
***** 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-2165\W3H-IMC-216

Report Generated On : 7/6/2017 9:38:24 AM

Sample Title : W3H-IMC-2165-S-P-6

Sample Description :

Sample Identification : IMC-2165-S-P-6

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 : 2.667E+002 grams

Sample Taken On : 5/1/2017 12:00:00 AM

Acquisition Started : 5/15/2017 9:11:06 AM

Live Time : 1800.0 seconds

Real Time : 1800.6 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-IMC-2165-S-P-6

Peak Analysis Performed on: 7/6/2017 9:38:18 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	203-	217	213.59	53.56	0.66	1.40E+002	62.06	1.18E+002
M	2	295-	314	299.65	75.10	0.59	2.02E+002	33.92	2.31E+002
m	3	295-	314	308.51	77.31	0.60	5.48E+001	21.01	1.95E+002
F	4	332-	344	337.18	84.49	0.83	3.77E+002	37.10	1.95E+002
F	5	355-	365	359.82	90.15	0.70	1.28E+002	22.06	1.80E+002
F	6	365-	379	373.55	93.59	0.58	2.26E+002	78.18	2.23E+002
F	7	427-	443	435.80	109.17	0.94	9.82E+001	79.27	1.87E+002
F	8	478-	491	483.67	121.15	0.65	6.57E+001	71.26	1.33E+002
F	9	569-	584	574.45	143.86	0.79	5.10E+002	44.42	1.60E+002
F	10	645-	660	652.44	163.38	0.79	2.13E+002	82.35	1.16E+002
F	11	735-	750	741.84	185.75	0.91	2.28E+003	88.93	1.12E+002
F	12	812-	828	819.93	205.29	0.87	1.58E+002	26.40	9.99E+001
F	13	945-	958	953.03	238.60	0.90	7.82E+001	64.44	6.48E+001
F	14	1171-	1184	1178.55	295.04	0.93	3.95E+001	15.67	4.34E+001
F	15	1398-	1411	1405.60	351.85	0.75	6.41E+001	47.66	3.22E+001
F	16	2322-	2335	2328.26	582.75	1.12	3.57E+001	14.39	1.87E+001
F	17	2425-	2441	2432.29	608.78	1.29	6.16E+001	17.33	1.84E+001
F	18	5824-	5849	5835.69	1460.46	2.60	1.44E+002	24.21	5.78E+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-IMC-2165-S-P-6

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	0.979	1460.82*	10.66	8.93566E+000	1.63494E+000
Pb-212	0.997	74.82*	10.28	1.65552E+000	3.56428E-001
		77.11*	17.10	2.64328E-001	1.07269E-001
		86.83	2.07		
		87.35	3.97		
		89.78*	1.46	6.65594E+000	1.41222E+000
		115.18	0.60		
		238.63*	43.60	2.06637E-001	1.71558E-001
		300.09	3.30		
BI-214	0.306	76.86*	0.55	8.29361E+000	3.37392E+000
		79.29	0.91		
		609.32*	45.49	4.07297E-001	1.18647E-001
		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	0.850	74.82*	5.80	2.93427E+000	6.84122E-001
		77.11*	9.70	4.65981E-001	1.93700E-001
		86.83	1.70		
		87.35	2.24		
		89.78*	0.82	1.18508E+001	2.71632E+000
		241.99	7.25		
		258.76	0.53		
		295.22*	18.42	3.03964E-001	1.23806E-001
		351.93*	35.60	3.06709E-001	2.29533E-001

Nuclide Name	Id Confidence	Energy (keV)	Yield (%)	Activity (pCi/gram)	Activity Uncertainty
PB-214	0.850	785.96	1.06		
		839.07	0.58		
Ra-226	0.885	81.07	0.20		
		83.79*	0.32	9.12255E+001	1.47116E+001
		186.21*	3.64	5.82226E+001	6.57607E+000
U-234	0.982	53.20*	0.12	1.46556E+002	6.86527E+001
		120.90*	0.04	1.40583E+002	1.58159E+002
U-235	0.997	89.96*	3.43	2.83309E+000	6.07899E-001
		93.35*	5.54	3.07302E+000	1.12828E+000
		104.82	0.69		
		105.60	1.31		
		108.58	0.50		
		109.19*	1.66	4.37510E+000	3.62336E+000
		143.76*	10.96	3.69662E+000	5.05176E-001
		163.36*	5.08	3.57363E+000	1.43253E+000
		194.94	0.63		
		202.12	1.08		
		205.32*	5.02	3.17931E+000	6.27043E-001

* = 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	0.979	8.935661E+000	1.634937E+000
Pb-212	0.997	1.969597E-001	9.779034E-002
BI-214	0.306	4.026865E-001	1.185905E-001
PB-214	0.850	3.020279E-001	1.040804E-001
Ra-226	0.885	6.371867E+001	6.003581E+000
U-234	0.982	1.456092E+002	6.297571E+001
U-235	0.997	3.258178E+000	3.034286E-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 9:38:18 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 16	582.75	1.9826E-002	40.33		

