# MODS Optics Bid Package

2001 May 13

The following specifications and drawings are for optical components we need for a large astronomical spectrograph under construction at The Ohio State University. Two identical copies of the instrument will become part of the instrument complement for the Large Binocular Telescope (LBT).

Note that this is the original bid package, some details have changed after consultation with the final vendors. This document is provided to give the reader some idea of the detailed technical specifications of the optics vis-a-vis actual fabrication of the pieces.

There are 7 items for which we request bids.

| Qty | Part# | Description | Price | Delivery |
|---|---|---|---|---|
| 2 | FIELD_LENS_R1.dwg | Field lens | | |
| 4 | COLLIMATOR_Rl.dwg | Collimator Mirror | | |
| 2 | RED_CORRECTOR_Rl.dwg | Red Camera Corrector | | |
| 2 | BLUE_CORRECTOR_R1.dwg | Blue Camera Corrector | | |
| 4 | CAMIERA_PRIMARY_R1.dwg | Camera Primary Mirror | | |
| 2 | RED_FLATTENER_R1.dwg | Red Camera Field-flattener | | |
| 2 | BLUE_FLATTENER_R1.dwg | Blue Camera Field flattener | | |

Notes

Please consider the following comments:

1. Detailed optical specifications and tolerances for each item are included in the accompanying sheets and attached drawings.
2. We will provide BK7 Material for RED_CORRECTOR_Rl.dwg
3. We will provide Fused Silica material for BLUE_CORRECTOR_R1.dwg
4. We will provide 4 Hextek Blanks for COLLIMATOR_R1.dwg
5. We will provide 4 Hextek Blanks for CAMERA_PRIMARY_R1.dwg
6. All Items are to be quoted uncoated
7. Explanatory note on the surface error tolerances:

   The surface error tolerances for each item have been derived using structure function arguments considering the encircled energy requirements in the final image. These tolerances are expressed as maximum allowable rms surface deviations for given scale length. The surface deviation tolerances are expressed in units of wavelength (X) for a test wavelength of 633 nm.
8. Test data for each item for customer verification will be required. Please include a description of the test data to be provided with all bids.

## Item 1: MODS SPECTROGRAPH FIELD LENS

| | |
|---|---|
| Number of pieces to quote: | Quantity 2 |
| Description: | Meniscus field lens |
| Material: | **UV-grade fused silica** (BPFS Coming #7980, Grade 0C) |
| Size: | Square, sides=230 mm, Center thickness 6 mm. |
| Surfaces: | both surfaces spherical |
| Coating: | uncoated |
| Drawing: | Attached drawing FIELD_LENS_R1.dwg |

SPECIFICATION OF MAXIMUM SURFACE FIGURE ERRORS

The specification for the surface figure is specified as RMS values at 5 different scales as follows:

| SCALE in mm | RMS error @ λ=633nm |
|---|---|
| <10 | λ/10 |
| 10-25 | λ/4 |
| 25-50 | λ/4 |
| 50-100 | λ/2 |
| 100 > 230 | λ/2 |

## Item 2:MODS SPECTROGRAPH COLLIMATOR MIRROR

| | |
|---|---|
| Number of pieces to quote: | Quantity 4 |
| Description: | Off-axis Paraboloid |
| Material: | **Hextek Substrates provided by Ohio State Refer to COLLIMATOR_BLANK_Rl.dwg** |
| Finished Size: | Square 490 mm by 490 mm. per drawing |
| Surface: | parabolic |
| Coating: | uncoated |
| Drawing: | Attached drawing COLL1MATOR_R1.dwg |

SPECIFICATION OF MAX1MUM SURFACE FIGURE ERRORS

The specification for the surface figure is specified as RMS values at 5 different scales as follows:

| SCALE in mm | RMS error @ λ=633nm |
|---|---|
| <10 | λ/20 |
| 10-25 | λ/20 |
| 25-50 | λ/8 |
| 50-100 | λ/3 |
| 100 > 230 | λ/2 |

# Item 3: MODS SPECTROGRAPH RED CAMERA CORRECTOR

| | |
|---|---|
| Number of pieces to quote: | Quantity 2 |
| Description: | **Decentered** meniscus Schmidt corrector lens |
| Material: | **BK7 Blank to be provided by Ohio State**<br>**Refer to RED_CORR_SUBSTRATE_Rl.dwg** |
| Size: | Rectangular 440 mm x 320 mm. |
| Surfaces: | Surface 1 portion of decentered sphere<br>Surface 2 portion of decentered asphere |
| Coating: | uncoated |
| Drawing: | Attached drawing RED-CORRECTOR-R1.dwg |

## 1. DESCRIPTION OF ASPHERIC SURFACE

The sag z measured in a direction perpendicular to the vertex of the parent asphere to the surface as a function of distance y measured tangentially from the vertex of the parent asphere is described by the following expression.

$$z = \frac{cy^2}{1+\left[1-(1+K)c^2y^2\right]^{1/2}} + Ay^4 + By^6 + Cy^8 + Dy^{10}$$

where: the vertex radius r = 1283.338 mm, c= 1/r = .000779218

K=0
A=+0. 15329763067E-09
B=+0.76065803763E-16
C= +0.150995730OIE-21
D= -0.65817047082E-28

## 2. SPECIFICATION OF MAXIMUM SURFACE FIGURE ERRORS

The specification for the surface figure is specified as RMS values at 5 different scales as follows:

Convex spherical surface S1

| SCALE in mm. | RMS error @ λ=633nm |
|---|---|
| <10 | λ/10 |
| 10-25 | λ/5 |
| 25-50 | λ/4 |
| 50-100 | λ/2 |
| 100 > 230 | λ |

Concave aspheric surface S2

| SCALE in mm. | RMS error @ λ=633nm |
|---|---|
| <10 | λ/5 |
| 10-25 | λ/3 |
| 25-50 | λ/2 |
| 50-100 | 1.3λ |
| 100 > 230 | 2.4λ |

# Item 4: MODS SPECTROGRAPH BLUE CANMRA CORRECTOR

| | |
|---|---|
| Number of pieces to quote: | Quantity 2 |
| Description: | **Decentered** meniscus Schmidt corrector lens |
| Material: | **Fused Silica Blank to be provided Ohio State Refer to BLUE_CORR_SUBSTRATE_Rl.dwg** |
| Size: | Rectangular 440 mm x 320 mm. |
| Surfaces: | Surface 1 portion of decentered sphere<br>Surface 2 portion of decentered asphere |
| Coating: | uncoated |
| Drawing: | Attached drawing BLUE_CORRECTOR_RI.dwg |

1. DESCRIPTION OF ASPHERIC SURFACE

The sag z measured in a direction perpendicular to the vertex of the parent asphere to the surface as a function of distance y measured tangentially from the vertex of the parent asphere is described by the following expression:

$$z = \frac{cy^2}{1+\left[1-(1+K)c^2y^2\right]^{1/2}} + Ay^4 + By^6 + Cy^8 + Dy^{10}$$

where: the vertex radius r = 2406.554 mm, c = 1/r =0.0004155319

K=0

A=+0.15613855651E-09

B=+0.25852423767E-16

C=+0.38802572960E-21

D= -0.73937860644E-27

2. SPECIFICATION OF MAXIMUM SURFACE FIGURE ERRORS

The specification for the surface figure is specified as RMS, values at 5 different scales as follows:

Convex spherical surface S1

| SCALE in mm. | RMS error @ λ=633 nm |
|---|---|
| <10 | λ/10 |
| 10-25 | λ/5 |
| 25-50 | λ/4 |
| 50-100 | λ/2 |
| 100 > 230 | λ |

Concave aspheric surface S2

| SCALE in mm. | RMS error @ λ=633nm |
|---|---|
| <10 | λ/5 |
| 10-25 | λ/3 |
| 25-50 | λ/2 |
| 50-100 | 1.3λ |

| | |
|---|---|
| 100 > 230 | 2.4λ |

## Item 5: MODS SPECTROGRAPH CAMERA PRIMARY MIRROR

| | |
|---|---|
| Number of pieces to quote: | Quantity: 4 |
| Description: | Spherical Schmidt camera mirror |
| Material: | **Hextek Substrates provided by Ohio State**<br>**Refer to CAMERA_PRIMARY_BLANK_Rl.dwg** |
| Size: | Rectangular 620 mm by 360 mm per drawing |
| Surface: | Spherical |
| Coating: | uncoated |
| Drawing: | Attached drawing CAMERA_PR1MARY_R1.dwg |

SPECIFICATION OF MAXIMUM SURFACE FIGURE ERRORS

The specification for the surface figure is specified as RMS values at 5 different scales as follows:

| SCALE in mm. | RMS error @ λ=633nm |
|---|---|
| <10 | λ/20 |
| 10-25 | λ/20 |
| 25-50 | λ/8 |
| 50-100 | λ/3 |
| 100 > 230 | λ/2 |

