

FIRST - SPIRE
Optical design configuration control file
PHOTOMETER and SPECTROMETER

SPIREconfig42
 Date: 20 June 2002

C:\Utilisateurs\Kjetil\SPIRE\OptoMech\OpticsConfig\[SPIREconfig39.xls]Introduction
Calculations based on identification numbers:

		Phot	Spec
Global data	Glob	(BOLPHT155D)	(BOLSP509H)
Gut ray	GutRay	(BOLPHT155)	(BOLSP508)
M3Cent ray	CM3CentRay	(BOLPHT154C)	
M5Cent ray	CM5CentRay	(BOLPHT154C)	

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

- Aperture data
- 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

SurfaceList: List of surface names and numbers used throughout

Final results:

Apertures: Dimensions and decenters of apertures in local coordinates

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

AperturesSyno: Read aperture data from SYNO output

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 and aperture data

PhotGlob: Photometer

SpecGlob: Spectrometer

- Gut ray impacts in global coordinates

PhotGutRay: Photometer

SpecGutRay: Spectrometer 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	
SPIREconfigPhot23	260301	Correct spigot direction (modify automatic sign calculation) and dowl direction (add flag). 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
SPIREconfig32	200801	Corrected SM8B spigot co-ordinates
SPIREconfig33	240801	BOLSP502: new telescope in spectrometer.
SPIREconfig34	270901	Added aperture data.
SPIREconfig35	031001	BOLSP503: lower half included.
SPIREconfig36	071101	
SPIREconfig37	211101	Further improvements and corrections for implementation of spectrometer upper and lower half includibg SCAL. Corrected Euler calculations in spec part (-cEuler replaces cEuler). NB: Re-corrected Euler calculations (cEuler replaces -cEuler). See my correspondence and notes of 11-13/7/01.
SPIREconfig38	051201	Bolsp505: Cold-stop dimensions, SM12 dimensions, det rotation. Bolpht155d: Cold-stop dimension
SPIREconfig39	040102	
SPIREconfig40	250302	Bolsp509. No SM11 gamma rotation, RT replaces CC, Sdet rotation (zero global). NormDir for holes correctly calculated and normal and sag unit vectors added in Apertures sheet.
SPIREconfig41	030602	Bolsp509e. tilt of SCS reduced by 10 deg.
SPIREconfig42	200602	Bolsp509f. Modified size of SCAL, SM8B and RT mirrors Bolsp509h. Lenses turned bulge towards det

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:

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

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
ThisCol	Column identification label
SystemPart	
CompName	
System	Ray traced system: Phot, SpecUp, SpecLo
Flag	
SurfNum	
Line	
Ray	
Syst	
Axe	
AxeSyno	
Local	
Type	Aperture type
Dia	
EllipsX	
EllipsY	
RectX	
RectY	
OffsetX	
OffsetY	
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	
XSpecGut	
YSpecGut	
ZSpecGut	
XgutPhot	Gut ray impact coordinates
YgutPhot	
ZgutPhot	
XGutSpec	
YGutSpec	
ZGutSpec	
XCM3cent	Ray centred on CM3, impact coordinates
YCM3cent	
ZCM3cent	
XCM5cent	Ray centred on CM5, impact coordinates
YCM5cent	
ZCM5cent	
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	
Line0Spec	
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
Csag	Local co-ordinates of aperture centre
Ctang	
NextIndex	Refractive index following the surface
ListLine0Phot	
ListLine0Spec	
IndexCol	
ListLine	
Air	1

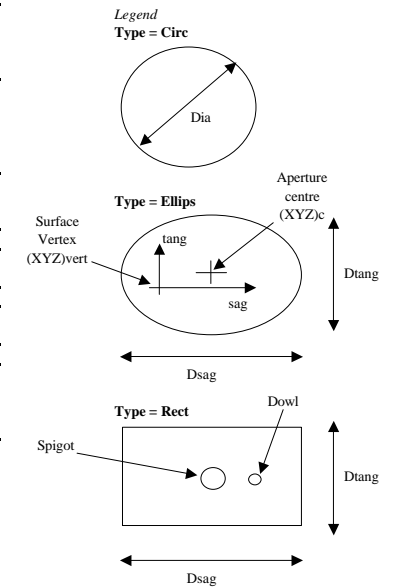
SystemPart	CompName	System	Flag	SurfNum
	Dummy	Phot	Ignore	5
Telescope	M1	Phot	Mirror	6
	M2	Phot	Mirror	7
Common optics	CFP	Phot	Ignore	9
	CM3	Phot	Mirror	11
	CM4	Phot	Mirror	14
	CM5	Phot	Mirror	17
Photometer optics	PM6	Phot	Mirror	20
	PM7	Phot	Mirror	22
	PM8	Phot	Mirror	24
	PCS	Phot	Hole	26
	PM9	Phot	Mirror	27
Short wave	PDIC1	Phot	Hole	31
	PM10	Phot	Mirror	36
	PSW	Phot	Det	38
	PDIC1	Phot	Ignore	31
Medium wave	PDIC2	Phot	Hole	46
	PMW	Phot	Det	51
	PDIC2	Phot	Ignore	46
Long wave	PM11	Phot	Mirror	57
	PLW	Phot	Det	59
	CM5	Spec	Ignore	17
Spectrometer optics	SM6	Spec	Mirror	22
	SCS	Spec	Hole	26
	SM7	Spec	Mirror	30
	SM8A	Spec	Mirror	36
Upper arm	SBS1	Spec	Hole	39
	SM9A	Spec	Mirror	43
	SRTA1	Spec	Mirror	46
	SRTA2	Spec	Mirror	51
	SM10A	Spec	Mirror	56
	SBS2	Spec	Hole	60
	SM11A	Spec	Mirror	63
	SM12A	Spec	Mirror	67
	SFLA	Spec	Hole	69
	SSW	Spec	Det	71
Lower arm	SCAL	Spec	Hole	102
	SM8B	Spec	Mirror	98
	SBS1	Spec	Hole	39
	SM9B	Spec	Mirror	111
	SRTB1	Spec	Mirror	114
	SRTB2	Spec	Mirror	119
	SM10B	Spec	Mirror	124
	SBS2	Spec	Hole	60
	SM11B	Spec	Mirror	131
	SM12B	Spec	Mirror	136
	SFLB	Spec	Hole	138
	SLW	Spec	Det	140

Axis directions:

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

ThisCol

SystemPart	CompName	System	Flag	Type	Dia or Dsag	Dtang	Csag	Ctang	Xc	Yc	Zc	Xnorm	Ynorm	Znorm	Xsag	Ysag	Zsag
Telescope	M1	Phot	Mirror	Circ	3500.000												
	M2	Phot	Mirror	Circ	308.120												
Common optics	CFP	Phot	Ignore														
	CM3	Phot	Mirror	Rect	139.000	62.000	-19.500	145.000									
	CM4	Phot	Mirror	Ellips	30.000	32.000											
	CM5	Phot	Mirror	Rect	161.000	85.000	19.500	-1.500									
Photometer optics	PM6	Phot	Mirror	Rect	46.000	27.000											
	PM7	Phot	Mirror	Rect	118.000	101.000	0.000	-1.000									
	PM8	Phot	Mirror	Circ	64.000												
	PCS	Phot	Hole	Ellips	46.128	39.808	0.000	0.738	192.327	0.000	-448.460	0.67997	0.00000	0.73324	0.00000	1.00000	0.00000
	PM9	Phot	Mirror	Circ	112.000												
Short wave	PDIC1	Phot	Hole	Circ	80.000				238.420	0.000	-527.460	-0.90513	0.00000	-0.42513	0.00000	1.00000	0.00000
	PM10	Phot	Mirror	Rect	78.000	40.000	2.500	0.000									
	PSW	Phot	Det	Rect	40.000	22.000			139.942	-50.000	-619.803	0.00000	1.00000	0.00000	0.72946	0.00000	0.68402
	PDIC1	Phot	Ignore														
Medium wave	PDIC2	Phot	Hole	Circ	72.000				337.640	0.000	-514.998	-0.89924	-0.42262	-0.11294	-0.41932	0.90631	-0.05267
	PMW	Phot	Det	Rect	40.000	22.000			283.429	-65.114	-521.807	0.63778	0.76604	0.08010	-0.76007	0.64279	-0.09546
	PDIC2	Phot	Ignore														
Long wave	PM11	Phot	Mirror	Rect	56.000	53.000	0.000	2.750									
	PLW	Phot	Det	Rect	40.000	22.000			381.298	0.000	-468.515	-0.00002	0.00000	-1.00000	0.00000	1.00000	0.00000
	CM5	Spec	Ignore														
Spectrometer optics	SM6	Spec	Mirror	Ellips	24.000	18.000	1.000	0.000									
	SCS	Spec	Hole	Circ	23.700		0.400	-0.570	314.478	142.070	-233.342	-0.34255	-0.82340	-0.45240	0.07281	0.45681	-0.88658
	SM7	Spec	Mirror	Rect	57.000	40.000	4.000	0.000									
	SM8A	Spec	Mirror	Circ	60.000												
Upper arm	SBS1	Spec	Hole	Circ	30.000		0.000	1.500	223.128	170.857	-319.899	1.00000	0.00000	0.00000	0.00000	1.00000	0.00000
	SM9A	Spec	Mirror	Circ	50.000												
	SRTA1	Spec	Mirror	Ellips	38.000	48.000	0.000	1.300									
	SRTA2	Spec	Mirror	Ellips	38.000	48.000	0.000	-1.300									
	SM10A	Spec	Mirror	Circ	60.000												
	SBS2	Spec	Hole	Circ	36.000		0.000	-2.000	223.128	170.857	-546.599	1.00000	0.00000	0.00000	0.00000	1.00000	0.00000
	SM11A	Spec	Mirror	Circ	74.000		0.000	1.000									
	SM12A	Spec	Mirror	Ellips	24.800	18.000	-0.630	0.500									
	SFLA	Spec	Hole	Circ	16.000				263.583	237.307	-636.663	0.00000	-1.00000	0.00000	-0.98481	0.00000	-0.17365
SSW	Spec	Det	Circ	20.000				263.583	250.857	-636.663	0.00000	-1.00000	0.00000	-1.00000	0.00000	0.00000	
Lower arm	SCAL	Spec	Hole	Circ	15.000				158.853	170.857	-219.396	0.98481	0.00000	0.17365	0.00000	1.00000	0.00000
	SM8B	Spec	Mirror	Circ	50.000												
	SBS1	Spec	Hole	Circ	30.000		0.000	1.500	223.128	170.857	-319.899	1.00000	0.00000	0.00000	0.00000	1.00000	0.00000
	SM9B	Spec	Mirror	Circ	50.000												
	SRTB1	Spec	Mirror	Ellips	38.000	48.000	0.000	-1.300									
	SRTB2	Spec	Mirror	Ellips	38.000	48.000	0.000	1.300									
	SM10B	Spec	Mirror	Circ	60.000												
	SBS2	Spec	Hole	Circ	36.000		0.000	-2.000	223.128	170.857	-546.599	1.00000	0.00000	0.00000	0.00000	1.00000	0.00000
	SM11B	Spec	Mirror	Circ	74.000		0.000	-1.000									
	SM12B	Spec	Mirror	Ellips	24.800	18.000	-0.630	-0.500									
	SFLB	Spec	Hole	Circ	16.000				182.673	247.507	-636.663	0.00000	-1.00000	0.00000	0.98481	0.00000	-0.17365
	SLW	Spec	Det	Circ	20.000				182.673	250.857	-636.663	0.00000	-1.00000	0.00000	1.00000	0.00000	0.00000



This sheet gives aperture dimensions and centre offset with respect to surface vertices (coincident with gut ray impact for all surfaces except CM3).

Interfaces for LAM supplied mirrors are given in terms of spigot and dowel coordinates in the "Interfaces" sheet.

For other surfaces, CM4, filters, dichroics, etc, this sheet calculates the global co-ordinates of the geometrical aperture centres, XYZc, and unit vectors indicating norm and sag vectors.

