

Current status of Calibration and Software: XRT and attitude

Y. Maeda, the XRT team and the attitude team

on behalf of the Suzaku team

Data-analyses mostly made by

M. Ebara, H. Mori, S. Okada, H. Inoue., Y. Uchiyama, K. Suzuki

Software-coding mainly made by

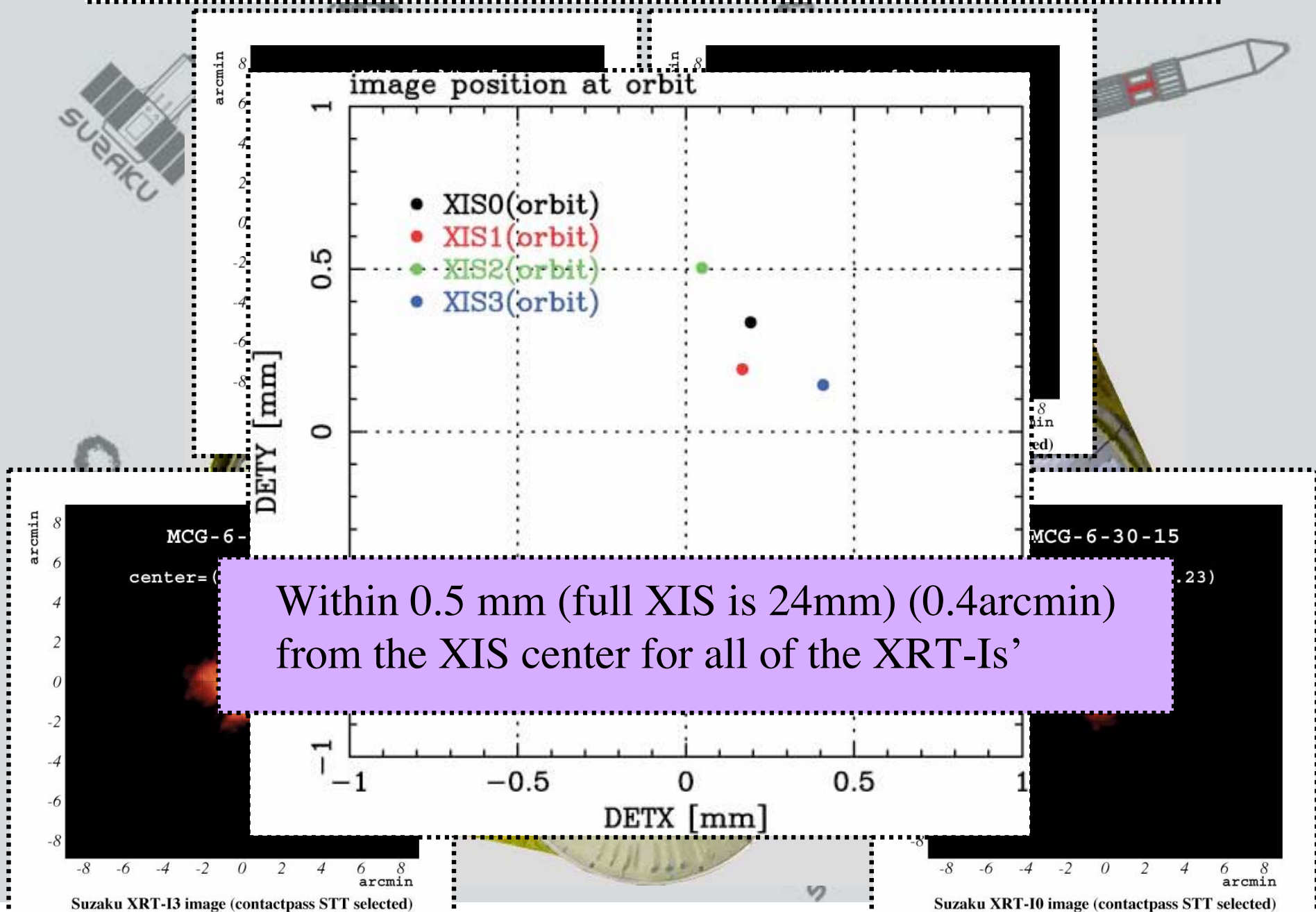
H. Mori, S. Okada and Y. Ishisaki

See Serlemitsos et al. and Ishisaki et al. in PASJ special issue 2006

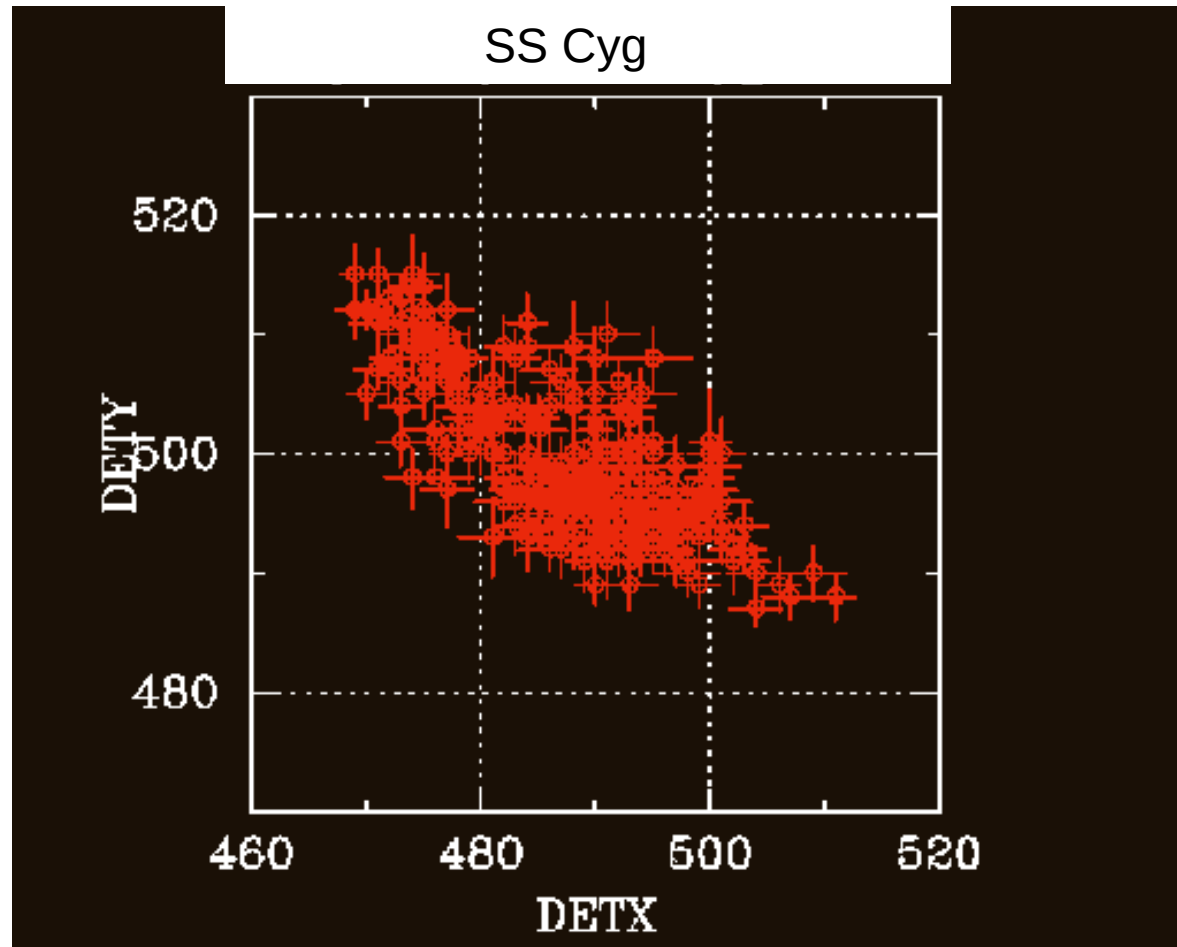
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1. XRT/XIS alignment and Attitude control

