 | 0.07 | 0.104 | Pass |
| **8/31/2019 12:48:00 PM** | 0.18 | 0.10 | 0.03 | 0.07 | Pass | 0.43 | 0.46 | 0.07 | -0.032 | Pass |
| **Detector 5** | | | | | | | | | | |
| **8/30/2019 4:53:00 AM** | 0.19 | 0.08 | 0.01 | 0.11 | FAIL | 0.66 | 0.44 | 0.11 | 0.211 | Pass |
| **8/31/2019 12:48:00 PM** | 0.19 | 0.08 | 0.01 | 0.11 | FAIL | 0.55 | 0.44 | 0.11 | 0.106 | Pass |
| **Detector 6** | | | | | | | | | | |
| **8/30/2019 4:53:00 AM** | 0.19 | 0.10 | 0.04 | 0.09 | Pass | 0.56 | 0.46 | 0.08 | 0.092 | Pass |
| **8/31/2019 12:48:00 PM** | 0.08 | 0.10 | 0.04 | -0.02 | Pass | 0.40 | 0.46 | 0.08 | -0.068 | Pass |
| **Detector 7** | | | | | | | | | | |
| **8/30/2019 4:53:00 AM** | 0.20 | 0.12 | 0.03 | 0.08 | Pass | 0.71 | 0.52 | 0.10 | 0.184 | Pass |
| **8/31/2019 12:49:00 PM** | 0.12 | 0.12 | 0.03 | 0.00 | Pass | 0.62 | 0.52 | 0.10 | 0.099 | Pass |
| **Detector 8** | | | | | | | | | | |
| **8/30/2019 4:53:00 AM** | 0.09 | 0.07 | 0.02 | 0.02 | Pass | 0.40 | 0.42 | 0.07 | -0.025 | Pass |
| **8/31/2019 12:49:00 PM** | 0.15 | 0.07 | 0.02 | 0.08 | FAIL | 0.44 | 0.42 | 0.07 | 0.015 | Pass |
| **Detector 9** | | | | | | | | | | |
| **8/30/2019 4:54:00 AM** | 0.24 | 0.11 | 0.03 | 0.12 | FAIL | 0.57 | 0.49 | 0.08 | 0.078 | Pass |
| **8/31/2019 12:49:00 PM** | 0.14 | 0.11 | 0.03 | 0.03 | Pass | 0.49 | 0.49 | 0.08 | -0.002 | Pass |
| **Detector 10** | | | | | | | | | | |
| **8/30/2019 4:54:00 AM** | 0.16 | 0.13 | 0.03 | 0.03 | Pass | 0.57 | 0.51 | 0.10 | 0.065 | Pass |
| **8/31/2019 12:49:00 PM** | 0.12 | 0.13 | 0.03 | -0.01 | Pass | 0.58 | 0.51 | 0.10 | 0.070 | Pass |

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# Gas Proportional Counter Daily Quality Control Checks

***Instrument: Orange***

| | AlphaBKG CPM | BKG Mean | BKG +/- limit | BKG Deviation | BKG Flag | BetaBKG CPM | BetaBKG Mean | BetaBKG +/- limit | BetaBKG Deviation | BetaBKG Flag |
|---|---|---|---|---|---|---|---|---|---|---|
| **Detector 11** | | | | | | | | | | |
| **8/30/2019 4:54:00 AM** | 0.18 | 0.12 | 0.03 | 0.06 | Pass | 0.66 | 0.72 | 0.10 | -0.059 | Pass |
| **8/31/2019 12:49:00 PM** | 0.20 | 0.12 | 0.03 | 0.08 | Pass | 0.65 | 0.72 | 0.10 | -0.069 | Pass |
| **Detector 12** | | | | | | | | | | |
| **8/30/2019 4:54:00 AM** | 0.19 | 0.10 | 0.03 | 0.09 | **FAIL** | 0.48 | 0.88 | 0.79 | -0.400 | Pass |
| **8/31/2019 12:49:00 PM** | 0.10 | 0.10 | 0.03 | 0.00 | Pass | 0.53 | 0.88 | 0.79 | -0.345 | Pass |
| **Detector 13** | | | | | | | | | | |
| **8/30/2019 4:54:00 AM** | 0.20 | 0.13 | 0.04 | 0.07 | Pass | 0.65 | 0.62 | 0.06 | 0.024 | Pass |
| **8/31/2019 12:49:00 PM** | 0.22 | 0.13 | 0.04 | 0.09 | Pass | 0.67 | 0.62 | 0.06 | 0.049 | Pass |
| **Detector 14** | | | | | | | | | | |
| **8/30/2019 4:54:00 AM** | 0.19 | 0.09 | 0.03 | 0.10 | Pass | 0.59 | 0.52 | 0.09 | 0.072 | Pass |
| **8/31/2019 12:49:00 PM** | 0.13 | 0.09 | 0.03 | 0.04 | Pass | 0.42 | 0.52 | 0.09 | -0.098 | Pass |
| **Detector 15** | | | | | | | | | | |
| **8/30/2019 4:54:00 AM** | 0.15 | 0.14 | 0.02 | 0.01 | Pass | 0.51 | 0.54 | 0.07 | -0.039 | Pass |
| **8/31/2019 12:49:00 PM** | 0.17 | 0.14 | 0.02 | 0.03 | Pass | 0.48 | 0.54 | 0.07 | -0.069 | Pass |
| **Detector 16** | | | | | | | | | | |
| **8/30/2019 4:54:00 AM** | 0.10 | 0.11 | 0.03 | -0.01 | Pass | 0.46 | 0.51 | 0.10 | -0.054 | Pass |
| **8/31/2019 12:49:00 PM** | 0.09 | 0.11 | 0.03 | -0.02 | Pass | 0.48 | 0.51 | 0.10 | -0.040 | Pass |
| **Detector 17** | | | | | | | | | | |
| **8/30/2019 4:54:00 AM** | 0.16 | 0.10 | 0.04 | 0.06 | Pass | 0.37 | 0.41 | 0.07 | -0.045 | Pass |
| **8/31/2019 12:49:00 PM** | 0.09 | 0.10 | 0.04 | -0.02 | Pass | 0.35 | 0.41 | 0.07 | -0.065 | Pass |
| **Detector 18** | | | | | | | | | | |
| **8/30/2019 4:54:00 AM** | 0.13 | 0.08 | 0.03 | 0.04 | Pass | 0.44 | 0.36 | 0.06 | 0.075 | Pass |
| **8/31/2019 12:49:00 PM** | 0.12 | 0.08 | 0.03 | 0.04 | Pass | 0.38 | 0.36 | 0.06 | 0.020 | Pass |
| **Detector 19** | | | | | | | | | | |
| **8/30/2019 4:53:00 AM** | 0.19 | 0.11 | 0.03 | 0.08 | Pass | 0.42 | 2.60 | 9.52 | -2.176 | Pass |
| **8/31/2019 12:49:00 PM** | 0.17 | 0.11 | 0.03 | 0.06 | Pass | 0.51 | 2.60 | 9.52 | -2.091 | Pass |
| **Detector 20** | | | | | | | | | | |
| **8/30/2019 4:53:00 AM** | 0.14 | 0.10 | 0.03 | 0.04 | Pass | 0.47 | 0.41 | 0.08 | 0.056 | Pass |
| **8/31/2019 12:50:00 PM** | 0.12 | 0.10 | 0.03 | 0.02 | Pass | 0.39 | 0.41 | 0.08 | -0.024 | Pass |
| **Detector 21** | | | | | | | | | | |
| **8/30/2019 6:51:00 AM** | 0.15 | 0.11 | 0.04 | 0.04 | Pass | 0.46 | 0.41 | 0.07 | 0.041 | Pass |
| **8/31/2019 12:50:00 PM** | 0.16 | 0.11 | 0.04 | 0.05 | Pass | 0.43 | 0.41 | 0.07 | 0.011 | Pass |

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# Gas Proportional Counter Daily Quality Control Checks

***Instrument: Orange***

| | AlphaBKG CPM | BKG Mean | BKG +/- limit | BKG Deviation | BKG Flag | BetaBKG CPM | BetaBKG Mean | BetaBKG +/- limit | BetaBKG Deviation | BetaBKG Flag |
|---|---|---|---|---|---|---|---|---|---|---|
| **Detector 22** | | | | | | | | | | |
| **8/30/2019 4:53:00 AM** | 0.13 | 0.10 | 0.03 | 0.03 | Pass | 0.46 | 0.41 | 0.06 | 0.049 | Pass |
| **8/31/2019 12:50:00 PM** | 0.16 | 0.10 | 0.03 | 0.05 | Pass | 0.46 | 0.41 | 0.06 | 0.054 | Pass |
| **Detector 23** | | | | | | | | | | |
| **8/30/2019 4:53:00 AM** | 0.17 | 0.11 | 0.03 | 0.06 | Pass | 0.49 | 0.44 | 0.11 | 0.051 | Pass |
| **8/31/2019 12:50:00 PM** | 0.11 | 0.11 | 0.03 | 0.00 | Pass | 0.39 | 0.44 | 0.11 | -0.054 | Pass |

**The Alpha and Beta +/- limit are based upon initial 20-point population.**

**The Alpha and Beta +/- limit for Efficiency is stated at 3%. Flags are "FAIL" > 3%.**

**The Alpha and Beta +/- limit for Background is stated at 1 StDev. Flags are "FAIL" > 3 StDev.**

**The Alpha +/- limit for Crosstalk is stated at 1 StDev. Flags are "Warning > 2 StDev and "DOEF" > 3 StDev. Beta is negligible, for trend only ("NA").**

**Times shown reflect the end of the count duration.**

# Gas Proportional Counter Daily Quality Control Checks

***Instrument: Protean***

| | Alpha CPM | Alpha Mean | Alpha +/- limit | Alpha Deviation | Alpha Flag | A>>B XT CPM | A>>B XT Mean | A>>B XT +/- limit | A>>B XT Deviation | A>>B XT Flag |
|---|---|---|---|---|---|---|---|---|---|---|
| **Check Type = Alpha** | | | | | | | | | | |
| **Detector 0** | | | | | | | | | | |
| **8/30/2019 1:38:00 AM** | 11803.20 | 12429.48 | 372.88 | -626.28 | FAIL | 4129.00 | 4217.68 | 31.15 | -88.675 | WARNING |
| **8/31/2019 7:21:00 AM** | 11841.83 | 12429.48 | 372.88 | -587.65 | FAIL | 4085.00 | 4217.68 | 31.15 | -132.675 | DOEF |
| **Detector 1** | | | | | | | | | | |
| **8/30/2019 1:38:00 AM** | 12850.37 | 13515.73 | 405.47 | -665.36 | FAIL | 4546.50 | 4578.40 | 63.08 | -31.900 | Pass |
| **8/31/2019 7:21:00 AM** | 12840.40 | 13515.73 | 405.47 | -675.33 | FAIL | 4670.00 | 4578.40 | 63.08 | 91.600 | Pass |
| **Detector 2** | | | | | | | | | | |
| **8/30/2019 1:38:00 AM** | 13187.21 | 14068.05 | 422.04 | -880.84 | FAIL | 4771.00 | 4802.25 | 75.57 | -31.250 | Pass |
| **8/31/2019 7:21:00 AM** | 13137.15 | 14068.05 | 422.04 | -930.90 | FAIL | 4678.00 | 4802.25 | 75.57 | -124.250 | Pass |
| **Detector 3** | | | | | | | | | | |
| **8/30/2019 1:38:00 AM** | 12773.17 | 13271.53 | 398.15 | -498.35 | FAIL | 4534.50 | 4349.03 | 65.64 | 185.475 | WARNING |
| **8/31/2019 7:21:00 AM** | 12787.26 | 13271.53 | 398.15 | -484.26 | FAIL | 4506.00 | 4349.03 | 65.64 | 156.975 | WARNING |
| **Detector 4** | | | | | | | | | | |
| **8/30/2019 1:38:00 AM** | 16216.84 | 16556.85 | 496.71 | -340.01 | Pass | 6186.50 | 6135.80 | 62.86 | 50.700 | Pass |
| **8/30/2019 2:03:00 AM** | 16134.14 | 16556.85 | 496.71 | -422.71 | Pass | 6291.00 | 6135.80 | 62.86 | 155.200 | WARNING |
| **8/31/2019 7:22:00 AM** | 15849.49 | 16556.85 | 496.71 | -707.36 | FAIL | 6236.50 | 6135.80 | 62.86 | 100.700 | Pass |
| **8/31/2019 7:46:00 AM** | 15853.50 | 16556.85 | 496.71 | -703.35 | FAIL | 6202.50 | 6135.80 | 62.86 | 66.700 | Pass |
| **8/31/2019 7:48:00 AM** | 15911.14 | 16556.85 | 496.71 | -645.71 | FAIL | 6341.00 | 6135.80 | 62.86 | 205.200 | DOEF |
| **Detector 5** | | | | | | | | | | |
| **8/30/2019 1:38:00 AM** | 15524.60 | 15673.68 | 470.21 | -149.08 | Pass | 6196.50 | 6104.98 | 888.40 | 91.525 | Pass |
| **8/31/2019 7:22:00 AM** | 15215.39 | 15673.68 | 470.21 | -458.29 | Pass | 6297.50 | 6104.98 | 888.40 | 192.525 | Pass |
| **Detector 6** | | | | | | | | | | |
| **8/30/2019 1:38:00 AM** | 14247.88 | 14736.55 | 442.10 | -488.67 | FAIL | 5642.50 | 5498.28 | 745.70 | 144.225 | Pass |
| **8/31/2019 7:22:00 AM** | 14075.51 | 14736.55 | 442.10 | -661.04 | FAIL | 5612.00 | 5498.28 | 745.70 | 113.725 | Pass |
| **Detector 7** | | | | | | | | | | |
| **8/30/2019 1:39:00 AM** | 14770.20 | 15385.65 | 461.57 | -615.45 | FAIL | 5625.00 | 5760.05 | 798.95 | -135.050 | Pass |
| **8/31/2019 7:22:00 AM** | 14829.41 | 15385.65 | 461.57 | -556.24 | FAIL | 5800.50 | 5760.05 | 798.95 | 40.450 | Pass |
| **Detector 8** | | | | | | | | | | |
| **8/30/2019 1:43:00 AM** | 11210.73 | 11620.55 | 348.62 | -409.82 | FAIL | 4079.50 | 3784.00 | 489.68 | 295.500 | Pass |
| **8/31/2019 7:28:00 AM** | 11149.63 | 11620.55 | 348.62 | -470.92 | FAIL | 3915.00 | 3784.00 | 489.68 | 131.000 | Pass |
| **Detector 9** | | | | | | | | | | |
| **8/30/2019 1:43:00 AM** | 12982.69 | 13544.15 | 406.32 | -561.46 | FAIL | 4549.50 | 4627.50 | 61.77 | -78.000 | Pass |
| **8/31/2019 7:28:00 AM** | 12823.85 | 13544.15 | 406.32 | -720.30 | FAIL | 4568.00 | 4627.50 | 61.77 | -59.500 | Pass |

# Gas Proportional Counter Daily Quality Control Checks

## *Instrument: Protean*

| | Alpha CPM | Alpha Mean | Alpha +/- limit | Alpha Deviation | Alpha Flag | A>>B XT CPM | A>>B XT Mean | A>>B XT +/- limit | A>>B XT Deviation | A>>B XT Flag |
|---|---|---|---|---|---|---|---|---|---|---|
| **Detector 10** | | | | | | | | | | |
| **8/30/2019 1:43:00 AM** | 13034.32 | 13960.33 | 418.81 | -926.00 | **FAIL** | 4690.50 | 4854.78 | 66.79 | -164.275 | **WARNING** |
| **8/31/2019 7:29:00 AM** | 12983.25 | 13960.33 | 418.81 | -977.07 | **FAIL** | 4761.50 | 4854.78 | 66.79 | -93.275 | Pass |
| **Detector 11** | | | | | | | | | | |
| **8/30/2019 1:43:00 AM** | 12754.12 | 13382.03 | 401.46 | -627.91 | **FAIL** | 4664.50 | 4646.93 | 43.88 | 17.575 | Pass |
| **8/31/2019 7:29:00 AM** | 12785.75 | 13382.03 | 401.46 | -596.27 | **FAIL** | 4623.00 | 4646.93 | 43.88 | -23.925 | Pass |
| **Detector 12** | | | | | | | | | | |
| **8/30/2019 1:43:00 AM** | 16500.55 | 16555.28 | 496.66 | -54.72 | Pass | 5497.50 | 5593.33 | 888.56 | -95.825 | Pass |
| **8/31/2019 7:29:00 AM** | 16273.05 | 16555.28 | 496.66 | -282.22 | Pass | 5633.00 | 5593.33 | 888.56 | 39.675 | Pass |
| **Detector 13** | | | | | | | | | | |
| **8/30/2019 1:43:00 AM** | 16062.95 | 16489.13 | 494.67 | -426.18 | Pass | 5784.00 | 5831.53 | 819.12 | -47.525 | Pass |
| **8/31/2019 7:29:00 AM** | 16280.57 | 16489.13 | 494.67 | -208.56 | Pass | 5834.50 | 5831.53 | 819.12 | 2.975 | Pass |
| **Detector 14** | | | | | | | | | | |
| **8/30/2019 1:43:00 AM** | 14401.77 | 15209.15 | 456.27 | -807.38 | **FAIL** | 5720.50 | 5770.45 | 63.71 | -49.950 | Pass |
| **8/31/2019 7:29:00 AM** | 14304.08 | 15209.15 | 456.27 | -905.07 | **FAIL** | 5579.00 | 5770.45 | 63.71 | -191.450 | **DOEF** |
| **Detector 15** | | | | | | | | | | |
| **8/30/2019 1:43:00 AM** | 14459.41 | 14890.68 | 446.72 | -431.26 | Pass | 5285.00 | 5361.50 | 749.04 | -76.500 | Pass |
| **8/30/2019 2:03:00 AM** | 14641.37 | 14890.68 | 446.72 | -249.31 | Pass | 5245.00 | 5361.50 | 749.04 | -116.500 | Pass |
| **8/31/2019 7:29:00 AM** | 14238.42 | 14890.68 | 446.72 | -652.26 | **FAIL** | 5273.50 | 5361.50 | 749.04 | -88.000 | Pass |
| **8/31/2019 7:46:00 AM** | 14358.22 | 14890.68 | 446.72 | -532.46 | **FAIL** | 5255.00 | 5361.50 | 749.04 | -106.500 | Pass |
| **8/31/2019 7:48:00 AM** | 14481.53 | 14890.68 | 446.72 | -409.14 | Pass | 5366.00 | 5361.50 | 749.04 | 4.500 | Pass |

# Gas Proportional Counter Daily Quality Control Checks

***Instrument: Protean***

| | Beta CPM | Beta Mean | Beta +/- limit | Beta Deviation | Beta Flag | B>>A XT CPM | B>>A XT Mean | B>>A XT +/- limit | B>>A XT Deviation | B>>A XT Flag |
|---|---|---|---|---|---|---|---|---|---|---|
| **Check Type = Beta** | | | | | | | | | | |
| **Detector 0** | | | | | | | | | | |
| **8/30/2019 1:44:00 AM** | 50172.63 | 48583.18 | 1457.50 | 1589.45 | FAIL | NA | NA | NA | NA | NA |
| **8/30/2019 6:15:00 AM** | 49652.42 | 48583.18 | 1457.50 | 1069.25 | Pass | NA | NA | NA | NA | NA |
| **8/30/2019 6:28:00 AM** | 49663.90 | 48583.18 | 1457.50 | 1080.73 | Pass | NA | NA | NA | NA | NA |
| **8/31/2019 7:27:00 AM** | 49333.22 | 48583.18 | 1457.50 | 750.05 | Pass | NA | NA | NA | NA | NA |
| **Detector 1** | | | | | | | | | | |
| **8/30/2019 1:44:00 AM** | 48639.65 | 47659.85 | 1429.80 | 979.80 | Pass | NA | NA | NA | NA | NA |
| **8/31/2019 7:27:00 AM** | 48272.88 | 47659.85 | 1429.80 | 613.03 | Pass | NA | NA | NA | NA | NA |
| **Detector 2** | | | | | | | | | | |
| **8/30/2019 1:44:00 AM** | 50373.50 | 49887.83 | 1496.63 | 485.68 | Pass | NA | NA | NA | NA | NA |
| **8/31/2019 7:27:00 AM** | 49914.00 | 49887.83 | 1496.63 | 26.17 | Pass | NA | NA | NA | NA | NA |
| **Detector 3** | | | | | | | | | | |
| **8/30/2019 1:44:00 AM** | 59399.36 | 59018.83 | 1770.56 | 380.54 | Pass | NA | NA | NA | NA | NA |
| **8/31/2019 7:28:00 AM** | 59034.90 | 59018.83 | 1770.56 | 16.08 | Pass | NA | NA | NA | NA | NA |
| **Detector 4** | | | | | | | | | | |
| **8/30/2019 1:44:00 AM** | 56396.24 | 56572.13 | 1697.16 | -175.88 | Pass | NA | NA | NA | NA | NA |
| **8/31/2019 7:28:00 AM** | 56272.13 | 56572.13 | 1697.16 | -300.00 | Pass | NA | NA | NA | NA | NA |
| **Detector 5** | | | | | | | | | | |
| **8/30/2019 1:44:00 AM** | 53737.52 | 53786.35 | 1613.59 | -48.83 | Pass | NA | NA | NA | NA | NA |
| **8/31/2019 7:28:00 AM** | 53377.37 | 53786.35 | 1613.59 | -408.98 | Pass | NA | NA | NA | NA | NA |
| **Detector 6** | | | | | | | | | | |
| **8/30/2019 1:43:00 AM** | 50966.33 | 51221.45 | 1536.64 | -255.12 | Pass | NA | NA | NA | NA | NA |
| **8/31/2019 7:28:00 AM** | 51153.45 | 51221.45 | 1536.64 | -68.00 | Pass | NA | NA | NA | NA | NA |
| **Detector 7** | | | | | | | | | | |
| **8/30/2019 1:43:00 AM** | 44873.96 | 44749.03 | 1342.47 | 124.94 | Pass | NA | NA | NA | NA | NA |
| **8/31/2019 7:28:00 AM** | 44824.75 | 44749.03 | 1342.47 | 75.72 | Pass | NA | NA | NA | NA | NA |
| **Detector 8** | | | | | | | | | | |
| **8/30/2019 1:39:00 AM** | 46529.86 | 46135.45 | 1384.06 | 394.41 | Pass | NA | NA | NA | NA | NA |
| **8/31/2019 7:22:00 AM** | 45996.53 | 46135.45 | 1384.06 | -138.92 | Pass | NA | NA | NA | NA | NA |
| **Detector 9** | | | | | | | | | | |
| **8/30/2019 1:39:00 AM** | 47824.88 | 47841.35 | 1435.24 | -16.47 | Pass | NA | NA | NA | NA | NA |
| **8/31/2019 7:23:00 AM** | 48101.46 | 47841.35 | 1435.24 | 260.11 | Pass | NA | NA | NA | NA | NA |

# Gas Proportional Counter Daily Quality Control Checks

## *Instrument: Protean*

| | Beta CPM | Beta Mean | Beta +/- limit | Beta Deviation | Beta Flag | B>>A XT CPM | B>>A XT Mean | B>>A XT +/- limit | B>>A XT Deviation | B>>A XT Flag |
|---|---|---|---|---|---|---|---|---|---|---|
| **Detector 10** | | | | | | | | | | |
| **8/30/2019 1:39:00 AM** | 49517.31 | 49376.35 | 1481.29 | 140.96 | Pass | NA | NA | NA | NA | NA |
| **8/31/2019 7:23:00 AM** | 49448.57 | 49376.35 | 1481.29 | 72.22 | Pass | NA | NA | NA | NA | NA |
| **Detector 11** | | | | | | | | | | |
| **8/30/2019 1:39:00 AM** | 59113.66 | 59256.13 | 1777.68 | -142.46 | Pass | NA | NA | NA | NA | NA |
| **8/31/2019 7:23:00 AM** | 59122.78 | 59256.13 | 1777.68 | -133.34 | Pass | NA | NA | NA | NA | NA |
| **Detector 12** | | | | | | | | | | |
| **8/30/2019 1:39:00 AM** | 57271.72 | 57255.23 | 1717.66 | 16.50 | Pass | NA | NA | NA | NA | NA |
| **8/31/2019 7:23:00 AM** | 57073.56 | 57255.23 | 1717.66 | -181.66 | Pass | NA | NA | NA | NA | NA |
| **Detector 13** | | | | | | | | | | |
| **8/30/2019 1:39:00 AM** | 54814.16 | 54928.25 | 1647.85 | -114.09 | Pass | NA | NA | NA | NA | NA |
| **8/31/2019 7:23:00 AM** | 54689.49 | 54928.25 | 1647.85 | -238.76 | Pass | NA | NA | NA | NA | NA |
| **Detector 14** | | | | | | | | | | |
| **8/30/2019 1:39:00 AM** | 51636.24 | 51515.98 | 1545.48 | 120.26 | Pass | NA | NA | NA | NA | NA |
| **8/31/2019 7:24:00 AM** | 51223.26 | 51515.98 | 1545.48 | -292.72 | Pass | NA | NA | NA | NA | NA |
| **Detector 15** | | | | | | | | | | |
| **8/30/2019 1:39:00 AM** | 44584.72 | 45036.85 | 1351.11 | -452.13 | Pass | NA | NA | NA | NA | NA |
| **8/31/2019 7:24:00 AM** | 44499.48 | 45036.85 | 1351.11 | -537.37 | Pass | NA | NA | NA | NA | NA |

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# Gas Proportional Counter Daily Quality Control Checks

***Instrument: Protean***

| | AlphaBKG CPM | BKG Mean | BKG +/- limit | BKG Deviation | BKG Flag | BetaBKG CPM | BetaBKG Mean | BetaBKG +/- limit | BetaBKG Deviation | BetaBKG Flag |
|---|---|---|---|---|---|---|---|---|---|---|
| **Check Type = BKG** | | | | | | | | | | |
| **Detector 0** | | | | | | | | | | |
| **8/30/2019 5:28:00 AM** | 0.17 | 0.10 | 0.04 | 0.07 | Pass | 0.75 | 0.72 | 0.09 | 0.034 | Pass |
| **8/31/2019 11:08:00 AM** | 0.19 | 0.10 | 0.04 | 0.09 | Pass | 0.67 | 0.72 | 0.09 | -0.051 | Pass |
| **Detector 1** | | | | | | | | | | |
| **8/30/2019 5:28:00 AM** | 0.14 | 0.11 | 0.03 | 0.03 | Pass | 0.53 | 0.50 | 0.08 | 0.033 | Pass |
| **8/31/2019 11:08:00 AM** | 0.17 | 0.11 | 0.03 | 0.05 | Pass | 0.59 | 0.50 | 0.08 | 0.087 | Pass |
| **Detector 2** | | | | | | | | | | |
| **8/30/2019 5:28:00 AM** | 0.29 | 0.09 | 0.03 | 0.20 | **FAIL** | 0.59 | 0.54 | 0.09 | 0.049 | Pass |
| **8/31/2019 11:08:00 AM** | 0.24 | 0.09 | 0.03 | 0.15 | **FAIL** | 0.66 | 0.54 | 0.09 | 0.119 | Pass |
| **Detector 3** | | | | | | | | | | |
| **8/30/2019 5:28:00 AM** | 0.18 | 0.08 | 0.02 | 0.09 | **FAIL** | 0.62 | 0.68 | 0.09 | -0.067 | Pass |
| **8/31/2019 11:08:00 AM** | 0.14 | 0.08 | 0.02 | 0.05 | Pass | 0.64 | 0.68 | 0.09 | -0.042 | Pass |
| **Detector 4** | | | | | | | | | | |
| **8/30/2019 5:28:00 AM** | 0.21 | 0.12 | 0.03 | 0.09 | Pass | 0.48 | 0.50 | 0.06 | -0.022 | Pass |
| **8/31/2019 11:10:00 AM** | 0.19 | 0.12 | 0.03 | 0.07 | Pass | 0.37 | 0.50 | 0.06 | -0.132 | Pass |
| **Detector 5** | | | | | | | | | | |
| **8/30/2019 5:28:00 AM** | 0.23 | 0.09 | 0.03 | 0.14 | **FAIL** | 0.54 | 0.47 | 0.07 | 0.075 | Pass |
| **8/31/2019 11:09:00 AM** | 0.21 | 0.09 | 0.03 | 0.11 | **FAIL** | 0.53 | 0.47 | 0.07 | 0.060 | Pass |
| **Detector 6** | | | | | | | | | | |
| **8/30/2019 5:28:00 AM** | 0.35 | 0.16 | 0.06 | 0.19 | **FAIL** | 0.45 | 0.52 | 0.06 | -0.067 | Pass |
| **8/31/2019 11:09:00 AM** | 0.25 | 0.16 | 0.06 | 0.09 | Pass | 0.56 | 0.52 | 0.06 | 0.043 | Pass |
| **Detector 7** | | | | | | | | | | |
| **8/30/2019 5:28:00 AM** | 0.16 | 0.07 | 0.03 | 0.09 | **FAIL** | 0.52 | 0.52 | 0.07 | -0.008 | Pass |
| **8/31/2019 11:09:00 AM** | 0.17 | 0.07 | 0.03 | 0.09 | **FAIL** | 0.63 | 0.52 | 0.07 | 0.107 | Pass |
| **Detector 8** | | | | | | | | | | |
| **8/30/2019 5:28:00 AM** | 0.18 | 0.10 | 0.03 | 0.08 | Pass | 0.42 | 0.45 | 0.08 | -0.030 | Pass |
| **8/31/2019 11:08:00 AM** | 0.23 | 0.10 | 0.03 | 0.13 | **FAIL** | 0.56 | 0.45 | 0.08 | 0.115 | Pass |
| **Detector 9** | | | | | | | | | | |
| **8/30/2019 5:28:00 AM** | 0.16 | 0.12 | 0.03 | 0.05 | Pass | 0.42 | 0.44 | 0.05 | -0.025 | Pass |
| **8/31/2019 11:08:00 AM** | 0.18 | 0.12 | 0.03 | 0.06 | Pass | 0.51 | 0.44 | 0.05 | 0.065 | Pass |
| **Detector 10** | | | | | | | | | | |
| **8/30/2019 5:28:00 AM** | 0.16 | 0.11 | 0.04 | 0.05 | Pass | 0.41 | 0.42 | 0.09 | -0.010 | Pass |
| **8/31/2019 11:09:00 AM** | 0.21 | 0.11 | 0.04 | 0.10 | Pass | 0.51 | 0.42 | 0.09 | 0.090 | Pass |

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# Gas Proportional Counter Daily Quality Control Checks

***Instrument: Protean***

| | AlphaBKG CPM | BKG Mean | BKG +/- limit | BKG Deviation | BKG Flag | BetaBKG CPM | BetaBKG Mean | BetaBKG +/- limit | BetaBKG Deviation | BetaBKG Flag |
|---|---|---|---|---|---|---|---|---|---|---|
| **Detector 11** | | | | | | | | | | |
| **8/30/2019 5:28:00 AM** | 0.21 | 0.10 | 0.03 | 0.11 | FAIL | 0.42 | 0.47 | 0.06 | -0.054 | Pass |
| **8/31/2019 11:09:00 AM** | 0.21 | 0.10 | 0.03 | 0.11 | FAIL | 0.44 | 0.47 | 0.06 | -0.034 | Pass |
| **Detector 12** | | | | | | | | | | |
| **8/30/2019 5:28:00 AM** | 0.08 | 0.11 | 0.04 | -0.04 | Pass | 0.68 | 0.49 | 0.11 | 0.183 | Pass |
| **8/31/2019 11:09:00 AM** | 0.12 | 0.11 | 0.04 | 0.01 | Pass | 0.49 | 0.49 | 0.11 | -0.007 | Pass |
| **Detector 13** | | | | | | | | | | |
| **8/30/2019 5:28:00 AM** | 0.23 | 0.14 | 0.02 | 0.08 | FAIL | 0.49 | 0.48 | 0.07 | 0.010 | Pass |
| **8/31/2019 11:09:00 AM** | 0.24 | 0.14 | 0.02 | 0.10 | FAIL | 0.48 | 0.48 | 0.07 | -0.005 | Pass |
| **Detector 14** | | | | | | | | | | |
| **8/30/2019 5:28:00 AM** | 0.15 | 0.11 | 0.04 | 0.04 | Pass | 0.34 | 0.43 | 0.07 | -0.099 | Pass |
| **8/31/2019 11:09:00 AM** | 0.17 | 0.11 | 0.04 | 0.06 | Pass | 0.47 | 0.43 | 0.07 | 0.036 | Pass |
| **Detector 15** | | | | | | | | | | |
| **8/30/2019 5:28:00 AM** | 0.30 | 0.15 | 0.02 | 0.15 | FAIL | 0.61 | 0.55 | 0.05 | 0.060 | Pass |
| **8/30/2019 9:33:00 AM** | 0.25 | 0.15 | 0.02 | 0.10 | FAIL | 0.65 | 0.55 | 0.05 | 0.095 | Pass |
| **8/31/2019 11:10:00 AM** | 0.23 | 0.15 | 0.02 | 0.08 | FAIL | 0.57 | 0.55 | 0.05 | 0.020 | Pass |

**The Alpha and Beta +/- limit are based upon initial 20-point population.**

**The Alpha and Beta +/- limit for Efficiency is stated at 3%. Flags are "FAIL" > 3%.**

**The Alpha and Beta +/- limit for Background is stated at 1 StDev. Flags are "FAIL" > 3 StDev.**

**The Alpha +/- limit for Crosstalk is stated at 1 StDev. Flags are "Warning > 2 StDev and "DOEF" > 3 StDev. Beta is negligible, for trend only ("NA").**

**Times shown reflect the end of the count duration.**

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# Gas Proportional Counter Daily Quality Control Checks

***Instrument: Purple***

| | Alpha CPM | Alpha Mean | Alpha +/- limit | Alpha Deviation | Alpha Flag | A>>B XT CPM | A>>B XT Mean | A>>B XT +/- limit | A>>B XT Deviation | A>>B XT Flag |
|---|---|---|---|---|---|---|---|---|---|---|
| **Check Type = Alpha** | | | | | | | | | | |
| **Detector 0** | | | | | | | | | | |
| **8/30/2019 12:29:00 AM** | 12035.24 | 12818.03 | 384.54 | -782.79 | FAIL | 3938.00 | 4137.60 | 27.33 | -199.600 | DOEF |
| **8/31/2019 8:35:00 AM** | 11988.68 | 12818.03 | 384.54 | -829.35 | FAIL | 3998.50 | 4137.60 | 27.33 | -139.100 | DOEF |
| **Detector 1** | | | | | | | | | | |
| **8/30/2019 12:29:00 AM** | 13142.98 | 13847.28 | 415.42 | -704.30 | FAIL | 4546.50 | 4251.53 | 66.02 | 294.975 | DOEF |
| **8/31/2019 8:35:00 AM** | 13211.70 | 13847.28 | 415.42 | -635.57 | FAIL | 4334.50 | 4251.53 | 66.02 | 82.975 | Pass |
| **Detector 2** | | | | | | | | | | |
| **8/30/2019 12:29:00 AM** | 13278.91 | 14354.23 | 430.63 | -1075.31 | FAIL | 4631.00 | 4891.15 | 60.37 | -260.150 | DOEF |
| **8/31/2019 8:35:00 AM** | 13266.44 | 14354.23 | 430.63 | -1087.78 | FAIL | 4570.50 | 4891.15 | 60.37 | -320.650 | DOEF |
| **Detector 3** | | | | | | | | | | |
| **8/30/2019 12:29:00 AM** | 12994.87 | 13419.20 | 402.58 | -424.33 | FAIL | 4794.00 | 4922.70 | 84.85 | -128.700 | Pass |
| **8/31/2019 8:35:00 AM** | 12999.44 | 13419.20 | 402.58 | -419.76 | FAIL | 4808.50 | 4922.70 | 84.85 | -114.200 | Pass |
| **Detector 4** | | | | | | | | | | |
| **8/30/2019 12:30:00 AM** | 16612.05 | 16907.73 | 507.23 | -295.68 | Pass | 6083.00 | 5249.05 | 86.84 | 833.950 | DOEF |
| **8/30/2019 1:31:00 AM** | 16487.24 | 16907.73 | 507.23 | -420.48 | Pass | 6114.50 | 5249.05 | 86.84 | 865.450 | DOEF |
| **8/31/2019 8:35:00 AM** | 16529.92 | 16907.73 | 507.23 | -377.81 | Pass | 5985.00 | 5249.05 | 86.84 | 735.950 | DOEF |
| **Detector 5** | | | | | | | | | | |
| **8/30/2019 12:30:00 AM** | 16664.18 | 16603.10 | 498.09 | 61.08 | Pass | 6057.50 | 5630.28 | 57.62 | 427.225 | DOEF |
| **8/31/2019 8:36:00 AM** | 16418.14 | 16603.10 | 498.09 | -184.96 | Pass | 6029.50 | 5630.28 | 57.62 | 399.225 | DOEF |
| **Detector 6** | | | | | | | | | | |
| **8/30/2019 12:30:00 AM** | 14592.56 | 15352.98 | 460.59 | -760.42 | FAIL | 5442.50 | 5483.13 | 60.86 | -40.625 | Pass |
| **8/31/2019 8:36:00 AM** | 14588.11 | 15352.98 | 460.59 | -764.86 | FAIL | 5470.50 | 5483.13 | 60.86 | -12.625 | Pass |
| **Detector 7** | | | | | | | | | | |
| **8/30/2019 12:30:00 AM** | 14884.76 | 15273.85 | 458.22 | -389.09 | Pass | 5775.00 | 5724.88 | 85.05 | 50.125 | Pass |
| **8/31/2019 8:36:00 AM** | 14633.78 | 15273.85 | 458.22 | -640.07 | FAIL | 5517.50 | 5724.88 | 85.05 | -207.375 | WARNING |
| **Detector 8** | | | | | | | | | | |
| **8/30/2019 12:32:00 AM** | 11847.27 | 12654.18 | 379.63 | -806.90 | FAIL | 4047.50 | 3940.58 | 65.19 | 106.925 | Pass |
| **8/31/2019 8:39:00 AM** | 11944.56 | 12654.18 | 379.63 | -709.61 | FAIL | 4027.00 | 3940.58 | 65.19 | 86.425 | Pass |
| **Detector 9** | | | | | | | | | | |
| **8/30/2019 12:32:00 AM** | 12868.87 | 13595.78 | 407.87 | -726.90 | FAIL | 4535.50 | 4722.55 | 71.26 | -187.050 | WARNING |
| **8/31/2019 8:39:00 AM** | 12781.23 | 13595.78 | 407.87 | -814.54 | FAIL | 4492.00 | 4722.55 | 71.26 | -230.550 | DOEF |

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# Gas Proportional Counter Daily Quality Control Checks

***Instrument: Purple***

| | Alpha CPM | Alpha Mean | Alpha +/- limit | Alpha Deviation | Alpha Flag | A>>B XT CPM | A>>B XT Mean | A>>B XT +/- limit | A>>B XT Deviation | A>>B XT Flag |
|---|---|---|---|---|---|---|---|---|---|---|
| **Detector 10** | | | | | | | | | | |
| **8/30/2019 12:32:00 AM** | 13094.59 | 14277.18 | 428.32 | -1182.58 | **FAIL** | 4741.50 | 5018.53 | 72.48 | -277.025 | **DOEF** |
| **8/31/2019 8:39:00 AM** | 13118.20 | 14277.18 | 428.32 | -1158.97 | **FAIL** | 4745.00 | 5018.53 | 72.48 | -273.525 | **DOEF** |
| **Detector 11** | | | | | | | | | | |
| **8/30/2019 12:32:00 AM** | 13076.81 | 13390.48 | 401.71 | -313.67 | Pass | 4540.50 | 4510.73 | 57.64 | 29.775 | Pass |
| **8/30/2019 1:24:00 AM** | 13103.37 | 13390.48 | 401.71 | -287.10 | Pass | 4550.50 | 4510.73 | 57.64 | 39.775 | Pass |
| **8/31/2019 8:39:00 AM** | 12958.07 | 13390.48 | 401.71 | -432.40 | **FAIL** | 4525.50 | 4510.73 | 57.64 | 14.775 | Pass |
| **Detector 16** | | | | | | | | | | |
| **8/30/2019 12:35:00 AM** | 11775.08 | 12631.78 | 378.95 | -856.69 | **FAIL** | 3853.00 | 3761.83 | 61.84 | 91.175 | Pass |
| **8/31/2019 8:43:00 AM** | 11832.28 | 12631.78 | 378.95 | -799.50 | **FAIL** | 3870.00 | 3761.83 | 61.84 | 108.175 | Pass |
| **Detector 17** | | | | | | | | | | |
| **8/30/2019 12:35:00 AM** | 13284.51 | 13889.18 | 416.68 | -604.66 | **FAIL** | 3972.50 | 4215.80 | 68.01 | -243.300 | **DOEF** |
| **8/31/2019 8:43:00 AM** | 13508.03 | 13889.18 | 416.68 | -381.15 | Pass | 4071.00 | 4215.80 | 68.01 | -144.800 | **WARNING** |
| **Detector 18** | | | | | | | | | | |
| **8/30/2019 12:35:00 AM** | 13355.49 | 14192.53 | 425.78 | -837.04 | **FAIL** | 4707.50 | 4822.80 | 47.76 | -115.300 | **WARNING** |
| **8/31/2019 8:43:00 AM** | 13052.80 | 14192.53 | 425.78 | -1139.73 | **FAIL** | 4722.50 | 4822.80 | 47.76 | -100.300 | **WARNING** |
| **Detector 19** | | | | | | | | | | |
| **8/30/2019 12:35:00 AM** | 13345.96 | 13562.28 | 406.87 | -216.31 | Pass | 4387.50 | 4355.90 | 55.82 | 31.600 | Pass |
| **8/31/2019 8:43:00 AM** | 13037.76 | 13562.28 | 406.87 | -524.51 | **FAIL** | 4346.50 | 4355.90 | 55.82 | -9.400 | Pass |

# Gas Proportional Counter Daily Quality Control Checks

***Instrument: Purple***

| | Beta CPM | Beta Mean | Beta +/- limit | Beta Deviation | Beta Flag | B>>A XT CPM | B>>A XT Mean | B>>A XT +/- limit | B>>A XT Deviation | B>>A XT Flag |
|---|---|---|---|---|---|---|---|---|---|---|
| **Check Type = Beta** | | | | | | | | | | |
| **Detector 0** | | | | | | | | | | |
| **8/30/2019 12:16:00 AM** | 50301.22 | 50226.98 | 1506.81 | 74.24 | Pass | NA | NA | NA | NA | NA |
| **8/31/2019 8:48:00 AM** | 50207.41 | 50226.98 | 1506.81 | -19.57 | Pass | NA | NA | NA | NA | NA |
| **Detector 1** | | | | | | | | | | |
| **8/30/2019 12:16:00 AM** | 49048.26 | 48796.70 | 1463.90 | 251.56 | Pass | NA | NA | NA | NA | NA |
| **8/31/2019 8:48:00 AM** | 49310.64 | 48796.70 | 1463.90 | 513.94 | Pass | NA | NA | NA | NA | NA |
| **Detector 2** | | | | | | | | | | |
| **8/30/2019 12:16:00 AM** | 50939.15 | 50875.48 | 1526.26 | 63.68 | Pass | NA | NA | NA | NA | NA |
| **8/31/2019 8:48:00 AM** | 50756.89 | 50875.48 | 1526.26 | -118.59 | Pass | NA | NA | NA | NA | NA |
| **Detector 3** | | | | | | | | | | |
| **8/30/2019 12:16:00 AM** | 59978.99 | 60107.23 | 1803.22 | -128.24 | Pass | NA | NA | NA | NA | NA |
| **8/31/2019 8:48:00 AM** | 59977.73 | 60107.23 | 1803.22 | -129.49 | Pass | NA | NA | NA | NA | NA |
| **Detector 4** | | | | | | | | | | |
| **8/30/2019 12:16:00 AM** | 56800.98 | 56940.95 | 1708.23 | -139.97 | Pass | NA | NA | NA | NA | NA |
| **8/31/2019 8:48:00 AM** | 56341.50 | 56940.95 | 1708.23 | -599.45 | Pass | NA | NA | NA | NA | NA |
| **Detector 5** | | | | | | | | | | |
| **8/30/2019 12:16:00 AM** | 55358.85 | 54659.90 | 1639.80 | 698.95 | Pass | NA | NA | NA | NA | NA |
| **8/31/2019 8:48:00 AM** | 55176.36 | 54659.90 | 1639.80 | 516.46 | Pass | NA | NA | NA | NA | NA |
| **Detector 6** | | | | | | | | | | |
| **8/30/2019 12:16:00 AM** | 51936.12 | 52013.25 | 1560.40 | -77.13 | Pass | NA | NA | NA | NA | NA |
| **8/31/2019 8:48:00 AM** | 51917.12 | 52013.25 | 1560.40 | -96.13 | Pass | NA | NA | NA | NA | NA |
| **Detector 7** | | | | | | | | | | |
| **8/30/2019 12:16:00 AM** | 45547.96 | 45069.13 | 1352.07 | 478.84 | Pass | NA | NA | NA | NA | NA |
| **8/31/2019 8:48:00 AM** | 45559.31 | 45069.13 | 1352.07 | 490.19 | Pass | NA | NA | NA | NA | NA |
| **Detector 8** | | | | | | | | | | |
| **8/30/2019 12:26:00 AM** | 50233.94 | 50025.35 | 1500.76 | 208.59 | Pass | NA | NA | NA | NA | NA |
| **8/31/2019 8:42:00 AM** | 50134.54 | 50025.35 | 1500.76 | 109.19 | Pass | NA | NA | NA | NA | NA |
| **Detector 9** | | | | | | | | | | |
| **8/30/2019 12:19:00 AM** | 49175.52 | 48665.90 | 1459.98 | 509.62 | Pass | NA | NA | NA | NA | NA |
| **8/31/2019 8:42:00 AM** | 48490.49 | 48665.90 | 1459.98 | -175.41 | Pass | NA | NA | NA | NA | NA |
| **Detector 10** | | | | | | | | | | |
| **8/30/2019 12:19:00 AM** | 50554.08 | 50649.48 | 1519.48 | -95.40 | Pass | NA | NA | NA | NA | NA |
| **8/31/2019 8:42:00 AM** | 50663.27 | 50649.48 | 1519.48 | 13.79 | Pass | NA | NA | NA | NA | NA |

# Gas Proportional Counter Daily Quality Control Checks

***Instrument: Purple***

| | Beta CPM | Beta Mean | Beta +/- limit | Beta Deviation | Beta Flag | B>>A XT CPM | B>>A XT Mean | B>>A XT +/- limit | B>>A XT Deviation | B>>A XT Flag |
|---|---|---|---|---|---|---|---|---|---|---|
| **Detector 11** | | | | | | | | | | |
| **8/30/2019 12:20:00 AM** | 59766.02 | 59849.50 | 1795.49 | -83.48 | Pass | NA | NA | NA | NA | NA |
| **8/31/2019 8:42:00 AM** | 60161.55 | 59849.50 | 1795.49 | 312.05 | Pass | NA | NA | NA | NA | NA |
| **Detector 16** | | | | | | | | | | |
| **8/30/2019 12:23:00 AM** | 49498.16 | 49489.98 | 1484.70 | 8.19 | Pass | NA | NA | NA | NA | NA |
| **8/31/2019 8:37:00 AM** | 49401.32 | 49489.98 | 1484.70 | -88.66 | Pass | NA | NA | NA | NA | NA |
| **Detector 17** | | | | | | | | | | |
| **8/30/2019 12:23:00 AM** | 46496.00 | 46812.78 | 1404.38 | -316.78 | Pass | NA | NA | NA | NA | NA |
| **8/31/2019 8:37:00 AM** | 46849.47 | 46812.78 | 1404.38 | 36.69 | Pass | NA | NA | NA | NA | NA |
| **Detector 18** | | | | | | | | | | |
| **8/30/2019 12:23:00 AM** | 49997.13 | 50124.63 | 1503.74 | -127.49 | Pass | NA | NA | NA | NA | NA |
| **8/31/2019 8:37:00 AM** | 50016.60 | 50124.63 | 1503.74 | -108.03 | Pass | NA | NA | NA | NA | NA |
| **Detector 19** | | | | | | | | | | |
| **8/30/2019 12:23:00 AM** | 60112.62 | 60073.05 | 1802.19 | 39.57 | Pass | NA | NA | NA | NA | NA |
| **8/31/2019 8:37:00 AM** | 59660.34 | 60073.05 | 1802.19 | -412.71 | Pass | NA | NA | NA | NA | NA |

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# Gas Proportional Counter Daily Quality Control Checks

***Instrument: Purple***

| | AlphaBKG CPM | BKG Mean | BKG +/- limit | BKG Deviation | BKG Flag | BetaBKG CPM | BetaBKG Mean | BetaBKG +/- limit | BetaBKG Deviation | BetaBKG Flag |
|---|---|---|---|---|---|---|---|---|---|---|
| **Check Type = BKG** | | | | | | | | | | |
| **Detector 0** | | | | | | | | | | |
| **8/30/2019 4:53:00 AM** | 0.20 | 0.12 | 0.01 | 0.08 | FAIL | 0.51 | 0.46 | 0.08 | 0.053 | Pass |
| **8/31/2019 12:39:00 PM** | 0.15 | 0.12 | 0.01 | 0.03 | Pass | 0.51 | 0.46 | 0.08 | 0.048 | Pass |
| **Detector 1** | | | | | | | | | | |
| **8/30/2019 4:53:00 AM** | 0.15 | 0.09 | 0.04 | 0.06 | Pass | 0.51 | 0.43 | 0.08 | 0.076 | Pass |
| **8/31/2019 12:39:00 PM** | 0.19 | 0.09 | 0.04 | 0.10 | Pass | 0.42 | 0.43 | 0.08 | -0.014 | Pass |
| **Detector 2** | | | | | | | | | | |
| **8/30/2019 4:53:00 AM** | 0.28 | 0.17 | 0.05 | 0.10 | Pass | 0.50 | 0.53 | 0.06 | -0.031 | Pass |
| **8/31/2019 12:39:00 PM** | 0.34 | 0.17 | 0.05 | 0.17 | FAIL | 0.54 | 0.53 | 0.06 | 0.014 | Pass |
| **Detector 3** | | | | | | | | | | |
| **8/30/2019 4:53:00 AM** | 0.28 | 0.08 | 0.02 | 0.19 | FAIL | 0.53 | 0.41 | 0.08 | 0.125 | Pass |
| **8/31/2019 12:39:00 PM** | 0.19 | 0.08 | 0.02 | 0.10 | FAIL | 0.51 | 0.41 | 0.08 | 0.105 | Pass |
| **Detector 4** | | | | | | | | | | |
| **8/30/2019 7:48:00 AM** | 0.12 | 0.11 | 0.03 | 0.00 | Pass | 0.41 | 0.46 | 0.08 | -0.045 | Pass |
| **8/31/2019 12:39:00 PM** | 0.18 | 0.11 | 0.03 | 0.07 | Pass | 0.42 | 0.46 | 0.08 | -0.040 | Pass |
| **Detector 5** | | | | | | | | | | |
| **8/30/2019 4:53:00 AM** | 0.21 | 0.13 | 0.05 | 0.08 | Pass | 0.41 | 0.40 | 0.07 | 0.013 | Pass |
| **8/31/2019 12:39:00 PM** | 0.21 | 0.13 | 0.05 | 0.07 | Pass | 0.45 | 0.40 | 0.07 | 0.048 | Pass |
| **Detector 6** | | | | | | | | | | |
| **8/30/2019 4:53:00 AM** | 0.13 | 0.10 | 0.03 | 0.03 | Pass | 0.42 | 0.46 | 0.08 | -0.049 | Pass |
| **8/31/2019 12:40:00 PM** | 0.21 | 0.10 | 0.03 | 0.11 | FAIL | 0.40 | 0.46 | 0.08 | -0.064 | Pass |
| **Detector 7** | | | | | | | | | | |
| **8/30/2019 4:53:00 AM** | 0.15 | 0.10 | 0.03 | 0.05 | Pass | 0.57 | 0.47 | 0.06 | 0.095 | Pass |
| **8/31/2019 12:40:00 PM** | 0.23 | 0.10 | 0.03 | 0.12 | FAIL | 0.40 | 0.47 | 0.06 | -0.075 | Pass |
| **Detector 8** | | | | | | | | | | |
| **8/30/2019 5:57:00 AM** | 0.20 | 0.12 | 0.04 | 0.08 | Pass | 0.43 | 0.47 | 0.05 | -0.050 | Pass |
| **8/31/2019 12:40:00 PM** | 0.15 | 0.12 | 0.04 | 0.03 | Pass | 0.50 | 0.47 | 0.05 | 0.020 | Pass |
| **Detector 9** | | | | | | | | | | |
| **8/30/2019 4:53:00 AM** | 0.27 | 0.07 | 0.02 | 0.20 | FAIL | 0.52 | 0.42 | 0.07 | 0.099 | Pass |
| **8/31/2019 12:40:00 PM** | 0.23 | 0.07 | 0.02 | 0.16 | FAIL | 0.43 | 0.42 | 0.07 | 0.009 | Pass |
| **Detector 10** | | | | | | | | | | |
| **8/30/2019 4:53:00 AM** | 0.17 | 0.08 | 0.02 | 0.09 | FAIL | 0.33 | 0.36 | 0.06 | -0.036 | Pass |
| **8/31/2019 12:40:00 PM** | 0.18 | 0.08 | 0.02 | 0.10 | FAIL | 0.35 | 0.36 | 0.06 | -0.011 | Pass |

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# Gas Proportional Counter Daily Quality Control Checks

***Instrument: Purple***

| | AlphaBKG CPM | BKG Mean | BKG +/- limit | BKG Deviation | BKG Flag | BetaBKG CPM | BetaBKG Mean | BetaBKG +/- limit | BetaBKG Deviation | BetaBKG Flag |
|---|---|---|---|---|---|---|---|---|---|---|
| **Detector 11** | | | | | | | | | | |
| **8/30/2019 4:53:00 AM** | 0.19 | 0.08 | 0.02 | 0.10 | FAIL | 0.45 | 0.43 | 0.06 | 0.021 | Pass |
| **8/31/2019 12:40:00 PM** | 0.10 | 0.08 | 0.02 | 0.02 | Pass | 0.34 | 0.43 | 0.06 | -0.090 | Pass |
| **Detector 16** | | | | | | | | | | |
| **8/30/2019 4:53:00 AM** | 0.20 | 0.07 | 0.02 | 0.13 | FAIL | 0.42 | 0.40 | 0.07 | 0.015 | Pass |
| **8/31/2019 12:40:00 PM** | 0.19 | 0.07 | 0.02 | 0.12 | FAIL | 0.34 | 0.40 | 0.07 | -0.060 | Pass |
| **Detector 17** | | | | | | | | | | |
| **8/30/2019 4:53:00 AM** | 0.18 | 0.15 | 0.02 | 0.04 | Pass | 0.37 | 0.31 | 0.06 | 0.060 | Pass |
| **8/31/2019 12:40:00 PM** | 0.23 | 0.15 | 0.02 | 0.08 | FAIL | 0.27 | 0.31 | 0.06 | -0.035 | Pass |
| **Detector 18** | | | | | | | | | | |
| **8/30/2019 4:53:00 AM** | 0.18 | 0.10 | 0.03 | 0.08 | Pass | 0.33 | 0.37 | 0.06 | -0.040 | Pass |
| **8/31/2019 12:40:00 PM** | 0.16 | 0.10 | 0.03 | 0.06 | Pass | 0.38 | 0.37 | 0.06 | 0.005 | Pass |
| **Detector 19** | | | | | | | | | | |
| **8/30/2019 4:53:00 AM** | 0.10 | 0.10 | 0.02 | 0.00 | Pass | 0.54 | 0.49 | 0.05 | 0.054 | Pass |
| **8/31/2019 12:40:00 PM** | 0.12 | 0.10 | 0.02 | 0.02 | Pass | 0.40 | 0.49 | 0.05 | -0.091 | Pass |

**The Alpha and Beta +/- limit are based upon initial 20-point population.**

**The Alpha and Beta +/- limit for Efficiency is stated at 3%. Flags are "FAIL" > 3%.**

**The Alpha and Beta +/- limit for Background is stated at 1 StDev. Flags are "FAIL" > 3 StDev.**

**The Alpha +/- limit for Crosstalk is stated at 1 StDev. Flags are "Warning > 2 StDev and "DOEF" > 3 StDev. Beta is negligible, for trend only ("NA").**

**Times shown reflect the end of the count duration.**

# Gas Proportional Counter Daily Quality Control Checks

***Instrument: Red***

| | Alpha CPM | Alpha Mean | Alpha +/- limit | Alpha Deviation | Alpha Flag | A>>B XT CPM | A>>B XT Mean | A>>B XT +/- limit | A>>B XT Deviation | A>>B XT Flag |
|---|---|---|---|---|---|---|---|---|---|---|
| **Check Type = Alpha** | | | | | | | | | | |
| **Detector 0** | | | | | | | | | | |
| **8/30/2019 2:17:00 AM** | 11472.36 | 11636.45 | 349.09 | -164.09 | Pass | 4145.00 | 4244.90 | 82.01 | -99.900 | Pass |
| **8/31/2019 7:00:00 AM** | 11495.41 | 11636.45 | 349.09 | -141.04 | Pass | 4151.50 | 4244.90 | 82.01 | -93.400 | Pass |
| **Detector 1** | | | | | | | | | | |
| **8/30/2019 2:17:00 AM** | 12377.05 | 12714.00 | 381.42 | -336.95 | Pass | 4699.50 | 4651.43 | 59.09 | 48.075 | Pass |
| **8/31/2019 7:00:00 AM** | 12370.61 | 12714.00 | 381.42 | -343.39 | Pass | 4727.50 | 4651.43 | 59.09 | 76.075 | Pass |
| **Detector 2** | | | | | | | | | | |
| **8/30/2019 2:17:00 AM** | 12628.12 | 12929.23 | 387.88 | -301.11 | Pass | 5028.50 | 4840.50 | 53.20 | 188.000 | **DOEF** |
| **8/30/2019 7:15:00 AM** | 12459.08 | 12929.23 | 387.88 | -470.14 | **FAIL** | 4971.50 | 4840.50 | 53.20 | 131.000 | **WARNING** |
| **8/30/2019 7:18:00 AM** | 12630.12 | 12929.23 | 387.88 | -299.11 | Pass | 4935.00 | 4840.50 | 53.20 | 94.500 | Pass |
| **8/31/2019 7:00:00 AM** | 12769.70 | 12929.23 | 387.88 | -159.52 | Pass | 4875.50 | 4840.50 | 53.20 | 35.000 | Pass |
| **Detector 3** | | | | | | | | | | |
| **8/30/2019 2:17:00 AM** | 12524.09 | 12666.45 | 379.99 | -142.36 | Pass | 4743.00 | 4707.03 | 68.01 | 35.975 | Pass |
| **8/31/2019 7:00:00 AM** | 12503.15 | 12666.45 | 379.99 | -163.30 | Pass | 4738.50 | 4707.03 | 68.01 | 31.475 | Pass |
| **Detector 4** | | | | | | | | | | |
| **8/30/2019 2:17:00 AM** | 16087.48 | 16214.73 | 486.44 | -127.24 | Pass | 5719.00 | 5722.18 | 88.74 | -3.175 | Pass |
| **8/31/2019 7:00:00 AM** | 16064.05 | 16214.73 | 486.44 | -150.67 | Pass | 5667.00 | 5722.18 | 88.74 | -55.175 | Pass |
| **Detector 5** | | | | | | | | | | |
| **8/30/2019 2:17:00 AM** | 16521.42 | 16567.48 | 497.02 | -46.05 | Pass | 5459.50 | 5564.83 | 57.93 | -105.325 | Pass |
| **8/31/2019 7:00:00 AM** | 16408.47 | 16567.48 | 497.02 | -159.00 | Pass | 5449.50 | 5564.83 | 57.93 | -115.325 | Pass |
| **Detector 6** | | | | | | | | | | |
| **8/30/2019 2:17:00 AM** | 14551.54 | 14664.68 | 439.94 | -113.13 | Pass | 5231.50 | 5281.70 | 81.05 | -50.200 | Pass |
| **8/31/2019 7:00:00 AM** | 14452.59 | 14664.68 | 439.94 | -212.08 | Pass | 5124.50 | 5281.70 | 81.05 | -157.200 | Pass |
| **Detector 7** | | | | | | | | | | |
| **8/30/2019 2:18:00 AM** | 14896.30 | 15035.35 | 451.06 | -139.05 | Pass | 5337.50 | 5485.58 | 54.64 | -148.075 | **WARNING** |
| **8/30/2019 7:16:00 AM** | 14590.74 | 15035.35 | 451.06 | -444.61 | Pass | 5338.00 | 5485.58 | 54.64 | -147.575 | **WARNING** |
| **8/30/2019 7:18:00 AM** | 14824.78 | 15035.35 | 451.06 | -210.57 | Pass | 5396.00 | 5485.58 | 54.64 | -89.575 | Pass |
| **8/31/2019 7:01:00 AM** | 14825.85 | 15035.35 | 451.06 | -209.50 | Pass | 5356.50 | 5485.58 | 54.64 | -129.075 | **WARNING** |
| **Detector 8** | | | | | | | | | | |
| **8/30/2019 2:20:00 AM** | 8795.99 | 9210.48 | 276.31 | -414.48 | **FAIL** | 5753.50 | 5765.45 | 148.00 | -11.950 | Pass |
| **8/30/2019 7:15:00 AM** | 8908.00 | 9210.48 | 276.31 | -302.47 | **FAIL** | 5753.50 | 5765.45 | 148.00 | -11.950 | Pass |
| **8/30/2019 7:18:00 AM** | 8708.48 | 9210.48 | 276.31 | -501.99 | **FAIL** | 5729.00 | 5765.45 | 148.00 | -36.450 | Pass |
| **8/31/2019 7:04:00 AM** | 8715.52 | 9210.48 | 276.31 | -494.95 | **FAIL** | 5831.50 | 5765.45 | 148.00 | 66.050 | Pass |

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# Gas Proportional Counter Daily Quality Control Checks

## *Instrument: Red*

| | Alpha CPM | Alpha Mean | Alpha +/- limit | Alpha Deviation | Alpha Flag | A>>B XT CPM | A>>B XT Mean | A>>B XT +/- limit | A>>B XT Deviation | A>>B XT Flag |
|---|---|---|---|---|---|---|---|---|---|---|
| **Detector 9** | | | | | | | | | | |
| **8/30/2019 2:20:00 AM** | 12432.23 | 12718.73 | 381.56 | -286.49 | Pass | 4533.00 | 4503.70 | 105.73 | 29.300 | Pass |
| **8/31/2019 7:04:00 AM** | 12520.80 | 12718.73 | 381.56 | -197.92 | Pass | 4432.50 | 4503.70 | 105.73 | -71.200 | Pass |
| **Detector 10** | | | | | | | | | | |
| **8/30/2019 2:20:00 AM** | 12721.10 | 13272.45 | 398.17 | -551.35 | **FAIL** | 4504.50 | 4549.20 | 59.78 | -44.700 | Pass |
| **8/30/2019 2:44:00 AM** | 12914.14 | 13272.45 | 398.17 | -358.31 | Pass | 4524.50 | 4549.20 | 59.78 | -24.700 | Pass |
| **8/30/2019 2:47:00 AM** | 12863.12 | 13272.45 | 398.17 | -409.33 | **FAIL** | 4492.00 | 4549.20 | 59.78 | -57.200 | Pass |
| **8/31/2019 7:04:00 AM** | 12880.68 | 13272.45 | 398.17 | -391.77 | Pass | 4399.50 | 4549.20 | 59.78 | -149.700 | **WARNING** |
| **8/31/2019 7:54:00 AM** | 12746.66 | 13272.45 | 398.17 | -525.79 | **FAIL** | 4535.50 | 4549.20 | 59.78 | -13.700 | Pass |
| **Detector 11** | | | | | | | | | | |
| **8/30/2019 2:20:00 AM** | 12716.48 | 12887.08 | 386.61 | -170.59 | Pass | 4296.50 | 4382.48 | 65.44 | -85.975 | Pass |
| **8/31/2019 7:04:00 AM** | 12654.03 | 12887.08 | 386.61 | -233.05 | Pass | 4269.00 | 4382.48 | 65.44 | -113.475 | Pass |
| **Detector 12** | | | | | | | | | | |
| **8/30/2019 2:21:00 AM** | 18273.68 | 16335.83 | 490.07 | 1937.85 | **FAIL** | 6716.50 | 5801.15 | 332.48 | 915.350 | **WARNING** |
| **8/30/2019 2:44:00 AM** | 16135.81 | 16335.83 | 490.07 | -200.02 | Pass | 5478.00 | 5801.15 | 332.48 | -323.150 | Pass |
| **8/30/2019 2:47:00 AM** | 16032.29 | 16335.83 | 490.07 | -303.54 | Pass | 5579.50 | 5801.15 | 332.48 | -221.650 | Pass |
| **8/31/2019 7:04:00 AM** | 16075.87 | 16335.83 | 490.07 | -259.96 | Pass | 5511.00 | 5801.15 | 332.48 | -290.150 | Pass |
| **Detector 13** | | | | | | | | | | |
| **8/30/2019 2:21:00 AM** | 16420.85 | 16489.35 | 494.68 | -68.50 | Pass | 5525.50 | 5665.38 | 56.94 | -139.875 | **WARNING** |
| **8/31/2019 7:04:00 AM** | 16183.87 | 16489.35 | 494.68 | -305.48 | Pass | 5564.50 | 5665.38 | 56.94 | -100.875 | Pass |
| **Detector 14** | | | | | | | | | | |
| **8/30/2019 2:21:00 AM** | 14664.55 | 14621.60 | 438.65 | 42.95 | Pass | 5071.00 | 5328.33 | 306.87 | -257.325 | Pass |
| **8/31/2019 7:04:00 AM** | 14784.64 | 14621.60 | 438.65 | 163.04 | Pass | 5152.00 | 5328.33 | 306.87 | -176.325 | Pass |
| **Detector 15** | | | | | | | | | | |
| **8/30/2019 2:21:00 AM** | 14667.99 | 14925.18 | 447.76 | -257.18 | Pass | 5383.00 | 5374.78 | 44.14 | 8.225 | Pass |
| **8/31/2019 7:04:00 AM** | 14883.10 | 14925.18 | 447.76 | -42.07 | Pass | 5277.00 | 5374.78 | 44.14 | -97.775 | **WARNING** |
| **Detector 16** | | | | | | | | | | |
| **8/30/2019 2:23:00 AM** | 11428.98 | 11658.43 | 349.75 | -229.44 | Pass | 4084.00 | 4225.30 | 85.14 | -141.300 | Pass |
| **8/31/2019 7:08:00 AM** | 11489.55 | 11658.43 | 349.75 | -168.88 | Pass | 4032.50 | 4225.30 | 85.14 | -192.800 | **WARNING** |
| **Detector 17** | | | | | | | | | | |
| **8/30/2019 2:23:00 AM** | 12782.29 | 12768.38 | 383.05 | 13.91 | Pass | 4672.00 | 4759.10 | 73.11 | -87.100 | Pass |
| **8/31/2019 7:08:00 AM** | 12721.33 | 12768.38 | 383.05 | -47.04 | Pass | 4676.50 | 4759.10 | 73.11 | -82.600 | Pass |

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# Gas Proportional Counter Daily Quality Control Checks

***Instrument: Red***

| | Alpha CPM | Alpha Mean | Alpha +/- limit | Alpha Deviation | Alpha Flag | A>>B XT CPM | A>>B XT Mean | A>>B XT +/- limit | A>>B XT Deviation | A>>B XT Flag |
|---|---|---|---|---|---|---|---|---|---|---|
| **Detector 18** | | | | | | | | | | |
| **8/30/2019 2:23:00 AM** | 12639.75 | 12778.08 | 383.34 | -138.33 | Pass | 4660.50 | 4942.93 | 73.13 | -282.425 | **DOEF** |
| **8/30/2019 7:21:00 AM** | 12750.27 | 12778.08 | 383.34 | -27.80 | Pass | 4842.00 | 4942.93 | 73.13 | -100.925 | Pass |
| **8/30/2019 7:24:00 AM** | 12492.21 | 12778.08 | 383.34 | -285.86 | Pass | 4759.50 | 4942.93 | 73.13 | -183.425 | **WARNING** |
| **8/31/2019 7:09:00 AM** | 12605.79 | 12778.08 | 383.34 | -172.28 | Pass | 4797.50 | 4942.93 | 73.13 | -145.425 | Pass |
| **Detector 19** | | | | | | | | | | |
| **8/30/2019 2:23:00 AM** | 12499.21 | 12762.55 | 382.88 | -263.34 | Pass | 4888.50 | 5127.18 | 85.78 | -238.675 | **WARNING** |
| **8/30/2019 7:16:00 AM** | 12592.23 | 12762.55 | 382.88 | -170.32 | Pass | 4759.50 | 5127.18 | 85.78 | -367.675 | **DOEF** |
| **8/30/2019 7:19:00 AM** | 12605.23 | 12762.55 | 382.88 | -157.32 | Pass | 4755.50 | 5127.18 | 85.78 | -371.675 | **DOEF** |
| **8/31/2019 7:09:00 AM** | 12556.28 | 12762.55 | 382.88 | -206.27 | Pass | 4733.00 | 5127.18 | 85.78 | -394.175 | **DOEF** |
| **Detector 20** | | | | | | | | | | |
| **8/30/2019 2:24:00 AM** | 18115.44 | 16109.33 | 483.28 | 2006.11 | **FAIL** | 6831.00 | 5745.18 | 102.18 | 1085.825 | **DOEF** |
| **8/30/2019 2:49:00 AM** | 16085.00 | 16109.33 | 483.28 | -24.33 | Pass | 5828.50 | 5745.18 | 102.18 | 83.325 | Pass |
| **8/30/2019 2:52:00 AM** | 16140.01 | 16109.33 | 483.28 | 30.68 | Pass | 5693.00 | 5745.18 | 102.18 | -52.175 | Pass |
| **8/31/2019 7:09:00 AM** | 16074.56 | 16109.33 | 483.28 | -34.76 | Pass | 5733.00 | 5745.18 | 102.18 | -12.175 | Pass |
| **Detector 21** | | | | | | | | | | |
| **8/30/2019 2:24:00 AM** | 15858.21 | 16127.88 | 483.84 | -269.66 | Pass | 6003.50 | 6019.88 | 140.49 | -16.375 | Pass |
| **8/31/2019 7:09:00 AM** | 15862.78 | 16127.88 | 483.84 | -265.09 | Pass | 6040.50 | 6019.88 | 140.49 | 20.625 | Pass |
| **Detector 22** | | | | | | | | | | |
| **8/30/2019 2:24:00 AM** | 14447.14 | 14645.15 | 439.35 | -198.01 | Pass | 5373.00 | 5469.68 | 76.39 | -96.675 | Pass |
| **8/31/2019 7:09:00 AM** | 14394.69 | 14645.15 | 439.35 | -250.46 | Pass | 5381.00 | 5469.68 | 76.39 | -88.675 | Pass |
| **Detector 23** | | | | | | | | | | |
| **8/30/2019 2:24:00 AM** | 14549.16 | 14642.50 | 439.28 | -93.34 | Pass | 5486.00 | 5684.70 | 107.32 | -198.700 | Pass |
| **8/31/2019 7:09:00 AM** | 14503.72 | 14642.50 | 439.28 | -138.78 | Pass | 5426.50 | 5684.70 | 107.32 | -258.200 | **WARNING** |

# Gas Proportional Counter Daily Quality Control Checks

***Instrument: Red***

| | Beta CPM | Beta Mean | Beta +/- limit | Beta Deviation | Beta Flag | B>>A XT CPM | B>>A XT Mean | B>>A XT +/- limit | B>>A XT Deviation | B>>A XT Flag |
|---|---|---|---|---|---|---|---|---|---|---|
| **Check Type = Beta** | | | | | | | | | | |
| **Detector 0** | | | | | | | | | | |
| **8/30/2019 2:22:00 AM** | 47157.13 | 47384.15 | 1421.52 | -227.02 | Pass | NA | NA | NA | NA | NA |
| **8/31/2019 7:05:00 AM** | 47409.59 | 47384.15 | 1421.52 | 25.44 | Pass | NA | NA | NA | NA | NA |
| **Detector 1** | | | | | | | | | | |
| **8/30/2019 2:22:00 AM** | 46223.59 | 46275.63 | 1388.27 | -52.04 | Pass | NA | NA | NA | NA | NA |
| **8/31/2019 7:05:00 AM** | 46241.69 | 46275.63 | 1388.27 | -33.93 | Pass | NA | NA | NA | NA | NA |
| **Detector 2** | | | | | | | | | | |
| **8/30/2019 2:22:00 AM** | 47098.37 | 47623.85 | 1428.72 | -525.48 | Pass | NA | NA | NA | NA | NA |
| **8/31/2019 7:05:00 AM** | 47108.00 | 47623.85 | 1428.72 | -515.85 | Pass | NA | NA | NA | NA | NA |
| **Detector 3** | | | | | | | | | | |
| **8/30/2019 2:23:00 AM** | 56785.33 | 57173.55 | 1715.21 | -388.22 | Pass | NA | NA | NA | NA | NA |
| **8/31/2019 7:05:00 AM** | 56877.38 | 57173.55 | 1715.21 | -296.17 | Pass | NA | NA | NA | NA | NA |
| **Detector 4** | | | | | | | | | | |
| **8/30/2019 2:22:00 AM** | 53081.89 | 53430.68 | 1602.92 | -348.78 | Pass | NA | NA | NA | NA | NA |
| **8/31/2019 7:05:00 AM** | 53422.79 | 53430.68 | 1602.92 | -7.88 | Pass | NA | NA | NA | NA | NA |
| **Detector 5** | | | | | | | | | | |
| **8/30/2019 2:22:00 AM** | 52203.68 | 52098.98 | 1562.97 | 104.71 | Pass | NA | NA | NA | NA | NA |
| **8/31/2019 7:06:00 AM** | 52133.92 | 52098.98 | 1562.97 | 34.95 | Pass | NA | NA | NA | NA | NA |
| **Detector 6** | | | | | | | | | | |
| **8/30/2019 2:22:00 AM** | 48735.81 | 48908.65 | 1467.26 | -172.84 | Pass | NA | NA | NA | NA | NA |
| **8/31/2019 7:06:00 AM** | 49154.23 | 48908.65 | 1467.26 | 245.58 | Pass | NA | NA | NA | NA | NA |
| **Detector 7** | | | | | | | | | | |
| **8/30/2019 2:22:00 AM** | 43638.40 | 44451.63 | 1333.55 | -813.23 | Pass | NA | NA | NA | NA | NA |
| **8/31/2019 7:06:00 AM** | 43804.75 | 44451.63 | 1333.55 | -646.88 | Pass | NA | NA | NA | NA | NA |
| **Detector 8** | | | | | | | | | | |
| **8/30/2019 2:16:00 AM** | 37841.84 | 39255.00 | 1177.65 | -1413.16 | **FAIL** | NA | NA | NA | NA | NA |
| **8/30/2019 7:21:00 AM** | 37929.01 | 39255.00 | 1177.65 | -1325.99 | **FAIL** | NA | NA | NA | NA | NA |
| **8/30/2019 7:23:00 AM** | 37744.14 | 39255.00 | 1177.65 | -1510.86 | **FAIL** | NA | NA | NA | NA | NA |
| **8/31/2019 7:09:00 AM** | 37582.29 | 39255.00 | 1177.65 | -1672.71 | **FAIL** | NA | NA | NA | NA | NA |
| **Detector 9** | | | | | | | | | | |
| **8/30/2019 2:16:00 AM** | 44827.68 | 45868.28 | 1376.05 | -1040.60 | Pass | NA | NA | NA | NA | NA |
| **8/31/2019 7:09:00 AM** | 44869.27 | 45868.28 | 1376.05 | -999.01 | Pass | NA | NA | NA | NA | NA |

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# Gas Proportional Counter Daily Quality Control Checks

## *Instrument: Red*

| | Beta CPM | Beta Mean | Beta +/- limit | Beta Deviation | Beta Flag | B>>A XT CPM | B>>A XT Mean | B>>A XT +/- limit | B>>A XT Deviation | B>>A XT Flag |
|---|---|---|---|---|---|---|---|---|---|---|
| **Detector 10** | | | | | | | | | | |
| **8/30/2019 2:16:00 AM** | 46923.10 | 47912.23 | 1437.37 | -989.13 | Pass | NA | NA | NA | NA | NA |
| **8/31/2019 7:10:00 AM** | 46110.95 | 47912.23 | 1437.37 | -1801.28 | **FAIL** | NA | NA | NA | NA | NA |
| **8/31/2019 7:59:00 AM** | 47403.81 | 47912.23 | 1437.37 | -508.42 | Pass | NA | NA | NA | NA | NA |
| **8/31/2019 8:01:00 AM** | 47103.30 | 47912.23 | 1437.37 | -808.93 | Pass | NA | NA | NA | NA | NA |
| **Detector 11** | | | | | | | | | | |
| **8/30/2019 2:16:00 AM** | 56455.80 | 57019.75 | 1710.59 | -563.95 | Pass | NA | NA | NA | NA | NA |
| **8/31/2019 7:10:00 AM** | 55850.97 | 57019.75 | 1710.59 | -1168.78 | Pass | NA | NA | NA | NA | NA |
| **Detector 12** | | | | | | | | | | |
| **8/30/2019 2:16:00 AM** | 53721.88 | 54144.28 | 1624.33 | -422.40 | Pass | NA | NA | NA | NA | NA |
| **8/31/2019 7:10:00 AM** | 53601.01 | 54144.28 | 1624.33 | -543.27 | Pass | NA | NA | NA | NA | NA |
| **Detector 13** | | | | | | | | | | |
| **8/30/2019 2:17:00 AM** | 52125.81 | 52356.60 | 1570.70 | -230.79 | Pass | NA | NA | NA | NA | NA |
| **8/31/2019 7:10:00 AM** | 52138.79 | 52356.60 | 1570.70 | -217.81 | Pass | NA | NA | NA | NA | NA |
| **Detector 14** | | | | | | | | | | |
| **8/30/2019 2:16:00 AM** | 49182.67 | 49410.80 | 1482.32 | -228.13 | Pass | NA | NA | NA | NA | NA |
| **8/31/2019 7:10:00 AM** | 49451.30 | 49410.80 | 1482.32 | 40.50 | Pass | NA | NA | NA | NA | NA |
| **Detector 15** | | | | | | | | | | |
| **8/30/2019 2:17:00 AM** | 43151.91 | 43528.55 | 1305.86 | -376.64 | Pass | NA | NA | NA | NA | NA |
| **8/31/2019 7:10:00 AM** | 48148.45 | 43528.55 | 1305.86 | 4619.90 | **FAIL** | NA | NA | NA | NA | NA |
| **8/31/2019 7:55:00 AM** | 43374.49 | 43528.55 | 1305.86 | -154.06 | Pass | NA | NA | NA | NA | NA |
| **8/31/2019 7:59:00 AM** | 43450.74 | 43528.55 | 1305.86 | -77.81 | Pass | NA | NA | NA | NA | NA |
| **Detector 16** | | | | | | | | | | |
| **8/30/2019 2:19:00 AM** | 47321.58 | 47204.35 | 1416.13 | 117.23 | Pass | NA | NA | NA | NA | NA |
| **8/31/2019 7:13:00 AM** | 47200.82 | 47204.35 | 1416.13 | -3.53 | Pass | NA | NA | NA | NA | NA |
| **Detector 17** | | | | | | | | | | |
| **8/30/2019 2:19:00 AM** | 47044.23 | 46324.63 | 1389.74 | 719.61 | Pass | NA | NA | NA | NA | NA |
| **8/31/2019 7:13:00 AM** | 46318.57 | 46324.63 | 1389.74 | -6.06 | Pass | NA | NA | NA | NA | NA |
| **Detector 18** | | | | | | | | | | |
| **8/30/2019 2:19:00 AM** | 46825.57 | 47174.85 | 1415.25 | -349.28 | Pass | NA | NA | NA | NA | NA |
| **8/31/2019 7:13:00 AM** | 47478.69 | 47174.85 | 1415.25 | 303.84 | Pass | NA | NA | NA | NA | NA |
| **Detector 19** | | | | | | | | | | |
| **8/30/2019 2:19:00 AM** | 56969.06 | 57102.93 | 1713.09 | -133.87 | Pass | NA | NA | NA | NA | NA |
| **8/31/2019 7:13:00 AM** | 56882.54 | 57102.93 | 1713.09 | -220.39 | Pass | NA | NA | NA | NA | NA |

# Gas Proportional Counter Daily Quality Control Checks

***Instrument: Red***

| | Beta CPM | Beta Mean | Beta +/- limit | Beta Deviation | Beta Flag | B>>A XT CPM | B>>A XT Mean | B>>A XT +/- limit | B>>A XT Deviation | B>>A XT Flag |
|---|---|---|---|---|---|---|---|---|---|---|
| **Detector 20** | | | | | | | | | | |
| **8/30/2019 2:19:00 AM** | 53194.02 | 53352.30 | 1600.57 | -158.28 | Pass | NA | NA | NA | NA | NA |
| **8/31/2019 7:13:00 AM** | 53707.13 | 53352.30 | 1600.57 | 354.83 | Pass | NA | NA | NA | NA | NA |
| **Detector 21** | | | | | | | | | | |
| **8/30/2019 2:19:00 AM** | 52176.92 | 52189.10 | 1565.67 | -12.18 | Pass | NA | NA | NA | NA | NA |
| **8/31/2019 7:13:00 AM** | 51505.25 | 52189.10 | 1565.67 | -683.85 | Pass | NA | NA | NA | NA | NA |
| **Detector 22** | | | | | | | | | | |
| **8/30/2019 2:19:00 AM** | 49378.36 | 49321.15 | 1479.63 | 57.21 | Pass | NA | NA | NA | NA | NA |
| **8/31/2019 7:13:00 AM** | 49420.25 | 49321.15 | 1479.63 | 99.10 | Pass | NA | NA | NA | NA | NA |
| **Detector 23** | | | | | | | | | | |
| **8/30/2019 2:19:00 AM** | 43194.97 | 43122.13 | 1293.66 | 72.85 | Pass | NA | NA | NA | NA | NA |
| **8/31/2019 7:13:00 AM** | 43181.27 | 43122.13 | 1293.66 | 59.15 | Pass | NA | NA | NA | NA | NA |

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# Gas Proportional Counter Daily Quality Control Checks

***Instrument: Red***

| | AlphaBKG CPM | BKG Mean | BKG +/- limit | BKG Deviation | BKG Flag | BetaBKG CPM | BetaBKG Mean | BetaBKG +/- limit | BetaBKG Deviation | BetaBKG Flag |
|---|---|---|---|---|---|---|---|---|---|---|
| **Check Type = BKG** | | | | | | | | | | |
| **Detector 0** | | | | | | | | | | |
| **8/30/2019 6:13:00 AM** | 0.10 | 0.04 | 0.02 | 0.06 | Pass | 0.50 | 1.04 | 0.67 | -0.545 | Pass |
| **8/31/2019 11:14:00 AM** | 0.12 | 0.04 | 0.02 | 0.08 | **FAIL** | 0.51 | 1.04 | 0.67 | -0.535 | Pass |
| **Detector 1** | | | | | | | | | | |
| **8/30/2019 6:13:00 AM** | 0.14 | 0.04 | 0.02 | 0.10 | **FAIL** | 0.39 | 0.54 | 0.11 | -0.153 | Pass |
| **8/31/2019 11:14:00 AM** | 0.08 | 0.04 | 0.02 | 0.04 | Pass | 0.47 | 0.54 | 0.11 | -0.073 | Pass |
| **Detector 2** | | | | | | | | | | |
| **8/30/2019 6:13:00 AM** | 0.12 | 0.05 | 0.04 | 0.07 | Pass | 0.37 | 0.39 | 0.07 | -0.028 | Pass |
| **8/31/2019 11:14:00 AM** | 0.08 | 0.05 | 0.04 | 0.03 | Pass | 0.33 | 0.39 | 0.07 | -0.068 | Pass |
| **Detector 3** | | | | | | | | | | |
| **8/30/2019 6:13:00 AM** | 0.05 | 0.04 | 0.01 | 0.01 | Pass | 0.47 | 0.55 | 0.06 | -0.086 | Pass |
| **8/31/2019 11:14:00 AM** | 0.10 | 0.04 | 0.01 | 0.06 | **FAIL** | 0.50 | 0.55 | 0.06 | -0.051 | Pass |
| **Detector 4** | | | | | | | | | | |
| **8/30/2019 6:13:00 AM** | 0.09 | 0.05 | 0.02 | 0.04 | Pass | 0.51 | 0.37 | 0.10 | 0.137 | Pass |
| **8/31/2019 11:14:00 AM** | 0.05 | 0.05 | 0.02 | 0.00 | Pass | 0.27 | 0.37 | 0.10 | -0.103 | Pass |
| **Detector 5** | | | | | | | | | | |
| **8/30/2019 6:13:00 AM** | 0.09 | 0.04 | 0.02 | 0.05 | Pass | 0.33 | 0.33 | 0.05 | -0.004 | Pass |
| **8/31/2019 11:14:00 AM** | 0.09 | 0.04 | 0.02 | 0.05 | Pass | 0.33 | 0.33 | 0.05 | -0.004 | Pass |
| **Detector 6** | | | | | | | | | | |
| **8/30/2019 6:13:00 AM** | 0.12 | 0.07 | 0.04 | 0.05 | Pass | 0.35 | 0.32 | 0.07 | 0.028 | Pass |
| **8/31/2019 11:14:00 AM** | 0.07 | 0.07 | 0.04 | 0.00 | Pass | 0.37 | 0.32 | 0.07 | 0.053 | Pass |
| **Detector 7** | | | | | | | | | | |
| **8/30/2019 6:13:00 AM** | 0.22 | 0.06 | 0.07 | 0.16 | Pass | 0.48 | 0.40 | 0.08 | 0.082 | Pass |
| **8/31/2019 11:14:00 AM** | 0.18 | 0.06 | 0.07 | 0.11 | Pass | 0.47 | 0.40 | 0.08 | 0.067 | Pass |
| **Detector 8** | | | | | | | | | | |
| **8/30/2019 6:13:00 AM** | 0.03 | 0.04 | 0.03 | -0.01 | Pass | 0.32 | 0.33 | 0.10 | -0.006 | Pass |
| **8/31/2019 11:17:00 AM** | 0.08 | 0.04 | 0.03 | 0.05 | Pass | 0.30 | 0.33 | 0.10 | -0.027 | Pass |
| **Detector 9** | | | | | | | | | | |
| **8/30/2019 6:13:00 AM** | 0.12 | 0.05 | 0.03 | 0.07 | Pass | 0.27 | 0.33 | 0.07 | -0.060 | Pass |
| **8/31/2019 11:18:00 AM** | 0.10 | 0.05 | 0.03 | 0.05 | Pass | 0.48 | 0.33 | 0.07 | 0.145 | Pass |
| **Detector 10** | | | | | | | | | | |
| **8/30/2019 6:13:00 AM** | 0.10 | 0.05 | 0.04 | 0.05 | Pass | 0.43 | 0.43 | 0.09 | 0.000 | Pass |
| **8/31/2019 11:22:00 AM** | 0.04 | 0.05 | 0.04 | -0.02 | Pass | 0.40 | 0.43 | 0.09 | -0.030 | Pass |

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# Gas Proportional Counter Daily Quality Control Checks

## *Instrument: Red*

| | AlphaBKG CPM | BKG Mean | BKG +/- limit | BKG Deviation | BKG Flag | BetaBKG CPM | BetaBKG Mean | BetaBKG +/- limit | BetaBKG Deviation | BetaBKG Flag |
|---|---|---|---|---|---|---|---|---|---|---|
| **Detector 11** | | | | | | | | | | |
| **8/30/2019 6:13:00 AM** | 0.10 | 0.05 | 0.08 | 0.04 | Pass | 0.48 | 0.58 | 0.19 | -0.102 | Pass |
| **8/31/2019 11:18:00 AM** | 0.08 | 0.05 | 0.08 | 0.03 | Pass | 0.44 | 0.58 | 0.19 | -0.137 | Pass |
| **Detector 12** | | | | | | | | | | |
| **8/30/2019 6:13:00 AM** | 0.16 | 0.04 | 0.02 | 0.12 | FAIL | 0.42 | 0.57 | 0.10 | -0.156 | Pass |
| **8/30/2019 10:35:00 AM** | 0.05 | 0.04 | 0.02 | 0.01 | Pass | 0.73 | 0.57 | 0.10 | 0.154 | Pass |
| **8/31/2019 11:18:00 AM** | 0.10 | 0.04 | 0.02 | 0.06 | Pass | 0.62 | 0.57 | 0.10 | 0.044 | Pass |
| **Detector 13** | | | | | | | | | | |
| **8/30/2019 6:13:00 AM** | 0.08 | 0.04 | 0.02 | 0.03 | Pass | 0.44 | 0.45 | 0.13 | -0.010 | Pass |
| **8/31/2019 11:18:00 AM** | 0.09 | 0.04 | 0.02 | 0.04 | Pass | 0.45 | 0.45 | 0.13 | 0.000 | Pass |
| **Detector 14** | | | | | | | | | | |
| **8/30/2019 6:13:00 AM** | 0.09 | 0.04 | 0.03 | 0.04 | Pass | 0.62 | 0.59 | 0.08 | 0.027 | Pass |
| **8/31/2019 11:18:00 AM** | 0.09 | 0.04 | 0.03 | 0.04 | Pass | 0.47 | 0.59 | 0.08 | -0.128 | Pass |
| **Detector 15** | | | | | | | | | | |
| **8/30/2019 6:13:00 AM** | 0.08 | 0.04 | 0.02 | 0.04 | Pass | 0.36 | 0.38 | 0.08 | -0.023 | Pass |
| **8/31/2019 11:19:00 AM** | 0.06 | 0.04 | 0.02 | 0.02 | Pass | 0.46 | 0.38 | 0.08 | 0.077 | Pass |
| **Detector 16** | | | | | | | | | | |
| **8/30/2019 6:13:00 AM** | 0.12 | 0.04 | 0.03 | 0.08 | FAIL | 0.57 | 0.37 | 0.08 | 0.197 | Pass |
| **8/30/2019 10:35:00 AM** | 0.09 | 0.04 | 0.03 | 0.05 | Pass | 0.43 | 0.37 | 0.08 | 0.062 | Pass |
| **8/31/2019 11:15:00 AM** | 0.07 | 0.04 | 0.03 | 0.03 | Pass | 0.45 | 0.37 | 0.08 | 0.082 | Pass |
| **Detector 17** | | | | | | | | | | |
| **8/30/2019 6:13:00 AM** | 0.06 | 0.05 | 0.03 | 0.00 | Pass | 0.25 | 0.31 | 0.06 | -0.062 | Pass |
| **8/31/2019 11:15:00 AM** | 0.05 | 0.05 | 0.03 | 0.00 | Pass | 0.40 | 0.31 | 0.06 | 0.084 | Pass |
| **Detector 18** | | | | | | | | | | |
| **8/30/2019 6:13:00 AM** | 0.08 | 0.04 | 0.03 | 0.04 | Pass | 0.21 | 0.29 | 0.07 | -0.077 | Pass |
| **8/31/2019 11:15:00 AM** | 0.09 | 0.04 | 0.03 | 0.05 | Pass | 0.35 | 0.29 | 0.07 | 0.058 | Pass |
| **Detector 19** | | | | | | | | | | |
| **8/30/2019 6:13:00 AM** | 0.07 | 0.05 | 0.03 | 0.02 | Pass | 0.38 | 0.38 | 0.07 | -0.004 | Pass |
| **8/31/2019 11:16:00 AM** | 0.10 | 0.05 | 0.03 | 0.05 | Pass | 0.37 | 0.38 | 0.07 | -0.014 | Pass |
| **Detector 20** | | | | | | | | | | |
| **8/30/2019 6:13:00 AM** | 0.10 | 0.04 | 0.03 | 0.06 | Pass | 0.52 | 0.40 | 0.07 | 0.122 | Pass |
| **8/31/2019 11:15:00 AM** | 0.10 | 0.04 | 0.03 | 0.06 | Pass | 0.45 | 0.40 | 0.07 | 0.052 | Pass |

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# Gas Proportional Counter Daily Quality Control Checks

***Instrument: Red***

| | AlphaBKG CPM | BKG Mean | BKG +/- limit | BKG Deviation | BKG Flag | BetaBKG CPM | BetaBKG Mean | BetaBKG +/- limit | BetaBKG Deviation | BetaBKG Flag |
|---|---|---|---|---|---|---|---|---|---|---|
| **Detector 21** | | | | | | | | | | |
| **8/30/2019 6:13:00 AM** | 0.10 | 0.04 | 0.03 | 0.06 | Pass | 0.51 | 0.36 | 0.06 | 0.145 | Pass |
| **8/31/2019 11:15:00 AM** | 0.10 | 0.04 | 0.03 | 0.06 | Pass | 0.46 | 0.36 | 0.06 | 0.095 | Pass |
| **Detector 22** | | | | | | | | | | |
| **8/30/2019 6:13:00 AM** | 0.16 | 0.09 | 0.03 | 0.07 | Pass | 0.63 | 0.44 | 0.07 | 0.181 | Pass |
| **8/31/2019 11:15:00 AM** | 0.11 | 0.09 | 0.03 | 0.02 | Pass | 0.56 | 0.44 | 0.07 | 0.111 | Pass |
| **Detector 23** | | | | | | | | | | |
| **8/30/2019 6:13:00 AM** | 0.16 | 0.04 | 0.02 | 0.12 | **FAIL** | 0.62 | 0.37 | 0.06 | 0.246 | **FAIL** |
| **8/30/2019 10:35:00 AM** | 0.04 | 0.04 | 0.02 | 0.00 | Pass | 0.42 | 0.37 | 0.06 | 0.041 | Pass |
| **8/31/2019 11:16:00 AM** | 0.11 | 0.04 | 0.02 | 0.07 | **FAIL** | 0.47 | 0.37 | 0.06 | 0.096 | Pass |

**The Alpha and Beta +/- limit are based upon initial 20-point population.**

**The Alpha and Beta +/- limit for Efficiency is stated at 3%. Flags are "FAIL" > 3%.**

**The Alpha and Beta +/- limit for Background is stated at 1 StDev. Flags are "FAIL" > 3 StDev.**

**The Alpha +/- limit for Crosstalk is stated at 1 StDev. Flags are "Warning > 2 StDev and "DOEF" > 3 StDev. Beta is negligible, for trend only ("NA").**

**Times shown reflect the end of the count duration.**

**APPROVED**
*By Conrad Reuscher at 4:15 pm, Sep 05, 2019*

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# Gas Proportional Counter Daily Quality Control Checks

***Instrument: Blue***

| | Alpha CPM | Alpha Mean | Alpha +/- limit | Alpha Deviation | Alpha Flag | A>>B XT CPM | A>>B XT Mean | A>>B XT +/- limit | A>>B XT Deviation | A>>B XT Flag |
|---|---|---|---|---|---|---|---|---|---|---|
| **Check Type = Alpha** | | | | | | | | | | |
| **Detector 0** | | | | | | | | | | |
| **8/31/2019 8:47:00 AM** | 11581.05 | 11687.23 | 350.62 | -106.18 | Pass | 4399.00 | 4369.78 | 44.00 | 29.225 | Pass |
| **9/1/2019 9:53:00 AM** | 11538.10 | 11687.23 | 350.62 | -149.13 | Pass | 4363.50 | 4369.78 | 44.00 | -6.275 | Pass |
| **Detector 1** | | | | | | | | | | |
| **8/31/2019 8:47:00 AM** | 12560.14 | 12660.45 | 379.81 | -100.31 | Pass | 4613.00 | 4639.33 | 62.38 | -26.325 | Pass |
| **9/1/2019 9:53:00 AM** | 12411.68 | 12660.45 | 379.81 | -248.77 | Pass | 4666.50 | 4639.33 | 62.38 | 27.175 | Pass |
| **Detector 2** | | | | | | | | | | |
| **8/31/2019 8:47:00 AM** | 12730.65 | 12819.28 | 384.58 | -88.62 | Pass | 4810.00 | 4776.73 | 60.67 | 33.275 | Pass |
| **9/1/2019 9:53:00 AM** | 12780.21 | 12819.28 | 384.58 | -39.06 | Pass | 4818.50 | 4776.73 | 60.67 | 41.775 | Pass |
| **Detector 3** | | | | | | | | | | |
| **8/31/2019 8:47:00 AM** | 12667.13 | 12695.28 | 380.86 | -28.14 | Pass | 4513.00 | 4545.10 | 50.19 | -32.100 | Pass |
| **9/1/2019 9:53:00 AM** | 12597.18 | 12695.28 | 380.86 | -98.10 | Pass | 4580.00 | 4545.10 | 50.19 | 34.900 | Pass |
| **Detector 4** | | | | | | | | | | |
| **8/31/2019 8:47:00 AM** | 15829.92 | 15947.40 | 478.42 | -117.48 | Pass | 6219.00 | 6010.63 | 170.60 | 208.375 | Pass |
| **9/1/2019 9:53:00 AM** | 15894.50 | 15947.40 | 478.42 | -52.90 | Pass | 6155.50 | 6010.63 | 170.60 | 144.875 | Pass |
| **Detector 5** | | | | | | | | | | |
| **8/31/2019 8:47:00 AM** | 16057.94 | 16232.73 | 486.98 | -174.78 | Pass | 5979.50 | 5886.28 | 70.81 | 93.225 | Pass |
| **9/1/2019 9:53:00 AM** | 15296.44 | 16232.73 | 486.98 | -936.28 | **FAIL** | 5363.50 | 5886.28 | 70.81 | -522.775 | **DOEF** |
| **Detector 6** | | | | | | | | | | |
| **8/31/2019 8:47:00 AM** | 14449.78 | 14681.80 | 440.45 | -232.02 | Pass | 5376.00 | 5388.75 | 56.94 | -12.750 | Pass |
| **9/1/2019 9:54:00 AM** | 14619.86 | 14681.80 | 440.45 | -61.94 | Pass | 5345.00 | 5388.75 | 56.94 | -43.750 | Pass |
| **Detector 7** | | | | | | | | | | |
| **8/31/2019 8:47:00 AM** | 14682.31 | 14832.35 | 444.97 | -150.04 | Pass | 5410.50 | 5352.95 | 57.41 | 57.550 | Pass |
| **9/1/2019 9:54:00 AM** | 14811.89 | 14832.35 | 444.97 | -20.46 | Pass | 5429.50 | 5352.95 | 57.41 | 76.550 | Pass |
| **Detector 8** | | | | | | | | | | |
| **8/31/2019 8:50:00 AM** | 11461.02 | 11576.25 | 347.29 | -115.23 | Pass | 4450.00 | 4391.63 | 40.19 | 58.375 | Pass |
| **9/1/2019 9:58:00 AM** | 11354.06 | 11576.25 | 347.29 | -222.19 | Pass | 4435.50 | 4391.63 | 40.19 | 43.875 | Pass |
| **Detector 9** | | | | | | | | | | |
| **8/31/2019 8:50:00 AM** | 12440.61 | 12556.93 | 376.71 | -116.32 | Pass | 4806.50 | 4786.65 | 49.55 | 19.850 | Pass |
| **9/1/2019 9:58:00 AM** | 12373.66 | 12556.93 | 376.71 | -183.27 | Pass | 4737.50 | 4786.65 | 49.55 | -49.150 | Pass |
| **Detector 10** | | | | | | | | | | |
| **8/31/2019 8:50:00 AM** | 12935.15 | 12963.10 | 388.89 | -27.95 | Pass | 4909.00 | 4837.70 | 61.92 | 71.300 | Pass |
| **9/1/2019 9:59:00 AM** | 13090.22 | 12963.10 | 388.89 | 127.12 | Pass | 4910.50 | 4837.70 | 61.92 | 72.800 | Pass |

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# Gas Proportional Counter Daily Quality Control Checks

## *Instrument: Blue*

| | Alpha CPM | Alpha Mean | Alpha +/- limit | Alpha Deviation | Alpha Flag | A>>B XT CPM | A>>B XT Mean | A>>B XT +/- limit | A>>B XT Deviation | A>>B XT Flag |
|---|---|---|---|---|---|---|---|---|---|---|
| **Detector 11** | | | | | | | | | | |
| **8/31/2019 8:50:00 AM** | 12602.13 | 12659.60 | 379.79 | -57.47 | Pass | 4767.50 | 4751.65 | 71.92 | 15.850 | Pass |
| **9/1/2019 9:59:00 AM** | 12532.68 | 12659.60 | 379.79 | -126.92 | Pass | 4801.00 | 4751.65 | 71.92 | 49.350 | Pass |
| **Detector 12** | | | | | | | | | | |
| **8/31/2019 8:51:00 AM** | 15166.35 | 15436.53 | 463.10 | -270.17 | Pass | 6969.50 | 6853.73 | 91.51 | 115.775 | Pass |
| **9/1/2019 9:59:00 AM** | 15207.92 | 15436.53 | 463.10 | -228.60 | Pass | 6962.50 | 6853.73 | 91.51 | 108.775 | Pass |
| **Detector 13** | | | | | | | | | | |
| **8/31/2019 8:51:00 AM** | 16749.49 | 16942.28 | 508.27 | -192.78 | Pass | 5398.50 | 5324.63 | 67.75 | 73.875 | Pass |
| **9/1/2019 9:59:00 AM** | 16851.58 | 16942.28 | 508.27 | -90.70 | Pass | 5266.00 | 5324.63 | 67.75 | -58.625 | Pass |
| **Detector 14** | | | | | | | | | | |
| **8/31/2019 8:51:00 AM** | 13775.73 | 14060.75 | 421.82 | -285.02 | Pass | 6271.50 | 6110.60 | 310.42 | 160.900 | Pass |
| **9/1/2019 9:59:00 AM** | 13712.78 | 14060.75 | 421.82 | -347.97 | Pass | 6250.50 | 6110.60 | 310.42 | 139.900 | Pass |
| **Detector 15** | | | | | | | | | | |
| **8/31/2019 8:51:00 AM** | 14090.26 | 14067.33 | 422.02 | 22.93 | Pass | 6101.00 | 5856.58 | 128.86 | 244.425 | Pass |
| **9/1/2019 9:59:00 AM** | 14012.81 | 14067.33 | 422.02 | -54.51 | Pass | 6070.00 | 5856.58 | 128.86 | 213.425 | Pass |
| **Detector 16** | | | | | | | | | | |
| **8/31/2019 8:55:00 AM** | 11598.53 | 11644.40 | 349.33 | -45.87 | Pass | 4470.00 | 4442.73 | 57.31 | 27.275 | Pass |
| **9/1/2019 10:09:00 AM** | 11642.09 | 11644.40 | 349.33 | -2.31 | Pass | 4499.50 | 4442.73 | 57.31 | 56.775 | Pass |
| **Detector 17** | | | | | | | | | | |
| **8/31/2019 8:55:00 AM** | 12569.62 | 12769.60 | 383.09 | -199.98 | Pass | 4668.00 | 4694.90 | 44.72 | -26.900 | Pass |
| **9/1/2019 10:09:00 AM** | 12528.17 | 12769.60 | 383.09 | -241.43 | Pass | 4711.00 | 4694.90 | 44.72 | 16.100 | Pass |
| **Detector 18** | | | | | | | | | | |
| **8/31/2019 8:55:00 AM** | 12879.65 | 13168.68 | 395.06 | -289.03 | Pass | 4720.00 | 4634.05 | 64.62 | 85.950 | Pass |
| **9/1/2019 10:09:00 AM** | 13106.73 | 13168.68 | 395.06 | -61.95 | Pass | 4778.50 | 4634.05 | 64.62 | 144.450 | **WARNING** |
| **Detector 19** | | | | | | | | | | |
| **8/31/2019 8:55:00 AM** | 12688.62 | 12692.53 | 380.78 | -3.90 | Pass | 4681.00 | 4577.53 | 110.81 | 103.475 | Pass |
| **9/1/2019 10:09:00 AM** | 12618.67 | 12692.53 | 380.78 | -73.85 | Pass | 4828.50 | 4577.53 | 110.81 | 250.975 | **WARNING** |
| **Detector 20** | | | | | | | | | | |
| **8/31/2019 8:55:00 AM** | 15016.82 | 15429.63 | 462.89 | -412.81 | Pass | 7414.50 | 7112.73 | 112.02 | 301.775 | **WARNING** |
| **9/1/2019 10:09:00 AM** | 15000.38 | 15429.63 | 462.89 | -429.24 | Pass | 7476.00 | 7112.73 | 112.02 | 363.275 | **DOEF** |
| **Detector 21** | | | | | | | | | | |
| **8/31/2019 8:55:00 AM** | 15479.36 | 15659.78 | 469.79 | -180.42 | Pass | 6707.50 | 6551.25 | 94.85 | 156.250 | Pass |
| **9/1/2019 10:09:00 AM** | 15396.92 | 15659.78 | 469.79 | -262.86 | Pass | 6728.00 | 6551.25 | 94.85 | 176.750 | Pass |

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# Gas Proportional Counter Daily Quality Control Checks

***Instrument: Blue***

| | Alpha CPM | Alpha Mean | Alpha +/- limit | Alpha Deviation | Alpha Flag | A>>B XT CPM | A>>B XT Mean | A>>B XT +/- limit | A>>B XT Deviation | A>>B XT Flag |
|---|---|---|---|---|---|---|---|---|---|---|
| **Detector 22** | | | | | | | | | | |
| **8/31/2019 8:55:00 AM** | 13766.21 | 13972.80 | 419.18 | -206.59 | Pass | 6574.00 | 6401.03 | 87.63 | 172.975 | Pass |
| **9/1/2019 10:09:00 AM** | 13508.74 | 13972.80 | 419.18 | -464.06 | **FAIL** | 6648.50 | 6401.03 | 87.63 | 247.475 | **WARNING** |
| **Detector 23** | | | | | | | | | | |
| **8/31/2019 8:55:00 AM** | 13853.60 | 14123.95 | 423.72 | -270.35 | Pass | 6684.50 | 6632.90 | 79.57 | 51.600 | Pass |
| **9/1/2019 10:09:00 AM** | 13771.16 | 14123.95 | 423.72 | -352.79 | Pass | 6898.00 | 6632.90 | 79.57 | 265.100 | **DOEF** |

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# Gas Proportional Counter Daily Quality Control Checks

***Instrument: Blue***

| | Beta CPM | Beta Mean | Beta +/- limit | Beta Deviation | Beta Flag | B>>A XT CPM | B>>A XT Mean | B>>A XT +/- limit | B>>A XT Deviation | B>>A XT Flag |
|---|---|---|---|---|---|---|---|---|---|---|
| **Check Type = Beta** | | | | | | | | | | |
| **Detector 0** | | | | | | | | | | |
| **8/31/2019 8:28:00 AM** | 50261.47 | 50552.05 | 1516.56 | -290.58 | Pass | NA | NA | NA | NA | NA |
| **9/1/2019 9:58:00 AM** | 50407.64 | 50552.05 | 1516.56 | -144.41 | Pass | NA | NA | NA | NA | NA |
| **Detector 1** | | | | | | | | | | |
| **8/31/2019 8:28:00 AM** | 48402.34 | 47641.23 | 1429.24 | 761.11 | Pass | NA | NA | NA | NA | NA |
| **9/1/2019 9:58:00 AM** | 48083.34 | 47641.23 | 1429.24 | 442.11 | Pass | NA | NA | NA | NA | NA |
| **Detector 2** | | | | | | | | | | |
| **8/31/2019 8:28:00 AM** | 49756.15 | 49734.44 | 1492.03 | 21.71 | Pass | NA | NA | NA | NA | NA |
| **9/1/2019 9:58:00 AM** | 50043.59 | 49734.44 | 1492.03 | 309.15 | Pass | NA | NA | NA | NA | NA |
| **Detector 3** | | | | | | | | | | |
| **8/31/2019 8:28:00 AM** | 59592.80 | 60167.98 | 1805.04 | -575.18 | Pass | NA | NA | NA | NA | NA |
| **9/1/2019 9:58:00 AM** | 59586.31 | 60167.98 | 1805.04 | -581.67 | Pass | NA | NA | NA | NA | NA |
| **Detector 4** | | | | | | | | | | |
| **8/31/2019 8:29:00 AM** | 54256.45 | 55277.35 | 1658.32 | -1020.90 | Pass | NA | NA | NA | NA | NA |
| **9/1/2019 9:58:00 AM** | 55607.17 | 55277.35 | 1658.32 | 329.82 | Pass | NA | NA | NA | NA | NA |
| **Detector 5** | | | | | | | | | | |
| **8/31/2019 8:29:00 AM** | 55110.87 | 55004.03 | 1650.12 | 106.84 | Pass | NA | NA | NA | NA | NA |
| **9/1/2019 9:58:00 AM** | 54745.40 | 55004.03 | 1650.12 | -258.63 | Pass | NA | NA | NA | NA | NA |
| **Detector 6** | | | | | | | | | | |
| **8/31/2019 8:29:00 AM** | 52105.36 | 52072.68 | 1562.18 | 32.68 | Pass | NA | NA | NA | NA | NA |
| **9/1/2019 9:58:00 AM** | 51677.03 | 52072.68 | 1562.18 | -395.65 | Pass | NA | NA | NA | NA | NA |
| **Detector 7** | | | | | | | | | | |
| **8/31/2019 8:29:00 AM** | 45244.38 | 44302.58 | 1329.08 | 941.81 | Pass | NA | NA | NA | NA | NA |
| **9/1/2019 9:58:00 AM** | 45594.64 | 44302.58 | 1329.08 | 1292.06 | Pass | NA | NA | NA | NA | NA |
| **Detector 8** | | | | | | | | | | |
| **8/31/2019 8:22:00 AM** | 50280.26 | 49959.33 | 1498.78 | 320.94 | Pass | NA | NA | NA | NA | NA |
| **9/1/2019 9:54:00 AM** | 50026.57 | 49959.33 | 1498.78 | 67.24 | Pass | NA | NA | NA | NA | NA |
| **Detector 9** | | | | | | | | | | |
| **8/31/2019 8:22:00 AM** | 48698.72 | 47696.08 | 1430.88 | 1002.64 | Pass | NA | NA | NA | NA | NA |
| **9/1/2019 9:54:00 AM** | 48474.11 | 47696.08 | 1430.88 | 778.03 | Pass | NA | NA | NA | NA | NA |
| **Detector 10** | | | | | | | | | | |
| **8/31/2019 8:22:00 AM** | 50619.94 | 50136.65 | 1504.10 | 483.29 | Pass | NA | NA | NA | NA | NA |
| **9/1/2019 9:54:00 AM** | 50613.90 | 50136.65 | 1504.10 | 477.25 | Pass | NA | NA | NA | NA | NA |

# Gas Proportional Counter Daily Quality Control Checks

## *Instrument: Blue*

| | Beta CPM | Beta Mean | Beta +/- limit | Beta Deviation | Beta Flag | B>>A XT CPM | B>>A XT Mean | B>>A XT +/- limit | B>>A XT Deviation | B>>A XT Flag |
|---|---|---|---|---|---|---|---|---|---|---|
| **Detector 11** | | | | | | | | | | |
| **8/31/2019 8:22:00 AM** | 59667.53 | 59951.55 | 1798.55 | -284.02 | Pass | NA | NA | NA | NA | NA |
| **9/1/2019 9:54:00 AM** | 60115.66 | 59951.55 | 1798.55 | 164.11 | Pass | NA | NA | NA | NA | NA |
| **Detector 12** | | | | | | | | | | |
| **8/31/2019 8:23:00 AM** | 55833.72 | 56070.40 | 1682.11 | -236.68 | Pass | NA | NA | NA | NA | NA |
| **9/1/2019 9:55:00 AM** | 56145.56 | 56070.40 | 1682.11 | 75.16 | Pass | NA | NA | NA | NA | NA |
| **Detector 13** | | | | | | | | | | |
| **8/31/2019 8:23:00 AM** | 55065.20 | 55607.20 | 1668.22 | -542.00 | Pass | NA | NA | NA | NA | NA |
| **9/1/2019 9:55:00 AM** | 55042.96 | 55607.20 | 1668.22 | -564.24 | Pass | NA | NA | NA | NA | NA |
| **Detector 14** | | | | | | | | | | |
| **8/31/2019 8:23:00 AM** | 50966.23 | 50580.03 | 1517.40 | 386.21 | Pass | NA | NA | NA | NA | NA |
| **9/1/2019 9:55:00 AM** | 50641.49 | 50580.03 | 1517.40 | 61.46 | Pass | NA | NA | NA | NA | NA |
| **Detector 15** | | | | | | | | | | |
| **8/31/2019 8:23:00 AM** | 44950.83 | 45674.43 | 1370.23 | -723.60 | Pass | NA | NA | NA | NA | NA |
| **9/1/2019 9:55:00 AM** | 45011.15 | 45674.43 | 1370.23 | -663.28 | Pass | NA | NA | NA | NA | NA |
| **Detector 16** | | | | | | | | | | |
| **8/31/2019 8:15:00 AM** | 49868.49 | 49653.23 | 1489.60 | 215.27 | Pass | NA | NA | NA | NA | NA |
| **9/1/2019 10:02:00 AM** | 49683.09 | 49653.23 | 1489.60 | 29.87 | Pass | NA | NA | NA | NA | NA |
| **Detector 17** | | | | | | | | | | |
| **8/31/2019 8:15:00 AM** | 48556.69 | 48166.13 | 1444.98 | 390.57 | Pass | NA | NA | NA | NA | NA |
| **9/1/2019 10:03:00 AM** | 48269.50 | 48166.13 | 1444.98 | 103.37 | Pass | NA | NA | NA | NA | NA |
| **Detector 18** | | | | | | | | | | |
| **8/31/2019 8:16:00 AM** | 50018.46 | 49957.23 | 1498.72 | 61.24 | Pass | NA | NA | NA | NA | NA |
| **9/1/2019 10:03:00 AM** | 50059.15 | 49957.23 | 1498.72 | 101.93 | Pass | NA | NA | NA | NA | NA |
| **Detector 19** | | | | | | | | | | |
| **8/31/2019 8:16:00 AM** | 59524.69 | 59167.80 | 1775.03 | 356.89 | Pass | NA | NA | NA | NA | NA |
| **9/1/2019 10:03:00 AM** | 59845.07 | 59167.80 | 1775.03 | 677.27 | Pass | NA | NA | NA | NA | NA |
| **Detector 20** | | | | | | | | | | |
| **8/31/2019 8:16:00 AM** | 56725.40 | 57321.08 | 1719.63 | -595.67 | Pass | NA | NA | NA | NA | NA |
| **9/1/2019 10:03:00 AM** | 56416.98 | 57321.08 | 1719.63 | -904.10 | Pass | NA | NA | NA | NA | NA |
| **Detector 21** | | | | | | | | | | |
| **8/31/2019 8:16:00 AM** | 54682.97 | 55281.80 | 1658.45 | -598.83 | Pass | NA | NA | NA | NA | NA |
| **9/1/2019 10:03:00 AM** | 54423.53 | 55281.80 | 1658.45 | -858.27 | Pass | NA | NA | NA | NA | NA |

# Gas Proportional Counter Daily Quality Control Checks

***Instrument: Blue***

| | Beta CPM | Beta Mean | Beta +/- limit | Beta Deviation | Beta Flag | B>>A XT CPM | B>>A XT Mean | B>>A XT +/- limit | B>>A XT Deviation | B>>A XT Flag |
|---|---|---|---|---|---|---|---|---|---|---|
| **Detector 22** | | | | | | | | | | |
| **8/31/2019 8:16:00 AM** | 52002.04 | 52477.75 | 1574.33 | -475.71 | Pass | NA | NA | NA | NA | NA |
| **9/1/2019 10:03:00 AM** | 51777.88 | 52477.75 | 1574.33 | -699.87 | Pass | NA | NA | NA | NA | NA |
| **Detector 23** | | | | | | | | | | |
| **8/31/2019 8:17:00 AM** | 45400.41 | 46160.75 | 1384.82 | -760.34 | Pass | NA | NA | NA | NA | NA |
| **9/1/2019 10:04:00 AM** | 45659.23 | 46160.75 | 1384.82 | -501.52 | Pass | NA | NA | NA | NA | NA |

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# Gas Proportional Counter Daily Quality Control Checks

***Instrument: Blue***

| | AlphaBKG CPM | BKG Mean | BKG +/- limit | BKG Deviation | BKG Flag | BetaBKG CPM | BetaBKG Mean | BetaBKG +/- limit | BetaBKG Deviation | BetaBKG Flag |
|---|---|---|---|---|---|---|---|---|---|---|
| **Check Type = BKG** | | | | | | | | | | |
| **Detector 0** | | | | | | | | | | |
| **8/31/2019 12:36:00 PM** | 0.12 | 0.14 | 0.03 | -0.02 | Pass | 0.41 | 0.49 | 0.08 | -0.084 | Pass |
| **9/1/2019 1:21:00 PM** | 0.20 | 0.14 | 0.03 | 0.06 | Pass | 0.45 | 0.49 | 0.08 | -0.044 | Pass |
| **Detector 1** | | | | | | | | | | |
| **8/31/2019 12:36:00 PM** | 0.17 | 0.15 | 0.02 | 0.02 | Pass | 0.33 | 0.44 | 0.07 | -0.108 | Pass |
| **9/1/2019 1:22:00 PM** | 0.24 | 0.15 | 0.02 | 0.09 | **FAIL** | 0.35 | 0.44 | 0.07 | -0.093 | Pass |
| **Detector 2** | | | | | | | | | | |
| **8/31/2019 12:36:00 PM** | 0.28 | 0.08 | 0.05 | 0.20 | **FAIL** | 0.46 | 0.42 | 0.08 | 0.031 | Pass |
| **9/1/2019 1:22:00 PM** | 0.27 | 0.08 | 0.05 | 0.19 | **FAIL** | 0.58 | 0.42 | 0.08 | 0.151 | Pass |
| **Detector 3** | | | | | | | | | | |
| **8/31/2019 12:36:00 PM** | 0.14 | 0.06 | 0.04 | 0.07 | Pass | 0.52 | 0.41 | 0.08 | 0.109 | Pass |
| **9/1/2019 1:22:00 PM** | 0.17 | 0.06 | 0.04 | 0.10 | Pass | 0.57 | 0.41 | 0.08 | 0.164 | Pass |
| **Detector 4** | | | | | | | | | | |
| **8/31/2019 12:36:00 PM** | 0.29 | 0.11 | 0.04 | 0.17 | **FAIL** | 0.46 | 0.40 | 0.08 | 0.055 | Pass |
| **9/1/2019 1:22:00 PM** | 0.21 | 0.11 | 0.04 | 0.10 | Pass | 0.53 | 0.40 | 0.08 | 0.125 | Pass |
| **Detector 5** | | | | | | | | | | |
| **8/31/2019 12:36:00 PM** | 0.20 | 0.11 | 0.04 | 0.09 | Pass | 0.26 | 0.41 | 0.08 | -0.154 | Pass |
| **Detector 6** | | | | | | | | | | |
| **8/31/2019 12:36:00 PM** | 0.16 | 0.14 | 0.04 | 0.01 | Pass | 0.32 | 0.42 | 0.05 | -0.099 | Pass |
| **9/1/2019 1:22:00 PM** | 0.24 | 0.14 | 0.04 | 0.10 | Pass | 0.35 | 0.42 | 0.05 | -0.074 | Pass |
| **Detector 7** | | | | | | | | | | |
| **8/31/2019 12:36:00 PM** | 0.11 | 0.10 | 0.04 | 0.01 | Pass | 0.47 | 0.49 | 0.12 | -0.016 | Pass |
| **9/1/2019 1:22:00 PM** | 0.27 | 0.10 | 0.04 | 0.17 | **FAIL** | 0.42 | 0.49 | 0.12 | -0.066 | Pass |
| **Detector 8** | | | | | | | | | | |
| **8/31/2019 12:36:00 PM** | 0.17 | 0.09 | 0.04 | 0.08 | Pass | 0.40 | 0.44 | 0.08 | -0.049 | Pass |
| **9/1/2019 1:22:00 PM** | 0.19 | 0.09 | 0.04 | 0.09 | Pass | 0.62 | 0.44 | 0.08 | 0.171 | Pass |
| **Detector 9** | | | | | | | | | | |
| **8/31/2019 12:36:00 PM** | 0.15 | 0.10 | 0.04 | 0.05 | Pass | 0.40 | 0.39 | 0.06 | 0.006 | Pass |
| **9/1/2019 1:22:00 PM** | 0.14 | 0.10 | 0.04 | 0.04 | Pass | 0.29 | 0.39 | 0.06 | -0.105 | Pass |
| **Detector 10** | | | | | | | | | | |
| **8/31/2019 12:36:00 PM** | 0.24 | 0.09 | 0.04 | 0.14 | **FAIL** | 0.33 | 0.33 | 0.08 | -0.001 | Pass |
| **9/1/2019 1:22:00 PM** | 0.15 | 0.09 | 0.04 | 0.05 | Pass | 0.29 | 0.33 | 0.08 | -0.041 | Pass |

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# Gas Proportional Counter Daily Quality Control Checks

***Instrument: Blue***

| | AlphaBKG CPM | BKG Mean | BKG +/- limit | BKG Deviation | BKG Flag | BetaBKG CPM | BetaBKG Mean | BetaBKG +/- limit | BetaBKG Deviation | BetaBKG Flag |
|---|---|---|---|---|---|---|---|---|---|---|
| **Detector 11** | | | | | | | | | | |
| **8/31/2019 12:36:00 PM** | 0.13 | 0.09 | 0.04 | 0.04 | Pass | 0.42 | 0.45 | 0.10 | -0.032 | Pass |
| **9/1/2019 1:22:00 PM** | 0.23 | 0.09 | 0.04 | 0.14 | **FAIL** | 0.54 | 0.45 | 0.10 | 0.088 | Pass |
| **Detector 12** | | | | | | | | | | |
| **8/31/2019 12:36:00 PM** | 0.14 | 0.11 | 0.03 | 0.02 | Pass | 0.33 | 0.44 | 0.11 | -0.115 | Pass |
| **9/1/2019 1:22:00 PM** | 0.20 | 0.11 | 0.03 | 0.09 | Pass | 0.41 | 0.44 | 0.11 | -0.035 | Pass |
| **Detector 13** | | | | | | | | | | |
| **8/31/2019 12:37:00 PM** | 0.12 | 0.09 | 0.05 | 0.03 | Pass | 0.35 | 0.40 | 0.09 | -0.045 | Pass |
| **9/1/2019 1:22:00 PM** | 0.10 | 0.09 | 0.05 | 0.00 | Pass | 0.44 | 0.40 | 0.09 | 0.045 | Pass |
| **Detector 14** | | | | | | | | | | |
| **8/31/2019 12:37:00 PM** | 0.12 | 0.10 | 0.04 | 0.02 | Pass | 0.37 | 0.39 | 0.08 | -0.016 | Pass |
| **9/1/2019 1:22:00 PM** | 0.15 | 0.10 | 0.04 | 0.05 | Pass | 0.36 | 0.39 | 0.08 | -0.026 | Pass |
| **Detector 15** | | | | | | | | | | |
| **8/31/2019 12:37:00 PM** | 0.21 | 0.09 | 0.04 | 0.12 | Pass | 0.37 | 0.44 | 0.07 | -0.070 | Pass |
| **9/1/2019 1:22:00 PM** | 0.14 | 0.09 | 0.04 | 0.05 | Pass | 0.51 | 0.44 | 0.07 | 0.070 | Pass |
| **Detector 16** | | | | | | | | | | |
| **8/31/2019 12:37:00 PM** | 0.21 | 0.10 | 0.05 | 0.11 | Pass | 5.45 | 1.85 | 2.38 | 3.600 | Pass |
| **9/1/2019 1:34:00 PM** | 0.17 | 0.10 | 0.05 | 0.07 | Pass | 7.49 | 1.85 | 2.38 | 5.640 | Pass |
| **Detector 17** | | | | | | | | | | |
| **8/31/2019 12:37:00 PM** | 0.13 | 0.08 | 0.05 | 0.05 | Pass | 0.36 | 0.43 | 0.08 | -0.073 | Pass |
| **9/1/2019 1:34:00 PM** | 0.24 | 0.08 | 0.05 | 0.16 | **FAIL** | 0.43 | 0.43 | 0.08 | -0.003 | Pass |
| **Detector 18** | | | | | | | | | | |
| **8/31/2019 12:37:00 PM** | 0.91 | 0.05 | 0.03 | 0.85 | **FAIL** | 1.28 | 0.62 | 0.09 | 0.655 | **FAIL** |
| **9/1/2019 1:34:00 PM** | 0.96 | 0.05 | 0.03 | 0.91 | **FAIL** | 1.23 | 0.62 | 0.09 | 0.610 | **FAIL** |
| **Detector 19** | | | | | | | | | | |
| **8/31/2019 12:37:00 PM** | 0.23 | 0.10 | 0.03 | 0.12 | **FAIL** | 0.49 | 0.49 | 0.10 | -0.007 | Pass |
| **9/1/2019 1:34:00 PM** | 0.33 | 0.10 | 0.03 | 0.22 | **FAIL** | 0.41 | 0.49 | 0.10 | -0.087 | Pass |
| **Detector 20** | | | | | | | | | | |
| **8/31/2019 12:37:00 PM** | 0.20 | 0.05 | 0.04 | 0.15 | **FAIL** | 0.45 | 0.42 | 0.12 | 0.028 | Pass |
| **9/1/2019 1:34:00 PM** | 0.26 | 0.05 | 0.04 | 0.21 | **FAIL** | 0.51 | 0.42 | 0.12 | 0.088 | Pass |
| **Detector 21** | | | | | | | | | | |
| **8/31/2019 12:37:00 PM** | 0.37 | 0.05 | 0.03 | 0.32 | **FAIL** | 0.51 | 0.34 | 0.12 | 0.162 | Pass |
| **9/1/2019 1:34:00 PM** | 0.30 | 0.05 | 0.03 | 0.25 | **FAIL** | 0.60 | 0.34 | 0.12 | 0.257 | Pass |

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# Gas Proportional Counter Daily Quality Control Checks

***Instrument: Blue***

| | AlphaBKG CPM | BKG Mean | BKG +/- limit | BKG Deviation | BKG Flag | BetaBKG CPM | BetaBKG Mean | BetaBKG +/- limit | BetaBKG Deviation | BetaBKG Flag |
|---|---|---|---|---|---|---|---|---|---|---|
| **Detector 22** | | | | | | | | | | |
| **8/31/2019 12:37:00 PM** | 0.25 | 0.07 | 0.04 | 0.18 | FAIL | 0.50 | 0.40 | 0.06 | 0.094 | Pass |
| **9/1/2019 1:34:00 PM** | 0.18 | 0.07 | 0.04 | 0.10 | Pass | 0.47 | 0.40 | 0.06 | 0.064 | Pass |
| **Detector 23** | | | | | | | | | | |
| **8/31/2019 12:38:00 PM** | 0.52 | 0.05 | 0.02 | 0.47 | FAIL | 0.88 | 0.47 | 0.10 | 0.412 | FAIL |
| **9/1/2019 1:34:00 PM** | 0.41 | 0.05 | 0.02 | 0.36 | FAIL | 0.82 | 0.47 | 0.10 | 0.347 | FAIL |

**The Alpha and Beta +/- limit are based upon initial 20-point population.**

**The Alpha and Beta +/- limit for Efficiency is stated at 3%. Flags are "FAIL" > 3%.**

**The Alpha and Beta +/- limit for Background is stated at 1 StDev. Flags are "FAIL" > 3 StDev.**

**The Alpha +/- limit for Crosstalk is stated at 1 StDev. Flags are "Warning > 2 StDev and "DOEF" > 3 StDev. Beta is negligible, for trend only ("NA").**

**Times shown reflect the end of the count duration.**

**APPROVED**
*By Conrad Reuscher at 5:19 pm, Sep 09, 2019*

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# Gas Proportional Counter Daily Quality Control Checks

