CHEOPS

OPTICAL SYSTEM TRANSMISSION

Issue 1.1

01/04/2015

Computation 1/2

- We have considered the ZEMAX model: **Model1.ZMX**
  - We are waiting SELEX-ES to confirm this model as optical system baseline
- We have inserted the coating provided by SELEX-ES on the proper surfaces:
  - HR MIRROR
  - AR-S-FPL51
  - AR-BPH5

  N.B.: Coatings are encrypted. We do not have the recipes.
- We have introduced in the model M2 Spiders obstructions and M2 physical aperture.
- We have introduced in the model M1 physical apertures and central obstruction.
- Model: **Model1_Transmission.ZMX**
- We have illuminated the entrance pupil (320 mm diameter circular unobstructed aperture) with a matrix of rays 2048×2048 (rays outside the 320 mm diameter circle are not considered) for the field (0, 0) degrees and in the wavelength range 300-1100 nm with sampling 5 nm.

Computation 2/2

- We have computed the Transmission with ZEMAX separately for each wavelength.

  N.B. For each ray, the real path is computed. Aperture, Fresnel, coating, vignetting, and internal transmittance effects are considered.

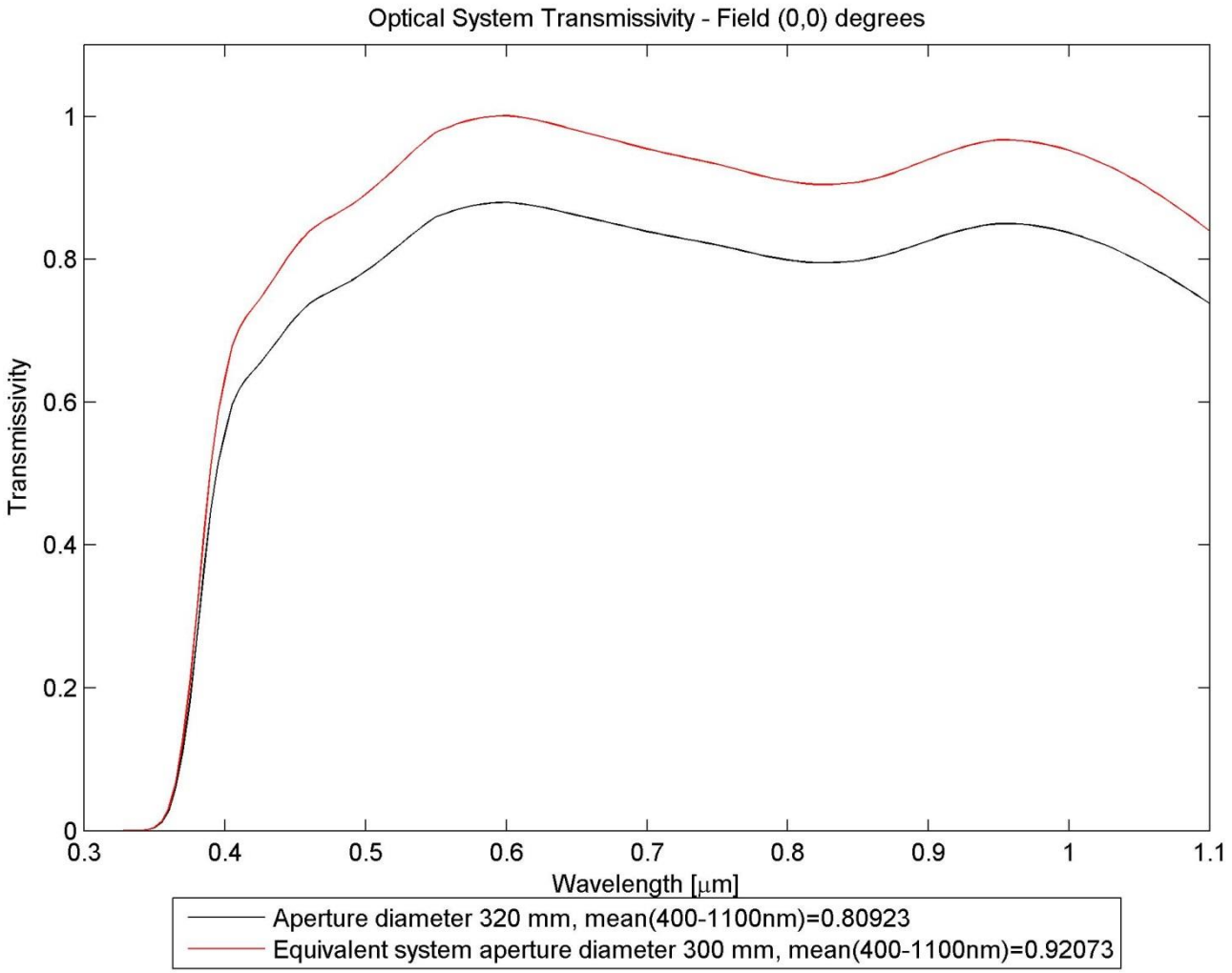
- We have obtained the system transmission for a 320 mm diameter unobstructed entrance pupil.
- The equivalent transmission of a 300 mm diameter unobstructed entrance pupil has been computed from the previous one by multiplying it by the ratio between the two collecting area, i.e.

