IBIS mask calibration status

latest developments and AO8 data

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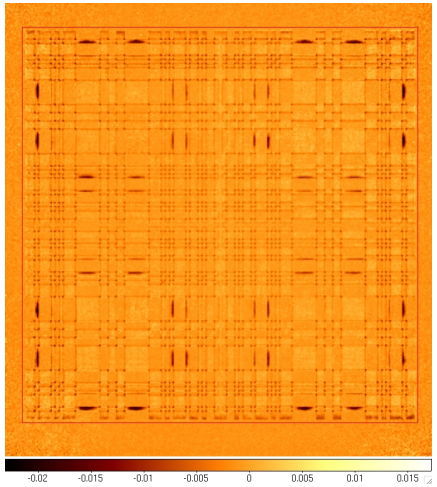
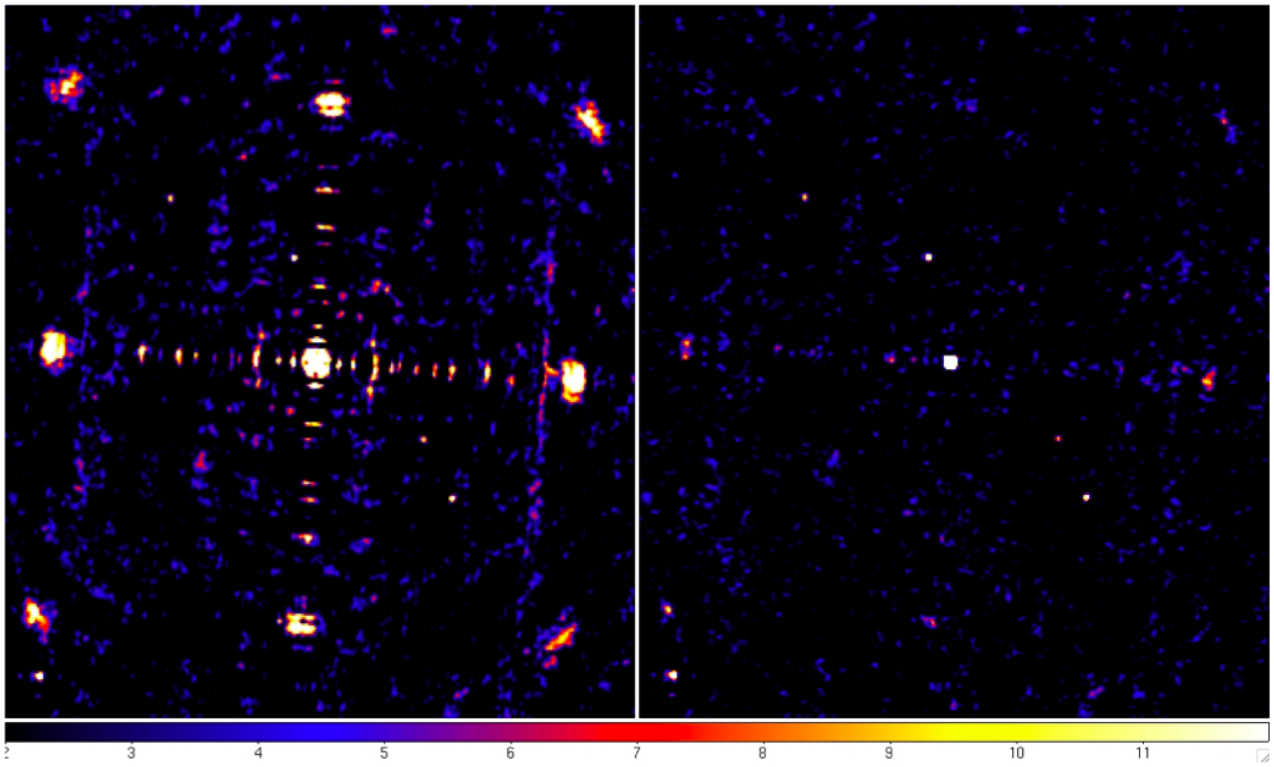
and the IBIS/ISGRI Paris-Saclay team



