```
*****************************************************************************
*****        G A M M A   S P E C T R U M   A N A L Y S I S        *****
*****************************************************************************


Filename: ERT01,C:\GENIE2K\CAMFILES\SMP-EMPTY JAR.CNF

Report Generated On              : 7/31/2017   2:15:14 PM

Sample Title                     : EMPTY JAR
Sample Description               : 450 cc Soil
Sample Identification            :
Sample Type                      :
Sample Geometry                  :

Peak Locate Threshold            :  3.00
Peak Locate Range (in channels)  :   100 -  8192
Peak Area Range (in channels)    :   100 -  8192
Identification Energy Tolerance  :    1.000 keV

Sample Size                      :  4.910E+001 GWET

Sample Taken On                  : 7/31/2017  12:14:00 PM
Acquisition Started              : 7/31/2017  12:15:11 PM

Live Time                        :     7200.0 seconds
Real Time                        :     7201.3 seconds

Dead Time                        :   0.02 %


              Energy Calibration Used Done On       : 5/10/2017
              Efficiency Calibration Used Done On   : 12/14/2016
              Efficiency ID                         : ERT0101
```

**********
***** P E A K A N A L Y S I S R E P O R T *****
**********

Detector Name: ERT01
Sample Title: EMPTY JAR
Peak Analysis Performed on: 7/31/2017 2:15:14 PM
Peak Analysis From Channel: 100
Peak Analysis To Channel: 8192

| Peak No. | ROI start | ROI end | Peak centroid | Energy (keV) | FWHM (keV) | Net Peak Area | Net Area Uncert. | Continuum Counts |
|---|---|---|---|---|---|---|---|---|
| 1 | 366- | 377 | 371.38 | 92.70 | 0.68 | 7.56E+001 | 15.42 | 6.44E+001 |
| 2 | 739- | 749 | 743.69 | 185.75 | 0.75 | 4.36E+001 | 12.24 | 4.44E+001 |
| 3 | 2035- | 2056 | 2043.02 | 510.48 | 1.43 | 1.31E+002 | 20.77 | 8.01E+001 |

M = First peak in a multiplet region
m = Other peak in a multiplet region
F = Fitted singlet

Errors quoted at 1.000 sigma

**********
***** N U C L I D E M D A R E P O R T *****
**********

Detector Name: ERT01
Sample Geometry:
Sample Title: EMPTY JAR
Nuclide Library Used: C:\GENIE2K\CAMFILES\ERT_LIBRARY_LMDA.NLB

