

Monitoring Reflectance and Scattering of WHT Primary Mirror

Neil O'Mahony performed cleaning, processed data and wrote this report.			
Dome Humidity ~15%. Flakes stuck before falling; second cleaning with faster flow.			
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Lambda	0.67		
Incident Angle	25		
Bandwidth Limits	1	0.01	

**SMS  $\mu$ Scan Measurements from BEFORE CO2 cleaning of WHT primary**

	BDSF (Scattering)		REFLECTANCE	Notes	Surface Roughness RMS ( $\text{\AA}$ )	TIME	DATE
	Pos 1: Zenith 0° Azim. 0°	Pos 2: Zenith 50° Azim. 180°					
Ref Mirror	2.85E-003	1.65E-003	0.924		37.1	10:41:53	08-20-1910
2	2.86E-003	1.65E-003	0.924		37.1	10:41:59	08-20-1910
3	4.23E-003	1.31E-003	0.923		47.5	10:42:23	08-20-1910
4	4.24E-003	1.32E-003	0.923		47.5	10:42:28	08-20-1910
5	7.37E-003	2.88E-003	0.918		61.2	10:42:36	08-20-1910
6	7.39E-003	2.88E-003	0.918		61.3	10:42:41	08-20-1910
7	5.26E-003	1.84E-003	0.925		52.1	10:42:48	08-20-1910
8	5.27E-003	1.84E-003	0.925		52.1	10:42:52	08-20-1910
9	2.48E-003	1.86E-003	0.921		34.4	10:42:58	08-20-1910
10	2.48E-003	1.86E-003	0.923		34.4	10:43:03	08-20-1910
11	2.59E-003	1.98E-003	0.929		35.1	10:43:08	08-20-1910
12	2.59E-003	1.98E-003	0.927		35.1	10:43:14	08-20-1910
13	8.57E-003	5.08E-003	0.923	skip	64.2	10:43:22	08-20-1910
Reference mirror	reflectance check		<b>0.923</b>		4.24	(Roughness absolute std error)	
Primary mirror	1.29E-002	7.83E-003	0.801		84.4	10:52:01	08-20-1910
15	1.29E-002	7.83E-003	0.801		84.4	10:52:06	08-20-1910
16	1.14E-002	6.63E-003	0.793		80	10:52:18	08-20-1910
17	1.14E-002	6.63E-003	0.793		80	10:52:23	08-20-1910
18	1.06E-002	5.08E-003	0.812		76.7	10:52:32	08-20-1910
19	1.06E-002	5.08E-003	0.812		76.7	10:52:37	08-20-1910
20	1.23E-002	7.74E-003	0.801		82.4	10:52:47	08-20-1910
21	1.23E-002	7.77E-003	0.802		82.4	10:52:51	08-20-1910
22	1.45E-002	7.69E-003	0.787		90.7	10:57:35	08-20-1910
23	1.45E-002	7.69E-003	0.787		90.7	10:57:40	08-20-1910
24	1.27E-002	5.96E-003	0.802		84.9	10:57:49	08-20-1910
25	1.27E-002	5.96E-003	0.802		84.8	10:57:54	08-20-1910
26	1.40E-002	6.64E-003	0.798		89	10:58:02	08-20-1910
27	1.40E-002	6.63E-003	0.797		89	10:58:07	08-20-1910
28	1.14E-002	5.93E-003	0.804	running	79.6	10:59:09	08-20-1910
29	1.14E-002	5.93E-003	0.804	avg:	79.5	10:59:14	08-20-1910
30	1.31E-002	8.35E-003	0.787	0.800	85.7	10:59:23	08-20-1910
31	1.30E-002	8.36E-003	0.788		85.6	10:59:28	08-20-1910
32	1.17E-002	6.12E-003	0.802		80.7	10:59:38	08-20-1910
33	1.17E-002	6.12E-003	0.803		80.7	10:59:43	08-20-1910
34	1.32E-002	7.28E-003	0.781		86.9	11:00:34	08-20-1910
35	1.32E-002	7.28E-003	0.780		87	11:00:38	08-20-1910
36	1.33E-002	8.26E-003	0.775		87.1	11:00:46	08-20-1910
37	1.33E-002	8.26E-003	0.775		87.1	11:00:52	08-20-1910
38	1.39E-002	6.24E-003	0.778		90.3	11:01:00	08-20-1910

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39	1.39E-002	6.24E-003	0.780		90.1	11:01:05	08-20-1910
40	1.33E-002	5.89E-003	0.783		88.1	11:01:14	08-20-1910
<b>Averages</b>	<b>1.27E-002</b>	<b>6.87E-003</b>	<b>79.363</b>		<b>84.61</b>		
<b>Std errors % (±)</b>	<b>2.45</b>	<b>4.06</b>	<b>0.308</b>		<b>1.18</b>		
						Roughness absolute std error	
41	5.99E-003	3.58E-003	0.905		54.2	11:05:25	08-20-1910
42	5.89E-003	3.57E-003	0.905		53.7	11:05:34	08-20-1910
43	1.19E-002	4.11E-003	0.898		79.6	11:05:42	08-20-1910
44	1.19E-002	4.11E-003	0.899		79.6	11:05:48	08-20-1910
45	6.43E-003	4.69E-003	0.909		55.9	11:05:54	08-20-1910
46	1.07E-002	4.37E-003	0.909		73.9	11:06:04	08-20-1910
Reference mirror reflectance check			<b>0.904</b>			2-3% lower than before measurement of primary!	

