
***** 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 9:37:44 AM

Sample Title : W3H-IMC-2165-S-P-5

Sample Description :

Sample Identification : IMC-2165-S-P-5

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 : 3.040E+002 grams

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

Acquisition Started : 5/15/2017 8:26:47 AM

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-IMC-2165-S-P-5

Peak Analysis Performed on: 7/6/2017 9:37:39 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	59-	69	65.12	16.41	0.62	1.90E+002	28.86	1.35E+002
F	2	183-	191	185.77	46.60	0.42	4.66E+001	18.07	7.20E+001
F	3	210-	219	213.13	53.44	0.71	9.32E+001	19.19	6.67E+001
M	4	284-	312	291.13	72.96	0.73	8.71E+001	37.52	1.43E+002
m	5	284-	312	299.81	75.14	0.73	2.14E+002	79.98	1.60E+002
m	6	284-	312	308.46	77.30	0.74	1.12E+002	44.56	1.65E+002
F	7	321-	330	324.44	81.30	0.48	3.11E+001	17.91	9.17E+001
F	8	332-	345	337.28	84.51	0.78	2.18E+002	29.95	1.87E+002
F	9	355-	366	359.83	90.16	0.66	1.18E+002	24.27	1.36E+002
F	10	366-	379	373.20	93.50	0.91	1.86E+002	92.44	1.26E+002
F	11	431-	441	435.74	109.15	0.55	3.84E+001	17.88	1.03E+002
F	12	566-	581	574.55	143.89	0.74	2.72E+002	82.23	1.28E+002
F	13	647-	658	652.94	163.51	0.71	1.27E+002	71.76	9.60E+001
F	14	736-	750	741.93	185.78	0.91	1.25E+003	66.44	8.81E+001
F	15	815-	826	820.38	205.41	0.85	9.94E+001	21.37	5.40E+001
F	16	945-	958	952.68	238.51	0.98	1.37E+002	37.79	6.65E+001
F	17	1175-	1184	1179.39	295.25	0.88	4.07E+001	15.35	2.70E+001
F	18	1400-	1411	1405.56	351.84	0.93	7.12E+001	18.41	2.40E+001
F	19	1514-	1523	1518.98	380.23	0.74	9.30E+000	4.33	1.30E+001
F	20	2322-	2338	2328.51	582.81	1.33	4.91E+001	16.14	2.41E+001
F	21	2426-	2440	2433.14	608.99	1.38	4.98E+001	16.19	2.00E+001
F	22	5824-	5851	5836.81	1460.74	2.69	1.81E+002	27.76	1.24E+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-IMC-2165-S-P-5

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	0.999	1460.82*	10.66	9.86060E+000	1.67115E+000
Pb-210	0.999	46.54*	4.25	1.62519E+000	7.38714E-001
Pb-212	0.907	74.82*	10.28	1.53884E+000	6.11210E-001
		77.11*	17.10	4.75590E-001	1.98886E-001
		86.83	2.07		
		87.35	3.97		
		89.78*	1.46	5.39087E+000	1.29358E+000
		115.18	0.60		
		238.63*	43.60	3.18503E-001	9.32996E-002
		300.09	3.30		
BI-214	0.216	76.86*	0.55	1.49222E+001	6.25467E+000
		79.29	0.91		
		609.32*	45.49	2.89028E-001	9.64366E-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	0.795	74.82*	5.80	2.72746E+000	1.11046E+000
		77.11*	9.70	8.38411E-001	3.58646E-001
		86.83	1.70		
		87.35	2.24		
		89.78*	0.82	9.59837E+000	2.44898E+000
		241.99	7.25		
		258.76	0.53		
		295.22*	18.42	2.75528E-001	1.06738E-001

Nuclide Name	Id Confidence	Energy (keV)	Yield (%)	Activity (pCi/gram)	Activity Uncertainty
PB-214	0.795	351.93*	35.60	2.98813E-001	8.12697E-002
		785.96	1.06		
		839.07	0.58		
Ra-226	0.967	81.07*	0.20	1.10997E+001	6.56858E+000
		83.79*	0.32	4.63367E+001	8.68736E+000
		186.21*	3.64	2.80520E+001	3.32580E+000
U-234	0.993	53.20*	0.12	8.55885E+001	2.21539E+001
		120.90	0.04		
U-235	0.997	89.96*	3.43	2.29461E+000	5.55482E-001
		93.35*	5.54	2.22212E+000	1.13569E+000
		104.82	0.69		
		105.60	1.31		
		108.58	0.50		
		109.19*	1.66	1.50172E+000	7.52646E-001
		143.76*	10.96	1.72967E+000	5.54040E-001
		163.36*	5.08	1.86923E+000	1.07508E+000
		194.94	0.63		
		202.12	1.08		
		205.32*	5.02	1.75280E+000	4.19484E-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	0.999	9.860604E+000	1.671147E+000
Pb-210	0.999	1.625189E+000	7.387138E-001
Pb-212	0.907	3.375420E-001	8.354520E-002
BI-214	0.216	2.887338E-001	9.640664E-002
PB-214	0.795	2.954407E-001	6.367681E-002
Ra-226	0.967	2.686442E+001	2.807886E+000
U-234	0.993	8.558846E+001	2.215389E+001
U-235	0.997	1.816204E+000	2.500717E-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 9:37:39 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 1	16.41	1.0569E-001	15.17		
M 4	72.96	4.8375E-002	43.09		
F 19	380.23	5.1661E-003	46.56	Sum	
F 20	582.81	2.7304E-002	32.84		

