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\*\*\*\*\* G A M M A S P E C T R U M A N A L Y S I S \*\*\*\*\*  
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Filename: C:\GENIE2K\CAMFILES\UNC 2017\IMC Samples\IMC-2120\W6H-IMC-212

Report Generated On : 4/19/2017 10:37:06 AM

Sample Title : W6H-IMC-2120-S-P-2

Sample Description :

Sample Identification : 2120-S-P-2

Sample Type :

Sample Geometry : Cylinder

Peak Locate Threshold : 3.00

Peak Locate Range (in channels) : 40 - 8192

Peak Area Range (in channels) : 40 - 8192

Identification Energy Tolerance : 1.500 keV

Sample Size : 2.292E+002 GRAMS

Sample Taken On : 3/17/2017 12:00:00 AM

Acquisition Started : 3/28/2017 8:25:26 AM

Live Time : 1800.0 seconds

Real Time : 1800.3 seconds

Dead Time : 0.02 %

Energy Calibration Used Done On : 3/24/2017

Efficiency Calibration Used Done On : 4/19/2017

Efficiency ID : H-IMC-2120-S-P-2

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\*\*\*\*\* P E A K A N A L Y S I S R E P O R T \*\*\*\*\*  
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Detector Name: 8566

Sample Title: W6H-IMC-2120-S-P-2

Peak Analysis Performed on: 4/19/2017 10:37:02 AM

Peak Analysis From Channel: 40

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
F	1	305-	312	308.52	77.35	0.70	5.53E+001	20.98	6.27E+001
F	2	737-	748	742.09	185.80	0.74	4.99E+001	17.32	4.20E+001
F	3	948-	958	953.45	238.67	0.84	7.15E+001	21.49	5.78E+001
F	4	1173-	1186	1179.06	295.11	1.05	4.02E+001	16.75	4.06E+001
F	5	1401-	1413	1406.24	351.94	1.20	7.08E+001	19.44	2.86E+001
F	6	2425-	2441	2433.77	608.97	1.78	5.48E+001	16.79	2.13E+001
F	7	5827-	5850	5838.23	1460.58	2.66	1.39E+002	22.11	5.33E+000

M = First peak in a multiplet region

m = Other peak in a multiplet region

F = Fitted singlet

Errors quoted at 1.960 sigma

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 \*\*\*\*\* 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 \*\*\*\*\*  
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Sample Title: W6H-IMC-2120-S-P-2  
 Nuclide Library Used: C:\GENIE2K\CAMFILES\UNC 2017 Full NLB.NL

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

Nuclide Name	Id Confidence	Energy (keV)	Yield (%)	Activity (pCi/GRAM)	Activity Uncertainty
K-40	0.996	1460.82*	10.66	9.29523E+000	1.67383E+000
Pb-212	0.999	74.82	10.28		
		77.11*	17.10	2.81022E-001	1.20683E-001
		86.83	2.07		
		87.35	3.97		
		89.78	1.46		
		115.18	0.60		
		238.63*	43.60	2.02758E-001	6.88607E-002
		300.09	3.30		
BI-214	0.361	76.86*	0.55	8.81738E+000	3.79485E+000
		79.29	0.91		
		89.26	0.11		
		89.81	0.21		
		273.80	0.13		
		348.92	0.10		
		386.78	0.29		
		388.89	0.40		
		405.72	0.17		
		454.79	0.29		
		469.77	0.13		
		609.32*	45.49	3.89661E-001	1.27824E-001
		665.45	1.53		
		703.11	0.47		
		719.87	0.39		
		752.85	0.13		
		768.36	4.89		
		786.35	0.32		
		806.18	1.26		
		821.18	0.16		
		826.45	0.12		
		934.06	3.11		
		964.08	0.37		
		1051.96	0.31		
		1069.96	0.27		
		1120.29	14.92		
		1133.66	0.25		
		1155.21	1.63		
		1207.68	0.45		
		1238.11	5.83		
		1280.98	1.43		
		1303.75	0.11		
		1377.67	3.99		

