

# T S SPACE SYSTEMS

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Unit A5, Rose Business Estate, Marlow Bottom  
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## OUTGASSING TEST – ECSS-Q-ST-70-02C

Customer  
Customer purchase order  
Test commencing



### 1. Mass spectroscopy report:

- A vac scan was made on reaching the operational vacuum level, at room temperature.
- A second vac scan was carried out on achieving 80°C
- A third vac scan was carried out at the end of the test
- The bar charts were logged every 15 minutes throughout the test

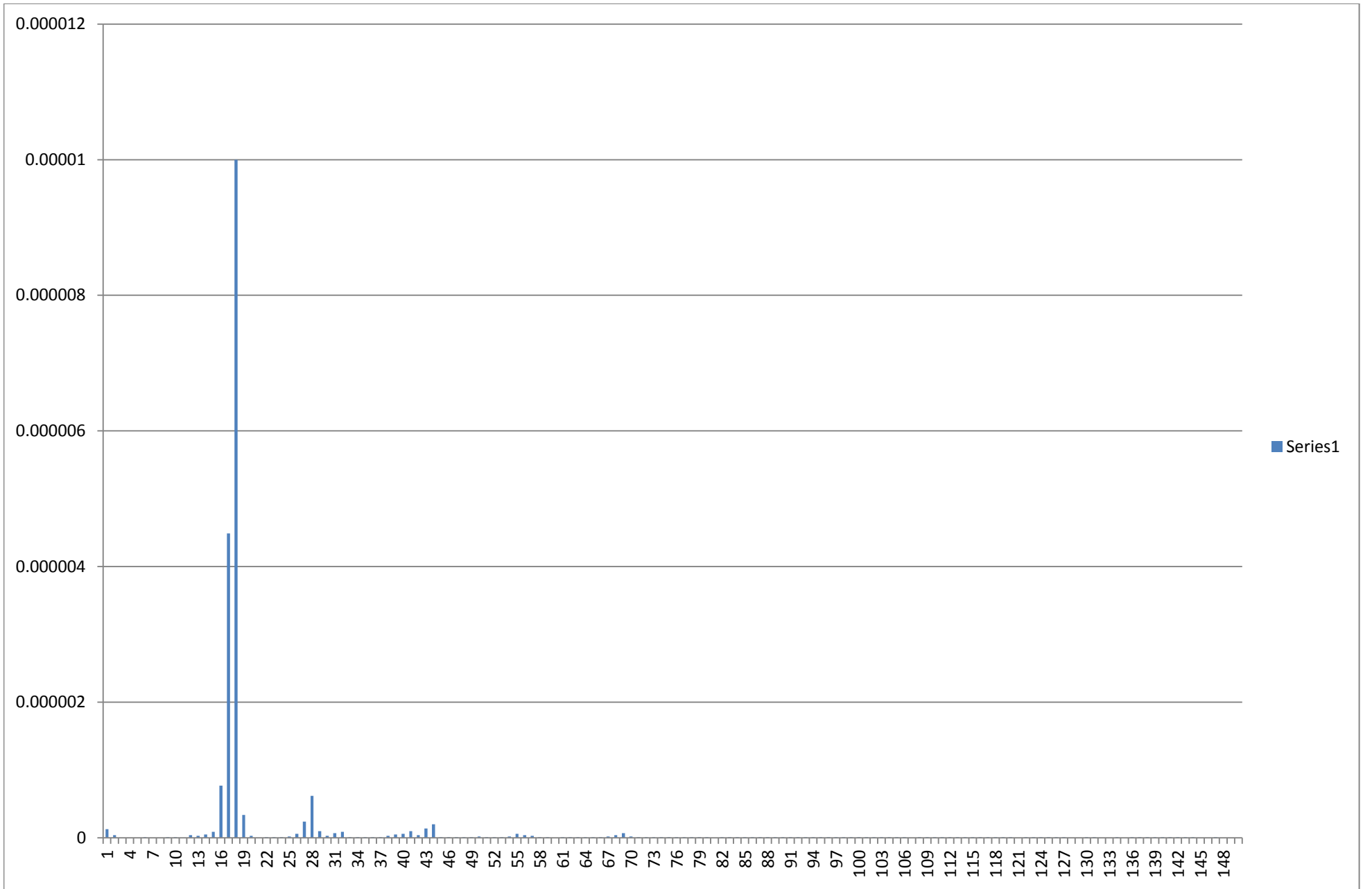
### 2. Other comments

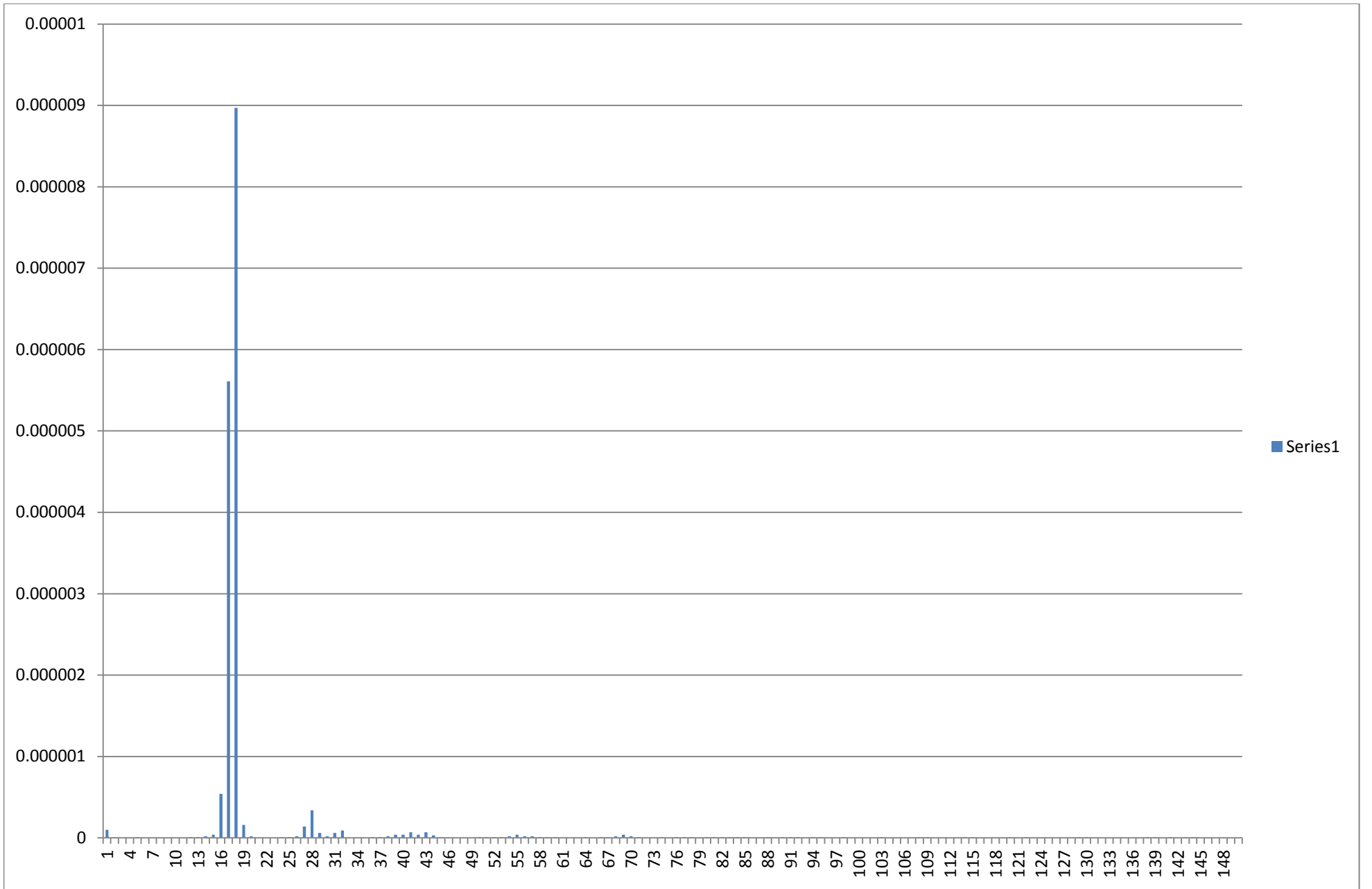
- This test was carried out with the samples at 80°C
- Results for the reference material match published data.
