

Measurement Uncertainties in Determining the Radius of Curvature for PR2-02

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We determined the Radius of Curvature from phase maps taken at CIT by R. Martin and G. Billingsley with the Wyko inteferometer. For different mirror orientations we measured the third order Zernike terms and the distance between the optic and the transmission sphere. Radii of Curvature for the Transmission Spheres (TS) were provided by the manufacturer. Based on measurement uncertainties we placed error bars on the calculated values.

For PR2-02, the measured ROC is very close to the lower end of the designed range (absolute value). The cumulative measurement error is less than 0.1%. Measured Zernike terms have the least effect. The uncertainty in measuring the gap between TS and optic contributes to 1 mm change in ROC per 1 mm distance.

Using Ave Values of ALL Zernike-3 terms from measured phase maps

PR2-02		0 deg	0 deg - 2nd	45 deg	90 deg	180 deg	360 deg	360 deg -2nd
Radius of curvature of TS	m	-4.996	-4.996	-4.996	-4.996	-4.996	-4.996	-4.996
Gap between TS and optic to be measured	m	0.4516	0.4516	0.4516	0.4486	0.4466	0.4456	0.4482
Zernike power coefficient	nm	-9.18	-8.86	-7.29	-13.43	-15.82	-21.95	-11.64
Part measured aperture	mm	40	40	40	40	40	40	40
Wavefront "sag" at part plus power	mm	-0.04403	-0.04403	-0.04402	-0.04401	-0.04399	-0.04400	-0.04400

Tolerance Estimates					
Effect of gap (0 deg)		Effect of Measured Zernike-3 (0 deg)		Effect of TS-ROC (0 deg)	
+2mm	-2mm	-0.001 wave	0.001 wave	x-scan ROC	y-scan ROC
<i>(conservative, measured +/-1 mm)</i>		<i>(conservative, measured +/-0.65*10^-3 wave)</i>		<i>(from ZYGO Report)</i>	
-4.996	-4.996	-4.996	-4.996	-4.994	-4.998
0.4536	0.4496	0.4516	0.4516	0.4516	0.4516
-9.18	-9.18	-8.12	-10.25	-9.18	-9.18
40	40	40	40	40	40
-0.04405	-0.04401	-0.04403	-0.04403	-0.04405	-0.04401

Part radius
Difference

	1	2	3	4	5	6	7
m	-4.5425	-4.5426	-4.5429	-4.5446	-4.5461	-4.5458	-4.5454

-4.5405	-4.5445	-4.5427	-4.5423	-4.5405	-4.5445
0.0020	-0.0020	-0.00022	0.00022	0.0020	-0.0020

Average: -4.5443 (+/- 2 mm)	This does not include TS-ROC uncertainties, or systematic errors in reading the gap between TS and optic
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+/- 2 mm	+/- 0.22 mm	+/- 2 mm
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	(m)	(mm)	(%)		
Min	-4.5425	0.0018	1.8	0.039	-4.5385
Max	-4.5461	0.0018	1.8	0.040	-4.5421

Add All (mm):	+/-4.22 mm	0.09 (%)
Specified:	-4.56+/-0.02	-4.58
	Design ROC	Max
		Min

