

Return to Scott Rychnovsky by e-mail (srychnov@chem.ps.uci.edu) or Fax (949) 824-6379

Mirror Tester Name: HOWARD BANICH

Number of telescope mirrors prepared by tester (experience level; circle one)

None 1-2 3-5 (6-25) More than 25

Mirror (A) B or C (circle one)

Optical diameter: 7.94"

Radius of Curvature: 85.70"

Moving Slit (Fixed Slit) (Circle one)

Foucault Measurements, Diameter One Units: INCHES

Zone 0	Zone 1	Zone 2	Zone 3	Zone 4	Zone 5	Zone 6
radius:	0.61	1.74	2.54	2.82	3.25	3.64
Data set 1	0.000	-0.011	0.005	0.051	0.062	0.116
Data set 2	0.000	-0.010	0.004	0.046	0.063	0.116
Data set 3	0.000	-0.012	0.006	0.044	0.060	0.115
Data set 4	0.000	-0.011	0.005	0.056	0.066	0.113
Data set 5	0.000	-0.011	0.005	0.044	0.065	0.114
Data set 6	0.000	-0.012	0.006	0.046	0.066	0.116

Foucault Measurements, Diameter Two Units: INCHES

Zone 0	Zone 1	Zone 2	Zone 3	Zone 4	Zone 5	Zone 6
Data set 1	0.000	-0.012	0.004	0.037	0.053	0.109
Data set 2	0.000	-0.012	0.008	0.055	0.056	0.099
Data set 3	0.000	-0.011	0.001	0.025	0.045	0.105
Data set 4	0.000	-0.012	0.004	0.033	0.062	0.105
Data set 5	0.000	-0.011	0.004	0.036	0.056	0.108
Data set 6	0.000	-0.012	0.004	0.033	0.053	0.107

Mirror Numerical Rating: MAXIMUM WAVE FRONT ERROR (TEX) 1/2.8 WAVE AT ZONE 1.

Is it overcorrected or undercorrected? OVER CORRECTED

Is the edge good? YES, BUT THERE IS STILL MORE FINISHING AND SMOOTHING TO DO.

What other errors are present? THE CENTER SUFFERS FROM A ROUGH, DOG-BISCUIT IN ZONES 1 THROUGH 3. THERE IS ALSO A SLIGHT RAISED HILL IN ZONE 1, WHICH HAS A SMALL SHALLOW HOLE IN ITS CENTER.

Predict Performance:

Outstanding (>45X per inch) Excellent (35-45X) Good (25-35X) Acceptable (20-25X) Poor (15-20X)

ALSO, THERE SEEMS TO BE A SLIGHT AMOUNT OF ASTIGMATISM IN THE OUTER 3 ZONES (4-6). THIS WAS THE MOST DIFFICULT MIRROR TO MEASURE, PROBABLY BECAUSE OF ITS ROUGHNESS.

Hi Scott

Here are my measurements from the 3 mirror test. I wanted to resuscitate the poor man Caustic test to see how it stacks up. I fear rather poorly. Data was entered into Sixtests (Burrow's program). First number is mirror diameter, followed by two columns: first column is zonal radius, second column is longitudinal measurement from the tester. Then Strehl and surface error.

Mel Bartels

Mirror A

Plot Caption

201.0 Mirror diameter (mm)

poor_man's

2169.0 Source distance (0=moving source) y, mm X, mm

25.4 0

38.1 1.27

50.8 2.54

63.5 3.81

69.9 5.08

76.2 6.36

88.9 7.62

*

-1.000 2168.448 Conic targets: b, R (mm) 0.1000 Measurement
std deviation, mm

2169.0 Longitudinal reading bias, mm

0.899 Strehl, 14.3nm surface

Guy Brandenburg; 6-25 mirrors prepared

Mirror A

8" optical diameter, 85" ROC, fixed slit, inches

zone 0	zone 1	zone 2	zone 3	zone 4	zone 5	zone 6
radii:						
0.61	1.74	2.34	2.82	3.25	3.64	4.00
readings:						
	.131	.093	.135	.161	.202	.240
	.126	.137	.134	.184	.203	.227
	.130	.116	.139	.174	.207	.255
	.127	.122	.138	.181	.204	.259
	.117	.100	.150	.189	.211	.254
		!!!!				

numerical rating: 1/2.6 wave (P-V) wavefront error by Tex, 1/2.9 to 1/4.5 by Figure4.5

I think it's undercorrected, by my calculations.

The edge is not good - a zone of turned edge nearly 1 cm wide.

Also a large "flat" (i.e. unparabolized) region in the center of the mirror; also, it is not smooth, especially in the center; it needs additional smoothing and polishing and figuring. Looks like there is an area of strain or something. Or maybe it's just really greasy. I should have washed it to see for sure, but I didn't.

I think it will be a poor mirror.

