System/Prescription Data

File : C:\tbida\zemax\dct\rc\DCT GamaGrating_1a_0.4-0.7.ZMX
Title: T Collimator GamaGrating_opt4_1a_Draw
Date : THU SEP 10 2009
Configuration 4 of 4

GENERAL LENS DATA:

Surfaces : 75
Stop : 1
System Aperture : Float By Stop Size = 2100
Glass Catalogs : HIKARI INFRARED MISC SCHOTT
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 : -17644.09 (in air at system temperature and pressure)
Effective Focal Length : -17644.09 (in image space)
Back Focal Length : 15.33013
Total Track : 7626.663
Image Space F/# : 4.200975
Paraxial Working F/# : 4.200975
Working F/# : 3.771582
Image Space NA : 0.1181858
Object Space NA : 2.1e-007
Stop Radius : 2100
Paraxial Image Height : 0.6158951
Paraxial Magnification : 0
Entrance Pupil Diameter : 4200
Entrance Pupil Position : 0
Exit Pupil Diameter : 276.1466
Exit Pupil Position : -1203.612
Field Type : Angle in degrees
Maximum Radial Field : 0.002
Primary Wavelength : 0.69 µm
Lens Units : Millimeters
Angular Magnification : -10.27159

Fields : 2
Field Type: Angle in degrees

| # | X-Value | Y-Value | Weight |
|---|---|---|---|
| 1 | 0.000000 | 0.000000 | 5.000000 |
| 2 | 0.000000 | 0.002000 | 1.000000 |

Vignetting Factors

| # | VDX | VDY | VCX | VCY | VAN |
|---|---|---|---|---|---|
| 1 | 0.000000 | 0.000000 | 0.000000 | 0.000000 | 0.000000 |
| 2 | 0.000000 | 0.000000 | 0.000000 | 0.000000 | 0.000000 |

Wavelengths : 5
Units: µm

| # | Value | Weight |
|---|---|---|
| 1 | 0.690000 | 1.000000 |
| 2 | 0.693100 | 1.000000 |
| 3 | 0.695900 | 1.000000 |
| 4 | 0.698400 | 1.000000 |
| 5 | 0.700500 | 1.000000 |

SURFACE DATA SUMMARY:

| Surf | Type | Radius | Thickness | Glass | Diameter | Conic | Comment |
|---|---|---|---|---|---|---|---|
| OBJ | STANDARD | Infinity | Infinity | | 0 | 0 | |
| STO | STANDARD | Infinity | 137.8 | | 4200 | 0 | |
| 2 | STANDARD | -16000 | -5620.924 | MIRROR | 4202 | -1.082674 | |
| 3 | STANDARD | -6926.4 | 5620.924 | MIRROR | 1310 | -4.500899 | |
| 4 | STANDARD | Infinity | 1800 | | 327.849 | 0 | |
| 5 | STANDARD | Infinity | 100 | | 200 | 0 | |
| 6 | STANDARD | Infinity | 100 | | 200 | 0 | |
| 7 | STANDARD | Infinity | -231.1647 | | 5.133886 | 0 | |
| 8 | STANDARD | Infinity | -100 | | 36.51614 | 0 | |
| 9 | STANDARD | Infinity | 100 | | 52.98646 | 0 | |
| 10 | STANDARD | 135.2605 | 15 | LF5 | 50 | 0 | |
| 11 | STANDARD | 88.34031 | 5.000047 | | 50 | 0 | |
| 12 | STANDARD | 87.70951 | 25 | CAF2 | 50 | 0 | |
| 13 | STANDARD | 1333.95 | 106.1733 | | 50 | 0 | |
| 14 | STANDARD | Infinity | 0 | | 1.174486 | 0 | slit |
| 15 | STANDARD | Infinity | 10 | | 1.174486 | 0 | |
| 16 | STANDARD | -19.01613 | 5 | SILICA | 10 | 0 | |
| 17 | STANDARD | -25.01534 | 2 | | 10 | 0 | |
| 18 | STANDARD | Infinity | 5 | SILICA | 10 | 0 | filter |
| 19 | STANDARD | Infinity | 20 | | 6.145813 | 0 | |
| 20 | COORDBRK | - | 0 | | - | - | |
| 21 | STANDARD | Infinity | 0 | MIRROR | 15.9189 | 0 | |
| 22 | COORDBRK | - | 0 | | - | - | |
| 23 | COORDBRK | - | 0 | | - | - | |
| 24 | STANDARD | Infinity | -512.5241 | | 41.10021 | 0 | |
| 25 | COORDBRK | - | 0 | | - | - | |
| 26 | EVENASPH | -257.3759 | -70 | N-PK51 | 210 | 0 | |

| | | | | | | | | |
|---|---|---|---|---|---|---|---|---|
| 27 | STANDARD | 249.9684 | -30 | | K7 | 210 | 0 | |
| 28 | STANDARD | 650.5103 | -5 | | | 210 | 0 | |
| 29 | EVENASPH | -453.852 | -45 | | CAF2 | 204 | 0 | |
| 30 | STANDARD | 227.0543 | -20 | | SILICA | 204 | 0 | |
| 31 | STANDARD | -401.7732 | -30 | | F2 | 204 | 0 | |
| 32 | STANDARD | -230.1457 | 0 | | | 204 | 0 | |
| 33 | COORDBRK | - | -165 | | | - | - | |
| 34 | COORDBRK | - | 0 | | | - | - | |
| 35 | COORDBRK | - | 48 | | | - | - | |
| 36 | TILTSURF | - | -96 | | F2 | 220 | - | |
| 37 | TILTSURF | - | 48 | | | 220 | - | |
| 38 | COORDBRK | - | 0 | | | - | - | untrans prism |
| 39 | COORDBRK | - | -48 | | | - | - | |
| 40 | STANDARD | Infinity | 0 | | | 201.0341 | 0 | |
| 41 | COORDBRK | - | 0 | | | - | - | |
| 42 | STANDARD | Infinity | -295 | | | 158.8753 | 0 | |
| 43 | COORDBRK | - | 0 | | | - | - | |
| 44 | STANDARD | Infinity | 0 | | | 114.8993 | 0 | |
| 45 | COORDBRK | - | 0 | | | - | - | |
| 46 | COORDBRK | - | 0 | | | - | - | |
| 47 | COORDBRK | - | 0 | | | - | - | |
| 48 | DGRATING | Infinity | 0 | | MIRROR | 473.8553 | 0 | Echell Grating |
| 49 | COORDBRK | - | 0 | | | - | - | |
| 50 | COORDBRK | - | 0 | | | - | - | |
| 51 | COORDBRK | - | 0 | | | - | - | |
| 52 | STANDARD | Infinity | 0 | | | 146.0326 | 0 | |
| 53 | COORDBRK | - | 0 | | | - | - | |
| 54 | DGRATING | Infinity | 295 | | | 178.5919 | 0 | |
| 55 | COORDBRK | - | 48 | | | - | - | |
| 56 | COORDBRK | - | 0 | | | - | - | |
| 57 | COORDBRK | - | -48 | | | - | - | trans prism |
| 58 | TILTSURF | - | 96 | | F2 | 220 | - | |
| 59 | TILTSURF | - | -48 | | | 220 | - | |
| 60 | COORDBRK | - | 0 | | | - | - | untrans prism |
| 61 | COORDBRK | - | 0 | | | - | - | |
| 62 | COORDBRK | - | 165 | | | - | - | |
| 63 | STANDARD | -230.1457 | 30 | | F2 | 204 | 0 | |
| 64 | STANDARD | -401.7732 | 20 | | SILICA | 204 | 0 | |
| 65 | STANDARD | 227.0543 | 45 | | CAF2 | 204 | 0 | |
| 66 | EVENASPH | -453.852 | 5 | | | 204 | 0 | |
| 67 | STANDARD | 650.5103 | 30 | | K7 | 210 | 0 | |
| 68 | STANDARD | 249.9684 | 70 | | N-PK51 | 210 | 0 | |
| 69 | EVENASPH | -257.3759 | 0 | | | 210 | 0 | |
| 70 | COORDBRK | - | 531.2541 | | | - | - | |
| 71 | COORDBRK | - | 0 | | | - | - | |
| 72 | STANDARD | -482.8509 | 10 | | SILICA | 82.19618 | 0 | |
| 73 | STANDARD | 877.1286 | 15 | | | 80.44679 | 0 | |
| 74 | STANDARD | Infinity | 0 | | | 78.25503 | 0 | |
| IMA | STANDARD | Infinity | | | | 78.25503 | 0 | |