***Instrument: Blue***

| | Alpha CPM | Alpha Mean | Alpha +/- limit | Alpha Deviation | Alpha Flag | A>>B XT CPM | A>>B XT Mean | A>>B XT +/- limit | A>>B XT Deviation | A>>B XT Flag |
|---|---|---|---|---|---|---|---|---|---|---|
| **Check Type = Alpha** | | | | | | | | | | |
| **Detector 0** | | | | | | | | | | |
| **9/9/2019 2:05:00 AM** | 11627.01 | 11687.23 | 350.62 | -60.21 | Pass | 4449.00 | 4369.78 | 44.00 | 79.225 | Pass |
| **Detector 1** | | | | | | | | | | |
| **9/8/2019 8:14:00 AM** | 12574.58 | 12660.45 | 379.81 | -85.87 | Pass | 4535.50 | 4639.33 | 62.38 | -103.825 | Pass |
| **9/9/2019 2:05:00 AM** | 12646.65 | 12660.45 | 379.81 | -13.80 | Pass | 4675.00 | 4639.33 | 62.38 | 35.675 | Pass |
| **Detector 2** | | | | | | | | | | |
| **9/8/2019 8:14:00 AM** | 12700.60 | 12819.28 | 384.58 | -118.68 | Pass | 4759.50 | 4776.73 | 60.67 | -17.225 | Pass |
| **9/9/2019 2:05:00 AM** | 12637.14 | 12819.28 | 384.58 | -182.13 | Pass | 4827.00 | 4776.73 | 60.67 | 50.275 | Pass |
| **Detector 3** | | | | | | | | | | |
| **9/9/2019 2:05:00 AM** | 12683.13 | 12695.28 | 380.86 | -12.14 | Pass | 4631.50 | 4545.10 | 50.19 | 86.400 | Pass |
| **Detector 4** | | | | | | | | | | |
| **9/8/2019 8:14:00 AM** | 15808.98 | 15947.40 | 478.42 | -138.42 | Pass | 6247.00 | 6010.63 | 170.60 | 236.375 | Pass |
| **9/9/2019 2:04:00 AM** | 15576.51 | 15947.40 | 478.42 | -370.89 | Pass | 6421.00 | 6010.63 | 170.60 | 410.375 | **WARNING** |
| **Detector 5** | | | | | | | | | | |
| **9/8/2019 8:15:00 AM** | 16068.51 | 16232.73 | 486.98 | -164.22 | Pass | 5902.00 | 5886.28 | 70.81 | 15.725 | Pass |
| **9/9/2019 2:04:00 AM** | 16156.59 | 16232.73 | 486.98 | -76.14 | Pass | 6032.00 | 5886.28 | 70.81 | 145.725 | **WARNING** |
| **Detector 6** | | | | | | | | | | |
| **9/9/2019 2:04:00 AM** | 14539.87 | 14681.80 | 440.45 | -141.93 | Pass | 5442.00 | 5388.75 | 56.94 | 53.250 | Pass |
| **Detector 7** | | | | | | | | | | |
| **9/8/2019 8:15:00 AM** | 14667.32 | 14832.35 | 444.97 | -165.03 | Pass | 5428.00 | 5352.95 | 57.41 | 75.050 | Pass |
| **9/9/2019 2:04:00 AM** | 14583.38 | 14832.35 | 444.97 | -248.97 | Pass | 5464.00 | 5352.95 | 57.41 | 111.050 | Pass |
| **Detector 8** | | | | | | | | | | |
| **9/8/2019 8:21:00 AM** | 11514.43 | 11576.25 | 347.29 | -61.82 | Pass | 4450.00 | 4391.63 | 40.19 | 58.375 | Pass |
| **9/9/2019 2:07:00 AM** | 11420.97 | 11576.25 | 347.29 | -155.28 | Pass | 4465.00 | 4391.63 | 40.19 | 73.375 | Pass |
| **Detector 9** | | | | | | | | | | |
| **9/8/2019 8:21:00 AM** | 12400.04 | 12556.93 | 376.71 | -156.88 | Pass | 4797.00 | 4786.65 | 49.55 | 10.350 | Pass |
| **9/9/2019 2:07:00 AM** | 12621.12 | 12556.93 | 376.71 | 64.20 | Pass | 4828.50 | 4786.65 | 49.55 | 41.850 | Pass |
| **Detector 10** | | | | | | | | | | |
| **9/8/2019 8:21:00 AM** | 12801.09 | 12963.10 | 388.89 | -162.01 | Pass | 4806.00 | 4837.70 | 61.92 | -31.700 | Pass |
| **9/9/2019 2:07:00 AM** | 12814.65 | 12963.10 | 388.89 | -148.45 | Pass | 4851.50 | 4837.70 | 61.92 | 13.800 | Pass |
| **Detector 11** | | | | | | | | | | |
| **9/9/2019 2:07:00 AM** | 12461.61 | 12659.60 | 379.79 | -197.99 | Pass | 4833.50 | 4751.65 | 71.92 | 81.850 | Pass |

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# Gas Proportional Counter Daily Quality Control Checks

***Instrument: Blue***

| | Alpha CPM | Alpha Mean | Alpha +/- limit | Alpha Deviation | Alpha Flag | A>>B XT CPM | A>>B XT Mean | A>>B XT +/- limit | A>>B XT Deviation | A>>B XT Flag |
|---|---|---|---|---|---|---|---|---|---|---|
| **Detector 12** | | | | | | | | | | |
| **9/8/2019 8:21:00 AM** | 15297.90 | 15436.53 | 463.10 | -138.62 | Pass | 6832.00 | 6853.73 | 91.51 | -21.725 | Pass |
| **9/9/2019 2:08:00 AM** | 15198.96 | 15436.53 | 463.10 | -237.57 | Pass | 7032.50 | 6853.73 | 91.51 | 178.775 | Pass |
| **Detector 13** | | | | | | | | | | |
| **9/8/2019 8:21:00 AM** | 16736.58 | 16942.28 | 508.27 | -205.70 | Pass | 5444.50 | 5324.63 | 67.75 | 119.875 | Pass |
| **9/9/2019 2:08:00 AM** | 16555.63 | 16942.28 | 508.27 | -386.65 | Pass | 5317.00 | 5324.63 | 67.75 | -7.625 | Pass |
| **Detector 14** | | | | | | | | | | |
| **9/8/2019 8:21:00 AM** | 13712.70 | 14060.75 | 421.82 | -348.05 | Pass | 6146.00 | 6110.60 | 310.42 | 35.400 | Pass |
| **9/9/2019 2:08:00 AM** | 13510.24 | 14060.75 | 421.82 | -550.51 | **FAIL** | 6234.00 | 6110.60 | 310.42 | 123.400 | Pass |
| **9/9/2019 2:35:00 AM** | 13693.76 | 14060.75 | 421.82 | -366.99 | Pass | 6172.00 | 6110.60 | 310.42 | 61.400 | Pass |
| **9/9/2019 2:38:00 AM** | 13719.26 | 14060.75 | 421.82 | -341.49 | Pass | 6166.00 | 6110.60 | 310.42 | 55.400 | Pass |
| **Detector 15** | | | | | | | | | | |
| **9/8/2019 8:21:00 AM** | 13880.72 | 14067.33 | 422.02 | -186.60 | Pass | 5990.50 | 5856.58 | 128.86 | 133.925 | Pass |
| **9/9/2019 2:08:00 AM** | 13899.29 | 14067.33 | 422.02 | -168.04 | Pass | 6058.00 | 5856.58 | 128.86 | 201.425 | Pass |
| **Detector 16** | | | | | | | | | | |
| **9/9/2019 2:11:00 AM** | 11550.49 | 11644.40 | 349.33 | -93.91 | Pass | 4426.50 | 4442.73 | 57.31 | -16.225 | Pass |
| **Detector 17** | | | | | | | | | | |
| **9/8/2019 8:26:00 AM** | 12609.57 | 12769.60 | 383.09 | -160.03 | Pass | 4733.50 | 4694.90 | 44.72 | 38.600 | Pass |
| **9/9/2019 2:11:00 AM** | 12529.61 | 12769.60 | 383.09 | -239.99 | Pass | 4742.00 | 4694.90 | 44.72 | 47.100 | Pass |
| **Detector 18** | | | | | | | | | | |
| **9/9/2019 2:11:00 AM** | 12949.17 | 13168.68 | 395.06 | -219.51 | Pass | 4682.50 | 4634.05 | 64.62 | 48.450 | Pass |
| **Detector 19** | | | | | | | | | | |
| **9/8/2019 8:26:00 AM** | 12408.04 | 12692.53 | 380.78 | -284.49 | Pass | 4656.50 | 4577.53 | 110.81 | 78.975 | Pass |
| **9/9/2019 2:11:00 AM** | 12613.62 | 12692.53 | 380.78 | -78.91 | Pass | 4782.50 | 4577.53 | 110.81 | 204.975 | Pass |
| **Detector 20** | | | | | | | | | | |
| **9/9/2019 2:11:00 AM** | 15115.42 | 15429.63 | 462.89 | -314.20 | Pass | 7266.50 | 7112.73 | 112.02 | 153.775 | Pass |
| **Detector 21** | | | | | | | | | | |
| **9/9/2019 2:11:00 AM** | 15309.45 | 15659.78 | 469.79 | -350.33 | Pass | 6716.50 | 6551.25 | 94.85 | 165.250 | Pass |
| **Detector 22** | | | | | | | | | | |
| **9/9/2019 2:11:00 AM** | 13677.24 | 13972.80 | 419.18 | -295.56 | Pass | 6627.00 | 6401.03 | 87.63 | 225.975 | **WARNING** |
| **Detector 23** | | | | | | | | | | |
| **9/9/2019 2:11:00 AM** | 13856.65 | 14123.95 | 423.72 | -267.30 | Pass | 6691.00 | 6632.90 | 79.57 | 58.100 | Pass |

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# Gas Proportional Counter Daily Quality Control Checks

***Instrument: Blue***

| | Beta CPM | Beta Mean | Beta +/- limit | Beta Deviation | Beta Flag | B>>A XT CPM | B>>A XT Mean | B>>A XT +/- limit | B>>A XT Deviation | B>>A XT Flag |
|---|---|---|---|---|---|---|---|---|---|---|
| **Check Type = Beta** | | | | | | | | | | |
| **Detector 0** | | | | | | | | | | |
| **9/9/2019 1:51:00 AM** | 50176.58 | 50552.05 | 1516.56 | -375.47 | Pass | NA | NA | NA | NA | NA |
| **Detector 1** | | | | | | | | | | |
| **9/8/2019 8:20:00 AM** | 48529.10 | 47641.23 | 1429.24 | 887.87 | Pass | NA | NA | NA | NA | NA |
| **9/9/2019 1:51:00 AM** | 48510.92 | 47641.23 | 1429.24 | 869.69 | Pass | NA | NA | NA | NA | NA |
| **Detector 2** | | | | | | | | | | |
| **9/8/2019 8:20:00 AM** | 49933.19 | 49734.44 | 1492.03 | 198.75 | Pass | NA | NA | NA | NA | NA |
| **9/9/2019 1:51:00 AM** | 50027.78 | 49734.44 | 1492.03 | 293.34 | Pass | NA | NA | NA | NA | NA |
| **Detector 3** | | | | | | | | | | |
| **9/9/2019 1:51:00 AM** | 59583.36 | 60167.98 | 1805.04 | -584.61 | Pass | NA | NA | NA | NA | NA |
| **Detector 4** | | | | | | | | | | |
| **9/8/2019 8:20:00 AM** | 55605.76 | 55277.35 | 1658.32 | 328.41 | Pass | NA | NA | NA | NA | NA |
| **9/9/2019 1:48:00 AM** | 54083.70 | 55277.35 | 1658.32 | -1193.65 | Pass | NA | NA | NA | NA | NA |
| **Detector 5** | | | | | | | | | | |
| **9/8/2019 8:21:00 AM** | 54700.29 | 55004.03 | 1650.12 | -303.73 | Pass | NA | NA | NA | NA | NA |
| **9/9/2019 1:48:00 AM** | 54870.30 | 55004.03 | 1650.12 | -133.73 | Pass | NA | NA | NA | NA | NA |
| **Detector 6** | | | | | | | | | | |
| **9/9/2019 1:48:00 AM** | 51632.77 | 52072.68 | 1562.18 | -439.91 | Pass | NA | NA | NA | NA | NA |
| **Detector 7** | | | | | | | | | | |
| **9/8/2019 8:20:00 AM** | 45361.11 | 44302.58 | 1329.08 | 1058.54 | Pass | NA | NA | NA | NA | NA |
| **9/9/2019 1:48:00 AM** | 45294.10 | 44302.58 | 1329.08 | 991.52 | Pass | NA | NA | NA | NA | NA |
| **Detector 8** | | | | | | | | | | |
| **9/8/2019 8:15:00 AM** | 50268.75 | 49959.33 | 1498.78 | 309.43 | Pass | NA | NA | NA | NA | NA |
| **9/9/2019 1:55:00 AM** | 50100.47 | 49959.33 | 1498.78 | 141.14 | Pass | NA | NA | NA | NA | NA |
| **Detector 9** | | | | | | | | | | |
| **9/8/2019 8:15:00 AM** | 48530.42 | 47696.08 | 1430.88 | 834.34 | Pass | NA | NA | NA | NA | NA |
| **9/9/2019 1:55:00 AM** | 48481.46 | 47696.08 | 1430.88 | 785.39 | Pass | NA | NA | NA | NA | NA |
| **Detector 10** | | | | | | | | | | |
| **9/8/2019 8:15:00 AM** | 50167.36 | 50136.65 | 1504.10 | 30.71 | Pass | NA | NA | NA | NA | NA |
| **9/9/2019 1:55:00 AM** | 50208.75 | 50136.65 | 1504.10 | 72.10 | Pass | NA | NA | NA | NA | NA |
| **Detector 11** | | | | | | | | | | |
| **9/9/2019 1:55:00 AM** | 59870.44 | 59951.55 | 1798.55 | -81.11 | Pass | NA | NA | NA | NA | NA |

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# Gas Proportional Counter Daily Quality Control Checks

***Instrument: Blue***

| | Beta CPM | Beta Mean | Beta +/- limit | Beta Deviation | Beta Flag | B>>A XT CPM | B>>A XT Mean | B>>A XT +/- limit | B>>A XT Deviation | B>>A XT Flag |
|---|---|---|---|---|---|---|---|---|---|---|
| **Detector 12** | | | | | | | | | | |
| **9/8/2019 8:15:00 AM** | 56111.61 | 56070.40 | 1682.11 | 41.21 | Pass | NA | NA | NA | NA | NA |
| **9/9/2019 1:55:00 AM** | 55931.46 | 56070.40 | 1682.11 | -138.94 | Pass | NA | NA | NA | NA | NA |
| **Detector 13** | | | | | | | | | | |
| **9/8/2019 8:16:00 AM** | 55077.21 | 55607.20 | 1668.22 | -529.99 | Pass | NA | NA | NA | NA | NA |
| **9/9/2019 1:55:00 AM** | 55107.25 | 55607.20 | 1668.22 | -499.95 | Pass | NA | NA | NA | NA | NA |
| **Detector 14** | | | | | | | | | | |
| **9/8/2019 8:16:00 AM** | 50731.69 | 50580.03 | 1517.40 | 151.67 | Pass | NA | NA | NA | NA | NA |
| **9/9/2019 1:55:00 AM** | 50361.20 | 50580.03 | 1517.40 | -218.83 | Pass | NA | NA | NA | NA | NA |
| **Detector 15** | | | | | | | | | | |
| **9/8/2019 8:16:00 AM** | 45222.34 | 45674.43 | 1370.23 | -452.09 | Pass | NA | NA | NA | NA | NA |
| **9/9/2019 1:55:00 AM** | 45132.99 | 45674.43 | 1370.23 | -541.43 | Pass | NA | NA | NA | NA | NA |
| **Detector 16** | | | | | | | | | | |
| **9/9/2019 1:58:00 AM** | 49930.81 | 49653.23 | 1489.60 | 277.59 | Pass | NA | NA | NA | NA | NA |
| **Detector 17** | | | | | | | | | | |
| **9/8/2019 8:30:00 AM** | 48576.09 | 48166.13 | 1444.98 | 409.96 | Pass | NA | NA | NA | NA | NA |
| **9/9/2019 1:58:00 AM** | 48431.67 | 48166.13 | 1444.98 | 265.55 | Pass | NA | NA | NA | NA | NA |
| **Detector 18** | | | | | | | | | | |
| **9/9/2019 1:58:00 AM** | 50410.34 | 49957.23 | 1498.72 | 453.12 | Pass | NA | NA | NA | NA | NA |
| **Detector 19** | | | | | | | | | | |
| **9/8/2019 8:30:00 AM** | 59801.29 | 59167.80 | 1775.03 | 633.49 | Pass | NA | NA | NA | NA | NA |
| **9/9/2019 1:58:00 AM** | 59847.48 | 59167.80 | 1775.03 | 679.68 | Pass | NA | NA | NA | NA | NA |
| **Detector 20** | | | | | | | | | | |
| **9/9/2019 1:58:00 AM** | 56746.11 | 57321.08 | 1719.63 | -574.96 | Pass | NA | NA | NA | NA | NA |
| **Detector 21** | | | | | | | | | | |
| **9/9/2019 1:58:00 AM** | 54761.25 | 55281.80 | 1658.45 | -520.55 | Pass | NA | NA | NA | NA | NA |
| **Detector 22** | | | | | | | | | | |
| **9/9/2019 1:58:00 AM** | 51971.09 | 52477.75 | 1574.33 | -506.66 | Pass | NA | NA | NA | NA | NA |
| **Detector 23** | | | | | | | | | | |
| **9/9/2019 1:58:00 AM** | 45338.44 | 46160.75 | 1384.82 | -822.31 | Pass | NA | NA | NA | NA | NA |

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# Gas Proportional Counter Daily Quality Control Checks

***Instrument: Blue***

| | AlphaBKG CPM | BKG Mean | BKG +/- limit | BKG Deviation | BKG Flag | BetaBKG CPM | BetaBKG Mean | BetaBKG +/- limit | BetaBKG Deviation | BetaBKG Flag |
|---|---|---|---|---|---|---|---|---|---|---|
| **Check Type = BKG** | | | | | | | | | | |
| **Detector 0** | | | | | | | | | | |
| **9/8/2019 11:45:00 AM** | 0.20 | 0.14 | 0.03 | 0.06 | Pass | 0.51 | 0.49 | 0.08 | 0.016 | Pass |
| **9/9/2019 6:10:00 AM** | 0.23 | 0.14 | 0.03 | 0.09 | Pass | 0.69 | 0.49 | 0.08 | 0.196 | Pass |
| **Detector 1** | | | | | | | | | | |
| **9/8/2019 11:45:00 AM** | 0.20 | 0.15 | 0.02 | 0.05 | Pass | 0.44 | 0.44 | 0.07 | 0.002 | Pass |
| **9/9/2019 6:10:00 AM** | 0.31 | 0.15 | 0.02 | 0.16 | FAIL | 0.50 | 0.44 | 0.07 | 0.062 | Pass |
| **9/9/2019 9:53:00 AM** | 0.20 | 0.15 | 0.02 | 0.05 | Pass | 0.43 | 0.44 | 0.07 | -0.013 | Pass |
| **Detector 2** | | | | | | | | | | |
| **9/8/2019 11:45:00 AM** | 0.27 | 0.08 | 0.05 | 0.19 | FAIL | 0.65 | 0.42 | 0.08 | 0.226 | Pass |
| **9/9/2019 6:10:00 AM** | 0.24 | 0.08 | 0.05 | 0.16 | Pass | 0.55 | 0.42 | 0.08 | 0.121 | Pass |
| **Detector 3** | | | | | | | | | | |
| **9/8/2019 11:45:00 AM** | 0.14 | 0.06 | 0.04 | 0.07 | Pass | 0.48 | 0.41 | 0.08 | 0.074 | Pass |
| **9/9/2019 6:10:00 AM** | 0.18 | 0.06 | 0.04 | 0.11 | Pass | 0.51 | 0.41 | 0.08 | 0.104 | Pass |
| **Detector 4** | | | | | | | | | | |
| **9/8/2019 11:45:00 AM** | 0.27 | 0.11 | 0.04 | 0.15 | FAIL | 0.61 | 0.40 | 0.08 | 0.205 | Pass |
| **9/9/2019 6:10:00 AM** | 0.27 | 0.11 | 0.04 | 0.16 | FAIL | 0.50 | 0.40 | 0.08 | 0.100 | Pass |
| **9/9/2019 9:53:00 AM** | 0.21 | 0.11 | 0.04 | 0.10 | Pass | 0.54 | 0.40 | 0.08 | 0.140 | Pass |
| **Detector 5** | | | | | | | | | | |
| **9/8/2019 11:45:00 AM** | 0.18 | 0.11 | 0.04 | 0.07 | Pass | 0.43 | 0.41 | 0.08 | 0.017 | Pass |
| **9/9/2019 6:10:00 AM** | 0.31 | 0.11 | 0.04 | 0.20 | FAIL | 0.45 | 0.41 | 0.08 | 0.037 | Pass |
| **9/9/2019 9:53:00 AM** | 0.19 | 0.11 | 0.04 | 0.08 | Pass | 0.50 | 0.41 | 0.08 | 0.082 | Pass |
| **Detector 6** | | | | | | | | | | |
| **9/8/2019 11:45:00 AM** | 0.14 | 0.14 | 0.04 | 0.00 | Pass | 0.43 | 0.42 | 0.05 | 0.006 | Pass |
| **9/9/2019 6:10:00 AM** | 0.15 | 0.14 | 0.04 | 0.01 | Pass | 0.41 | 0.42 | 0.05 | -0.014 | Pass |
| **Detector 7** | | | | | | | | | | |
| **9/8/2019 11:45:00 AM** | 0.30 | 0.10 | 0.04 | 0.20 | FAIL | 0.64 | 0.49 | 0.12 | 0.154 | Pass |
| **9/9/2019 6:10:00 AM** | 0.25 | 0.10 | 0.04 | 0.15 | FAIL | 0.55 | 0.49 | 0.12 | 0.064 | Pass |
| **Detector 8** | | | | | | | | | | |
| **9/8/2019 11:45:00 AM** | 0.15 | 0.09 | 0.04 | 0.05 | Pass | 0.53 | 0.44 | 0.08 | 0.086 | Pass |
| **9/9/2019 6:10:00 AM** | 0.19 | 0.09 | 0.04 | 0.09 | Pass | 0.51 | 0.44 | 0.08 | 0.061 | Pass |
| **Detector 9** | | | | | | | | | | |
| **9/8/2019 11:45:00 AM** | 0.18 | 0.10 | 0.04 | 0.08 | Pass | 0.46 | 0.39 | 0.06 | 0.066 | Pass |
| **9/9/2019 6:10:00 AM** | 0.18 | 0.10 | 0.04 | 0.08 | Pass | 0.43 | 0.39 | 0.06 | 0.036 | Pass |

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# Gas Proportional Counter Daily Quality Control Checks

***Instrument: Blue***

| | AlphaBKG CPM | BKG Mean | BKG +/- limit | BKG Deviation | BKG Flag | BetaBKG CPM | BetaBKG Mean | BetaBKG +/- limit | BetaBKG Deviation | BetaBKG Flag |
|---|---|---|---|---|---|---|---|---|---|---|
| **Detector 10** | | | | | | | | | | |
| **9/8/2019 11:45:00 AM** | 0.21 | 0.09 | 0.04 | 0.11 | Pass | 0.41 | 0.33 | 0.08 | 0.074 | Pass |
| **9/9/2019 6:10:00 AM** | 0.26 | 0.09 | 0.04 | 0.16 | **FAIL** | 0.51 | 0.33 | 0.08 | 0.174 | Pass |
| **9/9/2019 9:53:00 AM** | 0.17 | 0.09 | 0.04 | 0.07 | Pass | 0.36 | 0.33 | 0.08 | 0.024 | Pass |
| **Detector 11** | | | | | | | | | | |
| **9/8/2019 11:45:00 AM** | 0.12 | 0.09 | 0.04 | 0.03 | Pass | 0.39 | 0.45 | 0.10 | -0.062 | Pass |
| **9/9/2019 6:11:00 AM** | 0.12 | 0.09 | 0.04 | 0.03 | Pass | 0.55 | 0.45 | 0.10 | 0.103 | Pass |
| **Detector 12** | | | | | | | | | | |
| **9/8/2019 11:45:00 AM** | 0.15 | 0.11 | 0.03 | 0.03 | Pass | 0.52 | 0.44 | 0.11 | 0.070 | Pass |
| **9/9/2019 6:11:00 AM** | 0.22 | 0.11 | 0.03 | 0.11 | **FAIL** | 0.53 | 0.44 | 0.11 | 0.085 | Pass |
| **9/9/2019 9:53:00 AM** | 0.20 | 0.11 | 0.03 | 0.08 | Pass | 0.44 | 0.44 | 0.11 | -0.010 | Pass |
| **Detector 13** | | | | | | | | | | |
| **9/8/2019 11:45:00 AM** | 0.21 | 0.09 | 0.05 | 0.11 | Pass | 0.39 | 0.40 | 0.09 | -0.005 | Pass |
| **9/9/2019 6:11:00 AM** | 0.15 | 0.09 | 0.05 | 0.05 | Pass | 0.53 | 0.40 | 0.09 | 0.135 | Pass |
| **Detector 14** | | | | | | | | | | |
| **9/8/2019 11:45:00 AM** | 0.22 | 0.10 | 0.04 | 0.12 | **FAIL** | 0.49 | 0.39 | 0.08 | 0.104 | Pass |
| **9/9/2019 6:11:00 AM** | 0.17 | 0.10 | 0.04 | 0.07 | Pass | 0.29 | 0.39 | 0.08 | -0.096 | Pass |
| **Detector 15** | | | | | | | | | | |
| **9/8/2019 11:46:00 AM** | 0.14 | 0.09 | 0.04 | 0.05 | Pass | 0.42 | 0.44 | 0.07 | -0.025 | Pass |
| **9/9/2019 6:11:00 AM** | 0.13 | 0.09 | 0.04 | 0.04 | Pass | 0.50 | 0.44 | 0.07 | 0.055 | Pass |
| **Detector 16** | | | | | | | | | | |
| **9/8/2019 11:51:00 AM** | 0.17 | 0.10 | 0.05 | 0.07 | Pass | 5.59 | 1.85 | 2.38 | 3.735 | Pass |
| **9/9/2019 6:11:00 AM** | 0.16 | 0.10 | 0.05 | 0.05 | Pass | 5.99 | 1.85 | 2.38 | 4.135 | Pass |
| **Detector 17** | | | | | | | | | | |
| **9/8/2019 11:51:00 AM** | 0.27 | 0.08 | 0.05 | 0.19 | **FAIL** | 0.59 | 0.43 | 0.08 | 0.162 | Pass |
| **9/9/2019 6:11:00 AM** | 0.11 | 0.08 | 0.05 | 0.03 | Pass | 0.43 | 0.43 | 0.08 | 0.002 | Pass |
| **Detector 18** | | | | | | | | | | |
| **9/8/2019 11:51:00 AM** | 1.08 | 0.05 | 0.03 | 1.03 | **FAIL** | 1.26 | 0.62 | 0.09 | 0.640 | **FAIL** |
| **9/9/2019 6:11:00 AM** | 0.93 | 0.05 | 0.03 | 0.87 | **FAIL** | 1.43 | 0.62 | 0.09 | 0.805 | **FAIL** |
| **Detector 19** | | | | | | | | | | |
| **9/8/2019 11:51:00 AM** | 0.16 | 0.10 | 0.03 | 0.05 | Pass | 0.54 | 0.49 | 0.10 | 0.048 | Pass |
| **9/9/2019 6:11:00 AM** | 0.23 | 0.10 | 0.03 | 0.12 | **FAIL** | 0.67 | 0.49 | 0.10 | 0.173 | Pass |
| **Detector 20** | | | | | | | | | | |
| **9/9/2019 6:11:00 AM** | 0.17 | 0.11 | 0.07 | 0.06 | Pass | 0.51 | 0.44 | 0.11 | 0.070 | Pass |

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# Gas Proportional Counter Daily Quality Control Checks

***Instrument: Blue***

| | AlphaBKG CPM | BKG Mean | BKG +/- limit | BKG Deviation | BKG Flag | BetaBKG CPM | BetaBKG Mean | BetaBKG +/- limit | BetaBKG Deviation | BetaBKG Flag |
|---|---|---|---|---|---|---|---|---|---|---|
| **Detector 21** **9/9/2019 6:11:00 AM** | 0.22 | 0.05 | 0.03 | 0.17 | FAIL | 0.44 | 0.34 | 0.12 | 0.092 | Pass |
| **Detector 22** **9/9/2019 6:11:00 AM** | 0.24 | 0.07 | 0.04 | 0.16 | FAIL | 0.41 | 0.40 | 0.06 | 0.009 | Pass |
| **Detector 23** **9/9/2019 6:11:00 AM** | 0.42 | 0.05 | 0.02 | 0.37 | FAIL | 0.72 | 0.47 | 0.10 | 0.252 | Pass |

**The Alpha and Beta +/- limit are based upon initial 20-point population.**

**The Alpha and Beta +/- limit for Efficiency is stated at 3%. Flags are "FAIL" > 3%.**

**The Alpha and Beta +/- limit for Background is stated at 1 StDev. Flags are "FAIL" > 3 StDev.**

**The Alpha +/- limit for Crosstalk is stated at 1 StDev. Flags are "Warning > 2 StDev and "DOEF" > 3 StDev. Beta is negligible, for trend only ("NA").**

**Times shown reflect the end of the count duration.**

**APPROVED**
*By Kody Saulters at 7:12 am, Sep 10, 2019*

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# Gas Proportional Counter Daily Quality Control Checks

***Instrument: Blue***

| | Alpha CPM | Alpha Mean | Alpha +/- limit | Alpha Deviation | Alpha Flag | A>>B XT CPM | A>>B XT Mean | A>>B XT +/- limit | A>>B XT Deviation | A>>B XT Flag |
|---|---|---|---|---|---|---|---|---|---|---|
| **Check Type = Alpha** | | | | | | | | | | |
| **Detector 0** | | | | | | | | | | |
| **9/9/2019 2:05:00 AM** | 11627.01 | 11687.23 | 350.62 | -60.21 | Pass | 4449.00 | 4369.78 | 44.00 | 79.225 | Pass |
| **9/10/2019 12:48:00 AM** | 11609.56 | 11687.23 | 350.62 | -77.66 | Pass | 4372.50 | 4369.78 | 44.00 | 2.725 | Pass |
| **Detector 1** | | | | | | | | | | |
| **9/8/2019 8:14:00 AM** | 12574.58 | 12660.45 | 379.81 | -85.87 | Pass | 4535.50 | 4639.33 | 62.38 | -103.825 | Pass |
| **9/9/2019 2:05:00 AM** | 12646.65 | 12660.45 | 379.81 | -13.80 | Pass | 4675.00 | 4639.33 | 62.38 | 35.675 | Pass |
| **9/10/2019 12:48:00 AM** | 12550.19 | 12660.45 | 379.81 | -110.26 | Pass | 4641.00 | 4639.33 | 62.38 | 1.675 | Pass |
| **Detector 2** | | | | | | | | | | |
| **9/8/2019 8:14:00 AM** | 12700.60 | 12819.28 | 384.58 | -118.68 | Pass | 4759.50 | 4776.73 | 60.67 | -17.225 | Pass |
| **9/9/2019 2:05:00 AM** | 12637.14 | 12819.28 | 384.58 | -182.13 | Pass | 4827.00 | 4776.73 | 60.67 | 50.275 | Pass |
| **9/10/2019 12:48:00 AM** | 12755.72 | 12819.28 | 384.58 | -63.56 | Pass | 4811.00 | 4776.73 | 60.67 | 34.275 | Pass |
| **Detector 3** | | | | | | | | | | |
| **9/9/2019 2:05:00 AM** | 12683.13 | 12695.28 | 380.86 | -12.14 | Pass | 4631.50 | 4545.10 | 50.19 | 86.400 | Pass |
| **9/10/2019 12:48:00 AM** | 12505.17 | 12695.28 | 380.86 | -190.11 | Pass | 4616.50 | 4545.10 | 50.19 | 71.400 | Pass |
| **Detector 4** | | | | | | | | | | |
| **9/8/2019 8:14:00 AM** | 15808.98 | 15947.40 | 478.42 | -138.42 | Pass | 6247.00 | 6010.63 | 170.60 | 236.375 | Pass |
| **9/9/2019 2:04:00 AM** | 15576.51 | 15947.40 | 478.42 | -370.89 | Pass | 6421.00 | 6010.63 | 170.60 | 410.375 | **WARNING** |
| **9/10/2019 12:48:00 AM** | 15550.58 | 15947.40 | 478.42 | -396.82 | Pass | 6363.00 | 6010.63 | 170.60 | 352.375 | **WARNING** |
| **Detector 5** | | | | | | | | | | |
| **9/8/2019 8:15:00 AM** | 16068.51 | 16232.73 | 486.98 | -164.22 | Pass | 5902.00 | 5886.28 | 70.81 | 15.725 | Pass |
| **9/9/2019 2:04:00 AM** | 16156.59 | 16232.73 | 486.98 | -76.14 | Pass | 6032.00 | 5886.28 | 70.81 | 145.725 | **WARNING** |
| **9/10/2019 12:48:00 AM** | 16046.65 | 16232.73 | 486.98 | -186.08 | Pass | 6019.50 | 5886.28 | 70.81 | 133.225 | Pass |
| **Detector 6** | | | | | | | | | | |
| **9/9/2019 2:04:00 AM** | 14539.87 | 14681.80 | 440.45 | -141.93 | Pass | 5442.00 | 5388.75 | 56.94 | 53.250 | Pass |
| **9/10/2019 12:48:00 AM** | 14380.91 | 14681.80 | 440.45 | -300.89 | Pass | 5438.50 | 5388.75 | 56.94 | 49.750 | Pass |
| **Detector 7** | | | | | | | | | | |
| **9/8/2019 8:15:00 AM** | 14667.32 | 14832.35 | 444.97 | -165.03 | Pass | 5428.00 | 5352.95 | 57.41 | 75.050 | Pass |
| **9/9/2019 2:04:00 AM** | 14583.38 | 14832.35 | 444.97 | -248.97 | Pass | 5464.00 | 5352.95 | 57.41 | 111.050 | Pass |
| **9/10/2019 12:48:00 AM** | 14713.46 | 14832.35 | 444.97 | -118.89 | Pass | 5478.00 | 5352.95 | 57.41 | 125.050 | **WARNING** |
| **Detector 8** | | | | | | | | | | |
| **9/8/2019 8:21:00 AM** | 11514.43 | 11576.25 | 347.29 | -61.82 | Pass | 4450.00 | 4391.63 | 40.19 | 58.375 | Pass |
| **9/9/2019 2:07:00 AM** | 11420.97 | 11576.25 | 347.29 | -155.28 | Pass | 4465.00 | 4391.63 | 40.19 | 73.375 | Pass |
| **9/10/2019 12:51:00 AM** | 11486.53 | 11576.25 | 347.29 | -89.72 | Pass | 4464.50 | 4391.63 | 40.19 | 72.875 | Pass |

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# Gas Proportional Counter Daily Quality Control Checks

## *Instrument: Blue*

| | Alpha CPM | Alpha Mean | Alpha +/- limit | Alpha Deviation | Alpha Flag | A>>B XT CPM | A>>B XT Mean | A>>B XT +/- limit | A>>B XT Deviation | A>>B XT Flag |
|---|---|---|---|---|---|---|---|---|---|---|
| **Detector 9** | | | | | | | | | | |
| **9/8/2019 8:21:00 AM** | 12400.04 | 12556.93 | 376.71 | -156.88 | Pass | 4797.00 | 4786.65 | 49.55 | 10.350 | Pass |
| **9/9/2019 2:07:00 AM** | 12621.12 | 12556.93 | 376.71 | 64.20 | Pass | 4828.50 | 4786.65 | 49.55 | 41.850 | Pass |
| **9/10/2019 12:51:00 AM** | 12509.16 | 12556.93 | 376.71 | -47.76 | Pass | 4810.00 | 4786.65 | 49.55 | 23.350 | Pass |
| **Detector 10** | | | | | | | | | | |
| **9/8/2019 8:21:00 AM** | 12801.09 | 12963.10 | 388.89 | -162.01 | Pass | 4806.00 | 4837.70 | 61.92 | -31.700 | Pass |
| **9/9/2019 2:07:00 AM** | 12814.65 | 12963.10 | 388.89 | -148.45 | Pass | 4851.50 | 4837.70 | 61.92 | 13.800 | Pass |
| **9/10/2019 12:51:00 AM** | 12765.70 | 12963.10 | 388.89 | -197.40 | Pass | 4799.00 | 4837.70 | 61.92 | -38.700 | Pass |
| **Detector 11** | | | | | | | | | | |
| **9/9/2019 2:07:00 AM** | 12461.61 | 12659.60 | 379.79 | -197.99 | Pass | 4833.50 | 4751.65 | 71.92 | 81.850 | Pass |
| **9/10/2019 12:51:00 AM** | 12579.68 | 12659.60 | 379.79 | -79.92 | Pass | 4790.00 | 4751.65 | 71.92 | 38.350 | Pass |
| **Detector 12** | | | | | | | | | | |
| **9/8/2019 8:21:00 AM** | 15297.90 | 15436.53 | 463.10 | -138.62 | Pass | 6832.00 | 6853.73 | 91.51 | -21.725 | Pass |
| **9/9/2019 2:08:00 AM** | 15198.96 | 15436.53 | 463.10 | -237.57 | Pass | 7032.50 | 6853.73 | 91.51 | 178.775 | Pass |
| **9/10/2019 12:51:00 AM** | 15224.03 | 15436.53 | 463.10 | -212.50 | Pass | 6924.50 | 6853.73 | 91.51 | 70.775 | Pass |
| **Detector 13** | | | | | | | | | | |
| **9/8/2019 8:21:00 AM** | 16736.58 | 16942.28 | 508.27 | -205.70 | Pass | 5444.50 | 5324.63 | 67.75 | 119.875 | Pass |
| **9/9/2019 2:08:00 AM** | 16555.63 | 16942.28 | 508.27 | -386.65 | Pass | 5317.00 | 5324.63 | 67.75 | -7.625 | Pass |
| **9/10/2019 12:51:00 AM** | 16765.73 | 16942.28 | 508.27 | -176.54 | Pass | 5359.00 | 5324.63 | 67.75 | 34.375 | Pass |
| **Detector 14** | | | | | | | | | | |
| **9/8/2019 8:21:00 AM** | 13712.70 | 14060.75 | 421.82 | -348.05 | Pass | 6146.00 | 6110.60 | 310.42 | 35.400 | Pass |
| **9/9/2019 2:08:00 AM** | 13510.24 | 14060.75 | 421.82 | -550.51 | **FAIL** | 6234.00 | 6110.60 | 310.42 | 123.400 | Pass |
| **9/9/2019 2:35:00 AM** | 13693.76 | 14060.75 | 421.82 | -366.99 | Pass | 6172.00 | 6110.60 | 310.42 | 61.400 | Pass |
| **9/9/2019 2:38:00 AM** | 13719.26 | 14060.75 | 421.82 | -341.49 | Pass | 6166.00 | 6110.60 | 310.42 | 55.400 | Pass |
| **9/10/2019 12:51:00 AM** | 13647.82 | 14060.75 | 421.82 | -412.93 | Pass | 6222.00 | 6110.60 | 310.42 | 111.400 | Pass |
| **Detector 15** | | | | | | | | | | |
| **9/8/2019 8:21:00 AM** | 13880.72 | 14067.33 | 422.02 | -186.60 | Pass | 5990.50 | 5856.58 | 128.86 | 133.925 | Pass |
| **9/9/2019 2:08:00 AM** | 13899.29 | 14067.33 | 422.02 | -168.04 | Pass | 6058.00 | 5856.58 | 128.86 | 201.425 | Pass |
| **9/10/2019 12:51:00 AM** | 13871.35 | 14067.33 | 422.02 | -195.98 | Pass | 6123.00 | 5856.58 | 128.86 | 266.425 | **WARNING** |
| **Detector 16** | | | | | | | | | | |
| **9/9/2019 2:11:00 AM** | 11550.49 | 11644.40 | 349.33 | -93.91 | Pass | 4426.50 | 4442.73 | 57.31 | -16.225 | Pass |
| **9/10/2019 12:53:00 AM** | 11572.04 | 11644.40 | 349.33 | -72.36 | Pass | 4457.50 | 4442.73 | 57.31 | 14.775 | Pass |

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# Gas Proportional Counter Daily Quality Control Checks

***Instrument: Blue***

| | Alpha CPM | Alpha Mean | Alpha +/- limit | Alpha Deviation | Alpha Flag | A>>B XT CPM | A>>B XT Mean | A>>B XT +/- limit | A>>B XT Deviation | A>>B XT Flag |
|---|---|---|---|---|---|---|---|---|---|---|
| **Detector 17** | | | | | | | | | | |
| **9/8/2019 8:26:00 AM** | 12609.57 | 12769.60 | 383.09 | -160.03 | Pass | 4733.50 | 4694.90 | 44.72 | 38.600 | Pass |
| **9/9/2019 2:11:00 AM** | 12529.61 | 12769.60 | 383.09 | -239.99 | Pass | 4742.00 | 4694.90 | 44.72 | 47.100 | Pass |
| **9/10/2019 12:53:00 AM** | 12580.67 | 12769.60 | 383.09 | -188.93 | Pass | 4762.50 | 4694.90 | 44.72 | 67.600 | Pass |
| **Detector 18** | | | | | | | | | | |
| **9/9/2019 2:11:00 AM** | 12949.17 | 13168.68 | 395.06 | -219.51 | Pass | 4682.50 | 4634.05 | 64.62 | 48.450 | Pass |
| **9/10/2019 12:53:00 AM** | 12912.22 | 13168.68 | 395.06 | -256.46 | Pass | 4688.00 | 4634.05 | 64.62 | 53.950 | Pass |
| **Detector 19** | | | | | | | | | | |
| **9/8/2019 8:26:00 AM** | 12408.04 | 12692.53 | 380.78 | -284.49 | Pass | 4656.50 | 4577.53 | 110.81 | 78.975 | Pass |
| **9/9/2019 2:11:00 AM** | 12613.62 | 12692.53 | 380.78 | -78.91 | Pass | 4782.50 | 4577.53 | 110.81 | 204.975 | Pass |
| **9/10/2019 12:53:00 AM** | 12616.67 | 12692.53 | 380.78 | -75.85 | Pass | 4753.00 | 4577.53 | 110.81 | 175.475 | Pass |
| **Detector 20** | | | | | | | | | | |
| **9/9/2019 2:11:00 AM** | 15115.42 | 15429.63 | 462.89 | -314.20 | Pass | 7266.50 | 7112.73 | 112.02 | 153.775 | Pass |
| **9/10/2019 12:54:00 AM** | 15041.98 | 15429.63 | 462.89 | -387.65 | Pass | 7292.00 | 7112.73 | 112.02 | 179.275 | Pass |
| **Detector 21** | | | | | | | | | | |
| **9/9/2019 2:11:00 AM** | 15309.45 | 15659.78 | 469.79 | -350.33 | Pass | 6716.50 | 6551.25 | 94.85 | 165.250 | Pass |
| **9/10/2019 12:54:00 AM** | 15383.52 | 15659.78 | 469.79 | -276.25 | Pass | 6717.50 | 6551.25 | 94.85 | 166.250 | Pass |
| **Detector 22** | | | | | | | | | | |
| **9/9/2019 2:11:00 AM** | 13677.24 | 13972.80 | 419.18 | -295.56 | Pass | 6627.00 | 6401.03 | 87.63 | 225.975 | **WARNING** |
| **9/10/2019 12:54:00 AM** | 13678.30 | 13972.80 | 419.18 | -294.50 | Pass | 6543.00 | 6401.03 | 87.63 | 141.975 | Pass |
| **Detector 23** | | | | | | | | | | |
| **9/9/2019 2:11:00 AM** | 13856.65 | 14123.95 | 423.72 | -267.30 | Pass | 6691.00 | 6632.90 | 79.57 | 58.100 | Pass |
| **9/10/2019 12:54:00 AM** | 13884.71 | 14123.95 | 423.72 | -239.24 | Pass | 6694.00 | 6632.90 | 79.57 | 61.100 | Pass |

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# Gas Proportional Counter Daily Quality Control Checks

***Instrument: Blue***

| | Beta CPM | Beta Mean | Beta +/- limit | Beta Deviation | Beta Flag | B>>A XT CPM | B>>A XT Mean | B>>A XT +/- limit | B>>A XT Deviation | B>>A XT Flag |
|---|---|---|---|---|---|---|---|---|---|---|
| **Check Type = Beta** | | | | | | | | | | |
| **Detector 0** | | | | | | | | | | |
| **9/9/2019 1:51:00 AM** | 50176.58 | 50552.05 | 1516.56 | -375.47 | Pass | NA | NA | NA | NA | NA |
| **9/10/2019 12:39:00 AM** | 50626.45 | 50552.05 | 1516.56 | 74.40 | Pass | NA | NA | NA | NA | NA |
| **Detector 1** | | | | | | | | | | |
| **9/8/2019 8:20:00 AM** | 48529.10 | 47641.23 | 1429.24 | 887.87 | Pass | NA | NA | NA | NA | NA |
| **9/9/2019 1:51:00 AM** | 48510.92 | 47641.23 | 1429.24 | 869.69 | Pass | NA | NA | NA | NA | NA |
| **9/10/2019 12:39:00 AM** | 48448.91 | 47641.23 | 1429.24 | 807.69 | Pass | NA | NA | NA | NA | NA |
| **Detector 2** | | | | | | | | | | |
| **9/8/2019 8:20:00 AM** | 49933.19 | 49734.44 | 1492.03 | 198.75 | Pass | NA | NA | NA | NA | NA |
| **9/9/2019 1:51:00 AM** | 50027.78 | 49734.44 | 1492.03 | 293.34 | Pass | NA | NA | NA | NA | NA |
| **9/10/2019 12:39:00 AM** | 49958.04 | 49734.44 | 1492.03 | 223.60 | Pass | NA | NA | NA | NA | NA |
| **Detector 3** | | | | | | | | | | |
| **9/9/2019 1:51:00 AM** | 59583.36 | 60167.98 | 1805.04 | -584.61 | Pass | NA | NA | NA | NA | NA |
| **9/10/2019 12:39:00 AM** | 59402.62 | 60167.98 | 1805.04 | -765.35 | Pass | NA | NA | NA | NA | NA |
| **Detector 4** | | | | | | | | | | |
| **9/8/2019 8:20:00 AM** | 55605.76 | 55277.35 | 1658.32 | 328.41 | Pass | NA | NA | NA | NA | NA |
| **9/9/2019 1:48:00 AM** | 54083.70 | 55277.35 | 1658.32 | -1193.65 | Pass | NA | NA | NA | NA | NA |
| **9/10/2019 12:39:00 AM** | 54212.99 | 55277.35 | 1658.32 | -1064.36 | Pass | NA | NA | NA | NA | NA |
| **Detector 5** | | | | | | | | | | |
| **9/8/2019 8:21:00 AM** | 54700.29 | 55004.03 | 1650.12 | -303.73 | Pass | NA | NA | NA | NA | NA |
| **9/9/2019 1:48:00 AM** | 54870.30 | 55004.03 | 1650.12 | -133.73 | Pass | NA | NA | NA | NA | NA |
| **9/10/2019 12:39:00 AM** | 54714.82 | 55004.03 | 1650.12 | -289.21 | Pass | NA | NA | NA | NA | NA |
| **Detector 6** | | | | | | | | | | |
| **9/9/2019 1:48:00 AM** | 51632.77 | 52072.68 | 1562.18 | -439.91 | Pass | NA | NA | NA | NA | NA |
| **9/10/2019 12:39:00 AM** | 51730.57 | 52072.68 | 1562.18 | -342.11 | Pass | NA | NA | NA | NA | NA |
| **Detector 7** | | | | | | | | | | |
| **9/8/2019 8:20:00 AM** | 45361.11 | 44302.58 | 1329.08 | 1058.54 | Pass | NA | NA | NA | NA | NA |
| **9/9/2019 1:48:00 AM** | 45294.10 | 44302.58 | 1329.08 | 991.52 | Pass | NA | NA | NA | NA | NA |
| **9/10/2019 12:39:00 AM** | 45219.30 | 44302.58 | 1329.08 | 916.72 | Pass | NA | NA | NA | NA | NA |
| **Detector 8** | | | | | | | | | | |
| **9/8/2019 8:15:00 AM** | 50268.75 | 49959.33 | 1498.78 | 309.43 | Pass | NA | NA | NA | NA | NA |
| **9/9/2019 1:55:00 AM** | 50100.47 | 49959.33 | 1498.78 | 141.14 | Pass | NA | NA | NA | NA | NA |
| **9/10/2019 12:42:00 AM** | 50055.78 | 49959.33 | 1498.78 | 96.46 | Pass | NA | NA | NA | NA | NA |

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# Gas Proportional Counter Daily Quality Control Checks

***Instrument: Blue***

| | Beta CPM | Beta Mean | Beta +/- limit | Beta Deviation | Beta Flag | B>>A XT CPM | B>>A XT Mean | B>>A XT +/- limit | B>>A XT Deviation | B>>A XT Flag |
|---|---|---|---|---|---|---|---|---|---|---|
| **Detector 9** | | | | | | | | | | |
| **9/8/2019 8:15:00 AM** | 48530.42 | 47696.08 | 1430.88 | 834.34 | Pass | NA | NA | NA | NA | NA |
| **9/9/2019 1:55:00 AM** | 48481.46 | 47696.08 | 1430.88 | 785.39 | Pass | NA | NA | NA | NA | NA |
| **9/10/2019 12:42:00 AM** | 48735.58 | 47696.08 | 1430.88 | 1039.51 | Pass | NA | NA | NA | NA | NA |
| **Detector 10** | | | | | | | | | | |
| **9/8/2019 8:15:00 AM** | 50167.36 | 50136.65 | 1504.10 | 30.71 | Pass | NA | NA | NA | NA | NA |
| **9/9/2019 1:55:00 AM** | 50208.75 | 50136.65 | 1504.10 | 72.10 | Pass | NA | NA | NA | NA | NA |
| **9/10/2019 12:42:00 AM** | 50096.78 | 50136.65 | 1504.10 | -39.87 | Pass | NA | NA | NA | NA | NA |
| **Detector 11** | | | | | | | | | | |
| **9/9/2019 1:55:00 AM** | 59870.44 | 59951.55 | 1798.55 | -81.11 | Pass | NA | NA | NA | NA | NA |
| **9/10/2019 12:42:00 AM** | 59824.84 | 59951.55 | 1798.55 | -126.71 | Pass | NA | NA | NA | NA | NA |
| **Detector 12** | | | | | | | | | | |
| **9/8/2019 8:15:00 AM** | 56111.61 | 56070.40 | 1682.11 | 41.21 | Pass | NA | NA | NA | NA | NA |
| **9/9/2019 1:55:00 AM** | 55931.46 | 56070.40 | 1682.11 | -138.94 | Pass | NA | NA | NA | NA | NA |
| **9/10/2019 12:42:00 AM** | 56228.00 | 56070.40 | 1682.11 | 157.60 | Pass | NA | NA | NA | NA | NA |
| **Detector 13** | | | | | | | | | | |
| **9/8/2019 8:16:00 AM** | 55077.21 | 55607.20 | 1668.22 | -529.99 | Pass | NA | NA | NA | NA | NA |
| **9/9/2019 1:55:00 AM** | 55107.25 | 55607.20 | 1668.22 | -499.95 | Pass | NA | NA | NA | NA | NA |
| **9/10/2019 12:42:00 AM** | 54840.09 | 55607.20 | 1668.22 | -767.11 | Pass | NA | NA | NA | NA | NA |
| **Detector 14** | | | | | | | | | | |
| **9/8/2019 8:16:00 AM** | 50731.69 | 50580.03 | 1517.40 | 151.67 | Pass | NA | NA | NA | NA | NA |
| **9/9/2019 1:55:00 AM** | 50361.20 | 50580.03 | 1517.40 | -218.83 | Pass | NA | NA | NA | NA | NA |
| **9/10/2019 12:42:00 AM** | 50192.08 | 50580.03 | 1517.40 | -387.94 | Pass | NA | NA | NA | NA | NA |
| **Detector 15** | | | | | | | | | | |
| **9/8/2019 8:16:00 AM** | 45222.34 | 45674.43 | 1370.23 | -452.09 | Pass | NA | NA | NA | NA | NA |
| **9/9/2019 1:55:00 AM** | 45132.99 | 45674.43 | 1370.23 | -541.43 | Pass | NA | NA | NA | NA | NA |
| **9/10/2019 12:42:00 AM** | 45114.07 | 45674.43 | 1370.23 | -560.36 | Pass | NA | NA | NA | NA | NA |
| **Detector 16** | | | | | | | | | | |
| **9/9/2019 1:58:00 AM** | 49930.81 | 49653.23 | 1489.60 | 277.59 | Pass | NA | NA | NA | NA | NA |
| **9/10/2019 12:46:00 AM** | 50052.89 | 49653.23 | 1489.60 | 399.67 | Pass | NA | NA | NA | NA | NA |
| **Detector 17** | | | | | | | | | | |
| **9/8/2019 8:30:00 AM** | 48576.09 | 48166.13 | 1444.98 | 409.96 | Pass | NA | NA | NA | NA | NA |
| **9/9/2019 1:58:00 AM** | 48431.67 | 48166.13 | 1444.98 | 265.55 | Pass | NA | NA | NA | NA | NA |
| **9/10/2019 12:46:00 AM** | 48465.65 | 48166.13 | 1444.98 | 299.53 | Pass | NA | NA | NA | NA | NA |

# Gas Proportional Counter Daily Quality Control Checks

***Instrument: Blue***

| | Beta CPM | Beta Mean | Beta +/- limit | Beta Deviation | Beta Flag | B>>A XT CPM | B>>A XT Mean | B>>A XT +/- limit | B>>A XT Deviation | B>>A XT Flag |
|---|---|---|---|---|---|---|---|---|---|---|
| **Detector 18** | | | | | | | | | | |
| **9/9/2019 1:58:00 AM** | 50410.34 | 49957.23 | 1498.72 | 453.12 | Pass | NA | NA | NA | NA | NA |
| **9/10/2019 12:46:00 AM** | 50234.40 | 49957.23 | 1498.72 | 277.18 | Pass | NA | NA | NA | NA | NA |
| **Detector 19** | | | | | | | | | | |
| **9/8/2019 8:30:00 AM** | 59801.29 | 59167.80 | 1775.03 | 633.49 | Pass | NA | NA | NA | NA | NA |
| **9/9/2019 1:58:00 AM** | 59847.48 | 59167.80 | 1775.03 | 679.68 | Pass | NA | NA | NA | NA | NA |
| **9/10/2019 12:46:00 AM** | 59899.43 | 59167.80 | 1775.03 | 731.63 | Pass | NA | NA | NA | NA | NA |
| **Detector 20** | | | | | | | | | | |
| **9/9/2019 1:58:00 AM** | 56746.11 | 57321.08 | 1719.63 | -574.96 | Pass | NA | NA | NA | NA | NA |
| **9/10/2019 12:46:00 AM** | 56754.54 | 57321.08 | 1719.63 | -566.53 | Pass | NA | NA | NA | NA | NA |
| **Detector 21** | | | | | | | | | | |
| **9/9/2019 1:58:00 AM** | 54761.25 | 55281.80 | 1658.45 | -520.55 | Pass | NA | NA | NA | NA | NA |
| **9/10/2019 12:46:00 AM** | 54783.59 | 55281.80 | 1658.45 | -498.21 | Pass | NA | NA | NA | NA | NA |
| **Detector 22** | | | | | | | | | | |
| **9/9/2019 1:58:00 AM** | 51971.09 | 52477.75 | 1574.33 | -506.66 | Pass | NA | NA | NA | NA | NA |
| **9/10/2019 12:46:00 AM** | 52345.76 | 52477.75 | 1574.33 | -131.99 | Pass | NA | NA | NA | NA | NA |
| **Detector 23** | | | | | | | | | | |
| **9/9/2019 1:58:00 AM** | 45338.44 | 46160.75 | 1384.82 | -822.31 | Pass | NA | NA | NA | NA | NA |
| **9/10/2019 12:46:00 AM** | 45533.94 | 46160.75 | 1384.82 | -626.81 | Pass | NA | NA | NA | NA | NA |

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# Gas Proportional Counter Daily Quality Control Checks

***Instrument: Blue***

| | AlphaBKG CPM | BKG Mean | BKG +/- limit | BKG Deviation | BKG Flag | BetaBKG CPM | BetaBKG Mean | BetaBKG +/- limit | BetaBKG Deviation | BetaBKG Flag |
|---|---|---|---|---|---|---|---|---|---|---|
| **Check Type = BKG** | | | | | | | | | | |
| **Detector 0** | | | | | | | | | | |
| **9/8/2019 11:45:00 AM** | 0.20 | 0.14 | 0.03 | 0.06 | Pass | 0.51 | 0.49 | 0.08 | 0.016 | Pass |
| **9/9/2019 6:10:00 AM** | 0.23 | 0.14 | 0.03 | 0.09 | Pass | 0.69 | 0.49 | 0.08 | 0.196 | Pass |
| **9/10/2019 4:44:00 AM** | 0.15 | 0.14 | 0.03 | 0.01 | Pass | 0.51 | 0.49 | 0.08 | 0.011 | Pass |
| **Detector 1** | | | | | | | | | | |
| **9/8/2019 11:45:00 AM** | 0.20 | 0.15 | 0.02 | 0.05 | Pass | 0.44 | 0.44 | 0.07 | 0.002 | Pass |
| **9/9/2019 6:10:00 AM** | 0.31 | 0.15 | 0.02 | 0.16 | FAIL | 0.50 | 0.44 | 0.07 | 0.062 | Pass |
| **9/9/2019 9:53:00 AM** | 0.20 | 0.15 | 0.02 | 0.05 | Pass | 0.43 | 0.44 | 0.07 | -0.013 | Pass |
| **9/10/2019 4:44:00 AM** | 0.24 | 0.15 | 0.02 | 0.09 | FAIL | 0.46 | 0.44 | 0.07 | 0.022 | Pass |
| **Detector 2** | | | | | | | | | | |
| **9/8/2019 11:45:00 AM** | 0.27 | 0.08 | 0.05 | 0.19 | FAIL | 0.65 | 0.42 | 0.08 | 0.226 | Pass |
| **9/9/2019 6:10:00 AM** | 0.24 | 0.08 | 0.05 | 0.16 | Pass | 0.55 | 0.42 | 0.08 | 0.121 | Pass |
| **9/10/2019 4:44:00 AM** | 0.18 | 0.08 | 0.05 | 0.10 | Pass | 0.55 | 0.42 | 0.08 | 0.121 | Pass |
| **Detector 3** | | | | | | | | | | |
| **9/8/2019 11:45:00 AM** | 0.14 | 0.06 | 0.04 | 0.07 | Pass | 0.48 | 0.41 | 0.08 | 0.074 | Pass |
| **9/9/2019 6:10:00 AM** | 0.18 | 0.06 | 0.04 | 0.11 | Pass | 0.51 | 0.41 | 0.08 | 0.104 | Pass |
| **9/10/2019 4:44:00 AM** | 0.15 | 0.06 | 0.04 | 0.08 | Pass | 0.57 | 0.41 | 0.08 | 0.159 | Pass |
| **Detector 4** | | | | | | | | | | |
| **9/8/2019 11:45:00 AM** | 0.27 | 0.11 | 0.04 | 0.15 | FAIL | 0.61 | 0.40 | 0.08 | 0.205 | Pass |
| **9/9/2019 6:10:00 AM** | 0.27 | 0.11 | 0.04 | 0.16 | FAIL | 0.50 | 0.40 | 0.08 | 0.100 | Pass |
| **9/9/2019 9:53:00 AM** | 0.21 | 0.11 | 0.04 | 0.10 | Pass | 0.54 | 0.40 | 0.08 | 0.140 | Pass |
| **9/10/2019 4:44:00 AM** | 0.22 | 0.11 | 0.04 | 0.10 | Pass | 0.49 | 0.40 | 0.08 | 0.090 | Pass |
| **Detector 5** | | | | | | | | | | |
| **9/8/2019 11:45:00 AM** | 0.18 | 0.11 | 0.04 | 0.07 | Pass | 0.43 | 0.41 | 0.08 | 0.017 | Pass |
| **9/9/2019 6:10:00 AM** | 0.31 | 0.11 | 0.04 | 0.20 | FAIL | 0.45 | 0.41 | 0.08 | 0.037 | Pass |
| **9/9/2019 9:53:00 AM** | 0.19 | 0.11 | 0.04 | 0.08 | Pass | 0.50 | 0.41 | 0.08 | 0.082 | Pass |
| **9/10/2019 4:45:00 AM** | 0.18 | 0.11 | 0.04 | 0.07 | Pass | 0.62 | 0.41 | 0.08 | 0.202 | Pass |
| **Detector 6** | | | | | | | | | | |
| **9/8/2019 11:45:00 AM** | 0.14 | 0.14 | 0.04 | 0.00 | Pass | 0.43 | 0.42 | 0.05 | 0.006 | Pass |
| **9/9/2019 6:10:00 AM** | 0.15 | 0.14 | 0.04 | 0.01 | Pass | 0.41 | 0.42 | 0.05 | -0.014 | Pass |
| **9/10/2019 4:45:00 AM** | 0.11 | 0.14 | 0.04 | -0.03 | Pass | 0.54 | 0.42 | 0.05 | 0.121 | Pass |

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# Gas Proportional Counter Daily Quality Control Checks

***Instrument: Blue***

| | AlphaBKG CPM | BKG Mean | BKG +/- limit | BKG Deviation | BKG Flag | BetaBKG CPM | BetaBKG Mean | BetaBKG +/- limit | BetaBKG Deviation | BetaBKG Flag |
|---|---|---|---|---|---|---|---|---|---|---|
| **Detector 7** | | | | | | | | | | |
| **9/8/2019 11:45:00 AM** | 0.30 | 0.10 | 0.04 | 0.20 | FAIL | 0.64 | 0.49 | 0.12 | 0.154 | Pass |
| **9/9/2019 6:10:00 AM** | 0.25 | 0.10 | 0.04 | 0.15 | FAIL | 0.55 | 0.49 | 0.12 | 0.064 | Pass |
| **9/10/2019 4:45:00 AM** | 0.19 | 0.10 | 0.04 | 0.09 | Pass | 0.65 | 0.49 | 0.12 | 0.159 | Pass |
| **Detector 8** | | | | | | | | | | |
| **9/8/2019 11:45:00 AM** | 0.15 | 0.09 | 0.04 | 0.05 | Pass | 0.53 | 0.44 | 0.08 | 0.086 | Pass |
| **9/9/2019 6:10:00 AM** | 0.19 | 0.09 | 0.04 | 0.09 | Pass | 0.51 | 0.44 | 0.08 | 0.061 | Pass |
| **9/10/2019 4:45:00 AM** | 0.18 | 0.09 | 0.04 | 0.09 | Pass | 0.54 | 0.44 | 0.08 | 0.096 | Pass |
| **Detector 9** | | | | | | | | | | |
| **9/8/2019 11:45:00 AM** | 0.18 | 0.10 | 0.04 | 0.08 | Pass | 0.46 | 0.39 | 0.06 | 0.066 | Pass |
| **9/9/2019 6:10:00 AM** | 0.18 | 0.10 | 0.04 | 0.08 | Pass | 0.43 | 0.39 | 0.06 | 0.036 | Pass |
| **9/10/2019 4:45:00 AM** | 0.22 | 0.10 | 0.04 | 0.12 | Pass | 0.51 | 0.39 | 0.06 | 0.116 | Pass |
| **Detector 10** | | | | | | | | | | |
| **9/8/2019 11:45:00 AM** | 0.21 | 0.09 | 0.04 | 0.11 | Pass | 0.41 | 0.33 | 0.08 | 0.074 | Pass |
| **9/9/2019 6:10:00 AM** | 0.26 | 0.09 | 0.04 | 0.16 | FAIL | 0.51 | 0.33 | 0.08 | 0.174 | Pass |
| **9/9/2019 9:53:00 AM** | 0.17 | 0.09 | 0.04 | 0.07 | Pass | 0.36 | 0.33 | 0.08 | 0.024 | Pass |
| **9/10/2019 4:45:00 AM** | 0.14 | 0.09 | 0.04 | 0.05 | Pass | 0.32 | 0.33 | 0.08 | -0.016 | Pass |
| **Detector 11** | | | | | | | | | | |
| **9/8/2019 11:45:00 AM** | 0.12 | 0.09 | 0.04 | 0.03 | Pass | 0.39 | 0.45 | 0.10 | -0.062 | Pass |
| **9/9/2019 6:11:00 AM** | 0.12 | 0.09 | 0.04 | 0.03 | Pass | 0.55 | 0.45 | 0.10 | 0.103 | Pass |
| **9/10/2019 4:45:00 AM** | 0.15 | 0.09 | 0.04 | 0.06 | Pass | 0.58 | 0.45 | 0.10 | 0.133 | Pass |
| **Detector 12** | | | | | | | | | | |
| **9/8/2019 11:45:00 AM** | 0.15 | 0.11 | 0.03 | 0.03 | Pass | 0.52 | 0.44 | 0.11 | 0.070 | Pass |
| **9/9/2019 6:11:00 AM** | 0.22 | 0.11 | 0.03 | 0.11 | FAIL | 0.53 | 0.44 | 0.11 | 0.085 | Pass |
| **9/9/2019 9:53:00 AM** | 0.20 | 0.11 | 0.03 | 0.08 | Pass | 0.44 | 0.44 | 0.11 | -0.010 | Pass |
| **9/10/2019 4:45:00 AM** | 0.16 | 0.11 | 0.03 | 0.04 | Pass | 0.37 | 0.44 | 0.11 | -0.075 | Pass |
| **Detector 13** | | | | | | | | | | |
| **9/8/2019 11:45:00 AM** | 0.21 | 0.09 | 0.05 | 0.11 | Pass | 0.39 | 0.40 | 0.09 | -0.005 | Pass |
| **9/9/2019 6:11:00 AM** | 0.15 | 0.09 | 0.05 | 0.05 | Pass | 0.53 | 0.40 | 0.09 | 0.135 | Pass |
| **9/10/2019 4:45:00 AM** | 0.24 | 0.09 | 0.05 | 0.14 | FAIL | 0.53 | 0.40 | 0.09 | 0.135 | Pass |
| **Detector 14** | | | | | | | | | | |
| **9/8/2019 11:45:00 AM** | 0.22 | 0.10 | 0.04 | 0.12 | FAIL | 0.49 | 0.39 | 0.08 | 0.104 | Pass |
| **9/9/2019 6:11:00 AM** | 0.17 | 0.10 | 0.04 | 0.07 | Pass | 0.29 | 0.39 | 0.08 | -0.096 | Pass |
| **9/10/2019 4:45:00 AM** | 0.20 | 0.10 | 0.04 | 0.10 | Pass | 0.57 | 0.39 | 0.08 | 0.179 | Pass |

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# Gas Proportional Counter Daily Quality Control Checks

***Instrument: Blue***

| | AlphaBKG CPM | BKG Mean | BKG +/- limit | BKG Deviation | BKG Flag | BetaBKG CPM | BetaBKG Mean | BetaBKG +/- limit | BetaBKG Deviation | BetaBKG Flag |
|---|---|---|---|---|---|---|---|---|---|---|
| **Detector 15** | | | | | | | | | | |
| **9/8/2019 11:46:00 AM** | 0.14 | 0.09 | 0.04 | 0.05 | Pass | 0.42 | 0.44 | 0.07 | -0.025 | Pass |
| **9/9/2019 6:11:00 AM** | 0.13 | 0.09 | 0.04 | 0.04 | Pass | 0.50 | 0.44 | 0.07 | 0.055 | Pass |
| **9/10/2019 4:46:00 AM** | 0.23 | 0.09 | 0.04 | 0.14 | **FAIL** | 0.51 | 0.44 | 0.07 | 0.070 | Pass |
| **Detector 16** | | | | | | | | | | |
| **9/8/2019 11:51:00 AM** | 0.17 | 0.10 | 0.05 | 0.07 | Pass | 5.59 | 1.85 | 2.38 | 3.735 | Pass |
| **9/9/2019 6:11:00 AM** | 0.16 | 0.10 | 0.05 | 0.05 | Pass | 5.99 | 1.85 | 2.38 | 4.135 | Pass |
| **9/10/2019 4:46:00 AM** | 0.15 | 0.10 | 0.05 | 0.04 | Pass | 5.44 | 1.85 | 2.38 | 3.585 | Pass |
| **Detector 17** | | | | | | | | | | |
| **9/8/2019 11:51:00 AM** | 0.27 | 0.08 | 0.05 | 0.19 | **FAIL** | 0.59 | 0.43 | 0.08 | 0.162 | Pass |
| **9/9/2019 6:11:00 AM** | 0.11 | 0.08 | 0.05 | 0.03 | Pass | 0.43 | 0.43 | 0.08 | 0.002 | Pass |
| **9/10/2019 4:46:00 AM** | 0.18 | 0.08 | 0.05 | 0.10 | Pass | 0.36 | 0.43 | 0.08 | -0.073 | Pass |
| **Detector 18** | | | | | | | | | | |
| **9/8/2019 11:51:00 AM** | 1.08 | 0.05 | 0.03 | 1.03 | **FAIL** | 1.26 | 0.62 | 0.09 | 0.640 | **FAIL** |
| **9/9/2019 6:11:00 AM** | 0.93 | 0.05 | 0.03 | 0.87 | **FAIL** | 1.43 | 0.62 | 0.09 | 0.805 | **FAIL** |
| **9/10/2019 4:46:00 AM** | 1.11 | 0.05 | 0.03 | 1.05 | **FAIL** | 1.33 | 0.62 | 0.09 | 0.710 | **FAIL** |
| **Detector 19** | | | | | | | | | | |
| **9/8/2019 11:51:00 AM** | 0.16 | 0.10 | 0.03 | 0.05 | Pass | 0.54 | 0.49 | 0.10 | 0.048 | Pass |
| **9/9/2019 6:11:00 AM** | 0.23 | 0.10 | 0.03 | 0.12 | **FAIL** | 0.67 | 0.49 | 0.10 | 0.173 | Pass |
| **9/10/2019 4:46:00 AM** | 0.32 | 0.10 | 0.03 | 0.21 | **FAIL** | 0.60 | 0.49 | 0.10 | 0.103 | Pass |
| **Detector 20** | | | | | | | | | | |
| **9/9/2019 6:11:00 AM** | 0.17 | 0.11 | 0.07 | 0.06 | Pass | 0.51 | 0.44 | 0.11 | 0.070 | Pass |
| **9/10/2019 4:46:00 AM** | 0.19 | 0.11 | 0.07 | 0.08 | Pass | 0.52 | 0.44 | 0.11 | 0.080 | Pass |
| **Detector 21** | | | | | | | | | | |
| **9/9/2019 6:11:00 AM** | 0.22 | 0.05 | 0.03 | 0.17 | **FAIL** | 0.44 | 0.34 | 0.12 | 0.092 | Pass |
| **9/10/2019 4:46:00 AM** | 0.14 | 0.05 | 0.03 | 0.09 | **FAIL** | 0.42 | 0.34 | 0.12 | 0.077 | Pass |
| **Detector 22** | | | | | | | | | | |
| **9/9/2019 6:11:00 AM** | 0.24 | 0.07 | 0.04 | 0.16 | **FAIL** | 0.41 | 0.40 | 0.06 | 0.009 | Pass |
| **9/10/2019 4:46:00 AM** | 0.16 | 0.07 | 0.04 | 0.08 | Pass | 0.40 | 0.40 | 0.06 | -0.001 | Pass |
| **Detector 23** | | | | | | | | | | |
| **9/9/2019 6:11:00 AM** | 0.42 | 0.05 | 0.02 | 0.37 | **FAIL** | 0.72 | 0.47 | 0.10 | 0.252 | Pass |
| **9/10/2019 4:46:00 AM** | 0.46 | 0.05 | 0.02 | 0.40 | **FAIL** | 0.67 | 0.47 | 0.10 | 0.197 | Pass |

# Gas Proportional Counter Daily Quality Control Checks

***Instrument: Blue***

| | AlphaBKG CPM | BKG Mean | BKG +/- limit | BKG Deviation | BKG Flag | BetaBKG CPM | BetaBKG Mean | BetaBKG +/- limit | BetaBKG Deviation | BetaBKG Flag |
|---|---|---|---|---|---|---|---|---|---|---|

**The Alpha and Beta +/- limit are based upon initial 20-point population.**

**The Alpha and Beta +/- limit for Efficiency is stated at 3%. Flags are "FAIL" > 3%.**

**The Alpha and Beta +/- limit for Background is stated at 1 StDev. Flags are "FAIL" > 3 StDev.**

**The Alpha +/- limit for Crosstalk is stated at 1 StDev. Flags are "Warning > 2 StDev and "DOEF" > 3 StDev. Beta is negligible, for trend only ("NA").**

**Times shown reflect the end of the count duration.**

**APPROVED**
*By Kody Saulters at 9:12 am, Aug 29, 2019*

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# Gas Proportional Counter Daily Quality Control Checks

***Instrument: Orange***

| | Alpha CPM | Alpha Mean | Alpha +/- limit | Alpha Deviation | Alpha Flag | A>>B XT CPM | A>>B XT Mean | A>>B XT +/- limit | A>>B XT Deviation | A>>B XT Flag |
|---|---|---|---|---|---|---|---|---|---|---|
| **Check Type = Alpha** | | | | | | | | | | |
| **Detector 0** | | | | | | | | | | |
| **8/28/2019 12:25:00 AM** | 11844.87 | 12672.50 | 380.18 | -827.63 | FAIL | 4061.00 | 4296.38 | 82.77 | -235.375 | WARNING |
| **8/29/2019 12:02:00 AM** | 11908.56 | 12672.50 | 380.18 | -763.94 | FAIL | 4039.00 | 4296.38 | 82.77 | -257.375 | DOEF |
| **Detector 1** | | | | | | | | | | |
| **8/28/2019 12:25:00 AM** | 12750.27 | 13470.00 | 404.10 | -719.73 | FAIL | 4476.00 | 4380.30 | 175.16 | 95.700 | Pass |
| **8/29/2019 12:02:00 AM** | 12712.25 | 13470.00 | 404.10 | -757.75 | FAIL | 3990.00 | 4380.30 | 175.16 | -390.300 | WARNING |
| **Detector 2** | | | | | | | | | | |
| **8/28/2019 12:25:00 AM** | 13073.65 | 14052.18 | 421.57 | -978.52 | FAIL | 4383.50 | 4507.15 | 164.48 | -123.650 | Pass |
| **8/29/2019 12:02:00 AM** | 12998.05 | 14052.18 | 421.57 | -1054.13 | FAIL | 4113.50 | 4507.15 | 164.48 | -393.650 | WARNING |
| **Detector 3** | | | | | | | | | | |
| **8/28/2019 12:25:00 AM** | 12705.77 | 13117.55 | 393.53 | -411.78 | FAIL | 4324.50 | 4304.23 | 107.14 | 20.275 | Pass |
| **8/29/2019 12:02:00 AM** | 12638.68 | 13117.55 | 393.53 | -478.87 | FAIL | 4201.00 | 4304.23 | 107.14 | -103.225 | Pass |
| **Detector 4** | | | | | | | | | | |
| **8/28/2019 12:26:00 AM** | 15430.03 | 16081.68 | 482.45 | -651.64 | FAIL | 6151.50 | 6277.50 | 110.70 | -126.000 | Pass |
| **8/29/2019 12:02:00 AM** | 15628.52 | 16081.68 | 482.45 | -453.16 | Pass | 6183.50 | 6277.50 | 110.70 | -94.000 | Pass |
| **8/29/2019 1:40:00 AM** | 15546.85 | 16081.68 | 482.45 | -534.83 | FAIL | 6237.00 | 6277.50 | 110.70 | -40.500 | Pass |
| **Detector 5** | | | | | | | | | | |
| **8/28/2019 12:26:00 AM** | 15900.23 | 16223.20 | 486.70 | -322.97 | Pass | 6490.50 | 6745.73 | 1761.29 | -255.225 | Pass |
| **8/29/2019 12:02:00 AM** | 16013.54 | 16223.20 | 486.70 | -209.66 | Pass | 6109.50 | 6745.73 | 1761.29 | -636.225 | Pass |
| **Detector 6** | | | | | | | | | | |
| **8/28/2019 12:26:00 AM** | 13530.62 | 14588.50 | 437.66 | -1057.88 | FAIL | 6643.50 | 6496.20 | 551.68 | 147.300 | Pass |
| **Detector 7** | | | | | | | | | | |
| **8/28/2019 12:26:00 AM** | 14697.58 | 15629.53 | 468.89 | -931.95 | FAIL | 5483.50 | 5742.78 | 47.80 | -259.275 | DOEF |
| **8/29/2019 12:02:00 AM** | 14783.35 | 15629.53 | 468.89 | -846.17 | FAIL | 5553.00 | 5742.78 | 47.80 | -189.775 | DOEF |
| **Detector 8** | | | | | | | | | | |
| **8/28/2019 12:07:00 AM** | 11720.66 | 12479.00 | 374.37 | -758.34 | FAIL | 4162.50 | 4244.75 | 69.84 | -82.250 | Pass |
| **8/29/2019 12:11:00 AM** | 11775.35 | 12479.00 | 374.37 | -703.65 | FAIL | 4165.50 | 4244.75 | 69.84 | -79.250 | Pass |
| **Detector 9** | | | | | | | | | | |
| **8/28/2019 12:07:00 AM** | 13013.32 | 13598.65 | 407.96 | -585.33 | FAIL | 4648.00 | 4590.98 | 94.06 | 57.025 | Pass |
| **8/29/2019 12:11:00 AM** | 12945.21 | 13598.65 | 407.96 | -653.44 | FAIL | 4591.00 | 4590.98 | 94.06 | 0.025 | Pass |
| **Detector 10** | | | | | | | | | | |
| **8/28/2019 12:07:00 AM** | 10888.95 | 11579.50 | 347.39 | -690.55 | FAIL | 6925.50 | 7562.65 | 208.99 | -637.150 | DOEF |
| **8/29/2019 12:11:00 AM** | 10753.21 | 11579.50 | 347.39 | -826.29 | FAIL | 6973.00 | 7562.65 | 208.99 | -589.650 | WARNING |

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# Gas Proportional Counter Daily Quality Control Checks

## *Instrument: Orange*

| | Alpha CPM | Alpha Mean | Alpha +/- limit | Alpha Deviation | Alpha Flag | A>>B XT CPM | A>>B XT Mean | A>>B XT +/- limit | A>>B XT Deviation | A>>B XT Flag |
|---|---|---|---|---|---|---|---|---|---|---|
| **Detector 11** | | | | | | | | | | |
| **8/28/2019 12:07:00 AM** | 12845.96 | 13398.55 | 401.96 | -552.59 | FAIL | 4360.00 | 4216.58 | 69.06 | 143.425 | WARNING |
| **8/29/2019 12:11:00 AM** | 12957.80 | 13398.55 | 401.96 | -440.75 | FAIL | 4423.50 | 4216.58 | 69.06 | 206.925 | WARNING |
| **Detector 12** | | | | | | | | | | |
| **8/28/2019 12:08:00 AM** | 17283.86 | 16917.10 | 507.51 | 366.76 | Pass | 5981.50 | 5738.50 | 103.00 | 243.000 | WARNING |
| **8/29/2019 12:11:00 AM** | 17568.15 | 16917.10 | 507.51 | 651.05 | FAIL | 6161.50 | 5738.50 | 103.00 | 423.000 | DOEF |
| **Detector 13** | | | | | | | | | | |
| **8/28/2019 12:08:00 AM** | 16512.46 | 17051.55 | 511.55 | -539.09 | FAIL | 5263.00 | 5209.90 | 107.08 | 53.100 | Pass |
| **8/28/2019 1:43:00 AM** | 16714.96 | 17051.55 | 511.55 | -336.59 | Pass | 5301.50 | 5209.90 | 107.08 | 91.600 | Pass |
| **8/28/2019 1:48:00 AM** | 16584.63 | 17051.55 | 511.55 | -466.92 | Pass | 5295.00 | 5209.90 | 107.08 | 85.100 | Pass |
| **8/29/2019 12:11:00 AM** | 16632.83 | 17051.55 | 511.55 | -418.72 | Pass | 5343.00 | 5209.90 | 107.08 | 133.100 | Pass |
| **Detector 14** | | | | | | | | | | |
| **8/28/2019 12:08:00 AM** | 14949.17 | 15840.60 | 475.22 | -891.43 | FAIL | 4618.00 | 4992.58 | 237.19 | -374.575 | Pass |
| **8/29/2019 12:11:00 AM** | 14936.21 | 15840.60 | 475.22 | -904.39 | FAIL | 4733.00 | 4992.58 | 237.19 | -259.575 | Pass |
| **Detector 15** | | | | | | | | | | |
| **8/28/2019 12:08:00 AM** | 14990.21 | 15402.33 | 462.07 | -412.11 | Pass | 4926.00 | 5238.48 | 99.26 | -312.475 | DOEF |
| **8/29/2019 12:11:00 AM** | 14976.25 | 15402.33 | 462.07 | -426.08 | Pass | 4958.00 | 5238.48 | 99.26 | -280.475 | WARNING |
| **Detector 16** | | | | | | | | | | |
| **8/28/2019 12:12:00 AM** | 11852.55 | 12627.03 | 378.81 | -774.48 | FAIL | 4183.00 | 4414.55 | 41.62 | -231.550 | DOEF |
| **8/29/2019 12:33:00 AM** | 11738.32 | 12627.03 | 378.81 | -888.70 | FAIL | 4221.00 | 4414.55 | 41.62 | -193.550 | DOEF |
| **Detector 17** | | | | | | | | | | |
| **8/28/2019 12:12:00 AM** | 12470.07 | 13433.43 | 403.00 | -963.35 | FAIL | 4821.00 | 4784.03 | 106.71 | 36.975 | Pass |
| **8/29/2019 12:33:00 AM** | 12676.13 | 13433.43 | 403.00 | -757.29 | FAIL | 4788.00 | 4784.03 | 106.71 | 3.975 | Pass |
| **Detector 18** | | | | | | | | | | |
| **8/28/2019 12:12:00 AM** | 13221.42 | 14158.50 | 424.76 | -937.08 | FAIL | 4636.00 | 4572.70 | 56.75 | 63.300 | Pass |
| **8/29/2019 12:33:00 AM** | 13324.23 | 14158.50 | 424.76 | -834.27 | FAIL | 4684.50 | 4572.70 | 56.75 | 111.800 | Pass |
| **Detector 19** | | | | | | | | | | |
| **8/28/2019 12:12:00 AM** | 12922.40 | 13416.05 | 402.48 | -493.65 | FAIL | 4331.50 | 4519.53 | 68.19 | -188.025 | WARNING |
| **8/29/2019 12:33:00 AM** | 12963.54 | 13416.05 | 402.48 | -452.51 | FAIL | 4401.50 | 4519.53 | 68.19 | -118.025 | Pass |
| **Detector 20** | | | | | | | | | | |
| **8/28/2019 12:12:00 AM** | 16358.56 | 16878.00 | 506.34 | -519.44 | FAIL | 5621.50 | 5700.48 | 42.88 | -78.975 | Pass |
| **8/28/2019 1:43:00 AM** | 16529.48 | 16878.00 | 506.34 | -348.52 | Pass | 5609.50 | 5700.48 | 42.88 | -90.975 | WARNING |
| **8/28/2019 1:48:00 AM** | 16441.26 | 16878.00 | 506.34 | -436.74 | Pass | 5689.50 | 5700.48 | 42.88 | -10.975 | Pass |
| **8/29/2019 12:34:00 AM** | 16577.17 | 16878.00 | 506.34 | -300.83 | Pass | 5669.00 | 5700.48 | 42.88 | -31.475 | Pass |

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# Gas Proportional Counter Daily Quality Control Checks

***Instrument: Orange***

| | Alpha CPM | Alpha Mean | Alpha +/- limit | Alpha Deviation | Alpha Flag | A>>B XT CPM | A>>B XT Mean | A>>B XT +/- limit | A>>B XT Deviation | A>>B XT Flag |
|---|---|---|---|---|---|---|---|---|---|---|
| **Detector 21** | | | | | | | | | | |
| **8/28/2019 12:12:00 AM** | 16641.91 | 16936.60 | 508.10 | -294.69 | Pass | 5557.50 | 5744.13 | 61.40 | -186.625 | **DOEF** |
| **8/29/2019 12:34:00 AM** | 16557.31 | 16936.60 | 508.10 | -379.29 | Pass | 5521.00 | 5744.13 | 61.40 | -223.125 | **DOEF** |
| **Detector 22** | | | | | | | | | | |
| **8/28/2019 12:12:00 AM** | 14782.71 | 15510.45 | 465.31 | -727.74 | **FAIL** | 5295.00 | 5610.13 | 63.22 | -315.125 | **DOEF** |
| **8/29/2019 12:34:00 AM** | 14671.49 | 15510.45 | 465.31 | -838.96 | **FAIL** | 5447.00 | 5610.13 | 63.22 | -163.125 | **WARNING** |
| **Detector 23** | | | | | | | | | | |
| **8/28/2019 12:12:00 AM** | 14420.31 | 15430.00 | 462.90 | -1009.69 | **FAIL** | 5535.50 | 5503.28 | 61.42 | 32.225 | Pass |
| **8/29/2019 12:34:00 AM** | 14438.91 | 15430.00 | 462.90 | -991.09 | **FAIL** | 5578.50 | 5503.28 | 61.42 | 75.225 | Pass |

# Gas Proportional Counter Daily Quality Control Checks

***Instrument: Orange***

| | Beta CPM | Beta Mean | Beta +/- limit | Beta Deviation | Beta Flag | B>>A XT CPM | B>>A XT Mean | B>>A XT +/- limit | B>>A XT Deviation | B>>A XT Flag |
|---|---|---|---|---|---|---|---|---|---|---|
| **Check Type = Beta** | | | | | | | | | | |
| **Detector 0** | | | | | | | | | | |
| **8/28/2019 12:34:00 AM** | 49654.96 | 49935.03 | 1498.05 | -280.06 | Pass | NA | NA | NA | NA | NA |
| **8/29/2019 1:04:00 AM** | 49292.87 | 49935.03 | 1498.05 | -642.15 | Pass | NA | NA | NA | NA | NA |
| **Detector 1** | | | | | | | | | | |
| **8/28/2019 12:34:00 AM** | 47724.52 | 48521.48 | 1455.64 | -796.96 | Pass | NA | NA | NA | NA | NA |
| **8/29/2019 1:04:00 AM** | 47506.19 | 48521.48 | 1455.64 | -1015.28 | Pass | NA | NA | NA | NA | NA |
| **Detector 2** | | | | | | | | | | |
| **8/28/2019 12:34:00 AM** | 49577.61 | 49918.95 | 1497.57 | -341.34 | Pass | NA | NA | NA | NA | NA |
| **8/29/2019 1:04:00 AM** | 49487.82 | 49918.95 | 1497.57 | -431.13 | Pass | NA | NA | NA | NA | NA |
| **Detector 3** | | | | | | | | | | |
| **8/28/2019 12:34:00 AM** | 58740.90 | 59069.20 | 1772.08 | -328.30 | Pass | NA | NA | NA | NA | NA |
| **8/29/2019 1:04:00 AM** | 58194.25 | 59069.20 | 1772.08 | -874.95 | Pass | NA | NA | NA | NA | NA |
| **Detector 4** | | | | | | | | | | |
| **8/28/2019 12:33:00 AM** | 56201.25 | 55962.22 | 1678.87 | 239.03 | Pass | NA | NA | NA | NA | NA |
| **8/29/2019 1:04:00 AM** | 55950.07 | 55962.22 | 1678.87 | -12.15 | Pass | NA | NA | NA | NA | NA |
| **Detector 5** | | | | | | | | | | |
| **8/28/2019 12:33:00 AM** | 53803.67 | 54077.08 | 1622.31 | -273.40 | Pass | NA | NA | NA | NA | NA |
| **8/29/2019 1:04:00 AM** | 54042.75 | 54077.08 | 1622.31 | -34.33 | Pass | NA | NA | NA | NA | NA |
| **Detector 6** | | | | | | | | | | |
| **8/28/2019 12:33:00 AM** | 50674.93 | 49736.35 | 1492.09 | 938.58 | Pass | NA | NA | NA | NA | NA |
| **8/29/2019 1:04:00 AM** | 51111.77 | 49736.35 | 1492.09 | 1375.42 | Pass | NA | NA | NA | NA | NA |
| **Detector 7** | | | | | | | | | | |
| **8/28/2019 12:33:00 AM** | 45494.89 | 45414.23 | 1362.43 | 80.66 | Pass | NA | NA | NA | NA | NA |
| **8/29/2019 1:04:00 AM** | 45545.72 | 45414.23 | 1362.43 | 131.49 | Pass | NA | NA | NA | NA | NA |
| **Detector 8** | | | | | | | | | | |
| **8/28/2019 12:38:00 AM** | 49604.03 | 49452.15 | 1483.56 | 151.88 | Pass | NA | NA | NA | NA | NA |
| **8/29/2019 1:09:00 AM** | 50108.02 | 49452.15 | 1483.56 | 655.87 | Pass | NA | NA | NA | NA | NA |
| **Detector 9** | | | | | | | | | | |
| **8/28/2019 12:38:00 AM** | 49033.42 | 48747.90 | 1462.44 | 285.52 | Pass | NA | NA | NA | NA | NA |
| **8/29/2019 1:09:00 AM** | 48973.55 | 48747.90 | 1462.44 | 225.65 | Pass | NA | NA | NA | NA | NA |
| **Detector 10** | | | | | | | | | | |
| **8/28/2019 12:38:00 AM** | 50284.28 | 50054.68 | 1501.64 | 229.61 | Pass | NA | NA | NA | NA | NA |
| **8/29/2019 1:09:00 AM** | 50252.66 | 50054.68 | 1501.64 | 197.99 | Pass | NA | NA | NA | NA | NA |

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# Gas Proportional Counter Daily Quality Control Checks

## *Instrument: Orange*

| | Beta CPM | Beta Mean | Beta +/- limit | Beta Deviation | Beta Flag | B>>A XT CPM | B>>A XT Mean | B>>A XT +/- limit | B>>A XT Deviation | B>>A XT Flag |
|---|---|---|---|---|---|---|---|---|---|---|
| **Detector 11** | | | | | | | | | | |
| **8/28/2019 12:38:00 AM** | 59205.95 | 59142.43 | 1774.27 | 63.52 | Pass | NA | NA | NA | NA | NA |
| **8/29/2019 1:09:00 AM** | 59202.03 | 59142.43 | 1774.27 | 59.61 | Pass | NA | NA | NA | NA | NA |
| **Detector 12** | | | | | | | | | | |
| **8/28/2019 12:39:00 AM** | 59202.30 | 56886.15 | 1706.58 | 2316.15 | **FAIL** | NA | NA | NA | NA | NA |
| **8/29/2019 1:09:00 AM** | 59056.00 | 56886.15 | 1706.58 | 2169.85 | **FAIL** | NA | NA | NA | NA | NA |
| **Detector 13** | | | | | | | | | | |
| **8/28/2019 12:39:00 AM** | 54933.29 | 55204.43 | 1656.13 | -271.13 | Pass | NA | NA | NA | NA | NA |
| **8/29/2019 1:09:00 AM** | 55179.96 | 55204.43 | 1656.13 | -24.47 | Pass | NA | NA | NA | NA | NA |
| **Detector 14** | | | | | | | | | | |
| **8/28/2019 12:39:00 AM** | 50870.64 | 51681.73 | 1550.45 | -811.08 | Pass | NA | NA | NA | NA | NA |
| **8/29/2019 1:09:00 AM** | 51018.93 | 51681.73 | 1550.45 | -662.80 | Pass | NA | NA | NA | NA | NA |
| **Detector 15** | | | | | | | | | | |
| **8/28/2019 12:39:00 AM** | 45704.09 | 44769.68 | 1343.09 | 934.42 | Pass | NA | NA | NA | NA | NA |
| **8/29/2019 1:09:00 AM** | 45573.08 | 44769.68 | 1343.09 | 803.40 | Pass | NA | NA | NA | NA | NA |
| **Detector 16** | | | | | | | | | | |
| **8/28/2019 1:13:00 AM** | 49951.25 | 49427.80 | 1482.83 | 523.45 | Pass | NA | NA | NA | NA | NA |
| **8/29/2019 1:13:00 AM** | 49988.45 | 49427.80 | 1482.83 | 560.65 | Pass | NA | NA | NA | NA | NA |
| **Detector 17** | | | | | | | | | | |
| **8/28/2019 1:13:00 AM** | 48457.96 | 48123.48 | 1443.70 | 334.48 | Pass | NA | NA | NA | NA | NA |
| **8/29/2019 1:13:00 AM** | 48202.99 | 48123.48 | 1443.70 | 79.52 | Pass | NA | NA | NA | NA | NA |
| **Detector 18** | | | | | | | | | | |
| **8/28/2019 1:13:00 AM** | 49950.79 | 49818.00 | 1494.54 | 132.79 | Pass | NA | NA | NA | NA | NA |
| **8/29/2019 1:13:00 AM** | 50135.32 | 49818.00 | 1494.54 | 317.32 | Pass | NA | NA | NA | NA | NA |
| **Detector 19** | | | | | | | | | | |
| **8/28/2019 1:13:00 AM** | 59897.22 | 60133.55 | 1804.01 | -236.33 | Pass | NA | NA | NA | NA | NA |
| **8/29/2019 1:13:00 AM** | 60060.25 | 60133.55 | 1804.01 | -73.30 | Pass | NA | NA | NA | NA | NA |
| **Detector 20** | | | | | | | | | | |
| **8/28/2019 1:13:00 AM** | 55833.22 | 56390.63 | 1691.72 | -557.41 | Pass | NA | NA | NA | NA | NA |
| **8/29/2019 1:14:00 AM** | 55897.93 | 56390.63 | 1691.72 | -492.70 | Pass | NA | NA | NA | NA | NA |
| **Detector 21** | | | | | | | | | | |
| **8/28/2019 1:13:00 AM** | 55472.96 | 55234.63 | 1657.04 | 238.34 | Pass | NA | NA | NA | NA | NA |
| **8/29/2019 1:14:00 AM** | 55072.41 | 55234.63 | 1657.04 | -162.22 | Pass | NA | NA | NA | NA | NA |

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# Gas Proportional Counter Daily Quality Control Checks

***Instrument: Orange***

| | Beta CPM | Beta Mean | Beta +/- limit | Beta Deviation | Beta Flag | B>>A XT CPM | B>>A XT Mean | B>>A XT +/- limit | B>>A XT Deviation | B>>A XT Flag |
|---|---|---|---|---|---|---|---|---|---|---|
| **Detector 22** | | | | | | | | | | |
| **8/28/2019 1:13:00 AM** | 51467.81 | 52617.68 | 1578.53 | -1149.87 | Pass | NA | NA | NA | NA | NA |
| **8/29/2019 1:14:00 AM** | 51730.93 | 52617.68 | 1578.53 | -886.74 | Pass | NA | NA | NA | NA | NA |
| **Detector 23** | | | | | | | | | | |
| **8/28/2019 1:13:00 AM** | 44544.69 | 45356.30 | 1360.69 | -811.61 | Pass | NA | NA | NA | NA | NA |
| **8/29/2019 1:14:00 AM** | 44563.28 | 45356.30 | 1360.69 | -793.02 | Pass | NA | NA | NA | NA | NA |

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# Gas Proportional Counter Daily Quality Control Checks

***Instrument: Orange***

| | AlphaBKG CPM | BKG Mean | BKG +/- limit | BKG Deviation | BKG Flag | BetaBKG CPM | BetaBKG Mean | BetaBKG +/- limit | BetaBKG Deviation | BetaBKG Flag |
|---|---|---|---|---|---|---|---|---|---|---|
| **Check Type = BKG** | | | | | | | | | | |
| **Detector 0** | | | | | | | | | | |
| **8/28/2019 5:11:00 AM** | 0.19 | 0.10 | 0.04 | 0.09 | Pass | 0.58 | 0.50 | 0.10 | 0.076 | Pass |
| **8/29/2019 5:16:00 AM** | 0.12 | 0.10 | 0.04 | 0.02 | Pass | 0.49 | 0.50 | 0.10 | -0.015 | Pass |
| **Detector 1** | | | | | | | | | | |
| **8/28/2019 5:11:00 AM** | 0.18 | 0.08 | 0.03 | 0.10 | FAIL | 0.53 | 0.38 | 0.06 | 0.143 | Pass |
| **8/29/2019 5:16:00 AM** | 0.24 | 0.08 | 0.03 | 0.16 | FAIL | 0.42 | 0.38 | 0.06 | 0.033 | Pass |
| **Detector 2** | | | | | | | | | | |
| **8/28/2019 5:10:00 AM** | 0.17 | 0.09 | 0.03 | 0.07 | Pass | 0.45 | 0.41 | 0.05 | 0.037 | Pass |
| **8/29/2019 5:16:00 AM** | 0.14 | 0.09 | 0.03 | 0.04 | Pass | 0.51 | 0.41 | 0.05 | 0.097 | Pass |
| **Detector 3** | | | | | | | | | | |
| **8/28/2019 5:10:00 AM** | 0.16 | 0.10 | 0.02 | 0.06 | Pass | 0.61 | 0.60 | 0.10 | 0.004 | Pass |
| **8/29/2019 5:16:00 AM** | 0.21 | 0.10 | 0.02 | 0.10 | FAIL | 0.62 | 0.60 | 0.10 | 0.014 | Pass |
| **Detector 4** | | | | | | | | | | |
| **8/28/2019 5:11:00 AM** | 0.14 | 0.10 | 0.03 | 0.04 | Pass | 0.59 | 0.46 | 0.07 | 0.124 | Pass |
| **8/29/2019 5:16:00 AM** | 0.13 | 0.10 | 0.03 | 0.03 | Pass | 0.42 | 0.46 | 0.07 | -0.047 | Pass |
| **Detector 5** | | | | | | | | | | |
| **8/28/2019 5:11:00 AM** | 0.23 | 0.08 | 0.01 | 0.15 | FAIL | 0.61 | 0.44 | 0.11 | 0.161 | Pass |
| **8/29/2019 5:16:00 AM** | 0.26 | 0.08 | 0.01 | 0.18 | FAIL | 0.55 | 0.44 | 0.11 | 0.101 | Pass |
| **Detector 6** | | | | | | | | | | |
| **8/28/2019 5:11:00 AM** | 0.14 | 0.10 | 0.04 | 0.04 | Pass | 0.46 | 0.46 | 0.08 | -0.008 | Pass |
| **8/29/2019 5:16:00 AM** | 0.17 | 0.10 | 0.04 | 0.07 | Pass | 0.52 | 0.46 | 0.08 | 0.057 | Pass |
| **Detector 7** | | | | | | | | | | |
| **8/28/2019 5:10:00 AM** | 0.22 | 0.12 | 0.03 | 0.10 | Pass | 0.76 | 0.52 | 0.10 | 0.234 | Pass |
| **8/29/2019 5:16:00 AM** | 0.29 | 0.12 | 0.03 | 0.17 | FAIL | 0.77 | 0.52 | 0.10 | 0.249 | Pass |
| **Detector 8** | | | | | | | | | | |
| **8/28/2019 5:10:00 AM** | 0.14 | 0.07 | 0.02 | 0.07 | FAIL | 0.53 | 0.42 | 0.07 | 0.105 | Pass |
| **8/29/2019 5:16:00 AM** | 0.22 | 0.07 | 0.02 | 0.15 | FAIL | 0.48 | 0.42 | 0.07 | 0.060 | Pass |
| **Detector 9** | | | | | | | | | | |
| **8/28/2019 5:10:00 AM** | 0.14 | 0.11 | 0.03 | 0.02 | Pass | 0.54 | 0.49 | 0.08 | 0.053 | Pass |
| **8/29/2019 5:16:00 AM** | 0.20 | 0.11 | 0.03 | 0.08 | Pass | 0.73 | 0.49 | 0.08 | 0.243 | Pass |
| **Detector 10** | | | | | | | | | | |
| **8/28/2019 5:10:00 AM** | 0.12 | 0.13 | 0.03 | -0.01 | Pass | 0.65 | 0.51 | 0.10 | 0.145 | Pass |
| **8/29/2019 5:16:00 AM** | 0.10 | 0.13 | 0.03 | -0.03 | Pass | 0.63 | 0.51 | 0.10 | 0.120 | Pass |

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# Gas Proportional Counter Daily Quality Control Checks

## *Instrument: Orange*

| | AlphaBKG CPM | BKG Mean | BKG +/- limit | BKG Deviation | BKG Flag | BetaBKG CPM | BetaBKG Mean | BetaBKG +/- limit | BetaBKG Deviation | BetaBKG Flag |
|---|---|---|---|---|---|---|---|---|---|---|
| **Detector 11** | | | | | | | | | | |
| **8/28/2019 5:10:00 AM** | 0.20 | 0.12 | 0.03 | 0.08 | Pass | 0.67 | 0.72 | 0.10 | -0.049 | Pass |
| **8/29/2019 5:16:00 AM** | 0.20 | 0.12 | 0.03 | 0.08 | Pass | 0.90 | 0.72 | 0.10 | 0.176 | Pass |
| **Detector 12** | | | | | | | | | | |
| **8/28/2019 5:11:00 AM** | 0.16 | 0.10 | 0.03 | 0.06 | Pass | 0.60 | 0.88 | 0.79 | -0.275 | Pass |
| **8/29/2019 5:16:00 AM** | 0.10 | 0.10 | 0.03 | 0.00 | Pass | 0.58 | 0.88 | 0.79 | -0.295 | Pass |
| **Detector 13** | | | | | | | | | | |
| **8/28/2019 5:11:00 AM** | 0.18 | 0.13 | 0.04 | 0.04 | Pass | 0.80 | 0.62 | 0.06 | 0.174 | **FAIL** |
| **8/28/2019 9:25:00 AM** | 0.18 | 0.13 | 0.04 | 0.04 | Pass | 0.90 | 0.62 | 0.06 | 0.274 | **FAIL** |
| **8/29/2019 5:16:00 AM** | 0.21 | 0.13 | 0.04 | 0.07 | Pass | 0.70 | 0.62 | 0.06 | 0.079 | Pass |
| **Detector 14** | | | | | | | | | | |
| **8/28/2019 5:11:00 AM** | 0.22 | 0.09 | 0.03 | 0.13 | **FAIL** | 0.67 | 0.52 | 0.09 | 0.147 | Pass |
| **8/29/2019 5:16:00 AM** | 0.13 | 0.09 | 0.03 | 0.03 | Pass | 0.49 | 0.52 | 0.09 | -0.028 | Pass |
| **Detector 15** | | | | | | | | | | |
| **8/28/2019 5:11:00 AM** | 0.17 | 0.14 | 0.02 | 0.03 | Pass | 0.51 | 0.54 | 0.07 | -0.034 | Pass |
| **8/29/2019 5:16:00 AM** | 0.20 | 0.14 | 0.02 | 0.06 | Pass | 0.56 | 0.54 | 0.07 | 0.011 | Pass |
| **Detector 16** | | | | | | | | | | |
| **8/28/2019 5:10:00 AM** | 0.10 | 0.11 | 0.03 | -0.01 | Pass | 0.40 | 0.51 | 0.10 | -0.115 | Pass |
| **8/29/2019 5:15:00 AM** | 0.14 | 0.11 | 0.03 | 0.03 | Pass | 0.44 | 0.51 | 0.10 | -0.080 | Pass |
| **Detector 17** | | | | | | | | | | |
| **8/28/2019 5:10:00 AM** | 0.18 | 0.10 | 0.04 | 0.07 | Pass | 0.34 | 0.41 | 0.07 | -0.070 | Pass |
| **8/29/2019 5:15:00 AM** | 0.15 | 0.10 | 0.04 | 0.04 | Pass | 0.38 | 0.41 | 0.07 | -0.030 | Pass |
| **Detector 18** | | | | | | | | | | |
| **8/28/2019 5:10:00 AM** | 0.16 | 0.08 | 0.03 | 0.08 | Pass | 0.36 | 0.36 | 0.06 | -0.005 | Pass |
| **8/29/2019 5:15:00 AM** | 0.17 | 0.08 | 0.03 | 0.09 | **FAIL** | 0.37 | 0.36 | 0.06 | 0.005 | Pass |
| **Detector 19** | | | | | | | | | | |
| **8/28/2019 5:10:00 AM** | 0.17 | 0.11 | 0.03 | 0.06 | Pass | 0.49 | 2.60 | 9.52 | -2.111 | Pass |
| **8/29/2019 5:15:00 AM** | 0.15 | 0.11 | 0.03 | 0.04 | Pass | 0.48 | 2.60 | 9.52 | -2.116 | Pass |
| **Detector 20** | | | | | | | | | | |
| **8/28/2019 5:11:00 AM** | 0.20 | 0.10 | 0.03 | 0.10 | **FAIL** | 0.39 | 0.41 | 0.08 | -0.019 | Pass |
| **8/28/2019 9:26:00 AM** | 0.11 | 0.10 | 0.03 | 0.01 | Pass | 0.43 | 0.41 | 0.08 | 0.016 | Pass |
| **8/29/2019 5:15:00 AM** | 0.18 | 0.10 | 0.03 | 0.08 | Pass | 0.44 | 0.41 | 0.08 | 0.031 | Pass |

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# Gas Proportional Counter Daily Quality Control Checks

***Instrument: Orange***

| | AlphaBKG CPM | BKG Mean | BKG +/- limit | BKG Deviation | BKG Flag | BetaBKG CPM | BetaBKG Mean | BetaBKG +/- limit | BetaBKG Deviation | BetaBKG Flag |
|---|---|---|---|---|---|---|---|---|---|---|
| **Detector 21** | | | | | | | | | | |
| **8/28/2019 5:10:00 AM** | 0.18 | 0.11 | 0.04 | 0.07 | Pass | 0.48 | 0.41 | 0.07 | 0.061 | Pass |
| **8/29/2019 5:15:00 AM** | 0.16 | 0.11 | 0.04 | 0.05 | Pass | 0.37 | 0.41 | 0.07 | -0.044 | Pass |
| **Detector 22** | | | | | | | | | | |
| **8/28/2019 5:10:00 AM** | 0.11 | 0.10 | 0.03 | 0.01 | Pass | 0.39 | 0.41 | 0.06 | -0.017 | Pass |
| **8/29/2019 5:15:00 AM** | 0.14 | 0.10 | 0.03 | 0.03 | Pass | 0.47 | 0.41 | 0.06 | 0.059 | Pass |
| **Detector 23** | | | | | | | | | | |
| **8/28/2019 5:10:00 AM** | 0.18 | 0.11 | 0.03 | 0.07 | Pass | 0.31 | 0.44 | 0.11 | -0.134 | Pass |
| **8/29/2019 5:16:00 AM** | 0.12 | 0.11 | 0.03 | 0.01 | Pass | 0.45 | 0.44 | 0.11 | 0.011 | Pass |

**The Alpha and Beta +/- limit are based upon initial 20-point population.**

**The Alpha and Beta +/- limit for Efficiency is stated at 3%. Flags are "FAIL" > 3%.**

**The Alpha and Beta +/- limit for Background is stated at 1 StDev. Flags are "FAIL" > 3 StDev.**

**The Alpha +/- limit for Crosstalk is stated at 1 StDev. Flags are "Warning > 2 StDev and "DOEF" > 3 StDev. Beta is negligible, for trend only ("NA").**

**Times shown reflect the end of the count duration.**

**APPROVED**
*By Kody Saulters at 7:50 am, Aug 30, 2019*

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# Gas Proportional Counter Daily Quality Control Checks

***Instrument: Orange***

| | Alpha CPM | Alpha Mean | Alpha +/- limit | Alpha Deviation | Alpha Flag | A>>B XT CPM | A>>B XT Mean | A>>B XT +/- limit | A>>B XT Deviation | A>>B XT Flag |
|---|---|---|---|---|---|---|---|---|---|---|
| **Check Type = Alpha** | | | | | | | | | | |
| **Detector 0** | | | | | | | | | | |
| **8/29/2019 12:02:00 AM** | 11908.56 | 12672.50 | 380.18 | -763.94 | FAIL | 4039.00 | 4296.38 | 82.77 | -257.375 | DOEF |
| **8/30/2019 12:15:00 AM** | 11892.07 | 12672.50 | 380.18 | -780.43 | FAIL | 4112.50 | 4296.38 | 82.77 | -183.875 | WARNING |
| **Detector 1** | | | | | | | | | | |
| **8/29/2019 12:02:00 AM** | 12712.25 | 13470.00 | 404.10 | -757.75 | FAIL | 3990.00 | 4380.30 | 175.16 | -390.300 | WARNING |
| **8/30/2019 12:15:00 AM** | 12684.25 | 13470.00 | 404.10 | -785.75 | FAIL | 4416.50 | 4380.30 | 175.16 | 36.200 | Pass |
| **Detector 2** | | | | | | | | | | |
| **8/29/2019 12:02:00 AM** | 12998.05 | 14052.18 | 421.57 | -1054.13 | FAIL | 4113.50 | 4507.15 | 164.48 | -393.650 | WARNING |
| **8/30/2019 12:15:00 AM** | 13067.75 | 14052.18 | 421.57 | -984.42 | FAIL | 4379.50 | 4507.15 | 164.48 | -127.650 | Pass |
| **Detector 3** | | | | | | | | | | |
| **8/29/2019 12:02:00 AM** | 12638.68 | 13117.55 | 393.53 | -478.87 | FAIL | 4201.00 | 4304.23 | 107.14 | -103.225 | Pass |
| **8/30/2019 12:15:00 AM** | 12704.88 | 13117.55 | 393.53 | -412.67 | FAIL | 4226.50 | 4304.23 | 107.14 | -77.725 | Pass |
| **Detector 4** | | | | | | | | | | |
| **8/29/2019 12:02:00 AM** | 15628.52 | 16081.68 | 482.45 | -453.16 | Pass | 6183.50 | 6277.50 | 110.70 | -94.000 | Pass |
| **8/29/2019 1:40:00 AM** | 15546.85 | 16081.68 | 482.45 | -534.83 | FAIL | 6237.00 | 6277.50 | 110.70 | -40.500 | Pass |
| **8/30/2019 12:15:00 AM** | 15661.66 | 16081.68 | 482.45 | -420.02 | Pass | 6160.50 | 6277.50 | 110.70 | -117.000 | Pass |
| **8/30/2019 1:23:00 AM** | 15543.91 | 16081.68 | 482.45 | -537.77 | FAIL | 6247.00 | 6277.50 | 110.70 | -30.500 | Pass |
| **Detector 5** | | | | | | | | | | |
| **8/29/2019 12:02:00 AM** | 16013.54 | 16223.20 | 486.70 | -209.66 | Pass | 6109.50 | 6745.73 | 1761.29 | -636.225 | Pass |
| **8/30/2019 12:15:00 AM** | 16122.34 | 16223.20 | 486.70 | -100.86 | Pass | 6386.50 | 6745.73 | 1761.29 | -359.225 | Pass |
| **Detector 6** | | | | | | | | | | |
| **8/30/2019 12:15:00 AM** | 11992.46 | 14588.50 | 437.66 | -2596.04 | FAIL | 8040.00 | 6496.20 | 551.68 | 1543.800 | WARNING |
| **Detector 7** | | | | | | | | | | |
| **8/29/2019 12:02:00 AM** | 14783.35 | 15629.53 | 468.89 | -846.17 | FAIL | 5553.00 | 5742.78 | 47.80 | -189.775 | DOEF |
| **8/30/2019 12:15:00 AM** | 14822.52 | 15629.53 | 468.89 | -807.01 | FAIL | 5633.50 | 5742.78 | 47.80 | -109.275 | WARNING |
| **Detector 8** | | | | | | | | | | |
| **8/29/2019 12:11:00 AM** | 11775.35 | 12479.00 | 374.37 | -703.65 | FAIL | 4165.50 | 4244.75 | 69.84 | -79.250 | Pass |
| **8/30/2019 12:19:00 AM** | 11762.87 | 12479.00 | 374.37 | -716.13 | FAIL | 4104.50 | 4244.75 | 69.84 | -140.250 | WARNING |
| **Detector 9** | | | | | | | | | | |
| **8/29/2019 12:11:00 AM** | 12945.21 | 13598.65 | 407.96 | -653.44 | FAIL | 4591.00 | 4590.98 | 94.06 | 0.025 | Pass |
| **8/30/2019 12:19:00 AM** | 12921.20 | 13598.65 | 407.96 | -677.45 | FAIL | 4586.50 | 4590.98 | 94.06 | -4.475 | Pass |

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# Gas Proportional Counter Daily Quality Control Checks

***Instrument: Orange***

| | Alpha CPM | Alpha Mean | Alpha +/- limit | Alpha Deviation | Alpha Flag | A>>B XT CPM | A>>B XT Mean | A>>B XT +/- limit | A>>B XT Deviation | A>>B XT Flag |
|---|---|---|---|---|---|---|---|---|---|---|
| **Detector 10** | | | | | | | | | | |
| **8/29/2019 12:11:00 AM** | 10753.21 | 11579.50 | 347.39 | -826.29 | **FAIL** | 6973.00 | 7562.65 | 208.99 | -589.650 | **WARNING** |
| **8/30/2019 12:19:00 AM** | 10848.96 | 11579.50 | 347.39 | -730.54 | **FAIL** | 6929.50 | 7562.65 | 208.99 | -633.150 | **DOEF** |
| **Detector 11** | | | | | | | | | | |
| **8/29/2019 12:11:00 AM** | 12957.80 | 13398.55 | 401.96 | -440.75 | **FAIL** | 4423.50 | 4216.58 | 69.06 | 206.925 | **WARNING** |
| **8/30/2019 12:19:00 AM** | 12817.00 | 13398.55 | 401.96 | -581.55 | **FAIL** | 4473.00 | 4216.58 | 69.06 | 256.425 | **DOEF** |
| **Detector 12** | | | | | | | | | | |
| **8/29/2019 12:11:00 AM** | 17568.15 | 16917.10 | 507.51 | 651.05 | **FAIL** | 6161.50 | 5738.50 | 103.00 | 423.000 | **DOEF** |
| **8/30/2019 12:19:00 AM** | 17089.53 | 16917.10 | 507.51 | 172.43 | Pass | 6007.00 | 5738.50 | 103.00 | 268.500 | **WARNING** |
| **8/30/2019 1:26:00 AM** | 17181.76 | 16917.10 | 507.51 | 264.66 | Pass | 6021.50 | 5738.50 | 103.00 | 283.000 | **WARNING** |
| **Detector 13** | | | | | | | | | | |
| **8/29/2019 12:11:00 AM** | 16632.83 | 17051.55 | 511.55 | -418.72 | Pass | 5343.00 | 5209.90 | 107.08 | 133.100 | Pass |
| **8/30/2019 12:19:00 AM** | 16700.07 | 17051.55 | 511.55 | -351.48 | Pass | 5276.50 | 5209.90 | 107.08 | 66.600 | Pass |
| **Detector 14** | | | | | | | | | | |
| **8/29/2019 12:11:00 AM** | 14936.21 | 15840.60 | 475.22 | -904.39 | **FAIL** | 4733.00 | 4992.58 | 237.19 | -259.575 | Pass |
| **8/30/2019 12:19:00 AM** | 15020.45 | 15840.60 | 475.22 | -820.15 | **FAIL** | 4497.50 | 4992.58 | 237.19 | -495.075 | **WARNING** |
| **Detector 15** | | | | | | | | | | |
| **8/29/2019 12:11:00 AM** | 14976.25 | 15402.33 | 462.07 | -426.08 | Pass | 4958.00 | 5238.48 | 99.26 | -280.475 | **WARNING** |
| **8/30/2019 12:19:00 AM** | 15044.46 | 15402.33 | 462.07 | -357.87 | Pass | 4891.00 | 5238.48 | 99.26 | -347.475 | **DOEF** |
| **Detector 16** | | | | | | | | | | |
| **8/29/2019 12:33:00 AM** | 11738.32 | 12627.03 | 378.81 | -888.70 | **FAIL** | 4221.00 | 4414.55 | 41.62 | -193.550 | **DOEF** |
| **8/30/2019 12:24:00 AM** | 11930.85 | 12627.03 | 378.81 | -696.18 | **FAIL** | 4158.50 | 4414.55 | 41.62 | -256.050 | **DOEF** |
| **Detector 17** | | | | | | | | | | |
| **8/29/2019 12:33:00 AM** | 12676.13 | 13433.43 | 403.00 | -757.29 | **FAIL** | 4788.00 | 4784.03 | 106.71 | 3.975 | Pass |
| **8/30/2019 12:24:00 AM** | 12607.52 | 13433.43 | 403.00 | -825.90 | **FAIL** | 4842.00 | 4784.03 | 106.71 | 57.975 | Pass |
| **Detector 18** | | | | | | | | | | |
| **8/29/2019 12:33:00 AM** | 13324.23 | 14158.50 | 424.76 | -834.27 | **FAIL** | 4684.50 | 4572.70 | 56.75 | 111.800 | Pass |
| **8/30/2019 12:24:00 AM** | 13254.12 | 14158.50 | 424.76 | -904.38 | **FAIL** | 4774.50 | 4572.70 | 56.75 | 201.800 | **DOEF** |
| **Detector 19** | | | | | | | | | | |
| **8/29/2019 12:33:00 AM** | 12963.54 | 13416.05 | 402.48 | -452.51 | **FAIL** | 4401.50 | 4519.53 | 68.19 | -118.025 | Pass |
| **8/30/2019 12:24:00 AM** | 12966.61 | 13416.05 | 402.48 | -449.44 | **FAIL** | 4386.00 | 4519.53 | 68.19 | -133.525 | Pass |
| **Detector 20** | | | | | | | | | | |
| **8/29/2019 12:34:00 AM** | 16577.17 | 16878.00 | 506.34 | -300.83 | Pass | 5669.00 | 5700.48 | 42.88 | -31.475 | Pass |
| **8/30/2019 12:24:00 AM** | 16505.57 | 16878.00 | 506.34 | -372.43 | Pass | 5656.50 | 5700.48 | 42.88 | -43.975 | Pass |

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# Gas Proportional Counter Daily Quality Control Checks

***Instrument: Orange***

| | Alpha CPM | Alpha Mean | Alpha +/- limit | Alpha Deviation | Alpha Flag | A>>B XT CPM | A>>B XT Mean | A>>B XT +/- limit | A>>B XT Deviation | A>>B XT Flag |
|---|---|---|---|---|---|---|---|---|---|---|
| **Detector 21** | | | | | | | | | | |
| **8/29/2019 12:34:00 AM** | 16557.31 | 16936.60 | 508.10 | -379.29 | Pass | 5521.00 | 5744.13 | 61.40 | -223.125 | **DOEF** |
| **8/30/2019 12:24:00 AM** | 16705.19 | 16936.60 | 508.10 | -231.41 | Pass | 5629.50 | 5744.13 | 61.40 | -114.625 | Pass |
| **Detector 22** | | | | | | | | | | |
| **8/29/2019 12:34:00 AM** | 14671.49 | 15510.45 | 465.31 | -838.96 | **FAIL** | 5447.00 | 5610.13 | 63.22 | -163.125 | **WARNING** |
| **8/30/2019 12:24:00 AM** | 14760.28 | 15510.45 | 465.31 | -750.17 | **FAIL** | 5405.00 | 5610.13 | 63.22 | -205.125 | **DOEF** |
| **Detector 23** | | | | | | | | | | |
| **8/29/2019 12:34:00 AM** | 14438.91 | 15430.00 | 462.90 | -991.09 | **FAIL** | 5578.50 | 5503.28 | 61.42 | 75.225 | Pass |
| **8/30/2019 12:24:00 AM** | 14486.60 | 15430.00 | 462.90 | -943.40 | **FAIL** | 5441.50 | 5503.28 | 61.42 | -61.775 | Pass |

# Gas Proportional Counter Daily Quality Control Checks

***Instrument: Orange***

| | Beta CPM | Beta Mean | Beta +/- limit | Beta Deviation | Beta Flag | B>>A XT CPM | B>>A XT Mean | B>>A XT +/- limit | B>>A XT Deviation | B>>A XT Flag |
|---|---|---|---|---|---|---|---|---|---|---|
| **Check Type = Beta** | | | | | | | | | | |
| **Detector 0** | | | | | | | | | | |
| **8/29/2019 1:04:00 AM** | 49292.87 | 49935.03 | 1498.05 | -642.15 | Pass | NA | NA | NA | NA | NA |
| **8/30/2019 12:38:00 AM** | 49390.72 | 49935.03 | 1498.05 | -544.30 | Pass | NA | NA | NA | NA | NA |
| **Detector 1** | | | | | | | | | | |
| **8/29/2019 1:04:00 AM** | 47506.19 | 48521.48 | 1455.64 | -1015.28 | Pass | NA | NA | NA | NA | NA |
| **8/30/2019 12:38:00 AM** | 47584.20 | 48521.48 | 1455.64 | -937.27 | Pass | NA | NA | NA | NA | NA |
| **Detector 2** | | | | | | | | | | |
| **8/29/2019 1:04:00 AM** | 49487.82 | 49918.95 | 1497.57 | -431.13 | Pass | NA | NA | NA | NA | NA |
| **8/30/2019 12:38:00 AM** | 49613.80 | 49918.95 | 1497.57 | -305.15 | Pass | NA | NA | NA | NA | NA |
| **Detector 3** | | | | | | | | | | |
| **8/29/2019 1:04:00 AM** | 58194.25 | 59069.20 | 1772.08 | -874.95 | Pass | NA | NA | NA | NA | NA |
| **8/30/2019 12:38:00 AM** | 58755.42 | 59069.20 | 1772.08 | -313.78 | Pass | NA | NA | NA | NA | NA |
| **Detector 4** | | | | | | | | | | |
| **8/29/2019 1:04:00 AM** | 55950.07 | 55962.22 | 1678.87 | -12.15 | Pass | NA | NA | NA | NA | NA |
| **8/30/2019 12:39:00 AM** | 56159.77 | 55962.22 | 1678.87 | 197.55 | Pass | NA | NA | NA | NA | NA |
| **Detector 5** | | | | | | | | | | |
| **8/29/2019 1:04:00 AM** | 54042.75 | 54077.08 | 1622.31 | -34.33 | Pass | NA | NA | NA | NA | NA |
| **8/30/2019 12:39:00 AM** | 54085.31 | 54077.08 | 1622.31 | 8.24 | Pass | NA | NA | NA | NA | NA |
| **Detector 6** | | | | | | | | | | |
| **8/29/2019 1:04:00 AM** | 51111.77 | 49736.35 | 1492.09 | 1375.42 | Pass | NA | NA | NA | NA | NA |
| **8/30/2019 12:39:00 AM** | 47525.85 | 49736.35 | 1492.09 | -2210.50 | **FAIL** | NA | NA | NA | NA | NA |
| **Detector 7** | | | | | | | | | | |
| **8/29/2019 1:04:00 AM** | 45545.72 | 45414.23 | 1362.43 | 131.49 | Pass | NA | NA | NA | NA | NA |
| **8/30/2019 12:39:00 AM** | 45583.56 | 45414.23 | 1362.43 | 169.33 | Pass | NA | NA | NA | NA | NA |
| **Detector 8** | | | | | | | | | | |
| **8/29/2019 1:09:00 AM** | 50108.02 | 49452.15 | 1483.56 | 655.87 | Pass | NA | NA | NA | NA | NA |
| **8/30/2019 12:42:00 AM** | 49698.73 | 49452.15 | 1483.56 | 246.58 | Pass | NA | NA | NA | NA | NA |
| **Detector 9** | | | | | | | | | | |
| **8/29/2019 1:09:00 AM** | 48973.55 | 48747.90 | 1462.44 | 225.65 | Pass | NA | NA | NA | NA | NA |
| **8/30/2019 12:42:00 AM** | 49147.86 | 48747.90 | 1462.44 | 399.96 | Pass | NA | NA | NA | NA | NA |
| **Detector 10** | | | | | | | | | | |
| **8/29/2019 1:09:00 AM** | 50252.66 | 50054.68 | 1501.64 | 197.99 | Pass | NA | NA | NA | NA | NA |
| **8/30/2019 12:42:00 AM** | 50387.42 | 50054.68 | 1501.64 | 332.74 | Pass | NA | NA | NA | NA | NA |

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# Gas Proportional Counter Daily Quality Control Checks

## *Instrument: Orange*

| | Beta CPM | Beta Mean | Beta +/- limit | Beta Deviation | Beta Flag | B>>A XT CPM | B>>A XT Mean | B>>A XT +/- limit | B>>A XT Deviation | B>>A XT Flag |
|---|---|---|---|---|---|---|---|---|---|---|
| **Detector 11** | | | | | | | | | | |
| **8/29/2019 1:09:00 AM** | 59202.03 | 59142.43 | 1774.27 | 59.61 | Pass | NA | NA | NA | NA | NA |
| **8/30/2019 12:42:00 AM** | 59726.47 | 59142.43 | 1774.27 | 584.04 | Pass | NA | NA | NA | NA | NA |
| **Detector 12** | | | | | | | | | | |
| **8/29/2019 1:09:00 AM** | 59056.00 | 56886.15 | 1706.58 | 2169.85 | **FAIL** | NA | NA | NA | NA | NA |
| **8/30/2019 12:42:00 AM** | 59079.20 | 56886.15 | 1706.58 | 2193.05 | **FAIL** | NA | NA | NA | NA | NA |
| **Detector 13** | | | | | | | | | | |
| **8/29/2019 1:09:00 AM** | 55179.96 | 55204.43 | 1656.13 | -24.47 | Pass | NA | NA | NA | NA | NA |
| **8/30/2019 1:25:00 AM** | 55351.02 | 55204.43 | 1656.13 | 146.60 | Pass | NA | NA | NA | NA | NA |
| **Detector 14** | | | | | | | | | | |
| **8/29/2019 1:09:00 AM** | 51018.93 | 51681.73 | 1550.45 | -662.80 | Pass | NA | NA | NA | NA | NA |
| **8/30/2019 12:42:00 AM** | 50834.76 | 51681.73 | 1550.45 | -846.96 | Pass | NA | NA | NA | NA | NA |
| **Detector 15** | | | | | | | | | | |
| **8/29/2019 1:09:00 AM** | 45573.08 | 44769.68 | 1343.09 | 803.40 | Pass | NA | NA | NA | NA | NA |
| **8/30/2019 12:42:00 AM** | 45604.25 | 44769.68 | 1343.09 | 834.57 | Pass | NA | NA | NA | NA | NA |
| **Detector 16** | | | | | | | | | | |
| **8/29/2019 1:13:00 AM** | 49988.45 | 49427.80 | 1482.83 | 560.65 | Pass | NA | NA | NA | NA | NA |
| **8/30/2019 12:44:00 AM** | 49857.18 | 49427.80 | 1482.83 | 429.38 | Pass | NA | NA | NA | NA | NA |
| **Detector 17** | | | | | | | | | | |
| **8/29/2019 1:13:00 AM** | 48202.99 | 48123.48 | 1443.70 | 79.52 | Pass | NA | NA | NA | NA | NA |
| **8/30/2019 12:44:00 AM** | 48302.67 | 48123.48 | 1443.70 | 179.19 | Pass | NA | NA | NA | NA | NA |
| **Detector 18** | | | | | | | | | | |
| **8/29/2019 1:13:00 AM** | 50135.32 | 49818.00 | 1494.54 | 317.32 | Pass | NA | NA | NA | NA | NA |
| **8/30/2019 12:44:00 AM** | 50120.45 | 49818.00 | 1494.54 | 302.45 | Pass | NA | NA | NA | NA | NA |
| **Detector 19** | | | | | | | | | | |
| **8/29/2019 1:13:00 AM** | 60060.25 | 60133.55 | 1804.01 | -73.30 | Pass | NA | NA | NA | NA | NA |
| **8/30/2019 12:45:00 AM** | 60168.53 | 60133.55 | 1804.01 | 34.98 | Pass | NA | NA | NA | NA | NA |
| **Detector 20** | | | | | | | | | | |
| **8/29/2019 1:14:00 AM** | 55897.93 | 56390.63 | 1691.72 | -492.70 | Pass | NA | NA | NA | NA | NA |
| **8/30/2019 12:45:00 AM** | 56201.55 | 56390.63 | 1691.72 | -189.08 | Pass | NA | NA | NA | NA | NA |
| **Detector 21** | | | | | | | | | | |
| **8/29/2019 1:14:00 AM** | 55072.41 | 55234.63 | 1657.04 | -162.22 | Pass | NA | NA | NA | NA | NA |
| **8/30/2019 12:45:00 AM** | 55340.50 | 55234.63 | 1657.04 | 105.87 | Pass | NA | NA | NA | NA | NA |

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# Gas Proportional Counter Daily Quality Control Checks

***Instrument: Orange***

| | Beta CPM | Beta Mean | Beta +/- limit | Beta Deviation | Beta Flag | B>>A XT CPM | B>>A XT Mean | B>>A XT +/- limit | B>>A XT Deviation | B>>A XT Flag |
|---|---|---|---|---|---|---|---|---|---|---|
| **Detector 22** | | | | | | | | | | |
| **8/29/2019 1:14:00 AM** | 51730.93 | 52617.68 | 1578.53 | -886.74 | Pass | NA | NA | NA | NA | NA |
| **8/30/2019 12:45:00 AM** | 52040.00 | 52617.68 | 1578.53 | -577.68 | Pass | NA | NA | NA | NA | NA |
| **Detector 23** | | | | | | | | | | |
| **8/29/2019 1:14:00 AM** | 44563.28 | 45356.30 | 1360.69 | -793.02 | Pass | NA | NA | NA | NA | NA |
| **8/30/2019 12:45:00 AM** | 44687.26 | 45356.30 | 1360.69 | -669.04 | Pass | NA | NA | NA | NA | NA |

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# Gas Proportional Counter Daily Quality Control Checks

