
***** 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 10:01:01 AM

Sample Title : W3H-ERRU-0310-S-P-4

Sample Description :

Sample Identification : 0310-S-P-4

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 : 3.545E+002 grams

Sample Taken On : 6/1/2017 2:00:00 PM

Acquisition Started : 6/7/2017 8:44:48 AM

Live Time : 1800.0 seconds

Real Time : 1800.4 seconds

Dead Time : 0.02 %

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-ERRU-0310-S-P-4

Peak Analysis Performed on: 7/6/2017 10:00:57 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
M	1	295-	318	299.49	75.06	0.66	1.41E+002	26.52	1.41E+002
m	2	295-	318	308.33	77.27	0.67	1.05E+002	22.53	1.46E+002
F	3	366-	377	372.16	93.24	0.89	1.11E+002	80.11	6.80E+001
F	4	571-	579	574.52	143.88	0.80	6.71E+001	19.19	6.41E+001
F	5	736-	748	741.65	185.70	0.86	3.70E+002	37.90	6.01E+001
F	6	947-	959	952.87	238.56	0.89	1.76E+002	27.47	6.01E+001
F	7	1174-	1185	1179.04	295.16	1.21	5.54E+001	17.12	3.48E+001
F	8	1396-	1413	1405.10	351.73	0.81	7.07E+001	46.96	4.50E+001
F	9	2424-	2440	2432.30	608.78	1.23	5.25E+001	16.67	2.55E+001
F	10	5822-	5846	5834.65	1460.20	2.58	2.04E+002	29.05	1.11E+001

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-ERRU-0310-S-P-4
 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	0.940	1460.82*	10.66	9.49960E+000	1.52062E+000
Pb-212	0.998	74.82*	10.28	8.69239E-001	2.01199E-001
		77.11*	17.10	3.81714E-001	9.62808E-002
		86.83	2.07		
		87.35	3.97		
		89.78	1.46		
		115.18	0.60		
		238.63*	43.60	3.50564E-001	6.50684E-002
		300.09	3.30		
BI-214	0.205	76.86*	0.55	1.19767E+001	3.04004E+000
		79.29	0.91		
		609.32*	45.49	2.61230E-001	8.52173E-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	0.849	74.82*	5.80	1.54065E+000	3.82324E-001
		77.11*	9.70	6.72919E-001	1.80220E-001
		86.83	1.70		
		87.35	2.24		
		89.78	0.82		
		241.99	7.25		
		258.76	0.53		
		295.22*	18.42	3.21096E-001	1.03387E-001
		351.93*	35.60	2.54588E-001	1.70352E-001

Nuclide Name	Id Confidence	Energy (keV)	Yield (%)	Activity (pCi/gram)	Activity Uncertainty
PB-214	0.849	785.96	1.06		
		839.07	0.58		
Ra-226	0.965	81.07	0.20		
		83.79	0.32		
		186.21*	3.64	7.11180E+000	1.04871E+000
U-235	0.575	89.96	3.43		
		93.35*	5.54	1.13387E+000	8.31381E-001
		104.82	0.69		
		105.60	1.31		
		108.58	0.50		
		109.19	1.66		
		143.76*	10.96	3.66262E-001	1.11607E-001
		163.36	5.08		
		194.94	0.63		
		202.12	1.08		
		205.32	5.02		

* = 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	0.940	9.499601E+000	1.520616E+000
Pb-212	0.998	3.339356E-001	5.408842E-002
BI-214	0.205	2.580736E-001	8.517683E-002
PB-214	0.849	2.853062E-001	8.004820E-002
Ra-226	0.965	7.111801E+000	1.048713E+000
U-235	0.575	3.798504E-001	1.106150E-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 10:00:56 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.

