

FIRST - SPIRE
Optical design configuration control file
PHOTOMETER

LAM.PJT.SPI.???.200100x Ind. 01

Date: 16. January 2001

SPIRE-LAM-PRJ-000640

Calculations based on identification numbers:

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

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

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

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

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

Contents:

The file contains the following spreadsheets:

Introduction: This sheet.

History: Evolution history of the file

Theory:

Variables: List of variables

Final results:

GutRayImpacts: Coordinates of gut ray impacts on each surface

Interfaces: Coordinates defining mirror interfaces in global coordinates

SurfDef: Coordinates defining mirror interfaces in local coordinates

Intermediate calculations:

GutCalc: Calculating surface normal vectors at gut ray impacts

M3CentCalc: Calculating surface normal vectors at centre of M3

M5CentCalc: Calculating surface normal vectors at centre of M5

VertexCalc: Transform vertex data into instrument coordinates

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

RayImpacts: Transform ray impact data into instrument coordinates

RayImpactsSyno: Read ray impact data from SYNO output

SYNOPSIS outputs:

SpecGlob: System listing with surface data in global coordinates and Euler angles

GutRay: Ray impacts for gut ray in global coordinates

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

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

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

Theory

Contents

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

1. Surface orientation from Euler angles

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

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

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

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

The local axes are produced by the following:

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

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:

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

where the SIGNE function provides the correct sign of Theta.

4 Interface data in global coordinates

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 spigot axis

(Xspig, Yspig, Zspig): coordinates of a second point along the spigot axis

(Xsag, Ysag, Zsag): direction cosines of the sag vector, pointing towards the dowl

(Xdowl, Ydowl, Zdowl): coordinates of a point along the sag vector

5. Interface data in local coordinates

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:

$$\begin{aligned} X_{\text{mirr}} &= \text{VertexCalc!Xnorm} * (\text{Interfaces!Xmirr} - \text{VertexCalc!Xmirr}) \\ &\quad + \text{VertexCalc!Ynorm} * (\text{Interfaces!Ymirr} - \text{VertexCalc!Ymirr}) \\ &\quad + \text{VertexCalc!Znorm} * (\text{Interfaces!Zmirr} - \text{VertexCalc!Zmirr}) \\ Y_{\text{mirr}} &= \text{VertexCalc!Xsag} * (\text{Interfaces!Xmirr} - \text{VertexCalc!Xmirr}) \\ &\quad + \text{VertexCalc!Ysag} * (\text{Interfaces!Ymirr} - \text{VertexCalc!Ymirr}) \\ &\quad + \text{VertexCalc!Zsag} * (\text{Interfaces!Zmirr} - \text{VertexCalc!Zmirr}) \\ Z_{\text{mirr}} &= \text{VertexCalc!Xtang} * (\text{Interfaces!Xmirr} - \text{VertexCalc!Xmirr}) \\ &\quad + \text{VertexCalc!Ytang} * (\text{Interfaces!Ymirr} - \text{VertexCalc!Ymirr}) \\ &\quad + \text{VertexCalc!Ztang} * (\text{Interfaces!Zmirr} - \text{VertexCalc!Zmirr}) \end{aligned}$$

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

$$\begin{aligned} X_{\text{norm}} &= \text{VertexCalc!Xnorm} * \text{Interfaces!Xnorm} + \text{VertexCalc!Ynorm} * \text{Interfaces!Ynorm} \\ &\quad + \text{VertexCalc!Znorm} * \text{Interfaces!Znorm} \\ Y_{\text{norm}} &= \text{VertexCalc!Xsag} * \text{Interfaces!Xnorm} + \text{VertexCalc!Ysag} * \text{Interfaces!Ynorm} \\ &\quad + \text{VertexCalc!Zsag} * \text{Interfaces!Znorm} \\ Z_{\text{norm}} &= \text{VertexCalc!Xtang} * \text{Interfaces!Xnorm} + \text{VertexCalc!Ytang} * \text{Interfaces!Ynorm} \\ &\quad + \text{VertexCalc!Ztang} * \text{Interfaces!Znorm} \end{aligned}$$

Name	Description
ID	System identification number
SystemPart	
CompName	
Flag	
SurfNum	
Line	
Ray	
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)
Xgut	Gut ray impact coordinates
Ygut	
Zgut	
XM3cent	Ray centred on M3, impact coordinates
YM3cent	
ZM3cent	
XM5cent	Ray centred on M5, impact coordinates
YM5cent	
ZM5cent	
aEuler	Surface orientation Euler angles
bEuler	
cEuler	
Xaxis	Surface vertex axis direction vector
Yaxis	
Zaxis	
Xvertex	Surface vertex coordinates used in VertexCalc
Yvertex	
Zvertex	
Xtang	Surface vertex tangential vector
Ytang	
Ztang	
Xsag	Surface vertex sagittal vector
Ysag	
Zsag	
Xmirr	Mirror surface coordinate
Ymirr	
Zmirr	
Xnorm	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
Xcol	Column of each coordinate in listing
Ycol	
Zcol	
X0	Offset of SPIRE origin with respect to Synopsys origin
Y0	
Z0	
Xdiff	Difference between ray impact coordinates
Ydiff	
Zdiff	
DiffMod	Modulo of difference vector
Xray	Unit ray vector
Yray	
Zray	
dXray	Difference between unit ray vectors
dYray	
dZray	
dRayMod	Modulo of difference vector

SystemPart	CompName	Flag	Xgut	Ygut	Zgut
Telescope	M1	Dummy	1252.429	0.000	54.793
	M2	Ignore	2839.998	0.000	0.000
Common optics	CFP	Hole	228.383	0.000	-90.137
	CM3		131.142	0.000	-93.494
	CM4		316.125	0.000	-200.094
	CM5		119.783	0.000	-179.689
Photometer optics	PM6		296.151	0.000	-259.533
	PM7		94.234	0.000	-279.481
	PM8		240.466	0.000	-397.634
	PCS	Hole	192.867	0.000	-448.961
	PM9		104.471	0.000	-544.281
Short wave	PDIC1		238.419	0.000	-527.459
	PM10		139.942	0.000	-619.802
	PSW	Hole	139.942	-50.000	-619.803
	PDIC1	Ignore			
Medium wave	PDIC2		337.640	0.000	-514.998
	PMW	Hole	283.429	-65.114	-521.807
	PDIC2	Ignore			
Long wave	PM11		381.298	0.000	-509.515
	PLW	Hole	381.298	0.000	-468.515

Axis directions:

