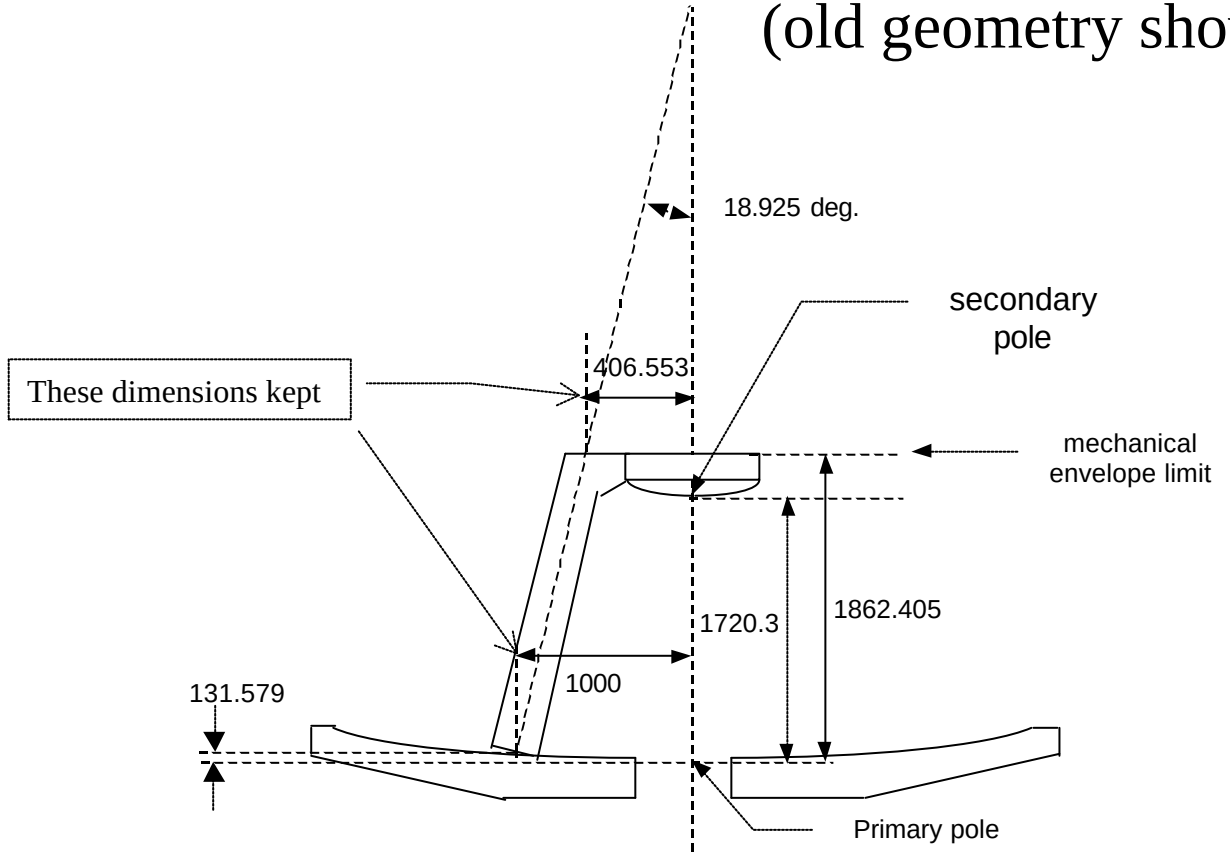
Main Telescope/PLM Geometry changes

M1-M2 spacing	1587.998	(was 1720.3)
Back-focal distance	1050.00	(was 975)
M1 - Fixation plane	250	(was 125)
M1 thickness at hole	100(TBC)	(was 100)
SPIRE cover upper surface location above best focus	243.52	(was 164.4)
Cryostat base shield (above best focus)	244+?	(was 244)

Forced Geometry changes(1)

