HIPPARCOS - PAYLOAD STUDY

(L. Lindegren, ESTEC 79-09-13)

Note concerning the deformation of complex mirror surfaces

The present baseline solution (as given in DP/PS(78)13, p. 24) is a fourth-order deformation of the complex mirror surfaces according to

$$\Delta x = \gamma h^4 , \qquad (1)$$

where $\gamma = -0.01511\ m^{-3}$ and h is the ray distance from optical axis. For the $0.1 \times 0.125\ m^2$ rectangular pupil, $h_{max} \equiv H \simeq 0.16$ m, yielding $|\Delta x|_{max} \simeq 10\ \mu m$. See Fig. 1.

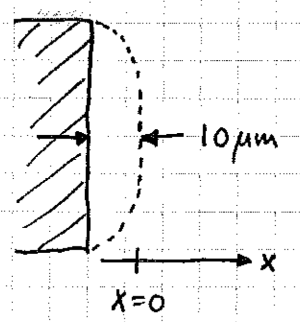

Fig. 1.

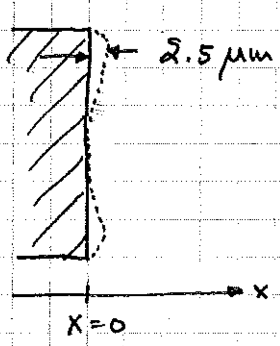

Fig. 2.

We propose using the modified deformation (Fig. 2)

$$\Delta x = -\gamma H^2 h^2 + \gamma h^4 , \qquad (2)$$

with $\gamma = -0.01511\ m^{-3}$, yielding $\Delta x = 0$ at $h=0$ and $h=H$, and $|\Delta x|_{max} = \frac{1}{4} \gamma H^4 \simeq 2.5\ \mu m$.

The paraxial curvature radius $\simeq 1293$ m may be compensated by changing the radius of curvature of the primary mirror from 2044 mm to 2047.24 mm. This leaves the positions of the mirrors and the focal surface unchanged, but increases the equivalent focal length by 5 mm. The new gaussian solution (<u>to be verified by MATRA !</u>) is :

Complex mirror radius of curvature :	1293000	mm
Primary mirror – " – :	2047.24	mm
Secondary mirror – " – :	1102	mm
CM – PM distance:	1300	mm
PM – SM distance:	700	mm
PM – focal surface distance:	74.760	mm
Equivalent focal length (f_{eq}):	2463.984	mm

It can be assumed that the optimal asphericities of all mirrors are not significantly changed by this small modification of gaussian parameters. The change in f_{eq} is insignificant. Obscuration factors etc. will remain practically the same as before.