Chandra Calibration Status

IACHEC Meeting April 11, 2011

Recent Calibration Products or Software Releases

ACIS

- ACIS temperature-dependent gain correction software for timed-event (TE) mode data was released in CIAO 4.3 on Dec. 15, 2010.
- ACIS cti-correction software for TE mode data in graded (G) telemetry was released in CIAO 4.3
- A new contamination model for the ACIS-I was released in CALDB 4.4.1 on Dec. 15, 2010.

HRC

- An uppdate to the HRC-I QE to improve cross-calibration between HRC-I/HRC-S/ACIS-S was released in CALDB 4.4.1
- A time-dependent HRC-S QE will be released in the next CALDB

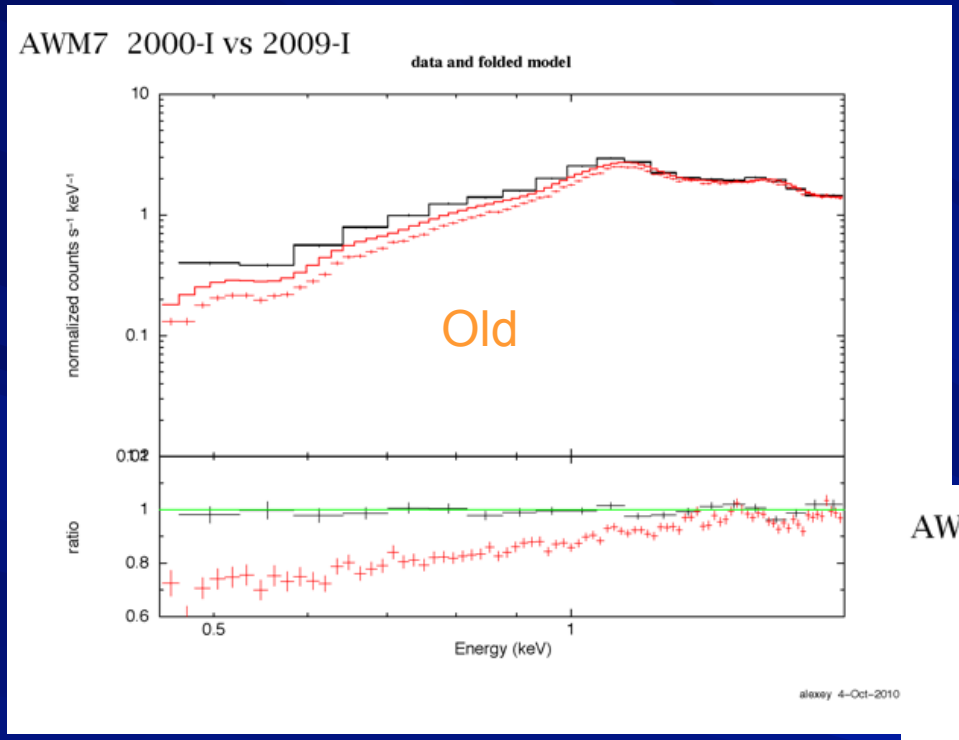
Recent Calibration Products or Software Releases

LETG

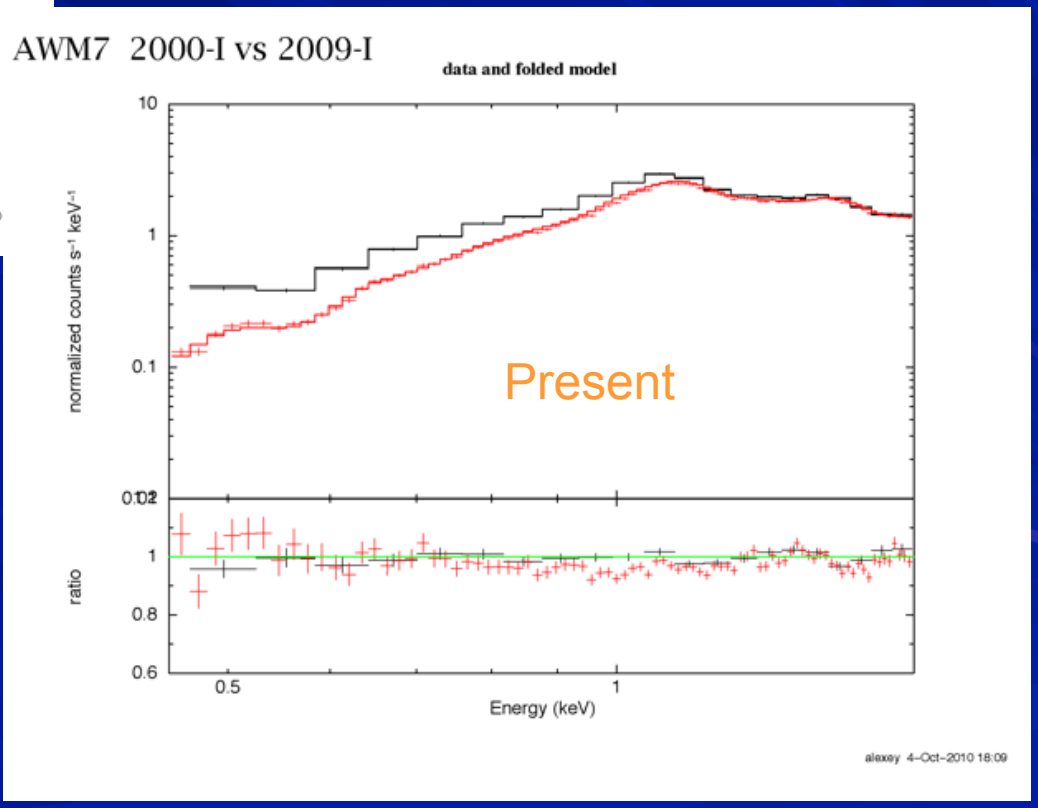
- Updated extraction regions and the clocking angle for dispersed LETG/ACIS-S spectra were released in CALDB 4.1.1

- Revised LETG transmission efficiencies for the higher orders (|m|>1) will be released in the next CALDB

Update to the ACIS-I contamination model

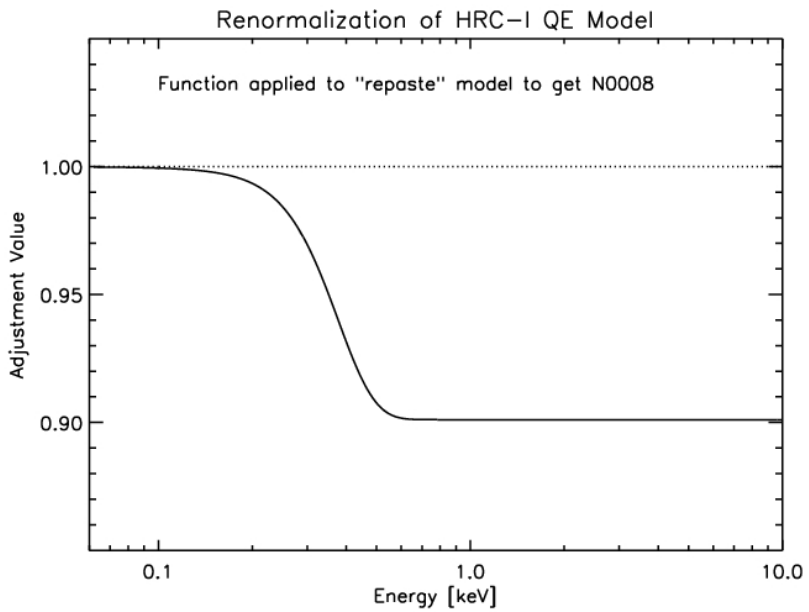


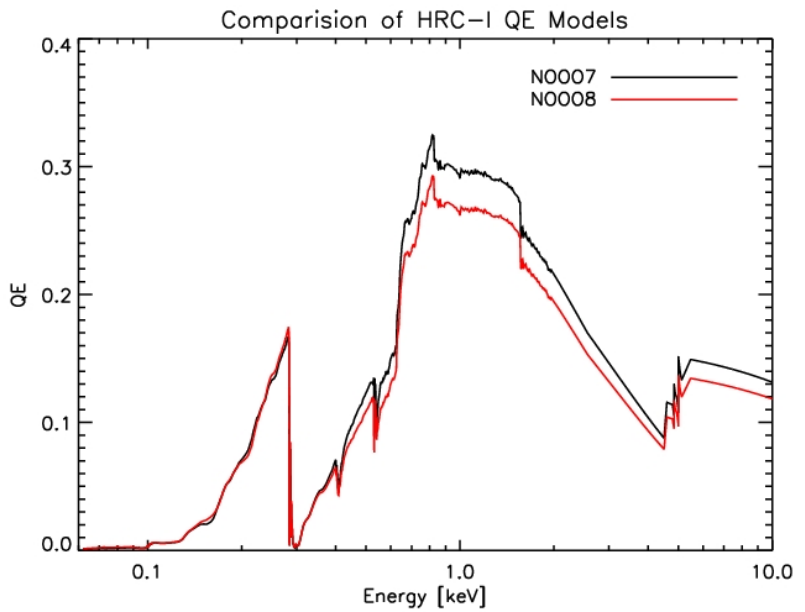
Comparison of two ACIS-I observations of AWM7 taken 9 years apart fit with the old and present versions of the ACIS-I contamination model.



Updates to the HRC-I Effective Area

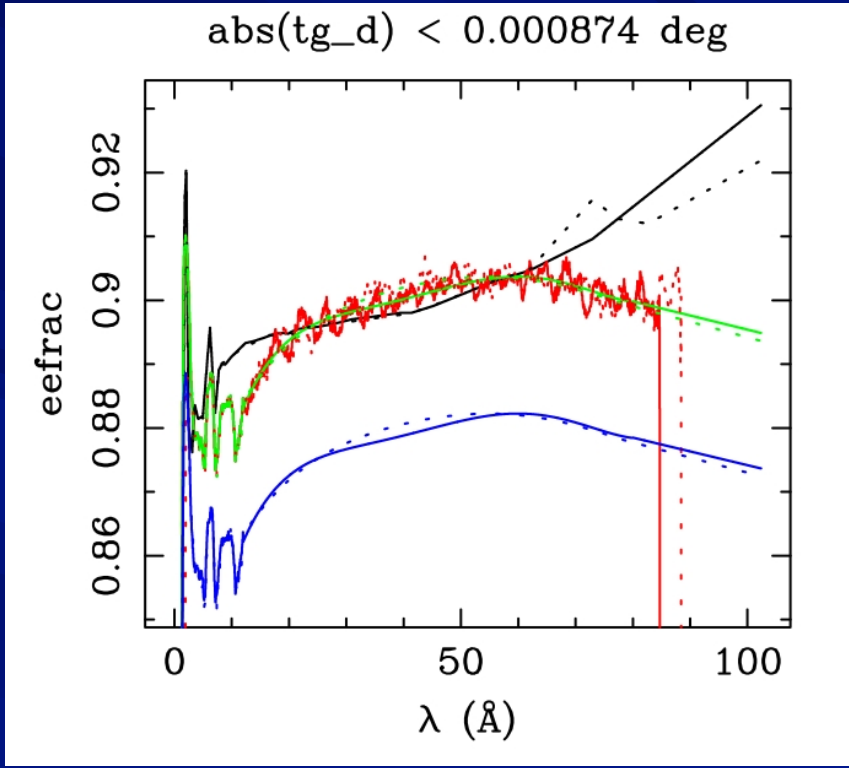
The HRC-I QE was recently updated to improve the cross-calibration between the HRC-I and other Chandra detectors.



