On-ground flat-field calibration of the Metis coronagraph on-board the Solar Orbiter ESA mission

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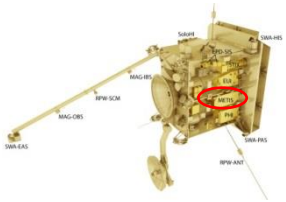
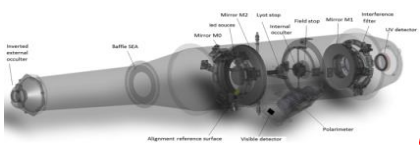
Motivations: the Solar Orbiter Mission

ORBIT:
0.28 – 0.32 AU (perihelion)
0.74 – 0.91 AU (aphelion)
Out-of-ecliptic view up to >24°

How is the solar wind generated and accelerated in the interplanetary space? To answer to this and other questions the Solar Orbiter mission was achieved. The Solar Orbiter payload is composed by 10 instruments.



Metis studies the Solar Corona



On-Ground Calibrations

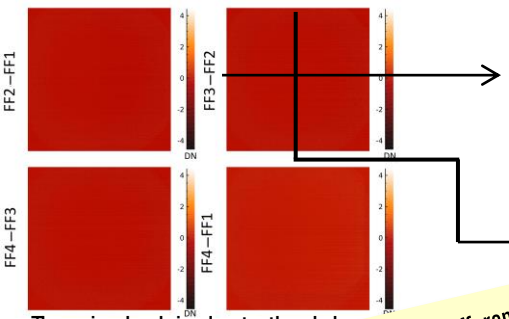
Experimental Set-up

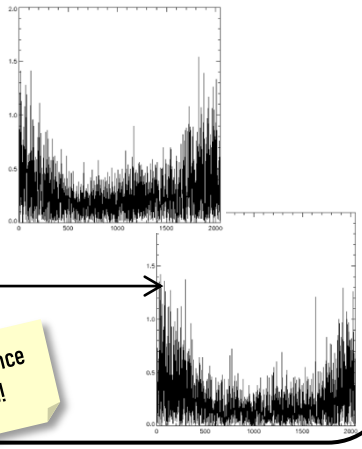
Metis in front of the flat field panel

Flat field panel is a matrix of LED
Panel @10 cm from the Metis aperture
Photodiode @ 8 cm from the centre of LED

Preliminary analysis

4 nominal identical images, are they really identical?



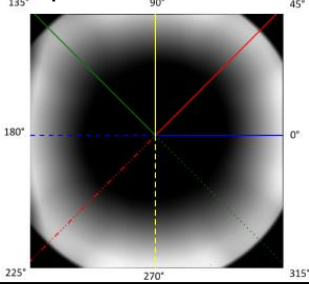


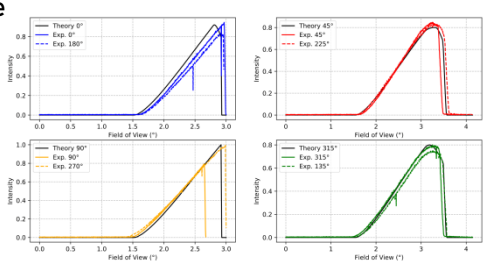
The noise level is due to the dark current and the readout noise

Yes! The difference is less than 2%!

Field of View

Radial profiles from the centre of the image





- ✓ Overplot the theoretical vignetting function calculated with Zemax (black)
- ✓ All the profiles have been normalized at the maximum value of 270°

The instrument requirements on FoV are completely satisfied.

Required value	Measured value
Min 1.5° Max 2.9°	Min 1.5° Max 3.5°

Perspectives: In-flight calibration

On-ground calibrations are fundamental for the correct interpretation of scientific images. Moreover, with the in-flight calibrations we can verify if there were movements of the optical during the launch. Both on-ground and in-flight calibrations, give us the opportunity to quantify the degradation of the system and to correct this effect.

Row image + On-ground + In-flight → SCIENCE