***Instrument: Orange***

| | AlphaBKG CPM | BKG Mean | BKG +/- limit | BKG Deviation | BKG Flag | BetaBKG CPM | BetaBKG Mean | BetaBKG +/- limit | BetaBKG Deviation | BetaBKG Flag |
|---|---|---|---|---|---|---|---|---|---|---|
| **Check Type = BKG** | | | | | | | | | | |
| **Detector 0** | | | | | | | | | | |
| **8/29/2019 5:16:00 AM** | 0.12 | 0.10 | 0.04 | 0.02 | Pass | 0.49 | 0.50 | 0.10 | -0.015 | Pass |
| **8/30/2019 4:53:00 AM** | 0.24 | 0.10 | 0.04 | 0.14 | **FAIL** | 0.53 | 0.50 | 0.10 | 0.026 | Pass |
| **Detector 1** | | | | | | | | | | |
| **8/29/2019 5:16:00 AM** | 0.24 | 0.08 | 0.03 | 0.16 | **FAIL** | 0.42 | 0.38 | 0.06 | 0.033 | Pass |
| **8/30/2019 4:53:00 AM** | 0.18 | 0.08 | 0.03 | 0.10 | **FAIL** | 0.26 | 0.38 | 0.06 | -0.122 | Pass |
| **Detector 2** | | | | | | | | | | |
| **8/29/2019 5:16:00 AM** | 0.14 | 0.09 | 0.03 | 0.04 | Pass | 0.51 | 0.41 | 0.05 | 0.097 | Pass |
| **8/30/2019 4:53:00 AM** | 0.12 | 0.09 | 0.03 | 0.02 | Pass | 0.50 | 0.41 | 0.05 | 0.087 | Pass |
| **Detector 3** | | | | | | | | | | |
| **8/29/2019 5:16:00 AM** | 0.21 | 0.10 | 0.02 | 0.10 | **FAIL** | 0.62 | 0.60 | 0.10 | 0.014 | Pass |
| **8/30/2019 4:53:00 AM** | 0.16 | 0.10 | 0.02 | 0.05 | Pass | 0.70 | 0.60 | 0.10 | 0.094 | Pass |
| **Detector 4** | | | | | | | | | | |
| **8/29/2019 5:16:00 AM** | 0.13 | 0.10 | 0.03 | 0.03 | Pass | 0.42 | 0.46 | 0.07 | -0.047 | Pass |
| **8/30/2019 4:53:00 AM** | 0.15 | 0.10 | 0.03 | 0.04 | Pass | 0.57 | 0.46 | 0.07 | 0.104 | Pass |
| **Detector 5** | | | | | | | | | | |
| **8/29/2019 5:16:00 AM** | 0.26 | 0.08 | 0.01 | 0.18 | **FAIL** | 0.55 | 0.44 | 0.11 | 0.101 | Pass |
| **8/30/2019 4:53:00 AM** | 0.19 | 0.08 | 0.01 | 0.11 | **FAIL** | 0.66 | 0.44 | 0.11 | 0.211 | Pass |
| **Detector 6** | | | | | | | | | | |
| **8/29/2019 5:16:00 AM** | 0.17 | 0.10 | 0.04 | 0.07 | Pass | 0.52 | 0.46 | 0.08 | 0.057 | Pass |
| **8/30/2019 4:53:00 AM** | 0.19 | 0.10 | 0.04 | 0.09 | Pass | 0.56 | 0.46 | 0.08 | 0.092 | Pass |
| **Detector 7** | | | | | | | | | | |
| **8/29/2019 5:16:00 AM** | 0.29 | 0.12 | 0.03 | 0.17 | **FAIL** | 0.77 | 0.52 | 0.10 | 0.249 | Pass |
| **8/30/2019 4:53:00 AM** | 0.20 | 0.12 | 0.03 | 0.08 | Pass | 0.71 | 0.52 | 0.10 | 0.184 | Pass |
| **Detector 8** | | | | | | | | | | |
| **8/29/2019 5:16:00 AM** | 0.22 | 0.07 | 0.02 | 0.15 | **FAIL** | 0.48 | 0.42 | 0.07 | 0.060 | Pass |
| **8/30/2019 4:53:00 AM** | 0.09 | 0.07 | 0.02 | 0.02 | Pass | 0.40 | 0.42 | 0.07 | -0.025 | Pass |
| **Detector 9** | | | | | | | | | | |
| **8/29/2019 5:16:00 AM** | 0.20 | 0.11 | 0.03 | 0.08 | Pass | 0.73 | 0.49 | 0.08 | 0.243 | Pass |
| **8/30/2019 4:54:00 AM** | 0.24 | 0.11 | 0.03 | 0.12 | **FAIL** | 0.57 | 0.49 | 0.08 | 0.078 | Pass |
| **Detector 10** | | | | | | | | | | |
| **8/29/2019 5:16:00 AM** | 0.10 | 0.13 | 0.03 | -0.03 | Pass | 0.63 | 0.51 | 0.10 | 0.120 | Pass |
| **8/30/2019 4:54:00 AM** | 0.16 | 0.13 | 0.03 | 0.03 | Pass | 0.57 | 0.51 | 0.10 | 0.065 | Pass |

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# Gas Proportional Counter Daily Quality Control Checks

***Instrument: Orange***

| | AlphaBKG CPM | BKG Mean | BKG +/- limit | BKG Deviation | BKG Flag | BetaBKG CPM | BetaBKG Mean | BetaBKG +/- limit | BetaBKG Deviation | BetaBKG Flag |
|---|---|---|---|---|---|---|---|---|---|---|
| **Detector 11** | | | | | | | | | | |
| **8/29/2019 5:16:00 AM** | 0.20 | 0.12 | 0.03 | 0.08 | Pass | 0.90 | 0.72 | 0.10 | 0.176 | Pass |
| **8/30/2019 4:54:00 AM** | 0.18 | 0.12 | 0.03 | 0.06 | Pass | 0.66 | 0.72 | 0.10 | -0.059 | Pass |
| **Detector 12** | | | | | | | | | | |
| **8/29/2019 5:16:00 AM** | 0.10 | 0.10 | 0.03 | 0.00 | Pass | 0.58 | 0.88 | 0.79 | -0.295 | Pass |
| **8/30/2019 4:54:00 AM** | 0.19 | 0.10 | 0.03 | 0.09 | **FAIL** | 0.48 | 0.88 | 0.79 | -0.400 | Pass |
| **Detector 13** | | | | | | | | | | |
| **8/29/2019 5:16:00 AM** | 0.21 | 0.13 | 0.04 | 0.07 | Pass | 0.70 | 0.62 | 0.06 | 0.079 | Pass |
| **8/30/2019 4:54:00 AM** | 0.20 | 0.13 | 0.04 | 0.07 | Pass | 0.65 | 0.62 | 0.06 | 0.024 | Pass |
| **Detector 14** | | | | | | | | | | |
| **8/29/2019 5:16:00 AM** | 0.13 | 0.09 | 0.03 | 0.03 | Pass | 0.49 | 0.52 | 0.09 | -0.028 | Pass |
| **8/30/2019 4:54:00 AM** | 0.19 | 0.09 | 0.03 | 0.10 | Pass | 0.59 | 0.52 | 0.09 | 0.072 | Pass |
| **Detector 15** | | | | | | | | | | |
| **8/29/2019 5:16:00 AM** | 0.20 | 0.14 | 0.02 | 0.06 | Pass | 0.56 | 0.54 | 0.07 | 0.011 | Pass |
| **8/30/2019 4:54:00 AM** | 0.15 | 0.14 | 0.02 | 0.01 | Pass | 0.51 | 0.54 | 0.07 | -0.039 | Pass |
| **Detector 16** | | | | | | | | | | |
| **8/29/2019 5:15:00 AM** | 0.14 | 0.11 | 0.03 | 0.03 | Pass | 0.44 | 0.51 | 0.10 | -0.080 | Pass |
| **8/30/2019 4:54:00 AM** | 0.10 | 0.11 | 0.03 | -0.01 | Pass | 0.46 | 0.51 | 0.10 | -0.054 | Pass |
| **Detector 17** | | | | | | | | | | |
| **8/29/2019 5:15:00 AM** | 0.15 | 0.10 | 0.04 | 0.04 | Pass | 0.38 | 0.41 | 0.07 | -0.030 | Pass |
| **8/30/2019 4:54:00 AM** | 0.16 | 0.10 | 0.04 | 0.06 | Pass | 0.37 | 0.41 | 0.07 | -0.045 | Pass |
| **Detector 18** | | | | | | | | | | |
| **8/29/2019 5:15:00 AM** | 0.17 | 0.08 | 0.03 | 0.09 | **FAIL** | 0.37 | 0.36 | 0.06 | 0.005 | Pass |
| **8/30/2019 4:54:00 AM** | 0.13 | 0.08 | 0.03 | 0.04 | Pass | 0.44 | 0.36 | 0.06 | 0.075 | Pass |
| **Detector 19** | | | | | | | | | | |
| **8/29/2019 5:15:00 AM** | 0.15 | 0.11 | 0.03 | 0.04 | Pass | 0.48 | 2.60 | 9.52 | -2.116 | Pass |
| **8/30/2019 4:53:00 AM** | 0.19 | 0.11 | 0.03 | 0.08 | Pass | 0.42 | 2.60 | 9.52 | -2.176 | Pass |
| **Detector 20** | | | | | | | | | | |
| **8/29/2019 5:15:00 AM** | 0.18 | 0.10 | 0.03 | 0.08 | Pass | 0.44 | 0.41 | 0.08 | 0.031 | Pass |
| **8/30/2019 4:53:00 AM** | 0.14 | 0.10 | 0.03 | 0.04 | Pass | 0.47 | 0.41 | 0.08 | 0.056 | Pass |
| **Detector 21** | | | | | | | | | | |
| **8/29/2019 5:15:00 AM** | 0.16 | 0.11 | 0.04 | 0.05 | Pass | 0.37 | 0.41 | 0.07 | -0.044 | Pass |

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# Gas Proportional Counter Daily Quality Control Checks

***Instrument: Orange***

| | AlphaBKG CPM | BKG Mean | BKG +/- limit | BKG Deviation | BKG Flag | BetaBKG CPM | BetaBKG Mean | BetaBKG +/- limit | BetaBKG Deviation | BetaBKG Flag |
|---|---|---|---|---|---|---|---|---|---|---|
| **Detector 22** | | | | | | | | | | |
| **8/29/2019 5:15:00 AM** | 0.14 | 0.10 | 0.03 | 0.03 | Pass | 0.47 | 0.41 | 0.06 | 0.059 | Pass |
| **8/30/2019 4:53:00 AM** | 0.13 | 0.10 | 0.03 | 0.03 | Pass | 0.46 | 0.41 | 0.06 | 0.049 | Pass |
| **Detector 23** | | | | | | | | | | |
| **8/29/2019 5:16:00 AM** | 0.12 | 0.11 | 0.03 | 0.01 | Pass | 0.45 | 0.44 | 0.11 | 0.011 | Pass |
| **8/30/2019 4:53:00 AM** | 0.17 | 0.11 | 0.03 | 0.06 | Pass | 0.49 | 0.44 | 0.11 | 0.051 | Pass |

**The Alpha and Beta +/- limit are based upon initial 20-point population.**

**The Alpha and Beta +/- limit for Efficiency is stated at 3%. Flags are "FAIL" > 3%.**

**The Alpha and Beta +/- limit for Background is stated at 1 StDev. Flags are "FAIL" > 3 StDev.**

**The Alpha +/- limit for Crosstalk is stated at 1 StDev. Flags are "Warning > 2 StDev and "DOEF" > 3 StDev. Beta is negligible, for trend only ("NA").**

**Times shown reflect the end of the count duration.**

**APPROVED**
*By Kody Saulters at 9:54 pm, Aug 30, 2019*

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# Gas Proportional Counter Daily Quality Control Checks

***Instrument: Purple***

| | Alpha CPM | Alpha Mean | Alpha +/- limit | Alpha Deviation | Alpha Flag | A>>B XT CPM | A>>B XT Mean | A>>B XT +/- limit | A>>B XT Deviation | A>>B XT Flag |
|---|---|---|---|---|---|---|---|---|---|---|
| **Check Type = Alpha** | | | | | | | | | | |
| **Detector 0** | | | | | | | | | | |
| **8/29/2019 12:37:00 AM** | 12052.23 | 12818.03 | 384.54 | -765.80 | FAIL | 3989.00 | 4137.60 | 27.33 | -148.600 | DOEF |
| **8/30/2019 12:29:00 AM** | 12035.24 | 12818.03 | 384.54 | -782.79 | FAIL | 3938.00 | 4137.60 | 27.33 | -199.600 | DOEF |
| **Detector 1** | | | | | | | | | | |
| **8/29/2019 12:38:00 AM** | 13275.75 | 13847.28 | 415.42 | -571.53 | FAIL | 4416.50 | 4251.53 | 66.02 | 164.975 | WARNING |
| **8/30/2019 12:29:00 AM** | 13142.98 | 13847.28 | 415.42 | -704.30 | FAIL | 4546.50 | 4251.53 | 66.02 | 294.975 | DOEF |
| **Detector 2** | | | | | | | | | | |
| **8/29/2019 12:38:00 AM** | 13209.20 | 14354.23 | 430.63 | -1145.03 | FAIL | 4589.00 | 4891.15 | 60.37 | -302.150 | DOEF |
| **8/30/2019 12:29:00 AM** | 13278.91 | 14354.23 | 430.63 | -1075.31 | FAIL | 4631.00 | 4891.15 | 60.37 | -260.150 | DOEF |
| **Detector 3** | | | | | | | | | | |
| **8/29/2019 12:38:00 AM** | 12885.57 | 13419.20 | 402.58 | -533.63 | FAIL | 4754.50 | 4922.70 | 84.85 | -168.200 | Pass |
| **8/29/2019 1:39:00 AM** | 12891.58 | 13419.20 | 402.58 | -527.62 | FAIL | 4586.00 | 4922.70 | 84.85 | -336.700 | DOEF |
| **8/29/2019 1:43:00 AM** | 12831.45 | 13419.20 | 402.58 | -587.75 | FAIL | 4703.50 | 4922.70 | 84.85 | -219.200 | WARNING |
| **8/30/2019 12:29:00 AM** | 12994.87 | 13419.20 | 402.58 | -424.33 | FAIL | 4794.00 | 4922.70 | 84.85 | -128.700 | Pass |
| **Detector 4** | | | | | | | | | | |
| **8/29/2019 12:38:00 AM** | 16701.20 | 16907.73 | 507.23 | -206.53 | Pass | 6062.50 | 5249.05 | 86.84 | 813.450 | DOEF |
| **8/30/2019 12:30:00 AM** | 16612.05 | 16907.73 | 507.23 | -295.68 | Pass | 6083.00 | 5249.05 | 86.84 | 833.950 | DOEF |
| **8/30/2019 1:31:00 AM** | 16487.24 | 16907.73 | 507.23 | -420.48 | Pass | 6114.50 | 5249.05 | 86.84 | 865.450 | DOEF |
| **Detector 5** | | | | | | | | | | |
| **8/29/2019 12:38:00 AM** | 16341.31 | 16603.10 | 498.09 | -261.79 | Pass | 6105.50 | 5630.28 | 57.62 | 475.225 | DOEF |
| **8/30/2019 12:30:00 AM** | 16664.18 | 16603.10 | 498.09 | 61.08 | Pass | 6057.50 | 5630.28 | 57.62 | 427.225 | DOEF |
| **Detector 6** | | | | | | | | | | |
| **8/29/2019 12:39:00 AM** | 14711.79 | 15352.98 | 460.59 | -641.19 | FAIL | 5344.00 | 5483.13 | 60.86 | -139.125 | WARNING |
| **8/30/2019 12:30:00 AM** | 14592.56 | 15352.98 | 460.59 | -760.42 | FAIL | 5442.50 | 5483.13 | 60.86 | -40.625 | Pass |
| **Detector 7** | | | | | | | | | | |
| **8/29/2019 12:39:00 AM** | 14617.12 | 15273.85 | 458.22 | -656.73 | FAIL | 5543.50 | 5724.88 | 85.05 | -181.375 | WARNING |
| **8/30/2019 12:30:00 AM** | 14884.76 | 15273.85 | 458.22 | -389.09 | Pass | 5775.00 | 5724.88 | 85.05 | 50.125 | Pass |
| **Detector 8** | | | | | | | | | | |
| **8/30/2019 12:32:00 AM** | 11847.27 | 12654.18 | 379.63 | -806.90 | FAIL | 4047.50 | 3940.58 | 65.19 | 106.925 | Pass |
| **Detector 9** | | | | | | | | | | |
| **8/29/2019 12:41:00 AM** | 12949.00 | 13595.78 | 407.87 | -646.78 | FAIL | 4577.00 | 4722.55 | 71.26 | -145.550 | WARNING |
| **8/30/2019 12:32:00 AM** | 12868.87 | 13595.78 | 407.87 | -726.90 | FAIL | 4535.50 | 4722.55 | 71.26 | -187.050 | WARNING |

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# Gas Proportional Counter Daily Quality Control Checks

***Instrument: Purple***

| | Alpha CPM | Alpha Mean | Alpha +/- limit | Alpha Deviation | Alpha Flag | A>>B XT CPM | A>>B XT Mean | A>>B XT +/- limit | A>>B XT Deviation | A>>B XT Flag |
|---|---|---|---|---|---|---|---|---|---|---|
| **Detector 10** | | | | | | | | | | |
| **8/29/2019 12:41:00 AM** | 13100.55 | 14277.18 | 428.32 | -1176.63 | **FAIL** | 4719.50 | 5018.53 | 72.48 | -299.025 | **DOEF** |
| **8/30/2019 12:32:00 AM** | 13094.59 | 14277.18 | 428.32 | -1182.58 | **FAIL** | 4741.50 | 5018.53 | 72.48 | -277.025 | **DOEF** |
| **Detector 11** | | | | | | | | | | |
| **8/29/2019 12:41:00 AM** | 12803.08 | 13390.48 | 401.71 | -587.40 | **FAIL** | 4617.00 | 4510.73 | 57.64 | 106.275 | Pass |
| **8/29/2019 1:47:00 AM** | 12952.95 | 13390.48 | 401.71 | -437.53 | **FAIL** | 4549.50 | 4510.73 | 57.64 | 38.775 | Pass |
| **8/29/2019 1:49:00 AM** | 12968.99 | 13390.48 | 401.71 | -421.49 | **FAIL** | 4501.50 | 4510.73 | 57.64 | -9.225 | Pass |
| **8/30/2019 12:32:00 AM** | 13076.81 | 13390.48 | 401.71 | -313.67 | Pass | 4540.50 | 4510.73 | 57.64 | 29.775 | Pass |
| **8/30/2019 1:24:00 AM** | 13103.37 | 13390.48 | 401.71 | -287.10 | Pass | 4550.50 | 4510.73 | 57.64 | 39.775 | Pass |
| **Detector 16** | | | | | | | | | | |
| **8/29/2019 12:47:00 AM** | 11599.60 | 12631.78 | 378.95 | -1032.18 | **FAIL** | 3828.50 | 3761.83 | 61.84 | 66.675 | Pass |
| **8/30/2019 12:35:00 AM** | 11775.08 | 12631.78 | 378.95 | -856.69 | **FAIL** | 3853.00 | 3761.83 | 61.84 | 91.175 | Pass |
| **Detector 17** | | | | | | | | | | |
| **8/29/2019 12:47:00 AM** | 13588.07 | 13889.18 | 416.68 | -301.10 | Pass | 4053.00 | 4215.80 | 68.01 | -162.800 | **WARNING** |
| **8/29/2019 1:39:00 AM** | 13294.47 | 13889.18 | 416.68 | -594.70 | **FAIL** | 3941.00 | 4215.80 | 68.01 | -274.800 | **DOEF** |
| **8/30/2019 12:35:00 AM** | 13284.51 | 13889.18 | 416.68 | -604.66 | **FAIL** | 3972.50 | 4215.80 | 68.01 | -243.300 | **DOEF** |
| **Detector 18** | | | | | | | | | | |
| **8/29/2019 12:47:00 AM** | 13202.55 | 14192.53 | 425.78 | -989.97 | **FAIL** | 4781.50 | 4822.80 | 47.76 | -41.300 | Pass |
| **8/30/2019 12:35:00 AM** | 13355.49 | 14192.53 | 425.78 | -837.04 | **FAIL** | 4707.50 | 4822.80 | 47.76 | -115.300 | **WARNING** |
| **Detector 19** | | | | | | | | | | |
| **8/29/2019 12:47:00 AM** | 13032.63 | 13562.28 | 406.87 | -529.64 | **FAIL** | 4455.00 | 4355.90 | 55.82 | 99.100 | Pass |
| **8/29/2019 1:52:00 AM** | 13293.78 | 13562.28 | 406.87 | -268.50 | Pass | 4427.50 | 4355.90 | 55.82 | 71.600 | Pass |
| **8/29/2019 1:56:00 AM** | 13252.68 | 13562.28 | 406.87 | -309.60 | Pass | 4402.50 | 4355.90 | 55.82 | 46.600 | Pass |
| **8/30/2019 12:35:00 AM** | 13345.96 | 13562.28 | 406.87 | -216.31 | Pass | 4387.50 | 4355.90 | 55.82 | 31.600 | Pass |

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# Gas Proportional Counter Daily Quality Control Checks

***Instrument: Purple***

| | Beta CPM | Beta Mean | Beta +/- limit | Beta Deviation | Beta Flag | B>>A XT CPM | B>>A XT Mean | B>>A XT +/- limit | B>>A XT Deviation | B>>A XT Flag |
|---|---|---|---|---|---|---|---|---|---|---|
| **Check Type = Beta** | | | | | | | | | | |
| **Detector 0** | | | | | | | | | | |
| **8/29/2019 12:02:00 AM** | 50196.10 | 50226.98 | 1506.81 | -30.87 | Pass | NA | NA | NA | NA | NA |
| **8/30/2019 12:16:00 AM** | 50301.22 | 50226.98 | 1506.81 | 74.24 | Pass | NA | NA | NA | NA | NA |
| **Detector 1** | | | | | | | | | | |
| **8/29/2019 12:02:00 AM** | 49076.17 | 48796.70 | 1463.90 | 279.47 | Pass | NA | NA | NA | NA | NA |
| **8/30/2019 12:16:00 AM** | 49048.26 | 48796.70 | 1463.90 | 251.56 | Pass | NA | NA | NA | NA | NA |
| **Detector 2** | | | | | | | | | | |
| **8/29/2019 12:02:00 AM** | 50803.88 | 50875.48 | 1526.26 | -71.59 | Pass | NA | NA | NA | NA | NA |
| **8/30/2019 12:16:00 AM** | 50939.15 | 50875.48 | 1526.26 | 63.68 | Pass | NA | NA | NA | NA | NA |
| **Detector 3** | | | | | | | | | | |
| **8/29/2019 12:02:00 AM** | 59932.28 | 60107.23 | 1803.22 | -174.95 | Pass | NA | NA | NA | NA | NA |
| **8/30/2019 12:16:00 AM** | 59978.99 | 60107.23 | 1803.22 | -128.24 | Pass | NA | NA | NA | NA | NA |
| **Detector 4** | | | | | | | | | | |
| **8/29/2019 12:02:00 AM** | 56427.52 | 56940.95 | 1708.23 | -513.43 | Pass | NA | NA | NA | NA | NA |
| **8/30/2019 12:16:00 AM** | 56800.98 | 56940.95 | 1708.23 | -139.97 | Pass | NA | NA | NA | NA | NA |
| **Detector 5** | | | | | | | | | | |
| **8/29/2019 12:02:00 AM** | 55071.58 | 54659.90 | 1639.80 | 411.68 | Pass | NA | NA | NA | NA | NA |
| **8/30/2019 12:16:00 AM** | 55358.85 | 54659.90 | 1639.80 | 698.95 | Pass | NA | NA | NA | NA | NA |
| **Detector 6** | | | | | | | | | | |
| **8/29/2019 12:02:00 AM** | 52195.97 | 52013.25 | 1560.40 | 182.72 | Pass | NA | NA | NA | NA | NA |
| **8/30/2019 12:16:00 AM** | 51936.12 | 52013.25 | 1560.40 | -77.13 | Pass | NA | NA | NA | NA | NA |
| **Detector 7** | | | | | | | | | | |
| **8/29/2019 12:02:00 AM** | 44731.11 | 45069.13 | 1352.07 | -338.01 | Pass | NA | NA | NA | NA | NA |
| **8/30/2019 12:16:00 AM** | 45547.96 | 45069.13 | 1352.07 | 478.84 | Pass | NA | NA | NA | NA | NA |
| **Detector 8** | | | | | | | | | | |
| **8/29/2019 12:10:00 AM** | 50146.17 | 50025.35 | 1500.76 | 120.82 | Pass | NA | NA | NA | NA | NA |
| **8/30/2019 12:26:00 AM** | 50233.94 | 50025.35 | 1500.76 | 208.59 | Pass | NA | NA | NA | NA | NA |
| **Detector 9** | | | | | | | | | | |
| **8/29/2019 12:10:00 AM** | 48680.11 | 48665.90 | 1459.98 | 14.21 | Pass | NA | NA | NA | NA | NA |
| **8/30/2019 12:19:00 AM** | 49175.52 | 48665.90 | 1459.98 | 509.62 | Pass | NA | NA | NA | NA | NA |
| **Detector 10** | | | | | | | | | | |
| **8/29/2019 12:10:00 AM** | 50716.53 | 50649.48 | 1519.48 | 67.06 | Pass | NA | NA | NA | NA | NA |
| **8/30/2019 12:19:00 AM** | 50554.08 | 50649.48 | 1519.48 | -95.40 | Pass | NA | NA | NA | NA | NA |

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# Gas Proportional Counter Daily Quality Control Checks

***Instrument: Purple***

| | Beta CPM | Beta Mean | Beta +/- limit | Beta Deviation | Beta Flag | B>>A XT CPM | B>>A XT Mean | B>>A XT +/- limit | B>>A XT Deviation | B>>A XT Flag |
|---|---|---|---|---|---|---|---|---|---|---|
| **Detector 11** | | | | | | | | | | |
| **8/29/2019 12:10:00 AM** | 59755.81 | 59849.50 | 1795.49 | -93.69 | Pass | NA | NA | NA | NA | NA |
| **8/30/2019 12:20:00 AM** | 59766.02 | 59849.50 | 1795.49 | -83.48 | Pass | NA | NA | NA | NA | NA |
| **Detector 16** | | | | | | | | | | |
| **8/29/2019 12:33:00 AM** | 49356.74 | 49489.98 | 1484.70 | -133.24 | Pass | NA | NA | NA | NA | NA |
| **8/30/2019 12:23:00 AM** | 49498.16 | 49489.98 | 1484.70 | 8.19 | Pass | NA | NA | NA | NA | NA |
| **Detector 17** | | | | | | | | | | |
| **8/29/2019 12:33:00 AM** | 46736.92 | 46812.78 | 1404.38 | -75.85 | Pass | NA | NA | NA | NA | NA |
| **8/30/2019 12:23:00 AM** | 46496.00 | 46812.78 | 1404.38 | -316.78 | Pass | NA | NA | NA | NA | NA |
| **Detector 18** | | | | | | | | | | |
| **8/29/2019 12:33:00 AM** | 50206.54 | 50124.63 | 1503.74 | 81.92 | Pass | NA | NA | NA | NA | NA |
| **8/30/2019 12:23:00 AM** | 49997.13 | 50124.63 | 1503.74 | -127.49 | Pass | NA | NA | NA | NA | NA |
| **Detector 19** | | | | | | | | | | |
| **8/29/2019 12:33:00 AM** | 60193.63 | 60073.05 | 1802.19 | 120.58 | Pass | NA | NA | NA | NA | NA |
| **8/30/2019 12:23:00 AM** | 60112.62 | 60073.05 | 1802.19 | 39.57 | Pass | NA | NA | NA | NA | NA |

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# Gas Proportional Counter Daily Quality Control Checks

***Instrument: Purple***

| | AlphaBKG CPM | BKG Mean | BKG +/- limit | BKG Deviation | BKG Flag | BetaBKG CPM | BetaBKG Mean | BetaBKG +/- limit | BetaBKG Deviation | BetaBKG Flag |
|---|---|---|---|---|---|---|---|---|---|---|
| **Check Type = BKG** | | | | | | | | | | |
| **Detector 0** | | | | | | | | | | |
| **8/29/2019 5:16:00 AM** | 0.23 | 0.12 | 0.01 | 0.11 | FAIL | 0.56 | 0.46 | 0.08 | 0.103 | Pass |
| **8/30/2019 4:53:00 AM** | 0.20 | 0.12 | 0.01 | 0.08 | FAIL | 0.51 | 0.46 | 0.08 | 0.053 | Pass |
| **Detector 1** | | | | | | | | | | |
| **8/29/2019 5:16:00 AM** | 0.19 | 0.09 | 0.04 | 0.09 | Pass | 0.57 | 0.43 | 0.08 | 0.136 | Pass |
| **8/30/2019 4:53:00 AM** | 0.15 | 0.09 | 0.04 | 0.06 | Pass | 0.51 | 0.43 | 0.08 | 0.076 | Pass |
| **Detector 2** | | | | | | | | | | |
| **8/29/2019 5:16:00 AM** | 0.28 | 0.17 | 0.05 | 0.10 | Pass | 0.95 | 0.53 | 0.06 | 0.424 | FAIL |
| **8/29/2019 10:55:00 AM** | 0.21 | 0.17 | 0.05 | 0.04 | Pass | 0.47 | 0.53 | 0.06 | -0.056 | Pass |
| **8/30/2019 4:53:00 AM** | 0.28 | 0.17 | 0.05 | 0.10 | Pass | 0.50 | 0.53 | 0.06 | -0.031 | Pass |
| **Detector 3** | | | | | | | | | | |
| **8/29/2019 5:16:00 AM** | 0.20 | 0.08 | 0.02 | 0.11 | FAIL | 0.42 | 0.41 | 0.08 | 0.015 | Pass |
| **8/30/2019 4:53:00 AM** | 0.28 | 0.08 | 0.02 | 0.19 | FAIL | 0.53 | 0.41 | 0.08 | 0.125 | Pass |
| **Detector 4** | | | | | | | | | | |
| **8/29/2019 5:16:00 AM** | 0.10 | 0.11 | 0.03 | -0.02 | Pass | 0.51 | 0.46 | 0.08 | 0.055 | Pass |
| **8/30/2019 7:48:00 AM** | 0.12 | 0.11 | 0.03 | 0.00 | Pass | 0.41 | 0.46 | 0.08 | -0.045 | Pass |
| **Detector 5** | | | | | | | | | | |
| **8/29/2019 5:16:00 AM** | 0.21 | 0.13 | 0.05 | 0.07 | Pass | 0.42 | 0.40 | 0.07 | 0.018 | Pass |
| **8/29/2019 12:25:00 PM** | 0.26 | 0.13 | 0.05 | 0.12 | Pass | 0.49 | 0.40 | 0.07 | 0.088 | Pass |
| **8/30/2019 4:53:00 AM** | 0.21 | 0.13 | 0.05 | 0.08 | Pass | 0.41 | 0.40 | 0.07 | 0.013 | Pass |
| **Detector 6** | | | | | | | | | | |
| **8/29/2019 5:16:00 AM** | 0.29 | 0.10 | 0.03 | 0.19 | FAIL | 0.38 | 0.46 | 0.08 | -0.089 | Pass |
| **8/30/2019 4:53:00 AM** | 0.13 | 0.10 | 0.03 | 0.03 | Pass | 0.42 | 0.46 | 0.08 | -0.049 | Pass |
| **Detector 7** | | | | | | | | | | |
| **8/29/2019 5:16:00 AM** | 0.20 | 0.10 | 0.03 | 0.09 | FAIL | 0.44 | 0.47 | 0.06 | -0.040 | Pass |
| **8/30/2019 4:53:00 AM** | 0.15 | 0.10 | 0.03 | 0.05 | Pass | 0.57 | 0.47 | 0.06 | 0.095 | Pass |
| **Detector 8** | | | | | | | | | | |
| **8/29/2019 5:16:00 AM** | 0.26 | 0.12 | 0.04 | 0.13 | FAIL | 0.61 | 0.47 | 0.05 | 0.130 | Pass |
| **8/30/2019 5:57:00 AM** | 0.20 | 0.12 | 0.04 | 0.08 | Pass | 0.43 | 0.47 | 0.05 | -0.050 | Pass |
| **Detector 9** | | | | | | | | | | |
| **8/29/2019 5:16:00 AM** | 0.28 | 0.07 | 0.02 | 0.21 | FAIL | 0.44 | 0.42 | 0.07 | 0.024 | Pass |
| **8/30/2019 4:53:00 AM** | 0.27 | 0.07 | 0.02 | 0.20 | FAIL | 0.52 | 0.42 | 0.07 | 0.099 | Pass |

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# Gas Proportional Counter Daily Quality Control Checks

***Instrument: Purple***

| | AlphaBKG CPM | BKG Mean | BKG +/- limit | BKG Deviation | BKG Flag | BetaBKG CPM | BetaBKG Mean | BetaBKG +/- limit | BetaBKG Deviation | BetaBKG Flag |
|---|---|---|---|---|---|---|---|---|---|---|
| **Detector 10** | | | | | | | | | | |
| **8/29/2019 5:16:00 AM** | 0.20 | 0.08 | 0.02 | 0.11 | FAIL | 0.28 | 0.36 | 0.06 | -0.081 | Pass |
| **8/30/2019 4:53:00 AM** | 0.17 | 0.08 | 0.02 | 0.09 | FAIL | 0.33 | 0.36 | 0.06 | -0.036 | Pass |
| **Detector 11** | | | | | | | | | | |
| **8/29/2019 5:16:00 AM** | 0.14 | 0.08 | 0.02 | 0.05 | Pass | 0.49 | 0.43 | 0.06 | 0.061 | Pass |
| **8/30/2019 4:53:00 AM** | 0.19 | 0.08 | 0.02 | 0.10 | FAIL | 0.45 | 0.43 | 0.06 | 0.021 | Pass |
| **Detector 16** | | | | | | | | | | |
| **8/29/2019 5:16:00 AM** | 0.27 | 0.07 | 0.02 | 0.20 | FAIL | 0.36 | 0.40 | 0.07 | -0.040 | Pass |
| **8/30/2019 4:53:00 AM** | 0.20 | 0.07 | 0.02 | 0.13 | FAIL | 0.42 | 0.40 | 0.07 | 0.015 | Pass |
| **Detector 17** | | | | | | | | | | |
| **8/29/2019 5:16:00 AM** | 0.16 | 0.15 | 0.02 | 0.01 | Pass | 0.26 | 0.31 | 0.06 | -0.045 | Pass |
| **8/30/2019 4:53:00 AM** | 0.18 | 0.15 | 0.02 | 0.04 | Pass | 0.37 | 0.31 | 0.06 | 0.060 | Pass |
| **Detector 18** | | | | | | | | | | |
| **8/29/2019 5:16:00 AM** | 0.16 | 0.10 | 0.03 | 0.06 | Pass | 0.50 | 0.37 | 0.06 | 0.130 | Pass |
| **8/30/2019 4:53:00 AM** | 0.18 | 0.10 | 0.03 | 0.08 | Pass | 0.33 | 0.37 | 0.06 | -0.040 | Pass |
| **Detector 19** | | | | | | | | | | |
| **8/29/2019 5:16:00 AM** | 0.15 | 0.10 | 0.02 | 0.05 | Pass | 0.60 | 0.49 | 0.05 | 0.109 | Pass |
| **8/30/2019 4:53:00 AM** | 0.10 | 0.10 | 0.02 | 0.00 | Pass | 0.54 | 0.49 | 0.05 | 0.054 | Pass |

**The Alpha and Beta +/- limit are based upon initial 20-point population.**

**The Alpha and Beta +/- limit for Efficiency is stated at 3%. Flags are "FAIL" > 3%.**

**The Alpha and Beta +/- limit for Background is stated at 1 StDev. Flags are "FAIL" > 3 StDev.**

**The Alpha +/- limit for Crosstalk is stated at 1 StDev. Flags are "Warning > 2 StDev and "DOEF" > 3 StDev. Beta is negligible, for trend only ("NA").**

**Times shown reflect the end of the count duration.**

**APPROVED**
*By Kody Saulters at 12:28 pm, Sep 03, 2019*

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# Gas Proportional Counter Daily Quality Control Checks

***Instrument: Purple***

| | Alpha CPM | Alpha Mean | Alpha +/- limit | Alpha Deviation | Alpha Flag | A>>B XT CPM | A>>B XT Mean | A>>B XT +/- limit | A>>B XT Deviation | A>>B XT Flag |
|---|---|---|---|---|---|---|---|---|---|---|
| **Check Type = Alpha** | | | | | | | | | | |
| **Detector 0** | | | | | | | | | | |
| **8/30/2019 12:29:00 AM** | 12035.24 | 12818.03 | 384.54 | -782.79 | FAIL | 3938.00 | 4137.60 | 27.33 | -199.600 | DOEF |
| **8/31/2019 8:35:00 AM** | 11988.68 | 12818.03 | 384.54 | -829.35 | FAIL | 3998.50 | 4137.60 | 27.33 | -139.100 | DOEF |
| **Detector 1** | | | | | | | | | | |
| **8/30/2019 12:29:00 AM** | 13142.98 | 13847.28 | 415.42 | -704.30 | FAIL | 4546.50 | 4251.53 | 66.02 | 294.975 | DOEF |
| **8/31/2019 8:35:00 AM** | 13211.70 | 13847.28 | 415.42 | -635.57 | FAIL | 4334.50 | 4251.53 | 66.02 | 82.975 | Pass |
| **Detector 2** | | | | | | | | | | |
| **8/30/2019 12:29:00 AM** | 13278.91 | 14354.23 | 430.63 | -1075.31 | FAIL | 4631.00 | 4891.15 | 60.37 | -260.150 | DOEF |
| **8/31/2019 8:35:00 AM** | 13266.44 | 14354.23 | 430.63 | -1087.78 | FAIL | 4570.50 | 4891.15 | 60.37 | -320.650 | DOEF |
| **Detector 3** | | | | | | | | | | |
| **8/30/2019 12:29:00 AM** | 12994.87 | 13419.20 | 402.58 | -424.33 | FAIL | 4794.00 | 4922.70 | 84.85 | -128.700 | Pass |
| **8/31/2019 8:35:00 AM** | 12999.44 | 13419.20 | 402.58 | -419.76 | FAIL | 4808.50 | 4922.70 | 84.85 | -114.200 | Pass |
| **Detector 4** | | | | | | | | | | |
| **8/30/2019 12:30:00 AM** | 16612.05 | 16907.73 | 507.23 | -295.68 | Pass | 6083.00 | 5249.05 | 86.84 | 833.950 | DOEF |
| **8/30/2019 1:31:00 AM** | 16487.24 | 16907.73 | 507.23 | -420.48 | Pass | 6114.50 | 5249.05 | 86.84 | 865.450 | DOEF |
| **8/31/2019 8:35:00 AM** | 16529.92 | 16907.73 | 507.23 | -377.81 | Pass | 5985.00 | 5249.05 | 86.84 | 735.950 | DOEF |
| **Detector 5** | | | | | | | | | | |
| **8/30/2019 12:30:00 AM** | 16664.18 | 16603.10 | 498.09 | 61.08 | Pass | 6057.50 | 5630.28 | 57.62 | 427.225 | DOEF |
| **8/31/2019 8:36:00 AM** | 16418.14 | 16603.10 | 498.09 | -184.96 | Pass | 6029.50 | 5630.28 | 57.62 | 399.225 | DOEF |
| **Detector 6** | | | | | | | | | | |
| **8/30/2019 12:30:00 AM** | 14592.56 | 15352.98 | 460.59 | -760.42 | FAIL | 5442.50 | 5483.13 | 60.86 | -40.625 | Pass |
| **8/31/2019 8:36:00 AM** | 14588.11 | 15352.98 | 460.59 | -764.86 | FAIL | 5470.50 | 5483.13 | 60.86 | -12.625 | Pass |
| **Detector 7** | | | | | | | | | | |
| **8/30/2019 12:30:00 AM** | 14884.76 | 15273.85 | 458.22 | -389.09 | Pass | 5775.00 | 5724.88 | 85.05 | 50.125 | Pass |
| **8/31/2019 8:36:00 AM** | 14633.78 | 15273.85 | 458.22 | -640.07 | FAIL | 5517.50 | 5724.88 | 85.05 | -207.375 | WARNING |
| **Detector 8** | | | | | | | | | | |
| **8/30/2019 12:32:00 AM** | 11847.27 | 12654.18 | 379.63 | -806.90 | FAIL | 4047.50 | 3940.58 | 65.19 | 106.925 | Pass |
| **8/31/2019 8:39:00 AM** | 11944.56 | 12654.18 | 379.63 | -709.61 | FAIL | 4027.00 | 3940.58 | 65.19 | 86.425 | Pass |
| **Detector 9** | | | | | | | | | | |
| **8/30/2019 12:32:00 AM** | 12868.87 | 13595.78 | 407.87 | -726.90 | FAIL | 4535.50 | 4722.55 | 71.26 | -187.050 | WARNING |
| **8/31/2019 8:39:00 AM** | 12781.23 | 13595.78 | 407.87 | -814.54 | FAIL | 4492.00 | 4722.55 | 71.26 | -230.550 | DOEF |

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# Gas Proportional Counter Daily Quality Control Checks

***Instrument: Purple***

| | Alpha CPM | Alpha Mean | Alpha +/- limit | Alpha Deviation | Alpha Flag | A>>B XT CPM | A>>B XT Mean | A>>B XT +/- limit | A>>B XT Deviation | A>>B XT Flag |
|---|---|---|---|---|---|---|---|---|---|---|
| **Detector 10** | | | | | | | | | | |
| **8/30/2019 12:32:00 AM** | 13094.59 | 14277.18 | 428.32 | -1182.58 | **FAIL** | 4741.50 | 5018.53 | 72.48 | -277.025 | **DOEF** |
| **8/31/2019 8:39:00 AM** | 13118.20 | 14277.18 | 428.32 | -1158.97 | **FAIL** | 4745.00 | 5018.53 | 72.48 | -273.525 | **DOEF** |
| **Detector 11** | | | | | | | | | | |
| **8/30/2019 12:32:00 AM** | 13076.81 | 13390.48 | 401.71 | -313.67 | Pass | 4540.50 | 4510.73 | 57.64 | 29.775 | Pass |
| **8/30/2019 1:24:00 AM** | 13103.37 | 13390.48 | 401.71 | -287.10 | Pass | 4550.50 | 4510.73 | 57.64 | 39.775 | Pass |
| **8/31/2019 8:39:00 AM** | 12958.07 | 13390.48 | 401.71 | -432.40 | **FAIL** | 4525.50 | 4510.73 | 57.64 | 14.775 | Pass |
| **Detector 16** | | | | | | | | | | |
| **8/30/2019 12:35:00 AM** | 11775.08 | 12631.78 | 378.95 | -856.69 | **FAIL** | 3853.00 | 3761.83 | 61.84 | 91.175 | Pass |
| **8/31/2019 8:43:00 AM** | 11832.28 | 12631.78 | 378.95 | -799.50 | **FAIL** | 3870.00 | 3761.83 | 61.84 | 108.175 | Pass |
| **Detector 17** | | | | | | | | | | |
| **8/30/2019 12:35:00 AM** | 13284.51 | 13889.18 | 416.68 | -604.66 | **FAIL** | 3972.50 | 4215.80 | 68.01 | -243.300 | **DOEF** |
| **8/31/2019 8:43:00 AM** | 13508.03 | 13889.18 | 416.68 | -381.15 | Pass | 4071.00 | 4215.80 | 68.01 | -144.800 | **WARNING** |
| **Detector 18** | | | | | | | | | | |
| **8/30/2019 12:35:00 AM** | 13355.49 | 14192.53 | 425.78 | -837.04 | **FAIL** | 4707.50 | 4822.80 | 47.76 | -115.300 | **WARNING** |
| **8/31/2019 8:43:00 AM** | 13052.80 | 14192.53 | 425.78 | -1139.73 | **FAIL** | 4722.50 | 4822.80 | 47.76 | -100.300 | **WARNING** |
| **Detector 19** | | | | | | | | | | |
| **8/30/2019 12:35:00 AM** | 13345.96 | 13562.28 | 406.87 | -216.31 | Pass | 4387.50 | 4355.90 | 55.82 | 31.600 | Pass |
| **8/31/2019 8:43:00 AM** | 13037.76 | 13562.28 | 406.87 | -524.51 | **FAIL** | 4346.50 | 4355.90 | 55.82 | -9.400 | Pass |

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# Gas Proportional Counter Daily Quality Control Checks

***Instrument: Purple***

| | Beta CPM | Beta Mean | Beta +/- limit | Beta Deviation | Beta Flag | B>>A XT CPM | B>>A XT Mean | B>>A XT +/- limit | B>>A XT Deviation | B>>A XT Flag |
|---|---|---|---|---|---|---|---|---|---|---|
| **Check Type = Beta** | | | | | | | | | | |
| **Detector 0** | | | | | | | | | | |
| **8/30/2019 12:16:00 AM** | 50301.22 | 50226.98 | 1506.81 | 74.24 | Pass | NA | NA | NA | NA | NA |
| **8/31/2019 8:48:00 AM** | 50207.41 | 50226.98 | 1506.81 | -19.57 | Pass | NA | NA | NA | NA | NA |
| **Detector 1** | | | | | | | | | | |
| **8/30/2019 12:16:00 AM** | 49048.26 | 48796.70 | 1463.90 | 251.56 | Pass | NA | NA | NA | NA | NA |
| **8/31/2019 8:48:00 AM** | 49310.64 | 48796.70 | 1463.90 | 513.94 | Pass | NA | NA | NA | NA | NA |
| **Detector 2** | | | | | | | | | | |
| **8/30/2019 12:16:00 AM** | 50939.15 | 50875.48 | 1526.26 | 63.68 | Pass | NA | NA | NA | NA | NA |
| **8/31/2019 8:48:00 AM** | 50756.89 | 50875.48 | 1526.26 | -118.59 | Pass | NA | NA | NA | NA | NA |
| **Detector 3** | | | | | | | | | | |
| **8/30/2019 12:16:00 AM** | 59978.99 | 60107.23 | 1803.22 | -128.24 | Pass | NA | NA | NA | NA | NA |
| **8/31/2019 8:48:00 AM** | 59977.73 | 60107.23 | 1803.22 | -129.49 | Pass | NA | NA | NA | NA | NA |
| **Detector 4** | | | | | | | | | | |
| **8/30/2019 12:16:00 AM** | 56800.98 | 56940.95 | 1708.23 | -139.97 | Pass | NA | NA | NA | NA | NA |
| **8/31/2019 8:48:00 AM** | 56341.50 | 56940.95 | 1708.23 | -599.45 | Pass | NA | NA | NA | NA | NA |
| **Detector 5** | | | | | | | | | | |
| **8/30/2019 12:16:00 AM** | 55358.85 | 54659.90 | 1639.80 | 698.95 | Pass | NA | NA | NA | NA | NA |
| **8/31/2019 8:48:00 AM** | 55176.36 | 54659.90 | 1639.80 | 516.46 | Pass | NA | NA | NA | NA | NA |
| **Detector 6** | | | | | | | | | | |
| **8/30/2019 12:16:00 AM** | 51936.12 | 52013.25 | 1560.40 | -77.13 | Pass | NA | NA | NA | NA | NA |
| **8/31/2019 8:48:00 AM** | 51917.12 | 52013.25 | 1560.40 | -96.13 | Pass | NA | NA | NA | NA | NA |
| **Detector 7** | | | | | | | | | | |
| **8/30/2019 12:16:00 AM** | 45547.96 | 45069.13 | 1352.07 | 478.84 | Pass | NA | NA | NA | NA | NA |
| **8/31/2019 8:48:00 AM** | 45559.31 | 45069.13 | 1352.07 | 490.19 | Pass | NA | NA | NA | NA | NA |
| **Detector 8** | | | | | | | | | | |
| **8/30/2019 12:26:00 AM** | 50233.94 | 50025.35 | 1500.76 | 208.59 | Pass | NA | NA | NA | NA | NA |
| **8/31/2019 8:42:00 AM** | 50134.54 | 50025.35 | 1500.76 | 109.19 | Pass | NA | NA | NA | NA | NA |
| **Detector 9** | | | | | | | | | | |
| **8/30/2019 12:19:00 AM** | 49175.52 | 48665.90 | 1459.98 | 509.62 | Pass | NA | NA | NA | NA | NA |
| **8/31/2019 8:42:00 AM** | 48490.49 | 48665.90 | 1459.98 | -175.41 | Pass | NA | NA | NA | NA | NA |
| **Detector 10** | | | | | | | | | | |
| **8/30/2019 12:19:00 AM** | 50554.08 | 50649.48 | 1519.48 | -95.40 | Pass | NA | NA | NA | NA | NA |
| **8/31/2019 8:42:00 AM** | 50663.27 | 50649.48 | 1519.48 | 13.79 | Pass | NA | NA | NA | NA | NA |

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# Gas Proportional Counter Daily Quality Control Checks

***Instrument: Purple***

| | Beta CPM | Beta Mean | Beta +/- limit | Beta Deviation | Beta Flag | B>>A XT CPM | B>>A XT Mean | B>>A XT +/- limit | B>>A XT Deviation | B>>A XT Flag |
|---|---|---|---|---|---|---|---|---|---|---|
| **Detector 11** | | | | | | | | | | |
| **8/30/2019 12:20:00 AM** | 59766.02 | 59849.50 | 1795.49 | -83.48 | Pass | NA | NA | NA | NA | NA |
| **8/31/2019 8:42:00 AM** | 60161.55 | 59849.50 | 1795.49 | 312.05 | Pass | NA | NA | NA | NA | NA |
| **Detector 16** | | | | | | | | | | |
| **8/30/2019 12:23:00 AM** | 49498.16 | 49489.98 | 1484.70 | 8.19 | Pass | NA | NA | NA | NA | NA |
| **8/31/2019 8:37:00 AM** | 49401.32 | 49489.98 | 1484.70 | -88.66 | Pass | NA | NA | NA | NA | NA |
| **Detector 17** | | | | | | | | | | |
| **8/30/2019 12:23:00 AM** | 46496.00 | 46812.78 | 1404.38 | -316.78 | Pass | NA | NA | NA | NA | NA |
| **8/31/2019 8:37:00 AM** | 46849.47 | 46812.78 | 1404.38 | 36.69 | Pass | NA | NA | NA | NA | NA |
| **Detector 18** | | | | | | | | | | |
| **8/30/2019 12:23:00 AM** | 49997.13 | 50124.63 | 1503.74 | -127.49 | Pass | NA | NA | NA | NA | NA |
| **8/31/2019 8:37:00 AM** | 50016.60 | 50124.63 | 1503.74 | -108.03 | Pass | NA | NA | NA | NA | NA |
| **Detector 19** | | | | | | | | | | |
| **8/30/2019 12:23:00 AM** | 60112.62 | 60073.05 | 1802.19 | 39.57 | Pass | NA | NA | NA | NA | NA |
| **8/31/2019 8:37:00 AM** | 59660.34 | 60073.05 | 1802.19 | -412.71 | Pass | NA | NA | NA | NA | NA |

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# Gas Proportional Counter Daily Quality Control Checks

***Instrument: Purple***

| | AlphaBKG CPM | BKG Mean | BKG +/- limit | BKG Deviation | BKG Flag | BetaBKG CPM | BetaBKG Mean | BetaBKG +/- limit | BetaBKG Deviation | BetaBKG Flag |
|---|---|---|---|---|---|---|---|---|---|---|
| **Check Type = BKG** | | | | | | | | | | |
| **Detector 0** | | | | | | | | | | |
| **8/30/2019 4:53:00 AM** | 0.20 | 0.12 | 0.01 | 0.08 | FAIL | 0.51 | 0.46 | 0.08 | 0.053 | Pass |
| **8/31/2019 12:39:00 PM** | 0.15 | 0.12 | 0.01 | 0.03 | Pass | 0.51 | 0.46 | 0.08 | 0.048 | Pass |
| **Detector 1** | | | | | | | | | | |
| **8/30/2019 4:53:00 AM** | 0.15 | 0.09 | 0.04 | 0.06 | Pass | 0.51 | 0.43 | 0.08 | 0.076 | Pass |
| **8/31/2019 12:39:00 PM** | 0.19 | 0.09 | 0.04 | 0.10 | Pass | 0.42 | 0.43 | 0.08 | -0.014 | Pass |
| **Detector 2** | | | | | | | | | | |
| **8/30/2019 4:53:00 AM** | 0.28 | 0.17 | 0.05 | 0.10 | Pass | 0.50 | 0.53 | 0.06 | -0.031 | Pass |
| **8/31/2019 12:39:00 PM** | 0.34 | 0.17 | 0.05 | 0.17 | FAIL | 0.54 | 0.53 | 0.06 | 0.014 | Pass |
| **Detector 3** | | | | | | | | | | |
| **8/30/2019 4:53:00 AM** | 0.28 | 0.08 | 0.02 | 0.19 | FAIL | 0.53 | 0.41 | 0.08 | 0.125 | Pass |
| **8/31/2019 12:39:00 PM** | 0.19 | 0.08 | 0.02 | 0.10 | FAIL | 0.51 | 0.41 | 0.08 | 0.105 | Pass |
| **Detector 4** | | | | | | | | | | |
| **8/30/2019 7:48:00 AM** | 0.12 | 0.11 | 0.03 | 0.00 | Pass | 0.41 | 0.46 | 0.08 | -0.045 | Pass |
| **8/31/2019 12:39:00 PM** | 0.18 | 0.11 | 0.03 | 0.07 | Pass | 0.42 | 0.46 | 0.08 | -0.040 | Pass |
| **Detector 5** | | | | | | | | | | |
| **8/30/2019 4:53:00 AM** | 0.21 | 0.13 | 0.05 | 0.08 | Pass | 0.41 | 0.40 | 0.07 | 0.013 | Pass |
| **8/31/2019 12:39:00 PM** | 0.21 | 0.13 | 0.05 | 0.07 | Pass | 0.45 | 0.40 | 0.07 | 0.048 | Pass |
| **Detector 6** | | | | | | | | | | |
| **8/30/2019 4:53:00 AM** | 0.13 | 0.10 | 0.03 | 0.03 | Pass | 0.42 | 0.46 | 0.08 | -0.049 | Pass |
| **8/31/2019 12:40:00 PM** | 0.21 | 0.10 | 0.03 | 0.11 | FAIL | 0.40 | 0.46 | 0.08 | -0.064 | Pass |
| **Detector 7** | | | | | | | | | | |
| **8/30/2019 4:53:00 AM** | 0.15 | 0.10 | 0.03 | 0.05 | Pass | 0.57 | 0.47 | 0.06 | 0.095 | Pass |
| **8/31/2019 12:40:00 PM** | 0.23 | 0.10 | 0.03 | 0.12 | FAIL | 0.40 | 0.47 | 0.06 | -0.075 | Pass |
| **Detector 8** | | | | | | | | | | |
| **8/30/2019 5:57:00 AM** | 0.20 | 0.12 | 0.04 | 0.08 | Pass | 0.43 | 0.47 | 0.05 | -0.050 | Pass |
| **8/31/2019 12:40:00 PM** | 0.15 | 0.12 | 0.04 | 0.03 | Pass | 0.50 | 0.47 | 0.05 | 0.020 | Pass |
| **Detector 9** | | | | | | | | | | |
| **8/30/2019 4:53:00 AM** | 0.27 | 0.07 | 0.02 | 0.20 | FAIL | 0.52 | 0.42 | 0.07 | 0.099 | Pass |
| **8/31/2019 12:40:00 PM** | 0.23 | 0.07 | 0.02 | 0.16 | FAIL | 0.43 | 0.42 | 0.07 | 0.009 | Pass |
| **Detector 10** | | | | | | | | | | |
| **8/30/2019 4:53:00 AM** | 0.17 | 0.08 | 0.02 | 0.09 | FAIL | 0.33 | 0.36 | 0.06 | -0.036 | Pass |
| **8/31/2019 12:40:00 PM** | 0.18 | 0.08 | 0.02 | 0.10 | FAIL | 0.35 | 0.36 | 0.06 | -0.011 | Pass |

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# Gas Proportional Counter Daily Quality Control Checks

***Instrument: Purple***

| | AlphaBKG CPM | BKG Mean | BKG +/- limit | BKG Deviation | BKG Flag | BetaBKG CPM | BetaBKG Mean | BetaBKG +/- limit | BetaBKG Deviation | BetaBKG Flag |
|---|---|---|---|---|---|---|---|---|---|---|
| **Detector 11** | | | | | | | | | | |
| **8/30/2019 4:53:00 AM** | 0.19 | 0.08 | 0.02 | 0.10 | FAIL | 0.45 | 0.43 | 0.06 | 0.021 | Pass |
| **8/31/2019 12:40:00 PM** | 0.10 | 0.08 | 0.02 | 0.02 | Pass | 0.34 | 0.43 | 0.06 | -0.090 | Pass |
| **Detector 16** | | | | | | | | | | |
| **8/30/2019 4:53:00 AM** | 0.20 | 0.07 | 0.02 | 0.13 | FAIL | 0.42 | 0.40 | 0.07 | 0.015 | Pass |
| **8/31/2019 12:40:00 PM** | 0.19 | 0.07 | 0.02 | 0.12 | FAIL | 0.34 | 0.40 | 0.07 | -0.060 | Pass |
| **Detector 17** | | | | | | | | | | |
| **8/30/2019 4:53:00 AM** | 0.18 | 0.15 | 0.02 | 0.04 | Pass | 0.37 | 0.31 | 0.06 | 0.060 | Pass |
| **8/31/2019 12:40:00 PM** | 0.23 | 0.15 | 0.02 | 0.08 | FAIL | 0.27 | 0.31 | 0.06 | -0.035 | Pass |
| **Detector 18** | | | | | | | | | | |
| **8/30/2019 4:53:00 AM** | 0.18 | 0.10 | 0.03 | 0.08 | Pass | 0.33 | 0.37 | 0.06 | -0.040 | Pass |
| **8/31/2019 12:40:00 PM** | 0.16 | 0.10 | 0.03 | 0.06 | Pass | 0.38 | 0.37 | 0.06 | 0.005 | Pass |
| **Detector 19** | | | | | | | | | | |
| **8/30/2019 4:53:00 AM** | 0.10 | 0.10 | 0.02 | 0.00 | Pass | 0.54 | 0.49 | 0.05 | 0.054 | Pass |
| **8/31/2019 12:40:00 PM** | 0.12 | 0.10 | 0.02 | 0.02 | Pass | 0.40 | 0.49 | 0.05 | -0.091 | Pass |

**The Alpha and Beta +/- limit are based upon initial 20-point population.**

**The Alpha and Beta +/- limit for Efficiency is stated at 3%. Flags are "FAIL" > 3%.**

**The Alpha and Beta +/- limit for Background is stated at 1 StDev. Flags are "FAIL" > 3 StDev.**

**The Alpha +/- limit for Crosstalk is stated at 1 StDev. Flags are "Warning > 2 StDev and "DOEF" > 3 StDev. Beta is negligible, for trend only ("NA").**

**Times shown reflect the end of the count duration.**

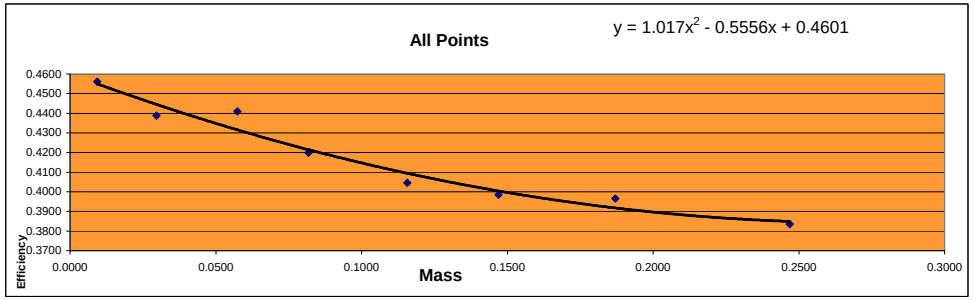
# Alpha Beta Calibrations

**Curve is for Gross Beta**
**Strontium 90**
**and**
**Total Strontium**

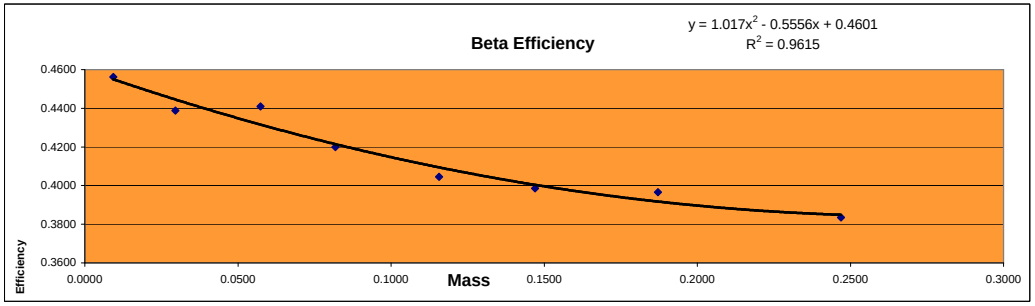
**Orange 0**

| Detector ID | Std ID | Count Date | Sample Wt | Count Time | Beta Counts | DPM 41588.469 CPM | Sr-90 Eff | Standard Aliquot |
|---|---|---|---|---|---|---|---|---|
| 0 | B1 | 1/23/2013 14:44 | 0.0093 | 5 | 94846 | 18969.200 | 0.4561 | 1mL |
| 0 | B2 | 1/23/2013 15:46 | 0.0296 | 5 | 91244 | 18248.800 | 0.4388 | 1mL |
| 0 | B3 | 1/23/2013 15:37 | 0.0574 | 5 | 91691 | 18338.200 | 0.4409 | 1mL |
| 0 | B4 | 1/23/2013 15:26 | 0.0818 | 5 | 87307 | 17461.400 | 0.4199 | 1mL |
| 0 | B5 | 1/23/2013 15:19 | 0.1157 | 5 | 84120 | 16824.000 | 0.4045 | 1mL |
| 0 | B6 | 1/23/2013 15:09 | 0.1470 | 5 | 82888 | 16577.600 | 0.3986 | 1mL |
| 0 | B7 | 1/23/2013 15:01 | 0.1871 | 5 | 82469 | 16493.800 | 0.3966 | 1mL |
| 0 | B8 | 1/23/2013 14:53 | 0.2469 | 5 | 79762 | 15952.400 | 0.3836 | 1mL |

| Mass | Measured Efficiency | Theoretical Efficiency | Percent Δ Efficiency |
|---|---|---|---|
| 0.0093 | 0.4561 | 0.4550 | 0.24% |
| 0.0296 | 0.4388 | 0.4445 | -1.29% |
| 0.0574 | 0.4409 | 0.4316 | 2.17% |
| 0.0818 | 0.4199 | 0.4215 | -0.38% |
| 0.1157 | 0.4045 | 0.4094 | -1.20% |
| 0.1470 | 0.3986 | 0.4004 | -0.45% |
| 0.1871 | 0.3966 | 0.3917 | 1.24% |
| 0.2469 | 0.3836 | 0.3849 | -0.35% |




| Mass | Efficiency |
|---|---|
| 0.0093 | 0.4561 |
| 0.0296 | 0.4388 |
| 0.0574 | 0.4409 |
| 0.0818 | 0.4199 |
| 0.1157 | 0.4045 |
| 0.1470 | 0.3986 |
| 0.1871 | 0.3966 |
| 0.2469 | 0.3836 |




**Standard ID**
Strontium 90
Sr-90_00004 #6322
Cert# 80573-334 Ref. date 9/172009

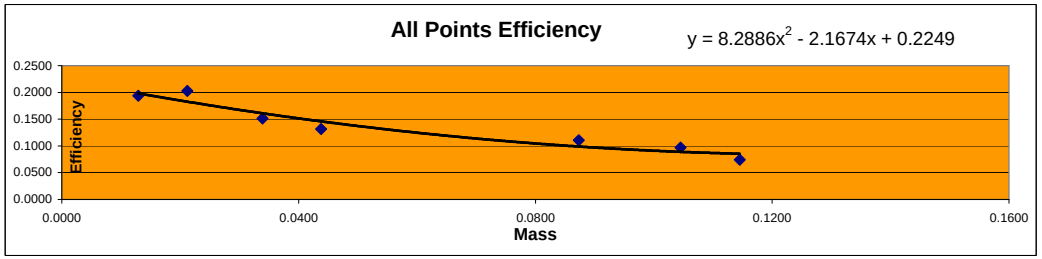
| | |
|---|---|
| Initial Activity: | 22560 dpm/mL |
| Reference Date: | 9/17/2009 |
| Count Date: | 1/23/2013 |
| Elapsed Time: | 1224.000 days |
| Half Life: | 10409.625 days |
| Exponential Term: | 0.92173026 |
| Corrected Activity: | 20794.2346 dpm/mL |
| Decay Activity (Sr/Y-90) | 41588.4692 dpm |

## Curve is for Gross Alpha

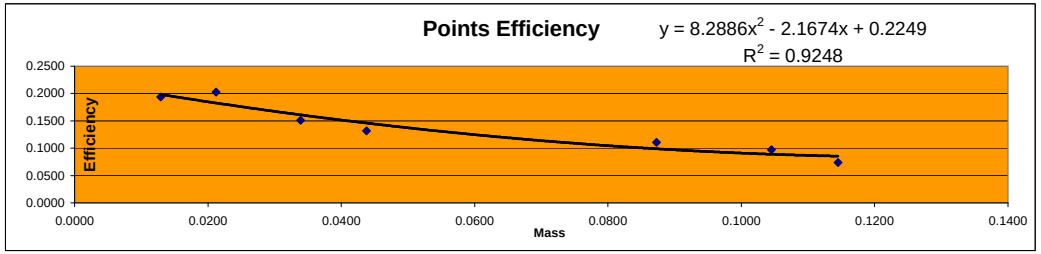
**Orange 0**

| Detector ID | Sample ID | Count Date | Count Time | Alpha Counts | Net CPM | DPM | Th-230 Efficiency | Standard Aliquot | Mass |
|---|---|---|---|---|---|---|---|---|---|
| 0 | ICABT-51465;A1 | 12/2/2015 11:00 | 40 | 18384 | 459.600 | 2374.5 | 0.1936 | 1mL | 0.0129 |
| 0 | ICABT-51465;A2 | 12/2/2015 19:20 | 40 | 19241 | 481.025 | 2374.5 | 0.2026 | 1mL | 0.0212 |
| 0 | ICABT-51465;A3 | 12/2/2015 17:07 | 40 | 14368 | 359.200 | 2374.5 | 0.1513 | 1mL | 0.0339 |
| 0 | ICABT-51465;A4 | 12/2/2015 16:12 | 40 | 12524 | 313.100 | 2374.5 | 0.1319 | 1mL | 0.0438 |
| 0 | ICABT-51465;A6 | 12/2/2015 14:12 | 40 | 21054 | 526.350 | 4749.0 | 0.1108 | 2mL | 0.0873 |
| 0 | ICABT-51465;A7 | 12/2/2015 13:20 | 40 | 18456 | 461.400 | 4749.0 | 0.0972 | 2mL | 0.1045 |
| 0 | ICABT-51465;A8 | 12/2/2015 12:28 | 40 | 14043 | 351.075 | 4749.0 | 0.0739 | 2mL | 0.1145 |

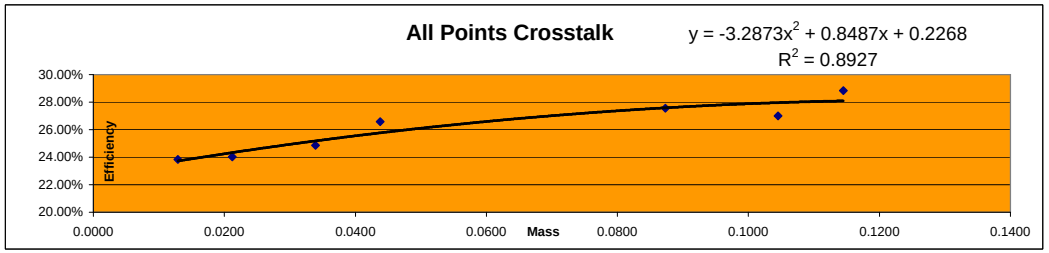
| Mass | Measured Efficiency | Theoretical Efficiency | Percent Δ Efficiency |
|---|---|---|---|
| 0.0129 | 0.1936 | 0.1983 | -2.40% |
| 0.0212 | 0.2026 | 0.1827 | 10.90% |
| 0.0339 | 0.1513 | 0.1610 | -6.01% |
| 0.0438 | 0.1319 | 0.1459 | -9.60% |
| 0.0873 | 0.1108 | 0.0989 | 12.12% |
| 0.1045 | 0.0972 | 0.0889 | 9.26% |
| 0.1145 | 0.0739 | 0.0854 | -13.43% |




| Mass | Efficiency |
|---|---|
| 0.0129 | 0.1936 |
| 0.0212 | 0.2026 |
| 0.0339 | 0.1513 |
| 0.0438 | 0.1319 |
| 0.0873 | 0.1108 |
| 0.1045 | 0.0972 |
| 0.1145 | 0.0739 |




| Detector ID | Sample ID | Mass | Count Time | Alpha Counts | Beta Counts | Alpha CPM | Beta CPM | % α into β | |
|---|---|---|---|---|---|---|---|---|---|
| 0 | ICABT-51465;A1 | 0.0129 | 40 | 18384 | 5751 | 459.60 | 143.78 | 23.83% | Min |
| 0 | ICABT-51465;A2 | 0.0212 | 40 | 19241 | 6080 | 481.03 | 152.00 | 24.01% | 23.83% |
| 0 | ICABT-51465;A3 | 0.0339 | 40 | 14368 | 4751 | 359.20 | 118.78 | 24.85% | |
| 0 | ICABT-51465;A4 | 0.0438 | 40 | 12524 | 4532 | 313.10 | 113.30 | 26.57% | Max |
| 0 | ICABT-51465;A6 | 0.0873 | 40 | 21054 | 8009 | 526.35 | 200.23 | 27.56% | 28.83% |
| 0 | ICABT-51465;A7 | 0.1045 | 40 | 18456 | 6828 | 461.40 | 170.70 | 27.01% | |
| 0 | ICABT-51465;A8 | 0.1145 | 40 | 14043 | 5688 | 351.08 | 142.20 | 28.83% | Mean |
| | | | | | | | | | 26.09% |




**Standard ID**
Thorium-230
Th-230_00016 #51465
Cert # 92523 Ref. date 11/29/2012
Activity 2374.5 dpm/mL

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09/13/2019

# Alpha/Beta Count Results

## Sample Activity Report

## Orange 0-3 - A

**Addr:** 0

**Sample ID** ICABT-6322;B1

**Repeat** 40

**Carrier No.** 0

**Batch ID** m122627

**Count Method** Gross Alpha Beta

**Detector Volts** 1515

**Sample Qty** 0 *l* **sd** 0 *l*

**Residual Wt** 0 *mg* **sd** 0 *mg*

**Count Began** 1/23/2013 2:44:52 PM **Collection Date 1** 1/1/1900 **Half Life** 0.00 *days*

**Count Ended** 1/23/2013 2:50:03 PM **Collection Date 2** 1/1/1900 **Decay Factor** 1.000

**Sample Count Time** 5.00 *mins* **Background Count Time** 1,000.00 *mins*

| | Efficiency % | Attenuation Factor | Activity Divisor | Background cpm | Gross counts | Gross cpm | Net cpm |
|---|---|---|---|---|---|---|---|
| **Alpha** | 0.000 | 1.000 | 1.000 | 0.078 | 396 | 79.200 | 79.122 |
| **sd** | 0.000 | | | 0.009 | 19.900 | 3.980 | 3.980 |
| **A to B** | 0.000 | 1.000 | | | | 0.000 | |
| **sd** | 0.000 | | | | | 0.000 | |
| **Beta** | 0.000 | 1.000 | 1.000 | 0.403 | 94,846 | 18,969.200 | 18,968.797 |
| **sd** | 0.000 | | | 0.020 | 307.971 | 61.594 | 61.594 |

| | Net Activity dpm | LLD dpm | MDC pCi/l | MPC pCi/l | Net Concentration * pCi/l | Conc / MPC Ratio |
|---|---|---|---|---|---|---|
| **Alpha** | 0.000 | 0.000 | 0.000 | 1.000 | 0.000 ± 0.000 | 0.000 |
| **sd** | 0.000 | | | | 0.000 | |
| **Beta** | 0.000 | 0.000 | 0.000 | 1.000 | 0.000 ± 0.000 | 0.000 |
| **sd** | 0.000 | | | | 0.000 | |

*** Note: Decay Corrected** **MDC Method** Tb = Ts < 10 **Error =** .00 **x sd**

# Alpha/Beta Count Results

## Sample Activity Report

## Orange 0-3 - A

**Addr:** 0

**Sample ID** ICABT-6322;B8

**Repeat** 40

**Carrier No.** 0

**Batch ID** m122627

**Count Method** Gross Alpha Beta

**Detector Volts** 1515

**Sample Qty** 0 *l* **sd** 0 *l*

**Residual Wt** 0 *mg* **sd** 0 *mg*

**Count Began** 1/23/2013 2:53:37 PM **Collection Date 1** 1/1/1900 **Half Life** 0.00 *days*

**Count Ended** 1/23/2013 2:58:47 PM **Collection Date 2** 1/1/1900 **Decay Factor** 1.000

**Sample Count Time** 5.00 *mins* **Background Count Time** 1,000.00 *mins*

| | Efficiency % | Attenuation Factor | Activity Divisor | Background cpm | Gross counts | Gross cpm | Net cpm |
|---|---|---|---|---|---|---|---|
| **Alpha** | 0.000 | 1.000 | 1.000 | 0.078 | 265 | 53.000 | 52.922 |
| **sd** | 0.000 | | | 0.009 | 16.279 | 3.256 | 3.256 |
| **A to B** | 0.000 | 1.000 | | | | 0.000 | |
| **sd** | 0.000 | | | | | 0.000 | |
| **Beta** | 0.000 | 1.000 | 1.000 | 0.403 | 79,762 | 15,952.400 | 15,951.997 |
| **sd** | 0.000 | | | 0.020 | 282.422 | 56.484 | 56.484 |

| | Net Activity dpm | LLD dpm | MDC pCi/l | MPC pCi/l | Net Concentration * pCi/l | Conc / MPC Ratio |
|---|---|---|---|---|---|---|
| **Alpha** | 0.000 | 0.000 | 0.000 | 1.000 | 0.000 ± 0.000 | 0.000 |
| **sd** | 0.000 | | | | 0.000 | |
| **Beta** | 0.000 | 0.000 | 0.000 | 1.000 | 0.000 ± 0.000 | 0.000 |
| **sd** | 0.000 | | | | 0.000 | |

*** Note: Decay Corrected** **MDC Method** Tb = Ts < 10 **Error =** .00 **x sd**

# Alpha/Beta Count Results

## Sample Activity Report

## Orange 0-3 - A

**Addr:** 0

**Sample ID** ICABT-6322;B7

**Repeat** 41

**Carrier No.** 0

**Batch ID** m122627

**Count Method** Gross Alpha Beta

**Detector Volts** 1515

**Sample Qty** 0 *l* **sd** 0 *l*

**Residual Wt** 0 *mg* **sd** 0 *mg*

**Count Began** 1/23/2013 3:01:10 PM **Collection Date 1** 1/1/1900 **Half Life** 0.00 *days*

**Count Ended** 1/23/2013 3:06:18 PM **Collection Date 2** 1/1/1900 **Decay Factor** 1.000

**Sample Count Time** 5.00 *mins* **Background Count Time** 1,000.00 *mins*

| | Efficiency % | Attenuation Factor | Activity Divisor | Background cpm | Gross counts | Gross cpm | Net cpm |
|---|---|---|---|---|---|---|---|
| **Alpha** | 0.000 | 1.000 | 1.000 | 0.078 | 306 | 61.200 | 61.122 |
| **sd** | 0.000 | | | 0.009 | 17.493 | 3.499 | 3.499 |
| **A to B** | 0.000 | 1.000 | | | | 0.000 | |
| **sd** | 0.000 | | | | | 0.000 | |
| **Beta** | 0.000 | 1.000 | 1.000 | 0.403 | 82,469 | 16,493.800 | 16,493.397 |
| **sd** | 0.000 | | | 0.020 | 287.174 | 57.435 | 57.435 |

| | Net Activity dpm | LLD dpm | MDC pCi/l | MPC pCi/l | Net Concentration * pCi/l | Conc / MPC Ratio |
|---|---|---|---|---|---|---|
| **Alpha** | 0.000 | 0.000 | 0.000 | 1.000 | 0.000 ± 0.000 | 0.000 |
| **sd** | 0.000 | | | | 0.000 | |
| **Beta** | 0.000 | 0.000 | 0.000 | 1.000 | 0.000 ± 0.000 | 0.000 |
| **sd** | 0.000 | | | | 0.000 | |

*** Note: Decay Corrected** **MDC Method** Tb = Ts < 10 **Error =** .00 **x sd**

# Alpha/Beta Count Results

## Sample Activity Report

## Orange 0-3 - A

**Addr:** 0

**Sample ID** ICABT-6322;B6

**Repeat** 42

**Carrier No.** 0

**Batch ID** m122627

**Count Method** Gross Alpha Beta

**Detector Volts** 1515

**Sample Qty** 0 *l* **sd** 0 *l*

**Residual Wt** 0 *mg* **sd** 0 *mg*

**Count Began** 1/23/2013 3:09:26 PM **Collection Date 1** 1/1/1900 **Half Life** 0.00 *days*

**Count Ended** 1/23/2013 3:14:35 PM **Collection Date 2** 1/1/1900 **Decay Factor** 1.000

**Sample Count Time** 5.00 *mins* **Background Count Time** 1,000.00 *mins*

| | Efficiency % | Attenuation Factor | Activity Divisor | Background cpm | Gross counts | Gross cpm | Net cpm |
|---|---|---|---|---|---|---|---|
| **Alpha** | 0.000 | 1.000 | 1.000 | 0.078 | 353 | 70.600 | 70.522 |
| **sd** | 0.000 | | | 0.009 | 18.788 | 3.758 | 3.758 |
| **A to B** | 0.000 | 1.000 | | | | 0.000 | |
| **sd** | 0.000 | | | | | 0.000 | |
| **Beta** | 0.000 | 1.000 | 1.000 | 0.403 | 82,888 | 16,577.600 | 16,577.197 |
| **sd** | 0.000 | | | 0.020 | 287.903 | 57.581 | 57.581 |

| | Net Activity dpm | LLD dpm | MDC pCi/l | MPC pCi/l | Net Concentration * pCi/l | Conc / MPC Ratio |
|---|---|---|---|---|---|---|
| **Alpha** | 0.000 | 0.000 | 0.000 | 1.000 | 0.000 ± 0.000 | 0.000 |
| **sd** | 0.000 | | | | 0.000 | |
| **Beta** | 0.000 | 0.000 | 0.000 | 1.000 | 0.000 ± 0.000 | 0.000 |
| **sd** | 0.000 | | | | 0.000 | |

*** Note: Decay Corrected** **MDC Method** Tb = Ts < 10 **Error =** .00 **x sd**

# Alpha/Beta Count Results

## Sample Activity Report

## Orange 0-3 - A

**Addr:** 0

**Sample ID** ICABT-6322;B5

**Repeat** 43

**Carrier No.** 0

**Batch ID** m122627

**Count Method** Gross Alpha Beta

**Detector Volts** 1515

| | | | |
|---|---|---|---|
| **Sample Qty** | 0 ***l*** | **sd** | 0 ***l*** |
| **Residual Wt** | 0 ***mg*** | **sd** | 0 ***mg*** |

**Count Began** 1/23/2013 3:19:14 PM **Collection Date 1** 1/1/1900 **Half Life** 0.00 ***days***

**Count Ended** 1/23/2013 3:24:23 PM **Collection Date 2** 1/1/1900 **Decay Factor** 1.000

**Sample Count Time** 5.00 ***mins*** **Background Count Time** 1,000.00 ***mins***

| | Efficiency % | Attenuation Factor | Activity Divisor | Background cpm | Gross counts | Gross cpm | Net cpm |
|---|---|---|---|---|---|---|---|
| **Alpha** | 0.000 | 1.000 | 1.000 | 0.078 | 341 | 68.200 | 68.122 |
| **sd** | 0.000 | | | 0.009 | 18.466 | 3.693 | 3.693 |
| **A to B** | 0.000 | 1.000 | | | | 0.000 | |
| **sd** | 0.000 | | | | | 0.000 | |
| **Beta** | 0.000 | 1.000 | 1.000 | 0.403 | 84,120 | 16,824.000 | 16,823.597 |
| **sd** | 0.000 | | | 0.020 | 290.034 | 58.007 | 58.007 |

| | Net Activity dpm | LLD dpm | MDC pCi/l | MPC pCi/l | Net Concentration * pCi/l | Conc / MPC Ratio |
|---|---|---|---|---|---|---|
| **Alpha** | 0.000 | 0.000 | 0.000 | 1.000 | 0.000 ± 0.000 | 0.000 |
| **sd** | 0.000 | | | | 0.000 | |
| **Beta** | 0.000 | 0.000 | 0.000 | 1.000 | 0.000 ± 0.000 | 0.000 |
| **sd** | 0.000 | | | | 0.000 | |

*** Note: Decay Corrected** **MDC Method** Tb = Ts < 10 **Error =** .00 **x sd**

# Alpha/Beta Count Results

## Sample Activity Report

## Orange 0-3 - A

**Addr:** 0

**Sample ID** ICABT-6322;B4

**Repeat** 45

**Carrier No.** 0

**Batch ID** m122627

**Count Method** Gross Alpha Beta

**Detector Volts** 1515

| | | | |
|---|---|---|---|
| **Sample Qty** | 0 ***l*** | **sd** | 0 ***l*** |
| **Residual Wt** | 0 ***mg*** | **sd** | 0 ***mg*** |

**Count Began** 1/23/2013 3:26:50 PM **Collection Date 1** 1/1/1900 **Half Life** 0.00 ***days***

**Count Ended** 1/23/2013 3:32:01 PM **Collection Date 2** 1/1/1900 **Decay Factor** 1.000

**Sample Count Time** 5.00 ***mins*** **Background Count Time** 1,000.00 ***mins***

| | Efficiency % | Attenuation Factor | Activity Divisor | Background cpm | Gross counts | Gross cpm | Net cpm |
|---|---|---|---|---|---|---|---|
| **Alpha** | 0.000 | 1.000 | 1.000 | 0.078 | 304 | 60.800 | 60.722 |
| **sd** | 0.000 | | | 0.009 | 17.436 | 3.487 | 3.487 |
| **A to B** | 0.000 | 1.000 | | | | 0.000 | |
| **sd** | 0.000 | | | | | 0.000 | |
| **Beta** | 0.000 | 1.000 | 1.000 | 0.403 | 87,307 | 17,461.400 | 17,460.997 |
| **sd** | 0.000 | | | 0.020 | 295.478 | 59.096 | 59.096 |

| | Net Activity dpm | LLD dpm | MDC pCi/l | MPC pCi/l | Net Concentration * pCi/l | Conc / MPC Ratio |
|---|---|---|---|---|---|---|
| **Alpha** | 0.000 | 0.000 | 0.000 | 1.000 | 0.000 ± 0.000 | 0.000 |
| **sd** | 0.000 | | | | 0.000 | |
| **Beta** | 0.000 | 0.000 | 0.000 | 1.000 | 0.000 ± 0.000 | 0.000 |
| **sd** | 0.000 | | | | 0.000 | |

*** Note: Decay Corrected** **MDC Method** Tb = Ts < 10 **Error =** .00 **x sd**

# Alpha/Beta Count Results

## Sample Activity Report

## Orange 0-3 - A

**Addr:** 0

**Sample ID** ICABT-6322;B3

**Repeat** 46

**Carrier No.** 0

**Batch ID** m122627

**Count Method** Gross Alpha Beta

**Detector Volts** 1515

**Sample Qty** 0 *l* **sd** 0 *l*

**Residual Wt** 0 *mg* **sd** 0 *mg*

**Count Began** 1/23/2013 3:37:05 PM **Collection Date 1** 1/1/1900 **Half Life** 0.00 *days*

**Count Ended** 1/23/2013 3:42:15 PM **Collection Date 2** 1/1/1900 **Decay Factor** 1.000

**Sample Count Time** 5.00 *mins* **Background Count Time** 1,000.00 *mins*

| | Efficiency % | Attenuation Factor | Activity Divisor | Background cpm | Gross counts | Gross cpm | Net cpm |
|---|---|---|---|---|---|---|---|
| **Alpha** | 0.000 | 1.000 | 1.000 | 0.078 | 362 | 72.400 | 72.322 |
| **sd** | 0.000 | | | 0.009 | 19.026 | 3.805 | 3.805 |
| **A to B** | 0.000 | 1.000 | | | | 0.000 | |
| **sd** | 0.000 | | | | | 0.000 | |
| **Beta** | 0.000 | 1.000 | 1.000 | 0.403 | 91,691 | 18,338.200 | 18,337.797 |
| **sd** | 0.000 | | | 0.020 | 302.805 | 60.561 | 60.561 |

| | Net Activity dpm | LLD dpm | MDC pCi/l | MPC pCi/l | Net Concentration * pCi/l | Conc / MPC Ratio |
|---|---|---|---|---|---|---|
| **Alpha** | 0.000 | 0.000 | 0.000 | 1.000 | 0.000 ± 0.000 | 0.000 |
| **sd** | 0.000 | | | | 0.000 | |
| **Beta** | 0.000 | 0.000 | 0.000 | 1.000 | 0.000 ± 0.000 | 0.000 |
| **sd** | 0.000 | | | | 0.000 | |

*** Note: Decay Corrected** **MDC Method** Tb = Ts < 10 **Error =** .00 **x sd**

# Alpha/Beta Count Results

## Sample Activity Report

## Orange 0-3 - A

**Addr:** 0

**Sample ID** ICABT-6322;B2

**Repeat** 47

**Carrier No.** 0

**Batch ID** m122627

**Count Method** Gross Alpha Beta

**Detector Volts** 1515

| | | | |
|---|---|---|---|
| **Sample Qty** | 0 ***l*** | **sd** | 0 ***l*** |
| **Residual Wt** | 0 ***mg*** | **sd** | 0 ***mg*** |

**Count Began** 1/23/2013 3:46:01 PM **Collection Date 1** 1/1/1900 **Half Life** 0.00 ***days***

**Count Ended** 1/23/2013 3:51:11 PM **Collection Date 2** 1/1/1900 **Decay Factor** 1.000

**Sample Count Time** 5.00 ***mins*** **Background Count Time** 1,000.00 ***mins***

| | Efficiency % | Attenuation Factor | Activity Divisor | Background cpm | Gross counts | Gross cpm | Net cpm |
|---|---|---|---|---|---|---|---|
| **Alpha** | 0.000 | 1.000 | 1.000 | 0.078 | 363 | 72.600 | 72.522 |
| **sd** | 0.000 | | | 0.009 | 19.053 | 3.811 | 3.811 |
| **A to B** | 0.000 | 1.000 | | | | 0.000 | |
| **sd** | 0.000 | | | | | 0.000 | |
| **Beta** | 0.000 | 1.000 | 1.000 | 0.403 | 91,244 | 18,248.800 | 18,248.397 |
| **sd** | 0.000 | | | 0.020 | 302.066 | 60.413 | 60.413 |

| | Net Activity dpm | LLD dpm | MDC pCi/l | MPC pCi/l | Net Concentration * pCi/l | Conc / MPC Ratio |
|---|---|---|---|---|---|---|
| **Alpha** | 0.000 | 0.000 | 0.000 | 1.000 | 0.000 ± 0.000 | 0.000 |
| **sd** | 0.000 | | | | 0.000 | |
| **Beta** | 0.000 | 0.000 | 0.000 | 1.000 | 0.000 ± 0.000 | 0.000 |
| **sd** | 0.000 | | | | 0.000 | |

*** Note: Decay Corrected** **MDC Method** Tb = Ts < 10 **Error =** .00 **x sd**

# Alpha/Beta Count Results

## Sample Activity Report

## Orange 0-3 - A

**Addr:** 0

**Sample ID** ICABT-51465;A1

**Repeat** 993

**Carrier No.** 0

**Batch ID** m153000

**Count Method** Gross Alpha Beta

**Detector Volts** 1515

**Sample Qty** 0 *l* **sd** 0 *l*

**Residual Wt** 0 *mg* **sd** 0 *mg*

**Count Began** 12/2/2015 11:00:58 AM **Collection Date 1** 1/1/1900 **Half Life** 0.00 *days*

**Count Ended** 12/2/2015 11:41:04 AM **Collection Date 2** 1/1/1900 **Decay Factor** 1.000

**Sample Count Time** 40.00 *mins* **Background Count Time** 1,000.00 *mins*

| | Efficiency % | Attenuation Factor | Activity Divisor | Background cpm | Gross counts | Gross cpm | Net cpm |
|---|---|---|---|---|---|---|---|
| **Alpha** | 0.000 | 1.000 | 1.000 | 0.113 | 18,384 | 459.600 | 459.487 |
| **sd** | 0.000 | | | 0.011 | 135.588 | 3.390 | 3.390 |
| **A to B** | 0.000 | 1.000 | | | | 0.000 | |
| **sd** | 0.000 | | | | | 0.000 | |
| **Beta** | 0.000 | 1.000 | 1.000 | 0.417 | 5,751 | 143.775 | 143.358 |
| **sd** | 0.000 | | | 0.020 | 75.835 | 1.896 | 1.896 |

| | Net Activity dpm | LLD dpm | MDC pCi/l | MPC pCi/l | Net Concentration * pCi/l | Conc / MPC Ratio |
|---|---|---|---|---|---|---|
| **Alpha** | 0.000 | 0.000 | 0.000 | 1.000 | 0.000 ± 0.000 | 0.000 |
| **sd** | 0.000 | | | | 0.000 | |
| **Beta** | 0.000 | 0.000 | 0.000 | 1.000 | 0.000 ± 0.000 | 0.000 |
| **sd** | 0.000 | | | | 0.000 | |

*** Note: Decay Corrected** **MDC Method** Tb = Ts < 10 **Error =** .00 **x sd**

# Alpha/Beta Count Results

## Sample Activity Report

## Orange 0-3 - A

**Addr:** 0

**Sample ID** ICABT-51465;A8

**Repeat** 995

**Carrier No.** 0

**Batch ID** m153000

**Count Method** Gross Alpha Beta

**Detector Volts** 1515

**Sample Qty** 0 *l* **sd** 0 *l*

**Residual Wt** 0 *mg* **sd** 0 *mg*

**Count Began** 12/2/2015 12:28:29 PM **Collection Date 1** 1/1/1900 **Half Life** 0.00 *days*

**Count Ended** 12/2/2015 1:08:35 PM **Collection Date 2** 1/1/1900 **Decay Factor** 1.000

**Sample Count Time** 40.00 *mins* **Background Count Time** 1,000.00 *mins*

| | Efficiency % | Attenuation Factor | Activity Divisor | Background cpm | Gross counts | Gross cpm | Net cpm |
|---|---|---|---|---|---|---|---|
| **Alpha** | 0.000 | 1.000 | 1.000 | 0.113 | 14,043 | 351.075 | 350.962 |
| **sd** | 0.000 | | | 0.011 | 118.503 | 2.963 | 2.963 |
| **A to B** | 0.000 | 1.000 | | | | 0.000 | |
| **sd** | 0.000 | | | | | 0.000 | |
| **Beta** | 0.000 | 1.000 | 1.000 | 0.417 | 5,688 | 142.200 | 141.783 |
| **sd** | 0.000 | | | 0.020 | 75.419 | 1.885 | 1.886 |

| | Net Activity dpm | LLD dpm | MDC pCi/l | MPC pCi/l | Net Concentration * pCi/l | Conc / MPC Ratio |
|---|---|---|---|---|---|---|
| **Alpha** | 0.000 | 0.000 | 0.000 | 1.000 | 0.000 ± 0.000 | 0.000 |
| **sd** | 0.000 | | | | 0.000 | |
| **Beta** | 0.000 | 0.000 | 0.000 | 1.000 | 0.000 ± 0.000 | 0.000 |
| **sd** | 0.000 | | | | 0.000 | |

*** Note: Decay Corrected** **MDC Method** Tb = Ts < 10 **Error =** .00 **x sd**

# Alpha/Beta Count Results

## Sample Activity Report

## Orange 0-3 - A

**Addr:** 0

**Sample ID** ICABT-51465;A7

**Repeat** 997

**Carrier No.** 0

**Batch ID** m153000

**Count Method** Gross Alpha Beta

**Detector Volts** 1515

**Sample Qty** 0 *l* **sd** 0 *l*

**Residual Wt** 0 *mg* **sd** 0 *mg*

**Count Began** 12/2/2015 1:20:51 PM **Collection Date 1** 1/1/1900 **Half Life** 0.00 *days*

**Count Ended** 12/2/2015 2:00:57 PM **Collection Date 2** 1/1/1900 **Decay Factor** 1.000

**Sample Count Time** 40.00 *mins* **Background Count Time** 1,000.00 *mins*

| | Efficiency % | Attenuation Factor | Activity Divisor | Background cpm | Gross counts | Gross cpm | Net cpm |
|---|---|---|---|---|---|---|---|
| **Alpha** | 0.000 | 1.000 | 1.000 | 0.113 | 18,456 | 461.400 | 461.287 |
| **sd** | 0.000 | | | 0.011 | 135.853 | 3.396 | 3.396 |
| **A to B** | 0.000 | 1.000 | | | | 0.000 | |
| **sd** | 0.000 | | | | | 0.000 | |
| **Beta** | 0.000 | 1.000 | 1.000 | 0.417 | 6,828 | 170.700 | 170.283 |
| **sd** | 0.000 | | | 0.020 | 82.632 | 2.066 | 2.066 |

| | Net Activity dpm | LLD dpm | MDC pCi/l | MPC pCi/l | Net Concentration * pCi/l | Conc / MPC Ratio |
|---|---|---|---|---|---|---|
| **Alpha** | 0.000 | 0.000 | 0.000 | 1.000 | 0.000 ± 0.000 | 0.000 |
| **sd** | 0.000 | | | | 0.000 | |
| **Beta** | 0.000 | 0.000 | 0.000 | 1.000 | 0.000 ± 0.000 | 0.000 |
| **sd** | 0.000 | | | | 0.000 | |

*** Note: Decay Corrected** **MDC Method** Tb = Ts < 10 **Error =** .00 **x sd**

# Alpha/Beta Count Results

## Sample Activity Report

## Orange 0-3 - A

**Addr:** 0

**Sample ID** ICABT-51465;A6

**Repeat** 999

**Carrier No.** 0

**Batch ID** m153000

**Count Method** Gross Alpha Beta

**Detector Volts** 1515

**Sample Qty** 0 *l* **sd** 0 *l*

**Residual Wt** 0 *mg* **sd** 0 *mg*

**Count Began** 12/2/2015 2:12:17 PM **Collection Date 1** 1/1/1900 **Half Life** 0.00 *days*

**Count Ended** 12/2/2015 2:52:23 PM **Collection Date 2** 1/1/1900 **Decay Factor** 1.000

**Sample Count Time** 40.00 *mins* **Background Count Time** 1,000.00 *mins*

| | Efficiency % | Attenuation Factor | Activity Divisor | Background cpm | Gross counts | Gross cpm | Net cpm |
|---|---|---|---|---|---|---|---|
| **Alpha** | 0.000 | 1.000 | 1.000 | 0.113 | 21,054 | 526.350 | 526.237 |
| **sd** | 0.000 | | | 0.011 | 145.100 | 3.627 | 3.628 |
| **A to B** | 0.000 | 1.000 | | | | 0.000 | |
| **sd** | 0.000 | | | | | 0.000 | |
| **Beta** | 0.000 | 1.000 | 1.000 | 0.417 | 8,009 | 200.225 | 199.808 |
| **sd** | 0.000 | | | 0.020 | 89.493 | 2.237 | 2.237 |

| | Net Activity dpm | LLD dpm | MDC pCi/l | MPC pCi/l | Net Concentration * pCi/l | Conc / MPC Ratio |
|---|---|---|---|---|---|---|
| **Alpha** | 0.000 | 0.000 | 0.000 | 1.000 | 0.000 ± 0.000 | 0.000 |
| **sd** | 0.000 | | | | 0.000 | |
| **Beta** | 0.000 | 0.000 | 0.000 | 1.000 | 0.000 ± 0.000 | 0.000 |
| **sd** | 0.000 | | | | 0.000 | |

*** Note: Decay Corrected** **MDC Method** Tb = Ts < 10 **Error =** .00 **x sd**

# Alpha/Beta Count Results

## Sample Activity Report

## Orange 0-3 - A

**Addr:** 0

**Sample ID** ICABT-51465;A5

**Repeat** 1001

**Carrier No.** 0

**Batch ID** m153000

**Count Method** Gross Alpha Beta

**Detector Volts** 1515

| | | | |
|---|---|---|---|
| **Sample Qty** | 0 ***l*** | **sd** | 0 ***l*** |
| **Residual Wt** | 0 ***mg*** | **sd** | 0 ***mg*** |

**Count Began** 12/2/2015 3:06:27 PM **Collection Date 1** 1/1/1900 **Half Life** 0.00 ***days***

**Count Ended** 12/2/2015 3:46:33 PM **Collection Date 2** 1/1/1900 **Decay Factor** 1.000

**Sample Count Time** 40.00 ***mins*** **Background Count Time** 1,000.00 ***mins***

| | Efficiency % | Attenuation Factor | Activity Divisor | Background cpm | Gross counts | Gross cpm | Net cpm |
|---|---|---|---|---|---|---|---|
| **Alpha** | 0.000 | 1.000 | 1.000 | 0.113 | 17,495 | 437.375 | 437.262 |
| **sd** | 0.000 | | | 0.011 | 132.269 | 3.307 | 3.307 |
| **A to B** | 0.000 | 1.000 | | | | 0.000 | |
| **sd** | 0.000 | | | | | 0.000 | |
| **Beta** | 0.000 | 1.000 | 1.000 | 0.417 | 6,921 | 173.025 | 172.608 |
| **sd** | 0.000 | | | 0.020 | 83.193 | 2.080 | 2.080 |

| | Net Activity dpm | LLD dpm | MDC pCi/l | MPC pCi/l | Net Concentration * pCi/l | Conc / MPC Ratio |
|---|---|---|---|---|---|---|
| **Alpha** | 0.000 | 0.000 | 0.000 | 1.000 | 0.000 ± 0.000 | 0.000 |
| **sd** | 0.000 | | | | 0.000 | |
| **Beta** | 0.000 | 0.000 | 0.000 | 1.000 | 0.000 ± 0.000 | 0.000 |
| **sd** | 0.000 | | | | 0.000 | |

*** Note: Decay Corrected** **MDC Method** Tb = Ts < 10 **Error =** .00 **x sd**

# Alpha/Beta Count Results

## Sample Activity Report

## Orange 0-3 - A

**Addr:** 0

**Sample ID** ICABT-51465;A4

**Repeat** 1003

**Carrier No.** 0

**Batch ID** m153000

**Count Method** Gross Alpha Beta

**Detector Volts** 1515

**Sample Qty** 0 *l* **sd** 0 *l*

**Residual Wt** 0 *mg* **sd** 0 *mg*

**Count Began** 12/2/2015 4:12:54 PM **Collection Date 1** 1/1/1900 **Half Life** 0.00 *days*

**Count Ended** 12/2/2015 4:52:58 PM **Collection Date 2** 1/1/1900 **Decay Factor** 1.000

**Sample Count Time** 40.00 *mins* **Background Count Time** 1,000.00 *mins*

| | Efficiency % | Attenuation Factor | Activity Divisor | Background cpm | Gross counts | Gross cpm | Net cpm |
|---|---|---|---|---|---|---|---|
| **Alpha** | 0.000 | 1.000 | 1.000 | 0.113 | 12,524 | 313.100 | 312.987 |
| **sd** | 0.000 | | | 0.011 | 111.911 | 2.798 | 2.798 |
| **A to B** | 0.000 | 1.000 | | | | 0.000 | |
| **sd** | 0.000 | | | | | 0.000 | |
| **Beta** | 0.000 | 1.000 | 1.000 | 0.417 | 4,532 | 113.300 | 112.883 |
| **sd** | 0.000 | | | 0.020 | 67.320 | 1.683 | 1.683 |

| | Net Activity dpm | LLD dpm | MDC pCi/l | MPC pCi/l | Net Concentration * pCi/l | Conc / MPC Ratio |
|---|---|---|---|---|---|---|
| **Alpha** | 0.000 | 0.000 | 0.000 | 1.000 | 0.000 ± 0.000 | 0.000 |
| **sd** | 0.000 | | | | 0.000 | |
| **Beta** | 0.000 | 0.000 | 0.000 | 1.000 | 0.000 ± 0.000 | 0.000 |
| **sd** | 0.000 | | | | 0.000 | |

*** Note: Decay Corrected** **MDC Method** Tb = Ts < 10 **Error =** .00 **x sd**

# Alpha/Beta Count Results

## Sample Activity Report

## Orange 0-3 - A

**Addr:** 0

**Sample ID** ICABT-51465;A3

**Repeat** 1005

**Carrier No.** 0

**Batch ID** m153000

**Count Method** Gross Alpha Beta

**Detector Volts** 1515

**Sample Qty** 0 *l* **sd** 0 *l*

**Residual Wt** 0 *mg* **sd** 0 *mg*

**Count Began** 12/2/2015 5:07:29 PM **Collection Date 1** 1/1/1900 **Half Life** 0.00 *days*

**Count Ended** 12/2/2015 5:47:35 PM **Collection Date 2** 1/1/1900 **Decay Factor** 1.000

**Sample Count Time** 40.00 *mins* **Background Count Time** 1,000.00 *mins*

| | Efficiency % | Attenuation Factor | Activity Divisor | Background cpm | Gross counts | Gross cpm | Net cpm |
|---|---|---|---|---|---|---|---|
| **Alpha** | 0.000 | 1.000 | 1.000 | 0.113 | 14,368 | 359.200 | 359.087 |
| **sd** | 0.000 | | | 0.011 | 119.867 | 2.997 | 2.997 |
| **A to B** | 0.000 | 1.000 | | | | 0.000 | |
| **sd** | 0.000 | | | | | 0.000 | |
| **Beta** | 0.000 | 1.000 | 1.000 | 0.417 | 4,751 | 118.775 | 118.358 |
| **sd** | 0.000 | | | 0.020 | 68.927 | 1.723 | 1.723 |

| | Net Activity dpm | LLD dpm | MDC pCi/l | MPC pCi/l | Net Concentration * pCi/l | Conc / MPC Ratio |
|---|---|---|---|---|---|---|
| **Alpha** | 0.000 | 0.000 | 0.000 | 1.000 | 0.000 ± 0.000 | 0.000 |
| **sd** | 0.000 | | | | 0.000 | |
| **Beta** | 0.000 | 0.000 | 0.000 | 1.000 | 0.000 ± 0.000 | 0.000 |
| **sd** | 0.000 | | | | 0.000 | |

*** Note: Decay Corrected** **MDC Method** Tb = Ts < 10 **Error =** .00 **x sd**

# Alpha/Beta Count Results

## Sample Activity Report

## Orange 0-3 - A

**Addr:** 0

**Sample ID** ICABT-51465;A2

**Repeat** 1007

**Carrier No.** 0

**Batch ID** m153000

**Count Method** Gross Alpha Beta

**Detector Volts** 1515

**Sample Qty** 0 *l* **sd** 0 *l*

**Residual Wt** 0 *mg* **sd** 0 *mg*

**Count Began** 12/2/2015 7:20:16 PM **Collection Date 1** 1/1/1900 **Half Life** 0.00 *days*

**Count Ended** 12/2/2015 8:00:21 PM **Collection Date 2** 1/1/1900 **Decay Factor** 1.000

**Sample Count Time** 40.00 *mins* **Background Count Time** 1,000.00 *mins*

| | Efficiency % | Attenuation Factor | Activity Divisor | Background cpm | Gross counts | Gross cpm | Net cpm |
|---|---|---|---|---|---|---|---|
| **Alpha** | 0.000 | 1.000 | 1.000 | 0.113 | 19,241 | 481.025 | 480.912 |
| **sd** | 0.000 | | | 0.011 | 138.712 | 3.468 | 3.468 |
| **A to B** | 0.000 | 1.000 | | | | 0.000 | |
| **sd** | 0.000 | | | | | 0.000 | |
| **Beta** | 0.000 | 1.000 | 1.000 | 0.417 | 6,080 | 152.000 | 151.583 |
| **sd** | 0.000 | | | 0.020 | 77.974 | 1.949 | 1.949 |

| | Net Activity dpm | LLD dpm | MDC pCi/l | MPC pCi/l | Net Concentration * pCi/l | Conc / MPC Ratio |
|---|---|---|---|---|---|---|
| **Alpha** | 0.000 | 0.000 | 0.000 | 1.000 | 0.000 ± 0.000 | 0.000 |
| **sd** | 0.000 | | | | 0.000 | |
| **Beta** | 0.000 | 0.000 | 0.000 | 1.000 | 0.000 ± 0.000 | 0.000 |
| **sd** | 0.000 | | | | 0.000 | |

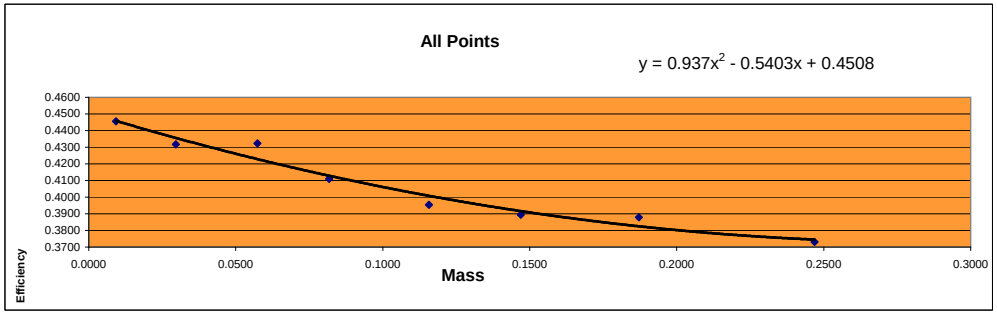
*** Note: Decay Corrected** **MDC Method** Tb = Ts < 10 **Error =** .00 **x sd**

**Curve is for Gross Beta**
**Strontium 90**
**and**
**Total Strontium**

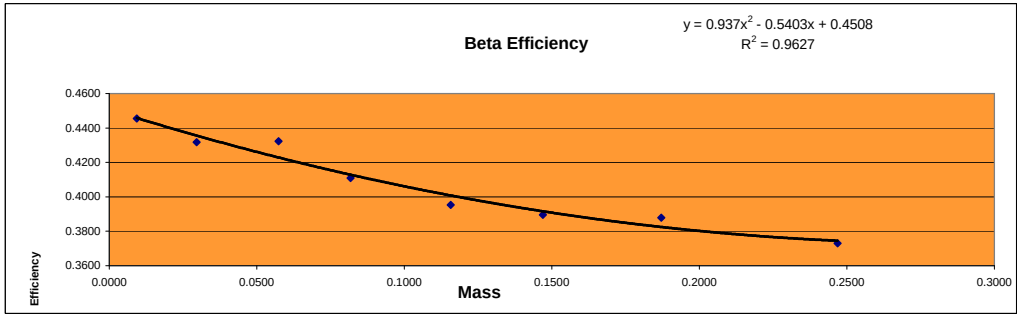
**Orange 14**

| Detector ID | Std ID | Count Date | Sample Wt | Count Time | Beta Counts | DPM 41588.469 CPM | Sr-90 Eff | Standard Aliquot |
|---|---|---|---|---|---|---|---|---|
| 14 | B1 | 1/23/2013 17:19 | 0.0093 | 5 | 92650 | 18530.000 | 0.4456 | 1mL |
| 14 | B2 | 1/23/2013 17:12 | 0.0296 | 5 | 89790 | 17958.000 | 0.4318 | 1mL |
| 14 | B3 | 1/23/2013 17:05 | 0.0574 | 5 | 89907 | 17981.400 | 0.4324 | 1mL |
| 14 | B4 | 1/23/2013 16:58 | 0.0818 | 5 | 85461 | 17092.200 | 0.4110 | 1mL |
| 14 | B5 | 1/23/2013 16:47 | 0.1157 | 5 | 82199 | 16439.800 | 0.3953 | 1mL |
| 14 | B6 | 1/23/2013 14:37 | 0.1470 | 5 | 80992 | 16198.400 | 0.3895 | 1mL |
| 14 | B7 | 1/23/2013 14:28 | 0.1871 | 5 | 80675 | 16135.000 | 0.3880 | 1mL |
| 14 | B8 | 1/23/2013 17:28 | 0.2469 | 5 | 77575 | 15515.000 | 0.3731 | 1mL |

| Mass | Measured Efficiency | Theoretical Efficiency | Percent Δ Efficiency |
|---|---|---|---|
| 0.0093 | 0.4456 | 0.4459 | -0.07% |
| 0.0296 | 0.4318 | 0.4356 | -0.88% |
| 0.0574 | 0.4324 | 0.4229 | 2.24% |
| 0.0818 | 0.4110 | 0.4129 | -0.46% |
| 0.1157 | 0.3953 | 0.4008 | -1.38% |
| 0.1470 | 0.3895 | 0.3916 | -0.54% |
| 0.1871 | 0.3880 | 0.3825 | 1.43% |
| 0.2469 | 0.3731 | 0.3745 | -0.39% |




| Mass | Efficiency |
|---|---|
| 0.0093 | 0.4456 |
| 0.0296 | 0.4318 |
| 0.0574 | 0.4324 |
| 0.0818 | 0.4110 |
| 0.1157 | 0.3953 |
| 0.1470 | 0.3895 |
| 0.1871 | 0.3880 |
| 0.2469 | 0.3731 |




**Standard ID**
Strontium 90
Sr-90_00004 #6322
Cert# 80573-334 Ref. date 9/172009

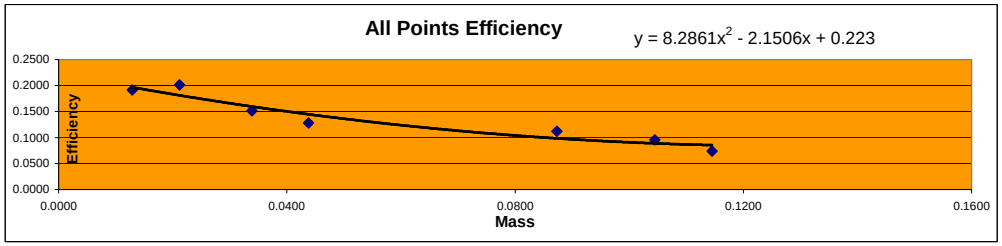
| | | |
|---|---|---|
| Initial Activity: | 22560 | dpm/mL |
| Reference Date: | 9/17/2009 | |
| Count Date: | 1/23/2013 | |
| Elapsed Time: | 1224.000 | days |
| Half Life: | 10409.625 | days |
| Exponential Term: | 0.921730256 | |
| Corrected Activity: | 20794.23458 | dpm/mL |
| Decay Activity (Sr/Y-90) | 41588.46916 | dpm |

## Curve is for Gross Alpha

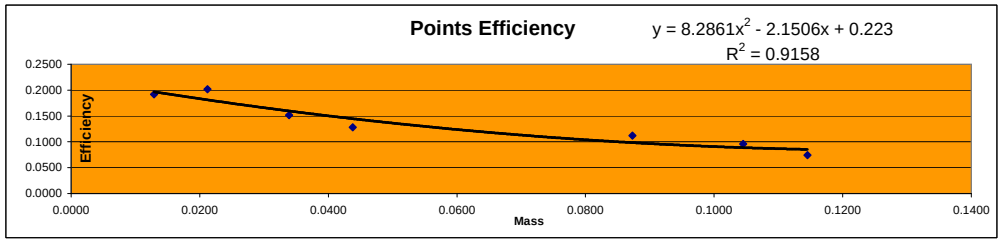
**Orange 14**

| Detector ID | Sample ID | Count Date | Count Time | Alpha Counts | Net CPM | DPM | Th-230 Efficiency | Standard Aliquot | Mass |
|---|---|---|---|---|---|---|---|---|---|
| 14 | ICABT-51465;A1 | 12/22/2015 1:01 | 40 | 18198 | 454.950 | 2374.5 | 0.1916 | 1mL | 0.0129 |
| 14 | ICABT-51465;A2 | 12/21/2015 21:56 | 40 | 19153 | 478.825 | 2374.5 | 0.2017 | 1mL | 0.0212 |
| 14 | ICABT-51465;A3 | 12/21/2015 20:26 | 40 | 14373 | 359.325 | 2374.5 | 0.1513 | 1mL | 0.0339 |
| 14 | ICABT-51465;A4 | 12/21/2015 19:38 | 40 | 12178 | 304.450 | 2374.5 | 0.1282 | 1mL | 0.0438 |
| 14 | ICABT-51465;A6 | 12/21/2015 17:46 | 40 | 21331 | 533.275 | 4749.0 | 0.1123 | 2mL | 0.0873 |
| 14 | ICABT-51465;A7 | 12/21/2015 16:29 | 40 | 18179 | 454.475 | 4749.0 | 0.0957 | 2mL | 0.1045 |
| 14 | ICABT-51465;A8 | 12/22/2015 1:49 | 40 | 14083 | 352.075 | 4749.0 | 0.0741 | 2mL | 0.1145 |

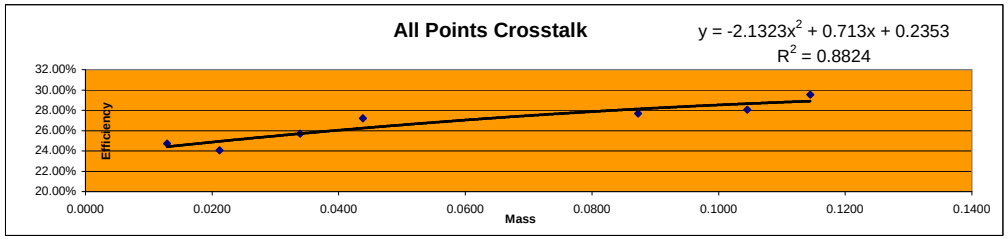
| Mass | Measured Efficiency | Theoretical Efficiency | Percent Δ Efficiency |
|---|---|---|---|
| 0.0129 | 0.1916 | 0.1966 | -2.56% |
| 0.0212 | 0.2017 | 0.1811 | 11.33% |
| 0.0339 | 0.1513 | 0.1596 | -5.19% |
| 0.0438 | 0.1282 | 0.1447 | -11.39% |
| 0.0873 | 0.1123 | 0.0984 | 14.11% |
| 0.1045 | 0.0957 | 0.0887 | 7.83% |
| 0.1145 | 0.0741 | 0.0854 | -13.18% |




| Mass | Efficiency |
|---|---|
| 0.0129 | 0.1916 |
| 0.0212 | 0.2017 |
| 0.0339 | 0.1513 |
| 0.0438 | 0.1282 |
| 0.0873 | 0.1123 |
| 0.1045 | 0.0957 |
| 0.1145 | 0.0741 |




| Detector ID | Sample ID | Mass | Count Time | Alpha Counts | Beta Counts | Alpha CPM | Beta CPM | % α into β | |
|---|---|---|---|---|---|---|---|---|---|
| 14 | ICABT-51465;A1 | 0.0129 | 40 | 18198 | 5975 | 454.95 | 149.38 | 24.72% | Min |
| 14 | ICABT-51465;A2 | 0.0212 | 40 | 19153 | 6074 | 478.83 | 151.85 | 24.08% | 24.08% |
| 14 | ICABT-51465;A3 | 0.0339 | 40 | 14373 | 4975 | 359.33 | 124.38 | 25.71% | |
| 14 | ICABT-51465;A4 | 0.0438 | 40 | 12178 | 4550 | 304.45 | 113.75 | 27.20% | Max |
| 14 | ICABT-51465;A6 | 0.0873 | 40 | 21331 | 8168 | 533.28 | 204.20 | 27.69% | |
| 14 | ICABT-51465;A7 | 0.1045 | 40 | 18179 | 7094 | 454.48 | 177.35 | 28.07% | Mean |
| 14 | ICABT-51465;A8 | 0.1145 | 40 | 14083 | 5901 | 352.08 | 147.53 | 29.53% | 26.71% |




**Standard ID**
Thorium-230
Th-230_00016 #51465
Cert # 92523 Ref. date 11/29/2012
Activity 2374.5 dpm/mL

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# Alpha/Beta Count Results

## Sample Activity Report

## Orange 12-15 - C

**Addr:** 14

**Sample ID** ICABT-6322;B7

**Repeat** 37

**Carrier No.** 0

**Batch ID** m122627

**Count Method** Gross Alpha Beta

**Detector Volts** 1515

**Sample Qty** 0 *l* **sd** 0 *l*

**Residual Wt** 0 *mg* **sd** 0 *mg*

**Count Began** 1/23/2013 2:28:09 PM **Collection Date 1** 1/1/1900 **Half Life** 0.00 *days*

**Count Ended** 1/23/2013 2:33:18 PM **Collection Date 2** 1/1/1900 **Decay Factor** 1.000

**Sample Count Time** 5.00 *mins* **Background Count Time** 1,000.00 *mins*

| | Efficiency % | Attenuation Factor | Activity Divisor | Background cpm | Gross counts | Gross cpm | Net cpm |
|---|---|---|---|---|---|---|---|
| **Alpha** | 0.000 | 1.000 | 1.000 | 0.122 | 90 | 18.000 | 17.878 |
| **sd** | 0.000 | | | 0.011 | 9.487 | 1.897 | 1.897 |
| **A to B** | 0.000 | 1.000 | | | | 0.000 | |
| **sd** | 0.000 | | | | | 0.000 | |
| **Beta** | 0.000 | 1.000 | 1.000 | 0.408 | 80,675 | 16,135.000 | 16,134.592 |
| **sd** | 0.000 | | | 0.020 | 284.033 | 56.807 | 56.807 |

| | Net Activity dpm | LLD dpm | MDC pCi/l | MPC pCi/l | Net Concentration * pCi/l | Conc / MPC Ratio |
|---|---|---|---|---|---|---|
| **Alpha** | 0.000 | 0.000 | 0.000 | 1.000 | 0.000 ± 0.000 | 0.000 |
| **sd** | 0.000 | | | | 0.000 | |
| **Beta** | 0.000 | 0.000 | 0.000 | 1.000 | 0.000 ± 0.000 | 0.000 |
| **sd** | 0.000 | | | | 0.000 | |

*** Note: Decay Corrected** **MDC Method** Tb = Ts < 10 **Error =** .00 **x sd**

# Alpha/Beta Count Results

## Sample Activity Report

## Orange 12-15 - C

**Addr:** 14

**Sample ID** ICABT-6322;B6

**Repeat** 38

**Carrier No.** 0

**Batch ID** m122627

**Count Method** Gross Alpha Beta

**Detector Volts** 1515

**Sample Qty** 0 *l* **sd** 0 *l*

**Residual Wt** 0 *mg* **sd** 0 *mg*

**Count Began** 1/23/2013 2:37:14 PM **Collection Date 1** 1/1/1900 **Half Life** 0.00 *days*

**Count Ended** 1/23/2013 2:42:23 PM **Collection Date 2** 1/1/1900 **Decay Factor** 1.000

**Sample Count Time** 5.00 *mins* **Background Count Time** 1,000.00 *mins*

| | Efficiency % | Attenuation Factor | Activity Divisor | Background cpm | Gross counts | Gross cpm | Net cpm |
|---|---|---|---|---|---|---|---|
| **Alpha** | 0.000 | 1.000 | 1.000 | 0.122 | 100 | 20.000 | 19.878 |
| **sd** | 0.000 | | | 0.011 | 10.000 | 2.000 | 2.000 |
| **A to B** | 0.000 | 1.000 | | | | 0.000 | |
| **sd** | 0.000 | | | | | 0.000 | |
| **Beta** | 0.000 | 1.000 | 1.000 | 0.408 | 80,992 | 16,198.400 | 16,197.992 |
| **sd** | 0.000 | | | 0.020 | 284.591 | 56.918 | 56.918 |

| | Net Activity dpm | LLD dpm | MDC pCi/l | MPC pCi/l | Net Concentration * pCi/l | Conc / MPC Ratio |
|---|---|---|---|---|---|---|
| **Alpha** | 0.000 | 0.000 | 0.000 | 1.000 | 0.000 ± 0.000 | 0.000 |
| **sd** | 0.000 | | | | 0.000 | |
| **Beta** | 0.000 | 0.000 | 0.000 | 1.000 | 0.000 ± 0.000 | 0.000 |
| **sd** | 0.000 | | | | 0.000 | |

*** Note: Decay Corrected** **MDC Method** Tb = Ts < 10 **Error =** .00 **x sd**

# Alpha/Beta Count Results

## Sample Activity Report

## Orange 12-15 - C

**Addr:** 14

**Sample ID** ICABT-6322;B5

**Repeat** 47

**Carrier No.** 0

**Batch ID** m122627

**Count Method** Gross Alpha Beta

**Detector Volts** 1515

| | | | |
|---|---|---|---|
| **Sample Qty** | 0 ***l*** | **sd** | 0 ***l*** |
| **Residual Wt** | 0 ***mg*** | **sd** | 0 ***mg*** |

**Count Began** 1/23/2013 4:47:14 PM **Collection Date 1** 1/1/1900 **Half Life** 0.00 ***days***

**Count Ended** 1/23/2013 4:52:24 PM **Collection Date 2** 1/1/1900 **Decay Factor** 1.000

**Sample Count Time** 5.00 ***mins*** **Background Count Time** 1,000.00 ***mins***

| | Efficiency % | Attenuation Factor | Activity Divisor | Background cpm | Gross counts | Gross cpm | Net cpm |
|---|---|---|---|---|---|---|---|
| **Alpha** | 0.000 | 1.000 | 1.000 | 0.122 | 96 | 19.200 | 19.078 |
| **sd** | 0.000 | | | 0.011 | 9.798 | 1.960 | 1.960 |
| **A to B** | 0.000 | 1.000 | | | | 0.000 | |
| **sd** | 0.000 | | | | | 0.000 | |
| **Beta** | 0.000 | 1.000 | 1.000 | 0.408 | 82,199 | 16,439.800 | 16,439.392 |
| **sd** | 0.000 | | | 0.020 | 286.704 | 57.341 | 57.341 |

| | Net Activity dpm | LLD dpm | MDC pCi/l | MPC pCi/l | Net Concentration * pCi/l | Conc / MPC Ratio |
|---|---|---|---|---|---|---|
| **Alpha** | 0.000 | 0.000 | 0.000 | 1.000 | 0.000 ± 0.000 | 0.000 |
| **sd** | 0.000 | | | | 0.000 | |
| **Beta** | 0.000 | 0.000 | 0.000 | 1.000 | 0.000 ± 0.000 | 0.000 |
| **sd** | 0.000 | | | | 0.000 | |

*** Note: Decay Corrected** **MDC Method** Tb = Ts < 10 **Error =** .00 **x sd**

# Alpha/Beta Count Results

## Sample Activity Report

## Orange 12-15 - C

**Addr:** 14

**Sample ID** ICABT-6322;B4

**Repeat** 49

**Carrier No.** 0

**Batch ID** m122627

**Count Method** Gross Alpha Beta

**Detector Volts** 1515

| | | | |
|---|---|---|---|
| **Sample Qty** | 0 ***l*** | **sd** | 0 ***l*** |
| **Residual Wt** | 0 ***mg*** | **sd** | 0 ***mg*** |

**Count Began** 1/23/2013 4:58:31 PM

**Collection Date 1** 1/1/1900

**Half Life** 0.00 ***days***

**Count Ended** 1/23/2013 5:03:41 PM

**Collection Date 2** 1/1/1900

**Decay Factor** 1.000

**Sample Count Time** 5.00 ***mins***

**Background Count Time** 1,000.00 ***mins***

| | Efficiency % | Attenuation Factor | Activity Divisor | Background cpm | Gross counts | Gross cpm | Net cpm |
|---|---|---|---|---|---|---|---|
| **Alpha** | 0.000 | 1.000 | 1.000 | 0.122 | 96 | 19.200 | 19.078 |
| **sd** | 0.000 | | | 0.011 | 9.798 | 1.960 | 1.960 |
| **A to B** | 0.000 | 1.000 | | | | 0.000 | |
| **sd** | 0.000 | | | | | 0.000 | |
| **Beta** | 0.000 | 1.000 | 1.000 | 0.408 | 85,461 | 17,092.200 | 17,091.792 |
| **sd** | 0.000 | | | 0.020 | 292.337 | 58.467 | 58.467 |

| | Net Activity dpm | LLD dpm | MDC pCi/l | MPC pCi/l | Net Concentration * pCi/l | Conc / MPC Ratio |
|---|---|---|---|---|---|---|
| **Alpha** | 0.000 | 0.000 | 0.000 | 1.000 | 0.000 ± 0.000 | 0.000 |
| **sd** | 0.000 | | | | 0.000 | |
| **Beta** | 0.000 | 0.000 | 0.000 | 1.000 | 0.000 ± 0.000 | 0.000 |
| **sd** | 0.000 | | | | 0.000 | |

*** Note: Decay Corrected**

**MDC Method** Tb = Ts < 10

**Error =** .00 **x sd**

# Alpha/Beta Count Results

## Sample Activity Report

## Orange 12-15 - C

**Addr:** 14

**Sample ID** ICABT-6322;B3

**Repeat** 50

**Carrier No.** 0

**Batch ID** m122627

**Count Method** Gross Alpha Beta

**Detector Volts** 1515

**Sample Qty** 0 *l* **sd** 0 *l*

**Residual Wt** 0 *mg* **sd** 0 *mg*

**Count Began** 1/23/2013 5:05:33 PM **Collection Date 1** 1/1/1900 **Half Life** 0.00 *days*

**Count Ended** 1/23/2013 5:10:42 PM **Collection Date 2** 1/1/1900 **Decay Factor** 1.000

**Sample Count Time** 5.00 *mins* **Background Count Time** 1,000.00 *mins*

| | Efficiency % | Attenuation Factor | Activity Divisor | Background cpm | Gross counts | Gross cpm | Net cpm |
|---|---|---|---|---|---|---|---|
| **Alpha** | 0.000 | 1.000 | 1.000 | 0.122 | 111 | 22.200 | 22.078 |
| **sd** | 0.000 | | | 0.011 | 10.536 | 2.107 | 2.107 |
| **A to B** | 0.000 | 1.000 | | | | 0.000 | |
| **sd** | 0.000 | | | | | 0.000 | |
| **Beta** | 0.000 | 1.000 | 1.000 | 0.408 | 89,907 | 17,981.400 | 17,980.992 |
| **sd** | 0.000 | | | 0.020 | 299.845 | 59.969 | 59.969 |

| | Net Activity dpm | LLD dpm | MDC pCi/l | MPC pCi/l | Net Concentration * pCi/l | Conc / MPC Ratio |
|---|---|---|---|---|---|---|
| **Alpha** | 0.000 | 0.000 | 0.000 | 1.000 | 0.000 ± 0.000 | 0.000 |
| **sd** | 0.000 | | | | 0.000 | |
| **Beta** | 0.000 | 0.000 | 0.000 | 1.000 | 0.000 ± 0.000 | 0.000 |
| **sd** | 0.000 | | | | 0.000 | |

*** Note: Decay Corrected** **MDC Method** Tb = Ts < 10 **Error =** .00 **x sd**

# Alpha/Beta Count Results

## Sample Activity Report

## Orange 12-15 - C

**Addr:** 14

**Sample ID** ICABT-6322;B2

**Repeat** 51

**Carrier No.** 0

**Batch ID** m122627

**Count Method** Gross Alpha Beta

**Detector Volts** 1515

**Sample Qty** 0 *l* **sd** 0 *l*

**Residual Wt** 0 *mg* **sd** 0 *mg*

**Count Began** 1/23/2013 5:12:18 PM **Collection Date 1** 1/1/1900 **Half Life** 0.00 *days*

**Count Ended** 1/23/2013 5:17:28 PM **Collection Date 2** 1/1/1900 **Decay Factor** 1.000

**Sample Count Time** 5.00 *mins* **Background Count Time** 1,000.00 *mins*

| | Efficiency % | Attenuation Factor | Activity Divisor | Background cpm | Gross counts | Gross cpm | Net cpm |
|---|---|---|---|---|---|---|---|
| **Alpha** | 0.000 | 1.000 | 1.000 | 0.122 | 113 | 22.600 | 22.478 |
| **sd** | 0.000 | | | 0.011 | 10.630 | 2.126 | 2.126 |
| **A to B** | 0.000 | 1.000 | | | | 0.000 | |
| **sd** | 0.000 | | | | | 0.000 | |
| **Beta** | 0.000 | 1.000 | 1.000 | 0.408 | 89,790 | 17,958.000 | 17,957.592 |
| **sd** | 0.000 | | | 0.020 | 299.650 | 59.930 | 59.930 |

| | Net Activity dpm | LLD dpm | MDC pCi/l | MPC pCi/l | Net Concentration * pCi/l | Conc / MPC Ratio |
|---|---|---|---|---|---|---|
| **Alpha** | 0.000 | 0.000 | 0.000 | 1.000 | 0.000 ± 0.000 | 0.000 |
| **sd** | 0.000 | | | | 0.000 | |
| **Beta** | 0.000 | 0.000 | 0.000 | 1.000 | 0.000 ± 0.000 | 0.000 |
| **sd** | 0.000 | | | | 0.000 | |

