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Measurement Uncertainties in Determining the Radius of Curvature for SR2-04

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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 SR2-04, 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%, and is conservative. 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.

SR2-04 (used average of all good files at each rotation)		50 mm aperture			Effect of TS-ROC (0 deg) (from ZYGO Report)		Effect of Gap (0 deg) (conservative, measured +/-1 mm)		Effect of Measured Zernike-3 (0 deg) from Z86 database, for all rotations	
		0 deg (arrow up)	90 deg (arrow right)	225 deg	ROC-x (max)	ROC-y (min)	+2mm	-2mm	Z[3]min=0.003954wv	Z[3]max=0.007719wv
Radius of curvature of TS	m	-6.49886	-6.49886	-6.49886	-6.50207	-6.49564	-6.49886	-6.49886	-6.49886	-6.49886
Gap between TS and part to be measured	m	0.09462	0.09462	0.09532	0.09462	0.09462	0.09662	0.09262	0.09462	0.09462
Zernike power coefficient	nm	**5.56**	**7.01**	**6.89**	**5.56**	**5.56**	**5.56**	**5.56**	**4.21**	**8.21**
Part measured aperture	mm	50.274	50.274	50.274	50.274	50.274	50.274	50.274	50.274	50.274
Wavefront "sag" at part plus power	mm	-0.049321	-0.04931804	-0.04932	-0.049296223	-0.049345754	-0.049336349	-0.049305537	-0.049323651	-0.049315639
Part radius	**m**	**-6.4057**	**-6.4061**	**-6.4053**	**-6.4089**	**-6.4025**	**-6.4037**	**-6.4077**	**-6.4053**	**-6.4064**
		-6.4057			**-0.0032**	**0.0032**	**0.0020**	**-0.0020**	**0.0004**	**-0.0007**
		0.00001	-0.00037	0.00036	Tolerances due to RS-ROC		Tolerances due to gap TS-optic		Tolerances due to Z-3 fluctuations	
		+/- 0.37 mm			**+/- 3.2 mm**		**+/- 2.0 mm**		**+/- 0.7 mm**	
					Cumulative: + 5.6 mm /- 5.9 mm (<0.1%)					

Specified Radius **m** **-6.43**
(+/-0.03) -6.40 min
-6.46 max

		25 mm aperture			Effect of TS-ROC (0 deg) (from ZYGO Report)		Effect of Gap (0 deg) (conservative, measured +/-1 mm)		Effect of mask centering on measured Zernike-3 (0 deg)			
		0 deg (arrow up)	90 deg (arrow right)	225 deg	ROC-x (max)	ROC-y (min)	+2mm	-2mm	x+5.32mm, y0	x-5.32mm, y0	x0, y+5.32mm	x0, y-5.32mm
Radius of curvature of TS	m	-6.49886	-6.49886	-6.49886	-6.50207	-6.49564	-6.49886	-6.49886	-6.49886	-6.49886	-6.49886	-6.49886
Gap between TS and part to be measured	m	0.09462	0.09462	0.09532	0.09462	0.09462	0.09662	0.09262	0.09462	0.09462	0.09462	0.09462
Zernike power coefficient	nm	**0.67**	**0.56**	**0.44**	**0.67**	**0.67**	**0.67**	**0.67**	**1.22**	**1.34**	**1.53**	**0.81**
Part measured aperture	mm	25.22	25.22	25.22	25.22	25.22	25.22	25.22	25.22	25.22	25.22	25.22
Wavefront "sag" at part plus power	mm	-0.012413	-0.01241347	-0.01242	-0.012407038	-0.012419502	-0.012417135	-0.012409381	-0.012412165	-0.012411923	-0.012411544	-0.012412968
Part radius	**m**	**-6.4049**	**-6.4048**	**-6.4040**	**-6.4081**	**-6.4017**	**-6.4029**	**-6.4069**	**-6.4055**	**-6.4056**	**-6.4058**	**-6.4051**
		-6.4046			**-0.0032**	**0.0032**	**0.0020**	**-0.0020**	**-0.0006**	**-0.0007**	**-0.0009**	**-0.0001**
		-0.00035	-0.00024	0.00059	Tolerances due to RS-ROC		Tolerances due to gap TS-optic		Tolerances due to Z-3 fluctuations over the selected aperture location			
		+/- 0.59 mm			**+/- 3.2 mm**		**+/- 2.0 mm**		**+0 mm/ -0.9 mm**			
					Cumulative: +5.2 mm / - 6.1 mm (<0.1%)							