- The test was conducted without incident, and the consistency of the results for each specimen confirms a successful run.
- Results, with regard to the empty crucibles, indicate the cleanliness of the equipment.

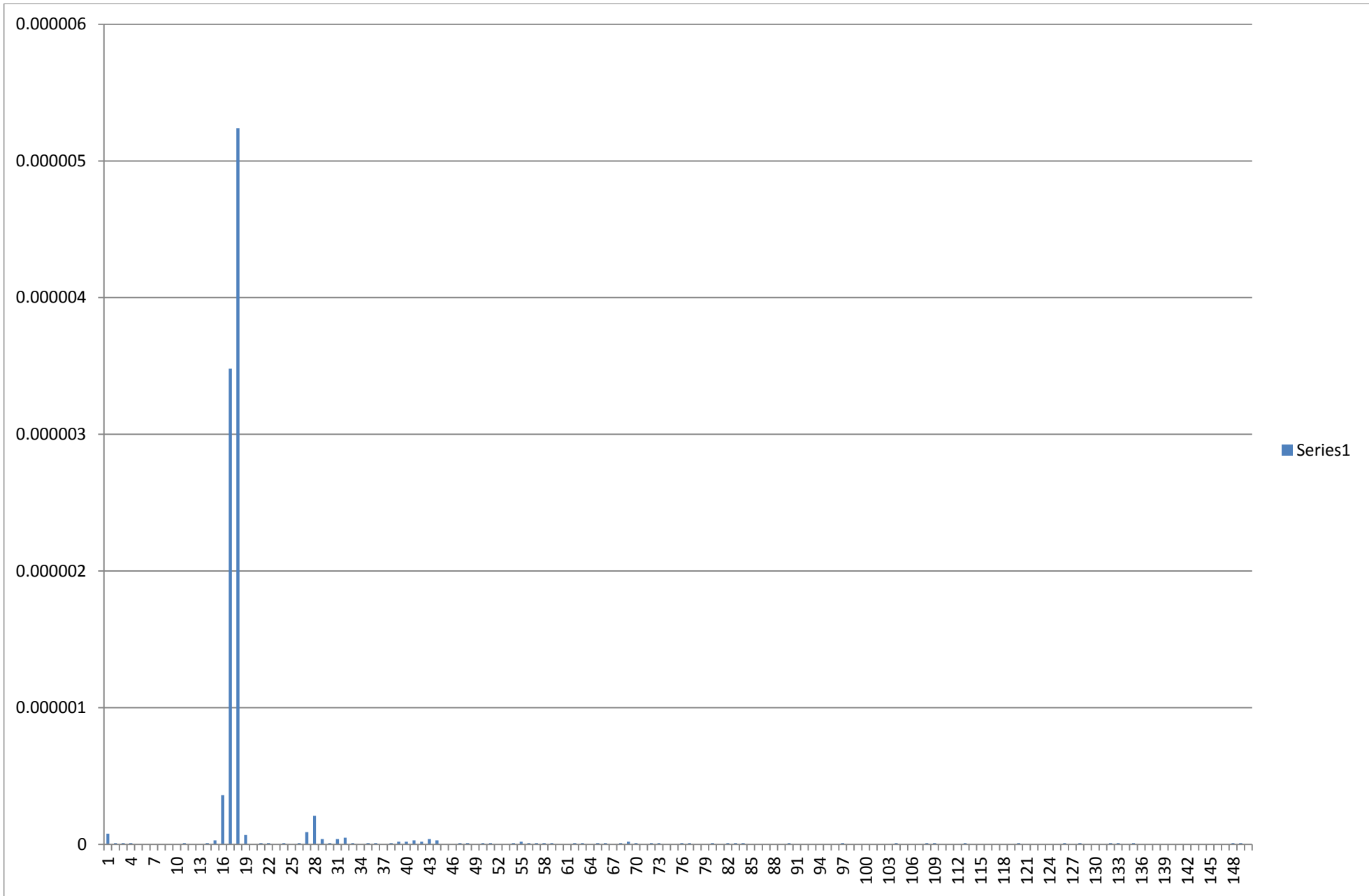
DATE: 18.03.14 at 16.40 – at room temperature			
MASS FOUND	PEAK HEIGHT	PERCENTAGE	COMMON GAS NAMES
18	1.34 10 <sup>-5</sup>	58.8	Water
17	6.21 10 <sup>-6</sup>	27.3	Water
16	6.74 10 <sup>-7</sup>	2.96	Oxygen
28	6.69 10 <sup>-7</sup>	2.94	Air / Nitrogen / Carbon Monoxide
19	5.20 10 <sup>-7</sup>	2.28	
27	2.67 10 <sup>-7</sup>	1.17	Hydrocarbons
43	2.22 10 <sup>-7</sup>	0.975	Hydrocarbons
44	1.96 10 <sup>-7</sup>	0.860	Carbon Dioxide