*** Note: Decay Corrected** **MDC Method** Tb = Ts < 10 **Error =** .00 **x sd**

# Alpha/Beta Count Results

## Sample Activity Report

## Orange 12-15 - C

**Addr:** 14

**Sample ID** ICABT-6322;B1

**Repeat** 52

**Carrier No.** 0

**Batch ID** m122627

**Count Method** Gross Alpha Beta

**Detector Volts** 1515

**Sample Qty** 0 *l* **sd** 0 *l*

**Residual Wt** 0 *mg* **sd** 0 *mg*

**Count Began** 1/23/2013 5:19:05 PM **Collection Date 1** 1/1/1900 **Half Life** 0.00 *days*

**Count Ended** 1/23/2013 5:24:15 PM **Collection Date 2** 1/1/1900 **Decay Factor** 1.000

**Sample Count Time** 5.00 *mins* **Background Count Time** 1,000.00 *mins*

| | Efficiency % | Attenuation Factor | Activity Divisor | Background cpm | Gross counts | Gross cpm | Net cpm |
|---|---|---|---|---|---|---|---|
| **Alpha** | 0.000 | 1.000 | 1.000 | 0.122 | 133 | 26.600 | 26.478 |
| **sd** | 0.000 | | | 0.011 | 11.533 | 2.307 | 2.307 |
| **A to B** | 0.000 | 1.000 | | | | 0.000 | |
| **sd** | 0.000 | | | | | 0.000 | |
| **Beta** | 0.000 | 1.000 | 1.000 | 0.408 | 92,650 | 18,530.000 | 18,529.592 |
| **sd** | 0.000 | | | 0.020 | 304.385 | 60.877 | 60.877 |

| | Net Activity dpm | LLD dpm | MDC pCi/l | MPC pCi/l | Net Concentration * pCi/l | Conc / MPC Ratio |
|---|---|---|---|---|---|---|
| **Alpha** | 0.000 | 0.000 | 0.000 | 1.000 | 0.000 ± 0.000 | 0.000 |
| **sd** | 0.000 | | | | 0.000 | |
| **Beta** | 0.000 | 0.000 | 0.000 | 1.000 | 0.000 ± 0.000 | 0.000 |
| **sd** | 0.000 | | | | 0.000 | |

*** Note: Decay Corrected** **MDC Method** Tb = Ts < 10 **Error =** .00 **x sd**

# Alpha/Beta Count Results

## Sample Activity Report

## Orange 12-15 - C

**Addr:** 14

**Sample ID** ICABT-6322;B8

**Repeat** 52

**Carrier No.** 0

**Batch ID** m122627

**Count Method** Gross Alpha Beta

**Detector Volts** 1515

**Sample Qty** 0 *l* **sd** 0 *l*

**Residual Wt** 0 *mg* **sd** 0 *mg*

**Count Began** 1/23/2013 5:28:12 PM **Collection Date 1** 1/1/1900 **Half Life** 0.00 *days*

**Count Ended** 1/23/2013 5:33:20 PM **Collection Date 2** 1/1/1900 **Decay Factor** 1.000

**Sample Count Time** 5.00 *mins* **Background Count Time** 1,000.00 *mins*

| | Efficiency % | Attenuation Factor | Activity Divisor | Background cpm | Gross counts | Gross cpm | Net cpm |
|---|---|---|---|---|---|---|---|
| **Alpha** | 0.000 | 1.000 | 1.000 | 0.122 | 102 | 20.400 | 20.278 |
| **sd** | 0.000 | | | 0.011 | 10.100 | 2.020 | 2.020 |
| **A to B** | 0.000 | 1.000 | | | | 0.000 | |
| **sd** | 0.000 | | | | | 0.000 | |
| **Beta** | 0.000 | 1.000 | 1.000 | 0.408 | 77,575 | 15,515.000 | 15,514.592 |
| **sd** | 0.000 | | | 0.020 | 278.523 | 55.705 | 55.705 |

| | Net Activity dpm | LLD dpm | MDC pCi/l | MPC pCi/l | Net Concentration * pCi/l | Conc / MPC Ratio |
|---|---|---|---|---|---|---|
| **Alpha** | 0.000 | 0.000 | 0.000 | 1.000 | 0.000 ± 0.000 | 0.000 |
| **sd** | 0.000 | | | | 0.000 | |
| **Beta** | 0.000 | 0.000 | 0.000 | 1.000 | 0.000 ± 0.000 | 0.000 |
| **sd** | 0.000 | | | | 0.000 | |

*** Note: Decay Corrected** **MDC Method** Tb = Ts < 10 **Error =** .00 **x sd**

# Alpha/Beta Count Results

## Sample Activity Report

## Orange 12-15 - C

**Addr:** 14

**Sample ID** ICABT-51465;A7

**Repeat** 1004

**Carrier No.** 0

**Batch ID** m153000

**Count Method** Gross Alpha Beta

**Detector Volts** 1515

| | | | |
|---|---|---|---|
| **Sample Qty** | 0 ***l*** | **sd** | 0 ***l*** |
| **Residual Wt** | 0 ***mg*** | **sd** | 0 ***mg*** |

**Count Began** 12/21/2015 4:29:08 PM **Collection Date 1** 1/1/1900 **Half Life** 0.00 ***days***

**Count Ended** 12/21/2015 5:09:13 PM **Collection Date 2** 1/1/1900 **Decay Factor** 1.000

**Sample Count Time** 40.00 ***mins*** **Background Count Time** 1,000.00 ***mins***

| | Efficiency % | Attenuation Factor | Activity Divisor | Background cpm | Gross counts | Gross cpm | Net cpm |
|---|---|---|---|---|---|---|---|
| **Alpha** | 0.000 | 1.000 | 1.000 | 0.143 | 18,179 | 454.475 | 454.332 |
| **sd** | 0.000 | | | 0.012 | 134.830 | 3.371 | 3.371 |
| **A to B** | 0.000 | 1.000 | | | | 0.000 | |
| **sd** | 0.000 | | | | | 0.000 | |
| **Beta** | 0.000 | 1.000 | 1.000 | 0.362 | 7,094 | 177.350 | 176.988 |
| **sd** | 0.000 | | | 0.019 | 84.226 | 2.106 | 2.106 |

| | Net Activity dpm | LLD dpm | MDC pCi/l | MPC pCi/l | Net Concentration * pCi/l | Conc / MPC Ratio |
|---|---|---|---|---|---|---|
| **Alpha** | 0.000 | 0.000 | 0.000 | 1.000 | 0.000 ± 0.000 | 0.000 |
| **sd** | 0.000 | | | | 0.000 | |
| **Beta** | 0.000 | 0.000 | 0.000 | 1.000 | 0.000 ± 0.000 | 0.000 |
| **sd** | 0.000 | | | | 0.000 | |

*** Note: Decay Corrected** **MDC Method** Tb = Ts < 10 **Error =** .00 **x sd**

# Alpha/Beta Count Results

## Sample Activity Report

## Orange 12-15 - C

**Addr:** 14

**Sample ID** ICABT-51465;A6

**Repeat** 1006

**Carrier No.** 0

**Batch ID** m153000

**Count Method** Gross Alpha Beta

**Detector Volts** 1515

**Sample Qty** 0 *l* **sd** 0 *l*

**Residual Wt** 0 *mg* **sd** 0 *mg*

**Count Began** 12/21/2015 5:46:06 PM **Collection Date 1** 1/1/1900 **Half Life** 0.00 *days*

**Count Ended** 12/21/2015 6:26:12 PM **Collection Date 2** 1/1/1900 **Decay Factor** 1.000

**Sample Count Time** 40.00 *mins* **Background Count Time** 1,000.00 *mins*

| | Efficiency % | Attenuation Factor | Activity Divisor | Background cpm | Gross counts | Gross cpm | Net cpm |
|---|---|---|---|---|---|---|---|
| **Alpha** | 0.000 | 1.000 | 1.000 | 0.143 | 21,331 | 533.275 | 533.132 |
| **sd** | 0.000 | | | 0.012 | 146.051 | 3.651 | 3.651 |
| **A to B** | 0.000 | 1.000 | | | | 0.000 | |
| **sd** | 0.000 | | | | | 0.000 | |
| **Beta** | 0.000 | 1.000 | 1.000 | 0.362 | 8,168 | 204.200 | 203.838 |
| **sd** | 0.000 | | | 0.019 | 90.377 | 2.259 | 2.260 |

| | Net Activity dpm | LLD dpm | MDC pCi/l | MPC pCi/l | Net Concentration * pCi/l | Conc / MPC Ratio |
|---|---|---|---|---|---|---|
| **Alpha** | 0.000 | 0.000 | 0.000 | 1.000 | 0.000 ± 0.000 | 0.000 |
| **sd** | 0.000 | | | | 0.000 | |
| **Beta** | 0.000 | 0.000 | 0.000 | 1.000 | 0.000 ± 0.000 | 0.000 |
| **sd** | 0.000 | | | | 0.000 | |

*** Note: Decay Corrected** **MDC Method** Tb = Ts < 10 **Error =** .00 **x sd**

# Alpha/Beta Count Results

## Sample Activity Report

## Orange 12-15 - C

**Addr:** 14

**Sample ID** ICABT-51465;A5

**Repeat** 1008

**Carrier No.** 0

**Batch ID** m153000

**Count Method** Gross Alpha Beta

**Detector Volts** 1515

**Sample Qty** 0 *l* **sd** 0 *l*

**Residual Wt** 0 *mg* **sd** 0 *mg*

**Count Began** 12/21/2015 6:52:06 PM **Collection Date 1** 1/1/1900 **Half Life** 0.00 *days*

**Count Ended** 12/21/2015 7:32:13 PM **Collection Date 2** 1/1/1900 **Decay Factor** 1.000

**Sample Count Time** 40.00 *mins* **Background Count Time** 1,000.00 *mins*

| | Efficiency % | Attenuation Factor | Activity Divisor | Background cpm | Gross counts | Gross cpm | Net cpm |
|---|---|---|---|---|---|---|---|
| **Alpha** | 0.000 | 1.000 | 1.000 | 0.143 | 17,339 | 433.475 | 433.332 |
| **sd** | 0.000 | | | 0.012 | 131.678 | 3.292 | 3.292 |
| **A to B** | 0.000 | 1.000 | | | | 0.000 | |
| **sd** | 0.000 | | | | | 0.000 | |
| **Beta** | 0.000 | 1.000 | 1.000 | 0.362 | 7,169 | 179.225 | 178.863 |
| **sd** | 0.000 | | | 0.019 | 84.670 | 2.117 | 2.117 |

| | Net Activity dpm | LLD dpm | MDC pCi/l | MPC pCi/l | Net Concentration * pCi/l | Conc / MPC Ratio |
|---|---|---|---|---|---|---|
| **Alpha** | 0.000 | 0.000 | 0.000 | 1.000 | 0.000 ± 0.000 | 0.000 |
| **sd** | 0.000 | | | | 0.000 | |
| **Beta** | 0.000 | 0.000 | 0.000 | 1.000 | 0.000 ± 0.000 | 0.000 |
| **sd** | 0.000 | | | | 0.000 | |

*** Note: Decay Corrected** **MDC Method** Tb = Ts < 10 **Error =** .00 **x sd**

# Alpha/Beta Count Results

## Sample Activity Report

## Orange 12-15 - C

**Addr:** 14

**Sample ID** ICABT-51465;A4

**Repeat** 1010

**Carrier No.** 0

**Batch ID** m153000

**Count Method** Gross Alpha Beta

**Detector Volts** 1515

| | | | |
|---|---|---|---|
| **Sample Qty** | 0 ***l*** | **sd** | 0 ***l*** |
| **Residual Wt** | 0 ***mg*** | **sd** | 0 ***mg*** |

**Count Began** 12/21/2015 7:38:58 PM **Collection Date 1** 1/1/1900 **Half Life** 0.00 ***days***

**Count Ended** 12/21/2015 8:19:02 PM **Collection Date 2** 1/1/1900 **Decay Factor** 1.000

**Sample Count Time** 40.00 ***mins*** **Background Count Time** 1,000.00 ***mins***

| | Efficiency % | Attenuation Factor | Activity Divisor | Background cpm | Gross counts | Gross cpm | Net cpm |
|---|---|---|---|---|---|---|---|
| **Alpha** | 0.000 | 1.000 | 1.000 | 0.143 | 12,178 | 304.450 | 304.307 |
| **sd** | 0.000 | | | 0.012 | 110.354 | 2.759 | 2.759 |
| **A to B** | 0.000 | 1.000 | | | | 0.000 | |
| **sd** | 0.000 | | | | | 0.000 | |
| **Beta** | 0.000 | 1.000 | 1.000 | 0.362 | 4,550 | 113.750 | 113.388 |
| **sd** | 0.000 | | | 0.019 | 67.454 | 1.686 | 1.686 |

| | Net Activity dpm | LLD dpm | MDC pCi/l | MPC pCi/l | Net Concentration * pCi/l | Conc / MPC Ratio |
|---|---|---|---|---|---|---|
| **Alpha** | 0.000 | 0.000 | 0.000 | 1.000 | 0.000 ± 0.000 | 0.000 |
| **sd** | 0.000 | | | | 0.000 | |
| **Beta** | 0.000 | 0.000 | 0.000 | 1.000 | 0.000 ± 0.000 | 0.000 |
| **sd** | 0.000 | | | | 0.000 | |

*** Note: Decay Corrected** **MDC Method** Tb = Ts < 10 **Error =** .00 **x sd**

# Alpha/Beta Count Results

## Sample Activity Report

## Orange 12-15 - C

**Addr:** 14

**Sample ID** ICABT-51465;A3

**Repeat** 1012

**Carrier No.** 0

**Batch ID** m153000

**Count Method** Gross Alpha Beta

**Detector Volts** 1515

| | | | |
|---|---|---|---|
| **Sample Qty** | 0 ***l*** | **sd** | 0 ***l*** |
| **Residual Wt** | 0 ***mg*** | **sd** | 0 ***mg*** |

**Count Began** 12/21/2015 8:26:11 PM **Collection Date 1** 1/1/1900 **Half Life** 0.00 ***days***

**Count Ended** 12/21/2015 9:06:17 PM **Collection Date 2** 1/1/1900 **Decay Factor** 1.000

**Sample Count Time** 40.00 ***mins*** **Background Count Time** 1,000.00 ***mins***

| | Efficiency % | Attenuation Factor | Activity Divisor | Background cpm | Gross counts | Gross cpm | Net cpm |
|---|---|---|---|---|---|---|---|
| **Alpha** | 0.000 | 1.000 | 1.000 | 0.143 | 14,373 | 359.325 | 359.182 |
| **sd** | 0.000 | | | 0.012 | 119.887 | 2.997 | 2.997 |
| **A to B** | 0.000 | 1.000 | | | | 0.000 | |
| **sd** | 0.000 | | | | | 0.000 | |
| **Beta** | 0.000 | 1.000 | 1.000 | 0.362 | 4,975 | 124.375 | 124.013 |
| **sd** | 0.000 | | | 0.019 | 70.534 | 1.763 | 1.763 |

| | Net Activity dpm | LLD dpm | MDC pCi/l | MPC pCi/l | Net Concentration * pCi/l | Conc / MPC Ratio |
|---|---|---|---|---|---|---|
| **Alpha** | 0.000 | 0.000 | 0.000 | 1.000 | 0.000 ± 0.000 | 0.000 |
| **sd** | 0.000 | | | | 0.000 | |
| **Beta** | 0.000 | 0.000 | 0.000 | 1.000 | 0.000 ± 0.000 | 0.000 |
| **sd** | 0.000 | | | | 0.000 | |

*** Note: Decay Corrected** **MDC Method** Tb = Ts < 10 **Error =** .00 **x sd**

# Alpha/Beta Count Results

## Sample Activity Report

## Orange 12-15 - C

**Addr:** 14

**Sample ID** ICABT-51465;A2

**Repeat** 1014

**Carrier No.** 0

**Batch ID** m153000

**Count Method** Gross Alpha Beta

**Detector Volts** 1515

**Sample Qty** 0 *l* **sd** 0 *l*

**Residual Wt** 0 *mg* **sd** 0 *mg*

**Count Began** 12/21/2015 9:56:25 PM **Collection Date 1** 1/1/1900 **Half Life** 0.00 *days*

**Count Ended** 12/21/2015 10:36:31 PM **Collection Date 2** 1/1/1900 **Decay Factor** 1.000

**Sample Count Time** 40.00 *mins* **Background Count Time** 1,000.00 *mins*

| | Efficiency % | Attenuation Factor | Activity Divisor | Background cpm | Gross counts | Gross cpm | Net cpm |
|---|---|---|---|---|---|---|---|
| **Alpha** | 0.000 | 1.000 | 1.000 | 0.143 | 19,153 | 478.825 | 478.682 |
| **sd** | 0.000 | | | 0.012 | 138.394 | 3.460 | 3.460 |
| **A to B** | 0.000 | 1.000 | | | | 0.000 | |
| **sd** | 0.000 | | | | | 0.000 | |
| **Beta** | 0.000 | 1.000 | 1.000 | 0.362 | 6,074 | 151.850 | 151.488 |
| **sd** | 0.000 | | | 0.019 | 77.936 | 1.948 | 1.948 |

| | Net Activity dpm | LLD dpm | MDC pCi/l | MPC pCi/l | Net Concentration * pCi/l | Conc / MPC Ratio |
|---|---|---|---|---|---|---|
| **Alpha** | 0.000 | 0.000 | 0.000 | 1.000 | 0.000 ± 0.000 | 0.000 |
| **sd** | 0.000 | | | | 0.000 | |
| **Beta** | 0.000 | 0.000 | 0.000 | 1.000 | 0.000 ± 0.000 | 0.000 |
| **sd** | 0.000 | | | | 0.000 | |

*** Note: Decay Corrected** **MDC Method** Tb = Ts < 10 **Error =** .00 **x sd**

# Alpha/Beta Count Results

## Sample Activity Report

## Orange 12-15 - C

**Addr:** 14

**Sample ID** ICABT-51465;A1

**Repeat** 1008

**Carrier No.** 0

**Batch ID** m153000

**Count Method** Gross Alpha Beta

**Detector Volts** 1515

| | | | |
|---|---|---|---|
| **Sample Qty** | 0 ***l*** | **sd** | 0 ***l*** |
| **Residual Wt** | 0 ***mg*** | **sd** | 0 ***mg*** |

**Count Began** 12/22/2015 1:01:10 AM **Collection Date 1** 1/1/1900 **Half Life** 0.00 ***days***

**Count Ended** 12/22/2015 1:41:15 AM **Collection Date 2** 1/1/1900 **Decay Factor** 1.000

**Sample Count Time** 40.00 ***mins*** **Background Count Time** 1,000.00 ***mins***

| | Efficiency % | Attenuation Factor | Activity Divisor | Background cpm | Gross counts | Gross cpm | Net cpm |
|---|---|---|---|---|---|---|---|
| **Alpha** | 0.000 | 1.000 | 1.000 | 0.143 | 18,198 | 454.950 | 454.807 |
| **sd** | 0.000 | | | 0.012 | 134.900 | 3.372 | 3.373 |
| **A to B** | 0.000 | 1.000 | | | | 0.000 | |
| **sd** | 0.000 | | | | | 0.000 | |
| **Beta** | 0.000 | 1.000 | 1.000 | 0.362 | 5,975 | 149.375 | 149.013 |
| **sd** | 0.000 | | | 0.019 | 77.298 | 1.932 | 1.933 |

| | Net Activity dpm | LLD dpm | MDC pCi/l | MPC pCi/l | Net Concentration * pCi/l | Conc / MPC Ratio |
|---|---|---|---|---|---|---|
| **Alpha** | 0.000 | 0.000 | 0.000 | 1.000 | 0.000 ± 0.000 | 0.000 |
| **sd** | 0.000 | | | | 0.000 | |
| **Beta** | 0.000 | 0.000 | 0.000 | 1.000 | 0.000 ± 0.000 | 0.000 |
| **sd** | 0.000 | | | | 0.000 | |

*** Note: Decay Corrected** **MDC Method** Tb = Ts < 10 **Error =** .00 **x sd**

# Alpha/Beta Count Results

## Sample Activity Report

## Orange 12-15 - C

**Addr:** 14

**Sample ID** ICABT-51465;A8

**Repeat** 1010

**Carrier No.** 0

**Batch ID** m153000

**Count Method** Gross Alpha Beta

**Detector Volts** 1515

| | | | |
|---|---|---|---|
| **Sample Qty** | 0 ***l*** | **sd** | 0 ***l*** |
| **Residual Wt** | 0 ***mg*** | **sd** | 0 ***mg*** |

**Count Began** 12/22/2015 1:49:54 AM **Collection Date 1** 1/1/1900 **Half Life** 0.00 ***days***

**Count Ended** 12/22/2015 2:29:59 AM **Collection Date 2** 1/1/1900 **Decay Factor** 1.000

**Sample Count Time** 40.00 ***mins*** **Background Count Time** 1,000.00 ***mins***

| | Efficiency % | Attenuation Factor | Activity Divisor | Background cpm | Gross counts | Gross cpm | Net cpm |
|---|---|---|---|---|---|---|---|
| **Alpha** | 0.000 | 1.000 | 1.000 | 0.143 | 14,083 | 352.075 | 351.932 |
| **sd** | 0.000 | | | 0.012 | 118.672 | 2.967 | 2.967 |
| **A to B** | 0.000 | 1.000 | | | | 0.000 | |
| **sd** | 0.000 | | | | | 0.000 | |
| **Beta** | 0.000 | 1.000 | 1.000 | 0.362 | 5,901 | 147.525 | 147.163 |
| **sd** | 0.000 | | | 0.019 | 76.818 | 1.920 | 1.921 |

| | Net Activity dpm | LLD dpm | MDC pCi/l | MPC pCi/l | Net Concentration * pCi/l | Conc / MPC Ratio |
|---|---|---|---|---|---|---|
| **Alpha** | 0.000 | 0.000 | 0.000 | 1.000 | 0.000 ± 0.000 | 0.000 |
| **sd** | 0.000 | | | | 0.000 | |
| **Beta** | 0.000 | 0.000 | 0.000 | 1.000 | 0.000 ± 0.000 | 0.000 |
| **sd** | 0.000 | | | | 0.000 | |

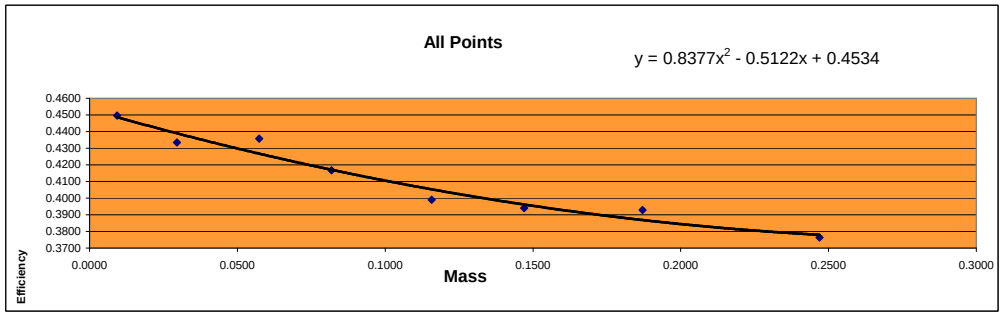
*** Note: Decay Corrected** **MDC Method** Tb = Ts < 10 **Error =** .00 **x sd**

**Curve is for Gross Beta**
**Strontium 90**
**and**
**Total Strontium**

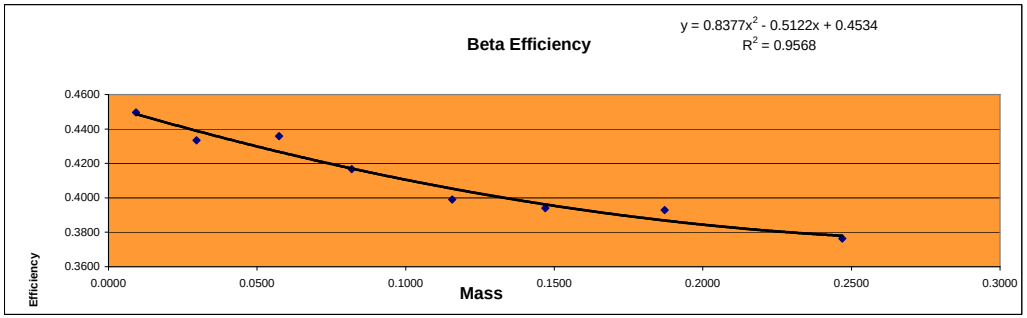
**Orange 18**

| Detector ID | Std ID | Count Date | Sample Wt | Count Time | Beta Counts | DPM 41588.469 CPM | Sr-90 Eff | Standard Aliquot |
|---|---|---|---|---|---|---|---|---|
| 18 | B1 | 1/23/2013 12:37 | 0.0093 | 5 | 93486 | 18697.2 | 0.4496 | 1mL |
| 18 | B2 | 1/23/2013 12:29 | 0.0296 | 5 | 90141 | 18028.2 | 0.4335 | 1mL |
| 18 | B3 | 1/23/2013 12:20 | 0.0574 | 5 | 90629 | 18125.8 | 0.4358 | 1mL |
| 18 | B4 | 1/23/2013 13:14 | 0.0818 | 5 | 86643 | 17328.6 | 0.4167 | 1mL |
| 18 | B5 | 1/23/2013 13:07 | 0.1157 | 5 | 82965 | 16593 | 0.3990 | 1mL |
| 18 | B6 | 1/23/2013 13:00 | 0.1470 | 5 | 81924 | 16384.8 | 0.3940 | 1mL |
| 18 | B7 | 1/23/2013 12:53 | 0.1871 | 5 | 81708 | 16341.6 | 0.3929 | 1mL |
| 18 | B8 | 1/23/2013 12:46 | 0.2469 | 5 | 78244 | 15648.8 | 0.3763 | 1mL |

| Mass | Measured Efficiency | Theoretical Efficiency | Percent Δ Efficiency |
|---|---|---|---|
| 0.0093 | 0.4496 | 0.4487 | 0.19% |
| 0.0296 | 0.4335 | 0.4390 | -1.25% |
| 0.0574 | 0.4358 | 0.4268 | 2.13% |
| 0.0818 | 0.4167 | 0.4171 | -0.11% |
| 0.1157 | 0.3990 | 0.4054 | -1.57% |
| 0.1470 | 0.3940 | 0.3962 | -0.56% |
| 0.1871 | 0.3929 | 0.3869 | 1.56% |
| 0.2469 | 0.3763 | 0.3780 | -0.46% |




| Mass | Efficiency |
|---|---|
| 0.0093 | 0.4496 |
| 0.0296 | 0.4335 |
| 0.0574 | 0.4358 |
| 0.0818 | 0.4167 |
| 0.1157 | 0.3990 |
| 0.1470 | 0.3940 |
| 0.1871 | 0.3929 |
| 0.2469 | 0.3763 |




**Standard ID**
Strontium 90
Sr-90_00004 #6322
Cert# 80573-334 Ref. date 9/172009

| | | |
|---|---|---|
| Initial Activity: | 22560 | dpm/mL |
| Reference Date: | 9/17/2009 | |
| Count Date: | 1/23/2013 | |
| Elapsed Time: | 1224.000 | days |
| Half Life: | 10409.625 | days |
| Exponential Term: | 0.921730256 | |
| Corrected Activity: | 20794.23458 | dpm/mL |
| Decay Activity (Sr/Y-90) | 41588.46916 | dpm |

# Alpha/Beta Count Results

## Sample Activity Report

## Orange 16-19 - C

**Addr:** 18

**Sample ID** ICABT-6322;B3

**Repeat** 30

**Carrier No.** 0

**Batch ID** m122627

**Count Method** Gross Alpha Beta

**Detector Volts** 1515

**Sample Qty** 0 *l* **sd** 0 *l*

**Residual Wt** 0 *mg* **sd** 0 *mg*

**Count Began** 1/23/2013 12:20:19 PM **Collection Date 1** 1/1/1900 **Half Life** 0.00 *days*

**Count Ended** 1/23/2013 12:25:29 PM **Collection Date 2** 1/1/1900 **Decay Factor** 1.000

**Sample Count Time** 5.00 *mins* **Background Count Time** 1,000.00 *mins*

| | Efficiency % | Attenuation Factor | Activity Divisor | Background cpm | Gross counts | Gross cpm | Net cpm |
|---|---|---|---|---|---|---|---|
| **Alpha** | 0.000 | 1.000 | 1.000 | 0.065 | 48 | 9.600 | 9.535 |
| **sd** | 0.000 | | | 0.008 | 6.928 | 1.386 | 1.386 |
| **A to B** | 0.000 | 1.000 | | | | 0.000 | |
| **sd** | 0.000 | | | | | 0.000 | |
| **Beta** | 0.000 | 1.000 | 1.000 | 0.390 | 90,629 | 18,125.800 | 18,125.410 |
| **sd** | 0.000 | | | 0.020 | 301.047 | 60.209 | 60.209 |

| | Net Activity dpm | LLD dpm | MDC pCi/l | MPC pCi/l | Net Concentration * pCi/l | Conc / MPC Ratio |
|---|---|---|---|---|---|---|
| **Alpha** | 0.000 | 0.000 | 0.000 | 1.000 | 0.000 ± 0.000 | 0.000 |
| **sd** | 0.000 | | | | 0.000 | |
| **Beta** | 0.000 | 0.000 | 0.000 | 1.000 | 0.000 ± 0.000 | 0.000 |
| **sd** | 0.000 | | | | 0.000 | |

*** Note: Decay Corrected** **MDC Method** Tb = Ts < 10 **Error =** .00 **x sd**

# Alpha/Beta Count Results

## Sample Activity Report

## Orange 16-19 - C

**Addr:** 18

**Sample ID** ICABT-6322;B2

**Repeat** 31

**Carrier No.** 0

**Batch ID** m122627

**Count Method** Gross Alpha Beta

**Detector Volts** 1515

| | | | |
|---|---|---|---|
| **Sample Qty** | 0 ***l*** | **sd** | 0 ***l*** |
| **Residual Wt** | 0 ***mg*** | **sd** | 0 ***mg*** |

**Count Began** 1/23/2013 12:29:54 PM **Collection Date 1** 1/1/1900 **Half Life** 0.00 ***days***

**Count Ended** 1/23/2013 12:35:04 PM **Collection Date 2** 1/1/1900 **Decay Factor** 1.000

**Sample Count Time** 5.00 ***mins*** **Background Count Time** 1,000.00 ***mins***

| | Efficiency % | Attenuation Factor | Activity Divisor | Background cpm | Gross counts | Gross cpm | Net cpm |
|---|---|---|---|---|---|---|---|
| **Alpha** | 0.000 | 1.000 | 1.000 | 0.065 | 42 | 8.400 | 8.335 |
| **sd** | 0.000 | | | 0.008 | 6.481 | 1.296 | 1.296 |
| **A to B** | 0.000 | 1.000 | | | | 0.000 | |
| **sd** | 0.000 | | | | | 0.000 | |
| **Beta** | 0.000 | 1.000 | 1.000 | 0.390 | 90,141 | 18,028.200 | 18,027.810 |
| **sd** | 0.000 | | | 0.020 | 300.235 | 60.047 | 60.047 |

| | Net Activity dpm | LLD dpm | MDC pCi/l | MPC pCi/l | Net Concentration * pCi/l | Conc / MPC Ratio |
|---|---|---|---|---|---|---|
| **Alpha** | 0.000 | 0.000 | 0.000 | 1.000 | 0.000 ± 0.000 | 0.000 |
| **sd** | 0.000 | | | | 0.000 | |
| **Beta** | 0.000 | 0.000 | 0.000 | 1.000 | 0.000 ± 0.000 | 0.000 |
| **sd** | 0.000 | | | | 0.000 | |

*** Note: Decay Corrected** **MDC Method** Tb = Ts < 10 **Error =** .00 **x sd**

# Alpha/Beta Count Results

## Sample Activity Report

## Orange 16-19 - C

**Addr:** 18

**Sample ID** ICABT-6322;B1

**Repeat** 32

**Carrier No.** 0

**Batch ID** m122627

**Count Method** Gross Alpha Beta

**Detector Volts** 1515

**Sample Qty** 0 *l* **sd** 0 *l*

**Residual Wt** 0 *mg* **sd** 0 *mg*

**Count Began** 1/23/2013 12:37:37 PM **Collection Date 1** 1/1/1900 **Half Life** 0.00 *days*

**Count Ended** 1/23/2013 12:42:47 PM **Collection Date 2** 1/1/1900 **Decay Factor** 1.000

**Sample Count Time** 5.00 *mins* **Background Count Time** 1,000.00 *mins*

| | Efficiency % | Attenuation Factor | Activity Divisor | Background cpm | Gross counts | Gross cpm | Net cpm |
|---|---|---|---|---|---|---|---|
| **Alpha** | 0.000 | 1.000 | 1.000 | 0.065 | 43 | 8.600 | 8.535 |
| **sd** | 0.000 | | | 0.008 | 6.557 | 1.311 | 1.312 |
| **A to B** | 0.000 | 1.000 | | | | 0.000 | |
| **sd** | 0.000 | | | | | 0.000 | |
| **Beta** | 0.000 | 1.000 | 1.000 | 0.390 | 93,486 | 18,697.200 | 18,696.810 |
| **sd** | 0.000 | | | 0.020 | 305.755 | 61.151 | 61.151 |

| | Net Activity dpm | LLD dpm | MDC pCi/l | MPC pCi/l | Net Concentration * pCi/l | Conc / MPC Ratio |
|---|---|---|---|---|---|---|
| **Alpha** | 0.000 | 0.000 | 0.000 | 1.000 | 0.000 ± 0.000 | 0.000 |
| **sd** | 0.000 | | | | 0.000 | |
| **Beta** | 0.000 | 0.000 | 0.000 | 1.000 | 0.000 ± 0.000 | 0.000 |
| **sd** | 0.000 | | | | 0.000 | |

*** Note: Decay Corrected** **MDC Method** Tb = Ts < 10 **Error =** .00 **x sd**

# Alpha/Beta Count Results

## Sample Activity Report

## Orange 16-19 - C

**Addr:** 18

**Sample ID** ICABT-6322;B8

**Repeat** 32

**Carrier No.** 0

**Batch ID** m122627

**Count Method** Gross Alpha Beta

**Detector Volts** 1515

| | | | |
|---|---|---|---|
| **Sample Qty** | 0 ***l*** | **sd** | 0 ***l*** |
| **Residual Wt** | 0 ***mg*** | **sd** | 0 ***mg*** |

**Count Began** 1/23/2013 12:46:16 PM **Collection Date 1** 1/1/1900 **Half Life** 0.00 ***days***

**Count Ended** 1/23/2013 12:51:24 PM **Collection Date 2** 1/1/1900 **Decay Factor** 1.000

**Sample Count Time** 5.00 ***mins*** **Background Count Time** 1,000.00 ***mins***

| | Efficiency % | Attenuation Factor | Activity Divisor | Background cpm | Gross counts | Gross cpm | Net cpm |
|---|---|---|---|---|---|---|---|
| **Alpha** | 0.000 | 1.000 | 1.000 | 0.065 | 30 | 6.000 | 5.935 |
| **sd** | 0.000 | | | 0.008 | 5.477 | 1.095 | 1.095 |
| **A to B** | 0.000 | 1.000 | | | | 0.000 | |
| **sd** | 0.000 | | | | | 0.000 | |
| **Beta** | 0.000 | 1.000 | 1.000 | 0.390 | 78,244 | 15,648.800 | 15,648.410 |
| **sd** | 0.000 | | | 0.020 | 279.721 | 55.944 | 55.944 |

| | Net Activity dpm | LLD dpm | MDC pCi/l | MPC pCi/l | Net Concentration * pCi/l | Conc / MPC Ratio |
|---|---|---|---|---|---|---|
| **Alpha** | 0.000 | 0.000 | 0.000 | 1.000 | 0.000 ± 0.000 | 0.000 |
| **sd** | 0.000 | | | | 0.000 | |
| **Beta** | 0.000 | 0.000 | 0.000 | 1.000 | 0.000 ± 0.000 | 0.000 |
| **sd** | 0.000 | | | | 0.000 | |

*** Note: Decay Corrected** **MDC Method** Tb = Ts < 10 **Error =** .00 **x sd**

# Alpha/Beta Count Results

## Sample Activity Report

## Orange 16-19 - C

**Addr:** 18

**Sample ID** ICABT-6322;B7

**Repeat** 33

**Carrier No.** 0

**Batch ID** m122627

**Count Method** Gross Alpha Beta

**Detector Volts** 1515

**Sample Qty** 0 *l* **sd** 0 *l*

**Residual Wt** 0 *mg* **sd** 0 *mg*

**Count Began** 1/23/2013 12:53:44 PM **Collection Date 1** 1/1/1900 **Half Life** 0.00 *days*

**Count Ended** 1/23/2013 12:58:52 PM **Collection Date 2** 1/1/1900 **Decay Factor** 1.000

**Sample Count Time** 5.00 *mins* **Background Count Time** 1,000.00 *mins*

| | Efficiency % | Attenuation Factor | Activity Divisor | Background cpm | Gross counts | Gross cpm | Net cpm |
|---|---|---|---|---|---|---|---|
| **Alpha** | 0.000 | 1.000 | 1.000 | 0.065 | 31 | 6.200 | 6.135 |
| **sd** | 0.000 | | | 0.008 | 5.568 | 1.114 | 1.114 |
| **A to B** | 0.000 | 1.000 | | | | 0.000 | |
| **sd** | 0.000 | | | | | 0.000 | |
| **Beta** | 0.000 | 1.000 | 1.000 | 0.390 | 81,708 | 16,341.600 | 16,341.210 |
| **sd** | 0.000 | | | 0.020 | 285.846 | 57.169 | 57.169 |

| | Net Activity dpm | LLD dpm | MDC pCi/l | MPC pCi/l | Net Concentration * pCi/l | Conc / MPC Ratio |
|---|---|---|---|---|---|---|
| **Alpha** | 0.000 | 0.000 | 0.000 | 1.000 | 0.000 ± 0.000 | 0.000 |
| **sd** | 0.000 | | | | 0.000 | |
| **Beta** | 0.000 | 0.000 | 0.000 | 1.000 | 0.000 ± 0.000 | 0.000 |
| **sd** | 0.000 | | | | 0.000 | |

*** Note: Decay Corrected** **MDC Method** Tb = Ts < 10 **Error =** .00 **x sd**

# Alpha/Beta Count Results

## Sample Activity Report

## Orange 16-19 - C

**Addr:** 18

**Sample ID** ICABT-6322;B6

**Repeat** 34

**Carrier No.** 0

**Batch ID** m122627

**Count Method** Gross Alpha Beta

**Detector Volts** 1515

**Sample Qty** 0 *l* **sd** 0 *l*

**Residual Wt** 0 *mg* **sd** 0 *mg*

**Count Began** 1/23/2013 1:00:37 PM **Collection Date 1** 1/1/1900 **Half Life** 0.00 *days*

**Count Ended** 1/23/2013 1:05:45 PM **Collection Date 2** 1/1/1900 **Decay Factor** 1.000

**Sample Count Time** 5.00 *mins* **Background Count Time** 1,000.00 *mins*

| | Efficiency % | Attenuation Factor | Activity Divisor | Background cpm | Gross counts | Gross cpm | Net cpm |
|---|---|---|---|---|---|---|---|
| **Alpha** | 0.000 | 1.000 | 1.000 | 0.065 | 44 | 8.800 | 8.735 |
| **sd** | 0.000 | | | 0.008 | 6.633 | 1.327 | 1.327 |
| **A to B** | 0.000 | 1.000 | | | | 0.000 | |
| **sd** | 0.000 | | | | | 0.000 | |
| **Beta** | 0.000 | 1.000 | 1.000 | 0.390 | 81,924 | 16,384.800 | 16,384.410 |
| **sd** | 0.000 | | | 0.020 | 286.224 | 57.245 | 57.245 |

| | Net Activity dpm | LLD dpm | MDC pCi/l | MPC pCi/l | Net Concentration * pCi/l | Conc / MPC Ratio |
|---|---|---|---|---|---|---|
| **Alpha** | 0.000 | 0.000 | 0.000 | 1.000 | 0.000 ± 0.000 | 0.000 |
| **sd** | 0.000 | | | | 0.000 | |
| **Beta** | 0.000 | 0.000 | 0.000 | 1.000 | 0.000 ± 0.000 | 0.000 |
| **sd** | 0.000 | | | | 0.000 | |

*** Note: Decay Corrected** **MDC Method** Tb = Ts < 10 **Error =** .00 **x sd**

# Alpha/Beta Count Results

## Sample Activity Report

## Orange 16-19 - C

**Addr:** 18

**Sample ID** ICABT-6322;B5

**Repeat** 35

**Carrier No.** 0

**Batch ID** m122627

**Count Method** Gross Alpha Beta

**Detector Volts** 1515

**Sample Qty** 0 *l* **sd** 0 *l*

**Residual Wt** 0 *mg* **sd** 0 *mg*

**Count Began** 1/23/2013 1:07:48 PM **Collection Date 1** 1/1/1900 **Half Life** 0.00 *days*

**Count Ended** 1/23/2013 1:12:57 PM **Collection Date 2** 1/1/1900 **Decay Factor** 1.000

**Sample Count Time** 5.00 *mins* **Background Count Time** 1,000.00 *mins*

| | Efficiency % | Attenuation Factor | Activity Divisor | Background cpm | Gross counts | Gross cpm | Net cpm |
|---|---|---|---|---|---|---|---|
| **Alpha** | 0.000 | 1.000 | 1.000 | 0.065 | 33 | 6.600 | 6.535 |
| **sd** | 0.000 | | | 0.008 | 5.745 | 1.149 | 1.149 |
| **A to B** | 0.000 | 1.000 | | | | 0.000 | |
| **sd** | 0.000 | | | | | 0.000 | |
| **Beta** | 0.000 | 1.000 | 1.000 | 0.390 | 82,965 | 16,593.000 | 16,592.610 |
| **sd** | 0.000 | | | 0.020 | 288.036 | 57.607 | 57.607 |

| | Net Activity dpm | LLD dpm | MDC pCi/l | MPC pCi/l | Net Concentration * pCi/l | Conc / MPC Ratio |
|---|---|---|---|---|---|---|
| **Alpha** | 0.000 | 0.000 | 0.000 | 1.000 | 0.000 ± 0.000 | 0.000 |
| **sd** | 0.000 | | | | 0.000 | |
| **Beta** | 0.000 | 0.000 | 0.000 | 1.000 | 0.000 ± 0.000 | 0.000 |
| **sd** | 0.000 | | | | 0.000 | |

*** Note: Decay Corrected** **MDC Method** Tb = Ts < 10 **Error =** .00 **x sd**

# Alpha/Beta Count Results

## Sample Activity Report

## Orange 16-19 - C

**Addr:** 18

**Sample ID** ICABT-6322;B4

**Repeat** 37

**Carrier No.** 0

**Batch ID** m122627

**Count Method** Gross Alpha Beta

**Detector Volts** 1515

**Sample Qty** 0 *l* **sd** 0 *l*

**Residual Wt** 0 *mg* **sd** 0 *mg*

**Count Began** 1/23/2013 1:14:58 PM **Collection Date 1** 1/1/1900 **Half Life** 0.00 *days*

**Count Ended** 1/23/2013 1:20:07 PM **Collection Date 2** 1/1/1900 **Decay Factor** 1.000

**Sample Count Time** 5.00 *mins* **Background Count Time** 1,000.00 *mins*

| | Efficiency % | Attenuation Factor | Activity Divisor | Background cpm | Gross counts | Gross cpm | Net cpm |
|---|---|---|---|---|---|---|---|
| **Alpha** | 0.000 | 1.000 | 1.000 | 0.065 | 48 | 9.600 | 9.535 |
| **sd** | 0.000 | | | 0.008 | 6.928 | 1.386 | 1.386 |
| **A to B** | 0.000 | 1.000 | | | | 0.000 | |
| **sd** | 0.000 | | | | | 0.000 | |
| **Beta** | 0.000 | 1.000 | 1.000 | 0.390 | 86,643 | 17,328.600 | 17,328.210 |
| **sd** | 0.000 | | | 0.020 | 294.352 | 58.870 | 58.870 |

| | Net Activity dpm | LLD dpm | MDC pCi/l | MPC pCi/l | Net Concentration * pCi/l | Conc / MPC Ratio |
|---|---|---|---|---|---|---|
| **Alpha** | 0.000 | 0.000 | 0.000 | 1.000 | 0.000 ± 0.000 | 0.000 |
| **sd** | 0.000 | | | | 0.000 | |
| **Beta** | 0.000 | 0.000 | 0.000 | 1.000 | 0.000 ± 0.000 | 0.000 |
| **sd** | 0.000 | | | | 0.000 | |

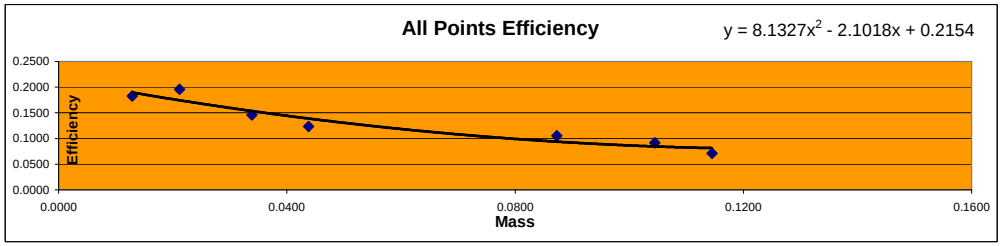
*** Note: Decay Corrected** **MDC Method** Tb = Ts < 10 **Error =** .00 **x sd**

## Curve is for Gross Alpha

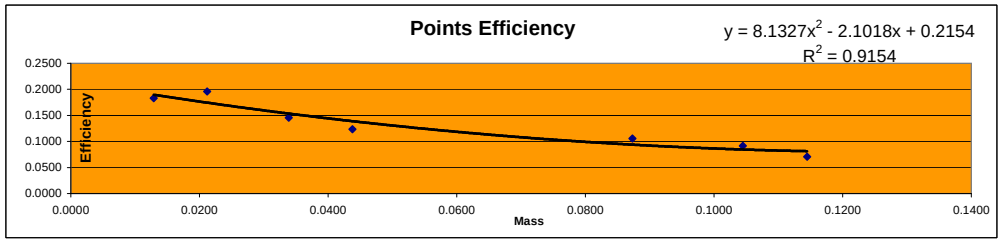
**Orange 18**

| Detector ID | Sample ID | Count Date | Count Time | Alpha Counts | Net CPM | DPM | Th-230 Efficiency | Standard Aliquot | Mass |
|---|---|---|---|---|---|---|---|---|---|
| 18 | ICABT-51465;A1 | 1/7/2016 1:46 | 40 | 17371 | 434.275 | 2374.5 | 0.1829 | 1mL | 0.0129 |
| 18 | ICABT-51465;A2 | 1/7/2016 1:05 | 40 | 18609 | 465.225 | 2374.5 | 0.1959 | 1mL | 0.0212 |
| 18 | ICABT-51465;A3 | 1/7/2016 0:06 | 40 | 13854 | 346.350 | 2374.5 | 0.1459 | 1mL | 0.0339 |
| 18 | ICABT-51465;A4 | 1/7/2016 10:30 | 40 | 11717 | 292.925 | 2374.5 | 0.1234 | 1mL | 0.0438 |
| 18 | ICABT-51465;A6 | 1/7/2016 8:29 | 40 | 20057 | 501.425 | 4749.0 | 0.1056 | 2mL | 0.0873 |
| 18 | ICABT-51465;A7 | 1/7/2016 7:41 | 40 | 17392 | 434.800 | 4749.0 | 0.0916 | 2mL | 0.1045 |
| 18 | ICABT-51465;A8 | 1/7/2016 6:24 | 40 | 13476 | 336.900 | 4749.0 | 0.0709 | 2mL | 0.1145 |

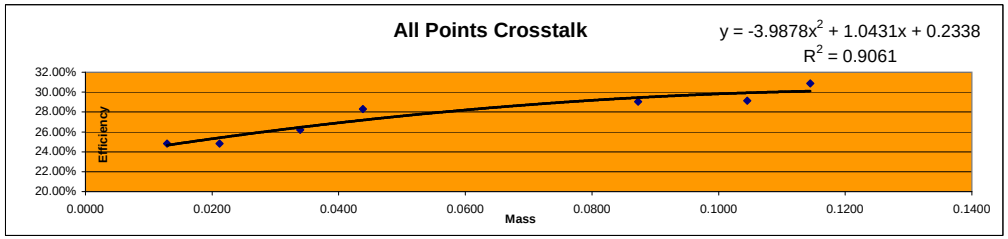
| Mass | Measured Efficiency | Theoretical Efficiency | Percent Δ Efficiency |
|---|---|---|---|
| 0.0129 | 0.1829 | 0.1896 | -3.56% |
| 0.0212 | 0.1959 | 0.1745 | 12.28% |
| 0.0339 | 0.1459 | 0.1535 | -4.97% |
| 0.0438 | 0.1234 | 0.1389 | -11.21% |
| 0.0873 | 0.1056 | 0.0939 | 12.45% |
| 0.1045 | 0.0916 | 0.0846 | 8.26% |
| 0.1145 | 0.0709 | 0.0814 | -12.81% |




| Mass | Efficiency |
|---|---|
| 0.0129 | 0.1829 |
| 0.0212 | 0.1959 |
| 0.0339 | 0.1459 |
| 0.0438 | 0.1234 |
| 0.0873 | 0.1056 |
| 0.1045 | 0.0916 |
| 0.1145 | 0.0709 |




| Detector ID | Sample ID | Mass | Count Time | Alpha Counts | Beta Counts | Alpha CPM | Beta CPM | % α into β | |
|---|---|---|---|---|---|---|---|---|---|
| 18 | ICABT-51465;A1 | 0.0129 | 40 | 17371 | 5734 | 434.28 | 143.35 | 24.82% | Min |
| 18 | ICABT-51465;A2 | 0.0212 | 40 | 18609 | 6146 | 465.23 | 153.65 | 24.83% | 24.82% |
| 18 | ICABT-51465;A3 | 0.0339 | 40 | 13854 | 4917 | 346.35 | 122.93 | 26.19% | |
| 18 | ICABT-51465;A4 | 0.0438 | 40 | 11717 | 4627 | 292.93 | 115.68 | 28.31% | Max |
| 18 | ICABT-51465;A6 | 0.0873 | 40 | 20057 | 8210 | 501.43 | 205.25 | 29.04% | |
| 18 | ICABT-51465;A7 | 0.1045 | 40 | 17392 | 7149 | 434.80 | 178.73 | 29.13% | Mean |
| 18 | ICABT-51465;A8 | 0.1145 | 40 | 13476 | 6019 | 336.90 | 150.48 | 30.87% | 27.60% |




**Standard ID**
Thorium-230
Th-230_00016 #51465
Cert # 92523 Ref. date 11/29/2012
Activity 2374.5 dpm/mL

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# Alpha/Beta Count Results

## Sample Activity Report

## Orange 16-19 - C

**Addr:** 18

**Sample ID** ICABT-51465;A3

**Repeat** 1017

**Carrier No.** 0

**Batch ID** m153000

**Count Method** Gross Alpha Beta

**Detector Volts** 1515

| | | | |
|---|---|---|---|
| **Sample Qty** | 0 ***l*** | **sd** | 0 ***l*** |
| **Residual Wt** | 0 ***mg*** | **sd** | 0 ***mg*** |

**Count Began** 1/7/2016 12:06:19 AM **Collection Date 1** 1/1/1900 **Half Life** 0.00 ***days***

**Count Ended** 1/7/2016 12:46:24 AM **Collection Date 2** 1/1/1900 **Decay Factor** 1.000

**Sample Count Time** 40.00 ***mins*** **Background Count Time** 1,000.00 ***mins***

| | Efficiency % | Attenuation Factor | Activity Divisor | Background cpm | Gross counts | Gross cpm | Net cpm |
|---|---|---|---|---|---|---|---|
| **Alpha** | 0.000 | 1.000 | 1.000 | 0.096 | 13,854 | 346.350 | 346.254 |
| **sd** | 0.000 | | | 0.010 | 117.703 | 2.943 | 2.943 |
| **A to B** | 0.000 | 1.000 | | | | 0.000 | |
| **sd** | 0.000 | | | | | 0.000 | |
| **Beta** | 0.000 | 1.000 | 1.000 | 0.465 | 4,917 | 122.925 | 122.460 |
| **sd** | 0.000 | | | 0.022 | 70.121 | 1.753 | 1.753 |

| | Net Activity dpm | LLD dpm | MDC pCi/l | MPC pCi/l | Net Concentration * pCi/l | Conc / MPC Ratio |
|---|---|---|---|---|---|---|
| **Alpha** | 0.000 | 0.000 | 0.000 | 1.000 | 0.000 ± 0.000 | 0.000 |
| **sd** | 0.000 | | | | 0.000 | |
| **Beta** | 0.000 | 0.000 | 0.000 | 1.000 | 0.000 ± 0.000 | 0.000 |
| **sd** | 0.000 | | | | 0.000 | |

*** Note: Decay Corrected** **MDC Method** Tb = Ts < 10 **Error =** .00 **x sd**

# Alpha/Beta Count Results

## Sample Activity Report

## Orange 16-19 - C

**Addr:** 18

**Sample ID** ICABT-51465;A2

**Repeat** 1019

**Carrier No.** 0

**Batch ID** m153000

**Count Method** Gross Alpha Beta

**Detector Volts** 1515

**Sample Qty** 0 *l* **sd** 0 *l*

**Residual Wt** 0 *mg* **sd** 0 *mg*

**Count Began** 1/7/2016 1:05:27 AM **Collection Date 1** 1/1/1900 **Half Life** 0.00 *days*

**Count Ended** 1/7/2016 1:45:32 AM **Collection Date 2** 1/1/1900 **Decay Factor** 1.000

**Sample Count Time** 40.00 *mins* **Background Count Time** 1,000.00 *mins*

| | Efficiency % | Attenuation Factor | Activity Divisor | Background cpm | Gross counts | Gross cpm | Net cpm |
|---|---|---|---|---|---|---|---|
| **Alpha** | 0.000 | 1.000 | 1.000 | 0.096 | 18,609 | 465.225 | 465.129 |
| **sd** | 0.000 | | | 0.010 | 136.415 | 3.410 | 3.410 |
| **A to B** | 0.000 | 1.000 | | | | 0.000 | |
| **sd** | 0.000 | | | | | 0.000 | |
| **Beta** | 0.000 | 1.000 | 1.000 | 0.465 | 6,146 | 153.650 | 153.185 |
| **sd** | 0.000 | | | 0.022 | 78.396 | 1.960 | 1.960 |

| | Net Activity dpm | LLD dpm | MDC pCi/l | MPC pCi/l | Net Concentration * pCi/l | Conc / MPC Ratio |
|---|---|---|---|---|---|---|
| **Alpha** | 0.000 | 0.000 | 0.000 | 1.000 | 0.000 ± 0.000 | 0.000 |
| **sd** | 0.000 | | | | 0.000 | |
| **Beta** | 0.000 | 0.000 | 0.000 | 1.000 | 0.000 ± 0.000 | 0.000 |
| **sd** | 0.000 | | | | 0.000 | |

*** Note: Decay Corrected** **MDC Method** Tb = Ts < 10 **Error =** .00 **x sd**

# Alpha/Beta Count Results

## Sample Activity Report

## Orange 16-19 - C

**Addr:** 18

**Sample ID** ICABT-51465;A1

**Repeat** 1013

**Carrier No.** 0

**Batch ID** m153000

**Count Method** Gross Alpha Beta

**Detector Volts** 1515

**Sample Qty** 0 *l* **sd** 0 *l*

**Residual Wt** 0 *mg* **sd** 0 *mg*

**Count Began** 1/7/2016 1:46:46 AM **Collection Date 1** 1/1/1900 **Half Life** 0.00 *days*

**Count Ended** 1/7/2016 2:26:51 AM **Collection Date 2** 1/1/1900 **Decay Factor** 1.000

**Sample Count Time** 40.00 *mins* **Background Count Time** 1,000.00 *mins*

| | Efficiency % | Attenuation Factor | Activity Divisor | Background cpm | Gross counts | Gross cpm | Net cpm |
|---|---|---|---|---|---|---|---|
| **Alpha** | 0.000 | 1.000 | 1.000 | 0.096 | 17,371 | 434.275 | 434.179 |
| **sd** | 0.000 | | | 0.010 | 131.799 | 3.295 | 3.295 |
| **A to B** | 0.000 | 1.000 | | | | 0.000 | |
| **sd** | 0.000 | | | | | 0.000 | |
| **Beta** | 0.000 | 1.000 | 1.000 | 0.465 | 5,734 | 143.350 | 142.885 |
| **sd** | 0.000 | | | 0.022 | 75.723 | 1.893 | 1.893 |

| | Net Activity dpm | LLD dpm | MDC pCi/l | MPC pCi/l | Net Concentration * pCi/l | Conc / MPC Ratio |
|---|---|---|---|---|---|---|
| **Alpha** | 0.000 | 0.000 | 0.000 | 1.000 | 0.000 ± 0.000 | 0.000 |
| **sd** | 0.000 | | | | 0.000 | |
| **Beta** | 0.000 | 0.000 | 0.000 | 1.000 | 0.000 ± 0.000 | 0.000 |
| **sd** | 0.000 | | | | 0.000 | |

*** Note: Decay Corrected** **MDC Method** Tb = Ts < 10 **Error =** .00 **x sd**

# Alpha/Beta Count Results

## Sample Activity Report

## Orange 16-19 - C

**Addr:** 18

**Sample ID** ICABT-51465;A8

**Repeat** 1015

**Carrier No.** 0

**Batch ID** m153000

**Count Method** Gross Alpha Beta

**Detector Volts** 1515

| | | | |
|---|---|---|---|
| **Sample Qty** | 0 ***l*** | **sd** | 0 ***l*** |
| **Residual Wt** | 0 ***mg*** | **sd** | 0 ***mg*** |

**Count Began** 1/7/2016 6:24:00 AM

**Collection Date 1** 1/1/1900

**Half Life** 0.00 ***days***

**Count Ended** 1/7/2016 7:04:05 AM

**Collection Date 2** 1/1/1900

**Decay Factor** 1.000

**Sample Count Time** 40.00 ***mins***

**Background Count Time** 1,000.00 ***mins***

| | Efficiency % | Attenuation Factor | Activity Divisor | Background cpm | Gross counts | Gross cpm | Net cpm |
|---|---|---|---|---|---|---|---|
| **Alpha** | 0.000 | 1.000 | 1.000 | 0.096 | 13,476 | 336.900 | 336.804 |
| **sd** | 0.000 | | | 0.010 | 116.086 | 2.902 | 2.902 |
| **A to B** | 0.000 | 1.000 | | | | 0.000 | |
| **sd** | 0.000 | | | | | 0.000 | |
| **Beta** | 0.000 | 1.000 | 1.000 | 0.465 | 6,019 | 150.475 | 150.010 |
| **sd** | 0.000 | | | 0.022 | 77.582 | 1.940 | 1.940 |

| | Net Activity dpm | LLD dpm | MDC pCi/l | MPC pCi/l | Net Concentration * pCi/l | Conc / MPC Ratio |
|---|---|---|---|---|---|---|
| **Alpha** | 0.000 | 0.000 | 0.000 | 1.000 | 0.000 ± 0.000 | 0.000 |
| **sd** | 0.000 | | | | 0.000 | |
| **Beta** | 0.000 | 0.000 | 0.000 | 1.000 | 0.000 ± 0.000 | 0.000 |
| **sd** | 0.000 | | | | 0.000 | |

*** Note: Decay Corrected**

**MDC Method** Tb = Ts < 10

**Error =** .00 **x sd**

# Alpha/Beta Count Results

## Sample Activity Report

## Orange 16-19 - C

**Addr:** 18

**Sample ID** ICABT-51465;A7

**Repeat** 1017

**Carrier No.** 0

**Batch ID** m153000

**Count Method** Gross Alpha Beta

**Detector Volts** 1515

**Sample Qty** 0 *l* **sd** 0 *l*

**Residual Wt** 0 *mg* **sd** 0 *mg*

**Count Began** 1/7/2016 7:41:20 AM **Collection Date 1** 1/1/1900 **Half Life** 0.00 *days*

**Count Ended** 1/7/2016 8:21:25 AM **Collection Date 2** 1/1/1900 **Decay Factor** 1.000

**Sample Count Time** 40.00 *mins* **Background Count Time** 1,000.00 *mins*

| | Efficiency % | Attenuation Factor | Activity Divisor | Background cpm | Gross counts | Gross cpm | Net cpm |
|---|---|---|---|---|---|---|---|
| **Alpha** | 0.000 | 1.000 | 1.000 | 0.096 | 17,392 | 434.800 | 434.704 |
| **sd** | 0.000 | | | 0.010 | 131.879 | 3.297 | 3.297 |
| **A to B** | 0.000 | 1.000 | | | | 0.000 | |
| **sd** | 0.000 | | | | | 0.000 | |
| **Beta** | 0.000 | 1.000 | 1.000 | 0.465 | 7,149 | 178.725 | 178.260 |
| **sd** | 0.000 | | | 0.022 | 84.552 | 2.114 | 2.114 |

| | Net Activity dpm | LLD dpm | MDC pCi/l | MPC pCi/l | Net Concentration * pCi/l | Conc / MPC Ratio |
|---|---|---|---|---|---|---|
| **Alpha** | 0.000 | 0.000 | 0.000 | 1.000 | 0.000 ± 0.000 | 0.000 |
| **sd** | 0.000 | | | | 0.000 | |
| **Beta** | 0.000 | 0.000 | 0.000 | 1.000 | 0.000 ± 0.000 | 0.000 |
| **sd** | 0.000 | | | | 0.000 | |

*** Note: Decay Corrected** **MDC Method** Tb = Ts < 10 **Error =** .00 **x sd**

# Alpha/Beta Count Results

## Sample Activity Report

## Orange 16-19 - C

**Addr:** 18

**Sample ID** ICABT-51465;A6

**Repeat** 1019

**Carrier No.** 0

**Batch ID** m153000

**Count Method** Gross Alpha Beta

**Detector Volts** 1515

**Sample Qty** 0 *l* **sd** 0 *l*

**Residual Wt** 0 *mg* **sd** 0 *mg*

**Count Began** 1/7/2016 8:29:25 AM **Collection Date 1** 1/1/1900 **Half Life** 0.00 *days*

**Count Ended** 1/7/2016 9:09:30 AM **Collection Date 2** 1/1/1900 **Decay Factor** 1.000

**Sample Count Time** 40.00 *mins* **Background Count Time** 1,000.00 *mins*

| | Efficiency % | Attenuation Factor | Activity Divisor | Background cpm | Gross counts | Gross cpm | Net cpm |
|---|---|---|---|---|---|---|---|
| **Alpha** | 0.000 | 1.000 | 1.000 | 0.096 | 20,057 | 501.425 | 501.329 |
| **sd** | 0.000 | | | 0.010 | 141.623 | 3.541 | 3.541 |
| **A to B** | 0.000 | 1.000 | | | | 0.000 | |
| **sd** | 0.000 | | | | | 0.000 | |
| **Beta** | 0.000 | 1.000 | 1.000 | 0.465 | 8,210 | 205.250 | 204.785 |
| **sd** | 0.000 | | | 0.022 | 90.609 | 2.265 | 2.265 |

| | Net Activity dpm | LLD dpm | MDC pCi/l | MPC pCi/l | Net Concentration * pCi/l | Conc / MPC Ratio |
|---|---|---|---|---|---|---|
| **Alpha** | 0.000 | 0.000 | 0.000 | 1.000 | 0.000 ± 0.000 | 0.000 |
| **sd** | 0.000 | | | | 0.000 | |
| **Beta** | 0.000 | 0.000 | 0.000 | 1.000 | 0.000 ± 0.000 | 0.000 |
| **sd** | 0.000 | | | | 0.000 | |

*** Note: Decay Corrected** **MDC Method** Tb = Ts < 10 **Error =** .00 **x sd**

# Alpha/Beta Count Results

## Sample Activity Report

## Orange 16-19 - C

**Addr:** 18

**Sample ID** ICABT-51465;A5

**Repeat** 1021

**Carrier No.** 0

**Batch ID** m153000

**Count Method** Gross Alpha Beta

**Detector Volts** 1515

**Sample Qty** 0 *l* **sd** 0 *l*

**Residual Wt** 0 *mg* **sd** 0 *mg*

**Count Began** 1/7/2016 9:33:36 AM **Collection Date 1** 1/1/1900 **Half Life** 0.00 *days*

**Count Ended** 1/7/2016 10:13:41 AM **Collection Date 2** 1/1/1900 **Decay Factor** 1.000

**Sample Count Time** 40.00 *mins* **Background Count Time** 1,000.00 *mins*

| | Efficiency % | Attenuation Factor | Activity Divisor | Background cpm | Gross counts | Gross cpm | Net cpm |
|---|---|---|---|---|---|---|---|
| **Alpha** | 0.000 | 1.000 | 1.000 | 0.096 | 16,368 | 409.200 | 409.104 |
| **sd** | 0.000 | | | 0.010 | 127.937 | 3.198 | 3.198 |
| **A to B** | 0.000 | 1.000 | | | | 0.000 | |
| **sd** | 0.000 | | | | | 0.000 | |
| **Beta** | 0.000 | 1.000 | 1.000 | 0.465 | 7,216 | 180.400 | 179.935 |
| **sd** | 0.000 | | | 0.022 | 84.947 | 2.124 | 2.124 |

| | Net Activity dpm | LLD dpm | MDC pCi/l | MPC pCi/l | Net Concentration * pCi/l | Conc / MPC Ratio |
|---|---|---|---|---|---|---|
| **Alpha** | 0.000 | 0.000 | 0.000 | 1.000 | 0.000 ± 0.000 | 0.000 |
| **sd** | 0.000 | | | | 0.000 | |
| **Beta** | 0.000 | 0.000 | 0.000 | 1.000 | 0.000 ± 0.000 | 0.000 |
| **sd** | 0.000 | | | | 0.000 | |

*** Note: Decay Corrected** **MDC Method** Tb = Ts < 10 **Error =** .00 **x sd**

# Alpha/Beta Count Results

## Sample Activity Report

## Orange 16-19 - C

**Addr:** 18

**Sample ID** ICABT-51465;A4

**Repeat** 1023

**Carrier No.** 0

**Batch ID** m153000

**Count Method** Gross Alpha Beta

**Detector Volts** 1515

| | | | |
|---|---|---|---|
| **Sample Qty** | 0 ***l*** | **sd** | 0 ***l*** |
| **Residual Wt** | 0 ***mg*** | **sd** | 0 ***mg*** |

**Count Began** 1/7/2016 10:30:06 AM **Collection Date 1** 1/1/1900 **Half Life** 0.00 ***days***

**Count Ended** 1/7/2016 11:10:10 AM **Collection Date 2** 1/1/1900 **Decay Factor** 1.000

**Sample Count Time** 40.00 ***mins*** **Background Count Time** 1,000.00 ***mins***

| | Efficiency % | Attenuation Factor | Activity Divisor | Background cpm | Gross counts | Gross cpm | Net cpm |
|---|---|---|---|---|---|---|---|
| **Alpha** | 0.000 | 1.000 | 1.000 | 0.096 | 11,717 | 292.925 | 292.829 |
| **sd** | 0.000 | | | 0.010 | 108.245 | 2.706 | 2.706 |
| **A to B** | 0.000 | 1.000 | | | | 0.000 | |
| **sd** | 0.000 | | | | | 0.000 | |
| **Beta** | 0.000 | 1.000 | 1.000 | 0.465 | 4,627 | 115.675 | 115.210 |
| **sd** | 0.000 | | | 0.022 | 68.022 | 1.701 | 1.701 |

| | Net Activity dpm | LLD dpm | MDC pCi/l | MPC pCi/l | Net Concentration * pCi/l | Conc / MPC Ratio |
|---|---|---|---|---|---|---|
| **Alpha** | 0.000 | 0.000 | 0.000 | 1.000 | 0.000 ± 0.000 | 0.000 |
| **sd** | 0.000 | | | | 0.000 | |
| **Beta** | 0.000 | 0.000 | 0.000 | 1.000 | 0.000 ± 0.000 | 0.000 |
| **sd** | 0.000 | | | | 0.000 | |

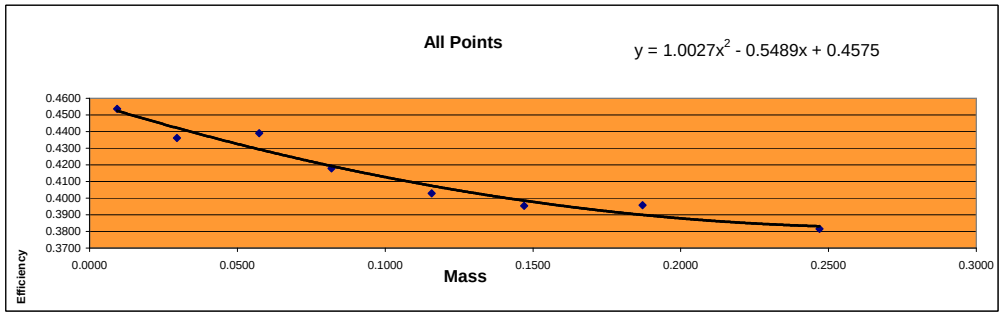
*** Note: Decay Corrected** **MDC Method** Tb = Ts < 10 **Error =** .00 **x sd**

**Curve is for Gross Beta**
**Strontium 90**
**and**
**Total Strontium**

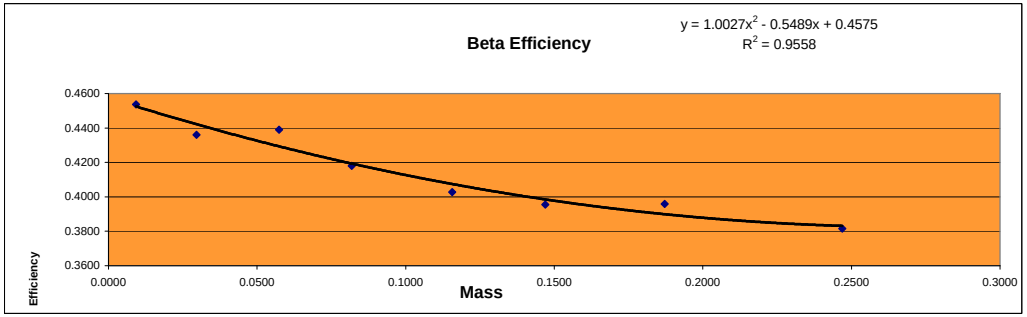
**Orange 19**

| Detector ID | Std ID | Count Date | Sample Wt | Count Time | Beta Counts | DPM 41588.469 CPM | Sr-90 Eff | Standard Aliquot |
|---|---|---|---|---|---|---|---|---|
| 19 | B1 | 1/23/2013 12:45 | 0.0093 | 5 | 94349 | 18869.8 | 0.4537 | 1mL |
| 19 | B2 | 1/23/2013 12:37 | 0.0296 | 5 | 90680 | 18136 | 0.4361 | 1mL |
| 19 | B3 | 1/23/2013 12:29 | 0.0574 | 5 | 91279 | 18255.8 | 0.4390 | 1mL |
| 19 | B4 | 1/23/2013 12:20 | 0.0818 | 5 | 86904 | 17380.8 | 0.4179 | 1mL |
| 19 | B5 | 1/23/2013 13:15 | 0.1157 | 5 | 83764 | 16752.8 | 0.4028 | 1mL |
| 19 | B6 | 1/23/2013 13:07 | 0.1470 | 5 | 82231 | 16446.2 | 0.3955 | 1mL |
| 19 | B7 | 1/23/2013 13:00 | 0.1871 | 5 | 82304 | 16460.8 | 0.3958 | 1mL |
| 19 | B8 | 1/23/2013 12:53 | 0.2469 | 5 | 79345 | 15869 | 0.3816 | 1mL |

| Mass | Measured Efficiency | Theoretical Efficiency | Percent Δ Efficiency |
|---|---|---|---|
| 0.0093 | 0.4537 | 0.4525 | 0.28% |
| 0.0296 | 0.4361 | 0.4421 | -1.37% |
| 0.0574 | 0.4390 | 0.4293 | 2.25% |
| 0.0818 | 0.4179 | 0.4193 | -0.33% |
| 0.1157 | 0.4028 | 0.4074 | -1.13% |
| 0.1470 | 0.3955 | 0.3985 | -0.76% |
| 0.1871 | 0.3958 | 0.3899 | 1.51% |
| 0.2469 | 0.3816 | 0.3831 | -0.40% |




| Mass | Efficiency |
|---|---|
| 0.0093 | 0.4537 |
| 0.0296 | 0.4361 |
| 0.0574 | 0.4390 |
| 0.0818 | 0.4179 |
| 0.1157 | 0.4028 |
| 0.1470 | 0.3955 |
| 0.1871 | 0.3958 |
| 0.2469 | 0.3816 |




**Standard ID**
Strontium 90
Sr-90_00004 #6322
Cert# 80573-334 Ref. date 9/172009

| | | |
|---|---|---|
| Initial Activity: | 22560 | dpm/mL |
| Reference Date: | 9/17/2009 | |
| Count Date: | 1/23/2013 | |
| Elapsed Time: | 1224.000 | days |
| Half Life: | 10409.625 | days |
| Exponential Term: | 0.921730256 | |
| Corrected Activity: | 20794.23458 | dpm/mL |
| Decay Activity (Sr/Y-90) | 41588.46916 | dpm |

# Alpha/Beta Count Results

## Sample Activity Report

## Orange 16-19 - D

**Addr:** 19

**Sample ID** ICABT-6322;B4

**Repeat** 30

**Carrier No.** 0

**Batch ID** m122627

**Count Method** Gross Alpha Beta

**Detector Volts** 1515

**Sample Qty** 0 *l* **sd** 0 *l*

**Residual Wt** 0 *mg* **sd** 0 *mg*

**Count Began** 1/23/2013 12:20:25 PM **Collection Date 1** 1/1/1900 **Half Life** 0.00 *days*

**Count Ended** 1/23/2013 12:25:35 PM **Collection Date 2** 1/1/1900 **Decay Factor** 1.000

**Sample Count Time** 5.00 *mins* **Background Count Time** 1,000.00 *mins*

| | Efficiency % | Attenuation Factor | Activity Divisor | Background cpm | Gross counts | Gross cpm | Net cpm |
|---|---|---|---|---|---|---|---|
| **Alpha** | 0.000 | 1.000 | 1.000 | 0.041 | 26 | 5.200 | 5.159 |
| **sd** | 0.000 | | | 0.006 | 5.099 | 1.020 | 1.020 |
| **A to B** | 0.000 | 1.000 | | | | 0.000 | |
| **sd** | 0.000 | | | | | 0.000 | |
| **Beta** | 0.000 | 1.000 | 1.000 | 0.378 | 86,904 | 17,380.800 | 17,380.422 |
| **sd** | 0.000 | | | 0.019 | 294.795 | 58.959 | 58.959 |

| | Net Activity dpm | LLD dpm | MDC pCi/l | MPC pCi/l | Net Concentration * pCi/l | Conc / MPC Ratio |
|---|---|---|---|---|---|---|
| **Alpha** | 0.000 | 0.000 | 0.000 | 1.000 | 0.000 ± 0.000 | 0.000 |
| **sd** | 0.000 | | | | 0.000 | |
| **Beta** | 0.000 | 0.000 | 0.000 | 1.000 | 0.000 ± 0.000 | 0.000 |
| **sd** | 0.000 | | | | 0.000 | |

*** Note: Decay Corrected** **MDC Method** Tb = Ts < 10 **Error =** .00 **x sd**

# Alpha/Beta Count Results

## Sample Activity Report

## Orange 16-19 - D

**Addr:** 19

**Sample ID** ICABT-6322;B3

**Repeat** 31

**Carrier No.** 0

**Batch ID** m122627

**Count Method** Gross Alpha Beta

**Detector Volts** 1515

**Sample Qty** 0 *l* **sd** 0 *l*

**Residual Wt** 0 *mg* **sd** 0 *mg*

**Count Began** 1/23/2013 12:29:59 PM **Collection Date 1** 1/1/1900 **Half Life** 0.00 *days*

**Count Ended** 1/23/2013 12:35:09 PM **Collection Date 2** 1/1/1900 **Decay Factor** 1.000

**Sample Count Time** 5.00 *mins* **Background Count Time** 1,000.00 *mins*

| | Efficiency % | Attenuation Factor | Activity Divisor | Background cpm | Gross counts | Gross cpm | Net cpm |
|---|---|---|---|---|---|---|---|
| **Alpha** | 0.000 | 1.000 | 1.000 | 0.041 | 32 | 6.400 | 6.359 |
| **sd** | 0.000 | | | 0.006 | 5.657 | 1.131 | 1.131 |
| **A to B** | 0.000 | 1.000 | | | | 0.000 | |
| **sd** | 0.000 | | | | | 0.000 | |
| **Beta** | 0.000 | 1.000 | 1.000 | 0.378 | 91,279 | 18,255.800 | 18,255.422 |
| **sd** | 0.000 | | | 0.019 | 302.124 | 60.425 | 60.425 |

| | Net Activity dpm | LLD dpm | MDC pCi/l | MPC pCi/l | Net Concentration * pCi/l | Conc / MPC Ratio |
|---|---|---|---|---|---|---|
| **Alpha** | 0.000 | 0.000 | 0.000 | 1.000 | 0.000 ± 0.000 | 0.000 |
| **sd** | 0.000 | | | | 0.000 | |
| **Beta** | 0.000 | 0.000 | 0.000 | 1.000 | 0.000 ± 0.000 | 0.000 |
| **sd** | 0.000 | | | | 0.000 | |

*** Note: Decay Corrected** **MDC Method** Tb = Ts < 10 **Error =** .00 **x sd**

# Alpha/Beta Count Results

## Sample Activity Report

## Orange 16-19 - D

**Addr:** 19

**Sample ID** ICABT-6322;B2

**Repeat** 32

**Carrier No.** 0

**Batch ID** m122627

**Count Method** Gross Alpha Beta

**Detector Volts** 1515

**Sample Qty** 0 *l* **sd** 0 *l*

**Residual Wt** 0 *mg* **sd** 0 *mg*

**Count Began** 1/23/2013 12:37:42 PM **Collection Date 1** 1/1/1900 **Half Life** 0.00 *days*

**Count Ended** 1/23/2013 12:42:51 PM **Collection Date 2** 1/1/1900 **Decay Factor** 1.000

**Sample Count Time** 5.00 *mins* **Background Count Time** 1,000.00 *mins*

| | Efficiency % | Attenuation Factor | Activity Divisor | Background cpm | Gross counts | Gross cpm | Net cpm |
|---|---|---|---|---|---|---|---|
| **Alpha** | 0.000 | 1.000 | 1.000 | 0.041 | 36 | 7.200 | 7.159 |
| **sd** | 0.000 | | | 0.006 | 6.000 | 1.200 | 1.200 |
| **A to B** | 0.000 | 1.000 | | | | 0.000 | |
| **sd** | 0.000 | | | | | 0.000 | |
| **Beta** | 0.000 | 1.000 | 1.000 | 0.378 | 90,680 | 18,136.000 | 18,135.622 |
| **sd** | 0.000 | | | 0.019 | 301.131 | 60.226 | 60.226 |

| | Net Activity dpm | LLD dpm | MDC pCi/l | MPC pCi/l | Net Concentration * pCi/l | Conc / MPC Ratio |
|---|---|---|---|---|---|---|
| **Alpha** | 0.000 | 0.000 | 0.000 | 1.000 | 0.000 ± 0.000 | 0.000 |
| **sd** | 0.000 | | | | 0.000 | |
| **Beta** | 0.000 | 0.000 | 0.000 | 1.000 | 0.000 ± 0.000 | 0.000 |
| **sd** | 0.000 | | | | 0.000 | |

*** Note: Decay Corrected** **MDC Method** Tb = Ts < 10 **Error =** .00 **x sd**

# Alpha/Beta Count Results

## Sample Activity Report

## Orange 16-19 - D

**Addr:** 19

**Sample ID** ICABT-6322;B1

**Repeat** 33

**Carrier No.** 0

**Batch ID** m122627

**Count Method** Gross Alpha Beta

**Detector Volts** 1515

**Sample Qty** 0 *l* **sd** 0 *l*

**Residual Wt** 0 *mg* **sd** 0 *mg*

**Count Began** 1/23/2013 12:45:37 PM **Collection Date 1** 1/1/1900 **Half Life** 0.00 *days*

**Count Ended** 1/23/2013 12:50:47 PM **Collection Date 2** 1/1/1900 **Decay Factor** 1.000

**Sample Count Time** 5.00 *mins* **Background Count Time** 1,000.00 *mins*

| | Efficiency % | Attenuation Factor | Activity Divisor | Background cpm | Gross counts | Gross cpm | Net cpm |
|---|---|---|---|---|---|---|---|
| **Alpha** | 0.000 | 1.000 | 1.000 | 0.041 | 39 | 7.800 | 7.759 |
| **sd** | 0.000 | | | 0.006 | 6.245 | 1.249 | 1.249 |
| **A to B** | 0.000 | 1.000 | | | | 0.000 | |
| **sd** | 0.000 | | | | | 0.000 | |
| **Beta** | 0.000 | 1.000 | 1.000 | 0.378 | 94,349 | 18,869.800 | 18,869.422 |
| **sd** | 0.000 | | | 0.019 | 307.163 | 61.433 | 61.433 |

| | Net Activity dpm | LLD dpm | MDC pCi/l | MPC pCi/l | Net Concentration * pCi/l | Conc / MPC Ratio |
|---|---|---|---|---|---|---|
| **Alpha** | 0.000 | 0.000 | 0.000 | 1.000 | 0.000 ± 0.000 | 0.000 |
| **sd** | 0.000 | | | | 0.000 | |
| **Beta** | 0.000 | 0.000 | 0.000 | 1.000 | 0.000 ± 0.000 | 0.000 |
| **sd** | 0.000 | | | | 0.000 | |

*** Note: Decay Corrected** **MDC Method** Tb = Ts < 10 **Error =** .00 **x sd**

# Alpha/Beta Count Results

## Sample Activity Report

## Orange 16-19 - D

**Addr:** 19

**Sample ID** ICABT-6322;B8

**Repeat** 33

**Carrier No.** 0

**Batch ID** m122627

**Count Method** Gross Alpha Beta

**Detector Volts** 1515

**Sample Qty** 0 *l* **sd** 0 *l*

**Residual Wt** 0 *mg* **sd** 0 *mg*

**Count Began** 1/23/2013 12:53:49 PM **Collection Date 1** 1/1/1900 **Half Life** 0.00 *days*

**Count Ended** 1/23/2013 12:58:58 PM **Collection Date 2** 1/1/1900 **Decay Factor** 1.000

**Sample Count Time** 5.00 *mins* **Background Count Time** 1,000.00 *mins*

| | Efficiency % | Attenuation Factor | Activity Divisor | Background cpm | Gross counts | Gross cpm | Net cpm |
|---|---|---|---|---|---|---|---|
| **Alpha** | 0.000 | 1.000 | 1.000 | 0.041 | 25 | 5.000 | 4.959 |
| **sd** | 0.000 | | | 0.006 | 5.000 | 1.000 | 1.000 |
| **A to B** | 0.000 | 1.000 | | | | 0.000 | |
| **sd** | 0.000 | | | | | 0.000 | |
| **Beta** | 0.000 | 1.000 | 1.000 | 0.378 | 79,345 | 15,869.000 | 15,868.622 |
| **sd** | 0.000 | | | 0.019 | 281.682 | 56.336 | 56.336 |

| | Net Activity dpm | LLD dpm | MDC pCi/l | MPC pCi/l | Net Concentration * pCi/l | Conc / MPC Ratio |
|---|---|---|---|---|---|---|
| **Alpha** | 0.000 | 0.000 | 0.000 | 1.000 | 0.000 ± 0.000 | 0.000 |
| **sd** | 0.000 | | | | 0.000 | |
| **Beta** | 0.000 | 0.000 | 0.000 | 1.000 | 0.000 ± 0.000 | 0.000 |
| **sd** | 0.000 | | | | 0.000 | |

*** Note: Decay Corrected** **MDC Method** Tb = Ts < 10 **Error =** .00 **x sd**

# Alpha/Beta Count Results

## Sample Activity Report

## Orange 16-19 - D

**Addr:** 19

**Sample ID** ICABT-6322;B7

**Repeat** 34

**Carrier No.** 0

**Batch ID** m122627

**Count Method** Gross Alpha Beta

**Detector Volts** 1515

**Sample Qty** 0 *l* **sd** 0 *l*

**Residual Wt** 0 *mg* **sd** 0 *mg*

**Count Began** 1/23/2013 1:00:41 PM **Collection Date 1** 1/1/1900 **Half Life** 0.00 *days*

**Count Ended** 1/23/2013 1:05:49 PM **Collection Date 2** 1/1/1900 **Decay Factor** 1.000

**Sample Count Time** 5.00 *mins* **Background Count Time** 1,000.00 *mins*

| | Efficiency % | Attenuation Factor | Activity Divisor | Background cpm | Gross counts | Gross cpm | Net cpm |
|---|---|---|---|---|---|---|---|
| **Alpha** | 0.000 | 1.000 | 1.000 | 0.041 | 29 | 5.800 | 5.759 |
| **sd** | 0.000 | | | 0.006 | 5.385 | 1.077 | 1.077 |
| **A to B** | 0.000 | 1.000 | | | | 0.000 | |
| **sd** | 0.000 | | | | | 0.000 | |
| **Beta** | 0.000 | 1.000 | 1.000 | 0.378 | 82,304 | 16,460.800 | 16,460.422 |
| **sd** | 0.000 | | | 0.019 | 286.887 | 57.377 | 57.377 |

| | Net Activity dpm | LLD dpm | MDC pCi/l | MPC pCi/l | Net Concentration * pCi/l | Conc / MPC Ratio |
|---|---|---|---|---|---|---|
| **Alpha** | 0.000 | 0.000 | 0.000 | 1.000 | 0.000 ± 0.000 | 0.000 |
| **sd** | 0.000 | | | | 0.000 | |
| **Beta** | 0.000 | 0.000 | 0.000 | 1.000 | 0.000 ± 0.000 | 0.000 |
| **sd** | 0.000 | | | | 0.000 | |

*** Note: Decay Corrected** **MDC Method** Tb = Ts < 10 **Error =** .00 **x sd**

# Alpha/Beta Count Results

## Sample Activity Report

## Orange 16-19 - D

**Addr:** 19

**Sample ID** ICABT-6322;B6

**Repeat** 35

**Carrier No.** 0

**Batch ID** m122627

**Count Method** Gross Alpha Beta

**Detector Volts** 1515

| | | | |
|---|---|---|---|
| **Sample Qty** | 0 ***l*** | **sd** | 0 ***l*** |
| **Residual Wt** | 0 ***mg*** | **sd** | 0 ***mg*** |

**Count Began** 1/23/2013 1:07:52 PM **Collection Date 1** 1/1/1900 **Half Life** 0.00 ***days***

**Count Ended** 1/23/2013 1:13:01 PM **Collection Date 2** 1/1/1900 **Decay Factor** 1.000

**Sample Count Time** 5.00 ***mins*** **Background Count Time** 1,000.00 ***mins***

| | Efficiency % | Attenuation Factor | Activity Divisor | Background cpm | Gross counts | Gross cpm | Net cpm |
|---|---|---|---|---|---|---|---|
| **Alpha** | 0.000 | 1.000 | 1.000 | 0.041 | 34 | 6.800 | 6.759 |
| **sd** | 0.000 | | | 0.006 | 5.831 | 1.166 | 1.166 |
| **A to B** | 0.000 | 1.000 | | | | 0.000 | |
| **sd** | 0.000 | | | | | 0.000 | |
| **Beta** | 0.000 | 1.000 | 1.000 | 0.378 | 82,231 | 16,446.200 | 16,445.822 |
| **sd** | 0.000 | | | 0.019 | 286.759 | 57.352 | 57.352 |

| | Net Activity dpm | LLD dpm | MDC pCi/l | MPC pCi/l | Net Concentration * pCi/l | Conc / MPC Ratio |
|---|---|---|---|---|---|---|
| **Alpha** | 0.000 | 0.000 | 0.000 | 1.000 | 0.000 ± 0.000 | 0.000 |
| **sd** | 0.000 | | | | 0.000 | |
| **Beta** | 0.000 | 0.000 | 0.000 | 1.000 | 0.000 ± 0.000 | 0.000 |
| **sd** | 0.000 | | | | 0.000 | |

*** Note: Decay Corrected** **MDC Method** Tb = Ts < 10 **Error =** .00 **x sd**

# Alpha/Beta Count Results

## Sample Activity Report

## Orange 16-19 - D

**Addr:** 19

**Sample ID** ICABT-6322;B5

**Repeat** 36

**Carrier No.** 0

**Batch ID** m122627

**Count Method** Gross Alpha Beta

**Detector Volts** 1515

**Sample Qty** 0 *l* **sd** 0 *l*

**Residual Wt** 0 *mg* **sd** 0 *mg*

**Count Began** 1/23/2013 1:15:02 PM **Collection Date 1** 1/1/1900 **Half Life** 0.00 *days*

**Count Ended** 1/23/2013 1:20:11 PM **Collection Date 2** 1/1/1900 **Decay Factor** 1.000

**Sample Count Time** 5.00 *mins* **Background Count Time** 1,000.00 *mins*

| | Efficiency % | Attenuation Factor | Activity Divisor | Background cpm | Gross counts | Gross cpm | Net cpm |
|---|---|---|---|---|---|---|---|
| **Alpha** | 0.000 | 1.000 | 1.000 | 0.041 | 31 | 6.200 | 6.159 |
| **sd** | 0.000 | | | 0.006 | 5.568 | 1.114 | 1.114 |
| **A to B** | 0.000 | 1.000 | | | | 0.000 | |
| **sd** | 0.000 | | | | | 0.000 | |
| **Beta** | 0.000 | 1.000 | 1.000 | 0.378 | 83,764 | 16,752.800 | 16,752.422 |
| **sd** | 0.000 | | | 0.019 | 289.420 | 57.884 | 57.884 |

| | Net Activity dpm | LLD dpm | MDC pCi/l | MPC pCi/l | Net Concentration * pCi/l | Conc / MPC Ratio |
|---|---|---|---|---|---|---|
| **Alpha** | 0.000 | 0.000 | 0.000 | 1.000 | 0.000 ± 0.000 | 0.000 |
| **sd** | 0.000 | | | | 0.000 | |
| **Beta** | 0.000 | 0.000 | 0.000 | 1.000 | 0.000 ± 0.000 | 0.000 |
| **sd** | 0.000 | | | | 0.000 | |

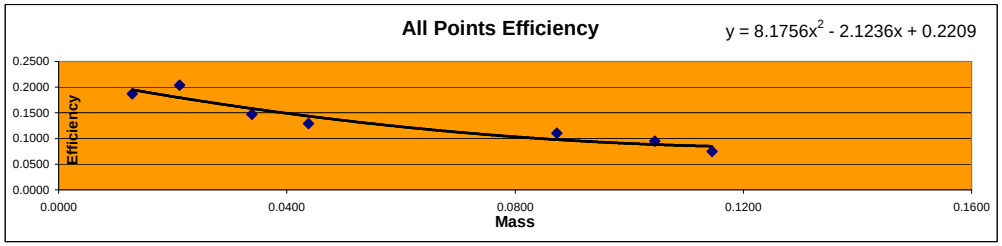
*** Note: Decay Corrected** **MDC Method** Tb = Ts < 10 **Error =** .00 **x sd**

## Curve is for Gross Alpha

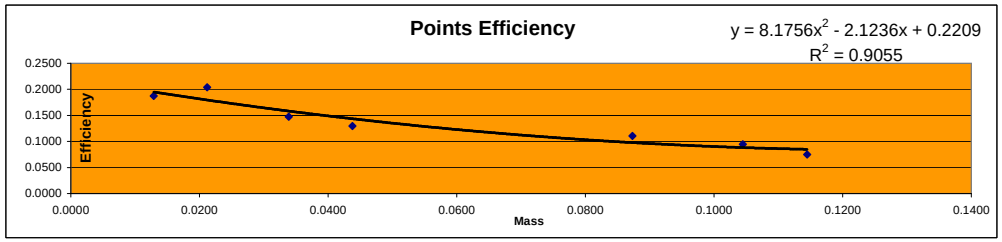
**Orange 19**

| Detector ID | Sample ID | Count Date | Count Time | Alpha Counts | Net CPM | DPM | Th-230 Efficiency | Standard Aliquot | Mass |
|---|---|---|---|---|---|---|---|---|---|
| 19 | ICABT-51465;A1 | 1/7/2016 6:22 | 40 | 17785 | 444.625 | 2374.5 | 0.1872 | 1mL | 0.0129 |
| 19 | ICABT-51465;A2 | 1/7/2016 1:46 | 40 | 19369 | 484.225 | 2374.5 | 0.2039 | 1mL | 0.0212 |
| 19 | ICABT-51465;A3 | 1/7/2016 1:05 | 40 | 13980 | 349.500 | 2374.5 | 0.1472 | 1mL | 0.0339 |
| 19 | ICABT-51465;A4 | 1/7/2016 0:06 | 40 | 12283 | 307.075 | 2374.5 | 0.1293 | 1mL | 0.0438 |
| 19 | ICABT-51465;A6 | 1/7/2016 9:33 | 40 | 20951 | 523.775 | 4749.0 | 0.1103 | 2mL | 0.0873 |
| 19 | ICABT-51465;A7 | 1/7/2016 8:29 | 40 | 17975 | 449.375 | 4749.0 | 0.0946 | 2mL | 0.1045 |
| 19 | ICABT-51465;A8 | 1/7/2016 7:41 | 40 | 14191 | 354.775 | 4749.0 | 0.0747 | 2mL | 0.1145 |

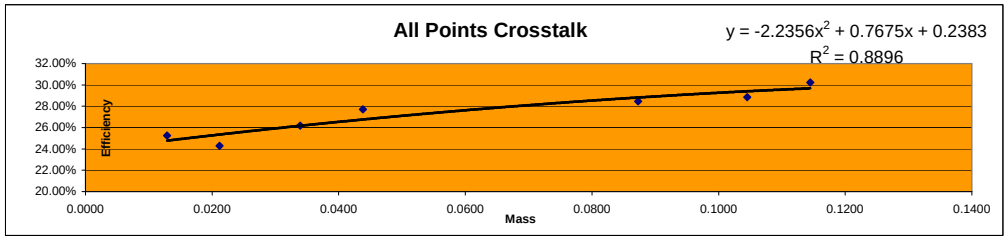
| Mass | Measured Efficiency | Theoretical Efficiency | Percent Δ Efficiency |
|---|---|---|---|
| 0.0129 | 0.1872 | 0.1949 | -3.91% |
| 0.0212 | 0.2039 | 0.1796 | 13.57% |
| 0.0339 | 0.1472 | 0.1583 | -7.02% |
| 0.0438 | 0.1293 | 0.1436 | -9.92% |
| 0.0873 | 0.1103 | 0.0978 | 12.75% |
| 0.1045 | 0.0946 | 0.0883 | 7.21% |
| 0.1145 | 0.0747 | 0.0849 | -12.04% |




| Mass | Efficiency |
|---|---|
| 0.0129 | 0.1872 |
| 0.0212 | 0.2039 |
| 0.0339 | 0.1472 |
| 0.0438 | 0.1293 |
| 0.0873 | 0.1103 |
| 0.1045 | 0.0946 |
| 0.1145 | 0.0747 |




| Detector ID | Sample ID | Mass | Count Time | Alpha Counts | Beta Counts | Alpha CPM | Beta CPM | % α into β | |
|---|---|---|---|---|---|---|---|---|---|
| 19 | ICABT-51465;A1 | 0.0129 | 40 | 17785 | 6007 | 444.63 | 150.18 | 25.25% | Min |
| 19 | ICABT-51465;A2 | 0.0212 | 40 | 19369 | 6213 | 484.23 | 155.33 | 24.29% | 24.29% |
| 19 | ICABT-51465;A3 | 0.0339 | 40 | 13980 | 4957 | 349.50 | 123.93 | 26.18% | |
| 19 | ICABT-51465;A4 | 0.0438 | 40 | 12283 | 4706 | 307.08 | 117.65 | 27.70% | Max |
| 19 | ICABT-51465;A6 | 0.0873 | 40 | 20951 | 8333 | 523.78 | 208.33 | 28.46% | |
| 19 | ICABT-51465;A7 | 0.1045 | 40 | 17975 | 7290 | 449.38 | 182.25 | 28.85% | Mean |
| 19 | ICABT-51465;A8 | 0.1145 | 40 | 14191 | 6153 | 354.78 | 153.83 | 30.24% | 27.28% |




**Standard ID**
Thorium-230
Th-230_00016 #51465
Cert # 92523 Ref. date 11/29/2012
Activity 2374.5 dpm/mL

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# Alpha/Beta Count Results

## Sample Activity Report

## Orange 16-19 - D

**Addr:** 19

**Sample ID** ICABT-51465;A4

**Repeat** 1016

**Carrier No.** 0

**Batch ID** m153000

**Count Method** Gross Alpha Beta

**Detector Volts** 1515

**Sample Qty** 0 *l* **sd** 0 *l*

**Residual Wt** 0 *mg* **sd** 0 *mg*

**Count Began** 1/7/2016 12:06:22 AM **Collection Date 1** 1/1/1900 **Half Life** 0.00 *days*

**Count Ended** 1/7/2016 12:46:27 AM **Collection Date 2** 1/1/1900 **Decay Factor** 1.000

**Sample Count Time** 40.00 *mins* **Background Count Time** 1,000.00 *mins*

| | Efficiency % | Attenuation Factor | Activity Divisor | Background cpm | Gross counts | Gross cpm | Net cpm |
|---|---|---|---|---|---|---|---|
| **Alpha** | 0.000 | 1.000 | 1.000 | 0.105 | 12,283 | 307.075 | 306.970 |
| **sd** | 0.000 | | | 0.010 | 110.829 | 2.771 | 2.771 |
| **A to B** | 0.000 | 1.000 | | | | 0.000 | |
| **sd** | 0.000 | | | | | 0.000 | |
| **Beta** | 0.000 | 1.000 | 1.000 | 0.426 | 4,706 | 117.650 | 117.224 |
| **sd** | 0.000 | | | 0.021 | 68.600 | 1.715 | 1.715 |

| | Net Activity dpm | LLD dpm | MDC pCi/l | MPC pCi/l | Net Concentration * pCi/l | Conc / MPC Ratio |
|---|---|---|---|---|---|---|
| **Alpha** | 0.000 | 0.000 | 0.000 | 1.000 | 0.000 ± 0.000 | 0.000 |
| **sd** | 0.000 | | | | 0.000 | |
| **Beta** | 0.000 | 0.000 | 0.000 | 1.000 | 0.000 ± 0.000 | 0.000 |
| **sd** | 0.000 | | | | 0.000 | |

*** Note: Decay Corrected** **MDC Method** Tb = Ts < 10 **Error =** .00 **x sd**

# Alpha/Beta Count Results

## Sample Activity Report

## Orange 16-19 - D

**Addr:** 19

**Sample ID** ICABT-51465;A3

**Repeat** 1018

**Carrier No.** 0

**Batch ID** m153000

**Count Method** Gross Alpha Beta

**Detector Volts** 1515

**Sample Qty** 0 *l* **sd** 0 *l*

**Residual Wt** 0 *mg* **sd** 0 *mg*

**Count Began** 1/7/2016 1:05:30 AM **Collection Date 1** 1/1/1900 **Half Life** 0.00 *days*

**Count Ended** 1/7/2016 1:45:35 AM **Collection Date 2** 1/1/1900 **Decay Factor** 1.000

**Sample Count Time** 40.00 *mins* **Background Count Time** 1,000.00 *mins*

| | Efficiency % | Attenuation Factor | Activity Divisor | Background cpm | Gross counts | Gross cpm | Net cpm |
|---|---|---|---|---|---|---|---|
| **Alpha** | 0.000 | 1.000 | 1.000 | 0.105 | 13,980 | 349.500 | 349.395 |
| **sd** | 0.000 | | | 0.010 | 118.237 | 2.956 | 2.956 |
| **A to B** | 0.000 | 1.000 | | | | 0.000 | |
| **sd** | 0.000 | | | | | 0.000 | |
| **Beta** | 0.000 | 1.000 | 1.000 | 0.426 | 4,957 | 123.925 | 123.499 |
| **sd** | 0.000 | | | 0.021 | 70.406 | 1.760 | 1.760 |

| | Net Activity dpm | LLD dpm | MDC pCi/l | MPC pCi/l | Net Concentration * pCi/l | Conc / MPC Ratio |
|---|---|---|---|---|---|---|
| **Alpha** | 0.000 | 0.000 | 0.000 | 1.000 | 0.000 ± 0.000 | 0.000 |
| **sd** | 0.000 | | | | 0.000 | |
| **Beta** | 0.000 | 0.000 | 0.000 | 1.000 | 0.000 ± 0.000 | 0.000 |
| **sd** | 0.000 | | | | 0.000 | |

*** Note: Decay Corrected** **MDC Method** Tb = Ts < 10 **Error =** .00 **x sd**

# Alpha/Beta Count Results

## Sample Activity Report

## Orange 16-19 - D

**Addr:** 19

**Sample ID** ICABT-51465;A2

**Repeat** 1020

**Carrier No.** 0

**Batch ID** m153000

**Count Method** Gross Alpha Beta

**Detector Volts** 1515

**Sample Qty** 0 *l* **sd** 0 *l*

**Residual Wt** 0 *mg* **sd** 0 *mg*

**Count Began** 1/7/2016 1:46:49 AM **Collection Date 1** 1/1/1900 **Half Life** 0.00 *days*

**Count Ended** 1/7/2016 2:26:54 AM **Collection Date 2** 1/1/1900 **Decay Factor** 1.000

**Sample Count Time** 40.00 *mins* **Background Count Time** 1,000.00 *mins*

| | Efficiency % | Attenuation Factor | Activity Divisor | Background cpm | Gross counts | Gross cpm | Net cpm |
|---|---|---|---|---|---|---|---|
| **Alpha** | 0.000 | 1.000 | 1.000 | 0.105 | 19,369 | 484.225 | 484.120 |
| **sd** | 0.000 | | | 0.010 | 139.173 | 3.479 | 3.479 |
| **A to B** | 0.000 | 1.000 | | | | 0.000 | |
| **sd** | 0.000 | | | | | 0.000 | |
| **Beta** | 0.000 | 1.000 | 1.000 | 0.426 | 6,213 | 155.325 | 154.899 |
| **sd** | 0.000 | | | 0.021 | 78.823 | 1.971 | 1.971 |

| | Net Activity dpm | LLD dpm | MDC pCi/l | MPC pCi/l | Net Concentration * pCi/l | Conc / MPC Ratio |
|---|---|---|---|---|---|---|
| **Alpha** | 0.000 | 0.000 | 0.000 | 1.000 | 0.000 ± 0.000 | 0.000 |
| **sd** | 0.000 | | | | 0.000 | |
| **Beta** | 0.000 | 0.000 | 0.000 | 1.000 | 0.000 ± 0.000 | 0.000 |
| **sd** | 0.000 | | | | 0.000 | |

*** Note: Decay Corrected** **MDC Method** Tb = Ts < 10 **Error =** .00 **x sd**

# Alpha/Beta Count Results

## Sample Activity Report

## Orange 16-19 - D

**Addr:** 19

**Sample ID** ICABT-51465;A1

**Repeat** 1014

**Carrier No.** 0

**Batch ID** m153000

**Count Method** Gross Alpha Beta

**Detector Volts** 1515

| | | | |
|---|---|---|---|
| **Sample Qty** | 0 ***l*** | **sd** | 0 ***l*** |
| **Residual Wt** | 0 ***mg*** | **sd** | 0 ***mg*** |

**Count Began** 1/7/2016 6:22:59 AM

**Collection Date 1** 1/1/1900

**Half Life** 0.00 ***days***

**Count Ended** 1/7/2016 7:03:06 AM

**Collection Date 2** 1/1/1900

**Decay Factor** 1.000

**Sample Count Time** 40.00 ***mins***

**Background Count Time** 1,000.00 ***mins***

| | Efficiency % | Attenuation Factor | Activity Divisor | Background cpm | Gross counts | Gross cpm | Net cpm |
|---|---|---|---|---|---|---|---|
| **Alpha** | 0.000 | 1.000 | 1.000 | 0.105 | 17,785 | 444.625 | 444.520 |
| **sd** | 0.000 | | | 0.010 | 133.360 | 3.334 | 3.334 |
| **A to B** | 0.000 | 1.000 | | | | 0.000 | |
| **sd** | 0.000 | | | | | 0.000 | |
| **Beta** | 0.000 | 1.000 | 1.000 | 0.426 | 6,007 | 150.175 | 149.749 |
| **sd** | 0.000 | | | 0.021 | 77.505 | 1.938 | 1.938 |

| | Net Activity dpm | LLD dpm | MDC pCi/l | MPC pCi/l | Net Concentration * pCi/l | Conc / MPC Ratio |
|---|---|---|---|---|---|---|
| **Alpha** | 0.000 | 0.000 | 0.000 | 1.000 | 0.000 ± 0.000 | 0.000 |
| **sd** | 0.000 | | | | 0.000 | |
| **Beta** | 0.000 | 0.000 | 0.000 | 1.000 | 0.000 ± 0.000 | 0.000 |
| **sd** | 0.000 | | | | 0.000 | |

*** Note: Decay Corrected**

**MDC Method** Tb = Ts < 10

**Error =** .00 **x sd**

# Alpha/Beta Count Results

## Sample Activity Report

## Orange 16-19 - D

**Addr:** 19

**Sample ID** ICABT-51465;A8

**Repeat** 1016

**Carrier No.** 0

**Batch ID** m153000

**Count Method** Gross Alpha Beta

**Detector Volts** 1515

**Sample Qty** 0 *l* **sd** 0 *l*

**Residual Wt** 0 *mg* **sd** 0 *mg*

**Count Began** 1/7/2016 7:41:24 AM **Collection Date 1** 1/1/1900 **Half Life** 0.00 *days*

**Count Ended** 1/7/2016 8:21:29 AM **Collection Date 2** 1/1/1900 **Decay Factor** 1.000

**Sample Count Time** 40.00 *mins* **Background Count Time** 1,000.00 *mins*

| | Efficiency % | Attenuation Factor | Activity Divisor | Background cpm | Gross counts | Gross cpm | Net cpm |
|---|---|---|---|---|---|---|---|
| **Alpha** | 0.000 | 1.000 | 1.000 | 0.105 | 14,191 | 354.775 | 354.670 |
| **sd** | 0.000 | | | 0.010 | 119.126 | 2.978 | 2.978 |
| **A to B** | 0.000 | 1.000 | | | | 0.000 | |
| **sd** | 0.000 | | | | | 0.000 | |
| **Beta** | 0.000 | 1.000 | 1.000 | 0.426 | 6,153 | 153.825 | 153.399 |
| **sd** | 0.000 | | | 0.021 | 78.441 | 1.961 | 1.961 |

| | Net Activity dpm | LLD dpm | MDC pCi/l | MPC pCi/l | Net Concentration * pCi/l | Conc / MPC Ratio |
|---|---|---|---|---|---|---|
| **Alpha** | 0.000 | 0.000 | 0.000 | 1.000 | 0.000 ± 0.000 | 0.000 |
| **sd** | 0.000 | | | | 0.000 | |
| **Beta** | 0.000 | 0.000 | 0.000 | 1.000 | 0.000 ± 0.000 | 0.000 |
| **sd** | 0.000 | | | | 0.000 | |

*** Note: Decay Corrected** **MDC Method** Tb = Ts < 10 **Error =** .00 **x sd**

# Alpha/Beta Count Results

## Sample Activity Report

## Orange 16-19 - D

**Addr:** 19

**Sample ID** ICABT-51465;A7

**Repeat** 1018

**Carrier No.** 0

**Batch ID** m153000

**Count Method** Gross Alpha Beta

**Detector Volts** 1515

| | | | |
|---|---|---|---|
| **Sample Qty** | 0 ***l*** | **sd** | 0 ***l*** |
| **Residual Wt** | 0 ***mg*** | **sd** | 0 ***mg*** |

**Count Began** 1/7/2016 8:29:28 AM **Collection Date 1** 1/1/1900 **Half Life** 0.00 ***days***

**Count Ended** 1/7/2016 9:09:34 AM **Collection Date 2** 1/1/1900 **Decay Factor** 1.000

**Sample Count Time** 40.00 ***mins*** **Background Count Time** 1,000.00 ***mins***

| | Efficiency % | Attenuation Factor | Activity Divisor | Background cpm | Gross counts | Gross cpm | Net cpm |
|---|---|---|---|---|---|---|---|
| **Alpha** | 0.000 | 1.000 | 1.000 | 0.105 | 17,975 | 449.375 | 449.270 |
| **sd** | 0.000 | | | 0.010 | 134.071 | 3.352 | 3.352 |
| **A to B** | 0.000 | 1.000 | | | | 0.000 | |
| **sd** | 0.000 | | | | | 0.000 | |
| **Beta** | 0.000 | 1.000 | 1.000 | 0.426 | 7,290 | 182.250 | 181.824 |
| **sd** | 0.000 | | | 0.021 | 85.381 | 2.135 | 2.135 |

| | Net Activity dpm | LLD dpm | MDC pCi/l | MPC pCi/l | Net Concentration * pCi/l | Conc / MPC Ratio |
|---|---|---|---|---|---|---|
| **Alpha** | 0.000 | 0.000 | 0.000 | 1.000 | 0.000 ± 0.000 | 0.000 |
| **sd** | 0.000 | | | | 0.000 | |
| **Beta** | 0.000 | 0.000 | 0.000 | 1.000 | 0.000 ± 0.000 | 0.000 |
| **sd** | 0.000 | | | | 0.000 | |

*** Note: Decay Corrected** **MDC Method** Tb = Ts < 10 **Error =** .00 **x sd**

# Alpha/Beta Count Results

## Sample Activity Report

## Orange 16-19 - D

**Addr:** 19

**Sample ID** ICABT-51465;A6

**Repeat** 1020

**Carrier No.** 0

**Batch ID** m153000

**Count Method** Gross Alpha Beta

**Detector Volts** 1515

**Sample Qty** 0 *l* **sd** 0 *l*

**Residual Wt** 0 *mg* **sd** 0 *mg*

**Count Began** 1/7/2016 9:33:40 AM **Collection Date 1** 1/1/1900 **Half Life** 0.00 *days*

**Count Ended** 1/7/2016 10:13:45 AM **Collection Date 2** 1/1/1900 **Decay Factor** 1.000

**Sample Count Time** 40.00 *mins* **Background Count Time** 1,000.00 *mins*

| | Efficiency % | Attenuation Factor | Activity Divisor | Background cpm | Gross counts | Gross cpm | Net cpm |
|---|---|---|---|---|---|---|---|
| **Alpha** | 0.000 | 1.000 | 1.000 | 0.105 | 20,951 | 523.775 | 523.670 |
| **sd** | 0.000 | | | 0.010 | 144.745 | 3.619 | 3.619 |
| **A to B** | 0.000 | 1.000 | | | | 0.000 | |
| **sd** | 0.000 | | | | | 0.000 | |
| **Beta** | 0.000 | 1.000 | 1.000 | 0.426 | 8,333 | 208.325 | 207.899 |
| **sd** | 0.000 | | | 0.021 | 91.285 | 2.282 | 2.282 |

| | Net Activity dpm | LLD dpm | MDC pCi/l | MPC pCi/l | Net Concentration * pCi/l | Conc / MPC Ratio |
|---|---|---|---|---|---|---|
| **Alpha** | 0.000 | 0.000 | 0.000 | 1.000 | 0.000 ± 0.000 | 0.000 |
| **sd** | 0.000 | | | | 0.000 | |
| **Beta** | 0.000 | 0.000 | 0.000 | 1.000 | 0.000 ± 0.000 | 0.000 |
| **sd** | 0.000 | | | | 0.000 | |

*** Note: Decay Corrected** **MDC Method** Tb = Ts < 10 **Error =** .00 **x sd**

# Alpha/Beta Count Results

## Sample Activity Report

## Orange 16-19 - D

**Addr:** 19

**Sample ID** ICABT-51465;A5

**Repeat** 1022

**Carrier No.** 0

**Batch ID** m153000

**Count Method** Gross Alpha Beta

**Detector Volts** 1515

**Sample Qty** 0 *l* **sd** 0 *l*

**Residual Wt** 0 *mg* **sd** 0 *mg*

**Count Began** 1/7/2016 10:30:10 AM **Collection Date 1** 1/1/1900 **Half Life** 0.00 *days*

**Count Ended** 1/7/2016 11:10:16 AM **Collection Date 2** 1/1/1900 **Decay Factor** 1.000

**Sample Count Time** 40.00 *mins* **Background Count Time** 1,000.00 *mins*

| | Efficiency % | Attenuation Factor | Activity Divisor | Background cpm | Gross counts | Gross cpm | Net cpm |
|---|---|---|---|---|---|---|---|
| **Alpha** | 0.000 | 1.000 | 1.000 | 0.105 | 17,322 | 433.050 | 432.945 |
| **sd** | 0.000 | | | 0.010 | 131.613 | 3.290 | 3.290 |
| **A to B** | 0.000 | 1.000 | | | | 0.000 | |
| **sd** | 0.000 | | | | | 0.000 | |
| **Beta** | 0.000 | 1.000 | 1.000 | 0.426 | 7,577 | 189.425 | 188.999 |
| **sd** | 0.000 | | | 0.021 | 87.046 | 2.176 | 2.176 |

| | Net Activity dpm | LLD dpm | MDC pCi/l | MPC pCi/l | Net Concentration * pCi/l | Conc / MPC Ratio |
|---|---|---|---|---|---|---|
| **Alpha** | 0.000 | 0.000 | 0.000 | 1.000 | 0.000 ± 0.000 | 0.000 |
| **sd** | 0.000 | | | | 0.000 | |
| **Beta** | 0.000 | 0.000 | 0.000 | 1.000 | 0.000 ± 0.000 | 0.000 |
| **sd** | 0.000 | | | | 0.000 | |

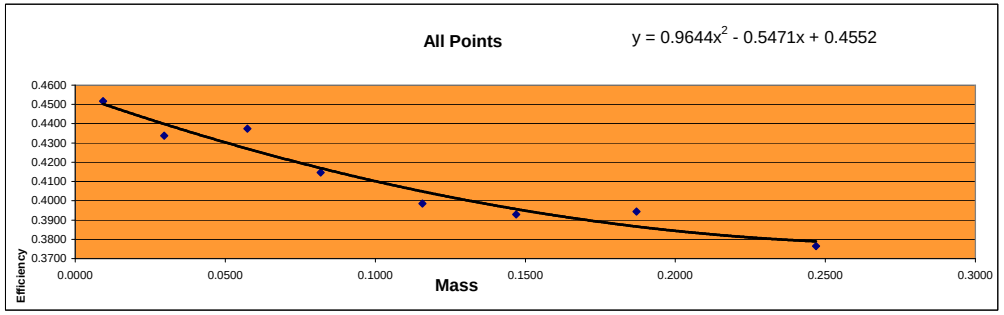
*** Note: Decay Corrected** **MDC Method** Tb = Ts < 10 **Error =** .00 **x sd**

**Curve is for Gross Beta**
**Strontium 90**
**and**
**Total Strontium**

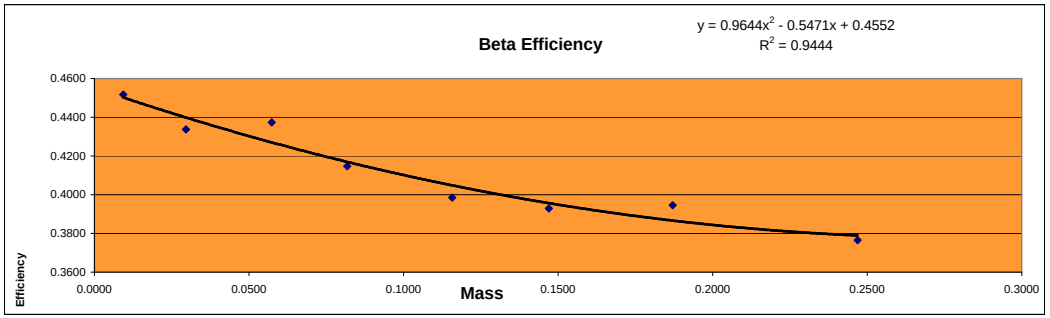
**Orange 22**

| Detector ID | Std ID | Count Date | Sample Wt | Count Time | Beta Counts | DPM 41588.469 CPM | Sr-90 Eff | Standard Aliquot |
|---|---|---|---|---|---|---|---|---|
| 22 | B1 | 1/23/2013 13:07 | 0.0093 | 5 | 93925 | 18785.000 | 0.4517 | 1mL |
| 22 | B2 | 1/23/2013 13:00 | 0.0296 | 5 | 90195 | 18039.000 | 0.4338 | 1mL |
| 22 | B3 | 1/23/2013 12:53 | 0.0574 | 5 | 90958 | 18191.600 | 0.4374 | 1mL |
| 22 | B4 | 1/23/2013 12:45 | 0.0818 | 5 | 86243 | 17248.600 | 0.4147 | 1mL |
| 22 | B5 | 1/23/2013 12:37 | 0.1157 | 5 | 82882 | 16576.400 | 0.3986 | 1mL |
| 22 | B6 | 1/23/2013 12:30 | 0.1470 | 5 | 81703 | 16340.600 | 0.3929 | 1mL |
| 22 | B7 | 1/23/2013 12:20 | 0.1871 | 5 | 82031 | 16406.200 | 0.3945 | 1mL |
| 22 | B8 | 1/23/2013 13:15 | 0.2469 | 5 | 78301 | 15660.200 | 0.3766 | 1mL |

| Mass | Measured Efficiency | Theoretical Efficiency | Percent Δ Efficiency |
|---|---|---|---|
| 0.0093 | 0.4517 | 0.4502 | 0.33% |
| 0.0296 | 0.4338 | 0.4399 | -1.39% |
| 0.0574 | 0.4374 | 0.4270 | 2.45% |
| 0.0818 | 0.4147 | 0.4169 | -0.52% |
| 0.1157 | 0.3986 | 0.4048 | -1.54% |
| 0.1470 | 0.3929 | 0.3956 | -0.68% |
| 0.1871 | 0.3945 | 0.3866 | 2.04% |
| 0.2469 | 0.3766 | 0.3789 | -0.62% |




| Mass | Efficiency |
|---|---|
| 0.0093 | 0.4517 |
| 0.0296 | 0.4338 |
| 0.0574 | 0.4374 |
| 0.0818 | 0.4147 |
| 0.1157 | 0.3986 |
| 0.1470 | 0.3929 |
| 0.1871 | 0.3945 |
| 0.2469 | 0.3766 |




**Standard ID**
Strontium 90
Sr-90_00004 #6322
Cert# 80573-334 Ref. date 9/172009

| | | |
|---|---|---|
| Initial Activity: | 22560 | dpm/mL |
| Reference Date: | 9/17/2009 | |
| Count Date: | 1/23/2013 | |
| Elapsed Time: | 1224.000 | days |
| Half Life: | 10409.625 | days |
| Exponential Term: | 0.921730256 | |
| Corrected Activity: | 20794.23458 | dpm/mL |
| Decay Activity (Sr/Y-90) | 41588.46916 | dpm |

# Alpha/Beta Count Results

## Sample Activity Report

## Orange 20-23 - C

**Addr:** 22

**Sample ID** ICABT-6322;B7

**Repeat** 29

**Carrier No.** 0

**Batch ID** m122627

**Count Method** Gross Alpha Beta

**Detector Volts** 1515

| | | | |
|---|---|---|---|
| **Sample Qty** | 0 ***l*** | **sd** | 0 ***l*** |
| **Residual Wt** | 0 ***mg*** | **sd** | 0 ***mg*** |

**Count Began** 1/23/2013 12:20:47 PM **Collection Date 1** 1/1/1900 **Half Life** 0.00 ***days***

**Count Ended** 1/23/2013 12:25:56 PM **Collection Date 2** 1/1/1900 **Decay Factor** 1.000

**Sample Count Time** 5.00 ***mins*** **Background Count Time** 1,000.00 ***mins***

| | Efficiency % | Attenuation Factor | Activity Divisor | Background cpm | Gross counts | Gross cpm | Net cpm |
|---|---|---|---|---|---|---|---|
| **Alpha** | 0.000 | 1.000 | 1.000 | 0.044 | 26 | 5.200 | 5.156 |
| **sd** | 0.000 | | | 0.007 | 5.099 | 1.020 | 1.020 |
| **A to B** | 0.000 | 1.000 | | | | 0.000 | |
| **sd** | 0.000 | | | | | 0.000 | |
| **Beta** | 0.000 | 1.000 | 1.000 | 0.301 | 82,031 | 16,406.200 | 16,405.899 |
| **sd** | 0.000 | | | 0.017 | 286.411 | 57.282 | 57.282 |

| | Net Activity dpm | LLD dpm | MDC pCi/l | MPC pCi/l | Net Concentration * pCi/l | Conc / MPC Ratio |
|---|---|---|---|---|---|---|
| **Alpha** | 0.000 | 0.000 | 0.000 | 1.000 | 0.000 ± 0.000 | 0.000 |
| **sd** | 0.000 | | | | 0.000 | |
| **Beta** | 0.000 | 0.000 | 0.000 | 1.000 | 0.000 ± 0.000 | 0.000 |
| **sd** | 0.000 | | | | 0.000 | |

*** Note: Decay Corrected** **MDC Method** Tb = Ts < 10 **Error =** .00 **x sd**

# Alpha/Beta Count Results

## Sample Activity Report

## Orange 20-23 - C

**Addr:** 22

**Sample ID** ICABT-6322;B6

**Repeat** 30

**Carrier No.** 0

**Batch ID** m122627

**Count Method** Gross Alpha Beta

**Detector Volts** 1515

| | | | |
|---|---|---|---|
| **Sample Qty** | 0 ***l*** | **sd** | 0 ***l*** |
| **Residual Wt** | 0 ***mg*** | **sd** | 0 ***mg*** |

**Count Began** 1/23/2013 12:30:14 PM **Collection Date 1** 1/1/1900 **Half Life** 0.00 ***days***

**Count Ended** 1/23/2013 12:35:23 PM **Collection Date 2** 1/1/1900 **Decay Factor** 1.000

**Sample Count Time** 5.00 ***mins*** **Background Count Time** 1,000.00 ***mins***

| | Efficiency % | Attenuation Factor | Activity Divisor | Background cpm | Gross counts | Gross cpm | Net cpm |
|---|---|---|---|---|---|---|---|
| **Alpha** | 0.000 | 1.000 | 1.000 | 0.044 | 25 | 5.000 | 4.956 |
| **sd** | 0.000 | | | 0.007 | 5.000 | 1.000 | 1.000 |
| **A to B** | 0.000 | 1.000 | | | | 0.000 | |
| **sd** | 0.000 | | | | | 0.000 | |
| **Beta** | 0.000 | 1.000 | 1.000 | 0.301 | 81,703 | 16,340.600 | 16,340.299 |
| **sd** | 0.000 | | | 0.017 | 285.837 | 57.167 | 57.167 |

| | Net Activity dpm | LLD dpm | MDC pCi/l | MPC pCi/l | Net Concentration * pCi/l | Conc / MPC Ratio |
|---|---|---|---|---|---|---|
| **Alpha** | 0.000 | 0.000 | 0.000 | 1.000 | 0.000 ± 0.000 | 0.000 |
| **sd** | 0.000 | | | | 0.000 | |
| **Beta** | 0.000 | 0.000 | 0.000 | 1.000 | 0.000 ± 0.000 | 0.000 |
| **sd** | 0.000 | | | | 0.000 | |

*** Note: Decay Corrected** **MDC Method** Tb = Ts < 10 **Error =** .00 **x sd**

# Alpha/Beta Count Results

## Sample Activity Report

## Orange 20-23 - C

**Addr:** 22

**Sample ID** ICABT-6322;B5

**Repeat** 31

**Carrier No.** 0

**Batch ID** m122627

**Count Method** Gross Alpha Beta

**Detector Volts** 1515

| | | | |
|---|---|---|---|
| **Sample Qty** | 0 ***l*** | **sd** | 0 ***l*** |
| **Residual Wt** | 0 ***mg*** | **sd** | 0 ***mg*** |

**Count Began** 1/23/2013 12:37:58 PM **Collection Date 1** 1/1/1900 **Half Life** 0.00 ***days***

**Count Ended** 1/23/2013 12:43:08 PM **Collection Date 2** 1/1/1900 **Decay Factor** 1.000

**Sample Count Time** 5.00 ***mins*** **Background Count Time** 1,000.00 ***mins***

| | Efficiency % | Attenuation Factor | Activity Divisor | Background cpm | Gross counts | Gross cpm | Net cpm |
|---|---|---|---|---|---|---|---|
| **Alpha** | 0.000 | 1.000 | 1.000 | 0.044 | 29 | 5.800 | 5.756 |
| **sd** | 0.000 | | | 0.007 | 5.385 | 1.077 | 1.077 |
| **A to B** | 0.000 | 1.000 | | | | 0.000 | |
| **sd** | 0.000 | | | | | 0.000 | |
| **Beta** | 0.000 | 1.000 | 1.000 | 0.301 | 82,882 | 16,576.400 | 16,576.099 |
| **sd** | 0.000 | | | 0.017 | 287.892 | 57.578 | 57.578 |

| | Net Activity dpm | LLD dpm | MDC pCi/l | MPC pCi/l | Net Concentration * pCi/l | Conc / MPC Ratio |
|---|---|---|---|---|---|---|
| **Alpha** | 0.000 | 0.000 | 0.000 | 1.000 | 0.000 ± 0.000 | 0.000 |
| **sd** | 0.000 | | | | 0.000 | |
| **Beta** | 0.000 | 0.000 | 0.000 | 1.000 | 0.000 ± 0.000 | 0.000 |
| **sd** | 0.000 | | | | 0.000 | |

*** Note: Decay Corrected** **MDC Method** Tb = Ts < 10 **Error =** .00 **x sd**

# Alpha/Beta Count Results

## Sample Activity Report

## Orange 20-23 - C

**Addr:** 22

**Sample ID** ICABT-6322;B4

**Repeat** 33

**Carrier No.** 0

**Batch ID** m122627

**Count Method** Gross Alpha Beta

**Detector Volts** 1515

| | | | |
|---|---|---|---|
| **Sample Qty** | 0 ***l*** | **sd** | 0 ***l*** |
| **Residual Wt** | 0 ***mg*** | **sd** | 0 ***mg*** |

**Count Began** 1/23/2013 12:45:56 PM

**Count Ended** 1/23/2013 12:51:06 PM

**Collection Date 1** 1/1/1900

**Collection Date 2** 1/1/1900

**Half Life** 0.00 ***days***

**Decay Factor** 1.000

**Sample Count Time** 5.00 ***mins***

**Background Count Time** 1,000.00 ***mins***

| | Efficiency % | Attenuation Factor | Activity Divisor | Background cpm | Gross counts | Gross cpm | Net cpm |
|---|---|---|---|---|---|---|---|
| **Alpha** | 0.000 | 1.000 | 1.000 | 0.044 | 18 | 3.600 | 3.556 |
| **sd** | 0.000 | | | 0.007 | 4.243 | 0.849 | 0.849 |
| **A to B** | 0.000 | 1.000 | | | | 0.000 | |
| **sd** | 0.000 | | | | | 0.000 | |
| **Beta** | 0.000 | 1.000 | 1.000 | 0.301 | 86,243 | 17,248.600 | 17,248.299 |
| **sd** | 0.000 | | | 0.017 | 293.672 | 58.734 | 58.734 |

| | Net Activity dpm | LLD dpm | MDC pCi/l | MPC pCi/l | Net Concentration * pCi/l | Conc / MPC Ratio |
|---|---|---|---|---|---|---|
| **Alpha** | 0.000 | 0.000 | 0.000 | 1.000 | 0.000 ± 0.000 | 0.000 |
| **sd** | 0.000 | | | | 0.000 | |
| **Beta** | 0.000 | 0.000 | 0.000 | 1.000 | 0.000 ± 0.000 | 0.000 |
| **sd** | 0.000 | | | | 0.000 | |