Nuclide Name	Id Confidence	Energy (keV)	Yield (%)	Activity (pCi/GRAM)	Activity Uncertainty
BI-214	0.361	1385.31	0.79		
		1401.52	1.33		
		1407.99	2.39		
		1509.21	2.13		
		1538.53	0.40		
		1543.34	0.30		
		1583.20	0.70		
		1594.75	0.27		
		1599.37	0.32		
		1661.27	1.05		
		1684.01	0.21		
		1729.59	2.88		
		1764.49	15.30		
		1838.36	0.35		
		1847.43	2.03		
		1873.16	0.21		
		1896.05	0.15		
		2118.51	1.16		
		2204.06	4.92		
		2293.38	0.31		
PB-214	0.999	2447.70	1.55		
		74.82	5.80		
		77.11*	9.70	4.95410E-001	2.17375E-001
		86.83	1.70		
		87.35	2.24		
		89.78	0.82		
		241.99	7.25		
		258.76	0.53		
		274.80	0.35		
		295.22*	18.42	3.32265E-001	1.48013E-001
		351.93*	35.60	3.64062E-001	1.13267E-001
		462.02	0.21		
		480.43	0.34		
		487.14	0.43		
		533.66	0.18		
		580.14	0.37		
		785.96	1.06		
		839.07	0.58		
Ra-226	0.990	81.07	0.20		
		83.79	0.32		
		186.21*	3.64	1.36626E+000	5.28002E-001

\* = Energy line found in the spectrum.

@ = Energy line not used for Weighted Mean Activity

Energy Tolerance : 1.500 keV

Nuclide confidence index threshold = 0.10

Errors quoted at 1.960 sigma

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 \*\*\*\*\* 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 \*\*\*\*\*  
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Nuclide Name	Nuclide Id Confidence	Wt mean Activity (pCi/GRAM)	Wt mean Activity Uncertainty
K-40	0.996	9.295232E+000	1.673826E+000
Pb-212	0.999	1.736557E-001	6.079287E-002
BI-214	0.361	3.864526E-001	1.277470E-001
PB-214	0.999	3.240302E-001	8.438809E-002
Ra-226	0.990	1.366260E+000	5.280018E-001

? = 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 1.960 sigma

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

Peak Locate Performed on: 4/19/2017 10:37:01 AM  
 Peak Locate From Channel: 40  
 Peak Locate To Channel: 8192

Peak No.	Energy (keV)	Peak Size in Counts per Second	Peak CPS % Uncertainty	Peak Type	Tol. Nuclide
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All peaks were identified.

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\*\*\*\*\* N U C L I D E M D A R E P O R T \*\*\*\*\*  
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Detector Name: 8566  
Sample Geometry: Cylinder  
Sample Title: W6H-IMC-2120-S-P-2  
Nuclide Library Used: C:\GENIE2K\CAMFILES\UNC 2017 Full NLB.NL