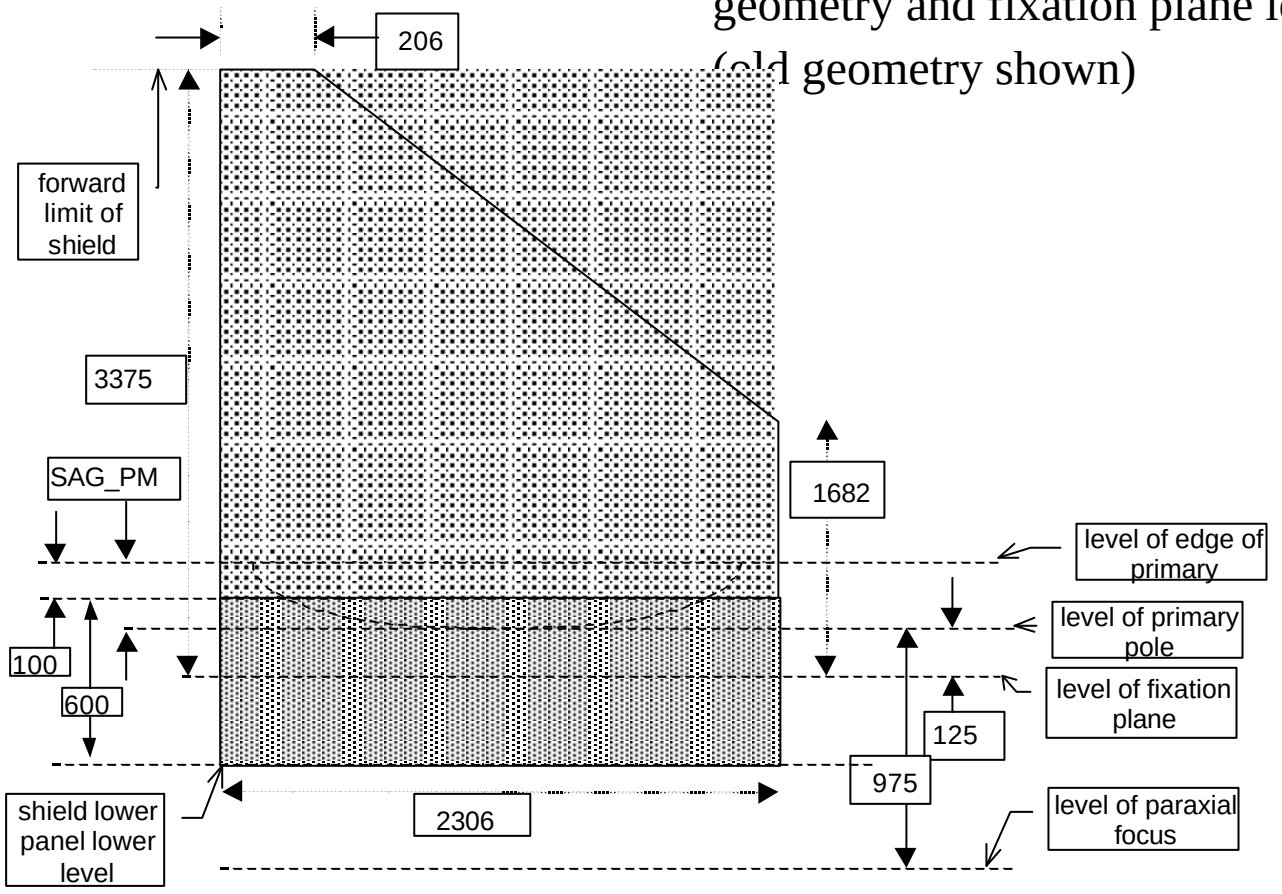
Tripod leg length responds to new M1-M2 spacing

(old geometry shown)



Forced Geometry changes(2)

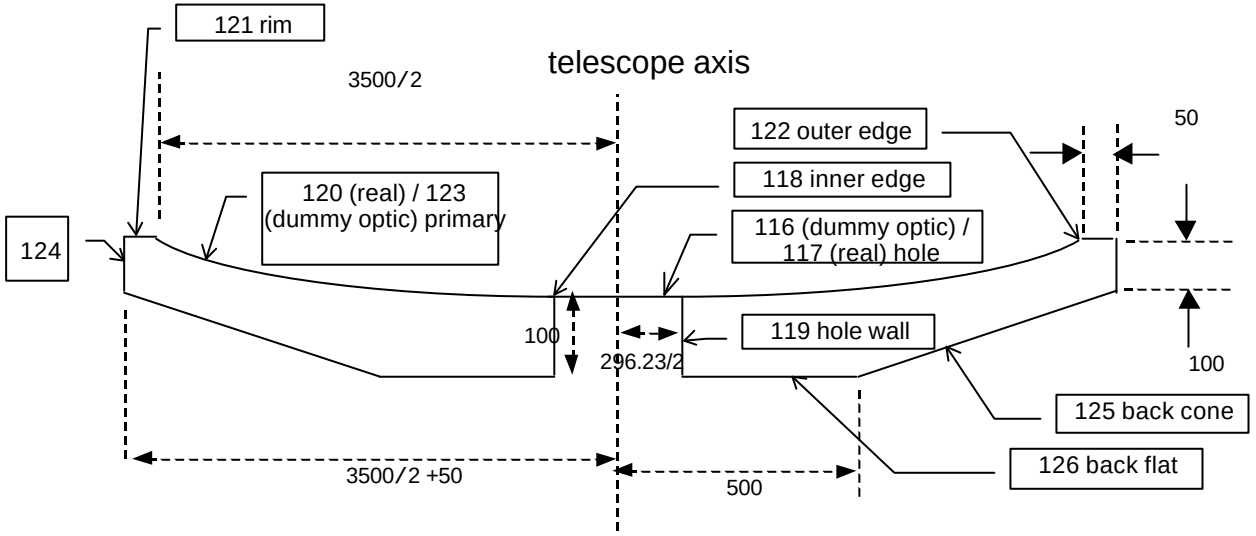
Sun shield geometry responds to M1-M2 spacing, M2 size and strut geometry and fixation plane location (old geometry shown)



Forced Geometry changes(3)

M1 thickness responds to new structure

M1 hole size responds to new structure

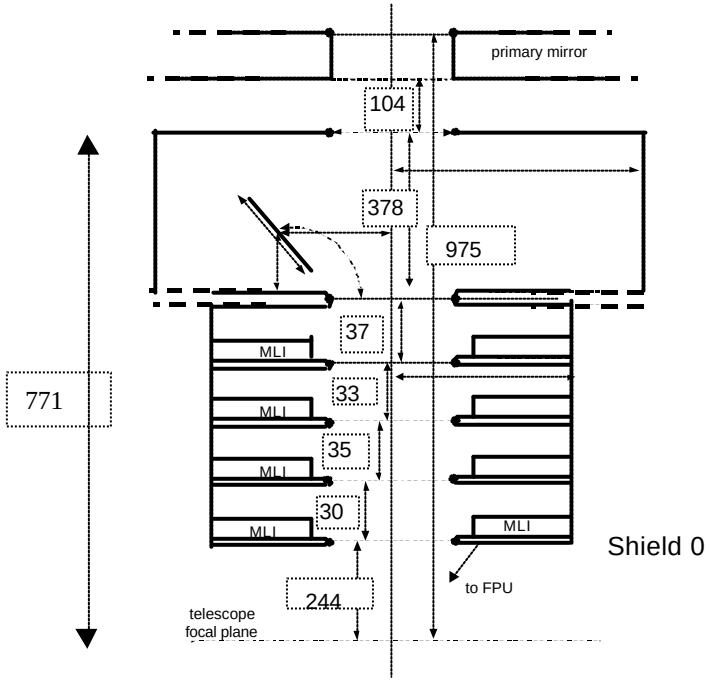


Forced Geometry changes(4)