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

SystemPart	CompName	DownDir	Flag	Xmirr	Ymirr	Zmirr	Xnorm	Ynorm	Znorm	Xspig	Yspig	Zspig	Xsug	Ysug	Zsug	Xdowl	Ydowl	Zdowl	Check
Telescope	Dummy		Ignore																
	M1		Ignore																
	M2		Ignore																
Common optics	CFP		Hole																
	CM3	1	M3Cent	131.229806	-19.500476	-95.222336	-0.970091	-0.051240	0.237270	130.259715	-19.551716	-94.985066	-0.052746	0.998608	0.000000	131.177060	-18.501868	-95.222336	90
	CM4		Ignore																
	CM5	1	M5Cent	120.054658	19.498667	-181.314796	-0.964213	0.070038	-0.285710	119.990445	19.569905	-181.059086	0.072447	0.997372	0.000000	120.127105	20.497239	-181.314796	90
Photometer optics	PM6	1	Vertex	296.150668	0.000000	-259.533222	0.986693	0.000000	-0.162592	297.137361	0.000000	-259.695814	0.000000	1.000000	0.000000	296.150668	1.000000	-259.533222	90
	PM7	1	Vertex	94.233806	0.000000	-279.482925	-0.958086	0.000000	0.286481	93.275720	0.000000	-279.196444	0.000000	1.000000	0.000000	94.233806	1.000000	-279.482925	90
	PM8	1	Vertex	240.466424	0.000000	-397.635459	0.997428	0.000000	0.071682	241.463852	0.000000	-397.563777	0.000000	1.000000	0.000000	240.466424	1.000000	-397.635459	90
	PCS		Hole																
	PM9	1	Vertex	104.472165	0.000000	-544.283205	-0.889746	0.000000	-0.456455	103.882419	0.000000	-544.739660	0.000000	1.000000	0.000000	104.472165	1.000000	-544.283205	90
Short wave	PDIC1		Ignore																
	PM10	-1	Vertex	139.942327	0.000000	-619.802728	-0.515808	0.707107	-0.483675	139.426519	0.707107	-620.286403	-0.515808	-0.707107	-0.483675	139.426519	-0.707107	-620.286403	90
	PSW		Det																
Medium wave	PDIC1		Ignore																
	PDIC2		Ignore																
	PMW		Det																
	PDIC2		Ignore																
Long wave	PM11	1	Vertex	381.297361	0.000000	-509.515249	0.749864	0.000000	-0.661392	382.047225	0.000000	-510.176841	0.000000	1.000000	0.000000	381.297361	1.000000	-509.515249	90
	PLW		Det																

Axis directions:

- X -Zsyno
- Y Xsyno
- Z Ysyno

- Tow. tel
- Tow. Spectro
- Tow. FAX

SpigLength
DowlSep

SystemPart	CompName	Flag	Xmirr	Ymirr	Zmirr	Xnorm	Ynorm	Znorm	Xspig	Yspig	Zspig	Xsag	Ysag	Zsag	Xdowl	Ydowl	Zdowl	Check
Telescope	M1	Ignore																
	M2	Ignore																
Common optics	CFP	Hole																
	CM3	M3Cent	-29.842009	-19.500476	145.000210	0.923152	-0.051240	0.381006	-28.918857	-19.551716	145.381216	0.052142	0.998608	0.007963	-29.789867	-18.501868	145.008173	90
	CM4	Ignore																
	CM5	M5Cent	-0.687534	19.499867	-1.499950	0.997531	0.070038	-0.005091	0.309997	19.569905	-1.505041	-0.069930	0.997372	0.018928	-0.757464	20.497239	-1.481022	90
Photometer optics	PM6	Vertex	0.000000	0.000000	0.000000	-1.000000	0.000000	0.000000	-1.000000	0.000000	0.000000	0.000000	1.000000	0.000000	0.000000	1.000000	0.000000	90
	PM7	Vertex	0.000000	0.000000	0.000000	1.000000	0.000000	0.000000	1.000000	0.000000	0.000000	0.000000	1.000000	0.000000	0.000000	1.000000	0.000000	90
	PM8	Vertex	0.000000	0.000000	0.000000	-1.000000	0.000000	0.000000	-1.000000	0.000000	0.000000	0.000000	1.000000	0.000000	0.000000	1.000000	0.000000	90
	PCS	Hole																
	PM9	Vertex	0.000000	0.000000	0.000000	1.000000	0.000000	0.000000	1.000000	0.000000	0.000000	0.000000	1.000000	0.000000	0.000000	1.000000	0.000000	90
Short wave	PDIC1	Ignore																
	PM10	Vertex	0.000000	0.000000	0.000000	1.000000	0.000000	0.000000	1.000000	0.000000	0.000000	0.000000	-1.000000	0.000000	0.000000	-1.000000	0.000000	90
	PSW	Det																
	PDIC1	Ignore																
Medium wave	PDIC2	Ignore																
	PMW	Det																
	PDIC2	Ignore																
Long wave	PM11	Vertex	0.000000	0.000000	0.000000	-1.000000	0.000000	0.000000	-1.000000	0.000000	0.000000	0.000000	1.000000	0.000000	0.000000	1.000000	0.000000	90
	PLW	Det																

Axis directions:

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

ID	SystemPart (BOLPHT155)	CompName	Flag	Xgut	Ygut	Zgut	Xdiff	Ydiff	Zdiff	DiffMod	Xray	Yray	Zray	dXray	dYray	dZray	drayMod	Xnorm	Ynorm	Znorm	UpFlag	#VALEUR!		
Ray	Telescope	M1		1252.429	0.000	54.793	-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	-1.000		
		M2		2839.998	0.000	0.000	1587.569	0.000	-54.793	1588.514	0.999	0.000	-0.034	-1.999	0.000	0.000	1.999	-1.000	0.000	0.000	0.000	-1.000	1.000	
	Common optics	CFP	Hole		228.383	0.000	-90.137	-2611.615	0.000	-90.137	2613.170	-0.999	0.000	-0.034										#VALEUR!
		CM3			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	-0.923	
		CM4			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	1.000	
		CM5			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	-1.000	
	Photometer optics	PM6			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	1.000	
		PM7			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	-1.000	
		PM8			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	1.000	
		PCS	Hole		192.867	0.000	-448.961	-47.599	0.000	-51.327	70.001	-0.680	0.000	-0.733										#VALEUR!
	Short wave	PM9			104.471	0.000	-544.281	-88.396	0.000	-95.320	129.999	-0.680	0.000	-0.733	1.672	0.000	0.858	1.879	0.890	0.000	0.456	1.000	-1.000	
		PDIC1			238.419	0.000	-527.459	133.948	0.000	16.822	135.000	0.992	0.000	0.125	-1.722	0.000	-0.809	1.902	-0.905	0.000	-0.425	-1.000	1.000	
		PM10			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	-1.000	
	Medium wave	PSW	Det		139.942	-50.000	-619.803	0.000	-50.000	0.000	50.000	0.000	-1.000	0.000										#VALEUR!
		PDIC1	Ignore		238.419	0.000	-527.459																	#VALEUR!
		PDIC2			337.640	0.000	-514.998	99.221	0.000	12.461	100.000	0.992	0.000	0.125	-1.630	-0.766	-0.205	1.813	-0.899	-0.423	-0.113	-1.000	1.000	
	Long wave	PMW	Det		283.429	-65.114	-521.807	-54.211	-65.114	-6.809	85.000	-0.638	-0.766	-0.080										#VALEUR!
		PDIC2	Ignore		337.640	0.000	-514.998																	#VALEUR!
		PM11			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	1.000	
		PLW	Det		381.298	0.000	-468.515	0.001	0.000	41.000	41.000	0.000	0.000	1.000										#VALEUR!