	Nuclide Name	Energy (keV)	Yield (%)	Line MDA (pCi/GRAM)	Nuclide MDA (pCi/GRAM)	Activity (pCi/GRAM)	Dec. Leve (pCi/GRAM)
+	K-40	1460.82*	10.66	9.549E-001	9.55E-001	9.295E+000	3.872E-00
	CO-60	1173.23	99.85	2.147E-001	1.91E-001	1.047E-001	9.934E-00
		1332.49	99.98	1.915E-001		2.052E-002	8.681E-00
	CS-137	661.66	85.10	1.534E-001	1.53E-001	4.683E-002	7.114E-00
	Pb-210	46.54	4.25	2.346E+000	2.35E+000	2.831E+000	1.117E+00
	BI-212	288.20	0.34	1.921E+001	2.14E+000	-9.707E+000	9.007E+00
		328.03	0.13	6.401E+001		1.427E+001	3.017E+00
		452.98	0.36	2.683E+001		-1.661E+001	1.252E+00
		727.33	6.67	2.142E+000		7.484E-001	9.933E-00
		785.37	1.10	1.296E+001		-1.498E+000	5.972E+00
		893.41	0.38	4.530E+001		2.289E+001	2.099E+00
		952.12	0.17	1.029E+002		-1.445E+001	4.753E+00
		1078.62	0.56	3.260E+001		-1.954E+001	1.499E+00
		1512.70	0.29	5.087E+001		-1.166E+001	2.202E+00
		1620.50	1.47	9.241E+000		-3.065E+000	3.903E+00
+	Pb-212	74.82	10.28	6.729E-001	1.17E-001	9.176E-001	3.247E-00
		77.11*	17.10	2.159E-001		2.810E-001	1.011E-00
		86.83	2.07	2.400E+000		1.322E+000	1.147E+00
		87.35	3.97	1.225E+000		-8.212E-002	5.849E-00
		89.78	1.46	3.104E+000		-2.487E-001	1.477E+00
		115.18	0.60	6.183E+000		4.179E+000	2.912E+00
		238.63*	43.60	1.169E-001		2.028E-001	5.461E-00
		300.09	3.30	2.223E+000		-4.414E-001	1.048E+00
+	BI-214	76.86*	0.55	6.776E+000	1.87E-001	8.817E+000	3.172E+00
		79.29	0.91	5.943E+000		-2.201E+000	2.844E+00
		89.26	0.11	4.173E+001		2.977E+001	1.987E+00
		89.81	0.21	2.158E+001		-1.729E+000	1.027E+00
		273.80	0.13	5.222E+001		-1.820E+001	2.462E+00
		348.92	0.10	1.024E+002		-1.220E+002	4.883E+00
		386.78	0.29	2.655E+001		-1.213E+001	1.235E+00
		388.89	0.40	2.019E+001		-6.928E+000	9.411E+00
		405.72	0.17	5.443E+001		2.692E+001	2.551E+00
		454.79	0.29	3.418E+001		1.539E+001	1.598E+00
		469.77	0.13	7.875E+001		-2.067E+001	3.683E+00
		609.32*	45.49	1.867E-001		3.897E-001	8.376E-00
		665.45	1.53	8.201E+000		-3.948E+000	3.789E+00
		703.11	0.47	3.005E+001		1.395E+001	1.396E+00
		719.87	0.39	3.486E+001		1.940E+000	1.612E+00
		752.85	0.13	1.114E+002		-3.387E+001	5.149E+00
		768.36	4.89	3.250E+000		2.113E+000	1.513E+00
		786.35	0.32	4.334E+001		-2.315E+001	1.992E+00
		806.18	1.26	1.326E+001		8.887E+000	6.176E+00

