

FIRST - SPIRE
Optical design configuration control file
PHOTOMETER and SPECTROMETER

SPIREconfig31

Date: 20 July 2001

SPIRE-LAM-PRJ-000761

D:\Dohlen\first\OptoMech\OpticsConfig\[SPIREconfig31.xls]GutRayImpacts

Calculations based on identification numbers:

Vertex	(BOLPHT155)
Gut	(BOLPHT155)
M3Cent	(BOLPHT154C)
M5Cent	(BOLPHT154C)

The configuration control file takes data generated by the SYNOPSIS raytracing program and calculates data concerning:

- Gut ray impacts on the optical surfaces
- Interface points for each mirror in the instrument coordinate system
- Interface points in the local surface coordinates

It also transforms the left handed system used by SYNOPSIS into a right handed one and transforms the labels of the axis to be compatible with the instrument standard:

<i>SPIRE</i>	<i>SYNO</i>	<i>LOCAL</i>	<i>Directions</i>
X	-Zsyno	Norm	Tow. tel
Y	Xsyno	Sag	Tow. Spectro
Z	Ysyno	Tang	Tow. PAX

Contents:

The file contains the following spreadsheets:

Introduction: This sheet.

History: Evolution history of the file

Theory:

Variables: List of variables

Final results:

GutRayImpacts: Coordinates of gut ray impacts on each surface

Interfaces: Coordinates defining mirror interfaces in global coordinates

SurfDef: Coordinates defining mirror interfaces in local coordinates

Intermediate calculations:

GutCalc: Calculating surface normal vectors at gut ray impacts

M3CentCalc: Calculating surface normal vectors at centre of M3

M5CentCalc: Calculating surface normal vectors at centre of M5

VertexCalc: Transform vertex data into instrument coordinates

VerticesSyno: Read vertex data from SYNO output and calculate local axes

RayImpacts: Transform ray impact data into instrument coordinates

RayImpactsSyno: Read ray impact data from SYNO output

SYNOPSIS outputs:

- Listing of surface data and Euler angles in global coordinates

PhotGlob: Photometer

SpecUpGlob: Spectrometer upper arm

SpecLoGlob: Spectrometer lower arm

- Gut ray impacts in global coordinates

PhotGutRay: Photometer

SpecUpGutRay: Spectrometer upper arm

SpecLoGutRay: Spectrometer lower arm

- Other

M3CentRay: Ray impacts for ray centred on M3 in global coordinates

M5CentRay: Ray impacts for ray centred on M5 in global coordinates

Filename	Date	Comments
SPIREconfig01	210700	
SPIREconfig02	240800	Corrected error in jumping from detector back to dichroic. Added dummy for normal on primary. Corrected sign of normals (norm = ray out - ray in).
SPIREconfig03	240800	Reviewed 'comments' sheet.
SPIREconfigPhot03	10900	Separate file for Phot and Spec
SPIREconfigPhot10	171000	Spigot axes calculated. Transformation to IID-B ("MSSL") coordinates.
SPIREconfigPhot11		
SPIREconfigPhot12	141100	Corrected Euler calculations, dowls added
SPIREconfigPhot13		
SPIREconfigPhot20	160101	Entirely renovated. Error in dowl calculation eliminated.
SPIREconfigPhot21	200301	Improved precision for interfaces
SPIREconfigPhot22	230301	Correct spigot direction (modify automatic sign calculation) and dowl direction (add flag).
SPIREconfigPhot23	260301	norm and sag vectors in Interfaces sheet has correct directions (towards spigot and towards dowl)
SPIREconfigPhot24	110501	BOLPHT155: new telescope. Includes comprative calculations
SPIREconfigPhot25	130601	Cleaned up: Comparative calculations removed
SPIREconfig30		Revised version, Euler calculation corrected, spig and dowl coordinates give positions on interface surface. Phot and Spec in same file. Draft
SPIREconfig31	200701	Official release of Revised version

Theory

Contents

1. Surface orientation from Euler angles
2. Surface normal vectors from ray impact data
3. Surface sagittal vectors
4. Interface data in global coordinates
5. Interface data in local coordinates

1. Surface orientation from Euler angles

The listing of surface data in global coordinates give coordinates for each surface vertex and the Euler angles (in degrees with 5 significant decimals, ie a precision of 1e-5 deg) defining the orientation of the surface in space. These are used to calculate interface data for all mirrors except CM3 and CM5, see sec. 2 and 3.

The global coordinate system used by SYNOPSIS is left-handed and has its origin at the telescope focal point, ie 202mm above the SPIRE origin. The Z-axis is along the telescope axis, pointing away from the telescope, the Y-axis is in the plane of the photometer, pointing towards PAX, the X-axis is perpendicular to the plane of the photometer, pointing towards the spectrometer, see table.

<i>SPIRE</i>	<i>SYNO</i>	<i>LOCAL</i>	<i>Directions</i>
X	-Zsyno	Norm	Tow. tel
Y	Xsyno	Sag	Tow. Spectro
Z	Ysyno	Tang	Tow. PAX

Euler angles aEuler, bEuler, cEuler represent consecutive rotations about the X, Y, and Z axes, respectively, in a counter-clockwise direction. The resulting coordinate system representing local surface coordinates are named Sag, Tang, and Norm, respectively. Norm is along the surface axis, Tan is in general in the plane of the system and Sag is in general pointing towards the optical bench. For centred surfaces, Norm defines the spigot axis and Sag defines the dowl location.

The local axes are produced by the following:

$$\begin{aligned}
 & \begin{bmatrix} ySag & yTan & yNorm \\ zSag & zTan & zNorm \\ -xSag & -xTan & -xNorm \end{bmatrix}_{SPIRE} \\
 &= \begin{bmatrix} xSag & xTan & xNorm \\ ySag & yTan & yNorm \\ zSag & zTan & zNorm \end{bmatrix}_{SYNOPSIS} \\
 &= \begin{bmatrix} 1 & 0 & 0 \\ 0 & \cos a & \sin a \\ 0 & -\sin a & \cos a \end{bmatrix} \begin{bmatrix} \cos b & 0 & -\sin b \\ 0 & 1 & 0 \\ \sin b & 0 & \cos b \end{bmatrix} \begin{bmatrix} \cos c & \sin c & 0 \\ -\sin c & \cos c & 0 \\ 0 & 0 & 1 \end{bmatrix} \\
 &= \begin{bmatrix} \cos b \cos c & \cos b \sin c & -\sin b \\ \sin a \sin b \cos c - \cos a \sin c & \sin a \sin b \sin c + \cos a \cos c & \sin a \cos b \\ \cos a \sin b \cos c + \sin a \sin c & \cos a \sin b \sin c - \sin a \cos c & \cos a \cos b \end{bmatrix}
 \end{aligned}$$

2. Surface normal vectors from ray impact data

For CM3 and CM5 (see sec 3), interface data are calculated from ray impact data. These are provided by raytracing outputs in mm with 6 significant decimals. With around 100 path length between impact points, this gives an angular precision of around 1e-6 deg.

For each component (i) the direction cosines of the exiting ray vector is calculated by normalizing the difference between ray impact coordinates on surfaces i and i+1:

$$\mathbf{r}_i = \frac{\mathbf{P}_{i+1} - \mathbf{P}_i}{|\mathbf{P}_{i+1} - \mathbf{P}_i|}$$

For reflecting surfaces, the local normal is obtained as the normalized difference between incident and reflected rays:

$$\mathbf{n}_i = \frac{\mathbf{r}_i - \mathbf{r}_{i-1}}{|\mathbf{r}_i - \mathbf{r}_{i-1}|}$$

3. Surface sagittal vectors

For centred surfaces, the spigot axis intercepts the optical surface at the surface vertex point, which is also coincident with the gut ray impact point. Two surfaces are not of this type:

CM3: This mirror is an off-axis asphere, ie its surface vertex does not coincide with the gut ray impact point. Also, since the mirror is common for photometer and spectrometer, its aperture is not symmetrical about the photometer gut ray impact point, and so the spigot, which is located near the centre of gravity of the mirror, does not intercept the surface in the gut ray impact point.

CM5: This mirror is common for photometer and spectrometer, its aperture is therefore not symmetrical about the photometer gut ray impact point, and so the spigot, which is located near the centre of gravity of the mirror, does not intercept the surface in the gut ray impact point.

For each of these surfaces a separate ray is traced for which the sky coordinates are chosen so as to impact the mirror surface at the spigot axis interception point. Local normal vectors are calculated as above and used to define the spigot vectors for these mirrors.

The local Sag vector (required to define the dowl position) is calculated by rotating the Sag vector at the vertex through an angle Theta in the X-Y plane:

$$\begin{aligned} X_{sag} &= \text{VertexCalc!Xsag} * \text{COS}(\text{Theta}) - \text{VertexCalc!Ysag} * \text{SIN}(\text{Theta}) \\ Y_{sag} &= \text{VertexCalc!Xsag} * \text{SIN}(\text{Theta}) + \text{VertexCalc!Ysag} * \text{COS}(\text{Theta}) \\ Z_{sag} &= \text{VertexCalc!Zsag} \end{aligned}$$

Theta is the angle between the projections onto the X-Y plane of the spigot vector and the vertex normal vector:

$$\begin{aligned} \text{Theta} &= \text{ACOS}((X_{\text{norm}} * \text{VertexCalc!Xnorm} + Y_{\text{norm}} * \text{VertexCalc!Ynorm}) \\ &\quad / ((\text{RACINE}(X_{\text{norm}}^2 + Y_{\text{norm}}^2) * \text{RACINE}(\text{VertexCalc!Xnorm}^2 + \text{VertexCalc!Ynorm}^2))) \\ &\quad * \text{SIGNE}(X_{\text{norm}} * Y_{\text{norm}})) \end{aligned}$$

where the SIGNE function provides the correct sign of Theta.

4 Interface data in global coordinates (Interfa&ces)

For each mirror, the following are given in the global instrument coordinate system:

(Xmirr, Ymirr, Zmirr): coordinates of the intersection point between the spigot axis and the optical surface

(Xnorm, Ynorm, Znorm): direction cosines of the surface normal, pointing away from the optical surface. This is parallel with the spigot axis.

(Xspig, Yspig, Zspig): coordinates of the intersection between the spigot axis and the interface plane:

$$(XYZ)_{spig} = (XYZ)_{mirr} + ThMirr * (XYZ)_{norm}$$

where ThMirr is a negative number giving the thickness of the mirror.

(Xsag, Ysag, Zsag): direction cosines of the surface sag vector along which the dowl is located. The sag vector always has a positive y co-ordinate.

(Xdowl, Ydowl, Zdowl): coordinates of the intersection between the dowl axis (parallel with the spigot axis) and the interface plane

$$(XYZ)_{dowl} = (XYZ)_{spig} + DowlDir * DowlSep * (XYZ)_{sag}$$

where DowlDir = +/-1 gives the direction towards the dowl and DowlSep is the distance between spigot and dowl axes.

5. Interface data in local coordinates (SurfDef)

For each mirror, the interface vectors listed above are also given in terms of local coordinates for each optical surface, whose origin is at the surface vertex and whose axes are aligned with the vertex normal. For the spigot interception points, this requires a transformation involving translation and rotation, expressed as:

$$\begin{aligned} X_{mirr} &= VertexCalc!X_{norm} * (Interfaces!X_{mirr} - VertexCalc!X_{mirr}) \\ &\quad + VertexCalc!Y_{norm} * (Interfaces!Y_{mirr} - VertexCalc!Y_{mirr}) \\ &\quad + VertexCalc!Z_{norm} * (Interfaces!Z_{mirr} - VertexCalc!Z_{mirr}) \\ Y_{mirr} &= VertexCalc!X_{sag} * (Interfaces!X_{mirr} - VertexCalc!X_{mirr}) \\ &\quad + VertexCalc!Y_{sag} * (Interfaces!Y_{mirr} - VertexCalc!Y_{mirr}) \\ &\quad + VertexCalc!Z_{sag} * (Interfaces!Z_{mirr} - VertexCalc!Z_{mirr}) \\ Z_{mirr} &= VertexCalc!X_{tang} * (Interfaces!X_{mirr} - VertexCalc!X_{mirr}) \\ &\quad + VertexCalc!Y_{tang} * (Interfaces!Y_{mirr} - VertexCalc!Y_{mirr}) \\ &\quad + VertexCalc!Z_{tang} * (Interfaces!Z_{mirr} - VertexCalc!Z_{mirr}) \end{aligned}$$

For the direction cosines for the Norm (spigot) and Sag (dowl) vectors, the transformation only involves rotation:

$$\begin{aligned} X_{norm} &= VertexCalc!X_{norm} * Interfaces!X_{norm} + VertexCalc!Y_{norm} * Interfaces!Y_{norm} \\ &\quad + VertexCalc!Z_{norm} * Interfaces!Z_{norm} \\ Y_{norm} &= VertexCalc!X_{sag} * Interfaces!X_{norm} + VertexCalc!Y_{sag} * Interfaces!Y_{norm} \\ &\quad + VertexCalc!Z_{sag} * Interfaces!Z_{norm} \\ Z_{norm} &= VertexCalc!X_{tang} * Interfaces!X_{norm} + VertexCalc!Y_{tang} * Interfaces!Y_{norm} \\ &\quad + VertexCalc!Z_{tang} * Interfaces!Z_{norm} \end{aligned}$$

