System/Prescription Data

File : C:\tbida\zemax\zemax\dct\rc\D10\RC_ADC_D11_LMI_ghost.ZMX
Title: F/6.1 R-C Corrected
Date : THU SEP 9 2010

LENS NOTES:

Notes...

GENERAL LENS DATA:

```
Surfaces               :              32
Stop                   :               4
System Aperture        : Entrance Pupil Diameter = 4200
Glass Catalogs         : SCHOTT INFRARED
Ray Aiming             : Off
Apodization            : Uniform, factor =   0.00000E+000
Temperature (C)        :    2.00000E+001
Pressure (ATM)         :    1.00000E+000
 Adjust Index Data To Environment  : Off
Effective Focal Length  :        25489.48 (in air at system temperature and pressure)
Effective Focal Length  :        25489.48 (in image space)
Back Focal Length       :        10.60577
Total Track             :        7845.814
Image Space F/#         :        6.068924
Paraxial Working F/#    :        6.068924
Working F/#             :        6.068986
Image Space NA          :      0.08210873
Object Space NA         :   2.099999e-007
Stop Radius             :            2100
Paraxial Image Height   :               0
Paraxial Magnification  :               0
Entrance Pupil Diameter :            4200
Entrance Pupil Position :            5700
Exit Pupil Diameter     :        502.9123
Exit Pupil Position     :       -3052.177
Field Type              : Angle in degrees
Maximum Radial Field    :               0
Primary Wavelength      :             0.5 µm
Lens Units              :   Millimeters
Angular Magnification   :               0

Fields          : 1
Field Type: Angle in degrees
#        X-Value        Y-Value         Weight
 1       0.000000       0.000000       1.000000

Vignetting Factors
#       VDX       VDY       VCX       VCY       VAN
1  0.000000  0.000000  0.000000  0.000000  0.000000

Wavelengths     : 5
Units: µm
#          Value         Weight
 1       0.500000       1.000000
 2       0.570000       1.000000
 3       0.650000       1.000000
 4       0.720000       1.000000
 5       0.800000       1.000000
```

SURFACE DATA SUMMARY:

| Surf | Type | Radius | Thickness | Glass | Diameter | Conic | Comment |
|---|---|---|---|---|---|---|---|
| OBJ | STANDARD | Infinity | Infinity | | 0 | 0 | |
| 1 | ATMOSPHR | Infinity | 0 | | 4200 | 0 | |
| 2 | STANDARD | Infinity | 0 | | 1400 | 0 | |
| 3 | STANDARD | Infinity | 5700 | | 0 | 0 | |

| | | | | | | | |
|---|---|---|---|---|---|---|---|
| STO | STANDARD | Infinity | 137.7 | | 0 | 0 | Aperture sto |
| 5 | STANDARD | -15994.7 | -5617.497 | MIRROR | 4201 | -1.082674 | Primary |
| 6 | STANDARD | -6926.407 | 5617.497 | MIRROR | 1310 | -4.500899 | Secondary |
| 7 | STANDARD | Infinity | 400 | | 0 | 0 | Primary hole |
| 8 | TILTSURF | - | 20 | F_SILICA | 470 | - | ADC 1A |
| 9 | TILTSURF | - | 20 | LLF6 | 470 | - | ADC 1B |
| 10 | STANDARD | Infinity | 10 | | 470 | 0 | |
| 11 | STANDARD | 64329.84 | 20 | F_SILICA | 470 | 0 | ADC 2A |
| 12 | TILTSURF | - | 20 | LLF6 | 470 | - | ADC 2B |
| 13 | TILTSURF | - | 610 | | 470 | - | |
| 14 | STANDARD | Infinity | 183.058 | | 150.0608 | 0 | Mounting fla |
| 15 | STANDARD | Infinity | 179.44 | | 119.5519 | 0 | Upper bulkhe |
| 16 | STANDARD | Infinity | 130 | | 180 | 0 | Fold Mirror |
| 17 | STANDARD | -3658.611 | 25 | F_SILICA | 350 | 0 | Element 1 |
| 18 | STANDARD | -1509.664 | 204.81 | | 350 | 0 | |
| 19 | STANDARD | -699.84 | 15 | F_SILICA | 310 | 0 | Element 2 |
| 20 | STANDARD | -2007.457 | 30.24 | | 310 | 0 | |
| 21 | STANDARD | Infinity | 29.02 | | 22.14556 | 0 | Guider axis |
| 22 | STANDARD | Infinity | 22.5 | | 17.34862 | 0 | Shutter |
| 23 | STANDARD | Infinity | 6.35 | | 13.62942 | 0 | Cube wall |
| 24 | STANDARD | Infinity | 12.38 | | 190.5 | 0 | Filter housi |
| 25 | STANDARD | Infinity | 10 | F_SILICA | 10.5334 | 0 | Filter 1 |
| 26 | STANDARD | Infinity | 7.7 | | 10.5334 | 0 | |
| 27 | STANDARD | Infinity | 10 | | 10.5334 | 0 | Filter 2 |
| 28 | STANDARD | Infinity | 18.97 | | 10.5334 | 0 | |
| 29 | STANDARD | Infinity | 1 | | 3.341113 | 0 | Filter housi |
| 30 | STANDARD | Infinity | 12 | F_SILICA | 3.175815 | 0 | Dewar window |
| 31 | STANDARD | Infinity | 10.64571 | | 3.175815 | 0 | |
| IMA | STANDARD | Infinity | | | 0.05911816 | 0 | CCD231 |