SURFACE DATA DETAIL:

```
Surface OBJ     : STANDARD
Surface STO     : STANDARD
Surface   2     : STANDARD
 Mirror Substrate : Curved, Thickness = 8.40400E+001
 Aperture       : Floating Aperture
 Maximum Radius :          2101
Surface   3     : STANDARD
 Mirror Substrate : Curved, Thickness = 2.62000E+001
 Aperture       : Floating Aperture
 Maximum Radius :           655
Surface   4     : STANDARD
Surface   5     : STANDARD
Surface   6     : STANDARD
Surface   7     : STANDARD
Surface   8     : STANDARD
Surface   9     : STANDARD
Surface  10     : STANDARD
 Aperture       : Floating Aperture
 Maximum Radius :            25
Surface  11     : STANDARD
 Aperture       : Floating Aperture
 Maximum Radius :            25
Surface  12     : STANDARD
 Aperture       : Floating Aperture
 Maximum Radius :            25
Surface  13     : STANDARD
 Aperture       : Floating Aperture
 Maximum Radius :            25
Surface  14     : STANDARD slit
Surface  15     : STANDARD
Surface  16     : STANDARD
 Aperture       : Floating Aperture
 Maximum Radius :             5
Surface  17     : STANDARD
 Aperture       : Floating Aperture
 Maximum Radius :             5
Surface  18     : STANDARD filter
 Aperture       : Floating Aperture
```

```
 Maximum Radius :             5
Surface  19     : STANDARD
Surface  20     : COORDBRK
 Decenter X     :                0
 Decenter Y     :                0
 Tilt About X   :              -45
 Tilt About Y   :                0
 Tilt About Z   :                0
 Order          : Decenter then tilt
Surface  21     : STANDARD
 Mirror Substrate : Curved, Thickness = 3.18378E-001
Surface  22     : COORDBRK
 Decenter X     :                0
 Decenter Y     :                0
 Tilt About X   :              -45
 Tilt About Y   :                0
 Tilt About Z   :                0
 Order          : Decenter then tilt
Surface  23     : COORDBRK
 Decenter X     :                0
 Decenter Y     :              -15
 Tilt About X   :                0
 Tilt About Y   :                0
 Tilt About Z   :                0
 Order          : Decenter then tilt
Surface  24     : STANDARD
Surface  25     : COORDBRK
 Decenter X     :                0
 Decenter Y     :                0
 Tilt About X   :                0
 Tilt About Y   :                0
 Tilt About Z   :                0
 Order          : Decenter then tilt
Surface  26     : EVENASPH
 Coeff on r  2  :                0
 Coeff on r  4  :                0
 Coeff on r  6  :                0
 Coeff on r  8  :                0
 Coeff on r 10  :                0
 Coeff on r 12  :                0
 Coeff on r 14  :                0
 Coeff on r 16  :                0
 Aperture       : Floating Aperture
 Maximum Radius :           105
Surface  27     : STANDARD
 Aperture       : Floating Aperture
 Maximum Radius :           105
Surface  28     : STANDARD
 Aperture       : Floating Aperture
 Maximum Radius :           105
Surface  29     : EVENASPH
 Coeff on r  2  :                0
 Coeff on r  4  :   1.7332224e-008
 Coeff on r  6  :   3.1458957e-013
 Coeff on r  8  :   4.2608936e-018
 Coeff on r 10  :                0
 Coeff on r 12  :                0
 Coeff on r 14  :                0
 Coeff on r 16  :                0
 Aperture       : Floating Aperture
 Maximum Radius :           102
Surface  30     : STANDARD
 Aperture       : Floating Aperture
 Maximum Radius :           102
Surface  31     : STANDARD
 Aperture       : Floating Aperture
 Maximum Radius :           102
Surface  32     : STANDARD
 Aperture       : Floating Aperture
 Maximum Radius :           102
Surface  33     : COORDBRK
 Decenter X     :                0
 Decenter Y     :                0
 Tilt About X   :                0
 Tilt About Y   :                0
 Tilt About Z   :                0
 Order          : Decenter then tilt
Surface  34     : COORDBRK
 Decenter X     :                0
 Decenter Y     :                0
 Tilt About X   :            -18.4
 Tilt About Y   :                0
 Tilt About Z   :                0
 Order          : Decenter then tilt
Surface  35     : COORDBRK
 Decenter X     :                0
 Decenter Y     :              -15
 Tilt About X   :                0
 Tilt About Y   :                0
 Tilt About Z   :                0
```

```
 Order          : Decenter then tilt
Surface  36     : TILTSURF
 X Tangent      :                0
 Y Tangent      :          -0.4663
 Aperture       : Rectangular Aperture
 X Half Width   :           110
 Y Half Width   :           100
 X- Decenter    :              15
 Y- Decenter    :             -15
Surface  37     : TILTSURF
 X Tangent      :                0
 Y Tangent      :           0.4663
 Aperture       : Rectangular Aperture, Pickup From Surface 36
 X Half Width   :           110
 Y Half Width   :           100
 X- Decenter    :              15
 Y- Decenter    :             -15
Surface  38     : COORDBRK untrans prism
 Decenter X     :                0
 Decenter Y     :               15
 Tilt About X   :                0
 Tilt About Y   :                0
 Tilt About Z   :                0
 Order          : Decenter then tilt
Surface  39     : COORDBRK
 Decenter X     :                0
 Decenter Y     :                0
 Tilt About X   :             18.4
 Tilt About Y   :                0
 Tilt About Z   :                0
 Order          : Decenter then tilt
Surface  40     : STANDARD
Surface  41     : COORDBRK
 Decenter X     :                0
 Decenter Y     :                0
 Tilt About X   :       -36.877979
 Tilt About Y   :                0
 Tilt About Z   :                0
 Order          : Decenter then tilt
Surface  42     : STANDARD
Surface  43     : COORDBRK
 Decenter X     :                0
 Decenter Y     :              -30
 Tilt About X   :                0
 Tilt About Y   :                0
 Tilt About Z   :                0
 Order          : Decenter then tilt
Surface  44     : STANDARD
Surface  45     : COORDBRK
 Decenter X     :                0
 Decenter Y     :                0
 Tilt About X   :                0
 Tilt About Y   :                0
 Tilt About Z   :                0
 Order          : Decenter then tilt
Surface  46     : COORDBRK
 Decenter X     :                0
 Decenter Y     :                0
 Tilt About X   :                0
 Tilt About Y   :               76
 Tilt About Z   :                0
 Order          : Decenter then tilt
Surface  47     : COORDBRK
 Decenter X     :                0
 Decenter Y     :                0
 Tilt About X   :                0
 Tilt About Y   :                0
 Tilt About Z   :               90
 Order          : Decenter then tilt
Surface  48     : DGRATING Echell Grating
 Mirror Substrate : Curved, Thickness = 9.47711E+000
 Lines / µm     :           0.0416
 Diffract Order :               67
 Aperture       : Rectangular Aperture
 X Half Width   :           100
 Y Half Width   :           200
 X- Decenter    :             -15
 Y- Decenter    :                0
Surface  49     : COORDBRK
 Decenter X     :                0
 Decenter Y     :                0
 Tilt About X   :                0
 Tilt About Y   :                0
 Tilt About Z   :              -90
 Order          : Decenter then tilt
Surface  50     : COORDBRK
 Decenter X     :                0
 Decenter Y     :                0
 Tilt About X   :                0
 Tilt About Y   :              -76
```

```
 Tilt About Z   :                0
 Order          : Decenter then tilt
Surface  51     : COORDBRK
 Decenter X     :                0
 Decenter Y     :                0
 Tilt About X   :                0
 Tilt About Y   :                0
 Tilt About Z   :                0
 Order          : Decenter then tilt
Surface  52     : STANDARD
Surface  53     : COORDBRK
 Decenter X     :                0
 Decenter Y     :               30
 Tilt About X   :                0
 Tilt About Y   :                0
 Tilt About Z   :                0
 Order          : Decenter then tilt
Surface  54     : DGRATING
 Lines / µm     :                0
 Diffract Order :                1
Surface  55     : COORDBRK
 Decenter X     :                0
 Decenter Y     :                0
 Tilt About X   :        36.877979
 Tilt About Y   :                0
 Tilt About Z   :                0
 Order          : Decenter then tilt
Surface  56     : COORDBRK
 Decenter X     :                0
 Decenter Y     :                0
 Tilt About X   :            -18.4
 Tilt About Y   :                0
 Tilt About Z   :                0
 Order          : Decenter then tilt
Surface  57     : COORDBRK trans prism
 Decenter X     :                0
 Decenter Y     :              -15
 Tilt About X   :                0
 Tilt About Y   :                0
 Tilt About Z   :                0
 Order          : Decenter then tilt
Surface  58     : TILTSURF
 X Tangent      :                0
 Y Tangent      :           0.4663
 Aperture       : Rectangular Aperture, Pickup From Surface 36
 X Half Width   :           110
 Y Half Width   :           100
 X- Decenter    :               15
 Y- Decenter    :              -15
Surface  59     : TILTSURF
 X Tangent      :                0
 Y Tangent      :          -0.4663
 Aperture       : Rectangular Aperture, Pickup From Surface 36
 X Half Width   :           110
 Y Half Width   :           100
 X- Decenter    :               15
 Y- Decenter    :              -15
Surface  60     : COORDBRK untrans prism
 Decenter X     :                0
 Decenter Y     :               15
 Tilt About X   :                0
 Tilt About Y   :                0
 Tilt About Z   :                0
 Order          : Decenter then tilt
Surface  61     : COORDBRK
 Decenter X     :                0
 Decenter Y     :                0
 Tilt About X   :             18.4
 Tilt About Y   :                0
 Tilt About Z   :                0
 Order          : Decenter then tilt
Surface  62     : COORDBRK
 Decenter X     :                0
 Decenter Y     :                0
 Tilt About X   :                0
 Tilt About Y   :                0
 Tilt About Z   :                0
 Order          : Decenter then tilt
Surface  63     : STANDARD
 Aperture       : Floating Aperture
 Maximum Radius :           102
Surface  64     : STANDARD
 Aperture       : Floating Aperture
 Maximum Radius :           102
Surface  65     : STANDARD
 Aperture       : Floating Aperture
 Maximum Radius :           102
Surface  66     : EVENASPH
 Coeff on r  2  :                0
 Coeff on r  4  :   1.7332224e-008
```

```
 Coeff on r  6  :   3.1458957e-013
 Coeff on r  8  :   4.2608936e-018
 Coeff on r 10  :                0
 Coeff on r 12  :                0
 Coeff on r 14  :                0
 Coeff on r 16  :                0
 Aperture       : Floating Aperture
 Maximum Radius :           102
Surface  67     : STANDARD
 Aperture       : Floating Aperture
 Maximum Radius :           105
Surface  68     : STANDARD
 Aperture       : Floating Aperture
 Maximum Radius :           105
Surface  69     : EVENASPH
 Coeff on r  2  :                0
 Coeff on r  4  :                0
 Coeff on r  6  :                0
 Coeff on r  8  :                0
 Coeff on r 10  :                0
 Coeff on r 12  :                0
 Coeff on r 14  :                0
 Coeff on r 16  :                0
 Aperture       : Floating Aperture
 Maximum Radius :           105
Surface  70     : COORDBRK
 Decenter X     :                0
 Decenter Y     :                0
 Tilt About X   :                0
 Tilt About Y   :                0
 Tilt About Z   :                0
 Order          : Decenter then tilt
Surface  71     : COORDBRK
 Decenter X     :                0
 Decenter Y     :              -25
 Tilt About X   :            0.745
 Tilt About Y   :                0
 Tilt About Z   :                0
 Order          : Decenter then tilt
Surface  72     : STANDARD
 Aperture       : Rectangular Aperture
 X Half Width   :            50
 Y Half Width   :            25
Surface  73     : STANDARD
 Aperture       : Rectangular Aperture, Pickup From Surface 72
 X Half Width   :            50
 Y Half Width   :            25
Surface  74     : STANDARD
Surface IMA     : STANDARD
 Aperture       : Rectangular Aperture
 X Half Width   :      31.64502
 Y Half Width   :      31.64502

COATING DEFINITIONS:


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
    Use Parallel Probing Rays              : Off
    Reference Radius                       : Best Fit
 STO 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
    Use Parallel Probing Rays              : Off
    Reference 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
    Use Parallel Probing Rays              : Off
    Reference 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
    Use Parallel Probing Rays              : Off
    Reference Radius                       : Best Fit
   4 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
  Use Parallel Probing Rays              : Off
  Reference Radius                       : Best Fit
 5 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
  Use Parallel Probing Rays              : Off
  Reference Radius                       : Best Fit
 6 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
  Use Parallel Probing Rays              : Off
  Reference Radius                       : Best Fit
 7 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
  Use Parallel Probing Rays              : Off
  Reference Radius                       : Best Fit
 8 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
  Use Parallel Probing Rays              : Off
  Reference Radius                       : Best Fit
 9 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
  Use Parallel Probing Rays              : Off
  Reference 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
  Use Parallel Probing Rays              : Off
  Reference Radius                       : Best Fit
11 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
  Use Parallel Probing Rays              : Off
  Reference Radius                       : Best Fit
12 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
  Use Parallel Probing Rays              : Off
  Reference Radius                       : Best Fit
13 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
  Use Parallel Probing Rays              : Off
  Reference Radius                       : Best Fit
14 STANDARD                slit
  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
  Use Parallel Probing Rays              : Off
  Reference Radius                       : Best Fit
15 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
  Use Parallel Probing Rays              : Off
  Reference Radius                       : Best Fit
16 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
  Use Parallel Probing Rays              : Off
  Reference Radius                       : Best Fit
17 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
  Use Parallel Probing Rays              : Off
  Reference Radius                       : Best Fit
18 STANDARD              filter
  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
  Use Parallel Probing Rays              : Off
  Reference Radius                       : Best Fit
19 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
  Use Parallel Probing Rays              : Off
  Reference Radius                       : Best Fit
20 COORDBRK
  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
  Use Parallel Probing Rays              : Off
  Reference Radius                       : Best Fit
21 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
  Use Parallel Probing Rays              : Off
  Reference Radius                       : Best Fit
22 COORDBRK
  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
  Use Parallel Probing Rays              : Off
  Reference Radius                       : Best Fit
23 COORDBRK
  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
  Use Parallel Probing Rays              : Off
  Reference Radius                       : Best Fit
24 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
  Use Parallel Probing Rays              : Off
  Reference Radius                       : Best Fit
25 COORDBRK
  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
  Use Parallel Probing Rays              : Off
  Reference Radius                       : Best Fit
26 EVENASPH
  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
  Use Parallel Probing Rays              : Off
  Reference Radius                       : Best Fit
27 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
  Use Parallel Probing Rays              : Off
  Reference 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
  Use Parallel Probing Rays              : Off
  Reference Radius                       : Best Fit
29 EVENASPH
  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
  Use Parallel Probing Rays              : Off
  Reference Radius                       : Best Fit
30 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
  Use Parallel Probing Rays              : Off
  Reference 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
  Use Parallel Probing Rays              : Off
  Reference Radius                       : Best Fit
32 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
  Use Parallel Probing Rays              : Off
  Reference Radius                       : Best Fit
33 COORDBRK
  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
  Use Parallel Probing Rays              : Off
  Reference Radius                       : Best Fit
34 COORDBRK
  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
  Use Parallel Probing Rays              : Off
  Reference Radius                       : Best Fit
35 COORDBRK
  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
  Use Parallel Probing Rays              : Off
  Reference Radius                       : Best Fit
36 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
  Use Parallel Probing Rays              : Off
  Reference Radius                       : Best Fit
37 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
  Use Parallel Probing Rays              : Off
  Reference Radius                       : Best Fit
38 COORDBRK        untrans prism
  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
  Use Parallel Probing Rays              : Off
  Reference Radius                       : Best Fit
39 COORDBRK
  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
  Use Parallel Probing Rays              : Off
  Reference Radius                       : Best Fit
40 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
  Use Parallel Probing Rays              : Off
  Reference Radius                       : Best Fit
41 COORDBRK
  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
  Use Parallel Probing Rays              : Off
  Reference Radius                       : Best Fit
42 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
  Use Parallel Probing Rays              : Off
  Reference Radius                       : Best Fit
43 COORDBRK
```