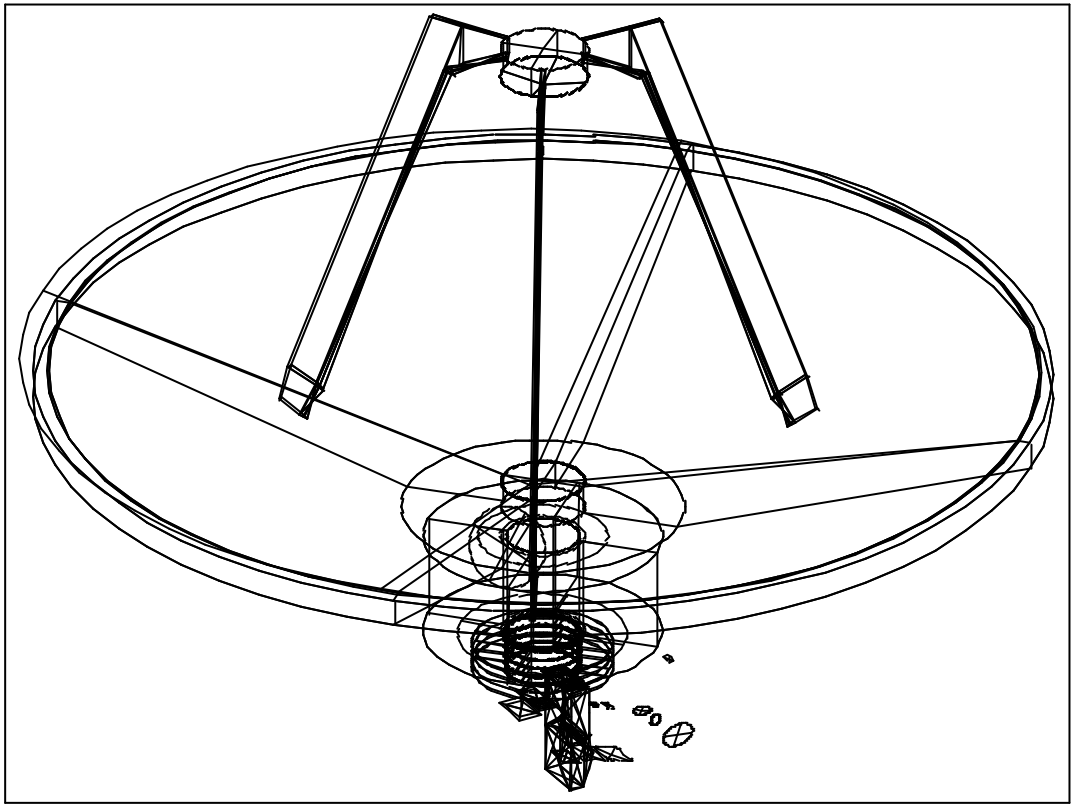
Cryostat base shield (above best focus) 244+65(TBC) (was 244)

Overall Cryostat length base shield to entrance port responds to cryostat redesign

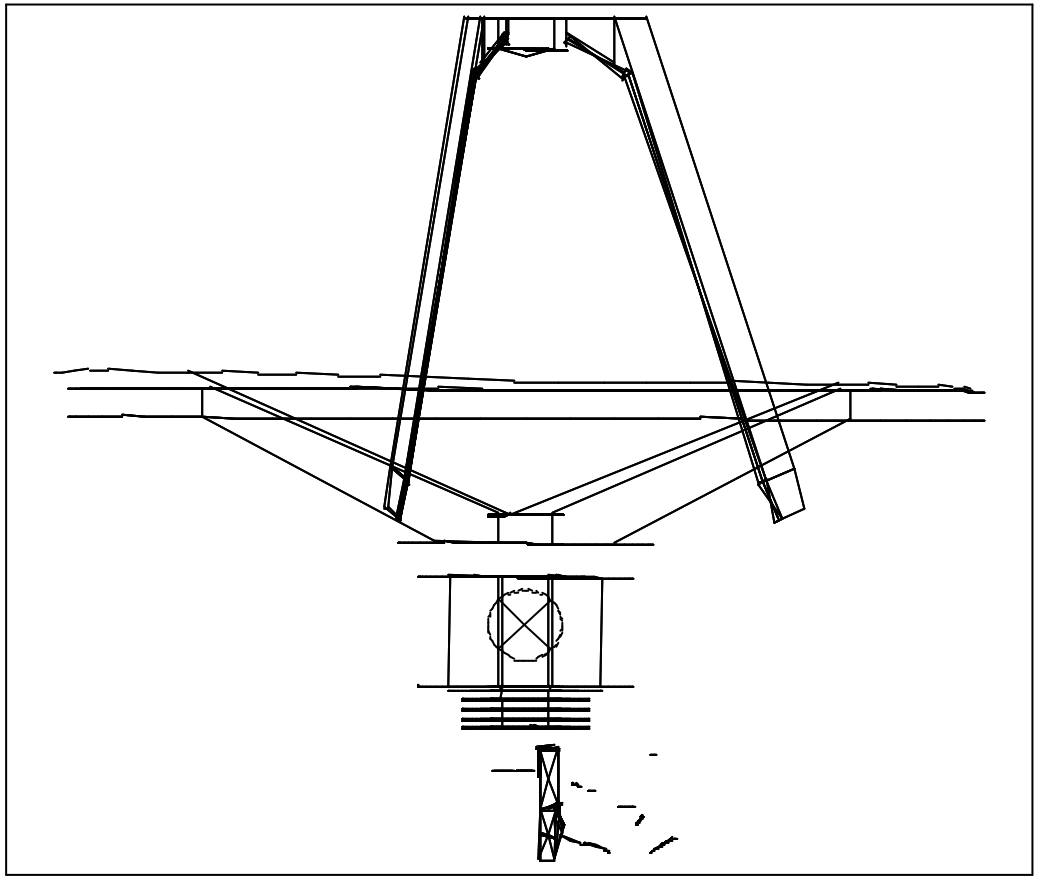
(old geometry shown)