Axe

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

ThisCol

SystemPart	CompName	System	Flag	XGut	YGut	ZGut
Telescope	M1	Phot	Mirror	1252.429	0.000	54.793
	M2	Phot	Mirror	2839.998	0.000	0.000
Common optics	CFP	Phot	Ignore			
	CM3	Phot	Mirror	131.142	0.000	-93.494
	CM4	Phot	Mirror	316.125	0.000	-200.094
	CM5	Phot	Mirror	119.783	0.000	-179.689
Photometer optics	PM6	Phot	Mirror	296.151	0.000	-259.533
	PM7	Phot	Mirror	94.234	0.000	-279.481
	PM8	Phot	Mirror	240.466	0.000	-397.634
	PCS	Phot	Hole	192.867	0.000	-448.961
	PM9	Phot	Mirror	104.471	0.000	-544.281
Short wave	PDIC1	Phot	Hole	238.419	0.000	-527.459
	PM10	Phot	Mirror	139.942	0.000	-619.802
	PSW	Phot	Det	139.942	-50.000	-619.803
	PDIC1	Phot	Ignore			
Medium wave	PDIC2	Phot	Hole	337.640	0.000	-514.998
	PMW	Phot	Det	283.429	-65.114	-521.807
	PDIC2	Phot	Ignore			
Long wave	PM11	Phot	Mirror	381.298	0.000	-509.515
	PLW	Phot	Det	381.298	0.000	-468.515
	CM5	Spec	Ignore			
Spectrometer optics	SM6	Spec	Mirror	306.147	33.819	-263.978
	SCS	Spec	Hole	314.984	141.696	-233.044
	SM7	Spec	Mirror	317.373	170.860	-224.681
	SM8A	Spec	Mirror	373.504	170.861	-234.579
Upper arm	SBS1	Spec	Hole	223.128	170.857	-321.398
	SM9A	Spec	Mirror	373.123	170.854	-407.998
	SRTA1	Spec	Mirror	248.124	170.854	-407.998
	SRTA2	Spec	Mirror	248.123	170.854	-457.999
	SM10A	Spec	Mirror	373.123	170.854	-457.998
	SBS2	Spec	Hole	223.128	170.857	-544.598
	SM11A	Spec	Mirror	354.746	170.860	-620.588
	SM12A	Spec	Mirror	263.581	170.858	-636.663
	SFLA	Spec	Hole	263.582	236.757	-636.663
	SSW	Spec	Det	263.583	250.857	-636.663
Lower arm	SCAL	Spec	Hole	158.853	170.859	-219.397
	SM8B	Spec	Mirror	72.751	170.861	-234.579
	SBS1	Spec	Hole	223.128	170.857	-321.398
	SM9B	Spec	Mirror	73.132	170.854	-407.998
	SRTB1	Spec	Mirror	198.132	170.854	-407.998
	SRTB2	Spec	Mirror	198.132	170.854	-457.999
	SM10B	Spec	Mirror	73.132	170.854	-457.998
	SBS2	Spec	Hole	223.128	170.857	-544.598
	SM11B	Spec	Mirror	91.509	170.860	-620.588
	SM12B	Spec	Mirror	182.674	170.858	-636.663
	SFLB	Spec	Hole	182.673	246.957	-636.663
	SLW	Spec	Det	182.673	250.857	-636.663

Axe
Local

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

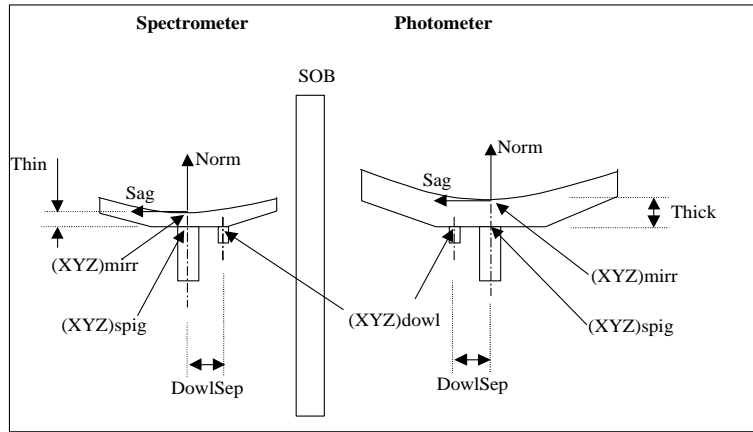
ThisCol

Mirror thickness
Thick -14.9380073
Thin -6.97107006
Dowl separation
DowlSep 11.95040582

Table with columns: SystemPart, CompName, System, ThMirr, DowlDir, Flag Ignore, Xmirr, Ymirr, Zmirr, Xnorm, Ynorm, Znorm, Xspig, Yspig, Zspig, Xsag, Ysag, Zsag, Xdowl, Ydowl, Zdowl, Check, CompName Dummy. Rows include Telescope, Common optics, Photometer optics, Short wave, Medium wave, Long wave, Spectrometer optics, Upper arm, Lower arm.

Axe

Axis directions: SPIRE SYNO LOCAL Directions X Norm Tow. tel Y Xsyno Sag Tow. Spectro Z Zsyno Tang Tow. PAX



179.99999

-1

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

ThisCol	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	Phot			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	#VALEUR!	#VALEUR!	#VALEUR!	90	M1
		M2	Phot			Vertex	#VALEUR!	0.000000	#VALEUR!	#VALEUR!	#VALEUR!	#VALEUR!	#VALEUR!	#VALEUR!	#VALEUR!	#VALEUR!	1.000000	#VALEUR!	#VALEUR!	#VALEUR!	#VALEUR!	90	M2
	Common optics	CFP	Phot			Ignore																90	CFP
		CM3	Phot	Thick	1	Vertex	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	CM3
		CM4	Phot			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	#VALEUR!	#VALEUR!	#VALEUR!	90	CM4
		CM5	Phot	Thick	1	Vertex	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	CM5
Mirror thickness	Thick	-14.9380073																					
		Thin																					
	Photometer optics	PM6	Phot		1	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	Phot	Thick	1	Vertex	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	PM7
		PM8	Phot		1	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	PM8
Dowl separation		PCS	Phot			Hole																	
		PM9	Phot	Thick	1	Vertex	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	PM9
	Short wave	PDIC1	Phot			Hole																	
		PM10	Phot		-1	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	PM10
		PSW	Phot			Det																	
		PDIC1	Phot			Ignore																	
	Medium wave	PDIC2	Phot			Hole																	
		PMW	Phot			Det																	
		PDIC2	Phot			Ignore																	
	Long wave	PM11	Phot		1	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	PM11
		PLW	Phot			Det																	
		CM5	Spec		1	Ignore																	
	Spectrometer optics	SM6	Spec		1	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	SM6
		SCS	Spec			Hole																	
		SM7	Spec		-1	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	SM7
		SM8A	Spec		-1	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	SM8A
	Upper arm	SBS1	Spec			Hole																	
		SM9A	Spec		-1	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	SM9A
		SRTA1	Spec		-1	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	SRTA1
		SRTA2	Spec		-1	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	SRTA2
		SM10A	Spec		-1	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	SM10A
		SBS2	Spec			Hole																	
		SM11A	Spec		-1	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	SM11A
		SM12A	Spec		-1	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	SM12A
		SFLA	Spec		-1	Hole																	
		SSW	Spec			Det																	
	Lower arm	SCAL	Spec			Hole																	
		SM8B	Spec		-1	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	SM8B
		SBS1	Spec			Hole																	
		SM9B	Spec		-1	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	SM9B
		SRTB1	Spec		-1	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	SRTB1
		SRTB2	Spec		-1	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	SRTB2
		SM10B	Spec		-1	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	SM10B
		SBS2	Spec			Hole																	
		SM11B	Spec		-1	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	SM11B
		SM12B	Spec		-1	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	SM12B
		SFLB	Spec			Hole																	
		SLW	Spec			Det																	

Axe
Local

Axis directions:

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

SPiRE

	SYNO	LOCAL
X	-Zsyno	Norm
Y	Xsyno	Sag
Z	Ysyno	Tang

LeftHandCorr	-1
NormDirCorr	-1

ThisCol ID	SystemPart	CompName Dummy	System Phot	Flag Ignore	XGut			Xdifff	Ydifff	Zdifff	DifffMod	Xray	Yray	Zray	dXray			dZray	drayMod	Xnorm	Ynorm	Znorm	UpFlag	
					3252.000	0.000	61.177								1.999	0.000	-0.031							2.000
Ray	Telescope	M1	Phot	Mirror	228.383	0.000	-90.137	-1999.571	0.000	-6.383	1999.581	-1.000	0.000	-0.003	1.999	0.000	-0.031	2.000	1.000	0.000	-0.016	1.000	#VALEUR!	
		M2	Phot	Mirror	228.383	0.000	-90.137	1587.569	0.000	-54.793	1588.514	0.999	0.000	-0.034	#VALEUR!	#####	#####	#####	#####	#####	#####	#####	#VALEUR!	0.99988
	Gut	Common optics	CFP	Phot	Ignore	131.142	0.000	-93.494	-97.241	0.000	-3.356	97.299	-0.999	0.000	-0.034	1.866	0.000	-0.465	1.923	0.970	0.000	-0.242	1.000	0.92273
		CM3	Phot	Mirror	316.125	0.000	-200.094	184.983	0.000	-106.600	213.501	0.866	0.000	-0.499	-1.861	0.000	0.603	1.956	-0.951	0.000	0.308	-1.000	1.00000	
		CM4	Phot	Mirror	119.783	0.000	-179.689	-196.343	0.000	20.405	197.400	-0.995	0.000	0.103	1.906	0.000	-0.516	1.974	0.965	0.000	-0.261	1.000	1.00000	
		CM5	Phot	Mirror	296.151	0.000	-259.533	176.368	0.000	-79.845	193.600	0.911	0.000	-0.412	-1.906	0.000	0.314	1.932	-0.987	0.000	0.163	-1.000	1.00000	
		PM6	Phot	Mirror	94.234	0.000	-279.481	-201.916	0.000	-19.948	202.899	-0.995	0.000	-0.098	1.773	0.000	-0.530	1.851	0.958	0.000	-0.286	1.000	1.00000	
		PM7	Phot	Mirror	240.466	0.000	-397.634	146.232	0.000	-118.153	188.000	0.778	0.000	-0.628	-1.458	0.000	-0.105	1.462	-0.997	0.000	-0.072	-1.000	1.00000	
		PM8	Phot	Mirror	192.867	0.000	-448.961	-47.599	0.000	-51.327	70.001	-0.680	0.000	-0.733	1.672	0.000	0.858	1.879	0.890	0.000	0.456	1.000	#VALEUR!	
		PCS	Phot	Hole	104.471	0.000	-544.281	-88.396	0.000	-95.320	129.999	-0.680	0.000	-0.723	1.672	0.000	0.858	1.879	0.890	0.000	0.456	1.000	1.00000	
		PM9	Phot	Mirror	238.419	0.000	-527.459	133.948	0.000	16.822	135.000	0.992	0.000	0.125									#VALEUR!	
		PDIC1	Phot	Hole	139.942	0.000	-619.802	-98.477	0.000	-92.344	135.000	-0.729	0.000	-0.684	0.729	-1.000	0.684	1.414	0.516	-0.707	0.484	1.000	1.00000	
		PM10	Phot	Mirror	139.942	-50.000	-619.803	0.000	-50.000	0.000	50.000	0.000	-1.000	0.000									#VALEUR!	
		PSW	Phot	Det	238.419	0.000	-527.459																#VALEUR!	
		PDIC1	Phot	Ignore	337.640	0.000	-514.998	99.221	0.000	12.461	100.000	0.992	0.000	0.125									#VALEUR!	
		PMW	Phot	Det	283.429	-65.114	-521.807	-54.211	-65.114	-6.809	85.000	-0.638	-0.766	-0.080									#VALEUR!	
		PDIC2	Phot	Ignore	337.640	0.000	-514.998																#VALEUR!	
		Long wave	PM11	Phot	Mirror	381.298	0.000	-509.515	43.657	0.000	5.483	44.000	0.992	0.000	0.125	-0.992	0.000	0.875	1.323	-0.750	0.000	0.662	-1.000	1.00000
			PLW	Phot	Det	381.298	0.000	-468.515	0.001	0.000	41.000	41.000	0.000	0.000	1.000								#VALEUR!	
			CM5	Spec	Ignore	125.121	58.001	-183.379															#VALEUR!	
		Spectrometer optics	SM6	Spec	Mirror	306.147	33.819	-263.978	181.027	-24.182	-80.599	199.629	0.907	-0.121	-0.404	-0.828	1.079	0.679	1.520	-0.545	0.710	0.446	-1.000	1.00000
			SCS	Spec	Hole	314.984	141.696	-233.044	8.837	107.877	30.934	112.572	0.078	0.958	0.275									#VALEUR!
			SM7	Spec	Mirror	317.373	170.860	-224.681	2.389	29.164	8.363	30.433	0.078	0.958	0.275	0.906	-0.958	-0.448	1.393	0.651	-0.688	-0.322	1.000	1.00000
			SM8A	Spec	Mirror	373.504	170.861	-234.579	56.131	0.001	-9.897	56.997	0.985	0.000	-0.174	-1.851	0.000	-0.326	1.879	-0.985	0.000	-0.174	-1.000	1.00000
		Upper arm	SBS1	Spec	Hole	223.128	170.857	-321.398	-150.377	-0.003	-86.820	173.640	-0.866	0.000	-0.500								#VALEUR!	
			SM9A	Spec	Mirror	373.123	170.854	-407.998	149.996	-0.003	-86.600	173.200	0.866	0.000	-0.500	-1.866	0.000	0.500	1.932	-0.966	0.000	0.259	-1.000	1.00000
			SRTA1	Spec	Mirror	248.124	170.854	-407.998	-125.000	0.000	0.000	125.000	-1.000	0.000	0.000	1.000	0.000	-1.000	1.414	0.707	0.000	-0.707	1.000	1.00000
			SRTA2	Spec	Mirror	248.123	170.854	-457.999	0.000	0.000	-50.000	50.000	0.000	0.000	-1.000	1.000	0.000	1.000	1.414	0.707	0.000	0.707	1.000	1.00000
			SM10A	Spec	Mirror	373.123	170.854	-457.998	125.000	0.000	0.000	125.000	1.000	0.000	0.000	-1.866	0.000	-0.500	1.932	-0.966	0.000	-0.259	-1.000	1.00000
			SBS2	Spec	Hole	223.128	170.857	-544.598	-149.996	0.003	-86.600	173.200	-0.866	0.000	-0.500								#VALEUR!	
			SM11A	Spec	Mirror	354.746	170.860	-620.588	131.619	0.003	-75.990	151.980	0.866	0.000	-0.500	-1.851	0.000	0.326	1.879	-0.985	0.000	0.174	-1.000	1.00000
			SM12A	Spec	Mirror	263.581	170.858	-636.663	-91.165	-0.002	-16.075	92.572	-0.985	0.000	-0.174	0.985	1.000	0.174	1.414	0.696	0.707	0.123	1.000	1.00000
			SFLA	Spec	Hole	263.582	236.757	-636.663	0.001	65.898	0.000	65.898	0.000	1.000	0.000								#VALEUR!	
			SSW	Spec	Det	263.583	250.857	-636.663	0.000	14.100	0.000	14.100	0.000	1.000	0.000								#VALEUR!	
		Lower arm	SCAL	Spec	Hole	158.853	170.859	-219.397	-104.730	-79.998	417.267	437.584	-0.239	-0.183	0.954								#VALEUR!	
			SM8B	Spec	Mirror	72.751	170.861	-234.579	-86.102	0.002	-15.182	87.430	-0.985	0.000	-0.174	1.851	0.000	-0.326	1.879	0.985	0.000	-0.174	1.000	1.00000
			SBS1	Spec	Hole	223.128	170.857	-321.398	150.377	-0.003	-86.820	173.640	0.866	0.000	-0.500								#VALEUR!	
			SM9B	Spec	Mirror	73.132	170.854	-407.998	-149.996	-0.003	-86.600	173.200	-0.866	0.000	-0.500	1.866	0.000	0.500	1.932	0.966	0.000	0.259	1.000	1.00000
			SRTB1	Spec	Mirror	198.132	170.854	-407.998	125.000	0.000	0.000	125.000	1.000	0.000	0.000	-1.000	0.000	-1.000	1.414	-0.707	0.000	-0.707	-1.000	1.00000
			SRTB2	Spec	Mirror	198.132	170.854	-457.999	0.000	0.000	-50.000	50.000	0.000	0.000	-1.000	-1.000	0.000	1.000	1.414	-0.707	0.000	0.707	-1.000	1.00000
			SM10B	Spec	Mirror	73.132	170.854	-457.998	-125.000	0.000	0.000	125.000	-1.000	0.000	0.000	1.866	0.000	-0.500	1.932	0.966	0.000	-0.259	1.000	1.00000
			SBS2	Spec	Hole	223.128	170.857	-544.598	-149.996	0.003	-86.600	173.200	0.866	0.000	-0.500								#VALEUR!	
			SM11B	Spec	Mirror	91.509	170.860	-620.588	-131.619	0.003	-75.990	151.980	-0.866	0.000	-0.500	1.851	0.000	0.326	1.879	0.985	0.000	0.174	1.000	1.00000
			SM12B	Spec	Mirror	182.674	170.858	-636.663	91.165	-0.002	-16.075	92.572	0.985	0.000	-0.174	-0.985	1.000	0.174	1.414	-0.696	0.707	0.123	-1.000	1.00000
			SFLB	Spec	Hole	182.673	246.957	-636.663	-0.002	76.098	0.000	76.098	0.000	1.000	0.000								#VALEUR!	
			SLW	Spec	Det	182.673	250.857	-636.663	-0.002	79.998	0.000	79.998	0.000	1.000	0.000								#VALEUR!	