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
Use Parallel Probing Rays : Off
Reference Radius : Best Fit
44 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
Use Parallel Probing Rays : Off
Reference Radius : Best Fit
45 COORDBRK
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
Use Parallel Probing Rays : Off
Reference Radius : Best Fit
46 COORDBRK
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
Use Parallel Probing Rays : Off
Reference Radius : Best Fit
47 COORDBRK
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
Use Parallel Probing Rays : Off
Reference Radius : Best Fit
48 DGRATING Echell Grating
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
Use Parallel Probing Rays : Off
Reference Radius : Best Fit
49 COORDBRK
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
Use Parallel Probing Rays : Off
Reference Radius : Best Fit
50 COORDBRK
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
Use Parallel Probing Rays : Off
Reference Radius : Best Fit
51 COORDBRK
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
Use Parallel Probing Rays : Off
Reference Radius : Best Fit
52 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
Use Parallel Probing Rays : Off
Reference Radius : Best Fit
53 COORDBRK
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
Use Parallel Probing Rays : Off
Reference Radius : Best Fit
54 DGRATING
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
Use Parallel Probing Rays : Off
Reference Radius : Best Fit
55 COORDBRK
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
Use Parallel Probing Rays : Off
Reference Radius : Best Fit

56 COORDBRK
  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
  Use Parallel Probing Rays              : Off
  Reference Radius                       : Best Fit
57 COORDBRK          trans prism
  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
  Use Parallel Probing Rays              : Off
  Reference Radius                       : Best Fit
58 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
  Use Parallel Probing Rays              : Off
  Reference Radius                       : Best Fit
59 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
  Use Parallel Probing Rays              : Off
  Reference Radius                       : Best Fit
60 COORDBRK        untrans prism
  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
  Use Parallel Probing Rays              : Off
  Reference Radius                       : Best Fit
61 COORDBRK
  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
  Use Parallel Probing Rays              : Off
  Reference Radius                       : Best Fit
62 COORDBRK
  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
  Use Parallel Probing Rays              : Off
  Reference Radius                       : Best Fit
63 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
  Use Parallel Probing Rays              : Off
  Reference Radius                       : Best Fit
64 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
  Use Parallel Probing Rays              : Off
  Reference Radius                       : Best Fit
65 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
  Use Parallel Probing Rays              : Off
  Reference Radius                       : Best Fit
66 EVENASPH
  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
  Use Parallel Probing Rays              : Off
  Reference Radius                       : Best Fit
67 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
  Use Parallel Probing Rays              : Off
  Reference Radius                       : Best Fit
68 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
  Use Parallel Probing Rays              : Off

```
    Reference Radius                      : Best Fit
   69 EVENASPH
    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
    Use Parallel Probing Rays              : Off
    Reference Radius                       : Best Fit
   70 COORDBRK
    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
    Use Parallel Probing Rays              : Off
    Reference Radius                       : Best Fit
   71 COORDBRK
    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
    Use Parallel Probing Rays              : Off
    Reference Radius                       : Best Fit
   72 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
    Use Parallel Probing Rays              : Off
    Reference Radius                       : Best Fit
   73 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
    Use Parallel Probing Rays              : Off
    Reference Radius                       : Best Fit
   74 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
    Use Parallel Probing Rays              : Off
    Reference Radius                       : Best Fit
  IMA 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
    Use Parallel Probing Rays              : Off
    Reference Radius                       : Best Fit

EDGE THICKNESS DATA:

Surf          X-Edge          Y-Edge
 STO       -0.094655       -0.094655
   2    -5513.761245    -5513.761245
   3     5651.655900     5651.655900
   4     1800.000000     1800.000000
   5      100.000000      100.000000
   6      100.000000      100.000000
   7     -231.164740     -231.164740
   8     -100.000000     -100.000000
   9      102.330432      102.330432
  10       16.280838       16.280838
  11        5.027139        5.027139
  12       21.595927       21.595927
  13      105.939060      105.939060
  14        0.000000        0.000000
  15        9.330892        9.330892
  16        5.164322        5.164322
  17        2.504786        2.504786
  18        5.000000        5.000000
  19       20.000000       20.000000
  20        0.000000        0.000000
  21        0.000000        0.000000
  22        0.000000        0.000000
  23        0.000000        0.000000
  24     -512.524073     -512.524073
  25      -22.392171      -22.392171
  26      -24.485631      -24.485631
  27      -44.592155      -44.592155
  28      -22.860139      -22.860139
  29      -11.469377      -11.469377
  30      -57.363761      -57.363761
  31      -40.674336      -40.674336
  32       23.837570       23.837570
  33     -165.000000     -165.000000
  34        0.000000        0.000000
  35       48.000000       -3.293000
  36      -96.000000        6.586000
```

