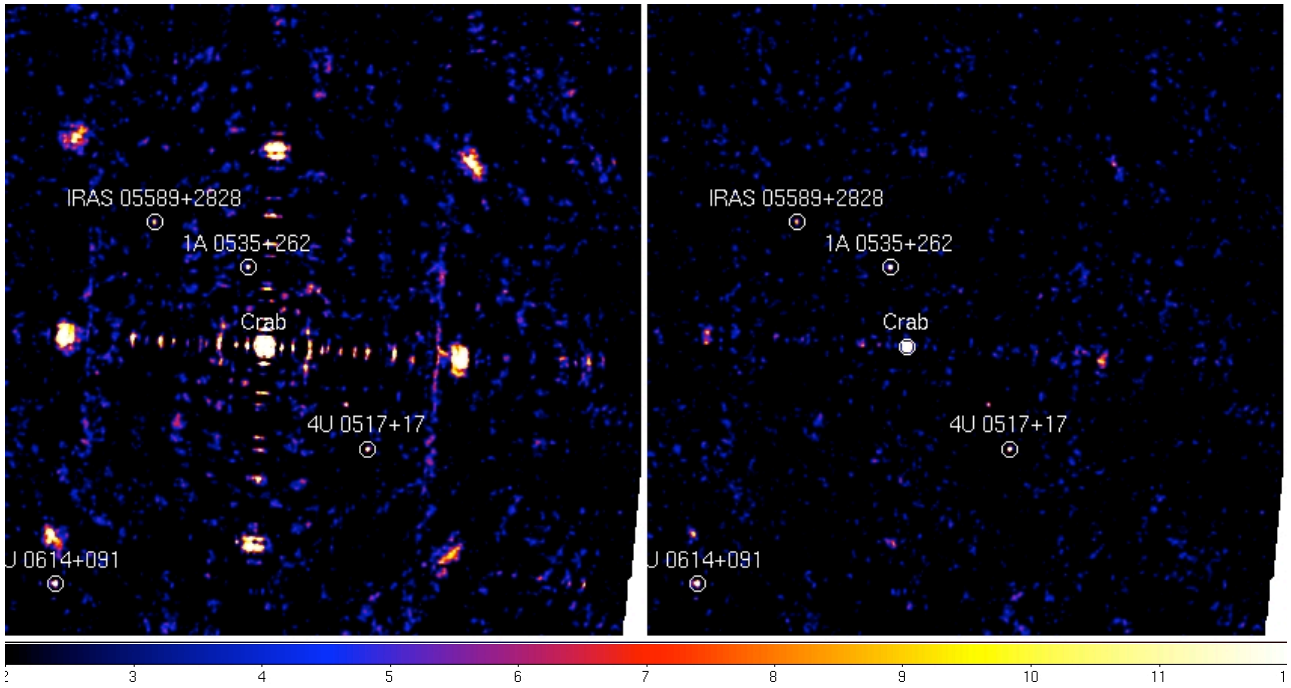
IBIS mask calibration: status and perspectives

