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

Filename: C:\GENIE2K\CAMFILES\UNC 2017\IMC Samples\IMC-0310\W3H-ERRU-03

Report Generated On : 7/6/2017 9:59:53 AM

Sample Title : W3H-EERU-0310-S-P-2
Sample Description :
Sample Identification : 0310-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 : 1.000 keV

Sample Size : 2.990E+002 grams

Sample Taken On : 6/1/2017 2:00:00 PM
Acquisition Started : 6/6/2017 2:41:53 PM

Live Time : 1800.0 seconds
Real Time : 1800.5 seconds

Dead Time : 0.03 %

Energy Calibration Used Done On : 4/13/2017
Efficiency Calibration Used Done On : 7/6/2017
Efficiency ID : H-IMC-2002-S-P-5

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

Detector Name: 8566

Sample Title: W3H-EERU-0310-S-P-2

Peak Analysis Performed on: 7/6/2017 9:59:48 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	208-	219	213.15	53.45	0.67	7.04E+001	18.53	8.00E+001
M	2	296-	313	299.94	75.17	0.71	1.49E+002	95.52	1.83E+002
m	3	296-	313	308.29	77.26	0.71	8.59E+001	49.84	2.24E+002
F	4	333-	345	337.15	84.48	0.84	2.29E+002	30.06	1.91E+002
F	5	356-	365	359.16	89.99	0.67	1.30E+002	24.59	1.18E+002
F	6	365-	381	373.01	93.45	0.78	1.54E+002	91.20	2.21E+002
F	7	429-	440	435.79	109.16	0.40	3.38E+001	31.69	1.30E+002
F	8	566-	581	574.32	143.83	0.83	2.95E+002	101.43	1.50E+002
F	9	647-	662	652.50	163.40	0.82	1.05E+002	22.39	1.08E+002
F	10	734-	750	741.82	185.75	0.91	1.48E+003	147.37	9.56E+001
F	11	813-	830	819.78	205.26	0.82	1.01E+002	66.59	8.78E+001
F	12	947-	959	952.67	238.51	0.83	1.29E+002	24.40	6.18E+001
F	13	1174-	1183	1178.25	294.96	0.64	3.08E+001	39.59	3.40E+001
F	14	1398-	1411	1405.38	351.80	0.99	5.15E+001	16.81	3.36E+001
F	15	2321-	2335	2327.94	582.67	1.22	4.22E+001	15.46	2.38E+001
F	16	2426-	2440	2432.57	608.85	1.15	4.87E+001	16.17	2.38E+001
F	17	5824-	5850	5836.16	1460.58	2.95	1.88E+002	27.47	4.50E+000

M = First peak in a multiplet region

m = Other peak in a multiplet region

F = Fitted singlet

Errors quoted at 1.960 sigma

***** 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: W3H-EERU-0310-S-P-2

Nuclide Library Used: C:\GENIE2K\CAMFILES\UNC 2017 NLB 0328201

IDENTIFIED NUCLIDES

Nuclide Name	Id Confidence	Energy (keV)	Yield (%)	Activity (pCi/gram)	Activity Uncertainty
K-40	0.991	1460.82*	10.66	1.03693E+001	1.69583E+000
Pb-212	0.995	74.82*	10.28	1.09183E+000	7.13269E-001
		77.11*	17.10	3.69914E-001	2.20105E-001
		86.83	2.07		
		87.35	3.97		
		89.78*	1.46	6.06614E+000	1.36674E+000
		115.18	0.60		
		238.63*	43.60	3.03251E-001	6.51365E-002
		300.09	3.30		
BI-214	0.236	76.86*	0.55	1.16065E+001	6.91391E+000
		79.29	0.91		
		609.32*	45.49	2.87072E-001	9.77913E-002
		665.45	1.53		
		768.36	4.89		
		806.18	1.26		
		934.06	3.11		
		1120.29	14.92		
		1155.21	1.63		
		1238.11	5.83		
		1280.98	1.43		
		1377.67	3.99		
		1385.31	0.79		
		1401.52	1.33		
		1407.99	2.39		
		1509.21	2.13		
		1583.20	0.70		
		1661.27	1.05		
		1729.59	2.88		
		1764.49	15.30		
		1847.43	2.03		
		2118.51	1.16		
		2204.06	4.92		
		2447.70	1.55		
PB-214	0.848	74.82*	5.80	1.93517E+000	1.27601E+000
		77.11*	9.70	6.52117E-001	3.92436E-001
		86.83	1.70		
		87.35	2.24		
		89.78*	0.82	1.08007E+001	2.60748E+000
		241.99	7.25		
		258.76	0.53		
		295.22*	18.42	2.11399E-001	2.72641E-001
		351.93*	35.60	2.19739E-001	7.40832E-002