| | | |
|---|---|---|
| 37 | 48.000000 | -3.293000 |
| 38 | 0.000000 | 0.000000 |
| 39 | -48.000000 | -48.000000 |
| 40 | 0.000000 | 0.000000 |
| 41 | 0.000000 | 0.000000 |
| 42 | -295.000000 | -295.000000 |
| 43 | 0.000000 | 0.000000 |
| 44 | 0.000000 | 0.000000 |
| 45 | 0.000000 | 0.000000 |
| 46 | 0.000000 | 0.000000 |
| 47 | 0.000000 | 0.000000 |
| 48 | 0.000000 | 0.000000 |
| 49 | 0.000000 | 0.000000 |
| 50 | 0.000000 | 0.000000 |
| 51 | 0.000000 | 0.000000 |
| 52 | 0.000000 | 0.000000 |
| 53 | 0.000000 | 0.000000 |
| 54 | 295.000000 | 295.000000 |
| 55 | 48.000000 | 48.000000 |
| 56 | 0.000000 | 0.000000 |
| 57 | -48.000000 | 3.293000 |
| 58 | 96.000000 | -6.586000 |
| 59 | -48.000000 | 3.293000 |
| 60 | 0.000000 | 0.000000 |
| 61 | 0.000000 | 0.000000 |
| 62 | 141.162430 | 141.162430 |
| 63 | 40.674336 | 40.674336 |
| 64 | 57.363761 | 57.363761 |
| 65 | 11.469377 | 11.469377 |
| 66 | 22.860139 | 22.860139 |
| 67 | 44.592155 | 44.592155 |
| 68 | 24.485631 | 24.485631 |
| 69 | 22.392171 | 22.392171 |
| 70 | 531.254131 | 531.254131 |
| 71 | -1.752221 | -1.752221 |
| 72 | 12.674989 | 12.674989 |
| 73 | 14.077232 | 14.077232 |
| 74 | 0.000000 | 0.000000 |
| IMA | 0.000000 | 0.000000 |

MULTI-CONFIGURATION DATA:

Configuration 1:

| | | |
|---|---|---|
| 1 Wavelength | 1 : | 0.4 |
| 2 Wavelength | 2 : | 0.401 |
| 3 Wavelength | 3 : | 0.4019 |
| 4 Wavelength | 4 : | 0.4035 |
| 5 Wavelength | 5 : | 0.405 |
| 6 Param 2 | 48 : | 116 |

Configuration 2:

| | | |
|---|---|---|
| 1 Wavelength | 1 : | 0.4533 |
| 2 Wavelength | 2 : | 0.4553 |
| 3 Wavelength | 3 : | 0.4571 |
| 4 Wavelength | 4 : | 0.4587 |
| 5 Wavelength | 5 : | 0.4601 |
| 6 Param 2 | 48 : | 102 |

Configuration 3:

| | | |
|---|---|---|
| 1 Wavelength | 1 : | 0.5295 |
| 2 Wavelength | 2 : | 0.5319 |
| 3 Wavelength | 3 : | 0.534 |
| 4 Wavelength | 4 : | 0.5369 |
| 5 Wavelength | 5 : | 0.5375 |
| 6 Param 2 | 48 : | 87.31 |

Configuration 4:

| | | |
|---|---|---|
| 1 Wavelength | 1 : | 0.69 |
| 2 Wavelength | 2 : | 0.6931 |
| 3 Wavelength | 3 : | 0.6959 |
| 4 Wavelength | 4 : | 0.6984 |
| 5 Wavelength | 5 : | 0.7005 |
| 6 Param 2 | 48 : | 67 |

SOLVE AND VARIABLE DATA:

| | | |
|---|---|---|
| Semi Diameter | 1 | : Fixed |
| Semi Diameter | 2 | : Fixed |
| Thickness of | 3 | : Solve, Pickup from surface 2 scaled by -1, offset by 0 |
| Semi Diameter | 3 | : Fixed |
| Semi Diameter | 5 | : Fixed |
| Semi Diameter | 6 | : Fixed |
| Semi Diameter | 10 | : Fixed |
| Semi Diameter | 11 | : Fixed |
| Semi Diameter | 12 | : Fixed |
| Semi Diameter | 13 | : Fixed |

```
 Semi Diameter  16      : Fixed
 Semi Diameter  17      : Fixed
 Semi Diameter  18      : Fixed
 Parameter  3 Surf  22  : Solve, Pickup from surface 20 scaled by 1, offset by 0
 Semi Diameter  26      : Fixed
 Semi Diameter  27      : Fixed
 Semi Diameter  28      : Fixed
 Semi Diameter  29      : Fixed
 Semi Diameter  30      : Fixed
 Semi Diameter  31      : Fixed
 Semi Diameter  32      : Fixed
 Parameter  1 Surf  33  : Solve, Pickup from surface 25 scaled by -1, offset by 0
 Parameter  2 Surf  33  : Solve, Pickup from surface 25 scaled by -1, offset by 0
 Thickness of  36       : Solve, Pickup from surface 35 scaled by -2, offset by 0
 Semi Diameter  36      : Fixed
 Thickness of  37       : Solve, Pickup from surface 35 scaled by 1, offset by 0
 Semi Diameter  37      : Solve, pickup from surface 36 scaled by 1
 Parameter  2 Surf  37  : Solve, Pickup from surface 36 scaled by -1, offset by 0
 Parameter  2 Surf  38  : Solve, Pickup from surface 35 scaled by -1, offset by 0
 Thickness of  39       : Solve, Pickup from surface 35 scaled by -1, offset by 0
 Parameter  3 Surf  39  : Solve, Pickup from surface 34 scaled by -1, offset by 0
 Parameter  5 Surf  49  : Solve, Pickup from surface 47 scaled by -1, offset by 0
 Parameter  4 Surf  50  : Solve, Pickup from surface 46 scaled by -1, offset by 0
 Parameter  4 Surf  51  : Solve, Pickup from surface 45 scaled by -1, offset by 0
 Thickness of  53       : Solve, Pickup from surface 41 scaled by -1, offset by 0
 Parameter  2 Surf  53  : Solve, Pickup from surface 43 scaled by -1, offset by 0
 Thickness of  54       : Solve, Pickup from surface 42 scaled by -1, offset by 0
 Thickness of  55       : Solve, Pickup from surface 35 scaled by 1, offset by 0
 Parameter  3 Surf  55  : Solve, Pickup from surface 41 scaled by -1, offset by 0
 Parameter  3 Surf  56  : Solve, Pickup from surface 34 scaled by 1, offset by 0
 Thickness of  57       : Solve, Pickup from surface 35 scaled by -1, offset by 0
 Parameter  2 Surf  57  : Solve, Pickup from surface 35 scaled by 1, offset by 0
 Thickness of  58       : Solve, Pickup from surface 36 scaled by -1, offset by 0
 Semi Diameter  58      : Solve, pickup from surface 36 scaled by 1
 Parameter  2 Surf  58  : Solve, Pickup from surface 36 scaled by -1, offset by 0
 Thickness of  59       : Solve, Pickup from surface 35 scaled by -1, offset by 0
 Semi Diameter  59      : Solve, pickup from surface 36 scaled by 1
 Parameter  2 Surf  59  : Solve, Pickup from surface 36 scaled by 1, offset by 0
 Parameter  2 Surf  60  : Solve, Pickup from surface 35 scaled by -1, offset by 0
 Thickness of  61       : Solve, Pickup from surface 32 scaled by -1, offset by 0
 Parameter  3 Surf  61  : Solve, Pickup from surface 34 scaled by -1, offset by 0
 Thickness of  62       : Solve, Pickup from surface 33 scaled by -1, offset by 0
 Parameter  1 Surf  62  : Solve, Pickup from surface 33 scaled by -1, offset by 0
 Parameter  2 Surf  62  : Solve, Pickup from surface 33 scaled by -1, offset by 0
 Curvature of  63       : Solve, Pickup from surface 32 scaled by 1
 Thickness of  63       : Solve, Pickup from surface 31 scaled by -1, offset by 0
 Semi Diameter  63      : Fixed
 Curvature of  64       : Solve, Pickup from surface 31 scaled by 1
 Thickness of  64       : Solve, Pickup from surface 30 scaled by -1, offset by 0
 Semi Diameter  64      : Fixed
 Curvature of  65       : Solve, Pickup from surface 30 scaled by 1
 Thickness of  65       : Solve, Pickup from surface 29 scaled by -1, offset by 0
 Semi Diameter  65      : Fixed
 Curvature of  66       : Solve, Pickup from surface 29 scaled by 1
 Thickness of  66       : Solve, Pickup from surface 28 scaled by -1, offset by 0
 Semi Diameter  66      : Fixed
 Parameter  2 Surf  66  : Solve, Pickup from surface 29 scaled by 1, offset by 0
 Parameter  3 Surf  66  : Solve, Pickup from surface 29 scaled by 1, offset by 0
 Parameter  4 Surf  66  : Solve, Pickup from surface 29 scaled by 1, offset by 0
 Curvature of  67       : Solve, Pickup from surface 28 scaled by 1
 Thickness of  67       : Solve, Pickup from surface 27 scaled by -1, offset by 0
 Semi Diameter  67      : Fixed
 Curvature of  68       : Solve, Pickup from surface 27 scaled by 1
 Thickness of  68       : Solve, Pickup from surface 26 scaled by -1, offset by 0
 Semi Diameter  68      : Fixed
 Curvature of  69       : Solve, Pickup from surface 26 scaled by 1
 Semi Diameter  69      : Fixed
 Parameter  2 Surf  69  : Solve, Pickup from surface 26 scaled by 1, offset by 0
 Parameter  3 Surf  69  : Solve, Pickup from surface 26 scaled by 1, offset by 0
 Parameter  1 Surf  70  : Solve, Pickup from surface 62 scaled by -1, offset by 0
 Parameter  2 Surf  70  : Solve, Pickup from surface 62 scaled by -1, offset by 0

INDEX OF REFRACTION DATA:

System Temperature:   20.0000 Celsius
System Pressure   :    1.0000 Atmospheres
Absolute air index:    1.000271 at wavelength 0.690000 µm
Index data is relative to air at the system temperature and pressure.

Surf                  Glass    Temp    Pres      0.690000    0.693100    0.695900    0.698400    0.700500
   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                 MIRROR   20.00    1.00    1.00000000  1.00000000  1.00000000  1.00000000  1.00000000
   3                 MIRROR   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                          20.00    1.00    1.00000000  1.00000000  1.00000000  1.00000000  1.00000000
   6                          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                          20.00    1.00    1.00000000  1.00000000  1.00000000  1.00000000  1.00000000
   9                          20.00    1.00    1.00000000  1.00000000  1.00000000  1.00000000  1.00000000
```