Name	Description
ID	System identification number
SystemPart	
CompName	
System	Ray traced system: Phot, SpecUp, SpecLo
Flag	
SurfNum	
Line	
Ray	
Syst	
Axe	
AxeSyno	
Local	
ThMirr	Mirror thickness
Thick	Thickness of thick mirrors (CM3, CM5, PM7, PM9)
Thin	Thickness of other mirrors
SpigLength	Distance to spigot point
DowlSep	Distance to dowl point
Theta	Angle between surface vertex normal and spigot axis
UpFlag	Direction of exiting ray, 1 for +X
LeftHandCorr	Factor applied to Zspire to transform LHS to RHS
NormDirCorr	Factor applied to VertexNormal to point it up (+X)
NormDir	Automatically determined normal direction factor
DowlDir	Manually entered factor (+/-1) to determine dowl direction (gen tow bench)
XPhotGut	Gut ray impact coordinates
YPhotGut	
ZPhotGut	
XSpecUpGut	
YSpecUpGut	
ZSpecUpGut	
XSpecLoGut	
YSpecLoGut	
ZSpecLoGut	
XgutPhot	Gut ray impact coordinates
YgutPhot	
ZgutPhot	
XGutSpecUp	
YGutSpecUp	
ZGutSpecUp	
XGutSpecLo	
YGutSpecLo	
ZGutSpecLo	
XM3cent	Ray centred on M3, impact coordinates
YM3cent	
ZM3cent	
XM5cent	Ray centred on M5, impact coordinates
YM5cent	
ZM5cent	
aEuler	Surface orientation Euler angles
bEuler	
cEuler	
Xaxis	Surface vertex axis direction vector
Yaxis	
Zaxis	
Xvertex	Surface vertex coordinates used in VertexCalc
Yvertex	
Zvertex	
Xtang	Surface vertex tangential vector
Ytang	
Ztang	
Xsag	Surface vertex sagittal vector
Ysag	
Zsag	
Xmirr	Mirror surface coordinate
Ymirr	
Zmirr	
Xnorm	Preliminary mirror normal vectors, to calculate NormDir
Ynorm	
Znorm	
Xnorm	Mirror normal vector (spigot vector)
Ynorm	
Znorm	
Xspig	Point along spigot vector
Yspig	
Zspig	
XsagM	Mirror sagittal vector (pointing towards dowl)
YsagM	
ZsagM	
Xdowl	Point in direction of dowl
Ydowl	
Zdowl	
Line0	Line of first surface in listing
Line0Phot	
Line0SpecUp	
Line0SpecLo	
Xcol	Column of each coordinate in listing
Ycol	
Zcol	
Xfact	Direction correction for SPIRE (RHS) with respect to Syno (LHS) co-ordinates
Yfact	
Zfact	
X0	Offset of SPIRE origin with respect to Synopsys origin
Y0	
Z0	
Xdiff	Difference between ray impact coordinates
Ydiff	
Zdiff	
DiffMod	Modulo of difference vector
Xray	Unit ray vector
Yray	
Zray	
dXray	Difference between unit ray vectors
dYray	
dZray	
dRayMod	Modulo of difference vector

SystemPart	CompName	System	Flag	Xgut	Ygut	Zgut
Telescope	Dummy	Phot	Ignore			
	M1	Phot		1252.429	0.000	54.793
	M2	Phot		2839.998	0.000	0.000
Common optics	CFP	Phot	Hole	228.383	0.000	-90.137
	CM3	Phot		131.142	0.000	-93.494
	CM4	Phot		316.125	0.000	-200.094
	CM5	Phot		119.783	0.000	-179.689
Photometer optics	PM6	Phot		296.151	0.000	-259.533
	PM7	Phot		94.234	0.000	-279.481
	PM8	Phot		240.466	0.000	-397.634
	PCS	Phot	Hole	192.867	0.000	-448.961
	PM9	Phot		104.471	0.000	-544.281
Short wave	PDIC1	Phot		238.419	0.000	-527.459
	PM10	Phot		139.942	0.000	-619.802
	PSW	Phot	Hole	139.942	-50.000	-619.803
	PDIC1	Phot	Ignore			
Medium wave	PDIC2	Phot		337.640	0.000	-514.998
	PMW	Phot	Hole	283.429	-65.114	-521.807
	PDIC2	Phot	Ignore			
Long wave	PM11	Phot		381.298	0.000	-509.515
	PLW	Phot	Hole	381.298	0.000	-468.515
	CM5	SpecUp	Ignore			
Spectrometer optics	SM6	SpecUp		306.147	33.819	-263.978
	SCS	SpecUp	Hole	314.984	141.696	-233.044
	SM7	SpecUp		317.372	170.859	-224.681
	SM8A	SpecUp		373.504	170.860	-234.579
Upper arm	SBS1	SpecUp		223.128	170.857	-321.398
	SM9A	SpecUp		373.124	170.854	-407.997
	SCCA1	SpecUp		248.124	170.855	-407.998
	SCCA2	SpecUp		248.127	170.859	-457.999
	SCCA3	SpecUp		248.124	170.855	-457.996
	SM10A	SpecUp		373.123	170.859	-457.998
	SBS2	SpecUp		223.128	170.856	-544.598
	SM11A	SpecUp		354.746	170.854	-620.587
	SM12A	SpecUp		263.584	170.855	-636.663
	SSW	SpecUp	Det	263.583	250.857	-636.664
	SM8A	SpecLo	Ignore			
Lower arm	SBS1	SpecLo	Hole	223.128	170.857	-321.398
	SM9B	SpecLo		73.132	170.854	-407.997
	SCCB1	SpecLo		198.132	170.855	-407.998
	SCCB2	SpecLo		198.129	170.859	-457.999
	SCCB3	SpecLo		198.132	170.855	-457.996
	SM10B	SpecLo		73.132	170.859	-457.998
	SBS2	SpecLo		223.128	170.856	-544.598
	SM11B	SpecLo		91.509	170.854	-620.587
	SM12B	SpecLo		182.672	170.855	-636.663
	SLW	SpecLo	Det	182.673	250.857	-636.664

Axe

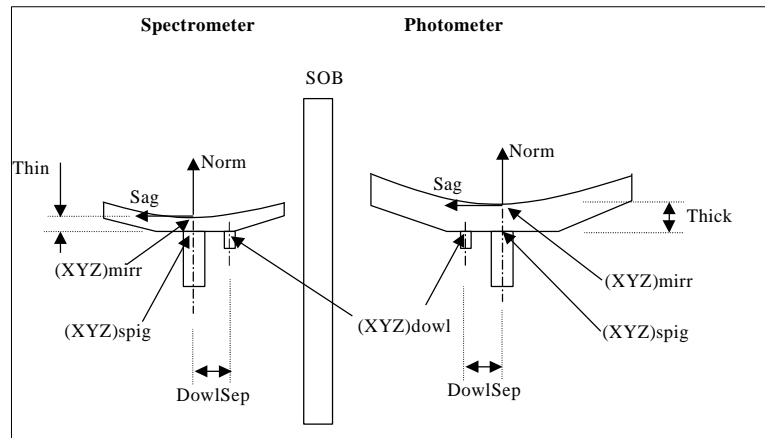
Axis directions: LOCAL
 X -Zsyno Norm Tow. tel
 Y Xsyno Sag Tow. Spectro
 Z Ysyno Tang Tow. PAX

SystemPart	CompName	System	ThMirr	DowlDir	Flag	Xmirr	Ymirr	Zmirr	Xnorm	Ynorm	Znorm	Xspig	Yspig	Zspig	Xsag	Ysag	Zsag	Xdowl	Ydowl	Zdowl	Check	CompName
Telescope	M1	Phot			Ignore																	M1
	M2	Phot			Ignore																	M2
Common optics	CFP	Phot			Hole																	CFP
	CM3	Phot	Thick	1	M3Cent	131.229806	-19.500476	-95.222336	0.970091	0.051240	-0.237270	116.738573	-20.265898	-91.677995	-0.052746	0.998608	0.000000	116.108235	-8.332128	-91.677995	90	CM3
	CM4	Phot			Ignore																	CM4
	CM5	Phot	Thick	1	M5Cent	120.054658	19.499867	-181.314796	0.964213	-0.070038	-0.255710	105.651236	20.546097	-177.494991	0.072447	0.997372	0.000000	106.517005	32.465101	-177.494991	90	CM5
	PM6	Phot		1	Vertex	296.150668	0.000000	-259.533222	-0.986693	0.000000	0.162592	303.028976	0.000000	-260.666665	0.000000	1.000000	0.000000	303.028976	11.950406	-260.666665	90	PM6
Photometer optics	PM7	Phot	Thick	1	Vertex	94.233806	0.000000	-279.482925	0.958086	0.000000	-0.286481	79.921912	0.000000	-275.203469	0.000000	1.000000	0.000000	79.921912	11.950406	-275.203469	90	PM7
	PM8	Phot		1	Vertex	240.466424	0.000000	-397.635459	-0.997428	0.000000	-0.071682	247.419561	0.000000	-397.135759	0.000000	1.000000	0.000000	247.419561	11.950406	-397.135759	90	PM8
	PCS	Phot			Hole																	PCS
	PM9	Phot	Thick	1	Vertex	104.472165	0.000000	-544.283205	0.889746	0.000000	0.456455	91.181126	0.000000	-551.101735	0.000000	1.000000	0.000000	91.181126	11.950406	-551.101735	90	PM9
Short wave	PDIC1	Phot			Ignore																	PDIC1
	PM10	Phot		-1	Vertex	139.942327	0.000000	-619.802728	0.515808	-0.707107	0.483675	136.346591	4.929291	-623.174463	0.515808	0.707107	0.483675	130.182473	-3.520922	-628.954579	90	PM10
	PSW	Phot			Det																	PSW
Medium wave	PDIC1	Phot			Ignore																	PDIC1
	PDIC2	Phot			Ignore																	PDIC2
	PMW	Phot			Det																	PMW
Long wave	PDIC2	Phot			Ignore																	PDIC2
	PM11	Phot		1	Vertex	381.297361	0.000000	-509.515249	-0.749864	0.000000	0.661592	386.524716	0.000000	-514.127253	0.000000	1.000000	0.000000	386.524716	11.950406	-514.127253	90	PM11
	PLW	Phot			Det																	PLW
Spectrometer optics	CM5	SpecUp			1	Ignore																CM5
	SM6	SpecUp		1	Vertex	306.150668	33.820000	-263.975222	-0.544804	0.709952	0.446270	309.948532	28.870872	-267.086199	0.687606	0.682830	-0.246862	318.165703	37.030973	-270.036295	90	SM6
	SCS	SpecUp			Hole																	SCS
Upper arm	SM7	SpecUp		-1	Vertex	317.370319	170.856678	-224.680587	0.650560	-0.687862	-0.321895	312.835218	175.651815	-222.436632	0.755385	0.629897	0.180620	303.808064	168.124290	-224.595115	90	SM7
	SM8A	SpecUp		-1	Vertex	373.504361	170.856678	-234.578533	-0.984808	0.000000	-0.173648	380.369525	170.856678	-233.368019	-0.018814	0.994113	0.106700	380.594362	158.976622	-234.643132	90	SM8A
	SBS1	SpecUp			Ignore																	SBS1
Lower arm	SM9A	SpecUp		-1	Vertex	373.123310	170.856678	-407.998533	-0.965926	0.000000	0.258819	379.856847	170.856678	-409.802779	0.000000	1.000000	0.000000	379.856847	158.906272	-409.802779	90	SM9A
	SCCA1	SpecUp			Ignore																	SCCA1
	SCCA2	SpecUp			Ignore																	SCCA2
	SCCA3	SpecUp			Ignore																	SCCA3
	SM10A	SpecUp		-1	Vertex	373.123310	170.856678	-457.998533	-0.965926	0.000000	-0.258819	379.856847	170.856678	-456.194287	0.000000	1.000000	0.000000	379.856847	158.906272	-456.194287	90	SM10A
	SBS2	SpecUp			Ignore																	SBS2
	SM11A	SpecUp		-1	Vertex	354.746250	170.856678	-620.588533	-0.984808	0.000000	0.173648	361.611414	170.856678	-621.799047	-0.005424	0.999512	-0.030762	361.676234	158.912104	-621.431431	90	SM11A
	SM12A	SpecUp		-1	Vertex	263.582597	170.856678	-636.663145	0.696364	0.707107	0.122788	258.728193	165.927387	-637.519107	-0.696364	0.707107	-0.122788	267.050028	157.477174	-636.051743	90	SM12A
	SSW	SpecUp			Det																	SSW
	SM8A	SpecLo			Ignore																	SM8A
Ref Arm	SBS1	SpecLo			Hole																	SBS1
	SM9B	SpecLo		-1	Vertex	73.132110	170.856678	-407.998533	0.965926	0.000000	0.258819	66.398573	170.856678	-409.802779	0.000000	1.000000	0.000000	66.398573	158.906272	-409.802779	90	SM9B
	SCCB1	SpecLo			Ignore																	SCCB1
	SCCB2	SpecLo			Ignore																	SCCB2
	SCCB3	SpecLo			Ignore																	SCCB3
	SM10B	SpecLo		-1	Vertex	73.132110	170.856678	-457.998533	0.965926	0.000000	-0.258819	66.398573	170.856678	-456.194287	0.000000	1.000000	0.000000	66.398573	158.906272	-456.194287	90	SM10B
	SBS2	SpecLo			Ignore																	SBS2
	SM11B	SpecLo		-1	Vertex	91.509169	170.856678	-620.588533	0.984808	0.000000	0.173648	84.644005	170.856678	-621.799047	0.005424	0.999512	-0.030762	84.579185	158.912104	-621.431431	90	SM11B
SM12B	SpecLo		-1	Vertex	182.672823	170.856678	-636.663145	-0.696364	0.707107	0.122788	187.527227	165.927387	-637.519107	0.696364	0.707107	-0.122788	179.205392	157.477174	-636.051743	90	SM12B	
SLW	SpecLo			Det																	SLW	
SM8B	SpecLo		-1	Vertex	72.751059	170.856678	-234.578533	0.984808	0.000000	-0.173648	79.616223	170.856678	-235.789047	0.018814	0.994113	0.106700	79.391386	158.976622	-237.064159	90	SM8B	

Axe

Axis directions:

SPIRE	SYNO	LOCAL	Directions
X	-Zsyno	Norm	Tow. tel
Y	Xsyno	Sag	Tow. Spectro
Z	Ysyno	Tang	Tow. PAX



NB: All dimensions are for operational conditions (4K)

