

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

Mirror Tester Name: Doug Angle

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: 7.96 +/- 0.07

Radius of Curvature: 80.54 +/- 0.04

Moving Slit

Fixed Slit (Circle one)

Foucault Measurements, Diameter One

Units: inch

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	3.809
Data set 1	0.2503	0.2689	0.2833	0.3044	0.3298	0.3464
Data set 2	0.2528	0.2729	0.2824	0.3033	0.3274	0.3448
Data set 3	0.2539	0.2738	0.2809	0.3043	0.3269	0.3458
Data set 4	0.2529	0.2758	0.2829	0.3043	0.3284	0.3458
Data set 5	0.2534	0.2753	0.2844	0.3028	0.3299	0.3458
Data set 6	0.2539	0.2753	0.2879	0.3038	0.3314	0.3458

Foucault Measurements, Diameter Two

Units:

Zone 0	Zone 1	Zone 2	Zone 3	Zone 4	Zone 5	Zone 6
Data set 1	0.2511	0.2732	0.2821	0.3047	0.3286	0.3447
Data set 2	0.2501	0.2762	0.2836	0.3032	0.3286	0.3457
Data set 3	0.2496	0.2752	0.2851	0.3037	0.3311	0.3462
Data set 4	0.2546	0.2727	0.2841	0.3047	0.3291	0.3462
Data set 5	0.2501	0.2757	0.2841	0.3052	0.3281	0.3447
Data set 6	0.2526	0.2747	0.2841	0.3052	0.3311	0.3442

Mirror Numerical Rating: 0.13 P-V wavefront, 0.035 RMS, Strehl = 0.821

Is it **overcorrected** or undercorrected? B= -1.158

Is the edge good? yes

What other errors are present? Narrow sharp groove 3" long _" from edge, 90 deg from chip on back.

Predict Performance:

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

Mirror Tester Name: HOWARD SANICH

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: 8.00" Radius of Curvature: 80.5"

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	2.34	2.82	3.25	3.64
Data set 1	0.000	0.025	0.047	0.065	0.108	0.154
Data set 2	0.000	0.024	0.045	0.069	0.109	0.152
Data set 3	0.000	0.026	0.045	0.068	0.108	0.151
Data set 4	0.000	0.025	0.044	0.069	0.107	0.150
Data set 5	0.000	0.026	0.045	0.068	0.107	0.153
Data set 6	0.000	0.025	0.045	0.067	0.106	0.151

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	0.023	0.043	0.064	0.104	0.147
Data set 2	0.000	0.023	0.042	0.064	0.104	0.147
Data set 3	0.000	0.023	0.042	0.062	0.105	0.146
Data set 4	0.000	0.024	0.042	0.061	0.102	0.145
Data set 5	0.000	0.022	0.042	0.061	0.101	0.145
Data set 6	0.000	0.022	0.042	0.061	0.102	0.143

Mirror Numerical Rating: MAXIMUM WAVE FRONT ERROR (TEX) 1/3.3 WAVE AT ZONE 2

Is it overcorrected or undercorrected? OVER CORRECTED

Is the edge good? YES, VERY NICE, JUST A BIT MORE FINISHING TO DO..

What other errors are present? VERY SMALL ANNULAR HOLES IN CENTER, NOTHING TO WORRY ABOUT BECAUSE IT IS SMALL ENOUGH TO BE COVERED BY THE DIAPHRAGM'S SHADOW.

Predict Performance:

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

BEAUTIFULLY SMOOTH! I HAD THE EASIEST TIME MEASURING THIS MIRROR.

Mel Bartels

Mirror B

Plot Caption

203.0 Mirror diameter (mm)

poor_man's

2047.0 Source distance (0=moving source) y, mm X, mm

17.8 0

35.6 1.27

50.8 2.54

61 3.81

73.7 5.08

81.3 6.35

91.4 7.62

*

0.000 2047.762 Conic targets: b, R (mm)

0.1000 Measurement std deviation, mm

2047.0 Longitudinal reading bias, mm

0.511 Strehl, 35.9nm surface

Guy Brandenburg; 6-25 mirrors prepared

Mirror B

OD 8", ROC about 80"

Looked really pretty at first glance with a Ronchi grating.

Fixed slit, diameter #1, 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:

.027	.044	.065	.095	.139	.168
.023	.041	.061	.103	.146	.179
.030	.047	.058	.096	.144	.163
.023	.050	.059	.101	.151	.179
.018	.049	.065	.099	.155	.176
.013	.046	.066	.101	.149	.178

by Tex, I get about 1/4 wave (P-V), by Figure 4.5 I get about 1/3.25 PV if you use the first handful of readings, but 1/5.8 if you use the last handful of readings; strehl about 0.8 or perhaps closer to 0.9 depending on which readings you use.