1	1.72 10 <sup>-7</sup>	0.755	
41	1.69 10 <sup>-7</sup>	0.742	Hydrocarbons
29	1.63 10 <sup>-7</sup>	0.716	
15	1.16 10 <sup>-7</sup>	0.509	Methane

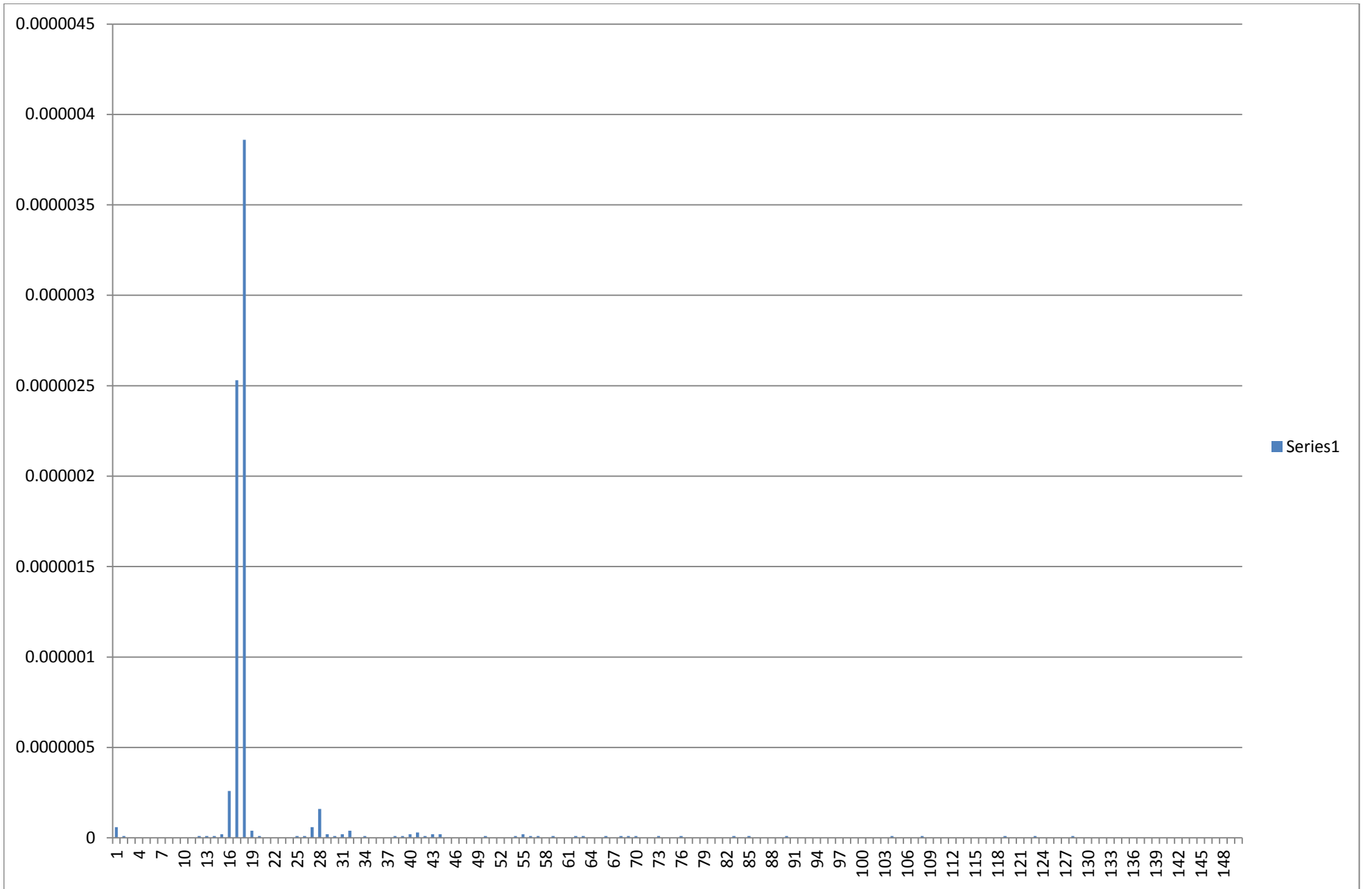
DATE: 18.03.14 at 17.23 – at 80°C			
MASS FOUND	PEAK HEIGHT	PERCENTAGE	COMMON GAS NAMES
18	1.46 10 <sup>-5</sup>	66.1	Water
17	4.27 10 <sup>-6</sup>	19.3	Water
28	8.31 10 <sup>-7</sup>	3.76	Air / Nitrogen / Carbon Monoxide
16	7.20 10 <sup>-7</sup>	3.26	Oxygen
19	4.30 10 <sup>-7</sup>	1.95	
27	3.10 10 <sup>-7</sup>	1.40	Hydro Carbons
44	2.43 10 <sup>-7</sup>	1.10	Carbon Dioxide
43	1.61 10 <sup>-7</sup>	0.729	Hydrocarbons
29	1.60 10 <sup>-7</sup>	0.724	
41	1.31 10 <sup>-7</sup>	0.593	Hydrocarbons
