YAEC Chemistry Lab Spectrum name: 101F_12SEPT2006_1807.An1

Sample description
FSS-SSS-01-01-015-F-S

Spectrum Filename: C:\GammaVision\Spectra\101F_12SEPT2006_1807.An1

Acquisition information
Start time: 12-Sep-2006 18:07:44
Live time: 2000
Real time: 2002
Dead time: 0.08 %
Detector ID: 1

Detector system
Det 101- DSPE-633

Calibration
Filename: D1_1LSa.Clb
Detector 101 1.0 Liter Marinelli Sand

Energy Calibration
Created: 03-Sep-2004 08:50:48
Zero offset: 0.244 keV
Gain: 0.500 keV/channel
Quadratic: -2.493E-08 keV/channel^2

Efficiency Calibration
Created: 03-Sep-2004 08:52:26
Type: Polynomial
Uncertainty: 0.626 %
Coefficients: -0.321775 -5.816463 0.734234
-0.099357 0.006049 -0.000149

Library Files
Main analysis library: FSS_Rev_1.Lib
Library Match Width: 1.000
Peak stripping: Library based

Analysis parameters
Analysis engine: Env32 G53W4.20
Start channel: 100 ( 50.23keV )
Stop channel: 4000 ( 1999.11keV )
Peak rejection level: 41.667%
Peak search sensitivity: 3
Sample Size: 2.0010E+03
Activity scaling factor: 1.0000E+06/( 1.0000E+00* 2.0010E+03) =
4.9975E+02
Detection limit method: Nureg 4.16
Random error: 1.0000000E+00
Systematic error: 1.0000000E+00

| | |
|---|---|
| Fraction Limit: | 0.000% |
| Background width: | average of five points. |

YAEC Chemistry Lab Spectrum name: 101F_12SEPT2006_1807.An1

Half lives decay limit: 12.000
Activity range factor: 2.000
Min. step backg. energy 0.000
Multiplet shift channel 2.000

| Corrections | Status | Comments |
|---|---|---|
| Decay correct to date: | YES | 08-Sep-2006 16:30:00 |
| Decay during acquisition: | NO | |
| Decay during collection: | NO | |
| True coincidence correction: | NO | |
| Peaked background correction: | YES | 101_150K_28APR05.Pbc 01-May-2005 05:24:47 |
| Absorption (Internal): | NO | |
| Geometry correction: | NO | |
| Random summing: | NO | |

total peaks alloc. 18 cutoff 20.00000 %
Energy Calibration
Normalized diff: 0.2898

***** S U M M A R Y O F P E A K S I N R A N G E *****

| Peak Energy | Area | Uncert | FWHM | Corrctn Factor | Nuclide Energy | Brnch. Ratio | Act. pCi/gm | Nuc |
|---|---|---|---|---|---|---|---|---|
| 63.69 | 93. | 40.87 | 1.20 | 1.145E-02 | 63.29 | 3.900 | PBC<MDA | TH234 |
| 74.42 | 169. | 20.33 | 1.00 | 1.651E-02 | | | | |
| 74.42 | 169. | 20.33 | 1.00 | 1.651E-02 | 74.81 | 9.600 | 6.956E-01 | PB212 |
| 77.42 | 318. | 10.89 | 1.01 | 1.736E-02 | 77.11 | 17.500 | 7.138E-01 | PB212 |
| | | | | | 77.11 | 10.700 | 1.154E+00 | PB214 |
| 87.11 | 116. | 25.45 | 1.01 | 1.923E-02 | 86.45 | 32.740 | 1.257E-01 | EU155 |
| 89.67 | 98. | 28.79 | 1.02 | 1.957E-02 | 88.04 | 3.790 | PBC<MDA | CD109 |
| 93.35 | 125. | 22.53 | 1.02 | 1.997E-02 | 92.38 | 2.570 | PBC<MDA | TH234 |
| | | | | | 92.80 | 3.000 | PBC<MDA | TH234 |
| 186.08 | 121. | 24.05 | 1.44 | 1.858E-02 | 185.99 | 3.280 | 1.341E+00 | RA226 |
| 209.34 | 84. | 35.58 | 1.47 | 1.721E-02 | | | | |
| 238.93 | 791. | 4.23 | 1.12 | 1.557E-02 | 238.63 | 43.100 | 7.897E-01 | PB212 |
| 241.82 | 132. | 18.77 | 1.12 | 1.542E-02 | 241.00 | 3.900 | 1.472E+00 | RA224 |
| 270.64 | 70. | 33.73 | 1.12 | 1.398E-02 | | | | |
| 295.23 | 186. | 14.10 | 1.19 | 1.292E-02 | 295.22 | 19.200 | 5.007E-01 | PB214 |
| 300.74 | 55. | 32.47 | 0.99 | 1.270E-02 | | | | |
| 328.38 | 37. | 40.72 | 0.98 | 1.168E-02 | | | | |
| 338.86 | 202. | 13.38 | 0.92 | 1.133E-02 | 338.40 | 12.010 | 9.900E-01 | AC228 |
| 352.18 | 286. | 9.66 | 1.32 | 1.092E-02 | 351.99 | 37.100 | 4.727E-01 | PB214 |
| 463.49 | 66. | 24.14 | 1.37 | 8.342E-03 | | | | |
| 463.49 | 66. | 24.14 | 1.37 | 8.342E-03 | 463.51 | 10.000 | 5.281E-01 | SB125 |
| 511.40 | 130. | 15.60 | 1.70 | 7.581E-03 | 510.72 | 22.500 | 4.495E-01 | TL208 |
| 583.61 | 228. | 8.07 | 1.37 | 6.679E-03 | 583.14 | 86.000 | 2.649E-01 | TL208 |
| 609.57 | 239. | 9.25 | 1.36 | 6.410E-03 | 609.32 | 46.090 | 5.438E-01 | BI214 |
| 661.88 | 58. | 22.83 | 1.29 | 5.935E-03 | 661.62 | 84.620 | 7.612E-02 | CS137 |
| 727.73 | 75. | 20.76 | 2.07 | 5.439E-03 | 727.17 | 11.800 | 7.836E-01 | BI212 |
| 911.69 | 164. | 10.51 | 1.71 | 4.444E-03 | 911.07 | 29.000 | 8.502E-01 | AC228 |

| | | | | | | | | |
|---|---|---|---|---|---|---|---|---|
| 969.16 | 91. | 17.66 | 1.63 | 4.211E-03 | 968.90 | 17.460 | 8.327E-01 | AC228 |
| 1120.98 | 77. | 21.11 | 1.91 | 3.711E-03 | 1120.28 | 15.040 | 9.271E-01 | BI214 |
| 1461.43 | 574. | 4.28 | 1.58 | 2.941E-03 | 1460.75 | 10.700 | 1.226E+01 | K40 |
| 1765.22 | 45. | 16.65 | 2.23 | 2.481E-03 | 1764.51 | 15.920 | 7.635E-01 | BI214 |

********** U N I D E N T I F I E D P E A K S U M M A R Y **********

| Peak Channel | Centroid Energy | Background Counts | Net Area Counts | Intensity Cts/Sec | Uncert 3 Sigma % | FWHM keV | Suspected Nuclide | |
|---|---|---|---|---|---|---|---|---|
| 126.93 | 63.69 | 589. | 93. | 0.047 | 122.60 | 1.196 | PA-234 | l |
| 148.42 | 74.72 | 504. | 169. | 0.084 | 60.98 | 1.005 | BI-207 | D |
| 154.42 | 77.72 | 442. | 318. | 0.159 | 32.68 | 1.007 | PB-214 | D |
| 173.79 | 87.36 | 379. | 116. | 0.058 | 76.35 | 1.014 | PB-214 | lD |
| 178.91 | 89.92 | 350. | 98. | 0.049 | 86.38 | 1.015 | PB-214 | lD |
| 418.36 | 209.34 | 339. | 84. | 0.042 | 106.73 | 1.467 | AC-228 | s |
| 477.57 | 238.75 | 165. | 789. | 0.395 | 12.72 | 1.122 | PB-212 | D |
| 541.00 | 270.64 | 195. | 70. | 0.035 | 101.19 | 1.123 | AC-228 | |
| 601.22 | 300.74 | 120. | 55. | 0.027 | 97.42 | 0.989 | PB-212 | |
| 656.53 | 328.38 | 95. | 37. | 0.019 | 122.16 | 0.984 | RH-106M | |
| 1455.61 | 727.73 | 86. | 36. | 0.018 | 119.81 | 2.073 | J-132 | s |

s - Peak fails shape tests.
D - Peak area deconvoluted.
L - Peak written from unknown list.
C - Area < Critical level.

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This section based on library: FSS_Rev_1.Lib

********** I D E N T I F I E D P E A K S U M M A R Y **********

| Nuclide | Peak Channel | Centroid Energy | Background Counts | Net Area Counts | Intensity Cts/Sec | Uncert 3 Sigma % | FWHM keV |
|---|---|---|---|---|---|---|---|
| HG-203 | 146.50 | 73.47 | 1038. | -132. | -0.066 | 107.06 | 1.499s |
| PB-212 | 149.57 | 75.00 | 1093. | 206. | 0.103 | 69.36 | 1.499 |
| PB-212 | 153.79 | 77.11 | 962. | 302. | 0.151 | 46.79 | 1.499D |
| PB-214 | 153.79 | 77.11 | 965. | 299. | 0.149 | 46.79 | 1.499D |
| TH-234 | 185.74 | 93.08 | 873. | 133. | 0.066 | 93.34 | 1.499s |
| RA-226 | 371.98 | 186.16 | 465. | 125. | 0.063 | 77.95 | 1.499s |
| PB-212 | 477.53 | 238.92 | 420. | 642. | 0.321 | 17.78 | 1.499 |
| RA-224 | 481.70 | 241.00 | 575. | 111. | 0.056 | 95.17 | 1.123D |
| PB-214 | 590.76 | 295.51 | 177. | 180. | 0.090 | 38.01 | 1.499s |
| AC-228 | 677.50 | 338.86 | 167. | 200. | 0.100 | 40.13 | 0.920s |
| PB-214 | 704.40 | 352.30 | 126. | 258. | 0.129 | 26.00 | 1.499s |
| SB-125 | 926.87 | 463.49 | 78. | 60. | 0.030 | 70.94 | 1.499 |
| TL-208 | 1022.75 | 511.40 | 106. | 114. | 0.057 | 46.81 | 1.695s |
| TL-208 | 1167.23 | 583.61 | 50. | 226. | 0.113 | 24.22 | 1.375 |
| BI-214 | 1219.18 | 609.57 | 77. | 238. | 0.119 | 27.76 | 1.355 |
| CS-137 | 1323.84 | 661.88 | 43. | 57. | 0.028 | 68.48 | 1.290 |
| BI-212 | 1455.61 | 727.73 | 54. | 38. | 0.019 | 92.91 | 1.499s |
| AC-228 | 1823.74 | 911.69 | 44. | 162. | 0.081 | 31.54 | 1.706 |
| AC-228 | 1938.73 | 969.16 | 55. | 91. | 0.045 | 52.99 | 1.634 |

| Nuclide | Channel | Energy | Background | Net area | Cnts/sec | Uncert | FWHM |
|---|---|---|---|---|---|---|---|
| BI-214 | 2242.56 | 1120.98 | 52. | 77. | 0.038 | 63.33 | 1.910 |
| K-40 | 2923.88 | 1461.43 | 10. | 572. | 0.286 | 12.85 | 1.585 |
| BI-214 | 3531.88 | 1765.22 | 3. | 45. | 0.022 | 49.96 | 2.229s |

s - Peak fails shape tests.
D - Peak area deconvoluted.
A Derived peak area.

***** S U M M A R Y O F L I B R A R Y P E A K U S A G E *****

| - Nuclide - Name | Code | Average Activity pCi/gm | Peak Energy keV | Peak Activity pCi/gm | Code | MDA Value pCi/gm | COMMENTS |
|---|---|---|---|---|---|---|---|
| BE-7 | | 5.8603E-02 | | | | | |
| | | | 477.56 | 5.860E-02 | %( | 3.666E-01 1.07E-01 | G |
| K-40 | | 1.2261E+01 | | | | | |
| | | | 1460.75 | 1.226E+01 | (P | 3.802E-01 5.27E-01 | G |
| MN-54 | | 1.6398E-02 | | | | | |
| | | | 834.81 | 1.640E-02 | &(P | 3.316E-02 1.01E-02 | G |
| CO-57 | | -5.5155E-03 | | | | | |
| | | | 122.07 | -5.516E-03 | %( | 4.838E-02 1.44E-02 | G K |
| | | | 136.43 | -5.732E-02 | % | 4.108E-01 1.23E-01 | G |
| CO-60 | | 2.3442E-02 | | | | | |
| | | | 1332.51 | 2.344E-02 | %(P | 4.679E-02 1.43E-02 | G K |
| | | | 1173.23 | 2.006E-02 | & P | 6.633E-02 1.96E-02 | G K |
| Sr-85 | | -1.4776E-02 | | | | | |
| | | | 514.00 | -1.478E-02 | %( | 5.967E-02 1.77E-02 | G |
| Kr-85 | | -3.5100E+02 | | | | | |
| | | | 513.99 | -3.510E+02 | %(P | 1.323E+03 3.92E+02 | G |
| Y-88 | | -5.2648E-04 | | | | | |
| | | | 1836.01 | -5.265E-04 | &( | 4.819E-02 1.23E-02 | G K |
| | | | 898.02 | -1.029E-03 | % P | 4.772E-02 1.31E-02 | G |
| NB-94 | | -1.0022E-02 | | | | | |
| | | | 871.10 | -1.002E-02 | &(P | 5.176E-02 1.50E-02 | G K |
| | | | 702.50 | -4.437E-03 | & P | 5.210E-02 1.50E-02 | G K |
| Ag-108M | | -1.1355E-02 | | | | | |
| | | | 722.95 | -1.136E-02 | %( | 5.328E-02 1.56E-02 | G K |
| | | | 614.37 | -4.739E-02 | % P | 7.004E-02 2.16E-02 | G |
| | | | 433.93 | 1.030E-02 | % | 4.002E-02 1.18E-02 | G |

| Nuclide | Ave activity | Energy | Activity | Code | Peak | MDA | Comments |
|---|---|---|---|---|---|---|---|
| CD-109 | 2.7850E-01 | | | | | | |
| | | 88.04 | 2.785E-01 | %(P | 1.380E+00 | 4.14E-01 | G |
| SN-113 | -1.5920E-02 | | | | | | |
| | | 391.71 | -1.592E-02 | &( | 6.596E-02 | 1.96E-02 | G K |
| | | 255.04 | -4.793E-03 | % P | 1.538E+00 | 4.48E-01 | G |
| SB-125 | 1.3860E-01 | | | | | | |
| | | 427.95 | 1.960E-02 | &(P | 1.034E-01 | 3.01E-02 | G K |
| | | 600.77 | 4.742E-03 | & P | 2.781E-01 | 7.98E-02 | G |
| | | 636.15 | 1.614E-01 | & P | 3.133E-01 | 9.55E-02 | G |
| | | 463.51 | 4.908E-01 | (P | 3.553E-01 | 1.19E-01 | G |
| | | 176.29 | -2.400E-02 | & P | 5.888E-01 | 1.74E-01 | G |
| I-131 | -7.1055E-03 | | | | | | |
| | | 364.48 | -7.106E-03 | %( | 7.100E-02 | 2.08E-02 | G K |
| | | 636.97 | 5.860E-02 | & | 6.155E-01 | 1.73E-01 | G |
| | | 284.29 | 8.992E-02 | % | 8.628E-01 | 2.54E-01 | G |
| CS-134 | 7.8760E-03 | | | | | | |
| | | 604.66 | 7.876E-03 | %(P | 5.186E-02 | 1.51E-02 | G K |
| | | 795.76 | 2.715E-03 | % P | 5.310E-02 | 1.49E-02 | G |
| | | 569.29 | 9.879E-02 | % P | 2.505E-01 | 7.50E-02 | G |
| | | 801.84 | 8.327E-02 | & | 5.221E-01 | 1.50E-01 | G |
| CS-137 | 7.6120E-02 | | | | | | |
| | | 661.62 | 7.612E-02 | (P | 4.491E-02 | 1.77E-02 | G |
| CE-139 | 1.0736E-02 | | | | | | |
| | | 165.85 | 1.074E-02 | &(P | 4.722E-02 | 1.41E-02 | G |
| EU-152 | -2.7411E-03 | | | | | | |
| | | 121.78 | -2.741E-03 | %(P | 1.244E-01 | 3.68E-02 | G K |
| | | 344.30 | -3.043E-02 | % P | 1.469E-01 | 4.34E-02 | G |
| | | 1408.08 | 5.500E-02 | % P | 2.011E-01 | 5.75E-02 | G |
| | | 964.00 | -1.043E-02 | % P | 4.827E-01 | 1.37E-01 | G |
| | | 1112.07 | 2.572E-02 | & P | 4.519E-01 | 1.27E-01 | G |
| | | 778.90 | -7.311E-03 | % P | 3.261E-01 | 9.08E-02 | G |
| EU-154 | -8.8655E-03 | | | | | | |
| | | 123.10 | -8.865E-03 | &(P | 9.771E-02 | 2.91E-02 | G K |
| | | 1274.80 | -1.276E-04 | % P | 1.800E-01 | 4.99E-02 | G |
| | | 723.30 | -6.124E-02 | % P | 2.568E-01 | 7.51E-02 | G |
| | | 1004.80 | 8.003E-02 | % P | 2.667E-01 | 7.82E-02 | G |

| Nuclide | Ave activity | Energy | Activity | Code | Peak | MDA | Comments |
|---|---|---|---|---|---|---|---|
| EU-155 | -2.3033E-03 | | | | | | |
| | | 86.45 | -2.303E-03 | %( | 1.734E-01 | 5.18E-02 | G K |
| | | 105.31 | 0.000E+00 | % | 2.009E-01 | 5.97E-02 | G |
| HG-203 | -1.2208E-03 | | | | | | |
| | | 279.17 | -1.221E-03 | &( | 4.631E-02 | 1.36E-02 | G K |
| | | 72.87 | -3.439E-02 | & P | 1.408E+00 | 4.21E-01 | G |
| | | 70.83 | -1.775E+00 | + | 2.060E+00 | 6.33E-01 | G |
| | | 82.50 | 1.850E-02 | % | 2.768E+00 | 8.26E-01 | G |
| TL-208 | 2.6494E-01 | | | | | | |
| | | 583.14 | 2.649E-01 | (P | 4.208E-02 | 2.16E-02 | G |
| | | 510.72 | 4.495E-01 | + P | 2.007E-01 | 8.01E-02 | G |
| PB-212 | 6.5544E-01 | | | | | | |
| | | 238.63 | 6.461E-01 | (P | 9.880E-02 | 3.87E-02 | G K |
| | | | | | | | Energy duplication |
| | | 77.11 | 6.785E-01 | *( | 3.302E-01 | 1.06E-01 | G |
| | | 74.81 | 8.765E-01 | & P | 6.668E-01 | 2.08E-01 | G |
| PB-214 | 4.5071E-01 | | | | | | |
| | | 351.99 | 4.300E-01 | @(P | 9.161E-02 | 3.75E-02 | G K |
| | | 295.22 | 4.908E-01 | *(P | 1.760E-01 | 6.28E-02 | G |
| | | | | | | | Energy duplication |
| | | 77.11 | 1.096E+00 | + P | 5.411E-01 | 1.73E-01 | G |
| | | 241.92 | 1.664E-01 | % P | 6.192E-01 | 1.86E-01 | G |
| BI-212 | 4.0398E-01 | | | | | | |
| | | 727.17 | 4.040E-01 | *(P | 3.900E-01 | 1.27E-01 | G K |
| | | 1620.56 | -3.525E-01 | % | 1.595E+00 | 4.47E-01 | G |
| | | 785.42 | -3.858E-01 | & P | 2.594E+00 | 7.48E-01 | G |
| BI-214 | 5.4380E-01 | | | | | | |
| | | 609.32 | 5.438E-01 | (P | 9.963E-02 | 5.06E-02 | G K |
| | | 1764.51 | 7.635E-01 | + P | 1.919E-01 | 1.28E-01 | G |
| | | 1120.28 | 9.271E-01 | + P | 4.409E-01 | 1.97E-01 | G |
| RA-224 | 1.2463E+00 | | | | | | |
| | | 241.00 | 1.246E+00 | (P | 1.283E+00 | 3.98E-01 | G |
| RA-226 | 1.3851E+00 | | | | | | |
| | | 185.99 | 1.385E+00 | ( | 1.143E+00 | 3.60E-01 | G |
| AC-228 | 8.7368E-01 | | | | | | |
| | | 911.07 | 8.502E-01 | (P | 1.755E-01 | 9.05E-02 | G K |
| | | 968.90 | 8.327E-01 | (P | 3.432E-01 | 1.48E-01 | G |
| | | 338.40 | 9.900E-01 | *(P | 3.120E-01 | 1.34E-01 | G |

| Nuclide | Ave activity | Energy | Activity | Code | Peak | MDA | Comments |
|---|---|---|---|---|---|---|---|
| TH-227 | -1.3602E-01 | | | | | | |
| | | 236.00 | -1.360E-01 | %(P | 4.320E-01 | 1.30E-01 | G K |
| | | 256.25 | 2.076E-02 | % P | 4.270E-01 | 1.24E-01 | G |
| PA-234 | 1.4045E-03 | | | | | | |
| | | 98.44 | 1.405E-03 | %( | 1.846E-01 | 5.50E-02 | G K |
| | | 946.00 | -4.784E-02 | & | 2.810E-01 | 8.12E-02 | G |
| | | 131.28 | -2.561E-02 | & | 2.180E-01 | 6.52E-02 | G |
| | | 94.67 | -1.219E-01 | % | 3.197E-01 | 9.66E-02 | G |
| | | 883.24 | 0.000E+00 | & | 4.927E-01 | 1.39E-01 | G |
| | | 926.70 | 0.000E+00 | % | 4.167E-01 | 1.15E-01 | G |
| | | 569.26 | 1.466E-01 | % | 3.697E-01 | 1.11E-01 | G |
| TH-234 | 1.2281E+00 | | | | | | |
| | | 63.29 | 1.016E+00 | %(P | 2.148E+00 | 6.50E-01 | G K |
| | | 92.80 | 1.503E+00 | (P | 1.588E+00 | 4.90E-01 | G |
| | | 92.38 | -4.115E-01 | & P | 1.960E+00 | 5.84E-01 | G |
| AM-241 | -8.8860E-03 | | | | | | |
| | | 59.54 | -8.886E-03 | %(P | 3.154E-01 | 9.40E-02 | G |

( - This peak used in the nuclide activity average.

* - Peak is too wide, but only one peak in library.
! - Peak is part of a multiplet and this area went negative during deconvolution.
? - Peak is too narrow.
@ - Peak is too wide at FW25M, but ok at FWHM.
% - Peak fails sensitivity test.
$ - Peak identified, but first peak of this nuclide failed one or more qualification tests.
+ - Peak activity higher than counting uncertainty range.
- - Peak activity lower than counting uncertainty range.
= - Peak outside analysis energy range.
& - Calculated peak centroid is not close enough to the library energy centroid for positive identification.
P - Peakbackground subtraction
} - Peak is too close to another for the activity to be found directly.

| Nuclide Codes: | Peak Codes: |
|---|---|
| T - Thermal Neutron Activation | G - Gamma Ray |
| F - Fast Neutron Activation | X - X-Ray |
| I - Fission Product | P - Positron Decay |
| N - Naturally Occurring Isotope | S - Single-Escape |
| P - Photon Reaction | D - Double-Escape |
| C - Charged Particle Reaction | K - Key Line |
| M - No MDA Calculation | A - Not in Average |

R - Coincidence Corrected C - Coincidence Peak
H - Halflife limit exceeded

- - - - - - - - - - - - - - - - - - - - - - - - - - - - - - - - - - - - - - -

***** S U M M A R Y O F N U C L I D E S I N S A M P L E *****

| Nuclide | | Time of Count Activity pCi/gm | Time Corrected Activity pCi/gm | Uncertainty 3 Sigma Counting pCi/gm | Total pCi/gm | MDA pCi/gm |
|---|---|---|---|---|---|---|
| BE-7 | #A | 5.5589E-02 | 5.8603E-02 | 3.1987E-01 | 3.1989E-01 | 3.478E-01 |
| K-40 | | 1.2261E+01 | 1.2261E+01 | 1.5813E+00 | 1.7264E+00 | |
| MN-54 | #A | 1.6251E-02 | 1.6398E-02 | 3.0236E-02 | 3.0250E-02 | 3.286E-02 |
| CO-57 | #B | -5.4582E-03 | -5.5155E-03 | 4.3331E-02 | 4.3332E-02 | 4.787E-02 |
| CO-60 | #B | 2.3408E-02 | 2.3442E-02 | 4.2895E-02 | 4.2916E-02 | 4.672E-02 |
| Sr-85 | #A | -1.4147E-02 | -1.4776E-02 | 5.3190E-02 | 5.3197E-02 | 5.713E-02 |
| Kr-85 | #A | -3.5099E+02 | -3.5100E+02 | 1.3521E+03 | 1.3522E+03 | 1.323E+03 |
| Y-88 | #B | -5.1274E-04 | -5.2648E-04 | 3.6863E-02 | 3.6863E-02 | 4.693E-02 |
| NB-94 | #B | -1.0022E-02 | -1.0022E-02 | 4.6706E-02 | 4.6709E-02 | 5.176E-02 |
| Ag-108M | #B | -1.1354E-02 | -1.1355E-02 | 4.6665E-02 | 4.6670E-02 | 5.328E-02 |
| CD-109 | #A | 2.7677E-01 | 2.7850E-01 | 1.2432E+00 | 1.2433E+00 | 1.372E+00 |
| SN-113 | #B | -1.5535E-02 | -1.5920E-02 | 5.8700E-02 | 5.8707E-02 | 6.436E-02 |
| SB-125 | #F | 1.3822E-01 | 1.3860E-01 | 1.0068E-01 | 1.0098E-01 | 1.031E-01 |
| I-131 | #B | -5.0037E-03 | -7.1055E-03 | 6.2459E-02 | 6.2460E-02 | 5.000E-02 |
| CS-134 | #B | 7.8465E-03 | 7.8760E-03 | 4.5339E-02 | 4.5341E-02 | 5.167E-02 |
| CS-137 | | 7.6100E-02 | 7.6120E-02 | 5.2937E-02 | 5.3111E-02 | |
| CE-139 | #A | 1.0518E-02 | 1.0736E-02 | 4.2411E-02 | 4.2415E-02 | 4.627E-02 |
| EU-152 | #B | -2.7394E-03 | -2.7411E-03 | 2.1109E-01 | 2.1109E-01 | 1.243E-01 |
| EU-154 | #B | -8.8574E-03 | -8.8655E-03 | 1.0274E-01 | 1.0274E-01 | 9.762E-02 |
| EU-155 | #B | -2.2997E-03 | -2.3033E-03 | 1.5529E-01 | 1.5529E-01 | 1.732E-01 |
| HG-203 | #B | -1.1491E-03 | -1.2208E-03 | 4.0652E-02 | 4.0652E-02 | 4.359E-02 |
| TL-208 | | 2.6494E-01 | 2.6494E-01 | 6.4845E-02 | 6.6550E-02 | |
| PB-212 | # | 6.5544E-01 | 6.5544E-01 | 1.1763E-01 | 1.2333E-01 | 9.880E-02 |
| PB-214 | # | 4.5071E-01 | 4.5071E-01 | 1.0473E-01 | 1.0778E-01 | 9.161E-02 |
| BI-212 | # | 4.0398E-01 | 4.0398E-01 | 3.8196E-01 | 3.8264E-01 | 3.900E-01 |
| BI-214 | | 5.4380E-01 | 5.4380E-01 | 1.5167E-01 | 1.5475E-01 | |
| RA-224 | A | 1.2463E+00 | 1.2463E+00 | 1.1937E+00 | 1.1957E+00 | |
| RA-226 | # | 1.3851E+00 | 1.3851E+00 | 1.0797E+00 | 1.0825E+00 | 1.143E+00 |
| AC-228 | | 8.7368E-01 | 8.7368E-01 | 2.1629E-01 | 2.2185E-01 | |
| TH-227 | #B | -1.3602E-01 | -1.3602E-01 | 3.9938E-01 | 3.9946E-01 | 4.320E-01 |
| PA-234 | #B | 1.4045E-03 | 1.4045E-03 | 1.6486E-01 | 1.6486E-01 | 1.846E-01 |
| TH-234 | #B | 1.2281E+00 | 1.2281E+00 | 1.1997E+00 | 1.2016E+00 | 2.148E+00 |
| AM-241 | #A | -8.8859E-03 | -8.8860E-03 | 4.3865E-01 | 4.3865E-01 | 3.154E-01 |

# - All peaks for activity calculation had bad shape.
* - Activity omitted from total
& - Activity omitted from total and all peaks had bad shape.
< - MDA value printed.
A - Activity printed, but activity < MDA.
B - Activity < MDA and failed test.
C - Area < Critical level.
F - Failed fraction or key line test.

H – Halflife limit exceeded

YAEC Chemistry Lab Spectrum name: 101F_12SEPT2006_1807.An1

---------- S U M M A R Y ----------

Total Activity ( 270.6 to 1999.1 keV) 1.5266020E+01 pCi/gm
Total Decayed Activity ( 270.6 to 1999.1 keV) 1.5266039E+01 pCi/gm

The library has energies which are not separable.

Analyzed by: _____
JJM

Reviewed by: _____
Supervisor

Laboratory: YAEC Chemistry Lab

YAEC Chemistry Lab Spectrum name: 101F_15SEPT2006_0847.An1

Sample description
FSS-SSS-01-01-026-F-B

Spectrum Filename: C:\GammaVision\Spectra\101F_15SEPT2006_0847.An1

Acquisition information
Start time: 15-Sep-2006 08:47:03
Live time: 2000
Real time: 2002
Dead time: 0.10 %
Detector ID: 1

Detector system
Det 101- DSPE-633

Calibration
Filename: D1_1LSa.Clb
Detector 101 1.0 Liter Marinelli Sand

Energy Calibration
Created: 03-Sep-2004 08:50:48
Zero offset: 0.244 keV
Gain: 0.500 keV/channel
Quadratic: -2.493E-08 keV/channel^2

Efficiency Calibration
Created: 03-Sep-2004 08:52:26
Type: Polynomial
Uncertainty: 0.626 %
Coefficients: -0.321775 -5.816463 0.734234
-0.099357 0.006049 -0.000149

Library Files
Main analysis library: FSS_Rev_1.Lib
Library Match Width: 1.000
Peak stripping: Library based

Analysis parameters
Analysis engine: Env32 G53W4.20
Start channel: 100 ( 50.23keV )
Stop channel: 4000 ( 1999.11keV )
Peak rejection level: 41.667%
Peak search sensitivity: 3
Sample Size: 1.6100E+03
Activity scaling factor: 1.0000E+06/( 1.0000E+00* 1.6100E+03) =
6.2112E+02
Detection limit method: Nureg 4.16
Random error: 1.0000000E+00
Systematic error: 1.0000000E+00

| | |
|---|---|
| Fraction Limit: | 0.000% |
| Background width: | average of five points. |

YAEC Chemistry Lab Spectrum name: 101F_15SEPT2006_0847.An1

Half lives decay limit: 12.000
Activity range factor: 2.000
Min. step backg. energy 0.000
Multiplet shift channel 2.000

| Corrections | Status | Comments |
|---|---|---|
| Decay correct to date: | YES | 09-Sep-2006 09:50:00 |
| Decay during acquisition: | NO | |
| Decay during collection: | NO | |
| True coincidence correction: | NO | |
| Peaked background correction: | YES | 101_150K_28APR05.Pbc 01-May-2005 05:24:47 |
| Absorption (Internal): | NO | |
| Geometry correction: | NO | |
| Random summing: | NO | |

total peaks alloc. 14 cutoff 20.00000 %
Energy Calibration
Normalized diff: 0.0540

***** S U M M A R Y O F P E A K S I N R A N G E *****

| Peak Energy | Area | Uncert | FWHM | Corrctn Factor | Nuclide Energy | Brnch. Ratio | Act. pCi/gm | Nuc |
|---|---|---|---|---|---|---|---|---|
| 62.76 | 131. | 28.81 | 0.73 | 1.085E-02 | | | | |
| 62.76 | 131. | 28.81 | 0.73 | 1.085E-02 | 63.29 | 3.900 | PBC<MDA | TH234 |
| 74.84 | 177. | 26.07 | 1.50 | 1.654E-02 | | | | |
| 74.84 | 177. | 26.07 | 1.50 | 1.654E-02 | 74.81 | 9.600 | 9.330E-01 | PB212 |
| 77.05 | 315. | 14.41 | 1.50 | 1.720E-02 | 77.11 | 17.500 | 8.781E-01 | PB212 |
| | | | | | 77.11 | 10.700 | 1.419E+00 | PB214 |
| 77.05 | 311. | 14.41 | 1.50 | 1.720E-02 | 77.11 | 17.500 | 8.677E-01 | PB212 |
| | | | | | 77.11 | 10.700 | 1.419E+00 | PB214 |
| 87.30 | 111. | 37.74 | 1.50 | 1.910E-02 | 86.45 | 32.740 | PBC<MDA | EU155 |
| | | | | | 88.04 | 3.790 | PBC<MDA | CD109 |
| 93.04 | 107. | 36.81 | 1.50 | 1.989E-02 | 92.38 | 2.570 | PBC<MDA | TH234 |
| | | | | | 92.80 | 3.000 | PBC<MDA | TH234 |
| 186.23 | 136. | 24.13 | 1.07 | 1.857E-02 | 185.99 | 3.280 | 1.866E+00 | RA226 |
| 209.37 | 86. | 24.06 | 1.01 | 1.721E-02 | | | | |
| 238.75 | 744. | 4.29 | 1.12 | 1.557E-02 | 238.63 | 43.100 | 9.232E-01 | PB212 |
| 241.60 | 133. | 17.74 | 1.12 | 1.542E-02 | 241.00 | 3.900 | 1.846E+00 | RA224 |
| | | | | | 241.92 | 7.470 | 9.669E-01 | PB214 |
| 269.82 | 77. | 30.65 | 1.02 | 1.402E-02 | | | | |
| 295.16 | 161. | 14.61 | 1.18 | 1.292E-02 | | | | |
| 295.16 | 161. | 14.61 | 1.18 | 1.292E-02 | 295.22 | 19.200 | 5.394E-01 | PB214 |
| 338.23 | 129. | 17.42 | 1.12 | 1.136E-02 | 338.40 | 12.010 | 7.833E-01 | AC228 |
| 352.02 | 284. | 9.67 | 1.20 | 1.092E-02 | 351.99 | 37.100 | 5.836E-01 | PB214 |
| 409.48 | 56. | 37.27 | 1.14 | 9.420E-03 | | | | |
| 463.22 | 51. | 24.65 | 1.60 | 8.347E-03 | | | | |
| 463.22 | 51. | 24.65 | 1.60 | 8.347E-03 | 463.51 | 10.000 | 5.037E-01 | SB125 |
| 510.61 | 113. | 17.78 | 1.38 | 7.592E-03 | 510.72 | 22.500 | 4.746E-01 | TL208 |
| 583.22 | 243. | 10.18 | 1.30 | 6.684E-03 | 583.14 | 86.000 | 3.515E-01 | TL208 |

| | | | | | | | | |
|---|---|---|---|---|---|---|---|---|
| 609.24 | 191. | 10.87 | 1.48 | 6.414E-03 | 609.32 | 46.090 | 5.393E-01 | BI214 |
| 726.68 | 52. | 28.52 | 1.91 | 5.446E-03 | | | | |
| 726.68 | 52. | 28.52 | 1.91 | 5.446E-03 | 727.17 | 11.800 | 6.707E-01 | BI212 |
| 911.14 | 148. | 10.63 | 1.68 | 4.446E-03 | 911.07 | 29.000 | 9.499E-01 | AC228 |
| 968.13 | 112. | 14.17 | 1.33 | 4.215E-03 | 968.90 | 17.460 | 1.265E+00 | AC228 |
| 1120.17 | 67. | 25.75 | 1.10 | 3.711E-03 | 1120.28 | 15.040 | 1.000E+00 | BI214 |
| 1460.76 | 642. | 4.02 | 1.96 | 2.942E-03 | 1460.75 | 10.700 | 1.707E+01 | K40 |

| pk energy | area | uncert | fwhm | corr | nuclide | brnch. | act. | nuc |
|---|---|---|---|---|---|---|---|---|
| 1620.28 | 13. | 32.90 | 2.02 | 2.682E-03 | 1620.56 | 2.750 | 1.516E+00 | BI212 |
| 1764.52 | 30. | 18.26 | 0.73 | 2.481E-03 | 1764.51 | 15.920 | 6.281E-01 | BI214 |

********** U N I D E N T I F I E D P E A K S U M M A R Y **********

| Peak Channel | Centroid Energy | Background Counts | Net Area Counts | Intensity Cts/Sec | Uncert 3 Sigma % | FWHM keV | Suspected Nuclide | |
|---|---|---|---|---|---|---|---|---|
| 125.08 | 62.76 | 539. | 131. | 0.065 | 86.44 | 0.732 | PA-234 | l |
| 418.42 | 209.37 | 180. | 86. | 0.043 | 72.17 | 1.011 | AC-228 | |
| 477.20 | 238.76 | 137. | 744. | 0.372 | 12.87 | 1.122 | PB-212 | D |
| 539.37 | 269.82 | 192. | 77. | 0.038 | 91.95 | 1.016 | AC-228 | s |
| 818.80 | 409.48 | 115. | 56. | 0.028 | 111.80 | 1.138 | AC-228 | |

s - Peak fails shape tests.
D - Peak area deconvoluted.
L - Peak written from unknown list.
C - Area < Critical level.

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This section based on library: FSS_Rev_1.Lib

********** I D E N T I F I E D P E A K S U M M A R Y **********

| Nuclide | Peak Channel | Centroid Energy | Background Counts | Net Area Counts | Intensity Cts/Sec | Uncert 3 Sigma % | FWHM keV |
|---|---|---|---|---|---|---|---|
| PB-212 | 149.25 | 74.84 | 1037. | 177. | 0.088 | 78.21 | 1.499 |
| PB-212 | 153.79 | 77.11 | 873. | 315. | 0.157 | 43.24 | 1.499D |
| PB-214 | 153.79 | 77.11 | 877. | 311. | 0.156 | 43.24 | 1.499D |
| EU-155 | 174.17 | 87.30 | 823. | 111. | 0.056 | 113.21 | 1.499 |
| TH-234 | 185.66 | 93.04 | 818. | 107. | 0.054 | 110.44 | 1.499s |
| RA-226 | 371.84 | 186.09 | 404. | 136. | 0.068 | 67.92 | 1.499s |
| PB-212 | 477.17 | 238.74 | 406. | 548. | 0.274 | 19.92 | 1.499 |
| RA-224 | 481.70 | 241.00 | 439. | 114. | 0.057 | 82.60 | 1.123D |
| PB-214 | 590.48 | 295.37 | 213. | 145. | 0.072 | 48.82 | 1.499s |
| AC-228 | 676.25 | 338.23 | 148. | 127. | 0.064 | 52.25 | 1.121 |
| PB-214 | 704.04 | 352.12 | 137. | 245. | 0.122 | 27.66 | 1.499 |
| SB-125 | 926.37 | 463.24 | 65. | 52. | 0.026 | 75.06 | 1.499s |
| TL-208 | 1021.16 | 510.61 | 103. | 97. | 0.048 | 53.35 | 1.377s |
| TL-208 | 1166.44 | 583.22 | 102. | 241. | 0.120 | 30.55 | 1.297 |
| BI-214 | 1218.51 | 609.24 | 81. | 190. | 0.095 | 32.61 | 1.477 |
| BI-212 | 1454.70 | 727.27 | 54. | 39. | 0.019 | 92.14 | 1.499s |
| AC-228 | 1822.64 | 911.14 | 36. | 146. | 0.073 | 31.90 | 1.680 |
| AC-228 | 1936.67 | 968.13 | 37. | 111. | 0.055 | 42.50 | 1.326s |
| BI-214 | 2240.93 | 1120.17 | 62. | 67. | 0.033 | 77.24 | 1.098s |
| K-40 | 2922.54 | 1460.76 | 10. | 640. | 0.320 | 12.07 | 1.963 |
| BI-212 | 3241.79 | 1620.28 | 3. | 13. | 0.007 | 98.69 | 2.021 |
| BI-214 | 3530.47 | 1764.52 | 0. | 30. | 0.015 | 54.77 | 0.729s |

s - Peak fails shape tests.
D - Peak area deconvoluted.
A Derived peak area.

***** S U M M A R Y O F L I B R A R Y P E A K U S A G E *****

| - Nuclide - Name | Code | Average Activity pCi/gm | Peak Energy keV | Peak Activity pCi/gm | Code | Peak MDA Value pCi/gm | | COMMENTS |
|---|---|---|---|---|---|---|---|---|
| BE-7 | | 6.6360E-02 | | | | | | |
| | | | 477.56 | 6.636E-02 | %( | 4.538E-01 | 1.32E-01 | G |
| K-40 | | 1.7068E+01 | | | | | | |
| | | | 1460.75 | 1.707E+01 | (P | 4.608E-01 | 6.89E-01 | G |
| MN-54 | | 1.8025E-02 | | | | | | |
| | | | 834.81 | 1.803E-02 | %(P | 5.396E-02 | 1.59E-02 | G |
| CO-57 | | -4.0134E-03 | | | | | | |
| | | | 122.07 | -4.013E-03 | %( | 5.433E-02 | 1.62E-02 | G K |
| | | | 136.43 | -7.255E-02 | % | 4.425E-01 | 1.32E-01 | G |
| CO-60 | | 9.5055E-03 | | | | | | |
| | | | 1332.51 | 9.506E-03 | %(P | 5.271E-02 | 1.47E-02 | G K |
| | | | 1173.23 | 1.714E-02 | % P | 7.859E-02 | 2.28E-02 | G K |
| Sr-85 | | -1.8191E-02 | | | | | | |
| | | | 514.00 | -1.819E-02 | %( | 6.125E-02 | 1.82E-02 | G |
| Kr-85 | | -5.2512E+02 | | | | | | |
| | | | 513.99 | -5.251E+02 | %(P | 1.385E+03 | 4.13E+02 | G |
| Y-88 | | 0.0000E+00 | | | | | | |
| | | | 1836.01 | 0.000E+00 | %( | 8.195E-02 | 2.19E-02 | G K |
| | | | 898.02 | -9.092E-03 | & P | 6.783E-02 | 1.93E-02 | G |
| NB-94 | | -7.1462E-03 | | | | | | |
| | | | 871.10 | -7.146E-03 | %(P | 5.530E-02 | 1.57E-02 | G K |
| | | | 702.50 | 5.671E-03 | % P | 5.520E-02 | 1.58E-02 | G K |
| Ag-108M | | -1.2973E-02 | | | | | | |
| | | | 722.95 | -1.297E-02 | %( | 6.835E-02 | 1.99E-02 | G K |
| | | | 614.37 | -9.167E-03 | % P | 6.481E-02 | 1.88E-02 | G |
| | | | 433.93 | 6.061E-03 | % | 4.533E-02 | 1.31E-02 | G |
| CD-109 | | -1.9009E-01 | | | | | | |
| | | | 88.04 | -1.901E-01 | &(P | 1.702E+00 | 5.09E-01 | G |

| Nuclide | Ave activity | Energy | Activity | Code | Peak | MDA | Comments |
|---|---|---|---|---|---|---|---|
| SN-113 | -1.8394E-02 | | | | | | |
| | | 391.71 | -1.839E-02 | %( | 7.558E-02 | 2.24E-02 | G K |
| | | 255.04 | -6.901E-01 | % P | 2.172E+00 | 6.51E-01 | G |
| SB-125 | 1.5598E-01 | | | | | | |
| | | 427.95 | 2.970E-02 | %(P | 1.518E-01 | 4.45E-02 | G K |
| | | 600.77 | 8.255E-02 | & P | 2.375E-01 | 7.05E-02 | G |
| | | 636.15 | -4.019E-02 | & P | 3.968E-01 | 1.12E-01 | G |
| | | 463.51 | 5.297E-01 | *(P | 4.080E-01 | 1.36E-01 | G |
| | | 176.29 | -2.291E-02 | % P | 7.518E-01 | 2.22E-01 | G |
| I-131 | -4.0674E-04 | | | | | | |
| | | 364.48 | -4.067E-04 | &( | 9.257E-02 | 2.68E-02 | G K |
| | | 636.97 | 1.192E-01 | & | 9.770E-01 | 2.78E-01 | G |
| | | 284.29 | 8.029E-02 | & | 1.117E+00 | 3.27E-01 | G |
| CS-134 | -1.3079E-02 | | | | | | |
| | | 604.66 | -1.308E-02 | %(P | 7.224E-02 | 2.12E-02 | G K |
| | | 795.76 | 3.474E-02 | % P | 5.680E-02 | 1.76E-02 | G |
| | | 569.29 | 1.104E-02 | & P | 3.379E-01 | 9.63E-02 | G |
| | | 801.84 | 1.809E-01 | % | 5.768E-01 | 1.70E-01 | G |
| CS-137 | 2.1698E-02 | | | | | | |
| | | 661.62 | 2.170E-02 | %(P | 5.987E-02 | 1.78E-02 | G |
| CE-139 | 9.8803E-04 | | | | | | |
| | | 165.85 | 9.880E-04 | %(P | 5.544E-02 | 1.64E-02 | G |
| EU-152 | -1.9406E-02 | | | | | | |
| | | 121.78 | -1.941E-02 | %(P | 1.621E-01 | 4.83E-02 | G K |
| | | 344.30 | -1.376E-03 | % P | 1.597E-01 | 4.61E-02 | G |
| | | 1408.08 | -2.370E-03 | & P | 3.276E-01 | 8.84E-02 | G |
| | | 964.00 | -1.607E-02 | % P | 6.373E-01 | 1.82E-01 | G |
| | | 1112.07 | 2.989E-02 | % P | 4.707E-01 | 1.31E-01 | G |
| | | 778.90 | 1.340E-01 | % P | 3.397E-01 | 1.01E-01 | G |
| EU-154 | 6.2219E-03 | | | | | | |
| | | 123.10 | 6.222E-03 | %(P | 1.158E-01 | 3.44E-02 | G K |
| | | 1274.80 | 4.949E-03 | % P | 1.903E-01 | 5.22E-02 | G |
| | | 723.30 | -2.836E-03 | & P | 4.929E-01 | 1.43E-01 | G |
| | | 1004.80 | -6.746E-02 | % P | 3.607E-01 | 1.04E-01 | G |
| EU-155 | 1.4943E-01 | | | | | | |
| | | 86.45 | 1.494E-01 | ( | 1.835E-01 | 5.64E-02 | G K |
| | | 105.31 | 5.565E-02 | % | 2.321E-01 | 6.97E-02 | G |

| Nuclide | Ave activity | Energy | Activity | Code | Peak | MDA | Comments |
|---|---|---|---|---|---|---|---|
| HG-203 | -5.9345E-03 | | | | | | |
| | | 279.17 | -5.935E-03 | %( | 5.817E-02 | 1.71E-02 | G K |
| | | 72.87 | -1.084E+00 | & P | 1.594E+00 | 4.86E-01 | G |
| | | 70.83 | -1.933E-01 | & | 2.546E+00 | 7.61E-01 | G |
| | | 82.50 | -6.328E-02 | % | 2.830E+00 | 8.41E-01 | G |
| TL-208 | 3.5148E-01 | | | | | | |
| | | 583.14 | 3.515E-01 | (P | 7.277E-02 | 3.61E-02 | G |
| | | 510.72 | 4.746E-01 | + P | 2.462E-01 | 9.84E-02 | G |
| PB-212 | 6.8520E-01 | | | | | | |
| | | 238.63 | 6.852E-01 | (P | 1.208E-01 | 4.60E-02 | G K |
| | | | | | | | Energy duplication |
| | | 77.11 | 8.781E-01 | + | 3.915E-01 | 1.27E-01 | G |
| | | 74.81 | 9.330E-01 | & P | 8.075E-01 | 2.50E-01 | G |
| PB-214 | 5.0104E-01 | | | | | | |
| | | 351.99 | 5.068E-01 | (P | 1.187E-01 | 4.71E-02 | G K |
| | | 295.22 | 4.900E-01 | @(P | 2.393E-01 | 8.07E-02 | G |
| | | | | | | | Energy duplication |
| | | 77.11 | 1.419E+00 | + P | 6.416E-01 | 2.07E-01 | G |
| | | 241.92 | 5.701E-01 | % P | 7.950E-01 | 2.44E-01 | G |
| BI-212 | 5.0546E-01 | | | | | | |
| | | 727.17 | 5.055E-01 | *(P | 4.831E-01 | 1.58E-01 | G K |
| | | 1620.56 | 1.516E+00 | + | 1.218E+00 | 4.99E-01 | G |
| | | 785.42 | 6.664E-01 | & P | 2.622E+00 | 7.64E-01 | G |
| BI-214 | 5.6208E-01 | | | | | | |
| | | 609.32 | 5.393E-01 | (P | 1.269E-01 | 5.89E-02 | G K |
| | | 1764.51 | 6.281E-01 | (P | 1.566E-01 | 1.16E-01 | G |
| | | 1120.28 | 1.000E+00 | + P | 5.947E-01 | 2.59E-01 | G |
| RA-224 | 1.5834E+00 | | | | | | |
| | | 241.00 | 1.583E+00 | (P | 1.398E+00 | 4.39E-01 | G |
| RA-226 | 1.8688E+00 | | | | | | |
| | | 185.99 | 1.869E+00 | @( | 1.327E+00 | 4.23E-01 | G |
| AC-228 | 9.0112E-01 | | | | | | |
| | | 911.07 | 9.499E-01 | (P | 1.998E-01 | 1.02E-01 | G K |
| | | 968.90 | 1.265E+00 | + P | 3.549E-01 | 1.80E-01 | G |
| | | 338.40 | 7.833E-01 | (P | 3.655E-01 | 1.39E-01 | G |
| TH-227 | -1.6976E-01 | | | | | | |
| | | 236.00 | -1.698E-01 | %(P | 5.303E-01 | 1.59E-01 | G K |
| | | 256.25 | 8.934E-02 | % P | 6.106E-01 | 1.80E-01 | G |

| Nuclide | Ave activity | Energy | Activity | Code | Peak | MDA | Comments |
|---|---|---|---|---|---|---|---|
| PA-234 | -8.9739E-03 | | | | | | |
| | | 98.44 | -8.974E-03 &( | | 2.127E-01 | 6.33E-02 | G K |
| | | 946.00 | -1.171E-03 & | | 3.287E-01 | 9.18E-02 | G |
| | | 131.28 | 1.251E-02 & | | 2.226E-01 | 6.61E-02 | G |
| | | 94.67 | -1.382E-01 % | | 3.789E-01 | 1.14E-01 | G |
| | | 883.24 | -4.659E-02 & | | 5.796E-01 | 1.65E-01 | G |
| | | 926.70 | -9.259E-02 % | | 5.975E-01 | 1.72E-01 | G |
| | | 569.26 | 1.972E-02 & | | 4.975E-01 | 1.42E-01 | G |
| TH-234 | 1.4620E+00 | | | | | | |
| | | 63.29 | 1.429E+00 %(P | | 2.492E+00 | 7.57E-01 | G K |
| | | 92.80 | 1.505E+00 *(P | | 1.913E+00 | 5.86E-01 | G |
| | | 92.38 | 3.155E-02 % P | | 2.277E+00 | 6.76E-01 | G |
| AM-241 | -5.2833E-03 | | | | | | |
| | | 59.54 | -5.283E-03 %(P | | 3.740E-01 | 1.11E-01 | G |

( - This peak used in the nuclide activity average.

* - Peak is too wide, but only one peak in library.
! - Peak is part of a multiplet and this area went
negative during deconvolution.
? - Peak is too narrow.
@ - Peak is too wide at FW25M, but ok at FWHM.
% - Peak fails sensitivity test.
$ - Peak identified, but first peak of this nuclide
failed one or more qualification tests.
+ - Peak activity higher than counting uncertainty range.
- - Peak activity lower than counting uncertainty range.
= - Peak outside analysis energy range.
& - Calculated peak centroid is not close enough to the
library energy centroid for positive identification.
P - Peakbackground subtraction
} - Peak is too close to another for the activity
to be found directly.

| Nuclide Codes: | Peak Codes: |
|---|---|
| T - Thermal Neutron Activation | G - Gamma Ray |
| F - Fast Neutron Activation | X - X-Ray |
| I - Fission Product | P - Positron Decay |
| N - Naturally Occurring Isotope | S - Single-Escape |
| P - Photon Reaction | D - Double-Escape |
| C - Charged Particle Reaction | K - Key Line |
| M - No MDA Calculation | A - Not in Average |
| R - Coincidence Corrected | C - Coincidence Peak |
| H - Halflife limit exceeded | |

- - - - - - - - - - - - - - - - - - - - - - - - - - - - - - - - - - - - - -

***** S U M M A R Y O F N U C L I D E S I N S A M P L E *****

| Nuclide | | Time of Count Activity pCi/gm | Time Corrected Activity pCi/gm | Uncertainty Counting pCi/gm | 3 Sigma Total pCi/gm | MDA pCi/gm |
|---|---|---|---|---|---|---|
| BE-7 | #A | 6.1422E-02 | 6.6360E-02 | 3.9467E-01 | 3.9469E-01 | 4.201E-01 |
| K-40 | | 1.7068E+01 | 1.7068E+01 | 2.0682E+00 | 2.2820E+00 | |
| MN-54 | #A | 1.7789E-02 | 1.8025E-02 | 4.7739E-02 | 4.7750E-02 | 5.325E-02 |
| CO-57 | #B | -3.9525E-03 | -4.0134E-03 | 4.8481E-02 | 4.8482E-02 | 5.351E-02 |
| CO-60 | #B | 9.4852E-03 | 9.5055E-03 | 4.4054E-02 | 4.4058E-02 | 5.259E-02 |
| Sr-85 | #A | -1.7069E-02 | -1.8191E-02 | 5.4639E-02 | 5.4648E-02 | 5.747E-02 |
| Kr-85 | #A | -5.2510E+02 | -5.2512E+02 | 1.3909E+03 | 1.3912E+03 | 1.385E+03 |
| Y-88 | #B | 0.0000E+00 | 0.0000E+00 | 6.5554E-02 | 6.5554E-02 | 7.884E-02 |
| NB-94 | #B | -7.1462E-03 | -7.1462E-03 | 5.0292E-02 | 5.0293E-02 | 5.530E-02 |
| Ag-108M | #B | -1.2972E-02 | -1.2973E-02 | 5.9726E-02 | 5.9731E-02 | 6.834E-02 |
| CD-109 | #A | -1.8837E-01 | -1.9009E-01 | 1.6169E+00 | 1.6169E+00 | 1.687E+00 |
| SN-113 | #B | -1.7746E-02 | -1.8394E-02 | 6.7134E-02 | 6.7142E-02 | 7.292E-02 |
| SB-125 | #F | 1.5534E-01 | 1.5598E-01 | 1.2030E-01 | 1.2062E-01 | 1.512E-01 |
| I-131 | #B | -2.4339E-04 | -4.0674E-04 | 8.0282E-02 | 8.0282E-02 | 5.539E-02 |
| CS-134 | #B | -1.3007E-02 | -1.3079E-02 | 7.2057E-02 | 7.2061E-02 | 7.184E-02 |
| CS-137 | #A | 2.1689E-02 | 2.1698E-02 | 5.3316E-02 | 5.3330E-02 | 5.985E-02 |
| CE-139 | #A | 9.5881E-04 | 9.8803E-04 | 4.9165E-02 | 4.9165E-02 | 5.380E-02 |
| EU-152 | #B | -1.9389E-02 | -1.9406E-02 | 1.6172E-01 | 1.6173E-01 | 1.619E-01 |
| EU-154 | #B | 6.2136E-03 | 6.2219E-03 | 1.0326E-01 | 1.0326E-01 | 1.157E-01 |
| EU-155 | #A | 1.4909E-01 | 1.4943E-01 | 1.6917E-01 | 1.6937E-01 | 1.831E-01 |
| HG-203 | #B | -5.4313E-03 | -5.9345E-03 | 5.1348E-02 | 5.1349E-02 | 5.323E-02 |
| TL-208 | | 3.5148E-01 | 3.5148E-01 | 1.0843E-01 | 1.1023E-01 | |
| PB-212 | # | 6.8520E-01 | 6.8520E-01 | 1.3804E-01 | 1.4337E-01 | 1.208E-01 |
| PB-214 | # | 5.0104E-01 | 5.0104E-01 | 1.3971E-01 | 1.4255E-01 | 1.187E-01 |
| BI-212 | # | 5.0546E-01 | 5.0546E-01 | 4.7388E-01 | 4.7474E-01 | 4.831E-01 |
| BI-214 | | 5.6208E-01 | 5.6208E-01 | 1.8138E-01 | 1.8414E-01 | |
| RA-224 | | 1.5834E+00 | 1.5834E+00 | 1.3160E+00 | 1.3191E+00 | |
| RA-226 | # | 1.8688E+00 | 1.8688E+00 | 1.2694E+00 | 1.2738E+00 | 1.327E+00 |
| AC-228 | | 9.0112E-01 | 9.0112E-01 | 2.8024E-01 | 2.8483E-01 | |
| TH-227 | #B | -1.6976E-01 | -1.6976E-01 | 4.9028E-01 | 4.9038E-01 | 5.303E-01 |
| PA-234 | #B | -8.9739E-03 | -8.9739E-03 | 1.8992E-01 | 1.8992E-01 | 2.127E-01 |
| TH-234 | #B | 1.4620E+00 | 1.4620E+00 | 1.4416E+00 | 1.4439E+00 | 2.492E+00 |
| AM-241 | #A | -5.2831E-03 | -5.2833E-03 | 8.9068E-01 | 8.9068E-01 | 3.740E-01 |

# - All peaks for activity calculation had bad shape.
* - Activity omitted from total
& - Activity omitted from total and all peaks had bad shape.
< - MDA value printed.
A - Activity printed, but activity < MDA.
B - Activity < MDA and failed test.
C - Area < Critical level.
F - Failed fraction or key line test.
H - Halflife limit exceeded

YAEC Chemistry Lab Spectrum name: 101F_15SEPT2006_0847.An1

---------- S U M M A R Y ----------

Total Activity ( 269.6 to 1999.1 keV) 2.0465843E+01 pCi/gm
Total Decayed Activity ( 269.6 to 1999.1 keV) 2.0465843E+01 pCi/gm

The library has energies which are not separable.

Analyzed by: _____
JPK

Reviewed by: _____
Supervisor

Laboratory: YAEC Chemistry Lab

YAEC Chemistry Lab Spectrum name: 101f_15SEPT2006_1007.An1

Sample description
FSS-SSS-01-01-029-F-B

Spectrum Filename: C:\GammaVision\Spectra\101f_15SEPT2006_1007.An1

Acquisition information
Start time: 15-Sep-2006 10:07:37
Live time: 2000
Real time: 2002
Dead time: 0.11 %
Detector ID: 1

Detector system
Det 101- DSPE-633

Calibration
Filename: D1_1LSa.Clb
Detector 101 1.0 Liter Marinelli Sand

Energy Calibration
Created: 03-Sep-2004 08:50:48
Zero offset: 0.244 keV
Gain: 0.500 keV/channel
Quadratic: -2.493E-08 keV/channel^2

Efficiency Calibration
Created: 03-Sep-2004 08:52:26
Type: Polynomial
Uncertainty: 0.626 %
Coefficients: -0.321775 -5.816463 0.734234
-0.099357 0.006049 -0.000149

Library Files
Main analysis library: FSS_Rev_1.Lib
Library Match Width: 1.000
Peak stripping: Library based

Analysis parameters
Analysis engine: Env32 G53W4.20
Start channel: 100 ( 50.23keV )
Stop channel: 4000 ( 1999.11keV )
Peak rejection level: 41.667%
Peak search sensitivity: 3
Sample Size: 1.8240E+03
Activity scaling factor: 1.0000E+06/( 1.0000E+00* 1.8240E+03) =
5.4825E+02
Detection limit method: Nureg 4.16
Random error: 1.0000000E+00
Systematic error: 1.0000000E+00

| | |
|---|---|
| Fraction Limit: | 0.000% |
| Background width: | average of five points. |

YAEC Chemistry Lab Spectrum name: 101f_15SEPT2006_1007.An1

Half lives decay limit: 12.000
Activity range factor: 2.000
Min. step backg. energy 0.000
Multiplet shift channel 2.000

| Corrections | Status | Comments |
|---|---|---|
| Decay correct to date: | YES | 09-Sep-2006 11:44:00 |
| Decay during acquisition: | NO | |
| Decay during collection: | NO | |
| True coincidence correction: | NO | |
| Peaked background correction: | YES | 101_150K_28APR05.Pbc 01-May-2005 05:24:47 |
| Absorption (Internal): | NO | |
| Geometry correction: | NO | |
| Random summing: | NO | |

total peaks alloc. 15 cutoff 20.00000 %
Energy Calibration
Normalized diff: 0.0983

***** S U M M A R Y O F P E A K S I N R A N G E *****

| Peak Energy | Area | Uncert | FWHM | Corrctn Factor | Nuclide Energy | Brnch. Ratio | Act. pCi/gm | Nuc |
|---|---|---|---|---|---|---|---|---|
| 74.76 | 212. | 23.07 | 1.50 | 1.654E-02 | | | | |
| 74.76 | 212. | 23.07 | 1.50 | 1.654E-02 | 74.81 | 9.600 | 9.880E-01 | PB212 |
| 77.06 | 299. | 16.09 | 1.50 | 1.720E-02 | 77.11 | 10.700 | 1.202E+00 | PB214 |
| | | | | | 77.11 | 17.500 | 7.352E-01 | PB212 |
| 77.06 | 302. | 16.09 | 1.50 | 1.720E-02 | 77.11 | 10.700 | 1.202E+00 | PB214 |
| | | | | | 77.11 | 17.500 | 7.443E-01 | PB212 |
| 86.66 | 86. | 34.18 | 1.01 | 1.911E-02 | 86.45 | 32.740 | 1.027E-01 | EU155 |
| 89.68 | 87. | 32.67 | 1.02 | 1.953E-02 | | | | |
| 93.29 | 140. | 21.71 | 1.02 | 1.993E-02 | 92.38 | 2.570 | PBC<MDA | TH234 |
| | | | | | 92.80 | 3.000 | PBC<MDA | TH234 |
| 186.00 | 83. | 29.85 | 1.13 | 1.858E-02 | 185.99 | 3.280 | 1.011E+00 | RA226 |
| 209.75 | 90. | 34.74 | 0.98 | 1.719E-02 | | | | |
| 238.78 | 789. | 4.22 | 1.12 | 1.557E-02 | 238.63 | 43.100 | 8.636E-01 | PB212 |
| 241.77 | 132. | 17.71 | 1.12 | 1.541E-02 | 241.00 | 3.900 | 1.617E+00 | RA224 |
| | | | | | 241.92 | 7.470 | 8.468E-01 | PB214 |
| 270.10 | 100. | 23.98 | 1.59 | 1.401E-02 | | | | |
| 295.23 | 191. | 11.87 | 1.25 | 1.292E-02 | 295.22 | 19.200 | 5.663E-01 | PB214 |
| 300.30 | 93. | 22.10 | 0.79 | 1.272E-02 | | | | |
| 338.55 | 188. | 13.99 | 1.13 | 1.134E-02 | 338.40 | 12.010 | 1.010E+00 | AC228 |
| 352.08 | 300. | 9.63 | 0.89 | 1.092E-02 | 351.99 | 37.100 | 5.444E-01 | PB214 |
| 462.96 | 55. | 25.78 | 0.97 | 8.351E-03 | | | | |
| 462.96 | 55. | 25.78 | 0.97 | 8.351E-03 | 463.51 | 10.000 | 4.740E-01 | SB125 |
| 510.97 | 110. | 19.13 | 1.11 | 7.587E-03 | 510.72 | 22.500 | 4.072E-01 | TL208 |
| 583.35 | 234. | 9.42 | 1.28 | 6.682E-03 | 583.14 | 86.000 | 2.985E-01 | TL208 |
| 609.30 | 190. | 9.98 | 1.65 | 6.413E-03 | 609.32 | 46.090 | 4.737E-01 | BI214 |
| 727.05 | 77. | 22.20 | 1.52 | 5.444E-03 | 727.17 | 11.800 | 8.758E-01 | BI212 |
| 795.09 | 36. | 27.63 | 1.50 | 5.016E-03 | 795.76 | 85.400 | 6.304E-02 | CS134 |

| | | | | | | | | |
|---|---|---|---|---|---|---|---|---|
| 860.90 | 31. | 31.77 | 1.17 | 4.675E-03 | | | | |
| 911.25 | 156. | 12.88 | 1.40 | 4.446E-03 | 911.07 | 29.000 | 8.884E-01 | AC228 |
| 964.55 | 36. | 24.21 | 1.61 | 4.228E-03 | | | | |
| 968.99 | 74. | 14.95 | 1.62 | 4.211E-03 | 968.90 | 17.460 | 7.386E-01 | AC228 |
| 1120.12 | 69. | 21.54 | 1.83 | 3.711E-03 | 1120.28 | 15.040 | 9.109E-01 | BI214 |
| 1460.82 | 751. | 3.69 | 1.89 | 2.942E-03 | 1460.75 | 10.700 | 1.761E+01 | K40 |
| 1764.41 | 38. | 16.22 | 2.25 | 2.481E-03 | 1764.51 | 15.920 | 7.045E-01 | BI214 |

********** U N I D E N T I F I E D P E A K S U M M A R Y **********

| Peak Channel | Centroid Energy | Background Counts | Net Area Counts | Intensity Cts/Sec | Uncert 3 Sigma % | FWHM keV | Suspected Nuclide | |
|---|---|---|---|---|---|---|---|---|
| 172.90 | 86.57 | 394. | 86. | 0.043 | 102.54 | 1.013 | BI-207 | lD |
| 178.94 | 89.59 | 362. | 87. | 0.044 | 98.00 | 1.016 | PB-214 | lD |
| 419.18 | 209.75 | 368. | 90. | 0.045 | 104.23 | 0.976 | NP-239 | |
| 477.27 | 238.68 | 159. | 789. | 0.394 | 12.66 | 1.122 | PB-212 | D |
| 483.24 | 241.67 | 208. | 132. | 0.066 | 53.12 | 1.124 | PB-214 | D |
| 539.92 | 270.10 | 199. | 100. | 0.050 | 71.94 | 1.586 | AC-228 | s |
| 600.35 | 300.30 | 139. | 93. | 0.047 | 66.30 | 0.793 | PB-212 | s |
| 1722.10 | 860.90 | 30. | 31. | 0.015 | 95.31 | 1.172 | TL-208 | |
| 1929.84 | 964.67 | 20. | 37. | 0.018 | 71.35 | 1.613 | AC-228 | D |

s - Peak fails shape tests.
D - Peak area deconvoluted.
L - Peak written from unknown list.
C - Area < Critical level.

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This section based on library: FSS_Rev_1.Lib

********** I D E N T I F I E D P E A K S U M M A R Y **********

| Nuclide | Peak Channel | Centroid Energy | Background Counts | Net Area Counts | Intensity Cts/Sec | Uncert 3 Sigma % | FWHM keV |
|---|---|---|---|---|---|---|---|
| PB-212 | 149.09 | 74.76 | 1149. | 212. | 0.106 | 69.20 | 1.499s |
| PB-214 | 153.79 | 77.11 | 1037. | 299. | 0.149 | 48.27 | 1.499D |
| PB-212 | 153.79 | 77.11 | 1033. | 302. | 0.151 | 48.27 | 1.499D |
| TH-234 | 185.53 | 92.97 | 909. | 148. | 0.074 | 83.26 | 1.499s |
| TH-234 | 185.51 | 92.96 | 870. | 155. | 0.078 | 80.78 | 1.499s |
| RA-226 | 371.63 | 185.99 | 517. | 95. | 0.048 | 105.98 | 1.499 |
| PB-212 | 477.32 | 238.81 | 412. | 621. | 0.311 | 18.14 | 1.499 |
| RA-224 | 482.50 | 241.40 | 511. | 96. | 0.048 | 104.20 | 1.499 |
| PB-214 | 590.36 | 295.31 | 212. | 167. | 0.083 | 43.22 | 1.499 |
| AC-228 | 676.89 | 338.55 | 170. | 186. | 0.093 | 41.98 | 1.131s |
| PB-214 | 703.88 | 352.04 | 128. | 272. | 0.136 | 25.08 | 1.499 |
| SB-125 | 926.68 | 463.39 | 68. | 50. | 0.025 | 79.60 | 1.499s |
| TL-208 | 1021.89 | 510.97 | 123. | 94. | 0.047 | 57.38 | 1.114s |
| TL-208 | 1166.71 | 583.35 | 86. | 232. | 0.116 | 28.26 | 1.281 |
| BI-214 | 1218.63 | 609.30 | 64. | 189. | 0.094 | 29.94 | 1.645s |
| BI-212 | 1454.26 | 727.05 | 65. | 76. | 0.038 | 66.59 | 1.519s |
| CS-134 | 1590.41 | 795.09 | 33. | 36. | 0.018 | 82.89 | 1.502s |
| AC-228 | 1822.85 | 911.25 | 69. | 155. | 0.077 | 38.64 | 1.403s |
| AC-228 | 1938.21 | 968.90 | 25. | 73. | 0.037 | 44.79 | 1.616D |
| BI-214 | 2240.83 | 1120.12 | 46. | 69. | 0.034 | 64.61 | 1.828s |
| K-40 | 2922.66 | 1460.82 | 6. | 748. | 0.374 | 11.06 | 1.891 |

| Nuclide | Channel | Energy | Background | Net area | Cnts/sec | Uncert | FWHM |
|---|---|---|---|---|---|---|---|
| BI-214 | 3530.26 | 1764.41 | 0. | 38. | 0.019 | 48.67 | 2.248s |

s - Peak fails shape tests.
D - Peak area deconvoluted.
A Derived peak area.

## ***** S U M M A R Y O F L I B R A R Y P E A K U S A G E *****

| Nuclide Name | Code | Average Activity pCi/gm | Peak Energy keV | Peak Activity pCi/gm | Code | MDA Value pCi/gm | | COMMENTS |
|---|---|---|---|---|---|---|---|---|
| BE-7 | | 8.3527E-02 | | | | | | |
| | | | 477.56 | 8.353E-02 | %( | 4.546E-01 | 1.33E-01 G | |
| K-40 | | 1.7609E+01 | | | | | | |
| | | | 1460.75 | 1.761E+01 | (P | 3.251E-01 | 6.51E-01 G | |
| MN-54 | | -2.3482E-03 | | | | | | |
| | | | 834.81 | -2.348E-03 | &(P | 6.088E-02 | 1.72E-02 G | |
| CO-57 | | 4.6586E-03 | | | | | | |
| | | | 122.07 | 4.659E-03 | %( | 5.339E-02 | 1.59E-02 G K | |
| | | | 136.43 | 3.528E-02 | & | 4.375E-01 | 1.30E-01 G | |
| CO-60 | | -8.6897E-03 | | | | | | |
| | | | 1332.51 | -8.690E-03 | %(P | 6.018E-02 | 1.69E-02 G K | |
| | | | 1173.23 | 1.448E-02 | % P | 7.301E-02 | 2.12E-02 G K | |
| Sr-85 | | -2.2381E-02 | | | | | | |
| | | | 514.00 | -2.238E-02 | %( | 6.405E-02 | 1.92E-02 G | |
| Kr-85 | | -5.1186E+02 | | | | | | |
| | | | 513.99 | -5.119E+02 | %(P | 1.393E+03 | 4.16E+02 G | |
| Y-88 | | 0.0000E+00 | | | | | | |
| | | | 1836.01 | 0.000E+00 | %( | 5.372E-02 | 1.36E-02 G K | |
| | | | 898.02 | -1.117E-02 | % P | 6.689E-02 | 1.93E-02 G | |
| NB-94 | | -6.5542E-03 | | | | | | |
| | | | 871.10 | -6.554E-03 | &(P | 5.302E-02 | 1.51E-02 G K | |
| | | | 702.50 | 1.752E-02 | & P | 4.060E-02 | 1.22E-02 G K | |
| Ag-108M | | -8.3694E-03 | | | | | | |
| | | | 722.95 | -8.369E-03 | %( | 6.040E-02 | 1.75E-02 G K | |
| | | | 614.37 | 6.524E-03 | & P | 4.647E-02 | 1.34E-02 G | |
| | | | 433.93 | -1.057E-02 | % | 4.985E-02 | 1.47E-02 G | |

| Nuclide | Ave activity | Energy | Activity | Code | Peak | MDA | Comments |
|---|---|---|---|---|---|---|---|
| CD-109 | 2.7814E-02 | | | | | | |
| | | 88.04 | 2.781E-02 | &(P | 1.620E+00 | 4.83E-01 | G |
| SN-113 | -7.8519E-03 | | | | | | |
| | | 391.71 | -7.852E-03 | &( | 7.340E-02 | 2.15E-02 | G K |
| | | 255.04 | -6.850E-02 | & P | 2.031E+00 | 5.97E-01 | G |
| SB-125 | 7.7032E-02 | | | | | | |
| | | 427.95 | -4.660E-02 | %(P | 1.665E-01 | 4.95E-02 | G K |
| | | 600.77 | 2.308E-02 | & P | 2.841E-01 | 8.19E-02 | G |
| | | 636.15 | -4.513E-02 | & P | 4.355E-01 | 1.25E-01 | G |
| | | 463.51 | 4.430E-01 | *(P | 3.665E-01 | 1.21E-01 | G |
| | | 176.29 | -1.029E-01 | & P | 6.797E-01 | 2.02E-01 | G |
| I-131 | 0.0000E+00 | | | | | | |
| | | 364.48 | 0.000E+00 | %( | 8.496E-02 | 2.46E-02 | G K |
| | | 636.97 | -4.440E-02 | & | 9.809E-01 | 2.77E-01 | G |
| | | 284.29 | -5.340E-03 | & | 9.001E-01 | 2.61E-01 | G |
| CS-134 | 1.6964E-02 | | | | | | |
| | | 604.66 | -2.336E-02 | %(P | 6.638E-02 | 1.98E-02 | G K |
| | | 795.76 | 6.304E-02 | @(P | 5.156E-02 | 1.76E-02 | G |
| | | 569.29 | 4.983E-02 | & P | 3.148E-01 | 9.15E-02 | G |
| | | 801.84 | 2.758E-02 | % | 4.614E-01 | 1.28E-01 | G |
| CS-137 | 9.4296E-03 | | | | | | |
| | | 661.62 | 9.430E-03 | &(P | 6.368E-02 | 1.84E-02 | G |
| CE-139 | 2.9437E-03 | | | | | | |
| | | 165.85 | 2.944E-03 | %(P | 5.331E-02 | 1.58E-02 | G |
| EU-152 | 1.5930E-02 | | | | | | |
| | | 121.78 | 1.593E-02 | %(P | 1.572E-01 | 4.69E-02 | G K |
| | | 344.30 | -4.163E-03 | % P | 1.510E-01 | 4.38E-02 | G |
| | | 1408.08 | 8.740E-02 | % P | 1.950E-01 | 5.88E-02 | G |
| | | 964.00 | 7.194E-02 | % P | 4.667E-01 | 1.35E-01 | G |
| | | 1112.07 | 1.635E-01 | % P | 4.166E-01 | 1.24E-01 | G |
| | | 778.90 | -1.019E-01 | % P | 4.269E-01 | 1.25E-01 | G |
| EU-154 | -3.0284E-03 | | | | | | |
| | | 123.10 | -3.028E-03 | %(P | 1.130E-01 | 3.36E-02 | G K |
| | | 1274.80 | -2.009E-02 | & P | 2.142E-01 | 6.09E-02 | G |
| | | 723.30 | -5.668E-02 | % P | 3.310E-01 | 9.65E-02 | G |
| | | 1004.80 | 6.221E-02 | & P | 3.270E-01 | 9.42E-02 | G |

| Nuclide | Ave activity | Energy | Activity | Code | Peak | MDA | Comments |
|---|---|---|---|---|---|---|---|
| EU-155 | 1.2860E-01 | | | | | | |
| | | 86.45 | 1.286E-01 | %( | 1.782E-01 | 5.45E-02 | G K |
| | | 105.31 | 9.704E-02 | % | 2.175E-01 | 6.59E-02 | G |
| HG-203 | 2.6752E-02 | | | | | | |
| | | 279.17 | 2.675E-02 | &( | 4.759E-02 | 1.45E-02 | G K |
| | | 72.87 | -6.367E-01 | & P | 1.454E+00 | 4.40E-01 | G |
| | | 70.83 | -9.347E-02 | % | 2.482E+00 | 7.42E-01 | G |
| | | 82.50 | 4.930E-02 | % | 2.764E+00 | 8.23E-01 | G |
| TL-208 | 2.9851E-01 | | | | | | |
| | | 583.14 | 2.985E-01 | (P | 5.931E-02 | 2.84E-02 | G |
| | | 510.72 | 4.072E-01 | + P | 2.361E-01 | 9.12E-02 | G |
| PB-212 | 7.0274E-01 | | | | | | |
| | | 238.63 | 6.859E-01 | (P | 1.074E-01 | 4.19E-02 | G K |
| | | | | | | | Energy duplication |
| | | 77.11 | 7.443E-01 | @( | 3.752E-01 | 1.20E-01 | G |
| | | 74.81 | 9.880E-01 | & P | 7.498E-01 | 2.34E-01 | G |
| PB-214 | 4.9796E-01 | | | | | | |
| | | 351.99 | 4.979E-01 | (P | 1.013E-01 | 4.19E-02 | G K |
| | | 295.22 | 4.981E-01 | (P | 2.109E-01 | 7.25E-02 | G |
| | | | | | | | Energy duplication |
| | | 77.11 | 1.202E+00 | + P | 6.147E-01 | 1.96E-01 | G |
| | | 241.92 | 4.303E-01 | % P | 6.994E-01 | 2.13E-01 | G |
| BI-212 | 8.7578E-01 | | | | | | |
| | | 727.17 | 8.758E-01 | *(P | 4.649E-01 | 1.96E-01 | G K |
| | | 1620.56 | 3.602E-01 | % | 1.682E+00 | 4.68E-01 | G |
| | | 785.42 | 6.071E-01 | % P | 2.803E+00 | 8.17E-01 | G |
| BI-214 | 4.7374E-01 | | | | | | |
| | | 609.32 | 4.737E-01 | @(P | 1.002E-01 | 4.76E-02 | G K |
| | | 1764.51 | 7.045E-01 | + P | 1.382E-01 | 1.16E-01 | G |
| | | 1120.28 | 9.109E-01 | + P | 4.573E-01 | 1.97E-01 | G |
| RA-224 | 1.1746E+00 | | | | | | |
| | | 241.00 | 1.175E+00 | (P | 1.329E+00 | 4.11E-01 | G |
| RA-226 | 1.1565E+00 | | | | | | |
| | | 185.99 | 1.156E+00 | ( | 1.321E+00 | 4.09E-01 | G |
| AC-228 | 8.6902E-01 | | | | | | |
| | | 911.07 | 8.884E-01 | @(P | 2.386E-01 | 1.16E-01 | G K |
| | | 968.90 | 7.398E-01 | (P | 2.616E-01 | 1.12E-01 | G |
| | | 338.40 | 1.010E+00 | @(P | 3.451E-01 | 1.43E-01 | G |

| Nuclide | Ave activity | Energy | Activity | Code | Peak | MDA | Comments |
|---|---|---|---|---|---|---|---|
| TH-227 | -1.0390E-01 | | | | | | |
| | | 236.00 | -1.039E-01 | %(P | 4.698E-01 | 1.41E-01 | G K |
| | | 256.25 | -1.585E-02 | % P | 6.239E-01 | 1.83E-01 | G |
| PA-234 | -5.8988E-02 | | | | | | |
| | | 98.44 | -5.899E-02 | %( | 1.818E-01 | 5.48E-02 | G K |
| | | 946.00 | 5.182E-02 | & | 2.791E-01 | 8.04E-02 | G |
| | | 131.28 | -5.051E-02 | % | 2.287E-01 | 6.86E-02 | G |
| | | 94.67 | -7.079E-02 | % | 3.455E-01 | 1.04E-01 | G |
| | | 883.24 | 0.000E+00 | & | 4.369E-01 | 1.21E-01 | G |
| | | 926.70 | 1.743E-01 | % | 4.080E-01 | 1.23E-01 | G |
| | | 569.26 | 7.737E-02 | & | 4.635E-01 | 1.35E-01 | G |
| TH-234 | 1.5147E+00 | | | | | | |
| | | 63.29 | 7.746E-01 | %(P | 2.405E+00 | 7.23E-01 | G K |
| | | 92.80 | 1.927E+00 | (P | 1.740E+00 | 5.40E-01 | G |
| | | 92.38 | 2.156E+00 | (P | 2.080E+00 | 6.42E-01 | G |
| AM-241 | -2.1209E-03 | | | | | | |
| | | 59.54 | -2.121E-03 | &(P | 3.318E-01 | 9.87E-02 | G |

( - This peak used in the nuclide activity average.

* - Peak is too wide, but only one peak in library.
! - Peak is part of a multiplet and this area went negative during deconvolution.
? - Peak is too narrow.
@ - Peak is too wide at FW25M, but ok at FWHM.
% - Peak fails sensitivity test.
$ - Peak identified, but first peak of this nuclide failed one or more qualification tests.
+ - Peak activity higher than counting uncertainty range.
- - Peak activity lower than counting uncertainty range.
= - Peak outside analysis energy range.
& - Calculated peak centroid is not close enough to the library energy centroid for positive identification.
P - Peakbackground subtraction
} - Peak is too close to another for the activity to be found directly.

| Nuclide Codes: | Peak Codes: |
|---|---|
| T - Thermal Neutron Activation | G - Gamma Ray |
| F - Fast Neutron Activation | X - X-Ray |
| I - Fission Product | P - Positron Decay |
| N - Naturally Occurring Isotope | S - Single-Escape |
| P - Photon Reaction | D - Double-Escape |
| C - Charged Particle Reaction | K - Key Line |
| M - No MDA Calculation | A - Not in Average |

R - Coincidence Corrected C - Coincidence Peak
H - Halflife limit exceeded

- - - - - - - - - - - - - - - - - - - - - - - - - - - - - - - - - - - - - -

***** S U M M A R Y O F N U C L I D E S I N S A M P L E *****

| Nuclide | | Time of Count Activity pCi/gm | Time Corrected Activity pCi/gm | Uncertainty 3 Sigma Counting pCi/gm | Total pCi/gm | MDA pCi/gm |
|---|---|---|---|---|---|---|
| BE-7 | #A | 7.7336E-02 | 8.3527E-02 | 3.9940E-01 | 3.9942E-01 | 4.209E-01 |
| K-40 | | 1.7609E+01 | 1.7609E+01 | 1.9533E+00 | 2.1921E+00 | |
| MN-54 | #A | -2.3175E-03 | -2.3482E-03 | 9.1382E-02 | 9.1382E-02 | 6.008E-02 |
| CO-57 | #B | 4.5881E-03 | 4.6586E-03 | 4.7765E-02 | 4.7766E-02 | 5.258E-02 |
| CO-60 | #B | -8.6712E-03 | -8.6897E-03 | 5.3157E-02 | 5.3160E-02 | 6.005E-02 |
| Sr-85 | #A | -2.1005E-02 | -2.2381E-02 | 5.7591E-02 | 5.7604E-02 | 6.012E-02 |
| Kr-85 | #A | -5.1183E+02 | -5.1186E+02 | 1.3862E+03 | 1.3865E+03 | 1.393E+03 |
| Y-88 | #B | 0.0000E+00 | 0.0000E+00 | 4.0909E-02 | 4.0909E-02 | 5.168E-02 |
| NB-94 | #B | -6.5542E-03 | -6.5542E-03 | 4.8325E-02 | 4.8326E-02 | 5.302E-02 |
| Ag-108M | #B | -8.3687E-03 | -8.3694E-03 | 5.2388E-02 | 5.2391E-02 | 6.040E-02 |
| CD-109 | #A | 2.7562E-02 | 2.7814E-02 | 1.4503E+00 | 1.4503E+00 | 1.605E+00 |
| SN-113 | #B | -7.5763E-03 | -7.8519E-03 | 6.4499E-02 | 6.4501E-02 | 7.083E-02 |
| SB-125 | #B | 7.6719E-02 | 7.7032E-02 | 6.3104E-02 | 6.3254E-02 | 1.658E-01 |
| I-131 | #B | 0.0000E+00 | 0.0000E+00 | 7.3795E-02 | 7.3795E-02 | 5.094E-02 |
| CS-134 | #B | 1.6871E-02 | 1.6964E-02 | 1.4224E-02 | 1.4256E-02 | 6.602E-02 |
| CS-137 | #A | 9.4261E-03 | 9.4296E-03 | 5.5318E-02 | 5.5321E-02 | 6.365E-02 |
| CE-139 | #A | 2.8570E-03 | 2.9437E-03 | 4.7466E-02 | 4.7466E-02 | 5.174E-02 |
| EU-152 | #B | 1.5916E-02 | 1.5930E-02 | 1.4077E-01 | 1.4077E-01 | 1.571E-01 |
| EU-154 | #B | -3.0244E-03 | -3.0284E-03 | 1.7209E-01 | 1.7209E-01 | 1.129E-01 |
| EU-155 | #B | 1.2831E-01 | 1.2860E-01 | 1.6354E-01 | 1.6370E-01 | 1.778E-01 |
| HG-203 | #B | 2.4492E-02 | 2.6752E-02 | 4.3595E-02 | 4.3621E-02 | 4.357E-02 |
| TL-208 | | 2.9851E-01 | 2.9851E-01 | 8.5235E-02 | 8.6888E-02 | |
| PB-212 | # | 7.0274E-01 | 7.0274E-01 | 1.2874E-01 | 1.3472E-01 | 1.074E-01 |
| PB-214 | # | 4.9796E-01 | 4.9796E-01 | 1.2564E-01 | 1.2876E-01 | 1.013E-01 |
| BI-212 | # | 8.7578E-01 | 8.7578E-01 | 5.8842E-01 | 5.9050E-01 | |
| BI-214 | # | 4.7374E-01 | 4.7374E-01 | 1.4267E-01 | 1.4516E-01 | |
| RA-224 | #A | 1.1746E+00 | 1.1746E+00 | 1.2331E+00 | 1.2349E+00 | 1.329E+00 |
| RA-226 | #A | 1.1564E+00 | 1.1565E+00 | 1.2257E+00 | 1.2274E+00 | 1.321E+00 |
| AC-228 | | 8.6902E-01 | 8.6902E-01 | 2.1243E-01 | 2.1803E-01 | |
| TH-227 | #B | -1.0390E-01 | -1.0390E-01 | 4.3700E-01 | 4.3704E-01 | 4.698E-01 |
| PA-234 | #B | -5.8988E-02 | -5.8988E-02 | 1.6427E-01 | 1.6430E-01 | 1.818E-01 |
| TH-234 | #B | 1.5147E+00 | 1.5147E+00 | 1.2723E+00 | 1.2751E+00 | 2.405E+00 |
| AM-241 | #A | -2.1208E-03 | -2.1209E-03 | 5.2567E-01 | 5.2567E-01 | 3.318E-01 |

# - All peaks for activity calculation had bad shape.
* - Activity omitted from total
& - Activity omitted from total and all peaks had bad shape.
< - MDA value printed.
A - Activity printed, but activity < MDA.
B - Activity < MDA and failed test.
C - Area < Critical level.
F - Failed fraction or key line test.

H – Halflife limit exceeded

YAEC Chemistry Lab Spectrum name: 101f_15SEPT2006_1007.An1

---------- S U M M A R Y ----------

Total Activity ( 1120.2 to 1999.1 keV) 2.0126118E+01 pCi/gm
Total Decayed Activity ( 1120.2 to 1999.1 keV) 2.0126118E+01 pCi/gm

The library has energies which are not separable.

Analyzed by: _____
JPK

Reviewed by: _____
Supervisor

Laboratory: YAEC Chemistry Lab

YAEC Chemistry Lab Spectrum name: 101F_15SEPT2006_1132.An1

Sample description
FSS-SSS-01-01-035-F-B

Spectrum Filename: C:\GammaVision\Spectra\101F_15SEPT2006_1132.An1

Acquisition information
Start time: 15-Sep-2006 11:32:19
Live time: 2000
Real time: 2002
Dead time: 0.09 %
Detector ID: 1

Detector system
Det 101- DSPE-633

Calibration
Filename: D1_1LSa.Clb
Detector 101 1.0 Liter Marinelli Sand

Energy Calibration
Created: 03-Sep-2004 08:50:48
Zero offset: 0.244 keV
Gain: 0.500 keV/channel
Quadratic: -2.493E-08 keV/channel^2

Efficiency Calibration
Created: 03-Sep-2004 08:52:26
Type: Polynomial
Uncertainty: 0.626 %
Coefficients: -0.321775 -5.816463 0.734234
-0.099357 0.006049 -0.000149

Library Files
Main analysis library: FSS_Rev_1.Lib
Library Match Width: 1.000
Peak stripping: Library based

Analysis parameters
Analysis engine: Env32 G53W4.20
Start channel: 100 ( 50.23keV )
Stop channel: 4000 ( 1999.11keV )
Peak rejection level: 41.667%
Peak search sensitivity: 3
Sample Size: 1.6970E+03
Activity scaling factor: 1.0000E+06/( 1.0000E+00* 1.6970E+03) =
5.8928E+02
Detection limit method: Nureg 4.16
Random error: 1.0000000E+00
Systematic error: 1.0000000E+00

| | |
|---|---|
| Fraction Limit: | 0.000% |
| Background width: | average of five points. |

YAEC Chemistry Lab Spectrum name: 101F_15SEPT2006_1132.An1

Half lives decay limit: 12.000
Activity range factor: 2.000
Min. step backg. energy 0.000
Multiplet shift channel 2.000

| Corrections | Status | Comments |
|---|---|---|
| Decay correct to date: | YES | 11-Sep-2006 11:50:00 |
| Decay during acquisition: | NO | |
| Decay during collection: | NO | |
| True coincidence correction: | NO | |
| Peaked background correction: | YES | 101_150K_28APR05.Pbc 01-May-2005 05:24:47 |
| Absorption (Internal): | NO | |
| Geometry correction: | NO | |
| Random summing: | NO | |

total peaks alloc. 11 cutoff 20.00000 %
Energy Calibration
Normalized diff: 0.1823

***** S U M M A R Y O F P E A K S I N R A N G E *****

| Peak Energy | Area | Uncert | FWHM | Corrctn Factor | Nuclide Energy | Brnch. Ratio | Act. pCi/gm | Nuc |
|---|---|---|---|---|---|---|---|---|
| 67.74 | 92. | 38.94 | 1.06 | 1.373E-02 | | | | |
| 74.86 | 176. | 24.64 | 1.50 | 1.654E-02 | 74.81 | 9.600 | 8.813E-01 | PB212 |
| 77.06 | 279. | 15.42 | 1.50 | 1.720E-02 | 77.11 | 10.700 | 1.205E+00 | PB214 |
| | | | | | 77.11 | 17.500 | 7.370E-01 | PB212 |
| 77.06 | 282. | 15.42 | 1.50 | 1.720E-02 | 77.11 | 10.700 | 1.205E+00 | PB214 |
| | | | | | 77.11 | 17.500 | 7.468E-01 | PB212 |
| 83.97 | 77. | 31.87 | 1.01 | 1.870E-02 | | | | |
| 86.55 | 82. | 33.12 | 1.01 | 1.912E-02 | 86.45 | 32.740 | 1.052E-01 | EU155 |
| 89.66 | 98. | 28.40 | 1.02 | 1.954E-02 | 88.04 | 3.790 | PBC<MDA | CD109 |
| 93.58 | 124. | 22.06 | 1.02 | 1.998E-02 | 92.38 | 2.570 | PBC<MDA | TH234 |
| | | | | | 92.80 | 3.000 | PBC<MDA | TH234 |
| 129.23 | 65. | 39.45 | 1.36 | 2.109E-02 | | | | |
| 186.29 | 117. | 25.44 | 1.57 | 1.857E-02 | 185.99 | 3.280 | 1.526E+00 | RA226 |
| 209.54 | 60. | 41.32 | 1.16 | 1.720E-02 | | | | |
| 238.83 | 683. | 4.41 | 1.12 | 1.556E-02 | 238.63 | 43.100 | 8.030E-01 | PB212 |
| 241.60 | 121. | 18.94 | 1.12 | 1.542E-02 | 241.00 | 3.900 | 1.589E+00 | RA224 |
| 270.34 | 73. | 30.42 | 1.62 | 1.400E-02 | | | | |
| 295.36 | 138. | 13.40 | 1.29 | 1.291E-02 | 295.22 | 19.200 | 4.373E-01 | PB214 |
| 338.62 | 180. | 15.64 | 1.21 | 1.134E-02 | 338.40 | 12.010 | 1.039E+00 | AC228 |
| 352.11 | 265. | 10.28 | 1.30 | 1.092E-02 | 351.99 | 37.100 | 5.176E-01 | PB214 |
| 463.21 | 59. | 22.90 | 1.29 | 8.347E-03 | | | | |
| 463.21 | 59. | 22.90 | 1.29 | 8.347E-03 | 463.51 | 10.000 | 5.548E-01 | SB125 |
| 510.62 | 106. | 21.91 | 1.94 | 7.592E-03 | | | | |
| 510.62 | 106. | 21.91 | 1.94 | 7.592E-03 | 510.72 | 22.500 | 4.172E-01 | TL208 |
| 583.33 | 200. | 13.80 | 1.44 | 6.682E-03 | 583.14 | 86.000 | 2.732E-01 | TL208 |
| 609.36 | 214. | 8.68 | 1.20 | 6.412E-03 | 609.32 | 46.090 | 5.747E-01 | BI214 |
| 727.63 | 50. | 26.82 | 1.34 | 5.440E-03 | 727.17 | 11.800 | 6.140E-01 | BI212 |

| | | | | | | | | |
|---|---|---|---|---|---|---|---|---|
| 785.60 | 28. | 35.09 | 1.50 | 5.075E-03 | 785.42 | 2.000 | PBC<MDA | BI212 |
| 794.98 | 31. | 29.30 | 1.50 | 5.016E-03 | 795.76 | 85.400 | 5.794E-02 | CS134 |
| 911.37 | 169. | 9.94 | 1.64 | 4.445E-03 | 911.07 | 29.000 | 1.035E+00 | AC228 |
| 968.43 | 115. | 13.86 | 1.95 | 4.214E-03 | 968.90 | 17.460 | 1.240E+00 | AC228 |
| 1119.93 | 47. | 33.08 | 0.86 | 3.711E-03 | 1120.28 | 15.040 | 6.766E-01 | BI214 |
| 1460.82 | 583. | 4.25 | 2.00 | 2.942E-03 | 1460.75 | 10.700 | 1.468E+01 | K40 |

| pk energy | area | uncert | fwhm | corr | nuclide | brnch. | act. | nuc |
|---|---|---|---|---|---|---|---|---|
| 1764.57 | 29. | 20.22 | 2.09 | 2.481E-03 | 1764.51 | 15.920 | 5.778E-01 | BI214 |

********** U N I D E N T I F I E D P E A K S U M M A R Y **********

| Peak Channel | Centroid Energy | Background Counts | Net Area Counts | Intensity Cts/Sec | Uncert 3 Sigma % | FWHM keV | Suspected Nuclide | |
|---|---|---|---|---|---|---|---|---|
| 135.03 | 67.74 | 527. | 88. | 0.044 | 115.54 | 1.057 | TA-182 | |
| 172.68 | 86.61 | 332. | 82. | 0.041 | 99.37 | 1.013 | BI-207 | lD |
| 178.89 | 89.71 | 342. | 98. | 0.049 | 85.20 | 1.015 | PB-214 | lD |
| 418.76 | 209.54 | 256. | 60. | 0.030 | 123.95 | 1.165 | AC-228 | |
| 477.36 | 238.88 | 113. | 683. | 0.342 | 13.24 | 1.122 | PB-212 | D |
| 482.89 | 241.64 | 202. | 121. | 0.060 | 56.83 | 1.124 | PB-214 | D |
| 540.41 | 270.34 | 175. | 73. | 0.036 | 91.25 | 1.622 | AC-228 | s |

s - Peak fails shape tests.
D - Peak area deconvoluted.
L - Peak written from unknown list.
C - Area < Critical level.

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This section based on library: FSS_Rev_1.Lib

********** I D E N T I F I E D P E A K S U M M A R Y **********

| Nuclide | Peak Channel | Centroid Energy | Background Counts | Net Area Counts | Intensity Cts/Sec | Uncert 3 Sigma % | FWHM keV |
|---|---|---|---|---|---|---|---|
| PB-212 | 149.28 | 74.86 | 909. | 176. | 0.088 | 73.93 | 1.499 |
| PB-214 | 153.79 | 77.11 | 811. | 279. | 0.139 | 46.27 | 1.499D |
| PB-212 | 153.79 | 77.11 | 807. | 282. | 0.141 | 46.27 | 1.499D |
| TH-234 | 185.75 | 93.08 | 777. | 143. | 0.072 | 80.04 | 1.499s |
| TH-234 | 185.74 | 93.08 | 749. | 147. | 0.074 | 79.12 | 1.499s |
| RA-226 | 371.92 | 186.13 | 378. | 116. | 0.058 | 76.26 | 1.499s |
| PB-212 | 477.27 | 238.79 | 399. | 541. | 0.271 | 20.00 | 1.499 |
| RA-224 | 483.36 | 241.83 | 456. | 105. | 0.052 | 90.77 | 1.499 |
| PB-214 | 590.48 | 295.37 | 171. | 137. | 0.069 | 47.17 | 1.499 |
| AC-228 | 677.02 | 338.62 | 177. | 178. | 0.089 | 46.92 | 1.206s |
| PB-214 | 704.01 | 352.11 | 118. | 245. | 0.123 | 26.55 | 1.499 |
| SB-125 | 926.42 | 463.26 | 69. | 53. | 0.027 | 75.81 | 1.499s |
| TL-208 | 1021.27 | 510.67 | 129. | 50. | 0.025 | 77.87 | 1.499s |
| TL-208 | 1166.67 | 583.33 | 82. | 176. | 0.088 | 30.86 | 1.499s |
| BI-214 | 1218.76 | 609.36 | 47. | 213. | 0.107 | 26.05 | 1.204 |
| BI-212 | 1455.42 | 727.63 | 47. | 50. | 0.025 | 80.45 | 1.338 |
| BI-212 | 1571.41 | 785.60 | 34. | 28. | 0.014 | 105.27 | 1.499 |
| CS-134 | 1590.18 | 794.98 | 27. | 31. | 0.016 | 87.89 | 1.502s |
| AC-228 | 1823.09 | 911.37 | 35. | 168. | 0.084 | 29.83 | 1.643s |
| AC-228 | 1937.27 | 968.43 | 39. | 114. | 0.057 | 41.59 | 1.946s |
| BI-214 | 2240.45 | 1119.93 | 54. | 47. | 0.024 | 99.23 | 0.860s |

YAEC Chemistry Lab Spectrum name: 101F_15SEPT2006_1132.An1

| Nuclide | Channel | Energy | Background | Net area | Cnts/sec | Uncert | FWHM |
|---|---|---|---|---|---|---|---|
| K-40 | 2922.65 | 1460.82 | 11. | 580. | 0.290 | 12.76 | 2.005 |
| BI-214 | 3530.57 | 1764.57 | 2. | 29. | 0.014 | 60.65 | 2.092 |

s - Peak fails shape tests.
D - Peak area deconvoluted.
A Derived peak area.

***** S U M M A R Y O F L I B R A R Y P E A K U S A G E *****

| - Nuclide - Name | Code | Average Activity pCi/gm | Peak Energy keV | Peak Activity pCi/gm | Code | MDA Value pCi/gm | COMMENTS |
|---|---|---|---|---|---|---|---|
| BE-7 | | -1.0697E-02 | | | | | |
| | | | 477.56 | -1.070E-02 | &( | 4.418E-01 1.26E-01 | G |
| K-40 | | 1.4678E+01 | | | | | |
| | | | 1460.75 | 1.468E+01 | (P | 4.537E-01 6.27E-01 | G |
| MN-54 | | 2.8799E-02 | | | | | |
| | | | 834.81 | 2.880E-02 | %(P | 6.011E-02 1.82E-02 | G |
| CO-57 | | -4.7302E-04 | | | | | |
| | | | 122.07 | -4.730E-04 | %( | 5.077E-02 1.50E-02 | G K |
| | | | 136.43 | 1.146E-01 | % | 3.909E-01 1.17E-01 | G |
| CO-60 | | -1.2668E-02 | | | | | |
| | | | 1332.51 | -1.267E-02 | %(P | 6.232E-02 1.77E-02 | G K |
| | | | 1173.23 | -7.118E-04 | & P | 7.908E-02 2.21E-02 | G K |
| Sr-85 | | -2.3000E-02 | | | | | |
| | | | 514.00 | -2.300E-02 | &( | 6.881E-02 2.06E-02 | G |
| Kr-85 | | -5.3720E+02 | | | | | |
| | | | 513.99 | -5.372E+02 | &(P | 1.527E+03 4.56E+02 | G |
| Y-88 | | 0.0000E+00 | | | | | |
| | | | 1836.01 | 0.000E+00 | &( | 2.535E-02 3.44E-03 | G K |
| | | | 898.02 | -3.432E-04 | % P | 7.145E-02 2.01E-02 | G |
| NB-94 | | 6.0260E-03 | | | | | |
| | | | 871.10 | 6.026E-03 | &(P | 5.069E-02 1.43E-02 | G K |
| | | | 702.50 | -7.577E-03 | % P | 4.966E-02 1.43E-02 | G K |
| Ag-108M | | 3.4236E-03 | | | | | |
| | | | 722.95 | 3.424E-03 | &( | 1.019E-01 2.97E-02 | G K |
| | | | 614.37 | -2.575E-02 | % P | 6.299E-02 1.89E-02 | G |
| | | | 433.93 | -4.176E-03 | & | 5.029E-02 1.46E-02 | G |

| Nuclide | Ave activity | Energy | Activity | Code | Peak | MDA | Comments |
|---|---|---|---|---|---|---|---|
| CD-109 | 9.1627E-02 | | | | | | |
| | | 88.04 | 9.163E-02 | %(P | 1.631E+00 | 4.87E-01 | G |
| SN-113 | -6.5513E-03 | | | | | | |
| | | 391.71 | -6.551E-03 | &( | 5.985E-02 | 1.73E-02 | G K |
| | | 255.04 | -2.143E-01 | % P | 1.956E+00 | 5.76E-01 | G |
| SB-125 | 1.3117E-01 | | | | | | |
| | | 427.95 | 3.728E-03 | %(P | 1.074E-01 | 3.03E-02 | G K |
| | | 600.77 | 3.542E-02 | % P | 1.861E-01 | 5.32E-02 | G |
| | | 636.15 | -3.290E-03 | % P | 4.000E-01 | 1.12E-01 | G |
| | | 463.51 | 5.084E-01 | (P | 3.971E-01 | 1.32E-01 | G |
| | | 176.29 | -3.311E-02 | % P | 6.919E-01 | 2.04E-01 | G |
| I-131 | 2.4281E-03 | | | | | | |
| | | 364.48 | 2.428E-03 | &( | 6.731E-02 | 1.94E-02 | G K |
| | | 636.97 | 2.470E-01 | % | 7.830E-01 | 2.31E-01 | G |
| | | 284.29 | -9.713E-02 | & | 9.624E-01 | 2.83E-01 | G |
| CS-134 | 1.9010E-02 | | | | | | |
| | | 604.66 | -1.505E-02 | %(P | 5.236E-02 | 1.54E-02 | G K |
| | | 795.76 | 5.794E-02 | *(P | 5.038E-02 | 1.72E-02 | G |
| | | 569.29 | -8.182E-02 | % P | 3.302E-01 | 9.68E-02 | G |
| | | 801.84 | 1.617E-01 | % | 5.186E-01 | 1.52E-01 | G |
| CS-137 | 1.8434E-02 | | | | | | |
| | | 661.62 | 1.843E-02 | %(P | 5.389E-02 | 1.59E-02 | G |
| CE-139 | 3.6002E-03 | | | | | | |
| | | 165.85 | 3.600E-03 | &(P | 5.554E-02 | 1.65E-02 | G |
| EU-152 | 2.2268E-02 | | | | | | |
| | | 121.78 | 2.227E-02 | %(P | 1.400E-01 | 4.18E-02 | G K |
| | | 344.30 | -3.369E-02 | % P | 1.527E-01 | 4.50E-02 | G |
| | | 1408.08 | 5.940E-02 | % P | 2.230E-01 | 6.34E-02 | G |
| | | 964.00 | 1.815E-01 | % P | 5.064E-01 | 1.51E-01 | G |
| | | 1112.07 | 1.380E-01 | & P | 3.854E-01 | 1.14E-01 | G |
| | | 778.90 | -1.173E-03 | & P | 4.277E-01 | 1.20E-01 | G |
| EU-154 | 2.5161E-02 | | | | | | |
| | | 123.10 | 2.516E-02 | &(P | 8.749E-02 | 2.62E-02 | G K |
| | | 1274.80 | 1.876E-02 | % P | 2.064E-01 | 5.82E-02 | G |
| | | 723.30 | -1.428E-01 | & P | 3.808E-01 | 1.14E-01 | G |
| | | 1004.80 | 3.434E-02 | % P | 3.572E-01 | 1.01E-01 | G |

| Nuclide | Ave activity | Energy | Activity | Code | Peak | MDA | Comments |
|---|---|---|---|---|---|---|---|
| EU-155 | 7.7242E-02 | | | | | | |
| | | 86.45 | 7.724E-02 | %( | 1.817E-01 | 5.50E-02 | G K |
| | | 105.31 | 9.710E-02 | % | 2.124E-01 | 6.44E-02 | G |
| HG-203 | -9.3202E-03 | | | | | | |
| | | 279.17 | -9.320E-03 | %( | 5.540E-02 | 1.64E-02 | G K |
| | | 72.87 | -7.403E-01 | % P | 1.371E+00 | 4.16E-01 | G |
| | | 70.83 | 8.449E-02 | % | 2.802E+00 | 8.38E-01 | G |
| | | 82.50 | -9.604E-01 | % | 2.810E+00 | 8.48E-01 | G |
| TL-208 | 2.4140E-01 | | | | | | |
| | | 583.14 | 2.440E-01 | @(P | 6.209E-02 | 2.54E-02 | G |
| | | 510.72 | 2.315E-01 | (P | 2.590E-01 | 7.95E-02 | G |
| PB-212 | 6.7244E-01 | | | | | | |
| | | 238.63 | 6.423E-01 | (P | 1.136E-01 | 4.33E-02 | G K |
| | | | | | | | Energy duplication |
| | | 77.11 | 7.468E-01 | @( | 3.573E-01 | 1.15E-01 | G |
| | | 74.81 | 8.813E-01 | & P | 7.183E-01 | 2.24E-01 | G |
| PB-214 | 4.6761E-01 | | | | | | |
| | | 351.99 | 4.818E-01 | (P | 1.046E-01 | 4.30E-02 | G K |
| | | 295.22 | 4.402E-01 | (P | 2.042E-01 | 7.01E-02 | G |
| | | | | | | | Energy duplication |
| | | 77.11 | 1.205E+00 | + P | 5.857E-01 | 1.88E-01 | G |
| | | 241.92 | -4.217E-01 | % P | 7.971E-01 | 2.42E-01 | G |
| BI-212 | 6.1400E-01 | | | | | | |
| | | 727.17 | 6.140E-01 | (P | 4.317E-01 | 1.67E-01 | G K |
| | | 1620.56 | -6.316E-02 | % | 1.888E+00 | 4.91E-01 | G |
| | | 785.42 | 2.177E+00 | + P | 2.359E+00 | 7.71E-01 | G |
| BI-214 | 5.9520E-01 | | | | | | |
| | | 609.32 | 5.747E-01 | (P | 9.311E-02 | 5.02E-02 | G K |
| | | 1764.51 | 5.778E-01 | (P | 1.983E-01 | 1.19E-01 | G |
| | | 1120.28 | 6.766E-01 | (P | 5.254E-01 | 2.26E-01 | G |
| RA-224 | 1.3834E+00 | | | | | | |
| | | 241.00 | 1.383E+00 | (P | 1.352E+00 | 4.21E-01 | G |
| RA-226 | 1.5179E+00 | | | | | | |
| | | 185.99 | 1.518E+00 | ( | 1.219E+00 | 3.86E-01 | G |
| AC-228 | 1.0967E+00 | | | | | | |
| | | 911.07 | 1.035E+00 | @(P | 1.881E-01 | 1.04E-01 | G K |
| | | 968.90 | 1.240E+00 | (P | 3.425E-01 | 1.73E-01 | G |
| | | 338.40 | 1.039E+00 | @(P | 3.782E-01 | 1.65E-01 | G |

| Nuclide | Ave activity | Energy | Activity | Code | Peak MDA | Comments |
|---|---|---|---|---|---|---|
| TH-227 | -2.6642E-01 | | | | | |
| | | 236.00 | -2.664E-01 | %(P | 5.191E-01 | 1.58E-01 G K |
| | | 256.25 | -1.021E-01 | % P | 5.670E-01 | 1.67E-01 G |
| PA-234 | 7.9037E-02 | | | | | |
| | | 98.44 | 7.904E-02 | %( | 1.686E-01 | 5.11E-02 G K |
| | | 946.00 | 1.387E-04 | & | 1.990E-01 | 5.28E-02 G |
| | | 131.28 | -2.266E-02 | & | 2.252E-01 | 6.71E-02 G |
| | | 94.67 | 2.320E-03 | % | 2.815E-01 | 8.34E-02 G |
| | | 883.24 | 1.634E-01 | % | 3.775E-01 | 1.14E-01 G |
| | | 926.70 | -7.109E-02 | % | 5.196E-01 | 1.48E-01 G |
| | | 569.26 | -1.178E-01 | % | 4.870E-01 | 1.43E-01 G |
| TH-234 | 1.5374E+00 | | | | | |
| | | 63.29 | 7.486E-01 | %(P | 2.321E+00 | 6.97E-01 G K |
| | | 92.80 | 1.967E+00 | (P | 1.738E+00 | 5.40E-01 G |
| | | 92.38 | 2.233E+00 | &(P | 2.070E+00 | 6.41E-01 G |
| AM-241 | 2.4118E-02 | | | | | |
| | | 59.54 | 2.412E-02 | %(P | 3.255E-01 | 9.70E-02 G |

( - This peak used in the nuclide activity average.

* - Peak is too wide, but only one peak in library.
! - Peak is part of a multiplet and this area went negative during deconvolution.
? - Peak is too narrow.
@ - Peak is too wide at FW25M, but ok at FWHM.
% - Peak fails sensitivity test.
$ - Peak identified, but first peak of this nuclide failed one or more qualification tests.
+ - Peak activity higher than counting uncertainty range.
- - Peak activity lower than counting uncertainty range.
= - Peak outside analysis energy range.
& - Calculated peak centroid is not close enough to the library energy centroid for positive identification.
P - Peakbackground subtraction
} - Peak is too close to another for the activity to be found directly.

| Nuclide Codes: | Peak Codes: |
|---|---|
| T - Thermal Neutron Activation | G - Gamma Ray |
| F - Fast Neutron Activation | X - X-Ray |
| I - Fission Product | P - Positron Decay |
| N - Naturally Occurring Isotope | S - Single-Escape |
| P - Photon Reaction | D - Double-Escape |
| C - Charged Particle Reaction | K - Key Line |
| M - No MDA Calculation | A - Not in Average |

R - Coincidence Corrected C - Coincidence Peak
H - Halflife limit exceeded

- - - - - - - - - - - - - - - - - - - - - - - - - - - - - - - - - - - - - - -

***** S U M M A R Y O F N U C L I D E S I N S A M P L E *****

| Nuclide | | Time of Count Activity pCi/gm | Time Corrected Activity pCi/gm | Uncertainty 3 Sigma Counting pCi/gm | Total pCi/gm | MDA pCi/gm |
|---|---|---|---|---|---|---|
| BE-7 | #A | -1.0158E-02 | -1.0697E-02 | 3.7867E-01 | 3.7868E-01 | 4.195E-01 |
| K-40 | | 1.4678E+01 | 1.4678E+01 | 1.8810E+00 | 2.0557E+00 | |
| MN-54 | #A | 2.8546E-02 | 2.8799E-02 | 5.4622E-02 | 5.4646E-02 | 5.958E-02 |
| CO-57 | #B | -4.6821E-04 | -4.7302E-04 | 4.5146E-02 | 4.5146E-02 | 5.025E-02 |
| CO-60 | #B | -1.2649E-02 | -1.2668E-02 | 5.5025E-02 | 5.5030E-02 | 6.223E-02 |
| Sr-85 | #A | -2.2040E-02 | -2.3000E-02 | 6.1797E-02 | 6.1811E-02 | 6.594E-02 |
| Kr-85 | #A | -5.3719E+02 | -5.3720E+02 | 1.5223E+03 | 1.5226E+03 | 1.527E+03 |
| Y-88 | #B | 0.0000E+00 | 0.0000E+00 | 1.0318E-02 | 1.0320E-02 | 2.470E-02 |
| NB-94 | #B | 6.0260E-03 | 6.0260E-03 | 4.2963E-02 | 4.2965E-02 | 5.069E-02 |
| Ag-108M | #B | 3.4234E-03 | 3.4236E-03 | 8.9069E-02 | 8.9069E-02 | 1.019E-01 |
| CD-109 | #A | 9.1070E-02 | 9.1627E-02 | 1.4604E+00 | 1.4604E+00 | 1.621E+00 |
| SN-113 | #B | -6.3959E-03 | -6.5513E-03 | 5.2039E-02 | 5.2040E-02 | 5.843E-02 |
| SB-125 | #F | 1.3081E-01 | 1.3117E-01 | 1.0216E-01 | 1.0242E-01 | 1.071E-01 |
| I-131 | #B | 1.7217E-03 | 2.4281E-03 | 5.8299E-02 | 5.8299E-02 | 4.773E-02 |
| CS-134 | #B | 1.8941E-02 | 1.9010E-02 | 1.6932E-02 | 1.6966E-02 | 5.217E-02 |
| CS-137 | #A | 1.8429E-02 | 1.8434E-02 | 4.7766E-02 | 4.7778E-02 | 5.388E-02 |
| CE-139 | #A | 3.5286E-03 | 3.6002E-03 | 4.9459E-02 | 4.9460E-02 | 5.444E-02 |
| EU-152 | #B | 2.2255E-02 | 2.2268E-02 | 1.2526E-01 | 1.2527E-01 | 1.399E-01 |
| EU-154 | #B | 2.5139E-02 | 2.5161E-02 | 7.8663E-02 | 7.8676E-02 | 8.741E-02 |
| EU-155 | #B | 7.7124E-02 | 7.7242E-02 | 1.6499E-01 | 1.6505E-01 | 1.814E-01 |
| HG-203 | #B | -8.7833E-03 | -9.3202E-03 | 4.9216E-02 | 4.9219E-02 | 5.221E-02 |
| TL-208 | # | 2.4140E-01 | 2.4140E-01 | 7.5493E-02 | 7.6715E-02 | 6.209E-02 |
| PB-212 | # | 6.7244E-01 | 6.7244E-01 | 1.3601E-01 | 1.4121E-01 | 1.136E-01 |
| PB-214 | # | 4.6761E-01 | 4.6761E-01 | 1.2514E-01 | 1.2790E-01 | 1.046E-01 |
| BI-212 | | 6.1400E-01 | 6.1400E-01 | 5.0075E-01 | 5.0195E-01 | |
| BI-214 | | 5.9520E-01 | 5.9520E-01 | 1.5587E-01 | 1.5945E-01 | |
| RA-224 | # | 1.3834E+00 | 1.3834E+00 | 1.2643E+00 | 1.2667E+00 | 1.352E+00 |
| RA-226 | # | 1.5179E+00 | 1.5179E+00 | 1.1575E+00 | 1.1607E+00 | 1.219E+00 |
| AC-228 | | 1.0967E+00 | 1.0967E+00 | 2.5633E-01 | 2.6371E-01 | |
| TH-227 | #B | -2.6642E-01 | -2.6642E-01 | 4.7988E-01 | 4.8012E-01 | 5.191E-01 |
| PA-234 | #B | 7.9037E-02 | 7.9037E-02 | 1.5327E-01 | 1.5334E-01 | 1.686E-01 |
| TH-234 | #B | 1.5374E+00 | 1.5374E+00 | 1.2673E+00 | 1.2702E+00 | 2.321E+00 |
| AM-241 | #A | 2.4118E-02 | 2.4118E-02 | 2.9092E-01 | 2.9093E-01 | 3.255E-01 |

# - All peaks for activity calculation had bad shape.
* - Activity omitted from total
& - Activity omitted from total and all peaks had bad shape.
< - MDA value printed.
A - Activity printed, but activity < MDA.
B - Activity < MDA and failed test.
C - Area < Critical level.
F - Failed fraction or key line test.

H – Halflife limit exceeded

YAEC Chemistry Lab Spectrum name: 101F_15SEPT2006_1132.An1

---------- S U M M A R Y ----------

Total Activity ( 270.1 to 1999.1 keV) 1.6983624E+01 pCi/gm
Total Decayed Activity ( 270.1 to 1999.1 keV) 1.6983624E+01 pCi/gm

The library has energies which are not separable.

Analyzed by: _____
JPK

Reviewed by: _____
Supervisor

Laboratory: YAEC Chemistry Lab

YAEC Chemistry Lab Spectrum name: 101F_15SEPT2006_1307.An1

Sample description
FSS-SSS-01-01-024-F

Spectrum Filename: C:\GammaVision\Spectra\101F_15SEPT2006_1307.An1

Acquisition information

| | |
|---|---|
| Start time: | 15-Sep-2006 13:08:33 |
| Live time: | 2000 |
| Real time: | 2002 |
| Dead time: | 0.09 % |
| Detector ID: | 1 |

Detector system
Det 101- DSPE-633

Calibration

| | |
|---|---|
| Filename: | D1_1LSa.Clb |

Detector 101 1.0 Liter Marinelli Sand

Energy Calibration

| | |
|---|---|
| Created: | 03-Sep-2004 08:50:48 |
| Zero offset: | 0.244 keV |
| Gain: | 0.500 keV/channel |
| Quadratic: | -2.493E-08 keV/channel^2 |

Efficiency Calibration

| | |
|---|---|
| Created: | 03-Sep-2004 08:52:26 |
| Type: | Polynomial |
| Uncertainty: | 0.626 % |
| Coefficients: | -0.321775 -5.816463 0.734234 |
| | -0.099357 0.006049 -0.000149 |

Library Files

| | |
|---|---|
| Main analysis library: | FSS_Rev_1.Lib |
| Library Match Width: | 1.000 |
| Peak stripping: | Library based |

Analysis parameters

| | |
|---|---|
| Analysis engine: | Env32 G53W4.20 |
| Start channel: | 100 ( 50.23keV ) |
| Stop channel: | 4000 ( 1999.11keV ) |
| Peak rejection level: | 41.667% |
| Peak search sensitivity: | 3 |
| Sample Size: | 1.8120E+03 |
| Activity scaling factor: | 1.0000E+06/( 1.0000E+00* 1.8120E+03) = 5.5188E+02 |
| Detection limit method: | Nureg 4.16 |
| Random error: | 1.0000000E+00 |
| Systematic error: | 1.0000000E+00 |

| | |
|---|---|
| Fraction Limit: | 0.000% |
| Background width: | average of five points. |

YAEC Chemistry Lab Spectrum name: 101F_15SEPT2006_1307.An1

Half lives decay limit: 12.000
Activity range factor: 2.000
Min. step backg. energy 0.000
Multiplet shift channel 2.000

| Corrections | Status | Comments |
|---|---|---|
| Decay correct to date: | YES | 08-Sep-2006 10:28:00 |
| Decay during acquisition: | NO | |
| Decay during collection: | NO | |
| True coincidence correction: | NO | |
| Peaked background correction: | YES | 101_150K_28APR05.Pbc 01-May-2005 05:24:47 |
| Absorption (Internal): | NO | |
| Geometry correction: | NO | |
| Random summing: | NO | |

total peaks alloc. 15 cutoff 20.00000 %
Energy Calibration
Normalized diff: 0.1292

***** S U M M A R Y O F P E A K S I N R A N G E *****

| Peak Energy | Area | Uncert | FWHM | Corrctn Factor | Nuclide Energy | Brnch. Ratio | Act. pCi/gm | Nuc |
|---|---|---|---|---|---|---|---|---|
| 74.94 | 150. | 29.70 | 1.50 | 1.654E-02 | 72.87 | 6.400 | PBC<MDA | HG203 |
| | | | | | 74.81 | 9.600 | 7.035E-01 | PB212 |
| 76.97 | 301. | 15.01 | 1.50 | 1.720E-02 | 77.11 | 10.700 | 1.218E+00 | PB214 |
| | | | | | 77.11 | 17.500 | 7.450E-01 | PB212 |
| 76.97 | 304. | 15.01 | 1.50 | 1.720E-02 | 77.11 | 10.700 | 1.218E+00 | PB214 |
| | | | | | 77.11 | 17.500 | 7.542E-01 | PB212 |
| 87.05 | 111. | 38.83 | 1.50 | 1.910E-02 | 86.45 | 32.740 | PBC<MDA | EU155 |
| 92.72 | 138. | 31.67 | 1.54 | 1.989E-02 | 92.38 | 2.570 | PBC<MDA | TH234 |
| | | | | | 92.80 | 3.000 | PBC<MDA | TH234 |
| 129.46 | 103. | 36.72 | 1.09 | 2.109E-02 | | | | |
| 186.07 | 90. | 29.60 | 0.94 | 1.858E-02 | 185.99 | 3.280 | 1.102E+00 | RA226 |
| 209.63 | 111. | 26.32 | 1.42 | 1.720E-02 | | | | |
| 238.84 | 678. | 4.45 | 1.12 | 1.556E-02 | 238.63 | 43.100 | 7.467E-01 | PB212 |
| | | | | | 241.92 | 7.470 | 4.392E+00 | PB214 |
| 241.89 | 105. | 19.04 | 1.12 | 1.540E-02 | | | | |
| 270.24 | 64. | 30.37 | 1.18 | 1.400E-02 | | | | |
| 295.25 | 157. | 15.40 | 1.14 | 1.292E-02 | 295.22 | 19.200 | 4.663E-01 | PB214 |
| 300.68 | 74. | 27.61 | 0.95 | 1.270E-02 | | | | |
| 308.35 | 74. | 28.62 | 0.59 | 1.240E-02 | | | | |
| 338.71 | 176. | 15.15 | 1.42 | 1.134E-02 | 338.40 | 12.010 | 9.499E-01 | AC228 |
| 352.18 | 269. | 11.25 | 1.01 | 1.092E-02 | 351.99 | 37.100 | 4.913E-01 | PB214 |
| 463.07 | 67. | 21.18 | 1.85 | 8.349E-03 | | | | |
| 463.07 | 67. | 21.18 | 1.85 | 8.349E-03 | 463.51 | 10.000 | 5.889E-01 | SB125 |
| 510.65 | 126. | 15.18 | 1.59 | 7.591E-03 | 510.72 | 22.500 | 4.802E-01 | TL208 |
| 583.42 | 234. | 9.09 | 1.41 | 6.681E-03 | 583.14 | 86.000 | 3.002E-01 | TL208 |
| 609.58 | 188. | 10.87 | 1.19 | 6.410E-03 | 609.32 | 46.090 | 4.703E-01 | BI214 |
| 661.90 | 38. | 39.91 | 1.32 | 5.935E-03 | 661.62 | 84.620 | 5.512E-02 | CS137 |

| | | | | | | | | |
|---|---|---|---|---|---|---|---|---|
| 727.26 | 48. | 27.78 | 1.53 | 5.442E-03 | 727.17 | 11.800 | 5.518E-01 | BI212 |
| 794.83 | 29. | 34.78 | 0.73 | 5.021E-03 | | | | |
| 794.83 | 29. | 34.78 | 0.73 | 5.021E-03 | 795.76 | 85.400 | 5.044E-02 | CS134 |
| 911.28 | 147. | 12.27 | 1.67 | 4.446E-03 | 911.07 | 29.000 | 8.417E-01 | AC228 |
| 968.49 | 134. | 12.93 | 1.87 | 4.214E-03 | 968.90 | 17.460 | 1.349E+00 | AC228 |
| 1120.24 | 39. | 29.64 | 1.20 | 3.711E-03 | 1120.28 | 15.040 | 5.200E-01 | BI214 |
| 1461.02 | 625. | 4.00 | 1.81 | 2.942E-03 | 1460.75 | 10.700 | 1.475E+01 | K40 |

| pk energy | area | uncert | fwhm | corr | nuclide | brnch. | act. | nuc |
|---|---|---|---|---|---|---|---|---|
| 1764.62 | 36. | 18.58 | 1.86 | 2.481E-03 | 1764.51 | 15.920 | 6.789E-01 | BI214 |

********** U N I D E N T I F I E D P E A K S U M M A R Y **********

| Peak Channel | Centroid Energy | Background Counts | Net Area Counts | Intensity Cts/Sec | Uncert 3 Sigma % | FWHM keV | Suspected Nuclide | |
|---|---|---|---|---|---|---|---|---|
| 258.52 | 129.46 | 531. | 103. | 0.052 | 110.16 | 1.087 | AC-228 | l |
| 418.94 | 209.63 | 297. | 111. | 0.056 | 78.96 | 1.418 | NP-239 | s |
| 477.38 | 238.88 | 117. | 678. | 0.339 | 13.36 | 1.122 | PB-212 | D |
| 483.48 | 241.93 | 147. | 105. | 0.052 | 57.11 | 1.124 | PB-214 | D |
| 540.21 | 270.24 | 147. | 64. | 0.032 | 91.12 | 1.180 | AC-228 | s |
| 601.12 | 300.68 | 141. | 74. | 0.037 | 82.83 | 0.953 | PB-212 | s |
| 616.45 | 308.35 | 142. | 74. | 0.037 | 85.87 | 0.585 | - | s |

s - Peak fails shape tests.
D - Peak area deconvoluted.
L - Peak written from unknown list.
C - Area < Critical level.

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This section based on library: FSS_Rev_1.Lib

********** I D E N T I F I E D P E A K S U M M A R Y **********

| Nuclide | Peak Channel | Centroid Energy | Background Counts | Net Area Counts | Intensity Cts/Sec | Uncert 3 Sigma % | FWHM keV | |
|---|---|---|---|---|---|---|---|---|
| PB-212 | 149.46 | 74.94 | 988. | 150. | 0.075 | 89.10 | 1.499 | |
| PB-214 | 153.79 | 77.11 | 896. | 301. | 0.150 | 45.04 | 1.499 | D |
| PB-212 | 153.79 | 77.11 | 893. | 304. | 0.152 | 45.04 | 1.499 | D |
| EU-155 | 173.68 | 87.05 | 867. | 111. | 0.055 | 116.48 | 1.499 | |
| TH-234 | 185.64 | 93.03 | 850. | 111. | 0.055 | 104.60 | 1.499 | s |
| TH-234 | 185.61 | 93.02 | 808. | 121. | 0.061 | 98.14 | 1.499 | s |
| RA-226 | 371.64 | 185.99 | 444. | 101. | 0.051 | 93.22 | 1.499 | s |
| PB-212 | 477.41 | 238.85 | 378. | 545. | 0.273 | 19.58 | 1.499 | |
| RA-224 | 483.13 | 241.71 | 433. | 92. | 0.046 | 99.67 | 1.499 | s |
| PB-214 | 590.51 | 295.38 | 153. | 144. | 0.072 | 43.47 | 1.499 | s |
| AC-228 | 677.21 | 338.71 | 174. | 174. | 0.087 | 45.46 | 1.418 | s |
| PB-214 | 704.06 | 352.13 | 129. | 234. | 0.117 | 28.10 | 1.499 | |
| SB-125 | 926.13 | 463.12 | 61. | 58. | 0.029 | 67.66 | 1.499 | s |
| TL-208 | 1021.24 | 510.65 | 96. | 110. | 0.055 | 45.55 | 1.587 | s |
| TL-208 | 1166.84 | 583.42 | 71. | 231. | 0.116 | 27.28 | 1.408 | s |
| BI-214 | 1219.20 | 609.58 | 75. | 186. | 0.093 | 32.61 | 1.186 | |
| CS-137 | 1323.63 | 661.77 | 39. | 36. | 0.018 | 87.02 | 1.499 | |
| BI-212 | 1454.23 | 727.04 | 38. | 43. | 0.021 | 74.68 | 1.499 | s |
| CS-134 | 1590.60 | 795.19 | 31. | 25. | 0.013 | 108.91 | 1.502 | s |
| AC-228 | 1822.91 | 911.28 | 50. | 146. | 0.073 | 36.82 | 1.668 | |
| AC-228 | 1937.39 | 968.49 | 41. | 133. | 0.066 | 38.79 | 1.865 | s |

| Nuclide | Channel | Energy | Background | Net area | Cnts/sec | Uncert | FWHM |
|---|---|---|---|---|---|---|---|
| BI-214 | 2241.06 | 1120.24 | 36. | 39. | 0.019 | 88.92 | 1.200s |
| K-40 | 2923.06 | 1461.02 | 2. | 623. | 0.311 | 12.00 | 1.813 |
| BI-214 | 3530.67 | 1764.62 | 3. | 36. | 0.018 | 55.75 | 1.857 |

s - Peak fails shape tests.
D - Peak area deconvoluted.
A Derived peak area.

***** S U M M A R Y O F L I B R A R Y P E A K U S A G E *****

| - Nuclide - Name | Code | Average Activity pCi/gm | Peak Energy keV | Peak Activity pCi/gm | Code | MDA Value pCi/gm | COMMENTS |
|---|---|---|---|---|---|---|---|
| BE-7 | | 2.3472E-01 | | | | | |
| | | | 477.56 | 2.347E-01 | %( | 3.833E-01 1.18E-01 | G |
| K-40 | | 1.4751E+01 | | | | | |
| | | | 1460.75 | 1.475E+01 | (P | 2.309E-01 5.92E-01 | G |
| MN-54 | | 3.6058E-03 | | | | | |
| | | | 834.81 | 3.606E-03 | &(P | 5.475E-02 1.55E-02 | G |
| CO-57 | | -7.7949E-03 | | | | | |
| | | | 122.07 | -7.795E-03 | %( | 5.230E-02 1.56E-02 | G K |
| | | | 136.43 | -6.361E-03 | & | 3.950E-01 1.17E-01 | G |
| CO-60 | | -2.0316E-04 | | | | | |
| | | | 1332.51 | -2.032E-04 | %(P | 7.462E-02 2.07E-02 | G K |
| | | | 1173.23 | -1.147E-03 | % P | 8.675E-02 2.46E-02 | G K |
| Sr-85 | | -2.0484E-02 | | | | | |
| | | | 514.00 | -2.048E-02 | %( | 6.165E-02 1.84E-02 | G |
| Kr-85 | | -4.6534E+02 | | | | | |
| | | | 513.99 | -4.653E+02 | %(P | 1.325E+03 3.94E+02 | G |
| Y-88 | | -4.8710E-04 | | | | | |
| | | | 1836.01 | -4.871E-04 | %( | 4.435E-02 1.08E-02 | G K |
| | | | 898.02 | -5.617E-03 | & P | 5.109E-02 1.43E-02 | G |
| NB-94 | | -2.1492E-04 | | | | | |
| | | | 871.10 | -2.149E-04 | %(P | 4.912E-02 1.36E-02 | G K |
| | | | 702.50 | -6.412E-04 | % P | 3.990E-02 1.10E-02 | G K |
| Ag-108M | | -2.5573E-02 | | | | | |
| | | | 722.95 | -2.557E-02 | %( | 6.800E-02 2.04E-02 | G K |
| | | | 614.37 | -5.195E-03 | % P | 5.456E-02 1.57E-02 | G |
| | | | 433.93 | -8.354E-04 | & | 3.888E-02 1.11E-02 | G |

| Nuclide | Ave activity | Energy | Activity | Code | Peak | MDA | Comments |
|---|---|---|---|---|---|---|---|
| CD-109 | 1.2554E-01 | | | | | | |
| | | 88.04 | 1.255E-01 | %(P | 1.480E+00 | 4.42E-01 | G |
| SN-113 | 5.7151E-04 | | | | | | |
| | | 391.71 | 5.715E-04 | &( | 6.757E-02 | 1.95E-02 | G K |
| | | 255.04 | 4.041E-01 | % P | 1.697E+00 | 5.04E-01 | G |
| SB-125 | 1.1549E-01 | | | | | | |
| | | 427.95 | -2.134E-02 | %(P | 1.482E-01 | 4.33E-02 | G K |
| | | 600.77 | 5.248E-03 | & P | 2.480E-01 | 7.03E-02 | G |
| | | 636.15 | 9.848E-02 | % P | 3.713E-01 | 1.09E-01 | G |
| | | 463.51 | 5.205E-01 | *(P | 3.525E-01 | 1.20E-01 | G |
| | | 176.29 | -1.085E-01 | % P | 5.898E-01 | 1.75E-01 | G |
| I-131 | 9.4946E-03 | | | | | | |
| | | 364.48 | 9.495E-03 | %( | 9.022E-02 | 2.64E-02 | G K |
| | | 636.97 | 2.848E-01 | % | 1.017E+00 | 2.98E-01 | G |
| | | 284.29 | 1.772E-01 | % | 1.155E+00 | 3.41E-01 | G |
| CS-134 | 2.1590E-02 | | | | | | |
| | | 604.66 | 1.799E-03 | &(P | 8.520E-02 | 2.49E-02 | G K |
| | | 795.76 | 4.421E-02 | (P | 5.016E-02 | 1.63E-02 | G |
| | | 569.29 | -1.782E-03 | % P | 2.721E-01 | 7.65E-02 | G |
| | | 801.84 | 2.067E-01 | & | 5.123E-01 | 1.53E-01 | G |
| CS-137 | 5.3013E-02 | | | | | | |
| | | 661.62 | 5.301E-02 | (P | 4.718E-02 | 1.58E-02 | G |
| CE-139 | -7.0463E-03 | | | | | | |
| | | 165.85 | -7.046E-03 | %(P | 5.594E-02 | 1.67E-02 | G |
| EU-152 | -4.1702E-04 | | | | | | |
| | | 121.78 | -4.170E-04 | %(P | 1.357E-01 | 4.02E-02 | G K |
| | | 344.30 | -1.487E-02 | % P | 1.539E-01 | 4.49E-02 | G |
| | | 1408.08 | -3.419E-04 | & P | 2.344E-01 | 6.14E-02 | G |
| | | 964.00 | -4.092E-02 | % P | 4.896E-01 | 1.40E-01 | G |
| | | 1112.07 | -3.315E-02 | % P | 4.475E-01 | 1.25E-01 | G |
| | | 778.90 | 1.086E-02 | % P | 4.770E-01 | 1.36E-01 | G |
| EU-154 | -2.1730E-02 | | | | | | |
| | | 123.10 | -2.173E-02 | %(P | 1.043E-01 | 3.12E-02 | G K |
| | | 1274.80 | -3.092E-02 | % P | 2.050E-01 | 5.87E-02 | G |
| | | 723.30 | 5.354E-04 | % P | 2.494E-01 | 6.99E-02 | G |
| | | 1004.80 | -4.671E-03 | % P | 2.737E-01 | 7.47E-02 | G |

| Nuclide | Ave activity | Energy | Activity | Code | Peak | MDA | Comments |
|---|---|---|---|---|---|---|---|
| EU-155 | 1.3235E-01 | | | | | | |
| | | 86.45 | 1.323E-01 | ( | 1.674E-01 | 5.14E-02 | G K |
| | | 105.31 | 4.345E-02 | & | 1.760E-01 | 5.27E-02 | G |
| HG-203 | 3.3182E-02 | | | | | | |
| | | 279.17 | 3.318E-02 | %( | 5.141E-02 | 1.58E-02 | G K |
| | | 72.87 | -2.657E-01 | & P | 1.370E+00 | 4.11E-01 | G |
| | | 70.83 | 3.828E-02 | % | 2.309E+00 | 6.88E-01 | G |
| | | 82.50 | -1.114E+00 | % | 2.899E+00 | 8.76E-01 | G |
| TL-208 | 3.0023E-01 | | | | | | |
| | | 583.14 | 3.002E-01 | @(P | 5.430E-02 | 2.76E-02 | G |
| | | 510.72 | 4.802E-01 | + P | 2.112E-01 | 8.35E-02 | G |
| PB-212 | 6.2365E-01 | | | | | | |
| | | 238.63 | 6.059E-01 | (P | 1.037E-01 | 4.00E-02 | G K |
| | | | | | | | Energy duplication |
| | | 77.11 | 7.542E-01 | + | 3.516E-01 | 1.13E-01 | G |
| | | 74.81 | 7.035E-01 | &(P | 7.006E-01 | 2.16E-01 | G |
| PB-214 | 4.3219E-01 | | | | | | |
| | | 351.99 | 4.311E-01 | (P | 1.022E-01 | 4.07E-02 | G K |
| | | 295.22 | 4.343E-01 | *(P | 1.815E-01 | 6.37E-02 | G |
| | | | | | | | Energy duplication |
| | | 77.11 | 1.218E+00 | + P | 5.762E-01 | 1.85E-01 | G |
| | | | | | | | Energy duplication |
| | | 241.92 | 2.787E-01 | % P | 6.890E-01 | 2.08E-01 | G |
| BI-212 | 4.9837E-01 | | | | | | |
| | | 727.17 | 4.984E-01 | (P | 3.640E-01 | 1.26E-01 | G K |
| | | 1620.56 | 3.585E-01 | & | 1.666E+00 | 4.63E-01 | G |
| | | 785.42 | 1.022E+00 | % P | 2.403E+00 | 7.22E-01 | G |
| BI-214 | 4.8255E-01 | | | | | | |
| | | 609.32 | 4.703E-01 | (P | 1.084E-01 | 5.14E-02 | G K |
| | | 1764.51 | 6.789E-01 | + P | 2.045E-01 | 1.28E-01 | G |
| | | 1120.28 | 5.200E-01 | @(P | 4.103E-01 | 1.56E-01 | G |
| RA-224 | 1.1446E+00 | | | | | | |
| | | 241.00 | 1.145E+00 | &(P | 1.234E+00 | 3.83E-01 | G |
| RA-226 | 1.2391E+00 | | | | | | |
| | | 185.99 | 1.239E+00 | ( | 1.235E+00 | 3.85E-01 | G |
| AC-228 | 8.7338E-01 | | | | | | |
| | | 911.07 | 8.417E-01 | (P | 2.071E-01 | 1.05E-01 | G K |
| | | 968.90 | 1.349E+00 | + P | 3.301E-01 | 1.75E-01 | G |
| | | 338.40 | 9.499E-01 | @(P | 3.515E-01 | 1.46E-01 | G |

| Nuclide | Ave activity | Energy | Activity | Code | Peak MDA | Comments |
|---|---|---|---|---|---|---|
| TH-227 | -7.1964E-02 | | | | | |
| | | 236.00 | -7.196E-02 | %(P | 4.357E-01 | 1.30E-01 G K |
| | | 256.25 | -1.227E-01 | % P | 6.071E-01 | 1.80E-01 G |
| PA-234 | -5.5101E-02 | | | | | |
| | | 98.44 | -5.510E-02 | &( | 1.834E-01 | 5.52E-02 G K |
| | | 946.00 | 0.000E+00 | & | 3.607E-01 | 1.02E-01 G |
| | | 131.28 | 4.085E-02 | % | 2.209E-01 | 6.61E-02 G |
| | | 94.67 | -4.310E-02 | % | 3.360E-01 | 1.01E-01 G |
| | | 883.24 | -9.241E-03 | % | 3.812E-01 | 1.05E-01 G |
| | | 926.70 | 1.546E-02 | % | 4.337E-01 | 1.20E-01 G |
| | | 569.26 | 2.025E-01 | % | 3.191E-01 | 9.95E-02 G |
| TH-234 | 9.6929E-01 | | | | | |
| | | 63.29 | 1.229E-01 | %(P | 2.269E+00 | 6.74E-01 G K |
| | | 92.80 | 1.512E+00 | *(P | 1.690E+00 | 5.20E-01 G |
| | | 92.38 | 1.620E+00 | *(P | 2.025E+00 | 6.20E-01 G |
| AM-241 | -6.0881E-03 | | | | | |
| | | 59.54 | -6.088E-03 | %(P | 3.132E-01 | 9.31E-02 G |

( - This peak used in the nuclide activity average.

* - Peak is too wide, but only one peak in library.
! - Peak is part of a multiplet and this area went negative during deconvolution.
? - Peak is too narrow.
@ - Peak is too wide at FW25M, but ok at FWHM.
% - Peak fails sensitivity test.
$ - Peak identified, but first peak of this nuclide failed one or more qualification tests.
+ - Peak activity higher than counting uncertainty range.
- - Peak activity lower than counting uncertainty range.
= - Peak outside analysis energy range.
& - Calculated peak centroid is not close enough to the library energy centroid for positive identification.
P - Peakbackground subtraction
} - Peak is too close to another for the activity to be found directly.

| Nuclide Codes: | Peak Codes: |
|---|---|
| T - Thermal Neutron Activation | G - Gamma Ray |
| F - Fast Neutron Activation | X - X-Ray |
| I - Fission Product | P - Positron Decay |
| N - Naturally Occurring Isotope | S - Single-Escape |
| P - Photon Reaction | D - Double-Escape |
| C - Charged Particle Reaction | K - Key Line |
| M - No MDA Calculation | A - Not in Average |

R - Coincidence Corrected C - Coincidence Peak
H - Halflife limit exceeded

- - - - - - - - - - - - - - - - - - - - - - - - - - - - - - - - - - - - - - -

***** S U M M A R Y O F N U C L I D E S I N S A M P L E *****

| Nuclide | | Time of Count Activity pCi/gm | Time Corrected Activity pCi/gm | Uncertainty 3 Sigma Counting pCi/gm | Total pCi/gm | MDA pCi/gm |
|---|---|---|---|---|---|---|
| BE-7 | #A | 2.1403E-01 | 2.3472E-01 | 3.5526E-01 | 3.5551E-01 | 3.495E-01 |
| K-40 | | 1.4751E+01 | 1.4751E+01 | 1.7765E+00 | 1.9623E+00 | |
| MN-54 | #A | 3.5493E-03 | 3.6058E-03 | 4.6408E-02 | 4.6408E-02 | 5.389E-02 |
| CO-57 | #B | -7.6539E-03 | -7.7949E-03 | 4.6899E-02 | 4.6901E-02 | 5.136E-02 |
| CO-60 | #B | -2.0264E-04 | -2.0316E-04 | 1.0761E-02 | 1.0761E-02 | 7.442E-02 |
| Sr-85 | #A | -1.8984E-02 | -2.0484E-02 | 5.5302E-02 | 5.5314E-02 | 5.714E-02 |
| Kr-85 | #A | -4.6532E+02 | -4.6534E+02 | 1.3293E+03 | 1.3296E+03 | 1.324E+03 |
| Y-88 | #B | -4.6509E-04 | -4.8710E-04 | 3.2493E-02 | 3.2493E-02 | 4.235E-02 |
| NB-94 | #B | -2.1492E-04 | -2.1492E-04 | 1.0845E-02 | 1.0845E-02 | 4.912E-02 |
| Ag-108M | #B | -2.5571E-02 | -2.5573E-02 | 6.1098E-02 | 6.1115E-02 | 6.799E-02 |
| CD-109 | #A | 1.2418E-01 | 1.2554E-01 | 1.3263E+00 | 1.3264E+00 | 1.464E+00 |
| SN-113 | #B | 5.4755E-04 | 5.7151E-04 | 5.8535E-02 | 5.8535E-02 | 6.474E-02 |
| SB-125 | #B | 1.1493E-01 | 1.1549E-01 | 8.0085E-02 | 8.0350E-02 | 1.475E-01 |
| I-131 | #B | 5.1430E-03 | 9.4946E-03 | 7.9055E-02 | 7.9056E-02 | 4.887E-02 |
| CS-134 | #B | 2.1449E-02 | 2.1590E-02 | 2.3902E-02 | 2.3933E-02 | 8.464E-02 |
| CS-137 | # | 5.2989E-02 | 5.3013E-02 | 4.7272E-02 | 4.7367E-02 | 4.716E-02 |
| CE-139 | #A | -6.7982E-03 | -7.0463E-03 | 5.2338E-02 | 5.2339E-02 | 5.397E-02 |
| EU-152 | #B | -4.1658E-04 | -4.1702E-04 | 3.1034E-01 | 3.1034E-01 | 1.356E-01 |
| EU-154 | #B | -2.1695E-02 | -2.1730E-02 | 1.0076E-01 | 1.0077E-01 | 1.041E-01 |
| EU-155 | #A | 1.3199E-01 | 1.3235E-01 | 1.5416E-01 | 1.5433E-01 | 1.670E-01 |
| HG-203 | #B | 2.9850E-02 | 3.3182E-02 | 4.7380E-02 | 4.7417E-02 | 4.625E-02 |
| TL-208 | # | 3.0023E-01 | 3.0023E-01 | 8.2747E-02 | 8.4468E-02 | |
| PB-212 | # | 6.2365E-01 | 6.2365E-01 | 1.2350E-01 | 1.2843E-01 | 1.037E-01 |
| PB-214 | # | 4.3219E-01 | 4.3219E-01 | 1.1310E-01 | 1.1571E-01 | 1.022E-01 |
| BI-212 | # | 4.9837E-01 | 4.9837E-01 | 3.7804E-01 | 3.7909E-01 | 3.640E-01 |
| BI-214 | | 4.8255E-01 | 4.8255E-01 | 1.5829E-01 | 1.6062E-01 | |
| RA-224 | #A | 1.1446E+00 | 1.1446E+00 | 1.1496E+00 | 1.1515E+00 | 1.234E+00 |
| RA-226 | # | 1.2391E+00 | 1.2391E+00 | 1.1550E+00 | 1.1572E+00 | 1.235E+00 |
| AC-228 | | 8.7338E-01 | 8.7338E-01 | 2.5869E-01 | 2.6336E-01 | |
| TH-227 | #B | -7.1964E-02 | -7.1964E-02 | 4.1005E-01 | 4.1007E-01 | 4.357E-01 |
| PA-234 | #B | -5.5101E-02 | -5.5101E-02 | 1.6561E-01 | 1.6564E-01 | 1.834E-01 |
| TH-234 | #B | 9.6929E-01 | 9.6929E-01 | 9.9985E-01 | 1.0013E+00 | 2.269E+00 |
| AM-241 | #A | -6.0879E-03 | -6.0881E-03 | 5.8071E-01 | 5.8071E-01 | 3.132E-01 |

# - All peaks for activity calculation had bad shape.
* - Activity omitted from total
& - Activity omitted from total and all peaks had bad shape.
< - MDA value printed.
A - Activity printed, but activity < MDA.
B - Activity < MDA and failed test.
C - Area < Critical level.
F - Failed fraction or key line test.