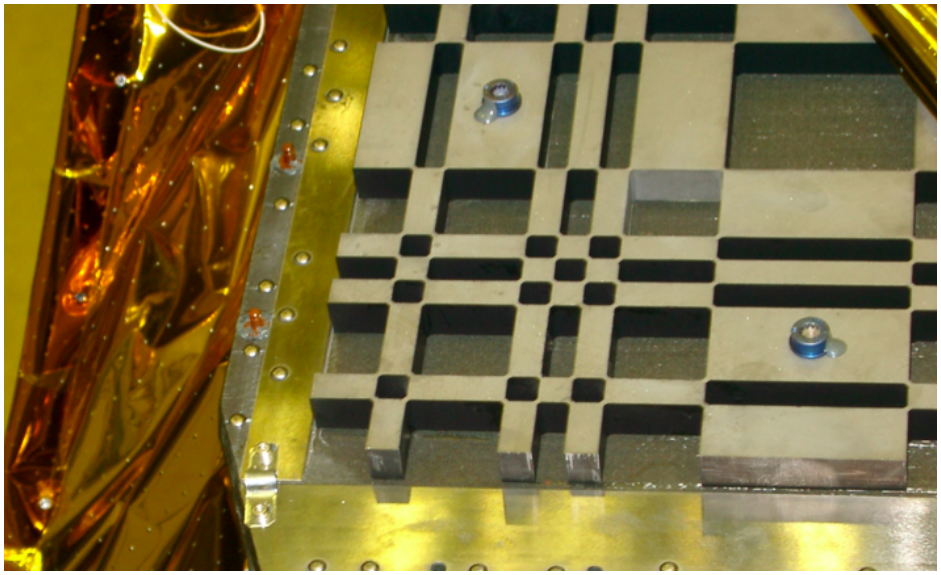
Recent improvements of the imaging performances of the IBIS software

