# Suzaku XRT Update

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Outline

- Fundamental XRT performance parameters:
  - Focal Point
  - Optical Axis
  - Effective Area
  - Angular Resolution
  - Vignetting
- Calibration/Software Update

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Focal Points

- MCG−6−30−15, observed on 2005.8.(17−19)

- Positional alignment: Aim points on XIS are slightly off center (~ 10 pixels)

- Co−alignment to ~ 0.3' (~0.4 mm range on XIS)

XRT−I focal position at the XIS aimpoint

- XRT−I0(orbit)
- XRT−I1(orbit)
- XRT−I2(orbit)
- XRT−I3(orbit)

DETY [mm]

DETX [mm]

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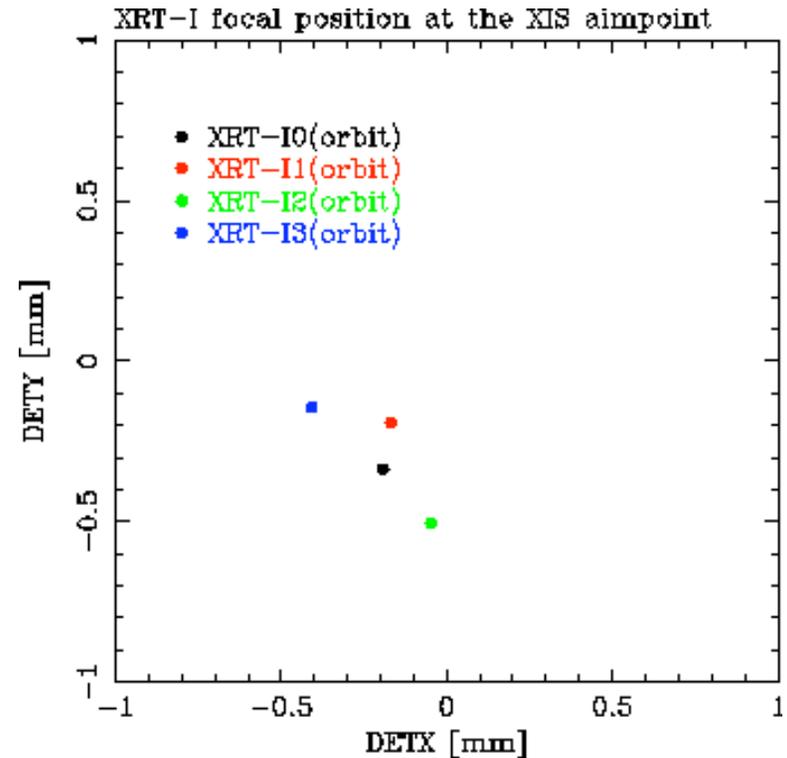
Optical Axis

- Crab nebula on 2005.8.(22-27)
- A series of pointings along +/- DETX & DETY directions
- Maximum throughput
- Intrinsic telescope alignment & to coupling optical bench (~ 1')
- DETX/Y (0,0) taken as optical axis
- Efficiency > 97%
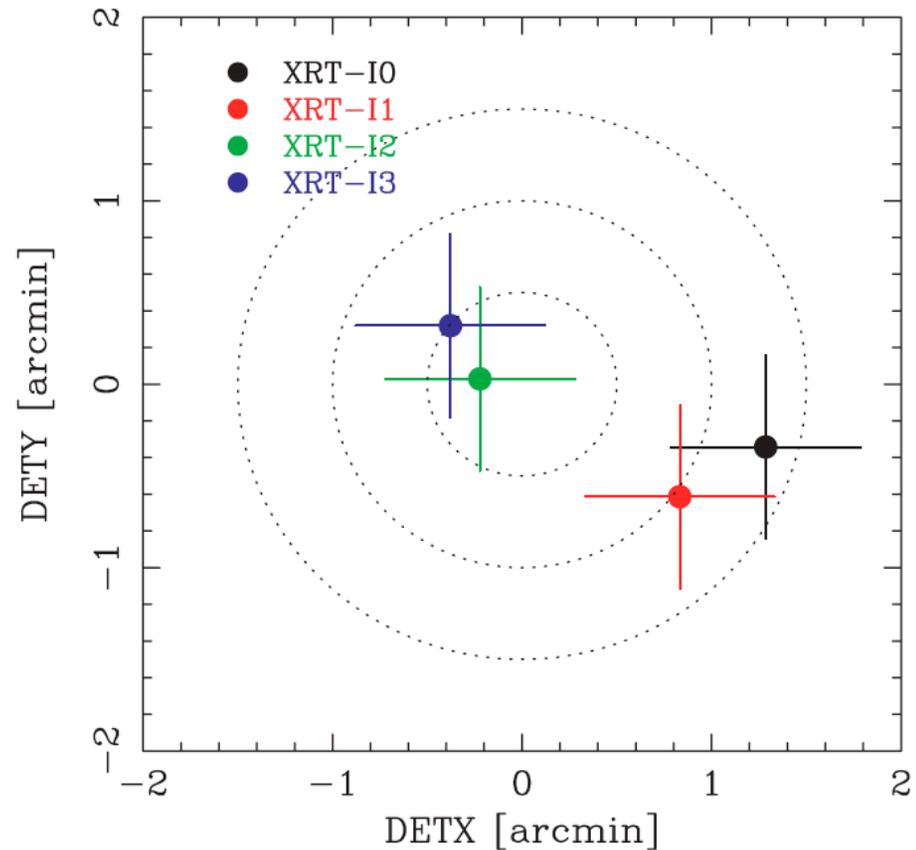
Effective Area