New Telescope / SPIRE Geometry(1)

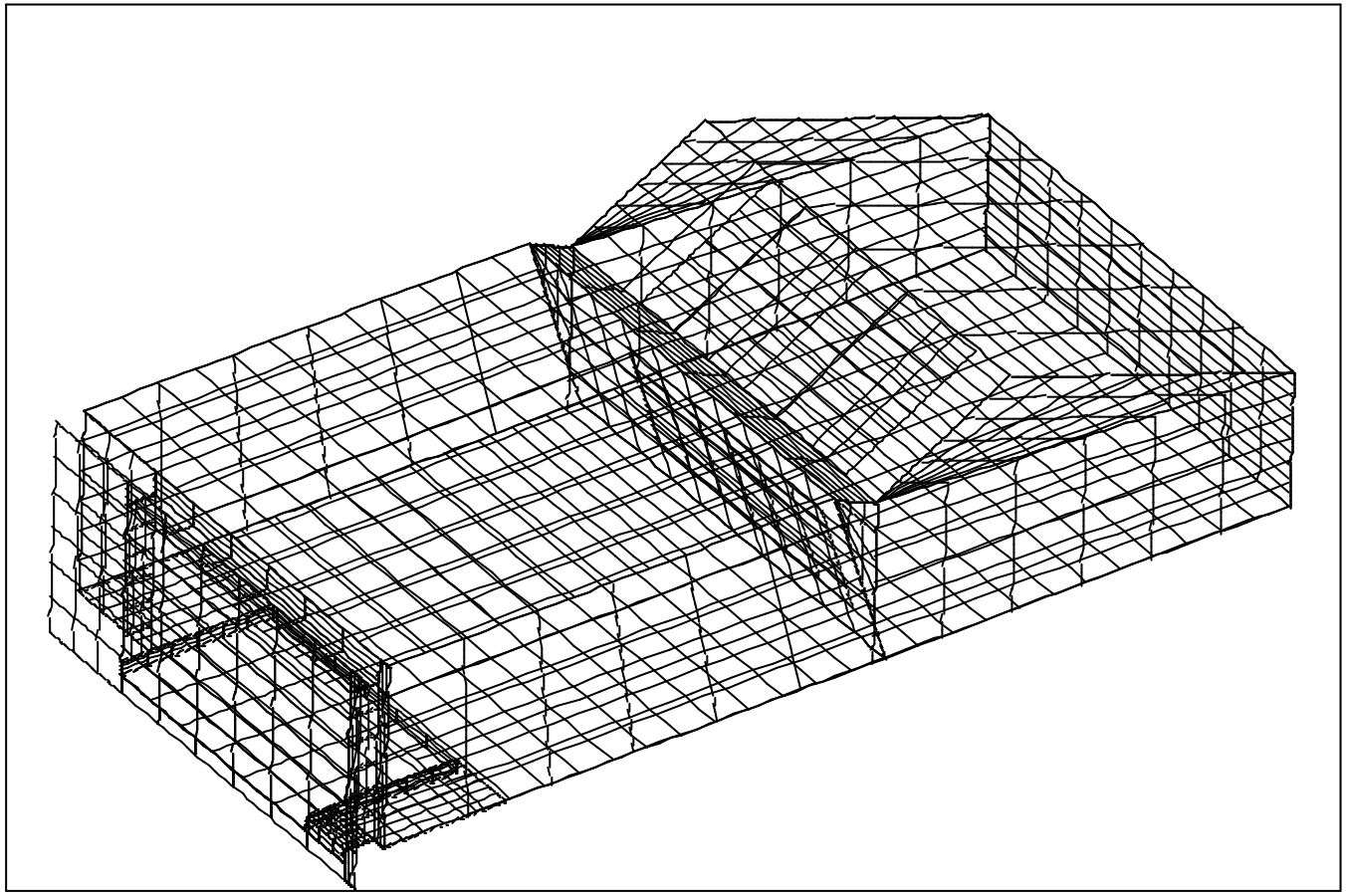


New Telescope / SPIRE Geometry(2)