H – Halflife limit exceeded

YAEC Chemistry Lab Spectrum name: 101F_15SEPT2006_1307.An1

---------- S U M M A R Y ----------

Total Activity ( 270.1 to 1999.1 keV) 1.6406713E+01 pCi/gm
Total Decayed Activity ( 270.1 to 1999.1 keV) 1.6406713E+01 pCi/gm

The library has energies which are not separable.

Analyzed by: _____
JPK

Reviewed by: _____
Supervisor

Laboratory: YAEC Chemistry Lab

YAEC Chemistry Lab Spectrum name: 101F_15SEPT2006_1349.An1

Sample description
FSS-SSS-01-01-010-F

Spectrum Filename: C:\GammaVision\Spectra\101F_15SEPT2006_1349.An1

Acquisition information
Start time: 15-Sep-2006 13:49:01
Live time: 2000
Real time: 2002
Dead time: 0.11 %
Detector ID: 1

Detector system
Det 101- DSPE-633

Calibration
Filename: D1_1LSa.Clb
Detector 101 1.0 Liter Marinelli Sand

Energy Calibration
Created: 03-Sep-2004 08:50:48
Zero offset: 0.244 keV
Gain: 0.500 keV/channel
Quadratic: -2.493E-08 keV/channel^2

Efficiency Calibration
Created: 03-Sep-2004 08:52:26
Type: Polynomial
Uncertainty: 0.626 %
Coefficients: -0.321775 -5.816463 0.734234
-0.099357 0.006049 -0.000149

Library Files
Main analysis library: FSS_Rev_1.Lib
Library Match Width: 1.000
Peak stripping: Library based

Analysis parameters
Analysis engine: Env32 G53W4.20
Start channel: 100 ( 50.23keV )
Stop channel: 4000 ( 1999.11keV )
Peak rejection level: 41.667%
Peak search sensitivity: 3
Sample Size: 1.9040E+03
Activity scaling factor: 1.0000E+06/( 1.0000E+00* 1.9040E+03) =
5.2521E+02
Detection limit method: Nureg 4.16
Random error: 1.0000000E+00
Systematic error: 1.0000000E+00

| | |
|---|---|
| Fraction Limit: | 0.000% |
| Background width: | average of five points. |

YAEC Chemistry Lab Spectrum name: 101F_15SEPT2006_1349.An1

Half lives decay limit: 12.000
Activity range factor: 2.000
Min. step backg. energy 0.000
Multiplet shift channel 2.000

| Corrections | Status | Comments |
|---|---|---|
| Decay correct to date: | YES | 09-Sep-2006 07:30:00 |
| Decay during acquisition: | NO | |
| Decay during collection: | NO | |
| True coincidence correction: | NO | |
| Peaked background correction: | YES | 101_150K_28APR05.Pbc 01-May-2005 05:24:47 |
| Absorption (Internal): | NO | |
| Geometry correction: | NO | |
| Random summing: | NO | |

total peaks alloc. 13 cutoff 20.00000 %
Energy Calibration
Normalized diff: 0.1320

***** S U M M A R Y O F P E A K S I N R A N G E *****

| Peak Energy | Area | Uncert | FWHM | Corrctn Factor | Nuclide Energy | Brnch. Ratio | Act. pCi/gm | Nuc |
|---|---|---|---|---|---|---|---|---|
| 74.63 | 250. | 15.04 | 1.00 | 1.651E-02 | | | | |
| 74.63 | 250. | 15.04 | 1.00 | 1.651E-02 | 74.81 | 9.600 | 1.096E+00 | PB212 |
| 77.98 | 129. | 29.97 | 1.01 | 1.745E-02 | 77.11 | 10.700 | PBC<MDA | PB214 |
| | | | | | 77.11 | 17.500 | 3.050E-01 | PB212 |
| 87.31 | 115. | 28.05 | 1.01 | 1.923E-02 | 86.45 | 32.740 | 1.313E-01 | EU155 |
| | | | | | 88.04 | 3.790 | PBC<MDA | CD109 |
| 89.62 | 114. | 30.56 | 1.02 | 1.954E-02 | | | | |
| 93.29 | 153. | 20.48 | 1.02 | 1.995E-02 | 92.38 | 2.570 | PBC<MDA | TH234 |
| | | | | | 92.80 | 3.000 | PBC<MDA | TH234 |
| 185.99 | 164. | 24.61 | 1.12 | 1.858E-02 | | | | |
| 185.99 | 164. | 24.61 | 1.12 | 1.858E-02 | 185.99 | 3.280 | 1.912E+00 | RA226 |
| 238.84 | 868. | 4.10 | 1.12 | 1.556E-02 | 238.63 | 43.100 | 9.114E-01 | PB212 |
| 241.86 | 137. | 16.58 | 1.12 | 1.540E-02 | 241.00 | 3.900 | 1.610E+00 | RA224 |
| 270.44 | 56. | 35.71 | 1.51 | 1.399E-02 | | | | |
| 295.51 | 179. | 11.31 | 1.16 | 1.291E-02 | 295.22 | 19.200 | 5.073E-01 | PB214 |
| 300.01 | 46. | 37.61 | 1.16 | 1.273E-02 | | | | |
| 338.52 | 196. | 12.43 | 1.06 | 1.135E-02 | 338.40 | 12.010 | 1.011E+00 | AC228 |
| 352.16 | 341. | 9.12 | 1.43 | 1.092E-02 | 351.99 | 37.100 | 5.944E-01 | PB214 |
| 409.05 | 71. | 35.42 | 1.07 | 9.430E-03 | | | | |
| 463.19 | 45. | 36.18 | 1.50 | 8.342E-03 | 463.51 | 10.000 | PBC<MDA | SB125 |
| 510.95 | 163. | 14.46 | 1.58 | 7.587E-03 | 510.72 | 22.500 | 6.124E-01 | TL208 |
| 583.38 | 286. | 8.65 | 1.38 | 6.682E-03 | 583.14 | 86.000 | 3.503E-01 | TL208 |
| 600.71 | 24. | 34.49 | 1.50 | 6.459E-03 | 604.66 | 97.600 | PBC<MDA | CS134 |
| 609.38 | 262. | 9.84 | 1.63 | 6.412E-03 | 609.32 | 46.090 | 6.265E-01 | BI214 |
| 727.28 | 90. | 20.33 | 1.40 | 5.442E-03 | 727.17 | 11.800 | 9.871E-01 | BI212 |
| 795.18 | 38. | 29.53 | 1.50 | 5.016E-03 | 795.76 | 85.400 | 6.252E-02 | CS134 |
| 911.44 | 158. | 11.35 | 1.30 | 4.445E-03 | 911.07 | 29.000 | 8.572E-01 | AC228 |

| | | | | | | | | |
|---|---|---|---|---|---|---|---|---|
| 968.95 | 134. | 13.57 | 1.93 | 4.212E-03 | 968.90 | 17.460 | 1.288E+00 | AC228 |
| 1120.04 | 65. | 22.29 | 2.04 | 3.711E-03 | 1120.28 | 15.040 | 8.306E-01 | BI214 |
| 1460.97 | 983. | 3.29 | 2.09 | 2.942E-03 | 1460.75 | 10.700 | 2.211E+01 | K40 |
| 1764.60 | 47. | 14.59 | 1.60 | 2.481E-03 | 1764.51 | 15.920 | 8.366E-01 | BI214 |

********** U N I D E N T I F I E D P E A K S U M M A R Y **********

| Peak Channel | Centroid Energy | Background Counts | Net Area Counts | Intensity Cts/Sec | Uncert 3 Sigma % | FWHM keV | Suspected Nuclide | |
|---|---|---|---|---|---|---|---|---|
| 174.19 | 87.40 | 466. | 115. | 0.058 | 84.14 | 1.014 | PB-214 | lD |
| 178.81 | 89.71 | 551. | 114. | 0.057 | 91.69 | 1.015 | PB-214 | lD |
| 477.38 | 238.82 | 201. | 868. | 0.434 | 12.31 | 1.122 | PB-212 | D |
| 483.42 | 241.84 | 191. | 137. | 0.069 | 49.73 | 1.124 | PB-214 | D |
| 540.60 | 270.44 | 184. | 56. | 0.028 | 107.13 | 1.514 | AC-228 | s |
| 599.76 | 299.85 | 129. | 46. | 0.023 | 112.83 | 1.165 | TH-227 | lD |
| 817.95 | 409.05 | 183. | 71. | 0.036 | 106.25 | 1.070 | CS-138 | s |

s - Peak fails shape tests.
D - Peak area deconvoluted.
L - Peak written from unknown list.
C - Area < Critical level.

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This section based on library: FSS_Rev_1.Lib

********** I D E N T I F I E D P E A K S U M M A R Y **********

| Nuclide | Peak Channel | Centroid Energy | Background Counts | Net Area Counts | Intensity Cts/Sec | Uncert 3 Sigma % | FWHM keV |
|---|---|---|---|---|---|---|---|
| PB-212 | 149.20 | 74.82 | 1422. | 218. | 0.109 | 74.33 | 1.499 |
| PB-214 | 153.79 | 77.11 | 1278. | 298. | 0.149 | 53.03 | 1.499D |
| PB-212 | 153.79 | 77.11 | 1274. | 302. | 0.151 | 53.03 | 1.499D |
| TH-234 | 185.74 | 93.08 | 1154. | 154. | 0.077 | 92.65 | 1.499s |
| RA-226 | 371.64 | 185.99 | 608. | 142. | 0.071 | 77.81 | 1.499D |
| PB-212 | 477.33 | 238.82 | 547. | 773. | 0.386 | 16.62 | 1.499 |
| RA-224 | 483.77 | 242.03 | 658. | 96. | 0.048 | 115.93 | 1.499s |
| PB-214 | 590.68 | 295.46 | 261. | 160. | 0.080 | 48.26 | 1.499s |
| AC-228 | 676.82 | 338.52 | 169. | 194. | 0.097 | 37.30 | 1.061s |
| PB-214 | 704.19 | 352.20 | 188. | 318. | 0.159 | 24.69 | 1.499 |
| SB-125 | 926.27 | 463.19 | 122. | 45. | 0.023 | 108.55 | 1.499s |
| TL-208 | 1021.83 | 510.95 | 136. | 147. | 0.074 | 43.37 | 1.582s |
| TL-208 | 1166.78 | 583.38 | 101. | 284. | 0.142 | 25.95 | 1.384s |
| CS-134 | 1201.45 | 600.71 | 25. | 24. | 0.012 | 103.46 | 1.499s |
| BI-214 | 1218.80 | 609.38 | 116. | 261. | 0.130 | 29.52 | 1.630 |
| BI-212 | 1454.72 | 727.28 | 73. | 89. | 0.045 | 60.99 | 1.399s |
| CS-134 | 1590.59 | 795.18 | 44. | 38. | 0.019 | 88.59 | 1.502s |
| AC-228 | 1823.22 | 911.44 | 64. | 156. | 0.078 | 34.04 | 1.301 |
| AC-228 | 1938.31 | 968.95 | 61. | 133. | 0.067 | 40.70 | 1.931s |
| BI-214 | 2240.68 | 1120.04 | 52. | 65. | 0.033 | 66.87 | 2.038 |
| K-40 | 2922.95 | 1460.97 | 16. | 981. | 0.490 | 9.87 | 2.090 |
| BI-214 | 3530.64 | 1764.60 | 0. | 47. | 0.023 | 43.76 | 1.599s |

s - Peak fails shape tests.
D - Peak area deconvoluted.

A Derived peak area.

***** S U M M A R Y O F L I B R A R Y P E A K U S A G E *****

| - Nuclide - Name | Code | Average Activity pCi/gm | Peak Energy keV | Peak Activity pCi/gm | Peak Code | Peak MDA Value pCi/gm | COMMENTS |
|---|---|---|---|---|---|---|---|
| BE-7 | | -3.6089E-02 | | | | | |
| | | | 477.56 | -3.609E-02 | &( | 5.013E-01 1.46E-01 | G |
| K-40 | | 2.2108E+01 | | | | | |
| | | | 1460.75 | 2.211E+01 | (P | 4.849E-01 7.29E-01 | G |
| MN-54 | | -1.1223E-04 | | | | | |
| | | | 834.81 | -1.122E-04 | %(P | 5.786E-02 1.63E-02 | G |
| CO-57 | | 5.5461E-03 | | | | | |
| | | | 122.07 | 5.546E-03 | %( | 3.894E-02 1.16E-02 | G K |
| | | | 136.43 | 7.438E-04 | % | 4.752E-01 1.42E-01 | G |
| CO-60 | | 4.9664E-03 | | | | | |
| | | | 1332.51 | 4.966E-03 | %(P | 5.991E-02 1.67E-02 | G K |
| | | | 1173.23 | 1.655E-02 | % P | 8.528E-02 2.49E-02 | G K |
| Sr-85 | | -3.4374E-02 | | | | | |
| | | | 514.00 | -3.437E-02 | %( | 6.944E-02 2.11E-02 | G |
| Kr-85 | | -7.6806E+02 | | | | | |
| | | | 513.99 | -7.681E+02 | %(P | 1.504E+03 4.55E+02 | G |
| Y-88 | | -2.1692E-03 | | | | | |
| | | | 1836.01 | -2.169E-03 | %( | 5.188E-02 1.34E-02 | G K |
| | | | 898.02 | 7.828E-03 | % P | 5.947E-02 1.70E-02 | G |
| NB-94 | | 7.5528E-03 | | | | | |
| | | | 871.10 | 7.553E-03 | %(P | 5.952E-02 1.71E-02 | G K |
| | | | 702.50 | 1.833E-02 | % P | 4.850E-02 1.45E-02 | G K |
| Ag-108M | | 3.4145E-03 | | | | | |
| | | | 722.95 | 3.415E-03 | %( | 6.244E-02 1.79E-02 | G K |
| | | | 614.37 | -1.406E-03 | % P | 6.171E-02 1.78E-02 | G |
| | | | 433.93 | 9.447E-04 | % | 5.973E-02 1.74E-02 | G |
| CD-109 | | 6.5887E-01 | | | | | |
| | | | 88.04 | 6.589E-01 | %(P | 1.601E+00 4.85E-01 | G |
| SN-113 | | 2.3276E-02 | | | | | |
| | | | 391.71 | 2.328E-02 | &( | 6.741E-02 2.02E-02 | G K |
| | | | 255.04 | 1.389E-01 | & P | 2.113E+00 6.24E-01 | G |

| Nuclide | Ave activity | Energy | Activity | Code | Peak | MDA | Comments |
|---|---|---|---|---|---|---|---|
| SB-125 | 9.7311E-02 | | | | | | |
| | | 427.95 | -8.650E-04 | &(P | 1.684E-01 | 4.88E-02 | G K |
| | | 600.77 | -7.995E-03 | % P | 2.328E-01 | 6.59E-02 | G |
| | | 636.15 | 1.326E-01 | % P | 4.519E-01 | 1.34E-01 | G |
| | | 463.51 | 3.879E-01 | *(P | 4.624E-01 | 1.45E-01 | G |
| | | 176.29 | 1.195E-02 | % P | 6.209E-01 | 1.84E-01 | G |
| I-131 | -3.3179E-02 | | | | | | |
| | | 364.48 | -3.318E-02 | %( | 1.030E-01 | 3.09E-02 | G K |
| | | 636.97 | -3.892E-03 | % | 1.050E+00 | 2.96E-01 | G |
| | | 284.29 | -2.702E-01 | % | 1.277E+00 | 3.81E-01 | G |
| CS-134 | 4.3826E-02 | | | | | | |
| | | 604.66 | 2.747E-02 | ?(P | 2.944E-02 | 9.71E-03 | G K |
| | | 795.76 | 6.252E-02 | (P | 5.614E-02 | 1.87E-02 | G |
| | | 569.29 | 5.683E-03 | % P | 3.260E-01 | 9.35E-02 | G |
| | | 801.84 | -4.022E-03 | % | 5.909E-01 | 1.66E-01 | G |
| CS-137 | 1.6507E-02 | | | | | | |
| | | 661.62 | 1.651E-02 | %(P | 6.492E-02 | 1.91E-02 | G |
| CE-139 | -1.1532E-02 | | | | | | |
| | | 165.85 | -1.153E-02 | &(P | 5.857E-02 | 1.75E-02 | G |
| EU-152 | -2.2801E-02 | | | | | | |
| | | 121.78 | -2.280E-02 | %(P | 1.556E-01 | 4.65E-02 | G K |
| | | 344.30 | 9.821E-03 | % P | 1.772E-01 | 5.20E-02 | G |
| | | 1408.08 | 2.066E-02 | % P | 2.518E-01 | 6.89E-02 | G |
| | | 964.00 | 3.096E-01 | % P | 4.763E-01 | 1.47E-01 | G |
| | | 1112.07 | 1.182E-01 | % P | 5.112E-01 | 1.49E-01 | G |
| | | 778.90 | 1.208E-01 | % P | 4.648E-01 | 1.37E-01 | G |
| EU-154 | -6.5219E-03 | | | | | | |
| | | 123.10 | -6.522E-03 | &(P | 1.035E-01 | 3.08E-02 | G K |
| | | 1274.80 | -1.203E-02 | % P | 2.053E-01 | 5.79E-02 | G |
| | | 723.30 | -3.218E-03 | % P | 2.758E-01 | 7.81E-02 | G |
| | | 1004.80 | 1.602E-01 | & P | 2.832E-01 | 8.74E-02 | G |
| EU-155 | 3.6340E-03 | | | | | | |
| | | 86.45 | 3.634E-03 | &( | 2.035E-01 | 6.08E-02 | G K |
| | | 105.31 | 7.827E-02 | % | 2.304E-01 | 6.95E-02 | G |
| HG-203 | 1.2507E-02 | | | | | | |
| | | 279.17 | 1.251E-02 | %( | 5.677E-02 | 1.69E-02 | G K |
| | | 72.87 | -6.663E-01 | % P | 1.502E+00 | 4.55E-01 | G |
| | | 70.83 | 3.116E-02 | & | 3.057E+00 | 9.16E-01 | G |
| | | 82.50 | -9.055E-01 | % | 3.110E+00 | 9.37E-01 | G |

| Nuclide | Ave activity | Energy | Activity | Code | Peak | MDA | Comments |
|---|---|---|---|---|---|---|---|
| TL-208 | 3.5029E-01 | | | | | | |
| | | 583.14 | 3.503E-01 | @(P | 6.125E-02 | 3.06E-02 | G |
| | | 510.72 | 6.124E-01 | + P | 2.368E-01 | 9.82E-02 | G |
| PB-212 | 7.8657E-01 | | | | | | |
| | | 238.63 | 8.168E-01 | (P | 1.181E-01 | 4.56E-02 | G K |
| | | | | | | | Energy duplication |
| | | 77.11 | 7.121E-01 | ( | 3.985E-01 | 1.26E-01 | G |
| | | 74.81 | 9.741E-01 | & P | 7.977E-01 | 2.47E-01 | G |
| PB-214 | 5.5621E-01 | | | | | | |
| | | 351.99 | 5.562E-01 | (P | 1.167E-01 | 4.61E-02 | G K |
| | | 295.22 | 4.585E-01 | - P | 2.230E-01 | 7.46E-02 | G |
| | | | | | | | Energy duplication |
| | | 77.11 | 1.150E+00 | + P | 6.527E-01 | 2.06E-01 | G |
| | | 241.92 | -1.285E-02 | % P | 8.424E-01 | 2.51E-01 | G |
| BI-212 | 9.8706E-01 | | | | | | |
| | | 727.17 | 9.871E-01 | *(P | 4.690E-01 | 2.02E-01 | G K |
| | | 1620.56 | -3.134E-01 | & | 1.797E+00 | 4.97E-01 | G |
| | | 785.42 | 8.236E-01 | % P | 2.795E+00 | 8.26E-01 | G |
| BI-214 | 6.2649E-01 | | | | | | |
| | | 609.32 | 6.265E-01 | (P | 1.271E-01 | 6.19E-02 | G K |
| | | 1764.51 | 8.366E-01 | + P | 1.324E-01 | 1.23E-01 | G |
| | | 1120.28 | 8.306E-01 | + P | 4.605E-01 | 1.86E-01 | G |
| RA-224 | 1.1366E+00 | | | | | | |
| | | 241.00 | 1.137E+00 | &(P | 1.440E+00 | 4.43E-01 | G |
| RA-226 | 1.6551E+00 | | | | | | |
| | | | | | | | Energy duplication |
| | | 185.99 | 1.655E+00 | *( | 1.370E+00 | 4.29E-01 | G |
| AC-228 | 9.0229E-01 | | | | | | |
| | | 911.07 | 8.572E-01 | (P | 2.205E-01 | 9.85E-02 | G K |
| | | 968.90 | 1.288E+00 | + P | 3.760E-01 | 1.76E-01 | G |
| | | 338.40 | 1.011E+00 | @(P | 3.293E-01 | 1.27E-01 | G |
| TH-227 | -2.7481E-02 | | | | | | |
| | | 236.00 | -2.748E-02 | %(P | 4.110E-01 | 1.22E-01 | G K |
| | | 256.25 | -1.643E-02 | % P | 6.349E-01 | 1.87E-01 | G |
| PA-234 | -3.7920E-04 | | | | | | |
| | | 98.44 | -3.792E-04 | %( | 2.065E-01 | 6.15E-02 | G K |
| | | 946.00 | -8.101E-02 | & | 3.762E-01 | 1.10E-01 | G |
| | | 131.28 | 1.794E-03 | & | 2.437E-01 | 7.26E-02 | G |
| | | 94.67 | -1.471E-01 | % | 3.849E-01 | 1.16E-01 | G |
| | | 883.24 | -8.392E-02 | % | 4.474E-01 | 1.29E-01 | G |
| | | 926.70 | -2.523E-02 | % | 5.788E-01 | 1.65E-01 | G |

| Nuclide | Ave activity | Energy | Activity | Code | Peak | MDA | Comments |
|---|---|---|---|---|---|---|---|
| | | 569.26 | 1.176E-02 % | | 4.801E-01 | 1.38E-01 | G |
| TH-234 | 1.1132E+00 | | | | | | |
| | | 63.29 | 5.580E-01 %( | P | 2.216E+00 | 6.64E-01 | G K |
| | | 92.80 | 1.835E+00 ( | P | 1.915E+00 | 5.89E-01 | G |
| | | 92.38 | 1.007E-01 % | P | 2.274E+00 | 6.78E-01 | G |
| AM-241 | -5.9490E-02 | | | | | | |
| | | 59.54 | -5.949E-02 &( | P | 3.274E-01 | 9.81E-02 | G |

( - This peak used in the nuclide activity average.

* - Peak is too wide, but only one peak in library.
! - Peak is part of a multiplet and this area went negative during deconvolution.
? - Peak is too narrow.
@ - Peak is too wide at FW25M, but ok at FWHM.
% - Peak fails sensitivity test.
$ - Peak identified, but first peak of this nuclide failed one or more qualification tests.
+ - Peak activity higher than counting uncertainty range.
- - Peak activity lower than counting uncertainty range.
= - Peak outside analysis energy range.
& - Calculated peak centroid is not close enough to the library energy centroid for positive identification.
P - Peakbackground subtraction
} - Peak is too close to another for the activity to be found directly.

| Nuclide Codes: | Peak Codes: |
|---|---|
| T - Thermal Neutron Activation | G - Gamma Ray |
| F - Fast Neutron Activation | X - X-Ray |
| I - Fission Product | P - Positron Decay |
| N - Naturally Occurring Isotope | S - Single-Escape |
| P - Photon Reaction | D - Double-Escape |
| C - Charged Particle Reaction | K - Key Line |
| M - No MDA Calculation | A - Not in Average |
| R - Coincidence Corrected | C - Coincidence Peak |
| H - Halflife limit exceeded | |

- - - - - - - - - - - - - - - - - - - - - - - - - - - - - - - - - - - - -

***** S U M M A R Y O F N U C L I D E S I N S A M P L E *****

| Nuclide | | Time of Count Activity pCi/gm | Time Corrected Activity pCi/gm | Uncertainty Counting pCi/gm | 3 Sigma Total pCi/gm | MDA pCi/gm |
|---|---|---|---|---|---|---|
| BE-7 | #A | -3.3271E-02 | -3.6089E-02 | 4.3707E-01 | 4.3708E-01 | 4.621E-01 |
| K-40 | | 2.2108E+01 | 2.2108E+01 | 2.1872E+00 | 2.5188E+00 | |
| MN-54 | #A | -1.1068E-04 | -1.1223E-04 | 7.0244E-02 | 7.0244E-02 | 5.706E-02 |
| CO-57 | #B | 5.4576E-03 | 5.5461E-03 | 3.4758E-02 | 3.4759E-02 | 3.832E-02 |
| CO-60 | #B | 4.9552E-03 | 4.9664E-03 | 5.0011E-02 | 5.0012E-02 | 5.978E-02 |

| | | | | | | |
|---|---|---|---|---|---|---|
| Sr-85 | #A | -3.2148E-02 | -3.4374E-02 | 6.3250E-02 | 6.3280E-02 | 6.494E-02 |
| Kr-85 | #A | -7.6802E+02 | -7.6806E+02 | 1.4604E+03 | 1.4611E+03 | 1.504E+03 |
| Y-88 | #B | -2.0826E-03 | -2.1692E-03 | 4.0320E-02 | 4.0320E-02 | 4.981E-02 |
| NB-94 | #B | 7.5528E-03 | 7.5528E-03 | 5.1399E-02 | 5.1401E-02 | 5.952E-02 |
| Ag-108M | #B | 3.4142E-03 | 3.4145E-03 | 5.3719E-02 | 5.3719E-02 | 6.243E-02 |
| CD-109 | #A | 6.5259E-01 | 6.5887E-01 | 1.4537E+00 | 1.4542E+00 | 1.586E+00 |
| SN-113 | #B | 2.2414E-02 | 2.3276E-02 | 6.0544E-02 | 6.0558E-02 | 6.491E-02 |
| SB-125 | #B | 9.6894E-02 | 9.7311E-02 | 1.0900E-01 | 1.0913E-01 | 1.676E-01 |
| I-131 | #B | -1.9336E-02 | -3.3179E-02 | 9.2627E-02 | 9.2646E-02 | 6.005E-02 |
| CS-134 | # | 4.3574E-02 | 4.3826E-02 | 3.0426E-02 | 3.0527E-02 | 2.927E-02 |
| CS-137 | #A | 1.6500E-02 | 1.6507E-02 | 5.7338E-02 | 5.7346E-02 | 6.490E-02 |
| CE-139 | #A | -1.1174E-02 | -1.1532E-02 | 5.4023E-02 | 5.4027E-02 | 5.675E-02 |
| EU-152 | #B | -2.2780E-02 | -2.2801E-02 | 1.5107E-01 | 1.5108E-01 | 1.555E-01 |
| EU-154 | #B | -6.5128E-03 | -6.5219E-03 | 1.1670E-01 | 1.1670E-01 | 1.034E-01 |
| EU-155 | #B | 3.6253E-03 | 3.6340E-03 | 1.8254E-01 | 1.8254E-01 | 2.030E-01 |
| HG-203 | #B | 1.1394E-02 | 1.2507E-02 | 5.0740E-02 | 5.0745E-02 | 5.172E-02 |
| TL-208 | # | 3.5029E-01 | 3.5029E-01 | 9.1664E-02 | 9.3777E-02 | |
| PB-212 | # | 7.8657E-01 | 7.8657E-01 | 1.3176E-01 | 1.3905E-01 | 1.181E-01 |
| PB-214 | # | 5.5621E-01 | 5.5621E-01 | 1.3820E-01 | 1.4173E-01 | 1.167E-01 |
| BI-212 | # | 9.8706E-01 | 9.8706E-01 | 6.0660E-01 | 6.0915E-01 | |
| BI-214 | | 6.2649E-01 | 6.2649E-01 | 1.8571E-01 | 1.8905E-01 | |
| RA-224 | #A | 1.1366E+00 | 1.1366E+00 | 1.3275E+00 | 1.3291E+00 | 1.440E+00 |
| RA-226 | # | 1.6551E+00 | 1.6551E+00 | 1.2879E+00 | 1.2913E+00 | 1.370E+00 |
| AC-228 | | 9.0229E-01 | 9.0229E-01 | 2.3046E-01 | 2.3603E-01 | |
| TH-227 | #B | -2.7481E-02 | -2.7481E-02 | 4.1535E-01 | 4.1535E-01 | 4.110E-01 |
| PA-234 | #B | -3.7920E-04 | -3.7920E-04 | 1.8458E-01 | 1.8458E-01 | 2.065E-01 |
| TH-234 | #B | 1.1132E+00 | 1.1132E+00 | 1.0727E+00 | 1.0744E+00 | 2.216E+00 |
| AM-241 | #A | -5.9489E-02 | -5.9490E-02 | 3.1516E-01 | 3.1518E-01 | 3.274E-01 |

# - All peaks for activity calculation had bad shape.
* - Activity omitted from total
& - Activity omitted from total and all peaks had bad shape.
< - MDA value printed.
A - Activity printed, but activity < MDA.
B - Activity < MDA and failed test.
C - Area < Critical level.
F - Failed fraction or key line test.
H - Halflife limit exceeded

---------- S U M M A R Y ----------

Total Activity ( 270.1 to 1999.1 keV) 2.4974262E+01 pCi/gm
Total Decayed Activity ( 270.1 to 1999.1 keV) 2.4974262E+01 pCi/gm

The library has energies which are not separable.

Analyzed by: _____
JPK

Reviewed by: _____
Supervisor

Laboratory: YAEC Chemistry Lab

YAEC Chemistry Lab Spectrum name: 101F_15SEPT2006_1429.An1

Sample description
FSS-SSS-01-01-014-F

Spectrum Filename: C:\GammaVision\Spectra\101F_15SEPT2006_1429.An1

Acquisition information
Start time: 15-Sep-2006 14:29:12
Live time: 2000
Real time: 2002
Dead time: 0.10 %
Detector ID: 1

Detector system
Det 101- DSPE-633

Calibration
Filename: D1_1LSa.Clb
Detector 101 1.0 Liter Marinelli Sand

Energy Calibration
Created: 03-Sep-2004 08:50:48
Zero offset: 0.244 keV
Gain: 0.500 keV/channel
Quadratic: -2.493E-08 keV/channel^2

Efficiency Calibration
Created: 03-Sep-2004 08:52:26
Type: Polynomial
Uncertainty: 0.626 %
Coefficients: -0.321775 -5.816463 0.734234
-0.099357 0.006049 -0.000149

Library Files
Main analysis library: FSS_Rev_1.Lib
Library Match Width: 1.000
Peak stripping: Library based

Analysis parameters
Analysis engine: Env32 G53W4.20
Start channel: 100 ( 50.23keV )
Stop channel: 4000 ( 1999.11keV )
Peak rejection level: 41.667%
Peak search sensitivity: 3
Sample Size: 1.8700E+03
Activity scaling factor: 1.0000E+06/( 1.0000E+00* 1.8700E+03) =
5.3476E+02
Detection limit method: Nureg 4.16
Random error: 1.0000000E+00
Systematic error: 1.0000000E+00

| | |
|---|---|
| Fraction Limit: | 0.000% |
| Background width: | average of five points. |

YAEC Chemistry Lab Spectrum name: 101F_15SEPT2006_1429.An1

Half lives decay limit: 12.000
Activity range factor: 2.000
Min. step backg. energy 0.000
Multiplet shift channel 2.000

| Corrections | Status | Comments |
|---|---|---|
| Decay correct to date: | YES | 10-Sep-2006 10:45:00 |
| Decay during acquisition: | NO | |
| Decay during collection: | NO | |
| True coincidence correction: | NO | |
| Peaked background correction: | YES | 101_150K_28APR05.Pbc 01-May-2005 05:24:47 |
| Absorption (Internal): | NO | |
| Geometry correction: | NO | |
| Random summing: | NO | |

total peaks alloc. 17 cutoff 20.00000 %
Energy Calibration
Normalized diff: 0.1649

***** S U M M A R Y O F P E A K S I N R A N G E *****

| Peak Energy | Area | Uncert | FWHM | Corrctn Factor | Nuclide Energy | Brnch. Ratio | Act. pCi/gm | Nuc |
|---|---|---|---|---|---|---|---|---|
| 74.77 | 272. | 12.83 | 1.00 | 1.651E-02 | 74.81 | 9.600 | 1.213E+00 | PB212 |
| 83.84 | 72. | 41.20 | 1.03 | 1.867E-02 | | | | |
| 93.10 | 123. | 34.26 | 1.50 | 1.989E-02 | 92.80 | 3.000 | PBC<MDA | TH234 |
| 128.99 | 85. | 39.54 | 1.10 | 2.110E-02 | | | | |
| 185.84 | 121. | 25.48 | 0.88 | 1.859E-02 | | | | |
| 185.84 | 121. | 25.48 | 0.88 | 1.859E-02 | 185.99 | 3.280 | 1.430E+00 | RA226 |
| 209.24 | 113. | 25.14 | 1.17 | 1.722E-02 | | | | |
| 238.83 | 829. | 4.13 | 1.12 | 1.557E-02 | 238.63 | 43.100 | 8.861E-01 | PB212 |
| 241.74 | 117. | 22.01 | 1.12 | 1.541E-02 | 241.00 | 3.900 | PBC<MDA | RA224 |
| | | | | | 241.92 | 7.470 | 7.335E-01 | PB214 |
| 270.16 | 77. | 27.95 | 1.28 | 1.401E-02 | | | | |
| 295.37 | 177. | 12.92 | 1.07 | 1.291E-02 | 295.22 | 19.200 | 5.110E-01 | PB214 |
| 328.16 | 69. | 32.55 | 1.48 | 1.169E-02 | | | | |
| 338.42 | 160. | 14.37 | 1.12 | 1.135E-02 | 338.40 | 12.010 | 8.393E-01 | AC228 |
| 352.05 | 334. | 9.25 | 1.07 | 1.092E-02 | 351.99 | 37.100 | 5.927E-01 | PB214 |
| 463.43 | 52. | 26.14 | 1.23 | 8.343E-03 | | | | |
| 463.43 | 52. | 26.14 | 1.23 | 8.343E-03 | 463.51 | 10.000 | 4.378E-01 | SB125 |
| 510.94 | 123. | 14.70 | 1.33 | 7.587E-03 | 510.72 | 22.500 | 4.526E-01 | TL208 |
| 562.89 | 50. | 35.24 | 1.15 | 6.913E-03 | | | | |
| 583.46 | 203. | 10.23 | 1.33 | 6.681E-03 | 583.14 | 86.000 | 2.522E-01 | TL208 |
| 609.65 | 238. | 12.13 | 1.06 | 6.409E-03 | 609.32 | 46.090 | 5.799E-01 | BI214 |
| 727.50 | 52. | 27.30 | 1.31 | 5.441E-03 | 727.17 | 11.800 | 5.730E-01 | BI212 |
| 782.30 | 41. | 31.52 | 0.71 | 5.094E-03 | | | | |
| 786.29 | 24. | 40.93 | 1.50 | 5.075E-03 | 785.42 | 2.000 | PBC<MDA | BI212 |
| 794.73 | 51. | 31.68 | 1.18 | 5.022E-03 | | | | |
| 794.73 | 51. | 31.68 | 1.18 | 5.022E-03 | 795.76 | 85.400 | 8.574E-02 | CS134 |
| 860.96 | 26. | 30.79 | 0.65 | 4.675E-03 | | | | |

| | | | | | | | | |
|---|---|---|---|---|---|---|---|---|
| 911.21 | 166. | 12.73 | 1.44 | 4.446E-03 | 911.07 | 29.000 | 9.187E-01 | AC228 |
| 968.57 | 107. | 17.82 | 1.67 | 4.213E-03 | 968.90 | 17.460 | 1.042E+00 | AC228 |
| 1120.43 | 67. | 21.93 | 1.43 | 3.710E-03 | 1120.28 | 15.040 | 8.600E-01 | BI214 |
| 1461.12 | 797. | 3.59 | 2.09 | 2.942E-03 | 1460.75 | 10.700 | 1.825E+01 | K40 |
| 1764.82 | 43. | 15.25 | 2.11 | 2.481E-03 | 1764.51 | 15.920 | 7.786E-01 | BI214 |

********** U N I D E N T I F I E D P E A K S U M M A R Y **********

| Peak Channel | Centroid Energy | Background Counts | Net Area Counts | Intensity Cts/Sec | Uncert 3 Sigma % | FWHM keV | Suspected Nuclide | |
|---|---|---|---|---|---|---|---|---|
| 153.77 | 77.04 | 449. | 377. | 0.188 | 28.43 | 1.006 | PB-214 | lD |
| 257.60 | 128.99 | 485. | 96. | 0.048 | 102.27 | 1.103 | AC-228 | s |
| 418.16 | 209.24 | 317. | 113. | 0.057 | 75.43 | 1.167 | AC-228 | s |
| 540.05 | 270.16 | 178. | 77. | 0.039 | 83.86 | 1.276 | AC-228 | s |
| 656.10 | 328.16 | 170. | 69. | 0.035 | 97.66 | 1.481 | AC-228 | s |
| 1125.76 | 562.89 | 84. | 50. | 0.025 | 88.59 | 1.147 | AS-76 | |
| 1564.81 | 782.30 | 45. | 41. | 0.021 | 94.56 | 0.710 | - | l |
| 1722.21 | 860.96 | 19. | 26. | 0.013 | 92.37 | 0.649 | TL-208 | s |

s - Peak fails shape tests.
D - Peak area deconvoluted.
L - Peak written from unknown list.
C - Area < Critical level.

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This section based on library: FSS_Rev_1.Lib

********** I D E N T I F I E D P E A K S U M M A R Y **********

| Nuclide | Peak Channel | Centroid Energy | Background Counts | Net Area Counts | Intensity Cts/Sec | Uncert 3 Sigma % | FWHM keV |
|---|---|---|---|---|---|---|---|
| PB-212 | 149.19 | 74.81 | 419. | 267. | 0.134 | 36.50 | 1.005D |
| PB-212 | 153.79 | 77.11 | 449. | 371. | 0.186 | 23.81 | 1.006A |
| TH-234 | 185.78 | 93.10 | 916. | 123. | 0.061 | 102.79 | 1.499 |
| RA-226 | 371.84 | 186.09 | 511. | 113. | 0.056 | 89.61 | 1.499 |
| PB-212 | 476.96 | 238.63 | 175. | 826. | 0.413 | 12.33 | 1.122D |
| RA-224 | 483.16 | 241.73 | 610. | 91. | 0.045 | 118.97 | 1.499s |
| PB-214 | 483.54 | 241.92 | 198. | 112. | 0.056 | 60.15 | 1.124D |
| PB-214 | 590.48 | 295.37 | 153. | 175. | 0.088 | 38.76 | 1.068s |
| AC-228 | 676.62 | 338.42 | 151. | 158. | 0.079 | 43.10 | 1.120 |
| PB-214 | 703.90 | 352.05 | 191. | 332. | 0.166 | 27.75 | 1.068s |
| SB-125 | 926.38 | 463.24 | 74. | 51. | 0.025 | 80.93 | 1.499s |
| TL-208 | 1021.82 | 510.94 | 84. | 107. | 0.053 | 44.11 | 1.332s |
| TL-208 | 1166.93 | 583.46 | 78. | 201. | 0.100 | 30.68 | 1.328 |
| BI-214 | 1219.34 | 609.65 | 147. | 237. | 0.119 | 36.39 | 1.064 |
| BI-212 | 1455.15 | 727.50 | 55. | 51. | 0.025 | 81.91 | 1.315 |
| BI-212 | 1572.79 | 786.29 | 36. | 24. | 0.012 | 122.78 | 1.499 |
| CS-134 | 1590.81 | 795.29 | 38. | 31. | 0.016 | 97.59 | 1.502 |
| AC-228 | 1822.78 | 911.21 | 70. | 164. | 0.082 | 38.19 | 1.440s |
| AC-228 | 1937.55 | 968.57 | 68. | 106. | 0.053 | 53.46 | 1.671s |
| BI-214 | 2241.46 | 1120.43 | 47. | 66. | 0.033 | 65.80 | 1.427 |
| K-40 | 2923.25 | 1461.12 | 8. | 795. | 0.397 | 10.77 | 2.089 |
| BI-214 | 3531.07 | 1764.82 | 0. | 43. | 0.021 | 45.75 | 2.106 |

s - Peak fails shape tests.
D - Peak area deconvoluted.
A Derived peak area.

***** S U M M A R Y O F L I B R A R Y P E A K U S A G E *****

| - Nuclide - Name | Code | Average Activity pCi/gm | Peak Energy keV | Peak Activity pCi/gm | Code | Peak MDA Value pCi/gm | | COMMENTS |
|---|---|---|---|---|---|---|---|---|
| BE-7 | | 8.8090E-02 | | | | | | |
| | | | 477.56 | 8.809E-02 | %( | 4.568E-01 | 1.34E-01 | G |
| K-40 | | 1.8245E+01 | | | | | | |
| | | | 1460.75 | 1.825E+01 | (P | 3.662E-01 | 6.57E-01 | G |
| MN-54 | | -6.3565E-04 | | | | | | |
| | | | 834.81 | -6.357E-04 | %(P | 6.277E-02 | 1.77E-02 | G |
| CO-57 | | -1.2700E-02 | | | | | | |
| | | | 122.07 | -1.270E-02 | %( | 5.459E-02 | 1.64E-02 | G K |
| | | | 136.43 | -1.536E-01 | % | 4.351E-01 | 1.31E-01 | G |
| CO-60 | | 8.9965E-03 | | | | | | |
| | | | 1332.51 | 8.997E-03 | &(P | 6.309E-02 | 1.78E-02 | G K |
| | | | 1173.23 | -2.003E-03 | % P | 8.139E-02 | 2.31E-02 | G K |
| Sr-85 | | -2.1340E-02 | | | | | | |
| | | | 514.00 | -2.134E-02 | %( | 6.077E-02 | 1.82E-02 | G |
| Kr-85 | | -4.9246E+02 | | | | | | |
| | | | 513.99 | -4.925E+02 | %(P | 1.333E+03 | 3.98E+02 | G |
| Y-88 | | 2.7055E-03 | | | | | | |
| | | | 1836.01 | 2.705E-03 | &( | 4.699E-02 | 1.20E-02 | G K |
| | | | 898.02 | 3.114E-03 | & P | 5.751E-02 | 1.62E-02 | G |
| NB-94 | | -4.0736E-03 | | | | | | |
| | | | 871.10 | -4.074E-03 | %(P | 3.915E-02 | 1.08E-02 | G K |
| | | | 702.50 | -3.169E-05 | % P | 4.912E-02 | 1.38E-02 | G K |
| Ag-108M | | -1.8837E-02 | | | | | | |
| | | | 722.95 | -1.884E-02 | %( | 6.330E-02 | 1.88E-02 | G K |
| | | | 614.37 | -1.865E-02 | & P | 6.606E-02 | 1.96E-02 | G |
| | | | 433.93 | -2.004E-03 | & | 4.786E-02 | 1.38E-02 | G |
| CD-109 | | -2.7071E-01 | | | | | | |
| | | | 88.04 | -2.707E-01 | %(P | 1.424E+00 | 4.27E-01 | G |

| Nuclide | Ave activity | Energy | Activity | Code | Peak | MDA | Comments |
|---|---|---|---|---|---|---|---|
| SN-113 | 6.1513E-03 | | | | | | |
| | | 391.71 | 6.151E-03 | %( | 6.877E-02 | 2.01E-02 | G K |
| | | 255.04 | 3.439E-01 | % P | 1.908E+00 | 5.66E-01 | G |
| SB-125 | 9.5826E-02 | | | | | | |
| | | 427.95 | -2.050E-02 | &(P | 1.245E-01 | 3.62E-02 | G K |
| | | 600.77 | 3.609E-02 | & P | 2.225E-01 | 6.42E-02 | G |
| | | 636.15 | -5.507E-02 | % P | 4.720E-01 | 1.36E-01 | G |
| | | 463.51 | 4.402E-01 | *(P | 3.723E-01 | 1.22E-01 | G |
| | | 176.29 | -1.714E-01 | % P | 7.061E-01 | 2.11E-01 | G |
| I-131 | 1.2533E-02 | | | | | | |
| | | 364.48 | 1.253E-02 | %( | 7.718E-02 | 2.27E-02 | G K |
| | | 636.97 | 1.714E-02 | & | 1.094E+00 | 3.12E-01 | G |
| | | 284.29 | -6.935E-02 | % | 9.996E-01 | 2.94E-01 | G |
| CS-134 | 1.3638E-02 | | | | | | |
| | | 604.66 | -2.087E-02 | %(P | 6.136E-02 | 1.83E-02 | G K |
| | | 795.76 | 5.308E-02 | (P | 5.317E-02 | 1.75E-02 | G |
| | | 569.29 | -3.059E-03 | % P | 3.216E-01 | 9.17E-02 | G |
| | | 801.84 | 1.384E-01 | % | 5.043E-01 | 1.47E-01 | G |
| CS-137 | -4.2503E-03 | | | | | | |
| | | 661.62 | -4.250E-03 | &(P | 4.617E-02 | 1.29E-02 | G |
| CE-139 | 9.9434E-03 | | | | | | |
| | | 165.85 | 9.943E-03 | &(P | 5.521E-02 | 1.65E-02 | G |
| EU-152 | -2.7581E-02 | | | | | | |
| | | 121.78 | -2.758E-02 | %(P | 1.568E-01 | 4.69E-02 | G K |
| | | 344.30 | 8.806E-03 | & P | 1.433E-01 | 4.17E-02 | G |
| | | 1408.08 | 3.821E-02 | % P | 2.222E-01 | 6.16E-02 | G |
| | | 964.00 | 1.923E-01 | % P | 5.065E-01 | 1.51E-01 | G |
| | | 1112.07 | 1.574E-02 | % P | 6.315E-01 | 1.80E-01 | G |
| | | 778.90 | 1.731E-01 | % P | 3.010E-01 | 9.31E-02 | G |
| EU-154 | -2.5346E-02 | | | | | | |
| | | 123.10 | -2.535E-02 | %(P | 1.077E-01 | 3.23E-02 | G K |
| | | 1274.80 | -3.241E-02 | & P | 2.073E-01 | 5.95E-02 | G |
| | | 723.30 | -9.589E-03 | % P | 4.568E-01 | 1.33E-01 | G |
| | | 1004.80 | -2.845E-02 | % P | 3.361E-01 | 9.51E-02 | G |
| EU-155 | 1.1557E-01 | | | | | | |
| | | 86.45 | 1.156E-01 | %( | 1.761E-01 | 5.38E-02 | G K |
| | | 105.31 | 7.783E-02 | % | 2.216E-01 | 6.69E-02 | G |

| Nuclide | Ave activity | Energy | Activity | Code | Peak | MDA | Comments |
|---|---|---|---|---|---|---|---|
| HG-203 | 1.2040E-03 | | | | | | |
| | | 279.17 | 1.204E-03 | %( | 5.496E-02 | 1.61E-02 | G K |
| | | 72.87-7.814E-01 | | % P | 1.317E+00 | 4.00E-01 | G |
| | | 70.83-1.092E-01 | | % | 2.959E+00 | 8.87E-01 | G |
| | | 82.50-7.327E-01 | | & | 2.863E+00 | 8.61E-01 | G |
| TL-208 | 2.5220E-01 | | | | | | |
| | | 583.14 | 2.522E-01 | (P | 5.527E-02 | 2.61E-02 | G |
| | | 510.72 | 4.526E-01 | + P | 1.922E-01 | 7.65E-02 | G |
| PB-212 | 8.9411E-01 | | | | | | |
| | | 238.63 | 8.897E-01 | (P | 6.935E-02 | 3.68E-02 | G K |
| | | | | | | | Energy duplication |
| | | 77.11 | 8.915E-01 | } | 2.435E-01 | 7.07E-02 | G |
| | | 74.81 | 1.217E+00 | + P | 4.463E-01 | 1.51E-01 | G |
| PB-214 | 5.8086E-01 | | | | | | |
| | | 351.99 | 5.927E-01 | @(P | 1.195E-01 | 5.52E-02 | G K |
| | | 295.22 | 5.110E-01 | @(P | 1.756E-01 | 6.67E-02 | G |
| | | | | | | | Energy duplication |
| | | 77.11 | 0.000E+00 | } P | 5.658E-01 | 0.00E+00 | G |
| | | 241.92 | 7.016E-01 | (P | 4.292E-01 | 1.42E-01 | G |
| BI-212 | 5.7295E-01 | | | | | | |
| | | 727.17 | 5.730E-01 | (P | 4.196E-01 | 1.59E-01 | G K |
| | | 1620.56 | 1.431E-01 | % | 1.443E+00 | 3.76E-01 | G |
| | | 785.42 | 1.686E+00 | + P | 2.189E+00 | 6.97E-01 | G |
| BI-214 | 6.3094E-01 | | | | | | |
| | | 609.32 | 5.799E-01 | (P | 1.447E-01 | 7.07E-02 | G K |
| | | 1764.51 | 7.786E-01 | (P | 1.348E-01 | 1.20E-01 | G |
| | | 1120.28 | 8.600E-01 | + P | 4.469E-01 | 1.90E-01 | G |
| RA-224 | 1.0862E+00 | | | | | | |
| | | 241.00 | 1.086E+00 | (P | 1.413E+00 | 4.34E-01 | G |
| RA-226 | 1.3376E+00 | | | | | | |
| | | 185.99 | 1.338E+00 | ( | 1.281E+00 | 4.00E-01 | G |
| AC-228 | 9.3933E-01 | | | | | | |
| | | 911.07 | 9.187E-01 | @(P | 2.338E-01 | 1.18E-01 | G K |
| | | 968.90 | 1.042E+00 | *(P | 4.040E-01 | 1.87E-01 | G |
| | | 338.40 | 8.393E-01 | (P | 3.176E-01 | 1.22E-01 | G |
| TH-227 | -2.3185E-01 | | | | | | |
| | | 236.00-2.318E-01 | | &(P | 5.202E-01 | 1.57E-01 | G K |
| | | 256.25 | 8.499E-02 | % P | 5.313E-01 | 1.57E-01 | G |

| Nuclide | Ave activity | Energy | Activity | Code | Peak | MDA | Comments |
|---|---|---|---|---|---|---|---|
| PA-234 | -2.0037E-03 | | | | | | |
| | | 98.44 | -2.004E-03 %( | | 2.016E-01 | 6.01E-02 | G K |
| | | 946.00 | 9.548E-03 & | | 3.070E-01 | 8.67E-02 | G |
| | | 131.28 | -1.957E-02 % | | 2.270E-01 | 6.77E-02 | G |
| | | 94.67 | -1.090E-01 & | | 3.545E-01 | 1.07E-01 | G |
| | | 883.24 | 1.664E-01 & | | 3.374E-01 | 1.03E-01 | G |
| | | 926.70 | -5.053E-02 % | | 4.359E-01 | 1.23E-01 | G |
| | | 569.26 | 0.000E+00 % | | 4.737E-01 | 1.35E-01 | G |
| TH-234 | 1.2680E+00 | | | | | | |
| | | 63.29 | 1.101E+00 %(P | | 2.418E+00 | 7.31E-01 | G K |
| | | 92.80 | 1.486E+00 (P | | 1.741E+00 | 5.35E-01 | G |
| | | 92.38 | 4.500E-01 % P | | 1.864E+00 | 5.58E-01 | G |
| AM-241 | -9.4314E-03 | | | | | | |
| | | 59.54 | -9.431E-03 &(P | | 3.199E-01 | 9.52E-02 | G |

( - This peak used in the nuclide activity average.

* - Peak is too wide, but only one peak in library.
! - Peak is part of a multiplet and this area went negative during deconvolution.
? - Peak is too narrow.
@ - Peak is too wide at FW25M, but ok at FWHM.
% - Peak fails sensitivity test.
$ - Peak identified, but first peak of this nuclide failed one or more qualification tests.
+ - Peak activity higher than counting uncertainty range.
- - Peak activity lower than counting uncertainty range.
= - Peak outside analysis energy range.
& - Calculated peak centroid is not close enough to the library energy centroid for positive identification.
P - Peakbackground subtraction
} - Peak is too close to another for the activity to be found directly.

| Nuclide Codes: | Peak Codes: |
|---|---|
| T - Thermal Neutron Activation | G - Gamma Ray |
| F - Fast Neutron Activation | X - X-Ray |
| I - Fission Product | P - Positron Decay |
| N - Naturally Occurring Isotope | S - Single-Escape |
| P - Photon Reaction | D - Double-Escape |
| C - Charged Particle Reaction | K - Key Line |
| M - No MDA Calculation | A - Not in Average |
| R - Coincidence Corrected | C - Coincidence Peak |
| H - Halflife limit exceeded | |

- - - - - - - - - - - - - - - - - - - - - - - - - - - - - - - - - - - - - - - -

***** S U M M A R Y O F N U C L I D E S I N S A M P L E *****

| Nuclide | | Time of Count Activity pCi/gm | Time Corrected Activity pCi/gm | Uncertainty Counting pCi/gm | 3 Sigma Total pCi/gm | MDA pCi/gm |
|---|---|---|---|---|---|---|
| BE-7 | #A | 8.2387E-02 | 8.8090E-02 | 4.0227E-01 | 4.0230E-01 | 4.272E-01 |
| K-40 | | 1.8245E+01 | 1.8245E+01 | 1.9716E+00 | 2.2248E+00 | |
| MN-54 | #A | -6.2842E-04 | -6.3565E-04 | 4.4478E-02 | 4.4478E-02 | 6.206E-02 |
| CO-57 | #B | -1.2533E-02 | -1.2700E-02 | 4.9172E-02 | 4.9177E-02 | 5.387E-02 |
| CO-60 | #B | 8.9798E-03 | 8.9965E-03 | 5.3542E-02 | 5.3545E-02 | 6.297E-02 |
| Sr-85 | #A | -2.0195E-02 | -2.1340E-02 | 5.4631E-02 | 5.4644E-02 | 5.751E-02 |
| Kr-85 | #A | -4.9244E+02 | -4.9246E+02 | 1.3278E+03 | 1.3281E+03 | 1.333E+03 |
| Y-88 | #B | 2.6163E-03 | 2.7055E-03 | 3.6095E-02 | 3.6095E-02 | 4.544E-02 |
| NB-94 | #B | -4.0736E-03 | -4.0736E-03 | 3.6052E-02 | 3.6053E-02 | 3.915E-02 |
| Ag-108M | #B | -1.8835E-02 | -1.8837E-02 | 5.6272E-02 | 5.6282E-02 | 6.329E-02 |
| CD-109 | #A | -2.6858E-01 | -2.7071E-01 | 1.3258E+00 | 1.3259E+00 | 1.413E+00 |
| SN-113 | #B | 5.9633E-03 | 6.1513E-03 | 6.0245E-02 | 6.0246E-02 | 6.667E-02 |
| SB-125 | #B | 9.5488E-02 | 9.5826E-02 | 7.9770E-02 | 7.9954E-02 | 1.241E-01 |
| I-131 | #B | 8.0357E-03 | 1.2533E-02 | 6.8124E-02 | 6.8127E-02 | 4.949E-02 |
| CS-134 | #B | 1.3574E-02 | 1.3638E-02 | 1.3487E-02 | 1.3509E-02 | 6.107E-02 |
| CS-137 | #A | -4.2489E-03 | -4.2503E-03 | 7.1493E-02 | 7.1494E-02 | 4.616E-02 |
| CE-139 | #A | 9.6883E-03 | 9.9434E-03 | 4.9528E-02 | 4.9531E-02 | 5.380E-02 |
| EU-152 | #B | -2.7560E-02 | -2.7581E-02 | 1.5048E-01 | 1.5049E-01 | 1.567E-01 |
| EU-154 | #B | -2.5317E-02 | -2.5346E-02 | 1.0299E-01 | 1.0300E-01 | 1.076E-01 |
| EU-155 | #B | 1.1534E-01 | 1.1557E-01 | 1.6126E-01 | 1.6139E-01 | 1.758E-01 |
| HG-203 | #B | 1.1151E-03 | 1.2040E-03 | 4.8381E-02 | 4.8382E-02 | 5.090E-02 |
| TL-208 | | 2.5220E-01 | 2.5220E-01 | 7.8293E-02 | 7.9579E-02 | |
| PB-212 | | 8.9411E-01 | 8.9411E-01 | 1.1107E-01 | 1.2202E-01 | |
| PB-214 | | 5.8086E-01 | 5.8086E-01 | 1.4965E-01 | 1.5321E-01 | |
| BI-212 | | 5.7295E-01 | 5.7295E-01 | 4.7554E-01 | 4.7664E-01 | |
| BI-214 | | 6.3094E-01 | 6.3094E-01 | 1.8592E-01 | 1.8930E-01 | |
| RA-224 | #A | 1.0862E+00 | 1.0862E+00 | 1.3024E+00 | 1.3039E+00 | 1.413E+00 |
| RA-226 | # | 1.3376E+00 | 1.3376E+00 | 1.1986E+00 | 1.2009E+00 | 1.281E+00 |
| AC-228 | | 9.3933E-01 | 9.3933E-01 | 2.4847E-01 | 2.5408E-01 | |
| TH-227 | #B | -2.3185E-01 | -2.3185E-01 | 4.7981E-01 | 4.7999E-01 | 5.202E-01 |
| PA-234 | #B | -2.0037E-03 | -2.0037E-03 | 1.8016E-01 | 1.8016E-01 | 2.016E-01 |
| TH-234 | #B | 1.2680E+00 | 1.2680E+00 | 1.3690E+00 | 1.3708E+00 | 2.418E+00 |
| AM-241 | #A | -9.4312E-03 | -9.4314E-03 | 4.4619E-01 | 4.4619E-01 | 3.199E-01 |

# - All peaks for activity calculation had bad shape.
* - Activity omitted from total
& - Activity omitted from total and all peaks had bad shape.
< - MDA value printed.
A - Activity printed, but activity < MDA.
B - Activity < MDA and failed test.
C - Area < Critical level.
F - Failed fraction or key line test.
H - Halflife limit exceeded

YAEC Chemistry Lab Spectrum name: 101F_15SEPT2006_1429.An1

---------- S U M M A R Y ----------

Total Activity ( 270.1 to 1999.1 keV) 2.2115885E+01 pCi/gm
Total Decayed Activity ( 270.1 to 1999.1 keV) 2.2115885E+01 pCi/gm

The library has energies which are not separable.

Analyzed by: _____
JPK

Reviewed by: _____
Supervisor

Laboratory: YAEC Chemistry Lab

YAEC Chemistry Lab Spectrum name: 101F_15SEPT2006_1509.An1

Sample description
FSS-SSS-01-01-003-F

Spectrum Filename: C:\GammaVision\Spectra\101F_15SEPT2006_1509.An1

Acquisition information

| | |
|---|---|
| Start time: | 15-Sep-2006 15:09:53 |
| Live time: | 2000 |
| Real time: | 2002 |
| Dead time: | 0.09 % |
| Detector ID: | 1 |

Detector system
Det 101- DSPE-633

Calibration

| | |
|---|---|
| Filename: | D1_1LSa.Clb |

Detector 101 1.0 Liter Marinelli Sand

Energy Calibration

| | |
|---|---|
| Created: | 03-Sep-2004 08:50:48 |
| Zero offset: | 0.244 keV |
| Gain: | 0.500 keV/channel |
| Quadratic: | -2.493E-08 keV/channel^2 |

Efficiency Calibration

| | |
|---|---|
| Created: | 03-Sep-2004 08:52:26 |
| Type: | Polynomial |
| Uncertainty: | 0.626 % |
| Coefficients: | -0.321775 -5.816463 0.734234 |
| | -0.099357 0.006049 -0.000149 |

Library Files

| | |
|---|---|
| Main analysis library: | FSS_Rev_1.Lib |
| Library Match Width: | 1.000 |
| Peak stripping: | Library based |

Analysis parameters

| | |
|---|---|
| Analysis engine: | Env32 G53W4.20 |
| Start channel: | 100 ( 50.23keV ) |
| Stop channel: | 4000 ( 1999.11keV ) |
| Peak rejection level: | 41.667% |
| Peak search sensitivity: | 3 |
| Sample Size: | 1.4240E+03 |
| Activity scaling factor: | 1.0000E+06/( 1.0000E+00* 1.4240E+03) = 7.0225E+02 |
| Detection limit method: | Nureg 4.16 |
| Random error: | 1.0000000E+00 |
| Systematic error: | 1.0000000E+00 |

| | |
|---|---|
| Fraction Limit: | 0.000% |
| Background width: | average of five points. |

YAEC Chemistry Lab Spectrum name: 101F_15SEPT2006_1509.An1

Half lives decay limit: 12.000
Activity range factor: 2.000
Min. step backg. energy 0.000
Multiplet shift channel 2.000

| Corrections | Status | Comments |
|---|---|---|
| Decay correct to date: | YES | 11-Sep-2006 11:36:00 |
| Decay during acquisition: | NO | |
| Decay during collection: | NO | |
| True coincidence correction: | NO | |
| Peaked background correction: | YES | 101_150K_28APR05.Pbc 01-May-2005 05:24:47 |
| Absorption (Internal): | NO | |
| Geometry correction: | NO | |
| Random summing: | NO | |

total peaks alloc. 16 cutoff 20.00000 %
Energy Calibration
Normalized diff: 0.2284

***** S U M M A R Y O F P E A K S I N R A N G E *****

| Peak Energy | Area | Uncert | FWHM | Corrctn Factor | Nuclide Energy | Brnch. Ratio | Act. pCi/gm | Nuc |
|---|---|---|---|---|---|---|---|---|
| 74.33 | 156. | 22.36 | 1.00 | 1.651E-02 | | | | |
| 74.33 | 156. | 22.36 | 1.00 | 1.651E-02 | 74.81 | 9.600 | PBC<MDA | PB212 |
| 77.43 | 374. | 8.86 | 1.01 | 1.739E-02 | 77.11 | 10.700 | 1.908E+00 | PB214 |
| | | | | | 77.11 | 17.500 | 1.178E+00 | PB212 |
| 86.96 | 149. | 19.09 | 1.01 | 1.916E-02 | 86.45 | 32.740 | 2.270E-01 | EU155 |
| 89.79 | 102. | 29.08 | 1.02 | 1.954E-02 | 88.04 | 3.790 | PBC<MDA | CD109 |
| 93.85 | 114. | 25.57 | 1.02 | 1.999E-02 | 92.38 | 2.570 | PBC<MDA | TH234 |
| | | | | | 92.80 | 3.000 | PBC<MDA | TH234 |
| 129.31 | 84. | 40.88 | 0.96 | 2.109E-02 | | | | |
| 185.75 | 117. | 31.13 | 1.15 | 1.860E-02 | | | | |
| 185.75 | 117. | 31.13 | 1.15 | 1.860E-02 | 185.99 | 3.280 | 1.820E+00 | RA226 |
| 209.44 | 99. | 25.56 | 1.34 | 1.721E-02 | | | | |
| 238.90 | 736. | 4.32 | 1.12 | 1.556E-02 | 238.63 | 43.100 | 1.032E+00 | PB212 |
| 241.91 | 103. | 20.13 | 1.12 | 1.540E-02 | | | | |
| 270.24 | 89. | 28.42 | 1.43 | 1.400E-02 | | | | |
| 295.36 | 191. | 13.75 | 1.16 | 1.291E-02 | 295.22 | 19.200 | 7.239E-01 | PB214 |
| 300.73 | 42. | 39.84 | 1.39 | 1.270E-02 | | | | |
| 338.50 | 191. | 14.63 | 1.20 | 1.135E-02 | 338.40 | 12.010 | 1.316E+00 | AC228 |
| 352.15 | 297. | 8.13 | 1.10 | 1.092E-02 | 351.99 | 37.100 | 6.908E-01 | PB214 |
| 463.71 | 38. | 40.44 | 1.50 | 8.342E-03 | 463.51 | 10.000 | PBC<MDA | SB125 |
| 510.82 | 103. | 17.40 | 0.96 | 7.589E-03 | 510.72 | 22.500 | 4.855E-01 | TL208 |
| 583.45 | 200. | 9.08 | 1.68 | 6.681E-03 | 583.14 | 86.000 | 3.269E-01 | TL208 |
| 609.56 | 201. | 11.26 | 1.56 | 6.410E-03 | 609.32 | 46.090 | 6.412E-01 | BI214 |
| 727.59 | 67. | 22.92 | 1.23 | 5.440E-03 | 727.17 | 11.800 | 9.740E-01 | BI212 |
| 911.40 | 185. | 10.43 | 1.24 | 4.445E-03 | 911.07 | 29.000 | 1.348E+00 | AC228 |
| 969.46 | 75. | 23.43 | 1.48 | 4.210E-03 | 968.90 | 17.460 | 9.637E-01 | AC228 |
| 1120.17 | 44. | 38.92 | 1.27 | 3.711E-03 | 1120.28 | 15.040 | 7.434E-01 | BI214 |

| | | | | | | | | |
|---|---|---|---|---|---|---|---|---|
| 1461.18 | 757. | 3.70 | 1.85 | 2.942E-03 | 1460.75 | 10.700 | 2.275E+01 | K40 |
| 1764.83 | 41. | 15.62 | 1.02 | 2.481E-03 | 1764.51 | 15.920 | 9.744E-01 | BI214 |

********** U N I D E N T I F I E D P E A K S U M M A R Y **********

| Peak Channel | Centroid Energy | Background Counts | Net Area Counts | Intensity Cts/Sec | Uncert 3 Sigma % | FWHM keV | Suspected Nuclide | |
|---|---|---|---|---|---|---|---|---|
| 173.49 | 86.88 | 332. | 149. | 0.075 | 57.27 | 1.014 | TB-160 | lD |
| 179.15 | 89.71 | 392. | 102. | 0.051 | 87.23 | 1.016 | PB-214 | lD |
| 258.22 | 129.31 | 475. | 89. | 0.045 | 108.64 | 0.964 | AC-228 | M |
| 418.56 | 209.44 | 246. | 99. | 0.049 | 76.67 | 1.340 | AC-228 | sM |
| 477.49 | 238.86 | 138. | 736. | 0.368 | 12.97 | 1.122 | PB-212 | D |
| 483.53 | 241.88 | 164. | 103. | 0.052 | 60.40 | 1.124 | PB-214 | D |
| 540.20 | 270.24 | 213. | 89. | 0.045 | 85.25 | 1.427 | AC-228 | s |
| 601.21 | 300.73 | 119. | 42. | 0.021 | 119.52 | 1.387 | PB-212 | |

s - Peak fails shape tests.
D - Peak area deconvoluted.
L - Peak written from unknown list.
C - Area < Critical level.
M - Peak is close to a library peak.

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This section based on library: FSS_Rev_1.Lib

********** I D E N T I F I E D P E A K S U M M A R Y **********

| Nuclide | Peak Channel | Centroid Energy | Background Counts | Net Area Counts | Intensity Cts/Sec | Uncert 3 Sigma % | FWHM keV |
|---|---|---|---|---|---|---|---|
| PB-212 | 149.45 | 74.94 | 1086. | 209. | 0.105 | 68.18 | 1.499s |
| PB-214 | 153.79 | 77.11 | 943. | 357. | 0.178 | 39.37 | 1.499D |
| PB-212 | 153.79 | 77.11 | 939. | 361. | 0.180 | 39.37 | 1.499D |
| TH-234 | 186.01 | 93.21 | 786. | 163. | 0.082 | 71.56 | 1.499s |
| TH-234 | 185.97 | 93.19 | 810. | 168. | 0.084 | 72.82 | 1.499s |
| RA-226 | 371.70 | 186.02 | 459. | 86. | 0.043 | 110.42 | 1.499s |
| PB-212 | 477.36 | 238.83 | 414. | 604. | 0.302 | 18.56 | 1.499 |
| RA-224 | 474.03 | 237.17 | 62. | 56. | 0.028 | 71.20 | 1.499 |
| PB-214 | 590.77 | 295.51 | 216. | 157. | 0.079 | 45.79 | 1.499 |
| AC-228 | 676.78 | 338.50 | 187. | 189. | 0.095 | 43.89 | 1.198s |
| PB-214 | 704.05 | 352.13 | 138. | 298. | 0.149 | 23.89 | 1.499s |
| TL-208 | 1021.57 | 510.82 | 98. | 87. | 0.044 | 52.20 | 0.957s |
| TL-208 | 1166.91 | 583.45 | 57. | 198. | 0.099 | 27.25 | 1.680s |
| BI-214 | 1219.16 | 609.56 | 92. | 200. | 0.100 | 33.77 | 1.555s |
| BI-212 | 1455.32 | 727.59 | 60. | 66. | 0.033 | 68.75 | 1.229 |
| AC-228 | 1823.16 | 911.40 | 54. | 183. | 0.092 | 31.29 | 1.236s |
| AC-228 | 1939.33 | 969.46 | 70. | 75. | 0.037 | 70.28 | 1.482 |
| BI-214 | 2240.94 | 1120.17 | 76. | 44. | 0.022 | 116.76 | 1.274 |
| K-40 | 2923.37 | 1461.18 | 10. | 755. | 0.377 | 11.10 | 1.854 |
| BI-214 | 3531.10 | 1764.83 | 0. | 41. | 0.020 | 46.85 | 1.016s |

s - Peak fails shape tests.
D - Peak area deconvoluted.

A Derived peak area.

***** S U M M A R Y O F L I B R A R Y P E A K U S A G E *****

| - Nuclide - Name | Code | Average Activity pCi/gm | Peak Energy keV | Peak Activity pCi/gm | Code | MDA Value pCi/gm | COMMENTS |
|---|---|---|---|---|---|---|---|
| BE-7 | | 1.8902E-01 | | | | | |
| | | | 477.56 | 1.890E-01 | %( | 5.385E-01 1.61E-01 | G |
| K-40 | | 2.2754E+01 | | | | | |
| | | | 1460.75 | 2.275E+01 | (P | 5.276E-01 8.45E-01 | G |
| MN-54 | | -8.3288E-04 | | | | | |
| | | | 834.81 | -8.329E-04 | %(P | 7.312E-02 2.05E-02 | G |
| CO-57 | | 1.2763E-02 | | | | | |
| | | | 122.07 | 1.276E-02 | %( | 6.410E-02 1.92E-02 | G K |
| | | | 136.43 | 3.862E-02 | % | 5.286E-01 1.57E-01 | G |
| CO-60 | | 1.6865E-02 | | | | | |
| | | | 1332.51 | 1.686E-02 | &(P | 8.365E-02 2.40E-02 | G K |
| | | | 1173.23 | 1.723E-02 | & P | 8.712E-02 2.52E-02 | G K |
| Sr-85 | | -2.8325E-02 | | | | | |
| | | | 514.00 | -2.833E-02 | %( | 8.081E-02 2.42E-02 | G |
| Kr-85 | | -6.6148E+02 | | | | | |
| | | | 513.99 | -6.615E+02 | %(P | 1.791E+03 5.35E+02 | G |
| Y-88 | | -3.1429E-03 | | | | | |
| | | | 1836.01 | -3.143E-03 | %( | 6.738E-02 1.74E-02 | G K |
| | | | 898.02 | 1.879E-02 | & P | 6.653E-02 1.94E-02 | G |
| NB-94 | | -1.6545E-02 | | | | | |
| | | | 871.10 | -1.655E-02 | &(P | 7.716E-02 2.25E-02 | G K |
| | | | 702.50 | -1.894E-04 | % P | 6.518E-02 1.84E-02 | G K |
| Ag-108M | | -1.1172E-02 | | | | | |
| | | | 722.95 | -1.117E-02 | %( | 7.940E-02 2.30E-02 | G K |
| | | | 614.37 | -3.629E-02 | % P | 7.892E-02 2.39E-02 | G |
| | | | 433.93 | 7.369E-03 | % | 6.042E-02 1.76E-02 | G |
| CD-109 | | 4.5579E-01 | | | | | |
| | | | 88.04 | 4.558E-01 | %(P | 1.883E+00 5.66E-01 | G |
| SN-113 | | -5.8147E-03 | | | | | |
| | | | 391.71 | -5.815E-03 | %( | 8.300E-02 2.41E-02 | G K |
| | | | 255.04 | 2.787E-01 | % P | 2.097E+00 6.17E-01 | G |

| Nuclide | Ave activity | Energy | Activity | Code | Peak | MDA | Comments |
|---|---|---|---|---|---|---|---|
| SB-125 | -2.8117E-03 | | | | | | |
| | | 427.95 | -2.812E-03 | %(P | 1.679E-01 | 4.80E-02 | G K |
| | | 600.77 | -4.265E-02 | % P | 3.604E-01 | 1.04E-01 | G |
| | | 636.15 | -1.430E-01 | % P | 5.529E-01 | 1.62E-01 | G |
| | | 463.51 | 4.324E-01 | % P | 5.843E-01 | 1.82E-01 | G |
| | | 176.29 | 4.586E-02 | % P | 8.228E-01 | 2.44E-01 | G |
| I-131 | 5.6199E-03 | | | | | | |
| | | 364.48 | 5.620E-03 | %( | 8.371E-02 | 2.43E-02 | G K |
| | | 636.97 | -3.231E-02 | & | 1.331E+00 | 3.80E-01 | G |
| | | 284.29 | -2.347E-01 | & | 1.222E+00 | 3.63E-01 | G |
| CS-134 | -2.8265E-03 | | | | | | |
| | | 604.66 | -2.826E-03 | %(P | 6.878E-02 | 1.96E-02 | G K |
| | | 795.76 | 6.662E-03 | % P | 7.140E-02 | 2.02E-02 | G |
| | | 569.29 | 9.023E-02 | & P | 3.290E-01 | 9.65E-02 | G |
| | | 801.84 | 3.971E-03 | & | 6.700E-01 | 1.86E-01 | G |
| CS-137 | 1.8689E-02 | | | | | | |
| | | 661.62 | 1.869E-02 | %(P | 8.301E-02 | 2.43E-02 | G |
| CE-139 | 1.6330E-02 | | | | | | |
| | | 165.85 | 1.633E-02 | &(P | 6.013E-02 | 1.80E-02 | G |
| EU-152 | 2.7725E-02 | | | | | | |
| | | 121.78 | 2.773E-02 | %(P | 1.903E-01 | 5.68E-02 | G K |
| | | 344.30 | 1.118E-03 | % P | 1.928E-01 | 5.59E-02 | G |
| | | 1408.08 | -2.619E-03 | % P | 3.632E-01 | 9.77E-02 | G |
| | | 964.00 | 2.876E-02 | % P | 5.833E-01 | 1.65E-01 | G |
| | | 1112.07 | 2.694E-01 | % P | 5.592E-01 | 1.70E-01 | G |
| | | 778.90 | 8.773E-03 | & P | 3.198E-01 | 8.59E-02 | G |
| EU-154 | 3.4498E-02 | | | | | | |
| | | 123.10 | 3.450E-02 | %(P | 1.378E-01 | 4.14E-02 | G K |
| | | 1274.80 | 5.296E-02 | % P | 2.582E-01 | 7.46E-02 | G |
| | | 723.30 | -3.205E-03 | % P | 6.299E-01 | 1.84E-01 | G |
| | | 1004.80 | 9.585E-03 | % P | 4.800E-01 | 1.35E-01 | G |
| EU-155 | 1.1329E-02 | | | | | | |
| | | 86.45 | 1.133E-02 | %( | 2.416E-01 | 7.22E-02 | G K |
| | | 105.31 | -6.694E-03 | % | 2.774E-01 | 8.26E-02 | G |
| HG-203 | 1.0076E-02 | | | | | | |
| | | 279.17 | 1.008E-02 | %( | 6.822E-02 | 2.02E-02 | G K |
| | | 72.87 | -5.304E-01 | % P | 1.711E+00 | 5.15E-01 | G |
| | | 70.83 | -1.204E+00 | % | 3.026E+00 | 9.15E-01 | G |
| | | 82.50 | -9.226E-01 | & | 3.579E+00 | 1.08E+00 | G |

| Nuclide | Ave activity | Energy | Activity | Code | Peak | MDA | Comments |
|---|---|---|---|---|---|---|---|
| TL-208 | 3.2690E-01 | | | | | | |
| | | 583.14 | 3.269E-01 | (P | 6.254E-02 | 3.01E-02 | G |
| | | 510.72 | 4.855E-01 | + P | 2.709E-01 | 1.00E-01 | G |
| PB-212 | 8.5375E-01 | | | | | | |
| | | 238.63 | 8.537E-01 | (P | 1.378E-01 | 5.34E-02 | G K |
| | | | | | | | Energy duplication |
| | | 77.11 | 1.137E+00 | + | 4.587E-01 | 1.49E-01 | G |
| | | 74.81 | 1.250E+00 | + P | 9.339E-01 | 2.91E-01 | G |
| PB-214 | 6.6489E-01 | | | | | | |
| | | 351.99 | 6.981E-01 | @(P | 1.343E-01 | 5.60E-02 | G K |
| | | 295.22 | 6.007E-01 | (P | 2.725E-01 | 9.27E-02 | G |
| | | | | | | | Energy duplication |
| | | 77.11 | 1.840E+00 | + P | 7.517E-01 | 2.44E-01 | G |
| | | 241.92 | 1.154E-01 | % P | 9.453E-01 | 2.82E-01 | G |
| BI-212 | 9.7404E-01 | | | | | | |
| | | 727.17 | 9.740E-01 | (P | 5.737E-01 | 2.26E-01 | G K |
| | | 1620.56 | 9.703E-01 | % | 1.511E+00 | 4.99E-01 | G |
| | | 785.42 | 1.215E+00 | % P | 3.026E+00 | 9.05E-01 | G |
| BI-214 | 6.6631E-01 | | | | | | |
| | | 609.32 | 6.412E-01 | @(P | 1.525E-01 | 7.26E-02 | G K |
| | | 1764.51 | 9.744E-01 | + P | 1.770E-01 | 1.54E-01 | G |
| | | 1120.28 | 7.434E-01 | (P | 7.381E-01 | 2.92E-01 | G |
| RA-224 | 8.7720E-01 | | | | | | |
| | | 241.00 | 8.772E-01 | (P | 6.212E-01 | 2.11E-01 | G |
| RA-226 | 1.3399E+00 | | | | | | |
| | | 185.99 | 1.340E+00 | *( | 1.596E+00 | 4.93E-01 | G |
| AC-228 | 1.3384E+00 | | | | | | |
| | | 911.07 | 1.348E+00 | @(P | 2.716E-01 | 1.42E-01 | G K |
| | | 968.90 | 9.637E-01 | - P | 5.392E-01 | 2.28E-01 | G |
| | | 338.40 | 1.316E+00 | @(P | 4.625E-01 | 1.95E-01 | G |
| TH-227 | 2.4038E-02 | | | | | | |
| | | 236.00 | 2.404E-02 | &(P | 4.264E-01 | 1.25E-01 | G K |
| | | 256.25 | -1.073E-01 | % P | 7.856E-01 | 2.32E-01 | G |
| PA-234 | 4.2951E-03 | | | | | | |
| | | 98.44 | 4.295E-03 | %( | 2.492E-01 | 7.42E-02 | G K |
| | | 946.00 | 1.836E-03 | & | 3.844E-01 | 1.08E-01 | G |
| | | 131.28 | -5.659E-02 | & | 2.787E-01 | 8.35E-02 | G |
| | | 94.67 | -6.639E-02 | % | 3.227E-01 | 9.65E-02 | G |
| | | 883.24 | 9.034E-03 | & | 4.698E-01 | 1.29E-01 | G |
| | | 926.70 | 4.001E-03 | % | 5.524E-01 | 1.52E-01 | G |

| Nuclide | Ave activity | Energy | Activity | Code | Peak MDA | Comments |
|---|---|---|---|---|---|---|
| | | 569.26 | 1.393E-01 | & | 4.844E-01 | 1.43E-01 G |
| TH-234 | 1.7272E+00 | | | | | |
| | | 63.29 | 1.420E-01 | %(P | 2.969E+00 | 8.83E-01 G K |
| | | 92.80 | 2.667E+00 | @(P | 2.152E+00 | 6.71E-01 G |
| | | 92.38 | 3.036E+00 | &(P | 2.480E+00 | 7.72E-01 G |
| AM-241 | 2.9925E-02 | | | | | |
| | | 59.54 | 2.992E-02 | %(P | 3.882E-01 | 1.16E-01 G |

( - This peak used in the nuclide activity average.

* - Peak is too wide, but only one peak in library.
! - Peak is part of a multiplet and this area went negative during deconvolution.
? - Peak is too narrow.
@ - Peak is too wide at FW25M, but ok at FWHM.
% - Peak fails sensitivity test.
$ - Peak identified, but first peak of this nuclide failed one or more qualification tests.
+ - Peak activity higher than counting uncertainty range.
- - Peak activity lower than counting uncertainty range.
= - Peak outside analysis energy range.
& - Calculated peak centroid is not close enough to the library energy centroid for positive identification.
P - Peakbackground subtraction
} - Peak is too close to another for the activity to be found directly.

| Nuclide Codes: | Peak Codes: |
|---|---|
| T - Thermal Neutron Activation | G - Gamma Ray |
| F - Fast Neutron Activation | X - X-Ray |
| I - Fission Product | P - Positron Decay |
| N - Naturally Occurring Isotope | S - Single-Escape |
| P - Photon Reaction | D - Double-Escape |
| C - Charged Particle Reaction | K - Key Line |
| M - No MDA Calculation | A - Not in Average |
| R - Coincidence Corrected | C - Coincidence Peak |
| H - Halflife limit exceeded | |

- - - - - - - - - - - - - - - - - - - - - - - - - - - - - - - - - - - - -

***** S U M M A R Y O F N U C L I D E S I N S A M P L E *****

| Nuclide | | Time of Count Activity pCi/gm | Time Corrected Activity pCi/gm | Uncertainty Counting pCi/gm | 3 Sigma Total pCi/gm | MDA pCi/gm |
|---|---|---|---|---|---|---|
| BE-7 | #A | 1.7911E-01 | 1.8902E-01 | 4.8234E-01 | 4.8246E-01 | 5.103E-01 |
| K-40 | | 2.2754E+01 | 2.2754E+01 | 2.5339E+00 | 2.8415E+00 | |
| MN-54 | #A | -8.2524E-04 | -8.3288E-04 | 5.1312E-02 | 5.1312E-02 | 7.245E-02 |
| CO-57 | #B | 1.2628E-02 | 1.2763E-02 | 5.7587E-02 | 5.7591E-02 | 6.343E-02 |
| CO-60 | #B | 1.6840E-02 | 1.6865E-02 | 7.1972E-02 | 7.1978E-02 | 8.353E-02 |

| | | | | | | |
|---|---|---|---|---|---|---|
| Sr-85 | #A | -2.7096E-02 | -2.8325E-02 | 7.2667E-02 | 7.2685E-02 | 7.731E-02 |
| Kr-85 | #A | -6.6146E+02 | -6.6148E+02 | 1.7815E+03 | 1.7819E+03 | 1.791E+03 |
| Y-88 | #B | -3.0593E-03 | -3.1429E-03 | 5.2339E-02 | 5.2339E-02 | 6.558E-02 |
| NB-94 | #B | -1.6545E-02 | -1.6545E-02 | 6.9642E-02 | 6.9648E-02 | 7.716E-02 |
| Ag-108M | #B | -1.1171E-02 | -1.1172E-02 | 6.8971E-02 | 6.8974E-02 | 7.939E-02 |
| CD-109 | #A | 4.5291E-01 | 4.5579E-01 | 1.6975E+00 | 1.6977E+00 | 1.871E+00 |
| SN-113 | #B | -5.6712E-03 | -5.8147E-03 | 7.2323E-02 | 7.2324E-02 | 8.095E-02 |
| SB-125 | #B | -2.8037E-03 | -2.8117E-03 | 3.4682E-01 | 3.4682E-01 | 1.675E-01 |
| I-131 | #B | 3.9301E-03 | 5.6199E-03 | 7.2860E-02 | 7.2861E-02 | 5.854E-02 |
| CS-134 | #B | -2.8157E-03 | -2.8265E-03 | 1.1705E-01 | 1.1705E-01 | 6.851E-02 |
| CS-137 | #A | 1.8684E-02 | 1.8689E-02 | 7.2926E-02 | 7.2934E-02 | 8.299E-02 |
| CE-139 | #A | 1.5992E-02 | 1.6330E-02 | 5.4062E-02 | 5.4070E-02 | 5.889E-02 |
| EU-152 | #B | 2.7708E-02 | 2.7725E-02 | 1.7055E-01 | 1.7055E-01 | 1.902E-01 |
| EU-154 | #B | 3.4466E-02 | 3.4498E-02 | 1.2411E-01 | 1.2413E-01 | 1.377E-01 |
| EU-155 | #B | 1.1311E-02 | 1.1329E-02 | 2.1656E-01 | 2.1656E-01 | 2.412E-01 |
| HG-203 | #B | 9.4729E-03 | 1.0076E-02 | 6.0545E-02 | 6.0548E-02 | 6.413E-02 |
| TL-208 | | 3.2690E-01 | 3.2690E-01 | 9.0161E-02 | 9.2033E-02 | |
| PB-212 | # | 8.5375E-01 | 8.5375E-01 | 1.6011E-01 | 1.6722E-01 | 1.378E-01 |
| PB-214 | # | 6.6489E-01 | 6.6489E-01 | 1.5992E-01 | 1.6427E-01 | 1.343E-01 |
| BI-212 | | 9.7404E-01 | 9.7404E-01 | 6.7650E-01 | 6.7873E-01 | |
| BI-214 | | 6.6631E-01 | 6.6631E-01 | 2.2625E-01 | 2.2937E-01 | |
| RA-224 | | 8.7720E-01 | 8.7720E-01 | 6.3261E-01 | 6.3455E-01 | 6.212E-01 |
| RA-226 | #A | 1.3399E+00 | 1.3399E+00 | 1.4796E+00 | 1.4815E+00 | 1.596E+00 |
| AC-228 | | 1.3384E+00 | 1.3384E+00 | 3.6472E-01 | 3.7248E-01 | |
| TH-227 | #B | 2.4038E-02 | 2.4038E-02 | 3.7632E-01 | 3.7632E-01 | 4.264E-01 |
| PA-234 | #B | 4.2951E-03 | 4.2951E-03 | 2.2246E-01 | 2.2246E-01 | 2.492E-01 |
| TH-234 | #B | 1.7272E+00 | 1.7272E+00 | 1.3041E+00 | 1.3076E+00 | 2.969E+00 |
| AM-241 | #A | 2.9924E-02 | 2.9925E-02 | 3.4700E-01 | 3.4700E-01 | 3.882E-01 |

# - All peaks for activity calculation had bad shape.
* - Activity omitted from total
& - Activity omitted from total and all peaks had bad shape.
< - MDA value printed.
A - Activity printed, but activity < MDA.
B - Activity < MDA and failed test.
C - Area < Critical level.
F - Failed fraction or key line test.
H - Halflife limit exceeded

---------- S U M M A R Y ----------

Total Activity ( 270.1 to 1999.1 keV) 2.6937233E+01 pCi/gm
Total Decayed Activity ( 270.1 to 1999.1 keV) 2.6937233E+01 pCi/gm

The library has energies which are not separable.

Analyzed by: _____
JPK

Reviewed by: _____
Supervisor

Laboratory: YAEC Chemistry Lab

YAEC Chemistry Lab Spectrum name: 101F_16SEPT2006_0905.An1

Sample description
FSS-SSS-01-01-036-F-B

Spectrum Filename: C:\GammaVision\Spectra\101F_16SEPT2006_0905.An1

Acquisition information

| | |
|---|---|
| Start time: | 16-Sep-2006 09:05:18 |
| Live time: | 2000 |
| Real time: | 2002 |
| Dead time: | 0.08 % |
| Detector ID: | 1 |

Detector system
Det 101- DSPE-633

Calibration

| | |
|---|---|
| Filename: | D1_1LSa.Clb |

Detector 101 1.0 Liter Marinelli Sand

Energy Calibration

| | |
|---|---|
| Created: | 03-Sep-2004 08:50:48 |
| Zero offset: | 0.244 keV |
| Gain: | 0.500 keV/channel |
| Quadratic: | -2.493E-08 keV/channel^2 |

Efficiency Calibration

| | |
|---|---|
| Created: | 03-Sep-2004 08:52:26 |
| Type: | Polynomial |
| Uncertainty: | 0.626 % |
| Coefficients: | -0.321775 -5.816463 0.734234 |
| | -0.099357 0.006049 -0.000149 |

Library Files

| | |
|---|---|
| Main analysis library: | FSS_Rev_1.Lib |
| Library Match Width: | 1.000 |
| Peak stripping: | Library based |

Analysis parameters

| | |
|---|---|
| Analysis engine: | Env32 G53W4.20 |
| Start channel: | 100 ( 50.23keV ) |
| Stop channel: | 4000 ( 1999.11keV ) |
| Peak rejection level: | 41.667% |
| Peak search sensitivity: | 3 |
| Sample Size: | 1.2850E+03 |
| Activity scaling factor: | 1.0000E+06/( 1.0000E+00* 1.2850E+03) = 7.7821E+02 |
| Detection limit method: | Nureg 4.16 |
| Random error: | 1.0000000E+00 |
| Systematic error: | 1.0000000E+00 |

| | |
|---|---|
| Fraction Limit: | 0.000% |
| Background width: | average of five points. |

YAEC Chemistry Lab Spectrum name: 101F_16SEPT2006_0905.An1

Half lives decay limit: 12.000
Activity range factor: 2.000
Min. step backg. energy 0.000
Multiplet shift channel 2.000

| Corrections | Status | Comments |
|---|---|---|
| Decay correct to date: | YES | 12-Sep-2006 13:30:00 |
| Decay during acquisition: | NO | |
| Decay during collection: | NO | |
| True coincidence correction: | NO | |
| Peaked background correction: | YES | 101_150K_28APR05.Pbc 01-May-2005 05:24:47 |
| Absorption (Internal): | NO | |
| Geometry correction: | NO | |
| Random summing: | NO | |

total peaks alloc. 14 cutoff 20.00000 %
Energy Calibration
Normalized diff: 0.1516

***** S U M M A R Y O F P E A K S I N R A N G E *****

| Peak Energy | Area | Uncert | FWHM | Corrctn Factor | Nuclide Energy | Brnch. Ratio | Act. pCi/gm | Nuc |
|---|---|---|---|---|---|---|---|---|
| 74.82 | 224. | 12.16 | 1.00 | 1.654E-02 | 74.81 | 9.600 | 1.482E+00 | PB212 |
| 75.73 | 128. | 2.47 | 1.50 | 1.720E-02 | 74.81 | 9.600 | PBC<MDA | PB212 |
| | | | | | 77.11 | 17.500 | PBC<MDA | PB212 |
| | | | | | 77.11 | 10.700 | PBC<MDA | PB214 |
| 93.10 | 107. | 33.29 | 1.50 | 1.989E-02 | 92.38 | 2.570 | PBC<MDA | TH234 |
| | | | | | 92.80 | 3.000 | PBC<MDA | TH234 |
| 185.74 | 142. | 20.05 | 1.24 | 1.860E-02 | | | | |
| 185.74 | 142. | 20.05 | 1.24 | 1.860E-02 | 185.99 | 3.280 | 2.441E+00 | RA226 |
| 209.69 | 69. | 38.11 | 1.11 | 1.719E-02 | | | | |
| 238.79 | 602. | 4.79 | 1.12 | 1.557E-02 | 238.63 | 43.100 | 9.343E-01 | PB212 |
| 242.19 | 89. | 20.93 | 1.12 | 1.539E-02 | 241.00 | 3.900 | 1.545E+00 | RA224 |
| | | | | | 241.92 | 7.470 | 8.094E-01 | PB214 |
| 269.77 | 70. | 32.76 | 1.58 | 1.402E-02 | | | | |
| 277.27 | 48. | 39.49 | 1.60 | 1.368E-02 | | | | |
| 295.48 | 140. | 12.36 | 1.16 | 1.291E-02 | 295.22 | 19.200 | 5.878E-01 | PB214 |
| 328.15 | 51. | 29.56 | 0.89 | 1.169E-02 | | | | |
| 338.75 | 144. | 15.87 | 1.20 | 1.134E-02 | 338.40 | 12.010 | 1.094E+00 | AC228 |
| 351.93 | 275. | 9.03 | 0.88 | 1.093E-02 | 351.99 | 37.100 | 7.084E-01 | PB214 |
| 511.07 | 101. | 15.85 | 1.89 | 7.585E-03 | 510.72 | 22.500 | 5.245E-01 | TL208 |
| 583.37 | 166. | 11.45 | 1.39 | 6.682E-03 | 583.14 | 86.000 | 2.993E-01 | TL208 |
| 609.22 | 213. | 9.26 | 1.31 | 6.414E-03 | 609.32 | 46.090 | 7.539E-01 | BI214 |
| 661.80 | 34. | 39.58 | 0.78 | 5.936E-03 | 661.62 | 84.620 | PBC<MDA | CS137 |
| 727.72 | 30. | 37.98 | 1.50 | 5.443E-03 | 727.17 | 11.800 | PBC<MDA | BI212 |
| 785.46 | 24. | 35.54 | 1.50 | 5.075E-03 | 785.42 | 2.000 | PBC<MDA | BI212 |
| 794.95 | 22. | 35.99 | 1.50 | 5.016E-03 | 795.76 | 85.400 | PBC<MDA | CS134 |
| 860.95 | 27. | 27.47 | 0.87 | 4.675E-03 | | | | |
| 911.54 | 111. | 12.50 | 1.43 | 4.444E-03 | 911.07 | 29.000 | 8.933E-01 | AC228 |

| | | | | | | | | |
|---|---|---|---|---|---|---|---|---|
| 969.27 | 72. | 22.90 | 1.46 | 4.211E-03 | 968.90 | 17.460 | 1.019E+00 | AC228 |
| 1120.07 | 48. | 20.09 | 2.23 | 3.711E-03 | 1120.28 | 15.040 | 8.973E-01 | BI214 |
| 1460.86 | 564. | 4.33 | 2.12 | 2.942E-03 | 1460.75 | 10.700 | 1.875E+01 | K40 |
| 1765.06 | 32. | 17.68 | 0.65 | 2.481E-03 | 1764.51 | 15.920 | 8.402E-01 | BI214 |

********** U N I D E N T I F I E D P E A K S U M M A R Y **********

| Peak Channel | Centroid Energy | Background Counts | Net Area Counts | Intensity Cts/Sec | Uncert 3 Sigma % | FWHM keV | Suspected Nuclide | |
|---|---|---|---|---|---|---|---|---|
| 419.05 | 209.69 | 249. | 69. | 0.034 | 114.33 | 1.105 | NP-239 | s |
| 539.26 | 269.77 | 164. | 70. | 0.035 | 98.28 | 1.575 | AC-228 | s |
| 554.26 | 277.27 | 125. | 50. | 0.025 | 103.94 | 1.596 | TL-208 | s |
| 656.08 | 328.15 | 82. | 51. | 0.026 | 88.69 | 0.889 | AC-228 | |
| 1722.20 | 860.95 | 14. | 27. | 0.014 | 82.40 | 0.866 | TL-208 | s |

s - Peak fails shape tests.
D - Peak area deconvoluted.
L - Peak written from unknown list.
C - Area < Critical level.

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This section based on library: FSS_Rev_1.Lib

********** I D E N T I F I E D P E A K S U M M A R Y **********

| Nuclide | Peak Channel | Centroid Energy | Background Counts | Net Area Counts | Intensity Cts/Sec | Uncert 3 Sigma % | FWHM keV |
|---|---|---|---|---|---|---|---|
| HG-203 | 146.49 | 73.46 | 856. | -124. | -0.062 | 104.03 | 1.499s |
| PB-212 | 149.19 | 74.81 | 279. | 224. | 0.112 | 36.48 | 1.005D |
| PB-212 | 153.79 | 77.11 | 323. | 267. | 0.134 | 29.77 | 1.006A |
| PB-214 | 153.79 | 77.11 | 453. | 128. | 0.064 | 7.41 | 1.499A |
| TH-234 | 185.77 | 93.10 | 658. | 107. | 0.053 | 99.86 | 1.499 |
| RA-226 | 371.94 | 186.14 | 299. | 113. | 0.057 | 70.66 | 1.499s |
| PB-212 | 476.96 | 238.63 | 121. | 596. | 0.298 | 14.36 | 1.122D |
| PB-214 | 483.54 | 241.92 | 116. | 92. | 0.046 | 58.42 | 1.124D |
| PB-214 | 590.66 | 295.46 | 185. | 137. | 0.068 | 55.37 | 0.957 |
| AC-228 | 677.29 | 338.75 | 128. | 142. | 0.071 | 47.60 | 1.201s |
| PB-214 | 703.66 | 351.93 | 116. | 273. | 0.137 | 27.10 | 0.883 |
| TL-208 | 1022.08 | 511.07 | 72. | 85. | 0.043 | 47.56 | 1.886s |
| TL-208 | 1166.75 | 583.37 | 65. | 164. | 0.082 | 34.35 | 1.387 |
| BI-214 | 1218.47 | 609.22 | 56. | 212. | 0.106 | 27.78 | 1.308 |
| CS-137 | 1323.95 | 661.93 | 46. | 27. | 0.013 | 118.27 | 1.499s |
| BI-212 | 1455.59 | 727.72 | 53. | 30. | 0.015 | 113.94 | 1.499s |
| BI-212 | 1571.14 | 785.46 | 26. | 24. | 0.012 | 106.62 | 1.499 |
| CS-134 | 1590.12 | 794.95 | 21. | 22. | 0.011 | 107.96 | 1.502s |
| AC-228 | 1823.43 | 911.54 | 32. | 110. | 0.055 | 37.51 | 1.428s |
| AC-228 | 1938.96 | 969.27 | 55. | 71. | 0.036 | 68.69 | 1.456 |
| BI-214 | 2240.73 | 1120.07 | 18. | 48. | 0.024 | 60.27 | 2.226s |
| K-40 | 2922.74 | 1460.86 | 11. | 561. | 0.281 | 12.99 | 2.121 |
| BI-214 | 3531.56 | 1765.06 | 0. | 32. | 0.016 | 53.03 | 0.649s |

s - Peak fails shape tests.
D - Peak area deconvoluted.
A Derived peak area.

***** S U M M A R Y O F L I B R A R Y P E A K U S A G E *****

| - Nuclide - Name | Code | Average Activity pCi/gm | Peak Energy keV | Peak Activity pCi/gm | Peak Code | Peak MDA Value pCi/gm | COMMENTS |
|---|---|---|---|---|---|---|---|
| BE-7 | | -3.5106E-02 | | | | | |
| | | | 477.56 | -3.511E-02 | %( | 5.384E-01 1.54E-01 | G |
| K-40 | | 1.8749E+01 | | | | | |
| | | | 1460.75 | 1.875E+01 | (P | 5.992E-01 8.15E-01 | G |
| MN-54 | | 3.1359E-02 | | | | | |
| | | | 834.81 | 3.136E-02 | %(P | 6.480E-02 1.96E-02 | G |
| CO-57 | | -3.7786E-03 | | | | | |
| | | | 122.07 | -3.779E-03 | %( | 5.935E-02 1.76E-02 | G K |
| | | | 136.43 | 0.000E+00 | & | 4.763E-01 1.41E-01 | G |
| CO-60 | | 2.8925E-02 | | | | | |
| | | | 1332.51 | 2.893E-02 | %(P | 6.941E-02 2.08E-02 | G K |
| | | | 1173.23 | 3.674E-02 | % P | 7.631E-02 2.32E-02 | G K |
| Sr-85 | | -2.2909E-02 | | | | | |
| | | | 514.00 | -2.291E-02 | %( | 7.771E-02 2.31E-02 | G |
| Kr-85 | | -5.4587E+02 | | | | | |
| | | | 513.99 | -5.459E+02 | %(P | 1.731E+03 5.12E+02 | G |
| Y-88 | | -1.2904E-03 | | | | | |
| | | | 1836.01 | -1.290E-03 | %( | 6.720E-02 1.68E-02 | G K |
| | | | 898.02 | -2.802E-02 | % P | 9.719E-02 2.86E-02 | G |
| NB-94 | | 1.7919E-02 | | | | | |
| | | | 871.10 | 1.792E-02 | %(P | 5.935E-02 1.73E-02 | G K |
| | | | 702.50 | 1.103E-02 | & P | 6.297E-02 1.81E-02 | G K |
| Ag-108M | | 7.0840E-04 | | | | | |
| | | | 722.95 | 7.084E-04 | &( | 5.121E-02 1.38E-02 | G K |
| | | | 614.37 | -1.940E-02 | % P | 7.316E-02 2.15E-02 | G |
| | | | 433.93 | -1.444E-03 | % | 6.287E-02 1.81E-02 | G |
| CD-109 | | 3.3442E-01 | | | | | |
| | | | 88.04 | 3.344E-01 | %(P | 1.872E+00 5.60E-01 | G |
| SN-113 | | 1.4884E-02 | | | | | |
| | | | 391.71 | 1.488E-02 | %( | 7.559E-02 2.21E-02 | G K |
| | | | 255.04 | -6.078E-01 | % P | 2.623E+00 7.81E-01 | G |

| Nuclide | Ave activity | Energy | Activity | Code | Peak | MDA | Comments |
|---|---|---|---|---|---|---|---|
| SB-125 | 3.3328E-02 | | | | | | |
| | | 427.95 | 3.333E-02 | %(P | 1.718E-01 | 5.02E-02 | G K |
| | | 600.77 | 6.635E-02 | % P | 3.093E-01 | 8.98E-02 | G |
| | | 636.15 | 2.489E-02 | & P | 4.862E-01 | 1.36E-01 | G |
| | | 463.51 | 2.366E-01 | % P | 4.829E-01 | 1.46E-01 | G |
| | | 176.29 | -1.205E-01 | % P | 8.580E-01 | 2.54E-01 | G |
| I-131 | 3.9176E-04 | | | | | | |
| | | 364.48 | 3.918E-04 | %( | 6.933E-02 | 1.97E-02 | G K |
| | | 636.97 | 1.185E-01 | % | 9.179E-01 | 2.59E-01 | G |
| | | 284.29 | 3.329E-02 | & | 1.078E+00 | 3.13E-01 | G |
| CS-134 | 1.5364E-02 | | | | | | |
| | | 604.66 | -1.809E-02 | &(P | 7.577E-02 | 2.22E-02 | G K |
| | | 795.76 | 5.359E-02 | (P | 5.949E-02 | 1.97E-02 | G |
| | | 569.29 | -2.797E-02 | & P | 4.159E-01 | 1.19E-01 | G |
| | | 801.84 | 9.604E-02 | % | 7.071E-01 | 2.01E-01 | G |
| CS-137 | 5.6043E-02 | | | | | | |
| | | 661.62 | 5.604E-02 | (P | 7.219E-02 | 2.28E-02 | G |
| CE-139 | 1.8281E-03 | | | | | | |
| | | 165.85 | 1.828E-03 | %(P | 6.572E-02 | 1.94E-02 | G |
| EU-152 | -1.1646E-02 | | | | | | |
| | | 121.78 | -1.165E-02 | %(P | 1.769E-01 | 5.24E-02 | G K |
| | | 344.30 | -3.290E-02 | % P | 1.915E-01 | 5.60E-02 | G |
| | | 1408.08 | 6.362E-03 | & P | 3.122E-01 | 8.17E-02 | G |
| | | 964.00 | -7.871E-03 | % P | 1.047E+00 | 3.03E-01 | G |
| | | 1112.07 | 3.786E-02 | & P | 5.520E-01 | 1.53E-01 | G |
| | | 778.90 | -4.494E-02 | % P | 4.172E-01 | 1.16E-01 | G |
| EU-154 | -1.9517E-03 | | | | | | |
| | | 123.10 | -1.952E-03 | %(P | 1.084E-01 | 3.19E-02 | G K |
| | | 1274.80 | -5.076E-02 | % P | 2.692E-01 | 7.73E-02 | G |
| | | 723.30 | -8.351E-02 | & P | 4.230E-01 | 1.23E-01 | G |
| | | 1004.80 | 8.461E-02 | % P | 4.129E-01 | 1.19E-01 | G |
| EU-155 | 1.3647E-02 | | | | | | |
| | | 86.45 | 1.365E-02 | %( | 1.920E-01 | 5.71E-02 | G K |
| | | 105.31 | 3.874E-02 | % | 2.590E-01 | 7.73E-02 | G |
| HG-203 | -1.3226E-02 | | | | | | |
| | | 279.17 | -1.323E-02 | &( | 6.690E-02 | 1.98E-02 | G K |
| | | 72.87 | -8.465E-01 | % P | 1.710E+00 | 5.18E-01 | G |
| | | 70.83 | -2.583E+00 | + | 2.907E+00 | 8.96E-01 | G |
| | | 82.50 | 1.270E-01 | % | 2.883E+00 | 8.55E-01 | G |

| Nuclide | Ave activity | Energy | Activity | Code | Peak | MDA | Comments |
|---|---|---|---|---|---|---|---|
| TL-208 | 2.9933E-01 | | | | | | |
| | | 583.14 | 2.993E-01 | (P | 7.389E-02 | 3.48E-02 | G |
| | | 510.72 | 5.245E-01 | + P | 2.599E-01 | 9.89E-02 | G |
| PB-212 | 9.3428E-01 | | | | | | |
| | | 238.63 | 9.343E-01 | (P | 8.450E-02 | 4.52E-02 | G K |
| | | | | | | | Energy duplication |
| | | 77.11 | 9.343E-01 | } | 3.022E-01 | 9.27E-02 | G |
| | | 74.81 | 1.482E+00 | + P | 5.332E-01 | 1.84E-01 | G |
| PB-214 | 7.3015E-01 | | | | | | |
| | | 351.99 | 7.084E-01 | (P | 1.372E-01 | 6.44E-02 | G K |
| | | 295.22 | 5.792E-01 | - P | 2.805E-01 | 1.08E-01 | G |
| | | | | | | | Energy duplication |
| | | 77.11 | 7.301E-01 | } P | 5.823E-01 | 1.80E-02 | G |
| | | 241.92 | 8.382E-01 | (P | 4.842E-01 | 1.64E-01 | G |
| BI-212 | 4.8994E-01 | | | | | | |
| | | 727.17 | 4.899E-01 | *(P | 5.994E-01 | 1.90E-01 | G K |
| | | 1620.56 | 1.866E-01 | % | 2.568E+00 | 6.82E-01 | G |
| | | 785.42 | 2.528E+00 | + P | 2.756E+00 | 9.07E-01 | G |
| BI-214 | 7.9974E-01 | | | | | | |
| | | 609.32 | 7.539E-01 | (P | 1.338E-01 | 7.02E-02 | G K |
| | | 1764.51 | 8.402E-01 | (P | 1.962E-01 | 1.51E-01 | G |
| | | 1120.28 | 8.973E-01 | @(P | 4.275E-01 | 1.82E-01 | G |
| RA-224 | 6.0197E-01 | | | | | | |
| | | 241.00 | 6.020E-01 | &(P | 1.544E+00 | 4.65E-01 | G |
| RA-226 | 1.9547E+00 | | | | | | |
| | | 185.99 | 1.955E+00 | @( | 1.438E+00 | 4.60E-01 | G |
| AC-228 | 9.7217E-01 | | | | | | |
| | | 911.07 | 8.933E-01 | (P | 2.386E-01 | 1.14E-01 | G K |
| | | 968.90 | 1.019E+00 | (P | 5.317E-01 | 2.36E-01 | G |
| | | 338.40 | 1.094E+00 | @(P | 4.280E-01 | 1.76E-01 | G |
| TH-227 | -8.9659E-03 | | | | | | |
| | | 236.00 | -8.966E-03 | %(P | 5.994E-01 | 1.77E-01 | G K |
| | | 256.25 | -1.510E-01 | & P | 7.196E-01 | 2.13E-01 | G |
| PA-234 | -7.7481E-03 | | | | | | |
| | | 98.44 | -7.748E-03 | &( | 2.336E-01 | 6.93E-02 | G K |
| | | 946.00 | 1.892E-02 | & | 4.014E-01 | 1.13E-01 | G |
| | | 131.28 | 1.219E-01 | & | 2.327E-01 | 7.08E-02 | G |
| | | 94.67 | -1.362E-01 | % | 4.304E-01 | 1.30E-01 | G |
| | | 883.24 | 1.192E-01 | % | 4.589E-01 | 1.32E-01 | G |
| | | 926.70 | -2.970E-02 | % | 6.662E-01 | 1.86E-01 | G |

| Nuclide | Ave activity | Energy | Activity | Code | Peak MDA | Comments |
|---|---|---|---|---|---|---|
| | | 569.26 | -3.476E-02 & | | 6.130E-01 1.75E-01 | G |
| TH-234 | 9.6660E-01 | | | | | |
| | | 63.29 | 2.607E-01 &(P | | 2.950E+00 8.76E-01 | G K |
| | | 92.80 | 1.884E+00 (P | | 2.155E+00 6.63E-01 | G |
| | | 92.38 | -3.116E-01 % P | | 2.605E+00 7.69E-01 | G |
| AM-241 | 4.6754E-02 | | | | | |
| | | 59.54 | 4.675E-02 &(P | | 3.384E-01 1.01E-01 | G |

( - This peak used in the nuclide activity average.

* - Peak is too wide, but only one peak in library.
! - Peak is part of a multiplet and this area went negative during deconvolution.
? - Peak is too narrow.
@ - Peak is too wide at FW25M, but ok at FWHM.
% - Peak fails sensitivity test.
$ - Peak identified, but first peak of this nuclide failed one or more qualification tests.
+ - Peak activity higher than counting uncertainty range.
- - Peak activity lower than counting uncertainty range.
= - Peak outside analysis energy range.
& - Calculated peak centroid is not close enough to the library energy centroid for positive identification.
P - Peakbackground subtraction
} - Peak is too close to another for the activity to be found directly.

| Nuclide Codes: | Peak Codes: |
|---|---|
| T - Thermal Neutron Activation | G - Gamma Ray |
| F - Fast Neutron Activation | X - X-Ray |
| I - Fission Product | P - Positron Decay |
| N - Naturally Occurring Isotope | S - Single-Escape |
| P - Photon Reaction | D - Double-Escape |
| C - Charged Particle Reaction | K - Key Line |
| M - No MDA Calculation | A - Not in Average |
| R - Coincidence Corrected | C - Coincidence Peak |
| H - Halflife limit exceeded | |

- - - - - - - - - - - - - - - - - - - - - - - - - - - - - - - - - - - - -

***** S U M M A R Y O F N U C L I D E S I N S A M P L E *****

| Nuclide | | Time of Count Activity pCi/gm | Time Corrected Activity pCi/gm | Uncertainty 3 Sigma Counting pCi/gm | Total pCi/gm | MDA pCi/gm |
|---|---|---|---|---|---|---|
| BE-7 | #A | -3.3409E-02 | -3.5106E-02 | 4.6204E-01 | 4.6204E-01 | 5.124E-01 |
| K-40 | | 1.8749E+01 | 1.8749E+01 | 2.4453E+00 | 2.6650E+00 | |
| MN-54 | #A | 3.1094E-02 | 3.1359E-02 | 5.8926E-02 | 5.8953E-02 | 6.425E-02 |
| CO-57 | #B | -3.7417E-03 | -3.7786E-03 | 5.2780E-02 | 5.2781E-02 | 5.878E-02 |
| CO-60 | #B | 2.8886E-02 | 2.8925E-02 | 6.2301E-02 | 6.2322E-02 | 6.932E-02 |

| | | | | | | |
|---|---|---|---|---|---|---|
| Sr-85 | #A | -2.1993E-02 | -2.2909E-02 | 6.9352E-02 | 6.9364E-02 | 7.460E-02 |
| Kr-85 | #A | -5.4586E+02 | -5.4587E+02 | 1.7680E+03 | 1.7683E+03 | 1.730E+03 |
| Y-88 | #B | -1.2588E-03 | -1.2904E-03 | 5.0511E-02 | 5.0511E-02 | 6.555E-02 |
| NB-94 | #B | 1.7919E-02 | 1.7919E-02 | 5.2012E-02 | 5.2022E-02 | 5.935E-02 |
| Ag-108M | #B | 7.0836E-04 | 7.0840E-04 | 4.1549E-02 | 4.1549E-02 | 5.121E-02 |
| CD-109 | #A | 3.3248E-01 | 3.3442E-01 | 1.6814E+00 | 1.6815E+00 | 1.861E+00 |
| SN-113 | #B | 1.4546E-02 | 1.4884E-02 | 6.6358E-02 | 6.6364E-02 | 7.387E-02 |
| SB-125 | #B | 3.3241E-02 | 3.3328E-02 | 1.5051E-01 | 1.5052E-01 | 1.714E-01 |
| I-131 | #B | 2.8192E-04 | 3.9176E-04 | 5.8972E-02 | 5.8972E-02 | 4.990E-02 |
| CS-134 | #B | 1.5310E-02 | 1.5364E-02 | 1.6905E-02 | 1.6927E-02 | 7.551E-02 |
| CS-137 | #A | 5.6029E-02 | 5.6043E-02 | 6.8471E-02 | 6.8545E-02 | 7.217E-02 |
| CE-139 | #A | 1.7933E-03 | 1.8281E-03 | 5.8240E-02 | 5.8240E-02 | 6.447E-02 |
| EU-152 | #B | -1.1639E-02 | -1.1646E-02 | 1.9787E-01 | 1.9787E-01 | 1.768E-01 |
| EU-154 | #B | -1.9500E-03 | -1.9517E-03 | 3.5441E-01 | 3.5441E-01 | 1.083E-01 |
| EU-155 | #B | 1.3627E-02 | 1.3647E-02 | 1.7125E-01 | 1.7125E-01 | 1.917E-01 |
| HG-203 | #B | -1.2496E-02 | -1.3226E-02 | 5.9447E-02 | 5.9451E-02 | 6.321E-02 |
| TL-208 | | 2.9933E-01 | 2.9933E-01 | 1.0432E-01 | 1.0568E-01 | |
| PB-212 | | 9.3428E-01 | 9.3428E-01 | 1.3556E-01 | 1.4548E-01 | |
| PB-214 | | 7.3015E-01 | 7.3015E-01 | 1.9929E-01 | 2.0351E-01 | |
| BI-212 | #A | 4.8994E-01 | 4.8994E-01 | 5.7087E-01 | 5.7154E-01 | 5.994E-01 |
| BI-214 | | 7.9974E-01 | 7.9974E-01 | 2.2332E-01 | 2.2785E-01 | |
| RA-224 | #A | 6.0197E-01 | 6.0197E-01 | 1.3960E+00 | 1.3964E+00 | 1.544E+00 |
| RA-226 | # | 1.9547E+00 | 1.9547E+00 | 1.3812E+00 | 1.3856E+00 | 1.438E+00 |
| AC-228 | | 9.7217E-01 | 9.7217E-01 | 3.0062E-01 | 3.0559E-01 | |
| TH-227 | #B | -8.9659E-03 | -8.9659E-03 | 9.6618E-01 | 9.6618E-01 | 5.994E-01 |
| PA-234 | #B | -7.7481E-03 | -7.7481E-03 | 2.0794E-01 | 2.0794E-01 | 2.336E-01 |
| TH-234 | #B | 9.6660E-01 | 9.6660E-01 | 1.0211E+00 | 1.0225E+00 | 2.950E+00 |
| AM-241 | #A | 4.6753E-02 | 4.6754E-02 | 3.0193E-01 | 3.0194E-01 | 3.384E-01 |

# - All peaks for activity calculation had bad shape.
* - Activity omitted from total
& - Activity omitted from total and all peaks had bad shape.
< - MDA value printed.
A - Activity printed, but activity < MDA.
B - Activity < MDA and failed test.
C - Area < Critical level.
F - Failed fraction or key line test.
H - Halflife limit exceeded

---------- S U M M A R Y ----------

Total Activity ( 269.6 to 1999.1 keV) 2.2484791E+01 pCi/gm
Total Decayed Activity ( 269.6 to 1999.1 keV) 2.2484791E+01 pCi/gm

The library has energies which are not separable.

Analyzed by: _____
JJM

Reviewed by: _____
Supervisor

Laboratory: YAEC Chemistry Lab

YAEC Chemistry Lab Spectrum name: 101F_16SEPT2006_0943.An1

Sample description
FSS-SSS-01-01-013-F

Spectrum Filename: C:\GammaVision\Spectra\101F_16SEPT2006_0943.An1

Acquisition information

| | |
|---|---|
| Start time: | 16-Sep-2006 09:43:07 |
| Live time: | 2000 |
| Real time: | 2002 |
| Dead time: | 0.12 % |
| Detector ID: | 1 |

Detector system
Det 101- DSPE-633

Calibration

| | |
|---|---|
| Filename: | D1_1LSa.Clb |

Detector 101 1.0 Liter Marinelli Sand

Energy Calibration

| | |
|---|---|
| Created: | 03-Sep-2004 08:50:48 |
| Zero offset: | 0.244 keV |
| Gain: | 0.500 keV/channel |
| Quadratic: | -2.493E-08 keV/channel^2 |

Efficiency Calibration

| | |
|---|---|
| Created: | 03-Sep-2004 08:52:26 |
| Type: | Polynomial |
| Uncertainty: | 0.626 % |
| Coefficients: | -0.321775 -5.816463 0.734234 |
| | -0.099357 0.006049 -0.000149 |

Library Files

| | |
|---|---|
| Main analysis library: | FSS_Rev_1.Lib |
| Library Match Width: | 1.000 |
| Peak stripping: | Library based |

Analysis parameters

| | |
|---|---|
| Analysis engine: | Env32 G53W4.20 |
| Start channel: | 100 ( 50.23keV ) |
| Stop channel: | 4000 ( 1999.11keV ) |
| Peak rejection level: | 41.667% |
| Peak search sensitivity: | 3 |
| Sample Size: | 1.9530E+03 |
| Activity scaling factor: | 1.0000E+06/( 1.0000E+00* 1.9530E+03) = 5.1203E+02 |
| Detection limit method: | Nureg 4.16 |
| Random error: | 1.0000000E+00 |
| Systematic error: | 1.0000000E+00 |

| | |
|---|---|
| Fraction Limit: | 0.000% |
| Background width: | average of five points. |

YAEC Chemistry Lab Spectrum name: 101F_16SEPT2006_0943.An1

Half lives decay limit: 12.000
Activity range factor: 2.000
Min. step backg. energy 0.000
Multiplet shift channel 2.000

| Corrections | Status | Comments |
|---|---|---|
| Decay correct to date: | YES | 09-Sep-2006 13:37:00 |
| Decay during acquisition: | NO | |
| Decay during collection: | NO | |
| True coincidence correction: | NO | |
| Peaked background correction: | YES | 101_150K_28APR05.Pbc 01-May-2005 05:24:47 |
| Absorption (Internal): | NO | |
| Geometry correction: | NO | |
| Random summing: | NO | |

total peaks alloc. 15 cutoff 20.00000 %
Energy Calibration
Normalized diff: 0.0941

***** S U M M A R Y O F P E A K S I N R A N G E *****

| Peak Energy | Area | Uncert | FWHM | Corrctn Factor | Nuclide Energy | Brnch. Ratio | Act. pCi/gm | Nuc |
|---|---|---|---|---|---|---|---|---|
| 74.39 | 202. | 19.27 | 1.00 | 1.651E-02 | 70.83 | 3.520 | 2.909E+00 | HG203 |
| | | | | | 74.81 | 9.600 | 8.580E-01 | PB212 |
| 77.39 | 378. | 10.14 | 1.01 | 1.736E-02 | 77.11 | 17.500 | 8.681E-01 | PB212 |
| | | | | | 77.11 | 10.700 | 1.406E+00 | PB214 |
| 93.16 | 156. | 30.97 | 1.50 | 1.989E-02 | 92.38 | 2.570 | PBC<MDA | TH234 |
| | | | | | 92.80 | 3.000 | PBC<MDA | TH234 |
| | | | | | 98.44 | 25.100 | PBC<MDA | PA234 |
| 93.17 | 149. | 31.82 | 1.50 | 1.985E-02 | 92.38 | 2.570 | PBC<MDA | TH234 |
| | | | | | 92.80 | 3.000 | PBC<MDA | TH234 |
| | | | | | 98.44 | 25.100 | PBC<MDA | PA234 |
| 186.34 | 135. | 29.23 | 1.01 | 1.856E-02 | 185.99 | 3.280 | 1.535E+00 | RA226 |
| 209.39 | 103. | 29.24 | 1.34 | 1.721E-02 | | | | |
| 238.79 | 857. | 4.10 | 1.12 | 1.557E-02 | 238.63 | 43.100 | 8.775E-01 | PB212 |
| 241.55 | 155. | 16.96 | 1.12 | 1.542E-02 | 241.00 | 3.900 | 1.772E+00 | RA224 |
| 270.44 | 118. | 28.09 | 1.39 | 1.399E-02 | | | | |
| 295.44 | 240. | 11.69 | 1.26 | 1.291E-02 | 295.22 | 19.200 | 6.645E-01 | PB214 |
| 300.66 | 78. | 31.87 | 1.31 | 1.270E-02 | | | | |
| 338.49 | 179. | 16.35 | 0.93 | 1.135E-02 | 338.40 | 12.010 | 8.975E-01 | AC228 |
| 352.00 | 422. | 7.84 | 1.29 | 1.092E-02 | 351.99 | 37.100 | 7.165E-01 | PB214 |
| 463.07 | 37. | 41.47 | 1.50 | 8.342E-03 | 463.51 | 10.000 | PBC<MDA | SB125 |
| 510.99 | 112. | 15.96 | 0.98 | 7.587E-03 | 510.72 | 22.500 | 3.896E-01 | TL208 |
| 583.27 | 262. | 8.61 | 1.37 | 6.683E-03 | 583.14 | 86.000 | 3.127E-01 | TL208 |
| 609.29 | 294. | 8.27 | 1.55 | 6.413E-03 | 609.32 | 46.090 | 6.848E-01 | BI214 |
| 727.16 | 84. | 23.25 | 1.39 | 5.443E-03 | 727.17 | 11.800 | 8.977E-01 | BI212 |
| 795.10 | 32. | 35.84 | 1.50 | 5.016E-03 | 795.76 | 85.400 | PBC<MDA | CS134 |
| 911.24 | 171. | 12.15 | 1.50 | 4.446E-03 | 911.07 | 29.000 | 9.086E-01 | AC228 |
| 968.92 | 138. | 15.64 | 2.11 | 4.212E-03 | 968.90 | 17.460 | 1.292E+00 | AC228 |

| | | | | | | | | |
|---|---|---|---|---|---|---|---|---|
| 1120.24 | 63. | 24.17 | 0.95 | 3.711E-03 | 1120.28 | 15.040 | 7.714E-01 | BI214 |
| 1460.96 | 973. | 3.26 | 1.69 | 2.942E-03 | 1460.75 | 10.700 | 2.132E+01 | K40 |

| pk energy | area | uncert | fwhm | corr | nuclide | brnch. | act. | nuc |
|---|---|---|---|---|---|---|---|---|
| 1764.77 | 49. | 14.29 | 2.02 | 2.481E-03 | 1764.51 | 15.920 | 8.506E-01 | BI214 |

********** U N I D E N T I F I E D P E A K S U M M A R Y **********

| Peak Channel | Centroid Energy | Background Counts | Net Area Counts | Intensity Cts/Sec | Uncert 3 Sigma % | FWHM keV | Suspected Nuclide | |
|---|---|---|---|---|---|---|---|---|
| 148.34 | 74.72 | 658. | 202. | 0.101 | 57.82 | 1.005 | BI-207 | D |
| 154.34 | 77.72 | 545. | 378. | 0.189 | 30.43 | 1.007 | PB-214 | D |
| 418.46 | 209.39 | 362. | 103. | 0.051 | 87.71 | 1.336 | AC-228 | s |
| 477.28 | 238.74 | 189. | 857. | 0.429 | 12.30 | 1.122 | PB-212 | D |
| 482.79 | 241.49 | 268. | 155. | 0.077 | 50.88 | 1.124 | PB-214 | D |
| 540.60 | 270.44 | 336. | 118. | 0.059 | 84.27 | 1.387 | AC-228 | s |
| 601.08 | 300.66 | 216. | 78. | 0.039 | 95.61 | 1.309 | PB-212 | s |

s - Peak fails shape tests.
D - Peak area deconvoluted.
L - Peak written from unknown list.
C - Area < Critical level.

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This section based on library: FSS_Rev_1.Lib

********** I D E N T I F I E D P E A K S U M M A R Y **********

| Nuclide | Peak Channel | Centroid Energy | Background Counts | Net Area Counts | Intensity Cts/Sec | Uncert 3 Sigma % | FWHM keV |
|---|---|---|---|---|---|---|---|
| HG-203 | 146.80 | 73.61 | 1392. | -149. | -0.075 | 108.94 | 1.499s |
| PB-212 | 149.27 | 74.85 | 1395. | 242. | 0.121 | 66.65 | 1.499 |
| PB-212 | 153.79 | 77.11 | 1265. | 352. | 0.176 | 45.79 | 1.499D |
| PB-214 | 153.79 | 77.11 | 1269. | 348. | 0.174 | 45.79 | 1.499D |
| TH-234 | 185.92 | 93.17 | 1226. | 149. | 0.075 | 95.46 | 1.499s |
| TH-234 | 185.91 | 93.16 | 1189. | 156. | 0.078 | 92.91 | 1.499s |
| RA-226 | 372.24 | 186.29 | 634. | 101. | 0.050 | 110.18 | 1.499s |
| PB-212 | 477.18 | 238.74 | 552. | 700. | 0.350 | 18.03 | 1.499 |
| RA-224 | 483.22 | 241.76 | 613. | 133. | 0.067 | 82.59 | 1.499 |
| PB-214 | 590.63 | 295.44 | 252. | 213. | 0.106 | 37.36 | 1.499 |
| AC-228 | 676.77 | 338.49 | 228. | 177. | 0.088 | 49.06 | 0.935 |
| PB-214 | 703.97 | 352.09 | 159. | 380. | 0.190 | 20.73 | 1.499 |
| TL-208 | 1021.91 | 510.99 | 103. | 96. | 0.048 | 47.87 | 0.976s |
| TL-208 | 1166.56 | 583.27 | 94. | 260. | 0.130 | 25.84 | 1.373 |
| BI-214 | 1218.62 | 609.29 | 94. | 292. | 0.146 | 24.80 | 1.551s |
| BI-212 | 1454.48 | 727.16 | 86. | 83. | 0.042 | 69.76 | 1.389s |
| CS-134 | 1590.43 | 795.10 | 51. | 32. | 0.016 | 107.52 | 1.502s |
| AC-228 | 1822.82 | 911.24 | 79. | 169. | 0.085 | 36.44 | 1.501 |
| AC-228 | 1938.26 | 968.92 | 92. | 137. | 0.069 | 46.91 | 2.110s |
| BI-214 | 2241.07 | 1120.24 | 60. | 62. | 0.031 | 72.51 | 0.954s |
| K-40 | 2922.94 | 1460.96 | 14. | 970. | 0.485 | 9.78 | 1.692 |

| Nuclide | Channel | Energy | Background | Net area | Cnts/sec | Uncert | FWHM |
|---|---|---|---|---|---|---|---|
| BI-214 | 3530.98 | 1764.77 | 0. | 49. | 0.024 | 42.86 | 2.022 |

s - Peak fails shape tests.
D - Peak area deconvoluted.
A Derived peak area.

***** S U M M A R Y O F L I B R A R Y P E A K U S A G E *****

| - Nuclide - Name | Code | Average Activity pCi/gm | Peak Energy keV | Peak Activity pCi/gm | Code | MDA Value pCi/gm | COMMENTS |
|---|---|---|---|---|---|---|---|
| BE-7 | | -1.3399E-01 | | | | | |
| | | | 477.56 | -1.340E-01 | &( | 4.976E-01 1.48E-01 | G |
| K-40 | | 2.1325E+01 | | | | | |
| | | | 1460.75 | 2.132E+01 | (P | 4.383E-01 6.97E-01 | G |
| MN-54 | | 5.3019E-03 | | | | | |
| | | | 834.81 | 5.302E-03 | &(P | 5.894E-02 1.69E-02 | G |
| CO-57 | | 5.1650E-03 | | | | | |
| | | | 122.07 | 5.165E-03 | %( | 5.446E-02 1.63E-02 | G K |
| | | | 136.43 | -9.360E-02 | % | 4.652E-01 1.40E-01 | G |
| CO-60 | | -1.8848E-04 | | | | | |
| | | | 1332.51 | -1.885E-04 | %(P | 8.830E-02 2.50E-02 | G K |
| | | | 1173.23 | 1.737E-02 | % P | 8.471E-02 2.48E-02 | G K |
| Sr-85 | | -2.5592E-02 | | | | | |
| | | | 514.00 | -2.559E-02 | %( | 6.560E-02 1.97E-02 | G |
| Kr-85 | | -5.7432E+02 | | | | | |
| | | | 513.99 | -5.743E+02 | %(P | 1.412E+03 4.24E+02 | G |
| Y-88 | | 0.0000E+00 | | | | | |
| | | | 1836.01 | 0.000E+00 | %( | 2.244E-02 3.04E-03 | G K |
| | | | 898.02 | -9.180E-03 | % P | 5.859E-02 1.68E-02 | G |
| NB-94 | | -1.0742E-02 | | | | | |
| | | | 871.10 | -1.074E-02 | %(P | 6.112E-02 1.78E-02 | G K |
| | | | 702.50 | 1.163E-02 | % P | 4.764E-02 1.40E-02 | G K |
| Ag-108M | | 2.7755E-03 | | | | | |
| | | | 722.95 | 2.775E-03 | %( | 6.167E-02 1.77E-02 | G K |
| | | | 614.37 | -7.263E-04 | & P | 6.372E-02 1.84E-02 | G |
| | | | 433.93 | -1.222E-02 | % | 5.678E-02 1.68E-02 | G |

| Nuclide | Ave activity | Energy | Activity | Code | Peak | MDA | Comments |
|---|---|---|---|---|---|---|---|
| CD-109 | -4.0804E-01 | | | | | | |
| | | 88.04 | -4.080E-01 | %(P | 1.729E+00 | 5.21E-01 | G |
| SN-113 | -1.2155E-03 | | | | | | |
| | | 391.71 | -1.216E-03 | &( | 8.036E-02 | 2.35E-02 | G K |
| | | 255.04 | -3.209E-01 | % P | 2.187E+00 | 6.50E-01 | G |
| SB-125 | -3.2294E-02 | | | | | | |
| | | 427.95 | -3.229E-02 | %(P | 1.766E-01 | 5.22E-02 | G K |
| | | 600.77 | -5.539E-03 | % P | 2.671E-01 | 7.63E-02 | G |
| | | 636.15 | 5.961E-02 | & P | 4.559E-01 | 1.32E-01 | G |
| | | 463.51 | 3.089E-01 | & P | 4.294E-01 | 1.33E-01 | G |
| | | 176.29 | 1.202E-01 | & P | 7.311E-01 | 2.19E-01 | G |
| I-131 | 1.3007E-03 | | | | | | |
| | | 364.48 | 1.301E-03 | %( | 9.226E-02 | 2.68E-02 | G K |
| | | 636.97 | 1.213E-01 | & | 1.143E+00 | 3.29E-01 | G |
| | | 284.29 | -1.454E-01 | & | 1.166E+00 | 3.44E-01 | G |
| CS-134 | 2.1249E-02 | | | | | | |
| | | 604.66 | -5.386E-03 | %(P | 1.118E-01 | 3.31E-02 | G K |
| | | 795.76 | 5.169E-02 | @(P | 5.848E-02 | 1.88E-02 | G |
| | | 569.29 | 7.149E-02 | & P | 2.857E-01 | 8.40E-02 | G |
| | | 801.84 | -1.367E-01 | & | 7.373E-01 | 2.16E-01 | G |
| CS-137 | 2.4943E-02 | | | | | | |
| | | 661.62 | 2.494E-02 | &(P | 6.430E-02 | 1.93E-02 | G |
| CE-139 | -1.4865E-04 | | | | | | |
| | | 165.85 | -1.487E-04 | &(P | 5.785E-02 | 1.72E-02 | G |
| EU-152 | 1.0881E-02 | | | | | | |
| | | 121.78 | 1.088E-02 | %(P | 1.619E-01 | 4.83E-02 | G K |
| | | 344.30 | 2.917E-02 | % P | 1.485E-01 | 4.39E-02 | G |
| | | 1408.08 | 4.897E-02 | % P | 2.448E-01 | 6.92E-02 | G |
| | | 964.00 | 2.806E-01 | % P | 4.841E-01 | 1.48E-01 | G |
| | | 1112.07 | 1.412E-01 | % P | 5.250E-01 | 1.54E-01 | G |
| | | 778.90 | -3.859E-04 | % P | 4.410E-01 | 1.25E-01 | G |
| EU-154 | 1.6269E-02 | | | | | | |
| | | 123.10 | 1.627E-02 | &(P | 1.147E-01 | 3.43E-02 | G K |
| | | 1274.80 | -2.290E-02 | % P | 2.135E-01 | 6.11E-02 | G |
| | | 723.30 | 3.997E-02 | % P | 2.045E-01 | 5.89E-02 | G |
| | | 1004.80 | -1.010E-02 | % P | 3.363E-01 | 9.45E-02 | G |

| Nuclide | Ave activity | Energy | Activity | Code | Peak | MDA | Comments |
|---|---|---|---|---|---|---|---|
| EU-155 | 6.5042E-02 | | | | | | |
| | | 86.45 | 6.504E-02 | %( | 1.572E-01 | 4.76E-02 | G K |
| | | 105.31 | 7.843E-02 | & | 2.027E-01 | 6.13E-02 | G |
| HG-203 | 3.0904E-02 | | | | | | |
| | | 279.17 | 3.090E-02 | %( | 5.038E-02 | 1.54E-02 | G K |
| | | 72.87 | -5.877E-01 | % P | 1.494E+00 | 4.52E-01 | G |
| | | 70.83 | -2.146E+00 | - | 2.541E+00 | 7.79E-01 | G |
| | | 82.50 | -8.638E-01 | % | 2.966E+00 | 8.94E-01 | G |
| TL-208 | 3.2869E-01 | | | | | | |
| | | 583.14 | 3.127E-01 | (P | 5.769E-02 | 2.72E-02 | G |
| | | 510.72 | 3.896E-01 | *(P | 2.024E-01 | 7.26E-02 | G |
| PB-212 | 7.4628E-01 | | | | | | |
| | | 238.63 | 7.211E-01 | (P | 1.157E-01 | 4.37E-02 | G K |
| | | | | | | | Energy duplication |
| | | 77.11 | 8.084E-01 | ( | 3.872E-01 | 1.23E-01 | G |
| | | 74.81 | 1.056E+00 | & P | 7.702E-01 | 2.40E-01 | G |
| PB-214 | 6.3005E-01 | | | | | | |
| | | 351.99 | 6.487E-01 | (P | 1.051E-01 | 4.51E-02 | G K |
| | | 295.22 | 5.941E-01 | (P | 2.140E-01 | 7.46E-02 | G |
| | | | | | | | Energy duplication |
| | | 77.11 | 1.308E+00 | + P | 6.341E-01 | 2.02E-01 | G |
| | | 241.92 | -3.886E-01 | % P | 7.602E-01 | 2.31E-01 | G |
| BI-212 | 8.9766E-01 | | | | | | |
| | | 727.17 | 8.977E-01 | *(P | 4.939E-01 | 2.10E-01 | G K |
| | | 1620.56 | 3.410E-01 | % | 1.648E+00 | 4.59E-01 | G |
| | | 785.42 | 1.361E+00 | % P | 2.976E+00 | 9.00E-01 | G |
| BI-214 | 7.3593E-01 | | | | | | |
| | | 609.32 | 6.848E-01 | *(P | 1.118E-01 | 5.68E-02 | G K |
| | | 1764.51 | 8.506E-01 | (P | 1.291E-01 | 1.23E-01 | G |
| | | 1120.28 | 7.714E-01 | (P | 4.803E-01 | 1.88E-01 | G |
| RA-224 | 1.5298E+00 | | | | | | |
| | | 241.00 | 1.530E+00 | (P | 1.357E+00 | 4.23E-01 | G |
| RA-226 | 1.1431E+00 | | | | | | |
| | | 185.99 | 1.143E+00 | *( | 1.362E+00 | 4.20E-01 | G |
| AC-228 | 9.0539E-01 | | | | | | |
| | | 911.07 | 9.086E-01 | (P | 2.363E-01 | 1.12E-01 | G K |
| | | 968.90 | 1.292E+00 | + P | 4.454E-01 | 2.03E-01 | G |
| | | 338.40 | 8.975E-01 | (P | 3.711E-01 | 1.49E-01 | G |

| Nuclide | Ave activity | Energy | Activity | Code | Peak | MDA | Comments |
|---|---|---|---|---|---|---|---|
| TH-227 | -2.7981E-01 | | | | | | |
| | | 236.00 | -2.798E-01 | %(P | 5.208E-01 | 1.58E-01 | G K |
| | | 256.25 | 8.486E-02 | % P | 5.626E-01 | 1.67E-01 | G |
| PA-234 | 1.7065E-02 | | | | | | |
| | | 98.44 | 1.707E-02 | %( | 1.558E-01 | 4.64E-02 | G K |
| | | 946.00 | -6.778E-02 | % | 3.284E-01 | 9.59E-02 | G |
| | | 131.28 | -1.810E-03 | % | 2.044E-01 | 6.07E-02 | G |
| | | 94.67 | -1.413E-01 | % | 3.734E-01 | 1.13E-01 | G |
| | | 883.24 | -8.471E-02 | % | 4.650E-01 | 1.35E-01 | G |
| | | 926.70 | 5.438E-03 | & | 4.459E-01 | 1.24E-01 | G |
| | | 569.26 | 1.096E-01 | & | 4.201E-01 | 1.24E-01 | G |
| TH-234 | 1.5689E+00 | | | | | | |
| | | 63.29 | 1.084E+00 | %(P | 2.354E+00 | 7.12E-01 | G K |
| | | 92.80 | 1.811E+00 | *(P | 1.894E+00 | 5.83E-01 | G |
| | | 92.38 | 2.022E+00 | *(P | 2.250E+00 | 6.90E-01 | G |
| AM-241 | -4.4092E-03 | | | | | | |
| | | 59.54 | -4.409E-03 | %(P | 2.909E-01 | 8.64E-02 | G |

( - This peak used in the nuclide activity average.

* - Peak is too wide, but only one peak in library.
! - Peak is part of a multiplet and this area went negative during deconvolution.
? - Peak is too narrow.
@ - Peak is too wide at FW25M, but ok at FWHM.
% - Peak fails sensitivity test.
$ - Peak identified, but first peak of this nuclide failed one or more qualification tests.
+ - Peak activity higher than counting uncertainty range.
- - Peak activity lower than counting uncertainty range.
= - Peak outside analysis energy range.
& - Calculated peak centroid is not close enough to the library energy centroid for positive identification.
P - Peakbackground subtraction
} - Peak is too close to another for the activity to be found directly.

| Nuclide Codes: | Peak Codes: |
|---|---|
| T - Thermal Neutron Activation | G - Gamma Ray |
| F - Fast Neutron Activation | X - X-Ray |
| I - Fission Product | P - Positron Decay |
| N - Naturally Occurring Isotope | S - Single-Escape |
| P - Photon Reaction | D - Double-Escape |
| C - Charged Particle Reaction | K - Key Line |
| M - No MDA Calculation | A - Not in Average |

R - Coincidence Corrected C - Coincidence Peak
H - Halflife limit exceeded

- - - - - - - - - - - - - - - - - - - - - - - - - - - - - - - - - - - - - - -

***** S U M M A R Y O F N U C L I D E S I N S A M P L E *****

| Nuclide | | Time of Count Activity pCi/gm | Time Corrected Activity pCi/gm | Uncertainty 3 Sigma Counting pCi/gm | Total pCi/gm | MDA pCi/gm |
|---|---|---|---|---|---|---|
| BE-7 | #A | -1.2261E-01 | -1.3399E-01 | 4.4321E-01 | 4.4328E-01 | 4.554E-01 |
| K-40 | | 2.1325E+01 | 2.1325E+01 | 2.0908E+00 | 2.4132E+00 | |
| MN-54 | #A | 5.2221E-03 | 5.3019E-03 | 5.0670E-02 | 5.0671E-02 | 5.806E-02 |
| CO-57 | #B | 5.0751E-03 | 5.1650E-03 | 4.8810E-02 | 4.8811E-02 | 5.351E-02 |
| CO-60 | #B | -1.8801E-04 | -1.8848E-04 | 1.2996E-02 | 1.2996E-02 | 8.808E-02 |
| Sr-85 | #A | -2.3788E-02 | -2.5592E-02 | 5.9239E-02 | 5.9256E-02 | 6.098E-02 |
| Kr-85 | #A | -5.7429E+02 | -5.7432E+02 | 1.3874E+03 | 1.3878E+03 | 1.412E+03 |
| Y-88 | #B | 0.0000E+00 | 0.0000E+00 | 9.1331E-03 | 9.1347E-03 | 2.146E-02 |
| NB-94 | #B | -1.0742E-02 | -1.0742E-02 | 5.5267E-02 | 5.5270E-02 | 6.112E-02 |
| Ag-108M | #B | 2.7752E-03 | 2.7755E-03 | 5.3033E-02 | 5.3033E-02 | 6.167E-02 |
| CD-109 | #A | -4.0380E-01 | -4.0804E-01 | 1.5961E+00 | 1.5963E+00 | 1.711E+00 |
| SN-113 | #B | -1.1665E-03 | -1.2155E-03 | 7.0435E-02 | 7.0435E-02 | 7.712E-02 |
| SB-125 | #B | -3.2143E-02 | -3.2294E-02 | 1.6503E-01 | 1.6504E-01 | 1.758E-01 |
| I-131 | #B | 7.2141E-04 | 1.3007E-03 | 8.0517E-02 | 8.0517E-02 | 5.117E-02 |
| CS-134 | #B | 2.1116E-02 | 2.1249E-02 | 2.3146E-02 | 2.3178E-02 | 1.111E-01 |
| CS-137 | #A | 2.4932E-02 | 2.4943E-02 | 5.7752E-02 | 5.7769E-02 | 6.428E-02 |
| CE-139 | #A | -1.4362E-04 | -1.4865E-04 | 3.3738E-02 | 3.3738E-02 | 5.589E-02 |
| EU-152 | #B | 1.0870E-02 | 1.0881E-02 | 1.4495E-01 | 1.4495E-01 | 1.617E-01 |
| EU-154 | #B | 1.6244E-02 | 1.6269E-02 | 1.0302E-01 | 1.0302E-01 | 1.146E-01 |
| EU-155 | #B | 6.4872E-02 | 6.5042E-02 | 1.4265E-01 | 1.4270E-01 | 1.568E-01 |
| HG-203 | #B | 2.7915E-02 | 3.0904E-02 | 4.6292E-02 | 4.6325E-02 | 4.551E-02 |
| TL-208 | | 3.2869E-01 | 3.2869E-01 | 8.5710E-02 | 8.7699E-02 | |
| PB-212 | # | 7.4628E-01 | 7.4628E-01 | 1.3571E-01 | 1.4211E-01 | 1.157E-01 |
| PB-214 | # | 6.3005E-01 | 6.3005E-01 | 1.3132E-01 | 1.3606E-01 | 1.051E-01 |
| BI-212 | # | 8.9766E-01 | 8.9766E-01 | 6.3128E-01 | 6.3331E-01 | |
| BI-214 | | 7.3593E-01 | 7.3593E-01 | 1.8323E-01 | 1.8789E-01 | |
| RA-224 | # | 1.5298E+00 | 1.5298E+00 | 1.2702E+00 | 1.2731E+00 | 1.357E+00 |
| RA-226 | #A | 1.1431E+00 | 1.1431E+00 | 1.2595E+00 | 1.2612E+00 | 1.362E+00 |
| AC-228 | | 9.0539E-01 | 9.0539E-01 | 2.7994E-01 | 2.8458E-01 | |
| TH-227 | #B | -2.7981E-01 | -2.7981E-01 | 4.8067E-01 | 4.8093E-01 | 5.208E-01 |
| PA-234 | #B | 1.7065E-02 | 1.7065E-02 | 1.3922E-01 | 1.3922E-01 | 1.558E-01 |
| TH-234 | #B | 1.5689E+00 | 1.5689E+00 | 1.2663E+00 | 1.2693E+00 | 2.354E+00 |
| AM-241 | #A | -4.4091E-03 | -4.4092E-03 | 6.8216E-01 | 6.8216E-01 | 2.908E-01 |

# - All peaks for activity calculation had bad shape.
* - Activity omitted from total
& - Activity omitted from total and all peaks had bad shape.
< - MDA value printed.
A - Activity printed, but activity < MDA.
B - Activity < MDA and failed test.
C - Area < Critical level.
F - Failed fraction or key line test.