SystemPart	CompName Dummy	System Phot	ThMirr	DowlDir	Flag Ignore	Xmirr	Ymirr	Zmirr	Xnorm	Ynorm	Znorm	Xspig	Yspig	Zspig	Xsag	Ysag	Zsag	Xdowl	Ydowl	Zdowl	Check	CompName Dummy
Telescope	M1 M2	Phot Phot			Ignore Ignore																	M1 M2
Common optics	CFP CM3 CM4 CM5	Phot Phot Phot Phot	Thick	1	Hole M3Cent Ignore M5Cent	29.842009	-19.500476	145.000210	0.923152	0.051240	-0.381006	16.051964	-20.265898	150.691682	-0.052142	0.998608	0.007963	15.428851	-8.332128	150.786845	90	CFP CM3 CM4 CM5
Mirror thickness Thick Thin	-14.9380073 -6.97107006					0.687534	19.499867	-1.499950	0.997531	-0.070038	0.005091	-14.213596	20.546097	-1.575997	0.069930	0.997372	0.018928	-13.377900	32.465101	-1.349798	90	
Photometer optics	PM6 PM7 PM8 PCS PM9	Phot Phot Phot Phot Phot	Thick	1	Vertex Vertex Vertex Hole Vertex	0.000000	0.000000	0.000000	1.000000	0.000000	0.000000	-6.971070	0.000000	0.000000	0.000000	1.000000	0.000000	-6.971070	11.950406	0.000000	90	PM6 PM7 PM8 PCS PM9
Dowl separation DowlSep	11.95040582					0.000000	0.000000	0.000000	1.000000	0.000000	0.000000	-14.938007	0.000000	0.000000	0.000000	1.000000	0.000000	-14.938007	11.950406	0.000000	90	
Short wave	PDIC1 PM10 PSW	Phot Phot Phot		-1	Ignore Vertex Det	0.000000	0.000000	0.000000	1.000000	0.000000	0.000000	-6.971070	0.000000	0.000000	0.000000	1.000000	0.000000	-6.971070	-11.950406	0.000000	90	PDIC1 PM10 PSW
Medium wave	PDIC1 PDIC2 PMW	Phot Phot Phot			Ignore Ignore Det																	PDIC1 PDIC2 PMW
Long wave	PM11 PLW	Phot Phot		1	Vertex Det	0.000000	0.000000	0.000000	1.000000	0.000000	0.000000	-6.971070	0.000000	0.000000	0.000000	1.000000	0.000000	-6.971070	11.950406	0.000000	90	PM11 PLW
Spectrometer optics	SM6 SCS SM7 SM8A	SpecUp SpecUp SpecUp SpecUp		1	Ignore Hole	0.000000	0.000000	0.000000	1.000000	0.000000	0.000000	-6.971070	0.000000	0.000000	0.000000	1.000000	0.000000	-6.971070	11.950406	0.000000	90	SM6 SCS SM7 SM8A
Upper arm	SBS1 SM9A SCCA1 SCCA2 SCCA3 SM10A SBS2 SM11A SM12A SSW	SpecUp SpecUp SpecUp SpecUp SpecUp SpecUp SpecUp SpecUp SpecUp SpecUp SpecUp		-1	Hole Ignore Ignore Ignore Hole Hole Hole Hole Det	0.000000	0.000000	0.000000	1.000000	0.000000	0.000000	-6.971070	0.000000	0.000000	0.000000	1.000000	0.000000	-6.971070	-11.950406	0.000000	90	SBS1 SM9A SCCA1 SCCA2 SCCA3 SM10A SBS2 SM11A SM12A SSW
Lower arm	SM8A SBS1 SM9B SCCB1 SCCB2 SCCB3 SM10B SBS2 SM11B SM12B SLW	SpecLo SpecLo SpecLo SpecLo SpecLo SpecLo SpecLo SpecLo SpecLo SpecLo SpecLo		-1	Hole Hole Ignore Ignore Ignore Hole Hole Hole Hole Det	0.000000	0.000000	0.000000	1.000000	0.000000	0.000000	-6.971070	0.000000	0.000000	0.000000	1.000000	0.000000	-6.971070	-11.950406	0.000000	90	SM8A SBS1 SM9B SCCB1 SCCB2 SCCB3 SM10B SBS2 SM11B SM12B SLW
Ref Arm	SM8B	SpecLo		-1	Det	0.000000	0.000000	0.000000	1.000000	0.000000	0.000000	-6.971070	0.000000	0.000000	0.000000	1.000000	0.000000	-6.971070	-11.950406	0.000000	90	SM8B

Axe
Local

Axis directions:
 X -Zsyno Tow. tel Directions
 Y Xsyno Tow. Spectro Tow. tel
 Z Ysyno Tow. PAX Tow. Spectro
 Tow. PAX

SPiRE
 X -Zsyno Norm
 Y Xsyno Sag
 Z Ysyno Tang

LeftHandCorr -1
 NormDirCorr -1

ID	SystemPart	CompName	Flag	XM3Cent	YM3Cent	ZM3Cent	Xdiff	Ydiff	Zdiff	DiffMod	Xray	Yray	Zray	dXray	dYray	dZray	drayMod	Xnorm	Ynorm	Znorm	Theta	1-cos(theta)	Xsag	Ysag	Zsag	normDOTsag		
Ray	(BOLPHT154C)	Telescope	M1	1252.6255	11.4279	55.8034	-1999.5365	-1.3315	-6.5020	1999.547	-0.99999	-0.00067	-0.00325	1.999351383	-0.006528	-0.031877	1.999616	0.999868	-0.003265	-0.015942	#VALEUR!	5.3E-06	#VALEUR!	#VALEUR!	#VALEUR!	#VALEUR!		
			M2	2840.1310	0.0000	0.0000	1587.5055	-11.4279	-55.8034	1588.527	0.999357	-0.00719	-0.03513	-1.99871378	2.17E-10	1.64E-10	1.9998714	-1	1.09E-10	8.2E-11	#VALEUR!	0.0E+00	#VALEUR!	#VALEUR!	#VALEUR!	#VALEUR!		
Ray	M3Cent	Common optics	CFP	Hole	230.6808	-18.7846	-91.7265	-2609.4502	-18.7846	-91.7265	2611.129	-0.99936	-0.00719	-0.03513														
			CM3		131.2298	-19.5005	-95.2223	-99.4510	-0.7159	-3.4959	99.51498	-0.99936	-0.00719	-0.03513	1.865488011	0.098535	-0.456271	1.923002	0.970091	0.05124	-0.23727	3.024	1.4E-03	-0.053	0.999	0.000	90.000	
			CM4		316.1172	-0.0026	-200.1183	184.8874	19.4979	-104.8959	213.4635	0.866131	0.09134	-0.4914	-1.85590195	6.12E-10	0.600993	1.950786	-0.951361	3.14E-10	0.308077	0.000	0.0E+00	0.000	1.000	0.000	90.000	
			CM5		120.7179	18.0297	-178.4826	-195.3993	18.0323	21.6357	197.4187	-0.98977	0.09134	0.109593	1.899207903	-0.127849	-0.523829	1.974268	0.961981	-0.064758	-0.265328	-3.851	2.3E-03	0.067	0.998	0.000	90.000	
			Photometer optics	PM6		296.4855	10.9737	-258.5423	175.7676	-7.0560	-80.0597	193.2708	0.909437	-0.03651	-0.41424	-1.90477568	0.059001	0.320453	1.932445	-0.985682	0.030532	0.165828	-1.774	4.8E-04	0.031	1.000	0.000	90.000
				PM7		95.2127	15.5219	-277.5065	-201.2729	4.5482	-18.9643	202.2155	-0.99534	0.022492	-0.09378	1.765649782	-0.086767	-0.540638	1.848604	0.955126	-0.046936	-0.292457	-2.813	1.2E-03	0.049	0.999	0.000	90.000
				PM8		240.4503	3.4032	-397.1228	145.2376	-12.1187	-119.6163	188.5441	0.770311	-0.06427	-0.63442	-1.44594073	0.01721	-0.101317	1.449588	-0.997484	0.011872	-0.069894	-0.682	7.1E-05	0.012	1.000	0.000	90.000
				PCS	Hole	192.8564	0.0878	-448.9510	-47.5939	-3.3154	-51.8282	70.44383	-0.67563	-0.04706	-0.73574													
				PM9		104.8114	-6.0455	-544.8290	-88.0450	-6.1333	-95.8780	130.3155	-0.67563	-0.04706	-0.73574	1.667834876	0.032335	0.859478	1.876545	0.88878	0.017231	0.458011	1.111	1.9E-04	-0.019	1.000	0.000	90.000
			Short wave	PDIC1		238.7332	-8.0337	-528.1273	133.9219	-1.9882	16.7017	134.974	0.992205	-0.01473	0.12374	-1.72099429	-2.65E-11	-0.80832	1.901369	-0.905134	-1.4E-11	-0.425125	0.000	0.0E+00	0.000	1.000	0.000	90.000
				PM10		133.0902	-10.1690	-627.3619	-105.6430	-2.1352	-99.2346	144.9569	-0.72879	-0.01473	-0.68458	0.718638501	-0.985161	0.67387	1.393228	0.515808	-0.707107	0.483675	0.000	0.0E+00	0.516	0.707	0.484	90.000
				PSW	Det	132.6859	-50.0000	-627.7885	-0.4043	-39.8310	-0.4266	39.83539	-0.01015	-0.99989	-0.01071													
				PDIC1	Ignore	238.7332	-8.0337	-528.1273																				
			Medium wave	PDIC2		342.1664	-9.5693	-515.2279	103.4332	-1.5356	12.8994	104.2458	0.992205	-0.01473	0.12374	-1.61860858	-0.760699	-0.20329	1.799968	-0.899243	-0.422618	-0.112941	0.000	0.0E+00	-0.419	0.906	-0.053	90.000
				PMW	Det	291.7118	-72.0274	-521.6353	-50.4546	-62.4582	-6.4074	80.54655	-0.6264	-0.77543	-0.07955													
		PDIC2	Ignore	342.1664	-9.5693	-515.2279																						
	Long wave	PM11		380.4720	-10.1379	-510.4507	38.3056	-0.5687	4.7772	38.6065	0.992205	-0.01473	0.12374	-0.99305026	-3.03E-09	0.876151	1.324307	-0.749864	-2.29E-09	0.661592	0.000	0.0E+00	0.000	1.000	0.000	90.000		
		PLW	Det	380.4366	-10.7557	-468.5152	-0.0354	-0.6178	41.9355	41.94005	-0.00084	-0.01473	0.999891															

Axis directions:
 X -Zsyno Tow. tel
 Y Xsyno Tow. Spectro
 Z Ysyno Tow. PAX

ID	SystemPart	CompName	Flag	XM5Cent	YM5Cent	ZM5Cent	Xdiff	Ydiff	Zdiff	DiffMod	Xray	Yray	Zray	dXray	dYray	dZray	drayMod	Xnorm	Ynorm	Znorm	Theta	1-cos(theta)	Xsag	Ysag	Zsag	normDOTsag	
Ray	Telescope	M1		1252.6005	12.3755	54.0055	-1999.5615	-1.4420	-6.2928	1999.572	-0.99999	-0.00072	-0.00315	1.999386328	-0.00707	-0.030851	1.999637	0.999875	-0.003535	-0.015428	#VALEUR!	6.3E-06	#VALEUR!	#VALEUR!	#VALEUR!	#VALEUR!	
		M2		2840.1310	0.0000	0.0000	1587.5305	-12.3755	-54.0055	1588.497	0.999392	-0.00779	-0.034	-1.99878308	1.49E-10	2.53E-10	1.998783	-1	7.43E-11	1.26E-10	#VALEUR!	0.0E+00	#VALEUR!	#VALEUR!	#VALEUR!	#VALEUR!	
	MSCent	Common optics	CFP	Hole	229.0220	-20.3548	-88.8262	-2611.1090	-20.3548	-88.8262	2612.699	-0.99939	-0.00779	-0.034	1.857648356	0.106277	-0.469684	1.919051	0.968004	0.05538	-0.244748	3.274	1.6E-03	-0.057	0.998	0.000	90.000
			CM3		132.0890	-21.1104	-92.1237	-96.9330	-0.7556	-3.2975	96.99197	-0.99939	-0.00779	-0.034	-1.84884772	5.11E-10	0.598708	1.943371	-0.951361	2.63E-10	0.308077	0.000	0.0E+00	0.000	1.000	0.000	90.000
			CM4		316.1157	0.0070	-200.1227	184.0267	21.1174	-107.9991	214.4192	0.858257	0.098487	-0.50368	1.902079502	-0.138163	-0.504434	1.972676	0.964213	-0.070038	-0.25571	-4.155	2.6E-03	0.072	0.997	0.000	90.000
			CM5		120.0547	19.4999	-181.3148	-196.0611	19.4928	18.8080	197.9234	-0.99059	0.098487	0.095026	1.902079502	-0.138163	-0.504434	1.972676	0.964213	-0.070038	-0.25571	-4.155	2.6E-03	0.072	0.997	0.000	90.000
		Photometer optics	PM6		296.2011	11.8325	-260.4333	176.1464	-7.6674	-79.1185	193.2514	0.911489	-0.03968	-0.40941	-1.906096	0.063602	0.308493	1.931946	-0.98662	0.032921	0.15968	-1.911	5.6E-04	0.033	0.999	0.000	90.000
			PM7		94.2458	16.6906	-280.9240	-201.9553	4.8581	-20.4906	203.0502	-0.99461	0.023926	-0.10091	1.773580729	-0.093433	-0.522279	1.851241	0.95805	-0.05047	-0.282124	-3.016	1.4E-03	0.053	0.999	0.000	90.000
			PM8		240.5116	3.6394	-397.9392	146.2658	-13.0512	-117.0153	187.7674	0.778973	-0.06951	-0.62319	-1.46079525	0.018597	-0.106552	1.464794	-0.99727	0.012696	-0.072742	-0.729	8.1E-05	0.013	1.000	0.000	90.000
			PCS	Hole	192.8529	0.0808	-448.9477	-47.6587	-3.5586	-51.0085	69.89909	-0.68182	-0.05091	-0.72974	1.673781117	0.035008	0.8553	1.879975	0.890321	0.018622	0.454953	1.198	2.2E-04	-0.021	1.000	0.000	90.000
			PM9		104.2706	-6.5334	-543.7561	-88.5822	-6.6142	-94.8083	129.9199	-0.68182	-0.05091	-0.72974	1.673781117	0.035008	0.8553	1.879975	0.890321	0.018622	0.454953	1.198	2.2E-04	-0.021	1.000	0.000	90.000
		Short wave	PDIC1		238.1168	-8.6790	-526.8148	133.8462	-2.1457	16.9413	134.9311	0.991959	-0.0159	0.125555	-1.72198781	2.65E-09	-0.808787	1.902466	-0.905134	1.39E-09	-0.425125	0.000	0.0E+00	0.000	1.000	0.000	90.000
			PM10		131.3549	-11.0046	-626.7329	-106.7619	-2.3255	-99.9181	146.2434	-0.73003	-0.0159	-0.68323	0.717777063	-0.983971	0.673056	1.391545	0.515808	-0.707107	0.483675	0.000	1.1E-16	0.516	0.707	0.484	90.000
			PSW	Det	130.8768	-50.0000	-627.1297	-0.4781	-38.9954	-0.3968	39.00035	-0.01226	-0.99987	-0.01018													
			PDIC1	Ignore	238.1168	-8.6790	-526.8148																				
		Medium wave	PDIC2		342.3318	-10.3497	-513.6240	104.2150	-1.6707	13.1908	105.0598	0.991959	-0.0159	0.125555	-1.61768862	-0.760267	-0.203174	1.798945	-0.899243	-0.422618	-0.112941	0.000	0.0E+00	-0.419	0.906	-0.053	90.000
			PMW	Det	292.1583	-72.5860	-519.8478	-50.1735	-62.2363	-6.2238	80.18403	-0.62573	-0.77617	-0.07762													
			PDIC2	Ignore	342.3318	-10.3497	-513.6240																				
		Long wave	PM11		382.1150	-10.9875	-508.5885	39.7833	-0.6378	5.0355	40.10574	0.991959	-0.0159	0.125555	-0.99097262	1.56E-08	0.874318	1.321536	-0.749864	1.18E-08	0.661592	0.000	0.0E+00	0.000	1.000	0.000	90.000
			PLW	Det	382.1546	-11.6248	-468.5153	0.0395	-0.6373	40.0732	40.0783	0.000987	-0.0159	0.999873													

