

MODS Optical Design Prescription

2001 May 13

This document gives the complete optical description for the red and blue channel optics for MODS. The descriptions are in the form of Code-V "sequence" (.seq) files. These data files are available online at <http://www.astronomy.ohio-state.edu/LBT/MODS/Optics/>

MODS Red Channel Optical Prescription

```
!file name: mods_red_v7glb.seq
!revised 11/14/00
!revised 01/10/01 changed rear radius of field lens to move stop image between
grating
!and corrector. There is no penalty in the error function and the footprint on
the camera
!mirror now agrees with the older values.
```

!

MODS RED SPECTROGRAPH

!

!

!BK7 Camera with filter in place. The error function of this camera is 119 for
a 4 arc

!minute slit height with the slit in the center of the field.

!

! All surfaces up to and including the grating are specified in global
coordinates with

! respect to the vertex of the telescope focal surface.

RDM;LEN "VERSION: 8.50 LENS VERSION: 50 Creation Date: 16-
Oct-2000"

TITLE 'MODS_red_v7glb'

EPD 8408.0

DIM M

WL 1022.22179954 893.167368547 764.112937554 636.504491195 508.896044836

REF 3

WTW 0 0 80 0 0

INI 'PLB'

! The field angles and vignetting factors are for a centered 4 arc-min high
slit

XAN -0.0333333333333333 -0.01666666666667 0.0 0.01666666666667 0.033333333333333

YAN 0.0 0.0 0.0 0.0 0.0

WTF 1.0 1.0 1.0 1.0 1.0

!These are the vignetting factors for the secondary diameter above

VUY	0.01513	0.01515	0.01515	0.01515	0.01513
-----	---------	---------	---------	---------	---------

VLY	0.01513	0.01515	0.01515	0.01515	0.01513
-----	---------	---------	---------	---------	---------

VUX	0.01618	0.01568	0.01515	0.01459	0.01400
-----	---------	---------	---------	---------	---------

VLX	0.01400	0.01459	0.01515	0.01568	0.01618
-----	---------	---------	---------	---------	---------

!

SO 0.0 0.1e21

S 0.0 10663.69

!position of secondary

S -19200.004 -10663.69 REFL

!telescope primary

CON

K -1.0

MODS Optical Prescription

```
CIR OBS 444.5
CUM 0.0; THM 750.0
S 1974.2416 10663.69 REFL !telescope secondary
STO
CON
K -0.7328021
CUM 0.0; THM 300.0
S -19200.0 3049.33 !surface of primary
S 1014.0 0.0 !telescope focal surface
S 500.0 6.0 SILICA_SPECIAL !front surface of field lens
GLB G5
XDE 0.0; YDE 0.0; ZDE 65
ADE 0.0; BDE 0.0; CDE 0.0
S 521.0 269.0 !rear surface of field lens
S 0.0 0.0 REFL !front surface of dichroic
GLB G5
XDE 0.0; YDE 0.0; ZDE 275
ADE 0.0; BDE 35.0; CDE 0.0
CUM 0.0; THM 25.0
S 0.0 -310.0 !dummy surface to realign chief ray
ADE 0.0; BDE 35.0; CDE 0.0
S 0.0 0.0 REFL !fold mirror
GLB G5
XDE 291.3047; YDE 0.0; ZDE 168.9738
ADE 0.0; BDE 32; CDE 0.0
CUM 0.0; THM 30.0
S 0.0 0.0 !dummy surface to realign chief ray
ADE 0.0; BDE -38.0; CDE 0.0
S 0.0 2870.644615 !dummy surface to locate vertex of
collimator
ADE -6.855431; BDE 0.0; CDE 0.0
S -6900.0 0.0 REFL !collimator mirror
GLB G5
XDE 589.2235; YDE -342.6532; ZDE 3003.4814
ADE -5.7312; BDE -5.9702; CDE -0.5981
CON
K -1.0
! ADE 1.15543; BDE 0.0; CDE 0.0
REX EDG 206.0; REY EDG 206.0
ADY EDG 314.0
CUM 0.0; THM 100.0
S 0.0 -3600.0 !dummy surface to align chief ray
XDE 0.0; YDE 343.502466; ZDE -8.55028528369
S 0.0 0.0 REFL !location of grating (global
coordinates)
GRT
K 0.0; IC Yes
A 0.0; B 0.0; C 0.0; D 0.0
GRO -1; GRS 0.0030303030303
GRX 0.0; GRY 1.0; GRZ 0.0
GLB G5
XDE 217.45843; YDE 357.55118; ZDE -533.62667
ADE 16.8872882382; BDE -5.74303787383; CDE 1.74001099192
REX EDG 153.0; REY EDG 204.0
CUM 0.0; THM 30.0
S 0.0 0.0
```