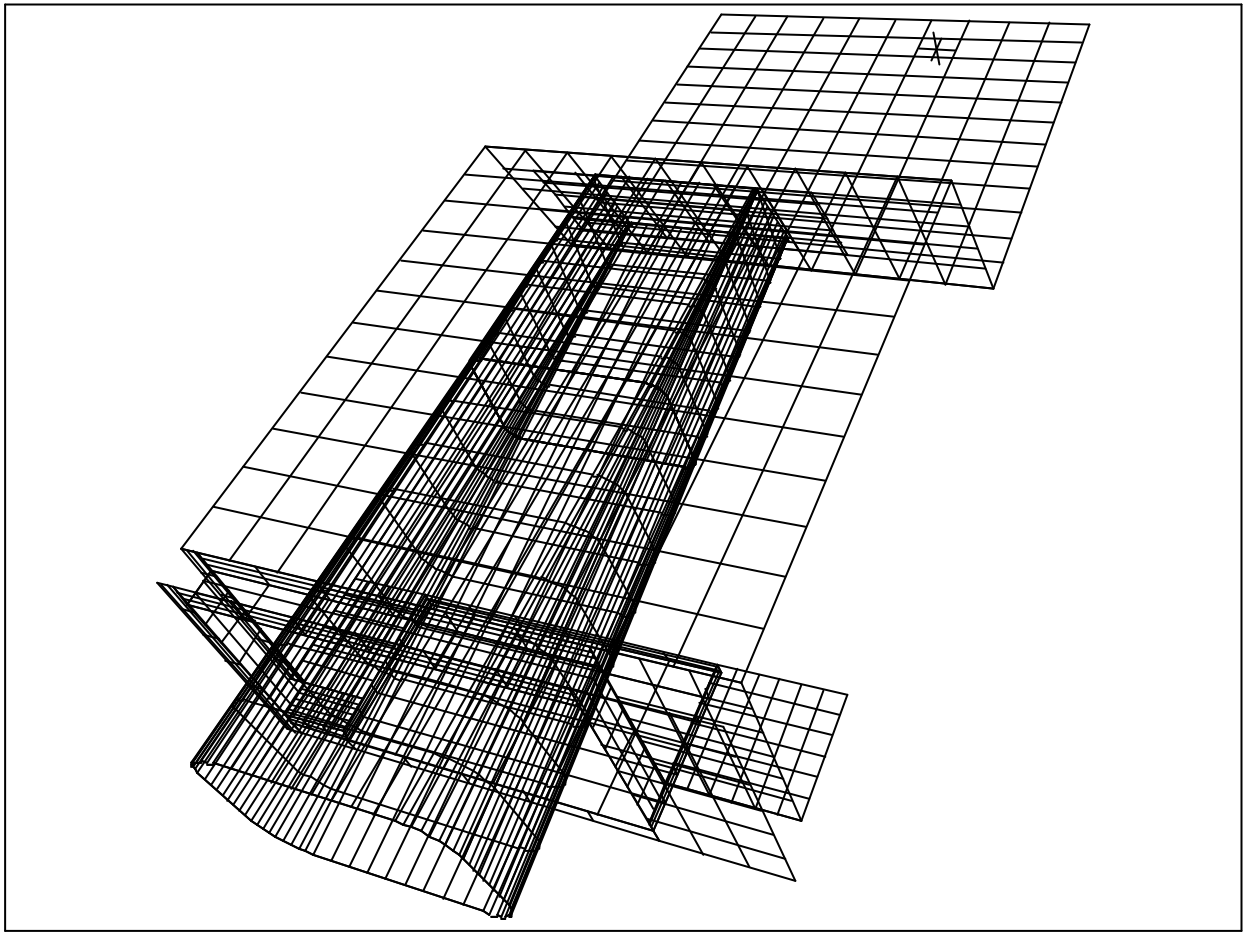
Draft APART Model Update SPIREFPU

New SPIRE Geometry(1)



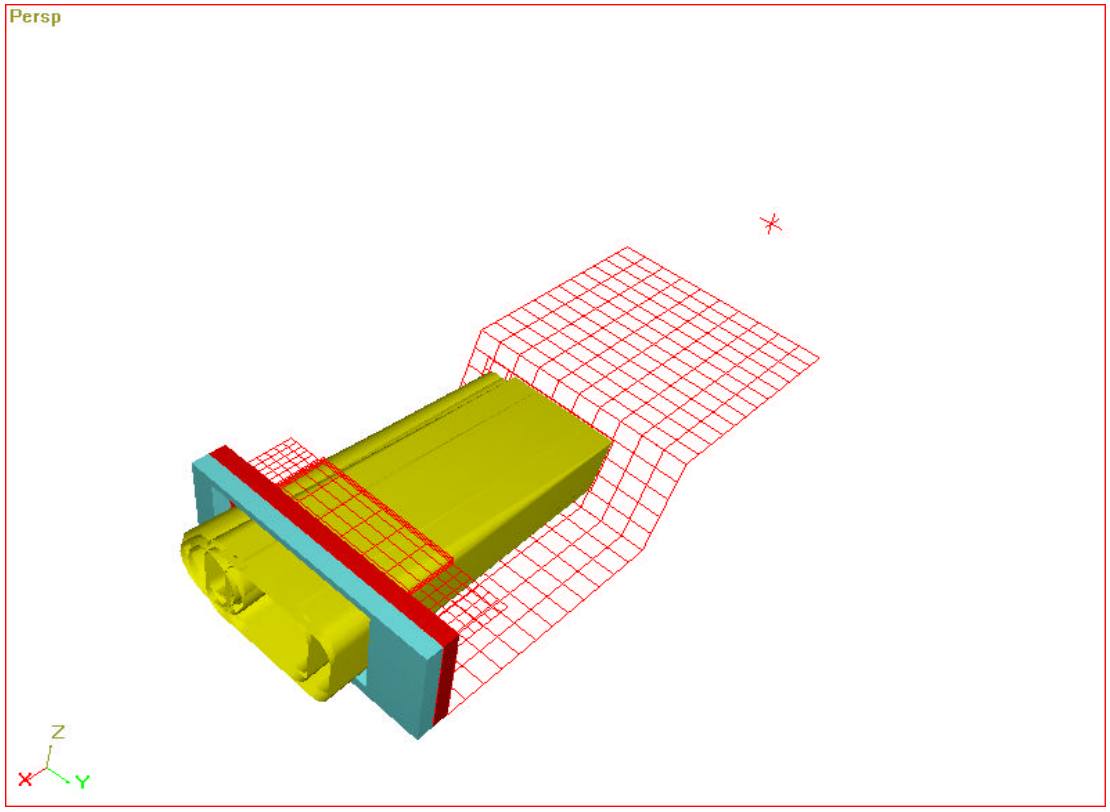
Draft APART Model Update SPIREFPU

New SPIRE Geometry(2)