| | | | | | | | | | |
|---|---|---|---|---|---|---|---|---|---|
| 10 | LF5 | 20.00 | 1.00 | 1.57559651 | 1.57545855 | 1.57533546 | 1.57522677 | 1.57513632 | |
| 11 | | 20.00 | 1.00 | 1.00000000 | 1.00000000 | 1.00000000 | 1.00000000 | 1.00000000 | |
| 12 | CAF2 | 20.00 | 1.00 | 1.43191109 | 1.43186437 | 1.43182264 | 1.43178575 | 1.43175504 | source: Handbook of |
| 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 | SILICA | 20.00 | 1.00 | 1.45552407 | 1.45545145 | 1.45538650 | 1.45532901 | 1.45528108 | source: Handbook of |
| 17 | | 20.00 | 1.00 | 1.00000000 | 1.00000000 | 1.00000000 | 1.00000000 | 1.00000000 | |
| 18 | SILICA | 20.00 | 1.00 | 1.45552407 | 1.45545145 | 1.45538650 | 1.45532901 | 1.45528108 | source: Handbook of |
| 19 | | 20.00 | 1.00 | 1.00000000 | 1.00000000 | 1.00000000 | 1.00000000 | 1.00000000 | |
| 20 | <CRD BRK> | | | 1.00000000 | 1.00000000 | 1.00000000 | 1.00000000 | 1.00000000 | |
| 21 | MIRROR | 20.00 | 1.00 | 1.00000000 | 1.00000000 | 1.00000000 | 1.00000000 | 1.00000000 | |
| 22 | <CRD BRK> | | | 1.00000000 | 1.00000000 | 1.00000000 | 1.00000000 | 1.00000000 | |
| 23 | <CRD BRK> | | | 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 | <CRD BRK> | | | 1.00000000 | 1.00000000 | 1.00000000 | 1.00000000 | 1.00000000 | |
| 26 | N-PK51 | 20.00 | 1.00 | 1.52563927 | 1.52556887 | 1.52550600 | 1.52545041 | 1.52540412 | |
| 27 | K7 | 20.00 | 1.00 | 1.50752122 | 1.50743390 | 1.50735587 | 1.50728687 | 1.50722939 | |
| 28 | | 20.00 | 1.00 | 1.00000000 | 1.00000000 | 1.00000000 | 1.00000000 | 1.00000000 | |
| 29 | CAF2 | 20.00 | 1.00 | 1.43191109 | 1.43186437 | 1.43182264 | 1.43178575 | 1.43175504 | source: Handbook of |
| 30 | SILICA | 20.00 | 1.00 | 1.45552407 | 1.45545145 | 1.45538650 | 1.45532901 | 1.45528108 | source: Handbook of |
| 31 | F2 | 20.00 | 1.00 | 1.61311251 | 1.61295044 | 1.61280593 | 1.61267838 | 1.61257230 | |
| 32 | | 20.00 | 1.00 | 1.00000000 | 1.00000000 | 1.00000000 | 1.00000000 | 1.00000000 | |
| 33 | <CRD BRK> | | | 1.00000000 | 1.00000000 | 1.00000000 | 1.00000000 | 1.00000000 | |
| 34 | <CRD BRK> | | | 1.00000000 | 1.00000000 | 1.00000000 | 1.00000000 | 1.00000000 | |
| 35 | <CRD BRK> | | | 1.00000000 | 1.00000000 | 1.00000000 | 1.00000000 | 1.00000000 | |
| 36 | F2 | 20.00 | 1.00 | 1.61311251 | 1.61295044 | 1.61280593 | 1.61267838 | 1.61257230 | |
| 37 | | 20.00 | 1.00 | 1.00000000 | 1.00000000 | 1.00000000 | 1.00000000 | 1.00000000 | |
| 38 | <CRD BRK> | | | 1.00000000 | 1.00000000 | 1.00000000 | 1.00000000 | 1.00000000 | |
| 39 | <CRD BRK> | | | 1.00000000 | 1.00000000 | 1.00000000 | 1.00000000 | 1.00000000 | |
| 40 | | 20.00 | 1.00 | 1.00000000 | 1.00000000 | 1.00000000 | 1.00000000 | 1.00000000 | |
| 41 | <CRD BRK> | | | 1.00000000 | 1.00000000 | 1.00000000 | 1.00000000 | 1.00000000 | |
| 42 | | 20.00 | 1.00 | 1.00000000 | 1.00000000 | 1.00000000 | 1.00000000 | 1.00000000 | |
| 43 | <CRD BRK> | | | 1.00000000 | 1.00000000 | 1.00000000 | 1.00000000 | 1.00000000 | |
| 44 | | 20.00 | 1.00 | 1.00000000 | 1.00000000 | 1.00000000 | 1.00000000 | 1.00000000 | |
| 45 | <CRD BRK> | | | 1.00000000 | 1.00000000 | 1.00000000 | 1.00000000 | 1.00000000 | |
| 46 | <CRD BRK> | | | 1.00000000 | 1.00000000 | 1.00000000 | 1.00000000 | 1.00000000 | |
| 47 | <CRD BRK> | | | 1.00000000 | 1.00000000 | 1.00000000 | 1.00000000 | 1.00000000 | |
| 48 | MIRROR | 20.00 | 1.00 | 1.00000000 | 1.00000000 | 1.00000000 | 1.00000000 | 1.00000000 | |
| 49 | <CRD BRK> | | | 1.00000000 | 1.00000000 | 1.00000000 | 1.00000000 | 1.00000000 | |
| 50 | <CRD BRK> | | | 1.00000000 | 1.00000000 | 1.00000000 | 1.00000000 | 1.00000000 | |
| 51 | <CRD BRK> | | | 1.00000000 | 1.00000000 | 1.00000000 | 1.00000000 | 1.00000000 | |
| 52 | | 20.00 | 1.00 | 1.00000000 | 1.00000000 | 1.00000000 | 1.00000000 | 1.00000000 | |
| 53 | <CRD BRK> | | | 1.00000000 | 1.00000000 | 1.00000000 | 1.00000000 | 1.00000000 | |
| 54 | | 20.00 | 1.00 | 1.00000000 | 1.00000000 | 1.00000000 | 1.00000000 | 1.00000000 | |
| 55 | <CRD BRK> | | | 1.00000000 | 1.00000000 | 1.00000000 | 1.00000000 | 1.00000000 | |
| 56 | <CRD BRK> | | | 1.00000000 | 1.00000000 | 1.00000000 | 1.00000000 | 1.00000000 | |
| 57 | <CRD BRK> | | | 1.00000000 | 1.00000000 | 1.00000000 | 1.00000000 | 1.00000000 | |
| 58 | F2 | 20.00 | 1.00 | 1.61311251 | 1.61295044 | 1.61280593 | 1.61267838 | 1.61257230 | |
| 59 | | 20.00 | 1.00 | 1.00000000 | 1.00000000 | 1.00000000 | 1.00000000 | 1.00000000 | |
| 60 | <CRD BRK> | | | 1.00000000 | 1.00000000 | 1.00000000 | 1.00000000 | 1.00000000 | |
| 61 | <CRD BRK> | | | 1.00000000 | 1.00000000 | 1.00000000 | 1.00000000 | 1.00000000 | |
| 62 | <CRD BRK> | | | 1.00000000 | 1.00000000 | 1.00000000 | 1.00000000 | 1.00000000 | |
| 63 | F2 | 20.00 | 1.00 | 1.61311251 | 1.61295044 | 1.61280593 | 1.61267838 | 1.61257230 | |
| 64 | SILICA | 20.00 | 1.00 | 1.45552407 | 1.45545145 | 1.45538650 | 1.45532901 | 1.45528108 | source: Handbook of |
| 65 | CAF2 | 20.00 | 1.00 | 1.43191109 | 1.43186437 | 1.43182264 | 1.43178575 | 1.43175504 | source: Handbook of |
| 66 | | 20.00 | 1.00 | 1.00000000 | 1.00000000 | 1.00000000 | 1.00000000 | 1.00000000 | |
| 67 | K7 | 20.00 | 1.00 | 1.50752122 | 1.50743390 | 1.50735587 | 1.50728687 | 1.50722939 | |
| 68 | N-PK51 | 20.00 | 1.00 | 1.52563927 | 1.52556887 | 1.52550600 | 1.52545041 | 1.52540412 | |
| 69 | | 20.00 | 1.00 | 1.00000000 | 1.00000000 | 1.00000000 | 1.00000000 | 1.00000000 | |
| 70 | <CRD BRK> | | | 1.00000000 | 1.00000000 | 1.00000000 | 1.00000000 | 1.00000000 | |
| 71 | <CRD BRK> | | | 1.00000000 | 1.00000000 | 1.00000000 | 1.00000000 | 1.00000000 | |
| 72 | SILICA | 20.00 | 1.00 | 1.45552407 | 1.45545145 | 1.45538650 | 1.45532901 | 1.45528108 | source: Handbook of |
| 73 | | 20.00 | 1.00 | 1.00000000 | 1.00000000 | 1.00000000 | 1.00000000 | 1.00000000 | |
| 74 | | 20.00 | 1.00 | 1.00000000 | 1.00000000 | 1.00000000 | 1.00000000 | 1.00000000 | |
| 75 | | 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 | MIRROR | 0.00000000 | |
| 3 | MIRROR | 0.00000000 | |
| 4 | | 0.00000000 | |
| 5 | | 0.00000000 | |
| 6 | | 0.00000000 | |
| 7 | | 0.00000000 | |
| 8 | | 0.00000000 | |
| 9 | | 0.00000000 | |
| 10 | LF5 | 10.60000000 | |
| 11 | | 0.00000000 | |
| 12 | CAF2 | 18.90000000 | source: Handbook of Optics Vol. II |
| 13 | | 0.00000000 | |
| 14 | | 0.00000000 | |
| 15 | | 0.00000000 | |
| 16 | SILICA | 0.00000000 | source: Handbook of Optics Vol. II |
| 17 | | 0.00000000 | |
| 18 | SILICA | 0.00000000 | source: Handbook of Optics Vol. II |
| 19 | | 0.00000000 | |