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

ID	SystemPart	CompName	Flag	XM3Cent	YM3Cent	ZM3Cent	Xdiff	Ydiff	Zdiff	DM3Mod	Xray	Yray	Zray	dXray	dYray	dZray	dm3Mod	Xnorm	Ynorm	Znorm	Theta	I-cos(theta)	Xsag	Ysag	Zsag	normDOTsag
	Telescope	M1	Ignore	1252.6255	11.4279	55.8034	-1999.5365	-1.3315	-6.5020	1999.547	-0.999999	-0.00067	-0.00325	1.999351383	-0.006528	-0.031877	1.999616	-0.999868	0.003265	0.015942	-0.187	2.0E+00	0.003	1.000	0.000	90.0000
		M2	Ignore	3252.1620	12.7595	62.3054	1587.5955	-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	0.000	2.0E+00	0.000	1.000	0.000	90.0000
	Common optics	CFP	Hole	2310.8808	-18.7846	-91.7265	-2609.4502	-18.7846	-91.7265	2611.129	-0.99936	-0.00719	-0.03513	1.865488011	0.088535	-0.456271	1.973002	-0.970091	-0.65124	0.23727	3.024	2.0E+00	-0.053	0.999	0.000	90.0000
		CM3		131.2298	-19.5005	-95.2223	-99.4510	-0.7159	-104.8959	213.4635	0.866131	0.09134	-0.4914	-1.85590195	6.12E-10	0.600933	1.950786	0.951361	-3.14E-10	-0.348077	0.000	2.0E+00	0.000	1.000	0.000	90.0000
		CM4		316.1172	-0.0026	-200.1183	184.8874	19.0979	-104.8959	213.4635	0.866131	0.09134	-0.4914	-1.85590195	6.12E-10	0.600933	1.950786	0.951361	-3.14E-10	-0.348077	0.000	2.0E+00	0.000	1.000	0.000	90.0000
		CM5		1302.1779	18.0297	178.4826	-195.3993	18.0223	21.6357	197.4187	-0.89877	0.09134	0.109593	1.890207903	-0.127849	-0.523829	1.974268	-0.961981	0.064758	0.265328	-3.851	2.0E+00	0.067	0.998	0.000	90.0000
	Photometer optics	PM6		296.4855	10.9737	-258.3423	175.7676	-70.6500	-80.0397	193.2708	0.999437	-0.03651	-0.44424	-1.9047568	0.059001	0.320453	1.932345	0.958562	-0.030352	-0.165828	-1.774	2.0E+00	0.031	1.000	0.000	90.0000
		PM7		952.2127	15.5219	-277.5965	-201.2729	4.5482	-18.9643	202.2155	-0.99534	0.02492	-0.09378	1.765609782	-0.086767	-0.540658	1.848664	-0.955126	0.046936	0.292457	-2.813	2.0E+00	0.049	0.999	0.000	90.0000
		PM8		240.4303	3.4032	-597.1228	145.2576	-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	2.0E+00	0.012	1.000	0.000	90.0000
		PCS	Hole	192.8564	0.0878	-448.9510	-47.5939	-3.3154	-51.8282	70.44383	-0.67363	-0.004706	-0.73574	1.667854876	0.023335	0.859478	1.876545	-0.888878	-0.017231	-0.458011	1.111	2.0E+00	-0.019	1.000	0.000	90.0000
		PM9		104.8114	-6.0455	-544.8290	-88.0450	-6.1333	-95.8780	130.3155	-0.67363	-0.004706	-0.73574	1.667854876	0.023335	0.859478	1.876545	-0.888878	-0.017231	-0.458011	1.111	2.0E+00	-0.019	1.000	0.000	90.0000
	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	-0.800832	1.901369	0.905134	1.4E-11	0.423125	0.000	2.0E+00	0.000	1.000	0.000	90.0000
		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	2.0E+00	0.516	0.707	0.484	90.0000
		PSW	Det	132.6859	-50.0000	-627.7885	-0.4043	-39.8310	-0.4266	39.85359	-0.01015	-0.99989	-0.01071	1.61860838	-0.760699	-0.20329	1.799568	0.899243	0.422618	0.112941	0.000	2.0E+00	-0.419	0.906	-0.033	90.0000
	Medium wave	PDIC2		342.1664	-9.5693	-515.2279	103.4332	-1.5356	12.8994	104.2458	0.992205	-0.01473	0.12374	-1.61860838	-0.760699	-0.20329	1.799568	0.899243	0.422618	0.112941	0.000	2.0E+00	-0.419	0.906	-0.033	90.0000
		PMW	Det	291.7118	-72.0274	-521.6353	-50.4546	-62.4582	-6.4074	80.54655	-0.62464	-0.77543	-0.07955	1.61860838	-0.760699	-0.20329	1.799568	0.899243	0.422618	0.112941	0.000	2.0E+00	-0.419	0.906	-0.033	90.0000
	Long wave	PM11		380.4720	-10.1379	-510.4507	38.3056	-0.5687	4.7772	38.6085	0.992205	-0.01473	0.12374	-1.61860838	-0.760699	-0.20329	1.799568	0.899243	0.422618	0.112941	0.000	2.0E+00	-0.419	0.906	-0.033	90.0000
		PLW	Det	380.4566	-10.7557	-468.4152	-0.0354	-0.6178	-41.9355	41.94005	-0.00084	-0.01473	0.999891	1.61860838	-0.760699	-0.20329	1.799568	0.899243	0.422618	0.112941	0.000	2.0E+00	-0.419	0.906	-0.033	90.0000

