

Reflectivity Measurements of WHT Primary Mirror from SMS before and after soap+water wash on 10 April 2014, because of months-old water & dust stains. CT7 measmts. after wash only. SMS measmts. usually in pairs to check 0.05% repeatable & bracketed by Reference measmts. CT7 measmts. follow immed. after a new VW calibration in good agreement with Schott data. Wash carried out by Neil, Emilie, Amado and David. Measurements and Report by Neil.

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

datum #	Scattering at angles Θ, Φ			Reflectivity	user comment	Roughness	TIME	DATE
	$\Theta_s \rightarrow$	0	50					
1	Ref 1	3.23E-03	2.10E-03	0.937		39	09:48:33	04/10/2014
2		3.24E-03	2.11E-03	0.936		39.1	09:48:39	04/10/2014
3	Ref 2	1.66E-02	5.36E-03	0.933		93	09:48:47	04/10/2014
4		1.66E-02	5.38E-03	0.932		93.1	09:48:52	04/10/2014
5	Ref 3	4.12E-03	1.67E-03	0.923		45.5	09:48:59	04/10/2014
6		4.13E-03	1.68E-03	0.922		45.5	09:49:05	04/10/2014
7	Ref 4	2.14E-03	2.19E-03	0.933		31.9	09:49:12	04/10/2014

Repeatability and sensitivity >93% are demonstrated.

Measurements of M1 at AP3, pre-washing, follow:

datum #	Scattering at angles Θ, Φ			Reflectivity	user comment	Roughness	TIME	DATE
	$\Theta_s \rightarrow$	0	50					
8	location 1	5.91E-03	2.54E-03	0.841		56.8	09:55:08	04/10/2014
9		5.89E-03	2.53E-03	0.841		56.7	09:55:14	04/10/2014
10	2	6.35E-03	2.48E-03	0.841		59.3	09:55:23	04/10/2014
11		6.35E-03	2.48E-03	0.841		59.3	09:55:28	04/10/2014
12	null	1.97E-08	2.25E-08	0.001	null	3	09:56:08	04/10/2014
13	3	6.37E-03	1.92E-03	0.845		61.2	09:56:18	04/10/2014
14		6.38E-03	1.92E-03	0.845		61.2	09:56:22	04/10/2014
15	4	8.56E-03	2.36E-03	0.839		72.2	09:56:34	04/10/2014
16		8.57E-03	2.37E-03	0.838		72.3	09:56:38	04/10/2014
17	5	9.30E-03	4.03E-03	0.832		71.5	09:57:38	04/10/2014
18		9.29E-03	4.04E-03	0.834		71.4	09:57:43	04/10/2014
19	6	7.74E-03	3.50E-03	0.817		65.7	09:58:27	04/10/2014
20		7.67E-03	3.47E-03	0.811		65.6	09:58:31	04/10/2014
21	7	8.26E-03	3.49E-03	0.835		67.5	09:58:40	04/10/2014
22		8.23E-03	3.49E-03	0.842	skip	67	09:58:45	04/10/2014
23		8.12E-03	3.45E-03	0.835		66.9	09:58:53	04/10/2014
24	8	7.54E-03	2.47E-03	0.839		66	09:59:03	04/10/2014
25		7.55E-03	2.47E-03	0.838		66.1	09:59:08	04/10/2014
26	9	5.15E-03	1.54E-03	0.852		54.9	10:00:02	04/10/2014
27		5.16E-03	1.56E-03	0.853		54.8	10:00:06	04/10/2014
28	10	5.23E-03	2.38E-03	0.85		52.9	10:00:16	04/10/2014

Averages **7.13E-03** **2.68E-03** **0.838** **63.3**

std deviations **0.001** **0.001** **0.011** **6.5**

Measurements from CT7 on WHT M1 at portholes, also taken 3 days after wash.

			Tempr. °C	wavelength of band (nm)							mean over 7 bands
				365	404	464	522	624	760	970	
156	14/04/2014	port 1	19.8	91	88.6	92.4	91.9	89.1	87.9	92.2	90.44
157	14/04/2014	port 1	19.5	90.3	88.2	92	91.5	88.7	87.5	91.8	90.00
158	14/04/2014	port 1	19.5	90.2	88.2	92	91.4	88.6	87.4	91.7	89.93
159	14/04/2014	port2	19.4	88.5	86.5	90.8	90.4	88.0	87.0	91.7	88.99
160	14/04/2014	port2	19.4	90.1	88.2	92	91.5	88.6	87.5	91.8	89.96
161	14/04/2014	port2	19.3	90	88.3	92	91.5	88.7	87.6	91.9	90.00
162	14/04/2014	port3	19.3	91.4	89.4	93	92.4	89.4	88.1	92.4	90.87
163	14/04/2014	port3	19.2	90.7	89	92.6	92	89.1	87.9	92.1	90.49
164	14/04/2014	port3	19.2	90.7	88.9	92.6	92	89.2	87.9	92.1	90.49
165	14/04/2014	port4	19.1	89.2	87.7	91.8	91.6	88.9	87.8	92.1	89.87
166	14/04/2014	port4	19.1	90.1	88.4	92.2	91.8	88.9	87.7	92	90.16
167	14/04/2014	port4	19.1	88.8	87.1	90.9	90.7	88.0	86.9	91.1	89.07
168	14/04/2014	port1 r	19	89.6	87.9	91.6	91.2	88.4	87.2	91.4	89.61

Evidence of a temperature-dependent trend in above data:

data 167, 168 are notably lower than initial ones

Highlit data are lower than the mean (see below) by more than 1 standard deviation and are omitted from the second analysis below. Row 162 is 1 std-dev above mean, but included.

Statistics on M1 measurements:

averages	19.3	90.05	88.18	91.99	91.53	88.74	87.57	91.87
std dev		0.84	0.78	0.63	0.54	0.43	0.37	0.35
Average, omitting low extremes		90.50	88.49	92.26	91.76	88.92	87.73	92.01
Alum Ref		92.00	91.90	91.80	91.60	90.80	88.60	92.40
difference Ref-meas		1.5	3.41	-0.46	-0.16	1.88	0.87	0.39
wavelength key		365	404	464	522	624	760	970

Conclusions:

Measurements on lower part of M1 immediately following drying are pessimistic

Improvements in all parameters are comaprable to that recorded in previous washes.

Wash has been successful, with reflectivity up to 88% from SMS at 670 nm.

CT7 measurements imply washed mirror is close to reference values for bare Aluminium

(G. Hass 1954), except for 2 bands which show similar error w.r.t. Schott reference mirror.

This implies the washed Aluminium is as Reflective as a fresh coat.