Return to Scott Rychnovsky by e-mail (**Error! Reference source not found.**) or Fax (949) 824-6379

Mirror Tester Name: Jim Burrows

Number of telescope mirrors prepared by tester (experience level; circle one)

None

1-2

3-5

6-25

More than 25

Mirror **A**, **B** or **C** (circle one)

Optical diameter: 202 mm

Radius of Curvature: 2157 mm

Moving Slit

Fixed Slit (Circle one)

Mirror A, diam 1.

202 0

Caustic

2176

y, mm	X, mm	Y, mm
2.5	0	0.045
10	0	0.17
20	0	0.362
30	0	0.525
40	0	0.718
50	0	0.855
60	0	1.071
70	0	1.237
80	0	1.477
90	0	1.651
98	0	1.906

Mirror A, diam 2.

202 0

Caustic

2170

y, mm	X, mm	Y, mm
2.5	0	0.027
10	0	0.163
20	0	0.338
30	0	0.502
40	0	0.676
50	0	0.826
60	0	1.02
70	0	1.193
80	0	1.387
90	0	1.581
98	0	1.807

*

-0.846 2156.308
0.002
2101

*

-0.759 2158.495
0.002
2112

Mirror Numerical Rating: surface RMS 25.9 ± 6.4 (2σ) nm, Strehl ratio 0.705

Is it overcorrected or undercorrected? under, b = -0.806

Is the edge good? yes, TDE ~ 50 nm

What other errors are present? Maybe astigmatism, b = -.870, -.770 for diams 1, 2, resp. Also the best-fit parabolas' RoC differed by 2 mm for the two diameters. This may or may not be on the glass (source and image distances were only tape-measured to ± 1 mm). I'll be able to evaluate this when I get my 2D Hartmann program checked out. The "Poor-man's Interferometer" said the surface was rough.

Predict Performance:

Outstanding (>45X per inch)	Excellent (35-45X)	Good (25-35X)	<input checked="" type="checkbox"/> Acceptable (20-25X)	Poor (15-20X)
--------------------------------	-----------------------	------------------	--	------------------

Lord Rayleigh says performance is significantly impacted by Strehl ratios < .8.

Roger Ceragioli

The preliminary results are in. I've sent you the interferograms as attachments, but in a few days I'll send you the full test data and an explanation.

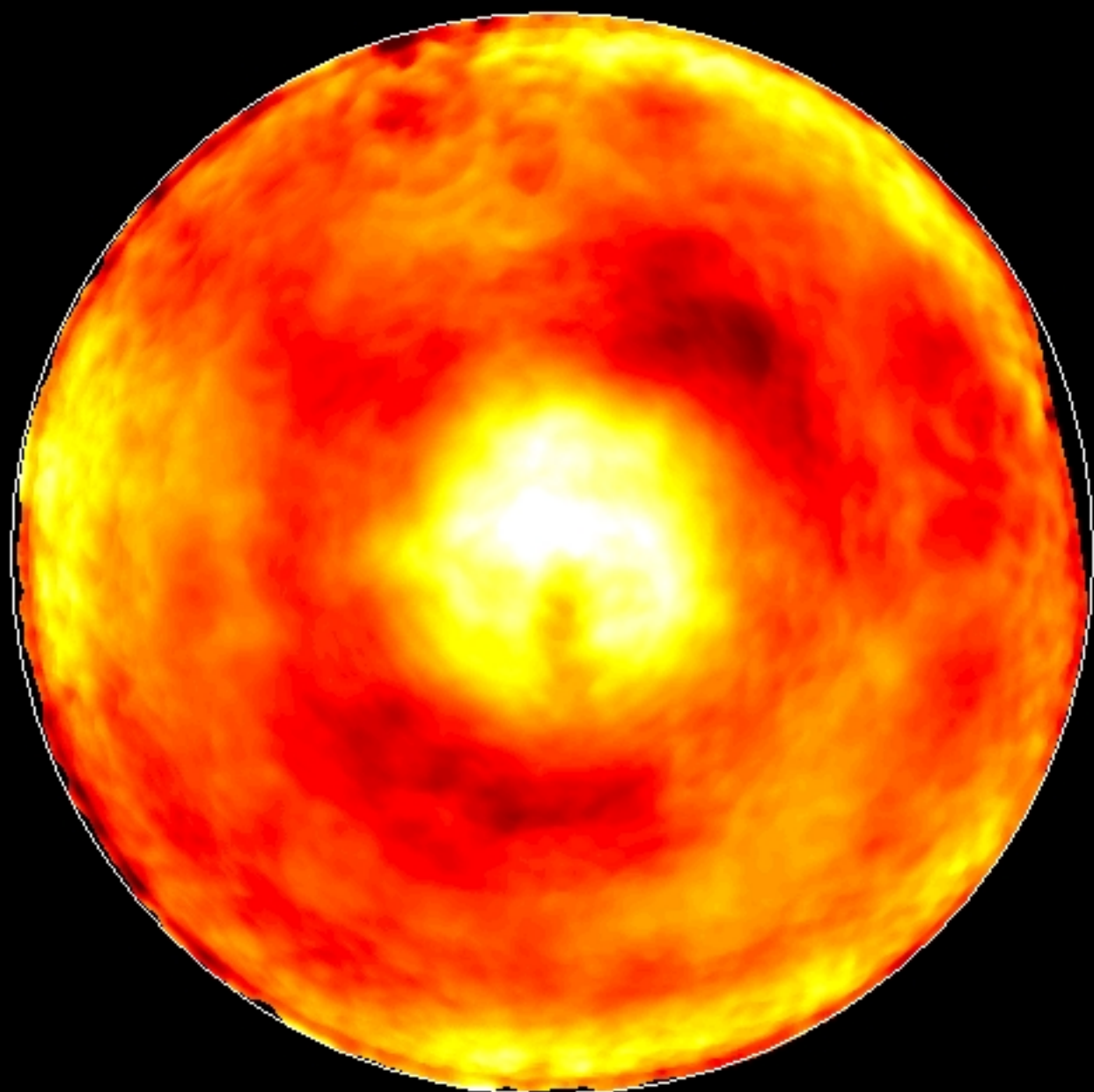
Mirror A appears to be the undercorrected one. It's also rough and zoney and has a bad TDE.