***** 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-ERRU-0310-S-P-4
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	9.156E-001	9.16E-001	9.500E+000	3.948E-00
	Pb-210	46.54	4.25	1.518E+000	1.52E+000	3.300E-001	7.185E-00
	BI-212	727.33	6.67	1.887E+000	1.89E+000	1.088E+000	8.892E-00
		785.37	1.10	1.061E+001		2.976E+000	4.952E+00
		1078.62	0.56	2.025E+001		-1.320E+001	9.209E+00
		1620.50	1.47	6.718E+000		-6.445E+000	2.858E+00
+	Pb-212	74.82*	10.28	3.576E-001	8.75E-002	8.692E-001	1.704E-00
		77.11*	17.10	2.139E-001		3.817E-001	1.020E-00
		86.83	2.07	2.182E+000		-8.794E-001	1.053E+00
		87.35	3.97	1.045E+000		-2.905E+000	5.025E-00
		89.78	1.46	2.742E+000		-9.818E-002	1.318E+00
		115.18	0.60	5.542E+000		4.843E-001	2.644E+00
		238.63*	43.60	8.754E-002		3.506E-001	4.108E-00
		300.09	3.30	1.822E+000		-1.053E+000	8.664E-00
+	BI-214	76.86*	0.55	6.711E+000	1.42E-001	1.198E+001	3.202E+00
		79.29	0.91	5.418E+000		-1.121E-001	2.618E+00
		609.32*	45.49	1.419E-001		2.612E-001	6.422E-00
		665.45	1.53	7.270E+000		5.263E+000	3.417E+00
		768.36	4.89	2.486E+000		1.239E-001	1.165E+00
		806.18	1.26	8.097E+000		-6.903E+000	3.732E+00
		934.06	3.11	3.976E+000		-1.338E+000	1.841E+00
		1120.29	14.92	9.698E-001		1.922E-001	4.490E-00
		1155.21	1.63	9.097E+000		2.751E+000	4.212E+00
		1238.11	5.83	2.862E+000		6.509E-001	1.331E+00
		1280.98	1.43	1.038E+001		8.198E+000	4.774E+00
		1377.67	3.99	3.848E+000		2.651E+000	1.764E+00
		1385.31	0.79	1.922E+001		3.889E+000	8.803E+00
		1401.52	1.33	9.846E+000		3.383E+000	4.436E+00
		1407.99	2.39	5.403E+000		-5.583E-001	2.429E+00
		1509.21	2.13	4.973E+000		-7.999E-002	2.162E+00
		1583.20	0.70	1.999E+001		1.765E+000	8.972E+00
		1661.27	1.05	1.070E+001		3.563E+000	4.629E+00
		1729.59	2.88	3.641E+000		-7.227E-001	1.549E+00
		1764.49	15.30	1.163E+000		9.253E-001	5.295E-00
		1847.43	2.03	5.507E+000		-1.336E+000	2.343E+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	6.338E-001	1.43E-001	1.541E+000	3.021E-00
		77.11*	9.70	3.771E-001		6.729E-001	1.799E-00
		86.83	1.70	2.656E+000		-1.071E+000	1.282E+00
		87.35	2.24	1.851E+000		-5.148E+000	8.907E-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	4.881E+000	1.43E-001	-1.748E-001	2.346E+00
		241.99	7.25	1.038E+000		9.994E-002	5.025E-00
		258.76	0.53	8.806E+000		-2.064E+000	4.164E+00
		295.22*	18.42	1.826E-001		3.211E-001	8.346E-00
		351.93*	35.60	1.427E-001		2.546E-001	6.646E-00
		785.96	1.06	1.080E+001		-4.673E+000	5.033E+00
		839.07	0.58	1.991E+001		1.082E+001	9.242E+00
+	Ra-226	81.07	0.20	1.873E+001	8.47E-001	-1.361E+001	8.949E+00
		83.79	0.32	1.406E+001		9.970E+000	6.782E+00
		186.21*	3.64	8.474E-001		7.112E+000	3.977E-00
	AC-228	89.96	1.90	1.409E+007	3.76E+006	-4.796E+005	6.783E+00
		93.35	3.10	8.779E+006		-4.068E+005	4.232E+00
		99.51	1.26	1.453E+007		4.233E+005	6.885E+00
		105.60	0.74	3.064E+007		8.048E+006	1.467E+00
		129.07	2.42	8.460E+006		3.954E+005	4.026E+00
		153.98	0.72	3.129E+007		2.244E+007	1.491E+00
		209.25	3.89	7.596E+006		-3.624E+005	3.628E+00