Axis directions:
 X -Zsyno Tow. tel
 Y Xsyno Tow. Spectro
 Z Ysyno Tow. PAX

 --- ID?
 The current lens ID is: ID SPIRE PHOT (BOLPHT155)

--- TIME
 11-MAY-01 14:39:00

 --- 'GRAY 2 2 0 0 0 SURF 0 Z1 0 Z1
 'GRAY SPEC GLOB 0 Z1

ID SPIRE PHOT (BOLPHT155) 247 11-MAY-01 14:39:00
 LENS SPECIFICATIONS:

SYSTEM SPECIFICATIONS

OBJECT	DISTANCE	(TH0)	INFINITE	FOCAL	LENGTH	(FOCL)	18375.2607
OBJECT	HEIGHT	(YPP0)	INFINITE	BACK	FOCAL	LENGTH	16.8202
MARG	RAY	HEIGHT	(YMP1)	1641.705	IMAGE	DISTANCE	(BACK) 0
MARG	RAY	ANGLE	(UMP0)	0	CELL	LENGTH	(TOTL) 888.1
CHIEF	RAY	HEIGHT	(YPP1)	-4.99	F/NUMBER	(FNUM)	5.5964
CHIEF	RAY	ANGLE	(UPP0)	0.0167	GAUSSIAN	IMAGE	HT(GIHT) 5.2322
ENTR	PUPIL	SEMI-APERT	1641.705	EXIT	PUPIL	SEMI-APERT	71.0326
ENTR	PUPIL	LOCATION	17154.0876	EXIT	PUPIL	LOCATION	-778.2332
X-OBJECT	HEIGHT	(XPP0)	INFINITE				
X-MARG	RAY	HEIGHT	(XMP1)	1641.705	X-CHIEF	RAY	HT (XPP1) -4.99
X-MARG	RAY	ANGLE	(VMP0)	0	X-CHIEF	RAY	ANGLE(VPP) 0.0167

WAVL	(uM)	200	400	600	250	0.6328
WEIGHTS		1	1	1	1	1
COLOR	ORDER	2	1	3	4	5
UNITS	MM					
APERTURE	STOP	SURFACE	(APS)	7	SEMI-APERT	154.97064
REAL	PUPIL	OPTION	ON			
FOCAL	MODE	ON				
MAGNIFICA	-1.80E-08					
GLOBAL	OPTION	ON				
VIGNETTINC	OPTION	(VIG)	OFF			
POLARIZATI	AND	COATINGS	ARE	IGNORED.		

SURFACE DATA

SURF	RADIUS	THICKNESS	MEDIUM	INDEX	V-NUMBER
	0	INFINITE	AIR		
	1	INFINITE	17771.1 AIR		
2A		INFINITE	0 AIR		
	3	INFINITE	-17771.1 AIR		
	4	INFINITE	-2000 AIR		
	5	INFINITE	2000.00000P AIR		
	6	-3500 O	-1587.998 #NOM?		
APS		-345.2 O	1587.99800P AIR		
	8	INFINITE	1050 AIR		
	9	-167.171	0 AIR		
10A		INFINITE	70.9 AIR		
11A		-365.963 O	0 #NOM?		
12A		INFINITE	-213.5 #NOM?		
13A		INFINITE	0 #NOM?		
	14	INFINITE	0.00000P AIR		
	15	INFINITE	0 AIR		
16A		INFINITE	197.4 AIR		
17A		-294.638 O	0 #NOM?		
18A		INFINITE	-193.6 #NOM?		
19A		INFINITE	0 #NOM?		
20A		-307.49 O	0 AIR		
21A		INFINITE	202.9 AIR		
22A		-330.7	0 #NOM?		
23A		INFINITE	-188 #NOM?		
24A		-286.651	0 AIR		
25A		INFINITE	70 AIR		
26A		INFINITE	130 AIR		
27A		-350.851	0 #NOM?		
28A		INFINITE	-320 #NOM?		
29A		INFINITE	0 #NOM?		
30A		INFINITE	185 #NOM?		
31A		INFINITE	0 AIR		
32A		INFINITE	0 AIR		
33A		INFINITE	0 AIR		
	34	INFINITE	0 AIR		
35A		INFINITE	135 AIR		
36A		INFINITE	0 #NOM?		
37A		INFINITE	-50.00000P #NOM?		
	38	INFINITE	0 #NOM?		
39A		INFINITE	0 #NOM?		
40A		INFINITE	0 #NOM?		
	41	INFINITE	50.00000P #NOM?		
42A		INFINITE	0 AIR		
43A		INFINITE	-135.00000P AIR		
44A		INFINITE	0 #NOM?		
45A		INFINITE	-100 #NOM?		
46A		INFINITE	0 AIR		
47A		INFINITE	0 AIR		
48A		INFINITE	0 AIR		
	49	INFINITE	0 AIR		
50A		INFINITE	85.00000P AIR		
	51	INFINITE	0 AIR		
52A		INFINITE	0 AIR		
53A		INFINITE	0 AIR		
	54	INFINITE	-85.00000P AIR		
55A		INFINITE	0 #NOM?		
56A		INFINITE	-44 #NOM?		
57A		INFINITE	0 AIR		
58A		INFINITE	41.00000P AIR		
	59	INFINITE	0 AIR		
60A		INFINITE	0 AIR		

61A INFINITE 0 AIR
 62 INFINITE 0 AIR
 IMG INFINITE

KEY TO SYMBOLS

A SURFACE HAS TILTS AND DECENTERS B TAG ON SURFACE
 G SURFACE IS IN GLOBAL COORDINATL SURFACE IS LOCAL COORDINATES
 O SPECIAL SURFACE TYPE P ITEM IS SUBJECT TO PICKUP
 S ITEM IS SUBJECT TO SOLVE

SPECIAL SURFACE DATA

SURFACE NO. 6 -- CONIC SURFACE
 CONIC CONSTANT (CC) -1
 SEMI-MAJOFAXIS (b) -3.50E+13 SEMI-MINOFAXIS (a) 3.50E+08

SURFACE NO. 7 -- CONIC SURFACE
 CONIC CONSTANT (CC) -1.279
 SEMI-MAJOFAXIS (b) 1237.275986 SEMI-MINOFAXIS (a) -653.534751

SURFACE NO. 11 -- CONIC SURFACE
 CONIC CONSTANT (CC) -0.5095
 SEMI-MAJOFAXIS (b) -746.101937 SEMI-MINOFAXIS (a) 522.537753

SURFACE NO. 17 -- TORIC SURFACE
 RX -278.418

SURFACE NO. 20 -- TORIC SURFACE
 RX -359.42

TILT AND DECENTER DATA
 LEFT-HAND COORDINATES

SURF	TYPE	X	Y	Z	ALPHA	BETA	GAMMA
2	REL	0	0	0	0.1829	0	0
10	REL	0	-91.048	0	-1.9766	0	0
11	REL	0	-149.224	12.676	-6.7066	0	0
12	REL	0	0	0	31.93	0	0
13	REL	0	0	0	-12.01	0	0
16	REL	0	0	0	-24.02	0	0
17	REL	0	0	0	9.212	0	0
18	REL	0	0	0	18.424	0	0
19	REL	0	0	0	-32.897	0	0
20	REL	0	0	0	-15	0	0
21	REL	0	0	0	-30	0	0
22	REL	0	0	0	22.29	0	0
23	REL	0	0	0	44.58	0	0
24	REL	0	0	0	-43.048	0	0
25	REL	0	0	0	-86.096	0	0
26	REL	0	0	0	0	0	0
27	REL	0	0	0	20	0	0
28	REL	0	0	0	40	0	0
29	REL	0	0	0	0	0	0
30	REL	0	0	0	0	0	0
31	REL	0	0	0	-18	0	0
32	REL	0	0	-5	0	0	0
33	REL	0	0	5	0	0	0
35	REL	0	0	0	-36	0	0
36	REL	0	0	0	0	-45	0
37	REL	0	0	0	0	-90	0
39	REL	0	0	15.86	0	0	0
40	REL	0	0	5	0	0	0
42	REL	0	0	0	0	45	0
43	REL	0	0	0	0	90	0
44	REL	0	0	0	18	0	0
45	REL	0	0	0	36	0	0
46	REL	0	0	0	0	25	0
47	REL	0	0	-5	0	0	0
48	REL	0	0	5	0	0	0
50	REL	0	0	0	0	50	0
52	REL	0	0	-8.5	0	0	0
53	REL	0	0	-5	0	0	0
55	REL	0	0	0	0	-25	0
56	REL	0	0	0	0	-50	0
57	REL	0	0	0	48.58	0	0
58	REL	0	0	0	97.16	0	0
60	REL	0	0	-8.99	0	0	0
61	REL	0	0	-5	0	0	0

KEY TO SURFACE TYPES

GLB GLOBAL COORDINAT LOC LOCAL COORDINATES
 REL RELATIVE COORDINAT REM REMOTE TILTS IN RELATIVE COORD.

SURF MESSAGES

12	UNDO	TILTS/DECE/OF	SURFACE	NO.	11
16	UNDO	TILTS/DECE/OF	SURFACE	NO.	13
18	UNDO	TILTS/DECE/OF	SURFACE	NO.	17
20	UNDO	TILTS/DECE/OF	SURFACE	NO.	19
21	UNDO	TILTS/DECE/OF	SURFACE	NO.	20
23	UNDO	TILTS/DECE/OF	SURFACE	NO.	22
25	UNDO	TILTS/DECE/OF	SURFACE	NO.	24
27	UNDO	TILTS/DECE/OF	SURFACE	NO.	26
28	UNDO	TILTS/DECE/OF	SURFACE	NO.	27
30	UNDO	TILTS/DECE/OF	SURFACE	NO.	29
31	UNDO	TILTS/DECE/OF	SURFACE	NO.	30
33	UNDO	TILTS/DECE/OF	SURFACE	NO.	32
34	UNDO	TILTS/DECE/OF	SURFACE	NO.	33
35	UNDO	TILTS/DECE/OF	SURFACE	NO.	31

37	UNDO	TILTS/DECE/OF	SURFACE	NO.	36
41	UNDO	TILTS/DECE/OF	SURFACE	NO.	40
42	UNDO	TILTS/DECE/OF	SURFACE	NO.	39
42	TILTS/DECE/PICKUP	FROM	SURFACE	NO.	-36
43	UNDO	TILTS/DECE/OF	SURFACE	NO.	42
43	TILTS/DECE/PICKUP	FROM	SURFACE	NO.	-37
44	TILTS/DECE/PICKUP	FROM	SURFACE	NO.	-31
45	UNDO	TILTS/DECE/OF	SURFACE	NO.	44
45	TILTS/DECE/PICKUP	FROM	SURFACE	NO.	-35
48	UNDO	TILTS/DECE/OF	SURFACE	NO.	47
49	UNDO	TILTS/DECE/OF	SURFACE	NO.	48
50	UNDO	TILTS/DECE/OF	SURFACE	NO.	46
54	UNDO	TILTS/DECE/OF	SURFACE	NO.	53
55	UNDO	TILTS/DECE/OF	SURFACE	NO.	52
55	TILTS/DECE/PICKUP	FROM	SURFACE	NO.	-46
56	UNDO	TILTS/DECE/OF	SURFACE	NO.	55
56	TILTS/DECE/PICKUP	FROM	SURFACE	NO.	-50
58	UNDO	TILTS/DECE/OF	SURFACE	NO.	57
62	UNDO	TILTS/DECE/OF	SURFACE	NO.	61
63	UNDO	TILTS/DECE/OF	SURFACE	NO.	60

GLOBAL COORDINATDATA

GLOBAL COORDINAT SURFACE LOCATION IN COORDINAT SYSTEM OF SURFACE 9

SURF	X	Y	Z	NOTES	ALPHA	BETA	GAMMA
	1	0	56.739172	-1049.90942	-0.18293	0	0
	2	0	0	1.67E+04	0	0	0
	3	0	0	1.67E+04	0	0	0
	4	0	0	-1050	0	0	0
	5	0	0	-3050	0	0	0
	6	0	0	-1050	0	0	0
APS	8	0	0	-2637.998	0	0	0
	9	0	0	-1050	0	0	0
	10	0	-91.048	0	-1.9766	0	0
	11	0	-243.065859	78.379337	-8.6832	0	0
	12	0	-93.493436	70.857814	29.9534	0	0
	13	0	-200.09302	-114.125371	17.9434	0	0
	14	0	-200.09302	-114.125371	17.9434	0	0
	15	0	-200.09302	-114.125371	17.9434	0	0
	16	0	-200.09302	-114.125371	5.9334	0	0
	17	0	-179.687314	82.217104	15.1454	0	0
	18	0	-179.687314	82.217104	24.3574	0	0
	19	0	-259.533222	-94.150668	-8.5396	0	0
	20	0	-259.533222	-94.150668	9.3574	0	0
	21	0	-259.533222	-94.150668	-5.6426	0	0
	22	0	-279.482925	107.766194	16.6474	0	0
	23	0	-279.482925	107.766194	38.9374	0	0
	24	0	-397.635459	-38.466424	-4.1106	0	0
	25	0	-397.635459	-38.466424	-47.1586	0	0
	26	0	-448.96217	9.131566	-47.1586	0	0
	27	0	-544.283205	97.527835	-27.1586	0	0
	28	0	-544.283205	97.527835	-7.1586	0	0
	29	0	-504.405979	-219.977766	-7.1586	0	0
	30	0	-504.405979	-219.977766	-7.1586	0	0
	31	0	-527.460001	-36.419841	-25.1586	0	0
	32	0	-525.334374	-40.945513	-25.1586	0	0
	33	0	-529.585628	-31.894168	-25.1586	0	0
	34	0	-527.460001	-36.419841	-25.1586	0	0
	35	0	-527.460001	-36.419841	-43.1586	0	0
	36	1.82E-14	-619.802728	62.057673	-43.1586	-45	0
	37	-3.85E-15	-619.802728	62.057673	0	-90	0
	38	-50	-619.802728	62.057673	0	-90	0
	39	-34.14	-619.802728	62.057673	0	-90	0
	40	-29.14	-619.802728	62.057673	0	-90	0
	41	-34.14	-619.802728	62.057673	0	-90	0
	42	1.82E-14	-619.802728	62.057673	-43.1586	-45	0
	43	-3.44E-15	-619.802728	62.057673	-43.1586	0	0
	44	2.02E-15	-527.460001	-36.419841	-25.1586	0	0
	45	2.02E-15	-527.460001	-36.419841	-7.1586	0	0
	46	7.15E-15	-514.998367	-135.640341	-7.1586	25	0
	47	2.113091	-514.433664	-140.136557	-7.1586	25	0
	48	-2.113091	-515.563071	-131.144126	-7.1586	25	0
	49	7.15E-15	-514.998367	-135.640341	-7.1586	25	0
	50	0	-514.998367	-135.640341	-7.1586	50	0
	51	-65.113778	-521.807023	-81.429289	-7.1586	50	0
	52	-58.6024	-521.126158	-86.850394	-7.1586	50	0
	53	-54.772178	-520.725649	-90.03928	-7.1586	50	0
	54	-58.6024	-521.126158	-86.850394	-7.1586	50	0
	55	-7.15E-15	-514.998367	-135.640341	-7.1586	25	0
	56	-7.91E-15	-514.998367	-135.640341	-7.1586	0	0
	57	-1.28E-14	-509.515249	-179.297361	41.4214	0	0
	58	-1.28E-14	-509.515249	-179.297361	90.0014	0	0
	59	-1.34E-14	-468.515249	-179.298363	90.0014	0	0
	60	-1.33E-14	-477.505249	-179.298143	90.0014	0	0
	61	-1.32E-14	-482.505249	-179.298021	90.0014	0	0
	62	-1.33E-14	-477.505249	-179.298143	90.0014	0	0
	63	-1.34E-14	-468.515249	-179.298363	90.0014	0	0