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-5
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	1.155E+000	1.16E+000	9.861E+000	5.041E-00
+	Pb-210	46.54*	4.25	1.635E+000	1.64E+000	1.625E+000	7.704E-00
	BI-212	727.33	6.67	1.943E+000	1.94E+000	7.752E-001	9.079E-00
		785.37	1.10	1.272E+001		8.031E+000	5.947E+00
		1078.62	0.56	2.870E+001		7.323E+000	1.328E+00
		1620.50	1.47	7.524E+000		-1.814E+000	3.177E+00
+	Pb-212	74.82*	10.28	4.430E-001	1.09E-001	1.539E+000	2.118E-00
		77.11*	17.10	2.643E-001		4.756E-001	1.264E-00
		86.83	2.07	3.161E+000		1.293E+000	1.536E+00
		87.35	3.97	1.392E+000		6.724E-001	6.732E-00
		89.78*	1.46	3.163E+000		5.391E+000	1.519E+00
		115.18	0.60	8.273E+000		1.330E+000	3.988E+00
		238.63*	43.60	1.094E-001		3.185E-001	5.156E-00
		300.09	3.30	1.890E+000		-1.612E+000	8.930E-00
+	BI-214	76.86*	0.55	8.294E+000	1.44E-001	1.492E+001	3.967E+00
		79.29	0.91	7.029E+000		-7.843E-002	3.409E+00
		609.32*	45.49	1.437E-001		2.890E-001	6.402E-00
		665.45	1.53	7.452E+000		1.746E+000	3.471E+00
		768.36	4.89	2.731E+000		2.745E-001	1.274E+00
		806.18	1.26	1.082E+001		6.256E+000	5.038E+00
		934.06	3.11	4.873E+000		1.814E+000	2.265E+00
		1120.29	14.92	1.179E+000		-6.821E-001	5.478E-00
		1155.21	1.63	1.061E+001		-4.531E+000	4.911E+00
		1238.11	5.83	3.067E+000		5.760E-001	1.417E+00
		1280.98	1.43	1.017E+001		-4.329E+000	4.597E+00
		1377.67	3.99	3.950E+000		-3.452E-001	1.788E+00
		1385.31	0.79	1.906E+001		-9.031E+000	8.588E+00
		1401.52	1.33	1.202E+001		5.205E+000	5.442E+00
		1407.99	2.39	6.194E+000		-1.758E+000	2.780E+00
		1509.21	2.13	6.724E+000		4.804E+000	2.983E+00
		1583.20	0.70	2.119E+001		8.085E+000	9.403E+00
		1661.27	1.05	1.247E+001		-3.721E-001	5.398E+00
		1729.59	2.88	4.407E+000		2.809E+000	1.887E+00
		1764.49	15.30	1.284E+000		5.720E-001	5.811E-00
		1847.43	2.03	7.122E+000		3.594E+000	3.082E+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	7.852E-001	1.12E-001	2.727E+000	3.753E-00
		77.11*	9.70	4.660E-001		8.384E-001	2.229E-00
		86.83	1.70	3.849E+000		1.574E+000	1.870E+00
		87.35	2.24	2.468E+000		1.192E+000	1.193E+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	5.631E+000	1.12E-001	9.598E+000	2.705E+00
		241.99	7.25	1.120E+000		-3.691E-001	5.410E-00
		258.76	0.53	9.982E+000		1.851E-001	4.713E+00
		295.22*	18.42	1.818E-001		2.755E-001	8.176E-00
		351.93*	35.60	1.117E-001		2.988E-001	5.018E-00
		785.96	1.06	1.323E+001		1.067E+001	6.187E+00
		839.07	0.58	2.264E+001		1.841E+000	1.049E+00
+	Ra-226	81.07*	0.20	1.935E+001	1.24E+000	1.110E+001	9.192E+00
		83.79*	0.32	1.801E+001		4.634E+001	8.715E+00
		186.21*	3.64	1.236E+000		2.805E+001	5.877E-00
	AC-228	89.96	1.90	2.425E+017	4.99E+016	3.393E+017	1.177E+01
		93.35	3.10	1.499E+017		-2.770E+017	7.282E+01
		99.51	1.26	2.510E+017		-6.166E+016	1.203E+01
		105.60	0.74	5.027E+017		3.526E+017	2.425E+01
		129.07	2.42	1.423E+017		5.889E+016	6.835E+01
		153.98	0.72	4.761E+017		-1.546E+017	2.280E+01
		209.25	3.89	1.097E+017		-5.057E+016	5.252E+01
		214.85	0.76	4.662E+017		-1.758E+017	2.209E+01
		270.24	3.46	1.317E+017		5.865E+016	6.253E+01
		328.00	2.95	1.651E+017		-1.227E+016	7.782E+01
		338.32	11.27	4.987E+016		1.612E+016	2.365E+01