I think it is a bit undercorrected by my calculations. The edge is not bad; a slightly turned edge about 1/8 to 1/4 inch wide.

Also, a bit of a 'flat' (i.e., spherical) area in the middle.

Acceptable to good performance.

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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: 2039 mm

Moving Slit

Fixed Slit (Circle one)

Mirror B, diam 1

202 0

Caustic

2061

y, mm	X, mm	Y, mm
2.5	0	0.043
10	0	0.174
20	0	0.343
30	0	0.528
40	0	0.7
50	0	0.901
60	0	1.083
70	0	1.284
80	0	1.501
90	0	1.739
98	0	1.927

*

-1.116 2039.059
0.002
1983

Mirror B, diam 2

202 0

Caustic

2061

y, mm	X, mm	Y, mm
2.5	0	0.044
10	0	0.17
20	0	0.368
30	0	0.522
40	0	0.723
50	0	0.898
60	0	1.109
70	0	1.296
80	0	1.531
90	0	1.76
98	0	1.967

*

-1.148 2039.304
0.002
1983

Mirror Numerical Rating: Surface RMS 14.6 ± 3.3 (2σ) nm, Strehl ratio 0.895

Is it overcorrected or undercorrected? Slightly over, b=-1.037, but never mind.

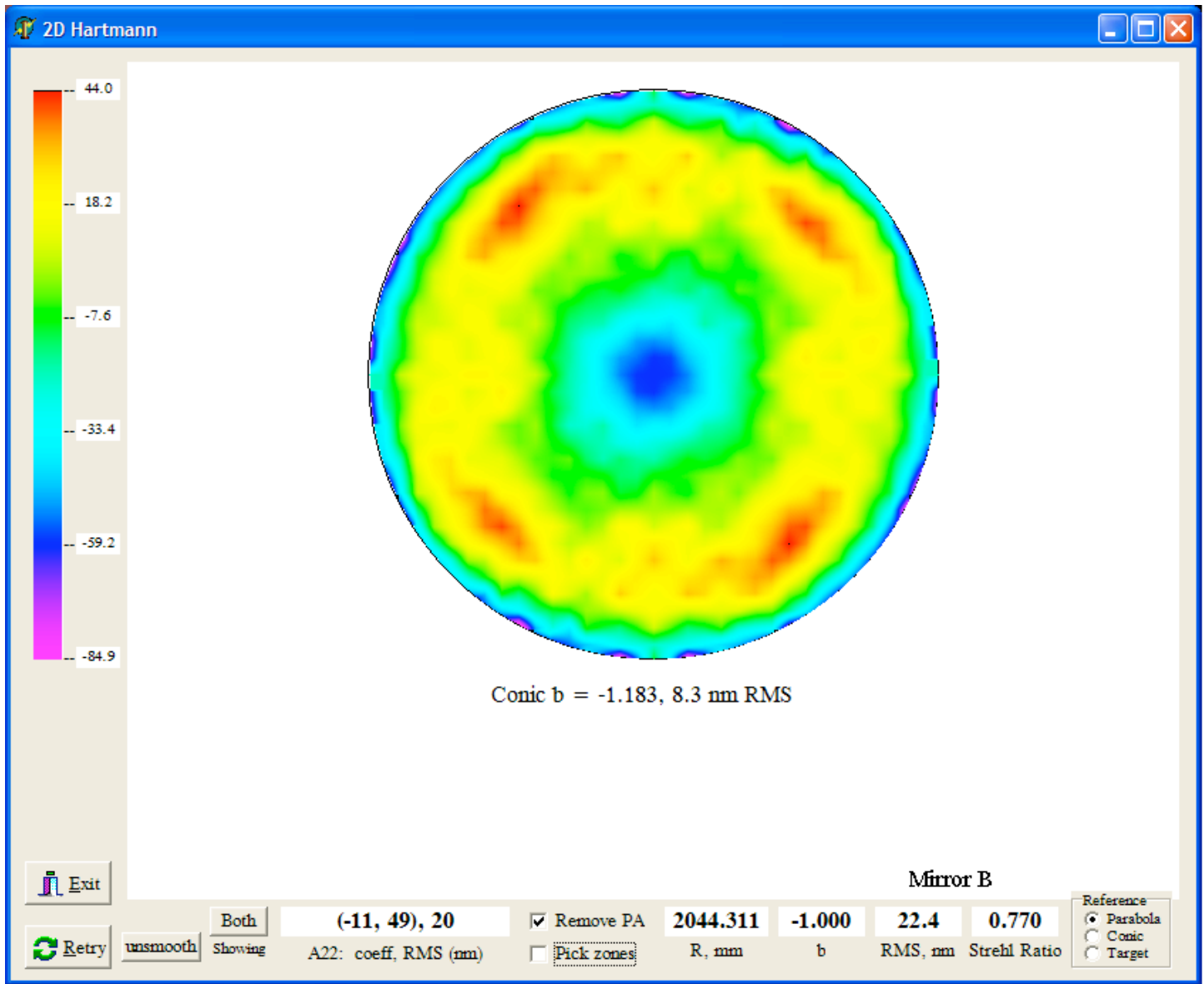
Is the edge good? yes, TDE also ~ 50 nm

What other errors are present? _____

Predict Performance:

Outstanding (>45X per inch)	<u>Excellent</u> (35-45X)	Good (25-35X)	Acceptable (20-25X)	Poor (15-20X)
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Jim Burrows 2D Hartmann test and data reduction.