| | | | |
|---|---|---|---|
| 20 | <CRD BRK> | 0.00000000 | |
| 21 | MIRROR | 0.00000000 | |
| 22 | <CRD BRK> | 0.00000000 | |
| 23 | <CRD BRK> | 0.00000000 | |
| 24 | | 0.00000000 | |
| 25 | <CRD BRK> | 0.00000000 | |
| 26 | N-PK51 | 12.35000000 | |
| 27 | K7 | 8.40000000 | |
| 28 | | 0.00000000 | |
| 29 | CAF2 | 18.90000000 | source: Handbook of Optics Vol. II |
| 30 | SILICA | 0.00000000 | source: Handbook of Optics Vol. II |
| 31 | F2 | 9.60000000 | |
| 32 | | 0.00000000 | |
| 33 | <CRD BRK> | 0.00000000 | |
| 34 | <CRD BRK> | 0.00000000 | |
| 35 | <CRD BRK> | 0.00000000 | |
| 36 | F2 | 9.60000000 | |
| 37 | | 0.00000000 | |
| 38 | <CRD BRK> | 0.00000000 | |
| 39 | <CRD BRK> | 0.00000000 | |
| 40 | | 0.00000000 | |
| 41 | <CRD BRK> | 0.00000000 | |
| 42 | | 0.00000000 | |
| 43 | <CRD BRK> | 0.00000000 | |
| 44 | | 0.00000000 | |
| 45 | <CRD BRK> | 0.00000000 | |
| 46 | <CRD BRK> | 0.00000000 | |
| 47 | <CRD BRK> | 0.00000000 | |
| 48 | MIRROR | 0.00000000 | |
| 49 | <CRD BRK> | 0.00000000 | |
| 50 | <CRD BRK> | 0.00000000 | |
| 51 | <CRD BRK> | 0.00000000 | |
| 52 | | 0.00000000 | |
| 53 | <CRD BRK> | 0.00000000 | |
| 54 | | 0.00000000 | |
| 55 | <CRD BRK> | 0.00000000 | |
| 56 | <CRD BRK> | 0.00000000 | |
| 57 | <CRD BRK> | 0.00000000 | |
| 58 | F2 | 9.60000000 | |
| 59 | | 0.00000000 | |
| 60 | <CRD BRK> | 0.00000000 | |
| 61 | <CRD BRK> | 0.00000000 | |
| 62 | <CRD BRK> | 0.00000000 | |
| 63 | F2 | 9.60000000 | |
| 64 | SILICA | 0.00000000 | source: Handbook of Optics Vol. II |
| 65 | CAF2 | 18.90000000 | source: Handbook of Optics Vol. II |
| 66 | | 0.00000000 | |
| 67 | K7 | 8.40000000 | |
| 68 | N-PK51 | 12.35000000 | |
| 69 | | 0.00000000 | |
| 70 | <CRD BRK> | 0.00000000 | |
| 71 | <CRD BRK> | 0.00000000 | |
| 72 | SILICA | 0.00000000 | source: Handbook of Optics Vol. II |
| 73 | | 0.00000000 | |
| 74 | | 0.00000000 | |
| 75 | | 0.00000000 | |

F/# DATA:

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

| | Wavelength: | 0.690000 | | 0.693100 | | 0.695900 | |
|---|---|---|---|---|---|---|---|
| # | Field | Tan | Sag | Tan | Sag | Tan | Sag |
| 1 | 0.0000, 0.0000 deg: | 4.3886 | 3.3581 | 4.3890 | 3.7018 | 4.3878 | 4.1210 |
| 2 | 0.0000, 0.0020 deg: | 4.4054 | 3.3587 | 4.4058 | 3.7012 | 4.4046 | 4.1185 |

| | Wavelength: | 0.698400 | | 0.700500 | |
|---|---|---|---|---|---|
| # | Field | Tan | Sag | Tan | Sag |
| 1 | 0.0000, 0.0000 deg: | 4.3853 | 4.6499 | 4.3813 | 5.3039 |
| 2 | 0.0000, 0.0020 deg: | 4.4021 | 4.6444 | 4.3981 | 5.2938 |