Nuclide Name	Id Confidence	Energy (keV)	Yield (%)	Activity (pCi/gram)	Activity Uncertainty
PB-214	0.848	785.96	1.06		
		839.07	0.58		
Ra-226	0.884	81.07	0.20		
		83.79*	0.32	4.94456E+001	9.05804E+000
		186.21*	3.64	3.37883E+001	4.91204E+000
U-234	0.992	53.20*	0.12	6.57221E+001	2.01395E+001
		120.90	0.04		
U-235	0.999	89.96*	3.43	2.58207E+000	5.87592E-001
		93.35*	5.54	1.86990E+000	1.12938E+000
		104.82	0.69		
		105.60	1.31		
		108.58	0.50		
		109.19*	1.66	1.34232E+000	1.28339E+000
		143.76*	10.96	1.91066E+000	6.86204E-001
		163.36*	5.08	1.56838E+000	3.74076E-001
		194.94	0.63		
		202.12	1.08		
		205.32*	5.02	1.81690E+000	1.20808E+000

* = Energy line found in the spectrum.

@ = Energy line not used for Weighted Mean Activity

Energy Tolerance : 1.000 keV

Nuclide confidence index threshold = 0.10

Errors quoted at 1.960 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/gram)	Wt mean Activity Uncertainty
K-40	0.991	1.036930E+001	1.695833E+000
Pb-212	0.995	3.058074E-001	6.194252E-002
BI-214	0.236	2.866273E-001	9.776246E-002
PB-214	0.848	2.208897E-001	7.027824E-002
Ra-226	0.884	3.734636E+001	4.317997E+000
U-234	0.992	6.572207E+001	2.013954E+001
U-235	0.999	1.812091E+000	2.626995E-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: 7/6/2017 9:59:48 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
F 15	582.67	2.3433E-002	36.66		

M = First peak in a multiplet region

m = Other peak in a multiplet region

F = Fitted singlet

Errors quoted at 1.960 sigma

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

Detector Name: 8566
Sample Geometry: cylinder
Sample Title: W3H-EERU-0310-S-P-2
Nuclide Library Used: C:\GENIE2K\CAMFILES\UNC 2017 NLB 0328201

	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	7.591E-001	7.59E-001	1.037E+001	3.048E-00
	Pb-210	46.54	4.25	2.012E+000	2.01E+000	6.757E-001	9.577E-00
	BI-212	727.33	6.67	2.067E+000	2.07E+000	-4.777E-002	9.688E-00
		785.37	1.10	1.194E+001		2.485E+000	5.551E+00
		1078.62	0.56	2.586E+001		6.539E-001	1.184E+00
		1620.50	1.47	8.555E+000		-5.269E-001	3.683E+00
+	Pb-212	74.82*	10.28	4.801E-001	1.05E-001	1.092E+000	2.301E-00
		77.11*	17.10	3.112E-001		3.699E-001	1.498E-00
		86.83	2.07	3.297E+000		-2.662E-001	1.603E+00
		87.35	3.97	1.494E+000		-1.385E-001	7.236E-00
		89.78*	1.46	2.845E+000		6.066E+000	1.360E+00
		115.18	0.60	8.244E+000		-6.576E+000	3.972E+00
		238.63*	43.60	1.051E-001		3.033E-001	4.935E-00
		300.09	3.30	2.078E+000		-6.556E-001	9.862E-00
+	BI-214	76.86*	0.55	9.764E+000	1.58E-001	1.161E+001	4.699E+00
		79.29	0.91	7.087E+000		7.974E-001	3.436E+00
		609.32*	45.49	1.578E-001		2.871E-001	7.091E-00
		665.45	1.53	8.717E+000		4.055E+000	4.100E+00
		768.36	4.89	2.717E+000		1.322E+000	1.266E+00
		806.18	1.26	9.786E+000		-5.548E-001	4.518E+00
		934.06	3.11	4.546E+000		-7.732E-001	2.099E+00
		1120.29	14.92	1.098E+000		-4.911E-002	5.066E-00
		1155.21	1.63	9.898E+000		-6.136E+000	4.550E+00
		1238.11	5.83	3.286E+000		4.214E-001	1.524E+00
		1280.98	1.43	1.244E+001		-2.751E+000	5.724E+00
		1377.67	3.99	3.836E+000		2.730E-001	1.728E+00
		1385.31	0.79	1.875E+001		-3.941E-002	8.414E+00
		1401.52	1.33	1.005E+001		-9.968E-001	4.445E+00
		1407.99	2.39	5.845E+000		-7.943E-002	2.600E+00
		1509.21	2.13	6.836E+000		5.216E-001	3.033E+00
		1583.20	0.70	2.411E+001		1.360E+001	1.084E+00
		1661.27	1.05	1.483E+001		3.405E+000	6.560E+00
		1729.59	2.88	5.074E+000		1.202E+000	2.215E+00
		1764.49	15.30	1.324E+000		1.293E+000	6.003E-00
		1847.43	2.03	8.080E+000		-1.836E+000	3.553E+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
>		2447.70	1.55	0.000E+000		0.000E+000	0.000E+00
+	PB-214	74.82*	5.80	8.509E-001	1.38E-001	1.935E+000	4.079E-00
		77.11*	9.70	5.486E-001		6.521E-001	2.640E-00
		86.83	1.70	4.014E+000		-3.242E-001	1.952E+00
		87.35	2.24	2.648E+000		-2.454E-001	1.282E+00