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.

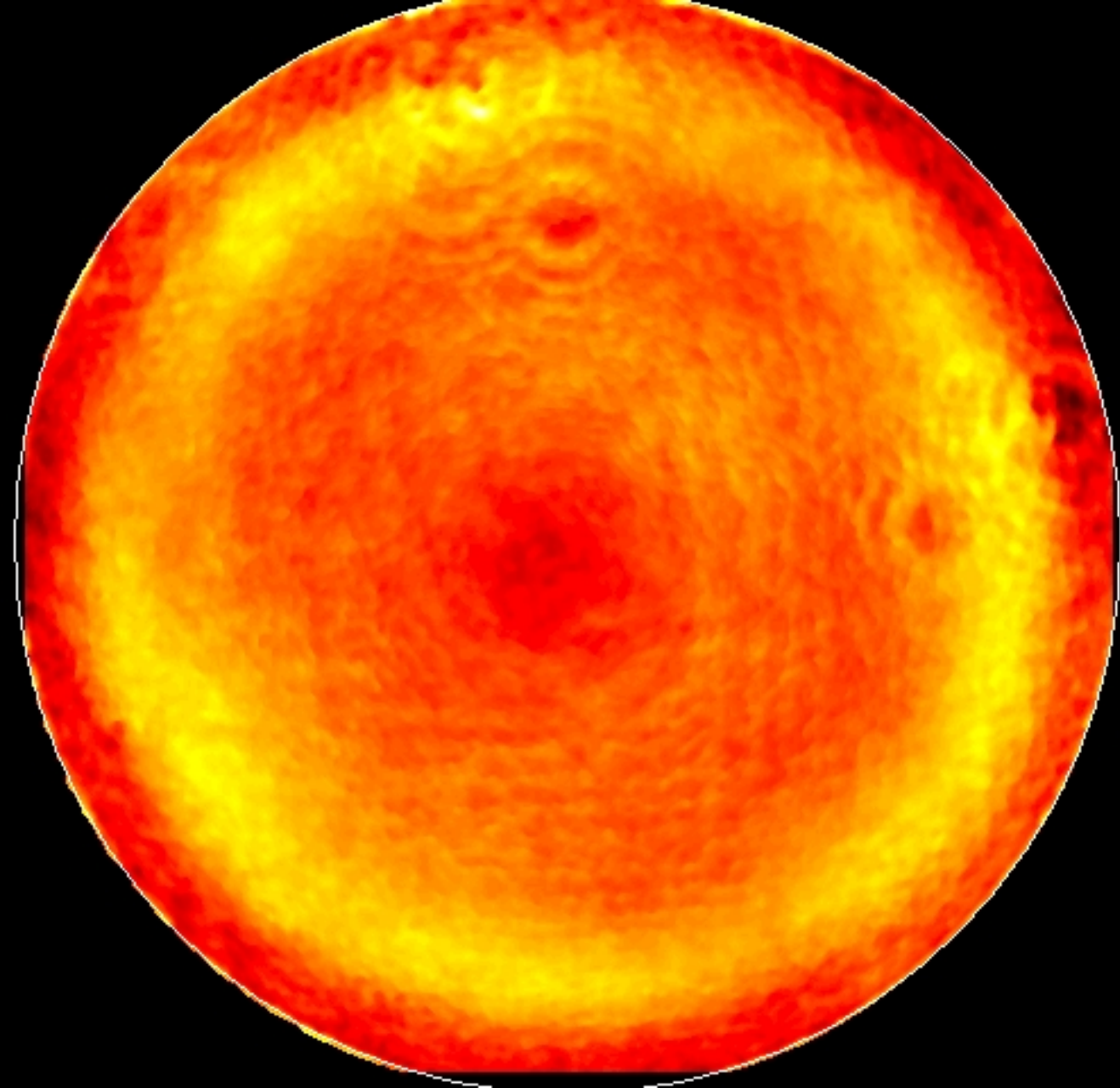
Mirror B appears to be the overcorrected one. It's much smoother than A, but has a pronounced up-down 60-100% zone.

