

SMS Reflectometer measurements before and after CO2 cleaning of WHT Primary mirror

27 February 2015. Cleaning , measurements and report by Neil.

Note: cleaning was interrupted by frozen pipe shortly before completion. Needs repetition.

Measurements performed in pairs to check 0.05% specified repeatability.

Lambda	0.67 micron	
Incident Angle	25 deg	<--SMS Summary characteristics
BW Limits	1 0.01	

Measurements before cleaning

datum #	Scattering at angles Θ, Φ			Reflectivity	user comment	Roughness RMS(Å)	TIME	DATE
	$\Theta_s \rightarrow$	$\Phi_s \rightarrow$						
4	location 1	0	50	0.809		90.1	11:24:53	02-26-1915
5		0	180	0.809		90.1	11:25:00	02-26-1915
6	2			0.797		101.1	11:25:26	02-26-1915
7				0.796		101.2	11:25:32	02-26-1915
8	3			0.811		85.6	11:25:42	02-26-1915
9				0.813		85.5	11:25:47	02-26-1915
10	4			0.818		85.1	11:26:30	02-26-1915
11				0.819		84.9	11:26:35	02-26-1915
12	5			0.817		82.6	11:26:44	02-26-1915
13				0.817		82.6	11:26:49	02-26-1915
14	6			0.826		78	11:26:57	02-26-1915
15				0.832		77.7	11:27:03	02-26-1915
16	7			0.809		91.6	11:27:10	02-26-1915
Averages		1.35E-02	5.71E-03	0.813		87.4		
std deviations		0.0023	0.0013	0.010		7.4		
std error				0.003				

Reference mirror data from before M1 measurement

1		1.12E-02	2.10E-03	0.943		85.5	11:12:34	02-26-1915
2		1.12E-02	2.11E-03	0.943		85.4	11:12:39	02-26-1915
3		5.46E-03	2.64E-03	0.94		51.2	11:12:47	02-26-1915

After M1 measurement

17		7.65E-03	3.97E-03	0.927		60.8	11:37:07	02-26-1915
18		7.65E-03	3.99E-03	0.928		60.8	11:37:12	02-26-1915
19		9.61E-04	8.01E-04	0.94		21.2	11:37:25	02-26-1915

Reflectometer is at normal sensitivity . All M1 measurements were repeatable.

Measurements taken following CO2 cleaning

20	location 1	1.04E-02	3.80E-03	0.83		76.9	15:56:02	02-26-1915
21		1.04E-02	3.79E-03	0.828		77.2	15:56:09	02-26-1915
22	2	9.75E-03	3.65E-03	0.834		74.1	15:56:19	02-26-1915
23		9.78E-03	3.64E-03	0.834		74.3	15:56:25	02-26-1915
24	3	7.11E-03	2.10E-03	0.843		64.9	15:56:37	02-26-1915
25		7.10E-03	2.10E-03	0.841		64.9	15:56:43	02-26-1915

26	4	1.82E-02	3.38E-03	0.825		116.9	15:57:53	02-26-1915
27		1.82E-02	3.38E-03	0.82	marginal	117.3	15:57:59	02-26-1915
28	6	9.83E-03	2.84E-03	0.835		76.9	15:58:08	02-26-1915
29		9.83E-03	2.86E-03	0.837		76.8	15:58:13	02-26-1915
30	6	1.37E-02	4.40E-03	0.822		90	15:58:22	02-26-1915
Averages		1.13E-02	3.27E-03	0.832		82.7		
std deviations		0.0038	0.0007	0.007		18.2		
std error				0.001				

Final Check of Reference Mirror

31		1.18E-02	4.29E-03	0.935		77.3	16:07:54	02-26-1915
32		1.18E-02	4.28E-03	0.934		77.2	16:08:02	02-26-1915
33		6.17E-03	2.02E-03	0.941		56.4	16:08:08	02-26-1915

Reflectometer sensitivity and repeatability is still normal.