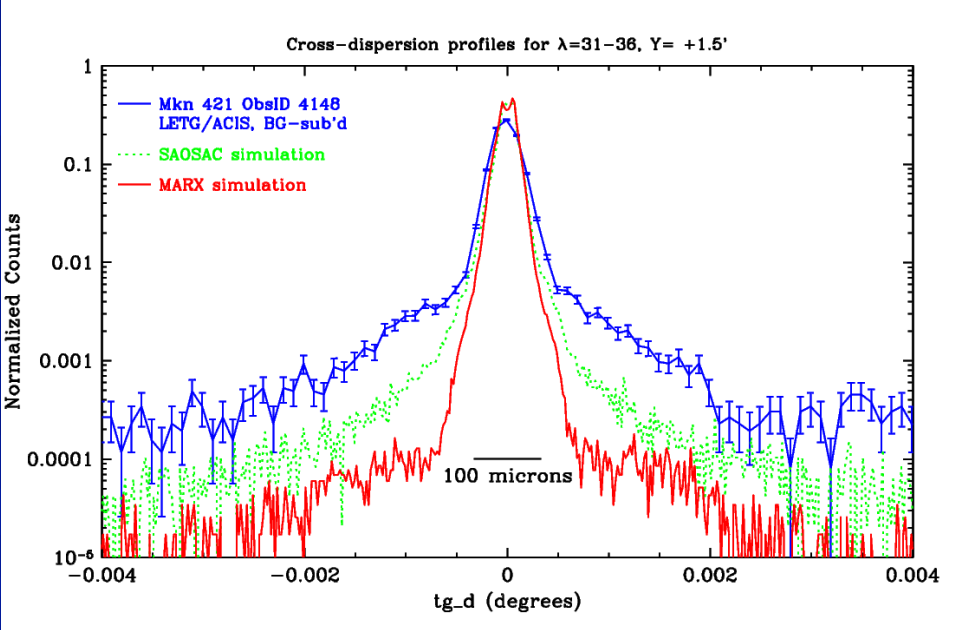


Target	Obs. Rate	Pred. N0007	%diff	Pred. N0008	%diff
HZ43 3.88	3.88	3.46	8.7	3.91	0.9
PKS2155	1.54	1.64	6.5	1.53	0.6
G21.5-09	0.541	0.601	11	0.541	0.0

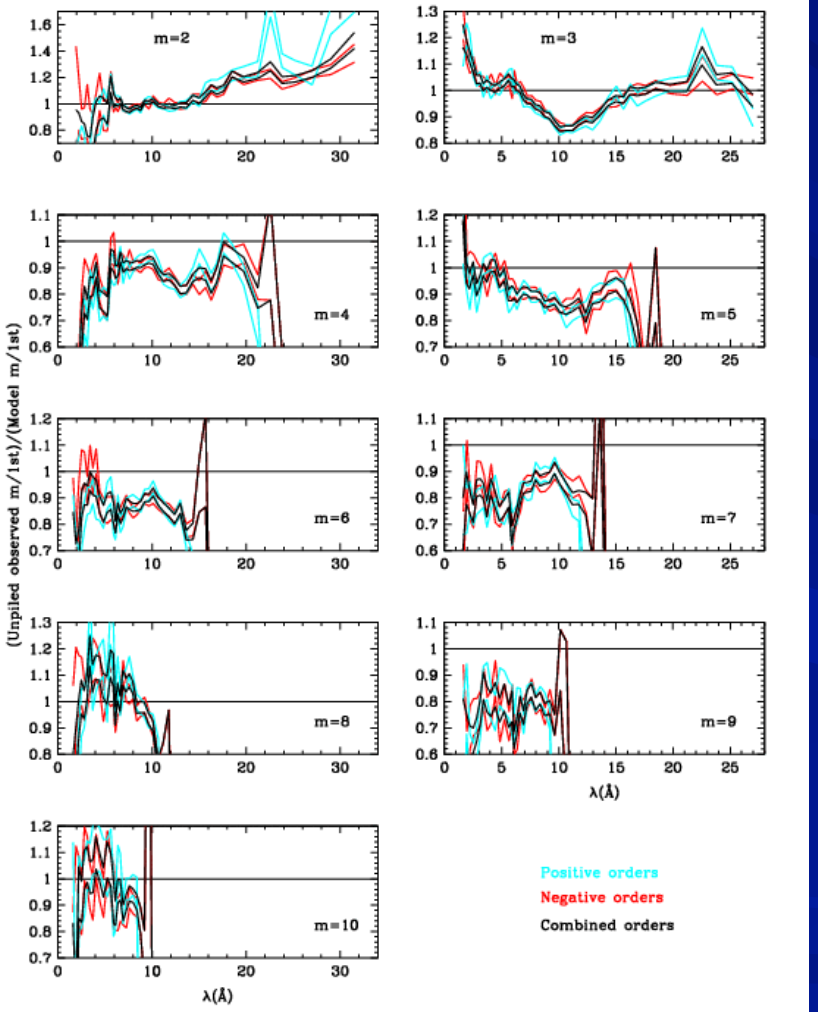
Updates to the LETG/ACIS-S Extraction Region

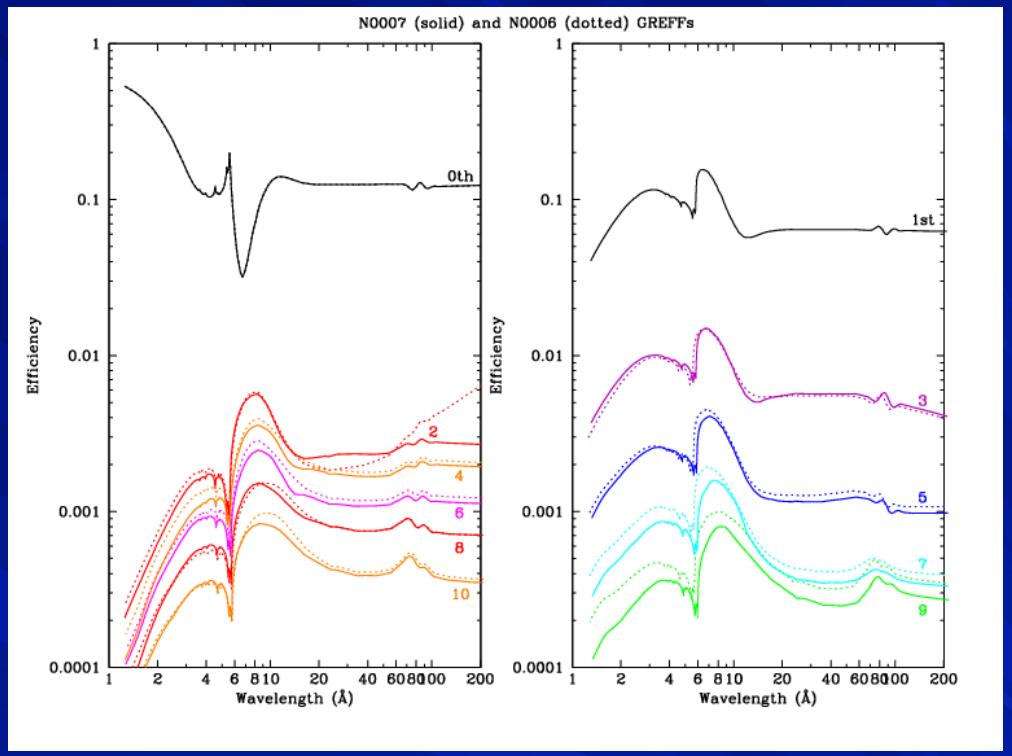


CALDB 4.1.1 contained an update to the LETG/ACIS-S source and background extraction regions and the fraction of total events within the source extraction region.



Updates to the LETG Higher Order Efficiencies





Internal Chandra Cross-Calibration

Calibration products derived from ground-based data.

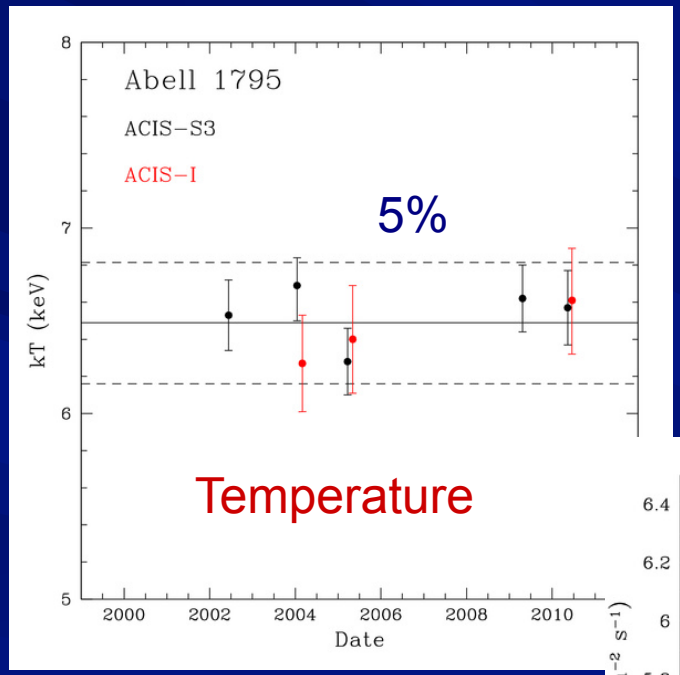
- HRMA effective area
- ACIS-S and ACIS-I QE
- LETG first order efficiency
- MEG first order efficiency for E<1 keV
- HEG first order efficiency for E>1 keV
- Shape of HRC QE

Calibration products derived in-flight data and internal cross-calibration

- HRC-I and HRC-S QE
- LETG higher order efficiencies
- ACIS contamination model
- MEG first order efficiency for E>1keV
- HEG first order efficiency for E<1keV

