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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-0011\W6H-IMC-001

Report Generated On : 3/10/2017 1:03:16 PM

Sample Title : W6H-IMC-0011-S-P-6

Sample Description : UNC 2017

Sample Identification : IMC-0011-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 : 2.827E+002 GRAMS

Sample Taken On : 2/28/2017 12:00:00 PM

Acquisition Started : 3/10/2017 10:00:21 AM

Live Time : 1800.0 seconds

Real Time : 1800.7 seconds

Dead Time : 0.04 %

Energy Calibration Used Done On : 3/9/2017

Efficiency Calibration Used Done On : 3/10/2017

Efficiency ID : H-IMC-0011-S-P-6

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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: 8381

Sample Title: W6H-IMC-0011-S-P-6

Peak Analysis Performed on: 3/10/2017 1:03:13 PM

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	182-	190	186.11	46.50	0.50	7.41E+001	19.87	4.28E+001
F	2	296-	304	299.75	74.93	0.55	8.75E+001	21.33	4.05E+001
F	3	949-	959	953.67	238.51	0.79	5.18E+001	18.02	4.13E+001
F	4	1403-	1412	1406.94	351.89	0.80	3.33E+001	14.65	2.70E+001
F	5	5825-	5848	5836.04	1459.81	2.04	1.74E+002	73.33	2.67E+001
F	6	7043-	7060	7051.79	1763.93	1.83	1.99E+001	9.97	3.60E+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-0011-S-P-6  
 Nuclide Library Used: C:\GENIE2K\CAMFILES\GE UNC\_b\_112211.NLB

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

Nuclide Name	Id Confidence	Energy (keV)	Yield (%)	Activity (pCi/GRAM)	Activity Uncertainty
PB-212	0.619	74.82*	10.28	6.75064E-001	2.17381E-001
		77.11	17.10		
		87.35	3.97		
		238.63*	43.60		
		300.09	3.30		
BI-214	0.214	609.32	45.49	1.20540E-001	4.65409E-002
		665.45	1.53		
		768.36	4.89		
		806.18	1.26		
		934.22	3.17		
		1120.29	14.92		
		1155.60	1.66		
		1238.12	5.83		
		1280.98	1.43		
		1377.67	3.99		
		1401.52	1.33		
		1407.99	2.39		
		1509.21	2.13		
		1729.59	2.88		
		1764.49*	15.30		
PB-214	0.191	1847.43	2.03	7.21023E-001	3.67064E-001
		53.23	1.08		
		74.82*	5.80		
		77.11	9.70		
		87.09	3.41		
		241.99	7.25		
		295.22	18.42		
		351.93*	35.60		
		785.96	1.06	1.32490E-001	6.15216E-002

\* = 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

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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
PB-212	0.619	1.417296E-001	4.497730E-002
BI-214	0.214	7.210232E-001	3.670640E-001
PB-214	0.191	1.537948E-001	6.063924E-002

? = 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: 3/10/2017 1:03:13 PM  
 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	46.50	4.1180E-002	26.81		
F	5	1459.81	9.6551E-002	42.20		

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 M D A R E P O R T \*\*\*\*\*  
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Detector Name: 8381  
 Sample Geometry: cylinder  
 Sample Title: W6H-IMC-0011-S-P-6  
 Nuclide Library Used: C:\GENIE2K\CAMFILES\GE UNC\_b\_112211.NLB

	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	3.301E+000	3.30E+000	9.044E+000	1.590E+00
	CO-60	1173.23	99.85	1.406E-001	1.38E-001	5.056E-002	6.487E-00
		1332.49	99.98	1.378E-001		8.173E-002	6.289E-00
	CS-137	661.66	85.10	1.223E-001	1.22E-001	1.835E-002	5.716E-00
	BI-212	727.33	6.67	1.634E+000	1.63E+000	-3.453E-001	7.618E-00
		785.37	1.10	1.135E+001		-1.312E-001	5.321E+00
		1620.50	1.47	7.505E+000		1.778E+000	3.276E+00
+	PB-212	74.82*	10.28	3.121E-001	8.21E-002	6.751E-001	1.456E-00
		77.11	17.10	2.393E-001		2.320E-001	1.135E-00
		87.35	3.97	7.706E-001		-3.080E-001	3.604E-00
		238.63*	43.60	8.209E-002		1.205E-001	3.790E-00
		300.09	3.30	1.561E+000		-1.909E-001	7.301E-00
+	BI-214	609.32	45.49	2.467E-001	2.47E-001	1.839E-001	1.164E-00
		665.45	1.53	6.779E+000		-2.172E+000	3.168E+00
		768.36	4.89	2.525E+000		-1.239E+000	1.184E+00
		806.18	1.26	1.042E+001		1.904E+000	4.895E+00
		934.22	3.17	4.298E+000		-1.271E+000	2.006E+00
		1120.29	14.92	9.709E-001		-2.280E-001	4.505E-00
		1155.60	1.66	9.814E+000		6.840E+000	4.584E+00
		1238.12	5.83	2.962E+000		1.838E+000	1.384E+00
		1280.98	1.43	1.046E+001		3.226E+000	4.824E+00
		1377.67	3.99	3.401E+000		5.700E-002	1.546E+00
		1401.52	1.33	1.020E+001		-5.197E-001	4.631E+00
		1407.99	2.39	5.687E+000		4.508E-001	2.582E+00
		1509.21	2.13	5.959E+000		4.107E+000	2.669E+00
		1729.59	2.88	4.652E+000		1.982E+000	2.069E+00
		1764.49*	15.30	4.101E-001		7.210E-001	1.560E-00
		1847.43	2.03	5.901E+000		-8.412E-001	2.565E+00
+	PB-214	53.23	1.08	3.415E+000	1.07E-001	1.686E+000	1.560E+00
		74.82*	5.80	5.532E-001		1.197E+000	2.581E-00
		77.11	9.70	4.219E-001		4.090E-001	2.001E-00
		87.09	3.41	9.272E-001		-4.607E-001	4.346E-00
		241.99	7.25	7.068E-001		0.000E+000	3.342E-00
		295.22	18.42	3.192E-001		6.578E-002	1.507E-00
		351.93*	35.60	1.069E-001		1.325E-001	4.807E-00
		785.96	1.06	1.166E+001		-2.671E+000	5.462E+00
	Ra-226	186.21	3.64	1.053E+000	1.05E+000	1.043E+000	4.948E-00
	TH-228	240.80	3.97	1.523E+000	1.52E+000	4.121E-001	7.264E-00
	TH-230	67.67	0.38	8.522E+000	8.52E+000	1.703E-001	3.954E+00
	TH-232	129.07	2.45	8.743E-001	3.33E-001	-2.442E-002	3.975E-00
		209.25	3.88	1.116E+000		-2.873E-001	5.259E-00
		270.24	3.43	1.527E+000		1.134E+000	7.189E-00