XRT-XIS alignment

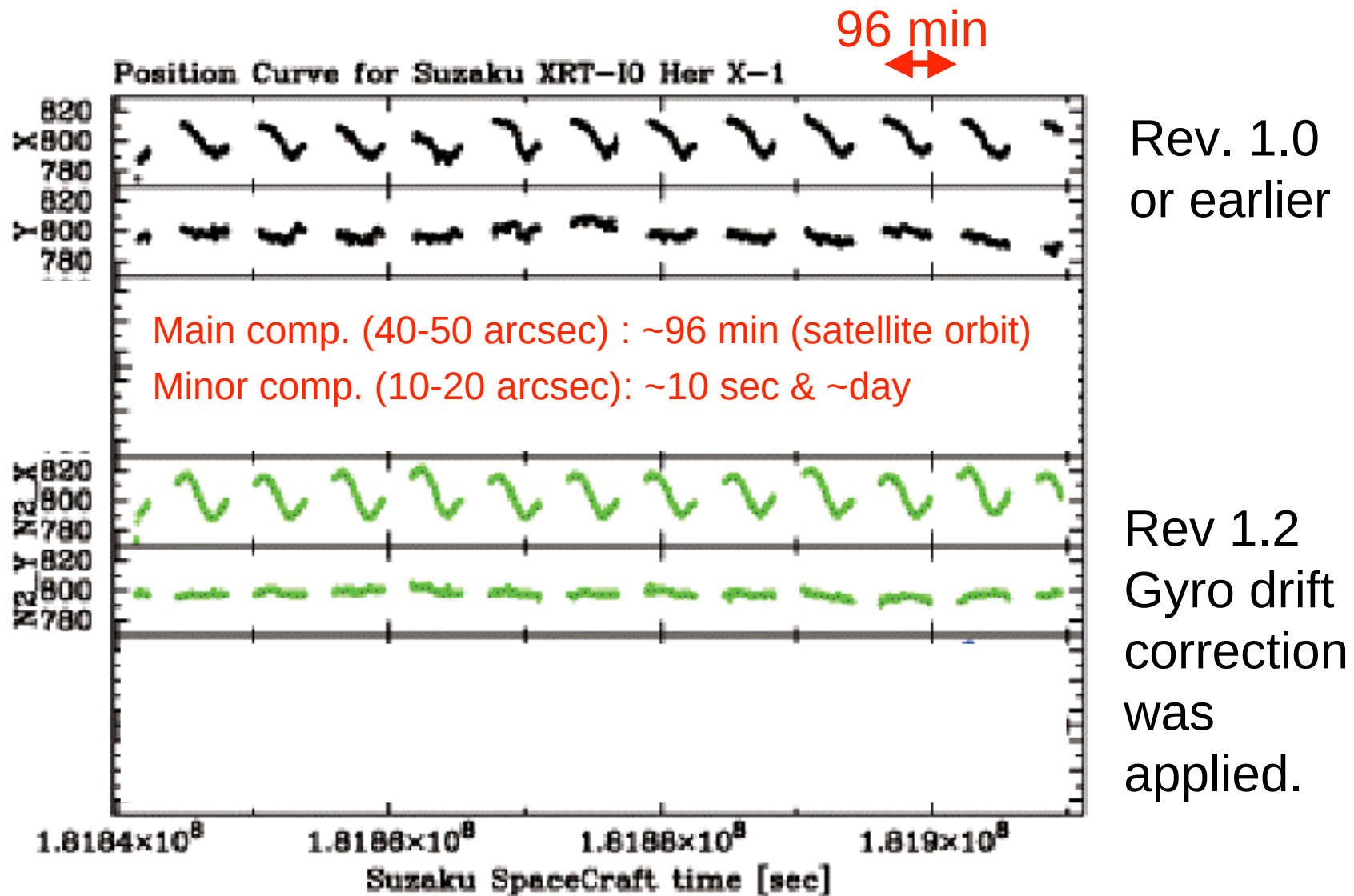


Attitude errors: 40-50 arcsec



1. Attitude error: 40-50 arcsec
2. The direction is different from pointing to pointing

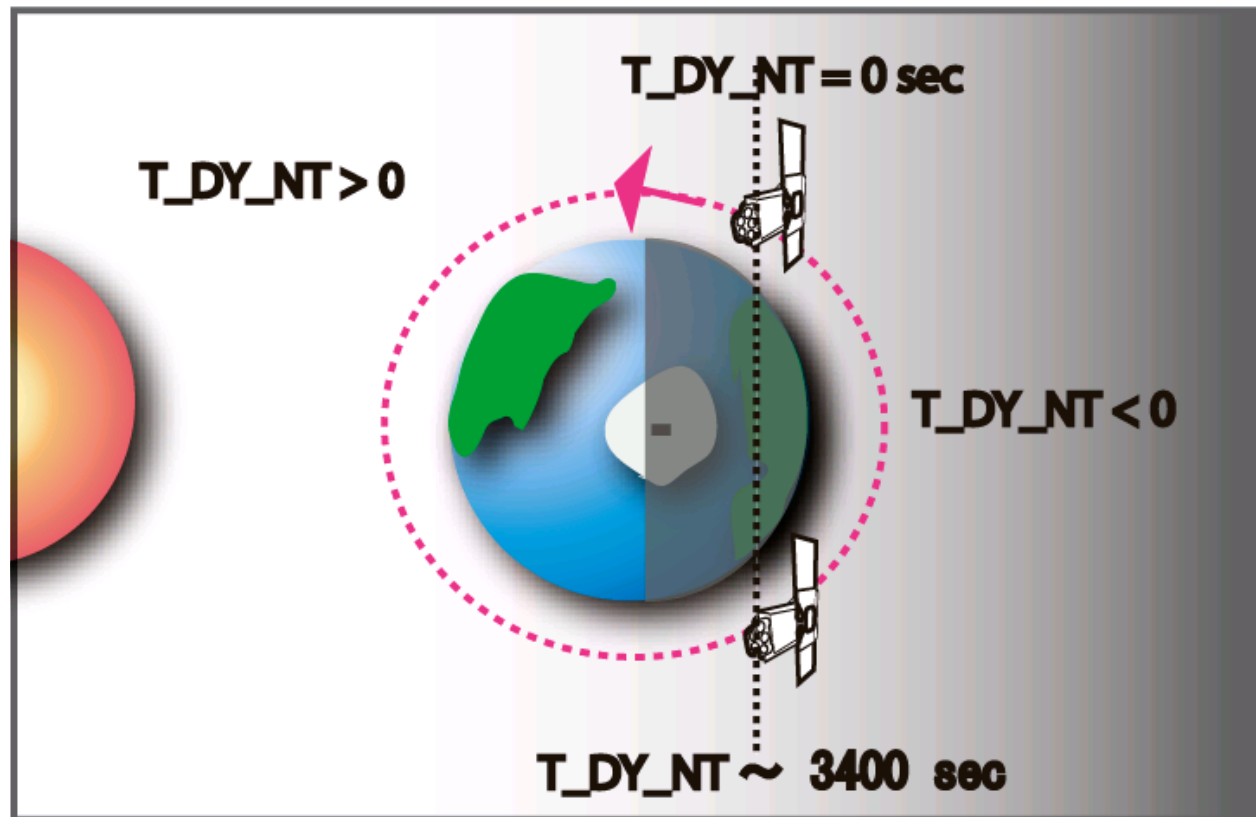
Attitude errors: Timescales



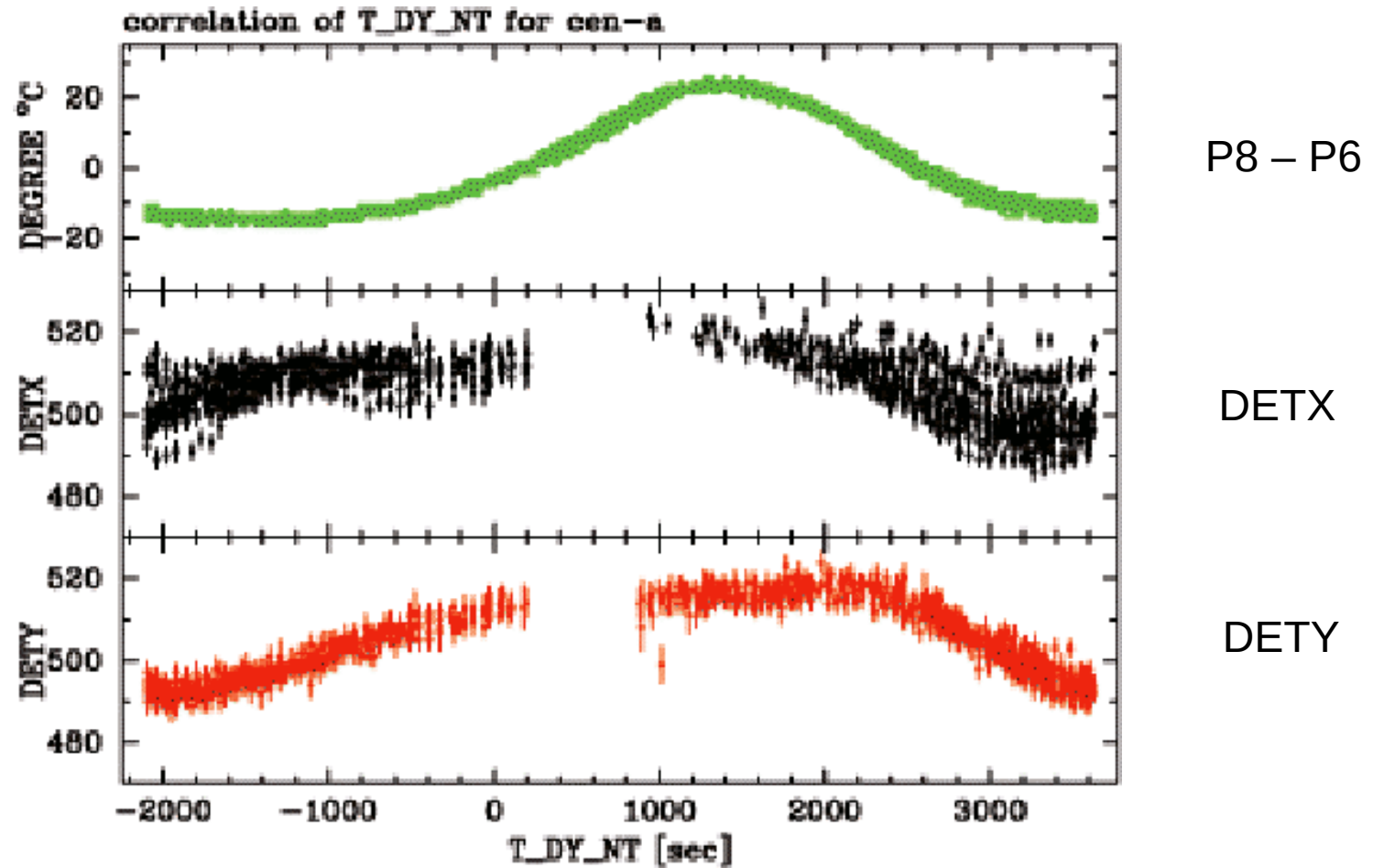
The 96 min attitude error was not disappeared with a drift correction.

