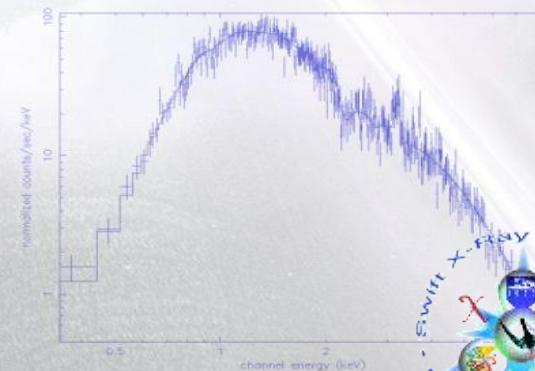
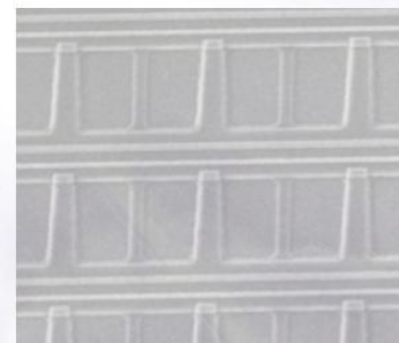
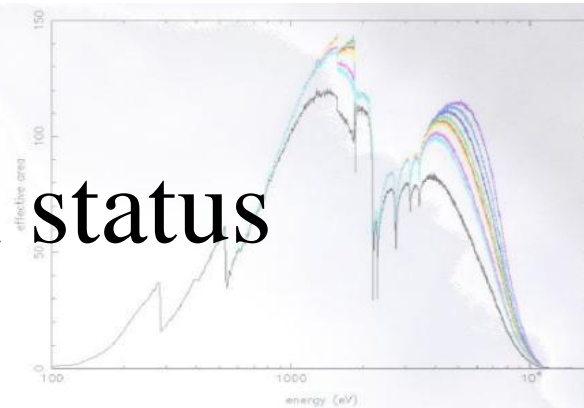


Swift XRT calibration status

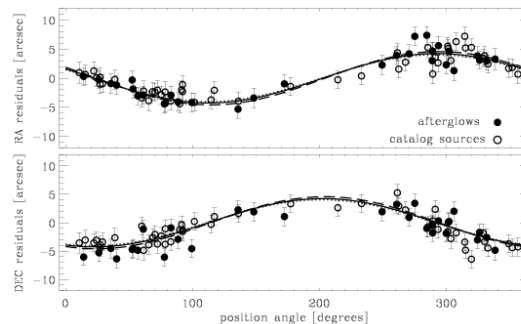
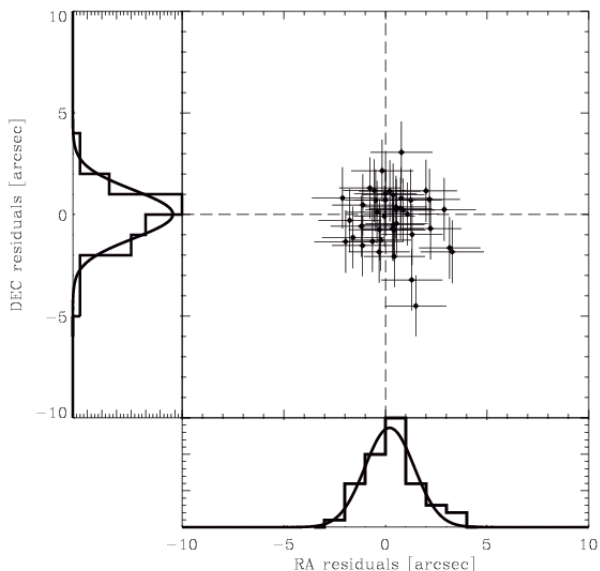
Andy Beardmore
on behalf of the
Swift XRT team



- XRT boresight
- Ground software updates
- CTI
 - column-by-column CTI required
- RMFs/ARFs – updated release
- BAT/XRT cross calibration
- Future Prospects

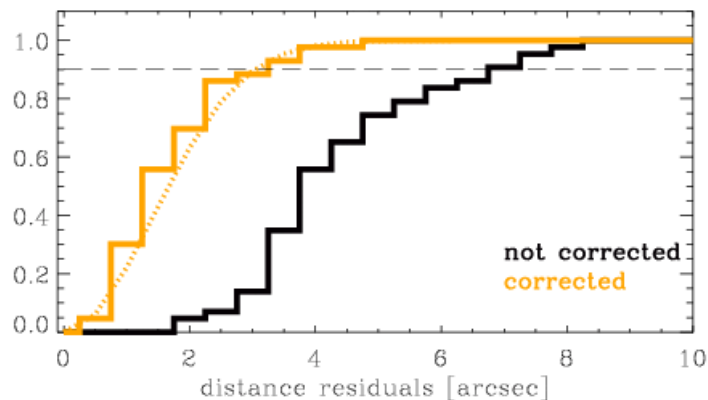
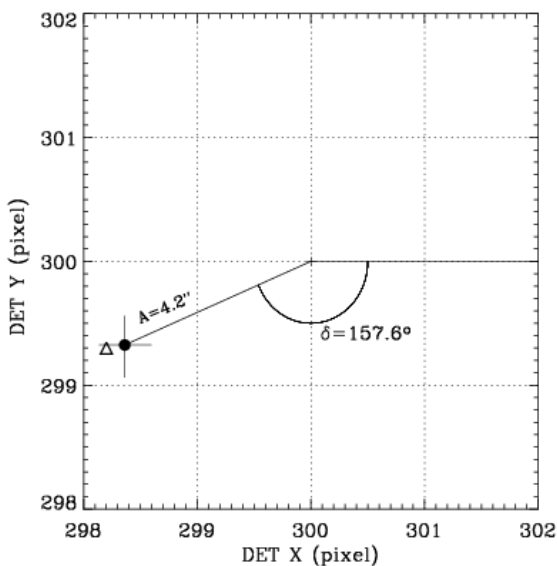