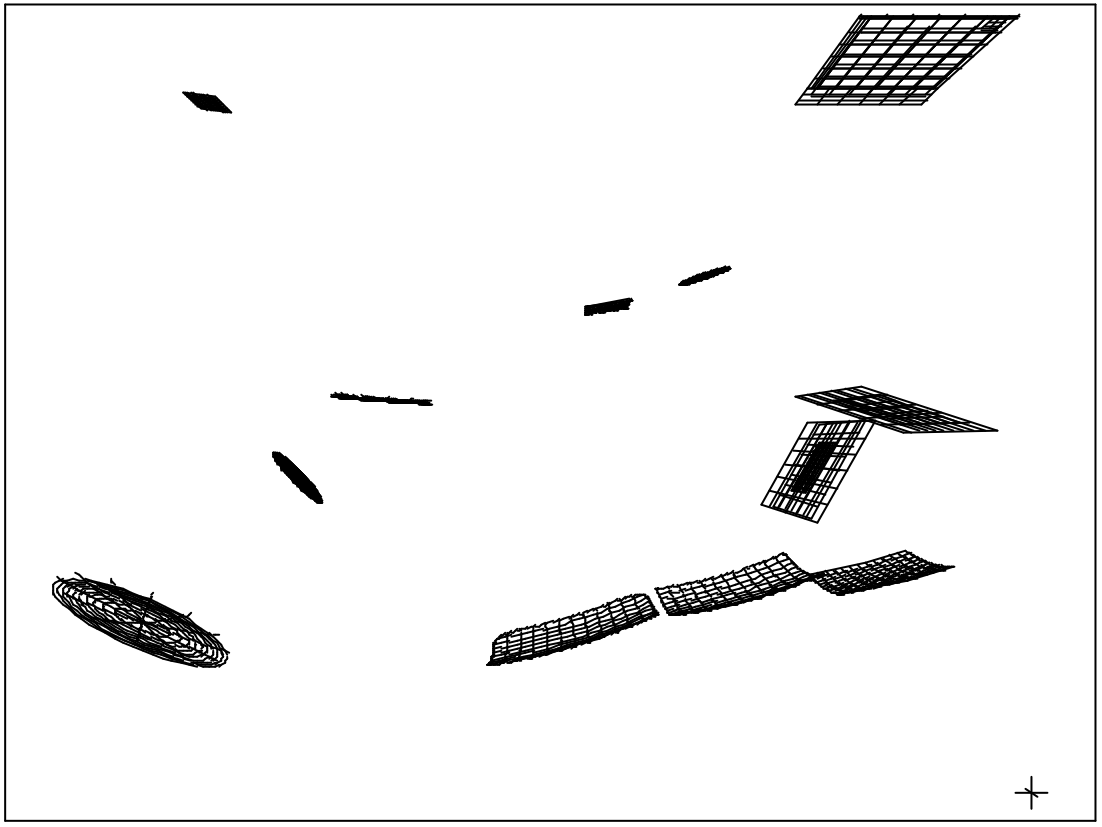
Draft APART Model Update SPIREFPU

New SPIRE Geometry(3)



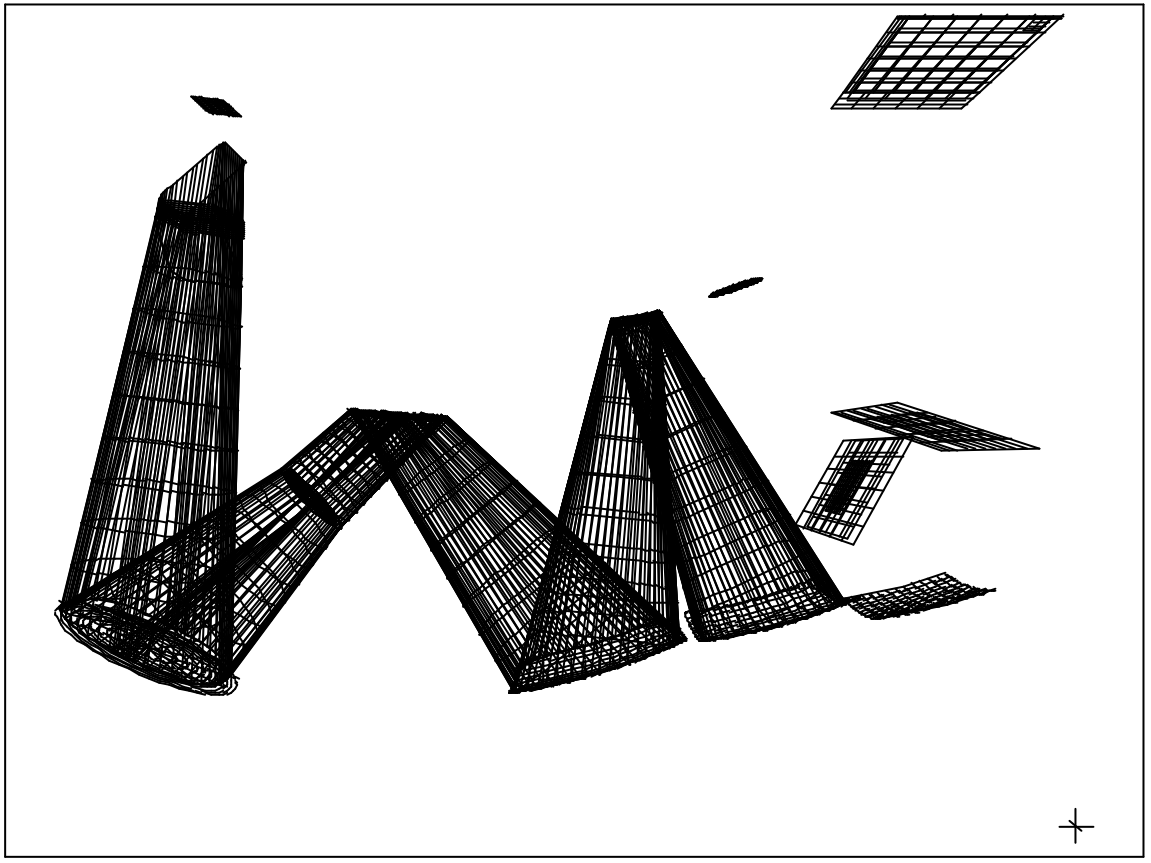
Chopped views and shutter/aperture geometry