	Nuclide Name	Energy (keV)	Yield (%)	Line MDA (pCi/gram)	Nuclide MDA (pCi/gram)	Activity (pCi/gram)	Dec. Leve (pCi/gram)
+	PB-214	89.78*	0.82	5.065E+000	1.38E-001	1.080E+001	2.421E+00
		241.99	7.25	1.129E+000		-8.977E-002	5.449E-00
		258.76	0.53	9.949E+000		-1.297E+000	4.691E+00
		295.22*	18.42	2.050E-001		2.114E-001	9.319E-00
		351.93*	35.60	1.376E-001		2.197E-001	6.305E-00
		785.96	1.06	1.203E+001		-2.239E+000	5.575E+00
		839.07	0.58	2.137E+001		-1.448E+001	9.843E+00
+	Ra-226	81.07	0.20	2.962E+001	1.36E+000	-2.615E+001	1.432E+00
		83.79*	0.32	1.804E+001		4.945E+001	8.730E+00
		186.21*	3.64	1.359E+000		3.379E+001	6.489E-00
	AC-228	89.96	1.90	2.900E+006	5.36E+005	4.174E+006	1.410E+00
		93.35	3.10	1.765E+006		-2.856E+006	8.582E+00
		99.51	1.26	3.104E+006		-1.313E+006	1.493E+00
		105.60	0.74	5.676E+006		1.965E+006	2.738E+00
		129.07	2.42	1.569E+006		-4.847E+005	7.530E+00
		153.98	0.72	5.192E+006		-1.089E+006	2.481E+00
		209.25	3.89	1.214E+006		6.451E+005	5.806E+00
		214.85	0.76	4.918E+006		-1.778E+006	2.321E+00
		270.24	3.46	1.466E+006		7.857E+005	6.951E+00
		328.00	2.95	1.885E+006		-9.955E+004	8.885E+00
		338.32	11.27	5.616E+005		4.253E+005	2.662E+00
		409.46	1.92	3.620E+006		3.245E+005	1.705E+00
		463.00	4.40	1.690E+006		4.092E+005	7.932E+00
		562.50	0.87	1.013E+007		6.517E+005	4.743E+00
		674.75	2.10	4.859E+006		2.182E+005	2.271E+00
		726.86	0.62	1.860E+007		4.486E+006	8.722E+00
		755.32	1.00	9.688E+006		-6.552E+006	4.473E+00
		772.29	1.49	7.177E+006		-2.796E+006	3.334E+00
		794.95	4.25	2.646E+006		-6.292E+004	1.231E+00
		830.49	0.54	1.902E+007		-1.086E+007	8.759E+00
		835.71	1.61	6.729E+006		3.411E+006	3.111E+00
		840.38	0.91	1.152E+007		-4.971E+006	5.311E+00
		904.20	0.77	1.702E+007		-1.519E+007	7.944E+00
		911.20	25.80	5.363E+005		2.274E+005	2.511E+00
		964.77	4.99	2.782E+006		1.288E+005	1.298E+00
		968.97	15.80	9.422E+005		4.137E+005	4.416E+00
		1247.08	0.50	2.810E+007		-3.817E+007	1.290E+00
		1459.14	0.83	4.211E+007		1.220E+008	2.026E+00
		1495.91	0.86	1.455E+007		4.718E+006	6.490E+00
		1588.20	3.22	4.254E+006		1.511E+006	1.905E+00
		1630.63	1.51	5.960E+006		-3.130E+006	2.496E+00
	TH-230	67.67	0.38	1.567E+001	1.57E+001	-4.061E+000	7.541E+00
	PA-234	742.81	0.11	1.252E+002	1.88E+001	-3.702E+000	5.849E+00
		766.42	0.32	4.122E+001		1.440E+001	1.918E+00
		1001.03	0.84	1.880E+001		2.590E+000	8.719E+00
	TH-234	63.29	3.70	1.851E+000	1.85E+000	1.444E+000	8.928E-00
		92.38	2.13	3.501E+000		8.743E+000	1.708E+00
		92.80	2.10	3.321E+000		-1.393E+000	1.617E+00
		112.81	0.21	2.349E+001		-8.024E+000	1.132E+00
+	U-234	53.20*	0.12	5.012E+001	5.01E+001	6.572E+001	2.380E+00
		120.90	0.04	1.469E+002		2.576E+001	7.089E+00