Axis directions:
X -Zsyno
Y Xsyno
Z Ysyno

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

SPiRE SYNO Directions
X -Zsyno Tow. tel
Y Xsyno Tow. Spectro
Z Ysyno Tow. PAX

LeftHandCorr -1
NormDirCorr -1

ID	SystemPart	CompName	Flag	XCM3Cent	YCM3Cent	ZCM3Cent	Xdiff	Ydiff	Zdiff	DiffMod	Xray	Yray	Zray	dXray	dYray	dZray	drayMod	Xnorm	Ynorm	Znorm	Theta	1-cos(theta)	Xsag	Ysag	Zsag	normDOTsag	
ID	(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	-0.187	5.3E-06	0.003	1.000	0.000	90.000	
			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	1.998714	-1	1.09E-10	8.2E-11	#VALEUR!	#VALEUR!	#VALEUR!	#VALEUR!	0.000	#VALEUR!	
Ray	CM3Cent	Common optics	CFP	Hole	230.6808	-18.7846	-91.7265	-2609.4502	-18.7846	-91.7265	2611.129	-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
			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
			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	#VALEUR!	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	#VALEUR!	-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	XCM5Cent	YCM5Cent	ZCM5Cent	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	-0.203	6.3E-06	0.004	1.000	0.000	90.000
		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!	#VALEUR!	#VALEUR!	#VALEUR!	0.000	#VALEUR!
	CM5Cent	Common optics	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		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		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	#VALEUR!	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		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	#VALEUR!	-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		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

ThisCol	SystemPart	CompName	System	Flag	SurfNum	Line	Type	Dia	EllipsX	EllipsY	RectX	RectY	OffsetX	OffsetY
		Dummy	Phot	Ignore	5	318								
	Telescope	M1	Phot	Mirror	6	319	Circ	3500.000						
Line0Phot	313	M2	Phot	Mirror	7	320	Circ	308.120						
Line0Spec	570	Common optics	CFP	Phot	Ignore	9	322							
		CM3	Phot	Mirror	11	324	Rect				139.000	62.000	-19.500	145.000
		CM4	Phot	Mirror	14	327	Ellips		30.000	32.000				
		CM5	Phot	Mirror	17	330	Rect				161.000	85.000	19.500	-1.500
Xcol	c	Photometer optics	PM6	Phot	Mirror	20	333	Rect			46.000	27.000		
Ycol	d	PM7	Phot	Mirror	22	335	Rect				118.000	101.000	0.000	-1.000
		PM8	Phot	Mirror	24	337	Circ	64.000						
		PCS	Phot	Hole	26	339	Ellips		46.128	39.808			0.000	0.738
		PM9	Phot	Mirror	27	340	Circ	112.000						
		Short wave	PDIC1	Phot	Hole	31	344	Circ						
		PM10	Phot	Mirror	36	349	Rect				78.000	40.000	2.500	0.000
		PSW	Phot	Det	38	351	Rect				40.000	22.000		
		PDIC1	Phot	Ignore	31	344								
		Medium wave	PDIC2	Phot	Hole	46	359	Circ						
		PMW	Phot	Det	51	364	Rect	72.000			40.000	22.000		
		PDIC2	Phot	Ignore	46	359								
		Long wave	PM11	Phot	Mirror	57	370	Rect			56.000	53.000	0.000	-2.750
		PLW	Phot	Det	59	372	Rect				40.000	22.000		
		CM5	Spec	Ignore	17	587								
		Spectrometer optics	SM6	Spec	Mirror	22	592	Ellips		24.000	18.000		1.000	0.000
		SCS	Spec	Hole	26	596	Circ	23.700					0.400	-0.570
		SM7	Spec	Mirror	30	600	Rect				57.000	40.000	4.000	0.000
		SM8A	Spec	Mirror	36	606	Circ	60.000						
		Upper arm	SBS1	Spec	Hole	39	609	Circ	30.000				0.000	1.500
		SM9A	Spec	Mirror	43	613	Circ	50.000						
		SRTA1	Spec	Mirror	46	616	Ellips		38.000	48.000			0.000	1.300
		SRTA2	Spec	Mirror	51	621	Ellips		38.000	48.000			0.000	1.300
		SM10A	Spec	Mirror	56	626	Circ	60.000						
		SBS2	Spec	Hole	60	630	Circ	36.000					0.000	2.000
		SM11A	Spec	Mirror	63	633	Circ	74.000					0.000	1.000
		SM12A	Spec	Mirror	67	637	Ellips		24.800	18.000			-0.630	-0.500
		SFLA	Spec	Hole	69	639	Circ	16.000						
		SSW	Spec	Det	71	641	Circ	20.000						
		Lower arm	SCAL	Spec	Hole	102	672	Circ			15.000			
		SM8B	Spec	Mirror	98	668	Circ	50.000					0.000	1.500
		SBS1	Spec	Hole	39	609	Circ	30.000						
		SM9B	Spec	Mirror	111	681	Circ	50.000						
		SRTB1	Spec	Mirror	114	684	Ellips		38.000	48.000			0.000	1.300
		SRTB2	Spec	Mirror	119	689	Ellips		38.000	48.000			0.000	1.300
		SM10B	Spec	Mirror	124	694	Circ	60.000						
		SBS2	Spec	Hole	60	630	Circ	36.000					0.000	2.000
		SM11B	Spec	Mirror	131	701	Circ	74.000					0.000	1.000
		SM12B	Spec	Mirror	136	706	Ellips		24.800	18.000			-0.630	-0.500
		SFLB	Spec	Hole	138	708	Circ	16.000						
		SLW	Spec	Det	140	710	Circ	20.000						

Axis directions:

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

ThisCol	IDPhot	SystemPart	CompName	System	Flag	Xvertex	Yvertex	Zvertex	XnormP	YnormP	ZnormP	NormDir	NextIndex	Xnorm	Ynorm	Znorm	Xsag	Ysag	Zsag	Xtang	Ytang	Ztang	TangDotNom	SagDotNorm	SagDotTan	
IDLPHOT	(BOLPH1155D)	Telescope	M1	Phot	Mirror	1252.0000	0.0000	0.0000	-1.0000	0.0000	0.0000	-1	1	1.0000	0.0000	0.0000	0.0000	1.0000	0.0000	0.0000	0.0000	1.0000	0.0000	0.0000	0.0000	0.0000
IDSpec	(BOLSP509H)	Common optics	M2	Phot	Mirror	2839.9980	0.0000	0.0000	-1.0000	0.0000	0.0000	#VALEUR!	1	#VALEUR!	#VALEUR!	#VALEUR!	0.0000	1.0000	0.0000	#VALEUR!	#VALEUR!	1.0000	#VALEUR!	#VALEUR!	#VALEUR!	#VALEUR!
		Photometer optics	PM6	Phot	Mirror	296.1529	0.0000	-259.5332	-0.9867	0.0000	0.1626	1	-1	0	-0.9867	0.0000	0.1626	0.0000	1.0000	0.0000	-0.1626	0.0000	-0.9867	0.0000	0.0000	0.0000
		Short wave	PM10	Phot	Mirror	139.9423	0.0000	-619.8027	-0.5158	0.7071	-0.4837	-1	1	0	0.5158	-0.7071	0.4837	0.5158	0.7071	0.4837	-0.6840	0.0000	0.7295	0.0000	0.0000	0.0000
		Medium wave	PDIC2	Phot	Hole	337.6403	0.0000	-514.9984	-0.8992	-0.4226	-0.1129	1	-1	0	-0.8992	-0.4226	-0.1129	-0.4193	0.9063	-0.0527	0.1246	0.0000	-0.9922	0.0000	0.0000	0.0000
		Long wave	PM11	Phot	Mirror	381.2974	0.0000	-509.5152	-0.7499	0.0000	0.6616	1	-1	0	-0.7499	0.0000	0.6616	0.0000	1.0000	0.0000	-0.6616	0.0000	-0.7499	0.0000	0.0000	0.0000
		Spectrometer optics	SM6	Spec	Mirror	306.1507	33.8200	-263.9752	-0.5448	0.7100	0.4463	1	-1	0	-0.5448	0.7100	0.4463	0.6876	0.6828	-0.2469	-0.4800	0.1724	-0.8602	0.0000	0.0000	0.0000
		Upper arm	SBS1	Spec	Hole	223.1277	170.8567	-321.3985	-1.0000	0.0000	0.0000	-1	1	0	1.0000	0.0000	0.0000	0.0000	1.0000	0.0000	0.0000	1.0000	0.0000	0.0000	0.0000	0.0000
		Lower arm	SBS1	Spec	Hole	223.1277	170.8567	-321.3985	-1.0000	0.0000	0.0000	-1	1	0	1.0000	0.0000	0.0000	0.0000	1.0000	0.0000	0.0000	1.0000	0.0000	0.0000	0.0000	0.0000
		Axis directions:	X	Y	Z	X	Y	Z	X	Y	Z	X	Y	Z	X	Y	Z	X	Y	Z	X	Y	Z	X	Y	Z
		Local	Vert	Vert	Vert	Norm	Norm	Norm	Norm	Norm	Norm	Norm	Norm	Norm	Norm	Norm	Sag	Sag	Sag	Tang	Tang	Tang	Tang	Tang	Tang	