Attitude error: Major comp.

Day-night transition: modified T_{DY_NT}



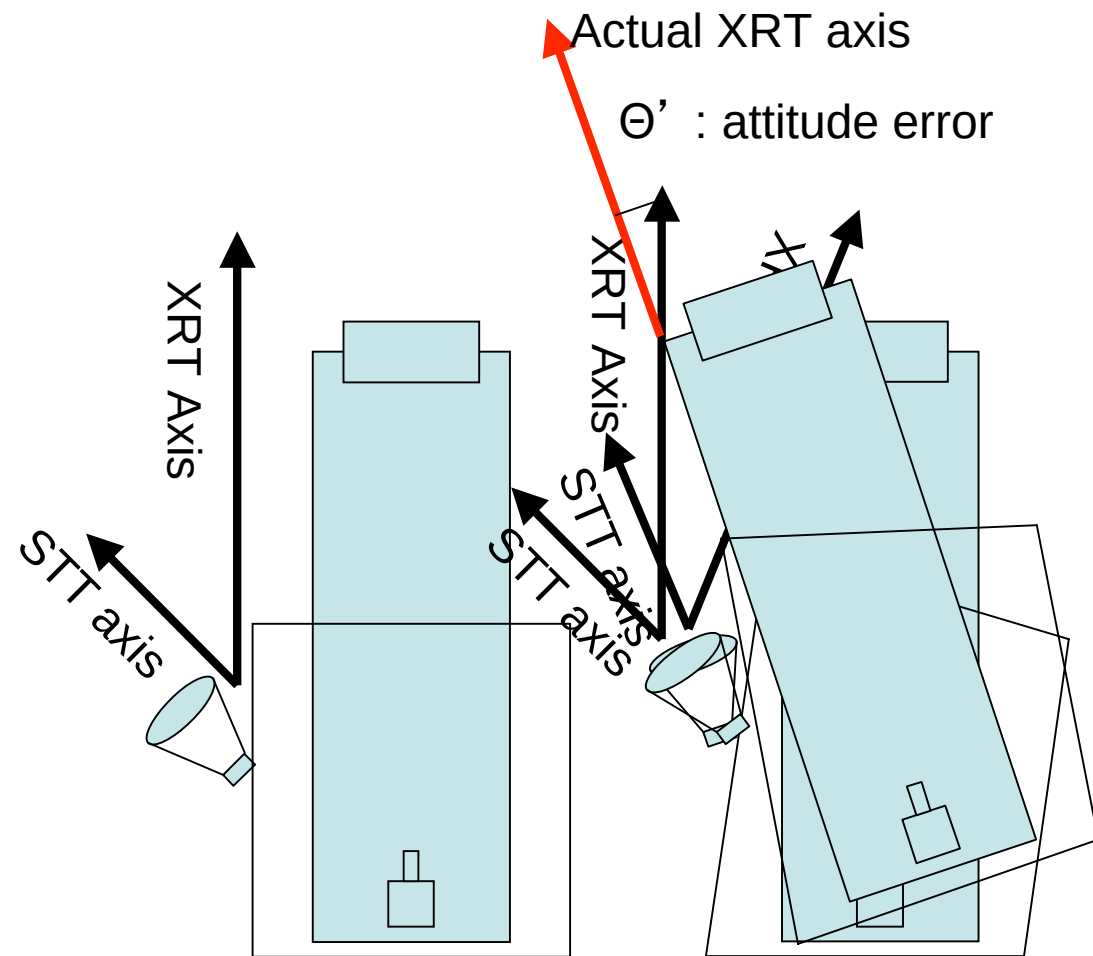
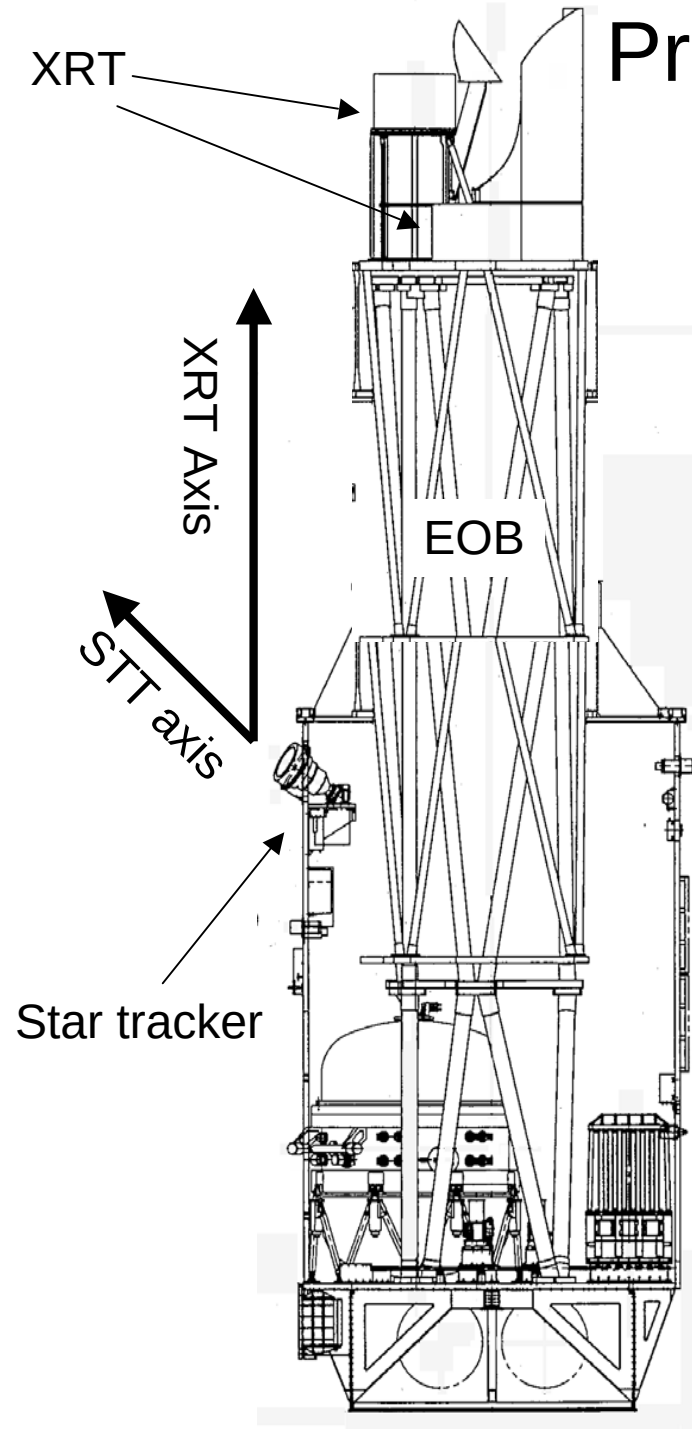
Attitude error: Major comp.