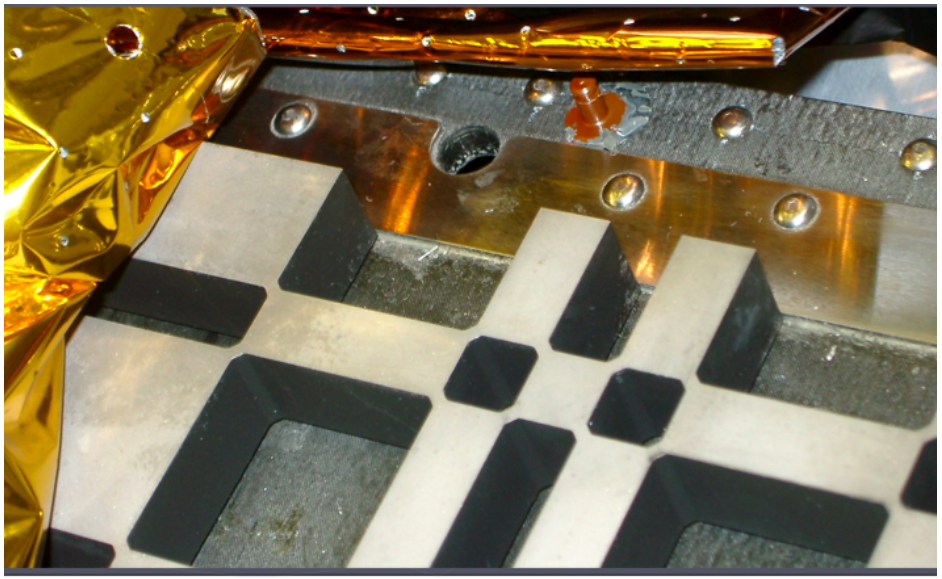


OSA-8 OSA-9

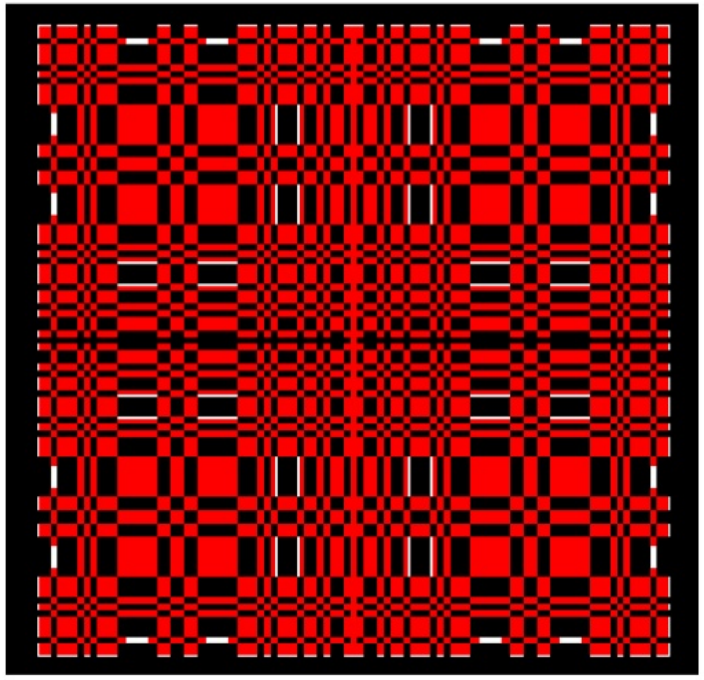
…but there still are residuals

Mask





Excluded regions in OSA 9

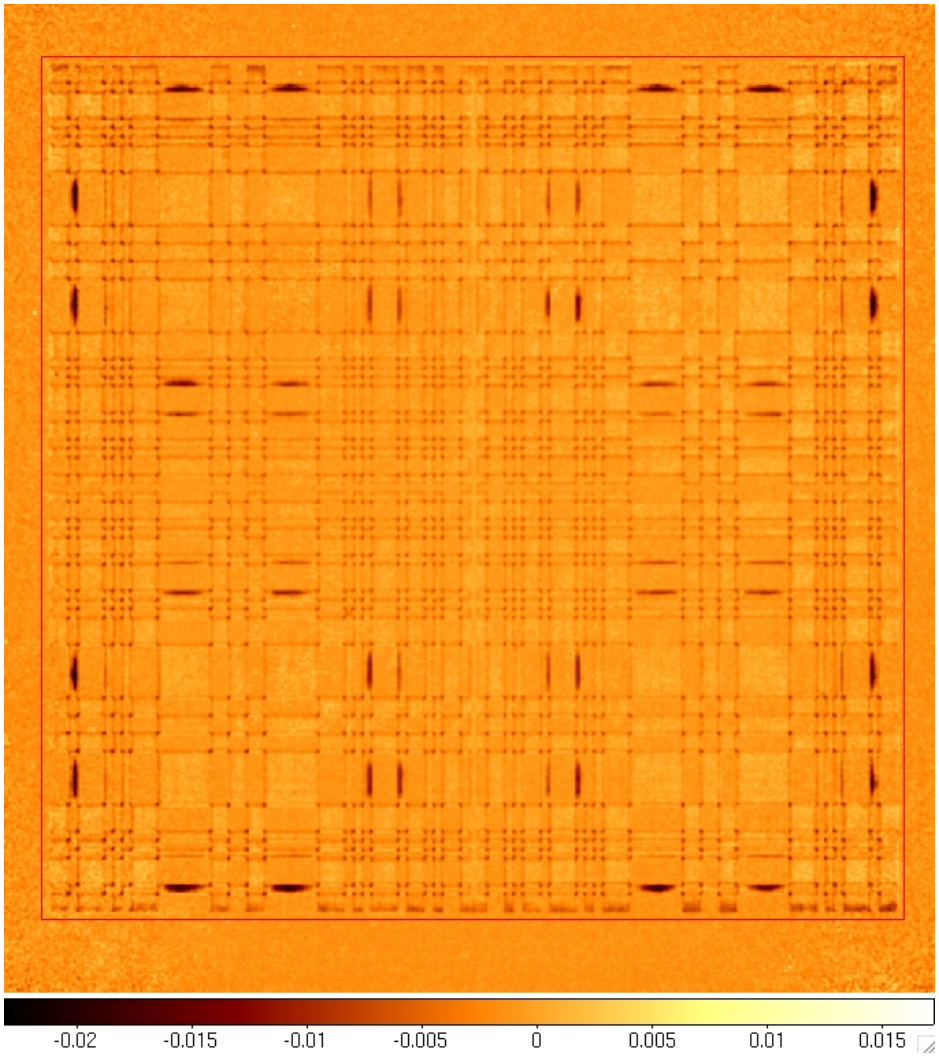


Excluded regions: white

Components:

- bolts and screws
- potting
- mask borders

Optimizing the excluded regions

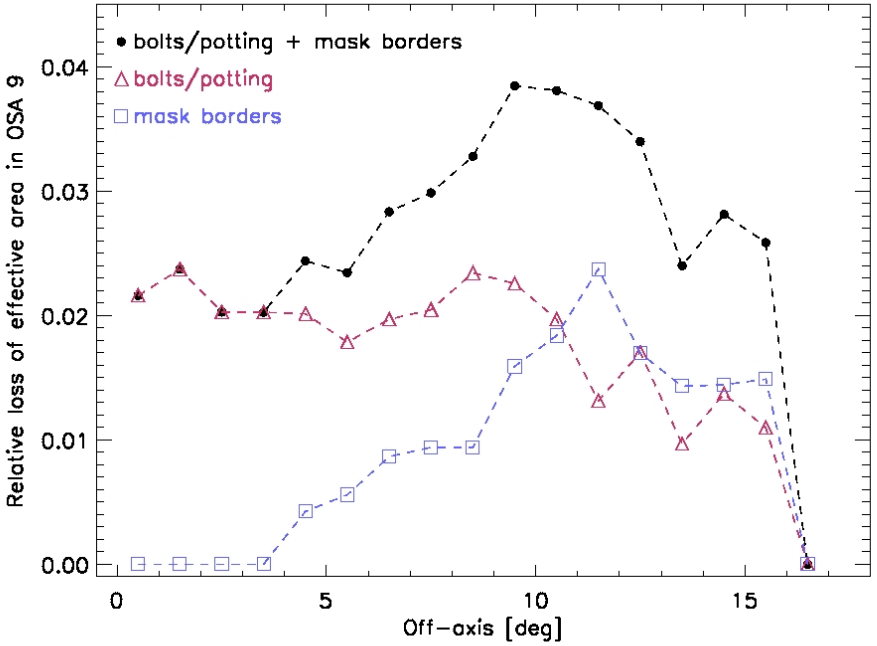


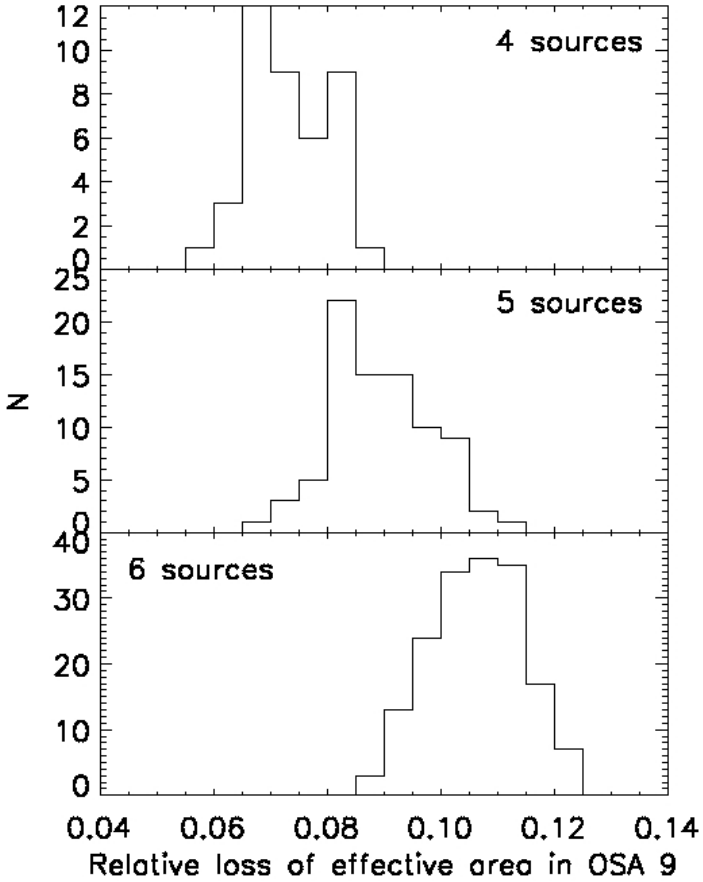
But the mask ‘radiography’ shows the complex geometry of the mask transparency.

We need to:
- minimize the rejected signal (to minimize the loss of effective area);
- refine the rejected area (to properly take into account the geometry and transparency of the defects)

Exclusion mask: loss of effective area

One source (Crab)
- on-axis loss ~2.2%
- maximum loss ~4.5% (< 10° off-axis)