ThisCol
GlobalCoords
Line0Phot
LineOSpec
Xcol
Ycol
Zcol
aCol
bCol
cCol

Listing
ListLine0Phot
ListLineOSpec
IndexCol

Axe

SystemPart	CompName	System	Flag	SurfNum	Line	ListLine	NextIndex	Xvert	Yvert	Zvert	aEuler	bEuler	cEuler	xNorm	yNorm	zNorm	xTang	yTang	zTang	xSag	ySag	zSag	angDotNorm	SagDotNorm	SagDotTan						
Dummy	Phot	Ignore	5	245	50	AIR	1.000	0.000	0.000	-3050.000	0.000	0.000	0.000	0.000	0.000	1.000	0.000	0.000	0.000	1.000	0.000	0.000	0.000	0.000	0.000						
Telescope	M1	Phot	Mirror	6	246	51	AIR	1	0.000	0.000	-1050.000	0.000	0.000	0.000	0.000	1.000	0.000	0.000	0.000	1.000	0.000	0.000	0.000	90.000	0.000	90.000	0.000	90.000			
	M2	Phot	Mirror	7	247	52	#NOM?	-1	0.000	0.000	-2637.998	0.000	0.000	0.000	0.000	1.000	0.000	0.000	0.000	1.000	0.000	0.000	0.000	0.000	90.000	0.000	90.000	0.000	90.000		
Common optics	CFP	Phot	Ignore	9	249	54	AIR	1	0.000	0.000	0.000	0.000	0.000	0.000	0.000	1.000	0.000	0.000	0.000	1.000	0.000	0.000	0.000	0.000	90.000	0.000	90.000	0.000	90.000		
	CM3	Phot	Mirror	11	251	56	AIR	1	0.000	-243.066	78.379	-8.683	0.000	0.000	0.000	1.000	0.989	0.151	1.000	0.000	0.000	0.000	0.000	0.000	90.000	0.000	90.000	0.000	90.000		
	CM4	Phot	Mirror	14	254	59	#NOM?	-1	0.000	-200.093	-114.125	17.943	0.000	0.000	0.000	1.000	0.951	-0.308	1.000	0.000	0.000	0.000	0.000	0.000	90.000	0.000	90.000	0.000	90.000		
	CM5	Phot	Mirror	17	257	62	AIR	1	0.000	-179.687	82.217	15.145	0.000	0.000	0.000	1.000	0.965	-0.261	1.000	0.000	0.000	0.000	0.000	0.000	90.000	0.000	90.000	0.000	90.000		
Photometer optics	PM6	Phot	Mirror	20	260	65	#NOM?	-1	0.000	-259.533	-94.151	9.357	0.000	0.000	0.000	1.000	0.987	-0.163	1.000	0.000	0.000	0.000	0.000	0.000	90.000	0.000	90.000	0.000	90.000		
	PM7	Phot	Mirror	22	262	67	AIR	1	0.000	-279.483	107.766	16.647	0.000	0.000	0.000	1.000	0.958	-0.286	1.000	0.000	0.000	0.000	0.000	0.000	90.000	0.000	90.000	0.000	90.000		
	PM8	Phot	Mirror	24	264	69	#NOM?	-1	0.000	-397.635	-38.466	-4.111	0.000	0.000	0.000	1.000	0.997	0.072	1.000	0.000	0.000	0.000	0.000	0.000	90.000	0.000	90.000	0.000	90.000		
	PCS	Phot	Hole	26	266	71	AIR	1	0.000	-448.962	9.132	-47.159	0.000	0.000	0.000	1.000	0.680	0.733	1.000	0.000	0.000	0.000	0.000	0.000	90.000	0.000	90.000	0.000	90.000		
	PM9	Phot	Mirror	27	267	72	AIR	1	0.000	-544.283	97.528	-27.159	0.000	0.000	0.000	1.000	0.890	0.456	1.000	0.000	0.000	0.000	0.000	0.000	90.000	0.000	90.000	0.000	90.000		
Short wave	PDIC1	Phot	Hole	31	271	76	#NOM?	-1	0.000	-527.460	-36.420	-25.159	0.000	0.000	0.000	1.000	0.905	0.425	1.000	0.000	0.000	0.000	0.000	0.000	90.000	0.000	90.000	0.000	90.000		
	PM10	Phot	Mirror	36	276	81	AIR	1	0.000	-619.803	62.058	-43.159	-45.000	0.000	0.000	1.000	0.729	0.684	0.707	0.484	-0.516	0.000	0.000	0.000	90.000	0.000	90.000	0.000	90.000		
	PSW	Phot	Det	38	278	83	#NOM?	-1	-50.000	-619.803	62.058	-43.159	-90.000	0.000	0.000	1.000	0.729	0.684	0.000	0.684	-0.729	0.000	0.000	0.000	0.000	90.000	0.000	90.000	0.000	90.000	
	PDIC1	Phot	Ignore	31	271	76	#NOM?	-1	0.000	-527.460	-36.420	-25.159	0.000	0.000	0.000	1.000	0.905	0.425	1.000	0.000	0.000	0.000	0.000	0.000	90.000	0.000	90.000	0.000	90.000		
Medium wave	PDIC2	Phot	Hole	46	286	91	#NOM?	-1	0.000	-514.998	-135.640	-7.159	25.000	0.000	0.000	1.000	0.899	0.125	0.992	0.125	0.906	-0.053	0.419	0.000	0.000	90.000	0.000	90.000	0.000	90.000	
	PMW	Phot	Det	51	291	96	AIR	1	-65.114	-521.807	-81.429	-7.159	50.000	0.000	0.000	1.000	0.638	0.092	-0.125	0.643	-0.095	0.760	0.000	0.000	0.000	90.000	0.000	90.000	0.000	90.000	
	PDIC2	Phot	Ignore	46	286	91	#NOM?	-1	0.000	-514.998	-135.640	-7.159	25.000	0.000	0.000	1.000	0.899	0.125	0.992	0.125	0.906	-0.053	0.419	0.000	0.000	90.000	0.000	90.000	0.000	90.000	
Long wave	PM11	Phot	Mirror	57	297	102	#NOM?	-1	0.000	-509.515	-179.297	41.421	0.000	0.000	0.000	1.000	0.750	0.000	0.750	-0.662	1.000	0.000	0.000	0.000	0.000	90.000	0.000	90.000	0.000	90.000	
	PLW	Phot	Det	59	299	104	AIR	1	0.000	-468.515	-179.298	90.001	0.000	0.000	0.000	1.000	0.000	0.000	-1.000	0.000	0.000	0.000	0.000	0.000	0.000	90.000	0.000	90.000	0.000	90.000	
	CM5	Spec	Ignore	17	437	62	AIR	1	0.000	-179.687	82.217	15.145	0.000	0.000	0.000	1.000	0.965	0.965	-0.261	1.000	0.000	0.000	0.000	0.000	0.000	90.000	0.000	90.000	0.000	90.000	
Spectrometer optics	SM6	Spec	Mirror	22	442	67	#NOM?	-1	33.820	-263.975	-104.151	39.322	-45.231	-14.167	0.710	0.446	0.545	-0.172	0.860	-0.480	0.683	-0.247	-0.688	0.000	0.000	90.000	0.000	90.000	0.000	90.000	
	SCS	Spec	Hole	26	446	71	AIR	1	141.696	-233.042	-112.983	127.133	-55.427	-36.388	0.823	0.452	-0.343	-0.337	-0.097	-0.937	0.457	-0.887	-0.073	0.000	0.000	90.000	0.000	90.000	0.000	90.000	
	SM7	Spec	Mirror	30	450	75	AIR	1	170.857	-224.881	-115.370	-153.674	43.461	29.794	-0.688	-0.322	-0.651	0.361	-0.929	0.079	0.630	0.181	-0.755	0.000	0.000	90.000	0.000	90.000	0.000	90.000	
	SM8A	Spec	Mirror	36	456	81	#NOM?	-1	170.857	-234.579	-171.504	-10.000	0.000	-6.220	0.000	-0.174	0.985	-0.108	0.979	0.173	0.994	0.107	-0.019	0.000	0.000	90.000	0.000	90.000	0.000	90.000	
Upper arm	SBS1	Spec	Hole	39	459	84	AIR	1	170.857	-321.399	-21.128	0.000	0.000	0.000	0.000	1.000	0.000	1.000	0.000	1.000	0.000	0.000	0.000	0.000	90.000	0.000	90.000	0.000	90.000		
	SM9A	Spec	Mirror	43	463	88	#NOM?	-1	170.857	-407.999	-171.123	15.000	0.000	0.000	0.000	1.000	0.966	0.000	0.966	-0.259	1.000	0.000	0.000	0.000	0.000	90.000	0.000	90.000	0.000	90.000	
	SRTA1	Spec	Mirror	46	466	91	AIR	1	170.857	-407.999	-46.123	45.000	0.000	0.000	0.000	1.000	0.707	0.707	0.000	0.707	-0.707	1.000	0.000	0.000	90.000	0.000	90.000	0.000	90.000		
	SRTA2	Spec	Mirror	51	471	96	#NOM?	-1	170.857	-457.999	-46.123	135.000	0.000	0.000	0.000	1.000	0.707	-0.707	0.000	-0.707	-0.707	1.000	0.000	0.000	90.000	0.000	90.000	0.000	90.000		
	SM10A	Spec	Mirror	56	476	101	AIR	1	170.857	-457.999	-171.123	165.000	0.000	0.000	0.000	1.000	0.259	-0.966	0.000	-0.966	-0.259	1.000	0.000	0.000	0.000	90.000	0.000	90.000	0.000	90.000	
	SBS2	Spec	Hole	60	480	105	#NOM?	-1	170.857	-544.599	-21.128	180.000	0.000	0.000	0.000	1.000	0.000	-1.000	0.000	-1.000	0.000	0.000	0.000	0.000	90.000	0.000	90.000	0.000	90.000		
	SM11A	Spec	Mirror	63	483	108	AIR	1	170.857	-620.589	-152.746	-170.000	0.000	0.000	0.000	1.000	-0.174	-0.985	0.000	-0.985	0.174	1.000	0.000	0.000	0.000	90.000	0.000	90.000	0.000	90.000	
	SM12A	Spec	Mirror	67	487	112	#NOM?	-1	170.857	-636.663	-61.583	170.000	-45.000	0.000	0.000	0.707	0.123	-0.696	0.000	-0.985	-0.174	0.707	-0.123	0.696	0.000	0.000	90.000	0.000	90.000	0.000	90.000
	SFLA	Spec	Hole	69	489	114	AIR	1	237.307	-636.663	-61.583	170.000	-90.000	0.000	1.000	0.000	0.000	0.000	-0.985	-0.174	0.000	-0.174	0.985	0.000	0.000	90.000	0.000	90.000	0.000	90.000	
	SSW	Spec	Det	71	491	116	AIR	1	250.857	-636.663	-61.583	-180.000	-90.000	0.000	1.000	0.000	0.000	0.000	-1.000	0.000	0.000	1.000	0.000	0.000	0.000	90.000	0.000	90.000	0.000	90.000	
Lower arm	SCAL	Spec	Hole	102	522	147	AIR	1	170.857	-219.396	43.147	-10.000	0.000	0.000	0.000	0.000	-0.174	0.985	0.000	0.985	0.174	1.000	0.000	0.000	0.000	90.000	0.000	90.000	0.000	90.000	
	SM8B	Spec	Mirror	98	518	143	#NOM?	-1	170.857	-234.579																					

ThisCol

SPiRE coordinates
 X=X0+Xfact*Zsyno
 Y=Y0+Yfact*Xsyno
 Z=Z0+Zfact*Ysyno
where:
 X0 202
 Y0 0
 Z0 0
 Xfact -1
 Yfact 1
 Zfact 1