- Source: Crab
- Observed on 2005.9.(15–16)
- Background regions ~ 1/4 rectangle(s) on either both sides or 1 sides of detector frame
- Confirmation of standard (common parameters for all XIS)
- From Sep–2006 data, issue perhaps with time-dependent contamination of Optical Blocking Filter
- *WORK IN PROGRESS:* latest version of XISSIM

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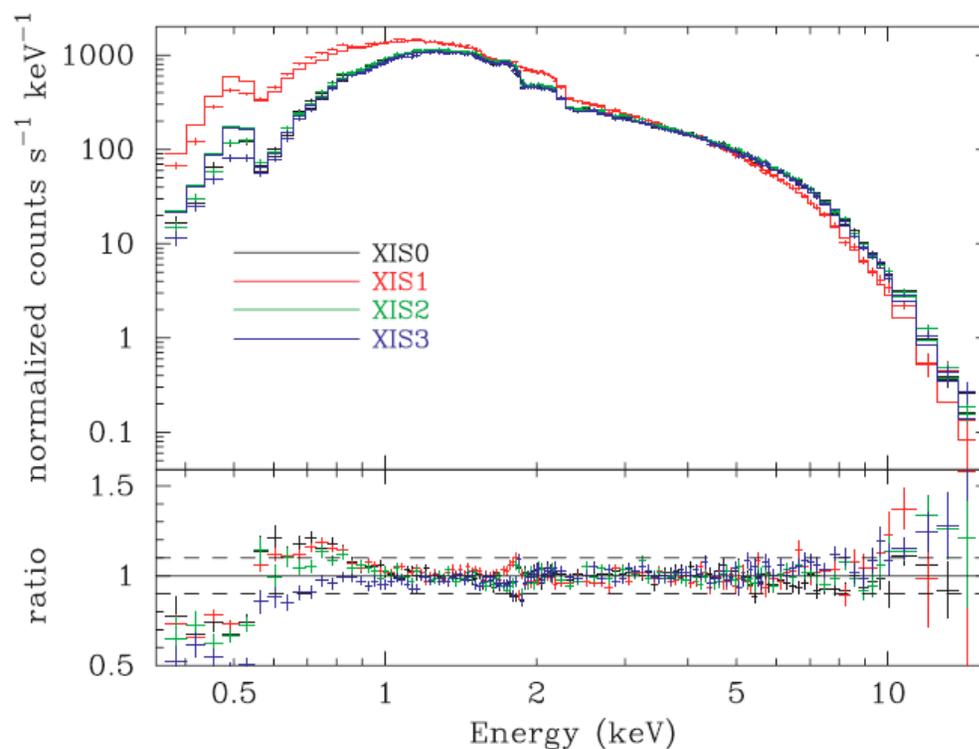
Angular Resolution

- SS Cyg on 2005.11.02
- Attitude control variation
  - Due to thermal variation in orbit of side panel #7 on which star trackers and gyros are mounted
  - Time dependent image centroid oscillates in both X & Y directions
  - Attitude variation typically 10"–30" (max ~ 1'), causing significant distortion of point spread function in central part of image (~ within 30")
- Software correction of the thermal wobbling
  - Implement tool "aeattcor" in future *ftools* update
  - Correction by correlation with parameters: latitude of source, temperature difference of radiator panels; time/phase of orbital cycle (details in JX–ISAS–SUZAKU–MEMO–2007–04, by Y. Uchiyama, et al.)

