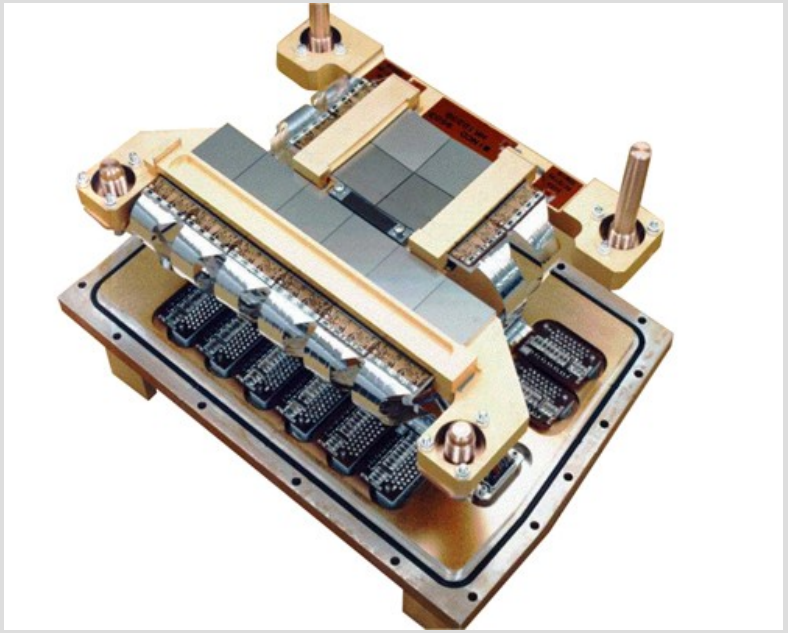
Chandra Calibration Status

IACHEC Meeting May 19, 2008

ACIS



Operating Modes

1. Timed event mode (TE)
2. Continuous Clocking Mode (CC)

Telemetry Formats

1. Very faint (VF) 5 x 5
2. Faint (F) 3x3
3. Graded

Time-independent calibration products

1. Detector QE and QE map (QEU)
2. HRMA effective area
3. Spectral response

Time-dependent calibration products

1. Detector gain (calibrated every 3 months)
2. Depth of the contaminant on the ACIS filters (measured every 6 months)

Summary of ACIS Calibration Efforts

1. A complete set of cti-corrected calibration products for TE data taken in F or VF telemetry format was released in Dec. 2006. These data comprise about 80% of all ACIS data.

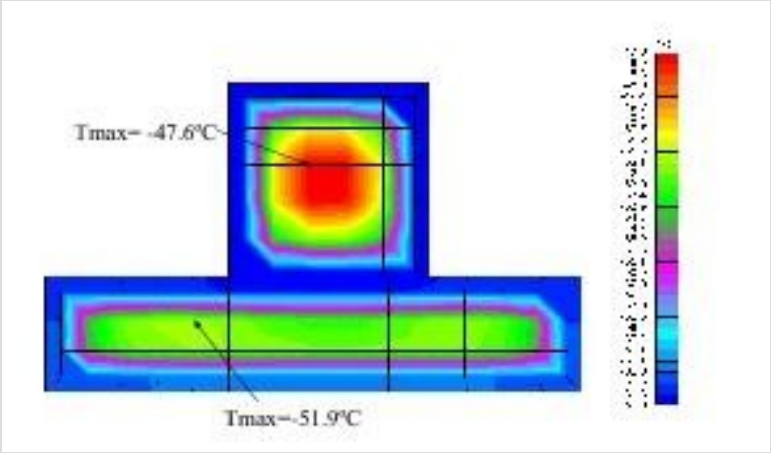
3. A complete set of cti-calibration products for TE data taken in graded telemetry format have been developed and tested with ECS data and in-flight data. These new calibration products require changes to the CIAO task acis_process_events.