H – Halflife limit exceeded

YAEC Chemistry Lab Spectrum name: 101F_16SEPT2006_0943.An1

---------- S U M M A R Y ----------

Total Activity ( 270.1 to 1999.1 keV) 2.4192537E+01 pCi/gm
Total Decayed Activity ( 270.1 to 1999.1 keV) 2.4192537E+01 pCi/gm

The library has energies which are not separable.

Analyzed by: _____
JJM

Reviewed by: _____
Supervisor

Laboratory: YAEC Chemistry Lab

YAEC Chemistry Lab Spectrum name: 102F_15SEPT2006_1023.An1

Sample description
FSS- SSS-01-01-019-F

Spectrum Filename: C:\GammaVision\Spectra\102F_15SEPT2006_1023.An1

Acquisition information

| | |
|---|---|
| Start time: | 15-Sep-2006 10:23:03 |
| Live time: | 2000 |
| Real time: | 2020 |
| Dead time: | 0.99 % |
| Detector ID: | 3 |

Detector system
Det 102 - DSPP-468

Calibration

| | |
|---|---|
| Filename: | D2_1LSa.Clb |

DET 102 1 Liter Sand Geometry

Energy Calibration

| | |
|---|---|
| Created: | 15-Jan-2005 03:09:29 |
| Zero offset: | 0.220 keV |
| Gain: | 0.500 keV/channel |
| Quadratic: | -6.435E-08 keV/channel^2 |

Efficiency Calibration

| | |
|---|---|
| Created: | 15-Jan-2005 06:48:10 |
| Type: | Polynomial |
| Uncertainty: | 0.497 % |
| Coefficients: | -0.294180 -5.980622 0.744607 |
| | -0.096737 0.005214 -0.000120 |

Library Files

| | |
|---|---|
| Main analysis library: | FSS_Rev_1.Lib |
| Library Match Width: | 1.000 |
| Peak stripping: | Library based |

Analysis parameters

| | |
|---|---|
| Analysis engine: | Env32 G53W4.20 |
| Start channel: | 100 ( 50.22keV ) |
| Stop channel: | 4000 ( 1999.02keV ) |
| Peak rejection level: | 41.667% |
| Peak search sensitivity: | 3 |
| Sample Size: | 1.7210E+03 |
| Activity scaling factor: | 1.0000E+06/( 1.0000E+00* 1.7210E+03) = 5.8106E+02 |
| Detection limit method: | Nureg 4.16 |
| Random error: | 1.0000000E+00 |
| Systematic error: | 1.0000000E+00 |

| | |
|---|---|
| Fraction Limit: | 0.000% |
| Background width: | average of five points. |

YAEC Chemistry Lab Spectrum name: 102F_15SEPT2006_1023.An1

Half lives decay limit: 12.000
Activity range factor: 2.000
Min. step backg. energy 0.000
Multiplet shift channel 2.000

| Corrections | Status | Comments |
|---|---|---|
| Decay correct to date: | YES | 08-Sep-2006 15:18:00 |
| Decay during acquisition: | NO | |
| Decay during collection: | NO | |
| True coincidence correction: | NO | |
| Peaked background correction: | YES | 102_150K_28APR05.Pbc 01-May-2005 05:27:47 |
| Absorption (Internal): | NO | |
| Geometry correction: | NO | |
| Random summing: | NO | |

total peaks alloc. 13 cutoff 20.00000 %
Energy Calibration
Normalized diff: 0.6968

***** S U M M A R Y O F P E A K S I N R A N G E *****

| Peak Energy | Area | Uncert | FWHM | Corrctn Factor | Nuclide Energy | Brnch. Ratio | Act. pCi/gm | Nuc |
|---|---|---|---|---|---|---|---|---|
| 77.38 | 211. | 13.54 | 1.10 | 9.670E-03 | 77.11 | 10.700 | 1.625E+00 | PB214 |
| | | | | | 77.11 | 17.500 | 9.937E-01 | PB212 |
| 93.33 | 102. | 41.60 | 1.50 | 1.333E-02 | 92.38 | 2.570 | PBC<MDA | TH234 |
| | | | | | 92.80 | 3.000 | 2.011E+00 | TH234 |
| 186.23 | 79. | 33.48 | 1.23 | 1.626E-02 | 185.99 | 3.280 | PBC<MDA | RA226 |
| 209.48 | 92. | 32.36 | 0.92 | 1.518E-02 | | | | |
| 239.08 | 699. | 4.36 | 1.22 | 1.379E-02 | 238.63 | 43.100 | 9.228E-01 | PB212 |
| 241.99 | 129. | 20.49 | 1.22 | 1.365E-02 | 241.00 | 3.900 | 1.880E+00 | RA224 |
| | | | | | 241.92 | 7.470 | 9.935E-01 | PB214 |
| 276.94 | 55. | 40.32 | 1.22 | 1.216E-02 | | | | |
| 295.77 | 173. | 14.03 | 1.15 | 1.145E-02 | 295.22 | 19.200 | 6.182E-01 | PB214 |
| 338.88 | 110. | 13.73 | 1.29 | 1.005E-02 | 338.40 | 12.010 | 7.132E-01 | AC228 |
| 352.50 | 248. | 10.77 | 1.47 | 9.665E-03 | 351.99 | 37.100 | 5.410E-01 | PB214 |
| 432.50 | 28. | 34.61 | 1.50 | 7.862E-03 | 433.93 | 89.881 | PBC<MDA | Ag108M |
| 463.74 | 68. | 25.35 | 1.33 | 7.361E-03 | 463.51 | 10.000 | 7.161E-01 | SB125 |
| 511.68 | 111. | 16.37 | 1.66 | 6.683E-03 | 510.72 | 22.500 | 5.776E-01 | TL208 |
| 584.07 | 174. | 9.93 | 1.40 | 5.881E-03 | 583.14 | 86.000 | 2.691E-01 | TL208 |
| 610.30 | 216. | 9.94 | 1.34 | 5.641E-03 | 609.32 | 46.090 | 6.514E-01 | BI214 |
| 728.85 | 55. | 29.18 | 1.13 | 4.784E-03 | 727.17 | 11.800 | 7.662E-01 | BI212 |
| 912.50 | 126. | 10.17 | 1.50 | 3.917E-03 | 911.07 | 29.000 | 8.655E-01 | AC228 |
| 970.24 | 114. | 15.03 | 1.67 | 3.713E-03 | 968.90 | 17.460 | 1.374E+00 | AC228 |
| 1121.91 | 75. | 17.63 | 1.16 | 3.279E-03 | 1120.28 | 15.040 | 1.193E+00 | BI214 |
| 1463.14 | 519. | 4.45 | 2.12 | 2.617E-03 | 1460.75 | 10.700 | 1.452E+01 | K40 |

********** U N I D E N T I F I E D P E A K S U M M A R Y **********

| Peak Channel | Centroid Energy | Background Counts | Net Area Counts | Intensity Cts/Sec | Uncert 3 Sigma % | FWHM keV | Suspected Nuclide | |
|---|---|---|---|---|---|---|---|---|
| 154.33 | 77.55 | 304. | 211. | 0.106 | 40.62 | 1.100 | PB-214 | D |
| 372.07 | 186.23 | 282. | 79. | 0.040 | 100.43 | 1.231 | PA-234 | l |
| 418.58 | 209.48 | 298. | 92. | 0.046 | 97.07 | 0.919 | AC-228 | sM |
| 477.79 | 239.03 | 115. | 699. | 0.350 | 13.08 | 1.215 | PB-212 | D |
| 483.62 | 241.94 | 285. | 129. | 0.065 | 61.46 | 1.217 | PB-214 | D |
| 553.52 | 276.94 | 165. | 58. | 0.029 | 101.54 | 1.220 | TL-208 | M |
| 677.43 | 338.59 | 59. | 110. | 0.055 | 41.18 | 1.285 | AC-228 | D |
| 1940.69 | 970.24 | 102. | 55. | 0.027 | 87.96 | 1.667 | AC-228 | M |

s - Peak fails shape tests.
D - Peak area deconvoluted.
L - Peak written from unknown list.
C - Area < Critical level.
M - Peak is close to a library peak.

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This section based on library: FSS_Rev_1.Lib

********** I D E N T I F I E D P E A K S U M M A R Y **********

| Nuclide | Peak Channel | Centroid Energy | Background Counts | Net Area Counts | Intensity Cts/Sec | Uncert 3 Sigma % | FWHM keV |
|---|---|---|---|---|---|---|---|
| PB-214 | 153.80 | 77.11 | 851. | 198. | 0.099 | 66.13 | 1.500D |
| PB-212 | 153.80 | 77.11 | 851. | 198. | 0.099 | 66.13 | 1.500D |
| TH-234 | 186.23 | 93.33 | 857. | 102. | 0.051 | 124.80 | 1.500 |
| PB-212 | 477.75 | 239.06 | 407. | 589. | 0.294 | 19.08 | 1.500s |
| RA-224 | 483.76 | 242.07 | 464. | 87. | 0.044 | 108.35 | 1.500 |
| PB-214 | 483.61 | 241.99 | 457. | 82. | 0.041 | 115.13 | 1.500 |
| PB-214 | 591.37 | 295.86 | 162. | 161. | 0.080 | 41.13 | 1.500s |
| AC-228 | 677.32 | 338.82 | 98. | 116. | 0.058 | 45.79 | 1.500 |
| PB-214 | 704.70 | 352.51 | 114. | 234. | 0.117 | 27.46 | 1.500 |
| Ag-108M | 864.73 | 432.50 | 33. | 28. | 0.014 | 103.83 | 1.500s |
| SB-125 | 927.49 | 463.87 | 62. | 51. | 0.025 | 75.42 | 1.500 |
| TL-208 | 1023.15 | 511.68 | 68. | 111. | 0.055 | 49.11 | 1.660s |
| TL-208 | 1167.98 | 584.07 | 48. | 174. | 0.087 | 29.80 | 1.399 |
| BI-214 | 1220.45 | 610.30 | 72. | 216. | 0.108 | 29.81 | 1.345 |
| BI-212 | 1457.07 | 728.56 | 51. | 29. | 0.015 | 117.04 | 1.554 |
| AC-228 | 1825.53 | 912.69 | 13. | 116. | 0.058 | 30.80 | 1.679 |
| AC-228 | 1941.35 | 970.57 | 41. | 59. | 0.029 | 60.57 | 1.718 |
| BI-214 | 2244.22 | 1121.91 | 27. | 75. | 0.038 | 52.90 | 1.158s |
| K-40 | 2927.27 | 1463.18 | 11. | 488. | 0.244 | 13.89 | 2.042 |

s - Peak fails shape tests.
D - Peak area deconvoluted.
A Derived peak area.

***** S U M M A R Y O F L I B R A R Y P E A K U S A G E *****

| - Nuclide - Name | Code | Average Activity pCi/gm | Peak Energy keV | Peak Activity pCi/gm | Code | MDA Value pCi/gm | COMMENTS |
|---|---|---|---|---|---|---|---|
| BE-7 | | 0.0000E+00 | | | | | |
| | | | 477.56 | 0.000E+00 | &( | 5.054E-01 1.44E-01 | G |
| K-40 | | 1.3661E+01 | | | | | |
| | | | 1460.75 | 1.366E+01 | (P | 5.138E-01 6.33E-01 | G |
| MN-54 | | -4.0164E-04 | | | | | |
| | | | 834.81 | -4.016E-04 | &(P | 7.005E-02 1.97E-02 | G |
| CO-57 | | -5.6359E-03 | | | | | |
| | | | 122.07 | -5.636E-03 | &( | 4.335E-02 1.28E-02 | G K |
| | | | 136.43 | -1.016E-01 | % | 4.923E-01 1.47E-01 | G |
| CO-60 | | 3.7250E-03 | | | | | |
| | | | 1332.51 | 3.725E-03 | %(P | 6.461E-02 1.76E-02 | G K |
| | | | 1173.23 | -3.602E-04 | % | 7.434E-02 2.05E-02 | G K |
| Sr-85 | | -1.2147E-02 | | | | | |
| | | | 514.00 | -1.215E-02 | &( | 6.520E-02 1.91E-02 | G |
| Kr-85 | | -2.6078E+02 | | | | | |
| | | | 513.99 | -2.608E+02 | &( | 1.400E+03 4.11E+02 | G |
| Y-88 | | -1.0330E-02 | | | | | |
| | | | 1836.01 | -1.033E-02 | %(P | 7.192E-02 1.97E-02 | G K |
| | | | 898.02 | -1.334E-03 | % P | 7.492E-02 2.08E-02 | G |
| NB-94 | | 1.2385E-02 | | | | | |
| | | | 871.10 | 1.239E-02 | %( | 5.081E-02 1.47E-02 | G K |
| | | | 702.50 | -3.434E-03 | % | 4.115E-02 1.14E-02 | G K |
| Ag-108M | | 1.4430E-02 | | | | | |
| | | | 722.95 | -2.106E-03 | &( | 6.042E-02 1.70E-02 | G K |
| | | | 614.37 | -5.178E-02 | % P | 8.661E-02 2.65E-02 | G |
| | | | 433.93 | 3.108E-02 | &( | 3.270E-02 1.08E-02 | G |
| CD-109 | | 6.0414E-01 | | | | | |
| | | | 88.04 | 6.041E-01 | %(P | 2.299E+00 6.91E-01 | G |
| SN-113 | | -1.5587E-03 | | | | | |
| | | | 391.71 | -1.559E-03 | %( | 8.607E-02 2.50E-02 | G K |
| | | | 255.04 | -5.683E-01 | % | 2.471E+00 7.37E-01 | G |

| Nuclide | Ave activity | Energy | Activity | Code | Peak | MDA | Comments |
|---|---|---|---|---|---|---|---|
| SB-125 | 1.3542E-01 | | | | | | |
| | | 427.95 | -2.789E-03 | %(P | 1.450E-01 | 4.10E-02 | G K |
| | | 600.77 | 4.795E-04 | % P | 2.325E-01 | 6.44E-02 | G |
| | | 636.15 | -8.885E-04 | & P | 5.488E-01 | 1.56E-01 | G |
| | | 463.51 | 5.445E-01 | (P | 4.223E-01 | 1.41E-01 | G |
| | | 176.29 | -1.025E-01 | % P | 7.408E-01 | 2.19E-01 | G |
| I-131 | -1.5536E-02 | | | | | | |
| | | 364.48 | -1.554E-02 | %( | 8.910E-02 | 2.61E-02 | G K |
| | | 636.97 | 6.369E-02 | % | 1.165E+00 | 3.28E-01 | G |
| | | 284.29 | -2.088E-02 | % | 1.295E+00 | 3.77E-01 | G |
| CS-134 | 2.5585E-02 | | | | | | |
| | | 604.66 | 2.559E-02 | %( | 4.449E-02 | 1.37E-02 | G K |
| | | 795.76 | 4.858E-03 | & | 6.244E-02 | 1.75E-02 | G |
| | | 569.29 | 1.079E-01 | % | 2.404E-01 | 7.26E-02 | G |
| | | 801.84 | -2.000E-01 | % P | 8.171E-01 | 2.40E-01 | G |
| CS-137 | 3.2444E-02 | | | | | | |
| | | 661.62 | 3.244E-02 | %( | 6.090E-02 | 1.86E-02 | G |
| CE-139 | -7.9549E-03 | | | | | | |
| | | 165.85 | -7.955E-03 | &(P | 6.156E-02 | 1.83E-02 | G |
| EU-152 | 4.9413E-03 | | | | | | |
| | | 121.78 | 4.941E-03 | &(P | 1.356E-01 | 3.99E-02 | G K |
| | | 344.30 | 4.913E-02 | % | 1.454E-01 | 4.34E-02 | G |
| | | 1408.08 | 0.000E+00 | & | 3.652E-01 | 9.96E-02 | G |
| | | 964.00 | -1.002E-01 | % P | 5.282E-01 | 1.53E-01 | G |
| | | 1112.07 | -2.550E-02 | % | 4.888E-01 | 1.36E-01 | G |
| | | 778.90 | 7.434E-02 | % P | 2.767E-01 | 7.94E-02 | G |
| EU-154 | -5.0907E-02 | | | | | | |
| | | 123.10 | -5.091E-02 | %(P | 1.320E-01 | 3.99E-02 | G K |
| | | 1274.80 | -6.389E-03 | % | 2.160E-01 | 5.98E-02 | G |
| | | 723.30 | -3.081E-02 | & P | 2.948E-01 | 8.39E-02 | G |
| | | 1004.80 | -9.600E-02 | % | 4.145E-01 | 1.21E-01 | G |
| EU-155 | 5.2231E-02 | | | | | | |
| | | 86.45 | 5.223E-02 | &(P | 2.976E-01 | 8.92E-02 | G K |
| | | 105.31 | 6.459E-02 | % | 2.773E-01 | 8.31E-02 | G |
| HG-203 | -2.9019E-03 | | | | | | |
| | | 279.17 | -2.902E-03 | &(P | 6.650E-02 | 1.95E-02 | G K |
| | | 72.87 | 1.108E-02 | % | 2.335E+00 | 6.95E-01 | G |
| | | 70.83 | -6.817E-01 | & | 4.582E+00 | 1.37E+00 | G |
| | | 82.50 | -7.640E-01 | % | 4.593E+00 | 1.37E+00 | G |

| Nuclide | Ave activity | Energy | Activity | Code | Peak | MDA | Comments |
|---|---|---|---|---|---|---|---|
| TL-208 | 2.6910E-01 | | | | | | |
| | | 583.14 | 2.691E-01 | (P | 5.446E-02 | 2.68E-02 | G |
| | | 510.72 | 5.776E-01 | + | 2.147E-01 | 9.47E-02 | G |
| PB-212 | 7.7714E-01 | | | | | | |
| | | 238.63 | 7.771E-01 | @( | 1.276E-01 | 4.94E-02 | G K |
| | | | | | | | Energy duplication |
| | | 77.11 | 9.300E-01 | + | 6.522E-01 | 2.05E-01 | G |
| | | 74.81 | 5.093E-01 | & P | 1.354E+00 | 4.09E-01 | G |
| PB-214 | 5.4508E-01 | | | | | | |
| | | 351.99 | 5.127E-01 | (P | 1.148E-01 | 4.70E-02 | G K |
| | | 295.22 | 5.732E-01 | @( | 2.215E-01 | 7.86E-02 | G |
| | | | | | | | Energy duplication |
| | | 77.11 | 1.521E+00 | + | 1.067E+00 | 3.35E-01 | G |
| | | 241.92 | 6.335E-01 | ?( | 7.882E-01 | 2.43E-01 | G |
| BI-212 | 4.0906E-01 | | | | | | |
| | | 727.17 | 4.091E-01 | ( | 5.012E-01 | 1.60E-01 | G K |
| | | 1620.56 | -2.536E-01 | % P | 1.976E+00 | 5.17E-01 | G |
| | | 785.42 | 1.004E+00 | % P | 2.588E+00 | 7.72E-01 | G |
| BI-214 | 6.5139E-01 | | | | | | |
| | | 609.32 | 6.514E-01 | ( | 1.274E-01 | 6.48E-02 | G K |
| | | 1764.51 | -6.278E-02 | & P | 3.602E-01 | 9.78E-02 | G |
| | | 1120.28 | 1.193E+00 | + | 4.282E-01 | 2.11E-01 | G |
| RA-224 | 1.2796E+00 | | | | | | |
| | | 241.00 | 1.280E+00 | &(P | 1.516E+00 | 4.68E-01 | G |
| RA-226 | 9.8722E-01 | | | | | | |
| | | 185.99 | 9.872E-01 | %(P | 1.471E+00 | 4.50E-01 | G |
| AC-228 | 7.6392E-01 | | | | | | |
| | | 911.07 | 8.021E-01 | (P | 1.366E-01 | 8.25E-02 | G K |
| | | 968.90 | 7.096E-01 | (P | 3.934E-01 | 1.43E-01 | G |
| | | 338.40 | 7.507E-01 | ( | 3.169E-01 | 1.15E-01 | G |
| TH-227 | -1.9855E-01 | | | | | | |
| | | 236.00 | -1.985E-01 | %(P | 5.281E-01 | 1.59E-01 | G K |
| | | 256.25 | -2.379E-01 | % | 7.153E-01 | 2.15E-01 | G |
| PA-234 | -2.7747E-02 | | | | | | |
| | | 98.44 | -2.775E-02 | &( | 2.679E-01 | 7.99E-02 | G K |
| | | 946.00 | -1.401E-02 | % | 2.914E-01 | 8.08E-02 | G |
| | | 131.28 | 1.869E-02 | & | 2.674E-01 | 7.95E-02 | G |
| | | 94.67 | -2.153E-01 | % | 5.341E-01 | 1.62E-01 | G |
| | | 883.24 | 1.742E-03 | % | 4.435E-01 | 1.21E-01 | G |
| | | 926.70 | -4.790E-02 | % | 4.289E-01 | 1.19E-01 | G |

| Nuclide | Ave activity | Energy | Activity | Code | Peak | MDA | Comments |
|---|---|---|---|---|---|---|---|
| | | 569.26 | 1.590E-01 % | | 3.545E-01 | 1.07E-01 | G |
| TH-234 | 9.1187E-02 | | | | | | |
| | | 63.29-1.386E+00 | %(P | | 4.913E+00 | 1.48E+00 | G K |
| | | 92.80 | 2.011E+00 | ( | 2.731E+00 | 8.37E-01 | G |
| | | 92.38 | 2.024E-01 % | P | 3.367E+00 | 1.00E+00 | G |
| AM-241 | 1.8759E-01 | | | | | | |
| | | 59.54 | 1.876E-01 %( | | 7.181E-01 | 2.16E-01 | G |

( - This peak used in the nuclide activity average.

* - Peak is too wide, but only one peak in library.
! - Peak is part of a multiplet and this area went negative during deconvolution.
? - Peak is too narrow.
@ - Peak is too wide at FW25M, but ok at FWHM.
% - Peak fails sensitivity test.
$ - Peak identified, but first peak of this nuclide failed one or more qualification tests.
+ - Peak activity higher than counting uncertainty range.
- - Peak activity lower than counting uncertainty range.
= - Peak outside analysis energy range.
& - Calculated peak centroid is not close enough to the library energy centroid for positive identification.
P - Peakbackground subtraction
} - Peak is too close to another for the activity to be found directly.

| Nuclide Codes: | Peak Codes: |
|---|---|
| T - Thermal Neutron Activation | G - Gamma Ray |
| F - Fast Neutron Activation | X - X-Ray |
| I - Fission Product | P - Positron Decay |
| N - Naturally Occurring Isotope | S - Single-Escape |
| P - Photon Reaction | D - Double-Escape |
| C - Charged Particle Reaction | K - Key Line |
| M - No MDA Calculation | A - Not in Average |
| R - Coincidence Corrected | C - Coincidence Peak |
| H - Halflife limit exceeded | |

- - - - - - - - - - - - - - - - - - - - - - - - - - - - - - - - - - - - -

***** S U M M A R Y O F N U C L I D E S I N S A M P L E *****

| Nuclide | | Time of Count Activity pCi/gm | Time Corrected Activity pCi/gm | Uncertainty Counting pCi/gm | 3 Sigma Total pCi/gm | MDA pCi/gm |
|---|---|---|---|---|---|---|
| BE-7 | #A | 0.0000E+00 | 0.0000E+00 | 4.3138E-01 | 4.3138E-01 | 4.627E-01 |
| K-40 | | 1.3661E+01 | 1.3661E+01 | 1.8975E+00 | 2.0465E+00 | 5.138E-01 |
| MN-54 | #A | -3.9562E-04 | -4.0164E-04 | 2.5180E-02 | 2.5180E-02 | 6.900E-02 |
| CO-57 | #B | -5.5385E-03 | -5.6359E-03 | 3.8464E-02 | 3.8466E-02 | 4.260E-02 |
| CO-60 | #B | 3.7159E-03 | 3.7250E-03 | 5.2802E-02 | 5.2803E-02 | 6.445E-02 |

| | | | | | | |
|---|---|---|---|---|---|---|
| Sr-85 | #A | -1.1296E-02 | -1.2147E-02 | 5.7438E-02 | 5.7442E-02 | 6.063E-02 |
| Kr-85 | #A | -2.6077E+02 | -2.6078E+02 | 1.2332E+03 | 1.2332E+03 | 1.400E+03 |
| Y-88 | #B | -9.8838E-03 | -1.0330E-02 | 5.9369E-02 | 5.9372E-02 | 6.882E-02 |
| NB-94 | #B | 1.2385E-02 | 1.2385E-02 | 4.4015E-02 | 4.4021E-02 | 5.081E-02 |
| Ag-108M | #B | 1.4429E-02 | 1.4430E-02 | 1.4983E-02 | 1.5005E-02 | 6.042E-02 |
| CD-109 | #A | 5.9789E-01 | 6.0414E-01 | 2.0729E+00 | 2.0731E+00 | 2.275E+00 |
| SN-113 | #B | -1.4962E-03 | -1.5587E-03 | 7.4883E-02 | 7.4883E-02 | 8.262E-02 |
| SB-125 | #B | 1.3479E-01 | 1.3542E-01 | 1.0524E-01 | 1.0551E-01 | 1.443E-01 |
| I-131 | #B | -8.6481E-03 | -1.5536E-02 | 7.8212E-02 | 7.8217E-02 | 4.959E-02 |
| CS-134 | #B | 2.5426E-02 | 2.5585E-02 | 4.1187E-02 | 4.1212E-02 | 4.421E-02 |
| CS-137 | #A | 3.2430E-02 | 3.2444E-02 | 5.5909E-02 | 5.5939E-02 | 6.087E-02 |
| CE-139 | #A | -7.6870E-03 | -7.9549E-03 | 5.8648E-02 | 5.8650E-02 | 5.948E-02 |
| EU-152 | #B | 4.9363E-03 | 4.9413E-03 | 1.1976E-01 | 1.1976E-01 | 1.355E-01 |
| EU-154 | #B | -5.0830E-02 | -5.0907E-02 | 1.2068E-01 | 1.2071E-01 | 1.318E-01 |
| EU-155 | #B | 5.2095E-02 | 5.2231E-02 | 2.6750E-01 | 2.6751E-01 | 2.968E-01 |
| HG-203 | #B | -2.6228E-03 | -2.9019E-03 | 6.1940E-02 | 6.1941E-02 | 6.010E-02 |
| TL-208 | | 2.6910E-01 | 2.6910E-01 | 8.0387E-02 | 8.1793E-02 | |
| PB-212 | # | 7.7714E-01 | 7.7714E-01 | 1.4826E-01 | 1.5454E-01 | 1.276E-01 |
| PB-214 | # | 5.4508E-01 | 5.4508E-01 | 1.4994E-01 | 1.5303E-01 | 1.148E-01 |
| BI-212 | A | 4.0906E-01 | 4.0906E-01 | 4.7875E-01 | 4.7930E-01 | 5.012E-01 |
| BI-214 | | 6.5139E-01 | 6.5139E-01 | 1.9421E-01 | 1.9762E-01 | |
| RA-224 | #A | 1.2796E+00 | 1.2796E+00 | 1.4049E+00 | 1.4067E+00 | 1.516E+00 |
| RA-226 | #A | 9.8722E-01 | 9.8722E-01 | 1.3490E+00 | 1.3501E+00 | 1.471E+00 |
| AC-228 | | 7.6392E-01 | 7.6392E-01 | 2.0878E-01 | 2.1313E-01 | 1.366E-01 |
| TH-227 | #B | -1.9855E-01 | -1.9855E-01 | 4.8467E-01 | 4.8480E-01 | 5.281E-01 |
| PA-234 | #B | -2.7747E-02 | -2.7747E-02 | 2.3967E-01 | 2.3968E-01 | 2.679E-01 |
| TH-234 | #B | 9.1187E-02 | 9.1187E-02 | 1.1380E-01 | 1.1392E-01 | 4.913E+00 |
| AM-241 | #A | 1.8759E-01 | 1.8759E-01 | 6.4662E-01 | 6.4670E-01 | 7.181E-01 |

# - All peaks for activity calculation had bad shape.
* - Activity omitted from total
& - Activity omitted from total and all peaks had bad shape.
< - MDA value printed.
A - Activity printed, but activity < MDA.
B - Activity < MDA and failed test.
C - Area < Critical level.
F - Failed fraction or key line test.
H - Halflife limit exceeded

---------- S U M M A R Y ----------

Total Activity ( 352.2 to 1999.0 keV) 1.5754241E+01 pCi/gm
Total Decayed Activity ( 352.2 to 1999.0 keV) 1.5754241E+01 pCi/gm

The library has energies which are not separable.

Analyzed by: _____
JPK

Reviewed by: _____
Supervisor

Laboratory: YAEC Chemistry Lab

YAEC Chemistry Lab Spectrum name: 102F_15SEPT2006_1136.An1

Sample description
FSS- SSS-01-01-011-F

Spectrum Filename: C:\GammaVision\Spectra\102F_15SEPT2006_1136.An1

Acquisition information
Start time: 15-Sep-2006 11:36:35
Live time: 2000
Real time: 2024
Dead time: 1.18 %
Detector ID: 3

Detector system
Det 102 - DSPP-468

Calibration
Filename: D2_1LSa.Clb
DET 102 1 Liter Sand Geometry

Energy Calibration
Created: 15-Jan-2005 03:09:29
Zero offset: 0.220 keV
Gain: 0.500 keV/channel
Quadratic: -6.435E-08 keV/channel^2

Efficiency Calibration
Created: 15-Jan-2005 06:48:10
Type: Polynomial
Uncertainty: 0.497 %
Coefficients: -0.294180 -5.980622 0.744607
-0.096737 0.005214 -0.000120

Library Files
Main analysis library: FSS_Rev_1.Lib
Library Match Width: 1.000
Peak stripping: Library based

Analysis parameters
Analysis engine: Env32 G53W4.20
Start channel: 100 ( 50.22keV )
Stop channel: 4000 ( 1999.02keV )
Peak rejection level: 41.667%
Peak search sensitivity: 3
Sample Size: 1.7380E+03
Activity scaling factor: 1.0000E+06/( 1.0000E+00* 1.7380E+03) =
5.7537E+02
Detection limit method: Nureg 4.16
Random error: 1.0000000E+00
Systematic error: 1.0000000E+00

| | |
|---|---|
| Fraction Limit: | 0.000% |
| Background width: | average of five points. |

YAEC Chemistry Lab Spectrum name: 102F_15SEPT2006_1136.An1

Half lives decay limit: 12.000
Activity range factor: 2.000
Min. step backg. energy 0.000
Multiplet shift channel 2.000

| Corrections | Status | Comments |
|---|---|---|
| Decay correct to date: | YES | 10-Sep-2006 14:00:00 |
| Decay during acquisition: | NO | |
| Decay during collection: | NO | |
| True coincidence correction: | NO | |
| Peaked background correction: | YES | 102_150K_28APR05.Pbc 01-May-2005 05:27:47 |
| Absorption (Internal): | NO | |
| Geometry correction: | NO | |
| Random summing: | NO | |

total peaks alloc. 16 cutoff 20.00000 %
Energy Calibration
Normalized diff: 0.8945

***** S U M M A R Y O F P E A K S I N R A N G E *****

| Peak Energy | Area | Uncert | FWHM | Corrctn Factor | Nuclide Energy | Brnch. Ratio | Act. pCi/gm | Nuc |
|---|---|---|---|---|---|---|---|---|
| 77.13 | 205. | 22.19 | 1.50 | 9.541E-03 | 77.11 | 10.700 | 1.564E+00 | PB214 |
| | | | | | 77.11 | 17.500 | 9.562E-01 | PB212 |
| 77.13 | 205. | 22.19 | 1.50 | 9.541E-03 | 77.11 | 10.700 | 1.564E+00 | PB214 |
| | | | | | 77.11 | 17.500 | 9.562E-01 | PB212 |
| 93.59 | 104. | 40.61 | 1.58 | 1.348E-02 | 92.80 | 3.000 | 2.022E+00 | TH234 |
| 185.88 | 133. | 30.15 | 1.42 | 1.627E-02 | | | | |
| 185.88 | 133. | 30.15 | 1.42 | 1.627E-02 | 185.99 | 3.280 | 1.867E+00 | RA226 |
| 239.12 | 680. | 4.66 | 1.22 | 1.378E-02 | 238.63 | 43.100 | 8.887E-01 | PB212 |
| 241.89 | 89. | 31.54 | 1.22 | 1.366E-02 | 241.00 | 3.900 | PBC<MDA | RA224 |
| | | | | | 241.92 | 7.470 | 6.789E-01 | PB214 |
| 271.19 | 88. | 28.35 | 1.52 | 1.239E-02 | | | | |
| 295.74 | 172. | 11.20 | 1.26 | 1.145E-02 | 295.22 | 19.200 | 6.066E-01 | PB214 |
| 300.53 | 59. | 27.53 | 1.26 | 1.128E-02 | | | | |
| 338.85 | 131. | 15.03 | 1.07 | 1.005E-02 | 338.40 | 12.010 | 8.456E-01 | AC228 |
| 352.64 | 282. | 7.85 | 1.20 | 9.661E-03 | 351.99 | 37.100 | 6.102E-01 | PB214 |
| 463.37 | 37. | 41.36 | 1.00 | 7.367E-03 | | | | |
| 463.37 | 37. | 41.36 | 1.00 | 7.367E-03 | 463.51 | 10.000 | PBC<MDA | SB125 |
| 512.12 | 131. | 17.71 | 1.63 | 6.677E-03 | 510.72 | 22.500 | 6.777E-01 | TL208 |
| 584.07 | 220. | 10.27 | 1.59 | 5.881E-03 | 583.14 | 86.000 | 3.363E-01 | TL208 |
| 610.34 | 209. | 10.74 | 1.41 | 5.640E-03 | 609.32 | 46.090 | 6.229E-01 | BI214 |
| 662.93 | 89. | 23.19 | 1.81 | 5.220E-03 | 661.62 | 84.620 | 1.571E-01 | CS137 |
| 728.71 | 38. | 32.25 | 1.51 | 4.785E-03 | 727.17 | 11.800 | 5.154E-01 | BI212 |
| 913.01 | 94. | 17.74 | 1.13 | 3.915E-03 | | | | |
| 966.28 | 25. | 34.43 | 1.71 | 3.734E-03 | 964.00 | 14.580 | PBC<MDA | EU152 |
| 970.57 | 78. | 20.92 | 1.61 | 3.712E-03 | | | | |
| 1121.59 | 50. | 30.07 | 1.54 | 3.280E-03 | 1120.28 | 15.040 | 7.873E-01 | BI214 |
| 1175.33 | 60. | 29.20 | 1.25 | 3.152E-03 | | | | |

| | | | | | | | | |
|---|---|---|---|---|---|---|---|---|
| 1334.42 | 47. | 25.03 | 1.27 | 2.830E-03 | | | | |
| 1463.21 | 737. | 3.86 | 1.97 | 2.617E-03 | 1460.75 | 10.700 | 2.043E+01 | K40 |

********** U N I D E N T I F I E D P E A K S U M M A R Y **********

| Peak Channel | Centroid Energy | Background Counts | Net Area Counts | Intensity Cts/Sec | Uncert 3 Sigma % | FWHM keV | Suspected Nuclide | |
|---|---|---|---|---|---|---|---|---|
| 186.76 | 93.59 | 700. | 104. | 0.052 | 121.84 | 1.584 | U-235 | l |
| 477.87 | 239.10 | 162. | 680. | 0.340 | 13.98 | 1.215 | PB-212 | D |
| 483.40 | 241.86 | 350. | 89. | 0.045 | 94.62 | 1.217 | PB-214 | D |
| 542.02 | 271.19 | 196. | 87. | 0.044 | 75.20 | 1.518 | AC-228 | sM |
| 600.49 | 300.42 | 132. | 48. | 0.024 | 112.71 | 0.696 | PB-212 | sM |
| 926.49 | 463.37 | 81. | 37. | 0.018 | 124.08 | 0.998 | SB-125 | l |
| 1826.16 | 913.01 | 51. | 100. | 0.050 | 42.52 | 1.131 | AC-228 | sM |
| 1941.34 | 970.57 | 48. | 91. | 0.046 | 44.82 | 1.612 | AC-228 | M |
| 2244.53 | 1121.59 | 39. | 38. | 0.019 | 83.79 | 1.820 | TA-182 | D |
| 2351.13 | 1175.33 | 59. | 65. | 0.033 | 62.36 | 1.245 | KR-87 | sM |
| 2669.54 | 1334.42 | 32. | 39. | 0.020 | 77.29 | 1.265 | CO-60 | sM |

s - Peak fails shape tests.
D - Peak area deconvoluted.
L - Peak written from unknown list.
C - Area < Critical level.
M - Peak is close to a library peak.

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This section based on library: FSS_Rev_1.Lib

********** I D E N T I F I E D P E A K S U M M A R Y **********

| Nuclide | Peak Channel | Centroid Energy | Background Counts | Net Area Counts | Intensity Cts/Sec | Uncert 3 Sigma % | FWHM keV |
|---|---|---|---|---|---|---|---|
| PB-214 | 153.80 | 77.11 | 935. | 205. | 0.103 | 66.56 | 1.500D |
| PB-212 | 153.80 | 77.11 | 935. | 205. | 0.103 | 66.56 | 1.500D |
| RA-226 | 372.49 | 186.44 | 511. | 87. | 0.043 | 109.59 | 1.500s |
| PB-212 | 477.72 | 239.05 | 469. | 538. | 0.269 | 21.42 | 1.500 |
| PB-214 | 591.14 | 295.74 | 230. | 159. | 0.080 | 46.87 | 1.500 |
| AC-228 | 677.33 | 338.83 | 164. | 131. | 0.066 | 48.95 | 1.500 |
| PB-214 | 704.94 | 352.63 | 127. | 275. | 0.138 | 25.04 | 1.500 |
| TL-208 | 1023.96 | 512.09 | 109. | 130. | 0.065 | 52.85 | 1.631s |
| TL-208 | 1167.98 | 584.07 | 83. | 219. | 0.110 | 30.81 | 1.585s |
| BI-214 | 1220.54 | 610.34 | 86. | 209. | 0.104 | 32.23 | 1.411s |
| CS-137 | 1325.77 | 662.93 | 90. | 89. | 0.045 | 69.58 | 1.813s |
| BI-212 | 1457.56 | 728.80 | 46. | 34. | 0.017 | 99.91 | 1.554 |
| EU-152 | 1932.76 | 966.28 | 24. | 25. | 0.012 | 103.30 | 1.714 |
| BI-214 | 2240.95 | 1120.28 | 52. | 36. | 0.018 | 99.46 | 1.819D |
| K-40 | 2927.35 | 1463.22 | 3. | 702. | 0.351 | 11.36 | 2.042 |

s - Peak fails shape tests.
D - Peak area deconvoluted.
A Derived peak area.

***** S U M M A R Y O F L I B R A R Y P E A K U S A G E *****

| - Nuclide - Name | Code | Average Activity pCi/gm | Peak Energy keV | Peak Activity pCi/gm | Code | MDA Value pCi/gm | COMMENTS |
|---|---|---|---|---|---|---|---|
| BE-7 | | -1.3321E-01 | | | | | |
| | | | 477.56 | -1.332E-01 | &( | 6.823E-01 2.02E-01 | G |
| K-40 | | 1.9475E+01 | | | | | |
| | | | 1460.75 | 1.948E+01 | (P | 2.979E-01 7.38E-01 | G |
| MN-54 | | 2.5340E-03 | | | | | |
| | | | 834.81 | 2.534E-03 | &(P | 6.624E-02 1.87E-02 | G |
| CO-57 | | -9.3240E-03 | | | | | |
| | | | 122.07 | -9.324E-03 | &( | 6.608E-02 1.97E-02 | G K |
| | | | 136.43 | 5.578E-02 | % | 5.182E-01 1.55E-01 | G |
| CO-60 | | 2.0047E-02 | | | | | |
| | | | 1332.51 | 2.005E-02 | %(P | 7.278E-02 2.12E-02 | G K |
| | | | 1173.23 | -1.203E-02 | % | 9.027E-02 2.59E-02 | G K |
| Sr-85 | | -1.9440E-02 | | | | | |
| | | | 514.00 | -1.944E-02 | &( | 8.121E-02 2.41E-02 | G |
| Kr-85 | | -4.2590E+02 | | | | | |
| | | | 513.99 | -4.259E+02 | &( | 1.779E+03 5.29E+02 | G |
| Y-88 | | -2.4680E-05 | | | | | |
| | | | 1836.01 | -2.468E-05 | %(P | 6.328E-02 1.61E-02 | G K |
| | | | 898.02 | -3.087E-03 | & P | 7.051E-02 1.96E-02 | G |
| NB-94 | | 1.4737E-02 | | | | | |
| | | | 871.10 | 1.474E-02 | &( | 5.735E-02 1.67E-02 | G K |
| | | | 702.50 | -8.981E-04 | % | 5.368E-02 1.50E-02 | G K |
| Ag-108M | | -1.4071E-03 | | | | | |
| | | | 722.95 | -1.407E-03 | &( | 6.811E-02 1.93E-02 | G K |
| | | | 614.37 | 7.497E-04 | % P | 5.442E-02 1.53E-02 | G |
| | | | 433.93 | 1.509E-02 | % | 5.624E-02 1.67E-02 | G |
| CD-109 | | 4.7322E-01 | | | | | |
| | | | 88.04 | 4.732E-01 | %(P | 2.529E+00 7.59E-01 | G |
| SN-113 | | 1.9295E-02 | | | | | |
| | | | 391.71 | 1.930E-02 | %( | 7.154E-02 2.12E-02 | G K |
| | | | 255.04 | -2.375E-01 | & | 2.530E+00 7.48E-01 | G |

| Nuclide | Ave activity | Energy | Activity | Code | Peak | MDA | Comments |
|---|---|---|---|---|---|---|---|
| SB-125 | -3.0631E-03 | | | | | | |
| | | 427.95 | -3.063E-03 | %(P | 1.708E-01 | 4.89E-02 | G K |
| | | 600.77 | 6.892E-02 | & P | 2.864E-01 | 8.39E-02 | G |
| | | 636.15 | -1.342E-01 | % P | 5.012E-01 | 1.47E-01 | G |
| | | 463.51 | 3.312E-01 | % P | 5.058E-01 | 1.56E-01 | G |
| | | 176.29 | -2.604E-02 | & P | 7.373E-01 | 2.17E-01 | G |
| I-131 | -2.7369E-03 | | | | | | |
| | | 364.48 | -2.737E-03 | &( | 9.137E-02 | 2.65E-02 | G K |
| | | 636.97 | -2.819E-01 | % | 1.169E+00 | 3.42E-01 | G |
| | | 284.29 | -2.366E-03 | % | 1.038E+00 | 3.01E-01 | G |
| CS-134 | -1.4612E-04 | | | | | | |
| | | 604.66 | -1.461E-04 | %( | 6.165E-02 | 1.76E-02 | G K |
| | | 795.76 | 3.159E-02 | % | 7.431E-02 | 2.24E-02 | G |
| | | 569.29 | -8.940E-03 | % | 3.757E-01 | 1.07E-01 | G |
| | | 801.84 | -1.140E-01 | % P | 7.435E-01 | 2.14E-01 | G |
| CS-137 | 1.5713E-01 | | | | | | |
| | | 661.62 | 1.571E-01 | @( | 8.229E-02 | 3.65E-02 | G |
| CE-139 | -1.8075E-02 | | | | | | |
| | | 165.85 | -1.807E-02 | %(P | 6.828E-02 | 2.05E-02 | G |
| EU-152 | 9.4355E-02 | | | | | | |
| | | 121.78 | -3.358E-02 | &(P | 1.967E-01 | 5.88E-02 | G K |
| | | 344.30 | -3.101E-03 | % | 2.029E-01 | 5.93E-02 | G |
| | | 1408.08 | -9.461E-03 | % | 2.985E-01 | 8.02E-02 | G |
| | | 964.00 | 3.509E-01 | (P | 3.667E-01 | 1.22E-01 | G |
| | | 1112.07 | 9.741E-02 | % | 5.869E-01 | 1.69E-01 | G |
| | | 778.90 | -6.310E-03 | & P | 4.756E-01 | 1.34E-01 | G |
| EU-154 | 6.8971E-03 | | | | | | |
| | | 123.10 | 6.897E-03 | %(P | 1.432E-01 | 4.26E-02 | G K |
| | | 1274.80 | 0.000E+00 | % | 3.237E-01 | 9.21E-02 | G |
| | | 723.30 | -7.210E-02 | & P | 3.376E-01 | 9.85E-02 | G |
| | | 1004.80 | 1.615E-01 | % | 3.364E-01 | 1.02E-01 | G |
| EU-155 | 1.1780E-02 | | | | | | |
| | | 86.45 | 1.178E-02 | &(P | 2.606E-01 | 7.75E-02 | G K |
| | | 105.31 | 9.908E-02 | % | 2.970E-01 | 8.95E-02 | G |
| HG-203 | 2.5536E-02 | | | | | | |
| | | 279.17 | 2.554E-02 | %(P | 5.592E-02 | 1.69E-02 | G K |
| | | 72.87 | -9.858E-01 | % | 2.587E+00 | 7.82E-01 | G |
| | | 70.83 | -1.355E+00 | & | 4.394E+00 | 1.32E+00 | G |
| | | 82.50 | -9.005E-01 | % | 4.997E+00 | 1.50E+00 | G |

| Nuclide | Ave activity | Energy | Activity | Code | Peak | MDA | Comments |
|---|---|---|---|---|---|---|---|
| TL-208 | 3.3631E-01 | | | | | | |
| | | 583.14 | 3.363E-01 | @(P | 6.929E-02 | 3.47E-02 | G |
| | | 510.72 | 6.700E-01 | + | 2.653E-01 | 1.18E-01 | G |
| PB-212 | 7.0296E-01 | | | | | | |
| | | 238.63 | 7.030E-01 | ( | 1.354E-01 | 5.02E-02 | G K |
| | | | | | | | Energy duplication |
| | | 77.11 | 9.562E-01 | + | 6.762E-01 | 2.12E-01 | G |
| | | 74.81 | 7.871E-01 | & P | 1.411E+00 | 4.29E-01 | G |
| PB-214 | 5.8428E-01 | | | | | | |
| | | 351.99 | 5.955E-01 | (P | 1.196E-01 | 4.98E-02 | G K |
| | | 295.22 | 5.626E-01 | ( | 2.592E-01 | 8.79E-02 | G |
| | | | | | | | Energy duplication |
| | | 77.11 | 1.564E+00 | + | 1.106E+00 | 3.47E-01 | G |
| | | 241.92 | 4.657E-01 | % | 8.485E-01 | 2.58E-01 | G |
| BI-212 | 4.6320E-01 | | | | | | |
| | | 727.17 | 4.632E-01 | ( | 4.723E-01 | 1.54E-01 | G K |
| | | 1620.56 | -2.314E-01 | % P | 1.870E+00 | 4.84E-01 | G |
| | | 785.42 | -4.449E-01 | % P | 3.348E+00 | 9.65E-01 | G |
| BI-214 | 6.0744E-01 | | | | | | |
| | | 609.32 | 6.229E-01 | @( | 1.374E-01 | 6.70E-02 | G K |
| | | 1764.51 | -8.027E-02 | % P | 5.435E-01 | 1.52E-01 | G |
| | | 1120.28 | 5.600E-01 | ( | 5.704E-01 | 1.86E-01 | G |
| RA-224 | 9.9403E-01 | | | | | | |
| | | 241.00 | 9.940E-01 | &(P | 1.509E+00 | 4.62E-01 | G |
| RA-226 | 1.2610E+00 | | | | | | |
| | | 185.99 | 1.261E+00 | *(P | 1.575E+00 | 4.84E-01 | G |
| AC-228 | 1.8345E-01 | | | | | | |
| | | 911.07 | -9.086E-02 | %(P | 3.438E-01 | 1.02E-01 | G K |
| | | 968.90 | -1.935E-01 | % P | 5.501E-01 | 1.64E-01 | G |
| | | 338.40 | 8.458E-01 | ( | 4.018E-01 | 1.38E-01 | G |
| TH-227 | -1.2035E-02 | | | | | | |
| | | 236.00 | -1.204E-02 | %(P | 6.672E-01 | 1.98E-01 | G K |
| | | 256.25 | 1.812E-01 | % | 7.180E-01 | 2.14E-01 | G |
| PA-234 | -4.8262E-02 | | | | | | |
| | | 98.44 | -4.826E-02 | &( | 3.014E-01 | 9.03E-02 | G K |
| | | 946.00 | -7.996E-02 | % | 3.553E-01 | 1.03E-01 | G |
| | | 131.28 | -9.612E-03 | % | 2.891E-01 | 8.60E-02 | G |
| | | 94.67 | -1.788E-01 | % | 5.393E-01 | 1.63E-01 | G |
| | | 883.24 | 3.006E-02 | & | 5.003E-01 | 1.40E-01 | G |
| | | 926.70 | -6.902E-03 | & | 5.215E-01 | 1.44E-01 | G |

| Nuclide | Ave activity | Energy | Activity | Code | Peak | MDA | Comments |
|---|---|---|---|---|---|---|---|
| | | 569.26 | -1.320E-02 % | | 5.548E-01 | 1.59E-01 | G |
| TH-234 | 1.9417E+00 | | | | | | |
| | | 63.29 | 1.942E+00 &(P | | 5.200E+00 | 1.57E+00 | G K |
| | | 92.80 | 1.980E+00 % | | 2.868E+00 | 8.77E-01 | G |
| | | 92.38 | 6.557E-01 & P | | 3.018E+00 | 9.05E-01 | G |
| AM-241 | -1.2343E-01 | | | | | | |
| | | 59.54 | -1.234E-01 %( | | 8.059E-01 | 2.41E-01 | G |

( - This peak used in the nuclide activity average.

* - Peak is too wide, but only one peak in library.
! - Peak is part of a multiplet and this area went negative during deconvolution.
? - Peak is too narrow.
@ - Peak is too wide at FW25M, but ok at FWHM.
% - Peak fails sensitivity test.
$ - Peak identified, but first peak of this nuclide failed one or more qualification tests.
+ - Peak activity higher than counting uncertainty range.
- - Peak activity lower than counting uncertainty range.
= - Peak outside analysis energy range.
& - Calculated peak centroid is not close enough to the library energy centroid for positive identification.
P - Peakbackground subtraction
} - Peak is too close to another for the activity to be found directly.

| Nuclide Codes: | Peak Codes: |
|---|---|
| T - Thermal Neutron Activation | G - Gamma Ray |
| F - Fast Neutron Activation | X - X-Ray |
| I - Fission Product | P - Positron Decay |
| N - Naturally Occurring Isotope | S - Single-Escape |
| P - Photon Reaction | D - Double-Escape |
| C - Charged Particle Reaction | K - Key Line |
| M - No MDA Calculation | A - Not in Average |
| R - Coincidence Corrected | C - Coincidence Peak |
| H - Halflife limit exceeded | |

- - - - - - - - - - - - - - - - - - - - - - - - - - - - - - - - - - - - -

***** S U M M A R Y O F N U C L I D E S I N S A M P L E *****

| Nuclide | | Time of Count Activity pCi/gm | Time Corrected Activity pCi/gm | Uncertainty 3 Sigma Counting pCi/gm | Total pCi/gm | MDA pCi/gm |
|---|---|---|---|---|---|---|
| BE-7 | #A | -1.2500E-01 | -1.3321E-01 | 6.0465E-01 | 6.0470E-01 | 6.402E-01 |
| K-40 | | 1.9475E+01 | 1.9475E+01 | 2.2136E+00 | 2.4687E+00 | 2.979E-01 |
| MN-54 | #A | 2.5066E-03 | 2.5340E-03 | 5.6048E-02 | 5.6048E-02 | 6.552E-02 |
| CO-57 | #B | -9.2074E-03 | -9.3240E-03 | 5.9205E-02 | 5.9207E-02 | 6.526E-02 |
| CO-60 | B | 2.0012E-02 | 2.0047E-02 | 6.3472E-02 | 6.3482E-02 | 7.265E-02 |

| | | | | | | |
|---|---|---|---|---|---|---|
| Sr-85 | #A | -1.8448E-02 | -1.9440E-02 | 7.2387E-02 | 7.2395E-02 | 7.706E-02 |
| Kr-85 | #A | -4.2588E+02 | -4.2590E+02 | 1.5859E+03 | 1.5860E+03 | 1.779E+03 |
| Y-88 | #B | -2.3906E-05 | -2.4680E-05 | 6.3424E-04 | 6.3424E-04 | 6.130E-02 |
| NB-94 | #B | 1.4737E-02 | 1.4737E-02 | 5.0105E-02 | 5.0111E-02 | 5.735E-02 |
| Ag-108M | #B | -1.4070E-03 | -1.4071E-03 | 5.7808E-02 | 5.7808E-02 | 6.811E-02 |
| CD-109 | #A | 4.6968E-01 | 4.7322E-01 | 2.2765E+00 | 2.2767E+00 | 2.511E+00 |
| SN-113 | #B | 1.8734E-02 | 1.9295E-02 | 6.3585E-02 | 6.3594E-02 | 6.946E-02 |
| SB-125 | #B | -3.0528E-03 | -3.0631E-03 | 3.8428E+00 | 3.8428E+00 | 1.702E-01 |
| I-131 | #B | -1.7938E-03 | -2.7369E-03 | 7.9579E-02 | 7.9579E-02 | 5.989E-02 |
| CS-134 | #B | -1.4546E-04 | -1.4612E-04 | 5.2679E-02 | 5.2679E-02 | 6.138E-02 |
| CS-137 | # | 1.5708E-01 | 1.5713E-01 | 1.0932E-01 | 1.0968E-01 | |
| CE-139 | #A | -1.7634E-02 | -1.8075E-02 | 6.3229E-02 | 6.3237E-02 | 6.661E-02 |
| EU-152 | #B | 9.4286E-02 | 9.4355E-02 | 9.8384E-02 | 9.8523E-02 | 1.966E-01 |
| EU-154 | #B | 6.8895E-03 | 6.8971E-03 | 1.2780E-01 | 1.2780E-01 | 1.430E-01 |
| EU-155 | #B | 1.1758E-02 | 1.1780E-02 | 2.3252E-01 | 2.3252E-01 | 2.601E-01 |
| HG-203 | #B | 2.3741E-02 | 2.5536E-02 | 5.0769E-02 | 5.0789E-02 | 5.199E-02 |
| TL-208 | # | 3.3631E-01 | 3.3631E-01 | 1.0382E-01 | 1.0552E-01 | |
| PB-212 | # | 7.0296E-01 | 7.0296E-01 | 1.5057E-01 | 1.5565E-01 | 1.354E-01 |
| PB-214 | # | 5.8428E-01 | 5.8428E-01 | 1.4653E-01 | 1.5016E-01 | 1.196E-01 |
| BI-212 | A | 4.6320E-01 | 4.6320E-01 | 4.6278E-01 | 4.6351E-01 | 4.723E-01 |
| BI-214 | | 6.0744E-01 | 6.0744E-01 | 1.9580E-01 | 1.9875E-01 | |
| RA-224 | #A | 9.9403E-01 | 9.9403E-01 | 1.3847E+00 | 1.3858E+00 | 1.509E+00 |
| RA-226 | #A | 1.2610E+00 | 1.2610E+00 | 1.4532E+00 | 1.4549E+00 | 1.575E+00 |
| AC-228 | B | 1.8345E-01 | 1.8345E-01 | 8.9797E-02 | 9.0385E-02 | 3.438E-01 |
| TH-227 | #B | -1.2035E-02 | -1.2035E-02 | 7.5507E-01 | 7.5507E-01 | 6.672E-01 |
| PA-234 | #B | -4.8262E-02 | -4.8262E-02 | 2.7078E-01 | 2.7079E-01 | 3.014E-01 |
| TH-234 | #B | 1.9417E+00 | 1.9417E+00 | 4.7093E+00 | 4.7105E+00 | 5.200E+00 |
| AM-241 | #A | -1.2343E-01 | -1.2343E-01 | 7.2321E-01 | 7.2324E-01 | 8.058E-01 |

# - All peaks for activity calculation had bad shape.
* - Activity omitted from total
& - Activity omitted from total and all peaks had bad shape.
< - MDA value printed.
A - Activity printed, but activity < MDA.
B - Activity < MDA and failed test.
C - Area < Critical level.
F - Failed fraction or key line test.
H - Halflife limit exceeded

---------- S U M M A R Y ----------

Total Activity ( 1172.8 to 1999.0 keV) 2.1222565E+01 pCi/gm
Total Decayed Activity ( 1172.8 to 1999.0 keV) 2.1222612E+01 pCi/gm

The library has energies which are not separable.

Analyzed by: _____
JPK

Reviewed by: _____
Supervisor

Laboratory: YAEC Chemistry Lab

YAEC Chemistry Lab Spectrum name: 102F_15SEPT2006_1313.An1

Sample description
FSS- SSS-01-01-022-F

Spectrum Filename: C:\GammaVision\Spectra\102F_15SEPT2006_1313.An1

Acquisition information

| | |
|---|---|
| Start time: | 15-Sep-2006 13:13:08 |
| Live time: | 2000 |
| Real time: | 2023 |
| Dead time: | 1.13 % |
| Detector ID: | 3 |

Detector system
Det 102 - DSPP-468

Calibration

| | |
|---|---|
| Filename: | D2_1LSa.Clb |

DET 102 1 Liter Sand Geometry

Energy Calibration

| | |
|---|---|
| Created: | 15-Jan-2005 03:09:29 |
| Zero offset: | 0.220 keV |
| Gain: | 0.500 keV/channel |
| Quadratic: | -6.435E-08 keV/channel^2 |

Efficiency Calibration

| | |
|---|---|
| Created: | 15-Jan-2005 06:48:10 |
| Type: | Polynomial |
| Uncertainty: | 0.497 % |
| Coefficients: | -0.294180 -5.980622 0.744607 |
| | -0.096737 0.005214 -0.000120 |

Library Files

| | |
|---|---|
| Main analysis library: | FSS_Rev_1.Lib |
| Library Match Width: | 1.000 |
| Peak stripping: | Library based |

Analysis parameters

| | |
|---|---|
| Analysis engine: | Env32 G53W4.20 |
| Start channel: | 100 ( 50.22keV ) |
| Stop channel: | 4000 ( 1999.02keV ) |
| Peak rejection level: | 41.667% |
| Peak search sensitivity: | 3 |
| Sample Size: | 1.7910E+03 |
| Activity scaling factor: | 1.0000E+06/( 1.0000E+00* 1.7910E+03) = 5.5835E+02 |
| Detection limit method: | Nureg 4.16 |
| Random error: | 1.0000000E+00 |
| Systematic error: | 1.0000000E+00 |

| | |
|---|---|
| Fraction Limit: | 0.000% |
| Background width: | average of five points. |

YAEC Chemistry Lab Spectrum name: 102F_15SEPT2006_1313.An1

Half lives decay limit: 12.000
Activity range factor: 2.000
Min. step backg. energy 0.000
Multiplet shift channel 2.000

| Corrections | Status | Comments |
|---|---|---|
| Decay correct to date: | YES | 09-Sep-2006 15:50:00 |
| Decay during acquisition: | NO | |
| Decay during collection: | NO | |
| True coincidence correction: | NO | |
| Peaked background correction: | YES | 102_150K_28APR05.Pbc 01-May-2005 05:27:47 |
| Absorption (Internal): | NO | |
| Geometry correction: | NO | |
| Random summing: | NO | |

total peaks alloc. 12 cutoff 20.00000 %
Energy Calibration
Normalized diff: 0.7003

***** S U M M A R Y O F P E A K S I N R A N G E *****

| Peak Energy | Area | Uncert | FWHM | Corrctn Factor | Nuclide Energy | Brnch. Ratio | Act. pCi/gm | Nuc |
|---|---|---|---|---|---|---|---|---|
| 74.67 | 131. | 22.13 | 1.10 | 8.908E-03 | 74.81 | 9.600 | PBC<MDA | PB212 |
| 77.39 | 238. | 13.21 | 1.10 | 9.719E-03 | 77.11 | 10.700 | 1.762E+00 | PB214 |
| | | | | | 77.11 | 17.500 | 1.077E+00 | PB212 |
| 93.18 | 125. | 33.82 | 1.50 | 1.325E-02 | 92.38 | 2.570 | PBC<MDA | TH234 |
| | | | | | 92.80 | 3.000 | PBC<MDA | TH234 |
| 93.19 | 125. | 33.89 | 1.50 | 1.333E-02 | 92.38 | 2.570 | PBC<MDA | TH234 |
| | | | | | 92.80 | 3.000 | 2.358E+00 | TH234 |
| 239.14 | 665. | 4.67 | 1.22 | 1.379E-02 | 238.63 | 43.100 | 8.432E-01 | PB212 |
| | | | | | 241.92 | 7.470 | 4.919E+00 | PB214 |
| 242.42 | 90. | 23.26 | 1.22 | 1.363E-02 | | | | |
| 270.47 | 81. | 34.13 | 1.28 | 1.242E-02 | | | | |
| 295.92 | 154. | 11.93 | 1.26 | 1.144E-02 | 295.22 | 19.200 | 5.268E-01 | PB214 |
| 338.97 | 122. | 18.00 | 1.08 | 1.004E-02 | 338.40 | 12.010 | 7.650E-01 | AC228 |
| 352.54 | 300. | 8.68 | 1.18 | 9.664E-03 | 351.99 | 37.100 | 6.296E-01 | PB214 |
| 463.86 | 61. | 34.02 | 1.23 | 7.359E-03 | 463.51 | 10.000 | 6.075E-01 | SB125 |
| 511.53 | 129. | 16.30 | 1.73 | 6.685E-03 | 510.72 | 22.500 | 6.447E-01 | TL208 |
| 584.07 | 186. | 12.24 | 1.62 | 5.881E-03 | 583.14 | 86.000 | 2.759E-01 | TL208 |
| 610.51 | 203. | 9.72 | 1.64 | 5.639E-03 | 609.32 | 46.090 | 5.894E-01 | BI214 |
| 728.62 | 58. | 28.61 | 1.28 | 4.785E-03 | 727.17 | 11.800 | 7.696E-01 | BI212 |
| 912.83 | 133. | 12.27 | 1.59 | 3.915E-03 | 911.07 | 29.000 | 8.821E-01 | AC228 |
| 969.98 | 102. | 16.12 | 1.52 | 3.714E-03 | 968.90 | 17.460 | 1.179E+00 | AC228 |
| 1463.31 | 661. | 4.04 | 2.11 | 2.617E-03 | | | | |

********** U N I D E N T I F I E D P E A K S U M M A R Y **********

| Peak Channel | Centroid Energy | Background Counts | Net Area Counts | Intensity Cts/Sec | Uncert 3 Sigma % | FWHM keV | Suspected Nuclide |
|---|---|---|---|---|---|---|---|

| | | | | | | | | |
|---|---|---|---|---|---|---|---|---|
| 148.92 | 75.01 | 353. | 131. | 0.065 | 66.38 | 1.098 | PB-214 | D |

YAEC Chemistry Lab Spectrum name: 102F_15SEPT2006_1313.An1

| Channel | Energy | Background | Net area | Cnts/sec | Uncert | FWHM | Suspected | |
|---|---|---|---|---|---|---|---|---|
| 154.35 | 77.72 | 377. | 238. | 0.119 | 39.63 | 1.100 | PB-214 | D |
| 477.91 | 239.06 | 150. | 665. | 0.332 | 14.02 | 1.215 | PB-212 | D |
| 484.48 | 242.34 | 175. | 90. | 0.045 | 69.77 | 1.217 | XE-138 | D |
| 540.59 | 270.47 | 247. | 81. | 0.041 | 102.39 | 1.285 | AC-228 | M |
| 1940.16 | 969.98 | 41. | 108. | 0.054 | 38.30 | 1.520 | AC-228 | M |
| 2927.52 | 1463.31 | 14. | 661. | 0.331 | 11.91 | 2.111 | K-40 | M |

s - Peak fails shape tests.
D - Peak area deconvoluted.
L - Peak written from unknown list.
C - Area < Critical level.
M - Peak is close to a library peak.

---

This section based on library: FSS_Rev_1.Lib

********** I D E N T I F I E D P E A K S U M M A R Y **********

| Nuclide | Peak Channel | Centroid Energy | Background Counts | Net Area Counts | Intensity Cts/Sec | Uncert 3 Sigma % | FWHM keV |
|---|---|---|---|---|---|---|---|
| PB-212 | 149.62 | 75.02 | 973. | 129. | 0.065 | 103.40 | 1.500s |
| PB-214 | 153.80 | 77.11 | 833. | 240. | 0.120 | 54.54 | 1.500D |
| PB-212 | 153.80 | 77.11 | 833. | 240. | 0.120 | 54.54 | 1.500D |
| TH-234 | 185.95 | 93.18 | 852. | 125. | 0.063 | 101.47 | 1.500 |
| TH-234 | 185.95 | 93.19 | 835. | 125. | 0.062 | 101.66 | 1.500 |
| PB-212 | 477.79 | 239.08 | 429. | 595. | 0.297 | 19.23 | 1.500 |
| PB-214 | 591.44 | 295.89 | 179. | 156. | 0.078 | 43.54 | 1.500s |
| AC-228 | 677.67 | 338.99 | 179. | 118. | 0.059 | 55.50 | 1.500 |
| PB-214 | 704.74 | 352.53 | 134. | 291. | 0.145 | 24.37 | 1.500 |
| SB-125 | 927.50 | 463.87 | 83. | 36. | 0.018 | 113.19 | 1.500 |
| TL-208 | 1022.83 | 511.53 | 94. | 129. | 0.064 | 48.89 | 1.730s |
| TL-208 | 1167.98 | 584.07 | 104. | 185. | 0.093 | 36.73 | 1.621s |
| BI-214 | 1220.87 | 610.51 | 65. | 203. | 0.102 | 29.16 | 1.644 |
| BI-212 | 1457.19 | 728.62 | 69. | 58. | 0.029 | 85.83 | 1.283 |
| AC-228 | 1825.92 | 912.89 | 33. | 114. | 0.057 | 35.06 | 1.679 |

s - Peak fails shape tests.
D - Peak area deconvoluted.
A Derived peak area.

***** S U M M A R Y O F L I B R A R Y P E A K U S A G E *****

| - Nuclide - Name | Code | Average Activity pCi/gm | Peak Energy keV | Peak Activity pCi/gm | Peak Code | Peak MDA Value pCi/gm | COMMENTS |
|---|---|---|---|---|---|---|---|
| BE-7 | | 1.1763E-01 | | | | | |
| | | | 477.56 | 1.176E-01 | %( | 4.199E-01 | 1.24E-01 G |

| Nuclide | Ave activity | Energy | Activity | Code | Peak | MDA | Comments |
|---|---|---|---|---|---|---|---|
| K-40 | -4.0659E-03 | | | | | | |
| | | 1460.75 | -4.066E-03 | %(P | 7.760E-01 | 2.13E-01 | G |
| MN-54 | 1.3991E-02 | | | | | | |
| | | 834.81 | 1.399E-02 | &(P | 5.368E-02 | 1.56E-02 | G |
| CO-57 | 5.3296E-04 | | | | | | |
| | | 122.07 | 5.330E-04 | %( | 6.059E-02 | 1.80E-02 | G K |
| | | 136.43 | 3.370E-02 | & | 4.971E-01 | 1.48E-01 | G |
| CO-60 | -4.8748E-03 | | | | | | |
| | | 1332.51 | -4.875E-03 | %(P | 6.486E-02 | 1.78E-02 | G K |
| | | 1173.23 | -1.516E-02 | & | 8.870E-02 | 2.57E-02 | G K |
| Sr-85 | 9.9705E-03 | | | | | | |
| | | 514.00 | 9.970E-03 | &( | 4.513E-02 | 1.32E-02 | G |
| Kr-85 | -1.0638E+01 | | | | | | |
| | | 513.99 | -1.064E+01 | &( | 1.395E+03 | 4.02E+02 | G |
| Y-88 | -2.4104E-05 | | | | | | |
| | | 1836.01 | -2.410E-05 | %(P | 9.974E-02 | 2.72E-02 | G K |
| | | 898.02 | 3.266E-03 | & P | 7.037E-02 | 1.97E-02 | G |
| NB-94 | 9.5019E-05 | | | | | | |
| | | 871.10 | 9.502E-05 | %( | 6.072E-02 | 1.69E-02 | G K |
| | | 702.50 | 2.575E-02 | & | 5.069E-02 | 1.55E-02 | G K |
| Ag-108M | 5.7577E-04 | | | | | | |
| | | 722.95 | 5.758E-04 | %( | 5.836E-02 | 1.63E-02 | G K |
| | | 614.37 | -5.922E-02 | % P | 9.086E-02 | 2.80E-02 | G |
| | | 433.93 | -1.200E-02 | % | 5.358E-02 | 1.58E-02 | G |
| CD-109 | 1.0229E+00 | | | | | | |
| | | 88.04 | 1.023E+00 | %(P | 2.171E+00 | 6.58E-01 | G |
| SN-113 | 3.8872E-03 | | | | | | |
| | | 391.71 | 3.887E-03 | %( | 6.754E-02 | 1.95E-02 | G K |
| | | 255.04 | -4.845E-01 | % | 2.410E+00 | 7.17E-01 | G |
| SB-125 | 1.0689E-01 | | | | | | |
| | | 427.95 | 1.797E-02 | %(P | 1.495E-01 | 4.33E-02 | G K |
| | | 600.77 | 1.103E-01 | & P | 2.422E-01 | 7.32E-02 | G |
| | | 636.15 | 1.376E-02 | % P | 4.987E-01 | 1.42E-01 | G |
| | | 463.51 | 3.701E-01 | (P | 4.646E-01 | 1.46E-01 | G |
| | | 176.29 | -3.141E-02 | % P | 7.680E-01 | 2.27E-01 | G |

| Nuclide | Ave activity | Energy | Activity | Code | Peak | MDA | Comments |
|---|---|---|---|---|---|---|---|
| I-131 | -1.1717E-02 | | | | | | |
| | | 364.48 | -1.172E-02 | &( | 9.992E-02 | 2.93E-02 | G K |
| | | 636.97 | 3.820E-03 | % | 1.321E+00 | 3.75E-01 | G |
| | | 284.29 | -1.221E-01 | % | 1.066E+00 | 3.13E-01 | G |
| CS-134 | -4.2215E-03 | | | | | | |
| | | 604.66 | -4.221E-03 | %( | 5.283E-02 | 1.51E-02 | G K |
| | | 795.76 | 3.111E-02 | % | 7.564E-02 | 2.27E-02 | G |
| | | 569.29 | -4.452E-02 | % | 3.610E-01 | 1.05E-01 | G |
| | | 801.84 | 2.618E-02 | & P | 6.767E-01 | 1.90E-01 | G |
| CS-137 | 1.8805E-02 | | | | | | |
| | | 661.62 | 1.880E-02 | &( | 5.872E-02 | 1.74E-02 | G |
| CE-139 | -5.7434E-03 | | | | | | |
| | | 165.85 | -5.743E-03 | %(P | 5.655E-02 | 1.68E-02 | G |
| EU-152 | 4.8917E-03 | | | | | | |
| | | 121.78 | 4.892E-03 | %(P | 1.483E-01 | 4.38E-02 | G K |
| | | 344.30 | -4.632E-02 | % | 1.758E-01 | 5.23E-02 | G |
| | | 1408.08 | 2.438E-02 | % | 2.889E-01 | 7.89E-02 | G |
| | | 964.00 | 1.335E-01 | & P | 5.117E-01 | 1.50E-01 | G |
| | | 1112.07 | 1.649E-01 | & | 5.777E-01 | 1.70E-01 | G |
| | | 778.90 | -4.102E-03 | % P | 4.662E-01 | 1.31E-01 | G |
| EU-154 | -4.9922E-04 | | | | | | |
| | | 123.10 | -4.992E-04 | &(P | 1.296E-01 | 3.84E-02 | G K |
| | | 1274.80 | -1.290E-02 | % | 2.286E-01 | 6.41E-02 | G |
| | | 723.30 | 7.225E-02 | & P | 2.211E-01 | 6.50E-02 | G |
| | | 1004.80 | -6.587E-02 | & | 3.884E-01 | 1.12E-01 | G |
| EU-155 | -7.1750E-02 | | | | | | |
| | | 86.45 | -7.175E-02 | %(P | 2.990E-01 | 8.97E-02 | G K |
| | | 105.31 | 8.798E-03 | & | 2.563E-01 | 7.61E-02 | G |
| HG-203 | -7.7573E-05 | | | | | | |
| | | 279.17 | -7.757E-05 | %(P | 6.075E-02 | 1.77E-02 | G K |
| | | 72.87 | -7.725E-01 | & | 2.537E+00 | 7.65E-01 | G |
| | | 70.83 | -1.950E-01 | & | 4.241E+00 | 1.26E+00 | G |
| | | 82.50 | 2.558E+00 | % | 4.681E+00 | 1.42E+00 | G |
| TL-208 | 2.7586E-01 | | | | | | |
| | | 583.14 | 2.759E-01 | *(P | 7.476E-02 | 3.39E-02 | G |
| | | 510.72 | 6.447E-01 | + | 2.402E-01 | 1.05E-01 | G |

| Nuclide | Ave activity | Energy | Activity | Code | Peak | MDA | Comments |
|---|---|---|---|---|---|---|---|
| PB-212 | 7.5407E-01 | | | | | | |
| | | 238.63 | 7.541E-01 | ( | 1.259E-01 | 4.83E-02 | G K |
| | | | | | | | Energy duplication |
| | | 77.11 | 1.086E+00 | + | 6.202E-01 | 1.97E-01 | G |
| | | 74.81 | 1.146E+00 | & P | 1.315E+00 | 4.04E-01 | G |
| PB-214 | 5.8497E-01 | | | | | | |
| | | 351.99 | 6.106E-01 | (P | 1.192E-01 | 4.97E-02 | G K |
| | | 295.22 | 5.355E-01 | ( | 2.229E-01 | 7.77E-02 | G |
| | | | | | | | Energy duplication |
| | | 77.11 | 1.775E+00 | + | 1.014E+00 | 3.23E-01 | G |
| | | 241.92 | 1.756E-01 | % | 7.060E-01 | 2.11E-01 | G |
| BI-212 | 7.6960E-01 | | | | | | |
| | | 727.17 | 7.696E-01 | ( | 5.536E-01 | 2.21E-01 | G K |
| | | 1620.56 | -1.937E-01 | % P | 2.124E+00 | 5.58E-01 | G |
| | | 785.42 | 8.108E-02 | % P | 2.606E+00 | 7.26E-01 | G |
| BI-214 | 5.8942E-01 | | | | | | |
| | | 609.32 | 5.894E-01 | ( | 1.164E-01 | 5.74E-02 | G K |
| | | 1764.51 | -8.806E-02 | & P | 5.755E-01 | 1.63E-01 | G |
| | | 1120.28 | -4.593E-02 | & | 6.074E-01 | 1.74E-01 | G |
| RA-224 | 7.0581E-02 | | | | | | |
| | | 241.00 | 7.058E-02 | &(P | 1.217E+00 | 3.59E-01 | G |
| RA-226 | 8.5538E-01 | | | | | | |
| | | 185.99 | 8.554E-01 | %(P | 1.484E+00 | 4.51E-01 | G |
| AC-228 | 7.5251E-01 | | | | | | |
| | | 911.07 | 7.591E-01 | (P | 1.947E-01 | 8.89E-02 | G K |
| | | 968.90 | -7.573E-02 | % P | 5.074E-01 | 1.47E-01 | G |
| | | 338.40 | 7.367E-01 | ( | 4.065E-01 | 1.36E-01 | G |
| TH-227 | -1.5047E-01 | | | | | | |
| | | 236.00 | -1.505E-01 | %(P | 5.139E-01 | 1.54E-01 | G K |
| | | 256.25 | 1.815E-02 | % | 7.483E-01 | 2.20E-01 | G |
| PA-234 | -6.2902E-02 | | | | | | |
| | | 98.44 | -6.290E-02 | %( | 2.762E-01 | 8.29E-02 | G K |
| | | 946.00 | -1.143E-02 | % | 3.170E-01 | 8.87E-02 | G |
| | | 131.28 | 4.069E-02 | & | 2.529E-01 | 7.55E-02 | G |
| | | 94.67 | -1.468E-01 | & | 5.116E-01 | 1.54E-01 | G |
| | | 883.24 | 9.522E-02 | & | 4.303E-01 | 1.24E-01 | G |
| | | 926.70 | 1.332E-01 | % | 5.602E-01 | 1.63E-01 | G |
| | | 569.26 | -6.569E-02 | % | 5.327E-01 | 1.54E-01 | G |

| Nuclide | Ave activity | Energy | Activity | Code | Peak | MDA | Comments |
|---|---|---|---|---|---|---|---|
| TH-234 | 2.1837E+00 | | | | | | |
| | | 63.29 | 1.660E+00 | %(P | 5.094E+00 | 1.53E+00 | G K |
| | | 92.80 | 2.358E+00 | ( | 2.591E+00 | 7.99E-01 | G |
| | | 92.38 | 2.774E+00 | (P | 3.073E+00 | 9.47E-01 | G |
| AM-241 | 1.2660E-01 | | | | | | |
| | | 59.54 | 1.266E-01 | %( | 7.119E-01 | 2.13E-01 | G |

( - This peak used in the nuclide activity average.

* - Peak is too wide, but only one peak in library.
! - Peak is part of a multiplet and this area went negative during deconvolution.
? - Peak is too narrow.
@ - Peak is too wide at FW25M, but ok at FWHM.
% - Peak fails sensitivity test.
$ - Peak identified, but first peak of this nuclide failed one or more qualification tests.
+ - Peak activity higher than counting uncertainty range.
- - Peak activity lower than counting uncertainty range.
= - Peak outside analysis energy range.
& - Calculated peak centroid is not close enough to the library energy centroid for positive identification.
P - Peakbackground subtraction
} - Peak is too close to another for the activity to be found directly.

| Nuclide Codes: | Peak Codes: |
|---|---|
| T - Thermal Neutron Activation | G - Gamma Ray |
| F - Fast Neutron Activation | X - X-Ray |
| I - Fission Product | P - Positron Decay |
| N - Naturally Occurring Isotope | S - Single-Escape |
| P - Photon Reaction | D - Double-Escape |
| C - Charged Particle Reaction | K - Key Line |
| M - No MDA Calculation | A - Not in Average |
| R - Coincidence Corrected | C - Coincidence Peak |
| H - Halflife limit exceeded | |

- - - - - - - - - - - - - - - - - - - - - - - - - - - - - - - - - - - - -

***** S U M M A R Y O F N U C L I D E S I N S A M P L E *****

| Nuclide | | Time of Count Activity pCi/gm | Time Corrected Activity pCi/gm | Uncertainty (3 Sigma) Counting pCi/gm | Total pCi/gm | MDA pCi/gm |
|---|---|---|---|---|---|---|
| BE-7 | #A | 1.0897E-01 | 1.1763E-01 | 3.7109E-01 | 3.7115E-01 | 3.889E-01 |
| K-40 | #A | -4.0659E-03 | -4.0659E-03 | 1.9298E-01 | 1.9298E-01 | 7.760E-01 |
| MN-54 | #A | 1.3809E-02 | 1.3991E-02 | 4.6843E-02 | 4.6849E-02 | 5.299E-02 |
| CO-57 | #B | 5.2496E-04 | 5.3296E-04 | 5.3878E-02 | 5.3878E-02 | 5.968E-02 |
| CO-60 | #B | -4.8645E-03 | -4.8748E-03 | 5.8187E-02 | 5.8188E-02 | 6.473E-02 |
| Sr-85 | #A | 9.3620E-03 | 9.9705E-03 | 3.9491E-02 | 3.9495E-02 | 4.237E-02 |

| | | | | | | |
|---|---|---|---|---|---|---|
| Kr-85 | #A | -1.0637E+01 | -1.0638E+01 | 1.2060E+03 | 1.2060E+03 | 1.395E+03 |
| Y-88 | #B | -2.3198E-05 | -2.4104E-05 | 1.0729E-03 | 1.0729E-03 | 9.600E-02 |
| NB-94 | #B | 9.5019E-05 | 9.5019E-05 | 5.0730E-02 | 5.0730E-02 | 6.072E-02 |
| Ag-108M | #B | 5.7572E-04 | 5.7577E-04 | 4.8961E-02 | 4.8961E-02 | 5.836E-02 |
| CD-109 | #A | 1.0137E+00 | 1.0229E+00 | 1.9737E+00 | 1.9745E+00 | 2.151E+00 |
| SN-113 | #B | 3.7517E-03 | 3.8872E-03 | 5.8462E-02 | 5.8462E-02 | 6.519E-02 |
| SB-125 | #B | 1.0646E-01 | 1.0689E-01 | 1.2620E-01 | 1.2634E-01 | 1.489E-01 |
| I-131 | #B | -7.0511E-03 | -1.1717E-02 | 8.7892E-02 | 8.7894E-02 | 6.013E-02 |
| CS-134 | #B | -4.1986E-03 | -4.2215E-03 | 4.5308E-02 | 4.5309E-02 | 5.255E-02 |
| CS-137 | #A | 1.8798E-02 | 1.8805E-02 | 5.2097E-02 | 5.2108E-02 | 5.869E-02 |
| CE-139 | #A | -5.5754E-03 | -5.7434E-03 | 5.4900E-02 | 5.4901E-02 | 5.489E-02 |
| EU-152 | #B | 4.8874E-03 | 4.8917E-03 | 1.3142E-01 | 1.3142E-01 | 1.482E-01 |
| EU-154 | #B | -4.9856E-04 | -4.9922E-04 | 3.0786E-01 | 3.0786E-01 | 1.295E-01 |
| EU-155 | #B | -7.1588E-02 | -7.1750E-02 | 3.3053E-01 | 3.3056E-01 | 2.983E-01 |
| HG-203 | #B | -7.1063E-05 | -7.7573E-05 | 9.8647E-03 | 9.8647E-03 | 5.565E-02 |
| TL-208 | # | 2.7586E-01 | 2.7586E-01 | 1.0156E-01 | 1.0273E-01 | |
| PB-212 | # | 7.5407E-01 | 7.5407E-01 | 1.4501E-01 | 1.5106E-01 | 1.259E-01 |
| PB-214 | # | 5.8497E-01 | 5.8497E-01 | 1.4276E-01 | 1.4649E-01 | 1.192E-01 |
| BI-212 | | 7.6960E-01 | 7.6960E-01 | 6.6057E-01 | 6.6198E-01 | |
| BI-214 | | 5.8942E-01 | 5.8942E-01 | 1.7185E-01 | 1.7500E-01 | |
| RA-224 | #A | 7.0581E-02 | 7.0581E-02 | 1.0759E+00 | 1.0759E+00 | 1.217E+00 |
| RA-226 | #A | 8.5538E-01 | 8.5538E-01 | 1.3539E+00 | 1.3547E+00 | 1.484E+00 |
| AC-228 | | 7.5251E-01 | 7.5251E-01 | 2.4715E-01 | 2.5073E-01 | 1.947E-01 |
| TH-227 | #B | -1.5047E-01 | -1.5047E-01 | 4.7146E-01 | 4.7154E-01 | 5.139E-01 |
| PA-234 | #B | -6.2902E-02 | -6.2902E-02 | 2.4869E-01 | 2.4871E-01 | 2.762E-01 |
| TH-234 | #B | 2.1837E+00 | 2.1837E+00 | 2.2200E+00 | 2.2233E+00 | 5.094E+00 |
| AM-241 | #A | 1.2660E-01 | 1.2660E-01 | 6.3873E-01 | 6.3876E-01 | 7.119E-01 |

# - All peaks for activity calculation had bad shape.
* - Activity omitted from total
& - Activity omitted from total and all peaks had bad shape.
< - MDA value printed.
A - Activity printed, but activity < MDA.
B - Activity < MDA and failed test.
C - Area < Critical level.
F - Failed fraction or key line test.
H - Halflife limit exceeded

---------- S U M M A R Y ----------

Total Activity ( 270.2 to 1999.0 keV) 2.3873878E+00 pCi/gm
Total Decayed Activity ( 270.2 to 1999.0 keV) 2.3873878E+00 pCi/gm

The library has energies which are not separable.

Analyzed by: _____
JPK

Reviewed by: _____
Supervisor

Laboratory: YAEC Chemistry Lab

YAEC Chemistry Lab Spectrum name: 102F_15SEPT2006_1354.An1

Sample description
FSS- SSS-01-01-015-F

Spectrum Filename: C:\GammaVision\Spectra\102F_15SEPT2006_1354.An1

Acquisition information

| | |
|---|---|
| Start time: | 15-Sep-2006 13:54:36 |
| Live time: | 2000 |
| Real time: | 2020 |
| Dead time: | 0.98 % |
| Detector ID: | 3 |

Detector system
Det 102 - DSPP-468

Calibration

| | |
|---|---|
| Filename: | D2_1LSa.Clb |

DET 102 1 Liter Sand Geometry

Energy Calibration

| | |
|---|---|
| Created: | 15-Jan-2005 03:09:29 |
| Zero offset: | 0.220 keV |
| Gain: | 0.500 keV/channel |
| Quadratic: | -6.435E-08 keV/channel^2 |

Efficiency Calibration

| | |
|---|---|
| Created: | 15-Jan-2005 06:48:10 |
| Type: | Polynomial |
| Uncertainty: | 0.497 % |
| Coefficients: | -0.294180 -5.980622 0.744607 |
| | -0.096737 0.005214 -0.000120 |

Library Files

| | |
|---|---|
| Main analysis library: | FSS_Rev_1.Lib |
| Library Match Width: | 1.000 |
| Peak stripping: | Library based |

Analysis parameters

| | |
|---|---|
| Analysis engine: | Env32 G53W4.20 |
| Start channel: | 100 ( 50.22keV ) |
| Stop channel: | 4000 ( 1999.02keV ) |
| Peak rejection level: | 41.667% |
| Peak search sensitivity: | 3 |
| Sample Size: | 1.7720E+03 |
| Activity scaling factor: | 1.0000E+06/( 1.0000E+00* 1.7720E+03) = 5.6433E+02 |
| Detection limit method: | Nureg 4.16 |
| Random error: | 1.0000000E+00 |
| Systematic error: | 1.0000000E+00 |

| | |
|---|---|
| Fraction Limit: | 0.000% |
| Background width: | average of five points. |

YAEC Chemistry Lab Spectrum name: 102F_15SEPT2006_1354.An1

Half lives decay limit: 12.000
Activity range factor: 2.000
Min. step backg. energy 0.000
Multiplet shift channel 2.000

| Corrections | Status | Comments |
|---|---|---|
| Decay correct to date: | YES | 08-Sep-2006 16:30:00 |
| Decay during acquisition: | NO | |
| Decay during collection: | NO | |
| True coincidence correction: | NO | |
| Peaked background correction: | YES | 102_150K_28APR05.Pbc 01-May-2005 05:27:47 |
| Absorption (Internal): | NO | |
| Geometry correction: | NO | |
| Random summing: | NO | |

total peaks alloc. 13 cutoff 20.00000 %
Energy Calibration
Normalized diff: 0.6022

***** S U M M A R Y O F P E A K S I N R A N G E *****

| Peak Energy | Area | Uncert | FWHM | Corrctn Factor | Nuclide Energy | Brnch. Ratio | Act. pCi/gm | Nuc |
|---|---|---|---|---|---|---|---|---|
| 76.39 | 306. | 15.36 | 1.12 | 9.328E-03 | | | | |
| 76.39 | 306. | 15.36 | 1.12 | 9.328E-03 | 77.11 | 10.700 | 2.284E+00 | PB214 |
| | | | | | 77.11 | 17.500 | 1.397E+00 | PB212 |
| 186.93 | 112. | 27.87 | 1.31 | 1.623E-02 | 185.99 | 3.280 | 1.537E+00 | RA226 |
| 239.11 | 595. | 4.94 | 1.22 | 1.378E-02 | 238.63 | 43.100 | 7.620E-01 | PB212 |
| 242.08 | 89. | 22.36 | 1.22 | 1.365E-02 | 241.00 | 3.900 | PBC<MDA | RA224 |
| | | | | | 241.92 | 7.470 | 6.692E-01 | PB214 |
| 282.33 | 48. | 30.27 | 1.00 | 1.195E-02 | | | | |
| 295.79 | 128. | 16.23 | 1.20 | 1.144E-02 | 295.22 | 19.200 | 4.434E-01 | PB214 |
| 329.11 | 68. | 28.66 | 1.22 | 1.034E-02 | | | | |
| 338.85 | 141. | 18.58 | 1.21 | 1.005E-02 | 338.40 | 12.010 | 8.875E-01 | AC228 |
| 352.53 | 244. | 9.01 | 1.19 | 9.664E-03 | 351.99 | 37.100 | 5.165E-01 | PB214 |
| 463.74 | 48. | 36.19 | 0.91 | 7.361E-03 | 463.51 | 10.000 | 4.781E-01 | SB125 |
| 511.87 | 83. | 23.01 | 1.74 | 6.680E-03 | 510.72 | 22.500 | 4.197E-01 | TL208 |
| | | | | | 513.99 | 0.004 | 2.210E+03 | Kr85 |
| | | | | | 514.00 | 99.270 | 1.030E-01 | Sr85 |
| 584.40 | 160. | 9.67 | 1.26 | 5.878E-03 | 583.14 | 86.000 | 2.403E-01 | TL208 |
| 610.20 | 183. | 13.27 | 1.35 | 5.642E-03 | 609.32 | 46.090 | 5.348E-01 | BI214 |
| 662.63 | 71. | 22.93 | 1.50 | 5.222E-03 | 661.62 | 84.620 | 1.231E-01 | CS137 |
| 727.83 | 45. | 33.04 | 1.16 | 4.790E-03 | 727.17 | 11.800 | 6.066E-01 | BI212 |
| 912.47 | 143. | 12.74 | 1.55 | 3.917E-03 | 911.07 | 29.000 | 9.573E-01 | AC228 |
| 969.86 | 126. | 14.94 | 1.84 | 3.715E-03 | | | | |
| 1121.97 | 59. | 23.91 | 2.54 | 3.283E-03 | 1120.28 | 15.040 | 9.112E-01 | BI214 |
| 1463.34 | 500. | 4.55 | 2.13 | 2.617E-03 | | | | |

********** U N I D E N T I F I E D P E A K S U M M A R Y **********

| Peak Channel | Centroid Energy | Background Counts | Net Area Counts | Intensity Cts/Sec | Uncert 3 Sigma % | FWHM keV | Suspected Nuclide | |
|---|---|---|---|---|---|---|---|---|
| 477.86 | 239.14 | 135. | 595. | 0.297 | 14.83 | 1.215 | PB-212 | D |

YAEC Chemistry Lab Spectrum name: 102F_15SEPT2006_1354.An1

| Channel | Energy | Background | Net area | Cnts/sec | Uncert | FWHM | Suspected | |
|---|---|---|---|---|---|---|---|---|
| 483.78 | 242.10 | 156. | 89. | 0.045 | 67.08 | 1.217 | PB-214 | D |
| 657.89 | 329.11 | 118. | 68. | 0.034 | 85.99 | 1.215 | LA-140 | sM |
| 1825.09 | 912.47 | 139. | 46. | 0.023 | 116.65 | 1.552 | AC-228 | sM |
| 1939.93 | 969.86 | 44. | 129. | 0.065 | 34.09 | 1.841 | AC-228 | sM |
| 2927.59 | 1463.34 | 6. | 500. | 0.250 | 13.58 | 2.127 | K-40 | M |

s - Peak fails shape tests.
D - Peak area deconvoluted.
L - Peak written from unknown list.
C - Area < Critical level.
M - Peak is close to a library peak.

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This section based on library: FSS_Rev_1.Lib

********** I D E N T I F I E D P E A K S U M M A R Y **********

| Nuclide | Peak Channel | Centroid Energy | Background Counts | Net Area Counts | Intensity Cts/Sec | Uncert 3 Sigma % | FWHM keV |
|---|---|---|---|---|---|---|---|
| PB-214 | 153.80 | 77.11 | 821. | 213. | 0.106 | 60.68 | 1.500D |
| PB-212 | 153.80 | 77.11 | 821. | 213. | 0.106 | 60.68 | 1.500D |
| RA-226 | 372.48 | 186.43 | 433. | 110. | 0.055 | 81.86 | 1.500s |
| PB-212 | 477.79 | 239.08 | 388. | 542. | 0.271 | 20.09 | 1.500 |
| PB-214 | 591.35 | 295.85 | 195. | 132. | 0.066 | 51.84 | 1.500 |
| AC-228 | 677.47 | 338.90 | 136. | 113. | 0.056 | 52.25 | 1.500 |
| PB-214 | 704.87 | 352.59 | 112. | 248. | 0.124 | 26.24 | 1.500 |
| SB-125 | 927.68 | 463.97 | 82. | 43. | 0.021 | 97.21 | 1.500 |
| TL-208 | 1023.53 | 511.87 | 85. | 83. | 0.041 | 69.02 | 1.745s |
| TL-208 | 1168.63 | 584.40 | 36. | 160. | 0.080 | 29.00 | 1.259 |
| BI-214 | 1220.25 | 610.20 | 106. | 183. | 0.091 | 39.80 | 1.350 |
| CS-137 | 1325.16 | 662.63 | 55. | 71. | 0.036 | 68.78 | 1.496s |
| BI-212 | 1455.62 | 727.83 | 55. | 45. | 0.023 | 99.11 | 1.159s |
| AC-228 | 1825.68 | 912.77 | 34. | 97. | 0.048 | 39.76 | 1.679 |
| BI-214 | 2244.33 | 1121.97 | 40. | 59. | 0.030 | 71.73 | 2.541s |

s - Peak fails shape tests.
D - Peak area deconvoluted.
A Derived peak area.

***** S U M M A R Y O F L I B R A R Y P E A K U S A G E *****

| - Nuclide - Name | Code | Average Activity pCi/gm | Peak Energy keV | Peak Activity pCi/gm | Peak Code | Peak MDA Value pCi/gm | COMMENTS |
|---|---|---|---|---|---|---|---|
| BE-7 | | 9.2957E-02 | | | | | |
| | | | 477.56 | 9.296E-02 | &( | 4.706E-01 1.37E-01 | G |

| Nuclide | Ave activity | Energy | Activity | Code | Peak | MDA | Comments |
|---|---|---|---|---|---|---|---|
| K-40 | -4.1095E-03 | | | | | | |
| | | 1460.75 | -4.110E-03 | %(P | 6.965E-01 | 1.88E-01 | G |
| MN-54 | 9.7787E-04 | | | | | | |
| | | 834.81 | 9.779E-04 | &(P | 5.437E-02 | 1.50E-02 | G |
| CO-57 | 5.3485E-03 | | | | | | |
| | | 122.07 | 5.348E-03 | &( | 5.562E-02 | 1.65E-02 | G K |
| | | 136.43 | 5.798E-02 | & | 4.767E-01 | 1.42E-01 | G |
| CO-60 | 6.7407E-04 | | | | | | |
| | | 1332.51 | 6.741E-04 | &(P | 6.866E-02 | 1.87E-02 | G K |
| | | 1173.23 | 9.701E-03 | % | 8.602E-02 | 2.46E-02 | G K |
| Sr-85 | -6.8917E-03 | | | | | | |
| | | 514.00 | -6.892E-03 | &( | 5.095E-02 | 1.47E-02 | G |
| Kr-85 | -1.4792E+02 | | | | | | |
| | | 513.99 | -1.479E+02 | &( | 1.093E+03 | 3.16E+02 | G |
| Y-88 | -3.4177E-03 | | | | | | |
| | | 1836.01 | -3.418E-03 | %(P | 6.416E-02 | 1.68E-02 | G K |
| | | 898.02 | -3.185E-03 | % P | 6.654E-02 | 1.84E-02 | G |
| NB-94 | -1.4141E-04 | | | | | | |
| | | 871.10 | -1.414E-04 | &( | 6.336E-02 | 1.77E-02 | G K |
| | | 702.50 | 8.897E-03 | % | 5.905E-02 | 1.71E-02 | G K |
| Ag-108M | -3.7106E-03 | | | | | | |
| | | 722.95 | -3.711E-03 | %( | 5.607E-02 | 1.58E-02 | G K |
| | | 614.37 | -4.042E-02 | % P | 7.869E-02 | 2.39E-02 | G |
| | | 433.93 | 6.628E-03 | % | 4.741E-02 | 1.38E-02 | G |
| CD-109 | -1.4717E-01 | | | | | | |
| | | 88.04 | -1.472E-01 | %(P | 2.328E+00 | 6.94E-01 | G |
| SN-113 | -1.4636E-02 | | | | | | |
| | | 391.71 | -1.464E-02 | %( | 7.292E-02 | 2.15E-02 | G K |
| | | 255.04 | 7.174E-01 | % | 2.000E+00 | 6.01E-01 | G |
| SB-125 | 1.4205E-01 | | | | | | |
| | | 427.95 | 3.982E-02 | %(P | 1.356E-01 | 4.00E-02 | G K |
| | | 600.77 | 2.967E-02 | & P | 2.884E-01 | 8.28E-02 | G |
| | | 636.15 | -4.862E-02 | & P | 4.607E-01 | 1.32E-01 | G |
| | | 463.51 | 4.447E-01 | (P | 4.682E-01 | 1.49E-01 | G |
| | | 176.29 | -2.031E-01 | % P | 7.838E-01 | 2.34E-01 | G |

| Nuclide | Ave activity | Energy | Activity | Code | Peak | MDA | Comments |
|---|---|---|---|---|---|---|---|
| I-131 | -1.6066E-02 | | | | | | |
| | | 364.48 | -1.607E-02 | %( | 9.878E-02 | 2.90E-02 | G K |
| | | 636.97 | 3.734E-02 | & | 1.195E+00 | 3.36E-01 | G |
| | | 284.29 | -1.796E-01 | & | 1.386E+00 | 4.09E-01 | G |
| CS-134 | -3.8368E-03 | | | | | | |
| | | 604.66 | -3.837E-03 | &( | 6.671E-02 | 1.92E-02 | G K |
| | | 795.76 | 3.115E-02 | % | 7.284E-02 | 2.19E-02 | G |
| | | 569.29 | 2.246E-02 | & | 2.928E-01 | 8.32E-02 | G |
| | | 801.84 | -1.443E-01 | & P | 8.452E-01 | 2.46E-01 | G |
| CS-137 | 1.2310E-01 | | | | | | |
| | | 661.62 | 1.231E-01 | *( | 6.404E-02 | 2.83E-02 | G |
| CE-139 | -2.9628E-03 | | | | | | |
| | | 165.85 | -2.963E-03 | %(P | 5.800E-02 | 1.72E-02 | G |
| EU-152 | 3.6054E-02 | | | | | | |
| | | 121.78 | 3.605E-02 | &(P | 1.559E-01 | 4.66E-02 | G K |
| | | 344.30 | -1.690E-02 | % | 1.724E-01 | 5.04E-02 | G |
| | | 1408.08 | 5.741E-02 | % | 2.685E-01 | 7.58E-02 | G |
| | | 964.00 | -3.124E-04 | & P | 4.132E-01 | 1.14E-01 | G |
| | | 1112.07 | -1.458E-02 | % | 4.731E-01 | 1.31E-01 | G |
| | | 778.90 | 5.745E-02 | % P | 4.197E-01 | 1.20E-01 | G |
| EU-154 | -2.9134E-02 | | | | | | |
| | | 123.10 | -2.913E-02 | %(P | 1.280E-01 | 3.83E-02 | G K |
| | | 1274.80 | -3.273E-02 | & | 2.127E-01 | 6.05E-02 | G |
| | | 723.30 | -5.877E-02 | % P | 3.229E-01 | 9.37E-02 | G |
| | | 1004.80 | 7.321E-02 | % | 3.263E-01 | 9.39E-02 | G |
| EU-155 | -1.2140E-03 | | | | | | |
| | | 86.45 | -1.214E-03 | %(P | 2.815E-01 | 8.37E-02 | G K |
| | | 105.31 | -2.359E-03 | & | 2.776E-01 | 8.24E-02 | G |
| HG-203 | -2.0897E-02 | | | | | | |
| | | 279.17 | -2.090E-02 | &(P | 6.883E-02 | 2.06E-02 | G K |
| | | 72.87 | -1.298E-01 | % | 2.141E+00 | 6.38E-01 | G |
| | | 70.83 | -1.372E+00 | % | 4.606E+00 | 1.39E+00 | G |
| | | 82.50 | -1.684E-01 | & | 4.645E+00 | 1.38E+00 | G |
| TL-208 | 2.4027E-01 | | | | | | |
| | | 583.14 | 2.403E-01 | (P | 4.641E-02 | 2.33E-02 | G |
| | | 510.72 | 4.197E-01 | + | 2.314E-01 | 9.68E-02 | G |

| Nuclide | Ave activity | Energy | Activity | Code | Peak | MDA | Comments |
|---|---|---|---|---|---|---|---|
| PB-212 | 6.9492E-01 | | | | | | |
| | | 238.63 | 6.949E-01 | ( | 1.211E-01 | 4.65E-02 | G K |
| | | | | | | | Energy duplication |
| | | 77.11 | 9.726E-01 | + | 6.223E-01 | 1.97E-01 | G |
| | | 74.81 | 6.002E-01 | & P | 1.289E+00 | 3.90E-01 | G |
| PB-214 | 5.0290E-01 | | | | | | |
| | | 351.99 | 5.262E-01 | (P | 1.104E-01 | 4.61E-02 | G K |
| | | 295.22 | 4.579E-01 | ( | 2.347E-01 | 7.91E-02 | G |
| | | | | | | | Energy duplication |
| | | 77.11 | 1.591E+00 | + | 1.018E+00 | 3.22E-01 | G |
| | | 241.92 | 4.841E-01 | % | 7.154E-01 | 2.19E-01 | G |
| BI-212 | 6.0664E-01 | | | | | | |
| | | 727.17 | 6.066E-01 | *( | 5.024E-01 | 2.01E-01 | G K |
| | | 1620.56 | -5.289E-01 | & P | 2.525E+00 | 7.06E-01 | G |
| | | 785.42 | 1.006E+00 | & P | 2.501E+00 | 7.48E-01 | G |
| BI-214 | 5.3482E-01 | | | | | | |
| | | 609.32 | 5.348E-01 | ( | 1.487E-01 | 7.11E-02 | G K |
| | | 1764.51 | -6.987E-02 | % P | 4.880E-01 | 1.36E-01 | G |
| | | 1120.28 | 9.112E-01 | + | 4.970E-01 | 2.18E-01 | G |
| RA-224 | 9.8055E-01 | | | | | | |
| | | 241.00 | 9.805E-01 | &(P | 1.385E+00 | 4.25E-01 | G |
| RA-226 | 1.5685E+00 | | | | | | |
| | | 185.99 | 1.569E+00 | @(P | 1.424E+00 | 4.45E-01 | G |
| AC-228 | 6.6585E-01 | | | | | | |
| | | 911.07 | 6.470E-01 | (P | 2.005E-01 | 8.60E-02 | G K |
| | | 968.90 | -4.225E-02 | % P | 4.037E-01 | 1.15E-01 | G |
| | | 338.40 | 7.112E-01 | ( | 3.604E-01 | 1.24E-01 | G |
| TH-227 | 1.4219E-02 | | | | | | |
| | | 236.00 | 1.422E-02 | %(P | 6.362E-01 | 1.89E-01 | G K |
| | | 256.25 | -1.780E-01 | & | 6.704E-01 | 2.00E-01 | G |
| PA-234 | -5.0313E-02 | | | | | | |
| | | 98.44 | -5.031E-02 | &( | 2.655E-01 | 7.95E-02 | G K |
| | | 946.00 | 5.056E-02 | % | 2.320E-01 | 6.61E-02 | G |
| | | 131.28 | -2.357E-03 | & | 2.399E-01 | 7.10E-02 | G |
| | | 94.67 | 1.732E-02 | % | 3.803E-01 | 1.13E-01 | G |
| | | 883.24 | 7.527E-03 | % | 4.602E-01 | 1.27E-01 | G |
| | | 926.70 | 0.000E+00 | % | 5.225E-01 | 1.44E-01 | G |
| | | 569.26 | 1.018E-01 | & | 3.832E-01 | 1.12E-01 | G |

| Nuclide | Ave activity | Energy | Activity | Code | Peak | MDA | Comments |
|---|---|---|---|---|---|---|---|
| TH-234 | 6.1571E-01 | | | | | | |
| | | 63.29 | 6.157E-01 | &(P | 5.079E+00 | 1.52E+00 | G K |
| | | 92.80 | 1.704E+00 | % | 2.535E+00 | 7.75E-01 | G |
| | | 92.38 | 1.993E+00 | % P | 2.914E+00 | 8.91E-01 | G |
| AM-241 | 1.8810E-01 | | | | | | |
| | | 59.54 | 1.881E-01 | %( | 7.086E-01 | 2.13E-01 | G |

( - This peak used in the nuclide activity average.

* - Peak is too wide, but only one peak in library.
! - Peak is part of a multiplet and this area went negative during deconvolution.
? - Peak is too narrow.
@ - Peak is too wide at FW25M, but ok at FWHM.
% - Peak fails sensitivity test.
$ - Peak identified, but first peak of this nuclide failed one or more qualification tests.
+ - Peak activity higher than counting uncertainty range.
- - Peak activity lower than counting uncertainty range.
= - Peak outside analysis energy range.
& - Calculated peak centroid is not close enough to the library energy centroid for positive identification.
P - Peakbackground subtraction
} - Peak is too close to another for the activity to be found directly.

| Nuclide Codes: | Peak Codes: |
|---|---|
| T - Thermal Neutron Activation | G - Gamma Ray |
| F - Fast Neutron Activation | X - X-Ray |
| I - Fission Product | P - Positron Decay |
| N - Naturally Occurring Isotope | S - Single-Escape |
| P - Photon Reaction | D - Double-Escape |
| C - Charged Particle Reaction | K - Key Line |
| M - No MDA Calculation | A - Not in Average |
| R - Coincidence Corrected | C - Coincidence Peak |
| H - Halflife limit exceeded | |

- - - - - - - - - - - - - - - - - - - - - - - - - - - - - - - - - - - - -

***** S U M M A R Y O F N U C L I D E S I N S A M P L E *****

| Nuclide | | Time of Count Activity pCi/gm | Time Corrected Activity pCi/gm | Uncertainty (3 Sigma) Counting pCi/gm | Total pCi/gm | MDA pCi/gm |
|---|---|---|---|---|---|---|
| BE-7 | #A | 8.5002E-02 | 9.2957E-02 | 4.1213E-01 | 4.1216E-01 | 4.303E-01 |
| K-40 | #A | -4.1095E-03 | -4.1095E-03 | 1.7083E-01 | 1.7083E-01 | 6.965E-01 |
| MN-54 | #A | 9.6302E-04 | 9.7787E-04 | 4.5094E-02 | 4.5094E-02 | 5.354E-02 |
| CO-57 | #B | 5.2547E-03 | 5.3485E-03 | 4.9574E-02 | 4.9574E-02 | 5.465E-02 |
| CO-60 | #B | 6.7240E-04 | 6.7407E-04 | 5.5950E-02 | 5.5950E-02 | 6.849E-02 |
| Sr-85 | #A | -6.4022E-03 | -6.8917E-03 | 4.4204E-02 | 4.4206E-02 | 4.733E-02 |

| | | | | | | |
|---|---|---|---|---|---|---|
| Kr-85 | #A | -1.4791E+02 | -1.4792E+02 | 9.4807E+02 | 9.4811E+02 | 1.093E+03 |
| Y-88 | #B | -3.2679E-03 | -3.4177E-03 | 5.1055E-02 | 5.1055E-02 | 6.135E-02 |
| NB-94 | #B | -1.4141E-04 | -1.4141E-04 | 5.3096E-02 | 5.3096E-02 | 6.336E-02 |
| Ag-108M | #B | -3.7102E-03 | -3.7106E-03 | 4.7352E-02 | 4.7353E-02 | 5.606E-02 |
| CD-109 | #A | -1.4563E-01 | -1.4717E-01 | 2.9115E+00 | 2.9115E+00 | 2.304E+00 |
| SN-113 | #B | -1.4041E-02 | -1.4636E-02 | 6.4354E-02 | 6.4359E-02 | 6.996E-02 |
| SB-125 | #F | 1.4138E-01 | 1.4205E-01 | 1.4309E-01 | 1.4331E-01 | 1.349E-01 |
| I-131 | #B | -8.8687E-03 | -1.6066E-02 | 8.6970E-02 | 8.6975E-02 | 5.453E-02 |
| CS-134 | #B | -3.8125E-03 | -3.8368E-03 | 5.7741E-02 | 5.7742E-02 | 6.629E-02 |
| CS-137 | # | 1.2305E-01 | 1.2310E-01 | 8.4668E-02 | 8.4949E-02 | |
| CE-139 | #A | -2.8616E-03 | -2.9628E-03 | 6.1120E-02 | 6.1121E-02 | 5.602E-02 |
| EU-152 | #B | 3.6017E-02 | 3.6054E-02 | 1.3988E-01 | 1.3990E-01 | 1.558E-01 |
| EU-154 | #B | -2.9089E-02 | -2.9134E-02 | 1.1685E-01 | 1.1686E-01 | 1.278E-01 |
| EU-155 | #B | -1.2108E-03 | -1.2140E-03 | 3.4922E-01 | 3.4922E-01 | 2.808E-01 |
| HG-203 | #B | -1.8860E-02 | -2.0897E-02 | 6.2328E-02 | 6.2339E-02 | 6.213E-02 |
| TL-208 | | 2.4027E-01 | 2.4027E-01 | 6.9855E-02 | 7.1144E-02 | |
| PB-212 | # | 6.9492E-01 | 6.9492E-01 | 1.3958E-01 | 1.4492E-01 | 1.211E-01 |
| PB-214 | # | 5.0290E-01 | 5.0290E-01 | 1.3218E-01 | 1.3516E-01 | 1.104E-01 |
| BI-212 | # | 6.0664E-01 | 6.0664E-01 | 6.0122E-01 | 6.0219E-01 | |
| BI-214 | | 5.3482E-01 | 5.3482E-01 | 2.1287E-01 | 2.1498E-01 | |
| RA-224 | #A | 9.8055E-01 | 9.8055E-01 | 1.2750E+00 | 1.2762E+00 | 1.385E+00 |
| RA-226 | # | 1.5685E+00 | 1.5685E+00 | 1.3361E+00 | 1.3390E+00 | 1.424E+00 |
| AC-228 | | 6.6585E-01 | 6.6585E-01 | 2.1877E-01 | 2.2194E-01 | 2.005E-01 |
| TH-227 | #B | 1.4219E-02 | 1.4219E-02 | 5.6766E-01 | 5.6766E-01 | 6.362E-01 |
| PA-234 | #B | -5.0313E-02 | -5.0313E-02 | 2.3852E-01 | 2.3854E-01 | 2.655E-01 |
| TH-234 | #B | 6.1571E-01 | 6.1571E-01 | 4.5491E+00 | 4.5492E+00 | 5.079E+00 |
| AM-241 | #A | 1.8809E-01 | 1.8810E-01 | 6.3827E-01 | 6.3835E-01 | 7.086E-01 |

# - All peaks for activity calculation had bad shape.
* - Activity omitted from total
& - Activity omitted from total and all peaks had bad shape.
< - MDA value printed.
A - Activity printed, but activity < MDA.
B - Activity < MDA and failed test.
C - Area < Critical level.
F - Failed fraction or key line test.
H - Halflife limit exceeded

---------- S U M M A R Y ----------

Total Activity ( 282.2 to 1999.0 keV) 2.1706271E+00 pCi/gm
Total Decayed Activity ( 282.2 to 1999.0 keV) 2.1706808E+00 pCi/gm

The library has energies which are not separable.

Analyzed by: _____
JPK

Reviewed by: _____
Supervisor

Laboratory: YAEC Chemistry Lab

YAEC Chemistry Lab Spectrum name: 102F_15SEPT2006_1434.An1

Sample description
FSS- SSS-01-01-031-F-B

Spectrum Filename: C:\GammaVision\Spectra\102F_15SEPT2006_1434.An1

Acquisition information
Start time: 15-Sep-2006 14:34:13
Live time: 2000
Real time: 2021
Dead time: 1.02 %
Detector ID: 3

Detector system
Det 102 - DSPP-468

Calibration
Filename: D2_1LSa.Clb
DET 102 1 Liter Sand Geometry

Energy Calibration
Created: 15-Jan-2005 03:09:29
Zero offset: 0.220 keV
Gain: 0.500 keV/channel
Quadratic: -6.435E-08 keV/channel^2

Efficiency Calibration
Created: 15-Jan-2005 06:48:10
Type: Polynomial
Uncertainty: 0.497 %
Coefficients: -0.294180 -5.980622 0.744607
-0.096737 0.005214 -0.000120

Library Files
Main analysis library: FSS_Rev_1.Lib
Library Match Width: 1.000
Peak stripping: Library based

Analysis parameters
Analysis engine: Env32 G53W4.20
Start channel: 100 ( 50.22keV )
Stop channel: 4000 ( 1999.02keV )
Peak rejection level: 41.667%
Peak search sensitivity: 3
Sample Size: 1.7040E+03
Activity scaling factor: 1.0000E+06/( 1.0000E+00* 1.7040E+03) =
5.8685E+02
Detection limit method: Nureg 4.16
Random error: 1.0000000E+00
Systematic error: 1.0000000E+00

| | |
|---|---|
| Fraction Limit: | 0.000% |
| Background width: | average of five points. |

YAEC Chemistry Lab Spectrum name: 102F_15SEPT2006_1434.An1

Half lives decay limit: 12.000
Activity range factor: 2.000
Min. step backg. energy 0.000
Multiplet shift channel 2.000

| Corrections | Status | Comments |
|---|---|---|
| Decay correct to date: | YES | 09-Sep-2006 14:00:00 |
| Decay during acquisition: | NO | |
| Decay during collection: | NO | |
| True coincidence correction: | NO | |
| Peaked background correction: | YES | 102_150K_28APR05.Pbc 01-May-2005 05:27:47 |
| Absorption (Internal): | NO | |
| Geometry correction: | NO | |
| Random summing: | NO | |

total peaks alloc. 17 cutoff 20.00000 %
Energy Calibration
Normalized diff: 0.7338

***** S U M M A R Y O F P E A K S I N R A N G E *****

| Peak Energy | Area | Uncert | FWHM | Corrctn Factor | Nuclide Energy | Brnch. Ratio | Act. pCi/gm | Nuc |
|---|---|---|---|---|---|---|---|---|
| 77.30 | 172. | 26.27 | 1.50 | 9.541E-03 | 77.11 | 10.700 | 1.335E+00 | PB214 |
| | | | | | 77.11 | 17.500 | 8.162E-01 | PB212 |
| 77.30 | 172. | 26.27 | 1.50 | 9.541E-03 | 77.11 | 10.700 | 1.335E+00 | PB214 |
| | | | | | 77.11 | 17.500 | 8.162E-01 | PB212 |
| 186.53 | 146. | 23.77 | 1.13 | 1.624E-02 | 185.99 | 3.280 | 2.104E+00 | RA226 |
| 239.25 | 702. | 6.00 | 1.19 | 1.378E-02 | 238.63 | 43.100 | 9.352E-01 | PB212 |
| 270.96 | 45. | 37.38 | 1.40 | 1.240E-02 | | | | |
| 295.70 | 119. | 15.03 | 1.25 | 1.144E-02 | 295.22 | 19.200 | 4.272E-01 | PB214 |
| 300.88 | 38. | 38.68 | 1.26 | 1.126E-02 | | | | |
| 329.09 | 53. | 41.26 | 1.35 | 1.034E-02 | | | | |
| 338.96 | 137. | 15.26 | 1.43 | 1.004E-02 | 338.40 | 12.010 | 8.993E-01 | AC228 |
| 352.62 | 268. | 10.34 | 1.49 | 9.662E-03 | 351.99 | 37.100 | 5.902E-01 | PB214 |
| 464.17 | 32. | 36.98 | 1.37 | 7.354E-03 | 463.51 | 10.000 | PBC<MDA | SB125 |
| 511.98 | 68. | 20.10 | 1.64 | 6.679E-03 | 510.72 | 22.500 | 3.580E-01 | TL208 |
| 584.42 | 187. | 9.97 | 1.41 | 5.878E-03 | 583.14 | 86.000 | 2.928E-01 | TL208 |
| 610.41 | 180. | 9.55 | 1.36 | 5.640E-03 | 609.32 | 46.090 | 5.485E-01 | BI214 |
| 662.95 | 64. | 23.74 | 1.69 | 5.220E-03 | 661.62 | 84.620 | 1.155E-01 | CS137 |
| 728.35 | 85. | 19.07 | 2.17 | 4.794E-03 | 727.17 | 11.800 | 1.197E+00 | BI212 |
| 796.58 | 29. | 31.97 | 1.60 | 4.420E-03 | 795.76 | 85.400 | 6.142E-02 | CS134 |
| 913.13 | 130. | 13.09 | 1.27 | 3.914E-03 | | | | |
| 970.72 | 84. | 17.51 | 1.75 | 3.712E-03 | | | | |
| 1463.45 | 630. | 4.09 | 1.97 | 2.617E-03 | 1460.75 | 10.700 | 1.780E+01 | K40 |

********** U N I D E N T I F I E D P E A K S U M M A R Y **********

| Peak Channel | Centroid Energy | Background Counts | Net Area Counts | Intensity Cts/Sec | Uncert 3 Sigma % | FWHM keV | Suspected Nuclide |
|---|---|---|---|---|---|---|---|

| | | | | | | | | |
|---|---|---|---|---|---|---|---|---|
| 478.13 | 239.25 | 909. | 137. | 0.068 | 97.09 | 1.185 | PB-212 | M |
| 541.56 | 270.96 | 119. | 45. | 0.023 | 112.15 | 1.402 | AC-228 | M |
| 601.42 | 301.00 | 91. | 38. | 0.019 | 116.03 | 1.259 | PB-212 | lD |

| Channel | Energy | Background | Net area | Cnts/sec | Uncert | FWHM | Suspected | |
|---|---|---|---|---|---|---|---|---|
| 657.85 | 329.09 | 149. | 53. | 0.026 | 123.77 | 1.346 | LA-140 | sM |
| 1826.40 | 913.13 | 42. | 130. | 0.065 | 33.93 | 1.267 | AC-228 | sM |
| 1941.66 | 970.72 | 38. | 84. | 0.042 | 45.45 | 1.750 | AC-228 | M |

s - Peak fails shape tests.
D - Peak area deconvoluted.
L - Peak written from unknown list.
C - Area < Critical level.
M - Peak is close to a library peak.

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This section based on library: FSS_Rev_1.Lib

********** I D E N T I F I E D P E A K S U M M A R Y **********

| Nuclide | Peak Channel | Centroid Energy | Background Counts | Net Area Counts | Intensity Cts/Sec | Uncert 3 Sigma % | FWHM keV |
|---|---|---|---|---|---|---|---|
| PB-214 | 153.80 | 77.11 | 933. | 172. | 0.086 | 78.80 | 1.500D |
| PB-212 | 153.80 | 77.11 | 933. | 172. | 0.086 | 78.80 | 1.500D |
| RA-226 | 372.51 | 186.45 | 406. | 88. | 0.044 | 97.08 | 1.500s |
| PB-212 | 477.77 | 239.07 | 386. | 525. | 0.263 | 20.57 | 1.500 |
| PB-214 | 591.04 | 295.69 | 177. | 119. | 0.060 | 54.61 | 1.500s |
| AC-228 | 677.59 | 338.96 | 137. | 140. | 0.070 | 43.68 | 1.500 |
| PB-214 | 705.16 | 352.74 | 118. | 232. | 0.116 | 27.92 | 1.500s |
| SB-125 | 927.78 | 464.02 | 86. | 43. | 0.022 | 97.54 | 1.500 |
| TL-208 | 1023.74 | 511.98 | 54. | 68. | 0.034 | 60.30 | 1.638s |
| TL-208 | 1168.67 | 584.42 | 51. | 187. | 0.093 | 29.92 | 1.406 |
| BI-214 | 1220.68 | 610.41 | 40. | 180. | 0.090 | 28.65 | 1.360 |
| Ag-108M | 1224.66 | 612.40 | 145. | -51. | -0.026 | 107.88 | 1.499s |
| CS-137 | 1325.79 | 662.95 | 55. | 64. | 0.032 | 71.21 | 1.693 |
| BI-212 | 1456.66 | 728.35 | 49. | 85. | 0.043 | 57.21 | 2.168s |
| CS-134 | 1593.19 | 796.58 | 29. | 29. | 0.015 | 95.90 | 1.601s |
| K-40 | 2927.87 | 1463.48 | 4. | 599. | 0.300 | 12.33 | 2.042 |

s - Peak fails shape tests.
D - Peak area deconvoluted.
A Derived peak area.

***** S U M M A R Y O F L I B R A R Y P E A K U S A G E *****

| - Nuclide - Name | Code | Average Activity pCi/gm | Peak Energy keV | Peak Activity pCi/gm | Peak Code | Peak MDA Value pCi/gm | COMMENTS |
|---|---|---|---|---|---|---|---|
| BE-7 | | 7.6246E-02 | | | | | |
| | | | 477.56 | 7.625E-02 | %( | 4.415E-01 1.28E-01 | G |

| Nuclide | Ave activity | Energy | Activity | Code | Peak | MDA | Comments |
|---|---|---|---|---|---|---|---|
| K-40 | 1.6942E+01 | | | | | | |
| | | 1460.75 | 1.694E+01 | (P | 3.385E-01 | 6.97E-01 | G |
| MN-54 | -9.2961E-03 | | | | | | |
| | | 834.81 | -9.296E-03 | %(P | 7.033E-02 | 2.02E-02 | G |
| CO-57 | -1.7006E-03 | | | | | | |
| | | 122.07 | -1.701E-03 | &( | 6.289E-02 | 1.87E-02 | G K |
| | | 136.43 | 1.600E-02 | & | 4.482E-01 | 1.33E-01 | G |
| CO-60 | -1.0256E-02 | | | | | | |
| | | 1332.51 | -1.026E-02 | %(P | 7.675E-02 | 2.16E-02 | G K |
| | | 1173.23 | -1.169E-02 | & | 9.940E-02 | 2.86E-02 | G K |
| Sr-85 | 2.5845E-03 | | | | | | |
| | | 514.00 | 2.584E-03 | %( | 4.984E-02 | 1.42E-02 | G |
| Kr-85 | 5.4926E+01 | | | | | | |
| | | 513.99 | 5.493E+01 | %( | 1.079E+03 | 3.07E+02 | G |
| Y-88 | 1.2783E-04 | | | | | | |
| | | 1836.01 | 1.278E-04 | %(P | 5.367E-02 | 1.31E-02 | G K |
| | | 898.02 | 1.959E-02 | % P | 7.130E-02 | 2.08E-02 | G |
| NB-94 | 9.3267E-03 | | | | | | |
| | | 871.10 | 9.327E-03 | &( | 4.403E-02 | 1.25E-02 | G K |
| | | 702.50 | 1.805E-02 | % | 4.895E-02 | 1.46E-02 | G K |
| Ag-108M | 1.3361E-02 | | | | | | |
| | | 722.95 | 1.336E-02 | %( | 3.914E-02 | 1.15E-02 | G K |
| | | 614.37 | -8.057E-02 | + P | 9.194E-02 | 2.89E-02 | G |
| | | 433.93 | 7.802E-03 | % | 4.837E-02 | 1.41E-02 | G |
| CD-109 | 2.9961E-01 | | | | | | |
| | | 88.04 | 2.996E-01 | %(P | 2.359E+00 | 7.05E-01 | G |
| SN-113 | -1.4198E-02 | | | | | | |
| | | 391.71 | -1.420E-02 | %( | 7.317E-02 | 2.15E-02 | G K |
| | | 255.04 | 5.746E-01 | & | 2.080E+00 | 6.20E-01 | G |
| SB-125 | 1.4453E-01 | | | | | | |
| | | 427.95 | 3.456E-02 | %(P | 1.328E-01 | 3.89E-02 | G K |
| | | 600.77 | -7.765E-03 | % P | 2.883E-01 | 8.15E-02 | G |
| | | 636.15 | 1.441E-01 | % P | 3.575E-01 | 1.07E-01 | G |
| | | 463.51 | 4.700E-01 | (P | 4.970E-01 | 1.58E-01 | G |
| | | 176.29 | -7.795E-02 | & P | 7.612E-01 | 2.25E-01 | G |

| Nuclide | Ave activity | Energy | Activity | Code | Peak | MDA | Comments |
|---|---|---|---|---|---|---|---|
| I-131 | -1.0097E-04 | | | | | | |
| | | 364.48 | -1.010E-04 | &( | 9.007E-02 | 2.59E-02 | G K |
| | | 636.97 | -3.378E-01 | % | 1.348E+00 | 3.96E-01 | G |
| | | 284.29 | 6.235E-03 | % | 1.242E+00 | 3.62E-01 | G |
| CS-134 | 2.5214E-02 | | | | | | |
| | | 604.66 | -6.469E-03 | %( | 4.980E-02 | 1.43E-02 | G K |
| | | 795.76 | 6.142E-02 | ( | 5.842E-02 | 1.96E-02 | G |
| | | 569.29 | -2.799E-02 | % | 3.399E-01 | 9.73E-02 | G |
| | | 801.84 | 1.678E-01 | % P | 5.932E-01 | 1.73E-01 | G |
| CS-137 | 1.1546E-01 | | | | | | |
| | | 661.62 | 1.155E-01 | ( | 6.659E-02 | 2.75E-02 | G |
| CE-139 | -6.1596E-03 | | | | | | |
| | | 165.85 | -6.160E-03 | %(P | 6.192E-02 | 1.84E-02 | G |
| EU-152 | 1.5984E-02 | | | | | | |
| | | 121.78 | 1.598E-02 | %(P | 1.725E-01 | 5.12E-02 | G K |
| | | 344.30 | -1.734E-03 | & | 1.666E-01 | 4.82E-02 | G |
| | | 1408.08 | -4.978E-02 | & | 3.140E-01 | 8.79E-02 | G |
| | | 964.00 | -5.012E-02 | & P | 5.075E-01 | 1.44E-01 | G |
| | | 1112.07 | 1.590E-01 | % | 5.510E-01 | 1.62E-01 | G |
| | | 778.90 | -1.023E-03 | & P | 5.143E-01 | 1.45E-01 | G |
| EU-154 | -5.9675E-03 | | | | | | |
| | | 123.10 | -5.968E-03 | &(P | 1.320E-01 | 3.92E-02 | G K |
| | | 1274.80 | 3.719E-02 | % | 2.207E-01 | 6.30E-02 | G |
| | | 723.30 | 7.000E-02 | % P | 3.045E-01 | 8.88E-02 | G |
| | | 1004.80 | -3.808E-02 | % | 3.802E-01 | 1.07E-01 | G |
| EU-155 | 3.7671E-02 | | | | | | |
| | | 86.45 | 3.767E-02 | &(P | 2.929E-01 | 8.76E-02 | G K |
| | | 105.31 | 7.921E-02 | % | 2.648E-01 | 7.96E-02 | G |
| HG-203 | -6.9942E-03 | | | | | | |
| | | 279.17 | -6.994E-03 | &(P | 6.160E-02 | 1.81E-02 | G K |
| | | 72.87 | -3.590E-01 | % | 2.559E+00 | 7.67E-01 | G |
| | | 70.83 | -3.470E-02 | % | 5.236E+00 | 1.56E+00 | G |
| | | 82.50 | -7.020E-01 | % | 5.029E+00 | 1.51E+00 | G |
| TL-208 | 3.0629E-01 | | | | | | |
| | | 583.14 | 2.928E-01 | (P | 5.635E-02 | 2.93E-02 | G |
| | | 510.72 | 3.580E-01 | ( | 1.946E-01 | 7.21E-02 | G |

| Nuclide | Ave activity | Energy | Activity | Code | Peak | MDA | Comments |
|---|---|---|---|---|---|---|---|
| PB-212 | 7.3385E-01 | | | | | | |
| | | 238.63 | 7.004E-01 | ( | 1.257E-01 | 4.80E-02 | G K |
| | | | | | | | Energy duplication |
| | | 77.11 | 8.162E-01 | ( | 6.889E-01 | 2.14E-01 | G |
| | | 74.81 | 6.420E-01 | & P | 1.429E+00 | 4.33E-01 | G |
| PB-214 | 4.8441E-01 | | | | | | |
| | | 351.99 | 5.124E-01 | @(P | 1.178E-01 | 4.78E-02 | G K |
| | | 295.22 | 4.304E-01 | @( | 2.330E-01 | 7.83E-02 | G |
| | | | | | | | Energy duplication |
| | | 77.11 | 1.335E+00 | + | 1.127E+00 | 3.51E-01 | G |
| | | 241.92 | 2.409E-01 | % | 8.370E-01 | 2.51E-01 | G |
| BI-212 | 1.1972E+00 | | | | | | |
| | | 727.17 | 1.197E+00 | @( | 4.934E-01 | 2.29E-01 | G K |
| | | 1620.56 | -2.187E-02 | % P | 2.138E+00 | 5.43E-01 | G |
| | | 785.42 | -3.458E-01 | & P | 2.766E+00 | 7.86E-01 | G |
| BI-214 | 5.4854E-01 | | | | | | |
| | | 609.32 | 5.485E-01 | ( | 9.791E-02 | 5.25E-02 | G K |
| | | 1764.51 | -6.108E-02 | % P | 4.392E-01 | 1.20E-01 | G |
| | | 1120.28 | -1.680E-01 | & | 5.754E-01 | 1.70E-01 | G |
| RA-224 | 5.6909E-01 | | | | | | |
| | | 241.00 | 5.691E-01 | &(P | 1.566E+00 | 4.72E-01 | G |
| RA-226 | 1.3084E+00 | | | | | | |
| | | 185.99 | 1.308E+00 | *(P | 1.436E+00 | 4.45E-01 | G |
| AC-228 | 2.7933E-01 | | | | | | |
| | | 911.07 | 1.519E-02 | %(P | 2.274E-01 | 6.40E-02 | G K |
| | | 968.90 | -4.237E-04 | % P | 4.351E-01 | 1.22E-01 | G |
| | | 338.40 | 9.171E-01 | ( | 3.759E-01 | 1.34E-01 | G |
| TH-227 | -3.4519E-01 | | | | | | |
| | | 236.00 | -3.452E-01 | %(P | 5.925E-01 | 1.80E-01 | G K |
| | | 256.25 | -1.634E-01 | % | 6.967E-01 | 2.08E-01 | G |
| PA-234 | -2.1953E-02 | | | | | | |
| | | 98.44 | -2.195E-02 | &( | 2.734E-01 | 8.14E-02 | G K |
| | | 946.00 | -8.613E-02 | % | 3.900E-01 | 1.14E-01 | G |
| | | 131.28 | -5.921E-02 | & | 2.598E-01 | 7.78E-02 | G |
| | | 94.67 | -1.809E-02 | % | 5.136E-01 | 1.53E-01 | G |
| | | 883.24 | 2.825E-04 | & | 3.451E-01 | 9.13E-02 | G |
| | | 926.70 | -5.632E-04 | & | 5.535E-01 | 1.53E-01 | G |
| | | 569.26 | -4.080E-02 | % | 4.900E-01 | 1.40E-01 | G |

| Nuclide | Ave activity | Energy | Activity | Code | Peak | MDA | Comments |
|---|---|---|---|---|---|---|---|
| TH-234 | 1.3324E+00 | | | | | | |
| | | 63.29 | 1.332E+00 | %(P | 5.113E+00 | 1.54E+00 | G K |
| | | 92.80 | 1.162E+00 | & | 2.698E+00 | 8.17E-01 | G |
| | | 92.38 | -1.937E-02 | & P | 2.996E+00 | 8.89E-01 | G |
| AM-241 | -2.2392E-01 | | | | | | |
| | | 59.54 | -2.239E-01 | &( | 7.955E-01 | 2.39E-01 | G |

( - This peak used in the nuclide activity average.

* - Peak is too wide, but only one peak in library.
! - Peak is part of a multiplet and this area went negative during deconvolution.
? - Peak is too narrow.
@ - Peak is too wide at FW25M, but ok at FWHM.
% - Peak fails sensitivity test.
$ - Peak identified, but first peak of this nuclide failed one or more qualification tests.
+ - Peak activity higher than counting uncertainty range.
- - Peak activity lower than counting uncertainty range.
= - Peak outside analysis energy range.
& - Calculated peak centroid is not close enough to the library energy centroid for positive identification.
P - Peakbackground subtraction
} - Peak is too close to another for the activity to be found directly.

| Nuclide Codes: | Peak Codes: |
|---|---|
| T - Thermal Neutron Activation | G - Gamma Ray |
| F - Fast Neutron Activation | X - X-Ray |
| I - Fission Product | P - Positron Decay |
| N - Naturally Occurring Isotope | S - Single-Escape |
| P - Photon Reaction | D - Double-Escape |
| C - Charged Particle Reaction | K - Key Line |
| M - No MDA Calculation | A - Not in Average |
| R - Coincidence Corrected | C - Coincidence Peak |
| H - Halflife limit exceeded | |

- - - - - - - - - - - - - - - - - - - - - - - - - - - - - - - - - - - - -

***** S U M M A R Y O F N U C L I D E S I N S A M P L E *****

| Nuclide | | Time of Count Activity pCi/gm | Time Corrected Activity pCi/gm | Uncertainty Counting pCi/gm | 3 Sigma Total pCi/gm | MDA pCi/gm |
|---|---|---|---|---|---|---|
| BE-7 | #A | 7.0512E-02 | 7.6246E-02 | 3.8375E-01 | 3.8378E-01 | 4.083E-01 |
| K-40 | | 1.6942E+01 | 1.6942E+01 | 2.0900E+00 | 2.2961E+00 | 3.385E-01 |
| MN-54 | #A | -9.1726E-03 | -9.2961E-03 | 6.6014E-02 | 6.6017E-02 | 6.940E-02 |
| CO-57 | #B | -1.6745E-03 | -1.7006E-03 | 5.5953E-02 | 5.5953E-02 | 6.192E-02 |
| CO-60 | #B | -1.0233E-02 | -1.0256E-02 | 6.7675E-02 | 6.7678E-02 | 7.659E-02 |
| Sr-85 | A | 2.4233E-03 | 2.5845E-03 | 4.2566E-02 | 4.2567E-02 | 4.673E-02 |

| | | | | | | |
|---|---|---|---|---|---|---|
| Kr-85 | A | 5.4924E+01 | 5.4926E+01 | 9.2148E+02 | 9.2149E+02 | 1.079E+03 |
| Y-88 | #B | 1.2292E-04 | 1.2783E-04 | 3.9374E-02 | 3.9374E-02 | 5.161E-02 |
| NB-94 | #B | 9.3267E-03 | 9.3267E-03 | 3.7531E-02 | 3.7534E-02 | 4.403E-02 |
| Ag-108M | #B | 1.3360E-02 | 1.3361E-02 | 3.4479E-02 | 3.4487E-02 | 3.914E-02 |
| CD-109 | #A | 2.9687E-01 | 2.9961E-01 | 2.1151E+00 | 2.1152E+00 | 2.337E+00 |
| SN-113 | #B | -1.3693E-02 | -1.4198E-02 | 6.4457E-02 | 6.4462E-02 | 7.056E-02 |
| SB-125 | #F | 1.4394E-01 | 1.4453E-01 | 1.4599E-01 | 1.4622E-01 | 1.323E-01 |
| I-131 | #B | -6.0067E-05 | -1.0097E-04 | 7.7683E-02 | 7.7683E-02 | 5.358E-02 |
| CS-134 | #B | 2.5075E-02 | 2.5214E-02 | 2.4181E-02 | 2.4222E-02 | 4.953E-02 |
| CS-137 | | 1.1541E-01 | 1.1546E-01 | 8.2214E-02 | 8.2469E-02 | |
| CE-139 | #A | -5.9754E-03 | -6.1596E-03 | 6.0064E-02 | 6.0065E-02 | 6.007E-02 |
| EU-152 | #B | 1.5969E-02 | 1.5984E-02 | 1.5373E-01 | 1.5374E-01 | 1.723E-01 |
| EU-154 | #B | -5.9595E-03 | -5.9675E-03 | 1.2738E-01 | 1.2738E-01 | 1.319E-01 |
| EU-155 | #B | 3.7585E-02 | 3.7671E-02 | 2.6271E-01 | 2.6272E-01 | 2.922E-01 |
| HG-203 | #B | -6.3946E-03 | -6.9942E-03 | 5.5684E-02 | 5.5686E-02 | 5.632E-02 |
| TL-208 | | 3.0629E-01 | 3.0629E-01 | 9.1842E-02 | 9.3436E-02 | |
| PB-212 | # | 7.3385E-01 | 7.3385E-01 | 1.5094E-01 | 1.5646E-01 | 1.257E-01 |
| PB-214 | # | 4.8441E-01 | 4.8441E-01 | 1.3545E-01 | 1.3815E-01 | 1.178E-01 |
| BI-212 | # | 1.1972E+00 | 1.1972E+00 | 6.8492E-01 | 6.8820E-01 | |
| BI-214 | | 5.4854E-01 | 5.4854E-01 | 1.5715E-01 | 1.6014E-01 | |
| RA-224 | #A | 5.6909E-01 | 5.6909E-01 | 1.4154E+00 | 1.4157E+00 | 1.566E+00 |
| RA-226 | #A | 1.3084E+00 | 1.3084E+00 | 1.3345E+00 | 1.3366E+00 | 1.436E+00 |
| AC-228 | F | 2.7933E-01 | 2.7933E-01 | 1.2200E-01 | 1.2300E-01 | 2.274E-01 |
| TH-227 | #B | -3.4519E-01 | -3.4519E-01 | 5.4603E-01 | 5.4637E-01 | 5.925E-01 |
| PA-234 | #B | -2.1953E-02 | -2.1953E-02 | 2.4433E-01 | 2.4434E-01 | 2.734E-01 |
| TH-234 | #B | 1.3324E+00 | 1.3324E+00 | 4.6058E+00 | 4.6064E+00 | 5.113E+00 |
| AM-241 | #A | -2.2391E-01 | -2.2392E-01 | 7.1762E-01 | 7.1773E-01 | 7.955E-01 |

# - All peaks for activity calculation had bad shape.
* - Activity omitted from total
& - Activity omitted from total and all peaks had bad shape.
< - MDA value printed.
A - Activity printed, but activity < MDA.
B - Activity < MDA and failed test.
C - Area < Critical level.
F - Failed fraction or key line test.
H - Halflife limit exceeded

---------- S U M M A R Y ----------

Total Activity ( 50.2 to 1999.0 keV) 1.9389145E+01 pCi/gm
Total Decayed Activity ( 50.2 to 1999.0 keV) 1.9389189E+01 pCi/gm

The library has energies which are not separable.

Analyzed by: _____
JPK

Reviewed by: _____
Supervisor

Laboratory: YAEC Chemistry Lab

YAEC Chemistry Lab Spectrum name: 102F_16SEPT2006_0813.An1

Sample description
FSS-SSS-01-01-012-F

Spectrum Filename: C:\GammaVision\Spectra\102F_16SEPT2006_0813.An1

Acquisition information
Start time: 16-Sep-2006 08:13:20
Live time: 2000
Real time: 2025
Dead time: 1.22 %
Detector ID: 3

Detector system
Det 102 - DSPP-468

Calibration
Filename: D2_1LSa.Clb
DET 102 1 Liter Sand Geometry

Energy Calibration
Created: 15-Jan-2005 03:09:29
Zero offset: 0.220 keV
Gain: 0.500 keV/channel
Quadratic: -6.435E-08 keV/channel^2

Efficiency Calibration
Created: 15-Jan-2005 06:48:10
Type: Polynomial
Uncertainty: 0.497 %
Coefficients: -0.294180 -5.980622 0.744607
-0.096737 0.005214 -0.000120

Library Files
Main analysis library: FSS_Rev_1.Lib
Library Match Width: 1.000
Peak stripping: Library based

Analysis parameters
Analysis engine: Env32 G53W4.20
Start channel: 100 ( 50.22keV )
Stop channel: 4000 ( 1999.02keV )
Peak rejection level: 41.667%
Peak search sensitivity: 3
Sample Size: 2.0500E+03
Activity scaling factor: 1.0000E+06/( 1.0000E+00* 2.0500E+03) =
4.8780E+02
Detection limit method: Nureg 4.16
Random error: 1.0000000E+00
Systematic error: 1.0000000E+00

| | |
|---|---|
| Fraction Limit: | 0.000% |
| Background width: | average of five points. |

YAEC Chemistry Lab Spectrum name: 102F_16SEPT2006_0813.An1

Half lives decay limit: 12.000
Activity range factor: 2.000
Min. step backg. energy 0.000
Multiplet shift channel 2.000

| Corrections | Status | Comments |
|---|---|---|
| Decay correct to date: | YES | 10-Sep-2006 13:30:00 |
| Decay during acquisition: | NO | |
| Decay during collection: | NO | |
| True coincidence correction: | NO | |
| Peaked background correction: | YES | 102_150K_28APR05.Pbc 01-May-2005 05:27:47 |
| Absorption (Internal): | NO | |
| Geometry correction: | NO | |
| Random summing: | NO | |

total peaks alloc. 17 cutoff 20.00000 %
Energy Calibration
Normalized diff: 0.7177

***** S U M M A R Y O F P E A K S I N R A N G E *****

| Peak Energy | Area | Uncert | FWHM | Corrctn Factor | Nuclide Energy | Brnch. Ratio | Act. pCi/gm | Nuc |
|---|---|---|---|---|---|---|---|---|
| 74.92 | 166. | 19.79 | 1.10 | 9.037E-03 | 74.81 | 9.600 | PBC<MDA | PB212 |
| 77.21 | 253. | 13.62 | 1.10 | 9.717E-03 | 77.11 | 10.700 | 1.631E+00 | PB214 |
| | | | | | 77.11 | 17.500 | 9.974E-01 | PB212 |
| 92.93 | 136. | 35.10 | 1.50 | 1.333E-02 | 92.38 | 2.570 | PBC<MDA | TH234 |
| | | | | | 92.80 | 3.000 | 2.234E+00 | TH234 |
| 92.97 | 131. | 36.72 | 1.50 | 1.325E-02 | 92.38 | 2.570 | PBC<MDA | TH234 |
| | | | | | 92.80 | 3.000 | PBC<MDA | TH234 |
| 186.49 | 122. | 26.82 | 1.15 | 1.624E-02 | 185.99 | 3.280 | 1.456E+00 | RA226 |
| 209.31 | 114. | 28.22 | 1.10 | 1.519E-02 | | | | |
| 239.15 | 768. | 4.45 | 1.22 | 1.378E-02 | 238.63 | 43.100 | 8.507E-01 | PB212 |
| 242.34 | 122. | 19.78 | 1.22 | 1.364E-02 | 241.00 | 3.900 | 1.488E+00 | RA224 |
| | | | | | 241.92 | 7.470 | 7.869E-01 | PB214 |
| 271.47 | 78. | 33.82 | 1.12 | 1.238E-02 | | | | |
| 278.28 | 57. | 35.76 | 1.37 | 1.211E-02 | | | | |
| 278.28 | 57. | 35.76 | 1.37 | 1.211E-02 | 279.17 | 81.500 | PBC<MDA | HG203 |
| 295.88 | 183. | 10.90 | 1.26 | 1.145E-02 | 295.22 | 19.200 | 5.486E-01 | PB214 |
| 300.88 | 53. | 30.64 | 1.26 | 1.127E-02 | | | | |
| 339.07 | 172. | 17.72 | 0.97 | 1.004E-02 | 338.40 | 12.010 | 9.363E-01 | AC228 |
| 352.63 | 360. | 9.36 | 1.42 | 9.661E-03 | 351.99 | 37.100 | 6.602E-01 | PB214 |
| 434.54 | 60. | 30.96 | 1.14 | 7.851E-03 | 433.93 | 89.881 | 5.597E-02 | Ag108M |
| 463.78 | 41. | 39.61 | 1.50 | 7.365E-03 | 463.51 | 10.000 | PBC<MDA | SB125 |
| 511.90 | 101. | 15.27 | 1.14 | 6.680E-03 | 510.72 | 22.500 | 4.429E-01 | TL208 |
| 584.35 | 261. | 10.72 | 1.24 | 5.878E-03 | 583.14 | 86.000 | 3.386E-01 | TL208 |
| 610.52 | 214. | 7.96 | 1.47 | 5.639E-03 | 609.32 | 46.090 | 5.428E-01 | BI214 |
| 615.65 | 49. | 23.20 | 1.48 | 5.595E-03 | | | | |
| 662.81 | 187. | 8.99 | 1.32 | 5.221E-03 | 661.62 | 84.620 | 2.784E-01 | CS137 |
| 724.36 | 36. | 34.36 | 1.55 | 4.817E-03 | 722.95 | 90.499 | PBC<MDA | Ag108M |

| | | | | | | | | |
|---|---|---|---|---|---|---|---|---|
| | | | | | 723.30 | 19.700 | PBC<MDA | EU154 |
| 724.37 | 37. | 31.91 | 1.55 | 4.820E-03 | 722.95 | 90.499 | 5.666E-02 | Ag108M |
| | | | | | 723.30 | 19.700 | PBC<MDA | EU154 |
| 728.88 | 44. | 27.80 | 1.69 | 4.784E-03 | | | | |
| 913.07 | 181. | 10.53 | 1.80 | 3.914E-03 | 911.07 | 29.000 | 1.045E+00 | AC228 |
| 970.63 | 102. | 21.04 | 1.21 | 3.712E-03 | | | | |
| 1122.00 | 77. | 23.12 | 1.85 | 3.279E-03 | | | | |

| pk energy | area | uncert | fwhm | corr | nuclide | brnch. | act. | nuc |
|---|---|---|---|---|---|---|---|---|
| 1175.39 | 33. | 41.15 | 1.85 | 3.157E-03 | 1173.23 | 99.860 | PBC<MDA | CO60 |
| 1463.43 | 701. | 3.88 | 2.27 | 2.617E-03 | | | | |

********** U N I D E N T I F I E D P E A K S U M M A R Y **********

| Peak Channel | Centroid Energy | Background Counts | Net Area Counts | Intensity Cts/Sec | Uncert 3 Sigma % | FWHM keV | Suspected Nuclide | |
|---|---|---|---|---|---|---|---|---|
| 149.42 | 75.43 | 455. | 166. | 0.083 | 59.38 | 1.098 | PB-214 | D |
| 153.99 | 77.71 | 465. | 253. | 0.126 | 40.85 | 1.100 | PB-214 | D |
| 418.24 | 209.31 | 382. | 114. | 0.057 | 84.65 | 1.101 | AC-228 | sM |
| 477.92 | 239.09 | 199. | 768. | 0.384 | 13.35 | 1.215 | PB-212 | D |
| 484.30 | 242.28 | 229. | 122. | 0.061 | 59.35 | 1.217 | XE-138 | D |
| 542.59 | 271.47 | 250. | 78. | 0.039 | 101.45 | 1.120 | PA-234 | M |
| 601.19 | 300.77 | 132. | 43. | 0.022 | 122.24 | 1.823 | PB-212 | sM |
| 1231.12 | 615.63 | 35. | 57. | 0.028 | 59.74 | 1.225 | RH-106M | M |
| 1457.71 | 728.88 | 38. | 54. | 0.027 | 63.40 | 1.692 | J-132 | M |
| 1941.48 | 970.63 | 77. | 107. | 0.053 | 45.43 | 1.210 | AC-228 | M |
| 2245.13 | 1122.00 | 27. | 48. | 0.024 | 63.35 | 1.820 | TA-182 | D |
| 2927.78 | 1463.43 | 9. | 700. | 0.350 | 11.49 | 2.269 | K-40 | M |

s - Peak fails shape tests.
D - Peak area deconvoluted.
L - Peak written from unknown list.
C - Area < Critical level.
M - Peak is close to a library peak.