(My comments to Roger)

Mirror A:

*Undercorrected by about 1/3 wave P-V, 1/15 RMS (from six tests)
Rough surface, thin, steep TDE. Zones.*

Agreed. I get 0.0695 wv RMS (wv = 532nm), or about 1/14 wv. Undercorrection is mainly a high center. From 40% to edge it's much better (about 1/6 th wv). But bad TDE. There is also noticeable trefoil error, which would be invisible in Foucault. This might cause the defocused star image to take on a slightly triangular appearance. Star test will be definitive.



Mirror Tester Name: Brad Davy

Number of telescope mirrors prepared by tester (experience level; circle one)

None 1-2 3-5 6-25 More than 25

Mirror A, B or C (circle one)

Optical diameter: 2"

Radius of Curvature: 85"

Moving Slit Fixed Slit (Circle one)

Foucault Measurements, Diameter One Units: in

Zone 0	Zone 1	Zone 2	Zone 3	Zone 4	Zone 5	Zone 6
radius:						
Data set 1	0	.0185	.0185	.042	.047	.087
Data set 2	.008	.011	.019	.045	.049	.079
Data set 3	.004	.0105	.0175	.043	.049	.078
Data set 4						
Data set 5						
Data set 6						

Foucault Measurements, Diameter Two Units: in

Zone 0	Zone 1	Zone 2	Zone 3	Zone 4	Zone 5	Zone 6
Data set 1	0	.007	.018	.039	.0445	.078
Data set 2	-.001	.003	.017	.040	.042	.078
Data set 3	.002	.003	.019	.039	.045	.075
Data set 4						
Data set 5						
Data set 6						

Mirror Numerical Rating: 1/5

Is it overcorrected or undercorrected? Under corrected

Is the edge good? Zone 6 d. blow = bad. Zone 6 turned down

What other errors are present? chip on edge on Diameter 2 makes Zone 6 bad. Shadous lack flat in the center. Does not present a smooth parabola.

Surface is rough - Ronchi test shows outer 1/8-1/4" is turned

Predict Performance:

Outstanding (>45X per inch) Excellent (35-45X) Good (25-35X) Acceptable (20-25X) Poor (15-20X)

Data for "A" mirror: Optical diameter D := 7.89 Radius of curvature R_c := 84.81

Data collected in inches using the Lateral Wire Test with wire 1/2" from R_c towards mirror. Wire and light source move together. Pin sticks on 2/3 inch increments. Last reading taken at the edge. Center reading is zero. Readings taken from pin pairs left to right of center and divide by two.

$Y1 := \begin{bmatrix} \frac{.00713}{2} \\ \frac{.00681}{2} \\ \frac{.00695}{2} \\ \frac{.00710}{2} \\ \frac{.00702}{2} \end{bmatrix}$	$Y2 := \begin{bmatrix} \frac{.01548}{2} \\ \frac{.01490}{2} \\ \frac{.01495}{2} \\ \frac{.01515}{2} \\ \frac{.01500}{2} \end{bmatrix}$	$Y3 := \begin{bmatrix} \frac{.02021}{2} \\ \frac{.02073}{2} \\ \frac{.02029}{2} \\ \frac{.02058}{2} \\ \frac{.02083}{2} \end{bmatrix}$	$Y4 := \begin{bmatrix} \frac{.03088}{2} \\ \frac{.03080}{2} \\ \frac{.03099}{2} \\ \frac{.03115}{2} \\ \frac{.03130}{2} \end{bmatrix}$	$Y5 := \begin{bmatrix} \frac{.04045}{2} \\ \frac{.04012}{2} \\ \frac{.04002}{2} \\ \frac{.04058}{2} \\ \frac{.03963}{2} \end{bmatrix}$	$Y6 := \begin{bmatrix} \frac{.04908}{2} \\ \frac{.04849}{2} \\ \frac{.04845}{2} \\ \frac{.04888}{2} \\ \frac{.04824}{2} \end{bmatrix}$
--	--	--	--	--	--