SURFACE DATA DETAIL:

```
Surface OBJ     : STANDARD
Surface   1     : ATMOSPHR
 Zenith (deg)   :                0
 Height (m)     :             2300
 Temperature(k) :              293
 Pressure (mb)  :              780
 Humidity (rel) :              0.2
 Latitude (deg) :               35
Surface   2     : STANDARD
 Aperture       : Circular Obscuration
 Minimum Radius :            0
 Maximum Radius :          700
Surface   3     : STANDARD
Surface STO     : STANDARD Aperture stop
 Aperture       : Circular Aperture
 Minimum Radius :          500
 Maximum Radius :         2100
Surface   5     : STANDARD Primary
 Mirror Substrate : Curved, Thickness = 8.40200E+001
 Aperture       : Circular Aperture
 Minimum Radius :          500
 Maximum Radius :        2100.5
Surface   6     : STANDARD Secondary
 Mirror Substrate : Curved, Thickness = 2.62000E+001
 Aperture       : Circular Aperture
 Minimum Radius :            0
 Maximum Radius :          655
Surface   7     : STANDARD Primary hole
Surface   8     : TILTSURF ADC 1A
 X Tangent      :     0.0019296299
 Y Tangent      :                0
 Aperture       : Floating Aperture
 Maximum Radius :          235
Surface   9     : TILTSURF ADC 1B
 X Tangent      :     -0.016552752
 Y Tangent      :                0
 Aperture       : Floating Aperture
 Maximum Radius :          235
```