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

Reference Surface: 7

| 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 | -2.137800000E+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 | -2.000000000E+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 | -7.620924304E+003 |

```
 4   1.0000000000   0.0000000000   0.0000000000  0.000000000E+000
     0.0000000000   1.0000000000   0.0000000000  0.000000000E+000
     0.0000000000   0.0000000000   1.0000000000 -2.000000000E+003

 5   1.0000000000   0.0000000000   0.0000000000  0.000000000E+000
     0.0000000000   1.0000000000   0.0000000000  0.000000000E+000
     0.0000000000   0.0000000000   1.0000000000 -2.000000000E+002

 6   1.0000000000   0.0000000000   0.0000000000  0.000000000E+000
     0.0000000000   1.0000000000   0.0000000000  0.000000000E+000
     0.0000000000   0.0000000000   1.0000000000 -1.000000000E+002

 7   1.0000000000   0.0000000000   0.0000000000  0.000000000E+000
     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
     0.0000000000   1.0000000000   0.0000000000  0.000000000E+000
     0.0000000000   0.0000000000   1.0000000000 -2.311647398E+002

 9   1.0000000000   0.0000000000   0.0000000000  0.000000000E+000
     0.0000000000   1.0000000000   0.0000000000  0.000000000E+000
     0.0000000000   0.0000000000   1.0000000000 -3.311647398E+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 -2.311647398E+002

11   1.0000000000   0.0000000000   0.0000000000  0.000000000E+000
     0.0000000000   1.0000000000   0.0000000000  0.000000000E+000
     0.0000000000   0.0000000000   1.0000000000 -2.161647398E+002

12   1.0000000000   0.0000000000   0.0000000000  0.000000000E+000
     0.0000000000   1.0000000000   0.0000000000  0.000000000E+000
     0.0000000000   0.0000000000   1.0000000000 -2.111646925E+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 -1.861646925E+002

14   1.0000000000   0.0000000000   0.0000000000  0.000000000E+000 slit
     0.0000000000   1.0000000000   0.0000000000  0.000000000E+000
     0.0000000000   0.0000000000   1.0000000000 -7.999134476E+001

15   1.0000000000   0.0000000000   0.0000000000  0.000000000E+000
     0.0000000000   1.0000000000   0.0000000000  0.000000000E+000
     0.0000000000   0.0000000000   1.0000000000 -7.999134476E+001

16   1.0000000000   0.0000000000   0.0000000000  0.000000000E+000
     0.0000000000   1.0000000000   0.0000000000  0.000000000E+000
     0.0000000000   0.0000000000   1.0000000000 -6.999134476E+001

17   1.0000000000   0.0000000000   0.0000000000  0.000000000E+000
     0.0000000000   1.0000000000   0.0000000000  0.000000000E+000
     0.0000000000   0.0000000000   1.0000000000 -6.499134476E+001

18   1.0000000000   0.0000000000   0.0000000000  0.000000000E+000 filter
     0.0000000000   1.0000000000   0.0000000000  0.000000000E+000
     0.0000000000   0.0000000000   1.0000000000 -6.299134476E+001

19   1.0000000000   0.0000000000   0.0000000000  0.000000000E+000
     0.0000000000   1.0000000000   0.0000000000  0.000000000E+000
     0.0000000000   0.0000000000   1.0000000000 -5.799134476E+001

20   1.0000000000   0.0000000000   0.0000000000  0.000000000E+000
     0.0000000000   0.7071067812   0.7071067812  0.000000000E+000
     0.0000000000  -0.7071067812   0.7071067812 -3.799134476E+001

21   1.0000000000   0.0000000000   0.0000000000  0.000000000E+000
     0.0000000000   0.7071067812   0.7071067812  0.000000000E+000
     0.0000000000  -0.7071067812   0.7071067812 -3.799134476E+001

22   1.0000000000   0.0000000000   0.0000000000  0.000000000E+000
     0.0000000000   0.0000000000   1.0000000000  0.000000000E+000
     0.0000000000  -1.0000000000   0.0000000000 -3.799134476E+001

23   1.0000000000   0.0000000000   0.0000000000  0.000000000E+000
     0.0000000000   0.0000000000   1.0000000000  6.661338148E-015
     0.0000000000  -1.0000000000   0.0000000000 -2.299134476E+001

24   1.0000000000   0.0000000000   0.0000000000  0.000000000E+000
     0.0000000000   0.0000000000   1.0000000000  6.661338148E-015
     0.0000000000  -1.0000000000   0.0000000000 -2.299134476E+001

25   1.0000000000   0.0000000000   0.0000000000  0.000000000E+000
     0.0000000000   0.0000000000   1.0000000000 -5.125240731E+002
     0.0000000000  -1.0000000000   0.0000000000 -2.299134476E+001

26   1.0000000000   0.0000000000   0.0000000000  0.000000000E+000
```

```
     0.0000000000   0.0000000000   1.0000000000 -5.125240731E+002
     0.0000000000  -1.0000000000   0.0000000000 -2.299134476E+001

27   1.0000000000   0.0000000000   0.0000000000  0.000000000E+000
     0.0000000000   0.0000000000   1.0000000000 -5.825240731E+002
     0.0000000000  -1.0000000000   0.0000000000 -2.299134476E+001

28   1.0000000000   0.0000000000   0.0000000000  0.000000000E+000
     0.0000000000   0.0000000000   1.0000000000 -6.125240731E+002
     0.0000000000  -1.0000000000   0.0000000000 -2.299134476E+001

29   1.0000000000   0.0000000000   0.0000000000  0.000000000E+000
     0.0000000000   0.0000000000   1.0000000000 -6.175240731E+002
     0.0000000000  -1.0000000000   0.0000000000 -2.299134476E+001

30   1.0000000000   0.0000000000   0.0000000000  0.000000000E+000
     0.0000000000   0.0000000000   1.0000000000 -6.625240731E+002
     0.0000000000  -1.0000000000   0.0000000000 -2.299134476E+001

31   1.0000000000   0.0000000000   0.0000000000  0.000000000E+000
     0.0000000000   0.0000000000   1.0000000000 -6.825240731E+002
     0.0000000000  -1.0000000000   0.0000000000 -2.299134476E+001

32   1.0000000000   0.0000000000   0.0000000000  0.000000000E+000
     0.0000000000   0.0000000000   1.0000000000 -7.125240731E+002
     0.0000000000  -1.0000000000   0.0000000000 -2.299134476E+001

33   1.0000000000   0.0000000000   0.0000000000  0.000000000E+000
     0.0000000000   0.0000000000   1.0000000000 -7.125240731E+002
     0.0000000000  -1.0000000000   0.0000000000 -2.299134476E+001

34   1.0000000000   0.0000000000   0.0000000000  0.000000000E+000
     0.0000000000  -0.3156490369   0.9488760116 -8.775240731E+002
     0.0000000000  -0.9488760116  -0.3156490369 -2.299134476E+001

35   1.0000000000   0.0000000000   0.0000000000  0.000000000E+000
     0.0000000000  -0.3156490369   0.9488760116 -8.727893375E+002
     0.0000000000  -0.9488760116  -0.3156490369 -8.758204587E+000

36   1.0000000000   0.0000000000   0.0000000000  0.000000000E+000
     0.0000000000  -0.3156490369   0.9488760116 -8.272432890E+002
     0.0000000000  -0.9488760116  -0.3156490369 -2.390935836E+001

37   1.0000000000   0.0000000000   0.0000000000  0.000000000E+000
     0.0000000000  -0.3156490369   0.9488760116 -9.183353861E+002
     0.0000000000  -0.9488760116  -0.3156490369  6.392949187E+000

38   1.0000000000   0.0000000000   0.0000000000  0.000000000E+000 untrans prism
     0.0000000000  -0.3156490369   0.9488760116 -8.775240731E+002
     0.0000000000  -0.9488760116  -0.3156490369 -2.299134476E+001

39   1.0000000000   0.0000000000   0.0000000000  0.000000000E+000
     0.0000000000   0.0000000000   1.0000000000 -8.775240731E+002
     0.0000000000  -1.0000000000   0.0000000000 -2.299134476E+001

40   1.0000000000   0.0000000000   0.0000000000  0.000000000E+000
     0.0000000000   0.0000000000   1.0000000000 -9.255240731E+002
     0.0000000000  -1.0000000000   0.0000000000 -2.299134476E+001

41   1.0000000000   0.0000000000   0.0000000000  0.000000000E+000
     0.0000000000  -0.6001128365   0.7999153602 -9.255240731E+002
     0.0000000000  -0.7999153602  -0.6001128365 -2.299134476E+001

42   1.0000000000   0.0000000000   0.0000000000  0.000000000E+000
     0.0000000000  -0.6001128365   0.7999153602 -9.255240731E+002
     0.0000000000  -0.7999153602  -0.6001128365 -2.299134476E+001

43   1.0000000000   0.0000000000   0.0000000000  0.000000000E+000
     0.0000000000  -0.6001128365   0.7999153602 -1.143495719E+003
     0.0000000000  -0.7999153602  -0.6001128365  1.780394028E+002

44   1.0000000000   0.0000000000   0.0000000000  0.000000000E+000
     0.0000000000  -0.6001128365   0.7999153602 -1.143495719E+003
     0.0000000000  -0.7999153602  -0.6001128365  1.780394028E+002

45   1.0000000000   0.0000000000   0.0000000000  0.000000000E+000
     0.0000000000  -0.6001128365   0.7999153602 -1.143495719E+003
     0.0000000000  -0.7999153602  -0.6001128365  1.780394028E+002

46   0.2419218956   0.0000000000   0.9702957263  0.000000000E+000
    -0.7761544554  -0.6001128365   0.1935170403 -1.143495719E+003
     0.5822869205  -0.7999153602  -0.1451804350  1.780394028E+002

47   0.0000000000  -0.2419218956   0.9702957263  0.000000000E+000
    -0.6001128365   0.7761544554   0.1935170403 -1.143495719E+003
    -0.7999153602  -0.5822869205  -0.1451804350  1.780394028E+002

48   0.0000000000  -0.2419218956   0.9702957263  0.000000000E+000 Echell Grating
    -0.6001128365   0.7761544554   0.1935170403 -1.143495719E+003
    -0.7999153602  -0.5822869205  -0.1451804350  1.780394028E+002
```

```
49   0.2419218956   0.0000000000   0.9702957263  0.000000000E+000
    -0.7761544554  -0.6001128365   0.1935170403 -1.143495719E+003
     0.5822869205  -0.7999153602  -0.1451804350  1.780394028E+002

50   1.0000000000   0.0000000000   0.0000000000  0.000000000E+000
     0.0000000000  -0.6001128365   0.7999153602 -1.143495719E+003
     0.0000000000  -0.7999153602  -0.6001128365  1.780394028E+002

51   1.0000000000   0.0000000000   0.0000000000  0.000000000E+000
     0.0000000000  -0.6001128365   0.7999153602 -1.143495719E+003
     0.0000000000  -0.7999153602  -0.6001128365  1.780394028E+002

52   1.0000000000   0.0000000000   0.0000000000  0.000000000E+000
     0.0000000000  -0.6001128365   0.7999153602 -1.143495719E+003
     0.0000000000  -0.7999153602  -0.6001128365  1.780394028E+002

53   1.0000000000   0.0000000000   0.0000000000  0.000000000E+000
     0.0000000000  -0.6001128365   0.7999153602 -1.161499104E+003
     0.0000000000  -0.7999153602  -0.6001128365  1.540419420E+002

54   1.0000000000   0.0000000000   0.0000000000  0.000000000E+000
     0.0000000000  -0.6001128365   0.7999153602 -1.161499104E+003
     0.0000000000  -0.7999153602  -0.6001128365  1.540419420E+002

55   1.0000000000   0.0000000000   0.0000000000  0.000000000E+000
     0.0000000000   0.0000000000   1.0000000000 -9.255240731E+002
     0.0000000000  -1.0000000000   0.0000000000 -2.299134476E+001

56   1.0000000000   0.0000000000   0.0000000000  0.000000000E+000
     0.0000000000  -0.3156490369   0.9488760116 -8.775240731E+002
     0.0000000000  -0.9488760116  -0.3156490369 -2.299134476E+001

57   1.0000000000   0.0000000000   0.0000000000  0.000000000E+000 trans prism
     0.0000000000  -0.3156490369   0.9488760116 -8.727893375E+002
     0.0000000000  -0.9488760116  -0.3156490369 -8.758204587E+000

58   1.0000000000   0.0000000000   0.0000000000  0.000000000E+000
     0.0000000000  -0.3156490369   0.9488760116 -9.183353861E+002
     0.0000000000  -0.9488760116  -0.3156490369  6.392949187E+000

59   1.0000000000   0.0000000000   0.0000000000  0.000000000E+000
     0.0000000000  -0.3156490369   0.9488760116 -8.272432890E+002
     0.0000000000  -0.9488760116  -0.3156490369 -2.390935836E+001

60   1.0000000000   0.0000000000   0.0000000000  0.000000000E+000 untrans prism
     0.0000000000  -0.3156490369   0.9488760116 -8.775240731E+002
     0.0000000000  -0.9488760116  -0.3156490369 -2.299134476E+001

61   1.0000000000   0.0000000000   0.0000000000  0.000000000E+000
     0.0000000000   0.0000000000   1.0000000000 -8.775240731E+002
     0.0000000000  -1.0000000000   0.0000000000 -2.299134476E+001

62   1.0000000000   0.0000000000   0.0000000000  0.000000000E+000
     0.0000000000   0.0000000000   1.0000000000 -8.775240731E+002
     0.0000000000  -1.0000000000   0.0000000000 -2.299134476E+001

63   1.0000000000   0.0000000000   0.0000000000  0.000000000E+000
     0.0000000000   0.0000000000   1.0000000000 -7.125240731E+002
     0.0000000000  -1.0000000000   0.0000000000 -2.299134476E+001

64   1.0000000000   0.0000000000   0.0000000000  0.000000000E+000
     0.0000000000   0.0000000000   1.0000000000 -6.825240731E+002
     0.0000000000  -1.0000000000   0.0000000000 -2.299134476E+001

65   1.0000000000   0.0000000000   0.0000000000  0.000000000E+000
     0.0000000000   0.0000000000   1.0000000000 -6.625240731E+002
     0.0000000000  -1.0000000000   0.0000000000 -2.299134476E+001

66   1.0000000000   0.0000000000   0.0000000000  0.000000000E+000
     0.0000000000   0.0000000000   1.0000000000 -6.175240731E+002
     0.0000000000  -1.0000000000   0.0000000000 -2.299134476E+001

67   1.0000000000   0.0000000000   0.0000000000  0.000000000E+000
     0.0000000000   0.0000000000   1.0000000000 -6.125240731E+002
     0.0000000000  -1.0000000000   0.0000000000 -2.299134476E+001

68   1.0000000000   0.0000000000   0.0000000000  0.000000000E+000
     0.0000000000   0.0000000000   1.0000000000 -5.825240731E+002
     0.0000000000  -1.0000000000   0.0000000000 -2.299134476E+001

69   1.0000000000   0.0000000000   0.0000000000  0.000000000E+000
     0.0000000000   0.0000000000   1.0000000000 -5.125240731E+002
     0.0000000000  -1.0000000000   0.0000000000 -2.299134476E+001

70   1.0000000000   0.0000000000   0.0000000000  0.000000000E+000
     0.0000000000   0.0000000000   1.0000000000 -5.125240731E+002
     0.0000000000  -1.0000000000   0.0000000000 -2.299134476E+001

71   1.0000000000   0.0000000000   0.0000000000  0.000000000E+000
```