Cen A

Rev.0.7 data (non drift correction)

Principle of the major attitude error

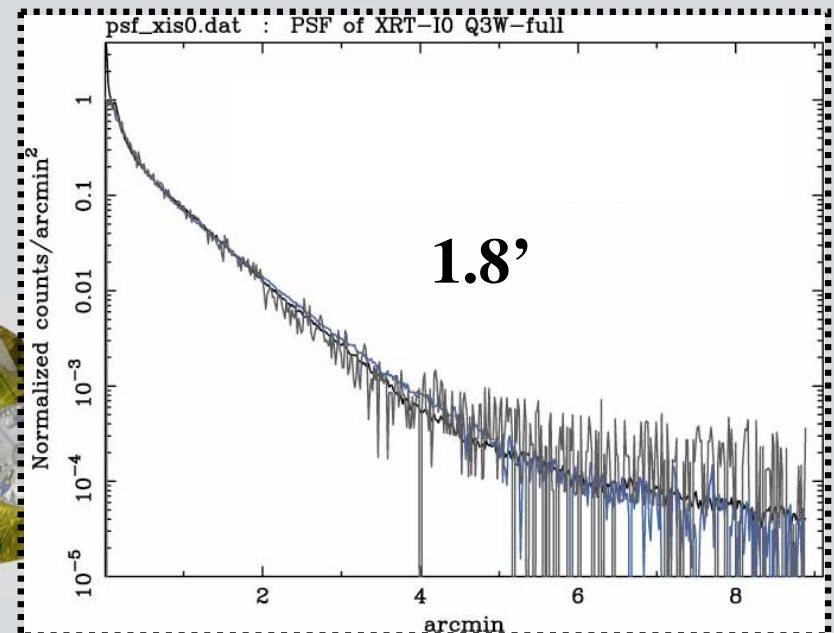
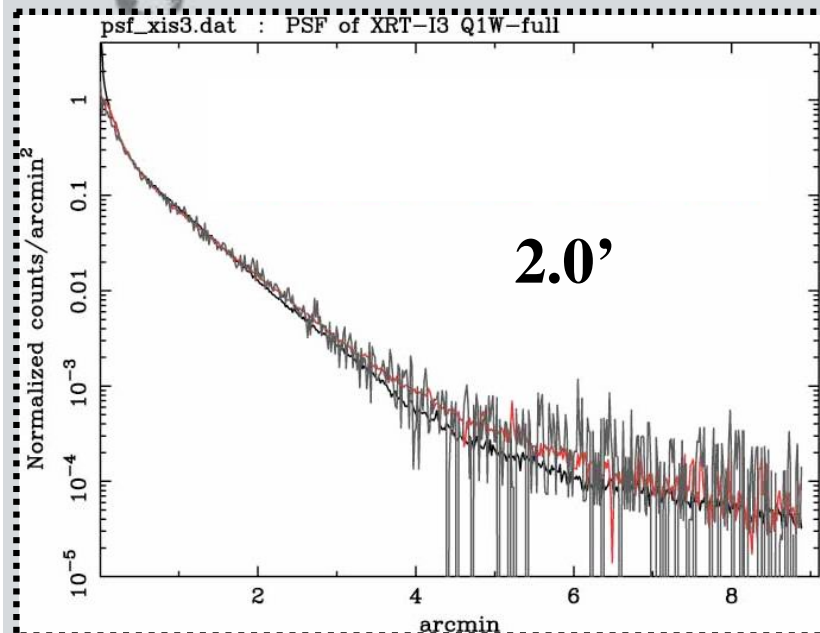
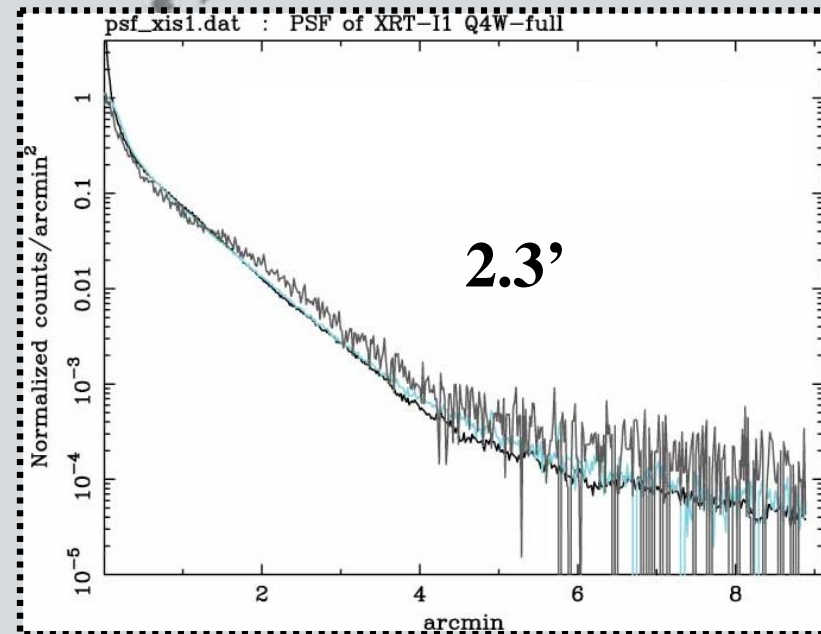
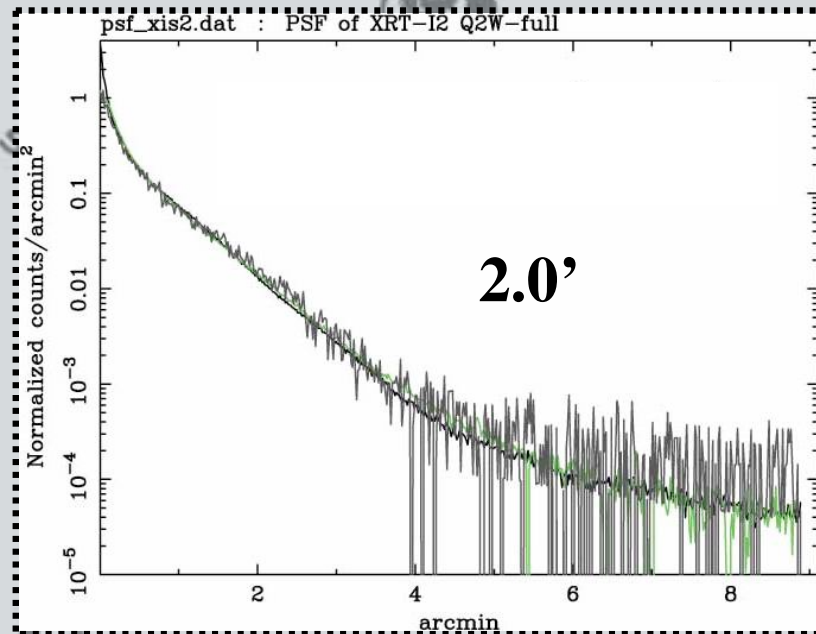


Major component of the attitude error is due to the thermal distortion of the STT side panel.