(My comments to Roger)

Mirror B:

Overcorrected by about 1/9 wave P-V; 1/36 wave RMS (six tests). Good clean edge. Nasty overcorrected zone at the 4/5 boundary (about 80% diameter). Smooth surface but a serious outer zone problem that would not be easy to fix.

I get about 1/6th wv. overcorrection, because it's hard to plumb the depths of the center with a knife edge. But then the diag. will obscure the worst part and your assessment will look correct in a star test. RMS is closer to 1/20th wv, again because you can't easily see how deep the center really is. What's wrong with the outer zones? Up-down area extending from about 60% to 80% (up part) and 80% to the edge (down part). The down slope is pretty steep, which is why it's so noticeable with Foucault or Ronchi (slope tests). It wouldn't be hard to correct most of that--armed with interferometry. BUT you'll end up with TDE. Better to mask the edge, or start over again.



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: 8

Radius of Curvature: 81 in

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:	<u>.61</u>	<u>1.74</u>	<u>2.34</u>	<u>2.82</u>	<u>3.25</u>	<u>3.64</u>
Data set 1	<u>.0</u>	<u>.0255</u>	<u>.034</u>	<u>.055</u>	<u>.072</u>	<u>.084</u>
Data set 2	<u>.0035</u>	<u>.0245</u>	<u>.036</u>	<u>.055</u>	<u>.074</u>	<u>.0841</u>
Data set 3	<u>.001</u>	<u>.027</u>	<u>.035</u>	<u>.055</u>	<u>.073</u>	<u>.0845</u>
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	<u>0</u>	<u>.020</u>	<u>.0275</u>	<u>.049</u>	<u>.0705</u>	<u>.082</u>
Data set 2	<u>.0025</u>	<u>.020</u>	<u>.0315</u>	<u>.049</u>	<u>.074</u>	<u>.083</u>
Data set 3	<u>.0065</u>	<u>.021</u>	<u>.032</u>	<u>.050</u>	<u>.072</u>	<u>.0825</u>
Data set 4						
Data set 5						
Data set 6						

Mirror Numerical Rating: 1/137

Is it overcorrected or undercorrected? Slightly over corrected

Is the edge good? YES

What other errors are present? - None Noticed - Ronchi test shows very smooth figure out to the edge, smooth surface. Excellent mirror.

Predict Performance:

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

Data for "B" mirror: Optical diameter D := 7.942 Radius of curvature Rc := 80.248

Data collected in inches using the Lateral Wire Test with wire 1/2" from Rc 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.

$Y1 := \begin{bmatrix} \frac{.00718}{2} \\ \frac{.00733}{2} \\ \frac{.00728}{2} \\ \frac{.00749}{2} \\ \frac{.00749}{2} \end{bmatrix}$	$Y2 := \begin{bmatrix} \frac{.01532}{2} \\ \frac{.01488}{2} \\ \frac{.01512}{2} \\ \frac{.01552}{2} \\ \frac{.01522}{2} \end{bmatrix}$	$Y3 := \begin{bmatrix} \frac{.02365}{2} \\ \frac{.02385}{2} \\ \frac{.02400}{2} \\ \frac{.02355}{2} \\ \frac{.02373}{2} \end{bmatrix}$	$Y4 := \begin{bmatrix} \frac{.03330}{2} \\ \frac{.03321}{2} \\ \frac{.03287}{2} \\ \frac{.03288}{2} \\ \frac{.03292}{2} \end{bmatrix}$	$Y5 := \begin{bmatrix} \frac{.04351}{2} \\ \frac{.04353}{2} \\ \frac{.04370}{2} \\ \frac{.04321}{2} \\ \frac{.04358}{2} \end{bmatrix}$	$Y6 := \begin{bmatrix} \frac{.05351}{2} \\ \frac{.05282}{2} \\ \frac{.05295}{2} \\ \frac{.05300}{2} \\ \frac{.05261}{2} \end{bmatrix}$
Average		Range		Standard deviation	

mean(Y1) = 0.003677	max(Y1) – min(Y1) = 0.000155	stdev(Y1) = 0.000061
mean(Y2) = 0.007606	max(Y2) – min(Y2) = 0.00032	stdev(Y2) = 0.000106
mean(Y3) = 0.011878	max(Y3) – min(Y3) = 0.000225	stdev(Y3) = 0.000078
mean(Y4) = 0.016518	max(Y4) – min(Y4) = 0.000215	stdev(Y4) = 0.000091
mean(Y5) = 0.021753	max(Y5) – min(Y5) = 0.000245	stdev(Y5) = 0.000081
mean(Y6) = 0.026489	max(Y6) – min(Y6) = 0.00045	stdev(Y6) = 0.000149