Prior to
Oct 2005



Position angle residual offset
dependence

New boresight
calibration,
Dec 2005

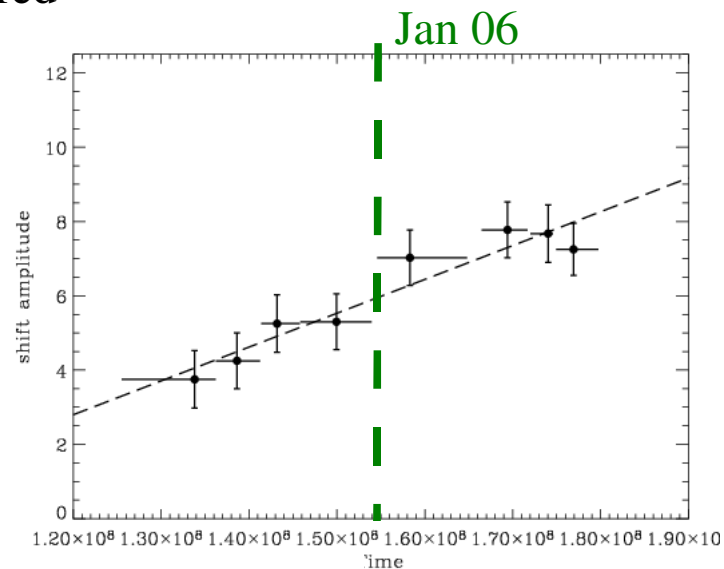
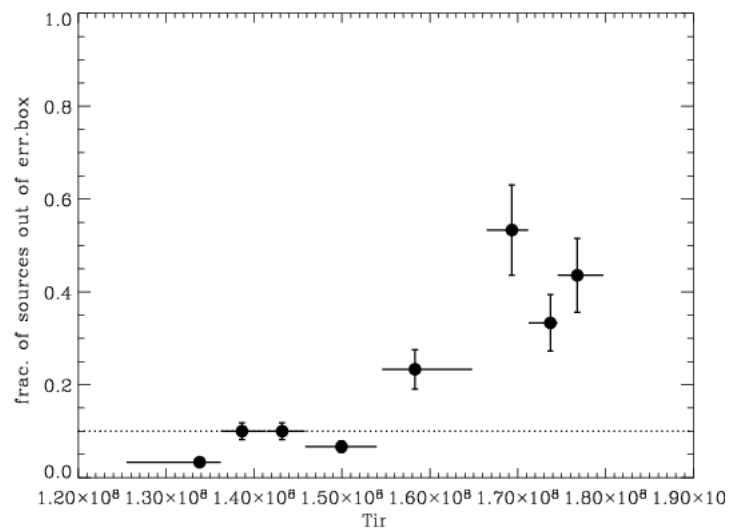


Typical GRB position accuracy
3.5'' (in 1ks).

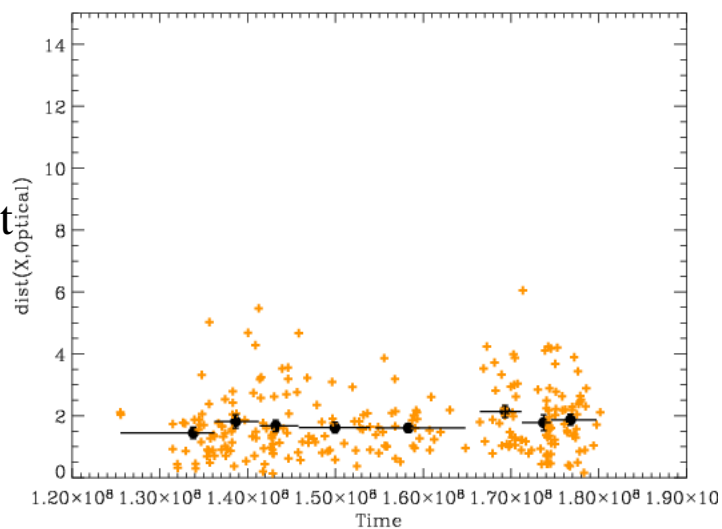
(Moretti et al 2006)



Time dependent boresight shift discovered

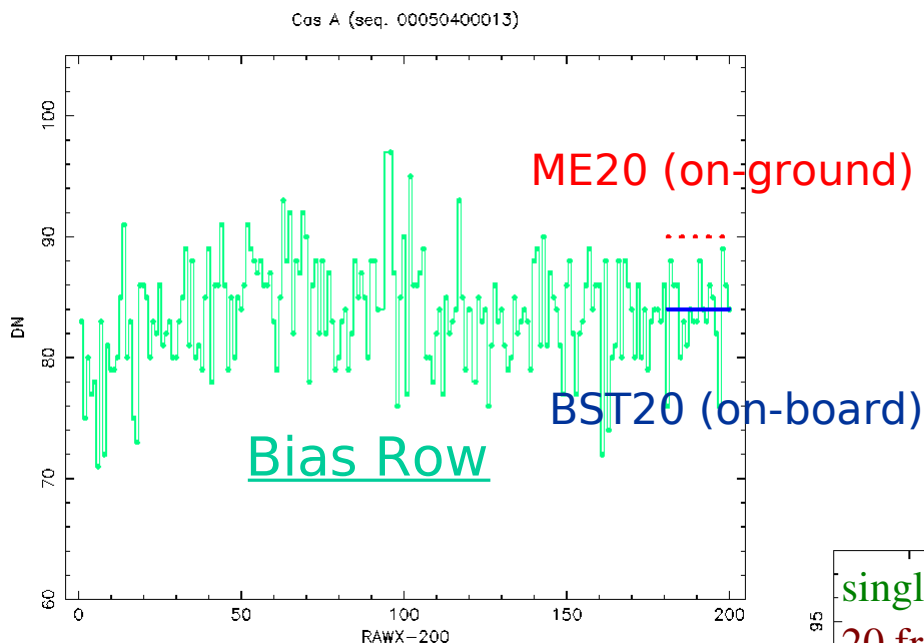


Residual after applying a time dependent boresight correction.



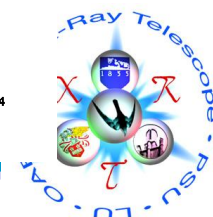
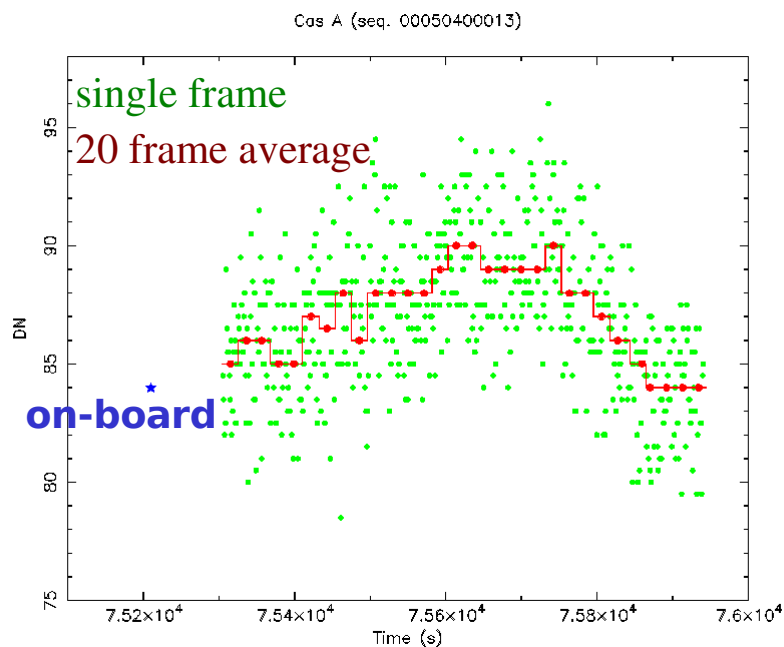
- `xrttdrss2`
 - Processes prompt PC mode Single Pixel Event data sent via TDRSS. Significantly improves no. of prompt XRT positions.
- `xrtexpomap`
 - creates exposure maps for both WT & PC modes to account for bad-columns. (Used in ARF and light curve generation.)
- `xrtwtcorr/xrtpccorr`
 - corrects for bias variations in WT/PC mode through an orbit