SystemPart	CompName	System	Flag	XPhotGut	YPhotGut	ZPhotGut	XSpecGut	YSpecGut	ZSpecGut	XCM3Cent	YCM3Cent	ZCM3Cent	XCM5Cent	YCM5Cent	ZCM5Cent
	Dummy	Phot	Ignore	3252.0000	0.0000	61.1768				3252.1620	12.7595	62.3054	3252.1620	13.8175	60.2982
Telescope	M1	Phot	Mirror	1252.428903	0.000000	54.793441				1252.625517	11.427923	55.803431	1252.600535	12.375513	54.005491
	M2	Phot	Mirror	2839.998000	0.000000	0.000000				2840.131000	0.000000	0.000000	2840.131000	0.000000	0.000000
	CFP	Phot	Ignore	228.382552	0.000000	-90.137429				230.680790	-18.784562	-91.726470	229.022003	-20.354767	-88.826152
Common optics	CM3	Phot	Mirror	131.141660	0.000000	-93.493606				131.229806	-19.500476	-95.222336	132.089046	-21.110403	-92.123671
	CM4	Phot	Mirror	316.125099	0.000000	-200.093860				316.117194	-0.002619	-200.118270	316.115744	0.007040	-200.122747
	CM5	Phot	Mirror	119.782557	0.000000	-179.688568				120.717899	18.029700	-178.482563	120.054658	19.499867	-181.314796
Photometer optics	PM6	Phot	Mirror	296.150670	0.000000	-259.533208				296.485541	10.973657	-258.542261	296.201070	11.832463	-260.433321
	PM7	Phot	Mirror	94.234236	0.000000	-279.481485				95.212653	15.521875	-277.506548	94.245810	16.690589	-280.923961
	PM8	Phot	Mirror	240.466330	0.000000	-397.634151				240.450296	3.403216	-397.122812	240.511584	3.639387	-397.939241
	PCS	Phot	Hole	192.867380	0.000000	-448.961193				192.856362	0.087781	-448.950976	192.852850	0.080828	-448.947719
	PM9	Phot	Mirror	104.471035	0.000000	-544.281002				104.811354	-6.045510	-544.828974	104.270608	-6.533386	-543.756057
Short wave	PDIC1	Phot	Hole	238.419239	0.000000	-527.458720				238.733246	-8.033705	-528.127272	238.116781	-8.679048	-526.814757
	PM10	Phot	Mirror	139.942078	0.000000	-619.802462				133.090238	-10.168951	-627.361870	131.354880	-11.004597	-626.732892
	PSW	Phot	Det	139.942327	-50.000000	-619.802728				132.685890	-50.000000	-627.788504	130.876814	-50.000000	-627.129735
	PDIC1	Phot	Ignore	238.419239	0.000000	-527.458720				238.733246	-8.033705	-528.127272	238.116781	-8.679048	-526.814757
Medium wave	PDIC2	Phot	Hole	337.640264	0.000000	-514.997754				342.166446	-9.569267	-515.227885	342.331781	-10.349698	-513.623960
	PMW	Phot	Det	283.429289	-65.113778	-521.807023				291.711826	-72.027431	-521.635326	292.158272	-72.586040	-519.847765
	PDIC2	Phot	Ignore	337.640264	0.000000	-514.997754				342.166446	-9.569267	-515.227885	342.331781	-10.349698	-513.623960
Long wave	PM11	Phot	Mirror	381.297659	0.000000	-509.514911				380.472020	-10.137949	-510.450710	382.115035	-10.987456	-508.588478
	PLW	Phot	Det	381.298363	0.000000	-468.515249				380.436583	-10.755735	-468.515228	382.154575	-11.624777	-468.515270
	CM5	Spec	Ignore							125.120533	58.001413	-183.378925	120.717899	18.029700	-178.482563
Spectrometer optics	SM6	Spec	Mirror	306.147355	33.819095	-263.977827				306.147355	33.819095	-263.977827	306.147355	33.819095	-263.977827
	SCS	Spec	Hole	314.984032	141.695796	-233.044025				314.984032	141.695796	-233.044025	314.984032	141.695796	-233.044025
	SM7	Spec	Mirror	317.372966	170.859510	-224.681288				317.372966	170.859510	-224.681288	317.372966	170.859510	-224.681288
	SM8A	Spec	Mirror	373.504392	170.860517	-234.578711				373.504392	170.860517	-234.578711	373.504392	170.860517	-234.578711
Upper arm	SBS1	Spec	Hole	223.127710	170.857397	-321.398300				132.846894	-34.140000	-627.618626	131.071251	-34.140000	-626.968333
	SM9A	Spec	Mirror	373.123463	170.854284	-407.997960				140.502065	-10.019144	-620.399652	139.389571	-10.829581	-619.213249
	SRTA1	Spec	Mirror	248.123579	170.854265	-407.998264				342.166446	-9.569267	-515.227885	342.331781	-10.349698	-513.623960
	SRTA2	Spec	Mirror	248.123457	170.854258	-457.998681				291.711826	-72.027431	-521.635326	292.158272	-72.586040	-519.847765
	SM10A	Spec	Mirror	373.123268	170.854239	-457.998377				337.738523	-9.503531	-515.780101	337.543836	-10.272944	-514.229985
	SBS2	Spec	Hole	223.127710	170.857352	-544.598115				380.444180	-10.623296	-477.505228	382.145705	-11.481801	-477.505270
	SM11A	Spec	Mirror	354.746350	170.860083	-620.587965				380.436583	-10.755735	-468.515228	382.154575	-11.624777	-468.515270
	SM12A	Spec	Mirror	263.581021	170.858259	-636.663312				202.000000	0.000000	0.000000	202.000000	0.000000	0.000000
	SFLA	Spec	Hole	263.582353	236.756678	-636.663389				202.000000	0.000000	0.000000	202.000000	0.000000	0.000000
	SSW	Spec	Det	263.582671	250.856678	-636.663366				202.000000	0.000000	0.000000	202.000000	0.000000	0.000000
Lower arm	SCAL	Spec	Hole	158.852846	170.858972	-219.396733				202.000000	0.000000	0.000000	202.000000	0.000000	0.000000
	SM8B	Spec	Mirror	72.751027	170.860517	-234.578711				202.000000	0.000000	0.000000	202.000000	0.000000	0.000000
	SBS1	Spec	Hole	223.127710	170.857397	-321.398300				132.846894	-34.140000	-627.618626	131.071251	-34.140000	-626.968333
	SM9B	Spec	Mirror	373.131956	170.854284	-407.997960				202.000000	0.000000	0.000000	202.000000	0.000000	0.000000
	SRTB1	Spec	Mirror	198.131841	170.854265	-407.998264				202.000000	0.000000	0.000000	202.000000	0.000000	0.000000
	SRTB2	Spec	Mirror	198.131962	170.854258	-457.998681				202.000000	0.000000	0.000000	202.000000	0.000000	0.000000
	SM10B	Spec	Mirror	373.132152	170.854239	-457.998377				202.000000	0.000000	0.000000	202.000000	0.000000	0.000000
	SBS2	Spec	Hole	223.127710	170.857352	-544.598115				380.444180	-10.623296	-477.505228	382.145705	-11.481801	-477.505270
	SM11B	Spec	Mirror	91.509069	170.860083	-620.587965				202.000000	0.000000	0.000000	202.000000	0.000000	0.000000
	SM12B	Spec	Mirror	182.674398	170.858259	-636.663312				202.000000	0.000000	0.000000	202.000000	0.000000	0.000000
	SFLB	Spec	Hole	182.672860	246.956678	-636.663401				202.000000	0.000000	0.000000	202.000000	0.000000	0.000000
	SLW	Spec	Det	182.672787	250.856678	-636.663396				202.000000	0.000000	0.000000	202.000000	0.000000	0.000000
Axe				X	Y	Z	X	Y	Z	X	Y	Z	X	Y	Z
Syst				Phot	Phot	Phot	Spec	Spec	Spec	CM3	CM3	CM3	CM5	CM5	CM5
Ray				Gut	Gut	Gut	Gut	Gut	Gut	Cent	Cent	Cent	Cent	Cent	Cent
AxeSyno	<i>Axis directions:</i>			z	x	y	z	x	y	z	x	y	z	x	y
	X	-Zsyno	Tow. tel												
	Y	Xsyno	Tow. Spectro												
	Z	Ysyno	Tow. PAX												

ThisCol	SystemPart	CompName	System	Flag	SurfNum	Line	XPhotGut	YPhotGut	ZPhotGut	XSpecGut	YSpecGut	ZSpecGut	XCM3Cent	YCM3Cent	ZCM3Cent	XCM5Cent	YCM5Cent	ZCM5Cent
		Dummy	Phot	Ignore	5	27	0.000000	61.176845	-3050.000000				12.759450	62.305383	-3050.162000	13.817514	60.298241	-3050.162000
	Telescope	M1	Phot	Mirror	6	28	0.000000	54.793441	-1050.428903				11.427923	55.803431	-1050.625517	12.375513	54.005491	-1050.600535
		M2	Phot	Mirror	7	29	0.000000	0.000000	-2637.998000				0.000000	0.000000	-2638.131000	0.000000	0.000000	-2638.131000
	Common optics	CFP	Phot	Ignore	9	31	0.000000	-90.137429	-26.382552				-18.784562	-91.726470	-28.680790	-20.354767	-88.826152	-27.022003
		CM3	Phot	Mirror	11	33	0.000000	-93.493606	70.858340				-19.500476	-95.223236	70.770194	-21.110403	-92.123671	69.910954
Line0		CM4	Phot	Mirror	14	36	0.000000	-200.093860	-114.125099				-0.002619	-200.118270	-114.117194	0.007040	-200.122747	-114.115744
Xcol		CM5	Phot	Mirror	17	39	0.000000	-179.688568	82.217443				18.029700	-178.482563	81.282101	19.499867	-181.314796	81.945342
Ycol		PM6	Phot	Mirror	20	42	0.000000	-259.533208	-94.150670				10.973657	-258.542261	-94.485541	11.832463	-260.433321	-94.201070
Zcol		PM7	Phot	Mirror	22	44	0.000000	-279.481485	107.765764				15.521875	-277.506548	106.787347	16.690589	-280.923961	107.754190
	Photometer optics	PM8	Phot	Mirror	24	46	0.000000	-397.634151	-38.466330				3.403216	-397.122812	-38.450296	3.639387	-397.939241	-38.511584
		PCS	Phot	Hole	26	48	0.000000	-448.961193	9.132620				0.087781	-448.950976	9.143638	0.080828	-448.947719	9.147150
		PM9	Phot	Mirror	27	49	0.000000	-544.281002	97.528965				-6.045510	-544.828974	97.188646	-6.533386	-543.756057	97.729392
	Short wave	PDI1	Phot	Hole	31	53	0.000000	-527.458720	-36.419239				-8.033705	-528.127272	-36.733246	-8.679048	-526.814757	-36.116781
		PM10	Phot	Mirror	36	58	0.000000	-619.802462	62.057922				-10.168951	-627.361870	68.909762	-11.004597	-626.732892	70.645120
		PSW	Phot	Det	38	60	-50.000000	-619.802728	62.057673				-50.000000	-627.788504	69.314110	-50.000000	-627.129735	71.123186
		PDI1	Phot	Ignore	31	53	0.000000	-527.458720	-36.419239				-8.033705	-528.127272	-36.733246	-8.679048	-526.814757	-36.116781
	Medium wave	PDI2	Phot	Hole	46	68	0.000000	-514.997754	-135.640264				-9.569267	-515.227885	-140.166446	-10.349698	-513.623960	-140.331781
		PMW	Phot	Det	51	73	-65.113778	-521.807023	-81.429289				-72.027431	-521.635326	-89.711826	-72.586040	-519.847765	-90.158272
		PDI2	Phot	Ignore	46	68	0.000000	-514.997754	-135.640264				-9.569267	-515.227885	-140.166446	-10.349698	-513.623960	-140.331781
	Long wave	PM11	Phot	Mirror	57	79	0.000000	-509.514911	-179.297659				-10.137949	-510.450710	-178.472020	-10.987456	-508.588478	-180.115035
		PLW	Phot	Det	59	81	0.000000	-468.515249	-179.298363				-10.755735	-468.515228	-178.436583	-11.624777	-468.515270	-180.154575
		CM5	Spec	Ignore	17	39				58.001413	-183.378925	76.879467	18.029700	-178.482563	81.282101	19.499867	-181.314796	81.945342
	Spectrometer optics	SM6	Spec	Mirror	22	44				33.819095	-263.977827	-104.147355	15.521875	-277.506548	106.787347	16.690589	-280.923961	107.754190
		SCS	Spec	Hole	26	48				141.695796	-233.044025	-112.984032	0.087781	-448.950976	9.143638	0.080828	-448.947719	9.147150
		SM7	Spec	Mirror	30	52				170.859510	-224.681288	-115.372966	-10.755735	-505.261042	-220.085158	-11.624777	-503.556441	-219.871068
		SM8A	Spec	Mirror	36	58				170.860517	-234.578711	-171.504392	-10.168951	-627.361870	68.909762	-11.004597	-626.732892	70.645120
	Upper arm	SBS1	Spec	Hole	39	61				170.857397	-321.398300	-21.127710	-34.140000	-627.618626	69.153106	-34.140000	-626.968333	70.928749
		SM9A	Spec	Mirror	43	65				170.854284	-407.997960	-171.123463	-10.019144	-620.399652	61.497935	-10.829581	-619.213249	62.610429
		SRTA1	Spec	Mirror	46	68				170.854265	-407.998264	-46.123579	-9.569267	-515.227885	-140.166446	-10.349698	-513.623960	-140.331781
		SRTA2	Spec	Mirror	51	73				170.854258	-457.998681	-46.123457	-72.027431	-521.635326	-89.711826	-72.586040	-519.847765	-90.158272
		SM10A	Spec	Mirror	56	78				170.854239	-457.998377	-171.123268	-9.503531	-515.780101	-135.738523	-10.272944	-514.229985	-135.543836
		SBS2	Spec	Hole	60	82				170.857352	-544.598115	-21.127710	-10.623296	-477.505228	-178.444180	-11.481801	-477.505270	-180.145705
		SM11A	Spec	Mirror	63	85				170.860083	-620.587965	-152.746350	-10.755735	-468.515228	-178.436583	-11.624777	-468.515270	-180.154575
		SM12A	Spec	Mirror	67	89				170.858259	-636.663312	-61.581021	0.000000	0.000000	0.000000	0.000000	0.000000	0.000000
		SFLA	Spec	Hole	69	91				236.756678	-636.663389	-61.582353	0.000000	0.000000	0.000000	0.000000	0.000000	0.000000
		SSW	Spec	Det	71	93				250.856678	-636.663366	-61.582671	0.000000	0.000000	0.000000	0.000000	0.000000	0.000000
	Lower arm	SCAL	Spec	Hole	102	124				170.858972	-219.396733	43.147154	0.000000	0.000000	0.000000	0.000000	0.000000	0.000000
		SM8B	Spec	Mirror	98	120				170.860517	-234.578711	129.248973	0.000000	0.000000	0.000000	0.000000	0.000000	0.000000
		SBS1	Spec	Hole	39	61				170.857397	-321.398300	-21.127710	-34.140000	-627.618626	69.153106	-34.140000	-626.968333	70.928749
		SM9B	Spec	Mirror	111	133				170.854284	-407.997960	128.868044	0.000000	0.000000	0.000000	0.000000	0.000000	0.000000
		SRTB1	Spec	Mirror	114	136				170.854265	-407.998264	3.868159	0.000000	0.000000	0.000000	0.000000	0.000000	0.000000
		SRTB2	Spec	Mirror	119	141				170.854258	-457.998681	3.868038	0.000000	0.000000	0.000000	0.000000	0.000000	0.000000
		SM10B	Spec	Mirror	124	146				170.854239	-457.998377	128.867848	0.000000	0.000000	0.000000	0.000000	0.000000	0.000000
		SBS2	Spec	Hole	60	82				170.857352	-544.598115	-21.127710	-10.623296	-477.505228	-178.444180	-11.481801	-477.505270	-180.145705
		SM11B	Spec	Mirror	131	153				170.860083	-620.587965	110.490931	0.000000	0.000000	0.000000	0.000000	0.000000	0.000000
		SM12B	Spec	Mirror	136	158				170.858259	-636.663312	19.325602	0.000000	0.000000	0.000000	0.000000	0.000000	0.000000
		SFLB	Spec	Hole	138	160				246.956678	-636.663401	19.327140	0.000000	0.000000	0.000000	0.000000	0.000000	0.000000
		SLW	Spec	Det	140	162				250.856678	-636.663396	19.327213	0.000000	0.000000	0.000000	0.000000	0.000000	0.000000

Axis directions:	X	Y	Z	X	Y	Z	X	Y	Z	X	Y	Z
X	-Zsyno	Tow. tel		Phot	Spec	Spec	CM3	CM3	CM3	CM5	CM5	CM5
Y	Xsyno	Tow. Spectro		Gut	Gut	Gut	Gut	Gut	Gut	Cent	Cent	Cent
Z	Ysyno	Tow. PAX										

--- ID?
 The current lens ID is: ID SPIRE PHOT (BOLPHT155D)