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Surface  10     : STANDARD
 Aperture       : Floating Aperture
 Maximum Radius :           235
Surface  11     : STANDARD ADC 2A
 Aperture       : Floating Aperture
 Maximum Radius :           235
Surface  12     : TILTSURF ADC 2B
 X Tangent      :      0.018515571
 Y Tangent      :                0
 Aperture       : Floating Aperture
 Maximum Radius :           235
Surface  13     : TILTSURF
 X Tangent      :     0.0019230692
 Y Tangent      :                0
 Aperture       : Floating Aperture
 Maximum Radius :           235
Surface  14     : STANDARD Mounting flange
Surface  15     : STANDARD Upper bulkhead
 Aperture       : Circular Aperture
 Minimum Radius :             0
 Maximum Radius :         215.9
Surface  16     : STANDARD Fold Mirror
 Tilt/Decenter  :      Decenter X      Decenter Y          Tilt X          Tilt Y          Tilt Z          C
 Before surface :               0               0              45               0               0 Decenter,
 After surface  :              -0              -0             -45              -0              -0 Tilt, Dece
Surface  17     : STANDARD Element 1
 Aperture       : Circular Aperture
 Minimum Radius :             0
 Maximum Radius :           175
Surface  18     : STANDARD
 Aperture       : Floating Aperture
 Maximum Radius :           175
Surface  19     : STANDARD Element 2
 Aperture       : Circular Aperture
 Minimum Radius :             0
 Maximum Radius :           155
Surface  20     : STANDARD
 Aperture       : Floating Aperture
 Maximum Radius :           155
Surface  21     : STANDARD Guider axis
Surface  22     : STANDARD Shutter
 Aperture       : Rectangular Aperture
 X Half Width   :            75
 Y Half Width   :            75
Surface  23     : STANDARD Cube wall
Surface  24     : STANDARD Filter housing
Surface  25     : STANDARD Filter 1
 Aperture       : Rectangular Aperture
 X Half Width   :        66.675
 Y Half Width   :        66.675
Surface  26     : STANDARD
 Aperture       : Rectangular Aperture, Pickup From Surface 25
 X Half Width   :        66.675
 Y Half Width   :        66.675
Surface  27     : STANDARD Filter 2
 Aperture       : Rectangular Aperture, Pickup From Surface 25
 X Half Width   :        66.675
 Y Half Width   :        66.675
Surface  28     : STANDARD
 Aperture       : Rectangular Aperture, Pickup From Surface 25
 X Half Width   :        66.675
 Y Half Width   :        66.675
Surface  29     : STANDARD Filter housing
Surface  30     : STANDARD Dewar window
 Aperture       : Circular Aperture
 Minimum Radius :             0
 Maximum Radius :          82.5
Surface  31     : STANDARD
Surface IMA     : STANDARD CCD231
 Aperture       : Rectangular Aperture
```

 X Half Width   :          46.2
 Y Half Width   :          46.2

COATING DEFINITIONS:


EDGE THICKNESS DATA:

| Surf | X-Edge | Y-Edge |
|---|---|---|
| 1 | 0.000000 | 0.000000 |
| 2 | 0.000000 | 0.000000 |
| 3 | 5700.000000 | 5700.000000 |
| STO | -0.174692 | -0.174692 |
| 5 | -5510.353856 | -5510.353856 |
| 6 | 5648.228548 | 5648.228548 |
| 7 | 400.453463 | 400.000000 |
| 8 | 15.656640 | 20.000000 |
| 9 | 23.889897 | 20.000000 |
| 10 | 10.429235 | 10.429235 |
| 11 | 23.921925 | 19.570765 |
| 12 | 16.100762 | 20.000000 |
| 13 | 609.548079 | 610.000000 |
| 14 | 183.058000 | 183.058000 |
| 15 | 179.440000 | 179.440000 |
| 16 | 125.812272 | 125.812272 |
| 17 | 19.010438 | 19.010438 |
| 18 | 197.606832 | 197.606832 |
| 19 | 26.387574 | 26.387574 |
| 20 | 36.232884 | 36.232884 |
| 21 | 29.020000 | 29.020000 |
| 22 | 22.500000 | 22.500000 |
| 23 | 6.350000 | 6.350000 |
| 24 | 12.380000 | 12.380000 |
| 25 | 10.000000 | 10.000000 |
| 26 | 7.700000 | 7.700000 |
| 27 | 10.000000 | 10.000000 |
| 28 | 18.970000 | 18.970000 |
| 29 | 1.000000 | 1.000000 |
| 30 | 12.000000 | 12.000000 |
| 31 | 10.645712 | 10.645712 |
| IMA | 0.000000 | 0.000000 |

SOLVE AND VARIABLE DATA:

 Semi Diameter   2      : Fixed
 Semi Diameter   3      : Fixed
 Semi Diameter   4      : Fixed
 Thickness of   5       : Variable
 Semi Diameter   5      : Fixed
 Thickness of   6       : Solve, Pickup from surface 5 scaled by -1, offset by 0
 Semi Diameter   6      : Fixed
 Semi Diameter   7      : Fixed
 Semi Diameter   8      : Fixed
 Semi Diameter   9      : Solve, pickup from surface 8 scaled by 1
 Semi Diameter  10      : Solve, pickup from surface 8 scaled by 1
 Semi Diameter  11      : Solve, pickup from surface 8 scaled by 1
 Semi Diameter  12      : Solve, pickup from surface 8 scaled by 1
 Semi Diameter  13      : Solve, pickup from surface 8 scaled by 1
 Semi Diameter  16      : Fixed
 Semi Diameter  17      : Fixed
 Semi Diameter  18      : Solve, pickup from surface 17 scaled by 1
 Semi Diameter  19      : Fixed
 Semi Diameter  20      : Solve, pickup from surface 19 scaled by 1
 Semi Diameter  24      : Fixed
 Semi Diameter  26      : Solve, pickup from surface 25 scaled by 1
 Semi Diameter  27      : Solve, pickup from surface 25 scaled by 1
 Semi Diameter  28      : Solve, pickup from surface 25 scaled by 1
 Semi Diameter  31      : Solve, pickup from surface 30 scaled by 1

INDEX OF REFRACTION DATA:

System Temperature:   20.0000 Celsius
System Pressure   :    1.0000 Atmospheres
Absolute air index:    1.000274 at wavelength 0.500000 µm
Index data is relative to air at the system temperature and pressure.
Wavelengths are measured in air at the system temperature and pressure.

| Surf | Glass | Temp | Pres | 0.500000 | 0.570000 | 0.650000 | 0.720000 | 0.800000 | |
|---|---|---|---|---|---|---|---|---|---|
| 0 | | 20.00 | 1.00 | 1.00000000 | 1.00000000 | 1.00000000 | 1.00000000 | 1.00000000 | |
| 1 | | 20.00 | 1.00 | 1.00000000 | 1.00000000 | 1.00000000 | 1.00000000 | 1.00000000 | |
| 2 | | 20.00 | 1.00 | 1.00000000 | 1.00000000 | 1.00000000 | 1.00000000 | 1.00000000 | |
| 3 | | 20.00 | 1.00 | 1.00000000 | 1.00000000 | 1.00000000 | 1.00000000 | 1.00000000 | |
| 4 | | 20.00 | 1.00 | 1.00000000 | 1.00000000 | 1.00000000 | 1.00000000 | 1.00000000 | |
| 5 | MIRROR | 20.00 | 1.00 | 1.00000000 | 1.00000000 | 1.00000000 | 1.00000000 | 1.00000000 | |
| 6 | MIRROR | 20.00 | 1.00 | 1.00000000 | 1.00000000 | 1.00000000 | 1.00000000 | 1.00000000 | |
| 7 | | 20.00 | 1.00 | 1.00000000 | 1.00000000 | 1.00000000 | 1.00000000 | 1.00000000 | |
| 8 | F_SILICA | 20.00 | 1.00 | 1.46232649 | 1.45910794 | 1.45653497 | 1.45485100 | 1.45331725 | so |
| 9 | LLF6 | 20.00 | 1.00 | 1.53801292 | 1.53274677 | 1.52870639 | 1.52617131 | 1.52396349 | |
| 10 | | 20.00 | 1.00 | 1.00000000 | 1.00000000 | 1.00000000 | 1.00000000 | 1.00000000 | |
| 11 | F_SILICA | 20.00 | 1.00 | 1.46232649 | 1.45910794 | 1.45653497 | 1.45485100 | 1.45331725 | so |
| 12 | LLF6 | 20.00 | 1.00 | 1.53801292 | 1.53274677 | 1.52870639 | 1.52617131 | 1.52396349 | |
| 13 | | 20.00 | 1.00 | 1.00000000 | 1.00000000 | 1.00000000 | 1.00000000 | 1.00000000 | |
| 14 | | 20.00 | 1.00 | 1.00000000 | 1.00000000 | 1.00000000 | 1.00000000 | 1.00000000 | |
| 15 | | 20.00 | 1.00 | 1.00000000 | 1.00000000 | 1.00000000 | 1.00000000 | 1.00000000 | |
| 16 | | 20.00 | 1.00 | 1.00000000 | 1.00000000 | 1.00000000 | 1.00000000 | 1.00000000 | |
| 17 | F_SILICA | 20.00 | 1.00 | 1.46232649 | 1.45910794 | 1.45653497 | 1.45485100 | 1.45331725 | so |
| 18 | | 20.00 | 1.00 | 1.00000000 | 1.00000000 | 1.00000000 | 1.00000000 | 1.00000000 | |
| 19 | F_SILICA | 20.00 | 1.00 | 1.46232649 | 1.45910794 | 1.45653497 | 1.45485100 | 1.45331725 | so |
| 20 | | 20.00 | 1.00 | 1.00000000 | 1.00000000 | 1.00000000 | 1.00000000 | 1.00000000 | |
| 21 | | 20.00 | 1.00 | 1.00000000 | 1.00000000 | 1.00000000 | 1.00000000 | 1.00000000 | |
| 22 | | 20.00 | 1.00 | 1.00000000 | 1.00000000 | 1.00000000 | 1.00000000 | 1.00000000 | |
| 23 | | 20.00 | 1.00 | 1.00000000 | 1.00000000 | 1.00000000 | 1.00000000 | 1.00000000 | |
| 24 | | 20.00 | 1.00 | 1.00000000 | 1.00000000 | 1.00000000 | 1.00000000 | 1.00000000 | |
| 25 | F_SILICA | 20.00 | 1.00 | 1.46232649 | 1.45910794 | 1.45653497 | 1.45485100 | 1.45331725 | so |
| 26 | | 20.00 | 1.00 | 1.00000000 | 1.00000000 | 1.00000000 | 1.00000000 | 1.00000000 | |
| 27 | | 20.00 | 1.00 | 1.00000000 | 1.00000000 | 1.00000000 | 1.00000000 | 1.00000000 | |
| 28 | | 20.00 | 1.00 | 1.00000000 | 1.00000000 | 1.00000000 | 1.00000000 | 1.00000000 | |
| 29 | | 20.00 | 1.00 | 1.00000000 | 1.00000000 | 1.00000000 | 1.00000000 | 1.00000000 | |
| 30 | F_SILICA | 20.00 | 1.00 | 1.46232649 | 1.45910794 | 1.45653497 | 1.45485100 | 1.45331725 | so |
| 31 | | 20.00 | 1.00 | 1.00000000 | 1.00000000 | 1.00000000 | 1.00000000 | 1.00000000 | |
| 32 | | 20.00 | 1.00 | 1.00000000 | 1.00000000 | 1.00000000 | 1.00000000 | 1.00000000 | |

THERMAL COEFFICIENT OF EXPANSION DATA:

| Surf | Glass | TCE *10E-6 | |
|---|---|---|---|
| 0 | | 0.00000000 | |
| 1 | | 0.00000000 | |
| 2 | | 0.00000000 | |
| 3 | | 0.00000000 | |
| 4 | | 0.00000000 | |
| 5 | MIRROR | 0.00000000 | |
| 6 | MIRROR | 0.00000000 | |
| 7 | | 0.00000000 | |
| 8 | F_SILICA | 0.51000000 | source:  The Infrared & Electro-Optical Systems Handbook V. III |
| 9 | LLF6 | 7.50000000 | |
| 10 | | 0.00000000 | |
| 11 | F_SILICA | 0.51000000 | source:  The Infrared & Electro-Optical Systems Handbook V. III |
| 12 | LLF6 | 7.50000000 | |
| 13 | | 0.00000000 | |
| 14 | | 0.00000000 | |
| 15 | | 0.00000000 | |
| 16 | | 0.00000000 | |
| 17 | F_SILICA | 0.51000000 | source:  The Infrared & Electro-Optical Systems Handbook V. III |
| 18 | | 0.00000000 | |
| 19 | F_SILICA | 0.51000000 | source:  The Infrared & Electro-Optical Systems Handbook V. III |
| 20 | | 0.00000000 | |
| 21 | | 0.00000000 | |
| 22 | | 0.00000000 | |
| 23 | | 0.00000000 | |
| 24 | | 0.00000000 | |