Average

Range

Standard deviation

mean(Y1) = 0.003501	max(Y1) – min(Y1) = 0.00016	stdev(Y1) = 0.000057
mean(Y2) = 0.007548	max(Y2) – min(Y2) = 0.00029	stdev(Y2) = 0.000105
mean(Y3) = 0.010264	max(Y3) – min(Y3) = 0.00031	stdev(Y3) = 0.000121
mean(Y4) = 0.015512	max(Y4) – min(Y4) = 0.00025	stdev(Y4) = 0.000091
mean(Y5) = 0.02008	max(Y5) – min(Y5) = 0.000475	stdev(Y5) = 0.000168
mean(Y6) = 0.024314	max(Y6) – min(Y6) = 0.00042	stdev(Y6) = 0.000153

Average standard deviation of readings:

$$DEV := \frac{\text{stdev}(Y1) + \text{stdev}(Y2) + \text{stdev}(Y3) + \text{stdev}(Y4) + \text{stdev}(Y5) + \text{stdev}(Y6)}{6}$$

Metric conversion for entry into Sixtests

$$D \cdot 25.4 = 200.406$$

$$(R_c - .5) \cdot 25.4 = 2141.474$$

$$\text{@ zone1 } .666 \cdot 25.4 = 16.9164 \qquad \text{mean}(Y1) \cdot 25.4 = 0.088925$$

$$\text{@ zone2 } 1.333 \cdot 25.4 = 33.8582 \qquad \text{mean}(Y2) \cdot 25.4 = 0.191719$$

$$\text{@ zone3 } 2 \cdot 25.4 = 50.8 \qquad \text{mean}(Y3) \cdot 25.4 = 0.260706$$

$$\text{@ zone4 } 2.666 \cdot 25.4 = 67.7164 \qquad \text{mean}(Y4) \cdot 25.4 = 0.394005$$

$$\text{@ zone5 } 3.333 \cdot 25.4 = 84.6582 \qquad \text{mean}(Y5) \cdot 25.4 = 0.510032$$

$$\text{@ zone6 } 3.944 \cdot 25.4 = 100.1776 \qquad \text{mean}(Y6) \cdot 25.4 = 0.617576$$

$$DEV \cdot 25.4 = 0.00294$$

Setup Plot

Reference

Parabola

Conic

Target

2152.660

R, mm

-1.000

b

0.737

Strehl

----- Surface, mm -----

24.2

RMS

5.3

σ (RMS)

Surface Z-coeff, mm

0: 1.1659877

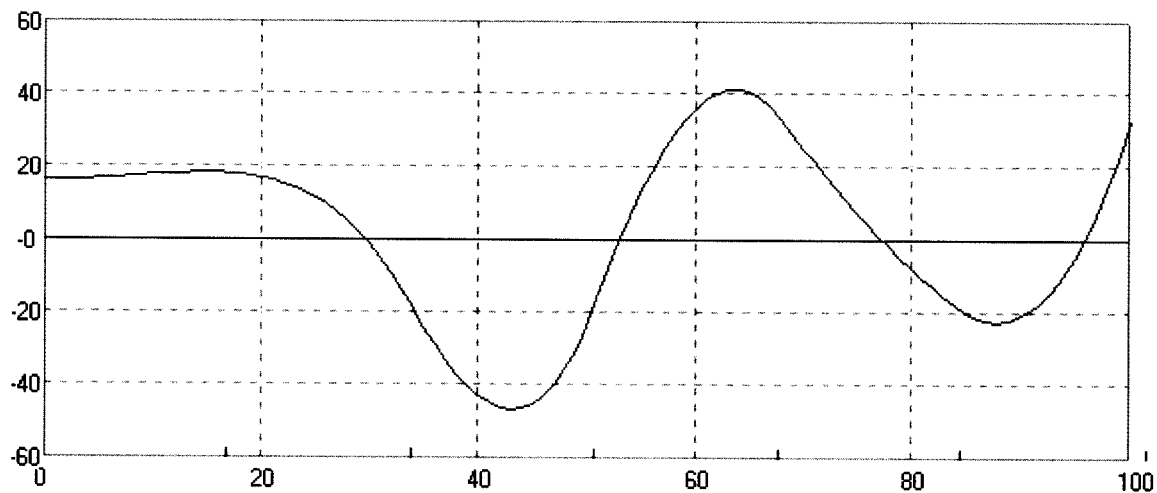
2: 1.1660040

4: -0.0000084

6: 0.0000125

8: 0.0000569

RMS-scaled



Amirror

Setup Plot

Reference

Parabola

Conic

Target

2152.613

-1.040

0.742

----- Surface, mm -----

23.9

5.2

R, mm

b

Strehl

RMS

σ (RMS)

