

DSCC IWV CORRELATION PROGRAM

ROUND TWO TEST RESULTS

Samples for the second round of the DSCC Internal Water Vapor Analysis Correlation Program were analyzed by the DSCC Product Test Center and five laboratories having DSCC suitability to perform IWV in accordance with Test Method 1018. Laboratory identification has been made anonymous by substituting their name with a numerical code.

The results of these tests are summarized in the attached Excel spreadsheet in terms of water vapor and other gasses detected and are expressed in units of parts per million by volume except where noted. Samples are grouped by 0.1cc and 1.0cc volumes. The 0.1cc samples were sealed with 4800ppmv of water vapor in nitrogen. The 1.0cc samples were sealed with 5100ppmv water vapor in nitrogen. Samples of 0.01cc volume are waiting for in house testing and are planned to be shipped later this year after an equipment upgrade is completed.

Laboratory 2 reported one 1.0cc sample as non-hermetic. This was confirmed after it was returned to DSCC. Laboratory 2 also reported a 1.0cc sample having 9170ppmv water vapor. It is uncertain why such a high reading exists, but the lab did verify a much larger peak was displayed and nothing proves the sample as being non-hermetic. Laboratory 3 reported one 0.1cc sample at 6937ppmv, well above the actual 4800ppmv sealed. This sample also had high levels of oxygen, argon and carbon dioxide. Although there is no proof explaining the cause, this reading is typical of the sample being either non-hermetic or there was a loss of vacuum to the sample during puncture since this sample was tested using an external fixture. Laboratory 5's initial results for the quantity of water vapor contained within the 0.1cc samples were much lower than actual. Communications with them revealed that analysis was performed at a condition other than calibrated at. The data reported herein reflects a 1.252 multiplier applied to the original data to compensate for the error. Recalibrating the system to the actual test conditions derived this multiplier. DSCC considers this as operator error and will be addressed to reduce the likelihood of reoccurrence. Laboratory 6 initially reported data approximately fifty percent of the actual values for both volumes and thus voluntarily halted production for a period to search for a cause. Although they were unable to explain the low readings, their search for a cause resulted in them finding some weaknesses in their procedures which have since been revised. A second set of samples were created by DSCC and sent to Laboratory 6 for additional analysis. Samples of both volumes were sealed in the same batch with 4800ppmv of water vapor, unlike the first set of 1.0cc samples, which were sealed at 5100ppmv.

For the 0.1cc samples, six laboratories have mean values evenly split below and above the actual amount sealed. Three laboratory means range from 100ppmv to 419ppmv below the actual amount and the other three laboratory means were as high as 717ppmv above the actual amount. All six of the laboratory means for 1.0cc samples range from 147ppmv to 937ppmv above the actual amount sealed. For the 0.1cc samples, five laboratories reported

all five readings within the +/- 20% tolerance while Laboratory 3 reported two readings above the tolerance. For the 1.0cc samples, four laboratories reported all five readings within the +/- 20% tolerance while Laboratory 2 and Laboratory 5 reported some readings above the tolerance. The values for other gasses detected (oxygen, hydrogen, argon and carbon dioxide) are also given.

A comparison of these results to those of the first round of samples tested last year is also given. Round Two shows improvement in both volumes. Data for the 0.1cc samples show little differences in the mean values with the exception of their range. Round Two has a smaller range of 1136ppmv indicating a tighter grouping of the labs and only one of the six labs reporting any individual sample data outside of the 20% tolerance. For the 1.0cc samples the mean value of 5687ppmv for Round Two is slightly higher than Round One (5457ppmv) with a smaller standard deviation of 365ppmv versus 1144ppmv and a range reduced from 3118ppmv to 873ppmv.