```
  25               F_SILICA     0.51000000 source:  The Infrared & Electro-Optical Systems Handbook V. III
  26                            0.00000000
  27                            0.00000000
  28                            0.00000000
  29                            0.00000000
  30               F_SILICA     0.51000000 source:  The Infrared & Electro-Optical Systems Handbook V. III
  31                            0.00000000
  32                            0.00000000
```

GLOBAL VERTEX COORDINATES, ORIENTATIONS, AND ROTATION/OFFSET MATRICES:

Reference Surface: 5

| Surf | R11 | R12 | R13 | X | |
|---|---|---|---|---|---|
| | R21 | R22 | R23 | Y | |
| | R31 | R32 | R33 | Z | |
| 1 | 1.0000000000 | 0.0000000000 | 0.0000000000 | 0.000000000E+000 | |
| | 0.0000000000 | 1.0000000000 | 0.0000000000 | 0.000000000E+000 | |
| | 0.0000000000 | 0.0000000000 | 1.0000000000 | -5.837700000E+003 | |
| 2 | 1.0000000000 | 0.0000000000 | 0.0000000000 | 0.000000000E+000 | |
| | 0.0000000000 | 1.0000000000 | 0.0000000000 | 0.000000000E+000 | |
| | 0.0000000000 | 0.0000000000 | 1.0000000000 | -5.837700000E+003 | |
| 3 | 1.0000000000 | 0.0000000000 | 0.0000000000 | 0.000000000E+000 | |
| | 0.0000000000 | 1.0000000000 | 0.0000000000 | 0.000000000E+000 | |
| | 0.0000000000 | 0.0000000000 | 1.0000000000 | -5.837700000E+003 | |
| 4 | 1.0000000000 | 0.0000000000 | 0.0000000000 | 0.000000000E+000 | Aperture stop |
| | 0.0000000000 | 1.0000000000 | 0.0000000000 | 0.000000000E+000 | |
| | 0.0000000000 | 0.0000000000 | 1.0000000000 | -1.377000000E+002 | |
| 5 | 1.0000000000 | 0.0000000000 | 0.0000000000 | 0.000000000E+000 | Primary |
| | 0.0000000000 | 1.0000000000 | 0.0000000000 | 0.000000000E+000 | |
| | 0.0000000000 | 0.0000000000 | 1.0000000000 | 0.000000000E+000 | |
| 6 | 1.0000000000 | 0.0000000000 | 0.0000000000 | 0.000000000E+000 | Secondary |
| | 0.0000000000 | 1.0000000000 | 0.0000000000 | 0.000000000E+000 | |
| | 0.0000000000 | 0.0000000000 | 1.0000000000 | -5.617496983E+003 | |
| 7 | 1.0000000000 | 0.0000000000 | 0.0000000000 | 0.000000000E+000 | Primary hole |
| | 0.0000000000 | 1.0000000000 | 0.0000000000 | 0.000000000E+000 | |
| | 0.0000000000 | 0.0000000000 | 1.0000000000 | 0.000000000E+000 | |
| 8 | 1.0000000000 | 0.0000000000 | 0.0000000000 | 0.000000000E+000 | ADC 1A |
| | 0.0000000000 | 1.0000000000 | 0.0000000000 | 0.000000000E+000 | |
| | 0.0000000000 | 0.0000000000 | 1.0000000000 | 4.000000000E+002 | |
| 9 | 1.0000000000 | 0.0000000000 | 0.0000000000 | 0.000000000E+000 | ADC 1B |
| | 0.0000000000 | 1.0000000000 | 0.0000000000 | 0.000000000E+000 | |
| | 0.0000000000 | 0.0000000000 | 1.0000000000 | 4.200000000E+002 | |
| 10 | 1.0000000000 | 0.0000000000 | 0.0000000000 | 0.000000000E+000 | |
| | 0.0000000000 | 1.0000000000 | 0.0000000000 | 0.000000000E+000 | |
| | 0.0000000000 | 0.0000000000 | 1.0000000000 | 4.400000000E+002 | |
| 11 | 1.0000000000 | 0.0000000000 | 0.0000000000 | 0.000000000E+000 | ADC 2A |
| | 0.0000000000 | 1.0000000000 | 0.0000000000 | 0.000000000E+000 | |
| | 0.0000000000 | 0.0000000000 | 1.0000000000 | 4.500000000E+002 | |
| 12 | 1.0000000000 | 0.0000000000 | 0.0000000000 | 0.000000000E+000 | ADC 2B |
| | 0.0000000000 | 1.0000000000 | 0.0000000000 | 0.000000000E+000 | |
| | 0.0000000000 | 0.0000000000 | 1.0000000000 | 4.700000000E+002 | |
| 13 | 1.0000000000 | 0.0000000000 | 0.0000000000 | 0.000000000E+000 | |
| | 0.0000000000 | 1.0000000000 | 0.0000000000 | 0.000000000E+000 | |
| | 0.0000000000 | 0.0000000000 | 1.0000000000 | 4.900000000E+002 | |
| 14 | 1.0000000000 | 0.0000000000 | 0.0000000000 | 0.000000000E+000 | Mounting flange |