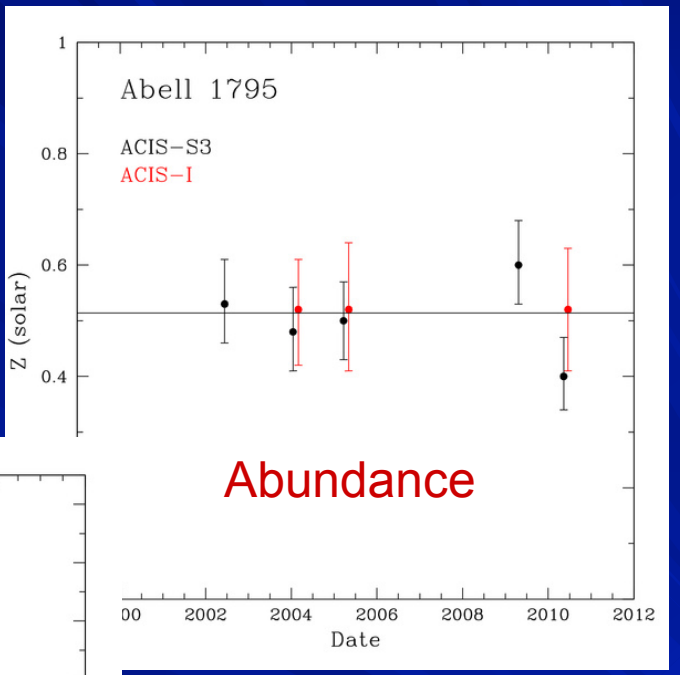
Internal Chandra Cross-Calibration

Bare ACIS-S/ACIS-I cross-calibration



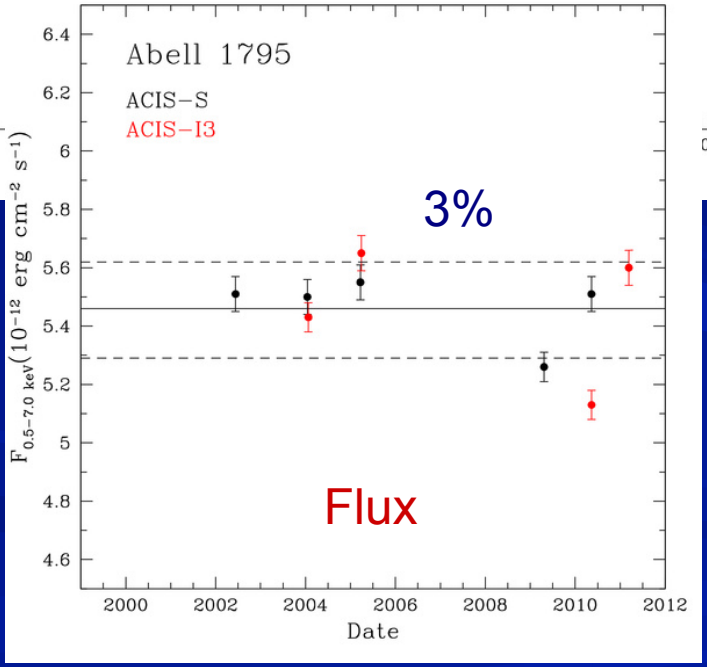
Abell 1795

phabs*apec



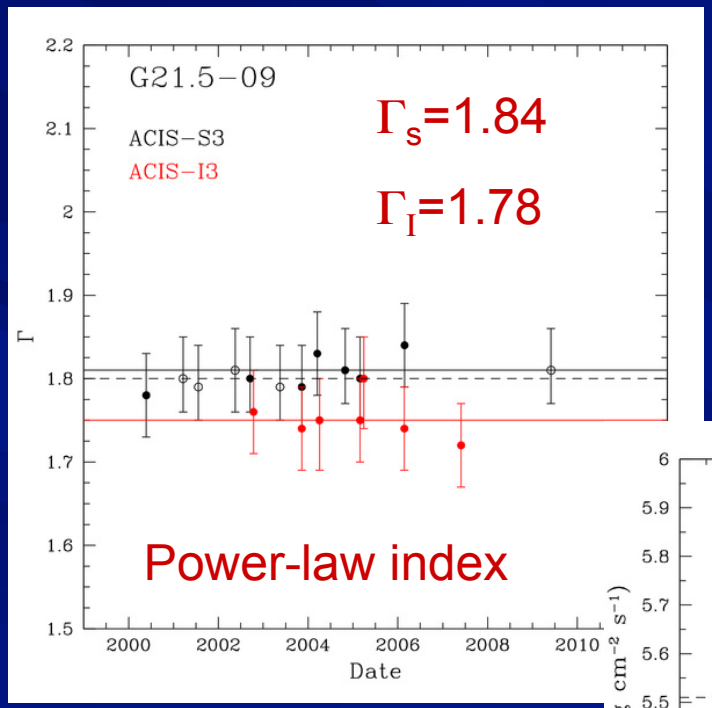
Temperature

Abundance



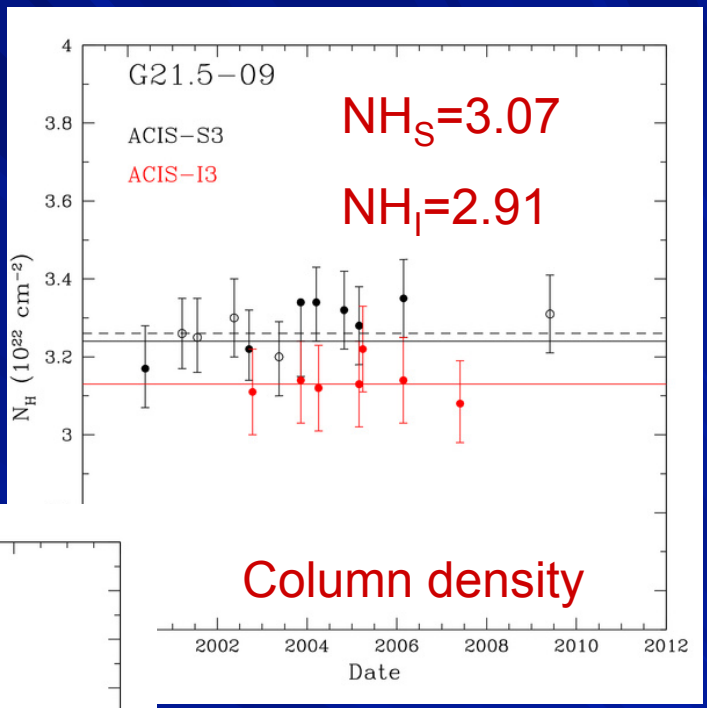
Flux

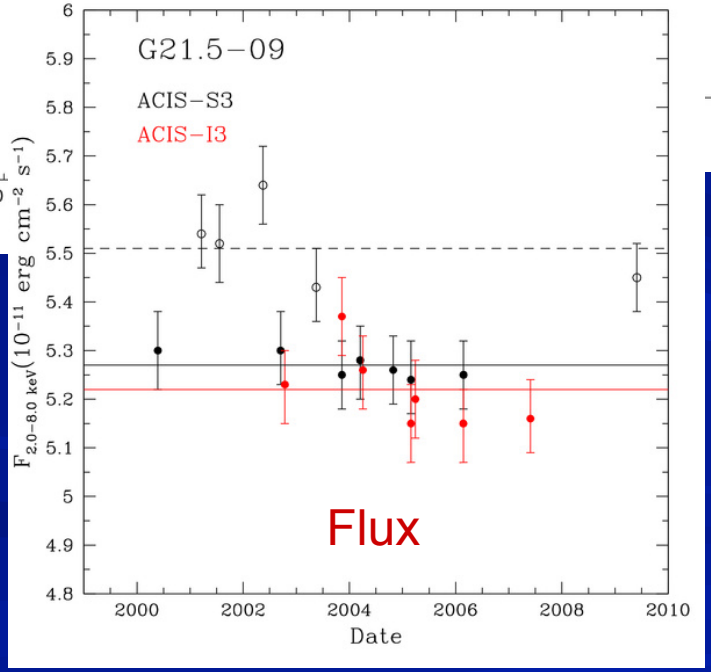
Bare ACIS-S/ACIS-I cross-calibration



G21.5-09

phabs*pow



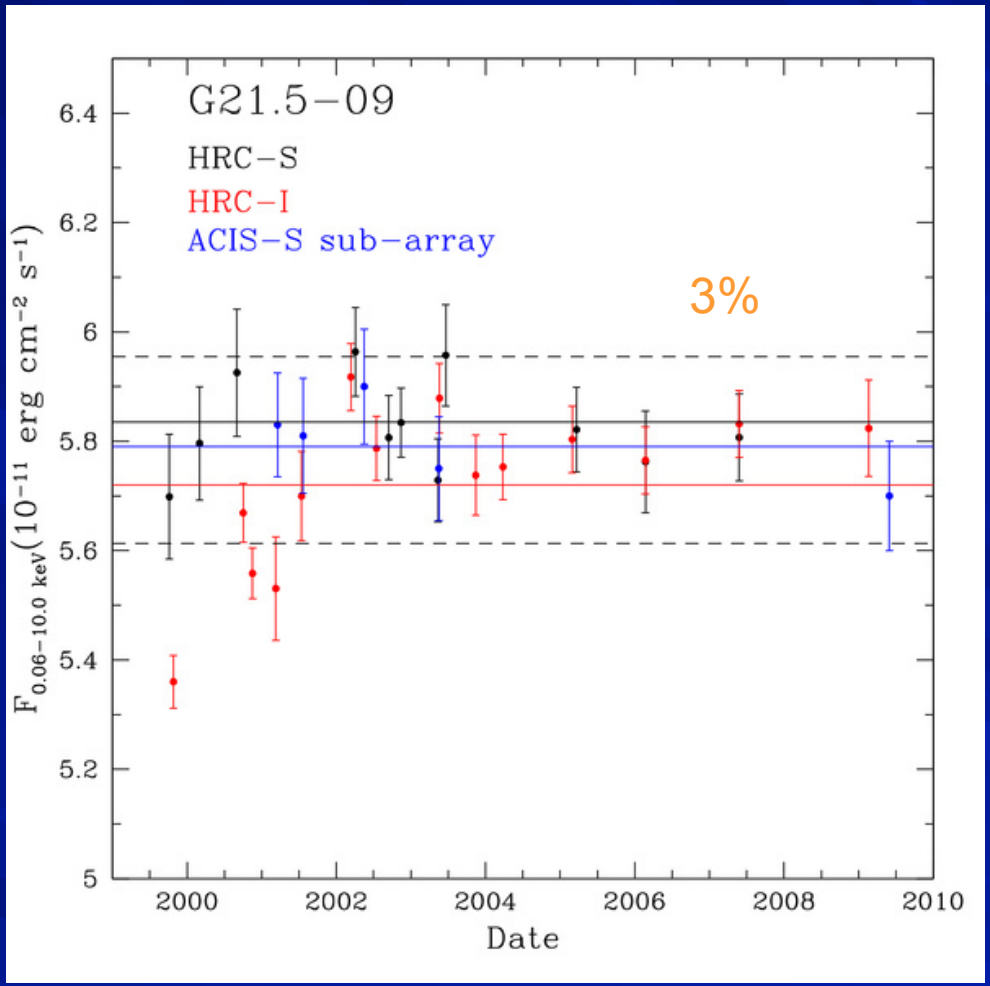