RMS-scaled

Surface Z-coeff, mm

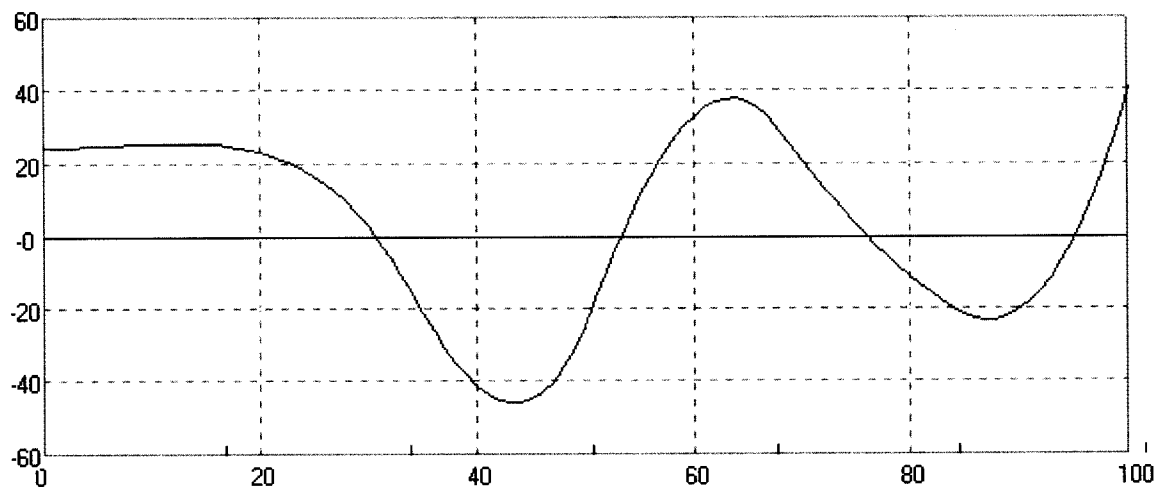
0: 1.1659877

2: 1.1660040

4: -0.0000084

6: 0.0000125

8: 0.0000569



Amirror

Return to Scott Rychnovsky by e-mail (srychnov@chem.ps.uci.edu) or Fax (949) 824-6379

Mirror Tester Name: STEVE GOLDMAN

Number of telescope mirrors prepared by tester (experience level; circle one)

None

1-2

3-5

6-25

More than 25

Mirror A B or C (circle one)

Optical diameter: 7 1/8

Radius of Curvature: 85"

Moving Slit

Fixed Slit (Circle one)

Foucault Measurements, Diameter One

Units: INCHES

Zone 0	Zone 1	Zone 2	Zone 3	Zone 4	Zone 5	Zone 6
radius:	1.175	2.04	2.58	3.035	3.445	3.82
Data set 1	.012	.0105	.0205	.043	.054	.075
Data set 2	.015	.0125	.0225	.046	.054	.0785
Data set 3	.0165	.010	.0205	.043	.055	.070
Data set 4						
Data set 5						
Data set 6						

Foucault Measurements, Diameter Two

Units: _____

Zone 0	Zone 1	Zone 2	Zone 3	Zone 4	Zone 5	Zone 6
Data set 1	.019	.0175	.031	.0495	.063	.0875
Data set 2	.0175	.019	.031	.048	.062	.0875
Data set 3	.0165	.0165	.0325	.048	.0625	.0875
Data set 4						
Data set 5						
Data set 6						

Mirror Numerical Rating: _____

Is it overcorrected or undercorrected? _____

Is the edge good? NO, I FOUND THIS EDGE VERY HARD TO TEST

What other errors are present? _____

Predict Performance:

Outstanding
(>45X per inch)

Excellent
(35-45X)

Good
(25-35X)

Acceptable
(20-25X)

Poor
(15-20X)

1/3 - 1/4 WAVE BY TEST

STANDARD MASK

Mirror Tester Name: JIM HAVENS

Number of telescope mirrors prepared by tester (experience level; circle one)

None 1-2 3-5 6-25 More than 25



Mirror (A) B or C (circle one)

Optical diameter: 7.9"

Radius of Curvature: 85.1"

Moving Slit

Fixed Slit (Circle one)

Foucault Measurements, Diameter One

Units: _____

Zone 0	Zone 1	Zone 2	Zone 3	Zone 4	Zone 5	Zone 6
radius:	1.24	2.05	2.58	3.04	3.45	3.8
Data set 1	.012	.001	.013	.029	.042	.055
Data set 2	.011	.000	.011	.031	.043	.058
Data set 3	.008	.001	.011	.029	.042	.056
Data set 4	.008	.001	.013	.030	.042	.055
Data set 5						
Data set 6						

Foucault Measurements, Diameter Two

Units: _____

Zone 0	Zone 1	Zone 2	Zone 3	Zone 4	Zone 5	Zone 6
Data set 1	.004	.000	.012	.031	.043	.059
Data set 2	.005	.000	.012	.031	.043	.059
Data set 3	.007	.000	.013	.031	.042	.059
Data set 4	.003	.000	.012	.031	.042	.059
Data set 5						
Data set 6						