| | | | | |
|---|---|---|---|---|
| | 0.0000000000 | 0.0130023365 | 0.9999154660 | 1.873005802E+001 |
| | 0.0000000000 | -0.9999154660 | 0.0130023365 | 2.008655238E+000 |
| 72 | 1.0000000000 | 0.0000000000 | 0.0000000000 | 0.000000000E+000 |
| | 0.0000000000 | 0.0130023365 | 0.9999154660 | 1.873005802E+001 |
| | 0.0000000000 | -0.9999154660 | 0.0130023365 | 2.008655238E+000 |
| 73 | 1.0000000000 | 0.0000000000 | 0.0000000000 | 0.000000000E+000 |
| | 0.0000000000 | 0.0130023365 | 0.9999154660 | 2.872921269E+001 |
| | 0.0000000000 | -0.9999154660 | 0.0130023365 | 2.138678604E+000 |
| 74 | 1.0000000000 | 0.0000000000 | 0.0000000000 | 0.000000000E+000 |
| | 0.0000000000 | 0.0130023365 | 0.9999154660 | 4.372794468E+001 |
| | 0.0000000000 | -0.9999154660 | 0.0130023365 | 2.333713652E+000 |
| 75 | 1.0000000000 | 0.0000000000 | 0.0000000000 | 0.000000000E+000 |
| | 0.0000000000 | 0.0130023365 | 0.9999154660 | 4.372794468E+001 |
| | 0.0000000000 | -0.9999154660 | 0.0130023365 | 2.333713652E+000 |

GLOBAL SURFACE CENTER OF CURVATURE POINTS:

Reference Surface: 7

| Surf | X | Y | Z | |
|---|---|---|---|---|
| 1 | - | - | - | |
| 2 | 0.0000000000 | 0.0000000000 | -18000.0000000000 | |
| 3 | 0.0000000000 | 0.0000000000 | -14547.3243043170 | |
| 4 | - | - | - | |
| 5 | - | - | - | |
| 6 | - | - | - | |
| 7 | - | - | - | |
| 8 | - | - | - | |
| 9 | - | - | - | |
| 10 | 0.0000000000 | 0.0000000000 | -95.9041930965 | |
| 11 | 0.0000000000 | 0.0000000000 | -127.8244340815 | |
| 12 | 0.0000000000 | 0.0000000000 | -123.4551813507 | |
| 13 | 0.0000000000 | 0.0000000000 | 1147.7852907235 | |
| 14 | - | - | - | slit |
| 15 | - | - | - | |
| 16 | 0.0000000000 | 0.0000000000 | -89.0074766241 | |
| 17 | 0.0000000000 | 0.0000000000 | -90.0066883592 | |
| 18 | - | - | - | filter |
| 19 | - | - | - | |
| 20 | - | - | - | |
| 21 | - | - | - | |
| 22 | - | - | - | |
| 23 | - | - | - | |
| 24 | - | - | - | |
| 25 | - | - | - | |
| 26 | 0.0000000000 | -769.8999498253 | -22.9913447615 | |
| 27 | 0.0000000000 | -332.5557111747 | -22.9913447615 | |
| 28 | 0.0000000000 | 37.9861968491 | -22.9913447615 | |
| 29 | 0.0000000000 | -1071.3760892202 | -22.9913447615 | |
| 30 | 0.0000000000 | -435.4698093998 | -22.9913447615 | |
| 31 | 0.0000000000 | -1084.2973062479 | -22.9913447615 | |
| 32 | 0.0000000000 | -942.6697964809 | -22.9913447615 | |
| 33 | - | - | - | |
| 34 | - | - | - | |
| 35 | - | - | - | |
| 36 | - | - | - | |
| 37 | - | - | - | |
| 38 | - | - | - | untrans prism |
| 39 | - | - | - | |
| 40 | - | - | - | |
| 41 | - | - | - | |
| 42 | - | - | - | |
| 43 | - | - | - | |
| 44 | - | - | - | |
| 45 | - | - | - | |
| 46 | - | - | - | |
| 47 | - | - | - | |
| 48 | - | - | - | Echell Grating |
| 49 | - | - | - | |
| 50 | - | - | - | |
| 51 | - | - | - | |
| 52 | - | - | - | |
| 53 | - | - | - | |
| 54 | - | - | - | |
| 55 | - | - | - | |
| 56 | - | - | - | |
| 57 | - | - | - | trans prism |
| 58 | - | - | - | |
| 59 | - | - | - | |
| 60 | - | - | - | untrans prism |
| 61 | - | - | - | |
| 62 | - | - | - | |
| 63 | 0.0000000000 | -942.6697964809 | -22.9913447615 | |
| 64 | 0.0000000000 | -1084.2973062479 | -22.9913447615 | |
| 65 | 0.0000000000 | -435.4698093998 | -22.9913447615 | |

| | | | |
|---|---|---|---|
| 66 | 0.0000000000 | -1071.3760892202 | -22.9913447615 |
| 67 | 0.0000000000 | 37.9861968491 | -22.9913447615 |
| 68 | 0.0000000000 | -332.5557111747 | -22.9913447615 |
| 69 | 0.0000000000 | -769.8999498253 | -22.9913447615 |
| 70 | - | - | - |
| 71 | - | - | - |
| 72 | 0.0000000000 | -464.0800371787 | -4.2695348222 |
| 73 | 0.0000000000 | 905.7836497061 | 13.5433996399 |
| 74 | - | - | - |
| 75 | - | - | - |

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 10 to 11 | 30.691858 | 3.240000 | 99.441621 |
| Element surf 12 to 13 | 45.770656 | 3.181000 | 145.596455 |
| Element surf 16 to 17 | 0.399062 | 0.000000 | 0.000000 |
| Element surf 18 to 19 | 0.392699 | 0.000000 | 0.000000 |
| Element surf 26 to 27 | 1648.656427 | 3.855000 | 6355.570525 |
| Element surf 27 to 28 | 1285.641408 | 2.530000 | 3252.672763 |
| Element surf 29 to 30 | 917.490625 | 3.181000 | 2918.537678 |
| Element surf 30 to 31 | 1255.706889 | 0.000000 | 0.000000 |
| Element surf 31 to 32 | 1149.101890 | 3.610000 | 4148.257824 |
| Element surf 36 to 37 | 4839.516000 | 3.610000 | 17470.652760 |
| Element surf 58 to 59 | 4839.516000 | 3.610000 | 17470.652760 |
| Element surf 63 to 64 | 1149.101890 | 3.610000 | 4148.257824 |
| Element surf 64 to 65 | 1255.706889 | 0.000000 | 0.000000 |
| Element surf 65 to 66 | 917.490625 | 3.181000 | 2918.537678 |
| Element surf 67 to 68 | 1285.641408 | 2.530000 | 3252.672763 |
| Element surf 68 to 69 | 1648.656427 | 3.855000 | 6355.570525 |
| Element surf 72 to 73 | 58.365466 | 0.000000 | 0.000000 |
| Total Mass: | | | 68536.421177 |

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 = 0.690000 (Primary) | | |
| Focal Length : | 17644.094612 | -17644.094612 |
| Focal Planes : | -181232.965312 | 0.330130 |
| Principal Planes : | -198877.059924 | 17644.424742 |
| Anti-Principal Planes : | -163588.870700 | -17643.764482 |
| Nodal Planes : | -198877.059924 | 17644.424742 |
| Anti-Nodal Planes : | -163588.870700 | -17643.764482 |
| W = 0.693100 | | |
| Focal Length : | 17644.113154 | -17644.113154 |
| Focal Planes : | -181118.009499 | 0.326413 |
| Principal Planes : | -198762.122654 | 17644.439568 |
| Anti-Principal Planes : | -163473.896345 | -17643.786741 |
| Nodal Planes : | -198762.122654 | 17644.439568 |
| Anti-Nodal Planes : | -163473.896345 | -17643.786741 |
| W = 0.695900 | | |
| Focal Length : | 17644.128757 | -17644.128757 |
| Focal Planes : | -181014.998383 | 0.322908 |
| Principal Planes : | -198659.127140 | 17644.451665 |
| Anti-Principal Planes : | -163370.869625 | -17643.805849 |
| Nodal Planes : | -198659.127140 | 17644.451665 |
| Anti-Nodal Planes : | -163370.869625 | -17643.805849 |
| W = 0.698400 | | |
| Focal Length : | 17644.141764 | -17644.141764 |
| Focal Planes : | -180923.666024 | 0.319660 |
| Principal Planes : | -198567.807788 | 17644.461424 |
| Anti-Principal Planes : | -163279.524261 | -17643.822104 |
| Nodal Planes : | -198567.807788 | 17644.461424 |
| Anti-Nodal Planes : | -163279.524261 | -17643.822104 |
| W = 0.700500 | | |
| Focal Length : | 17644.152012 | -17644.152012 |
| Focal Planes : | -180847.404922 | 0.316845 |
| Principal Planes : | -198491.556934 | 17644.468857 |
| Anti-Principal Planes : | -163203.252910 | -17643.835167 |
| Nodal Planes : | -198491.556934 | 17644.468857 |
| Anti-Nodal Planes : | -163203.252910 | -17643.835167 |