Unless noted, Euler angles are taken in the order alpha, beta, gamma

 --- POF C

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--- ID?
The current lens ID is: ID SPIRE SPECTRO (BOLSP501G)
---
--- TIME
21-mars-01 12:18:54
---
---
!GRAY !GRAY 2 0 0 0 SURF 0 Z1
!GRAY RAY 2 0 0 0 SURF 0 Z1
---
SPEC GLOB Z1

ID SPIRE SPECTRO (BOLSP501G) 243 21-mars-01 12:18:54
LENS SPECIFICATIONS:

SYSTEM SPECIFICATIONS
-----
OBJECT DISTANCE (TH0) INFINITE FOCAL LENGTH (FOCL) 45846.389
OBJECT HEIGHT (YPP0) INFINITE BACK FOCAL LENGTH 133.6632
MARG RAY HEIGHT (YMP1) 1641.705 IMAGE DISTANCE (BACK) 0
MARG RAY ANGLE (UMP0) 0 CELL LENGTH (TOTL) 1154.012
CHIEF RAY HEIGHT (YPP1) -4.989 F/NUMBER (FNUM) 13.963
CHIEF RAY ANGLE (UPP0) 0.0167 GAUSSIAN IMAGE HT(GIHT) 5.6669
ENTR PUPIL SEMI-APERT 1641.705 EXIT PUPIL SEMI-APERT 8.3211
ENTR PUPIL LOCATION 17150.7042 EXIT PUPIL LOCATION -98.741

X-OBJECT HEIGHT (XPP0) INFINITE
X-MARG RAY HEIGHT (XMP1) 1641.705 X-CHIEF RAY HT (XPP1) -4.989
X-MARG RAY ANGLE (VMP0) 0 X-CHIEF RAY ANGLE(VPP0) 0.0167

WAVL (uM) 200 400 600 250 0.6328
WEIGHTS 1 1 1 1 1
COLOR ORDER 2 1 3 4 5
UNITS MM
APERTURE STOP SURFACE (APS) 7 SEMI-APERT 155.17235
REAL PUPIL OPTION ON
NONSEQUENRAYTRACE ON
FOCAL MODE ON
MAGNIFICA1 -1.95E-08
GLOBAL OPTION ON
VIGNETTINGOPTION (VIG) OFF
POLARIZATION COATINGS ARE IGNORED.

SURFACE DATA
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SURF RADIUS THICKNESS MEDIUM INDEX V-NUMBER
-----
0 INFINITE INFINITE AIR
1 INFINITE 17771.1 AIR
2A INFINITE 0 AIR
3A INFINITE -17771.1 AIR
4 INFINITE -2000 AIR
5 INFINITE 2000.00000P AIR
6 -3500 O -1587.969 #NOM?
APS -345.264 O 1587.96900P AIR
8 INFINITE 1050.162 AIR
9 -167.171 0 AIR
10A INFINITE 70.9 AIR
11A -365.963 O 0 #NOM?
12A INFINITE -213.5 #NOM?
13A INFINITE 0 #NOM?
14 INFINITE 0.00000P AIR
15 INFINITE 0 AIR
16A INFINITE 197.4 AIR
17A -294.638 O 0 #NOM?
18A INFINITE -193.6 #NOM?
19A INFINITE -10 #NOM?
20A INFINITE 0 #NOM?
21A INFINITE 0 #NOM?
22 L 269.92 O 1.97E-13 AIR
23 INFINITE 0 AIR
24A INFINITE 112.57 AIR
25 INFINITE 0 AIR
26 L INFINITE 7.11E-15 AIR
27 INFINITE 30.43 AIR
28A INFINITE 0 AIR
29 INFINITE 0 AIR
30 L INFINITE -1.27E-13 #NOM?
31 INFINITE 0 #NOM?
32A INFINITE 0 #NOM?
33A INFINITE 0 #NOM?
34A INFINITE -57 #NOM?
35A INFINITE 0 #NOM?
36A 230.34 O 0 AIR
37 INFINITE 0 AIR
38A INFINITE 173.64 AIR
39A INFINITE 0 #NOM?
40A INFINITE -40 #NOM?
41 INFINITE 0 #NOM?
42 INFINITE -133.2 #NOM?
43A 259.5 0 AIR
44A INFINITE 150 AIR
45 INFINITE -25 AIR
46A INFINITE 0 #NOM?
47A INFINITE -25.00000P #NOM?
48 INFINITE 0 #NOM?
49 INFINITE -25.00000P #NOM?
50A INFINITE 0 #NOM?
51A INFINITE 0 AIR
52 INFINITE 0 #NOM?
53A INFINITE 0 AIR
54A INFINITE -25.00000P AIR
55 INFINITE 150.00000P AIR
56A -260 0 #NOM?
57A INFINITE -133.20000P #NOM?
58 INFINITE 0 #NOM?
59 INFINITE -40.00000P #NOM?
60A INFINITEP 0 AIR

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61A INFINITE 151.98 AIR
 62A INFINITE 0 AIR
 63A -196.99 O 0 #NOM?
 64 INFINITE 0 #NOM?
 65A INFINITE -60 #NOM?
 66 INFINITE -32.57 #NOM?
 67A INFINITE 0 AIR
 68A INFINITE 80 AIR
 69 INFINITE 0 AIR
 IMG INFINITE

KEY TO SYMBOLS

A SURFACE HAS TILTS AND DECENTERS B TAG ON SURFACE IN PICKUP LOCAL COORDINATES
 G SURFACE IS IN GLOBAL COORDINAT L SURFACE IS TO
 O SPECIAL SURFACE TYPE P ITEM IS SUBJECT TO
 S ITEM IS SUBJECT TO SOLVE

SPECIAL SURFACE DATA

SURFACE NO. 6 -- CONIC SURFACE
 CONIC CONSTANT (CC) -1.00129
 SEMI-MAJORAXIS (b) 2.71E+06 SEMI-MINORAXIS (a) -97448.0619

SURFACE NO. 7 -- CONIC SURFACE
 CONIC CONSTANT (CC) -1.296
 SEMI-MAJORAXIS (b) 1166.432433 SEMI-MINORAXIS (a) -634.607853

SURFACE NO. 11 -- CONIC SURFACE
 CONIC CONSTANT (CC) -0.5095
 SEMI-MAJORAXIS (b) -746.101937 SEMI-MINORAXIS (a) 522.537753

SURFACE NO. 17 -- TORIC SURFACE
 RX -278.418

SURFACE NO. 22 -- TORIC SURFACE
 RX 523.79

SURFACE NO. 36 -- TORIC SURFACE
 RX 202

SURFACE NO. 63 -- TORIC SURFACE
 RX -169.84

TILT AND DECENTER DATA LEFT-HANDECOORDINATES

SURF	TYPE	X	Y	Z	ALPHA	BETA	GAMMA
2 REL		0	0	0	0.1829	0	0
3 REL		0	0	0	0	-0.123	0
10 REL		0	-91.048	0	-1.9766	0	0
11 REL		0	-149.224	12.676	-6.7066	0	0
12 REL		0	0	0	31.93	0	0
13 REL		0	0	0	-12.01	0	0
16 REL		0	0	0	-24.02	0	0
17 REL		0	0	0	9.212	0	0
18 REL		0	0	0	18.424	0	0
19 REL		0	0	0	-24.3574	0	0
20 REL		33.82	-4.442	0	0	0	74
21 REL		0	0	0	45	0	0
22 LOC	ABG	0	0	0	0	10.926	13.491 -64.05
24 REL		0	0	0	49.5	0	0
26 LOC	ABG	0	0	0	0	26	12 0
28 REL		0	0	0	-45	0	0
30 LOC	ABG	0	0	0	0	179.559	-6.882 90
32 REL		0	0	0	-49.5	0	0
33 REL		0	0	0	0	0	-74
34 REL		0	0	0	10	0	0
35 REL		0	0	0	-20	0	0
36 REL		0	0	0	0	0	-6.22
38 REL		0	0	0	-40	0	0
39 REL		0	0	0	30	0	0
40 REL		0	0	0	60	0	0
43 REL		0	0	0	-15	0	0
44 REL		0	0	0	-30	0	0
46 REL		0	0	0	45	0	0
47 REL		0	0	0	90	0	0
50 REL		0	0	0	45	0	0
51 REL		0	0	0	0	45	0
53 REL		0	0	0	0	-45	0
54 REL		0	0	0	45	0	0
56 REL		0	0	0	-15	0	0
57 REL		0	0	0	-30	0	0
60 REL		0	0	0	30	0	0
61 REL		0	0	0	60	0	0
62 REL		0	0	0	-20	0	0
63 REL		0	0	0	0	0	-1.79
65 REL		0	0	0	-40	0	0
67 REL		0	0	0	0	-45	0
68 REL		0	0	0	0	-90	0

KEY TO SURFACE TYPES

GLB GLOBAL COORDINAT LOC LOCAL COORDINATES
 REL RELATIVE COORDINAT REM REMOTE TILTS IN RELATIVE COORD.

SURF MESSAGES

12 UNDO TILTS/DECE:OF SURFACE NO. 11
 16 UNDO TILTS/DECE:OF SURFACE NO. 13

18	UNDO	TILTS/DECE	NOF	SURFACE	NO.		17
23	COINCIDENT	WITH		SURFACE	NO.	21	
27	COINCIDENT	WITH		SURFACE	NO.	25	
31	COINCIDENT	WITH		SURFACE	NO.	29	
37	UNDO	TILTS/DECE	NOF	SURFACE	NO.		36
38	UNDO	TILTS/DECE	NOF	SURFACE	NO.		35
40	UNDO	TILTS/DECE	NOF	SURFACE	NO.		39
44	UNDO	TILTS/DECE	NOF	SURFACE	NO.		43
47	UNDO	TILTS/DECE	NOF	SURFACE	NO.		46
52	UNDO	TILTS/DECE	NOF	SURFACE	NO.		51
54	UNDO	TILTS/DECE	NOF	SURFACE	NO.		53
56	TILTS/DECE	PICKUP	FROM	SURFACE	NO.		43
57	UNDO	TILTS/DECE	NOF	SURFACE	NO.		56
57	TILTS/DECE	PICKUP	FROM	SURFACE	NO.		44
60	TILTS/DECE	PICKUP	FROM	SURFACE	NO.		39
61	UNDO	TILTS/DECE	NOF	SURFACE	NO.		60
61	TILTS/DECE	PICKUP	FROM	SURFACE	NO.		40
64	UNDO	TILTS/DECE	NOF	SURFACE	NO.		63
65	UNDO	TILTS/DECE	NOF	SURFACE	NO.		62
68	UNDO	TILTS/DECE	NOF	SURFACE	NO.		67