IBIS/ISGRI Paris-Saclay team

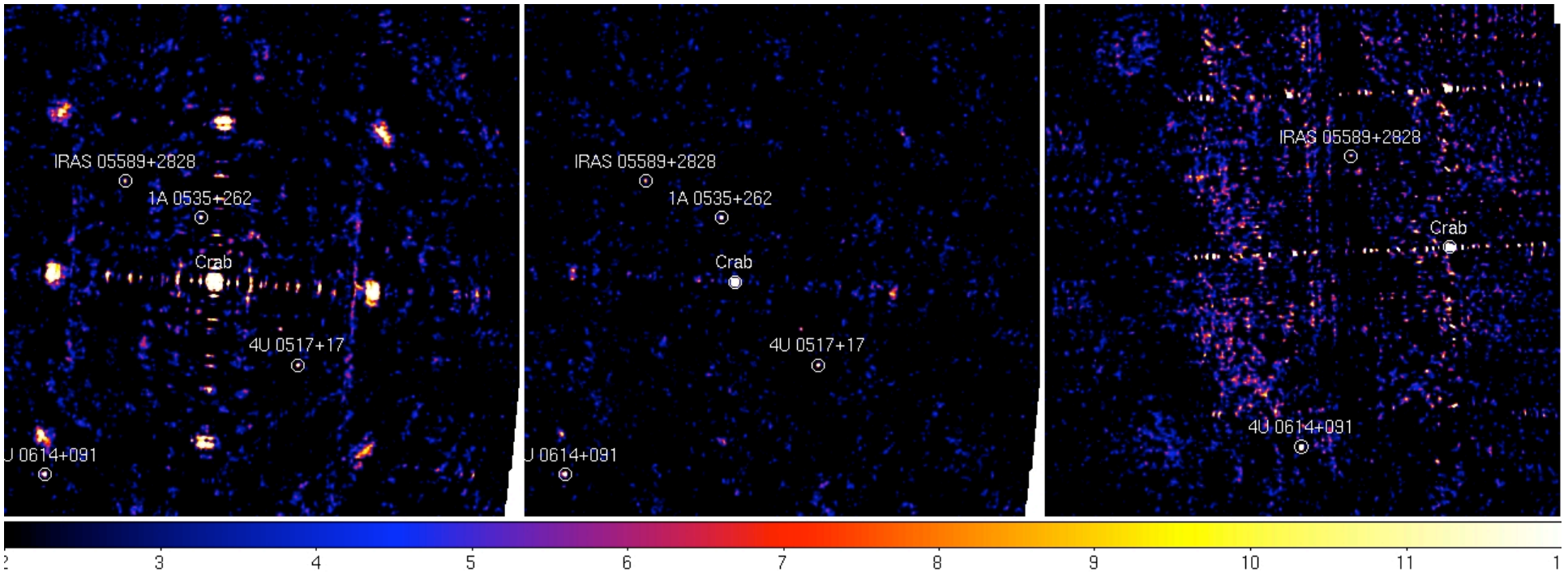
Improvements of the imaging performances of the IBIS software with OSA 9



OSA 8
(Crab on-axis)

OSA 9
(Crab on-axis)

Improvements of the imaging performances of the IBIS software with OSA 9



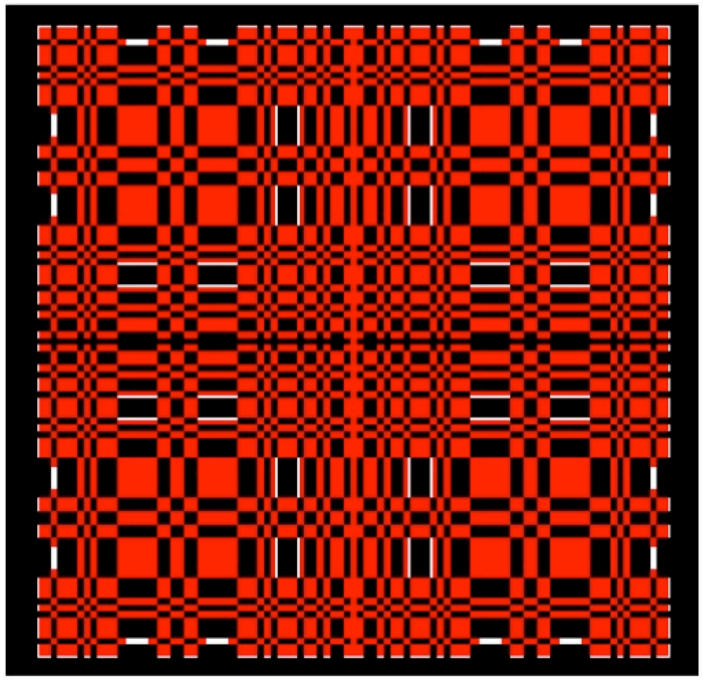
OSA 8
(Crab on-axis)

OSA 9
(Crab on-axis)

OSA 9
(Crab off-axis)