5. Work is on-going to develop a set of cti-corrected calibration products for CC data taken in F telemetry mode.

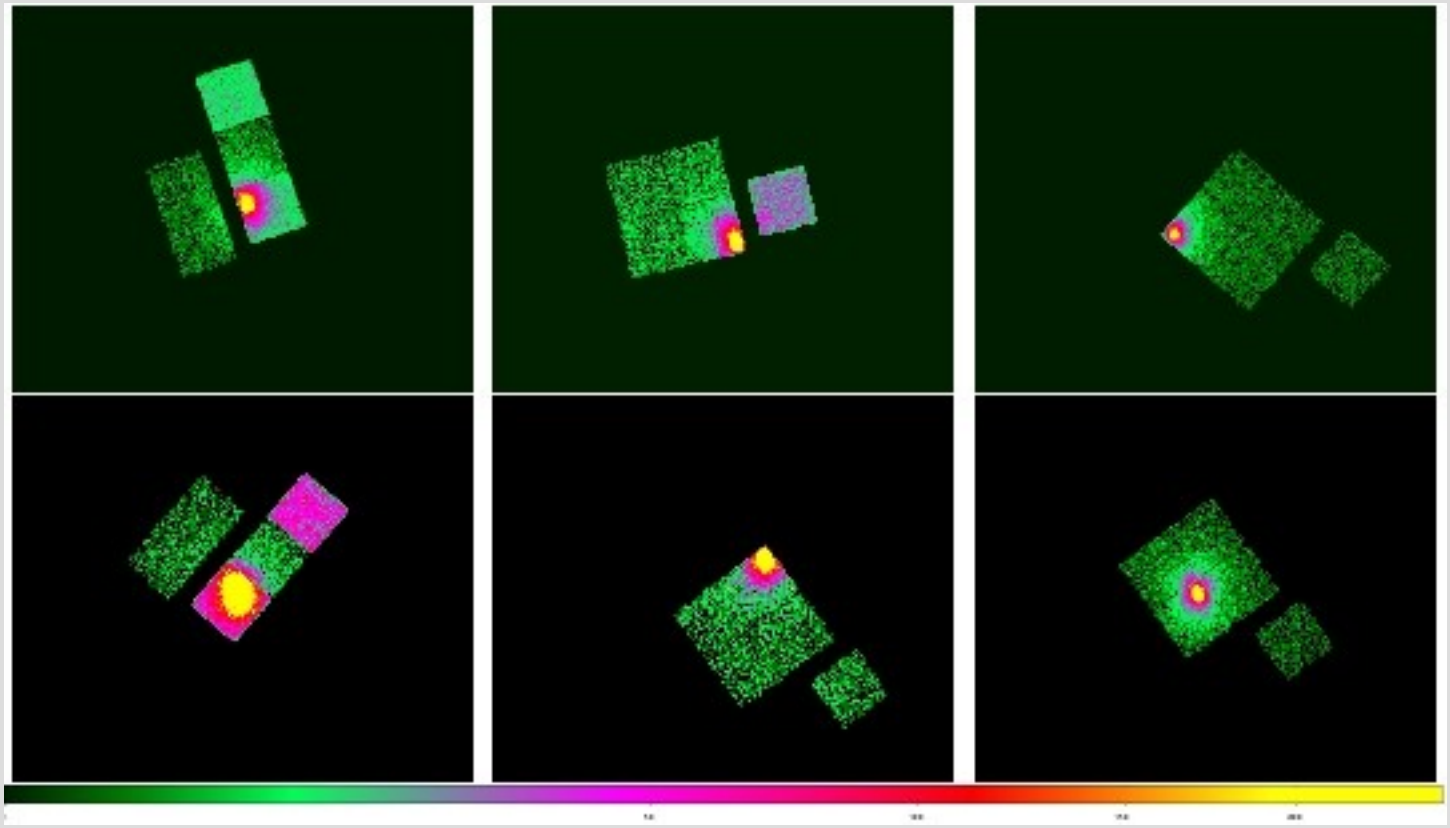
7. Work has not yet commenced on updating the calibration for CC data taken in graded mode.