Reflectivity before cleaning: **81.3 % ± 0.3 %**

Reflectivity after cleaning: **83.2 % ± 0.1 %**

Avg increase in R%: **2%**

Avg decrease in Scattering: **19% at 0° and 75% at 180°**

Surface Roughness improvement is marginal (5%)

The improvement in reflectivity is good, but not as good as usual in scattering.

Water stains remain and requires a water wash to remove them.

CT7 measurements before cleaning.

					365	404	464	522	624	760	970
338	26/02/2015 10:13	1	Reflection	15.6	42.7	86.2	86.6	86.6	94.5	84.0	89.4
339	26/02/2015 10:14	1	Reflection	15.5	86.5	86.7	86.9	86.7	94.3	83.9	89.5
340	26/02/2015 10:15	1	Reflection	15.5	85.3	85.6	85.6	85.3	92.9	82.3	87.9
341	26/02/2015 10:15	1	Reflection	15.5	85.2	85.9	85.7	85.7	92.8	82.5	87.8
342	26/02/2015 10:16	1	Reflection	15.5	85.5	86.1	86.3	85.9	93.5	83.1	88.5
Averages (anomalous values highlighted)					85.6	86.1	86.2	86.0	93.6	83.2	88.6
Gauge measurements 28/3/2014					84.3	82.8	90.8	91.9	89.6	84.8	87.0
Schott measurements of Gauge					85.3	86.1	91.2	92.7	91.4	83.7	87.5

Reference (guage) mirror measurements (repeated 10x, with 1 movement on mirror.

343	27/02/2015 11:21	1	Reflection	21.8	83.2	84.0	89.0	90.6	98.3	83.7	87.1
344	27/02/2015 11:21	1	Reflection	21.8	83.2	84.0	89.0	90.6	98.3	83.7	87.1
345	27/02/2015 11:21	1	Reflection	21.9	83.2	84.0	89.0	90.6	98.3	83.7	87.0
346	27/02/2015 11:22	1	Reflection	21.9	83.2	84.0	89.0	90.6	98.3	83.7	87.0
347	27/02/2015 11:22	1	moved	21.9	83.0	83.7	88.8	90.5	98.2	83.7	86.9
348	27/02/2015 11:22	1	Reflection	21.9	83.0	83.7	88.8	90.5	98.2	83.6	86.9
349	27/02/2015 11:22	1	Reflection	22.0	83.0	83.8	88.8	90.5	98.2	83.6	86.9
350	27/02/2015 11:23	1	Reflection	22.1	83.0	83.8	88.8	90.5	98.2	83.6	86.9
351	27/02/2015 11:23	1	Reflection	22.1	83.0	83.8	88.8	90.5	98.2	83.6	86.8
352	27/02/2015 11:23	1	Reflection	22.1	83.0	83.8	88.8	90.5	98.2	83.6	86.9
353	27/02/2015 11:58	1	move?	21.1	85.9	86.8	87.1	87.0	94.8	84.6	90.5
354	27/02/2015 11:58	1	Reflection	21.1	86.3	86.8	86.8	87.0	94.6	84.5	90.4
355	27/02/2015 11:59	1	Reflection	21.0	84.2	85.1	85.9	85.8	94.0	83.4	89.3

Measurements after cleaning

358	27/02/2015 12:01	1	Reflection	20.6	87.4	88.1	88.3	88.2	95.7	85.3	91.1
359	27/02/2015 12:02	1	Reflection	20.6	87.0	87.9	88.0	87.8	95.3	85.0	90.8
360	27/02/2015 12:02	1	Reflection	20.5	86.7	87.1	87.3	86.9	94.5	84.0	89.5
361	27/02/2015 12:03	1	Reflection	20.4	87.0	87.8	87.8	87.9	94.8	84.8	90.3
362	27/02/2015 12:04	1	Reflection	20.3	87.8	88.1	88.0	87.9	95.3	84.8	90.6
363	27/02/2015 12:05	1	Reflection	20.2	84.8	85.2	85.4	85.1	92.8	82.3	88.0
Averages					86.8	87.4	87.5	87.3	94.7	84.4	90.1

% Differences from before cleaning

1.2 1.3 1.2 1.3 1.1 1.2 1.4