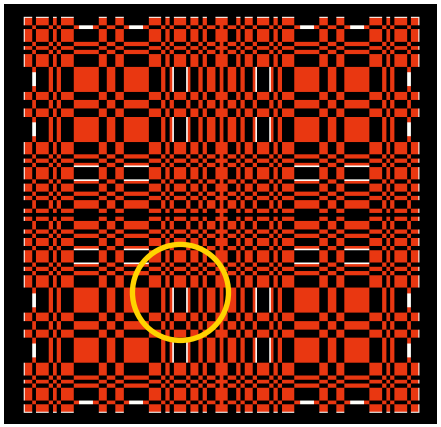




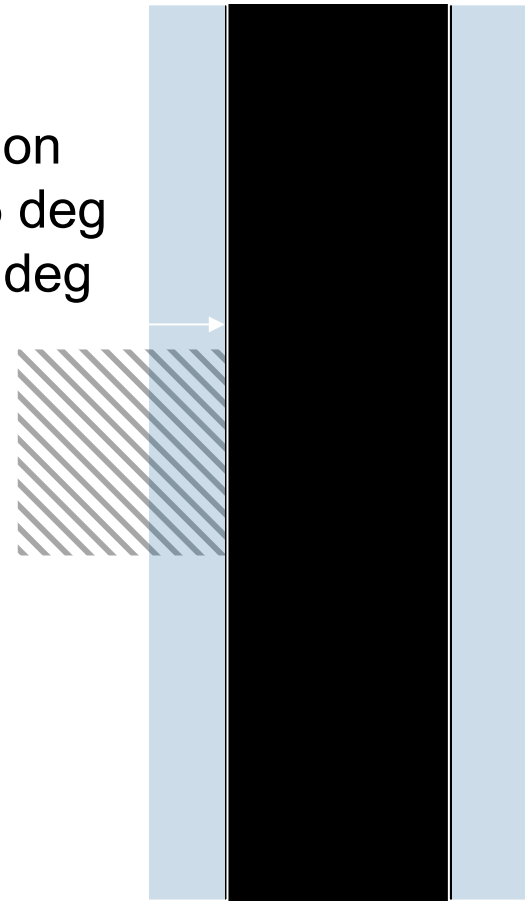
Crowded field (Inner Galactic disk)

# sources	Mean	Max
4	7.4%	8.7%
5	8.9%	11.2%
6	10.6%	12.3%

Exclusion mask: not enough area excluded



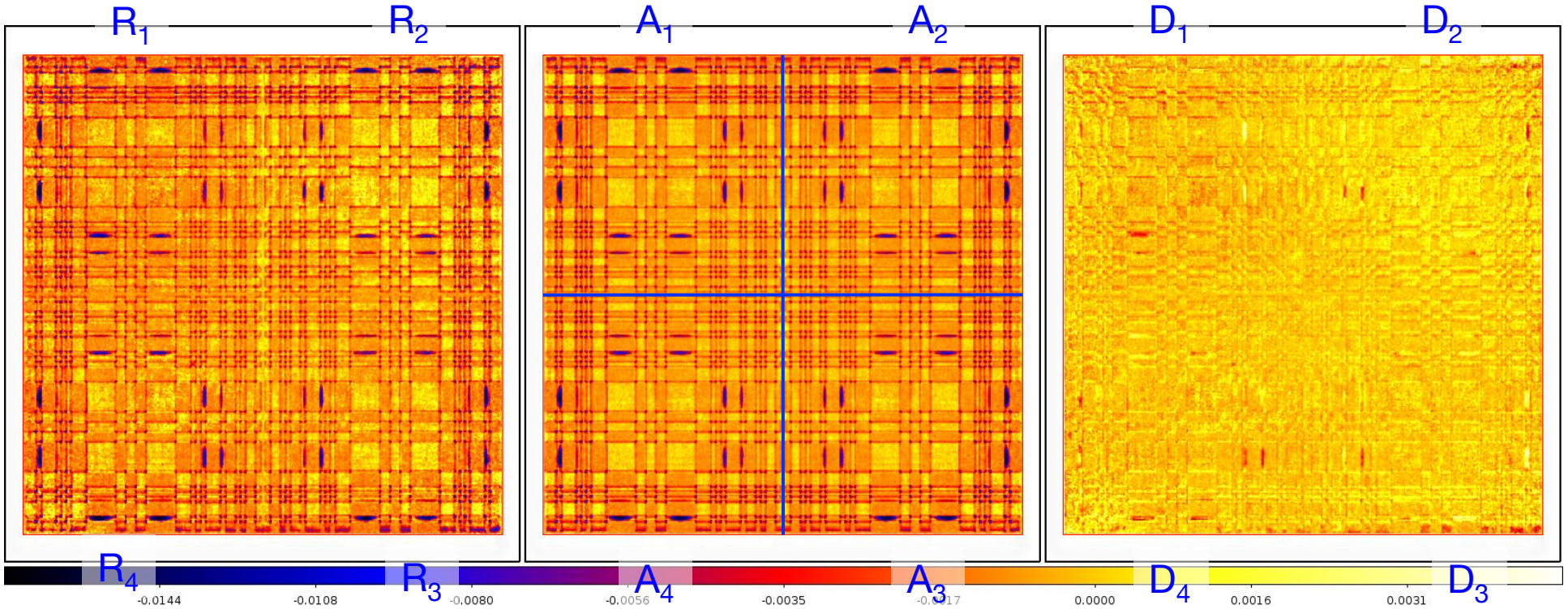
Screw projection
6.3 mm @ 4.5 deg
17 mm @ 12 deg