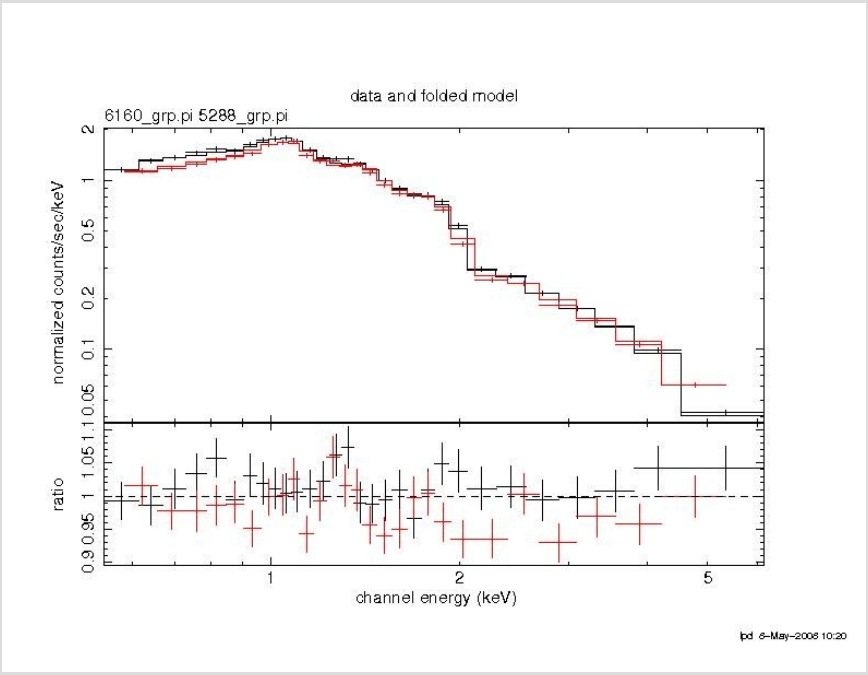
9. Updates are underway for improving the ACIS contamination model.

ACIS Internal Calibration



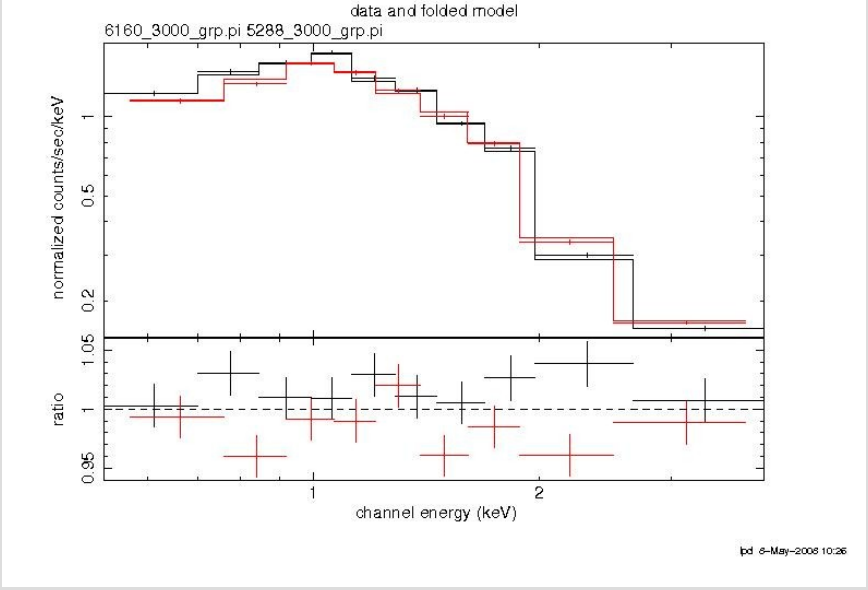
Abell 1795 observations





Comparison of Abell 1795 data at the S3 aim-point and top of S3. The data are simultaneously fit to an absorbed VAPEC model.