Filled symbols – full-frame

Open symbols – sub-array

Bare HRC-I/HRC-S/ACIS-S cross-calibration

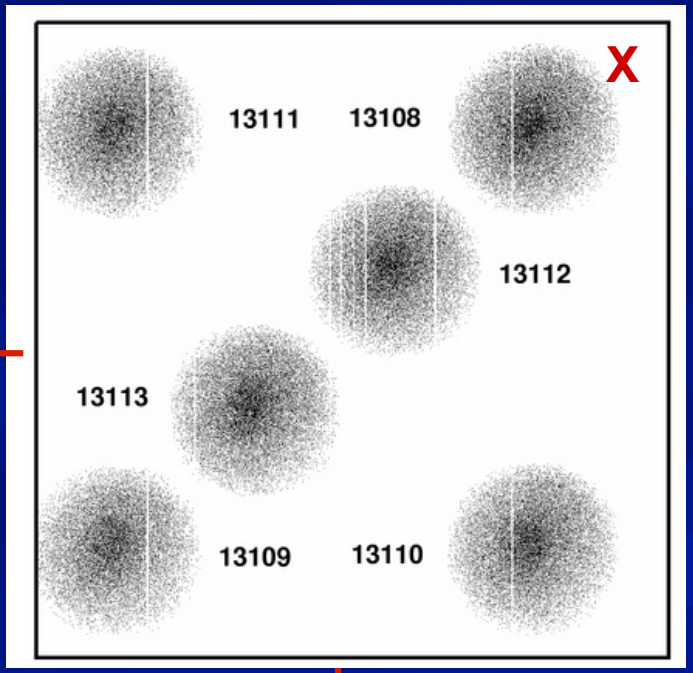
G21.5-09



Mirror Vignetting and ACIS QE MAP

Abell 1795

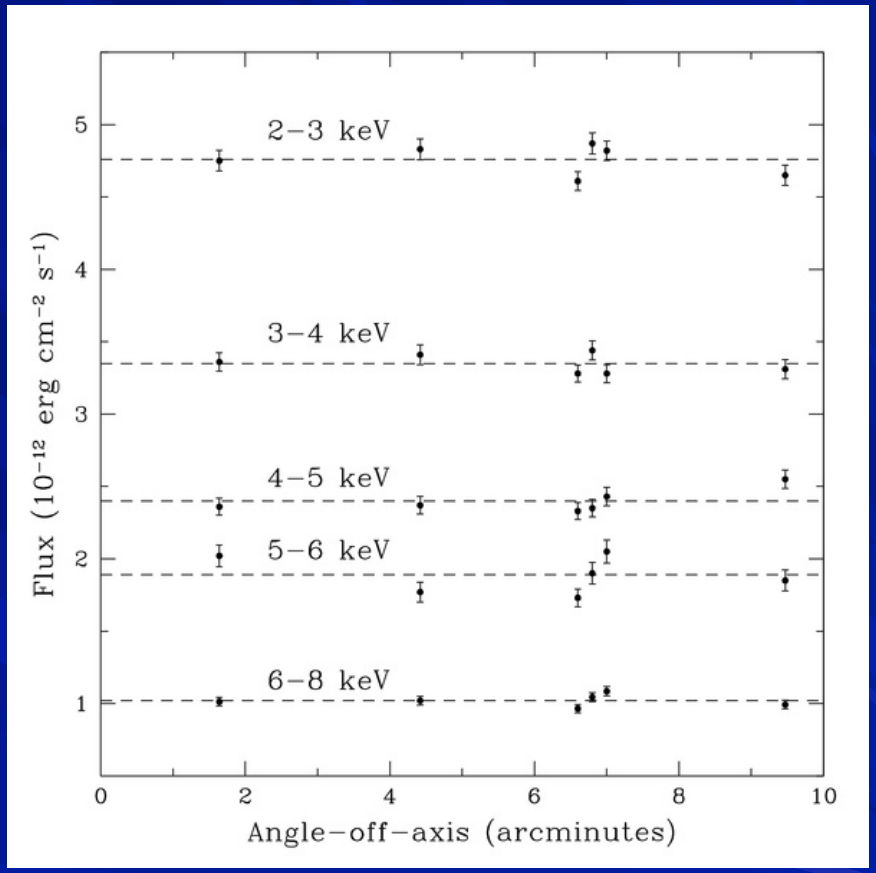
ACIS-I3



aim point

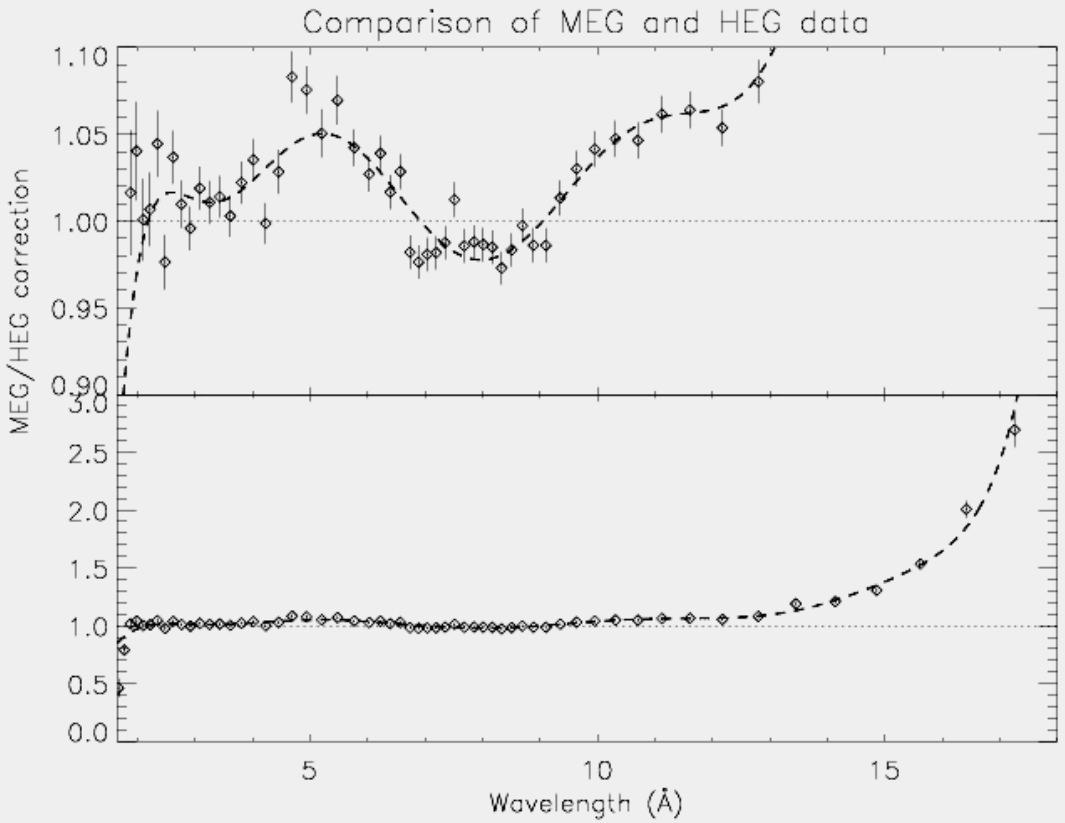
ACIS-S

read-out

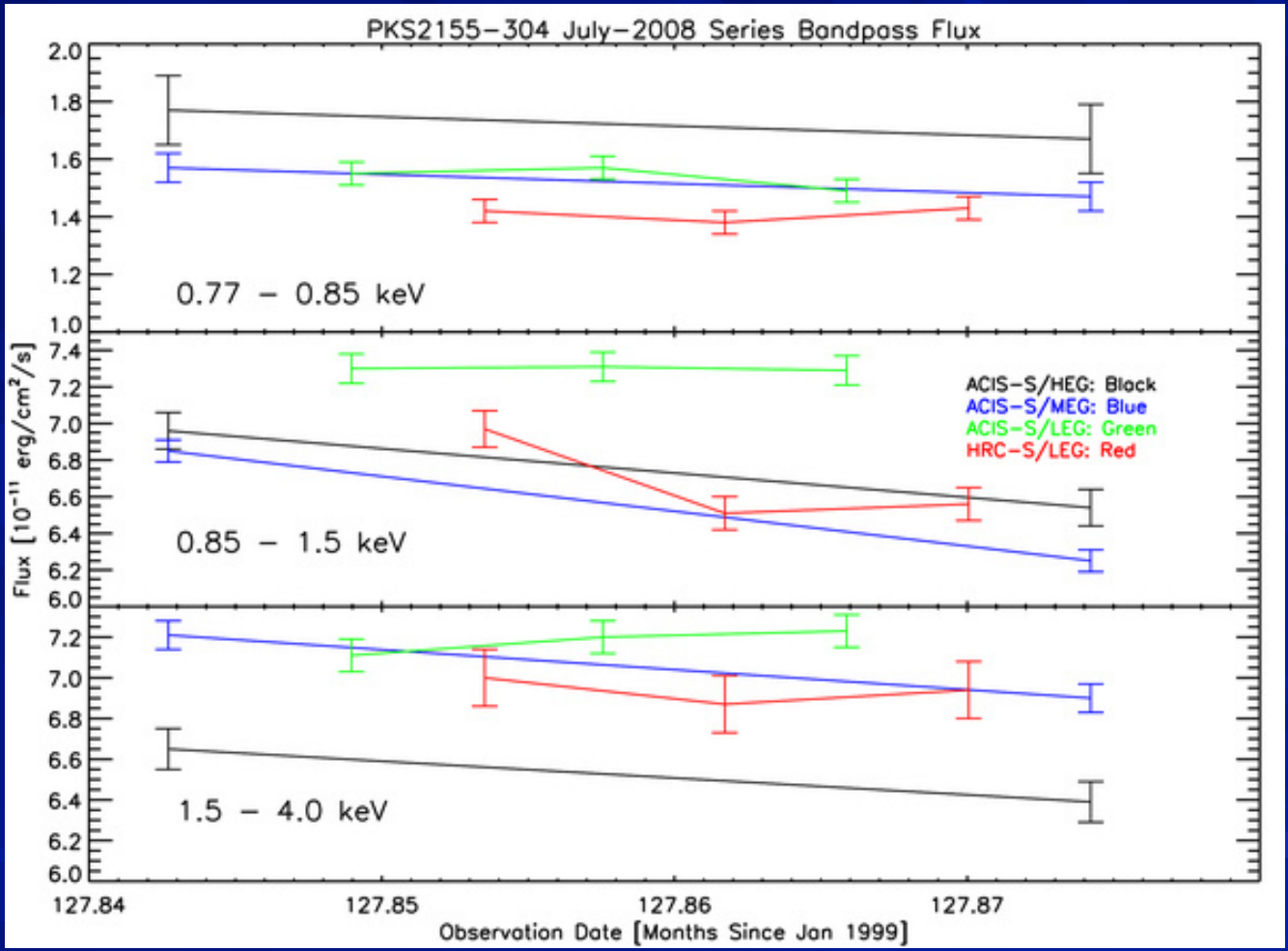


HEG/MEG Cross-Calibration

Sample of about 30 HETG/ACIS-S AGN observations