	Nuclide Name	Energy (keV)	Yield (%)	Line MDA (pCi/GRAM)	Nuclide MDA (pCi/GRAM)	Activity (pCi/GRAM)	Dec. Leve (pCi/GRAM)
+	BI-214	821.18	0.16	9.241E+001	1.87E-001	-2.041E+001	4.259E+00
		826.45	0.12	1.328E+002		1.347E+001	6.141E+00
		934.06	3.11	5.163E+000		2.409E+000	2.371E+00
		964.08	0.37	5.020E+001		4.073E+001	2.326E+00
		1051.96	0.31	5.688E+001		4.281E-001	2.612E+00
		1069.96	0.27	7.120E+001		7.374E+000	3.290E+00
		1120.29	14.92	1.590E+000		1.102E+000	7.436E-00
		1133.66	0.25	8.326E+001		2.518E+001	3.855E+00
		1155.21	1.63	1.302E+001		3.937E+000	6.027E+00
		1207.68	0.45	4.301E+001		-3.832E+001	1.969E+00
		1238.11	5.83	4.032E+000		1.136E+000	1.873E+00
		1280.98	1.43	1.303E+001		6.642E-001	5.918E+00
		1303.75	0.11	1.536E+002		-3.012E+000	6.867E+00
		1377.67	3.99	4.323E+000		-8.287E-001	1.932E+00
		1385.31	0.79	2.303E+001		3.997E+000	1.035E+00
		1401.52	1.33	1.619E+001		4.242E+000	7.399E+00
		1407.99	2.39	8.586E+000		1.439E-001	3.904E+00
		1509.21	2.13	7.523E+000		3.284E+000	3.296E+00
		1538.53	0.40	4.199E+001		4.988E+000	1.846E+00
		1543.34	0.30	5.794E+001		2.094E+001	2.563E+00
		1583.20	0.70	2.603E+001		6.139E+000	1.155E+00
		1594.75	0.27	6.770E+001		1.216E+001	2.995E+00
		1599.37	0.32	5.207E+001		1.229E+001	2.282E+00
		1661.27	1.05	1.327E+001		-4.952E-001	5.604E+00
		1684.01	0.21	5.987E+001		-3.679E+001	2.483E+00
		1729.59	2.88	5.603E+000		2.689E+000	2.412E+00
		1764.49	15.30	1.431E+000		5.732E-001	6.411E-00
		1838.36	0.35	3.974E+001		-1.653E+001	1.648E+00
		1847.43	2.03	9.015E+000		1.762E+000	3.919E+00
		1873.16	0.21	5.469E+001		-2.732E+001	2.170E+00
		1896.05	0.15	1.141E+002		2.728E+000	4.885E+00
		2118.51	1.16	0.000E+000		0.000E+000	0.000E+00
		2204.06	4.92	0.000E+000		0.000E+000	0.000E+00
		2293.38	0.31	0.000E+000		0.000E+000	0.000E+00
		2447.70	1.55	0.000E+000		0.000E+000	0.000E+00
>		2118.51	1.16	0.000E+000		0.000E+000	0.000E+00
		2204.06	4.92	0.000E+000		0.000E+000	0.000E+00
		2293.38	0.31	0.000E+000		0.000E+000	0.000E+00
		2447.70	1.55	0.000E+000		0.000E+000	0.000E+00
+	PB-214	74.82	5.80	1.193E+000	1.51E-001	1.626E+000	5.756E-00
		77.11*	9.70	3.807E-001		4.954E-001	1.782E-00
		86.83	1.70	2.923E+000		1.610E+000	1.396E+00
		87.35	2.24	2.172E+000		-1.455E-001	1.037E+00
		89.78	0.82	5.527E+000		-4.429E-001	2.631E+00
		241.99	7.25	1.180E+000		-5.656E-001	5.667E-00
		258.76	0.53	1.153E+001		4.477E+000	5.426E+00
		274.80	0.35	1.821E+001		-9.382E+000	8.562E+00
		295.22*	18.42	2.909E-001		3.323E-001	1.343E-00
		351.93*	35.60	1.510E-001		3.641E-001	6.856E-00
		462.02	0.21	5.066E+001		4.790E-001	2.377E+00
		480.43	0.34	3.397E+001		1.620E+001	1.597E+00
		487.14	0.43	2.564E+001		-6.211E+000	1.201E+00
		533.66	0.18	6.465E+001		3.843E+001	3.021E+00
		580.14	0.37	3.837E+001		6.866E+000	1.806E+00
		785.96	1.06	1.294E+001		-4.536E+000	5.943E+00