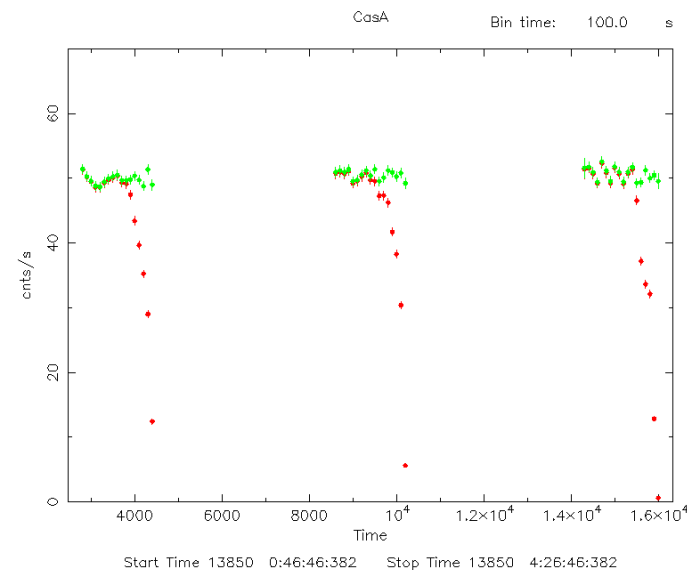
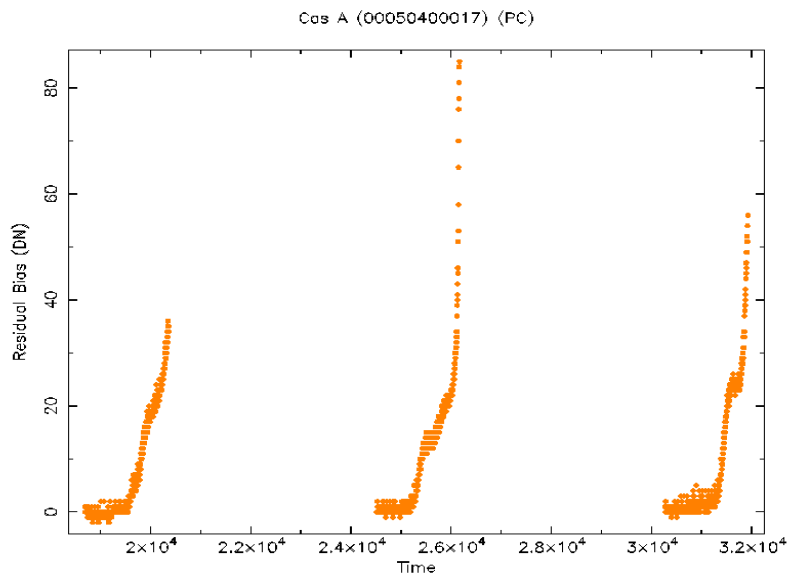
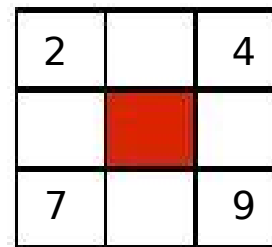
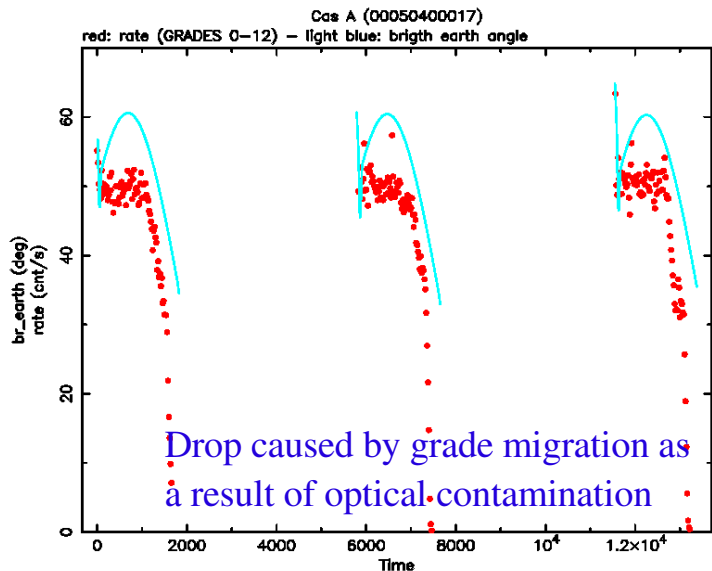


Adjusts bias row subtraction using last 20 pixel data telemetered with every frame

Corrects for temperature dependent bias offsets.



Estimate residual bias for PC mode data from mean of corner pixels of grade 0 events

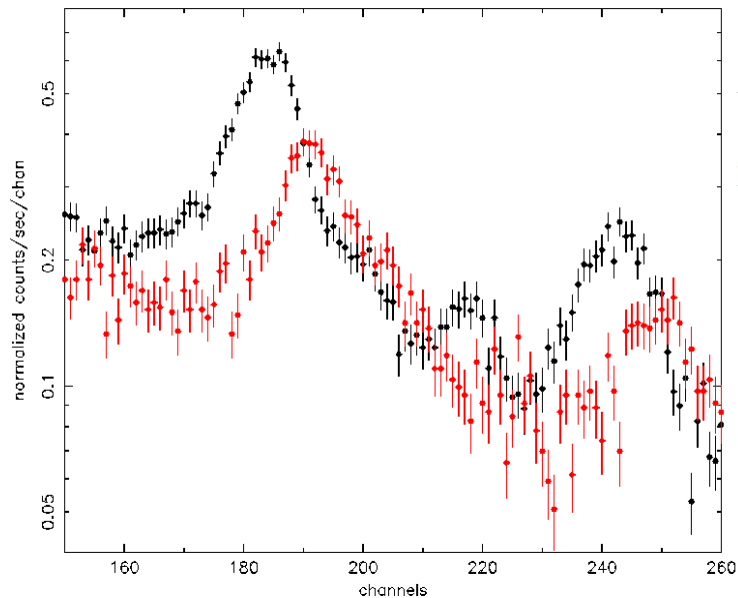


Cas A (00050400017) (PC)