| | Nuclide Name | Energy (keV) | Yield (%) | Line MDA (pCi/GWET) | Nuclide MDA (pCi/GWET) | Activity (pCi/GWET) |
|---|---|---|---|---|---|---|
| | K-40 | 1460.82 | 10.55 | 4.8545E+000 | 4.85E+000 | 1.9419E+000 |
| | Co-60 | 1173.23 | 99.85 | 5.1284E-001 | 4.73E-001 | 1.1855E-001 |
| | | 1332.49 | 99.98 | 4.7281E-001 | | -5.8190E-002 |
| > | | 2505.71 | 0.10 | 0.0000E+000 | | 0.0000E+000 |
| | Cs-137 | 32.06 | 5.54 | 2.3172E+004 | 4.40E-001 | -6.4597E+003 |
| | | 661.66 | 84.99 | 4.4040E-001 | | 2.9466E-001 |
| | Tl-208 | 72.80 | 2.02 | 2.9621E+001 | 4.64E-001 | 4.9979E+000 |
| | | 74.97 | 3.41 | 1.5229E+001 | | -2.4007E+000 |
| | | 84.90 | 1.51 | 2.4730E+001 | | 2.2332E+000 |
| | | 277.36 | 6.31 | 5.0654E+000 | | 1.5350E+000 |
| | | 510.77 | 22.60 | 3.0913E+000 | | 5.7017E+000 |
| | | 583.19 | 84.50 | 4.6378E-001 | | 9.0825E-002 |
| | | 763.13 | 1.81 | 2.1111E+001 | | -5.0723E+000 |
| | | 860.56 | 12.42 | 3.4998E+000 | | 1.4870E+000 |
| | Bi-212 | 39.86 | 1.06 | 4.0425E+003 | 6.18E+000 | 1.3692E+003 |
| | | 727.33 | 6.74 | 6.1779E+000 | | 2.9871E+000 |
| | | 785.37 | 1.11 | 2.7200E+001 | | -1.4260E+001 |
| | | 1620.74 | 1.51 | 2.6630E+001 | | -1.5073E+001 |
| | | 1806.00 | 0.09 | 3.8802E+002 | | -2.0965E+002 |
| | Pb-212 | 74.81 | 10.40 | 5.1007E+000 | 7.72E-001 | 1.3194E-001 |
| | | 77.11 | 17.50 | 2.7494E+000 | | -1.2435E-001 |
| | | 87.30 | 7.81 | 4.4974E+000 | | -2.1576E+000 |
| | | 115.18 | 0.59 | 4.0479E+001 | | -1.9605E+001 |
| | | 238.63 | 43.30 | 7.7243E-001 | | 4.8667E-001 |
| | | 300.09 | 3.28 | 1.0486E+001 | | 2.5292E-001 |
| | Bi-214 | 76.86 | 0.43 | 1.1394E+002 | 9.21E-001 | -5.1533E+000 |
| | | 89.81 | 0.24 | 1.6542E+002 | | -2.0204E+001 |
| | | 386.77 | 0.30 | 1.0121E+002 | | 3.2257E+000 |
| | | 454.77 | 0.29 | 1.0437E+002 | | -2.8116E+001 |
| | | 609.31 | 45.49 | 9.2091E-001 | | -1.0805E-001 |
| | | 665.45 | 1.53 | 2.5423E+001 | | 4.0633E+000 |
| | | 703.11 | 0.48 | 8.4217E+001 | | -1.5520E+000 |
| | | 719.86 | 0.39 | 9.8087E+001 | | -1.0163E+002 |
| | | 768.36 | 4.89 | 8.3244E+000 | | -3.3271E-001 |
| | | 786.10 | 0.31 | 9.7501E+001 | | -6.5240E+001 |
| | | 806.17 | 1.26 | 3.3422E+001 | | 1.5931E+001 |
| | | 934.06 | 3.10 | 1.2590E+001 | | 4.5009E+000 |
| | | 964.08 | 0.36 | 1.2835E+002 | | 6.4780E+001 |
| | | 1051.96 | 0.31 | 1.3060E+002 | | -3.8889E+001 |
| | | 1120.29 | 14.91 | 3.2697E+000 | | 6.5642E-001 |