MODS Optical Prescription

GLB G5 !dummy surface at front of camera
lens (global)
XDE 286.05109; YDE 653.84151; ZDE 118.9889 !global position w.r.t.
slit center
ADE 24.4183; BDE -5.4667; CDE 2.4766

!

MODS RED CAMERA SECTION SEQUENTIAL FILE

! The first surface of each refractive surface is located globally with
respect to the surface preceding the camera
! section (S16 above for the red camera)

!
S 1235.946 40.0 BK7_SCHOTT !front of corrector lens
XDE 220.0; YDE 0.0; ZDE 0.0
S 1283.338 1032.524 !rear (aspheric surface of
corrector lens)

ASP

K 0.0

IC Yes; CUF 0.0

A 0.153297630669e-9; B 0.760658037634e-16; C 0.150995730012e-21; D &
-0.658170470821e-28

S -1525.0 -684.969 REFL !camera mirror

GLB G16

XDE 3.541; YDE 0.0; ZDE 1057.093

ADE 0.0; BDE 8.159; CDE 0.0

THM 80

!

S 0.0 -6.0 BK7_SCHOTT !filter front

GLB G16

XDE 220; YDE 0.0; ZDE 387.555

!

S 0.0 -2.0 !filter rear

S -260.778 -25.0 BK7_SCHOTT !field flattener front

GLB G16

XDE 220; YDE 0.0; ZDE 379.555

!

S 0.0 -37.275 !field flattener rear

S 0.0 0.0 !focal surface

GLB G16

XDE 220; YDE 0.0; ZDE 317.28

SI

ZOO 5

ZOO WTW W1 0 80 0 0 0

ZOO WTW W2 0 0 80 0 0

ZOO WTW W3 80 0 0 0 0

ZOO WTW W4 0 0 0 80 0

ZOO WTW W5 0 0 0 0 80

ZOO REF 3 1 2 4 5

GO

MODS Optical Prescription

MODS Blue Channel Optical Prescription

```
!file: mods_blue_v7glb
!revised 11/14/00
!revised 1/31/00 position of field lens corrected to agree with red channel
RDM;LEN      "VERSION: 8.50      LENS VERSION: 50      Creation Date: 27-
Oct-2000"
TITLE 'MODS bluechannel'
!
!-----
!
!                      MODS BLUE SPECTROGRAPH
!-----
!
!Fused Silica Camera with filter in place. and dichroic substrate in place.
Error
!function is dependent on whether dichroic is in or out.
EPD  8408.0 !diameter of primary mirror NB used diameter is less
DIM  M
WL   642.758576347 565.799121337 488.839666327 412.679255855 336.518845383
REF  3
WTW  0 0 80 0 0
INI  'PLB'
XAN  -0.033333333333333333 -0.01666666666667 0.0 0.01666666666667 0.033333333333333333
!Field values for a 4 arc-min slit
YAN  0.0 0.0 0.0 0.0 0.0
WTF  1.0 1.0 1.0 1.0 1.0
!These are the vignetting factors for the secondary diameter of 457 mm
calculated
!for a 4 arc-min slit height.
VUY      0.01513      0.01515      0.01515      0.01515      0.01513
VLY      0.01513      0.01515      0.01515      0.01515      0.01513
VUX      0.01618      0.01568      0.01515      0.01459      0.01400
VLX      0.01400      0.01459      0.01515      0.01568      0.01618
!
SO  0.0 0.1e21
S  0.0 10663.69
S  -19200.004 -10663.69 REFL      !Telescope Primary
CON
K  -1.0
CIR OBS 444.5
CUM 0.0; THM 750.0
S  1974.2416 10663.69 REFL      !Telescope secondary
STO
CON
K  -0.7328021
CIR EDG 457.1      !size of secondary for f/15 @
focus
CUM 0.0; THM 300.0
S  -19200.0 3049.33
S  1014.0 0.0      !focal surface
S  500.0 6.0 SILICA_SPECIAL
GLB G5      !location for front of field
lens
XDE 0.0; YDE 0.0; ZDE 65.0
ADE 0.0; BDE 0.0; CDE 0.0
S  521.00 269.0      !rear of field lens
```