No bias correction

black - first 700s

red - last 500s

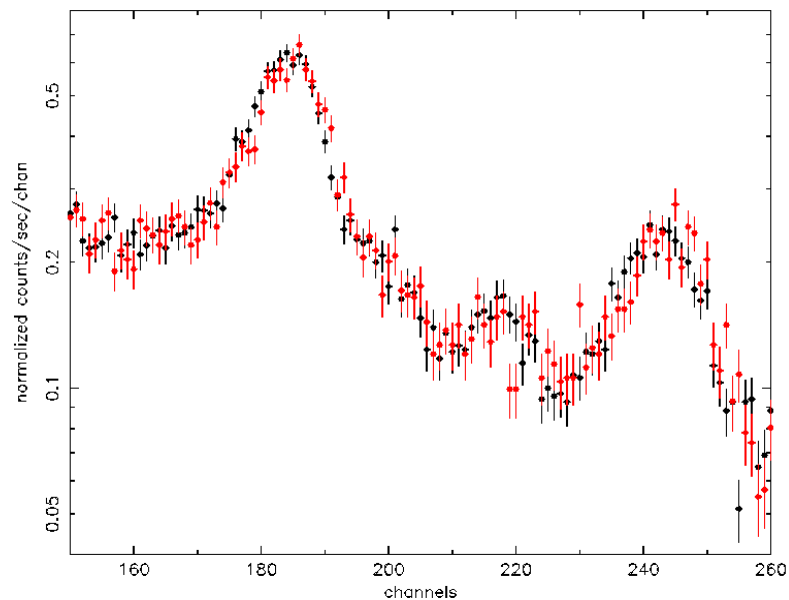


With bias correction

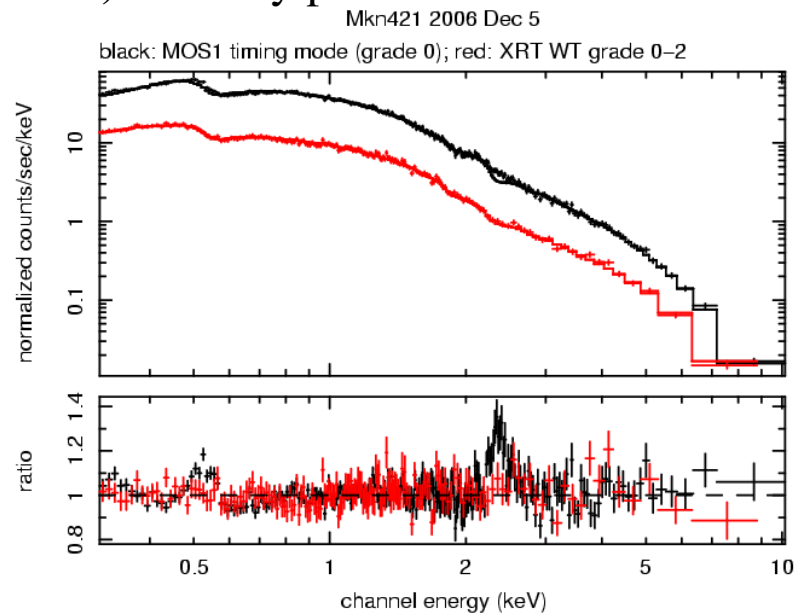
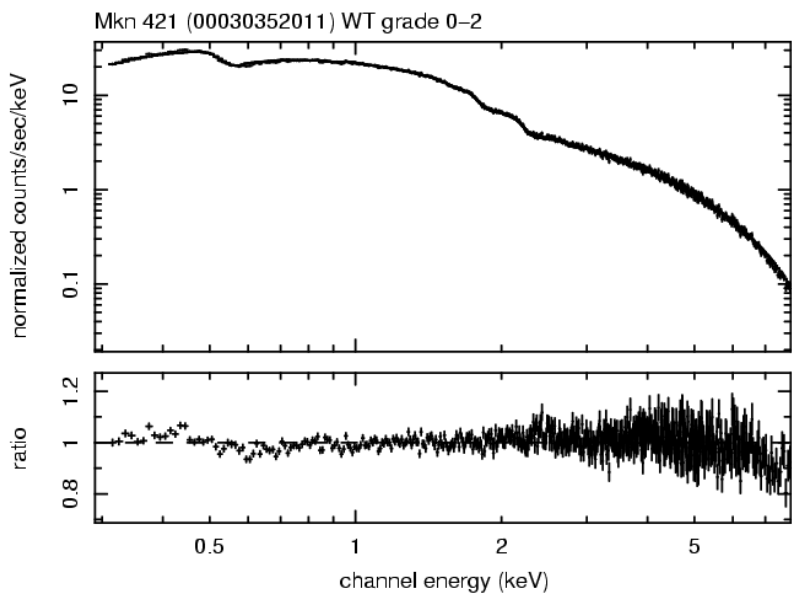
black - first 700s

red - last 500s

Cas A (00050400017) (PC)



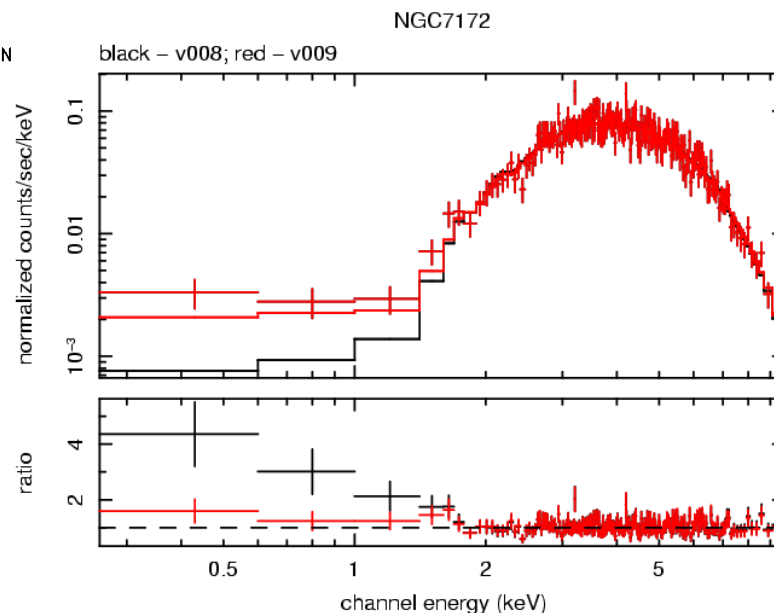
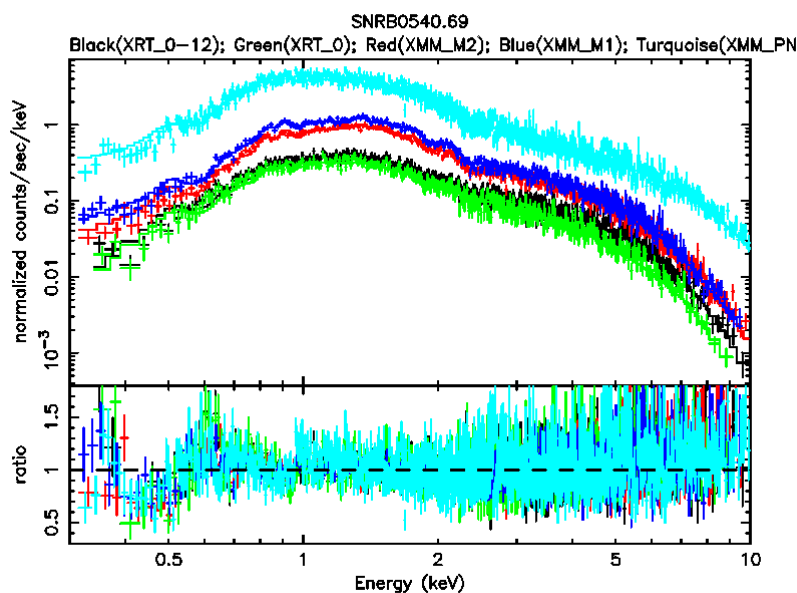
- WT mode calibration no longer performed on Crab because of pile-up and its extended source nature
- Used two observations of Mkn421
 - one deep (3e6 photons) to smooth residuals around O, Al, Si, Au-edges
 - one simultaneous with XMM (Dec 06) to verify parameters