Simulator XISSIM & Library

- Simulation work at JAXA/ISAS
- New components
  - Latest version (> XISSIM20060615) better models the PSF tail
  - "teldef": incorporate optical axis data
  - Ray-tracing library/reference files
    - Module parameters at quadrant level: focal lengths, optical axis
    - Scattering (Au surface)
- Simulation
  - PSF/EEF nearly completed
 - Effective area is ongoing

Point Spread Function

PSF of SUZAKU XRT–I0

PSF of SUZAKU XRT–I1

PSF of SUZAKU XRT–I2

PSF of SUZAKU XRT–I3
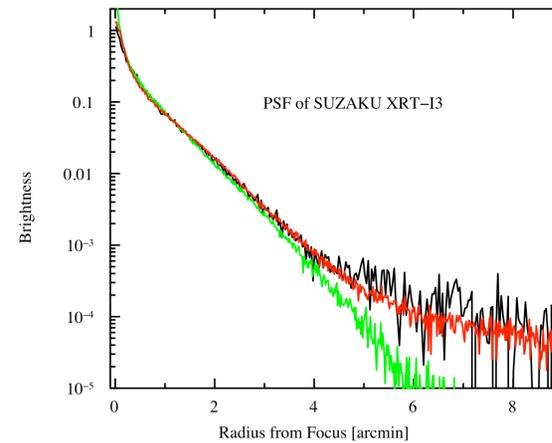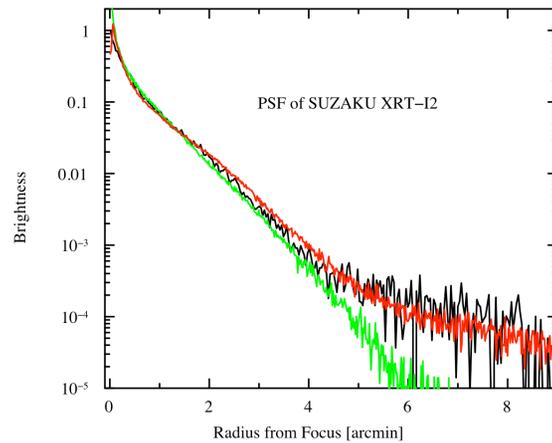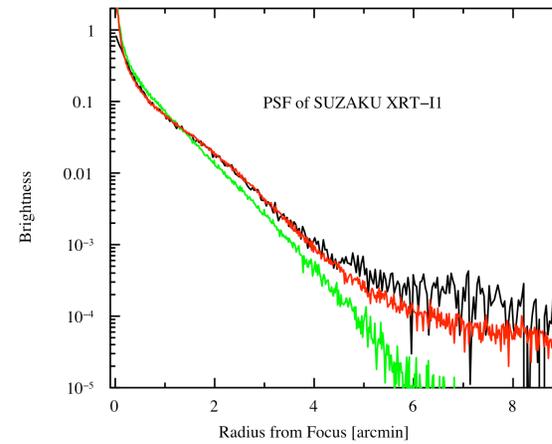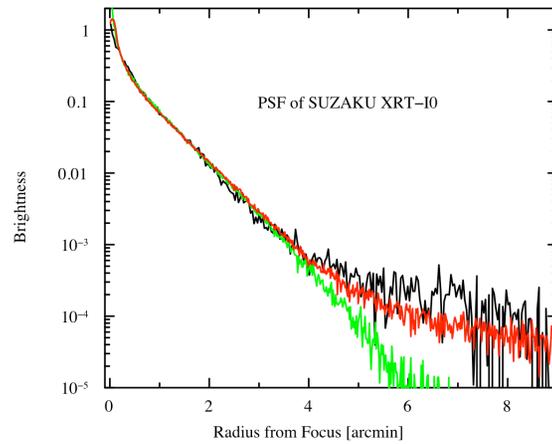
SS Cyg   XISSIM 20060615   Current Test version

Encircled Energy Function

EEF of SUZAKU XRT−I0
HPD = 1'.79 (obs)
HPD = 1'.80 (new)
HPD = 1'.70 (old)

EEF of SUZAKU XRT−I1
HPD = 2'.28 (obs)
HPD = 2'.25 (new)
HPD = 1'.70 (old)

EEF of SUZAKU XRT−I2
HPD = 2'.03 (obs)
HPD = 2'.18 (new)
HPD = 1'.70 (old)