--- TIME
 04-janv-02 14:23:18

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

ID SPIRE PHOT (BOLPHT155) 288 04-janv-02 14:23:18
 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	(UMPO)	0	CELL	LENGTH	(TOTL)	888.1
CHIEF	RAY	HEIGHT	(YPP1)	-4.99	F/NUMBER	(FNUM)	5.5964	
CHIEF	RAY	ANGLE	(UPPO)	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)
X-MARG	RAY	ANGLE	(VMP0)	0	X-CHIEF	RAY	ANGLE(VPP0)	-4.99
WAVL	(uM)	200	400	600	250	0.6328		
WEIGHTS		1	1	1	1			
COLOR	ORDER	2	1	3	4	5		
UNITS	MM							
APERTURE	STOP	SURFACE	(APS)	7	SEMI-APERT	-154.06		
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	INFINITE	AIR		
1	INFINITE	17771.1	AIR		
2	INFINITE	0	AIR		
3	INFINITE	-17771.1	AIR		
4	INFINITE	-2000	AIR		
5	INFINITE	2000	AIR		
6	-3500	-1587.998	#NOM?		
APS	-345.2	1587.998	AIR		
8	INFINITE	1050	AIR		
9	-167.171	0	AIR		
10	INFINITE	70.9	AIR		
11	-365.963	0	#NOM?		
12	INFINITE	-213.5	#NOM?		
13	INFINITE	0	#NOM?		
14	INFINITE	0	AIR		
15	INFINITE	0	AIR		
16	INFINITE	197.4	AIR		
17	-294.638	0	#NOM?		
18	INFINITE	-193.6	#NOM?		
19	INFINITE	0	#NOM?		
20	-307.49	0	AIR		
21	INFINITE	202.9	AIR		
22	-330.7	0	#NOM?		
23	INFINITE	-188	#NOM?		
24	-286.651	0	AIR		
25	INFINITE	70	AIR		
26	INFINITE	130	AIR		
27	-350.851	0	#NOM?		
28	INFINITE	-320	#NOM?		
29	INFINITE	0	#NOM?		
30	INFINITE	185	#NOM?		
31	INFINITE	0	AIR		
32	INFINITE	0	AIR		
33	INFINITE	0	AIR		
34	INFINITE	0	AIR		
35	INFINITE	135	AIR		
36	INFINITE	0	#NOM?		
37	INFINITE	-50	#NOM?		
38	INFINITE	0	#NOM?		
39	INFINITE	0	#NOM?		
40	INFINITE	0	#NOM?		
41	INFINITE	50	#NOM?		
42	INFINITE	0	AIR		
43	INFINITE	-135	AIR		
44	INFINITE	0	#NOM?		
45	INFINITE	-100	#NOM?		
46	INFINITE	0	AIR		
47	INFINITE	0	AIR		
48	INFINITE	0	AIR		
49	INFINITE	0	AIR		
50	INFINITE	85	AIR		
51	INFINITE	0	AIR		
52	INFINITE	0	AIR		
53	INFINITE	0	AIR		
54	INFINITE	-85	AIR		
55	INFINITE	0	#NOM?		
56	INFINITE	-44	#NOM?		
57	INFINITE	0	AIR		
58	INFINITE	41	AIR		
59	INFINITE	0	AIR		
60	INFINITE	0	AIR		
61	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 IN 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-MINOF AXIS (a) 3.50E+08

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

SURFACE NO. 11 -- CONIC SURFACE
 CONIC CONSTANT (CC) -0.5095
 SEMI-MAJOFAXIS (b) -746.101937 SEMI-MINOF AXIS (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	0	-5	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 COORDINAT DATA

GLOBAL COORDINAT SURFACE LOCATION IN COORDINAT SYSTEM OF SURFACE 9

SURF	X	Y	Z	NOTES	ALPHA	BETA	GAMMA
1	0	56.731939	-1049.90945	-0.18291	0	0	0
2	0	0	1.67E+04	0	0	0	0
3	0	0	1.67E+04	0	0	0	0
4	0	0	-1.05E+03	0	0	0	0
5	0	0	-3050	0	0	0	0
6	0	0	-1050	0	0	0	0
APS	0	0	-2637.998	0	0	0	0
8	0	0	-1050	0	0	0	0
9	0	0	0	0	0	0	0
10	0	-91.048	0	-1.9766	0	0	0
11	0	-243.065859	78.379337	-8.6832	0	0	0
12	0	-93.493436	70.857814	29.9534	0	0	0
13	0	-200.09302	-114.125371	17.9434	0	0	0
14	0	-200.09302	-114.125371	17.9434	0	0	0
15	0	-200.09302	-114.125371	17.9434	0	0	0
16	0	-200.09302	-114.125371	5.9334	0	0	0
17	0	-179.687314	82.217104	15.1454	0	0	0
18	0	-179.687314	82.217104	24.3574	0	0	0
19	0	-259.533222	-94.150668	-8.5396	0	0	0
20	0	-259.533222	-94.150668	9.3574	0	0	0
21	0	-259.533222	-94.150668	-5.6426	0	0	0
22	0	-279.482925	107.766194	16.6474	0	0	0
23	0	-279.482925	107.766194	38.9374	0	0	0
24	0	-397.635459	-38.466424	-4.1106	0	0	0
25	0	-397.635459	-38.466424	-47.1586	0	0	0
26	0	-448.96217	9.131566	-47.1586	0	0	0
27	0	-544.283205	97.527835	-27.1586	0	0	0
28	0	-544.283205	97.527835	-7.1586	0	0	0
29	0	-504.405979	-219.977766	-7.1586	0	0	0
30	0	-504.405979	-219.977766	-7.1586	0	0	0
31	0	-527.460001	-36.419841	-25.1586	0	0	0
32	0	-525.334374	-40.945513	-25.1586	0	0	0
33	0	-529.585628	-31.894168	-25.1586	0	0	0
34	0	-527.460001	-36.419841	-25.1586	0	0	0
35	0	-527.460001	-36.419841	-43.1586	0	0	0
36	1.82E-14	-619.802728	62.057673	-43.1586	-45	0	0
37	-3.85E-15	-619.802728	62.057673	-43.1586	-90	0	0
38	-5.00E+01	-619.802728	62.057673	-43.1586	-90	0	0
39	-34.14	-619.802728	62.057673	-43.1586	-90	0	0
40	-29.14	-619.802728	62.057673	-43.1586	-90	0	0
41	-34.14	-619.802728	62.057673	-43.1586	-90	0	0
42	1.82E-14	-619.802728	62.057673	-43.1586	-45	0	0
43	-3.44E-15	-619.802728	62.057673	-43.1586	0	0	0
44	2.02E-15	-527.460001	-36.419841	-25.1586	0	0	0
45	2.02E-15	-527.460001	-36.419841	-7.1586	0	0	0
46	7.15E-15	-514.998367	-135.640341	-7.1586	25	0	0
47	2.11E+00	-514.433664	-140.136557	-7.1586	25	0	0
48	-2.113091	-515.563071	-131.144126	-7.1586	25	0	0
49	7.15E-15	-514.998367	-135.640341	-7.1586	25	0	0
50	0.00E+00	-514.998367	-135.640341	-7.1586	50	0	0
51	-65.113778	-521.807023	-81.429289	-7.1586	50	0	0
52	-58.6024	-521.126158	-86.850394	-7.1586	50	0	0
53	-54.772178	-520.725649	-90.03928	-7.1586	50	0	0
54	-58.6024	-521.126158	-86.850394	-7.1586	50	0	0
55	-7.15E-15	-514.998367	-135.640341	-7.1586	25	0	0
56	-7.91E-15	-514.998367	-135.640341	-7.1586	0	0	0
57	-1.28E-14	-509.515249	-179.297361	41.4214	0	0	0
58	-1.28E-14	-509.515249	-179.297361	90.0014	0	0	0
59	-1.34E-14	-468.515249	-179.298363	90.0014	0	0	0
60	-1.33E-14	-477.505249	-179.298143	90.0014	0	0	0
61	-1.32E-14	-482.505249	-179.298021	90.0014	0	0	0
62	-1.33E-14	-477.505249	-179.298143	90.0014	0	0	0
63	-1.34E-14	-468.515249	-179.298363	90.0014	0	0	0

Unless noted, Euler angles are taken in the order alpha, beta, gamma
 --- CAP
 ID SPIRE PHOT (BOLPHT155) 288 04-janv-02 14:23:20

CLEAR APERTURE DATA
 (Y-coordinate only)

SURF	X	OR	R-APER.	Y-APER.	REMARK	X-OFFSET	Y-OFFSET
1	1650.7121	Soft	CAO				
2	1643.8966	Soft	CAO				
3	1643.8966	Soft	CAO				
4	1703.5776	Soft	CAO				
5	1710.7852	Soft	CAO				
6	1750	User	CAO				
7	154.06	User	CAO				
8	122.3149	Soft	CAO				

9	124	User	CAO						
10	13.9413	Soft	CAO						
11	139	62 User	CAO	RAO	-19.5	145			
12	18.5633	Soft	CAO						
13	12.7086	Soft	CAO						
14	15	16 User	CAO	EAO					
15	12.7086	Soft	CAO						
16	12.3736	Soft	CAO						
17	161	85 User	CAO	RAO	19.5	-1.5			
18	29.6189	Soft	CAO						
19	9.1357	Soft	CAO						
20	46	27 User	CAO	RAO					
21	8.0804	Soft	CAO						
22	118	101 User	CAO	RAO	0	-1			
23	34.0856	Soft	CAO						
24	32	User	CAO						
25	16.0174	Soft	CAO						
26	23.064	19.904 User	CAO	EAO	0	0.738			
27	56	User	CAO						
28	37.619	Soft	CAO						
29	7.2672	Soft	CAO						
30	44	22 User	CAO	RAO					
31	40	User	CAO						
32	50	User	CAO						
33	50	User	CAO						
34	25.4656	Soft	CAO						
35	24.7592	Soft	CAO						
36	78	40 User	CAO	RAO	2.5	0			
37	11.8994	Soft	CAO						
38	40	22 User	CAO	RAO					
39	32.5	User	CAO						
40	32.5	User	CAO						
41	8.6473	Soft	CAO						
42	11.8994	Soft	CAO						
43	11.8994	Soft	CAO						
44	50	User	CAO						
45	24.7592	Soft	CAO						
46	36	User	CAO						
47	46	User	CAO						
48	46	User	CAO						
49	15.2334	Soft	CAO						
50	15.2334	Soft	CAO						
51	40	22 User	CAO	RAO					
52	32.5	User	CAO						
53	32.5	User	CAO						
54	7.9462	Soft	CAO						
55	15.2334	Soft	CAO						
56	15.2334	Soft	CAO						
57	56	53 User	CAO	RAO	0	-2.75			
58	11.042	Soft	CAO						
59	40	22 User	CAO	RAO					
60	32.5	User	CAO						
61	32.5	User	CAO						
62	7.9928	Soft	CAO						
63	7.2672	Soft	CAO						

NOTE: CAO, CAI, EAO, and EAI input is semi-aperture.
 RAO and RAI input full aperture.
 --- PMA BOLSPECGLOB03
 *****MACRO LIST *****
 BOLSPECGLOB03
 !bolgutglob01 to 210700 Glob coords of gut ray impacts
 ! import into XL
 !bolspecglob01 10900 Clob coords of surface summits
 ! 2 270901 Include CAP listing
 ! 3 121101 Switch 74 ON, list macro at the end

on 74
 fnm: specglob.txt
 !Origin surf num
 z1 = 9
 pon fnm
 id?
 time
 !gray 2 0 0 0 surf 0 z1
 spec glob z1
 cap pma bolspecglob03
 pof c
 off 74

 --- POF C

--- ID?
The current lens ID is: ID SPICE SPECTRO (BOLSP509H)

--- TIME
--- 20-jun-02 12:16:25
--- VGRAY GLOB 2 0 0 0 SURF 0 ZI

ID SPICE SPECTRO (BOLSP509H) 312 20-jun-02 12:16:25
LENS SPECIFICATIONS

SYSTEM SPECIFICATIONS

OBJECT DISTANCE (TBO) INFINITE FOCAL LENGTH (FOCL) 17688.3629
OBJECT HEIGHT (YH) INFINITE BACK LENGTH (FOCL) 51.0013
MARG RAY HEIGHT (YHP) 1641.705 IMAGE DISTANCE (BACK) -1.71
MARG RAY ANGLE (YMP) 0 CELL LENGTH (TOTL) 160.54
CHIEF RAY HEIGHT (YRF) -4.99 FNUMBER (FNUM) -5.4481
CHIEF RAY ANGLE (RFP) 0.0107 GAUSSIAN IMAGE HEIGHT) 5.5244
ENTR PUPIL SEMI-APERT 1641.705 EXIT PUPIL SEMI-APERT 76.5536
ENTR PUPIL LOCATION 17158.0876 EXIT PUPIL LOCATION -884.9669
X-OBJECT HEIGHT (XHP) INFINITE 1641.705 X-CHIEF RAY HT (XFP) -4.99
X-MARG RAY HEIGHT (XMP) 0 X-CHIEF RAY ANGLE (XRF) 0.0107
X-MARG RAY ANGLE (XRF) 0 X-CHIEF RAY ANGLE (XRF) 0.0107

SURFACE DATA

Table with columns: SURF, RADII, THICKNESS, MEDIUM, INDEX, V-NUMBER. Contains surface data for 139 surfaces, including various optical elements like lenses and mirrors.