…but there still are residuals

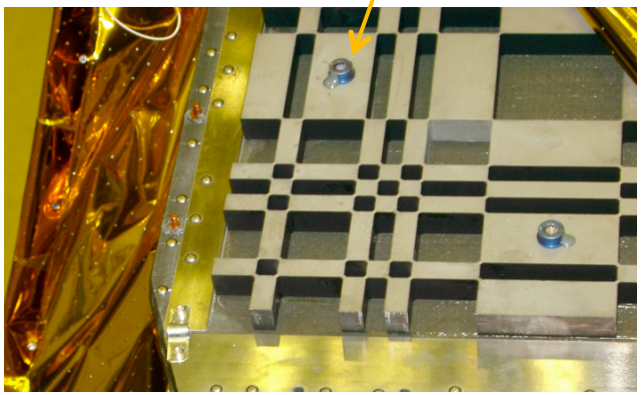
Excluded regions in OSA 9

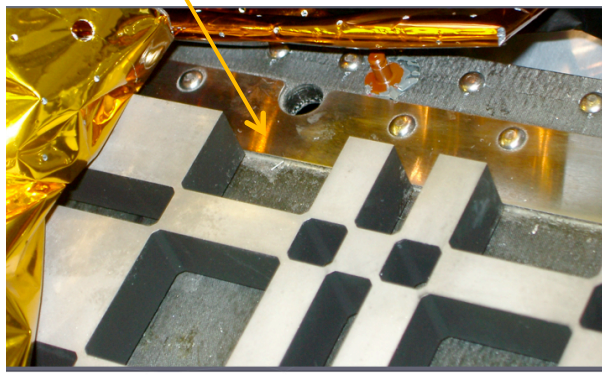


Excluded regions: white

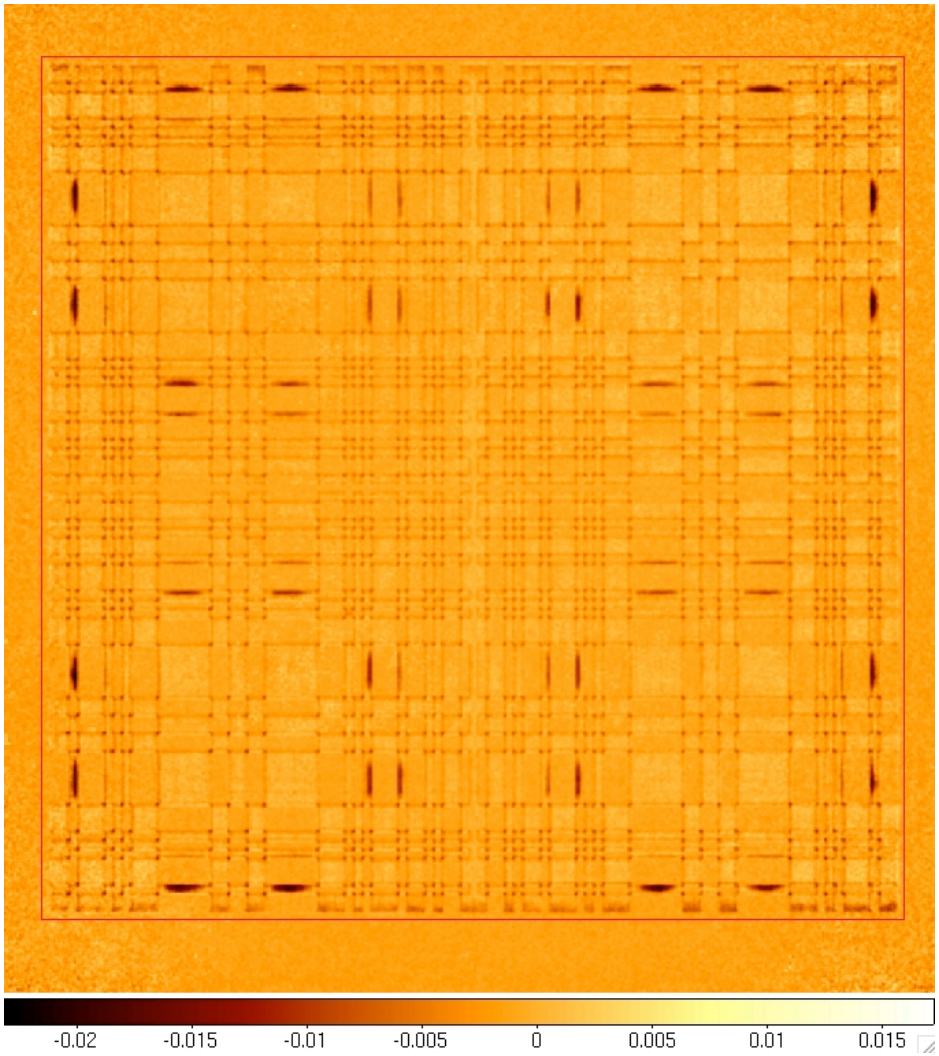
Components:

- bolts and screws
- potting
- mask borders





Optimizing the excluded regions



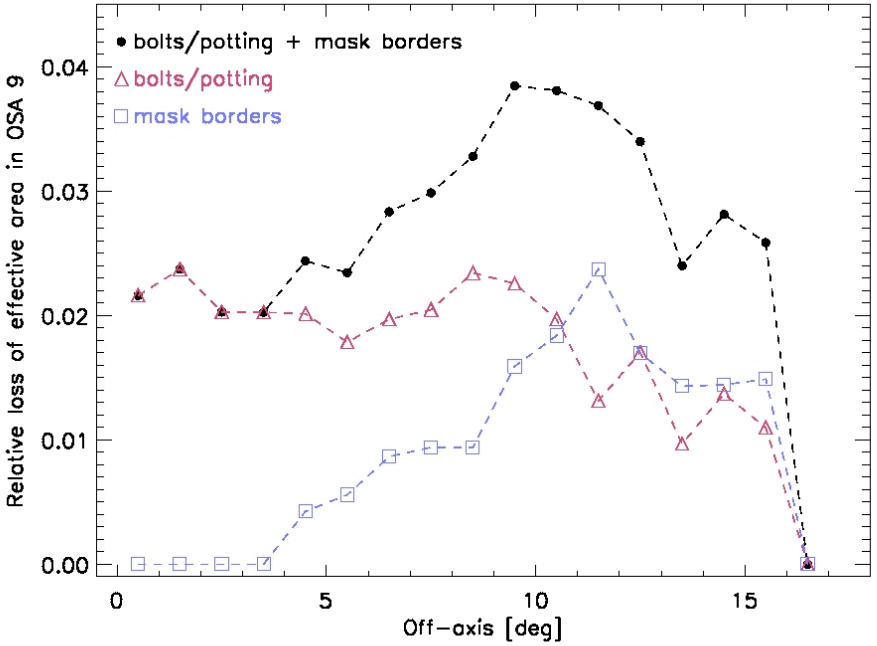
But the mask ‘radiography’ shows the complex geometry of the mask transparency.

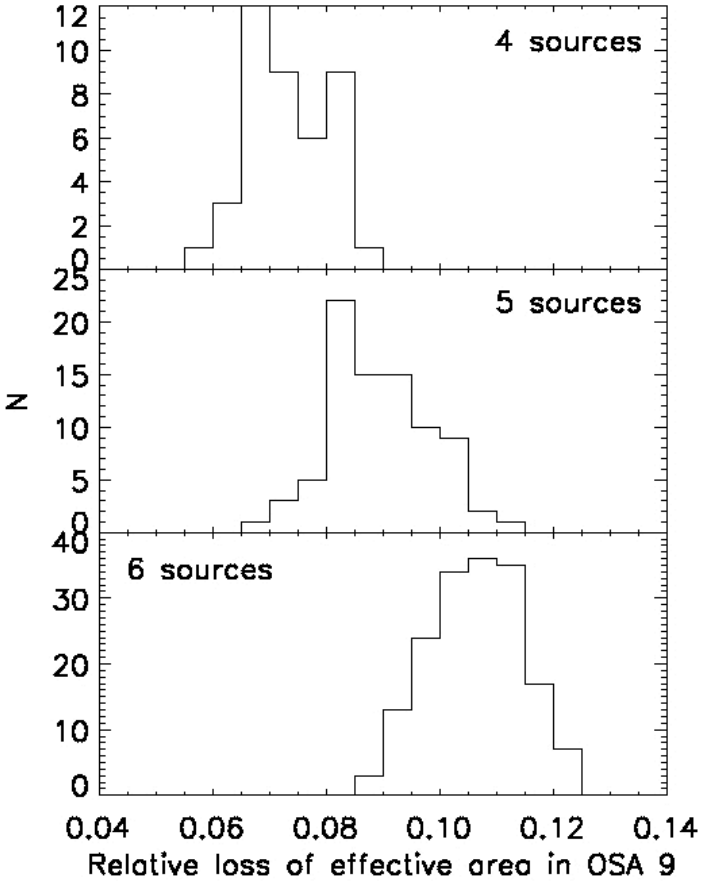
We need to:

- 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)

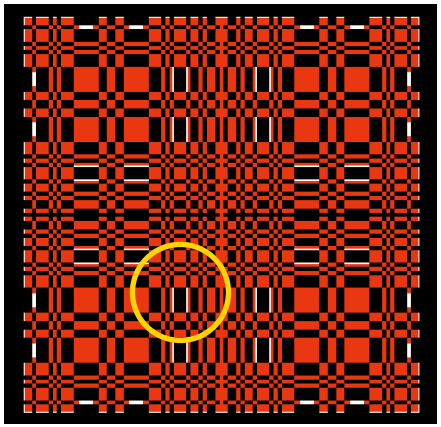




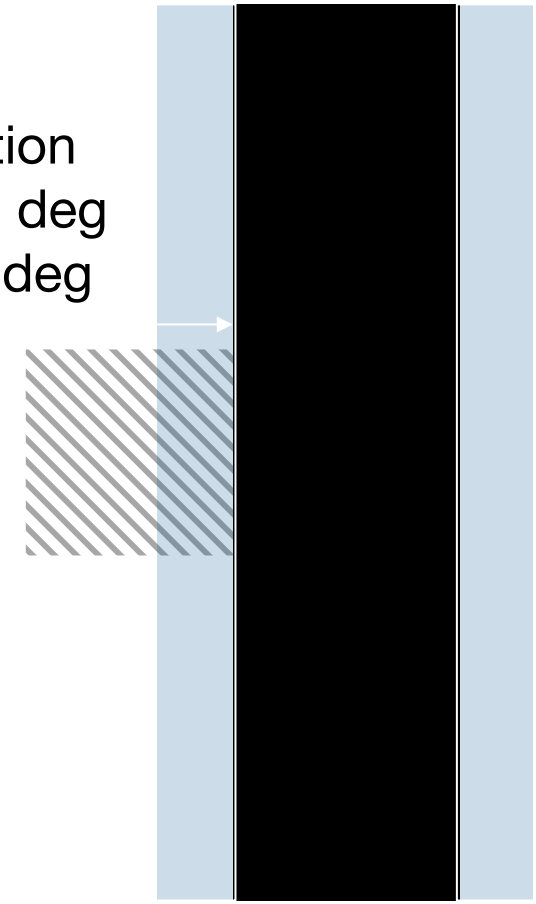
Crowded field (Inner Galactic disk)

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

Exclusion mask: not enough area excluded



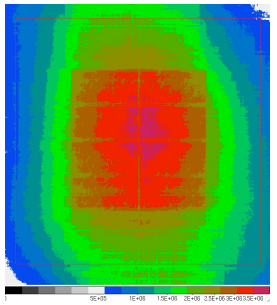
Screw projection
6.3 mm @ 4.5 deg
17 mm @ 12 deg



- 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

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

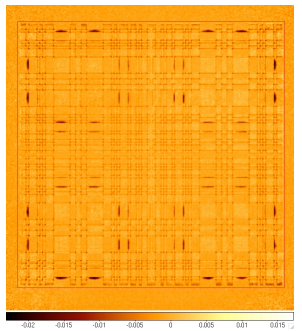


To reach this goal, we are:

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

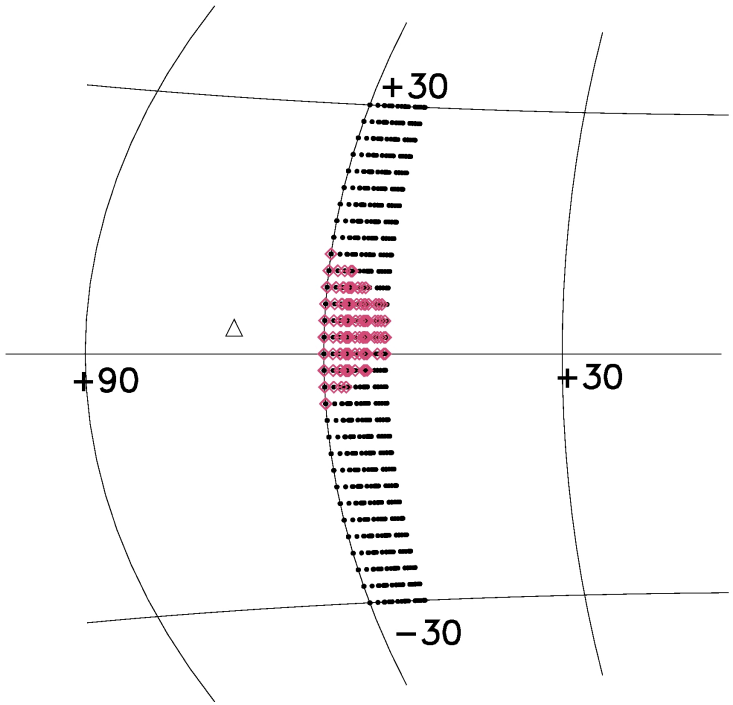
  (modification of the Galactic latitude scans in AO-8 not accepted by the PI)

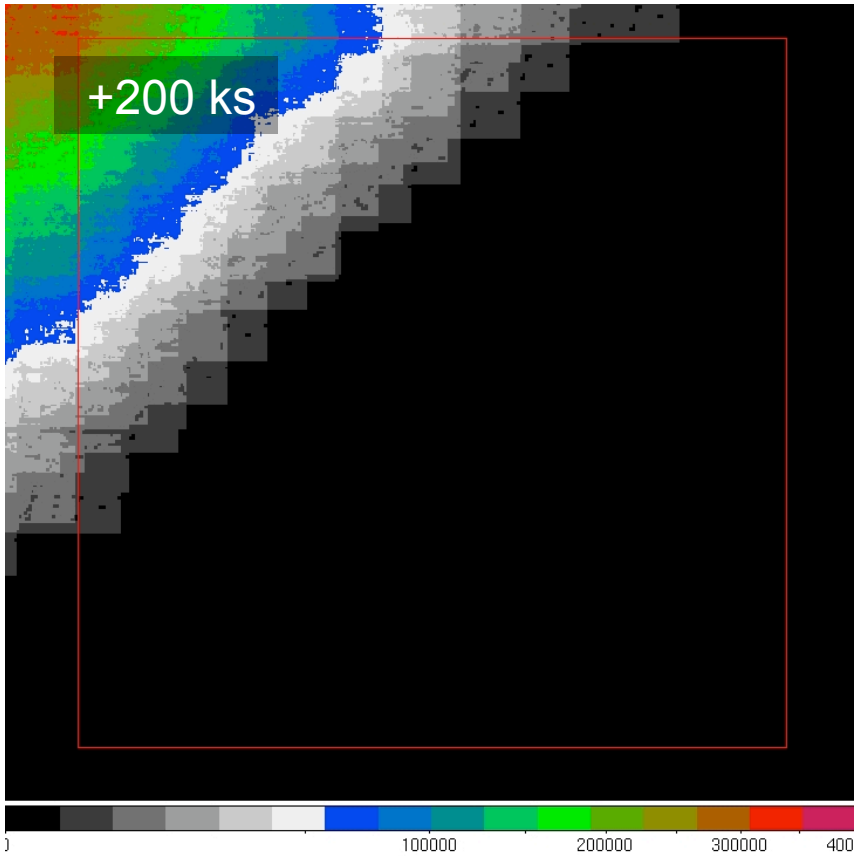
- modeling the mask defects (geometry and absorption) to implement a new mask model in the IBIS software



IBIS mask calibration with AO–8 open time observations: unsuccessful attempt (I)

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 with increased (2 → 3.6 ks) exposure

IBIS mask calibration with AO–8 open time observations: unsuccessful attempt (II)