- The exclusion region due to the screws should be one-sided
- Screw projection overcoming the exclusion region
- A treatment depending on the off-axis and roll angle is required even in the FCFOV

exclusion region 3.8 mm

Asymmetric mask defects



Mask defect radiography

R_N = mask defects radiography of the N corner

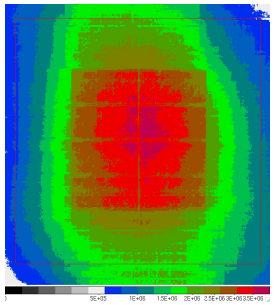
$A_N = (R_1+R_2+R_3+R_4)/4$

A_N = average of the radiography of the 4 mask corners

$D_N = R_N - A_N$

D_N = difference of the N corner from the average

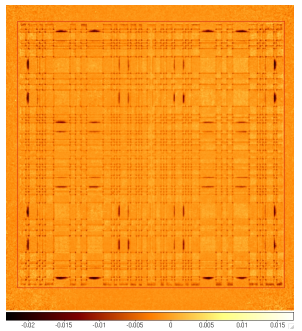
For a significant improvement over OSA 9, we need to characterize the transparency of the mask at a ~1% level



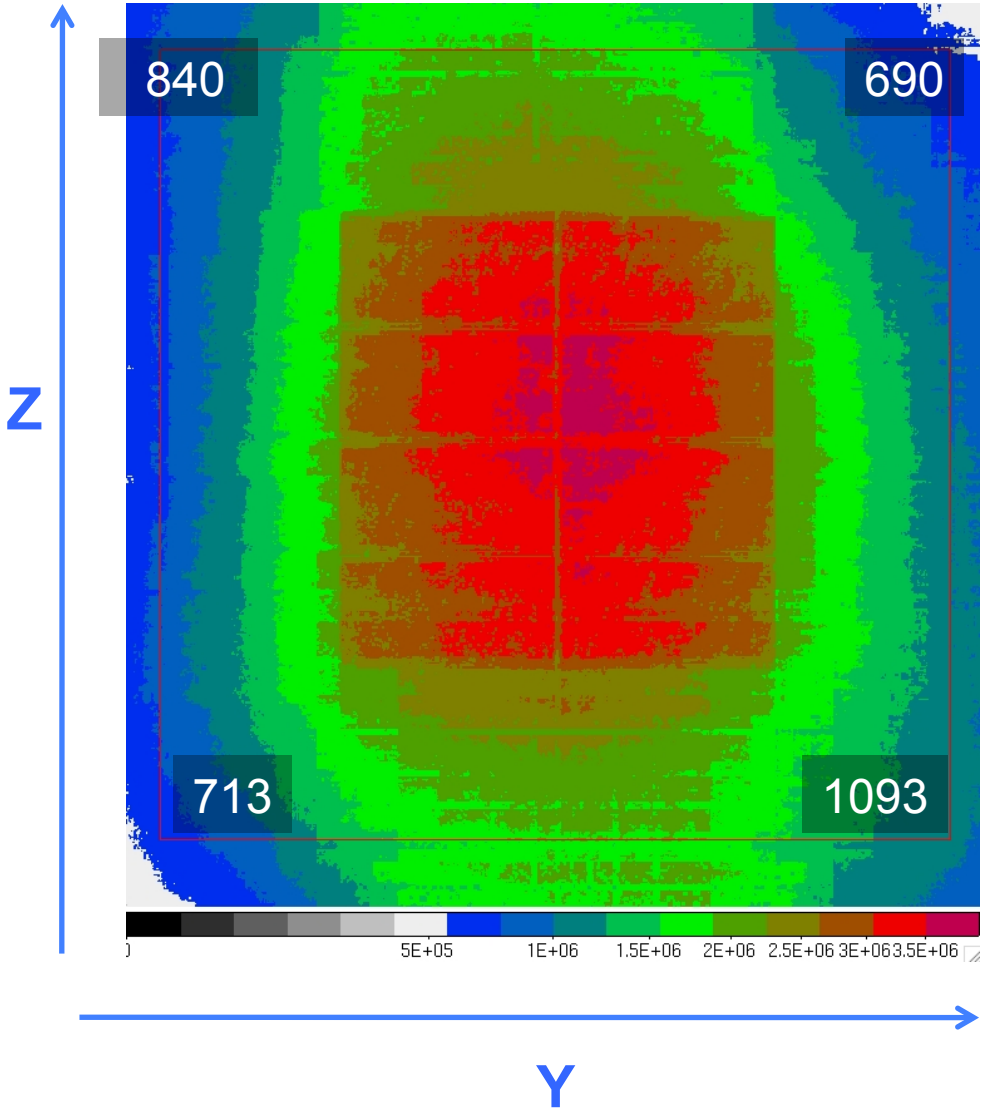
To reach this goal, we are:

- accumulating large exposure of the mask, 1 Ms per mask corner, adding up Crab and Cyg X-1 archival data and upcoming observations

- modeling the mask defects (geometry and absorption) to implement a new mask model in the IBIS software