		214.85	0.76	3.571E+007		1.592E+007	1.696E+00
		270.24	3.46	9.255E+006		2.695E+005	4.384E+00
		328.00	2.95	1.323E+007		3.980E+006	6.266E+00
		338.32	11.27	3.756E+006		1.180E+006	1.784E+00
		409.46	1.92	2.322E+007		5.481E+006	1.094E+00
		463.00	4.40	1.077E+007		-8.844E+006	5.050E+00
		562.50	0.87	7.008E+007		1.108E+007	3.297E+00
		674.75	2.10	2.959E+007		-2.501E+007	1.377E+00
		726.86	0.62	1.298E+008		8.680E+007	6.115E+00
		755.32	1.00	7.472E+007		1.139E+007	3.496E+00
		772.29	1.49	5.219E+007		-1.508E+007	2.445E+00
		794.95	4.25	1.512E+007		-3.340E+006	6.970E+00
		830.49	0.54	1.214E+008		-3.452E+007	5.587E+00
		835.71	1.61	4.494E+007		1.363E+007	2.084E+00
		840.38	0.91	7.717E+007		-7.823E+006	3.568E+00
		904.20	0.77	1.144E+008		-6.041E+007	5.351E+00
		911.20	25.80	3.934E+006		3.340E+006	1.857E+00
		964.77	4.99	1.881E+007		1.656E+007	8.805E+00
		968.97	15.80	6.076E+006		7.671E+006	2.848E+00
		1247.08	0.50	1.731E+008		-2.465E+008	7.910E+00
		1459.14	0.83	2.862E+008		8.818E+008	1.379E+00
		1495.91	0.86	9.386E+007		3.043E+007	4.186E+00
		1588.20	3.22	2.978E+007		1.086E+007	1.346E+00
		1630.63	1.51	4.917E+007		1.234E+007	2.146E+00
	TH-230	67.67	0.38	1.217E+001	1.22E+001	7.004E+000	5.838E+00
	PA-234	742.81	0.11	1.056E+002	1.61E+001	7.182E+001	4.933E+00
		766.42	0.32	3.732E+001		-1.463E+001	1.745E+00
		1001.03	0.84	1.613E+001		3.037E+000	7.486E+00
	TH-234	63.29	3.70	1.332E+000	1.33E+000	-2.917E-001	6.386E-00
		92.38	2.13	2.196E+000		4.454E+000	1.062E+00
		92.80	2.10	2.138E+000		1.243E+000	1.033E+00
		112.81	0.21	1.485E+001		-1.305E+001	7.067E+00
	U-234	53.20	0.12	4.649E+001	4.65E+001	1.535E+001	2.217E+00
		120.90	0.04	9.136E+001		-2.012E-001	4.350E+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	1.227E+000	2.24E-001	-4.176E-002	5.907E-00
		93.35*	5.54	5.082E-001		1.134E+000	2.403E-00
		104.82	0.69	5.044E+000		1.719E+000	2.412E+00
		105.60	1.31	2.720E+000		7.146E-001	1.303E+00
		108.58	0.50	7.088E+000		7.971E-001	3.393E+00
		109.19	1.66	2.069E+000		-1.028E+000	9.891E-00
		143.76*	10.96	2.243E-001		3.663E-001	1.048E-00
		163.36	5.08	7.838E-001		5.979E-001	3.748E-00
		194.94	0.63	6.757E+000		-3.881E+000	3.222E+00
		202.12	1.08	4.344E+000		1.456E+000	2.078E+00
		205.32	5.02	9.219E-001		-2.021E-001	4.405E-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
 =====

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	^	9.50E+000	16.007			
Pb-212	74.8		8.69E-001	23.147	2.480[29.669]	2.53	-0.464
	77.1		3.82E-001	25.223	1.089[31.317]		[0.296]
	238.6	^	3.51E-001	18.561	1.000[26.249]		
BI-214	76.9		1.20E+001	25.383	45.847[41.334]	11.85	-1.848
	609.3	^	2.61E-001	32.622	1.000[46.134]		[0.299]
PB-214	74.8		1.54E+000	24.816	6.052[71.366]	5.23	-0.885
	77.1		6.73E-001	26.782	2.643[72.073]		[0.541]
	295.2		3.21E-001	32.198	1.261[74.256]		
	351.9	^	2.55E-001	66.913	1.000[94.629]		
Ra-226	186.2	^	7.11E+000	14.746			
U-235	93.3		1.13E+000	73.322	3.096[79.402]	13.00	-2.617
	143.8	^	3.66E-001	30.472	1.000[43.094]		[2.092]