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·25.4 = 201.7268

(Rc – .5)·25.4 = 2025.5992

@ zone1 .666·25.4 = 16.9164

mean(Y1)·25.4 = 0.093396

@ zone2 1.333·25.4 = 33.8582

mean(Y2)·25.4 = 0.193192

@ zone3 2·25.4 = 50.8

mean(Y3)·25.4 = 0.301701

@ zone4 2.666·25.4 = 67.7164

mean(Y4)·25.4 = 0.419557

@ zone5 3.333·25.4 = 84.6582

mean(Y5)·25.4 = 0.552526

@ zone6 3.971·25.4 = 100.8634

mean(Y6)·25.4 = 0.672821

DEV·25.4 = 0.002396

Setup

Plot

Reference

 Parabola Conic Target2037.045

R, mm

-1.000

b

0.903

Strehl

----- Surface, nm -----

14.0

RMS

2.9

 σ (RMS) RMS-scaled

Surface Z-coeff, mm

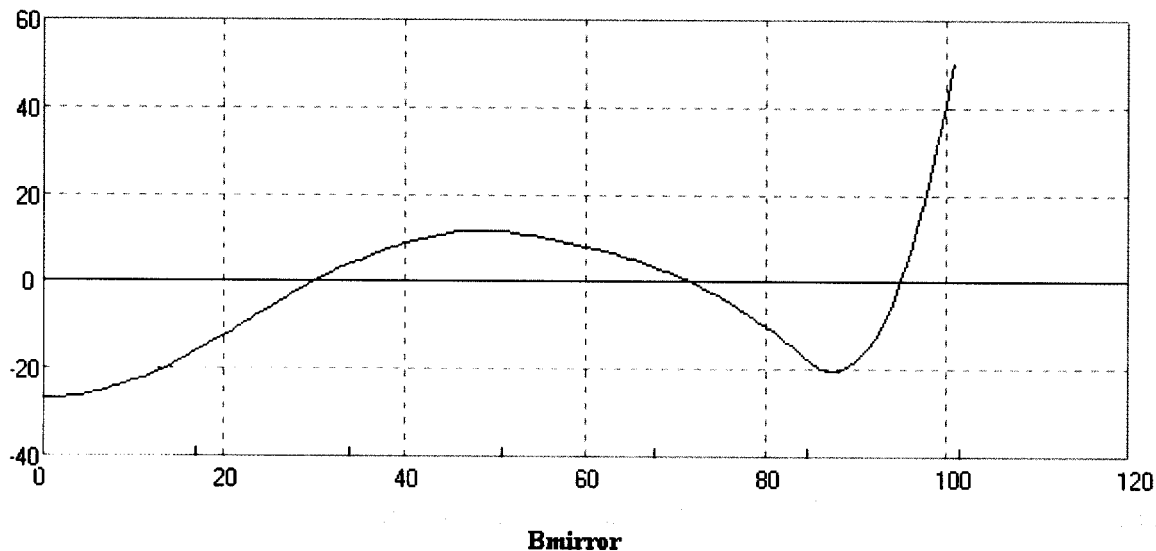
0: 1.2482468

2: 1.2482199

4: 0.0000073

6: 0.0000347

8: 0.0000075



Setup Plot

Reference

 Parabela Conic Target

2037.081

R, mm

-0.971

b

0.908

Strehl

----- Surface, nm -----

13.6

RMS

2.8

 σ (RMS) RMS-scaled

Surface Z-coeff, mm

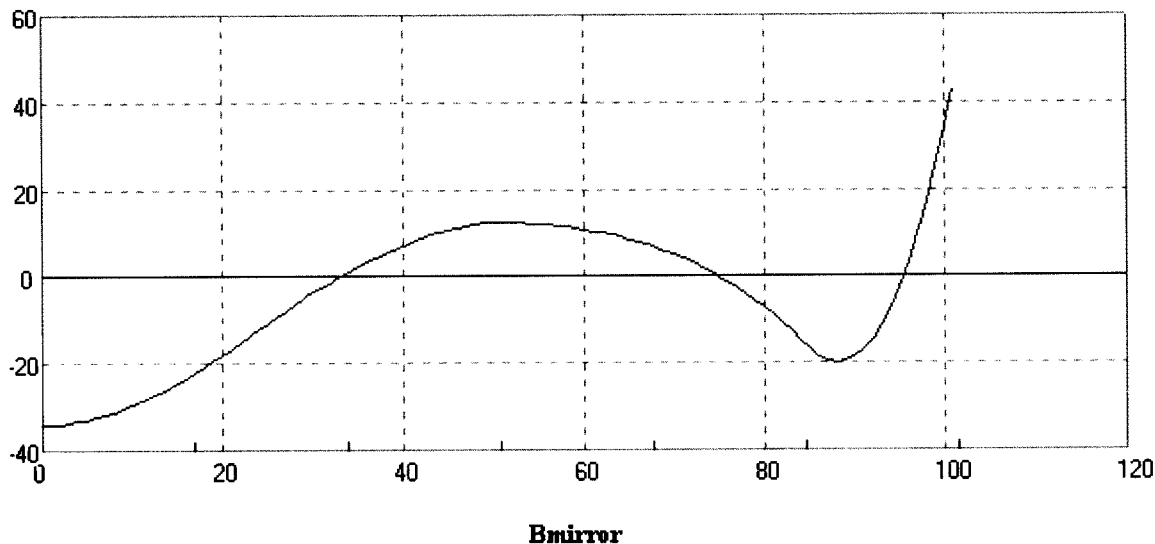
0: 1.2482468

2: 1.2482199

4: 0.0000073

6: 0.0000347

8: 0.0000075



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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 1/2"