Where we are with the mask exposure



Effective exposure
time in ks
up to the end of 2010

IBIS mask calibration with AO−8 open time observations (I)

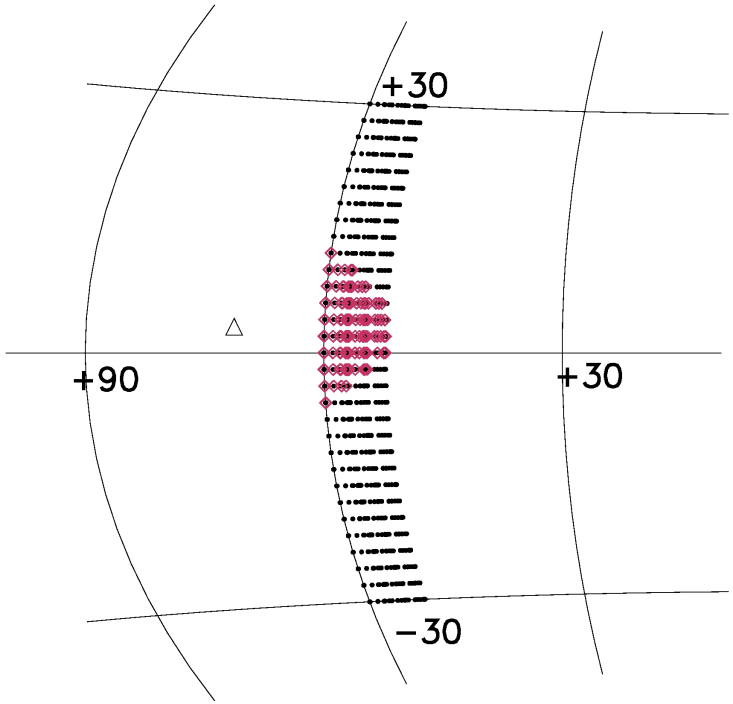
Method:

- use already approved observations
- keep the original pattern strategy
- select the satellite z-axis direction to illuminate the “correct” mask corner
- increase the exposure time of a fraction of the pointings (those useful for calibration).

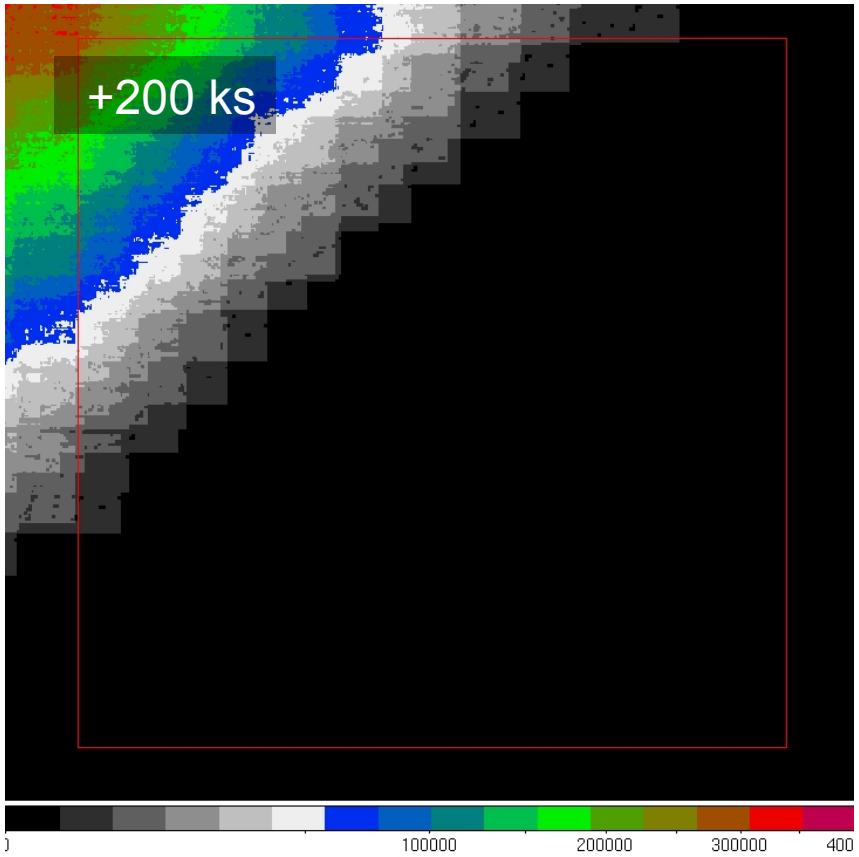
Successfully applied in AO-7 to the Cygnus region observation (PI: P. Martin) in collaboration with ISOC