	Nuclide Name	Energy (keV)	Yield (%)	Line MDA (pCi/gram)	Nuclide MDA (pCi/gram)	Activity (pCi/gram)	Dec. Leve (pCi/gram)
+	U-235	89.96*	3.43	1.211E+000	4.69E-001	2.582E+000	5.787E-00
		93.35*	5.54	1.193E+000		1.870E+000	5.802E-00
		104.82	0.69	7.157E+000		1.155E+000	3.448E+00
		105.60	1.31	3.854E+000		1.334E+000	1.859E+00
		108.58	0.50	1.086E+001		-2.308E+000	5.251E+00
		109.19*	1.66	2.689E+000		1.342E+000	1.291E+00
		143.76*	10.96	4.689E-001		1.911E+000	2.257E-00
		163.36*	5.08	9.267E-001		1.568E+000	4.431E-00
		194.94	0.63	7.714E+000		8.382E-001	3.672E+00
		202.12	1.08	5.998E+000		-1.356E+000	2.888E+00
		205.32*	5.02	1.044E+000		1.817E+000	4.976E-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-0310\W3H-ERRU-03

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	^	1.04E+001	16.354			
Pb-212	74.8		1.09E+000	65.328	3.600[68.768]	11.16	-2.016
	77.1		3.70E-001	59.502	1.220[63.260]		[0.385]
	89.8		6.07E+000	22.531	20.004[31.129]		
	238.6	^	3.03E-001	21.479	1.000[30.376]		
BI-214	76.9		1.16E+001	59.569	40.431[68.622]	11.46	-1.787
	609.3	^	2.87E-001	34.065	1.000[48.175]		[0.405]
PB-214	74.8		1.94E+000	65.938	8.807[74.057]	11.52	-1.947
	77.1		6.52E-001	60.179	2.968[68.979]		[0.388]
	89.8		1.08E+001	24.142	49.152[41.467]		
	295.2		2.11E-001	128.97	0.962[133.30]		
	351.9	^	2.20E-001	33.714	1.000[47.679]		
Ra-226	83.8		4.94E+001	18.319	1.463[23.387]	2.49	-0.477
	186.2	^	3.38E+001	14.538	1.000[20.559]		[0.390]
U-234	53.2	^	6.57E+001	30.643			
U-235	90.0		2.58E+000	22.757	1.351[42.517]	2.38	-0.489
	93.3		1.87E+000	60.398	0.979[70.269]		[0.772]
	109.2		1.34E+000	95.610	0.703[102.13]		
	143.8	^	1.91E+000	35.915	1.000[50.791]		
	163.4		1.57E+000	23.851	0.821[43.113]		
	205.3		1.82E+000	66.491	0.951[75.571]		