Axis directions:

- X -Zsyno
- Y Xsyno
- Z Ysyno

ID	Roy	SystemPart	CompName	Flag	XM5Cent	YM5Cent	ZM5Cent	Xdiff	Ydiff	Zdiff	DiffMod	Xray	Yray	Zray	dXray	dYray	dZray	drayMod	Xnorm	Ynorm	Znorm	Theta	1-cos(theta)	Xsag	Ysag	Zsag	normDOTsag	
		Telescope	M1	Ignore	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	1.9995637	-0.999875	0.003535	0.015428	-0.203	2.0E+00	0.004	1.000	0.000	90.000	
			M2		2840.1310	0.0000	0.0000	1587.5305	-12.3755	-54.0055	1588.497	0.999992	-0.00779	-0.0334	-1.999878308	1.49E-10	2.53E-10	1.998783	1	-7.43E-11	-1.26E-10	0.000	2.0E+00	0.000	1.000	0.000	90.000	
		Common optics	CM3	Hole	229.0220	-20.3548	88.8362	-2611.1090	-20.3548	-88.8362	2612.699	-0.99939	-0.00779	-0.0334	1.857648356	0.106277	-0.469684	1.919051	-0.968004	-0.05538	0.244748	3.274	2.0E+00	-0.057	0.998	0.000	90.000	
			CM4		132.0890	-21.1104	-92.1237	-96.9330	-0.7556	-3.2975	96.99197	-0.99939	-0.00779	-0.0334	-1.84884772	5.11E-10	0.998708	1.943371	0.951561	-2.63E-10	-0.308077	0.000	2.0E+00	0.000	1.000	0.000	90.000	
			CM5		120.0547	19.4999	-181.3148	184.0267	21.1174	-107.9991	197.9234	-0.99959	0.008487	0.095026	0.095026	1.902079502	-0.138163	-0.504434	1.972676	-0.964213	0.070038	0.25571	-4.155	2.0E+00	0.072	0.997	0.000	90.000
		Photometer optics	PM6		296.2011	11.8325	-260.4333	176.1464	-7.6674	-79.1185	193.2514	0.911489	-0.03968	-0.40941	-1.906096	0.063602	0.308493	1.931946	0.98662	0.032921	-0.15968	-1.911	2.0E+00	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	2.0E+00	0.053	0.999	0.000	90.000	
			PM8		240.5116	3.6394	-397.9592	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	2.0E+00	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	2.0E+00	-0.021	1.000	0.000	90.000	
		Short wave	PDIC1		338.1168	-8.6790	-526.8118	133.8462	-2.1457	163.013	134.9311	0.991059	-0.0159	0.125555	-1.72198781	2.65E-09	-0.808787	1.902466	0.905134	-1.39E-09	0.435125	0.000	2.0E+00	0.000	1.000	0.000	90.000	
			PM10		131.3549	-11.0046	-62.6729	-106.7619	-2.3255	-99.9181	146.2434	-0.73003	-0.0159	-0.68323	0.171777063	-0.983971	0.673056	1.391545	-0.515808	0.707107	-0.483675	0.000	2.0E+00	0.516	0.707	0.484	90.000	
			PSW	Det	130.8768	-50.0000	-62.71297	-0.4781	-38.9954	-0.3968	39.00035	-0.01228	-0.99987	-0.01018														
			PDIC1	Ignore	238.1168	-8.6790	-526.8148																					
		Medium wave	PDIC2		342.3318	-10.3497	-513.6240	104.2150	-1.6707	13.1908	105.0598	0.991959	-0.0159	0.125555	-1.61768862	-0.203174	1.798945	0.899243	0.422618	0.112941	0.000	2.0E+00	-0.419	0.906	-0.083	90.000		
			PMW	Det	292.1583	-72.5860	-519.8478	-50.1735	-62.2363	-6.2238	80.18403	-0.62573	-0.77617	-0.07762														
			PDIC2	Ignore	342.3318	-10.3497	-513.6240																					
		Long wave	PM11		382.1150	-10.9875	-508.5885	39.7833	-0.6378	5.0355	40.10574	0.991959	-0.0159	0.125555	-0.99097262	1.56E-08	0.874318	1.321556	0.749864	-1.18E-08	-0.660192	0.000	2.0E+00	0.000	1.000	0.000	90.000	
			PLW	Det	382.1150	-11.6248	-468.5153	0.0395	-0.6373	-40.0732	40.0732	0.000987	-0.0159	0.999873														