```
     0.00000000000   1.00000000000   0.00000000000  0.000000000E+000
     0.00000000000   0.00000000000   1.00000000000  1.100000000E+003

15   1.00000000000   0.00000000000   0.00000000000  0.000000000E+000 Upper bulkhead
     0.00000000000   1.00000000000   0.00000000000  0.000000000E+000
     0.00000000000   0.00000000000   1.00000000000  1.283058000E+003

16   1.00000000000   0.00000000000   0.00000000000  0.000000000E+000 Fold Mirror
     0.00000000000   0.7071067812  -0.7071067812   0.000000000E+000
     0.00000000000   0.7071067812   0.7071067812   1.462498000E+003

17   1.00000000000   0.00000000000   0.00000000000  0.000000000E+000 Element 1
     0.00000000000   1.00000000000   0.00000000000  0.000000000E+000
     0.00000000000   0.00000000000   1.00000000000  1.592498000E+003

18   1.00000000000   0.00000000000   0.00000000000  0.000000000E+000
     0.00000000000   1.00000000000   0.00000000000  0.000000000E+000
     0.00000000000   0.00000000000   1.00000000000  1.617498000E+003

19   1.00000000000   0.00000000000   0.00000000000  0.000000000E+000 Element 2
     0.00000000000   1.00000000000   0.00000000000  0.000000000E+000
     0.00000000000   0.00000000000   1.00000000000  1.822308000E+003

20   1.00000000000   0.00000000000   0.00000000000  0.000000000E+000
     0.00000000000   1.00000000000   0.00000000000  0.000000000E+000
     0.00000000000   0.00000000000   1.00000000000  1.837308000E+003

21   1.00000000000   0.00000000000   0.00000000000  0.000000000E+000 Guider axis
     0.00000000000   1.00000000000   0.00000000000  0.000000000E+000
     0.00000000000   0.00000000000   1.00000000000  1.867548000E+003

22   1.00000000000   0.00000000000   0.00000000000  0.000000000E+000 Shutter
     0.00000000000   1.00000000000   0.00000000000  0.000000000E+000
     0.00000000000   0.00000000000   1.00000000000  1.896568000E+003

23   1.00000000000   0.00000000000   0.00000000000  0.000000000E+000 Cube wall
     0.00000000000   1.00000000000   0.00000000000  0.000000000E+000
     0.00000000000   0.00000000000   1.00000000000  1.919068000E+003

24   1.00000000000   0.00000000000   0.00000000000  0.000000000E+000 Filter housing
     0.00000000000   1.00000000000   0.00000000000  0.000000000E+000
     0.00000000000   0.00000000000   1.00000000000  1.925418000E+003

25   1.00000000000   0.00000000000   0.00000000000  0.000000000E+000 Filter 1
     0.00000000000   1.00000000000   0.00000000000  0.000000000E+000
     0.00000000000   0.00000000000   1.00000000000  1.937798000E+003

26   1.00000000000   0.00000000000   0.00000000000  0.000000000E+000
     0.00000000000   1.00000000000   0.00000000000  0.000000000E+000
     0.00000000000   0.00000000000   1.00000000000  1.947798000E+003

27   1.00000000000   0.00000000000   0.00000000000  0.000000000E+000 Filter 2
     0.00000000000   1.00000000000   0.00000000000  0.000000000E+000
     0.00000000000   0.00000000000   1.00000000000  1.955498000E+003

28   1.00000000000   0.00000000000   0.00000000000  0.000000000E+000
     0.00000000000   1.00000000000   0.00000000000  0.000000000E+000
     0.00000000000   0.00000000000   1.00000000000  1.965498000E+003

29   1.00000000000   0.00000000000   0.00000000000  0.000000000E+000 Filter housing
     0.00000000000   1.00000000000   0.00000000000  0.000000000E+000
     0.00000000000   0.00000000000   1.00000000000  1.984468000E+003