	Nuclide Name	Energy (keV)	Yield (%)	Line MDA (pCi/GRAM)	Nuclide MDA (pCi/GRAM)	Activity (pCi/GRAM)	Dec. Leve (pCi/GRAM)
+	PB-214	839.07	0.58	2.628E+001	1.51E-001	-1.048E+001	1.212E+00
+	Ra-226	81.07	0.20	2.101E+001	9.98E-001	-2.800E+000	9.921E+00
		83.79	0.32	1.368E+001		2.655E+000	6.494E+00
		186.21*	3.64	9.980E-001		1.366E+000	4.619E-00
	AC-228	89.96	1.90	5.298E+013	1.52E+013	-4.245E+012	2.521E+01
		93.35	3.10	2.803E+013		-1.745E+013	1.324E+01
		99.51	1.26	6.343E+013		-4.405E+012	2.983E+01
		104.82	0.39	2.065E+014		-3.956E+013	9.717E+01
		105.60	0.74	1.105E+014		1.337E+013	5.208E+01
		108.58	0.28	2.984E+014		2.038E+014	1.407E+01
		129.07	2.42	4.084E+013		3.498E+013	1.941E+01
		145.85	0.16	5.836E+014		-2.615E+014	2.755E+01
		153.98	0.72	1.333E+014		-5.925E+013	6.301E+01
		191.35	0.12	8.947E+014		-8.296E+013	4.224E+01
		199.41	0.31	3.978E+014		1.842E+014	1.888E+01
		204.03	0.11	1.040E+015		-9.251E+014	4.912E+01
		209.25	3.89	3.000E+013		4.392E+012	1.415E+01
		214.85	0.76	1.481E+014		-1.232E+012	6.963E+01
		270.24	3.46	4.407E+013		2.569E+013	2.082E+01
		278.95	0.16	8.959E+014		-5.375E+014	4.209E+01
		321.65	0.23	6.815E+014		-1.146E+015	3.186E+01
		327.44	0.12	1.479E+015		9.893E+014	6.970E+01
		328.00	2.95	6.027E+013		1.344E+013	2.840E+01
		332.37	0.40	3.877E+014		-5.742E+014	1.809E+01
		338.32	11.27	1.516E+013		-8.651E+011	7.110E+01
		340.96	0.37	4.832E+014		2.238E+014	2.272E+01
		409.46	1.92	1.127E+014		9.242E+013	5.297E+01
		440.44	0.12	1.712E+015		1.384E+014	7.985E+01
		463.00	4.40	5.371E+013		-1.038E+013	2.518E+01
		478.33	0.21	1.219E+015		3.292E+014	5.729E+01
		503.82	0.18	1.328E+015		-2.046E+015	6.201E+01
		508.96	0.45	7.448E+014		9.704E+014	3.544E+01
		523.13	0.10	2.474E+015		8.573E+014	1.156E+01
		546.47	0.20	1.334E+015		6.810E+014	6.238E+01
		562.50	0.87	3.000E+014		1.525E+013	1.397E+01
		570.91	0.18	1.509E+015		5.364E+014	7.045E+01
		572.14	0.15	1.835E+015		1.158E+015	8.566E+01
		583.41	0.11	2.858E+015		3.301E+015	1.345E+01
		674.75	2.10	1.419E+014		5.943E+013	6.584E+01
		701.75	0.17	1.818E+015		1.165E+015	8.446E+01
		707.41	0.16	1.944E+015		-2.145E+014	8.995E+01
		726.86	0.62	5.075E+014		2.132E+014	2.351E+01
		755.32	1.00	3.177E+014		-6.442E+013	1.469E+01
		772.29	1.49	2.384E+014		-2.164E+013	1.110E+01
		782.14	0.49	6.829E+014		1.561E+014	3.160E+01
		794.95	4.25	7.911E+013		-2.961E+013	3.660E+01
		830.49	0.54	6.306E+014		-3.575E+013	2.911E+01
		835.71	1.61	2.186E+014		2.800E+013	1.012E+01
		840.38	0.91	3.853E+014		1.172E+014	1.782E+01
		904.20	0.77	4.909E+014		-5.725E+014	2.271E+01
		911.20	25.80	1.660E+013		9.677E+012	7.747E+01