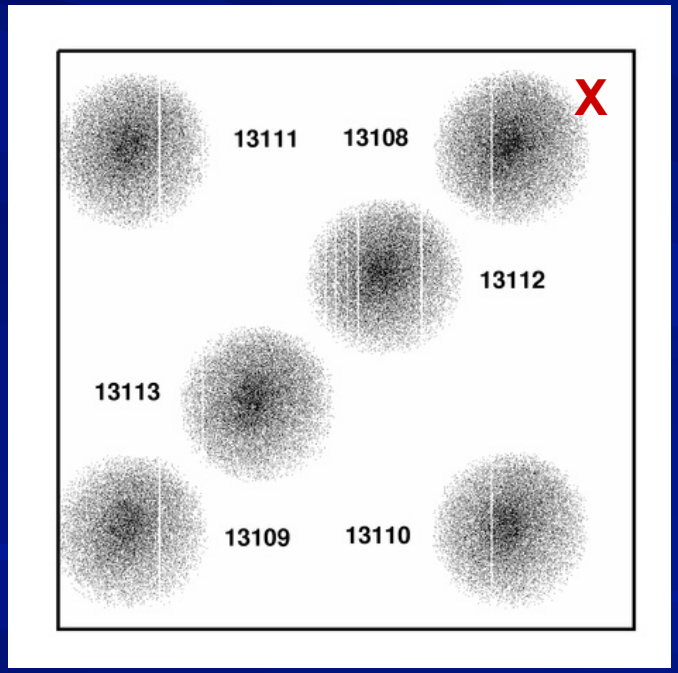
LEG/MEG/HEG Cross-Calibration

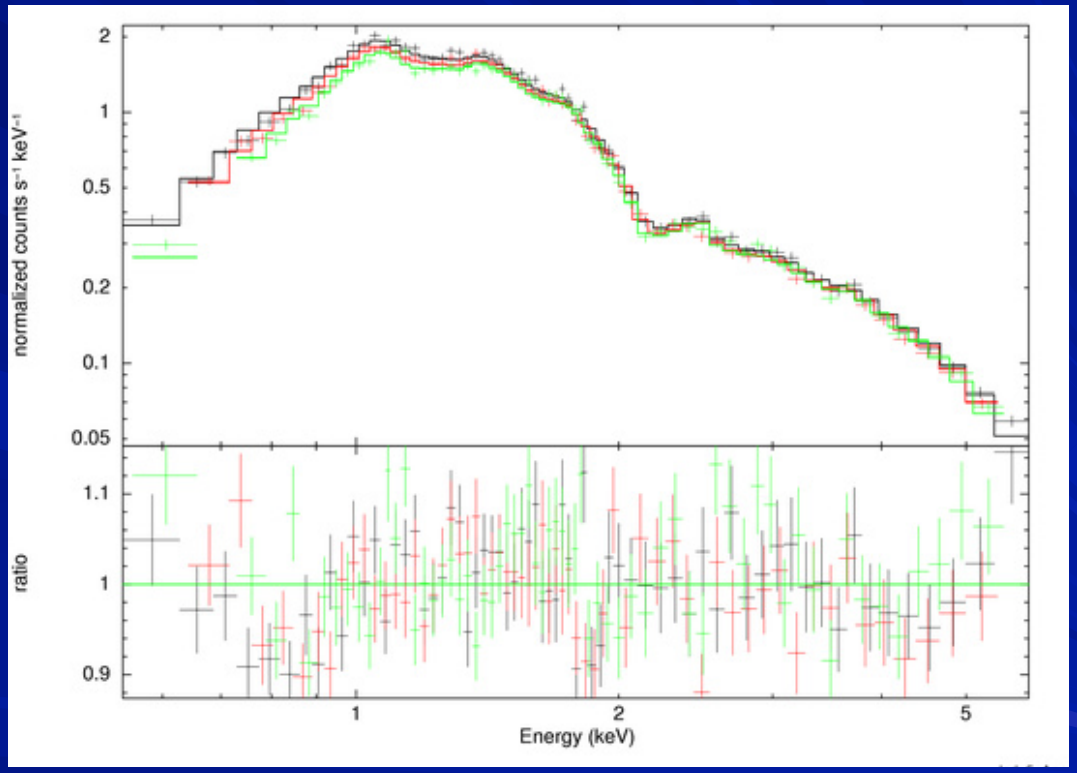


Current Calibration Issues

ACIS contamination model

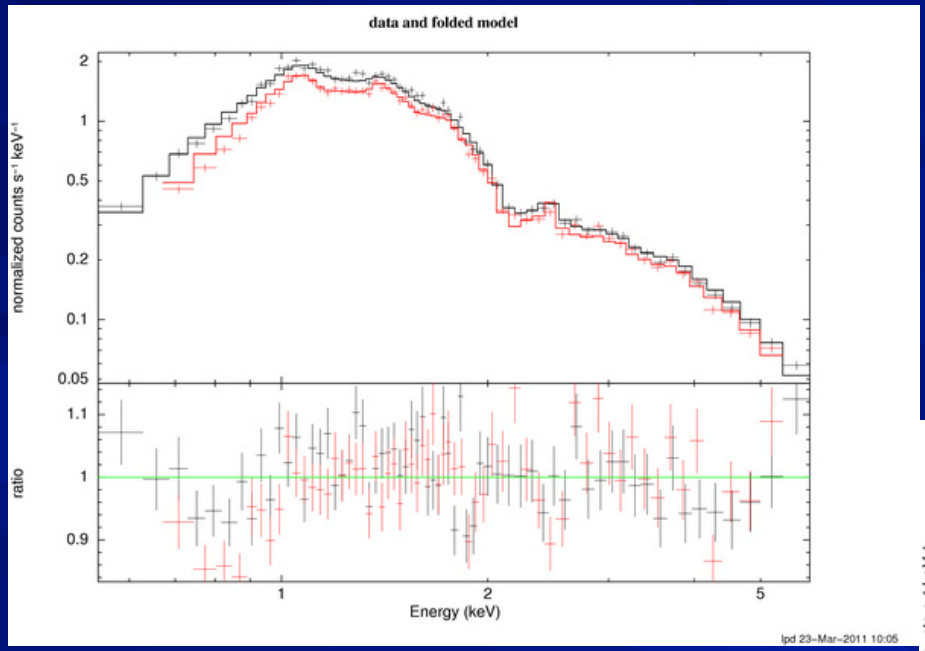
ACIS-I3





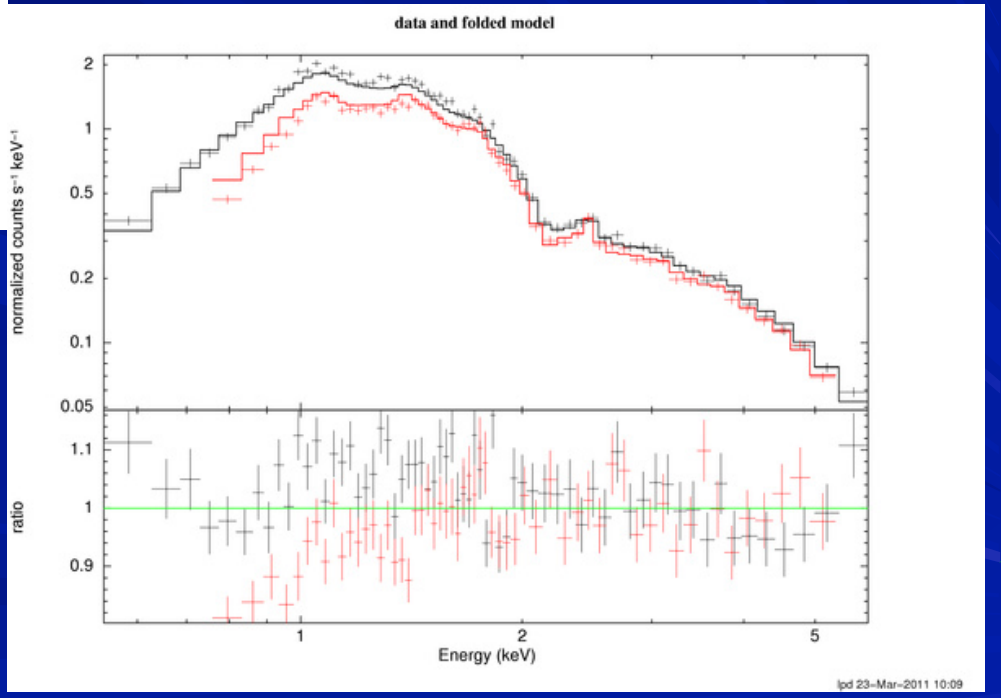
Simultaneous two-temperature fit to 13108, 13112 and 13113

ACIS contamination model



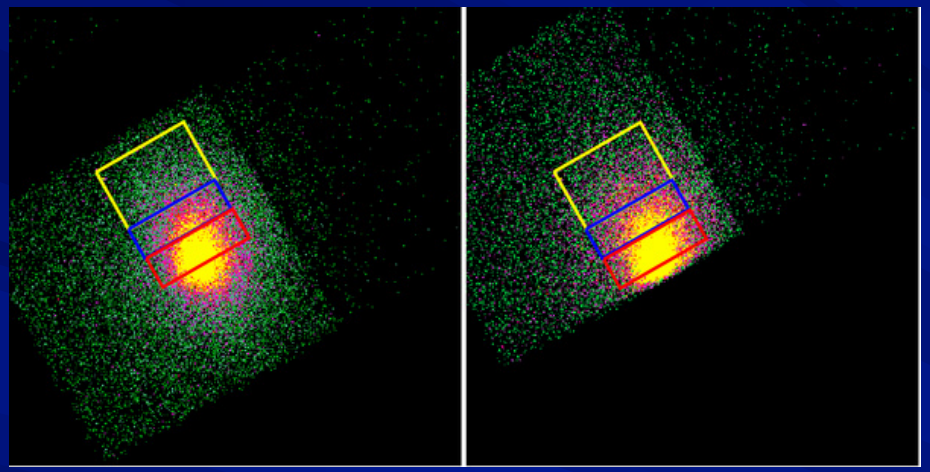
Simultaneous two-temperature fit to 13108 and 13111