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This section based on library: FSS_Rev_1.Lib

********** I D E N T I F I E D P E A K S U M M A R Y **********

| Nuclide | Peak Channel | Centroid Energy | Background Counts | Net Area Counts | Intensity Cts/Sec | Uncert 3 Sigma % | FWHM keV |
|---|---|---|---|---|---|---|---|
| PB-214 | 153.80 | 77.11 | 1105. | 214. | 0.107 | 69.05 | 1.500D |
| PB-212 | 153.80 | 77.11 | 1105. | 214. | 0.107 | 69.05 | 1.500D |
| TH-234 | 185.53 | 92.97 | 1105. | 131. | 0.065 | 110.15 | 1.500s |
| TH-234 | 185.45 | 92.93 | 1064. | 136. | 0.068 | 105.30 | 1.500s |
| RA-226 | 372.28 | 186.34 | 559. | 126. | 0.063 | 80.75 | 1.500s |
| PB-212 | 477.82 | 239.09 | 558. | 639. | 0.320 | 19.66 | 1.500 |
| RA-224 | 483.93 | 242.15 | 625. | 90. | 0.045 | 120.20 | 1.500 |
| HG-203 | 556.12 | 278.24 | 250. | 57. | 0.029 | 123.20 | 1.500 |
| PB-214 | 591.35 | 295.85 | 274. | 170. | 0.085 | 47.29 | 1.500 |
| AC-228 | 677.92 | 339.12 | 225. | 120. | 0.060 | 59.58 | 1.500 |
| PB-214 | 705.08 | 352.70 | 192. | 310. | 0.155 | 25.49 | 1.500 |
| Ag-108M | 869.28 | 434.78 | 127. | 60. | 0.030 | 88.93 | 1.500 |
| SB-125 | 927.31 | 463.78 | 121. | 41. | 0.020 | 118.83 | 1.500s |
| TL-208 | 1023.58 | 511.90 | 60. | 101. | 0.051 | 45.80 | 1.138s |
| TL-208 | 1168.53 | 584.35 | 134. | 260. | 0.130 | 32.17 | 1.242 |

| Nuclide | Channel | Energy | Background | Net area | Cnts/sec | Uncert | FWHM |
|---|---|---|---|---|---|---|---|
| BI-214 | 1220.89 | 610.52 | 101. | 262. | 0.131 | 28.71 | 1.248 |
| Ag-108M | 1225.61 | 612.88 | 198. | -54. | -0.027 | 118.89 | 1.499 |
| CS-137 | 1325.52 | 662.81 | 43. | 187. | 0.093 | 26.96 | 1.319 |
| Ag-108M | 1448.70 | 724.37 | 53. | 37. | 0.019 | 95.72 | 1.551 |
| EU-154 | 1448.68 | 724.36 | 59. | 36. | 0.018 | 103.08 | 1.551s |
| AC-228 | 1825.90 | 912.88 | 37. | 147. | 0.074 | 30.23 | 1.679 |
| CO-60 | 2351.24 | 1175.39 | 75. | 33. | 0.016 | 123.44 | 1.854s |

s - Peak fails shape tests.
D - Peak area deconvoluted.
A Derived peak area.

***** S U M M A R Y O F L I B R A R Y P E A K U S A G E *****

| Nuclide Name | Code | Average Activity pCi/gm | Peak Energy keV | Peak Activity pCi/gm | Code | MDA Value pCi/gm | COMMENTS |
|---|---|---|---|---|---|---|---|
| BE-7 | | -1.6049E-01 | | | | | |
| | | | 477.56 | -1.605E-01 | &( | 5.501E-01 1.64E-01 | G |
| K-40 | | 3.0542E-02 | | | | | |
| | | | 1460.75 | 3.054E-02 | %(P | 1.097E+00 3.15E-01 | G |
| MN-54 | | -1.1001E-02 | | | | | |
| | | | 834.81 | -1.100E-02 | %(P | 5.532E-02 1.60E-02 | G |
| CO-57 | | 4.7267E-03 | | | | | |
| | | | 122.07 | 4.727E-03 | %( | 6.417E-02 1.91E-02 | G K |
| | | | 136.43 | 6.486E-02 | & | 4.549E-01 1.36E-01 | G |
| CO-60 | | 2.5967E-02 | | | | | |
| | | | 1332.51 | -1.677E-02 | %(P | 7.335E-02 2.13E-02 | G K |
| | | | 1173.23 | 6.875E-02 | &( | 9.008E-02 2.83E-02 | G K |
| Sr-85 | | -1.7584E-02 | | | | | |
| | | | 514.00 | -1.758E-02 | %( | 6.142E-02 1.83E-02 | G |
| Kr-85 | | -3.8163E+02 | | | | | |
| | | | 513.99 | -3.816E+02 | %( | 1.333E+03 3.97E+02 | G |
| Y-88 | | -2.1044E-05 | | | | | |
| | | | 1836.01 | -2.104E-05 | %(P | 5.396E-02 1.37E-02 | G K |
| | | | 898.02 | -1.347E-02 | & P | 7.846E-02 2.27E-02 | G |
| NB-94 | | 0.0000E+00 | | | | | |
| | | | 871.10 | 0.000E+00 | %( | 6.834E-02 1.94E-02 | G K |
| | | | 702.50 | -7.789E-03 | & | 5.487E-02 1.59E-02 | G K |

| Nuclide | Ave activity | Energy | Activity | Code | Peak | MDA | Comments |
|---|---|---|---|---|---|---|---|
| Ag-108M | 5.6235E-02 | | | | | | |
| | | 722.95 | 5.666E-02 | ( | 5.526E-02 | 1.81E-02 | G K |
| | | 614.37-6.976E-02 | | - P | 8.875E-02 | 2.75E-02 | G |
| | | 433.93 | 5.581E-02 | ( | 5.158E-02 | 1.65E-02 | G |
| CD-109 | -3.3091E-02 | | | | | | |
| | | 88.04-3.309E-02 | | %(P | 2.295E+00 | 6.85E-01 | G |
| SN-113 | -2.3137E-02 | | | | | | |
| | | 391.71-2.314E-02 | | %( | 8.171E-02 | 2.44E-02 | G K |
| | | 255.04-3.270E-01 | | & | 2.011E+00 | 5.96E-01 | G |
| SB-125 | 9.0203E-02 | | | | | | |
| | | 427.95-3.215E-03 | | &(P | 1.684E-01 | 4.86E-02 | G K |
| | | 600.77 | 8.098E-03 | & P | 2.915E-01 | 8.36E-02 | G |
| | | 636.15-2.784E-02 | | % P | 4.966E-01 | 1.43E-01 | G |
| | | 463.51 | 3.667E-01 | *(P | 4.852E-01 | 1.51E-01 | G |
| | | 176.29 | 5.428E-02 | & P | 7.546E-01 | 2.24E-01 | G |
| I-131 | -1.6099E-02 | | | | | | |
| | | 364.48-1.610E-02 | | &( | 9.560E-02 | 2.82E-02 | G K |
| | | 636.97-9.015E-02 | | % | 1.216E+00 | 3.50E-01 | G |
| | | 284.29-2.079E-01 | | & | 1.007E+00 | 2.99E-01 | G |
| CS-134 | -6.4557E-03 | | | | | | |
| | | 604.66-6.456E-03 | | &( | 5.215E-02 | 1.51E-02 | G K |
| | | 795.76 | 1.802E-02 | % | 6.670E-02 | 1.96E-02 | G |
| | | 569.29 | 1.129E-02 | % | 3.406E-01 | 9.79E-02 | G |
| | | 801.84-3.489E-02 | | % P | 6.257E-01 | 1.77E-01 | G |
| CS-137 | 2.7837E-01 | | | | | | |
| | | 661.62 | 2.784E-01 | ( | 4.968E-02 | 2.51E-02 | G |
| CE-139 | -5.0099E-03 | | | | | | |
| | | 165.85-5.010E-03 | | %(P | 5.514E-02 | 1.64E-02 | G |
| EU-152 | 2.0605E-02 | | | | | | |
| | | 121.78 | 2.060E-02 | %(P | 1.841E-01 | 5.50E-02 | G K |
| | | 344.30-4.134E-02 | | & | 1.835E-01 | 5.46E-02 | G |
| | | 1408.08 | 5.519E-03 | & | 2.633E-01 | 7.09E-02 | G |
| | | 964.00-1.175E-01 | | & P | 4.963E-01 | 1.45E-01 | G |
| | | 1112.07-1.450E-01 | | % | 6.184E-01 | 1.82E-01 | G |
| | | 778.90-5.972E-03 | | % P | 3.509E-01 | 9.74E-02 | G |
| EU-154 | 8.5514E-02 | | | | | | |
| | | 123.10 | 5.428E-03 | %(P | 1.326E-01 | 3.95E-02 | G K |
| | | 1274.80 | 5.741E-04 | & | 1.980E-01 | 5.49E-02 | G |

| Nuclide | Ave activity | Energy | Activity | Code | Peak | MDA | Comments |
|---|---|---|---|---|---|---|---|
| | | 723.30 | 2.500E-01 | (P | 2.686E-01 | 8.64E-02 | G |
| | | 1004.80 | 1.571E-02 % | | 2.616E-01 | 7.20E-02 | G |
| EU-155 | 1.7734E-01 | | | | | | |
| | | 86.45 | 1.773E-01 %( | P | 2.629E-01 | 8.02E-02 | G K |
| | | 105.31 | 4.501E-02 % | | 1.984E-01 | 5.93E-02 | G |
| HG-203 | 4.1908E-02 | | | | | | |
| | | 279.17 | 4.191E-02 | (P | 5.578E-02 | 1.72E-02 | G K |
| | | 72.87 | -5.636E-01 % | | 2.262E+00 | 6.81E-01 | G |
| | | 70.83 | 0.000E+00 % | | 4.886E+00 | 1.46E+00 | G |
| | | 82.50 | -1.787E+00 % | | 4.669E+00 | 1.41E+00 | G |
| TL-208 | 3.6023E-01 | | | | | | |
| | | 583.14 | 3.386E-01 | (P | 7.368E-02 | 3.64E-02 | G |
| | | 510.72 | 4.429E-01 *( | | 1.696E-01 | 6.78E-02 | G |
| PB-212 | 7.4778E-01 | | | | | | |
| | | 238.63 | 7.084E-01 | ( | 1.250E-01 | 4.64E-02 | G K |
| | | | | | | | Energy duplication |
| | | 77.11 | 8.447E-01 @( | | 6.224E-01 | 1.94E-01 | G |
| | | 74.81 | 9.083E-01 & P | | 1.281E+00 | 3.91E-01 | G |
| PB-214 | 5.4819E-01 | | | | | | |
| | | 351.99 | 5.683E-01 | (P | 1.236E-01 | 4.84E-02 | G K |
| | | 295.22 | 5.092E-01 | ( | 2.392E-01 | 8.03E-02 | G |
| | | | | | | | Energy duplication |
| | | 77.11 | 1.381E+00 + | | 1.018E+00 | 3.18E-01 | G |
| | | 241.92 | 4.842E-01 % | | 7.913E-01 | 2.41E-01 | G |
| BI-212 | -1.5387E-01 | | | | | | |
| | | 727.17 | -1.539E-01 %( | | 5.752E-01 | 1.70E-01 | G K |
| | | 1620.56 | -1.949E-01 % P | | 1.584E+00 | 4.10E-01 | G |
| | | 785.42 | 5.424E-01 % P | | 2.400E+00 | 6.97E-01 | G |
| BI-214 | 6.6230E-01 | | | | | | |
| | | 609.32 | 6.623E-01 | ( | 1.257E-01 | 6.35E-02 | G K |
| | | 1764.51 | -1.070E-01 % P | | 4.711E-01 | 1.35E-01 | G |
| | | 1120.28 | -1.461E-01 % | | 6.204E-01 | 1.83E-01 | G |
| RA-224 | 1.1129E+00 | | | | | | |
| | | 241.00 | 1.113E+00 | (P | 1.471E+00 | 4.52E-01 | G |
| RA-226 | 1.5614E+00 | | | | | | |
| | | 185.99 | 1.561E+00 | (P | 1.395E+00 | 4.35E-01 | G |
| AC-228 | 8.5399E-01 | | | | | | |
| | | 911.07 | 8.540E-01 | (P | 1.799E-01 | 8.62E-02 | G K |
| | | 968.90 | -5.351E-02 % P | | 4.950E-01 | 1.44E-01 | G |
| | | 338.40 | 6.560E-01 - | | 3.961E-01 | 1.30E-01 | G |

| Nuclide | Ave activity | Energy | Activity | Code | Peak | MDA | Comments |
|---|---|---|---|---|---|---|---|
| TH-227 | -3.7924E-01 | | | | | | |
| | | 236.00 | -3.792E-01 | &(P | 5.752E-01 | 1.76E-01 | G K |
| | | 256.25 | -2.539E-02 | % | 6.651E-01 | 1.96E-01 | G |
| PA-234 | 7.5760E-02 | | | | | | |
| | | 98.44 | 7.576E-02 | %( | 2.700E-01 | 8.13E-02 | G K |
| | | 946.00 | 5.613E-02 | % | 2.902E-01 | 8.39E-02 | G |
| | | 131.28 | -7.827E-03 | & | 2.488E-01 | 7.40E-02 | G |
| | | 94.67 | -1.959E-01 | % | 5.145E-01 | 1.56E-01 | G |
| | | 883.24 | -4.349E-04 | & | 4.715E-01 | 1.32E-01 | G |
| | | 926.70 | 1.592E-01 | % | 3.623E-01 | 1.09E-01 | G |
| | | 569.26 | 1.669E-02 | % | 5.026E-01 | 1.44E-01 | G |
| TH-234 | 1.6477E+00 | | | | | | |
| | | 63.29 | 6.174E-01 | %(P | 4.827E+00 | 1.44E+00 | G K |
| | | 92.80 | 2.234E+00 | ( | 2.550E+00 | 7.84E-01 | G |
| | | 92.38 | 2.527E+00 | (P | 3.051E+00 | 9.36E-01 | G |
| AM-241 | -1.2812E-02 | | | | | | |
| | | 59.54 | -1.281E-02 | &( | 6.973E-01 | 2.07E-01 | G |

( - This peak used in the nuclide activity average.

* - Peak is too wide, but only one peak in library.
! - Peak is part of a multiplet and this area went negative during deconvolution.
? - Peak is too narrow.
@ - Peak is too wide at FW25M, but ok at FWHM.
% - Peak fails sensitivity test.
$ - Peak identified, but first peak of this nuclide failed one or more qualification tests.
+ - Peak activity higher than counting uncertainty range.
- - Peak activity lower than counting uncertainty range.
= - Peak outside analysis energy range.
& - Calculated peak centroid is not close enough to the library energy centroid for positive identification.
P - Peakbackground subtraction
} - Peak is too close to another for the activity to be found directly.

| Nuclide Codes: | Peak Codes: |
|---|---|
| T - Thermal Neutron Activation | G - Gamma Ray |
| F - Fast Neutron Activation | X - X-Ray |
| I - Fission Product | P - Positron Decay |
| N - Naturally Occurring Isotope | S - Single-Escape |
| P - Photon Reaction | D - Double-Escape |
| C - Charged Particle Reaction | K - Key Line |
| M - No MDA Calculation | A - Not in Average |

R - Coincidence Corrected C - Coincidence Peak
H - Halflife limit exceeded

- - - - - - - - - - - - - - - - - - - - - - - - - - - - - - - - - - - - - - -

***** S U M M A R Y O F N U C L I D E S I N S A M P L E *****

| Nuclide | | Time of Count Activity pCi/gm | Time Corrected Activity pCi/gm | Uncertainty 3 Sigma Counting pCi/gm | Total pCi/gm | MDA pCi/gm |
|---|---|---|---|---|---|---|
| BE-7 | #A | -1.4889E-01 | -1.6049E-01 | 4.9138E-01 | 4.9146E-01 | 5.103E-01 |
| K-40 | A | 3.0542E-02 | 3.0542E-02 | 9.4406E-01 | 9.4406E-01 | 1.097E+00 |
| MN-54 | #A | -1.0861E-02 | -1.1001E-02 | 5.1004E-02 | 5.1008E-02 | 5.462E-02 |
| CO-57 | #B | 4.6571E-03 | 4.7267E-03 | 5.7450E-02 | 5.7451E-02 | 6.323E-02 |
| CO-60 | #B | 2.5913E-02 | 2.5967E-02 | 3.2053E-02 | 3.2086E-02 | 7.320E-02 |
| Sr-85 | #A | -1.6531E-02 | -1.7584E-02 | 5.4851E-02 | 5.4860E-02 | 5.774E-02 |
| Kr-85 | #A | -3.8162E+02 | -3.8163E+02 | 1.1904E+03 | 1.1906E+03 | 1.333E+03 |
| Y-88 | #B | -2.0268E-05 | -2.1044E-05 | 5.4080E-04 | 5.4080E-04 | 5.197E-02 |
| NB-94 | #B | 0.0000E+00 | 0.0000E+00 | 5.8235E-02 | 5.8236E-02 | 6.834E-02 |
| Ag-108M | | 5.6230E-02 | 5.6235E-02 | 3.6736E-02 | 3.6871E-02 | 5.526E-02 |
| CD-109 | #A | -3.2799E-02 | -3.3091E-02 | 9.2843E+00 | 9.2843E+00 | 2.275E+00 |
| SN-113 | #B | -2.2345E-02 | -2.3137E-02 | 7.3134E-02 | 7.3145E-02 | 7.891E-02 |
| SB-125 | #B | 8.9847E-02 | 9.0203E-02 | 1.1126E-01 | 1.1137E-01 | 1.677E-01 |
| I-131 | #B | -9.7812E-03 | -1.6099E-02 | 8.4742E-02 | 8.4747E-02 | 5.808E-02 |
| CS-134 | #B | -6.4214E-03 | -6.4557E-03 | 4.5303E-02 | 4.5304E-02 | 5.187E-02 |
| CS-137 | | 2.7827E-01 | 2.7837E-01 | 7.5052E-02 | 7.6661E-02 | |
| CE-139 | #A | -4.8660E-03 | -5.0099E-03 | 5.3645E-02 | 5.3645E-02 | 5.356E-02 |
| EU-152 | #B | 2.0587E-02 | 2.0605E-02 | 1.6502E-01 | 1.6502E-01 | 1.839E-01 |
| EU-154 | #B | 8.5404E-02 | 8.5514E-02 | 8.8696E-02 | 8.8822E-02 | 1.325E-01 |
| EU-155 | #B | 1.7695E-01 | 1.7734E-01 | 2.4067E-01 | 2.4087E-01 | 2.624E-01 |
| HG-203 | #A | 3.8455E-02 | 4.1908E-02 | 5.1716E-02 | 5.1769E-02 | 5.119E-02 |
| TL-208 | | 3.6023E-01 | 3.6023E-01 | 1.0087E-01 | 1.0287E-01 | |
| PB-212 | # | 7.4778E-01 | 7.4778E-01 | 1.4702E-01 | 1.5289E-01 | 1.250E-01 |
| PB-214 | # | 5.4819E-01 | 5.4819E-01 | 1.3993E-01 | 1.4327E-01 | 1.236E-01 |
| BI-212 | #B | -1.5387E-01 | -1.5387E-01 | 5.1099E-01 | 5.1106E-01 | 5.752E-01 |
| BI-214 | | 6.6230E-01 | 6.6230E-01 | 1.9013E-01 | 1.9373E-01 | |
| RA-224 | #A | 1.1129E+00 | 1.1129E+00 | 1.3549E+00 | 1.3564E+00 | 1.471E+00 |
| RA-226 | # | 1.5613E+00 | 1.5614E+00 | 1.3054E+00 | 1.3083E+00 | 1.395E+00 |
| AC-228 | | 8.5399E-01 | 8.5399E-01 | 2.5852E-01 | 2.6293E-01 | 1.799E-01 |
| TH-227 | #B | -3.7924E-01 | -3.7924E-01 | 5.3034E-01 | 5.3077E-01 | 5.752E-01 |
| PA-234 | #B | 7.5760E-02 | 7.5760E-02 | 2.4386E-01 | 2.4390E-01 | 2.700E-01 |
| TH-234 | #B | 1.6477E+00 | 1.6477E+00 | 1.7350E+00 | 1.7375E+00 | 4.827E+00 |
| AM-241 | #A | -1.2811E-02 | -1.2812E-02 | 6.2242E-01 | 6.2242E-01 | 6.973E-01 |

# - All peaks for activity calculation had bad shape.
* - Activity omitted from total
& - Activity omitted from total and all peaks had bad shape.
< - MDA value printed.
A - Activity printed, but activity < MDA.
B - Activity < MDA and failed test.
C - Area < Critical level.
F - Failed fraction or key line test.

H – Halflife limit exceeded

YAEC Chemistry Lab Spectrum name: 102F_16SEPT2006_0813.An1

---------- S U M M A R Y ----------

Total Activity ( 1460.5 to 1999.0 keV) 2.2110145E+00 pCi/gm
Total Decayed Activity ( 1460.5 to 1999.0 keV) 2.2111208E+00 pCi/gm

The library has energies which are not separable.

Analyzed by: _____
JJM

Reviewed by: _____
Supervisor

Laboratory: YAEC Chemistry Lab

YAEC Chemistry Lab Spectrum name: 102F_16SEPT2006_0908.An1

Sample description
FSS-SSS-01-01-007-F

Spectrum Filename: C:\GammaVision\Spectra\102F_16SEPT2006_0908.An1

Acquisition information
Start time: 16-Sep-2006 09:08:24
Live time: 2000
Real time: 2022
Dead time: 1.09 %
Detector ID: 3

Detector system
Det 102 - DSPP-468

Calibration
Filename: D2_1LSa.Clb
DET 102 1 Liter Sand Geometry

Energy Calibration
Created: 15-Jan-2005 03:09:29
Zero offset: 0.220 keV
Gain: 0.500 keV/channel
Quadratic: -6.435E-08 keV/channel^2

Efficiency Calibration
Created: 15-Jan-2005 06:48:10
Type: Polynomial
Uncertainty: 0.497 %
Coefficients: -0.294180 -5.980622 0.744607
-0.096737 0.005214 -0.000120

Library Files
Main analysis library: FSS_Rev_1.Lib
Library Match Width: 1.000
Peak stripping: Library based

Analysis parameters
Analysis engine: Env32 G53W4.20
Start channel: 100 ( 50.22keV )
Stop channel: 4000 ( 1999.02keV )
Peak rejection level: 41.667%
Peak search sensitivity: 3
Sample Size: 1.8300E+03
Activity scaling factor: 1.0000E+06/( 1.0000E+00* 1.8300E+03) =
5.4645E+02
Detection limit method: Nureg 4.16
Random error: 1.0000000E+00
Systematic error: 1.0000000E+00

| | |
|---|---|
| Fraction Limit: | 0.000% |
| Background width: | average of five points. |

YAEC Chemistry Lab Spectrum name: 102F_16SEPT2006_0908.An1

Half lives decay limit: 12.000
Activity range factor: 2.000
Min. step backg. energy 0.000
Multiplet shift channel 2.000

| Corrections | Status | Comments |
|---|---|---|
| Decay correct to date: | YES | 09-Sep-2006 11:00:00 |
| Decay during acquisition: | NO | |
| Decay during collection: | NO | |
| True coincidence correction: | NO | |
| Peaked background correction: | YES | 102_150K_28APR05.Pbc 01-May-2005 05:27:47 |
| Absorption (Internal): | NO | |
| Geometry correction: | NO | |
| Random summing: | NO | |

total peaks alloc. 11 cutoff 20.00000 %
Energy Calibration
Normalized diff: 0.6873

***** S U M M A R Y O F P E A K S I N R A N G E *****

| Peak Energy | Area | Uncert | FWHM | Corrctn Factor | Nuclide Energy | Brnch. Ratio | Act. pCi/gm | Nuc |
|---|---|---|---|---|---|---|---|---|
| 74.98 | 140. | 32.80 | 1.50 | 8.847E-03 | 72.87 | 6.400 | 2.179E+00 | HG203 |
| | | | | | 74.81 | 9.600 | PBC<MDA | PB212 |
| 77.14 | 207. | 21.75 | 1.50 | 9.541E-03 | 77.11 | 10.700 | 1.496E+00 | PB214 |
| | | | | | 77.11 | 17.500 | 9.144E-01 | PB212 |
| 77.14 | 207. | 21.75 | 1.50 | 9.541E-03 | 77.11 | 10.700 | 1.496E+00 | PB214 |
| | | | | | 77.11 | 17.500 | 9.144E-01 | PB212 |
| 128.85 | 107. | 38.36 | 1.32 | 1.714E-02 | | | | |
| 186.88 | 126. | 25.19 | 1.44 | 1.623E-02 | 185.99 | 3.280 | 1.675E+00 | RA226 |
| 209.36 | 97. | 37.38 | 1.13 | 1.519E-02 | | | | |
| 239.13 | 688. | 4.55 | 1.22 | 1.378E-02 | 238.63 | 43.100 | 8.536E-01 | PB212 |
| 242.33 | 111. | 20.46 | 1.22 | 1.364E-02 | 241.00 | 3.900 | 1.515E+00 | RA224 |
| | | | | | 241.92 | 7.470 | 8.018E-01 | PB214 |
| 271.11 | 72. | 29.88 | 1.06 | 1.239E-02 | | | | |
| 295.75 | 169. | 11.28 | 1.26 | 1.144E-02 | 295.22 | 19.200 | 5.667E-01 | PB214 |
| 300.69 | 54. | 28.52 | 1.26 | 1.127E-02 | | | | |
| 328.15 | 63. | 32.78 | 1.22 | 1.037E-02 | | | | |
| 339.25 | 133. | 19.59 | 1.73 | 1.004E-02 | 338.40 | 12.010 | 8.129E-01 | AC228 |
| 352.51 | 296. | 8.35 | 1.24 | 9.665E-03 | 351.99 | 37.100 | 6.088E-01 | PB214 |
| 463.05 | 47. | 36.79 | 0.92 | 7.372E-03 | | | | |
| 463.05 | 47. | 36.79 | 0.92 | 7.372E-03 | 463.51 | 10.000 | PBC<MDA | SB125 |
| 511.04 | 103. | 19.49 | 1.31 | 6.691E-03 | 510.72 | 22.500 | 5.069E-01 | TL208 |
| 584.09 | 219. | 8.79 | 1.39 | 5.881E-03 | 583.14 | 86.000 | 3.187E-01 | TL208 |
| 610.43 | 230. | 10.50 | 1.39 | 5.640E-03 | 609.32 | 46.090 | 6.512E-01 | BI214 |
| 728.55 | 32. | 34.52 | 1.55 | 4.794E-03 | 727.17 | 11.800 | PBC<MDA | BI212 |
| 913.32 | 147. | 12.29 | 1.60 | 3.913E-03 | | | | |
| 969.97 | 120. | 13.59 | 1.58 | 3.714E-03 | 968.90 | 17.460 | 1.368E+00 | AC228 |
| 1121.08 | 68. | 22.22 | 1.53 | 3.283E-03 | 1120.28 | 15.040 | 1.014E+00 | BI214 |

| | | | | | | | | |
|---|---|---|---|---|---|---|---|---|
| 1463.51 | 632. | 4.08 | 2.05 | 2.617E-03 | 1460.75 | 10.700 | 1.665E+01 | K40 |

********** U N I D E N T I F I E D P E A K S U M M A R Y **********

| Peak Channel | Centroid Energy | Background Counts | Net Area Counts | Intensity Cts/Sec | Uncert 3 Sigma % | FWHM keV | Suspected Nuclide | |
|---|---|---|---|---|---|---|---|---|
| 257.28 | 128.85 | 565. | 125. | 0.062 | 85.37 | 1.323 | AC-228 | M |
| 418.35 | 209.36 | 422. | 97. | 0.049 | 112.15 | 1.131 | AC-228 | sM |
| 477.89 | 239.08 | 146. | 688. | 0.344 | 13.66 | 1.215 | PB-212 | D |
| 484.30 | 242.29 | 201. | 111. | 0.055 | 61.37 | 1.217 | XE-138 | D |
| 541.86 | 271.11 | 179. | 72. | 0.036 | 89.65 | 1.061 | AC-228 | M |
| 601.22 | 300.78 | 160. | 70. | 0.035 | 93.66 | 1.911 | PB-212 | sM |
| 655.98 | 328.15 | 141. | 63. | 0.032 | 98.35 | 1.216 | AC-228 | sM |
| 925.86 | 463.05 | 90. | 47. | 0.023 | 110.37 | 0.923 | AC-228 | l |
| 1826.78 | 913.32 | 46. | 149. | 0.074 | 31.37 | 1.597 | AC-228 | sM |
| 1940.15 | 969.97 | 99. | 59. | 0.029 | 82.05 | 1.585 | AC-228 | M |

s - Peak fails shape tests.
D - Peak area deconvoluted.
L - Peak written from unknown list.
C - Area < Critical level.
M - Peak is close to a library peak.

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This section based on library: FSS_Rev_1.Lib

********** I D E N T I F I E D P E A K S U M M A R Y **********

| Nuclide | Peak Channel | Centroid Energy | Background Counts | Net Area Counts | Intensity Cts/Sec | Uncert 3 Sigma % | FWHM keV |
|---|---|---|---|---|---|---|---|
| PB-212 | 149.54 | 74.98 | 1036. | 140. | 0.070 | 98.41 | 1.500s |
| PB-214 | 153.80 | 77.11 | 908. | 207. | 0.103 | 65.26 | 1.500D |
| PB-212 | 153.80 | 77.11 | 908. | 207. | 0.103 | 65.26 | 1.500D |
| RA-226 | 372.57 | 186.48 | 453. | 98. | 0.049 | 92.87 | 1.500s |
| PB-212 | 477.89 | 239.13 | 437. | 604. | 0.302 | 19.11 | 1.500 |
| RA-224 | 483.15 | 241.76 | 521. | 87. | 0.044 | 114.03 | 1.500s |
| PB-214 | 591.19 | 295.77 | 177. | 168. | 0.084 | 40.74 | 1.500 |
| AC-228 | 677.80 | 339.06 | 176. | 110. | 0.055 | 58.46 | 1.500 |
| PB-214 | 704.90 | 352.61 | 142. | 266. | 0.133 | 26.40 | 1.500 |
| TL-208 | 1021.85 | 511.04 | 95. | 103. | 0.052 | 58.47 | 1.314s |
| TL-208 | 1168.01 | 584.09 | 54. | 219. | 0.109 | 26.36 | 1.387s |
| BI-214 | 1220.71 | 610.43 | 92. | 230. | 0.115 | 31.49 | 1.387 |
| BI-212 | 1457.05 | 728.55 | 46. | 32. | 0.016 | 103.57 | 1.554s |
| AC-228 | 1941.38 | 970.59 | 40. | 62. | 0.031 | 57.79 | 1.718 |
| BI-214 | 2242.56 | 1121.08 | 44. | 68. | 0.034 | 66.65 | 1.526s |
| K-40 | 2927.95 | 1463.52 | 7. | 619. | 0.309 | 12.19 | 2.042 |

s - Peak fails shape tests.
D - Peak area deconvoluted.
A Derived peak area.

***** S U M M A R Y O F L I B R A R Y P E A K U S A G E *****

| - Nuclide - Name | Code | Average Activity pCi/gm | Peak Energy keV | Peak Activity pCi/gm | Peak Code | Peak MDA Value pCi/gm | COMMENTS |
|---|---|---|---|---|---|---|---|
| BE-7 | | -1.3928E-02 | | | | | |
| | | | 477.56 | -1.393E-02 % | ( | 4.838E-01 1.38E-01 | G |
| K-40 | | 1.6290E+01 | | | | | |
| | | | 1460.75 | 1.629E+01 | (P | 3.960E-01 6.62E-01 | G |
| MN-54 | | -1.3021E-02 | | | | | |
| | | | 834.81 | -1.302E-02 %(P | | 6.217E-02 1.80E-02 | G |
| CO-57 | | 8.9517E-03 | | | | | |
| | | | 122.07 | 8.952E-03 %( | | 6.396E-02 1.91E-02 | G K |
| | | | 136.43 | 2.364E-03 % | | 4.770E-01 1.41E-01 | G |
| CO-60 | | -1.5058E-03 | | | | | |
| | | | 1332.51 | -1.506E-03 %(P | | 6.242E-02 1.69E-02 | G K |
| | | | 1173.23 | 1.995E-02 % | | 9.209E-02 2.69E-02 | G K |
| Sr-85 | | -1.7791E-02 | | | | | |
| | | | 514.00 | -1.779E-02 %( | | 7.120E-02 2.11E-02 | G |
| Kr-85 | | -3.8145E+02 | | | | | |
| | | | 513.99 | -3.814E+02 %( | | 1.526E+03 4.53E+02 | G |
| Y-88 | | 7.9949E-03 | | | | | |
| | | | 1836.01 | 7.995E-03 &(P | | 5.548E-02 1.49E-02 | G K |
| | | | 898.02 | -1.400E-02 % P | | 7.184E-02 2.06E-02 | G |
| NB-94 | | 1.5241E-02 | | | | | |
| | | | 871.10 | 1.524E-02 %( | | 5.159E-02 1.51E-02 | G K |
| | | | 702.50 | 3.296E-03 & | | 4.707E-02 1.32E-02 | G K |
| Ag-108M | | -1.4130E-02 | | | | | |
| | | | 722.95 | -1.413E-02 &( | | 6.806E-02 1.99E-02 | G K |
| | | | 614.37 | -4.497E-02 & P | | 8.327E-02 2.54E-02 | G |
| | | | 433.93 | -6.767E-03 % | | 5.398E-02 1.57E-02 | G |
| CD-109 | | -1.0856E-01 | | | | | |
| | | | 88.04 | -1.086E-01 %(P | | 2.537E+00 7.57E-01 | G |
| SN-113 | | 1.0660E-03 | | | | | |
| | | | 391.71 | 1.066E-03 %( | | 7.592E-02 2.19E-02 | G K |
| | | | 255.04 | -5.835E-01 % | | 2.063E+00 6.16E-01 | G |

| Nuclide | Ave activity | Energy | Activity | Code | Peak | MDA | Comments |
|---|---|---|---|---|---|---|---|
| SB-125 | -3.8411E-03 | | | | | | |
| | | 427.95 | -3.841E-03 | %(P | 1.506E-01 | 4.29E-02 | G K |
| | | 600.77 | -8.481E-03 | & P | 3.304E-01 | 9.47E-02 | G |
| | | 636.15 | -4.426E-03 | & P | 3.799E-01 | 1.05E-01 | G |
| | | 463.51 | 3.244E-01 | % P | 4.673E-01 | 1.45E-01 | G |
| | | 176.29 | -2.571E-02 | & P | 7.158E-01 | 2.11E-01 | G |
| I-131 | -9.7306E-03 | | | | | | |
| | | 364.48 | -9.731E-03 | %( | 9.871E-02 | 2.88E-02 | G K |
| | | 636.97 | 1.495E-01 | % | 1.155E+00 | 3.30E-01 | G |
| | | 284.29 | 7.241E-02 | % | 1.283E+00 | 3.76E-01 | G |
| CS-134 | 1.0697E-02 | | | | | | |
| | | 604.66 | 1.070E-02 | %( | 4.645E-02 | 1.35E-02 | G K |
| | | 795.76 | 4.882E-02 | % | 6.444E-02 | 2.04E-02 | G |
| | | 569.29 | 1.099E-01 | & | 2.095E-01 | 6.42E-02 | G |
| | | 801.84 | -7.265E-02 | % P | 6.386E-01 | 1.82E-01 | G |
| CS-137 | 2.9171E-04 | | | | | | |
| | | 661.62 | 2.917E-04 | %( | 6.429E-02 | 1.82E-02 | G |
| CE-139 | 9.0387E-03 | | | | | | |
| | | 165.85 | 9.039E-03 | &(P | 6.094E-02 | 1.82E-02 | G |
| EU-152 | 2.4333E-03 | | | | | | |
| | | 121.78 | 2.433E-03 | %(P | 1.644E-01 | 4.87E-02 | G K |
| | | 344.30 | -1.267E-02 | % | 1.763E-01 | 5.16E-02 | G |
| | | 1408.08 | -3.509E-02 | & | 3.232E-01 | 9.00E-02 | G |
| | | 964.00 | -1.315E-01 | % P | 5.055E-01 | 1.48E-01 | G |
| | | 1112.07 | 2.041E-01 | & | 4.504E-01 | 1.36E-01 | G |
| | | 778.90 | -1.528E-02 | % P | 3.365E-01 | 9.26E-02 | G |
| EU-154 | -1.5226E-03 | | | | | | |
| | | 123.10 | -1.523E-03 | %(P | 1.232E-01 | 3.65E-02 | G K |
| | | 1274.80 | -4.395E-02 | & | 2.600E-01 | 7.52E-02 | G |
| | | 723.30 | -1.033E-02 | & P | 3.638E-01 | 1.04E-01 | G |
| | | 1004.80 | 9.860E-02 | & | 3.364E-01 | 9.85E-02 | G |
| EU-155 | 1.7009E-01 | | | | | | |
| | | 86.45 | 1.701E-01 | %(P | 2.783E-01 | 8.47E-02 | G K |
| | | 105.31 | 1.900E-03 | % | 2.234E-01 | 6.60E-02 | G |
| HG-203 | 3.1148E-02 | | | | | | |
| | | 279.17 | 3.115E-02 | &(P | 5.784E-02 | 1.76E-02 | G K |
| | | 72.87 | 8.473E-01 | & | 2.343E+00 | 7.08E-01 | G |
| | | 70.83 | 3.260E-02 | % | 4.331E+00 | 1.29E+00 | G |
| | | 82.50 | -7.057E-02 | & | 5.113E+00 | 1.53E+00 | G |

| Nuclide | Ave activity | Energy | Activity | Code | Peak | MDA | Comments |
|---|---|---|---|---|---|---|---|
| TL-208 | 3.1867E-01 | | | | | | |
| | | 583.14 | 3.187E-01 | @(P | 5.406E-02 | 2.81E-02 | G |
| | | 510.72 | 5.069E-01 | + | 2.355E-01 | 9.89E-02 | G |
| PB-212 | 7.4937E-01 | | | | | | |
| | | 238.63 | 7.494E-01 | ( | 1.243E-01 | 4.77E-02 | G K |
| | | | | | | | Energy duplication |
| | | 77.11 | 9.144E-01 | + | 6.330E-01 | 1.99E-01 | G |
| | | 74.81 | 1.219E+00 | + P | 1.328E+00 | 4.09E-01 | G |
| PB-214 | 5.5325E-01 | | | | | | |
| | | 351.99 | 5.477E-01 | (P | 1.200E-01 | 4.83E-02 | G K |
| | | 295.22 | 5.640E-01 | ( | 2.168E-01 | 7.66E-02 | G |
| | | | | | | | Energy duplication |
| | | 77.11 | 1.496E+00 | + | 1.035E+00 | 3.25E-01 | G |
| | | 241.92 | 5.653E-01 | % | 8.026E-01 | 2.46E-01 | G |
| BI-212 | 4.2179E-01 | | | | | | |
| | | 727.17 | 4.218E-01 | @( | 4.482E-01 | 1.46E-01 | G K |
| | | 1620.56 | -1.712E-01 | & P | 2.094E+00 | 5.49E-01 | G |
| | | 785.42 | -9.362E-03 | & P | 2.930E+00 | 8.21E-01 | G |
| BI-214 | 6.5116E-01 | | | | | | |
| | | 609.32 | 6.512E-01 | ( | 1.347E-01 | 6.85E-02 | G K |
| | | 1764.51 | -1.806E-03 | % P | 3.495E-01 | 8.85E-02 | G |
| | | 1120.28 | 1.014E+00 | + | 5.039E-01 | 2.25E-01 | G |
| RA-224 | 1.2057E+00 | | | | | | |
| | | 241.00 | 1.206E+00 | &(P | 1.508E+00 | 4.64E-01 | G |
| RA-226 | 1.3513E+00 | | | | | | |
| | | 185.99 | 1.351E+00 | *(P | 1.410E+00 | 4.37E-01 | G |
| AC-228 | 3.4330E-01 | | | | | | |
| | | 911.07 | -9.226E-03 | %(P | 2.820E-01 | 8.04E-02 | G K |
| | | 968.90 | 7.008E-01 | (P | 3.649E-01 | 1.35E-01 | G |
| | | 338.40 | 6.748E-01 | ( | 3.946E-01 | 1.31E-01 | G |
| TH-227 | -1.5165E-01 | | | | | | |
| | | 236.00 | -1.516E-01 | %(P | 5.102E-01 | 1.53E-01 | G K |
| | | 256.25 | -6.539E-02 | % | 6.539E-01 | 1.93E-01 | G |
| PA-234 | -1.8838E-02 | | | | | | |
| | | 98.44 | -1.884E-02 | &( | 2.780E-01 | 8.29E-02 | G K |
| | | 946.00 | -6.975E-02 | % | 3.008E-01 | 8.73E-02 | G |
| | | 131.28 | -3.777E-02 | % | 2.559E-01 | 7.64E-02 | G |
| | | 94.67 | -1.857E-01 | % | 5.102E-01 | 1.54E-01 | G |
| | | 883.24 | 1.044E-01 | & | 4.614E-01 | 1.34E-01 | G |
| | | 926.70 | -7.804E-02 | & | 5.537E-01 | 1.58E-01 | G |

| Nuclide | Ave activity | Energy | Activity | Code | Peak | MDA | Comments |
|---|---|---|---|---|---|---|---|
| | | 569.26 | 9.361E-02 | & | 3.565E-01 | 1.04E-01 | G |
| TH-234 | 6.9324E-01 | | | | | | |
| | | 63.29 | 6.932E-01 | %(P | 5.046E+00 | 1.51E+00 | G K |
| | | 92.80 | 1.510E+00 | % | 2.725E+00 | 8.29E-01 | G |
| | | 92.38 | -1.178E-01 | % P | 3.307E+00 | 9.86E-01 | G |
| AM-241 | -1.1063E-01 | | | | | | |
| | | 59.54 | -1.106E-01 | %( | 7.310E-01 | 2.19E-01 | G |

( - This peak used in the nuclide activity average.

* - Peak is too wide, but only one peak in library.
! - Peak is part of a multiplet and this area went negative during deconvolution.
? - Peak is too narrow.
@ - Peak is too wide at FW25M, but ok at FWHM.
% - Peak fails sensitivity test.
$ - Peak identified, but first peak of this nuclide failed one or more qualification tests.
+ - Peak activity higher than counting uncertainty range.
- - Peak activity lower than counting uncertainty range.
= - Peak outside analysis energy range.
& - Calculated peak centroid is not close enough to the library energy centroid for positive identification.
P - Peakbackground subtraction
} - Peak is too close to another for the activity to be found directly.

| Nuclide Codes: | Peak Codes: |
|---|---|
| T - Thermal Neutron Activation | G - Gamma Ray |
| F - Fast Neutron Activation | X - X-Ray |
| I - Fission Product | P - Positron Decay |
| N - Naturally Occurring Isotope | S - Single-Escape |
| P - Photon Reaction | D - Double-Escape |
| C - Charged Particle Reaction | K - Key Line |
| M - No MDA Calculation | A - Not in Average |
| R - Coincidence Corrected | C - Coincidence Peak |
| H - Halflife limit exceeded | |

- - - - - - - - - - - - - - - - - - - - - - - - - - - - - - - - - - - - -

***** S U M M A R Y O F N U C L I D E S I N S A M P L E *****

| Nuclide | | Time of Count Activity pCi/gm | Time Corrected Activity pCi/gm | Uncertainty Counting pCi/gm | 3 Sigma Total pCi/gm | MDA pCi/gm |
|---|---|---|---|---|---|---|
| BE-7 | #A | -1.2731E-02 | -1.3928E-02 | 4.1504E-01 | 4.1504E-01 | 4.422E-01 |
| K-40 | | 1.6290E+01 | 1.6290E+01 | 1.9867E+00 | 2.1870E+00 | 3.960E-01 |
| MN-54 | #A | -1.2822E-02 | -1.3021E-02 | 5.7240E-02 | 5.7245E-02 | 6.122E-02 |
| CO-57 | #B | 8.7940E-03 | 8.9517E-03 | 5.7315E-02 | 5.7317E-02 | 6.284E-02 |
| CO-60 | #B | -1.5021E-03 | -1.5058E-03 | 6.6375E-02 | 6.6375E-02 | 6.226E-02 |

| | | | | | | |
|---|---|---|---|---|---|---|
| Sr-85 | #A | -1.6522E-02 | -1.7791E-02 | 6.3391E-02 | 6.3399E-02 | 6.612E-02 |
| Kr-85 | #A | -3.8143E+02 | -3.8145E+02 | 1.3591E+03 | 1.3593E+03 | 1.526E+03 |
| Y-88 | #B | 7.6430E-03 | 7.9949E-03 | 4.4592E-02 | 4.4594E-02 | 5.303E-02 |
| NB-94 | #B | 1.5241E-02 | 1.5241E-02 | 4.5331E-02 | 4.5339E-02 | 5.159E-02 |
| Ag-108M | #B | -1.4128E-02 | -1.4130E-02 | 5.9618E-02 | 5.9623E-02 | 6.805E-02 |
| CD-109 | #A | -1.0742E-01 | -1.0856E-01 | 3.5395E+00 | 3.5395E+00 | 2.510E+00 |
| SN-113 | #B | 1.0225E-03 | 1.0660E-03 | 6.5822E-02 | 6.5822E-02 | 7.282E-02 |
| SB-125 | #B | -3.8229E-03 | -3.8411E-03 | 1.2908E+00 | 1.2908E+00 | 1.499E-01 |
| I-131 | #B | -5.3573E-03 | -9.7306E-03 | 8.6409E-02 | 8.6411E-02 | 5.434E-02 |
| CS-134 | #B | 1.0629E-02 | 1.0697E-02 | 4.0605E-02 | 4.0610E-02 | 4.615E-02 |
| CS-137 | #A | 2.9159E-04 | 2.9171E-04 | 5.4457E-02 | 5.4457E-02 | 6.427E-02 |
| CE-139 | #A | 8.7287E-03 | 9.0387E-03 | 5.4504E-02 | 5.4506E-02 | 5.885E-02 |
| EU-152 | #B | 2.4308E-03 | 2.4333E-03 | 1.4601E-01 | 1.4601E-01 | 1.642E-01 |
| EU-154 | #B | -1.5202E-03 | -1.5226E-03 | 1.4696E-01 | 1.4696E-01 | 1.230E-01 |
| EU-155 | #B | 1.6964E-01 | 1.7009E-01 | 2.5419E-01 | 2.5436E-01 | 2.775E-01 |
| HG-203 | #B | 2.8099E-02 | 3.1148E-02 | 5.2854E-02 | 5.2883E-02 | 5.218E-02 |
| TL-208 | # | 3.1867E-01 | 3.1867E-01 | 8.4148E-02 | 8.6027E-02 | |
| PB-212 | # | 7.4937E-01 | 7.4937E-01 | 1.4317E-01 | 1.4922E-01 | 1.243E-01 |
| PB-214 | # | 5.5325E-01 | 5.5325E-01 | 1.3434E-01 | 1.3788E-01 | 1.200E-01 |
| BI-212 | #A | 4.2179E-01 | 4.2179E-01 | 4.3684E-01 | 4.3749E-01 | 4.482E-01 |
| BI-214 | | 6.5116E-01 | 6.5116E-01 | 2.0503E-01 | 2.0826E-01 | |
| RA-224 | #A | 1.2057E+00 | 1.2057E+00 | 1.3932E+00 | 1.3948E+00 | 1.508E+00 |
| RA-226 | #A | 1.3513E+00 | 1.3513E+00 | 1.3123E+00 | 1.3145E+00 | 1.410E+00 |
| AC-228 | F | 3.4330E-01 | 3.4330E-01 | 1.9850E-01 | 1.9943E-01 | 2.820E-01 |
| TH-227 | #B | -1.5165E-01 | -1.5165E-01 | 4.6799E-01 | 4.6807E-01 | 5.102E-01 |
| PA-234 | #B | -1.8838E-02 | -1.8838E-02 | 2.4878E-01 | 2.4878E-01 | 2.780E-01 |
| TH-234 | #B | 6.9324E-01 | 6.9324E-01 | 4.5243E+00 | 4.5245E+00 | 5.046E+00 |
| AM-241 | #A | -1.1063E-01 | -1.1063E-01 | 6.5557E-01 | 6.5560E-01 | 7.310E-01 |

# - All peaks for activity calculation had bad shape.
* - Activity omitted from total
& - Activity omitted from total and all peaks had bad shape.
< - MDA value printed.
A - Activity printed, but activity < MDA.
B - Activity < MDA and failed test.
C - Area < Critical level.
F - Failed fraction or key line test.
H - Halflife limit exceeded

---------- S U M M A R Y ----------

Total Activity ( 270.7 to 1999.0 keV) 1.7603083E+01 pCi/gm
Total Decayed Activity ( 270.7 to 1999.0 keV) 1.7603083E+01 pCi/gm

The library has energies which are not separable.

Analyzed by: _____
JJM

Reviewed by: _____
Supervisor

Laboratory: YAEC Chemistry Lab

YAEC Chemistry Lab Spectrum name: 102F_16SEPT2006_0947.An1

Sample description
FSS-SSS-01-01-017-F

Spectrum Filename: C:\GammaVision\Spectra\102F_16SEPT2006_0947.An1

Acquisition information
Start time: 16-Sep-2006 09:47:28
Live time: 2000
Real time: 2022
Dead time: 1.11 %
Detector ID: 3

Detector system
Det 102 - DSPP-468

Calibration
Filename: D2_1LSa.Clb
DET 102 1 Liter Sand Geometry

Energy Calibration
Created: 15-Jan-2005 03:09:29
Zero offset: 0.220 keV
Gain: 0.500 keV/channel
Quadratic: -6.435E-08 keV/channel^2

Efficiency Calibration
Created: 15-Jan-2005 06:48:10
Type: Polynomial
Uncertainty: 0.497 %
Coefficients: -0.294180 -5.980622 0.744607
-0.096737 0.005214 -0.000120

Library Files
Main analysis library: FSS_Rev_1.Lib
Library Match Width: 1.000
Peak stripping: Library based

Analysis parameters
Analysis engine: Env32 G53W4.20
Start channel: 100 ( 50.22keV )
Stop channel: 4000 ( 1999.02keV )
Peak rejection level: 41.667%
Peak search sensitivity: 3
Sample Size: 1.7690E+03
Activity scaling factor: 1.0000E+06/( 1.0000E+00* 1.7690E+03) =
5.6529E+02
Detection limit method: Nureg 4.16
Random error: 1.0000000E+00
Systematic error: 1.0000000E+00

| | |
|---|---|
| Fraction Limit: | 0.000% |
| Background width: | average of five points. |

YAEC Chemistry Lab Spectrum name: 102F_16SEPT2006_0947.An1

Half lives decay limit: 12.000
Activity range factor: 2.000
Min. step backg. energy 0.000
Multiplet shift channel 2.000

| Corrections | Status | Comments |
|---|---|---|
| Decay correct to date: | YES | 09-Sep-2006 12:40:00 |
| Decay during acquisition: | NO | |
| Decay during collection: | NO | |
| True coincidence correction: | NO | |
| Peaked background correction: | YES | 102_150K_28APR05.Pbc 01-May-2005 05:27:47 |
| Absorption (Internal): | NO | |
| Geometry correction: | NO | |
| Random summing: | NO | |

total peaks alloc. 10 cutoff 20.00000 %
Energy Calibration
Normalized diff: 0.7152

***** S U M M A R Y O F P E A K S I N R A N G E *****

| Peak Energy | Area | Uncert | FWHM | Corrctn Factor | Nuclide Energy | Brnch. Ratio | Act. pCi/gm | Nuc |
|---|---|---|---|---|---|---|---|---|
| 75.05 | 127. | 26.37 | 1.10 | 8.965E-03 | 74.81 | 9.600 | PBC<MDA | PB212 |
| 77.22 | 281. | 11.11 | 1.10 | 9.615E-03 | 77.11 | 17.500 | 1.284E+00 | PB212 |
| | | | | | 77.11 | 10.700 | 2.100E+00 | PB214 |
| 129.34 | 89. | 38.78 | 0.82 | 1.716E-02 | | | | |
| 186.20 | 102. | 33.43 | 0.88 | 1.626E-02 | 185.99 | 3.280 | PBC<MDA | RA226 |
| 209.19 | 92. | 29.16 | 1.05 | 1.520E-02 | | | | |
| 239.08 | 698. | 4.48 | 1.22 | 1.379E-02 | 238.63 | 43.100 | 8.960E-01 | PB212 |
| 242.36 | 95. | 22.77 | 1.22 | 1.364E-02 | 241.00 | 3.900 | PBC<MDA | RA224 |
| | | | | | 241.92 | 7.470 | 7.095E-01 | PB214 |
| 270.68 | 92. | 28.74 | 1.81 | 1.241E-02 | | | | |
| 295.88 | 167. | 11.60 | 1.26 | 1.144E-02 | 295.22 | 19.200 | 5.781E-01 | PB214 |
| 300.70 | 59. | 25.42 | 1.26 | 1.127E-02 | | | | |
| 339.15 | 140. | 21.03 | 1.32 | 1.004E-02 | 338.40 | 12.010 | 8.820E-01 | AC228 |
| 352.72 | 307. | 10.45 | 1.27 | 9.659E-03 | 351.99 | 37.100 | 6.519E-01 | PB214 |
| 463.83 | 44. | 30.94 | 1.15 | 7.360E-03 | 463.51 | 10.000 | 4.414E-01 | SB125 |
| 511.93 | 96. | 21.69 | 2.11 | 6.679E-03 | 510.72 | 22.500 | 4.894E-01 | TL208 |
| | | | | | 513.99 | 0.004 | 2.577E+03 | Kr85 |
| | | | | | 514.00 | 99.270 | 1.201E-01 | Sr85 |
| 584.29 | 230. | 8.49 | 1.25 | 5.879E-03 | 583.14 | 86.000 | 3.461E-01 | TL208 |
| 610.45 | 212. | 12.19 | 1.49 | 5.639E-03 | 609.32 | 46.090 | 6.220E-01 | BI214 |
| 728.41 | 61. | 19.26 | 2.21 | 4.794E-03 | 727.17 | 11.800 | 8.264E-01 | BI212 |
| 796.55 | 36. | 30.20 | 1.60 | 4.420E-03 | 795.76 | 85.400 | 7.306E-02 | CS134 |
| 912.95 | 170. | 12.53 | 1.65 | 3.915E-03 | | | | |
| 970.26 | 103. | 15.84 | 1.70 | 3.713E-03 | 968.90 | 17.460 | 1.212E+00 | AC228 |
| 1463.51 | 670. | 3.98 | 1.83 | 2.617E-03 | | | | |

********** U N I D E N T I F I E D  P E A K  S U M M A R Y **********

| Peak Channel | Centroid Energy | Background Counts | Net Area Counts | Intensity Cts/Sec | Uncert 3 Sigma % | FWHM keV | Suspected Nuclide | |
|---|---|---|---|---|---|---|---|---|
| 149.67 | 75.19 | 495. | 127. | 0.063 | 79.10 | 1.099 | PB-214 | D |

YAEC Chemistry Lab Spectrum name: 102F_16SEPT2006_0947.An1

| Channel | Energy | Background | Net area | Cnts/sec | Uncert | FWHM | Suspected | |
|---|---|---|---|---|---|---|---|---|
| 154.02 | 77.36 | 346. | 281. | 0.140 | 33.33 | 1.100 | PB-214 | D |
| 418.00 | 209.19 | 273. | 92. | 0.046 | 87.49 | 1.055 | AC-228 | M |
| 477.78 | 239.03 | 139. | 698. | 0.349 | 13.43 | 1.215 | PB-212 | D |
| 484.36 | 242.31 | 185. | 95. | 0.047 | 68.31 | 1.217 | XE-138 | D |
| 541.00 | 270.68 | 218. | 92. | 0.046 | 86.21 | 1.807 | AC-228 | sM |
| 601.18 | 300.76 | 136. | 50. | 0.025 | 113.41 | 1.236 | PB-212 | sM |
| 1826.05 | 912.95 | 63. | 170. | 0.085 | 30.32 | 1.649 | AC-228 | M |
| 1940.72 | 970.26 | 47. | 104. | 0.052 | 40.68 | 1.695 | AC-228 | M |
| 2927.92 | 1463.51 | 10. | 670. | 0.335 | 11.76 | 1.833 | K-40 | M |

s - Peak fails shape tests.
D - Peak area deconvoluted.
L - Peak written from unknown list.
C - Area < Critical level.
M - Peak is close to a library peak.

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This section based on library: FSS_Rev_1.Lib

********** I D E N T I F I E D P E A K S U M M A R Y **********

| Nuclide | Peak Channel | Centroid Energy | Background Counts | Net Area Counts | Intensity Cts/Sec | Uncert 3 Sigma % | FWHM keV | |
|---|---|---|---|---|---|---|---|---|
| PB-212 | 149.36 | 74.89 | 1062. | 115. | 0.058 | 120.08 | 1.500 | |
| PB-212 | 153.80 | 77.11 | 977. | 240. | 0.120 | 58.63 | 1.500 | D |
| PB-214 | 153.80 | 77.11 | 977. | 240. | 0.120 | 58.63 | 1.500 | D |
| RA-226 | 372.16 | 186.28 | 466. | 80. | 0.040 | 112.92 | 1.500 | |
| PB-212 | 477.79 | 239.08 | 416. | 627. | 0.314 | 18.27 | 1.500 | |
| PB-214 | 591.47 | 295.91 | 179. | 177. | 0.088 | 39.22 | 1.500 | |
| AC-228 | 677.81 | 339.06 | 164. | 127. | 0.064 | 50.32 | 1.500 | |
| PB-214 | 705.14 | 352.73 | 150. | 262. | 0.131 | 27.11 | 1.500 | |
| SB-125 | 927.74 | 464.00 | 72. | 34. | 0.017 | 112.46 | 1.500 | |
| TL-208 | 1023.27 | 511.74 | 101. | 54. | 0.027 | 88.63 | 1.499 | s |
| Kr-85 | 1023.53 | 511.88 | 99. | 41. | 0.020 | 114.10 | 1.500 | s |
| Sr-85 | 1023.52 | 511.87 | 95. | 43. | 0.021 | 106.76 | 1.500 | s |
| TL-208 | 1168.58 | 584.37 | 47. | 223. | 0.112 | 23.90 | 1.499 | |
| BI-214 | 1220.76 | 610.45 | 114. | 212. | 0.106 | 36.57 | 1.492 | |
| Ag-108M | 1224.51 | 612.33 | 213. | -67. | -0.033 | 100.12 | 1.499 | s |
| BI-212 | 1456.77 | 728.41 | 34. | 61. | 0.031 | 57.78 | 2.210 | s |
| CS-134 | 1593.13 | 796.55 | 41. | 36. | 0.018 | 90.60 | 1.601 | s |

s - Peak fails shape tests.
D - Peak area deconvoluted.
A Derived peak area.

***** S U M M A R Y O F L I B R A R Y P E A K U S A G E *****

| - Nuclide - Name | Code | Average Activity pCi/gm | Peak Energy keV | Peak Activity pCi/gm | Peak Code | Peak MDA Value pCi/gm | COMMENTS |
|---|---|---|---|---|---|---|---|
| BE-7 | | -1.2072E-02 | | | | | |
| | | | 477.56 | -1.207E-02 | %( | 5.791E-01 1.67E-01 | G |
| K-40 | | -4.1165E-03 | | | | | |
| | | | 1460.75 | -4.116E-03 | %(P | 1.291E+00 3.69E-01 | G |
| MN-54 | | -9.4840E-03 | | | | | |
| | | | 834.81 | -9.484E-03 | &(P | 6.402E-02 1.83E-02 | G |
| CO-57 | | -4.7079E-03 | | | | | |
| | | | 122.07 | -4.708E-03 | %( | 6.463E-02 1.92E-02 | G K |
| | | | 136.43 | -1.260E-01 | % | 5.396E-01 1.62E-01 | G |
| CO-60 | | 8.2658E-03 | | | | | |
| | | | 1332.51 | 8.266E-03 | %(P | 5.385E-02 1.49E-02 | G K |
| | | | 1173.23 | 2.938E-02 | & | 7.842E-02 2.34E-02 | G K |
| Sr-85 | | 5.3418E-02 | | | | | |
| | | | 514.00 | 5.342E-02 | &( | 5.996E-02 1.90E-02 | G |
| Kr-85 | | 1.0848E+03 | | | | | |
| | | | 513.99 | 1.085E+03 | &( | 1.311E+03 4.13E+02 | G |
| Y-88 | | 5.9802E-03 | | | | | |
| | | | 1836.01 | 5.980E-03 | %(P | 5.177E-02 1.35E-02 | G K |
| | | | 898.02 | -2.235E-03 | & P | 6.502E-02 1.79E-02 | G |
| NB-94 | | 5.3607E-03 | | | | | |
| | | | 871.10 | 5.361E-03 | %( | 4.389E-02 1.22E-02 | G K |
| | | | 702.50 | 0.000E+00 | % | 7.077E-02 2.02E-02 | G K |
| Ag-108M | | 1.4324E-02 | | | | | |
| | | | 722.95 | 1.432E-02 | &( | 6.750E-02 1.97E-02 | G K |
| | | | 614.37 | -1.004E-01 | + P | 1.065E-01 3.34E-02 | G |
| | | | 433.93 | 1.764E-02 | % | 4.890E-02 1.46E-02 | G |
| CD-109 | | 1.4176E+00 | | | | | |
| | | | 88.04 | 1.418E+00 | %(P | 2.405E+00 7.32E-01 | G |
| SN-113 | | -1.2423E-02 | | | | | |
| | | | 391.71 | -1.242E-02 | %( | 8.150E-02 2.39E-02 | G K |
| | | | 255.04 | -5.682E-01 | % | 2.121E+00 6.33E-01 | G |

| Nuclide | Ave activity | Energy | Activity | Code | Peak | MDA | Comments |
|---|---|---|---|---|---|---|---|
| SB-125 | 1.3402E-01 | | | | | | |
| | | 427.95 | 6.026E-02 | %(P | 1.206E-01 | 3.66E-02 | G K |
| | | 600.77-3.972E-02 | | & P | 2.965E-01 | 8.56E-02 | G |
| | | 636.15-5.079E-02 | | & P | 4.921E-01 | 1.41E-01 | G |
| | | 463.51 | 3.524E-01 | (P | 4.395E-01 | 1.38E-01 | G |
| | | 176.29-5.357E-02 | | % P | 7.833E-01 | 2.32E-01 | G |
| I-131 | 1.6093E-02 | | | | | | |
| | | 364.48 | 1.609E-02 | %( | 1.050E-01 | 3.09E-02 | G K |
| | | 636.97-1.141E-01 | | & | 1.009E+00 | 2.84E-01 | G |
| | | 284.29 | 1.499E-01 | % | 1.230E+00 | 3.62E-01 | G |
| CS-134 | 3.7146E-02 | | | | | | |
| | | 604.66 | 5.719E-03 | %( | 5.497E-02 | 1.58E-02 | G K |
| | | 795.76 | 7.306E-02 | ( | 6.610E-02 | 2.21E-02 | G |
| | | 569.29 | 0.000E+00 | % | 4.420E-01 | 1.27E-01 | G |
| | | 801.84-1.042E-01 | | % P | 7.686E-01 | 2.21E-01 | G |
| CS-137 | 1.1388E-02 | | | | | | |
| | | 661.62 | 1.139E-02 | &( | 6.579E-02 | 1.91E-02 | G |
| CE-139 | -4.8663E-03 | | | | | | |
| | | 165.85-4.866E-03 | | %(P | 6.683E-02 | 1.99E-02 | G |
| EU-152 | -2.1395E-02 | | | | | | |
| | | 121.78-2.139E-02 | | %(P | 1.751E-01 | 5.21E-02 | G K |
| | | 344.30-3.665E-02 | | % | 1.953E-01 | 5.78E-02 | G |
| | | 1408.08-7.398E-02 | | % | 3.673E-01 | 1.05E-01 | G |
| | | 964.00-6.691E-03 | | & P | 5.212E-01 | 1.46E-01 | G |
| | | 1112.07 | 7.048E-03 | % | 6.421E-01 | 1.81E-01 | G |
| | | 778.90-9.858E-04 | | % P | 5.070E-01 | 1.43E-01 | G |
| EU-154 | -3.0735E-02 | | | | | | |
| | | 123.10-3.073E-02 | | &(P | 1.146E-01 | 3.44E-02 | G K |
| | | 1274.80 | 4.642E-02 | % | 2.334E-01 | 6.74E-02 | G |
| | | 723.30 | 7.072E-03 | & P | 4.836E-01 | 1.40E-01 | G |
| | | 1004.80-4.284E-02 | | % | 4.225E-01 | 1.20E-01 | G |
| EU-155 | 1.7479E-02 | | | | | | |
| | | 86.45 | 1.748E-02 | %(P | 3.099E-01 | 9.25E-02 | G K |
| | | 105.31 | 4.419E-02 | % | 2.772E-01 | 8.29E-02 | G |
| HG-203 | 3.3040E-02 | | | | | | |
| | | 279.17 | 3.304E-02 | &(P | 5.807E-02 | 1.77E-02 | G K |
| | | 72.87-5.571E-01 | | % | 2.689E+00 | 8.08E-01 | G |
| | | 70.83-1.161E+00 | | % | 4.809E+00 | 1.45E+00 | G |
| | | 82.50-6.821E-02 | | & | 4.716E+00 | 1.40E+00 | G |

| Nuclide | Ave activity | Energy | Activity | Code | Peak | MDA | Comments |
|---|---|---|---|---|---|---|---|
| TL-208 | 3.3643E-01 | | | | | | |
| | | 583.14 | 3.364E-01 | (P | 5.234E-02 | 2.68E-02 | G |
| | | 510.72 | 2.744E-01 | - | 2.509E-01 | 8.11E-02 | G |
| PB-212 | 8.0545E-01 | | | | | | |
| | | 238.63 | 8.054E-01 | ( | 1.256E-01 | 4.91E-02 | G K |
| | | | | | | | Energy duplication |
| | | 77.11 | 1.096E+00 | + | 6.788E-01 | 2.14E-01 | G |
| | | 74.81 | 1.035E+00 | & P | 1.390E+00 | 4.25E-01 | G |
| PB-214 | 5.7653E-01 | | | | | | |
| | | 351.99 | 5.571E-01 | (P | 1.272E-01 | 5.04E-02 | G K |
| | | 295.22 | 6.141E-01 | ( | 2.259E-01 | 8.03E-02 | G |
| | | | | | | | Energy duplication |
| | | 77.11 | 1.793E+00 | + | 1.110E+00 | 3.50E-01 | G |
| | | 241.92 | 4.772E-01 | % | 7.870E-01 | 2.40E-01 | G |
| BI-212 | 8.2643E-01 | | | | | | |
| | | 727.17 | 8.264E-01 | ( | 4.024E-01 | 1.59E-01 | G K |
| | | 1620.56 | -4.435E-01 | & P | 2.007E+00 | 5.50E-01 | G |
| | | 785.42 | -2.001E-01 | % P | 2.930E+00 | 8.29E-01 | G |
| BI-214 | 6.2198E-01 | | | | | | |
| | | 609.32 | 6.220E-01 | ( | 1.539E-01 | 7.60E-02 | G K |
| | | 1764.51 | -1.869E-03 | % P | 3.616E-01 | 9.16E-02 | G |
| | | 1120.28 | 1.331E-01 | & | 6.477E-01 | 1.89E-01 | G |
| RA-224 | 8.0064E-01 | | | | | | |
| | | 241.00 | 8.006E-01 | &(P | 1.450E+00 | 4.41E-01 | G |
| RA-226 | 1.1430E+00 | | | | | | |
| | | 185.99 | 1.143E+00 | (P | 1.479E+00 | 4.54E-01 | G |
| AC-228 | 2.3325E-01 | | | | | | |
| | | 911.07 | -2.828E-03 | %(P | 2.309E-01 | 6.45E-02 | G K |
| | | 968.90 | -1.011E-02 | % P | 4.586E-01 | 1.30E-01 | G |
| | | 338.40 | 8.033E-01 | ( | 3.939E-01 | 1.35E-01 | G |
| TH-227 | -3.5046E-01 | | | | | | |
| | | 236.00 | -3.505E-01 | %(P | 5.797E-01 | 1.77E-01 | G K |
| | | 256.25 | 1.195E-01 | % | 6.118E-01 | 1.81E-01 | G |
| PA-234 | -2.9959E-02 | | | | | | |
| | | 98.44 | -2.996E-02 | %( | 2.645E-01 | 7.89E-02 | G K |
| | | 946.00 | 1.233E-01 | % | 3.388E-01 | 1.01E-01 | G |
| | | 131.28 | -5.657E-02 | & | 2.703E-01 | 8.10E-02 | G |
| | | 94.67 | -8.663E-02 | & | 5.238E-01 | 1.57E-01 | G |
| | | 883.24 | -2.271E-02 | & | 5.566E-01 | 1.57E-01 | G |
| | | 926.70 | 7.483E-03 | % | 4.961E-01 | 1.36E-01 | G |

| Nuclide | Ave activity | Energy | Activity | Code | Peak | MDA | Comments |
|---|---|---|---|---|---|---|---|
| | | 569.26 | 0.000E+00 % | | 6.516E-01 | 1.88E-01 | G |
| TH-234 | 8.6978E-01 | | | | | | |
| | | 63.29 | 8.698E-01 %( | P | 5.499E+00 | 1.65E+00 | G K |
| | | 92.80 | 1.382E+00 & | | 2.808E+00 | 8.52E-01 | G |
| | | 92.38 | 1.598E-01 & | P | 2.852E+00 | 8.49E-01 | G |
| AM-241 | 1.6548E-01 | | | | | | |
| | | 59.54 | 1.655E-01 &( | | 7.639E-01 | 2.29E-01 | G |

( - This peak used in the nuclide activity average.

* - Peak is too wide, but only one peak in library.
! - Peak is part of a multiplet and this area went negative during deconvolution.
? - Peak is too narrow.
@ - Peak is too wide at FW25M, but ok at FWHM.
% - Peak fails sensitivity test.
$ - Peak identified, but first peak of this nuclide failed one or more qualification tests.
+ - Peak activity higher than counting uncertainty range.
- - Peak activity lower than counting uncertainty range.
= - Peak outside analysis energy range.
& - Calculated peak centroid is not close enough to the library energy centroid for positive identification.
P - Peakbackground subtraction
} - Peak is too close to another for the activity to be found directly.

| Nuclide Codes: | Peak Codes: |
|---|---|
| T - Thermal Neutron Activation | G - Gamma Ray |
| F - Fast Neutron Activation | X - X-Ray |
| I - Fission Product | P - Positron Decay |
| N - Naturally Occurring Isotope | S - Single-Escape |
| P - Photon Reaction | D - Double-Escape |
| C - Charged Particle Reaction | K - Key Line |
| M - No MDA Calculation | A - Not in Average |
| R - Coincidence Corrected | C - Coincidence Peak |
| H - Halflife limit exceeded | |

- - - - - - - - - - - - - - - - - - - - - - - - - - - - - - - - - - - - -

***** S U M M A R Y O F N U C L I D E S I N S A M P L E *****

| Nuclide | | Time of Count Activity pCi/gm | Time Corrected Activity pCi/gm | Uncertainty 3 Sigma Counting pCi/gm | Total pCi/gm | MDA pCi/gm |
|---|---|---|---|---|---|---|
| BE-7 | #A | -1.1040E-02 | -1.2072E-02 | 5.0048E-01 | 5.0048E-01 | 5.296E-01 |
| K-40 | #A | -4.1165E-03 | -4.1165E-03 | 3.3453E-01 | 3.3453E-01 | 1.291E+00 |
| MN-54 | #A | -9.3402E-03 | -9.4840E-03 | 5.9752E-02 | 5.9754E-02 | 6.305E-02 |
| CO-57 | #B | -4.6255E-03 | -4.7079E-03 | 5.7709E-02 | 5.7710E-02 | 6.350E-02 |
| CO-60 | #B | 8.2454E-03 | 8.2658E-03 | 4.4614E-02 | 4.4617E-02 | 5.372E-02 |

| | | | | | | |
|---|---|---|---|---|---|---|
| Sr-85 | #A | 4.9630E-02 | 5.3418E-02 | 5.7029E-02 | 5.7107E-02 | 5.570E-02 |
| Kr-85 | #A | 1.0848E+03 | 1.0848E+03 | 1.2378E+03 | 1.2393E+03 | 1.311E+03 |
| Y-88 | #B | 5.7186E-03 | 5.9802E-03 | 4.0460E-02 | 4.0461E-02 | 4.950E-02 |
| NB-94 | #B | 5.3607E-03 | 5.3607E-03 | 3.6597E-02 | 3.6598E-02 | 4.389E-02 |
| Ag-108M | #B | 1.4322E-02 | 1.4324E-02 | 5.9073E-02 | 5.9079E-02 | 6.749E-02 |
| CD-109 | #A | 1.4028E+00 | 1.4176E+00 | 2.1965E+00 | 2.1979E+00 | 2.380E+00 |
| SN-113 | #B | -1.1918E-02 | -1.2423E-02 | 7.1806E-02 | 7.1809E-02 | 7.820E-02 |
| SB-125 | #F | 1.3339E-01 | 1.3402E-01 | 1.4524E-01 | 1.4543E-01 | 1.201E-01 |
| I-131 | #B | 8.8929E-03 | 1.6093E-02 | 9.2577E-02 | 9.2582E-02 | 5.804E-02 |
| CS-134 | #B | 3.6911E-02 | 3.7146E-02 | 3.3653E-02 | 3.3718E-02 | 5.463E-02 |
| CS-137 | #A | 1.1383E-02 | 1.1388E-02 | 5.7205E-02 | 5.7209E-02 | 6.576E-02 |
| CE-139 | #A | -4.7004E-03 | -4.8663E-03 | 6.6155E-02 | 6.6155E-02 | 6.455E-02 |
| EU-152 | #B | -2.1373E-02 | -2.1395E-02 | 1.7765E-01 | 1.7765E-01 | 1.749E-01 |
| EU-154 | #B | -3.0687E-02 | -3.0735E-02 | 1.0461E-01 | 1.0462E-01 | 1.144E-01 |
| EU-155 | #B | 1.7433E-02 | 1.7479E-02 | 2.7761E-01 | 2.7761E-01 | 3.090E-01 |
| HG-203 | #B | 2.9826E-02 | 3.3040E-02 | 5.3204E-02 | 5.3236E-02 | 5.242E-02 |
| TL-208 | # | 3.3643E-01 | 3.3643E-01 | 8.0549E-02 | 8.2731E-02 | 5.234E-02 |
| PB-212 | # | 8.0545E-01 | 8.0545E-01 | 1.4717E-01 | 1.5396E-01 | 1.256E-01 |
| PB-214 | # | 5.7653E-01 | 5.7653E-01 | 1.3751E-01 | 1.4127E-01 | 1.272E-01 |
| BI-212 | | 8.2643E-01 | 8.2643E-01 | 4.7752E-01 | 4.7977E-01 | |
| BI-214 | | 6.2198E-01 | 6.2198E-01 | 2.2748E-01 | 2.3015E-01 | |
| RA-224 | #A | 8.0064E-01 | 8.0064E-01 | 1.3235E+00 | 1.3242E+00 | 1.450E+00 |
| RA-226 | #A | 1.1430E+00 | 1.1430E+00 | 1.3628E+00 | 1.3643E+00 | 1.479E+00 |
| AC-228 | F | 2.3325E-01 | 2.3325E-01 | 1.1737E-01 | 1.1809E-01 | 2.309E-01 |
| TH-227 | #B | -3.5046E-01 | -3.5046E-01 | 5.3454E-01 | 5.3490E-01 | 5.797E-01 |
| PA-234 | #B | -2.9959E-02 | -2.9959E-02 | 2.3678E-01 | 2.3678E-01 | 2.645E-01 |
| TH-234 | #B | 8.6978E-01 | 8.6978E-01 | 4.9386E+00 | 4.9388E+00 | 5.499E+00 |
| AM-241 | #A | 1.6548E-01 | 1.6548E-01 | 6.8712E-01 | 6.8718E-01 | 7.639E-01 |

# - All peaks for activity calculation had bad shape.
* - Activity omitted from total
& - Activity omitted from total and all peaks had bad shape.
< - MDA value printed.
A - Activity printed, but activity < MDA.
B - Activity < MDA and failed test.
C - Area < Critical level.
F - Failed fraction or key line test.
H - Halflife limit exceeded

---------- S U M M A R Y ----------

Total Activity ( 270.7 to 1999.0 keV) 1.6816635E+00 pCi/gm
Total Decayed Activity ( 270.7 to 1999.0 keV) 1.6816635E+00 pCi/gm

The library has energies which are not separable.

Analyzed by: _____
JJM

Reviewed by: _____
Supervisor

Laboratory: YAEC Chemistry Lab

YAEC Chemistry Lab Spectrum name: 103F_15SEPT2006_0838.An1

Sample description
FSS-SSS-01-01-009-F

Spectrum Filename: C:\GammaVision\Spectra\103F_15SEPT2006_0838.An1

Acquisition information
Start time: 15-Sep-2006 08:38:08
Live time: 2000
Real time: 2002
Dead time: 0.12 %
Detector ID: 4

Detector system
Det 103 - DSPE-471

Calibration
Filename: D3_1LSa.Clb
Detector_103 1.0 Liter Sand Geometry

Energy Calibration
Created: 08-Aug-2005 11:09:41
Zero offset: 0.409 keV
Gain: 0.500 keV/channel
Quadratic: 1.092E-08 keV/channel^2

Efficiency Calibration
Created: 08-Aug-2005 11:11:25
Type: Polynomial
Uncertainty: 0.993 %
Coefficients: -0.264059 -5.138468 0.638383
-0.089199 0.005011 -0.000129

Library Files
Main analysis library: FSS_Rev_1.Lib
Library Match Width: 1.000
Peak stripping: Library based

Analysis parameters
Analysis engine: Env32 G53W4.20
Start channel: 100 ( 50.41keV )
Stop channel: 4000 ( 2000.67keV )
Peak rejection level: 41.667%
Peak search sensitivity: 3
Sample Size: 1.9040E+03
Activity scaling factor: 1.0000E+06/( 1.0000E+00* 1.9040E+03) =
5.2521E+02
Detection limit method: Nureg 4.16
Random error: 1.0000000E+00
Systematic error: 1.0000000E+00

| | |
|---|---|
| Fraction Limit: | 0.000% |
| Background width: | average of five points. |

YAEC Chemistry Lab Spectrum name: 103F_15SEPT2006_0838.An1

Half lives decay limit: 12.000
Activity range factor: 2.000
Min. step backg. energy 0.000
Multiplet shift channel 2.000

| Corrections | Status | Comments |
|---|---|---|
| Decay correct to date: | YES | 10-Sep-2006 10:09:00 |
| Decay during acquisition: | NO | |
| Decay during collection: | NO | |
| True coincidence correction: | NO | |
| Peaked background correction: | YES | 103_150K_05AUG05.Pbc 08-Aug-2005 12:54:15 |
| Absorption (Internal): | NO | |
| Geometry correction: | NO | |
| Random summing: | NO | |

total peaks alloc. 17 cutoff 20.00000 %
Energy Calibration
Normalized diff: 0.1809

***** S U M M A R Y O F P E A K S I N R A N G E *****

| Peak Energy | Area | Uncert | FWHM | Corrctn Factor | Nuclide Energy | Brnch. Ratio | Act. pCi/gm | Nuc |
|---|---|---|---|---|---|---|---|---|
| 46.64 | 144. | 31.81 | 0.96 | 0.000E+00 | | | | |
| 74.89 | 148. | 20.68 | 0.99 | 9.052E-03 | 74.81 | 9.600 | 1.208E+00 | PB212 |
| 77.19 | 210. | 11.80 | 0.99 | 1.011E-02 | 77.11 | 10.700 | 1.442E+00 | PB214 |
| | | | | | 77.11 | 17.500 | 8.817E-01 | PB212 |
| 93.15 | 114. | 36.21 | 1.50 | 1.631E-02 | 92.38 | 2.570 | PBC<MDA | TH234 |
| | | | | | 92.80 | 3.000 | PBC<MDA | TH234 |
| 93.17 | 117. | 35.12 | 1.50 | 1.645E-02 | 92.38 | 2.570 | PBC<MDA | TH234 |
| | | | | | 92.80 | 3.000 | PBC<MDA | TH234 |
| 128.81 | 111. | 40.89 | 0.89 | 2.434E-02 | | | | |
| 186.47 | 128. | 29.04 | 1.20 | 2.565E-02 | 185.99 | 3.280 | PBC<MDA | RA226 |
| 209.69 | 154. | 22.39 | 0.98 | 2.469E-02 | | | | |
| 238.81 | 1178. | 3.39 | 1.09 | 2.319E-02 | 238.63 | 43.100 | 8.280E-01 | PB212 |
| 241.51 | 170. | 20.11 | 1.09 | 2.305E-02 | 241.00 | 3.900 | 1.340E+00 | RA224 |
| | | | | | 241.92 | 7.470 | 7.013E-01 | PB214 |
| 270.23 | 130. | 22.95 | 1.43 | 2.151E-02 | | | | |
| 295.37 | 340. | 8.54 | 1.07 | 2.024E-02 | 295.22 | 19.200 | 6.137E-01 | PB214 |
| 300.46 | 86. | 29.90 | 1.13 | 2.000E-02 | | | | |
| 327.80 | 90. | 30.82 | 1.83 | 1.875E-02 | | | | |
| 338.52 | 286. | 10.37 | 1.18 | 1.830E-02 | 338.40 | 12.010 | 9.206E-01 | AC228 |
| 352.00 | 621. | 5.91 | 1.10 | 1.775E-02 | 351.99 | 37.100 | 6.629E-01 | PB214 |
| 409.74 | 61. | 36.09 | 0.88 | 1.574E-02 | | | | |
| 462.72 | 76. | 27.01 | 1.23 | 1.427E-02 | | | | |
| 462.72 | 76. | 27.01 | 1.23 | 1.427E-02 | 463.51 | 10.000 | 3.755E-01 | SB125 |
| 510.74 | 178. | 16.27 | 1.29 | 1.317E-02 | 510.72 | 22.500 | 3.621E-01 | TL208 |
| 583.42 | 406. | 6.88 | 1.43 | 1.184E-02 | 583.14 | 86.000 | 2.797E-01 | TL208 |
| 609.44 | 456. | 6.92 | 1.49 | 1.144E-02 | 609.32 | 46.090 | 6.047E-01 | BI214 |
| 727.13 | 131. | 17.52 | 1.03 | 9.965E-03 | 727.17 | 11.800 | 7.865E-01 | BI212 |

| | | | | | | | | |
|---|---|---|---|---|---|---|---|---|
| 768.55 | 65. | 38.02 | 1.19 | 9.551E-03 | | | | |
| 786.96 | 88. | 24.61 | 1.22 | 9.380E-03 | 785.42 | 2.000 | 3.305E+00 | BI212 |
| 795.10 | 37. | 35.69 | 1.50 | 9.301E-03 | 795.76 | 85.400 | PBC<MDA | CS134 |
| 795.98 | 61. | 28.17 | 0.88 | 9.299E-03 | | | | |
| 860.98 | 48. | 36.71 | 1.59 | 8.764E-03 | | | | |
| 911.60 | 276. | 7.49 | 1.66 | 8.398E-03 | 911.07 | 29.000 | 7.939E-01 | AC228 |
| 965.15 | 56. | 22.43 | 1.54 | 8.048E-03 | 964.00 | 14.580 | 3.356E-01 | EU152 |
| 969.33 | 163. | 9.85 | 1.54 | 8.022E-03 | 968.90 | 17.460 | 8.238E-01 | AC228 |
| 1120.46 | 109. | 16.91 | 1.57 | 7.211E-03 | 1120.28 | 15.040 | 7.022E-01 | BI214 |
| 1461.32 | 1574. | 2.60 | 2.01 | 5.930E-03 | 1460.75 | 10.700 | 1.739E+01 | K40 |

YAEC Chemistry Lab Spectrum name: 103F_15SEPT2006_0838.An1

| pk energy | area | uncert | fwhm | corr | nuclide | brnch. | act. | nuc |
|---|---|---|---|---|---|---|---|---|
| 1622.18 | 24. | 27.74 | 0.59 | 5.488E-03 | 1620.56 | 2.750 | 1.113E+00 | BI212 |
| 1765.35 | 92. | 11.53 | 1.65 | 5.140E-03 | 1764.51 | 15.920 | 7.728E-01 | BI214 |

********** U N I D E N T I F I E D P E A K S U M M A R Y **********

| Peak Channel | Centroid Energy | Background Counts | Net Area Counts | Intensity Cts/Sec | Uncert 3 Sigma % | FWHM keV | Suspected Nuclide | |
|---|---|---|---|---|---|---|---|---|
| 92.47 | 46.64 | 788. | 144. | 0.072 | 95.44 | 0.956 | EU-152 | |
| 256.79 | 128.81 | 779. | 144. | 0.072 | 86.23 | 0.889 | AC-228 | s |
| 418.54 | 209.69 | 469. | 154. | 0.077 | 67.18 | 0.982 | NP-239 | s |
| 539.62 | 270.23 | 318. | 130. | 0.065 | 68.85 | 1.425 | AC-228 | s |
| 600.06 | 300.46 | 248. | 86. | 0.043 | 89.71 | 1.132 | PB-212 | |
| 654.75 | 327.80 | 268. | 90. | 0.045 | 92.45 | 1.832 | AC-228 | s |
| 818.61 | 409.74 | 178. | 61. | 0.031 | 108.28 | 0.884 | AC-228 | s |
| 1536.15 | 768.55 | 158. | 65. | 0.032 | 114.05 | 1.187 | BI-214 | M |
| 1572.98 | 786.96 | 146. | 49. | 0.025 | 112.55 | 1.215 | PA-234 | sM |
| 1591.02 | 795.98 | 82. | 61. | 0.031 | 84.52 | 0.877 | PA-234 | l |
| 1721.00 | 860.98 | 89. | 48. | 0.024 | 94.61 | 1.594 | TL-208 | |
| 1930.39 | 965.31 | 60. | 47. | 0.023 | 83.37 | 1.539 | AC-228 | D |

s - Peak fails shape tests.
D - Peak area deconvoluted.
L - Peak written from unknown list.
C - Area < Critical level.
M - Peak is close to a library peak.

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This section based on library: FSS_Rev_1.Lib

********** I D E N T I F I E D P E A K S U M M A R Y **********

| Nuclide | Peak Channel | Centroid Energy | Background Counts | Net Area Counts | Intensity Cts/Sec | Uncert 3 Sigma % | FWHM keV |
|---|---|---|---|---|---|---|---|
| PB-212 | 148.79 | 74.81 | 415. | 148. | 0.074 | 62.05 | 0.993D |
| PB-212 | 153.39 | 77.11 | 421. | 210. | 0.105 | 35.41 | 0.995A |
| TH-234 | 185.50 | 93.17 | 1066. | 117. | 0.058 | 105.37 | 1.500 |
| RA-226 | 371.80 | 186.32 | 862. | 124. | 0.062 | 93.94 | 1.500s |
| PB-212 | 476.78 | 238.81 | 767. | 1163. | 0.582 | 14.47 | 1.022 |
| RA-224 | 482.72 | 241.78 | 908. | 130. | 0.065 | 102.00 | 1.500 |
| PB-214 | 589.88 | 295.37 | 244. | 336. | 0.168 | 25.62 | 1.067 |
| AC-228 | 676.19 | 338.52 | 230. | 285. | 0.143 | 31.11 | 1.182 |
| PB-214 | 703.13 | 352.00 | 265. | 615. | 0.308 | 17.73 | 1.097 |
| SB-125 | 925.39 | 463.13 | 143. | 68. | 0.034 | 81.05 | 1.500 |
| TL-208 | 1020.58 | 510.74 | 227. | 151. | 0.076 | 48.82 | 1.290s |
| TL-208 | 1165.93 | 583.42 | 134. | 401. | 0.201 | 20.65 | 1.430s |
| BI-214 | 1217.97 | 609.44 | 170. | 449. | 0.225 | 20.76 | 1.490 |
| Ag-108M | 1222.90 | 611.90 | 220. | -64. | -0.032 | 104.86 | 1.500s |

| Nuclide | Channel | Energy | Background | Net area | Cnts/sec | Uncert | FWHM |
|---|---|---|---|---|---|---|---|
| BI-212 | 1453.34 | 727.13 | 124. | 130. | 0.065 | 52.55 | 1.035s |
| CS-134 | 1589.26 | 795.10 | 70. | 37. | 0.019 | 107.06 | 1.500s |
| AC-228 | 1822.23 | 911.60 | 59. | 273. | 0.136 | 22.48 | 1.664 |
| AC-228 | 1936.81 | 968.90 | 49. | 162. | 0.081 | 29.75 | 1.541D |
| BI-214 | 2239.89 | 1120.46 | 85. | 107. | 0.054 | 50.73 | 1.572s |
| K-40 | 2921.51 | 1461.32 | 44. | 1555. | 0.778 | 7.80 | 2.009 |
| BI-212 | 3243.17 | 1622.18 | 6. | 24. | 0.012 | 83.23 | 0.593s |
| BI-214 | 3529.45 | 1765.35 | 10. | 89. | 0.045 | 34.59 | 1.651 |

s - Peak fails shape tests.
D - Peak area deconvoluted.
A Derived peak area.

***** S U M M A R Y O F L I B R A R Y P E A K U S A G E *****

| Nuclide Name | Code | Average Activity pCi/gm | Peak Energy keV | Peak Activity pCi/gm | Code | MDA Value pCi/gm | COMMENTS |
|---|---|---|---|---|---|---|---|
| BE-7 | | -6.9431E-02 | | | | | |
| | | | 477.56 | -6.943E-02 | %( | 3.452E-01 1.02E-01 | G |
| K-40 | | 1.7393E+01 | | | | | |
| | | | 1460.75 | 1.739E+01 | (P | 3.741E-01 4.58E-01 | G |
| MN-54 | | 4.6885E-03 | | | | | |
| | | | 834.81 | 4.689E-03 | %(P | 3.594E-02 1.04E-02 | G |
| CO-57 | | 2.9804E-04 | | | | | |
| | | | 122.07 | 2.980E-04 | &(P | 5.183E-02 1.54E-02 | G K |
| | | | 136.43 | -7.255E-02 | % | 4.255E-01 1.28E-01 | G |
| CO-60 | | -4.3860E-03 | | | | | |
| | | | 1332.51 | -4.386E-03 | &(P | 3.989E-02 1.10E-02 | G K |
| | | | 1173.23 | 1.377E-03 | % P | 5.733E-02 1.65E-02 | G K |
| Sr-85 | | -1.2976E-02 | | | | | |
| | | | 514.00 | -1.298E-02 | &( | 4.357E-02 1.30E-02 | G |
| Kr-85 | | -2.8460E+02 | | | | | |
| | | | 513.99 | -2.846E+02 | &( | 9.542E+02 2.86E+02 | G |
| Y-88 | | -3.8850E-03 | | | | | |
| | | | 1836.01 | -3.885E-03 | %(P | 2.894E-02 7.91E-03 | G K |
| | | | 898.02 | 3.974E-04 | & P | 4.956E-02 1.43E-02 | G |
| NB-94 | | -4.7971E-03 | | | | | |
| | | | 871.10 | -4.797E-03 | %( | 3.411E-02 9.88E-03 | G K |
| | | | 702.50 | 1.847E-02 | & | 2.504E-02 7.89E-03 | G K |

| Nuclide | Ave activity | Energy | Activity | Code | Peak | MDA | Comments |
|---|---|---|---|---|---|---|---|
| Ag-108M | -8.7287E-03 | | | | | | |
| | | 722.95 | -8.729E-03 | &( | 5.049E-02 | 1.49E-02 | G K |
| | | 614.37 | -4.444E-02 | & P | 4.961E-02 | 1.55E-02 | G |
| | | 433.93 | 6.345E-03 | % | 3.404E-02 | 1.01E-02 | G |
| CD-109 | 6.7447E-01 | | | | | | |
| | | 88.04 | 6.745E-01 | %( | 1.622E+00 | 4.91E-01 | G |
| SN-113 | 5.0679E-03 | | | | | | |
| | | 391.71 | 5.068E-03 | %( | 5.315E-02 | 1.57E-02 | G K |
| | | 255.04 | 6.443E-02 | & | 1.569E+00 | 4.64E-01 | G |
| SB-125 | 8.3992E-02 | | | | | | |
| | | 427.95 | -2.750E-03 | %(P | 1.003E-01 | 2.92E-02 | G K |
| | | 600.77 | -5.181E-02 | % P | 1.724E-01 | 5.13E-02 | G |
| | | 636.15 | 1.017E-02 | & P | 2.837E-01 | 8.16E-02 | G |
| | | 463.51 | 3.407E-01 | (P | 2.917E-01 | 9.38E-02 | G |
| | | 176.29 | 9.284E-03 | & | 5.767E-01 | 1.72E-01 | G |
| I-131 | -6.9624E-03 | | | | | | |
| | | 364.48 | -6.962E-03 | &(P | 5.456E-02 | 1.61E-02 | G K |
| | | 636.97 | -1.440E-02 | % | 7.943E-01 | 2.30E-01 | G |
| | | 284.29 | -1.392E-01 | % P | 8.550E-01 | 2.55E-01 | G |
| CS-134 | 1.4838E-02 | | | | | | |
| | | 604.66 | -1.351E-03 | %( | 7.176E-02 | 2.13E-02 | G K |
| | | 795.76 | 3.334E-02 | @(P | 3.736E-02 | 1.19E-02 | G |
| | | 569.29 | -2.376E-02 | % P | 2.136E-01 | 6.18E-02 | G |
| | | 801.84 | -1.602E-01 | % P | 4.804E-01 | 1.42E-01 | G |
| CS-137 | 9.5102E-03 | | | | | | |
| | | 661.62 | 9.510E-03 | %(P | 4.083E-02 | 1.20E-02 | G |
| CE-139 | -1.1422E-02 | | | | | | |
| | | 165.85 | -1.142E-02 | %( | 4.709E-02 | 1.41E-02 | G |
| EU-152 | -2.6140E-03 | | | | | | |
| | | 121.78 | -2.614E-03 | &(P | 1.501E-01 | 4.47E-02 | G K |
| | | 344.30 | -1.898E-02 | % P | 1.186E-01 | 3.52E-02 | G |
| | | 1408.08 | 1.015E-01 | % | 1.533E-01 | 4.82E-02 | G |
| | | 964.00 | 2.271E-01 | % P | 3.268E-01 | 1.01E-01 | G |
| | | 1112.07 | 5.837E-02 | % | 3.052E-01 | 8.91E-02 | G |
| | | 778.90 | -7.714E-03 | % | 2.653E-01 | 7.60E-02 | G |
| EU-154 | 2.9211E-04 | | | | | | |
| | | 123.10 | 2.921E-04 | &( | 1.058E-01 | 3.15E-02 | G K |
| | | 1274.80 | 2.579E-02 | % | 9.612E-02 | 2.81E-02 | G |

| Nuclide | Ave activity | Energy | Activity | Code | Peak | MDA | Comments |
|---|---|---|---|---|---|---|---|
| | | 723.30 | 3.837E-03 | & | 3.300E-01 | 9.73E-02 | G |
| | | 1004.80 | 6.157E-02 | % | 1.863E-01 | 5.52E-02 | G |
| EU-155 | 1.3976E-01 | | | | | | |
| | | 86.45 | 1.398E-01 | %( | 2.483E-01 | 7.55E-02 | G K |
| | | 105.31 | -3.338E-02 | & | 2.491E-01 | 7.46E-02 | G |
| HG-203 | 2.2420E-02 | | | | | | |
| | | 279.17 | 2.242E-02 | &(P | 4.131E-02 | 1.26E-02 | G K |
| | | 72.87 | -3.282E-01 | % P | 2.516E+00 | 7.54E-01 | G |
| | | 70.83 | -4.447E-01 | & | 4.797E+00 | 1.44E+00 | G |
| | | 82.50 | -3.005E-01 | & | 4.245E+00 | 1.27E+00 | G |
| TL-208 | 2.7974E-01 | | | | | | |
| | | 583.14 | 2.797E-01 | @(P | 3.940E-02 | 1.95E-02 | G |
| | | 510.72 | 3.621E-01 | + P | 1.745E-01 | 6.93E-02 | G |
| PB-212 | 8.4189E-01 | | | | | | |
| | | 238.63 | 8.257E-01 | (P | 9.352E-02 | 4.02E-02 | G K |
| | | | | | | | Energy duplication |
| | | 77.11 | 8.419E-01 | } P | 3.943E-01 | 9.94E-02 | G |
| | | 74.81 | 1.208E+00 | + P | 7.976E-01 | 2.55E-01 | G |
| PB-214 | 6.4611E-01 | | | | | | |
| | | 351.99 | 6.629E-01 | (P | 8.464E-02 | 3.95E-02 | G K |
| | | 295.22 | 6.137E-01 | (P | 1.378E-01 | 5.30E-02 | G |
| | | | | | | | Energy duplication |
| | | 77.11 | 0.000E+00 | } P | 9.575E-01 | 0.00E+00 | G |
| | | 241.92 | 2.599E-01 | % | 6.103E-01 | 1.85E-01 | G |
| BI-212 | 8.4815E-01 | | | | | | |
| | | 727.17 | 7.865E-01 | *(P | 3.292E-01 | 1.38E-01 | G K |
| | | 1620.56 | 1.113E+00 | *(P | 6.795E-01 | 3.09E-01 | G |
| | | 785.42 | 1.446E+00 | % | 1.946E+00 | 6.06E-01 | G |
| BI-214 | 6.2870E-01 | | | | | | |
| | | 609.32 | 6.047E-01 | (P | 8.538E-02 | 4.25E-02 | G K |
| | | 1764.51 | 7.728E-01 | + P | 1.504E-01 | 9.24E-02 | G |
| | | 1120.28 | 7.022E-01 | @(P | 2.984E-01 | 1.21E-01 | G |
| RA-224 | 1.0234E+00 | | | | | | |
| | | 241.00 | 1.023E+00 | ( | 1.129E+00 | 3.48E-01 | G |
| RA-226 | 1.0442E+00 | | | | | | |
| | | 185.99 | 1.044E+00 | (P | 1.177E+00 | 3.61E-01 | G |
| AC-228 | 8.2838E-01 | | | | | | |
| | | 911.07 | 7.939E-01 | (P | 1.126E-01 | 6.02E-02 | G K |
| | | 968.90 | 8.222E-01 | (P | 1.784E-01 | 8.16E-02 | G |
| | | 338.40 | 9.206E-01 | (P | 2.369E-01 | 9.59E-02 | G |

| Nuclide | Ave activity | Energy | Activity | Code | Peak | MDA | Comments |
|---|---|---|---|---|---|---|---|
| TH-227 | 0.0000E+00 | | | | | | |
| | | 236.00 | 0.000E+00 %( | | 4.710E-01 | 1.41E-01 | G K |
| | | 256.25 | 3.502E-02 % P | | 4.772E-01 | 1.42E-01 | G |
| PA-234 | 3.4610E-02 | | | | | | |
| | | 98.44 | 3.461E-02 %(P | | 2.434E-01 | 7.29E-02 | G K |
| | | 946.00 | -2.195E-02 % P | | 2.253E-01 | 6.55E-02 | G |
| | | 131.28 | -5.147E-02 & P | | 2.275E-01 | 6.84E-02 | G |
| | | 94.67 | -1.526E-01 % P | | 4.296E-01 | 1.30E-01 | G |
| | | 883.24 | -6.220E-02 & | | 3.088E-01 | 9.04E-02 | G |
| | | 926.70 | -2.457E-02 & | | 3.419E-01 | 9.84E-02 | G |
| | | 569.26 | -4.069E-02 % P | | 3.066E-01 | 8.88E-02 | G |
| TH-234 | 1.7849E+00 | | | | | | |
| | | 63.29 | 1.866E+00 %(P | | 6.845E+00 | 2.06E+00 | G K |
| | | 92.80 | 1.680E+00 (P | | 2.227E+00 | 6.79E-01 | G |
| | | 92.38 | 1.934E+00 & P | | 2.652E+00 | 8.08E-01 | G |
| AM-241 | 5.3793E-02 | | | | | | |
| | | 59.54 | 5.379E-02 &(P | | 1.259E+00 | 3.76E-01 | G |

( - This peak used in the nuclide activity average.

* - Peak is too wide, but only one peak in library.
! - Peak is part of a multiplet and this area went negative during deconvolution.
? - Peak is too narrow.
@ - Peak is too wide at FW25M, but ok at FWHM.
% - Peak fails sensitivity test.
$ - Peak identified, but first peak of this nuclide failed one or more qualification tests.
+ - Peak activity higher than counting uncertainty range.
- - Peak activity lower than counting uncertainty range.
= - Peak outside analysis energy range.
& - Calculated peak centroid is not close enough to the library energy centroid for positive identification.
P - Peakbackground subtraction
} - Peak is too close to another for the activity to be found directly.

| Nuclide Codes: | Peak Codes: |
|---|---|
| T - Thermal Neutron Activation | G - Gamma Ray |
| F - Fast Neutron Activation | X - X-Ray |
| I - Fission Product | P - Positron Decay |
| N - Naturally Occurring Isotope | S - Single-Escape |
| P - Photon Reaction | D - Double-Escape |
| C - Charged Particle Reaction | K - Key Line |
| M - No MDA Calculation | A - Not in Average |

R - Coincidence Corrected C - Coincidence Peak
H - Halflife limit exceeded

- - - - - - - - - - - - - - - - - - - - - - - - - - - - - - - - - - - - - -

***** S U M M A R Y O F N U C L I D E S I N S A M P L E *****

| Nuclide | | Time of Count Activity pCi/gm | Time Corrected Activity pCi/gm | Uncertainty 3 Sigma Counting pCi/gm | Total pCi/gm | MDA pCi/gm |
|---|---|---|---|---|---|---|
| BE-7 | #A | -6.5121E-02 | -6.9431E-02 | 3.0666E-01 | 3.0669E-01 | 3.238E-01 |
| K-40 | | 1.7393E+01 | 1.7393E+01 | 1.3733E+00 | 1.7046E+00 | |
| MN-54 | #A | 4.6374E-03 | 4.6885E-03 | 3.1255E-02 | 3.1256E-02 | 3.554E-02 |
| CO-57 | #B | 2.9429E-04 | 2.9804E-04 | 4.6312E-02 | 4.6312E-02 | 5.118E-02 |
| CO-60 | #B | -4.3782E-03 | -4.3860E-03 | 1.6995E-01 | 1.6995E-01 | 3.982E-02 |
| Sr-85 | #A | -1.2309E-02 | -1.2976E-02 | 3.9117E-02 | 3.9125E-02 | 4.133E-02 |
| Kr-85 | #A | -2.8459E+02 | -2.8460E+02 | 8.5673E+02 | 8.5689E+02 | 9.542E+02 |
| Y-88 | #B | -3.7623E-03 | -3.8850E-03 | 2.4896E-02 | 2.4897E-02 | 2.802E-02 |
| NB-94 | #B | -4.7971E-03 | -4.7971E-03 | 2.9638E-02 | 2.9639E-02 | 3.411E-02 |
| Ag-108M | #B | -8.7280E-03 | -8.7287E-03 | 4.4730E-02 | 4.4733E-02 | 5.049E-02 |
| CD-109 | #A | 6.6940E-01 | 6.7447E-01 | 1.4718E+00 | 1.4723E+00 | 1.610E+00 |
| SN-113 | #B | 4.9194E-03 | 5.0679E-03 | 4.7005E-02 | 4.7006E-02 | 5.159E-02 |
| SB-125 | #B | 8.3708E-02 | 8.3992E-02 | 6.9352E-02 | 6.9523E-02 | 9.998E-02 |
| I-131 | #B | -4.5490E-03 | -6.9624E-03 | 5.6082E-02 | 5.6084E-02 | 3.565E-02 |
| CS-134 | #B | 1.4771E-02 | 1.4838E-02 | 1.5923E-02 | 1.5946E-02 | 7.144E-02 |
| CS-137 | #A | 9.5073E-03 | 9.5102E-03 | 3.6072E-02 | 3.6076E-02 | 4.081E-02 |
| CE-139 | #A | -1.1141E-02 | -1.1422E-02 | 4.2438E-02 | 4.2443E-02 | 4.593E-02 |
| EU-152 | #B | -2.6121E-03 | -2.6140E-03 | 2.9776E-01 | 2.9776E-01 | 1.500E-01 |
| EU-154 | #B | 2.9179E-04 | 2.9211E-04 | 9.4467E-02 | 9.4467E-02 | 1.056E-01 |
| EU-155 | #B | 1.3949E-01 | 1.3976E-01 | 2.2661E-01 | 2.2675E-01 | 2.479E-01 |
| HG-203 | #B | 2.0833E-02 | 2.2420E-02 | 3.7719E-02 | 3.7742E-02 | 3.838E-02 |
| TL-208 | # | 2.7974E-01 | 2.7974E-01 | 5.8396E-02 | 6.0612E-02 | |
| PB-212 | | 8.4189E-01 | 8.4189E-01 | 1.2308E-01 | 1.3243E-01 | |
| PB-214 | | 6.4611E-01 | 6.4611E-01 | 1.0177E-01 | 1.0846E-01 | |
| BI-212 | # | 8.4815E-01 | 8.4815E-01 | 4.1844E-01 | 4.2133E-01 | |
| BI-214 | | 6.2870E-01 | 6.2870E-01 | 1.3241E-01 | 1.3735E-01 | |
| RA-224 | #A | 1.0234E+00 | 1.0234E+00 | 1.0439E+00 | 1.0455E+00 | 1.129E+00 |
| RA-226 | #A | 1.0442E+00 | 1.0442E+00 | 1.0836E+00 | 1.0853E+00 | 1.177E+00 |
| AC-228 | | 8.2838E-01 | 8.2838E-01 | 1.3471E-01 | 1.4303E-01 | |
| TH-227 | #B | 0.0000E+00 | 0.0000E+00 | 4.2216E-01 | 4.2216E-01 | 4.710E-01 |
| PA-234 | #B | 3.4610E-02 | 3.4610E-02 | 2.1883E-01 | 2.1884E-01 | 2.434E-01 |
| TH-234 | #B | 1.7849E+00 | 1.7849E+00 | 2.1650E+00 | 2.1673E+00 | 6.845E+00 |
| AM-241 | #A | 5.3792E-02 | 5.3793E-02 | 1.1269E+00 | 1.1269E+00 | 1.259E+00 |

# - All peaks for activity calculation had bad shape.
* - Activity omitted from total
& - Activity omitted from total and all peaks had bad shape.
< - MDA value printed.
A - Activity printed, but activity < MDA.
B - Activity < MDA and failed test.
C - Area < Critical level.
F - Failed fraction or key line test.

H – Halflife limit exceeded

YAEC Chemistry Lab Spectrum name: 103F_15SEPT2006_0838.An1

S U M M A R Y

Total Activity ( 1120.0 to 2000.7 keV) 2.1466202E+01 pCi/gm
Total Decayed Activity ( 1120.0 to 2000.7 keV) 2.1466202E+01 pCi/gm

The library has energies which are not separable.

Analyzed by: _____
JPK

Reviewed by: _____
Supervisor

Laboratory: YAEC Chemistry Lab

YAEC Chemistry Lab Spectrum name: 103F_15SEPT2006_0959.An1

Sample description
FSS-SSS-01-01-008-F

Spectrum Filename: C:\GammaVision\Spectra\103F_15SEPT2006_0959.An1

Acquisition information

| | |
|---|---|
| Start time: | 15-Sep-2006 09:59:10 |
| Live time: | 2000 |
| Real time: | 2002 |
| Dead time: | 0.12 % |
| Detector ID: | 4 |

Detector system
Det 103 - DSPE-471

Calibration

| | |
|---|---|
| Filename: | D3_1LSa.Clb |

Detector_103 1.0 Liter Sand Geometry

Energy Calibration

| | |
|---|---|
| Created: | 08-Aug-2005 11:09:41 |
| Zero offset: | 0.409 keV |
| Gain: | 0.500 keV/channel |
| Quadratic: | 1.092E-08 keV/channel^2 |

Efficiency Calibration

| | |
|---|---|
| Created: | 08-Aug-2005 11:11:25 |
| Type: | Polynomial |
| Uncertainty: | 0.993 % |
| Coefficients: | -0.264059 -5.138468 0.638383 |
| | -0.089199 0.005011 -0.000129 |

Library Files

| | |
|---|---|
| Main analysis library: | FSS_Rev_1.Lib |
| Library Match Width: | 1.000 |
| Peak stripping: | Library based |

Analysis parameters

| | |
|---|---|
| Analysis engine: | Env32 G53W4.20 |
| Start channel: | 100 ( 50.41keV ) |
| Stop channel: | 4000 ( 2000.67keV ) |
| Peak rejection level: | 41.667% |
| Peak search sensitivity: | 3 |
| Sample Size: | 1.8860E+03 |
| Activity scaling factor: | 1.0000E+06/( 1.0000E+00* 1.8860E+03) = 5.3022E+02 |
| Detection limit method: | Nureg 4.16 |
| Random error: | 1.0000000E+00 |
| Systematic error: | 1.0000000E+00 |

| | |
|---|---|
| Fraction Limit: | 0.000% |
| Background width: | average of five points. |

YAEC Chemistry Lab Spectrum name: 103F_15SEPT2006_0959.An1

Half lives decay limit: 12.000
Activity range factor: 2.000
Min. step backg. energy 0.000
Multiplet shift channel 2.000

| Corrections | Status | Comments |
|---|---|---|
| Decay correct to date: | YES | 10-Sep-2006 08:20:00 |
| Decay during acquisition: | NO | |
| Decay during collection: | NO | |
| True coincidence correction: | NO | |
| Peaked background correction: | YES | 103_150K_05AUG05.Pbc 08-Aug-2005 12:54:15 |
| Absorption (Internal): | NO | |
| Geometry correction: | NO | |
| Random summing: | NO | |

total peaks alloc. 16 cutoff 20.00000 %
Energy Calibration
Normalized diff: 0.2351

***** S U M M A R Y O F P E A K S I N R A N G E *****

| Peak Energy | Area | Uncert | FWHM | Corrctn Factor | Nuclide Energy | Brnch. Ratio | Act. pCi/gm | Nuc |
|---|---|---|---|---|---|---|---|---|
| 74.47 | 80. | 39.33 | 0.99 | 9.023E-03 | 74.81 | 9.600 | PBC<MDA | PB212 |
| 77.28 | 263. | 12.29 | 0.99 | 1.032E-02 | 77.11 | 17.500 | 1.054E+00 | PB212 |
| | | | | | 77.11 | 10.700 | 1.724E+00 | PB214 |
| 87.40 | 104. | 28.37 | 1.00 | 1.459E-02 | 86.45 | 32.740 | 1.620E-01 | EU155 |
| | | | | | 88.04 | 3.790 | 1.349E+00 | CD109 |
| 93.45 | 119. | 26.33 | 1.00 | 1.678E-02 | 92.38 | 2.570 | PBC<MDA | TH234 |
| | | | | | 92.80 | 3.000 | PBC<MDA | TH234 |
| 129.04 | 104. | 36.86 | 0.86 | 2.437E-02 | | | | |
| 186.38 | 156. | 20.45 | 1.05 | 2.565E-02 | 185.99 | 3.280 | 1.217E+00 | RA226 |
| 209.25 | 151. | 26.42 | 1.02 | 2.472E-02 | | | | |
| 238.78 | 1172. | 3.45 | 1.09 | 2.320E-02 | 238.63 | 43.100 | 8.315E-01 | PB212 |
| 241.28 | 174. | 18.89 | 1.09 | 2.306E-02 | 241.00 | 3.900 | 1.388E+00 | RA224 |
| | | | | | 241.92 | 7.470 | 7.261E-01 | PB214 |
| 270.08 | 123. | 28.98 | 1.14 | 2.152E-02 | | | | |
| 295.31 | 258. | 12.14 | 0.97 | 2.024E-02 | 295.22 | 19.200 | 4.680E-01 | PB214 |
| 300.21 | 111. | 22.38 | 1.26 | 2.001E-02 | | | | |
| 327.97 | 88. | 30.84 | 1.64 | 1.874E-02 | | | | |
| 338.56 | 248. | 12.60 | 1.02 | 1.829E-02 | 338.40 | 12.010 | 8.049E-01 | AC228 |
| 352.05 | 474. | 8.14 | 1.30 | 1.775E-02 | 351.99 | 37.100 | 5.095E-01 | PB214 |
| 409.88 | 51. | 34.47 | 1.27 | 1.573E-02 | | | | |
| 462.62 | 52. | 39.49 | 1.06 | 1.427E-02 | | | | |
| 462.62 | 52. | 39.49 | 1.06 | 1.427E-02 | 463.51 | 10.000 | PBC<MDA | SB125 |
| 510.57 | 170. | 17.13 | 1.76 | 1.318E-02 | 510.72 | 22.500 | 3.460E-01 | TL208 |
| 583.36 | 412. | 6.53 | 1.23 | 1.184E-02 | 583.14 | 86.000 | 2.871E-01 | TL208 |
| 609.45 | 427. | 6.64 | 1.51 | 1.144E-02 | 609.32 | 46.090 | 5.715E-01 | BI214 |
| 727.52 | 98. | 15.05 | 1.39 | 9.959E-03 | 727.17 | 11.800 | 5.947E-01 | BI212 |
| 768.91 | 82. | 25.81 | 1.01 | 9.547E-03 | | | | |

| | | | | | | | | |
|---|---|---|---|---|---|---|---|---|
| 794.98 | 67. | 21.77 | 1.98 | 9.308E-03 | | | | |
| 794.98 | 67. | 21.77 | 1.98 | 9.308E-03 | 795.76 | 85.400 | 6.100E-02 | CS134 |
| 860.89 | 65. | 25.12 | 1.68 | 8.765E-03 | | | | |
| 911.60 | 269. | 8.18 | 1.91 | 8.398E-03 | 911.07 | 29.000 | 7.809E-01 | AC228 |
| 964.69 | 42. | 29.07 | 1.54 | 8.052E-03 | 964.00 | 14.580 | PBC<MDA | EU152 |
| 969.55 | 157. | 9.97 | 1.54 | 8.022E-03 | 968.90 | 17.460 | 7.998E-01 | AC228 |
| 1120.85 | 80. | 22.90 | 1.60 | 7.209E-03 | 1120.28 | 15.040 | 5.173E-01 | BI214 |
| 1239.38 | 78. | 33.24 | 1.38 | 6.697E-03 | | | | |
| 1461.37 | 1932. | 2.37 | 1.78 | 5.930E-03 | 1460.75 | 10.700 | 2.159E+01 | K40 |
| 1621.71 | 24. | 24.07 | 0.79 | 5.488E-03 | 1620.56 | 2.750 | 1.156E+00 | BI212 |

| pk energy | area | uncert | fwhm | corr | nuclide | brnch. | act. | nuc |
|---|---|---|---|---|---|---|---|---|
| 1765.03 | 60. | 13.94 | 0.75 | 5.142E-03 | 1764.51 | 15.920 | 5.281E-01 | BI214 |

********** U N I D E N T I F I E D P E A K S U M M A R Y **********

| Peak Channel | Centroid Energy | Background Counts | Net Area Counts | Intensity Cts/Sec | Uncert 3 Sigma % | FWHM keV | Suspected Nuclide | |
|---|---|---|---|---|---|---|---|---|
| 173.98 | 87.71 | 385. | 104. | 0.052 | 85.12 | 1.001 | PB-214 | lD |
| 417.67 | 209.25 | 576. | 151. | 0.075 | 79.25 | 1.022 | AC-228 | s |
| 539.31 | 270.08 | 425. | 123. | 0.062 | 86.94 | 1.144 | AC-228 | |
| 599.57 | 300.21 | 229. | 111. | 0.055 | 67.15 | 1.260 | PB-212 | |
| 655.08 | 327.97 | 262. | 88. | 0.044 | 92.51 | 1.640 | AC-228 | s |
| 818.90 | 409.88 | 129. | 51. | 0.025 | 103.40 | 1.269 | AC-228 | |
| 1536.89 | 768.91 | 122. | 82. | 0.041 | 66.06 | 1.013 | BI-214 | M |
| 1720.83 | 860.89 | 72. | 65. | 0.032 | 75.36 | 1.675 | TL-208 | s |
| 1929.50 | 964.64 | 50. | 45. | 0.023 | 79.71 | 1.538 | AC-228 | D |
| 2477.71 | 1239.38 | 168. | 78. | 0.039 | 99.73 | 1.375 | CO-56 | |

s - Peak fails shape tests.
D - Peak area deconvoluted.
L - Peak written from unknown list.
C - Area < Critical level.
M - Peak is close to a library peak.

---

This section based on library: FSS_Rev_1.Lib

********** I D E N T I F I E D P E A K S U M M A R Y **********

| Nuclide | Peak Channel | Centroid Energy | Background Counts | Net Area Counts | Intensity Cts/Sec | Uncert 3 Sigma % | FWHM keV |
|---|---|---|---|---|---|---|---|
| PB-212 | 148.79 | 74.81 | 426. | 112. | 0.056 | 80.57 | 0.993D |
| PB-212 | 153.39 | 77.11 | 398. | 191. | 0.096 | 41.13 | 0.995A |
| TH-234 | 185.69 | 93.26 | 1054. | 132. | 0.066 | 94.70 | 1.500s |
| TH-234 | 185.67 | 93.25 | 1043. | 131. | 0.066 | 94.46 | 1.500s |
| RA-226 | 371.39 | 186.12 | 779. | 144. | 0.072 | 78.49 | 1.500s |
| PB-212 | 476.69 | 238.77 | 894. | 1080. | 0.540 | 16.20 | 1.025 |
| RA-224 | 482.59 | 241.72 | 870. | 166. | 0.083 | 78.95 | 1.500 |
| PB-214 | 482.12 | 241.48 | 907. | 115. | 0.057 | 114.93 | 1.500s |
| PB-214 | 589.76 | 295.31 | 305. | 254. | 0.127 | 36.41 | 0.971 |
| AC-228 | 676.27 | 338.56 | 281. | 247. | 0.123 | 37.79 | 1.016 |
| PB-214 | 703.24 | 352.05 | 344. | 468. | 0.234 | 24.41 | 1.297 |
| SB-125 | 925.29 | 463.08 | 169. | 59. | 0.030 | 98.36 | 1.500 |
| TL-208 | 1020.26 | 510.57 | 238. | 143. | 0.072 | 51.38 | 1.760s |
| TL-208 | 1165.82 | 583.36 | 116. | 408. | 0.204 | 19.59 | 1.227 |
| BI-214 | 1217.99 | 609.45 | 132. | 421. | 0.210 | 19.93 | 1.515 |
| BI-212 | 1453.41 | 727.17 | 53. | 98. | 0.049 | 43.66 | 1.392D |
| CS-134 | 1589.89 | 795.41 | 80. | 55. | 0.028 | 79.53 | 1.500s |

| Nuclide | Channel | Energy | Background | Net area | Cnts/sec | Uncert | FWHM |
|---|---|---|---|---|---|---|---|
| AC-228 | 1822.23 | 911.60 | 77. | 266. | 0.133 | 24.54 | 1.908s |
| AC-228 | 1936.81 | 968.90 | 48. | 156. | 0.078 | 30.37 | 1.541D |
| BI-214 | 2240.68 | 1120.85 | 94. | 78. | 0.039 | 68.69 | 1.595 |
| K-40 | 2921.60 | 1461.37 | 52. | 1913. | 0.956 | 7.10 | 1.785 |
| BI-212 | 3242.23 | 1621.71 | 4. | 24. | 0.012 | 72.20 | 0.792s |
| BI-214 | 3528.81 | 1765.03 | 7. | 60. | 0.030 | 41.81 | 0.751s |

s - Peak fails shape tests.
D - Peak area deconvoluted.
A Derived peak area.

***** S U M M A R Y O F L I B R A R Y P E A K U S A G E *****

| - Nuclide - Name | Code | Average Activity pCi/gm | Peak Energy keV | Peak Activity pCi/gm | Peak Code | Peak MDA Value pCi/gm | COMMENTS |
|---|---|---|---|---|---|---|---|
| BE-7 | | 6.6591E-02 | | | | | |
| | | | 477.56 | 6.659E-02 | %( | 3.314E-01 9.80E-02 | G |
| K-40 | | 2.1595E+01 | | | | | |
| | | | 1460.75 | 2.159E+01 | (P | 4.100E-01 5.16E-02 | G |
| MN-54 | | 1.6779E-02 | | | | | |
| | | | 834.81 | 1.678E-02 | %(P | 3.318E-02 1.01E-02 | G |
| CO-57 | | 3.0390E-03 | | | | | |
| | | | 122.07 | 3.039E-03 | &(P | 5.402E-02 1.61E-02 | G K |
| | | | 136.43 | -2.707E-02 | & | 4.059E-01 1.21E-01 | G |
| CO-60 | | 4.4196E-03 | | | | | |
| | | | 1332.51 | 4.420E-03 | %(P | 3.847E-02 1.08E-02 | G K |
| | | | 1173.23 | -1.026E-02 | % P | 5.774E-02 1.68E-02 | G K |
| Sr-85 | | -1.8568E-02 | | | | | |
| | | | 514.00 | -1.857E-02 | %( | 4.648E-02 1.40E-02 | G |
| Kr-85 | | -4.0578E+02 | | | | | |
| | | | 513.99 | -4.058E+02 | %( | 1.016E+03 3.07E+02 | G |
| Y-88 | | -9.4142E-05 | | | | | |
| | | | 1836.01 | -9.414E-05 | %(P | 4.478E-02 1.23E-02 | G K |
| | | | 898.02 | -8.547E-03 | & P | 4.610E-02 1.35E-02 | G |
| NB-94 | | 0.0000E+00 | | | | | |
| | | | 871.10 | 0.000E+00 | &( | 4.463E-02 1.29E-02 | G K |
| | | | 702.50 | 5.733E-04 | & | 3.286E-02 9.42E-03 | G K |

| Nuclide | Ave activity | Energy | Activity | Code | Peak | MDA | Comments |
|---|---|---|---|---|---|---|---|
| Ag-108M | -1.1569E-02 | | | | | | |
| | | 722.95 | -1.157E-02 | %( | 4.562E-02 | 1.35E-02 | G K |
| | | 614.37 | -2.406E-02 | & P | 4.228E-02 | 1.29E-02 | G |
| | | 433.93 | 5.479E-03 | % | 3.241E-02 | 9.55E-03 | G |
| CD-109 | -6.8880E-02 | | | | | | |
| | | 88.04 | -6.888E-02 | %( | 2.148E+00 | 6.42E-01 | G |
| SN-113 | -2.0298E-03 | | | | | | |
| | | 391.71 | -2.030E-03 | %( | 5.094E-02 | 1.49E-02 | G K |
| | | 255.04 | -1.702E-02 | % | 1.797E+00 | 5.33E-01 | G |
| SB-125 | 7.6954E-02 | | | | | | |
| | | 427.95 | 1.642E-03 | %(P | 1.178E-01 | 3.45E-02 | G K |
| | | 600.77 | 7.280E-02 | & P | 1.649E-01 | 4.98E-02 | G |
| | | 636.15 | 1.284E-01 | & P | 2.304E-01 | 7.05E-02 | G |
| | | 463.51 | 2.999E-01 | (P | 3.193E-01 | 1.00E-01 | G |
| | | 176.29 | 1.144E-01 | & | 5.883E-01 | 1.76E-01 | G |
| I-131 | -1.0379E-02 | | | | | | |
| | | 364.48 | -1.038E-02 | %(P | 6.308E-02 | 1.87E-02 | G K |
| | | 636.97 | -5.171E-02 | & | 7.256E-01 | 2.11E-01 | G |
| | | 284.29 | 4.770E-01 | & P | 7.338E-01 | 2.25E-01 | G |
| CS-134 | 2.2980E-02 | | | | | | |
| | | 604.66 | -6.822E-04 | %( | 7.466E-02 | 2.21E-02 | G K |
| | | 795.76 | 5.002E-02 | @(P | 4.019E-02 | 1.33E-02 | G |
| | | 569.29 | 5.584E-03 | % P | 2.212E-01 | 6.39E-02 | G |
| | | 801.84 | 3.144E-02 | % P | 3.803E-01 | 1.09E-01 | G |
| CS-137 | 9.8104E-03 | | | | | | |
| | | 661.62 | 9.810E-03 | %(P | 4.211E-02 | 1.24E-02 | G |
| CE-139 | 3.5308E-03 | | | | | | |
| | | 165.85 | 3.531E-03 | %( | 4.705E-02 | 1.40E-02 | G |
| EU-152 | 8.2902E-03 | | | | | | |
| | | 121.78 | 8.290E-03 | &(P | 1.521E-01 | 4.54E-02 | G K |
| | | 344.30 | -4.623E-03 | & P | 1.130E-01 | 3.32E-02 | G |
| | | 1408.08 | 7.359E-02 | % | 1.385E-01 | 4.26E-02 | G |
| | | 964.00 | -1.665E-02 | % P | 4.398E-01 | 1.29E-01 | G |
| | | 1112.07 | 4.621E-02 | % | 3.958E-01 | 1.16E-01 | G |
| | | 778.90 | -9.051E-03 | & | 2.899E-01 | 8.35E-02 | G |
| EU-154 | 5.6394E-05 | | | | | | |
| | | 123.10 | 5.639E-05 | &( | 1.107E-01 | 3.30E-02 | G K |
| | | 1274.80 | -1.104E-02 | % | 1.445E-01 | 4.17E-02 | G |

| Nuclide | Ave activity | Energy | Activity | Code | Peak | MDA | Comments |
|---|---|---|---|---|---|---|---|
| | | 723.30 | -4.960E-02 % | | 1.983E-01 | 5.88E-02 | G |
| | | 1004.80 | 9.782E-02 % | | 2.184E-01 | 6.60E-02 | G |
| EU-155 | 1.3239E-02 | | | | | | |
| | | 86.45 | 1.324E-02 %( | | 2.524E-01 | 7.55E-02 | G K |
| | | 105.31 | 1.338E-02 % | | 2.508E-01 | 7.49E-02 | G |
| HG-203 | 2.5381E-02 | | | | | | |
| | | 279.17 | 2.538E-02 &(P | | 3.891E-02 | 1.19E-02 | G K |
| | | 72.87 | -6.028E-01 % P | | 2.562E+00 | 7.71E-01 | G |
| | | 70.83 | -9.771E-02 % | | 5.079E+00 | 1.52E+00 | G |
| | | 82.50 | 8.795E-03 & | | 3.788E+00 | 1.13E+00 | G |
| TL-208 | 2.8705E-01 | | | | | | |
| | | 583.14 | 2.871E-01 (P | | 3.720E-02 | 1.89E-02 | G |
| | | 510.72 | 3.460E-01 + P | | 1.803E-01 | 7.03E-02 | G |
| PB-212 | 7.7375E-01 | | | | | | |
| | | 238.63 | 7.738E-01 (P | | 1.018E-01 | 4.22E-02 | G K |
| | | | | | | | Energy duplication |
| | | 77.11 | 7.738E-01 } P | | 3.871E-01 | 1.06E-01 | G |
| | | 74.81 | 9.261E-01 + P | | 8.151E-01 | 2.56E-01 | G |
| PB-214 | 4.9328E-01 | | | | | | |
| | | 351.99 | 5.095E-01 (P | | 9.693E-02 | 4.20E-02 | G K |
| | | 295.22 | 4.680E-01 (P | | 1.550E-01 | 5.77E-02 | G |
| | | | | | | | Energy duplication |
| | | 77.11 | 0.000E+00 } P | | 9.688E-01 | 0.00E+00 | G |
| | | 241.92 | 4.775E-01 ( | | 5.959E-01 | 1.83E-01 | G |
| BI-212 | 5.9490E-01 | | | | | | |
| | | 727.17 | 5.949E-01 (P | | 2.240E-01 | 8.70E-02 | G K |
| | | 1620.56 | 1.156E+00 + P | | 5.511E-01 | 2.79E-01 | G |
| | | 785.42 | 5.162E-01 % | | 2.038E+00 | 6.04E-01 | G |
| BI-214 | 5.5195E-01 | | | | | | |
| | | 609.32 | 5.715E-01 (P | | 7.657E-02 | 3.86E-02 | G K |
| | | 1764.51 | 5.281E-01 (P | | 1.291E-01 | 7.76E-02 | G |
| | | 1120.28 | 5.173E-01 (P | | 3.159E-01 | 1.21E-01 | G |
| RA-224 | 1.3210E+00 | | | | | | |
| | | 241.00 | 1.321E+00 ( | | 1.116E+00 | 3.48E-01 | G |
| RA-226 | 1.2270E+00 | | | | | | |
| | | 185.99 | 1.227E+00 @(P | | 1.130E+00 | 3.50E-01 | G |
| AC-228 | 7.9155E-01 | | | | | | |
| | | 911.07 | 7.809E-01 (P | | 1.286E-01 | 6.47E-02 | G K |
| | | 968.90 | 8.001E-01 (P | | 1.781E-01 | 8.11E-02 | G |
| | | 338.40 | 8.049E-01 (P | | 2.635E-01 | 1.02E-01 | G |

| Nuclide | Ave activity | Energy | Activity | Code | Peak | MDA | Comments |
|---|---|---|---|---|---|---|---|
| TH-227 | -1.1014E-01 | | | | | | |
| | | 236.00 | -1.101E-01 %( | | 3.956E-01 | 1.19E-01 | G K |
| | | 256.25 | 1.375E-01 % P | | 4.471E-01 | 1.34E-01 | G |
| PA-234 | 1.5905E-02 | | | | | | |
| | | 98.44 | 1.591E-02 %(P | | 2.366E-01 | 7.07E-02 | G K |
| | | 946.00 | 5.883E-03 % P | | 1.075E-01 | 2.94E-02 | G |
| | | 131.28 | -4.805E-02 % P | | 2.293E-01 | 6.89E-02 | G |
| | | 94.67 | 1.044E-03 % P | | 3.521E-01 | 1.05E-01 | G |
| | | 883.24 | -1.385E-02 & | | 3.153E-01 | 9.05E-02 | G |
| | | 926.70 | 1.054E-01 % | | 3.586E-01 | 1.06E-01 | G |
| | | 569.26 | 5.577E-03 % P | | 3.334E-01 | 9.64E-02 | G |
| TH-234 | 1.4755E+00 | | | | | | |
| | | 63.29 | 6.331E-01 %(P | | 6.829E+00 | 2.04E+00 | G K |
| | | 92.80 | 1.906E+00 *(P | | 2.224E+00 | 6.81E-01 | G |
| | | 92.38 | 2.252E+00 *(P | | 2.633E+00 | 8.06E-01 | G |
| AM-241 | 9.8562E-02 | | | | | | |
| | | 59.54 | 9.856E-02 %(P | | 1.180E+00 | 3.52E-01 | G |

( - This peak used in the nuclide activity average.

* - Peak is too wide, but only one peak in library.
! - Peak is part of a multiplet and this area went negative during deconvolution.
? - Peak is too narrow.
@ - Peak is too wide at FW25M, but ok at FWHM.
% - Peak fails sensitivity test.
$ - Peak identified, but first peak of this nuclide failed one or more qualification tests.
+ - Peak activity higher than counting uncertainty range.
- - Peak activity lower than counting uncertainty range.
= - Peak outside analysis energy range.
& - Calculated peak centroid is not close enough to the library energy centroid for positive identification.
P - Peakbackground subtraction
} - Peak is too close to another for the activity to be found directly.

| Nuclide Codes: | Peak Codes: |
|---|---|
| T - Thermal Neutron Activation | G - Gamma Ray |
| F - Fast Neutron Activation | X - X-Ray |
| I - Fission Product | P - Positron Decay |
| N - Naturally Occurring Isotope | S - Single-Escape |
| P - Photon Reaction | D - Double-Escape |
| C - Charged Particle Reaction | K - Key Line |
| M - No MDA Calculation | A - Not in Average |

R - Coincidence Corrected C - Coincidence Peak
H - Halflife limit exceeded

- - - - - - - - - - - - - - - - - - - - - - - - - - - - - - - - - - - - - - -

***** S U M M A R Y O F N U C L I D E S I N S A M P L E *****

| Nuclide | | Time of Count Activity pCi/gm | Time Corrected Activity pCi/gm | Uncertainty 3 Sigma Counting pCi/gm | Total pCi/gm | MDA pCi/gm |
|---|---|---|---|---|---|---|
| BE-7 | #A | 6.2351E-02 | 6.6591E-02 | 2.9401E-01 | 2.9403E-01 | 3.103E-01 |
| K-40 | | 2.1595E+01 | 2.1595E+01 | 1.5476E+00 | 1.9917E+00 | |
| MN-54 | #A | 1.6591E-02 | 1.6779E-02 | 3.0262E-02 | 3.0277E-02 | 3.280E-02 |
| CO-57 | #B | 2.9997E-03 | 3.0390E-03 | 4.8386E-02 | 4.8386E-02 | 5.332E-02 |
| CO-60 | #B | 4.4115E-03 | 4.4196E-03 | 3.2460E-02 | 3.2461E-02 | 3.840E-02 |
| Sr-85 | #A | -1.7589E-02 | -1.8568E-02 | 4.2057E-02 | 4.2071E-02 | 4.403E-02 |
| Kr-85 | #A | -4.0576E+02 | -4.0578E+02 | 9.1965E+02 | 9.1995E+02 | 1.016E+03 |
| Y-88 | #B | -9.1089E-05 | -9.4142E-05 | 4.6660E-03 | 4.6660E-03 | 4.333E-02 |
| NB-94 | #B | 0.0000E+00 | 0.0000E+00 | 3.8597E-02 | 3.8597E-02 | 4.463E-02 |
| Ag-108M | #B | -1.1568E-02 | -1.1569E-02 | 4.0614E-02 | 4.0619E-02 | 4.562E-02 |
| CD-109 | #A | -6.8349E-02 | -6.8880E-02 | 1.9262E+00 | 1.9262E+00 | 2.132E+00 |
| SN-113 | #B | -1.9688E-03 | -2.0298E-03 | 4.4784E-02 | 4.4784E-02 | 4.941E-02 |
| SB-125 | #B | 7.6687E-02 | 7.6954E-02 | 7.7314E-02 | 7.7443E-02 | 1.174E-01 |
| I-131 | #B | -6.7047E-03 | -1.0379E-02 | 6.2200E-02 | 6.2202E-02 | 4.075E-02 |
| CS-134 | #B | 2.2873E-02 | 2.2980E-02 | 1.8304E-02 | 1.8353E-02 | 7.431E-02 |
| CS-137 | #A | 9.8073E-03 | 9.8104E-03 | 3.7233E-02 | 3.7237E-02 | 4.210E-02 |
| CE-139 | #A | 3.4417E-03 | 3.5308E-03 | 4.2102E-02 | 4.2103E-02 | 4.587E-02 |
| EU-152 | #B | 8.2839E-03 | 8.2902E-03 | 1.3614E-01 | 1.3614E-01 | 1.520E-01 |
| EU-154 | #B | 5.6330E-05 | 5.6394E-05 | 9.8925E-02 | 9.8925E-02 | 1.106E-01 |
| EU-155 | #B | 1.3213E-02 | 1.3239E-02 | 2.2639E-01 | 2.2639E-01 | 2.519E-01 |
| HG-203 | #B | 2.3537E-02 | 2.5381E-02 | 3.5782E-02 | 3.5812E-02 | 3.608E-02 |
| TL-208 | | 2.8705E-01 | 2.8705E-01 | 5.6814E-02 | 5.9208E-02 | |
| PB-212 | | 7.7375E-01 | 7.7375E-01 | 1.2671E-01 | 1.3444E-01 | |
| PB-214 | | 4.9328E-01 | 4.9328E-01 | 1.2188E-01 | 1.2520E-01 | |
| BI-212 | | 5.9490E-01 | 5.9490E-01 | 2.6103E-01 | 2.6330E-01 | |
| BI-214 | | 5.5195E-01 | 5.5195E-01 | 1.1172E-01 | 1.1622E-01 | |
| RA-224 | | 1.3210E+00 | 1.3210E+00 | 1.0429E+00 | 1.0457E+00 | 1.116E+00 |
| RA-226 | # | 1.2270E+00 | 1.2270E+00 | 1.0496E+00 | 1.0520E+00 | 1.130E+00 |
| AC-228 | | 7.9155E-01 | 7.9155E-01 | 1.4410E-01 | 1.5125E-01 | |
| TH-227 | #B | -1.1014E-01 | -1.1014E-01 | 3.5724E-01 | 3.5730E-01 | 3.956E-01 |
| PA-234 | #B | 1.5905E-02 | 1.5905E-02 | 2.1203E-01 | 2.1204E-01 | 2.366E-01 |
| TH-234 | #B | 1.4755E+00 | 1.4755E+00 | 1.5811E+00 | 1.5832E+00 | 6.829E+00 |
| AM-241 | #A | 9.8560E-02 | 9.8562E-02 | 1.0561E+00 | 1.0561E+00 | 1.180E+00 |

# - All peaks for activity calculation had bad shape.
* - Activity omitted from total
& - Activity omitted from total and all peaks had bad shape.
< - MDA value printed.
A - Activity printed, but activity < MDA.
B - Activity < MDA and failed test.
C - Area < Critical level.
F - Failed fraction or key line test.

H – Halflife limit exceeded

YAEC Chemistry Lab Spectrum name: 103F_15SEPT2006_0959.An1

---------- S U M M A R Y ----------

Total Activity ( 1120.0 to 2000.7 keV) 2.6408432E+01 pCi/gm
Total Decayed Activity ( 1120.0 to 2000.7 keV) 2.6408432E+01 pCi/gm

The library has energies which are not separable.