EEF of SUZAKU XRT−I3
HPD = 1'.96 (obs)
HPD = 2'.03 (new)
HPD = 1'.70 (old)
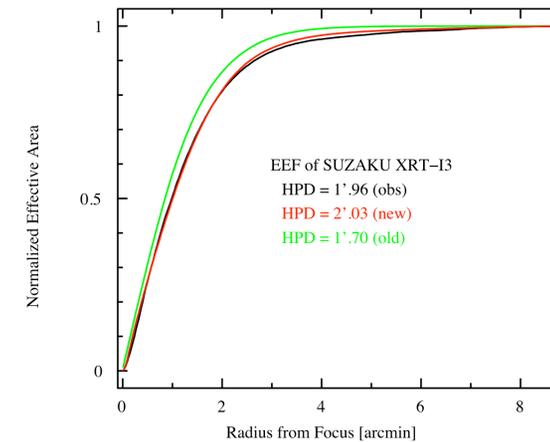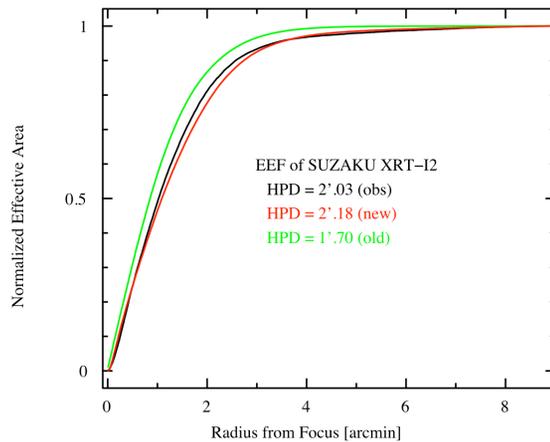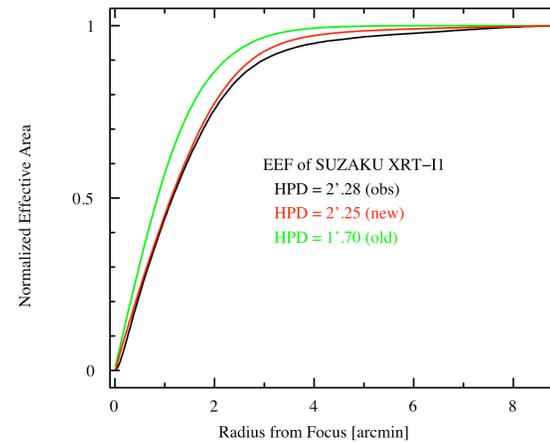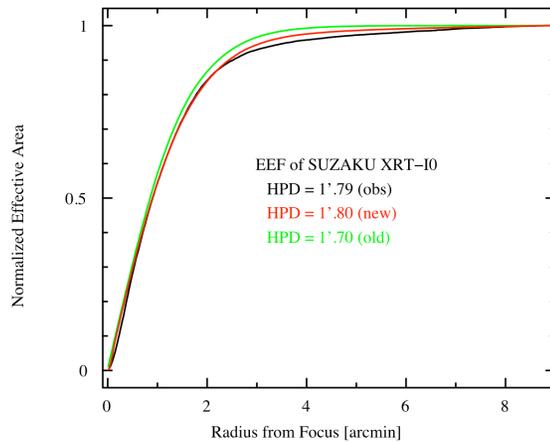
SS Cyg   XISSIM 20060615   Current Test version

Vignetting

- Crab offset pointings in Sep–2005 & Sep–2006
- XISSIM20060615 (and current Test Version): Evaluated for energies 4.5 keV & 8.0 keV
- Vignetting in DETX & DETY directions, and for XIS 0, 1, 2, 3
- Current version adopt more accurate optical axis data for each quadrant
- Result: successful in lower energy band (3–6 keV); less so in higher energy band (8–10 keV, especially for XIS 2)