*** Note: Decay Corrected**

**MDC Method** Tb = Ts < 10

**Error =** .00 **x sd**

# Alpha/Beta Count Results

## Sample Activity Report

## Orange 20-23 - C

**Addr:** 22

**Sample ID** ICABT-6322;B3

**Repeat** 34

**Carrier No.** 0

**Batch ID** m122627

**Count Method** Gross Alpha Beta

**Detector Volts** 1515

**Sample Qty** 0 *l* **sd** 0 *l*

**Residual Wt** 0 *mg* **sd** 0 *mg*

**Count Began** 1/23/2013 12:53:25 PM **Collection Date 1** 1/1/1900 **Half Life** 0.00 *days*

**Count Ended** 1/23/2013 12:58:35 PM **Collection Date 2** 1/1/1900 **Decay Factor** 1.000

**Sample Count Time** 5.00 *mins* **Background Count Time** 1,000.00 *mins*

| | Efficiency % | Attenuation Factor | Activity Divisor | Background cpm | Gross counts | Gross cpm | Net cpm |
|---|---|---|---|---|---|---|---|
| **Alpha** | 0.000 | 1.000 | 1.000 | 0.044 | 35 | 7.000 | 6.956 |
| **sd** | 0.000 | | | 0.007 | 5.916 | 1.183 | 1.183 |
| **A to B** | 0.000 | 1.000 | | | | 0.000 | |
| **sd** | 0.000 | | | | | 0.000 | |
| **Beta** | 0.000 | 1.000 | 1.000 | 0.301 | 90,958 | 18,191.600 | 18,191.299 |
| **sd** | 0.000 | | | 0.017 | 301.592 | 60.318 | 60.318 |

| | Net Activity dpm | LLD dpm | MDC pCi/l | MPC pCi/l | Net Concentration * pCi/l | Conc / MPC Ratio |
|---|---|---|---|---|---|---|
| **Alpha** | 0.000 | 0.000 | 0.000 | 1.000 | 0.000 ± 0.000 | 0.000 |
| **sd** | 0.000 | | | | 0.000 | |
| **Beta** | 0.000 | 0.000 | 0.000 | 1.000 | 0.000 ± 0.000 | 0.000 |
| **sd** | 0.000 | | | | 0.000 | |

*** Note: Decay Corrected** **MDC Method** Tb = Ts < 10 **Error =** .00 **x sd**

# Alpha/Beta Count Results

## Sample Activity Report

## Orange 20-23 - C

**Addr:** 22

**Sample ID** ICABT-6322;B2

**Repeat** 35

**Carrier No.** 0

**Batch ID** m122627

**Count Method** Gross Alpha Beta

**Detector Volts** 1515

**Sample Qty** 0 *l* **sd** 0 *l*

**Residual Wt** 0 *mg* **sd** 0 *mg*

**Count Began** 1/23/2013 1:00:15 PM **Collection Date 1** 1/1/1900 **Half Life** 0.00 *days*

**Count Ended** 1/23/2013 1:05:26 PM **Collection Date 2** 1/1/1900 **Decay Factor** 1.000

**Sample Count Time** 5.00 *mins* **Background Count Time** 1,000.00 *mins*

| | Efficiency % | Attenuation Factor | Activity Divisor | Background cpm | Gross counts | Gross cpm | Net cpm |
|---|---|---|---|---|---|---|---|
| **Alpha** | 0.000 | 1.000 | 1.000 | 0.044 | 20 | 4.000 | 3.956 |
| **sd** | 0.000 | | | 0.007 | 4.472 | 0.894 | 0.894 |
| **A to B** | 0.000 | 1.000 | | | | 0.000 | |
| **sd** | 0.000 | | | | | 0.000 | |
| **Beta** | 0.000 | 1.000 | 1.000 | 0.301 | 90,195 | 18,039.000 | 18,038.699 |
| **sd** | 0.000 | | | 0.017 | 300.325 | 60.065 | 60.065 |

| | Net Activity dpm | LLD dpm | MDC pCi/l | MPC pCi/l | Net Concentration * pCi/l | Conc / MPC Ratio |
|---|---|---|---|---|---|---|
| **Alpha** | 0.000 | 0.000 | 0.000 | 1.000 | 0.000 ± 0.000 | 0.000 |
| **sd** | 0.000 | | | | 0.000 | |
| **Beta** | 0.000 | 0.000 | 0.000 | 1.000 | 0.000 ± 0.000 | 0.000 |
| **sd** | 0.000 | | | | 0.000 | |

*** Note: Decay Corrected** **MDC Method** Tb = Ts < 10 **Error =** .00 **x sd**

# Alpha/Beta Count Results

## Sample Activity Report

## Orange 20-23 - C

**Addr:** 22

**Sample ID** ICABT-6322;B1

**Repeat** 36

**Carrier No.** 0

**Batch ID** m122627

**Count Method** Gross Alpha Beta

**Detector Volts** 1515

| | | | |
|---|---|---|---|
| **Sample Qty** | 0 ***l*** | **sd** | 0 ***l*** |
| **Residual Wt** | 0 ***mg*** | **sd** | 0 ***mg*** |

**Count Began** 1/23/2013 1:07:24 PM **Collection Date 1** 1/1/1900 **Half Life** 0.00 ***days***

**Count Ended** 1/23/2013 1:12:33 PM **Collection Date 2** 1/1/1900 **Decay Factor** 1.000

**Sample Count Time** 5.00 ***mins*** **Background Count Time** 1,000.00 ***mins***

| | Efficiency % | Attenuation Factor | Activity Divisor | Background cpm | Gross counts | Gross cpm | Net cpm |
|---|---|---|---|---|---|---|---|
| **Alpha** | 0.000 | 1.000 | 1.000 | 0.044 | 23 | 4.600 | 4.556 |
| **sd** | 0.000 | | | 0.007 | 4.796 | 0.959 | 0.959 |
| **A to B** | 0.000 | 1.000 | | | | 0.000 | |
| **sd** | 0.000 | | | | | 0.000 | |
| **Beta** | 0.000 | 1.000 | 1.000 | 0.301 | 93,925 | 18,785.000 | 18,784.699 |
| **sd** | 0.000 | | | 0.017 | 306.472 | 61.294 | 61.294 |

| | Net Activity dpm | LLD dpm | MDC pCi/l | MPC pCi/l | Net Concentration * pCi/l | Conc / MPC Ratio |
|---|---|---|---|---|---|---|
| **Alpha** | 0.000 | 0.000 | 0.000 | 1.000 | 0.000 ± 0.000 | 0.000 |
| **sd** | 0.000 | | | | 0.000 | |
| **Beta** | 0.000 | 0.000 | 0.000 | 1.000 | 0.000 ± 0.000 | 0.000 |
| **sd** | 0.000 | | | | 0.000 | |

*** Note: Decay Corrected** **MDC Method** Tb = Ts < 10 **Error =** .00 **x sd**

# Alpha/Beta Count Results

## Sample Activity Report

## Orange 20-23 - C

**Addr:** 22

**Sample ID** ICABT-6322;B8

**Repeat** 36

**Carrier No.** 0

**Batch ID** m122627

**Count Method** Gross Alpha Beta

**Detector Volts** 1515

| | | | |
|---|---|---|---|
| **Sample Qty** | 0 ***l*** | **sd** | 0 ***l*** |
| **Residual Wt** | 0 ***mg*** | **sd** | 0 ***mg*** |

**Count Began** 1/23/2013 1:15:17 PM **Collection Date 1** 1/1/1900 **Half Life** 0.00 ***days***

**Count Ended** 1/23/2013 1:20:26 PM **Collection Date 2** 1/1/1900 **Decay Factor** 1.000

**Sample Count Time** 5.00 ***mins*** **Background Count Time** 1,000.00 ***mins***

| | Efficiency % | Attenuation Factor | Activity Divisor | Background cpm | Gross counts | Gross cpm | Net cpm |
|---|---|---|---|---|---|---|---|
| **Alpha** | 0.000 | 1.000 | 1.000 | 0.044 | 18 | 3.600 | 3.556 |
| **sd** | 0.000 | | | 0.007 | 4.243 | 0.849 | 0.849 |
| **A to B** | 0.000 | 1.000 | | | | 0.000 | |
| **sd** | 0.000 | | | | | 0.000 | |
| **Beta** | 0.000 | 1.000 | 1.000 | 0.301 | 78,301 | 15,660.200 | 15,659.899 |
| **sd** | 0.000 | | | 0.017 | 279.823 | 55.965 | 55.965 |

| | Net Activity dpm | LLD dpm | MDC pCi/l | MPC pCi/l | Net Concentration * pCi/l | Conc / MPC Ratio |
|---|---|---|---|---|---|---|
| **Alpha** | 0.000 | 0.000 | 0.000 | 1.000 | 0.000 ± 0.000 | 0.000 |
| **sd** | 0.000 | | | | 0.000 | |
| **Beta** | 0.000 | 0.000 | 0.000 | 1.000 | 0.000 ± 0.000 | 0.000 |
| **sd** | 0.000 | | | | 0.000 | |

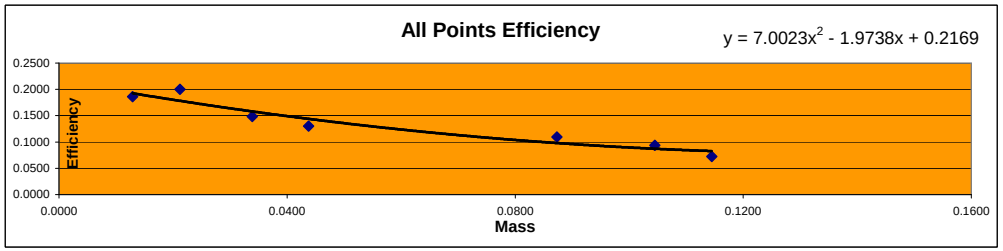
*** Note: Decay Corrected** **MDC Method** Tb = Ts < 10 **Error =** .00 **x sd**

## Curve is for Gross Alpha

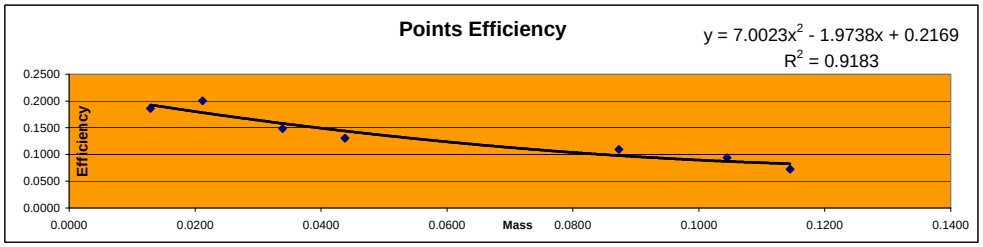
**Orange 22**

| Detector ID | Sample ID | Count Date | Count Time | Alpha Counts | Net CPM | DPM | Th-230 Efficiency | Standard Aliquot | Mass |
|---|---|---|---|---|---|---|---|---|---|
| 22 | ICABT-51465;A1 | 1/7/2016 9:33 | 40 | 17671 | 441.775 | 2374.5 | 0.1860 | 1mL | 0.0129 |
| 22 | ICABT-51465;A2 | 1/7/2016 8:28 | 40 | 19010 | 475.250 | 2374.5 | 0.2001 | 1mL | 0.0212 |
| 22 | ICABT-51465;A3 | 1/7/2016 7:41 | 40 | 14069 | 351.725 | 2374.5 | 0.1481 | 1mL | 0.0339 |
| 22 | ICABT-51465;A4 | 1/7/2016 6:23 | 40 | 12383 | 309.575 | 2374.5 | 0.1304 | 1mL | 0.0438 |
| 22 | ICABT-51465;A6 | 1/7/2016 1:05 | 40 | 20786 | 519.650 | 4749.0 | 0.1094 | 2mL | 0.0873 |
| 22 | ICABT-51465;A7 | 1/7/2016 0:06 | 40 | 17837 | 445.925 | 4749.0 | 0.0939 | 2mL | 0.1045 |
| 22 | ICABT-51465;A8 | 1/7/2016 10:30 | 40 | 13791 | 344.775 | 4749.0 | 0.0726 | 2mL | 0.1145 |

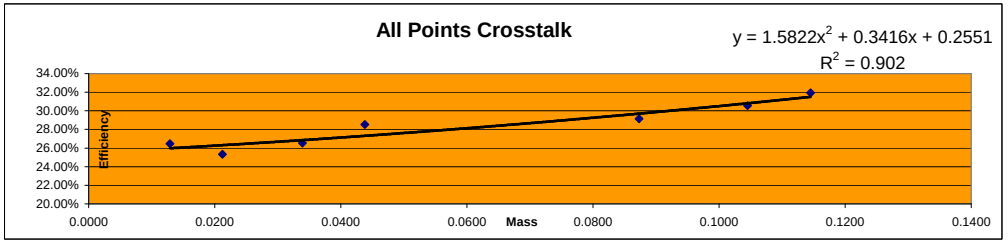
| Mass | Measured Efficiency | Theoretical Efficiency | Percent Δ Efficiency |
|---|---|---|---|
| 0.0129 | 0.1860 | 0.1926 | -3.40% |
| 0.0212 | 0.2001 | 0.1782 | 12.31% |
| 0.0339 | 0.1481 | 0.1580 | -6.27% |
| 0.0438 | 0.1304 | 0.1439 | -9.39% |
| 0.0873 | 0.1094 | 0.0980 | 11.71% |
| 0.1045 | 0.0939 | 0.0871 | 7.80% |
| 0.1145 | 0.0726 | 0.0827 | -12.22% |




| Mass | Efficiency |
|---|---|
| 0.0129 | 0.1860 |
| 0.0212 | 0.2001 |
| 0.0339 | 0.1481 |
| 0.0438 | 0.1304 |
| 0.0873 | 0.1094 |
| 0.1045 | 0.0939 |
| 0.1145 | 0.0726 |




| Detector ID | Sample ID | Mass | Count Time | Alpha Counts | Beta Counts | Alpha CPM | Beta CPM | % α into β | |
|---|---|---|---|---|---|---|---|---|---|
| 22 | ICABT-51465;A1 | 0.0129 | 40 | 17671 | 6356 | 441.78 | 158.90 | 26.45% | Min |
| 22 | ICABT-51465;A2 | 0.0212 | 40 | 19010 | 6450 | 475.25 | 161.25 | 25.33% | 25.33% |
| 22 | ICABT-51465;A3 | 0.0339 | 40 | 14069 | 5079 | 351.73 | 126.98 | 26.52% | |
| 22 | ICABT-51465;A4 | 0.0438 | 40 | 12383 | 4946 | 309.58 | 123.65 | 28.54% | Max |
| 22 | ICABT-51465;A6 | 0.0873 | 40 | 20786 | 8547 | 519.65 | 213.68 | 29.14% | |
| 22 | ICABT-51465;A7 | 0.1045 | 40 | 17837 | 7845 | 445.93 | 196.13 | 30.55% | Mean |
| 22 | ICABT-51465;A8 | 0.1145 | 40 | 13791 | 6466 | 344.78 | 161.65 | 31.92% | 28.35% |




**Standard ID**
Thorium-230
Th-230_00016 #51465
Cert # 92523 Ref. date 11/29/2012
Activity 2374.5 dpm/mL

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# Alpha/Beta Count Results

## Sample Activity Report

## Orange 20-23 - C

**Addr:** 22

**Sample ID** ICABT-51465;A7

**Repeat** 1013

**Carrier No.** 0

**Batch ID** m153000

**Count Method** Gross Alpha Beta

**Detector Volts** 1515

| | | | |
|---|---|---|---|
| **Sample Qty** | 0 ***l*** | **sd** | 0 ***l*** |
| **Residual Wt** | 0 ***mg*** | **sd** | 0 ***mg*** |

**Count Began** 1/7/2016 12:06:31 AM **Collection Date 1** 1/1/1900 **Half Life** 0.00 ***days***

**Count Ended** 1/7/2016 12:46:38 AM **Collection Date 2** 1/1/1900 **Decay Factor** 1.000

**Sample Count Time** 40.00 ***mins*** **Background Count Time** 1,000.00 ***mins***

| | Efficiency % | Attenuation Factor | Activity Divisor | Background cpm | Gross counts | Gross cpm | Net cpm |
|---|---|---|---|---|---|---|---|
| **Alpha** | 0.000 | 1.000 | 1.000 | 0.048 | 17,837 | 445.925 | 445.877 |
| **sd** | 0.000 | | | 0.007 | 133.555 | 3.339 | 3.339 |
| **A to B** | 0.000 | 1.000 | | | | 0.000 | |
| **sd** | 0.000 | | | | | 0.000 | |
| **Beta** | 0.000 | 1.000 | 1.000 | 0.419 | 7,845 | 196.125 | 195.706 |
| **sd** | 0.000 | | | 0.020 | 88.572 | 2.214 | 2.214 |

| | Net Activity dpm | LLD dpm | MDC pCi/l | MPC pCi/l | Net Concentration * pCi/l | Conc / MPC Ratio |
|---|---|---|---|---|---|---|
| **Alpha** | 0.000 | 0.000 | 0.000 | 1.000 | 0.000 ± 0.000 | 0.000 |
| **sd** | 0.000 | | | | 0.000 | |
| **Beta** | 0.000 | 0.000 | 0.000 | 1.000 | 0.000 ± 0.000 | 0.000 |
| **sd** | 0.000 | | | | 0.000 | |

*** Note: Decay Corrected** **MDC Method** Tb = Ts < 10 **Error =** .00 **x sd**

# Alpha/Beta Count Results

## Sample Activity Report

## Orange 20-23 - C

**Addr:** 22

**Sample ID** ICABT-51465;A6

**Repeat** 1015

**Carrier No.** 0

**Batch ID** m153000

**Count Method** Gross Alpha Beta

**Detector Volts** 1515

| | | | |
|---|---|---|---|
| **Sample Qty** | 0 ***l*** | **sd** | 0 ***l*** |
| **Residual Wt** | 0 ***mg*** | **sd** | 0 ***mg*** |

**Count Began** 1/7/2016 1:05:41 AM **Collection Date 1** 1/1/1900 **Half Life** 0.00 ***days***

**Count Ended** 1/7/2016 1:45:48 AM **Collection Date 2** 1/1/1900 **Decay Factor** 1.000

**Sample Count Time** 40.00 ***mins*** **Background Count Time** 1,000.00 ***mins***

| | Efficiency % | Attenuation Factor | Activity Divisor | Background cpm | Gross counts | Gross cpm | Net cpm |
|---|---|---|---|---|---|---|---|
| **Alpha** | 0.000 | 1.000 | 1.000 | 0.048 | 20,786 | 519.650 | 519.602 |
| **sd** | 0.000 | | | 0.007 | 144.174 | 3.604 | 3.604 |
| **A to B** | 0.000 | 1.000 | | | | 0.000 | |
| **sd** | 0.000 | | | | | 0.000 | |
| **Beta** | 0.000 | 1.000 | 1.000 | 0.419 | 8,547 | 213.675 | 213.256 |
| **sd** | 0.000 | | | 0.020 | 92.450 | 2.311 | 2.311 |

| | Net Activity dpm | LLD dpm | MDC pCi/l | MPC pCi/l | Net Concentration * pCi/l | Conc / MPC Ratio |
|---|---|---|---|---|---|---|
| **Alpha** | 0.000 | 0.000 | 0.000 | 1.000 | 0.000 ± 0.000 | 0.000 |
| **sd** | 0.000 | | | | 0.000 | |
| **Beta** | 0.000 | 0.000 | 0.000 | 1.000 | 0.000 ± 0.000 | 0.000 |
| **sd** | 0.000 | | | | 0.000 | |

*** Note: Decay Corrected** **MDC Method** Tb = Ts < 10 **Error =** .00 **x sd**

# Alpha/Beta Count Results

## Sample Activity Report

## Orange 20-23 - C

**Addr:** 22

**Sample ID** ICABT-51465;A5

**Repeat** 1017

**Carrier No.** 0

**Batch ID** m153000

**Count Method** Gross Alpha Beta

**Detector Volts** 1515

| | | | |
|---|---|---|---|
| **Sample Qty** | 0 ***l*** | **sd** | 0 ***l*** |
| **Residual Wt** | 0 ***mg*** | **sd** | 0 ***mg*** |

**Count Began** 1/7/2016 1:46:59 AM **Collection Date 1** 1/1/1900 **Half Life** 0.00 ***days***

**Count Ended** 1/7/2016 2:27:05 AM **Collection Date 2** 1/1/1900 **Decay Factor** 1.000

**Sample Count Time** 40.00 ***mins*** **Background Count Time** 1,000.00 ***mins***

| | Efficiency % | Attenuation Factor | Activity Divisor | Background cpm | Gross counts | Gross cpm | Net cpm |
|---|---|---|---|---|---|---|---|
| **Alpha** | 0.000 | 1.000 | 1.000 | 0.048 | 17,115 | 427.875 | 427.827 |
| **sd** | 0.000 | | | 0.007 | 130.824 | 3.271 | 3.271 |
| **A to B** | 0.000 | 1.000 | | | | 0.000 | |
| **sd** | 0.000 | | | | | 0.000 | |
| **Beta** | 0.000 | 1.000 | 1.000 | 0.419 | 7,731 | 193.275 | 192.856 |
| **sd** | 0.000 | | | 0.020 | 87.926 | 2.198 | 2.198 |

| | Net Activity dpm | LLD dpm | MDC pCi/l | MPC pCi/l | Net Concentration * pCi/l | Conc / MPC Ratio |
|---|---|---|---|---|---|---|
| **Alpha** | 0.000 | 0.000 | 0.000 | 1.000 | 0.000 ± 0.000 | 0.000 |
| **sd** | 0.000 | | | | 0.000 | |
| **Beta** | 0.000 | 0.000 | 0.000 | 1.000 | 0.000 ± 0.000 | 0.000 |
| **sd** | 0.000 | | | | 0.000 | |

*** Note: Decay Corrected** **MDC Method** Tb = Ts < 10 **Error =** .00 **x sd**

# Alpha/Beta Count Results

## Sample Activity Report

## Orange 20-23 - C

Addr: 22

**Sample ID** ICABT-51465;A4

**Repeat** 1019

**Carrier No.** 0

**Batch ID** m153000

**Count Method** Gross Alpha Beta

**Detector Volts** 1515

| | | | |
|---|---|---|---|
| **Sample Qty** | 0 ***l*** | **sd** | 0 ***l*** |
| **Residual Wt** | 0 ***mg*** | **sd** | 0 ***mg*** |

**Count Began** 1/7/2016 6:23:32 AM

**Collection Date 1** 1/1/1900

**Half Life** 0.00 ***days***

**Count Ended** 1/7/2016 7:03:37 AM

**Collection Date 2** 1/1/1900

**Decay Factor** 1.000

**Sample Count Time** 40.00 ***mins***

**Background Count Time** 1,000.00 ***mins***

| | Efficiency % | Attenuation Factor | Activity Divisor | Background cpm | Gross counts | Gross cpm | Net cpm |
|---|---|---|---|---|---|---|---|
| **Alpha** | 0.000 | 1.000 | 1.000 | 0.048 | 12,383 | 309.575 | 309.527 |
| **sd** | 0.000 | | | 0.007 | 111.279 | 2.782 | 2.782 |
| **A to B** | 0.000 | 1.000 | | | | 0.000 | |
| **sd** | 0.000 | | | | | 0.000 | |
| **Beta** | 0.000 | 1.000 | 1.000 | 0.419 | 4,946 | 123.650 | 123.231 |
| **sd** | 0.000 | | | 0.020 | 70.328 | 1.758 | 1.758 |

| | Net Activity dpm | LLD dpm | MDC pCi/l | MPC pCi/l | Net Concentration * pCi/l | Conc / MPC Ratio |
|---|---|---|---|---|---|---|
| **Alpha** | 0.000 | 0.000 | 0.000 | 1.000 | 0.000 ± 0.000 | 0.000 |
| **sd** | 0.000 | | | | 0.000 | |
| **Beta** | 0.000 | 0.000 | 0.000 | 1.000 | 0.000 ± 0.000 | 0.000 |
| **sd** | 0.000 | | | | 0.000 | |

*** Note: Decay Corrected**

**MDC Method** Tb = Ts < 10

**Error =** .00 **x sd**

# Alpha/Beta Count Results

## Sample Activity Report

## Orange 20-23 - C

**Addr:** 22

**Sample ID** ICABT-51465;A3

**Repeat** 1021

**Carrier No.** 0

**Batch ID** m153000

**Count Method** Gross Alpha Beta

**Detector Volts** 1515

**Sample Qty** 0 *l* **sd** 0 *l*

**Residual Wt** 0 *mg* **sd** 0 *mg*

**Count Began** 1/7/2016 7:41:01 AM **Collection Date 1** 1/1/1900 **Half Life** 0.00 *days*

**Count Ended** 1/7/2016 8:21:06 AM **Collection Date 2** 1/1/1900 **Decay Factor** 1.000

**Sample Count Time** 40.00 *mins* **Background Count Time** 1,000.00 *mins*

| | Efficiency % | Attenuation Factor | Activity Divisor | Background cpm | Gross counts | Gross cpm | Net cpm |
|---|---|---|---|---|---|---|---|
| **Alpha** | 0.000 | 1.000 | 1.000 | 0.048 | 14,069 | 351.725 | 351.677 |
| **sd** | 0.000 | | | 0.007 | 118.613 | 2.965 | 2.965 |
| **A to B** | 0.000 | 1.000 | | | | 0.000 | |
| **sd** | 0.000 | | | | | 0.000 | |
| **Beta** | 0.000 | 1.000 | 1.000 | 0.419 | 5,079 | 126.975 | 126.556 |
| **sd** | 0.000 | | | 0.020 | 71.267 | 1.782 | 1.782 |

| | Net Activity dpm | LLD dpm | MDC pCi/l | MPC pCi/l | Net Concentration * pCi/l | Conc / MPC Ratio |
|---|---|---|---|---|---|---|
| **Alpha** | 0.000 | 0.000 | 0.000 | 1.000 | 0.000 ± 0.000 | 0.000 |
| **sd** | 0.000 | | | | 0.000 | |
| **Beta** | 0.000 | 0.000 | 0.000 | 1.000 | 0.000 ± 0.000 | 0.000 |
| **sd** | 0.000 | | | | 0.000 | |

*** Note: Decay Corrected** **MDC Method** Tb = Ts < 10 **Error =** .00 **x sd**

# Alpha/Beta Count Results

## Sample Activity Report

## Orange 20-23 - C

**Addr:** 22

**Sample ID** ICABT-51465;A2

**Repeat** 1023

**Carrier No.** 0

**Batch ID** m153000

**Count Method** Gross Alpha Beta

**Detector Volts** 1515

| | | | |
|---|---|---|---|
| **Sample Qty** | 0 ***l*** | **sd** | 0 ***l*** |
| **Residual Wt** | 0 ***mg*** | **sd** | 0 ***mg*** |

**Count Began** 1/7/2016 8:28:51 AM **Collection Date 1** 1/1/1900 **Half Life** 0.00 ***days***

**Count Ended** 1/7/2016 9:08:57 AM **Collection Date 2** 1/1/1900 **Decay Factor** 1.000

**Sample Count Time** 40.00 ***mins*** **Background Count Time** 1,000.00 ***mins***

| | Efficiency % | Attenuation Factor | Activity Divisor | Background cpm | Gross counts | Gross cpm | Net cpm |
|---|---|---|---|---|---|---|---|
| **Alpha** | 0.000 | 1.000 | 1.000 | 0.048 | 19,010 | 475.250 | 475.202 |
| **sd** | 0.000 | | | 0.007 | 137.877 | 3.447 | 3.447 |
| **A to B** | 0.000 | 1.000 | | | | 0.000 | |
| **sd** | 0.000 | | | | | 0.000 | |
| **Beta** | 0.000 | 1.000 | 1.000 | 0.419 | 6,450 | 161.250 | 160.831 |
| **sd** | 0.000 | | | 0.020 | 80.312 | 2.008 | 2.008 |

| | Net Activity dpm | LLD dpm | MDC pCi/l | MPC pCi/l | Net Concentration * pCi/l | Conc / MPC Ratio |
|---|---|---|---|---|---|---|
| **Alpha** | 0.000 | 0.000 | 0.000 | 1.000 | 0.000 ± 0.000 | 0.000 |
| **sd** | 0.000 | | | | 0.000 | |
| **Beta** | 0.000 | 0.000 | 0.000 | 1.000 | 0.000 ± 0.000 | 0.000 |
| **sd** | 0.000 | | | | 0.000 | |

*** Note: Decay Corrected** **MDC Method** Tb = Ts < 10 **Error =** .00 **x sd**

# Alpha/Beta Count Results

## Sample Activity Report

## Orange 20-23 - C

**Addr:** 22

**Sample ID** ICABT-51465;A1

**Repeat** 1017

**Carrier No.** 0

**Batch ID** m153000

**Count Method** Gross Alpha Beta

**Detector Volts** 1515

**Sample Qty** 0 *l* **sd** 0 *l*

**Residual Wt** 0 *mg* **sd** 0 *mg*

**Count Began** 1/7/2016 9:33:18 AM **Collection Date 1** 1/1/1900 **Half Life** 0.00 *days*

**Count Ended** 1/7/2016 10:13:23 AM **Collection Date 2** 1/1/1900 **Decay Factor** 1.000

**Sample Count Time** 40.00 *mins* **Background Count Time** 1,000.00 *mins*

| | Efficiency % | Attenuation Factor | Activity Divisor | Background cpm | Gross counts | Gross cpm | Net cpm |
|---|---|---|---|---|---|---|---|
| **Alpha** | 0.000 | 1.000 | 1.000 | 0.048 | 17,671 | 441.775 | 441.727 |
| **sd** | 0.000 | | | 0.007 | 132.932 | 3.323 | 3.323 |
| **A to B** | 0.000 | 1.000 | | | | 0.000 | |
| **sd** | 0.000 | | | | | 0.000 | |
| **Beta** | 0.000 | 1.000 | 1.000 | 0.419 | 6,356 | 158.900 | 158.481 |
| **sd** | 0.000 | | | 0.020 | 79.725 | 1.993 | 1.993 |

| | Net Activity dpm | LLD dpm | MDC pCi/l | MPC pCi/l | Net Concentration * pCi/l | Conc / MPC Ratio |
|---|---|---|---|---|---|---|
| **Alpha** | 0.000 | 0.000 | 0.000 | 1.000 | 0.000 ± 0.000 | 0.000 |
| **sd** | 0.000 | | | | 0.000 | |
| **Beta** | 0.000 | 0.000 | 0.000 | 1.000 | 0.000 ± 0.000 | 0.000 |
| **sd** | 0.000 | | | | 0.000 | |

*** Note: Decay Corrected** **MDC Method** Tb = Ts < 10 **Error =** .00 **x sd**

# Alpha/Beta Count Results

## Sample Activity Report

## Orange 20-23 - C

**Addr:** 22

**Sample ID** ICABT-51465;A8

**Repeat** 1019

**Carrier No.** 0

**Batch ID** m153000

**Count Method** Gross Alpha Beta

**Detector Volts** 1515

| | | | |
|---|---|---|---|
| **Sample Qty** | 0 ***l*** | **sd** | 0 ***l*** |
| **Residual Wt** | 0 ***mg*** | **sd** | 0 ***mg*** |

**Count Began** 1/7/2016 10:30:27 AM **Collection Date 1** 1/1/1900 **Half Life** 0.00 ***days***

**Count Ended** 1/7/2016 11:10:32 AM **Collection Date 2** 1/1/1900 **Decay Factor** 1.000

**Sample Count Time** 40.00 ***mins*** **Background Count Time** 1,000.00 ***mins***

| | Efficiency % | Attenuation Factor | Activity Divisor | Background cpm | Gross counts | Gross cpm | Net cpm |
|---|---|---|---|---|---|---|---|
| **Alpha** | 0.000 | 1.000 | 1.000 | 0.048 | 13,791 | 344.775 | 344.727 |
| **sd** | 0.000 | | | 0.007 | 117.435 | 2.936 | 2.936 |
| **A to B** | 0.000 | 1.000 | | | | 0.000 | |
| **sd** | 0.000 | | | | | 0.000 | |
| **Beta** | 0.000 | 1.000 | 1.000 | 0.419 | 6,466 | 161.650 | 161.231 |
| **sd** | 0.000 | | | 0.020 | 80.411 | 2.010 | 2.010 |

| | Net Activity dpm | LLD dpm | MDC pCi/l | MPC pCi/l | Net Concentration * pCi/l | Conc / MPC Ratio |
|---|---|---|---|---|---|---|
| **Alpha** | 0.000 | 0.000 | 0.000 | 1.000 | 0.000 ± 0.000 | 0.000 |
| **sd** | 0.000 | | | | 0.000 | |
| **Beta** | 0.000 | 0.000 | 0.000 | 1.000 | 0.000 ± 0.000 | 0.000 |
| **sd** | 0.000 | | | | 0.000 | |

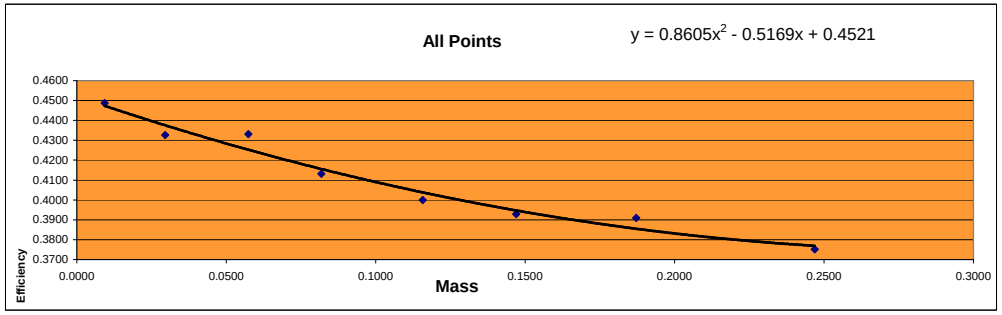
*** Note: Decay Corrected** **MDC Method** Tb = Ts < 10 **Error =** .00 **x sd**

**Curve is for Gross Beta**
**Strontium 90**
**and**
**Total Strontium**

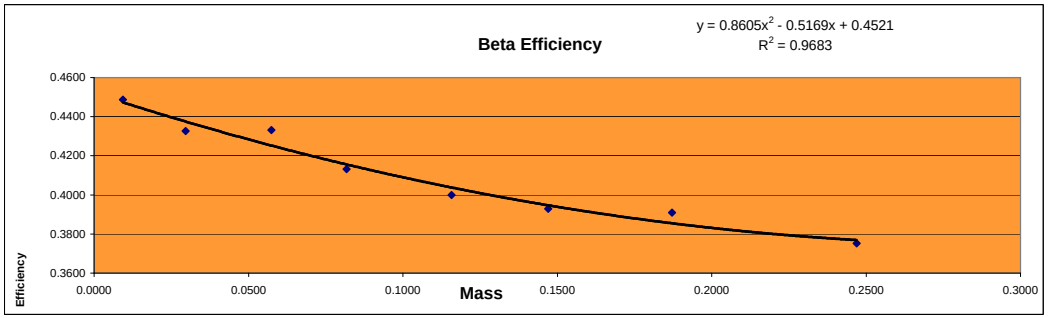
**Orange 23**

| Detector ID | Std ID | Count Date | Sample Wt | Count Time | Beta Counts | DPM 41588.469 CPM | Sr-90 Eff | Standard Aliquot |
|---|---|---|---|---|---|---|---|---|
| 23 | B1 | 1/23/2013 13:14 | 0.0093 | 5 | 93320 | 18664.000 | 0.4488 | 1mL |
| 23 | B2 | 1/23/2013 13:07 | 0.0296 | 5 | 89959 | 17991.800 | 0.4326 | 1mL |
| 23 | B3 | 1/23/2013 13:00 | 0.0574 | 5 | 90060 | 18012.000 | 0.4331 | 1mL |
| 23 | B4 | 1/23/2013 12:53 | 0.0818 | 5 | 85913 | 17182.600 | 0.4132 | 1mL |
| 23 | B5 | 1/23/2013 12:46 | 0.1157 | 5 | 83172 | 16634.400 | 0.4000 | 1mL |
| 23 | B6 | 1/23/2013 12:38 | 0.1470 | 5 | 81701 | 16340.200 | 0.3929 | 1mL |
| 23 | B7 | 1/23/2013 12:30 | 0.1871 | 5 | 81277 | 16255.400 | 0.3909 | 1mL |
| 23 | B8 | 1/23/2013 12:20 | 0.2469 | 5 | 78026 | 15605.200 | 0.3752 | 1mL |

| Mass | Measured Efficiency | Theoretical Efficiency | Percent Δ Efficiency |
|---|---|---|---|
| 0.0093 | 0.4488 | 0.4474 | 0.32% |
| 0.0296 | 0.4326 | 0.4376 | -1.13% |
| 0.0574 | 0.4331 | 0.4253 | 1.84% |
| 0.0818 | 0.4132 | 0.4156 | -0.58% |
| 0.1157 | 0.4000 | 0.4038 | -0.95% |
| 0.1470 | 0.3929 | 0.3947 | -0.46% |
| 0.1871 | 0.3909 | 0.3855 | 1.39% |
| 0.2469 | 0.3752 | 0.3769 | -0.45% |




| Mass | Efficiency |
|---|---|
| 0.0093 | 0.4488 |
| 0.0296 | 0.4326 |
| 0.0574 | 0.4331 |
| 0.0818 | 0.4132 |
| 0.1157 | 0.4000 |
| 0.1470 | 0.3929 |
| 0.1871 | 0.3909 |
| 0.2469 | 0.3752 |




**Standard ID**
Strontium 90
Sr-90_00004 #6322
Cert# 80573-334 Ref. date 9/172009

| | | |
|---|---|---|
| Initial Activity: | 22560 | dpm/mL |
| Reference Date: | 9/17/2009 | |
| Count Date: | 1/23/2013 | |
| Elapsed Time: | 1224.000 | days |
| Half Life: | 10409.625 | days |
| Exponential Term: | 0.921730256 | |
| Corrected Activity: | 20794.23458 | dpm/mL |
| Decay Activity (Sr/Y-90) | 41588.46916 | dpm |

# Alpha/Beta Count Results

## Sample Activity Report

## Orange 20-23 - D

**Addr:** 23

**Sample ID** ICABT-6322;B8

**Repeat** 29

**Carrier No.** 0

**Batch ID** m122627

**Count Method** Gross Alpha Beta

**Detector Volts** 1515

**Sample Qty** 0 *l* **sd** 0 *l*

**Residual Wt** 0 *mg* **sd** 0 *mg*

**Count Began** 1/23/2013 12:20:54 PM **Collection Date 1** 1/1/1900 **Half Life** 0.00 *days*

**Count Ended** 1/23/2013 12:26:03 PM **Collection Date 2** 1/1/1900 **Decay Factor** 1.000

**Sample Count Time** 5.00 *mins* **Background Count Time** 1,000.00 *mins*

| | Efficiency % | Attenuation Factor | Activity Divisor | Background cpm | Gross counts | Gross cpm | Net cpm |
|---|---|---|---|---|---|---|---|
| **Alpha** | 0.000 | 1.000 | 1.000 | 0.046 | 34 | 6.800 | 6.754 |
| **sd** | 0.000 | | | 0.007 | 5.831 | 1.166 | 1.166 |
| **A to B** | 0.000 | 1.000 | | | | 0.000 | |
| **sd** | 0.000 | | | | | 0.000 | |
| **Beta** | 0.000 | 1.000 | 1.000 | 0.330 | 78,026 | 15,605.200 | 15,604.870 |
| **sd** | 0.000 | | | 0.018 | 279.331 | 55.866 | 55.866 |

| | Net Activity dpm | LLD dpm | MDC pCi/l | MPC pCi/l | Net Concentration * pCi/l | Conc / MPC Ratio |
|---|---|---|---|---|---|---|
| **Alpha** | 0.000 | 0.000 | 0.000 | 1.000 | 0.000 ± 0.000 | 0.000 |
| **sd** | 0.000 | | | | 0.000 | |
| **Beta** | 0.000 | 0.000 | 0.000 | 1.000 | 0.000 ± 0.000 | 0.000 |
| **sd** | 0.000 | | | | 0.000 | |

*** Note: Decay Corrected** **MDC Method** Tb = Ts < 10 **Error =** .00 **x sd**

# Alpha/Beta Count Results

## Sample Activity Report

## Orange 20-23 - D

**Addr:** 23

**Sample ID** ICABT-6322;B7

**Repeat** 30

**Carrier No.** 0

**Batch ID** m122627

**Count Method** Gross Alpha Beta

**Detector Volts** 1515

| | | | |
|---|---|---|---|
| **Sample Qty** | 0 ***l*** | **sd** | 0 ***l*** |
| **Residual Wt** | 0 ***mg*** | **sd** | 0 ***mg*** |

**Count Began** 1/23/2013 12:30:20 PM **Collection Date 1** 1/1/1900 **Half Life** 0.00 ***days***

**Count Ended** 1/23/2013 12:35:29 PM **Collection Date 2** 1/1/1900 **Decay Factor** 1.000

**Sample Count Time** 5.00 ***mins*** **Background Count Time** 1,000.00 ***mins***

| | Efficiency % | Attenuation Factor | Activity Divisor | Background cpm | Gross counts | Gross cpm | Net cpm |
|---|---|---|---|---|---|---|---|
| **Alpha** | 0.000 | 1.000 | 1.000 | 0.046 | 28 | 5.600 | 5.554 |
| **sd** | 0.000 | | | 0.007 | 5.292 | 1.058 | 1.058 |
| **A to B** | 0.000 | 1.000 | | | | 0.000 | |
| **sd** | 0.000 | | | | | 0.000 | |
| **Beta** | 0.000 | 1.000 | 1.000 | 0.330 | 81,277 | 16,255.400 | 16,255.070 |
| **sd** | 0.000 | | | 0.018 | 285.091 | 57.018 | 57.018 |

| | Net Activity dpm | LLD dpm | MDC pCi/l | MPC pCi/l | Net Concentration * pCi/l | Conc / MPC Ratio |
|---|---|---|---|---|---|---|
| **Alpha** | 0.000 | 0.000 | 0.000 | 1.000 | 0.000 ± 0.000 | 0.000 |
| **sd** | 0.000 | | | | 0.000 | |
| **Beta** | 0.000 | 0.000 | 0.000 | 1.000 | 0.000 ± 0.000 | 0.000 |
| **sd** | 0.000 | | | | 0.000 | |

*** Note: Decay Corrected** **MDC Method** Tb = Ts < 10 **Error =** .00 **x sd**

# Alpha/Beta Count Results

## Sample Activity Report

## Orange 20-23 - D

**Addr:** 23

**Sample ID** ICABT-6322;B6

**Repeat** 31

**Carrier No.** 0

**Batch ID** m122627

**Count Method** Gross Alpha Beta

**Detector Volts** 1515

**Sample Qty** 0 *l* **sd** 0 *l*

**Residual Wt** 0 *mg* **sd** 0 *mg*

**Count Began** 1/23/2013 12:38:03 PM **Collection Date 1** 1/1/1900 **Half Life** 0.00 *days*

**Count Ended** 1/23/2013 12:43:11 PM **Collection Date 2** 1/1/1900 **Decay Factor** 1.000

**Sample Count Time** 5.00 *mins* **Background Count Time** 1,000.00 *mins*

| | Efficiency % | Attenuation Factor | Activity Divisor | Background cpm | Gross counts | Gross cpm | Net cpm |
|---|---|---|---|---|---|---|---|
| **Alpha** | 0.000 | 1.000 | 1.000 | 0.046 | 34 | 6.800 | 6.754 |
| **sd** | 0.000 | | | 0.007 | 5.831 | 1.166 | 1.166 |
| **A to B** | 0.000 | 1.000 | | | | 0.000 | |
| **sd** | 0.000 | | | | | 0.000 | |
| **Beta** | 0.000 | 1.000 | 1.000 | 0.330 | 81,701 | 16,340.200 | 16,339.870 |
| **sd** | 0.000 | | | 0.018 | 285.834 | 57.167 | 57.167 |

| | Net Activity dpm | LLD dpm | MDC pCi/l | MPC pCi/l | Net Concentration * pCi/l | Conc / MPC Ratio |
|---|---|---|---|---|---|---|
| **Alpha** | 0.000 | 0.000 | 0.000 | 1.000 | 0.000 ± 0.000 | 0.000 |
| **sd** | 0.000 | | | | 0.000 | |
| **Beta** | 0.000 | 0.000 | 0.000 | 1.000 | 0.000 ± 0.000 | 0.000 |
| **sd** | 0.000 | | | | 0.000 | |

*** Note: Decay Corrected** **MDC Method** Tb = Ts < 10 **Error =** .00 **x sd**

# Alpha/Beta Count Results

## Sample Activity Report

## Orange 20-23 - D

**Addr:** 23

**Sample ID** ICABT-6322;B5

**Repeat** 32

**Carrier No.** 0

**Batch ID** m122627

**Count Method** Gross Alpha Beta

**Detector Volts** 1515

**Sample Qty** 0 *l* **sd** 0 *l*

**Residual Wt** 0 *mg* **sd** 0 *mg*

**Count Began** 1/23/2013 12:46:01 PM **Collection Date 1** 1/1/1900 **Half Life** 0.00 *days*

**Count Ended** 1/23/2013 12:51:10 PM **Collection Date 2** 1/1/1900 **Decay Factor** 1.000

**Sample Count Time** 5.00 *mins* **Background Count Time** 1,000.00 *mins*

| | Efficiency % | Attenuation Factor | Activity Divisor | Background cpm | Gross counts | Gross cpm | Net cpm |
|---|---|---|---|---|---|---|---|
| **Alpha** | 0.000 | 1.000 | 1.000 | 0.046 | 29 | 5.800 | 5.754 |
| **sd** | 0.000 | | | 0.007 | 5.385 | 1.077 | 1.077 |
| **A to B** | 0.000 | 1.000 | | | | 0.000 | |
| **sd** | 0.000 | | | | | 0.000 | |
| **Beta** | 0.000 | 1.000 | 1.000 | 0.330 | 83,172 | 16,634.400 | 16,634.070 |
| **sd** | 0.000 | | | 0.018 | 288.396 | 57.679 | 57.679 |

| | Net Activity dpm | LLD dpm | MDC pCi/l | MPC pCi/l | Net Concentration * pCi/l | Conc / MPC Ratio |
|---|---|---|---|---|---|---|
| **Alpha** | 0.000 | 0.000 | 0.000 | 1.000 | 0.000 ± 0.000 | 0.000 |
| **sd** | 0.000 | | | | 0.000 | |
| **Beta** | 0.000 | 0.000 | 0.000 | 1.000 | 0.000 ± 0.000 | 0.000 |
| **sd** | 0.000 | | | | 0.000 | |

*** Note: Decay Corrected** **MDC Method** Tb = Ts < 10 **Error =** .00 **x sd**

# Alpha/Beta Count Results

## Sample Activity Report

## Orange 20-23 - D

**Addr:** 23

**Sample ID** ICABT-6322;B4

**Repeat** 34

**Carrier No.** 0

**Batch ID** m122627

**Count Method** Gross Alpha Beta

**Detector Volts** 1515

| | | | |
|---|---|---|---|
| **Sample Qty** | 0 ***l*** | **sd** | 0 ***l*** |
| **Residual Wt** | 0 ***mg*** | **sd** | 0 ***mg*** |

**Count Began** 1/23/2013 12:53:30 PM **Collection Date 1** 1/1/1900 **Half Life** 0.00 ***days***

**Count Ended** 1/23/2013 12:58:39 PM **Collection Date 2** 1/1/1900 **Decay Factor** 1.000

**Sample Count Time** 5.00 ***mins*** **Background Count Time** 1,000.00 ***mins***

| | Efficiency % | Attenuation Factor | Activity Divisor | Background cpm | Gross counts | Gross cpm | Net cpm |
|---|---|---|---|---|---|---|---|
| **Alpha** | 0.000 | 1.000 | 1.000 | 0.046 | 33 | 6.600 | 6.554 |
| **sd** | 0.000 | | | 0.007 | 5.745 | 1.149 | 1.149 |
| **A to B** | 0.000 | 1.000 | | | | 0.000 | |
| **sd** | 0.000 | | | | | 0.000 | |
| **Beta** | 0.000 | 1.000 | 1.000 | 0.330 | 85,913 | 17,182.600 | 17,182.270 |
| **sd** | 0.000 | | | 0.018 | 293.109 | 58.622 | 58.622 |

| | Net Activity dpm | LLD dpm | MDC pCi/l | MPC pCi/l | Net Concentration * pCi/l | Conc / MPC Ratio |
|---|---|---|---|---|---|---|
| **Alpha** | 0.000 | 0.000 | 0.000 | 1.000 | 0.000 ± 0.000 | 0.000 |
| **sd** | 0.000 | | | | 0.000 | |
| **Beta** | 0.000 | 0.000 | 0.000 | 1.000 | 0.000 ± 0.000 | 0.000 |
| **sd** | 0.000 | | | | 0.000 | |

*** Note: Decay Corrected** **MDC Method** Tb = Ts < 10 **Error =** .00 **x sd**

# Alpha/Beta Count Results

## Sample Activity Report

## Orange 20-23 - D

**Addr:** 23

**Sample ID** ICABT-6322;B3

**Repeat** 35

**Carrier No.** 0

**Batch ID** m122627

**Count Method** Gross Alpha Beta

**Detector Volts** 1515

**Sample Qty** 0 *l* **sd** 0 *l*

**Residual Wt** 0 *mg* **sd** 0 *mg*

**Count Began** 1/23/2013 1:00:20 PM **Collection Date 1** 1/1/1900 **Half Life** 0.00 *days*

**Count Ended** 1/23/2013 1:05:30 PM **Collection Date 2** 1/1/1900 **Decay Factor** 1.000

**Sample Count Time** 5.00 *mins* **Background Count Time** 1,000.00 *mins*

| | Efficiency % | Attenuation Factor | Activity Divisor | Background cpm | Gross counts | Gross cpm | Net cpm |
|---|---|---|---|---|---|---|---|
| **Alpha** | 0.000 | 1.000 | 1.000 | 0.046 | 40 | 8.000 | 7.954 |
| **sd** | 0.000 | | | 0.007 | 6.325 | 1.265 | 1.265 |
| **A to B** | 0.000 | 1.000 | | | | 0.000 | |
| **sd** | 0.000 | | | | | 0.000 | |
| **Beta** | 0.000 | 1.000 | 1.000 | 0.330 | 90,060 | 18,012.000 | 18,011.670 |
| **sd** | 0.000 | | | 0.018 | 300.100 | 60.020 | 60.020 |

| | Net Activity dpm | LLD dpm | MDC pCi/l | MPC pCi/l | Net Concentration * pCi/l | Conc / MPC Ratio |
|---|---|---|---|---|---|---|
| **Alpha** | 0.000 | 0.000 | 0.000 | 1.000 | 0.000 ± 0.000 | 0.000 |
| **sd** | 0.000 | | | | 0.000 | |
| **Beta** | 0.000 | 0.000 | 0.000 | 1.000 | 0.000 ± 0.000 | 0.000 |
| **sd** | 0.000 | | | | 0.000 | |

*** Note: Decay Corrected** **MDC Method** Tb = Ts < 10 **Error =** .00 **x sd**

# Alpha/Beta Count Results

## Sample Activity Report

## Orange 20-23 - D

**Addr:** 23

**Sample ID** ICABT-6322;B2

**Repeat** 36

**Carrier No.** 0

**Batch ID** m122627

**Count Method** Gross Alpha Beta

**Detector Volts** 1515

| | | | |
|---|---|---|---|
| **Sample Qty** | 0 ***l*** | **sd** | 0 ***l*** |
| **Residual Wt** | 0 ***mg*** | **sd** | 0 ***mg*** |

**Count Began** 1/23/2013 1:07:31 PM **Collection Date 1** 1/1/1900 **Half Life** 0.00 ***days***

**Count Ended** 1/23/2013 1:12:42 PM **Collection Date 2** 1/1/1900 **Decay Factor** 1.000

**Sample Count Time** 5.00 ***mins*** **Background Count Time** 1,000.00 ***mins***

| | Efficiency % | Attenuation Factor | Activity Divisor | Background cpm | Gross counts | Gross cpm | Net cpm |
|---|---|---|---|---|---|---|---|
| **Alpha** | 0.000 | 1.000 | 1.000 | 0.046 | 28 | 5.600 | 5.554 |
| **sd** | 0.000 | | | 0.007 | 5.292 | 1.058 | 1.058 |
| **A to B** | 0.000 | 1.000 | | | | 0.000 | |
| **sd** | 0.000 | | | | | 0.000 | |
| **Beta** | 0.000 | 1.000 | 1.000 | 0.330 | 89,959 | 17,991.800 | 17,991.470 |
| **sd** | 0.000 | | | 0.018 | 299.932 | 59.986 | 59.986 |

| | Net Activity dpm | LLD dpm | MDC pCi/l | MPC pCi/l | Net Concentration * pCi/l | Conc / MPC Ratio |
|---|---|---|---|---|---|---|
| **Alpha** | 0.000 | 0.000 | 0.000 | 1.000 | 0.000 ± 0.000 | 0.000 |
| **sd** | 0.000 | | | | 0.000 | |
| **Beta** | 0.000 | 0.000 | 0.000 | 1.000 | 0.000 ± 0.000 | 0.000 |
| **sd** | 0.000 | | | | 0.000 | |

*** Note: Decay Corrected** **MDC Method** Tb = Ts < 10 **Error =** .00 **x sd**

# Alpha/Beta Count Results

## Sample Activity Report

## Orange 20-23 - D

**Addr:** 23

**Sample ID** ICABT-6322;B1

**Repeat** 37

**Carrier No.** 0

**Batch ID** m122627

**Count Method** Gross Alpha Beta

**Detector Volts** 1515

**Sample Qty** 0 *l* **sd** 0 *l*

**Residual Wt** 0 *mg* **sd** 0 *mg*

**Count Began** 1/23/2013 1:14:46 PM **Collection Date 1** 1/1/1900 **Half Life** 0.00 *days*

**Count Ended** 1/23/2013 1:19:55 PM **Collection Date 2** 1/1/1900 **Decay Factor** 1.000

**Sample Count Time** 5.00 *mins* **Background Count Time** 1,000.00 *mins*

| | Efficiency % | Attenuation Factor | Activity Divisor | Background cpm | Gross counts | Gross cpm | Net cpm |
|---|---|---|---|---|---|---|---|
| **Alpha** | 0.000 | 1.000 | 1.000 | 0.046 | 34 | 6.800 | 6.754 |
| **sd** | 0.000 | | | 0.007 | 5.831 | 1.166 | 1.166 |
| **A to B** | 0.000 | 1.000 | | | | 0.000 | |
| **sd** | 0.000 | | | | | 0.000 | |
| **Beta** | 0.000 | 1.000 | 1.000 | 0.330 | 93,320 | 18,664.000 | 18,663.670 |
| **sd** | 0.000 | | | 0.018 | 305.483 | 61.097 | 61.097 |

| | Net Activity dpm | LLD dpm | MDC pCi/l | MPC pCi/l | Net Concentration * pCi/l | Conc / MPC Ratio |
|---|---|---|---|---|---|---|
| **Alpha** | 0.000 | 0.000 | 0.000 | 1.000 | 0.000 ± 0.000 | 0.000 |
| **sd** | 0.000 | | | | 0.000 | |
| **Beta** | 0.000 | 0.000 | 0.000 | 1.000 | 0.000 ± 0.000 | 0.000 |
| **sd** | 0.000 | | | | 0.000 | |

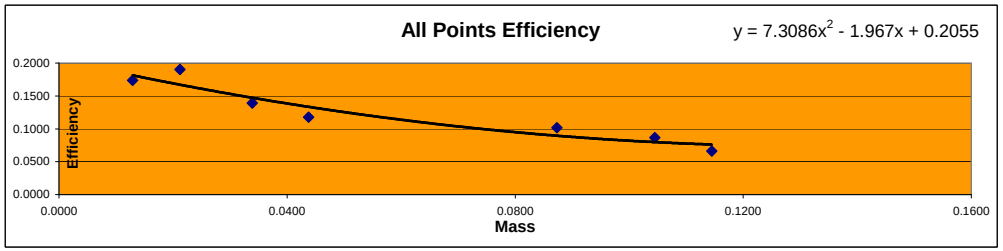
*** Note: Decay Corrected** **MDC Method** Tb = Ts < 10 **Error =** .00 **x sd**

## Curve is for Gross Alpha

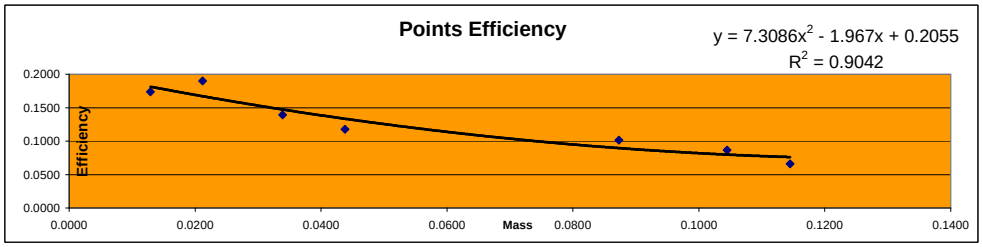
**Orange 23**

| Detector ID | Sample ID | Count Date | Count Time | Alpha Counts | Net CPM | DPM | Th-230 Efficiency | Standard Aliquot | Mass |
|---|---|---|---|---|---|---|---|---|---|
| 23 | ICABT-51465;A1 | 1/7/2016 10:29 | 40 | 16516 | 412.900 | 2374.5 | 0.1739 | 1mL | 0.0129 |
| 23 | ICABT-51465;A2 | 1/7/2016 9:33 | 40 | 18051 | 451.275 | 2374.5 | 0.1901 | 1mL | 0.0212 |
| 23 | ICABT-51465;A3 | 1/7/2016 8:29 | 40 | 13210 | 330.250 | 2374.5 | 0.1391 | 1mL | 0.0339 |
| 23 | ICABT-51465;A4 | 1/7/2016 7:41 | 40 | 11180 | 279.500 | 2374.5 | 0.1177 | 1mL | 0.0438 |
| 23 | ICABT-51465;A6 | 1/7/2016 1:47 | 40 | 19296 | 482.400 | 4749.0 | 0.1016 | 2mL | 0.0873 |
| 23 | ICABT-51465;A7 | 1/7/2016 1:05 | 40 | 16412 | 410.300 | 4749.0 | 0.0864 | 2mL | 0.1045 |
| 23 | ICABT-51465;A8 | 1/7/2016 0:06 | 40 | 12534 | 313.350 | 4749.0 | 0.0660 | 2mL | 0.1145 |

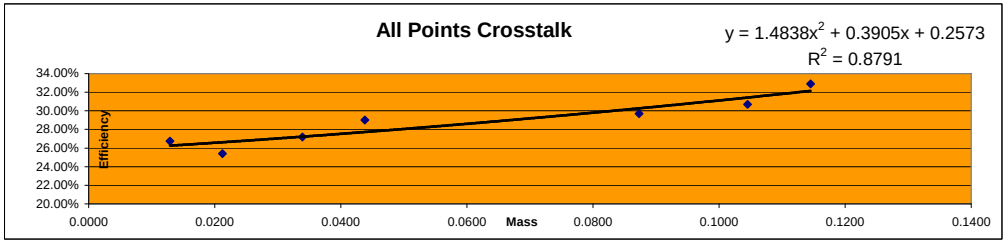
| Mass | Measured Efficiency | Theoretical Efficiency | Percent Δ Efficiency |
|---|---|---|---|
| 0.0129 | 0.1739 | 0.1813 | -4.11% |
| 0.0212 | 0.1901 | 0.1671 | 13.75% |
| 0.0339 | 0.1391 | 0.1472 | -5.53% |
| 0.0438 | 0.1177 | 0.1334 | -11.74% |
| 0.0873 | 0.1016 | 0.0895 | 13.52% |
| 0.1045 | 0.0864 | 0.0798 | 8.32% |
| 0.1145 | 0.0660 | 0.0761 | -13.29% |




| Mass | Efficiency |
|---|---|
| 0.0129 | 0.1739 |
| 0.0212 | 0.1901 |
| 0.0339 | 0.1391 |
| 0.0438 | 0.1177 |
| 0.0873 | 0.1016 |
| 0.1045 | 0.0864 |
| 0.1145 | 0.0660 |




| Detector ID | Sample ID | Mass | Count Time | Alpha Counts | Beta Counts | Alpha CPM | Beta CPM | % α into β | |
|---|---|---|---|---|---|---|---|---|---|
| 23 | ICABT-51465;A1 | 0.0129 | 40 | 16516 | 6031 | 412.90 | 150.78 | 26.75% | Min |
| 23 | ICABT-51465;A2 | 0.0212 | 40 | 18051 | 6144 | 451.28 | 153.60 | 25.39% | 25.39% |
| 23 | ICABT-51465;A3 | 0.0339 | 40 | 13210 | 4929 | 330.25 | 123.23 | 27.17% | |
| 23 | ICABT-51465;A4 | 0.0438 | 40 | 11180 | 4569 | 279.50 | 114.23 | 29.01% | Max |
| 23 | ICABT-51465;A6 | 0.0873 | 40 | 19296 | 8158 | 482.40 | 203.95 | 29.72% | |
| 23 | ICABT-51465;A7 | 0.1045 | 40 | 16412 | 7275 | 410.30 | 181.88 | 30.71% | Mean |
| 23 | ICABT-51465;A8 | 0.1145 | 40 | 12534 | 6150 | 313.35 | 153.75 | 32.92% | 28.81% |




**Standard ID**
Thorium-230
Th-230_00016 #51465
Cert # 92523 Ref. date 11/29/2012
Activity 2374.5 dpm/mL

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# Alpha/Beta Count Results

## Sample Activity Report

## Orange 20-23 - D

**Addr:** 23

**Sample ID** ICABT-51465;A8

**Repeat** 1012

**Carrier No.** 0

**Batch ID** m153000

**Count Method** Gross Alpha Beta

**Detector Volts** 1515

**Sample Qty** 0 *l* **sd** 0 *l*

**Residual Wt** 0 *mg* **sd** 0 *mg*

**Count Began** 1/7/2016 12:06:35 AM **Collection Date 1** 1/1/1900 **Half Life** 0.00 *days*

**Count Ended** 1/7/2016 12:46:41 AM **Collection Date 2** 1/1/1900 **Decay Factor** 1.000

**Sample Count Time** 40.00 *mins* **Background Count Time** 1,000.00 *mins*

| | Efficiency % | Attenuation Factor | Activity Divisor | Background cpm | Gross counts | Gross cpm | Net cpm |
|---|---|---|---|---|---|---|---|
| **Alpha** | 0.000 | 1.000 | 1.000 | 0.141 | 12,534 | 313.350 | 313.209 |
| **sd** | 0.000 | | | 0.012 | 111.955 | 2.799 | 2.799 |
| **A to B** | 0.000 | 1.000 | | | | 0.000 | |
| **sd** | 0.000 | | | | | 0.000 | |
| **Beta** | 0.000 | 1.000 | 1.000 | 0.485 | 6,150 | 153.750 | 153.265 |
| **sd** | 0.000 | | | 0.022 | 78.422 | 1.961 | 1.961 |

| | Net Activity dpm | LLD dpm | MDC pCi/l | MPC pCi/l | Net Concentration * pCi/l | Conc / MPC Ratio |
|---|---|---|---|---|---|---|
| **Alpha** | 0.000 | 0.000 | 0.000 | 1.000 | 0.000 ± 0.000 | 0.000 |
| **sd** | 0.000 | | | | 0.000 | |
| **Beta** | 0.000 | 0.000 | 0.000 | 1.000 | 0.000 ± 0.000 | 0.000 |
| **sd** | 0.000 | | | | 0.000 | |

*** Note: Decay Corrected** **MDC Method** Tb = Ts < 10 **Error =** .00 **x sd**

# Alpha/Beta Count Results

## Sample Activity Report

## Orange 20-23 - D

**Addr:** 23

**Sample ID** ICABT-51465;A7

**Repeat** 1014

**Carrier No.** 0

**Batch ID** m153000

**Count Method** Gross Alpha Beta

**Detector Volts** 1515

| | | | |
|---|---|---|---|
| **Sample Qty** | 0 ***l*** | **sd** | 0 ***l*** |
| **Residual Wt** | 0 ***mg*** | **sd** | 0 ***mg*** |

**Count Began** 1/7/2016 1:05:44 AM

**Collection Date 1** 1/1/1900

**Half Life** 0.00 ***days***

**Count Ended** 1/7/2016 1:45:49 AM

**Collection Date 2** 1/1/1900

**Decay Factor** 1.000

**Sample Count Time** 40.00 ***mins***

**Background Count Time** 1,000.00 ***mins***

| | Efficiency % | Attenuation Factor | Activity Divisor | Background cpm | Gross counts | Gross cpm | Net cpm |
|---|---|---|---|---|---|---|---|
| **Alpha** | 0.000 | 1.000 | 1.000 | 0.141 | 16,412 | 410.300 | 410.159 |
| **sd** | 0.000 | | | 0.012 | 128.109 | 3.203 | 3.203 |
| **A to B** | 0.000 | 1.000 | | | | 0.000 | |
| **sd** | 0.000 | | | | | 0.000 | |
| **Beta** | 0.000 | 1.000 | 1.000 | 0.485 | 7,275 | 181.875 | 181.390 |
| **sd** | 0.000 | | | 0.022 | 85.294 | 2.132 | 2.132 |

| | Net Activity dpm | LLD dpm | MDC pCi/l | MPC pCi/l | Net Concentration * pCi/l | Conc / MPC Ratio |
|---|---|---|---|---|---|---|
| **Alpha** | 0.000 | 0.000 | 0.000 | 1.000 | 0.000 ± 0.000 | 0.000 |
| **sd** | 0.000 | | | | 0.000 | |
| **Beta** | 0.000 | 0.000 | 0.000 | 1.000 | 0.000 ± 0.000 | 0.000 |
| **sd** | 0.000 | | | | 0.000 | |

*** Note: Decay Corrected**

**MDC Method** Tb = Ts < 10

**Error =** .00 **x sd**

# Alpha/Beta Count Results

## Sample Activity Report

## Orange 20-23 - D

**Addr:** 23

**Sample ID** ICABT-51465;A6

**Repeat** 1016

**Carrier No.** 0

**Batch ID** m153000

**Count Method** Gross Alpha Beta

**Detector Volts** 1515

**Sample Qty** 0 *l* **sd** 0 *l*

**Residual Wt** 0 *mg* **sd** 0 *mg*

**Count Began** 1/7/2016 1:47:01 AM **Collection Date 1** 1/1/1900 **Half Life** 0.00 *days*

**Count Ended** 1/7/2016 2:27:08 AM **Collection Date 2** 1/1/1900 **Decay Factor** 1.000

**Sample Count Time** 40.00 *mins* **Background Count Time** 1,000.00 *mins*

| | Efficiency % | Attenuation Factor | Activity Divisor | Background cpm | Gross counts | Gross cpm | Net cpm |
|---|---|---|---|---|---|---|---|
| **Alpha** | 0.000 | 1.000 | 1.000 | 0.141 | 19,296 | 482.400 | 482.259 |
| **sd** | 0.000 | | | 0.012 | 138.910 | 3.473 | 3.473 |
| **A to B** | 0.000 | 1.000 | | | | 0.000 | |
| **sd** | 0.000 | | | | | 0.000 | |
| **Beta** | 0.000 | 1.000 | 1.000 | 0.485 | 8,158 | 203.950 | 203.465 |
| **sd** | 0.000 | | | 0.022 | 90.322 | 2.258 | 2.258 |

| | Net Activity dpm | LLD dpm | MDC pCi/l | MPC pCi/l | Net Concentration * pCi/l | Conc / MPC Ratio |
|---|---|---|---|---|---|---|
| **Alpha** | 0.000 | 0.000 | 0.000 | 1.000 | 0.000 ± 0.000 | 0.000 |
| **sd** | 0.000 | | | | 0.000 | |
| **Beta** | 0.000 | 0.000 | 0.000 | 1.000 | 0.000 ± 0.000 | 0.000 |
| **sd** | 0.000 | | | | 0.000 | |

*** Note: Decay Corrected** **MDC Method** Tb = Ts < 10 **Error =** .00 **x sd**

# Alpha/Beta Count Results

## Sample Activity Report

## Orange 20-23 - D

**Addr:** 23

**Sample ID** ICABT-51465;A5

**Repeat** 1018

**Carrier No.** 0

**Batch ID** m153000

**Count Method** Gross Alpha Beta

**Detector Volts** 1515

| | | | |
|---|---|---|---|
| **Sample Qty** | 0 ***l*** | **sd** | 0 ***l*** |
| **Residual Wt** | 0 ***mg*** | **sd** | 0 ***mg*** |

**Count Began** 1/7/2016 6:23:40 AM **Collection Date 1** 1/1/1900 **Half Life** 0.00 ***days***

**Count Ended** 1/7/2016 7:03:45 AM **Collection Date 2** 1/1/1900 **Decay Factor** 1.000

**Sample Count Time** 40.00 ***mins*** **Background Count Time** 1,000.00 ***mins***

| | Efficiency % | Attenuation Factor | Activity Divisor | Background cpm | Gross counts | Gross cpm | Net cpm |
|---|---|---|---|---|---|---|---|
| **Alpha** | 0.000 | 1.000 | 1.000 | 0.141 | 15,597 | 389.925 | 389.784 |
| **sd** | 0.000 | | | 0.012 | 124.888 | 3.122 | 3.122 |
| **A to B** | 0.000 | 1.000 | | | | 0.000 | |
| **sd** | 0.000 | | | | | 0.000 | |
| **Beta** | 0.000 | 1.000 | 1.000 | 0.485 | 7,329 | 183.225 | 182.740 |
| **sd** | 0.000 | | | 0.022 | 85.610 | 2.140 | 2.140 |

| | Net Activity dpm | LLD dpm | MDC pCi/l | MPC pCi/l | Net Concentration * pCi/l | Conc / MPC Ratio |
|---|---|---|---|---|---|---|
| **Alpha** | 0.000 | 0.000 | 0.000 | 1.000 | 0.000 ± 0.000 | 0.000 |
| **sd** | 0.000 | | | | 0.000 | |
| **Beta** | 0.000 | 0.000 | 0.000 | 1.000 | 0.000 ± 0.000 | 0.000 |
| **sd** | 0.000 | | | | 0.000 | |

*** Note: Decay Corrected** **MDC Method** Tb = Ts < 10 **Error =** .00 **x sd**

# Alpha/Beta Count Results

## Sample Activity Report

## Orange 20-23 - D

**Addr:** 23

**Sample ID** ICABT-51465;A4

**Repeat** 1020

**Carrier No.** 0

**Batch ID** m153000

**Count Method** Gross Alpha Beta

**Detector Volts** 1515

| | | | |
|---|---|---|---|
| **Sample Qty** | 0 ***l*** | **sd** | 0 ***l*** |
| **Residual Wt** | 0 ***mg*** | **sd** | 0 ***mg*** |

**Count Began** 1/7/2016 7:41:08 AM **Collection Date 1** 1/1/1900 **Half Life** 0.00 ***days***

**Count Ended** 1/7/2016 8:21:12 AM **Collection Date 2** 1/1/1900 **Decay Factor** 1.000

**Sample Count Time** 40.00 ***mins*** **Background Count Time** 1,000.00 ***mins***

| | Efficiency % | Attenuation Factor | Activity Divisor | Background cpm | Gross counts | Gross cpm | Net cpm |
|---|---|---|---|---|---|---|---|
| **Alpha** | 0.000 | 1.000 | 1.000 | 0.141 | 11,180 | 279.500 | 279.359 |
| **sd** | 0.000 | | | 0.012 | 105.736 | 2.643 | 2.643 |
| **A to B** | 0.000 | 1.000 | | | | 0.000 | |
| **sd** | 0.000 | | | | | 0.000 | |
| **Beta** | 0.000 | 1.000 | 1.000 | 0.485 | 4,569 | 114.225 | 113.740 |
| **sd** | 0.000 | | | 0.022 | 67.594 | 1.690 | 1.690 |

| | Net Activity dpm | LLD dpm | MDC pCi/l | MPC pCi/l | Net Concentration * pCi/l | Conc / MPC Ratio |
|---|---|---|---|---|---|---|
| **Alpha** | 0.000 | 0.000 | 0.000 | 1.000 | 0.000 ± 0.000 | 0.000 |
| **sd** | 0.000 | | | | 0.000 | |
| **Beta** | 0.000 | 0.000 | 0.000 | 1.000 | 0.000 ± 0.000 | 0.000 |
| **sd** | 0.000 | | | | 0.000 | |

*** Note: Decay Corrected** **MDC Method** Tb = Ts < 10 **Error =** .00 **x sd**

# Alpha/Beta Count Results

## Sample Activity Report

## Orange 20-23 - D

**Addr:** 23

**Sample ID** ICABT-51465;A3

**Repeat** 1022

**Carrier No.** 0

**Batch ID** m153000

**Count Method** Gross Alpha Beta

**Detector Volts** 1515

| | | | |
|---|---|---|---|
| **Sample Qty** | 0 ***l*** | **sd** | 0 ***l*** |
| **Residual Wt** | 0 ***mg*** | **sd** | 0 ***mg*** |

**Count Began** 1/7/2016 8:29:12 AM

**Collection Date 1** 1/1/1900

**Half Life** 0.00 ***days***

**Count Ended** 1/7/2016 9:09:17 AM

**Collection Date 2** 1/1/1900

**Decay Factor** 1.000

**Sample Count Time** 40.00 ***mins***

**Background Count Time** 1,000.00 ***mins***

| | Efficiency % | Attenuation Factor | Activity Divisor | Background cpm | Gross counts | Gross cpm | Net cpm |
|---|---|---|---|---|---|---|---|
| **Alpha** | 0.000 | 1.000 | 1.000 | 0.141 | 13,210 | 330.250 | 330.109 |
| **sd** | 0.000 | | | 0.012 | 114.935 | 2.873 | 2.873 |
| **A to B** | 0.000 | 1.000 | | | | 0.000 | |
| **sd** | 0.000 | | | | | 0.000 | |
| **Beta** | 0.000 | 1.000 | 1.000 | 0.485 | 4,929 | 123.225 | 122.740 |
| **sd** | 0.000 | | | 0.022 | 70.207 | 1.755 | 1.755 |

| | Net Activity dpm | LLD dpm | MDC pCi/l | MPC pCi/l | Net Concentration * pCi/l | Conc / MPC Ratio |
|---|---|---|---|---|---|---|
| **Alpha** | 0.000 | 0.000 | 0.000 | 1.000 | 0.000 ± 0.000 | 0.000 |
| **sd** | 0.000 | | | | 0.000 | |
| **Beta** | 0.000 | 0.000 | 0.000 | 1.000 | 0.000 ± 0.000 | 0.000 |
| **sd** | 0.000 | | | | 0.000 | |

*** Note: Decay Corrected**

**MDC Method** Tb = Ts < 10

**Error =** .00 **x sd**

# Alpha/Beta Count Results

## Sample Activity Report

## Orange 20-23 - D

**Addr:** 23

**Sample ID** ICABT-51465;A2

**Repeat** 1024

**Carrier No.** 0

**Batch ID** m153000

**Count Method** Gross Alpha Beta

**Detector Volts** 1515

**Sample Qty** 0 *l* **sd** 0 *l*

**Residual Wt** 0 *mg* **sd** 0 *mg*

**Count Began** 1/7/2016 9:33:23 AM **Collection Date 1** 1/1/1900 **Half Life** 0.00 *days*

**Count Ended** 1/7/2016 10:13:29 AM **Collection Date 2** 1/1/1900 **Decay Factor** 1.000

**Sample Count Time** 40.00 *mins* **Background Count Time** 1,000.00 *mins*

| | Efficiency % | Attenuation Factor | Activity Divisor | Background cpm | Gross counts | Gross cpm | Net cpm |
|---|---|---|---|---|---|---|---|
| **Alpha** | 0.000 | 1.000 | 1.000 | 0.141 | 18,051 | 451.275 | 451.134 |
| **sd** | 0.000 | | | 0.012 | 134.354 | 3.359 | 3.359 |
| **A to B** | 0.000 | 1.000 | | | | 0.000 | |
| **sd** | 0.000 | | | | | 0.000 | |
| **Beta** | 0.000 | 1.000 | 1.000 | 0.485 | 6,144 | 153.600 | 153.115 |
| **sd** | 0.000 | | | 0.022 | 78.384 | 1.960 | 1.960 |

| | Net Activity dpm | LLD dpm | MDC pCi/l | MPC pCi/l | Net Concentration * pCi/l | Conc / MPC Ratio |
|---|---|---|---|---|---|---|
| **Alpha** | 0.000 | 0.000 | 0.000 | 1.000 | 0.000 ± 0.000 | 0.000 |
| **sd** | 0.000 | | | | 0.000 | |
| **Beta** | 0.000 | 0.000 | 0.000 | 1.000 | 0.000 ± 0.000 | 0.000 |
| **sd** | 0.000 | | | | 0.000 | |

*** Note: Decay Corrected** **MDC Method** Tb = Ts < 10 **Error =** .00 **x sd**

# Alpha/Beta Count Results

## Sample Activity Report

## Orange 20-23 - D

**Addr:** 23

**Sample ID** ICABT-51465;A1

**Repeat** 1018

**Carrier No.** 0

**Batch ID** m153000

**Count Method** Gross Alpha Beta

**Detector Volts** 1515

**Sample Qty** 0 *l* **sd** 0 *l*

**Residual Wt** 0 *mg* **sd** 0 *mg*

**Count Began** 1/7/2016 10:29:53 AM **Collection Date 1** 1/1/1900 **Half Life** 0.00 *days*

**Count Ended** 1/7/2016 11:09:59 AM **Collection Date 2** 1/1/1900 **Decay Factor** 1.000

**Sample Count Time** 40.00 *mins* **Background Count Time** 1,000.00 *mins*

| | Efficiency % | Attenuation Factor | Activity Divisor | Background cpm | Gross counts | Gross cpm | Net cpm |
|---|---|---|---|---|---|---|---|
| **Alpha** | 0.000 | 1.000 | 1.000 | 0.141 | 16,516 | 412.900 | 412.759 |
| **sd** | 0.000 | | | 0.012 | 128.515 | 3.213 | 3.213 |
| **A to B** | 0.000 | 1.000 | | | | 0.000 | |
| **sd** | 0.000 | | | | | 0.000 | |
| **Beta** | 0.000 | 1.000 | 1.000 | 0.485 | 6,031 | 150.775 | 150.290 |
| **sd** | 0.000 | | | 0.022 | 77.660 | 1.941 | 1.942 |

| | Net Activity dpm | LLD dpm | MDC pCi/l | MPC pCi/l | Net Concentration * pCi/l | Conc / MPC Ratio |
|---|---|---|---|---|---|---|
| **Alpha** | 0.000 | 0.000 | 0.000 | 1.000 | 0.000 ± 0.000 | 0.000 |
| **sd** | 0.000 | | | | 0.000 | |
| **Beta** | 0.000 | 0.000 | 0.000 | 1.000 | 0.000 ± 0.000 | 0.000 |
| **sd** | 0.000 | | | | 0.000 | |

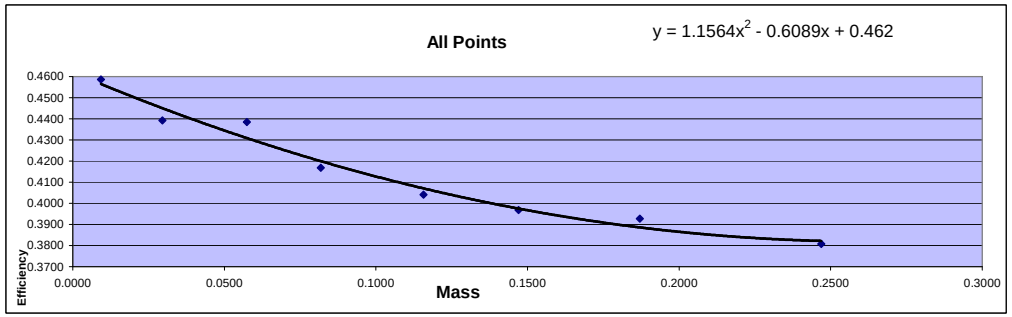
*** Note: Decay Corrected** **MDC Method** Tb = Ts < 10 **Error =** .00 **x sd**

**Curve is for Gross Beta**
**Strontium 90**
**and**
**Total Strontium**

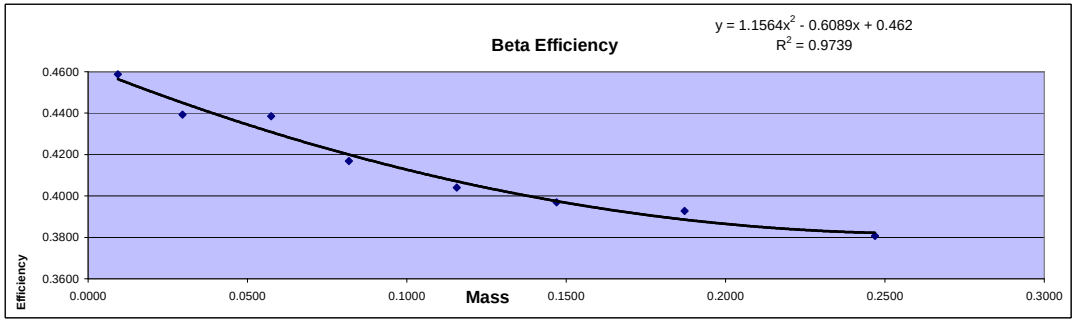
**Purple 0**

| Detector ID | Std ID | Count Date | Sample Wt | Count Time | Beta Counts | DPM 41558.018 CPM | Sr-90 Eff | Standard Aliquot |
|---|---|---|---|---|---|---|---|---|
| 0 | B1 | 2/3/2013 15:26 | 0.0093 | 5 | 95312 | 19062.400 | 0.4587 | 1mL |
| 0 | B2 | 2/3/2013 17:14 | 0.0296 | 5 | 91281 | 18256.200 | 0.4393 | 1mL |
| 0 | B3 | 2/3/2013 17:05 | 0.0574 | 5 | 91120 | 18224.000 | 0.4385 | 1mL |
| 0 | B4 | 2/3/2013 16:48 | 0.0818 | 5 | 86609 | 17321.800 | 0.4168 | 1mL |
| 0 | B5 | 2/3/2013 16:41 | 0.1157 | 5 | 83957 | 16791.400 | 0.4040 | 1mL |
| 0 | B6 | 2/3/2013 16:34 | 0.1470 | 5 | 82467 | 16493.400 | 0.3969 | 1mL |
| 0 | B7 | 2/3/2013 16:23 | 0.1871 | 5 | 81608 | 16321.600 | 0.3927 | 1mL |
| 0 | B8 | 2/3/2013 16:02 | 0.2469 | 5 | 79105 | 15821.000 | 0.3807 | 1mL |

| Mass | Measured Efficiency | Theoretical Efficiency | Percent Δ Efficiency |
|---|---|---|---|
| 0.0093 | 0.4587 | 0.4564 | 0.49% |
| 0.0296 | 0.4393 | 0.4450 | -1.28% |
| 0.0574 | 0.4385 | 0.4309 | 1.78% |
| 0.0818 | 0.4168 | 0.4199 | -0.74% |
| 0.1157 | 0.4040 | 0.4070 | -0.73% |
| 0.1470 | 0.3969 | 0.3975 | -0.15% |
| 0.1871 | 0.3927 | 0.3886 | 1.08% |
| 0.2469 | 0.3807 | 0.3822 | -0.38% |




| Mass | Efficiency |
|---|---|
| 0.0093 | 0.4587 |
| 0.0296 | 0.4393 |
| 0.0574 | 0.4385 |
| 0.0818 | 0.4168 |
| 0.1157 | 0.4040 |
| 0.1470 | 0.3969 |
| 0.1871 | 0.3927 |
| 0.2469 | 0.3807 |




**Standard ID**
Strontium 90
Sr-90_00004 #6322
Cert# 80573-334 Ref. date 9/172009

| | | |
|---|---|---|
| Initial Activity: | 22560 | dpm/mL |
| Reference Date: | 9/17/2009 | |
| Count Date: | 2/3/2013 | |
| Elapsed Time: | 1235.000 | days |
| Half Life: | 10409.625 | days |
| Exponential Term: | 0.92105537 | |
| Corrected Activity: | 20779.0092 | dpm/mL |
| Decay Activity (Sr/Y-90) | 41558.0185 | dpm |

# Alpha/Beta Count Results

## Sample Activity Report

## Purple 0-3 - A

**Addr:** 0

**Sample ID** ICABT-6322;B1

**Repeat** 28

**Carrier No.** 0

**Batch ID** M122627

**Count Method** Gross Alpha Beta

**Detector Volts** 1515

**Sample Qty** 0 ***Sample*** **sd** 0 ***Sample***

**Residual Wt** 0 ***mg*** **sd** 0 ***mg***

**Count Began** 2/3/2013 3:26:56 PM **Collection Date 1** 1/1/1900 **Half Life** 0.00 ***days***

**Count Ended** 2/3/2013 3:32:07 PM **Collection Date 2** 1/1/1900 **Decay Factor** 1.000

**Sample Count Time** 5.00 ***mins*** **Background Count Time** 1,000.00 ***mins***

| | Efficiency % | Attenuation Factor | Activity Divisor | Background cpm | Gross counts | Gross cpm | Net cpm |
|---|---|---|---|---|---|---|---|
| **Alpha** | 0.000 | 1.000 | 1.000 | 0.087 | 1,085 | 217.000 | 216.913 |
| **sd** | 0.000 | | | 0.009 | 32.939 | 6.588 | 6.588 |
| **A to B** | 0.000 | 1.000 | | | | 0.000 | |
| **sd** | 0.000 | | | | | 0.000 | |
| **Beta** | 0.000 | 1.000 | 1.000 | 0.405 | 95,312 | 19,062.400 | 19,061.995 |
| **sd** | 0.000 | | | 0.020 | 308.726 | 61.745 | 61.745 |

| | Net Activity dpm | LLD dpm | MDC DPM | MPC DPM | Net Concentration * DPM | Conc / MPC Ratio |
|---|---|---|---|---|---|---|
| **Alpha** | 0.000 | 0.000 | 0.000 | 0.000 | 0.000 ± 0.000 | 0.000 |
| **sd** | 0.000 | | | | 0.000 | |
| **Beta** | 0.000 | 0.000 | 0.000 | 0.000 | 0.000 ± 0.000 | 0.000 |
| **sd** | 0.000 | | | | 0.000 | |

*** Note: Decay Corrected** **MDC Method** Currie **Error =** .00 **x sd**

# Alpha/Beta Count Results

## Sample Activity Report

## Purple 0-3 - A

**Addr:** 0

**Sample ID** ICABT-6322;B8

**Repeat** 28

**Carrier No.** 0

**Batch ID** M122627

**Count Method** Gross Alpha Beta

**Detector Volts** 1515

| | | | |
|---|---|---|---|
| **Sample Qty** | 0 ***Sample*** | **sd** | 0 ***Sample*** |
| **Residual Wt** | 0 ***mg*** | **sd** | 0 ***mg*** |

**Count Began** 2/3/2013 4:02:02 PM **Collection Date 1** 1/1/1900 **Half Life** 0.00 ***days***

**Count Ended** 2/3/2013 4:07:11 PM **Collection Date 2** 1/1/1900 **Decay Factor** 1.000

**Sample Count Time** 5.00 ***mins*** **Background Count Time** 1,000.00 ***mins***

| | Efficiency % | Attenuation Factor | Activity Divisor | Background cpm | Gross counts | Gross cpm | Net cpm |
|---|---|---|---|---|---|---|---|
| **Alpha** | 0.000 | 1.000 | 1.000 | 0.087 | 821 | 164.200 | 164.113 |
| **sd** | 0.000 | | | 0.009 | 28.653 | 5.731 | 5.731 |
| **A to B** | 0.000 | 1.000 | | | | 0.000 | |
| **sd** | 0.000 | | | | | 0.000 | |
| **Beta** | 0.000 | 1.000 | 1.000 | 0.405 | 79,105 | 15,821.000 | 15,820.595 |
| **sd** | 0.000 | | | 0.020 | 281.256 | 56.251 | 56.251 |

| | Net Activity dpm | LLD dpm | MDC DPM | MPC DPM | Net Concentration * DPM | Conc / MPC Ratio |
|---|---|---|---|---|---|---|
| **Alpha** | 0.000 | 0.000 | 0.000 | 0.000 | 0.000 ± 0.000 | 0.000 |
| **sd** | 0.000 | | | | 0.000 | |
| **Beta** | 0.000 | 0.000 | 0.000 | 0.000 | 0.000 ± 0.000 | 0.000 |
| **sd** | 0.000 | | | | 0.000 | |

*** Note: Decay Corrected** **MDC Method** Currie **Error =** .00 **x sd**

# Alpha/Beta Count Results

## Sample Activity Report

## Purple 0-3 - A

**Addr:** 0

**Sample ID** ICABT-6322;B7

**Repeat** 29

**Carrier No.** 0

**Batch ID** M122627

**Count Method** Gross Alpha Beta

**Detector Volts** 1515

**Sample Qty** 0 ***Sample*** **sd** 0 ***Sample***

**Residual Wt** 0 ***mg*** **sd** 0 ***mg***

**Count Began** 2/3/2013 4:23:17 PM **Collection Date 1** 1/1/1900 **Half Life** 0.00 ***days***

**Count Ended** 2/3/2013 4:28:26 PM **Collection Date 2** 1/1/1900 **Decay Factor** 1.000

**Sample Count Time** 5.00 ***mins*** **Background Count Time** 1,000.00 ***mins***

| | Efficiency % | Attenuation Factor | Activity Divisor | Background cpm | Gross counts | Gross cpm | Net cpm |
|---|---|---|---|---|---|---|---|
| **Alpha** | 0.000 | 1.000 | 1.000 | 0.087 | 891 | 178.200 | 178.113 |
| **sd** | 0.000 | | | 0.009 | 29.850 | 5.970 | 5.970 |
| **A to B** | 0.000 | 1.000 | | | | 0.000 | |
| **sd** | 0.000 | | | | | 0.000 | |
| **Beta** | 0.000 | 1.000 | 1.000 | 0.405 | 81,608 | 16,321.600 | 16,321.195 |
| **sd** | 0.000 | | | 0.020 | 285.671 | 57.134 | 57.134 |

| | Net Activity dpm | LLD dpm | MDC DPM | MPC DPM | Net Concentration * DPM | Conc / MPC Ratio |
|---|---|---|---|---|---|---|
| **Alpha** | 0.000 | 0.000 | 0.000 | 0.000 | 0.000 ± 0.000 | 0.000 |
| **sd** | 0.000 | | | | 0.000 | |
| **Beta** | 0.000 | 0.000 | 0.000 | 0.000 | 0.000 ± 0.000 | 0.000 |
| **sd** | 0.000 | | | | 0.000 | |

*** Note: Decay Corrected** **MDC Method** Currie **Error =** .00 **x sd**

# Alpha/Beta Count Results

## Sample Activity Report

## Purple 0-3 - A

**Addr:** 0

**Sample ID** ICABT-6322;B6

**Repeat** 30

**Carrier No.** 0

**Batch ID** M122627

**Count Method** Gross Alpha Beta

**Detector Volts** 1515

**Sample Qty** 0 ***Sample*** **sd** 0 ***Sample***

**Residual Wt** 0 ***mg*** **sd** 0 ***mg***

**Count Began** 2/3/2013 4:34:26 PM **Collection Date 1** 1/1/1900 **Half Life** 0.00 ***days***

**Count Ended** 2/3/2013 4:39:36 PM **Collection Date 2** 1/1/1900 **Decay Factor** 1.000

**Sample Count Time** 5.00 ***mins*** **Background Count Time** 1,000.00 ***mins***

| | Efficiency % | Attenuation Factor | Activity Divisor | Background cpm | Gross counts | Gross cpm | Net cpm |
|---|---|---|---|---|---|---|---|
| **Alpha** | 0.000 | 1.000 | 1.000 | 0.087 | 898 | 179.600 | 179.513 |
| **sd** | 0.000 | | | 0.009 | 29.967 | 5.993 | 5.993 |
| **A to B** | 0.000 | 1.000 | | | | 0.000 | |
| **sd** | 0.000 | | | | | 0.000 | |
| **Beta** | 0.000 | 1.000 | 1.000 | 0.405 | 82,467 | 16,493.400 | 16,492.995 |
| **sd** | 0.000 | | | 0.020 | 287.171 | 57.434 | 57.434 |

| | Net Activity dpm | LLD dpm | MDC DPM | MPC DPM | Net Concentration * DPM | Conc / MPC Ratio |
|---|---|---|---|---|---|---|
| **Alpha** | 0.000 | 0.000 | 0.000 | 0.000 | 0.000 ± 0.000 | 0.000 |
| **sd** | 0.000 | | | | 0.000 | |
| **Beta** | 0.000 | 0.000 | 0.000 | 0.000 | 0.000 ± 0.000 | 0.000 |
| **sd** | 0.000 | | | | 0.000 | |

*** Note: Decay Corrected** **MDC Method** Currie **Error =** .00 **x sd**

# Alpha/Beta Count Results

## Sample Activity Report

## Purple 0-3 - A

**Addr:** 0

**Sample ID** ICABT-6322;B5

**Repeat** 31

**Carrier No.** 0

**Batch ID** M122627

**Count Method** Gross Alpha Beta

**Detector Volts** 1515

**Sample Qty** 0 ***Sample*** **sd** 0 ***Sample***

**Residual Wt** 0 ***mg*** **sd** 0 ***mg***

**Count Began** 2/3/2013 4:41:38 PM **Collection Date 1** 1/1/1900 **Half Life** 0.00 ***days***

**Count Ended** 2/3/2013 4:46:48 PM **Collection Date 2** 1/1/1900 **Decay Factor** 1.000

**Sample Count Time** 5.00 ***mins*** **Background Count Time** 1,000.00 ***mins***

| | Efficiency % | Attenuation Factor | Activity Divisor | Background cpm | Gross counts | Gross cpm | Net cpm |
|---|---|---|---|---|---|---|---|
| **Alpha** | 0.000 | 1.000 | 1.000 | 0.087 | 890 | 178.000 | 177.913 |
| **sd** | 0.000 | | | 0.009 | 29.833 | 5.967 | 5.967 |
| **A to B** | 0.000 | 1.000 | | | | 0.000 | |
| **sd** | 0.000 | | | | | 0.000 | |
| **Beta** | 0.000 | 1.000 | 1.000 | 0.405 | 83,957 | 16,791.400 | 16,790.995 |
| **sd** | 0.000 | | | 0.020 | 289.753 | 57.951 | 57.951 |

| | Net Activity dpm | LLD dpm | MDC DPM | MPC DPM | Net Concentration * DPM | Conc / MPC Ratio |
|---|---|---|---|---|---|---|
| **Alpha** | 0.000 | 0.000 | 0.000 | 0.000 | 0.000 ± 0.000 | 0.000 |
| **sd** | 0.000 | | | | 0.000 | |
| **Beta** | 0.000 | 0.000 | 0.000 | 0.000 | 0.000 ± 0.000 | 0.000 |
| **sd** | 0.000 | | | | 0.000 | |

*** Note: Decay Corrected** **MDC Method** Currie **Error =** .00 **x sd**

# Alpha/Beta Count Results

## Sample Activity Report

## Purple 0-3 - A

**Addr:** 0

**Sample ID** ICABT-6322;B4

**Repeat** 33

**Carrier No.** 0

**Batch ID** M122627

**Count Method** Gross Alpha Beta

**Detector Volts** 1515

**Sample Qty** 0 ***Sample*** **sd** 0 ***Sample***

**Residual Wt** 0 ***mg*** **sd** 0 ***mg***

**Count Began** 2/3/2013 4:48:03 PM **Collection Date 1** 1/1/1900 **Half Life** 0.00 ***days***

**Count Ended** 2/3/2013 4:53:12 PM **Collection Date 2** 1/1/1900 **Decay Factor** 1.000

**Sample Count Time** 5.00 ***mins*** **Background Count Time** 1,000.00 ***mins***

| | Efficiency % | Attenuation Factor | Activity Divisor | Background cpm | Gross counts | Gross cpm | Net cpm |
|---|---|---|---|---|---|---|---|
| **Alpha** | 0.000 | 1.000 | 1.000 | 0.087 | 986 | 197.200 | 197.113 |
| **sd** | 0.000 | | | 0.009 | 31.401 | 6.280 | 6.280 |
| **A to B** | 0.000 | 1.000 | | | | 0.000 | |
| **sd** | 0.000 | | | | | 0.000 | |
| **Beta** | 0.000 | 1.000 | 1.000 | 0.405 | 86,609 | 17,321.800 | 17,321.395 |
| **sd** | 0.000 | | | 0.020 | 294.294 | 58.859 | 58.859 |

| | Net Activity dpm | LLD dpm | MDC DPM | MPC DPM | Net Concentration * DPM | Conc / MPC Ratio |
|---|---|---|---|---|---|---|
| **Alpha** | 0.000 | 0.000 | 0.000 | 0.000 | 0.000 ± 0.000 | 0.000 |
| **sd** | 0.000 | | | | 0.000 | |
| **Beta** | 0.000 | 0.000 | 0.000 | 0.000 | 0.000 ± 0.000 | 0.000 |
| **sd** | 0.000 | | | | 0.000 | |

*** Note: Decay Corrected** **MDC Method** Currie **Error =** .00 **x sd**

# Alpha/Beta Count Results

## Sample Activity Report

## Purple 0-3 - A

**Addr:** 0

**Sample ID** ICABT-6322;B3

**Repeat** 34

**Carrier No.** 0

**Batch ID** M122627

**Count Method** Gross Alpha Beta

**Detector Volts** 1515

**Sample Qty** 0 ***Sample*** **sd** 0 ***Sample***

**Residual Wt** 0 ***mg*** **sd** 0 ***mg***

**Count Began** 2/3/2013 5:05:20 PM **Collection Date 1** 1/1/1900 **Half Life** 0.00 ***days***

**Count Ended** 2/3/2013 5:10:29 PM **Collection Date 2** 1/1/1900 **Decay Factor** 1.000

**Sample Count Time** 5.00 ***mins*** **Background Count Time** 1,000.00 ***mins***

| | Efficiency % | Attenuation Factor | Activity Divisor | Background cpm | Gross counts | Gross cpm | Net cpm |
|---|---|---|---|---|---|---|---|
| **Alpha** | 0.000 | 1.000 | 1.000 | 0.087 | 1,116 | 223.200 | 223.113 |
| **sd** | 0.000 | | | 0.009 | 33.407 | 6.681 | 6.681 |
| **A to B** | 0.000 | 1.000 | | | | 0.000 | |
| **sd** | 0.000 | | | | | 0.000 | |
| **Beta** | 0.000 | 1.000 | 1.000 | 0.405 | 91,120 | 18,224.000 | 18,223.595 |
| **sd** | 0.000 | | | 0.020 | 301.861 | 60.372 | 60.372 |

| | Net Activity dpm | LLD dpm | MDC DPM | MPC DPM | Net Concentration * DPM | Conc / MPC Ratio |
|---|---|---|---|---|---|---|
| **Alpha** | 0.000 | 0.000 | 0.000 | 0.000 | 0.000 ± 0.000 | 0.000 |
| **sd** | 0.000 | | | | 0.000 | |
| **Beta** | 0.000 | 0.000 | 0.000 | 0.000 | 0.000 ± 0.000 | 0.000 |
| **sd** | 0.000 | | | | 0.000 | |

*** Note: Decay Corrected** **MDC Method** Currie **Error =** .00 **x sd**

# Alpha/Beta Count Results

## Sample Activity Report

## Purple 0-3 - A

**Addr:** 0

**Sample ID** ICABT-6322;B2

**Repeat** 35

**Carrier No.** 0

**Batch ID** M122627

**Count Method** Gross Alpha Beta

**Detector Volts** 1515

**Sample Qty** 0 ***Sample*** **sd** 0 ***Sample***

**Residual Wt** 0 ***mg*** **sd** 0 ***mg***

**Count Began** 2/3/2013 5:14:13 PM **Collection Date 1** 1/1/1900 **Half Life** 0.00 ***days***

**Count Ended** 2/3/2013 5:19:23 PM **Collection Date 2** 1/1/1900 **Decay Factor** 1.000

**Sample Count Time** 5.00 ***mins*** **Background Count Time** 1,000.00 ***mins***

| | Efficiency % | Attenuation Factor | Activity Divisor | Background cpm | Gross counts | Gross cpm | Net cpm |
|---|---|---|---|---|---|---|---|
| **Alpha** | 0.000 | 1.000 | 1.000 | 0.087 | 1,106 | 221.200 | 221.113 |
| **sd** | 0.000 | | | 0.009 | 33.257 | 6.651 | 6.651 |
| **A to B** | 0.000 | 1.000 | | | | 0.000 | |
| **sd** | 0.000 | | | | | 0.000 | |
| **Beta** | 0.000 | 1.000 | 1.000 | 0.405 | 91,281 | 18,256.200 | 18,255.795 |
| **sd** | 0.000 | | | 0.020 | 302.127 | 60.425 | 60.425 |

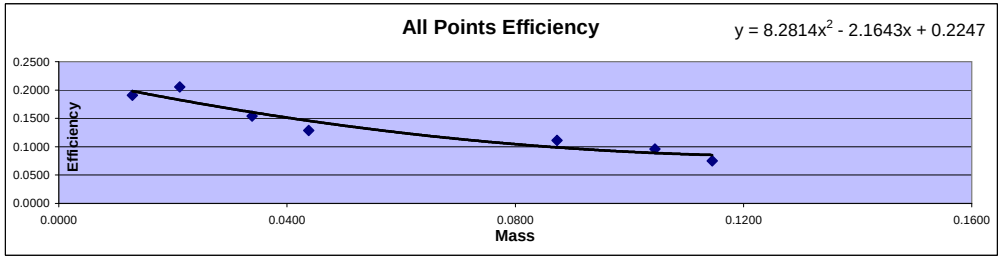
| | Net Activity dpm | LLD dpm | MDC DPM | MPC DPM | Net Concentration * DPM | Conc / MPC Ratio |
|---|---|---|---|---|---|---|
| **Alpha** | 0.000 | 0.000 | 0.000 | 0.000 | 0.000 ± 0.000 | 0.000 |
| **sd** | 0.000 | | | | 0.000 | |
| **Beta** | 0.000 | 0.000 | 0.000 | 0.000 | 0.000 ± 0.000 | 0.000 |
| **sd** | 0.000 | | | | 0.000 | |

*** Note: Decay Corrected** **MDC Method** Currie **Error =** .00 **x sd**

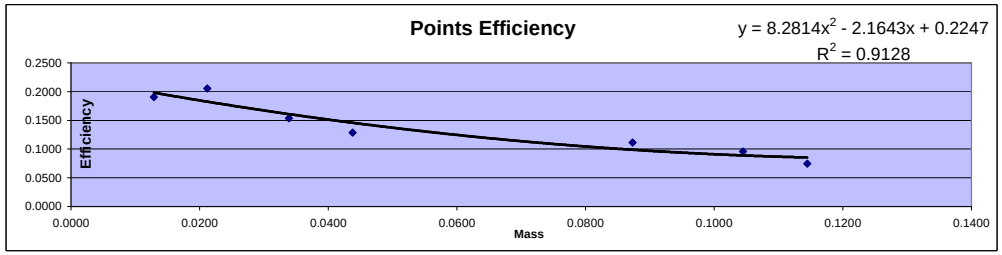
**Purple 0**

| Detector ID | Sample ID | Count Date | Count Time | Alpha Counts | Net CPM | DPM | Th-230 Efficiency | Standard Aliquot | Mass |
|---|---|---|---|---|---|---|---|---|---|
| 0 | ICABT-51465;A1 | 1/16/2016 10:15 | 40 | 18103 | 452.575 | 2374.5 | 0.1906 | 1mL | 0.0129 |
| 0 | ICABT-51465;A2 | 1/16/2016 15:15 | 40 | 19498 | 487.450 | 2374.5 | 0.2053 | 1mL | 0.0212 |
| 0 | ICABT-51465;A3 | 1/16/2016 14:32 | 40 | 14616 | 365.400 | 2374.5 | 0.1539 | 1mL | 0.0339 |
| 0 | ICABT-51465;A4 | 1/16/2016 13:49 | 40 | 12219 | 305.475 | 2374.5 | 0.1286 | 1mL | 0.0438 |
| 0 | ICABT-51465;A6 | 1/16/2016 12:25 | 40 | 21130 | 528.250 | 4749.0 | 0.1112 | 2mL | 0.0873 |
| 0 | ICABT-51465;A7 | 1/16/2016 11:43 | 40 | 18214 | 455.350 | 4749.0 | 0.0959 | 2mL | 0.1045 |
| 0 | ICABT-51465;A8 | 1/16/2016 11:01 | 40 | 14219 | 355.475 | 4749.0 | 0.0749 | 2mL | 0.1145 |

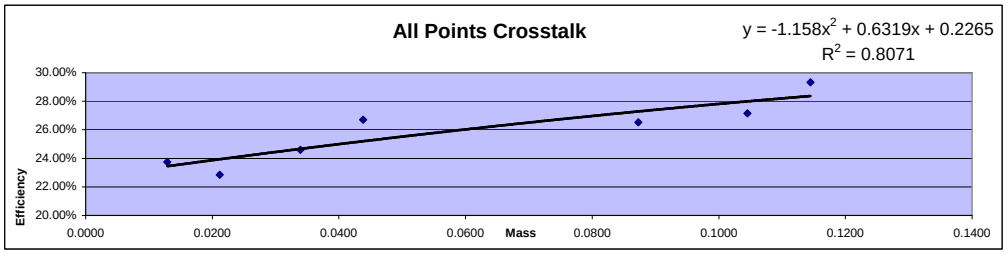
| Mass | Measured Efficiency | Theoretical Efficiency | Percent Δ Efficiency |
|---|---|---|---|
| 0.0129 | 0.1906 | 0.1982 | -3.82% |
| 0.0212 | 0.2053 | 0.1825 | 12.46% |
| 0.0339 | 0.1539 | 0.1608 | -4.33% |
| 0.0438 | 0.1286 | 0.1458 | -11.76% |
| 0.0873 | 0.1112 | 0.0989 | 12.50% |
| 0.1045 | 0.0959 | 0.0890 | 7.78% |
| 0.1145 | 0.0749 | 0.0855 | -12.41% |




| Mass | Efficiency |
|---|---|
| 0.0129 | 0.1906 |
| 0.0212 | 0.2053 |
| 0.0339 | 0.1539 |
| 0.0438 | 0.1286 |
| 0.0873 | 0.1112 |
| 0.1045 | 0.0959 |
| 0.1145 | 0.0749 |




| Detector ID | Sample ID | Mass | Count Time | Alpha Counts | Beta Counts | Alpha CPM | Beta CPM | % α into β | |
|---|---|---|---|---|---|---|---|---|---|
| 0 | ICABT-51465;A1 | 0.0129 | 40.00 | 18103 | 5640 | 452.58 | 141.00 | 23.75% | Min |
| 0 | ICABT-51465;A2 | 0.0212 | 40.00 | 19498 | 5772 | 487.45 | 144.30 | 22.84% | 22.84% |
| 0 | ICABT-51465;A3 | 0.0339 | 40.00 | 14616 | 4765 | 365.40 | 119.13 | 24.59% | |
| 0 | ICABT-51465;A4 | 0.0438 | 40.00 | 12219 | 4453 | 305.48 | 111.33 | 26.71% | Max |
| 0 | ICABT-51465;A6 | 0.0873 | 40.00 | 21130 | 7624 | 528.25 | 190.60 | 26.51% | |
| 0 | ICABT-51465;A7 | 0.1045 | 40.00 | 18214 | 6792 | 455.35 | 169.80 | 27.16% | Mean |
| 0 | ICABT-51465;A8 | 0.1145 | 40.00 | 14219 | 5901 | 355.48 | 147.53 | 29.33% | 25.84% |




**Standard ID**
Thorium-230
Th-230_00016
Container#: 51465
Cert #: 92523 Ref. date 11/29/2012
Activity 2374.5 dpm/mL

# Alpha/Beta Count Results

## Sample Activity Report

## Purple 0-3 - A

**Addr:** 0

**Sample ID** ICABT-51465;A1

**Repeat** 49

**Carrier No.** 0

**Batch ID** m153000

**Count Method** Gross Alpha Beta

**Detector Volts** 1515

**Sample Qty** 0 ***Sample*** **sd** 0 ***Sample***

**Residual Wt** 0 ***mg*** **sd** 0 ***mg***

**Count Began** 1/16/2016 10:15:12 AM **Collection Date 1** 1/1/1900 **Half Life** 0.00 ***days***

**Count Ended** 1/16/2016 10:55:18 AM **Collection Date 2** 1/1/1900 **Decay Factor** 1.000

**Sample Count Time** 40.00 ***mins*** **Background Count Time** 1,000.00 ***mins***

| | Efficiency % | Attenuation Factor | Activity Divisor | Background cpm | Gross counts | Gross cpm | Net cpm |
|---|---|---|---|---|---|---|---|
| **Alpha** | 0.000 | 1.000 | 1.000 | 0.145 | 18,103 | 452.575 | 452.430 |
| **sd** | 0.000 | | | 0.012 | 134.547 | 3.364 | 3.364 |
| **A to B** | 0.000 | 1.000 | | | | 0.000 | |
| **sd** | 0.000 | | | | | 0.000 | |
| **Beta** | 0.000 | 1.000 | 1.000 | 0.509 | 5,640 | 141.000 | 140.491 |
| **sd** | 0.000 | | | 0.023 | 75.100 | 1.877 | 1.878 |

| | Net Activity dpm | LLD dpm | MDC DPM | MPC DPM | Net Concentration * DPM | Conc / MPC Ratio |
|---|---|---|---|---|---|---|
| **Alpha** | 0.000 | 0.000 | 0.000 | 0.000 | 0.000 ± 0.000 | 0.000 |
| **sd** | 0.000 | | | | 0.000 | |
| **Beta** | 0.000 | 0.000 | 0.000 | 0.000 | 0.000 ± 0.000 | 0.000 |
| **sd** | 0.000 | | | | 0.000 | |

*** Note: Decay Corrected** **MDC Method** Currie **Error =** .00 **x sd**

# Alpha/Beta Count Results

## Sample Activity Report

## Purple 0-3 - A

**Addr:** 0

**Sample ID** ICABT-51465;A8

**Repeat** 50

**Carrier No.** 0

**Batch ID** m153000

**Count Method** Gross Alpha Beta

**Detector Volts** 1515

| | | | |
|---|---|---|---|
| **Sample Qty** | 0 ***Sample*** | **sd** | 0 ***Sample*** |
| **Residual Wt** | 0 ***mg*** | **sd** | 0 ***mg*** |

**Count Began** 1/16/2016 11:01:41 AM

**Count Ended** 1/16/2016 11:41:47 AM

**Collection Date 1** 1/1/1900

**Collection Date 2** 1/1/1900

**Half Life** 0.00 ***days***

**Decay Factor** 1.000

**Sample Count Time** 40.00 ***mins***

**Background Count Time** 1,000.00 ***mins***

| | Efficiency % | Attenuation Factor | Activity Divisor | Background cpm | Gross counts | Gross cpm | Net cpm |
|---|---|---|---|---|---|---|---|
| **Alpha** | 0.000 | 1.000 | 1.000 | 0.145 | 14,219 | 355.475 | 355.330 |
| **sd** | 0.000 | | | 0.012 | 119.243 | 2.981 | 2.981 |
| **A to B** | 0.000 | 1.000 | | | | 0.000 | |
| **sd** | 0.000 | | | | | 0.000 | |
| **Beta** | 0.000 | 1.000 | 1.000 | 0.509 | 5,901 | 147.525 | 147.016 |
| **sd** | 0.000 | | | 0.023 | 76.818 | 1.920 | 1.921 |

| | Net Activity dpm | LLD dpm | MDC DPM | MPC DPM | Net Concentration * DPM | Conc / MPC Ratio |
|---|---|---|---|---|---|---|
| **Alpha** | 0.000 | 0.000 | 0.000 | 0.000 | 0.000 ± 0.000 | 0.000 |
| **sd** | 0.000 | | | | 0.000 | |
| **Beta** | 0.000 | 0.000 | 0.000 | 0.000 | 0.000 ± 0.000 | 0.000 |
| **sd** | 0.000 | | | | 0.000 | |

*** Note: Decay Corrected**

**MDC Method** Currie

**Error =** .00 **x sd**

# Alpha/Beta Count Results

## Sample Activity Report

## Purple 0-3 - A

**Addr:** 0

**Sample ID** ICABT-51465;A7

**Repeat** 51

**Carrier No.** 0

**Batch ID** m153000

**Count Method** Gross Alpha Beta

**Detector Volts** 1515

| | | | |
|---|---|---|---|
| **Sample Qty** | 0 ***Sample*** | **sd** | 0 ***Sample*** |
| **Residual Wt** | 0 ***mg*** | **sd** | 0 ***mg*** |

**Count Began** 1/16/2016 11:43:26 AM

**Count Ended** 1/16/2016 12:23:33 PM

**Collection Date 1** 1/1/1900

**Collection Date 2** 1/1/1900

**Half Life** 0.00 ***days***

**Decay Factor** 1.000

**Sample Count Time** 40.00 ***mins***

**Background Count Time** 1,000.00 ***mins***

| | Efficiency % | Attenuation Factor | Activity Divisor | Background cpm | Gross counts | Gross cpm | Net cpm |
|---|---|---|---|---|---|---|---|
| **Alpha** | 0.000 | 1.000 | 1.000 | 0.145 | 18,214 | 455.350 | 455.205 |
| **sd** | 0.000 | | | 0.012 | 134.959 | 3.374 | 3.374 |
| **A to B** | 0.000 | 1.000 | | | | 0.000 | |
| **sd** | 0.000 | | | | | 0.000 | |
| **Beta** | 0.000 | 1.000 | 1.000 | 0.509 | 6,792 | 169.800 | 169.291 |
| **sd** | 0.000 | | | 0.023 | 82.414 | 2.060 | 2.060 |

| | Net Activity dpm | LLD dpm | MDC DPM | MPC DPM | Net Concentration * DPM | Conc / MPC Ratio |
|---|---|---|---|---|---|---|
| **Alpha** | 0.000 | 0.000 | 0.000 | 0.000 | 0.000 ± 0.000 | 0.000 |
| **sd** | 0.000 | | | | 0.000 | |
| **Beta** | 0.000 | 0.000 | 0.000 | 0.000 | 0.000 ± 0.000 | 0.000 |
| **sd** | 0.000 | | | | 0.000 | |

*** Note: Decay Corrected**

**MDC Method** Currie

**Error =** .00 **x sd**

# Alpha/Beta Count Results

## Sample Activity Report

## Purple 0-3 - A

**Addr:** 0

**Sample ID** ICABT-51465;A6

**Repeat** 129

**Carrier No.** 0

**Batch ID** m153000

**Count Method** Gross Alpha Beta

**Detector Volts** 1515

**Sample Qty** 0 ***Sample*** **sd** 0 ***Sample***

**Residual Wt** 0 ***mg*** **sd** 0 ***mg***

**Count Began** 1/16/2016 12:25:26 PM **Collection Date 1** 1/1/1900 **Half Life** 0.00 ***days***

**Count Ended** 1/16/2016 1:05:32 PM **Collection Date 2** 1/1/1900 **Decay Factor** 1.000

**Sample Count Time** 40.00 ***mins*** **Background Count Time** 1,000.00 ***mins***

| | Efficiency % | Attenuation Factor | Activity Divisor | Background cpm | Gross counts | Gross cpm | Net cpm |
|---|---|---|---|---|---|---|---|
| **Alpha** | 0.000 | 1.000 | 1.000 | 0.145 | 21,130 | 528.250 | 528.105 |
| **sd** | 0.000 | | | 0.012 | 145.362 | 3.634 | 3.634 |
| **A to B** | 0.000 | 1.000 | | | | 0.000 | |
| **sd** | 0.000 | | | | | 0.000 | |
| **Beta** | 0.000 | 1.000 | 1.000 | 0.509 | 7,624 | 190.600 | 190.091 |
| **sd** | 0.000 | | | 0.023 | 87.316 | 2.183 | 2.183 |

| | Net Activity dpm | LLD dpm | MDC DPM | MPC DPM | Net Concentration * DPM | Conc / MPC Ratio |
|---|---|---|---|---|---|---|
| **Alpha** | 0.000 | 0.000 | 0.000 | 0.000 | 0.000 ± 0.000 | 0.000 |
| **sd** | 0.000 | | | | 0.000 | |
| **Beta** | 0.000 | 0.000 | 0.000 | 0.000 | 0.000 ± 0.000 | 0.000 |
| **sd** | 0.000 | | | | 0.000 | |

*** Note: Decay Corrected** **MDC Method** Currie **Error =** .00 **x sd**

# Alpha/Beta Count Results

## Sample Activity Report

## Purple 0-3 - A

**Addr:** 0

**Sample ID** ICABT-51465;A5

**Repeat** 53

**Carrier No.** 0

**Batch ID** m153000

**Count Method** Gross Alpha Beta

**Detector Volts** 1515

**Sample Qty** 0 ***Sample*** **sd** 0 ***Sample***

**Residual Wt** 0 ***mg*** **sd** 0 ***mg***

**Count Began** 1/16/2016 1:06:35 PM **Collection Date 1** 1/1/1900 **Half Life** 0.00 ***days***

**Count Ended** 1/16/2016 1:46:40 PM **Collection Date 2** 1/1/1900 **Decay Factor** 1.000

**Sample Count Time** 40.00 ***mins*** **Background Count Time** 1,000.00 ***mins***

| | Efficiency % | Attenuation Factor | Activity Divisor | Background cpm | Gross counts | Gross cpm | Net cpm |
|---|---|---|---|---|---|---|---|
| **Alpha** | 0.000 | 1.000 | 1.000 | 0.145 | 17,802 | 445.050 | 444.905 |
| **sd** | 0.000 | | | 0.012 | 133.424 | 3.336 | 3.336 |
| **A to B** | 0.000 | 1.000 | | | | 0.000 | |
| **sd** | 0.000 | | | | | 0.000 | |
| **Beta** | 0.000 | 1.000 | 1.000 | 0.509 | 7,096 | 177.400 | 176.891 |
| **sd** | 0.000 | | | 0.023 | 84.238 | 2.106 | 2.106 |

| | Net Activity dpm | LLD dpm | MDC DPM | MPC DPM | Net Concentration * DPM | Conc / MPC Ratio |
|---|---|---|---|---|---|---|
| **Alpha** | 0.000 | 0.000 | 0.000 | 0.000 | 0.000 ± 0.000 | 0.000 |
| **sd** | 0.000 | | | | 0.000 | |
| **Beta** | 0.000 | 0.000 | 0.000 | 0.000 | 0.000 ± 0.000 | 0.000 |
| **sd** | 0.000 | | | | 0.000 | |

*** Note: Decay Corrected** **MDC Method** Currie **Error =** .00 **x sd**

# Alpha/Beta Count Results

## Sample Activity Report

## Purple 0-3 - A

**Addr:** 0

**Sample ID** ICABT-51465;A4

**Repeat** 54

**Carrier No.** 0

**Batch ID** m153000

**Count Method** Gross Alpha Beta

**Detector Volts** 1515

**Sample Qty** 0 ***Sample*** **sd** 0 ***Sample***

**Residual Wt** 0 ***mg*** **sd** 0 ***mg***

**Count Began** 1/16/2016 1:49:23 PM **Collection Date 1** 1/1/1900 **Half Life** 0.00 ***days***

**Count Ended** 1/16/2016 2:29:29 PM **Collection Date 2** 1/1/1900 **Decay Factor** 1.000

**Sample Count Time** 40.00 ***mins*** **Background Count Time** 1,000.00 ***mins***

| | Efficiency % | Attenuation Factor | Activity Divisor | Background cpm | Gross counts | Gross cpm | Net cpm |
|---|---|---|---|---|---|---|---|
| **Alpha** | 0.000 | 1.000 | 1.000 | 0.145 | 12,219 | 305.475 | 305.330 |
| **sd** | 0.000 | | | 0.012 | 110.540 | 2.763 | 2.764 |
| **A to B** | 0.000 | 1.000 | | | | 0.000 | |
| **sd** | 0.000 | | | | | 0.000 | |
| **Beta** | 0.000 | 1.000 | 1.000 | 0.509 | 4,453 | 111.325 | 110.816 |
| **sd** | 0.000 | | | 0.023 | 66.731 | 1.668 | 1.668 |

| | Net Activity dpm | LLD dpm | MDC DPM | MPC DPM | Net Concentration * DPM | Conc / MPC Ratio |
|---|---|---|---|---|---|---|
| **Alpha** | 0.000 | 0.000 | 0.000 | 0.000 | 0.000 ± 0.000 | 0.000 |
| **sd** | 0.000 | | | | 0.000 | |
| **Beta** | 0.000 | 0.000 | 0.000 | 0.000 | 0.000 ± 0.000 | 0.000 |
| **sd** | 0.000 | | | | 0.000 | |

*** Note: Decay Corrected** **MDC Method** Currie **Error =** .00 **x sd**

# Alpha/Beta Count Results

## Sample Activity Report

## Purple 0-3 - A

**Addr:** 0

**Sample ID** ICABT-51465;A3

**Repeat** 55

**Carrier No.** 0

**Batch ID** m153000

**Count Method** Gross Alpha Beta

**Detector Volts** 1515

**Sample Qty** 0 ***Sample*** **sd** 0 ***Sample***

**Residual Wt** 0 ***mg*** **sd** 0 ***mg***

**Count Began** 1/16/2016 2:32:20 PM **Collection Date 1** 1/1/1900 **Half Life** 0.00 ***days***

**Count Ended** 1/16/2016 3:12:24 PM **Collection Date 2** 1/1/1900 **Decay Factor** 1.000

**Sample Count Time** 40.00 ***mins*** **Background Count Time** 1,000.00 ***mins***

| | Efficiency % | Attenuation Factor | Activity Divisor | Background cpm | Gross counts | Gross cpm | Net cpm |
|---|---|---|---|---|---|---|---|
| **Alpha** | 0.000 | 1.000 | 1.000 | 0.145 | 14,616 | 365.400 | 365.255 |
| **sd** | 0.000 | | | 0.012 | 120.897 | 3.022 | 3.022 |
| **A to B** | 0.000 | 1.000 | | | | 0.000 | |
| **sd** | 0.000 | | | | | 0.000 | |
| **Beta** | 0.000 | 1.000 | 1.000 | 0.509 | 4,765 | 119.125 | 118.616 |
| **sd** | 0.000 | | | 0.023 | 69.029 | 1.726 | 1.726 |

| | Net Activity dpm | LLD dpm | MDC DPM | MPC DPM | Net Concentration * DPM | Conc / MPC Ratio |
|---|---|---|---|---|---|---|
| **Alpha** | 0.000 | 0.000 | 0.000 | 0.000 | 0.000 ± 0.000 | 0.000 |
| **sd** | 0.000 | | | | 0.000 | |
| **Beta** | 0.000 | 0.000 | 0.000 | 0.000 | 0.000 ± 0.000 | 0.000 |
| **sd** | 0.000 | | | | 0.000 | |

*** Note: Decay Corrected** **MDC Method** Currie **Error =** .00 **x sd**

# Alpha/Beta Count Results

## Sample Activity Report

## Purple 0-3 - A

**Addr:** 0

**Sample ID** ICABT-51465;A2

**Repeat** 56

**Carrier No.** 0

**Batch ID** m153000

**Count Method** Gross Alpha Beta

**Detector Volts** 1515

**Sample Qty** 0 ***Sample*** **sd** 0 ***Sample***

**Residual Wt** 0 ***mg*** **sd** 0 ***mg***

**Count Began** 1/16/2016 3:15:17 PM **Collection Date 1** 1/1/1900 **Half Life** 0.00 ***days***

**Count Ended** 1/16/2016 3:55:22 PM **Collection Date 2** 1/1/1900 **Decay Factor** 1.000

**Sample Count Time** 40.00 ***mins*** **Background Count Time** 1,000.00 ***mins***

| | Efficiency % | Attenuation Factor | Activity Divisor | Background cpm | Gross counts | Gross cpm | Net cpm |
|---|---|---|---|---|---|---|---|
| **Alpha** | 0.000 | 1.000 | 1.000 | 0.145 | 19,498 | 487.450 | 487.305 |
| **sd** | 0.000 | | | 0.012 | 139.635 | 3.491 | 3.491 |
| **A to B** | 0.000 | 1.000 | | | | 0.000 | |
| **sd** | 0.000 | | | | | 0.000 | |
| **Beta** | 0.000 | 1.000 | 1.000 | 0.509 | 5,772 | 144.300 | 143.791 |
| **sd** | 0.000 | | | 0.023 | 75.974 | 1.899 | 1.899 |

| | Net Activity dpm | LLD dpm | MDC DPM | MPC DPM | Net Concentration * DPM | Conc / MPC Ratio |
|---|---|---|---|---|---|---|
| **Alpha** | 0.000 | 0.000 | 0.000 | 0.000 | 0.000 ± 0.000 | 0.000 |
| **sd** | 0.000 | | | | 0.000 | |
| **Beta** | 0.000 | 0.000 | 0.000 | 0.000 | 0.000 ± 0.000 | 0.000 |
| **sd** | 0.000 | | | | 0.000 | |

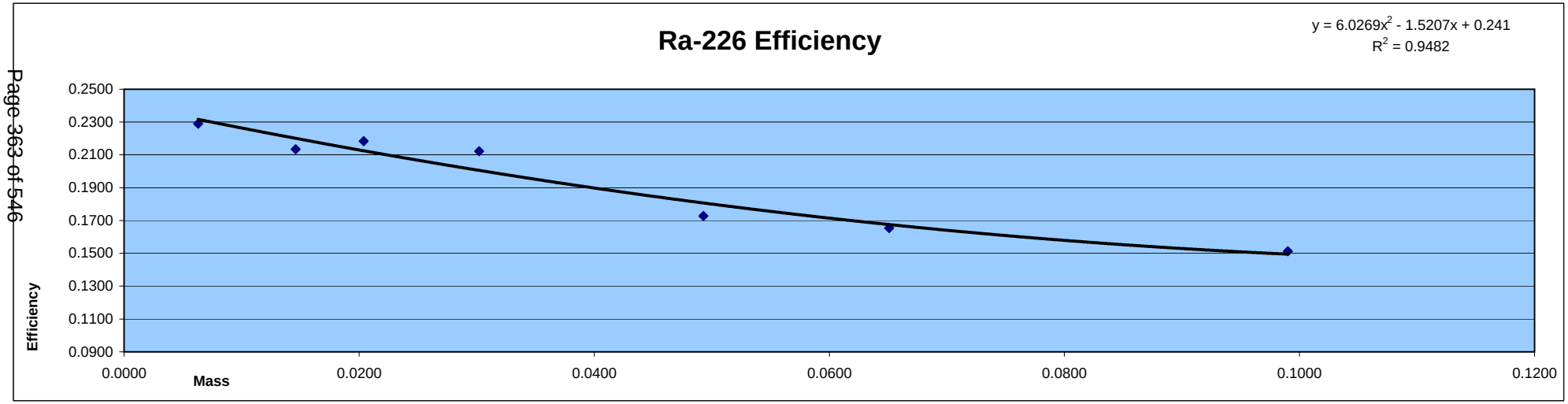
*** Note: Decay Corrected** **MDC Method** Currie **Error =** .00 **x sd**

# Ra-226 Calibrations

# Ra-226 Calibration 2019

**Blue 0**

| Std # | Sample Time | Count Time | Alpha Counts | CPM | Sep Time | Ingrowth | Recovery | Adj CPM | DPM | Efficiency | Mass |
|---|---|---|---|---|---|---|---|---|---|---|---|
| ICRa6-1063071;Ra2 | 7/26/2019 18:14 | 15 | 46454 | 3096.9333 | 2/13/2017 13:30 | 4.0000 | 0.4487 | 1725.4264 | 7534.6 | 0.2290 | 0.0063 |
| ICRa6-1063071;Ra3 | 7/26/2019 17:42 | 15 | 66910 | 4460.6667 | 2/13/2017 13:30 | 4.0000 | 0.6933 | 1608.5836 | 7534.6 | 0.2135 | 0.0146 |
| ICRa6-1063071;Ra4 | 7/26/2019 17:22 | 15 | 71726 | 4781.7333 | 2/13/2017 13:30 | 4.0000 | 0.7265 | 1645.4691 | 7534.6 | 0.2184 | 0.0204 |
| ICRa6-1063071;Ra5 | 7/26/2019 17:06 | 15 | 82557 | 5503.8000 | 2/13/2017 13:30 | 4.0000 | 0.8604 | 1599.1980 | 7534.6 | 0.2122 | 0.0302 |
| ICRa6-1063071;Ra6 | 7/26/2019 16:49 | 15 | 73140 | 4876.0000 | 2/13/2017 13:30 | 4.0000 | 0.9364 | 1301.8358 | 7534.6 | 0.1728 | 0.0493 |
| ICRa6-1063071;Ra7 | 7/26/2019 16:32 | 15 | 69347 | 4623.1333 | 2/13/2017 13:30 | 4.0000 | 0.9274 | 1246.3291 | 7534.6 | 0.1654 | 0.0651 |
| ICRa6-1063071;Ra8 | 7/26/2019 16:14 | 15 | 64272 | 4284.8000 | 2/13/2017 13:30 | 4.0000 | 0.9402 | 1139.3684 | 7534.6 | 0.1512 | 0.0990 |




Reagent ID:Ra-226_00022
Container #:986404
Final Conc.: 7534.60740 dpm/mL
Added: 1mL