If you have any questions, please contact Jim Eschmeyer at 614-692-0591 or e-mailed at james.eschmeyer@dsc.dla.mil

ROUND TWO 1.0cc SAMPLES - 5100 ppmv H2O

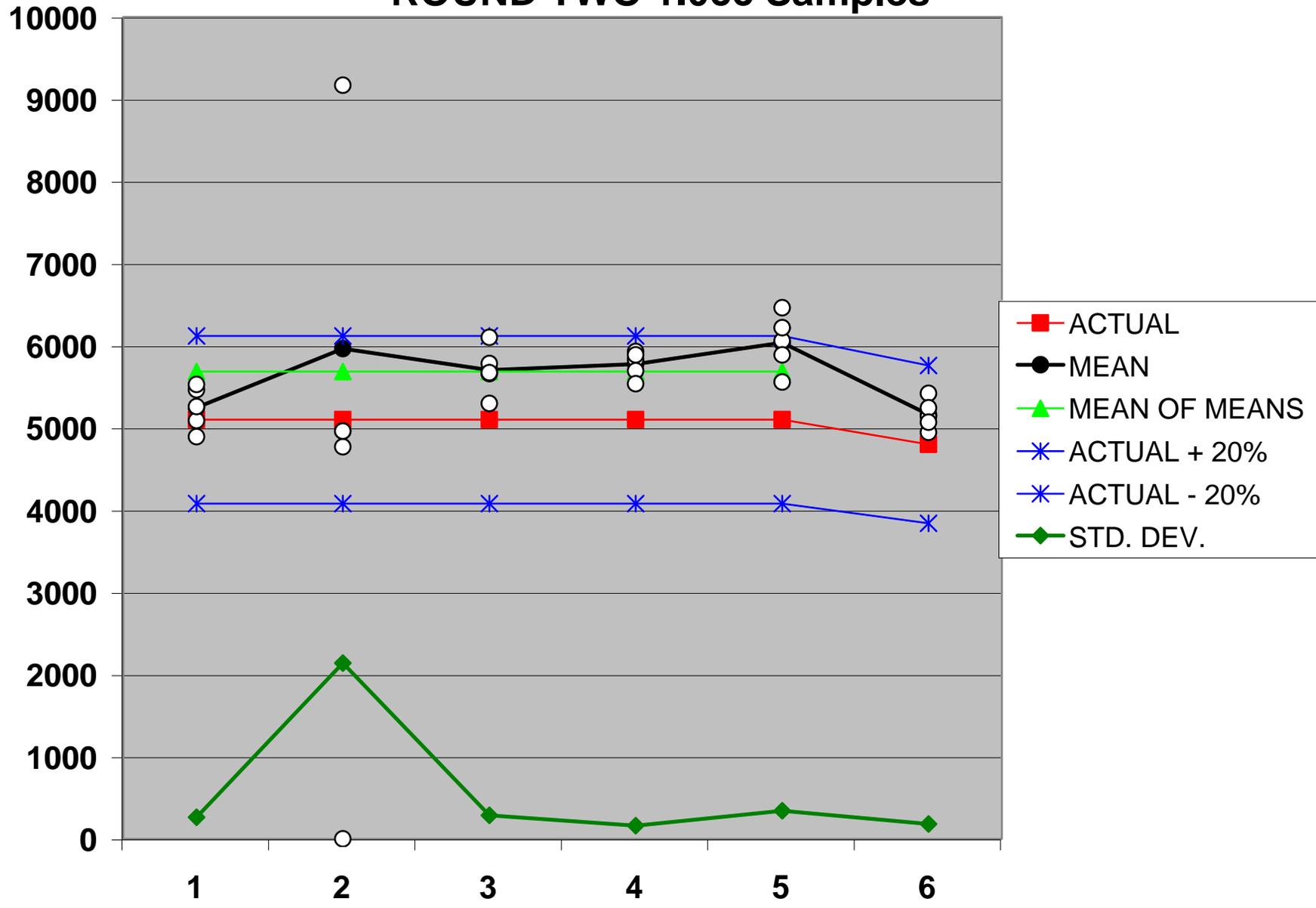
LAB	DSCC	2	3	4	5	6 **
	MEAS.	MEAS.	MEAS.	MEAS.	MEAS.	MEAS.
	5089	*	5661	5930	5558	5421
	5464	4960	5298	5832	6461	5138
	5527	4770	5783	5695	6061	4946
	5260	4960	5672	5888	6220	5245
	4894	9170	6101	5538	5887	5069
MEAN	5247	5965	5703	5777	6037	5164
STD. DEV.	262	2139	288	160	341	180
MEAN TO ACTUAL %	2.9	17.0	11.8	13.3	18.4	7.6
ACTUAL + 20%	6120	6120	6120	6120	6120	5760
ACTUAL - 20%	4080	4080	4080	4080	4080	3840
MEAN OF MEANS	5687	5687	5687	5687	5687	5687
STD. DEV. OF MEANS	365	365	365	365	365	365