Axis directions:
X -Zsymo
Y Xsymo
Z Ysymo

Tow tel
Tow Spectro
Tow PAX

ID	(BOLPH1155)	SystemPart	CompName	Flag	Xvertex	Yvertex	Zvertex	Xnorm	Ynorm	Znorm	NormDir	Xsag	Ysag	Zsag	Xtang	Ytang	Ztang	TangBotNorm	SagBotNorm	SagDofTan	
				Ignore														#VALEUR!	#VALEUR!	#VALEUR!	
Telescope																					
M1			M1	Dimmy	3252.0000	0.0000	0.0000	-1.0000	0.0000	0.0000	0.9999	0.0000	1.0000	0.0000	0.0000	0.0000	1.0000	0.0000	0.0000	0.0000	90.0000
M2			M2		2839.9980	0.0000	0.0000	-1.0000	0.0000	0.0000	-1.0000	0.0000	1.0000	0.0000	0.0000	0.0000	-1.0000	0.0000	0.0000	0.0000	90.0000
Common optics																					
CTP			CTP	Hole	202.0000	0.0000	0.0000	-1.0000	0.0000	0.0000	1.0000	0.0000	1.0000	0.0000	0.0000	0.0000	1.0000	0.0000	0.0000	0.0000	90.0000
CM3			CM3		123.6397	0.0000	-243.0659	-0.9885	0.0000	-0.1510	0.9227	0.0000	1.0000	0.0000	0.0000	0.0000	0.9885	0.0000	0.0000	0.0000	90.0000
CM4			CM4		316.1254	0.0000	-200.0930	-0.9514	0.0000	0.3081	-1.0000	0.0000	1.0000	0.0000	-0.3081	0.0000	-0.9514	0.0000	0.0000	0.0000	90.0000
CM5			CM5		119.7829	0.0000	-179.6873	-0.9653	0.0000	0.2613	1.0000	0.0000	1.0000	0.0000	0.0000	0.0000	0.9653	0.0000	0.0000	0.0000	90.0000
Photometer optics																					
PM6			PM6		296.1307	0.0000	-259.5332	-0.9867	0.0000	0.1626	-1.0000	0.0000	1.0000	0.0000	-0.1626	0.0000	-0.9867	0.0000	0.0000	0.0000	90.0000
PM7			PM7		94.2338	0.0000	-279.4829	-0.9581	0.0000	0.2865	1.0000	0.0000	1.0000	0.0000	0.0000	0.0000	0.9581	0.0000	0.0000	0.0000	90.0000
PM8			PM8		240.4664	0.0000	-397.6355	-0.9974	0.0000	-0.0717	-1.0000	0.0000	1.0000	0.0000	0.0717	0.0000	-0.9974	0.0000	0.0000	0.0000	90.0000
PCS			PCS	Hole	192.8684	0.0000	-448.9622	-0.6800	0.0000	-0.7332	1.0000	0.0000	1.0000	0.0000	0.0000	0.0000	0.6800	0.0000	0.0000	0.0000	90.0000
PM9			PM9		104.4722	0.0000	-544.2832	-0.8897	0.0000	-0.4565	1.0000	0.0000	1.0000	0.0000	-0.4565	0.0000	0.8897	0.0000	0.0000	0.0000	90.0000
Short wave																					
PDIC1			PDIC1		338.4198	0.0000	-527.4600	-0.9051	0.0000	-0.4251	-1.0000	0.0000	1.0000	0.0000	0.4251	0.0000	-0.9051	0.0000	0.0000	0.0000	90.0000
PM10			PM10	Det	139.9423	0.0000	-619.8027	-0.5158	0.0000	-0.4837	1.0000	0.0000	1.0000	0.0000	-0.4837	0.0000	0.5158	0.0000	0.0000	0.0000	90.0000
FSW			FSW		139.9423	-50.8000	-619.8027	0.0000	1.0000	0.0000	1.0000	0.0000	0.0000	0.0000	0.0000	0.0000	1.0000	0.0000	0.0000	0.0000	90.0000
Medium wave																					
PDIC2			PDIC2		337.6403	0.0000	-514.9984	-0.8992	-0.4226	-0.1129	-1.0000	0.0000	1.0000	0.0000	0.1246	0.0000	-0.9922	0.0000	0.0000	0.0000	90.0000
PMW			PMW	Det	283.4293	-65.1138	-521.8070	-0.6378	-0.7660	-0.0801	1.0000	-0.7601	0.6428	-0.0955	-0.1246	0.0000	0.9922	0.0000	0.0000	0.0000	90.0000
PDIC2			PDIC2	Ignore	337.6403	0.0000	-514.9984	0.0000	0.0000	-0.4193	0.9063	-0.0527	0.9063	-0.0527	0.0000	0.0000	-0.9922	0.0000	0.0000	0.0000	90.0000
Long wave																					
PM11			PM11		381.2974	0.0000	-509.5152	-0.7499	0.0000	0.6616	-1.0000	0.0000	1.0000	0.0000	-0.6616	0.0000	-0.7499	0.0000	0.0000	0.0000	90.0000
PLW			PLW	Det	381.2984	0.0000	-468.5152	0.0000	0.0000	1.0000	1.0000	0.0000	0.0000	0.0000	1.0000	0.0000	0.0000	0.0000	0.0000	0.0000	90.0000
LOCAL																					
X	SYNO																				
Y	-Zsyno																				
Z	Xsyno																				
	Sag																				
	Tang																				
	LeftHandCorr																				
	NormDirCorr																				

SystemPart	CompName	Flag	SurfNum	Line	Xvert	Yvert	Zvert	aEuler	bEuler	cEuler	xNorm	yNorm	zNorm	XtAng	YtAng	ZtAng	xSag	ySag	zSag	angBotNorm	SagBotNorm	SagBotTan
Telescope	M1	Dummy	5	246	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
	M2	Ignore	6	247	0.000	0.000	-1050.000	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
	CFP	Hole	9	250	0.000	0.000	-2637.998	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
	CM3		11	252	0.000	-243.066	78.379	-8.683	0.000	0.000	0.000	0.000	0.000	1.000	0.000	0.000	1.000	0.000	0.000	0.000	0.000	0.000
	CM4		14	255	0.000	-200.093	-114.125	17.943	0.000	0.000	0.000	0.000	0.000	1.000	0.000	0.000	1.000	0.000	0.000	0.000	0.000	0.000
Common optics	CM5		17	258	0.000	-179.687	82.217	15.145	0.000	0.000	0.000	-0.151	0.989	0.000	0.989	0.151	1.000	0.000	0.000	0.000	0.000	0.000
	PM6		20	261	0.000	-259.533	-94.151	9.357	0.000	0.000	0.000	0.163	0.987	0.000	0.987	-0.163	1.000	0.000	0.000	0.000	0.000	0.000
	PM7		22	263	0.000	-279.483	107.766	16.647	0.000	0.000	0.000	0.286	0.958	0.000	0.958	-0.286	1.000	0.000	0.000	0.000	0.000	0.000
	PM8		24	265	0.000	-397.635	-38.466	-4.111	0.000	0.000	0.000	-0.072	0.997	0.000	0.997	0.072	1.000	0.000	0.000	0.000	0.000	0.000
	PCS	Hole	26	267	0.000	-448.962	9.132	-471.59	0.000	0.000	0.000	-0.733	0.680	0.000	0.680	0.733	1.000	0.000	0.000	0.000	0.000	0.000
Short wave	PM9		27	268	0.000	-544.283	97.528	-271.59	0.000	0.000	0.000	-0.456	0.890	0.000	0.890	0.456	1.000	0.000	0.000	0.000	0.000	0.000
	PDIC1		31	272	0.000	-577.460	-36.420	-25.159	0.000	0.000	0.000	-0.425	0.905	0.000	0.905	0.425	1.000	0.000	0.000	0.000	0.000	0.000
	PM10		36	277	0.000	-619.803	62.058	-43.159	45.000	0.000	0.707	-0.484	0.516	0.000	0.729	0.684	0.707	0.484	-0.516	0.000	0.000	0.000
	PSW	Det	38	279	-50.000	-619.803	62.058	0.000	-90.000	0.000	1.000	0.000	0.000	0.000	1.000	0.000	0.000	0.000	-1.000	0.000	0.000	0.000
	PDIC1	Ignore	31	272	0.000	-577.460	-36.420	-25.159	0.000	0.000	0.000	-0.425	0.905	0.000	0.905	0.425	1.000	0.000	0.000	0.000	0.000	0.000
Medium wave	PDIC2		46	287	0.000	-514.998	-135.640	-7.159	25.000	0.000	-0.423	-0.113	0.899	0.000	0.992	0.125	0.906	-0.053	0.419	0.000	0.000	0.000
	PMW	Det	51	292	-65.114	-521.807	-81.429	-7.159	50.000	0.000	-0.766	-0.080	0.638	0.000	0.992	0.125	0.643	-0.095	0.760	0.000	0.000	0.000
	PDIC2	Ignore	46	287	0.000	-514.998	-135.640	-7.159	50.000	0.000	-0.423	-0.113	0.899	0.000	0.992	0.125	0.906	-0.053	0.419	0.000	0.000	0.000
Long wave	PM11		57	298	0.000	-509.515	-179.297	-41.421	0.000	0.000	0.000	0.662	0.750	0.000	0.750	-0.662	1.000	0.000	0.000	0.000	0.000	0.000
	PLW	Det	59	300	0.000	-468.515	-179.298	90.001	0.000	0.000	0.000	1.000	0.000	0.000	1.000	-1.000	1.000	0.000	0.000	0.000	0.000	0.000