## Item 6: MODS SPECTROGRAPH RED CAMERA FLATTENER

| | |
|---|---|
| Number of Pieces to quote: | Quantity 2 |
| Description: | Section of plano-convex field flattener |
| Material: | BK7 (Schott BK7 Class H4 BO or better) |
| Size: | Rectangular 175 mm by 116 mm per drawing |
| Surfaces: | Surface 1 spherical<br>Surface 2 plano |
| Coating: | uncoated |
| Drawing: | Attached drawing RED_FLATTENER_R1.dwg |

SPECIFICATION OF MAXIMUM SURFACE FIGURE ERRORS

The specification for the surface figure is specified as RMS values at 5 different scales as follows:

| SCALE in mm. | RMS error @ λ=633nm |
|---|---|
| <10 | λ/10 |
| 10-25 | λ/4 |
| 25-50 | λ/4 |
| 50-100 | λ/2 |
| 100 > 230 | λ/2 |

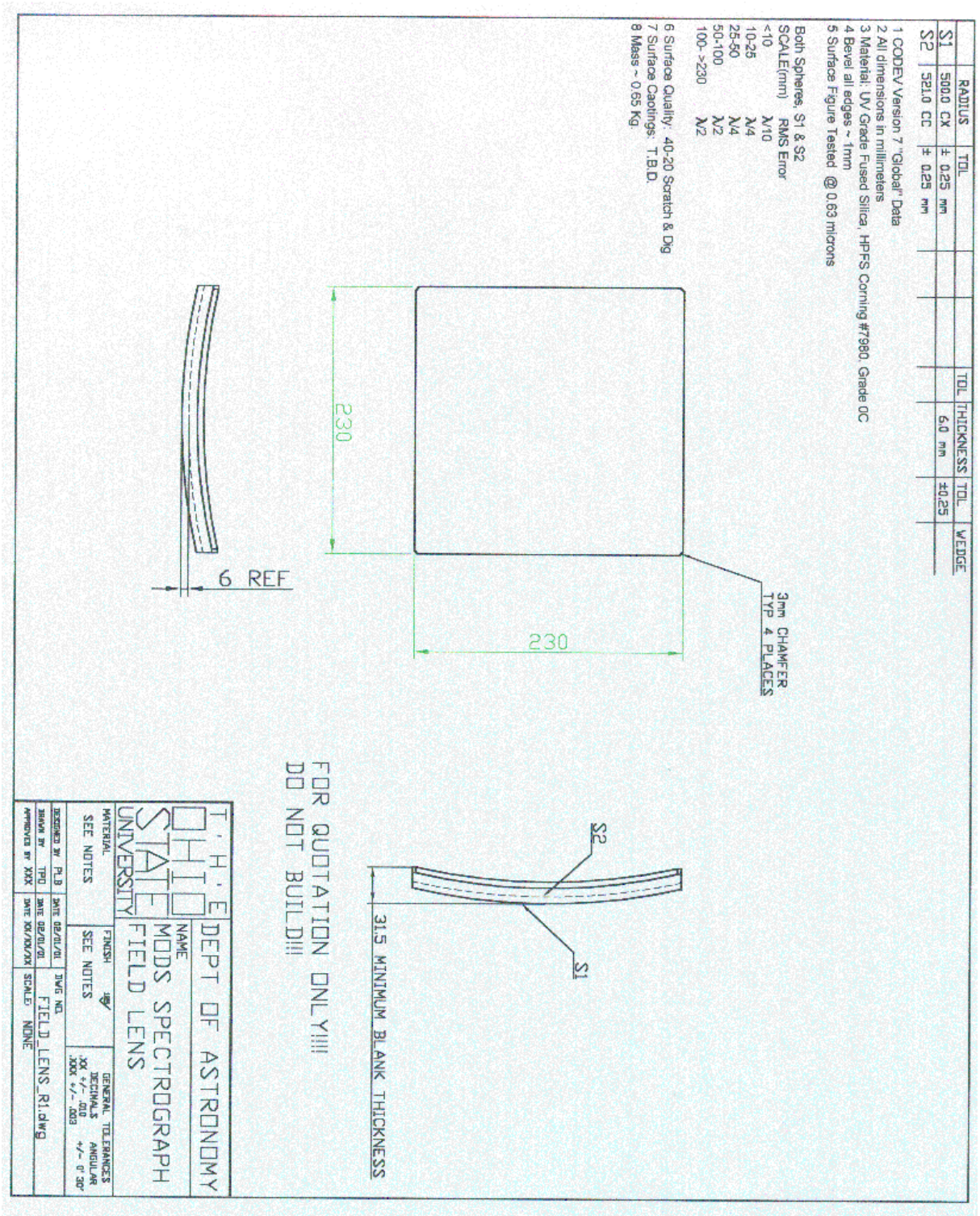
## Item 7: MODS SPECTROGRAPH BLUE CAMERA FIELD FLATTENER

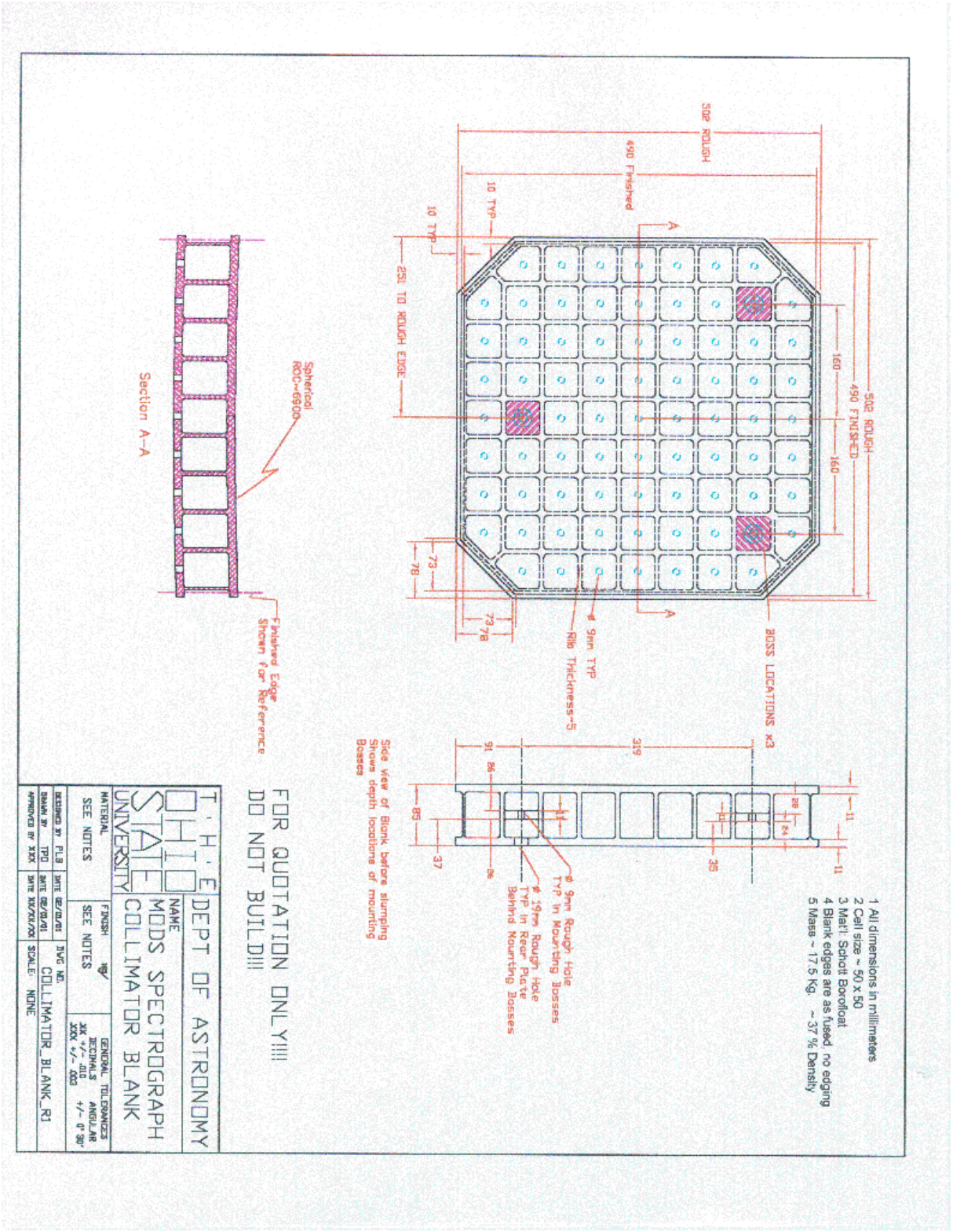
| | |
|---|---|
| Number of pieces to quote: | Quantity 2 |
| Description: | Section of plano convex field flattener |
| Material: | UV grade fused silica (BPFS Coming #7980, Grade OC) |
| Size: | Rectangular 175 mm by 116 mm per drawing |
| Surfaces: | Surface 1 spherical |
| | Surface 2 plano |
| Coating: | uncoated |
| Drawing: | Attached drawing BLUE_FLATTENER_R1.dwg |