XIS0
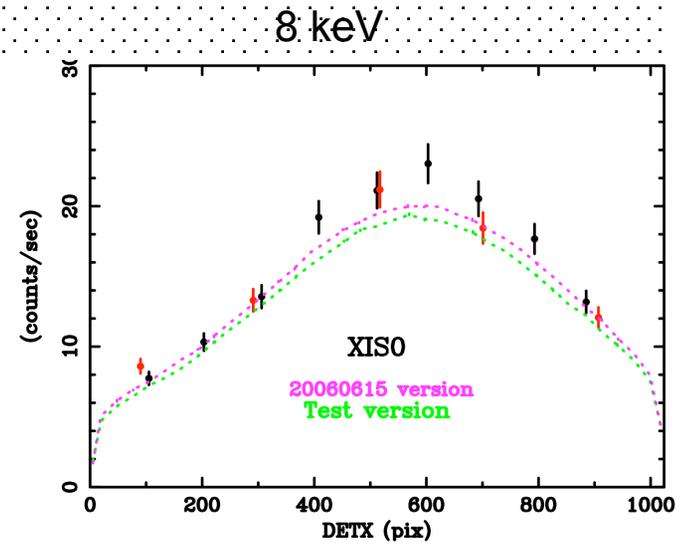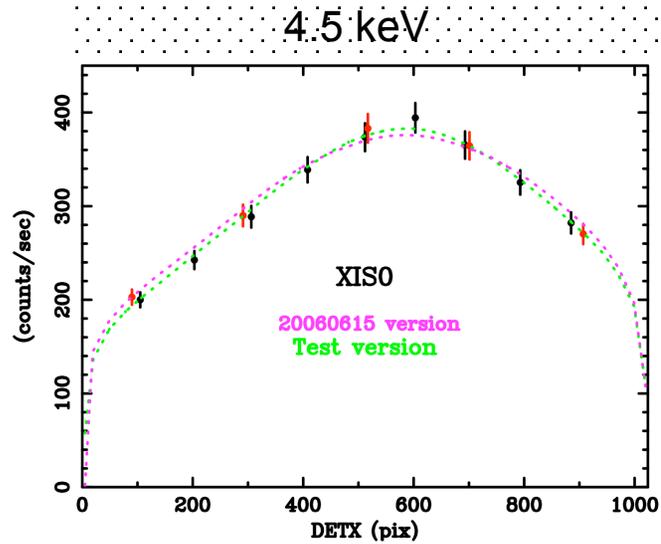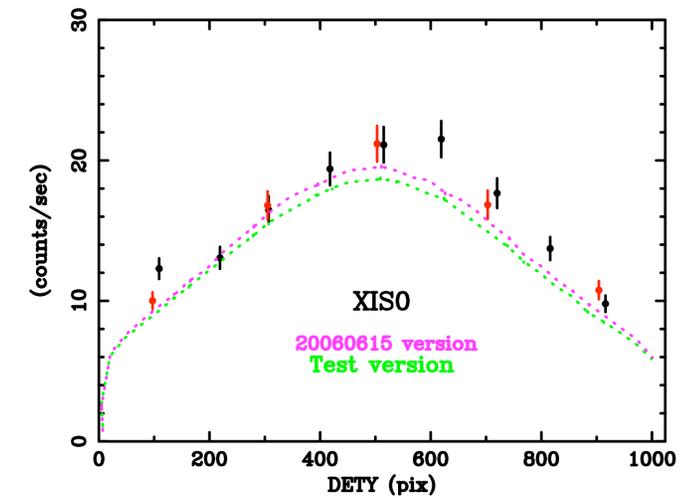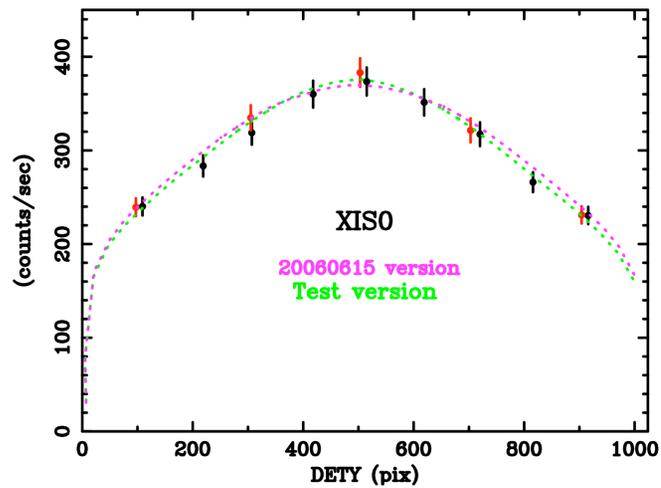
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XIS1