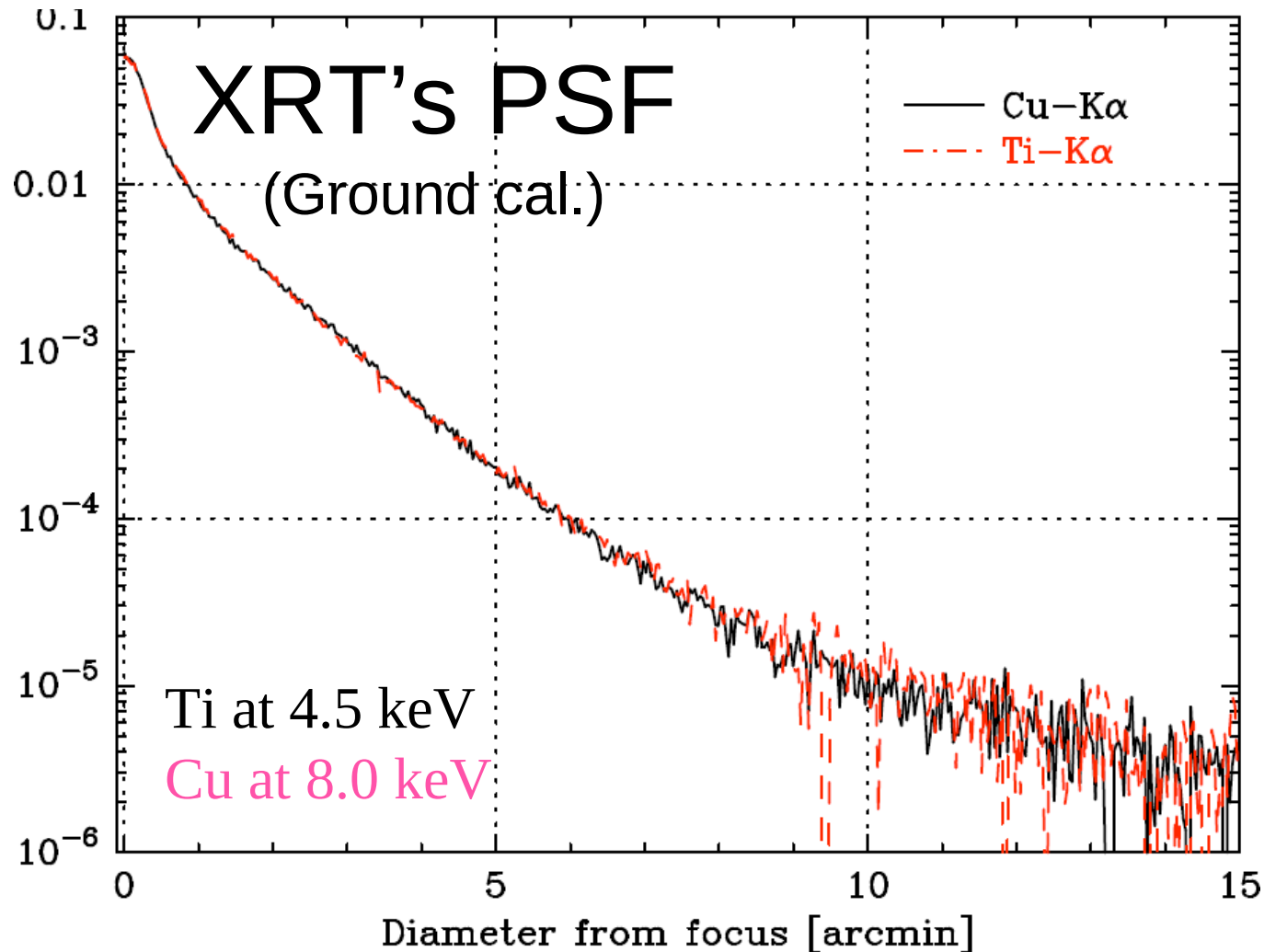
- 2. XRT calibration

XIS PSF/EEF

Point Spread Function / HPD



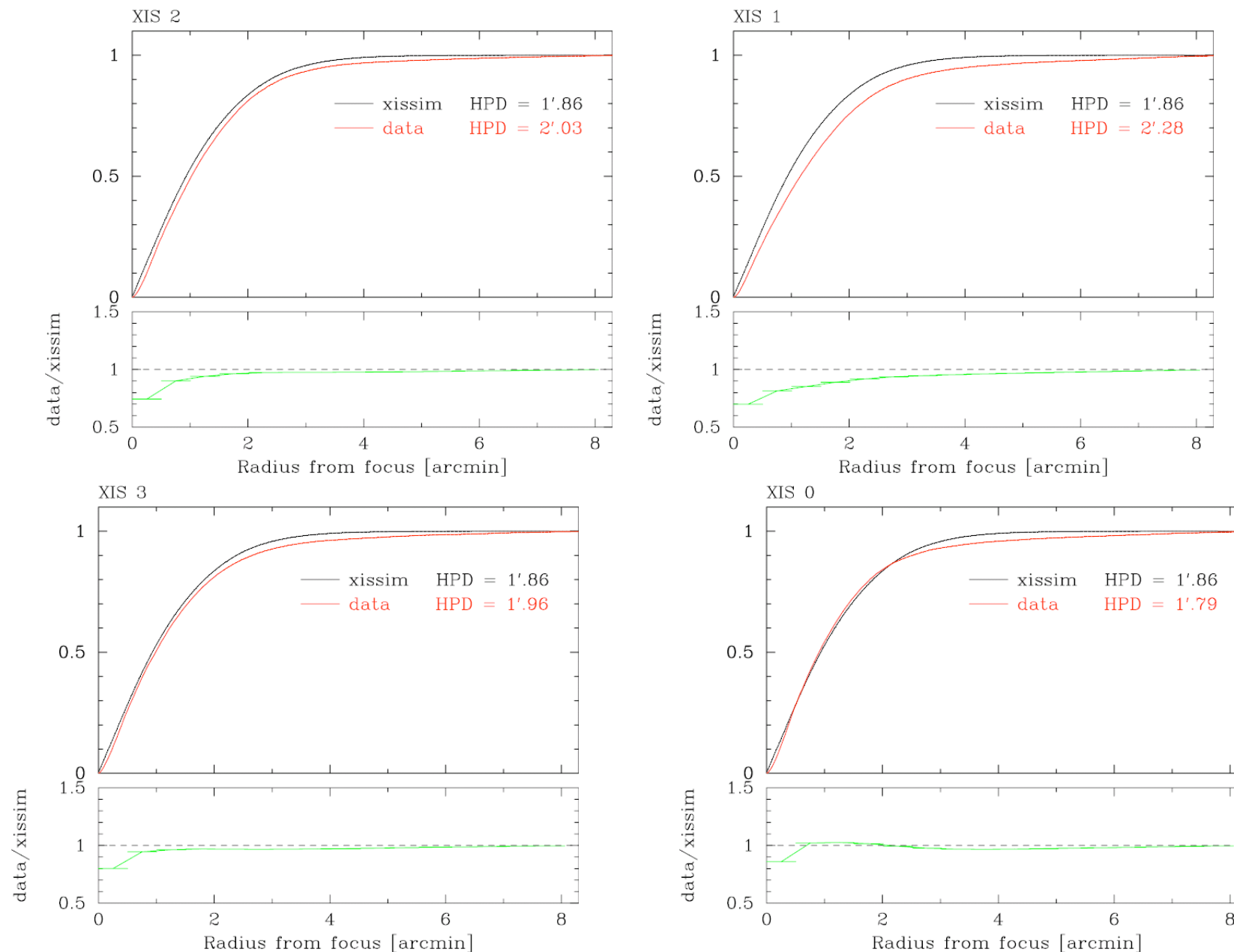
Energy independent PSF



Comment: Low energy PSF has weak energy dependence due to the detector contamination. Consider the contamination if you analyze the low-energy band of the recent data. This effect is already included in xissim./xissimarfgen.