1	1.25 10 <sup>-7</sup>	0.566	
15	1.04 10 <sup>-7</sup>	0.471	Methane

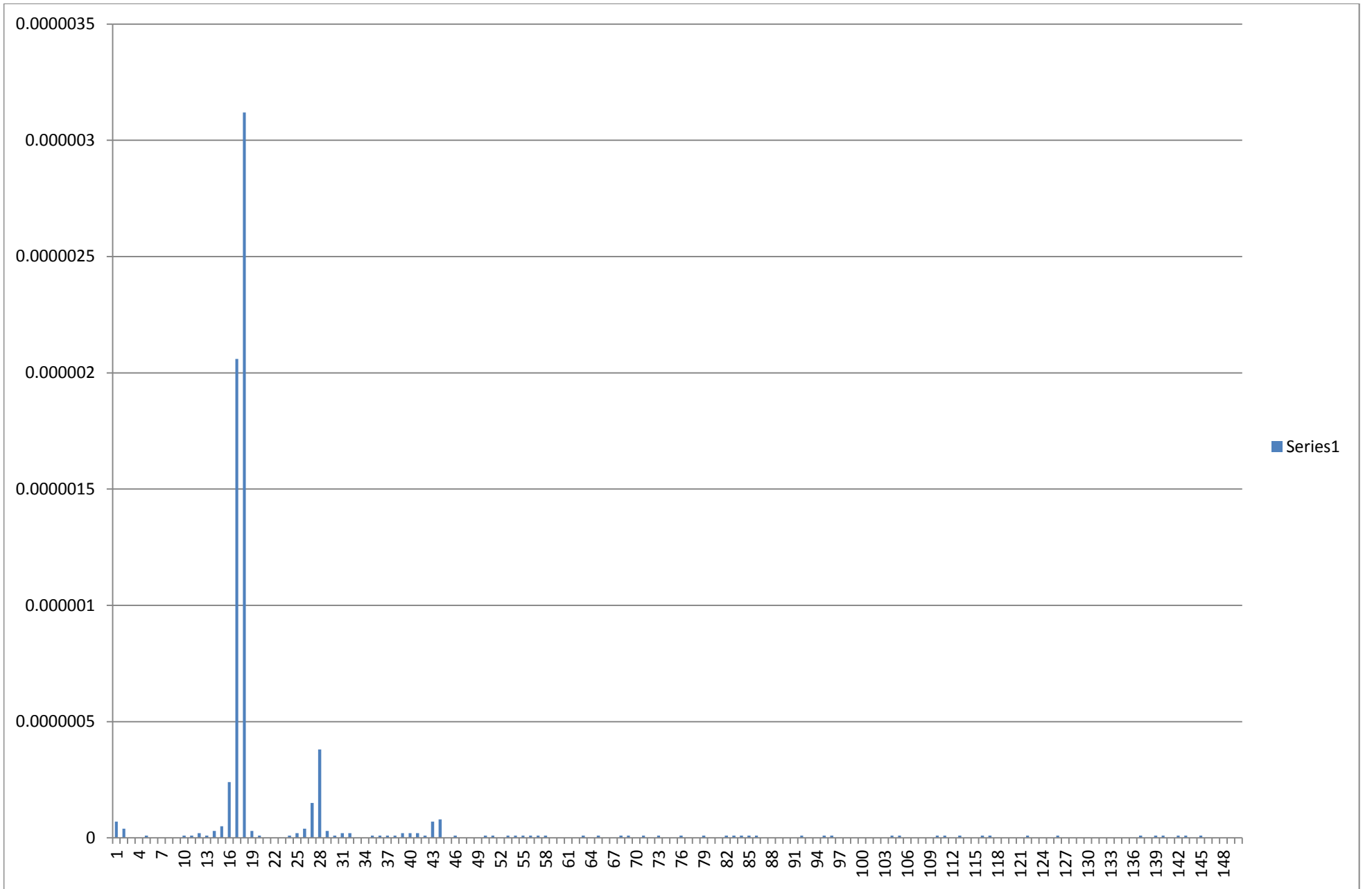
DATE: 19.03.14 at 17.22 – at end of test			
MASS FOUND	PEAK HEIGHT	PERCENTAGE	COMMON GAS NAMES
18	3.22 10 <sup>-6</sup>	48.8	Water
17	2.44 10 <sup>-6</sup>	37.0	Water
16	3.59 10 <sup>-7</sup>	5.44	Oxygen
28	2.02 10 <sup>-7</sup>	3.06	Air / Nitrogen / Carbon Monoxide
27	1.05 10 <sup>-7</sup>	1.59	Hydrocarbons
1	8.14 10 <sup>-8</sup>	1.23	
15	4.91 10 <sup>-8</sup>	0.744	Methane
43	3.85 10 <sup>-8</sup>	0.583	Hydrocarbons
44	3.36 10 <sup>-8</sup>	0.509	Carbon Dioxide
32	2.99 10 <sup>-8</sup>	0.453	Oxygen
2	2.44 10 <sup>-8</sup>	0.370	Hydrogen
31	1.92 10 <sup>-8</sup>	0.291	Alcohols