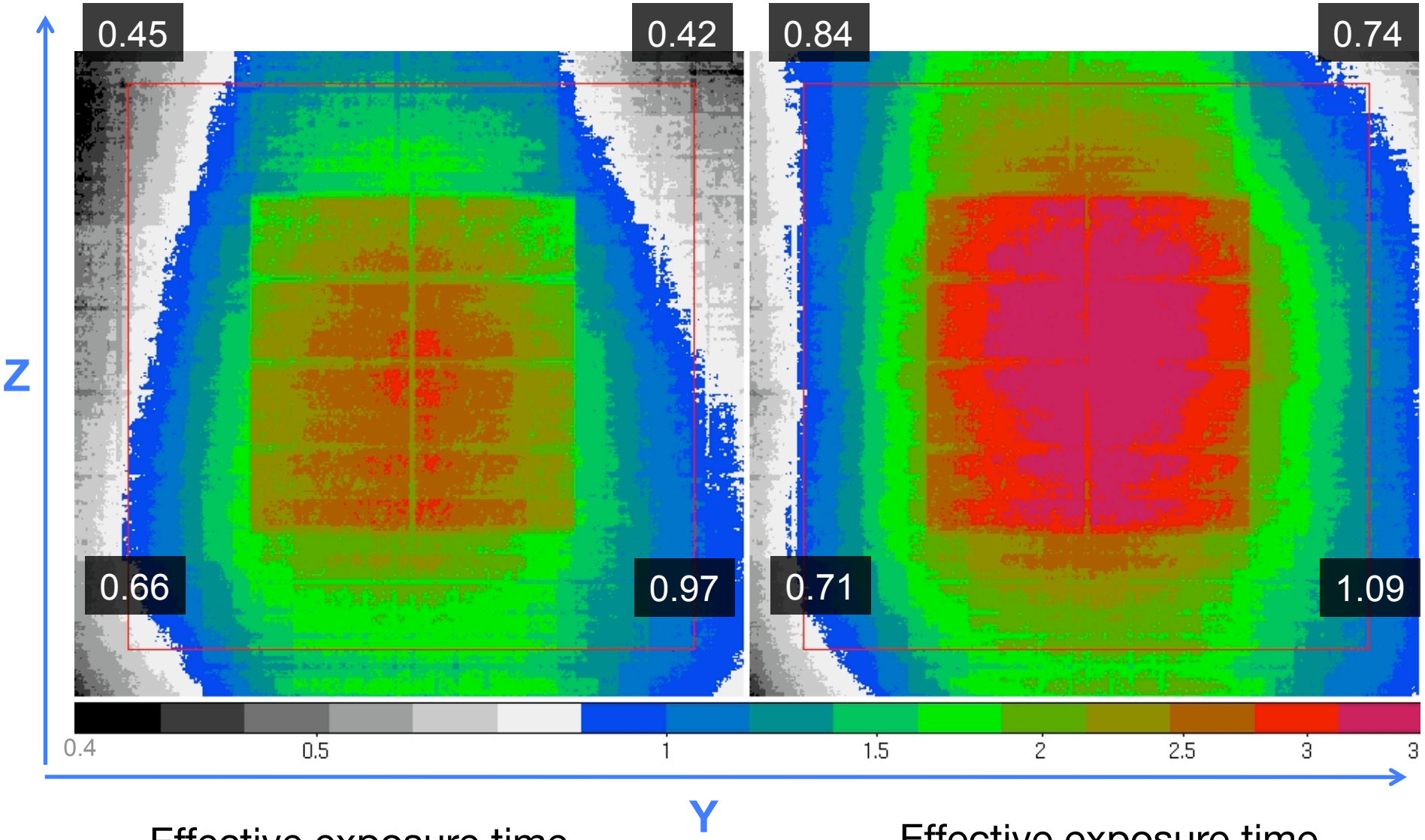
- In coordination with ISOC, simulations to modify the planned observation
  → observations in April-May 2011 for the maximum calibration return

- December 2010: request presented at the IUG meeting
- February 2011: finalization of the written report with the proposal

- March 2011: PI contacted through the IUG
- End of March 2011: SPI annealing puts new constraints on the possible observing window, i.e. April 11-19 only possible period in April
  → recalculation of the calibration proposal

- April 7-8: last minute rescheduling at ISOC to be ready in case of positive answer from the PI
- April 10: negative answer from the PI

Where we are with the mask exposure [Msec]



Effective exposure time
before February 2009

Effective exposure time
up to February 2011

Perspectives

- Dedicated mask calibration?
  70 ks/rev. per corner (2 corners/rev, as e.g. in rev. 968)

- Implementation in OSA:
  1) modify the exclusion mask used by ghost buster → finer sampling
  2) take into account the thickness of the mask defects
  3) energy dependent exclusion mask?

- Working right now on 1) and 2)