IBIS mask calibration with AO−8 open time observations (II)

Broad view on high energy Galactic background: Galactic latitude scans at l=55 deg (ID 0820029, PI: A. A. Lutovinov)



Raster pattern: 139 useful pointings

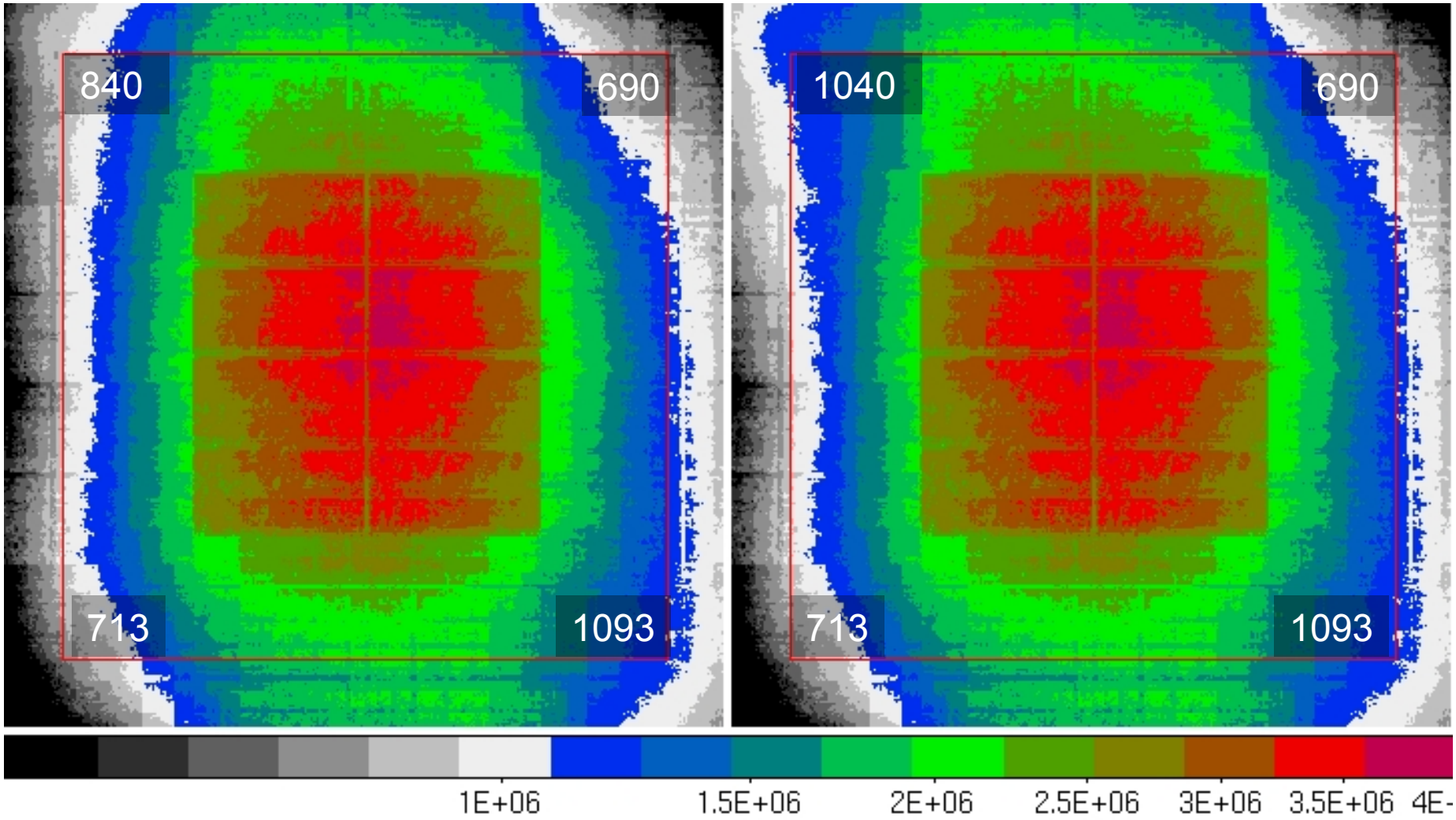


To be discussed with the PI

IBIS mask calibration with AO−8 open time observations (III)

up to end AO-7

up to end AO-7 + Galactic Scan AO-8



Scale from 600 ks to 4 Ms

Perspectives

- AO-8 Galactic scan observation?
- Dedicated mask calibration:
  70 ks/rev. per corner (2 corners/rev.)

→ with Galactic scan + 4 dedicated mask calibration revolutions we will reach the 1 Ms/corner goal

- Implementation in OSA