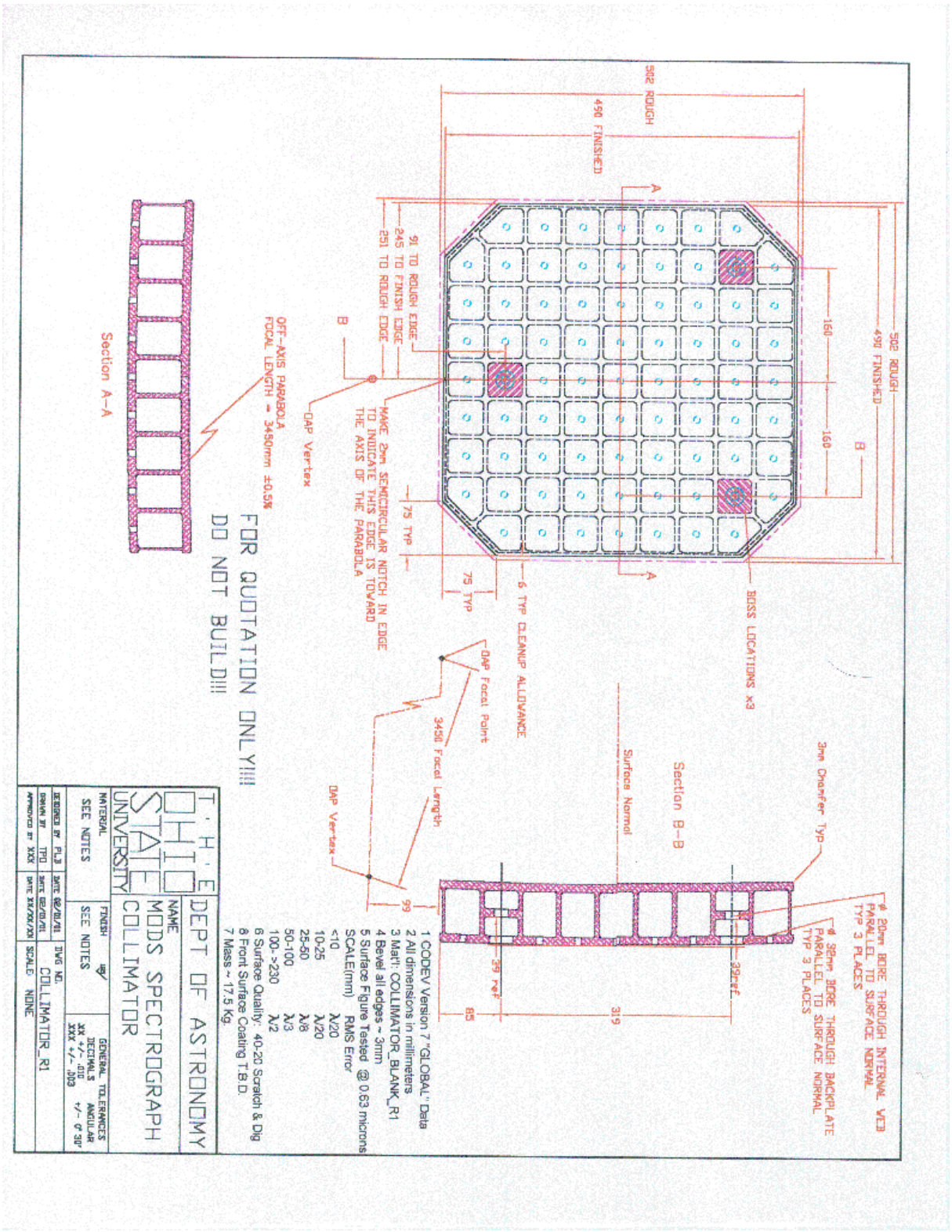
SPECIFICATION OF MAXIMUM SURFACE FIGURE ERRORS

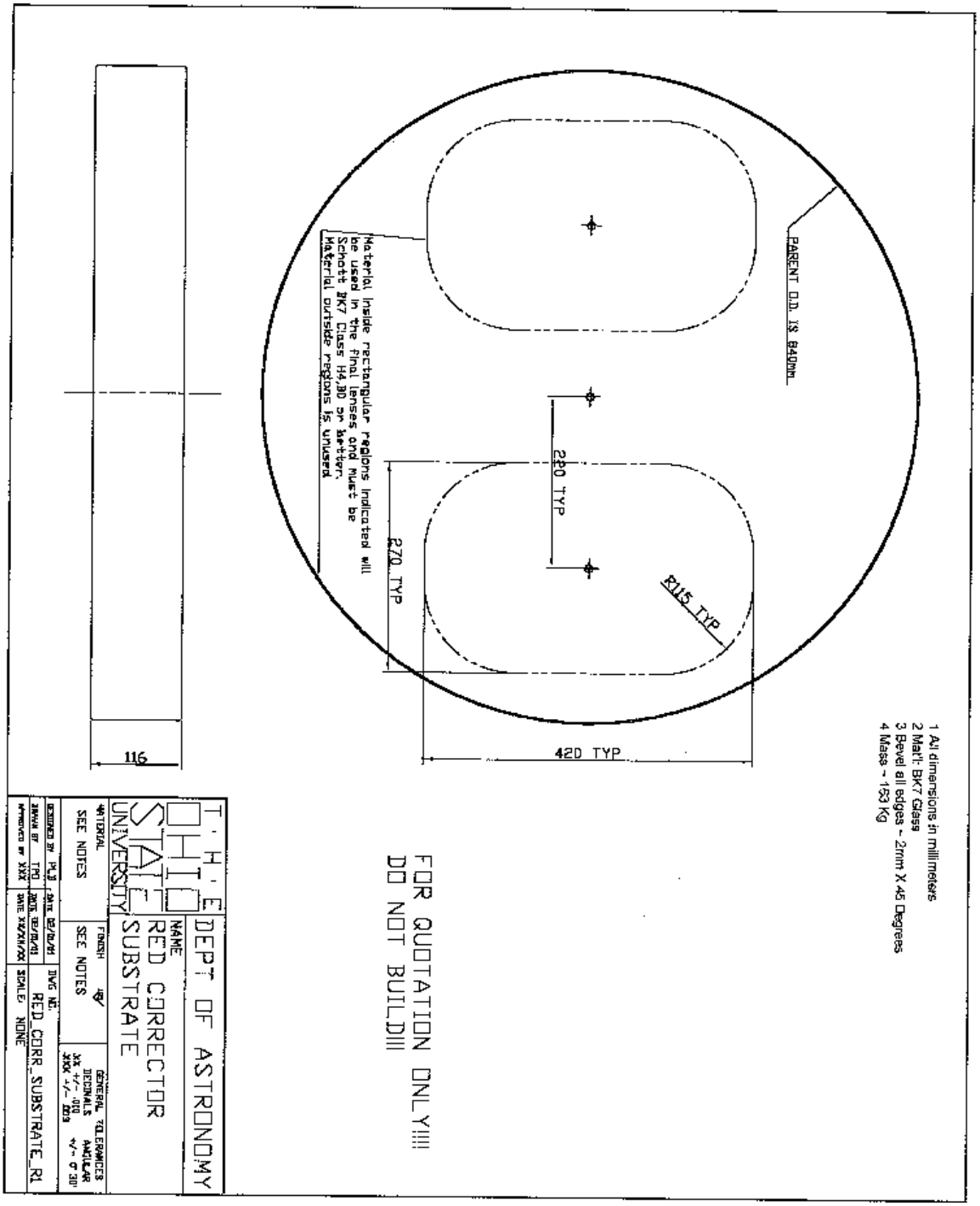
The specification for the surface figure is specified as RMS values at 5 different scales as follows:

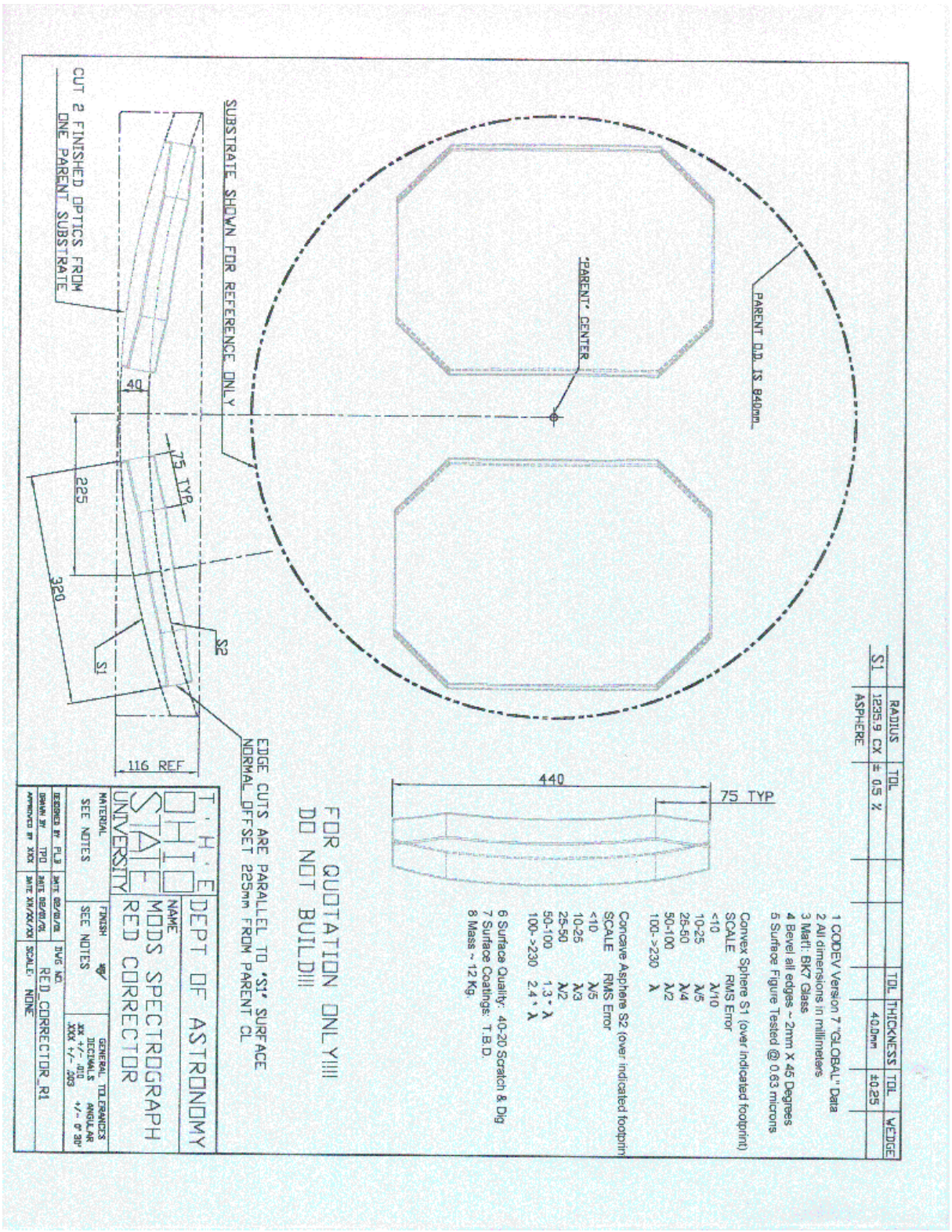
| SCALE in mm. | RMS error @ λ=633nm |
|---|---|
| <10 | λ/10 |
| 10-25 | λ/4 |
| 25-50 | λ/4 |
| 50-100 | λ/2 |
| 100 > 230 | λ/2 |

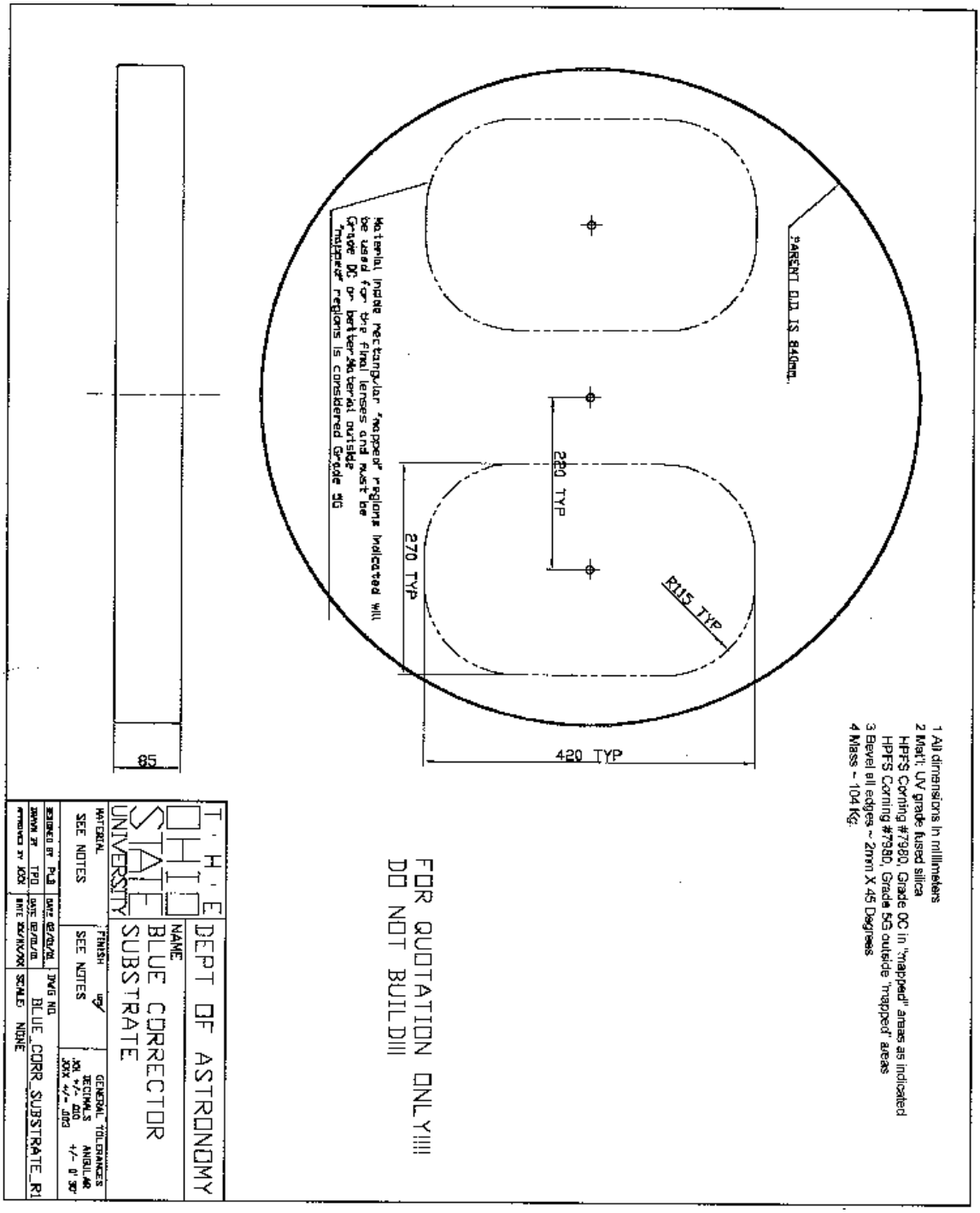

RADIUS
TOL
THICKNESS
TOL
WEDGE
S1
500.0 CX
± 0.25 mm
6.0 mm
±0.25
S2
521.0 CC
± 0.25 mm
1 CODEV Version 7 "Global" Data
2 All dimensions in millimeters
3 Material: UV Grade Fused Silica, HPFS Corning #7980, Grade 0C
4 Bevel all edges ~ 1mm
5 Surface Figure Tested @ 0.63 microns
Both Spheres, S1 & S2
SCALE(mm) RMS Error
<10 λ/10
10-25 λ/4
25-50 λ/4
50-100 λ/2
100- >230 λ/2
6 Surface Quality: 40-20 Scratch & Dig
7 Surface Caotings: T.B.D.
8 Mass ~ 0.65 Kg
230
230
6 REF
3mm CHAMFER
TYP 4 PLACES
S2
S1
31.5 MINIMUM BLANK THICKNESS
FOR QUOTATION ONLY!!!!
DO NOT BUILD!!!
T.H.E. OHIO STATE UNIVERSITY
DEPT OF ASTRONOMY
NAME
MODS SPECTROGRAPH
FIELD LENS
MATERIAL
SEE NOTES
FINISH
SEE NOTES
GENERAL TOLERANCES
DECIMALS
ANGULAR
DRAWN BY
DATE
DESIGNED BY
APPROVED BY
DWG NO.
FIELD_LENS_R1.dwg
SCALE: NONE