Reagent ID:Ba Carrier_00026
Container #: 1015438
Cert.#: 16I027

# Alpha/Beta Count Results

## Sample Activity Report

## Blue 0-3 - A

**Addr:** 0

**Sample ID** ICRa6-1063071;Ra1

**Repeat** 18

**Carrier No.** 0

**Batch ID** Ra226 - IC

**Count Method** Gross Alpha Beta

**Detector Volts** 1515

**Sample Qty** 0 ***Sample*** **sd** 0 ***Sample***

**Residual Wt** 0 ***mg*** **sd** 0 ***mg***

**Count Began** 7/26/2019 3:55:54 PM **Collection Date 1** 1/1/1900 **Half Life** 0.00 ***days***

**Count Ended** 7/26/2019 4:11:06 PM **Collection Date 2** 1/1/1900 **Decay Factor** 1.000

**Sample Count Time** 15.00 ***mins*** **Background Count Time** 1,000.00 ***mins***

| | Efficiency % | Attenuation Factor | Activity Divisor | Background cpm | Gross counts | Gross cpm | Net cpm |
|---|---|---|---|---|---|---|---|
| **Alpha** | 0.000 | 1.000 | 1.000 | 0.140 | 46,200 | 3,080.000 | 3,079.860 |
| **sd** | 0.000 | | | 0.012 | 214.942 | 14.329 | 14.329 |
| **A to B** | 0.000 | 1.000 | | | | 0.000 | |
| **sd** | 0.000 | | | | | 0.000 | |
| **Beta** | 0.000 | 1.000 | 1.000 | 0.442 | 53,301 | 3,553.400 | 3,552.958 |
| **sd** | 0.000 | | | 0.021 | 230.870 | 15.391 | 15.391 |

| | Net Activity dpm | LLD dpm | MDC DPM | MPC DPM | Net Concentration * DPM | Conc / MPC Ratio |
|---|---|---|---|---|---|---|
| **Alpha** | 0.000 | 0.000 | 0.000 | 0.000 | 0.000 ± 0.000 | 0.000 |
| **sd** | 0.000 | | | | 0.000 | |
| **Beta** | 0.000 | 0.000 | 0.000 | 0.000 | 0.000 ± 0.000 | 0.000 |
| **sd** | 0.000 | | | | 0.000 | |

*** Note: Decay Corrected** **MDC Method** Currie **Error =** .00 **x sd**

# Alpha/Beta Count Results

## Sample Activity Report

## Blue 0-3 - A

**Addr:** 0

**Sample ID** ICRa6-1063071;Ra8

**Repeat** 18

**Carrier No.** 0

**Batch ID** Ra226 - IC

**Count Method** Gross Alpha Beta

**Detector Volts** 1515

**Sample Qty** 0 ***Sample*** **sd** 0 ***Sample***

**Residual Wt** 0 ***mg*** **sd** 0 ***mg***

**Count Began** 7/26/2019 4:14:41 PM **Collection Date 1** 1/1/1900 **Half Life** 0.00 ***days***

**Count Ended** 7/26/2019 4:29:58 PM **Collection Date 2** 1/1/1900 **Decay Factor** 1.000

**Sample Count Time** 15.00 ***mins*** **Background Count Time** 1,000.00 ***mins***

| | Efficiency % | Attenuation Factor | Activity Divisor | Background cpm | Gross counts | Gross cpm | Net cpm |
|---|---|---|---|---|---|---|---|
| **Alpha** | 0.000 | 1.000 | 1.000 | 0.140 | 64,272 | 4,284.800 | 4,284.660 |
| **sd** | 0.000 | | | 0.012 | 253.519 | 16.901 | 16.901 |
| **A to B** | 0.000 | 1.000 | | | | 0.000 | |
| **sd** | 0.000 | | | | | 0.000 | |
| **Beta** | 0.000 | 1.000 | 1.000 | 0.442 | 100,581 | 6,705.400 | 6,704.958 |
| **sd** | 0.000 | | | 0.021 | 317.145 | 21.143 | 21.143 |

| | Net Activity dpm | LLD dpm | MDC DPM | MPC DPM | Net Concentration * DPM | Conc / MPC Ratio |
|---|---|---|---|---|---|---|
| **Alpha** | 0.000 | 0.000 | 0.000 | 0.000 | 0.000 ± 0.000 | 0.000 |
| **sd** | 0.000 | | | | 0.000 | |
| **Beta** | 0.000 | 0.000 | 0.000 | 0.000 | 0.000 ± 0.000 | 0.000 |
| **sd** | 0.000 | | | | 0.000 | |

*** Note: Decay Corrected** **MDC Method** Currie **Error =** .00 **x sd**

# Alpha/Beta Count Results

## Sample Activity Report

## Blue 0-3 - A

**Addr:** 0

**Sample ID** ICRa6-1063071;Ra7

**Repeat** 20

**Carrier No.** 0

**Batch ID** Ra226 - IC

**Count Method** Gross Alpha Beta

**Detector Volts** 1515

**Sample Qty** 0 ***Sample*** **sd** 0 ***Sample***

**Residual Wt** 0 ***mg*** **sd** 0 ***mg***

**Count Began** 7/26/2019 4:32:00 PM **Collection Date 1** 1/1/1900 **Half Life** 0.00 ***days***

**Count Ended** 7/26/2019 4:47:19 PM **Collection Date 2** 1/1/1900 **Decay Factor** 1.000

**Sample Count Time** 15.00 ***mins*** **Background Count Time** 1,000.00 ***mins***

| | Efficiency % | Attenuation Factor | Activity Divisor | Background cpm | Gross counts | Gross cpm | Net cpm |
|---|---|---|---|---|---|---|---|
| **Alpha** | 0.000 | 1.000 | 1.000 | 0.140 | 69,347 | 4,623.133 | 4,622.993 |
| **sd** | 0.000 | | | 0.012 | 263.338 | 17.556 | 17.556 |
| **A to B** | 0.000 | 1.000 | | | | 0.000 | |
| **sd** | 0.000 | | | | | 0.000 | |
| **Beta** | 0.000 | 1.000 | 1.000 | 0.442 | 97,631 | 6,508.733 | 6,508.291 |
| **sd** | 0.000 | | | 0.021 | 312.460 | 20.831 | 20.831 |

| | Net Activity dpm | LLD dpm | MDC DPM | MPC DPM | Net Concentration * DPM | Conc / MPC Ratio |
|---|---|---|---|---|---|---|
| **Alpha** | 0.000 | 0.000 | 0.000 | 0.000 | 0.000 ± 0.000 | 0.000 |
| **sd** | 0.000 | | | | 0.000 | |
| **Beta** | 0.000 | 0.000 | 0.000 | 0.000 | 0.000 ± 0.000 | 0.000 |
| **sd** | 0.000 | | | | 0.000 | |

*** Note: Decay Corrected** **MDC Method** Currie **Error =** .00 **x sd**

# Alpha/Beta Count Results

## Sample Activity Report

## Blue 0-3 - A

**Addr:** 0

**Sample ID** ICRa6-1063071;Ra6

**Repeat** 21

**Carrier No.** 0

**Batch ID** Ra226 - IC

**Count Method** Gross Alpha Beta

**Detector Volts** 1515

**Sample Qty** 0 ***Sample*** **sd** 0 ***Sample***

**Residual Wt** 0 ***mg*** **sd** 0 ***mg***

**Count Began** 7/26/2019 4:49:14 PM **Collection Date 1** 1/1/1900 **Half Life** 0.00 ***days***

**Count Ended** 7/26/2019 5:04:36 PM **Collection Date 2** 1/1/1900 **Decay Factor** 1.000

**Sample Count Time** 15.00 ***mins*** **Background Count Time** 1,000.00 ***mins***

| | Efficiency % | Attenuation Factor | Activity Divisor | Background cpm | Gross counts | Gross cpm | Net cpm |
|---|---|---|---|---|---|---|---|
| **Alpha** | 0.000 | 1.000 | 1.000 | 0.140 | 73,140 | 4,876.000 | 4,875.860 |
| **sd** | 0.000 | | | 0.012 | 270.444 | 18.030 | 18.030 |
| **A to B** | 0.000 | 1.000 | | | | 0.000 | |
| **sd** | 0.000 | | | | | 0.000 | |
| **Beta** | 0.000 | 1.000 | 1.000 | 0.442 | 98,441 | 6,562.733 | 6,562.291 |
| **sd** | 0.000 | | | 0.021 | 313.753 | 20.917 | 20.917 |

| | Net Activity dpm | LLD dpm | MDC DPM | MPC DPM | Net Concentration * DPM | Conc / MPC Ratio |
|---|---|---|---|---|---|---|
| **Alpha** | 0.000 | 0.000 | 0.000 | 0.000 | 0.000 ± 0.000 | 0.000 |
| **sd** | 0.000 | | | | 0.000 | |
| **Beta** | 0.000 | 0.000 | 0.000 | 0.000 | 0.000 ± 0.000 | 0.000 |
| **sd** | 0.000 | | | | 0.000 | |

*** Note: Decay Corrected** **MDC Method** Currie **Error =** .00 **x sd**

# Alpha/Beta Count Results

## Sample Activity Report

## Blue 0-3 - A

**Addr:** 0

**Sample ID** ICRa6-1063071;Ra5

**Repeat** 22

**Carrier No.** 0

**Batch ID** Ra226 - IC

**Count Method** Gross Alpha Beta

**Detector Volts** 1515

**Sample Qty** 0 ***Sample*** **sd** 0 ***Sample***

**Residual Wt** 0 ***mg*** **sd** 0 ***mg***

**Count Began** 7/26/2019 5:06:03 PM **Collection Date 1** 1/1/1900 **Half Life** 0.00 ***days***

**Count Ended** 7/26/2019 5:21:25 PM **Collection Date 2** 1/1/1900 **Decay Factor** 1.000

**Sample Count Time** 15.00 ***mins*** **Background Count Time** 1,000.00 ***mins***

| | Efficiency % | Attenuation Factor | Activity Divisor | Background cpm | Gross counts | Gross cpm | Net cpm |
|---|---|---|---|---|---|---|---|
| **Alpha** | 0.000 | 1.000 | 1.000 | 0.140 | 82,557 | 5,503.800 | 5,503.660 |
| **sd** | 0.000 | | | 0.012 | 287.327 | 19.155 | 19.155 |
| **A to B** | 0.000 | 1.000 | | | | 0.000 | |
| **sd** | 0.000 | | | | | 0.000 | |
| **Beta** | 0.000 | 1.000 | 1.000 | 0.442 | 97,159 | 6,477.267 | 6,476.825 |
| **sd** | 0.000 | | | 0.021 | 311.703 | 20.780 | 20.780 |

| | Net Activity dpm | LLD dpm | MDC DPM | MPC DPM | Net Concentration * DPM | Conc / MPC Ratio |
|---|---|---|---|---|---|---|
| **Alpha** | 0.000 | 0.000 | 0.000 | 0.000 | 0.000 ± 0.000 | 0.000 |
| **sd** | 0.000 | | | | 0.000 | |
| **Beta** | 0.000 | 0.000 | 0.000 | 0.000 | 0.000 ± 0.000 | 0.000 |
| **sd** | 0.000 | | | | 0.000 | |

*** Note: Decay Corrected** **MDC Method** Currie **Error =** .00 **x sd**

# Alpha/Beta Count Results

## Sample Activity Report

## Blue 0-3 - A

**Addr:** 0

**Sample ID** ICRa6-1063071;Ra4

**Repeat** 23

**Carrier No.** 0

**Batch ID** Ra226 - IC

**Count Method** Gross Alpha Beta

**Detector Volts** 1515

**Sample Qty** 0 ***Sample*** **sd** 0 ***Sample***

**Residual Wt** 0 ***mg*** **sd** 0 ***mg***

**Count Began** 7/26/2019 5:22:59 PM **Collection Date 1** 1/1/1900 **Half Life** 0.00 ***days***

**Count Ended** 7/26/2019 5:38:21 PM **Collection Date 2** 1/1/1900 **Decay Factor** 1.000

**Sample Count Time** 15.00 ***mins*** **Background Count Time** 1,000.00 ***mins***

| | Efficiency % | Attenuation Factor | Activity Divisor | Background cpm | Gross counts | Gross cpm | Net cpm |
|---|---|---|---|---|---|---|---|
| **Alpha** | 0.000 | 1.000 | 1.000 | 0.140 | 71,726 | 4,781.733 | 4,781.593 |
| **sd** | 0.000 | | | 0.012 | 267.817 | 17.854 | 17.854 |
| **A to B** | 0.000 | 1.000 | | | | 0.000 | |
| **sd** | 0.000 | | | | | 0.000 | |
| **Beta** | 0.000 | 1.000 | 1.000 | 0.442 | 84,403 | 5,626.867 | 5,626.425 |
| **sd** | 0.000 | | | 0.021 | 290.522 | 19.368 | 19.368 |

| | Net Activity dpm | LLD dpm | MDC DPM | MPC DPM | Net Concentration * DPM | Conc / MPC Ratio |
|---|---|---|---|---|---|---|
| **Alpha** | 0.000 | 0.000 | 0.000 | 0.000 | 0.000 ± 0.000 | 0.000 |
| **sd** | 0.000 | | | | 0.000 | |
| **Beta** | 0.000 | 0.000 | 0.000 | 0.000 | 0.000 ± 0.000 | 0.000 |
| **sd** | 0.000 | | | | 0.000 | |

*** Note: Decay Corrected** **MDC Method** Currie **Error =** .00 **x sd**

# Alpha/Beta Count Results

## Sample Activity Report

## Blue 0-3 - A

**Addr:** 0

**Sample ID** ICRa6-1063071;Ra3

**Repeat** 24

**Carrier No.** 0

**Batch ID** Ra226 - IC

**Count Method** Gross Alpha Beta

**Detector Volts** 1515

**Sample Qty** 0 ***Sample*** **sd** 0 ***Sample***

**Residual Wt** 0 ***mg*** **sd** 0 ***mg***

**Count Began** 7/26/2019 5:42:07 PM **Collection Date 1** 1/1/1900 **Half Life** 0.00 ***days***

**Count Ended** 7/26/2019 5:57:26 PM **Collection Date 2** 1/1/1900 **Decay Factor** 1.000

**Sample Count Time** 15.00 ***mins*** **Background Count Time** 1,000.00 ***mins***

| | Efficiency % | Attenuation Factor | Activity Divisor | Background cpm | Gross counts | Gross cpm | Net cpm |
|---|---|---|---|---|---|---|---|
| **Alpha** | 0.000 | 1.000 | 1.000 | 0.140 | 66,910 | 4,460.667 | 4,460.527 |
| **sd** | 0.000 | | | 0.012 | 258.670 | 17.245 | 17.245 |
| **A to B** | 0.000 | 1.000 | | | | 0.000 | |
| **sd** | 0.000 | | | | | 0.000 | |
| **Beta** | 0.000 | 1.000 | 1.000 | 0.442 | 75,950 | 5,063.333 | 5,062.891 |
| **sd** | 0.000 | | | 0.021 | 275.590 | 18.373 | 18.373 |

| | Net Activity dpm | LLD dpm | MDC DPM | MPC DPM | Net Concentration * DPM | Conc / MPC Ratio |
|---|---|---|---|---|---|---|
| **Alpha** | 0.000 | 0.000 | 0.000 | 0.000 | 0.000 ± 0.000 | 0.000 |
| **sd** | 0.000 | | | | 0.000 | |
| **Beta** | 0.000 | 0.000 | 0.000 | 0.000 | 0.000 ± 0.000 | 0.000 |
| **sd** | 0.000 | | | | 0.000 | |

*** Note: Decay Corrected** **MDC Method** Currie **Error =** .00 **x sd**

# Alpha/Beta Count Results

## Sample Activity Report

## Blue 0-3 - A

**Addr:** 0

**Sample ID** ICRa6-1063071;Ra2

**Repeat** 25

**Carrier No.** 0

**Batch ID** Ra226 - IC

**Count Method** Gross Alpha Beta

**Detector Volts** 1515

**Sample Qty** 0 ***Sample*** **sd** 0 ***Sample***

**Residual Wt** 0 ***mg*** **sd** 0 ***mg***

**Count Began** 7/26/2019 6:14:16 PM **Collection Date 1** 1/1/1900 **Half Life** 0.00 ***days***

**Count Ended** 7/26/2019 6:29:31 PM **Collection Date 2** 1/1/1900 **Decay Factor** 1.000

**Sample Count Time** 15.00 ***mins*** **Background Count Time** 1,000.00 ***mins***

| | Efficiency % | Attenuation Factor | Activity Divisor | Background cpm | Gross counts | Gross cpm | Net cpm |
|---|---|---|---|---|---|---|---|
| **Alpha** | 0.000 | 1.000 | 1.000 | 0.140 | 46,454 | 3,096.933 | 3,096.793 |
| **sd** | 0.000 | | | 0.012 | 215.532 | 14.369 | 14.369 |
| **A to B** | 0.000 | 1.000 | | | | 0.000 | |
| **sd** | 0.000 | | | | | 0.000 | |
| **Beta** | 0.000 | 1.000 | 1.000 | 0.442 | 51,777 | 3,451.800 | 3,451.358 |
| **sd** | 0.000 | | | 0.021 | 227.546 | 15.170 | 15.170 |

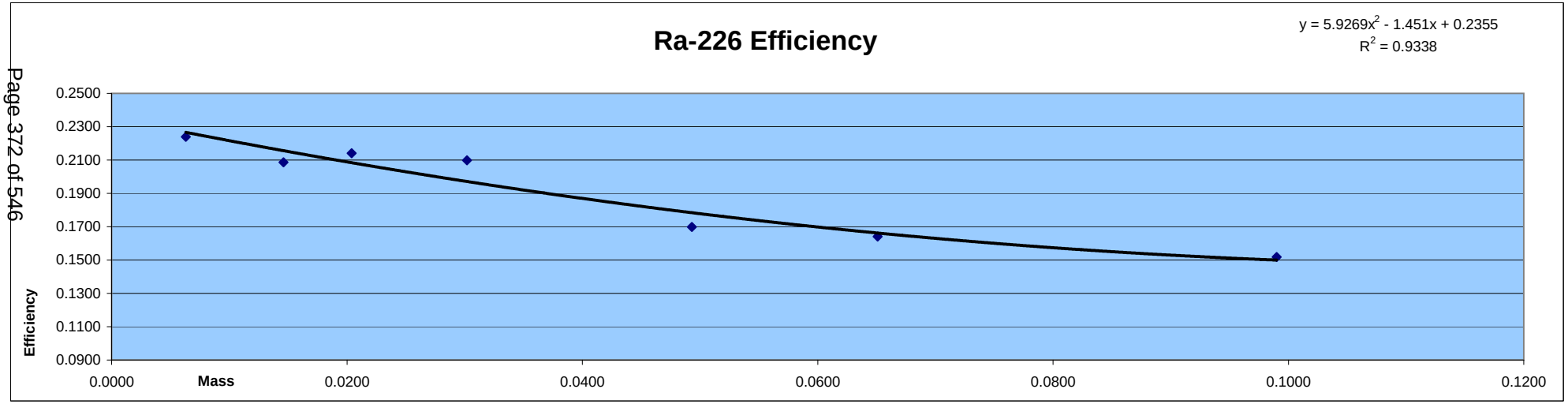
| | Net Activity dpm | LLD dpm | MDC DPM | MPC DPM | Net Concentration * DPM | Conc / MPC Ratio |
|---|---|---|---|---|---|---|
| **Alpha** | 0.000 | 0.000 | 0.000 | 0.000 | 0.000 ± 0.000 | 0.000 |
| **sd** | 0.000 | | | | 0.000 | |
| **Beta** | 0.000 | 0.000 | 0.000 | 0.000 | 0.000 ± 0.000 | 0.000 |
| **sd** | 0.000 | | | | 0.000 | |

*** Note: Decay Corrected** **MDC Method** Currie **Error =** .00 **x sd**

# Ra-226 Calibration 2019

**Blue 1**

| Std # | Sample Time | Count Time | Alpha Counts | CPM | Sep Time | Ingrowth | Recovery | Adj CPM | DPM | Efficiency | Mass |
|---|---|---|---|---|---|---|---|---|---|---|---|
| ICRa6-1063071;Ra2 | 7/26/2019 15:56 | 15 | 45438 | 3029.2000 | 2/13/2017 13:30 | 4.0000 | 0.4487 | 1687.6894 | 7534.6 | 0.2240 | 0.0063 |
| ICRa6-1063071;Ra3 | 7/26/2019 18:14 | 15 | 65406 | 4360.4000 | 2/13/2017 13:30 | 4.0000 | 0.6933 | 1572.4259 | 7534.6 | 0.2087 | 0.0146 |
| ICRa6-1063071;Ra4 | 7/26/2019 17:42 | 15 | 70317 | 4687.8000 | 2/13/2017 13:30 | 4.0000 | 0.7265 | 1613.1452 | 7534.6 | 0.2141 | 0.0204 |
| ICRa6-1063071;Ra5 | 7/26/2019 17:23 | 15 | 81647 | 5443.1333 | 2/13/2017 13:30 | 4.0000 | 0.8604 | 1581.5706 | 7534.6 | 0.2099 | 0.0302 |
| ICRa6-1063071;Ra6 | 7/26/2019 17:06 | 15 | 71914 | 4794.2667 | 2/13/2017 13:30 | 4.0000 | 0.9364 | 1280.0140 | 7534.6 | 0.1699 | 0.0493 |
| ICRa6-1063071;Ra7 | 7/26/2019 16:49 | 15 | 68788 | 4585.8667 | 2/13/2017 13:30 | 4.0000 | 0.9274 | 1236.2826 | 7534.6 | 0.1641 | 0.0651 |
| ICRa6-1063071;Ra8 | 7/26/2019 16:32 | 15 | 63626 | 4241.7333 | 2/14/2017 13:30 | 4.0000 | 0.9274 | 1143.5093 | 7535.6 | 0.1517 | 0.0990 |




Reagent ID:Ra-226_00022
Container #:986404
Final Conc.: 7534.60740 dpm/mL
Added: 1mL

Reagent ID:Ba Carrier_00026
Container #: 1015438
Cert.#: 16I027

# Alpha/Beta Count Results

## Sample Activity Report

## Blue 0-3 - B

**Addr:** 1

**Sample ID** ICRa6-1063071;Ra2

**Repeat** 18

**Carrier No.** 0

**Batch ID** Ra226 - IC

**Count Method** Gross Alpha Beta

**Detector Volts** 1515

**Sample Qty** 0 ***Sample*** **sd** 0 ***Sample***

**Residual Wt** 0 ***mg*** **sd** 0 ***mg***

**Count Began** 7/26/2019 3:56:13 PM **Collection Date 1** 1/1/1900 **Half Life** 0.00 ***days***

**Count Ended** 7/26/2019 4:11:28 PM **Collection Date 2** 1/1/1900 **Decay Factor** 1.000

**Sample Count Time** 15.00 ***mins*** **Background Count Time** 1,000.00 ***mins***

| | Efficiency % | Attenuation Factor | Activity Divisor | Background cpm | Gross counts | Gross cpm | Net cpm |
|---|---|---|---|---|---|---|---|
| **Alpha** | 0.000 | 1.000 | 1.000 | 0.216 | 45,438 | 3,029.200 | 3,028.984 |
| **sd** | 0.000 | | | 0.015 | 213.162 | 14.211 | 14.211 |
| **A to B** | 0.000 | 1.000 | | | | 0.000 | |
| **sd** | 0.000 | | | | | 0.000 | |
| **Beta** | 0.000 | 1.000 | 1.000 | 0.434 | 51,174 | 3,411.600 | 3,411.166 |
| **sd** | 0.000 | | | 0.021 | 226.217 | 15.081 | 15.081 |

| | Net Activity dpm | LLD dpm | MDC DPM | MPC DPM | Net Concentration * DPM | Conc / MPC Ratio |
|---|---|---|---|---|---|---|
| **Alpha** | 0.000 | 0.000 | 0.000 | 0.000 | 0.000 ± 0.000 | 0.000 |
| **sd** | 0.000 | | | | 0.000 | |
| **Beta** | 0.000 | 0.000 | 0.000 | 0.000 | 0.000 ± 0.000 | 0.000 |
| **sd** | 0.000 | | | | 0.000 | |

*** Note: Decay Corrected** **MDC Method** Currie **Error =** .00 **x sd**

# Alpha/Beta Count Results

## Sample Activity Report

## Blue 0-3 - B

**Addr:** 1

**Sample ID** ICRa6-1063071;Ra1

**Repeat** 19

**Carrier No.** 0

**Batch ID** Ra226 - IC

**Count Method** Gross Alpha Beta

**Detector Volts** 1515

**Sample Qty** 0 ***Sample*** **sd** 0 ***Sample***

**Residual Wt** 0 ***mg*** **sd** 0 ***mg***

**Count Began** 7/26/2019 4:14:45 PM **Collection Date 1** 1/1/1900 **Half Life** 0.00 ***days***

**Count Ended** 7/26/2019 4:30:02 PM **Collection Date 2** 1/1/1900 **Decay Factor** 1.000

**Sample Count Time** 15.00 ***mins*** **Background Count Time** 1,000.00 ***mins***

| | Efficiency % | Attenuation Factor | Activity Divisor | Background cpm | Gross counts | Gross cpm | Net cpm |
|---|---|---|---|---|---|---|---|
| **Alpha** | 0.000 | 1.000 | 1.000 | 0.216 | 45,437 | 3,029.133 | 3,028.917 |
| **sd** | 0.000 | | | 0.015 | 213.160 | 14.211 | 14.211 |
| **A to B** | 0.000 | 1.000 | | | | 0.000 | |
| **sd** | 0.000 | | | | | 0.000 | |
| **Beta** | 0.000 | 1.000 | 1.000 | 0.434 | 52,840 | 3,522.667 | 3,522.233 |
| **sd** | 0.000 | | | 0.021 | 229.870 | 15.325 | 15.325 |

| | Net Activity dpm | LLD dpm | MDC DPM | MPC DPM | Net Concentration * DPM | Conc / MPC Ratio |
|---|---|---|---|---|---|---|
| **Alpha** | 0.000 | 0.000 | 0.000 | 0.000 | 0.000 ± 0.000 | 0.000 |
| **sd** | 0.000 | | | | 0.000 | |
| **Beta** | 0.000 | 0.000 | 0.000 | 0.000 | 0.000 ± 0.000 | 0.000 |
| **sd** | 0.000 | | | | 0.000 | |

*** Note: Decay Corrected** **MDC Method** Currie **Error =** .00 **x sd**

# Alpha/Beta Count Results

## Sample Activity Report

## Blue 0-3 - B

**Addr:** 1

**Sample ID** ICRa6-1063071;Ra8

**Repeat** 19

**Carrier No.** 0

**Batch ID** Ra226 - IC

**Count Method** Gross Alpha Beta

**Detector Volts** 1515

**Sample Qty** 0 ***Sample*** **sd** 0 ***Sample***

**Residual Wt** 0 ***mg*** **sd** 0 ***mg***

**Count Began** 7/26/2019 4:32:06 PM **Collection Date 1** 1/1/1900 **Half Life** 0.00 ***days***

**Count Ended** 7/26/2019 4:47:26 PM **Collection Date 2** 1/1/1900 **Decay Factor** 1.000

**Sample Count Time** 15.00 ***mins*** **Background Count Time** 1,000.00 ***mins***

| | Efficiency % | Attenuation Factor | Activity Divisor | Background cpm | Gross counts | Gross cpm | Net cpm |
|---|---|---|---|---|---|---|---|
| **Alpha** | 0.000 | 1.000 | 1.000 | 0.216 | 63,626 | 4,241.733 | 4,241.517 |
| **sd** | 0.000 | | | 0.015 | 252.242 | 16.816 | 16.816 |
| **A to B** | 0.000 | 1.000 | | | | 0.000 | |
| **sd** | 0.000 | | | | | 0.000 | |
| **Beta** | 0.000 | 1.000 | 1.000 | 0.434 | 99,839 | 6,655.933 | 6,655.499 |
| **sd** | 0.000 | | | 0.021 | 315.973 | 21.065 | 21.065 |

| | Net Activity dpm | LLD dpm | MDC DPM | MPC DPM | Net Concentration * DPM | Conc / MPC Ratio |
|---|---|---|---|---|---|---|
| **Alpha** | 0.000 | 0.000 | 0.000 | 0.000 | 0.000 ± 0.000 | 0.000 |
| **sd** | 0.000 | | | | 0.000 | |
| **Beta** | 0.000 | 0.000 | 0.000 | 0.000 | 0.000 ± 0.000 | 0.000 |
| **sd** | 0.000 | | | | 0.000 | |

*** Note: Decay Corrected** **MDC Method** Currie **Error =** .00 **x sd**

# Alpha/Beta Count Results

## Sample Activity Report

## Blue 0-3 - B

**Addr:** 1

**Sample ID** ICRa6-1063071;Ra7

**Repeat** 21

**Carrier No.** 0

**Batch ID** Ra226 - IC

**Count Method** Gross Alpha Beta

**Detector Volts** 1515

**Sample Qty** 0 ***Sample*** **sd** 0 ***Sample***

**Residual Wt** 0 ***mg*** **sd** 0 ***mg***

**Count Began** 7/26/2019 4:49:19 PM **Collection Date 1** 1/1/1900 **Half Life** 0.00 ***days***

**Count Ended** 7/26/2019 5:04:39 PM **Collection Date 2** 1/1/1900 **Decay Factor** 1.000

**Sample Count Time** 15.00 ***mins*** **Background Count Time** 1,000.00 ***mins***

| | Efficiency % | Attenuation Factor | Activity Divisor | Background cpm | Gross counts | Gross cpm | Net cpm |
|---|---|---|---|---|---|---|---|
| **Alpha** | 0.000 | 1.000 | 1.000 | 0.216 | 68,788 | 4,585.867 | 4,585.651 |
| **sd** | 0.000 | | | 0.015 | 262.275 | 17.485 | 17.485 |
| **A to B** | 0.000 | 1.000 | | | | 0.000 | |
| **sd** | 0.000 | | | | | 0.000 | |
| **Beta** | 0.000 | 1.000 | 1.000 | 0.434 | 96,424 | 6,428.267 | 6,427.833 |
| **sd** | 0.000 | | | 0.021 | 310.522 | 20.701 | 20.701 |

| | Net Activity dpm | LLD dpm | MDC DPM | MPC DPM | Net Concentration * DPM | Conc / MPC Ratio |
|---|---|---|---|---|---|---|
| **Alpha** | 0.000 | 0.000 | 0.000 | 0.000 | 0.000 ± 0.000 | 0.000 |
| **sd** | 0.000 | | | | 0.000 | |
| **Beta** | 0.000 | 0.000 | 0.000 | 0.000 | 0.000 ± 0.000 | 0.000 |
| **sd** | 0.000 | | | | 0.000 | |

*** Note: Decay Corrected** **MDC Method** Currie **Error =** .00 **x sd**

# Alpha/Beta Count Results

## Sample Activity Report

## Blue 0-3 - B

**Addr:** 1

**Sample ID** ICRa6-1063071;Ra6

**Repeat** 22

**Carrier No.** 0

**Batch ID** Ra226 - IC

**Count Method** Gross Alpha Beta

**Detector Volts** 1515

**Sample Qty** 0 ***Sample*** **sd** 0 ***Sample***

**Residual Wt** 0 ***mg*** **sd** 0 ***mg***

**Count Began** 7/26/2019 5:06:08 PM **Collection Date 1** 1/1/1900 **Half Life** 0.00 ***days***

**Count Ended** 7/26/2019 5:21:27 PM **Collection Date 2** 1/1/1900 **Decay Factor** 1.000

**Sample Count Time** 15.00 ***mins*** **Background Count Time** 1,000.00 ***mins***

| | Efficiency % | Attenuation Factor | Activity Divisor | Background cpm | Gross counts | Gross cpm | Net cpm |
|---|---|---|---|---|---|---|---|
| **Alpha** | 0.000 | 1.000 | 1.000 | 0.216 | 71,914 | 4,794.267 | 4,794.051 |
| **sd** | 0.000 | | | 0.015 | 268.168 | 17.878 | 17.878 |
| **A to B** | 0.000 | 1.000 | | | | 0.000 | |
| **sd** | 0.000 | | | | | 0.000 | |
| **Beta** | 0.000 | 1.000 | 1.000 | 0.434 | 98,078 | 6,538.533 | 6,538.099 |
| **sd** | 0.000 | | | 0.021 | 313.174 | 20.878 | 20.878 |

| | Net Activity dpm | LLD dpm | MDC DPM | MPC DPM | Net Concentration * DPM | Conc / MPC Ratio |
|---|---|---|---|---|---|---|
| **Alpha** | 0.000 | 0.000 | 0.000 | 0.000 | 0.000 ± 0.000 | 0.000 |
| **sd** | 0.000 | | | | 0.000 | |
| **Beta** | 0.000 | 0.000 | 0.000 | 0.000 | 0.000 ± 0.000 | 0.000 |
| **sd** | 0.000 | | | | 0.000 | |

*** Note: Decay Corrected** **MDC Method** Currie **Error =** .00 **x sd**

# Alpha/Beta Count Results

## Sample Activity Report

## Blue 0-3 - B

**Addr:** 1

**Sample ID** ICRa6-1063071;Ra5

**Repeat** 23

**Carrier No.** 0

**Batch ID** Ra226 - IC

**Count Method** Gross Alpha Beta

**Detector Volts** 1515

**Sample Qty** 0 ***Sample*** **sd** 0 ***Sample***

**Residual Wt** 0 ***mg*** **sd** 0 ***mg***

**Count Began** 7/26/2019 5:23:04 PM **Collection Date 1** 1/1/1900 **Half Life** 0.00 ***days***

**Count Ended** 7/26/2019 5:38:29 PM **Collection Date 2** 1/1/1900 **Decay Factor** 1.000

**Sample Count Time** 15.00 ***mins*** **Background Count Time** 1,000.00 ***mins***

| | Efficiency % | Attenuation Factor | Activity Divisor | Background cpm | Gross counts | Gross cpm | Net cpm |
|---|---|---|---|---|---|---|---|
| **Alpha** | 0.000 | 1.000 | 1.000 | 0.216 | 81,647 | 5,443.133 | 5,442.917 |
| **sd** | 0.000 | | | 0.015 | 285.739 | 19.049 | 19.049 |
| **A to B** | 0.000 | 1.000 | | | | 0.000 | |
| **sd** | 0.000 | | | | | 0.000 | |
| **Beta** | 0.000 | 1.000 | 1.000 | 0.434 | 97,183 | 6,478.867 | 6,478.433 |
| **sd** | 0.000 | | | 0.021 | 311.742 | 20.783 | 20.783 |

| | Net Activity dpm | LLD dpm | MDC DPM | MPC DPM | Net Concentration * DPM | Conc / MPC Ratio |
|---|---|---|---|---|---|---|
| **Alpha** | 0.000 | 0.000 | 0.000 | 0.000 | 0.000 ± 0.000 | 0.000 |
| **sd** | 0.000 | | | | 0.000 | |
| **Beta** | 0.000 | 0.000 | 0.000 | 0.000 | 0.000 ± 0.000 | 0.000 |
| **sd** | 0.000 | | | | 0.000 | |

*** Note: Decay Corrected** **MDC Method** Currie **Error =** .00 **x sd**

# Alpha/Beta Count Results

## Sample Activity Report

## Blue 0-3 - B

**Addr:** 1

**Sample ID** ICRa6-1063071;Ra4

**Repeat** 24

**Carrier No.** 0

**Batch ID** Ra226 - IC

**Count Method** Gross Alpha Beta

**Detector Volts** 1515

**Sample Qty** 0 ***Sample*** **sd** 0 ***Sample***

**Residual Wt** 0 ***mg*** **sd** 0 ***mg***

**Count Began** 7/26/2019 5:42:12 PM **Collection Date 1** 1/1/1900 **Half Life** 0.00 ***days***

**Count Ended** 7/26/2019 5:57:29 PM **Collection Date 2** 1/1/1900 **Decay Factor** 1.000

**Sample Count Time** 15.00 ***mins*** **Background Count Time** 1,000.00 ***mins***

| | Efficiency % | Attenuation Factor | Activity Divisor | Background cpm | Gross counts | Gross cpm | Net cpm |
|---|---|---|---|---|---|---|---|
| **Alpha** | 0.000 | 1.000 | 1.000 | 0.216 | 70,317 | 4,687.800 | 4,687.584 |
| **sd** | 0.000 | | | 0.015 | 265.174 | 17.678 | 17.678 |
| **A to B** | 0.000 | 1.000 | | | | 0.000 | |
| **sd** | 0.000 | | | | | 0.000 | |
| **Beta** | 0.000 | 1.000 | 1.000 | 0.434 | 82,935 | 5,529.000 | 5,528.566 |
| **sd** | 0.000 | | | 0.021 | 287.984 | 19.199 | 19.199 |

| | Net Activity dpm | LLD dpm | MDC DPM | MPC DPM | Net Concentration * DPM | Conc / MPC Ratio |
|---|---|---|---|---|---|---|
| **Alpha** | 0.000 | 0.000 | 0.000 | 0.000 | 0.000 ± 0.000 | 0.000 |
| **sd** | 0.000 | | | | 0.000 | |
| **Beta** | 0.000 | 0.000 | 0.000 | 0.000 | 0.000 ± 0.000 | 0.000 |
| **sd** | 0.000 | | | | 0.000 | |

*** Note: Decay Corrected** **MDC Method** Currie **Error =** .00 **x sd**

# Alpha/Beta Count Results

## Sample Activity Report

## Blue 0-3 - B

**Addr:** 1

**Sample ID** ICRa6-1063071;Ra3

**Repeat** 25

**Carrier No.** 0

**Batch ID** Ra226 - IC

**Count Method** Gross Alpha Beta

**Detector Volts** 1515

**Sample Qty** 0 ***Sample*** **sd** 0 ***Sample***

**Residual Wt** 0 ***mg*** **sd** 0 ***mg***

**Count Began** 7/26/2019 6:14:20 PM **Collection Date 1** 1/1/1900 **Half Life** 0.00 ***days***

**Count Ended** 7/26/2019 6:29:39 PM **Collection Date 2** 1/1/1900 **Decay Factor** 1.000

**Sample Count Time** 15.00 ***mins*** **Background Count Time** 1,000.00 ***mins***

| | Efficiency % | Attenuation Factor | Activity Divisor | Background cpm | Gross counts | Gross cpm | Net cpm |
|---|---|---|---|---|---|---|---|
| **Alpha** | 0.000 | 1.000 | 1.000 | 0.216 | 65,406 | 4,360.400 | 4,360.184 |
| **sd** | 0.000 | | | 0.015 | 255.746 | 17.050 | 17.050 |
| **A to B** | 0.000 | 1.000 | | | | 0.000 | |
| **sd** | 0.000 | | | | | 0.000 | |
| **Beta** | 0.000 | 1.000 | 1.000 | 0.434 | 75,164 | 5,010.933 | 5,010.499 |
| **sd** | 0.000 | | | 0.021 | 274.161 | 18.277 | 18.277 |

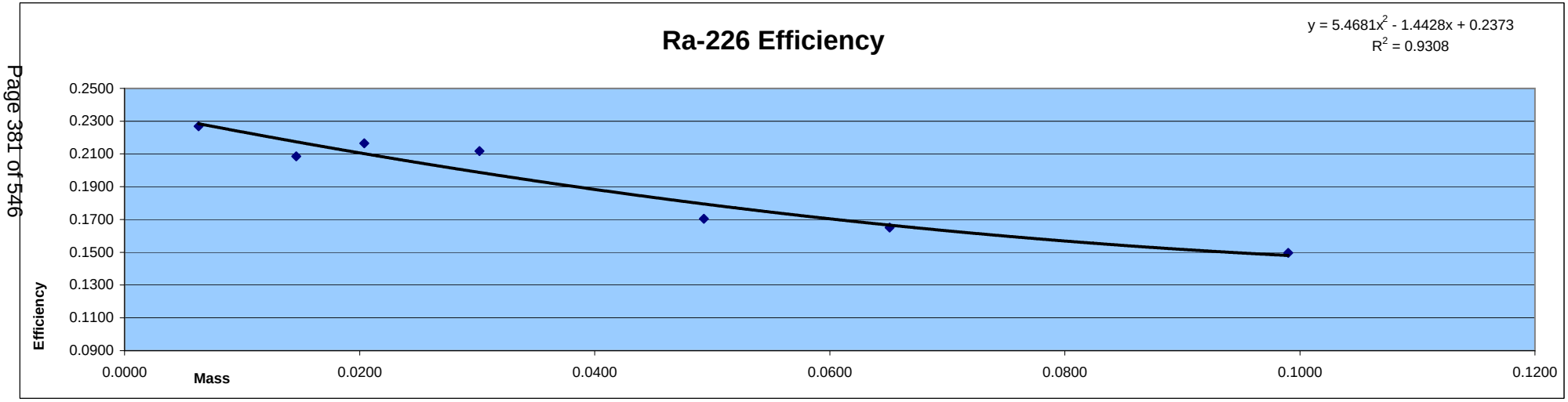
| | Net Activity dpm | LLD dpm | MDC DPM | MPC DPM | Net Concentration * DPM | Conc / MPC Ratio |
|---|---|---|---|---|---|---|
| **Alpha** | 0.000 | 0.000 | 0.000 | 0.000 | 0.000 ± 0.000 | 0.000 |
| **sd** | 0.000 | | | | 0.000 | |
| **Beta** | 0.000 | 0.000 | 0.000 | 0.000 | 0.000 ± 0.000 | 0.000 |
| **sd** | 0.000 | | | | 0.000 | |

*** Note: Decay Corrected** **MDC Method** Currie **Error =** .00 **x sd**

# Ra-226 Calibration 2019

**Blue 3**

| Std # | Sample Time | Count Time | Alpha Counts | CPM | Sep Time | Ingrowth | Recovery | Adj CPM | DPM | Efficiency | Mass |
|---|---|---|---|---|---|---|---|---|---|---|---|
| ICRa6-1063071;Ra2 | 7/26/2019 16:32 | 15 | 46028 | 3068.5333 | 2/13/2017 13:30 | 4.0000 | 0.4487 | 1709.6036 | 7534.6 | 0.2269 | 0.0063 |
| ICRa6-1063071;Ra3 | 7/26/2019 16:14 | 15 | 65354 | 4356.9333 | 2/13/2017 13:30 | 4.0000 | 0.6933 | 1571.1758 | 7534.6 | 0.2085 | 0.0146 |
| ICRa6-1063071;Ra4 | 7/26/2019 15:56 | 15 | 71098 | 4739.8667 | 2/13/2017 13:30 | 4.0000 | 0.7265 | 1631.0622 | 7534.6 | 0.2165 | 0.0204 |
| ICRa6-1063071;Ra5 | 7/26/2019 18:14 | 15 | 82384 | 5492.2667 | 2/13/2017 13:30 | 4.0000 | 0.8604 | 1595.8469 | 7534.6 | 0.2118 | 0.0302 |
| ICRa6-1063071;Ra6 | 7/26/2019 17:42 | 15 | 72176 | 4811.7333 | 2/13/2017 13:30 | 4.0000 | 0.9364 | 1284.6774 | 7534.6 | 0.1705 | 0.0493 |
| ICRa6-1063071;Ra7 | 7/26/2019 17:23 | 15 | 69202 | 4613.4667 | 2/13/2017 13:30 | 4.0000 | 0.9274 | 1243.7232 | 7534.6 | 0.1651 | 0.0651 |
| ICRa6-1063071;Ra8 | 7/26/2019 17:06 | 15 | 63621 | 4241.4000 | 2/13/2017 13:30 | 4.0000 | 0.9402 | 1127.8279 | 7534.6 | 0.1497 | 0.0990 |




Reagent ID:Ra-226_00022
Container #:986404
Final Conc.: 7534.60740 dpm/mL
Added: 1mL

Reagent ID:Ba Carrier_00026
Container #: 1015438
Cert.#: 16I027

# Alpha/Beta Count Results

## Sample Activity Report

## Blue 0-3 - D

**Addr:** 3

**Sample ID** ICRa6-1063071;Ra4

**Repeat** 18

**Carrier No.** 0

**Batch ID** Ra226 - IC

**Count Method** Gross Alpha Beta

**Detector Volts** 1515

**Sample Qty** 0 ***Sample*** **sd** 0 ***Sample***

**Residual Wt** 0 ***mg*** **sd** 0 ***mg***

**Count Began** 7/26/2019 3:56:22 PM **Collection Date 1** 1/1/1900 **Half Life** 0.00 ***days***

**Count Ended** 7/26/2019 4:11:43 PM **Collection Date 2** 1/1/1900 **Decay Factor** 1.000

**Sample Count Time** 15.00 ***mins*** **Background Count Time** 1,000.00 ***mins***

| | Efficiency % | Attenuation Factor | Activity Divisor | Background cpm | Gross counts | Gross cpm | Net cpm |
|---|---|---|---|---|---|---|---|
| **Alpha** | 0.000 | 1.000 | 1.000 | 0.086 | 71,098 | 4,739.867 | 4,739.781 |
| **sd** | 0.000 | | | 0.009 | 266.642 | 17.776 | 17.776 |
| **A to B** | 0.000 | 1.000 | | | | 0.000 | |
| **sd** | 0.000 | | | | | 0.000 | |
| **Beta** | 0.000 | 1.000 | 1.000 | 0.393 | 82,741 | 5,516.067 | 5,515.674 |
| **sd** | 0.000 | | | 0.020 | 287.647 | 19.176 | 19.177 |

| | Net Activity dpm | LLD dpm | MDC DPM | MPC DPM | Net Concentration * DPM | Conc / MPC Ratio |
|---|---|---|---|---|---|---|
| **Alpha** | 0.000 | 0.000 | 0.000 | 0.000 | 0.000 ± 0.000 | 0.000 |
| **sd** | 0.000 | | | | 0.000 | |
| **Beta** | 0.000 | 0.000 | 0.000 | 0.000 | 0.000 ± 0.000 | 0.000 |
| **sd** | 0.000 | | | | 0.000 | |

*** Note: Decay Corrected** **MDC Method** Currie **Error =** .00 **x sd**

# Alpha/Beta Count Results

## Sample Activity Report

## Blue 0-3 - D

**Addr:** 3

**Sample ID** ICRa6-1063071;Ra3

**Repeat** 19

**Carrier No.** 0

**Batch ID** Ra226 - IC

**Count Method** Gross Alpha Beta

**Detector Volts** 1515

**Sample Qty** 0 ***Sample*** **sd** 0 ***Sample***

**Residual Wt** 0 ***mg*** **sd** 0 ***mg***

**Count Began** 7/26/2019 4:14:54 PM **Collection Date 1** 1/1/1900 **Half Life** 0.00 ***days***

**Count Ended** 7/26/2019 4:30:14 PM **Collection Date 2** 1/1/1900 **Decay Factor** 1.000

**Sample Count Time** 15.00 ***mins*** **Background Count Time** 1,000.00 ***mins***

| | Efficiency % | Attenuation Factor | Activity Divisor | Background cpm | Gross counts | Gross cpm | Net cpm |
|---|---|---|---|---|---|---|---|
| **Alpha** | 0.000 | 1.000 | 1.000 | 0.086 | 65,354 | 4,356.933 | 4,356.847 |
| **sd** | 0.000 | | | 0.009 | 255.644 | 17.043 | 17.043 |
| **A to B** | 0.000 | 1.000 | | | | 0.000 | |
| **sd** | 0.000 | | | | | 0.000 | |
| **Beta** | 0.000 | 1.000 | 1.000 | 0.393 | 75,403 | 5,026.867 | 5,026.474 |
| **sd** | 0.000 | | | 0.020 | 274.596 | 18.306 | 18.306 |

| | Net Activity dpm | LLD dpm | MDC DPM | MPC DPM | Net Concentration * DPM | Conc / MPC Ratio |
|---|---|---|---|---|---|---|
| **Alpha** | 0.000 | 0.000 | 0.000 | 0.000 | 0.000 ± 0.000 | 0.000 |
| **sd** | 0.000 | | | | 0.000 | |
| **Beta** | 0.000 | 0.000 | 0.000 | 0.000 | 0.000 ± 0.000 | 0.000 |
| **sd** | 0.000 | | | | 0.000 | |

*** Note: Decay Corrected** **MDC Method** Currie **Error =** .00 **x sd**

# Alpha/Beta Count Results

## Sample Activity Report

## Blue 0-3 - D

**Addr:** 3

**Sample ID** ICRa6-1063071;Ra2

**Repeat** 20

**Carrier No.** 0

**Batch ID** Ra226 - IC

**Count Method** Gross Alpha Beta

**Detector Volts** 1515

**Sample Qty** 0 ***Sample*** **sd** 0 ***Sample***

**Residual Wt** 0 ***mg*** **sd** 0 ***mg***

**Count Began** 7/26/2019 4:32:17 PM **Collection Date 1** 1/1/1900 **Half Life** 0.00 ***days***

**Count Ended** 7/26/2019 4:47:35 PM **Collection Date 2** 1/1/1900 **Decay Factor** 1.000

**Sample Count Time** 15.00 ***mins*** **Background Count Time** 1,000.00 ***mins***

| | Efficiency % | Attenuation Factor | Activity Divisor | Background cpm | Gross counts | Gross cpm | Net cpm |
|---|---|---|---|---|---|---|---|
| **Alpha** | 0.000 | 1.000 | 1.000 | 0.086 | 46,028 | 3,068.533 | 3,068.447 |
| **sd** | 0.000 | | | 0.009 | 214.541 | 14.303 | 14.303 |
| **A to B** | 0.000 | 1.000 | | | | 0.000 | |
| **sd** | 0.000 | | | | | 0.000 | |
| **Beta** | 0.000 | 1.000 | 1.000 | 0.393 | 51,168 | 3,411.200 | 3,410.807 |
| **sd** | 0.000 | | | 0.020 | 226.203 | 15.080 | 15.080 |

| | Net Activity dpm | LLD dpm | MDC DPM | MPC DPM | Net Concentration * DPM | Conc / MPC Ratio |
|---|---|---|---|---|---|---|
| **Alpha** | 0.000 | 0.000 | 0.000 | 0.000 | 0.000 ± 0.000 | 0.000 |
| **sd** | 0.000 | | | | 0.000 | |
| **Beta** | 0.000 | 0.000 | 0.000 | 0.000 | 0.000 ± 0.000 | 0.000 |
| **sd** | 0.000 | | | | 0.000 | |

*** Note: Decay Corrected** **MDC Method** Currie **Error =** .00 **x sd**

# Alpha/Beta Count Results

## Sample Activity Report

## Blue 0-3 - D

**Addr:** 3

**Sample ID** ICRa6-1063071;Ra1

**Repeat** 21

**Carrier No.** 0

**Batch ID** Ra226 - IC

**Count Method** Gross Alpha Beta

**Detector Volts** 1515

**Sample Qty** 0 ***Sample*** **sd** 0 ***Sample***

**Residual Wt** 0 ***mg*** **sd** 0 ***mg***

**Count Began** 7/26/2019 4:49:28 PM **Collection Date 1** 1/1/1900 **Half Life** 0.00 ***days***

**Count Ended** 7/26/2019 5:04:40 PM **Collection Date 2** 1/1/1900 **Decay Factor** 1.000

**Sample Count Time** 15.00 ***mins*** **Background Count Time** 1,000.00 ***mins***

| | Efficiency % | Attenuation Factor | Activity Divisor | Background cpm | Gross counts | Gross cpm | Net cpm |
|---|---|---|---|---|---|---|---|
| **Alpha** | 0.000 | 1.000 | 1.000 | 0.086 | 46,299 | 3,086.600 | 3,086.514 |
| **sd** | 0.000 | | | 0.009 | 215.172 | 14.345 | 14.345 |
| **A to B** | 0.000 | 1.000 | | | | 0.000 | |
| **sd** | 0.000 | | | | | 0.000 | |
| **Beta** | 0.000 | 1.000 | 1.000 | 0.393 | 52,440 | 3,496.000 | 3,495.607 |
| **sd** | 0.000 | | | 0.020 | 228.998 | 15.267 | 15.267 |

| | Net Activity dpm | LLD dpm | MDC DPM | MPC DPM | Net Concentration * DPM | Conc / MPC Ratio |
|---|---|---|---|---|---|---|
| **Alpha** | 0.000 | 0.000 | 0.000 | 0.000 | 0.000 ± 0.000 | 0.000 |
| **sd** | 0.000 | | | | 0.000 | |
| **Beta** | 0.000 | 0.000 | 0.000 | 0.000 | 0.000 ± 0.000 | 0.000 |
| **sd** | 0.000 | | | | 0.000 | |

*** Note: Decay Corrected** **MDC Method** Currie **Error =** .00 **x sd**

# Alpha/Beta Count Results

## Sample Activity Report

## Blue 0-3 - D

**Addr:** 3

**Sample ID** ICRa6-1063071;Ra8

**Repeat** 21

**Carrier No.** 0

**Batch ID** Ra226 - IC

**Count Method** Gross Alpha Beta

**Detector Volts** 1515

**Sample Qty** 0 ***Sample*** **sd** 0 ***Sample***

**Residual Wt** 0 ***mg*** **sd** 0 ***mg***

**Count Began** 7/26/2019 5:06:17 PM **Collection Date 1** 1/1/1900 **Half Life** 0.00 ***days***

**Count Ended** 7/26/2019 5:21:41 PM **Collection Date 2** 1/1/1900 **Decay Factor** 1.000

**Sample Count Time** 15.00 ***mins*** **Background Count Time** 1,000.00 ***mins***

| | Efficiency % | Attenuation Factor | Activity Divisor | Background cpm | Gross counts | Gross cpm | Net cpm |
|---|---|---|---|---|---|---|---|
| **Alpha** | 0.000 | 1.000 | 1.000 | 0.086 | 63,621 | 4,241.400 | 4,241.314 |
| **sd** | 0.000 | | | 0.009 | 252.232 | 16.815 | 16.815 |
| **A to B** | 0.000 | 1.000 | | | | 0.000 | |
| **sd** | 0.000 | | | | | 0.000 | |
| **Beta** | 0.000 | 1.000 | 1.000 | 0.393 | 99,452 | 6,630.133 | 6,629.740 |
| **sd** | 0.000 | | | 0.020 | 315.360 | 21.024 | 21.024 |

| | Net Activity dpm | LLD dpm | MDC DPM | MPC DPM | Net Concentration * DPM | Conc / MPC Ratio |
|---|---|---|---|---|---|---|
| **Alpha** | 0.000 | 0.000 | 0.000 | 0.000 | 0.000 ± 0.000 | 0.000 |
| **sd** | 0.000 | | | | 0.000 | |
| **Beta** | 0.000 | 0.000 | 0.000 | 0.000 | 0.000 ± 0.000 | 0.000 |
| **sd** | 0.000 | | | | 0.000 | |

*** Note: Decay Corrected** **MDC Method** Currie **Error =** .00 **x sd**

# Alpha/Beta Count Results

## Sample Activity Report

## Blue 0-3 - D

**Addr:** 3

**Sample ID** ICRa6-1063071;Ra7

**Repeat** 23

**Carrier No.** 0

**Batch ID** Ra226 - IC

**Count Method** Gross Alpha Beta

**Detector Volts** 1515

**Sample Qty** 0 ***Sample*** **sd** 0 ***Sample***

**Residual Wt** 0 ***mg*** **sd** 0 ***mg***

**Count Began** 7/26/2019 5:23:12 PM **Collection Date 1** 1/1/1900 **Half Life** 0.00 ***days***

**Count Ended** 7/26/2019 5:38:30 PM **Collection Date 2** 1/1/1900 **Decay Factor** 1.000

**Sample Count Time** 15.00 ***mins*** **Background Count Time** 1,000.00 ***mins***

| | Efficiency % | Attenuation Factor | Activity Divisor | Background cpm | Gross counts | Gross cpm | Net cpm |
|---|---|---|---|---|---|---|---|
| **Alpha** | 0.000 | 1.000 | 1.000 | 0.086 | 69,202 | 4,613.467 | 4,613.381 |
| **sd** | 0.000 | | | 0.009 | 263.063 | 17.538 | 17.538 |
| **A to B** | 0.000 | 1.000 | | | | 0.000 | |
| **sd** | 0.000 | | | | | 0.000 | |
| **Beta** | 0.000 | 1.000 | 1.000 | 0.393 | 96,142 | 6,409.467 | 6,409.074 |
| **sd** | 0.000 | | | 0.020 | 310.068 | 20.671 | 20.671 |

| | Net Activity dpm | LLD dpm | MDC DPM | MPC DPM | Net Concentration * DPM | Conc / MPC Ratio |
|---|---|---|---|---|---|---|
| **Alpha** | 0.000 | 0.000 | 0.000 | 0.000 | 0.000 ± 0.000 | 0.000 |
| **sd** | 0.000 | | | | 0.000 | |
| **Beta** | 0.000 | 0.000 | 0.000 | 0.000 | 0.000 ± 0.000 | 0.000 |
| **sd** | 0.000 | | | | 0.000 | |

*** Note: Decay Corrected** **MDC Method** Currie **Error =** .00 **x sd**

# Alpha/Beta Count Results

## Sample Activity Report

## Blue 0-3 - D

**Addr:** 3

**Sample ID** ICRa6-1063071;Ra6

**Repeat** 24

**Carrier No.** 0

**Batch ID** Ra226 - IC

**Count Method** Gross Alpha Beta

**Detector Volts** 1515

**Sample Qty** 0 ***Sample*** **sd** 0 ***Sample***

**Residual Wt** 0 ***mg*** **sd** 0 ***mg***

**Count Began** 7/26/2019 5:42:22 PM **Collection Date 1** 1/1/1900 **Half Life** 0.00 ***days***

**Count Ended** 7/26/2019 5:57:42 PM **Collection Date 2** 1/1/1900 **Decay Factor** 1.000

**Sample Count Time** 15.00 ***mins*** **Background Count Time** 1,000.00 ***mins***

| | Efficiency % | Attenuation Factor | Activity Divisor | Background cpm | Gross counts | Gross cpm | Net cpm |
|---|---|---|---|---|---|---|---|
| **Alpha** | 0.000 | 1.000 | 1.000 | 0.086 | 72,176 | 4,811.733 | 4,811.647 |
| **sd** | 0.000 | | | 0.009 | 268.656 | 17.910 | 17.910 |
| **A to B** | 0.000 | 1.000 | | | | 0.000 | |
| **sd** | 0.000 | | | | | 0.000 | |
| **Beta** | 0.000 | 1.000 | 1.000 | 0.393 | 97,377 | 6,491.800 | 6,491.407 |
| **sd** | 0.000 | | | 0.020 | 312.053 | 20.804 | 20.804 |

| | Net Activity dpm | LLD dpm | MDC DPM | MPC DPM | Net Concentration * DPM | Conc / MPC Ratio |
|---|---|---|---|---|---|---|
| **Alpha** | 0.000 | 0.000 | 0.000 | 0.000 | 0.000 ± 0.000 | 0.000 |
| **sd** | 0.000 | | | | 0.000 | |
| **Beta** | 0.000 | 0.000 | 0.000 | 0.000 | 0.000 ± 0.000 | 0.000 |
| **sd** | 0.000 | | | | 0.000 | |

*** Note: Decay Corrected** **MDC Method** Currie **Error =** .00 **x sd**

# Alpha/Beta Count Results

## Sample Activity Report

## Blue 0-3 - D

**Addr:** 3

**Sample ID** ICRa6-1063071;Ra5

**Repeat** 25

**Carrier No.** 0

**Batch ID** Ra226 - IC

**Count Method** Gross Alpha Beta

**Detector Volts** 1515

**Sample Qty** 0 ***Sample*** **sd** 0 ***Sample***

**Residual Wt** 0 ***mg*** **sd** 0 ***mg***

**Count Began** 7/26/2019 6:14:29 PM **Collection Date 1** 1/1/1900 **Half Life** 0.00 ***days***

**Count Ended** 7/26/2019 6:29:54 PM **Collection Date 2** 1/1/1900 **Decay Factor** 1.000

**Sample Count Time** 15.00 ***mins*** **Background Count Time** 1,000.00 ***mins***

| | Efficiency % | Attenuation Factor | Activity Divisor | Background cpm | Gross counts | Gross cpm | Net cpm |
|---|---|---|---|---|---|---|---|
| **Alpha** | 0.000 | 1.000 | 1.000 | 0.086 | 82,384 | 5,492.267 | 5,492.181 |
| **sd** | 0.000 | | | 0.009 | 287.026 | 19.135 | 19.135 |
| **A to B** | 0.000 | 1.000 | | | | 0.000 | |
| **sd** | 0.000 | | | | | 0.000 | |
| **Beta** | 0.000 | 1.000 | 1.000 | 0.393 | 96,306 | 6,420.400 | 6,420.007 |
| **sd** | 0.000 | | | 0.020 | 310.332 | 20.689 | 20.689 |

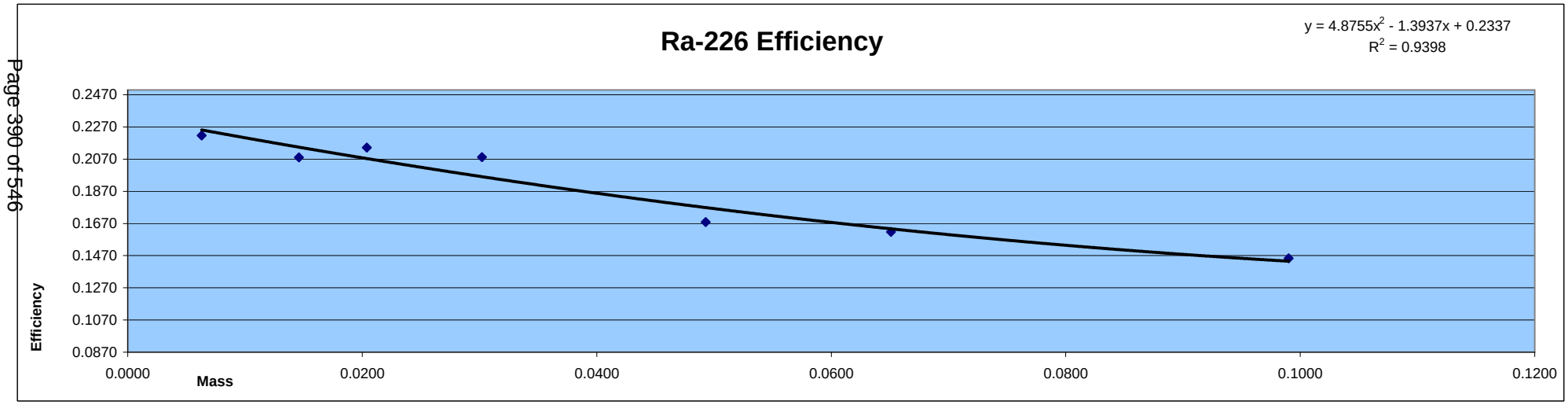
| | Net Activity dpm | LLD dpm | MDC DPM | MPC DPM | Net Concentration * DPM | Conc / MPC Ratio |
|---|---|---|---|---|---|---|
| **Alpha** | 0.000 | 0.000 | 0.000 | 0.000 | 0.000 ± 0.000 | 0.000 |
| **sd** | 0.000 | | | | 0.000 | |
| **Beta** | 0.000 | 0.000 | 0.000 | 0.000 | 0.000 ± 0.000 | 0.000 |
| **sd** | 0.000 | | | | 0.000 | |

*** Note: Decay Corrected** **MDC Method** Currie **Error =** .00 **x sd**

# Ra-226 Calibration 2019

**Blue 9**

| Std # | Sample Time | Count Time | Alpha Counts | CPM | Sep Time | Ingrowth | Recovery | Adj CPM | DPM | Efficiency | Mass |
|---|---|---|---|---|---|---|---|---|---|---|---|
| ICRa6-1063071;Ra2 | 7/24/2019 13:40 | 15 | 44976 | 2998.4000 | 2/13/2017 13:30 | 4.0000 | 0.4487 | 1670.5295 | 7534.6 | 0.2217 | 0.0063 |
| ICRa6-1063071;Ra3 | 7/24/2019 17:07 | 15 | 65204 | 4346.9333 | 2/13/2017 13:30 | 4.0000 | 0.6933 | 1567.5696 | 7534.6 | 0.2080 | 0.0146 |
| ICRa6-1063071;Ra4 | 7/24/2019 16:50 | 15 | 70349 | 4689.9333 | 2/13/2017 13:30 | 4.0000 | 0.7265 | 1613.8793 | 7534.6 | 0.2142 | 0.0204 |
| ICRa6-1063071;Ra5 | 7/24/2019 16:26 | 15 | 80969 | 5397.9333 | 2/13/2017 13:30 | 4.0000 | 0.8604 | 1568.4372 | 7534.6 | 0.2082 | 0.0302 |
| ICRa6-1063071;Ra6 | 7/24/2019 15:48 | 15 | 71078 | 4738.5333 | 2/13/2017 13:30 | 4.0000 | 0.9364 | 1265.1338 | 7534.6 | 0.1679 | 0.0493 |
| ICRa6-1063071;Ra7 | 7/24/2019 15:16 | 15 | 67826 | 4521.7333 | 2/13/2017 13:30 | 4.0000 | 0.9274 | 1218.9932 | 7534.6 | 0.1618 | 0.0651 |
| ICRa6-1063071;Ra8 | 7/24/2019 14:34 | 15 | 61773 | 4118.2000 | 2/13/2017 13:30 | 4.0000 | 0.9402 | 1095.0679 | 7534.6 | 0.1453 | 0.0990 |




Reagent ID:Ra-226_00022
Container #:986404
Final Conc.: 7534.60740 dpm/mL
Added: 1mL

Reagent ID:Ba Carrier_00026
Container #: 1015438
Cert.#: 16I027

# Alpha/Beta Count Results

## Sample Activity Report

## Blue 8-11 - B

**Addr:** 9

**Sample ID** ICRa6-1063071;Ra2

**Repeat** 10

**Carrier No.** 0

**Batch ID** Ra226 - IC

**Count Method** Gross Alpha Beta

**Detector Volts** 1515

**Sample Qty** 0 ***Sample*** **sd** 0 ***Sample***

**Residual Wt** 0 ***mg*** **sd** 0 ***mg***

**Count Began** 7/24/2019 1:40:23 PM **Collection Date 1** 1/1/1900 **Half Life** 0.00 ***days***

**Count Ended** 7/24/2019 1:55:40 PM **Collection Date 2** 1/1/1900 **Decay Factor** 1.000

**Sample Count Time** 15.00 ***mins*** **Background Count Time** 1,000.00 ***mins***

| | Efficiency % | Attenuation Factor | Activity Divisor | Background cpm | Gross counts | Gross cpm | Net cpm |
|---|---|---|---|---|---|---|---|
| **Alpha** | 0.000 | 1.000 | 1.000 | 0.112 | 44,976 | 2,998.400 | 2,998.288 |
| **sd** | 0.000 | | | 0.011 | 212.075 | 14.138 | 14.138 |
| **A to B** | 0.000 | 1.000 | | | | 0.000 | |
| **sd** | 0.000 | | | | | 0.000 | |
| **Beta** | 0.000 | 1.000 | 1.000 | 0.383 | 51,396 | 3,426.400 | 3,426.017 |
| **sd** | 0.000 | | | 0.020 | 226.707 | 15.114 | 15.114 |

| | Net Activity dpm | LLD dpm | MDC DPM | MPC DPM | Net Concentration * DPM | Conc / MPC Ratio |
|---|---|---|---|---|---|---|
| **Alpha** | 0.000 | 0.000 | 0.000 | 0.000 | 0.000 ± 0.000 | 0.000 |
| **sd** | 0.000 | | | | 0.000 | |
| **Beta** | 0.000 | 0.000 | 0.000 | 0.000 | 0.000 ± 0.000 | 0.000 |
| **sd** | 0.000 | | | | 0.000 | |

*** Note: Decay Corrected** **MDC Method** Currie **Error =** .00 **x sd**

# Alpha/Beta Count Results

## Sample Activity Report

## Blue 8-11 - B

**Addr:** 9

**Sample ID** ICRa6-1063071;Ra1

**Repeat** 11

**Carrier No.** 0

**Batch ID** Ra226 - IC

**Count Method** Gross Alpha Beta

**Detector Volts** 1515

**Sample Qty** 0 ***Sample*** **sd** 0 ***Sample***

**Residual Wt** 0 ***mg*** **sd** 0 ***mg***

**Count Began** 7/24/2019 1:58:08 PM **Collection Date 1** 1/1/1900 **Half Life** 0.00 ***days***

**Count Ended** 7/24/2019 2:13:19 PM **Collection Date 2** 1/1/1900 **Decay Factor** 1.000

**Sample Count Time** 15.00 ***mins*** **Background Count Time** 1,000.00 ***mins***

| | Efficiency % | Attenuation Factor | Activity Divisor | Background cpm | Gross counts | Gross cpm | Net cpm |
|---|---|---|---|---|---|---|---|
| **Alpha** | 0.000 | 1.000 | 1.000 | 0.112 | 45,567 | 3,037.800 | 3,037.688 |
| **sd** | 0.000 | | | 0.011 | 213.464 | 14.231 | 14.231 |
| **A to B** | 0.000 | 1.000 | | | | 0.000 | |
| **sd** | 0.000 | | | | | 0.000 | |
| **Beta** | 0.000 | 1.000 | 1.000 | 0.383 | 53,113 | 3,540.867 | 3,540.484 |
| **sd** | 0.000 | | | 0.020 | 230.463 | 15.364 | 15.364 |

| | Net Activity dpm | LLD dpm | MDC DPM | MPC DPM | Net Concentration * DPM | Conc / MPC Ratio |
|---|---|---|---|---|---|---|
| **Alpha** | 0.000 | 0.000 | 0.000 | 0.000 | 0.000 ± 0.000 | 0.000 |
| **sd** | 0.000 | | | | 0.000 | |
| **Beta** | 0.000 | 0.000 | 0.000 | 0.000 | 0.000 ± 0.000 | 0.000 |
| **sd** | 0.000 | | | | 0.000 | |

*** Note: Decay Corrected** **MDC Method** Currie **Error =** .00 **x sd**

# Alpha/Beta Count Results

## Sample Activity Report

## Blue 8-11 - B

**Addr:** 9

**Sample ID** ICRa6-1063071;Ra8

**Repeat** 11

**Carrier No.** 0

**Batch ID** Ra226 - IC

**Count Method** Gross Alpha Beta

**Detector Volts** 1515

**Sample Qty** 0 ***Sample*** **sd** 0 ***Sample***

**Residual Wt** 0 ***mg*** **sd** 0 ***mg***

**Count Began** 7/24/2019 2:34:32 PM **Collection Date 1** 1/1/1900 **Half Life** 0.00 ***days***

**Count Ended** 7/24/2019 2:49:49 PM **Collection Date 2** 1/1/1900 **Decay Factor** 1.000

**Sample Count Time** 15.00 ***mins*** **Background Count Time** 1,000.00 ***mins***

| | Efficiency % | Attenuation Factor | Activity Divisor | Background cpm | Gross counts | Gross cpm | Net cpm |
|---|---|---|---|---|---|---|---|
| **Alpha** | 0.000 | 1.000 | 1.000 | 0.112 | 61,773 | 4,118.200 | 4,118.088 |
| **sd** | 0.000 | | | 0.011 | 248.542 | 16.569 | 16.569 |
| **A to B** | 0.000 | 1.000 | | | | 0.000 | |
| **sd** | 0.000 | | | | | 0.000 | |
| **Beta** | 0.000 | 1.000 | 1.000 | 0.383 | 100,318 | 6,687.867 | 6,687.484 |
| **sd** | 0.000 | | | 0.020 | 316.730 | 21.115 | 21.115 |

| | Net Activity dpm | LLD dpm | MDC DPM | MPC DPM | Net Concentration * DPM | Conc / MPC Ratio |
|---|---|---|---|---|---|---|
| **Alpha** | 0.000 | 0.000 | 0.000 | 0.000 | 0.000 ± 0.000 | 0.000 |
| **sd** | 0.000 | | | | 0.000 | |
| **Beta** | 0.000 | 0.000 | 0.000 | 0.000 | 0.000 ± 0.000 | 0.000 |
| **sd** | 0.000 | | | | 0.000 | |

*** Note: Decay Corrected** **MDC Method** Currie **Error =** .00 **x sd**

# Alpha/Beta Count Results

## Sample Activity Report

## Blue 8-11 - B

**Addr:** 9

**Sample ID** ICRa6-1063071;Ra7

**Repeat** 13

**Carrier No.** 0

**Batch ID** Ra226 - IC

**Count Method** Gross Alpha Beta

**Detector Volts** 1515

**Sample Qty** 0 ***Sample*** **sd** 0 ***Sample***

**Residual Wt** 0 ***mg*** **sd** 0 ***mg***

**Count Began** 7/24/2019 3:16:47 PM **Collection Date 1** 1/1/1900 **Half Life** 0.00 ***days***

**Count Ended** 7/24/2019 3:32:07 PM **Collection Date 2** 1/1/1900 **Decay Factor** 1.000

**Sample Count Time** 15.00 ***mins*** **Background Count Time** 1,000.00 ***mins***

| | Efficiency % | Attenuation Factor | Activity Divisor | Background cpm | Gross counts | Gross cpm | Net cpm |
|---|---|---|---|---|---|---|---|
| **Alpha** | 0.000 | 1.000 | 1.000 | 0.112 | 67,826 | 4,521.733 | 4,521.621 |
| **sd** | 0.000 | | | 0.011 | 260.434 | 17.362 | 17.362 |
| **A to B** | 0.000 | 1.000 | | | | 0.000 | |
| **sd** | 0.000 | | | | | 0.000 | |
| **Beta** | 0.000 | 1.000 | 1.000 | 0.383 | 96,670 | 6,444.667 | 6,444.284 |
| **sd** | 0.000 | | | 0.020 | 310.918 | 20.728 | 20.728 |

| | Net Activity dpm | LLD dpm | MDC DPM | MPC DPM | Net Concentration * DPM | Conc / MPC Ratio |
|---|---|---|---|---|---|---|
| **Alpha** | 0.000 | 0.000 | 0.000 | 0.000 | 0.000 ± 0.000 | 0.000 |
| **sd** | 0.000 | | | | 0.000 | |
| **Beta** | 0.000 | 0.000 | 0.000 | 0.000 | 0.000 ± 0.000 | 0.000 |
| **sd** | 0.000 | | | | 0.000 | |

*** Note: Decay Corrected** **MDC Method** Currie **Error =** .00 **x sd**

# Alpha/Beta Count Results

## Sample Activity Report

## Blue 8-11 - B

**Addr:** 9

**Sample ID** ICRa6-1063071;Ra6

**Repeat** 14

**Carrier No.** 0

**Batch ID** Ra226 - IC

**Count Method** Gross Alpha Beta

**Detector Volts** 1515

**Sample Qty** 0 ***Sample*** **sd** 0 ***Sample***

**Residual Wt** 0 ***mg*** **sd** 0 ***mg***

**Count Began** 7/24/2019 3:48:25 PM **Collection Date 1** 1/1/1900 **Half Life** 0.00 ***days***

**Count Ended** 7/24/2019 4:03:45 PM **Collection Date 2** 1/1/1900 **Decay Factor** 1.000

**Sample Count Time** 15.00 ***mins*** **Background Count Time** 1,000.00 ***mins***

| | Efficiency % | Attenuation Factor | Activity Divisor | Background cpm | Gross counts | Gross cpm | Net cpm |
|---|---|---|---|---|---|---|---|
| **Alpha** | 0.000 | 1.000 | 1.000 | 0.112 | 71,078 | 4,738.533 | 4,738.421 |
| **sd** | 0.000 | | | 0.011 | 266.605 | 17.774 | 17.774 |
| **A to B** | 0.000 | 1.000 | | | | 0.000 | |
| **sd** | 0.000 | | | | | 0.000 | |
| **Beta** | 0.000 | 1.000 | 1.000 | 0.383 | 98,862 | 6,590.800 | 6,590.417 |
| **sd** | 0.000 | | | 0.020 | 314.423 | 20.962 | 20.962 |

| | Net Activity dpm | LLD dpm | MDC DPM | MPC DPM | Net Concentration * DPM | Conc / MPC Ratio |
|---|---|---|---|---|---|---|
| **Alpha** | 0.000 | 0.000 | 0.000 | 0.000 | 0.000 ± 0.000 | 0.000 |
| **sd** | 0.000 | | | | 0.000 | |
| **Beta** | 0.000 | 0.000 | 0.000 | 0.000 | 0.000 ± 0.000 | 0.000 |
| **sd** | 0.000 | | | | 0.000 | |

*** Note: Decay Corrected** **MDC Method** Currie **Error =** .00 **x sd**

# Alpha/Beta Count Results

## Sample Activity Report

## Blue 8-11 - B

**Addr:** 9

**Sample ID** ICRa6-1063071;Ra5

**Repeat** 15

**Carrier No.** 0

**Batch ID** Ra226 - IC

**Count Method** Gross Alpha Beta

**Detector Volts** 1515

**Sample Qty** 0 ***Sample*** **sd** 0 ***Sample***

**Residual Wt** 0 ***mg*** **sd** 0 ***mg***

**Count Began** 7/24/2019 4:26:03 PM **Collection Date 1** 1/1/1900 **Half Life** 0.00 ***days***

**Count Ended** 7/24/2019 4:41:24 PM **Collection Date 2** 1/1/1900 **Decay Factor** 1.000

**Sample Count Time** 15.00 ***mins*** **Background Count Time** 1,000.00 ***mins***

| | Efficiency % | Attenuation Factor | Activity Divisor | Background cpm | Gross counts | Gross cpm | Net cpm |
|---|---|---|---|---|---|---|---|
| **Alpha** | 0.000 | 1.000 | 1.000 | 0.112 | 80,969 | 5,397.933 | 5,397.821 |
| **sd** | 0.000 | | | 0.011 | 284.551 | 18.970 | 18.970 |
| **A to B** | 0.000 | 1.000 | | | | 0.000 | |
| **sd** | 0.000 | | | | | 0.000 | |
| **Beta** | 0.000 | 1.000 | 1.000 | 0.383 | 97,361 | 6,490.733 | 6,490.350 |
| **sd** | 0.000 | | | 0.020 | 312.027 | 20.802 | 20.802 |

| | Net Activity dpm | LLD dpm | MDC DPM | MPC DPM | Net Concentration * DPM | Conc / MPC Ratio |
|---|---|---|---|---|---|---|
| **Alpha** | 0.000 | 0.000 | 0.000 | 0.000 | 0.000 ± 0.000 | 0.000 |
| **sd** | 0.000 | | | | 0.000 | |
| **Beta** | 0.000 | 0.000 | 0.000 | 0.000 | 0.000 ± 0.000 | 0.000 |
| **sd** | 0.000 | | | | 0.000 | |

*** Note: Decay Corrected** **MDC Method** Currie **Error =** .00 **x sd**

# Alpha/Beta Count Results

## Sample Activity Report

## Blue 8-11 - B

**Addr:** 9

**Sample ID** ICRa6-1063071;Ra4

**Repeat** 16

**Carrier No.** 0

**Batch ID** Ra226 - IC

**Count Method** Gross Alpha Beta

**Detector Volts** 1515

**Sample Qty** 0 ***Sample*** **sd** 0 ***Sample***

**Residual Wt** 0 ***mg*** **sd** 0 ***mg***

**Count Began** 7/24/2019 4:50:00 PM **Collection Date 1** 1/1/1900 **Half Life** 0.00 ***days***

**Count Ended** 7/24/2019 5:05:16 PM **Collection Date 2** 1/1/1900 **Decay Factor** 1.000

**Sample Count Time** 15.00 ***mins*** **Background Count Time** 1,000.00 ***mins***

| | Efficiency % | Attenuation Factor | Activity Divisor | Background cpm | Gross counts | Gross cpm | Net cpm |
|---|---|---|---|---|---|---|---|
| **Alpha** | 0.000 | 1.000 | 1.000 | 0.112 | 70,349 | 4,689.933 | 4,689.821 |
| **sd** | 0.000 | | | 0.011 | 265.234 | 17.682 | 17.682 |
| **A to B** | 0.000 | 1.000 | | | | 0.000 | |
| **sd** | 0.000 | | | | | 0.000 | |
| **Beta** | 0.000 | 1.000 | 1.000 | 0.383 | 84,053 | 5,603.533 | 5,603.150 |
| **sd** | 0.000 | | | 0.020 | 289.919 | 19.328 | 19.328 |

| | Net Activity dpm | LLD dpm | MDC DPM | MPC DPM | Net Concentration * DPM | Conc / MPC Ratio |
|---|---|---|---|---|---|---|
| **Alpha** | 0.000 | 0.000 | 0.000 | 0.000 | 0.000 ± 0.000 | 0.000 |
| **sd** | 0.000 | | | | 0.000 | |
| **Beta** | 0.000 | 0.000 | 0.000 | 0.000 | 0.000 ± 0.000 | 0.000 |
| **sd** | 0.000 | | | | 0.000 | |

*** Note: Decay Corrected** **MDC Method** Currie **Error =** .00 **x sd**

# Alpha/Beta Count Results

## Sample Activity Report

## Blue 8-11 - B

**Addr:** 9

**Sample ID** ICRa6-1063071;Ra3

**Repeat** 17

**Carrier No.** 0

**Batch ID** Ra226 - IC

**Count Method** Gross Alpha Beta

**Detector Volts** 1515

**Sample Qty** 0 ***Sample*** **sd** 0 ***Sample***

**Residual Wt** 0 ***mg*** **sd** 0 ***mg***

**Count Began** 7/24/2019 5:07:36 PM **Collection Date 1** 1/1/1900 **Half Life** 0.00 ***days***

**Count Ended** 7/24/2019 5:22:53 PM **Collection Date 2** 1/1/1900 **Decay Factor** 1.000

**Sample Count Time** 15.00 ***mins*** **Background Count Time** 1,000.00 ***mins***

| | Efficiency % | Attenuation Factor | Activity Divisor | Background cpm | Gross counts | Gross cpm | Net cpm |
|---|---|---|---|---|---|---|---|
| **Alpha** | 0.000 | 1.000 | 1.000 | 0.112 | 65,204 | 4,346.933 | 4,346.821 |
| **sd** | 0.000 | | | 0.011 | 255.351 | 17.023 | 17.023 |
| **A to B** | 0.000 | 1.000 | | | | 0.000 | |
| **sd** | 0.000 | | | | | 0.000 | |
| **Beta** | 0.000 | 1.000 | 1.000 | 0.383 | 75,538 | 5,035.867 | 5,035.484 |
| **sd** | 0.000 | | | 0.020 | 274.842 | 18.323 | 18.323 |

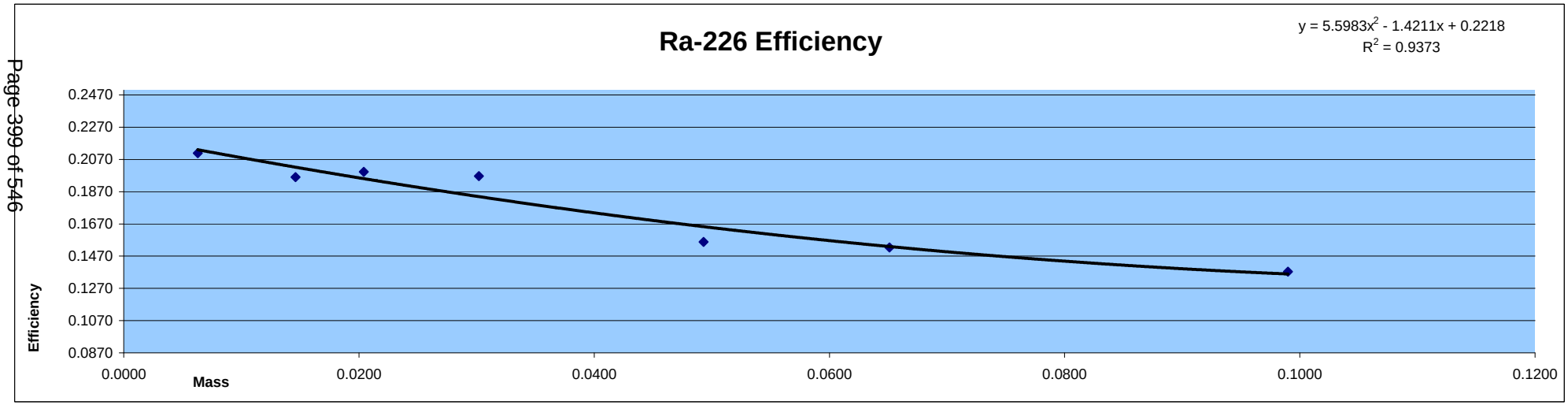
| | Net Activity dpm | LLD dpm | MDC DPM | MPC DPM | Net Concentration * DPM | Conc / MPC Ratio |
|---|---|---|---|---|---|---|
| **Alpha** | 0.000 | 0.000 | 0.000 | 0.000 | 0.000 ± 0.000 | 0.000 |
| **sd** | 0.000 | | | | 0.000 | |
| **Beta** | 0.000 | 0.000 | 0.000 | 0.000 | 0.000 ± 0.000 | 0.000 |
| **sd** | 0.000 | | | | 0.000 | |

*** Note: Decay Corrected** **MDC Method** Currie **Error =** .00 **x sd**

# Ra-226 Calibration 2019

**Blue 12**

| Std # | Sample Time | Count Time | Alpha Counts | CPM | Sep Time | Ingrowth | Recovery | Adj CPM | DPM | Efficiency | Mass |
|---|---|---|---|---|---|---|---|---|---|---|---|
| ICRa6-1063071;Ra2 | 7/24/2019 15:17 | 15 | 42771 | 2851.400 | 2/13/2017 13:30 | 4.0000 | 0.4487 | 1588.6299 | 7534.6 | 0.2108 | 0.0063 |
| ICRa6-1063071;Ra3 | 7/24/2019 14:34 | 15 | 61453 | 4096.867 | 2/13/2017 13:30 | 4.0000 | 0.6933 | 1477.3918 | 7534.6 | 0.1961 | 0.0146 |
| ICRa6-1063071;Ra4 | 7/24/2019 13:58 | 15 | 65449 | 4363.267 | 2/13/2017 13:30 | 4.0000 | 0.7265 | 1501.4682 | 7534.6 | 0.1993 | 0.0204 |
| ICRa6-1063071;Ra5 | 7/24/2019 13:40 | 15 | 76519 | 5101.267 | 2/13/2017 13:30 | 4.0000 | 0.8604 | 1482.2369 | 7534.6 | 0.1967 | 0.0302 |
| ICRa6-1063071;Ra6 | 7/24/2019 17:07 | 15 | 65981 | 4398.733 | 2/13/2017 13:30 | 4.0000 | 0.9364 | 1174.4111 | 7534.6 | 0.1559 | 0.0493 |
| ICRa6-1063071;Ra7 | 7/24/2019 16:50 | 15 | 63875 | 4258.333 | 2/13/2017 13:30 | 4.0000 | 0.9274 | 1147.9844 | 7534.6 | 0.1524 | 0.0651 |
| ICRa6-1063071;Ra8 | 7/24/2019 16:26 | 15 | 58360 | 3890.667 | 2/13/2017 13:30 | 4.0000 | 0.9402 | 1034.5647 | 7534.6 | 0.1373 | 0.0990 |




Reagent ID:Ra-226_00022
Container #:986404
Final Conc.: 7534.60740 dpm/mL
Added: 1mL

Reagent ID:Ba Carrier_00026
Container #: 1015438
Cert.#: 16I027

# Alpha/Beta Count Results

## Sample Activity Report

## Blue 12-15 - A

**Addr:** 12

**Sample ID** ICRa6-1063071;Ra5

**Repeat** 10

**Carrier No.** 0

**Batch ID** Ra226 - IC

**Count Method** Gross Alpha Beta

**Detector Volts** 1515

**Sample Qty** 0 ***Sample*** **sd** 0 ***Sample***

**Residual Wt** 0 ***mg*** **sd** 0 ***mg***

**Count Began** 7/24/2019 1:40:36 PM **Collection Date 1** 1/1/1900 **Half Life** 0.00 ***days***

**Count Ended** 7/24/2019 1:55:57 PM **Collection Date 2** 1/1/1900 **Decay Factor** 1.000

**Sample Count Time** 15.00 ***mins*** **Background Count Time** 1,000.00 ***mins***

| | Efficiency % | Attenuation Factor | Activity Divisor | Background cpm | Gross counts | Gross cpm | Net cpm |
|---|---|---|---|---|---|---|---|
| **Alpha** | 0.000 | 1.000 | 1.000 | 0.118 | 76,519 | 5,101.267 | 5,101.149 |
| **sd** | 0.000 | | | 0.011 | 276.621 | 18.441 | 18.441 |
| **A to B** | 0.000 | 1.000 | | | | 0.000 | |
| **sd** | 0.000 | | | | | 0.000 | |
| **Beta** | 0.000 | 1.000 | 1.000 | 0.357 | 102,691 | 6,846.067 | 6,845.710 |
| **sd** | 0.000 | | | 0.019 | 320.454 | 21.364 | 21.364 |

| | Net Activity dpm | LLD dpm | MDC DPM | MPC DPM | Net Concentration * DPM | Conc / MPC Ratio |
|---|---|---|---|---|---|---|
| **Alpha** | 0.000 | 0.000 | 0.000 | 0.000 | 0.000 ± 0.000 | 0.000 |
| **sd** | 0.000 | | | | 0.000 | |
| **Beta** | 0.000 | 0.000 | 0.000 | 0.000 | 0.000 ± 0.000 | 0.000 |
| **sd** | 0.000 | | | | 0.000 | |

*** Note: Decay Corrected** **MDC Method** Currie **Error =** .00 **x sd**

# Alpha/Beta Count Results

## Sample Activity Report

## Blue 12-15 - A

**Addr:** 12

**Sample ID** ICRa6-1063071;Ra4

**Repeat** 11

**Carrier No.** 0

**Batch ID** Ra226 - IC

**Count Method** Gross Alpha Beta

**Detector Volts** 1515

**Sample Qty** 0 ***Sample*** **sd** 0 ***Sample***

**Residual Wt** 0 ***mg*** **sd** 0 ***mg***

**Count Began** 7/24/2019 1:58:22 PM **Collection Date 1** 1/1/1900 **Half Life** 0.00 ***days***

**Count Ended** 7/24/2019 2:13:45 PM **Collection Date 2** 1/1/1900 **Decay Factor** 1.000

**Sample Count Time** 15.00 ***mins*** **Background Count Time** 1,000.00 ***mins***

| | Efficiency % | Attenuation Factor | Activity Divisor | Background cpm | Gross counts | Gross cpm | Net cpm |
|---|---|---|---|---|---|---|---|
| **Alpha** | 0.000 | 1.000 | 1.000 | 0.118 | 65,449 | 4,363.267 | 4,363.149 |
| **sd** | 0.000 | | | 0.011 | 255.830 | 17.055 | 17.055 |
| **A to B** | 0.000 | 1.000 | | | | 0.000 | |
| **sd** | 0.000 | | | | | 0.000 | |
| **Beta** | 0.000 | 1.000 | 1.000 | 0.357 | 88,049 | 5,869.933 | 5,869.576 |
| **sd** | 0.000 | | | 0.019 | 296.731 | 19.782 | 19.782 |

| | Net Activity dpm | LLD dpm | MDC DPM | MPC DPM | Net Concentration * DPM | Conc / MPC Ratio |
|---|---|---|---|---|---|---|
| **Alpha** | 0.000 | 0.000 | 0.000 | 0.000 | 0.000 ± 0.000 | 0.000 |
| **sd** | 0.000 | | | | 0.000 | |
| **Beta** | 0.000 | 0.000 | 0.000 | 0.000 | 0.000 ± 0.000 | 0.000 |
| **sd** | 0.000 | | | | 0.000 | |

*** Note: Decay Corrected** **MDC Method** Currie **Error =** .00 **x sd**

# Alpha/Beta Count Results

## Sample Activity Report

## Blue 12-15 - A

**Addr:** 12

**Sample ID** ICRa6-1063071;Ra3

**Repeat** 12

**Carrier No.** 0

**Batch ID** Ra226 - IC

**Count Method** Gross Alpha Beta

**Detector Volts** 1515

**Sample Qty** 0 ***Sample*** **sd** 0 ***Sample***

**Residual Wt** 0 ***mg*** **sd** 0 ***mg***

**Count Began** 7/24/2019 2:34:47 PM **Collection Date 1** 1/1/1900 **Half Life** 0.00 ***days***

**Count Ended** 7/24/2019 2:50:06 PM **Collection Date 2** 1/1/1900 **Decay Factor** 1.000

**Sample Count Time** 15.00 ***mins*** **Background Count Time** 1,000.00 ***mins***

| | Efficiency % | Attenuation Factor | Activity Divisor | Background cpm | Gross counts | Gross cpm | Net cpm |
|---|---|---|---|---|---|---|---|
| **Alpha** | 0.000 | 1.000 | 1.000 | 0.118 | 61,453 | 4,096.867 | 4,096.749 |
| **sd** | 0.000 | | | 0.011 | 247.897 | 16.526 | 16.526 |
| **A to B** | 0.000 | 1.000 | | | | 0.000 | |
| **sd** | 0.000 | | | | | 0.000 | |
| **Beta** | 0.000 | 1.000 | 1.000 | 0.357 | 79,673 | 5,311.533 | 5,311.176 |
| **sd** | 0.000 | | | 0.019 | 282.264 | 18.818 | 18.818 |

| | Net Activity dpm | LLD dpm | MDC DPM | MPC DPM | Net Concentration * DPM | Conc / MPC Ratio |
|---|---|---|---|---|---|---|
| **Alpha** | 0.000 | 0.000 | 0.000 | 0.000 | 0.000 ± 0.000 | 0.000 |
| **sd** | 0.000 | | | | 0.000 | |
| **Beta** | 0.000 | 0.000 | 0.000 | 0.000 | 0.000 ± 0.000 | 0.000 |
| **sd** | 0.000 | | | | 0.000 | |

*** Note: Decay Corrected** **MDC Method** Currie **Error =** .00 **x sd**

# Alpha/Beta Count Results

## Sample Activity Report

## Blue 12-15 - A

**Addr:** 12

**Sample ID** ICRa6-1063071;Ra2

**Repeat** 13

**Carrier No.** 0

**Batch ID** Ra226 - IC

**Count Method** Gross Alpha Beta

**Detector Volts** 1515

**Sample Qty** 0 ***Sample*** **sd** 0 ***Sample***

**Residual Wt** 0 ***mg*** **sd** 0 ***mg***

**Count Began** 7/24/2019 3:17:00 PM **Collection Date 1** 1/1/1900 **Half Life** 0.00 ***days***

**Count Ended** 7/24/2019 3:32:18 PM **Collection Date 2** 1/1/1900 **Decay Factor** 1.000

**Sample Count Time** 15.00 ***mins*** **Background Count Time** 1,000.00 ***mins***

| | Efficiency % | Attenuation Factor | Activity Divisor | Background cpm | Gross counts | Gross cpm | Net cpm |
|---|---|---|---|---|---|---|---|
| **Alpha** | 0.000 | 1.000 | 1.000 | 0.118 | 42,771 | 2,851.400 | 2,851.282 |
| **sd** | 0.000 | | | 0.011 | 206.812 | 13.787 | 13.787 |
| **A to B** | 0.000 | 1.000 | | | | 0.000 | |
| **sd** | 0.000 | | | | | 0.000 | |
| **Beta** | 0.000 | 1.000 | 1.000 | 0.357 | 54,183 | 3,612.200 | 3,611.843 |
| **sd** | 0.000 | | | 0.019 | 232.772 | 15.518 | 15.518 |

| | Net Activity dpm | LLD dpm | MDC DPM | MPC DPM | Net Concentration * DPM | Conc / MPC Ratio |
|---|---|---|---|---|---|---|
| **Alpha** | 0.000 | 0.000 | 0.000 | 0.000 | 0.000 ± 0.000 | 0.000 |
| **sd** | 0.000 | | | | 0.000 | |
| **Beta** | 0.000 | 0.000 | 0.000 | 0.000 | 0.000 ± 0.000 | 0.000 |
| **sd** | 0.000 | | | | 0.000 | |

*** Note: Decay Corrected** **MDC Method** Currie **Error =** .00 **x sd**

# Alpha/Beta Count Results

## Sample Activity Report

## Blue 12-15 - A

**Addr:** 12

**Sample ID** ICRa6-1063071;Ra1

**Repeat** 14

**Carrier No.** 0

**Batch ID** Ra226 - IC

**Count Method** Gross Alpha Beta

**Detector Volts** 1515

**Sample Qty** 0 ***Sample*** **sd** 0 ***Sample***

**Residual Wt** 0 ***mg*** **sd** 0 ***mg***

**Count Began** 7/24/2019 3:48:41 PM **Collection Date 1** 1/1/1900 **Half Life** 0.00 ***days***

**Count Ended** 7/24/2019 4:03:57 PM **Collection Date 2** 1/1/1900 **Decay Factor** 1.000

**Sample Count Time** 15.00 ***mins*** **Background Count Time** 1,000.00 ***mins***

| | Efficiency % | Attenuation Factor | Activity Divisor | Background cpm | Gross counts | Gross cpm | Net cpm |
|---|---|---|---|---|---|---|---|
| **Alpha** | 0.000 | 1.000 | 1.000 | 0.118 | 43,417 | 2,894.467 | 2,894.349 |
| **sd** | 0.000 | | | 0.011 | 208.367 | 13.891 | 13.891 |
| **A to B** | 0.000 | 1.000 | | | | 0.000 | |
| **sd** | 0.000 | | | | | 0.000 | |
| **Beta** | 0.000 | 1.000 | 1.000 | 0.357 | 56,211 | 3,747.400 | 3,747.043 |
| **sd** | 0.000 | | | 0.019 | 237.089 | 15.806 | 15.806 |

| | Net Activity dpm | LLD dpm | MDC DPM | MPC DPM | Net Concentration * DPM | Conc / MPC Ratio |
|---|---|---|---|---|---|---|
| **Alpha** | 0.000 | 0.000 | 0.000 | 0.000 | 0.000 ± 0.000 | 0.000 |
| **sd** | 0.000 | | | | 0.000 | |
| **Beta** | 0.000 | 0.000 | 0.000 | 0.000 | 0.000 ± 0.000 | 0.000 |
| **sd** | 0.000 | | | | 0.000 | |

*** Note: Decay Corrected** **MDC Method** Currie **Error =** .00 **x sd**

# Alpha/Beta Count Results

## Sample Activity Report

## Blue 12-15 - A

**Addr:** 12

**Sample ID** ICRa6-1063071;Ra8

**Repeat** 14

**Carrier No.** 0

**Batch ID** Ra226 - IC

**Count Method** Gross Alpha Beta

**Detector Volts** 1515

**Sample Qty** 0 *Sample* **sd** 0 *Sample*

**Residual Wt** 0 *mg* **sd** 0 *mg*

**Count Began** 7/24/2019 4:26:19 PM **Collection Date 1** 1/1/1900 **Half Life** 0.00 *days*

**Count Ended** 7/24/2019 4:41:42 PM **Collection Date 2** 1/1/1900 **Decay Factor** 1.000

**Sample Count Time** 15.00 *mins* **Background Count Time** 1,000.00 *mins*

| | Efficiency % | Attenuation Factor | Activity Divisor | Background cpm | Gross counts | Gross cpm | Net cpm |
|---|---|---|---|---|---|---|---|
| **Alpha** | 0.000 | 1.000 | 1.000 | 0.118 | 58,360 | 3,890.667 | 3,890.549 |
| **sd** | 0.000 | | | 0.011 | 241.578 | 16.105 | 16.105 |
| **A to B** | 0.000 | 1.000 | | | | 0.000 | |
| **sd** | 0.000 | | | | | 0.000 | |
| **Beta** | 0.000 | 1.000 | 1.000 | 0.357 | 105,447 | 7,029.800 | 7,029.443 |
| **sd** | 0.000 | | | 0.019 | 324.726 | 21.648 | 21.648 |

| | Net Activity dpm | LLD dpm | MDC DPM | MPC DPM | Net Concentration * DPM | Conc / MPC Ratio |
|---|---|---|---|---|---|---|
| **Alpha** | 0.000 | 0.000 | 0.000 | 0.000 | 0.000 ± 0.000 | 0.000 |
| **sd** | 0.000 | | | | 0.000 | |
| **Beta** | 0.000 | 0.000 | 0.000 | 0.000 | 0.000 ± 0.000 | 0.000 |
| **sd** | 0.000 | | | | 0.000 | |

*** Note: Decay Corrected** **MDC Method** Currie **Error =** .00 **x sd**

# Alpha/Beta Count Results

## Sample Activity Report

## Blue 12-15 - A

**Addr:** 12

**Sample ID** ICRa6-1063071;Ra7

**Repeat** 16

**Carrier No.** 0

**Batch ID** Ra226 - IC

**Count Method** Gross Alpha Beta

**Detector Volts** 1515

**Sample Qty** 0 ***Sample*** **sd** 0 ***Sample***

**Residual Wt** 0 ***mg*** **sd** 0 ***mg***

**Count Began** 7/24/2019 4:50:14 PM **Collection Date 1** 1/1/1900 **Half Life** 0.00 ***days***

**Count Ended** 7/24/2019 5:05:36 PM **Collection Date 2** 1/1/1900 **Decay Factor** 1.000

**Sample Count Time** 15.00 ***mins*** **Background Count Time** 1,000.00 ***mins***

| | Efficiency % | Attenuation Factor | Activity Divisor | Background cpm | Gross counts | Gross cpm | Net cpm |
|---|---|---|---|---|---|---|---|
| **Alpha** | 0.000 | 1.000 | 1.000 | 0.118 | 63,875 | 4,258.333 | 4,258.215 |
| **sd** | 0.000 | | | 0.011 | 252.735 | 16.849 | 16.849 |
| **A to B** | 0.000 | 1.000 | | | | 0.000 | |
| **sd** | 0.000 | | | | | 0.000 | |
| **Beta** | 0.000 | 1.000 | 1.000 | 0.357 | 102,124 | 6,808.267 | 6,807.910 |
| **sd** | 0.000 | | | 0.019 | 319.568 | 21.305 | 21.305 |

| | Net Activity dpm | LLD dpm | MDC DPM | MPC DPM | Net Concentration * DPM | Conc / MPC Ratio |
|---|---|---|---|---|---|---|
| **Alpha** | 0.000 | 0.000 | 0.000 | 0.000 | 0.000 ± 0.000 | 0.000 |
| **sd** | 0.000 | | | | 0.000 | |
| **Beta** | 0.000 | 0.000 | 0.000 | 0.000 | 0.000 ± 0.000 | 0.000 |
| **sd** | 0.000 | | | | 0.000 | |

*** Note: Decay Corrected** **MDC Method** Currie **Error =** .00 **x sd**

# Alpha/Beta Count Results

## Sample Activity Report

## Blue 12-15 - A

**Addr:** 12

**Sample ID** ICRa6-1063071;Ra6

**Repeat** 17

**Carrier No.** 0

**Batch ID** Ra226 - IC

**Count Method** Gross Alpha Beta

**Detector Volts** 1515

**Sample Qty** 0 ***Sample*** **sd** 0 ***Sample***

**Residual Wt** 0 ***mg*** **sd** 0 ***mg***

**Count Began** 7/24/2019 5:07:51 PM **Collection Date 1** 1/1/1900 **Half Life** 0.00 ***days***

**Count Ended** 7/24/2019 5:23:11 PM **Collection Date 2** 1/1/1900 **Decay Factor** 1.000

**Sample Count Time** 15.00 ***mins*** **Background Count Time** 1,000.00 ***mins***

| | Efficiency % | Attenuation Factor | Activity Divisor | Background cpm | Gross counts | Gross cpm | Net cpm |
|---|---|---|---|---|---|---|---|
| **Alpha** | 0.000 | 1.000 | 1.000 | 0.118 | 65,981 | 4,398.733 | 4,398.615 |
| **sd** | 0.000 | | | 0.011 | 256.868 | 17.125 | 17.125 |
| **A to B** | 0.000 | 1.000 | | | | 0.000 | |
| **sd** | 0.000 | | | | | 0.000 | |
| **Beta** | 0.000 | 1.000 | 1.000 | 0.357 | 103,183 | 6,878.867 | 6,878.510 |
| **sd** | 0.000 | | | 0.019 | 321.221 | 21.415 | 21.415 |

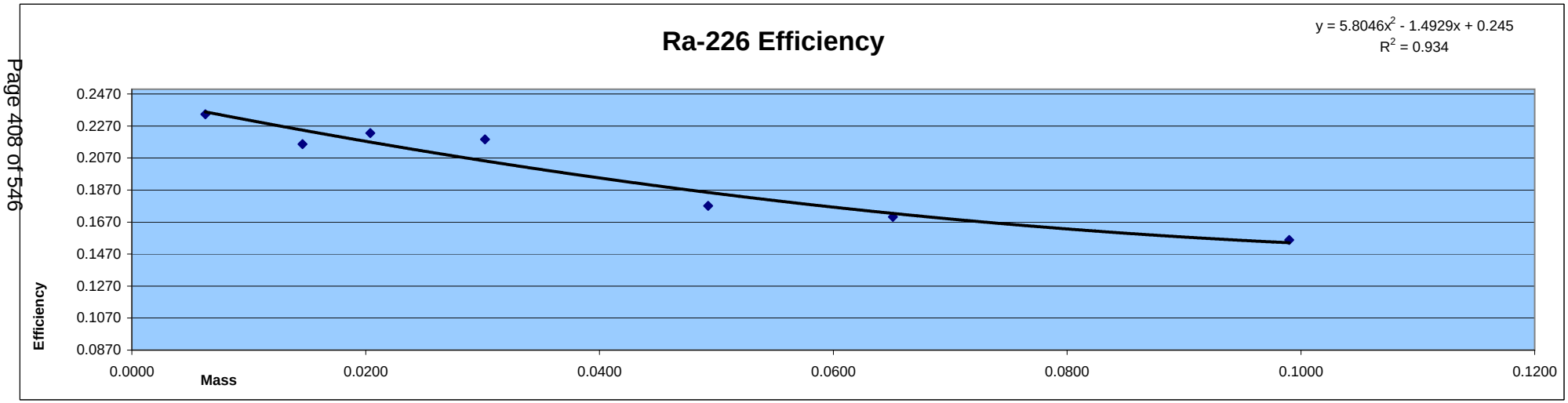
| | Net Activity dpm | LLD dpm | MDC DPM | MPC DPM | Net Concentration * DPM | Conc / MPC Ratio |
|---|---|---|---|---|---|---|
| **Alpha** | 0.000 | 0.000 | 0.000 | 0.000 | 0.000 ± 0.000 | 0.000 |
| **sd** | 0.000 | | | | 0.000 | |
| **Beta** | 0.000 | 0.000 | 0.000 | 0.000 | 0.000 ± 0.000 | 0.000 |
| **sd** | 0.000 | | | | 0.000 | |

*** Note: Decay Corrected** **MDC Method** Currie **Error =** .00 **x sd**

# Ra-226 Calibration 2019

**Blue 13**

| Std # | Sample Time | Count Time | Alpha Counts | CPM | Sep Time | Ingrowth | Recovery | Adj CPM | DPM | Efficiency | Mass |
|---|---|---|---|---|---|---|---|---|---|---|---|
| ICRa6-1063071;Ra2 | 7/24/2019 15:48 | 15 | 47540 | 3169.333 | 2/13/2017 13:30 | 4.0000 | 0.4487 | 1765.7634 | 7534.6 | 0.2344 | 0.0063 |
| ICRa6-1063071;Ra3 | 7/24/2019 15:17 | 15 | 67578 | 4505.200 | 2/13/2017 13:30 | 4.0000 | 0.6933 | 1624.6430 | 7534.6 | 0.2156 | 0.0146 |
| ICRa6-1063071;Ra4 | 7/24/2019 14:34 | 15 | 73095 | 4873.000 | 2/13/2017 13:30 | 4.0000 | 0.7265 | 1676.8754 | 7534.6 | 0.2226 | 0.0204 |
| ICRa6-1063071;Ra5 | 7/24/2019 13:58 | 15 | 85066 | 5671.067 | 2/13/2017 13:30 | 4.0000 | 0.8604 | 1647.7995 | 7534.6 | 0.2187 | 0.0302 |
| ICRa6-1063071;Ra6 | 7/24/2019 13:40 | 15 | 74944 | 4996.267 | 2/13/2017 13:30 | 4.0000 | 0.9364 | 1333.9456 | 7534.6 | 0.1770 | 0.0493 |
| ICRa6-1063071;Ra7 | 7/24/2019 17:07 | 15 | 71396 | 4759.733 | 2/13/2017 13:30 | 4.0000 | 0.9274 | 1283.1545 | 7534.6 | 0.1703 | 0.0651 |
| ICRa6-1063071;Ra8 | 7/24/2019 16:50 | 15 | 66214 | 4414.267 | 2/13/2017 13:30 | 4.0000 | 0.9402 | 1173.7948 | 7534.6 | 0.1558 | 0.0990 |




Reagent ID:Ra-226_00022
Container #:986404
Final Conc.: 7534.60740 dpm/mL
Added: 1mL

Reagent ID:Ba Carrier_00026
Container #: 1015438
Cert.#: 16I027

# Alpha/Beta Count Results

## Sample Activity Report

## Blue 12-15 - B

**Addr:** 13

**Sample ID** ICRa6-1063071;Ra6

**Repeat** 10

**Carrier No.** 0

**Batch ID** Ra226 - IC

**Count Method** Gross Alpha Beta

**Detector Volts** 1515

**Sample Qty** 0 ***Sample*** **sd** 0 ***Sample***

**Residual Wt** 0 ***mg*** **sd** 0 ***mg***

**Count Began** 7/24/2019 1:40:40 PM **Collection Date 1** 1/1/1900 **Half Life** 0.00 ***days***

**Count Ended** 7/24/2019 1:56:00 PM **Collection Date 2** 1/1/1900 **Decay Factor** 1.000

**Sample Count Time** 15.00 ***mins*** **Background Count Time** 1,000.00 ***mins***

| | Efficiency % | Attenuation Factor | Activity Divisor | Background cpm | Gross counts | Gross cpm | Net cpm |
|---|---|---|---|---|---|---|---|
| **Alpha** | 0.000 | 1.000 | 1.000 | 0.111 | 74,944 | 4,996.267 | 4,996.156 |
| **sd** | 0.000 | | | 0.011 | 273.759 | 18.251 | 18.251 |
| **A to B** | 0.000 | 1.000 | | | | 0.000 | |
| **sd** | 0.000 | | | | | 0.000 | |
| **Beta** | 0.000 | 1.000 | 1.000 | 0.361 | 95,462 | 6,364.133 | 6,363.772 |
| **sd** | 0.000 | | | 0.019 | 308.969 | 20.598 | 20.598 |

| | Net Activity dpm | LLD dpm | MDC DPM | MPC DPM | Net Concentration * DPM | Conc / MPC Ratio |
|---|---|---|---|---|---|---|
| **Alpha** | 0.000 | 0.000 | 0.000 | 0.000 | 0.000 ± 0.000 | 0.000 |
| **sd** | 0.000 | | | | 0.000 | |
| **Beta** | 0.000 | 0.000 | 0.000 | 0.000 | 0.000 ± 0.000 | 0.000 |
| **sd** | 0.000 | | | | 0.000 | |

*** Note: Decay Corrected** **MDC Method** Currie **Error =** .00 **x sd**

# Alpha/Beta Count Results

## Sample Activity Report

## Blue 12-15 - B

**Addr:** 13

**Sample ID** ICRa6-1063071;Ra5

**Repeat** 11

**Carrier No.** 0

**Batch ID** Ra226 - IC

**Count Method** Gross Alpha Beta

**Detector Volts** 1515

**Sample Qty** 0 *Sample* **sd** 0 *Sample*

**Residual Wt** 0 *mg* **sd** 0 *mg*

**Count Began** 7/24/2019 1:58:27 PM **Collection Date 1** 1/1/1900 **Half Life** 0.00 *days*

**Count Ended** 7/24/2019 2:13:47 PM **Collection Date 2** 1/1/1900 **Decay Factor** 1.000

**Sample Count Time** 15.00 *mins* **Background Count Time** 1,000.00 *mins*

| | Efficiency % | Attenuation Factor | Activity Divisor | Background cpm | Gross counts | Gross cpm | Net cpm |
|---|---|---|---|---|---|---|---|
| **Alpha** | 0.000 | 1.000 | 1.000 | 0.111 | 85,066 | 5,671.067 | 5,670.956 |
| **sd** | 0.000 | | | 0.011 | 291.661 | 19.444 | 19.444 |
| **A to B** | 0.000 | 1.000 | | | | 0.000 | |
| **sd** | 0.000 | | | | | 0.000 | |
| **Beta** | 0.000 | 1.000 | 1.000 | 0.361 | 94,997 | 6,333.133 | 6,332.772 |
| **sd** | 0.000 | | | 0.019 | 308.216 | 20.548 | 20.548 |

| | Net Activity dpm | LLD dpm | MDC DPM | MPC DPM | Net Concentration * DPM | Conc / MPC Ratio |
|---|---|---|---|---|---|---|
| **Alpha** | 0.000 | 0.000 | 0.000 | 0.000 | 0.000 ± 0.000 | 0.000 |
| **sd** | 0.000 | | | | 0.000 | |
| **Beta** | 0.000 | 0.000 | 0.000 | 0.000 | 0.000 ± 0.000 | 0.000 |
| **sd** | 0.000 | | | | 0.000 | |

*** Note: Decay Corrected** **MDC Method** Currie **Error =** .00 **x sd**

# Alpha/Beta Count Results

## Sample Activity Report

## Blue 12-15 - B

**Addr:** 13

**Sample ID** ICRa6-1063071;Ra4

**Repeat** 12

**Carrier No.** 0

**Batch ID** Ra226 - IC

**Count Method** Gross Alpha Beta

**Detector Volts** 1515

**Sample Qty** 0 *Sample* **sd** 0 *Sample*

**Residual Wt** 0 *mg* **sd** 0 *mg*

**Count Began** 7/24/2019 2:34:52 PM **Collection Date 1** 1/1/1900 **Half Life** 0.00 *days*

**Count Ended** 7/24/2019 2:50:15 PM **Collection Date 2** 1/1/1900 **Decay Factor** 1.000

**Sample Count Time** 15.00 *mins* **Background Count Time** 1,000.00 *mins*

| | Efficiency % | Attenuation Factor | Activity Divisor | Background cpm | Gross counts | Gross cpm | Net cpm |
|---|---|---|---|---|---|---|---|
| **Alpha** | 0.000 | 1.000 | 1.000 | 0.111 | 73,095 | 4,873.000 | 4,872.889 |
| **sd** | 0.000 | | | 0.011 | 270.361 | 18.024 | 18.024 |
| **A to B** | 0.000 | 1.000 | | | | 0.000 | |
| **sd** | 0.000 | | | | | 0.000 | |
| **Beta** | 0.000 | 1.000 | 1.000 | 0.361 | 81,045 | 5,403.000 | 5,402.639 |
| **sd** | 0.000 | | | 0.019 | 284.684 | 18.979 | 18.979 |

| | Net Activity dpm | LLD dpm | MDC DPM | MPC DPM | Net Concentration * DPM | Conc / MPC Ratio |
|---|---|---|---|---|---|---|
| **Alpha** | 0.000 | 0.000 | 0.000 | 0.000 | 0.000 ± 0.000 | 0.000 |
| **sd** | 0.000 | | | | 0.000 | |
| **Beta** | 0.000 | 0.000 | 0.000 | 0.000 | 0.000 ± 0.000 | 0.000 |
| **sd** | 0.000 | | | | 0.000 | |

*** Note: Decay Corrected** **MDC Method** Currie **Error =** .00 **x sd**

# Alpha/Beta Count Results

## Sample Activity Report

## Blue 12-15 - B

**Addr:** 13

**Sample ID** ICRa6-1063071;Ra3

**Repeat** 13

**Carrier No.** 0

**Batch ID** Ra226 - IC

**Count Method** Gross Alpha Beta

**Detector Volts** 1515

**Sample Qty** 0 *Sample* **sd** 0 *Sample*

**Residual Wt** 0 *mg* **sd** 0 *mg*

**Count Began** 7/24/2019 3:17:05 PM **Collection Date 1** 1/1/1900 **Half Life** 0.00 *days*

**Count Ended** 7/24/2019 3:32:23 PM **Collection Date 2** 1/1/1900 **Decay Factor** 1.000

**Sample Count Time** 15.00 *mins* **Background Count Time** 1,000.00 *mins*

| | Efficiency % | Attenuation Factor | Activity Divisor | Background cpm | Gross counts | Gross cpm | Net cpm |
|---|---|---|---|---|---|---|---|
| **Alpha** | 0.000 | 1.000 | 1.000 | 0.111 | 67,578 | 4,505.200 | 4,505.089 |
| **sd** | 0.000 | | | 0.011 | 259.958 | 17.331 | 17.331 |
| **A to B** | 0.000 | 1.000 | | | | 0.000 | |
| **sd** | 0.000 | | | | | 0.000 | |
| **Beta** | 0.000 | 1.000 | 1.000 | 0.361 | 73,720 | 4,914.667 | 4,914.306 |
| **sd** | 0.000 | | | 0.019 | 271.514 | 18.101 | 18.101 |

| | Net Activity dpm | LLD dpm | MDC DPM | MPC DPM | Net Concentration * DPM | Conc / MPC Ratio |
|---|---|---|---|---|---|---|
| **Alpha** | 0.000 | 0.000 | 0.000 | 0.000 | 0.000 ± 0.000 | 0.000 |
| **sd** | 0.000 | | | | 0.000 | |
| **Beta** | 0.000 | 0.000 | 0.000 | 0.000 | 0.000 ± 0.000 | 0.000 |
| **sd** | 0.000 | | | | 0.000 | |

*** Note: Decay Corrected** **MDC Method** Currie **Error =** .00 **x sd**

# Alpha/Beta Count Results

## Sample Activity Report

## Blue 12-15 - B

**Addr:** 13

**Sample ID** ICRa6-1063071;Ra2

**Repeat** 14

**Carrier No.** 0

**Batch ID** Ra226 - IC

**Count Method** Gross Alpha Beta

**Detector Volts** 1515

**Sample Qty** 0 ***Sample*** **sd** 0 ***Sample***

**Residual Wt** 0 ***mg*** **sd** 0 ***mg***

**Count Began** 7/24/2019 3:48:47 PM **Collection Date 1** 1/1/1900 **Half Life** 0.00 ***days***

**Count Ended** 7/24/2019 4:04:03 PM **Collection Date 2** 1/1/1900 **Decay Factor** 1.000

**Sample Count Time** 15.00 ***mins*** **Background Count Time** 1,000.00 ***mins***

| | Efficiency % | Attenuation Factor | Activity Divisor | Background cpm | Gross counts | Gross cpm | Net cpm |
|---|---|---|---|---|---|---|---|
| **Alpha** | 0.000 | 1.000 | 1.000 | 0.111 | 47,540 | 3,169.333 | 3,169.222 |
| **sd** | 0.000 | | | 0.011 | 218.037 | 14.536 | 14.536 |
| **A to B** | 0.000 | 1.000 | | | | 0.000 | |
| **sd** | 0.000 | | | | | 0.000 | |
| **Beta** | 0.000 | 1.000 | 1.000 | 0.361 | 49,713 | 3,314.200 | 3,313.839 |
| **sd** | 0.000 | | | 0.019 | 222.964 | 14.864 | 14.864 |

| | Net Activity dpm | LLD dpm | MDC DPM | MPC DPM | Net Concentration * DPM | Conc / MPC Ratio |
|---|---|---|---|---|---|---|
| **Alpha** | 0.000 | 0.000 | 0.000 | 0.000 | 0.000 ± 0.000 | 0.000 |
| **sd** | 0.000 | | | | 0.000 | |
| **Beta** | 0.000 | 0.000 | 0.000 | 0.000 | 0.000 ± 0.000 | 0.000 |
| **sd** | 0.000 | | | | 0.000 | |

*** Note: Decay Corrected** **MDC Method** Currie **Error =** .00 **x sd**

# Alpha/Beta Count Results

## Sample Activity Report

## Blue 12-15 - B

**Addr:** 13

**Sample ID** ICRa6-1063071;Ra1

**Repeat** 15

**Carrier No.** 0

**Batch ID** Ra226 - IC

**Count Method** Gross Alpha Beta

**Detector Volts** 1515

**Sample Qty** 0 ***Sample*** **sd** 0 ***Sample***

**Residual Wt** 0 ***mg*** **sd** 0 ***mg***

**Count Began** 7/24/2019 4:26:24 PM **Collection Date 1** 1/1/1900 **Half Life** 0.00 ***days***

**Count Ended** 7/24/2019 4:41:44 PM **Collection Date 2** 1/1/1900 **Decay Factor** 1.000

**Sample Count Time** 15.00 ***mins*** **Background Count Time** 1,000.00 ***mins***

| | Efficiency % | Attenuation Factor | Activity Divisor | Background cpm | Gross counts | Gross cpm | Net cpm |
|---|---|---|---|---|---|---|---|
| **Alpha** | 0.000 | 1.000 | 1.000 | 0.111 | 46,957 | 3,130.467 | 3,130.356 |
| **sd** | 0.000 | | | 0.011 | 216.696 | 14.446 | 14.446 |
| **A to B** | 0.000 | 1.000 | | | | 0.000 | |
| **sd** | 0.000 | | | | | 0.000 | |
| **Beta** | 0.000 | 1.000 | 1.000 | 0.361 | 51,435 | 3,429.000 | 3,428.639 |
| **sd** | 0.000 | | | 0.019 | 226.793 | 15.120 | 15.120 |

| | Net Activity dpm | LLD dpm | MDC DPM | MPC DPM | Net Concentration * DPM | Conc / MPC Ratio |
|---|---|---|---|---|---|---|
| **Alpha** | 0.000 | 0.000 | 0.000 | 0.000 | 0.000 ± 0.000 | 0.000 |
| **sd** | 0.000 | | | | 0.000 | |
| **Beta** | 0.000 | 0.000 | 0.000 | 0.000 | 0.000 ± 0.000 | 0.000 |
| **sd** | 0.000 | | | | 0.000 | |

*** Note: Decay Corrected** **MDC Method** Currie **Error =** .00 **x sd**

# Alpha/Beta Count Results

## Sample Activity Report

## Blue 12-15 - B

**Addr:** 13

**Sample ID** ICRa6-1063071;Ra8

**Repeat** 15

**Carrier No.** 0

**Batch ID** Ra226 - IC

**Count Method** Gross Alpha Beta

**Detector Volts** 1515

**Sample Qty** 0 ***Sample*** **sd** 0 ***Sample***

**Residual Wt** 0 ***mg*** **sd** 0 ***mg***

**Count Began** 7/24/2019 4:50:19 PM **Collection Date 1** 1/1/1900 **Half Life** 0.00 ***days***

**Count Ended** 7/24/2019 5:05:37 PM **Collection Date 2** 1/1/1900 **Decay Factor** 1.000

**Sample Count Time** 15.00 ***mins*** **Background Count Time** 1,000.00 ***mins***

| | Efficiency % | Attenuation Factor | Activity Divisor | Background cpm | Gross counts | Gross cpm | Net cpm |
|---|---|---|---|---|---|---|---|
| **Alpha** | 0.000 | 1.000 | 1.000 | 0.111 | 66,214 | 4,414.267 | 4,414.156 |
| **sd** | 0.000 | | | 0.011 | 257.321 | 17.155 | 17.155 |
| **A to B** | 0.000 | 1.000 | | | | 0.000 | |
| **sd** | 0.000 | | | | | 0.000 | |
| **Beta** | 0.000 | 1.000 | 1.000 | 0.361 | 97,725 | 6,515.000 | 6,514.639 |
| **sd** | 0.000 | | | 0.019 | 312.610 | 20.841 | 20.841 |

| | Net Activity dpm | LLD dpm | MDC DPM | MPC DPM | Net Concentration * DPM | Conc / MPC Ratio |
|---|---|---|---|---|---|---|
| **Alpha** | 0.000 | 0.000 | 0.000 | 0.000 | 0.000 ± 0.000 | 0.000 |
| **sd** | 0.000 | | | | 0.000 | |
| **Beta** | 0.000 | 0.000 | 0.000 | 0.000 | 0.000 ± 0.000 | 0.000 |
| **sd** | 0.000 | | | | 0.000 | |

*** Note: Decay Corrected** **MDC Method** Currie **Error =** .00 **x sd**

# Alpha/Beta Count Results

## Sample Activity Report

## Blue 12-15 - B

**Addr:** 13

**Sample ID** ICRa6-1063071;Ra7

**Repeat** 17

**Carrier No.** 0

**Batch ID** Ra226 - IC

**Count Method** Gross Alpha Beta

**Detector Volts** 1515

**Sample Qty** 0 ***Sample*** **sd** 0 ***Sample***

**Residual Wt** 0 ***mg*** **sd** 0 ***mg***

**Count Began** 7/24/2019 5:07:57 PM **Collection Date 1** 1/1/1900 **Half Life** 0.00 ***days***

**Count Ended** 7/24/2019 5:23:19 PM **Collection Date 2** 1/1/1900 **Decay Factor** 1.000

**Sample Count Time** 15.00 ***mins*** **Background Count Time** 1,000.00 ***mins***

| | Efficiency % | Attenuation Factor | Activity Divisor | Background cpm | Gross counts | Gross cpm | Net cpm |
|---|---|---|---|---|---|---|---|
| **Alpha** | 0.000 | 1.000 | 1.000 | 0.111 | 71,396 | 4,759.733 | 4,759.622 |
| **sd** | 0.000 | | | 0.011 | 267.200 | 17.813 | 17.813 |
| **A to B** | 0.000 | 1.000 | | | | 0.000 | |
| **sd** | 0.000 | | | | | 0.000 | |
| **Beta** | 0.000 | 1.000 | 1.000 | 0.361 | 94,040 | 6,269.333 | 6,268.972 |
| **sd** | 0.000 | | | 0.019 | 306.659 | 20.444 | 20.444 |

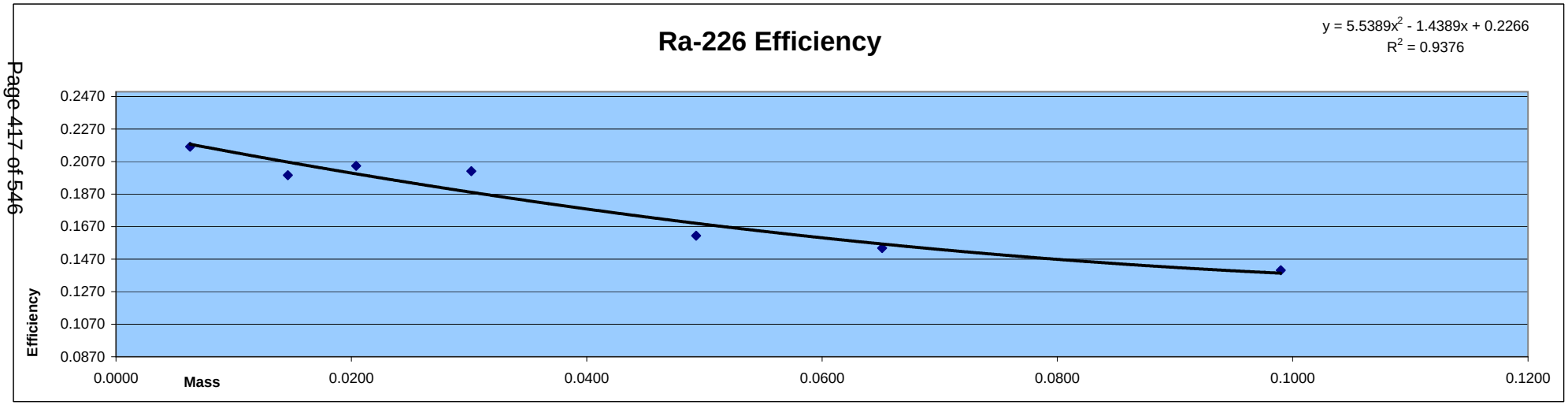
| | Net Activity dpm | LLD dpm | MDC DPM | MPC DPM | Net Concentration * DPM | Conc / MPC Ratio |
|---|---|---|---|---|---|---|
| **Alpha** | 0.000 | 0.000 | 0.000 | 0.000 | 0.000 ± 0.000 | 0.000 |
| **sd** | 0.000 | | | | 0.000 | |
| **Beta** | 0.000 | 0.000 | 0.000 | 0.000 | 0.000 ± 0.000 | 0.000 |
| **sd** | 0.000 | | | | 0.000 | |

*** Note: Decay Corrected** **MDC Method** Currie **Error =** .00 **x sd**

# Ra-226 Calibration 2019

**Blue 15**

| Std # | Sample Time | Count Time | Alpha Counts | CPM | Sep Time | Ingrowth | Recovery | Adj CPM | DPM | Efficiency | Mass |
|---|---|---|---|---|---|---|---|---|---|---|---|
| ICRa6-1063071;Ra2 | 7/24/2019 16:50 | 15 | 43861 | 2924.067 | 2/13/2017 13:30 | 4.0000 | 0.4487 | 1629.1154 | 7534.6 | 0.2162 | 0.0063 |
| ICRa6-1063071;Ra3 | 7/24/2019 16:26 | 15 | 62257 | 4150.467 | 2/13/2017 13:30 | 4.0000 | 0.6933 | 1496.7208 | 7534.6 | 0.1986 | 0.0146 |
| ICRa6-1063071;Ra4 | 7/24/2019 15:48 | 15 | 67149 | 4476.600 | 2/13/2017 13:30 | 4.0000 | 0.7265 | 1540.4680 | 7534.6 | 0.2045 | 0.0204 |
| ICRa6-1063071;Ra5 | 7/24/2019 15:17 | 15 | 78262 | 5217.467 | 2/13/2017 13:30 | 4.0000 | 0.8604 | 1516.0003 | 7534.6 | 0.2012 | 0.0302 |
| ICRa6-1063071;Ra6 | 7/24/2019 14:35 | 15 | 68345 | 4556.333 | 2/13/2017 13:30 | 4.0000 | 0.9364 | 1216.4885 | 7534.6 | 0.1615 | 0.0493 |
| ICRa6-1063071;Ra7 | 7/24/2019 13:58 | 15 | 64516 | 4301.067 | 2/13/2017 13:30 | 4.0000 | 0.9274 | 1159.5047 | 7534.6 | 0.1539 | 0.0651 |
| ICRa6-1063071;Ra8 | 7/24/2019 13:40 | 15 | 59556 | 3970.400 | 2/13/2017 13:30 | 4.0000 | 0.9402 | 1055.7665 | 7534.6 | 0.1401 | 0.0990 |