- Further observations of 3c273 (Jan 07 - simultaneous with XMM), and RXJ1856 used to verify effective area - reduction by 15% at low E required compared with theoretical ARFs.



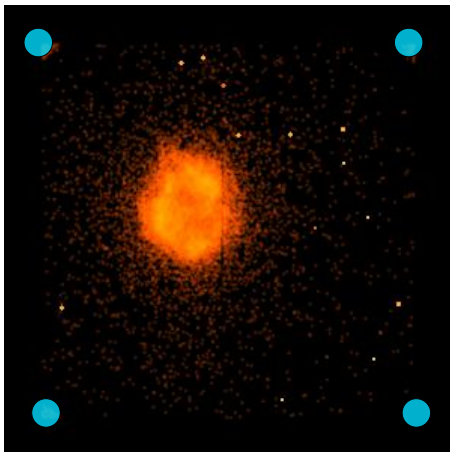
- PC mode primarily calibrated on PSR0549-69
- Observations of 3c273 and RXJ1856 used to verify effective area
 - reduction of 15% required at low E.



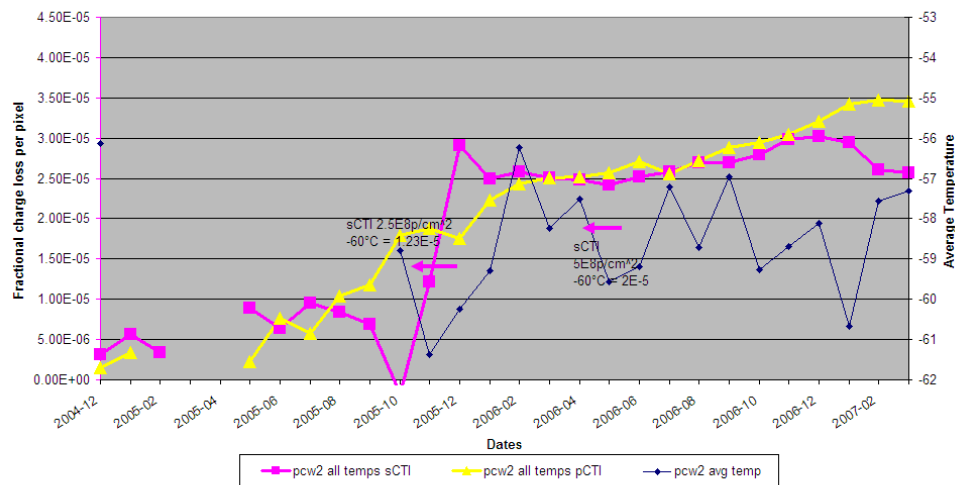
- Latest RMF significantly improves the redistribution tail of high energy photons for observations of heavily absorbed sources