Line# 241

Xcol c
Ycol d
Zcol e
aCol f
bCol g
cCol h

X Z-syno Tow. tel
Y X-syno Tow. Spectro
Z Y-syno Tow. PAX

SystemPart	CompName	Flag	Xgut	Ygut	Zgut	XM3cent	YM3cent	ZM3cent	XM5cent	YM5cent	ZM5cent
Telescope	M1	Dummy	1252.0000	0.0000	61.1768	3252.1620	12.7595	62.3054	3252.1620	13.8175	60.2982
	M2	Ignore	2839.9980	0.0000	0.0000	2840.1310	0.0000	2840.1310	0.0000	0.0000	0.0000
Common optics	CTP	Hole	228.5826	0.0000	-90.1574	230.6808	-18.7846	-91.7265	229.0220	-20.3548	-88.8262
	CM3		131.1417	0.0000	-93.4936	131.2298	-19.5005	-95.2223	132.0890	-21.1104	-92.1237
	CM4		316.1251	0.0000	-200.0939	316.1172	-0.0026	-200.1183	316.1157	0.0070	-200.1227
	CM5		119.7826	0.0000	-179.6886	120.7179	18.0297	-178.4826	120.0847	19.4999	-181.3148
Photometer optics	PM6		296.1307	0.0000	-259.5332	296.4855	10.9737	-258.5423	296.2011	11.8325	-260.4333
	PM7		94.2342	0.0000	-279.4815	95.2127	15.5219	-277.5065	94.2458	16.6906	-280.9240
	PM8		240.4663	0.0000	-397.6342	240.4503	3.4032	-397.1228	240.5116	3.6394	-397.9392
	PCS	Hole	192.8674	0.0000	-448.9612	192.8564	0.0878	-448.9510	192.8529	0.0808	-448.9477
	PM9		104.4710	0.0000	-544.2810	104.8114	-6.0455	-544.8290	104.2706	-6.5334	-543.7561
	PM10		338.4192	0.0000	-527.4587	338.7332	-8.0337	-528.1273	338.1168	-8.6790	-526.8148
Short wave	PM10	Det	139.9421	0.0000	-619.8025	133.0902	-10.1690	-627.3619	131.3549	-11.0046	-626.7739
	PSW		139.9423	-50.8000	-619.8027	132.6859	-50.0000	-627.7885	130.8768	-50.0000	-627.1292
	PDIC1	Ignore	238.4192	0.0000	-527.4587	238.7332	-8.0337	-528.1273	238.1168	-8.6790	-526.8148
	PDIC2		337.6403	0.0000	-514.9978	342.1664	-9.5693	-515.2279	342.3318	-10.3497	-513.6240
Medium wave	PMW	Det	283.4293	-65.1138	-521.8070	291.7118	-72.0274	-521.6533	292.1583	-72.5860	-519.8478
	PDIC2	Ignore	337.6403	0.0000	-514.9978	342.1664	-9.5693	-515.2279	342.3318	-10.3497	-513.6240
Long wave	PM11		381.2977	0.0000	-509.5149	380.4720	-10.1379	-510.4307	382.1150	-10.9875	-508.5885
	PMW	Det	381.2984	0.0000	-468.5152	380.4366	-10.7557	-468.5152	382.1546	-11.0248	-468.5153

SPiRE coordinates
X=X0-Zsyno
Y=Y0-Xsyno
Z=Z0-Ysyno
where:

X0 202
Y0 0
Z0 0

Axis directions:

X -Zsyno
Y Xsyno
Z Ysyno

Tow, tel
Tow, Spectro
Tow, PAX

SystemPart	CompName	Flag	SurfNum	Line	Xqut	Yqut	Zqut	XM3cent	YM3cent	ZM3cent	XM5cent	YM5cent	ZM5cent
Telescope	Dummy	Ignore	5	27	0.000000	54.176845	-3050.000000	12.759450	62.305383	-3050.162000	13.817514	60.298241	-3050.162000
	M1		6	28	0.000000	1050.428903	11.427923	55.803431	-1050.625517	12.375513	54.005491	-1050.600553	
Common optics	M2		7	29	0.000000	-2637.988000	0.000000	0.000000	-2638.131000	0.000000	0.000000	0.000000	-2638.131000
	CTP	Hole	9	31	0.000000	-90.137429	-26.383552	18.784562	91.726170	-28.680790	-20.354767	88.826152	-27.032003
	CM3		11	33	0.000000	-93.495806	70.858340	-19.500476	-95.222336	70.770194	-21.110403	-92.123671	69.910994
	CM4		14	36	0.000000	-200.093860	-114.125899	-0.022619	-200.118270	-114.117194	0.007040	-200.122747	-114.115744
	CM5		17	39	0.000000	-179.688568	82.217443	18.029700	-178.482563	81.282101	19.499867	-181.314796	81.945342
Photometer optics	PM6		20	42	0.000000	-259.533208	-94.150670	10.973657	-258.542261	-94.485541	11.832463	-260.433321	-94.201070
	PM7		22	44	0.000000	-279.481485	107.765764	15.521875	-277.506548	106.787347	16.690589	-280.923961	107.754190
	PM8		24	46	0.000000	-397.634151	-38.466330	3.403216	-397.122812	-38.450296	3.639387	-397.939241	-38.511584
	PCS	Hole	26	48	0.000000	-448.961193	9.132620	0.087781	-448.950976	9.143638	0.080828	-448.947719	9.147150
	PM9		27	49	0.000000	-544.281002	97.528965	-6.045510	-544.828974	97.188646	-6.533386	-543.756057	97.729392
	PM10		31	53	0.000000	-577.458720	-36.419239	-8.033705	-578.121772	-36.733246	-8.679048	-576.814757	-36.116781
	PSW	Det	38	60	-50.000000	-619.802728	62.057573	-50.000000	-627.788894	69.514110	-50.000000	-627.129735	71.123186
Medium wave	PDIC1	Ignore	31	53	0.000000	-577.458720	-36.419239	-8.033705	-578.121772	-36.733246	-8.679048	-576.814757	-36.116781
	PDIC2		46	68	0.000000	-514.997754	-135.640264	-9.569267	-515.227885	-140.166446	-10.349698	-513.623960	-140.331781
	PMW	Det	51	73	-65.113778	-521.807023	-81.429289	-72.027431	-521.635326	-89.711836	-72.586040	-519.847765	-90.158272
Long wave	PDIC2	Ignore	46	68	0.000000	-514.997754	-135.640264	-9.569267	-515.227885	-140.166446	-10.349698	-513.623960	-140.331781
	PM11		57	79	0.000000	-509.514911	-179.297659	-10.137949	-510.450710	-178.472020	-10.987456	-508.588478	-180.115035
	PMW	Det	59	81	0.000000	-468.515249	-179.298363	-10.755735	-468.515228	-178.436583	-11.024777	-468.515270	-180.154575

22

Line0
Xcol
Ycol
Zcol

X
Y
Z

Tow_tel
Tow_Spectro
Tow_PAX

-Zsyno
Xsyno
Ysyno

--- ID?

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

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

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

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

SYSTEM SPECIFICATIONS

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

X-OBJECT	HEIGHT	(XPP0)	INFINITE				
X-MARG	RAY	HEIGHT	(XMP1)	1641.705	X-CHIEF	RAY	HT (XPP1) -4.99
X-MARG	RAY	ANGLE	(VMP0)	0	X-CHIEF	RAY	ANGLE(VPP) 0.0167

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

SURFACE DATA

SURF	RADIUS	THICKNESS	MEDIUM	INDEX	V-NUMBER
0	INFINITE	INFINITE	AIR		
1	INFINITE	17771.1	AIR		
2A	INFINITE	0	AIR		
3	INFINITE	-17771.1	AIR		
4	INFINITE	-2000	AIR		
5	INFINITE	2000.00000P	AIR		
6	-3500	O		-1587.998	#NOM?
7	-345.2	O		1587.99800P	AIR
8	INFINITE	1050	AIR		
9	-167.171		0	AIR	
10A	INFINITE	70.9	AIR		
11A	-365.963	O		0	#NOM?
12A	INFINITE	-213.5	#NOM?		
13A	INFINITE	0	#NOM?		
14	INFINITE	0.00000P	AIR		
15	INFINITE	0	AIR		
16A	INFINITE	197.4	AIR		
17A	-294.638	O		0	#NOM?
18A	INFINITE	-193.6	#NOM?		
19A	INFINITE	0	#NOM?		
20A	-307.49	O		0	AIR
21A	INFINITE	202.9	AIR		
22A	-330.7		0	#NOM?	
23A	INFINITE	-188	#NOM?		
24A	-286.651		0	AIR	
25A	INFINITE	70	AIR		
26A	INFINITE	130	AIR		
27A	-350.851		0	#NOM?	
28A	INFINITE	-320	#NOM?		
29A	INFINITE	0	#NOM?		
30A	INFINITE	185	#NOM?		
31A	INFINITE	0	AIR		
32A	INFINITE	0	AIR		
33A	INFINITE	0	AIR		
34	INFINITE	0	AIR		
35A	INFINITE	135	AIR		
36A	INFINITE	0	#NOM?		
37A	INFINITE	-50.00000P	#NOM?		
38	INFINITE	0	#NOM?		
39A	INFINITE	0	#NOM?		
40A	INFINITE	0	#NOM?		
41	INFINITE	50.00000P	#NOM?		
42A	INFINITE	0	AIR		
43A	INFINITE	-135.00000P	AIR		
44A	INFINITE	0	#NOM?		
45A	INFINITE	-100	#NOM?		
46A	INFINITE	0	AIR		
47A	INFINITE	0	AIR		
48A	INFINITE	0	AIR		
49	INFINITE	0	AIR		
50A	INFINITE	85.00000P	AIR		
51	INFINITE	0	AIR		
52A	INFINITE	0	AIR		
53A	INFINITE	0	AIR		
54	INFINITE	-85.00000P	AIR		
55A	INFINITE	0	#NOM?		
56A	INFINITE	-44	#NOM?		
57A	INFINITE	0	AIR		
58A	INFINITE	41.00000P	AIR		
59	INFINITE	0	AIR		
60A	INFINITE	0	AIR		

61A INFINITE 0 AIR
 62 INFINITE 0 AIR
 IMG INFINITE
 KEY TO SYMBOLS
 A SURFACE HAS TILTS AND DECENTERS B TAG ON SURFACE
 G SURFACE IS IN GLOBAL COORDINATL SURFACE IS LOCAL COORDINATES
 O SPECIAL SURFACE TYPE P ITEM IS SUBJECT TO PICKUP
 S ITEM IS SUBJECT TO SOLVE

SPECIAL SURFACE DATA
 SURFACE NO. 6 -- CONIC SURFACE
 CONIC CONSTANT (CC) -1
 SEMI-MAJORAXIS (b) -3.50E+13 SEMI-MINORAXIS (a) 3.50E+08
 SURFACE NO. 7 -- CONIC SURFACE
 CONIC CONSTANT (CC) -1.279
 SEMI-MAJORAXIS (b) 1237.275986 SEMI-MINORAXIS (a) -653.534751
 SURFACE NO. 11 -- CONIC SURFACE
 CONIC CONSTANT (CC) -0.5095
 SEMI-MAJORAXIS (b) -746.101937 SEMI-MINORAXIS (a) 522.537753
 SURFACE NO. 17 -- TORIC SURFACE
 RX -278.418
 SURFACE NO. 20 -- TORIC SURFACE
 RX -359.42

TILT AND DECENTER DATA
 LEFT-HAND COORDINATES

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

KEY TO SURFACE TYPES
 GLB GLOBAL COORDINATLOC LOCAL COORDINATES
 REL RELATIVE COORDINATREM REMOTE TILTS IN RELATIVE COORD.