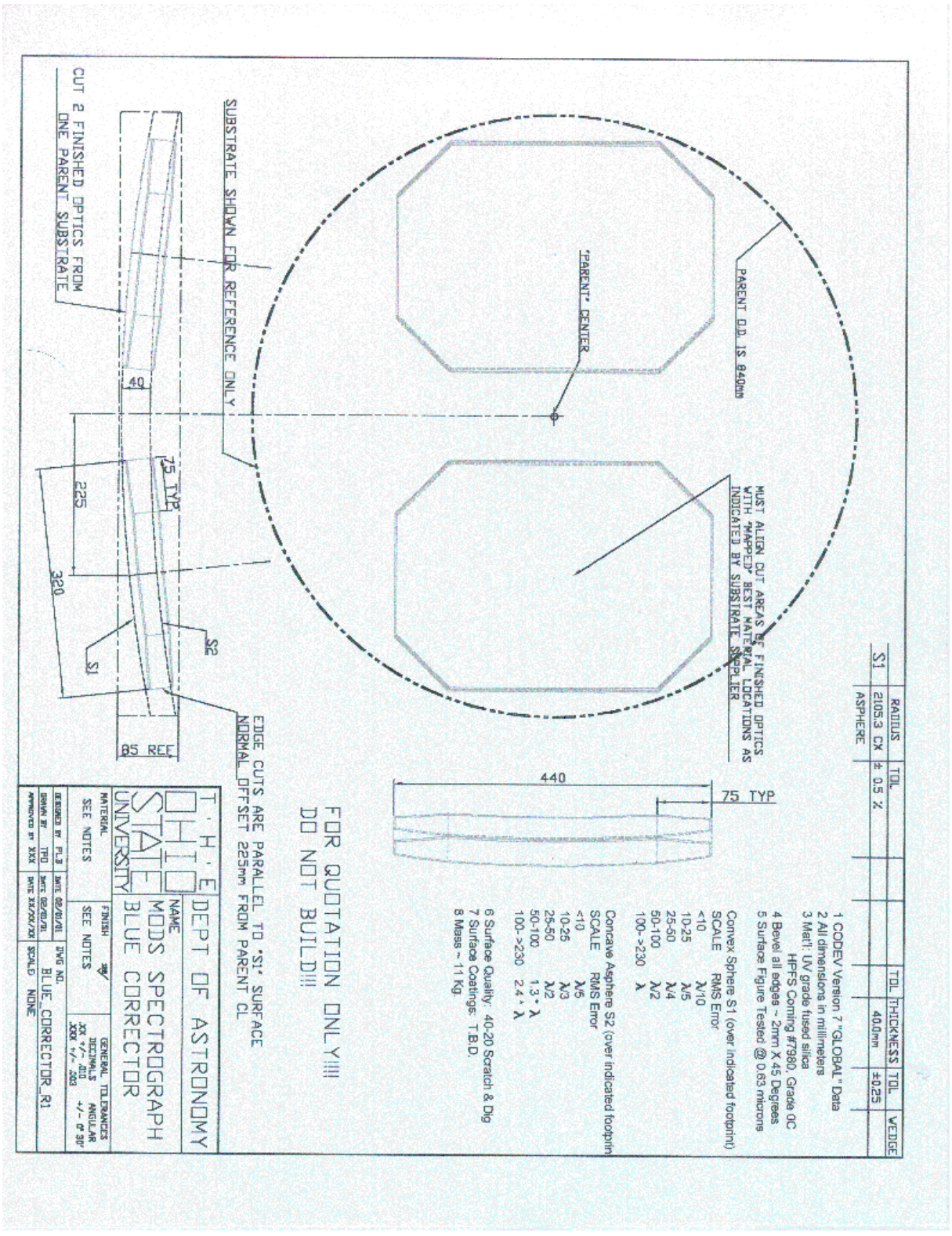

1 All dimensions in millimeters
2 Cell size ~ 50 x 50
3 Matl: Schott Borofloat
4 Blank edges are as fused, no edging
5 Mass ~ 17.5 kg ~ 37 % Density
502 ROUGH
490 FINISHED
160
160
BOSS LOCATIONS x3
502 ROUGH
490 Finished
10 TYP
10 TYP
251 TO ROUGH EDGE
73
78
73
78
9mm TYP
Rib Thickness~5
Section A-A
Spherical
ROC=6900
Finished Edge
Shown for Reference
Side view of Blank before slumping
Shows depth locations of mounting
Bosses
319
91
26
85
37
11
28
24
11
11
35
Ø 9mm Rough Hole
TYP in Mounting Bosses
Ø 19mm Rough Hole
TYP in Rear Plate
Behind Mounting Bosses
FOR QUOTATION ONLY!!!!
DO NOT BUILD!!!
THE OHIO STATE UNIVERSITY
DEPT OF ASTRONOMY
NAME
MODS SPECTROGRAPH
COLLIMATOR BLANK
MATERIAL
SEE NOTES
FINISH
SEE NOTES
GENERAL TOLERANCES
DECIMALS ANGULAR
XX +/- .010 +/- 0° 30'
XXX +/- .003
DESIGNED BY: PLB DATE: 02/01/01
DRAWN BY: TPD DATE: 02/01/01
APPROVED BY: XXX DATE: XX/XX/XX
DWG NO.
COLLIMATOR_BLANK_R1
SCALE: NONE