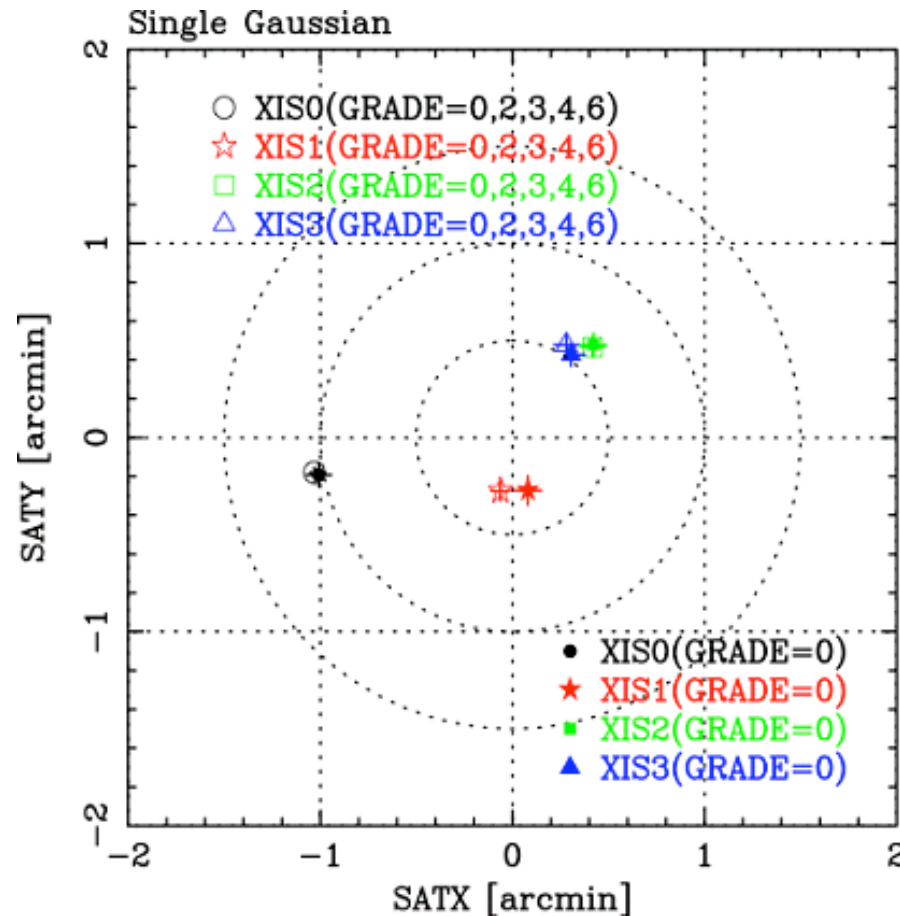
Encircled Energy Function

Akiharu Itoh



Optical Axis, Vignetting

Optical Axis

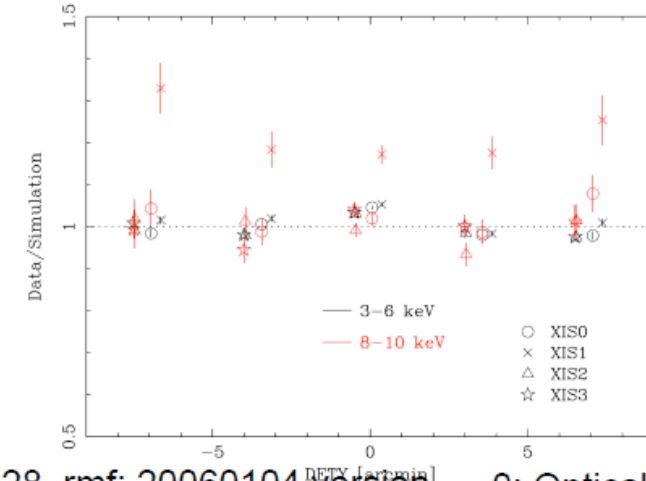
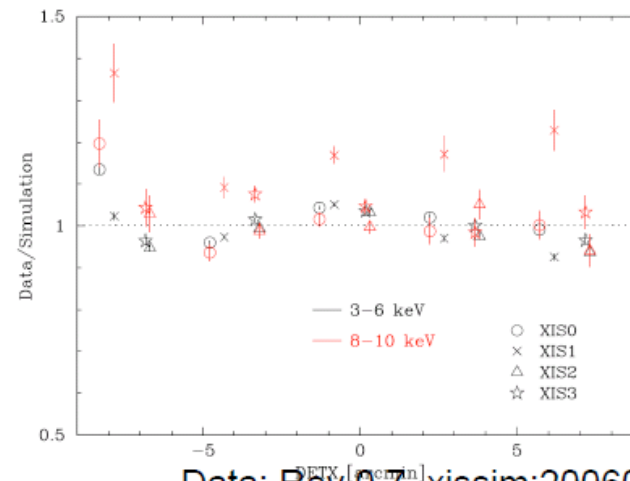
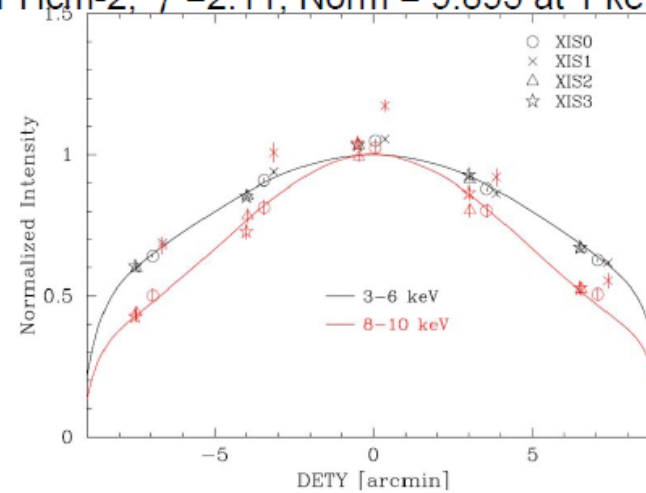
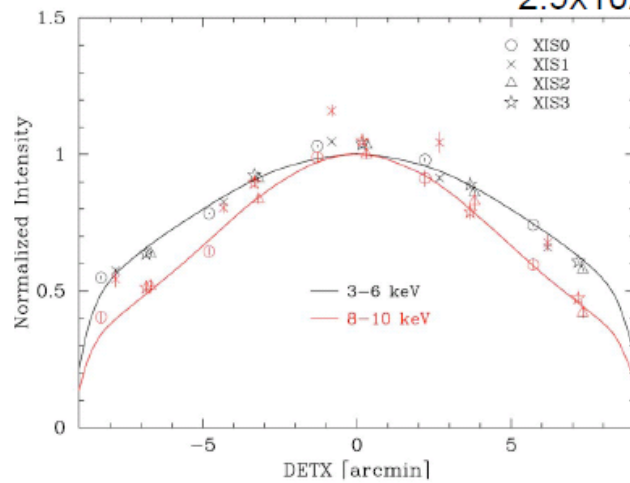


< 1 arcmin from the XIS nominal position.

VIGNETTING

Crab Offset vs. Simulation (H. Inoue)

2.9x10²¹ Hcm-2, $\gamma = 2.11$, Norm = 9.895 at 1 keV



< 10%

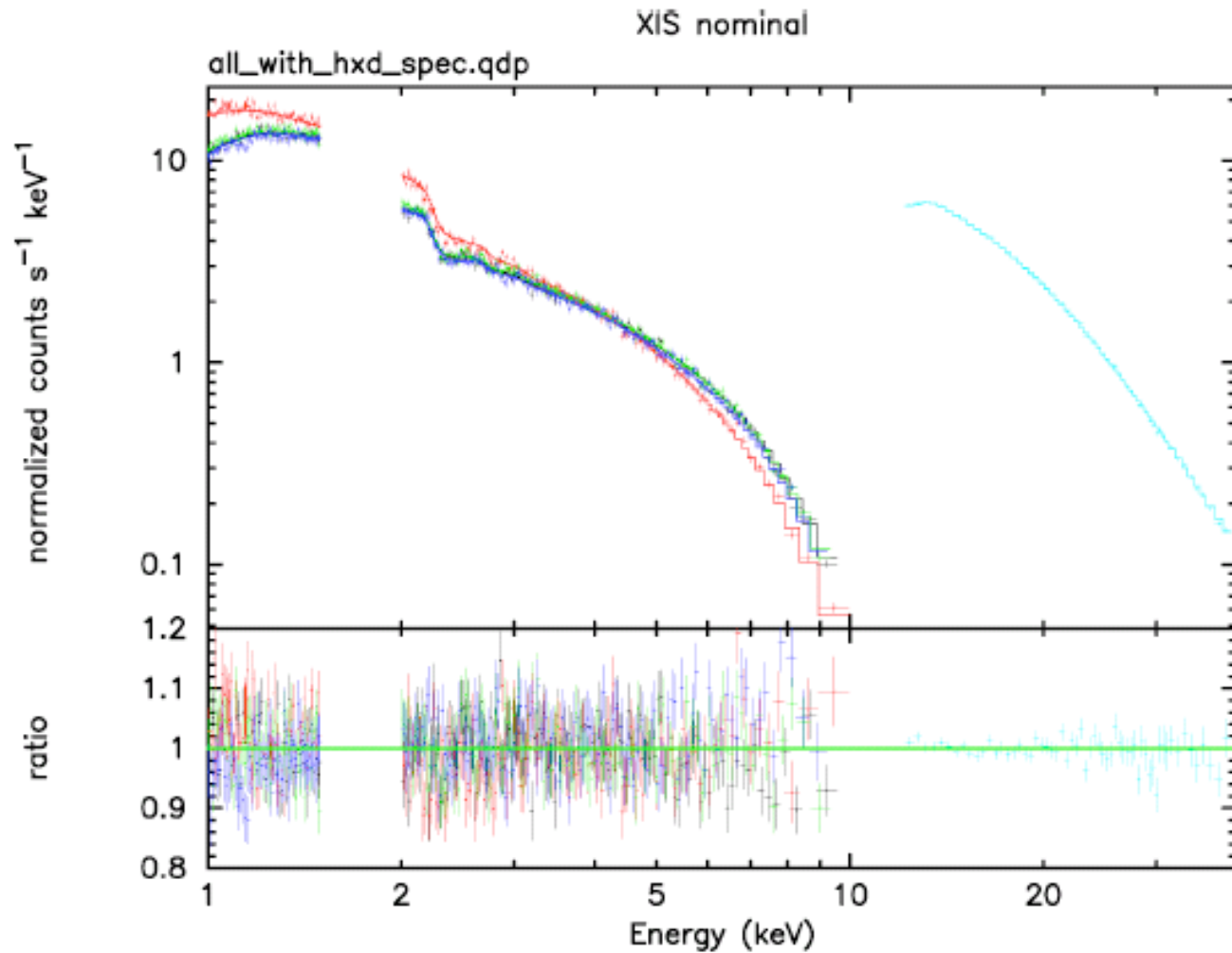
(~20% > 8 keV
for XIS1)