MODS Optical Prescription

```
S      0.0 25.0 SILICA_SPECIAL          !dichroic substrate
      GLB G5
      XDE 0.0; YDE 0.0; ZDE 275.0
      ADE 0.0; BDE 35.0; CDE 0.0
S      0.0 0.0                          !rear surface of dichroic
S     -6900.0 0.0 REFL                  !collimator
      GLB G5
      XDE 0.0; YDE 342.6532; ZDE 3445.77    !Value of zde with dichroic
      ADE 5.70; BDE 0.0; CDE 0.0
      CON
      K   -1.0
      CUM 0.0; THM 100.0
S      0.0 0.0 REFL                    !grating
      GRT
      K   0.0; IC Yes
      A   0.0; B 0.0; C 0.0; D 0.0
      GRO 1; GRS 0.0018181818181818
      GRX 0.0; GRY 1.0; GRZ 0.0
      GLB G5
      XDE 0.0; YDE -357.5510; ZDE -123.3558
      ADE -17.3; BDE 0.0; CDE 0.0
      CUM 0.0; THM 30.0
S      0.0 0.0                          !dummy surface locating camera
(S10)
      GLB G5
      XDE 0.0; YDE -653.8413; ZDE 532.8646    !global position w.r.t. slit
center
      ADE -24.299999; BDE 0.0; CDE 0.0
```

```
!
!
```

MODS BLUE CAMERA SECTION SEQUENTIAL FILE

```
!
!
! The first surface of each refractive surface is located globally with
respect to the surface preceding the camera
! section (S12 above for the blue camera)
!
```

```
S      2105.27833 40.0 SILICA_SPECIAL    !front of corrector lens
      GLB G12
      XDE 220.0; YDE 0.0; ZDE 0.0
!
S      2406.55412 1147.0876             !rear of corrector lens
(aspheric surface)
      ASP
      k   0.0
      A 0.156138556515e-9; B 0.258524237673e-16; C 0.388025729601e-21; D&
      -0.739378606444e-27
!
S     -1525.0 -691.750992 REFL          !camera mirror
      GLB G12
      XDE 6.454; YDE 0.0; ZDE 1172.0825
      ADE 0.0; BDE 8.04; CDE 0.0
      THM 80
!
```

MODS Optical Prescription

```
S      0.0 -6.0 SILICA_SPECIAL          !filter front
      GLB G12
      XDE 220; YDE 0.0; ZDE 495.3366
!
S      0.0 -2                          !filter rear
!
S      -244.34593 -25.0 SILICA_SPECIAL  !field flattener front
      GLB G12
      XDE 220; YDE 0.0; ZDE 487.3366
!
S      0.0 -26.8672044                !field flattener rear
S      0.0 0.0                          !focal surface
      GLB G12
      XDE 220; YDE 0.0; ZDE 435.469
!
SI     0.0 0.0
ZOO    5
ZOO    WTW W1 0 80 0 0 0
ZOO    WTW W2 0 0 80 0 0
ZOO    WTW W3 80 0 0 0 0
ZOO    WTW W4 0 0 0 80 0
ZOO    WTW W5 0 0 0 0 80
ZOO    REF 3 1 2 4 5
GO
```