Reagent ID:Ra-226_00022
Container #:986404
Final Conc.: 7534.60740 dpm/mL
Added: 1mL

Reagent ID:Ba Carrier_00026
Container #: 1015438
Cert.#: 16I027

# Alpha/Beta Count Results

## Sample Activity Report

## Blue 12-15 - D

**Addr:** 15

**Sample ID** ICRa6-1063071;Ra8

**Repeat** 9

**Carrier No.** 0

**Batch ID** Ra226 - IC

**Count Method** Gross Alpha Beta

**Detector Volts** 1515

**Sample Qty** 0 ***Sample*** **sd** 0 ***Sample***

**Residual Wt** 0 ***mg*** **sd** 0 ***mg***

**Count Began** 7/24/2019 1:40:53 PM **Collection Date 1** 1/1/1900 **Half Life** 0.00 ***days***

**Count Ended** 7/24/2019 1:56:12 PM **Collection Date 2** 1/1/1900 **Decay Factor** 1.000

**Sample Count Time** 15.00 ***mins*** **Background Count Time** 1,000.00 ***mins***

| | Efficiency % | Attenuation Factor | Activity Divisor | Background cpm | Gross counts | Gross cpm | Net cpm |
|---|---|---|---|---|---|---|---|
| **Alpha** | 0.000 | 1.000 | 1.000 | 0.097 | 59,556 | 3,970.400 | 3,970.303 |
| **sd** | 0.000 | | | 0.010 | 244.041 | 16.269 | 16.269 |
| **A to B** | 0.000 | 1.000 | | | | 0.000 | |
| **sd** | 0.000 | | | | | 0.000 | |
| **Beta** | 0.000 | 1.000 | 1.000 | 0.449 | 103,379 | 6,891.933 | 6,891.484 |
| **sd** | 0.000 | | | 0.021 | 321.526 | 21.435 | 21.435 |

| | Net Activity dpm | LLD dpm | MDC DPM | MPC DPM | Net Concentration * DPM | Conc / MPC Ratio |
|---|---|---|---|---|---|---|
| **Alpha** | 0.000 | 0.000 | 0.000 | 0.000 | 0.000 ± 0.000 | 0.000 |
| **sd** | 0.000 | | | | 0.000 | |
| **Beta** | 0.000 | 0.000 | 0.000 | 0.000 | 0.000 ± 0.000 | 0.000 |
| **sd** | 0.000 | | | | 0.000 | |

*** Note: Decay Corrected** **MDC Method** Currie **Error =** .00 **x sd**

# Alpha/Beta Count Results

## Sample Activity Report

## Blue 12-15 - D

**Addr:** 15

**Sample ID** ICRa6-1063071;Ra7

**Repeat** 11

**Carrier No.** 0

**Batch ID** Ra226 - IC

**Count Method** Gross Alpha Beta

**Detector Volts** 1515

**Sample Qty** 0 ***Sample*** **sd** 0 ***Sample***

**Residual Wt** 0 ***mg*** **sd** 0 ***mg***

**Count Began** 7/24/2019 1:58:37 PM **Collection Date 1** 1/1/1900 **Half Life** 0.00 ***days***

**Count Ended** 7/24/2019 2:13:57 PM **Collection Date 2** 1/1/1900 **Decay Factor** 1.000

**Sample Count Time** 15.00 ***mins*** **Background Count Time** 1,000.00 ***mins***

| | Efficiency % | Attenuation Factor | Activity Divisor | Background cpm | Gross counts | Gross cpm | Net cpm |
|---|---|---|---|---|---|---|---|
| **Alpha** | 0.000 | 1.000 | 1.000 | 0.097 | 64,516 | 4,301.067 | 4,300.970 |
| **sd** | 0.000 | | | 0.010 | 254.000 | 16.933 | 16.933 |
| **A to B** | 0.000 | 1.000 | | | | 0.000 | |
| **sd** | 0.000 | | | | | 0.000 | |
| **Beta** | 0.000 | 1.000 | 1.000 | 0.449 | 99,903 | 6,660.200 | 6,659.751 |
| **sd** | 0.000 | | | 0.021 | 316.074 | 21.072 | 21.072 |

| | Net Activity dpm | LLD dpm | MDC DPM | MPC DPM | Net Concentration * DPM | Conc / MPC Ratio |
|---|---|---|---|---|---|---|
| **Alpha** | 0.000 | 0.000 | 0.000 | 0.000 | 0.000 ± 0.000 | 0.000 |
| **sd** | 0.000 | | | | 0.000 | |
| **Beta** | 0.000 | 0.000 | 0.000 | 0.000 | 0.000 ± 0.000 | 0.000 |
| **sd** | 0.000 | | | | 0.000 | |

*** Note: Decay Corrected** **MDC Method** Currie **Error =** .00 **x sd**

# Alpha/Beta Count Results

## Sample Activity Report

## Blue 12-15 - D

**Addr:** 15

**Sample ID** ICRa6-1063071;Ra6

**Repeat** 12

**Carrier No.** 0

**Batch ID** Ra226 - IC

**Count Method** Gross Alpha Beta

**Detector Volts** 1515

**Sample Qty** 0 ***Sample*** **sd** 0 ***Sample***

**Residual Wt** 0 ***mg*** **sd** 0 ***mg***

**Count Began** 7/24/2019 2:35:01 PM **Collection Date 1** 1/1/1900 **Half Life** 0.00 ***days***

**Count Ended** 7/24/2019 2:50:25 PM **Collection Date 2** 1/1/1900 **Decay Factor** 1.000

**Sample Count Time** 15.00 ***mins*** **Background Count Time** 1,000.00 ***mins***

| | Efficiency % | Attenuation Factor | Activity Divisor | Background cpm | Gross counts | Gross cpm | Net cpm |
|---|---|---|---|---|---|---|---|
| **Alpha** | 0.000 | 1.000 | 1.000 | 0.097 | 68,345 | 4,556.333 | 4,556.236 |
| **sd** | 0.000 | | | 0.010 | 261.429 | 17.429 | 17.429 |
| **A to B** | 0.000 | 1.000 | | | | 0.000 | |
| **sd** | 0.000 | | | | | 0.000 | |
| **Beta** | 0.000 | 1.000 | 1.000 | 0.449 | 101,770 | 6,784.667 | 6,784.218 |
| **sd** | 0.000 | | | 0.021 | 319.014 | 21.268 | 21.268 |

| | Net Activity dpm | LLD dpm | MDC DPM | MPC DPM | Net Concentration * DPM | Conc / MPC Ratio |
|---|---|---|---|---|---|---|
| **Alpha** | 0.000 | 0.000 | 0.000 | 0.000 | 0.000 ± 0.000 | 0.000 |
| **sd** | 0.000 | | | | 0.000 | |
| **Beta** | 0.000 | 0.000 | 0.000 | 0.000 | 0.000 ± 0.000 | 0.000 |
| **sd** | 0.000 | | | | 0.000 | |

*** Note: Decay Corrected** **MDC Method** Currie **Error =** .00 **x sd**

# Alpha/Beta Count Results

## Sample Activity Report

## Blue 12-15 - D

**Addr:** 15

**Sample ID** ICRa6-1063071;Ra5

**Repeat** 13

**Carrier No.** 0

**Batch ID** Ra226 - IC

**Count Method** Gross Alpha Beta

**Detector Volts** 1515

**Sample Qty** 0 ***Sample*** **sd** 0 ***Sample***

**Residual Wt** 0 ***mg*** **sd** 0 ***mg***

**Count Began** 7/24/2019 3:17:14 PM **Collection Date 1** 1/1/1900 **Half Life** 0.00 ***days***

**Count Ended** 7/24/2019 3:32:39 PM **Collection Date 2** 1/1/1900 **Decay Factor** 1.000

**Sample Count Time** 15.00 ***mins*** **Background Count Time** 1,000.00 ***mins***

| | Efficiency % | Attenuation Factor | Activity Divisor | Background cpm | Gross counts | Gross cpm | Net cpm |
|---|---|---|---|---|---|---|---|
| **Alpha** | 0.000 | 1.000 | 1.000 | 0.097 | 78,262 | 5,217.467 | 5,217.370 |
| **sd** | 0.000 | | | 0.010 | 279.753 | 18.650 | 18.650 |
| **A to B** | 0.000 | 1.000 | | | | 0.000 | |
| **sd** | 0.000 | | | | | 0.000 | |
| **Beta** | 0.000 | 1.000 | 1.000 | 0.449 | 101,348 | 6,756.533 | 6,756.084 |
| **sd** | 0.000 | | | 0.021 | 318.352 | 21.223 | 21.223 |

| | Net Activity dpm | LLD dpm | MDC DPM | MPC DPM | Net Concentration * DPM | Conc / MPC Ratio |
|---|---|---|---|---|---|---|
| **Alpha** | 0.000 | 0.000 | 0.000 | 0.000 | 0.000 ± 0.000 | 0.000 |
| **sd** | 0.000 | | | | 0.000 | |
| **Beta** | 0.000 | 0.000 | 0.000 | 0.000 | 0.000 ± 0.000 | 0.000 |
| **sd** | 0.000 | | | | 0.000 | |

*** Note: Decay Corrected** **MDC Method** Currie **Error =** .00 **x sd**

# Alpha/Beta Count Results

## Sample Activity Report

## Blue 12-15 - D

**Addr:** 15

**Sample ID** ICRa6-1063071;Ra4

**Repeat** 14

**Carrier No.** 0

**Batch ID** Ra226 - IC

**Count Method** Gross Alpha Beta

**Detector Volts** 1515

**Sample Qty** 0 ***Sample*** **sd** 0 ***Sample***

**Residual Wt** 0 ***mg*** **sd** 0 ***mg***

**Count Began** 7/24/2019 3:48:57 PM **Collection Date 1** 1/1/1900 **Half Life** 0.00 ***days***

**Count Ended** 7/24/2019 4:04:16 PM **Collection Date 2** 1/1/1900 **Decay Factor** 1.000

**Sample Count Time** 15.00 ***mins*** **Background Count Time** 1,000.00 ***mins***

| | Efficiency % | Attenuation Factor | Activity Divisor | Background cpm | Gross counts | Gross cpm | Net cpm |
|---|---|---|---|---|---|---|---|
| **Alpha** | 0.000 | 1.000 | 1.000 | 0.097 | 67,149 | 4,476.600 | 4,476.503 |
| **sd** | 0.000 | | | 0.010 | 259.131 | 17.275 | 17.275 |
| **A to B** | 0.000 | 1.000 | | | | 0.000 | |
| **sd** | 0.000 | | | | | 0.000 | |
| **Beta** | 0.000 | 1.000 | 1.000 | 0.449 | 86,276 | 5,751.733 | 5,751.284 |
| **sd** | 0.000 | | | 0.021 | 293.728 | 19.582 | 19.582 |

| | Net Activity dpm | LLD dpm | MDC DPM | MPC DPM | Net Concentration * DPM | Conc / MPC Ratio |
|---|---|---|---|---|---|---|
| **Alpha** | 0.000 | 0.000 | 0.000 | 0.000 | 0.000 ± 0.000 | 0.000 |
| **sd** | 0.000 | | | | 0.000 | |
| **Beta** | 0.000 | 0.000 | 0.000 | 0.000 | 0.000 ± 0.000 | 0.000 |
| **sd** | 0.000 | | | | 0.000 | |

*** Note: Decay Corrected** **MDC Method** Currie **Error =** .00 **x sd**

# Alpha/Beta Count Results

## Sample Activity Report

## Blue 12-15 - D

**Addr:** 15

**Sample ID** ICRa6-1063071;Ra3

**Repeat** 15

**Carrier No.** 0

**Batch ID** Ra226 - IC

**Count Method** Gross Alpha Beta

**Detector Volts** 1515

**Sample Qty** 0 ***Sample*** **sd** 0 ***Sample***

**Residual Wt** 0 ***mg*** **sd** 0 ***mg***

**Count Began** 7/24/2019 4:26:32 PM **Collection Date 1** 1/1/1900 **Half Life** 0.00 ***days***

**Count Ended** 7/24/2019 4:41:51 PM **Collection Date 2** 1/1/1900 **Decay Factor** 1.000

**Sample Count Time** 15.00 ***mins*** **Background Count Time** 1,000.00 ***mins***

| | Efficiency % | Attenuation Factor | Activity Divisor | Background cpm | Gross counts | Gross cpm | Net cpm |
|---|---|---|---|---|---|---|---|
| **Alpha** | 0.000 | 1.000 | 1.000 | 0.097 | 62,257 | 4,150.467 | 4,150.370 |
| **sd** | 0.000 | | | 0.010 | 249.514 | 16.634 | 16.634 |
| **A to B** | 0.000 | 1.000 | | | | 0.000 | |
| **sd** | 0.000 | | | | | 0.000 | |
| **Beta** | 0.000 | 1.000 | 1.000 | 0.449 | 78,613 | 5,240.867 | 5,240.418 |
| **sd** | 0.000 | | | 0.021 | 280.380 | 18.692 | 18.692 |

| | Net Activity dpm | LLD dpm | MDC DPM | MPC DPM | Net Concentration * DPM | Conc / MPC Ratio |
|---|---|---|---|---|---|---|
| **Alpha** | 0.000 | 0.000 | 0.000 | 0.000 | 0.000 ± 0.000 | 0.000 |
| **sd** | 0.000 | | | | 0.000 | |
| **Beta** | 0.000 | 0.000 | 0.000 | 0.000 | 0.000 ± 0.000 | 0.000 |
| **sd** | 0.000 | | | | 0.000 | |

*** Note: Decay Corrected** **MDC Method** Currie **Error =** .00 **x sd**

# Alpha/Beta Count Results

## Sample Activity Report

## Blue 12-15 - D

**Addr:** 15

**Sample ID** ICRa6-1063071;Ra2

**Repeat** 16

**Carrier No.** 0

**Batch ID** Ra226 - IC

**Count Method** Gross Alpha Beta

**Detector Volts** 1515

**Sample Qty** 0 ***Sample*** **sd** 0 ***Sample***

**Residual Wt** 0 ***mg*** **sd** 0 ***mg***

**Count Began** 7/24/2019 4:50:28 PM **Collection Date 1** 1/1/1900 **Half Life** 0.00 ***days***

**Count Ended** 7/24/2019 5:05:44 PM **Collection Date 2** 1/1/1900 **Decay Factor** 1.000

**Sample Count Time** 15.00 ***mins*** **Background Count Time** 1,000.00 ***mins***

| | Efficiency % | Attenuation Factor | Activity Divisor | Background cpm | Gross counts | Gross cpm | Net cpm |
|---|---|---|---|---|---|---|---|
| **Alpha** | 0.000 | 1.000 | 1.000 | 0.097 | 43,861 | 2,924.067 | 2,923.970 |
| **sd** | 0.000 | | | 0.010 | 209.430 | 13.962 | 13.962 |
| **A to B** | 0.000 | 1.000 | | | | 0.000 | |
| **sd** | 0.000 | | | | | 0.000 | |
| **Beta** | 0.000 | 1.000 | 1.000 | 0.449 | 53,869 | 3,591.267 | 3,590.818 |
| **sd** | 0.000 | | | 0.021 | 232.097 | 15.473 | 15.473 |

| | Net Activity dpm | LLD dpm | MDC DPM | MPC DPM | Net Concentration * DPM | Conc / MPC Ratio |
|---|---|---|---|---|---|---|
| **Alpha** | 0.000 | 0.000 | 0.000 | 0.000 | 0.000 ± 0.000 | 0.000 |
| **sd** | 0.000 | | | | 0.000 | |
| **Beta** | 0.000 | 0.000 | 0.000 | 0.000 | 0.000 ± 0.000 | 0.000 |
| **sd** | 0.000 | | | | 0.000 | |

*** Note: Decay Corrected** **MDC Method** Currie **Error =** .00 **x sd**

# Alpha/Beta Count Results

## Sample Activity Report

## Blue 12-15 - D

**Addr:** 15

**Sample ID** ICRa6-1063071;Ra1

**Repeat** 17

**Carrier No.** 0

**Batch ID** Ra226 - IC

**Count Method** Gross Alpha Beta

**Detector Volts** 1515

**Sample Qty** 0 ***Sample*** **sd** 0 ***Sample***

**Residual Wt** 0 ***mg*** **sd** 0 ***mg***

**Count Began** 7/24/2019 5:08:06 PM **Collection Date 1** 1/1/1900 **Half Life** 0.00 ***days***

**Count Ended** 7/24/2019 5:23:24 PM **Collection Date 2** 1/1/1900 **Decay Factor** 1.000

**Sample Count Time** 15.00 ***mins*** **Background Count Time** 1,000.00 ***mins***

| | Efficiency % | Attenuation Factor | Activity Divisor | Background cpm | Gross counts | Gross cpm | Net cpm |
|---|---|---|---|---|---|---|---|
| **Alpha** | 0.000 | 1.000 | 1.000 | 0.097 | 43,667 | 2,911.133 | 2,911.036 |
| **sd** | 0.000 | | | 0.010 | 208.967 | 13.931 | 13.931 |
| **A to B** | 0.000 | 1.000 | | | | 0.000 | |
| **sd** | 0.000 | | | | | 0.000 | |
| **Beta** | 0.000 | 1.000 | 1.000 | 0.449 | 54,764 | 3,650.933 | 3,650.484 |
| **sd** | 0.000 | | | 0.021 | 234.017 | 15.601 | 15.601 |

| | Net Activity dpm | LLD dpm | MDC DPM | MPC DPM | Net Concentration * DPM | Conc / MPC Ratio |
|---|---|---|---|---|---|---|
| **Alpha** | 0.000 | 0.000 | 0.000 | 0.000 | 0.000 ± 0.000 | 0.000 |
| **sd** | 0.000 | | | | 0.000 | |
| **Beta** | 0.000 | 0.000 | 0.000 | 0.000 | 0.000 ± 0.000 | 0.000 |
| **sd** | 0.000 | | | | 0.000 | |

*** Note: Decay Corrected** **MDC Method** Currie **Error =** .00 **x sd**

# Alpha Beta Calibration Verifications

**ICV is for Gross Beta**
**Strontium 90**
**and**
**Total Strontium**

| Orange Beta ICV 2013 | | | | |
|---|---|---|---|---|
| Detector | Low Mass Recovery | Medium Mass Recovery | High Mass Recovery | Mean Recovery |
| 0 | 97.69% | 98.94% | 99.54% | 98.72% |

Beta Activity 2009.34 pCi

**Standard ID**

Strontium 90
Sr-90_00018 #51512
Cert# 92352 Ref. date 11/29/12

| | | | |
|---|---|---|---|
| Initial Activity: | 2238.7 | dpm | |
| Reference Date: | 11/29/2012 | | |
| Count Date: | 1/24/2013 | | (or date at which you wish to determine activity) |
| Elapsed Time: | 56.000 | days | |
| Half Life: | 10409.625 | days | |
| Exponential Term: | 0.996278064 | | |
| Corrected Activity: | 2230.367701 | dpm | |
| Decay Activity (Sr/Y-90) | 4460.735402 | dpm | 2009.34 pCi |

# ICV is for Gross Alpha

| Orange Alpha ICV 2015 | | | | |
|---|---|---|---|---|
| | | | | Mean |
| | Low Mass | Medium Mass | High Mass | Recovery |
| Detector | Recovery | Recovery | Recovery | |
| 0 | 102.60% | 99.97% | 104.13% | 102.24% |

**Standard ID**

Thorium-230

Th-230_00019 #181198

Cert # 92776 Ref. date 08/08/2013

Activity 5.0185 pCi/mL

Prep Batch: M153007

| | Low Mass | Medium Mass | High Mass |
|---|---|---|---|
| | 0.161g | 0.0552g | 0.0777g |
| Detector | Activity (pCi/mL) | Activity (pCi/mL) | Activity (pCi/mL) |
| 0 | 5.149 | 5.017 | 5.226 |

# Alpha/Beta Count Results

## Sample Activity Report

## Orange 0-3 - A

**Addr:** 0

**Sample ID** ICV-51512;Beta 1

**Repeat** 8

**Carrier No.** 0

**Batch ID** m122640

**Count Method** Gross Alpha Beta

**Detector Volts** 1515

**Sample Qty** 0 *l* **sd** 0 *l*

**Residual Wt** 0 *mg* **sd** 0 *mg*

**Count Began** 1/24/2013 7:06:32 PM **Collection Date 1** 1/1/1900 **Half Life** 0.00 *days*

**Count Ended** 1/24/2013 7:11:34 PM **Collection Date 2** 1/1/1900 **Decay Factor** 1.000

**Sample Count Time** 5.00 *mins* **Background Count Time** 1,000.00 *mins*

| | Efficiency % | Attenuation Factor | Activity Divisor | Background cpm | Gross counts | Gross cpm | Net cpm |
|---|---|---|---|---|---|---|---|
| **Alpha** | 0.000 | 1.000 | 1.000 | 0.078 | 32 | 6.400 | 6.322 |
| **sd** | 0.000 | | | 0.009 | 5.657 | 1.131 | 1.131 |
| **A to B** | 0.000 | 1.000 | | | | 0.000 | |
| **sd** | 0.000 | | | | | 0.000 | |
| **Beta** | 0.000 | 1.000 | 1.000 | 0.403 | 9,465 | 1,893.000 | 1,892.597 |
| **sd** | 0.000 | | | 0.020 | 97.288 | 19.458 | 19.458 |

| | Net Activity dpm | LLD dpm | MDC pCi/l | MPC pCi/l | Net Concentration * pCi/l | Conc / MPC Ratio |
|---|---|---|---|---|---|---|
| **Alpha** | 0.000 | 0.000 | 0.000 | 1.000 | 0.000 ± 0.000 | 0.000 |
| **sd** | 0.000 | | | | 0.000 | |
| **Beta** | 0.000 | 0.000 | 0.000 | 1.000 | 0.000 ± 0.000 | 0.000 |
| **sd** | 0.000 | | | | 0.000 | |

*** Note: Decay Corrected** **MDC Method** Tb = Ts < 10 **Error =** .00 **x sd**

# Alpha/Beta Count Results

## Sample Activity Report

## Orange 0-3 - A

**Addr:** 0

**Sample ID** ICV-51512;Beta 3

**Repeat** 8

**Carrier No.** 0

**Batch ID** m122640

**Count Method** Gross Alpha Beta

**Detector Volts** 1515

**Sample Qty** 0 *l* **sd** 0 *l*

**Residual Wt** 0 *mg* **sd** 0 *mg*

**Count Began** 1/24/2013 7:16:00 PM **Collection Date 1** 1/1/1900 **Half Life** 0.00 *days*

**Count Ended** 1/24/2013 7:21:03 PM **Collection Date 2** 1/1/1900 **Decay Factor** 1.000

**Sample Count Time** 5.00 *mins* **Background Count Time** 1,000.00 *mins*

| | Efficiency % | Attenuation Factor | Activity Divisor | Background cpm | Gross counts | Gross cpm | Net cpm |
|---|---|---|---|---|---|---|---|
| **Alpha** | 0.000 | 1.000 | 1.000 | 0.078 | 30 | 6.000 | 5.922 |
| **sd** | 0.000 | | | 0.009 | 5.477 | 1.095 | 1.095 |
| **A to B** | 0.000 | 1.000 | | | | 0.000 | |
| **sd** | 0.000 | | | | | 0.000 | |
| **Beta** | 0.000 | 1.000 | 1.000 | 0.403 | 8,720 | 1,744.000 | 1,743.597 |
| **sd** | 0.000 | | | 0.020 | 93.381 | 18.676 | 18.676 |

| | Net Activity dpm | LLD dpm | MDC pCi/l | MPC pCi/l | Net Concentration * pCi/l | Conc / MPC Ratio |
|---|---|---|---|---|---|---|
| **Alpha** | 0.000 | 0.000 | 0.000 | 1.000 | 0.000 ± 0.000 | 0.000 |
| **sd** | 0.000 | | | | 0.000 | |
| **Beta** | 0.000 | 0.000 | 0.000 | 1.000 | 0.000 ± 0.000 | 0.000 |
| **sd** | 0.000 | | | | 0.000 | |

*** Note: Decay Corrected** **MDC Method** Tb = Ts < 10 **Error =** .00 **x sd**

# Alpha/Beta Count Results

## Sample Activity Report

## Orange 0-3 - A

**Addr:** 0

**Sample ID** ICV-51512;Beta 2

**Repeat** 9

**Carrier No.** 0

**Batch ID** m122640

**Count Method** Gross Alpha Beta

**Detector Volts** 1515

**Sample Qty** 0 *l* **sd** 0 *l*

**Residual Wt** 0 *mg* **sd** 0 *mg*

**Count Began** 1/24/2013 7:24:30 PM **Collection Date 1** 1/1/1900 **Half Life** 0.00 *days*

**Count Ended** 1/24/2013 7:29:34 PM **Collection Date 2** 1/1/1900 **Decay Factor** 1.000

**Sample Count Time** 5.00 *mins* **Background Count Time** 1,000.00 *mins*

| | Efficiency % | Attenuation Factor | Activity Divisor | Background cpm | Gross counts | Gross cpm | Net cpm |
|---|---|---|---|---|---|---|---|
| **Alpha** | 0.000 | 1.000 | 1.000 | 0.078 | 39 | 7.800 | 7.722 |
| **sd** | 0.000 | | | 0.009 | 6.245 | 1.249 | 1.249 |
| **A to B** | 0.000 | 1.000 | | | | 0.000 | |
| **sd** | 0.000 | | | | | 0.000 | |
| **Beta** | 0.000 | 1.000 | 1.000 | 0.403 | 9,066 | 1,813.200 | 1,812.797 |
| **sd** | 0.000 | | | 0.020 | 95.216 | 19.043 | 19.043 |

| | Net Activity dpm | LLD dpm | MDC pCi/l | MPC pCi/l | Net Concentration * pCi/l | Conc / MPC Ratio |
|---|---|---|---|---|---|---|
| **Alpha** | 0.000 | 0.000 | 0.000 | 1.000 | 0.000 ± 0.000 | 0.000 |
| **sd** | 0.000 | | | | 0.000 | |
| **Beta** | 0.000 | 0.000 | 0.000 | 1.000 | 0.000 ± 0.000 | 0.000 |
| **sd** | 0.000 | | | | 0.000 | |

*** Note: Decay Corrected** **MDC Method** Tb = Ts < 10 **Error =** .00 **x sd**

# Alpha/Beta Count Results

## Sample Activity Report

## Orange 0-3 - A

**Addr:** 0

**Sample ID** ICVABT-181198; A1

**Repeat** 1

**Carrier No.** 0

**Batch ID** m153007

**Count Method** Gross Alpha Beta

**Detector Volts** 1515

**Sample Qty** 0 *l* **sd** 0 *l*

**Residual Wt** 0 *mg* **sd** 0 *mg*

**Count Began** 12/3/2015 3:57:37 PM **Collection Date 1** 1/1/1900 **Half Life** 0.00 *days*

**Count Ended** 12/3/2015 4:27:39 PM **Collection Date 2** 1/1/1900 **Decay Factor** 1.000

**Sample Count Time** 30.00 *mins* **Background Count Time** 1,000.00 *mins*

| | Efficiency % | Attenuation Factor | Activity Divisor | Background cpm | Gross counts | Gross cpm | Net cpm |
|---|---|---|---|---|---|---|---|
| **Alpha** | 0.000 | 1.000 | 1.000 | 0.113 | 7,419 | 247.300 | 247.187 |
| **sd** | 0.000 | | | 0.011 | 86.134 | 2.871 | 2.871 |
| **A to B** | 0.000 | 1.000 | | | | 0.000 | |
| **sd** | 0.000 | | | | | 0.000 | |
| **Beta** | 0.000 | 1.000 | 1.000 | 0.417 | 2,533 | 84.433 | 84.016 |
| **sd** | 0.000 | | | 0.020 | 50.329 | 1.678 | 1.678 |

| | Net Activity dpm | LLD dpm | MDC pCi/l | MPC pCi/l | Net Concentration * pCi/l | Conc / MPC Ratio |
|---|---|---|---|---|---|---|
| **Alpha** | 0.000 | 0.000 | 0.000 | 1.000 | 0.000 ± 0.000 | 0.000 |
| **sd** | 0.000 | | | | 0.000 | |
| **Beta** | 0.000 | 0.000 | 0.000 | 1.000 | 0.000 ± 0.000 | 0.000 |
| **sd** | 0.000 | | | | 0.000 | |

*** Note: Decay Corrected** **MDC Method** Tb = Ts < 10 **Error =** .00 **x sd**

# Alpha/Beta Count Results

## Sample Activity Report

## Orange 0-3 - A

**Addr:** 0

**Sample ID** ICVABT-181198; A3

**Repeat** 7

**Carrier No.** 0

**Batch ID** m153007

**Count Method** Gross Alpha Beta

**Detector Volts** 1515

**Sample Qty** 0 *l* **sd** 0 *l*

**Residual Wt** 0 *mg* **sd** 0 *mg*

**Count Began** 12/4/2015 1:19:31 AM **Collection Date 1** 1/1/1900 **Half Life** 0.00 *days*

**Count Ended** 12/4/2015 1:49:34 AM **Collection Date 2** 1/1/1900 **Decay Factor** 1.000

**Sample Count Time** 30.00 *mins* **Background Count Time** 1,000.00 *mins*

| | Efficiency % | Attenuation Factor | Activity Divisor | Background cpm | Gross counts | Gross cpm | Net cpm |
|---|---|---|---|---|---|---|---|
| **Alpha** | 0.000 | 1.000 | 1.000 | 0.113 | 8,725 | 290.833 | 290.720 |
| **sd** | 0.000 | | | 0.011 | 93.408 | 3.114 | 3.114 |
| **A to B** | 0.000 | 1.000 | | | | 0.000 | |
| **sd** | 0.000 | | | | | 0.000 | |
| **Beta** | 0.000 | 1.000 | 1.000 | 0.417 | 2,933 | 97.767 | 97.350 |
| **sd** | 0.000 | | | 0.020 | 54.157 | 1.805 | 1.805 |

| | Net Activity dpm | LLD dpm | MDC pCi/l | MPC pCi/l | Net Concentration * pCi/l | Conc / MPC Ratio |
|---|---|---|---|---|---|---|
| **Alpha** | 0.000 | 0.000 | 0.000 | 1.000 | 0.000 ± 0.000 | 0.000 |
| **sd** | 0.000 | | | | 0.000 | |
| **Beta** | 0.000 | 0.000 | 0.000 | 1.000 | 0.000 ± 0.000 | 0.000 |
| **sd** | 0.000 | | | | 0.000 | |

*** Note: Decay Corrected** **MDC Method** Tb = Ts < 10 **Error =** .00 **x sd**

# Alpha/Beta Count Results

## Sample Activity Report

## Orange 0-3 - A

**Addr:** 0

**Sample ID** ICVABT-181198; A2

**Repeat** 8

**Carrier No.** 0

**Batch ID** m153007

**Count Method** Gross Alpha Beta

**Detector Volts** 1515

**Sample Qty** 0 *l* **sd** 0 *l*

**Residual Wt** 0 *mg* **sd** 0 *mg*

**Count Began** 12/4/2015 2:01:06 AM **Collection Date 1** 1/1/1900 **Half Life** 0.00 *days*

**Count Ended** 12/4/2015 2:31:11 AM **Collection Date 2** 1/1/1900 **Decay Factor** 1.000

**Sample Count Time** 30.00 *mins* **Background Count Time** 1,000.00 *mins*

| | Efficiency % | Attenuation Factor | Activity Divisor | Background cpm | Gross counts | Gross cpm | Net cpm |
|---|---|---|---|---|---|---|---|
| **Alpha** | 0.000 | 1.000 | 1.000 | 0.113 | 13,181 | 439.367 | 439.254 |
| **sd** | 0.000 | | | 0.011 | 114.809 | 3.827 | 3.827 |
| **A to B** | 0.000 | 1.000 | | | | 0.000 | |
| **sd** | 0.000 | | | | | 0.000 | |
| **Beta** | 0.000 | 1.000 | 1.000 | 0.417 | 3,991 | 133.033 | 132.616 |
| **sd** | 0.000 | | | 0.020 | 63.174 | 2.106 | 2.106 |

| | Net Activity dpm | LLD dpm | MDC pCi/l | MPC pCi/l | Net Concentration * pCi/l | Conc / MPC Ratio |
|---|---|---|---|---|---|---|
| **Alpha** | 0.000 | 0.000 | 0.000 | 1.000 | 0.000 ± 0.000 | 0.000 |
| **sd** | 0.000 | | | | 0.000 | |
| **Beta** | 0.000 | 0.000 | 0.000 | 1.000 | 0.000 ± 0.000 | 0.000 |
| **sd** | 0.000 | | | | 0.000 | |

*** Note: Decay Corrected** **MDC Method** Tb = Ts < 10 **Error =** .00 **x sd**

**ICV is for Gross Beta**
**Strontium 90**
**and**
**Total Strontium**

| Orange Beta ICV 2013 | | | | |
|---|---|---|---|---|
| Detector | Low Mass Recovery | Medium Mass Recovery | High Mass Recovery | Mean Recovery |
| 14 | 96.45% | 99.24% | 97.99% | 97.89% |

Beta Activity 2009.34 pCi

**Standard ID**

Strontium 90
Sr-90_00018 #51512 (Rad12-0043)
Cert# 92352 Ref. date 11/29/12

| | | | |
|---|---|---|---|
| Initial Activity: | 2238.7 | dpm | |
| Reference Date: | 11/29/2012 | | |
| Current Date: | 1/24/2013 | | (or date at which you wish to determine activity) |
| Elapsed Time: | 56.000 | days | |
| Half Life: | 10409.625 | days | |
| Exponential Term: | 0.996278064 | | |
| Corrected Activity: | 2230.367701 | dpm | |
| Decay Activity (Sr/Y-90) | 4460.735402 | dpm | 2009.34 pCi |

# ICV is for Gross Alpha

| Orange Alpha ICV 2015 | | | | |
|---|---|---|---|---|
| | | | | Mean |
| | Low Mass | Medium Mass | High Mass | Recovery |
| Detector | Recovery | Recovery | Recovery | |
| 14 | 105.41% | 103.04% | 106.78% | 105.08% |

**Standard ID**

Thorium-230

Th-230_00019 #181198

Cert # 92776 Ref. date 08/08/2013

Activity 5.0185 pCi/mL

Prep Batch: M153007

| | Low Mass | Medium Mass | High Mass |
|---|---|---|---|
| | 0.161g | 0.0552g | 0.0777g |
| Detector | Activity (pCi/mL) | Activity (pCi/mL) | Activity (pCi/mL) |
| 14 | 5.29 | 5.171 | 5.359 |

# Alpha/Beta Count Results

## Sample Activity Report

## Orange 12-15 - C

**Addr:** 14

**Sample ID** ICV-51512;Beta 3

**Repeat** 13

**Carrier No.** 0

**Batch ID** m122640

**Count Method** Gross Alpha Beta

**Detector Volts** 1515

**Sample Qty** 0 *l* **sd** 0 *l*

**Residual Wt** 0 *mg* **sd** 0 *mg*

**Count Began** 1/24/2013 9:08:20 PM **Collection Date 1** 1/1/1900 **Half Life** 0.00 *days*

**Count Ended** 1/24/2013 9:13:22 PM **Collection Date 2** 1/1/1900 **Decay Factor** 1.000

**Sample Count Time** 5.00 *mins* **Background Count Time** 1,000.00 *mins*

| | Efficiency % | Attenuation Factor | Activity Divisor | Background cpm | Gross counts | Gross cpm | Net cpm |
|---|---|---|---|---|---|---|---|
| **Alpha** | 0.000 | 1.000 | 1.000 | 0.122 | 12 | 2.400 | 2.278 |
| **sd** | 0.000 | | | 0.011 | 3.464 | 0.693 | 0.693 |
| **A to B** | 0.000 | 1.000 | | | | 0.000 | |
| **sd** | 0.000 | | | | | 0.000 | |
| **Beta** | 0.000 | 1.000 | 1.000 | 0.408 | 8,386 | 1,677.200 | 1,676.792 |
| **sd** | 0.000 | | | 0.020 | 91.575 | 18.315 | 18.315 |

| | Net Activity dpm | LLD dpm | MDC pCi/l | MPC pCi/l | Net Concentration * pCi/l | Conc / MPC Ratio |
|---|---|---|---|---|---|---|
| **Alpha** | 0.000 | 0.000 | 0.000 | 1.000 | 0.000 ± 0.000 | 0.000 |
| **sd** | 0.000 | | | | 0.000 | |
| **Beta** | 0.000 | 0.000 | 0.000 | 1.000 | 0.000 ± 0.000 | 0.000 |
| **sd** | 0.000 | | | | 0.000 | |

*** Note: Decay Corrected** **MDC Method** Tb = Ts < 10 **Error =** .00 **x sd**

# Alpha/Beta Count Results

## Sample Activity Report

## Orange 12-15 - C

**Addr:** 14

**Sample ID** ICV-51512;Beta 2

**Repeat** 14

**Carrier No.** 0

**Batch ID** m122640

**Count Method** Gross Alpha Beta

**Detector Volts** 1515

**Sample Qty** 0 *l* **sd** 0 *l*

**Residual Wt** 0 *mg* **sd** 0 *mg*

**Count Began** 1/24/2013 9:14:33 PM **Collection Date 1** 1/1/1900 **Half Life** 0.00 *days*

**Count Ended** 1/24/2013 9:19:35 PM **Collection Date 2** 1/1/1900 **Decay Factor** 1.000

**Sample Count Time** 5.00 *mins* **Background Count Time** 1,000.00 *mins*

| | Efficiency % | Attenuation Factor | Activity Divisor | Background cpm | Gross counts | Gross cpm | Net cpm |
|---|---|---|---|---|---|---|---|
| **Alpha** | 0.000 | 1.000 | 1.000 | 0.122 | 15 | 3.000 | 2.878 |
| **sd** | 0.000 | | | 0.011 | 3.873 | 0.775 | 0.775 |
| **A to B** | 0.000 | 1.000 | | | | 0.000 | |
| **sd** | 0.000 | | | | | 0.000 | |
| **Beta** | 0.000 | 1.000 | 1.000 | 0.408 | 8,905 | 1,781.000 | 1,780.592 |
| **sd** | 0.000 | | | 0.020 | 94.366 | 18.873 | 18.873 |

| | Net Activity dpm | LLD dpm | MDC pCi/l | MPC pCi/l | Net Concentration * pCi/l | Conc / MPC Ratio |
|---|---|---|---|---|---|---|
| **Alpha** | 0.000 | 0.000 | 0.000 | 1.000 | 0.000 ± 0.000 | 0.000 |
| **sd** | 0.000 | | | | 0.000 | |
| **Beta** | 0.000 | 0.000 | 0.000 | 1.000 | 0.000 ± 0.000 | 0.000 |
| **sd** | 0.000 | | | | 0.000 | |

*** Note: Decay Corrected** **MDC Method** Tb = Ts < 10 **Error =** .00 **x sd**

# Alpha/Beta Count Results

## Sample Activity Report

## Orange 12-15 - C

**Addr:** 14

**Sample ID** ICV-51512;Beta 1

**Repeat** 15

**Carrier No.** 0

**Batch ID** m122640

**Count Method** Gross Alpha Beta

**Detector Volts** 1515

**Sample Qty** 0 *l* **sd** 0 *l*

**Residual Wt** 0 *mg* **sd** 0 *mg*

**Count Began** 1/24/2013 9:23:06 PM **Collection Date 1** 1/1/1900 **Half Life** 0.00 *days*

**Count Ended** 1/24/2013 9:28:09 PM **Collection Date 2** 1/1/1900 **Decay Factor** 1.000

**Sample Count Time** 5.00 *mins* **Background Count Time** 1,000.00 *mins*

| | Efficiency % | Attenuation Factor | Activity Divisor | Background cpm | Gross counts | Gross cpm | Net cpm |
|---|---|---|---|---|---|---|---|
| **Alpha** | 0.000 | 1.000 | 1.000 | 0.122 | 15 | 3.000 | 2.878 |
| **sd** | 0.000 | | | 0.011 | 3.873 | 0.775 | 0.775 |
| **A to B** | 0.000 | 1.000 | | | | 0.000 | |
| **sd** | 0.000 | | | | | 0.000 | |
| **Beta** | 0.000 | 1.000 | 1.000 | 0.408 | 9,156 | 1,831.200 | 1,830.792 |
| **sd** | 0.000 | | | 0.020 | 95.687 | 19.137 | 19.137 |

| | Net Activity dpm | LLD dpm | MDC pCi/l | MPC pCi/l | Net Concentration * pCi/l | Conc / MPC Ratio |
|---|---|---|---|---|---|---|
| **Alpha** | 0.000 | 0.000 | 0.000 | 1.000 | 0.000 ± 0.000 | 0.000 |
| **sd** | 0.000 | | | | 0.000 | |
| **Beta** | 0.000 | 0.000 | 0.000 | 1.000 | 0.000 ± 0.000 | 0.000 |
| **sd** | 0.000 | | | | 0.000 | |

*** Note: Decay Corrected** **MDC Method** Tb = Ts < 10 **Error =** .00 **x sd**

# Alpha/Beta Count Results

## Sample Activity Report

## Orange 12-15 - C

**Addr:** 14

**Sample ID** ICVABT-181198; A3

**Repeat** 10

**Carrier No.** 0

**Batch ID** m153007

**Count Method** Gross Alpha Beta

**Detector Volts** 1515

| | | | |
|---|---|---|---|
| **Sample Qty** | 0 ***l*** | **sd** | 0 ***l*** |
| **Residual Wt** | 0 ***mg*** | **sd** | 0 ***mg*** |

**Count Began** 12/22/2015 10:29:08 AM **Collection Date 1** 1/1/1900 **Half Life** 0.00 ***days***

**Count Ended** 12/22/2015 10:59:12 AM **Collection Date 2** 1/1/1900 **Decay Factor** 1.000

**Sample Count Time** 30.00 ***mins*** **Background Count Time** 1,000.00 ***mins***

| | Efficiency % | Attenuation Factor | Activity Divisor | Background cpm | Gross counts | Gross cpm | Net cpm |
|---|---|---|---|---|---|---|---|
| **Alpha** | 0.000 | 1.000 | 1.000 | 0.143 | 7,566 | 252.200 | 252.057 |
| **sd** | 0.000 | | | 0.012 | 86.983 | 2.899 | 2.899 |
| **A to B** | 0.000 | 1.000 | | | | 0.000 | |
| **sd** | 0.000 | | | | | 0.000 | |
| **Beta** | 0.000 | 1.000 | 1.000 | 0.362 | 2,827 | 94.233 | 93.871 |
| **sd** | 0.000 | | | 0.019 | 53.170 | 1.772 | 1.772 |

| | Net Activity dpm | LLD dpm | MDC pCi/l | MPC pCi/l | Net Concentration * pCi/l | Conc / MPC Ratio |
|---|---|---|---|---|---|---|
| **Alpha** | 0.000 | 0.000 | 0.000 | 1.000 | 0.000 ± 0.000 | 0.000 |
| **sd** | 0.000 | | | | 0.000 | |
| **Beta** | 0.000 | 0.000 | 0.000 | 1.000 | 0.000 ± 0.000 | 0.000 |
| **sd** | 0.000 | | | | 0.000 | |

*** Note: Decay Corrected** **MDC Method** Tb = Ts < 10 **Error =** .00 **x sd**

# Alpha/Beta Count Results

## Sample Activity Report

## Orange 12-15 - C

**Addr:** 14

**Sample ID** ICVABT-181198; A2

**Repeat** 10

**Carrier No.** 0

**Batch ID** m153007

**Count Method** Gross Alpha Beta

**Detector Volts** 1515

**Sample Qty** 0 *l* **sd** 0 *l*

**Residual Wt** 0 *mg* **sd** 0 *mg*

**Count Began** 12/22/2015 11:34:55 AM **Collection Date 1** 1/1/1900 **Half Life** 0.00 *days*

**Count Ended** 12/22/2015 12:05:00 PM **Collection Date 2** 1/1/1900 **Decay Factor** 1.000

**Sample Count Time** 30.00 *mins* **Background Count Time** 1,000.00 *mins*

| | Efficiency % | Attenuation Factor | Activity Divisor | Background cpm | Gross counts | Gross cpm | Net cpm |
|---|---|---|---|---|---|---|---|
| **Alpha** | 0.000 | 1.000 | 1.000 | 0.143 | 8,926 | 297.533 | 297.390 |
| **sd** | 0.000 | | | 0.012 | 94.478 | 3.149 | 3.149 |
| **A to B** | 0.000 | 1.000 | | | | 0.000 | |
| **sd** | 0.000 | | | | | 0.000 | |
| **Beta** | 0.000 | 1.000 | 1.000 | 0.362 | 3,232 | 107.733 | 107.371 |
| **sd** | 0.000 | | | 0.019 | 56.851 | 1.895 | 1.895 |

| | Net Activity dpm | LLD dpm | MDC pCi/l | MPC pCi/l | Net Concentration * pCi/l | Conc / MPC Ratio |
|---|---|---|---|---|---|---|
| **Alpha** | 0.000 | 0.000 | 0.000 | 1.000 | 0.000 ± 0.000 | 0.000 |
| **sd** | 0.000 | | | | 0.000 | |
| **Beta** | 0.000 | 0.000 | 0.000 | 1.000 | 0.000 ± 0.000 | 0.000 |
| **sd** | 0.000 | | | | 0.000 | |

*** Note: Decay Corrected** **MDC Method** Tb = Ts < 10 **Error =** .00 **x sd**

# Alpha/Beta Count Results

## Sample Activity Report

## Orange 12-15 - C

**Addr:** 14

**Sample ID** ICVABT-181198; A1

**Repeat** 11

**Carrier No.** 0

**Batch ID** m153007

**Count Method** Gross Alpha Beta

**Detector Volts** 1515

**Sample Qty** 0 *l* **sd** 0 *l*

**Residual Wt** 0 *mg* **sd** 0 *mg*

**Count Began** 12/22/2015 12:11:40 PM **Collection Date 1** 1/1/1900 **Half Life** 0.00 *days*

**Count Ended** 12/22/2015 12:41:45 PM **Collection Date 2** 1/1/1900 **Decay Factor** 1.000

**Sample Count Time** 30.00 *mins* **Background Count Time** 1,000.00 *mins*

| | Efficiency % | Attenuation Factor | Activity Divisor | Background cpm | Gross counts | Gross cpm | Net cpm |
|---|---|---|---|---|---|---|---|
| **Alpha** | 0.000 | 1.000 | 1.000 | 0.143 | 13,428 | 447.600 | 447.457 |
| **sd** | 0.000 | | | 0.012 | 115.879 | 3.863 | 3.863 |
| **A to B** | 0.000 | 1.000 | | | | 0.000 | |
| **sd** | 0.000 | | | | | 0.000 | |
| **Beta** | 0.000 | 1.000 | 1.000 | 0.362 | 4,239 | 141.300 | 140.938 |
| **sd** | 0.000 | | | 0.019 | 65.108 | 2.170 | 2.170 |

| | Net Activity dpm | LLD dpm | MDC pCi/l | MPC pCi/l | Net Concentration * pCi/l | Conc / MPC Ratio |
|---|---|---|---|---|---|---|
| **Alpha** | 0.000 | 0.000 | 0.000 | 1.000 | 0.000 ± 0.000 | 0.000 |
| **sd** | 0.000 | | | | 0.000 | |
| **Beta** | 0.000 | 0.000 | 0.000 | 1.000 | 0.000 ± 0.000 | 0.000 |
| **sd** | 0.000 | | | | 0.000 | |

*** Note: Decay Corrected** **MDC Method** Tb = Ts < 10 **Error =** .00 **x sd**

**ICV is for Gross Beta**
**Strontium 90**
**and**
**Total Strontium**

| Orange Beta ICV 2013 | | | | |
|---|---|---|---|---|
| Detector | Low Mass Recovery | Medium Mass Recovery | High Mass Recovery | Mean Recovery |
| 18 | 96.95% | 97.69% | 99.04% | 97.89% |

Beta Activity 2009.34 pCi

**Standard ID**

Strontium 90
Sr-90_00018 #51512 (Rad12-0043)
Cert# 92352 Ref. date 11/29/12

| | | | |
|---|---|---|---|
| Initial Activity: | 2238.7 | dpm | |
| Reference Date: | 11/29/2012 | | |
| Current Date: | 1/24/2013 | | (or date at which you wish to determine activity) |
| Elapsed Time: | 56.000 | days | |
| Half Life: | 10409.625 | days | |
| Exponential Term: | 0.996278064 | | |
| Corrected Activity: | 2230.367701 | dpm | |
| Decay Activity (Sr/Y-90) | 4460.735402 | dpm | 2009.34 pCi |

# ICV is for Gross Alpha

| Orange Alpha ICV 2015 | | | | |
|---|---|---|---|---|
| | | | | Mean |
| | Low Mass | Medium Mass | High Mass | Recovery |
| Detector | Recovery | Recovery | Recovery | |
| 18 | 104.29% | 101.76% | 103.28% | 103.11% |

**Standard ID**

Thorium-230

Th-230_00019 #181198

Cert # 84460-334 Ref. date 08/08/2013

Activity 5.0185 pCi/mL

Prep Batch: M153007

| | | | |
|---|---|---|---|
| | Low Mass | Medium Mass | High Mass |
| Detector | Activity (pCi/mL) | Activity (pCi/mL) | Activity (pCi/mL) |
| 18 | 5.23E+00 | 5.11E+00 | 5.18E+00 |

# Alpha/Beta Count Results

## Sample Activity Report

## Orange 16-19 - C

**Addr:** 18

**Sample ID** ICV-51512;Beta 3

**Repeat** 17

**Carrier No.** 0

**Batch ID** m122640

**Count Method** Gross Alpha Beta

**Detector Volts** 1515

**Sample Qty** 0 *l* **sd** 0 *l*

**Residual Wt** 0 *mg* **sd** 0 *mg*

**Count Began** 1/24/2013 9:41:39 PM **Collection Date 1** 1/1/1900 **Half Life** 0.00 *days*

**Count Ended** 1/24/2013 9:46:41 PM **Collection Date 2** 1/1/1900 **Decay Factor** 1.000

**Sample Count Time** 5.00 *mins* **Background Count Time** 1,000.00 *mins*

| | Efficiency % | Attenuation Factor | Activity Divisor | Background cpm | Gross counts | Gross cpm | Net cpm |
|---|---|---|---|---|---|---|---|
| **Alpha** | 0.000 | 1.000 | 1.000 | 0.065 | 4 | 0.800 | 0.735 |
| **sd** | 0.000 | | | 0.008 | 2.000 | 0.400 | 0.400 |
| **A to B** | 0.000 | 1.000 | | | | 0.000 | |
| **sd** | 0.000 | | | | | 0.000 | |
| **Beta** | 0.000 | 1.000 | 1.000 | 0.390 | 8,572 | 1,714.400 | 1,714.010 |
| **sd** | 0.000 | | | 0.020 | 92.585 | 18.517 | 18.517 |

| | Net Activity dpm | LLD dpm | MDC pCi/l | MPC pCi/l | Net Concentration * pCi/l | Conc / MPC Ratio |
|---|---|---|---|---|---|---|
| **Alpha** | 0.000 | 0.000 | 0.000 | 1.000 | 0.000 ± 0.000 | 0.000 |
| **sd** | 0.000 | | | | 0.000 | |
| **Beta** | 0.000 | 0.000 | 0.000 | 1.000 | 0.000 ± 0.000 | 0.000 |
| **sd** | 0.000 | | | | 0.000 | |

*** Note: Decay Corrected** **MDC Method** Tb = Ts < 10 **Error =** .00 **x sd**

# Alpha/Beta Count Results

## Sample Activity Report

## Orange 16-19 - C

**Addr:** 18

**Sample ID** ICV-51512;Beta 2

**Repeat** 18

**Carrier No.** 0

**Batch ID** m122640

**Count Method** Gross Alpha Beta

**Detector Volts** 1515

**Sample Qty** 0 *l* **sd** 0 *l*

**Residual Wt** 0 *mg* **sd** 0 *mg*

**Count Began** 1/24/2013 9:48:01 PM **Collection Date 1** 1/1/1900 **Half Life** 0.00 *days*

**Count Ended** 1/24/2013 9:53:03 PM **Collection Date 2** 1/1/1900 **Decay Factor** 1.000

**Sample Count Time** 5.00 *mins* **Background Count Time** 1,000.00 *mins*

| | Efficiency % | Attenuation Factor | Activity Divisor | Background cpm | Gross counts | Gross cpm | Net cpm |
|---|---|---|---|---|---|---|---|
| **Alpha** | 0.000 | 1.000 | 1.000 | 0.065 | 4 | 0.800 | 0.735 |
| **sd** | 0.000 | | | 0.008 | 2.000 | 0.400 | 0.400 |
| **A to B** | 0.000 | 1.000 | | | | 0.000 | |
| **sd** | 0.000 | | | | | 0.000 | |
| **Beta** | 0.000 | 1.000 | 1.000 | 0.390 | 8,863 | 1,772.600 | 1,772.210 |
| **sd** | 0.000 | | | 0.020 | 94.144 | 18.829 | 18.829 |

| | Net Activity dpm | LLD dpm | MDC pCi/l | MPC pCi/l | Net Concentration * pCi/l | Conc / MPC Ratio |
|---|---|---|---|---|---|---|
| **Alpha** | 0.000 | 0.000 | 0.000 | 1.000 | 0.000 ± 0.000 | 0.000 |
| **sd** | 0.000 | | | | 0.000 | |
| **Beta** | 0.000 | 0.000 | 0.000 | 1.000 | 0.000 ± 0.000 | 0.000 |
| **sd** | 0.000 | | | | 0.000 | |

*** Note: Decay Corrected** **MDC Method** Tb = Ts < 10 **Error =** .00 **x sd**

# Alpha/Beta Count Results

## Sample Activity Report

## Orange 16-19 - C

**Addr:** 18

**Sample ID** ICV-51512;Beta 1

**Repeat** 19

**Carrier No.** 0

**Batch ID** m122640

**Count Method** Gross Alpha Beta

**Detector Volts** 1515

| | | | |
|---|---|---|---|
| **Sample Qty** | 0 ***l*** | **sd** | 0 ***l*** |
| **Residual Wt** | 0 ***mg*** | **sd** | 0 ***mg*** |

**Count Began** 1/24/2013 9:54:58 PM **Collection Date 1** 1/1/1900 **Half Life** 0.00 ***days***

**Count Ended** 1/24/2013 9:58:00 PM **Collection Date 2** 1/1/1900 **Decay Factor** 1.000

**Sample Count Time** 3.00 ***mins*** **Background Count Time** 1,000.00 ***mins***

| | Efficiency % | Attenuation Factor | Activity Divisor | Background cpm | Gross counts | Gross cpm | Net cpm |
|---|---|---|---|---|---|---|---|
| **Alpha** | 0.000 | 1.000 | 1.000 | 0.065 | 3 | 1.000 | 0.935 |
| **sd** | 0.000 | | | 0.008 | 1.732 | 0.577 | 0.577 |
| **A to B** | 0.000 | 1.000 | | | | 0.000 | |
| **sd** | 0.000 | | | | | 0.000 | |
| **Beta** | 0.000 | 1.000 | 1.000 | 0.390 | 5,571 | 1,857.000 | 1,856.610 |
| **sd** | 0.000 | | | 0.020 | 74.639 | 24.880 | 24.880 |

| | Net Activity dpm | LLD dpm | MDC pCi/l | MPC pCi/l | Net Concentration * pCi/l | Conc / MPC Ratio |
|---|---|---|---|---|---|---|
| **Alpha** | 0.000 | 0.000 | 0.000 | 1.000 | 0.000 ± 0.000 | 0.000 |
| **sd** | 0.000 | | | | 0.000 | |
| **Beta** | 0.000 | 0.000 | 0.000 | 1.000 | 0.000 ± 0.000 | 0.000 |
| **sd** | 0.000 | | | | 0.000 | |

*** Note: Decay Corrected** **MDC Method** Tb = Ts < 10 **Error =** .00 **x sd**

# Alpha/Beta Count Results

## Sample Activity Report

## Orange 16-19 - C

**Addr:** 18

**Sample ID** ICVABT-181198; A3

**Repeat** 18

**Carrier No.** 0

**Batch ID** m153007

**Count Method** Gross Alpha Beta

**Detector Volts** 1515

**Sample Qty** 0 *l* **sd** 0 *l*

**Residual Wt** 0 *mg* **sd** 0 *mg*

**Count Began** 1/7/2016 2:42:49 PM **Collection Date 1** 1/1/1900 **Half Life** 0.00 *days*

**Count Ended** 1/7/2016 3:12:53 PM **Collection Date 2** 1/1/1900 **Decay Factor** 1.000

**Sample Count Time** 30.00 *mins* **Background Count Time** 1,000.00 *mins*

| | Efficiency % | Attenuation Factor | Activity Divisor | Background cpm | Gross counts | Gross cpm | Net cpm |
|---|---|---|---|---|---|---|---|
| **Alpha** | 0.000 | 1.000 | 1.000 | 0.096 | 6,989 | 232.967 | 232.871 |
| **sd** | 0.000 | | | 0.010 | 83.600 | 2.787 | 2.787 |
| **A to B** | 0.000 | 1.000 | | | | 0.000 | |
| **sd** | 0.000 | | | | | 0.000 | |
| **Beta** | 0.000 | 1.000 | 1.000 | 0.465 | 2,757 | 91.900 | 91.435 |
| **sd** | 0.000 | | | 0.022 | 52.507 | 1.750 | 1.750 |

| | Net Activity dpm | LLD dpm | MDC pCi/l | MPC pCi/l | Net Concentration * pCi/l | Conc / MPC Ratio |
|---|---|---|---|---|---|---|
| **Alpha** | 0.000 | 0.000 | 0.000 | 1.000 | 0.000 ± 0.000 | 0.000 |
| **sd** | 0.000 | | | | 0.000 | |
| **Beta** | 0.000 | 0.000 | 0.000 | 1.000 | 0.000 ± 0.000 | 0.000 |
| **sd** | 0.000 | | | | 0.000 | |

*** Note: Decay Corrected** **MDC Method** Tb = Ts < 10 **Error =** .00 **x sd**

# Alpha/Beta Count Results

## Sample Activity Report

## Orange 16-19 - C

**Addr:** 18

**Sample ID** ICVABT-181198; A2

**Repeat** 18

**Carrier No.** 0

**Batch ID** m153007

**Count Method** Gross Alpha Beta

**Detector Volts** 1515

| | | | |
|---|---|---|---|
| **Sample Qty** | 0 ***l*** | **sd** | 0 ***l*** |
| **Residual Wt** | 0 ***mg*** | **sd** | 0 ***mg*** |

**Count Began** 1/7/2016 3:30:55 PM **Collection Date 1** 1/1/1900 **Half Life** 0.00 ***days***

**Count Ended** 1/7/2016 4:00:59 PM **Collection Date 2** 1/1/1900 **Decay Factor** 1.000

**Sample Count Time** 30.00 ***mins*** **Background Count Time** 1,000.00 ***mins***

| | Efficiency % | Attenuation Factor | Activity Divisor | Background cpm | Gross counts | Gross cpm | Net cpm |
|---|---|---|---|---|---|---|---|
| **Alpha** | 0.000 | 1.000 | 1.000 | 0.096 | 8,449 | 281.633 | 281.537 |
| **sd** | 0.000 | | | 0.010 | 91.918 | 3.064 | 3.064 |
| **A to B** | 0.000 | 1.000 | | | | 0.000 | |
| **sd** | 0.000 | | | | | 0.000 | |
| **Beta** | 0.000 | 1.000 | 1.000 | 0.465 | 3,209 | 106.967 | 106.502 |
| **sd** | 0.000 | | | 0.022 | 56.648 | 1.888 | 1.888 |

| | Net Activity dpm | LLD dpm | MDC pCi/l | MPC pCi/l | Net Concentration * pCi/l | Conc / MPC Ratio |
|---|---|---|---|---|---|---|
| **Alpha** | 0.000 | 0.000 | 0.000 | 1.000 | 0.000 ± 0.000 | 0.000 |
| **sd** | 0.000 | | | | 0.000 | |
| **Beta** | 0.000 | 0.000 | 0.000 | 1.000 | 0.000 ± 0.000 | 0.000 |
| **sd** | 0.000 | | | | 0.000 | |

*** Note: Decay Corrected** **MDC Method** Tb = Ts < 10 **Error =** .00 **x sd**

# Alpha/Beta Count Results

## Sample Activity Report

## Orange 16-19 - C

**Addr:** 18

**Sample ID** ICVABT-181198; A1

**Repeat** 19

**Carrier No.** 0

**Batch ID** m153007

**Count Method** Gross Alpha Beta

**Detector Volts** 1515

**Sample Qty** 0 *l* **sd** 0 *l*

**Residual Wt** 0 *mg* **sd** 0 *mg*

**Count Began** 1/7/2016 4:19:44 PM **Collection Date 1** 1/1/1900 **Half Life** 0.00 *days*

**Count Ended** 1/7/2016 4:49:49 PM **Collection Date 2** 1/1/1900 **Decay Factor** 1.000

**Sample Count Time** 30.00 *mins* **Background Count Time** 1,000.00 *mins*

| | Efficiency % | Attenuation Factor | Activity Divisor | Background cpm | Gross counts | Gross cpm | Net cpm |
|---|---|---|---|---|---|---|---|
| **Alpha** | 0.000 | 1.000 | 1.000 | 0.096 | 12,808 | 426.933 | 426.837 |
| **sd** | 0.000 | | | 0.010 | 113.172 | 3.772 | 3.772 |
| **A to B** | 0.000 | 1.000 | | | | 0.000 | |
| **sd** | 0.000 | | | | | 0.000 | |
| **Beta** | 0.000 | 1.000 | 1.000 | 0.465 | 4,232 | 141.067 | 140.602 |
| **sd** | 0.000 | | | 0.022 | 65.054 | 2.168 | 2.169 |

| | Net Activity dpm | LLD dpm | MDC pCi/l | MPC pCi/l | Net Concentration * pCi/l | Conc / MPC Ratio |
|---|---|---|---|---|---|---|
| **Alpha** | 0.000 | 0.000 | 0.000 | 1.000 | 0.000 ± 0.000 | 0.000 |
| **sd** | 0.000 | | | | 0.000 | |
| **Beta** | 0.000 | 0.000 | 0.000 | 1.000 | 0.000 ± 0.000 | 0.000 |
| **sd** | 0.000 | | | | 0.000 | |

*** Note: Decay Corrected** **MDC Method** Tb = Ts < 10 **Error =** .00 **x sd**

**ICV is for Gross Beta**
**Strontium 90**
**and**
**Total Strontium**

| Orange Beta ICV 2013 | | | | |
|---|---|---|---|---|
| Detector | Low Mass Recovery | Medium Mass Recovery | High Mass Recovery | Mean Recovery |
| 19 | 97.79% | 98.19% | 98.99% | 98.32% |

Beta Activity 2009.34 pCi

**Standard ID**

Strontium 90
Sr-90_00018 #51512 (Rad12-0043)
Cert# 92352 Ref. date 11/29/12

| | | | |
|---|---|---|---|
| Initial Activity: | 2238.7 | dpm | |
| Reference Date: | 11/29/2012 | | |
| Current Date: | 1/24/2013 | | (or date at which you wish to determine activity) |
| Elapsed Time: | 56.000 | days | |
| Half Life: | 10409.625 | days | |
| Exponential Term: | 0.996278064 | | |
| Corrected Activity: | 2230.367701 | dpm | |
| Decay Activity (Sr/Y-90) | 4460.735402 | dpm | 2009.34 pCi |

# ICV is for Gross Alpha

| Orange Alpha ICV 2015 | | | | |
|---|---|---|---|---|
| | | | | Mean |
| | Low Mass | Medium Mass | High Mass | Recovery |
| Detector | Recovery | Recovery | Recovery | |
| 19 | 105.23% | 103.72% | 104.77% | 104.57% |

**Standard ID**

Thorium-230

Th-230_00019 #181198

Cert # 84460-334 Ref. date 08/08/2013

Activity 5.0185 pCi/mL

Prep Batch: M153007

| | | | |
|---|---|---|---|
| | Low Mass | Medium Mass | High Mass |
| Detector | Activity (pCi/mL) | Activity (pCi/mL) | Activity (pCi/mL) |
| 19 | 5.28E+00 | 5.21E+00 | 5.26E+00 |

# Alpha/Beta Count Results

## Sample Activity Report

## Orange 16-19 - D

**Addr:** 19

**Sample ID** ICV-51512;Beta 3

**Repeat** 18

**Carrier No.** 0

**Batch ID** m122640

**Count Method** Gross Alpha Beta

**Detector Volts** 1515

**Sample Qty** 0 *l* **sd** 0 *l*

**Residual Wt** 0 *mg* **sd** 0 *mg*

**Count Began** 1/24/2013 9:48:05 PM **Collection Date 1** 1/1/1900 **Half Life** 0.00 *days*

**Count Ended** 1/24/2013 9:53:08 PM **Collection Date 2** 1/1/1900 **Decay Factor** 1.000

**Sample Count Time** 5.00 *mins* **Background Count Time** 1,000.00 *mins*

| | Efficiency % | Attenuation Factor | Activity Divisor | Background cpm | Gross counts | Gross cpm | Net cpm |
|---|---|---|---|---|---|---|---|
| **Alpha** | 0.000 | 1.000 | 1.000 | 0.041 | 2 | 0.400 | 0.359 |
| **sd** | 0.000 | | | 0.006 | 1.414 | 0.283 | 0.283 |
| **A to B** | 0.000 | 1.000 | | | | 0.000 | |
| **sd** | 0.000 | | | | | 0.000 | |
| **Beta** | 0.000 | 1.000 | 1.000 | 0.378 | 8,635 | 1,727.000 | 1,726.622 |
| **sd** | 0.000 | | | 0.019 | 92.925 | 18.585 | 18.585 |

| | Net Activity dpm | LLD dpm | MDC pCi/l | MPC pCi/l | Net Concentration * pCi/l | Conc / MPC Ratio |
|---|---|---|---|---|---|---|
| **Alpha** | 0.000 | 0.000 | 0.000 | 1.000 | 0.000 ± 0.000 | 0.000 |
| **sd** | 0.000 | | | | 0.000 | |
| **Beta** | 0.000 | 0.000 | 0.000 | 1.000 | 0.000 ± 0.000 | 0.000 |
| **sd** | 0.000 | | | | 0.000 | |

*** Note: Decay Corrected** **MDC Method** Tb = Ts < 10 **Error =** .00 **x sd**

# Alpha/Beta Count Results

## Sample Activity Report

## Orange 16-19 - D

**Addr:** 19

**Sample ID** ICV-51512;Beta 2

**Repeat** 19

**Carrier No.** 0

**Batch ID** m122640

**Count Method** Gross Alpha Beta

**Detector Volts** 1515

**Sample Qty** 0 *l* **sd** 0 *l*

**Residual Wt** 0 *mg* **sd** 0 *mg*

**Count Began** 1/24/2013 9:55:02 PM **Collection Date 1** 1/1/1900 **Half Life** 0.00 *days*

**Count Ended** 1/24/2013 10:00:04 PM **Collection Date 2** 1/1/1900 **Decay Factor** 1.000

**Sample Count Time** 5.00 *mins* **Background Count Time** 1,000.00 *mins*

| | Efficiency % | Attenuation Factor | Activity Divisor | Background cpm | Gross counts | Gross cpm | Net cpm |
|---|---|---|---|---|---|---|---|
| **Alpha** | 0.000 | 1.000 | 1.000 | 0.041 | 2 | 0.400 | 0.359 |
| **sd** | 0.000 | | | 0.006 | 1.414 | 0.283 | 0.283 |
| **A to B** | 0.000 | 1.000 | | | | 0.000 | |
| **sd** | 0.000 | | | | | 0.000 | |
| **Beta** | 0.000 | 1.000 | 1.000 | 0.378 | 8,953 | 1,790.600 | 1,790.222 |
| **sd** | 0.000 | | | 0.019 | 94.620 | 18.924 | 18.924 |

| | Net Activity dpm | LLD dpm | MDC pCi/l | MPC pCi/l | Net Concentration * pCi/l | Conc / MPC Ratio |
|---|---|---|---|---|---|---|
| **Alpha** | 0.000 | 0.000 | 0.000 | 1.000 | 0.000 ± 0.000 | 0.000 |
| **sd** | 0.000 | | | | 0.000 | |
| **Beta** | 0.000 | 0.000 | 0.000 | 1.000 | 0.000 ± 0.000 | 0.000 |
| **sd** | 0.000 | | | | 0.000 | |

*** Note: Decay Corrected** **MDC Method** Tb = Ts < 10 **Error =** .00 **x sd**

# Alpha/Beta Count Results

## Sample Activity Report

## Orange 16-19 - D

**Addr:** 19

**Sample ID** ICV-51512;Beta 1

**Repeat** 20

**Carrier No.** 0

**Batch ID** m122640

**Count Method** Gross Alpha Beta

**Detector Volts** 1515

**Sample Qty** 0 *l* **sd** 0 *l*

**Residual Wt** 0 *mg* **sd** 0 *mg*

**Count Began** 1/24/2013 10:02:00 PM **Collection Date 1** 1/1/1900 **Half Life** 0.00 *days*

**Count Ended** 1/24/2013 10:07:02 PM **Collection Date 2** 1/1/1900 **Decay Factor** 1.000

**Sample Count Time** 5.00 *mins* **Background Count Time** 1,000.00 *mins*

| | Efficiency % | Attenuation Factor | Activity Divisor | Background cpm | Gross counts | Gross cpm | Net cpm |
|---|---|---|---|---|---|---|---|
| **Alpha** | 0.000 | 1.000 | 1.000 | 0.041 | 5 | 1.000 | 0.959 |
| **sd** | 0.000 | | | 0.006 | 2.236 | 0.447 | 0.447 |
| **A to B** | 0.000 | 1.000 | | | | 0.000 | |
| **sd** | 0.000 | | | | | 0.000 | |
| **Beta** | 0.000 | 1.000 | 1.000 | 0.378 | 9,422 | 1,884.400 | 1,884.022 |
| **sd** | 0.000 | | | 0.019 | 97.067 | 19.413 | 19.413 |

| | Net Activity dpm | LLD dpm | MDC pCi/l | MPC pCi/l | Net Concentration * pCi/l | Conc / MPC Ratio |
|---|---|---|---|---|---|---|
| **Alpha** | 0.000 | 0.000 | 0.000 | 1.000 | 0.000 ± 0.000 | 0.000 |
| **sd** | 0.000 | | | | 0.000 | |
| **Beta** | 0.000 | 0.000 | 0.000 | 1.000 | 0.000 ± 0.000 | 0.000 |
| **sd** | 0.000 | | | | 0.000 | |

*** Note: Decay Corrected** **MDC Method** Tb = Ts < 10 **Error =** .00 **x sd**

# Alpha/Beta Count Results

## Sample Activity Report

## Orange 16-19 - D

**Addr:** 19

**Sample ID** ICVABT-181198; A3

**Repeat** 19

**Carrier No.** 0

**Batch ID** m153007

**Count Method** Gross Alpha Beta

**Detector Volts** 1515

**Sample Qty** 0 *l* **sd** 0 *l*

**Residual Wt** 0 *mg* **sd** 0 *mg*

**Count Began** 1/7/2016 3:31:03 PM **Collection Date 1** 1/1/1900 **Half Life** 0.00 *days*

**Count Ended** 1/7/2016 4:01:07 PM **Collection Date 2** 1/1/1900 **Decay Factor** 1.000

**Sample Count Time** 30.00 *mins* **Background Count Time** 1,000.00 *mins*

| | Efficiency % | Attenuation Factor | Activity Divisor | Background cpm | Gross counts | Gross cpm | Net cpm |
|---|---|---|---|---|---|---|---|
| **Alpha** | 0.000 | 1.000 | 1.000 | 0.105 | 7,375 | 245.833 | 245.728 |
| **sd** | 0.000 | | | 0.010 | 85.878 | 2.863 | 2.863 |
| **A to B** | 0.000 | 1.000 | | | | 0.000 | |
| **sd** | 0.000 | | | | | 0.000 | |
| **Beta** | 0.000 | 1.000 | 1.000 | 0.426 | 2,893 | 96.433 | 96.007 |
| **sd** | 0.000 | | | 0.021 | 53.787 | 1.793 | 1.793 |

| | Net Activity dpm | LLD dpm | MDC pCi/l | MPC pCi/l | Net Concentration * pCi/l | Conc / MPC Ratio |
|---|---|---|---|---|---|---|
| **Alpha** | 0.000 | 0.000 | 0.000 | 1.000 | 0.000 ± 0.000 | 0.000 |
| **sd** | 0.000 | | | | 0.000 | |
| **Beta** | 0.000 | 0.000 | 0.000 | 1.000 | 0.000 ± 0.000 | 0.000 |
| **sd** | 0.000 | | | | 0.000 | |

*** Note: Decay Corrected** **MDC Method** Tb = Ts < 10 **Error =** .00 **x sd**

# Alpha/Beta Count Results

## Sample Activity Report

## Orange 16-19 - D

**Addr:** 19

**Sample ID** ICVABT-181198; A2

**Repeat** 19

**Carrier No.** 0

**Batch ID** m153007

**Count Method** Gross Alpha Beta

**Detector Volts** 1515

**Sample Qty** 0 *l* **sd** 0 *l*

**Residual Wt** 0 *mg* **sd** 0 *mg*

**Count Began** 1/7/2016 4:19:52 PM **Collection Date 1** 1/1/1900 **Half Life** 0.00 *days*

**Count Ended** 1/7/2016 4:49:56 PM **Collection Date 2** 1/1/1900 **Decay Factor** 1.000

**Sample Count Time** 30.00 *mins* **Background Count Time** 1,000.00 *mins*

| | Efficiency % | Attenuation Factor | Activity Divisor | Background cpm | Gross counts | Gross cpm | Net cpm |
|---|---|---|---|---|---|---|---|
| **Alpha** | 0.000 | 1.000 | 1.000 | 0.105 | 8,919 | 297.300 | 297.195 |
| **sd** | 0.000 | | | 0.010 | 94.440 | 3.148 | 3.148 |
| **A to B** | 0.000 | 1.000 | | | | 0.000 | |
| **sd** | 0.000 | | | | | 0.000 | |
| **Beta** | 0.000 | 1.000 | 1.000 | 0.426 | 3,316 | 110.533 | 110.107 |
| **sd** | 0.000 | | | 0.021 | 57.585 | 1.919 | 1.920 |

| | Net Activity dpm | LLD dpm | MDC pCi/l | MPC pCi/l | Net Concentration * pCi/l | Conc / MPC Ratio |
|---|---|---|---|---|---|---|
| **Alpha** | 0.000 | 0.000 | 0.000 | 1.000 | 0.000 ± 0.000 | 0.000 |
| **sd** | 0.000 | | | | 0.000 | |
| **Beta** | 0.000 | 0.000 | 0.000 | 1.000 | 0.000 ± 0.000 | 0.000 |
| **sd** | 0.000 | | | | 0.000 | |

*** Note: Decay Corrected** **MDC Method** Tb = Ts < 10 **Error =** .00 **x sd**

# Alpha/Beta Count Results

## Sample Activity Report

## Orange 16-19 - D

**Addr:** 19

**Sample ID** ICVABT-181198; A1

**Repeat** 20

**Carrier No.** 0

**Batch ID** m153007

**Count Method** Gross Alpha Beta

**Detector Volts** 1515

**Sample Qty** 0 *l* **sd** 0 *l*

**Residual Wt** 0 *mg* **sd** 0 *mg*

**Count Began** 1/7/2016 4:51:05 PM **Collection Date 1** 1/1/1900 **Half Life** 0.00 *days*

**Count Ended** 1/7/2016 5:21:10 PM **Collection Date 2** 1/1/1900 **Decay Factor** 1.000

**Sample Count Time** 30.00 *mins* **Background Count Time** 1,000.00 *mins*

| | Efficiency % | Attenuation Factor | Activity Divisor | Background cpm | Gross counts | Gross cpm | Net cpm |
|---|---|---|---|---|---|---|---|
| **Alpha** | 0.000 | 1.000 | 1.000 | 0.105 | 13,285 | 442.833 | 442.728 |
| **sd** | 0.000 | | | 0.010 | 115.261 | 3.842 | 3.842 |
| **A to B** | 0.000 | 1.000 | | | | 0.000 | |
| **sd** | 0.000 | | | | | 0.000 | |
| **Beta** | 0.000 | 1.000 | 1.000 | 0.426 | 4,350 | 145.000 | 144.574 |
| **sd** | 0.000 | | | 0.021 | 65.955 | 2.198 | 2.199 |

| | Net Activity dpm | LLD dpm | MDC pCi/l | MPC pCi/l | Net Concentration * pCi/l | Conc / MPC Ratio |
|---|---|---|---|---|---|---|
| **Alpha** | 0.000 | 0.000 | 0.000 | 1.000 | 0.000 ± 0.000 | 0.000 |
| **sd** | 0.000 | | | | 0.000 | |
| **Beta** | 0.000 | 0.000 | 0.000 | 1.000 | 0.000 ± 0.000 | 0.000 |
| **sd** | 0.000 | | | | 0.000 | |

*** Note: Decay Corrected** **MDC Method** Tb = Ts < 10 **Error =** .00 **x sd**

**ICV is for Gross Beta**
**Strontium 90**
**and**
**Total Strontium**

| Orange Beta ICV 2013 | | | | |
|---|---|---|---|---|
| Detector | Low Mass Recovery | Medium Mass Recovery | High Mass Recovery | Mean Recovery |
| 22 | 97.15% | 97.44% | 98.99% | 97.86% |

Beta Activity 2009.34 pCi

**Standard ID**

Strontium 90
Sr-90_00018 #51512 (Rad12-0043)
Cert# 92352 Ref. date 11/29/12

| | | | |
|---|---|---|---|
| Initial Activity: | 2238.7 | dpm | |
| Reference Date: | 11/29/2012 | | |
| Current Date: | 1/24/2013 | | (or date at which you wish to determine activity) |
| Elapsed Time: | 56.000 | days | |
| Half Life: | 10409.625 | days | |
| Exponential Term: | 0.996278064 | | |
| Corrected Activity: | 2230.367701 | dpm | |
| Decay Activity (Sr/Y-90) | 4460.735402 | dpm | 2009.34 pCi |

# ICV is for Gross Alpha

| Orange Alpha ICV 2015 | | | | |
|---|---|---|---|---|
| | | | | Mean |
| | Low Mass | Medium Mass | High Mass | Recovery |
| Detector | Recovery | Recovery | Recovery | |
| 22 | 106.43% | 102.92% | 101.84% | 103.73% |

**Standard ID**

Thorium-230

Th-230_00019 #181198

Cert # 84460-334 Ref. date 08/08/2013

Activity 5.0185 pCi/mL

Prep Batch: M153007

| | | | |
|---|---|---|---|
| | Low Mass | Medium Mass | High Mass |
| Detector | Activity (pCi/mL) | Activity (pCi/mL) | Activity (pCi/mL) |
| 22 | 5.34E+00 | 5.17E+00 | 5.11E+00 |

# Alpha/Beta Count Results

## Sample Activity Report

## Orange 20-23 - C

**Addr:** 22

**Sample ID** ICV-51512;Beta 3

**Repeat** 21

**Carrier No.** 0

**Batch ID** m122640

**Count Method** Gross Alpha Beta

**Detector Volts** 1515

**Sample Qty** 0 *l* **sd** 0 *l*

**Residual Wt** 0 *mg* **sd** 0 *mg*

**Count Began** 1/24/2013 10:42:54 PM **Collection Date 1** 1/1/1900 **Half Life** 0.00 *days*

**Count Ended** 1/24/2013 10:47:56 PM **Collection Date 2** 1/1/1900 **Decay Factor** 1.000

**Sample Count Time** 5.00 *mins* **Background Count Time** 1,000.00 *mins*

| | Efficiency % | Attenuation Factor | Activity Divisor | Background cpm | Gross counts | Gross cpm | Net cpm |
|---|---|---|---|---|---|---|---|
| **Alpha** | 0.000 | 1.000 | 1.000 | 0.044 | 1 | 0.200 | 0.156 |
| **sd** | 0.000 | | | 0.007 | 1.000 | 0.200 | 0.200 |
| **A to B** | 0.000 | 1.000 | | | | 0.000 | |
| **sd** | 0.000 | | | | | 0.000 | |
| **Beta** | 0.000 | 1.000 | 1.000 | 0.301 | 8,562 | 1,712.400 | 1,712.099 |
| **sd** | 0.000 | | | 0.017 | 92.531 | 18.506 | 18.506 |

| | Net Activity dpm | LLD dpm | MDC pCi/l | MPC pCi/l | Net Concentration * pCi/l | Conc / MPC Ratio |
|---|---|---|---|---|---|---|
| **Alpha** | 0.000 | 0.000 | 0.000 | 1.000 | 0.000 ± 0.000 | 0.000 |
| **sd** | 0.000 | | | | 0.000 | |
| **Beta** | 0.000 | 0.000 | 0.000 | 1.000 | 0.000 ± 0.000 | 0.000 |
| **sd** | 0.000 | | | | 0.000 | |

*** Note: Decay Corrected** **MDC Method** Tb = Ts < 10 **Error =** .00 **x sd**

# Alpha/Beta Count Results

## Sample Activity Report

## Orange 20-23 - C

**Addr:** 22

**Sample ID** ICV-51512;Beta 2

**Repeat** 22

**Carrier No.** 0

**Batch ID** m122640

**Count Method** Gross Alpha Beta

**Detector Volts** 1515

**Sample Qty** 0 *l* **sd** 0 *l*

**Residual Wt** 0 *mg* **sd** 0 *mg*

**Count Began** 1/24/2013 10:51:06 PM **Collection Date 1** 1/1/1900 **Half Life** 0.00 *days*

**Count Ended** 1/24/2013 10:56:08 PM **Collection Date 2** 1/1/1900 **Decay Factor** 1.000

**Sample Count Time** 5.00 *mins* **Background Count Time** 1,000.00 *mins*

| | Efficiency % | Attenuation Factor | Activity Divisor | Background cpm | Gross counts | Gross cpm | Net cpm |
|---|---|---|---|---|---|---|---|
| **Alpha** | 0.000 | 1.000 | 1.000 | 0.044 | 2 | 0.400 | 0.356 |
| **sd** | 0.000 | | | 0.007 | 1.414 | 0.283 | 0.283 |
| **A to B** | 0.000 | 1.000 | | | | 0.000 | |
| **sd** | 0.000 | | | | | 0.000 | |
| **Beta** | 0.000 | 1.000 | 1.000 | 0.301 | 8,829 | 1,765.800 | 1,765.499 |
| **sd** | 0.000 | | | 0.017 | 93.963 | 18.793 | 18.793 |

| | Net Activity dpm | LLD dpm | MDC pCi/l | MPC pCi/l | Net Concentration * pCi/l | Conc / MPC Ratio |
|---|---|---|---|---|---|---|
| **Alpha** | 0.000 | 0.000 | 0.000 | 1.000 | 0.000 ± 0.000 | 0.000 |
| **sd** | 0.000 | | | | 0.000 | |
| **Beta** | 0.000 | 0.000 | 0.000 | 1.000 | 0.000 ± 0.000 | 0.000 |
| **sd** | 0.000 | | | | 0.000 | |

*** Note: Decay Corrected** **MDC Method** Tb = Ts < 10 **Error =** .00 **x sd**

# Alpha/Beta Count Results

## Sample Activity Report

## Orange 20-23 - C

**Addr:** 22

**Sample ID** ICV-51512;Beta 1

**Repeat** 23

**Carrier No.** 0

**Batch ID** m122640

**Count Method** Gross Alpha Beta

**Detector Volts** 1515

| | | | |
|---|---|---|---|
| **Sample Qty** | 0 ***l*** | **sd** | 0 ***l*** |
| **Residual Wt** | 0 ***mg*** | **sd** | 0 ***mg*** |

**Count Began** 1/24/2013 11:01:24 PM

**Collection Date 1** 1/1/1900

**Half Life** 0.00 ***days***

**Count Ended** 1/24/2013 11:06:26 PM

**Collection Date 2** 1/1/1900

**Decay Factor** 1.000

**Sample Count Time** 5.00 ***mins***

**Background Count Time** 1,000.00 ***mins***

| | Efficiency % | Attenuation Factor | Activity Divisor | Background cpm | Gross counts | Gross cpm | Net cpm |
|---|---|---|---|---|---|---|---|
| **Alpha** | 0.000 | 1.000 | 1.000 | 0.044 | 6 | 1.200 | 1.156 |
| **sd** | 0.000 | | | 0.007 | 2.449 | 0.490 | 0.490 |
| **A to B** | 0.000 | 1.000 | | | | 0.000 | |
| **sd** | 0.000 | | | | | 0.000 | |
| **Beta** | 0.000 | 1.000 | 1.000 | 0.301 | 9,312 | 1,862.400 | 1,862.099 |
| **sd** | 0.000 | | | 0.017 | 96.499 | 19.300 | 19.300 |

| | Net Activity dpm | LLD dpm | MDC pCi/l | MPC pCi/l | Net Concentration * pCi/l | Conc / MPC Ratio |
|---|---|---|---|---|---|---|
| **Alpha** | 0.000 | 0.000 | 0.000 | 1.000 | 0.000 ± 0.000 | 0.000 |
| **sd** | 0.000 | | | | 0.000 | |
| **Beta** | 0.000 | 0.000 | 0.000 | 1.000 | 0.000 ± 0.000 | 0.000 |
| **sd** | 0.000 | | | | 0.000 | |

*** Note: Decay Corrected**

**MDC Method** Tb = Ts < 10

**Error =** .00 **x sd**

# Alpha/Beta Count Results

## Sample Activity Report

## Orange 20-23 - C

**Addr:** 22

**Sample ID** ICVABT-181198; A3

**Repeat** 22

**Carrier No.** 0

**Batch ID** m153007

**Count Method** Gross Alpha Beta

**Detector Volts** 1515

**Sample Qty** 0 *l* **sd** 0 *l*

**Residual Wt** 0 *mg* **sd** 0 *mg*

**Count Began** 1/7/2016 5:39:42 PM **Collection Date 1** 1/1/1900 **Half Life** 0.00 *days*

**Count Ended** 1/7/2016 6:09:45 PM **Collection Date 2** 1/1/1900 **Decay Factor** 1.000

**Sample Count Time** 30.00 *mins* **Background Count Time** 1,000.00 *mins*

| | Efficiency % | Attenuation Factor | Activity Divisor | Background cpm | Gross counts | Gross cpm | Net cpm |
|---|---|---|---|---|---|---|---|
| **Alpha** | 0.000 | 1.000 | 1.000 | 0.048 | 7,205 | 240.167 | 240.119 |
| **sd** | 0.000 | | | 0.007 | 84.882 | 2.829 | 2.829 |
| **A to B** | 0.000 | 1.000 | | | | 0.000 | |
| **sd** | 0.000 | | | | | 0.000 | |
| **Beta** | 0.000 | 1.000 | 1.000 | 0.419 | 2,986 | 99.533 | 99.114 |
| **sd** | 0.000 | | | 0.020 | 54.644 | 1.821 | 1.822 |

| | Net Activity dpm | LLD dpm | MDC pCi/l | MPC pCi/l | Net Concentration * pCi/l | Conc / MPC Ratio |
|---|---|---|---|---|---|---|
| **Alpha** | 0.000 | 0.000 | 0.000 | 1.000 | 0.000 ± 0.000 | 0.000 |
| **sd** | 0.000 | | | | 0.000 | |
| **Beta** | 0.000 | 0.000 | 0.000 | 1.000 | 0.000 ± 0.000 | 0.000 |
| **sd** | 0.000 | | | | 0.000 | |

*** Note: Decay Corrected** **MDC Method** Tb = Ts < 10 **Error =** .00 **x sd**

# Alpha/Beta Count Results

## Sample Activity Report

## Orange 20-23 - C

**Addr:** 22

**Sample ID** ICVABT-181198; A2

**Repeat** 22

**Carrier No.** 0

**Batch ID** m153007

**Count Method** Gross Alpha Beta

**Detector Volts** 1515

**Sample Qty** 0 *l* **sd** 0 *l*

**Residual Wt** 0 *mg* **sd** 0 *mg*

**Count Began** 1/7/2016 6:10:53 PM **Collection Date 1** 1/1/1900 **Half Life** 0.00 *days*

**Count Ended** 1/7/2016 6:40:57 PM **Collection Date 2** 1/1/1900 **Decay Factor** 1.000

**Sample Count Time** 30.00 *mins* **Background Count Time** 1,000.00 *mins*

| | Efficiency % | Attenuation Factor | Activity Divisor | Background cpm | Gross counts | Gross cpm | Net cpm |
|---|---|---|---|---|---|---|---|
| **Alpha** | 0.000 | 1.000 | 1.000 | 0.048 | 8,895 | 296.500 | 296.452 |
| **sd** | 0.000 | | | 0.007 | 94.313 | 3.144 | 3.144 |
| **A to B** | 0.000 | 1.000 | | | | 0.000 | |
| **sd** | 0.000 | | | | | 0.000 | |
| **Beta** | 0.000 | 1.000 | 1.000 | 0.419 | 3,372 | 112.400 | 111.981 |
| **sd** | 0.000 | | | 0.020 | 58.069 | 1.936 | 1.936 |

| | Net Activity dpm | LLD dpm | MDC pCi/l | MPC pCi/l | Net Concentration * pCi/l | Conc / MPC Ratio |
|---|---|---|---|---|---|---|
| **Alpha** | 0.000 | 0.000 | 0.000 | 1.000 | 0.000 ± 0.000 | 0.000 |
| **sd** | 0.000 | | | | 0.000 | |
| **Beta** | 0.000 | 0.000 | 0.000 | 1.000 | 0.000 ± 0.000 | 0.000 |
| **sd** | 0.000 | | | | 0.000 | |

*** Note: Decay Corrected** **MDC Method** Tb = Ts < 10 **Error =** .00 **x sd**

# Alpha/Beta Count Results

## Sample Activity Report

## Orange 20-23 - C

**Addr:** 22

**Sample ID** ICVABT-181198; A1

**Repeat** 23

**Carrier No.** 0

**Batch ID** m153007

**Count Method** Gross Alpha Beta

**Detector Volts** 1515

| | | | |
|---|---|---|---|
| **Sample Qty** | 0 ***l*** | **sd** | 0 ***l*** |
| **Residual Wt** | 0 ***mg*** | **sd** | 0 ***mg*** |

**Count Began** 1/7/2016 7:31:11 PM **Collection Date 1** 1/1/1900 **Half Life** 0.00 ***days***

**Count Ended** 1/7/2016 8:01:16 PM **Collection Date 2** 1/1/1900 **Decay Factor** 1.000

**Sample Count Time** 30.00 ***mins*** **Background Count Time** 1,000.00 ***mins***

| | Efficiency % | Attenuation Factor | Activity Divisor | Background cpm | Gross counts | Gross cpm | Net cpm |
|---|---|---|---|---|---|---|---|
| **Alpha** | 0.000 | 1.000 | 1.000 | 0.048 | 13,300 | 443.333 | 443.285 |
| **sd** | 0.000 | | | 0.007 | 115.326 | 3.844 | 3.844 |
| **A to B** | 0.000 | 1.000 | | | | 0.000 | |
| **sd** | 0.000 | | | | | 0.000 | |
| **Beta** | 0.000 | 1.000 | 1.000 | 0.419 | 4,454 | 148.467 | 148.048 |
| **sd** | 0.000 | | | 0.020 | 66.738 | 2.225 | 2.225 |

| | Net Activity dpm | LLD dpm | MDC pCi/l | MPC pCi/l | Net Concentration * pCi/l | Conc / MPC Ratio |
|---|---|---|---|---|---|---|
| **Alpha** | 0.000 | 0.000 | 0.000 | 1.000 | 0.000 ± 0.000 | 0.000 |
| **sd** | 0.000 | | | | 0.000 | |
| **Beta** | 0.000 | 0.000 | 0.000 | 1.000 | 0.000 ± 0.000 | 0.000 |
| **sd** | 0.000 | | | | 0.000 | |

*** Note: Decay Corrected** **MDC Method** Tb = Ts < 10 **Error =** .00 **x sd**

**ICV is for Gross Beta**
**Strontium 90**
**and**
**Total Strontium**

| Orange Beta ICV 2013 | | | | |
|---|---|---|---|---|
| Detector | Low Mass Recovery | Medium Mass Recovery | High Mass Recovery | Mean Recovery |
| 23 | 98.69% | 98.64% | 101.53% | 99.62% |

Beta Activity 2009.34 pCi

**Standard ID**

Strontium 90
Sr-90_00018 #51512 (Rad12-0043)
Cert# 92352 Ref. date 11/29/12

| | | | |
|---|---|---|---|
| Initial Activity: | 2238.7 | dpm | |
| Reference Date: | 11/29/2012 | | |
| Current Date: | 1/24/2013 | | (or date at which you wish to determine activity) |
| Elapsed Time: | 56.000 | days | |
| Half Life: | 10409.625 | days | |
| Exponential Term: | 0.996278064 | | |
| Corrected Activity: | 2230.367701 | dpm | |
| Decay Activity (Sr/Y-90) | 4460.735402 | dpm | 2009.34 pCi |

# Alpha/Beta Count Results

## Sample Activity Report

## Orange 20-23 - D

**Addr:** 23

**Sample ID** ICV-51512;Beta 3

**Repeat** 22

**Carrier No.** 0

**Batch ID** m122640

**Count Method** Gross Alpha Beta

**Detector Volts** 1515

| | | | |
|---|---|---|---|
| **Sample Qty** | 0 ***l*** | **sd** | 0 ***l*** |
| **Residual Wt** | 0 ***mg*** | **sd** | 0 ***mg*** |

**Count Began** 1/24/2013 10:51:11 PM **Collection Date 1** 1/1/1900 **Half Life** 0.00 ***days***

**Count Ended** 1/24/2013 10:56:14 PM **Collection Date 2** 1/1/1900 **Decay Factor** 1.000

**Sample Count Time** 5.00 ***mins*** **Background Count Time** 1,000.00 ***mins***

| | Efficiency % | Attenuation Factor | Activity Divisor | Background cpm | Gross counts | Gross cpm | Net cpm |
|---|---|---|---|---|---|---|---|
| **Alpha** | 0.000 | 1.000 | 1.000 | 0.046 | 3 | 0.600 | 0.554 |
| **sd** | 0.000 | | | 0.007 | 1.732 | 0.346 | 0.346 |
| **A to B** | 0.000 | 1.000 | | | | 0.000 | |
| **sd** | 0.000 | | | | | 0.000 | |
| **Beta** | 0.000 | 1.000 | 1.000 | 0.330 | 8,756 | 1,751.200 | 1,750.870 |
| **sd** | 0.000 | | | 0.018 | 93.574 | 18.715 | 18.715 |

| | Net Activity dpm | LLD dpm | MDC pCi/l | MPC pCi/l | Net Concentration * pCi/l | Conc / MPC Ratio |
|---|---|---|---|---|---|---|
| **Alpha** | 0.000 | 0.000 | 0.000 | 1.000 | 0.000 ± 0.000 | 0.000 |
| **sd** | 0.000 | | | | 0.000 | |
| **Beta** | 0.000 | 0.000 | 0.000 | 1.000 | 0.000 ± 0.000 | 0.000 |
| **sd** | 0.000 | | | | 0.000 | |

*** Note: Decay Corrected** **MDC Method** Tb = Ts < 10 **Error =** .00 **x sd**

# Alpha/Beta Count Results

## Sample Activity Report

## Orange 20-23 - D

**Addr:** 23

**Sample ID** ICV-51512;Beta 2

**Repeat** 23

**Carrier No.** 0

**Batch ID** m122640

**Count Method** Gross Alpha Beta

**Detector Volts** 1515

**Sample Qty** 0 *l* **sd** 0 *l*

**Residual Wt** 0 *mg* **sd** 0 *mg*

**Count Began** 1/24/2013 11:01:28 PM **Collection Date 1** 1/1/1900 **Half Life** 0.00 *days*

**Count Ended** 1/24/2013 11:06:30 PM **Collection Date 2** 1/1/1900 **Decay Factor** 1.000

**Sample Count Time** 5.00 *mins* **Background Count Time** 1,000.00 *mins*

| | Efficiency % | Attenuation Factor | Activity Divisor | Background cpm | Gross counts | Gross cpm | Net cpm |
|---|---|---|---|---|---|---|---|
| **Alpha** | 0.000 | 1.000 | 1.000 | 0.046 | 5 | 1.000 | 0.954 |
| **sd** | 0.000 | | | 0.007 | 2.236 | 0.447 | 0.447 |
| **A to B** | 0.000 | 1.000 | | | | 0.000 | |
| **sd** | 0.000 | | | | | 0.000 | |
| **Beta** | 0.000 | 1.000 | 1.000 | 0.330 | 8,918 | 1,783.600 | 1,783.270 |
| **sd** | 0.000 | | | 0.018 | 94.435 | 18.887 | 18.887 |

| | Net Activity dpm | LLD dpm | MDC pCi/l | MPC pCi/l | Net Concentration * pCi/l | Conc / MPC Ratio |
|---|---|---|---|---|---|---|
| **Alpha** | 0.000 | 0.000 | 0.000 | 1.000 | 0.000 ± 0.000 | 0.000 |
| **sd** | 0.000 | | | | 0.000 | |
| **Beta** | 0.000 | 0.000 | 0.000 | 1.000 | 0.000 ± 0.000 | 0.000 |
| **sd** | 0.000 | | | | 0.000 | |

*** Note: Decay Corrected** **MDC Method** Tb = Ts < 10 **Error =** .00 **x sd**

# Alpha/Beta Count Results

## Sample Activity Report

## Orange 20-23 - D

**Addr:** 23

**Sample ID** ICV-51512;Beta 1

**Repeat** 24

**Carrier No.** 0

**Batch ID** m122640

**Count Method** Gross Alpha Beta

**Detector Volts** 1515

**Sample Qty** 0 *l* **sd** 0 *l*

**Residual Wt** 0 *mg* **sd** 0 *mg*

**Count Began** 1/24/2013 11:07:36 PM **Collection Date 1** 1/1/1900 **Half Life** 0.00 *days*

**Count Ended** 1/24/2013 11:12:38 PM **Collection Date 2** 1/1/1900 **Decay Factor** 1.000

**Sample Count Time** 5.00 *mins* **Background Count Time** 1,000.00 *mins*

| | Efficiency % | Attenuation Factor | Activity Divisor | Background cpm | Gross counts | Gross cpm | Net cpm |
|---|---|---|---|---|---|---|---|
| **Alpha** | 0.000 | 1.000 | 1.000 | 0.046 | 3 | 0.600 | 0.554 |
| **sd** | 0.000 | | | 0.007 | 1.732 | 0.346 | 0.346 |
| **A to B** | 0.000 | 1.000 | | | | 0.000 | |
| **sd** | 0.000 | | | | | 0.000 | |
| **Beta** | 0.000 | 1.000 | 1.000 | 0.330 | 9,421 | 1,884.200 | 1,883.870 |
| **sd** | 0.000 | | | 0.018 | 97.062 | 19.412 | 19.412 |

| | Net Activity dpm | LLD dpm | MDC pCi/l | MPC pCi/l | Net Concentration * pCi/l | Conc / MPC Ratio |
|---|---|---|---|---|---|---|
| **Alpha** | 0.000 | 0.000 | 0.000 | 1.000 | 0.000 ± 0.000 | 0.000 |
| **sd** | 0.000 | | | | 0.000 | |
| **Beta** | 0.000 | 0.000 | 0.000 | 1.000 | 0.000 ± 0.000 | 0.000 |
| **sd** | 0.000 | | | | 0.000 | |

*** Note: Decay Corrected** **MDC Method** Tb = Ts < 10 **Error =** .00 **x sd**

# ICV is for Gross Alpha

| Orange Alpha ICV 2015 | | | | |
|---|---|---|---|---|
| | | | | Mean |
| | Low Mass | Medium Mass | High Mass | Recovery |
| Detector | Recovery | Recovery | Recovery | |
| 23 | 102.60% | 99.97% | 104.13% | 102.24% |

**Standard ID**

Thorium-230

Th-230_00019 #181198

Cert # 84460-334 Ref. date 08/08/2013

Activity 5.0185 pCi/mL

Prep Batch: M153007

| | | | |
|---|---|---|---|
| | | | |
| | Low Mass | Medium Mass | High Mass |
| Detector | Activity (pCi/mL) | Activity (pCi/mL) | Activity (pCi/mL) |
| 23 | 5.149 | 5.017 | 5.226 |

# Alpha/Beta Count Results

## Sample Activity Report

## Orange 20-23 - D

**Addr:** 23

**Sample ID** ICVABT-181198; A3

**Repeat** 23

**Carrier No.** 0

**Batch ID** m153007

**Count Method** Gross Alpha Beta

**Detector Volts** 1515

**Sample Qty** 0 *l* **sd** 0 *l*

**Residual Wt** 0 *mg* **sd** 0 *mg*

**Count Began** 1/7/2016 6:10:58 PM **Collection Date 1** 1/1/1900 **Half Life** 0.00 *days*

**Count Ended** 1/7/2016 6:41:01 PM **Collection Date 2** 1/1/1900 **Decay Factor** 1.000

**Sample Count Time** 30.00 *mins* **Background Count Time** 1,000.00 *mins*

| | Efficiency % | Attenuation Factor | Activity Divisor | Background cpm | Gross counts | Gross cpm | Net cpm |
|---|---|---|---|---|---|---|---|
| **Alpha** | 0.000 | 1.000 | 1.000 | 0.141 | 6,578 | 219.267 | 219.126 |
| **sd** | 0.000 | | | 0.012 | 81.105 | 2.703 | 2.704 |
| **A to B** | 0.000 | 1.000 | | | | 0.000 | |
| **sd** | 0.000 | | | | | 0.000 | |
| **Beta** | 0.000 | 1.000 | 1.000 | 0.485 | 2,950 | 98.333 | 97.848 |
| **sd** | 0.000 | | | 0.022 | 54.314 | 1.810 | 1.811 |

| | Net Activity dpm | LLD dpm | MDC pCi/l | MPC pCi/l | Net Concentration * pCi/l | Conc / MPC Ratio |
|---|---|---|---|---|---|---|
| **Alpha** | 0.000 | 0.000 | 0.000 | 1.000 | 0.000 ± 0.000 | 0.000 |
| **sd** | 0.000 | | | | 0.000 | |
| **Beta** | 0.000 | 0.000 | 0.000 | 1.000 | 0.000 ± 0.000 | 0.000 |
| **sd** | 0.000 | | | | 0.000 | |

*** Note: Decay Corrected** **MDC Method** Tb = Ts < 10 **Error =** .00 **x sd**

# Alpha/Beta Count Results

## Sample Activity Report

## Orange 20-23 - D

**Addr:** 23

**Sample ID** ICVABT-181198; A2

**Repeat** 23

**Carrier No.** 0

**Batch ID** m153007

**Count Method** Gross Alpha Beta

**Detector Volts** 1515

| | | | |
|---|---|---|---|
| **Sample Qty** | 0 ***l*** | **sd** | 0 ***l*** |
| **Residual Wt** | 0 ***mg*** | **sd** | 0 ***mg*** |

**Count Began** 1/7/2016 7:31:15 PM **Collection Date 1** 1/1/1900 **Half Life** 0.00 ***days***

**Count Ended** 1/7/2016 8:01:18 PM **Collection Date 2** 1/1/1900 **Decay Factor** 1.000

**Sample Count Time** 30.00 ***mins*** **Background Count Time** 1,000.00 ***mins***

| | Efficiency % | Attenuation Factor | Activity Divisor | Background cpm | Gross counts | Gross cpm | Net cpm |
|---|---|---|---|---|---|---|---|
| **Alpha** | 0.000 | 1.000 | 1.000 | 0.141 | 8,180 | 272.667 | 272.526 |
| **sd** | 0.000 | | | 0.012 | 90.443 | 3.015 | 3.015 |
| **A to B** | 0.000 | 1.000 | | | | 0.000 | |
| **sd** | 0.000 | | | | | 0.000 | |
| **Beta** | 0.000 | 1.000 | 1.000 | 0.485 | 3,305 | 110.167 | 109.682 |
| **sd** | 0.000 | | | 0.022 | 57.489 | 1.916 | 1.916 |

| | Net Activity dpm | LLD dpm | MDC pCi/l | MPC pCi/l | Net Concentration * pCi/l | Conc / MPC Ratio |
|---|---|---|---|---|---|---|
| **Alpha** | 0.000 | 0.000 | 0.000 | 1.000 | 0.000 ± 0.000 | 0.000 |
| **sd** | 0.000 | | | | 0.000 | |
| **Beta** | 0.000 | 0.000 | 0.000 | 1.000 | 0.000 ± 0.000 | 0.000 |
| **sd** | 0.000 | | | | 0.000 | |

*** Note: Decay Corrected** **MDC Method** Tb = Ts < 10 **Error =** .00 **x sd**

# Alpha/Beta Count Results

## Sample Activity Report

## Orange 20-23 - D

**Addr:** 23

**Sample ID** ICVABT-181198; A1

**Repeat** 24

**Carrier No.** 0

**Batch ID** m153007

**Count Method** Gross Alpha Beta

**Detector Volts** 1515

| | | | |
|---|---|---|---|
| **Sample Qty** | 0 ***l*** | **sd** | 0 ***l*** |
| **Residual Wt** | 0 ***mg*** | **sd** | 0 ***mg*** |

**Count Began** 1/7/2016 10:48:24 PM **Collection Date 1** 1/1/1900 **Half Life** 0.00 ***days***

**Count Ended** 1/7/2016 11:18:56 PM **Collection Date 2** 1/1/1900 **Decay Factor** 1.000

**Sample Count Time** 30.00 ***mins*** **Background Count Time** 1,000.00 ***mins***

| | Efficiency % | Attenuation Factor | Activity Divisor | Background cpm | Gross counts | Gross cpm | Net cpm |
|---|---|---|---|---|---|---|---|
| **Alpha** | 0.000 | 1.000 | 1.000 | 0.141 | 12,626 | 420.867 | 420.726 |
| **sd** | 0.000 | | | 0.012 | 112.365 | 3.746 | 3.746 |
| **A to B** | 0.000 | 1.000 | | | | 0.000 | |
| **sd** | 0.000 | | | | | 0.000 | |
| **Beta** | 0.000 | 1.000 | 1.000 | 0.485 | 4,352 | 145.067 | 144.582 |
| **sd** | 0.000 | | | 0.022 | 65.970 | 2.199 | 2.199 |

| | Net Activity dpm | LLD dpm | MDC pCi/l | MPC pCi/l | Net Concentration * pCi/l | Conc / MPC Ratio |
|---|---|---|---|---|---|---|
| **Alpha** | 0.000 | 0.000 | 0.000 | 1.000 | 0.000 ± 0.000 | 0.000 |
| **sd** | 0.000 | | | | 0.000 | |
| **Beta** | 0.000 | 0.000 | 0.000 | 1.000 | 0.000 ± 0.000 | 0.000 |
| **sd** | 0.000 | | | | 0.000 | |

*** Note: Decay Corrected** **MDC Method** Tb = Ts < 10 **Error =** .00 **x sd**

# ICV is for Gross Beta
# Strontium 90
# and
# Total Strontium

| Purple Beta ICV 2013 | | | | |
|---|---|---|---|---|
| Detector | Low Mass Recovery | Medium Mass Recovery | High Mass Recovery | Mean Recovery |
| 0 | 97.22% | 100.50% | 100.16% | 99.29% |

Beta Activity 2007.869 pCi

**Standard ID**

Strontium 90
Sr-90_00018 #51512
Cert# 92352 Ref. date 11/29/12

| | | | |
|---|---|---|---|
| Initial Activity: | 2238.7 | dpm | |
| Reference Date: | 11/29/2012 | | |
| Count Date: | 2/4/2013 | | (or date at which you wish to determine activity) |
| Elapsed Time: | 67.000 | days | |
| Half Life: | 10409.625 | days | |
| Exponential Term: | 0.995548598 | | |
| Corrected Activity: | 2228.734647 | dpm | |
| Decay Activity (Sr/Y-90) | 4457.469295 | dpm | 2007.869 pCi |

# Alpha/Beta Count Results

## Sample Activity Report

## Purple 0-3 - A

**Addr:** 0

**Sample ID** ICVABT-51512;Beta 1

**Repeat** 19

**Carrier No.** 0

**Batch ID** m122640

**Count Method** Gross Alpha Beta

**Detector Volts** 1515

**Sample Qty** 0 ***Sample*** **sd** 0 ***Sample***

**Residual Wt** 0 ***mg*** **sd** 0 ***mg***

**Count Began** 2/4/2013 10:27:35 PM **Collection Date 1** 1/1/1900 **Half Life** 0.00 ***days***

**Count Ended** 2/4/2013 10:32:38 PM **Collection Date 2** 1/1/1900 **Decay Factor** 1.000

**Sample Count Time** 5.00 ***mins*** **Background Count Time** 1,000.00 ***mins***

| | Efficiency % | Attenuation Factor | Activity Divisor | Background cpm | Gross counts | Gross cpm | Net cpm |
|---|---|---|---|---|---|---|---|
| **Alpha** | 0.000 | 1.000 | 1.000 | 0.087 | 107 | 21.400 | 21.313 |
| **sd** | 0.000 | | | 0.009 | 10.344 | 2.069 | 2.069 |
| **A to B** | 0.000 | 1.000 | | | | 0.000 | |
| **sd** | 0.000 | | | | | 0.000 | |
| **Beta** | 0.000 | 1.000 | 1.000 | 0.405 | 9,402 | 1,880.400 | 1,879.995 |
| **sd** | 0.000 | | | 0.020 | 96.964 | 19.393 | 19.393 |

| | Net Activity dpm | LLD dpm | MDC DPM | MPC DPM | Net Concentration * DPM | Conc / MPC Ratio |
|---|---|---|---|---|---|---|
| **Alpha** | 0.000 | 0.000 | 0.000 | 0.000 | 0.000 ± 0.000 | 0.000 |
| **sd** | 0.000 | | | | 0.000 | |
| **Beta** | 0.000 | 0.000 | 0.000 | 0.000 | 0.000 ± 0.000 | 0.000 |
| **sd** | 0.000 | | | | 0.000 | |

*** Note: Decay Corrected** **MDC Method** Currie **Error =** .00 **x sd**

# Alpha/Beta Count Results

## Sample Activity Report

## Purple 0-3 - A

**Addr:** 0

**Sample ID** ICVABT-51512;Beta 3

**Repeat** 43

**Carrier No.** 0

**Batch ID** m122640

**Count Method** Gross Alpha Beta

**Detector Volts** 1515

**Sample Qty** 0 ***Sample*** **sd** 0 ***Sample***

**Residual Wt** 0 ***mg*** **sd** 0 ***mg***

**Count Began** 2/4/2013 11:10:35 PM **Collection Date 1** 1/1/1900 **Half Life** 0.00 ***days***

**Count Ended** 2/4/2013 11:15:40 PM **Collection Date 2** 1/1/1900 **Decay Factor** 1.000

**Sample Count Time** 5.00 ***mins*** **Background Count Time** 1,000.00 ***mins***

| | Efficiency % | Attenuation Factor | Activity Divisor | Background cpm | Gross counts | Gross cpm | Net cpm |
|---|---|---|---|---|---|---|---|
| **Alpha** | 0.000 | 1.000 | 1.000 | 0.087 | 104 | 20.800 | 20.713 |
| **sd** | 0.000 | | | 0.009 | 10.198 | 2.040 | 2.040 |
| **A to B** | 0.000 | 1.000 | | | | 0.000 | |
| **sd** | 0.000 | | | | | 0.000 | |
| **Beta** | 0.000 | 1.000 | 1.000 | 0.405 | 8,700 | 1,740.000 | 1,739.595 |
| **sd** | 0.000 | | | 0.020 | 93.274 | 18.655 | 18.655 |

| | Net Activity dpm | LLD dpm | MDC DPM | MPC DPM | Net Concentration * DPM | Conc / MPC Ratio |
|---|---|---|---|---|---|---|
| **Alpha** | 0.000 | 0.000 | 0.000 | 0.000 | 0.000 ± 0.000 | 0.000 |
| **sd** | 0.000 | | | | 0.000 | |
| **Beta** | 0.000 | 0.000 | 0.000 | 0.000 | 0.000 ± 0.000 | 0.000 |
| **sd** | 0.000 | | | | 0.000 | |

*** Note: Decay Corrected** **MDC Method** Currie **Error =** .00 **x sd**

# Alpha/Beta Count Results

## Sample Activity Report

## Purple 0-3 - A

**Addr:** 0

**Sample ID** ICVABT-51512;Beta 2

**Repeat** 26

**Carrier No.** 0

**Batch ID** m122640

**Count Method** Gross Alpha Beta

**Detector Volts** 1515

**Sample Qty** 0 ***Sample*** **sd** 0 ***Sample***

**Residual Wt** 0 ***mg*** **sd** 0 ***mg***

**Count Began** 2/4/2013 11:19:39 PM **Collection Date 1** 1/1/1900 **Half Life** 0.00 ***days***

**Count Ended** 2/4/2013 11:24:41 PM **Collection Date 2** 1/1/1900 **Decay Factor** 1.000

**Sample Count Time** 5.00 ***mins*** **Background Count Time** 1,000.00 ***mins***

| | Efficiency % | Attenuation Factor | Activity Divisor | Background cpm | Gross counts | Gross cpm | Net cpm |
|---|---|---|---|---|---|---|---|
| **Alpha** | 0.000 | 1.000 | 1.000 | 0.087 | 90 | 18.000 | 17.913 |
| **sd** | 0.000 | | | 0.009 | 9.487 | 1.897 | 1.897 |
| **A to B** | 0.000 | 1.000 | | | | 0.000 | |
| **sd** | 0.000 | | | | | 0.000 | |
| **Beta** | 0.000 | 1.000 | 1.000 | 0.405 | 9,154 | 1,830.800 | 1,830.395 |
| **sd** | 0.000 | | | 0.020 | 95.677 | 19.135 | 19.135 |

| | Net Activity dpm | LLD dpm | MDC DPM | MPC DPM | Net Concentration * DPM | Conc / MPC Ratio |
|---|---|---|---|---|---|---|
| **Alpha** | 0.000 | 0.000 | 0.000 | 0.000 | 0.000 ± 0.000 | 0.000 |
| **sd** | 0.000 | | | | 0.000 | |
| **Beta** | 0.000 | 0.000 | 0.000 | 0.000 | 0.000 ± 0.000 | 0.000 |
| **sd** | 0.000 | | | | 0.000 | |

*** Note: Decay Corrected** **MDC Method** Currie **Error =** .00 **x sd**

# ICV is for Gross Alpha

| Purple Alpha ICV 2016 | | | | |
|---|---|---|---|---|
| | | | | |
| | Low Mass | Medium Mass | High Mass | Mean |
| Detector | Recovery | Recovery | Recovery | Recovery |
| 0 | 96.20% | 96.68% | 95.70% | 102.24% |

**Standard ID**

Thorium-230
Th-230_00019
Container#: 181198
Ref. date 08/08/2013
Activity: 5.0185 pCi/mL

Prep Batch: M163021
Date counted: 1/17/16

| | Low Mass | Medium Mass | High Mass |
|---|---|---|---|
| | 0.161g | 0.0552g | 0.0777g |
| Detector | Activity (pCi/mL) | Activity (pCi/mL) | Activity (pCi/mL) |
| 0 | 5.22E+00 | 5.19E+00 | 5.24E+00 |

# Alpha/Beta Count Results

## Sample Activity Report

## Purple 0-3 - A

**Addr:** 0

**Sample ID** ICVABT-181198;A1

**Repeat** 1

**Carrier No.** 0

**Batch ID** m163021

**Count Method** Gross Alpha Beta

**Detector Volts** 1515

**Sample Qty** 0 ***Sample*** **sd** 0 ***Sample***

**Residual Wt** 0 ***mg*** **sd** 0 ***mg***

**Count Began** 1/17/2016 5:23:51 PM **Collection Date 1** 1/1/1900 **Half Life** 0.00 ***days***

**Count Ended** 1/17/2016 5:53:56 PM **Collection Date 2** 1/1/1900 **Decay Factor** 1.000

**Sample Count Time** 30.00 ***mins*** **Background Count Time** 1,000.00 ***mins***

| | Efficiency % | Attenuation Factor | Activity Divisor | Background cpm | Gross counts | Gross cpm | Net cpm |
|---|---|---|---|---|---|---|---|
| **Alpha** | 0.000 | 1.000 | 1.000 | 0.145 | 13,346 | 444.867 | 444.722 |
| **sd** | 0.000 | | | 0.012 | 115.525 | 3.851 | 3.851 |
| **A to B** | 0.000 | 1.000 | | | | 0.000 | |
| **sd** | 0.000 | | | | | 0.000 | |
| **Beta** | 0.000 | 1.000 | 1.000 | 0.509 | 4,118 | 137.267 | 136.758 |
| **sd** | 0.000 | | | 0.023 | 64.172 | 2.139 | 2.139 |

| | Net Activity dpm | LLD dpm | MDC DPM | MPC DPM | Net Concentration * DPM | Conc / MPC Ratio |
|---|---|---|---|---|---|---|
| **Alpha** | 0.000 | 0.000 | 0.000 | 0.000 | 0.000 ± 0.000 | 0.000 |
| **sd** | 0.000 | | | | 0.000 | |
| **Beta** | 0.000 | 0.000 | 0.000 | 0.000 | 0.000 ± 0.000 | 0.000 |
| **sd** | 0.000 | | | | 0.000 | |

*** Note: Decay Corrected** **MDC Method** Currie **Error =** .00 **x sd**

# Alpha/Beta Count Results

## Sample Activity Report

## Purple 0-3 - A

**Addr:** 0

**Sample ID** ICVABT-181198;A3

**Repeat** 7

**Carrier No.** 0

**Batch ID** m163021

**Count Method** Gross Alpha Beta

**Detector Volts** 1515

**Sample Qty** 0 ***Sample*** **sd** 0 ***Sample***

**Residual Wt** 0 ***mg*** **sd** 0 ***mg***

**Count Began** 1/17/2016 10:54:54 PM **Collection Date 1** 1/1/1900 **Half Life** 0.00 ***days***

**Count Ended** 1/17/2016 11:24:57 PM **Collection Date 2** 1/1/1900 **Decay Factor** 1.000

**Sample Count Time** 30.00 ***mins*** **Background Count Time** 1,000.00 ***mins***

| | Efficiency % | Attenuation Factor | Activity Divisor | Background cpm | Gross counts | Gross cpm | Net cpm |
|---|---|---|---|---|---|---|---|
| **Alpha** | 0.000 | 1.000 | 1.000 | 0.145 | 7,446 | 248.200 | 248.055 |
| **sd** | 0.000 | | | 0.012 | 86.290 | 2.876 | 2.876 |
| **A to B** | 0.000 | 1.000 | | | | 0.000 | |
| **sd** | 0.000 | | | | | 0.000 | |
| **Beta** | 0.000 | 1.000 | 1.000 | 0.509 | 2,702 | 90.067 | 89.558 |
| **sd** | 0.000 | | | 0.023 | 51.981 | 1.733 | 1.733 |

| | Net Activity dpm | LLD dpm | MDC DPM | MPC DPM | Net Concentration * DPM | Conc / MPC Ratio |
|---|---|---|---|---|---|---|
| **Alpha** | 0.000 | 0.000 | 0.000 | 0.000 | 0.000 ± 0.000 | 0.000 |
| **sd** | 0.000 | | | | 0.000 | |
| **Beta** | 0.000 | 0.000 | 0.000 | 0.000 | 0.000 ± 0.000 | 0.000 |
| **sd** | 0.000 | | | | 0.000 | |

*** Note: Decay Corrected** **MDC Method** Currie **Error =** .00 **x sd**

# Alpha/Beta Count Results

## Sample Activity Report

## Purple 0-3 - A

**Addr:** 0

**Sample ID** ICVABT-181198;A2

**Repeat** 8

**Carrier No.** 0

**Batch ID** m163021

**Count Method** Gross Alpha Beta

**Detector Volts** 1515

**Sample Qty** 0 ***Sample*** **sd** 0 ***Sample***

**Residual Wt** 0 ***mg*** **sd** 0 ***mg***

**Count Began** 1/17/2016 11:37:46 PM **Collection Date 1** 1/1/1900 **Half Life** 0.00 ***days***

**Count Ended** 1/18/2016 12:07:49 AM **Collection Date 2** 1/1/1900 **Decay Factor** 1.000

**Sample Count Time** 30.00 ***mins*** **Background Count Time** 1,000.00 ***mins***

| | Efficiency % | Attenuation Factor | Activity Divisor | Background cpm | Gross counts | Gross cpm | Net cpm |
|---|---|---|---|---|---|---|---|
| **Alpha** | 0.000 | 1.000 | 1.000 | 0.145 | 9,026 | 300.867 | 300.722 |
| **sd** | 0.000 | | | 0.012 | 95.005 | 3.167 | 3.167 |
| **A to B** | 0.000 | 1.000 | | | | 0.000 | |
| **sd** | 0.000 | | | | | 0.000 | |
| **Beta** | 0.000 | 1.000 | 1.000 | 0.509 | 3,022 | 100.733 | 100.224 |
| **sd** | 0.000 | | | 0.023 | 54.973 | 1.832 | 1.833 |

| | Net Activity dpm | LLD dpm | MDC DPM | MPC DPM | Net Concentration * DPM | Conc / MPC Ratio |
|---|---|---|---|---|---|---|
| **Alpha** | 0.000 | 0.000 | 0.000 | 0.000 | 0.000 ± 0.000 | 0.000 |
| **sd** | 0.000 | | | | 0.000 | |
| **Beta** | 0.000 | 0.000 | 0.000 | 0.000 | 0.000 ± 0.000 | 0.000 |
| **sd** | 0.000 | | | | 0.000 | |

*** Note: Decay Corrected** **MDC Method** Currie **Error =** .00 **x sd**

# Ra-226 Calibration Verifications

# Ra226 ICV

| Blue - Ra226 ICV 2019 | | | | |
|---|---|---|---|---|
| | Low | Medium | High | Mean |
| | Mass | Mass | Mass | Recovery |
| Detector | Recovery | Recovery | Recovery | |
| 0 | 87.63% | 96.94% | 90.22% | 91.60% |

**Standard ID**

Ra-226
Ra-226_00025 #1063071
Cert # 104858
Added: 1mL
Activity 3.7839E+06 pCi/mL

Prep Batch: 291970 7/28/2019

| Detector | 1 | Activity | Units |
|---|---|---|---|
| 0 | Low Mass (0.0132g) | 3.316E+06 | pCi/mL |

| 2 | Activity | Units |
|---|---|---|
| Medium Mass (0.0271g) | 3.668E+06 | pCi/mL |

| 3 | Activity | Units |
|---|---|---|
| High Mass (0.0498g) | 3.414E+06 | pCi/mL |

# Alpha/Beta Count Results

## Sample Activity Report

## Blue 0-3 - A

**Addr:** 0

**Sample ID** ICVRa6-1063071;Ra1

**Repeat** 1

**Carrier No.** 0

**Batch ID** 291970

**Count Method** Gross Alpha Beta

**Detector Volts** 1515

**Sample Qty** 0 ***Sample*** **sd** 0 ***Sample***

**Residual Wt** 0 ***mg*** **sd** 0 ***mg***

**Count Began** 7/28/2019 11:31:48 AM **Collection Date 1** 1/1/1900 **Half Life** 0.00 ***days***

**Count Ended** 7/28/2019 11:36:57 AM **Collection Date 2** 1/1/1900 **Decay Factor** 1.000

**Sample Count Time** 5.00 ***mins*** **Background Count Time** 1,000.00 ***mins***

| | Efficiency % | Attenuation Factor | Activity Divisor | Background cpm | Gross counts | Gross cpm | Net cpm |
|---|---|---|---|---|---|---|---|
| **Alpha** | 0.000 | 1.000 | 1.000 | 0.140 | 20,601 | 4,120.200 | 4,120.060 |
| **sd** | 0.000 | | | 0.012 | 143.530 | 28.706 | 28.706 |
| **A to B** | 0.000 | 1.000 | | | | 0.000 | |
| **sd** | 0.000 | | | | | 0.000 | |
| **Beta** | 0.000 | 1.000 | 1.000 | 0.442 | 24,827 | 4,965.400 | 4,964.958 |
| **sd** | 0.000 | | | 0.021 | 157.566 | 31.513 | 31.513 |

| | Net Activity dpm | LLD dpm | MDC DPM | MPC DPM | Net Concentration * DPM | Conc / MPC Ratio |
|---|---|---|---|---|---|---|
| **Alpha** | 0.000 | 0.000 | 0.000 | 0.000 | 0.000 ± 0.000 | 0.000 |
| **sd** | 0.000 | | | | 0.000 | |
| **Beta** | 0.000 | 0.000 | 0.000 | 0.000 | 0.000 ± 0.000 | 0.000 |
| **sd** | 0.000 | | | | 0.000 | |

*** Note: Decay Corrected** **MDC Method** Currie **Error =** .00 **x sd**

# Alpha/Beta Count Results

## Sample Activity Report

## Blue 0-3 - A

**Addr:** 0

**Sample ID** ICVRa6-1063071;Ra3

**Repeat** 7

**Carrier No.** 0

**Batch ID** 291970

**Count Method** Gross Alpha Beta

**Detector Volts** 1515

**Sample Qty** 0 ***Sample*** **sd** 0 ***Sample***

**Residual Wt** 0 ***mg*** **sd** 0 ***mg***

**Count Began** 7/28/2019 12:15:29 PM **Collection Date 1** 1/1/1900 **Half Life** 0.00 ***days***

**Count Ended** 7/28/2019 12:20:40 PM **Collection Date 2** 1/1/1900 **Decay Factor** 1.000

**Sample Count Time** 5.00 ***mins*** **Background Count Time** 1,000.00 ***mins***

| | Efficiency % | Attenuation Factor | Activity Divisor | Background cpm | Gross counts | Gross cpm | Net cpm |
|---|---|---|---|---|---|---|---|
| **Alpha** | 0.000 | 1.000 | 1.000 | 0.140 | 25,381 | 5,076.200 | 5,076.060 |
| **sd** | 0.000 | | | 0.012 | 159.314 | 31.863 | 31.863 |
| **A to B** | 0.000 | 1.000 | | | | 0.000 | |
| **sd** | 0.000 | | | | | 0.000 | |
| **Beta** | 0.000 | 1.000 | 1.000 | 0.442 | 34,915 | 6,983.000 | 6,982.558 |
| **sd** | 0.000 | | | 0.021 | 186.856 | 37.371 | 37.371 |

| | Net Activity dpm | LLD dpm | MDC DPM | MPC DPM | Net Concentration * DPM | Conc / MPC Ratio |
|---|---|---|---|---|---|---|
| **Alpha** | 0.000 | 0.000 | 0.000 | 0.000 | 0.000 ± 0.000 | 0.000 |
| **sd** | 0.000 | | | | 0.000 | |
| **Beta** | 0.000 | 0.000 | 0.000 | 0.000 | 0.000 ± 0.000 | 0.000 |
| **sd** | 0.000 | | | | 0.000 | |

*** Note: Decay Corrected** **MDC Method** Currie **Error =** .00 **x sd**

# Alpha/Beta Count Results

## Sample Activity Report

## Blue 0-3 - A

**Addr:** 0

**Sample ID** ICVRa6-1063071;Ra2

**Repeat** 8

**Carrier No.** 0

**Batch ID** 291970

**Count Method** Gross Alpha Beta

**Detector Volts** 1515

**Sample Qty** 0 ***Sample*** **sd** 0 ***Sample***

**Residual Wt** 0 ***mg*** **sd** 0 ***mg***

**Count Began** 7/28/2019 1:05:10 PM **Collection Date 1** 1/1/1900 **Half Life** 0.00 ***days***

**Count Ended** 7/28/2019 1:10:16 PM **Collection Date 2** 1/1/1900 **Decay Factor** 1.000

**Sample Count Time** 5.00 ***mins*** **Background Count Time** 1,000.00 ***mins***

| | Efficiency % | Attenuation Factor | Activity Divisor | Background cpm | Gross counts | Gross cpm | Net cpm |
|---|---|---|---|---|---|---|---|
| **Alpha** | 0.000 | 1.000 | 1.000 | 0.140 | 26,049 | 5,209.800 | 5,209.660 |
| **sd** | 0.000 | | | 0.012 | 161.397 | 32.279 | 32.279 |
| **A to B** | 0.000 | 1.000 | | | | 0.000 | |
| **sd** | 0.000 | | | | | 0.000 | |
| **Beta** | 0.000 | 1.000 | 1.000 | 0.442 | 31,121 | 6,224.200 | 6,223.758 |
| **sd** | 0.000 | | | 0.021 | 176.411 | 35.282 | 35.282 |

| | Net Activity dpm | LLD dpm | MDC DPM | MPC DPM | Net Concentration * DPM | Conc / MPC Ratio |
|---|---|---|---|---|---|---|
| **Alpha** | 0.000 | 0.000 | 0.000 | 0.000 | 0.000 ± 0.000 | 0.000 |
| **sd** | 0.000 | | | | 0.000 | |
| **Beta** | 0.000 | 0.000 | 0.000 | 0.000 | 0.000 ± 0.000 | 0.000 |
| **sd** | 0.000 | | | | 0.000 | |