GLOBAL COORDINAT DATA

GLOBAL COORDINAT SURFACE LOCATION IN COORDINAT SYSTEM OF SURFACE 9

SURF	X	Y	Z	NOTES	ALPHA	BETA	GAMMA
	1	38.149974	56.739172	-1050.03047	-0.18293	0.123	-0.00039
	2	0	0	1.67E+04	0	0.123	0
	3	0	0	1.67E+04	0	0	0
	4	0	0	-1050.162	0	0	0
	5	0	0	-3050.162	0	0	0
	6	0	0	-1050.162	0	0	0
APS	7	0	0	-2638.131	0	0	0
	8	0	0	-1050.162	0	0	0
	9	0	0	0	0	0	0
	10	0	-91.048	0	-1.9766	0	0
	11	0	-243.065859	78.379337	-8.6832	0	0
	12	0	-93.493436	70.857814	29.9534	0	0
	13	0	-200.09302	-114.125371	17.9434	0	0
	14	0	-200.09302	-114.125371	17.9434	0	0
	15	0	-200.09302	-114.125371	17.9434	0	0
	16	0	-200.09302	-114.125371	5.9334	0	0
	17	0	-179.687314	82.217104	15.1454	0	0
	18	0	-179.687314	82.217104	24.3574	0	0
	19	0	-259.533222	-94.150668	0	0	0
	20	33.82	-263.975222	-104.150668	0	0	74
	21	33.82	-263.975222	-104.150668	15.4102	-42.82135	67.9265
	22	33.82	-263.975222	-104.150668	39.32223	-45.23104	-14.16719
	23	33.82	-263.975222	-104.150668	15.4102	-42.82135	67.9265
	24	33.82	-263.975222	-104.150668	105.93544	-73.39516	-15.30268
	25	141.695656	-233.042376	-112.982809	105.93544	-73.39516	-15.30268
	26	141.695656	-233.042376	-112.982809	138.95995	-48.8373	-47.8363
	27	141.695656	-233.042376	-112.982809	105.93544	-73.39516	-15.30268
	28	170.856678	-224.680587	-115.370319	17.88644	-46.96602	66.1775
	29	170.856678	-224.680587	-115.370319	17.88644	-46.96602	66.1775
	30	170.856678	-224.680587	-115.370319	-153.67393	43.46114	29.79408
	31	170.856678	-224.680587	-115.370319	17.88644	-46.96602	66.1775
	32	170.856678	-224.680587	-115.370319	0	0	74
	33	170.856678	-224.680587	-115.370319	0.00E+00	0	0.00E+00
	34	170.856678	-224.680587	-115.370319	10	0	0
	35	170.856678	-234.578533	-171.504361	-10	0	0
	36	170.856678	-234.578533	-171.504361	-10	0	-6.22
	37	170.856678	-234.578533	-171.504361	-10	0	0
	38	170.856678	-234.578533	-171.504361	-30	0	0
	39	170.856678	-321.398533	-21.12771	0.00E+00	0	0.00E+00
	40	170.856678	-321.398533	-21.12771	30	0	0
	41	170.856678	-341.398533	-55.768726	30	0	0
	42	170.856678	-341.398533	-55.768726	30	0	0
	43	170.856678	-407.998533	-171.12331	15	0	0
	44	170.856678	-407.998533	-171.12331	0.00E+00	0	0.00E+00
	45	170.856678	-407.998533	-21.12331	0.00E+00	0	0.00E+00
	46	170.856678	-407.998533	-46.12331	45	0	0
	47	170.856678	-407.998533	-46.12331	90	0	0
	48	170.856678	-432.998533	-46.12331	90	0	0
	49	170.856678	-432.998533	-46.12331	90	0	0
	50	170.856678	-457.998533	-46.12331	135	0	0
	51	170.856678	-457.998533	-46.12331	135	45	0
	52	170.856678	-457.998533	-46.12331	135	0	0
	53	170.856678	-457.998533	-46.12331	135	-45	0
	54	170.856678	-457.998533	-46.12331	180	0	-7.39E-07
	55	170.856678	-457.998533	-21.12331	180	0	-7.39E-07
	56	170.856678	-457.998533	-171.12331	165	0	0
	57	170.856678	-457.998533	-171.12331	150	0	0
	58	170.856678	-524.598533	-55.768726	150	0	0
	59	170.856678	-524.598533	-55.768726	150	0	0
	60	170.856678	-544.598533	-21.12771	180	0	-8.54E-07
	61	170.856678	-544.598533	-21.12771	-150	0	0
	62	170.856678	-620.588533	-152.74625	-170	0	0
	63	170.856678	-620.588533	-152.74625	-170	0	-1.79
	64	170.856678	-620.588533	-152.74625	-170	0	0
	65	170.856678	-620.588533	-152.74625	170	0	0
	66	170.856678	-631.007424	-93.657785	170	0	0
	67	170.856678	-636.663145	-61.582597	170	-45	0
	68	170.856678	-636.663145	-61.582597	-139.79703	-90	-49.79703
	69	250.856678	-636.663145	-61.582597	-139.79703	-90	-49.79703
	70	250.856678	-636.663145	-61.582597	-139.79703	-90	-49.79703

Unless noted, Euler angles are taken in the order alpha, beta, gamma

 --- POF C

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---
--- ID?
The current lens ID is: ID SPIRE SPECTRO (BOLSP501F_LO)
---
TIME
15-mars-01 12:00:55
---
!GRAY !GRAY 2 0 0 0 SURF 0 SURF 0 Z1
---
SPEC GLOB Z1

ID SPIRE SPECTRO (BOLSP501F_ 242 15-mars-01 12:00:55
LENS SPECIFICATIONS:

SYSTEM SPECIFICATIONS

OBJECT DISTANCE (TH0) INFINITE FOCAL LENGTH (FOCL) 46037.9196
OBJECT HEIGHT (YPP0) INFINITE BACK FOCAL LENGTH -133.6632
MARG RAY HEIGHT (YMP1) 1641.705 IMAGE DISTANCE (BACK) 0
MARG RAY ANGLE (UMP0) 0 CELL LENGTH (TOTL) 1167.992
CHIEF RAY HEIGHT (YPP1) -4.989 F/NUMBER (FNUM) -14.0214
CHIEF RAY ANGLE (UPP0) 0.0167 GAUSSIAN IMAGE HT(GIHT) 4.689
ENTR PUPIL SEMI-APERT 1641.705 EXIT PUPIL SEMI-APERT 7.3344
ENTR PUPIL LOCATION 17150.7042 EXIT PUPIL LOCATION 72.0137

X-OBJECT HEIGHT (XPP0) INFINITE
X-MARG RAY HEIGHT (XMP1) 1641.705 X-CHIEF RAY HT (XPP1) -4.989
X-MARG RAY ANGLE (VMP0) 0 X-CHIEF RAY ANGLE(VPP0) 0.0167

WAVL (uM) 200 400 600 250 0.6328
WEIGHTS 1 1 1 1 1
COLOR ORDER 2 1 3 4 5
UNITS MM
APERTURE STOP SURFACE (APS) 7 SEMI-APERT 155.17235
REAL PUPIL OPTION ON
NONSEQUENRAYTRACE ON
FOCAL MODE ON
MAGNIFICA -1.61E-08
GLOBAL OPTION ON
VIGNETTINC OPTION (VIG) OFF
POLARIZATI AND COATINGS ARE IGNORED.

SURFACE DATA

SURF RADIUS THICKNESS MEDIUM INDEX V-NUMBER
---
0 INFINITE INFINITE AIR
1 INFINITE 17771.1 AIR
2A INFINITE 0 AIR
3A INFINITE -17771.1 AIR
4 INFINITE -2000 AIR
5 INFINITE 2000.00000P AIR
6 -3500 O -1587.969 #NOM?
APS -345.264 O 1587.96900P AIR
8 INFINITE 1050.162 AIR
9 -167.171 0 AIR
10A INFINITE 70.9 AIR
11A -365.963 O 0 #NOM?
12A INFINITE -213.5 #NOM?
13A INFINITE 0 #NOM?
14 INFINITE 0.00000P AIR
15 INFINITE 0 AIR
16A INFINITE 197.4 AIR
17A -294.638 O 0 #NOM?
18A INFINITE -193.6 #NOM?
19A INFINITE -10 #NOM?
20A INFINITE 0 #NOM?
21A INFINITE 0 #NOM?
22 L 523.79 O -1.61E-13 AIR
23 INFINITE 0 AIR
24A INFINITE 112.57 AIR
25 INFINITE 0 AIR
26 L INFINITE -5.73E-14 AIR
27 INFINITE 30.43 AIR
28A INFINITE 0 AIR
29 INFINITE 0 AIR
30 L INFINITE 1.27E-13 #NOM?
31 INFINITE 0 #NOM?
32A INFINITE 0 #NOM?
33A INFINITE 0 #NOM?
34A INFINITE -57 #NOM?
35A INFINITE 0 #NOM?
36A 230.34 O 0 AIR
37 INFINITE 0 AIR
38A INFINITE 173.64 AIR
39A INFINITE 0 AIR
40A INFINITE 40 AIR
41 INFINITE 0 AIR
42 INFINITE 133.2 AIR
43A -259.5 0 #NOM?

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44A      INFINITE      -150  #NOM?
        45 INFINITE      25   #NOM?
46A      INFINITE      0 AIR
47A      INFINITE      25.00000P AIR
        48 INFINITE      0 AIR
        49 INFINITE      25.00000P AIR
50A      INFINITE      0 AIR
51A      INFINITE      0 #NOM?
        52 INFINITE      0 AIR
53A      INFINITE      0 #NOM?
54A      INFINITE      25.00000P #NOM?
        55 INFINITE      -150.00000P #NOM?
56A      260          0 AIR
57A      INFINITE      133.20000P AIR
        58 INFINITE      0 AIR
        59 INFINITE      40.00000P AIR
60A      INFINITEP     0 #NOM?
61A      INFINITE      -151.98 #NOM?
62A      INFINITE      0 #NOM?
63A      196.99 O      0 AIR
        64 INFINITE      0 AIR
65A      INFINITE      60 AIR
        66 INFINITE      32.57 AIR
67A      INFINITE      0 #NOM?
68A      INFINITE      -80 #NOM?
69 INFINITE      0 #NOM?
IMG      INFINITE
    
```

KEY TO SYMBOLS

```

A SURFACE HAS TILTS AND DECENTERS B TAG ON SURFACE
G SURFACE IS IN GLOBAL COORDINATL SURFACE IS IN LOCAL
O SPECIAL SURFACE TYPE P ITEM IS SUBJECT TO PICKUP COORDINATES
S ITEM IS SUBJECT TO SOLVE
    
```

SPECIAL SURFACE DATA

```

SURFACE NO. 6 -- CONIC SURFACE
CONIC CONSTANT (CC) -1.00129
SEMI-MAJOF AXIS (b) 2.71E+06 SEMI-MINOF AXIS (a) -97448.0619

SURFACE NO. 7 -- CONIC SURFACE
CONIC CONSTANT (CC) -1.296
SEMI-MAJOF AXIS (b) 1166.432433 SEMI-MINOF AXIS (a) -634.607853

SURFACE NO. 11 -- CONIC SURFACE
CONIC CONSTANT (CC) -0.5095
SEMI-MAJOF AXIS (b) -746.101937 SEMI-MINOF AXIS (a) 522.537753