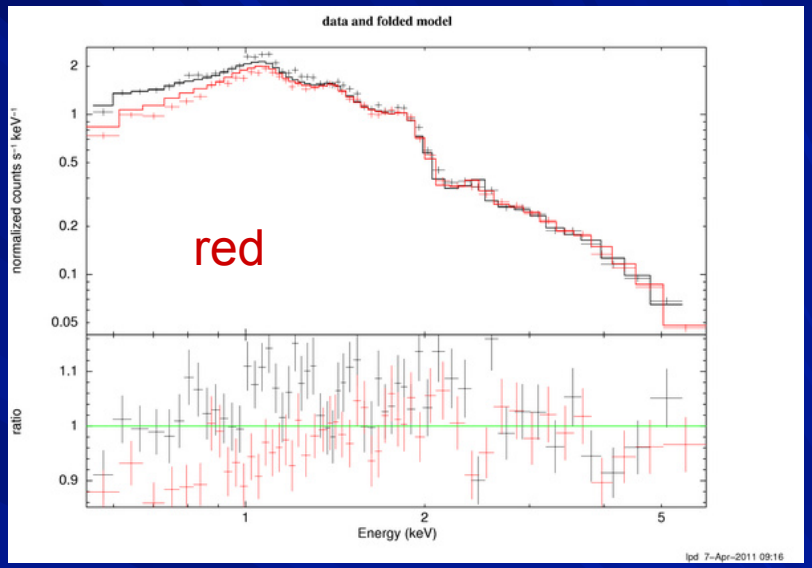
13108 and 13109

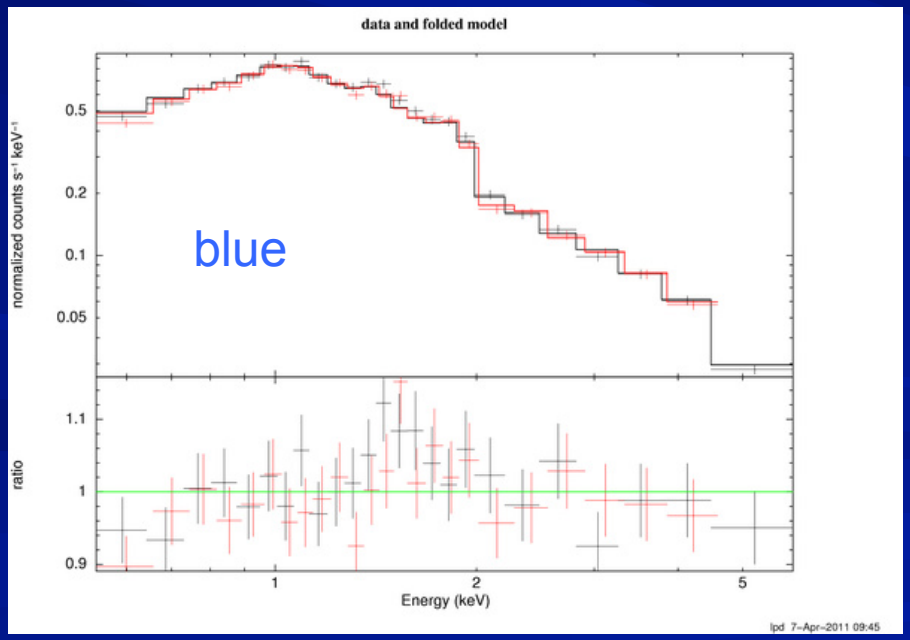


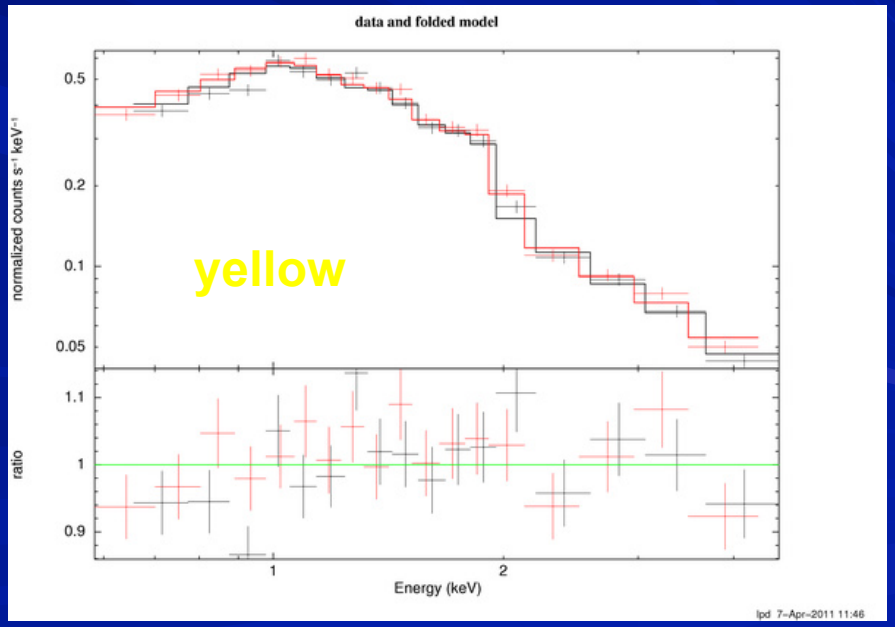
ACIS contamination model

A1795 on S3

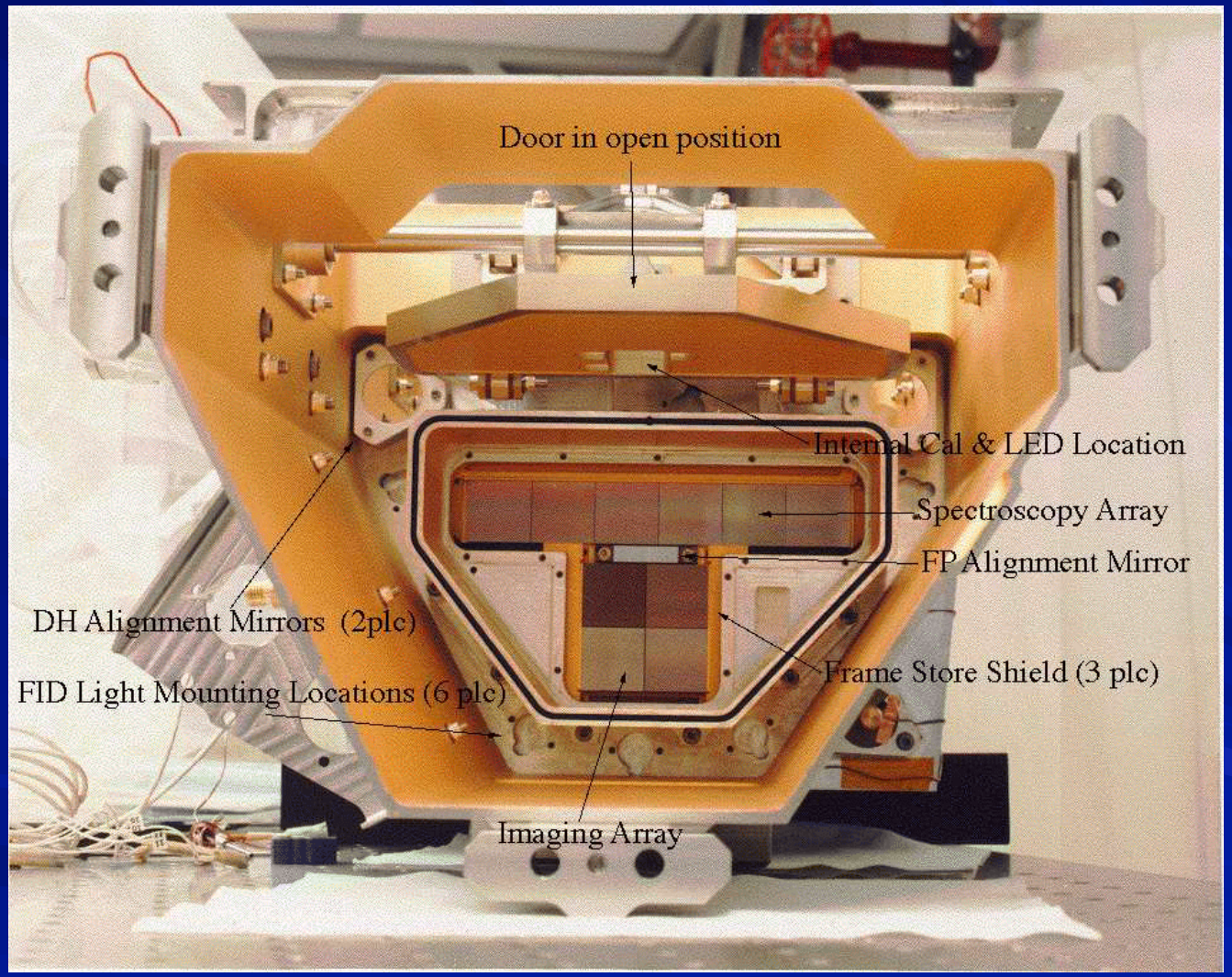








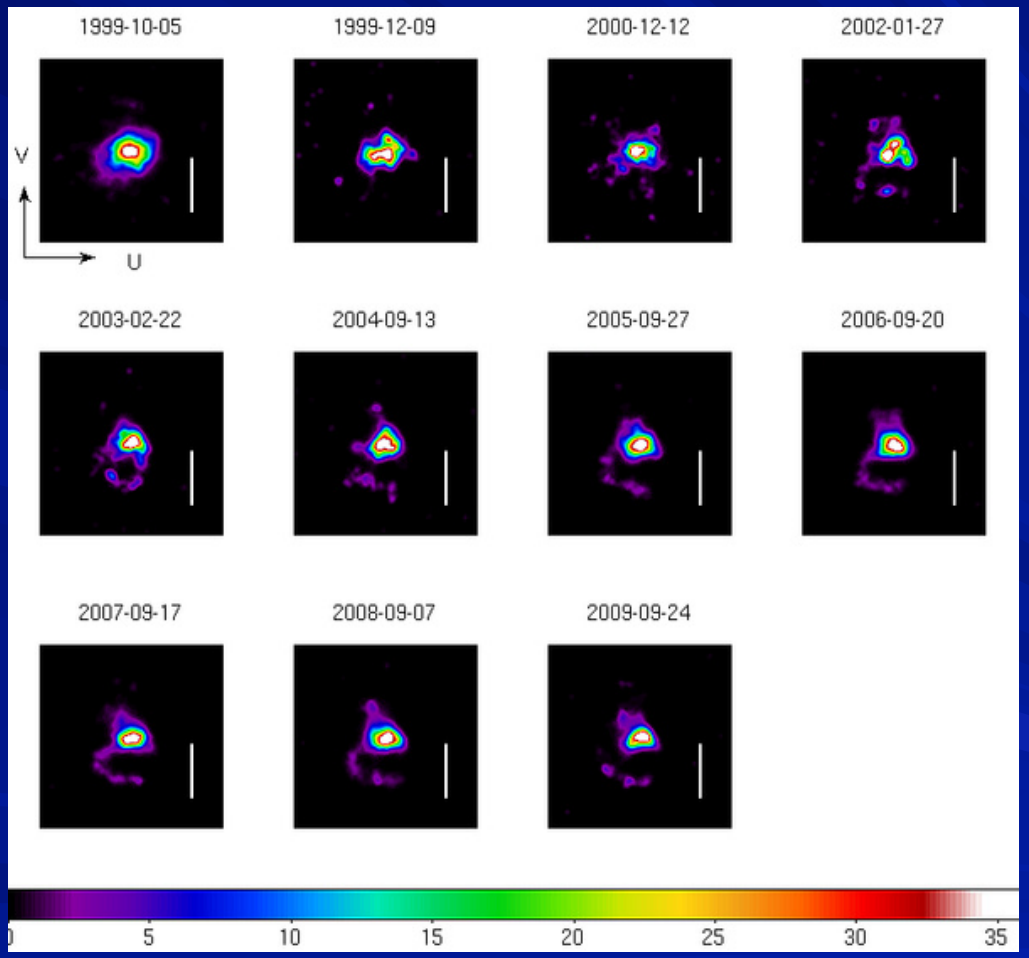
ACIS Detector



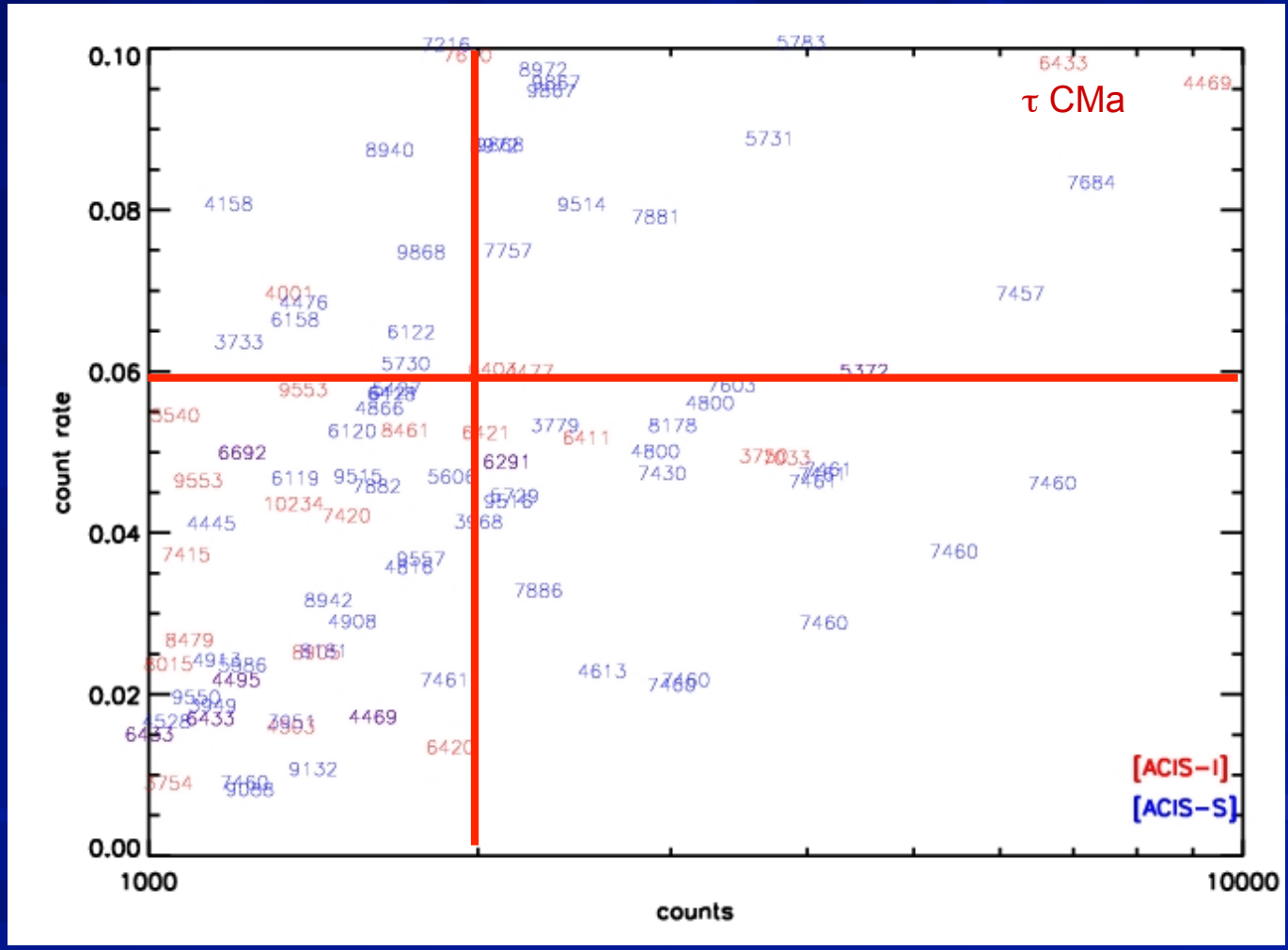
PSF Feature at 0.8” from image centroid

AR Lac HRC-I observations

Feature contains about 3% of the flux

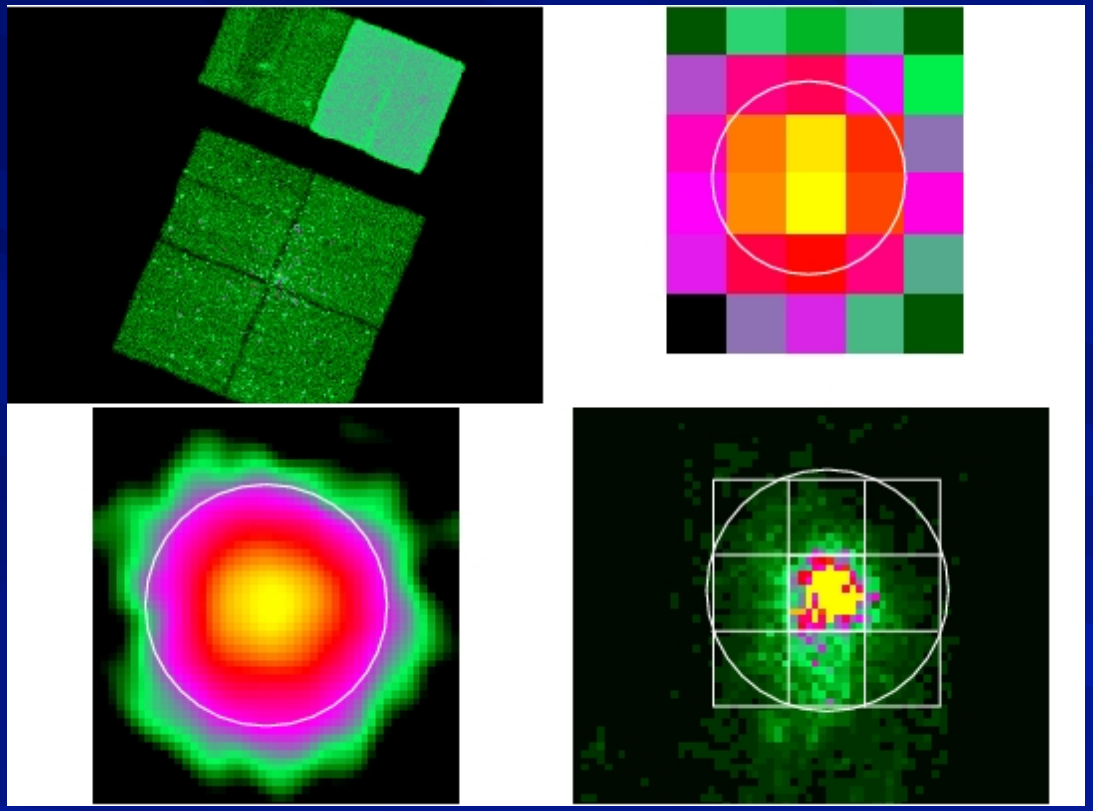


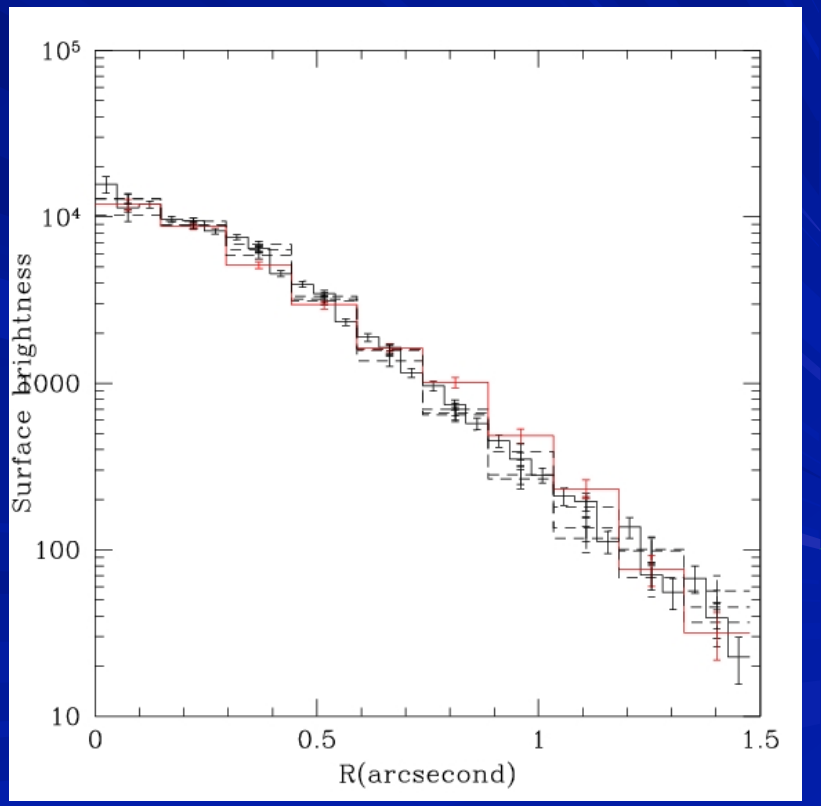