Analyzed by: _____
JPK

Reviewed by: _____
Supervisor

Laboratory: YAEC Chemistry Lab

YAEC Chemistry Lab Spectrum name: 103F_15SEPT2006_1123.An1

Sample description
FSS-SSS-01-01-016-F

Spectrum Filename: C:\GammaVision\Spectra\103F_15SEPT2006_1123.An1

Acquisition information
Start time: 15-Sep-2006 11:23:19
Live time: 2000
Real time: 2002
Dead time: 0.11 %
Detector ID: 4

Detector system
Det 103 - DSPE-471

Calibration
Filename: D3_1LSa.Clb
Detector_103 1.0 Liter Sand Geometry

Energy Calibration
Created: 08-Aug-2005 11:09:41
Zero offset: 0.409 keV
Gain: 0.500 keV/channel
Quadratic: 1.092E-08 keV/channel^2

Efficiency Calibration
Created: 08-Aug-2005 11:11:25
Type: Polynomial
Uncertainty: 0.993 %
Coefficients: -0.264059 -5.138468 0.638383
-0.089199 0.005011 -0.000129

Library Files
Main analysis library: FSS_Rev_1.Lib
Library Match Width: 1.000
Peak stripping: Library based

Analysis parameters
Analysis engine: Env32 G53W4.20
Start channel: 100 ( 50.41keV )
Stop channel: 4000 ( 2000.67keV )
Peak rejection level: 41.667%
Peak search sensitivity: 3
Sample Size: 1.9230E+03
Activity scaling factor: 1.0000E+06/( 1.0000E+00* 1.9230E+03) =
5.2002E+02
Detection limit method: Nureg 4.16
Random error: 1.0000000E+00
Systematic error: 1.0000000E+00

| | |
|---|---|
| Fraction Limit: | 0.000% |
| Background width: | average of five points. |

YAEC Chemistry Lab Spectrum name: 103F_15SEPT2006_1123.An1

Half lives decay limit: 12.000
Activity range factor: 2.000
Min. step backg. energy 0.000
Multiplet shift channel 2.000

| Corrections | Status | Comments |
|---|---|---|
| Decay correct to date: | YES | 10-Sep-2006 14:38:00 |
| Decay during acquisition: | NO | |
| Decay during collection: | NO | |
| True coincidence correction: | NO | |
| Peaked background correction: | YES | 103_150K_05AUG05.Pbc 08-Aug-2005 12:54:15 |
| Absorption (Internal): | NO | |
| Geometry correction: | NO | |
| Random summing: | NO | |

total peaks alloc. 21 cutoff 20.00000 %
Energy Calibration
Normalized diff: 0.2608

***** S U M M A R Y O F P E A K S I N R A N G E *****

| Peak Energy | Area | Uncert | FWHM | Corrctn Factor | Nuclide Energy | Brnch. Ratio | Act. pCi/gm | Nuc |
|---|---|---|---|---|---|---|---|---|
| 74.98 | 148. | 20.22 | 0.99 | 9.052E-03 | 74.81 | 9.600 | 1.193E+00 | PB212 |
| 93.15 | 79. | 40.06 | 1.44 | 1.657E-02 | 92.38 | 2.570 | PBC<MDA | TH234 |
| | | | | | 92.80 | 3.000 | PBC<MDA | TH234 |
| 128.20 | 132. | 31.92 | 0.84 | 2.427E-02 | | | | |
| 186.42 | 144. | 19.47 | 1.06 | 2.565E-02 | 185.99 | 3.280 | 1.094E+00 | RA226 |
| 210.07 | 98. | 35.67 | 1.00 | 2.468E-02 | | | | |
| 238.80 | 1151. | 3.45 | 1.09 | 2.319E-02 | 238.63 | 43.100 | 8.003E-01 | PB212 |
| 241.71 | 195. | 13.86 | 1.09 | 2.304E-02 | 241.00 | 3.900 | 1.524E+00 | RA224 |
| | | | | | 241.92 | 7.470 | 7.972E-01 | PB214 |
| 270.78 | 101. | 23.74 | 1.00 | 2.148E-02 | | | | |
| 295.41 | 257. | 13.09 | 0.99 | 2.024E-02 | 295.22 | 19.200 | 4.579E-01 | PB214 |
| 300.29 | 74. | 29.85 | 1.12 | 2.000E-02 | | | | |
| 328.31 | 82. | 31.65 | 1.30 | 1.873E-02 | | | | |
| 338.43 | 240. | 10.89 | 1.15 | 1.830E-02 | 338.40 | 12.010 | 7.625E-01 | AC228 |
| 352.10 | 520. | 7.11 | 1.10 | 1.775E-02 | 351.99 | 37.100 | 5.488E-01 | PB214 |
| 409.32 | 51. | 39.33 | 1.03 | 1.575E-02 | | | | |
| 463.02 | 79. | 21.62 | 1.69 | 1.426E-02 | | | | |
| 463.02 | 79. | 21.62 | 1.69 | 1.426E-02 | 463.51 | 10.000 | 3.866E-01 | SB125 |
| 511.25 | 147. | 18.03 | 1.24 | 1.316E-02 | 510.72 | 22.500 | 2.855E-01 | TL208 |
| 583.48 | 382. | 6.16 | 1.51 | 1.184E-02 | 583.14 | 86.000 | 2.606E-01 | TL208 |
| 609.56 | 375. | 7.29 | 1.35 | 1.144E-02 | 609.32 | 46.090 | 4.912E-01 | BI214 |
| 662.05 | 121. | 17.88 | 1.44 | 1.072E-02 | 661.62 | 84.620 | 9.244E-02 | CS137 |
| 727.42 | 119. | 17.72 | 1.19 | 9.962E-03 | 727.17 | 11.800 | 7.088E-01 | BI212 |
| 794.99 | 59. | 27.72 | 1.15 | 9.308E-03 | | | | |
| 794.99 | 59. | 27.72 | 1.15 | 9.308E-03 | 795.76 | 85.400 | 5.271E-02 | CS134 |
| 860.68 | 83. | 23.49 | 1.69 | 8.767E-03 | | | | |
| 911.61 | 274. | 7.61 | 1.25 | 8.398E-03 | 911.07 | 29.000 | 7.818E-01 | AC228 |

| | | | | | | | | |
|---|---|---|---|---|---|---|---|---|
| 965.19 | 54. | 26.18 | 1.54 | 8.056E-03 | 964.00 | 14.580 | 3.214E-01 | EU152 |
| 969.01 | 229. | 11.64 | 1.17 | 8.025E-03 | 968.90 | 17.460 | 1.149E+00 | AC228 |
| 1120.54 | 116. | 19.60 | 1.64 | 7.211E-03 | 1120.28 | 15.040 | 7.406E-01 | BI214 |
| 1174.41 | 82. | 28.19 | 1.23 | 6.966E-03 | 1173.23 | 99.860 | 8.095E-02 | CO60 |
| 1238.42 | 56. | 27.87 | 1.00 | 6.700E-03 | | | | |
| 1461.51 | 1472. | 2.68 | 1.91 | 5.930E-03 | 1460.75 | 10.700 | 1.609E+01 | K40 |
| 1621.52 | 20. | 25.50 | 0.66 | 5.488E-03 | 1620.56 | 2.750 | 9.293E-01 | BI212 |
| 1765.37 | 68. | 12.95 | 1.73 | 5.140E-03 | 1764.51 | 15.920 | 5.583E-01 | BI214 |

YAEC Chemistry Lab Spectrum name: 103F_15SEPT2006_1123.An1

********** U N I D E N T I F I E D P E A K S U M M A R Y **********

| Peak Channel | Centroid Energy | Background Counts | Net Area Counts | Intensity Cts/Sec | Uncert 3 Sigma % | FWHM keV | Suspected Nuclide | |
|---|---|---|---|---|---|---|---|---|
| 255.57 | 128.20 | 655. | 157. | 0.079 | 73.12 | 0.843 | AC-228 | s |
| 419.30 | 210.07 | 506. | 98. | 0.049 | 107.00 | 1.003 | NP-239 | s |
| 540.71 | 270.78 | 237. | 101. | 0.051 | 71.23 | 1.001 | AC-228 | |
| 599.73 | 300.29 | 207. | 74. | 0.037 | 89.56 | 1.119 | PB-212 | |
| 655.76 | 328.31 | 248. | 82. | 0.041 | 94.96 | 1.299 | RH-106M | s |
| 817.76 | 409.32 | 152. | 51. | 0.025 | 117.99 | 1.030 | AC-228 | |
| 1720.40 | 860.68 | 86. | 83. | 0.041 | 70.46 | 1.690 | TL-208 | s |
| 2475.78 | 1238.42 | 74. | 56. | 0.028 | 83.61 | 1.002 | CO-56 | s |

s - Peak fails shape tests.
D - Peak area deconvoluted.
L - Peak written from unknown list.
C - Area < Critical level.

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This section based on library: FSS_Rev_1.Lib

********** I D E N T I F I E D P E A K S U M M A R Y **********

| Nuclide | Peak Channel | Centroid Energy | Background Counts | Net Area Counts | Intensity Cts/Sec | Uncert 3 Sigma % | FWHM keV |
|---|---|---|---|---|---|---|---|
| PB-212 | 148.79 | 74.81 | 391. | 148. | 0.074 | 60.66 | 0.993D |
| PB-212 | 153.39 | 77.11 | 393. | 210. | 0.105 | 34.79 | 0.995A |
| RA-226 | 372.06 | 186.45 | 752. | 134. | 0.067 | 82.45 | 1.500 |
| PB-212 | 476.42 | 238.63 | 229. | 1142. | 0.571 | 10.36 | 1.093D |
| PB-214 | 483.00 | 241.92 | 363. | 135. | 0.067 | 51.58 | 1.095A |
| PB-214 | 589.97 | 295.41 | 342. | 253. | 0.127 | 39.27 | 0.989 |
| AC-228 | 675.99 | 338.43 | 201. | 239. | 0.119 | 32.66 | 1.154s |
| PB-214 | 703.35 | 352.10 | 279. | 514. | 0.257 | 21.33 | 1.104 |
| SB-125 | 925.34 | 463.11 | 114. | 70. | 0.035 | 71.96 | 1.500s |
| TL-208 | 1021.61 | 511.25 | 219. | 120. | 0.060 | 54.10 | 1.242s |
| TL-208 | 1166.06 | 583.48 | 82. | 378. | 0.189 | 18.48 | 1.508 |
| BI-214 | 1218.23 | 609.56 | 130. | 369. | 0.184 | 21.87 | 1.347 |
| CS-137 | 1323.19 | 662.05 | 113. | 119. | 0.060 | 53.64 | 1.443s |
| BI-212 | 1453.91 | 727.42 | 99. | 119. | 0.059 | 53.16 | 1.188s |
| CS-134 | 1590.10 | 795.52 | 59. | 50. | 0.025 | 78.14 | 1.500s |
| AC-228 | 1822.24 | 911.61 | 61. | 271. | 0.136 | 22.82 | 1.248 |
| EU-152 | 1929.40 | 965.19 | 74. | 54. | 0.027 | 78.54 | 1.538 |
| AC-228 | 1937.04 | 969.01 | 118. | 229. | 0.115 | 34.93 | 1.170 |
| BI-214 | 2240.06 | 1120.54 | 114. | 114. | 0.057 | 58.80 | 1.644 |
| CO-60 | 2346.80 | 1173.92 | 98. | 41. | 0.021 | 106.09 | 1.667 |
| K-40 | 2921.88 | 1461.51 | 44. | 1453. | 0.727 | 8.05 | 1.909 |
| BI-212 | 3241.86 | 1621.52 | 2. | 20. | 0.010 | 76.49 | 0.662s |

| Nuclide | Channel | Energy | Background | Net area | Cnts/sec | Uncert | FWHM |
|---|---|---|---|---|---|---|---|
| BI-214 | 3529.50 | 1765.37 | 6. | 65. | 0.033 | 38.86 | 1.732 |

s - Peak fails shape tests.
D - Peak area deconvoluted.
A Derived peak area.

***** S U M M A R Y O F L I B R A R Y P E A K U S A G E *****

| - Nuclide - Name | Code | Average Activity pCi/gm | Peak Energy keV | Peak Activity pCi/gm | Code | MDA Value pCi/gm | | COMMENTS |
|---|---|---|---|---|---|---|---|---|
| BE-7 | | 1.6762E-02 | | | | | | |
| | | | 477.56 | 1.676E-02 | &( | 3.039E-01 | 8.84E-02 | G |
| K-40 | | 1.6090E+01 | | | | | | |
| | | | 1460.75 | 1.609E+01 | (P | 3.711E-01 | 4.37E-01 | G |
| MN-54 | | 6.3878E-04 | | | | | | |
| | | | 834.81 | 6.388E-04 | %(P | 3.225E-02 | 9.15E-03 | G |
| CO-57 | | 1.8852E-02 | | | | | | |
| | | | 122.07 | 1.885E-02 | %(P | 5.121E-02 | 1.55E-02 | G K |
| | | | 136.43 | 9.139E-02 | % | 3.682E-01 | 1.11E-01 | G |
| CO-60 | | 3.0852E-02 | | | | | | |
| | | | 1332.51 | 1.983E-02 | %(P | 3.888E-02 | 1.17E-02 | G K |
| | | | 1173.23 | 4.188E-02 | (P | 4.936E-02 | 1.55E-02 | G K |
| Sr-85 | | -1.0020E-02 | | | | | | |
| | | | 514.00 | -1.002E-02 | &( | 4.533E-02 | 1.35E-02 | G |
| Kr-85 | | -2.1960E+02 | | | | | | |
| | | | 513.99 | -2.196E+02 | &( | 9.935E+02 | 2.96E+02 | G |
| Y-88 | | -8.4796E-04 | | | | | | |
| | | | 1836.01 | -8.480E-04 | &(P | 2.314E-02 | 5.89E-03 | G K |
| | | | 898.02 | 1.546E-02 | % P | 3.790E-02 | 1.14E-02 | G |
| NB-94 | | 9.7987E-03 | | | | | | |
| | | | 871.10 | 9.799E-03 | &( | 3.096E-02 | 9.17E-03 | G K |
| | | | 702.50 | 3.035E-03 | % | 3.696E-02 | 1.07E-02 | G K |
| Ag-108M | | 4.3545E-03 | | | | | | |
| | | | 722.95 | 4.355E-03 | %( | 3.914E-02 | 1.14E-02 | G K |
| | | | 614.37 | -2.495E-02 | % P | 4.421E-02 | 1.35E-02 | G |
| | | | 433.93 | -8.666E-03 | % | 3.715E-02 | 1.11E-02 | G |

| Nuclide | Ave activity | Energy | Activity | Code | Peak | MDA | Comments |
|---|---|---|---|---|---|---|---|
| CD-109 | 7.6328E-01 | | | | | | |
| | | 88.04 | 7.633E-01 | %( | 1.838E+00 | 5.56E-01 | G |
| SN-113 | -8.1557E-03 | | | | | | |
| | | 391.71 | -8.156E-03 | &( | 5.203E-02 | 1.54E-02 | G K |
| | | 255.04 | -4.879E-02 | & | 1.607E+00 | 4.76E-01 | G |
| SB-125 | 9.9261E-02 | | | | | | |
| | | 427.95 | 1.495E-02 | &(P | 1.018E-01 | 3.00E-02 | G K |
| | | 600.77 | 7.005E-03 | % P | 1.904E-01 | 5.53E-02 | G |
| | | 636.15 | -4.378E-02 | % P | 2.903E-01 | 8.46E-02 | G |
| | | 463.51 | 3.488E-01 | (P | 2.591E-01 | 8.52E-02 | G |
| | | 176.29 | 1.500E-01 | % | 5.705E-01 | 1.71E-01 | G |
| I-131 | -7.2330E-04 | | | | | | |
| | | 364.48 | -7.233E-04 | %(P | 5.413E-02 | 1.58E-02 | G K |
| | | 636.97 | -1.399E-01 | % | 6.339E-01 | 1.86E-01 | G |
| | | 284.29 | -9.621E-02 | & P | 7.883E-01 | 2.34E-01 | G |
| CS-134 | 1.6404E-02 | | | | | | |
| | | 604.66 | -7.932E-03 | %( | 3.816E-02 | 1.13E-02 | G K |
| | | 795.76 | 4.422E-02 | *(P | 3.434E-02 | 1.15E-02 | G |
| | | 569.29 | 4.566E-02 | % P | 1.847E-01 | 5.43E-02 | G |
| | | 801.84 | 1.403E-01 | % P | 2.833E-01 | 8.55E-02 | G |
| CS-137 | 9.2438E-02 | | | | | | |
| | | 661.62 | 9.244E-02 | (P | 4.043E-02 | 1.67E-02 | G |
| CE-139 | 1.3452E-02 | | | | | | |
| | | 165.85 | 1.345E-02 | %( | 4.621E-02 | 1.39E-02 | G |
| EU-152 | 1.4309E-01 | | | | | | |
| | | 121.78 | 5.417E-02 | %(P | 1.485E-01 | 4.48E-02 | G K |
| | | 344.30 | 3.123E-02 | % P | 1.110E-01 | 3.32E-02 | G |
| | | 1408.08 | 0.000E+00 | % | 1.586E-01 | 4.37E-02 | G |
| | | 964.00 | 3.214E-01 | (P | 2.566E-01 | 8.50E-02 | G |
| | | 1112.07 | 1.533E-01 | & | 2.862E-01 | 8.75E-02 | G |
| | | 778.90 | -7.853E-03 | & | 2.783E-01 | 8.00E-02 | G |
| EU-154 | 3.6018E-02 | | | | | | |
| | | 123.10 | 3.602E-02 | &( | 1.012E-01 | 3.06E-02 | G K |
| | | 1274.80 | -1.215E-02 | % | 1.168E-01 | 3.35E-02 | G |
| | | 723.30 | 1.797E-02 | % | 1.730E-01 | 5.02E-02 | G |
| | | 1004.80 | 1.278E-02 | & | 1.982E-01 | 5.65E-02 | G |

| Nuclide | Ave activity | Energy | Activity | Code | Peak | MDA | Comments |
|---|---|---|---|---|---|---|---|
| EU-155 | 8.3947E-02 | | | | | | |
| | | 86.45 | 8.395E-02 | &( | 2.331E-01 | 7.04E-02 | G K |
| | | 105.31 | 8.659E-02 | % | 2.302E-01 | 6.95E-02 | G |
| HG-203 | 4.6307E-03 | | | | | | |
| | | 279.17 | 4.631E-03 | &(P | 4.510E-02 | 1.34E-02 | G K |
| | | 72.87 | -5.285E-01 | % P | 2.311E+00 | 6.95E-01 | G |
| | | 70.83 | -1.273E+00 | % | 4.594E+00 | 1.38E+00 | G |
| | | 82.50 | 1.014E-01 | & | 3.777E+00 | 1.13E+00 | G |
| TL-208 | 2.6574E-01 | | | | | | |
| | | 583.14 | 2.606E-01 | (P | 3.103E-02 | 1.62E-02 | G |
| | | 510.72 | 2.855E-01 | *(P | 1.698E-01 | 6.29E-02 | G |
| PB-212 | 8.3190E-01 | | | | | | |
| | | 238.63 | 8.027E-01 | (P | 5.151E-02 | 2.80E-02 | G K |
| | | | | | | | Energy duplication |
| | | 77.11 | 8.319E-01 | } P | 3.777E-01 | 9.65E-02 | G |
| | | 74.81 | 1.193E+00 | + P | 7.676E-01 | 2.46E-01 | G |
| PB-214 | 5.5082E-01 | | | | | | |
| | | 351.99 | 5.488E-01 | (P | 8.589E-02 | 3.94E-02 | G K |
| | | 295.22 | 4.579E-01 | - P | 1.606E-01 | 6.09E-02 | G |
| | | | | | | | Energy duplication |
| | | 77.11 | 0.000E+00 | } P | 8.706E-01 | 0.00E+00 | G |
| | | 241.92 | 5.508E-01 | } | 3.737E-01 | 9.47E-02 | G |
| BI-212 | 7.5050E-01 | | | | | | |
| | | 727.17 | 7.088E-01 | @(P | 2.939E-01 | 1.26E-01 | G K |
| | | 1620.56 | 9.293E-01 | (P | 4.365E-01 | 2.38E-01 | G |
| | | 785.42 | 0.000E+00 | % | 1.912E+00 | 5.49E-01 | G |
| BI-214 | 5.0841E-01 | | | | | | |
| | | 609.32 | 4.912E-01 | (P | 7.456E-02 | 3.64E-02 | G K |
| | | 1764.51 | 5.583E-01 | (P | 1.210E-01 | 7.60E-02 | G |
| | | 1120.28 | 7.406E-01 | + P | 3.395E-01 | 1.48E-01 | G |
| RA-224 | 8.7375E-01 | | | | | | |
| | | | | | | | Derived Ave Activity |
| | | 241.00 | 8.737E-01 | }( | 1.190E+00 | 3.77E-01 | G |
| RA-226 | 1.1158E+00 | | | | | | |
| | | 185.99 | 1.116E+00 | (P | 1.089E+00 | 3.36E-01 | G |
| AC-228 | 7.7613E-01 | | | | | | |
| | | 911.07 | 7.818E-01 | (P | 1.128E-01 | 6.02E-02 | G K |
| | | 968.90 | 1.149E+00 | + P | 2.674E-01 | 1.34E-01 | G |
| | | 338.40 | 7.625E-01 | @(P | 2.202E-01 | 8.34E-02 | G |

| Nuclide | Ave activity | Energy | Activity | Code | Peak | MDA | Comments |
|---|---|---|---|---|---|---|---|
| TH-227 | -1.0787E-01 | | | | | | |
| | | 236.00 | -1.079E-01 | &( | 3.561E-01 | 1.07E-01 | G K |
| | | 256.25 | 1.158E-01 | % P | 4.772E-01 | 1.43E-01 | G |
| PA-234 | -3.1398E-03 | | | | | | |
| | | 98.44 | -3.140E-03 | %(P | 1.924E-01 | 5.71E-02 | G K |
| | | 946.00 | 3.383E-02 | % P | 1.489E-01 | 4.34E-02 | G |
| | | 131.28 | -4.212E-02 | % P | 2.126E-01 | 6.38E-02 | G |
| | | 94.67 | -1.857E-01 | % P | 4.112E-01 | 1.25E-01 | G |
| | | 883.24 | 1.015E-01 | % | 2.433E-01 | 7.31E-02 | G |
| | | 926.70 | -2.159E-03 | & | 3.362E-01 | 9.58E-02 | G |
| | | 569.26 | 6.744E-02 | % P | 2.728E-01 | 8.02E-02 | G |
| TH-234 | 1.8477E+00 | | | | | | |
| | | 63.29 | 1.848E+00 | &(P | 6.138E+00 | 1.84E+00 | G K |
| | | 92.80 | 1.457E+00 | % P | 2.097E+00 | 6.38E-01 | G |
| | | 92.38 | 1.671E+00 | % P | 2.514E+00 | 7.64E-01 | G |
| AM-241 | -2.1480E-01 | | | | | | |
| | | 59.54 | -2.148E-01 | %(P | 1.132E+00 | 3.39E-01 | G |

( - This peak used in the nuclide activity average.

* - Peak is too wide, but only one peak in library.
! - Peak is part of a multiplet and this area went negative during deconvolution.
? - Peak is too narrow.
@ - Peak is too wide at FW25M, but ok at FWHM.
% - Peak fails sensitivity test.
$ - Peak identified, but first peak of this nuclide failed one or more qualification tests.
\+ - Peak activity higher than counting uncertainty range.
\- - Peak activity lower than counting uncertainty range.
= - Peak outside analysis energy range.
& - Calculated peak centroid is not close enough to the library energy centroid for positive identification.
P - Peakbackground subtraction
} - Peak is too close to another for the activity to be found directly.

| Nuclide Codes: | Peak Codes: |
|---|---|
| T - Thermal Neutron Activation | G - Gamma Ray |
| F - Fast Neutron Activation | X - X-Ray |
| I - Fission Product | P - Positron Decay |
| N - Naturally Occurring Isotope | S - Single-Escape |
| P - Photon Reaction | D - Double-Escape |
| C - Charged Particle Reaction | K - Key Line |
| M - No MDA Calculation | A - Not in Average |

R - Coincidence Corrected C - Coincidence Peak
H - Halflife limit exceeded

- - - - - - - - - - - - - - - - - - - - - - - - - - - - - - - - - - - - - - -

***** S U M M A R Y O F N U C L I D E S I N S A M P L E *****

| Nuclide | | Time of Count Activity pCi/gm | Time Corrected Activity pCi/gm | Uncertainty 3 Sigma Counting pCi/gm | Total pCi/gm | MDA pCi/gm |
|---|---|---|---|---|---|---|
| BE-7 | #A | 1.5737E-02 | 1.6762E-02 | 2.6529E-01 | 2.6529E-01 | 2.853E-01 |
| K-40 | | 1.6090E+01 | 1.6090E+01 | 1.3116E+00 | 1.6103E+00 | |
| MN-54 | #A | 6.3192E-04 | 6.3878E-04 | 2.7456E-02 | 2.7456E-02 | 3.191E-02 |
| CO-57 | #B | 1.8618E-02 | 1.8852E-02 | 4.6393E-02 | 4.6405E-02 | 5.057E-02 |
| CO-60 | #B | 3.0798E-02 | 3.0852E-02 | 3.2264E-02 | 3.2314E-02 | 3.881E-02 |
| Sr-85 | #A | -9.5120E-03 | -1.0020E-02 | 4.0506E-02 | 4.0510E-02 | 4.303E-02 |
| Kr-85 | #A | -2.1959E+02 | -2.1960E+02 | 8.8776E+02 | 8.8785E+02 | 9.935E+02 |
| Y-88 | #B | -8.2156E-04 | -8.4796E-04 | 2.1986E-02 | 2.1986E-02 | 2.242E-02 |
| NB-94 | #B | 9.7987E-03 | 9.7987E-03 | 2.7517E-02 | 2.7523E-02 | 3.096E-02 |
| Ag-108M | #B | 4.3542E-03 | 4.3545E-03 | 3.4167E-02 | 3.4168E-02 | 3.914E-02 |
| CD-109 | #A | 7.5762E-01 | 7.6328E-01 | 1.6685E+00 | 1.6691E+00 | 1.825E+00 |
| SN-113 | #B | -7.9202E-03 | -8.1557E-03 | 4.6217E-02 | 4.6219E-02 | 5.053E-02 |
| SB-125 | #B | 9.8931E-02 | 9.9261E-02 | 7.2718E-02 | 7.2946E-02 | 1.015E-01 |
| I-131 | #B | -4.7552E-04 | -7.2330E-04 | 2.9135E-01 | 2.9135E-01 | 3.558E-02 |
| CS-134 | #B | 1.6331E-02 | 1.6404E-02 | 1.2841E-02 | 1.2876E-02 | 3.799E-02 |
| CS-137 | # | 9.2409E-02 | 9.2438E-02 | 5.0160E-02 | 5.0446E-02 | |
| CE-139 | #A | 1.3126E-02 | 1.3452E-02 | 4.1727E-02 | 4.1734E-02 | 4.509E-02 |
| EU-152 | #B | 1.4299E-01 | 1.4309E-01 | 1.1352E-01 | 1.1380E-01 | 1.484E-01 |
| EU-154 | #B | 3.5978E-02 | 3.6018E-02 | 9.1668E-02 | 9.1690E-02 | 1.011E-01 |
| EU-155 | #B | 8.3791E-02 | 8.3947E-02 | 2.1120E-01 | 2.1125E-01 | 2.327E-01 |
| HG-203 | #B | 4.3074E-03 | 4.6307E-03 | 4.0198E-02 | 4.0199E-02 | 4.195E-02 |
| TL-208 | | 2.6574E-01 | 2.6574E-01 | 4.9663E-02 | 5.2004E-02 | |
| PB-212 | | 8.3190E-01 | 8.3190E-01 | 8.7104E-02 | 9.9599E-02 | |
| PB-214 | | 5.5082E-01 | 5.5082E-01 | 1.1875E-01 | 1.2298E-01 | |
| BI-212 | | 7.5050E-01 | 7.5050E-01 | 3.5054E-01 | 3.5323E-01 | |
| BI-214 | | 5.0841E-01 | 5.0841E-01 | 1.1312E-01 | 1.1690E-01 | |
| RA-224 | A | 8.7375E-01 | 8.7375E-01 | 1.1054E+00 | 1.1065E+00 | |
| RA-226 | # | 1.1158E+00 | 1.1158E+00 | 1.0091E+00 | 1.0112E+00 | 1.089E+00 |
| AC-228 | | 7.7613E-01 | 7.7613E-01 | 1.5573E-01 | 1.6212E-01 | |
| TH-227 | #B | -1.0787E-01 | -1.0787E-01 | 3.2164E-01 | 3.2170E-01 | 3.561E-01 |
| PA-234 | #B | -3.1398E-03 | -3.1398E-03 | 4.9171E-01 | 4.9171E-01 | 1.924E-01 |
| TH-234 | #B | 1.8477E+00 | 1.8477E+00 | 5.5323E+00 | 5.5332E+00 | 6.138E+00 |
| AM-241 | #A | -2.1480E-01 | -2.1480E-01 | 1.0338E+00 | 1.0338E+00 | 1.132E+00 |

# - All peaks for activity calculation had bad shape.
* - Activity omitted from total
& - Activity omitted from total and all peaks had bad shape.
< - MDA value printed.
A - Activity printed, but activity < MDA.
B - Activity < MDA and failed test.
C - Area < Critical level.
F - Failed fraction or key line test.

H – Halflife limit exceeded

YAEC Chemistry Lab Spectrum name: 103F_15SEPT2006_1123.An1

---------- S U M M A R Y ----------

Total Activity ( 270.4 to 2000.7 keV) 2.0739532E+01 pCi/gm
Total Decayed Activity ( 270.4 to 2000.7 keV) 2.0739561E+01 pCi/gm

The library has energies which are not separable.

Analyzed by: _____
JPK

Reviewed by: _____
Supervisor

Laboratory: YAEC Chemistry Lab

YAEC Chemistry Lab Spectrum name: 103F_15SEPT2006_1259.An1

Sample description
FSS-SSS-01-01-004-F

Spectrum Filename: C:\GammaVision\Spectra\103F_15SEPT2006_1259.An1

Acquisition information
Start time: 15-Sep-2006 12:59:09
Live time: 2000
Real time: 2003
Dead time: 0.13 %
Detector ID: 4

Detector system
Det 103 - DSPE-471

Calibration
Filename: D3_1LSa.Clb
Detector_103 1.0 Liter Sand Geometry

Energy Calibration
Created: 08-Aug-2005 11:09:41
Zero offset: 0.409 keV
Gain: 0.500 keV/channel
Quadratic: 1.092E-08 keV/channel^2

Efficiency Calibration
Created: 08-Aug-2005 11:11:25
Type: Polynomial
Uncertainty: 0.993 %
Coefficients: -0.264059 -5.138468 0.638383
-0.089199 0.005011 -0.000129

Library Files
Main analysis library: FSS_Rev_1.Lib
Library Match Width: 1.000
Peak stripping: Library based

Analysis parameters
Analysis engine: Env32 G53W4.20
Start channel: 100 ( 50.41keV )
Stop channel: 4000 ( 2000.67keV )
Peak rejection level: 41.667%
Peak search sensitivity: 3
Sample Size: 1.9860E+03
Activity scaling factor: 1.0000E+06/( 1.0000E+00* 1.9860E+03) =
5.0352E+02
Detection limit method: Nureg 4.16
Random error: 1.0000000E+00
Systematic error: 1.0000000E+00

| | |
|---|---|
| Fraction Limit: | 0.000% |
| Background width: | average of five points. |

YAEC Chemistry Lab Spectrum name: 103F_15SEPT2006_1259.An1

Half lives decay limit: 12.000
Activity range factor: 2.000
Min. step backg. energy 0.000
Multiplet shift channel 2.000

| Corrections | Status | Comments |
|---|---|---|
| Decay correct to date: | YES | 10-Sep-2006 09:46:00 |
| Decay during acquisition: | NO | |
| Decay during collection: | NO | |
| True coincidence correction: | NO | |
| Peaked background correction: | YES | 103_150K_05AUG05.Pbc 08-Aug-2005 12:54:15 |
| Absorption (Internal): | NO | |
| Geometry correction: | NO | |
| Random summing: | NO | |

total peaks alloc. 18 cutoff 20.00000 %
Energy Calibration
Normalized diff: 0.2731

***** S U M M A R Y O F P E A K S I N R A N G E *****

| Peak Energy | Area | Uncert | FWHM | Corrctn Factor | Nuclide Energy | Brnch. Ratio | Act. pCi/gm | Nuc |
|---|---|---|---|---|---|---|---|---|
| 74.92 | 202. | 15.48 | 0.99 | 9.052E-03 | 74.81 | 9.600 | 1.583E+00 | PB212 |
| 77.22 | 213. | 14.55 | 0.99 | 1.011E-02 | 77.11 | 17.500 | 9.899E-01 | PB212 |
| | | | | | 77.11 | 10.700 | 1.619E+00 | PB214 |
| 93.05 | 110. | 37.81 | 1.50 | 1.631E-02 | 92.38 | 2.570 | PBC<MDA | TH234 |
| | | | | | 92.80 | 3.000 | PBC<MDA | TH234 |
| 93.05 | 108. | 38.23 | 1.50 | 1.645E-02 | 92.38 | 2.570 | PBC<MDA | TH234 |
| | | | | | 92.80 | 3.000 | PBC<MDA | TH234 |
| 186.29 | 178. | 24.00 | 1.02 | 2.566E-02 | 185.99 | 3.280 | 1.334E+00 | RA226 |
| 209.60 | 141. | 27.26 | 0.82 | 2.470E-02 | | | | |
| 238.82 | 1285. | 3.30 | 1.09 | 2.319E-02 | 238.63 | 43.100 | 8.666E-01 | PB212 |
| 241.74 | 177. | 16.46 | 1.09 | 2.303E-02 | 241.00 | 3.900 | 1.339E+00 | RA224 |
| | | | | | 241.92 | 7.470 | 7.003E-01 | PB214 |
| 270.34 | 93. | 32.84 | 1.06 | 2.151E-02 | | | | |
| 277.33 | 117. | 29.48 | 0.76 | 2.114E-02 | | | | |
| 277.33 | 117. | 29.48 | 0.76 | 2.114E-02 | 279.17 | 81.500 | 4.990E-02 | HG203 |
| 295.36 | 279. | 12.07 | 0.94 | 2.024E-02 | 295.22 | 19.200 | 4.819E-01 | PB214 |
| 300.33 | 89. | 27.13 | 1.35 | 2.000E-02 | | | | |
| 327.93 | 69. | 34.23 | 0.95 | 1.874E-02 | | | | |
| 338.59 | 293. | 11.48 | 1.18 | 1.829E-02 | 338.40 | 12.010 | 9.024E-01 | AC228 |
| 352.05 | 482. | 8.37 | 1.23 | 1.775E-02 | 351.99 | 37.100 | 4.925E-01 | PB214 |
| 409.79 | 55. | 34.27 | 1.20 | 1.574E-02 | | | | |
| 462.96 | 97. | 22.86 | 1.40 | 1.426E-02 | | | | |
| 462.96 | 97. | 22.86 | 1.40 | 1.426E-02 | 463.51 | 10.000 | 4.569E-01 | SB125 |
| 511.38 | 234. | 11.96 | 1.46 | 1.316E-02 | 510.72 | 22.500 | 4.751E-01 | TL208 |
| 583.37 | 471. | 6.46 | 1.51 | 1.184E-02 | 583.14 | 86.000 | 3.117E-01 | TL208 |
| 609.67 | 407. | 8.39 | 1.36 | 1.143E-02 | 609.32 | 46.090 | 5.167E-01 | BI214 |
| 728.03 | 115. | 20.23 | 1.13 | 9.956E-03 | 727.17 | 11.800 | 6.649E-01 | BI212 |

| | | | | | | | | |
|---|---|---|---|---|---|---|---|---|
| 795.24 | 87. | 25.26 | 1.55 | 9.306E-03 | | | | |
| 795.24 | 87. | 25.26 | 1.55 | 9.306E-03 | 795.76 | 85.400 | 7.515E-02 | CS134 |
| 860.67 | 65. | 31.06 | 1.65 | 8.767E-03 | | | | |
| 911.65 | 302. | 9.00 | 1.53 | 8.397E-03 | 911.07 | 29.000 | 8.340E-01 | AC228 |
| 969.28 | 212. | 11.12 | 1.63 | 8.023E-03 | 968.90 | 17.460 | 1.030E+00 | AC228 |
| 1120.28 | 104. | 22.01 | 1.70 | 7.212E-03 | 1120.28 | 15.040 | 6.380E-01 | BI214 |
| 1461.62 | 1788. | 2.40 | 1.80 | 5.929E-03 | 1460.75 | 10.700 | 1.897E+01 | K40 |
| 1765.29 | 72. | 14.41 | 1.73 | 5.140E-03 | 1764.51 | 15.920 | 5.746E-01 | BI214 |

********** U N I D E N T I F I E D P E A K S U M M A R Y **********

| Peak Channel | Centroid Energy | Background Counts | Net Area Counts | Intensity Cts/Sec | Uncert 3 Sigma % | FWHM keV | Suspected Nuclide | |
|---|---|---|---|---|---|---|---|---|
| 418.37 | 209.60 | 584. | 141. | 0.071 | 81.78 | 0.817 | NP-239 | s |
| 539.84 | 270.34 | 350. | 93. | 0.047 | 98.53 | 1.064 | AC-228 | s |
| 553.81 | 277.33 | 394. | 117. | 0.058 | 88.44 | 0.758 | TL-208 | l |
| 599.80 | 300.33 | 238. | 89. | 0.045 | 81.40 | 1.345 | PB-212 | s |
| 655.00 | 327.93 | 232. | 69. | 0.034 | 102.70 | 0.953 | AC-228 | |
| 818.72 | 409.79 | 143. | 55. | 0.027 | 102.81 | 1.202 | AC-228 | |
| 1720.38 | 860.67 | 108. | 65. | 0.033 | 93.19 | 1.649 | TL-208 | s |

s - Peak fails shape tests.
D - Peak area deconvoluted.
L - Peak written from unknown list.
C - Area < Critical level.

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This section based on library: FSS_Rev_1.Lib

********** I D E N T I F I E D P E A K S U M M A R Y **********

| Nuclide | Peak Channel | Centroid Energy | Background Counts | Net Area Counts | Intensity Cts/Sec | Uncert 3 Sigma % | FWHM keV |
|---|---|---|---|---|---|---|---|
| PB-212 | 148.79 | 74.81 | 405. | 202. | 0.101 | 46.44 | 0.993D |
| PB-212 | 153.39 | 77.11 | 413. | 213. | 0.107 | 43.65 | 0.995A |
| RA-226 | 371.98 | 186.41 | 877. | 170. | 0.085 | 71.83 | 1.500 |
| PB-212 | 476.42 | 238.63 | 280. | 1273. | 0.637 | 9.96 | 1.093D |
| RA-224 | 481.16 | 241.00 | 1168. | 127. | 0.064 | 118.01 | 1.095D |
| PB-214 | 483.00 | 241.92 | 433. | 122. | 0.061 | 57.68 | 1.095A |
| PB-214 | 589.87 | 295.36 | 334. | 275. | 0.138 | 36.20 | 0.943 |
| AC-228 | 676.32 | 338.59 | 310. | 292. | 0.146 | 34.43 | 1.182s |
| PB-214 | 703.25 | 352.05 | 364. | 477. | 0.238 | 25.11 | 1.231 |
| SB-125 | 925.41 | 463.14 | 167. | 86. | 0.043 | 69.98 | 1.500s |
| TL-208 | 1021.88 | 511.38 | 203. | 207. | 0.103 | 35.88 | 1.464s |
| TL-208 | 1165.84 | 583.37 | 156. | 467. | 0.233 | 19.39 | 1.509s |
| BI-214 | 1218.44 | 609.67 | 212. | 400. | 0.200 | 25.18 | 1.359 |
| Ag-108M | 1222.27 | 611.59 | 280. | -111. | -0.055 | 70.15 | 1.500s |
| BI-212 | 1455.14 | 728.03 | 139. | 115. | 0.057 | 60.69 | 1.126s |
| CS-134 | 1589.93 | 795.44 | 88. | 58. | 0.029 | 78.69 | 1.500s |
| AC-228 | 1822.32 | 911.65 | 128. | 299. | 0.149 | 27.01 | 1.534 |
| AC-228 | 1937.58 | 969.28 | 108. | 212. | 0.106 | 33.37 | 1.627 |
| BI-214 | 2239.53 | 1120.28 | 124. | 102. | 0.051 | 66.02 | 1.699s |
| K-40 | 2922.11 | 1461.62 | 39. | 1769. | 0.885 | 7.21 | 1.795 |
| BI-214 | 3529.33 | 1765.29 | 11. | 69. | 0.035 | 43.24 | 1.732 |

s - Peak fails shape tests.
D - Peak area deconvoluted.
A Derived peak area.

***** S U M M A R Y O F L I B R A R Y P E A K U S A G E *****

| - Nuclide - Name | Code | Average Activity pCi/gm | Peak Energy keV | Peak Activity pCi/gm | Peak Code | Peak MDA Value pCi/gm | COMMENTS |
|---|---|---|---|---|---|---|---|
| BE-7 | | -7.9518E-02 | | | | | |
| | | | 477.56 | -7.952E-02 | %( | 3.462E-01 1.03E-01 | G |
| K-40 | | 1.8967E+01 | | | | | |
| | | | 1460.75 | 1.897E+01 | (P | 3.399E-01 4.61E-01 | G |
| MN-54 | | 1.1317E-02 | | | | | |
| | | | 834.81 | 1.132E-02 | %(P | 3.564E-02 1.06E-02 | G |
| CO-57 | | -7.0293E-03 | | | | | |
| | | | 122.07 | -7.029E-03 | %(P | 5.211E-02 1.56E-02 | G K |
| | | | 136.43 | -4.021E-02 | % | 4.149E-01 1.24E-01 | G |
| CO-60 | | -3.1872E-03 | | | | | |
| | | | 1332.51 | -3.187E-03 | &(P | 3.692E-02 1.00E-02 | G K |
| | | | 1173.23 | -3.557E-03 | & P | 4.706E-02 1.34E-02 | G K |
| Sr-85 | | -8.2376E-03 | | | | | |
| | | | 514.00 | -8.238E-03 | %( | 4.426E-02 1.32E-02 | G |
| Kr-85 | | -1.7992E+02 | | | | | |
| | | | 513.99 | -1.799E+02 | %( | 9.673E+02 2.87E+02 | G |
| Y-88 | | 1.3423E-02 | | | | | |
| | | | 1836.01 | 1.342E-02 | %(P | 1.851E-02 6.22E-03 | G K |
| | | | 898.02 | 1.146E-02 | % P | 3.115E-02 9.26E-03 | G |
| NB-94 | | 4.9463E-05 | | | | | |
| | | | 871.10 | 4.946E-05 | &( | 3.179E-02 9.01E-03 | G K |
| | | | 702.50 | 2.417E-03 | % | 3.660E-02 1.06E-02 | G K |
| Ag-108M | | 1.5993E-03 | | | | | |
| | | | 722.95 | 1.599E-03 | %( | 6.228E-02 1.83E-02 | G K |
| | | | 614.37 | -7.341E-02 | + P | 5.344E-02 1.71E-02 | G |
| | | | 433.93 | -1.073E-03 | % | 3.728E-02 1.09E-02 | G |
| CD-109 | | -1.1775E-01 | | | | | |
| | | | 88.04 | -1.178E-01 | %( | 2.102E+00 6.29E-01 | G |
| SN-113 | | -7.1351E-04 | | | | | |
| | | | 391.71 | -7.135E-04 | &( | 5.079E-02 1.49E-02 | G K |
| | | | 255.04 | -1.174E-01 | % | 1.574E+00 4.67E-01 | G |

| Nuclide | Ave activity | Energy | Activity | Code | Peak | MDA | Comments |
|---|---|---|---|---|---|---|---|
| SB-125 | 1.0912E-01 | | | | | | |
| | | 427.95 | 6.042E-03 | &(P | 1.027E-01 | 3.01E-02 | G K |
| | | 600.77 | 2.501E-02 | & P | 1.861E-01 | 5.46E-02 | G |
| | | 636.15 | -3.188E-03 | % P | 2.755E-01 | 7.89E-02 | G |
| | | 463.51 | 4.142E-01 | *(P | 3.013E-01 | 9.81E-02 | G |
| | | 176.29 | 1.610E-01 | % | 5.921E-01 | 1.78E-01 | G |
| I-131 | 8.4680E-03 | | | | | | |
| | | 364.48 | 8.468E-03 | &(P | 5.518E-02 | 1.63E-02 | G K |
| | | 636.97 | -1.416E-01 | % | 6.701E-01 | 1.97E-01 | G |
| | | 284.29 | -2.188E-01 | % P | 7.769E-01 | 2.33E-01 | G |
| CS-134 | 1.9645E-02 | | | | | | |
| | | 604.66 | -7.078E-03 | %( | 3.727E-02 | 1.10E-02 | G K |
| | | 795.76 | 5.019E-02 | *(P | 4.000E-02 | 1.32E-02 | G |
| | | 569.29 | 5.077E-02 | & P | 2.123E-01 | 6.27E-02 | G |
| | | 801.84 | -1.005E-01 | % P | 3.724E-01 | 1.08E-01 | G |
| CS-137 | 9.9530E-03 | | | | | | |
| | | 661.62 | 9.953E-03 | %(P | 3.800E-02 | 1.12E-02 | G |
| CE-139 | -1.7833E-03 | | | | | | |
| | | 165.85 | -1.783E-03 | %( | 4.944E-02 | 1.47E-02 | G |
| EU-152 | -2.1015E-02 | | | | | | |
| | | 121.78 | -2.102E-02 | %(P | 1.510E-01 | 4.52E-02 | G K |
| | | 344.30 | -1.384E-02 | % P | 1.153E-01 | 3.41E-02 | G |
| | | 1408.08 | 7.393E-02 | % | 1.231E-01 | 3.85E-02 | G |
| | | 964.00 | 4.278E-02 | % P | 1.941E-01 | 5.62E-02 | G |
| | | 1112.07 | -6.149E-02 | % | 3.912E-01 | 1.15E-01 | G |
| | | 778.90 | -2.604E-02 | % | 2.797E-01 | 8.12E-02 | G |
| EU-154 | -1.5178E-03 | | | | | | |
| | | 123.10 | -1.518E-03 | %( | 1.134E-01 | 3.38E-02 | G K |
| | | 1274.80 | 3.766E-02 | & | 1.132E-01 | 3.36E-02 | G |
| | | 723.30 | -9.142E-02 | % | 2.380E-01 | 7.16E-02 | G |
| | | 1004.80 | -1.492E-02 | % | 2.093E-01 | 6.00E-02 | G |
| EU-155 | 1.3772E-01 | | | | | | |
| | | 86.45 | 1.377E-01 | %( | 2.400E-01 | 7.30E-02 | G K |
| | | 105.31 | 6.256E-02 | % | 2.205E-01 | 6.64E-02 | G |
| HG-203 | 2.5574E-02 | | | | | | |
| | | 279.17 | 2.557E-02 | &(P | 3.944E-02 | 1.21E-02 | G K |
| | | 72.87 | 4.880E-01 | % P | 1.633E+00 | 4.91E-01 | G |
| | | 70.83 | 2.175E+00 | & | 3.561E+00 | 1.09E+00 | G |
| | | 82.50 | -1.306E+00 | & | 4.104E+00 | 1.24E+00 | G |

| Nuclide | Ave activity | Energy | Activity | Code | Peak | MDA | Comments |
|---|---|---|---|---|---|---|---|
| TL-208 | 3.1174E-01 | | | | | | |
| | | 583.14 | 3.117E-01 | @(P | 4.073E-02 | 2.03E-02 | G |
| | | 510.72 | 4.751E-01 | + P | 1.587E-01 | 6.42E-02 | G |
| PB-212 | 8.6635E-01 | | | | | | |
| | | 238.63 | 8.663E-01 | (P | 5.488E-02 | 2.90E-02 | G K |
| | | | | | | | Energy duplication |
| | | 77.11 | 8.191E-01 | } P | 3.747E-01 | 1.19E-01 | G |
| | | 74.81 | 1.583E+00 | + P | 7.555E-01 | 2.49E-01 | G |
| PB-214 | 4.8103E-01 | | | | | | |
| | | 351.99 | 4.925E-01 | (P | 9.468E-02 | 4.17E-02 | G K |
| | | 295.22 | 4.819E-01 | (P | 1.537E-01 | 5.90E-02 | G |
| | | | | | | | Energy duplication |
| | | 77.11 | 7.545E-02 | } P | 8.973E-01 | 2.44E-01 | G |
| | | 241.92 | 4.810E-01 | } | 3.946E-01 | 9.25E-02 | G |
| BI-212 | 6.6494E-01 | | | | | | |
| | | 727.17 | 6.649E-01 | @(P | 3.337E-01 | 1.35E-01 | G K |
| | | 1620.56 | 1.553E-01 | % P | 8.800E-01 | 2.45E-01 | G |
| | | 785.42 | 9.624E-01 | % | 1.718E+00 | 5.26E-01 | G |
| BI-214 | 5.5233E-01 | | | | | | |
| | | 609.32 | 5.167E-01 | (P | 9.100E-02 | 4.41E-02 | G K |
| | | 1764.51 | 5.746E-01 | (P | 1.503E-01 | 8.68E-02 | G |
| | | 1120.28 | 6.380E-01 | @(P | 3.429E-01 | 1.43E-01 | G |
| RA-224 | 9.6394E-01 | | | | | | |
| | | | | | | | Derived Ave Activity |
| | | 241.00 | 9.639E-01 | }( | 1.225E+00 | 3.88E-01 | G |
| RA-226 | 1.3705E+00 | | | | | | |
| | | 185.99 | 1.370E+00 | (P | 1.137E+00 | 3.53E-01 | G |
| AC-228 | 9.0651E-01 | | | | | | |
| | | 911.07 | 8.340E-01 | (P | 1.550E-01 | 7.60E-02 | G K |
| | | 968.90 | 1.030E+00 | (P | 2.483E-01 | 1.15E-01 | G |
| | | 338.40 | 9.024E-01 | @(P | 2.626E-01 | 1.04E-01 | G |
| TH-227 | -1.8143E-01 | | | | | | |
| | | 236.00 | -1.814E-01 | %( | 4.034E-01 | 1.22E-01 | G K |
| | | 256.25 | -9.065E-02 | % P | 4.356E-01 | 1.30E-01 | G |
| PA-234 | 6.0982E-02 | | | | | | |
| | | 98.44 | 6.098E-02 | %(P | 2.202E-01 | 6.63E-02 | G K |
| | | 946.00 | 2.011E-02 | & P | 1.597E-01 | 4.60E-02 | G |
| | | 131.28 | 1.971E-03 | % P | 2.048E-01 | 6.10E-02 | G |
| | | 94.67 | -1.612E-01 | % P | 4.276E-01 | 1.29E-01 | G |
| | | 883.24 | -4.557E-02 | % | 2.895E-01 | 8.42E-02 | G |

| Nuclide | Ave activity | Energy | Activity | Code | Peak | MDA | Comments |
|---|---|---|---|---|---|---|---|
| | | 926.70 | 5.325E-03 | & | 2.529E-01 | 7.09E-02 | G |
| | | 569.26 | 7.617E-02 | & P | 3.132E-01 | 9.26E-02 | G |
| TH-234 | 8.5617E-01 | | | | | | |
| | | 63.29 | 8.562E-01 | %(P | 6.295E+00 | 1.88E+00 | G K |
| | | 92.80 | 1.494E+00 | % P | 2.184E+00 | 6.64E-01 | G |
| | | 92.38 | 1.794E+00 | % P | 2.584E+00 | 7.87E-01 | G |
| AM-241 | 1.7836E-01 | | | | | | |
| | | 59.54 | 1.784E-01 | %(P | 1.111E+00 | 3.32E-01 | G |

( - This peak used in the nuclide activity average.

* - Peak is too wide, but only one peak in library.
! - Peak is part of a multiplet and this area went negative during deconvolution.
? - Peak is too narrow.
@ - Peak is too wide at FW25M, but ok at FWHM.
% - Peak fails sensitivity test.
$ - Peak identified, but first peak of this nuclide failed one or more qualification tests.
+ - Peak activity higher than counting uncertainty range.
- - Peak activity lower than counting uncertainty range.
= - Peak outside analysis energy range.
& - Calculated peak centroid is not close enough to the library energy centroid for positive identification.
P - Peakbackground subtraction
} - Peak is too close to another for the activity to be found directly.

| Nuclide Codes: | Peak Codes: |
|---|---|
| T - Thermal Neutron Activation | G - Gamma Ray |
| F - Fast Neutron Activation | X - X-Ray |
| I - Fission Product | P - Positron Decay |
| N - Naturally Occurring Isotope | S - Single-Escape |
| P - Photon Reaction | D - Double-Escape |
| C - Charged Particle Reaction | K - Key Line |
| M - No MDA Calculation | A - Not in Average |
| R - Coincidence Corrected | C - Coincidence Peak |
| H - Halflife limit exceeded | |

- - - - - - - - - - - - - - - - - - - - - - - - - - - - - - - - - - - - - -

***** S U M M A R Y O F N U C L I D E S I N S A M P L E *****

| Nuclide | | Time of Count Activity pCi/gm | Time Corrected Activity pCi/gm | Uncertainty 3 Sigma Counting pCi/gm | Total pCi/gm | MDA pCi/gm |
|---|---|---|---|---|---|---|
| BE-7 | #A | -7.4391E-02 | -7.9518E-02 | 3.0861E-01 | 3.0864E-01 | 3.239E-01 |
| K-40 | | 1.8967E+01 | 1.8967E+01 | 1.3825E+00 | 1.7675E+00 | |
| MN-54 | #A | 1.1188E-02 | 1.1317E-02 | 3.1782E-02 | 3.1789E-02 | 3.524E-02 |
| CO-57 | #B | -6.9372E-03 | -7.0293E-03 | 4.8829E-02 | 4.8831E-02 | 5.143E-02 |

| | | | | | | |
|---|---|---|---|---|---|---|
| CO-60 | #B | -3.1813E-03 | -3.1872E-03 | 5.2636E-01 | 5.2636E-01 | 3.685E-02 |
| Sr-85 | #A | -7.7977E-03 | -8.2376E-03 | 3.9460E-02 | 3.9462E-02 | 4.190E-02 |
| Kr-85 | #A | -1.7991E+02 | -1.7992E+02 | 8.6231E+02 | 8.6237E+02 | 9.673E+02 |
| Y-88 | #B | 1.2982E-02 | 1.3423E-02 | 1.8671E-02 | 1.8687E-02 | 1.790E-02 |
| NB-94 | #B | 4.9463E-05 | 4.9463E-05 | 2.7019E-02 | 2.7019E-02 | 3.179E-02 |
| Ag-108M | #B | 1.5992E-03 | 1.5993E-03 | 5.4947E-02 | 5.4947E-02 | 6.228E-02 |
| CD-109 | #A | -1.1683E-01 | -1.1775E-01 | 1.8869E+00 | 1.8869E+00 | 2.086E+00 |
| SN-113 | #B | -6.9179E-04 | -7.1351E-04 | 4.4640E-02 | 4.4640E-02 | 4.925E-02 |
| SB-125 | #F | 1.0874E-01 | 1.0912E-01 | 7.7489E-02 | 7.7747E-02 | 1.023E-01 |
| I-131 | #B | 5.4394E-03 | 8.4680E-03 | 4.8931E-02 | 4.8933E-02 | 3.544E-02 |
| CS-134 | #B | 1.9552E-02 | 1.9645E-02 | 1.5481E-02 | 1.5523E-02 | 3.710E-02 |
| CS-137 | #A | 9.9498E-03 | 9.9530E-03 | 3.3654E-02 | 3.3659E-02 | 3.799E-02 |
| CE-139 | #A | -1.7377E-03 | -1.7833E-03 | 4.4248E-02 | 4.4248E-02 | 4.818E-02 |
| EU-152 | #B | -2.0999E-02 | -2.1015E-02 | 1.4846E-01 | 1.4846E-01 | 1.509E-01 |
| EU-154 | #B | -1.5161E-03 | -1.5178E-03 | 1.0154E-01 | 1.0154E-01 | 1.133E-01 |
| EU-155 | #B | 1.3745E-01 | 1.3772E-01 | 2.1904E-01 | 2.1918E-01 | 2.395E-01 |
| HG-203 | #B | 2.3693E-02 | 2.5574E-02 | 3.6235E-02 | 3.6265E-02 | 3.654E-02 |
| TL-208 | # | 3.1174E-01 | 3.1174E-01 | 6.1014E-02 | 6.3641E-02 | |
| PB-212 | | 8.6635E-01 | 8.6635E-01 | 8.7106E-02 | 1.0059E-01 | |
| PB-214 | | 4.8103E-01 | 4.8103E-01 | 1.2220E-01 | 1.2535E-01 | |
| BI-212 | # | 6.6494E-01 | 6.6494E-01 | 4.0531E-01 | 4.0714E-01 | |
| BI-214 | | 5.5233E-01 | 5.5233E-01 | 1.4134E-01 | 1.4493E-01 | |
| RA-224 | A | 9.6394E-01 | 9.6394E-01 | 1.1376E+00 | 1.1389E+00 | |
| RA-226 | # | 1.3704E+00 | 1.3705E+00 | 1.0596E+00 | 1.0626E+00 | 1.137E+00 |
| AC-228 | | 9.0651E-01 | 9.0651E-01 | 1.6705E-01 | 1.7514E-01 | |
| TH-227 | #B | -1.8143E-01 | -1.8143E-01 | 3.6669E-01 | 3.6684E-01 | 4.034E-01 |
| PA-234 | #B | 6.0982E-02 | 6.0982E-02 | 1.9887E-01 | 1.9890E-01 | 2.202E-01 |
| TH-234 | #B | 8.5617E-01 | 8.5617E-01 | 5.6389E+00 | 5.6391E+00 | 6.295E+00 |
| AM-241 | #A | 1.7835E-01 | 1.7836E-01 | 9.9744E-01 | 9.9749E-01 | 1.111E+00 |

# - All peaks for activity calculation had bad shape.
* - Activity omitted from total
& - Activity omitted from total and all peaks had bad shape.
< - MDA value printed.
A - Activity printed, but activity < MDA.
B - Activity < MDA and failed test.
C - Area < Critical level.
F - Failed fraction or key line test.
H - Halflife limit exceeded

---------- S U M M A R Y ----------

Total Activity ( 269.9 to 2000.7 keV) 2.3713902E+01 pCi/gm
Total Decayed Activity ( 269.9 to 2000.7 keV) 2.3713902E+01 pCi/gm

The library has energies which are not separable.

Analyzed by: _____
JPK

Reviewed by: _____
Supervisor

Laboratory:  YAEC Chemistry Lab

YAEC Chemistry Lab Spectrum name: 103F_15SEPT2006_1338.An1

Sample description
FSS-SSS-01-01-005-F

Spectrum Filename: C:\GammaVision\Spectra\103F_15SEPT2006_1338.An1

Acquisition information
Start time: 15-Sep-2006 13:38:08
Live time: 2000
Real time: 2003
Dead time: 0.13 %
Detector ID: 4

Detector system
Det 103 - DSPE-471

Calibration
Filename: D3_1LSa.Clb
Detector_103 1.0 Liter Sand Geometry

Energy Calibration
Created: 08-Aug-2005 11:09:41
Zero offset: 0.409 keV
Gain: 0.500 keV/channel
Quadratic: 1.092E-08 keV/channel^2

Efficiency Calibration
Created: 08-Aug-2005 11:11:25
Type: Polynomial
Uncertainty: 0.993 %
Coefficients: -0.264059 -5.138468 0.638383
-0.089199 0.005011 -0.000129

Library Files
Main analysis library: FSS_Rev_1.Lib
Library Match Width: 1.000
Peak stripping: Library based

Analysis parameters
Analysis engine: Env32 G53W4.20
Start channel: 100 ( 50.41keV )
Stop channel: 4000 ( 2000.67keV )
Peak rejection level: 41.667%
Peak search sensitivity: 3
Sample Size: 1.8510E+03
Activity scaling factor: 1.0000E+06/( 1.0000E+00* 1.8510E+03) =
5.4025E+02
Detection limit method: Nureg 4.16
Random error: 1.0000000E+00
Systematic error: 1.0000000E+00

| | |
|---|---|
| Fraction Limit: | 0.000% |
| Background width: | average of five points. |

YAEC Chemistry Lab Spectrum name: 103F_15SEPT2006_1338.An1

Half lives decay limit: 12.000
Activity range factor: 2.000
Min. step backg. energy 0.000
Multiplet shift channel 2.000

| Corrections | Status | Comments |
|---|---|---|
| Decay correct to date: | YES | 09-Sep-2006 07:59:00 |
| Decay during acquisition: | NO | |
| Decay during collection: | NO | |
| True coincidence correction: | NO | |
| Peaked background correction: | YES | 103_150K_05AUG05.Pbc 08-Aug-2005 12:54:15 |
| Absorption (Internal): | NO | |
| Geometry correction: | NO | |
| Random summing: | NO | |

total peaks alloc. 19 cutoff 20.00000 %
Energy Calibration
Normalized diff: 0.2839

***** S U M M A R Y O F P E A K S I N R A N G E *****

| Peak Energy | Area | Uncert | FWHM | Corrctn Factor | Nuclide Energy | Brnch. Ratio | Act. pCi/gm | Nuc |
|---|---|---|---|---|---|---|---|---|
| 74.90 | 163. | 19.92 | 0.99 | 9.130E-03 | 74.81 | 9.600 | 1.346E+00 | PB212 |
| 77.29 | 247. | 13.72 | 0.99 | 1.023E-02 | 77.11 | 17.500 | 1.006E+00 | PB212 |
| | | | | | 77.11 | 10.700 | 1.645E+00 | PB214 |
| 87.38 | 134. | 37.86 | 1.50 | 1.410E-02 | 86.45 | 32.740 | PBC<MDA | EU155 |
| | | | | | 88.04 | 3.790 | 1.768E+00 | CD109 |
| 87.39 | 146. | 32.91 | 1.50 | 1.472E-02 | 86.45 | 32.740 | PBC<MDA | EU155 |
| | | | | | 88.04 | 3.790 | 1.927E+00 | CD109 |
| 186.18 | 228. | 20.77 | 1.04 | 2.566E-02 | 185.99 | 3.280 | 1.868E+00 | RA226 |
| 209.75 | 129. | 24.01 | 1.09 | 2.469E-02 | | | | |
| 238.81 | 1267. | 3.39 | 1.09 | 2.319E-02 | 238.63 | 43.100 | 9.167E-01 | PB212 |
| 242.14 | 165. | 17.00 | 1.10 | 2.301E-02 | 241.00 | 3.900 | 1.336E+00 | RA224 |
| | | | | | 241.92 | 7.470 | 6.991E-01 | PB214 |
| 270.09 | 97. | 32.62 | 0.85 | 2.152E-02 | | | | |
| 276.99 | 77. | 38.32 | 1.30 | 2.116E-02 | | | | |
| 295.42 | 338. | 11.09 | 0.98 | 2.024E-02 | 295.22 | 19.200 | 6.264E-01 | PB214 |
| 300.50 | 89. | 31.80 | 1.23 | 1.999E-02 | | | | |
| 328.08 | 107. | 31.58 | 1.10 | 1.874E-02 | | | | |
| 338.40 | 255. | 15.91 | 1.13 | 1.830E-02 | 338.40 | 12.010 | 8.420E-01 | AC228 |
| 352.14 | 525. | 6.64 | 1.17 | 1.775E-02 | 351.99 | 37.100 | 5.761E-01 | PB214 |
| 462.79 | 102. | 25.46 | 1.28 | 1.426E-02 | | | | |
| 462.79 | 102. | 25.46 | 1.28 | 1.426E-02 | 463.51 | 10.000 | 5.209E-01 | SB125 |
| 511.17 | 238. | 12.77 | 1.43 | 1.316E-02 | 510.72 | 22.500 | 5.196E-01 | TL208 |
| 583.46 | 436. | 7.07 | 1.54 | 1.184E-02 | 583.14 | 86.000 | 3.095E-01 | TL208 |
| 609.62 | 438. | 7.21 | 1.55 | 1.143E-02 | 609.32 | 46.090 | 5.975E-01 | BI214 |
| 727.84 | 145. | 15.85 | 1.41 | 9.958E-03 | 727.17 | 11.800 | 8.978E-01 | BI212 |
| 796.18 | 59. | 34.19 | 1.42 | 9.298E-03 | 795.76 | 85.400 | 5.446E-02 | CS134 |
| 836.85 | 62. | 31.23 | 1.24 | 8.954E-03 | | | | |

| | | | | | | | | |
|---|---|---|---|---|---|---|---|---|
| 861.11 | 58. | 26.93 | 1.30 | 8.763E-03 | | | | |
| 911.83 | 340. | 7.54 | 1.73 | 8.396E-03 | 911.07 | 29.000 | 1.009E+00 | AC228 |
| 964.68 | 46. | 27.81 | 1.54 | 8.052E-03 | 964.00 | 14.580 | 2.831E-01 | EU152 |
| 969.74 | 155. | 11.03 | 1.54 | 8.021E-03 | 968.90 | 17.460 | 8.073E-01 | AC228 |
| 1107.08 | 35. | 39.18 | 1.30 | 7.275E-03 | | | | |
| 1120.68 | 162. | 17.95 | 2.14 | 7.210E-03 | 1120.28 | 15.040 | 1.078E+00 | BI214 |
| 1461.55 | 1996. | 2.32 | 1.89 | 5.930E-03 | 1460.75 | 10.700 | 2.274E+01 | K40 |
| 1591.13 | 60. | 15.56 | 0.81 | 5.564E-03 | | | | |
| 1622.05 | 26. | 24.28 | 1.23 | 5.488E-03 | 1620.56 | 2.750 | 1.246E+00 | BI212 |

| pk energy | area | uncert | fwhm | corr | nuclide | brnch. | act. | nuc |
|---|---|---|---|---|---|---|---|---|
| 1765.62 | 82. | 12.36 | 1.45 | 5.139E-03 | 1764.51 | 15.920 | 7.057E-01 | BI214 |

********** U N I D E N T I F I E D P E A K S U M M A R Y **********

| Peak Channel | Centroid Energy | Background Counts | Net Area Counts | Intensity Cts/Sec | Uncert 3 Sigma % | FWHM keV | Suspected Nuclide | |
|---|---|---|---|---|---|---|---|---|
| 418.65 | 209.75 | 415. | 129. | 0.064 | 72.02 | 1.093 | NP-239 | |
| 539.33 | 270.09 | 375. | 97. | 0.048 | 97.87 | 0.851 | AC-228 | s |
| 553.12 | 276.99 | 331. | 89. | 0.045 | 92.29 | 1.299 | TL-208 | |
| 600.14 | 300.50 | 300. | 89. | 0.045 | 95.41 | 1.231 | PB-212 | s |
| 655.31 | 328.08 | 373. | 107. | 0.054 | 94.75 | 1.098 | AC-228 | |
| 1672.74 | 836.85 | 91. | 77. | 0.038 | 63.12 | 1.237 | J-135 | |
| 1721.26 | 861.11 | 70. | 58. | 0.029 | 80.79 | 1.299 | TL-208 | |
| 1929.85 | 964.68 | 54. | 51. | 0.026 | 74.07 | 1.539 | AC-228 | D |
| 3181.08 | 1591.13 | 8. | 60. | 0.030 | 46.69 | 0.810 | - | s |

s - Peak fails shape tests.
D - Peak area deconvoluted.
L - Peak written from unknown list.
C - Area < Critical level.

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This section based on library: FSS_Rev_1.Lib

********** I D E N T I F I E D P E A K S U M M A R Y **********

| Nuclide | Peak Channel | Centroid Energy | Background Counts | Net Area Counts | Intensity Cts/Sec | Uncert 3 Sigma % | FWHM keV |
|---|---|---|---|---|---|---|---|
| PB-212 | 148.79 | 74.81 | 427. | 163. | 0.082 | 57.41 | 0.993D |
| PB-212 | 153.39 | 77.11 | 452. | 188. | 0.094 | 42.20 | 0.995A |
| EU-155 | 173.93 | 87.38 | 1216. | 134. | 0.067 | 113.57 | 1.500s |
| CD-109 | 173.95 | 87.39 | 1079. | 146. | 0.073 | 98.72 | 1.500s |
| RA-226 | 371.67 | 186.25 | 894. | 172. | 0.086 | 71.39 | 1.500s |
| PB-212 | 476.84 | 238.84 | 753. | 1310. | 0.655 | 12.93 | 1.019 |
| RA-224 | 482.76 | 241.80 | 970. | 133. | 0.067 | 102.60 | 1.500 |
| PB-214 | 589.99 | 295.42 | 398. | 334. | 0.167 | 33.28 | 0.984 |
| AC-228 | 675.95 | 338.40 | 434. | 254. | 0.127 | 47.74 | 1.133 |
| PB-214 | 703.42 | 352.14 | 271. | 520. | 0.260 | 19.91 | 1.172 |
| SB-125 | 925.62 | 463.25 | 184. | 85. | 0.042 | 73.95 | 1.500 |
| TL-208 | 1021.46 | 511.17 | 240. | 211. | 0.105 | 38.31 | 1.433s |
| TL-208 | 1166.02 | 583.46 | 170. | 432. | 0.216 | 21.21 | 1.538 |
| BI-214 | 1218.34 | 609.62 | 166. | 432. | 0.216 | 21.64 | 1.548s |
| BI-212 | 1454.75 | 727.84 | 124. | 145. | 0.072 | 47.56 | 1.411s |
| CS-134 | 1589.85 | 795.40 | 95. | 43. | 0.022 | 105.12 | 1.500 |
| AC-228 | 1822.68 | 911.83 | 102. | 337. | 0.168 | 22.61 | 1.727 |
| EU-152 | 1929.24 | 965.11 | 65. | 51. | 0.025 | 78.70 | 1.538s |
| AC-228 | 1936.81 | 968.90 | 64. | 155. | 0.078 | 32.51 | 1.541D |

| Nuclide | Channel | Energy | Background | Net area | Cnts/sec | Uncert | FWHM |
|---|---|---|---|---|---|---|---|
| BI-214 | 2240.34 | 1120.68 | 173. | 160. | 0.080 | 53.86 | 2.142s |
| K-40 | 2921.97 | 1461.55 | 53. | 1977. | 0.989 | 6.95 | 1.895 |
| BI-212 | 3242.91 | 1622.05 | 3. | 26. | 0.013 | 72.84 | 1.233s |
| BI-214 | 3529.99 | 1765.62 | 9. | 79. | 0.040 | 37.07 | 1.449 |

s - Peak fails shape tests.
D - Peak area deconvoluted.
A Derived peak area.

***** S U M M A R Y O F L I B R A R Y P E A K U S A G E *****

| - Nuclide - Name | Code | Average Activity pCi/gm | Peak Energy keV | Peak Activity pCi/gm | Code | MDA Value pCi/gm | COMMENTS |
|---|---|---|---|---|---|---|---|
| BE-7 | | -1.6103E-02 | | | | | |
| | | | 477.56 | -1.610E-02 | &( | 3.787E-01 1.11E-01 | G |
| K-40 | | 2.2742E+01 | | | | | |
| | | | 1460.75 | 2.274E+01 | (P | 4.207E-01 5.32E-01 | G |
| MN-54 | | -1.3295E-02 | | | | | |
| | | | 834.81 | -1.329E-02 | %(P | 4.323E-02 1.28E-02 | G |
| CO-57 | | -1.4189E-02 | | | | | |
| | | | 122.07 | -1.419E-02 | %(P | 5.717E-02 1.72E-02 | G K |
| | | | 136.43 | -1.406E-02 | & | 4.153E-01 1.24E-01 | G |
| CO-60 | | -9.8191E-03 | | | | | |
| | | | 1332.51 | -9.819E-03 | %(P | 4.571E-02 1.30E-02 | G K |
| | | | 1173.23 | 2.337E-02 | % P | 5.148E-02 1.55E-02 | G K |
| Sr-85 | | -2.4786E-02 | | | | | |
| | | | 514.00 | -2.479E-02 | &( | 5.364E-02 1.63E-02 | G |
| Kr-85 | | -5.3540E+02 | | | | | |
| | | | 513.99 | -5.354E+02 | &( | 1.159E+03 3.51E+02 | G |
| Y-88 | | -4.6911E-03 | | | | | |
| | | | 1836.01 | -4.691E-03 | %(P | 3.444E-02 9.55E-03 | G K |
| | | | 898.02 | 1.228E-02 | % P | 4.338E-02 1.28E-02 | G |
| NB-94 | | 1.1015E-02 | | | | | |
| | | | 871.10 | 1.101E-02 | &( | 3.654E-02 1.08E-02 | G K |
| | | | 702.50 | -4.581E-03 | & | 4.238E-02 1.24E-02 | G K |
| Ag-108M | | -1.7173E-02 | | | | | |
| | | | 722.95 | -1.717E-02 | %( | 4.884E-02 1.46E-02 | G K |
| | | | 614.37 | -1.857E-02 | % P | 4.693E-02 1.41E-02 | G |

| Nuclide | Ave activity | Energy | Activity | Code | Peak | MDA | Comments |
|---|---|---|---|---|---|---|---|
| | | 433.93 | -6.153E-03 % | | 3.813E-02 | 1.13E-02 | G |
| CD-109 | 1.9272E+00 | | | | | | |
| | | 88.04 | 1.927E+00 @( | | 2.058E+00 | 6.34E-01 | G |
| SN-113 | -1.7397E-02 | | | | | | |
| | | 391.71 | -1.740E-02 %( | | 5.757E-02 | 1.72E-02 | G K |
| | | 255.04 | -4.723E-01 % | | 1.844E+00 | 5.53E-01 | G |
| SB-125 | 1.1107E-01 | | | | | | |
| | | 427.95 | 8.618E-04 %(P | | 1.039E-01 | 3.02E-02 | G K |
| | | 600.77 | -8.855E-04 % P | | 1.815E-01 | 5.23E-02 | G |
| | | 636.15 | 1.950E-03 % P | | 3.329E-01 | 9.61E-02 | G |
| | | 463.51 | 4.373E-01 (P | | 3.393E-01 | 1.09E-01 | G |
| | | 176.29 | 1.919E-01 & | | 6.428E-01 | 1.94E-01 | G |
| I-131 | -7.9611E-04 | | | | | | |
| | | 364.48 | -7.961E-04 &(P | | 7.870E-02 | 2.31E-02 | G K |
| | | 636.97 | 1.389E-02 & | | 6.441E-01 | 1.83E-01 | G |
| | | 284.29 | -7.433E-02 % P | | 9.808E-01 | 2.91E-01 | G |
| CS-134 | 1.7101E-02 | | | | | | |
| | | 604.66 | -3.109E-03 %( | | 3.164E-02 | 9.18E-03 | G K |
| | | 795.76 | 4.020E-02 (P | | 4.446E-02 | 1.41E-02 | G |
| | | 569.29 | -2.359E-02 & P | | 2.345E-01 | 6.80E-02 | G |
| | | 801.84 | 7.170E-02 & P | | 3.607E-01 | 1.04E-01 | G |
| CS-137 | 1.4475E-02 | | | | | | |
| | | 661.62 | 1.448E-02 %(P | | 4.663E-02 | 1.39E-02 | G |
| CE-139 | 6.8600E-03 | | | | | | |
| | | 165.85 | 6.860E-03 %( | | 5.096E-02 | 1.52E-02 | G |
| EU-152 | 7.6927E-02 | | | | | | |
| | | 121.78 | -4.181E-02 %(P | | 1.652E-01 | 4.97E-02 | G K |
| | | 344.30 | 2.063E-03 % P | | 1.326E-01 | 3.90E-02 | G |
| | | 1408.08 | 0.000E+00 % | | 1.833E-01 | 5.10E-02 | G |
| | | 964.00 | 3.151E-01 (P | | 2.508E-01 | 8.35E-02 | G |
| | | 1112.07 | 8.349E-02 % | | 3.387E-01 | 9.98E-02 | G |
| | | 778.90 | 4.562E-02 % | | 2.777E-01 | 8.11E-02 | G |
| EU-154 | 1.1575E-02 | | | | | | |
| | | 123.10 | 1.157E-02 %( | | 1.182E-01 | 3.54E-02 | G K |
| | | 1274.80 | -1.589E-02 % | | 1.392E-01 | 4.03E-02 | G |
| | | 723.30 | -1.739E-03 % | | 2.039E-01 | 5.89E-02 | G |
| | | 1004.80 | 1.796E-02 % | | 2.169E-01 | 6.22E-02 | G |

| Nuclide | Ave activity | Energy | Activity | Code | Peak | MDA | Comments |
|---|---|---|---|---|---|---|---|
| EU-155 | 2.1203E-01 | | | | | | |
| | | 86.45 | 2.120E-01 | &( | 2.618E-01 | 8.03E-02 | G K |
| | | 105.31 | 5.191E-03 | & | 2.574E-01 | 7.68E-02 | G |
| HG-203 | -7.9697E-03 | | | | | | |
| | | 279.17 | -7.970E-03 | &(P | 5.233E-02 | 1.56E-02 | G K |
| | | 72.87 | 5.282E-03 | % P | 2.908E+00 | 8.70E-01 | G |
| | | 70.83 | 1.362E+00 | & | 4.404E+00 | 1.33E+00 | G |
| | | 82.50 | -8.421E-01 | % | 4.602E+00 | 1.38E+00 | G |
| TL-208 | 3.0947E-01 | | | | | | |
| | | 583.14 | 3.095E-01 | (P | 4.551E-02 | 2.21E-02 | G |
| | | 510.72 | 5.196E-01 | + P | 1.845E-01 | 7.48E-02 | G |
| PB-212 | 9.7216E-01 | | | | | | |
| | | 238.63 | 9.567E-01 | (P | 9.533E-02 | 4.16E-02 | G K |
| | | | | | | | Energy duplication |
| | | 77.11 | 7.758E-01 | } P | 4.198E-01 | 1.09E-01 | G |
| | | 74.81 | 1.372E+00 | + P | 8.315E-01 | 2.67E-01 | G |
| PB-214 | 5.9326E-01 | | | | | | |
| | | 351.99 | 5.761E-01 | (P | 8.808E-02 | 3.87E-02 | G K |
| | | 295.22 | 6.264E-01 | (P | 1.798E-01 | 7.04E-02 | G |
| | | | | | | | Energy duplication |
| | | 77.11 | 1.657E-01 | } P | 1.015E+00 | 2.41E-01 | G |
| | | 241.92 | 2.283E-01 | % | 6.479E-01 | 1.96E-01 | G |
| BI-212 | 9.6364E-01 | | | | | | |
| | | 727.17 | 8.978E-01 | *(P | 3.395E-01 | 1.43E-01 | G K |
| | | 1620.56 | 1.246E+00 | (P | 5.372E-01 | 3.03E-01 | G |
| | | 785.42 | 4.136E-02 | % | 2.331E+00 | 6.77E-01 | G |
| BI-214 | 6.2532E-01 | | | | | | |
| | | 609.32 | 5.975E-01 | *(P | 8.701E-02 | 4.38E-02 | G K |
| | | 1764.51 | 7.057E-01 | (P | 1.480E-01 | 9.09E-02 | G |
| | | 1120.28 | 1.078E+00 | + P | 4.307E-01 | 1.96E-01 | G |
| RA-224 | 1.0802E+00 | | | | | | |
| | | 241.00 | 1.080E+00 | ( | 1.200E+00 | 3.69E-01 | G |
| RA-226 | 1.4957E+00 | | | | | | |
| | | 185.99 | 1.496E+00 | *(P | 1.232E+00 | 3.83E-01 | G |
| AC-228 | 1.0087E+00 | | | | | | |
| | | 911.07 | 1.009E+00 | (P | 1.494E-01 | 7.68E-02 | G K |
| | | 968.90 | 8.078E-01 | - P | 2.083E-01 | 8.76E-02 | G |
| | | 338.40 | 8.420E-01 | - P | 3.316E-01 | 1.35E-01 | G |

| Nuclide | Ave activity | Energy | Activity | Code | Peak | MDA | Comments |
|---|---|---|---|---|---|---|---|
| TH-227 | -2.2496E-01 | | | | | | |
| | | 236.00 | -2.250E-01 | &( | 4.346E-01 | 1.32E-01 | G K |
| | | 256.25 | -1.558E-02 | % P | 5.830E-01 | 1.73E-01 | G |
| PA-234 | 6.8397E-02 | | | | | | |
| | | 98.44 | 6.840E-02 | %(P | 2.481E-01 | 7.47E-02 | G K |
| | | 946.00 | -2.763E-02 | % P | 2.113E-01 | 6.14E-02 | G |
| | | 131.28 | -2.514E-03 | & P | 2.315E-01 | 6.90E-02 | G |
| | | 94.67 | -1.418E-01 | & P | 4.519E-01 | 1.36E-01 | G |
| | | 883.24 | -6.650E-02 | & | 3.576E-01 | 1.05E-01 | G |
| | | 926.70 | 7.854E-02 | & | 3.605E-01 | 1.06E-01 | G |
| | | 569.26 | -3.187E-02 | & P | 3.455E-01 | 1.00E-01 | G |
| TH-234 | 1.1494E+00 | | | | | | |
| | | 63.29 | 1.149E+00 | %(P | 7.400E+00 | 2.21E+00 | G K |
| | | 92.80 | 1.396E+00 | % P | 2.406E+00 | 7.30E-01 | G |
| | | 92.38 | 1.648E+00 | & P | 2.865E+00 | 8.69E-01 | G |
| AM-241 | -2.0160E-01 | | | | | | |
| | | 59.54 | -2.016E-01 | %(P | 1.289E+00 | 3.86E-01 | G |

( - This peak used in the nuclide activity average.

* - Peak is too wide, but only one peak in library.
! - Peak is part of a multiplet and this area went negative during deconvolution.
? - Peak is too narrow.
@ - Peak is too wide at FW25M, but ok at FWHM.
% - Peak fails sensitivity test.
$ - Peak identified, but first peak of this nuclide failed one or more qualification tests.
+ - Peak activity higher than counting uncertainty range.
- - Peak activity lower than counting uncertainty range.
= - Peak outside analysis energy range.
& - Calculated peak centroid is not close enough to the library energy centroid for positive identification.
P - Peakbackground subtraction
} - Peak is too close to another for the activity to be found directly.

| Nuclide Codes: | Peak Codes: |
|---|---|
| T - Thermal Neutron Activation | G - Gamma Ray |
| F - Fast Neutron Activation | X - X-Ray |
| I - Fission Product | P - Positron Decay |
| N - Naturally Occurring Isotope | S - Single-Escape |
| P - Photon Reaction | D - Double-Escape |
| C - Charged Particle Reaction | K - Key Line |
| M - No MDA Calculation | A - Not in Average |

R - Coincidence Corrected C - Coincidence Peak
H - Halflife limit exceeded

- - - - - - - - - - - - - - - - - - - - - - - - - - - - - - - - - - - - - - -

***** S U M M A R Y O F N U C L I D E S I N S A M P L E *****

| Nuclide | | Time of Count Activity pCi/gm | Time Corrected Activity pCi/gm | Uncertainty 3 Sigma Counting pCi/gm | Total pCi/gm | MDA pCi/gm |
|---|---|---|---|---|---|---|
| BE-7 | #A | -1.4851E-02 | -1.6103E-02 | 3.3240E-01 | 3.3240E-01 | 3.493E-01 |
| K-40 | | 2.2742E+01 | 2.2742E+01 | 1.5947E+00 | 2.0703E+00 | |
| MN-54 | #A | -1.3112E-02 | -1.3295E-02 | 4.0290E-02 | 4.0297E-02 | 4.264E-02 |
| CO-57 | #B | -1.3964E-02 | -1.4189E-02 | 5.2755E-02 | 5.2761E-02 | 5.626E-02 |
| CO-60 | #B | -9.7971E-03 | -9.8191E-03 | 7.3891E-02 | 7.3893E-02 | 4.561E-02 |
| Sr-85 | #A | -2.3187E-02 | -2.4786E-02 | 4.8751E-02 | 4.8772E-02 | 5.018E-02 |
| Kr-85 | #A | -5.3538E+02 | -5.3540E+02 | 1.0529E+03 | 1.0534E+03 | 1.159E+03 |
| Y-88 | #B | -4.5047E-03 | -4.6911E-03 | 2.9859E-02 | 2.9860E-02 | 3.308E-02 |
| NB-94 | #B | 1.1015E-02 | 1.1015E-02 | 3.2500E-02 | 3.2506E-02 | 3.654E-02 |
| Ag-108M | #B | -1.7172E-02 | -1.7173E-02 | 4.3920E-02 | 4.3931E-02 | 4.884E-02 |
| CD-109 | #A | 1.9089E+00 | 1.9272E+00 | 1.9025E+00 | 1.9055E+00 | 2.039E+00 |
| SN-113 | #B | -1.6756E-02 | -1.7397E-02 | 5.1736E-02 | 5.1745E-02 | 5.545E-02 |
| SB-125 | #F | 1.1059E-01 | 1.1107E-01 | 8.3362E-02 | 8.3611E-02 | 1.035E-01 |
| I-131 | #B | -4.6506E-04 | -7.9611E-04 | 5.2205E-01 | 5.2205E-01 | 4.598E-02 |
| CS-134 | #B | 1.7003E-02 | 1.7101E-02 | 1.8013E-02 | 1.8040E-02 | 3.146E-02 |
| CS-137 | #A | 1.4470E-02 | 1.4475E-02 | 4.1643E-02 | 4.1652E-02 | 4.661E-02 |
| CE-139 | #A | 6.6477E-03 | 6.8600E-03 | 4.5747E-02 | 4.5749E-02 | 4.938E-02 |
| EU-152 | #B | 7.6855E-02 | 7.6927E-02 | 6.1192E-02 | 6.1340E-02 | 1.651E-01 |
| EU-154 | #B | 1.1559E-02 | 1.1575E-02 | 1.0610E-01 | 1.0610E-01 | 1.180E-01 |
| EU-155 | #A | 2.1153E-01 | 2.1203E-01 | 2.4081E-01 | 2.4110E-01 | 2.612E-01 |
| HG-203 | #B | -7.2636E-03 | -7.9697E-03 | 4.7057E-02 | 4.7059E-02 | 4.769E-02 |
| TL-208 | | 3.0947E-01 | 3.0947E-01 | 6.6284E-02 | 6.8676E-02 | |
| PB-212 | | 9.7216E-01 | 9.7216E-01 | 1.2686E-01 | 1.3885E-01 | |
| PB-214 | | 5.9326E-01 | 5.9326E-01 | 1.1639E-01 | 1.2138E-01 | |
| BI-212 | # | 9.6364E-01 | 9.6364E-01 | 4.2009E-01 | 4.2380E-01 | |
| BI-214 | | 6.2532E-01 | 6.2532E-01 | 1.3733E-01 | 1.4205E-01 | |
| RA-224 | A | 1.0802E+00 | 1.0802E+00 | 1.1084E+00 | 1.1101E+00 | 1.200E+00 |
| RA-226 | # | 1.4957E+00 | 1.4957E+00 | 1.1479E+00 | 1.1512E+00 | 1.232E+00 |
| AC-228 | | 1.0087E+00 | 1.0087E+00 | 2.3039E-01 | 2.3771E-01 | |
| TH-227 | #B | -2.2496E-01 | -2.2496E-01 | 3.9600E-01 | 3.9622E-01 | 4.346E-01 |
| PA-234 | #B | 6.8397E-02 | 6.8397E-02 | 2.2412E-01 | 2.2415E-01 | 2.481E-01 |
| TH-234 | #B | 1.1494E+00 | 1.1494E+00 | 6.6436E+00 | 6.6439E+00 | 7.400E+00 |
| AM-241 | #A | -2.0159E-01 | -2.0160E-01 | 1.1791E+00 | 1.1792E+00 | 1.289E+00 |

# - All peaks for activity calculation had bad shape.
* - Activity omitted from total
& - Activity omitted from total and all peaks had bad shape.
< - MDA value printed.
A - Activity printed, but activity < MDA.
B - Activity < MDA and failed test.
C - Area < Critical level.
F - Failed fraction or key line test.

H – Halflife limit exceeded

YAEC Chemistry Lab Spectrum name: 103F_15SEPT2006_1338.An1

---------- S U M M A R Y ----------

Total Activity ( 1107.0 to 2000.7 keV) 2.8294500E+01 pCi/gm
Total Decayed Activity ( 1107.0 to 2000.7 keV) 2.8294500E+01 pCi/gm

The library has energies which are not separable.

Analyzed by: _____
JPK

Reviewed by: _____
Supervisor

Laboratory: YAEC Chemistry Lab

YAEC Chemistry Lab Spectrum name: 103F_15SEPT2006_1419.An1

Sample description
FSS-SSS-01-01-018-F

Spectrum Filename: C:\GammaVision\Spectra\103F_15SEPT2006_1419.An1

Acquisition information
Start time: 15-Sep-2006 14:19:00
Live time: 2000
Real time: 2002
Dead time: 0.12 %
Detector ID: 4

Detector system
Det 103 - DSPE-471

Calibration
Filename: D3_1LSa.Clb
Detector_103 1.0 Liter Sand Geometry

Energy Calibration
Created: 08-Aug-2005 11:09:41
Zero offset: 0.409 keV
Gain: 0.500 keV/channel
Quadratic: 1.092E-08 keV/channel^2

Efficiency Calibration
Created: 08-Aug-2005 11:11:25
Type: Polynomial
Uncertainty: 0.993 %
Coefficients: -0.264059 -5.138468 0.638383
-0.089199 0.005011 -0.000129

Library Files
Main analysis library: FSS_Rev_1.Lib
Library Match Width: 1.000
Peak stripping: Library based

Analysis parameters
Analysis engine: Env32 G53W4.20
Start channel: 100 ( 50.41keV )
Stop channel: 4000 ( 2000.67keV )
Peak rejection level: 41.667%
Peak search sensitivity: 3
Sample Size: 1.8980E+03
Activity scaling factor: 1.0000E+06/( 1.0000E+00* 1.8980E+03) =
5.2687E+02
Detection limit method: Nureg 4.16
Random error: 1.0000000E+00
Systematic error: 1.0000000E+00

| | |
|---|---|
| Fraction Limit: | 0.000% |
| Background width: | average of five points. |

YAEC Chemistry Lab Spectrum name: 103F_15SEPT2006_1419.An1

Half lives decay limit: 12.000
Activity range factor: 2.000
Min. step backg. energy 0.000
Multiplet shift channel 2.000

| Corrections | Status | Comments |
|---|---|---|
| Decay correct to date: | YES | 10-Sep-2006 15:10:00 |
| Decay during acquisition: | NO | |
| Decay during collection: | NO | |
| True coincidence correction: | NO | |
| Peaked background correction: | YES | 103_150K_05AUG05.Pbc 08-Aug-2005 12:54:15 |
| Absorption (Internal): | NO | |
| Geometry correction: | NO | |
| Random summing: | NO | |

total peaks alloc. 15 cutoff 20.00000 %
Energy Calibration
Normalized diff: 0.2254

***** S U M M A R Y O F P E A K S I N R A N G E *****

| Peak Energy | Area | Uncert | FWHM | Corrctn Factor | Nuclide Energy | Brnch. Ratio | Act. pCi/gm | Nuc |
|---|---|---|---|---|---|---|---|---|
| 74.78 | 111. | 26.10 | 0.99 | 9.055E-03 | 74.81 | 9.600 | 8.859E-01 | PB212 |
| 77.24 | 253. | 12.32 | 0.99 | 1.019E-02 | 77.11 | 17.500 | 1.008E+00 | PB212 |
| | | | | | 77.11 | 10.700 | 1.648E+00 | PB214 |
| 86.84 | 97. | 30.44 | 1.00 | 1.427E-02 | 86.45 | 32.740 | 1.496E-01 | EU155 |
| 89.90 | 99. | 30.87 | 1.00 | 1.542E-02 | | | | |
| 93.95 | 105. | 30.43 | 1.00 | 1.685E-02 | 92.38 | 2.570 | PBC<MDA | TH234 |
| | | | | | 92.80 | 3.000 | PBC<MDA | TH234 |
| 186.35 | 152. | 25.15 | 1.09 | 2.566E-02 | 185.99 | 3.280 | 1.172E+00 | RA226 |
| 209.70 | 108. | 30.87 | 0.95 | 2.469E-02 | | | | |
| 238.81 | 1141. | 3.52 | 1.09 | 2.319E-02 | 238.63 | 43.100 | 8.038E-01 | PB212 |
| 241.53 | 165. | 20.22 | 1.09 | 2.305E-02 | 241.00 | 3.900 | 1.305E+00 | RA224 |
| | | | | | 241.92 | 7.470 | 6.825E-01 | PB214 |
| 270.49 | 130. | 25.63 | 1.18 | 2.150E-02 | | | | |
| 277.49 | 86. | 34.83 | 0.86 | 2.114E-02 | | | | |
| 295.46 | 260. | 9.20 | 1.13 | 2.024E-02 | 295.22 | 19.200 | 4.686E-01 | PB214 |
| 300.08 | 82. | 24.74 | 1.13 | 2.001E-02 | | | | |
| 328.22 | 122. | 22.25 | 1.20 | 1.873E-02 | | | | |
| 338.49 | 257. | 14.18 | 1.22 | 1.830E-02 | 338.40 | 12.010 | 8.277E-01 | AC228 |
| 352.08 | 499. | 7.83 | 1.22 | 1.775E-02 | 351.99 | 37.100 | 5.335E-01 | PB214 |
| 463.30 | 124. | 22.06 | 1.84 | 1.425E-02 | | | | |
| 463.30 | 124. | 22.06 | 1.84 | 1.425E-02 | 463.51 | 10.000 | 6.129E-01 | SB125 |
| 511.02 | 171. | 15.79 | 1.45 | 1.317E-02 | 510.72 | 22.500 | 3.467E-01 | TL208 |
| 583.48 | 417. | 7.50 | 1.45 | 1.184E-02 | 583.14 | 86.000 | 2.883E-01 | TL208 |
| 609.51 | 399. | 7.10 | 1.26 | 1.144E-02 | 609.32 | 46.090 | 5.298E-01 | BI214 |
| 727.94 | 131. | 15.63 | 0.97 | 9.957E-03 | 727.17 | 11.800 | 7.902E-01 | BI212 |
| 795.36 | 53. | 24.46 | 1.20 | 9.305E-03 | | | | |
| 795.36 | 53. | 24.46 | 1.20 | 9.305E-03 | 795.76 | 85.400 | 4.783E-02 | CS134 |

| | | | | | | | | |
|---|---|---|---|---|---|---|---|---|
| 911.65 | 309. | 8.20 | 1.61 | 8.397E-03 | 911.07 | 29.000 | 8.932E-01 | AC228 |
| 965.11 | 56. | 22.38 | 1.54 | 8.049E-03 | 964.00 | 14.580 | PBC<MDA | EU152 |
| 969.66 | 165. | 9.78 | 1.54 | 8.021E-03 | 968.90 | 17.460 | 8.385E-01 | AC228 |
| 1120.71 | 82. | 21.05 | 0.90 | 7.210E-03 | 1120.28 | 15.040 | 5.258E-01 | BI214 |
| 1461.55 | 1720. | 2.52 | 1.92 | 5.930E-03 | 1460.75 | 10.700 | 1.908E+01 | K40 |
| 1589.15 | 62. | 16.84 | 0.89 | 5.569E-03 | | | | |
| 1765.28 | 82. | 12.36 | 2.07 | 5.140E-03 | 1764.51 | 15.920 | 6.883E-01 | BI214 |

********** U N I D E N T I F I E D P E A K S U M M A R Y **********

| Peak Channel | Centroid Energy | Background Counts | Net Area Counts | Intensity Cts/Sec | Uncert 3 Sigma % | FWHM keV | Suspected Nuclide | |
|---|---|---|---|---|---|---|---|---|
| 172.86 | 86.86 | 386. | 97. | 0.048 | 91.31 | 1.001 | TB-160 | lD |
| 178.97 | 89.91 | 418. | 99. | 0.050 | 92.60 | 1.002 | PB-214 | lD |
| 418.56 | 209.70 | 456. | 108. | 0.054 | 92.60 | 0.953 | NP-239 | |
| 540.13 | 270.49 | 374. | 130. | 0.065 | 76.88 | 1.181 | AC-228 | s |
| 554.13 | 277.49 | 332. | 83. | 0.041 | 98.96 | 0.864 | NP-239 | |
| 599.30 | 300.08 | 204. | 77. | 0.038 | 85.80 | 0.707 | PB-212 | |
| 655.58 | 328.22 | 246. | 122. | 0.061 | 66.76 | 1.198 | AC-228 | s |
| 1930.80 | 965.21 | 61. | 46. | 0.023 | 85.18 | 1.539 | AC-228 | D |
| 3177.12 | 1589.15 | 9. | 62. | 0.031 | 50.52 | 0.887 | AC-228 | s |

s - Peak fails shape tests.
D - Peak area deconvoluted.
L - Peak written from unknown list.
C - Area < Critical level.

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This section based on library: FSS_Rev_1.Lib

********** I D E N T I F I E D P E A K S U M M A R Y **********

| Nuclide | Peak Channel | Centroid Energy | Background Counts | Net Area Counts | Intensity Cts/Sec | Uncert 3 Sigma % | FWHM keV |
|---|---|---|---|---|---|---|---|
| PB-212 | 148.79 | 74.81 | 370. | 107. | 0.054 | 78.78 | 0.993D |
| PB-212 | 153.39 | 77.11 | 364. | 197. | 0.098 | 4.20 | 0.995A |
| TH-234 | 185.83 | 93.33 | 1003. | 152. | 0.076 | 82.05 | 1.500s |
| TH-234 | 185.82 | 93.32 | 979. | 157. | 0.078 | 78.79 | 1.500s |
| RA-226 | 371.85 | 186.35 | 578. | 139. | 0.069 | 75.46 | 1.089s |
| PB-212 | 476.74 | 238.79 | 723. | 1082. | 0.541 | 14.69 | 1.063 |
| RA-224 | 482.84 | 241.84 | 794. | 138. | 0.069 | 90.14 | 1.500 |
| PB-214 | 590.06 | 295.46 | 255. | 236. | 0.118 | 35.15 | 0.974 |
| AC-228 | 676.11 | 338.49 | 345. | 256. | 0.128 | 42.54 | 1.216 |
| PB-214 | 703.29 | 352.08 | 337. | 494. | 0.247 | 23.49 | 1.216 |
| SB-125 | 925.81 | 463.34 | 191. | 77. | 0.039 | 81.82 | 1.500s |
| TL-208 | 1021.15 | 511.02 | 213. | 144. | 0.072 | 47.37 | 1.446s |
| TL-208 | 1166.07 | 583.48 | 175. | 412. | 0.206 | 22.51 | 1.452 |
| BI-214 | 1218.13 | 609.51 | 137. | 392. | 0.196 | 21.31 | 1.264 |
| BI-212 | 1454.95 | 727.94 | 96. | 131. | 0.065 | 46.88 | 0.970s |
| CS-134 | 1589.64 | 795.29 | 48. | 57. | 0.029 | 64.64 | 1.500 |
| AC-228 | 1822.33 | 911.65 | 98. | 306. | 0.153 | 24.59 | 1.612s |
| AC-228 | 1936.81 | 968.90 | 54. | 165. | 0.082 | 30.08 | 1.541D |
| BI-214 | 2240.39 | 1120.71 | 74. | 80. | 0.040 | 63.16 | 0.900s |
| K-40 | 2921.98 | 1461.55 | 56. | 1701. | 0.850 | 7.57 | 1.924 |
| BI-214 | 3529.30 | 1765.28 | 9. | 79. | 0.040 | 37.07 | 2.074 |

s - Peak fails shape tests.
D - Peak area deconvoluted.
A Derived peak area.

***** S U M M A R Y O F L I B R A R Y P E A K U S A G E *****

| - Nuclide - Name | Code | Average Activity pCi/gm | Peak Energy keV | Peak Activity pCi/gm | Code | Peak MDA Value pCi/gm | | COMMENTS |
|---|---|---|---|---|---|---|---|---|
| BE-7 | | 7.1885E-02 | | | | | | |
| | | | 477.56 | 7.188E-02 | %( | 3.497E-01 | 1.04E-01 G | |
| K-40 | | 1.9079E+01 | | | | | | |
| | | | 1460.75 | 1.908E+01 | (P | 4.220E-01 | 4.87E-01 G | |
| MN-54 | | -2.6167E-03 | | | | | | |
| | | | 834.81 | -2.617E-03 | &(P | 3.814E-02 | 1.10E-02 G | |
| CO-57 | | -6.9497E-03 | | | | | | |
| | | | 122.07 | -6.950E-03 | %(P | 5.466E-02 | 1.64E-02 G K | |
| | | | 136.43 | -7.015E-03 | % | 3.481E-01 | 1.04E-01 G | |
| CO-60 | | -4.9999E-03 | | | | | | |
| | | | 1332.51 | -5.000E-03 | %(P | 3.855E-02 | 1.06E-02 G K | |
| | | | 1173.23 | 6.574E-03 | % P | 5.018E-02 | 1.45E-02 G K | |
| Sr-85 | | -2.0423E-02 | | | | | | |
| | | | 514.00 | -2.042E-02 | &( | 4.571E-02 | 1.38E-02 G | |
| Kr-85 | | -4.4714E+02 | | | | | | |
| | | | 513.99 | -4.471E+02 | &( | 1.001E+03 | 3.03E+02 G | |
| Y-88 | | 4.6274E-03 | | | | | | |
| | | | 1836.01 | 4.627E-03 | &(P | 2.045E-02 | 5.62E-03 G K | |
| | | | 898.02 | 1.072E-02 | % P | 3.774E-02 | 1.11E-02 G | |
| NB-94 | | 9.4455E-03 | | | | | | |
| | | | 871.10 | 9.446E-03 | %( | 3.330E-02 | 9.83E-03 G K | |
| | | | 702.50 | 9.994E-04 | % | 3.331E-02 | 9.57E-03 G K | |
| Ag-108M | | 1.2423E-03 | | | | | | |
| | | | 722.95 | 1.242E-03 | %( | 4.446E-02 | 1.29E-02 G K | |
| | | | 614.37 | -3.241E-02 | & P | 4.715E-02 | 1.45E-02 G | |
| | | | 433.93 | -1.559E-02 | % | 3.907E-02 | 1.18E-02 G | |
| CD-109 | | -2.6182E-01 | | | | | | |
| | | | 88.04 | -2.618E-01 | &( | 1.519E+00 | 4.54E-01 G | |

| Nuclide | Ave activity | Energy | Activity | Code | Peak | MDA | Comments |
|---|---|---|---|---|---|---|---|
| SN-113 | -7.2506E-04 | | | | | | |
| | | 391.71 | -7.251E-04 | %( | 5.196E-02 | 1.52E-02 | G K |
| | | 255.04 | 3.258E-01 | & | 1.618E+00 | 4.83E-01 | G |
| SB-125 | 9.7728E-02 | | | | | | |
| | | 427.95 | -1.232E-04 | %(P | 1.063E-01 | 3.10E-02 | G K |
| | | 600.77 | 5.846E-02 | % P | 1.537E-01 | 4.61E-02 | G |
| | | 636.15 | 6.200E-03 | & P | 2.502E-01 | 7.13E-02 | G |
| | | 463.51 | 3.874E-01 | *(P | 3.368E-01 | 1.07E-01 | G |
| | | 176.29 | 2.750E-02 | % | 5.873E-01 | 1.75E-01 | G |
| I-131 | -5.7027E-03 | | | | | | |
| | | 364.48 | -5.703E-03 | &(P | 5.794E-02 | 1.70E-02 | G K |
| | | 636.97 | -8.704E-02 | % | 7.206E-01 | 2.10E-01 | G |
| | | 284.29 | 1.547E-01 | % P | 7.656E-01 | 2.28E-01 | G |
| CS-134 | 2.3869E-02 | | | | | | |
| | | 604.66 | -5.297E-04 | %( | 3.674E-02 | 1.06E-02 | G K |
| | | 795.76 | 5.175E-02 | (P | 3.158E-02 | 1.12E-02 | G |
| | | 569.29 | -6.486E-03 | & P | 2.445E-01 | 7.07E-02 | G |
| | | 801.84 | -1.618E-02 | % P | 4.119E-01 | 1.17E-01 | G |
| CS-137 | 6.7302E-03 | | | | | | |
| | | 661.62 | 6.730E-03 | %(P | 4.056E-02 | 1.19E-02 | G |
| CE-139 | -9.7804E-03 | | | | | | |
| | | 165.85 | -9.780E-03 | &( | 4.712E-02 | 1.41E-02 | G |
| EU-152 | -1.8470E-02 | | | | | | |
| | | 121.78 | -1.847E-02 | %(P | 1.582E-01 | 4.73E-02 | G K |
| | | 344.30 | -4.601E-03 | % P | 1.172E-01 | 3.44E-02 | G |
| | | 1408.08 | 6.860E-02 | % | 1.503E-01 | 4.55E-02 | G |
| | | 964.00 | 3.313E-03 | % P | 3.763E-01 | 1.09E-01 | G |
| | | 1112.07 | 8.364E-03 | % | 3.498E-01 | 1.01E-01 | G |
| | | 778.90 | -6.871E-02 | % | 3.011E-01 | 8.89E-02 | G |
| EU-154 | -1.2363E-02 | | | | | | |
| | | 123.10 | -1.236E-02 | %( | 9.240E-02 | 2.76E-02 | G K |
| | | 1274.80 | -2.825E-02 | % | 1.409E-01 | 4.13E-02 | G |
| | | 723.30 | 3.312E-02 | % | 2.001E-01 | 5.88E-02 | G |
| | | 1004.80 | -5.748E-03 | % | 2.494E-01 | 7.16E-02 | G |
| EU-155 | 1.3797E-01 | | | | | | |
| | | 86.45 | 1.380E-01 | %( | 2.345E-01 | 7.14E-02 | G K |
| | | 105.31 | 1.768E-02 | & | 2.290E-01 | 6.84E-02 | G |

| Nuclide | Ave activity | Energy | Activity | Code | Peak | MDA | Comments |
|---|---|---|---|---|---|---|---|
| HG-203 | 1.6084E-03 | | | | | | |
| | | 279.17 | 1.608E-03 | &(P | 4.356E-02 | 1.29E-02 | G K |
| | | 72.87 | -7.222E-01 | % P | 2.312E+00 | 6.97E-01 | G |
| | | 70.83 | -1.293E-01 | % | 5.027E+00 | 1.50E+00 | G |
| | | 82.50 | -1.080E+00 | % | 3.915E+00 | 1.18E+00 | G |
| TL-208 | 3.0042E-01 | | | | | | |
| | | 583.14 | 2.883E-01 | (P | 4.492E-02 | 2.19E-02 | G |
| | | 510.72 | 3.467E-01 | *(P | 1.698E-01 | 6.49E-02 | G |
| PB-212 | 7.9059E-01 | | | | | | |
| | | 238.63 | 7.705E-01 | (P | 9.115E-02 | 3.82E-02 | G K |
| | | | | | | | Energy duplication |
| | | 77.11 | 7.906E-01 | } P | 3.683E-01 | 1.11E-02 | G |
| | | 74.81 | 8.808E-01 | (P | 7.561E-01 | 2.38E-01 | G |
| PB-214 | 5.3354E-01 | | | | | | |
| | | 351.99 | 5.335E-01 | (P | 9.547E-02 | 4.23E-02 | G K |
| | | 295.22 | 4.325E-01 | - P | 1.412E-01 | 5.16E-02 | G |
| | | | | | | | Energy duplication |
| | | 77.11 | 9.024E-02 | } P | 8.893E-01 | 2.37E-01 | G |
| | | 241.92 | 2.970E-01 | % | 5.781E-01 | 1.76E-01 | G |
| BI-212 | 7.9023E-01 | | | | | | |
| | | 727.17 | 7.902E-01 | (P | 2.936E-01 | 1.24E-01 | G K |
| | | 1620.56 | 7.007E-02 | & P | 1.021E+00 | 2.77E-01 | G |
| | | 785.42 | -7.700E-02 | % | 1.953E+00 | 5.64E-01 | G |
| BI-214 | 5.2883E-01 | | | | | | |
| | | 609.32 | 5.298E-01 | (P | 7.723E-02 | 3.83E-02 | G K |
| | | 1764.51 | 6.883E-01 | + P | 1.443E-01 | 8.86E-02 | G |
| | | 1120.28 | 5.258E-01 | *(P | 2.807E-01 | 1.13E-01 | G |
| RA-224 | 1.0945E+00 | | | | | | |
| | | 241.00 | 1.094E+00 | &( | 1.061E+00 | 3.29E-01 | G |
| RA-226 | 1.1717E+00 | | | | | | |
| | | 185.99 | 1.172E+00 | *(P | 9.708E-01 | 3.22E-01 | G |
| AC-228 | 8.6285E-01 | | | | | | |
| | | 911.07 | 8.932E-01 | @(P | 1.430E-01 | 7.41E-02 | G K |
| | | 968.90 | 8.367E-01 | (P | 1.883E-01 | 8.40E-02 | G |
| | | 338.40 | 8.277E-01 | (P | 2.894E-01 | 1.18E-01 | G |
| TH-227 | -1.2573E-01 | | | | | | |
| | | 236.00 | -1.257E-01 | %( | 3.873E-01 | 1.17E-01 | G K |
| | | 256.25 | 1.137E-01 | % P | 4.814E-01 | 1.44E-01 | G |

| Nuclide | Ave activity | Energy | Activity | Code | Peak | MDA | Comments |
|---|---|---|---|---|---|---|---|
| PA-234 | -1.9834E-03 | | | | | | |
| | | 98.44 | -1.983E-03 | %(P | 2.221E-01 | 6.61E-02 | G K |
| | | 946.00 | -2.521E-04 | & P | 1.507E-01 | 4.22E-02 | G |
| | | 131.28 | -9.115E-04 | & P | 2.117E-01 | 6.30E-02 | G |
| | | 94.67 | 3.907E-02 | % P | 3.504E-01 | 1.05E-01 | G |
| | | 883.24 | 8.626E-02 | % | 2.532E-01 | 7.52E-02 | G |
| | | 926.70 | 5.011E-02 | & | 2.931E-01 | 8.49E-02 | G |
| | | 569.26 | -9.578E-03 | & P | 3.610E-01 | 1.04E-01 | G |
| TH-234 | 1.7170E+00 | | | | | | |
| | | 63.29 | 7.335E-01 | %(P | 6.936E+00 | 2.07E+00 | G K |
| | | 92.80 | 2.261E+00 | &(P | 2.143E+00 | 6.61E-01 | G |
| | | 92.38 | 2.574E+00 | &(P | 2.554E+00 | 7.86E-01 | G |
| AM-241 | 3.4941E-01 | | | | | | |
| | | 59.54 | 3.494E-01 | &(P | 1.080E+00 | 3.25E-01 | G |

( - This peak used in the nuclide activity average.

* - Peak is too wide, but only one peak in library.
! - Peak is part of a multiplet and this area went
negative during deconvolution.
? - Peak is too narrow.
@ - Peak is too wide at FW25M, but ok at FWHM.
% - Peak fails sensitivity test.
$ - Peak identified, but first peak of this nuclide
failed one or more qualification tests.
+ - Peak activity higher than counting uncertainty range.
- - Peak activity lower than counting uncertainty range.
= - Peak outside analysis energy range.
& - Calculated peak centroid is not close enough to the
library energy centroid for positive identification.
P - Peakbackground subtraction
} - Peak is too close to another for the activity
to be found directly.

| Nuclide Codes: | Peak Codes: |
|---|---|
| T - Thermal Neutron Activation | G - Gamma Ray |
| F - Fast Neutron Activation | X - X-Ray |
| I - Fission Product | P - Positron Decay |
| N - Naturally Occurring Isotope | S - Single-Escape |
| P - Photon Reaction | D - Double-Escape |
| C - Charged Particle Reaction | K - Key Line |
| M - No MDA Calculation | A - Not in Average |
| R - Coincidence Corrected | C - Coincidence Peak |
| H - Halflife limit exceeded | |

- - - - - - - - - - - - - - - - - - - - - - - - - - - - - - - - - - - - - - -

***** S U M M A R Y O F N U C L I D E S I N S A M P L E *****

| Nuclide | | Time of Count Activity pCi/gm | Time Corrected Activity pCi/gm | Uncertainty Counting pCi/gm | 3 Sigma Total pCi/gm | MDA pCi/gm |
|---|---|---|---|---|---|---|
| BE-7 | #A | 6.7398E-02 | 7.1885E-02 | 3.1087E-01 | 3.1090E-01 | 3.279E-01 |
| K-40 | | 1.9079E+01 | 1.9079E+01 | 1.4607E+00 | 1.8332E+00 | |
| MN-54 | #A | -2.5880E-03 | -2.6167E-03 | 4.1059E-02 | 4.1059E-02 | 3.772E-02 |
| CO-57 | #B | -6.8617E-03 | -6.9497E-03 | 5.1328E-02 | 5.1329E-02 | 5.397E-02 |
| CO-60 | #B | -4.9909E-03 | -4.9999E-03 | 1.2478E-01 | 1.2478E-01 | 3.848E-02 |
| Sr-85 | #A | -1.9368E-02 | -2.0423E-02 | 4.1487E-02 | 4.1504E-02 | 4.334E-02 |
| Kr-85 | #A | -4.4713E+02 | -4.4714E+02 | 9.0830E+02 | 9.0867E+02 | 1.001E+03 |
| Y-88 | #B | 4.4804E-03 | 4.6274E-03 | 1.6857E-02 | 1.6859E-02 | 1.980E-02 |
| NB-94 | #B | 9.4455E-03 | 9.4455E-03 | 2.9498E-02 | 2.9503E-02 | 3.330E-02 |
| Ag-108M | #B | 1.2422E-03 | 1.2423E-03 | 3.8648E-02 | 3.8648E-02 | 4.445E-02 |
| CD-109 | #A | -2.5984E-01 | -2.6182E-01 | 1.3627E+00 | 1.3627E+00 | 1.508E+00 |
| SN-113 | #B | -7.0370E-04 | -7.2506E-04 | 4.5626E-02 | 4.5626E-02 | 5.043E-02 |
| SB-125 | #B | 9.7396E-02 | 9.7728E-02 | 8.1282E-02 | 8.1480E-02 | 1.060E-01 |
| I-131 | #B | -3.7171E-03 | -5.7027E-03 | 6.1642E-02 | 6.1643E-02 | 3.777E-02 |
| CS-134 | #B | 2.3760E-02 | 2.3869E-02 | 1.5453E-02 | 1.5515E-02 | 3.657E-02 |
| CS-137 | #A | 6.7281E-03 | 6.7302E-03 | 3.5559E-02 | 3.5561E-02 | 4.055E-02 |
| CE-139 | #A | -9.5387E-03 | -9.7804E-03 | 4.2400E-02 | 4.2404E-02 | 4.596E-02 |
| EU-152 | #B | -1.8456E-02 | -1.8470E-02 | 1.5816E-01 | 1.5816E-01 | 1.581E-01 |
| EU-154 | #B | -1.2350E-02 | -1.2363E-02 | 8.2787E-02 | 8.2790E-02 | 9.230E-02 |
| EU-155 | #B | 1.3771E-01 | 1.3797E-01 | 2.1424E-01 | 2.1438E-01 | 2.341E-01 |
| HG-203 | #B | 1.4939E-03 | 1.6084E-03 | 3.8640E-02 | 3.8640E-02 | 4.046E-02 |
| TL-208 | | 3.0042E-01 | 3.0042E-01 | 6.8346E-02 | 7.0536E-02 | |
| PB-212 | | 7.9059E-01 | 7.9059E-01 | 1.1746E-01 | 1.2611E-01 | |
| PB-214 | | 5.3354E-01 | 5.3354E-01 | 1.2676E-01 | 1.3049E-01 | |
| BI-212 | # | 7.9023E-01 | 7.9023E-01 | 3.7184E-01 | 3.7466E-01 | |
| BI-214 | | 5.2883E-01 | 5.2883E-01 | 1.1455E-01 | 1.1859E-01 | |
| RA-224 | # | 1.0945E+00 | 1.0945E+00 | 9.8651E-01 | 9.8855E-01 | 1.061E+00 |
| RA-226 | # | 1.1717E+00 | 1.1717E+00 | 9.6686E-01 | 9.6925E-01 | |
| AC-228 | | 8.6285E-01 | 8.6285E-01 | 1.6648E-01 | 1.7385E-01 | |
| TH-227 | #B | -1.2573E-01 | -1.2573E-01 | 3.5033E-01 | 3.5041E-01 | 3.873E-01 |
| PA-234 | #B | -1.9834E-03 | -1.9834E-03 | 1.5655E+00 | 1.5655E+00 | 2.221E-01 |
| TH-234 | #B | 1.7170E+00 | 1.7170E+00 | 1.5052E+00 | 1.5082E+00 | 6.936E+00 |
| AM-241 | #A | 3.4940E-01 | 3.4941E-01 | 9.7584E-01 | 9.7603E-01 | 1.080E+00 |

# - All peaks for activity calculation had bad shape.
* - Activity omitted from total
& - Activity omitted from total and all peaks had bad shape.
< - MDA value printed.
A - Activity printed, but activity < MDA.
B - Activity < MDA and failed test.
C - Area < Critical level.
F - Failed fraction or key line test.
H - Halflife limit exceeded

YAEC Chemistry Lab Spectrum name: 103F_15SEPT2006_1419.An1

---------- S U M M A R Y ----------

Total Activity ( 1120.0 to 2000.7 keV) 2.4057386E+01 pCi/gm
Total Decayed Activity ( 1120.0 to 2000.7 keV) 2.4057394E+01 pCi/gm

The library has energies which are not separable.

Analyzed by: _____
JPK

Reviewed by: _____
Supervisor

Laboratory: YAEC Chemistry Lab

YAEC Chemistry Lab Spectrum name: 103F_15SEPT2006_1458.An1

Sample description
FSS-SSS-01-01-018-F-RC

Spectrum Filename: C:\GammaVision\Spectra\103F_15SEPT2006_1458.An1

Acquisition information
Start time: 15-Sep-2006 14:58:16
Live time: 2000
Real time: 2002
Dead time: 0.12 %
Detector ID: 4

Detector system
Det 103 - DSPE-471

Calibration
Filename: D3_1LSa.Clb
Detector_103 1.0 Liter Sand Geometry

Energy Calibration
Created: 08-Aug-2005 11:09:41
Zero offset: 0.409 keV
Gain: 0.500 keV/channel
Quadratic: 1.092E-08 keV/channel^2

Efficiency Calibration
Created: 08-Aug-2005 11:11:25
Type: Polynomial
Uncertainty: 0.993 %
Coefficients: -0.264059 -5.138468 0.638383
-0.089199 0.005011 -0.000129

Library Files
Main analysis library: FSS_Rev_1.Lib
Library Match Width: 1.000
Peak stripping: Library based

Analysis parameters
Analysis engine: Env32 G53W4.20
Start channel: 100 ( 50.41keV )
Stop channel: 4000 ( 2000.67keV )
Peak rejection level: 41.667%
Peak search sensitivity: 3
Sample Size: 1.8980E+03
Activity scaling factor: 1.0000E+06/( 1.0000E+00* 1.8980E+03) =
5.2687E+02
Detection limit method: Nureg 4.16
Random error: 1.0000000E+00
Systematic error: 1.0000000E+00

| | |
|---|---|
| Fraction Limit: | 0.000% |
| Background width: | average of five points. |

YAEC Chemistry Lab Spectrum name: 103F_15SEPT2006_1458.An1

Half lives decay limit: 12.000
Activity range factor: 2.000
Min. step backg. energy 0.000
Multiplet shift channel 2.000

| Corrections | Status | Comments |
|---|---|---|
| Decay correct to date: | YES | 10-Sep-2006 15:10:00 |
| Decay during acquisition: | NO | |
| Decay during collection: | NO | |
| True coincidence correction: | NO | |
| Peaked background correction: | YES | 103_150K_05AUG05.Pbc 08-Aug-2005 12:54:15 |
| Absorption (Internal): | NO | |
| Geometry correction: | NO | |
| Random summing: | NO | |

total peaks alloc. 17 cutoff 20.00000 %
Energy Calibration
Normalized diff: 0.2935

***** S U M M A R Y O F P E A K S I N R A N G E *****

| Peak Energy | Area | Uncert | FWHM | Corrctn Factor | Nuclide Energy | Brnch. Ratio | Act. pCi/gm | Nuc |
|---|---|---|---|---|---|---|---|---|
| 74.91 | 138. | 21.83 | 0.99 | 9.052E-03 | 74.81 | 9.600 | 1.127E+00 | PB212 |
| 77.21 | 185. | 14.04 | 0.99 | 1.011E-02 | 77.11 | 17.500 | 9.668E-01 | PB212 |
| | | | | | 77.11 | 10.700 | 1.581E+00 | PB214 |
| 93.48 | 130. | 38.35 | 1.41 | 1.668E-02 | 92.38 | 2.570 | PBC<MDA | TH234 |
| | | | | | 92.80 | 3.000 | PBC<MDA | TH234 |
| 128.65 | 99. | 39.77 | 1.04 | 2.432E-02 | | | | |
| 186.33 | 158. | 23.43 | 0.94 | 2.566E-02 | 185.99 | 3.280 | 1.223E+00 | RA226 |
| 209.86 | 90. | 33.92 | 1.02 | 2.469E-02 | | | | |
| 238.80 | 1234. | 3.33 | 1.09 | 2.319E-02 | 238.63 | 43.100 | 8.704E-01 | PB212 |
| 242.49 | 123. | 22.74 | 1.10 | 2.299E-02 | 241.00 | 3.900 | 9.726E-01 | RA224 |
| | | | | | 241.92 | 7.470 | 5.089E-01 | PB214 |
| 270.62 | 96. | 26.49 | 1.05 | 2.149E-02 | | | | |
| 277.42 | 88. | 35.57 | 1.40 | 2.114E-02 | | | | |
| 277.42 | 88. | 35.57 | 1.40 | 2.114E-02 | 279.17 | 81.500 | PBC<MDA | HG203 |
| 295.30 | 284. | 10.83 | 1.28 | 2.024E-02 | 295.22 | 19.200 | 5.134E-01 | PB214 |
| 300.21 | 58. | 36.90 | 1.41 | 2.001E-02 | | | | |
| 328.14 | 83. | 26.82 | 1.46 | 1.874E-02 | | | | |
| 338.63 | 280. | 11.36 | 1.11 | 1.829E-02 | 338.40 | 12.010 | 9.025E-01 | AC228 |
| 352.20 | 482. | 6.99 | 1.27 | 1.774E-02 | 351.99 | 37.100 | 5.145E-01 | PB214 |
| 409.18 | 47. | 36.04 | 1.24 | 1.576E-02 | | | | |
| 463.02 | 67. | 26.23 | 0.79 | 1.426E-02 | | | | |
| 463.02 | 67. | 26.23 | 0.79 | 1.426E-02 | 463.51 | 10.000 | 3.286E-01 | SB125 |
| 511.14 | 200. | 15.96 | 1.62 | 1.316E-02 | 510.72 | 22.500 | 4.152E-01 | TL208 |
| 583.51 | 416. | 6.16 | 1.27 | 1.184E-02 | 583.14 | 86.000 | 2.878E-01 | TL208 |
| 609.65 | 379. | 7.48 | 1.48 | 1.143E-02 | 609.32 | 46.090 | 5.033E-01 | BI214 |
| 727.95 | 102. | 20.94 | 1.43 | 9.957E-03 | 727.17 | 11.800 | 6.177E-01 | BI212 |
| 795.71 | 79. | 27.16 | 1.22 | 9.302E-03 | | | | |

| | | | | | | | | |
|---|---|---|---|---|---|---|---|---|
| 795.71 | 79. | 27.16 | 1.22 | 9.302E-03 | 795.76 | 85.400 | 7.124E-02 | CS134 |
| 836.68 | 32. | 32.41 | 1.11 | 8.955E-03 | | | | |
| 860.84 | 60. | 25.82 | 1.44 | 8.765E-03 | | | | |
| 911.71 | 286. | 8.22 | 1.51 | 8.397E-03 | 911.07 | 29.000 | 8.257E-01 | AC228 |
| 964.87 | 47. | 27.51 | 1.54 | 8.050E-03 | 964.00 | 14.580 | PBC<MDA | EU152 |
| 969.61 | 140. | 10.57 | 1.54 | 8.021E-03 | 968.90 | 17.460 | 7.095E-01 | AC228 |
| 1120.93 | 83. | 24.35 | 1.79 | 7.209E-03 | 1120.28 | 15.040 | 5.324E-01 | BI214 |
| 1461.61 | 1600. | 2.62 | 1.94 | 5.929E-03 | 1460.75 | 10.700 | 1.774E+01 | K40 |
| 1765.49 | 80. | 11.99 | 1.42 | 5.140E-03 | 1764.51 | 15.920 | 6.674E-01 | BI214 |

********** U N I D E N T I F I E D P E A K S U M M A R Y **********

| Peak Channel | Centroid Energy | Background Counts | Net Area Counts | Intensity Cts/Sec | Uncert 3 Sigma % | FWHM keV | Suspected Nuclide | |
|---|---|---|---|---|---|---|---|---|
| 418.88 | 209.86 | 421. | 90. | 0.045 | 101.76 | 1.024 | NP-239 | s |
| 540.39 | 270.62 | 263. | 96. | 0.048 | 79.48 | 1.053 | AC-228 | |
| 554.00 | 277.42 | 352. | 88. | 0.044 | 106.71 | 1.397 | TL-208 | l |
| 599.57 | 300.21 | 200. | 58. | 0.029 | 110.69 | 1.406 | PB-212 | s |
| 655.43 | 328.14 | 197. | 83. | 0.042 | 80.45 | 1.455 | AC-228 | s |
| 817.49 | 409.18 | 120. | 47. | 0.023 | 108.13 | 1.242 | CS-138 | |
| 1590.49 | 795.71 | 147. | 45. | 0.022 | 123.65 | 1.224 | CS-134 | |
| 1720.73 | 860.84 | 65. | 60. | 0.030 | 77.47 | 1.439 | TL-208 | |
| 1930.10 | 964.90 | 52. | 55. | 0.028 | 68.39 | 1.539 | AC-228 | D |

s - Peak fails shape tests.
D - Peak area deconvoluted.
L - Peak written from unknown list.
C - Area < Critical level.

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This section based on library: FSS_Rev_1.Lib

********** I D E N T I F I E D P E A K S U M M A R Y **********

| Nuclide | Peak Channel | Centroid Energy | Background Counts | Net Area Counts | Intensity Cts/Sec | Uncert 3 Sigma % | FWHM keV |
|---|---|---|---|---|---|---|---|
| PB-212 | 148.79 | 74.81 | 404. | 138. | 0.069 | 65.49 | 0.993D |
| PB-212 | 153.39 | 77.11 | 397. | 185. | 0.093 | 42.13 | 0.995A |
| RA-226 | 371.82 | 186.33 | 691. | 143. | 0.072 | 82.74 | 0.943 |
| PB-212 | 476.86 | 238.85 | 828. | 1173. | 0.587 | 14.74 | 1.052 |
| RA-224 | 482.62 | 241.73 | 868. | 119. | 0.059 | 108.64 | 1.500 |
| PB-214 | 589.74 | 295.30 | 293. | 280. | 0.140 | 32.48 | 1.281 |
| AC-228 | 676.40 | 338.63 | 271. | 279. | 0.139 | 34.08 | 1.112 |
| PB-214 | 703.53 | 352.20 | 247. | 476. | 0.238 | 20.97 | 1.266 |
| SB-125 | 925.49 | 463.18 | 165. | 56. | 0.028 | 102.92 | 1.500s |
| TL-208 | 1021.39 | 511.14 | 259. | 173. | 0.086 | 47.87 | 1.623s |
| TL-208 | 1166.12 | 583.51 | 100. | 412. | 0.206 | 18.47 | 1.267 |
| BI-214 | 1218.39 | 609.65 | 135. | 373. | 0.186 | 22.44 | 1.484 |
| BI-212 | 1454.97 | 727.95 | 116. | 102. | 0.051 | 62.81 | 1.431s |
| AC-228 | 1822.45 | 911.71 | 89. | 283. | 0.141 | 24.67 | 1.505 |
| EU-152 | 1929.78 | 965.38 | 101. | 41. | 0.020 | 113.20 | 1.538 |
| AC-228 | 1936.81 | 968.90 | 47. | 140. | 0.070 | 32.78 | 1.541D |
| BI-214 | 2240.83 | 1120.93 | 107. | 81. | 0.041 | 73.05 | 1.785 |
| K-40 | 2922.09 | 1461.61 | 51. | 1581. | 0.791 | 7.87 | 1.943 |
| BI-214 | 3529.73 | 1765.49 | 6. | 77. | 0.038 | 35.97 | 1.419s |

s - Peak fails shape tests.
D - Peak area deconvoluted.
A Derived peak area.

***** S U M M A R Y O F L I B R A R Y P E A K U S A G E *****

| Nuclide Name | Code | Average Activity pCi/gm | Peak Energy keV | Peak Activity pCi/gm | Code | MDA Value pCi/gm | COMMENTS |
|---|---|---|---|---|---|---|---|
| BE-7 | | 4.9729E-02 | | | | | |
| | | | 477.56 | 4.973E-02 | &( | 3.112E-01 9.15E-02 | G |
| K-40 | | 1.7738E+01 | | | | | |
| | | | 1460.75 | 1.774E+01 | (P | 4.027E-01 4.71E-01 | G |
| MN-54 | | -1.3234E-02 | | | | | |
| | | | 834.81 | -1.323E-02 | %(P | 4.128E-02 1.23E-02 | G |
| CO-57 | | 4.7953E-04 | | | | | |
| | | | 122.07 | 4.795E-04 | &(P | 4.638E-02 1.38E-02 | G K |
| | | | 136.43 | 6.404E-02 | % | 4.155E-01 1.25E-01 | G |
| CO-60 | | -3.9664E-04 | | | | | |
| | | | 1332.51 | -3.966E-04 | %(P | 3.073E-02 8.17E-03 | G K |
| | | | 1173.23 | 1.590E-02 | % P | 5.564E-02 1.65E-02 | G K |
| Sr-85 | | -1.1165E-02 | | | | | |
| | | | 514.00 | -1.117E-02 | &( | 4.643E-02 1.38E-02 | G |
| Kr-85 | | -2.4436E+02 | | | | | |
| | | | 513.99 | -2.444E+02 | &( | 1.016E+03 3.03E+02 | G |
| Y-88 | | -3.2350E-04 | | | | | |
| | | | 1836.01 | -3.235E-04 | %(P | 2.362E-02 5.95E-03 | G K |
| | | | 898.02 | 7.957E-03 | & P | 3.770E-02 1.10E-02 | G |
| NB-94 | | 1.6431E-05 | | | | | |
| | | | 871.10 | 1.643E-05 | %( | 3.442E-02 9.77E-03 | G K |
| | | | 702.50 | 6.888E-03 | & | 3.706E-02 1.09E-02 | G K |
| Ag-108M | | -1.3939E-02 | | | | | |
| | | | 722.95 | -1.394E-02 | &( | 4.532E-02 1.35E-02 | G K |
| | | | 614.37 | -1.703E-02 | % P | 4.396E-02 1.32E-02 | G |
| | | | 433.93 | 3.419E-03 | % | 3.493E-02 1.03E-02 | G |
| CD-109 | | 1.3279E+00 | | | | | |
| | | | 88.04 | 1.328E+00 | %( | 1.946E+00 5.95E-01 | G |
| SN-113 | | -2.4613E-04 | | | | | |
| | | | 391.71 | -2.461E-04 | %( | 4.927E-02 1.44E-02 | G K |
| | | | 255.04 | -2.912E-01 | % | 1.566E+00 4.67E-01 | G |

| Nuclide | Ave activity | Energy | Activity | Code | Peak | MDA | Comments |
|---|---|---|---|---|---|---|---|
| SB-125 | 7.3564E-02 | | | | | | |
| | | 427.95 | 3.815E-03 | %(P | 1.125E-01 | 3.29E-02 | G K |
| | | 600.77-8.904E-05 | | % P | 1.584E-01 | 4.53E-02 | G |
| | | 636.15 | 1.186E-02 | & P | 3.080E-01 | 8.90E-02 | G |
| | | 463.51 | 2.800E-01 | *(P | 3.135E-01 | 9.83E-02 | G |
| | | 176.29-3.186E-02 | | & | 5.223E-01 | 1.55E-01 | G |
| I-131 | -1.3642E-03 | | | | | | |
| | | 364.48-1.364E-03 | | &(P | 6.330E-02 | 1.86E-02 | G K |
| | | 636.97 | 0.000E+00 | % | 8.434E-01 | 2.45E-01 | G |
| | | 284.29-1.923E-01 | | % P | 8.290E-01 | 2.48E-01 | G |
| CS-134 | -9.0969E-03 | | | | | | |
| | | 604.66-9.097E-03 | | %( | 3.435E-02 | 1.02E-02 | G K |
| | | 795.76 | 3.099E-02 | % P | 4.162E-02 | 1.30E-02 | G |
| | | 569.29-9.482E-03 | | % P | 2.342E-01 | 6.76E-02 | G |
| | | 801.84-9.207E-02 | | % P | 4.331E-01 | 1.26E-01 | G |
| CS-137 | -7.2550E-03 | | | | | | |
| | | 661.62-7.255E-03 | | %(P | 4.086E-02 | 1.19E-02 | G |
| CE-139 | 4.4091E-03 | | | | | | |
| | | 165.85 | 4.409E-03 | &( | 4.731E-02 | 1.41E-02 | G |
| EU-152 | 7.1970E-02 | | | | | | |
| | | 121.78-1.549E-02 | | %(P | 1.288E-01 | 3.84E-02 | G K |
| | | 344.30-2.891E-02 | | & P | 1.272E-01 | 3.79E-02 | G |
| | | 1408.08 | 1.081E-01 | % | 1.448E-01 | 4.64E-02 | G |
| | | 964.00 | 2.474E-01 | (P | 3.012E-01 | 9.46E-02 | G |
| | | 1112.07 | 2.414E-02 | % | 3.431E-01 | 9.91E-02 | G |
| | | 778.90-4.288E-02 | | % | 2.680E-01 | 7.82E-02 | G |
| EU-154 | -1.1328E-02 | | | | | | |
| | | 123.10-1.133E-02 | | &( | 1.122E-01 | 3.36E-02 | G K |
| | | 1274.80 | 7.236E-02 | % | 1.074E-01 | 3.35E-02 | G |
| | | 723.30-3.849E-03 | | & | 3.105E-01 | 9.13E-02 | G |
| | | 1004.80-3.718E-02 | | % | 2.439E-01 | 7.11E-02 | G |
| EU-155 | 1.5639E-01 | | | | | | |
| | | 86.45 | 1.564E-01 | &( | 2.449E-01 | 7.47E-02 | G K |
| | | 105.31 | 4.264E-02 | % | 2.332E-01 | 6.99E-02 | G |
| HG-203 | 2.3829E-02 | | | | | | |
| | | 279.17 | 2.383E-02 | %(P | 4.155E-02 | 1.27E-02 | G K |
| | | 72.87-8.491E-01 | | % P | 2.331E+00 | 7.04E-01 | G |
| | | 70.83-1.180E+00 | | & | 4.746E+00 | 1.43E+00 | G |
| | | 82.50-8.753E-02 | | & | 4.468E+00 | 1.33E+00 | G |

| Nuclide | Ave activity | Energy | Activity | Code | Peak | MDA | Comments |
|---|---|---|---|---|---|---|---|
| TL-208 | 2.8775E-01 | | | | | | |
| | | 583.14 | 2.878E-01 | (P | 3.452E-02 | 1.79E-02 | G |
| | | 510.72 | 4.152E-01 | + P | 1.867E-01 | 7.65E-02 | G |
| PB-212 | 8.7327E-01 | | | | | | |
| | | 238.63 | 8.353E-01 | (P | 9.741E-02 | 4.15E-02 | G K |
| | | | | | | | Energy duplication |
| | | 77.11 | 7.452E-01 | } P | 3.842E-01 | 1.05E-01 | G |
| | | 74.81 | 1.127E+00 | + P | 7.900E-01 | 2.52E-01 | G |
| PB-214 | 5.1414E-01 | | | | | | |
| | | 351.99 | 5.145E-01 | (P | 8.211E-02 | 3.64E-02 | G K |
| | | 295.22 | 5.134E-01 | (P | 1.510E-01 | 5.64E-02 | G |
| | | | | | | | Energy duplication |
| | | 77.11 | 1.976E-01 | } P | 9.414E-01 | 2.23E-01 | G |
| | | 241.92 | 4.871E-02 | % | 6.181E-01 | 1.85E-01 | G |
| BI-212 | 6.1766E-01 | | | | | | |
| | | 727.17 | 6.177E-01 | *(P | 3.203E-01 | 1.30E-01 | G K |
| | | 1620.56 | -2.426E-01 | & P | 9.894E-01 | 2.82E-01 | G |
| | | 785.42 | 6.629E-01 | % | 1.742E+00 | 5.22E-01 | G |
| BI-214 | 5.1049E-01 | | | | | | |
| | | 609.32 | 5.033E-01 | (P | 7.685E-02 | 3.83E-02 | G K |
| | | 1764.51 | 6.674E-01 | + P | 1.251E-01 | 8.35E-02 | G |
| | | 1120.28 | 5.324E-01 | (P | 3.340E-01 | 1.33E-01 | G |
| RA-224 | 9.4122E-01 | | | | | | |
| | | 241.00 | 9.412E-01 | ( | 1.108E+00 | 3.41E-01 | G |
| RA-226 | 1.2098E+00 | | | | | | |
| | | 185.99 | 1.210E+00 | (P | 1.059E+00 | 3.64E-01 | G |
| AC-228 | 8.0710E-01 | | | | | | |
| | | 911.07 | 8.257E-01 | (P | 1.367E-01 | 6.87E-02 | G K |
| | | 968.90 | 7.107E-01 | (P | 1.763E-01 | 7.77E-02 | G |
| | | 338.40 | 9.025E-01 | (P | 2.575E-01 | 1.03E-01 | G |
| TH-227 | -2.3019E-03 | | | | | | |
| | | 236.00 | -2.302E-03 | %( | 3.771E-01 | 1.12E-01 | G K |
| | | 256.25 | 5.761E-04 | % P | 4.938E-01 | 1.46E-01 | G |
| PA-234 | -9.7996E-03 | | | | | | |
| | | 98.44 | -9.800E-03 | &(P | 2.334E-01 | 6.96E-02 | G K |
| | | 946.00 | -4.540E-02 | & P | 2.057E-01 | 6.05E-02 | G |
| | | 131.28 | -4.862E-02 | % P | 2.237E-01 | 6.72E-02 | G |
| | | 94.67 | -1.429E-01 | % P | 4.154E-01 | 1.25E-01 | G |
| | | 883.24 | 4.096E-02 | % | 2.773E-01 | 8.03E-02 | G |
| | | 926.70 | 4.130E-02 | & | 2.996E-01 | 8.64E-02 | G |

| Nuclide | Ave activity | Energy | Activity | Code | Peak | MDA | Comments |
|---|---|---|---|---|---|---|---|
| | | 569.26 | -1.561E-02 % | P | 3.461E-01 | 1.00E-01 | G |
| TH-234 | -2.1497E-01 | | | | | | |
| | | 63.29 | -2.150E-01 %( | P | 6.778E+00 | 2.01E+00 | G K |
| | | 92.80 | 1.461E+00 % | P | 2.295E+00 | 6.97E-01 | G |
| | | 92.38 | 1.720E+00 % | P | 2.725E+00 | 8.28E-01 | G |
| AM-241 | -1.7333E-03 | | | | | | |
| | | 59.54 | -1.733E-03 &( | P | 1.224E+00 | 3.64E-01 | G |

( - This peak used in the nuclide activity average.

* - Peak is too wide, but only one peak in library.
! - Peak is part of a multiplet and this area went negative during deconvolution.
? - Peak is too narrow.
@ - Peak is too wide at FW25M, but ok at FWHM.
% - Peak fails sensitivity test.
$ - Peak identified, but first peak of this nuclide failed one or more qualification tests.
+ - Peak activity higher than counting uncertainty range.
- - Peak activity lower than counting uncertainty range.
= - Peak outside analysis energy range.
& - Calculated peak centroid is not close enough to the library energy centroid for positive identification.
P - Peakbackground subtraction
} - Peak is too close to another for the activity to be found directly.

| Nuclide Codes: | Peak Codes: |
|---|---|
| T - Thermal Neutron Activation | G - Gamma Ray |
| F - Fast Neutron Activation | X - X-Ray |
| I - Fission Product | P - Positron Decay |
| N - Naturally Occurring Isotope | S - Single-Escape |
| P - Photon Reaction | D - Double-Escape |
| C - Charged Particle Reaction | K - Key Line |
| M - No MDA Calculation | A - Not in Average |
| R - Coincidence Corrected | C - Coincidence Peak |
| H - Halflife limit exceeded | |

- - - - - - - - - - - - - - - - - - - - - - - - - - - - - - - - - - - - -

***** S U M M A R Y O F N U C L I D E S I N S A M P L E *****

| Nuclide | | Time of Count Activity pCi/gm | Time Corrected Activity pCi/gm | Uncertainty Counting pCi/gm | 3 Sigma Total pCi/gm | MDA pCi/gm |
|---|---|---|---|---|---|---|
| BE-7 | #A | 4.6609E-02 | 4.9729E-02 | 2.7457E-01 | 2.7459E-01 | 2.916E-01 |
| K-40 | | 1.7738E+01 | 1.7738E+01 | 1.4118E+00 | 1.7475E+00 | |
| MN-54 | #A | -1.3088E-02 | -1.3234E-02 | 3.8468E-02 | 3.8475E-02 | 4.082E-02 |
| CO-57 | #B | 4.7342E-04 | 4.7953E-04 | 4.1353E-02 | 4.1353E-02 | 4.579E-02 |
| CO-60 | #B | -3.9593E-04 | -3.9664E-04 | 3.2069E-02 | 3.2069E-02 | 3.068E-02 |

| | | | | | | |
|---|---|---|---|---|---|---|
| Sr-85 | #A | -1.0585E-02 | -1.1165E-02 | 4.1548E-02 | 4.1553E-02 | 4.401E-02 |
| Kr-85 | #A | -2.4435E+02 | -2.4436E+02 | 9.0935E+02 | 9.0946E+02 | 1.016E+03 |
| Y-88 | #B | -3.1316E-04 | -3.2350E-04 | 3.2376E-02 | 3.2376E-02 | 2.287E-02 |
| NB-94 | #B | 1.6431E-05 | 1.6431E-05 | 2.9317E-02 | 2.9317E-02 | 3.442E-02 |
| Ag-108M | #B | -1.3938E-02 | -1.3939E-02 | 4.0553E-02 | 4.0561E-02 | 4.531E-02 |
| CD-109 | #A | 1.3178E+00 | 1.3279E+00 | 1.7839E+00 | 1.7855E+00 | 1.932E+00 |
| SN-113 | #B | -2.3884E-04 | -2.4613E-04 | 4.3144E-02 | 4.3144E-02 | 4.781E-02 |
| SB-125 | #B | 7.3313E-02 | 7.3564E-02 | 7.7440E-02 | 7.7558E-02 | 1.122E-01 |
| I-131 | #B | -8.8713E-04 | -1.3642E-03 | 1.2729E-01 | 1.2729E-01 | 4.116E-02 |
| CS-134 | #B | -9.0552E-03 | -9.0969E-03 | 3.0565E-02 | 3.0569E-02 | 3.419E-02 |
| CS-137 | #A | -7.2527E-03 | -7.2550E-03 | 4.8268E-02 | 4.8270E-02 | 4.085E-02 |
| CE-139 | #A | 4.2995E-03 | 4.4091E-03 | 4.2369E-02 | 4.2369E-02 | 4.613E-02 |
| EU-152 | #B | 7.1916E-02 | 7.1970E-02 | 8.2558E-02 | 8.2654E-02 | 1.287E-01 |
| EU-154 | #B | -1.1316E-02 | -1.1328E-02 | 1.0069E-01 | 1.0069E-01 | 1.121E-01 |
| EU-155 | #B | 1.5609E-01 | 1.5639E-01 | 2.2404E-01 | 2.2421E-01 | 2.444E-01 |
| HG-203 | #B | 2.2123E-02 | 2.3829E-02 | 3.8012E-02 | 3.8037E-02 | 3.858E-02 |
| TL-208 | | 2.8775E-01 | 2.8775E-01 | 5.3706E-02 | 5.6244E-02 | |
| PB-212 | | 8.7327E-01 | 8.7327E-01 | 1.3000E-01 | 1.3954E-01 | |
| PB-214 | | 5.1414E-01 | 5.1414E-01 | 1.0075E-01 | 1.0508E-01 | |
| BI-212 | # | 6.1766E-01 | 6.1766E-01 | 3.8984E-01 | 3.9148E-01 | |
| BI-214 | | 5.1049E-01 | 5.1049E-01 | 1.1652E-01 | 1.2023E-01 | |
| RA-224 | A | 9.4122E-01 | 9.4122E-01 | 1.0225E+00 | 1.0240E+00 | 1.108E+00 |
| RA-226 | | 1.2098E+00 | 1.2098E+00 | 1.0916E+00 | 1.0938E+00 | |
| AC-228 | | 8.0710E-01 | 8.0710E-01 | 1.4413E-01 | 1.5156E-01 | |
| TH-227 | #B | -2.3019E-03 | -2.3019E-03 | 3.3673E-01 | 3.3673E-01 | 3.771E-01 |
| PA-234 | #B | -9.7996E-03 | -9.7996E-03 | 2.8654E-01 | 2.8655E-01 | 2.334E-01 |
| TH-234 | #B | -2.1497E-01 | -2.1497E-01 | 8.8183E+01 | 8.8183E+01 | 6.778E+00 |
| AM-241 | #A | -1.7332E-03 | -1.7333E-03 | 4.3448E-01 | 4.3448E-01 | 1.224E+00 |

# - All peaks for activity calculation had bad shape.
* - Activity omitted from total
& - Activity omitted from total and all peaks had bad shape.
< - MDA value printed.
A - Activity printed, but activity < MDA.
B - Activity < MDA and failed test.
C - Area < Critical level.
F - Failed fraction or key line test.
H - Halflife limit exceeded

---------- S U M M A R Y ----------

Total Activity ( 1120.0 to 2000.7 keV) 2.3499029E+01 pCi/gm
Total Decayed Activity ( 1120.0 to 2000.7 keV) 2.3499037E+01 pCi/gm

The library has energies which are not separable.