3MAY2007   Suzaku Users Group: XRT

XIS2

Suzaku Users Group: XRT

XIS3

3MAY2007   Suzaku Users Group: XRT
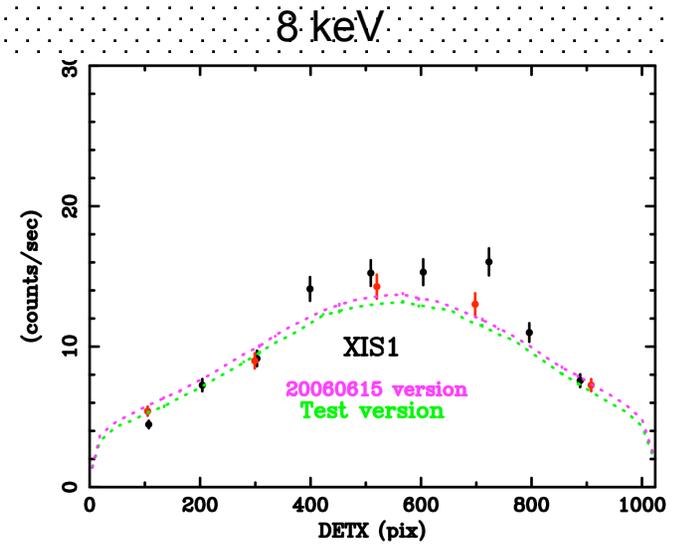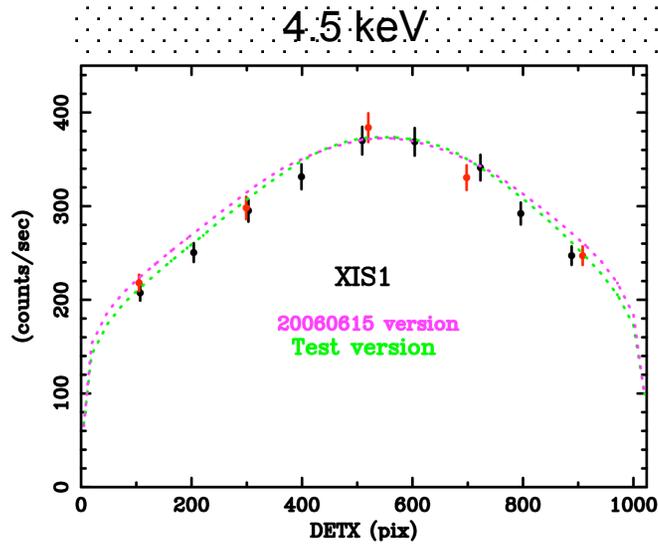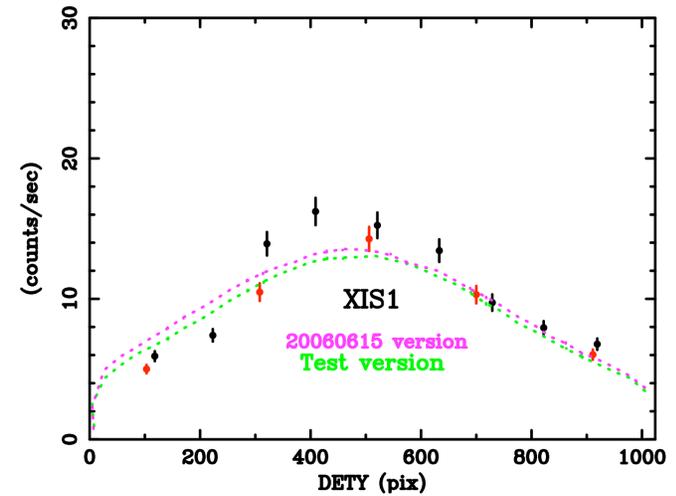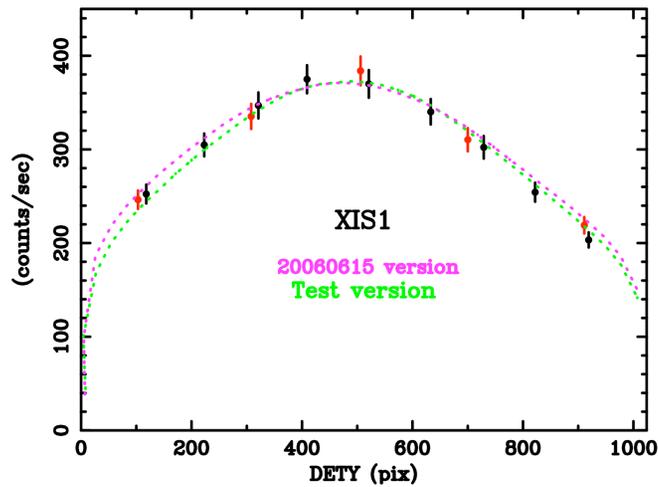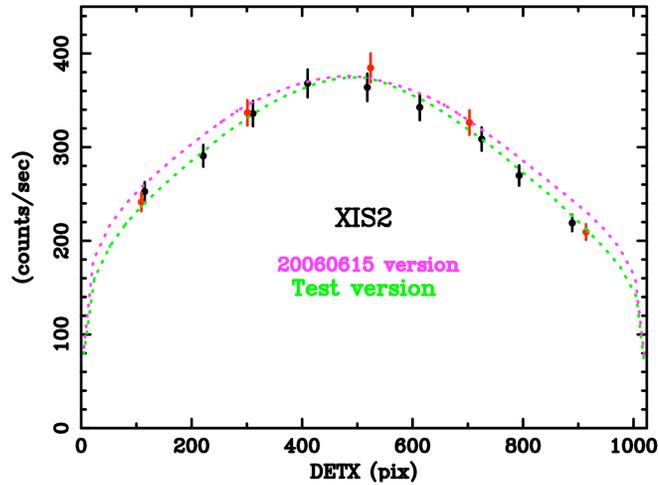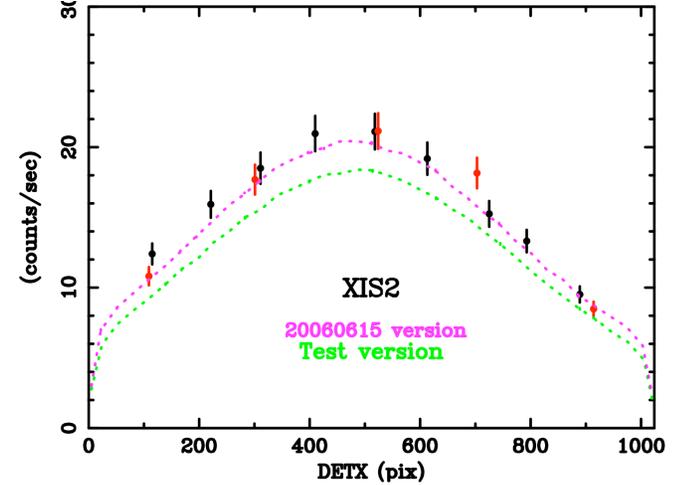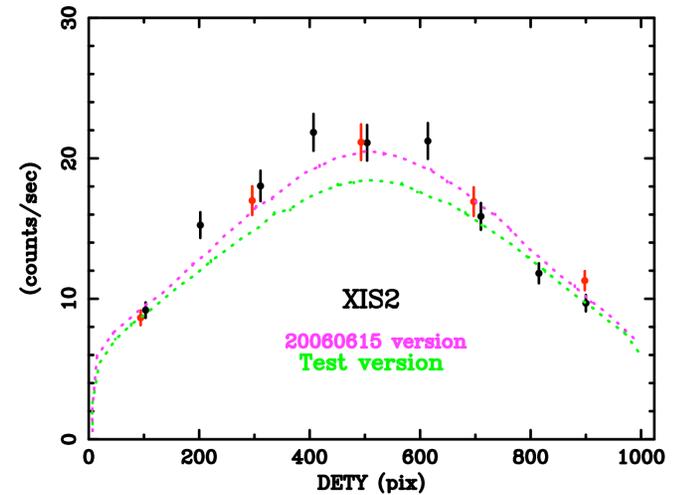