$$(320/300)^2=1.1378$$

- The mean optical system transmission from 400 nm to 1100 nm is: 80.92%

  The mean optical system transmission from 400 nm to 1100 nm for the equivalent system having a 300 mm diameter unobstructed entrance pupil is: 92.58%
- In the data file,
  - First column: Wavelength from 300 to 1100 nm with sampling 5 nm.
  - Second column: Transmission for 320 mm diameter unobstructed entrance pupil.
  - Third column: Equivalent Transmission for 300 mm diameter unobstructed entrance pupil.

Result

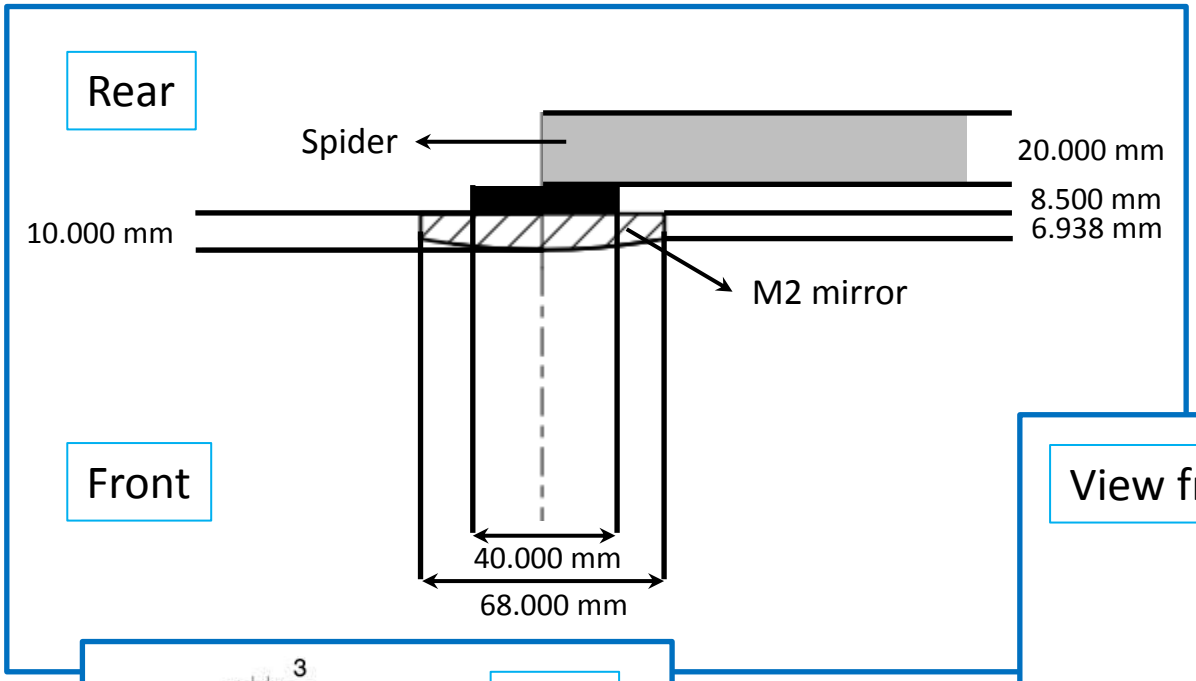

Optical System Transmissivity - Field (0,0) degrees