Analyzed by: _____
JPK

Reviewed by: _____
Supervisor

Laboratory: YAEC Chemistry Lab

YAEC Chemistry Lab Spectrum name: 103F_16SEPT2006_0737.An1

Sample description
FSS-SSS-01-01-025-F

Spectrum Filename: C:\GammaVision\Spectra\103F_16SEPT2006_0737.An1

Acquisition information
Start time: 16-Sep-2006 07:37:55
Live time: 2000
Real time: 2002
Dead time: 0.11 %
Detector ID: 4

Detector system
Det 103 - DSPE-471

Calibration
Filename: D3_1LSa.Clb
Detector_103 1.0 Liter Sand Geometry

Energy Calibration
Created: 08-Aug-2005 11:09:41
Zero offset: 0.409 keV
Gain: 0.500 keV/channel
Quadratic: 1.092E-08 keV/channel^2

Efficiency Calibration
Created: 08-Aug-2005 11:11:25
Type: Polynomial
Uncertainty: 0.993 %
Coefficients: -0.264059 -5.138468 0.638383
-0.089199 0.005011 -0.000129

Library Files
Main analysis library: FSS_Rev_1.Lib
Library Match Width: 1.000
Peak stripping: Library based

Analysis parameters
Analysis engine: Env32 G53W4.20
Start channel: 100 ( 50.41keV )
Stop channel: 4000 ( 2000.67keV )
Peak rejection level: 41.667%
Peak search sensitivity: 3
Sample Size: 1.5630E+03
Activity scaling factor: 1.0000E+06/( 1.0000E+00* 1.5630E+03) =
6.3980E+02
Detection limit method: Nureg 4.16
Random error: 1.0000000E+00
Systematic error: 1.0000000E+00

| | |
|---|---|
| Fraction Limit: | 0.000% |
| Background width: | average of five points. |

YAEC Chemistry Lab Spectrum name: 103F_16SEPT2006_0737.An1

Half lives decay limit: 12.000
Activity range factor: 2.000
Min. step backg. energy 0.000
Multiplet shift channel 2.000

| Corrections | Status | Comments |
|---|---|---|
| Decay correct to date: | YES | 08-Sep-2006 09:18:00 |
| Decay during acquisition: | NO | |
| Decay during collection: | NO | |
| True coincidence correction: | NO | |
| Peaked background correction: | YES | 103_150K_05AUG05.Pbc 08-Aug-2005 12:54:15 |
| Absorption (Internal): | NO | |
| Geometry correction: | NO | |
| Random summing: | NO | |

total peaks alloc. 19 cutoff 20.00000 %
Energy Calibration
Normalized diff: 0.3523

***** S U M M A R Y O F P E A K S I N R A N G E *****

| Peak Energy | Area | Uncert | FWHM | Corrctn Factor | Nuclide Energy | Brnch. Ratio | Act. pCi/gm | Nuc |
|---|---|---|---|---|---|---|---|---|
| 74.71 | 119. | 22.85 | 0.99 | 9.100E-03 | 74.81 | 9.600 | 1.157E+00 | PB212 |
| 77.31 | 274. | 11.42 | 0.99 | 1.029E-02 | 77.11 | 10.700 | 2.162E+00 | PB214 |
| | | | | | 77.11 | 17.500 | 1.322E+00 | PB212 |
| 87.25 | 126. | 34.36 | 1.50 | 1.472E-02 | 86.45 | 32.740 | PBC<MDA | EU155 |
| | | | | | 88.04 | 3.790 | 1.971E+00 | CD109 |
| 87.25 | 133. | 33.77 | 1.50 | 1.410E-02 | 86.45 | 32.740 | PBC<MDA | EU155 |
| | | | | | 88.04 | 3.790 | 2.087E+00 | CD109 |
| 93.33 | 95. | 40.63 | 1.50 | 1.631E-02 | 92.38 | 2.570 | PBC<MDA | TH234 |
| | | | | | 92.80 | 3.000 | PBC<MDA | TH234 |
| | | | | | 94.67 | 15.500 | PBC<MDA | PA234 |
| 93.33 | 101. | 38.25 | 1.50 | 1.645E-02 | 92.38 | 2.570 | PBC<MDA | TH234 |
| | | | | | 92.80 | 3.000 | PBC<MDA | TH234 |
| | | | | | 94.67 | 15.500 | PBC<MDA | PA234 |
| 186.47 | 155. | 19.81 | 1.12 | 2.565E-02 | 185.99 | 3.280 | 1.459E+00 | RA226 |
| 209.29 | 118. | 32.88 | 0.89 | 2.471E-02 | | | | |
| 238.81 | 1334. | 3.10 | 1.09 | 2.319E-02 | 238.63 | 43.100 | 1.143E+00 | PB212 |
| 241.89 | 179. | 14.52 | 1.10 | 2.303E-02 | 241.00 | 3.900 | 1.720E+00 | RA224 |
| | | | | | 241.92 | 7.470 | 8.998E-01 | PB214 |
| 270.10 | 141. | 24.78 | 1.47 | 2.152E-02 | | | | |
| 277.59 | 88. | 32.05 | 0.81 | 2.113E-02 | | | | |
| 295.27 | 277. | 11.93 | 1.01 | 2.025E-02 | 295.22 | 19.200 | 6.079E-01 | PB214 |
| 300.21 | 94. | 28.84 | 1.14 | 2.001E-02 | | | | |
| 327.83 | 104. | 24.27 | 1.26 | 1.875E-02 | | | | |
| 338.28 | 314. | 11.64 | 1.14 | 1.831E-02 | 338.40 | 12.010 | 1.231E+00 | AC228 |
| 352.04 | 456. | 6.07 | 1.27 | 1.775E-02 | 351.99 | 37.100 | 5.907E-01 | PB214 |
| 409.63 | 57. | 39.80 | 1.52 | 1.574E-02 | | | | |
| 463.17 | 74. | 24.53 | 1.46 | 1.425E-02 | | | | |

| | | | | | | | | |
|---|---|---|---|---|---|---|---|---|
| 463.17 | 74. | 24.53 | 1.46 | 1.425E-02 | 463.51 | 10.000 | 4.450E-01 | SB125 |
| 510.87 | 210. | 16.19 | 1.60 | 1.317E-02 | 510.72 | 22.500 | 5.360E-01 | TL208 |
| 583.53 | 402. | 8.22 | 1.18 | 1.184E-02 | 583.14 | 86.000 | 3.376E-01 | TL208 |
| 609.50 | 366. | 8.04 | 1.36 | 1.144E-02 | 609.32 | 46.090 | 5.889E-01 | BI214 |
| 727.68 | 127. | 15.45 | 1.68 | 9.959E-03 | 727.17 | 11.800 | 9.302E-01 | BI212 |
| 768.48 | 65. | 27.39 | 1.52 | 9.552E-03 | | | | |
| 785.66 | 58. | 28.23 | 1.84 | 9.394E-03 | 785.42 | 2.000 | 2.669E+00 | BI212 |
| 795.56 | 80. | 18.30 | 1.96 | 9.303E-03 | | | | |

| pk energy | area | uncert | fwhm | corr | nuclide | brnch. | act. | nuc |
|---|---|---|---|---|---|---|---|---|
| 795.56 | 80. | 18.30 | 1.96 | 9.303E-03 | 795.76 | 85.400 | 8.729E-02 | CS134 |
| 861.01 | 58. | 19.02 | 1.73 | 8.764E-03 | | | | |
| 911.62 | 315. | 8.25 | 1.75 | 8.398E-03 | 911.07 | 29.000 | 1.105E+00 | AC228 |
| 934.08 | 34. | 40.33 | 1.05 | 8.247E-03 | | | | |
| 965.18 | 57. | 20.76 | 1.54 | 8.048E-03 | | | | |
| 969.36 | 153. | 9.61 | 1.54 | 8.022E-03 | 968.90 | 17.460 | 9.414E-01 | AC228 |
| 1121.06 | 101. | 21.34 | 1.94 | 7.208E-03 | 1120.28 | 15.040 | 7.884E-01 | BI214 |
| 1461.48 | 1266. | 2.97 | 2.02 | 5.930E-03 | 1460.75 | 10.700 | 1.698E+01 | K40 |
| 1765.47 | 68. | 13.37 | 1.42 | 5.140E-03 | 1764.51 | 15.920 | 6.794E-01 | BI214 |

********** U N I D E N T I F I E D P E A K S U M M A R Y **********

| Peak Channel | Centroid Energy | Background Counts | Net Area Counts | Intensity Cts/Sec | Uncert 3 Sigma % | FWHM keV | Suspected Nuclide | |
|---|---|---|---|---|---|---|---|---|
| 417.73 | 209.29 | 555. | 118. | 0.059 | 98.65 | 0.893 | AC-228 | |
| 539.35 | 270.10 | 383. | 141. | 0.070 | 74.35 | 1.471 | AC-228 | s |
| 554.34 | 277.59 | 287. | 88. | 0.044 | 87.73 | 0.809 | NP-239 | s |
| 599.56 | 300.21 | 254. | 94. | 0.047 | 86.53 | 1.137 | PB-212 | |
| 654.81 | 327.83 | 221. | 104. | 0.052 | 72.81 | 1.259 | AC-228 | s |
| 818.40 | 409.63 | 176. | 57. | 0.029 | 119.39 | 1.524 | AC-228 | s |
| 1536.02 | 768.48 | 84. | 65. | 0.032 | 70.45 | 1.519 | BI-214 | |
| 1721.05 | 861.01 | 27. | 58. | 0.029 | 57.07 | 1.725 | TL-208 | s |
| 1867.18 | 934.08 | 58. | 34. | 0.017 | 107.47 | 1.054 | BI-214 | s |
| 1930.38 | 965.28 | 45. | 54. | 0.027 | 66.96 | 1.539 | AC-228 | D |

s - Peak fails shape tests.
D - Peak area deconvoluted.
L - Peak written from unknown list.
C - Area < Critical level.

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This section based on library: FSS_Rev_1.Lib

********** I D E N T I F I E D P E A K S U M M A R Y **********

| Nuclide | Peak Channel | Centroid Energy | Background Counts | Net Area Counts | Intensity Cts/Sec | Uncert 3 Sigma % | FWHM keV |
|---|---|---|---|---|---|---|---|
| PB-212 | 148.79 | 74.81 | 369. | 122. | 0.061 | 69.98 | 0.993D |
| PB-212 | 153.39 | 77.11 | 368. | 235. | 0.118 | 37.77 | 0.995A |
| EU-155 | 173.68 | 87.25 | 943. | 133. | 0.067 | 101.32 | 1.500 |
| CD-109 | 173.67 | 87.25 | 869. | 126. | 0.063 | 103.07 | 1.500 |
| RA-226 | 372.10 | 186.47 | 407. | 142. | 0.071 | 59.44 | 1.118 |
| PB-212 | 476.75 | 238.80 | 689. | 1312. | 0.656 | 12.72 | 1.025 |
| RA-224 | 482.56 | 241.70 | 738. | 150. | 0.075 | 80.42 | 1.500 |
| PB-214 | 482.79 | 241.81 | 331. | 73. | 0.036 | 106.58 | 1.473s |
| PB-214 | 589.68 | 295.27 | 307. | 273. | 0.137 | 35.78 | 1.013s |
| AC-228 | 675.70 | 338.28 | 320. | 313. | 0.156 | 34.91 | 1.143s |
| PB-214 | 703.22 | 352.04 | 153. | 450. | 0.225 | 18.21 | 1.268 |
| SB-125 | 925.71 | 463.30 | 147. | 59. | 0.030 | 93.07 | 1.500s |

| | | | | | | | |
|---|---|---|---|---|---|---|---|
| TL-208 | 1020.86 | 510.87 | 270. | 184. | 0.092 | 48.57 | 1.600s |

| Nuclide | Channel | Energy | Background | Net area | Cnts/sec | Uncert | FWHM |
|---|---|---|---|---|---|---|---|
| TL-208 | 1166.15 | 583.53 | 181. | 398. | 0.199 | 24.65 | 1.182 |
| BI-214 | 1218.10 | 609.50 | 153. | 359. | 0.180 | 24.11 | 1.362 |
| BI-212 | 1454.43 | 727.68 | 86. | 127. | 0.063 | 46.35 | 1.676s |
| BI-212 | 1570.38 | 785.66 | 70. | 58. | 0.029 | 84.68 | 1.842s |
| CS-134 | 1589.90 | 795.42 | 40. | 63. | 0.031 | 57.11 | 1.500s |
| AC-228 | 1822.27 | 911.62 | 101. | 311. | 0.156 | 24.75 | 1.750s |
| AC-228 | 1936.81 | 968.90 | 38. | 152. | 0.076 | 29.66 | 1.541D |
| BI-214 | 2241.09 | 1121.06 | 97. | 99. | 0.049 | 64.01 | 1.935 |
| K-40 | 2921.83 | 1461.48 | 49. | 1247. | 0.623 | 8.91 | 2.022 |
| BI-214 | 3529.70 | 1765.47 | 8. | 64. | 0.032 | 40.11 | 1.415s |

s - Peak fails shape tests.
D - Peak area deconvoluted.
A Derived peak area.

***** S U M M A R Y O F L I B R A R Y P E A K U S A G E *****

| Nuclide Name | Code | Average Activity pCi/gm | Peak Energy keV | Peak Activity pCi/gm | Code | MDA Value pCi/gm | COMMENTS |
|---|---|---|---|---|---|---|---|
| BE-7 | | 3.6377E-02 | | | | | |
| | | | 477.56 | 3.638E-02 | %( | 3.926E-01 1.15E-01 | G |
| K-40 | | 1.6984E+01 | | | | | |
| | | | 1460.75 | 1.698E+01 | (P | 4.818E-01 5.12E-01 | G |
| MN-54 | | -6.0320E-03 | | | | | |
| | | | 834.81 | -6.032E-03 | %(P | 4.288E-02 1.24E-02 | G |
| CO-57 | | 7.4566E-04 | | | | | |
| | | | 122.07 | 7.457E-04 | &(P | 6.381E-02 1.90E-02 | G K |
| | | | 136.43 | 1.158E-01 | % | 4.558E-01 1.37E-01 | G |
| CO-60 | | -4.0487E-03 | | | | | |
| | | | 1332.51 | -4.049E-03 | %(P | 4.353E-02 1.17E-02 | G K |
| | | | 1173.23 | -2.020E-02 | % P | 6.037E-02 1.78E-02 | G K |
| Sr-85 | | -1.6427E-02 | | | | | |
| | | | 514.00 | -1.643E-02 | %( | 5.582E-02 1.67E-02 | G |
| Kr-85 | | -3.4816E+02 | | | | | |
| | | | 513.99 | -3.482E+02 | %( | 1.184E+03 3.54E+02 | G |
| Y-88 | | -8.6285E-04 | | | | | |
| | | | 1836.01 | -8.629E-04 | %(P | 3.692E-02 9.74E-03 | G K |
| | | | 898.02 | 7.218E-04 | % P | 3.975E-02 1.11E-02 | G |

| Nuclide | Ave activity | Energy | Activity | Code | Peak | MDA | Comments |
|---|---|---|---|---|---|---|---|
| NB-94 | 5.8821E-03 | | | | | | |
| | | 871.10 | 5.882E-03 | %( | 3.393E-02 | 9.78E-03 | G K |
| | | 702.50 | -5.159E-03 | & | 4.589E-02 | 1.34E-02 | G K |
| Ag-108M | 1.0161E-03 | | | | | | |
| | | 722.95 | 1.016E-03 | &( | 7.538E-02 | 2.21E-02 | G K |
| | | 614.37 | -1.381E-02 | % P | 4.876E-02 | 1.45E-02 | G |
| | | 433.93 | 6.505E-03 | % | 3.669E-02 | 1.08E-02 | G |
| CD-109 | 1.9709E+00 | | | | | | |
| | | 88.04 | 1.971E+00 | ( | 2.197E+00 | 6.77E-01 | G |
| SN-113 | 0.0000E+00 | | | | | | |
| | | 391.71 | 0.000E+00 | &( | 5.799E-02 | 1.69E-02 | G K |
| | | 255.04 | -3.466E-01 | % | 2.040E+00 | 6.09E-01 | G |
| SB-125 | 8.8120E-02 | | | | | | |
| | | 427.95 | -4.187E-03 | &(P | 1.255E-01 | 3.66E-02 | G K |
| | | 600.77 | -2.437E-02 | % P | 1.943E-01 | 5.65E-02 | G |
| | | 636.15 | 1.187E-02 | & P | 3.238E-01 | 9.28E-02 | G |
| | | 463.51 | 3.613E-01 | (P | 3.614E-01 | 1.15E-01 | G |
| | | 176.29 | 2.017E-01 | % | 6.619E-01 | 1.99E-01 | G |
| I-131 | 1.3596E-03 | | | | | | |
| | | 364.48 | 1.360E-03 | %(P | 7.805E-02 | 2.27E-02 | G K |
| | | 636.97 | 2.413E-02 | % | 9.867E-01 | 2.83E-01 | G |
| | | 284.29 | -6.370E-04 | % P | 1.244E+00 | 3.66E-01 | G |
| CS-134 | 3.1716E-02 | | | | | | |
| | | 604.66 | -8.878E-04 | &( | 3.822E-02 | 1.10E-02 | G K |
| | | 795.76 | 6.898E-02 | (P | 3.548E-02 | 1.31E-02 | G |
| | | 569.29 | -3.998E-02 | % P | 2.580E-01 | 7.50E-02 | G |
| | | 801.84 | -1.127E-01 | % P | 4.366E-01 | 1.26E-01 | G |
| CS-137 | 1.1941E-02 | | | | | | |
| | | 661.62 | 1.194E-02 | %(P | 4.200E-02 | 1.24E-02 | G |
| CE-139 | -1.3789E-03 | | | | | | |
| | | 165.85 | -1.379E-03 | &( | 5.427E-02 | 1.61E-02 | G |
| EU-152 | 1.4827E-03 | | | | | | |
| | | 121.78 | 1.483E-03 | &(P | 1.781E-01 | 5.30E-02 | G K |
| | | 344.30 | -1.224E-02 | % P | 1.404E-01 | 4.14E-02 | G |
| | | 1408.08 | 6.591E-02 | % | 1.569E-01 | 4.71E-02 | G |
| | | 964.00 | -5.902E-02 | % P | 3.433E-01 | 9.99E-02 | G |
| | | 1112.07 | 7.287E-02 | % | 3.491E-01 | 1.02E-01 | G |
| | | 778.90 | 7.321E-02 | % | 2.592E-01 | 7.63E-02 | G |

| Nuclide | Ave activity | Energy | Activity | Code | Peak | MDA | Comments |
|---|---|---|---|---|---|---|---|
| EU-154 | -5.5608E-02 | | | | | | |
| | | 123.10 | -5.561E-02 | %( | 1.314E-01 | 3.98E-02 | G K |
| | | 1274.80 | -2.072E-02 | % | 1.492E-01 | 4.31E-02 | G |
| | | 723.30 | 8.536E-02 | % | 1.267E-01 | 3.99E-02 | G |
| | | 1004.80 | -6.030E-02 | % | 2.455E-01 | 7.20E-02 | G |
| EU-155 | 2.4983E-01 | | | | | | |
| | | 86.45 | 2.498E-01 | ( | 2.738E-01 | 8.44E-02 | G K |
| | | 105.31 | 1.222E-01 | % | 2.734E-01 | 8.28E-02 | G |
| HG-203 | 2.7260E-04 | | | | | | |
| | | 279.17 | 2.726E-04 | &(P | 5.263E-02 | 1.55E-02 | G K |
| | | 72.87 | -2.270E-02 | & P | 1.912E+00 | 5.64E-01 | G |
| | | 70.83 | -1.562E-01 | % | 5.725E+00 | 1.71E+00 | G |
| | | 82.50 | -1.746E+00 | % | 5.161E+00 | 1.56E+00 | G |
| TL-208 | 3.3763E-01 | | | | | | |
| | | 583.14 | 3.376E-01 | (P | 5.554E-02 | 2.81E-02 | G |
| | | 510.72 | 5.360E-01 | + P | 2.314E-01 | 9.94E-02 | G |
| PB-212 | 1.1501E+00 | | | | | | |
| | | 238.63 | 1.135E+00 | (P | 1.081E-01 | 4.86E-02 | G K |
| | | | | | | | Energy duplication |
| | | 77.11 | 1.150E+00 | } P | 4.497E-01 | 1.45E-01 | G |
| | | 74.81 | 1.218E+00 | (P | 9.179E-01 | 2.91E-01 | G |
| PB-214 | 5.9654E-01 | | | | | | |
| | | 351.99 | 5.907E-01 | (P | 7.923E-02 | 3.63E-02 | G K |
| | | 295.22 | 6.079E-01 | @(P | 1.875E-01 | 7.36E-02 | G |
| | | | | | | | Energy duplication |
| | | 77.11 | 2.095E-01 | } P | 1.117E+00 | 2.83E-01 | G |
| | | 241.92 | 3.660E-01 | - | 4.400E-01 | 1.30E-01 | G |
| BI-212 | 9.3019E-01 | | | | | | |
| | | 727.17 | 9.302E-01 | @(P | 3.386E-01 | 1.44E-01 | G K |
| | | 1620.56 | 6.072E-01 | % P | 9.697E-01 | 3.09E-01 | G |
| | | 785.42 | 2.669E+00 | + | 1.919E+00 | 7.54E-01 | G |
| BI-214 | 6.1216E-01 | | | | | | |
| | | 609.32 | 5.889E-01 | (P | 9.893E-02 | 4.82E-02 | G K |
| | | 1764.51 | 6.794E-01 | (P | 1.650E-01 | 9.55E-02 | G |
| | | 1120.28 | 7.884E-01 | + P | 3.876E-01 | 1.72E-01 | G |
| RA-224 | 1.4460E+00 | | | | | | |
| | | 241.00 | 1.446E+00 | ( | 1.243E+00 | 3.88E-01 | G |
| RA-226 | 1.4588E+00 | | | | | | |
| | | 185.99 | 1.459E+00 | (P | 9.933E-01 | 3.16E-01 | G |

| Nuclide | Ave activity | Energy | Activity | Code | Peak | MDA | Comments |
|---|---|---|---|---|---|---|---|
| AC-228 | 1.0818E+00 | | | | | | |
| | | 911.07 | 1.105E+00 | @(P | 1.755E-01 | 9.22E-02 | G K |
| | | 968.90 | 9.403E-01 | (P | 1.930E-01 | 9.31E-02 | G |
| | | 338.40 | 1.231E+00 | @(P | 3.386E-01 | 1.44E-01 | G |
| TH-227 | -1.2438E-01 | | | | | | |
| | | 236.00 | -1.244E-01 | %( | 4.351E-01 | 1.31E-01 | G K |
| | | 256.25 | -1.225E-01 | % P | 5.338E-01 | 1.60E-01 | G |
| PA-234 | -4.7206E-02 | | | | | | |
| | | 98.44 | -4.721E-02 | &(P | 2.679E-01 | 8.02E-02 | G K |
| | | 946.00 | -6.797E-02 | % P | 2.360E-01 | 6.99E-02 | G |
| | | 131.28 | 1.082E-01 | % P | 2.147E-01 | 6.52E-02 | G |
| | | 94.67 | 2.364E-03 | % P | 4.784E-01 | 1.43E-01 | G |
| | | 883.24 | -8.016E-02 | & | 3.401E-01 | 9.98E-02 | G |
| | | 926.70 | 3.130E-02 | & | 3.654E-01 | 1.05E-01 | G |
| | | 569.26 | -5.901E-02 | % P | 3.800E-01 | 1.10E-01 | G |
| TH-234 | 1.3358E+00 | | | | | | |
| | | 63.29 | 1.336E+00 | &(P | 7.847E+00 | 2.35E+00 | G K |
| | | 92.80 | 1.764E+00 | & P | 2.607E+00 | 7.93E-01 | G |
| | | 92.38 | 1.960E+00 | & P | 3.109E+00 | 9.44E-01 | G |
| AM-241 | 1.2728E-01 | | | | | | |
| | | 59.54 | 1.273E-01 | %(P | 1.385E+00 | 4.13E-01 | G |

( - This peak used in the nuclide activity average.

* - Peak is too wide, but only one peak in library.
! - Peak is part of a multiplet and this area went negative during deconvolution.
? - Peak is too narrow.
@ - Peak is too wide at FW25M, but ok at FWHM.
% - Peak fails sensitivity test.
$ - Peak identified, but first peak of this nuclide failed one or more qualification tests.
+ - Peak activity higher than counting uncertainty range.
- - Peak activity lower than counting uncertainty range.
= - Peak outside analysis energy range.
& - Calculated peak centroid is not close enough to the library energy centroid for positive identification.
P - Peakbackground subtraction
} - Peak is too close to another for the activity to be found directly.

Nuclide Codes:
T - Thermal Neutron Activation
F - Fast Neutron Activation

Peak Codes:
G - Gamma Ray
X - X-Ray

I - Fission Product
N - Naturally Occurring Isotope
P - Photon Reaction
C - Charged Particle Reaction
M - No MDA Calculation
R - Coincidence Corrected
H - Halflife limit exceeded

P - Positron Decay
S - Single-Escape
D - Double-Escape
K - Key Line
A - Not in Average
C - Coincidence Peak

- - - - - - - - - - - - - - - - - - - - - - - - - - - - - - - - - - - - - -

***** S U M M A R Y O F N U C L I D E S I N S A M P L E *****

| Nuclide | | Time of Count Activity pCi/gm | Time Corrected Activity pCi/gm | Uncertainty Counting pCi/gm | 3 Sigma Total pCi/gm | MDA pCi/gm |
|---|---|---|---|---|---|---|
| BE-7 | #A | 3.2819E-02 | 3.6377E-02 | 3.4409E-01 | 3.4410E-01 | 3.542E-01 |
| K-40 | | 1.6984E+01 | 1.6984E+01 | 1.5353E+00 | 1.8247E+00 | |
| MN-54 | #A | -5.9267E-03 | -6.0320E-03 | 4.1811E-02 | 4.1812E-02 | 4.213E-02 |
| CO-57 | #B | 7.3063E-04 | 7.4566E-04 | 5.7031E-02 | 5.7031E-02 | 6.252E-02 |
| CO-60 | #B | -4.0372E-03 | -4.0487E-03 | 6.2011E-01 | 6.2011E-01 | 4.341E-02 |
| Sr-85 | #A | -1.5092E-02 | -1.6427E-02 | 5.0115E-02 | 5.0124E-02 | 5.128E-02 |
| Kr-85 | #A | -3.4814E+02 | -3.4816E+02 | 1.0629E+03 | 1.0631E+03 | 1.184E+03 |
| Y-88 | #B | -8.1948E-04 | -8.6285E-04 | 3.8277E-02 | 3.8277E-02 | 3.506E-02 |
| NB-94 | #B | 5.8821E-03 | 5.8821E-03 | 2.9351E-02 | 2.9353E-02 | 3.393E-02 |
| Ag-108M | #B | 1.0160E-03 | 1.0161E-03 | 6.6344E-02 | 6.6344E-02 | 7.538E-02 |
| CD-109 | #A | 1.9471E+00 | 1.9709E+00 | 2.0314E+00 | 2.0343E+00 | 2.171E+00 |
| SN-113 | #B | 0.0000E+00 | 0.0000E+00 | 5.0661E-02 | 5.0661E-02 | 5.529E-02 |
| SB-125 | #B | 8.7642E-02 | 8.8120E-02 | 8.3779E-02 | 8.3935E-02 | 1.248E-01 |
| I-131 | #B | 6.8623E-04 | 1.3596E-03 | 6.8092E-02 | 6.8092E-02 | 3.940E-02 |
| CS-134 | #B | 3.1486E-02 | 3.1716E-02 | 1.8137E-02 | 1.8230E-02 | 3.794E-02 |
| CS-137 | #A | 1.1935E-02 | 1.1941E-02 | 3.7137E-02 | 3.7143E-02 | 4.198E-02 |
| CE-139 | #A | -1.3248E-03 | -1.3789E-03 | 4.8403E-02 | 4.8403E-02 | 5.215E-02 |
| EU-152 | #B | 1.4810E-03 | 1.4827E-03 | 1.5905E-01 | 1.5905E-01 | 1.779E-01 |
| EU-154 | #B | -5.5509E-02 | -5.5608E-02 | 1.1927E-01 | 1.1931E-01 | 1.311E-01 |
| EU-155 | #A | 2.4907E-01 | 2.4983E-01 | 2.5313E-01 | 2.5351E-01 | 2.730E-01 |
| HG-203 | #B | 2.4226E-04 | 2.7260E-04 | 4.6535E-02 | 4.6535E-02 | 4.678E-02 |
| TL-208 | | 3.3763E-01 | 3.3763E-01 | 8.4143E-02 | 8.6397E-02 | |
| PB-212 | | 1.1501E+00 | 1.1501E+00 | 1.4758E-01 | 1.6198E-01 | |
| PB-214 | | 5.9654E-01 | 5.9654E-01 | 1.1002E-01 | 1.1534E-01 | |
| BI-212 | # | 9.3019E-01 | 9.3019E-01 | 4.3283E-01 | 4.3618E-01 | |
| BI-214 | | 6.1216E-01 | 6.1216E-01 | 1.4929E-01 | 1.5346E-01 | |
| RA-224 | | 1.4460E+00 | 1.4460E+00 | 1.1629E+00 | 1.1659E+00 | 1.243E+00 |
| RA-226 | | 1.4588E+00 | 1.4588E+00 | 9.4613E-01 | 9.4991E-01 | |
| AC-228 | | 1.0818E+00 | 1.0818E+00 | 1.8855E-01 | 1.9873E-01 | |
| TH-227 | #B | -1.2438E-01 | -1.2438E-01 | 3.9271E-01 | 3.9278E-01 | 4.351E-01 |
| PA-234 | #B | -4.7206E-02 | -4.7206E-02 | 2.6055E-01 | 2.6056E-01 | 2.679E-01 |
| TH-234 | #B | 1.3358E+00 | 1.3358E+00 | 7.0369E+00 | 7.0373E+00 | 7.847E+00 |
| AM-241 | #A | 1.2728E-01 | 1.2728E-01 | 1.2392E+00 | 1.2392E+00 | 1.384E+00 |

# - All peaks for activity calculation had bad shape.
* - Activity omitted from total
& - Activity omitted from total and all peaks had bad shape.
< - MDA value printed.
A - Activity printed, but activity < MDA.
B - Activity < MDA and failed test.
C - Area < Critical level.
F - Failed fraction or key line test.
H - Halflife limit exceeded

---------- S U M M A R Y ----------

Total Activity ( 1120.0 to 2000.7 keV) 2.4597530E+01 pCi/gm
Total Decayed Activity ( 1120.0 to 2000.7 keV) 2.4597542E+01 pCi/gm

The library has energies which are not separable.

Analyzed by: _____
JJM

Reviewed by: _____
Supervisor

Laboratory: YAEC Chemistry Lab

YAEC Chemistry Lab Spectrum name: 103F_16SEPT2006_0816.An1

Sample description
FSS-SSS-01-01-001-F

Spectrum Filename: C:\GammaVision\Spectra\103F_16SEPT2006_0816.An1

Acquisition information

| | |
|---|---|
| Start time: | 16-Sep-2006 08:16:48 |
| Live time: | 2000 |
| Real time: | 2002 |
| Dead time: | 0.12 % |
| Detector ID: | 4 |

Detector system
Det 103 - DSPE-471

Calibration

| | |
|---|---|
| Filename: | D3_1LSa.Clb |

Detector_103 1.0 Liter Sand Geometry

Energy Calibration

| | |
|---|---|
| Created: | 08-Aug-2005 11:09:41 |
| Zero offset: | 0.409 keV |
| Gain: | 0.500 keV/channel |
| Quadratic: | 1.092E-08 keV/channel^2 |

Efficiency Calibration

| | |
|---|---|
| Created: | 08-Aug-2005 11:11:25 |
| Type: | Polynomial |
| Uncertainty: | 0.993 % |
| Coefficients: | -0.264059 -5.138468 0.638383 |
| | -0.089199 0.005011 -0.000129 |

Library Files

| | |
|---|---|
| Main analysis library: | FSS_Rev_1.Lib |
| Library Match Width: | 1.000 |
| Peak stripping: | Library based |

Analysis parameters

| | |
|---|---|
| Analysis engine: | Env32 G53W4.20 |
| Start channel: | 100 ( 50.41keV ) |
| Stop channel: | 4000 ( 2000.67keV ) |
| Peak rejection level: | 41.667% |
| Peak search sensitivity: | 3 |
| Sample Size: | 1.8320E+03 |
| Activity scaling factor: | 1.0000E+06/( 1.0000E+00* 1.8320E+03) = 5.4585E+02 |
| Detection limit method: | Nureg 4.16 |
| Random error: | 1.0000000E+00 |
| Systematic error: | 1.0000000E+00 |

| | |
|---|---|
| Fraction Limit: | 0.000% |
| Background width: | average of five points. |

YAEC Chemistry Lab Spectrum name: 103F_16SEPT2006_0816.An1

| | |
|---|---|
| Half lives decay limit: | 12.000 |
| Activity range factor: | 2.000 |
| Min. step backg. energy | 0.000 |
| Multiplet shift channel | 2.000 |

| Corrections | Status | Comments |
|---|---|---|
| Decay correct to date: | YES | 16-Sep-2006 08:40:00 |
| Decay during acquisition: | NO | |
| Decay during collection: | NO | |
| True coincidence correction: | NO | |
| Peaked background correction: | YES | 103_150K_05AUG05.Pbc 08-Aug-2005 12:54:15 |
| Absorption (Internal): | NO | |
| Geometry correction: | NO | |
| Random summing: | NO | |

total peaks alloc. 19 cutoff 20.00000 %

Energy Calibration

Normalized diff: 0.2462

***** S U M M A R Y O F P E A K S I N R A N G E *****

| Peak Energy | Area | Uncert | FWHM | Corrctn Factor | Nuclide Energy | Brnch. Ratio | Act. pCi/gm | Nuc |
|---|---|---|---|---|---|---|---|---|
| 75.08 | 187. | 16.69 | 0.99 | 9.198E-03 | 74.81 | 9.600 | 1.563E+00 | PB212 |
| 129.43 | 100. | 40.84 | 1.50 | 2.461E-02 | | | | |
| 129.43 | 100. | 40.84 | 1.50 | 2.461E-02 | 131.28 | 20.000 | PBC<MDA | PA234 |
| 186.07 | 140. | 26.42 | 1.12 | 2.566E-02 | 185.99 | 3.280 | PBC<MDA | RA226 |
| 209.56 | 148. | 25.71 | 0.72 | 2.470E-02 | | | | |
| 238.79 | 1252. | 3.32 | 1.09 | 2.320E-02 | 238.63 | 43.100 | 9.149E-01 | PB212 |
| 241.88 | 191. | 15.17 | 1.10 | 2.303E-02 | 241.00 | 3.900 | 1.566E+00 | RA224 |
| | | | | | 241.92 | 7.470 | 8.192E-01 | PB214 |
| 270.44 | 116. | 23.94 | 1.84 | 2.150E-02 | | | | |
| 295.43 | 298. | 10.06 | 0.91 | 2.024E-02 | 295.22 | 19.200 | 5.585E-01 | PB214 |
| 300.35 | 83. | 27.02 | 1.14 | 2.000E-02 | | | | |
| 328.09 | 105. | 22.60 | 1.07 | 1.874E-02 | | | | |
| 338.51 | 264. | 14.20 | 1.15 | 1.830E-02 | 338.40 | 12.010 | 8.837E-01 | AC228 |
| 352.18 | 552. | 6.22 | 1.19 | 1.775E-02 | 351.99 | 37.100 | 6.123E-01 | PB214 |
| 462.83 | 111. | 25.00 | 1.16 | 1.426E-02 | | | | |
| 462.83 | 111. | 25.00 | 1.16 | 1.426E-02 | 463.51 | 10.000 | 5.691E-01 | SB125 |
| 510.95 | 172. | 18.27 | 1.41 | 1.317E-02 | 510.72 | 22.500 | 3.617E-01 | TL208 |
| 583.42 | 459. | 7.19 | 1.23 | 1.184E-02 | 583.14 | 86.000 | 3.293E-01 | TL208 |
| 609.59 | 322. | 8.21 | 1.22 | 1.144E-02 | 609.32 | 46.090 | 4.409E-01 | BI214 |
| 727.69 | 92. | 24.55 | 1.76 | 9.959E-03 | 727.17 | 11.800 | 5.772E-01 | BI212 |
| 794.40 | 57. | 29.38 | 1.35 | 9.313E-03 | | | | |
| 794.40 | 57. | 29.38 | 1.35 | 9.313E-03 | 795.76 | 85.400 | 5.266E-02 | CS134 |
| 860.81 | 55. | 24.48 | 1.86 | 8.766E-03 | | | | |
| 901.52 | 23. | 35.16 | 1.50 | 8.492E-03 | 898.02 | 94.000 | PBC<MDA | Y88 |
| 911.73 | 290. | 8.51 | 1.46 | 8.397E-03 | 911.07 | 29.000 | 8.681E-01 | AC228 |
| 964.96 | 68. | 19.71 | 1.54 | 8.050E-03 | 964.00 | 14.580 | 4.240E-01 | EU152 |
| 969.53 | 164. | 9.84 | 1.54 | 8.022E-03 | 968.90 | 17.460 | 8.603E-01 | AC228 |

| | | | | | | | | |
|---|---|---|---|---|---|---|---|---|
| 1120.94 | 89. | 24.03 | 1.32 | 7.209E-03 | 1120.28 | 15.040 | 5.944E-01 | BI214 |
| 1461.48 | 1766. | 2.43 | 1.85 | 5.930E-03 | 1460.75 | 10.700 | 2.031E+01 | K40 |
| 1590.89 | 51. | 16.82 | 1.61 | 5.565E-03 | | | | |
| 1620.99 | 13. | 34.46 | 0.68 | 5.488E-03 | 1620.56 | 2.750 | 6.528E-01 | BI212 |
| 1764.96 | 68. | 13.26 | 1.93 | 5.141E-03 | 1764.51 | 15.920 | 5.815E-01 | BI214 |

********** U N I D E N T I F I E D P E A K S U M M A R Y **********

| Peak Channel | Centroid Energy | Background Counts | Net Area Counts | Intensity Cts/Sec | Uncert 3 Sigma % | FWHM keV | Suspected Nuclide | |
|---|---|---|---|---|---|---|---|---|
| 153.65 | 77.29 | 416. | 253. | 0.127 | 39.02 | 0.995 | PB-214 | lD |
| 418.27 | 209.56 | 545. | 148. | 0.074 | 77.12 | 0.721 | AC-228 | s |
| 540.02 | 270.44 | 299. | 116. | 0.058 | 71.81 | 1.841 | AC-228 | s |
| 599.84 | 300.35 | 210. | 83. | 0.041 | 81.06 | 1.135 | PB-212 | |
| 655.32 | 328.09 | 206. | 105. | 0.052 | 67.79 | 1.074 | AC-228 | s |
| 1587.85 | 794.40 | 79. | 57. | 0.028 | 88.15 | 1.354 | AC-228 | l |
| 1720.66 | 860.81 | 56. | 55. | 0.027 | 73.45 | 1.864 | TL-208 | s |
| 1929.95 | 964.93 | 55. | 69. | 0.035 | 57.67 | 1.539 | AC-228 | D |
| 3180.60 | 1590.89 | 7. | 51. | 0.026 | 50.46 | 1.613 | AC-228 | s |

s - Peak fails shape tests.
D - Peak area deconvoluted.
L - Peak written from unknown list.
C - Area < Critical level.

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This section based on library: FSS_Rev_1.Lib

********** I D E N T I F I E D P E A K S U M M A R Y **********

| Nuclide | Peak Channel | Centroid Energy | Background Counts | Net Area Counts | Intensity Cts/Sec | Uncert 3 Sigma % | FWHM keV |
|---|---|---|---|---|---|---|---|
| PB-212 | 148.79 | 74.81 | 379. | 186. | 0.093 | 48.69 | 0.993D |
| PB-212 | 153.39 | 77.11 | 418. | 240. | 0.120 | 31.65 | 0.995A |
| PA-234 | 258.04 | 129.43 | 792. | 100. | 0.050 | 122.52 | 1.500s |
| RA-226 | 371.57 | 186.20 | 830. | 144. | 0.072 | 80.66 | 1.500 |
| PB-212 | 476.84 | 238.84 | 630. | 1332. | 0.666 | 12.00 | 1.013 |
| RA-224 | 482.78 | 241.81 | 851. | 178. | 0.089 | 73.28 | 1.500 |
| PB-214 | 483.03 | 241.94 | 920. | 133. | 0.067 | 99.92 | 1.500s |
| PB-214 | 590.00 | 295.43 | 278. | 294. | 0.147 | 30.17 | 0.907 |
| AC-228 | 676.16 | 338.51 | 371. | 263. | 0.132 | 42.61 | 1.153 |
| PB-214 | 703.50 | 352.18 | 247. | 547. | 0.273 | 18.66 | 1.186 |
| SB-125 | 925.35 | 463.11 | 171. | 78. | 0.039 | 77.31 | 1.500 |
| TL-208 | 1021.01 | 510.95 | 267. | 145. | 0.073 | 54.82 | 1.413s |
| TL-208 | 1165.93 | 583.42 | 184. | 455. | 0.227 | 21.57 | 1.228 |
| BI-214 | 1218.28 | 609.59 | 146. | 315. | 0.158 | 24.64 | 1.217 |
| BI-212 | 1454.45 | 727.69 | 137. | 92. | 0.046 | 73.65 | 1.756s |
| Y-88 | 1802.07 | 901.52 | 24. | 23. | 0.012 | 105.47 | 1.500s |
| AC-228 | 1822.48 | 911.73 | 106. | 287. | 0.143 | 25.52 | 1.463 |
| AC-228 | 1936.81 | 968.90 | 48. | 163. | 0.082 | 29.50 | 1.541D |
| BI-214 | 2240.85 | 1120.94 | 122. | 87. | 0.044 | 72.08 | 1.317 |
| K-40 | 2921.83 | 1461.48 | 38. | 1748. | 0.874 | 7.29 | 1.846 |
| BI-212 | 3240.79 | 1620.99 | 4. | 13. | 0.007 | 103.37 | 0.682s |

| Nuclide | Channel | Energy | Background | Net area | Cnts/sec | Uncert | FWHM |
|---|---|---|---|---|---|---|---|
| BI-214 | 3528.67 | 1764.96 | 7. | 65. | 0.032 | 39.78 | 1.932 |

s - Peak fails shape tests.
D - Peak area deconvoluted.
A Derived peak area.

***** S U M M A R Y O F L I B R A R Y P E A K U S A G E *****

| - Nuclide - Name | Code | Average Activity pCi/gm | Peak Energy keV | Peak Activity pCi/gm | Code | MDA Value pCi/gm | | COMMENTS |
|---|---|---|---|---|---|---|---|---|
| BE-7 | | 7.6618E-02 | | | | | | |
| | | | 477.56 | 7.662E-02 | %( | 3.307E-01 | 9.82E-02 | G |
| K-40 | | 2.0310E+01 | | | | | | |
| | | | 1460.75 | 2.031E+01 | (P | 3.667E-01 | 4.99E-01 | G |
| MN-54 | | -1.5433E-04 | | | | | | |
| | | | 834.81 | -1.543E-04 | %(P | 3.843E-02 | 1.10E-02 | G |
| CO-57 | | 2.3094E-02 | | | | | | |
| | | | 122.07 | 2.309E-02 | %(P | 4.510E-02 | 1.37E-02 | G K |
| | | | 136.43 | 7.696E-02 | % | 3.933E-01 | 1.18E-01 | G |
| CO-60 | | 3.9575E-05 | | | | | | |
| | | | 1332.51 | 3.958E-05 | &(P | 4.043E-02 | 1.12E-02 | G K |
| | | | 1173.23 | -1.470E-02 | & P | 6.236E-02 | 1.83E-02 | G K |
| Sr-85 | | -1.5617E-02 | | | | | | |
| | | | 514.00 | -1.562E-02 | %( | 4.419E-02 | 1.33E-02 | G |
| Kr-85 | | -3.6063E+02 | | | | | | |
| | | | 513.99 | -3.606E+02 | %( | 1.020E+03 | 3.07E+02 | G |
| Y-88 | | 9.8732E-03 | | | | | | |
| | | | 1836.01 | -1.196E-03 | %(P | 2.889E-02 | 7.63E-03 | G K |
| | | | 898.02 | 2.157E-02 | &(P | 2.368E-02 | 7.79E-03 | G |
| NB-94 | | 3.1819E-05 | | | | | | |
| | | | 871.10 | 3.182E-05 | %( | 3.255E-02 | 9.18E-03 | G K |
| | | | 702.50 | 8.029E-03 | % | 4.063E-02 | 1.20E-02 | G K |
| Ag-108M | | -1.7336E-03 | | | | | | |
| | | | 722.95 | -1.734E-03 | &( | 6.493E-02 | 1.91E-02 | G K |
| | | | 614.37 | -2.181E-02 | % P | 4.713E-02 | 1.43E-02 | G |
| | | | 433.93 | 3.530E-03 | & | 3.842E-02 | 1.13E-02 | G |

| Nuclide | Ave activity | Energy | Activity | Code | Peak | MDA | Comments |
|---|---|---|---|---|---|---|---|
| CD-109 | 7.7080E-01 | | | | | | |
| | | 88.04 | 7.708E-01 | &( | 2.066E+00 | 6.24E-01 | G |
| SN-113 | 9.1951E-03 | | | | | | |
| | | 391.71 | 9.195E-03 | %( | 5.074E-02 | 1.50E-02 | G K |
| | | 255.04 | 6.065E-02 | & | 1.426E+00 | 4.21E-01 | G |
| SB-125 | 8.6272E-02 | | | | | | |
| | | 427.95 | -2.123E-02 | %(P | 1.213E-01 | 3.60E-02 | G K |
| | | 600.77 | -4.209E-02 | % P | 2.169E-01 | 6.41E-02 | G |
| | | 636.15 | 6.423E-02 | % P | 2.896E-01 | 8.51E-02 | G |
| | | 463.51 | 4.045E-01 | (P | 3.294E-01 | 1.06E-01 | G |
| | | 176.29 | 5.792E-03 | % | 5.924E-01 | 1.76E-01 | G |
| I-131 | 1.8198E-02 | | | | | | |
| | | 364.48 | 1.820E-02 | %(P | 3.142E-02 | 9.60E-03 | G K |
| | | 636.97 | 1.013E-01 | % | 4.366E-01 | 1.29E-01 | G |
| | | 284.29 | -1.629E-01 | % P | 5.876E-01 | 1.76E-01 | G |
| CS-134 | 7.6845E-05 | | | | | | |
| | | 604.66 | 7.685E-05 | %( | 3.470E-02 | 9.99E-03 | G K |
| | | 795.76 | 2.989E-02 | % P | 4.323E-02 | 1.34E-02 | G |
| | | 569.29 | -9.461E-02 | % P | 2.584E-01 | 7.71E-02 | G |
| | | 801.84 | 7.176E-02 | % P | 4.243E-01 | 1.23E-01 | G |
| CS-137 | -8.4713E-04 | | | | | | |
| | | 661.62 | -8.471E-04 | &(P | 4.541E-02 | 1.30E-02 | G |
| CE-139 | 2.8098E-03 | | | | | | |
| | | 165.85 | 2.810E-03 | &( | 4.875E-02 | 1.45E-02 | G |
| EU-152 | -4.6658E-03 | | | | | | |
| | | 121.78 | -4.666E-03 | %(P | 1.490E-01 | 4.43E-02 | G K |
| | | 344.30 | -2.143E-02 | % P | 1.311E-01 | 3.89E-02 | G |
| | | 1408.08 | 0.000E+00 | % | 1.851E-01 | 5.15E-02 | G |
| | | 964.00 | -1.713E-02 | & P | 4.193E-01 | 1.22E-01 | G |
| | | 1112.07 | 1.813E-03 | % | 3.969E-01 | 1.14E-01 | G |
| | | 778.90 | -8.336E-02 | & | 3.298E-01 | 9.78E-02 | G |
| EU-154 | -2.9648E-02 | | | | | | |
| | | 123.10 | -2.965E-02 | &( | 1.220E-01 | 3.67E-02 | G K |
| | | 1274.80 | -7.916E-03 | & | 1.425E-01 | 4.09E-02 | G |
| | | 723.30 | -1.340E-01 | & | 2.570E-01 | 7.82E-02 | G |
| | | 1004.80 | -2.974E-02 | & | 2.407E-01 | 6.98E-02 | G |

| Nuclide | Ave activity | Energy | Activity | Code | Peak | MDA | Comments |
|---|---|---|---|---|---|---|---|
| EU-155 | 9.5747E-02 | | | | | | |
| | | 86.45 | 9.575E-02 | %( | 2.606E-01 | 7.87E-02 | G K |
| | | 105.31 | 7.596E-02 | % | 2.489E-01 | 7.50E-02 | G |
| HG-203 | -8.6325E-03 | | | | | | |
| | | 279.17 | -8.632E-03 | &(P | 4.485E-02 | 1.34E-02 | G K |
| | | 72.87 | -1.373E+00 | % P | 2.279E+00 | 6.94E-01 | G |
| | | 70.83 | 2.798E-01 | & | 5.111E+00 | 1.53E+00 | G |
| | | 82.50 | -1.194E+00 | & | 4.250E+00 | 1.28E+00 | G |
| TL-208 | 3.3598E-01 | | | | | | |
| | | 583.14 | 3.293E-01 | (P | 4.777E-02 | 2.39E-02 | G |
| | | 510.72 | 3.617E-01 | *(P | 1.961E-01 | 7.83E-02 | G |
| PB-212 | 1.0009E+00 | | | | | | |
| | | 238.63 | 9.827E-01 | (P | 8.829E-02 | 3.97E-02 | G K |
| | | | | | | | Energy duplication |
| | | 77.11 | 1.001E+00 | } P | 4.084E-01 | 1.06E-01 | G |
| | | 74.81 | 1.578E+00 | + P | 7.932E-01 | 2.60E-01 | G |
| PB-214 | 5.9142E-01 | | | | | | |
| | | 351.99 | 6.123E-01 | (P | 8.510E-02 | 3.85E-02 | G K |
| | | 295.22 | 5.585E-01 | (P | 1.525E-01 | 5.70E-02 | G |
| | | | | | | | Energy duplication |
| | | 77.11 | 0.000E+00 | } P | 9.636E-01 | 0.00E+00 | G |
| | | 241.92 | 5.722E-01 | ( | 6.180E-01 | 1.91E-01 | G |
| BI-212 | 5.9147E-01 | | | | | | |
| | | 727.17 | 5.772E-01 | *(P | 3.592E-01 | 1.43E-01 | G K |
| | | 1620.56 | 6.528E-01 | (P | 5.673E-01 | 2.26E-01 | G |
| | | 785.42 | 5.138E-01 | % | 1.736E+00 | 5.15E-01 | G |
| BI-214 | 4.4089E-01 | | | | | | |
| | | 609.32 | 4.409E-01 | (P | 8.253E-02 | 3.70E-02 | G K |
| | | 1764.51 | 5.815E-01 | + P | 1.392E-01 | 8.10E-02 | G |
| | | 1120.28 | 5.944E-01 | + P | 3.679E-01 | 1.46E-01 | G |
| RA-224 | 1.4552E+00 | | | | | | |
| | | 241.00 | 1.455E+00 | ( | 1.137E+00 | 3.55E-01 | G |
| RA-226 | 1.2655E+00 | | | | | | |
| | | 185.99 | 1.265E+00 | (P | 1.200E+00 | 3.71E-01 | G |
| AC-228 | 8.6902E-01 | | | | | | |
| | | 911.07 | 8.681E-01 | (P | 1.536E-01 | 7.48E-02 | G K |
| | | 968.90 | 8.604E-01 | (P | 1.838E-01 | 8.47E-02 | G |
| | | 338.40 | 8.837E-01 | (P | 3.102E-01 | 1.26E-01 | G |

| Nuclide | Ave activity | Energy | Activity | Code | Peak | MDA | Comments |
|---|---|---|---|---|---|---|---|
| TH-227 | -2.8100E-01 | | | | | | |
| | | 236.00 | -2.810E-01 | %( | 4.242E-01 | 1.30E-01 | G K |
| | | 256.25 | 4.841E-02 | & P | 5.407E-01 | 1.61E-01 | G |
| PA-234 | 3.8623E-02 | | | | | | |
| | | 98.44 | -4.985E-02 | %(P | 2.370E-01 | 7.11E-02 | G K |
| | | 946.00 | -5.202E-02 | & P | 2.217E-01 | 6.54E-02 | G |
| | | 131.28 | 1.497E-01 | &(P | 2.007E-01 | 6.15E-02 | G |
| | | 94.67 | -1.795E-01 | & P | 4.563E-01 | 1.38E-01 | G |
| | | 883.24 | 3.298E-03 | & | 3.035E-01 | 8.64E-02 | G |
| | | 926.70 | -1.553E-01 | & | 3.829E-01 | 1.15E-01 | G |
| | | 569.26 | -1.400E-01 | % P | 3.834E-01 | 1.14E-01 | G |
| TH-234 | 2.4200E+00 | | | | | | |
| | | 63.29 | 2.420E+00 | %(P | 6.800E+00 | 2.05E+00 | G K |
| | | 92.80 | 1.289E+00 | % P | 2.352E+00 | 7.12E-01 | G |
| | | 92.38 | 1.454E+00 | % P | 2.811E+00 | 8.51E-01 | G |
| AM-241 | 3.7063E-02 | | | | | | |
| | | 59.54 | 3.706E-02 | &(P | 8.850E-01 | 2.62E-01 | G |

( - This peak used in the nuclide activity average.

* - Peak is too wide, but only one peak in library.
! - Peak is part of a multiplet and this area went negative during deconvolution.
? - Peak is too narrow.
@ - Peak is too wide at FW25M, but ok at FWHM.
% - Peak fails sensitivity test.
$ - Peak identified, but first peak of this nuclide failed one or more qualification tests.
+ - Peak activity higher than counting uncertainty range.
- - Peak activity lower than counting uncertainty range.
= - Peak outside analysis energy range.
& - Calculated peak centroid is not close enough to the library energy centroid for positive identification.
P - Peakbackground subtraction
} - Peak is too close to another for the activity to be found directly.

| Nuclide Codes: | Peak Codes: |
|---|---|
| T - Thermal Neutron Activation | G - Gamma Ray |
| F - Fast Neutron Activation | X - X-Ray |
| I - Fission Product | P - Positron Decay |
| N - Naturally Occurring Isotope | S - Single-Escape |
| P - Photon Reaction | D - Double-Escape |
| C - Charged Particle Reaction | K - Key Line |
| M - No MDA Calculation | A - Not in Average |

R - Coincidence Corrected C - Coincidence Peak
H - Halflife limit exceeded

- - - - - - - - - - - - - - - - - - - - - - - - - - - - - - - - - - - - - - -

***** S U M M A R Y O F N U C L I D E S I N S A M P L E *****

| Nuclide | | Time of Count Activity pCi/gm | Time Corrected Activity pCi/gm | Uncertainty 3 Sigma Counting pCi/gm | Total pCi/gm | MDA pCi/gm |
|---|---|---|---|---|---|---|
| BE-7 | #A | 7.6634E-02 | 7.6618E-02 | 2.9450E-01 | 2.9453E-01 | 3.308E-01 |
| K-40 | | 2.0310E+01 | 2.0310E+01 | 1.4959E+00 | 1.9047E+00 | |
| MN-54 | #A | -1.5433E-04 | -1.5433E-04 | 1.0550E-01 | 1.0550E-01 | 3.843E-02 |
| CO-57 | #B | 2.3095E-02 | 2.3094E-02 | 4.1088E-02 | 4.1108E-02 | 4.510E-02 |
| CO-60 | #B | 3.9575E-05 | 3.9575E-05 | 3.3469E-02 | 3.3469E-02 | 4.043E-02 |
| Sr-85 | #A | -1.5620E-02 | -1.5617E-02 | 3.9842E-02 | 3.9853E-02 | 4.419E-02 |
| Kr-85 | #A | -3.6063E+02 | -3.6063E+02 | 9.1995E+02 | 9.2019E+02 | 1.020E+03 |
| Y-88 | #B | 9.8742E-03 | 9.8732E-03 | 1.0695E-02 | 1.0710E-02 | 2.890E-02 |
| NB-94 | #B | 3.1819E-05 | 3.1819E-05 | 2.7542E-02 | 2.7542E-02 | 3.255E-02 |
| Ag-108M | #B | -1.7336E-03 | -1.7336E-03 | 5.7220E-02 | 5.7220E-02 | 6.493E-02 |
| CD-109 | #A | 7.7082E-01 | 7.7080E-01 | 1.8730E+00 | 1.8735E+00 | 2.066E+00 |
| SN-113 | #B | 9.1960E-03 | 9.1951E-03 | 4.5105E-02 | 4.5108E-02 | 5.074E-02 |
| SB-125 | #B | 8.6273E-02 | 8.6272E-02 | 6.7784E-02 | 6.7968E-02 | 1.213E-01 |
| I-131 | #B | 1.8224E-02 | 1.8198E-02 | 2.8810E-02 | 2.8829E-02 | 3.146E-02 |
| CS-134 | #B | 7.6846E-05 | 7.6845E-05 | 2.9984E-02 | 2.9984E-02 | 3.470E-02 |
| CS-137 | #A | -8.4713E-04 | -8.4713E-04 | 2.7500E-01 | 2.7500E-01 | 4.541E-02 |
| CE-139 | #A | 2.8100E-03 | 2.8098E-03 | 4.3617E-02 | 4.3617E-02 | 4.876E-02 |
| EU-152 | #B | -4.6658E-03 | -4.6658E-03 | 2.0831E-01 | 2.0831E-01 | 1.490E-01 |
| EU-154 | #B | -2.9648E-02 | -2.9648E-02 | 1.1014E-01 | 1.1015E-01 | 1.220E-01 |
| EU-155 | #B | 9.5748E-02 | 9.5747E-02 | 2.3624E-01 | 2.3630E-01 | 2.606E-01 |
| HG-203 | #B | -8.6346E-03 | -8.6325E-03 | 4.0340E-02 | 4.0343E-02 | 4.486E-02 |
| TL-208 | | 3.3598E-01 | 3.3598E-01 | 7.3154E-02 | 7.5710E-02 | |
| PB-212 | | 1.0009E+00 | 1.0009E+00 | 1.2116E-01 | 1.3437E-01 | |
| PB-214 | | 5.9142E-01 | 5.9142E-01 | 1.1150E-01 | 1.1666E-01 | |
| BI-212 | | 5.9147E-01 | 5.9147E-01 | 3.7688E-01 | 3.7844E-01 | |
| BI-214 | | 4.4089E-01 | 4.4089E-01 | 1.1089E-01 | 1.1380E-01 | |
| RA-224 | | 1.4552E+00 | 1.4552E+00 | 1.0663E+00 | 1.0697E+00 | 1.137E+00 |
| RA-226 | # | 1.2655E+00 | 1.2655E+00 | 1.1123E+00 | 1.1148E+00 | 1.200E+00 |
| AC-228 | | 8.6902E-01 | 8.6902E-01 | 1.6814E-01 | 1.7555E-01 | |
| TH-227 | #B | -2.8100E-01 | -2.8100E-01 | 3.8856E-01 | 3.8890E-01 | 4.242E-01 |
| PA-234 | #B | 3.8623E-02 | 3.8623E-02 | 4.7619E-02 | 4.7667E-02 | 2.370E-01 |
| TH-234 | #B | 2.4200E+00 | 2.4200E+00 | 6.1466E+00 | 6.1481E+00 | 6.800E+00 |
| AM-241 | #A | 3.7063E-02 | 3.7063E-02 | 7.8525E-01 | 7.8526E-01 | 8.850E-01 |

# - All peaks for activity calculation had bad shape.
* - Activity omitted from total
& - Activity omitted from total and all peaks had bad shape.
< - MDA value printed.
A - Activity printed, but activity < MDA.
B - Activity < MDA and failed test.
C - Area < Critical level.
F - Failed fraction or key line test.

H – Halflife limit exceeded

YAEC Chemistry Lab Spectrum name: 103F_16SEPT2006_0816.An1

---------- S U M M A R Y ----------

Total Activity ( 1120.0 to 2000.7 keV) 2.5595299E+01 pCi/gm
Total Decayed Activity ( 1120.0 to 2000.7 keV) 2.5595299E+01 pCi/gm

The library has energies which are not separable.

Analyzed by: _____
JJM

Reviewed by: _____
Supervisor

Laboratory: YAEC Chemistry Lab

YAEC Chemistry Lab Spectrum name: 103F_16SEPT2006_0858.An1

Sample description
FSS-SSS-01-01-002-F

Spectrum Filename: C:\GammaVision\Spectra\103F_16SEPT2006_0858.An1

Acquisition information

| | |
|---|---|
| Start time: | 16-Sep-2006 08:58:52 |
| Live time: | 2000 |
| Real time: | 2002 |
| Dead time: | 0.10 % |
| Detector ID: | 4 |

Detector system
Det 103 - DSPE-471

Calibration

| | |
|---|---|
| Filename: | D3_1LSa.Clb |

Detector_103 1.0 Liter Sand Geometry

Energy Calibration

| | |
|---|---|
| Created: | 08-Aug-2005 11:09:41 |
| Zero offset: | 0.409 keV |
| Gain: | 0.500 keV/channel |
| Quadratic: | 1.092E-08 keV/channel^2 |

Efficiency Calibration

| | |
|---|---|
| Created: | 08-Aug-2005 11:11:25 |
| Type: | Polynomial |
| Uncertainty: | 0.993 % |
| Coefficients: | -0.264059 -5.138468 0.638383 |
| | -0.089199 0.005011 -0.000129 |

Library Files

| | |
|---|---|
| Main analysis library: | FSS_Rev_1.Lib |
| Library Match Width: | 1.000 |
| Peak stripping: | Library based |

Analysis parameters

| | |
|---|---|
| Analysis engine: | Env32 G53W4.20 |
| Start channel: | 100 ( 50.41keV ) |
| Stop channel: | 4000 ( 2000.67keV ) |
| Peak rejection level: | 41.667% |
| Peak search sensitivity: | 3 |
| Sample Size: | 1.7290E+03 |
| Activity scaling factor: | 1.0000E+06/( 1.0000E+00* 1.7290E+03) = 5.7837E+02 |
| Detection limit method: | Nureg 4.16 |
| Random error: | 1.0000000E+00 |
| Systematic error: | 1.0000000E+00 |

| | |
|---|---|
| Fraction Limit: | 0.000% |
| Background width: | average of five points. |

YAEC Chemistry Lab Spectrum name: 103F_16SEPT2006_0858.An1

Half lives decay limit: 12.000
Activity range factor: 2.000
Min. step backg. energy 0.000
Multiplet shift channel 2.000

| Corrections | Status | Comments |
|---|---|---|
| Decay correct to date: | YES | 09-Sep-2006 09:00:00 |
| Decay during acquisition: | NO | |
| Decay during collection: | NO | |
| True coincidence correction: | NO | |
| Peaked background correction: | YES | 103_150K_05AUG05.Pbc 08-Aug-2005 12:54:15 |
| Absorption (Internal): | NO | |
| Geometry correction: | NO | |
| Random summing: | NO | |

total peaks alloc. 20 cutoff 20.00000 %
Energy Calibration
Normalized diff: 0.2878

***** S U M M A R Y O F P E A K S I N R A N G E *****

| Peak Energy | Area | Uncert | FWHM | Corrctn Factor | Nuclide Energy | Brnch. Ratio | Act. pCi/gm | Nuc |
|---|---|---|---|---|---|---|---|---|
| 74.94 | 143. | 19.80 | 0.99 | 9.052E-03 | 74.81 | 9.600 | 1.287E+00 | PB212 |
| 77.24 | 191. | 12.52 | 0.99 | 1.011E-02 | 77.11 | 17.500 | 9.631E-01 | PB212 |
| 93.15 | 99. | 36.82 | 1.50 | 1.631E-02 | 92.38 | 2.570 | PBC<MDA | TH234 |
| | | | | | 92.80 | 3.000 | PBC<MDA | TH234 |
| 93.15 | 100. | 36.04 | 1.50 | 1.645E-02 | 92.38 | 2.570 | PBC<MDA | TH234 |
| | | | | | 92.80 | 3.000 | PBC<MDA | TH234 |
| 186.19 | 163. | 23.68 | 1.42 | 2.566E-02 | 185.99 | 3.280 | 1.393E+00 | RA226 |
| 209.51 | 110. | 22.17 | 1.08 | 2.470E-02 | | | | |
| 238.79 | 1145. | 3.43 | 1.09 | 2.319E-02 | 238.63 | 43.100 | 8.858E-01 | PB212 |
| 242.01 | 209. | 13.12 | 1.10 | 2.302E-02 | 241.00 | 3.900 | 1.815E+00 | RA224 |
| | | | | | 241.92 | 7.470 | 9.494E-01 | PB214 |
| 270.53 | 125. | 22.94 | 1.49 | 2.150E-02 | | | | |
| 277.65 | 68. | 36.97 | 1.50 | 2.105E-02 | 279.17 | 81.500 | PBC<MDA | HG203 |
| 295.38 | 279. | 9.80 | 1.10 | 2.024E-02 | 295.22 | 19.200 | 5.536E-01 | PB214 |
| 300.87 | 114. | 24.97 | 1.12 | 1.998E-02 | | | | |
| 328.37 | 76. | 36.25 | 1.56 | 1.873E-02 | | | | |
| 338.61 | 307. | 11.03 | 1.33 | 1.829E-02 | 338.40 | 12.010 | 1.088E+00 | AC228 |
| 352.07 | 493. | 6.53 | 1.04 | 1.775E-02 | 351.99 | 37.100 | 5.788E-01 | PB214 |
| 409.91 | 55. | 34.53 | 1.15 | 1.573E-02 | | | | |
| 462.99 | 76. | 22.45 | 1.71 | 1.426E-02 | | | | |
| 462.99 | 76. | 22.45 | 1.71 | 1.426E-02 | 463.51 | 10.000 | 4.108E-01 | SB125 |
| 510.87 | 205. | 11.35 | 1.64 | 1.317E-02 | 510.72 | 22.500 | 4.703E-01 | TL208 |
| 583.44 | 373. | 7.12 | 1.31 | 1.184E-02 | 583.14 | 86.000 | 2.830E-01 | TL208 |
| 609.54 | 375. | 8.66 | 1.35 | 1.144E-02 | 609.32 | 46.090 | 5.463E-01 | BI214 |
| 727.70 | 85. | 23.62 | 1.48 | 9.959E-03 | 727.17 | 11.800 | 5.624E-01 | BI212 |
| 768.10 | 62. | 29.83 | 1.47 | 9.555E-03 | | | | |
| 786.42 | 32. | 38.46 | 1.50 | 9.394E-03 | 785.42 | 2.000 | PBC<MDA | BI212 |

| | | | | | | | | |
|---|---|---|---|---|---|---|---|---|
| 795.69 | 78. | 20.92 | 0.73 | 9.302E-03 | | | | |
| 795.69 | 78. | 20.92 | 0.73 | 9.302E-03 | 795.76 | 85.400 | 7.726E-02 | CS134 |
| 860.74 | 53. | 24.17 | 1.19 | 8.766E-03 | | | | |
| 911.70 | 311. | 7.20 | 1.75 | 8.397E-03 | 911.07 | 29.000 | 9.856E-01 | AC228 |
| 964.87 | 49. | 22.22 | 1.54 | 8.050E-03 | 964.00 | 14.580 | PBC<MDA | EU152 |
| 969.34 | 159. | 9.42 | 1.54 | 8.022E-03 | 968.90 | 17.460 | 8.834E-01 | AC228 |
| 1121.23 | 85. | 24.06 | 1.75 | 7.207E-03 | 1120.28 | 15.040 | 6.017E-01 | BI214 |
| 1461.49 | 1335. | 2.77 | 1.78 | 5.930E-03 | 1460.75 | 10.700 | 1.620E+01 | K40 |

| pk energy | area | uncert | fwhm | corr | nuclide | brnch. | act. | nuc |
|---|---|---|---|---|---|---|---|---|
| 1621.03 | 32. | 25.20 | 0.62 | 5.488E-03 | 1620.56 | 2.750 | 1.671E+00 | BI212 |
| 1765.12 | 43. | 16.83 | 2.04 | 5.142E-03 | 1764.51 | 15.920 | 4.070E-01 | BI214 |

********** U N I D E N T I F I E D P E A K S U M M A R Y **********

| Peak Channel | Centroid Energy | Background Counts | Net Area Counts | Intensity Cts/Sec | Uncert 3 Sigma % | FWHM keV | Suspected Nuclide | |
|---|---|---|---|---|---|---|---|---|
| 418.41 | 209.63 | 310. | 107. | 0.054 | 73.67 | 1.019 | NP-239 | |
| 540.21 | 270.53 | 279. | 125. | 0.062 | 68.83 | 1.486 | AC-228 | s |
| 600.89 | 300.87 | 269. | 114. | 0.057 | 74.91 | 1.121 | PB-212 | s |
| 655.89 | 328.37 | 266. | 76. | 0.038 | 108.75 | 1.559 | RH-106M | s |
| 818.94 | 409.91 | 131. | 55. | 0.027 | 103.58 | 1.154 | AC-228 | |
| 1535.27 | 768.10 | 97. | 62. | 0.031 | 89.48 | 1.468 | BI-214 | sM |
| 1720.53 | 860.74 | 48. | 53. | 0.026 | 72.52 | 1.190 | TL-208 | |
| 1929.77 | 964.97 | 41. | 43. | 0.022 | 77.24 | 1.539 | AC-228 | D |

s - Peak fails shape tests.
D - Peak area deconvoluted.
L - Peak written from unknown list.
C - Area < Critical level.
M - Peak is close to a library peak.

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This section based on library: FSS_Rev_1.Lib

********** I D E N T I F I E D P E A K S U M M A R Y **********

| Nuclide | Peak Channel | Centroid Energy | Background Counts | Net Area Counts | Intensity Cts/Sec | Uncert 3 Sigma % | FWHM keV |
|---|---|---|---|---|---|---|---|
| PB-212 | 148.79 | 74.81 | 349. | 143. | 0.072 | 59.41 | 0.993D |
| PB-212 | 153.39 | 77.11 | 367. | 191. | 0.096 | 37.57 | 0.995A |
| RA-226 | 371.72 | 186.28 | 706. | 146. | 0.073 | 74.21 | 1.500s |
| PB-212 | 476.42 | 238.63 | 234. | 1131. | 0.565 | 10.46 | 1.093D |
| RA-224 | 481.16 | 241.00 | 1010. | 129. | 0.064 | 109.09 | 1.095D |
| PB-214 | 483.00 | 241.92 | 325. | 125. | 0.063 | 53.71 | 1.095A |
| HG-203 | 554.46 | 277.65 | 279. | 68. | 0.034 | 110.92 | 1.500s |
| PB-214 | 589.92 | 295.38 | 218. | 275. | 0.138 | 29.39 | 1.097 |
| AC-228 | 676.36 | 338.61 | 272. | 306. | 0.153 | 33.08 | 1.328s |
| PB-214 | 703.29 | 352.07 | 215. | 488. | 0.244 | 19.59 | 1.043 |
| SB-125 | 925.09 | 462.98 | 129. | 82. | 0.041 | 66.38 | 1.500s |
| TL-208 | 1020.86 | 510.87 | 139. | 178. | 0.089 | 34.04 | 1.638s |
| TL-208 | 1165.98 | 583.44 | 123. | 369. | 0.184 | 21.36 | 1.307 |
| BI-214 | 1218.18 | 609.54 | 180. | 369. | 0.184 | 25.97 | 1.350 |
| BI-212 | 1454.47 | 727.70 | 103. | 85. | 0.042 | 70.86 | 1.483 |
| BI-212 | 1571.89 | 786.42 | 61. | 32. | 0.016 | 115.38 | 1.500 |
| CS-134 | 1590.14 | 795.54 | 59. | 50. | 0.025 | 77.63 | 1.500s |
| AC-228 | 1822.44 | 911.70 | 63. | 307. | 0.154 | 21.61 | 1.754s |

YAEC Chemistry Lab Spectrum name: 103F_16SEPT2006_0858.An1

| Nuclide | Channel | Energy | Background | Net area | Cnts/sec | Uncert | FWHM |
|---|---|---|---|---|---|---|---|
| AC-228 | 1936.81 | 968.90 | 33. | 158. | 0.079 | 28.31 | 1.541D |
| BI-214 | 2241.44 | 1121.23 | 95. | 84. | 0.042 | 72.19 | 1.752s |
| K-40 | 2921.85 | 1461.49 | 27. | 1316. | 0.658 | 8.31 | 1.780 |
| BI-212 | 3240.87 | 1621.03 | 9. | 32. | 0.016 | 75.59 | 0.619s |
| BI-214 | 3528.99 | 1765.12 | 8. | 43. | 0.021 | 50.49 | 2.042 |

s - Peak fails shape tests.
D - Peak area deconvoluted.
A Derived peak area.

***** S U M M A R Y O F L I B R A R Y P E A K U S A G E *****

| - Nuclide - Name | Code | Average Activity pCi/gm | Peak Energy keV | Peak Activity pCi/gm | Code | MDA Value pCi/gm | | COMMENTS |
|---|---|---|---|---|---|---|---|---|
| BE-7 | | 7.4649E-02 | | | | | | |
| | | | 477.56 | 7.465E-02 | &( | 3.246E-01 | 9.59E-02 | G |
| K-40 | | 1.6203E+01 | | | | | | |
| | | | 1460.75 | 1.620E+01 | (P | 3.322E-01 | 4.55E-01 | G |
| MN-54 | | 1.9405E-02 | | | | | | |
| | | | 834.81 | 1.941E-02 | %(P | 4.142E-02 | 1.25E-02 | G |
| CO-57 | | -1.0157E-02 | | | | | | |
| | | | 122.07 | -1.016E-02 | &(P | 5.482E-02 | 1.64E-02 | G K |
| | | | 136.43 | 2.567E-02 | % | 3.558E-01 | 1.06E-01 | G |
| CO-60 | | -1.1933E-02 | | | | | | |
| | | | 1332.51 | -1.193E-02 | %(P | 4.456E-02 | 1.26E-02 | G K |
| | | | 1173.23 | 1.723E-02 | % P | 4.736E-02 | 1.41E-02 | G K |
| Sr-85 | | -1.5508E-02 | | | | | | |
| | | | 514.00 | -1.551E-02 | %( | 4.758E-02 | 1.43E-02 | G |
| Kr-85 | | -3.3287E+02 | | | | | | |
| | | | 513.99 | -3.329E+02 | %( | 1.019E+03 | 3.06E+02 | G |
| Y-88 | | 3.4505E-03 | | | | | | |
| | | | 1836.01 | 3.450E-03 | %(P | 2.290E-02 | 6.07E-03 | G K |
| | | | 898.02 | -1.850E-04 | % P | 3.743E-02 | 1.05E-02 | G |
| NB-94 | | -8.0016E-03 | | | | | | |
| | | | 871.10 | -8.002E-03 | &( | 4.074E-02 | 1.19E-02 | G K |
| | | | 702.50 | 1.250E-03 | & | 3.696E-02 | 1.06E-02 | G K |

| Nuclide | Ave activity | Energy | Activity | Code | Peak | MDA | Comments |
|---|---|---|---|---|---|---|---|
| Ag-108M | -1.2195E-02 | | | | | | |
| | | 722.95 | -1.219E-02 | %( | 4.396E-02 | 1.30E-02 | G K |
| | | 614.37 | -1.130E-02 | % P | 4.582E-02 | 1.36E-02 | G |
| | | 433.93 | -4.296E-03 | % | 3.577E-02 | 1.05E-02 | G |
| CD-109 | 1.3564E-01 | | | | | | |
| | | 88.04 | 1.356E-01 | %( | 2.108E+00 | 6.30E-01 | G |
| SN-113 | 1.4962E-02 | | | | | | |
| | | 391.71 | 1.496E-02 | %( | 5.491E-02 | 1.64E-02 | G K |
| | | 255.04 | -2.721E-01 | & | 1.649E+00 | 4.91E-01 | G |
| SB-125 | 1.1549E-01 | | | | | | |
| | | 427.95 | 1.793E-03 | &(P | 1.181E-01 | 3.44E-02 | G K |
| | | 600.77 | -4.392E-02 | % P | 2.214E-01 | 6.54E-02 | G |
| | | 636.15 | 1.687E-03 | & P | 3.105E-01 | 8.89E-02 | G |
| | | 463.51 | 4.520E-01 | (P | 3.071E-01 | 1.02E-01 | G |
| | | 176.29 | -2.817E-02 | % | 5.159E-01 | 1.53E-01 | G |
| I-131 | -1.3237E-02 | | | | | | |
| | | 364.48 | -1.324E-02 | %(P | 7.271E-02 | 2.15E-02 | G K |
| | | 636.97 | 1.294E-01 | & | 8.371E-01 | 2.44E-01 | G |
| | | 284.29 | 6.697E-02 | & P | 1.028E+00 | 3.04E-01 | G |
| CS-134 | 2.2360E-02 | | | | | | |
| | | 604.66 | -1.491E-03 | %( | 7.240E-02 | 2.14E-02 | G K |
| | | 795.76 | 4.962E-02 | @(P | 3.823E-02 | 1.29E-02 | G |
| | | 569.29 | 5.171E-02 | % P | 2.320E-01 | 6.83E-02 | G |
| | | 801.84 | 1.630E-02 | % P | 4.222E-01 | 1.20E-01 | G |
| CS-137 | 1.8742E-02 | | | | | | |
| | | 661.62 | 1.874E-02 | %(P | 4.227E-02 | 1.27E-02 | G |
| CE-139 | 1.8763E-02 | | | | | | |
| | | 165.85 | 1.876E-02 | %( | 4.779E-02 | 1.44E-02 | G |
| EU-152 | -3.0086E-02 | | | | | | |
| | | 121.78 | -3.009E-02 | &(P | 1.581E-01 | 4.74E-02 | G K |
| | | 344.30 | -2.248E-02 | & P | 1.229E-01 | 3.65E-02 | G |
| | | 1408.08 | 0.000E+00 | % | 1.963E-01 | 5.46E-02 | G |
| | | 964.00 | 1.817E-02 | % P | 3.866E-01 | 1.12E-01 | G |
| | | 1112.07 | -7.707E-02 | % | 3.815E-01 | 1.12E-01 | G |
| | | 778.90 | -7.070E-03 | & | 2.052E-01 | 5.74E-02 | G |
| EU-154 | 8.5664E-04 | | | | | | |
| | | 123.10 | 8.566E-04 | %( | 1.170E-01 | 3.48E-02 | G K |
| | | 1274.80 | 3.689E-02 | % | 1.172E-01 | 3.46E-02 | G |

| Nuclide | Ave activity | Energy | Activity | Code | Peak | MDA | Comments |
|---|---|---|---|---|---|---|---|
| | | 723.30 | -1.367E-01 | % | 2.492E-01 | 7.60E-02 | G |
| | | 1004.80 | 2.547E-02 | & | 2.122E-01 | 6.09E-02 | G |
| EU-155 | 1.1962E-01 | | | | | | |
| | | 86.45 | 1.196E-01 | &( | 2.457E-01 | 7.45E-02 | G K |
| | | 105.31 | 1.590E-02 | & | 2.397E-01 | 7.15E-02 | G |
| HG-203 | 3.4154E-02 | | | | | | |
| | | 279.17 | 3.415E-02 | &(P | 4.069E-02 | 1.26E-02 | G K |
| | | 72.87 | -6.324E-01 | & P | 2.681E+00 | 8.06E-01 | G |
| | | 70.83 | -3.167E+00 | % | 4.894E+00 | 1.49E+00 | G |
| | | 82.50 | 0.000E+00 | % | 4.718E+00 | 1.41E+00 | G |
| TL-208 | 2.8304E-01 | | | | | | |
| | | 583.14 | 2.830E-01 | (P | 4.175E-02 | 2.04E-02 | G |
| | | 510.72 | 4.703E-01 | + P | 1.519E-01 | 6.13E-02 | G |
| PB-212 | 9.0677E-01 | | | | | | |
| | | 238.63 | 8.839E-01 | (P | 5.784E-02 | 3.11E-02 | G K |
| | | | | | | | Energy duplication |
| | | 77.11 | 8.453E-01 | } P | 4.061E-01 | 1.06E-01 | G |
| | | 74.81 | 1.287E+00 | + P | 8.073E-01 | 2.60E-01 | G |
| PB-214 | 5.7020E-01 | | | | | | |
| | | 351.99 | 5.788E-01 | (P | 8.435E-02 | 3.82E-02 | G K |
| | | 295.22 | 5.536E-01 | (P | 1.437E-01 | 5.51E-02 | G |
| | | | | | | | Energy duplication |
| | | 77.11 | 0.000E+00 | } P | 9.614E-01 | 0.00E+00 | G |
| | | 241.92 | 5.702E-01 | } | 3.943E-01 | 1.02E-01 | G |
| BI-212 | 5.6237E-01 | | | | | | |
| | | 727.17 | 5.624E-01 | (P | 3.330E-01 | 1.34E-01 | G K |
| | | 1620.56 | 1.671E+00 | + P | 8.541E-01 | 4.22E-01 | G |
| | | 785.42 | 1.344E+00 | + | 1.628E+00 | 5.17E-01 | G |
| BI-214 | 5.5995E-01 | | | | | | |
| | | 609.32 | 5.463E-01 | (P | 9.682E-02 | 4.81E-02 | G K |
| | | 1764.51 | 4.070E-01 | - P | 1.546E-01 | 7.38E-02 | G |
| | | 1120.28 | 6.017E-01 | *(P | 3.477E-01 | 1.48E-01 | G |
| RA-224 | 1.1194E+00 | | | | | | |
| | | | | | | | Derived Ave Activity |
| | | 241.00 | 1.119E+00 | }( | 1.310E+00 | 4.17E-01 | G |
| RA-226 | 1.3552E+00 | | | | | | |
| | | 185.99 | 1.355E+00 | (P | 1.175E+00 | 3.65E-01 | G |
| AC-228 | 9.7592E-01 | | | | | | |
| | | 911.07 | 9.856E-01 | (P | 1.271E-01 | 7.18E-02 | G K |
| | | 968.90 | 8.827E-01 | (P | 1.636E-01 | 8.34E-02 | G |

| Nuclide | Ave activity | Energy | Activity | Code | Peak | MDA | Comments |
|---|---|---|---|---|---|---|---|
| | | 338.40 | 1.088E+00 | @(P | 2.829E-01 | 1.20E-01 | G |
| TH-227 | -1.3323E-01 | | | | | | |
| | | 236.00 | -1.332E-01 | &( | 3.957E-01 | 1.19E-01 | G K |
| | | 256.25 | -5.677E-03 | & P | 5.047E-01 | 1.49E-01 | G |
| PA-234 | 1.2629E-04 | | | | | | |
| | | 98.44 | 1.263E-04 | %(P | 2.436E-01 | 7.25E-02 | G K |
| | | 946.00 | 6.207E-02 | % P | 1.162E-01 | 3.58E-02 | G |
| | | 131.28 | -3.412E-02 | & P | 2.373E-01 | 7.10E-02 | G |
| | | 94.67 | -1.409E-01 | & P | 4.322E-01 | 1.30E-01 | G |
| | | 883.24 | -1.101E-03 | % | 3.000E-01 | 8.49E-02 | G |
| | | 926.70 | 8.316E-02 | % | 2.917E-01 | 8.57E-02 | G |
| | | 569.26 | 4.069E-02 | % P | 3.558E-01 | 1.04E-01 | G |
| TH-234 | 5.1667E-01 | | | | | | |
| | | 63.29 | 5.167E-01 | &(P | 6.909E+00 | 2.06E+00 | G K |
| | | 92.80 | 1.584E+00 | % P | 2.204E+00 | 6.72E-01 | G |
| | | 92.38 | 1.839E+00 | & P | 2.623E+00 | 7.98E-01 | G |
| AM-241 | 1.4247E-02 | | | | | | |
| | | 59.54 | 1.425E-02 | %(P | 1.179E+00 | 3.50E-01 | G |

( - This peak used in the nuclide activity average.

* - Peak is too wide, but only one peak in library.
! - Peak is part of a multiplet and this area went negative during deconvolution.
? - Peak is too narrow.
@ - Peak is too wide at FW25M, but ok at FWHM.
% - Peak fails sensitivity test.
$ - Peak identified, but first peak of this nuclide failed one or more qualification tests.
+ - Peak activity higher than counting uncertainty range.
- - Peak activity lower than counting uncertainty range.
= - Peak outside analysis energy range.
& - Calculated peak centroid is not close enough to the library energy centroid for positive identification.
P - Peakbackground subtraction
} - Peak is too close to another for the activity to be found directly.

| Nuclide Codes: | Peak Codes: |
|---|---|
| T - Thermal Neutron Activation | G - Gamma Ray |
| F - Fast Neutron Activation | X - X-Ray |
| I - Fission Product | P - Positron Decay |
| N - Naturally Occurring Isotope | S - Single-Escape |
| P - Photon Reaction | D - Double-Escape |
| C - Charged Particle Reaction | K - Key Line |

M - No MDA Calculation
R - Coincidence Corrected
H - Halflife limit exceeded
A - Not in Average
C - Coincidence Peak

- - - - - - - - - - - - - - - - - - - - - - - - - - - - - - - - - - - - - - - -

***** S U M M A R Y O F N U C L I D E S I N S A M P L E *****

| Nuclide | | Time of Count Activity pCi/gm | Time Corrected Activity pCi/gm | Uncertainty Counting pCi/gm | 3 Sigma Total pCi/gm | MDA pCi/gm |
|---|---|---|---|---|---|---|
| BE-7 | #A | 6.8166E-02 | 7.4649E-02 | 2.8783E-01 | 2.8786E-01 | 2.964E-01 |
| K-40 | | 1.6203E+01 | 1.6203E+01 | 1.3656E+00 | 1.6582E+00 | |
| MN-54 | #A | 1.9106E-02 | 1.9405E-02 | 3.7604E-02 | 3.7621E-02 | 4.078E-02 |
| CO-57 | #B | -9.9764E-03 | -1.0157E-02 | 5.0968E-02 | 5.0971E-02 | 5.384E-02 |
| CO-60 | #B | -1.1903E-02 | -1.1933E-02 | 6.6357E-02 | 6.6361E-02 | 4.444E-02 |
| Sr-85 | #A | -1.4390E-02 | -1.5508E-02 | 4.2794E-02 | 4.2804E-02 | 4.415E-02 |
| Kr-85 | #A | -3.3286E+02 | -3.3287E+02 | 9.1678E+02 | 9.1699E+02 | 1.019E+03 |
| Y-88 | #B | 3.2970E-03 | 3.4505E-03 | 1.8196E-02 | 1.8197E-02 | 2.188E-02 |
| NB-94 | #B | -8.0016E-03 | -8.0016E-03 | 3.5786E-02 | 3.5789E-02 | 4.074E-02 |
| Ag-108M | #B | -1.2194E-02 | -1.2195E-02 | 3.9127E-02 | 3.9134E-02 | 4.396E-02 |
| CD-109 | #A | 1.3420E-01 | 1.3564E-01 | 1.8885E+00 | 1.8885E+00 | 2.085E+00 |
| SN-113 | #B | 1.4345E-02 | 1.4962E-02 | 4.9151E-02 | 4.9158E-02 | 5.265E-02 |
| SB-125 | #B | 1.1494E-01 | 1.1549E-01 | 7.7852E-02 | 7.8141E-02 | 1.175E-01 |
| I-131 | #B | -7.2398E-03 | -1.3237E-02 | 7.1647E-02 | 7.1651E-02 | 3.977E-02 |
| CS-134 | #B | 2.2217E-02 | 2.2360E-02 | 1.7389E-02 | 1.7438E-02 | 7.193E-02 |
| CS-137 | #A | 1.8734E-02 | 1.8742E-02 | 3.8182E-02 | 3.8197E-02 | 4.225E-02 |
| CE-139 | #A | 1.8112E-02 | 1.8763E-02 | 4.3312E-02 | 4.3326E-02 | 4.613E-02 |
| EU-152 | #B | -3.0055E-02 | -3.0086E-02 | 1.5283E-01 | 1.5284E-01 | 1.580E-01 |
| EU-154 | #B | 8.5530E-04 | 8.5664E-04 | 1.0449E-01 | 1.0449E-01 | 1.168E-01 |
| EU-155 | #B | 1.1930E-01 | 1.1962E-01 | 2.2363E-01 | 2.2373E-01 | 2.450E-01 |
| HG-203 | #A | 3.0776E-02 | 3.4154E-02 | 3.7906E-02 | 3.7957E-02 | 3.667E-02 |
| TL-208 | | 2.8304E-01 | 2.8304E-01 | 6.1154E-02 | 6.3323E-02 | |
| PB-212 | | 9.0677E-01 | 9.0677E-01 | 9.5830E-02 | 1.0934E-01 | |
| PB-214 | | 5.7020E-01 | 5.7020E-01 | 1.0209E-01 | 1.0733E-01 | |
| BI-212 | | 5.6237E-01 | 5.6237E-01 | 4.0085E-01 | 4.0218E-01 | |
| BI-214 | | 5.5995E-01 | 5.5995E-01 | 1.4796E-01 | 1.5149E-01 | |
| RA-224 | A | 1.1194E+00 | 1.1194E+00 | 1.2212E+00 | 1.2229E+00 | |
| RA-226 | # | 1.3552E+00 | 1.3552E+00 | 1.0950E+00 | 1.0978E+00 | 1.175E+00 |
| AC-228 | | 9.7592E-01 | 9.7592E-01 | 1.5878E-01 | 1.6859E-01 | |
| TH-227 | #B | -1.3323E-01 | -1.3323E-01 | 3.5795E-01 | 3.5803E-01 | 3.957E-01 |
| PA-234 | #B | 1.2629E-04 | 1.2629E-04 | 2.1749E-01 | 2.1749E-01 | 2.436E-01 |
| TH-234 | #B | 5.1667E-01 | 5.1667E-01 | 6.1666E+00 | 6.1667E+00 | 6.909E+00 |
| AM-241 | #A | 1.4246E-02 | 1.4247E-02 | 1.0501E+00 | 1.0501E+00 | 1.179E+00 |

# - All peaks for activity calculation had bad shape.
* - Activity omitted from total
& - Activity omitted from total and all peaks had bad shape.

YAEC Chemistry Lab Spectrum name: 103F_16SEPT2006_0858.An1

< - MDA value printed.
A - Activity printed, but activity < MDA.
B - Activity < MDA and failed test.
C - Area < Critical level.
F - Failed fraction or key line test.
H - Halflife limit exceeded

S U M M A R Y

Total Activity ( 1120.0 to 2000.7 keV) 2.1180925E+01 pCi/gm
Total Decayed Activity ( 1120.0 to 2000.7 keV) 2.1180925E+01 pCi/gm

The library has energies which are not separable.

Analyzed by: _____
JJM

Reviewed by: _____
Supervisor

Laboratory: YAEC Chemistry Lab

YAEC Chemistry Lab Spectrum name: 103F_16SEPT2006_0936.An1

Sample description
FSS-SSS-01-01-006-F

Spectrum Filename: C:\GammaVision\Spectra\103F_16SEPT2006_0936.An1

Acquisition information
Start time: 16-Sep-2006 09:36:54
Live time: 2000
Real time: 2002
Dead time: 0.11 %
Detector ID: 4

Detector system
Det 103 - DSPE-471

Calibration
Filename: D3_1LSa.Clb
Detector_103 1.0 Liter Sand Geometry

Energy Calibration
Created: 08-Aug-2005 11:09:41
Zero offset: 0.409 keV
Gain: 0.500 keV/channel
Quadratic: 1.092E-08 keV/channel^2

Efficiency Calibration
Created: 08-Aug-2005 11:11:25
Type: Polynomial
Uncertainty: 0.993 %
Coefficients: -0.264059 -5.138468 0.638383
-0.089199 0.005011 -0.000129

Library Files
Main analysis library: FSS_Rev_1.Lib
Library Match Width: 1.000
Peak stripping: Library based

Analysis parameters
Analysis engine: Env32 G53W4.20
Start channel: 100 ( 50.41keV )
Stop channel: 4000 ( 2000.67keV )
Peak rejection level: 41.667%
Peak search sensitivity: 3
Sample Size: 1.8010E+03
Activity scaling factor: 1.0000E+06/( 1.0000E+00* 1.8010E+03) =
5.5525E+02
Detection limit method: Nureg 4.16
Random error: 1.0000000E+00
Systematic error: 1.0000000E+00

| | |
|---|---|
| Fraction Limit: | 0.000% |
| Background width: | average of five points. |

YAEC Chemistry Lab Spectrum name: 103F_16SEPT2006_0936.An1

Half lives decay limit: 12.000
Activity range factor: 2.000
Min. step backg. energy 0.000
Multiplet shift channel 2.000

| Corrections | Status | Comments |
|---|---|---|
| Decay correct to date: | YES | 11-Sep-2006 10:30:00 |
| Decay during acquisition: | NO | |
| Decay during collection: | NO | |
| True coincidence correction: | NO | |
| Peaked background correction: | YES | 103_150K_05AUG05.Pbc 08-Aug-2005 12:54:15 |
| Absorption (Internal): | NO | |
| Geometry correction: | NO | |
| Random summing: | NO | |

total peaks alloc. 18 cutoff 20.00000 %
Energy Calibration
Normalized diff: 0.2106

***** S U M M A R Y O F P E A K S I N R A N G E *****

| Peak Energy | Area | Uncert | FWHM | Corrctn Factor | Nuclide Energy | Brnch. Ratio | Act. pCi/gm | Nuc |
|---|---|---|---|---|---|---|---|---|
| 74.65 | 154. | 17.81 | 0.99 | 9.100E-03 | 74.81 | 9.600 | 1.303E+00 | PB212 |
| 77.43 | 229. | 13.34 | 0.99 | 1.038E-02 | 77.11 | 17.500 | 9.572E-01 | PB212 |
| | | | | | 77.11 | 10.700 | 1.566E+00 | PB214 |
| 87.29 | 74. | 40.52 | 1.00 | 1.452E-02 | | | | |
| 87.29 | 74. | 40.52 | 1.00 | 1.452E-02 | 88.04 | 3.790 | 9.969E-01 | CD109 |
| 93.05 | 113. | 26.14 | 1.00 | 1.661E-02 | 92.38 | 2.570 | PBC<MDA | TH234 |
| | | | | | 92.80 | 3.000 | PBC<MDA | TH234 |
| 186.49 | 157. | 20.09 | 1.02 | 2.565E-02 | 185.99 | 3.280 | 1.284E+00 | RA226 |
| 209.66 | 134. | 27.50 | 1.41 | 2.470E-02 | | | | |
| 238.78 | 1184. | 3.41 | 1.09 | 2.319E-02 | 238.63 | 43.100 | 8.796E-01 | PB212 |
| 241.82 | 157. | 17.27 | 1.09 | 2.303E-02 | 241.00 | 3.900 | 1.306E+00 | RA224 |
| | | | | | 241.92 | 7.470 | 6.834E-01 | PB214 |
| 270.44 | 103. | 28.57 | 0.75 | 2.150E-02 | | | | |
| 295.37 | 300. | 10.88 | 1.01 | 2.024E-02 | 295.22 | 19.200 | 5.714E-01 | PB214 |
| 300.26 | 86. | 31.51 | 0.93 | 2.001E-02 | | | | |
| 328.17 | 86. | 35.19 | 1.00 | 1.873E-02 | | | | |
| 338.45 | 264. | 11.92 | 1.19 | 1.830E-02 | 338.40 | 12.010 | 8.982E-01 | AC228 |
| 352.11 | 574. | 7.43 | 1.21 | 1.775E-02 | 351.99 | 37.100 | 6.475E-01 | PB214 |
| 409.32 | 36. | 39.38 | 1.10 | 1.575E-02 | | | | |
| 463.52 | 80. | 22.16 | 0.97 | 1.425E-02 | 463.51 | 10.000 | 4.176E-01 | SB125 |
| 511.15 | 206. | 14.39 | 1.51 | 1.316E-02 | 510.72 | 22.500 | 4.547E-01 | TL208 |
| 583.46 | 353. | 7.39 | 1.27 | 1.184E-02 | 583.14 | 86.000 | 2.568E-01 | TL208 |
| 609.52 | 360. | 7.48 | 1.37 | 1.144E-02 | 609.32 | 46.090 | 5.031E-01 | BI214 |
| 728.41 | 102. | 20.44 | 1.40 | 9.952E-03 | 727.17 | 11.800 | 6.471E-01 | BI212 |
| 795.30 | 77. | 20.85 | 1.63 | 9.305E-03 | | | | |
| 795.30 | 77. | 20.85 | 1.63 | 9.305E-03 | 795.76 | 85.400 | 7.270E-02 | CS134 |
| 835.84 | 28. | 37.35 | 1.20 | 8.962E-03 | 834.81 | 99.978 | PBC<MDA | MN54 |

| | | | | | | | | |
|---|---|---|---|---|---|---|---|---|
| 861.05 | 76. | 26.61 | 1.07 | 8.764E-03 | | | | |
| 911.58 | 261. | 7.51 | 1.39 | 8.398E-03 | 911.07 | 29.000 | 7.925E-01 | AC228 |
| 964.83 | 46. | 26.54 | 1.54 | 8.051E-03 | 964.00 | 14.580 | 2.931E-01 | EU152 |
| 969.56 | 139. | 10.54 | 1.54 | 8.022E-03 | 968.90 | 17.460 | 7.416E-01 | AC228 |
| 1120.62 | 97. | 16.81 | 1.13 | 7.210E-03 | 1120.28 | 15.040 | 6.607E-01 | BI214 |
| 1461.44 | 1503. | 2.73 | 1.67 | 5.930E-03 | 1460.75 | 10.700 | 1.754E+01 | K40 |
| 1621.34 | 25. | 26.93 | 1.89 | 5.488E-03 | 1620.56 | 2.750 | 1.226E+00 | BI212 |

| pk energy | area | uncert | fwhm | corr | nuclide | brnch. | act. | nuc |
|---|---|---|---|---|---|---|---|---|
| 1765.46 | 77. | 11.79 | 2.01 | 5.140E-03 | 1764.51 | 15.920 | 6.767E-01 | BI214 |

********** U N I D E N T I F I E D P E A K S U M M A R Y **********

| Peak Channel | Centroid Energy | Background Counts | Net Area Counts | Intensity Cts/Sec | Uncert 3 Sigma % | FWHM keV | Suspected Nuclide | |
|---|---|---|---|---|---|---|---|---|
| 173.75 | 87.52 | 408. | 74. | 0.037 | 121.57 | 1.001 | PB-214 | lD |
| 418.49 | 209.66 | 508. | 134. | 0.067 | 82.49 | 1.413 | NP-239 | s |
| 540.02 | 270.44 | 321. | 103. | 0.052 | 85.72 | 0.751 | AC-228 | s |
| 599.67 | 300.26 | 262. | 86. | 0.043 | 94.52 | 0.933 | PB-212 | s |
| 655.49 | 328.17 | 293. | 86. | 0.043 | 105.56 | 1.003 | AC-228 | |
| 817.76 | 409.32 | 93. | 36. | 0.018 | 118.15 | 1.097 | AC-228 | |
| 1670.74 | 835.84 | 41. | 28. | 0.014 | 111.81 | 1.195 | AC-228 | s |
| 1721.14 | 861.05 | 94. | 76. | 0.038 | 63.75 | 1.072 | TL-208 | |
| 1929.79 | 964.80 | 44. | 55. | 0.027 | 65.43 | 1.539 | AC-228 | D |

s - Peak fails shape tests.
D - Peak area deconvoluted.
L - Peak written from unknown list.
C - Area < Critical level.

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This section based on library: FSS_Rev_1.Lib

********** I D E N T I F I E D P E A K S U M M A R Y **********

| Nuclide | Peak Channel | Centroid Energy | Background Counts | Net Area Counts | Intensity Cts/Sec | Uncert 3 Sigma % | FWHM keV |
|---|---|---|---|---|---|---|---|
| PB-212 | 148.79 | 74.81 | 352. | 167. | 0.084 | 51.95 | 0.993D |
| PB-212 | 153.39 | 77.11 | 362. | 188. | 0.094 | 39.84 | 0.995A |
| TH-234 | 185.33 | 93.08 | 955. | 117. | 0.059 | 99.85 | 1.500 |
| TH-234 | 185.33 | 93.08 | 953. | 115. | 0.057 | 101.34 | 1.500 |
| RA-226 | 372.14 | 186.49 | 432. | 144. | 0.072 | 60.27 | 1.016 |
| PB-212 | 476.72 | 238.78 | 774. | 1062. | 0.531 | 15.43 | 0.976 |
| RA-224 | 482.48 | 241.66 | 821. | 143. | 0.071 | 88.81 | 1.500 |
| PB-214 | 589.90 | 295.37 | 288. | 296. | 0.148 | 32.65 | 1.010 |
| AC-228 | 676.04 | 338.45 | 252. | 263. | 0.132 | 35.76 | 1.194 |
| PB-214 | 703.37 | 352.11 | 361. | 568. | 0.284 | 22.28 | 1.209 |
| SB-125 | 925.68 | 463.28 | 130. | 67. | 0.034 | 79.29 | 1.500s |
| TL-208 | 1021.42 | 511.15 | 231. | 180. | 0.090 | 43.18 | 1.511s |
| TL-208 | 1166.02 | 583.46 | 121. | 349. | 0.174 | 22.17 | 1.269 |
| BI-214 | 1218.14 | 609.52 | 128. | 354. | 0.177 | 22.45 | 1.368 |
| Ag-108M | 1222.61 | 611.76 | 170. | -48. | -0.024 | 123.80 | 1.500s |
| BI-212 | 1455.89 | 728.41 | 108. | 101. | 0.051 | 61.33 | 1.396s |
| CS-134 | 1589.92 | 795.43 | 62. | 58. | 0.029 | 69.55 | 1.500s |
| AC-228 | 1822.18 | 911.58 | 57. | 257. | 0.129 | 22.53 | 1.390 |
| EU-152 | 1929.74 | 965.36 | 73. | 44. | 0.022 | 93.47 | 1.538 |

YAEC Chemistry Lab Spectrum name: 103F_16SEPT2006_0936.An1

| Nuclide | Channel | Energy | Background | Net area | Cnts/sec | Uncert | FWHM |
|---|---|---|---|---|---|---|---|
| AC-228 | 1936.81 | 968.90 | 40. | 139. | 0.069 | 31.96 | 1.541D |
| BI-214 | 2240.22 | 1120.62 | 67. | 96. | 0.048 | 50.42 | 1.129 |
| K-40 | 2921.75 | 1461.44 | 53. | 1484. | 0.742 | 8.20 | 1.667 |
| BI-212 | 3241.49 | 1621.34 | 6. | 25. | 0.012 | 80.78 | 1.888s |
| BI-214 | 3529.68 | 1765.46 | 5. | 74. | 0.037 | 35.37 | 2.009s |

s - Peak fails shape tests.
D - Peak area deconvoluted.
A Derived peak area.

***** S U M M A R Y O F L I B R A R Y P E A K U S A G E *****

| - Nuclide - Name | Code | Average Activity pCi/gm | Peak Energy keV | Peak Activity pCi/gm | Code | MDA Value pCi/gm | COMMENTS |
|---|---|---|---|---|---|---|---|
| BE-7 | | -9.5697E-02 | | | | | |
| | | | 477.56 | -9.570E-02 | %( | 3.694E-01 | 1.10E-01 G |
| K-40 | | 1.7542E+01 | | | | | |
| | | | 1460.75 | 1.754E+01 | (P | 4.335E-01 | 4.85E-01 G |
| MN-54 | | -7.4931E-04 | | | | | |
| | | | 834.81 | -7.493E-04 | %(P | 3.827E-02 | 1.09E-02 G |
| CO-57 | | 1.0194E-02 | | | | | |
| | | | 122.07 | 1.019E-02 | %(P | 5.427E-02 | 1.63E-02 G K |
| | | | 136.43 | 9.313E-03 | & | 4.200E-01 | 1.25E-01 G |
| CO-60 | | -4.3818E-03 | | | | | |
| | | | 1332.51 | -4.382E-03 | %(P | 3.741E-02 | 1.01E-02 G K |
| | | | 1173.23 | 1.429E-02 | % P | 4.980E-02 | 1.47E-02 G K |
| Sr-85 | | -1.5416E-02 | | | | | |
| | | | 514.00 | -1.542E-02 | %( | 5.039E-02 | 1.51E-02 G |
| Kr-85 | | -3.3752E+02 | | | | | |
| | | | 513.99 | -3.375E+02 | %( | 1.103E+03 | 3.31E+02 G |
| Y-88 | | -3.3542E-03 | | | | | |
| | | | 1836.01 | -3.354E-03 | %(P | 2.903E-02 | 7.83E-03 G K |
| | | | 898.02 | 6.089E-03 | % P | 3.861E-02 | 1.12E-02 G |
| NB-94 | | 8.1640E-03 | | | | | |
| | | | 871.10 | 8.164E-03 | &( | 3.251E-02 | 9.53E-03 G K |
| | | | 702.50 | 1.367E-02 | % | 3.936E-02 | 1.18E-02 G K |

| Nuclide | Ave activity | Energy | Activity | Code | Peak | MDA | Comments |
|---|---|---|---|---|---|---|---|
| Ag-108M | -1.8618E-02 | | | | | | |
| | | 722.95 | -1.862E-02 | %( | 4.650E-02 | 1.40E-02 | G K |
| | | 614.37 | -3.492E-02 | + P | 4.635E-02 | 1.44E-02 | G |
| | | 433.93 | 2.949E-04 | % | 3.041E-02 | 8.78E-03 | G |
| CD-109 | -1.1539E-01 | | | | | | |
| | | 88.04 | -1.154E-01 | %( | 2.135E+00 | 6.38E-01 | G |
| SN-113 | -1.4791E-02 | | | | | | |
| | | 391.71 | -1.479E-02 | &( | 5.434E-02 | 1.62E-02 | G K |
| | | 255.04 | -5.891E-01 | % | 1.728E+00 | 5.20E-01 | G |
| SB-125 | 8.7754E-02 | | | | | | |
| | | 427.95 | -2.264E-03 | &(P | 1.018E-01 | 2.96E-02 | G K |
| | | 600.77 | 9.810E-02 | & P | 1.601E-01 | 4.93E-02 | G |
| | | 636.15 | 4.690E-02 | % P | 3.105E-01 | 9.07E-02 | G |
| | | 463.51 | 3.542E-01 | @(P | 2.952E-01 | 9.54E-02 | G |
| | | 176.29 | -5.008E-02 | & | 6.069E-01 | 1.81E-01 | G |
| I-131 | 1.5785E-02 | | | | | | |
| | | 364.48 | 1.579E-02 | %(P | 6.066E-02 | 1.81E-02 | G K |
| | | 636.97 | 1.737E-01 | % | 6.727E-01 | 1.99E-01 | G |
| | | 284.29 | 6.826E-03 | % P | 8.564E-01 | 2.52E-01 | G |
| CS-134 | 2.5735E-02 | | | | | | |
| | | 604.66 | 0.000E+00 | %( | 6.588E-02 | 1.94E-02 | G K |
| | | 795.76 | 5.515E-02 | *(P | 3.740E-02 | 1.28E-02 | G |
| | | 569.29 | -8.701E-03 | % P | 2.162E-01 | 6.19E-02 | G |
| | | 801.84 | 2.377E-01 | % P | 3.506E-01 | 1.09E-01 | G |
| CS-137 | 2.1557E-02 | | | | | | |
| | | 661.62 | 2.156E-02 | %(P | 4.374E-02 | 1.32E-02 | G |
| CE-139 | -8.3269E-03 | | | | | | |
| | | 165.85 | -8.327E-03 | %( | 5.084E-02 | 1.52E-02 | G |
| EU-152 | 1.1216E-01 | | | | | | |
| | | 121.78 | 2.899E-02 | %(P | 1.573E-01 | 4.72E-02 | G K |
| | | 344.30 | -2.061E-02 | % P | 1.241E-01 | 3.68E-02 | G |
| | | 1408.08 | 6.946E-02 | % | 1.317E-01 | 4.05E-02 | G |
| | | 964.00 | 2.789E-01 | (P | 2.722E-01 | 8.80E-02 | G |
| | | 1112.07 | 1.067E-01 | % | 2.860E-01 | 8.54E-02 | G |
| | | 778.90 | 8.181E-02 | % | 2.585E-01 | 7.68E-02 | G |
| EU-154 | 1.9374E-03 | | | | | | |
| | | 123.10 | 1.937E-03 | %( | 8.829E-02 | 2.62E-02 | G K |
| | | 1274.80 | 0.000E+00 | % | 1.532E-01 | 4.38E-02 | G |

| Nuclide | Ave activity | Energy | Activity | Code | Peak | MDA | Comments |
|---|---|---|---|---|---|---|---|
| | | 723.30 | -1.078E-01 % | | 2.351E-01 | 7.11E-02 | G |
| | | 1004.80 | -4.479E-02 % | | 2.127E-01 | 6.21E-02 | G |
| EU-155 | 1.4708E-02 | | | | | | |
| | | 86.45 | 1.471E-02 %( | | 2.153E-01 | 6.42E-02 | G K |
| | | 105.31 | 5.147E-02 & | | 2.387E-01 | 7.17E-02 | G |
| HG-203 | -3.2111E-03 | | | | | | |
| | | 279.17 | -3.211E-03 &(P | | 4.693E-02 | 1.39E-02 | G K |
| | | 72.87 | -8.047E-01 & P | | 2.436E+00 | 7.35E-01 | G |
| | | 70.83 | -2.725E+00 % | | 4.576E+00 | 1.39E+00 | G |
| | | 82.50 | -4.032E-02 & | | 4.159E+00 | 1.24E+00 | G |
| TL-208 | 2.5685E-01 | | | | | | |
| | | 583.14 | 2.568E-01 (P | | 3.980E-02 | 1.92E-02 | G |
| | | 510.72 | 4.548E-01 + P | | 1.863E-01 | 7.52E-02 | G |
| PB-212 | 7.9729E-01 | | | | | | |
| | | 238.63 | 7.973E-01 (P | | 9.930E-02 | 4.15E-02 | G K |
| | | | | | | | Energy duplication |
| | | 77.11 | 7.973E-01 } P | | 3.872E-01 | 1.06E-01 | G |
| | | 74.81 | 1.442E+00 + P | | 7.782E-01 | 2.54E-01 | G |
| PB-214 | 6.2153E-01 | | | | | | |
| | | 351.99 | 6.475E-01 (P | | 1.039E-01 | 4.86E-02 | G K |
| | | 295.22 | 5.714E-01 (P | | 1.579E-01 | 6.31E-02 | G |
| | | | | | | | Energy duplication |
| | | 77.11 | 0.000E+00 } P | | 9.360E-01 | 0.00E+00 | G |
| | | 241.92 | 3.577E-01 % | | 6.250E-01 | 1.90E-01 | G |
| BI-212 | 6.4710E-01 | | | | | | |
| | | 727.17 | 6.471E-01 @(P | | 3.257E-01 | 1.33E-01 | G K |
| | | 1620.56 | 1.226E+00 + P | | 7.184E-01 | 3.31E-01 | G |
| | | 785.42 | 9.548E-01 % | | 1.659E+00 | 5.09E-01 | G |
| BI-214 | 5.0312E-01 | | | | | | |
| | | 609.32 | 5.031E-01 (P | | 7.903E-02 | 3.84E-02 | G K |
| | | 1764.51 | 6.767E-01 + P | | 1.220E-01 | 8.33E-02 | G |
| | | 1120.28 | 6.607E-01 + P | | 2.836E-01 | 1.13E-01 | G |
| RA-224 | 1.1903E+00 | | | | | | |
| | | 241.00 | 1.190E+00 ( | | 1.136E+00 | 3.52E-01 | G |
| RA-226 | 1.2839E+00 | | | | | | |
| | | 185.99 | 1.284E+00 (P | | 8.874E-01 | 2.81E-01 | G |
| AC-228 | 7.9946E-01 | | | | | | |
| | | 911.07 | 7.925E-01 (P | | 1.164E-01 | 6.03E-02 | G K |
| | | 968.90 | 7.431E-01 (P | | 1.728E-01 | 7.93E-02 | G |
| | | 338.40 | 8.982E-01 (P | | 2.617E-01 | 1.08E-01 | G |

| Nuclide | Ave activity | Energy | Activity | Code | Peak | MDA | Comments |
|---|---|---|---|---|---|---|---|
| TH-227 | -1.6296E-01 | | | | | | |
| | | 236.00 | -1.630E-01 %( | | 3.670E-01 | 1.11E-01 | G K |
| | | 256.25 | -3.863E-02 & P | | 4.835E-01 | 1.43E-01 | G |
| PA-234 | 3.5672E-03 | | | | | | |
| | | 98.44 | 3.567E-03 %(P | | 2.292E-01 | 6.82E-02 | G K |
| | | 946.00 | 4.467E-02 % P | | 1.620E-01 | 4.76E-02 | G |
| | | 131.28 | -9.606E-04 % P | | 2.167E-01 | 6.45E-02 | G |
| | | 94.67 | -5.622E-02 & P | | 4.202E-01 | 1.26E-01 | G |
| | | 883.24 | -7.134E-02 % | | 3.352E-01 | 9.84E-02 | G |
| | | 926.70 | 4.958E-02 % | | 3.699E-01 | 1.07E-01 | G |
| | | 569.26 | -1.269E-02 % P | | 3.192E-01 | 9.14E-02 | G |
| TH-234 | 1.8101E+00 | | | | | | |
| | | 63.29 | 1.672E+00 %(P | | 6.883E+00 | 2.06E+00 | G K |
| | | 92.80 | 1.746E+00 (P | | 2.228E+00 | 6.80E-01 | G |
| | | 92.38 | 2.095E+00 (P | | 2.627E+00 | 8.02E-01 | G |
| AM-241 | -1.8266E-03 | | | | | | |
| | | 59.54 | -1.827E-03 &(P | | 1.253E+00 | 3.73E-01 | G |

( - This peak used in the nuclide activity average.

* - Peak is too wide, but only one peak in library.
! - Peak is part of a multiplet and this area went negative during deconvolution.
? - Peak is too narrow.
@ - Peak is too wide at FW25M, but ok at FWHM.
% - Peak fails sensitivity test.
$ - Peak identified, but first peak of this nuclide failed one or more qualification tests.
\+ - Peak activity higher than counting uncertainty range.
\- - Peak activity lower than counting uncertainty range.
= - Peak outside analysis energy range.
& - Calculated peak centroid is not close enough to the library energy centroid for positive identification.
P - Peakbackground subtraction
} - Peak is too close to another for the activity to be found directly.

| Nuclide Codes: | Peak Codes: |
|---|---|
| T - Thermal Neutron Activation | G - Gamma Ray |
| F - Fast Neutron Activation | X - X-Ray |
| I - Fission Product | P - Positron Decay |
| N - Naturally Occurring Isotope | S - Single-Escape |
| P - Photon Reaction | D - Double-Escape |
| C - Charged Particle Reaction | K - Key Line |
| M - No MDA Calculation | A - Not in Average |

R - Coincidence Corrected C - Coincidence Peak
H - Halflife limit exceeded

- - - - - - - - - - - - - - - - - - - - - - - - - - - - - - - - - - - - - - -

***** S U M M A R Y O F N U C L I D E S I N S A M P L E *****

| Nuclide | | Time of Count Activity pCi/gm | Time Corrected Activity pCi/gm | Uncertainty 3 Sigma Counting pCi/gm | Total pCi/gm | MDA pCi/gm |
|---|---|---|---|---|---|---|
| BE-7 | #A | -8.9726E-02 | -9.5697E-02 | 3.2989E-01 | 3.2994E-01 | 3.463E-01 |
| K-40 | | 1.7542E+01 | 1.7542E+01 | 1.4557E+00 | 1.7766E+00 | |
| MN-54 | #A | -7.4110E-04 | -7.4931E-04 | 7.7099E-02 | 7.7099E-02 | 3.785E-02 |
| CO-57 | #B | 1.0065E-02 | 1.0194E-02 | 4.8831E-02 | 4.8834E-02 | 5.359E-02 |
| CO-60 | #B | -4.3740E-03 | -4.3818E-03 | 1.8228E-01 | 1.8228E-01 | 3.734E-02 |
| Sr-85 | #A | -1.4620E-02 | -1.5416E-02 | 4.5315E-02 | 4.5323E-02 | 4.778E-02 |
| Kr-85 | #A | -3.3751E+02 | -3.3752E+02 | 9.9210E+02 | 9.9229E+02 | 1.103E+03 |
| Y-88 | #B | -3.2477E-03 | -3.3542E-03 | 2.4924E-02 | 2.4924E-02 | 2.810E-02 |
| NB-94 | #B | 8.1640E-03 | 8.1640E-03 | 2.8596E-02 | 2.8599E-02 | 3.251E-02 |
| Ag-108M | #B | -1.8617E-02 | -1.8618E-02 | 4.1979E-02 | 4.1993E-02 | 4.650E-02 |
| CD-109 | #A | -1.1452E-01 | -1.1539E-01 | 1.9142E+00 | 1.9142E+00 | 2.119E+00 |
| SN-113 | #B | -1.4356E-02 | -1.4791E-02 | 4.8671E-02 | 4.8679E-02 | 5.274E-02 |
| SB-125 | #B | 8.7457E-02 | 8.7754E-02 | 7.0906E-02 | 7.1089E-02 | 1.015E-01 |
| I-131 | #B | 1.0290E-02 | 1.5785E-02 | 5.4249E-02 | 5.4257E-02 | 3.954E-02 |
| CS-134 | #B | 2.5618E-02 | 2.5735E-02 | 1.7927E-02 | 1.7989E-02 | 6.558E-02 |
| CS-137 | #A | 2.1550E-02 | 2.1557E-02 | 3.9745E-02 | 3.9765E-02 | 4.373E-02 |
| CE-139 | #A | -8.1212E-03 | -8.3269E-03 | 4.5683E-02 | 4.5686E-02 | 4.959E-02 |
| EU-152 | #B | 1.1208E-01 | 1.1216E-01 | 1.0615E-01 | 1.0633E-01 | 1.572E-01 |
| EU-154 | #B | 1.9352E-03 | 1.9374E-03 | 7.8528E-02 | 7.8528E-02 | 8.819E-02 |
| EU-155 | #B | 1.4681E-02 | 1.4708E-02 | 1.9260E-01 | 1.9260E-01 | 2.149E-01 |
| HG-203 | #B | -2.9825E-03 | -3.2111E-03 | 4.2201E-02 | 4.2202E-02 | 4.359E-02 |
| TL-208 | | 2.5685E-01 | 2.5685E-01 | 5.7650E-02 | 5.9547E-02 | |
| PB-212 | | 7.9729E-01 | 7.9729E-01 | 1.2443E-01 | 1.3276E-01 | |
| PB-214 | | 6.2153E-01 | 6.2153E-01 | 1.2436E-01 | 1.2949E-01 | |
| BI-212 | # | 6.4710E-01 | 6.4710E-01 | 3.9877E-01 | 4.0054E-01 | |
| BI-214 | | 5.0312E-01 | 5.0312E-01 | 1.1504E-01 | 1.1869E-01 | |
| RA-224 | | 1.1903E+00 | 1.1903E+00 | 1.0572E+00 | 1.0594E+00 | 1.136E+00 |
| RA-226 | | 1.2838E+00 | 1.2839E+00 | 8.4343E-01 | 8.4672E-01 | |
| AC-228 | | 7.9946E-01 | 7.9946E-01 | 1.4186E-01 | 1.4926E-01 | |
| TH-227 | #B | -1.6296E-01 | -1.6296E-01 | 3.3338E-01 | 3.3352E-01 | 3.670E-01 |
| PA-234 | #B | 3.5672E-03 | 3.5672E-03 | 2.0474E-01 | 2.0474E-01 | 2.292E-01 |
| TH-234 | #B | 1.8101E+00 | 1.8101E+00 | 2.0799E+00 | 2.0823E+00 | 6.883E+00 |
| AM-241 | #A | -1.8266E-03 | -1.8266E-03 | 4.4450E-01 | 4.4450E-01 | 1.253E+00 |

# - All peaks for activity calculation had bad shape.
* - Activity omitted from total
& - Activity omitted from total and all peaks had bad shape.
< - MDA value printed.
A - Activity printed, but activity < MDA.
B - Activity < MDA and failed test.
C - Area < Critical level.
F - Failed fraction or key line test.

H – Halflife limit exceeded

YAEC Chemistry Lab Spectrum name: 103F_16SEPT2006_0936.An1

---------- S U M M A R Y ----------

Total Activity ( 1120.0 to 2000.7 keV) 2.3641050E+01 pCi/gm
Total Decayed Activity ( 1120.0 to 2000.7 keV) 2.3641058E+01 pCi/gm

The library has energies which are not separable.

Analyzed by: _____
JJM

Reviewed by: _____
Supervisor

Laboratory: YAEC Chemistry Lab

YAEC Chemistry Lab Spectrum name: 103F_16SEPT2006_1017.An1

Sample description
FSS-SSS-01-01-030-F-B

Spectrum Filename: C:\GammaVision\Spectra\103F_16SEPT2006_1017.An1

Acquisition information
Start time: 16-Sep-2006 10:17:40
Live time: 2000
Real time: 2003
Dead time: 0.13 %
Detector ID: 4

Detector system
Det 103 - DSPE-471

Calibration
Filename: D3_1LSa.Clb
Detector_103 1.0 Liter Sand Geometry

Energy Calibration
Created: 08-Aug-2005 11:09:41
Zero offset: 0.409 keV
Gain: 0.500 keV/channel
Quadratic: 1.092E-08 keV/channel^2

Efficiency Calibration
Created: 08-Aug-2005 11:11:25
Type: Polynomial
Uncertainty: 0.993 %
Coefficients: -0.264059 -5.138468 0.638383
-0.089199 0.005011 -0.000129

Library Files
Main analysis library: FSS_Rev_1.Lib
Library Match Width: 1.000
Peak stripping: Library based

Analysis parameters
Analysis engine: Env32 G53W4.20
Start channel: 100 ( 50.41keV )
Stop channel: 4000 ( 2000.67keV )
Peak rejection level: 41.667%
Peak search sensitivity: 3
Sample Size: 1.8640E+03
Activity scaling factor: 1.0000E+06/( 1.0000E+00* 1.8640E+03) =
5.3648E+02
Detection limit method: Nureg 4.16
Random error: 1.0000000E+00
Systematic error: 1.0000000E+00

| | |
|---|---|
| Fraction Limit: | 0.000% |
| Background width: | average of five points. |

YAEC Chemistry Lab Spectrum name: 103F_16SEPT2006_1017.An1

Half lives decay limit: 12.000
Activity range factor: 2.000
Min. step backg. energy 0.000
Multiplet shift channel 2.000

| Corrections | Status | Comments |
|---|---|---|
| Decay correct to date: | YES | 10-Sep-2006 07:20:00 |
| Decay during acquisition: | NO | |
| Decay during collection: | NO | |
| True coincidence correction: | NO | |
| Peaked background correction: | YES | 103_150K_05AUG05.Pbc 08-Aug-2005 12:54:15 |
| Absorption (Internal): | NO | |
| Geometry correction: | NO | |
| Random summing: | NO | |

total peaks alloc. 15 cutoff 20.00000 %
Energy Calibration
Normalized diff: 0.2272

***** S U M M A R Y O F P E A K S I N R A N G E *****

| Peak Energy | Area | Uncert | FWHM | Corrctn Factor | Nuclide Energy | Brnch. Ratio | Act. pCi/gm | Nuc |
|---|---|---|---|---|---|---|---|---|
| 74.94 | 144. | 21.64 | 0.99 | 9.052E-03 | 74.81 | 9.600 | 1.201E+00 | PB212 |
| 77.24 | 203. | 13.65 | 0.99 | 1.011E-02 | 77.11 | 17.500 | 1.115E+00 | PB212 |
| | | | | | 77.11 | 10.700 | 1.824E+00 | PB214 |
| 87.22 | 120. | 38.99 | 1.50 | 1.472E-02 | 86.45 | 32.740 | PBC<MDA | EU155 |
| | | | | | 88.04 | 3.790 | 1.572E+00 | CD109 |
| 186.10 | 207. | 20.28 | 1.23 | 2.566E-02 | 185.99 | 3.280 | 1.668E+00 | RA226 |
| 238.82 | 1279. | 3.31 | 1.09 | 2.319E-02 | 238.63 | 43.100 | 9.189E-01 | PB212 |
| 242.50 | 109. | 26.93 | 1.10 | 2.299E-02 | 241.00 | 3.900 | 8.780E-01 | RA224 |
| | | | | | 241.92 | 7.470 | 4.594E-01 | PB214 |
| 270.02 | 124. | 26.51 | 1.57 | 2.152E-02 | | | | |
| 277.19 | 81. | 39.11 | 0.91 | 2.115E-02 | | | | |
| 295.37 | 301. | 9.67 | 0.90 | 2.024E-02 | 295.22 | 19.200 | 5.543E-01 | PB214 |
| 300.25 | 61. | 36.91 | 1.23 | 2.001E-02 | | | | |
| 327.87 | 65. | 37.01 | 1.08 | 1.875E-02 | | | | |
| 338.61 | 254. | 12.84 | 1.19 | 1.829E-02 | 338.40 | 12.010 | 8.329E-01 | AC228 |
| 352.14 | 541. | 5.72 | 1.10 | 1.775E-02 | 351.99 | 37.100 | 5.888E-01 | PB214 |
| 463.15 | 109. | 22.31 | 1.19 | 1.426E-02 | | | | |
| 463.15 | 109. | 22.31 | 1.19 | 1.426E-02 | 463.51 | 10.000 | 5.490E-01 | SB125 |
| 510.50 | 218. | 11.42 | 1.40 | 1.318E-02 | 510.72 | 22.500 | 4.690E-01 | TL208 |
| 583.40 | 463. | 7.46 | 1.40 | 1.184E-02 | 583.14 | 86.000 | 3.266E-01 | TL208 |
| 609.61 | 418. | 6.78 | 1.55 | 1.143E-02 | 609.32 | 46.090 | 5.659E-01 | BI214 |
| 727.63 | 148. | 18.84 | 1.65 | 9.960E-03 | 727.17 | 11.800 | 9.082E-01 | BI212 |
| 767.47 | 88. | 24.86 | 1.31 | 9.561E-03 | | | | |
| 785.95 | 29. | 40.99 | 1.57 | 9.394E-03 | 785.42 | 2.000 | PBC<MDA | BI212 |
| 795.52 | 71. | 30.26 | 1.22 | 9.303E-03 | | | | |
| 795.52 | 71. | 30.26 | 1.22 | 9.303E-03 | 795.76 | 85.400 | 6.509E-02 | CS134 |
| 861.39 | 75. | 22.98 | 1.19 | 8.761E-03 | | | | |

| | | | | | | | | |
|---|---|---|---|---|---|---|---|---|
| 895.07 | 27. | 34.43 | 1.50 | 8.492E-03 | 898.02 | 94.000 | PBC<MDA | Y88 |
| 911.38 | 285. | 8.13 | 1.75 | 8.399E-03 | 911.07 | 29.000 | 8.380E-01 | AC228 |
| 965.23 | 48. | 25.13 | 1.54 | 8.048E-03 | | | | |
| 969.33 | 195. | 8.39 | 1.54 | 8.023E-03 | 968.90 | 17.460 | 1.011E+00 | AC228 |
| 1120.73 | 105. | 18.43 | 1.42 | 7.210E-03 | 1120.28 | 15.040 | 6.865E-01 | BI214 |
| 1238.94 | 46. | 41.66 | 1.90 | 6.698E-03 | | | | |
| 1461.50 | 1924. | 2.32 | 1.67 | 5.930E-03 | 1460.75 | 10.700 | 2.177E+01 | K40 |
| 1765.18 | 96. | 11.81 | 2.08 | 5.140E-03 | 1764.51 | 15.920 | 8.177E-01 | BI214 |

********** U N I D E N T I F I E D P E A K S U M M A R Y **********

| Peak Channel | Centroid Energy | Background Counts | Net Area Counts | Intensity Cts/Sec | Uncert 3 Sigma % | FWHM keV | Suspected Nuclide | |
|---|---|---|---|---|---|---|---|---|
| 484.16 | 242.42 | 376. | 109. | 0.054 | 80.79 | 1.095 | XE-138 | lD |
| 539.19 | 270.02 | 380. | 124. | 0.062 | 79.54 | 1.569 | AC-228 | s |
| 553.54 | 277.19 | 369. | 81. | 0.041 | 105.69 | 0.906 | TL-208 | s |
| 599.65 | 300.25 | 223. | 61. | 0.031 | 110.74 | 1.234 | PB-212 | |
| 654.89 | 327.87 | 230. | 65. | 0.032 | 111.02 | 1.083 | AC-228 | |
| 1533.99 | 767.47 | 126. | 88. | 0.044 | 74.58 | 1.307 | J-134 | s |
| 1721.82 | 861.39 | 74. | 75. | 0.038 | 68.93 | 1.192 | TL-208 | s |
| 1930.31 | 965.24 | 55. | 43. | 0.022 | 85.33 | 1.539 | AC-228 | D |
| 2476.82 | 1238.94 | 117. | 46. | 0.023 | 124.97 | 1.902 | CO-56 | |

s - Peak fails shape tests.
D - Peak area deconvoluted.
L - Peak written from unknown list.
C - Area < Critical level.

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This section based on library: FSS_Rev_1.Lib

********** I D E N T I F I E D P E A K S U M M A R Y **********

| Nuclide | Peak Channel | Centroid Energy | Background Counts | Net Area Counts | Intensity Cts/Sec | Uncert 3 Sigma % | FWHM keV |
|---|---|---|---|---|---|---|---|
| PB-212 | 148.79 | 74.81 | 436. | 144. | 0.072 | 64.93 | 0.993D |
| PB-212 | 153.39 | 77.11 | 455. | 203. | 0.102 | 40.95 | 0.995A |
| CD-109 | 173.61 | 87.22 | 1033. | 120. | 0.060 | 116.96 | 1.500s |
| RA-226 | 371.86 | 186.35 | 817. | 175. | 0.087 | 67.69 | 1.500s |
| PB-212 | 476.85 | 238.85 | 814. | 1257. | 0.628 | 13.86 | 1.050 |
| PB-214 | 589.89 | 295.37 | 265. | 297. | 0.149 | 29.01 | 0.903 |
| AC-228 | 676.36 | 338.61 | 311. | 253. | 0.126 | 38.53 | 1.192 |
| PB-214 | 703.42 | 352.14 | 194. | 535. | 0.267 | 17.15 | 1.099 |
| SB-125 | 925.66 | 463.27 | 174. | 65. | 0.032 | 92.20 | 1.500s |
| TL-208 | 1020.10 | 510.50 | 176. | 192. | 0.096 | 34.27 | 1.396s |
| TL-208 | 1165.90 | 583.40 | 207. | 459. | 0.229 | 22.37 | 1.400s |
| CS-134 | 1214.12 | 607.51 | 208. | -61. | -0.031 | 107.40 | 1.500s |
| BI-214 | 1218.32 | 609.61 | 139. | 412. | 0.206 | 20.35 | 1.555 |
| BI-212 | 1453.86 | 727.39 | 171. | 137. | 0.069 | 60.26 | 1.636s |
| BI-212 | 1570.95 | 785.95 | 54. | 29. | 0.015 | 122.97 | 1.571 |
| CS-134 | 1589.48 | 795.21 | 98. | 49. | 0.025 | 95.28 | 1.500s |
| Y-88 | 1789.18 | 895.07 | 31. | 27. | 0.013 | 103.30 | 1.500s |
| AC-228 | 1821.79 | 911.38 | 93. | 282. | 0.141 | 24.39 | 1.751 |
| AC-228 | 1936.81 | 968.90 | 39. | 195. | 0.098 | 25.35 | 1.541D |
| BI-214 | 2240.43 | 1120.73 | 97. | 103. | 0.051 | 55.30 | 1.420 |
| K-40 | 2921.87 | 1461.50 | 40. | 1906. | 0.953 | 6.97 | 1.666 |

| Nuclide | Channel | Energy | Background | Net area | Cnts/sec | Uncert | FWHM |
|---|---|---|---|---|---|---|---|
| BI-214 | 3528.99 | 1765.12 | 6. | 64. | 0.032 | 37.96 | 2.033 |

s - Peak fails shape tests.
D - Peak area deconvoluted.
A Derived peak area.

***** S U M M A R Y O F L I B R A R Y P E A K U S A G E *****

| - Nuclide - Name | Code | Average Activity pCi/gm | Peak Energy keV | Peak Activity pCi/gm | Code | MDA Value pCi/gm | COMMENTS |
|---|---|---|---|---|---|---|---|
| BE-7 | | -1.8208E-02 | | | | | |
| | | | 477.56 | -1.821E-02 | %( | 3.329E-01 | 9.71E-02 G |
| K-40 | | 2.1766E+01 | | | | | |
| | | | 1460.75 | 2.177E+01 | (P | 3.689E-01 | 5.11E-01 G |
| MN-54 | | -7.5454E-03 | | | | | |
| | | | 834.81 | -7.545E-03 | %(P | 3.916E-02 | 1.15E-02 G |
| CO-57 | | 2.1491E-02 | | | | | |
| | | | 122.07 | 2.149E-02 | %(P | 5.280E-02 | 1.60E-02 G K |
| | | | 136.43 | 6.740E-03 | % | 4.409E-01 | 1.32E-01 G |
| CO-60 | | -1.7176E-02 | | | | | |
| | | | 1332.51 | -1.718E-02 | &(P | 4.724E-02 | 1.37E-02 G K |
| | | | 1173.23 | 2.265E-02 | % P | 5.674E-02 | 1.70E-02 G K |
| Sr-85 | | -2.2231E-02 | | | | | |
| | | | 514.00 | -2.223E-02 | &( | 4.925E-02 | 1.49E-02 G |
| Kr-85 | | -4.8096E+02 | | | | | |
| | | | 513.99 | -4.810E+02 | &( | 1.065E+03 | 3.22E+02 G |
| Y-88 | | 1.2527E-02 | | | | | |
| | | | 1836.01 | 5.553E-04 | &(P | 3.123E-02 | 8.27E-03 G K |
| | | | 898.02 | 2.518E-02 | ?(P | 2.712E-02 | 8.88E-03 G |
| NB-94 | | -2.3780E-04 | | | | | |
| | | | 871.10 | -2.378E-04 | %( | 3.413E-02 | 9.68E-03 G K |
| | | | 702.50 | 9.914E-03 | & | 3.548E-02 | 1.05E-02 G K |
| Ag-108M | | -3.4221E-03 | | | | | |
| | | | 722.95 | -3.422E-03 | %( | 4.515E-02 | 1.31E-02 G K |
| | | | 614.37 | -2.798E-02 | % P | 4.734E-02 | 1.45E-02 G |
| | | | 433.93 | 1.369E-02 | % | 3.685E-02 | 1.11E-02 G |

| Nuclide | Ave activity | Energy | Activity | Code | Peak | MDA | Comments |
|---|---|---|---|---|---|---|---|
| CD-109 | 1.5725E+00 | | | | | | |
| | | 88.04 | 1.572E+00 | &( | 1.999E+00 | 6.13E-01 | G |
| SN-113 | 3.6310E-03 | | | | | | |
| | | 391.71 | 3.631E-03 | %( | 5.094E-02 | 1.50E-02 | G K |
| | | 255.04 | 1.964E-02 | & | 1.780E+00 | 5.27E-01 | G |
| SB-125 | 8.3418E-02 | | | | | | |
| | | 427.95 | -6.042E-05 | &(P | 1.158E-01 | 3.38E-02 | G K |
| | | 600.77 | -3.563E-03 | % P | 1.923E-01 | 5.57E-02 | G |
| | | 636.15 | -2.644E-03 | & P | 3.013E-01 | 8.64E-02 | G |
| | | 463.51 | 3.305E-01 | *(P | 3.277E-01 | 1.04E-01 | G |
| | | 176.29 | 7.834E-02 | & | 5.819E-01 | 1.74E-01 | G |
| I-131 | -1.5758E-02 | | | | | | |
| | | 364.48 | -1.576E-02 | %(P | 7.457E-02 | 2.22E-02 | G K |
| | | 636.97 | -9.297E-02 | % | 8.570E-01 | 2.50E-01 | G |
| | | 284.29 | -1.410E-01 | % P | 9.874E-01 | 2.94E-01 | G |
| CS-134 | -3.9595E-02 | | | | | | |
| | | 604.66 | -3.960E-02 | ?( | 4.538E-02 | 1.42E-02 | G K |
| | | 795.76 | 4.519E-02 | + P | 4.486E-02 | 1.44E-02 | G |
| | | 569.29 | 3.143E-02 | % P | 2.294E-01 | 6.71E-02 | G |
| | | 801.84 | 9.961E-03 | % P | 4.700E-01 | 1.35E-01 | G |
| CS-137 | -1.4508E-02 | | | | | | |
| | | 661.62 | -1.451E-02 | %(P | 4.709E-02 | 1.40E-02 | G |
| CE-139 | 4.3121E-03 | | | | | | |
| | | 165.85 | 4.312E-03 | &( | 5.196E-02 | 1.55E-02 | G |
| EU-152 | 2.8761E-02 | | | | | | |
| | | 121.78 | 2.876E-02 | %(P | 1.564E-01 | 4.69E-02 | G K |
| | | 344.30 | -2.567E-02 | & P | 1.301E-01 | 3.87E-02 | G |
| | | 1408.08 | 1.004E-01 | % | 1.631E-01 | 5.08E-02 | G |
| | | 964.00 | -1.283E-01 | % P | 3.115E-01 | 9.34E-02 | G |
| | | 1112.07 | 3.522E-03 | % | 3.812E-01 | 1.10E-01 | G |
| | | 778.90 | 0.000E+00 | & | 2.991E-01 | 8.59E-02 | G |
| EU-154 | 8.0876E-04 | | | | | | |
| | | 123.10 | 8.088E-04 | %( | 1.269E-01 | 3.79E-02 | G K |
| | | 1274.80 | 3.826E-03 | % | 1.554E-01 | 4.47E-02 | G |
| | | 723.30 | -4.184E-03 | % | 2.152E-01 | 6.24E-02 | G |
| | | 1004.80 | -8.362E-02 | & | 2.771E-01 | 8.25E-02 | G |

| Nuclide | Ave activity | Energy | Activity | Code | Peak | MDA | Comments |
|---|---|---|---|---|---|---|---|
| EU-155 | 1.7700E-01 | | | | | | |
| | | 86.45 | 1.770E-01 | %( | 2.518E-01 | 7.70E-02 | G K |
| | | 105.31 | 7.422E-02 | % | 2.421E-01 | 7.30E-02 | G |
| HG-203 | -6.2338E-03 | | | | | | |
| | | 279.17 | -6.234E-03 | &(P | 4.133E-02 | 1.23E-02 | G K |
| | | 72.87 | -8.916E-01 | % P | 2.745E+00 | 8.29E-01 | G |
| | | 70.83 | -1.835E-01 | % | 5.080E+00 | 1.52E+00 | G |
| | | 82.50 | -8.245E-01 | & | 4.275E+00 | 1.28E+00 | G |
| TL-208 | 3.2660E-01 | | | | | | |
| | | 583.14 | 3.266E-01 | @(P | 4.966E-02 | 2.46E-02 | G |
| | | 510.72 | 4.690E-01 | + P | 1.580E-01 | 6.10E-02 | G |
| PB-212 | 9.1115E-01 | | | | | | |
| | | 238.63 | 9.111E-01 | (P | 9.839E-02 | 4.25E-02 | G K |
| | | | | | | | Energy duplication |
| | | 77.11 | 8.320E-01 | } P | 4.181E-01 | 1.14E-01 | G |
| | | 74.81 | 1.201E+00 | + P | 8.344E-01 | 2.66E-01 | G |
| PB-214 | 5.7706E-01 | | | | | | |
| | | 351.99 | 5.888E-01 | (P | 7.443E-02 | 3.40E-02 | G K |
| | | 295.22 | 5.543E-01 | (P | 1.465E-01 | 5.43E-02 | G |
| | | | | | | | Energy duplication |
| | | 77.11 | 4.420E-01 | } P | 1.013E+00 | 2.50E-01 | G |
| | | 241.92 | 2.656E-01 | % | 6.271E-01 | 1.90E-01 | G |
| BI-212 | 8.8714E-01 | | | | | | |
| | | 727.17 | 8.472E-01 | @(P | 3.920E-01 | 1.71E-01 | G K |
| | | 1620.56 | -1.321E-02 | & P | 1.082E+00 | 2.89E-01 | G |
| | | 785.42 | 1.123E+00 | ( | 1.425E+00 | 4.61E-01 | G |
| BI-214 | 5.6592E-01 | | | | | | |
| | | 609.32 | 5.659E-01 | (P | 7.940E-02 | 3.90E-02 | G K |
| | | 1764.51 | 5.661E-01 | ?(P | 1.235E-01 | 7.53E-02 | G |
| | | 1120.28 | 6.865E-01 | + P | 3.253E-01 | 1.29E-01 | G |
| RA-224 | 7.9441E-01 | | | | | | |
| | | 241.00 | 7.944E-01 | %( | 1.198E+00 | 3.66E-01 | G |
| RA-226 | 1.5059E+00 | | | | | | |
| | | 185.99 | 1.506E+00 | @(P | 1.170E+00 | 3.65E-01 | G |
| AC-228 | 8.8836E-01 | | | | | | |
| | | 911.07 | 8.380E-01 | (P | 1.420E-01 | 6.90E-02 | G K |
| | | 968.90 | 1.010E+00 | (P | 1.641E-01 | 8.54E-02 | G |
| | | 338.40 | 8.329E-01 | (P | 2.802E-01 | 1.07E-01 | G |

| Nuclide | Ave activity | Energy | Activity | Code | Peak | MDA | Comments |
|---|---|---|---|---|---|---|---|
| TH-227 | -2.6828E-01 | | | | | | |
| | | 236.00 | -2.683E-01 %( | | 4.447E-01 | 1.35E-01 | G K |
| | | 256.25 | -2.246E-03 & P | | 4.196E-01 | 1.23E-01 | G |
| PA-234 | 6.9000E-03 | | | | | | |
| | | 98.44 | 6.900E-03 %(P | | 2.137E-01 | 6.36E-02 | G K |
| | | 946.00 | -2.671E-02 % P | | 2.366E-01 | 6.90E-02 | G |
| | | 131.28 | 2.050E-02 % P | | 2.001E-01 | 5.98E-02 | G |
| | | 94.67 | -1.280E-01 & P | | 4.632E-01 | 1.40E-01 | G |
| | | 883.24 | 1.738E-01 % | | 2.874E-01 | 8.86E-02 | G |
| | | 926.70 | -9.568E-02 & | | 3.727E-01 | 1.10E-01 | G |
| | | 569.26 | 2.941E-02 % P | | 3.453E-01 | 1.01E-01 | G |
| TH-234 | 1.1410E+00 | | | | | | |
| | | 63.29 | 1.141E+00 &(P | | 6.343E+00 | 1.90E+00 | G K |
| | | 92.80 | 1.416E+00 % P | | 2.345E+00 | 7.12E-01 | G |
| | | 92.38 | 1.618E+00 % P | | 2.786E+00 | 8.45E-01 | G |
| AM-241 | -1.1591E-01 | | | | | | |
| | | 59.54 | -1.159E-01 %(P | | 1.119E+00 | 3.34E-01 | G |

( - This peak used in the nuclide activity average.