* NON-HERMETIC

** SECOND SET (SEALED AT 4800ppm)

MEASUREMENTS IN BOLD ARE ABOVE THE 20% TOLERANCE

ROUND TWO 1.0cc Samples



ROUND TWO 0.1cc SAMPLES - 4800 ppmv H2O

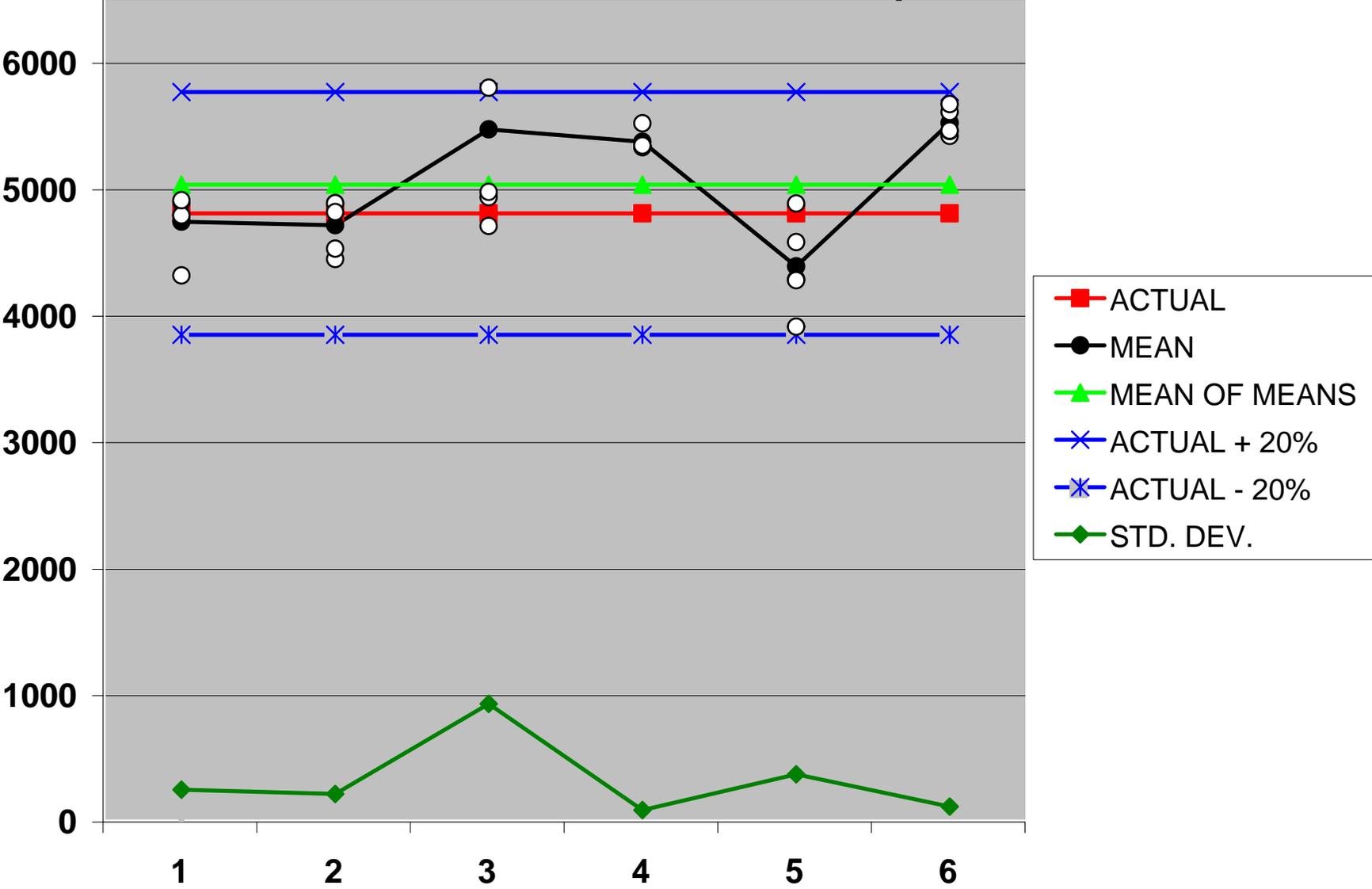
LAB	DSCC	2	3	4	5 *	6 **
	MEAS.	MEAS.	MEAS.	MEAS.	MEAS.	MEAS.
	4887	4880	4927	5331	4877	5412
	4309	4880	4700	5330	3904	5603
	4788	4440	5793	5513	4279	5451
	4784	4520	4970	5322	4271	5664
	4903	4810	6937	5336	4572	5455
MEAN	4734	4706	5465	5366	4381	5517
STD. DEV.	244	210	921	82	365	110
MEAN TO ACTUAL %	-1.4	-2.0	13.9	11.8	-8.7	14.9
ACTUAL + 20%	5760	5760	5760	5760	5760	5760
ACTUAL - 20%	3840	3840	3840	3840	3840	3840
MEAN OF MEANS	5028	5028	5028	5028	5028	5028
STD. DEV. OF MEANS	480	480	480	480	480	480