SURFACE NO. 17 -- TORIC SURFACE
RX -278.418

SURFACE NO. 22 -- TORIC SURFACE
RX 269.92

SURFACE NO. 36 -- TORIC SURFACE
RX 202

SURFACE NO. 63 -- TORIC SURFACE
RX 169.84
    
```

TILT AND DECENTER DATA LEFT-HAND COORDINATES

SURF	TYPE	X	Y	Z	ALPHA	BETA	GAMMA	
2	REL	0	0	0	0.1829	0	0	
3	REL	0	0	0	0	-0.123	0	
10	REL	0	-91.048	0	-1.9766	0	0	
11	REL	0	-149.224	12.676	-6.7066	0	0	
12	REL	0	0	0	31.93	0	0	
13	REL	0	0	0	-12.01	0	0	
16	REL	0	0	0	-24.02	0	0	
17	REL	0	0	0	9.212	0	0	
18	REL	0	0	0	18.424	0	0	
19	REL	0	0	0	-24.3574	0	0	
20	REL	33.82	-4.442	0	0	0	74	
21	REL	0	0	0	45	0	0	
22	LOC	ABG	0	0	0	10.926	13.491	25.95
24	REL	0	0	0	49.5	0	0	
26	LOC	ABG	0	0	0	26	12	0
28	REL	0	0	0	-45	0	0	
30	LOC	ABG	0	0	0	-0.441	-173.118	0
32	REL	0	0	0	-49.5	0	0	

33 REL	0	0	0	0	0	-74
34 REL	0	0	0	10	0	0
35 REL	0	0	0	-20	0	0
36 REL	0	0	0	0	0	-6.22
38 REL	0	0	0	-40	0	0
39 REL	0	0	0	30	0	0
40 REL	0	0	0	90	0	0
43 REL	0	0	0	15	0	0
44 REL	0	0	0	30	0	0
46 REL	0	0	0	-45	0	0
47 REL	0	0	0	-90	0	0
50 REL	0	0	0	-45	0	0
51 REL	0	0	0	0	-45	0
53 REL	0	0	0	0	45	0
54 REL	0	0	0	-45	0	0
56 REL	0	0	0	15	0	0
57 REL	0	0	0	30	0	0
60 REL	0	0	0	-30	0	0
61 REL	0	0	0	-30	0	0
62 REL	0	0	0	20	0	0
63 REL	0	0	0	0	0	-1.79
65 REL	0	0	0	20	0	0
67 REL	0	0	0	0	45	0
68 REL	0	0	0	0	90	0

KEY	TO	SURFACE	TYPES	LOCAL	COORDINATES	RELATIVE	COORD.
GLB	GLOBAL	COORDINAT	LOC	LOCAL	COORDINATES		
REL	RELATIVE	COORDINAT	REM	REMOTE	TILTS	IN	

SURF	MESSAGES					
12 UNDO	TILTS/DECEI	OF	SURFACE	NO.		11
16 UNDO	TILTS/DECEI	OF	SURFACE	NO.		13
18 UNDO	TILTS/DECEI	OF	SURFACE	NO.		17
23 COINCIDENT	WITH	SURFACE	NO.		21	
27 COINCIDENT	WITH	SURFACE	NO.		25	
31 COINCIDENT	WITH	SURFACE	NO.		29	
37 UNDO	TILTS/DECEI	OF	SURFACE	NO.		36
38 UNDO	TILTS/DECEI	OF	SURFACE	NO.		35
40 UNDO	TILTS/DECEI	OF	SURFACE	NO.		39
41 UNDO	TILTS/DECEI	OF	SURFACE	NO.		40
44 UNDO	TILTS/DECEI	OF	SURFACE	NO.		43
47 UNDO	TILTS/DECEI	OF	SURFACE	NO.		46
52 UNDO	TILTS/DECEI	OF	SURFACE	NO.		51
54 UNDO	TILTS/DECEI	OF	SURFACE	NO.		53
57 UNDO	TILTS/DECEI	OF	SURFACE	NO.		56
64 UNDO	TILTS/DECEI	OF	SURFACE	NO.		63
68 UNDO	TILTS/DECEI	OF	SURFACE	NO.		67

GLOBAL COORDINAT DATA

GLOBAL	COORDINAT	SURFACE	LOCATION	IN	COORDINAT	SYSTEM	OF	SURFACE	
SURF	X	Y	Z	NOTES	ALPHA	BETA	GAMMA		
	1	38.149974	56.739172	-1.05E+03	-0.18293	0.123	-0.00039		
	2	0	0	1.67E+04	0	0.123	0		
	3	0	0	1.67E+04	0	0	0		
	4	0	0	-1050.162	0	0	0		
	5	0	0	-3050.162	0	0	0		
	6	0	0	-1050.162	0	0	0		
APS	7	0	0	-2638.131	0	0	0		
	8	0	0	-1050.162	0	0	0		
	9	0	0	0	0	0	0		
	10	0	-91.048	0	-1.9766	0	0		
	11	0	-243.065859	78.379337	-8.6832	0	0		
	12	0	-93.493436	70.857814	29.9534	0	0		
	13	0	-200.09302	-114.125371	17.9434	0	0		
	14	0	-200.09302	-114.125371	17.9434	0	0		
	15	0	-200.09302	-114.125371	17.9434	0	0		
	16	0	-200.09302	-114.125371	5.9334	0	0		
	17	0	-179.687314	82.217104	15.1454	0	0		
	18	0	-179.687314	82.217104	24.3574	0	0		
	19	0	-259.533222	-94.150668	0	0	0		
	20	33.82	-263.975222	-104.150668	0	0	74		
	21	33.82	-263.975222	-104.150668	15.4102	-42.82135	67.9265		
	22	33.82	-263.975222	-104.150668	39.32223	-45.23104	75.83281		
	23	33.82	-263.975222	-104.150668	15.4102	-42.82135	67.9265		
	24	33.82	-263.975222	-104.150668	105.93544	-73.39516	-15.30268		
	25	141.695656	-233.042376	-112.982809	105.93544	-73.39516	-15.30268		
	26	141.695656	-233.042376	-112.982809	138.95995	-48.8373	-47.8363		
	27	141.695656	-233.042376	-112.982809	105.93544	-73.39516	-15.30268		
	28	170.856678	-224.680587	-115.370319	17.88644	-46.96602	66.1775		
	29	170.856678	-224.680587	-115.370319	17.88644	-46.96602	66.1775		
	30	170.856678	-224.680587	-115.370319	26.32607	136.53886	-60.20592		
	31	170.856678	-224.680587	-115.370319	17.88644	-46.96602	66.1775		
	32	170.856678	-224.680587	-115.370319	0	0	74		
	33	170.856678	-224.680587	-115.370319	0	0	0		
	34	170.856678	-224.680587	-115.370319	10	0	0		
	35	170.856678	-234.578533	-171.504361	-10	0	0		

36	170.856678	-234.578533	-171.504361	-10	0	-6.22
37	170.856678	-234.578533	-171.504361	-10	0	0
38	170.856678	-234.578533	-171.504361	-30	0	0
39	170.856678	-321.398533	-21.12771	0	0	0
40	170.856678	-321.398533	-21.12771	60	0	0
41	170.856678	-341.398533	13.513306	-30	0	0
42	170.856678	-341.398533	13.513306	-30	0	0
43	170.856678	-407.998533	128.86789	-15	0	0
44	170.856678	-407.998533	128.86789	0	0	0
45	170.856678	-407.998533	-21.13211	0	0	0
46	170.856678	-407.998533	3.86789	-45	0	0
47	170.856678	-407.998533	3.86789	-90	0	0
48	170.856678	-432.998533	3.86789	-90	0	0
49	170.856678	-432.998533	3.86789	-90	0	0
50	170.856678	-457.998533	3.86789	-135	0	0
51	170.856678	-457.998533	3.86789	-135	-45	0
52	170.856678	-457.998533	3.86789	-135	0	0.00E+00
53	170.856678	-457.998533	3.86789	-135	45	0.00E+00
54	170.856678	-457.998533	3.86789	180	0	-8.54E-07
55	170.856678	-457.998533	-21.13211	180	0	-7.39E-07
56	170.856678	-457.998533	128.86789	-165	0	0
57	170.856678	-457.998533	128.86789	-150	0	0
58	170.856678	-524.598533	13.513306	-150	0	0.00E+00
59	170.856678	-524.598533	13.513306	-150	0	0
60	170.856678	-544.598533	-21.12771	180	0	-8.54E-07
61	170.856678	-544.598533	-21.12771	150	0	0
62	170.856678	-620.588533	110.490831	170	0	0
63	170.856678	-620.588533	110.490831	170	0	-1.79
64	170.856678	-620.588533	110.490831	170	0	0
65	170.856678	-620.588533	110.490831	-170	0	0
66	170.856678	-631.007424	51.402366	-170	0	0
67	170.856678	-636.663145	19.327177	-170	45	0
68	170.856678	-636.663145	19.327177	82.43122	90	-108.3757
69	250.856678	-636.663145	19.327177	82.43122	90	-108.3757
70	250.856678	-636.663145	19.327177	82.43122	90	-108.3757

Unless noted, Euler angles are taken in the order alpha, beta, gamma

 --- POF C

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---
--- ID?
The current lens ID is: ID SPIRE PHOT (BOLPHT155)
---
--- TIME
11-MAY-01 14:56:38
---
--- GRAY 2 0 0 0 SURF 0 ZI
ID SPIRE PHOT (BOLPHT155) 247 11-MAY-01 14:56:38

GLOBAL RAYTRACE ANALYSIS

RAY DATA IN COORDINAT SYSTEM OF SURFACE NO. 9
FRACT. OBJECT HEIGHT HBAR 0 GBAR 0
FRACT. ENTRANCE PUPIL COORD. YEN 0 XEN 0
COLOR NUMBER 2

RAY VECTORS (X DIR TAN) (Y DIR TAN)
SURF X Y Z ZZ HH
-----
1 0 54.791802 -1049.91564 0 -0.003192
2 0 -1.940157 16721.1 0 -0.003192
3 0 -1.940157 16721.1 0 -0.003192
4 0 54.792071 -1050 0 -0.003192
5 0 61.176845 -3050 0 -0.003192
6 0 54.793441 -1050.4289 0 0.034514
7 0 7.11E-15 -2637.998 0 -0.034514
8 0 -54.808244 -1050 0 -0.034514
9 0 -90.137429 -26.382552 0 -0.034514
10 0 -91.047997 8.98E-08 0 -0.034514
11 0 -93.493606 70.85834 0 0.576269
12 0 -93.493791 70.858019 0 0.576269
13 0 -200.09386 -114.125099 0 0.576269
14 0 -200.09386 -114.125099 0 0.103927
15 0 -200.09386 -114.125099 0 0.103927
16 0 -200.093879 -114.125281 0 0.103927
17 0 -179.688568 82.217443 0 0.452716
18 0 -179.688483 82.217633 0 0.452716
19 0 -259.533206 -94.150666 0 0.452716
20 0 -259.533208 -94.15067 0 -0.098795
21 0 -259.533209 -94.150667 0 -0.098795
22 0 -279.481485 107.765764 0 0.80798
23 0 -279.481843 107.76532 0 0.80798
24 0 -397.634151 -38.46633 0 -1.078323
25 0 -397.634808 -38.465722 0 -1.078323
26 0 -448.961193 9.13262 0 -1.078323
27 0 -544.281002 97.528965 0 -0.125588
28 0 -544.280897 97.528125 0 -0.125588
29 0 -504.405979 -219.977766 0 -0.125588
30 0 -504.405979 -219.977766 0 -0.125588
31 0 -527.45872 -36.419239 0 -0.937717
32 0 -523.862577 -40.254237 0 -0.937717
33 0 -531.054864 -32.584242 0 -0.937717
34 0 -527.45872 -36.419239 0 -0.937717
35 0 -527.459019 -36.418921 0 -0.937717
36 1.82E-14 -619.802462 62.057922 2.01E+05 1.06654
37 -3.85E-15 -619.802462 62.057922 2.01E+05 1.06654
38 -50 -619.802728 62.057673 2.01E+05 1.06654
39 -34.14 -619.802643 62.057752 2.01E+05 1.06654
40 -29.14 -619.802617 62.057777 2.01E+05 1.06654
41 -34.14 -619.802643 62.057752 2.01E+05 1.06654
42 1.82E-14 -619.802462 62.057922 3.23E-16 -0.937717
43 -3.44E-15 -619.802462 62.057922 2.42E-16 -0.937717
44 -2.72E-14 -527.45872 -36.419239 -2.74E-16 -0.125588
45 -2.72E-14 -527.458666 -36.419673 -2.74E-16 -0.125588
46 -4.41E-16 -514.997754 -135.640264 -1.201118 -0.125607
47 4.226183 -514.555801 -139.158805 -1.201118 -0.125607
48 -4.226183 -515.439707 -132.121723 -1.201118 -0.125607
49 -5.00E-16 -514.997754 -135.640264 -1.201118 -0.125607
50 -4.92E-15 -514.997754 -135.640264 -1.201118 -0.125607
51 -65.113778 -521.807023 -81.429289 -1.201118 -0.125607
52 -58.6024 -521.126096 -86.850387 -1.201118 -0.125607
53 -54.772178 -520.725551 -90.039268 -1.201118 -0.125607
54 -58.6024 -521.126096 -86.850387 -1.201118 -0.125607
55 -1.48E-14 -514.997754 -135.640264 -3.55E-16 -0.125588
56 -1.56E-14 -514.997754 -135.640264 -2.47E-16 -0.125588
57 -4.78E-15 -509.514911 -179.297659 -2.00E-11 -5.83E+04
58 -4.78E-15 -509.515249 -179.297659 -2.00E-11 -5.83E+04
59 9.28E-15 -468.515249 -179.298363 -2.00E-11 -5.83E+04
60 6.20E-15 -477.505249 -179.298209 -2.00E-11 -5.83E+04
61 4.48E-15 -482.505249 -179.298123 -2.00E-11 -5.83E+04
62 6.20E-15 -477.505249 -179.298209 -2.00E-11 -5.83E+04
63 9.28E-15 -468.515249 -179.298363

---
---
--- POF C

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---
---      ID?
The      current      lens      ID      is:      ID      SPIRE      SPECTRO      (BOLSP501E)
---
---      TIME
06-sept-00      09:58:01
---
---      GRAY      2      0      0      0 SURF      0 ZI
ID      SPIRE      SPECTRO      (BOLSP501E)      216      06-sept-00      09:58:01

GLOBAL      RAYTRACE      ANALYSIS

RAY      DATA      IN      COORDINAT SYSTEM      OF      SURFACE      NO.      9

FRACT.      OBJECT      HEIGHT      HBAR      0 GBAR      0
FRACT.      ENTRANCE      PUPIL      COORD.      YEN      0 XEN      0
COLOR      NUMBER      2

RAY      VECTORS      (X      DIR      TAN)      (Y      DIR      TAN)
SURF      X      Y      Z      ZZ      HH

1      36.846967      54.801254      -1050.03946      -0.002147      -0.003193
2      -1.30302      -1.937938      16720.9352      -0.002147      -0.003193
3      -1.303026      -1.937947      16720.938      -0.002147      -0.003193
4      36.84723      54.801645      -1050.162      -0.002147      -0.003193
5      41.140746      61.187248      -3050.162      -0.002147      -0.003193
6      36.848567      54.803634      -1050.78504      0.023214      0.034525
7      3.77E-13      -3.62E-13      -2638.131      -0.023214      -0.034525
8      -36.86303      -54.825145      -1050.162      -0.023214      -0.034525
9      -60.320777      -89.713062      -39.659771      -0.023214      -0.034525
10     -61.241409      -91.082288      -1.18E-03      -0.023214      -0.034525
11     -62.761232      -93.342669      65.469052      -0.350914      0.596191
12     -64.145984      -90.990021      69.415181      -0.350914      0.596191
13     0.23026      -200.363128      -114.037902      -0.350914      0.596191
14     0.23026      -200.363128      -114.037902      0.302602      0.088962
15     0.23026      -200.363128      -114.037902      0.302602      0.088962
16     0.212451      -200.368364      -114.096754      0.302602      0.088962
17     58.002151      -183.378714      76.879249      0.133588      0.445235
18     58.7814      -180.781552      82.712492      0.133588      0.445235
19     35.15469      -259.52714      -94.150668      0.133588      0.445235
20     33.818815      -263.979485      -104.150668      0.133588      0.445235
21     33.819062      -263.978662      -104.148819      0.133588      0.445235
22     33.819252      -263.978028      -104.147395      -12.208409      -3.500795
23     33.817394      -263.978561      -104.147243      -12.208409      -3.500795
24     33.820924      -263.977549      -104.147532      -12.208409      -3.500795
25     141.696068      -233.044057      -112.983667      -12.208409      -3.500795
26     141.696058      -233.04406      -112.983666      -12.208409      -3.500795
27     141.696068      -233.044057      -112.983667      -12.208409      -3.500795
28     170.858814      -224.68156      -115.372409      -12.208409      -3.500795
29     170.858814      -224.68156      -115.372409      -12.208409      -3.500795
30     170.859094      -224.68148      -115.372432      -1.40E-05      0.176326
31     170.859094      -224.681533      -115.372733      -1.40E-05      0.176326
32     170.859094      -224.681107      -115.370319      -1.40E-05      0.176326
33     170.859094      -224.681107      -115.370319      -1.40E-05      0.176326
34     170.859094      -224.681091      -115.37023      -1.40E-05      0.176326
35     170.859883      -234.57904      -171.50445      -1.40E-05      0.176326
36     1.71E+02      -234.57904      -171.50445      -1.83E-05      -0.577344
37     1.71E+02      -234.57904      -171.50445      -1.83E-05      -0.577344