Transmissivity
Wavelength [μm]
0
0.2
0.4
0.6
0.8
1
0.3
0.4
0.5
0.6
0.7
0.8
0.9
1
1.1
Aperture diameter 320 mm, mean(400-1100nm)=0.80923
Equivalent system aperture diameter 300 mm, mean(400-1100nm)=0.92073

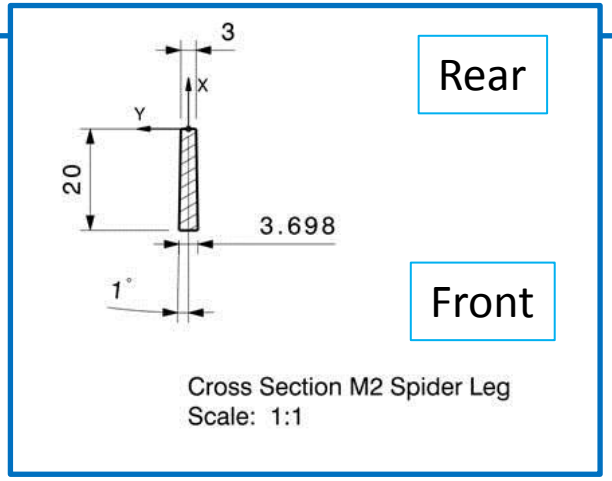
System Data

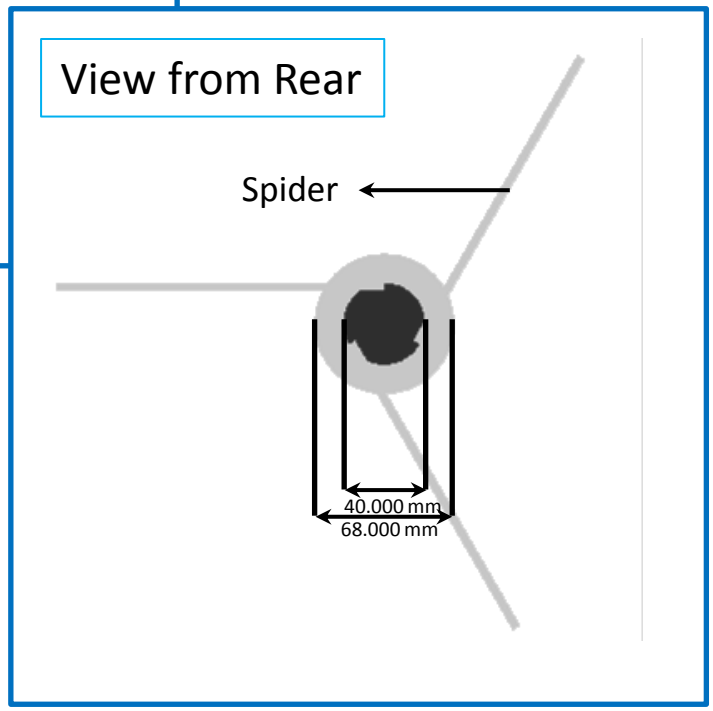
Geometry Data

- M1 diameter = 320 mm
- M1 optical obstruction = 76 mm
- M2 diameter front side = 68 mm
- M2 diameter rear side = 68 mm
- M2 thickness (Vertex-to-rear side) = 10 mm
- M1-M2 distance (Vertex-to-Vertex)= 300 mm
- Spider thickness = 20 mm
- Spider width rear side = 3 mm
- Spider width front side = 3.698 mm