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-IMC-2165-S-P-6
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	9.333E-001	9.33E-001	8.936E+000	3.828E-00
	Pb-210	46.54	4.25	2.599E+000	2.60E+000	1.197E+000	1.245E+00
	BI-212	727.33	6.67	2.138E+000	2.14E+000	2.410E-001	9.967E-00
		785.37	1.10	1.307E+001		-3.333E+000	6.063E+00
		1078.62	0.56	2.763E+001		-1.573E+001	1.260E+00
		1620.50	1.47	9.903E+000		-9.846E-002	4.285E+00
+	Pb-212	74.82*	10.28	6.021E-001	1.23E-001	1.656E+000	2.900E-00
		77.11*	17.10	3.262E-001		2.643E-001	1.566E-00
		86.83	2.07	4.205E+000		2.176E+000	2.052E+00
		87.35	3.97	1.826E+000		1.132E+000	8.868E-00
		89.78*	1.46	4.010E+000		6.656E+000	1.935E+00
		115.18	0.60	1.007E+001		2.700E-001	4.868E+00
		238.63*	43.60	1.232E-001		2.066E-001	5.801E-00
		300.09	3.30	2.071E+000		-1.741E+000	9.763E-00
+	BI-214	76.86*	0.55	1.024E+001	1.63E-001	8.294E+000	4.913E+00
		79.29	0.91	8.167E+000		3.725E-001	3.962E+00
		609.32*	45.49	1.630E-001		4.073E-001	7.254E-00
		665.45	1.53	7.770E+000		-1.806E+000	3.595E+00
		768.36	4.89	3.068E+000		1.592E-001	1.430E+00
		806.18	1.26	1.295E+001		-2.022E+000	6.054E+00
		934.06	3.11	4.950E+000		-3.070E-001	2.280E+00
		1120.29	14.92	1.376E+000		5.374E-001	6.403E-00
		1155.21	1.63	1.220E+001		5.248E+000	5.651E+00
		1238.11	5.83	3.591E+000		1.338E+000	1.663E+00
		1280.98	1.43	1.275E+001		2.262E+000	5.819E+00
		1377.67	3.99	4.696E+000		2.422E+000	2.135E+00
		1385.31	0.79	1.870E+001		-2.258E+001	8.274E+00
		1401.52	1.33	1.198E+001		-8.594E+000	5.343E+00
		1407.99	2.39	6.812E+000		-3.532E+000	3.045E+00
		1509.21	2.13	8.992E+000		5.901E+000	4.064E+00
		1583.20	0.70	2.515E+001		1.123E+001	1.122E+00
		1661.27	1.05	1.282E+001		-7.705E+000	5.454E+00
		1729.59	2.88	5.023E+000		1.254E+000	2.151E+00
		1764.49	15.30	1.566E+000		1.094E+000	7.138E-00
		1847.43	2.03	7.596E+000		-1.372E+000	3.252E+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	1.067E+000	1.51E-001	2.934E+000	5.139E-00
		77.11*	9.70	5.751E-001		4.660E-001	2.760E-00
		86.83	1.70	5.120E+000		2.650E+000	2.499E+00
		87.35	2.24	3.237E+000		2.006E+000	1.572E+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	7.140E+000	1.51E-001	1.185E+001	3.445E+00
		241.99	7.25	1.167E+000		-2.757E-001	5.619E-00
		258.76	0.53	1.170E+001		-4.923E+000	5.535E+00
		295.22*	18.42	2.795E-001		3.040E-001	1.293E-00
		351.93*	35.60	1.514E-001		3.067E-001	6.921E-00
		785.96	1.06	1.360E+001		-8.281E-001	6.307E+00
		839.07	0.58	2.467E+001		-6.495E+000	1.139E+00
+	Ra-226	81.07	0.20	3.404E+001	1.61E+000	-6.121E-001	1.647E+00
		83.79*	0.32	2.045E+001		9.123E+001	9.898E+00
		186.21*	3.64	1.612E+000		5.822E+001	7.714E-00
	AC-228	89.96	1.90	3.375E+017	5.17E+016	4.165E+017	1.644E+01
		93.35	3.10	2.141E+017		-3.175E+017	1.044E+01
		99.51	1.26	3.401E+017		-3.342E+017	1.636E+01
		105.60	0.74	7.188E+017		5.163E+017	3.485E+01
		129.07	2.42	1.879E+017		4.428E+016	9.050E+01
		153.98	0.72	6.458E+017		1.984E+017	3.104E+01
		209.25	3.89	1.407E+017		2.746E+016	6.748E+01
		214.85	0.76	5.874E+017		-3.350E+017	2.786E+01
		270.24	3.46	1.511E+017		1.794E+016	7.142E+01
		328.00	2.95	2.088E+017		1.086E+017	9.851E+01
		338.32	11.27	5.672E+016		2.232E+016	2.677E+01
		409.46	1.92	3.887E+017		1.416E+017	1.829E+01
		463.00	4.40	1.930E+017		7.812E+016	9.082E+01
		562.50	0.87	1.166E+018		4.977E+017	5.480E+01
		674.75	2.10	5.119E+017		8.882E+016	2.386E+01
		726.86	0.62	1.875E+018		4.196E+017	8.743E+01
		755.32	1.00	1.179E+018		-1.070E+017	5.489E+01
		772.29	1.49	8.138E+017		1.716E+017	3.791E+01
		794.95	4.25	2.704E+017		9.558E+016	1.252E+01
		830.49	0.54	2.096E+018		-2.423E+017	9.660E+01
		835.71	1.61	7.538E+017		2.101E+017	3.493E+01
		840.38	0.91	1.317E+018		3.010E+017	6.095E+01
		904.20	0.77	1.818E+018		-7.141E+017	8.468E+01
		911.20	25.80	5.171E+016		-9.449E+015	2.399E+01
		964.77	4.99	2.489E+017		2.857E+016	1.143E+01
		968.97	15.80	8.459E+016		4.262E+016	3.908E+01
		1247.08	0.50	3.559E+018		1.738E+018	1.653E+01
		1459.14	0.83	4.031E+018		9.484E+018	1.929E+01
		1495.91	0.86	1.195E+018		5.289E+016	5.114E+01
		1588.20	3.22	4.202E+017		-2.065E+017	1.859E+01
		1630.63	1.51	7.849E+017		-1.463E+017	3.397E+01
	TH-230	67.67	0.38	1.948E+001	1.95E+001	-4.756E+000	9.410E+00
	PA-234	742.81	0.11	1.324E+002	2.09E+001	4.321E+001	6.159E+00
		766.42	0.32	4.691E+001		2.282E+001	2.185E+00
	TH-234	1001.03	0.84	2.090E+001	2.07E+000	1.646E+001	9.685E+00
		63.29	3.70	2.071E+000		1.506E+000	9.989E-00
		92.38	2.13	4.330E+000		1.406E+001	2.117E+00
		92.80	2.10	4.190E+000		4.327E+000	2.046E+00
		112.81	0.21	2.732E+001		-4.939E+000	1.318E+00
+	U-234	53.20*	0.12	7.242E+001	7.24E+001	1.466E+002	3.480E+00
		120.90*	0.04	1.405E+002		1.406E+002	6.733E+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	1.707E+000	5.42E-001	2.833E+000	8.235E-00
		93.35*	5.54	1.284E+000		3.073E+000	6.234E-00
		104.82	0.69	9.498E+000		1.180E+001	4.603E+00
		105.60	1.31	5.015E+000		3.602E+000	2.431E+00
		108.58	0.50	1.386E+001		-2.316E+000	6.731E+00
		109.19*	1.66	4.044E+000		4.375E+000	1.962E+00
		143.76*	10.96	5.424E-001		3.697E+000	2.614E-00
		163.36*	5.08	1.075E+000		3.574E+000	5.148E-00
		194.94	0.63	8.460E+000		4.469E+000	4.023E+00
		202.12	1.08	7.884E+000		5.829E+000	3.817E+00
		205.32*	5.02	1.222E+000		3.179E+000	5.837E-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 ***