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

SPECIAL SURFACE DATA
SURFACE NO 6 -- CONIC SURFACE
CONIC CONSTANT (CC) -1
SEMI-MAJOR AXIS (b) -1.50E+13 SEMI-MINOR AXIS (a) 3.50E+08
SURFACE NO 7 -- CONIC SURFACE
CONIC CONSTANT (CC) -1.279
SEMI-MAJOR AXIS (b) 1227.27986 SEMI-MINOR AXIS (a) -653.534751
SURFACE NO 11 -- CONIC SURFACE
CONIC CONSTANT (CC) -0.5095
SEMI-MAJOR AXIS (b) -746.101937 SEMI-MINOR AXIS (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: 65 -- TORIC SURFACE
 RX -169.84

SURFACE NO: 78 -- TORIC SURFACE
 RX -169.84

SURFACE NO: 98 -- TORIC SURFACE
 RX -202

SURFACE NO: 105 -- TORIC SURFACE
 RX -202

SURFACE NO: 131 -- 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	-91048	0	-1.9766	0	0
11	REL	0	-149224	12.676	-6.7066	0	0
12	REL	0	0	0	0	0	0
13	REL	0	0	0	0	-12.01	0
14	REL	0	0	0	0	0	0
16	REL	0	0	0	0	-24.02	0
17	REL	0	0	0	9.212	0	0
18	REL	0	0	0	18.424	0	0
19	REL	0	0	0	-24.374	0	0
20	REL	3382	-4.442	0	0	0	74
21	REL	0	0	0	45	0	0
22	LOC	ARG	0	0	0	10.929	13.491
24	REL	0	0	0	49.5	0	0
26	LOC	ARG	0	0	0	16	12
28	REL	0	0	0	-45	0	0
30	LOC	ARG	0	0	0	-0.441	-173.118
32	REL	0	0	0	-49.5	0	0
33	REL	0	0	0	0	0	-74
34	REL	0	0	0	30	0	0
35	REL	0	0	0	-20	0	0
36	REL	0	0	0	0	0	-6.22
38	REL	0	0	0	0	0	0
39	REL	0	0	0	30	0	0
40	REL	0	0	0	60	0	0
41	REL	0	0	0	0.00E+00	-15	0.00E+00
44	REL	0	0	0	0.00E+00	-30	0.00E+00
46	REL	0	0	0	45	0	0
47	REL	0	0	0	90	0	0
51	REL	0	0	0	45	0	0
54	REL	0	0	0	-45	0	0
56	REL	0	0	0	0.00E+00	-15	0.00E+00
57	REL	0	0	0	0.00E+00	-30	0.00E+00
60	REL	0	0	0	30	0	0
63	REL	0	0	0	60	0	0
62	REL	0	0	0	-20	0	0
63	REL	0	0	0	0.00E+00	0	0.00E+00
65	REL	0	0	0	0.00E+00	-40	0.00E+00
67	REL	0	0	0	0.00E+00	0	-4.50E-01
68	REL	0	0	0	0	0	-90
71	REL	0	0	0	0	0	10
74	REL	0	0	0	0	45	0
75	REL	0	0	0	0	90	0
77	REL	0	0	0	20	0	0
78	REL	0	0	0	0	0	0
80	REL	0	0	0	40	0	0
83	REL	0	0	0	-20	0.00E+00	0
82	REL	0	0	0	-60	0.00E+00	0
84	REL	0	0	0	15	0.00E+00	0
85	REL	0	0	0	20	0	0
87	REL	0	0	0	-45	0	0
88	REL	0	0	0	-45	0	0
90	REL	0	0	0	-45	0.00E+00	0
91	REL	0	0	0	-90	0.00E+00	0
93	REL	0	0	0	15	0	0
94	REL	0	0	0	30	0	0
97	REL	0	0	0	-20	0	0
98	REL	0	0	0	0	0	-6.22
100	REL	0	0	0	0	0	0
104	REL	0	0	0	20	0	0
105	REL	0	0	0	0	0	-6.22
107	REL	0	0	0	40	0	0
108	REL	0	0	0	-30	0	0
109	REL	0	0	0	-60	0	0
111	REL	0	0	0	15	0	0
112	REL	0	0	0	30	0	0
114	REL	0	0	0	-45	0	0
115	REL	0	0	0	-60	0	0
119	REL	0	0	0	-45	0	0
122	REL	0	0	0	-45	0	0
124	REL	0	0	0	15	0	0
125	REL	0	0	0	30	0	0
129	REL	0	0	0	20	0	0
129	REL	0	0	0	-60	0	0
130	REL	0	0	0	20	0	0
131	REL	0	0	0	0	0	0
134	REL	0	0	0	40	0	0
136	REL	0	0	0	0	45	0
137	REL	0	0	0	0	90	0
140	REL	0	0	0	0	0	10

KEY TO SURFACE TYPES

GLB GLOBAL COORDINATES LOCAL COORDINATES
 REL RELATIVE COORDINATE REMOTE TELTS IN RELATIVE COORD.

SURF MESSAGES

12	UNDO	TILTSDECE	FROM	SURFACE NO.	11
15	UNDO	TILTSDECE	FROM	SURFACE NO.	14
16	UNDO	TILTSDECE	FROM	SURFACE NO.	13
18	UNDO	TILTSDECE	FROM	SURFACE NO.	17
21	CONCERN WITH	SURFACE NO.		21	
27	CONCERN WITH	SURFACE NO.		29	
31	CONCERN WITH	SURFACE NO.		29	
37	UNDO	TILTSDECE	FROM	SURFACE NO.	36
38	UNDO	TILTSDECE	FROM	SURFACE NO.	35
40	UNDO	TILTSDECE	FROM	SURFACE NO.	39
44	UNDO	TILTSDECE	FROM	SURFACE NO.	43
47	UNDO	TILTSDECE	FROM	SURFACE NO.	46
57	UNDO	TILTSDECE	FROM	SURFACE NO.	56
61	UNDO	TILTSDECE	FROM	SURFACE NO.	60
64	UNDO	TILTSDECE	FROM	SURFACE NO.	63
65	UNDO	TILTSDECE	FROM	SURFACE NO.	62
68	UNDO	TILTSDECE	FROM	SURFACE NO.	67
73	UNDO	TILTSDECE	FROM	SURFACE NO.	71
74	TILTSDECE	FROM	SURFACE NO.	67	
75	UNDO	TILTSDECE	FROM	SURFACE NO.	74
75	TILTSDECE	FROM	SURFACE NO.	68	
77	TILTSDECE	FROM	SURFACE NO.	62	
78	TILTSDECE	FROM	SURFACE NO.	63	
79	UNDO	TILTSDECE	FROM	SURFACE NO.	63
80	UNDO	TILTSDECE	FROM	SURFACE NO.	77
80	TILTSDECE	FROM	SURFACE NO.	65	
81	TILTSDECE	FROM	SURFACE NO.	80	
82	UNDO	TILTSDECE	FROM	SURFACE NO.	81
82	TILTSDECE	FROM	SURFACE NO.	81	
84	TILTSDECE	FROM	SURFACE NO.	56	
85	UNDO	TILTSDECE	FROM	SURFACE NO.	84
85	TILTSDECE	FROM	SURFACE NO.	57	
87	TILTSDECE	FROM	SURFACE NO.	51	
88	TILTSDECE	FROM	SURFACE NO.	54	
90	TILTSDECE	FROM	SURFACE NO.	46	
91	UNDO	TILTSDECE	FROM	SURFACE NO.	90
91	TILTSDECE	FROM	SURFACE NO.	47	
93	TILTSDECE	FROM	SURFACE NO.	43	
94	UNDO	TILTSDECE	FROM	SURFACE NO.	93
94	TILTSDECE	FROM	SURFACE NO.	44	
97	TILTSDECE	FROM	SURFACE NO.	35	
98	TILTSDECE	FROM	SURFACE NO.	36	
99	UNDO	TILTSDECE	FROM	SURFACE NO.	98
100	UNDO	TILTSDECE	FROM	SURFACE NO.	9.70E-01
100	TILTSDECE	FROM	SURFACE NO.	38	
104	TILTSDECE	FROM	SURFACE NO.	-9.70E-01	
105	TILTSDECE	FROM	SURFACE NO.	9.90E-01	
106	UNDO	TILTSDECE	FROM	SURFACE NO.	105
107	UNDO	TILTSDECE	FROM	SURFACE NO.	104
107	TILTSDECE	FROM	SURFACE NO.	-100	
108	TILTSDECE	FROM	SURFACE NO.	-39	
109	UNDO	TILTSDECE	FROM	SURFACE NO.	108
109	TILTSDECE	FROM	SURFACE NO.	-4.00E-01	
111	TILTSDECE	FROM	SURFACE NO.	-4.30E-01	
112	UNDO	TILTSDECE	FROM	SURFACE NO.	1.11E-02
112	TILTSDECE	FROM	SURFACE NO.	-4.40E-01	
114	TILTSDECE	FROM	SURFACE NO.	-4.60E-01	
115	UNDO	TILTSDECE	FROM	SURFACE NO.	1.14E-02
115	TILTSDECE	FROM	SURFACE NO.	-47	
119	TILTSDECE	FROM	SURFACE NO.	-5.10E-01	
122	TILTSDECE	FROM	SURFACE NO.	-5.40E-01	
124	TILTSDECE	FROM	SURFACE NO.	-56	
125	UNDO	TILTSDECE	FROM	SURFACE NO.	124
125	TILTSDECE	FROM	SURFACE NO.	-57	
129	TILTSDECE	FROM	SURFACE NO.	-80	
129	UNDO	TILTSDECE	FROM	SURFACE NO.	128
129	TILTSDECE	FROM	SURFACE NO.	61	
130	TILTSDECE	FROM	SURFACE NO.	62	
131	TILTSDECE	FROM	SURFACE NO.	63	
132	UNDO	TILTSDECE	FROM	SURFACE NO.	131
133	UNDO	TILTSDECE	FROM	SURFACE NO.	130
134	TILTSDECE	FROM	SURFACE NO.	65	
136	TILTSDECE	FROM	SURFACE NO.	67	
137	UNDO	TILTSDECE	FROM	SURFACE NO.	136
137	TILTSDECE	FROM	SURFACE NO.	68	
140	TILTSDECE	FROM	SURFACE NO.	71	

GLOBAL COORDINATE DATA

GLOBAL COORDINATE REFERENCE LOCATION IN COORDINATE SYSTEM OF SURFACE 9

SURF	X	Y	Z	NOTES	ALPHA	BETA	GAMMA
1	38144766	56731939	-104980831		-0.18291	0.12298	-0.00039
2	0	0	0		0	0.12298	0
3	0	0	0		0	0	0
4	0	0	0		0	0.00E+00	0
5	0	0	0		0	0.00E+00	0
6	0	0	0		0	0.00E+00	0
7	0	0	0		0	0.00E+00	0
8	0	0	0		0	0.00E+00	0
9	0	0	0		0	0	0
10	0	-91.048	2.18E+17		-1.9766	0	0.00E+00
11	0	-241.6659	78.77037		-6.8832	0	0
12	0	-91.49346	70.87814		29.6534	0	0.00E+00
13	0	-200.09302	-114.12571		17.6434	0	0.00E+00
14	0	-200.09302	-114.12571		17.6434	0	0

82	12544	Soft	CAD								
83	94896	Soft	CAD								
84	124591	Soft	CAD								
85	205882	Soft	CAD								
86	115256	Soft	CAD								
87	191398	Soft	CAD								
88	129201	Soft	CAD								
89	115256	Soft	CAD								
90	18494	Soft	CAD								
91	125414	Soft	CAD								
92	115256	Soft	CAD								
93	219113	Soft	CAD								
94	209961	Soft	CAD								
95	94811	Soft	CAD								
96	12183	Soft	CAD								
97	259942	Soft	CAD								
98	25	Layer	CAD								
99	267898	Soft	CAD								
100	249955	Soft	CAD								
101	160377	Soft	CAD								
102	75	Layer	CAD								
103	160377	Soft	CAD								
104	267898	Soft	CAD								
105	259942	Soft	CAD								
106	259942	Soft	CAD								
107	247971	Soft	CAD								
108	145408	Soft	CAD								
109	12183	Soft	CAD								
110	94815	Soft	CAD								
111	25	Layer	CAD								
112	21488	Soft	CAD								
113	115256	Soft	CAD								
114	19	24	Use	EAO		0		1.3			
115	125414	Soft	CAD								
116	16	Layer	CAD								
117	115256	Soft	CAD								
118	129201	Soft	CAD								
119	19	24	Use	EAO		0		1.3			
120	191398	Soft	CAD								
121	191398	Soft	CAD								
122	129201	Soft	CAD								
123	115256	Soft	CAD								
124	30	Layer	CAD								
125	205581	Soft	CAD								
126	10	Layer	CAD								
127	93696	Soft	CAD								
128	18	Layer	CAD			0		2			
129	125408	Soft	CAD								
130	246788	Soft	CAD								
131	71	Layer	CAD			0		1			
132	242228	Soft	CAD								
133	220199	Soft	CAD								
134	238682	Soft	CAD								
135	18.5	Layer	CAD			0		2		-0.5	
136	12.4	9	Use	EAO		-0.65		-0.5			
137	95011	Soft	CAD								
138	8	Layer	CAD								
139	8	Layer	CAD								
140	10	Layer	CAD								

NOTE CAD, CAL, EAO, and is EAL input is semi-aperture.