38     170.859883      -234.578952      -171.504602      -1.83E-05      -0.577344
39     170.857126      -321.398179      -21.12771      1.83E-05      0.577344
40     170.857126      -321.398267      -21.127863      1.83E-05      0.577344
41     170.856491      -341.398109      -55.768971      1.83E-05      0.577344
42     1.71E+02      -341.398109      -55.768971      1.83E-05      0.577344
43     1.71E+02      -407.997437      -171.123603      1.26E-06      -4.19E-06
44     1.71E+02      -407.997437      -171.12331      1.26E-06      -4.19E-06
45     1.69E+02      1.00E+06      -21.12331      8.06E-04      -0.000746
46     1.71E+02      -407.997961      -46.123882      0.30052      -2.39E+05
47     170.854534      -407.998533      -4.61E+01      0.30052      -2.39E+05
48     170.854565      -432.998533      -46.123777      0.30052      -2.39E+05
49     1.71E+02      -432.998533      -46.123777      0.30052      -2.39E+05
50     1.69E+02      -7.08E+05      -7.07E+05      1.080066      -1340.34181
51     170.858759      -457.998896      -46.126616      1.26E-06      -4.19E-06
52     -1857.54682      -7.08E+05      -7.07E+05      1.417942      1.002283
53     170.854597      -457.995952      -46.123672      -1.41E+00      1.00E+00
54     168.554662      -1.00E+06      -46.122592      -0.000806      -0.000746
55     1.69E+02      -1.00E+06      -21.122592      -8.06E-04      -0.000746
56     1.71E+02      -457.998372      -171.123266      -1.80E-05      -0.577346
57     1.71E+02      -457.998394      -171.123229      -1.80E-05      -0.577346
58     1.71E+02      -524.598058      -55.768452      -1.80E-05      -0.577346
59     1.71E+02      -524.598058      -55.768452      -1.80E-05      -0.577346
60     1.71E+02      -544.597766      -21.12771      1.80E-05      0.577346
61     1.71E+02      -544.597958      -21.128042      1.80E-05      0.577346
62     1.71E+02      -620.587374      -152.746455      1.80E-05      0.577346
63     1.71E+02      -620.587374      -152.746455      1.95E-05      -0.176336
64     170.853544      -620.587374      -152.746455      1.95E-05      -0.176336
65     170.853544      -620.587444      -152.746058      1.95E-05      -0.176336
66     170.854694      -631.006879      -93.657689      1.95E-05      -0.176336
67     170.855319      -636.662659      -61.583891      5.78E+04      -0.717173
68     170.856678      -636.662659      -61.583891      5.78E+04      -0.717173
69     250.856678      -636.663651      -61.582508      5.78E+04      -0.717173
70     250.856678      -636.663651      -61.582508

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---      POF      C

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---
--- ID?
The current lens ID is: ID SPIRE SPECTRO (BOLSP501F_LO)
---
TIME
15-mars-01 11:35:03
---
--- GRAY 2 0 0 0 SURF 0 ZI
ID SPIRE SPECTRO (BOLSP501F_ 242 15-mars-01 11:35:03
GLOBAL RAYTRACE ANALYSIS
RAY DATA IN COORDINAT SYSTEM OF SURFACE NO. 9
FRACT. OBJECT HEIGHT HBAR 0 GBAR 0
FRACT. ENTRANCE PUPIL COORD. YEN 0 XEN 0
COLOR NUMBER 2
RAY VECTORS (X DIR TAN) (Y DIR TAN)
SURF X Y Z ZZ HH
1 36.846967 54.801254 -1050.03946 -0.002147 -0.003193
2 -1.30302 -1.937938 16720.9352 -0.002147 -0.003193
3 -1.303026 -1.937947 16720.938 -0.002147 -0.003193
4 36.84723 54.801645 -1050.162 -0.002147 -0.003193
5 41.140746 61.187248 -3050.162 -0.002147 -0.003193
6 36.848567 54.803634 -1050.78504 0.023214 0.034525
7 3.77E-13 -3.62E-13 -2638.131 -0.023214 -0.034525
8 -36.86303 -54.825145 -1050.162 -0.023214 -0.034525
9 -60.320777 -89.713062 -39.659771 -0.023214 -0.034525
10 -61.241409 -91.082288 -0.001183 -0.023214 -0.034525
11 -62.761232 -93.342669 65.469052 -0.350914 0.596191
12 -64.145984 -90.990021 69.415181 -0.350914 0.596191
13 0.23026 -200.363128 -114.037902 -0.350914 0.596191
14 0.23026 -200.363128 -114.037902 0.302602 0.088962
15 0.23026 -200.363128 -114.037902 0.302602 0.088962
16 0.212451 -200.368364 -114.096754 0.302602 0.088962
17 58.002151 -183.378714 76.879249 0.133588 0.445235
18 58.7814 -180.781552 82.712492 0.133588 0.445235
19 35.15469 -259.52714 -94.150668 0.133588 0.445235
20 33.818815 -263.979485 -104.150668 0.133588 0.445235
21 33.819062 -263.978662 -104.148819 0.133588 0.445235
22 33.819252 -263.978028 -104.147395 -12.208409 -3.500795
23 33.817394 -263.978561 -104.147243 -12.208409 -3.500795
24 33.820924 -263.977549 -104.147532 -12.208409 -3.500795
25 141.696068 -233.044057 -112.983667 -12.208409 -3.500795
26 141.696058 -233.04406 -112.983666 -12.208409 -3.500795
27 141.696068 -233.044057 -112.983667 -12.208409 -3.500795
28 170.858814 -224.68156 -115.372409 -12.208409 -3.500795
29 170.858814 -224.68156 -115.372409 -12.208409 -3.500795
30 170.859094 -224.68148 -115.372432 -1.40E-05 0.176326
31 170.859094 -224.681533 -115.372733 -1.40E-05 0.176326
32 170.859094 -224.681107 -115.370319 -1.40E-05 0.176326
33 170.859094 -224.681107 -115.370319 -1.40E-05 0.176326
34 170.859094 -224.681091 -115.37023 -1.40E-05 0.176326
35 170.859883 -234.57904 -171.50445 -1.40E-05 0.176326
36 170.859883 -234.57904 -171.50445 -1.83E-05 -0.577344
37 170.859883 -234.57904 -171.50445 -1.83E-05 -0.577344
38 170.859883 -234.578952 -171.504602 -1.83E-05 -0.577344
39 170.857126 -321.398179 -21.12771 -1.83E-05 -0.577344
40 170.857126 -321.398267 -21.127556 -1.83E-05 -0.577344
41 170.856491 -341.398109 13.513551 -1.83E-05 -0.577344
42 170.856491 -341.398109 13.513551 -1.83E-05 -0.577344
43 170.854376 -407.997437 128.868184 -1.26E-06 4.19E-06
44 170.854376 -407.997437 128.86789 -1.26E-06 4.19E-06
45 168.534517 1.00E+06 -21.13211 -0.000806 0.000746
46 170.854534 -407.997961 3.868462 -0.30052 2.39E+05
47 170.854534 -407.998533 3.868462 -0.30052 2.39E+05
48 170.854565 -432.998533 3.868358 -0.30052 2.39E+05
49 170.854565 -432.998533 3.868358 -0.30052 2.39E+05
50 168.546847 -7.08E+05 7.07E+05 -1.080066 1340.341805
51 170.858759 -457.998896 3.871196 -1.26E-06 4.19E-06
52 -1857.54682 -7.08E+05 7.07E+05 -1.417942 -1.002283
53 170.854597 -457.995952 3.868253 1.414228 -1.000004
54 168.554662 -1.00E+06 3.867173 0.000806 0.000746
55 168.534517 -1.00E+06 -21.132827 0.000806 0.000746
56 170.858602 -457.998372 128.867847 1.80E-05 0.577346
57 170.858602 -457.998394 128.86781 1.80E-05 0.577346
58 170.85653 -524.598058 13.513032 1.80E-05 0.577346
59 170.85653 -524.598058 13.513032 1.80E-05 0.577346
60 170.855908 -544.597766 -21.12771 -1.80E-05 -0.577346
61 170.855908 -544.597958 -21.127377 -1.80E-05 -0.577346
62 170.853544 -620.587374 110.491036 -1.80E-05 -0.577346
63 170.853544 -620.587374 110.491035 -1.95E-05 0.176336
64 170.853544 -620.587374 110.491036 -1.95E-05 0.176336
65 170.853544 -620.587444 110.490639 -1.95E-05 0.176336
66 170.854694 -631.006879 51.40227 -1.95E-05 0.176336
67 170.855319 -636.662659 19.328471 -57841.5508 0.717173
68 170.856678 -636.662659 19.328471 -57841.5508 0.717173
69 250.856678 -636.663651 19.327088 -57841.5508 0.717173
70 250.856678 -636.663651 19.327088
---
--- POF C

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---
--- ID?
The current lens ID is: ID SPIRE PHOT (BOLPHT154C)
---
--- TIME
16-janv-01 18:16:55
---
--- GRAY 2 Z2 0 0 SURF Z3 Z1
ID SPIRE PHOT (BOLPHT154C) 238 16-janv-01 18:16:55

GLOBAL RAYTRACE ANALYSIS

RAY DATA IN COORDINAT SYSTEM OF SURFACE NO. 9
FRACT. OBJECT HEIGHT HBAR -0.2026 GBAR -2.2892
FRACT. ENTRANCE PUPIL COORD. YEN 0 XEN 0
COLOR NUMBER 2

RAY VECTORS (X DIR TAN) (Y DIR TAN)
SURF X Y Z ZZ HH
-----
1 11.427556 55.801639 -1050.07442 -0.000666 -0.003252
2 -0.406484 -1.984891 16720.938 -0.000666 -0.003252
3 -0.406484 -1.984891 16720.938 -0.000666 -0.003252
4 11.427614 55.801923 -1050.162 -0.000666 -0.003252
5 12.75945 62.305383 -3050.162 -0.000666 -0.003252
6 11.427923 55.803431 -1050.62552 0.007199 0.035152
7 3.55E-15 1.42E-14 -2638.131 -0.007199 -0.035152
8 -11.431259 -55.819724 -1050.162 -0.007199 -0.035152
9 -18.784562 -91.72647 -28.68079 -0.007199 -0.035152
10 -18.990607 -92.732603 -0.058139 -0.007199 -0.035152
11 -19.500476 -95.222336 70.770194 -0.105458 0.56735
12 -19.586621 -94.75889 71.587053 -0.105458 0.56735
13 -0.002619 -200.11827 -114.117194 -0.105458 0.56735
14 -0.002619 -200.11827 -114.117194 0.092284 0.110726
15 -0.002619 -200.11827 -114.117194 0.092284 0.110726
16 -0.003126 -200.118878 -114.122683 0.092284 0.110726
17 18.0297 -178.482563 81.282101 0.040144 0.455486
18 18.042666 -178.335449 81.605082 0.040144 0.455486
19 10.994499 -258.30578 -93.966358 0.040144 0.455486
20 10.973657 -258.542261 -94.485541 0.022597 -0.094222
21 10.983347 -258.582662 -94.056751 0.022597 -0.094222
22 15.521875 -277.506548 106.787347 0.08344 0.82359
23 15.490912 -277.812169 106.416262 0.08344 0.82359
24 3.403216 -397.122812 -38.450296 -0.069661 -1.088966
25 3.386021 -397.391603 -38.203465 -0.069661 -1.088966
26 0.087781 -448.950976 9.143638 -0.069661 -1.088966
27 -6.04551 -544.828974 97.188646 0.014846 -0.124712
28 -6.041554 -544.862206 97.455115 0.014846 -0.124712
29 -10.755735 -505.261042 -220.085158 0.014846 -0.124712
30 -10.755735 -505.261042 -220.085158 0.014846 -0.124712
31 -8.033705 -528.127272 -36.733246 -0.020212 -0.939339
32 -7.956233 -524.526814 -40.566217 -0.020212 -0.939339
33 -8.111177 -531.727731 -32.900276 -0.020212 -0.939339
34 -8.033705 -528.127272 -36.733246 -0.020212 -0.939339
35 -8.030349 -527.971302 -36.89929 -0.020212 -0.939339
36 -10.168951 -627.36187 68.909762 -98.506828 -1.055117
37 3.59E-09 -627.252949 68.806531 -98.506828 -1.055117
38 -50 -627.788504 69.314111 -98.506828 -1.055117
39 -34.14 -627.618626 69.153106 -98.506828 -1.055117
40 -29.14 -627.565071 69.102348 -98.506828 -1.055117
41 -34.14 -627.618626 69.153106 -98.506828 -1.055117
42 -10.168951 -627.36187 68.909762 -0.020212 -0.939339
43 -10.019144 -620.399652 61.497935 -0.020212 -0.939339
44 -8.033705 -528.127272 -36.733246 0.014846 -0.124712
45 -8.030349 -528.155465 -36.507188 0.014846 -0.124712
46 -9.569267 -515.227885 -140.166446 -1.237908 -0.126994
47 -5.261249 -514.785935 -143.646527 -1.237908 -0.126994
48 -13.877286 -515.669835 -136.686366 -1.237908 -0.126994
49 -9.569267 -515.227885 -140.166446 -1.237908 -0.126994
50 -6.108752 -514.872878 -142.961902 -1.237908 -0.126994
51 -72.027431 -521.635326 -89.711826 -1.237908 -0.126994
52 -65.435563 -520.959081 -95.036834 -1.237908 -0.126994
53 -61.557994 -520.56129 -98.169191 -1.237908 -0.126994
54 -65.435563 -520.959081 -95.036834 -1.237908 -0.126994
55 -9.569267 -515.227885 -140.166446 0.014846 -0.124712
56 -9.503531 -515.780101 -135.738523 0.014846 -0.124712
57 -10.137949 -510.45071 -178.47202 -17.433341 1183.380263
58 -10.151731 -509.515229 -178.471229 -17.433341 1183.380263
59 -10.755735 -468.515228 -178.436583 -17.433341 1183.380263
60 -10.623296 -477.505228 -178.44418 -17.433341 1183.380263
61 -10.549637 -482.505228 -178.448405 -17.433341 1183.380263
62 -10.623296 -477.505228 -178.44418 -17.433341 1183.380263
63 -10.755735 -468.515228 -178.436583
---
---
--- POF C

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---
--- ID?
The current lens ID is: ID SPIRE PHOT (BOLPHT154C)
---
--- TIME
16-janv-01 18:41:53
---
--- GRAY 2 Z2 0 0 SURF Z3 Z1
ID SPIRE PHOT (BOLPHT154C) 238 16-janv-01 18:41:53

GLOBAL RAYTRACE ANALYSIS

RAY DATA IN COORDINAT SYSTEM OF SURFACE NO. 9
FRACT. OBJECT HEIGHT HBAR 0.1572 GBAR -2.4791
FRACT. ENTRANCE PUPIL COORD. YEN 0 XEN 0
COLOR NUMBER 2

RAY VECTORS (X DIR TAN) (Y DIR TAN)
SURF X Y Z ZZ HH
-----
1 12.375137 54.003853 -1050.08016 -0.000721 -0.003147
2 -0.440591 -1.922697 16720.938 -0.000721 -0.003147
3 -0.440591 -1.922697 16720.938 -0.000721 -0.003147
4 12.375196 54.00411 -1050.162 -0.000721 -0.003147
5 13.817514 60.298241 -3050.162 -0.000721 -0.003147
6 12.375513 54.005491 -1050.60054 0.007795 0.034019
7 1.78E-15 -7.11E-15 -2638.131 -0.007795 -0.034019
8 -12.378931 -54.020409 -1050.162 -0.007795 -0.034019
9 -20.354767 -88.826152 -27.022003 -0.007795 -0.034019
10 -20.565766 -89.746929 0.044902 -0.007795 -0.034019
11 -21.110403 -92.123671 69.910954 -0.114752 0.586866
12 -21.12391 -92.054594 70.028658 -0.114752 0.586866
13 0.00704 -200.122747 -114.115744 -0.114752 0.586866
14 0.00704 -200.122747 -114.115744 0.099422 0.095929
15 0.00704 -200.122747 -114.115744 0.099422 0.095929
16 0.006397 -200.123368 -114.122216 0.099422 0.095929
17 19.499867 -181.314796 81.945342 0.043529 0.449163
18 19.53635 -180.938338 82.783472 0.043529 0.449163
19 11.828507 -260.474142 -94.291954 0.043529 0.449163
20 11.832463 -260.433321 -94.20107 0.024055 -0.101461
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