New SPIRE Geometry(4)



APART model of SPIRE Photometer optics

New SPIRE Geometry(5)



APART model of SPIRE Photometer optics, with CODEV beam envelopes

Beam shape effects.

- Important for (a) Stray-light (beam wings on optics surround) (b) Point spread function.

- Interested in clipping down to **< 1 %,** & beam is a **truncated** gaussian.

- Use full description: Beam patterns of smooth-wall circular horns, sized for $1/e^2$ clip at cold stops.

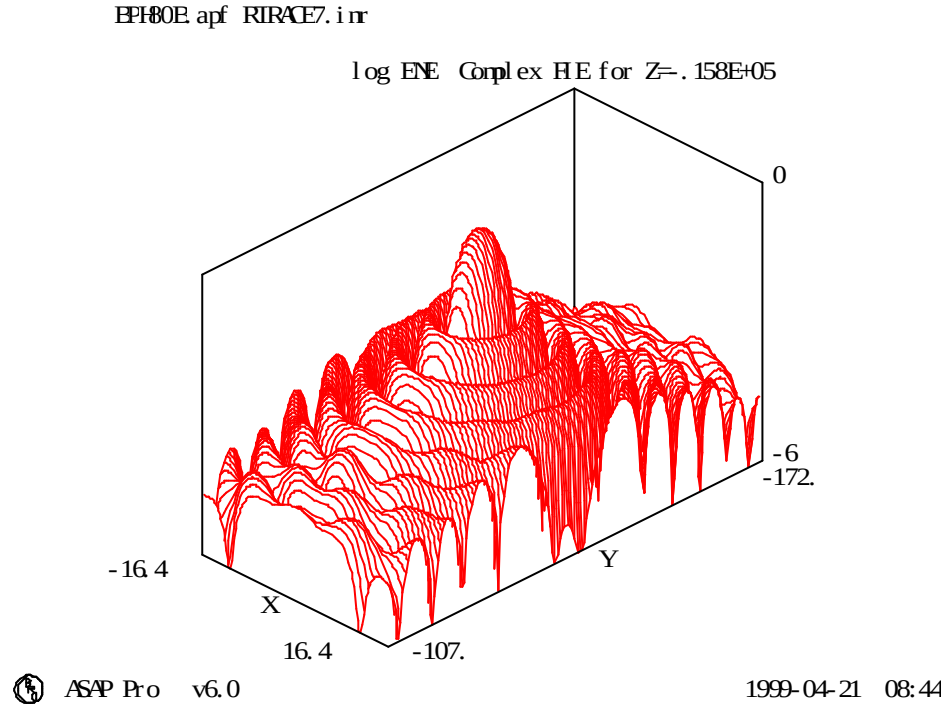
- Tested optics sizing for Worst-case: λ=0.5mm, single-moded.

- Clipping found to be : < 1 % throughout instrument, fore-optics chopping TBC.

- But more severe clipping in telescope …

HERSCHEL meeting, APART Straylight Model June 18 ESTEC

SPIRE LW beam (λ=0.5mm) at Herschel Focal surface, centre of Phot. field



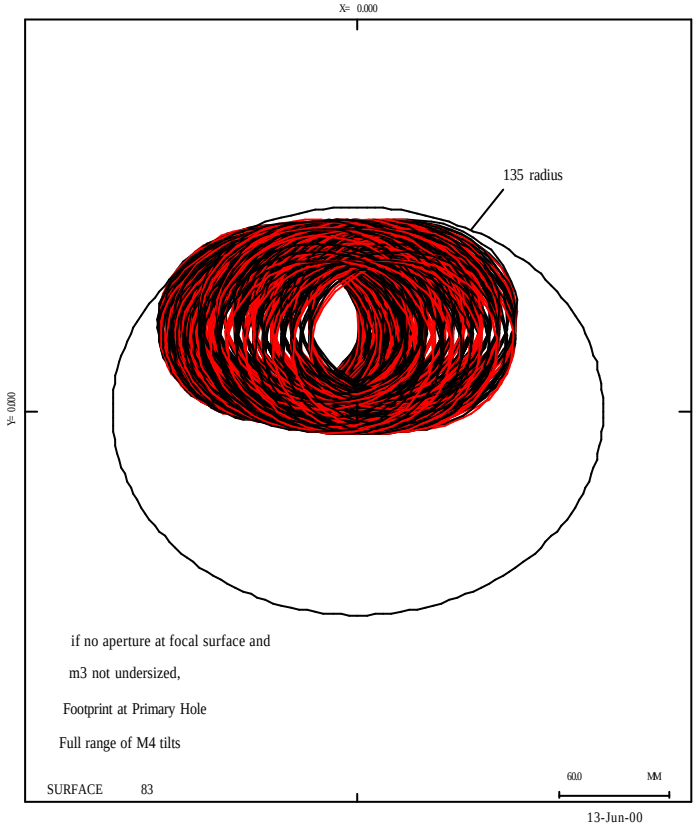
Airy pattern intensity (log scale) versus position in mm.