UNUSUAL APERTURE DATA

SURF APERTURE SPECIFICATIONS

X	43 POLYGON APERTURE WITH	4 VERTICES (OUTSIDE)
Y		
-30	30	
30	30	
-22.5		
-30	-22.5	
X	56 POLYGON APERTURE WITH	4 VERTICES (OUTSIDE)
Y		
-40	40	
40	40	
-28		
-40	-28	
X	111 POLYGON APERTURE WITH	4 VERTICES (OUTSIDE)
Y		
-30	30	
30	30	
-22.5		
-30	-22.5	
X	124 POLYGON APERTURE WITH	4 VERTICES (OUTSIDE)
Y		
-40	40	
40	40	
-28		
-40	-28	

```

----- PMA BOLSPECJOB03
*****MACRO LIST *****
BOLSPECJOB03
! $pdqghbb01 210700 Glob coords of gut rny impacts
! $pdqghbb01 10900 Club coords of surface summits
! $pdqghbb01 2 27000 Include CAP 74 ON, list macro at the end
! $pdqghbb01 3 121100 Switch
on
fmm: specglob.rst
!Origin surf nam 9
!1 -
pos fmm
!dt
time
!gray
!spec glob 2 0 0 0 surf 0 z1
!cap
!pma bolspecjob03
!pdf c
!off 74
-----

```

X	124 POLYGON APERTURE WITH	4 VERTICES (OUTSIDE)
Y		
-40	40	
40	40	
-28		
-40	-28	

```

----- PMA BOLSPECJOB03
*****MACRO LIST *****
BOLSPECJOB03
! $pdqghbb01 210700 Glob coords of gut rny impacts
! $pdqghbb01 10900 Club coords of surface summits
! $pdqghbb01 2 27000 Include CAP 74 ON, list macro at the end
! $pdqghbb01 3 121100 Switch
on
fmm: specglob.rst
!Origin surf nam 9
!1 -
pos fmm
!dt
time
!gray
!spec glob 2 0 0 0 surf 0 z1
!cap
!pma bolspecjob03
!pdf c
!off 74
-----

```

```

---
--- ID?
The current lens ID is: ID SPIRE PHOT (BOLPHT155)
---
--- TIME
11-MAY-01 14:56:38
---
--- GRAY 2 0 0 0 SURF 0 Z1
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

```

```
-- ID?
The current loss ID ic ID SPRE SPECTRO (BOLSP508)
-- TIME
04.jan.02 15:03:08
-- GRAY 2 Z2 0 0 SURF Z3 Z1
ID SPRE SPECTRO (BOLSP508) 288 04.jan.02 15:03:08
GLOBAL RAYTRACE ANALYSIS
RAY DATA IN COORDINAT SYSTEM OF SURFACE NO. 9
FRACT. OBJECT HEIGHT HBAR OF BAR 0
FRACT. ENTRANCE PUPIL COORD YEN O XEN 0
COLOR NUMBER Z
RAY VECTORS (X Y DHR TAN) (Y DHR TAN)
SURF X Y Z ZZ HH HH
1 36.849291 54.805206 -1049.87744 -0.002146 -0.003192
2 -1.295484 -1.920762 16721.0 -0.002146 -0.003192
3 -1.295484 -1.920762 16721.0 -0.002146 -0.003192
4 36.849554 54.805597 1050.0 -0.002146 -0.003192
5 41.142485 61.190386 -3050 -0.002146 -0.003192
6 36.850892 54.807588 ##### 0.022125 -0.034527
7 -2.77113 -1.71415 -2871.998 0.022125 -0.034527
8 -36.865558 -54.829101 1050.0 -0.022125 -0.034527
9 -60.230760 -80.713308 -39657962 -0.022125 -0.034527
10 -61.241069 -91.082604 -119E-03 -0.022125 -0.034527
11 -62.709664 -92.343113 65.469209 -0.350911 0.596199
12 -64.145713 90.990424 69.415413 -0.350911 0.596199
13 0.229982 -200.363461 -144.037794 -0.350911 0.596199
14 0.229982 -200.363461 -144.037794 0.350299 0.088963
15 0.229982 -200.363461 -144.037794 0.350299 0.088963
16 0.221125 -200.363461 -144.037794 0.350299 0.088963
17 8.001411 -18.178925 78.879467 0.131584 0.445232
18 58.78063 -180.791822 82.712614 0.131584 0.445232
19 35.145498 -295.550951 94.150668 0.131584 0.445232
20 33.818652 -263.979302 -104.150668 0.131584 0.445232
21 33.818911 -263.97844 -104.148774 0.131584 0.445232
22 33.819058 -263.97767 -104.147355 -1.207836 -1.500615
23 33.817295 -263.978341 -104.147208 -1.207836 -1.500615
24 33.820861 -263.97712 -104.1475 -1.207836 -1.500615
25 141.69601 -233.043964 -112.98405 -1.207836 -1.500615
26 141.69796 -233.044022 -112.98402 -1.207836 -1.500615
27 141.69601 -233.043964 -112.98405 -1.207836 -1.500615
28 170.859234 -224.681367 -115.02102 -1.226101 -1.500615
29 170.859234 -224.681367 -115.02102 -1.207836 -1.500615
30 170.85951 -224.681288 -115.027966 -1.79E-05 0.176326
31 170.85951 -224.681288 -115.027966 -1.79E-05 0.176326
32 170.85951 -224.680821 -115.031919 -1.79E-05 0.176326
33 170.85951 -224.680821 -115.031919 -1.79E-05 0.176326
34 170.85951 -224.680821 -115.031919 -1.79E-05 0.176326
35 170.860517 -234.578711 -171.504392 -2.08E-05 0.577349
36 1.71E-02 -234.578711 -171.504392 -2.08E-05 0.577349
37 1.71E-02 -234.578711 -171.504392 -2.08E-05 0.577349
38 170.860517 -234.57868 -171.504445 -2.08E-05 0.577349
39 170.857397 -321.3983 -21.12771 -2.08E-05 0.577349
40 170.857397 -321.39838 -21.12781 -2.08E-05 0.577349
41 170.856678 -341.398284 -55.76887 -2.08E-05 0.577349
42 1.71E-02 -341.398284 -55.76887 -2.08E-05 0.577349
43 1.71E-02 -407.99796 -171.123463 -1.49E-07 -2.43E-06
44 1.71E-02 -407.99796 -171.12331 -1.49E-07 -2.43E-06
45 1.71E-02 -408E-02 -21.12331 -1.49E-07 -2.43E-06
46 1.71E-02 -407.998264 -46.123579 -0.061174 -4.11E-05
47 170.854261 -407.998325 -46.1E-01 -0.061174 -4.11E-05
48 170.854261 -432.998333 -46.123518 -0.061174 -4.11E-05
49 1.71E-02 -432.998333 -46.123518 -0.061174 -4.11E-05
50 1.71E-02 -438E-02 -46.12351 -0.061174 -4.11E-05
51 170.854261 -457.998881 -46.123457 -1.49E-07 -2.43E-06
52 170.854261 -457.998881 -46.123457 -1.49E-07 -2.43E-06
53 170.854261 -457.998881 -46.123457 -1.49E-07 -2.43E-06
54 170.854261 -458E-02 -46.12331 -1.49E-07 -2.43E-06
55 1.71E-02 -458E-02 -21.12331 -1.49E-07 -2.43E-06
56 1.71E-02 -457.998377 -171.12338 -2.08E-05 0.577349
57 1.71E-02 -457.998398 -171.12323 -2.08E-05 0.577349
58 1.71E-02 -524.598261 -15.576858 -2.08E-05 0.577349
59 1.71E-02 -524.598261 -15.576858 -2.08E-05 0.577349
60 1.71E-02 -544.598115 -21.12771 -2.08E-05 0.577349
61 1.71E-02 -544.59822 -21.12791 -2.08E-05 0.577349
62 1.71E-02 -620.587965 -152.746551 -2.08E-05 0.577349
63 1.71E-02 -620.587965 -152.746551 -2.08E-05 0.577349
64 170.860083 -620.587965 -152.746551 -2.08E-05 0.176332
65 170.860083 -620.587965 -152.746551 -2.08E-05 0.176332
66 170.859891 -631.007166 -90.485774 -2.08E-05 -0.176332
67 170.858259 -636.663312 -46.581021 -4.95E-04 -0.058223
68 170.856678 -636.663312 -46.581021 -4.95E-04 -0.058223
69 237.56678 -636.663386 -46.582351 -4.74E-04 -0.074778
70 237.56678 -636.663386 -46.582358 -4.73E-04 -0.074778
71 237.56678 -636.663386 -46.582351 -4.73E-04 -0.074778
72 237.56678 -636.663386 -46.582358 -4.73E-04 -0.074778
73 237.56678 -636.663386 -46.582351 -4.95E-04 -0.058223
74 237.56678 -636.663312 -46.581021 -2.08E-05 0.176332
75 170.858259 -636.663037 -46.582378 -2.08E-05 -0.176332
76 170.859891 -631.007166 -90.485774 -2.08E-05 -0.176332
77 170.860083 -620.587965 -152.746551 -2.08E-05 0.176332
78 170.860083 -620.587965 -152.746551 -2.08E-05 0.577349
79 170.860083 -620.587965 -152.746551 -2.08E-05 0.577349
80 170.860083 -620.587965 -152.746551 -2.08E-05 0.577349
81 170.857352 -544.598115 -21.12771 -2.08E-05 0.577349
82 170.857352 -544.59822 -21.12759 -2.08E-05 0.577349
83 170.856633 -524.598261 -15.576858 -2.08E-05 0.577349
84 170.854261 -457.998377 -171.12338 -2.08E-05 0.577349
85 170.854261 -457.998377 -171.12331 -1.49E-07 -2.43E-06
86 170.854261 -457.998881 -46.123518 -1.49E-07 -2.43E-06
87 170.854261 -457.998881 -46.123457 -0.061174 -4.11E-05
88 170.854261 -457.998333 -46.123518 -0.061174 -4.11E-05
89 170.854261 -407.998264 -46.123579 -1.49E-07 -2.43E-06
90 170.854261 -407.998264 -46.12331 -1.49E-07 -2.43E-06
91 170.854261 -407.998325 -21.12331 -1.49E-07 -2.43E-06
92 170.854261 -407.99796 -128.36799 -1.49E-07 -2.43E-06
93 170.854261 -407.99796 -128.36799 -1.49E-07 -2.43E-06
94 170.854261 -407.998264 -46.123579 -1.49E-07 -2.43E-06
95 170.854261 -407.998333 -3.868199 0.061174 4.11E-05
96 170.854261 -432.998333 -3.868098 0.061174 4.11E-05
97 170.854261 -432.998333 -3.868098 0.061174 4.11E-05
98 170.854261 -457.998333 -3.868098 0.061174 4.11E-05
99 170.854261 -457.998881 -3.868098 0.061174 4.11E-05
100 170.854261 -457.998881 -3.86789 -1.49E-07 -2.43E-06
101 170.854261 -457.998742 -21.12311 -1.49E-07 -2.43E-06
102 170.854261 -457.998398 -128.86784 -2.08E-05 0.577349
103 170.854261 -457.998398 -128.86784 -2.08E-05 0.577349
104 170.856633 -524.598261 -15.576858 -2.08E-05 0.577349
105 170.857352 -544.598115 -21.12771 -2.08E-05 0.577349
106 170.857352 -544.59822 -21.12759 -2.08E-05 0.577349
107 170.860083 -620.587965 -152.746551 -2.08E-05 0.577349
108 170.860083 -620.587965 -152.746551 -2.08E-05 0.176332
109 170.860083 -620.587965 -152.746551 -2.08E-05 0.176332
110 170.860083 -620.587965 -152.746551 -2.08E-05 0.176332
111 170.858901 -631.007166 -90.485774 -2.08E-05 -0.176332
112 170.858259 -636.663312 -46.581021 -4.95E-04 -0.058223
113 170.856678 -636.663312 -46.581021 -4.95E-04 -0.058223
114 246.956678 -636.663401 19.327174 75484.44657 -0.072666
115 247.956678 -636.6634 19.327154 46236.9867 -0.072667
116 250.856678 -636.663396 19.327213
```

```
-----PMA BOLGET(LGLOB3)
*****MCKO LIST *****
BOLGET(LGLOB3)
! ! to 2 161000 Glob coords of gut ray impacts
! ! ! import use M.
! ! ! 3 211200 Add file being at the end
fmm: gmm: nat
Vbegin surf mm 9
z1 = 9
Hray coordinate: z2 is k H z3 is G
zcut ray 0
z1 0
IM3 = -0.2026
z2 = -2.2892
IM3 = -0.1464
z2 = -0.1574
z2 = 0.1572
z3 = -2.4815
z3 = -2.4791
pou fmm
k? time
gray 2 z2 0 0 surf z3 z1
pma bdqangb03
pof c
-----PCF C
```

```

---
--- 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 69.31411 -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

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---
--- 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
21 11.831546 -260.42945 -94.239217 0.024055 -0.101461
22 16.690589 -280.923961 107.75419 0.089229 0.800018
23 16.754343 -280.352359 108.468676 0.089229 0.800018
24 3.639387 -397.939241 -38.511584 -0.074667 -1.070286
25 3.649176 -397.79892 -38.64269 -0.074667 -1.070286
26 0.080828 -448.947719 9.14715 -0.074667 -1.070286
27 -6.533386 -543.756057 97.729392 0.016031 -0.126573
28 -6.535522 -543.739193 97.59616 0.016031 -0.126573
29 -11.624777 -503.556441 -219.871068 0.016031 -0.126573
30 -11.624777 -503.556441 -219.871068 0.016031 -0.126573
31 -8.679048 -526.814757 -36.116781 -0.021783 -0.935897
32 -8.595462 -523.223463 -39.954056 -0.021783 -0.935897
33 -8.762634 -530.40605 -32.279506 -0.021783 -0.935897
34 -8.679048 -526.814757 -36.116781 -0.021783 -0.935897
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--- POF C

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