Radius of Curvature: 80 1/16"

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:	.175	2.04	2.58	3.035	3.445	3.82
Data set 1	.032	.0500	.060	.079	.108	.119
Data set 2	.037	.0495	.063	.0755	.105	.115
Data set 3	.033	.044	.061	.077	.106	.118
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	.064	.0735	.090	.1065	.135	.1465
Data set 2	.0635	.0785	.0985	.106	.133	.144
Data set 3	.0635	.0755	.091	.106	.134	.147
Data set 4						
Data set 5						
Data set 6						

Mirror Numerical Rating: _____

Is it overcorrected or undercorrected? _____

Is the edge good? best at 10X

What other errors are present? _____

Predict Performance:

Outstanding
(>45X per inch)

Excellent
(35-45X)

Good
(25-35X)

Acceptable
(20-25X)

Poor
(15-20X)

STANDARD MASK

1/8 wave by Tex.

Zone 5
TOO
HIGH

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: 80.4"

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:	<u>1.24</u>	<u>2.05</u>	<u>2.58</u>	<u>3.04</u>	<u>3.45</u>	<u>3.8</u>
Data set 1	<u>.000</u>	<u>.017</u>	<u>.030</u>	<u>.043</u>	<u>.070</u>	<u>.080</u>
Data set 2	<u>.000</u>	<u>.017</u>	<u>.028</u>	<u>.043</u>	<u>.070</u>	<u>.080</u>
Data set 3	<u>.000</u>	<u>.018</u>	<u>.029</u>	<u>.043</u>	<u>.070</u>	<u>.080</u>
Data set 4	<u>.000</u>	<u>.017</u>	<u>.029</u>	<u>.043</u>	<u>.070</u>	<u>.080</u>
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	<u>.000</u>	<u>.016</u>	<u>.026</u>	<u>.039</u>	<u>.066</u>	<u>.075</u>
Data set 2	<u>.000</u>	<u>.016</u>	<u>.025</u>	<u>.041</u>	<u>.066</u>	<u>.075</u>
Data set 3	<u>.000</u>	<u>.015</u>	<u>.025</u>	<u>.040</u>	<u>.067</u>	<u>.077</u>
Data set 4	<u>.000</u>	<u>.015</u>	<u>.025</u>	<u>.039</u>	<u>.066</u>	<u>.076</u>
Data set 5						
Data set 6						

Mirror Numerical Rating: Strehl = .97 1/10 WAVE P-V

Is it overcorrected or undercorrected? Very slightly under corrected

Is the edge good? YES

What other errors are present? _____

Predict Performance:

Outstanding
($>45X$ per inch)

Excellent
(35-45X)

Good
(25-35X)

Acceptable
(20-25X)

Poor
(15-20X)

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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: **8"** (tiny bevel) Radius of Curvature: **80.6"**

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	0.2640	0.2820	0.2938	0.3101	0.3337	0.3455
Data set 2	0.2640	0.2805	0.2935	0.3088	0.3336	0.3450
Data set 3	0.2638	0.2810	0.2931	0.3085	0.3322	0.3441
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	0.2555	0.2719	0.2836	0.3019	0.3252	0.3368
Data set 2	0.2556	0.2720	0.2847	0.2995	0.3250	0.3360
Data set 3	0.2543	0.2731	0.2850	0.3011	0.3245	0.3369
Data set 4						
Data set 5						
Data set 6						

Mirror Numerical Rating: **Wavefront: 57 nm PV, 17 nm RMS. I would call this "1/9th wave"**

Is it overcorrected or undercorrected? **Slightly overcorrected**

Is the edge good? **I think the very outer edge (maybe 1/16") is slightly turned up.**

What other errors are present? **Just inside the edge, at about the 80% zone, there is high ring zone about 1" wide. This was apparent under the knife edge test and also showed up in the integrated surface profile. The surface is pretty smooth. A small amount of astigmatism was detected in the Ronchi test and is indicated by different best-fit focal lengths for the two diameters.**

Predict Performance:

Outstanding
(>45X per inch)

Excellent
(35-45X)

Good
(25-35X)

Acceptable
(20-25X)

Poor
(15-20X)

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: 7.95"

Radius of Curvature: 80.5"

Moving Slit

Fixed Slit (Circle one)

2045 mm

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	3.98
Data set 1	42	60	70	87	110	124
Data set 2	41	60	71	86	111	125
Data set 3	41	60	72	86	110	124
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	40	59	67	87	110	124
Data set 2	40	59	68	84	110	123
Data set 3	38	58	67	85	111	123
Data set 4						
Data set 5						
Data set 6						

1/36 RMS strehl 0.97

Mirror Numerical Rating: Tex 1/9 wave TA ~ 1// Tex = 1/7 wave TA ~ 1.4

Is it overcorrected or undercorrected? Slightly overcorrected

Is the edge good? Good, clean edge!