| | Nuclide Name | Energy (keV) | Yield (%) | Line MDA (pCi/GWET) | Nuclide MDA (pCi/GWET) | Activity (pCi/GWET) |
|---|---|---|---|---|---|---|
| | Bi-214 | 1133.66 | 0.25 | 1.7205E+002 | 9.21E-001 | -4.3541E+001 |
| | | 1155.19 | 1.63 | 2.1123E+001 | | -7.5332E+000 |
| | | 1207.68 | 0.45 | 9.7196E+001 | | -6.3118E+001 |
| | | 1238.11 | 5.79 | 7.7257E+000 | | 5.1495E-001 |
| | | 1280.96 | 1.43 | 2.9314E+001 | | 8.7735E+000 |
| | | 1377.67 | 4.00 | 1.1489E+001 | | 1.9046E-001 |
| | | 1385.31 | 0.76 | 6.8351E+001 | | 1.9882E+001 |
| | | 1401.50 | 1.27 | 3.5254E+001 | | -1.2766E+001 |
| | | 1407.98 | 2.15 | 2.1295E+001 | | 9.9079E-001 |
| | | 1509.23 | 2.11 | 2.0396E+001 | | -1.5157E+001 |
| | | 1538.50 | 0.38 | 9.7521E+001 | | -9.0716E+001 |
| | | 1543.32 | 0.20 | 2.1269E+002 | | 1.2507E+002 |
| | | 1583.22 | 0.69 | 6.9979E+001 | | 3.0894E+001 |
| | | 1594.73 | 0.25 | 1.8584E+002 | | 8.4602E+001 |
| | | 1599.31 | 0.23 | 1.8372E+002 | | -1.3679E+001 |
| | | 1661.28 | 1.15 | 2.8147E+001 | | 1.1151E+000 |
| | | 1683.99 | 0.22 | 2.0575E+002 | | -1.1072E+002 |
| | | 1729.59 | 2.92 | 1.4969E+001 | | 5.5209E+000 |
| | | 1764.49 | 15.40 | 3.4110E+000 | | 2.3097E-001 |
| | | 1847.42 | 2.11 | 2.3739E+001 | | 1.5564E+001 |
| | | 1873.16 | 0.22 | 2.3405E+002 | | 5.2964E+001 |
| > | | 2118.55 | 1.14 | 0.0000E+000 | | 0.0000E+000 |
| > | | 2204.21 | 5.08 | 0.0000E+000 | | 0.0000E+000 |
| | Pb-214 | 53.28 | 1.20 | 2.2334E+002 | 9.13E-001 | 3.5318E+001 |
| | | 74.81 | 6.44 | 8.2372E+000 | | 2.1307E-001 |
| | | 77.11 | 10.80 | 4.4551E+000 | | -2.0150E-001 |
| | | 87.30 | 4.84 | 7.2571E+000 | | -3.4815E+000 |
| | | 242.00 | 7.43 | 4.3186E+000 | | -1.4867E+000 |
| | | 258.87 | 0.52 | 5.8504E+001 | | -8.1028E+000 |
| | | 274.80 | 0.47 | 6.5826E+001 | | -6.9122E+000 |
| | | 295.22 | 19.30 | 1.6556E+000 | | 1.5164E-001 |
| | | 351.93 | 37.60 | 9.1341E-001 | | 2.0771E-001 |
| | | 462.00 | 0.22 | 1.3953E+002 | | 4.8786E+001 |
| | | 533.66 | 0.19 | 1.8570E+002 | | -1.5346E+001 |
| | | 785.96 | 1.07 | 2.8230E+001 | | -1.8890E+001 |
| | | 839.04 | 0.59 | 7.5423E+001 | | 2.0917E+001 |
| | Ra-224 | 81.07 | 0.13 | 3.1623E+002 | 8.05E+000 | 6.2153E+001 |
| | | 83.78 | 0.22 | 1.7176E+002 | | -2.2256E+001 |
| | | 240.99 | 4.10 | 8.0531E+000 | | 1.2377E+000 |
| + | Ra-226 | 81.07 | 0.20 | 2.1028E+002 | 6.79E+000 | 4.1330E+001 |
| | | 83.78 | 0.33 | 1.1363E+002 | | -1.4724E+001 |
| | | 94.90 | 0.15 | 2.6144E+002 | | -3.6314E+001 |
| | | 186.21* | 3.59 | 6.7930E+000 | | -6.3441E-001 |
| | Ac-228 | 99.50 | 1.26 | 2.3807E+001 | 1.73E+000 | 1.0721E+001 |
| | | 129.07 | 2.50 | 1.0375E+001 | | -3.4811E+000 |
| | | 209.25 | 3.97 | 7.4912E+000 | | -1.5370E+000 |
| | | 270.24 | 3.55 | 8.0619E+000 | | -1.6880E+000 |
| | | 328.00 | 3.04 | 1.1218E+001 | | 4.0793E+000 |
| | | 338.32 | 11.40 | 2.8108E+000 | | 1.2073E+000 |
| | | 409.46 | 2.02 | 1.5276E+001 | | 4.8690E-001 |