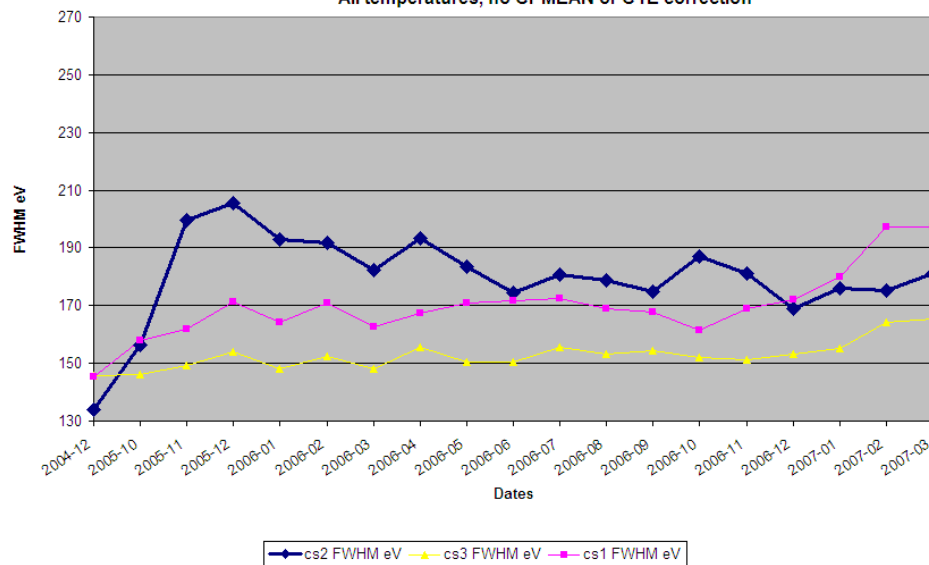
corner sources

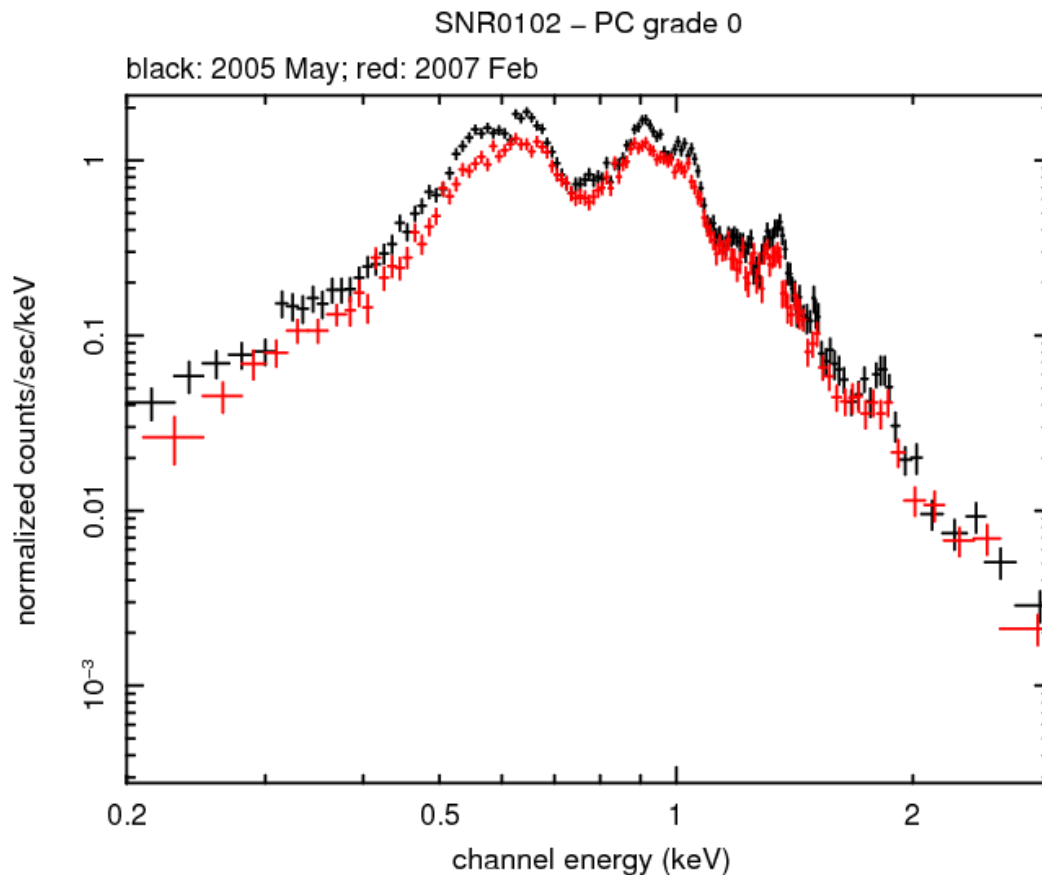


CTI History



All temperatures, no CPMEAN or CTE correction

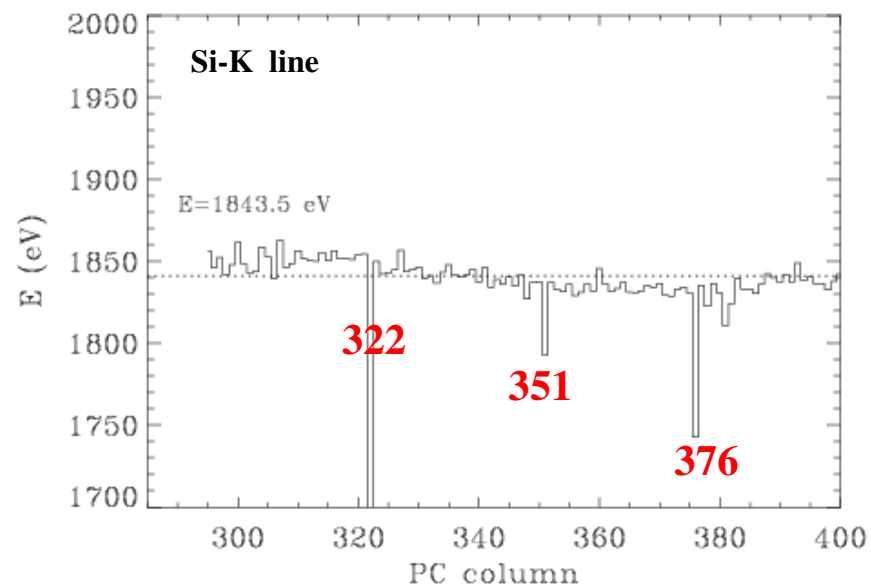
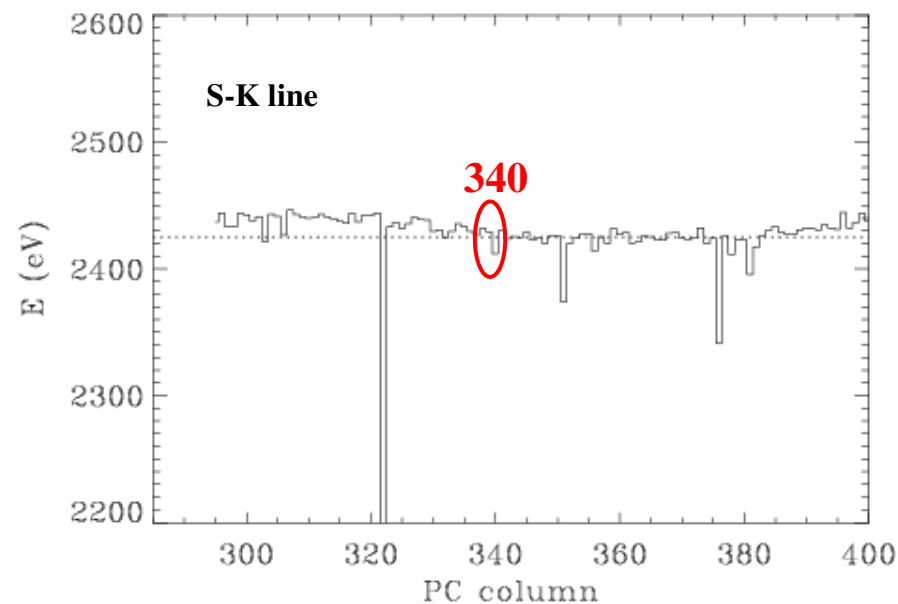
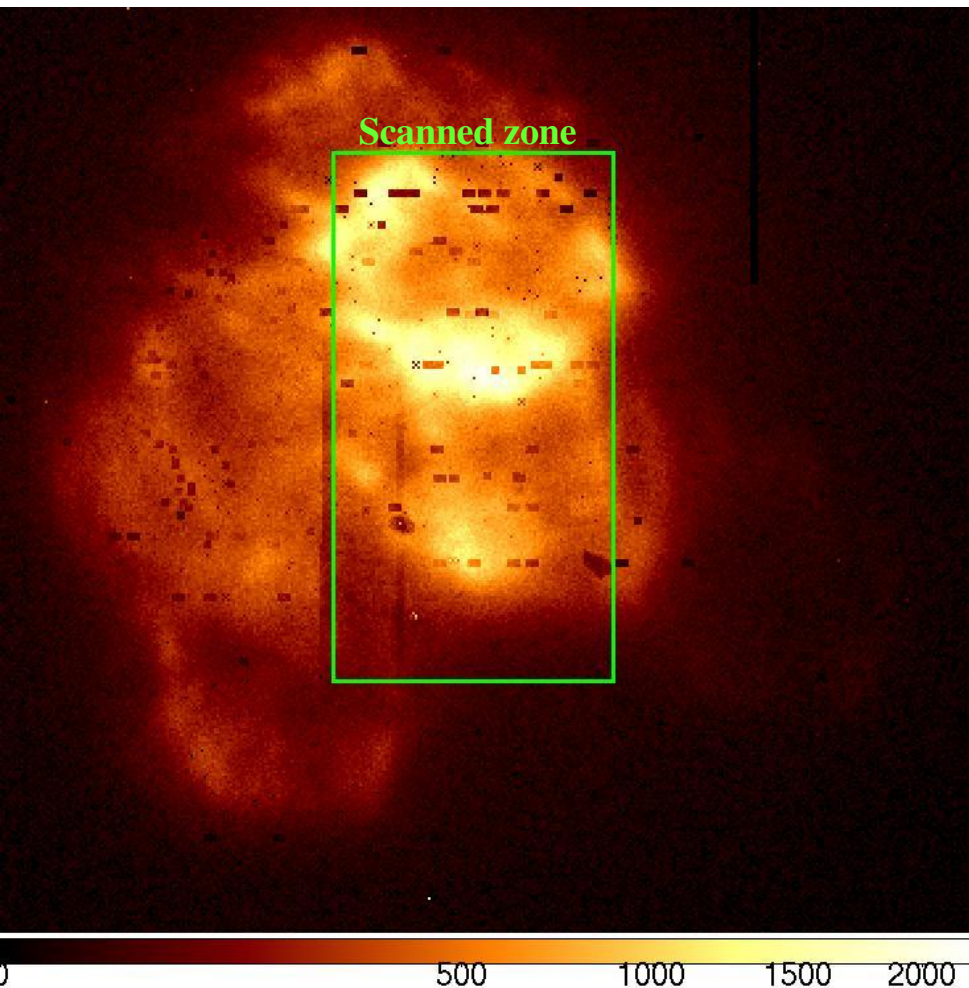