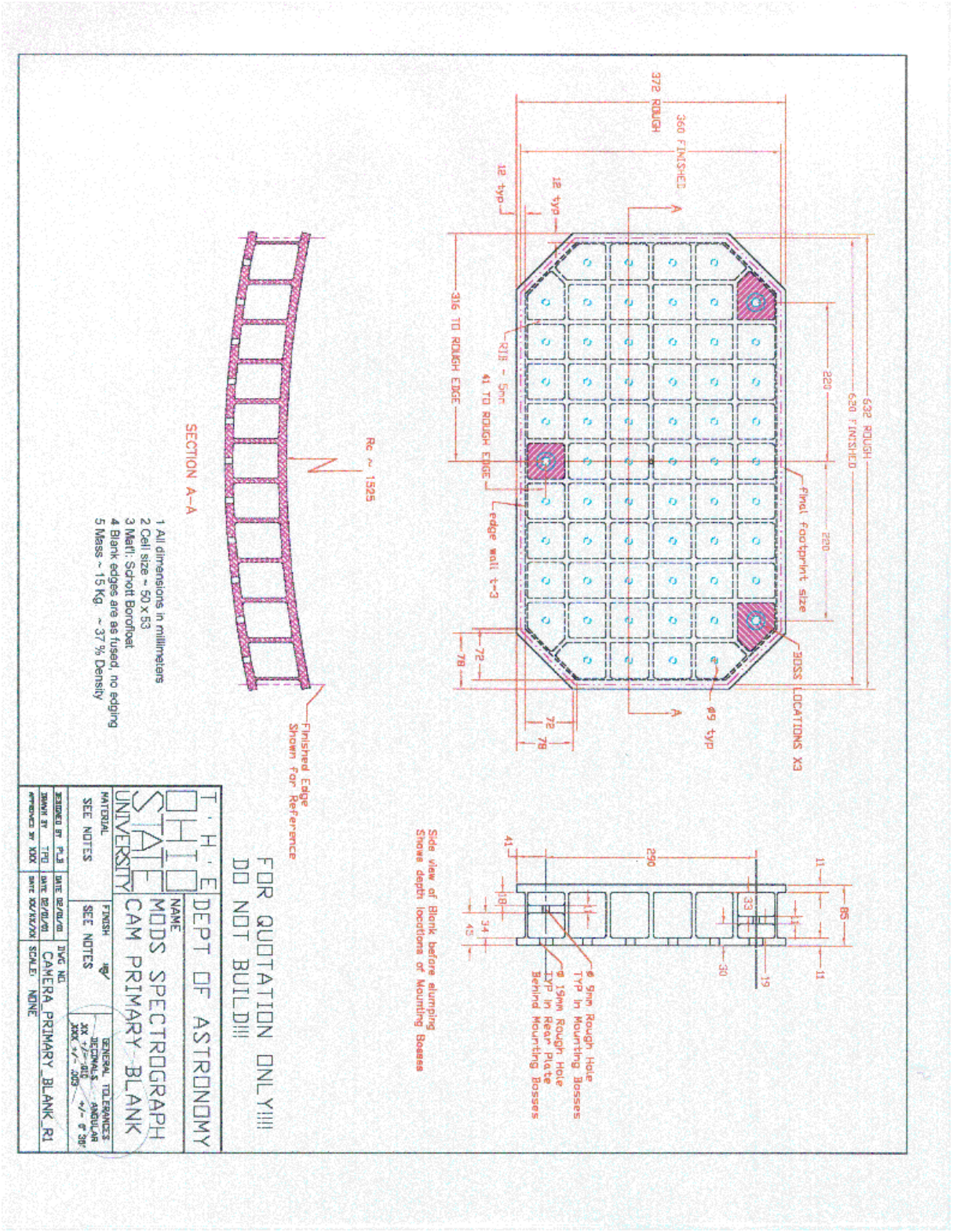

502 ROUGH
490 FINISHED
160
160
B
A
A
502 ROUGH
490 FINISHED
9± TO ROUGH EDGE
245 TO FINISH EDGE
251 TO ROUGH EDGE
B
MAKE 2mm SEMICIRCULAR NOTCH IN EDGE TO INDICATE THIS EDGE IS TOWARD THE AXIS OF THE PARABOLA
OAP Vertex
OFF-AXIS PARABOLA
FOCAL LENGTH = 3450mm ±0.5%
75 TYP
75 TYP
6 TYP CLEANUP ALLOWANCE
OAP Focal Point
3450 Focal Length
OAP Vertex
99
BOSS LOCATIONS x3
Surface Normal
Section B-B
3mm Chamfer Typ
ø 20mm BORE THROUGH INTERNAL VEE PARALLEL TO SURFACE NORMAL TYP 3 PLACES
ø 38mm BORE THROUGH BACKPLATE PARALLEL TO SURFACE NORMAL TYP 3 PLACES
39 ref.
39ref.
85
319
Section A-A
FOR QUOTATION ONLY!!!!
DO NOT BUILD!!!
1 CODEV Version 7 "GLOBAL" Data
2 All dimensions in millimeters
3 Matl: COLLIMATOR_BLANK_R1
4 Bevel all edges ~ 3mm
5 Surface Figure Tested @ 0.63 microns
SCALE(mm) RMS Error
<10 λ/20
10-25 λ/20
25-50 λ/8
50-100 λ/3
100->230 λ/2
6 Surface Quality: 40-20 Scratch & Dig
8 Front Surface Coating T.B.D.
7 Mass ~ 17.5 Kg
T. H. E. OHIO STATE UNIVERSITY
DEPT OF ASTRONOMY
NAME
MODS SPECTROGRAPH
COLLIMATOR
MATERIAL
SEE NOTES
FINISH
SEE NOTES
GENERAL TOLERANCES
DECIMALS
XX +/- .010
XXX +/- .003
ANGULAR
+/- 0° 30'
DESIGNED BY PLB DATE 02/01/01
DRAWN BY TPD DATE 02/01/01
APPROVED BY XXX DATE XX/XX/XX
DWG NO. COLLIMATOR_R1
SCALE: NONE

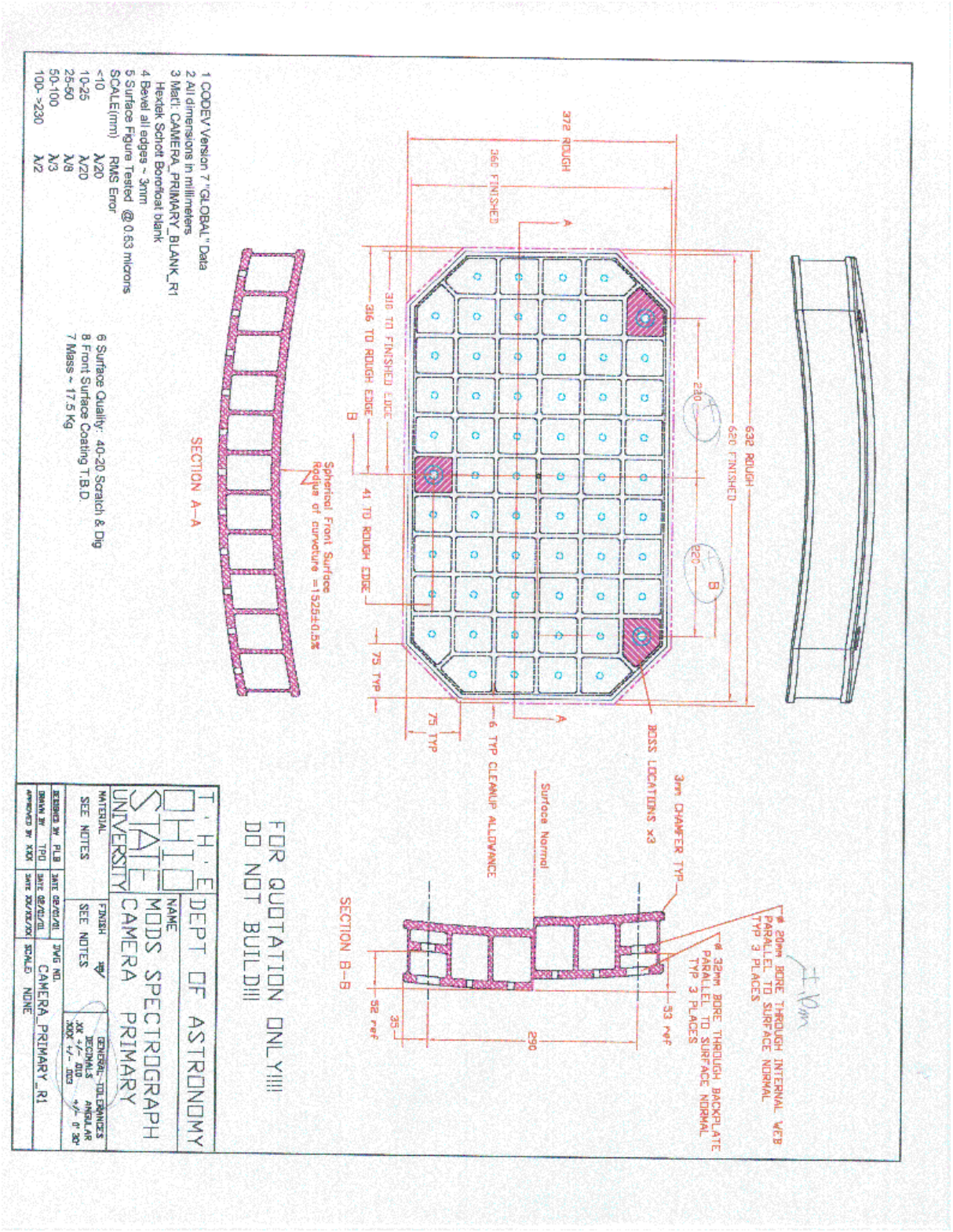

1 All dimensions in millimeters
2 Matl: BK7 Glass
3 Bevel all edges ~ 2mm X 45 Degrees
4 Mass ~ 1.53 Kg
PARENT O.D. IS 840mm
Material inside rectangular regions indicated will be used in the final lenses and must be Schott BK7 Class H4 3D or better. Material outside regions is unused
280 TYP
270 TYP
R115 TYP
420 TYP
116
FOR QUOTATION ONLY!!!!
DO NOT BUILD!!!
THE OHIO STATE UNIVERSITY
DEPT OF ASTRONOMY
NAME
RED CORRECTOR SUBSTRATE
MATERIAL
SEE NOTES
FINISH
SEE NOTES
GENERAL TOLERANCES
DECIMALS ANGULAR
XX +/- .010 +/- 0° 30'
XXX +/- .003
DRAWN BY PKS DATE 02/06/01
CHKD BY TPG DATE 02/06/01
APPROVED BY XXX DATE XX/XX/XX
DWG NO. RED_CORR_SUBSTRATE_R1
SCALE: NONE