*** Note: Decay Corrected** **MDC Method** Currie **Error =** .00 **x sd**

# Ra226 ICV

| Blue - Ra226 ICV 2019 | | | | |
|---|---|---|---|---|
| | Low | Medium | High | Mean |
| | Mass | Mass | Mass | Recovery |
| Detector | Recovery | Recovery | Recovery | |
| 1 | 89.46% | 96.91% | 89.51% | 91.96% |

**Standard ID**

Ra-226
Ra-226_00025 #1063071
Cert # 104858
Added: 1mL
Activity 3.7839E+06 pCi/mL

Prep Batch: 291970 7/28/2019

| Detector | 1 | Activity | Units |
|---|---|---|---|
| 1 | Low Mass (0.0132g) | 3.385E+06 | pCi/mL |

| 2 | Activity | Units |
|---|---|---|
| Medium Mass (0.0271g) | 3.667E+06 | pCi/mL |

| 3 | Activity | Units |
|---|---|---|
| High Mass (0.0498g) | 3.387E+06 | pCi/mL |

# Alpha/Beta Count Results

## Sample Activity Report

## Blue 0-3 - B

**Addr:** 1

**Sample ID** ICVRa6-1063071;Ra2

**Repeat** 1

**Carrier No.** 0

**Batch ID** 291970

**Count Method** Gross Alpha Beta

**Detector Volts** 1515

**Sample Qty** 0 ***Sample*** **sd** 0 ***Sample***

**Residual Wt** 0 ***mg*** **sd** 0 ***mg***

**Count Began** 7/28/2019 11:31:54 AM **Collection Date 1** 1/1/1900 **Half Life** 0.00 ***days***

**Count Ended** 7/28/2019 11:37:04 AM **Collection Date 2** 1/1/1900 **Decay Factor** 1.000

**Sample Count Time** 5.00 ***mins*** **Background Count Time** 1,000.00 ***mins***

| | Efficiency % | Attenuation Factor | Activity Divisor | Background cpm | Gross counts | Gross cpm | Net cpm |
|---|---|---|---|---|---|---|---|
| **Alpha** | 0.000 | 1.000 | 1.000 | 0.216 | 25,576 | 5,115.200 | 5,114.984 |
| **sd** | 0.000 | | | 0.015 | 159.925 | 31.985 | 31.985 |
| **A to B** | 0.000 | 1.000 | | | | 0.000 | |
| **sd** | 0.000 | | | | | 0.000 | |
| **Beta** | 0.000 | 1.000 | 1.000 | 0.434 | 31,101 | 6,220.200 | 6,219.766 |
| **sd** | 0.000 | | | 0.021 | 176.355 | 35.271 | 35.271 |

| | Net Activity dpm | LLD dpm | MDC DPM | MPC DPM | Net Concentration * DPM | Conc / MPC Ratio |
|---|---|---|---|---|---|---|
| **Alpha** | 0.000 | 0.000 | 0.000 | 0.000 | 0.000 ± 0.000 | 0.000 |
| **sd** | 0.000 | | | | 0.000 | |
| **Beta** | 0.000 | 0.000 | 0.000 | 0.000 | 0.000 ± 0.000 | 0.000 |
| **sd** | 0.000 | | | | 0.000 | |

*** Note: Decay Corrected** **MDC Method** Currie **Error =** .00 **x sd**

# Alpha/Beta Count Results

## Sample Activity Report

## Blue 0-3 - B

**Addr:** 1

**Sample ID** ICVRa6-1063071;Ra1

**Repeat** 2

**Carrier No.** 0

**Batch ID** 291970

**Count Method** Gross Alpha Beta

**Detector Volts** 1515

**Sample Qty** 0 ***Sample*** **sd** 0 ***Sample***

**Residual Wt** 0 ***mg*** **sd** 0 ***mg***

**Count Began** 7/28/2019 11:38:29 AM **Collection Date 1** 1/1/1900 **Half Life** 0.00 ***days***

**Count Ended** 7/28/2019 11:43:40 AM **Collection Date 2** 1/1/1900 **Decay Factor** 1.000

**Sample Count Time** 5.00 ***mins*** **Background Count Time** 1,000.00 ***mins***

| | Efficiency % | Attenuation Factor | Activity Divisor | Background cpm | Gross counts | Gross cpm | Net cpm |
|---|---|---|---|---|---|---|---|
| **Alpha** | 0.000 | 1.000 | 1.000 | 0.216 | 20,595 | 4,119.000 | 4,118.784 |
| **sd** | 0.000 | | | 0.015 | 143.510 | 28.702 | 28.702 |
| **A to B** | 0.000 | 1.000 | | | | 0.000 | |
| **sd** | 0.000 | | | | | 0.000 | |
| **Beta** | 0.000 | 1.000 | 1.000 | 0.434 | 24,378 | 4,875.600 | 4,875.166 |
| **sd** | 0.000 | | | 0.021 | 156.135 | 31.227 | 31.227 |

| | Net Activity dpm | LLD dpm | MDC DPM | MPC DPM | Net Concentration * DPM | Conc / MPC Ratio |
|---|---|---|---|---|---|---|
| **Alpha** | 0.000 | 0.000 | 0.000 | 0.000 | 0.000 ± 0.000 | 0.000 |
| **sd** | 0.000 | | | | 0.000 | |
| **Beta** | 0.000 | 0.000 | 0.000 | 0.000 | 0.000 ± 0.000 | 0.000 |
| **sd** | 0.000 | | | | 0.000 | |

*** Note: Decay Corrected** **MDC Method** Currie **Error =** .00 **x sd**

# Alpha/Beta Count Results

## Sample Activity Report

## Blue 0-3 - B

**Addr:** 1

**Sample ID** ICVRa6-1063071;Ra3

**Repeat** 8

**Carrier No.** 0

**Batch ID** 291970

**Count Method** Gross Alpha Beta

**Detector Volts** 1515

**Sample Qty** 0 ***Sample*** **sd** 0 ***Sample***

**Residual Wt** 0 ***mg*** **sd** 0 ***mg***

**Count Began** 7/28/2019 1:05:15 PM **Collection Date 1** 1/1/1900 **Half Life** 0.00 ***days***

**Count Ended** 7/28/2019 1:10:24 PM **Collection Date 2** 1/1/1900 **Decay Factor** 1.000

**Sample Count Time** 5.00 ***mins*** **Background Count Time** 1,000.00 ***mins***

| | Efficiency % | Attenuation Factor | Activity Divisor | Background cpm | Gross counts | Gross cpm | Net cpm |
|---|---|---|---|---|---|---|---|
| **Alpha** | 0.000 | 1.000 | 1.000 | 0.216 | 24,856 | 4,971.200 | 4,970.984 |
| **sd** | 0.000 | | | 0.015 | 157.658 | 31.532 | 31.532 |
| **A to B** | 0.000 | 1.000 | | | | 0.000 | |
| **sd** | 0.000 | | | | | 0.000 | |
| **Beta** | 0.000 | 1.000 | 1.000 | 0.434 | 34,641 | 6,928.200 | 6,927.766 |
| **sd** | 0.000 | | | 0.021 | 186.121 | 37.224 | 37.224 |

| | Net Activity dpm | LLD dpm | MDC DPM | MPC DPM | Net Concentration * DPM | Conc / MPC Ratio |
|---|---|---|---|---|---|---|
| **Alpha** | 0.000 | 0.000 | 0.000 | 0.000 | 0.000 ± 0.000 | 0.000 |
| **sd** | 0.000 | | | | 0.000 | |
| **Beta** | 0.000 | 0.000 | 0.000 | 0.000 | 0.000 ± 0.000 | 0.000 |
| **sd** | 0.000 | | | | 0.000 | |

*** Note: Decay Corrected** **MDC Method** Currie **Error =** .00 **x sd**

# Ra226 ICV

| Blue - Ra226 ICV 2019 | | | | |
|---|---|---|---|---|
| | Low | Medium | High | Mean |
| | Mass | Mass | Mass | Recovery |
| Detector | Recovery | Recovery | Recovery | |
| 3 | 88.43% | 96.65% | 90.49% | 91.85% |

**Standard ID**

Ra-226
Ra-226_00025 #1063071
Cert # 104858
Added: 1mL
Activity 3.7839E+06 pCi/mL

Prep Batch: 291970 7/28/2019

| Detector | 1 | Activity | Units |
|---|---|---|---|
| 3 | Low Mass (0.0132g) | 3.346E+06 | pCi/mL |

| 2 | Activity | Units |
|---|---|---|
| Medium Mass (0.0271g) | 3.657E+06 | pCi/mL |

| 3 | Activity | Units |
|---|---|---|
| High Mass (0.0498g) | 3.424E+06 | pCi/mL |

# Alpha/Beta Count Results

## Sample Activity Report

## Blue 0-3 - D

**Addr:** 3

**Sample ID** ICVRa6-1063071;Ra3

**Repeat** 2

**Carrier No.** 0

**Batch ID** 291970

**Count Method** Gross Alpha Beta

**Detector Volts** 1515

**Sample Qty** 0 ***Sample*** **sd** 0 ***Sample***

**Residual Wt** 0 ***mg*** **sd** 0 ***mg***

**Count Began** 7/28/2019 11:38:42 AM **Collection Date 1** 1/1/1900 **Half Life** 0.00 ***days***

**Count Ended** 7/28/2019 11:43:52 AM **Collection Date 2** 1/1/1900 **Decay Factor** 1.000

**Sample Count Time** 5.00 ***mins*** **Background Count Time** 1,000.00 ***mins***

| | Efficiency % | Attenuation Factor | Activity Divisor | Background cpm | Gross counts | Gross cpm | Net cpm |
|---|---|---|---|---|---|---|---|
| **Alpha** | 0.000 | 1.000 | 1.000 | 0.086 | 25,284 | 5,056.800 | 5,056.714 |
| **sd** | 0.000 | | | 0.009 | 159.009 | 31.802 | 31.802 |
| **A to B** | 0.000 | 1.000 | | | | 0.000 | |
| **sd** | 0.000 | | | | | 0.000 | |
| **Beta** | 0.000 | 1.000 | 1.000 | 0.393 | 35,261 | 7,052.200 | 7,051.807 |
| **sd** | 0.000 | | | 0.020 | 187.779 | 37.556 | 37.556 |

| | Net Activity dpm | LLD dpm | MDC DPM | MPC DPM | Net Concentration * DPM | Conc / MPC Ratio |
|---|---|---|---|---|---|---|
| **Alpha** | 0.000 | 0.000 | 0.000 | 0.000 | 0.000 ± 0.000 | 0.000 |
| **sd** | 0.000 | | | | 0.000 | |
| **Beta** | 0.000 | 0.000 | 0.000 | 0.000 | 0.000 ± 0.000 | 0.000 |
| **sd** | 0.000 | | | | 0.000 | |

*** Note: Decay Corrected** **MDC Method** Currie **Error =** .00 **x sd**

# Alpha/Beta Count Results

## Sample Activity Report

## Blue 0-3 - D

**Addr:** 3

**Sample ID** ICVRa6-1063071;Ra2

**Repeat** 3

**Carrier No.** 0

**Batch ID** 291970

**Count Method** Gross Alpha Beta

**Detector Volts** 1515

**Sample Qty** 0 ***Sample*** **sd** 0 ***Sample***

**Residual Wt** 0 ***mg*** **sd** 0 ***mg***

**Count Began** 7/28/2019 11:44:32 AM **Collection Date 1** 1/1/1900 **Half Life** 0.00 ***days***

**Count Ended** 7/28/2019 11:49:43 AM **Collection Date 2** 1/1/1900 **Decay Factor** 1.000

**Sample Count Time** 5.00 ***mins*** **Background Count Time** 1,000.00 ***mins***

| | Efficiency % | Attenuation Factor | Activity Divisor | Background cpm | Gross counts | Gross cpm | Net cpm |
|---|---|---|---|---|---|---|---|
| **Alpha** | 0.000 | 1.000 | 1.000 | 0.086 | 25,715 | 5,143.000 | 5,142.914 |
| **sd** | 0.000 | | | 0.009 | 160.359 | 32.072 | 32.072 |
| **A to B** | 0.000 | 1.000 | | | | 0.000 | |
| **sd** | 0.000 | | | | | 0.000 | |
| **Beta** | 0.000 | 1.000 | 1.000 | 0.393 | 31,020 | 6,204.000 | 6,203.607 |
| **sd** | 0.000 | | | 0.020 | 176.125 | 35.225 | 35.225 |

| | Net Activity dpm | LLD dpm | MDC DPM | MPC DPM | Net Concentration * DPM | Conc / MPC Ratio |
|---|---|---|---|---|---|---|
| **Alpha** | 0.000 | 0.000 | 0.000 | 0.000 | 0.000 ± 0.000 | 0.000 |
| **sd** | 0.000 | | | | 0.000 | |
| **Beta** | 0.000 | 0.000 | 0.000 | 0.000 | 0.000 ± 0.000 | 0.000 |
| **sd** | 0.000 | | | | 0.000 | |

*** Note: Decay Corrected** **MDC Method** Currie **Error =** .00 **x sd**

# Alpha/Beta Count Results

## Sample Activity Report

## Blue 0-3 - D

**Addr:** 3

**Sample ID** ICVRa6-1063071;Ra1

**Repeat** 4

**Carrier No.** 0

**Batch ID** 291970

**Count Method** Gross Alpha Beta

**Detector Volts** 1515

**Sample Qty** 0 ***Sample*** **sd** 0 ***Sample***

**Residual Wt** 0 ***mg*** **sd** 0 ***mg***

**Count Began** 7/28/2019 11:50:50 AM **Collection Date 1** 1/1/1900 **Half Life** 0.00 ***days***

**Count Ended** 7/28/2019 11:55:57 AM **Collection Date 2** 1/1/1900 **Decay Factor** 1.000

**Sample Count Time** 5.00 ***mins*** **Background Count Time** 1,000.00 ***mins***

| | Efficiency % | Attenuation Factor | Activity Divisor | Background cpm | Gross counts | Gross cpm | Net cpm |
|---|---|---|---|---|---|---|---|
| **Alpha** | 0.000 | 1.000 | 1.000 | 0.086 | 20,534 | 4,106.800 | 4,106.714 |
| **sd** | 0.000 | | | 0.009 | 143.297 | 28.659 | 28.659 |
| **A to B** | 0.000 | 1.000 | | | | 0.000 | |
| **sd** | 0.000 | | | | | 0.000 | |
| **Beta** | 0.000 | 1.000 | 1.000 | 0.393 | 24,351 | 4,870.200 | 4,869.807 |
| **sd** | 0.000 | | | 0.020 | 156.048 | 31.210 | 31.210 |

| | Net Activity dpm | LLD dpm | MDC DPM | MPC DPM | Net Concentration * DPM | Conc / MPC Ratio |
|---|---|---|---|---|---|---|
| **Alpha** | 0.000 | 0.000 | 0.000 | 0.000 | 0.000 ± 0.000 | 0.000 |
| **sd** | 0.000 | | | | 0.000 | |
| **Beta** | 0.000 | 0.000 | 0.000 | 0.000 | 0.000 ± 0.000 | 0.000 |
| **sd** | 0.000 | | | | 0.000 | |

*** Note: Decay Corrected** **MDC Method** Currie **Error =** .00 **x sd**

# Ra226 ICV

| Blue - Ra226 ICV 2019 | | | | |
|---|---|---|---|---|
| | Low | Medium | High | Mean |
| | Mass | Mass | Mass | Recovery |
| Detector | Recovery | Recovery | Recovery | |
| 9 | 87.53% | 96.91% | 90.70% | 91.71% |

**Standard ID**

Ra-226
Ra-226_00025 #1063071
Cert # 104858
Added: 1mL
Activity 3.7839E+06 pCi/mL

Prep Batch: 291970 7/28-29/19

| Detector | 1 | Activity | Units |
|---|---|---|---|
| 9 | Low Mass (0.0132g) | 3.312E+06 | pCi/mL |

| 2 | Activity | Units |
|---|---|---|
| Medium Mass (0.0271g) | 3.667E+06 | pCi/mL |

| 3 | Activity | Units |
|---|---|---|
| High Mass (0.0498g) | 3.432E+06 | pCi/mL |

# Alpha/Beta Count Results

## Sample Activity Report

## Blue 8-11 - B

**Addr:** 9

**Sample ID** ICVRa6-1063071;Ra2

**Repeat** 9

**Carrier No.** 0

**Batch ID** 291970

**Count Method** Gross Alpha Beta

**Detector Volts** 1515

**Sample Qty** 0 ***Sample*** **sd** 0 ***Sample***

**Residual Wt** 0 ***mg*** **sd** 0 ***mg***

**Count Began** 7/28/2019 1:17:03 PM **Collection Date 1** 1/1/1900 **Half Life** 0.00 ***days***

**Count Ended** 7/28/2019 1:22:13 PM **Collection Date 2** 1/1/1900 **Decay Factor** 1.000

**Sample Count Time** 5.00 ***mins*** **Background Count Time** 1,000.00 ***mins***

| | Efficiency % | Attenuation Factor | Activity Divisor | Background cpm | Gross counts | Gross cpm | Net cpm |
|---|---|---|---|---|---|---|---|
| **Alpha** | 0.000 | 1.000 | 1.000 | 0.112 | 25,444 | 5,088.800 | 5,088.688 |
| **sd** | 0.000 | | | 0.011 | 159.512 | 31.902 | 31.902 |
| **A to B** | 0.000 | 1.000 | | | | 0.000 | |
| **sd** | 0.000 | | | | | 0.000 | |
| **Beta** | 0.000 | 1.000 | 1.000 | 0.383 | 31,367 | 6,273.400 | 6,273.017 |
| **sd** | 0.000 | | | 0.020 | 177.107 | 35.421 | 35.421 |

| | Net Activity dpm | LLD dpm | MDC DPM | MPC DPM | Net Concentration * DPM | Conc / MPC Ratio |
|---|---|---|---|---|---|---|
| **Alpha** | 0.000 | 0.000 | 0.000 | 0.000 | 0.000 ± 0.000 | 0.000 |
| **sd** | 0.000 | | | | 0.000 | |
| **Beta** | 0.000 | 0.000 | 0.000 | 0.000 | 0.000 ± 0.000 | 0.000 |
| **sd** | 0.000 | | | | 0.000 | |

*** Note: Decay Corrected** **MDC Method** Currie **Error =** .00 **x sd**

# Alpha/Beta Count Results

## Sample Activity Report

## Blue 8-11 - B

**Addr:** 9

**Sample ID** ICVRa6-1063071;Ra1

**Repeat** 10

**Carrier No.** 0

**Batch ID** 291970

**Count Method** Gross Alpha Beta

**Detector Volts** 1515

**Sample Qty** 0 ***Sample*** **sd** 0 ***Sample***

**Residual Wt** 0 ***mg*** **sd** 0 ***mg***

**Count Began** 7/28/2019 1:23:40 PM **Collection Date 1** 1/1/1900 **Half Life** 0.00 ***days***

**Count Ended** 7/28/2019 1:28:50 PM **Collection Date 2** 1/1/1900 **Decay Factor** 1.000

**Sample Count Time** 5.00 ***mins*** **Background Count Time** 1,000.00 ***mins***

| | Efficiency % | Attenuation Factor | Activity Divisor | Background cpm | Gross counts | Gross cpm | Net cpm |
|---|---|---|---|---|---|---|---|
| **Alpha** | 0.000 | 1.000 | 1.000 | 0.112 | 20,042 | 4,008.400 | 4,008.288 |
| **sd** | 0.000 | | | 0.011 | 141.570 | 28.314 | 28.314 |
| **A to B** | 0.000 | 1.000 | | | | 0.000 | |
| **sd** | 0.000 | | | | | 0.000 | |
| **Beta** | 0.000 | 1.000 | 1.000 | 0.383 | 24,392 | 4,878.400 | 4,878.017 |
| **sd** | 0.000 | | | 0.020 | 156.179 | 31.236 | 31.236 |

| | Net Activity dpm | LLD dpm | MDC DPM | MPC DPM | Net Concentration * DPM | Conc / MPC Ratio |
|---|---|---|---|---|---|---|
| **Alpha** | 0.000 | 0.000 | 0.000 | 0.000 | 0.000 ± 0.000 | 0.000 |
| **sd** | 0.000 | | | | 0.000 | |
| **Beta** | 0.000 | 0.000 | 0.000 | 0.000 | 0.000 ± 0.000 | 0.000 |
| **sd** | 0.000 | | | | 0.000 | |

*** Note: Decay Corrected** **MDC Method** Currie **Error =** .00 **x sd**

# Alpha/Beta Count Results

## Sample Activity Report

## Blue 8-11 - B

**Addr:** 9

**Sample ID** ICVRa6-1063071;Ra3

**Repeat** 16

**Carrier No.** 0

**Batch ID** 291970

**Count Method** Gross Alpha Beta

**Detector Volts** 1515

**Sample Qty** 0 ***Sample*** **sd** 0 ***Sample***

**Residual Wt** 0 ***mg*** **sd** 0 ***mg***

**Count Began** 7/29/2019 7:23:27 AM **Collection Date 1** 1/1/1900 **Half Life** 0.00 ***days***

**Count Ended** 7/29/2019 7:28:35 AM **Collection Date 2** 1/1/1900 **Decay Factor** 1.000

**Sample Count Time** 5.00 ***mins*** **Background Count Time** 1,000.00 ***mins***

| | Efficiency % | Attenuation Factor | Activity Divisor | Background cpm | Gross counts | Gross cpm | Net cpm |
|---|---|---|---|---|---|---|---|
| **Alpha** | 0.000 | 1.000 | 1.000 | 0.112 | 24,973 | 4,994.600 | 4,994.488 |
| **sd** | 0.000 | | | 0.011 | 158.028 | 31.606 | 31.606 |
| **A to B** | 0.000 | 1.000 | | | | 0.000 | |
| **sd** | 0.000 | | | | | 0.000 | |
| **Beta** | 0.000 | 1.000 | 1.000 | 0.383 | 35,307 | 7,061.400 | 7,061.017 |
| **sd** | 0.000 | | | 0.020 | 187.902 | 37.580 | 37.580 |

| | Net Activity dpm | LLD dpm | MDC DPM | MPC DPM | Net Concentration * DPM | Conc / MPC Ratio |
|---|---|---|---|---|---|---|
| **Alpha** | 0.000 | 0.000 | 0.000 | 0.000 | 0.000 ± 0.000 | 0.000 |
| **sd** | 0.000 | | | | 0.000 | |
| **Beta** | 0.000 | 0.000 | 0.000 | 0.000 | 0.000 ± 0.000 | 0.000 |
| **sd** | 0.000 | | | | 0.000 | |

*** Note: Decay Corrected** **MDC Method** Currie **Error =** .00 **x sd**

# Ra226 ICV

| Blue - Ra226 ICV 2019 | | | | |
|---|---|---|---|---|
| | Low | Medium | High | Mean |
| | Mass | Mass | Mass | Recovery |
| Detector | Recovery | Recovery | Recovery | |
| 12 | 87.19% | 96.46% | 88.69% | 90.78% |

**Standard ID**

Ra-226
Ra-226_00025 #1063071
Cert # 104858
Added: 1mL
Activity 3.7839E+06 pCi/mL

Prep Batch: 291970 7/28/2019

| Detector | 1 | Activity | Units |
|---|---|---|---|
| 12 | Low Mass (0.0132g) | 3.299E+06 | pCi/mL |

| 2 | Activity | Units |
|---|---|---|
| Medium Mass (0.0271g) | 3.650E+06 | pCi/mL |

| 3 | Activity | Units |
|---|---|---|
| High Mass (0.0498g) | 3.356E+06 | pCi/mL |

# Alpha/Beta Count Results

## Sample Activity Report

## Blue 12-15 - A

**Addr:** 12

**Sample ID** ICVRa6-1063071;Ra3

**Repeat** 11

**Carrier No.** 0

**Batch ID** 291970

**Count Method** Gross Alpha Beta

**Detector Volts** 1515

**Sample Qty** 0 ***Sample*** **sd** 0 ***Sample***

**Residual Wt** 0 ***mg*** **sd** 0 ***mg***

**Count Began** 7/28/2019 1:31:15 PM **Collection Date 1** 1/1/1900 **Half Life** 0.00 ***days***

**Count Ended** 7/28/2019 1:36:23 PM **Collection Date 2** 1/1/1900 **Decay Factor** 1.000

**Sample Count Time** 5.00 ***mins*** **Background Count Time** 1,000.00 ***mins***

| | Efficiency % | Attenuation Factor | Activity Divisor | Background cpm | Gross counts | Gross cpm | Net cpm |
|---|---|---|---|---|---|---|---|
| **Alpha** | 0.000 | 1.000 | 1.000 | 0.118 | 22,834 | 4,566.800 | 4,566.682 |
| **sd** | 0.000 | | | 0.011 | 151.109 | 30.222 | 30.222 |
| **A to B** | 0.000 | 1.000 | | | | 0.000 | |
| **sd** | 0.000 | | | | | 0.000 | |
| **Beta** | 0.000 | 1.000 | 1.000 | 0.357 | 37,173 | 7,434.600 | 7,434.243 |
| **sd** | 0.000 | | | 0.019 | 192.803 | 38.561 | 38.561 |

| | Net Activity dpm | LLD dpm | MDC DPM | MPC DPM | Net Concentration * DPM | Conc / MPC Ratio |
|---|---|---|---|---|---|---|
| **Alpha** | 0.000 | 0.000 | 0.000 | 0.000 | 0.000 ± 0.000 | 0.000 |
| **sd** | 0.000 | | | | 0.000 | |
| **Beta** | 0.000 | 0.000 | 0.000 | 0.000 | 0.000 ± 0.000 | 0.000 |
| **sd** | 0.000 | | | | 0.000 | |

*** Note: Decay Corrected** **MDC Method** Currie **Error =** .00 **x sd**

# Alpha/Beta Count Results

## Sample Activity Report

## Blue 12-15 - A

**Addr:** 12

**Sample ID** ICVRa6-1063071;Ra2

**Repeat** 12

**Carrier No.** 0

**Batch ID** 291970

**Count Method** Gross Alpha Beta

**Detector Volts** 1515

**Sample Qty** 0 ***Sample*** **sd** 0 ***Sample***

**Residual Wt** 0 ***mg*** **sd** 0 ***mg***

**Count Began** 7/28/2019 1:38:22 PM **Collection Date 1** 1/1/1900 **Half Life** 0.00 ***days***

**Count Ended** 7/28/2019 1:43:33 PM **Collection Date 2** 1/1/1900 **Decay Factor** 1.000

**Sample Count Time** 5.00 ***mins*** **Background Count Time** 1,000.00 ***mins***

| | Efficiency % | Attenuation Factor | Activity Divisor | Background cpm | Gross counts | Gross cpm | Net cpm |
|---|---|---|---|---|---|---|---|
| **Alpha** | 0.000 | 1.000 | 1.000 | 0.118 | 23,780 | 4,756.000 | 4,755.882 |
| **sd** | 0.000 | | | 0.011 | 154.208 | 30.842 | 30.842 |
| **A to B** | 0.000 | 1.000 | | | | 0.000 | |
| **sd** | 0.000 | | | | | 0.000 | |
| **Beta** | 0.000 | 1.000 | 1.000 | 0.357 | 33,070 | 6,614.000 | 6,613.643 |
| **sd** | 0.000 | | | 0.019 | 181.852 | 36.370 | 36.370 |

| | Net Activity dpm | LLD dpm | MDC DPM | MPC DPM | Net Concentration * DPM | Conc / MPC Ratio |
|---|---|---|---|---|---|---|
| **Alpha** | 0.000 | 0.000 | 0.000 | 0.000 | 0.000 ± 0.000 | 0.000 |
| **sd** | 0.000 | | | | 0.000 | |
| **Beta** | 0.000 | 0.000 | 0.000 | 0.000 | 0.000 ± 0.000 | 0.000 |
| **sd** | 0.000 | | | | 0.000 | |

*** Note: Decay Corrected** **MDC Method** Currie **Error =** .00 **x sd**

# Alpha/Beta Count Results

## Sample Activity Report

## Blue 12-15 - A

**Addr:** 12

**Sample ID** ICVRa6-1063071;Ra1

**Repeat** 13

**Carrier No.** 0

**Batch ID** 291970

**Count Method** Gross Alpha Beta

**Detector Volts** 1515

**Sample Qty** 0 ***Sample*** **sd** 0 ***Sample***

**Residual Wt** 0 ***mg*** **sd** 0 ***mg***

**Count Began** 7/28/2019 1:45:11 PM **Collection Date 1** 1/1/1900 **Half Life** 0.00 ***days***

**Count Ended** 7/28/2019 1:50:22 PM **Collection Date 2** 1/1/1900 **Decay Factor** 1.000

**Sample Count Time** 5.00 ***mins*** **Background Count Time** 1,000.00 ***mins***

| | Efficiency % | Attenuation Factor | Activity Divisor | Background cpm | Gross counts | Gross cpm | Net cpm |
|---|---|---|---|---|---|---|---|
| **Alpha** | 0.000 | 1.000 | 1.000 | 0.118 | 18,839 | 3,767.800 | 3,767.682 |
| **sd** | 0.000 | | | 0.011 | 137.255 | 27.451 | 27.451 |
| **A to B** | 0.000 | 1.000 | | | | 0.000 | |
| **sd** | 0.000 | | | | | 0.000 | |
| **Beta** | 0.000 | 1.000 | 1.000 | 0.357 | 25,957 | 5,191.400 | 5,191.043 |
| **sd** | 0.000 | | | 0.019 | 161.112 | 32.222 | 32.222 |

| | Net Activity dpm | LLD dpm | MDC DPM | MPC DPM | Net Concentration * DPM | Conc / MPC Ratio |
|---|---|---|---|---|---|---|
| **Alpha** | 0.000 | 0.000 | 0.000 | 0.000 | 0.000 ± 0.000 | 0.000 |
| **sd** | 0.000 | | | | 0.000 | |
| **Beta** | 0.000 | 0.000 | 0.000 | 0.000 | 0.000 ± 0.000 | 0.000 |
| **sd** | 0.000 | | | | 0.000 | |

*** Note: Decay Corrected** **MDC Method** Currie **Error =** .00 **x sd**

# Ra226 ICV

| Blue - Ra226 ICV 2019 | | | | |
|---|---|---|---|---|
| | Low | Medium | High | Mean |
| | Mass | Mass | Mass | Recovery |
| Detector | Recovery | Recovery | Recovery | |
| 13 | 89.04% | 96.99% | 90.07% | 92.03% |

**Standard ID**

Ra-226
Ra-226_00025 #1063071
Cert # 104858
Added: 1mL
Activity 3.7839E+06 pCi/mL

Prep Batch: 291970 7/28-29/19

| Detector | 1 | Activity | Units |
|---|---|---|---|
| 13 | Low Mass (0.0132g) | 3.369E+06 | pCi/mL |

| 2 | Activity | Units |
|---|---|---|
| Medium Mass (0.0271g) | 3.670E+06 | pCi/mL |

| 3 | Activity | Units |
|---|---|---|
| High Mass (0.0498g) | 3.408E+06 | pCi/mL |

# Alpha/Beta Count Results

## Sample Activity Report

## Blue 12-15 - B

**Addr:** 13

**Sample ID** ICVRa6-1063071;Ra3

**Repeat** 12

**Carrier No.** 0

**Batch ID** 291970

**Count Method** Gross Alpha Beta

**Detector Volts** 1515

**Sample Qty** 0 ***Sample*** **sd** 0 ***Sample***

**Residual Wt** 0 ***mg*** **sd** 0 ***mg***

**Count Began** 7/28/2019 1:38:27 PM **Collection Date 1** 1/1/1900 **Half Life** 0.00 ***days***

**Count Ended** 7/28/2019 1:43:40 PM **Collection Date 2** 1/1/1900 **Decay Factor** 1.000

**Sample Count Time** 5.00 ***mins*** **Background Count Time** 1,000.00 ***mins***

| | Efficiency % | Attenuation Factor | Activity Divisor | Background cpm | Gross counts | Gross cpm | Net cpm |
|---|---|---|---|---|---|---|---|
| **Alpha** | 0.000 | 1.000 | 1.000 | 0.111 | 26,009 | 5,201.800 | 5,201.689 |
| **sd** | 0.000 | | | 0.011 | 161.273 | 32.255 | 32.255 |
| **A to B** | 0.000 | 1.000 | | | | 0.000 | |
| **sd** | 0.000 | | | | | 0.000 | |
| **Beta** | 0.000 | 1.000 | 1.000 | 0.361 | 34,392 | 6,878.400 | 6,878.039 |
| **sd** | 0.000 | | | 0.019 | 185.451 | 37.090 | 37.090 |

| | Net Activity dpm | LLD dpm | MDC DPM | MPC DPM | Net Concentration * DPM | Conc / MPC Ratio |
|---|---|---|---|---|---|---|
| **Alpha** | 0.000 | 0.000 | 0.000 | 0.000 | 0.000 ± 0.000 | 0.000 |
| **sd** | 0.000 | | | | 0.000 | |
| **Beta** | 0.000 | 0.000 | 0.000 | 0.000 | 0.000 ± 0.000 | 0.000 |
| **sd** | 0.000 | | | | 0.000 | |

*** Note: Decay Corrected** **MDC Method** Currie **Error =** .00 **x sd**

# Alpha/Beta Count Results

## Sample Activity Report

## Blue 12-15 - B

**Addr:** 13

**Sample ID** ICVRa6-1063071;Ra2

**Repeat** 13

**Carrier No.** 0

**Batch ID** 291970

**Count Method** Gross Alpha Beta

**Detector Volts** 1515

**Sample Qty** 0 ***Sample*** **sd** 0 ***Sample***

**Residual Wt** 0 ***mg*** **sd** 0 ***mg***

**Count Began** 7/28/2019 1:45:15 PM **Collection Date 1** 1/1/1900 **Half Life** 0.00 ***days***

**Count Ended** 7/28/2019 1:50:25 PM **Collection Date 2** 1/1/1900 **Decay Factor** 1.000

**Sample Count Time** 5.00 ***mins*** **Background Count Time** 1,000.00 ***mins***

| | Efficiency % | Attenuation Factor | Activity Divisor | Background cpm | Gross counts | Gross cpm | Net cpm |
|---|---|---|---|---|---|---|---|
| **Alpha** | 0.000 | 1.000 | 1.000 | 0.111 | 26,649 | 5,329.800 | 5,329.689 |
| **sd** | 0.000 | | | 0.011 | 163.245 | 32.649 | 32.649 |
| **A to B** | 0.000 | 1.000 | | | | 0.000 | |
| **sd** | 0.000 | | | | | 0.000 | |
| **Beta** | 0.000 | 1.000 | 1.000 | 0.361 | 30,389 | 6,077.800 | 6,077.439 |
| **sd** | 0.000 | | | 0.019 | 174.324 | 34.865 | 34.865 |

| | Net Activity dpm | LLD dpm | MDC DPM | MPC DPM | Net Concentration * DPM | Conc / MPC Ratio |
|---|---|---|---|---|---|---|
| **Alpha** | 0.000 | 0.000 | 0.000 | 0.000 | 0.000 ± 0.000 | 0.000 |
| **sd** | 0.000 | | | | 0.000 | |
| **Beta** | 0.000 | 0.000 | 0.000 | 0.000 | 0.000 ± 0.000 | 0.000 |
| **sd** | 0.000 | | | | 0.000 | |

*** Note: Decay Corrected** **MDC Method** Currie **Error =** .00 **x sd**

# Alpha/Beta Count Results

## Sample Activity Report

## Blue 12-15 - B

**Addr:** 13

**Sample ID** ICVRa6-1063071;Ra1

**Repeat** 14

**Carrier No.** 0

**Batch ID** 291970

**Count Method** Gross Alpha Beta

**Detector Volts** 1515

**Sample Qty** 0 ***Sample*** **sd** 0 ***Sample***

**Residual Wt** 0 ***mg*** **sd** 0 ***mg***

**Count Began** 7/29/2019 6:49:49 AM **Collection Date 1** 1/1/1900 **Half Life** 0.00 ***days***

**Count Ended** 7/29/2019 6:54:57 AM **Collection Date 2** 1/1/1900 **Decay Factor** 1.000

**Sample Count Time** 5.00 ***mins*** **Background Count Time** 1,000.00 ***mins***

| | Efficiency % | Attenuation Factor | Activity Divisor | Background cpm | Gross counts | Gross cpm | Net cpm |
|---|---|---|---|---|---|---|---|
| **Alpha** | 0.000 | 1.000 | 1.000 | 0.111 | 21,344 | 4,268.800 | 4,268.689 |
| **sd** | 0.000 | | | 0.011 | 146.096 | 29.219 | 29.219 |
| **A to B** | 0.000 | 1.000 | | | | 0.000 | |
| **sd** | 0.000 | | | | | 0.000 | |
| **Beta** | 0.000 | 1.000 | 1.000 | 0.361 | 23,667 | 4,733.400 | 4,733.039 |
| **sd** | 0.000 | | | 0.019 | 153.841 | 30.768 | 30.768 |

| | Net Activity dpm | LLD dpm | MDC DPM | MPC DPM | Net Concentration * DPM | Conc / MPC Ratio |
|---|---|---|---|---|---|---|
| **Alpha** | 0.000 | 0.000 | 0.000 | 0.000 | 0.000 ± 0.000 | 0.000 |
| **sd** | 0.000 | | | | 0.000 | |
| **Beta** | 0.000 | 0.000 | 0.000 | 0.000 | 0.000 ± 0.000 | 0.000 |
| **sd** | 0.000 | | | | 0.000 | |

*** Note: Decay Corrected** **MDC Method** Currie **Error =** .00 **x sd**

# Ra226 ICV

| Blue - Ra226 ICV 2019 | | | | |
|---|---|---|---|---|
| | Low | Medium | High | Mean |
| | Mass | Mass | Mass | Recovery |
| Detector | Recovery | Recovery | Recovery | |
| 15 | 88.00% | 97.76% | 89.56% | 91.77% |

**Standard ID**

Ra-226
Ra-226_00025 #1063071
Cert # 104858
Added: 1mL
Activity 3.7839E+06 pCi/mL

Prep Batch: 291970 7/29/2019

| Detector | 1 | Activity | Units |
|---|---|---|---|
| 15 | Low Mass (0.0132g) | 3.330E+06 | pCi/mL |

| 2 | Activity | Units |
|---|---|---|
| Medium Mass (0.0271g) | 3.699E+06 | pCi/mL |

| 3 | Activity | Units |
|---|---|---|
| High Mass (0.0498g) | 3.389E+06 | pCi/mL |

# Alpha/Beta Count Results

## Sample Activity Report

## Blue 12-15 - D

**Addr:** 15

**Sample ID** ICVRa6-1063071;Ra3

**Repeat** 14

**Carrier No.** 0

**Batch ID** 291970

**Count Method** Gross Alpha Beta

**Detector Volts** 1515

**Sample Qty** 0 ***Sample*** **sd** 0 ***Sample***

**Residual Wt** 0 ***mg*** **sd** 0 ***mg***

**Count Began** 7/29/2019 6:50:20 AM **Collection Date 1** 1/1/1900 **Half Life** 0.00 ***days***

**Count Ended** 7/29/2019 6:55:32 AM **Collection Date 2** 1/1/1900 **Decay Factor** 1.000

**Sample Count Time** 5.00 ***mins*** **Background Count Time** 1,000.00 ***mins***

| | Efficiency % | Attenuation Factor | Activity Divisor | Background cpm | Gross counts | Gross cpm | Net cpm |
|---|---|---|---|---|---|---|---|
| **Alpha** | 0.000 | 1.000 | 1.000 | 0.097 | 23,585 | 4,717.000 | 4,716.903 |
| **sd** | 0.000 | | | 0.010 | 153.574 | 30.715 | 30.715 |
| **A to B** | 0.000 | 1.000 | | | | 0.000 | |
| **sd** | 0.000 | | | | | 0.000 | |
| **Beta** | 0.000 | 1.000 | 1.000 | 0.449 | 36,479 | 7,295.800 | 7,295.351 |
| **sd** | 0.000 | | | 0.021 | 190.995 | 38.199 | 38.199 |

| | Net Activity dpm | LLD dpm | MDC DPM | MPC DPM | Net Concentration * DPM | Conc / MPC Ratio |
|---|---|---|---|---|---|---|
| **Alpha** | 0.000 | 0.000 | 0.000 | 0.000 | 0.000 ± 0.000 | 0.000 |
| **sd** | 0.000 | | | | 0.000 | |
| **Beta** | 0.000 | 0.000 | 0.000 | 0.000 | 0.000 ± 0.000 | 0.000 |
| **sd** | 0.000 | | | | 0.000 | |

*** Note: Decay Corrected** **MDC Method** Currie **Error =** .00 **x sd**

# Alpha/Beta Count Results

## Sample Activity Report

## Blue 12-15 - D

**Addr:** 15

**Sample ID** ICVRa6-1063071;Ra2

**Repeat** 15

**Carrier No.** 0

**Batch ID** 291970

**Count Method** Gross Alpha Beta

**Detector Volts** 1515

**Sample Qty** 0 ***Sample*** **sd** 0 ***Sample***

**Residual Wt** 0 ***mg*** **sd** 0 ***mg***

**Count Began** 7/29/2019 7:07:37 AM **Collection Date 1** 1/1/1900 **Half Life** 0.00 ***days***

**Count Ended** 7/29/2019 7:12:45 AM **Collection Date 2** 1/1/1900 **Decay Factor** 1.000

**Sample Count Time** 5.00 ***mins*** **Background Count Time** 1,000.00 ***mins***

| | Efficiency % | Attenuation Factor | Activity Divisor | Background cpm | Gross counts | Gross cpm | Net cpm |
|---|---|---|---|---|---|---|---|
| **Alpha** | 0.000 | 1.000 | 1.000 | 0.097 | 24,652 | 4,930.400 | 4,930.303 |
| **sd** | 0.000 | | | 0.010 | 157.010 | 31.402 | 31.402 |
| **A to B** | 0.000 | 1.000 | | | | 0.000 | |
| **sd** | 0.000 | | | | | 0.000 | |
| **Beta** | 0.000 | 1.000 | 1.000 | 0.449 | 32,177 | 6,435.400 | 6,434.951 |
| **sd** | 0.000 | | | 0.021 | 179.379 | 35.876 | 35.876 |

| | Net Activity dpm | LLD dpm | MDC DPM | MPC DPM | Net Concentration * DPM | Conc / MPC Ratio |
|---|---|---|---|---|---|---|
| **Alpha** | 0.000 | 0.000 | 0.000 | 0.000 | 0.000 ± 0.000 | 0.000 |
| **sd** | 0.000 | | | | 0.000 | |
| **Beta** | 0.000 | 0.000 | 0.000 | 0.000 | 0.000 ± 0.000 | 0.000 |
| **sd** | 0.000 | | | | 0.000 | |

*** Note: Decay Corrected** **MDC Method** Currie **Error =** .00 **x sd**

# Alpha/Beta Count Results

## Sample Activity Report

## Blue 12-15 - D

**Addr:** 15

**Sample ID** ICVRa6-1063071;Ra1

**Repeat** 16

**Carrier No.** 0

**Batch ID** 291970

**Count Method** Gross Alpha Beta

**Detector Volts** 1515

**Sample Qty** 0 ***Sample*** **sd** 0 ***Sample***

**Residual Wt** 0 ***mg*** **sd** 0 ***mg***

**Count Began** 7/29/2019 7:23:14 AM **Collection Date 1** 1/1/1900 **Half Life** 0.00 ***days***

**Count Ended** 7/29/2019 7:28:22 AM **Collection Date 2** 1/1/1900 **Decay Factor** 1.000

**Sample Count Time** 5.00 ***mins*** **Background Count Time** 1,000.00 ***mins***

| | Efficiency % | Attenuation Factor | Activity Divisor | Background cpm | Gross counts | Gross cpm | Net cpm |
|---|---|---|---|---|---|---|---|
| **Alpha** | 0.000 | 1.000 | 1.000 | 0.097 | 19,440 | 3,888.000 | 3,887.903 |
| **sd** | 0.000 | | | 0.010 | 139.427 | 27.885 | 27.885 |
| **A to B** | 0.000 | 1.000 | | | | 0.000 | |
| **sd** | 0.000 | | | | | 0.000 | |
| **Beta** | 0.000 | 1.000 | 1.000 | 0.449 | 25,211 | 5,042.200 | 5,041.751 |
| **sd** | 0.000 | | | 0.021 | 158.780 | 31.756 | 31.756 |

| | Net Activity dpm | LLD dpm | MDC DPM | MPC DPM | Net Concentration * DPM | Conc / MPC Ratio |
|---|---|---|---|---|---|---|
| **Alpha** | 0.000 | 0.000 | 0.000 | 0.000 | 0.000 ± 0.000 | 0.000 |
| **sd** | 0.000 | | | | 0.000 | |
| **Beta** | 0.000 | 0.000 | 0.000 | 0.000 | 0.000 ± 0.000 | 0.000 |
| **sd** | 0.000 | | | | 0.000 | |

*** Note: Decay Corrected** **MDC Method** Currie **Error =** .00 **x sd**

# Monthly Backgrounds

# Alpha/Beta Count Results

## Source Count Report

## Blue 0-3 - A

**Addr:** 0

**Sample ID** ICB
ICB;Monthly Background

**Repeat** 765
**Carrier No.** 0

**Batch ID** ICB;Monthly Background

**Detector Volts** 1515

**Residual Wt** 0 *mg*
**Half Life** 0.00 *Years*
**Count Began** 8/3/2019 6:36:12 PM
**Calibration Date** 3/21/2017 12:09:15 PM
**Decay Factor** 1.000
**Count Ended** 8/4/2019 11:17:18 AM
**Backgrounds From**

**Sample Count Time** 1,000.00 *mins*
**Background Count Time** 0.00

| | Gross counts | Gross cpm | Background cpm | Net cpm |
|---|---|---|---|---|
| **Alpha** | 165 | 0.165 | 0.000 | 0.165 |
| **sd** | 12.845 | 0.013 | 0.000 | 0.013 |
| | | | | |
| **Beta** | 515 | 0.515 | 0.000 | 0.515 |
| **sd** | 22.694 | 0.023 | 0.000 | 0.023 |

| | Uncorrected DPM | Corrected DPM | Corrected dpm | Efficiency % |
|---|---|---|---|---|
| **Alpha** | 0.000 | 0.000 | 0.000 | 0.000 |
| **sd** | 0.000 | 0.000 | 0.000 | 0.000 |
| **Alpha to Beta** | | | | 0.000 |
| **sd** | | | | 0.000 |
| **Beta** | 0.000 | 0.000 | 0.000 | 0.000 |
| **sd** | 0.000 | 0.000 | 0.000 | 0.000 |

# Alpha/Beta Count Results

## Source Count Report

## Blue 0-3 - A

**Addr:** 0

**Sample ID** ICB
ICB;Monthly Background

**Repeat** 765
**Carrier No.** 0

**Batch ID** ICB;Monthly Background

**Detector Volts** 1515

**Residual Wt** 0 *mg*
**Half Life** 0.00 *Years*
**Count Began** 8/3/2019 6:36:12 PM
**Calibration Date** 3/21/2017 12:09:15 PM
**Decay Factor** 1.000
**Count Ended** 8/4/2019 11:17:18 AM
**Backgrounds From**

**Sample Count Time** 1,000.00 *mins*
**Background Count Time** 0.00

| | Gross counts | Gross cpm | Background cpm | Net cpm |
|---|---|---|---|---|
| **Alpha** | 165 | 0.165 | 0.000 | 0.165 |
| **sd** | 12.845 | 0.013 | 0.000 | 0.013 |
| | | | | |
| **Beta** | 515 | 0.515 | 0.000 | 0.515 |
| **sd** | 22.694 | 0.023 | 0.000 | 0.023 |

| | Uncorrected DPM | Corrected DPM | Corrected dpm | Efficiency % |
|---|---|---|---|---|
| **Alpha** | 0.000 | 0.000 | 0.000 | 0.000 |
| **sd** | 0.000 | 0.000 | 0.000 | 0.000 |
| **Alpha to Beta** | | | | 0.000 |
| **sd** | | | | 0.000 |
| **Beta** | 0.000 | 0.000 | 0.000 | 0.000 |
| **sd** | 0.000 | 0.000 | 0.000 | 0.000 |

# Alpha/Beta Count Results

## Source Count Report

## Blue 0-3 - B

**Addr:** 1

**Sample ID** ICB
ICB;Monthly Background

**Repeat** 808
**Carrier No.** 0

**Batch ID** ICB;Monthly Background

**Detector Volts** 1515

**Residual Wt** 0 *mg*
**Half Life** 0.00 *Years*
**Count Began** 9/6/2019 8:02:32 PM
**Calibration Date** 3/21/2017 12:09:15 PM
**Decay Factor** 1.000
**Count Ended** 9/7/2019 12:43:35 PM
**Backgrounds From**

**Sample Count Time** 1,000.00 *mins*
**Background Count Time** 0.00

| | Gross counts | Gross cpm | Background cpm | Net cpm |
|---|---|---|---|---|
| **Alpha** | 205 | 0.205 | 0.000 | 0.205 |
| **sd** | 14.318 | 0.014 | 0.000 | 0.014 |
| | | | | |
| **Beta** | 378 | 0.378 | 0.000 | 0.378 |
| **sd** | 19.442 | 0.019 | 0.000 | 0.019 |

| | Uncorrected DPM | Corrected DPM | Corrected dpm | Efficiency % |
|---|---|---|---|---|
| **Alpha** | 0.000 | 0.000 | 0.000 | 0.000 |
| **sd** | 0.000 | 0.000 | 0.000 | 0.000 |
| **Alpha to Beta** | | | | 0.000 |
| **sd** | | | | 0.000 |
| **Beta** | 0.000 | 0.000 | 0.000 | 0.000 |
| **sd** | 0.000 | 0.000 | 0.000 | 0.000 |

# Alpha/Beta Count Results

## Source Count Report

## Blue 0-3 - D

**Addr:** 3

**Sample ID** ICB
ICB;Monthly Background

**Repeat** 789
**Carrier No.** 0

**Batch ID** ICB;Monthly Background

**Detector Volts** 1515

**Residual Wt** 0 *mg*
**Half Life** 0.00 *Years*
**Count Began** 8/5/2019 2:37:58 AM
**Calibration Date** 3/21/2017 12:09:15 PM
**Decay Factor** 1.000
**Count Ended** 8/5/2019 7:20:53 PM
**Backgrounds From**

**Sample Count Time** 1,000.00 *mins*
**Background Count Time** 0.00

| | Gross counts | Gross cpm | Background cpm | Net cpm |
|---|---|---|---|---|
| **Alpha** | 128 | 0.128 | 0.000 | 0.128 |
| **sd** | 11.314 | 0.011 | 0.000 | 0.011 |
| | | | | |
| **Beta** | 457 | 0.457 | 0.000 | 0.457 |
| **sd** | 21.378 | 0.021 | 0.000 | 0.021 |

| | Uncorrected DPM | Corrected DPM | Corrected dpm | Efficiency % |
|---|---|---|---|---|
| **Alpha** | 0.000 | 0.000 | 0.000 | 0.000 |
| **sd** | 0.000 | 0.000 | 0.000 | 0.000 |
| **Alpha to Beta** | | | | 0.000 |
| **sd** | | | | 0.000 |
| **Beta** | 0.000 | 0.000 | 0.000 | 0.000 |
| **sd** | 0.000 | 0.000 | 0.000 | 0.000 |

# Alpha/Beta Count Results

## Source Count Report

## Blue 0-3 - D

**Addr:** 3

**Sample ID** ICB
ICB;Monthly Background

**Repeat** 789
**Carrier No.** 0

**Batch ID** ICB;Monthly Background

**Detector Volts** 1515

**Residual Wt** 0 *mg*
**Half Life** 0.00 *Years*
**Count Began** 8/5/2019 2:37:58 AM
**Calibration Date** 3/21/2017 12:09:15 PM
**Decay Factor** 1.000
**Count Ended** 8/5/2019 7:20:53 PM
**Backgrounds From**

**Sample Count Time** 1,000.00 *mins*
**Background Count Time** 0.00

| | Gross counts | Gross cpm | Background cpm | Net cpm |
|---|---|---|---|---|
| **Alpha** | 128 | 0.128 | 0.000 | 0.128 |
| **sd** | 11.314 | 0.011 | 0.000 | 0.011 |
| | | | | |
| **Beta** | 457 | 0.457 | 0.000 | 0.457 |
| **sd** | 21.378 | 0.021 | 0.000 | 0.021 |

| | Uncorrected DPM | Corrected DPM | Corrected dpm | Efficiency % |
|---|---|---|---|---|
| **Alpha** | 0.000 | 0.000 | 0.000 | 0.000 |
| **sd** | 0.000 | 0.000 | 0.000 | 0.000 |
| **Alpha to Beta** | | | | 0.000 |
| **sd** | | | | 0.000 |
| **Beta** | 0.000 | 0.000 | 0.000 | 0.000 |
| **sd** | 0.000 | 0.000 | 0.000 | 0.000 |

# Alpha/Beta Count Results

## Source Count Report

## Blue 8-11 - B

**Addr:** 9

**Sample ID** ICB
ICB;Monthly Background

**Repeat** 828
**Carrier No.** 0

**Batch ID** ICB;Monthly Background

**Detector Volts** 1515

**Residual Wt** 0 *mg*
**Half Life** 0.00 *Years*
**Count Began** 9/6/2019 8:34:25 PM
**Calibration Date** 3/21/2017 12:09:15 PM
**Decay Factor** 1.000
**Count Ended** 9/7/2019 1:15:28 PM
**Backgrounds From**

**Sample Count Time** 1,000.00 *mins*
**Background Count Time** 0.00

| | Gross counts | Gross cpm | Background cpm | Net cpm |
|---|---|---|---|---|
| **Alpha** | 138 | 0.138 | 0.000 | 0.138 |
| **sd** | 11.747 | 0.012 | 0.000 | 0.012 |
| | | | | |
| **Beta** | 404 | 0.404 | 0.000 | 0.404 |
| **sd** | 20.100 | 0.020 | 0.000 | 0.020 |

| | Uncorrected DPM | Corrected DPM | Corrected dpm | Efficiency % |
|---|---|---|---|---|
| **Alpha** | 0.000 | 0.000 | 0.000 | 0.000 |
| **sd** | 0.000 | 0.000 | 0.000 | 0.000 |
| **Alpha to Beta** | | | | 0.000 |
| **sd** | | | | 0.000 |
| **Beta** | 0.000 | 0.000 | 0.000 | 0.000 |
| **sd** | 0.000 | 0.000 | 0.000 | 0.000 |

# Alpha/Beta Count Results

## Source Count Report

## Blue 12-15 - A

**Addr:** 12

**Sample ID** ICB
ICB;Monthly Background

**Repeat** 817
**Carrier No.** 0

**Batch ID** ICB;Monthly Background

**Detector Volts** 1515

**Residual Wt** 0 *mg*
**Half Life** 0.00 *Years*
**Count Began** 9/6/2019 8:03:36 PM
**Calibration Date** 3/21/2017 12:09:15 PM
**Decay Factor** 1.000
**Count Ended** 9/7/2019 12:44:35 PM
**Backgrounds From**

**Sample Count Time** 1,000.00 *mins*
**Background Count Time** 0.00

| | Gross counts | Gross cpm | Background cpm | Net cpm |
|---|---|---|---|---|
| **Alpha** | 138 | 0.138 | 0.000 | 0.138 |
| **sd** | 11.747 | 0.012 | 0.000 | 0.012 |
| | | | | |
| **Beta** | 354 | 0.354 | 0.000 | 0.354 |
| **sd** | 18.815 | 0.019 | 0.000 | 0.019 |

| | Uncorrected DPM | Corrected DPM | Corrected dpm | Efficiency % |
|---|---|---|---|---|
| **Alpha** | 0.000 | 0.000 | 0.000 | 0.000 |
| **sd** | 0.000 | 0.000 | 0.000 | 0.000 |
| **Alpha to Beta** | | | | 0.000 |
| **sd** | | | | 0.000 |
| **Beta** | 0.000 | 0.000 | 0.000 | 0.000 |
| **sd** | 0.000 | 0.000 | 0.000 | 0.000 |

# Alpha/Beta Count Results

## Source Count Report

## Blue 12-15 - B

**Addr:** 13

**Sample ID** ICB
ICB;Monthly Background

**Repeat** 818
**Carrier No.** 0

**Batch ID** ICB;Monthly Background

**Detector Volts** 1515

**Residual Wt** 0 *mg*
**Half Life** 0.00 *Years*
**Count Began** 9/6/2019 8:04:35 PM
**Calibration Date** 3/21/2017 12:09:15 PM
**Decay Factor** 1.000
**Count Ended** 9/7/2019 12:45:35 PM
**Backgrounds From**

**Sample Count Time** 1,000.00 *mins*
**Background Count Time** 0.00

| | Gross counts | Gross cpm | Background cpm | Net cpm |
|---|---|---|---|---|
| **Alpha** | 164 | 0.164 | 0.000 | 0.164 |
| **sd** | 12.806 | 0.013 | 0.000 | 0.013 |
| | | | | |
| **Beta** | 372 | 0.372 | 0.000 | 0.372 |
| **sd** | 19.287 | 0.019 | 0.000 | 0.019 |

| | Uncorrected DPM | Corrected DPM | Corrected dpm | Efficiency % |
|---|---|---|---|---|
| **Alpha** | 0.000 | 0.000 | 0.000 | 0.000 |
| **sd** | 0.000 | 0.000 | 0.000 | 0.000 |
| **Alpha to Beta** | | | | 0.000 |
| **sd** | | | | 0.000 |
| **Beta** | 0.000 | 0.000 | 0.000 | 0.000 |
| **sd** | 0.000 | 0.000 | 0.000 | 0.000 |

# Alpha/Beta Count Results

## Source Count Report

## Blue 12-15 - D

**Addr:** 15

**Sample ID** ICB
ICB;Monthly Background

**Repeat** 799
**Carrier No.** 0

**Batch ID** ICB;Monthly Background

**Detector Volts** 1515

**Residual Wt** 0 *mg*
**Half Life** 0.00 *Years*
**Count Began** 8/5/2019 2:37:10 AM
**Calibration Date** 3/21/2017 12:09:15 PM
**Decay Factor** 1.000
**Count Ended** 8/5/2019 7:26:29 PM
**Backgrounds From**

**Sample Count Time** 1,000.00 *mins*
**Background Count Time** 0.00

| | Gross counts | Gross cpm | Background cpm | Net cpm |
|---|---|---|---|---|
| **Alpha** | 120 | 0.120 | 0.000 | 0.120 |
| **sd** | 10.954 | 0.011 | 0.000 | 0.011 |
| | | | | |
| **Beta** | 424 | 0.424 | 0.000 | 0.424 |
| **sd** | 20.591 | 0.021 | 0.000 | 0.021 |

| | Uncorrected DPM | Corrected DPM | Corrected dpm | Efficiency % |
|---|---|---|---|---|
| **Alpha** | 0.000 | 0.000 | 0.000 | 0.000 |
| **sd** | 0.000 | 0.000 | 0.000 | 0.000 |
| **Alpha to Beta** | | | | 0.000 |
| **sd** | | | | 0.000 |
| **Beta** | 0.000 | 0.000 | 0.000 | 0.000 |
| **sd** | 0.000 | 0.000 | 0.000 | 0.000 |

# Alpha/Beta Count Results

## Source Count Report

## Blue 12-15 - D

**Addr:** 15

**Sample ID** ICB
ICB;Monthly Background

**Repeat** 799
**Carrier No.** 0

**Batch ID** ICB;Monthly Background

**Detector Volts** 1515

**Residual Wt** 0 *mg*
**Half Life** 0.00 *Years*
**Count Began** 8/5/2019 2:37:10 AM
**Calibration Date** 3/21/2017 12:09:15 PM
**Decay Factor** 1.000
**Count Ended** 8/5/2019 7:26:29 PM
**Backgrounds From**

**Sample Count Time** 1,000.00 *mins*
**Background Count Time** 0.00

| | Gross counts | Gross cpm | Background cpm | Net cpm |
|---|---|---|---|---|
| **Alpha** | 120 | 0.120 | 0.000 | 0.120 |
| **sd** | 10.954 | 0.011 | 0.000 | 0.011 |
| | | | | |
| **Beta** | 424 | 0.424 | 0.000 | 0.424 |
| **sd** | 20.591 | 0.021 | 0.000 | 0.021 |

| | Uncorrected DPM | Corrected DPM | Corrected dpm | Efficiency % |
|---|---|---|---|---|
| **Alpha** | 0.000 | 0.000 | 0.000 | 0.000 |
| **sd** | 0.000 | 0.000 | 0.000 | 0.000 |
| **Alpha to Beta** | | | | 0.000 |
| **sd** | | | | 0.000 |
| **Beta** | 0.000 | 0.000 | 0.000 | 0.000 |
| **sd** | 0.000 | 0.000 | 0.000 | 0.000 |

# Alpha/Beta Count Results

## Source Count Report

## Orange 0-3 - A

**Addr:** 0

**Sample ID** ICB
ICB;Monthly Background Check

**Repeat** 2310
**Carrier No.** 0

**Batch ID** ICB;Monthly Background

**Detector Volts** 1515

**Residual Wt** 0 *mg*
**Half Life** 0.00 *Years*
**Count Began** 8/3/2019 5:31:31 PM
**Calibration Date** 8/4/2012 9:20:16 AM
**Decay Factor** 1.000
**Count Ended** 8/4/2019 10:12:30 AM
**Backgrounds From**

**Sample Count Time** 1,000.00 *mins*
**Background Count Time** 0.00

| | Gross counts | Gross cpm | Background cpm | Net cpm |
|---|---|---|---|---|
| **Alpha** | 126 | 0.126 | 0.000 | 0.126 |
| **sd** | 11.225 | 0.011 | 0.000 | 0.011 |
| | | | | |
| **Beta** | 520 | 0.520 | 0.000 | 0.520 |
| **sd** | 22.804 | 0.023 | 0.000 | 0.023 |

| | Uncorrected DPM | Corrected DPM | Corrected dpm | Efficiency % |
|---|---|---|---|---|
| **Alpha** | 0.000 | 0.000 | 0.000 | 0.000 |
| **sd** | 0.000 | 0.000 | 0.000 | 0.000 |
| **Alpha to Beta** | | | | 0.000 |
| **sd** | | | | 0.000 |
| **Beta** | 0.000 | 0.000 | 0.000 | 0.000 |
| **sd** | 0.000 | 0.000 | 0.000 | 0.000 |

# Alpha/Beta Count Results

## Source Count Report

## Orange 12-15 - C

**Addr:** 14

**Sample ID** ICB
ICB;Monthly Background Check

**Repeat** 2304
**Carrier No.** 0

**Batch ID** ICB;Monthly Background

**Detector Volts** 1515

**Residual Wt** 0 *mg*
**Half Life** 0.00 *Years*
**Count Began** 8/3/2019 5:31:01 PM
**Calibration Date** 8/4/2012 9:20:16 AM
**Decay Factor** 1.000
**Count Ended** 8/4/2019 10:12:01 AM
**Backgrounds From**

**Sample Count Time** 1,000.00 *mins*
**Background Count Time** 0.00

| | Gross counts | Gross cpm | Background cpm | Net cpm |
|---|---|---|---|---|
| **Alpha** | 120 | 0.120 | 0.000 | 0.120 |
| **sd** | 10.954 | 0.011 | 0.000 | 0.011 |
| | | | | |
| **Beta** | 509 | 0.509 | 0.000 | 0.509 |
| **sd** | 22.561 | 0.023 | 0.000 | 0.023 |

| | Uncorrected DPM | Corrected DPM | Corrected dpm | Efficiency % |
|---|---|---|---|---|
| **Alpha** | 0.000 | 0.000 | 0.000 | 0.000 |
| **sd** | 0.000 | 0.000 | 0.000 | 0.000 |
| **Alpha to Beta** | | | | 0.000 |
| **sd** | | | | 0.000 |
| **Beta** | 0.000 | 0.000 | 0.000 | 0.000 |
| **sd** | 0.000 | 0.000 | 0.000 | 0.000 |

# Alpha/Beta Count Results

## Source Count Report

## Orange 16-19 - C

**Addr:** 18

**Sample ID** ICB
ICB;Monthly Background Check

**Repeat** 2308
**Carrier No.** 0

**Batch ID** ICB;Monthly Background

**Detector Volts** 1515

**Residual Wt** 0 *mg*
**Half Life** 0.00 *Years*
**Count Began** 8/3/2019 5:31:20 PM
**Calibration Date** 8/4/2012 9:20:16 AM
**Decay Factor** 1.000
**Count Ended** 8/4/2019 10:12:19 AM
**Backgrounds From**

**Sample Count Time** 1,000.00 *mins*
**Background Count Time** 0.00

| | Gross counts | Gross cpm | Background cpm | Net cpm |
|---|---|---|---|---|
| **Alpha** | 111 | 0.111 | 0.000 | 0.111 |
| **sd** | 10.536 | 0.011 | 0.000 | 0.011 |
| | | | | |
| **Beta** | 347 | 0.347 | 0.000 | 0.347 |
| **sd** | 18.628 | 0.019 | 0.000 | 0.019 |

| | Uncorrected DPM | Corrected DPM | Corrected dpm | Efficiency % |
|---|---|---|---|---|
| **Alpha** | 0.000 | 0.000 | 0.000 | 0.000 |
| **sd** | 0.000 | 0.000 | 0.000 | 0.000 |
| **Alpha to Beta** | | | | 0.000 |
| **sd** | | | | 0.000 |
| **Beta** | 0.000 | 0.000 | 0.000 | 0.000 |
| **sd** | 0.000 | 0.000 | 0.000 | 0.000 |

# Alpha/Beta Count Results

## Source Count Report

## Orange 16-19 - D

**Addr:** 19

**Sample ID** ICB
ICB;Monthly Background Check

**Repeat** 2309
**Carrier No.** 0

**Batch ID** ICB;Monthly Background

**Detector Volts** 1515

**Residual Wt** 0 *mg*
**Half Life** 0.00 *Years*
**Count Began** 8/3/2019 5:31:23 PM
**Calibration Date** 8/4/2012 9:20:16 AM
**Decay Factor** 1.000
**Count Ended** 8/4/2019 10:12:28 AM
**Backgrounds From**

**Sample Count Time** 1,000.00 *mins*
**Background Count Time** 0.00

| | Gross counts | Gross cpm | Background cpm | Net cpm |
|---|---|---|---|---|
| **Alpha** | 136 | 0.136 | 0.000 | 0.136 |
| **sd** | 11.662 | 0.012 | 0.000 | 0.012 |
| | | | | |
| **Beta** | 427 | 0.427 | 0.000 | 0.427 |
| **sd** | 20.664 | 0.021 | 0.000 | 0.021 |

| | Uncorrected DPM | Corrected DPM | Corrected dpm | Efficiency % |
|---|---|---|---|---|
| **Alpha** | 0.000 | 0.000 | 0.000 | 0.000 |
| **sd** | 0.000 | 0.000 | 0.000 | 0.000 |
| **Alpha to Beta** | | | | 0.000 |
| **sd** | | | | 0.000 |
| **Beta** | 0.000 | 0.000 | 0.000 | 0.000 |
| **sd** | 0.000 | 0.000 | 0.000 | 0.000 |

# Alpha/Beta Count Results

## Source Count Report

## Orange 20-23 - C

**Addr:** 22

**Sample ID** ICB
ICB;Monthly Background Check

**Repeat** 2324
**Carrier No.** 0

**Batch ID** ICB;Monthly Background

**Detector Volts** 1515

**Residual Wt** 0 *mg*
**Half Life** 0.00 *Years*
**Count Began** 8/3/2019 5:32:32 PM
**Calibration Date** 8/4/2012 9:20:16 AM
**Decay Factor** 1.000
**Count Ended** 8/4/2019 10:13:34 AM
**Backgrounds From**

**Sample Count Time** 1,000.00 *mins*
**Background Count Time** 0.00

| | Gross counts | Gross cpm | Background cpm | Net cpm |
|---|---|---|---|---|
| **Alpha** | 105 | 0.105 | 0.000 | 0.105 |
| **sd** | 10.247 | 0.010 | 0.000 | 0.010 |
| | | | | |
| **Beta** | 401 | 0.401 | 0.000 | 0.401 |
| **sd** | 20.025 | 0.020 | 0.000 | 0.020 |

| | Uncorrected DPM | Corrected DPM | Corrected dpm | Efficiency % |
|---|---|---|---|---|
| **Alpha** | 0.000 | 0.000 | 0.000 | 0.000 |
| **sd** | 0.000 | 0.000 | 0.000 | 0.000 |
| **Alpha to Beta** | | | | 0.000 |
| **sd** | | | | 0.000 |
| **Beta** | 0.000 | 0.000 | 0.000 | 0.000 |
| **sd** | 0.000 | 0.000 | 0.000 | 0.000 |

# Alpha/Beta Count Results

## Source Count Report

## Orange 20-23 - D

**Addr:** 23

**Sample ID** ICB
ICB;Monthly Background Check

**Repeat** 2325
**Carrier No.** 0

**Batch ID** ICB;Monthly Background

**Detector Volts** 1515

**Residual Wt** 0 *mg*
**Half Life** 0.00 *Years*
**Count Began** 8/3/2019 5:32:36 PM
**Calibration Date** 8/4/2012 9:20:16 AM
**Decay Factor** 1.000
**Count Ended** 8/4/2019 10:13:34 AM
**Backgrounds From**

**Sample Count Time** 1,000.00 *mins*
**Background Count Time** 0.00

| | Gross counts | Gross cpm | Background cpm | Net cpm |
|---|---|---|---|---|
| **Alpha** | 103 | 0.103 | 0.000 | 0.103 |
| **sd** | 10.149 | 0.010 | 0.000 | 0.010 |
| | | | | |
| **Beta** | 417 | 0.417 | 0.000 | 0.417 |
| **sd** | 20.421 | 0.020 | 0.000 | 0.020 |

| | Uncorrected DPM | Corrected DPM | Corrected dpm | Efficiency % |
|---|---|---|---|---|
| **Alpha** | 0.000 | 0.000 | 0.000 | 0.000 |
| **sd** | 0.000 | 0.000 | 0.000 | 0.000 |
| **Alpha to Beta** | | | | 0.000 |
| **sd** | | | | 0.000 |
| **Beta** | 0.000 | 0.000 | 0.000 | 0.000 |
| **sd** | 0.000 | 0.000 | 0.000 | 0.000 |

# Alpha/Beta Count Results

## Source Count Report

## Purple 0-3 - A

**Addr:** 0

**Sample ID** ICB
None

**Repeat** 2276
**Carrier No.** 0

**Batch ID** ICB;Monthly Background

**Detector Volts** 1515

**Residual Wt** 0 *mg*
**Half Life** 0.00 *Years*
**Count Began** 8/5/2019 2:36:12 AM
**Calibration Date** 7/27/2018 3:07:26 PM
**Decay Factor** 1.000
**Count Ended** 8/5/2019 7:17:15 PM
**Backgrounds From**

**Sample Count Time** 1,000.00 *mins*
**Background Count Time** 0.00

| | Gross counts | Gross cpm | Background cpm | Net cpm |
|---|---|---|---|---|
| **Alpha** | 170 | 0.170 | 0.000 | 0.170 |
| **sd** | 13.038 | 0.013 | 0.000 | 0.013 |
| | | | | |
| **Beta** | 470 | 0.470 | 0.000 | 0.470 |
| **sd** | 21.679 | 0.022 | 0.000 | 0.022 |

| | Uncorrected DPM | Corrected DPM | Corrected dpm | Efficiency % |
|---|---|---|---|---|
| **Alpha** | 0.000 | 0.000 | 0.000 | 0.000 |
| **sd** | 0.000 | 0.000 | 0.000 | 0.000 |
| **Alpha to Beta** | | | | 0.000 |
| **sd** | | | | 0.000 |
| **Beta** | 0.000 | 0.000 | 0.000 | 0.000 |
| **sd** | 0.000 | 0.000 | 0.000 | 0.000 |

# Run Logs

# Gas Flow Proportional Counter Run Log

## Detector: Blue0 — Serial Number: Unknown

| Analysis Date | Count Minutes | Lab Sample ID | Client Sample ID | Analysis Batch | Prep Batch | Method | Analyst Initials |
|---|---|---|---|---|---|---|---|
| 07/26/19 15:55 | 15 | ICRA6 160-439055/1 | | 439055 | | | SCB |
| 07/26/19 16:14 | 15 | ICRA6 160-439055/2 | | 439055 | | | SCB |
| 07/26/19 16:32 | 15 | ICRA6 160-439055/3 | | 439055 | | | SCB |
| 07/26/19 16:49 | 15 | ICRA6 160-439055/4 | | 439055 | | | SCB |
| 07/26/19 17:06 | 15 | ICRA6 160-439055/5 | | 439055 | | | SCB |
| 07/26/19 17:22 | 15 | ICRA6 160-439055/6 | | 439055 | | | SCB |
| 07/26/19 17:42 | 15 | ICRA6 160-439055/7 | | 439055 | | | SCB |
| 07/26/19 18:14 | 15 | ICRA6 160-439055/8 | | 439055 | | | SCB |
| 07/28/19 11:31 | 5 | ICVRA6 160-439055/9 | | 439055 | | | SCB |
| 07/28/19 12:15 | 5 | ICVRA6 160-439055/10 | | 439055 | | | SCB |
| 07/28/19 13:05 | 5 | ICVRA6 160-439055/11 | | 439055 | | | SCB |
| 08/03/19 18:36 | 1000 | ICB 160-437879/1 | | 437879 | | | PS |
| 08/31/19 08:26 | 2 | CCVB 160-441511/17 | | 441511 | | | KLS |
| 08/31/19 08:44 | 2 | CCVA 160-441511/25 | | 441511 | | | KLS |
| 08/31/19 09:15 | 0 | CCB 160-441511/49 | | 441511 | | | KLS |
| 08/31/19 13:13 | 100 | ZZZZZ | | 441511 | | | |
| 08/31/19 15:13 | 100 | ZZZZZ | | 441511 | | | |
| 08/31/19 17:10 | 100 | ZZZZZ | | 441511 | | | |
| 08/31/19 18:55 | 100 | 180-93098-3 | JSF-STR-PB07-CC-SUR-0190718 ~ STR-PB07 | 441511 | 436764 | 903.0 | KLS |
| 08/31/19 22:04 | 100 | ZZZZZ | | 441511 | | | |

## Detector: Blue1 — Serial Number: Unknown

| Analysis Date | Count Minutes | Lab Sample ID | Client Sample ID | Analysis Batch | Prep Batch | Method | Analyst Initials |
|---|---|---|---|---|---|---|---|
| 07/26/19 15:56 | 15 | ICRA6 160-439056/1 | | 439056 | | | SCB |
| 07/26/19 16:14 | 15 | ICRA6 160-439056/2 | | 439056 | | | SCB |
| 07/26/19 16:32 | 15 | ICRA6 160-439056/3 | | 439056 | | | SCB |
| 07/26/19 16:49 | 15 | ICRA6 160-439056/4 | | 439056 | | | SCB |
| 07/26/19 17:06 | 15 | ICRA6 160-439056/5 | | 439056 | | | SCB |
| 07/26/19 17:23 | 15 | ICRA6 160-439056/6 | | 439056 | | | SCB |
| 07/26/19 17:42 | 15 | ICRA6 160-439056/7 | | 439056 | | | SCB |
| 07/26/19 18:14 | 15 | ICRA6 160-439056/8 | | 439056 | | | SCB |
| 07/28/19 11:31 | 5 | ICVRA6 160-439056/9 | | 439056 | | | SCB |
| 07/28/19 11:38 | 5 | ICVRA6 160-439056/10 | | 439056 | | | SCB |
| 07/28/19 13:05 | 5 | ICVRA6 160-439056/11 | | 439056 | | | SCB |
| 09/06/19 20:02 | 1000 | ICB 160-442494/2 | | 442494 | | | CDR |
| 09/08/19 08:12 | 2 | CCVA 160-442151/1 | | 442151 | | | |
| 09/08/19 08:18 | 2 | CCVB 160-442151/13 | | 442151 | | | |
| 09/08/19 08:24 | 0 | CCB 160-442151/28 | | 442151 | | | |
| 09/08/19 12:53 | 200 | ZZZZZ | | 442151 | | | |
| 09/08/19 16:42 | 100 | ZZZZZ | | 442151 | | | |
| 09/08/19 19:02 | 100 | LCS 160-436764/1-A | | 442151 | 436764 | 903.0 | CDR |
| 09/08/19 21:47 | 100 | ZZZZZ | | 442151 | | | |
| 09/08/19 23:41 | 100 | ZZZZZ | | 442151 | | | |

## Detector: Blue3 — Serial Number: Unknown

| Analysis Date | Count Minutes | Lab Sample ID | Client Sample ID | Analysis Batch | Prep Batch | Method | Analyst Initials |
|---|---|---|---|---|---|---|---|
| 07/26/19 15:56 | 15 | ICRA6 160-439058/1 | | 439058 | | | SCB |
| 07/26/19 16:14 | 15 | ICRA6 160-439058/2 | | 439058 | | | SCB |
| 07/26/19 16:32 | 15 | ICRA6 160-439058/3 | | 439058 | | | SCB |

# Gas Flow Proportional Counter Run Log

## Detector: Blue3 (Continued) — Serial Number: Unknown

| Analysis Date | Count Minutes | Lab Sample ID | Client Sample ID | Analysis Batch | Prep Batch | Method | Analyst Initials |
|---|---|---|---|---|---|---|---|
| 07/26/19 16:49 | 15 | ICRA6 160-439058/4 | | 439058 | | | SCB |
| 07/26/19 17:06 | 15 | ICRA6 160-439058/5 | | 439058 | | | SCB |
| 07/26/19 17:23 | 15 | ICRA6 160-439058/6 | | 439058 | | | SCB |
| 07/26/19 17:42 | 15 | ICRA6 160-439058/7 | | 439058 | | | SCB |
| 07/26/19 18:14 | 15 | ICRA6 160-439058/8 | | 439058 | | | SCB |
| 07/28/19 11:38 | 5 | ICVRA6 160-439058/9 | | 439058 | | | SCB |
| 07/28/19 11:44 | 5 | ICVRA6 160-439058/10 | | 439058 | | | SCB |
| 07/28/19 11:50 | 5 | ICVRA6 160-439058/11 | | 439058 | | | SCB |
| 08/05/19 02:37 | 1000 | ICB 160-438261/9 | | 438261 | | | PS |
| 08/31/19 08:26 | 2 | CCVB 160-441511/20 | | 441511 | | | KLS |
| 08/31/19 08:45 | 2 | CCVA 160-441511/28 | | 441511 | | | KLS |
| 08/31/19 09:16 | 0 | CCB 160-441511/52 | | 441511 | | | KLS |
| 08/31/19 13:14 | 100 | ZZZZZ | | 441511 | | | |
| 08/31/19 15:13 | 100 | ZZZZZ | | 441511 | | | |
| 08/31/19 17:10 | 100 | ZZZZZ | | 441511 | | | |
| 08/31/19 18:55 | 100 | MB 160-436764/18-A | | 441511 | 436764 | 903.0 | KLS |
| 08/31/19 22:04 | 100 | ZZZZZ | | 441511 | | | |

## Detector: Blue9 — Serial Number: Unknown

| Analysis Date | Count Minutes | Lab Sample ID | Client Sample ID | Analysis Batch | Prep Batch | Method | Analyst Initials |
|---|---|---|---|---|---|---|---|
| 07/24/19 13:40 | 15 | ICRA6 160-439065/1 | | 439065 | | | SCB |
| 07/24/19 13:58 | 15 | ICRA6 160-439065/2 | | 439065 | | | SCB |
| 07/24/19 14:34 | 15 | ICRA6 160-439065/3 | | 439065 | | | SCB |
| 07/24/19 15:16 | 15 | ICRA6 160-439065/4 | | 439065 | | | SCB |
| 07/24/19 15:48 | 15 | ICRA6 160-439065/5 | | 439065 | | | SCB |
| 07/24/19 16:26 | 15 | ICRA6 160-439065/6 | | 439065 | | | SCB |
| 07/24/19 16:50 | 15 | ICRA6 160-439065/7 | | 439065 | | | SCB |
| 07/24/19 17:07 | 15 | ICRA6 160-439065/8 | | 439065 | | | SCB |
| 07/28/19 13:17 | 5 | ICVRA6 160-439065/9 | | 439065 | | | SCB |
| 07/28/19 13:23 | 5 | ICVRA6 160-439065/10 | | 439065 | | | SCB |
| 07/29/19 07:23 | 5 | ICVRA6 160-439065/11 | | 439065 | | | SCB |
| 09/06/19 20:34 | 1000 | ICB 160-442494/22 | | 442494 | | | CDR |
| 09/09/19 01:44 | 2 | CCVB 160-442471/10 | | 442471 | | | CDR |
| 09/09/19 01:59 | 2 | CCVA 160-442471/38 | | 442471 | | | CDR |
| 09/09/19 02:47 | 200 | CCB 160-442471/52 | | 442471 | | | CDR |
| 09/09/19 06:41 | 100 | ZZZZZ | | 442471 | | | |
| 09/09/19 09:02 | 100 | ZZZZZ | | 442471 | | | |
| 09/09/19 10:50 | 100 | ZZZZZ | | 442471 | | | |
| 09/09/19 12:56 | 100 | ZZZZZ | | 442471 | | | |
| 09/09/19 15:10 | 100 | ZZZZZ | | 442471 | | | |
| 09/09/19 17:03 | 100 | ZZZZZ | | 442471 | | | |
| 09/09/19 22:22 | 100 | 180-93047-C-9-A DU | | 442471 | 436764 | 903.0 | CDR |

## Detector: Blue12 — Serial Number: Unknown

| Analysis Date | Count Minutes | Lab Sample ID | Client Sample ID | Analysis Batch | Prep Batch | Method | Analyst Initials |
|---|---|---|---|---|---|---|---|
| 07/24/19 13:40 | 15 | ICRA6 160-439069/1 | | 439069 | | | SCB |
| 07/24/19 13:58 | 15 | ICRA6 160-439069/2 | | 439069 | | | SCB |
| 07/24/19 14:34 | 15 | ICRA6 160-439069/3 | | 439069 | | | SCB |
| 07/24/19 15:17 | 15 | ICRA6 160-439069/4 | | 439069 | | | SCB |
| 07/24/19 15:48 | 15 | ICRA6 160-439069/5 | | 439069 | | | SCB |

# Gas Flow Proportional Counter Run Log

## Detector: Blue12 (Continued) — Serial Number: Unknown

| Analysis Date | Count Minutes | Lab Sample ID | Client Sample ID | Analysis Batch | Prep Batch | Method | Analyst Initials |
|---|---|---|---|---|---|---|---|
| 07/24/19 16:26 | 15 | ICRA6 160-439069/6 | | 439069 | | | SCB |
| 07/24/19 16:50 | 15 | ICRA6 160-439069/7 | | 439069 | | | SCB |
| 07/24/19 17:07 | 15 | ICRA6 160-439069/8 | | 439069 | | | SCB |
| 07/28/19 13:31 | 5 | ICVRA6 160-439069/9 | | 439069 | | | SCB |
| 07/28/19 13:38 | 5 | ICVRA6 160-439069/10 | | 439069 | | | SCB |
| 07/28/19 13:45 | 5 | ICVRA6 160-439069/11 | | 439069 | | | SCB |
| 09/06/19 20:03 | 1000 | ICB 160-442494/11 | | 442494 | | | CDR |
| 09/08/19 08:13 | 2 | CCVB 160-442151/9 | | 442151 | | | |
| 09/08/19 08:19 | 2 | CCVA 160-442151/21 | | 442151 | | | |
| 09/08/19 08:25 | 0 | CCB 160-442151/39 | | 442151 | | | |
| 09/08/19 12:54 | 200 | ZZZZZ | | 442151 | | | |
| 09/08/19 16:43 | 100 | ZZZZZ | | 442151 | | | |
| 09/08/19 19:00 | 100 | 180-93098-2 | JSF-STR-PB08-CC-SUR-0190718 ~ STR-PB08 | 442151 | 436764 | 903.0 | CDR |
| 09/08/19 21:49 | 100 | ZZZZZ | | 442151 | | | |
| 09/08/19 23:42 | 100 | ZZZZZ | | 442151 | | | |

## Detector: Blue13 — Serial Number: Unknown

| Analysis Date | Count Minutes | Lab Sample ID | Client Sample ID | Analysis Batch | Prep Batch | Method | Analyst Initials |
|---|---|---|---|---|---|---|---|
| 07/24/19 13:40 | 15 | ICRA6 160-439070/1 | | 439070 | | | SCB |
| 07/24/19 13:58 | 15 | ICRA6 160-439070/2 | | 439070 | | | SCB |
| 07/24/19 14:34 | 15 | ICRA6 160-439070/3 | | 439070 | | | SCB |
| 07/24/19 15:17 | 15 | ICRA6 160-439070/4 | | 439070 | | | SCB |
| 07/24/19 15:48 | 15 | ICRA6 160-439070/5 | | 439070 | | | SCB |
| 07/24/19 16:26 | 15 | ICRA6 160-439070/6 | | 439070 | | | SCB |
| 07/24/19 16:50 | 15 | ICRA6 160-439070/7 | | 439070 | | | SCB |
| 07/24/19 17:07 | 15 | ICRA6 160-439070/8 | | 439070 | | | SCB |
| 07/28/19 13:38 | 5 | ICVRA6 160-439070/9 | | 439070 | | | SCB |
| 07/28/19 13:45 | 5 | ICVRA6 160-439070/10 | | 439070 | | | SCB |
| 07/29/19 06:49 | 5 | ICVRA6 160-439070/11 | | 439070 | | | SCB |
| 09/06/19 20:04 | 1000 | ICB 160-442494/12 | | 442494 | | | CDR |
| 09/08/19 08:14 | 2 | CCVB 160-442151/11 | | 442151 | | | |
| 09/08/19 08:19 | 2 | CCVA 160-442151/22 | | 442151 | | | |
| 09/08/19 08:25 | 0 | CCB 160-442151/40 | | 442151 | | | |
| 09/08/19 12:54 | 200 | ZZZZZ | | 442151 | | | |
| 09/08/19 16:43 | 100 | ZZZZZ | | 442151 | | | |
| 09/08/19 19:00 | 100 | 180-93098-4 | JSF-STR-PB06-CC-SUR-0190718 ~ STR-PB06 | 442151 | 436764 | 903.0 | CDR |
| 09/08/19 21:49 | 100 | ZZZZZ | | 442151 | | | |
| 09/08/19 23:42 | 100 | ZZZZZ | | 442151 | | | |

## Detector: Blue15 — Serial Number: Unknown

| Analysis Date | Count Minutes | Lab Sample ID | Client Sample ID | Analysis Batch | Prep Batch | Method | Analyst Initials |
|---|---|---|---|---|---|---|---|
| 07/24/19 13:40 | 15 | ICRA6 160-439072/1 | | 439072 | | | SCB |
| 07/24/19 13:58 | 15 | ICRA6 160-439072/2 | | 439072 | | | SCB |
| 07/24/19 14:35 | 15 | ICRA6 160-439072/3 | | 439072 | | | SCB |
| 07/24/19 15:17 | 15 | ICRA6 160-439072/4 | | 439072 | | | SCB |
| 07/24/19 15:48 | 15 | ICRA6 160-439072/5 | | 439072 | | | SCB |
| 07/24/19 16:26 | 15 | ICRA6 160-439072/6 | | 439072 | | | SCB |
| 07/24/19 16:50 | 15 | ICRA6 160-439072/7 | | 439072 | | | SCB |

# Gas Flow Proportional Counter Run Log

## Detector: Blue15 (Continued) — Serial Number: Unknown

| Analysis Date | Count Minutes | Lab Sample ID | Client Sample ID | Analysis Batch | Prep Batch | Method | Analyst Initials |
|---|---|---|---|---|---|---|---|
| 07/24/19 17:08 | 15 | ICRA6 160-439072/8 | | 439072 | | | SCB |
| 07/29/19 06:50 | 5 | ICVRA6 160-439072/9 | | 439072 | | | SCB |
| 07/29/19 07:07 | 5 | ICVRA6 160-439072/10 | | 439072 | | | SCB |
| 07/29/19 07:23 | 5 | ICVRA6 160-439072/11 | | 439072 | | | SCB |
| 08/05/19 02:37 | 1000 | ICB 160-438261/3 | | 438261 | | | PS |
| 08/31/19 08:21 | 2 | CCVB 160-441511/16 | | 441511 | | | KLS |
| 08/31/19 08:49 | 2 | CCVA 160-441511/40 | | 441511 | | | KLS |
| 08/31/19 09:16 | 0 | CCB 160-441511/64 | | 441511 | | | KLS |
| 08/31/19 13:21 | 100 | ZZZZZ | | 441511 | | | |
| 08/31/19 16:00 | 100 | ZZZZZ | | 441511 | | | |
| 08/31/19 17:52 | 100 | 180-93098-1 | JSF-STR-PB09-CC-SUR-0190718 ~ STR-PB09 | 441511 | 436764 | 903.0 | KLS |
| 08/31/19 22:06 | 100 | ZZZZZ | | 441511 | | | |

## Detector: Orange0

| Analysis Date | Count Minutes | Lab Sample ID | Client Sample ID | Analysis Batch | Prep Batch | Method | Analyst Initials |
|---|---|---|---|---|---|---|---|
| 01/23/13 14:44 | 5 | ICABT 160-226164/12 | | 226164 | | | JLW |
| 01/23/13 14:53 | 5 | ICABT 160-226164/13 | | 226164 | | | JLW |
| 01/23/13 15:01 | 5 | ICABT 160-226164/14 | | 226164 | | | JLW |
| 01/23/13 15:09 | 5 | ICABT 160-226164/15 | | 226164 | | | JLW |
| 01/23/13 15:19 | 5 | ICABT 160-226164/16 | | 226164 | | | JLW |
| 01/23/13 15:26 | 5 | ICABT 160-226164/17 | | 226164 | | | JLW |
| 01/23/13 15:37 | 5 | ICABT 160-226164/18 | | 226164 | | | JLW |
| 01/23/13 15:46 | 5 | ICABT 160-226164/19 | | 226164 | | | JLW |
| 01/24/13 19:06 | 5 | ICVABT 160-226164/20 | | 226164 | | | JLW |
| 01/24/13 19:16 | 5 | ICVABT 160-226164/21 | | 226164 | | | JLW |
| 01/24/13 19:24 | 5 | ICVABT 160-226164/22 | | 226164 | | | JLW |
| 12/02/15 11:00 | 40 | ICABT 160-226164/1 | | 226164 | | | JLW |
| 12/02/15 12:28 | 40 | ICABT 160-226164/2 | | 226164 | | | JLW |
| 12/02/15 13:20 | 40 | ICABT 160-226164/3 | | 226164 | | | JLW |
| 12/02/15 14:12 | 40 | ICABT 160-226164/4 | | 226164 | | | JLW |
| 12/02/15 15:06 | 40 | ICABT 160-226164/5 | | 226164 | | | JLW |
| 12/02/15 16:12 | 40 | ICABT 160-226164/6 | | 226164 | | | JLW |
| 12/02/15 17:07 | 40 | ICABT 160-226164/7 | | 226164 | | | JLW |
| 12/02/15 19:20 | 40 | ICABT 160-226164/8 | | 226164 | | | JLW |
| 12/03/15 15:57 | 30 | ICVABT 160-226164/9 | | 226164 | | | JLW |
| 12/04/15 01:19 | 30 | ICVABT 160-226164/10 | | 226164 | | | JLW |
| 12/04/15 02:01 | 30 | ICVABT 160-226164/11 | | 226164 | | | JLW |
| 08/03/19 17:31 | 1000 | ICB 160-437823/1 | | 437823 | | | PS |
| 08/29/19 00:00 | 2 | CCVA 160-441267/11 | | 441267 | | | |
| 08/29/19 00:46 | 2 | CCVB 160-441267/33 | | 441267 | | | |
| 08/29/19 01:45 | 200 | CCB 160-441267/47 | | 441267 | | | |
| 08/29/19 09:13 | 200 | ZZZZZ | | 441267 | | | |
| 08/29/19 14:16 | 200 | ZZZZZ | | 441267 | | | |
| 08/30/19 00:08 | 2 | CCVA 160-441267/128 | | 441267 | | | |
| 08/30/19 00:30 | 2 | CCVB 160-441267/140 | | 441267 | | | CDR |
| 08/30/19 01:29 | 200 | CCB 160-441267/166 | | 441267 | | | CDR |
| 08/30/19 09:23 | 200 | ZZZZZ | | 441488 | | | |
| 08/30/19 14:41 | 200 | LCS 160-436768/1-A | | 441488 | 436768 | 904.0 | KLS |

# Gas Flow Proportional Counter Run Log

## Detector: Orange14

| Analysis Date | Count Minutes | Lab Sample ID | Client Sample ID | Analysis Batch | Prep Batch | Method | Analyst Initials |
|---|---|---|---|---|---|---|---|
| 01/23/13 14:28 | 5 | ICABT 160-229166/18 | | 229166 | | | JLW |
| 01/23/13 14:37 | 5 | ICABT 160-229166/17 | | 229166 | | | JLW |
| 01/23/13 16:47 | 5 | ICABT 160-229166/16 | | 229166 | | | JLW |
| 01/23/13 16:58 | 5 | ICABT 160-229166/15 | | 229166 | | | JLW |
| 01/23/13 17:05 | 5 | ICABT 160-229166/14 | | 229166 | | | JLW |
| 01/23/13 17:12 | 5 | ICABT 160-229166/13 | | 229166 | | | JLW |
| 01/23/13 17:19 | 5 | ICABT 160-229166/12 | | 229166 | | | JLW |
| 01/23/13 17:28 | 5 | ICABT 160-229166/19 | | 229166 | | | JLW |
| 01/24/13 21:08 | 5 | ICVABT 160-229166/22 | | 229166 | | | JLW |
| 01/24/13 21:14 | 5 | ICVABT 160-229166/21 | | 229166 | | | JLW |
| 01/24/13 21:23 | 5 | ICVABT 160-229166/20 | | 229166 | | | JLW |
| 12/21/15 16:29 | 40 | ICABT 160-229166/1 | | 229166 | | | JLW |
| 12/21/15 17:46 | 40 | ICABT 160-229166/2 | | 229166 | | | JLW |
| 12/21/15 18:52 | 40 | ICABT 160-229166/3 | | 229166 | | | JLW |
| 12/21/15 19:38 | 40 | ICABT 160-229166/4 | | 229166 | | | JLW |
| 12/21/15 20:26 | 40 | ICABT 160-229166/5 | | 229166 | | | JLW |
| 12/21/15 21:56 | 40 | ICABT 160-229166/6 | | 229166 | | | JLW |
| 12/22/15 01:01 | 40 | ICABT 160-229166/7 | | 229166 | | | JLW |
| 12/22/15 01:49 | 40 | ICABT 160-229166/8 | | 229166 | | | JLW |
| 12/22/15 10:29 | 30 | ICVABT 160-229166/9 | | 229166 | | | JLW |
| 12/22/15 11:34 | 30 | ICVABT 160-229166/10 | | 229166 | | | JLW |
| 12/22/15 12:11 | 30 | ICVABT 160-229166/11 | | 229166 | | | JLW |
| 08/03/19 17:31 | 1000 | ICB 160-437825/1 | | 437825 | | | PS |
| 08/29/19 00:00 | 2 | CCVA 160-441267/2 | | 441267 | | | |
| 08/29/19 00:45 | 2 | CCVB 160-441267/23 | | 441267 | | | |
| 08/29/19 01:46 | 200 | CCB 160-441267/60 | | 441267 | | | |
| 08/29/19 09:15 | 200 | ZZZZZ | | 441267 | | | |
| 08/29/19 14:21 | 200 | ZZZZZ | | 441267 | | | |
| 08/30/19 00:07 | 2 | CCVA 160-441267/118 | | 441267 | | | |
| 08/30/19 00:31 | 2 | CCVB 160-441267/154 | | 441267 | | | CDR |
| 08/30/19 01:30 | 200 | CCB 160-441267/180 | | 441267 | | | CDR |
| 08/30/19 09:26 | 200 | ZZZZZ | | 441488 | | | |
| 08/30/19 14:43 | 200 | 180-93047-C-9-B DU | | 441488 | 436768 | 904.0 | KLS |

## Detector: Orange18

| Analysis Date | Count Minutes | Lab Sample ID | Client Sample ID | Analysis Batch | Prep Batch | Method | Analyst Initials |
|---|---|---|---|---|---|---|---|
| 01/23/13 12:20 | 5 | ICABT 160-231346/12 | | 231346 | | | JLW |
| 01/23/13 12:29 | 5 | ICABT 160-231346/13 | | 231346 | | | JLW |
| 01/23/13 12:37 | 5 | ICABT 160-231346/14 | | 231346 | | | JLW |
| 01/23/13 12:46 | 5 | ICABT 160-231346/15 | | 231346 | | | JLW |
| 01/23/13 12:53 | 5 | ICABT 160-231346/16 | | 231346 | | | JLW |
| 01/23/13 13:00 | 5 | ICABT 160-231346/17 | | 231346 | | | JLW |
| 01/23/13 13:07 | 5 | ICABT 160-231346/18 | | 231346 | | | JLW |
| 01/23/13 13:14 | 5 | ICABT 160-231346/19 | | 231346 | | | JLW |
| 01/24/13 21:41 | 5 | ICVABT 160-231346/20 | | 231346 | | | JLW |
| 01/24/13 21:48 | 5 | ICVABT 160-231346/21 | | 231346 | | | JLW |
| 01/24/13 21:54 | 3 | ICVABT 160-231346/22 | | 231346 | | | JLW |
| 01/07/16 00:06 | 40 | ICABT 160-231346/1 | | 231346 | | | JLW |
| 01/07/16 01:05 | 40 | ICABT 160-231346/2 | | 231346 | | | JLW |
| 01/07/16 01:46 | 40 | ICABT 160-231346/3 | | 231346 | | | JLW |
| 01/07/16 06:24 | 40 | ICABT 160-231346/4 | | 231346 | | | JLW |
| 01/07/16 07:41 | 40 | ICABT 160-231346/5 | | 231346 | | | JLW |

# Gas Flow Proportional Counter Run Log

## Detector: Orange18 (Continued)

| Analysis Date | Count Minutes | Lab Sample ID | Client Sample ID | Analysis Batch | Prep Batch | Method | Analyst Initials |
|---|---|---|---|---|---|---|---|
| 01/07/16 08:29 | 40 | ICABT 160-231346/6 | | 231346 | | | JLW |
| 01/07/16 09:33 | 40 | ICABT 160-231346/7 | | 231346 | | | JLW |
| 01/07/16 10:30 | 40 | ICABT 160-231346/8 | | 231346 | | | JLW |
| 01/07/16 14:42 | 30 | ICVABT 160-231346/9 | | 231346 | | | JLW |
| 01/07/16 15:30 | 30 | ICVABT 160-231346/10 | | 231346 | | | JLW |
| 01/07/16 16:19 | 30 | ICVABT 160-231346/11 | | 231346 | | | JLW |
| 08/03/19 17:31 | 1000 | ICB 160-437829/1 | | 437829 | | | PS |
| 08/29/19 00:00 | 2 | CCVA 160-441267/20 | | 441267 | | | |
| 08/29/19 00:46 | 2 | CCVB 160-441267/27 | | 441267 | | | |
| 08/29/19 01:46 | 200 | CCB 160-441267/63 | | 441267 | | | |
| 08/29/19 09:15 | 200 | ZZZZZ | | 441267 | | | |
| 08/29/19 14:24 | 200 | ZZZZZ | | 441267 | | | |
| 08/30/19 00:07 | 2 | CCVA 160-441267/122 | | 441267 | | | |
| 08/30/19 00:32 | 2 | CCVB 160-441267/158 | | 441267 | | | CDR |
| 08/30/19 01:30 | 200 | CCB 160-441267/184 | | 441267 | | | CDR |
| 08/30/19 09:26 | 200 | ZZZZZ | | 441488 | | | |
| 08/30/19 14:44 | 200 | 180-93098-2 | JSF-STR-PB08-CC-SUR-0190718 ~ STR-PB08 | 441488 | 436768 | 904.0 | KLS |

## Detector: Orange19

| Analysis Date | Count Minutes | Lab Sample ID | Client Sample ID | Analysis Batch | Prep Batch | Method | Analyst Initials |
|---|---|---|---|---|---|---|---|
| 01/23/13 12:20 | 5 | ICABT 160-231347/12 | | 231347 | | | JLW |
| 01/23/13 12:29 | 5 | ICABT 160-231347/13 | | 231347 | | | JLW |
| 01/23/13 12:37 | 5 | ICABT 160-231347/14 | | 231347 | | | JLW |
| 01/23/13 12:45 | 5 | ICABT 160-231347/15 | | 231347 | | | JLW |
| 01/23/13 12:53 | 5 | ICABT 160-231347/16 | | 231347 | | | JLW |
| 01/23/13 13:00 | 5 | ICABT 160-231347/17 | | 231347 | | | JLW |
| 01/23/13 13:07 | 5 | ICABT 160-231347/18 | | 231347 | | | JLW |
| 01/23/13 13:15 | 5 | ICABT 160-231347/19 | | 231347 | | | JLW |
| 01/24/13 21:48 | 5 | ICVABT 160-231347/20 | | 231347 | | | JLW |
| 01/24/13 21:55 | 5 | ICVABT 160-231347/21 | | 231347 | | | JLW |
| 01/24/13 22:02 | 5 | ICVABT 160-231347/22 | | 231347 | | | JLW |
| 01/07/16 00:06 | 40 | ICABT 160-231347/1 | | 231347 | | | JLW |
| 01/07/16 01:05 | 40 | ICABT 160-231347/2 | | 231347 | | | JLW |
| 01/07/16 01:46 | 40 | ICABT 160-231347/3 | | 231347 | | | JLW |
| 01/07/16 06:22 | 40 | ICABT 160-231347/4 | | 231347 | | | JLW |
| 01/07/16 07:41 | 40 | ICABT 160-231347/5 | | 231347 | | | JLW |
| 01/07/16 08:29 | 40 | ICABT 160-231347/6 | | 231347 | | | JLW |
| 01/07/16 09:33 | 40 | ICABT 160-231347/7 | | 231347 | | | JLW |
| 01/07/16 10:30 | 40 | ICABT 160-231347/8 | | 231347 | | | JLW |
| 01/07/16 15:31 | 30 | ICVABT 160-231347/9 | | 231347 | | | JLW |
| 01/07/16 16:19 | 30 | ICVABT 160-231347/10 | | 231347 | | | JLW |
| 01/07/16 16:51 | 30 | ICVABT 160-231347/11 | | 231347 | | | JLW |
| 08/03/19 17:31 | 1000 | ICB 160-437830/1 | | 437830 | | | PS |
| 08/29/19 00:00 | 2 | CCVA 160-441267/5 | | 441267 | | | |
| 08/29/19 00:46 | 2 | CCVB 160-441267/28 | | 441267 | | | |
| 08/29/19 01:46 | 200 | CCB 160-441267/62 | | 441267 | | | |
| 08/29/19 09:15 | 200 | ZZZZZ | | 441267 | | | |
| 08/29/19 14:24 | 200 | ZZZZZ | | 441267 | | | |
| 08/30/19 00:07 | 2 | CCVA 160-441267/123 | | 441267 | | | |
| 08/30/19 00:32 | 2 | CCVB 160-441267/159 | | 441267 | | | CDR |
| 08/30/19 01:30 | 200 | CCB 160-441267/185 | | 441267 | | | CDR |

# Gas Flow Proportional Counter Run Log

## Detector: Orange19 (Continued)

| Analysis Date | Count Minutes | Lab Sample ID | Client Sample ID | Analysis Batch | Prep Batch | Method | Analyst Initials |
|---|---|---|---|---|---|---|---|
| 08/30/19 09:26 | 200 | ZZZZZ | | 441488 | | | |
| 08/30/19 14:44 | 200 | 180-93098-3 | JSF-STR-PB07-CC-SUR-0190718 ~ STR-PB07 | 441488 | 436768 | 904.0 | KLS |

## Detector: Orange22

| Analysis Date | Count Minutes | Lab Sample ID | Client Sample ID | Analysis Batch | Prep Batch | Method | Analyst Initials |
|---|---|---|---|---|---|---|---|
| 01/23/13 12:20 | 5 | ICABT 160-231350/12 | | 231350 | | | JLW |
| 01/23/13 12:30 | 5 | ICABT 160-231350/13 | | 231350 | | | JLW |
| 01/23/13 12:37 | 5 | ICABT 160-231350/14 | | 231350 | | | JLW |
| 01/23/13 12:45 | 5 | ICABT 160-231350/15 | | 231350 | | | JLW |
| 01/23/13 12:53 | 5 | ICABT 160-231350/16 | | 231350 | | | JLW |
| 01/23/13 13:00 | 5 | ICABT 160-231350/17 | | 231350 | | | JLW |
| 01/23/13 13:07 | 5 | ICABT 160-231350/18 | | 231350 | | | JLW |
| 01/23/13 13:15 | 5 | ICABT 160-231350/19 | | 231350 | | | JLW |
| 01/24/13 22:42 | 5 | ICVABT 160-231350/20 | | 231350 | | | JLW |
| 01/24/13 22:51 | 5 | ICVABT 160-231350/21 | | 231350 | | | JLW |
| 01/24/13 23:01 | 5 | ICVABT 160-231350/22 | | 231350 | | | JLW |
| 01/07/16 00:06 | 40 | ICABT 160-231350/1 | | 231350 | | | JLW |
| 01/07/16 01:05 | 40 | ICABT 160-231350/2 | | 231350 | | | JLW |
| 01/07/16 01:46 | 40 | ICABT 160-231350/3 | | 231350 | | | JLW |
| 01/07/16 06:23 | 40 | ICABT 160-231350/4 | | 231350 | | | JLW |
| 01/07/16 07:41 | 40 | ICABT 160-231350/5 | | 231350 | | | JLW |
| 01/07/16 08:28 | 40 | ICABT 160-231350/6 | | 231350 | | | JLW |
| 01/07/16 09:33 | 40 | ICABT 160-231350/7 | | 231350 | | | JLW |
| 01/07/16 10:30 | 40 | ICABT 160-231350/8 | | 231350 | | | JLW |
| 01/07/16 17:39 | 30 | ICVABT 160-231350/9 | | 231350 | | | JLW |
| 01/07/16 18:10 | 30 | ICVABT 160-231350/10 | | 231350 | | | JLW |
| 01/07/16 19:31 | 30 | ICVABT 160-231350/11 | | 231350 | | | JLW |
| 08/03/19 17:32 | 1000 | ICB 160-437843/1 | | 437843 | | | PS |
| 08/29/19 00:00 | 2 | CCVA 160-441267/2 | | 441267 | | | |
| 08/29/19 00:46 | 2 | CCVB 160-441267/31 | | 441267 | | | |
| 08/29/19 01:46 | 200 | CCB 160-441267/68 | | 441267 | | | |
| 08/29/19 09:15 | 200 | ZZZZZ | | 441267 | | | |
| 08/29/19 14:25 | 200 | ZZZZZ | | 441267 | | | |
| 08/30/19 00:08 | 2 | CCVA 160-441267/126 | | 441267 | | | |
| 08/30/19 00:32 | 2 | CCVB 160-441267/162 | | 441267 | | | CDR |
| 08/30/19 01:30 | 200 | CCB 160-441267/187 | | 441267 | | | CDR |
| 08/30/19 09:27 | 200 | ZZZZZ | | 441488 | | | |
| 08/30/19 14:44 | 200 | 180-93098-4 | JSF-STR-PB06-CC-SUR-0190718 ~ STR-PB06 | 441488 | 436768 | 904.0 | KLS |

## Detector: Orange23

| Analysis Date | Count Minutes | Lab Sample ID | Client Sample ID | Analysis Batch | Prep Batch | Method | Analyst Initials |
|---|---|---|---|---|---|---|---|
| 01/23/13 12:20 | 5 | ICABT 160-231351/12 | | 231351 | | | JLW |
| 01/23/13 12:30 | 5 | ICABT 160-231351/13 | | 231351 | | | JLW |
| 01/23/13 12:38 | 5 | ICABT 160-231351/14 | | 231351 | | | JLW |
| 01/23/13 12:46 | 5 | ICABT 160-231351/15 | | 231351 | | | JLW |
| 01/23/13 12:53 | 5 | ICABT 160-231351/16 | | 231351 | | | JLW |
| 01/23/13 13:00 | 5 | ICABT 160-231351/17 | | 231351 | | | JLW |
| 01/23/13 13:07 | 5 | ICABT 160-231351/18 | | 231351 | | | JLW |

# Gas Flow Proportional Counter Run Log

## Detector: Orange23 (Continued)

| Analysis Date | Count Minutes | Lab Sample ID | Client Sample ID | Analysis Batch | Prep Batch | Method | Analyst Initials |
|---|---|---|---|---|---|---|---|
| 01/23/13 13:14 | 5 | ICABT 160-231351/19 | | 231351 | | | JLW |
| 01/24/13 22:51 | 5 | ICVABT 160-231351/20 | | 231351 | | | JLW |
| 01/24/13 23:01 | 5 | ICVABT 160-231351/21 | | 231351 | | | JLW |
| 01/24/13 23:07 | 5 | ICVABT 160-231351/22 | | 231351 | | | JLW |
| 01/07/16 00:06 | 40 | ICABT 160-231351/1 | | 231351 | | | JLW |
| 01/07/16 01:05 | 40 | ICABT 160-231351/2 | | 231351 | | | JLW |
| 01/07/16 01:47 | 40 | ICABT 160-231351/3 | | 231351 | | | JLW |
| 01/07/16 06:23 | 40 | ICABT 160-231351/4 | | 231351 | | | JLW |
| 01/07/16 07:41 | 40 | ICABT 160-231351/5 | | 231351 | | | JLW |
| 01/07/16 08:29 | 40 | ICABT 160-231351/6 | | 231351 | | | JLW |
| 01/07/16 09:33 | 40 | ICABT 160-231351/7 | | 231351 | | | JLW |
| 01/07/16 10:29 | 40 | ICABT 160-231351/8 | | 231351 | | | JLW |
| 01/07/16 18:10 | 30 | ICVABT 160-231351/9 | | 231351 | | | JLW |
| 01/07/16 19:31 | 30 | ICVABT 160-231351/10 | | 231351 | | | JLW |
| 01/07/16 22:48 | 30 | ICVABT 160-231351/11 | | 231351 | | | JLW |
| 08/03/19 07:08 | 2 | CCVA 160-437776/24 | | 437776 | | | |
| 08/03/19 07:21 | 2 | CCVB 160-437776/48 | | 437776 | | | |
| 08/03/19 08:35 | 200 | CCB 160-437776/78 | | 437776 | | | |
| 08/03/19 17:32 | 1000 | ICB 160-437776/79 | | 437776 | | | PS |
| 08/29/19 00:00 | 2 | CCVA 160-441267/8 | | 441267 | | | |
| 08/29/19 00:46 | 2 | CCVB 160-441267/32 | | 441267 | | | |
| 08/29/19 01:46 | 200 | CCB 160-441267/69 | | 441267 | | | |
| 08/29/19 09:16 | 200 | ZZZZZ | | 441267 | | | |
| 08/29/19 14:25 | 200 | ZZZZZ | | 441267 | | | |
| 08/30/19 00:08 | 2 | CCVA 160-441267/127 | | 441267 | | | |
| 08/30/19 00:32 | 2 | CCVB 160-441267/163 | | 441267 | | | CDR |
| 08/30/19 01:30 | 200 | CCB 160-441267/186 | | 441267 | | | CDR |
| 08/30/19 09:27 | 200 | ZZZZZ | | 441488 | | | |
| 08/30/19 14:44 | 200 | MB 160-436768/18-A | | 441488 | 436768 | 904.0 | KLS |

## Detector: Purple0

| Analysis Date | Count Minutes | Lab Sample ID | Client Sample ID | Analysis Batch | Prep Batch | Method | Analyst Initials |
|---|---|---|---|---|---|---|---|
| 02/03/13 15:26 | 5 | ICABT 160-233497/12 | | 233497 | | | JLW |
| 02/03/13 16:02 | 5 | ICABT 160-233497/13 | | 233497 | | | JLW |
| 02/03/13 16:23 | 5 | ICABT 160-233497/14 | | 233497 | | | JLW |
| 02/03/13 16:34 | 5 | ICABT 160-233497/15 | | 233497 | | | JLW |
| 02/03/13 16:41 | 5 | ICABT 160-233497/16 | | 233497 | | | JLW |
| 02/03/13 16:48 | 5 | ICABT 160-233497/17 | | 233497 | | | JLW |
| 02/03/13 17:05 | 5 | ICABT 160-233497/18 | | 233497 | | | JLW |
| 02/03/13 17:14 | 5 | ICABT 160-233497/19 | | 233497 | | | JLW |
| 02/04/13 22:27 | 5 | ICVABT 160-233497/20 | | 233497 | | | JLW |
| 02/04/13 23:10 | 5 | ICVABT 160-233497/21 | | 233497 | | | JLW |
| 02/04/13 23:19 | 5 | ICVABT 160-233497/22 | | 233497 | | | JLW |
| 01/16/16 10:15 | 40 | ICABT 160-233497/1 | | 233497 | | | JLW |
| 01/16/16 11:01 | 40 | ICABT 160-233497/2 | | 233497 | | | JLW |
| 01/16/16 11:43 | 40 | ICABT 160-233497/3 | | 233497 | | | JLW |
| 01/16/16 12:25 | 40 | ICABT 160-233497/4 | | 233497 | | | JLW |
| 01/16/16 13:06 | 40 | ICABT 160-233497/5 | | 233497 | | | JLW |
| 01/16/16 13:49 | 40 | ICABT 160-233497/6 | | 233497 | | | JLW |
| 01/16/16 14:32 | 40 | ICABT 160-233497/7 | | 233497 | | | JLW |
| 01/16/16 15:15 | 40 | ICABT 160-233497/8 | | 233497 | | | JLW |
| 01/17/16 17:23 | 30 | ICVABT 160-233497/9 | | 233497 | | | JLW |

# Gas Flow Proportional Counter Run Log

## Detector: Purple0 (Continued)

| Analysis Date | Count Minutes | Lab Sample ID | Client Sample ID | Analysis Batch | Prep Batch | Method | Analyst Initials |
|---|---|---|---|---|---|---|---|
| 01/17/16 22:54 | 30 | ICVABT 160-233497/10 | | 233497 | | | JLW |
| 01/17/16 23:37 | 30 | ICVABT 160-233497/11 | | 233497 | | | JLW |
| 08/05/19 02:36 | 1000 | ICB 160-438186/3 | | 438186 | | | PS |
| 08/30/19 00:09 | 2 | CCVB 160-441352/5 | | 441352 | | | KLS |
| 08/30/19 00:24 | 2 | CCVA 160-441352/17 | | 441352 | | | KLS |
| 08/30/19 01:30 | 200 | CCB 160-441352/35 | | 441352 | | | KLS |
| 08/30/19 09:20 | 200 | ZZZZZ | | 441352 | | | |
| 08/30/19 14:47 | 200 | 180-93098-1 | JSF-STR-PB09-CC-SUR-0190718 ~ STR-PB09 | 441352 | 436768 | 904.0 | KLS |

# Subcontract Data

# Shipping and Receiving Documents

# TVA Environmental Investigations

Tennessee Valley Authority

| COOLER No.: | 1 | of | 1 |
|---|---|---|---|
| COC No: | JSF_STR_20190718_3B | | |
| 1 of 1 Pages | | | |
| Task Desc: | JSF_STR | | |

## Chain-of-Custody / Analytical Request Document

**Chain-of-Custody is a LEGAL DOCUMENT. All relevant fields must be completed and accurate**

| Required Ship to Lab: | | Required Project Information: | | Required Sampler Information | |
|---|---|---|---|---|---|
| Lab Name: | TestAmerica Pittsburgh | Site ID #: | JOHN SEVIER FOSSIL PLANT | Sampler: Carina O'Bara | |
| Lab Address: | 301 Alpha Drive | Project #: | 0779777 | Sampling Company: TVA | |
| | RIDC Park | Site Address | 611 Old Highway 70 S | Address: TVA Chickamauga Power Service Center, 4601 N. Access Road, 37415 | |
| | Pittsburgh, PA 15238 | City | Rogersville State, Zip: TN, 37857 | City/State: Chattanooga, TN | Phone: 423-876-6733 |
| Lab Manager Contact Information | | Site PM Name: | Roy Quinn | | |
| Lab PM: | Gail Lage | Phone/Fax: | 423-751-3753 | Sampling Team Number: | 3 |
| Phone/Fax: | 615-301-5741/615-726-3404 | Site PM Email: | jrquinn@tva.gov | Send EDD/Hard Copy to: | tva_deliverables@envstd.com |
| Lab Email: | Gail.Lage@testamericainc.com | | | | |

**Analysis Turnaround Time**

☐ CALENDAR DAYS ☑ WORKING DAYS

TAT if different from Below _____

☐ 24 Hours
☐ 3 Business Days
☐ 5 Business Days
☐ 10 Business Days (Standard)

| ITEMS # | SAMPLE ID Samples IDs MUST BE UNIQUE | SAMPLE LOCATION | Sample Depth: Depth Unit | Sample Depth: Meters Start Depth | Sample Depth: Meters End Depth | MATRIX CODE | G= GRAB C=COMP | SAMPLE TYPE | SAMPLE DATE | SAMPLE TIME | # OF CONTAINERS | Comments/ Lab Sample I.D. | MS/MSD | Analysis: SW_RAD (Filtered: N; Preserve: HNO3) |
|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|
| 1 | JSF-STR-PB09-CC-SUR-20190718 | STR-PB09 | | 0.03 | NA | SW | G | N | 7/18/2019 | 1345 | 3 | | ☐ | X |
| 2 | JSF-STR-PB08-CC-SUR-20190718 | STR-PB08 | | 0.05 | NA | SW | G | N | 7/18/2019 | 1435 | 3 | | ☐ | X |
| 3 | JSF-STR-PB07-CC-SUR-20190718 | STR-PB07 | | 0.10 | NA | SW | G | N | 7/18/2019 | 1505 | 3 | | ☐ | X |
| 4 | JSF-STR-PB06-CC-SUR-20190718 | STR-PB06 | | 0.10 | NA | SW | G | N | 7/18/2019 | 1545 | 3 | | ☐ | X |
| 5 | | | | | | | | | | | | | ☐ | |
| 6 | | | | | | | | | | | | | ☐ | |
| 7 | | | | | | | | | | | | | | |
| 8 | | | | | | | | | | | | | | |
| 9 | | | | | | | | | | | | | | |
| 10 | | | | | | | | | | | | | | |
| 11 | | | | | | | | | | | | | | |
| 12 | | | | | | | | | | | | | | |
| 13 | | | | | | | | | | | | | | |

Carina O'Bara 7-22-19

180-93098 Chain of Custody

**Additional Comments/Special Instructions:**

Custody seal # 683626

| RELINQISHED BY / AFFILIATION | DATE | TIME | ACCEPTED BY / AFFILIATION | DATE | TIME |
|---|---|---|---|---|---|
| Carina O'Bara TVA-JSG | 7-22-19 | 1325 | [illegible] | 7/23/19 | 920 |
| | | | | | |
| | | | | | |
| | | | | | |

| SHIPPING METHOD: | SAMPLER NAME AND SIGNATURE |
|---|---|
| Fedex | Carina O'Bara Carina O'Bara |

**Sample Receipt Conditions**

| Temperature in °C | Sample on Ice? | Sample Intact? | Trip Blank? |
|---|---|---|---|
| ☑Yes ☐No | ☑Yes ☐No | ☑Yes ☐No | ☑Yes ☐No |
| ☑Yes ☐No | ☑Yes ☐No | ☑Yes ☐No | ☑Yes ☐No |
| ☑Yes ☐No | ☑Yes ☐No | ☑Yes ☐No | ☑Yes ☐No |
| ☑Yes ☐No | ☑Yes ☐No | ☑Yes ☐No | ☑Yes ☐No |

Form TVA 30067A

180-93098 Waybill

TestAm ca

THE LEADER IN ENV TESTING

RT 97 FZ

1 10:30

ORIGIN ID:MIFA (281) 552-8437
TYLER BAKER
CHICKAMAUGA POWER SERVICE CENTER
4601 NORTH ACCESS ROAD, BUILDING G

CHATTANOOGA, TN 37415
UNITED STATES US

SHIP DATE: 14FEB19
ACTWGT: 10.00 LB MAN
CAD: 592545/CAFE3211

TO

TESTAMERICA PITTSBURGH
301 ALPHA DRIVE
RIDC PARK
PITTSBURGH PA 15238-2907

(412) 963-7058
DEPT: BOTTLES

REF: S180-49805

RMA:

FedEx
TRK# 0221 4759 5527 5894

TUE - 23 J
PRIORITY OV

XH AGCA

PA-

Uncorrected temp 1.2 °C
Thermometer ID 12
CF -0.6 Initials B

PT-WI-SR-001 effective 11/8/18

**Eurofins TestAmerica, Pittsburgh**
301 Alpha Drive RIDC Park
Pittsburgh, PA 15238
Phone: 412-963-7058 Fax: 412-963-2468

# Chain of Custody Record

eurofins | Environment Testing TestAmerica

| Client Information (Sub Contract Lab) | Sampler: | Lab PM: Rumble, Jennifer L | Carrier Tracking No(s): | COC No: 180-369435.1 |
|---|---|---|---|---|
| Client Contact: Shipping/Receiving | Phone: | E-Mail: jennifer.rumble@testamericainc.com | State of Origin: Tennessee | Page: Page 1 of 1 |
| Company: TestAmerica Laboratories, Inc. | | Accreditations Required (See note): | | Job #: 180-93098-1 |
| Address: 13715 Rider Trail North, , | Due Date Requested: 8/22/2019 | | | |
| City: Earth City | TAT Requested (days): | | | |
| State, Zip: MO, 63045 | | | | |
| Phone: 314-298-8566(Tel) 314-298-8757(Fax) | PO #: | | | |
| Email: | WO #: | | | |
| Project Name: JSF_STR_20190718_3B | Project #: 18019862 | | | |
| Site: | SSOW#: | | | |

**Analysis Requested**

**Preservation Codes:**

A - HCL, B - NaOH, C - Zn Acetate, D - Nitric Acid, E - NaHSO4, F - MeOH, G - Amchlor, H - Ascorbic Acid, I - Ice, J - DI Water, K - EDTA, L - EDA, M - Hexane, N - None, O - AsNaO2, P - Na2O4S, Q - Na2SO3, R - Na2S2O3, S - H2SO4, T - TSP Dodecahydrate, U - Acetone, V - MCAA, W - pH 4-5, Z - other (specify)

Other:

| Sample Identification - Client ID (Lab ID) | Sample Date | Sample Time | Sample Type (C=comp, G=grab) | Matrix (W=water, S=solid, O=waste/oil, BT=Tissue, A=Air) | Field Filtered Sample (Yes or No) | Perform MS/MSD (Yes or No) | 903.0/PrecSep_STD Ra-226 | 904.0/PrecSep_0 Ra-228 | Ra226_228GFPC_P/ Combined Radium-226/228 | Total Number of containers | Special Instructions/Note: |
|---|---|---|---|---|---|---|---|---|---|---|---|
| | | | Preservation Code: | | | | | | | | |
| JSF-STR-PB09-CC-SUR-20190718 ~ STR-PB09 (180-93098-1) | 7/18/19 | 13:45 Eastern | | Water | | | X | X | X | 3 | TVA - Batch alone |
| JSF-STR-PB08-CC-SUR-20190718 ~ STR-PB08 (180-93098-2) | 7/18/19 | 14:35 Eastern | | Water | | | X | X | X | 3 | TVA - Batch alone |
| JSF-STR-PB07-CC-SUR-20190718 ~ STR-PB07 (180-93098-3) | 7/18/19 | 15:05 Eastern | | Water | | | X | X | X | 3 | TVA - Batch alone |
| JSF-STR-PB06-CC-SUR-20190718 ~ STR-PB06 (180-93098-4) | 7/18/19 | 15:45 Eastern | | Water | | | X | X | X | 3 | TVA - Batch alone |

Note: Since laboratory accreditations are subject to change, TestAmerica Laboratories, Inc. places the ownership of method, analyte & accreditation compliance upon out subcontract laboratories. This sample shipment is forwarded under chain-of-custody. If the laboratory does not currently maintain accreditation in the State of Origin listed above for analysis/tests/matrix being analyzed, the samples must be shipped back to the TestAmerica laboratory or other instructions will be provided. Any changes to accreditation status should be brought to TestAmerica Laboratories, Inc. attention immediately. If all requested accreditations are current to date, return the signed Chain of Custody attesting to said complicance to TestAmerica Laboratories, Inc.

***Possible Hazard Identification***
*Unconfirmed*

***Sample Disposal ( A fee may be assessed if samples are retained longer than 1 month)***
☐ *Return To Client* ☐ *Disposal By Lab* ☐ *Archive For* _____ *Months*

Deliverable Requested: I, II, III, IV, Other (specify) Primary Deliverable Rank: 2

Special Instructions/QC Requirements:

| Empty Kit Relinquished by: | Date: | Time: | Method of Shipment: | | |
|---|---|---|---|---|---|
| Relinquished by: | Date/Time: 7/24/19 1700 | Company MRI | Received by: | Date/Time: 7-25-19 0930 | Company TA STL |
| Relinquished by: | Date/Time: | Company | Received by: | Date/Time: | Company |
| Relinquished by: | Date/Time: | Company | Received by: | Date/Time: | Company |

| Custody Seals Intact: Δ Yes Δ No | Custody Seal No.: | Cooler Temperature(s) °C and Other Remarks: |
|---|---|---|

Ver: 01/16/2019

# Login Sample Receipt Checklist

Client: Environmental Standards Inc. Job Number: 180-93098-1

**Login Number: 93098** **List Source: Eurofins TestAmerica, Pittsburgh**
**List Number: 1**
**Creator: Say, Thomas C**

| Question | Answer | Comment |
|---|---|---|
| Radioactivity wasn't checked or is </= background as measured by a survey meter. | True | |
| The cooler's custody seal, if present, is intact. | True | |
| Sample custody seals, if present, are intact. | True | |
| The cooler or samples do not appear to have been compromised or tampered with. | True | |
| Samples were received on ice. | True | |
| Cooler Temperature is acceptable. | True | |
| Cooler Temperature is recorded. | True | |
| COC is present. | True | |
| COC is filled out in ink and legible. | True | |
| COC is filled out with all pertinent information. | True | |
| Is the Field Sampler's name present on COC? | True | |
| There are no discrepancies between the containers received and the COC. | True | |
| Samples are received within Holding Time (excluding tests with immediate HTs) | True | |
| Sample containers have legible labels. | True | |
| Containers are not broken or leaking. | True | |
| Sample collection date/times are provided. | True | |
| Appropriate sample containers are used. | True | |
| Sample bottles are completely filled. | True | |
| Sample Preservation Verified. | True | |
| There is sufficient vol. for all requested analyses, incl. any requested MS/MSDs | True | |
| Containers requiring zero headspace have no headspace or bubble is <6mm (1/4"). | True | |
| Multiphasic samples are not present. | True | |
| Samples do not require splitting or compositing. | True | |
| Residual Chlorine Checked. | N/A | |

# Login Sample Receipt Checklist

Client: Environmental Standards Inc.

Job Number: 180-93098-1

**Login Number: 93098**
**List Number: 2**
**Creator: Hellm, Michael**

**List Source: Eurofins TestAmerica, St. Louis**
**List Creation: 07/25/19 02:09 PM**

| Question | Answer | Comment |
|---|---|---|
| Radioactivity wasn't checked or is </= background as measured by a survey meter. | True | |
| The cooler's custody seal, if present, is intact. | True | |
| Sample custody seals, if present, are intact. | N/A | |
| The cooler or samples do not appear to have been compromised or tampered with. | True | |
| Samples were received on ice. | N/A | |
| Cooler Temperature is acceptable. | True | |
| Cooler Temperature is recorded. | True | 18.0 |
| COC is present. | True | |
| COC is filled out in ink and legible. | True | |
| COC is filled out with all pertinent information. | True | |
| Is the Field Sampler's name present on COC? | N/A | |
| There are no discrepancies between the containers received and the COC. | True | |
| Samples are received within Holding Time (excluding tests with immediate HTs) | True | |
| Sample containers have legible labels. | True | |
| Containers are not broken or leaking. | True | |
| Sample collection date/times are provided. | True | |
| Appropriate sample containers are used. | True | |
| Sample bottles are completely filled. | True | |
| Sample Preservation Verified. | True | |
| There is sufficient vol. for all requested analyses, incl. any requested MS/MSDs | True | |
| Containers requiring zero headspace have no headspace or bubble is <6mm (1/4"). | N/A | |
| Multiphasic samples are not present. | N/A | |
| Samples do not require splitting or compositing. | True | |
| Residual Chlorine Checked. | N/A | |