* - Peak is too wide, but only one peak in library.
! - Peak is part of a multiplet and this area went negative during deconvolution.
? - Peak is too narrow.
@ - Peak is too wide at FW25M, but ok at FWHM.
% - Peak fails sensitivity test.
$ - Peak identified, but first peak of this nuclide failed one or more qualification tests.
+ - Peak activity higher than counting uncertainty range.
- - Peak activity lower than counting uncertainty range.
= - Peak outside analysis energy range.
& - Calculated peak centroid is not close enough to the library energy centroid for positive identification.
P - Peakbackground subtraction
} - Peak is too close to another for the activity to be found directly.

| Nuclide Codes: | Peak Codes: |
|---|---|
| T - Thermal Neutron Activation | G - Gamma Ray |
| F - Fast Neutron Activation | X - X-Ray |
| I - Fission Product | P - Positron Decay |
| N - Naturally Occurring Isotope | S - Single-Escape |
| P - Photon Reaction | D - Double-Escape |
| C - Charged Particle Reaction | K - Key Line |
| M - No MDA Calculation | A - Not in Average |

R - Coincidence Corrected C - Coincidence Peak
H - Halflife limit exceeded

- - - - - - - - - - - - - - - - - - - - - - - - - - - - - - - - - - - - - - - -

***** S U M M A R Y O F N U C L I D E S I N S A M P L E *****

| Nuclide | | Time of Count Activity pCi/gm | Time Corrected Activity pCi/gm | Uncertainty (3 Sigma) Counting pCi/gm | Total pCi/gm | MDA pCi/gm |
|---|---|---|---|---|---|---|
| BE-7 | #A | -1.6817E-02 | -1.8208E-02 | 2.9115E-01 | 2.9116E-01 | 3.075E-01 |
| K-40 | | 2.1766E+01 | 2.1766E+01 | 1.5316E+00 | 1.9856E+00 | |
| MN-54 | #A | -7.4435E-03 | -7.5454E-03 | 3.7131E-02 | 3.7134E-02 | 3.863E-02 |
| CO-57 | #B | 2.1156E-02 | 2.1491E-02 | 4.7910E-02 | 4.7925E-02 | 5.198E-02 |
| CO-60 | #B | -1.7138E-02 | -1.7176E-02 | 5.8860E-02 | 5.8868E-02 | 4.714E-02 |
| Sr-85 | #A | -2.0822E-02 | -2.2231E-02 | 4.4719E-02 | 4.4738E-02 | 4.613E-02 |
| Kr-85 | #A | -4.8094E+02 | -4.8096E+02 | 9.6705E+02 | 9.6745E+02 | 1.065E+03 |
| Y-88 | #B | 1.2038E-02 | 1.2527E-02 | 1.3247E-02 | 1.3267E-02 | 3.001E-02 |
| NB-94 | #B | -2.3780E-04 | -2.3780E-04 | 2.9047E-02 | 2.9047E-02 | 3.413E-02 |
| Ag-108M | #B | -3.4218E-03 | -3.4221E-03 | 3.9446E-02 | 3.9447E-02 | 4.515E-02 |
| CD-109 | #A | 1.5578E+00 | 1.5725E+00 | 1.8392E+00 | 1.8413E+00 | 1.981E+00 |
| SN-113 | #B | 3.4995E-03 | 3.6310E-03 | 4.4868E-02 | 4.4868E-02 | 4.910E-02 |
| SB-125 | #B | 8.3069E-02 | 8.3418E-02 | 7.8429E-02 | 7.8578E-02 | 1.153E-01 |
| I-131 | #B | -9.2947E-03 | -1.5758E-02 | 7.1821E-02 | 7.1827E-02 | 4.398E-02 |
| CS-134 | #A | -3.9373E-02 | -3.9595E-02 | 4.2523E-02 | 4.2585E-02 | 4.512E-02 |
| CS-137 | #A | -1.4503E-02 | -1.4508E-02 | 4.8802E-02 | 4.8809E-02 | 4.707E-02 |
| CE-139 | #A | 4.1811E-03 | 4.3121E-03 | 4.6570E-02 | 4.6571E-02 | 5.038E-02 |
| EU-152 | #B | 2.8735E-02 | 2.8761E-02 | 1.4074E-01 | 1.4075E-01 | 1.563E-01 |
| EU-154 | #B | 8.0765E-04 | 8.0876E-04 | 1.1364E-01 | 1.1364E-01 | 1.267E-01 |
| EU-155 | #B | 1.7659E-01 | 1.7700E-01 | 2.3088E-01 | 2.3109E-01 | 2.512E-01 |
| HG-203 | #B | -5.6910E-03 | -6.2338E-03 | 3.7048E-02 | 3.7049E-02 | 3.773E-02 |
| TL-208 | # | 3.2660E-01 | 3.2660E-01 | 7.3755E-02 | 7.6153E-02 | |
| PB-212 | | 9.1115E-01 | 9.1115E-01 | 1.2749E-01 | 1.3803E-01 | |
| PB-214 | | 5.7706E-01 | 5.7706E-01 | 9.8479E-02 | 1.0402E-01 | |
| BI-212 | | 8.8714E-01 | 8.8714E-01 | 5.3652E-01 | 5.3898E-01 | |
| BI-214 | | 5.6592E-01 | 5.6592E-01 | 1.1696E-01 | 1.2148E-01 | |
| RA-224 | #A | 7.9441E-01 | 7.9441E-01 | 1.0976E+00 | 1.0986E+00 | 1.198E+00 |
| RA-226 | # | 1.5059E+00 | 1.5059E+00 | 1.0948E+00 | 1.0983E+00 | 1.170E+00 |
| AC-228 | | 8.8836E-01 | 8.8836E-01 | 1.5529E-01 | 1.6363E-01 | |
| TH-227 | #B | -2.6828E-01 | -2.6828E-01 | 4.0638E-01 | 4.0667E-01 | 4.447E-01 |
| PA-234 | #B | 6.9000E-03 | 6.9000E-03 | 1.9082E-01 | 1.9083E-01 | 2.137E-01 |
| TH-234 | #B | 1.1410E+00 | 1.1410E+00 | 5.6865E+00 | 5.6868E+00 | 6.343E+00 |
| AM-241 | #A | -1.1591E-01 | -1.1591E-01 | 1.0327E+00 | 1.0327E+00 | 1.119E+00 |

# - All peaks for activity calculation had bad shape.
* - Activity omitted from total
& - Activity omitted from total and all peaks had bad shape.
< - MDA value printed.
A - Activity printed, but activity < MDA.
B - Activity < MDA and failed test.
C - Area < Critical level.
F - Failed fraction or key line test.

H – Halflife limit exceeded

YAEC Chemistry Lab Spectrum name: 103F_16SEPT2006_1017.An1

---------- S U M M A R Y ----------

Total Activity ( 1120.0 to 2000.7 keV) 2.5922634E+01 pCi/gm
Total Decayed Activity ( 1120.0 to 2000.7 keV) 2.5922634E+01 pCi/gm

The library has energies which are not separable.

Analyzed by: _____
JJM

Reviewed by: _____
Supervisor

Laboratory: YAEC Chemistry Lab

YAEC Chemistry Lab Spectrum name: 107_13SEPT2006_0814.An1

Sample description
SSS-01-01-020-F-S WET

Spectrum Filename: C:\GammaVision\Spectra\107_13SEPT2006_0814.An1

Acquisition information

| | |
|---|---|
| Start time: | 13-Sep-2006 08:14:07 |
| Live time: | 2000 |
| Real time: | 2002 |
| Dead time: | 0.12 % |
| Detector ID: | 2 |

Detector system
Det 107- DSPE- 634

Calibration

| | |
|---|---|
| Filename: | 107_500S.Clb |

Detector 107 500 ml Sand Geometry (800 g)

Energy Calibration

| | |
|---|---|
| Created: | 21-Nov-2004 02:37:40 |
| Zero offset: | 0.150 keV |
| Gain: | 0.500 keV/channel |
| Quadratic: | -1.833E-08 keV/channel^2 |

Efficiency Calibration

| | |
|---|---|
| Created: | 21-Nov-2004 06:51:17 |
| Type: | Polynomial |
| Uncertainty: | 1.459 % |
| Coefficients: | -0.291037 -4.391410 0.659468 |
| | -0.095428 0.006081 -0.000153 |

Library Files

| | |
|---|---|
| Main analysis library: | FSS_Rev_1.Lib |
| Library Match Width: | 1.000 |
| Peak stripping: | Library based |

Analysis parameters

| | |
|---|---|
| Analysis engine: | Env32 G53W4.20 |
| Start channel: | 100 ( 50.17keV ) |
| Stop channel: | 4000 ( 2000.50keV ) |
| Peak rejection level: | 41.667% |
| Peak search sensitivity: | 3 |
| Sample Size: | 1.0030E+03 |
| Activity scaling factor: | 1.0000E+06/( 1.0000E+00* 1.0030E+03) = 9.9701E+02 |
| Detection limit method: | Nureg 4.16 |
| Random error: | 1.0000000E+00 |
| Systematic error: | 1.0000000E+00 |

| | |
|---|---|
| Fraction Limit: | 0.000% |
| Background width: | average of five points. |

YAEC Chemistry Lab Spectrum name: 107_13SEPT2006_0814.An1

| | |
|---|---|
| Half lives decay limit: | 12.000 |
| Activity range factor: | 2.000 |
| Min. step backg. energy | 0.000 |
| Multiplet shift channel | 2.000 |

| Corrections | Status | Comments |
|---|---|---|
| Decay correct to date: | YES | 11-Sep-2006 08:04:00 |
| Decay during acquisition: | NO | |
| Decay during collection: | NO | |
| True coincidence correction: | NO | |
| Peaked background correction: | YES | 1010K_Background_Det101.Pbc 17-May-2004 16:32:19 |
| Absorption (Internal): | NO | |
| Geometry correction: | NO | |
| Random summing: | NO | |

total peaks alloc. 18 cutoff 20.00000 %

Energy Calibration

Normalized diff: 1.0000

***** S U M M A R Y O F P E A K S I N R A N G E *****

| Peak Energy | Area | Uncert | FWHM | Corrctn Factor | Nuclide Energy | Brnch. Ratio | Act. pCi/gm | Nuc |
|---|---|---|---|---|---|---|---|---|
| 76.14 | 878. | 7.45 | 2.28 | 5.062E-02 | 74.81 | 9.600 | 2.484E+00 | PB212 |
| | | | | | 77.11 | 17.500 | 1.318E+00 | PB212 |
| | | | | | 77.11 | 10.700 | 2.155E+00 | PB214 |
| 93.23 | 153. | 29.97 | 2.25 | 5.829E-02 | 92.38 | 2.570 | 1.382E+00 | TH234 |
| | | | | | 92.80 | 3.000 | 1.181E+00 | TH234 |
| | | | | | 94.67 | 15.500 | 2.267E-01 | PA234 |
| 185.53 | 196. | 20.77 | 1.88 | 5.843E-02 | 185.99 | 3.280 | 1.379E+00 | RA226 |
| 239.23 | 1370. | 4.39 | 1.99 | 5.108E-02 | 238.63 | 43.100 | 8.373E-01 | PB212 |
| | | | | | 241.00 | 3.900 | 9.312E+00 | RA224 |
| 241.53 | 161. | 20.78 | 1.30 | 5.072E-02 | 241.00 | 3.900 | 1.092E+00 | RA224 |
| | | | | | 241.92 | 7.470 | 5.715E-01 | PB214 |
| 296.03 | 383. | 9.89 | 2.09 | 4.397E-02 | 295.22 | 19.200 | 6.105E-01 | PB214 |
| 338.59 | 208. | 16.47 | 1.69 | 3.957E-02 | 338.40 | 12.010 | 5.888E-01 | AC228 |
| 352.11 | 499. | 7.04 | 2.20 | 3.834E-02 | 351.99 | 37.100 | 4.725E-01 | PB214 |
| 510.92 | 143. | 14.36 | 3.20 | 2.812E-02 | 510.72 | 22.500 | 3.051E-01 | TL208 |
| | | | | | 513.99 | 0.004 | 1.605E+03 | Kr85 |
| | | | | | 514.00 | 99.270 | 7.104E-02 | Sr85 |
| 583.27 | 380. | 7.54 | 2.49 | 2.518E-02 | 583.14 | 86.000 | 2.363E-01 | TL208 |
| 609.41 | 359. | 7.88 | 2.16 | 2.429E-02 | 609.32 | 46.090 | 4.318E-01 | BI214 |
| 662.22 | 103. | 18.63 | 2.03 | 2.271E-02 | 661.62 | 84.620 | 7.251E-02 | CS137 |
| 726.82 | 117. | 15.74 | 1.76 | 2.105E-02 | 727.17 | 11.800 | 6.349E-01 | BI212 |
| 911.27 | 290. | 8.85 | 2.27 | 1.760E-02 | 911.07 | 29.000 | 7.661E-01 | AC228 |
| 968.72 | 199. | 12.63 | 1.30 | 1.677E-02 | 968.90 | 17.460 | 9.136E-01 | AC228 |
| 1120.53 | 73. | 19.76 | 1.92 | 1.499E-02 | 1120.28 | 15.040 | 4.364E-01 | BI214 |
| 1461.22 | 1314. | 2.87 | 2.86 | 1.218E-02 | 1460.75 | 10.700 | 1.359E+01 | K40 |
| 1765.18 | 74. | 15.02 | 2.57 | 1.045E-02 | 1764.51 | 15.920 | 5.991E-01 | BI214 |

********** U N I D E N T I F I E D P E A K S U M M A R Y **********

| Peak Channel | Centroid Energy | Background Counts | Net Area Counts | Intensity Cts/Sec | Uncert 3 Sigma % | FWHM keV | Suspected Nuclide | |
|---|---|---|---|---|---|---|---|---|
| 477.25 | 239.23 | 454. | 797. | 0.398 | 15.55 | 1.299 | PB-212 | D |

s - Peak fails shape tests.
D - Peak area deconvoluted.
L - Peak written from unknown list.
C - Area < Critical level.

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This section based on library: FSS_Rev_1.Lib

********** I D E N T I F I E D P E A K S U M M A R Y **********

| Nuclide | Peak Channel | Centroid Energy | Background Counts | Net Area Counts | Intensity Cts/Sec | Uncert 3 Sigma % | FWHM keV |
|---|---|---|---|---|---|---|---|
| PB-212 | 149.57 | 74.96 | 1486. | 211. | 0.106 | 80.19 | 1.500s |
| PB-212 | 153.87 | 77.11 | 1275. | 403. | 0.202 | 40.41 | 1.500D |
| PB-214 | 153.87 | 77.11 | 1132. | 878. | 0.439 | 22.34 | 2.283D |
| TH-234 | 185.66 | 93.01 | 1045. | 119. | 0.059 | 118.53 | 1.500s |
| TH-234 | 185.63 | 93.00 | 1015. | 118. | 0.059 | 118.26 | 1.500s |
| RA-226 | 370.65 | 185.53 | 522. | 196. | 0.098 | 62.32 | 1.883s |
| TH-227 | 471.52 | 235.98 | 1316. | -154. | -0.077 | 103.07 | 1.500s |
| PB-212 | 477.24 | 238.84 | 861. | 783. | 0.391 | 19.18 | 1.500s |
| PB-214 | 483.39 | 241.92 | 477. | 161. | 0.080 | 62.35 | 1.301D |
| PB-214 | 591.58 | 296.03 | 320. | 383. | 0.192 | 29.68 | 2.088s |
| AC-228 | 676.67 | 338.59 | 283. | 208. | 0.104 | 49.40 | 1.688s |
| PB-214 | 703.71 | 352.11 | 223. | 499. | 0.249 | 21.13 | 2.202s |
| TL-208 | 1021.24 | 510.92 | 104. | 143. | 0.072 | 43.07 | 3.201s |
| TL-208 | 1165.91 | 583.27 | 122. | 380. | 0.190 | 22.62 | 2.490s |
| BI-214 | 1218.17 | 609.41 | 122. | 359. | 0.179 | 23.63 | 2.159s |
| CS-137 | 1323.77 | 662.22 | 84. | 103. | 0.052 | 55.88 | 2.030s |
| BI-212 | 1452.95 | 726.82 | 74. | 117. | 0.058 | 47.21 | 1.765s |
| AC-228 | 1821.78 | 911.27 | 86. | 290. | 0.145 | 26.54 | 2.266s |
| AC-228 | 1936.65 | 968.72 | 102. | 199. | 0.099 | 37.88 | 1.303s |
| BI-214 | 2240.22 | 1120.53 | 54. | 73. | 0.036 | 59.27 | 1.923s |
| K-40 | 2921.51 | 1461.22 | 20. | 1314. | 0.657 | 8.60 | 2.860s |
| BI-214 | 3529.38 | 1765.18 | 9. | 74. | 0.037 | 45.05 | 2.565s |

s - Peak fails shape tests.
D - Peak area deconvoluted.
A Derived peak area.

***** S U M M A R Y O F L I B R A R Y P E A K U S A G E *****

| - Nuclide - Name | Code | Average Activity pCi/gm | Peak Energy keV | Peak Activity pCi/gm | Code | MDA Value pCi/gm | COMMENTS |
|---|---|---|---|---|---|---|---|
| BE-7 | | 2.8217E-02 | | | | | |
| | | | 477.56 | 2.822E-02 | &( | 2.323E-01 6.77E-02 | G |
| K-40 | | 1.3588E+01 | | | | | |
| | | | 1460.75 | 1.359E+01 | *( | 2.461E-01 3.90E-01 | G |
| MN-54 | | 5.8262E-03 | | | | | |
| | | | 834.81 | 5.826E-03 | &( | 3.247E-02 9.49E-03 | G |
| CO-57 | | -8.2486E-03 | | | | | |
| | | | 122.07 | -8.249E-03 | %(P | 3.220E-02 9.66E-03 | G K |
| | | | 136.43 | -1.060E-03 | % | 2.314E-01 6.86E-02 | G |
| CO-60 | | 9.9541E-03 | | | | | |
| | | | 1332.51 | 9.954E-03 | %(P | 3.342E-02 9.48E-03 | G K |
| | | | 1173.23 | 1.227E-02 | % P | 4.818E-02 1.40E-02 | G K |
| Sr-85 | | -1.3148E-02 | | | | | |
| | | | 514.00 | -1.315E-02 | &( | 3.631E-02 1.09E-02 | G |
| Kr-85 | | -2.9720E+02 | | | | | |
| | | | 513.99 | -2.972E+02 | &( | 8.204E+02 2.47E+02 | G |
| Y-88 | | 1.9167E-03 | | | | | |
| | | | 1836.01 | 1.917E-03 | %(P | 2.125E-02 5.53E-03 | G K |
| | | | 898.02 | 8.001E-03 | % P | 2.930E-02 8.58E-03 | G |
| NB-94 | | 3.0632E-03 | | | | | |
| | | | 871.10 | 3.063E-03 | &( | 2.746E-02 7.87E-03 | G K |
| | | | 702.50 | 0.000E+00 | % | 3.291E-02 9.48E-03 | G K |
| Ag-108M | | -1.2551E-02 | | | | | |
| | | | 722.95 | -1.255E-02 | %( | 4.314E-02 1.29E-02 | G K |
| | | | 614.37 | -2.472E-02 | % | 4.043E-02 1.24E-02 | G |
| | | | 433.93 | 2.132E-03 | & | 2.124E-02 6.14E-03 | G |
| CD-109 | | 6.2218E-01 | | | | | |
| | | | 88.04 | 6.222E-01 | %( | 9.651E-01 2.94E-01 | G |
| SN-113 | | -1.0331E-03 | | | | | |
| | | | 391.71 | -1.033E-03 | &(P | 3.700E-02 1.07E-02 | G K |
| | | | 255.04 | 1.037E-01 | & | 1.137E+00 3.36E-01 | G |

| Nuclide | Ave activity | Energy | Activity | Code | Peak | MDA | Comments |
|---|---|---|---|---|---|---|---|
| SB-125 | -3.5996E-03 | | | | | | |
| | | 427.95 | -3.600E-03 | &( | 7.933E-02 | 2.30E-02 | G K |
| | | 600.77 | -3.491E-03 | & | 1.264E-01 | 3.61E-02 | G |
| | | 636.15 | 3.244E-02 | % | 2.242E-01 | 6.51E-02 | G |
| | | 463.51 | 1.358E-01 | % | 2.495E-01 | 7.61E-02 | G |
| | | 176.29 | -1.671E-02 | & | 3.977E-01 | 1.18E-01 | G |
| I-131 | 9.8359E-03 | | | | | | |
| | | 364.48 | 9.836E-03 | %( | 3.072E-02 | 9.17E-03 | G K |
| | | 636.97 | -1.468E-02 | % | 4.402E-01 | 1.26E-01 | G |
| | | 284.29 | 8.275E-02 | & | 4.926E-01 | 1.46E-01 | G |
| CS-134 | -2.3313E-02 | | | | | | |
| | | 604.66 | -2.331E-02 | %( | 4.237E-02 | 1.29E-02 | G K |
| | | 795.76 | 2.163E-02 | % | 3.470E-02 | 1.07E-02 | G |
| | | 569.29 | 3.574E-02 | % | 1.690E-01 | 4.97E-02 | G |
| | | 801.84 | 4.543E-02 | % | 3.429E-01 | 9.94E-02 | G |
| CS-137 | 7.2508E-02 | | | | | | |
| | | 661.62 | 7.251E-02 | ( | 3.178E-02 | 1.35E-02 | G |
| CE-139 | -7.0008E-03 | | | | | | |
| | | 165.85 | -7.001E-03 | %(P | 3.254E-02 | 9.74E-03 | G |
| EU-152 | -2.2848E-02 | | | | | | |
| | | 121.78 | -2.285E-02 | %( | 9.615E-02 | 2.89E-02 | G K |
| | | 344.30 | -3.255E-02 | % | 8.961E-02 | 2.69E-02 | G |
| | | 1408.08 | -2.298E-02 | % | 1.420E-01 | 4.04E-02 | G |
| | | 964.00 | -8.940E-02 | % | 3.317E-01 | 9.87E-02 | G |
| | | 1112.07 | 7.211E-02 | % | 2.506E-01 | 7.39E-02 | G |
| | | 778.90 | -1.653E-02 | & | 2.089E-01 | 5.98E-02 | G |
| EU-154 | -1.2022E-02 | | | | | | |
| | | 123.10 | -1.202E-02 | %( | 6.700E-02 | 2.01E-02 | G K |
| | | 1274.80 | 9.889E-05 | % | 9.938E-02 | 2.79E-02 | G |
| | | 723.30 | -3.514E-02 | % | 1.891E-01 | 5.58E-02 | G |
| | | 1004.80 | 4.914E-03 | % | 1.607E-01 | 4.52E-02 | G |
| EU-155 | 6.5967E-02 | | | | | | |
| | | 86.45 | 6.597E-02 | %( | 1.184E-01 | 3.60E-02 | G K |
| | | 105.31 | 3.128E-02 | % | 1.263E-01 | 3.79E-02 | G |
| HG-203 | 3.9594E-03 | | | | | | |
| | | 279.17 | 3.959E-03 | &(P | 3.045E-02 | 8.98E-03 | G K |
| | | 72.87 | 1.445E-02 | % | 9.895E-01 | 2.97E-01 | G |
| | | 70.83 | -7.777E-01 | & | 1.486E+00 | 4.51E-01 | G |
| | | 82.50 | -9.636E-01 | % | 1.730E+00 | 5.26E-01 | G |

| Nuclide | Ave activity | Energy | Activity | Code | Peak | MDA | Comments |
|---|---|---|---|---|---|---|---|
| TL-208 | 2.3626E-01 | | | | | | |
| | | 583.14 | 2.363E-01 | *( | 3.373E-02 | 1.78E-02 | G |
| | | 510.72 | 3.051E-01 | + | 1.068E-01 | 4.38E-02 | G |
| PB-212 | 4.7812E-01 | | | | | | |
| | | 238.63 | 4.781E-01 | *( | 8.518E-02 | 3.06E-02 | G K |
| | | | | | | | Energy duplication |
| | | 77.11 | 6.055E-01 | + | 2.538E-01 | 8.16E-02 | G |
| | | 74.81 | 5.971E-01 | + | 5.159E-01 | 1.60E-01 | G |
| PB-214 | 4.8905E-01 | | | | | | |
| | | 351.99 | 4.725E-01 | *( | 6.848E-02 | 3.33E-02 | G K |
| | | 295.22 | 6.105E-01 | + | 1.370E-01 | 6.04E-02 | G |
| | | | | | | | Energy duplication |
| | | 77.11 | 2.155E+00 | + | 3.914E-01 | 1.62E-01 | G |
| | | 241.92 | 5.715E-01 | ( | 3.717E-01 | 1.19E-01 | G |
| BI-212 | 6.3494E-01 | | | | | | |
| | | 727.17 | 6.349E-01 | *( | 2.323E-01 | 9.99E-02 | G K |
| | | 1620.56 | 2.853E-01 | % | 7.632E-01 | 2.25E-01 | G |
| | | 785.42 | 4.683E-01 | % | 1.360E+00 | 4.05E-01 | G |
| BI-214 | 4.3293E-01 | | | | | | |
| | | 609.32 | 4.318E-01 | *( | 6.526E-02 | 3.40E-02 | G K |
| | | 1764.51 | 5.991E-01 | + | 1.351E-01 | 9.00E-02 | G |
| | | 1120.28 | 4.364E-01 | ( | 2.209E-01 | 8.62E-02 | G |
| RA-224 | -9.7201E-02 | | | | | | |
| | | 241.00 | -9.720E-02 | &( | 1.094E+00 | 3.27E-01 | G |
| RA-226 | 1.3794E+00 | | | | | | |
| | | 185.99 | 1.379E+00 | *( | 7.683E-01 | 2.86E-01 | G |
| AC-228 | 8.2150E-01 | | | | | | |
| | | 911.07 | 7.661E-01 | *( | 1.211E-01 | 6.78E-02 | G K |
| | | 968.90 | 9.136E-01 | *( | 2.294E-01 | 1.15E-01 | G |
| | | 338.40 | 5.888E-01 | - | 2.299E-01 | 9.70E-02 | G |
| TH-227 | -3.5866E-01 | | | | | | |
| | | 236.00 | -3.587E-01 | ?( | 4.010E-01 | 1.23E-01 | G K |
| | | 256.25 | 3.421E-02 | % | 3.433E-01 | 1.02E-01 | G |
| PA-234 | -2.3100E-02 | | | | | | |
| | | 98.44 | -2.310E-02 | %( | 1.182E-01 | 3.54E-02 | G K |
| | | 946.00 | 1.730E-02 | & | 1.545E-01 | 4.44E-02 | G |
| | | 131.28 | 1.453E-02 | & | 1.391E-01 | 4.15E-02 | G |
| | | 94.67 | -1.104E-02 | % | 2.069E-01 | 6.17E-02 | G |
| | | 883.24 | 5.887E-02 | & | 2.129E-01 | 6.25E-02 | G |
| | | 926.70 | 1.111E-03 | % | 2.967E-01 | 8.43E-02 | G |

| Nuclide | Ave activity | Energy | Activity | Code | Peak | MDA | Comments |
|---|---|---|---|---|---|---|---|
| | | 569.26 | 5.289E-02 % | | 2.503E-01 | 7.36E-02 | G |
| TH-234 | 7.2078E-01 | | | | | | |
| | | 63.29 | 3.440E-01 &( | | 1.399E+00 | 4.21E-01 | G K |
| | | 92.80 | 9.078E-01 *( | | 1.167E+00 | 3.58E-01 | G |
| | | 92.38 | 1.074E+00 *( | | 1.385E+00 | 4.24E-01 | G |
| AM-241 | 7.6170E-03 | | | | | | |
| | | 59.54 | 7.617E-03 %(P | | 1.906E-01 | 5.68E-02 | G |

( - This peak used in the nuclide activity average.

* - Peak is too wide, but only one peak in library.
! - Peak is part of a multiplet and this area went negative during deconvolution.
? - Peak is too narrow.
@ - Peak is too wide at FW25M, but ok at FWHM.
% - Peak fails sensitivity test.
$ - Peak identified, but first peak of this nuclide failed one or more qualification tests.
+ - Peak activity higher than counting uncertainty range.
- - Peak activity lower than counting uncertainty range.
= - Peak outside analysis energy range.
& - Calculated peak centroid is not close enough to the library energy centroid for positive identification.
P - Peakbackground subtraction
} - Peak is too close to another for the activity to be found directly.

| Nuclide Codes: | Peak Codes: |
|---|---|
| T - Thermal Neutron Activation | G - Gamma Ray |
| F - Fast Neutron Activation | X - X-Ray |
| I - Fission Product | P - Positron Decay |
| N - Naturally Occurring Isotope | S - Single-Escape |
| P - Photon Reaction | D - Double-Escape |
| C - Charged Particle Reaction | K - Key Line |
| M - No MDA Calculation | A - Not in Average |
| R - Coincidence Corrected | C - Coincidence Peak |
| H - Halflife limit exceeded | |

- - - - - - - - - - - - - - - - - - - - - - - - - - - - - - - - - - - - -

***** S U M M A R Y O F N U C L I D E S I N S A M P L E *****

| Nuclide | | Time of Count Activity pCi/gm | Time Corrected Activity pCi/gm | Uncertainty Counting pCi/gm | 3 Sigma Total pCi/gm | MDA pCi/gm |
|---|---|---|---|---|---|---|
| BE-7 | #A | 2.7492E-02 | 2.8217E-02 | 2.0316E-01 | 2.0317E-01 | 2.263E-01 |
| K-40 | # | 1.3588E+01 | 1.3588E+01 | 1.1682E+00 | 1.4319E+00 | |
| MN-54 | #A | 5.8003E-03 | 5.8262E-03 | 2.8464E-02 | 2.8466E-02 | 3.233E-02 |
| CO-57 | #B | -8.2062E-03 | -8.2486E-03 | 3.1430E-02 | 3.1433E-02 | 3.204E-02 |
| CO-60 | #B | 9.9469E-03 | 9.9541E-03 | 2.8426E-02 | 2.8433E-02 | 3.340E-02 |

| | | | | | | |
|---|---|---|---|---|---|---|
| Sr-85 | #A | -1.2869E-02 | -1.3148E-02 | 3.2741E-02 | 3.2751E-02 | 3.554E-02 |
| Kr-85 | #A | -2.9720E+02 | -2.9720E+02 | 7.3984E+02 | 7.4006E+02 | 8.204E+02 |
| Y-88 | #B | 1.8919E-03 | 1.9167E-03 | 1.6587E-02 | 1.6587E-02 | 2.097E-02 |
| NB-94 | #B | 3.0632E-03 | 3.0632E-03 | 2.3616E-02 | 2.3616E-02 | 2.746E-02 |
| Ag-108M | #B | -1.2551E-02 | -1.2551E-02 | 3.8587E-02 | 3.8594E-02 | 4.314E-02 |
| CD-109 | #A | 6.2027E-01 | 6.2218E-01 | 8.8330E-01 | 8.8397E-01 | 9.621E-01 |
| SN-113 | #B | -1.0207E-03 | -1.0331E-03 | 1.8400E-01 | 1.8400E-01 | 3.655E-02 |
| SB-125 | #B | -3.5947E-03 | -3.5996E-03 | 6.9104E-02 | 6.9105E-02 | 7.922E-02 |
| I-131 | #B | 8.2731E-03 | 9.8359E-03 | 2.7525E-02 | 2.7531E-02 | 2.584E-02 |
| CS-134 | #B | -2.3270E-02 | -2.3313E-02 | 3.8743E-02 | 3.8769E-02 | 4.229E-02 |
| CS-137 | # | 7.2498E-02 | 7.2508E-02 | 4.0516E-02 | 4.0756E-02 | |
| CE-139 | #A | -6.9303E-03 | -7.0008E-03 | 2.9561E-02 | 2.9564E-02 | 3.221E-02 |
| EU-152 | #B | -2.2841E-02 | -2.2848E-02 | 8.6594E-02 | 8.6603E-02 | 9.612E-02 |
| EU-154 | #B | -1.2016E-02 | -1.2022E-02 | 6.0164E-02 | 6.0168E-02 | 6.697E-02 |
| EU-155 | #B | 6.5917E-02 | 6.5967E-02 | 1.0800E-01 | 1.0806E-01 | 1.183E-01 |
| HG-203 | #B | 3.8429E-03 | 3.9594E-03 | 2.6941E-02 | 2.6942E-02 | 2.956E-02 |
| TL-208 | # | 2.3626E-01 | 2.3626E-01 | 5.3430E-02 | 5.5336E-02 | |
| PB-212 | # | 4.7812E-01 | 4.7812E-01 | 9.1713E-02 | 9.6230E-02 | 8.518E-02 |
| PB-214 | | 4.8905E-01 | 4.8905E-01 | 1.0335E-01 | 1.0756E-01 | |
| BI-212 | # | 6.3494E-01 | 6.3494E-01 | 2.9976E-01 | 3.0224E-01 | |
| BI-214 | # | 4.3293E-01 | 4.3293E-01 | 1.0230E-01 | 1.0565E-01 | |
| RA-224 | #A | -9.7201E-02 | -9.7201E-02 | 9.8242E-01 | 9.8244E-01 | 1.094E+00 |
| RA-226 | # | 1.3794E+00 | 1.3794E+00 | 8.5957E-01 | 8.6367E-01 | |
| AC-228 | # | 8.2150E-01 | 8.2150E-01 | 1.8997E-01 | 1.9645E-01 | |
| TH-227 | #A | -3.5866E-01 | -3.5866E-01 | 3.6968E-01 | 3.7033E-01 | 4.010E-01 |
| PA-234 | #B | -2.3100E-02 | -2.3100E-02 | 1.0623E-01 | 1.0624E-01 | 1.182E-01 |
| TH-234 | #B | 7.2078E-01 | 7.2078E-01 | 8.5236E-01 | 8.5330E-01 | 1.399E+00 |
| AM-241 | #A | 7.6169E-03 | 7.6170E-03 | 1.7040E-01 | 1.7040E-01 | 1.906E-01 |

# - All peaks for activity calculation had bad shape.
* - Activity omitted from total
& - Activity omitted from total and all peaks had bad shape.
< - MDA value printed.
A - Activity printed, but activity < MDA.
B - Activity < MDA and failed test.
C - Area < Critical level.
F - Failed fraction or key line test.
H - Halflife limit exceeded

---------- S U M M A R Y ----------

Total Activity ( 294.7 to 2000.5 keV) 1.7654854E+01 pCi/gm
Total Decayed Activity ( 294.7 to 2000.5 keV) 1.7654867E+01 pCi/gm

The library has energies which are not separable.

Analyzed by: _____
JPK

Reviewed by: _____
Supervisor

Laboratory: YAEC Chemistry Lab

YAEC Chemistry Lab Spectrum name: 107_15SEPT2006_1303.An1

Sample description
FSS-SSS-01-01-020-F

Spectrum Filename: C:\GammaVision\Spectra\107_15SEPT2006_1303.An1

Acquisition information
Start time: 15-Sep-2006 13:03:55
Live time: 2000
Real time: 2002
Dead time: 0.10 %
Detector ID: 2

Detector system
Det 107- DSPE- 634

Calibration
Filename: 107_500S.Clb
Detector 107 500 ml Sand Geometry (800 g)

Energy Calibration
Created: 21-Nov-2004 02:37:40
Zero offset: 0.150 keV
Gain: 0.500 keV/channel
Quadratic: -1.833E-08 keV/channel^2

Efficiency Calibration
Created: 21-Nov-2004 06:51:17
Type: Polynomial
Uncertainty: 1.459 %
Coefficients: -0.291037 -4.391410 0.659468
-0.095428 0.006081 -0.000153

Library Files
Main analysis library: FSS_Rev_1.Lib
Library Match Width: 1.000
Peak stripping: Library based

Analysis parameters
Analysis engine: Env32 G53W4.20
Start channel: 100 ( 50.17keV )
Stop channel: 4000 ( 2000.50keV )
Peak rejection level: 41.667%
Peak search sensitivity: 3
Sample Size: 5.9900E+02
Activity scaling factor: 1.0000E+06/( 1.0000E+00* 5.9900E+02) =
1.6694E+03
Detection limit method: Nureg 4.16
Random error: 1.0000000E+00
Systematic error: 1.0000000E+00

| | |
|---|---|
| Fraction Limit: | 0.000% |
| Background width: | average of five points. |

YAEC Chemistry Lab Spectrum name: 107_15SEPT2006_1303.An1

Half lives decay limit: 12.000
Activity range factor: 2.000
Min. step backg. energy 0.000
Multiplet shift channel 2.000

| Corrections | Status | Comments |
|---|---|---|
| Decay correct to date: | YES | 11-Sep-2006 08:04:00 |
| Decay during acquisition: | NO | |
| Decay during collection: | NO | |
| True coincidence correction: | NO | |
| Peaked background correction: | YES | 1010K_Background_Det101.Pbc 17-May-2004 16:32:19 |
| Absorption (Internal): | NO | |
| Geometry correction: | NO | |
| Random summing: | NO | |

total peaks alloc. 17 cutoff 20.00000 %
Energy Calibration
Normalized diff: 0.1964

***** S U M M A R Y O F P E A K S I N R A N G E *****

| Peak Energy | Area | Uncert | FWHM | Corrctn Factor | Nuclide Energy | Brnch. Ratio | Act. pCi/gm | Nuc |
|---|---|---|---|---|---|---|---|---|
| 76.12 | 637. | 9.58 | 3.48 | 5.061E-02 | 72.87 | 6.400 | 4.988E+00 | HG203 |
| | | | | | 74.81 | 9.600 | 3.019E+00 | PB212 |
| | | | | | 77.11 | 10.700 | 2.619E+00 | PB214 |
| | | | | | 77.11 | 17.500 | 1.601E+00 | PB212 |
| 86.99 | 106. | 38.54 | 1.35 | 5.630E-02 | 86.45 | 32.740 | 1.307E-01 | EU155 |
| | | | | | 88.04 | 3.790 | 1.123E+00 | CD109 |
| 92.35 | 152. | 27.34 | 1.81 | 5.804E-02 | | | | |
| 92.35 | 152. | 27.34 | 1.81 | 5.804E-02 | 92.38 | 2.570 | 2.306E+00 | TH234 |
| | | | | | 92.80 | 3.000 | 1.972E+00 | TH234 |
| 185.76 | 162. | 20.00 | 1.93 | 5.840E-02 | | | | |
| 185.76 | 162. | 20.00 | 1.93 | 5.840E-02 | 185.99 | 3.280 | 1.914E+00 | RA226 |
| 238.85 | 630. | 6.00 | 1.30 | 5.113E-02 | 238.63 | 43.100 | 6.444E-01 | PB212 |
| 241.99 | 145. | 20.75 | 1.30 | 5.070E-02 | 241.00 | 3.900 | 1.649E+00 | RA224 |
| 270.74 | 85. | 30.94 | 1.07 | 4.697E-02 | | | | |
| 296.03 | 255. | 13.11 | 1.89 | 4.397E-02 | 295.22 | 19.200 | 6.790E-01 | PB214 |
| 338.64 | 240. | 13.01 | 1.83 | 3.957E-02 | 338.40 | 12.010 | 1.139E+00 | AC228 |
| 352.14 | 376. | 9.08 | 2.02 | 3.833E-02 | 351.99 | 37.100 | 5.956E-01 | PB214 |
| 463.05 | 43. | 37.47 | 1.50 | 3.050E-02 | 463.51 | 10.000 | PBC<MDA | SB125 |
| 511.27 | 183. | 14.67 | 3.53 | 2.812E-02 | 510.72 | 22.500 | 6.525E-01 | TL208 |
| | | | | | 513.99 | 0.004 | 3.433E+03 | Kr85 |
| | | | | | 514.00 | 99.270 | 1.555E-01 | Sr85 |
| 583.64 | 307. | 8.36 | 2.65 | 2.517E-02 | 583.14 | 86.000 | 3.194E-01 | TL208 |
| 609.62 | 279. | 8.86 | 2.69 | 2.428E-02 | 609.32 | 46.090 | 5.614E-01 | BI214 |
| 661.95 | 156. | 14.57 | 1.62 | 2.270E-02 | 661.62 | 84.620 | 1.830E-01 | CS137 |
| 727.69 | 77. | 27.27 | 2.10 | 2.104E-02 | 727.17 | 11.800 | 6.979E-01 | BI212 |
| 911.73 | 252. | 8.91 | 2.03 | 1.759E-02 | 911.07 | 29.000 | 1.114E+00 | AC228 |
| 969.24 | 167. | 13.04 | 1.41 | 1.677E-02 | 968.90 | 17.460 | 1.289E+00 | AC228 |

| | | | | | | | | |
|---|---|---|---|---|---|---|---|---|
| 1122.07 | 70. | 24.64 | 1.12 | 1.499E-02 | 1120.28 | 15.040 | 7.006E-01 | BI214 |
| 1461.49 | 1037. | 3.20 | 2.60 | 1.218E-02 | 1460.75 | 10.700 | 1.794E+01 | K40 |

| pk energy | area | uncert | fwhm | corr | nuclide | brnch. | act. | nuc |
|---|---|---|---|---|---|---|---|---|
| 1620.46 | 16. | 28.45 | 1.08 | 1.121E-02 | 1620.56 | 2.750 | 1.186E+00 | BI212 |
| 1765.26 | 53. | 15.31 | 2.69 | 1.045E-02 | 1764.51 | 15.920 | 7.171E-01 | BI214 |

********** U N I D E N T I F I E D P E A K S U M M A R Y **********

| Peak Channel | Centroid Energy | Background Counts | Net Area Counts | Intensity Cts/Sec | Uncert 3 Sigma % | FWHM keV | Suspected Nuclide | |
|---|---|---|---|---|---|---|---|---|
| 151.89 | 76.12 | 1379. | 224. | 0.112 | 73.11 | 3.477 | BI-207 | s |
| 173.62 | 86.99 | 654. | 106. | 0.053 | 115.62 | 1.347 | BI-207 | l |
| 477.25 | 238.87 | 398. | 630. | 0.315 | 17.99 | 1.299 | PB-212 | D |
| 483.54 | 242.01 | 380. | 145. | 0.072 | 62.26 | 1.301 | PB-214 | D |
| 541.01 | 270.74 | 218. | 85. | 0.043 | 92.83 | 1.070 | AC-228 | |
| 591.58 | 296.03 | 429. | 94. | 0.047 | 98.54 | 1.885 | PB-214 | s |
| 703.78 | 352.14 | 495. | 99. | 0.049 | 100.35 | 2.024 | PB-214 | s |

s - Peak fails shape tests.
D - Peak area deconvoluted.
L - Peak written from unknown list.
C - Area < Critical level.

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This section based on library: FSS_Rev_1.Lib

********** I D E N T I F I E D P E A K S U M M A R Y **********

| Nuclide | Peak Channel | Centroid Energy | Background Counts | Net Area Counts | Intensity Cts/Sec | Uncert 3 Sigma % | FWHM keV | |
|---|---|---|---|---|---|---|---|---|
| PB-212 | 151.16 | 75.75 | 1223. | 131. | 0.065 | 116.54 | 1.500 | s |
| PB-214 | 153.87 | 77.11 | 961. | 282. | 0.141 | 49.87 | 1.500 | D |
| PB-212 | 153.87 | 77.11 | 961. | 282. | 0.141 | 49.87 | 1.500 | D |
| TH-234 | 185.33 | 92.85 | 817. | 116. | 0.058 | 108.04 | 1.500 | s |
| TH-234 | 185.34 | 92.85 | 769. | 121. | 0.061 | 100.91 | 1.500 | s |
| RA-226 | 371.72 | 186.07 | 340. | 96. | 0.048 | 87.10 | 1.500 | s |
| PB-212 | 477.25 | 238.85 | 648. | 638. | 0.319 | 20.68 | 1.500 | s |
| PB-214 | 590.22 | 295.35 | 266. | 161. | 0.080 | 49.11 | 1.500 | s |
| AC-228 | 676.78 | 338.64 | 210. | 240. | 0.120 | 39.03 | 1.829 | s |
| PB-214 | 704.00 | 352.25 | 201. | 277. | 0.138 | 28.24 | 1.500 | s |
| SB-125 | 925.52 | 463.05 | 106. | 43. | 0.021 | 112.42 | 1.500 | s |
| TL-208 | 1021.95 | 511.27 | 128. | 183. | 0.091 | 44.01 | 3.527 | s |
| TL-208 | 1166.66 | 583.64 | 92. | 307. | 0.153 | 25.09 | 2.648 | s |
| BI-214 | 1218.88 | 609.76 | 101. | 296. | 0.148 | 26.09 | 2.702 | s |
| CS-137 | 1323.23 | 661.95 | 97. | 156. | 0.078 | 43.72 | 1.621 | |
| BI-212 | 1454.68 | 727.69 | 95. | 77. | 0.038 | 81.80 | 2.105 | s |
| AC-228 | 1822.70 | 911.73 | 63. | 252. | 0.126 | 26.73 | 2.028 | s |
| AC-228 | 1937.70 | 969.24 | 74. | 167. | 0.084 | 39.12 | 1.411 | |
| BI-214 | 2243.30 | 1122.07 | 65. | 70. | 0.035 | 73.92 | 1.117 | s |
| K-40 | 2922.06 | 1461.49 | 14. | 1037. | 0.518 | 9.61 | 2.602 | s |

| Nuclide | Channel | Energy | Background | Net area | Cnts/sec | Uncert | FWHM |
|---|---|---|---|---|---|---|---|
| BI-212 | 3239.95 | 1620.46 | 2. | 16. | 0.008 | 85.35 | 1.078s |
| BI-214 | 3529.54 | 1765.26 | 3. | 53. | 0.026 | 45.94 | 2.688s |

s - Peak fails shape tests.
D - Peak area deconvoluted.
A Derived peak area.

***** S U M M A R Y O F L I B R A R Y P E A K U S A G E *****

| - Nuclide - Name | Code | Average Activity pCi/gm | Peak Energy keV | Peak Activity pCi/gm | Code | MDA Value pCi/gm | COMMENTS |
|---|---|---|---|---|---|---|---|
| BE-7 | | -8.3688E-02 | | | | | |
| | | | 477.56 | -8.369E-02 | &( | 3.874E-01 1.14E-01 | G |
| K-40 | | 1.7943E+01 | | | | | |
| | | | 1460.75 | 1.794E+01 | *( | 3.530E-01 5.75E-01 | G |
| MN-54 | | -6.1315E-03 | | | | | |
| | | | 834.81 | -6.131E-03 | %( | 5.286E-02 1.53E-02 | G |
| CO-57 | | 2.2210E-03 | | | | | |
| | | | 122.07 | 2.221E-03 | %(P | 4.447E-02 1.32E-02 | G K |
| | | | 136.43 | -3.366E-05 | & | 3.482E-01 1.03E-01 | G |
| CO-60 | | 1.5794E-02 | | | | | |
| | | | 1332.51 | 1.579E-02 | %(P | 5.603E-02 1.58E-02 | G K |
| | | | 1173.23 | 1.239E-02 | % P | 6.056E-02 1.72E-02 | G K |
| Sr-85 | | -5.6136E-03 | | | | | |
| | | | 514.00 | -5.614E-03 | %( | 5.597E-02 1.64E-02 | G |
| Kr-85 | | -1.2389E+02 | | | | | |
| | | | 513.99 | -1.239E+02 | %( | 1.235E+03 3.63E+02 | G |
| Y-88 | | 4.2931E-03 | | | | | |
| | | | 1836.01 | 4.293E-03 | &(P | 3.662E-02 9.67E-03 | G K |
| | | | 898.02 | 5.812E-03 | & P | 4.920E-02 1.40E-02 | G |
| NB-94 | | 7.4431E-03 | | | | | |
| | | | 871.10 | 7.443E-03 | %( | 3.714E-02 1.07E-02 | G K |
| | | | 702.50 | -5.992E-03 | % | 4.214E-02 1.22E-02 | G K |
| Ag-108M | | -1.0833E-02 | | | | | |
| | | | 722.95 | -1.083E-02 | %( | 5.434E-02 1.59E-02 | G K |
| | | | 614.37 | -2.667E-02 | % | 6.372E-02 1.92E-02 | G |
| | | | 433.93 | -8.223E-03 | % | 4.455E-02 1.31E-02 | G |

| Nuclide | Ave activity | Energy | Activity | Code | Peak | MDA | Comments |
|---|---|---|---|---|---|---|---|
| CD-109 | 7.8516E-01 | | | | | | |
| | | 88.04 | 7.852E-01 | %( | 1.491E+00 | 4.53E-01 | G |
| SN-113 | 8.0970E-03 | | | | | | |
| | | 391.71 | 8.097E-03 | %(P | 5.986E-02 | 1.75E-02 | G K |
| | | 255.04 | 0.000E+00 | % | 1.783E+00 | 5.22E-01 | G |
| SB-125 | 7.9553E-02 | | | | | | |
| | | 427.95 | -1.347E-04 | %( | 1.245E-01 | 3.59E-02 | G K |
| | | 600.77 | 6.085E-02 | % | 1.922E-01 | 5.69E-02 | G |
| | | 636.15 | -1.036E-01 | % | 3.848E-01 | 1.14E-01 | G |
| | | 463.51 | 3.154E-01 | *( | 3.755E-01 | 1.18E-01 | G |
| | | 176.29 | 3.995E-02 | & | 5.649E-01 | 1.67E-01 | G |
| I-131 | 8.5854E-03 | | | | | | |
| | | 364.48 | 8.585E-03 | &( | 6.274E-02 | 1.84E-02 | G K |
| | | 636.97 | -1.068E-01 | % | 8.125E-01 | 2.35E-01 | G |
| | | 284.29 | -1.257E-02 | % | 8.389E-01 | 2.45E-01 | G |
| CS-134 | -2.4094E-02 | | | | | | |
| | | 604.66 | -2.409E-02 | %( | 5.639E-02 | 1.70E-02 | G K |
| | | 795.76 | 3.033E-02 | % | 4.513E-02 | 1.41E-02 | G |
| | | 569.29 | 1.481E-02 | % | 2.146E-01 | 6.11E-02 | G |
| | | 801.84 | 8.410E-02 | & | 4.956E-01 | 1.43E-01 | G |
| CS-137 | 1.8296E-01 | | | | | | |
| | | 661.62 | 1.830E-01 | ( | 5.714E-02 | 2.67E-02 | G |
| CE-139 | -9.0498E-03 | | | | | | |
| | | 165.85 | -9.050E-03 | %(P | 4.858E-02 | 1.45E-02 | G |
| EU-152 | 9.8518E-04 | | | | | | |
| | | 121.78 | 9.852E-04 | %( | 1.301E-01 | 3.85E-02 | G K |
| | | 344.30 | -1.076E-03 | % | 1.125E-01 | 3.24E-02 | G |
| | | 1408.08 | 3.471E-02 | % | 2.094E-01 | 5.91E-02 | G |
| | | 964.00 | 4.400E-03 | % | 5.001E-01 | 1.44E-01 | G |
| | | 1112.07 | 0.000E+00 | & | 4.999E-01 | 1.43E-01 | G |
| | | 778.90 | -1.041E-02 | % | 4.117E-01 | 1.18E-01 | G |
| EU-154 | 9.6505E-04 | | | | | | |
| | | 123.10 | 9.650E-04 | %( | 9.136E-02 | 2.70E-02 | G K |
| | | 1274.80 | -5.958E-02 | % | 1.778E-01 | 5.28E-02 | G |
| | | 723.30 | -2.739E-02 | & | 2.887E-01 | 8.40E-02 | G |
| | | 1004.80 | -4.517E-02 | & | 2.984E-01 | 8.62E-02 | G |

| Nuclide | Ave activity | Energy | Activity | Code | Peak | MDA | Comments |
|---|---|---|---|---|---|---|---|
| EU-155 | 9.8567E-02 | | | | | | |
| | | 86.45 | 9.857E-02 | %( | 1.709E-01 | 5.20E-02 | G K |
| | | 105.31 | 9.746E-02 | % | 1.794E-01 | 5.46E-02 | G |
| HG-203 | -3.2719E-03 | | | | | | |
| | | 279.17 | -3.272E-03 | &(P | 4.835E-02 | 1.40E-02 | G K |
| | | 72.87 | -3.566E-01 | % | 1.376E+00 | 4.14E-01 | G |
| | | 70.83 | -1.079E-01 | % | 1.447E+00 | 4.29E-01 | G |
| | | 82.50 | -9.681E-02 | % | 2.063E+00 | 6.11E-01 | G |
| TL-208 | 3.1936E-01 | | | | | | |
| | | 583.14 | 3.194E-01 | *( | 4.948E-02 | 2.67E-02 | G |
| | | 510.72 | 6.525E-01 | + | 1.976E-01 | 9.58E-02 | G |
| PB-212 | 6.6237E-01 | | | | | | |
| | | 238.63 | 6.528E-01 | *( | 1.241E-01 | 4.50E-02 | G K |
| | | | | | | | Energy duplication |
| | | 77.11 | 7.098E-01 | *( | 3.699E-01 | 1.18E-01 | G |
| | | 74.81 | 6.189E-01 | *( | 7.848E-01 | 2.40E-01 | G |
| PB-214 | 4.3550E-01 | | | | | | |
| | | 351.99 | 4.391E-01 | *( | 1.092E-01 | 4.13E-02 | G K |
| | | 295.22 | 4.285E-01 | *( | 2.098E-01 | 7.01E-02 | G |
| | | | | | | | Energy duplication |
| | | 77.11 | 1.161E+00 | + | 6.049E-01 | 1.93E-01 | G |
| | | 241.92 | -4.359E-01 | % | 8.096E-01 | 2.46E-01 | G |
| BI-212 | 7.9007E-01 | | | | | | |
| | | 727.17 | 6.979E-01 | @( | 4.378E-01 | 1.90E-01 | G K |
| | | 1620.56 | 1.186E+00 | *( | 6.559E-01 | 3.37E-01 | G |
| | | 785.42 | 1.066E+00 | % | 2.149E+00 | 6.54E-01 | G |
| BI-214 | 6.4125E-01 | | | | | | |
| | | 609.32 | 5.957E-01 | *( | 1.000E-01 | 5.18E-02 | G K |
| | | 1764.51 | 7.171E-01 | *( | 1.480E-01 | 1.10E-01 | G |
| | | 1120.28 | 7.006E-01 | @( | 4.032E-01 | 1.73E-01 | G |
| RA-224 | 5.9369E-01 | | | | | | |
| | | 241.00 | 5.937E-01 | &( | 1.526E+00 | 4.61E-01 | G |
| RA-226 | 1.1308E+00 | | | | | | |
| | | 185.99 | 1.131E+00 | *( | 1.045E+00 | 3.28E-01 | G |
| AC-228 | 1.1714E+00 | | | | | | |
| | | 911.07 | 1.114E+00 | *( | 1.755E-01 | 9.93E-02 | G K |
| | | 968.90 | 1.289E+00 | ( | 3.288E-01 | 1.68E-01 | G |
| | | 338.40 | 1.139E+00 | *( | 3.333E-01 | 1.48E-01 | G |

| Nuclide | Ave activity | Energy | Activity | Code | Peak | MDA | Comments |
|---|---|---|---|---|---|---|---|
| TH-227 | -4.0852E-01 | | | | | | |
| | | 236.00 | -4.085E-01 | %( | 5.727E-01 | 1.75E-01 | G K |
| | | 256.25 | -6.859E-02 | & | 5.354E-01 | 1.58E-01 | G |
| PA-234 | -3.6306E-03 | | | | | | |
| | | 98.44 | -3.631E-03 | &( | 1.334E-01 | 3.93E-02 | G K |
| | | 946.00 | -4.884E-02 | % | 2.586E-01 | 7.52E-02 | G |
| | | 131.28 | -6.904E-02 | & | 2.014E-01 | 6.07E-02 | G |
| | | 94.67 | -7.596E-02 | % | 3.310E-01 | 9.94E-02 | G |
| | | 883.24 | -5.058E-02 | & | 3.917E-01 | 1.13E-01 | G |
| | | 926.70 | 0.000E+00 | & | 5.083E-01 | 1.45E-01 | G |
| | | 569.26 | 2.198E-02 | % | 3.172E-01 | 9.04E-02 | G |
| TH-234 | 1.4239E+00 | | | | | | |
| | | 63.29 | 1.095E+00 | %( | 2.056E+00 | 6.25E-01 | G K |
| | | 92.80 | 1.566E+00 | ( | 1.706E+00 | 5.27E-01 | G |
| | | 92.38 | 1.757E+00 | ( | 2.056E+00 | 6.33E-01 | G |
| AM-241 | -6.5915E-02 | | | | | | |
| | | 59.54 | -6.592E-02 | %(P | 2.705E-01 | 8.11E-02 | G |

( - This peak used in the nuclide activity average.

* - Peak is too wide, but only one peak in library.
! - Peak is part of a multiplet and this area went negative during deconvolution.
? - Peak is too narrow.
@ - Peak is too wide at FW25M, but ok at FWHM.
% - Peak fails sensitivity test.
$ - Peak identified, but first peak of this nuclide failed one or more qualification tests.
+ - Peak activity higher than counting uncertainty range.
- - Peak activity lower than counting uncertainty range.
= - Peak outside analysis energy range.
& - Calculated peak centroid is not close enough to the library energy centroid for positive identification.
P - Peakbackground subtraction
} - Peak is too close to another for the activity to be found directly.

| Nuclide Codes: | Peak Codes: |
|---|---|
| T - Thermal Neutron Activation | G - Gamma Ray |
| F - Fast Neutron Activation | X - X-Ray |
| I - Fission Product | P - Positron Decay |
| N - Naturally Occurring Isotope | S - Single-Escape |
| P - Photon Reaction | D - Double-Escape |
| C - Charged Particle Reaction | K - Key Line |
| M - No MDA Calculation | A - Not in Average |

R - Coincidence Corrected C - Coincidence Peak
H - Halflife limit exceeded

- - - - - - - - - - - - - - - - - - - - - - - - - - - - - - - - - - - - - - -

***** S U M M A R Y O F N U C L I D E S I N S A M P L E *****

| Nuclide | | Time of Count Activity pCi/gm | Time Corrected Activity pCi/gm | Uncertainty 3 Sigma Counting pCi/gm | Total pCi/gm | MDA pCi/gm |
|---|---|---|---|---|---|---|
| BE-7 | #A | -7.9240E-02 | -8.3688E-02 | 3.4220E-01 | 3.4223E-01 | 3.668E-01 |
| K-40 | # | 1.7943E+01 | 1.7943E+01 | 1.7245E+00 | 2.0419E+00 | |
| MN-54 | #A | -6.0745E-03 | -6.1315E-03 | 4.5879E-02 | 4.5880E-02 | 5.237E-02 |
| CO-57 | #B | 2.1971E-03 | 2.2210E-03 | 3.9514E-02 | 3.9514E-02 | 4.399E-02 |
| CO-60 | #B | 1.5770E-02 | 1.5794E-02 | 4.7515E-02 | 4.7524E-02 | 5.594E-02 |
| Sr-85 | #A | -5.3666E-03 | -5.6136E-03 | 4.9299E-02 | 4.9300E-02 | 5.351E-02 |
| Kr-85 | #A | -1.2389E+02 | -1.2389E+02 | 1.0881E+03 | 1.0881E+03 | 1.235E+03 |
| Y-88 | #B | 4.1772E-03 | 4.2931E-03 | 2.9009E-02 | 2.9010E-02 | 3.563E-02 |
| NB-94 | #B | 7.4431E-03 | 7.4431E-03 | 3.2077E-02 | 3.2081E-02 | 3.714E-02 |
| Ag-108M | #B | -1.0832E-02 | -1.0833E-02 | 4.7784E-02 | 4.7789E-02 | 5.434E-02 |
| CD-109 | #A | 7.8012E-01 | 7.8516E-01 | 1.3594E+00 | 1.3601E+00 | 1.482E+00 |
| SN-113 | #B | 7.8944E-03 | 8.0970E-03 | 5.2576E-02 | 5.2579E-02 | 5.837E-02 |
| SB-125 | #B | 7.9324E-02 | 7.9553E-02 | 8.9435E-02 | 8.9566E-02 | 1.241E-01 |
| I-131 | #B | 5.9730E-03 | 8.5854E-03 | 5.5229E-02 | 5.5231E-02 | 4.365E-02 |
| CS-134 | #B | -2.4001E-02 | -2.4094E-02 | 5.1054E-02 | 5.1076E-02 | 5.617E-02 |
| CS-137 | | 1.8291E-01 | 1.8296E-01 | 7.9985E-02 | 8.0758E-02 | |
| CE-139 | #A | -8.8598E-03 | -9.0498E-03 | 4.4141E-02 | 4.4144E-02 | 4.756E-02 |
| EU-152 | #B | 9.8456E-04 | 9.8518E-04 | 1.1544E-01 | 1.1544E-01 | 1.300E-01 |
| EU-154 | #B | 9.6414E-04 | 9.6505E-04 | 8.1021E-02 | 8.1021E-02 | 9.127E-02 |
| EU-155 | #B | 9.8409E-02 | 9.8567E-02 | 1.5608E-01 | 1.5618E-01 | 1.706E-01 |
| HG-203 | #B | -3.0733E-03 | -3.2719E-03 | 4.2830E-01 | 4.2830E-01 | 4.542E-02 |
| TL-208 | # | 3.1936E-01 | 3.1936E-01 | 8.0140E-02 | 8.2469E-02 | |
| PB-212 | # | 6.6237E-01 | 6.6237E-01 | 1.3696E-01 | 1.4278E-01 | 1.241E-01 |
| PB-214 | # | 4.3550E-01 | 4.3550E-01 | 1.2299E-01 | 1.2582E-01 | 1.092E-01 |
| BI-212 | # | 7.9007E-01 | 7.9007E-01 | 4.6701E-01 | 4.6949E-01 | |
| BI-214 | # | 6.4125E-01 | 6.4125E-01 | 1.6727E-01 | 1.7178E-01 | |
| RA-224 | #A | 5.9369E-01 | 5.9369E-01 | 1.3831E+00 | 1.3836E+00 | 1.526E+00 |
| RA-226 | # | 1.1308E+00 | 1.1308E+00 | 9.8497E-01 | 9.8738E-01 | 1.045E+00 |
| AC-228 | | 1.1714E+00 | 1.1714E+00 | 2.3969E-01 | 2.5010E-01 | |
| TH-227 | #B | -4.0852E-01 | -4.0852E-01 | 5.2559E-01 | 5.2618E-01 | 5.727E-01 |
| PA-234 | #B | -3.6306E-03 | -3.6306E-03 | 1.1796E-01 | 1.1796E-01 | 1.334E-01 |
| TH-234 | #B | 1.4239E+00 | 1.4239E+00 | 1.0736E+00 | 1.0765E+00 | 2.056E+00 |
| AM-241 | #A | -6.5914E-02 | -6.5915E-02 | 2.4775E-01 | 2.4778E-01 | 2.705E-01 |

# - All peaks for activity calculation had bad shape.
* - Activity omitted from total
& - Activity omitted from total and all peaks had bad shape.
< - MDA value printed.
A - Activity printed, but activity < MDA.
B - Activity < MDA and failed test.
C - Area < Critical level.
F - Failed fraction or key line test.

H – Halflife limit exceeded

YAEC Chemistry Lab Spectrum name: 107_15SEPT2006_1303.An1

---------- S U M M A R Y ----------

Total Activity ( 270.7 to 2000.5 keV) 2.1047831E+01 pCi/gm
Total Decayed Activity ( 270.7 to 2000.5 keV) 2.1047880E+01 pCi/gm

The library has energies which are not separable.

Analyzed by: _____
JPK

Reviewed by: _____
Supervisor

Laboratory: YAEC Chemistry Lab

YAEC Chemistry Lab Spectrum name: 107F_15SEPT2006_0842.An1

Sample description
FSS-SSS-01-01-032-F-B

Spectrum Filename: C:\GammaVision\Spectra\107F_15SEPT2006_0842.An1

Acquisition information
Start time: 15-Sep-2006 08:42:13
Live time: 2000
Real time: 2004
Dead time: 0.20 %
Detector ID: 2

Detector system
Det 107- DSPE- 634

Calibration
Filename: D7_1LSa.Clb
Detector 107 Calibration for 1 Liter Sand Marinelli

Energy Calibration
Created: 29-Oct-2004 06:48:53
Zero offset: 0.157 keV
Gain: 0.500 keV/channel
Quadratic: -1.676E-08 keV/channel^2

Efficiency Calibration
Created: 29-Oct-2004 06:51:32
Type: Polynomial
Uncertainty: 1.174 %
Coefficients: -0.279532 -4.778179 0.614896
-0.087174 0.005356 -0.000131

Library Files
Main analysis library: FSS_Rev_1.Lib
Library Match Width: 1.000
Peak stripping: Library based

Analysis parameters
Analysis engine: Env32 G53W4.20
Start channel: 100 ( 50.16keV )
Stop channel: 4000 ( 2000.15keV )
Peak rejection level: 41.667%
Peak search sensitivity: 3
Sample Size: 2.0240E+03
Activity scaling factor: 1.0000E+06/( 1.0000E+00* 2.0240E+03) =
4.9407E+02
Detection limit method: Nureg 4.16
Random error: 1.0000000E+00
Systematic error: 1.0000000E+00

| | |
|---|---|
| Fraction Limit: | 0.000% |
| Background width: | average of five points. |

YAEC Chemistry Lab Spectrum name: 107F_15SEPT2006_0842.An1

Half lives decay limit: 12.000
Activity range factor: 2.000
Min. step backg. energy 0.000
Multiplet shift channel 2.000

| Corrections | Status | Comments |
|---|---|---|
| Decay correct to date: | YES | 11-Sep-2006 07:25:00 |
| Decay during acquisition: | NO | |
| Decay during collection: | NO | |
| True coincidence correction: | NO | |
| Peaked background correction: | YES | 107_150K_28APR05.Pbc 01-May-2005 05:30:33 |
| Absorption (Internal): | NO | |
| Geometry correction: | NO | |
| Random summing: | NO | |

total peaks alloc. 18 cutoff 20.00000 %
Energy Calibration
Normalized diff: 0.0845

***** S U M M A R Y O F P E A K S I N R A N G E *****

| Peak Energy | Area | Uncert | FWHM | Corrctn Factor | Nuclide Energy | Brnch. Ratio | Act. pCi/gm | Nuc |
|---|---|---|---|---|---|---|---|---|
| 74.78 | 372. | 13.76 | 1.18 | 2.849E-02 | 74.81 | 9.600 | 9.075E-01 | PB212 |
| 77.08 | 217. | 21.96 | 1.18 | 2.957E-02 | 77.11 | 17.500 | 5.831E-01 | PB212 |
| | | | | | 77.11 | 10.700 | 9.436E-01 | PB214 |
| 77.20 | 217. | 25.93 | 1.50 | 2.957E-02 | 77.11 | 17.500 | PBC<MDA | PB212 |
| | | | | | 77.11 | 10.700 | PBC<MDA | PB214 |
| 93.26 | 141. | 39.98 | 1.50 | 3.438E-02 | 92.38 | 2.570 | PBC<MDA | TH234 |
| | | | | | 92.80 | 3.000 | PBC<MDA | TH234 |
| 129.82 | 162. | 36.23 | 0.95 | 3.820E-02 | | | | |
| 129.82 | 162. | 36.23 | 0.95 | 3.820E-02 | 131.28 | 20.000 | 1.413E-01 | PA234 |
| 186.16 | 272. | 19.82 | 2.76 | 3.609E-02 | 185.99 | 3.280 | 1.531E+00 | RA226 |
| 209.42 | 138. | 30.05 | 0.74 | 3.428E-02 | | | | |
| 239.27 | 2044. | 3.69 | 1.94 | 3.184E-02 | 238.63 | 43.100 | 9.851E-01 | PB212 |
| | | | | | 241.00 | 3.900 | 1.103E+01 | RA224 |
| 242.08 | 245. | 17.50 | 1.30 | 3.163E-02 | 241.00 | 3.900 | 1.325E+00 | RA224 |
| | | | | | 241.92 | 7.470 | 6.936E-01 | PB214 |
| 269.33 | 153. | 25.57 | 1.35 | 2.951E-02 | | | | |
| 295.69 | 392. | 13.31 | 2.12 | 2.764E-02 | 295.22 | 19.200 | 4.867E-01 | PB214 |
| 338.85 | 365. | 10.98 | 2.17 | 2.498E-02 | 338.40 | 12.010 | 8.044E-01 | AC228 |
| 351.84 | 741. | 6.42 | 2.11 | 2.427E-02 | 351.99 | 37.100 | 5.461E-01 | PB214 |
| 463.26 | 64. | 31.12 | 1.13 | 1.954E-02 | | | | |
| 463.26 | 64. | 31.12 | 1.13 | 1.954E-02 | 463.51 | 10.000 | PBC<MDA | SB125 |
| 510.93 | 219. | 17.43 | 1.95 | 1.808E-02 | 510.72 | 22.500 | 3.039E-01 | TL208 |
| 583.32 | 636. | 6.49 | 2.23 | 1.629E-02 | 583.14 | 86.000 | 3.009E-01 | TL208 |
| 609.30 | 557. | 7.42 | 2.36 | 1.574E-02 | 609.32 | 46.090 | 5.083E-01 | BI214 |
| 662.11 | 289. | 9.85 | 2.44 | 1.476E-02 | 661.62 | 84.620 | 1.525E-01 | CS137 |
| 726.60 | 212. | 14.86 | 1.95 | 1.375E-02 | 727.17 | 11.800 | 8.675E-01 | BI212 |
| 795.19 | 55. | 32.91 | 1.68 | 1.284E-02 | 795.76 | 85.400 | PBC<MDA | CS134 |

| | | | | | | | | |
|---|---|---|---|---|---|---|---|---|
| 860.65 | 94. | 21.44 | 1.24 | 1.211E-02 | | | | |
| 911.33 | 398. | 7.06 | 2.47 | 1.161E-02 | 911.07 | 29.000 | 7.810E-01 | AC228 |
| 968.35 | 278. | 10.79 | 2.17 | 1.110E-02 | 968.90 | 17.460 | 9.493E-01 | AC228 |
| 1119.73 | 224. | 15.75 | 1.57 | 9.973E-03 | 1120.28 | 15.040 | 9.935E-01 | BI214 |

| pk energy | area | uncert | fwhm | corr | nuclide | brnch. | act. | nuc |
|---|---|---|---|---|---|---|---|---|
| 1173.83 | 47. | 33.23 | 1.93 | 9.637E-03 | 1173.23 | 99.860 | PBC<MDA | CO60 |
| 1332.71 | 27. | 38.30 | 2.03 | 8.773E-03 | 1332.51 | 99.980 | PBC<MDA | CO60 |
| 1377.90 | 33. | 31.02 | 1.42 | 8.557E-03 | | | | |
| 1461.06 | 2300. | 2.14 | 2.56 | 8.190E-03 | 1460.75 | 10.700 | 1.748E+01 | K40 |
| 1620.75 | 29. | 23.72 | 0.64 | 7.569E-03 | 1620.56 | 2.750 | 9.398E-01 | BI212 |
| 1764.82 | 113. | 9.83 | 0.88 | 7.083E-03 | 1764.51 | 15.920 | 6.649E-01 | BI214 |

********** U N I D E N T I F I E D P E A K S U M M A R Y **********

| Peak Channel | Centroid Energy | Background Counts | Net Area Counts | Intensity Cts/Sec | Uncert 3 Sigma % | FWHM keV | Suspected Nuclide | |
|---|---|---|---|---|---|---|---|---|
| 418.47 | 209.42 | 682. | 138. | 0.069 | 90.15 | 0.737 | AC-228 | s |
| 538.28 | 269.33 | 510. | 153. | 0.076 | 76.70 | 1.349 | AC-228 | s |
| 1720.86 | 860.65 | 104. | 94. | 0.047 | 64.31 | 1.236 | TL-208 | s |
| 2755.39 | 1377.90 | 27. | 33. | 0.016 | 93.06 | 1.423 | BI-214 | s |

s - Peak fails shape tests.
D - Peak area deconvoluted.
L - Peak written from unknown list.
C - Area < Critical level.

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This section based on library: FSS_Rev_1.Lib

********** I D E N T I F I E D P E A K S U M M A R Y **********

| Nuclide | Peak Channel | Centroid Energy | Background Counts | Net Area Counts | Intensity Cts/Sec | Uncert 3 Sigma % | FWHM keV |
|---|---|---|---|---|---|---|---|
| PB-212 | 149.29 | 74.81 | 1151. | 372. | 0.186 | 41.27 | 1.178D |
| PB-212 | 153.89 | 77.11 | 1232. | 217. | 0.108 | 65.87 | 1.179A |
| PB-214 | 153.89 | 77.11 | 2129. | 217. | 0.108 | 77.78 | 1.500A |
| PA-234 | 257.79 | 129.07 | 1047. | 128. | 0.064 | 110.49 | 1.500s |
| RA-226 | 371.56 | 185.96 | 1038. | 187. | 0.093 | 76.52 | 1.500s |
| PB-212 | 476.89 | 238.63 | 713. | 1278. | 0.639 | 12.03 | 1.297D |
| PB-214 | 483.47 | 241.92 | 812. | 245. | 0.123 | 52.50 | 1.299D |
| PB-214 | 590.70 | 295.54 | 800. | 362. | 0.181 | 45.87 | 2.084s |
| AC-228 | 677.31 | 338.85 | 417. | 362. | 0.181 | 32.95 | 2.166s |
| PB-214 | 703.30 | 351.84 | 454. | 736. | 0.368 | 19.27 | 2.110s |
| TL-208 | 1021.45 | 510.93 | 377. | 185. | 0.093 | 52.29 | 1.954s |
| TL-208 | 1166.23 | 583.32 | 272. | 631. | 0.316 | 19.47 | 2.233s |
| BI-214 | 1218.19 | 609.30 | 272. | 552. | 0.276 | 22.26 | 2.365s |
| Ag-108M | 1224.93 | 612.68 | 350. | -84. | -0.042 | 99.95 | 1.561 |
| CS-137 | 1323.79 | 662.11 | 172. | 285. | 0.143 | 29.54 | 2.444s |
| BI-212 | 1452.78 | 726.60 | 196. | 211. | 0.105 | 44.57 | 1.954s |
| CS-134 | 1589.96 | 795.19 | 139. | 55. | 0.027 | 98.74 | 1.684s |
| AC-228 | 1822.23 | 911.33 | 130. | 394. | 0.197 | 21.17 | 2.471s |
| AC-228 | 1936.26 | 968.35 | 170. | 275. | 0.138 | 32.37 | 2.166s |
| BI-214 | 2238.92 | 1119.67 | 211. | 210. | 0.105 | 50.26 | 1.549s |

| Nuclide | Channel | Energy | Background | Net area | Cnts/sec | Uncert | FWHM |
|---|---|---|---|---|---|---|---|
| CO-60 | 2347.22 | 1173.83 | 124. | 47. | 0.024 | 99.70 | 1.931s |
| K-40 | 2921.72 | 1461.06 | 30. | 2295. | 1.148 | 6.41 | 2.560s |
| BI-212 | 3241.12 | 1620.75 | 8. | 29. | 0.015 | 71.16 | 0.641s |
| BI-214 | 3529.29 | 1764.82 | 4. | 112. | 0.056 | 29.49 | 0.877s |

s - Peak fails shape tests.
D - Peak area deconvoluted.
A Derived peak area.

***** S U M M A R Y O F L I B R A R Y P E A K U S A G E *****

| - Nuclide - Name | Code | Average Activity pCi/gm | Peak Energy keV | Peak Activity pCi/gm | Code | MDA Value pCi/gm | COMMENTS |
|---|---|---|---|---|---|---|---|
| BE-7 | | 3.4649E-02 | | | | | |
| | | | 477.56 | 3.465E-02 | &( | 2.460E-01 7.26E-02 | G |
| K-40 | | 1.7484E+01 | | | | | |
| | | | 1460.75 | 1.748E+01 | *(P | 2.149E-01 3.74E-01 | G |
| MN-54 | | -2.3332E-04 | | | | | |
| | | | 834.81 | -2.333E-04 | &(P | 3.704E-02 1.08E-02 | G |
| CO-57 | | -2.0281E-03 | | | | | |
| | | | 122.07 | -2.028E-03 | %(P | 3.783E-02 1.13E-02 | G K |
| | | | 136.43 | 4.533E-02 | % P | 2.877E-01 8.64E-02 | G |
| CO-60 | | 2.6602E-02 | | | | | |
| | | | 1332.51 | 2.044E-02 | %(P | 2.889E-02 8.93E-03 | G K |
| | | | 1173.23 | 3.278E-02 | (P | 3.794E-02 1.19E-02 | G K |
| Sr-85 | | -1.1233E-02 | | | | | |
| | | | 514.00 | -1.123E-02 | &( | 3.549E-02 1.07E-02 | G |
| Kr-85 | | -2.7414E+02 | | | | | |
| | | | 513.99 | -2.741E+02 | &(P | 7.877E+02 2.36E+02 | G |
| Y-88 | | 1.6549E-03 | | | | | |
| | | | 1836.01 | 1.655E-03 | %(P | 2.235E-02 6.03E-03 | G K |
| | | | 898.02 | -1.884E-04 | & P | 3.965E-02 1.15E-02 | G |
| NB-94 | | 4.5372E-05 | | | | | |
| | | | 871.10 | 4.537E-05 | &(P | 2.627E-02 7.51E-03 | G K |
| | | | 702.50 | -6.560E-05 | % P | 2.969E-02 8.61E-03 | G K |
| Ag-108M | | 2.7794E-03 | | | | | |
| | | | 722.95 | 2.779E-03 | &( | 3.102E-02 9.06E-03 | G K |
| | | | 614.37 | -3.969E-02 | + | 4.245E-02 1.32E-02 | G |

| Nuclide | Ave activity | Energy | Activity | Code | Peak | MDA | Comments |
|---|---|---|---|---|---|---|---|
| | | 433.93 | -6.666E-04 | & P | 2.958E-02 | 8.65E-03 | G |
| CD-109 | 5.8340E-01 | | | | | | |
| | | 88.04 | 5.834E-01 | %(P | 1.109E+00 | 3.37E-01 | G |
| SN-113 | -8.4621E-03 | | | | | | |
| | | 391.71 | -8.462E-03 | &(P | 4.159E-02 | 1.23E-02 | G K |
| | | 255.04 | 9.912E-02 | % | 1.338E+00 | 3.98E-01 | G |
| SB-125 | -2.4564E-02 | | | | | | |
| | | 427.95 | -2.456E-02 | %(P | 9.502E-02 | 2.83E-02 | G K |
| | | 600.77 | -8.164E-03 | % P | 1.577E-01 | 4.59E-02 | G |
| | | 636.15 | -2.788E-02 | % P | 2.373E-01 | 6.94E-02 | G |
| | | 463.51 | 1.818E-01 | % P | 2.584E-01 | 7.94E-02 | G |
| | | 176.29 | 6.438E-02 | % P | 4.271E-01 | 1.28E-01 | G |
| I-131 | -3.8563E-03 | | | | | | |
| | | 364.48 | -3.856E-03 | %( | 4.159E-02 | 1.23E-02 | G K |
| | | 636.97 | -8.192E-02 | % | 5.133E-01 | 1.51E-01 | G |
| | | 284.29 | -1.707E-01 | % | 6.144E-01 | 1.84E-01 | G |
| CS-134 | 1.1272E-02 | | | | | | |
| | | 604.66 | -8.182E-03 | %(P | 2.728E-02 | 8.12E-03 | G K |
| | | 795.76 | 3.350E-02 | *(P | 3.521E-02 | 1.11E-02 | G |
| | | 569.29 | -9.644E-03 | & | 1.645E-01 | 4.80E-02 | G |
| | | 801.84 | 1.853E-02 | % P | 3.536E-01 | 1.03E-01 | G |
| CS-137 | 1.5252E-01 | | | | | | |
| | | 661.62 | 1.525E-01 | *(P | 3.406E-02 | 1.52E-02 | G |
| CE-139 | -1.1770E-02 | | | | | | |
| | | 165.85 | -1.177E-02 | %(P | 3.682E-02 | 1.11E-02 | G |
| EU-152 | -1.2874E-02 | | | | | | |
| | | 121.78 | -1.287E-02 | %(P | 1.076E-01 | 3.23E-02 | G K |
| | | 344.30 | -3.339E-02 | % P | 1.028E-01 | 3.09E-02 | G |
| | | 1408.08 | 2.472E-02 | % P | 1.057E-01 | 3.04E-02 | G |
| | | 964.00 | -1.866E-03 | & P | 3.493E-01 | 1.03E-01 | G |
| | | 1112.07 | -1.011E-01 | % P | 2.949E-01 | 8.81E-02 | G |
| | | 778.90 | -5.496E-02 | % P | 2.188E-01 | 6.47E-02 | G |
| EU-154 | -5.2327E-03 | | | | | | |
| | | 123.10 | -5.233E-03 | &(P | 7.442E-02 | 2.23E-02 | G K |
| | | 1274.80 | -3.635E-03 | % P | 1.309E-01 | 3.81E-02 | G |
| | | 723.30 | 4.096E-02 | & P | 1.244E-01 | 3.71E-02 | G |
| | | 1004.80 | 3.830E-03 | & P | 2.076E-01 | 6.02E-02 | G |

| Nuclide | Ave activity | Energy | Activity | Code | Peak | MDA | Comments |
|---|---|---|---|---|---|---|---|
| EU-155 | 5.4035E-02 | | | | | | |
| | | 86.45 | 5.404E-02 | %( | 1.366E-01 | 4.14E-02 | G K |
| | | 105.31 | 3.947E-03 | % P | 1.548E-01 | 4.63E-02 | G |
| HG-203 | 8.9779E-03 | | | | | | |
| | | 279.17 | 8.978E-03 | %(P | 3.141E-02 | 9.42E-03 | G K |
| | | 72.87 | -5.401E-01 | % P | 1.067E+00 | 3.24E-01 | G |
| | | 70.83 | -6.269E-01 | % | 1.764E+00 | 5.34E-01 | G |
| | | 82.50 | 1.626E-01 | % | 2.054E+00 | 6.17E-01 | G |
| TL-208 | 3.0155E-01 | | | | | | |
| | | 583.14 | 3.009E-01 | *(P | 3.789E-02 | 1.97E-02 | G |
| | | 510.72 | 3.039E-01 | @(P | 1.529E-01 | 6.26E-02 | G |
| PB-212 | 6.0969E-01 | | | | | | |
| | | 238.63 | 6.205E-01 | (P | 6.177E-02 | 2.52E-02 | G K |
| | | | | | | | Energy duplication |
| | | 77.11 | 2.798E-01 | } | 2.145E-01 | 6.14E-02 | G |
| | | 74.81 | 9.075E-01 | + P | 3.925E-01 | 1.26E-01 | G |
| PB-214 | 5.4608E-01 | | | | | | |
| | | 351.99 | 5.461E-01 | *(P | 7.566E-02 | 3.53E-02 | G K |
| | | 295.22 | 4.554E-01 | - P | 1.690E-01 | 7.05E-02 | G |
| | | | | | | | Energy duplication |
| | | 77.11 | 4.568E-01 | } P | 4.594E-01 | 1.18E-01 | G |
| | | 241.92 | 6.936E-01 | + P | 3.828E-01 | 1.22E-01 | G |
| BI-212 | 8.8120E-01 | | | | | | |
| | | 727.17 | 8.675E-01 | *(P | 2.800E-01 | 1.30E-01 | G K |
| | | 1620.56 | 9.398E-01 | (P | 5.018E-01 | 2.27E-01 | G |
| | | 785.42 | -1.512E-01 | & P | 1.593E+00 | 4.64E-01 | G |
| BI-214 | 5.0830E-01 | | | | | | |
| | | 609.32 | 5.083E-01 | *(P | 7.317E-02 | 3.80E-02 | G K |
| | | 1764.51 | 6.649E-01 | + P | 6.909E-02 | 6.59E-02 | G |
| | | 1120.28 | 9.329E-01 | + P | 3.138E-01 | 1.57E-01 | G |
| RA-224 | 2.6529E-01 | | | | | | |
| | | 241.00 | 2.653E-01 | &(P | 1.081E+00 | 3.26E-01 | G |
| RA-226 | 1.0516E+00 | | | | | | |
| | | 185.99 | 1.052E+00 | *( | 8.620E-01 | 2.68E-01 | G |
| AC-228 | 7.8784E-01 | | | | | | |
| | | 911.07 | 7.810E-01 | *(P | 1.109E-01 | 5.57E-02 | G K |
| | | 968.90 | 9.493E-01 | + P | 2.186E-01 | 1.03E-01 | G |
| | | 338.40 | 8.044E-01 | *(P | 2.177E-01 | 8.92E-02 | G |

| Nuclide | Ave activity | Energy | Activity | Code | Peak MDA | Comments |
|---|---|---|---|---|---|---|
| TH-227 | -2.4840E-03 | | | | | |
| | | 236.00 | -2.484E-03 | %(P | 3.908E-01 | 1.17E-01 G K |
| | | 256.25 | 2.856E-02 | % P | 3.864E-01 | 1.15E-01 G |
| PA-234 | 4.1240E-02 | | | | | |
| | | 98.44 | -1.495E-02 | %( | 1.428E-01 | 4.29E-02 G K |
| | | 946.00 | 4.833E-03 | & | 1.646E-01 | 4.77E-02 G |
| | | 131.28 | 1.118E-01 | &( | 1.340E-01 | 4.12E-02 G |
| | | 94.67 | -7.439E-02 | % | 2.532E-01 | 7.64E-02 G |
| | | 883.24 | 4.474E-02 | & | 2.524E-01 | 7.42E-02 G |
| | | 926.70 | 1.931E-02 | & | 2.993E-01 | 8.71E-02 G |
| | | 569.26 | -2.173E-02 | & | 2.365E-01 | 6.92E-02 G |
| TH-234 | 2.0451E-01 | | | | | |
| | | 63.29 | 2.045E-01 | %(P | 1.645E+00 | 4.93E-01 G K |
| | | 92.80 | 9.119E-01 | % P | 1.367E+00 | 4.16E-01 G |
| | | 92.38 | -2.430E-01 | % P | 1.632E+00 | 4.90E-01 G |
| AM-241 | -1.1387E-02 | | | | | |
| | | 59.54 | -1.139E-02 | %(P | 2.190E-01 | 6.56E-02 G |

( - This peak used in the nuclide activity average.

* - Peak is too wide, but only one peak in library.
! - Peak is part of a multiplet and this area went negative during deconvolution.
? - Peak is too narrow.
@ - Peak is too wide at FW25M, but ok at FWHM.
% - Peak fails sensitivity test.
$ - Peak identified, but first peak of this nuclide failed one or more qualification tests.
+ - Peak activity higher than counting uncertainty range.
- - Peak activity lower than counting uncertainty range.
= - Peak outside analysis energy range.
& - Calculated peak centroid is not close enough to the library energy centroid for positive identification.
P - Peakbackground subtraction
} - Peak is too close to another for the activity to be found directly.

| Nuclide Codes: | Peak Codes: |
|---|---|
| T - Thermal Neutron Activation | G - Gamma Ray |
| F - Fast Neutron Activation | X - X-Ray |
| I - Fission Product | P - Positron Decay |
| N - Naturally Occurring Isotope | S - Single-Escape |
| P - Photon Reaction | D - Double-Escape |
| C - Charged Particle Reaction | K - Key Line |
| M - No MDA Calculation | A - Not in Average |

R - Coincidence Corrected C - Coincidence Peak
H - Halflife limit exceeded

- - - - - - - - - - - - - - - - - - - - - - - - - - - - - - - - - - - - - -

***** S U M M A R Y O F N U C L I D E S I N S A M P L E *****

| Nuclide | | Time of Count Activity pCi/gm | Time Corrected Activity pCi/gm | Uncertainty 3 Sigma Counting pCi/gm | Total pCi/gm | MDA pCi/gm |
|---|---|---|---|---|---|---|
| BE-7 | #A | 3.2873E-02 | 3.4649E-02 | 2.1772E-01 | 2.1773E-01 | 2.334E-01 |
| K-40 | # | 1.7484E+01 | 1.7484E+01 | 1.1233E+00 | 1.5258E+00 | |
| MN-54 | #A | -2.3123E-04 | -2.3332E-04 | 2.7745E-02 | 2.7745E-02 | 3.671E-02 |
| CO-57 | #B | -2.0071E-03 | -2.0281E-03 | 3.5954E-02 | 3.5954E-02 | 3.744E-02 |
| CO-60 | #B | 2.6563E-02 | 2.6602E-02 | 2.2628E-02 | 2.2683E-02 | 2.885E-02 |
| Sr-85 | #A | -1.0757E-02 | -1.1233E-02 | 3.1967E-02 | 3.1974E-02 | 3.398E-02 |
| Kr-85 | #A | -2.7413E+02 | -2.7414E+02 | 8.5369E+02 | 8.5384E+02 | 7.876E+02 |
| Y-88 | #B | 1.6119E-03 | 1.6549E-03 | 1.8080E-02 | 1.8080E-02 | 2.177E-02 |
| NB-94 | #B | 4.5372E-05 | 4.5372E-05 | 2.2540E-02 | 2.2540E-02 | 2.627E-02 |
| Ag-108M | #B | 2.7792E-03 | 2.7794E-03 | 2.7173E-02 | 2.7174E-02 | 3.102E-02 |
| CD-109 | #A | 5.7980E-01 | 5.8340E-01 | 1.0101E+00 | 1.0106E+00 | 1.102E+00 |
| SN-113 | #B | -8.2581E-03 | -8.4621E-03 | 4.5471E-02 | 4.5474E-02 | 4.058E-02 |
| SB-125 | #B | -2.4495E-02 | -2.4564E-02 | 9.6240E-02 | 9.6251E-02 | 9.476E-02 |
| I-131 | #B | -2.7189E-03 | -3.8563E-03 | 3.6879E-02 | 3.6880E-02 | 2.932E-02 |
| CS-134 | #B | 1.1230E-02 | 1.1272E-02 | 1.1237E-02 | 1.1256E-02 | 2.718E-02 |
| CS-137 | # | 1.5248E-01 | 1.5252E-01 | 4.5613E-02 | 4.6494E-02 | |
| CE-139 | #A | -1.1532E-02 | -1.1770E-02 | 3.3760E-02 | 3.3767E-02 | 3.608E-02 |
| EU-152 | #B | -1.2866E-02 | -1.2874E-02 | 9.8079E-02 | 9.8082E-02 | 1.075E-01 |
| EU-154 | #B | -5.2280E-03 | -5.2327E-03 | 7.3101E-02 | 7.3102E-02 | 7.435E-02 |
| EU-155 | #B | 5.3951E-02 | 5.4035E-02 | 1.2405E-01 | 1.2409E-01 | 1.364E-01 |
| HG-203 | #B | 8.4525E-03 | 8.9779E-03 | 2.8269E-02 | 2.8274E-02 | 2.957E-02 |
| TL-208 | # | 3.0155E-01 | 3.0155E-01 | 5.9138E-02 | 6.1761E-02 | |
| PB-212 | | 6.0969E-01 | 6.0969E-01 | 7.4238E-02 | 8.2511E-02 | |
| PB-214 | | 5.4608E-01 | 5.4608E-01 | 1.0597E-01 | 1.1077E-01 | |
| BI-212 | | 8.8120E-01 | 8.8120E-01 | 3.7513E-01 | 3.7873E-01 | |
| BI-214 | # | 5.0830E-01 | 5.0830E-01 | 1.1403E-01 | 1.1791E-01 | |
| RA-224 | #A | 2.6529E-01 | 2.6529E-01 | 9.7674E-01 | 9.7687E-01 | 1.081E+00 |
| RA-226 | # | 1.0516E+00 | 1.0516E+00 | 8.0476E-01 | 8.0715E-01 | 8.620E-01 |
| AC-228 | # | 7.8784E-01 | 7.8784E-01 | 1.5572E-01 | 1.6253E-01 | |
| TH-227 | #B | -2.4840E-03 | -2.4840E-03 | 5.3167E-01 | 5.3167E-01 | 3.908E-01 |
| PA-234 | #B | 4.1240E-02 | 4.1240E-02 | 4.5565E-02 | 4.5623E-02 | 1.428E-01 |
| TH-234 | #B | 2.0451E-01 | 2.0451E-01 | 1.4788E+00 | 1.4788E+00 | 1.645E+00 |
| AM-241 | #A | -1.1387E-02 | -1.1387E-02 | 2.2379E-01 | 2.2379E-01 | 2.190E-01 |

# - All peaks for activity calculation had bad shape.
* - Activity omitted from total
& - Activity omitted from total and all peaks had bad shape.
< - MDA value printed.
A - Activity printed, but activity < MDA.
B - Activity < MDA and failed test.
C - Area < Critical level.
F - Failed fraction or key line test.

H – Halflife limit exceeded

YAEC Chemistry Lab Spectrum name: 107F_15SEPT2006_0842.An1

---------- S U M M A R Y ----------

Total Activity ( 269.2 to 2000.1 keV) 2.1270924E+01 pCi/gm
Total Decayed Activity ( 269.2 to 2000.1 keV) 2.1270962E+01 pCi/gm

The library has energies which are not separable.

Analyzed by: _____
JPK

Reviewed by: _____
Supervisor

Laboratory: YAEC Chemistry Lab

YAEC Chemistry Lab Spectrum name: 107F_15SEPT2006_1003.An1

Sample description
FSS-SSS-01-01-037-F-B

Spectrum Filename: C:\GammaVision\Spectra\107F_15SEPT2006_1003.An1

Acquisition information
Start time: 15-Sep-2006 10:03:12
Live time: 2000
Real time: 2003
Dead time: 0.17 %
Detector ID: 2

Detector system
Det 107- DSPE- 634

Calibration
Filename: D7_1LSa.Clb
Detector 107 Calibration for 1 Liter Sand Marinelli

Energy Calibration
Created: 29-Oct-2004 06:48:53
Zero offset: 0.157 keV
Gain: 0.500 keV/channel
Quadratic: -1.676E-08 keV/channel^2

Efficiency Calibration
Created: 29-Oct-2004 06:51:32
Type: Polynomial
Uncertainty: 1.174 %
Coefficients: -0.279532 -4.778179 0.614896
-0.087174 0.005356 -0.000131

Library Files
Main analysis library: FSS_Rev_1.Lib
Library Match Width: 1.000
Peak stripping: Library based

Analysis parameters
Analysis engine: Env32 G53W4.20
Start channel: 100 ( 50.16keV )
Stop channel: 4000 ( 2000.15keV )
Peak rejection level: 41.667%
Peak search sensitivity: 3
Sample Size: 1.8870E+03
Activity scaling factor: 1.0000E+06/( 1.0000E+00* 1.8870E+03) =
5.2994E+02
Detection limit method: Nureg 4.16
Random error: 1.0000000E+00
Systematic error: 1.0000000E+00

| | |
|---|---|
| Fraction Limit: | 0.000% |
| Background width: | average of five points. |

YAEC Chemistry Lab Spectrum name: 107F_15SEPT2006_1003.An1

Half lives decay limit: 12.000
Activity range factor: 2.000
Min. step backg. energy 0.000
Multiplet shift channel 2.000

| Corrections | Status | Comments |
|---|---|---|
| Decay correct to date: | YES | 11-Sep-2006 14:21:00 |
| Decay during acquisition: | NO | |
| Decay during collection: | NO | |
| True coincidence correction: | NO | |
| Peaked background correction: | YES | 107_150K_28APR05.Pbc 01-May-2005 05:30:33 |
| Absorption (Internal): | NO | |
| Geometry correction: | NO | |
| Random summing: | NO | |

total peaks alloc. 18 cutoff 20.00000 %
Energy Calibration
Normalized diff: 0.3004

***** S U M M A R Y O F P E A K S I N R A N G E *****

| Peak Energy | Area | Uncert | FWHM | Corrctn Factor | Nuclide Energy | Brnch. Ratio | Act. pCi/gm | Nuc |
|---|---|---|---|---|---|---|---|---|
| 76.10 | 962. | 7.85 | 1.94 | 2.912E-02 | 74.81 | 9.600 | 2.508E+00 | PB212 |
| | | | | | 77.11 | 17.500 | 1.331E+00 | PB212 |
| | | | | | 77.11 | 10.700 | 2.166E+00 | PB214 |
| 87.15 | 157. | 40.18 | 1.46 | 3.303E-02 | 86.45 | 32.740 | 1.045E-01 | EU155 |
| | | | | | 88.04 | 3.790 | PBC<MDA | CD109 |
| 93.12 | 165. | 32.28 | 1.65 | 3.445E-02 | 92.38 | 2.570 | PBC<MDA | TH234 |
| | | | | | 92.80 | 3.000 | PBC<MDA | TH234 |
| 186.04 | 249. | 18.05 | 2.47 | 3.610E-02 | 185.99 | 3.280 | 1.503E+00 | RA226 |
| 209.58 | 164. | 22.95 | 1.57 | 3.426E-02 | | | | |
| 239.29 | 1644. | 4.12 | 1.94 | 3.184E-02 | 238.63 | 43.100 | 8.480E-01 | PB212 |
| | | | | | 241.00 | 3.900 | 9.506E+00 | RA224 |
| 242.10 | 182. | 21.19 | 1.30 | 3.163E-02 | 241.92 | 7.470 | 5.518E-01 | PB214 |
| 295.02 | 366. | 9.90 | 1.61 | 2.769E-02 | 295.22 | 19.200 | 4.869E-01 | PB214 |
| 300.92 | 68. | 40.00 | 1.33 | 2.730E-02 | | | | |
| 328.99 | 128. | 24.90 | 1.73 | 2.554E-02 | | | | |
| 338.52 | 348. | 11.54 | 1.54 | 2.500E-02 | 338.40 | 12.010 | 8.234E-01 | AC228 |
| 352.10 | 639. | 7.40 | 2.06 | 2.425E-02 | 351.99 | 37.100 | 5.045E-01 | PB214 |
| 463.13 | 80. | 29.67 | 1.91 | 1.954E-02 | | | | |
| 463.13 | 80. | 29.67 | 1.91 | 1.954E-02 | 463.51 | 10.000 | 2.827E-01 | SB125 |
| 511.10 | 220. | 15.04 | 2.34 | 1.807E-02 | 510.72 | 22.500 | 3.287E-01 | TL208 |
| 583.08 | 480. | 7.66 | 2.42 | 1.629E-02 | 583.14 | 86.000 | 2.430E-01 | TL208 |
| 609.43 | 509. | 6.99 | 1.97 | 1.574E-02 | 609.32 | 46.090 | 4.981E-01 | BI214 |
| 727.11 | 146. | 21.62 | 0.85 | 1.374E-02 | 727.17 | 11.800 | 6.400E-01 | BI212 |
| 794.83 | 69. | 25.69 | 1.37 | 1.285E-02 | | | | |
| 794.83 | 69. | 25.69 | 1.37 | 1.285E-02 | 795.76 | 85.400 | 4.462E-02 | CS134 |
| 911.39 | 327. | 9.95 | 2.00 | 1.160E-02 | 911.07 | 29.000 | 6.875E-01 | AC228 |
| 968.67 | 258. | 11.15 | 2.65 | 1.109E-02 | 968.90 | 17.460 | 9.475E-01 | AC228 |

| | | | | | | | | |
|---|---|---|---|---|---|---|---|---|
| 1120.32 | 135. | 18.01 | 1.93 | 9.970E-03 | 1120.28 | 15.040 | 6.405E-01 | BI214 |
| 1461.10 | 1738. | 2.53 | 2.75 | 8.189E-03 | 1460.75 | 10.700 | 1.416E+01 | K40 |
| 1621.75 | 22. | 28.63 | 0.64 | 7.569E-03 | 1620.56 | 2.750 | 7.637E-01 | BI212 |
| 1764.36 | 116. | 9.28 | 1.54 | 7.084E-03 | 1764.51 | 15.920 | 7.310E-01 | BI214 |

********** U N I D E N T I F I E D P E A K S U M M A R Y **********

| Peak Channel | Centroid Energy | Background Counts | Net Area Counts | Intensity Cts/Sec | Uncert 3 Sigma % | FWHM keV | Suspected Nuclide | |
|---|---|---|---|---|---|---|---|---|
| 418.79 | 209.58 | 519. | 164. | 0.082 | 68.86 | 1.574 | NP-239 | s |
| 601.46 | 300.92 | 280. | 68. | 0.034 | 120.01 | 1.327 | PB-212 | s |
| 657.60 | 328.99 | 296. | 128. | 0.064 | 74.71 | 1.727 | LA-140 | s |

s - Peak fails shape tests.
D - Peak area deconvoluted.
L - Peak written from unknown list.
C - Area < Critical level.

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This section based on library: FSS_Rev_1.Lib

********** I D E N T I F I E D P E A K S U M M A R Y **********

| Nuclide | Peak Channel | Centroid Energy | Background Counts | Net Area Counts | Intensity Cts/Sec | Uncert 3 Sigma % | FWHM keV |
|---|---|---|---|---|---|---|---|
| PB-212 | 149.29 | 74.81 | 862. | 301. | 0.150 | 44.26 | 1.178D |
| PB-212 | 153.89 | 77.11 | 877. | 246. | 0.123 | 45.28 | 1.179A |
| PB-214 | 153.89 | 77.11 | 1408. | 181. | 0.090 | 82.35 | 1.500A |
| CD-109 | 173.92 | 87.13 | 1379. | 148. | 0.074 | 108.87 | 1.500s |
| RA-226 | 371.71 | 186.04 | 678. | 249. | 0.124 | 54.14 | 2.473s |
| TH-227 | 470.30 | 235.33 | 1477. | -180. | -0.090 | 93.44 | 1.500s |
| PB-212 | 476.89 | 238.63 | 599. | 1018. | 0.509 | 13.61 | 1.297D |
| RA-224 | 477.43 | 238.90 | 1151. | 819. | 0.409 | 20.40 | 1.500s |
| PB-214 | 483.47 | 241.92 | 666. | 182. | 0.091 | 63.58 | 1.299D |
| PB-214 | 589.65 | 295.02 | 355. | 361. | 0.181 | 29.70 | 1.609s |
| AC-228 | 676.66 | 338.52 | 366. | 345. | 0.173 | 34.62 | 1.539s |
| PB-214 | 703.82 | 352.10 | 414. | 634. | 0.317 | 22.19 | 2.065s |
| SB-125 | 925.94 | 463.17 | 150. | 57. | 0.028 | 94.67 | 1.500s |
| TL-208 | 1021.79 | 511.10 | 271. | 187. | 0.093 | 45.13 | 2.339s |
| TL-208 | 1165.75 | 583.08 | 213. | 475. | 0.238 | 22.99 | 2.417s |
| BI-214 | 1218.45 | 609.43 | 193. | 505. | 0.252 | 20.96 | 1.970s |
| BI-212 | 1453.78 | 727.11 | 195. | 145. | 0.072 | 64.85 | 0.854s |
| CS-134 | 1589.65 | 795.04 | 85. | 57. | 0.028 | 79.00 | 1.684 |
| AC-228 | 1822.34 | 911.39 | 171. | 323. | 0.162 | 29.84 | 1.999s |
| AC-228 | 1936.91 | 968.67 | 142. | 256. | 0.128 | 33.44 | 2.646s |
| BI-214 | 2240.20 | 1120.32 | 115. | 134. | 0.067 | 54.02 | 1.935 |
| K-40 | 2921.79 | 1461.10 | 42. | 1733. | 0.867 | 7.58 | 2.753s |
| BI-212 | 3243.12 | 1621.75 | 7. | 22. | 0.011 | 85.88 | 0.640s |
| BI-214 | 3528.38 | 1764.36 | 1. | 115. | 0.058 | 27.85 | 1.538s |

s - Peak fails shape tests.
D - Peak area deconvoluted.
A Derived peak area.

***** S U M M A R Y O F L I B R A R Y P E A K U S A G E *****

| - Nuclide - Name | Code | Average Activity pCi/gm | Peak Energy keV | Peak Activity pCi/gm | Peak Code | Peak MDA Value pCi/gm | COMMENTS |
|---|---|---|---|---|---|---|---|
| BE-7 | | 9.4583E-02 | | | | | |
| | | | 477.56 | 9.458E-02 | %( | 2.462E-01 7.40E-02 | G |
| K-40 | | 1.4163E+01 | | | | | |
| | | | 1460.75 | 1.416E+01 | *(P | 2.678E-01 3.59E-01 | G |
| MN-54 | | -8.2380E-03 | | | | | |
| | | | 834.81 | -8.238E-03 | %(P | 3.397E-02 1.00E-02 | G |
| CO-57 | | 1.2821E-03 | | | | | |
| | | | 122.07 | 1.282E-03 | &(P | 3.221E-02 9.61E-03 | G K |
| | | | 136.43 | -4.123E-02 | % P | 2.797E-01 8.39E-02 | G |
| CO-60 | | -3.1577E-03 | | | | | |
| | | | 1332.51 | -3.158E-03 | &(P | 3.360E-02 9.26E-03 | G K |
| | | | 1173.23 | 7.067E-03 | % P | 3.886E-02 1.13E-02 | G K |
| Sr-85 | | -1.6659E-02 | | | | | |
| | | | 514.00 | -1.666E-02 | &( | 3.615E-02 1.10E-02 | G |
| Kr-85 | | -3.9703E+02 | | | | | |
| | | | 513.99 | -3.970E+02 | &(P | 8.048E+02 2.43E+02 | G |
| Y-88 | | -3.8602E-03 | | | | | |
| | | | 1836.01 | -3.860E-03 | %(P | 2.288E-02 6.17E-03 | G K |
| | | | 898.02 | -5.053E-03 | % P | 3.553E-02 1.03E-02 | G |
| NB-94 | | -8.1165E-05 | | | | | |
| | | | 871.10 | -8.116E-05 | %(P | 2.449E-02 6.94E-03 | G K |
| | | | 702.50 | 5.886E-03 | % P | 2.779E-02 8.19E-03 | G K |
| Ag-108M | | -9.1210E-03 | | | | | |
| | | | 722.95 | -9.121E-03 | %( | 4.012E-02 1.19E-02 | G K |
| | | | 614.37 | -2.830E-02 | % | 4.018E-02 1.24E-02 | G |
| | | | 433.93 | -1.176E-03 | % P | 2.503E-02 7.26E-03 | G |
| CD-109 | | 8.4695E-01 | | | | | |
| | | | 88.04 | 8.469E-01 | *(P | 1.004E+00 3.08E-01 | G |
| SN-113 | | 2.6922E-03 | | | | | |
| | | | 391.71 | 2.692E-03 | &(P | 3.672E-02 1.08E-02 | G K |
| | | | 255.04 | -4.137E-02 | & | 1.188E+00 3.52E-01 | G |

| Nuclide | Ave activity | Energy | Activity | Code | Peak | MDA | Comments |
|---|---|---|---|---|---|---|---|
| SB-125 | 5.2518E-02 | | | | | | |
| | | 427.95 | -3.130E-04 | &(P | 8.153E-02 | 2.37E-02 | G K |
| | | 600.77 | 1.401E-02 | % P | 1.197E-01 | 3.47E-02 | G |
| | | 636.15 | 2.193E-03 | % P | 2.240E-01 | 6.45E-02 | G |
| | | 463.51 | 2.089E-01 | *(P | 2.198E-01 | 6.92E-02 | G |
| | | 176.29 | 2.045E-02 | % P | 4.381E-01 | 1.31E-01 | G |
| I-131 | -6.8202E-03 | | | | | | |
| | | 364.48 | -6.820E-03 | &( | 3.883E-02 | 1.15E-02 | G K |
| | | 636.97 | -6.256E-02 | & | 4.932E-01 | 1.44E-01 | G |
| | | 284.29 | -1.398E-01 | & | 5.768E-01 | 1.73E-01 | G |
| CS-134 | 1.5285E-02 | | | | | | |
| | | 604.66 | -3.834E-03 | &(P | 6.353E-02 | 1.89E-02 | G K |
| | | 795.76 | 3.714E-02 | (P | 2.999E-02 | 9.87E-03 | G |
| | | 569.29 | 5.331E-02 | & | 1.525E-01 | 4.56E-02 | G |
| | | 801.84 | 1.871E-02 | % P | 3.159E-01 | 9.12E-02 | G |
| CS-137 | 2.2348E-02 | | | | | | |
| | | 661.62 | 2.235E-02 | %(P | 3.433E-02 | 1.05E-02 | G |
| CE-139 | 7.6482E-03 | | | | | | |
| | | 165.85 | 7.648E-03 | %(P | 3.326E-02 | 9.99E-03 | G |
| EU-152 | -3.8887E-03 | | | | | | |
| | | 121.78 | -3.889E-03 | &(P | 9.650E-02 | 2.88E-02 | G K |
| | | 344.30 | -2.160E-02 | % P | 9.427E-02 | 2.81E-02 | G |
| | | 1408.08 | 3.072E-03 | % P | 9.949E-02 | 2.69E-02 | G |
| | | 964.00 | -4.089E-02 | % P | 3.158E-01 | 9.32E-02 | G |
| | | 1112.07 | 8.899E-04 | % P | 2.296E-01 | 6.53E-02 | G |
| | | 778.90 | -4.803E-03 | & P | 1.955E-01 | 5.58E-02 | G |
| EU-154 | 6.1075E-03 | | | | | | |
| | | 123.10 | 6.108E-03 | &(P | 6.911E-02 | 2.07E-02 | G K |
| | | 1274.80 | 7.940E-03 | % P | 1.044E-01 | 3.01E-02 | G |
| | | 723.30 | -4.459E-02 | & P | 1.836E-01 | 5.46E-02 | G |
| | | 1004.80 | 1.708E-02 | % P | 1.477E-01 | 4.25E-02 | G |
| EU-155 | 9.0157E-02 | | | | | | |
| | | 86.45 | 9.016E-02 | %( | 1.281E-01 | 3.91E-02 | G K |
| | | 105.31 | 4.683E-04 | % P | 1.398E-01 | 4.17E-02 | G |
| HG-203 | -3.9893E-03 | | | | | | |
| | | 279.17 | -3.989E-03 | &(P | 3.254E-02 | 9.65E-03 | G K |
| | | 72.87 | -2.344E-01 | % P | 8.378E-01 | 2.53E-01 | G |
| | | 70.83 | -4.412E-01 | % | 1.636E+00 | 4.93E-01 | G |
| | | 82.50 | -6.407E-01 | % | 1.765E+00 | 5.33E-01 | G |

| Nuclide | Ave activity | Energy | Activity | Code | Peak | MDA | Comments |
|---|---|---|---|---|---|---|---|
| TL-208 | 2.4305E-01 | | | | | | |
| | | 583.14 | 2.430E-01 | *(P | 3.611E-02 | 1.88E-02 | G |
| | | 510.72 | 3.287E-01 | + P | 1.399E-01 | 5.84E-02 | G |
| PB-212 | 5.3047E-01 | | | | | | |
| | | 238.63 | 5.305E-01 | (P | 6.081E-02 | 2.44E-02 | G K |
| | | | | | | | Energy duplication |
| | | 77.11 | 3.406E-01 | } | 1.947E-01 | 5.14E-02 | G |
| | | 74.81 | 7.877E-01 | + P | 3.653E-01 | 1.18E-01 | G |
| PB-214 | 5.0473E-01 | | | | | | |
| | | 351.99 | 5.045E-01 | *(P | 7.761E-02 | 3.76E-02 | G K |
| | | 295.22 | 4.869E-01 | *(P | 1.219E-01 | 4.88E-02 | G |
| | | | | | | | Energy duplication |
| | | 77.11 | 4.093E-01 | } P | 4.019E-01 | 1.12E-01 | G |
| | | 241.92 | 5.518E-01 | (P | 3.727E-01 | 1.18E-01 | G |
| BI-212 | 6.6334E-01 | | | | | | |
| | | 727.17 | 6.400E-01 | *(P | 2.994E-01 | 1.40E-01 | G K |
| | | 1620.56 | 7.637E-01 | (P | 5.114E-01 | 2.24E-01 | G |
| | | 785.42 | -2.031E-03 | % P | 1.439E+00 | 4.13E-01 | G |
| BI-214 | 4.9813E-01 | | | | | | |
| | | 609.32 | 4.981E-01 | *(P | 6.663E-02 | 3.51E-02 | G K |
| | | 1764.51 | 7.310E-01 | + P | 4.680E-02 | 6.84E-02 | G |
| | | 1120.28 | 6.405E-01 | + P | 2.515E-01 | 1.16E-01 | G |
| RA-224 | 4.7426E+00 | | | | | | |
| | | 241.00 | 4.743E+00 | &(P | 9.312E-01 | 3.23E-01 | G |
| RA-226 | 1.5035E+00 | | | | | | |
| | | 185.99 | 1.503E+00 | *( | 7.504E-01 | 2.71E-01 | G |
| AC-228 | 7.2731E-01 | | | | | | |
| | | 911.07 | 6.875E-01 | @(P | 1.353E-01 | 6.93E-02 | G K |
| | | 968.90 | 9.475E-01 | + P | 2.152E-01 | 1.07E-01 | G |
| | | 338.40 | 8.234E-01 | *(P | 2.190E-01 | 9.59E-02 | G |
| TH-227 | -3.5843E-01 | | | | | | |
| | | 236.00 | -3.584E-01 | ?(P | 3.620E-01 | 1.11E-01 | G K |
| | | 256.25 | 6.541E-02 | % P | 3.689E-01 | 1.10E-01 | G |
| PA-234 | 2.5698E-03 | | | | | | |
| | | 98.44 | 2.570E-03 | %( | 1.290E-01 | 3.85E-02 | G K |
| | | 946.00 | 2.188E-02 | % | 1.454E-01 | 4.23E-02 | G |
| | | 131.28 | 6.869E-02 | & | 1.274E-01 | 3.87E-02 | G |
| | | 94.67 | -1.097E-01 | % | 2.259E-01 | 6.85E-02 | G |
| | | 883.24 | 4.796E-02 | & | 1.875E-01 | 5.50E-02 | G |
| | | 926.70 | 4.099E-02 | % | 2.645E-01 | 7.71E-02 | G |

| Nuclide | Ave activity | Energy | Activity | Code | Peak | MDA | Comments |
|---|---|---|---|---|---|---|---|
| | | 569.26 | 7.867E-02 | & | 2.255E-01 | 6.75E-02 | G |
| TH-234 | 5.1262E-01 | | | | | | |
| | | 63.29 | 5.126E-01 | %(P | 1.598E+00 | 4.81E-01 | G K |
| | | 92.80 | 8.430E-01 | % P | 1.282E+00 | 3.90E-01 | G |
| | | 92.38 | 1.086E+00 | % P | 1.517E+00 | 4.63E-01 | G |
| AM-241 | -5.7978E-02 | | | | | | |
| | | 59.54 | -5.798E-02 | %(P | 2.148E-01 | 6.47E-02 | G |

( - This peak used in the nuclide activity average.

* - Peak is too wide, but only one peak in library.
! - Peak is part of a multiplet and this area went negative during deconvolution.
? - Peak is too narrow.
@ - Peak is too wide at FW25M, but ok at FWHM.
% - Peak fails sensitivity test.
$ - Peak identified, but first peak of this nuclide failed one or more qualification tests.
+ - Peak activity higher than counting uncertainty range.
- - Peak activity lower than counting uncertainty range.
= - Peak outside analysis energy range.
& - Calculated peak centroid is not close enough to the library energy centroid for positive identification.
P - Peakbackground subtraction
} - Peak is too close to another for the activity to be found directly.

| Nuclide Codes: | Peak Codes: |
|---|---|
| T - Thermal Neutron Activation | G - Gamma Ray |
| F - Fast Neutron Activation | X - X-Ray |
| I - Fission Product | P - Positron Decay |
| N - Naturally Occurring Isotope | S - Single-Escape |
| P - Photon Reaction | D - Double-Escape |
| C - Charged Particle Reaction | K - Key Line |
| M - No MDA Calculation | A - Not in Average |
| R - Coincidence Corrected | C - Coincidence Peak |
| H - Halflife limit exceeded | |

- - - - - - - - - - - - - - - - - - - - - - - - - - - - - - - - - - - - -

***** S U M M A R Y O F N U C L I D E S I N S A M P L E *****

| Nuclide | | Time of Count Activity pCi/gm | Time Corrected Activity pCi/gm | Uncertainty Counting pCi/gm | 3 Sigma Total pCi/gm | MDA pCi/gm |
|---|---|---|---|---|---|---|
| BE-7 | #A | 9.0007E-02 | 9.4583E-02 | 2.2212E-01 | 2.2219E-01 | 2.342E-01 |
| K-40 | # | 1.4163E+01 | 1.4163E+01 | 1.0759E+00 | 1.3628E+00 | |
| MN-54 | #A | -8.1684E-03 | -8.2380E-03 | 3.2038E-02 | 3.2042E-02 | 3.369E-02 |
| CO-57 | #B | 1.2696E-03 | 1.2821E-03 | 2.8817E-02 | 2.8818E-02 | 3.190E-02 |
| CO-60 | #B | -3.1534E-03 | -3.1577E-03 | 2.1174E+00 | 2.1174E+00 | 3.356E-02 |

| | | | | | | |
|---|---|---|---|---|---|---|
| Sr-85 | #A | -1.5992E-02 | -1.6659E-02 | 3.2852E-02 | 3.2867E-02 | 3.471E-02 |
| Kr-85 | #A | -3.9702E+02 | -3.9703E+02 | 8.3731E+02 | 8.3764E+02 | 8.048E+02 |
| Y-88 | #B | -3.7655E-03 | -3.8602E-03 | 2.9351E-02 | 2.9352E-02 | 2.232E-02 |
| NB-94 | #B | -8.1165E-05 | -8.1165E-05 | 5.6596E-03 | 5.6596E-03 | 2.449E-02 |
| Ag-108M | #B | -9.1205E-03 | -9.1210E-03 | 3.5776E-02 | 3.5780E-02 | 4.012E-02 |
| CD-109 | #A | 8.4201E-01 | 8.4695E-01 | 9.2408E-01 | 9.2527E-01 | 9.985E-01 |
| SN-113 | #B | 2.6309E-03 | 2.6922E-03 | 3.2296E-02 | 3.2296E-02 | 3.589E-02 |
| SB-125 | #B | 5.2380E-02 | 5.2518E-02 | 5.2183E-02 | 5.2275E-02 | 8.131E-02 |
| I-131 | #B | -4.9061E-03 | -6.8202E-03 | 3.4538E-02 | 3.4540E-02 | 2.793E-02 |
| CS-134 | #B | 1.5231E-02 | 1.5285E-02 | 1.2187E-02 | 1.2220E-02 | 6.331E-02 |
| CS-137 | #A | 2.2343E-02 | 2.2348E-02 | 3.1550E-02 | 3.1577E-02 | 3.432E-02 |
| CE-139 | #A | 7.5023E-03 | 7.6482E-03 | 2.9958E-02 | 2.9962E-02 | 3.263E-02 |
| EU-152 | #B | -3.8865E-03 | -3.8887E-03 | 9.0446E-02 | 9.0446E-02 | 9.645E-02 |
| EU-154 | #B | 6.1023E-03 | 6.1075E-03 | 6.1966E-02 | 6.1967E-02 | 6.905E-02 |
| EU-155 | #B | 9.0026E-02 | 9.0157E-02 | 1.1728E-01 | 1.1739E-01 | 1.279E-01 |
| HG-203 | #B | -3.7688E-03 | -3.9893E-03 | 3.5748E-02 | 3.5749E-02 | 3.074E-02 |
| TL-208 | # | 2.4305E-01 | 2.4305E-01 | 5.6422E-02 | 5.8219E-02 | |
| PB-212 | | 5.3047E-01 | 5.3047E-01 | 7.3305E-02 | 7.9719E-02 | |
| PB-214 | | 5.0473E-01 | 5.0473E-01 | 1.1288E-01 | 1.1675E-01 | |
| BI-212 | | 6.6334E-01 | 6.6334E-01 | 3.6325E-01 | 3.6535E-01 | |
| BI-214 | | 4.9813E-01 | 4.9813E-01 | 1.0532E-01 | 1.0935E-01 | |
| RA-224 | # | 4.7426E+00 | 4.7426E+00 | 9.7019E-01 | 1.0098E+00 | 9.312E-01 |
| RA-226 | # | 1.5035E+00 | 1.5035E+00 | 8.1392E-01 | 8.1875E-01 | |
| AC-228 | # | 7.2731E-01 | 7.2731E-01 | 1.6802E-01 | 1.7342E-01 | |
| TH-227 | #A | -3.5843E-01 | -3.5843E-01 | 3.3542E-01 | 3.3609E-01 | 3.620E-01 |
| PA-234 | #B | 2.5698E-03 | 2.5698E-03 | 1.1555E-01 | 1.1555E-01 | 1.290E-01 |
| TH-234 | #B | 5.1262E-01 | 5.1262E-01 | 1.4427E+00 | 1.4430E+00 | 1.598E+00 |
| AM-241 | #A | -5.7977E-02 | -5.7978E-02 | 1.9946E-01 | 1.9948E-01 | 2.148E-01 |

# - All peaks for activity calculation had bad shape.
* - Activity omitted from total
& - Activity omitted from total and all peaks had bad shape.
< - MDA value printed.
A - Activity printed, but activity < MDA.
B - Activity < MDA and failed test.
C - Area < Critical level.
F - Failed fraction or key line test.
H - Halflife limit exceeded

---------- S U M M A R Y ----------

Total Activity ( 277.2 to 2000.1 keV) 1.8833954E+01 pCi/gm
Total Decayed Activity ( 277.2 to 2000.1 keV) 1.8833961E+01 pCi/gm

The library has energies which are not separable.

Analyzed by: _____
JPK

Reviewed by: _____
Supervisor

Laboratory: YAEC Chemistry Lab

YAEC Chemistry Lab Spectrum name: 107F_15SEPT2006_1127.An1

Sample description
FSS-SSS-01-01-021-F

Spectrum Filename: C:\GammaVision\Spectra\107F_15SEPT2006_1127.An1

Acquisition information

| | |
|---|---|
| Start time: | 15-Sep-2006 11:27:37 |
| Live time: | 2000 |
| Real time: | 2003 |
| Dead time: | 0.14 % |
| Detector ID: | 2 |

Detector system
Det 107- DSPE- 634

Calibration

| | |
|---|---|
| Filename: | D7_1LSa.Clb |

Detector 107 Calibration for 1 Liter Sand Marinelli

Energy Calibration

| | |
|---|---|
| Created: | 29-Oct-2004 06:48:53 |
| Zero offset: | 0.157 keV |
| Gain: | 0.500 keV/channel |
| Quadratic: | -1.676E-08 keV/channel^2 |

Efficiency Calibration

| | |
|---|---|
| Created: | 29-Oct-2004 06:51:32 |
| Type: | Polynomial |
| Uncertainty: | 1.174 % |
| Coefficients: | -0.279532 -4.778179 0.614896 |
| | -0.087174 0.005356 -0.000131 |

Library Files

| | |
|---|---|
| Main analysis library: | FSS_Rev_1.Lib |
| Library Match Width: | 1.000 |
| Peak stripping: | Library based |

Analysis parameters

| | |
|---|---|
| Analysis engine: | Env32 G53W4.20 |
| Start channel: | 100 ( 50.16keV ) |
| Stop channel: | 4000 ( 2000.15keV ) |
| Peak rejection level: | 41.667% |
| Peak search sensitivity: | 3 |
| Sample Size: | 1.4420E+03 |
| Activity scaling factor: | 1.0000E+06/( 1.0000E+00* 1.4420E+03) = 6.9348E+02 |
| Detection limit method: | Nureg 4.16 |
| Random error: | 1.0000000E+00 |
| Systematic error: | 1.0000000E+00 |

| | |
|---|---|
| Fraction Limit: | 0.000% |
| Background width: | average of five points. |

YAEC Chemistry Lab Spectrum name: 107F_15SEPT2006_1127.An1

Half lives decay limit: 12.000
Activity range factor: 2.000
Min. step backg. energy 0.000
Multiplet shift channel 2.000

| Corrections | Status | Comments |
|---|---|---|
| Decay correct to date: | YES | 09-Sep-2006 14:40:00 |
| Decay during acquisition: | NO | |
| Decay during collection: | NO | |
| True coincidence correction: | NO | |
| Peaked background correction: | YES | 107_150K_28APR05.Pbc 01-May-2005 05:30:33 |
| Absorption (Internal): | NO | |
| Geometry correction: | NO | |
| Random summing: | NO | |

total peaks alloc. 15 cutoff 20.00000 %
Energy Calibration
Normalized diff: 1.0000

***** S U M M A R Y O F P E A K S I N R A N G E *****

| Peak Energy | Area | Uncert | FWHM | Corrctn Factor | Nuclide Energy | Brnch. Ratio | Act. pCi/gm | Nuc |
|---|---|---|---|---|---|---|---|---|
| 74.80 | 212. | 29.41 | 1.50 | 2.747E-02 | 72.87 | 6.400 | 1.231E+00 | HG203 |
| | | | | | 74.81 | 9.600 | PBC<MDA | PB212 |
| 74.93 | 402. | 11.38 | 1.18 | 2.849E-02 | 72.87 | 6.400 | 2.338E+00 | HG203 |
| | | | | | 74.81 | 9.600 | 1.377E+00 | PB212 |
| 77.15 | 189. | 27.22 | 1.50 | 2.957E-02 | 77.11 | 17.500 | PBC<MDA | PB212 |
| | | | | | 77.11 | 10.700 | PBC<MDA | PB214 |
| 77.23 | 231. | 16.48 | 1.18 | 2.957E-02 | 77.11 | 17.500 | 7.880E-01 | PB212 |
| | | | | | 77.11 | 10.700 | 1.275E+00 | PB214 |
| 87.21 | 228. | 27.81 | 1.91 | 3.305E-02 | 86.45 | 32.740 | 1.993E-01 | EU155 |
| | | | | | 88.04 | 3.790 | 1.708E+00 | CD109 |
| 185.78 | 182. | 22.30 | 2.21 | 3.612E-02 | | | | |
| 185.78 | 182. | 22.30 | 2.21 | 3.612E-02 | 185.99 | 3.280 | 1.442E+00 | RA226 |
| 239.21 | 1730. | 3.72 | 2.16 | 3.185E-02 | 238.63 | 43.100 | 1.168E+00 | PB212 |
| | | | | | 241.00 | 3.900 | 1.309E+01 | RA224 |
| 242.07 | 175. | 21.80 | 1.30 | 3.163E-02 | 241.92 | 7.470 | 6.936E-01 | PB214 |
| 270.37 | 174. | 19.77 | 2.22 | 2.943E-02 | | | | |
| 295.91 | 377. | 11.93 | 2.09 | 2.763E-02 | 295.22 | 19.200 | 6.572E-01 | PB214 |
| 338.27 | 357. | 9.78 | 2.44 | 2.501E-02 | 338.40 | 12.010 | 1.103E+00 | AC228 |
| 351.94 | 598. | 6.29 | 2.17 | 2.426E-02 | 351.99 | 37.100 | 6.178E-01 | PB214 |
| 463.13 | 59. | 32.23 | 1.50 | 1.953E-02 | 463.51 | 10.000 | PBC<MDA | SB125 |
| 510.89 | 249. | 13.05 | 2.29 | 1.808E-02 | 510.72 | 22.500 | 4.968E-01 | TL208 |
| 583.37 | 525. | 6.20 | 2.15 | 1.628E-02 | 583.14 | 86.000 | 3.480E-01 | TL208 |
| 609.57 | 404. | 6.86 | 1.80 | 1.574E-02 | 609.32 | 46.090 | 5.157E-01 | BI214 |
| 727.26 | 49. | 36.93 | 1.64 | 1.374E-02 | 727.17 | 11.800 | PBC<MDA | BI212 |
| 795.25 | 41. | 38.01 | 1.68 | 1.284E-02 | 795.76 | 85.400 | PBC<MDA | CS134 |
| 859.85 | 99. | 20.37 | 1.56 | 1.212E-02 | | | | |
| 911.49 | 386. | 7.14 | 2.25 | 1.160E-02 | 911.07 | 29.000 | 1.063E+00 | AC228 |

| | | | | | | | | |
|---|---|---|---|---|---|---|---|---|
| 965.07 | 43. | 31.93 | 1.80 | 1.112E-02 | | | | |
| 969.41 | 168. | 10.82 | 1.80 | 1.109E-02 | 968.90 | 17.460 | 8.035E-01 | AC228 |
| 1120.60 | 104. | 15.95 | 2.08 | 9.970E-03 | 1120.28 | 15.040 | 6.495E-01 | BI214 |

| pk energy | area | uncert | fwhm | corr | nuclide | brnch. | act. | nuc |
|---|---|---|---|---|---|---|---|---|
| 1461.13 | 1708. | 2.48 | 2.73 | 8.189E-03 | 1460.75 | 10.700 | 1.821E+01 | K40 |
| 1765.21 | 88. | 11.25 | 0.62 | 7.084E-03 | 1764.51 | 15.920 | 7.330E-01 | BI214 |

********** U N I D E N T I F I E D P E A K S U M M A R Y **********

| Peak Channel | Centroid Energy | Background Counts | Net Area Counts | Intensity Cts/Sec | Uncert 3 Sigma % | FWHM keV | Suspected Nuclide | |
|---|---|---|---|---|---|---|---|---|
| 540.37 | 270.37 | 372. | 174. | 0.087 | 59.30 | 2.219 | AC-228 | s |
| 1719.26 | 859.85 | 84. | 99. | 0.050 | 61.10 | 1.562 | TL-208 | s |
| 1929.71 | 965.20 | 73. | 43. | 0.022 | 95.79 | 1.797 | AC-228 | lD |

s - Peak fails shape tests.
D - Peak area deconvoluted.
L - Peak written from unknown list.
C - Area < Critical level.

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This section based on library: FSS_Rev_1.Lib

********** I D E N T I F I E D P E A K S U M M A R Y **********

| Nuclide | Peak Channel | Centroid Energy | Background Counts | Net Area Counts | Intensity Cts/Sec | Uncert 3 Sigma % | FWHM keV | |
|---|---|---|---|---|---|---|---|---|
| HG-203 | 149.26 | 74.80 | 1865. | 212. | 0.106 | 88.24 | 1.500 | s |
| PB-212 | 149.29 | 74.81 | 866. | 402. | 0.201 | 34.13 | 1.178 | D |
| PB-212 | 153.89 | 77.11 | 990. | 231. | 0.115 | 49.44 | 1.179 | A |
| PB-214 | 153.89 | 77.11 | 1421. | 189. | 0.095 | 81.67 | 1.500 | A |
| CD-109 | 174.44 | 87.39 | 1387. | 135. | 0.068 | 119.16 | 1.500 | s |
| RA-226 | 371.16 | 185.76 | 767. | 142. | 0.071 | 86.48 | 1.500 | s |
| PB-212 | 476.89 | 238.63 | 606. | 1070. | 0.535 | 13.15 | 1.297 | D |
| RA-224 | 477.35 | 238.86 | 976. | 960. | 0.480 | 16.81 | 1.500 | s |
| PB-214 | 483.47 | 241.92 | 652. | 175. | 0.087 | 65.40 | 1.299 | D |
| PB-214 | 591.44 | 295.91 | 489. | 373. | 0.186 | 35.79 | 2.085 | s |
| AC-228 | 676.16 | 338.27 | 300. | 353. | 0.177 | 29.34 | 2.436 | s |
| PB-214 | 703.49 | 351.94 | 270. | 593. | 0.297 | 18.88 | 2.169 | s |
| SB-125 | 925.86 | 463.13 | 172. | 59. | 0.030 | 96.70 | 1.500 | s |
| TL-208 | 1021.36 | 510.89 | 252. | 216. | 0.108 | 39.15 | 2.289 | s |
| TL-208 | 1166.32 | 583.37 | 153. | 520. | 0.260 | 18.60 | 2.155 | s |
| BI-214 | 1218.72 | 609.57 | 130. | 399. | 0.200 | 20.59 | 1.797 | s |
| BI-212 | 1454.08 | 727.26 | 151. | 49. | 0.025 | 110.79 | 1.638 | s |
| CS-134 | 1590.06 | 795.25 | 104. | 41. | 0.020 | 114.02 | 1.684 | s |
| AC-228 | 1822.54 | 911.49 | 108. | 382. | 0.191 | 21.43 | 2.251 | s |
| AC-228 | 1937.36 | 968.90 | 85. | 166. | 0.083 | 32.61 | 1.799 | D |
| BI-214 | 2240.76 | 1120.60 | 68. | 104. | 0.052 | 47.86 | 2.085 | s |
| K-40 | 2921.85 | 1461.13 | 21. | 1703. | 0.852 | 7.43 | 2.726 | s |
| BI-214 | 3530.08 | 1765.21 | 4. | 88. | 0.044 | 33.74 | 0.624 | s |

s - Peak fails shape tests.
D - Peak area deconvoluted.

A Derived peak area.

***** S U M M A R Y O F L I B R A R Y P E A K U S A G E *****

| - Nuclide - Name | Code | Average Activity pCi/gm | Peak Energy keV | Peak Activity pCi/gm | Peak Code | Peak MDA Value pCi/gm | COMMENTS |
|---|---|---|---|---|---|---|---|
| BE-7 | | 7.5599E-04 | | | | | |
| | | | 477.56 | 7.560E-04 | &( | 3.128E-01 9.07E-02 | G |
| K-40 | | 1.8212E+01 | | | | | |
| | | | 1460.75 | 1.821E+01 | *(P | 2.558E-01 4.52E-01 | G |
| MN-54 | | 2.5935E-02 | | | | | |
| | | | 834.81 | 2.593E-02 | %(P | 3.802E-02 1.18E-02 | G |
| CO-57 | | -4.8234E-03 | | | | | |
| | | | 122.07 | -4.823E-03 | %(P | 4.528E-02 1.36E-02 | G K |
| | | | 136.43 | -2.826E-03 | & P | 3.290E-01 9.79E-02 | G |
| CO-60 | | -5.7921E-03 | | | | | |
| | | | 1332.51 | -5.792E-03 | &(P | 4.187E-02 1.15E-02 | G K |
| | | | 1173.23 | 1.729E-03 | % P | 5.329E-02 1.53E-02 | G K |
| Sr-85 | | -2.7274E-02 | | | | | |
| | | | 514.00 | -2.727E-02 | %( | 4.933E-02 1.50E-02 | G |
| Kr-85 | | -6.2766E+02 | | | | | |
| | | | 513.99 | -6.277E+02 | %(P | 1.074E+03 3.26E+02 | G |
| Y-88 | | -4.8760E-03 | | | | | |
| | | | 1836.01 | -4.876E-03 | %(P | 2.826E-02 7.53E-03 | G K |
| | | | 898.02 | -1.751E-02 | % P | 4.543E-02 1.35E-02 | G |
| NB-94 | | -1.0532E-02 | | | | | |
| | | | 871.10 | -1.053E-02 | &(P | 3.818E-02 1.13E-02 | G K |
| | | | 702.50 | -3.543E-04 | % P | 4.051E-02 1.17E-02 | G K |
| Ag-108M | | -4.1565E-03 | | | | | |
| | | | 722.95 | -4.156E-03 | %( | 3.658E-02 1.06E-02 | G K |
| | | | 614.37 | -2.462E-02 | % | 4.647E-02 1.41E-02 | G |
| | | | 433.93 | 4.502E-03 | % P | 3.038E-02 8.91E-03 | G |
| CD-109 | | 1.0161E+00 | | | | | |
| | | | 88.04 | 1.016E+00 | (P | 1.322E+00 4.05E-01 | G |
| SN-113 | | -1.2791E-02 | | | | | |
| | | | 391.71 | -1.279E-02 | &(P | 4.988E-02 1.48E-02 | G K |
| | | | 255.04 | 2.520E-01 | % | 1.210E+00 3.60E-01 | G |

| Nuclide | Ave activity | Energy | Activity | Code | Peak | MDA | Comments |
|---|---|---|---|---|---|---|---|
| SB-125 | 5.9916E-02 | | | | | | |
| | | 427.95 | -1.623E-02 | %(P | 1.009E-01 | 2.96E-02 | G K |
| | | 600.77 | -2.584E-02 | % P | 1.843E-01 | 5.37E-02 | G |
| | | 636.15 | -5.870E-04 | % P | 2.534E-01 | 7.22E-02 | G |
| | | 463.51 | 2.853E-01 | *(P | 3.072E-01 | 9.63E-02 | G |
| | | 176.29 | -6.491E-03 | % P | 5.419E-01 | 1.61E-01 | G |
| I-131 | 9.2610E-03 | | | | | | |
| | | 364.48 | 9.261E-03 | &( | 6.053E-02 | 1.79E-02 | G K |
| | | 636.97 | -3.504E-03 | % | 6.060E-01 | 1.72E-01 | G |
| | | 284.29 | -1.438E-01 | % | 8.390E-01 | 2.50E-01 | G |
| CS-134 | -3.8005E-02 | | | | | | |
| | | 604.66 | -3.801E-02 | &(P | 5.309E-02 | 1.63E-02 | G K |
| | | 795.76 | 3.512E-02 | + P | 4.309E-02 | 1.35E-02 | G |
| | | 569.29 | 4.115E-02 | & | 1.851E-01 | 5.46E-02 | G |
| | | 801.84 | -5.608E-02 | % P | 4.016E-01 | 1.17E-01 | G |
| CS-137 | 2.0788E-02 | | | | | | |
| | | 661.62 | 2.079E-02 | %(P | 4.466E-02 | 1.35E-02 | G |
| CE-139 | 2.0302E-03 | | | | | | |
| | | 165.85 | 2.030E-03 | %(P | 4.106E-02 | 1.22E-02 | G |
| EU-152 | 1.0458E-02 | | | | | | |
| | | 121.78 | 1.046E-02 | %(P | 1.258E-01 | 3.76E-02 | G K |
| | | 344.30 | 2.021E-02 | % P | 1.049E-01 | 3.11E-02 | G |
| | | 1408.08 | -3.252E-03 | % P | 1.497E-01 | 4.07E-02 | G |
| | | 964.00 | -9.414E-02 | % P | 3.846E-01 | 1.14E-01 | G |
| | | 1112.07 | -4.160E-02 | % P | 3.340E-01 | 9.68E-02 | G |
| | | 778.90 | -5.224E-02 | % P | 2.913E-01 | 8.53E-02 | G |
| EU-154 | -8.7966E-03 | | | | | | |
| | | 123.10 | -8.797E-03 | &(P | 9.148E-02 | 2.73E-02 | G K |
| | | 1274.80 | -1.200E-02 | & P | 1.276E-01 | 3.67E-02 | G |
| | | 723.30 | -9.541E-03 | % P | 2.885E-01 | 8.48E-02 | G |
| | | 1004.80 | -5.116E-02 | & P | 2.281E-01 | 6.70E-02 | G |
| EU-155 | 1.0566E-01 | | | | | | |
| | | 86.45 | 1.057E-01 | %( | 1.632E-01 | 4.98E-02 | G K |
| | | 105.31 | 5.195E-02 | % P | 1.732E-01 | 5.22E-02 | G |
| HG-203 | 9.5954E-02 | | | | | | |
| | | 279.17 | 6.798E-03 | &(P | 4.159E-02 | 1.24E-02 | G K |
| | | 72.87 | 1.231E+00 | ?(P | 1.186E+00 | 3.65E-01 | G |
| | | 70.83 | 7.319E-02 | & | 2.231E+00 | 6.69E-01 | G |
| | | 82.50 | -9.231E-01 | % | 2.597E+00 | 7.85E-01 | G |

| Nuclide | Ave activity | Energy | Activity | Code | Peak | MDA | Comments |
|---|---|---|---|---|---|---|---|
| TL-208 | 3.4802E-01 | | | | | | |
| | | 583.14 | 3.480E-01 | *(P | 4.034E-02 | 2.18E-02 | G |
| | | 510.72 | 4.968E-01 | + P | 1.768E-01 | 7.49E-02 | G |
| PB-212 | 7.4632E-01 | | | | | | |
| | | 238.63 | 7.294E-01 | (P | 8.005E-02 | 3.25E-02 | G K |
| | | | | | | | Energy duplication |
| | | 77.11 | 4.183E-01 | } | 2.704E-01 | 6.89E-02 | G |
| | | 74.81 | 1.377E+00 | + P | 4.791E-01 | 1.58E-01 | G |
| PB-214 | 6.3855E-01 | | | | | | |
| | | 351.99 | 6.178E-01 | *(P | 8.251E-02 | 3.92E-02 | G K |
| | | 295.22 | 6.572E-01 | *(P | 1.866E-01 | 7.94E-02 | G |
| | | | | | | | Energy duplication |
| | | 77.11 | 5.611E-01 | } P | 5.283E-01 | 1.53E-01 | G |
| | | 241.92 | 6.936E-01 | (P | 4.827E-01 | 1.52E-01 | G |
| BI-212 | 2.8557E-01 | | | | | | |
| | | 727.17 | 2.856E-01 | *(P | 3.469E-01 | 1.08E-01 | G K |
| | | 1620.56 | 5.108E-02 | % P | 9.612E-01 | 2.57E-01 | G |
| | | 785.42 | 6.344E-01 | % P | 1.967E+00 | 5.86E-01 | G |
| BI-214 | 5.1571E-01 | | | | | | |
| | | 609.32 | 5.157E-01 | *(P | 7.206E-02 | 3.58E-02 | G K |
| | | 1764.51 | 7.330E-01 | + P | 9.797E-02 | 8.33E-02 | G |
| | | 1120.28 | 6.495E-01 | + P | 2.572E-01 | 1.05E-01 | G |
| RA-224 | 7.2774E+00 | | | | | | |
| | | 241.00 | 7.277E+00 | &(P | 1.124E+00 | 4.09E-01 | G |
| RA-226 | 1.1242E+00 | | | | | | |
| | | 185.99 | 1.124E+00 | *( | 1.043E+00 | 3.24E-01 | G |
| AC-228 | 1.0745E+00 | | | | | | |
| | | 911.07 | 1.063E+00 | *(P | 1.425E-01 | 7.68E-02 | G K |
| | | 968.90 | 8.025E-01 | - P | 2.212E-01 | 8.84E-02 | G |
| | | 338.40 | 1.103E+00 | *(P | 2.602E-01 | 1.09E-01 | G |
| TH-227 | -9.0348E-03 | | | | | | |
| | | 236.00 | -9.035E-03 | %(P | 4.975E-01 | 1.49E-01 | G K |
| | | 256.25 | 1.133E-01 | % P | 4.422E-01 | 1.32E-01 | G |
| PA-234 | -5.1271E-02 | | | | | | |
| | | 98.44 | -5.127E-02 | &( | 1.468E-01 | 4.43E-02 | G K |
| | | 946.00 | -3.635E-02 | % | 2.083E-01 | 6.11E-02 | G |
| | | 131.28 | 8.268E-03 | & | 1.673E-01 | 4.99E-02 | G |
| | | 94.67 | -4.299E-04 | % | 2.986E-01 | 8.92E-02 | G |
| | | 883.24 | -4.956E-02 | & | 3.165E-01 | 9.24E-02 | G |
| | | 926.70 | 1.254E-01 | & | 2.964E-01 | 8.92E-02 | G |

| Nuclide | Ave activity | Energy | Activity | Code | Peak MDA | Comments |
|---|---|---|---|---|---|---|
| | | 569.26 | 6.043E-02 & | | 2.732E-01 | 8.05E-02 G |
| TH-234 | 6.7475E-01 | | | | | |
| | | 63.29 | 6.748E-01 %(P | | 2.029E+00 | 6.11E-01 G K |
| | | 92.80 | -7.948E-02 % P | | 1.443E+00 | 4.28E-01 G |
| | | 92.38 | -4.229E-01 & P | | 1.938E+00 | 5.81E-01 G |
| AM-241 | 1.0233E-02 | | | | | |
| | | 59.54 | 1.023E-02 %(P | | 2.527E-01 | 7.55E-02 G |

( - This peak used in the nuclide activity average.

* - Peak is too wide, but only one peak in library.
! - Peak is part of a multiplet and this area went negative during deconvolution.
? - Peak is too narrow.
@ - Peak is too wide at FW25M, but ok at FWHM.
% - Peak fails sensitivity test.
$ - Peak identified, but first peak of this nuclide failed one or more qualification tests.
+ - Peak activity higher than counting uncertainty range.
- - Peak activity lower than counting uncertainty range.
= - Peak outside analysis energy range.
& - Calculated peak centroid is not close enough to the library energy centroid for positive identification.
P - Peakbackground subtraction
} - Peak is too close to another for the activity to be found directly.

| Nuclide Codes: | Peak Codes: |
|---|---|
| T - Thermal Neutron Activation | G - Gamma Ray |
| F - Fast Neutron Activation | X - X-Ray |
| I - Fission Product | P - Positron Decay |
| N - Naturally Occurring Isotope | S - Single-Escape |
| P - Photon Reaction | D - Double-Escape |
| C - Charged Particle Reaction | K - Key Line |
| M - No MDA Calculation | A - Not in Average |
| R - Coincidence Corrected | C - Coincidence Peak |
| H - Halflife limit exceeded | |

- - - - - - - - - - - - - - - - - - - - - - - - - - - - - - - - - - - - -

***** S U M M A R Y O F N U C L I D E S I N S A M P L E *****

| Nuclide | | Time of Count Activity pCi/gm | Time Corrected Activity pCi/gm | Uncertainty Counting pCi/gm | 3 Sigma Total pCi/gm | MDA pCi/gm |
|---|---|---|---|---|---|---|
| BE-7 | #A | 7.0056E-04 | 7.5599E-04 | 2.7217E-01 | 2.7217E-01 | 2.899E-01 |
| K-40 | # | 1.8212E+01 | 1.8212E+01 | 1.3564E+00 | 1.7311E+00 | |
| MN-54 | #A | 2.5599E-02 | 2.5935E-02 | 3.5322E-02 | 3.5355E-02 | 3.753E-02 |
| CO-57 | #B | -4.7513E-03 | -4.8234E-03 | 4.2037E-02 | 4.2038E-02 | 4.461E-02 |
| CO-60 | #B | -5.7799E-03 | -5.7921E-03 | 1.9271E-01 | 1.9271E-01 | 4.179E-02 |

| | | | | | | |
|---|---|---|---|---|---|---|
| Sr-85 | #A | -2.5616E-02 | -2.7274E-02 | 4.5084E-02 | 4.5112E-02 | 4.633E-02 |
| Kr-85 | #A | -6.2763E+02 | -6.2766E+02 | 1.0974E+03 | 1.0980E+03 | 1.074E+03 |
| Y-88 | #B | -4.6935E-03 | -4.8760E-03 | 3.6732E-02 | 3.6733E-02 | 2.720E-02 |
| NB-94 | #B | -1.0532E-02 | -1.0532E-02 | 3.4597E-02 | 3.4602E-02 | 3.818E-02 |
| Ag-108M | #B | -4.1561E-03 | -4.1565E-03 | 3.1892E-02 | 3.1892E-02 | 3.657E-02 |
| CD-109 | #A | 1.0071E+00 | 1.0161E+00 | 1.2136E+00 | 1.2149E+00 | 1.310E+00 |
| SN-113 | #B | -1.2347E-02 | -1.2791E-02 | 5.3809E-02 | 5.3814E-02 | 4.815E-02 |
| SB-125 | #B | 5.9676E-02 | 5.9916E-02 | 6.0691E-02 | 6.0794E-02 | 1.005E-01 |
| I-131 | #B | 5.5848E-03 | 9.2610E-03 | 5.3746E-02 | 5.3749E-02 | 3.651E-02 |
| CS-134 | #B | -3.7801E-02 | -3.8005E-02 | 4.9782E-02 | 4.9833E-02 | 5.280E-02 |
| CS-137 | #A | 2.0781E-02 | 2.0788E-02 | 4.0355E-02 | 4.0373E-02 | 4.464E-02 |
| CE-139 | #A | 1.9711E-03 | 2.0302E-03 | 3.6663E-02 | 3.6664E-02 | 3.986E-02 |
| EU-152 | #B | 1.0449E-02 | 1.0458E-02 | 1.1282E-01 | 1.1282E-01 | 1.257E-01 |
| EU-154 | #B | -8.7851E-03 | -8.7966E-03 | 8.8436E-02 | 8.8437E-02 | 9.136E-02 |
| EU-155 | #B | 1.0542E-01 | 1.0566E-01 | 1.4927E-01 | 1.4938E-01 | 1.629E-01 |
| HG-203 | #F | 8.7934E-02 | 9.5954E-02 | 8.5358E-02 | 8.5546E-02 | 3.812E-02 |
| TL-208 | # | 3.4802E-01 | 3.4802E-01 | 6.5285E-02 | 6.8444E-02 | |
| PB-212 | | 7.4632E-01 | 7.4632E-01 | 9.9618E-02 | 1.0893E-01 | |
| PB-214 | | 6.3855E-01 | 6.3855E-01 | 1.2161E-01 | 1.2733E-01 | |
| BI-212 | #A | 2.8557E-01 | 2.8557E-01 | 3.2464E-01 | 3.2508E-01 | 3.469E-01 |
| BI-214 | # | 5.1571E-01 | 5.1571E-01 | 1.0733E-01 | 1.1157E-01 | |
| RA-224 | # | 7.2774E+00 | 7.2774E+00 | 1.2264E+00 | 1.2996E+00 | 1.124E+00 |
| RA-226 | # | 1.1242E+00 | 1.1242E+00 | 9.7223E-01 | 9.7449E-01 | 1.043E+00 |
| AC-228 | | 1.0745E+00 | 1.0745E+00 | 1.9711E-01 | 2.0708E-01 | |
| TH-227 | #B | -9.0348E-03 | -9.0348E-03 | 5.2314E-01 | 5.2314E-01 | 4.975E-01 |
| PA-234 | #B | -5.1271E-02 | -5.1271E-02 | 1.3294E-01 | 1.3297E-01 | 1.468E-01 |
| TH-234 | #B | 6.7475E-01 | 6.7475E-01 | 1.8326E+00 | 1.8330E+00 | 2.029E+00 |
| AM-241 | #A | 1.0232E-02 | 1.0233E-02 | 2.2641E-01 | 2.2641E-01 | 2.527E-01 |

# - All peaks for activity calculation had bad shape.
* - Activity omitted from total
& - Activity omitted from total and all peaks had bad shape.
< - MDA value printed.
A - Activity printed, but activity < MDA.
B - Activity < MDA and failed test.
C - Area < Critical level.
F - Failed fraction or key line test.
H - Halflife limit exceeded

---------- S U M M A R Y ----------

Total Activity ( 1120.2 to 2000.1 keV) 2.1535553E+01 pCi/gm
Total Decayed Activity ( 1120.2 to 2000.1 keV) 2.1535553E+01 pCi/gm

The library has energies which are not separable.