30   1.00000000000   0.00000000000   0.00000000000  0.000000000E+000 Dewar window
     0.00000000000   1.00000000000   0.00000000000  0.000000000E+000
     0.00000000000   0.00000000000   1.00000000000  1.985468000E+003

31   1.00000000000   0.00000000000   0.00000000000  0.000000000E+000
     0.00000000000   1.00000000000   0.00000000000  0.000000000E+000
     0.00000000000   0.00000000000   1.00000000000  1.997468000E+003
```

| | | | | |
|---|---|---|---|---|
| 32 | 1.0000000000 | 0.0000000000 | 0.0000000000 | 0.000000000E+000 CCD231 |
| | 0.0000000000 | 1.0000000000 | 0.0000000000 | 0.000000000E+000 |
| | 0.0000000000 | 0.0000000000 | 1.0000000000 | 2.008113712E+003 |

GLOBAL SURFACE CENTER OF CURVATURE POINTS:

Reference Surface: 5

| Surf | X | Y | Z | |
|---|---|---|---|---|
| 1 | - | - | - | |
| 2 | - | - | - | |
| 3 | - | - | - | |
| 4 | - | - | - | Aperture stop |
| 5 | 0.0000000000 | 0.0000000000 | -15994.7000000000 | Primary |
| 6 | 0.0000000000 | 0.0000000000 | -12543.9039592478 | Secondary |
| 7 | - | - | - | Primary hole |
| 8 | - | - | - | ADC 1A |
| 9 | - | - | - | ADC 1B |
| 10 | - | - | - | |
| 11 | 0.0000000000 | 0.0000000000 | 64779.8365759837 | ADC 2A |
| 12 | - | - | - | ADC 2B |
| 13 | - | - | - | |
| 14 | - | - | - | Mounting flange |
| 15 | - | - | - | Upper bulkhead |
| 16 | - | - | - | Fold Mirror |
| 17 | 0.0000000000 | 0.0000000000 | -2066.1130000000 | Element 1 |
| 18 | 0.0000000000 | 0.0000000000 | 107.8340000000 | |
| 19 | 0.0000000000 | 0.0000000000 | 1122.4680000000 | Element 2 |
| 20 | 0.0000000000 | 0.0000000000 | -170.1490000000 | |
| 21 | - | - | - | Guider axis |
| 22 | - | - | - | Shutter |
| 23 | - | - | - | Cube wall |
| 24 | - | - | - | Filter housing |
| 25 | - | - | - | Filter 1 |
| 26 | - | - | - | |
| 27 | - | - | - | Filter 2 |
| 28 | - | - | - | |
| 29 | - | - | - | Filter housing |
| 30 | - | - | - | Dewar window |
| 31 | - | - | - | |
| 32 | - | - | - | CCD231 |

ELEMENT VOLUME DATA:

For centered elements with plane or spherical circular faces, exact volumes are computed by assuming edges are squared up to the larger of the front and back radial aperture.

For all other elements, approximate volumes are numerically integrated to 0.1% accuracy. Zero volume means the volume cannot be accurately computed.

Single elements that are duplicated in the Lens Data Editor for ray tracing purposes may be listed more than once yielding incorrect total mass estimates.

| | Volume cc | Density g/cc | Mass g |
|---|---|---|---|
| Element surf 8 to 9 | 3470.841375 | 2.200000 | 7635.851026 |
| Element surf 9 to 10 | 3470.841375 | 2.810000 | 9753.064265 |
| Element surf 11 to 12 | 3433.586117 | 2.200000 | 7553.889458 |
| Element surf 12 to 13 | 3470.841375 | 2.810000 | 9753.064265 |
| Element surf 17 to 18 | 2117.663669 | 2.200000 | 4658.860072 |
| Element surf 19 to 20 | 1559.263731 | 2.200000 | 3430.380209 |
| Element surf 25 to 26 | 177.822225 | 2.200000 | 391.208895 |
| Element surf 30 to 31 | 256.589580 | 2.200000 | 564.497076 |
| Total Mass: | | | 43740.815265 |

F/# DATA:

F/# calculations consider vignetting factors and ignore surface apertures.

| | Wavelength: | 0.500000 | | 0.570000 | | 0.650000 | |
|---|---|---|---|---|---|---|---|
| # | Field | Tan | Sag | Tan | Sag | Tan | Sag |
| 1 | 0.0000, 0.0000 deg: | 6.0688 | 6.0691 | 6.0692 | 6.0695 | 6.0695 | 6.0698 |

| | Wavelength: | 0.720000 | | 0.800000 | |
|---|---|---|---|---|---|
| # | Field | Tan | Sag | Tan | Sag |
| 1 | 0.0000, 0.0000 deg: | 6.0697 | 6.0700 | 6.0698 | 6.0701 |

CARDINAL POINTS:

Object space positions are measured with respect to surface 1.
Image space positions are measured with respect to the image surface.
The index in both the object space and image space is considered.

| | Object Space | Image Space |
|---|---|---|
| W = 0.500000 (Primary) | | |
| Focal Length : | -25489.482232 | 25489.482232 |
| Focal Planes : | -207168.245970 | -0.039944 |
| Principal Planes : | -181678.763737 | -25489.522177 |
| Anti-Principal Planes : | -232657.728202 | 25489.442288 |
| Nodal Planes : | -181678.763737 | -25489.522177 |
| Anti-Nodal Planes : | -232657.728202 | 25489.442288 |
| W = 0.570000 | | |
| Focal Length : | -25490.937441 | 25490.937441 |
| Focal Planes : | -206245.108392 | -0.071716 |
| Principal Planes : | -180754.170951 | -25491.009157 |
| Anti-Principal Planes : | -231736.045833 | 25490.865725 |
| Nodal Planes : | -180754.170951 | -25491.009157 |
| Anti-Nodal Planes : | -231736.045833 | 25490.865725 |
| W = 0.650000 | | |
| Focal Length : | -25492.104261 | 25492.104261 |
| Focal Planes : | -205506.238808 | -0.095254 |
| Principal Planes : | -180014.134547 | -25492.199515 |
| Anti-Principal Planes : | -230998.343069 | 25492.009007 |
| Nodal Planes : | -180014.134547 | -25492.199515 |
| Anti-Nodal Planes : | -230998.343069 | 25492.009007 |
| W = 0.720000 | | |
| Focal Length : | -25492.872380 | 25492.872380 |
| Focal Planes : | -205022.242579 | -0.109265 |
| Principal Planes : | -179529.370199 | -25492.981645 |
| Anti-Principal Planes : | -230515.114959 | 25492.763115 |
| Nodal Planes : | -179529.370199 | -25492.981645 |
| Anti-Nodal Planes : | -230515.114959 | 25492.763115 |
| W = 0.800000 | | |
| Focal Length : | -25493.577601 | 25493.577601 |
| Focal Planes : | -204581.153852 | -0.120606 |
| Principal Planes : | -179087.576251 | -25493.698206 |
| Anti-Principal Planes : | -230074.731452 | 25493.456995 |
| Nodal Planes : | -179087.576251 | -25493.698206 |
| Anti-Nodal Planes : | -230074.731452 | 25493.456995 |

PHYSICAL OPTICS PROPAGATION SETTINGS SUMMARY:

OBJ STANDARD
- Use Rays To Propagate To Next Surface : Off
- Recompute Pilot Beam : Off
- Do Not Rescale Beam Size Using Ray Data: Off
- Use Angular Spectrum Propagator : Off
- Output Pilot Radius : Best Fit

1 ATMOSPHR
- Use Rays To Propagate To Next Surface : Off
- Recompute Pilot Beam : Off
- Do Not Rescale Beam Size Using Ray Data: Off
- Use Angular Spectrum Propagator : Off