Nuclide Name	Energy (keV)	Yield (%)	Line MDA (pCi/GRAM)	Nuclide MDA (pCi/GRAM)	Activity (pCi/GRAM)	Dec. Leve (pCi/GRAM)
TH-232	277.35	2.48	2.065E+000	3.33E-001	-1.957E+000	9.696E-00
	327.99	3.06	1.844E+000		-3.301E-001	8.634E-00
	338.32	11.30	5.606E-001		1.645E-001	2.639E-00
	409.46	1.94	3.775E+000		7.954E-001	1.774E+00
	463.01	4.44	1.669E+000		3.478E-001	7.791E-00
	583.00	30.96	3.328E-001		1.408E-001	1.566E-00
	755.32	1.01	1.056E+001		-2.097E+000	4.907E+00
	772.29	1.50	8.995E+000		2.253E+000	4.240E+00
	794.95	4.34	2.745E+000		-1.375E+000	1.281E+00
	835.71	1.68	7.842E+000		4.531E+000	3.676E+00
	860.30	4.32	3.026E+000		-6.704E-002	1.415E+00
	911.21	26.60	5.574E-001		6.673E-002	2.621E-00
	964.77	5.11	2.882E+000		7.289E-001	1.350E+00
	968.97	16.20	8.833E-001		1.246E-001	4.130E-00
	1588.21	3.27	4.044E+000		1.619E+000	1.811E+00
	1630.63	1.60	6.119E+000		3.413E-001	2.620E+00
U-233	42.44	0.06	8.814E+001	8.81E+001	1.518E+000	3.996E+00
	54.70	0.01	2.187E+002		-1.361E+002	9.854E+00
	97.14	0.02	9.860E+001		-2.093E+001	4.495E+00
	146.35	0.01	3.592E+002		3.960E+001	1.635E+00
	164.51	0.01	3.669E+002		2.216E+002	1.672E+00
	291.32	0.01	1.009E+003		-1.460E+003	4.733E+00
	317.13	0.01	5.854E+002		-4.252E+002	2.728E+00
	320.51	0.00	1.905E+003		1.413E+003	8.957E+00
U-234	53.20	0.12	2.987E+001	2.99E+001	1.475E+001	1.365E+00
	120.90	0.04	6.065E+001		1.180E+000	2.793E+00
U-235	105.60	1.32	1.565E+000	6.82E-002	-1.063E-001	7.106E-00
	109.16	1.54	1.497E+000		6.606E-001	6.868E-00
	143.76	10.96	1.968E-001		-1.481E-001	8.925E-00
	163.33	5.08	4.748E-001		-3.877E-002	2.164E-00
	185.71	57.00	6.825E-002		7.665E-002	3.211E-00
	202.11	1.08	3.269E+000		-2.015E+000	1.522E+00
	205.31	5.01	7.931E-001		-1.720E-001	3.720E-00
	63.29	3.70	1.108E+000	8.14E-001	8.624E-001	5.201E-00
U-238	92.60	4.23	8.136E-001		5.291E-001	3.839E-00
	766.42	0.32	3.709E+001		-1.644E+000	1.735E+00
	1001.03	0.84	1.585E+001		1.493E+000	7.360E+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

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\*\*\* 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-0011\W6H-IMC-001

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]
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PB-212	74.8	6.75E-001	32.202	5.600[50.276]	8.13	-1.485
	238.6 ^	1.21E-001	38.610	1.000[54.603]		[ 0.640]
BI-214	1764.5	7.21E-001	*****			
PB-214	74.8	1.20E+000	32.887	9.031[56.901]	8.33	-1.421
	351.9 ^	1.32E-001	46.435	1.000[65.669]		[ 0.561]