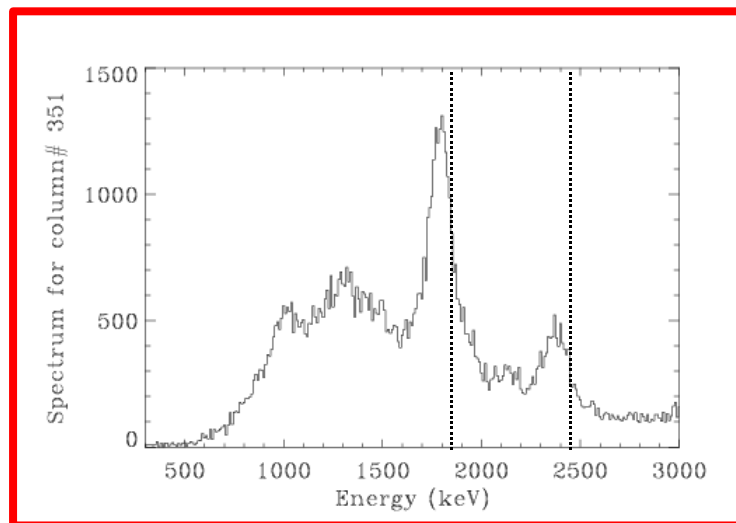
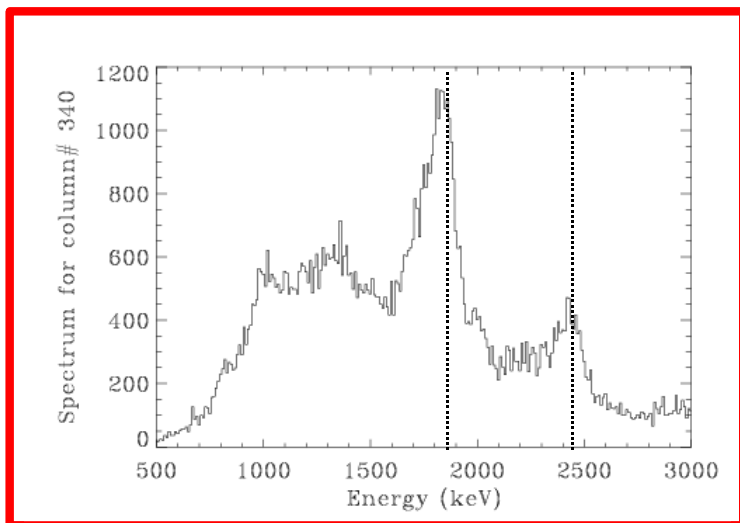
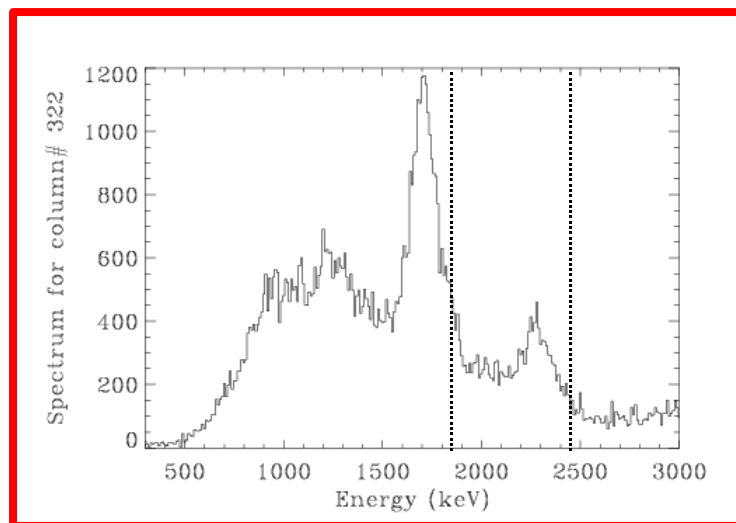
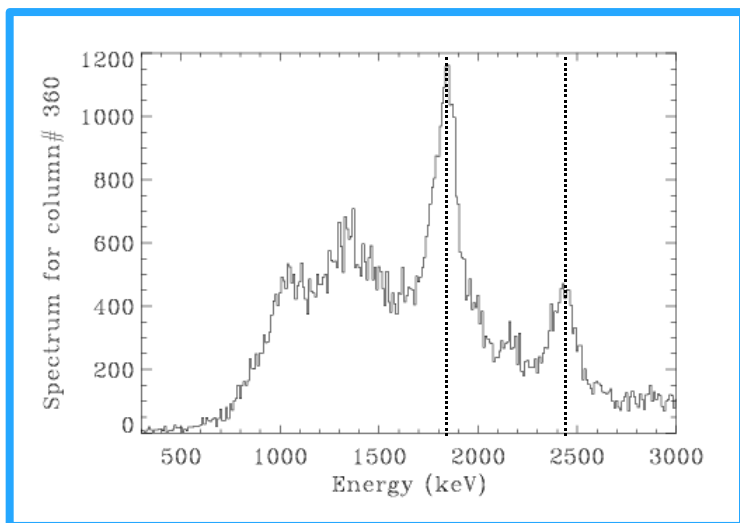