What other errors are present? Nasty overcorrected zone at the 4/5 boundary. Smooth surface, but serious outer zone problem that is not easily fixed.

Predict Performance:

Outstanding
(>45X per inch)

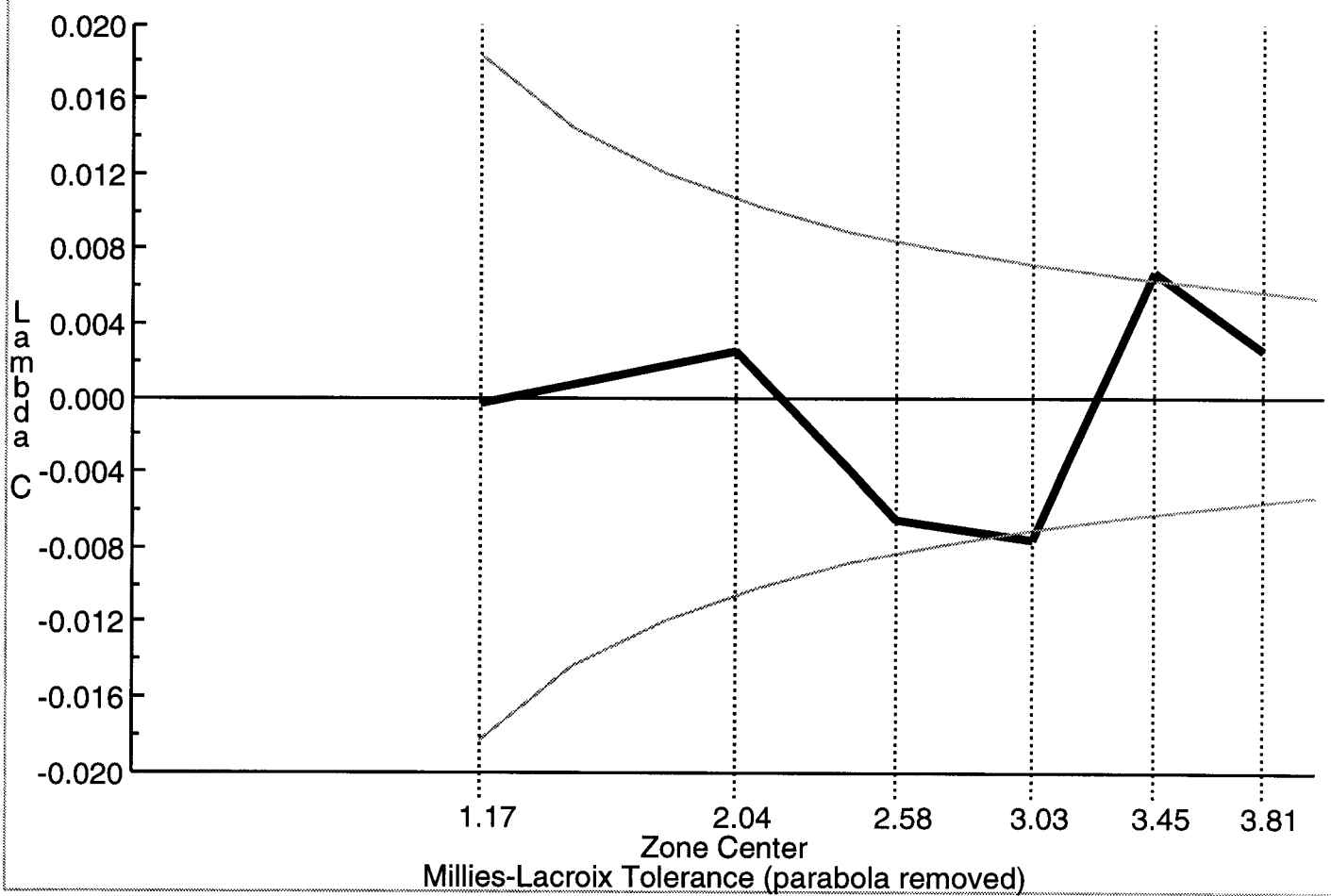
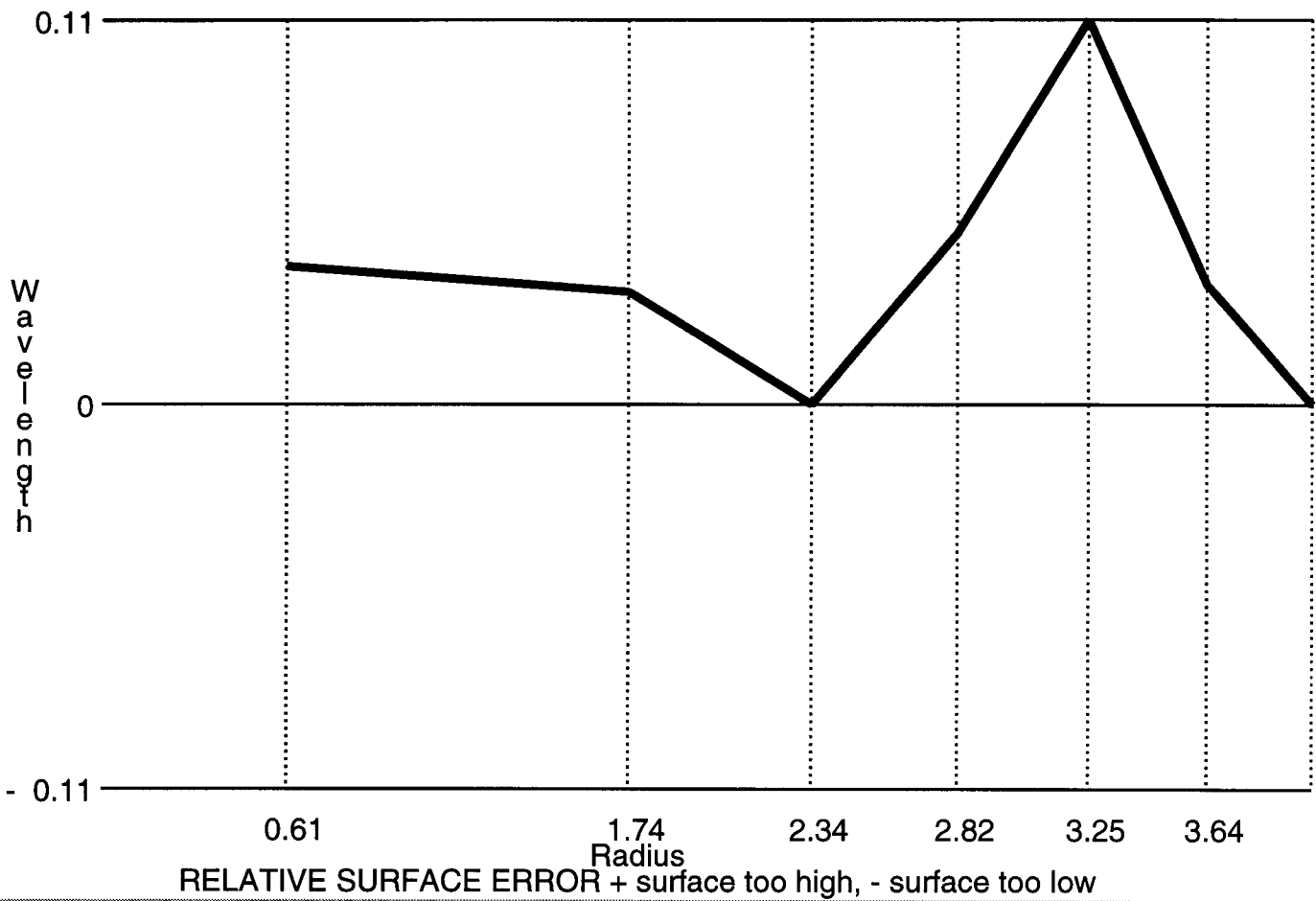
Excellent
(35-45X)

Good
(25-35X)

Acceptable
(20-25X)

Poor
(15-20X)

Modest but noticeable diffraction error at focus in "Figure" program.



From Steve Vegos

Mirror B:

ROC 80.5"
Dia. 7.97

radius .995 2.42 3.13 3.71

data 1 .234 .285 .331 .383
data 2 .250 .291 .343 .400
data 3 .376 .431 .483 .539

normalized

data 1 0 .051 .097 .149
data 2 0 .041 .093 .150
data 3 0 .055 .107 .163

ave. 0 .049 .099 .154

PV 1/14
RMS 1/61.6
SR .99

Comments:
Individual data sets yield ~:

PV ~1/10
RMS ~1/40
SR ~.975

The Ave. of my wild data sets gave better results than individual data sets as shown above. Fine smooth surface. A joy to look at. The individual numbers are probably more accurate than the average numbers.

Predicted performance: Excellent