| Nuclide Name | Energy (keV) | Yield (%) | Line MDA (pCi/GWET) | Nuclide MDA (pCi/GWET) | Activity (pCi/GWET) |
|---|---|---|---|---|---|
| Ac-228 | 463.00 | 4.45 | 7.0560E+000 | 1.73E+000 | 1.0515E+000 |
| | 755.31 | 1.03 | 3.7582E+001 | | -3.8689E+000 |
| | 772.29 | 1.52 | 2.6144E+001 | | -1.0561E+001 |
| | 794.94 | 4.31 | 8.6383E+000 | | -1.9792E+000 |
| | 835.70 | 1.70 | 2.2728E+001 | | -9.5487E+000 |
| | 911.20 | 26.20 | 1.7345E+000 | | 5.1651E-001 |
| | 964.79 | 4.99 | 9.0576E+000 | | 6.6536E-001 |
| | 968.96 | 15.90 | 2.5280E+000 | | 7.3167E-001 |
| | 1588.20 | 3.06 | 1.6116E+001 | | -5.6620E+000 |
| | 1630.62 | 1.52 | 2.8071E+001 | | 2.5884E+000 |
| Th-228 | 84.37 | 1.26 | 2.9769E+001 | 2.98E+001 | -1.7395E+000 |
| | 131.61 | 0.13 | 1.9533E+002 | | -3.9114E+001 |
| | 166.41 | 0.10 | 2.3688E+002 | | -2.1418E+002 |
| | 215.98 | 0.25 | 1.1270E+002 | | 7.1718E-001 |
| Pa-234m | 258.23 | 0.07 | 4.0510E+002 | 4.94E+001 | -1.4487E+002 |
| | 742.81 | 0.09 | 4.1108E+002 | | -2.1876E+002 |
| | 766.36 | 0.32 | 1.2705E+002 | | 1.0328E+002 |
| | 786.27 | 0.05 | 5.7371E+002 | | -2.7756E+002 |
| | 1001.03 | 0.85 | 4.9363E+001 | | 4.1517E+001 |
| | 1737.77 | 0.02 | 1.8747E+003 | | 6.8753E+002 |
| Th-234 | 63.30 | 3.75 | 2.7724E+001 | 9.66E+000 | -2.2602E+000 |
| | 92.59 | 4.33 | 9.6555E+000 | | 1.1229E+001 |
| | 112.81 | 0.22 | 1.1367E+002 | | 2.4932E+001 |

+ = Nuclide identified during the nuclide identification
* = Energy line found in the spectrum
> = Calculated MDA is zero due to zero counts in the region, or the region is outside the spectrum, or has not been calculated
@ = Half-life too short to be able to perform the decay correction

```
*********************************************************************
*****  N U C L I D E   I D E N T I F I C A T I O N   R E P O R T  *****
*********************************************************************
```

Sample Title: EMPTY JAR
Nuclide Library Used: C:\GENIE2K\CAMFILES\ERT_LIBRARY_LMDA.NLB

..... IDENTIFIED NUCLIDES .....

| Nuclide Name | Id Confidence | Energy (keV) | | Yield (%) | Activity (pCi/GWET) | Activity Uncertainty |
|---|---|---|---|---|---|---|
| Ra-226 | 0.748 | 81.07 | @ | 0.20 | | |
| | | 83.78 | @ | 0.33 | | |
| | | 94.90 | @ | 0.15 | | |
| | | 186.21* | | 3.59 | -6.34406E-001 | 1.37678E+000 |

* = Energy line found in the spectrum.
@ = Energy line not used for Weighted Mean Activity
Energy Tolerance : 1.000 keV
Nuclide confidence index threshold = 0.45
Errors quoted at 1.000 sigma

**********
***** I N T E R F E R E N C E C O R R E C T E D R E P O R T *****
**********

| Nuclide Name | Nuclide Id Confidence | Wt mean Activity (pCi/GWET) | Wt mean Activity Uncertainty |
|---|---|---|---|
| Ra-226 @ | 0.748 | -6.344061E-001 | 1.376781E+000 |

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

Errors quoted at 1.000 sigma

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

Peak Locate Performed on: 7/31/2017 2:15:14 PM
Peak Locate From Channel: 100
Peak Locate To Channel: 8192

| Peak No. | Energy (keV) | Peak Size in Counts per Second | Peak CPS % Uncertainty | Peak Type | Tol. Nuclide |
|---|---|---|---|---|---|
| 1 | 92.70 | -5.4001E-005 | -4250.0 | Tol. | Yb-169<br>Th-234 |
| 3 | 510.48 | -5.4180E-003 | -55.61 | Tol. | Tl-208 |

M = First peak in a multiplet region
m = Other peak in a multiplet region
F = Fitted singlet

Errors quoted at 1.000 sigma