Mirror Numerical Rating: STREHL = .75 1/2 WAVE P-V

Is it overcorrected or undercorrected? Undercorrected

Is the edge good? YES

What other errors are present? A BIT ROUGH

Predict Performance:

Outstanding (>45X per inch) Excellent (35-45X) Good (25-35X) Acceptable (20-25X) Poor (15-20X)

Return to Scott Rychnovsky by e-mail (srychnov@chem.ps.uci.edu) or Fax (949) 824-6379

Mirror Tester Name: Michael Mills

Number of telescope mirrors prepared by tester (experience level; circle one)

None

1-2

3-5

6-25

More than 25

Mirror A, B or C (circle one)

Optical diameter: 7.8"

Radius of Curvature: 84.625"

Moving Slit

Fixed Slit (Circle one)

Foucault Measurements, Diameter One

Units: Inches

Zone 0	Zone 1	Zone 2	Zone 3	Zone 4	Zone 5	Zone 6
radius:	1.23	2.04	2.59	3.04	3.45	3.82
Data set 1	0.4618	0.4562	0.4671	0.4880	0.4978	0.5160
Data set 2	0.4630	0.4549	0.4692	0.4865	0.4989	0.5142
Data set 3	0.4620	0.4552	0.4678	0.4868	0.4982	0.5138
Data set 4						
Data set 5						
Data set 6						

Foucault Measurements, Diameter Two

Units: Inches

Zone 0	Zone 1	Zone 2	Zone 3	Zone 4	Zone 5	Zone 6
Data set 1						
Data set 2						
Data set 3						
Data set 4						
Data set 5						
Data set 6						

Mirror Numerical Rating: **Wavefront: 263 nm PV, 46 nm RMS. I would call this "1/2 wave"**

Is it overcorrected or undercorrected? **Overall, undercorrected. From about the 50% zone out to within 1/2" of the edge, the correction is good.**

Is the edge good? **No; approximately 1/2 inch of outermost edge is turned down**

What other errors are present? **The surface is very rough--lots of primary ripple. This mirror is unfinished, so diameter 2 was not measured.**

Predict Performance:

Outstanding
(>45X per inch)

Excellent
(35-45X)

Good
(25-35X)

Acceptable
(20-25X)

Poor
(15-20X)

Return to Scott Rychnovsky by e-mail (srychnov@chem.ps.uci.edu) or Fax (949) 824-6379

Mirror Tester Name: Michael Mills

Number of telescope mirrors prepared by tester (experience level; circle one)

None

1-2

3-5

6-25

More than 25

Mirror A B or C (circle one)

Optical diameter: 7.8"

Radius of Curvature: 84.625"

Moving Slit

Fixed Slit (Circle one)

Foucault Measurements, Diameter One

Units: Inches

Zone 0	Zone 1	Zone 2	Zone 3	Zone 4	Zone 5	Zone 6
radius:	1.23	2.04	2.59	3.04	3.45	3.82
Data set 1	0.4618	0.4562	0.4671	0.4880	0.4978	0.5160
Data set 2	0.4630	0.4549	0.4692	0.4865	0.4989	0.5142
Data set 3	0.4620	0.4552	0.4678	0.4868	0.4982	0.5138
Data set 4						
Data set 5						
Data set 6						

Foucault Measurements, Diameter Two

Units: Inches

Zone 0	Zone 1	Zone 2	Zone 3	Zone 4	Zone 5	Zone 6
Data set 1						
Data set 2						
Data set 3						
Data set 4						
Data set 5						
Data set 6						

Mirror Numerical Rating: **Wavefront: 263 nm PV, 46 nm RMS. I would call this "1/2 wave"**

Is it overcorrected or undercorrected? **Overall, undercorrected. From about the 50% zone out to within 1/2" of the edge, the correction is good.**

Is the edge good? **No; approximately 1/2 inch of outermost edge is turned down**

What other errors are present? **The surface is very rough--lots of primary ripple. This mirror is unfinished, so diameter 2 was not measured.**

Predict Performance:

Outstanding
(>45X per inch)

Excellent
(35-45X)

Good
(25-35X)

Acceptable
(20-25X)

Poor
(15-20X)

Return to Scott Rychnovsky by e-mail (srychnov@chem.ps.uci.edu) or Fax (949) 824-6379

Mirror Tester Name: Scott Rychnovsky

Number of telescope mirrors prepared by tester (experience level: circle one)

None 1-2 3-5 6-20 21-50 more than 50

Mirror A B or C (circle one)

Optical diameter: 7.94"

Radius of Curvature: 85.12"

Moving Slit ^{201mm}

Fixed Slit (Circle one)

2162mm

Foucault Measurements, Diameter One

Units: 0.001"

