

Washing of Isaac Newton telescope Primary mirror , 26 November 2015.

CT7 reflectivity measurements only - no SMS uScan measurements were taken.

Washing carried out by N. O'Mahony, C. Fariña and students Marta Tabor and Paulina Sowicka

Measurements, analysis and report by Neil O'Mahony

				Measured % Reflectivity per waveband (nm)						
Reflectivities before washing:		T/°C		365	404	464	522	624	760	970
573	26/11/2015 10:07	2	22	88.3	86.8	86.4	86.7	85.7	83.0	88.8
574	26/11/2015 10:09	2	22	81.6	80.2	79.6	79.9	79.4	76.2	82.2
575	26/11/2015 10:10	2	22	84.0	82.3	82.1	83.0	82.3	79.6	85.5
576	26/11/2015 10:10	2	22	88.2	86.7	86.6	86.8	86.1	83.3	89.0
577	26/11/2015 10:11	2	22	83.9	81.3	79.7	82.1	80.3	79.0	84.9
578	26/11/2015 10:11	2	22	88.0	86.8	86.6	86.9	85.7	83.4	88.9
579	26/11/2015 10:12	2	22	84.6	84.4	84.5	84.8	83.2	81.8	86.1
lowest 4, averaged				83.5	82.1	81.5	82.5	81.3	79.2	84.7
average of all				85.5	84.1	83.6	84.3	83.2	80.9	86.5
best 3, average				88.2	86.8	86.5	86.8	85.8	83.2	88.9
variance (all)				7.0	8.0	10.0	7.5	7.4	7.4	6.6
std. error (all)				1.0	1.1	1.2	1.0	1.0	1.0	1.0

Note measurements above are divided into two distinct groups, differing in average by up to 4%.

The 3 higher values are highlighted in green. The remaining values provide the "lowest 4 average".

The positions of these measurements was not recorded but no special distribution is recalled.

The appearance of the mirror before cleaning showed a pattern of water drops with dust all over.

				Measured % Reflectivity per waveband (nm)						
After washing:				365	404	464	522	624	760	970
580	26/11/2015 14:53	2	13	0.0	89	88.9	89.4	89	86.1	92.2
581	26/11/2015 14:55	2	14	90.7	89.6	89.4	89.9	89.1	86.5	92.5
582	26/11/2015 14:55	2	14	89.9	88.9	88.9	88.4	88.8	86.1	91.2
583	26/11/2015 14:56	2	14	90.9	89.7	89.5	90	89.2	86.6	92.5
584	26/11/2015 14:58	2	15	88.9	87.7	87.6	88.1	87.7	85	91.1
585	26/11/2015 14:58	2	15	91.3	90	89.8	90.2	89.4	86.7	92.6
lowest				88.9	87.7	87.6	88.1	87.7	85	91.1
average of all				90.3	89.2	89.0	89.3	88.9	86.2	92.0
highest				91.3	90	89.8	90.2	89.4	86.7	92.6
variance				0.9	0.7	0.6	0.8	0.4	0.4	0.5
std.error				0.4	0.3	0.3	0.4	0.2	0.3	0.3

Improvements in %Reflectivity resulting from the Wash

minimum increase*	0.7	0.9	1.1	1.3	1.9	1.8	2.2
average increase**	4.8	5.1	5.4	5.0	5.6	5.3	5.5

*the difference between the lowest reflectivity after washing and the highest average before

**This is the difference between global averages before and after.

Note: bad instrument contact for the first measurement after wash (highlighted in red)

CT7 on Fresh Aluminium 25/6/15 93.4 91.7 91.2 91.2 90.2 87.5 93.5

Current %R shortfall of INT M1 3.1 2.6 2.2 1.9 1.3 1.3 1.5

These shortfalls are identical (to within 0.1%) to estimate from water wash of WHT M1 on 20/08/15

Conclusion: mirror reflectivity was increased by at least 1% and on average 5% over all wavebands

The reflectivity is now much more uniform, consistent with the near disappearance of water stains.