SURF MESSAGES

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

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

GLOBAL COORDINATDATA

GLOBAL COORDINATSURFACE LOCATION IN COORDINATSYSTEM OF SURFACE 9

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

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

 --- POF C

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---
--- ID?
The current lens ID is: ID SPIRE PHOT (BOLPHT155)
--- TIME
11-MAY-01 14:56:38
---
--- GRAY 2 0 0 0 SURF 0 ZI
ID SPIRE PHOT (BOLPHT155) 247 11-MAY-01 14:56:38
GLOBAL RAYTRACE ANALYSIS
RAY DATA IN COORDINATSYSTEM 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 -94.150667 0 -0.098795
21 0 -259.533209 -94.150667 0 -0.098795
22 0 -279.481485 107.765764 0 0.80798
23 0 -279.481843 107.76532 0 0.80798
24 0 -397.634151 -38.46633 0 -1.078323
25 0 -397.634808 -38.465722 0 -1.078323
26 0 -448.961193 9.13262 0 -1.078323
27 0 -544.281002 97.528965 0 -0.125588
28 0 -544.280897 97.528125 0 -0.125588
29 0 -504.405979 -219.977766 0 -0.125588
30 0 -504.405979 -219.977766 0 -0.125588
31 0 -527.45872 -36.419239 0 -0.937717
32 0 -523.862577 -40.254237 0 -0.937717
33 0 -531.054864 -32.584242 0 -0.937717
34 0 -527.45872 -36.419239 0 -0.937717
35 0 -527.459019 -36.418921 0 -0.937717
36 1.82E-14 -619.802462 62.057922 2.01E+05 1.06654
37 -3.85E-15 -619.802462 62.057922 2.01E+05 1.06654
38 -50 -619.802728 62.057673 2.01E+05 1.06654
39 -34.14 -619.802643 62.057752 2.01E+05 1.06654
40 -29.14 -619.802617 62.057777 2.01E+05 1.06654
41 -34.14 -619.802643 62.057752 2.01E+05 1.06654
42 1.82E-14 -619.802462 62.057922 3.23E-16 -0.937717
43 -3.44E-15 -619.802462 62.057922 2.42E-16 -0.937717
44 -2.72E-14 -527.45872 -36.419239 -2.74E-16 -0.125588
45 -2.72E-14 -527.458666 -36.419673 -2.74E-16 -0.125588
46 -4.41E-16 -514.997754 -135.640264 -1.201118 -0.125607
47 4.226183 -514.555801 -139.158805 -1.201118 -0.125607
48 -4.226183 -515.439707 -132.121723 -1.201118 -0.125607
49 -5.00E-16 -514.997754 -135.640264 -1.201118 -0.125607
50 -4.92E-15 -514.997754 -135.640264 -1.201118 -0.125607
51 -65.113778 -521.807023 -81.429289 -1.201118 -0.125607
52 -58.6024 -521.126096 -86.850387 -1.201118 -0.125607
53 -54.772178 -520.725551 -90.039268 -1.201118 -0.125607
54 -58.6024 -521.126096 -86.850387 -1.201118 -0.125607
55 -1.48E-14 -514.997754 -135.640264 -3.55E-16 -0.125588
56 -1.56E-14 -514.997754 -135.640264 -2.47E-16 -0.125588
57 -4.78E-15 -509.514911 -179.297659 -2.00E-11 -5.83E+04
58 -4.78E-15 -509.515249 -179.297659 -2.00E-11 -5.83E+04
59 9.28E-15 -468.515249 -179.298363 -2.00E-11 -5.83E+04
60 6.20E-15 -477.505249 -179.298209 -2.00E-11 -5.83E+04
61 4.48E-15 -482.505249 -179.298123 -2.00E-11 -5.83E+04
62 6.20E-15 -477.505249 -179.298209 -2.00E-11 -5.83E+04
63 9.28E-15 -468.515249 -179.298363
---
--- POF C

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

GLOBAL RAYTRACE ANALYSIS

RAY DATA IN COORDINATSYSTEM 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 COORDINATSYSTEM 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
35 -8.682551 -526.965284 -35.955943 -0.021783 -0.935897
36 -11.004597 -626.732892 70.64512 -81.56915 -0.830102
37 3.88E-09 -626.620901 70.510209 -81.56915 -0.830102
38 -50 -627.129735 71.123186 -81.56915 -0.830102
39 -34.14 -626.968333 70.928749 -81.56915 -0.830102
40 -29.14 -626.917449 70.867452 -81.56915 -0.830102
41 -34.14 -626.968333 70.928749 -81.56915 -0.830102
42 -11.004597 -626.732892 70.64512 -0.021783 -0.935897
43 -10.829581 -619.213249 62.610429 -0.021783 -0.935897
44 -8.679048 -526.814757 -36.116781 0.016031 -0.126573
45 -8.682551 -526.787095 -36.335327 0.016031 -0.126573
46 -10.349698 -513.62396 -140.331781 -1.240422 -0.124046
47 -6.03512 -513.192491 -143.810095 -1.240422 -0.124046
48 -14.664277 -514.05543 -136.853467 -1.240422 -0.124046
49 -10.349698 -513.62396 -140.331781 -1.240422 -0.124046
50 -6.603321 -513.249312 -143.352024 -1.240422 -0.124046
51 -72.58604 -519.847765 -90.158272 -1.240422 -0.124046
52 -65.987769 -519.18792 -95.477647 -1.240422 -0.124046
53 -62.106432 -518.799775 -98.606691 -1.240422 -0.124046
54 -65.987769 -519.18792 -95.477647 -1.240422 -0.124046
55 -10.349698 -513.62396 -140.331781 0.016031 -0.126573
56 -10.272944 -514.229985 -135.543836 0.016031 -0.126573
57 -10.987456 -508.588478 -180.115035 16.118236 -1013.47537
58 -10.972716 -509.515269 -180.114121 16.118236 -1013.47537
59 -11.624777 -468.51527 -180.154575 16.118236 -1013.47537
60 -11.481801 -477.50527 -180.145705 16.118236 -1013.47537
61 -11.402281 -482.505269 -180.140771 16.118236 -1013.47537
62 -11.481801 -477.50527 -180.145705 16.118236 -1013.47537
63 -11.624777 -468.51527 -180.154575

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--- POF C

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