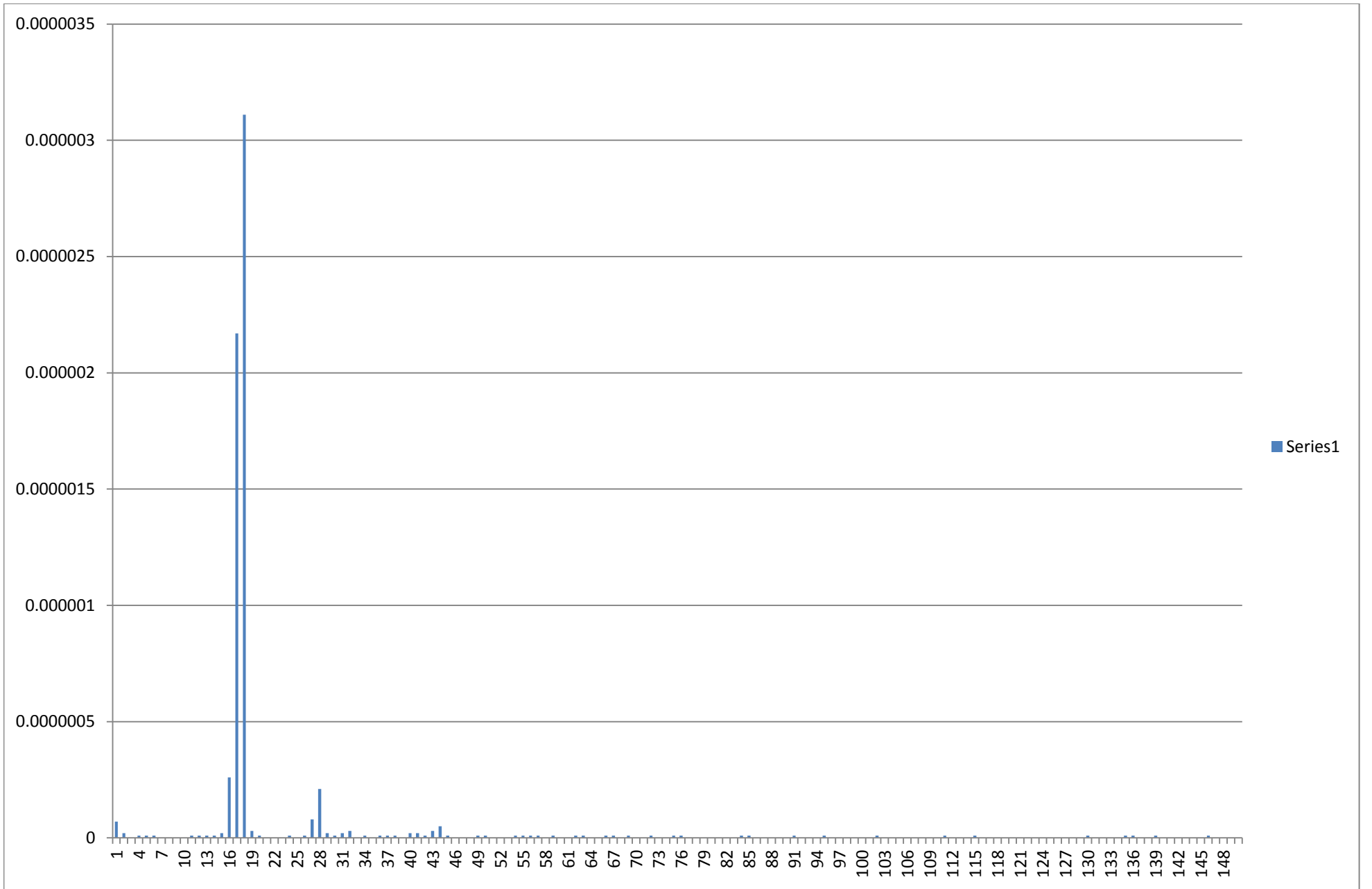




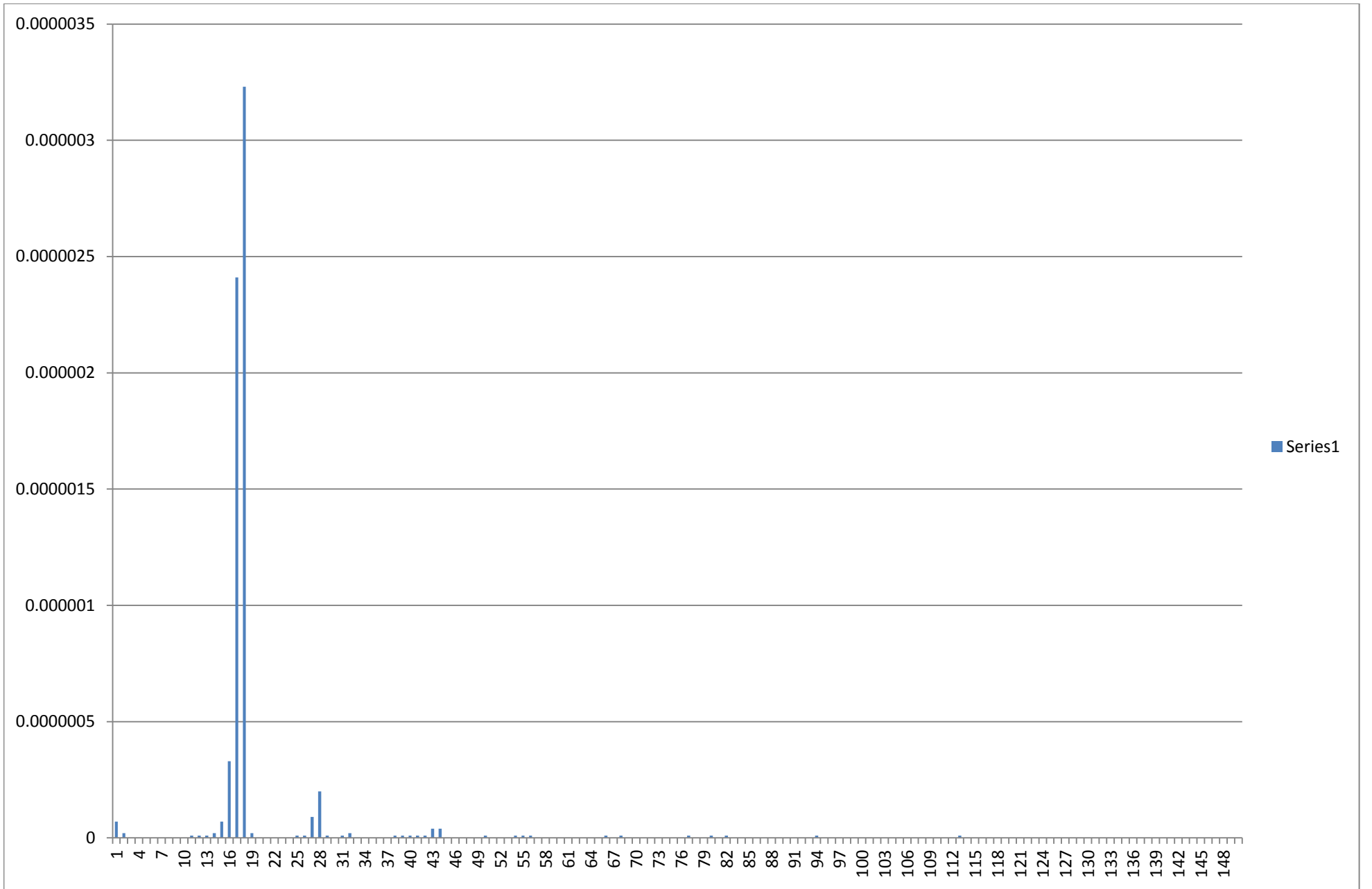












Outgassing test- [REDACTED]

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Outgassing test to standard						ECSS-Q-ST-70-02C (run at 80°C as per [REDACTED] request)					
Commencing						10.03.14					
Customer						[REDACTED]					
Cell ref	Contents	Mass of crucible	Mass of crucible and sample	Mass of crucible and sample after run	Total mass lost %	Mass of mirror	Mass of mirror after run	Mass gain % *	Crucible and sample after conditioning	Recovered mass loss%	WaterVapour regained %
1	S1	27.922	64.204	62.915	3.553	971.764	971.756	-0.022		176.958	-173.406