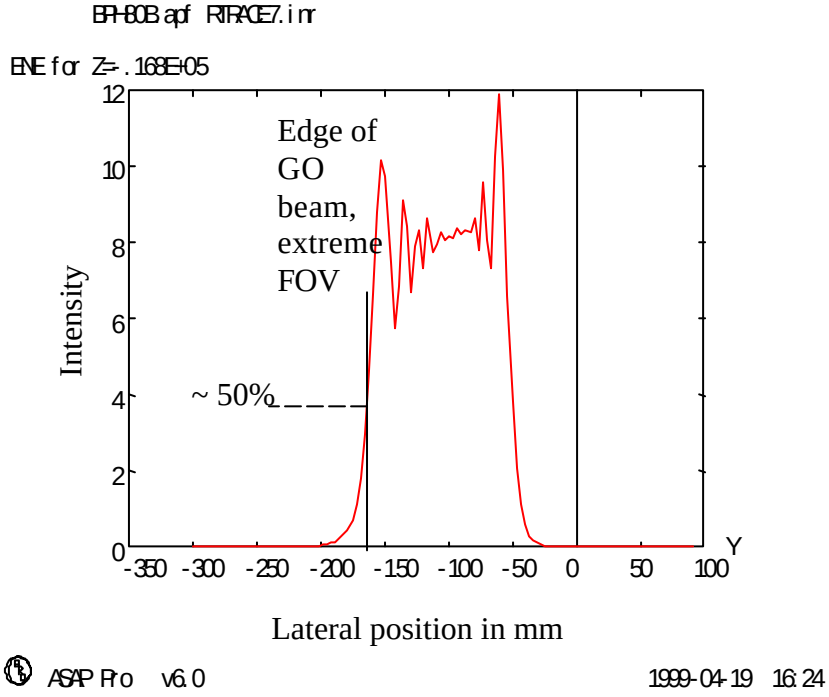
Clipped by instrument rectangular field stop, effective size at FP : X ,Y = 32.8 , 65 mm.

pupil-imaging is poor due to large f-number : 2600mm/X , 2600mm/Y = 80 , 40 .

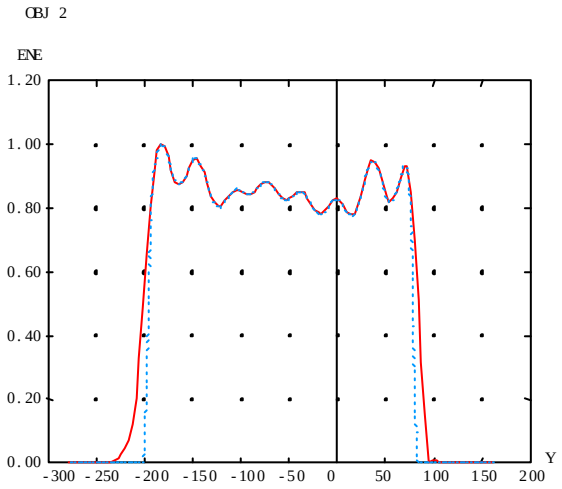
Draft APART Model Update SPIREFPU

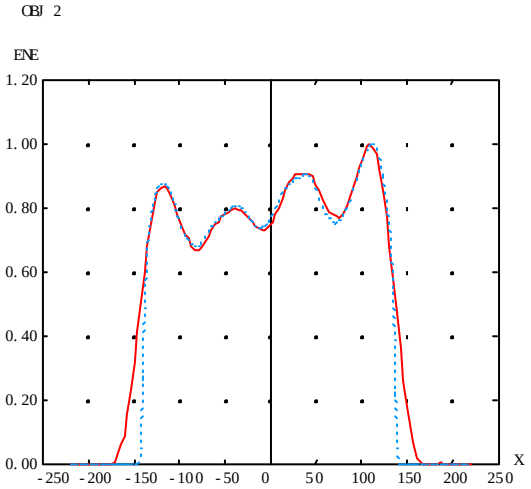
SPIRE LW beam at M1 cut-out





SPIRE LW beam at M2





- Intensity plots in 2 sections.
- Approx. edge of M2 shown in blue dots, over-spill mainly on to cold space, & spider
- Number of ripples ~ no. of Airy rings across field stop.
- Edge diffraction blur diameter $\approx 2.F_{fs}.\lambda \sim 60.\lambda$ = 60mm (average of X & Y directions).
- - applies also to M2 central cone, preventing efficient blocking of this by the instrument.

Telescope diffractive stray-light: Summary

$$Stray\ Light\ fraction = \frac{\text{power from surround}}{\text{power from M1 \& M2}} = \frac{e_s.P(T_s).B_S}{2.e_m.P(T_m).}$$

P = Planck function

ε_s , T_s surround emissivity, temp.

ε_m mirrors emissivity, temp

Telescope component & surround	**Beam fraction B_s**	**emissivity e_S**	**Source temp. T**	**Background level SL fraction**	Ref
M1 cut-out, edge of FOV	0.02	0.15 (cryostat)	80 K	**0.15**	Fig.13
M2 surround: Non-spider, (space viewing)	0.13	1	Cold space	**0**	Fig.14
M2 surround : Spider	0.13x 1/16	0.02	Telescope 76 K	**0.01**	“
M2 surround: Centre cone	~ 0.01	0.02	76 K	**0.01**	
M1 surround Sun-shield, edge of FOV	2E-4	0.04	160 K	**2e-3**	Ref.9