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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-2198\UNC-IMC-219

Report Generated On : 5/4/2017 8:08:35 AM

Sample Title : UNC-IMC-2198-S-P-5

Sample Description :

Sample Identification : IMC-2198-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 : 5.796E+002 grams

Sample Taken On : 4/10/2017 12:00:00 AM

Acquisition Started : 4/21/2017 8:50:13 AM

Live Time : 1800.0 seconds

Real Time : 1800.7 seconds

Dead Time : 0.04 %

Energy Calibration Used Done On : 4/13/2017

Efficiency Calibration Used Done On : 5/4/2017

Efficiency ID : H-IMC-2189-S-P-5

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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: 8566

Sample Title: UNC-IMC-2198-S-P-5

Peak Analysis Performed on: 5/4/2017 8:08:29 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-	71	65.07	16.39	0.83	6.07E+002	152.39	3.19E+002
F	2	93-	108	102.83	25.84	0.65	1.81E+002	90.17	2.40E+002
F	3	206-	221	213.11	53.44	0.67	2.33E+002	99.19	3.17E+002
M	4	288-	314	290.99	72.93	0.80	1.84E+002	72.08	3.29E+002
m	5	288-	314	299.43	75.04	0.81	4.22E+002	128.58	5.52E+002
m	6	288-	314	308.25	77.25	0.81	1.98E+002	66.03	5.18E+002
M	7	320-	344	324.97	81.43	0.83	1.09E+002	31.15	3.77E+002
m	8	320-	344	337.17	84.49	0.84	6.35E+002	53.75	6.70E+002
F	9	354-	365	359.78	90.14	0.63	2.60E+002	40.18	4.22E+002
F	10	366-	380	373.15	93.49	0.95	4.38E+002	180.11	5.35E+002
F	11	429-	441	436.64	109.38	0.60	1.66E+002	121.33	4.03E+002
F	12	479-	492	483.21	121.03	0.72	1.12E+002	31.40	4.25E+002
F	13	569-	580	574.44	143.86	0.87	8.90E+002	58.27	2.64E+002
F	14	647-	660	652.54	163.40	0.86	3.68E+002	34.36	2.66E+002
F	15	735-	749	741.78	185.74	0.97	4.32E+003	223.22	2.29E+002
F	16	774-	783	778.47	194.92	0.69	2.93E+001	17.26	8.25E+001
M	17	802-	829	807.31	202.14	0.94	4.74E+001	18.98	8.84E+001
m	18	802-	829	820.10	205.34	0.95	3.50E+002	36.69	1.00E+002
F	19	948-	959	952.79	238.54	0.90	1.76E+002	28.64	8.55E+001
F	20	1173-	1184	1178.66	295.06	0.73	6.25E+001	19.56	6.24E+001
F	21	1346-	1355	1350.83	338.15	0.90	3.08E+001	15.06	3.30E+001
F	22	1397-	1411	1404.90	351.68	1.05	1.27E+002	64.99	4.35E+001
F	23	2030-	2045	2037.81	510.06	1.64	6.03E+001	19.35	4.93E+001
F	24	2321-	2335	2328.16	582.72	1.46	7.39E+001	20.13	3.63E+001
F	25	2423-	2441	2432.63	608.86	1.59	7.66E+001	19.28	2.69E+001
F	26	5824-	5848	5836.42	1460.64	2.54	2.15E+002	29.79	9.72E+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: UNC-IMC-2198-S-P-5  
 Nuclide Library Used: C:\GENIE2K\CAMFILES\GE\_UNC\_U-NLB.NLB

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

Nuclide Name	Id Confidence	Energy (keV)	Yield (%)	Activity (pCi/gram)	Activity Uncertainty
K-40	0.995	1460.82*	10.66	7.20559E+000	1.17202E+000
U-234	0.992	53.20*	0.12	2.16349E+002	1.05843E+002
		120.90*	0.04	1.58497E+002	7.01831E+001
U-235	0.999	105.60	1.31		
		109.19*	1.66	5.01661E+000	3.88318E+000
		143.76*	10.96	4.13813E+000	8.61391E-001
		163.36*	5.08	3.87185E+000	8.09177E-001
		202.12*	1.08	2.66450E+000	1.15209E+000
		205.32*	5.02	4.28628E+000	8.14581E-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

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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
K-40	0.995	7.205592E+000	1.172017E+000
U-234	0.992	1.761649E+002	5.849234E+001
U-235	0.999	3.900638E+000	4.384549E-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: 5/4/2017 8:08:29 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	16.39	3.3719E-001	25.11		
F	2	25.84	1.0076E-001	49.72		
M	4	72.93	1.0213E-001	39.21		
m	5	75.04	2.3428E-001	30.49		
m	6	77.25	1.1010E-001	33.31		
M	7	81.43	6.0716E-002	28.50		
m	8	84.49	3.5272E-001	8.47		
F	9	90.14	1.4471E-001	15.43		
F	10	93.49	2.4360E-001	41.08		
F	15	185.74	2.3982E+000	5.17		
F	16	194.92	1.6303E-002	58.83		
F	19	238.54	9.7567E-002	16.31		
F	20	295.06	3.4724E-002	31.30		
F	21	338.15	1.7105E-002	48.91		
F	22	351.68	7.0472E-002	51.23		
F	23	510.06	3.3476E-002	32.11		
F	24	582.72	4.1079E-002	27.22		
F	25	608.86	4.2541E-002	25.18		

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: 8566  
 Sample Geometry: cylinder  
 Sample Title: UNC-IMC-2198-S-P-5  
 Nuclide Library Used: C:\GENIE2K\CAMFILES\GE\_UNC\_U-NLB.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	6.223E-001	6.22E-001	7.206E+000	2.658E-00
	PA-234	742.81	0.11	7.748E+001	1.21E+001	-4.321E+001	3.613E+00
		766.42	0.32	3.168E+001		2.312E+001	1.494E+00
		1001.03	0.84	1.206E+001		-4.901E-001	5.605E+00
	TH-234	63.29	3.70	2.567E+000	2.57E+000	2.761E+000	1.253E+00
		92.38	2.13	4.483E+000		1.773E+001	2.207E+00
		92.80	2.10	4.377E+000		3.338E+000	2.154E+00
		112.81	0.21	3.057E+001		-9.528E+000	1.496E+00
+	U-234	53.20*	0.12	1.067E+002	1.07E+002	2.163E+002	5.211E+00
		120.90*	0.04	1.637E+002		1.585E+002	7.993E+00
+	U-235	105.60	1.31	5.292E+000	4.06E-001	3.164E+000	2.594E+00
		109.19*	1.66	3.644E+000		5.017E+000	1.781E+00
		143.76*	10.96	4.056E-001		4.138E+000	1.965E-00
		163.36*	5.08	9.657E-001		3.872E+000	4.686E-00
		202.12*	1.08	2.614E+000		2.664E+000	1.231E+00
		205.32*	5.02	6.028E-001		4.286E+000	2.848E-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-2198\UNC-IMC-219

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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K-40	1460.8	^	7.21E+000	16.265			
U-234	53.2	^	2.16E+002	48.922	1.000[69.187]	1.51	-0.379
	120.9		1.58E+002	44.281	0.733[65.986]		[ 1.165]
U-235	109.2		5.02E+000	77.406	1.212[80.156]	1.41	-0.283
	143.8	^	4.14E+000	20.816	1.000[29.438]		[ 0.903]
	163.4		3.87E+000	20.899	0.936[29.497]		
	202.1		2.66E+000	43.239	0.644[47.988]		
	205.3		4.29E+000	19.004	1.036[28.186]		