		409.46	1.92	3.221E+017		1.565E+016	1.518E+01
		463.00	4.40	1.349E+017		-6.081E+016	6.288E+01
		562.50	0.87	8.747E+017		-3.183E+017	4.091E+01
		674.75	2.10	3.650E+017		-2.920E+017	1.685E+01
		726.86	0.62	1.546E+018		1.110E+018	7.219E+01
		755.32	1.00	9.935E+017		-3.818E+017	4.640E+01
		772.29	1.49	6.371E+017		1.930E+017	2.961E+01
		794.95	4.25	2.003E+017		-2.157E+017	9.209E+01
		830.49	0.54	1.923E+018		7.159E+017	8.956E+01
		835.71	1.61	6.340E+017		1.920E+017	2.947E+01
		840.38	0.91	1.044E+018		-4.566E+017	4.824E+01
		904.20	0.77	1.551E+018		-1.298E+018	7.256E+01
		911.20	25.80	5.211E+016		6.078E+016	2.455E+01
		964.77	4.99	2.681E+017		2.038E+017	1.259E+01
		968.97	15.80	8.038E+016		2.685E+016	3.759E+01
		1247.08	0.50	2.607E+018		8.710E+017	1.201E+01
		1459.14	0.83	3.725E+018		1.007E+019	1.792E+01
		1495.91	0.86	8.924E+017		-5.977E+016	3.769E+01
		1588.20	3.22	3.609E+017		1.611E+017	1.609E+01
		1630.63	1.51	5.713E+017		-2.126E+017	2.430E+01
	TH-230	67.67	0.38	1.538E+001	1.54E+001	-1.370E+001	7.401E+00
	PA-234	742.81	0.11	1.232E+002	1.69E+001	-2.549E+001	5.752E+00
		766.42	0.32	4.380E+001		2.180E+001	2.050E+00
		1001.03	0.84	1.686E+001		-2.423E+000	7.756E+00
	TH-234	63.29	3.70	1.803E+000	1.80E+000	1.226E+000	8.693E-00
		92.38	2.13	3.377E+000		1.186E+001	1.647E+00
		92.80	2.10	3.222E+000		2.189E+000	1.568E+00
		112.81	0.21	2.229E+001		-1.527E+001	1.073E+00
+	U-234	53.20*	0.12	4.278E+001	4.28E+001	8.559E+001	2.015E+00
		120.90	0.04	1.409E+002		8.727E+001	6.792E+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	1.346E+000	4.27E-001	2.295E+000	6.468E-00
		93.35*	5.54	8.357E-001		2.222E+000	4.017E-00
		104.82	0.69	7.237E+000		7.434E+000	3.490E+00
		105.60	1.31	3.812E+000		2.673E+000	1.839E+00
		108.58	0.50	1.043E+001		-5.577E+000	5.040E+00
		109.19*	1.66	2.298E+000		1.502E+000	1.096E+00
		143.76*	10.96	4.275E-001		1.730E+000	2.051E-00
		163.36*	5.08	7.904E-001		1.869E+000	3.753E-00
		194.94	0.63	7.958E+000		2.221E+000	3.797E+00
		202.12	1.08	5.912E+000		6.064E-002	2.846E+00
		205.32*	5.02	7.216E-001		1.753E+000	3.369E-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	^	9.86E+000	16.948			
Pb-210	46.5	^	1.63E+000	45.454			
Pb-212	74.8		1.54E+000	39.719	4.831[49.353]	8.33	-1.486
	77.1		4.76E-001	41.819	1.493[51.058]		[0.453]
	89.8		5.39E+000	23.996	16.926[37.867]		
	238.6	^	3.19E-001	29.293	1.000[41.427]		
BI-214	76.9		1.49E+001	41.915	51.629[53.574]	12.22	-1.905
	609.3	^	2.89E-001	33.366	1.000[47.186]		[0.345]
PB-214	74.8		2.73E+000	40.714	9.128[48.963]	9.99	-1.713
	77.1		8.38E-001	42.777	2.806[50.691]		[0.282]
	89.8		9.60E+000	25.515	32.122[37.292]		
	295.2		2.76E-001	38.739	0.922[47.333]		
	351.9	^	2.99E-001	27.198	1.000[38.463]		
Ra-226	81.1		1.11E+001	59.178	0.396[60.354]	2.10	-0.401
	83.8		4.63E+001	18.748	1.652[22.182]		[0.333]
	186.2	^	2.81E+001	11.856	1.000[16.767]		
U-234	53.2	^	8.56E+001	25.884			
U-235	90.0		2.29E+000	24.208	1.327[40.150]	1.43	-0.275
	93.3		2.22E+000	51.108	1.285[60.317]		[0.608]
	109.2		1.50E+000	50.119	0.868[59.480]		
	143.8	^	1.73E+000	32.032	1.000[45.299]		
	163.4		1.87E+000	57.515	1.081[65.833]		
	205.3		1.75E+000	23.932	1.013[39.985]		