Nuclide Name	Energy (keV)	Yield (%)	Line MDA (pCi/GRAM)	Nuclide MDA (pCi/GRAM)	Activity (pCi/GRAM)	Dec. Leve (pCi/GRAM)
AC-228	947.98	0.11	3.817E+015	1.52E+013	2.468E+015	1.770E+01
	958.61	0.28	1.303E+015		-2.010E+014	5.982E+01
	964.77	4.99	8.165E+013		4.343E+013	3.783E+01
	968.97	15.80	2.697E+013		1.245E+013	1.254E+01
	1033.25	0.20	1.875E+015		-7.839E+014	8.584E+01
	1065.18	0.13	3.423E+015		1.858E+015	1.588E+01
	1095.68	0.13	3.038E+015		-2.744E+015	1.390E+01
	1110.61	0.28	1.684E+015		-9.225E+014	7.827E+01
	1153.52	0.14	3.394E+015		1.380E+015	1.571E+01
	1247.08	0.50	9.820E+014		7.584E+013	4.537E+01
	1459.14	0.83	1.209E+015		3.041E+015	5.788E+01
	1495.91	0.86	4.108E+014		-3.024E+013	1.800E+01
	1501.57	0.46	7.901E+014		2.405E+014	3.474E+01
	1557.11	0.18	1.947E+015		-3.131E+013	8.464E+01
	1580.53	0.60	6.020E+014		-1.977E+014	2.628E+01
	1588.20	3.22	1.421E+014		1.010E+014	6.389E+01
	1625.06	0.25	1.236E+015		4.807E+014	5.257E+01
	1630.63	1.51	2.172E+014		1.924E+012	9.301E+01
	1638.28	0.47	7.254E+014		4.344E+013	3.123E+01
	1666.52	0.18	1.811E+015		3.495E+013	7.705E+01
TH-230	67.67	0.38	1.242E+001	1.24E+001	1.322E+000	5.862E+00
PA-234	742.81	0.11	1.401E+002	2.09E+001	1.234E+001	6.510E+00
	766.42	0.32	4.853E+001		-3.636E-001	2.254E+00
TH-234	1001.03	0.84	2.089E+001	1.39E+000	1.284E+001	9.619E+00
	63.29	3.70	1.386E+000		-1.556E-001	6.548E-00
	92.38	2.13	2.000E+000		1.803E+000	9.493E-00
	92.80	2.10	1.926E+000		-4.947E-001	9.115E-00
	112.81	0.21	1.768E+001		-9.013E+000	8.334E+00
U-234	53.20	0.12	4.241E+001	4.24E+001	-1.186E+001	1.972E+00
	120.90	0.04	9.804E+001		7.125E+000	4.593E+00
U-235	72.70	0.12	4.807E+001	4.04E-001	-7.762E+001	2.301E+00
	89.96	3.43	1.321E+000		-1.058E-001	6.285E-00
	93.35	5.54	7.058E-001		-4.393E-001	3.334E-00
	104.82	0.69	5.290E+000		-1.013E+000	2.490E+00
	105.60	1.31	2.810E+000		3.399E-001	1.324E+00
	108.58	0.50	7.519E+000		5.137E+000	3.547E+00
	109.19	1.66	2.254E+000		4.106E-001	1.063E+00
	140.76	0.20	2.050E+001		-3.468E+000	9.680E+00
	143.76	10.96	4.041E-001		3.670E-001	1.916E-00
	163.36	5.08	8.229E-001		-3.634E-001	3.872E-00
	182.62	0.39	1.438E+001		-6.880E+000	6.849E+00
	194.94	0.63	7.820E+000		-4.377E+000	3.688E+00
	202.12	1.08	5.042E+000		1.716E+000	2.388E+00
	205.32	5.02	1.019E+000		-8.288E-001	4.804E-00
	221.39	0.12	4.409E+001		1.735E+001	2.072E+00

+ = Nuclide identified during the nuclide identification

\* = Energy line found in the spectrum

> = MDA value not calculated

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

\*\*\*\*\*  
\*\*\* LINE ACTIVITY CONSISTENCY EVALUATOR \*\*\*  
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=====  
Analysis using Key Line Activities  
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Filename: C:\GENIE2K\CAMFILES\UNC 2017\IMC Samples\IMC-2120\W6H-IMC-212

Equation used to calculate plot:  $\ln(\text{Ratio}) = A + B \cdot \ln(\text{Energy})$   
where: Ratio = Activity/KL Activity

Notes:

'^' Denotes Key Line energy

\* All uncertainties quoted at 1.96 sigma

Nuclide	Energy (keV)		Activity (pCi/GRAM)	Activity %Uncert*	Ratio[%Uncert]	A	B [uncert]
-----	-----		-----	-----	-----	-----	-----
K-40	1460.8	^	9.30E+000	18.007			
Pb-212	77.1		2.81E-001	42.944	1.386[54.751]	1.58	-0.289
	238.6	^	2.03E-001	33.962	1.000[48.030]		[ 0.645]

Nuclide	Energy (keV)		Activity (pCi/GRAM)	Activity %Uncert*	Ratio[%Uncert]	A	B [uncert]
-----	-----		-----	-----	-----	-----	-----
BI-214	76.9		8.82E+000	43.038	22.628[54.115]	9.66	-1.507
	609.3	^	3.90E-001	32.804	1.000[46.392]		[ 0.344]
PB-214	77.1		4.95E-001	43.878	1.361[53.789]	1.29	-0.228
	295.2		3.32E-001	44.547	0.913[54.336]		[ 0.437]
	351.9	^	3.64E-001	31.112	1.000[43.999]		
Ra-226	186.2	^	1.37E+000	38.646			