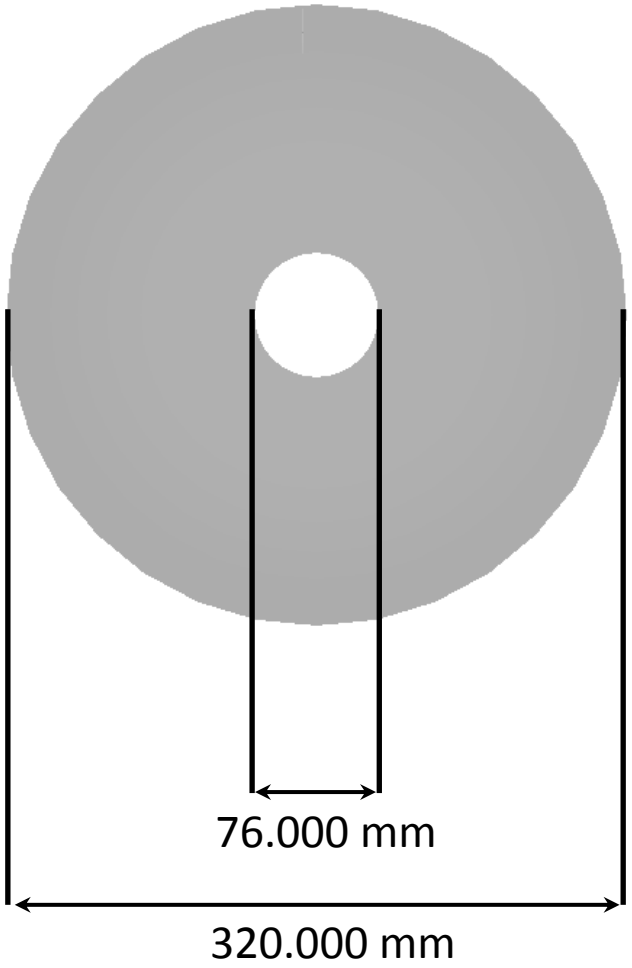
M2 and Spiders

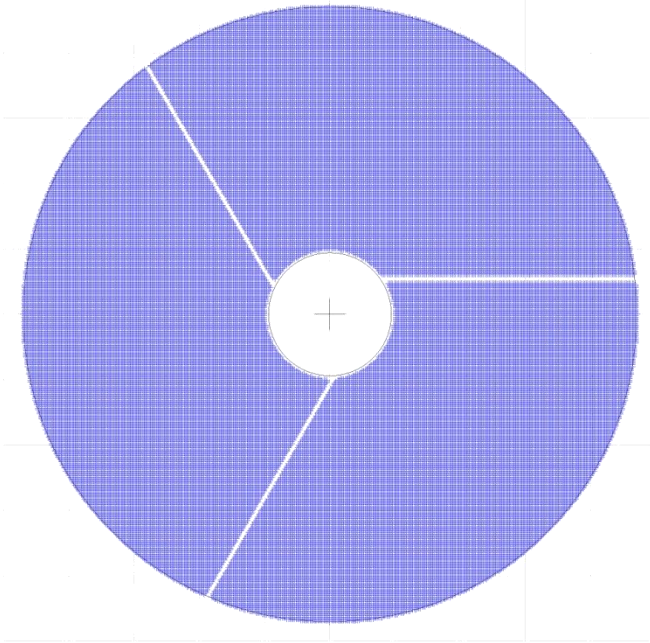






M1





Footprint on M1 for field (0,0) degrees

Percentage with respect to 320 mm diameter entrance pupil = 92.58%