```
   Output Pilot Radius                   : Best Fit
  2 STANDARD
   Use Rays To Propagate To Next Surface  : Off
   Recompute Pilot Beam                   : Off
   Do Not Rescale Beam Size Using Ray Data: Off
   Use Angular Spectrum Propagator        : Off
   Output Pilot Radius                    : Best Fit
  3 STANDARD
   Use Rays To Propagate To Next Surface  : Off
   Recompute Pilot Beam                   : Off
   Do Not Rescale Beam Size Using Ray Data: Off
   Use Angular Spectrum Propagator        : Off
   Output Pilot Radius                    : Best Fit
STO STANDARD        Aperture stop
   Use Rays To Propagate To Next Surface  : Off
   Recompute Pilot Beam                   : Off
   Do Not Rescale Beam Size Using Ray Data: Off
   Use Angular Spectrum Propagator        : Off
   Output Pilot Radius                    : Best Fit
  5 STANDARD              Primary
   Use Rays To Propagate To Next Surface  : Off
   Recompute Pilot Beam                   : Off
   Do Not Rescale Beam Size Using Ray Data: Off
   Use Angular Spectrum Propagator        : Off
   Output Pilot Radius                    : Best Fit
  6 STANDARD            Secondary
   Use Rays To Propagate To Next Surface  : Off
   Recompute Pilot Beam                   : Off
   Do Not Rescale Beam Size Using Ray Data: Off
   Use Angular Spectrum Propagator        : Off
   Output Pilot Radius                    : Best Fit
  7 STANDARD         Primary hole
   Use Rays To Propagate To Next Surface  : Off
   Recompute Pilot Beam                   : Off
   Do Not Rescale Beam Size Using Ray Data: Off
   Use Angular Spectrum Propagator        : Off
   Output Pilot Radius                    : Best Fit
  8 TILTSURF              ADC 1A
   Use Rays To Propagate To Next Surface  : Off
   Recompute Pilot Beam                   : Off
   Do Not Rescale Beam Size Using Ray Data: Off
   Use Angular Spectrum Propagator        : Off
   Output Pilot Radius                    : Best Fit
  9 TILTSURF              ADC 1B
   Use Rays To Propagate To Next Surface  : Off
   Recompute Pilot Beam                   : Off
   Do Not Rescale Beam Size Using Ray Data: Off
   Use Angular Spectrum Propagator        : Off
   Output Pilot Radius                    : Best Fit
 10 STANDARD
   Use Rays To Propagate To Next Surface  : Off
   Recompute Pilot Beam                   : Off
   Do Not Rescale Beam Size Using Ray Data: Off
   Use Angular Spectrum Propagator        : Off
   Output Pilot Radius                    : Best Fit
 11 STANDARD              ADC 2A
   Use Rays To Propagate To Next Surface  : Off
   Recompute Pilot Beam                   : Off
   Do Not Rescale Beam Size Using Ray Data: Off
   Use Angular Spectrum Propagator        : Off
   Output Pilot Radius                    : Best Fit
 12 TILTSURF              ADC 2B
   Use Rays To Propagate To Next Surface  : Off
   Recompute Pilot Beam                   : Off
   Do Not Rescale Beam Size Using Ray Data: Off
   Use Angular Spectrum Propagator        : Off
   Output Pilot Radius                    : Best Fit
 13 TILTSURF
   Use Rays To Propagate To Next Surface  : Off
   Recompute Pilot Beam                   : Off
```