Data: Rev 0.7, xissim:20060528, rmf: 20060104 version 0: Optical Axis

Effective Area (EA)

arf	 xissimarfgen XRT including Thermal shield transmission XIS OBF contamination Bad column (currently not supported)
rmf	 xisrmfgen XIS OBF transmission CCD detection efficiency

XIS-HXD broadband Crab spectra



Response files used for fittings

- Nominal contami files:
 - ae_xi[0-3]_contami_20061016.fits
- Old contami files:
 - ae_xi[0-3]_contami_20060525.fits
- Arf files (XRT part)
 - equivalent to 20060615 version (R=6mm)
- Rmf files:
 - ae_xi?_20060213[c].rmf
- Model
 - Phabs+Powerlaw

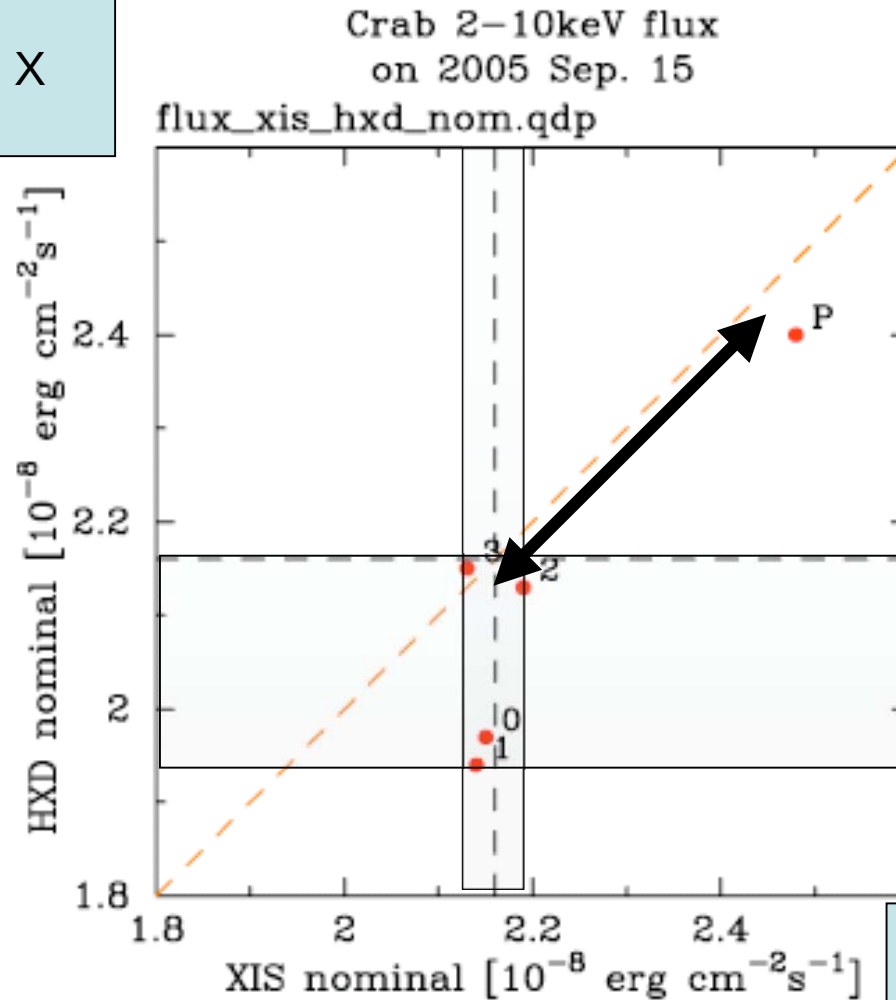
Crab flux in 5 detectors

I. XIS flux in the XIS nominal
< a few %

II. XIS flux in the HXD nominal
XIS2,3 < a few %
XIS0,1 ~10% lower

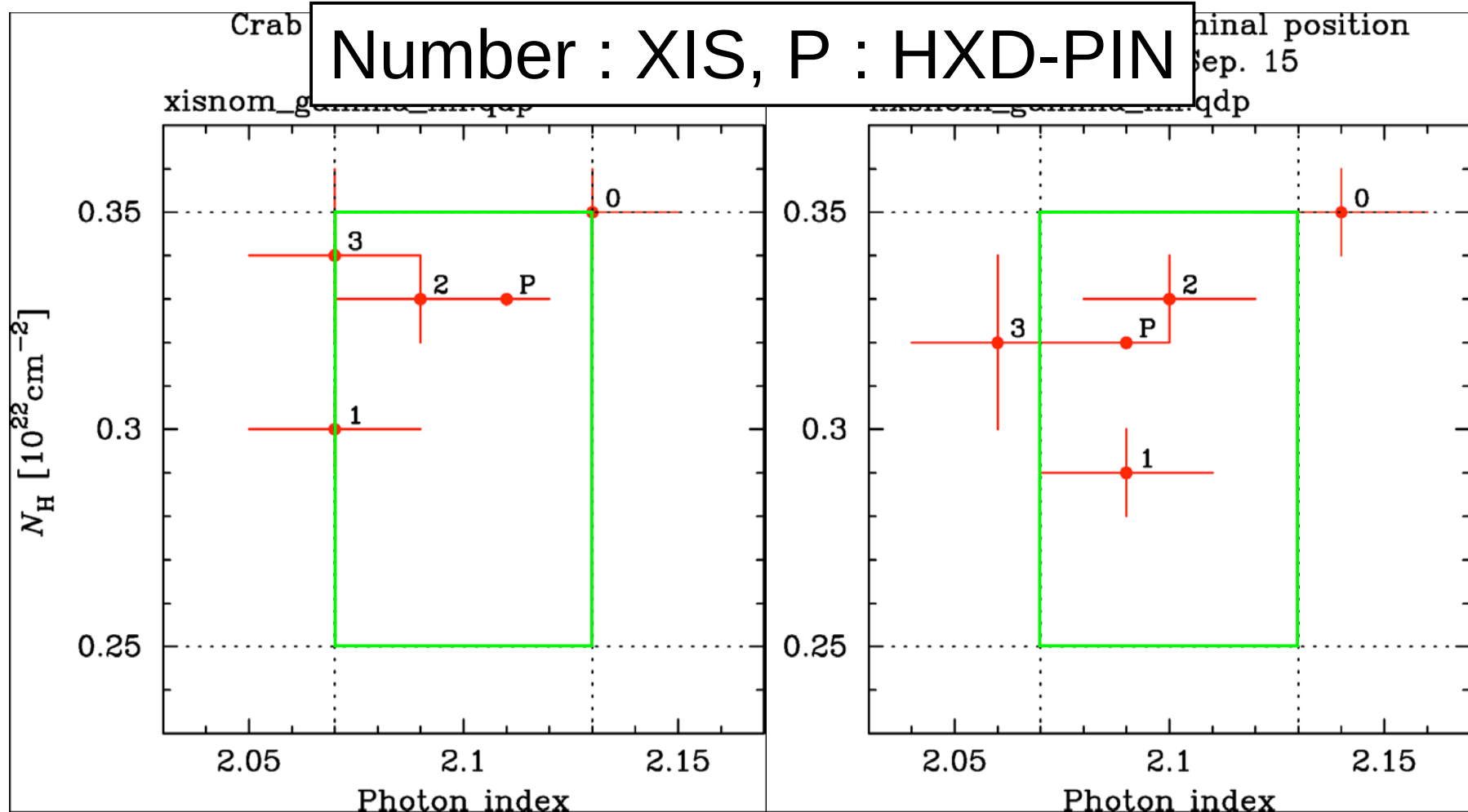
III. PIN flux in the XIS/HXD nominal
~13% higher than XIS's

X



X

Crab slope in 5 detectors



Canonical values by Toor & Seward 1974

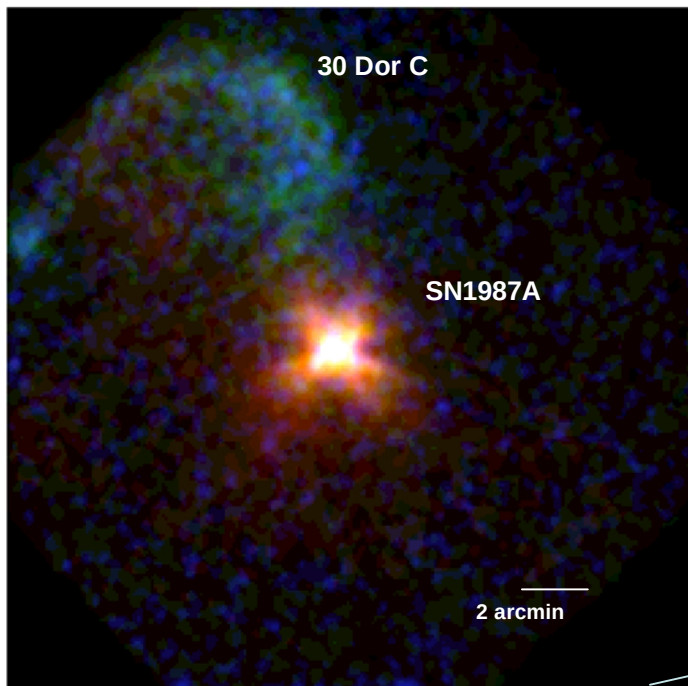
Effective Area issue

- EA
 - XIS nominal $\pm 3\%$
 - HXD nominal $\pm 10\%$
 - EA at < 1 keV (contamination etc),
1.5—2 keV (gain and energy resolution)
> 8 keV (poor statistics etc.)
have larger systematics.