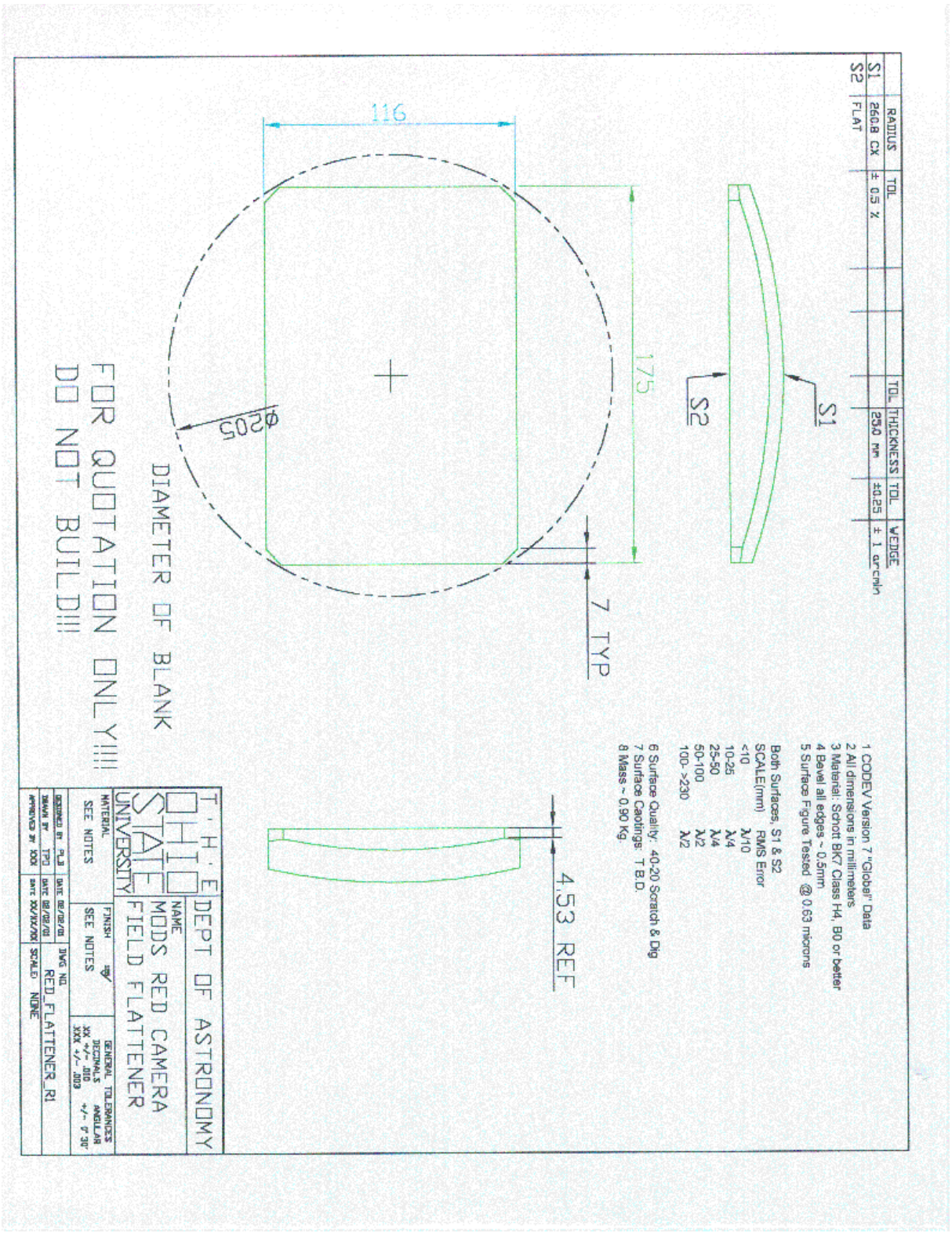

S1
RADIUS
TOL
TOL THICKNESS
TOL
WEDGE
1235.9 CX
± 0.5 %
40.0mm
±0.25
ASPHERE
1 CODEV Version 7 "GLOBAL" Data
2 All dimensions in millimeters
3 Matl: BK7 Glass
4 Bevel all edges ~ 2mm X 45 Degrees
5 Surface Figure Tested @ 0.63 microns
Convex Sphere S1 (over indicated footprint)
SCALE RMS Error
<10 λ/10
10-25 λ/5
25-50 λ/4
50-100 λ/2
100->230 λ
Concave Asphere S2 (over indicated footprint)
SCALE RMS Error
<10 λ/5
10-25 λ/3
25-50 λ/2
50-100 1.3 * λ
100->230 2.4 * λ
6 Surface Quality: 40-20 Scratch & Dig
7 Surface Coatings: T.B.D.
8 Mass ~ 12 Kg.
440
75 TYP
FOR QUOTATION ONLY!!!!
DO NOT BUILD!!!
EDGE CUTS ARE PARALLEL TO 'S1' SURFACE
NORMAL OFFSET 225mm FROM PARENT CL
SUBSTRATE SHOWN FOR REFERENCE ONLY
CUT 2 FINISHED OPTICS FROM
ONE PARENT SUBSTRATE
40
75 TYP
225
320
S1
S2
116 REF
T. H. E
OHIO
STATE
UNIVERSITY
DEPT OF ASTRONOMY
NAME
MODS SPECTROGRAPH
RED CORRECTOR
MATERIAL
SEE NOTES
FINISH
SEE NOTES
GENERAL TOLERANCES
DECIMALS
ANGULAR
DESIGNED BY PLB
DRAWN BY TPD
APPROVED BY XXX
DATE
DATE 02/01/01
DATE XX/XX/XX
DWG NO
RED_CORRECTOR_R1
SCALE: NONE

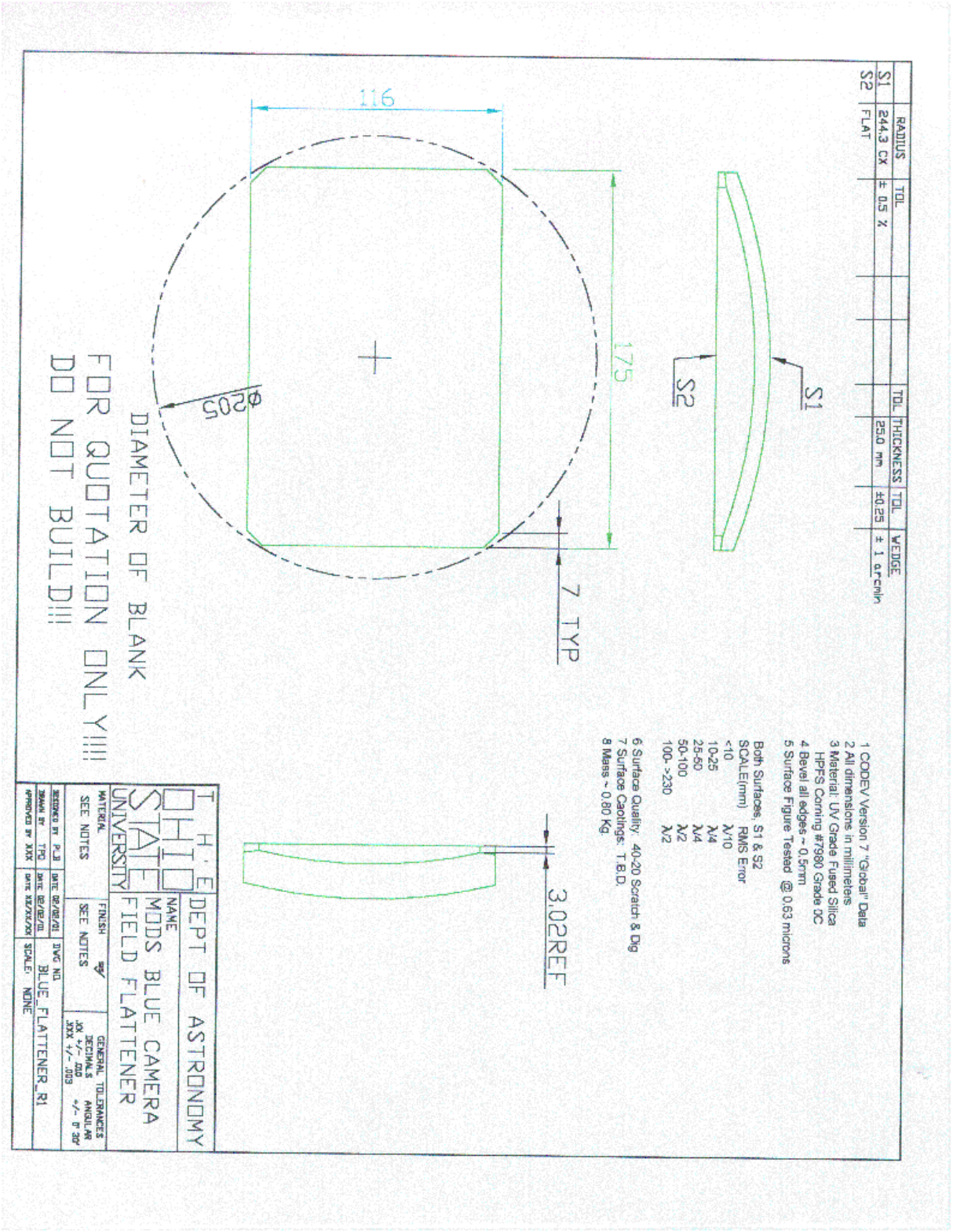

1 All dimensions in millimeters
2 Matl: UV grade fused silica
HPFS Corning #7980, Grade 0C in "mapped" areas as indicated
HPFS Corning #7980, Grade 5G outside "mapped" areas
3 Bevel all edges ~ 2mm X 45 Degrees
4 Mass ~ 104 Kg
PARENT O.D. IS 840mm
280 TYP
270 TYP
R115 TYP
420 TYP
Material inside rectangular "mapped" regions indicated will be used for the final lenses and must be Grade 0C or better. Material outside "mapped" regions is considered Grade 5G
85
FOR QUOTATION ONLY!!!!
DO NOT BUILD!!!
THE OHIO STATE UNIVERSITY
DEPT OF ASTRONOMY
NAME
BLUE CORRECTOR SUBSTRATE
MATERIAL
SEE NOTES
FINISH
SEE NOTES
GENERAL TOLERANCES
DECIMALS
ANGULAR
DESIGNED BY
DRAWN BY
APPROVED BY
DWG NO
BLUE_CORR_SUBSTRATE_R1
SCALE
NONE