* DATA CORRECTED BY 1.252 MULTIPLIER

** SECOND SET

MEASUREMENTS IN BOLD ARE ABOVE THE 20% TOLERANCE

ROUND TWO 0.1cc Samples



ROUND TWO 1.0cc SAMPLES OTHER GASES

LAB	DSCC	2	3	4	5	6
OXYGEN	96	*	11	ND	28	13
	105	ND	5	ND	26	56
	97	ND	0	ND	25	65
	39	ND	0	ND	25	49
	40	ND	0	ND	23	ND
HYDROGEN	5	*	0	< 100	0	176
	6	ND	0	< 100	0	175
	3	ND	0	< 100	0	116
	6	ND	1	< 100	0	142
	6	ND	0	< 100	0	123
ARGON	211	*	224	220	227	236
	212	260	222	222	225	288
	211	220	223	226	227	293
	208	280	223	223	228	280
	208	300	221	224	227	278
CO2	56	*	17	< 100	30	47
	71	ND	17	< 100	36	26
	69	ND	27	< 100	31	41
	60	ND	18	< 100	31	15
	55	ND	29	< 100	30	18

* NON-HERMETIC

ND = NONE DETECTED

ROUND TWO 0.1cc SAMPLES OTHER GASES

LAB	DSCC	2	3	4	5	6
OXYGEN	58	< 100	37	ND	77	119
	57	< 100	24	ND	72	117
	375	< 100	0	ND	59	160
	68	< 100	0	ND	22	64
	450	< 100	2.75%	ND	154	5
HYDROGEN	44	< 100	0	< 100	53	138
	39	< 100	0	< 100	42	127
	89	< 100	0	< 100	46	149
	28	< 100	0	< 100	66	134
	73	< 100	0	< 100	29	126
ARGON	198	220	175	187	200	159
	198	300	180	187	200	167
	219	220	171	180	199	179
	199	230	173	170	198	205
	224	220	1236	188	204	234
CO2	68	< 100	54	< 100	58	18
	73	< 100	39	< 100	45	28
	76	< 100	26	< 100	47	28
	65	< 100	35	< 100	43	35
	78	< 100	159	< 100	49	37

ND = NONE DETECTED

ROUND TWO

MEAN / VOLUME COMPARISON

	DSCC	2	3	4	5	6
1.0cc	HIGH ~ 147	HIGH ~ 865	HIGH ~ 603	HIGH ~ 677	HIGH ~ 937	HIGH ~ 364
0.1cc	LOW < 100	LOW < 100	HIGH ~ 665	HIGH ~ 566	LOW ~ 419	HIGH ~ 717

SAMPLE / VOLUME COMPARISON

	DSCC	2	3	4	5	6
1.0cc	ALL +/- 20%	1 > + 20%	ALL +/- 20%	ALL +/- 20%	2 > + 20%	ALL +/- 20%
0.1cc	ALL +/- 20%	ALL +/- 20%	2 > + 20%	ALL +/- 20%	ALL +/- 20%	ALL +/- 20%

COMPARISON OF ROUNDS 1 & 2

	0.1 cc		1.0 cc	
	Round 1	Round 2	Round 1	Round 2
Amount H ₂ O Sealed	4800	4800	5100	5100
Average Mean	6760	5028	5457	5687
Std. Dev. Of Means	2815	480	1144	365
Mean Distribution	Even	Even	Even	All Above
Range	1000	817	2700	900
Labs Out of Range	3	1	2	2