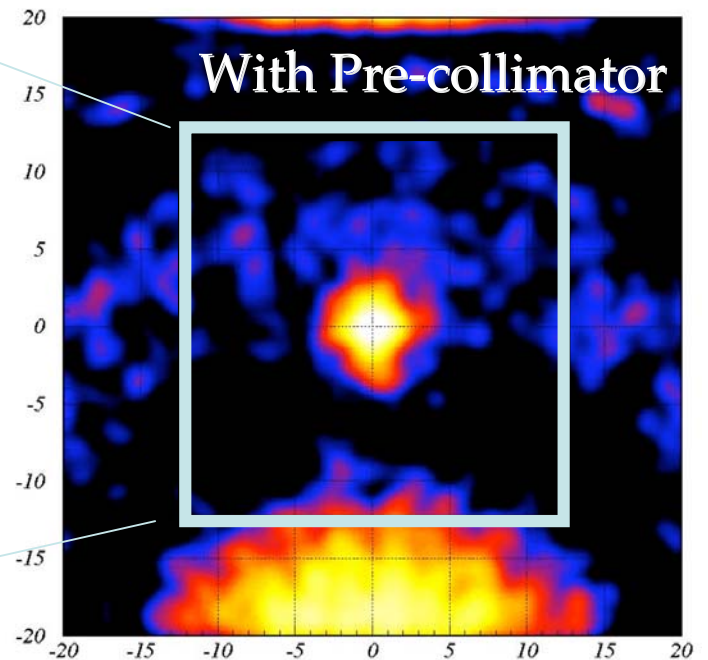
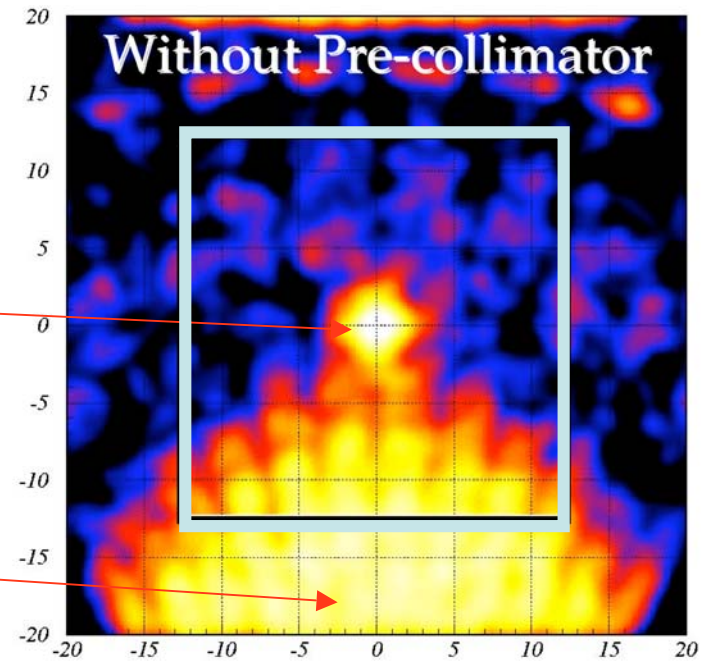
Stray Lights

SN1987A

LMC X-1



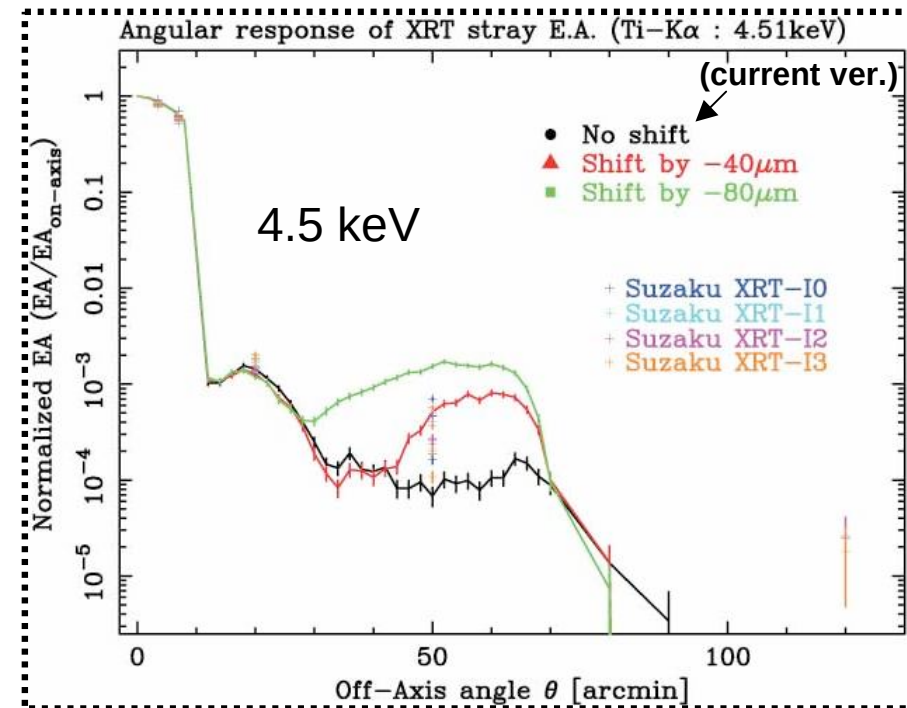
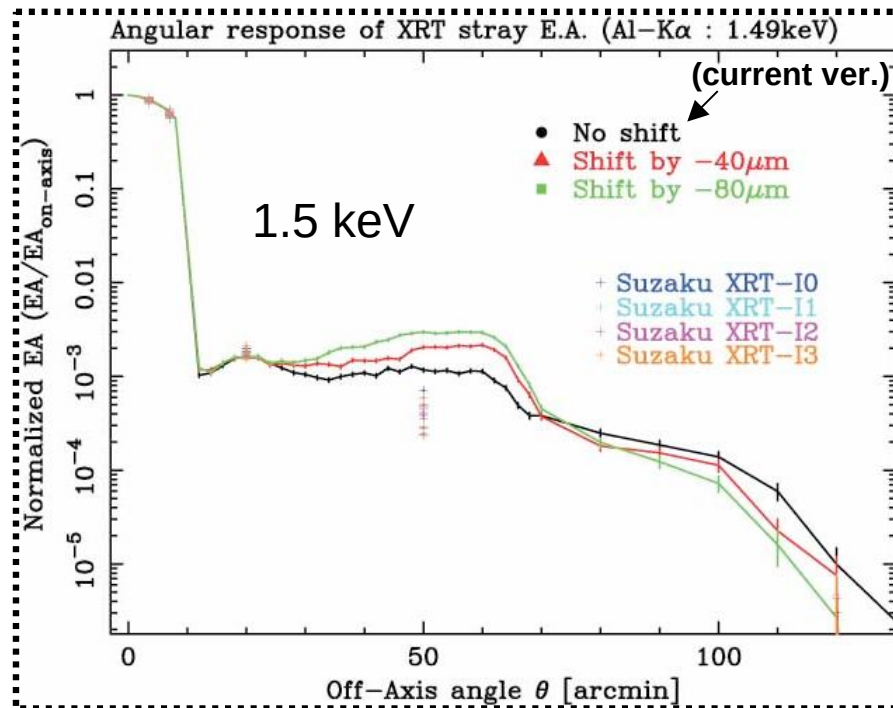
Suzaku XIS image by the 1987A team



STRAY

Hideyuki Mori

No stray light except for the Crab was reported.



Good agreement with most of the off-axes

The stray flux in the 30-60 off axes will be overestimated
by a factor of three below 1.5 keV.

Stray light modeling ($< 0.5\text{keV}$) at very large off-axis is robust. Calculation at
 $> \sim 2$ degree gives an unrealistically large effective area.

Thanks to Prof. D. McCammon

(Use of the xissim/xissimarfgen should be limited to $< \sim 2$ degree, Please).

Thanks!!