Analyzed by: _____
JPK

Reviewed by: _____
Supervisor

Laboratory: YAEC Chemistry Lab

YAEC Chemistry Lab Spectrum name: 107F_15SEPT2006_1424.An1

Sample description
FSS-SSS-01-01-023-F

Spectrum Filename: C:\GammaVision\Spectra\107F_15SEPT2006_1424.An1

Acquisition information

| | |
|---|---|
| Start time: | 15-Sep-2006 14:24:11 |
| Live time: | 2000 |
| Real time: | 2009 |
| Dead time: | 0.44 % |
| Detector ID: | 2 |

Detector system
Det 107- DSPE- 634

Calibration

| | |
|---|---|
| Filename: | D7_1LSa.Clb |

Detector 107 Calibration for 1 Liter Sand Marinelli

Energy Calibration

| | |
|---|---|
| Created: | 29-Oct-2004 06:48:53 |
| Zero offset: | 0.157 keV |
| Gain: | 0.500 keV/channel |
| Quadratic: | -1.676E-08 keV/channel^2 |

Efficiency Calibration

| | |
|---|---|
| Created: | 29-Oct-2004 06:51:32 |
| Type: | Polynomial |
| Uncertainty: | 1.174 % |
| Coefficients: | -0.279532 -4.778179 0.614896 |
| | -0.087174 0.005356 -0.000131 |

Library Files

| | |
|---|---|
| Main analysis library: | FSS_Rev_1.Lib |
| Library Match Width: | 1.000 |
| Peak stripping: | Library based |

Analysis parameters

| | |
|---|---|
| Analysis engine: | Env32 G53W4.20 |
| Start channel: | 100 ( 50.16keV ) |
| Stop channel: | 4000 ( 2000.15keV ) |
| Peak rejection level: | 41.667% |
| Peak search sensitivity: | 3 |
| Sample Size: | 1.5080E+03 |
| Activity scaling factor: | 1.0000E+06/( 1.0000E+00* 1.5080E+03) = 6.6313E+02 |
| Detection limit method: | Nureg 4.16 |
| Random error: | 1.0000000E+00 |
| Systematic error: | 1.0000000E+00 |

| | |
|---|---|
| Fraction Limit: | 0.000% |
| Background width: | average of five points. |

YAEC Chemistry Lab Spectrum name: 107F_15SEPT2006_1424.An1

Half lives decay limit: 12.000
Activity range factor: 2.000
Min. step backg. energy 0.000
Multiplet shift channel 2.000

| Corrections | Status | Comments |
|---|---|---|
| Decay correct to date: | YES | 08-Sep-2006 10:55:00 |
| Decay during acquisition: | NO | |
| Decay during collection: | NO | |
| True coincidence correction: | NO | |
| Peaked background correction: | YES | 107_150K_28APR05.Pbc 01-May-2005 05:30:33 |
| Absorption (Internal): | NO | |
| Geometry correction: | NO | |
| Random summing: | NO | |

total peaks alloc. 18 cutoff 20.00000 %
Energy Calibration
Normalized diff: 0.3217

***** S U M M A R Y O F P E A K S I N R A N G E *****

| Peak Energy | Area | Uncert | FWHM | Corrctn Factor | Nuclide Energy | Brnch. Ratio | Act. pCi/gm | Nuc |
|---|---|---|---|---|---|---|---|---|
| 74.83 | 403. | 11.65 | 1.18 | 2.849E-02 | 74.81 | 9.600 | 1.320E+00 | PB212 |
| 77.13 | 309. | 14.22 | 1.18 | 2.957E-02 | 77.11 | 17.500 | 8.767E-01 | PB212 |
| | | | | | 77.11 | 10.700 | 1.420E+00 | PB214 |
| 77.39 | 169. | 31.98 | 1.50 | 2.957E-02 | 77.11 | 17.500 | PBC<MDA | PB212 |
| | | | | | 77.11 | 10.700 | PBC<MDA | PB214 |
| 87.35 | 188. | 32.38 | 1.99 | 3.308E-02 | 86.45 | 32.740 | 1.571E-01 | EU155 |
| | | | | | 88.04 | 3.790 | 1.349E+00 | CD109 |
| 93.28 | 125. | 40.61 | 1.50 | 3.448E-02 | 92.80 | 3.000 | PBC<MDA | TH234 |
| 105.49 | 115. | 39.06 | 1.34 | 3.649E-02 | 105.31 | 21.800 | PBC<MDA | EU155 |
| 186.07 | 256. | 19.91 | 2.01 | 3.610E-02 | 185.99 | 3.280 | 1.934E+00 | RA226 |
| 209.39 | 148. | 25.30 | 1.44 | 3.428E-02 | | | | |
| 239.02 | 1941. | 3.68 | 1.97 | 3.186E-02 | 238.63 | 43.100 | 1.255E+00 | PB212 |
| | | | | | 241.00 | 3.900 | 1.405E+01 | RA224 |
| 242.08 | 185. | 21.53 | 1.30 | 3.163E-02 | 241.92 | 7.470 | 7.014E-01 | PB214 |
| 270.16 | 156. | 26.04 | 2.30 | 2.945E-02 | | | | |
| 295.35 | 266. | 10.66 | 1.34 | 2.768E-02 | 295.22 | 19.200 | 4.404E-01 | PB214 |
| 300.70 | 69. | 33.59 | 1.34 | 2.732E-02 | | | | |
| 338.62 | 399. | 11.49 | 2.09 | 2.499E-02 | 338.40 | 12.010 | 1.181E+00 | AC228 |
| 352.15 | 648. | 5.54 | 2.09 | 2.425E-02 | 351.99 | 37.100 | 6.405E-01 | PB214 |
| 409.16 | 51. | 38.39 | 1.37 | 2.156E-02 | | | | |
| 462.98 | 113. | 22.43 | 1.56 | 1.954E-02 | | | | |
| 462.98 | 113. | 22.43 | 1.56 | 1.954E-02 | 463.51 | 10.000 | 5.081E-01 | SB125 |
| 510.56 | 223. | 12.71 | 1.98 | 1.809E-02 | 510.72 | 22.500 | 4.162E-01 | TL208 |
| 583.45 | 608. | 6.22 | 2.17 | 1.628E-02 | 583.14 | 86.000 | 3.858E-01 | TL208 |
| 609.51 | 496. | 6.50 | 2.08 | 1.574E-02 | 609.32 | 46.090 | 6.068E-01 | BI214 |
| 663.19 | 95. | 25.34 | 1.94 | 1.477E-02 | 661.62 | 84.620 | 6.847E-02 | CS137 |
| 727.54 | 137. | 17.62 | 2.23 | 1.374E-02 | 727.17 | 11.800 | 7.516E-01 | BI212 |

| | | | | | | | | |
|---|---|---|---|---|---|---|---|---|
| 861.23 | 75. | 17.88 | 2.10 | 1.210E-02 | | | | |
| 911.70 | 428. | 6.48 | 2.34 | 1.160E-02 | 911.07 | 29.000 | 1.129E+00 | AC228 |
| 968.73 | 289. | 9.59 | 2.06 | 1.109E-02 | 968.90 | 17.460 | 1.327E+00 | AC228 |
| 1120.89 | 113. | 20.32 | 2.91 | 9.970E-03 | 1120.28 | 15.040 | 6.772E-01 | BI214 |
| 1461.28 | 1846. | 2.39 | 2.85 | 8.189E-03 | 1460.75 | 10.700 | 1.883E+01 | K40 |

YAEC Chemistry Lab Spectrum name: 107F_15SEPT2006_1424.An1

| pk energy | area | uncert | fwhm | corr | nuclide | brnch. | act. | nuc |
|---|---|---|---|---|---|---|---|---|
| 1765.51 | 112. | 9.41 | 3.17 | 7.084E-03 | 1764.51 | 15.920 | 8.908E-01 | BI214 |

********** U N I D E N T I F I E D P E A K S U M M A R Y **********

| Peak Channel | Centroid Energy | Background Counts | Net Area Counts | Intensity Cts/Sec | Uncert 3 Sigma % | FWHM keV | Suspected Nuclide | |
|---|---|---|---|---|---|---|---|---|
| 186.21 | 93.28 | 1066. | 125. | 0.062 | 121.83 | 1.501 | U-235 | l |
| 210.65 | 105.49 | 824. | 115. | 0.057 | 109.73 | 1.342 | EU-155 | s |
| 418.43 | 209.39 | 549. | 148. | 0.074 | 75.91 | 1.436 | AC-228 | s |
| 539.95 | 270.16 | 498. | 156. | 0.078 | 78.12 | 2.296 | AC-228 | s |
| 600.65 | 300.51 | 376. | 95. | 0.047 | 103.42 | 0.548 | PB-212 | sM |
| 817.93 | 409.16 | 154. | 51. | 0.026 | 115.16 | 1.374 | CS-138 | s |
| 1722.03 | 861.23 | 51. | 75. | 0.038 | 53.63 | 2.096 | TL-208 | s |

s - Peak fails shape tests.
D - Peak area deconvoluted.
L - Peak written from unknown list.
C - Area < Critical level.
M - Peak is close to a library peak.

---

This section based on library: FSS_Rev_1.Lib

********** I D E N T I F I E D P E A K S U M M A R Y **********

| Nuclide | Peak Channel | Centroid Energy | Background Counts | Net Area Counts | Intensity Cts/Sec | Uncert 3 Sigma % | FWHM keV | |
|---|---|---|---|---|---|---|---|---|
| PB-212 | 149.29 | 74.81 | 923. | 403. | 0.201 | 34.94 | 1.178 | D |
| PB-212 | 153.89 | 77.11 | 1042. | 309. | 0.154 | 42.65 | 1.179 | A |
| PB-214 | 153.89 | 77.11 | 1577. | 169. | 0.085 | 95.93 | 1.500 | A |
| CD-109 | 174.25 | 87.29 | 1551. | 152. | 0.076 | 112.40 | 1.500 | s |
| RA-226 | 371.79 | 186.07 | 833. | 256. | 0.128 | 59.72 | 2.006 | s |
| TH-227 | 471.24 | 235.80 | 1833. | -219. | -0.110 | 85.33 | 1.500 | s |
| PB-212 | 476.89 | 238.63 | 637. | 1218. | 0.609 | 12.10 | 1.297 | D |
| RA-224 | 477.33 | 238.85 | 972. | 1143. | 0.572 | 14.55 | 1.500 | s |
| PB-214 | 483.47 | 241.92 | 713. | 185. | 0.092 | 64.58 | 1.299 | D |
| PB-214 | 589.95 | 295.16 | 297. | 312. | 0.156 | 29.40 | 2.033 | s |
| AC-228 | 676.86 | 338.62 | 451. | 396. | 0.198 | 34.47 | 2.095 | s |
| PB-214 | 703.91 | 352.15 | 234. | 643. | 0.322 | 16.61 | 2.087 | s |
| SB-125 | 925.51 | 462.95 | 178. | 83. | 0.042 | 72.70 | 1.500 | |
| TL-208 | 1020.72 | 510.56 | 214. | 189. | 0.094 | 38.12 | 1.979 | s |
| TL-208 | 1166.49 | 583.45 | 226. | 603. | 0.302 | 18.65 | 2.171 | s |
| BI-214 | 1218.61 | 609.51 | 174. | 491. | 0.246 | 19.50 | 2.081 | s |
| Ag-108M | 1226.03 | 613.23 | 324. | -71. | -0.036 | 112.81 | 1.561 | s |
| CS-137 | 1325.95 | 663.19 | 160. | 95. | 0.048 | 76.02 | 1.942 | s |
| BI-212 | 1454.66 | 727.54 | 137. | 136. | 0.068 | 52.85 | 2.226 | s |
| AC-228 | 1822.96 | 911.70 | 105. | 424. | 0.212 | 19.45 | 2.344 | s |

| Nuclide | Channel | Energy | Background | Net area | Cnts/sec | Uncert | FWHM |
|---|---|---|---|---|---|---|---|
| AC-228 | 1937.03 | 968.73 | 128. | 287. | 0.143 | 28.76 | 2.061s |
| BI-214 | 2241.35 | 1120.89 | 126. | 113. | 0.057 | 60.96 | 2.909s |
| K-40 | 2922.17 | 1461.28 | 26. | 1842. | 0.921 | 7.17 | 2.853s |
| BI-214 | 3530.68 | 1765.51 | 1. | 112. | 0.056 | 28.22 | 3.175s |

s - Peak fails shape tests.
D - Peak area deconvoluted.
A Derived peak area.

***** S U M M A R Y O F L I B R A R Y P E A K U S A G E *****

| - Nuclide - Name | Code | Average Activity pCi/gm | Peak Energy keV | Peak Activity pCi/gm | Code | MDA Value pCi/gm | COMMENTS |
|---|---|---|---|---|---|---|---|
| BE-7 | | -6.3313E-02 | | | | | |
| | | | 477.56 | -6.331E-02 | &( | 3.071E-01 9.09E-02 | G |
| K-40 | | 1.8830E+01 | | | | | |
| | | | 1460.75 | 1.883E+01 | *(P | 2.722E-01 4.51E-01 | G |
| MN-54 | | 5.7703E-04 | | | | | |
| | | | 834.81 | 5.770E-04 | &(P | 4.422E-02 1.28E-02 | G |
| CO-57 | | 1.2345E-02 | | | | | |
| | | | 122.07 | 1.234E-02 | %(P | 4.132E-02 1.24E-02 | G K |
| | | | 136.43 | 1.864E-02 | % P | 3.617E-01 1.08E-01 | G |
| CO-60 | | 1.0004E-02 | | | | | |
| | | | 1332.51 | 1.000E-02 | %(P | 3.877E-02 1.12E-02 | G K |
| | | | 1173.23 | 1.408E-02 | % P | 4.833E-02 1.42E-02 | G K |
| Sr-85 | | -2.6630E-02 | | | | | |
| | | | 514.00 | -2.663E-02 | %( | 4.871E-02 1.48E-02 | G |
| Kr-85 | | -6.0437E+02 | | | | | |
| | | | 513.99 | -6.044E+02 | %(P | 1.046E+03 3.17E+02 | G |
| Y-88 | | -1.4157E-03 | | | | | |
| | | | 1836.01 | -1.416E-03 | %(P | 2.618E-02 6.61E-03 | G K |
| | | | 898.02 | -7.964E-03 | % P | 4.265E-02 1.24E-02 | G |
| NB-94 | | -1.0496E-04 | | | | | |
| | | | 871.10 | -1.050E-04 | &(P | 3.718E-02 1.07E-02 | G K |
| | | | 702.50 | -3.388E-04 | & P | 3.919E-02 1.14E-02 | G K |
| Ag-108M | | -2.4152E-02 | | | | | |
| | | | 722.95 | -2.415E-02 | &( | 5.300E-02 1.60E-02 | G K |
| | | | 614.37 | -4.521E-02 | + | 5.488E-02 1.70E-02 | G |

| Nuclide | Ave activity | Energy | Activity | Code | Peak | MDA | Comments |
|---|---|---|---|---|---|---|---|
| | | 433.93 | -1.847E-03 | % P | 3.443E-02 | 1.00E-02 | G |
| CD-109 | 1.0918E+00 | | | | | | |
| | | 88.04 | 1.092E+00 | *(P | 1.338E+00 | 4.10E-01 | G |
| SN-113 | -1.4621E-02 | | | | | | |
| | | 391.71 | -1.462E-02 | %(P | 5.092E-02 | 1.52E-02 | G K |
| | | 255.04 | -1.127E-02 | % | 1.382E+00 | 4.08E-01 | G |
| SB-125 | 9.5533E-02 | | | | | | |
| | | 427.95 | -2.049E-03 | &(P | 1.009E-01 | 2.93E-02 | G K |
| | | 600.77 | 6.960E-02 | % P | 1.724E-01 | 5.18E-02 | G |
| | | 636.15 | -2.834E-02 | & P | 3.197E-01 | 9.32E-02 | G |
| | | 463.51 | 3.844E-01 | (P | 2.990E-01 | 9.63E-02 | G |
| | | 176.29 | 1.072E-01 | % P | 5.362E-01 | 1.61E-01 | G |
| I-131 | 1.3750E-03 | | | | | | |
| | | 364.48 | 1.375E-03 | %( | 6.686E-02 | 1.96E-02 | G K |
| | | 636.97 | -4.384E-02 | & | 8.787E-01 | 2.56E-01 | G |
| | | 284.29 | -1.448E-01 | & | 1.008E+00 | 3.00E-01 | G |
| CS-134 | -9.4953E-04 | | | | | | |
| | | 604.66 | -9.495E-04 | &(P | 7.962E-02 | 2.37E-02 | G K |
| | | 795.76 | 3.179E-02 | % P | 4.549E-02 | 1.41E-02 | G |
| | | 569.29 | -2.635E-02 | % | 2.361E-01 | 6.94E-02 | G |
| | | 801.84 | 2.002E-03 | % P | 4.391E-01 | 1.27E-01 | G |
| CS-137 | 6.8475E-02 | | | | | | |
| | | 661.62 | 6.847E-02 | *(P | 4.416E-02 | 1.80E-02 | G |
| CE-139 | -8.2169E-04 | | | | | | |
| | | 165.85 | -8.217E-04 | %(P | 4.400E-02 | 1.31E-02 | G |
| EU-152 | 1.2480E-02 | | | | | | |
| | | 121.78 | 1.248E-02 | %(P | 1.256E-01 | 3.76E-02 | G K |
| | | 344.30 | -1.447E-02 | % P | 1.173E-01 | 3.47E-02 | G |
| | | 1408.08 | 8.541E-02 | % P | 1.349E-01 | 4.20E-02 | G |
| | | 964.00 | -1.785E-01 | % P | 4.495E-01 | 1.36E-01 | G |
| | | 1112.07 | -8.881E-03 | % P | 3.212E-01 | 9.20E-02 | G |
| | | 778.90 | -5.741E-02 | % P | 3.022E-01 | 8.88E-02 | G |
| EU-154 | 2.3827E-02 | | | | | | |
| | | 123.10 | 2.383E-02 | %(P | 7.758E-02 | 2.34E-02 | G K |
| | | 1274.80 | -9.342E-04 | % P | 1.094E-01 | 3.08E-02 | G |
| | | 723.30 | -1.147E-01 | % P | 2.515E-01 | 7.61E-02 | G |
| | | 1004.80 | 5.883E-02 | % P | 2.092E-01 | 6.19E-02 | G |

| Nuclide | Ave activity | Energy | Activity | Code | Peak | MDA | Comments |
|---|---|---|---|---|---|---|---|
| EU-155 | 1.1881E-01 | | | | | | |
| | | 86.45 | 1.188E-01 | %( | 1.630E-01 | 4.98E-02 | G K |
| | | 105.31 | -7.116E-04 | % P | 1.828E-01 | 5.45E-02 | G |
| HG-203 | 2.0860E-02 | | | | | | |
| | | 279.17 | 2.086E-02 | %(P | 4.027E-02 | 1.22E-02 | G K |
| | | 72.87 | -3.855E-01 | % P | 1.357E+00 | 4.10E-01 | G |
| | | 70.83 | -7.997E-01 | % | 2.199E+00 | 6.65E-01 | G |
| | | 82.50 | -7.318E-01 | % | 2.566E+00 | 7.74E-01 | G |
| TL-208 | 3.9207E-01 | | | | | | |
| | | 583.14 | 3.858E-01 | *(P | 4.654E-02 | 2.42E-02 | G |
| | | 510.72 | 4.162E-01 | *(P | 1.561E-01 | 6.23E-02 | G |
| PB-212 | 8.1780E-01 | | | | | | |
| | | 238.63 | 7.939E-01 | (P | 7.845E-02 | 3.24E-02 | G K |
| | | | | | | | Energy duplication |
| | | 77.11 | 5.349E-01 | } | 2.651E-01 | 7.60E-02 | G |
| | | 74.81 | 1.320E+00 | + P | 4.727E-01 | 1.55E-01 | G |
| PB-214 | 6.5073E-01 | | | | | | |
| | | 351.99 | 6.405E-01 | *(P | 7.363E-02 | 3.58E-02 | G K |
| | | 295.22 | 5.256E-01 | - P | 1.401E-01 | 5.23E-02 | G |
| | | | | | | | Energy duplication |
| | | 77.11 | 4.791E-01 | } P | 5.317E-01 | 1.53E-01 | G |
| | | 241.92 | 7.014E-01 | (P | 4.822E-01 | 1.52E-01 | G |
| BI-212 | 7.5161E-01 | | | | | | |
| | | 727.17 | 7.516E-01 | *(P | 3.164E-01 | 1.34E-01 | G K |
| | | 1620.56 | 3.571E-01 | % P | 1.006E+00 | 2.95E-01 | G |
| | | 785.42 | 5.838E-01 | % P | 1.928E+00 | 5.73E-01 | G |
| BI-214 | 6.2410E-01 | | | | | | |
| | | 609.32 | 6.068E-01 | *(P | 7.921E-02 | 3.98E-02 | G K |
| | | 1764.51 | 8.908E-01 | + P | 5.856E-02 | 8.45E-02 | G |
| | | 1120.28 | 6.772E-01 | (P | 3.284E-01 | 1.39E-01 | G |
| RA-224 | 8.2864E+00 | | | | | | |
| | | 241.00 | 8.286E+00 | ?(P | 1.073E+00 | 4.03E-01 | G |
| RA-226 | 1.9343E+00 | | | | | | |
| | | 185.99 | 1.934E+00 | *( | 1.039E+00 | 3.85E-01 | G |
| AC-228 | 1.1986E+00 | | | | | | |
| | | 911.07 | 1.129E+00 | *(P | 1.343E-01 | 7.40E-02 | G K |
| | | 968.90 | 1.327E+00 | *(P | 2.567E-01 | 1.28E-01 | G |
| | | 338.40 | 1.181E+00 | *(P | 3.035E-01 | 1.37E-01 | G |

| Nuclide | Ave activity | Energy | Activity | Code | Peak | MDA | Comments |
|---|---|---|---|---|---|---|---|
| TH-227 | -5.4674E-01 | | | | | | |
| | | 236.00 | -5.467E-01 | ?(P | 5.039E-01 | 1.55E-01 | G K |
| | | 256.25 | 1.006E-01 | % P | 4.669E-01 | 1.40E-01 | G |
| PA-234 | 4.2391E-04 | | | | | | |
| | | 98.44 | 4.239E-04 | &( | 1.429E-01 | 4.26E-02 | G K |
| | | 946.00 | -2.824E-02 | % | 2.274E-01 | 6.66E-02 | G |
| | | 131.28 | 9.280E-02 | & | 1.716E-01 | 5.22E-02 | G |
| | | 94.67 | -1.271E-01 | % | 2.954E-01 | 8.95E-02 | G |
| | | 883.24 | 7.590E-02 | & | 2.517E-01 | 7.45E-02 | G |
| | | 926.70 | -8.857E-02 | % | 3.373E-01 | 9.97E-02 | G |
| | | 569.26 | -3.999E-02 | % | 3.481E-01 | 1.02E-01 | G |
| TH-234 | 3.9291E-01 | | | | | | |
| | | 63.29 | 3.929E-01 | &(P | 1.934E+00 | 5.80E-01 | G K |
| | | 92.80 | 1.002E+00 | % P | 1.641E+00 | 4.98E-01 | G |
| | | 92.38 | -6.635E-01 | % P | 1.808E+00 | 5.44E-01 | G |
| AM-241 | -7.8369E-06 | | | | | | |
| | | 59.54 | -7.837E-06 | &(P | 2.617E-01 | 7.81E-02 | G |

( - This peak used in the nuclide activity average.

* - Peak is too wide, but only one peak in library.
! - Peak is part of a multiplet and this area went negative during deconvolution.
? - Peak is too narrow.
@ - Peak is too wide at FW25M, but ok at FWHM.
% - Peak fails sensitivity test.
$ - Peak identified, but first peak of this nuclide failed one or more qualification tests.
+ - Peak activity higher than counting uncertainty range.
- - Peak activity lower than counting uncertainty range.
= - Peak outside analysis energy range.
& - Calculated peak centroid is not close enough to the library energy centroid for positive identification.
P - Peakbackground subtraction
} - Peak is too close to another for the activity to be found directly.

| Nuclide Codes: | Peak Codes: |
|---|---|
| T - Thermal Neutron Activation | G - Gamma Ray |
| F - Fast Neutron Activation | X - X-Ray |
| I - Fission Product | P - Positron Decay |
| N - Naturally Occurring Isotope | S - Single-Escape |
| P - Photon Reaction | D - Double-Escape |
| C - Charged Particle Reaction | K - Key Line |
| M - No MDA Calculation | A - Not in Average |

R - Coincidence Corrected C - Coincidence Peak
H - Halflife limit exceeded

- - - - - - - - - - - - - - - - - - - - - - - - - - - - - - - - - - - - - - -

***** S U M M A R Y O F N U C L I D E S I N S A M P L E *****

| Nuclide | | Time of Count Activity pCi/gm | Time Corrected Activity pCi/gm | Uncertainty 3 Sigma Counting pCi/gm | Total pCi/gm | MDA pCi/gm |
|---|---|---|---|---|---|---|
| BE-7 | #A | -5.7705E-02 | -6.3313E-02 | 2.7256E-01 | 2.7259E-01 | 2.799E-01 |
| K-40 | # | 1.8830E+01 | 1.8830E+01 | 1.3531E+00 | 1.7515E+00 | |
| MN-54 | #A | 5.6795E-04 | 5.7703E-04 | 3.8473E-02 | 3.8473E-02 | 4.353E-02 |
| CO-57 | #B | 1.2120E-02 | 1.2345E-02 | 3.7347E-02 | 3.7354E-02 | 4.057E-02 |
| CO-60 | #B | 9.9782E-03 | 1.0004E-02 | 3.3629E-02 | 3.3634E-02 | 3.868E-02 |
| Sr-85 | #A | -2.4672E-02 | -2.6630E-02 | 4.4499E-02 | 4.4527E-02 | 4.513E-02 |
| Kr-85 | #A | -6.0434E+02 | -6.0437E+02 | 1.0676E+03 | 1.0682E+03 | 1.046E+03 |
| Y-88 | #B | -1.3514E-03 | -1.4157E-03 | 1.6987E-01 | 1.6987E-01 | 2.499E-02 |
| NB-94 | #B | -1.0496E-04 | -1.0496E-04 | 1.9440E+00 | 1.9440E+00 | 3.718E-02 |
| Ag-108M | #B | -2.4149E-02 | -2.4152E-02 | 4.8131E-02 | 4.8153E-02 | 5.299E-02 |
| CD-109 | #A | 1.0800E+00 | 1.0918E+00 | 1.2298E+00 | 1.2313E+00 | 1.324E+00 |
| SN-113 | #B | -1.4005E-02 | -1.4621E-02 | 5.3487E-02 | 5.3494E-02 | 4.878E-02 |
| SB-125 | #B | 9.5067E-02 | 9.5533E-02 | 7.1795E-02 | 7.2016E-02 | 1.004E-01 |
| I-131 | #B | 7.4265E-04 | 1.3750E-03 | 5.8824E-02 | 5.8824E-02 | 3.611E-02 |
| CS-134 | #B | -9.4331E-04 | -9.4953E-04 | 1.3853E-01 | 1.3853E-01 | 7.910E-02 |
| CS-137 | # | 6.8444E-02 | 6.8475E-02 | 5.3983E-02 | 5.4135E-02 | |
| CE-139 | #A | -7.9262E-04 | -8.2169E-04 | 5.0943E-02 | 5.0943E-02 | 4.244E-02 |
| EU-152 | #B | 1.2467E-02 | 1.2480E-02 | 1.1273E-01 | 1.1273E-01 | 1.254E-01 |
| EU-154 | #B | 2.3789E-02 | 2.3827E-02 | 7.0074E-02 | 7.0086E-02 | 7.745E-02 |
| EU-155 | #B | 1.1848E-01 | 1.1881E-01 | 1.4936E-01 | 1.4950E-01 | 1.625E-01 |
| HG-203 | #B | 1.8756E-02 | 2.0860E-02 | 3.6691E-02 | 3.6712E-02 | 3.621E-02 |
| TL-208 | # | 3.9207E-01 | 3.9207E-01 | 7.3671E-02 | 7.7225E-02 | |
| PB-212 | | 8.1780E-01 | 8.1780E-01 | 1.0025E-01 | 1.1128E-01 | |
| PB-214 | | 6.5073E-01 | 6.5073E-01 | 1.0893E-01 | 1.1551E-01 | |
| BI-212 | # | 7.5161E-01 | 7.5161E-01 | 4.0101E-01 | 4.0346E-01 | |
| BI-214 | | 6.2410E-01 | 6.2410E-01 | 1.2277E-01 | 1.2818E-01 | |
| RA-224 | # | 8.2864E+00 | 8.2864E+00 | 1.2078E+00 | 1.3032E+00 | 1.073E+00 |
| RA-226 | # | 1.9343E+00 | 1.9343E+00 | 1.1552E+00 | 1.1609E+00 | |
| AC-228 | # | 1.1986E+00 | 1.1986E+00 | 1.9710E-01 | 2.0942E-01 | |
| TH-227 | #A | -5.4674E-01 | -5.4674E-01 | 4.6711E-01 | 4.6823E-01 | 5.039E-01 |
| PA-234 | #B | 4.2391E-04 | 4.2391E-04 | 1.2766E-01 | 1.2766E-01 | 1.429E-01 |
| TH-234 | #B | 3.9291E-01 | 3.9291E-01 | 1.7391E+00 | 1.7393E+00 | 1.934E+00 |
| AM-241 | #A | -7.8367E-06 | -7.8369E-06 | 2.3815E-01 | 2.3815E-01 | 2.617E-01 |

# - All peaks for activity calculation had bad shape.
* - Activity omitted from total
& - Activity omitted from total and all peaks had bad shape.
< - MDA value printed.
A - Activity printed, but activity < MDA.
B - Activity < MDA and failed test.
C - Area < Critical level.
F - Failed fraction or key line test.

H – Halflife limit exceeded

YAEC Chemistry Lab Spectrum name: 107F_15SEPT2006_1424.An1

---------- S U M M A R Y ----------

Total Activity ( 269.7 to 2000.1 keV) 2.5268064E+01 pCi/gm
Total Decayed Activity ( 269.7 to 2000.1 keV) 2.5268112E+01 pCi/gm

The library has energies which are not separable.

Analyzed by: _____
JPK

Reviewed by: _____
Supervisor

Laboratory: YAEC Chemistry Lab

YAEC Chemistry Lab Spectrum name: 107F_15SEPT2006_1443.An1

Sample description
FSS-SSS-01-01-021-F-RC

Spectrum Filename: C:\GammaVision\Spectra\107F_15SEPT2006_1443.An1

Acquisition information

| | |
|---|---|
| Start time: | 15-Sep-2006 13:43:26 |
| Live time: | 2000 |
| Real time: | 2008 |
| Dead time: | 0.41 % |
| Detector ID: | 2 |

Detector system
Det 107- DSPE- 634

Calibration

| | |
|---|---|
| Filename: | D7_1LSa.Clb |

Detector 107 Calibration for 1 Liter Sand Marinelli

Energy Calibration

| | |
|---|---|
| Created: | 29-Oct-2004 06:48:53 |
| Zero offset: | 0.157 keV |
| Gain: | 0.500 keV/channel |
| Quadratic: | -1.676E-08 keV/channel^2 |

Efficiency Calibration

| | |
|---|---|
| Created: | 29-Oct-2004 06:51:32 |
| Type: | Polynomial |
| Uncertainty: | 1.174 % |
| Coefficients: | -0.279532 -4.778179 0.614896 |
| | -0.087174 0.005356 -0.000131 |

Library Files

| | |
|---|---|
| Main analysis library: | FSS_Rev_1.Lib |
| Library Match Width: | 1.000 |
| Peak stripping: | Library based |

Analysis parameters

| | |
|---|---|
| Analysis engine: | Env32 G53W4.20 |
| Start channel: | 100 ( 50.16keV ) |
| Stop channel: | 4000 ( 2000.15keV ) |
| Peak rejection level: | 41.667% |
| Peak search sensitivity: | 3 |
| Sample Size: | 1.4420E+03 |
| Activity scaling factor: | 1.0000E+06/( 1.0000E+00* 1.4420E+03) = 6.9348E+02 |
| Detection limit method: | Nureg 4.16 |
| Random error: | 1.0000000E+00 |
| Systematic error: | 1.0000000E+00 |

| | |
|---|---|
| Fraction Limit: | 0.000% |
| Background width: | average of five points. |

YAEC Chemistry Lab Spectrum name: 107F_15SEPT2006_1443.An1

Half lives decay limit: 12.000
Activity range factor: 2.000
Min. step backg. energy 0.000
Multiplet shift channel 2.000

| Corrections | Status | Comments |
|---|---|---|
| Decay correct to date: | YES | 09-Sep-2040 14:40:00 |
| Decay during acquisition: | NO | |
| Decay during collection: | NO | |
| True coincidence correction: | NO | |
| Peaked background correction: | YES | 107_150K_28APR05.Pbc 01-May-2005 05:30:33 |
| Absorption (Internal): | NO | |
| Geometry correction: | NO | |
| Random summing: | NO | |

total peaks alloc. 19 cutoff 20.00000 %
Energy Calibration
Normalized diff: 1.0000

***** S U M M A R Y O F P E A K S I N R A N G E *****

| Peak Energy | Area | Uncert | FWHM | Corrctn Factor | Nuclide Energy | Brnch. Ratio | Act. pCi/gm | Nuc |
|---|---|---|---|---|---|---|---|---|
| 74.73 | 329. | 13.48 | 1.18 | 2.842E-02 | 74.81 | 9.600 | 1.114E+00 | PB212 |
| 77.14 | 548. | 8.70 | 1.18 | 2.956E-02 | 77.11 | 17.500 | 9.926E-01 | PB212 |
| | | | | | 77.11 | 10.700 | 1.609E+00 | PB214 |
| 87.70 | 192. | 32.13 | 1.76 | 3.318E-02 | 86.45 | 32.740 | 1.447E-03 | EU155 |
| | | | | | 88.04 | 3.790 | 8.115E-09 | CD109 |
| 93.14 | 124. | 39.60 | 1.48 | 3.445E-02 | 92.38 | 2.570 | PBC<MDA | TH234 |
| | | | | | 92.80 | 3.000 | PBC<MDA | TH234 |
| 186.02 | 239. | 18.04 | 2.05 | 3.610E-02 | 185.99 | 3.280 | 1.864E+00 | RA226 |
| 239.19 | 1880. | 3.81 | 2.14 | 3.185E-02 | 238.63 | 43.100 | 1.271E+00 | PB212 |
| 242.12 | 177. | 22.49 | 1.30 | 3.163E-02 | 241.00 | 3.900 | 1.345E+00 | RA224 |
| | | | | | 241.92 | 7.470 | 7.036E-01 | PB214 |
| 270.02 | 162. | 23.18 | 1.58 | 2.946E-02 | | | | |
| 295.47 | 387. | 11.11 | 2.11 | 2.766E-02 | 295.22 | 19.200 | 6.738E-01 | PB214 |
| 338.76 | 333. | 11.68 | 1.75 | 2.498E-02 | 338.40 | 12.010 | 1.030E+00 | AC228 |
| 352.15 | 607. | 5.90 | 1.82 | 2.425E-02 | 351.99 | 37.100 | 6.270E-01 | PB214 |
| 511.03 | 263. | 11.22 | 2.16 | 1.807E-02 | 510.72 | 22.500 | 5.283E-01 | TL208 |
| 583.50 | 498. | 6.03 | 2.47 | 1.628E-02 | 583.14 | 86.000 | 3.300E-01 | TL208 |
| 609.45 | 478. | 6.39 | 2.07 | 1.574E-02 | 609.32 | 46.090 | 6.118E-01 | BI214 |
| 661.61 | 100. | 27.46 | 1.79 | 1.477E-02 | 661.62 | 84.620 | 3.320E-02 | CS137 |
| 727.55 | 144. | 23.16 | 2.01 | 1.374E-02 | 727.17 | 11.800 | 8.218E-01 | BI212 |
| 795.02 | 84. | 27.35 | 0.99 | 1.285E-02 | | | | |
| 795.02 | 84. | 27.35 | 0.99 | 1.285E-02 | 795.76 | 85.400 | 7.841E-07 | CS134 |
| 860.94 | 65. | 21.82 | 0.74 | 1.211E-02 | | | | |
| 911.54 | 402. | 6.27 | 2.01 | 1.160E-02 | 911.07 | 29.000 | 1.107E+00 | AC228 |
| 968.27 | 323. | 8.23 | 1.95 | 1.110E-02 | 968.90 | 17.460 | 1.552E+00 | AC228 |
| 1120.86 | 56. | 29.88 | 1.90 | 9.970E-03 | 1120.28 | 15.040 | 3.496E-01 | BI214 |
| 1377.59 | 40. | 24.77 | 1.25 | 8.559E-03 | | | | |

| | | | | | | | | |
|---|---|---|---|---|---|---|---|---|
| 1461.21 | 1728. | 2.50 | 2.36 | 8.189E-03 | 1460.75 | 10.700 | 1.843E+01 | K40 |
| 1765.34 | 48. | 19.03 | 2.29 | 7.084E-03 | 1764.51 | 15.920 | 3.961E-01 | BI214 |

********** U N I D E N T I F I E D P E A K S U M M A R Y **********

| Peak Channel | Centroid Energy | Background Counts | Net Area Counts | Intensity Cts/Sec | Uncert 3 Sigma % | FWHM keV | Suspected Nuclide | |
|---|---|---|---|---|---|---|---|---|
| 539.66 | 270.02 | 428. | 162. | 0.081 | 69.54 | 1.580 | AC-228 | |
| 1218.49 | 609.45 | 474. | 142. | 0.071 | 69.67 | 2.066 | BI-214 | s |
| 1721.45 | 860.94 | 53. | 65. | 0.033 | 65.47 | 0.737 | TL-208 | s |
| 2754.77 | 1377.59 | 19. | 40. | 0.020 | 74.32 | 1.247 | BI-214 | s |

s - Peak fails shape tests.
D - Peak area deconvoluted.
L - Peak written from unknown list.
C - Area < Critical level.

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This section based on library: FSS_Rev_1.Lib

********** I D E N T I F I E D P E A K S U M M A R Y **********

| Nuclide | Peak Channel | Centroid Energy | Background Counts | Net Area Counts | Intensity Cts/Sec | Uncert 3 Sigma % | FWHM keV |
|---|---|---|---|---|---|---|---|
| PB-212 | 149.29 | 74.81 | 819. | 329. | 0.164 | 39.98 | 1.178D |
| PB-212 | 153.89 | 77.11 | 864. | 347. | 0.174 | 33.20 | 1.179A |
| PB-214 | 153.89 | 77.11 | 1327. | 190. | 0.095 | 80.83 | 1.500A |
| CD-109 | 174.45 | 87.39 | 1455. | 144. | 0.072 | 115.14 | 1.500s |
| TH-234 | 185.51 | 92.93 | 1432. | 158. | 0.079 | 92.42 | 1.500s |
| RA-226 | 371.69 | 186.02 | 648. | 239. | 0.119 | 54.12 | 2.050s |
| TH-227 | 471.65 | 236.01 | 1644. | -205. | -0.103 | 86.43 | 1.500s |
| PB-212 | 476.89 | 238.63 | 605. | 1192. | 0.596 | 12.14 | 1.297D |
| PB-214 | 483.47 | 241.92 | 721. | 177. | 0.089 | 67.46 | 1.299D |
| PB-214 | 590.57 | 295.47 | 475. | 382. | 0.191 | 33.33 | 2.113s |
| AC-228 | 677.13 | 338.76 | 373. | 330. | 0.165 | 35.04 | 1.748s |
| PB-214 | 703.92 | 352.15 | 239. | 602. | 0.301 | 17.71 | 1.817s |
| TL-208 | 1021.64 | 511.03 | 203. | 229. | 0.115 | 33.67 | 2.157s |
| TL-208 | 1166.58 | 583.50 | 135. | 493. | 0.247 | 18.09 | 2.475s |
| BI-214 | 1218.83 | 609.63 | 182. | 366. | 0.183 | 21.83 | 1.558s |
| CS-137 | 1322.79 | 661.61 | 177. | 97. | 0.048 | 82.38 | 1.786s |
| BI-212 | 1454.62 | 727.52 | 193. | 123. | 0.062 | 71.06 | 1.998s |
| CS-134 | 1590.19 | 795.31 | 106. | 44. | 0.022 | 108.52 | 1.684s |
| AC-228 | 1822.65 | 911.54 | 82. | 398. | 0.199 | 18.82 | 2.005s |
| AC-228 | 1936.11 | 968.27 | 91. | 321. | 0.160 | 24.69 | 1.948s |
| BI-214 | 2241.28 | 1120.86 | 117. | 56. | 0.028 | 89.63 | 1.897s |
| K-40 | 2922.02 | 1461.21 | 36. | 1724. | 0.862 | 7.51 | 2.362s |
| BI-214 | 3530.32 | 1765.34 | 19. | 48. | 0.024 | 57.10 | 2.291s |

s - Peak fails shape tests.
D - Peak area deconvoluted.
A Derived peak area.

***** S U M M A R Y O F L I B R A R Y P E A K U S A G E *****

| - Nuclide - Name | Code | Average Activity pCi/gm | Peak Energy keV | Peak Activity pCi/gm | Peak Code | Peak MDA Value pCi/gm | COMMENTS |
|---|---|---|---|---|---|---|---|
| BE-7 | | 0.0000E+00 | | | | | |
| | | | 477.56 | 0.000E+00 | &( | 0.000E+00 0.00E+00 | G |
| K-40 | | 1.8432E+01 | | | | | |
| | | | 1460.75 | 1.843E+01 | @(P | 3.289E-01 4.63E-01 | G |
| MN-54 | | 1.3856E-14 | | | | | |
| | | | 834.81 | 1.386E-14 | %(P | 4.284E-14 1.28E-14 | G |
| CO-57 | | 3.3837E-17 | | | | | |
| | | | 122.07 | 3.384E-17 | %(P | 6.356E-16 1.90E-16 | G K |
| | | | 136.43 | -3.291E-16 | % P | 4.252E-15 1.27E-15 | G |
| CO-60 | | 3.4913E-05 | | | | | |
| | | | 1332.51 | 3.491E-05 | %(P | 4.168E-04 1.16E-04 | G K |
| | | | 1173.23 | 2.791E-04 | % P | 5.954E-04 1.79E-04 | G K |
| Sr-85 | | 0.0000E+00 | | | | | |
| | | | 514.00 | 0.000E+00 | %( | 0.000E+00 0.00E+00 | G |
| Kr-85 | | -4.1561E+02 | | | | | |
| | | | 513.99 | -4.156E+02 | %(P | 9.234E+02 2.78E+02 | G |
| Y-88 | | -1.5941E-38 | | | | | |
| | | | 1836.01 | -1.594E-38 | &(P | 2.247E-37 5.67E-38 | G K |
| | | | 898.02 | -1.077E-37 | % P | 3.711E-37 1.09E-37 | G |
| NB-94 | | 8.5403E-04 | | | | | |
| | | | 871.10 | 8.540E-04 | %(P | 3.595E-02 1.03E-02 | G K |
| | | | 702.50 | 7.724E-03 | & P | 3.867E-02 1.14E-02 | G K |
| Ag-108M | | -3.9443E-06 | | | | | |
| | | | 722.95 | -3.944E-06 | %( | 3.042E-02 8.72E-03 | G K |
| | | | 614.37 | -2.233E-02 | % | 4.155E-02 1.27E-02 | G |
| | | | 433.93 | 1.032E-02 | % P | 2.545E-02 7.65E-03 | G |
| CD-109 | | 6.0878E-09 | | | | | |
| | | | 88.04 | 6.088E-09 | *(P | 7.648E-09 2.34E-09 | G |
| SN-113 | | 1.1319E-35 | | | | | |
| | | | 391.71 | 1.132E-35 | &(P | 1.571E-34 4.60E-35 | G K |
| | | | 255.04 | -4.972E-35 | & | 4.656E-33 1.37E-33 | G |

| Nuclide | Ave activity | Energy | Activity | Code | Peak MDA | Comments |
|---|---|---|---|---|---|---|
| SB-125 | 2.5167E-07 | | | | | |
| | | 427.95 | 2.517E-07 | %(P | 2.172E-05 | 6.33E-06 G K |
| | | 600.77 | 2.047E-06 | % P | 3.394E-05 | 9.81E-06 G |
| | | 636.15 | -1.092E-06 | & P | 5.276E-05 | 1.51E-05 G |
| | | 463.51 | 4.276E-05 | % P | 6.501E-05 | 1.99E-05 G |
| | | 176.29 | 1.897E-05 | & P | 9.367E-05 | 2.80E-05 G |
| I-131 | 0.0000E+00 | | | | | |
| | | 364.48 | 0.000E+00 | %( | 0.000E+00 | 0.00E+00 G K |
| | | 636.97 | 0.000E+00 | & | 0.000E+00 | 0.00E+00 G |
| | | 284.29 | 0.000E+00 | % | 0.000E+00 | 0.00E+00 G |
| CS-134 | 1.8414E-07 | | | | | |
| | | 604.66 | -1.078E-08 | %(P | 8.357E-07 | 2.48E-07 G K |
| | | 795.76 | 4.069E-07 | (P | 4.728E-07 | 1.49E-07 G |
| | | 569.29 | -1.004E-08 | & | 2.395E-06 | 6.94E-07 G |
| | | 801.84 | -7.336E-07 | % P | 4.673E-06 | 1.36E-06 G |
| CS-137 | 3.3205E-02 | | | | | |
| | | 661.62 | 3.320E-02 | *(P | 2.219E-02 | 9.45E-03 G |
| CE-139 | -2.3276E-30 | | | | | |
| | | 165.85 | -2.328E-30 | %(P | 2.829E-29 | 8.44E-30 G |
| EU-152 | -1.8272E-05 | | | | | |
| | | 121.78 | -1.827E-05 | %(P | 2.077E-02 | 6.19E-03 G K |
| | | 344.30 | -1.700E-03 | % P | 1.880E-02 | 5.55E-03 G |
| | | 1408.08 | -1.530E-03 | & P | 1.820E-02 | 4.83E-03 G |
| | | 964.00 | -1.383E-02 | & P | 5.118E-02 | 1.52E-02 G |
| | | 1112.07 | -6.252E-04 | & P | 5.806E-02 | 1.67E-02 G |
| | | 778.90 | -7.976E-03 | % P | 4.387E-02 | 1.28E-02 G |
| EU-154 | 8.8957E-04 | | | | | |
| | | 123.10 | 8.896E-04 | %(P | 5.366E-03 | 1.61E-03 G K |
| | | 1274.80 | -1.205E-03 | % P | 7.979E-03 | 2.31E-03 G |
| | | 723.30 | 4.053E-04 | % P | 2.144E-02 | 6.33E-03 G |
| | | 1004.80 | -2.384E-03 | % P | 1.383E-02 | 4.03E-03 G |
| EU-155 | 9.7096E-04 | | | | | |
| | | 86.45 | 9.710E-04 | %( | 1.419E-03 | 4.33E-04 G K |
| | | 105.31 | 9.773E-04 | % P | 1.537E-03 | 4.69E-04 G |
| HG-203 | 0.0000E+00 | | | | | |
| | | 279.17 | 0.000E+00 | &(P | 0.000E+00 | 0.00E+00 G K |
| | | 72.87 | 0.000E+00 | % P | 0.000E+00 | 0.00E+00 G |
| | | 70.83 | 0.000E+00 | % | 0.000E+00 | 0.00E+00 G |
| | | 82.50 | 0.000E+00 | % | 0.000E+00 | 0.00E+00 G |

| Nuclide | Ave activity | Energy | Activity | Code | Peak | MDA | Comments |
|---|---|---|---|---|---|---|---|
| TL-208 | 3.2996E-01 | | | | | | |
| | | 583.14 | 3.300E-01 | *(P | 3.800E-02 | 2.01E-02 | G |
| | | 510.72 | 5.283E-01 | + P | 1.591E-01 | 6.80E-02 | G |
| PB-212 | 8.1248E-01 | | | | | | |
| | | 238.63 | 8.125E-01 | (P | 8.000E-02 | 3.33E-02 | G K |
| | | | | | | | Energy duplication |
| | | 77.11 | 6.291E-01 | } | 2.529E-01 | 6.96E-02 | G |
| | | 74.81 | 1.126E+00 | + P | 4.663E-01 | 1.52E-01 | G |
| PB-214 | 6.5010E-01 | | | | | | |
| | | 351.99 | 6.270E-01 | *(P | 7.781E-02 | 3.73E-02 | G K |
| | | 295.22 | 6.738E-01 | *(P | 1.839E-01 | 7.57E-02 | G |
| | | | | | | | Energy duplication |
| | | 77.11 | 5.641E-01 | } P | 5.107E-01 | 1.52E-01 | G |
| | | 241.92 | 7.036E-01 | (P | 5.069E-01 | 1.59E-01 | G |
| BI-212 | 7.1261E-01 | | | | | | |
| | | 727.17 | 7.126E-01 | *(P | 3.895E-01 | 1.71E-01 | G K |
| | | 1620.56 | 1.849E-01 | & P | 1.007E+00 | 2.82E-01 | G |
| | | 785.42 | 6.362E-01 | % P | 1.860E+00 | 5.54E-01 | G |
| BI-214 | 4.7274E-01 | | | | | | |
| | | 609.32 | 4.727E-01 | *(P | 8.475E-02 | 3.48E-02 | G K |
| | | 1764.51 | 3.961E-01 | - P | 1.928E-01 | 7.68E-02 | G |
| | | 1120.28 | 3.496E-01 | - P | 3.314E-01 | 1.06E-01 | G |
| RA-224 | 2.6453E-01 | | | | | | |
| | | 241.00 | 2.645E-01 | %(P | 1.307E+00 | 3.93E-01 | G |
| RA-226 | 1.8638E+00 | | | | | | |
| | | 185.99 | 1.864E+00 | *( | 9.462E-01 | 3.36E-01 | G |
| AC-228 | 1.0848E+00 | | | | | | |
| | | 911.07 | 1.107E+00 | *(P | 1.252E-01 | 7.02E-02 | G K |
| | | 968.90 | 1.552E+00 | + P | 2.286E-01 | 1.29E-01 | G |
| | | 338.40 | 1.030E+00 | *(P | 2.893E-01 | 1.22E-01 | G |
| TH-227 | -5.3527E-01 | | | | | | |
| | | 236.00 | -5.353E-01 | ?(P | 4.994E-01 | 1.54E-01 | G K |
| | | 256.25 | 9.254E-02 | & P | 4.676E-01 | 1.40E-01 | G |
| PA-234 | -2.4620E-02 | | | | | | |
| | | 98.44 | -2.462E-02 | &( | 1.399E-01 | 4.19E-02 | G K |
| | | 946.00 | -3.919E-02 | & | 2.268E-01 | 6.66E-02 | G |
| | | 131.28 | -2.480E-03 | % | 1.872E-01 | 5.58E-02 | G |
| | | 94.67 | -1.139E-01 | & | 3.025E-01 | 9.15E-02 | G |
| | | 883.24 | 9.588E-02 | % | 2.635E-01 | 7.87E-02 | G |
| | | 926.70 | 1.585E-01 | % | 2.731E-01 | 8.41E-02 | G |

| Nuclide | Ave activity | Energy | Activity | Code | Peak MDA | Comments |
|---|---|---|---|---|---|---|
| | | 569.26 | -1.212E-04 & | | 3.250E-01 | 9.42E-02 G |
| TH-234 | 5.2071E-01 | | | | | |
| | | 63.29 | -1.841E-01 &(P | | 2.020E+00 | 6.00E-01 G K |
| | | 92.80 | 1.437E+00 (P | | 1.627E+00 | 4.98E-01 G |
| | | 92.38 | -2.432E-01 % P | | 1.977E+00 | 5.91E-01 G |
| AM-241 | 4.5815E-02 | | | | | |
| | | 59.54 | 4.581E-02 %(P | | 2.517E-01 | 7.56E-02 G |

( - This peak used in the nuclide activity average.

* - Peak is too wide, but only one peak in library.
! - Peak is part of a multiplet and this area went negative during deconvolution.
? - Peak is too narrow.
@ - Peak is too wide at FW25M, but ok at FWHM.
% - Peak fails sensitivity test.
$ - Peak identified, but first peak of this nuclide failed one or more qualification tests.
+ - Peak activity higher than counting uncertainty range.
- - Peak activity lower than counting uncertainty range.
= - Peak outside analysis energy range.
& - Calculated peak centroid is not close enough to the library energy centroid for positive identification.
P - Peakbackground subtraction
} - Peak is too close to another for the activity to be found directly.

| Nuclide Codes: | Peak Codes: |
|---|---|
| T - Thermal Neutron Activation | G - Gamma Ray |
| F - Fast Neutron Activation | X - X-Ray |
| I - Fission Product | P - Positron Decay |
| N - Naturally Occurring Isotope | S - Single-Escape |
| P - Photon Reaction | D - Double-Escape |
| C - Charged Particle Reaction | K - Key Line |
| M - No MDA Calculation | A - Not in Average |
| R - Coincidence Corrected | C - Coincidence Peak |
| H - Halflife limit exceeded | |

- - - - - - - - - - - - - - - - - - - - - - - - - - - - - - - - - - - - -

***** S U M M A R Y O F N U C L I D E S I N S A M P L E *****

| Nuclide | | Time of Count Activity pCi/gm | Time Corrected Activity pCi/gm | Uncertainty Counting pCi/gm | 3 Sigma Total pCi/gm | MDA pCi/gm |
|---|---|---|---|---|---|---|
| BE-7 | #A | 8.2420E-05 | 0.0000E+00 | 0.0000E+00 | 0.0000E+00 | 2.762E-01 |
| K-40 | # | 1.8432E+01 | 1.8432E+01 | 1.3873E+00 | 1.7634E+00 | |
| MN-54 | #A | 1.2899E-02 | 1.3856E-14 | 3.8307E-14 | 3.8316E-14 | 3.988E-02 |
| CO-57 | #B | 2.3389E-03 | 3.3837E-17 | 5.6949E-16 | 5.6949E-16 | 4.394E-02 |
| CO-60 | #B | 3.0447E-03 | 3.4913E-05 | 3.4746E-04 | 3.4747E-04 | 3.635E-02 |

| | | | | | | |
|---|---|---|---|---|---|---|
| Sr-85 | #A | -1.8152E-02 | 0.0000E+00 | 0.0000E+00 | 0.0000E+00 | 4.362E-02 |
| Kr-85 | #A | -4.5546E+02 | -4.1561E+02 | 9.7648E+02 | 9.7679E+02 | 1.012E+03 |
| Y-88 | #B | -1.8028E-03 | -1.5941E-38 | 7.2562E-37 | 7.2562E-37 | 2.541E-02 |
| NB-94 | #B | 8.5502E-04 | 8.5403E-04 | 3.0886E-02 | 3.0886E-02 | 3.599E-02 |
| Ag-108M | #B | -4.7481E-06 | -3.9443E-06 | 2.6156E-02 | 2.6156E-02 | 3.662E-02 |
| CD-109 | #A | 1.0677E+00 | 6.0878E-09 | 7.0250E-09 | 7.0331E-09 | 1.341E+00 |
| SN-113 | #B | 3.3006E-03 | 1.1319E-35 | 1.3807E-34 | 1.3807E-34 | 4.582E-02 |
| SB-125 | #B | 1.2424E-03 | 2.5167E-07 | 1.9003E-05 | 1.9003E-05 | 1.072E-01 |
| I-131 | #B | -2.7900E-03 | 0.0000E+00 | 0.0000E+00 | 0.0000E+00 | 3.606E-02 |
| CS-134 | #B | 1.6855E-02 | 1.8414E-07 | 2.0225E-07 | 2.0254E-07 | 7.649E-02 |
| CS-137 | # | 7.2626E-02 | 3.3205E-02 | 2.8351E-02 | 2.8419E-02 | |
| CE-139 | #A | -3.4905E-03 | -2.3276E-30 | 2.6916E-29 | 2.6917E-29 | 4.242E-02 |
| EU-152 | #B | -1.1678E-04 | -1.8272E-05 | 5.1326E-03 | 5.1326E-03 | 1.327E-01 |
| EU-154 | #B | 1.4217E-02 | 8.8957E-04 | 4.8226E-03 | 4.8229E-03 | 8.576E-02 |
| EU-155 | #B | 1.1217E-01 | 9.7096E-04 | 1.2994E-03 | 1.3005E-03 | 1.640E-01 |
| HG-203 | #B | 1.5630E-02 | 0.0000E+00 | 0.0000E+00 | 0.0000E+00 | 3.571E-02 |
| TL-208 | # | 3.2996E-01 | 3.2996E-01 | 6.0252E-02 | 6.3325E-02 | |
| PB-212 | | 8.1248E-01 | 8.1248E-01 | 9.9909E-02 | 1.1084E-01 | |
| PB-214 | | 6.5010E-01 | 6.5010E-01 | 1.1610E-01 | 1.2228E-01 | |
| BI-212 | # | 7.1261E-01 | 7.1261E-01 | 5.1167E-01 | 5.1340E-01 | |
| BI-214 | # | 4.7274E-01 | 4.7274E-01 | 1.0441E-01 | 1.0808E-01 | 8.475E-02 |
| RA-224 | #A | 2.6453E-01 | 2.6453E-01 | 1.1786E+00 | 1.1787E+00 | 1.307E+00 |
| RA-226 | # | 1.8915E+00 | 1.8638E+00 | 1.0087E+00 | 1.0147E+00 | |
| AC-228 | # | 1.0848E+00 | 1.0848E+00 | 2.0634E-01 | 2.1605E-01 | |
| TH-227 | #A | -5.3527E-01 | -5.3527E-01 | 4.6323E-01 | 4.6431E-01 | 4.994E-01 |
| PA-234 | #B | -2.4620E-02 | -2.4620E-02 | 1.2575E-01 | 1.2575E-01 | 1.399E-01 |
| TH-234 | #B | 5.2071E-01 | 5.2071E-01 | 5.4126E-01 | 5.4203E-01 | 2.020E+00 |
| AM-241 | #A | 4.8376E-02 | 4.5815E-02 | 2.2677E-01 | 2.2678E-01 | 2.658E-01 |

# - All peaks for activity calculation had bad shape.
* - Activity omitted from total
& - Activity omitted from total and all peaks had bad shape.
< - MDA value printed.
A - Activity printed, but activity < MDA.
B - Activity < MDA and failed test.
C - Area < Critical level.
F - Failed fraction or key line test.
H - Halflife limit exceeded

---------- S U M M A R Y ----------

Total Activity ( 269.7 to 2000.1 keV) 2.3985695E+01 pCi/gm
Total Decayed Activity ( 269.7 to 2000.1 keV) 2.3918629E+01 pCi/gm

The library has energies which are not separable.

Analyzed by: _____
JPK

Reviewed by: _____
Supervisor

Laboratory: YAEC Chemistry Lab

YAEC Chemistry Lab Spectrum name: 107F_15SEPT2006_1504.An1

Sample description
FSS-SSS-01-01-034-F-B

Spectrum Filename: C:\GammaVision\Spectra\107F_15SEPT2006_1504.An1

Acquisition information
Start time: 15-Sep-2006 15:03:46
Live time: 2000
Real time: 2009
Dead time: 0.43 %
Detector ID: 2

Detector system
Det 107- DSPE- 634

Calibration
Filename: D7_1LSa.Clb
Detector 107 Calibration for 1 Liter Sand Marinelli

Energy Calibration
Created: 29-Oct-2004 06:48:53
Zero offset: 0.157 keV
Gain: 0.500 keV/channel
Quadratic: -1.676E-08 keV/channel^2

Efficiency Calibration
Created: 29-Oct-2004 06:51:32
Type: Polynomial
Uncertainty: 1.174 %
Coefficients: -0.279532 -4.778179 0.614896
-0.087174 0.005356 -0.000131

Library Files
Main analysis library: FSS_Rev_1.Lib
Library Match Width: 1.000
Peak stripping: Library based

Analysis parameters
Analysis engine: Env32 G53W4.20
Start channel: 100 ( 50.16keV )
Stop channel: 4000 ( 2000.15keV )
Peak rejection level: 41.667%
Peak search sensitivity: 3
Sample Size: 1.8820E+03
Activity scaling factor: 1.0000E+06/( 1.0000E+00* 1.8820E+03) =
5.3135E+02
Detection limit method: Nureg 4.16
Random error: 1.0000000E+00
Systematic error: 1.0000000E+00

| | |
|---|---|
| Fraction Limit: | 0.000% |
| Background width: | average of five points. |

YAEC Chemistry Lab Spectrum name: 107F_15SEPT2006_1504.An1

Half lives decay limit: 12.000
Activity range factor: 2.000
Min. step backg. energy 0.000
Multiplet shift channel 2.000

| Corrections | Status | Comments |
|---|---|---|
| Decay correct to date: | YES | 10-Sep-2006 10:30:00 |
| Decay during acquisition: | NO | |
| Decay during collection: | NO | |
| True coincidence correction: | NO | |
| Peaked background correction: | YES | 107_150K_28APR05.Pbc 01-May-2005 05:30:33 |
| Absorption (Internal): | NO | |
| Geometry correction: | NO | |
| Random summing: | NO | |

total peaks alloc. 16 cutoff 20.00000 %
Energy Calibration
Normalized diff: 0.2707

***** S U M M A R Y O F P E A K S I N R A N G E *****

| Peak Energy | Area | Uncert | FWHM | Corrctn Factor | Nuclide Energy | Brnch. Ratio | Act. pCi/gm | Nuc |
|---|---|---|---|---|---|---|---|---|
| 76.19 | 1064. | 7.96 | 3.69 | 2.916E-02 | 72.87 | 6.400 | 4.688E+00 | HG203 |
| | | | | | 74.81 | 9.600 | 2.783E+00 | PB212 |
| | | | | | 77.11 | 10.700 | 2.404E+00 | PB214 |
| | | | | | 77.11 | 17.500 | 1.476E+00 | PB212 |
| 87.06 | 147. | 39.85 | 1.50 | 3.327E-02 | | | | |
| 87.06 | 147. | 39.85 | 1.50 | 3.327E-02 | 86.45 | 32.740 | PBC<MDA | EU155 |
| | | | | | 88.04 | 3.790 | PBC<MDA | CD109 |
| 93.31 | 145. | 36.66 | 1.50 | 3.438E-02 | 92.38 | 2.570 | PBC<MDA | TH234 |
| | | | | | 92.80 | 3.000 | PBC<MDA | TH234 |
| 185.95 | 258. | 20.00 | 1.43 | 3.610E-02 | 185.99 | 3.280 | 1.562E+00 | RA226 |
| 209.69 | 156. | 33.56 | 1.13 | 3.425E-02 | | | | |
| 239.21 | 2017. | 3.98 | 2.04 | 3.185E-02 | 238.63 | 43.100 | 1.045E+00 | PB212 |
| 242.11 | 199. | 21.70 | 1.30 | 3.163E-02 | 241.92 | 7.470 | 6.047E-01 | PB214 |
| 295.24 | 259. | 11.56 | 1.34 | 2.767E-02 | 295.22 | 19.200 | 3.432E-01 | PB214 |
| 300.61 | 88. | 26.65 | 1.34 | 2.731E-02 | | | | |
| 338.40 | 406. | 11.33 | 2.15 | 2.500E-02 | 338.40 | 12.010 | 9.619E-01 | AC228 |
| 351.98 | 601. | 7.34 | 2.41 | 2.426E-02 | 351.99 | 37.100 | 4.753E-01 | PB214 |
| 463.38 | 120. | 26.59 | 1.76 | 1.953E-02 | | | | |
| 463.38 | 120. | 26.59 | 1.76 | 1.953E-02 | 463.51 | 10.000 | 4.336E-01 | SB125 |
| 511.30 | 223. | 12.82 | 1.68 | 1.806E-02 | 510.72 | 22.500 | 3.342E-01 | TL208 |
| 583.27 | 618. | 6.20 | 2.14 | 1.629E-02 | 583.14 | 86.000 | 3.142E-01 | TL208 |
| 609.62 | 528. | 5.68 | 2.34 | 1.574E-02 | 609.32 | 46.090 | 5.185E-01 | BI214 |
| 727.56 | 125. | 15.53 | 2.02 | 1.374E-02 | 727.17 | 11.800 | 5.496E-01 | BI212 |
| 795.12 | 42. | 39.17 | 1.68 | 1.284E-02 | 795.76 | 85.400 | PBC<MDA | CS134 |
| 911.20 | 470. | 7.08 | 2.31 | 1.161E-02 | 911.07 | 29.000 | 9.946E-01 | AC228 |
| 967.92 | 359. | 9.07 | 1.67 | 1.110E-02 | 968.90 | 17.460 | 1.323E+00 | AC228 |
| 1121.09 | 150. | 22.90 | 1.35 | 9.965E-03 | 1120.28 | 15.040 | 7.126E-01 | BI214 |

| | | | | | | | | |
|---|---|---|---|---|---|---|---|---|
| 1461.26 | 2093. | 2.25 | 2.81 | 8.189E-03 | 1460.75 | 10.700 | 1.711E+01 | K40 |
| 1619.96 | 25. | 40.34 | 0.93 | 7.569E-03 | 1620.56 | 2.750 | 8.796E-01 | BI212 |
| 1765.31 | 112. | 10.13 | 0.85 | 7.084E-03 | 1764.51 | 15.920 | 7.138E-01 | BI214 |

********** U N I D E N T I F I E D P E A K S U M M A R Y **********

| Peak Channel | Centroid Energy | Background Counts | Net Area Counts | Intensity Cts/Sec | Uncert 3 Sigma % | FWHM keV | Suspected Nuclide | |
|---|---|---|---|---|---|---|---|---|
| 419.01 | 209.69 | 889. | 156. | 0.078 | 100.69 | 1.125 | NP-239 | s |
| 600.85 | 300.71 | 233. | 88. | 0.044 | 79.94 | 1.341 | PB-212 | lD |

s - Peak fails shape tests.
D - Peak area deconvoluted.
L - Peak written from unknown list.
C - Area < Critical level.

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This section based on library: FSS_Rev_1.Lib

********** I D E N T I F I E D P E A K S U M M A R Y **********

| Nuclide | Peak Channel | Centroid Energy | Background Counts | Net Area Counts | Intensity Cts/Sec | Uncert 3 Sigma % | FWHM keV |
|---|---|---|---|---|---|---|---|
| PB-212 | 149.29 | 74.81 | 966. | 323. | 0.162 | 43.50 | 1.178D |
| PB-212 | 153.89 | 77.11 | 1059. | 464. | 0.232 | 24.58 | 1.179A |
| CD-109 | 173.78 | 87.06 | 1654. | 147. | 0.074 | 119.56 | 1.500s |
| TH-234 | 186.29 | 93.31 | 1759. | 145. | 0.072 | 109.98 | 1.500s |
| RA-226 | 371.55 | 185.95 | 887. | 258. | 0.129 | 59.99 | 1.432s |
| TH-227 | 471.08 | 235.72 | 1951. | -214. | -0.107 | 89.97 | 1.500s |
| PB-212 | 476.89 | 238.63 | 708. | 1204. | 0.602 | 12.55 | 1.297D |
| PB-214 | 483.47 | 241.92 | 847. | 199. | 0.099 | 65.10 | 1.299D |
| PB-214 | 590.42 | 295.40 | 591. | 368. | 0.184 | 37.13 | 2.149s |
| AC-228 | 676.41 | 338.40 | 491. | 402. | 0.201 | 34.00 | 2.155s |
| PB-214 | 703.57 | 351.98 | 425. | 596. | 0.298 | 22.02 | 2.407s |
| SB-125 | 926.53 | 463.47 | 245. | 68. | 0.034 | 100.39 | 1.500s |
| TL-208 | 1022.19 | 511.30 | 232. | 189. | 0.095 | 38.45 | 1.679s |
| TL-208 | 1166.12 | 583.27 | 222. | 613. | 0.306 | 18.60 | 2.141s |
| BI-214 | 1218.82 | 609.62 | 142. | 524. | 0.262 | 17.04 | 2.338s |
| BI-212 | 1454.69 | 727.56 | 99. | 124. | 0.062 | 46.58 | 2.020s |
| CS-134 | 1589.80 | 795.12 | 117. | 42. | 0.021 | 117.50 | 1.684s |
| AC-228 | 1821.96 | 911.20 | 153. | 466. | 0.233 | 21.23 | 2.314s |
| AC-228 | 1935.40 | 967.92 | 162. | 357. | 0.178 | 27.22 | 1.666s |
| BI-214 | 2241.76 | 1121.09 | 219. | 149. | 0.074 | 68.71 | 1.352s |
| K-40 | 2922.12 | 1461.26 | 35. | 2089. | 1.044 | 6.76 | 2.806s |
| BI-212 | 3239.55 | 1619.96 | 22. | 25. | 0.013 | 121.02 | 0.925s |
| BI-214 | 3530.27 | 1765.31 | 7. | 112. | 0.056 | 30.39 | 0.850s |

s - Peak fails shape tests.
D - Peak area deconvoluted.
A Derived peak area.

***** S U M M A R Y O F L I B R A R Y P E A K U S A G E *****

| - Nuclide - Name | Code | Average Activity pCi/gm | Peak Energy keV | Peak Activity pCi/gm | Code | MDA Value pCi/gm | COMMENTS |
|---|---|---|---|---|---|---|---|
| BE-7 | | 2.1735E-02 | | | | | |
| | | | 477.56 | 2.173E-02 | &( | 2.574E-01 7.55E-02 | G |
| K-40 | | 1.7112E+01 | | | | | |
| | | | 1460.75 | 1.711E+01 | *(P | 2.491E-01 3.87E-01 | G |
| MN-54 | | 1.6038E-02 | | | | | |
| | | | 834.81 | 1.604E-02 | &(P | 2.948E-02 8.99E-03 | G |
| CO-57 | | 6.2479E-03 | | | | | |
| | | | 122.07 | 6.248E-03 | &(P | 3.636E-02 1.09E-02 | G K |
| | | | 136.43 | -2.182E-02 | % P | 2.982E-01 8.92E-02 | G |
| CO-60 | | 1.2545E-02 | | | | | |
| | | | 1332.51 | 1.255E-02 | %(P | 2.842E-02 8.42E-03 | G K |
| | | | 1173.23 | -4.481E-03 | % P | 4.322E-02 1.24E-02 | G K |
| Sr-85 | | -1.4103E-02 | | | | | |
| | | | 514.00 | -1.410E-02 | &( | 3.852E-02 1.16E-02 | G |
| Kr-85 | | -3.3577E+02 | | | | | |
| | | | 513.99 | -3.358E+02 | &(P | 8.448E+02 2.53E+02 | G |
| Y-88 | | 5.1863E-03 | | | | | |
| | | | 1836.01 | 5.186E-03 | %(P | 2.182E-02 6.12E-03 | G K |
| | | | 898.02 | -1.681E-03 | % P | 3.733E-02 1.07E-02 | G |
| NB-94 | | 5.3283E-03 | | | | | |
| | | | 871.10 | 5.328E-03 | %(P | 2.907E-02 8.52E-03 | G K |
| | | | 702.50 | -4.558E-04 | & P | 3.227E-02 9.37E-03 | G K |
| Ag-108M | | -8.3579E-03 | | | | | |
| | | | 722.95 | -8.358E-03 | %( | 3.946E-02 1.17E-02 | G K |
| | | | 614.37 | -2.625E-02 | % | 4.324E-02 1.32E-02 | G |
| | | | 433.93 | 4.135E-03 | % P | 2.937E-02 8.67E-03 | G |
| CD-109 | | 8.4491E-01 | | | | | |
| | | | 88.04 | 8.449E-01 | &(P | 1.104E+00 3.37E-01 | G |
| SN-113 | | -1.7700E-02 | | | | | |
| | | | 391.71 | -1.770E-02 | %(P | 4.305E-02 1.29E-02 | G K |
| | | | 255.04 | 3.609E-01 | & | 1.217E+00 3.65E-01 | G |

| Nuclide | Ave activity | Energy | Activity | Code | Peak | MDA | Comments |
|---|---|---|---|---|---|---|---|
| SB-125 | 7.4571E-02 | | | | | | |
| | | 427.95 | 1.546E-02 | %(P | 8.278E-02 | 2.45E-02 | G K |
| | | 600.77 | 5.123E-03 | % P | 1.527E-01 | 4.44E-02 | G |
| | | 636.15 | 1.098E-02 | & P | 2.292E-01 | 6.63E-02 | G |
| | | 463.51 | 2.495E-01 | *(P | 2.794E-01 | 8.70E-02 | G |
| | | 176.29 | -3.623E-03 | % P | 4.558E-01 | 1.36E-01 | G |
| I-131 | -1.9025E-04 | | | | | | |
| | | 364.48 | -1.902E-04 | %( | 4.720E-02 | 1.38E-02 | G K |
| | | 636.97 | 1.355E-01 | & | 4.422E-01 | 1.31E-01 | G |
| | | 284.29 | 5.651E-02 | & | 6.982E-01 | 2.07E-01 | G |
| CS-134 | 1.1356E-02 | | | | | | |
| | | 604.66 | -2.819E-03 | %(P | 6.574E-02 | 1.96E-02 | G K |
| | | 795.76 | 2.756E-02 | *(P | 3.499E-02 | 1.09E-02 | G |
| | | 569.29 | -3.299E-03 | % | 1.609E-01 | 4.66E-02 | G |
| | | 801.84 | -4.684E-03 | % P | 2.519E-01 | 7.11E-02 | G |
| CS-137 | 2.3107E-03 | | | | | | |
| | | 661.62 | 2.311E-03 | %(P | 3.772E-02 | 1.10E-02 | G |
| CE-139 | -3.5499E-04 | | | | | | |
| | | 165.85 | -3.550E-04 | %(P | 3.800E-02 | 1.13E-02 | G |
| EU-152 | 1.7804E-02 | | | | | | |
| | | 121.78 | 1.780E-02 | &(P | 1.082E-01 | 3.25E-02 | G K |
| | | 344.30 | -2.713E-02 | % P | 1.058E-01 | 3.16E-02 | G |
| | | 1408.08 | -2.852E-03 | % P | 1.138E-01 | 3.09E-02 | G |
| | | 964.00 | 1.871E-03 | & P | 3.137E-01 | 9.16E-02 | G |
| | | 1112.07 | -5.507E-02 | % P | 2.866E-01 | 8.41E-02 | G |
| | | 778.90 | -2.047E-02 | % P | 2.422E-01 | 7.05E-02 | G |
| EU-154 | -1.3629E-02 | | | | | | |
| | | 123.10 | -1.363E-02 | %(P | 8.023E-02 | 2.41E-02 | G K |
| | | 1274.80 | -1.599E-02 | % P | 1.181E-01 | 3.45E-02 | G |
| | | 723.30 | -7.804E-02 | % P | 1.968E-01 | 5.92E-02 | G |
| | | 1004.80 | 6.046E-02 | % P | 1.794E-01 | 5.35E-02 | G |
| EU-155 | 8.3393E-02 | | | | | | |
| | | 86.45 | 8.339E-02 | %( | 1.401E-01 | 4.26E-02 | G K |
| | | 105.31 | 8.285E-03 | & P | 1.530E-01 | 4.58E-02 | G |
| HG-203 | -4.0646E-04 | | | | | | |
| | | 279.17 | -4.065E-04 | &(P | 3.195E-02 | 9.41E-03 | G K |
| | | 72.87 | -3.462E-01 | & P | 1.067E+00 | 3.22E-01 | G |
| | | 70.83 | 1.133E-01 | % | 1.390E+00 | 4.16E-01 | G |
| | | 82.50 | -1.091E+00 | % | 2.227E+00 | 6.76E-01 | G |

| Nuclide | Ave activity | Energy | Activity | Code | Peak | MDA | Comments |
|---|---|---|---|---|---|---|---|
| TL-208 | 3.1832E-01 | | | | | | |
| | | 583.14 | 3.142E-01 | *(P | 3.698E-02 | 1.96E-02 | G |
| | | 510.72 | 3.342E-01 | *(P | 1.300E-01 | 5.05E-02 | G |
| PB-212 | 6.4360E-01 | | | | | | |
| | | 238.63 | 6.289E-01 | (P | 6.619E-02 | 2.67E-02 | G K |
| | | | | | | | Energy duplication |
| | | 77.11 | 6.431E-01 | } | | 2.142E-01 | 5.27E-02 G |
| | | 74.81 | 8.488E-01 | + P | 3.872E-01 | 1.25E-01 | G |
| PB-214 | 4.8299E-01 | | | | | | |
| | | 351.99 | 4.753E-01 | *(P | 7.884E-02 | 3.52E-02 | G K |
| | | 295.22 | 4.979E-01 | *(P | 1.567E-01 | 6.24E-02 | G |
| | | | | | | | Energy duplication |
| | | 77.11 | 4.992E-02 | } P | 4.522E-01 | 1.26E-01 | G |
| | | 241.92 | 6.047E-01 | + P | 4.204E-01 | 1.32E-01 | G |
| BI-212 | 5.4955E-01 | | | | | | |
| | | 727.17 | 5.496E-01 | *(P | 2.172E-01 | 8.63E-02 | G K |
| | | 1620.56 | 8.796E-01 | + P | 8.389E-01 | 3.62E-01 | G |
| | | 785.42 | 3.342E-01 | % P | 1.618E+00 | 4.77E-01 | G |
| BI-214 | 5.1855E-01 | | | | | | |
| | | 609.32 | 5.185E-01 | *(P | 5.764E-02 | 2.97E-02 | G K |
| | | 1764.51 | 7.138E-01 | + P | 9.517E-02 | 7.29E-02 | G |
| | | 1120.28 | 7.126E-01 | + P | 3.433E-01 | 1.64E-01 | G |
| RA-224 | -5.0310E-02 | | | | | | |
| | | 241.00 | -5.031E-02 | &(P | 8.399E-01 | 2.50E-01 | G |
| RA-226 | 1.5621E+00 | | | | | | |
| | | 185.99 | 1.562E+00 | *( | 8.582E-01 | 3.12E-01 | G |
| AC-228 | 9.8500E-01 | | | | | | |
| | | 911.07 | 9.946E-01 | *(P | 1.286E-01 | 7.11E-02 | G K |
| | | 968.90 | 1.323E+00 | + P | 2.300E-01 | 1.21E-01 | G |
| | | 338.40 | 9.619E-01 | *(P | 2.533E-01 | 1.10E-01 | G |
| TH-227 | -4.2768E-01 | | | | | | |
| | | 236.00 | -4.277E-01 | ?(P | 4.164E-01 | 1.28E-01 | G K |
| | | 256.25 | -5.154E-02 | & P | 4.076E-01 | 1.21E-01 | G |
| PA-234 | 7.4981E-03 | | | | | | |
| | | 98.44 | 7.498E-03 | %( | 1.108E-01 | 3.31E-02 | G K |
| | | 946.00 | 6.925E-02 | % | 1.394E-01 | 4.24E-02 | G |
| | | 131.28 | 5.607E-02 | & | 1.500E-01 | 4.53E-02 | G |
| | | 94.67 | -1.446E-01 | % | 2.619E-01 | 7.96E-02 | G |
| | | 883.24 | -6.440E-03 | & | 2.580E-01 | 7.44E-02 | G |
| | | 926.70 | -2.108E-02 | % | 3.234E-01 | 9.41E-02 | G |

| Nuclide | Ave activity | Energy | Activity | Code | Peak | MDA | Comments |
|---|---|---|---|---|---|---|---|
| | | 569.26 | -2.859E-03 % | | 2.371E-01 | 6.86E-02 | G |
| TH-234 | 3.9674E-01 | | | | | | |
| | | 63.29 | -7.420E-02 &(P | | 1.739E+00 | 5.18E-01 | G K |
| | | 92.80 | 1.009E+00 (P | | 1.379E+00 | 4.20E-01 | G |
| | | 92.38 | -1.690E-01 % P | | 1.602E+00 | 4.79E-01 | G |
| AM-241 | 3.4036E-02 | | | | | | |
| | | 59.54 | 3.404E-02 &(P | | 1.913E-01 | 5.74E-02 | G |

( - This peak used in the nuclide activity average.

* - Peak is too wide, but only one peak in library.
! - Peak is part of a multiplet and this area went negative during deconvolution.
? - Peak is too narrow.
@ - Peak is too wide at FW25M, but ok at FWHM.
% - Peak fails sensitivity test.
$ - Peak identified, but first peak of this nuclide failed one or more qualification tests.
+ - Peak activity higher than counting uncertainty range.
- - Peak activity lower than counting uncertainty range.
= - Peak outside analysis energy range.
& - Calculated peak centroid is not close enough to the library energy centroid for positive identification.
P - Peakbackground subtraction
} - Peak is too close to another for the activity to be found directly.

| Nuclide Codes: | Peak Codes: |
|---|---|
| T - Thermal Neutron Activation | G - Gamma Ray |
| F - Fast Neutron Activation | X - X-Ray |
| I - Fission Product | P - Positron Decay |
| N - Naturally Occurring Isotope | S - Single-Escape |
| P - Photon Reaction | D - Double-Escape |
| C - Charged Particle Reaction | K - Key Line |
| M - No MDA Calculation | A - Not in Average |
| R - Coincidence Corrected | C - Coincidence Peak |
| H - Halflife limit exceeded | |

- - - - - - - - - - - - - - - - - - - - - - - - - - - - - - - - - - - - -

***** S U M M A R Y O F N U C L I D E S I N S A M P L E *****

| Nuclide | | Time of Count Activity pCi/gm | Time Corrected Activity pCi/gm | Uncertainty 3 Sigma Counting pCi/gm | Total pCi/gm | MDA pCi/gm |
|---|---|---|---|---|---|---|
| BE-7 | #A | 2.0319E-02 | 2.1735E-02 | 2.2640E-01 | 2.2640E-01 | 2.406E-01 |
| K-40 | # | 1.7112E+01 | 1.7112E+01 | 1.1601E+00 | 1.5386E+00 | |
| MN-54 | #A | 1.5855E-02 | 1.6038E-02 | 2.6982E-02 | 2.6999E-02 | 2.914E-02 |
| CO-57 | #B | 6.1652E-03 | 6.2479E-03 | 3.2738E-02 | 3.2740E-02 | 3.588E-02 |
| CO-60 | #B | 1.2522E-02 | 1.2545E-02 | 2.5274E-02 | 2.5285E-02 | 2.837E-02 |

| | | | | | | |
|---|---|---|---|---|---|---|
| Sr-85 | #A | -1.3342E-02 | -1.4103E-02 | 3.4809E-02 | 3.4819E-02 | 3.645E-02 |
| Kr-85 | #A | -3.3576E+02 | -3.3577E+02 | 8.9733E+02 | 8.9755E+02 | 8.448E+02 |
| Y-88 | #B | 5.0142E-03 | 5.1863E-03 | 1.8365E-02 | 1.8368E-02 | 2.110E-02 |
| NB-94 | #B | 5.3283E-03 | 5.3283E-03 | 2.5547E-02 | 2.5549E-02 | 2.907E-02 |
| Ag-108M | #B | -8.3572E-03 | -8.3579E-03 | 3.5128E-02 | 3.5132E-02 | 3.946E-02 |
| CD-109 | #A | 8.3823E-01 | 8.4491E-01 | 1.0124E+00 | 1.0135E+00 | 1.095E+00 |
| SN-113 | #B | -1.7156E-02 | -1.7700E-02 | 4.3166E-02 | 4.3179E-02 | 4.173E-02 |
| SB-125 | #B | 7.4307E-02 | 7.4571E-02 | 7.7978E-02 | 7.8103E-02 | 8.248E-02 |
| I-131 | #B | -1.2162E-04 | -1.9025E-04 | 4.1539E-02 | 4.1539E-02 | 3.017E-02 |
| CS-134 | #B | 1.1302E-02 | 1.1356E-02 | 1.3512E-02 | 1.3529E-02 | 6.543E-02 |
| CS-137 | #A | 2.3099E-03 | 2.3107E-03 | 3.2947E-02 | 3.2947E-02 | 3.771E-02 |
| CE-139 | #A | -3.4582E-04 | -3.5499E-04 | 5.5090E-02 | 5.5090E-02 | 3.702E-02 |
| EU-152 | #B | 1.7790E-02 | 1.7804E-02 | 9.7414E-02 | 9.7419E-02 | 1.081E-01 |
| EU-154 | #B | -1.3613E-02 | -1.3629E-02 | 7.4996E-02 | 7.4999E-02 | 8.013E-02 |
| EU-155 | #B | 8.3227E-02 | 8.3393E-02 | 1.2792E-01 | 1.2800E-01 | 1.399E-01 |
| HG-203 | #B | -3.7625E-04 | -4.0646E-04 | 1.0900E+00 | 1.0900E+00 | 2.957E-02 |
| TL-208 | # | 3.1832E-01 | 3.1832E-01 | 5.9647E-02 | 6.2539E-02 | |
| PB-212 | | 6.4360E-01 | 6.4360E-01 | 8.1844E-02 | 9.0241E-02 | |
| PB-214 | | 4.8299E-01 | 4.8299E-01 | 1.0543E-01 | 1.0922E-01 | |
| BI-212 | | 5.4955E-01 | 5.4955E-01 | 2.5866E-01 | 2.6069E-01 | |
| BI-214 | # | 5.1855E-01 | 5.1855E-01 | 8.9073E-02 | 9.4191E-02 | |
| RA-224 | #A | -5.0310E-02 | -5.0310E-02 | 1.2720E+00 | 1.2720E+00 | 8.399E-01 |
| RA-226 | # | 1.5620E+00 | 1.5621E+00 | 9.3710E-01 | 9.4163E-01 | |
| AC-228 | # | 9.8500E-01 | 9.8500E-01 | 1.9905E-01 | 2.0738E-01 | |
| TH-227 | #A | -4.2768E-01 | -4.2768E-01 | 3.8529E-01 | 3.8611E-01 | 4.164E-01 |
| PA-234 | #B | 7.4981E-03 | 7.4981E-03 | 9.9175E-02 | 9.9176E-02 | 1.108E-01 |
| TH-234 | #B | 3.9674E-01 | 3.9674E-01 | 4.9569E-01 | 4.9618E-01 | 1.739E+00 |
| AM-241 | #A | 3.4036E-02 | 3.4036E-02 | 1.7221E-01 | 1.7222E-01 | 1.913E-01 |

# - All peaks for activity calculation had bad shape.
* - Activity omitted from total
& - Activity omitted from total and all peaks had bad shape.
< - MDA value printed.
A - Activity printed, but activity < MDA.
B - Activity < MDA and failed test.
C - Area < Critical level.
F - Failed fraction or key line test.
H - Halflife limit exceeded

---------- S U M M A R Y ----------

Total Activity ( 295.2 to 2000.1 keV) 2.2172028E+01 pCi/gm
Total Decayed Activity ( 295.2 to 2000.1 keV) 2.2172037E+01 pCi/gm

The library has energies which are not separable.

Analyzed by: _____
JPK

Reviewed by: _____
Supervisor

Laboratory: YAEC Chemistry Lab

YAEC Chemistry Lab Spectrum name: 107F_16SEPT2006_0901.An1

Sample description
FSS-SSS-01-01-033-F-B

Spectrum Filename: C:\GammaVision\Spectra\107F_16SEPT2006_0901.An1

Acquisition information

| | |
|---|---|
| Start time: | 16-Sep-2006 09:01:57 |
| Live time: | 2000 |
| Real time: | 2005 |
| Dead time: | 0.27 % |
| Detector ID: | 2 |

Detector system
Det 107- DSPE- 634

Calibration

| | |
|---|---|
| Filename: | D7_1LSa.Clb |

Detector 107 Calibration for 1 Liter Sand Marinelli

Energy Calibration

| | |
|---|---|
| Created: | 29-Oct-2004 06:48:53 |
| Zero offset: | 0.157 keV |
| Gain: | 0.500 keV/channel |
| Quadratic: | -1.676E-08 keV/channel^2 |

Efficiency Calibration

| | |
|---|---|
| Created: | 29-Oct-2004 06:51:32 |
| Type: | Polynomial |
| Uncertainty: | 1.174 % |
| Coefficients: | -0.279532 -4.778179 0.614896 |
| | -0.087174 0.005356 -0.000131 |

Library Files

| | |
|---|---|
| Main analysis library: | FSS_Rev_1.Lib |
| Library Match Width: | 1.000 |
| Peak stripping: | Library based |

Analysis parameters

| | |
|---|---|
| Analysis engine: | Env32 G53W4.20 |
| Start channel: | 100 ( 50.16keV ) |
| Stop channel: | 4000 ( 2000.15keV ) |
| Peak rejection level: | 41.667% |
| Peak search sensitivity: | 3 |
| Sample Size: | 1.9110E+03 |
| Activity scaling factor: | 1.0000E+06/( 1.0000E+00* 1.9110E+03) = 5.2329E+02 |
| Detection limit method: | Nureg 4.16 |
| Random error: | 1.0000000E+00 |
| Systematic error: | 1.0000000E+00 |

| | |
|---|---|
| Fraction Limit: | 0.000% |
| Background width: | average of five points. |

YAEC Chemistry Lab Spectrum name: 107F_16SEPT2006_0901.An1

Half lives decay limit: 12.000
Activity range factor: 2.000
Min. step backg. energy 0.000
Multiplet shift channel 2.000

| Corrections | Status | Comments |
|---|---|---|
| Decay correct to date: | YES | 10-Sep-2006 11:45:00 |
| Decay during acquisition: | NO | |
| Decay during collection: | NO | |
| True coincidence correction: | NO | |
| Peaked background correction: | YES | 107_150K_28APR05.Pbc 01-May-2005 05:30:33 |
| Absorption (Internal): | NO | |
| Geometry correction: | NO | |
| Random summing: | NO | |

total peaks alloc. 14 cutoff 20.00000 %
Energy Calibration
Normalized diff: 1.0000

***** S U M M A R Y O F P E A K S I N R A N G E *****

| Peak Energy | Area | Uncert | FWHM | Corrctn Factor | Nuclide Energy | Brnch. Ratio | Act. pCi/gm | Nuc |
|---|---|---|---|---|---|---|---|---|
| 76.10 | 974. | 8.07 | 4.54 | 2.912E-02 | 72.87 | 6.400 | 4.272E+00 | HG203 |
| | | | | | 74.81 | 9.600 | 2.509E+00 | PB212 |
| | | | | | 77.11 | 10.700 | 2.167E+00 | PB214 |
| | | | | | 77.11 | 17.500 | 1.332E+00 | PB212 |
| 239.17 | 1877. | 3.87 | 2.95 | 3.185E-02 | 238.63 | 43.100 | 9.575E-01 | PB212 |
| | | | | | 241.00 | 3.900 | 1.072E+01 | RA224 |
| 270.75 | 85. | 31.65 | 1.49 | 2.941E-02 | | | | |
| 295.37 | 149. | 23.89 | 1.50 | 2.768E-02 | 295.22 | 19.200 | 1.982E-01 | PB214 |
| 338.59 | 283. | 13.51 | 2.09 | 2.499E-02 | 338.40 | 12.010 | 6.586E-01 | AC228 |
| 352.00 | 706. | 7.45 | 2.71 | 2.426E-02 | 351.99 | 37.100 | 5.506E-01 | PB214 |
| 463.37 | 118. | 27.86 | 1.64 | 1.953E-02 | | | | |
| 463.37 | 118. | 27.86 | 1.64 | 1.953E-02 | 463.51 | 10.000 | 4.188E-01 | SB125 |
| 510.92 | 205. | 16.81 | 2.56 | 1.808E-02 | 510.72 | 22.500 | 3.562E-01 | TL208 |
| 583.40 | 463. | 8.42 | 2.81 | 1.628E-02 | 583.14 | 86.000 | 2.314E-01 | TL208 |
| 609.74 | 522. | 7.42 | 3.13 | 1.573E-02 | 604.66 | 97.600 | 2.400E-01 | CS134 |
| | | | | | 609.32 | 46.090 | 5.048E-01 | BI214 |
| | | | | | 614.37 | 90.393 | 2.613E-01 | Ag108M |
| 727.49 | 63. | 30.47 | 1.64 | 1.374E-02 | 727.17 | 11.800 | 2.729E-01 | BI212 |
| 911.76 | 382. | 8.01 | 2.59 | 1.160E-02 | 911.07 | 29.000 | 7.933E-01 | AC228 |
| 968.44 | 281. | 9.34 | 3.12 | 1.109E-02 | 964.00 | 14.580 | 1.227E+00 | EU152 |
| | | | | | 968.90 | 17.460 | 1.028E+00 | AC228 |
| 1119.70 | 137. | 18.00 | 3.05 | 9.970E-03 | 1120.28 | 15.040 | 6.466E-01 | BI214 |
| 1461.14 | 1950. | 2.34 | 3.26 | 8.189E-03 | 1460.75 | 10.700 | 1.570E+01 | K40 |
| 1764.78 | 71. | 13.47 | 1.61 | 7.084E-03 | 1764.51 | 15.920 | 4.421E-01 | BI214 |

********** U N I D E N T I F I E D P E A K S U M M A R Y **********

| Peak Channel | Centroid Energy | Background Counts | Net Area Counts | Intensity Cts/Sec | Uncert 3 Sigma % | FWHM keV | Suspected Nuclide | |
|---|---|---|---|---|---|---|---|---|
| 151.87 | 76.10 | 2304. | 466. | 0.233 | 45.81 | 4.539 | BI-207 | s |
| 477.23 | 239.17 | 829. | 875. | 0.437 | 17.26 | 1.297 | PB-212 | D |
| 541.12 | 270.75 | 306. | 85. | 0.043 | 94.96 | 1.494 | AC-228 | s |
| 703.61 | 352.00 | 847. | 361. | 0.180 | 37.69 | 2.709 | PB-214 | s |

s - Peak fails shape tests.
D - Peak area deconvoluted.
L - Peak written from unknown list.
C - Area < Critical level.

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This section based on library: FSS_Rev_1.Lib

********** I D E N T I F I E D P E A K S U M M A R Y **********

| Nuclide | Peak Channel | Centroid Energy | Background Counts | Net Area Counts | Intensity Cts/Sec | Uncert 3 Sigma % | FWHM keV | |
|---|---|---|---|---|---|---|---|---|
| PB-212 | 151.89 | 76.11 | 2370. | 195. | 0.097 | 105.98 | 1.500 | s |
| PB-214 | 153.89 | 77.11 | 2091. | 304. | 0.152 | 64.95 | 1.500 | D |
| PB-212 | 153.89 | 77.11 | 2086. | 309. | 0.155 | 64.95 | 1.500 | D |
| TH-227 | 469.88 | 235.12 | 1612. | -172. | -0.086 | 101.61 | 1.500 | s |
| PB-212 | 477.50 | 238.93 | 1392. | 841. | 0.420 | 21.05 | 1.500 | s |
| RA-224 | 481.63 | 241.00 | 1072. | 417. | 0.208 | 36.23 | 1.298 | D |
| PB-214 | 590.36 | 295.37 | 600. | 149. | 0.074 | 71.66 | 1.500 | s |
| AC-228 | 676.80 | 338.59 | 383. | 280. | 0.140 | 40.54 | 2.091 | s |
| PB-214 | 703.59 | 351.99 | 515. | 340. | 0.170 | 32.12 | 1.500 | D |
| SB-125 | 927.25 | 463.83 | 236. | 60. | 0.030 | 109.72 | 1.500 | s |
| TL-208 | 1021.43 | 510.92 | 360. | 205. | 0.102 | 50.44 | 2.560 | s |
| TL-208 | 1166.37 | 583.40 | 269. | 458. | 0.229 | 25.25 | 2.805 | s |
| BI-214 | 1219.07 | 609.74 | 243. | 518. | 0.259 | 22.25 | 3.127 | s |
| BI-212 | 1454.55 | 727.49 | 159. | 63. | 0.031 | 91.41 | 1.638 | s |
| AC-228 | 1823.08 | 911.76 | 146. | 378. | 0.189 | 24.03 | 2.586 | s |
| AC-228 | 1936.44 | 968.44 | 110. | 281. | 0.141 | 28.02 | 3.116 | s |
| BI-214 | 2238.97 | 1119.70 | 127. | 137. | 0.069 | 53.99 | 3.054 | s |
| K-40 | 2921.88 | 1461.14 | 37. | 1945. | 0.973 | 7.02 | 3.257 | s |
| BI-214 | 3529.20 | 1764.78 | 7. | 71. | 0.035 | 40.41 | 1.611 | s |

s - Peak fails shape tests.
D - Peak area deconvoluted.
A Derived peak area.

***** S U M M A R Y O F L I B R A R Y P E A K U S A G E *****

| - Nuclide - Name | Code | Average Activity pCi/gm | Peak Energy keV | Peak Activity pCi/gm | Peak Code | Peak MDA Value pCi/gm | COMMENTS |
|---|---|---|---|---|---|---|---|
| BE-7 | | -4.9277E-02 | | | | | |
| | | | 477.56 | -4.928E-02 | %( | 2.364E-01 6.99E-02 | G |
| K-40 | | 1.5695E+01 | | | | | |
| | | | 1460.75 | 1.570E+01 | *(P | 2.497E-01 3.68E-01 | G |
| MN-54 | | -3.1351E-04 | | | | | |
| | | | 834.81 | -3.135E-04 | %(P | 3.154E-02 9.08E-03 | G |
| CO-57 | | -9.3269E-03 | | | | | |
| | | | 122.07 | -9.327E-03 | %(P | 3.664E-02 1.10E-02 | G K |
| | | | 136.43 | 1.567E-03 | & P | 2.384E-01 7.09E-02 | G |
| CO-60 | | -3.0396E-03 | | | | | |
| | | | 1332.51 | -3.040E-03 | %(P | 3.824E-02 1.07E-02 | G K |
| | | | 1173.23 | -3.419E-03 | % P | 4.216E-02 1.20E-02 | G K |
| Sr-85 | | -1.2623E-02 | | | | | |
| | | | 514.00 | -1.262E-02 | &( | 3.850E-02 1.16E-02 | G |
| Kr-85 | | -3.0101E+02 | | | | | |
| | | | 513.99 | -3.010E+02 | &(P | 8.379E+02 2.51E+02 | G |
| Y-88 | | -1.2829E-03 | | | | | |
| | | | 1836.01 | -1.283E-03 | &(P | 2.323E-02 6.04E-03 | G K |
| | | | 898.02 | 4.401E-03 | % P | 3.027E-02 8.77E-03 | G |
| NB-94 | | 6.4518E-04 | | | | | |
| | | | 871.10 | 6.452E-04 | &(P | 2.746E-02 7.87E-03 | G K |
| | | | 702.50 | 8.706E-03 | & P | 2.705E-02 8.06E-03 | G K |
| Ag-108M | | -1.5344E-02 | | | | | |
| | | | 722.95 | -1.534E-02 | &( | 4.176E-02 1.26E-02 | G K |
| | | | 614.37 | -3.377E-02 | % | 4.796E-02 1.47E-02 | G |
| | | | 433.93 | -7.693E-04 | % P | 2.684E-02 7.80E-03 | G |
| CD-109 | | 4.2165E-01 | | | | | |
| | | | 88.04 | 4.216E-01 | %(P | 1.063E+00 3.22E-01 | G |
| SN-113 | | 7.2155E-03 | | | | | |
| | | | 391.71 | 7.216E-03 | %(P | 3.802E-02 1.13E-02 | G K |
| | | | 255.04 | 1.636E-02 | % | 1.096E+00 3.23E-01 | G |

| Nuclide | Ave activity | Energy | Activity | Code | Peak | MDA | Comments |
|---|---|---|---|---|---|---|---|
| SB-125 | 4.8594E-02 | | | | | | |
| | | 427.95 | -8.738E-03 | %(P | 7.992E-02 | 2.34E-02 | G K |
| | | 600.77 | 1.186E-02 | % P | 1.405E-01 | 4.09E-02 | G |
| | | 636.15 | -1.123E-02 | % P | 2.394E-01 | 6.93E-02 | G |
| | | 463.51 | 2.183E-01 | *(P | 2.699E-01 | 8.36E-02 | G |
| | | 176.29 | 4.414E-02 | & P | 4.537E-01 | 1.36E-01 | G |
| I-131 | -3.9085E-04 | | | | | | |
| | | 364.48 | -3.908E-04 | %( | 4.725E-02 | 1.38E-02 | G K |
| | | 636.97 | -9.375E-02 | & | 6.160E-01 | 1.81E-01 | G |
| | | 284.29 | 5.204E-02 | % | 6.863E-01 | 2.04E-01 | G |
| CS-134 | 1.2391E-02 | | | | | | |
| | | 604.66 | 1.239E-02 | %(P | 3.450E-02 | 1.04E-02 | G K |
| | | 795.76 | 4.840E-03 | % P | 3.848E-02 | 1.13E-02 | G |
| | | 569.29 | -1.609E-02 | % | 1.731E-01 | 5.07E-02 | G |
| | | 801.84 | -7.541E-02 | & P | 3.215E-01 | 9.47E-02 | G |
| CS-137 | 1.5189E-02 | | | | | | |
| | | 661.62 | 1.519E-02 | %(P | 3.808E-02 | 1.14E-02 | G |
| CE-139 | -8.3066E-05 | | | | | | |
| | | 165.85 | -8.307E-05 | &(P | 3.538E-02 | 1.05E-02 | G |
| EU-152 | -3.1878E-02 | | | | | | |
| | | 121.78 | -3.188E-02 | &(P | 1.065E-01 | 3.21E-02 | G K |
| | | 344.30 | -3.358E-02 | % P | 1.019E-01 | 3.06E-02 | G |
| | | 1408.08 | 4.059E-02 | & P | 1.095E-01 | 3.24E-02 | G |
| | | 964.00 | -8.386E-02 | & P | 3.541E-01 | 1.06E-01 | G |
| | | 1112.07 | -2.452E-02 | % P | 2.703E-01 | 7.83E-02 | G |
| | | 778.90 | -6.431E-02 | % P | 2.515E-01 | 7.45E-02 | G |
| EU-154 | -2.3349E-02 | | | | | | |
| | | 123.10 | -2.335E-02 | %(P | 7.297E-02 | 2.20E-02 | G K |
| | | 1274.80 | 3.094E-02 | & P | 1.029E-01 | 3.05E-02 | G |
| | | 723.30 | -7.458E-02 | & P | 2.006E-01 | 6.03E-02 | G |
| | | 1004.80 | 4.183E-02 | % P | 1.908E-01 | 5.62E-02 | G |
| EU-155 | 4.9841E-02 | | | | | | |
| | | 86.45 | 4.984E-02 | &( | 1.336E-01 | 4.04E-02 | G K |
| | | 105.31 | -1.972E-03 | & P | 1.400E-01 | 4.18E-02 | G |
| HG-203 | -9.3472E-04 | | | | | | |
| | | 279.17 | -9.347E-04 | %(P | 3.527E-02 | 1.04E-02 | G K |
| | | 72.87 | 6.217E-01 | % P | 9.158E-01 | 2.79E-01 | G |
| | | 70.83 | 9.500E-01 | & | 1.494E+00 | 4.55E-01 | G |
| | | 82.50 | 2.525E-01 | % | 2.148E+00 | 6.45E-01 | G |

| Nuclide | Ave activity | Energy | Activity | Code | Peak | MDA | Comments |
|---|---|---|---|---|---|---|---|
| TL-208 | 2.3141E-01 | | | | | | |
| | | 583.14 | 2.314E-01 | *(P | 3.991E-02 | 1.97E-02 | G |
| | | 510.72 | 3.562E-01 | + P | 1.584E-01 | 6.98E-02 | G |
| PB-212 | 4.3969E-01 | | | | | | |
| | | 238.63 | 4.324E-01 | *(P | 9.084E-02 | 3.09E-02 | G K |
| | | | | | | | Energy duplication |
| | | 77.11 | 4.225E-01 | *( | 2.945E-01 | 9.15E-02 | G |
| | | 74.81 | 5.039E-01 | *(P | 5.934E-01 | 1.82E-01 | G |
| PB-214 | 2.6704E-01 | | | | | | |
| | | | | | | | Energy duplication |
| | | 351.99 | 2.670E-01 | *(P | 8.518E-02 | 2.90E-02 | G K |
| | | 295.22 | 1.982E-01 | - P | 1.555E-01 | 4.88E-02 | G |
| | | | | | | | Energy duplication |
| | | 77.11 | 6.804E-01 | + P | 4.823E-01 | 1.50E-01 | G |
| | | 241.92 | -3.637E-01 | & P | 6.322E-01 | 1.92E-01 | G |
| BI-212 | 2.7285E-01 | | | | | | |
| | | 727.17 | 2.729E-01 | *(P | 2.678E-01 | 8.49E-02 | G K |
| | | 1620.56 | 1.887E-01 | % P | 7.694E-01 | 2.19E-01 | G |
| | | 785.42 | 3.232E-01 | & P | 1.486E+00 | 4.38E-01 | G |
| BI-214 | 4.8873E-01 | | | | | | |
| | | 609.32 | 5.048E-01 | *(P | 7.345E-02 | 3.78E-02 | G K |
| | | 1764.51 | 4.421E-01 | (P | 9.700E-02 | 6.03E-02 | G |
| | | 1120.28 | 6.466E-01 | + P | 2.603E-01 | 1.17E-01 | G |
| RA-224 | 2.3829E+00 | | | | | | |
| | | 241.00 | 2.383E+00 | (P | 8.882E-01 | 2.89E-01 | G |
| RA-226 | 5.3542E-01 | | | | | | |
| | | 185.99 | 5.354E-01 | %( | 8.675E-01 | 2.64E-01 | G |
| AC-228 | 7.9335E-01 | | | | | | |
| | | 911.07 | 7.933E-01 | *(P | 1.241E-01 | 6.43E-02 | G K |
| | | 968.90 | 1.028E+00 | + P | 1.880E-01 | 9.67E-02 | G |
| | | 338.40 | 6.586E-01 | - P | 2.212E-01 | 9.00E-02 | G |
| TH-227 | -3.3892E-01 | | | | | | |
| | | 236.00 | -3.389E-01 | ?(P | 3.733E-01 | 1.15E-01 | G K |
| | | 256.25 | 4.558E-02 | % P | 3.800E-01 | 1.13E-01 | G |
| PA-234 | -1.5325E-02 | | | | | | |
| | | 98.44 | -1.532E-02 | &( | 1.375E-01 | 4.12E-02 | G K |
| | | 946.00 | -8.941E-03 | % | 1.679E-01 | 4.87E-02 | G |
| | | 131.28 | 2.149E-02 | & | 1.414E-01 | 4.24E-02 | G |
| | | 94.67 | -8.724E-02 | % | 2.482E-01 | 7.50E-02 | G |
| | | 883.24 | -6.291E-02 | % | 2.623E-01 | 7.76E-02 | G |
| | | 926.70 | 2.792E-02 | % | 2.071E-01 | 5.96E-02 | G |

| Nuclide | Ave activity | Energy | Activity | Code | Peak MDA | Comments |
|---|---|---|---|---|---|---|
| | | 569.26 | -2.353E-02 % | | 2.554E-01 | 7.48E-02 G |
| TH-234 | -1.7285E-01 | | | | | |
| | | 63.29 | -1.729E-01 &(P | | 1.534E+00 | 4.56E-01 G K |
| | | 92.80 | 2.653E-01 % P | | 1.370E+00 | 4.11E-01 G |
| | | 92.38 | 5.018E-01 % P | | 1.605E+00 | 4.84E-01 G |
| AM-241 | 4.8515E-02 | | | | | |
| | | 59.54 | 4.851E-02 %(P | | 2.068E-01 | 6.22E-02 G |

( - This peak used in the nuclide activity average.

* - Peak is too wide, but only one peak in library.
! - Peak is part of a multiplet and this area went negative during deconvolution.
? - Peak is too narrow.
@ - Peak is too wide at FW25M, but ok at FWHM.
% - Peak fails sensitivity test.
$ - Peak identified, but first peak of this nuclide failed one or more qualification tests.
+ - Peak activity higher than counting uncertainty range.
- - Peak activity lower than counting uncertainty range.
= - Peak outside analysis energy range.
& - Calculated peak centroid is not close enough to the library energy centroid for positive identification.
P - Peakbackground subtraction
} - Peak is too close to another for the activity to be found directly.

| Nuclide Codes: | Peak Codes: |
|---|---|
| T - Thermal Neutron Activation | G - Gamma Ray |
| F - Fast Neutron Activation | X - X-Ray |
| I - Fission Product | P - Positron Decay |
| N - Naturally Occurring Isotope | S - Single-Escape |
| P - Photon Reaction | D - Double-Escape |
| C - Charged Particle Reaction | K - Key Line |
| M - No MDA Calculation | A - Not in Average |
| R - Coincidence Corrected | C - Coincidence Peak |
| H - Halflife limit exceeded | |

- - - - - - - - - - - - - - - - - - - - - - - - - - - - - - - - - - - - -

***** S U M M A R Y O F N U C L I D E S I N S A M P L E *****

| Nuclide | | Time of Count Activity pCi/gm | Time Corrected Activity pCi/gm | Uncertainty 3 Sigma Counting pCi/gm | Total pCi/gm | MDA pCi/gm |
|---|---|---|---|---|---|---|
| BE-7 | #A | -4.5652E-02 | -4.9277E-02 | 2.0977E-01 | 2.0979E-01 | 2.190E-01 |
| K-40 | # | 1.5695E+01 | 1.5695E+01 | 1.1051E+00 | 1.4424E+00 | |
| MN-54 | #A | -3.0943E-04 | -3.1351E-04 | 2.3406E-01 | 2.3406E-01 | 3.113E-02 |
| CO-57 | #B | -9.1871E-03 | -9.3269E-03 | 3.3525E-02 | 3.3529E-02 | 3.609E-02 |
| CO-60 | #B | -3.0331E-03 | -3.0396E-03 | 2.4184E-01 | 2.4184E-01 | 3.816E-02 |

| | | | | | | |
|---|---|---|---|---|---|---|
| Sr-85 | #A | -1.1853E-02 | -1.2623E-02 | 3.4707E-02 | 3.4715E-02 | 3.615E-02 |
| Kr-85 | #A | -3.0099E+02 | -3.0101E+02 | 9.0280E+02 | 9.0297E+02 | 8.379E+02 |
| Y-88 | #B | -1.2348E-03 | -1.2829E-03 | 9.6261E-02 | 9.6262E-02 | 2.235E-02 |
| NB-94 | #B | 6.4518E-04 | 6.4518E-04 | 2.3608E-02 | 2.3608E-02 | 2.746E-02 |
| Ag-108M | #B | -1.5342E-02 | -1.5344E-02 | 3.7679E-02 | 3.7690E-02 | 4.176E-02 |
| CD-109 | #A | 4.1787E-01 | 4.2165E-01 | 9.6476E-01 | 9.6504E-01 | 1.053E+00 |
| SN-113 | #B | 6.9642E-03 | 7.2155E-03 | 3.3788E-02 | 3.3791E-02 | 3.670E-02 |
| SB-125 | #B | 4.8399E-02 | 4.8594E-02 | 5.5818E-02 | 5.5891E-02 | 7.960E-02 |
| I-131 | #B | -2.3529E-04 | -3.9085E-04 | 4.1531E-02 | 4.1531E-02 | 2.844E-02 |
| CS-134 | #B | 1.2324E-02 | 1.2391E-02 | 3.1092E-02 | 3.1101E-02 | 3.431E-02 |
| CS-137 | #A | 1.5183E-02 | 1.5189E-02 | 3.4266E-02 | 3.4278E-02 | 3.806E-02 |
| CE-139 | #A | -8.0638E-05 | -8.3066E-05 | 2.1575E-02 | 2.1575E-02 | 3.435E-02 |
| EU-152 | #B | -3.1850E-02 | -3.1878E-02 | 9.6895E-02 | 9.6911E-02 | 1.064E-01 |
| EU-154 | #B | -2.3318E-02 | -2.3349E-02 | 6.7431E-02 | 6.7444E-02 | 7.287E-02 |
| EU-155 | #B | 4.9729E-02 | 4.9841E-02 | 1.2128E-01 | 1.2131E-01 | 1.333E-01 |
| HG-203 | #B | -8.5634E-04 | -9.3472E-04 | 8.3675E-02 | 8.3675E-02 | 3.231E-02 |
| TL-208 | # | 2.3141E-01 | 2.3141E-01 | 5.9019E-02 | 6.0581E-02 | |
| PB-212 | # | 4.3969E-01 | 4.3969E-01 | 9.4287E-02 | 9.7798E-02 | 9.084E-02 |
| PB-214 | # | 2.6704E-01 | 2.6704E-01 | 8.7050E-02 | 8.8468E-02 | 8.518E-02 |
| BI-212 | # | 2.7285E-01 | 2.7285E-01 | 2.5456E-01 | 2.5507E-01 | 2.678E-01 |
| BI-214 | # | 4.8873E-01 | 4.8873E-01 | 1.0967E-01 | 1.1340E-01 | |
| RA-224 | | 2.3829E+00 | 2.3829E+00 | 8.6794E-01 | 8.7927E-01 | |
| RA-226 | #A | 5.3541E-01 | 5.3542E-01 | 7.9340E-01 | 7.9403E-01 | 8.675E-01 |
| AC-228 | # | 7.9335E-01 | 7.9335E-01 | 1.9281E-01 | 1.9842E-01 | |
| TH-227 | #A | -3.3892E-01 | -3.3892E-01 | 3.4491E-01 | 3.4549E-01 | 3.733E-01 |
| PA-234 | #B | -1.5325E-02 | -1.5325E-02 | 1.2363E-01 | 1.2364E-01 | 1.375E-01 |
| TH-234 | #B | -1.7285E-01 | -1.7285E-01 | 1.1637E+01 | 1.1637E+01 | 1.534E+00 |
| AM-241 | #A | 4.8513E-02 | 4.8515E-02 | 1.8672E-01 | 1.8674E-01 | 2.068E-01 |

# - All peaks for activity calculation had bad shape.
* - Activity omitted from total
& - Activity omitted from total and all peaks had bad shape.
< - MDA value printed.
A - Activity printed, but activity < MDA.
B - Activity < MDA and failed test.
C - Area < Critical level.
F - Failed fraction or key line test.
H - Halflife limit exceeded

---------- S U M M A R Y ----------

Total Activity ( 270.7 to 2000.1 keV) 1.9591660E+01 pCi/gm
Total Decayed Activity ( 270.7 to 2000.1 keV) 1.9591660E+01 pCi/gm

The library has energies which are not separable.

Analyzed by: _____
JJM

Reviewed by: _____
Supervisor

Laboratory: YAEC Chemistry Lab

YAEC Chemistry Lab Spectrum name: 107F_16SEPT2006_0940.An1

Sample description
FSS-SSS-01-01-038-F-B

Spectrum Filename: C:\GammaVision\Spectra\107F_16SEPT2006_0940.An1

Acquisition information

| | |
|---|---|
| Start time: | 16-Sep-2006 09:40:09 |
| Live time: | 2000 |
| Real time: | 2003 |
| Dead time: | 0.16 % |
| Detector ID: | 2 |

Detector system
Det 107- DSPE- 634

Calibration

| | |
|---|---|
| Filename: | D7_1LSa.Clb |

Detector 107 Calibration for 1 Liter Sand Marinelli

Energy Calibration

| | |
|---|---|
| Created: | 29-Oct-2004 06:48:53 |
| Zero offset: | 0.157 keV |
| Gain: | 0.500 keV/channel |
| Quadratic: | -1.676E-08 keV/channel^2 |

Efficiency Calibration

| | |
|---|---|
| Created: | 29-Oct-2004 06:51:32 |
| Type: | Polynomial |
| Uncertainty: | 1.174 % |
| Coefficients: | -0.279532 -4.778179 0.614896 |
| | -0.087174 0.005356 -0.000131 |

Library Files

| | |
|---|---|
| Main analysis library: | FSS_Rev_1.Lib |
| Library Match Width: | 1.000 |
| Peak stripping: | Library based |

Analysis parameters

| | |
|---|---|
| Analysis engine: | Env32 G53W4.20 |
| Start channel: | 100 ( 50.16keV ) |
| Stop channel: | 4000 ( 2000.15keV ) |
| Peak rejection level: | 41.667% |
| Peak search sensitivity: | 3 |
| Sample Size: | 2.0880E+03 |
| Activity scaling factor: | 1.0000E+06/( 1.0000E+00* 2.0880E+03) = 4.7893E+02 |
| Detection limit method: | Nureg 4.16 |
| Random error: | 1.0000000E+00 |
| Systematic error: | 1.0000000E+00 |

| | |
|---|---|
| Fraction Limit: | 0.000% |
| Background width: | average of five points. |

YAEC Chemistry Lab Spectrum name: 107F_16SEPT2006_0940.An1

Half lives decay limit: 12.000
Activity range factor: 2.000
Min. step backg. energy 0.000
Multiplet shift channel 2.000

| Corrections | Status | Comments |
|---|---|---|
| Decay correct to date: | YES | 11-Sep-2006 15:30:00 |
| Decay during acquisition: | NO | |
| Decay during collection: | NO | |
| True coincidence correction: | NO | |
| Peaked background correction: | YES | 107_150K_28APR05.Pbc 01-May-2005 05:30:33 |
| Absorption (Internal): | NO | |
| Geometry correction: | NO | |
| Random summing: | NO | |

total peaks alloc. 13 cutoff 20.00000 %
Energy Calibration
Normalized diff: 1.0000

***** S U M M A R Y O F P E A K S I N R A N G E *****

| Peak Energy | Area | Uncert | FWHM | Corrctn Factor | Nuclide Energy | Brnch. Ratio | Act. pCi/gm | Nuc |
|---|---|---|---|---|---|---|---|---|
| 76.16 | 1088. | 8.18 | 4.41 | 2.914E-02 | 72.87 | 6.400 | 4.293E+00 | HG203 |
| | | | | | 74.81 | 9.600 | 2.565E+00 | PB212 |
| | | | | | 77.11 | 17.500 | 1.361E+00 | PB212 |
| | | | | | 77.11 | 10.700 | 2.216E+00 | PB214 |
| | | | | | 82.50 | 2.240 | 1.067E+01 | HG203 |
| 208.91 | 170. | 27.82 | 1.20 | 3.432E-02 | | | | |
| 239.14 | 2108. | 3.76 | 3.27 | 3.185E-02 | 238.63 | 43.100 | 9.851E-01 | PB212 |
| | | | | | 241.00 | 3.900 | 1.102E+01 | RA224 |
| | | | | | 241.92 | 7.470 | 5.771E+00 | PB214 |
| 295.17 | 232. | 13.89 | 1.34 | 2.768E-02 | | | | |
| 295.17 | 232. | 13.89 | 1.34 | 2.768E-02 | 295.22 | 19.200 | 2.771E-01 | PB214 |
| 299.45 | 87. | 29.72 | 1.34 | 2.739E-02 | | | | |
| 338.81 | 358. | 12.03 | 3.37 | 2.498E-02 | 338.40 | 12.010 | 7.646E-01 | AC228 |
| 352.07 | 766. | 6.65 | 2.60 | 2.425E-02 | 351.99 | 37.100 | 5.472E-01 | PB214 |
| 510.66 | 71. | 24.96 | 1.50 | 1.808E-02 | 510.72 | 22.500 | PBC<MDA | TL208 |
| 583.30 | 568. | 7.70 | 2.81 | 1.629E-02 | 583.14 | 86.000 | 2.603E-01 | TL208 |
| 609.54 | 580. | 7.15 | 3.11 | 1.574E-02 | 609.32 | 46.090 | 5.136E-01 | BI214 |
| | | | | | 614.37 | 90.393 | 2.656E-01 | Ag108M |
| 727.36 | 52. | 38.59 | 1.64 | 1.374E-02 | 727.17 | 11.800 | PBC<MDA | BI212 |
| 911.51 | 459. | 8.07 | 2.57 | 1.160E-02 | 911.07 | 29.000 | 8.743E-01 | AC228 |
| 967.83 | 311. | 11.66 | 3.18 | 1.109E-02 | 964.00 | 14.580 | 1.242E+00 | EU152 |
| | | | | | 968.90 | 17.460 | 1.040E+00 | AC228 |
| 1121.33 | 159. | 16.06 | 2.15 | 9.970E-03 | 1120.28 | 15.040 | 6.850E-01 | BI214 |
| 1172.92 | 343. | 9.42 | 2.33 | 9.639E-03 | 1173.23 | 99.860 | 2.284E-01 | CO60 |
| 1332.86 | 292. | 9.67 | 3.39 | 8.771E-03 | 1332.51 | 99.980 | 2.128E-01 | CO60 |
| 1461.19 | 2276. | 2.16 | 3.17 | 8.189E-03 | 1460.75 | 10.700 | 1.678E+01 | K40 |
| 1764.51 | 93. | 11.83 | 3.37 | 7.084E-03 | 1764.51 | 15.920 | 5.355E-01 | BI214 |

********** U N I D E N T I F I E D P E A K S U M M A R Y **********

| Peak Channel | Centroid Energy | Background Counts | Net Area Counts | Intensity Cts/Sec | Uncert 3 Sigma % | FWHM keV | Suspected Nuclide | |
|---|---|---|---|---|---|---|---|---|
| 151.99 | 76.16 | 2556. | 735. | 0.368 | 31.20 | 4.406 | BI-207 | s |
| 417.45 | 208.91 | 797. | 170. | 0.085 | 83.46 | 1.202 | AC-228 | s |
| 477.06 | 239.14 | 928. | 929. | 0.464 | 17.05 | 1.297 | PB-212 | D |
| 589.96 | 295.17 | 864. | 111. | 0.055 | 116.08 | 1.701 | PB-214 | s |
| 598.51 | 299.45 | 291. | 87. | 0.044 | 89.17 | 1.341 | TH-227 | lD |
| 703.76 | 352.07 | 978. | 295. | 0.147 | 48.33 | 2.598 | PB-214 | s |
| 1166.18 | 583.30 | 635. | 239. | 0.119 | 48.87 | 2.813 | TL-208 | s |

s - Peak fails shape tests.
D - Peak area deconvoluted.
L - Peak written from unknown list.
C - Area < Critical level.

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This section based on library: FSS_Rev_1.Lib

********** I D E N T I F I E D P E A K S U M M A R Y **********

| Nuclide | Peak Channel | Centroid Energy | Background Counts | Net Area Counts | Intensity Cts/Sec | Uncert 3 Sigma % | FWHM keV | |
|---|---|---|---|---|---|---|---|---|
| PB-212 | 153.89 | 77.11 | 2571. | 241. | 0.121 | 91.18 | 1.500 | D |
| PB-214 | 153.89 | 77.11 | 2575. | 237. | 0.118 | 91.18 | 1.500 | D |
| TH-227 | 470.72 | 235.54 | 2043. | -204. | -0.102 | 96.54 | 1.500 | s |
| PB-212 | 477.29 | 238.83 | 1717. | 846. | 0.423 | 22.73 | 1.500 | s |
| RA-224 | 481.63 | 241.00 | 1180. | 445. | 0.222 | 35.54 | 1.298 | D |
| PB-214 | 591.11 | 295.74 | 766. | 212. | 0.106 | 57.88 | 1.500 | s |
| AC-228 | 677.23 | 338.81 | 486. | 355. | 0.177 | 36.09 | 3.368 | s |
| PB-214 | 703.71 | 352.05 | 485. | 466. | 0.233 | 24.08 | 1.500 | s |
| TL-208 | 1020.91 | 510.66 | 320. | 71. | 0.035 | 74.89 | 1.500 | s |
| TL-208 | 1166.33 | 583.37 | 309. | 325. | 0.162 | 27.89 | 1.540 | s |
| BI-214 | 1218.66 | 609.54 | 297. | 576. | 0.288 | 21.46 | 3.111 | s |
| Ag-108M | 1224.36 | 612.39 | 422. | -85. | -0.042 | 107.97 | 1.561 | s |
| BI-212 | 1454.29 | 727.36 | 188. | 52. | 0.026 | 115.78 | 1.638 | s |
| AC-228 | 1822.58 | 911.51 | 207. | 455. | 0.227 | 24.21 | 2.571 | s |
| AC-228 | 1935.22 | 967.83 | 230. | 311. | 0.156 | 34.99 | 3.185 | s |
| BI-214 | 2242.23 | 1121.33 | 147. | 159. | 0.079 | 48.19 | 2.148 | s |
| CO-60 | 2345.41 | 1172.92 | 184. | 339. | 0.170 | 28.25 | 2.328 | s |
| CO-60 | 2665.31 | 1332.86 | 111. | 288. | 0.144 | 29.02 | 3.392 | s |
| K-40 | 2921.99 | 1461.19 | 36. | 2272. | 1.136 | 6.48 | 3.174 | s |
| BI-214 | 3528.67 | 1764.51 | 8. | 93. | 0.047 | 35.48 | 3.371 | s |

s - Peak fails shape tests.
D - Peak area deconvoluted.
A Derived peak area.

***** S U M M A R Y O F L I B R A R Y P E A K U S A G E *****

| - Nuclide - Name | Code | Average Activity pCi/gm | Peak Energy keV | Peak Activity pCi/gm | Peak Code | Peak MDA Value pCi/gm | COMMENTS |
|---|---|---|---|---|---|---|---|
| BE-7 | | 3.8544E-02 | | | | | |
| | | | 477.56 | 3.854E-02 | %( | 2.514E-01 7.43E-02 | G |
| K-40 | | 1.6776E+01 | | | | | |
| | | | 1460.75 | 1.678E+01 | *(P | 2.271E-01 3.63E-01 | G |
| MN-54 | | 6.1971E-03 | | | | | |
| | | | 834.81 | 6.197E-03 | %(P | 3.296E-02 9.73E-03 | G |
| CO-57 | | 5.9378E-03 | | | | | |
| | | | 122.07 | 5.938E-03 | %(P | 3.631E-02 1.09E-02 | G K |
| | | | 136.43 | -5.303E-02 | % P | 2.834E-01 8.52E-02 | G |
| CO-60 | | 2.2060E-01 | | | | | |
| | | | 1332.51 | 2.128E-01 | *(P | 3.830E-02 2.09E-02 | G K |
| | | | 1173.23 | 2.284E-01 | *(P | 4.440E-02 2.18E-02 | G K |
| Sr-85 | | -1.3549E-02 | | | | | |
| | | | 514.00 | -1.355E-02 | %( | 3.720E-02 1.12E-02 | G |
| Kr-85 | | -3.2231E+02 | | | | | |
| | | | 513.99 | -3.223E+02 | %(P | 8.191E+02 2.46E+02 | G |
| Y-88 | | -7.9610E-04 | | | | | |
| | | | 1836.01 | -7.961E-04 | %(P | 1.670E-02 4.07E-03 | G K |
| | | | 898.02 | 8.465E-03 | % P | 3.042E-02 8.99E-03 | G |
| NB-94 | | 4.2397E-03 | | | | | |
| | | | 871.10 | 4.240E-03 | %(P | 2.747E-02 8.03E-03 | G K |
| | | | 702.50 | -5.224E-03 | % P | 3.204E-02 9.46E-03 | G K |
| Ag-108M | | -2.8993E-03 | | | | | |
| | | | 722.95 | -2.899E-03 | &( | 2.963E-02 8.65E-03 | G K |
| | | | 614.37 | -3.876E-02 | + | 4.506E-02 1.39E-02 | G |
| | | | 433.93 | 1.202E-05 | % P | 2.811E-02 8.23E-03 | G |
| CD-109 | | 4.5943E-01 | | | | | |
| | | | 88.04 | 4.594E-01 | %(P | 9.890E-01 3.00E-01 | G |
| SN-113 | | -9.9680E-03 | | | | | |
| | | | 391.71 | -9.968E-03 | %(P | 4.246E-02 1.26E-02 | G K |
| | | | 255.04 | -5.553E-03 | % | 1.289E+00 3.83E-01 | G |

| Nuclide | Ave activity | Energy | Activity | Code | Peak | MDA | Comments |
|---|---|---|---|---|---|---|---|
| SB-125 | -1.7018E-02 | | | | | | |
| | | 427.95 | -1.702E-02 | %( | P | 9.056E-02 | 2.69E-02 G K |
| | | 600.77 | 3.127E-02 | % | P | 1.450E-01 | 4.29E-02 G |
| | | 636.15 | 4.836E-02 | & | P | 2.229E-01 | 6.59E-02 G |
| | | 463.51 | 1.704E-01 | % | P | 2.455E-01 | 7.54E-02 G |
| | | 176.29 | -6.336E-02 | % | P | 4.235E-01 | 1.27E-01 G |
| I-131 | -7.0237E-04 | | | | | | |
| | | 364.48 | -7.024E-04 | &( | | 4.199E-02 | 1.23E-02 G K |
| | | 636.97 | 1.011E-01 | & | | 5.075E-01 | 1.50E-01 G |
| | | 284.29 | 1.162E-02 | % | | 6.394E-01 | 1.90E-01 G |
| CS-134 | -2.6683E-02 | | | | | | |
| | | 604.66 | -2.668E-02 | %( | P | 4.048E-02 | 1.24E-02 G K |
| | | 795.76 | 2.384E-02 | % | P | 3.567E-02 | 1.10E-02 G |
| | | 569.29 | 1.751E-02 | & | | 1.675E-01 | 4.92E-02 G |
| | | 801.84 | -5.040E-02 | % | P | 3.710E-01 | 1.09E-01 G |
| CS-137 | 2.6066E-02 | | | | | | |
| | | 661.62 | 2.607E-02 | %( | P | 3.876E-02 | 1.19E-02 G |
| CE-139 | 5.5570E-03 | | | | | | |
| | | 165.85 | 5.557E-03 | &( | P | 3.393E-02 | 1.02E-02 G |
| EU-152 | 2.1110E-02 | | | | | | |
| | | 121.78 | 2.111E-02 | &( | P | 1.039E-01 | 3.13E-02 G K |
| | | 344.30 | -2.656E-02 | % | P | 1.050E-01 | 3.15E-02 G |
| | | 1408.08 | 6.082E-02 | & | P | 1.232E-01 | 3.73E-02 G |
| | | 964.00 | -7.115E-04 | & | P | 3.701E-01 | 1.09E-01 G |
| | | 1112.07 | -1.187E-02 | & | P | 2.809E-01 | 8.15E-02 G |
| | | 778.90 | -2.088E-03 | % | P | 1.694E-01 | 4.81E-02 G |
| EU-154 | 2.6606E-03 | | | | | | |
| | | 123.10 | 2.661E-03 | %( | P | 7.287E-02 | 2.18E-02 G K |
| | | 1274.80 | -2.637E-02 | & | P | 1.207E-01 | 3.57E-02 G |
| | | 723.30 | -7.093E-02 | % | P | 1.890E-01 | 5.68E-02 G |
| | | 1004.80 | 3.093E-02 | % | P | 1.796E-01 | 5.27E-02 G |
| EU-155 | 4.2997E-02 | | | | | | |
| | | 86.45 | 4.300E-02 | %( | | 1.272E-01 | 3.84E-02 G K |
| | | 105.31 | 2.614E-02 | % | P | 1.375E-01 | 4.13E-02 G |
| HG-203 | 1.0125E-02 | | | | | | |
| | | 279.17 | 1.013E-02 | %( | P | 3.302E-02 | 9.92E-03 G K |
| | | 72.87 | -4.342E-01 | % | P | 9.075E-01 | 2.75E-01 G |
| | | 70.83 | 4.338E-03 | % | | 1.683E+00 | 5.05E-01 G |
| | | 82.50 | -9.539E-01 | % | | 1.817E+00 | 5.52E-01 G |

| Nuclide | Ave activity | Energy | Activity | Code | Peak | MDA | Comments |
|---|---|---|---|---|---|---|---|
| TL-208 | 1.5012E-01 | | | | | | |
| | | 583.14 | 1.501E-01 | *(P | 3.909E-02 | 1.42E-02 | G |
| | | 510.72 | 1.122E-01 | - P | 1.369E-01 | 4.14E-02 | G |
| PB-212 | 3.9842E-01 | | | | | | |
| | | 238.63 | 3.984E-01 | *(P | 9.217E-02 | 3.07E-02 | G K |
| | | | | | | | Energy duplication |
| | | 77.11 | 3.019E-01 | - | 2.989E-01 | 9.17E-02 | G |
| | | 74.81 | 2.547E-01 | % P | 5.944E-01 | 1.80E-01 | G |
| PB-214 | 3.3539E-01 | | | | | | |
| | | 351.99 | 3.354E-01 | *(P | 7.577E-02 | 2.72E-02 | G K |
| | | 295.22 | 2.578E-01 | - P | 1.604E-01 | 5.08E-02 | G |
| | | | | | | | Energy duplication |
| | | 77.11 | 4.840E-01 | + P | 4.892E-01 | 1.50E-01 | G |
| | | 241.92 | -3.186E-01 | & P | 6.189E-01 | 1.88E-01 | G |
| BI-212 | 2.0869E-01 | | | | | | |
| | | 727.17 | 2.087E-01 | *(P | 2.660E-01 | 8.25E-02 | G K |
| | | 1620.56 | 1.914E-01 | % P | 6.942E-01 | 1.99E-01 | G |
| | | 785.42 | 3.276E-01 | % P | 1.606E+00 | 4.75E-01 | G |
| BI-214 | 5.1921E-01 | | | | | | |
| | | 609.32 | 5.136E-01 | *(P | 7.408E-02 | 3.70E-02 | G K |
| | | 1764.51 | 5.355E-01 | *(P | 8.975E-02 | 6.39E-02 | G |
| | | 1120.28 | 6.850E-01 | + P | 2.558E-01 | 1.11E-01 | G |
| RA-224 | 2.3278E+00 | | | | | | |
| | | 241.00 | 2.328E+00 | (P | 8.522E-01 | 2.77E-01 | G |
| RA-226 | 5.1530E-01 | | | | | | |
| | | 185.99 | 5.153E-01 | %( | 8.963E-01 | 2.73E-01 | G |
| AC-228 | 9.3664E-01 | | | | | | |
| | | 911.07 | 8.743E-01 | *(P | 1.342E-01 | 7.12E-02 | G K |
| | | 968.90 | 1.040E+00 | *(P | 2.451E-01 | 1.22E-01 | G |
| | | 338.40 | 7.646E-01 | - P | 2.273E-01 | 9.29E-02 | G |
| TH-227 | -3.6678E-01 | | | | | | |
| | | 236.00 | -3.668E-01 | ?(P | 3.840E-01 | 1.18E-01 | G K |
| | | 256.25 | -4.299E-02 | & P | 3.746E-01 | 1.11E-01 | G |
| PA-234 | -3.8757E-02 | | | | | | |
| | | 98.44 | -3.876E-02 | &( | 1.289E-01 | 3.89E-02 | G K |
| | | 946.00 | -3.312E-02 | % | 1.573E-01 | 4.64E-02 | G |
| | | 131.28 | -2.277E-02 | % | 1.587E-01 | 4.77E-02 | G |
| | | 94.67 | 8.955E-03 | % | 2.485E-01 | 7.45E-02 | G |
| | | 883.24 | 7.107E-02 | & | 2.321E-01 | 6.91E-02 | G |
| | | 926.70 | -5.315E-03 | % | 3.004E-01 | 8.71E-02 | G |

| Nuclide | Ave activity | Energy | Activity | Code | Peak MDA | Comments |
|---|---|---|---|---|---|---|
| | | 569.26 | 2.586E-02 & | | 2.474E-01 7.27E-02 | G |
| TH-234 | 3.8369E-01 | | | | | |
| | | 63.29 | 3.837E-01 %(P | | 1.612E+00 4.85E-01 | G K |
| | | 92.80 | 6.851E-01 % P | | 1.325E+00 4.01E-01 | G |
| | | 92.38 | 6.225E-01 % P | | 1.583E+00 4.79E-01 | G |
| AM-241 | -9.5059E-02 | | | | | |
| | | 59.54 | -9.506E-02 &(P | | 2.213E-01 6.70E-02 | G |

( - This peak used in the nuclide activity average.

* - Peak is too wide, but only one peak in library.
! - Peak is part of a multiplet and this area went negative during deconvolution.
? - Peak is too narrow.
@ - Peak is too wide at FW25M, but ok at FWHM.
% - Peak fails sensitivity test.
$ - Peak identified, but first peak of this nuclide failed one or more qualification tests.
+ - Peak activity higher than counting uncertainty range.
- - Peak activity lower than counting uncertainty range.
= - Peak outside analysis energy range.
& - Calculated peak centroid is not close enough to the library energy centroid for positive identification.
P - Peakbackground subtraction
} - Peak is too close to another for the activity to be found directly.

| Nuclide Codes: | Peak Codes: |
|---|---|
| T - Thermal Neutron Activation | G - Gamma Ray |
| F - Fast Neutron Activation | X - X-Ray |
| I - Fission Product | P - Positron Decay |
| N - Naturally Occurring Isotope | S - Single-Escape |
| P - Photon Reaction | D - Double-Escape |
| C - Charged Particle Reaction | K - Key Line |
| M - No MDA Calculation | A - Not in Average |
| R - Coincidence Corrected | C - Coincidence Peak |
| H - Halflife limit exceeded | |

- - - - - - - - - - - - - - - - - - - - - - - - - - - - - - - - - - - - -

***** S U M M A R Y O F N U C L I D E S I N S A M P L E *****

| Nuclide | | Time of Count Activity pCi/gm | Time Corrected Activity pCi/gm | Uncertainty Counting pCi/gm | 3 Sigma Total pCi/gm | MDA pCi/gm |
|---|---|---|---|---|---|---|
| BE-7 | #A | 3.6236E-02 | 3.8544E-02 | 2.2295E-01 | 2.2297E-01 | 2.363E-01 |
| K-40 | # | 1.6776E+01 | 1.6776E+01 | 1.0894E+00 | 1.4726E+00 | |
| MN-54 | #A | 6.1320E-03 | 6.1971E-03 | 2.9191E-02 | 2.9193E-02 | 3.261E-02 |
| CO-57 | #B | 5.8657E-03 | 5.9378E-03 | 3.2726E-02 | 3.2727E-02 | 3.587E-02 |
| CO-60 | # | 2.2023E-01 | 2.2060E-01 | 4.5235E-02 | 4.7074E-02 | |

| | | | | | | |
|---|---|---|---|---|---|---|
| Sr-85 | #A | -1.2878E-02 | -1.3549E-02 | 3.3625E-02 | 3.3635E-02 | 3.535E-02 |
| Kr-85 | #A | -3.2230E+02 | -3.2231E+02 | 8.6204E+02 | 8.6225E+02 | 8.190E+02 |
| Y-88 | #B | -7.7185E-04 | -7.9610E-04 | 1.9885E-02 | 1.9885E-02 | 1.619E-02 |
| NB-94 | #B | 4.2397E-03 | 4.2397E-03 | 2.4102E-02 | 2.4103E-02 | 2.747E-02 |
| Ag-108M | #B | -2.8991E-03 | -2.8993E-03 | 2.5956E-02 | 2.5956E-02 | 2.962E-02 |
| CD-109 | #A | 4.5610E-01 | 4.5943E-01 | 8.9962E-01 | 8.9998E-01 | 9.819E-01 |
| SN-113 | #B | -9.6865E-03 | -9.9680E-03 | 4.4936E-02 | 4.4940E-02 | 4.126E-02 |
| SB-125 | #B | -1.6963E-02 | -1.7018E-02 | 9.5935E-02 | 9.5941E-02 | 9.026E-02 |
| I-131 | #B | -4.6607E-04 | -7.0237E-04 | 3.7021E-02 | 3.7021E-02 | 2.787E-02 |
| CS-134 | #B | -2.6567E-02 | -2.6683E-02 | 3.7785E-02 | 3.7818E-02 | 4.030E-02 |
| CS-137 | #A | 2.6058E-02 | 2.6066E-02 | 3.5630E-02 | 3.5663E-02 | 3.875E-02 |
| CE-139 | #A | 5.4253E-03 | 5.5570E-03 | 3.0526E-02 | 3.0528E-02 | 3.313E-02 |
| EU-152 | #B | 2.1095E-02 | 2.1110E-02 | 9.3766E-02 | 9.3774E-02 | 1.039E-01 |
| EU-154 | #B | 2.6578E-03 | 2.6606E-03 | 6.5374E-02 | 6.5374E-02 | 7.279E-02 |
| EU-155 | #B | 4.2919E-02 | 4.2997E-02 | 1.1531E-01 | 1.1533E-01 | 1.269E-01 |
| HG-203 | #B | 9.4333E-03 | 1.0125E-02 | 2.9774E-02 | 2.9780E-02 | 3.077E-02 |
| TL-208 | # | 1.5012E-01 | 1.5012E-01 | 4.2451E-02 | 4.3367E-02 | 3.909E-02 |
| PB-212 | # | 3.9842E-01 | 3.9842E-01 | 9.2226E-02 | 9.5180E-02 | 9.217E-02 |
| PB-214 | # | 3.3539E-01 | 3.3539E-01 | 8.1637E-02 | 8.4005E-02 | 7.577E-02 |
| BI-212 | #A | 2.0869E-01 | 2.0869E-01 | 2.4757E-01 | 2.4787E-01 | 2.660E-01 |
| BI-214 | # | 5.1921E-01 | 5.1921E-01 | 1.0863E-01 | 1.1287E-01 | |
| RA-224 | | 2.3278E+00 | 2.3278E+00 | 8.3136E-01 | 8.4265E-01 | |
| RA-226 | #A | 5.1529E-01 | 5.1530E-01 | 8.1818E-01 | 8.1875E-01 | 8.963E-01 |
| AC-228 | # | 9.3664E-01 | 9.3664E-01 | 2.0086E-01 | 2.0834E-01 | |
| TH-227 | #A | -3.6678E-01 | -3.6678E-01 | 3.5455E-01 | 3.5521E-01 | 3.840E-01 |
| PA-234 | #B | -3.8757E-02 | -3.8757E-02 | 1.1662E-01 | 1.1664E-01 | 1.289E-01 |
| TH-234 | #B | 3.8369E-01 | 3.8369E-01 | 1.4537E+00 | 1.4538E+00 | 1.612E+00 |
| AM-241 | #A | -9.5057E-02 | -9.5059E-02 | 2.0409E-01 | 2.0415E-01 | 2.213E-01 |

# - All peaks for activity calculation had bad shape.
* - Activity omitted from total
& - Activity omitted from total and all peaks had bad shape.
< - MDA value printed.
A - Activity printed, but activity < MDA.
B - Activity < MDA and failed test.
C - Area < Critical level.
F - Failed fraction or key line test.
H - Halflife limit exceeded

---------- S U M M A R Y ----------

Total Activity ( 294.7 to 2000.1 keV) 2.0779703E+01 pCi/gm
Total Decayed Activity ( 294.7 to 2000.1 keV) 2.0780081E+01 pCi/gm

The library has energies which are not separable.

Analyzed by: _____
JJM

Reviewed by: _____
Supervisor

Laboratory: YAEC Chemistry Lab