PSF Feature


τ CMa
[ACIS-I]
[ACIS-S]
count rate
counts
0.10
0.08
0.06
0.04
0.02
0.00
1000
10000

PSF Feature at 0.8” from image centroid

τ CMa



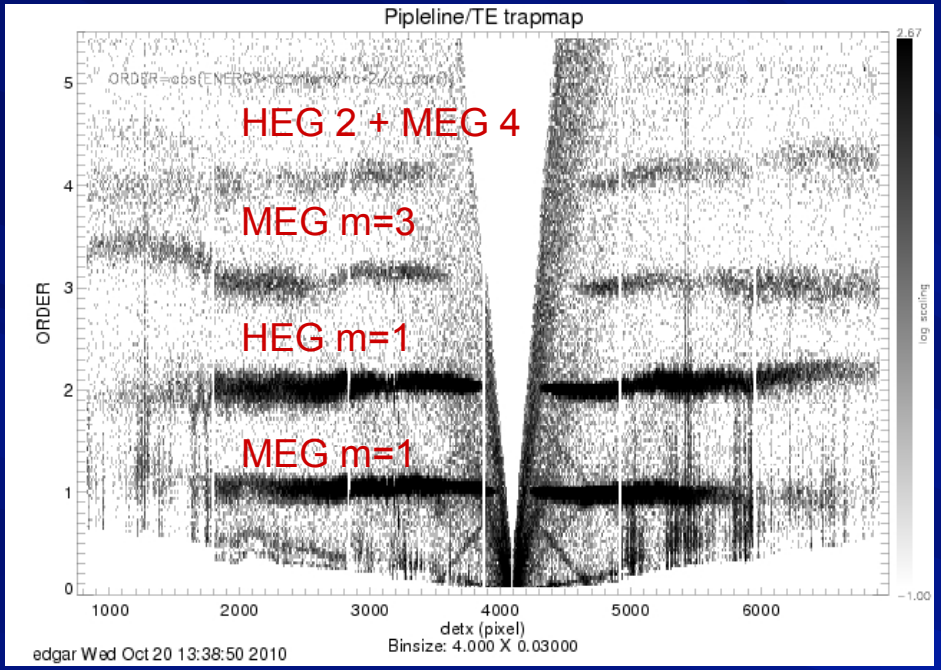


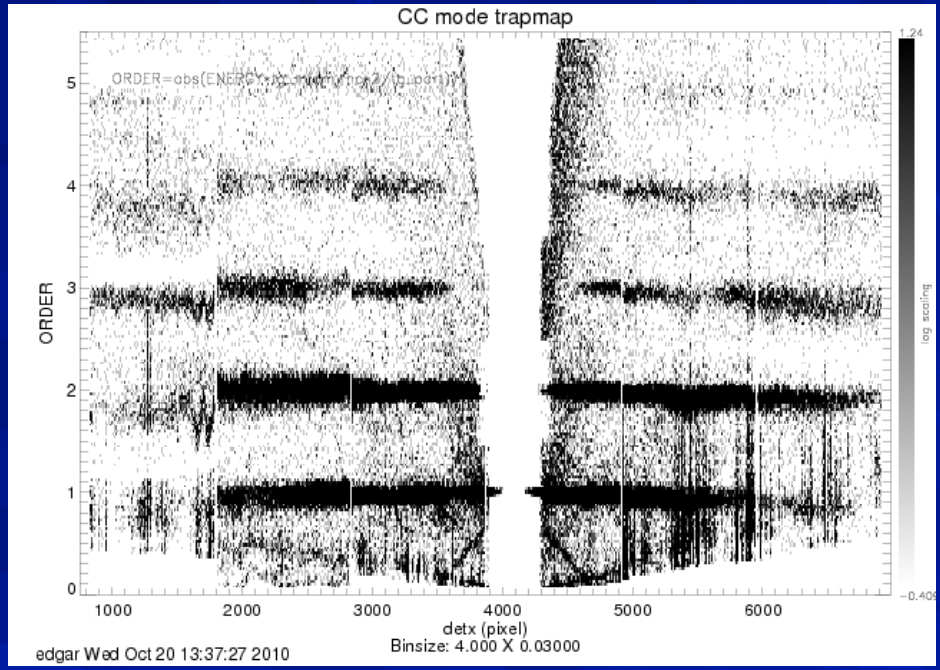
CC-F mode calibration

Required products for CC-F mode calibration

- Trap maps for CC mode data - done
- Gain tables for CC mode data – being worked
- QE tables for CC mode data
  - Prior to Dec. 2009 – being worked
  - After Dec. 2009 – should be similar to TE mode data
- RMF for CC-mode data - ?