2	S4	28.309	262.167	257.391	2.042	822.006	822.004	-0.001		112.105	-110.063
3	E	28.234	28.234	28.227	#DIV/0!	927.122	927.114	#DIV/0!		#DIV/0!	#DIV/0!
4	S9	27.042	168.940	167.400	1.085	924.840	924.818	-0.016		119.057	-117.972
5	S2	31.050	90.687	88.409	3.820	898.676	898.668	-0.013		152.065	-148.245
6	S5	31.255	309.207	303.390	2.093	882.464	882.460	-0.001		111.245	-109.152
7	S10	26.480	153.355	151.836	1.197	980.534	980.526	-0.006		120.871	-119.674
8	S12	27.089	68.995	66.877	5.054	910.934	911.032	0.234		164.642	-159.588
9	S3	29.864	79.567	77.704	3.748	1044.125	1044.125	0.000		160.085	-156.337
10	S6	27.769	294.045	288.323	2.149	978.774	978.766	-0.003		110.429	-108.280
11	S11	30.689	264.317	262.604	0.733	981.772	981.756	-0.007		113.136	-112.403
12	C	30.453	307.349	305.599	0.632	938.116	938.104	-0.004		110.998	-110.366
Note:	Control - ESA data					Samples #1--6, 9-12 [REDACTED]					
	TML	0.52 %				C	Control				
	Condensibles	0.02 %				E	Empty				
<p>* Negative values indicate a "no gain". The aluminium mirrors are cleaned with chromatographic level IPA for each use - hence they are completely unlubricated. Microscopic amounts of aluminium are, therefore, sloughed off the threads with each removal of the steel nut. Since the microbalance used (Sartorius M3P) weighs to a millionth of a gram, where there has been no gain this delivers an apparently negative result.</p>											