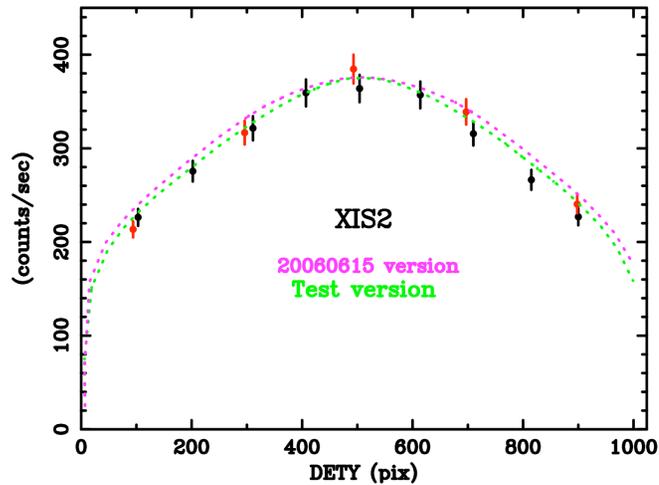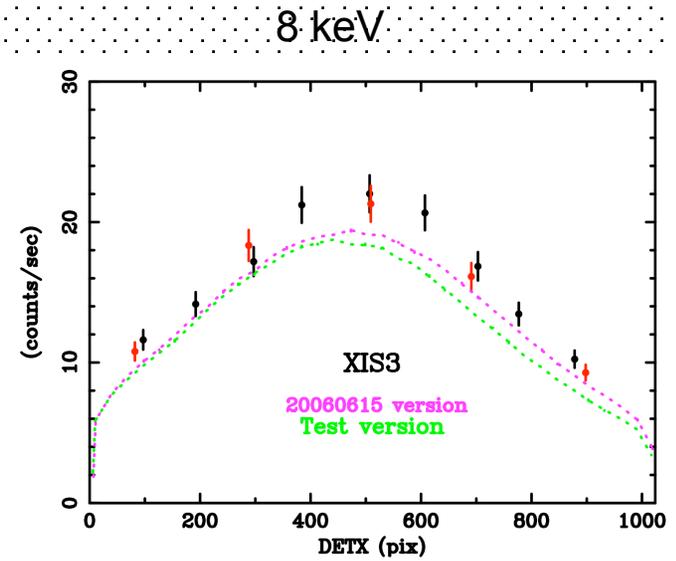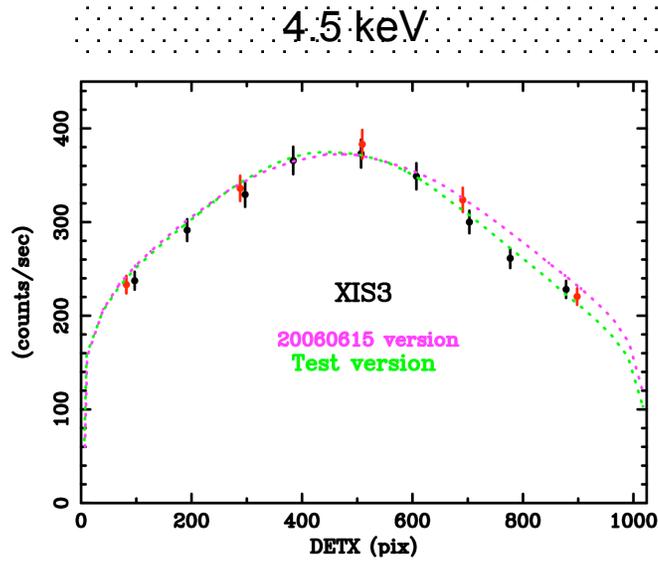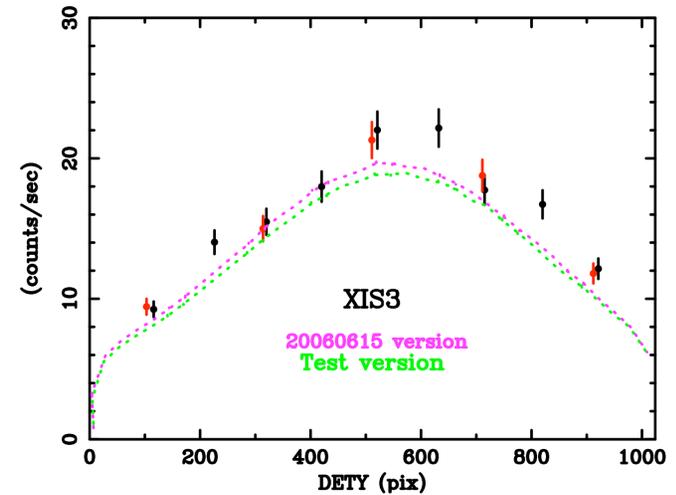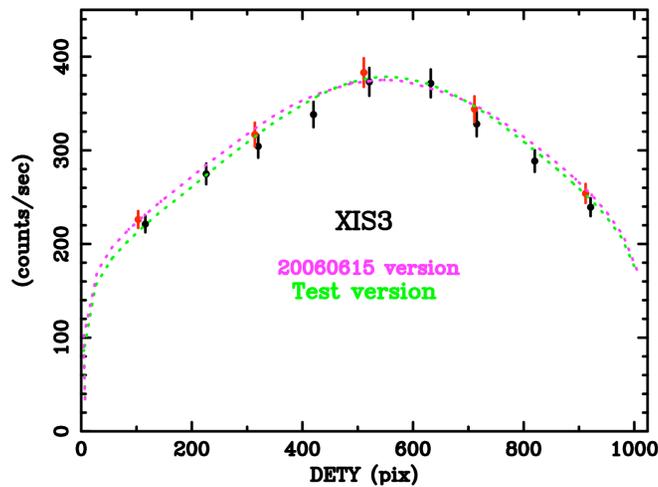
Summary

- Continue to update XISSIM beyond version 20060615
- Current Test Version nearly completed for
  - Angular Resolution (PSF/EEF)
  - Vignetting
- Work in progress
  - Effective area
- Software Releases
  - Current version of xissim, xissimarfgen & xisrmfgen: all 2006–11–26 versions
  - Next minor update in "early summer 07" [but may not include some library components (?)]
  - Attitude correction tool "aeattcor" will be released in the next ftools update planned in June 07 [may release in GOF/ISAS web page earlier in May (?)]