Zone 0	Zone 1	Zone 2	Zone 3	Zone 4	Zone 5	Zone 6
radius 0.61	1.74	2.34	2.82	3.25	3.64	3.97
Data set 1	188	181	191	215	222	250
Data set 2	188	182	192	214	222	249
Data set 3	189	181	192	214	221	247
Data set 4						
Data set 5						
Data set 6						

Foucault Measurements, Diameter Two

Units: 0.001"

Zone 0	Zone 1	Zone 2	Zone 3	Zone 4	Zone 5	Zone 6
Data set 1	168	162	178	194	206	231
Data set 2	166	162	177	192	205	229
Data set 3	166	161	176	192	205	227
Data set 4						(232)
Data set 5						(230)
Data set 6						

RMS = 1/15 Stahl 0.85 TA = 2.6

Mirror Numerical Rating: 1/3.0 wave TA=2.0 // 1/3.5 wave, TA ~ 1.6

Is it overcorrected or undercorrected? Undercorrected (high center).

Is the edge good? No; Thin, Steep T.D.F.

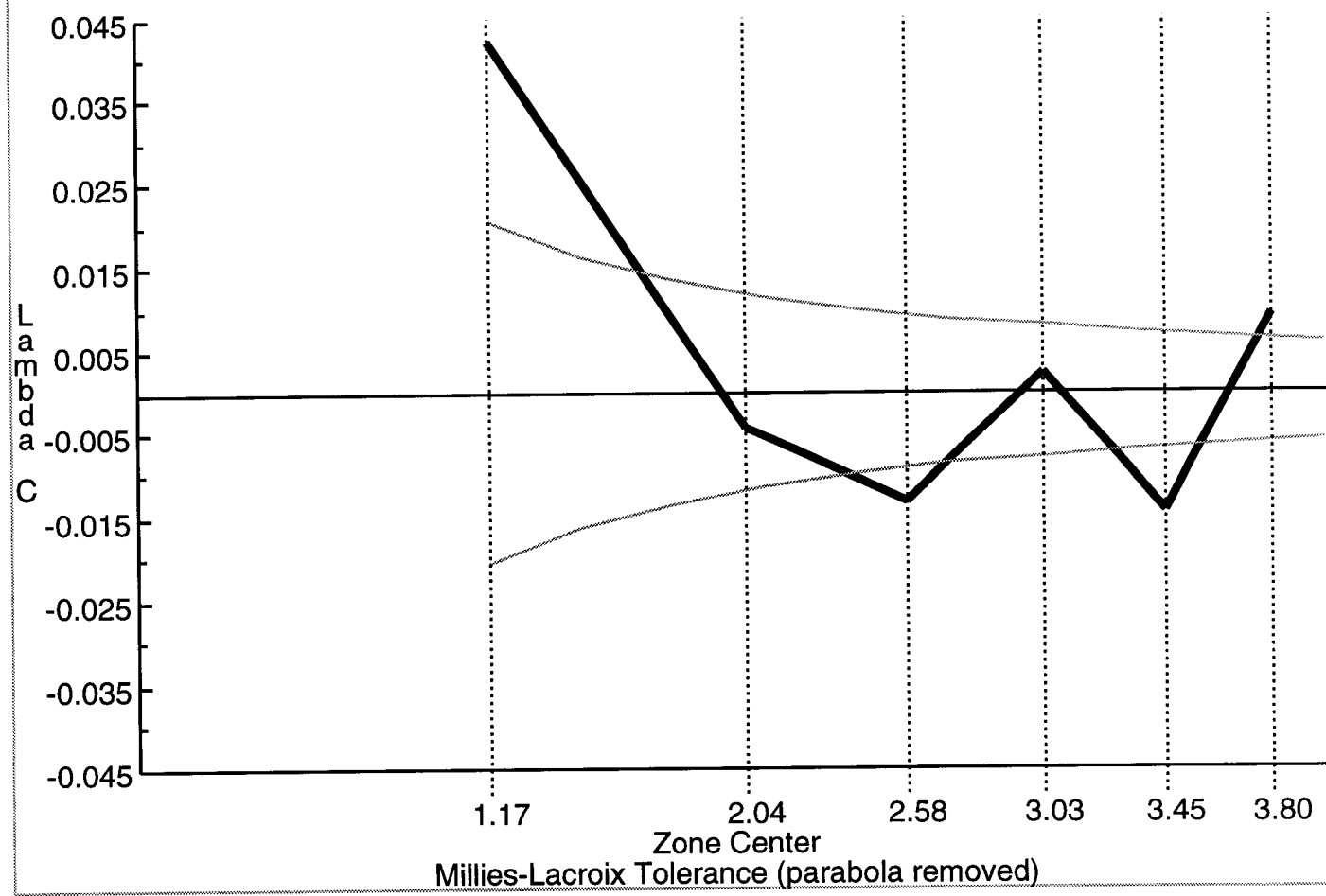
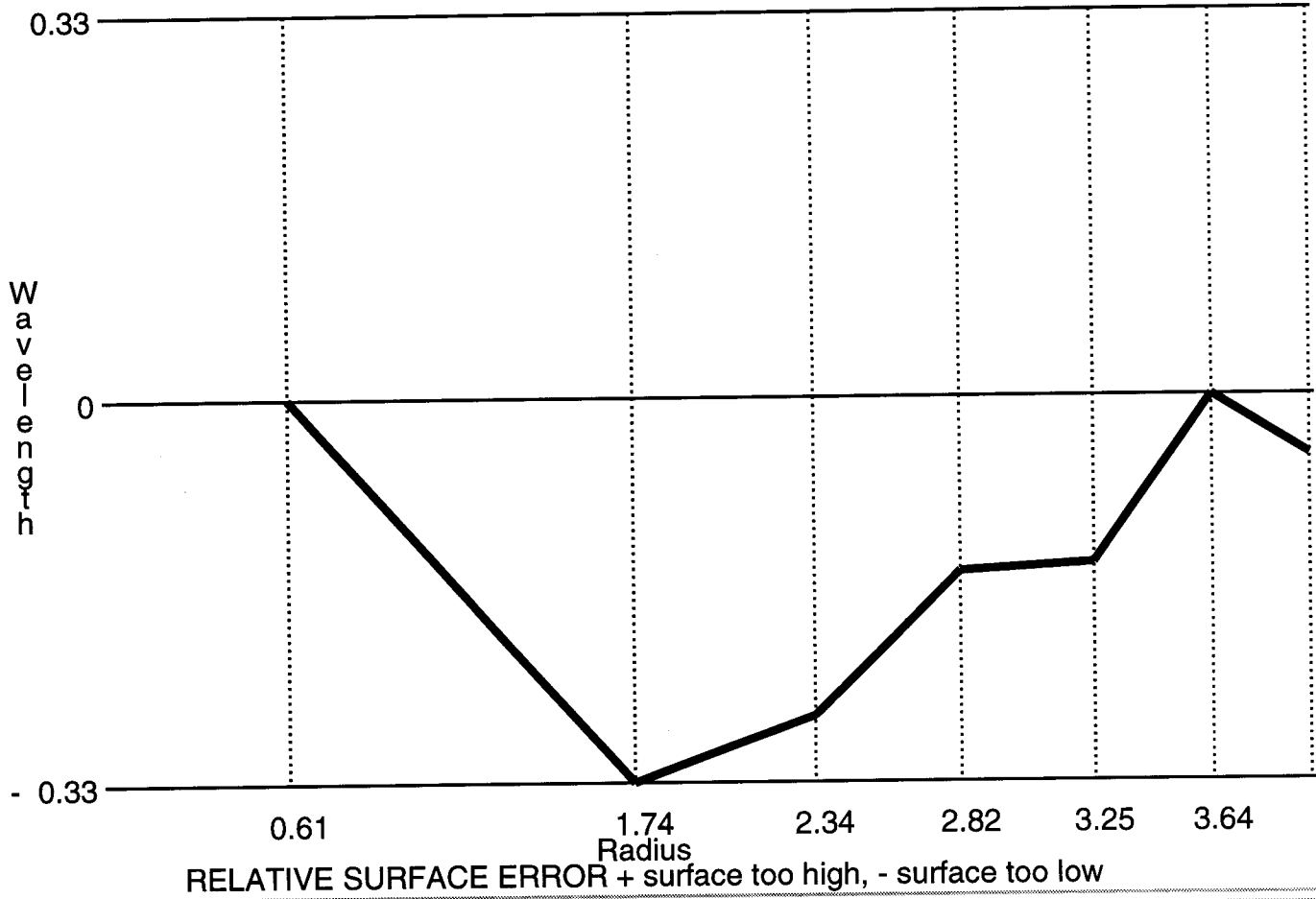
What other errors are present? Very rough surface - Pay Biscuit? Serious Zones. Significantly undercorrected.

Predict Performance:

Outstanding Excellent Good Acceptable X Poor
 (>45X per inch) (35-45X) (25-35X) (20-25X) (15-20X)

seriously enlarged spot at focus according to Figure program, but not horrible.

AL-SPK-01 (1/15)



From Steve Vegos

Scott:

Here's the results of Foucault tests on the 3 mirrors. I used D. Rowe's Fig4.5 for data reducing.

I rate myself 1 to 2 mirrors. I have yet to actually complete one mirror of my own, but have worked on a few others in our TM group of the local club. -----

- Mirror A:

ROC 85"

Dia. 7.94"

radius .995 2.42 3.13 3.71

data 1 .383 .394 .449 .484

data 2 .219 .230 .287 .315

normalized

data 1 0 .011 .066 .101

data 2 0 .011 .068 .096

ave. 0 .011 .067 .0985

PV 1/3.34

RMS 1/15.4

SR .849

Comments:

8" cast with tapered edges.

Micro ripple from center to 2/3's radius. Edge ok with KE, not checked with Ronchi.

Predicted performance: Unknown to me. Acceptable?