CC-F mode calibration



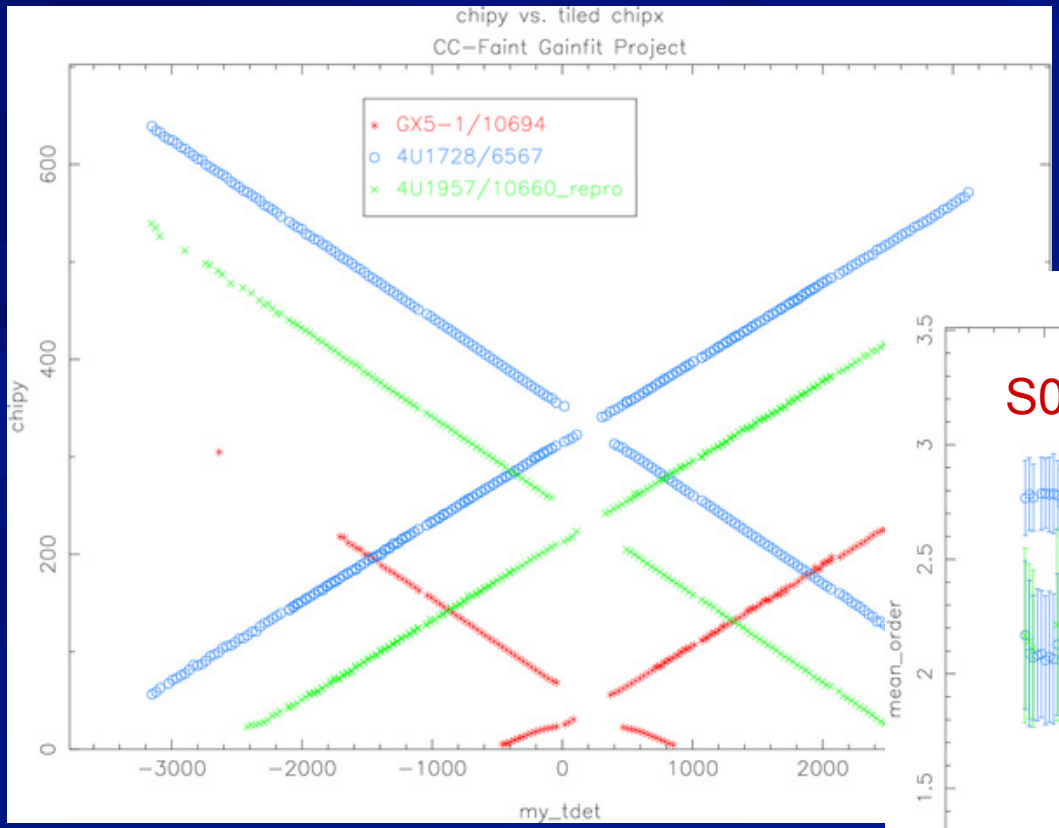


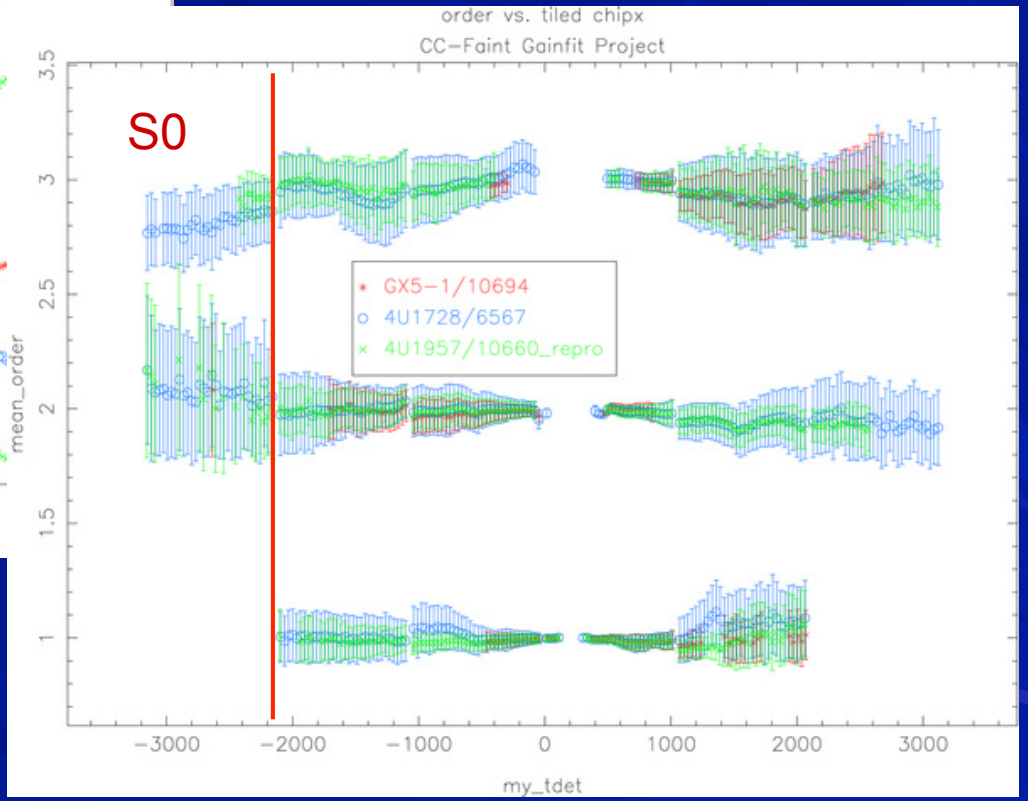
Present Default – TE mode trap map

CC-F mode trap map

Her X-1

CC-F mode gain calibration



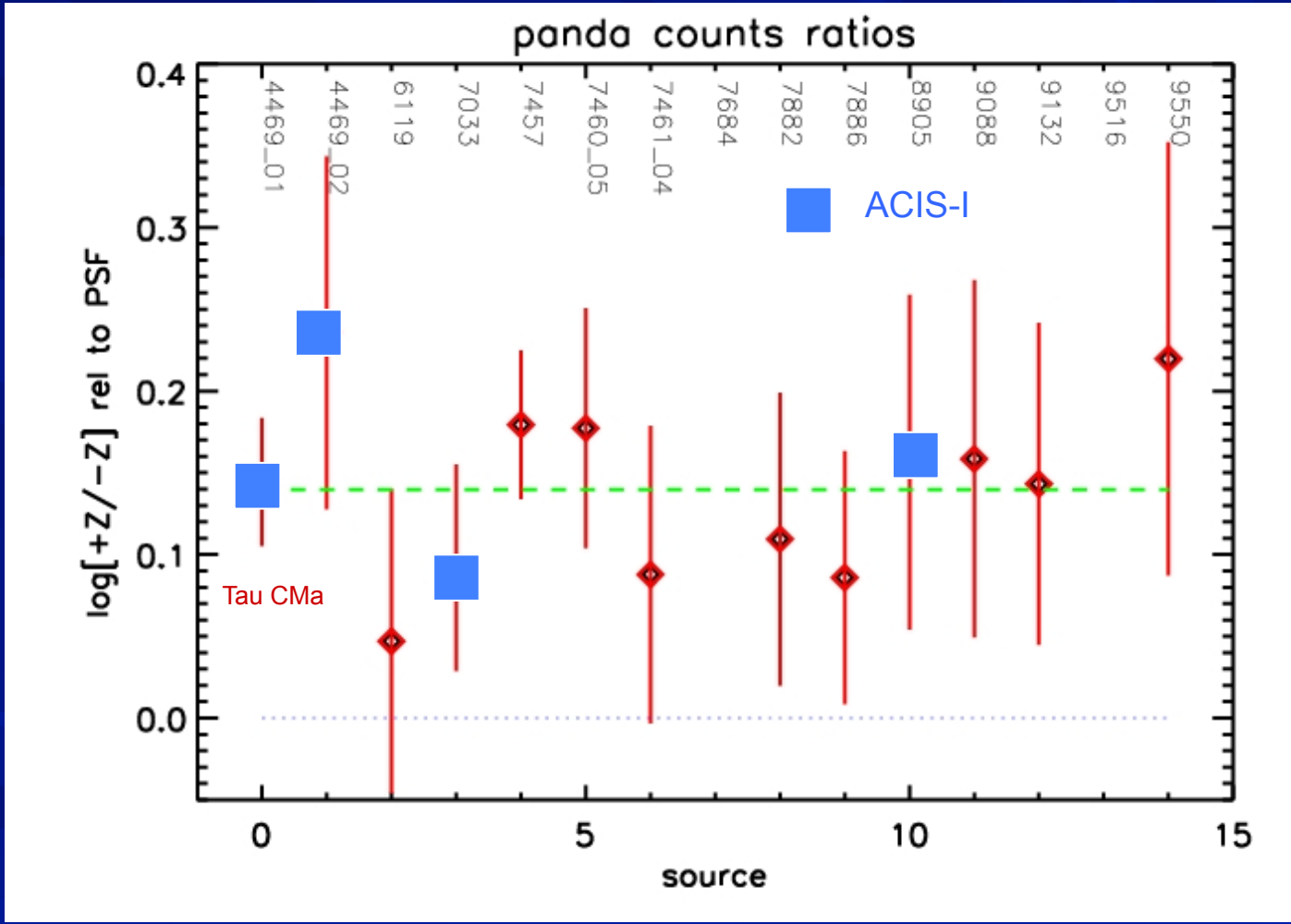


Summary of Present Calibration Activities

- CC- mode calibration
- Investigate PSF feature
- ACIS contamination model
- Adjustment to HRC-S QE below the C-K edge
- HETG higher order efficiencies

PSF Feature

Ratio of counts between 0.5-1.0” in + and – Z direction (i.e., parallel to the SIM)



Chandra Calibration Status

- Calibration updates since IACHEC 2010
- Internal Chandra cross-calibration status
- Current calibration issues and projects