```
  Do Not Rescale Beam Size Using Ray Data: Off
  Use Angular Spectrum Propagator        : Off
  Output Pilot Radius                    : Best Fit
14 STANDARD      Mounting flange
  Use Rays To Propagate To Next Surface  : Off
  Recompute Pilot Beam                   : Off
  Do Not Rescale Beam Size Using Ray Data: Off
  Use Angular Spectrum Propagator        : Off
  Output Pilot Radius                    : Best Fit
15 STANDARD       Upper bulkhead
  Use Rays To Propagate To Next Surface  : Off
  Recompute Pilot Beam                   : Off
  Do Not Rescale Beam Size Using Ray Data: Off
  Use Angular Spectrum Propagator        : Off
  Output Pilot Radius                    : Best Fit
16 STANDARD          Fold Mirror
  Use Rays To Propagate To Next Surface  : Off
  Recompute Pilot Beam                   : Off
  Do Not Rescale Beam Size Using Ray Data: Off
  Use Angular Spectrum Propagator        : Off
  Output Pilot Radius                    : Best Fit
17 STANDARD            Element 1
  Use Rays To Propagate To Next Surface  : Off
  Recompute Pilot Beam                   : Off
  Do Not Rescale Beam Size Using Ray Data: Off
  Use Angular Spectrum Propagator        : Off
  Output Pilot Radius                    : Best Fit
18 STANDARD
  Use Rays To Propagate To Next Surface  : Off
  Recompute Pilot Beam                   : Off
  Do Not Rescale Beam Size Using Ray Data: Off
  Use Angular Spectrum Propagator        : Off
  Output Pilot Radius                    : Best Fit
19 STANDARD            Element 2
  Use Rays To Propagate To Next Surface  : Off
  Recompute Pilot Beam                   : Off
  Do Not Rescale Beam Size Using Ray Data: Off
  Use Angular Spectrum Propagator        : Off
  Output Pilot Radius                    : Best Fit
20 STANDARD
  Use Rays To Propagate To Next Surface  : Off
  Recompute Pilot Beam                   : Off
  Do Not Rescale Beam Size Using Ray Data: Off
  Use Angular Spectrum Propagator        : Off
  Output Pilot Radius                    : Best Fit
21 STANDARD          Guider axis
  Use Rays To Propagate To Next Surface  : Off
  Recompute Pilot Beam                   : Off
  Do Not Rescale Beam Size Using Ray Data: Off
  Use Angular Spectrum Propagator        : Off
  Output Pilot Radius                    : Best Fit
22 STANDARD              Shutter
  Use Rays To Propagate To Next Surface  : Off
  Recompute Pilot Beam                   : Off
  Do Not Rescale Beam Size Using Ray Data: Off
  Use Angular Spectrum Propagator        : Off
  Output Pilot Radius                    : Best Fit
23 STANDARD            Cube wall
  Use Rays To Propagate To Next Surface  : Off
  Recompute Pilot Beam                   : Off
  Do Not Rescale Beam Size Using Ray Data: Off
  Use Angular Spectrum Propagator        : Off
  Output Pilot Radius                    : Best Fit
24 STANDARD       Filter housing
  Use Rays To Propagate To Next Surface  : Off
  Recompute Pilot Beam                   : Off
  Do Not Rescale Beam Size Using Ray Data: Off
  Use Angular Spectrum Propagator        : Off
  Output Pilot Radius                    : Best Fit
25 STANDARD             Filter 1
```

```
    Use Rays To Propagate To Next Surface  : Off
    Recompute Pilot Beam                   : Off
    Do Not Rescale Beam Size Using Ray Data: Off
    Use Angular Spectrum Propagator        : Off
    Output Pilot Radius                    : Best Fit
  26 STANDARD
    Use Rays To Propagate To Next Surface  : Off
    Recompute Pilot Beam                   : Off
    Do Not Rescale Beam Size Using Ray Data: Off
    Use Angular Spectrum Propagator        : Off
    Output Pilot Radius                    : Best Fit
  27 STANDARD             Filter 2
    Use Rays To Propagate To Next Surface  : Off
    Recompute Pilot Beam                   : Off
    Do Not Rescale Beam Size Using Ray Data: Off
    Use Angular Spectrum Propagator        : Off
    Output Pilot Radius                    : Best Fit
  28 STANDARD
    Use Rays To Propagate To Next Surface  : Off
    Recompute Pilot Beam                   : Off
    Do Not Rescale Beam Size Using Ray Data: Off
    Use Angular Spectrum Propagator        : Off
    Output Pilot Radius                    : Best Fit
  29 STANDARD       Filter housing
    Use Rays To Propagate To Next Surface  : Off
    Recompute Pilot Beam                   : Off
    Do Not Rescale Beam Size Using Ray Data: Off
    Use Angular Spectrum Propagator        : Off
    Output Pilot Radius                    : Best Fit
  30 STANDARD         Dewar window
    Use Rays To Propagate To Next Surface  : Off
    Recompute Pilot Beam                   : Off
    Do Not Rescale Beam Size Using Ray Data: Off
    Use Angular Spectrum Propagator        : Off
    Output Pilot Radius                    : Best Fit
  31 STANDARD
    Use Rays To Propagate To Next Surface  : Off
    Recompute Pilot Beam                   : Off
    Do Not Rescale Beam Size Using Ray Data: Off
    Use Angular Spectrum Propagator        : Off
    Output Pilot Radius                    : Best Fit
 IMA STANDARD               CCD231
    Use Rays To Propagate To Next Surface  : Off
    Recompute Pilot Beam                   : Off
    Do Not Rescale Beam Size Using Ray Data: Off
    Use Angular Spectrum Propagator        : Off
    Output Pilot Radius                    : Best Fit

FILES USED:

ZEMAX File
  C:\TBIDA\ZEMAX\ZEMAX\DCT\RC\D10\RC_ADC_D11_LMI_GHOST.ZMX
Session File
  C:\TBIDA\ZEMAX\ZEMAX\DCT\RC\D10\RC_ADC_D11_LMI_GHOST.SES
Glass Catalogs
  C:\PROGRAM FILES\ZEMAX\GLASSCAT\SCHOTT.AGF
  C:\PROGRAM FILES\ZEMAX\GLASSCAT\INFRARED.AGF
Coating Data
  C:\PROGRAM FILES\ZEMAX\COATINGS\COATING.DAT
```