S1
RADIUS
TOL
TOL THICKNESS
TOL
WEDGE
ASPHERE
2105.3 CX
± 0.5 %
40.0mm
±0.25
1 CODEV Version 7 "GLOBAL" Data
2 All dimensions in millimeters
3 Matl: UV grade fused silica
HPFS Corning #7980, Grade 0C
4 Bevel all edges ~ 2mm X 45 Degrees
5 Surface Figure Tested @ 0.63 microns
Convex Sphere S1 (over indicated footprint)
SCALE RMS Error
<10 λ/10
10-25 λ/5
25-50 λ/4
50-100 λ/2
100->230 λ
Concave Asphere S2 (over indicated footprint)
SCALE RMS Error
<10 λ/5
10-25 λ/3
25-50 λ/2
50-100 1.3* λ
100->230 2.4* λ
6 Surface Quality: 40-20 Scratch & Dig
7 Surface Coatings: T.B.D.
8 Mass ~ 11 Kg.
FOR QUOTATION ONLY!!!!
DO NOT BUILD!!!
440
75 TYP
MUST ALIGN CUT AREAS OF FINISHED OPTICS WITH "MAPPED" BEST MATERIAL LOCATIONS AS INDICATED BY SUBSTRATE SUPPLIER
"PARENT" CENTER
PARENT O.D. IS 840mm
SUBSTRATE SHOWN FOR REFERENCE ONLY
EDGE CUTS ARE PARALLEL TO "S1" SURFACE
NORMAL OFFSET 225mm FROM PARENT CL
CUT 2 FINISHED OPTICS FROM ONE PARENT SUBSTRATE
40
75 TYP
225
320
S1
S2
85 REF
THE OHIO STATE UNIVERSITY
DEPT OF ASTRONOMY
NAME
MODS SPECTROGRAPH
BLUE CORRECTOR
MATERIAL
SEE NOTES
FINISH
SEE NOTES
GENERAL TOLERANCES
DESIGNED BY PLB
DRAWN BY TPO
APPROVED BY XXX
DWG NO.
BLUE_CORRECTOR_R1
SCALE NONE


632 ROUGH
620 FINISHED
372 ROUGH
360 FINISHED
316 TO ROUGH EDGE
41 TO ROUGH EDGE
R18 - 5mm
12 typ
12 typ
220
220
Final Footprint size
edge wall t=3
72
78
72
78
BOSS LOCATIONS X3
Ø9 typ
Rc ~ 1525
Finished Edge
Shown for Reference
SECTION A-A
1 All dimensions in millimeters
2 Cell size ~ 50 x 53
3 Melt: Schott Borofloat
4 Blank edges are as fused, no edging
5 Mass ~ 15 Kg. ~ 37 % Density
FOR QUOTATION ONLY!!!!
DO NOT BUILD!!!
Side view of Blank before slumping
Shows depth locations of Mounting Bosses
41
290
11
65
11
33
34
43
8
30
19
Ø 9mm Rough Hole
TYP in Mounting Bosses
Ø 19mm Rough Hole
TYP in Rear Plate
Behind Mounting Bosses
THE OHIO STATE UNIVERSITY
DEPT OF ASTRONOMY
NAME
MODS SPECTROGRAPH
CAM PRIMARY BLANK
MATERIAL
SEE NOTES
FINISH
SEE NOTES
GENERAL TOLERANCES
DECIMALS ANGULAR
XX +/- .01 +/- 0° 30'
XXX +/- .005
DESIGNED BY PLB DATE 02/01/01
DRAWN BY TPD DATE 02/01/01
APPROVED BY XXX DATE XX/XX/XX
DWG NO. CAMERA_PRIMARY_BLANK_R1
SCALE: NONE


1 CODEV Version 7 "GLOBAL" Data
2 All dimensions in millimeters
3 Matl: CAMERA_PRIMARY_BLANK_R1
Hextek Schott Borofloat blank
4 Bevel all edges ~ 3mm
5 Surface Figure Tested @ 0.63 microns
SCALE(mm) RMS Error
<10 λ/20
10-25 λ/20
25-50 λ/8
50-100 λ/3
100- >230 λ/2
6 Surface Quality: 40-20 Scratch & Dig
8 Front Surface Coating T.B.D.
7 Mass ~ 17.5 Kg
SECTION A-A
Spherical Front Surface
Radius of curvature =1525±0.5%
372 ROUGH
360 FINISHED
316 TO FINISHED EDGE
316 TO ROUGH EDGE
632 ROUGH
620 FINISHED
230
220
41 TO ROUGH EDGE
75 TYP
75 TYP
6 TYP CLEANUP ALLOWANCE
BOSS LOCATIONS x3
3mm CHAMFER TYP
Surface Normal
SECTION B-B
Ø 20mm BORE THROUGH INTERNAL WEB
PARALLEL TO SURFACE NORMAL
TYP 3 PLACES
Ø 32mm BORE THROUGH BACKPLATE
PARALLEL TO SURFACE NORMAL
TYP 3 PLACES
33 ref
290
35
52 ref
FOR QUOTATION ONLY!!!!
DO NOT BUILD!!!
THE OHIO STATE UNIVERSITY
DEPT OF ASTRONOMY
NAME
MODS SPECTROGRAPH
CAMERA PRIMARY
MATERIAL
SEE NOTES
FINISH
SEE NOTES
GENERAL TOLERANCES
DECIMALS
ANGULAR
DESIGNED BY PLB
DRAWN BY TPU
APPROVED BY KOOI
DWG NO.
CAMERA_PRIMARY_R1
SCALE NONE


S1
S2
FLAT
260.8 CX
± 0.5 %
250 mm
±0.25
± 1 arcmin
S2
S1
116
175
7 TYP
4.53 REF
DIAMETER OF BLANK
FOR QUOTATION ONLY!!!!
DO NOT BUILD!!!
1 CODEV Version 7 "Globel" Data
2 All dimensions in millimeters
3 Material: Schott BK7 Class H4, B0 or better
4 Bevel all edges ~ 0.5mm
5 Surface Figure Tested @ 0.63 microns
Both Surfaces, S1 & S2
SCALE(mm) RMS Error
<10 λ/10
10-25 λ/4
25-50 λ/4
50-100 λ/2
100- >230 λ/2
6 Surface Quality: 40-20 Scratch & Dig
7 Surface Caotings: T B.D.
8 Mass ~ 0.90 Kg
T. H. E. OHIO STATE UNIVERSITY
DEPT OF ASTRONOMY
NAME
MODS RED CAMERA FIELD FLATTENER
MATERIAL
SEE NOTES
FINISH
SEE NOTES
RED_FLATTENER_R1
SCALE: NONE


RADIUS TOL
S1 244.3 CX ± 0.5 %
S2 FLAT
TOL THICKNESS TOL WEDGE
25.0 mm ±0.25 ± 1 arcmin
S1
S2
116
175
7 TYP
Ø205
3.02REF
DIAMETER OF BLANK
FOR QUOTATION ONLY!!!!
DO NOT BUILD!!!
1 CODEV Version 7 "Global" Data
2 All dimensions in millimeters
3 Material: UV Grade Fused Silica
HPFS Corning #7980 Grade 0C
4 Bevel all edges ~ 0.5mm
5 Surface Figure Tested @ 0.63 microns
Both Surfaces, S1 & S2
SCALE(mm) RMS Error
<10 λ/10
10-25 λ/4
25-50 λ/4
50-100 λ/2
100- >230 λ/2
6 Surface Quality: 40-20 Scratch & Dig
7 Surface Caotings: T.B.D.
8 Mass ~ 0.80 Kg
THE OHIO STATE UNIVERSITY
DEPT OF ASTRONOMY
NAME
MODS BLUE CAMERA
FIELD FLATTENER
MATERIAL
SEE NOTES
FINISH
SEE NOTES
GENERAL TOLERANCES
DECIMALS
.XX +/- .010
.XXX +/- .003
ANGULAR
+/- 0° 30'
DRAWN BY PLB DATE 02/08/01
APPROVED BY XXX DATE XX/XX/XXX
DWG NO
BLUE_FLATTENER_R1
SCALE: NONE