=====
 Analysis using Key Line Activities
 =====

Filename: C:\GENIE2K\CAMFILES\UNC 2017\IMC Samples\IMC-2165\W3H-IMC-216

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 ^	8.94E+000	18.297			
Pb-212	74.8	1.66E+000	21.530	8.012[85.770]	8.04	-1.391
	77.1	2.64E-001	40.582	1.279[92.411]		[1.156]
	89.8	6.66E+000	21.217	32.211[85.692]		
	238.6 ^	2.07E-001	83.024	1.000[117.41]		
BI-214	76.9	8.29E+000	40.681	20.363[50.035]	9.33	-1.456
	609.3 ^	4.07E-001	29.130	1.000[41.196]		[0.313]
PB-214	74.8	2.93E+000	23.315	9.567[78.385]	8.58	-1.468
	77.1	4.66E-001	41.568	1.519[85.607]		[0.587]
	89.8	1.19E+001	22.921	38.639[78.269]		
	295.2	3.04E-001	40.730	0.991[85.203]		
	351.9 ^	3.07E-001	74.837	1.000[105.83]		
Ra-226	83.8	9.12E+001	16.127	1.567[19.689]	2.94	-0.562
	186.2 ^	5.82E+001	11.295	1.000[15.973]		[0.317]
U-234	53.2 ^	1.47E+002	46.844	1.000[66.247]	0.20	-0.051
	120.9	1.41E+002	112.50	0.959[121.86]		[1.690]
U-235	90.0	2.83E+000	21.457	0.766[25.439]	-0.86	0.152
	93.3	3.07E+000	36.716	0.831[39.176]		[0.382]
	109.2	4.38E+000	82.818	1.184[83.938]		
	143.8 ^	3.70E+000	13.666	1.000[19.326]		
	163.4	3.57E+000	40.086	0.967[42.352]		
	205.3	3.18E+000	19.723	0.860[23.995]		