**Next: SMS  $\mu$ Scan Measurements 4 days AFTER CO2 cleaning of WHT primary**

<b>Ref Mirror</b>	4.38E-003	3.15E-003	0.910		46.1	10:28:46	08-24-1910	
2	4.40E-003	3.15E-003	0.910		46.2	10:28:51	08-24-1910	
	.....40 measurements not listed .....							
44	3.99E-003	1.45E-003	0.916		45.4	11:06:04	08-24-1910	
45	3.25E-003	1.03E-003	0.912		41.8	11:06:11	08-24-1910	
Reference mirror reflectance check			<b>0.912</b>			not altered by several attempts to air-clean head		

	BDSF (Scattering)		REFLECTANCE	Notes	Surface Roughness RMS (Å)
	Pos 1: Zenith 0° Azim. 0°	Pos 2: Zenith 50° Azim. 180°			
46	6.28E-003	1.61E-003	0.837		62.8
47	6.28E-003	1.61E-003	0.835		62.8
48	6.32E-003	1.99E-003	0.834		61
49	6.32E-003	1.99E-003	0.834		61
50	6.02E-003	1.73E-003	0.839		60.1
51	6.03E-003	1.73E-003	0.840		60.1
52	7.33E-003	1.63E-003	0.839		69.9
53	7.32E-003	1.64E-003	0.836		69.8
54	6.48E-003	1.66E-003	0.840		63.7
55	6.49E-003	1.66E-003	0.840		63.7
56	5.84E-003	1.34E-003	0.841		61.9
57	5.85E-003	1.34E-003	0.841		62
58	4.62E-003	1.17E-003	0.829		54.2
59	4.62E-003	1.17E-003	0.828		54.3
60	5.99E-003	1.90E-003	0.824		59.6
61	5.99E-003	1.90E-003	0.825		59.6
62	4.63E-003	1.19E-003	0.830		54.1
63	4.62E-003	1.21E-003	0.831		53.8
64	1.00E-002	2.93E-003	0.820		78.2
65	9.98E-003	2.93E-003	0.819		78.1
66	4.51E-003	1.11E-003	0.826		54
67	4.51E-003	1.11E-003	0.827		53.9
68	3.46E-003	7.69E-004	0.835		48.2
69	3.47E-003	7.69E-004	0.832		48.4

11:14:07	08-24-1910
11:14:13	08-24-1910
11:14:22	08-24-1910
11:14:27	08-24-1910
11:14:36	08-24-1910
11:14:41	08-24-1910
11:15:24	08-24-1910
11:15:28	08-24-1910
11:15:36	08-24-1910
11:15:41	08-24-1910
11:15:49	08-24-1910
11:15:53	08-24-1910
11:16:42	08-24-1910
11:16:47	08-24-1910
11:16:59	08-24-1910
11:17:04	08-24-1910
11:17:12	08-24-1910
11:17:19	08-24-1910
11:17:58	08-24-1910
11:18:03	08-24-1910
11:18:13	08-24-1910
11:18:17	08-24-1910
11:18:25	08-24-1910
11:18:31	08-24-1910

<b>Averages</b>	<b>5.96E-003</b>	<b>1.59E-003</b>	<b>83.258 %</b>		<b>60.63</b>		
<b>Std errors % (±)</b>	<b>7.9</b>	<b>9.8</b>	<b>0.193 %</b>		<b>2.24</b>		
<b>Improvement</b>	<b>2.1</b>	<b>4.3</b>	<b>3.895 %</b>		<b>28.34 %</b>		
						Roughness absolute std error	

Ref Mirror	4.13E-003	1.69E-003	0.914		45.7	11:25:30	08-24-1910
71	4.14E-003	1.69E-003	0.916		45.7	11:25:36	08-24-1910

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72	9.94E-003	3.57E-003	0.903		72.3	11:25:42	08-24-1910
73	9.94E-003	3.56E-003	0.903		72.3	11:25:47	08-24-1910
74	1.68E-002	4.21E-003	0.912		98.6	11:25:54	08-24-1910
75	1.68E-002	4.21E-003	0.910		98.7	11:26:00	08-24-1910
76	1.96E-003	1.23E-003	0.910		30.9	11:26:06	08-24-1910
77	1.96E-003	1.23E-003	0.909		30.9	11:26:10	08-24-1910
78	2.97E-002	8.17E-003	0.881		131.3	11:26:16	08-24-1910
79	2.97E-002	8.16E-003	0.880		131.4	11:26:21	08-24-1910
80	5.00E-003	1.94E-003	0.914		50.6	11:26:27	08-24-1910
81	5.01E-003	1.94E-003	0.913		50.6	11:26:32	08-24-1910

Reference mirror reflectance check **0.905** Low but consistent with previous Ref mirror value

**Conclusions: Significant improvement in Reflectance and Scattering.  
Final Reflectance value of 83.3% may be an underestimate.**