aph 1-Mar-2007 14:29

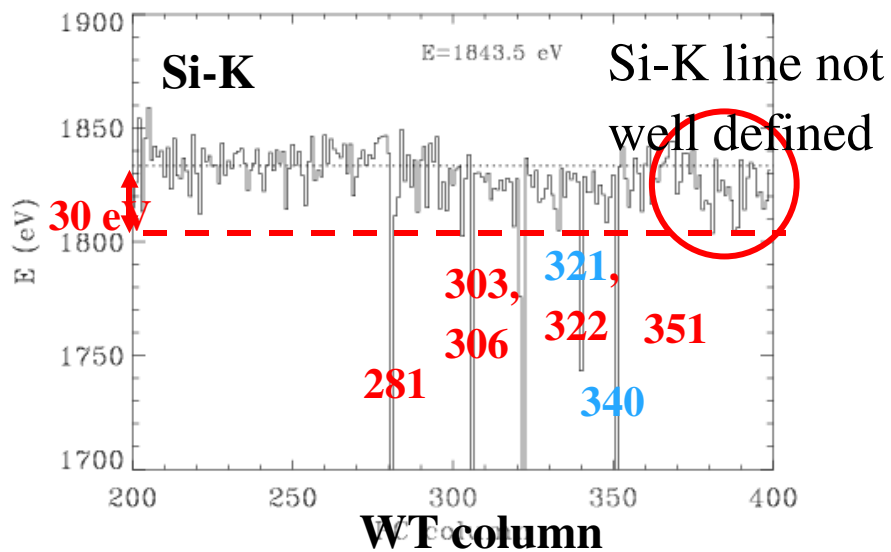
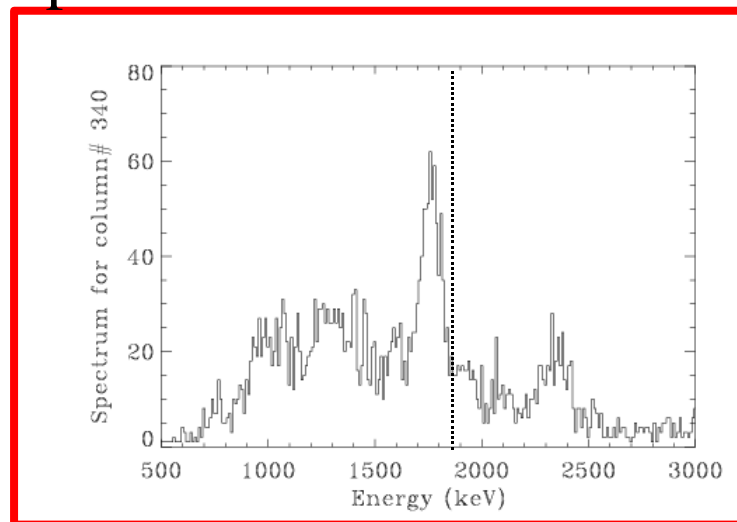
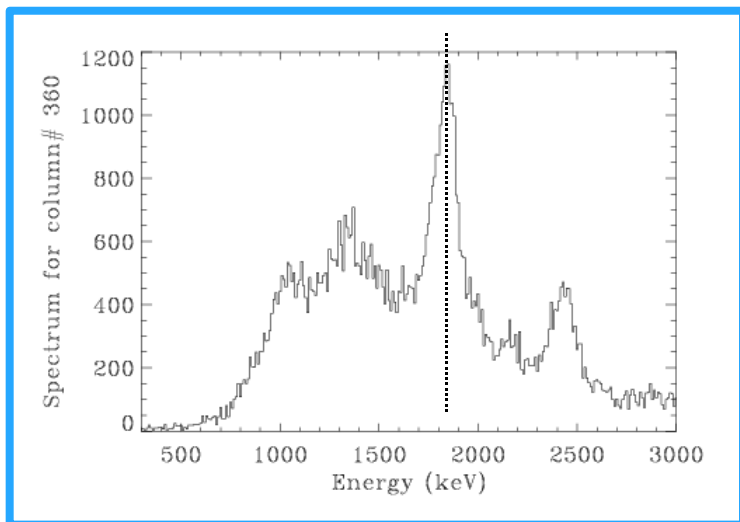


94 ks total exposure (non uniform)

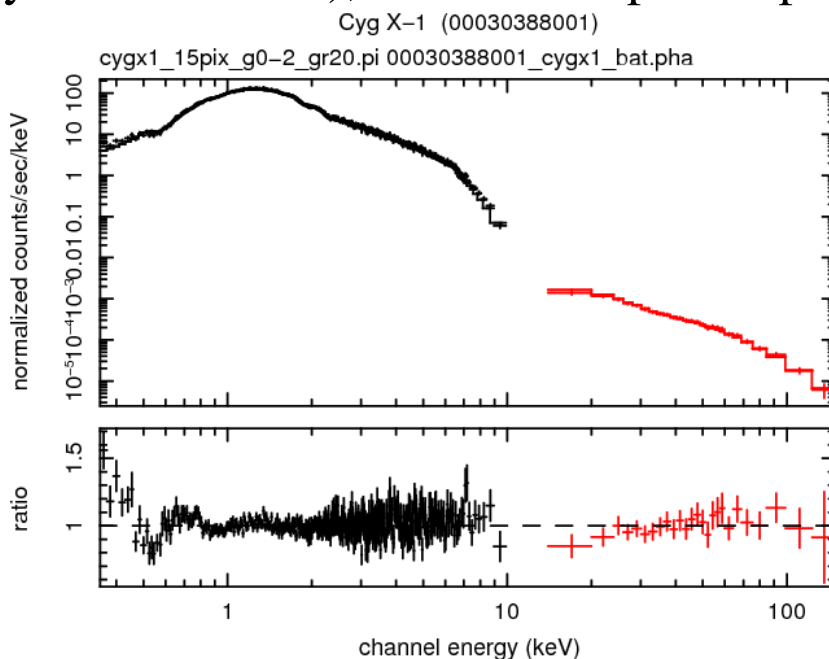




34ks exposure



- Crab isn't a favourable cross-calibration source from an XRT point-of-view – piled-up (in WT) and extended (no extended source ARF available)
- Require a source bright in the BAT, and favourably placed (so as not to be contaminated by other sources), and not too piled-up in XRT WT mode.



Cyg X-1

XRT: 550-850 cps
(excluded 15pixels
from core)

- Const factor 0.98 for simple vphabs (diskbb + powerlaw + diskline) fit
- Const factor 0.85 for vphabs (diskbb + bknpow + diskline) fit.



- CTI corrected on a column-by-column basis
 - requires 50-75ks exposure on Cas A or Pup A to map central CCD
- CCD substrate voltage will be raised to 6V in order to reduce dark current and noise at our relatively high operating temperatures (-50 to -70 C)
 - New “calibration” mode created to enable easy selection of WT or PC mode.

Special thanks to XMM calibration team for notifying us of cross-calibration opportunities. So far 3c273, Mkn421, PKS2155, NGC7172...