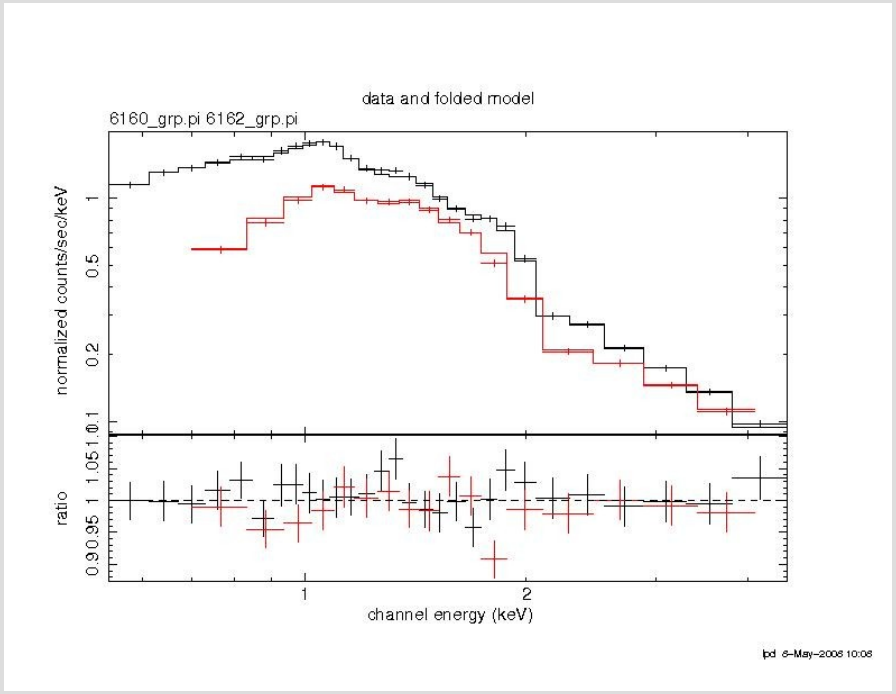
Bin = 1000



Bin = 3000

Most residuals are less than 3%

Comparison of Abell 1795 data at the S3 and I3 aim-points.



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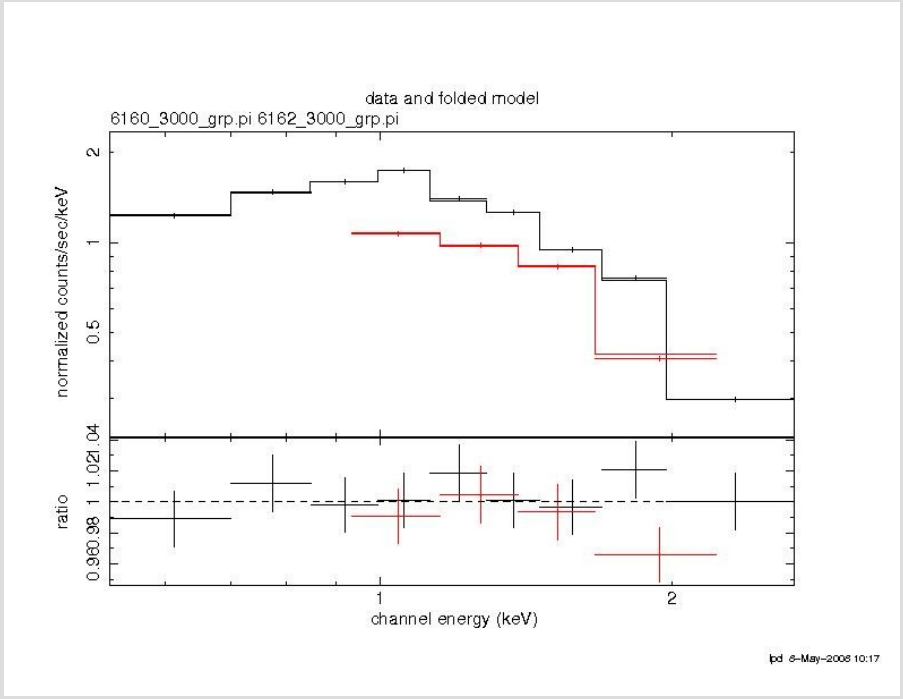
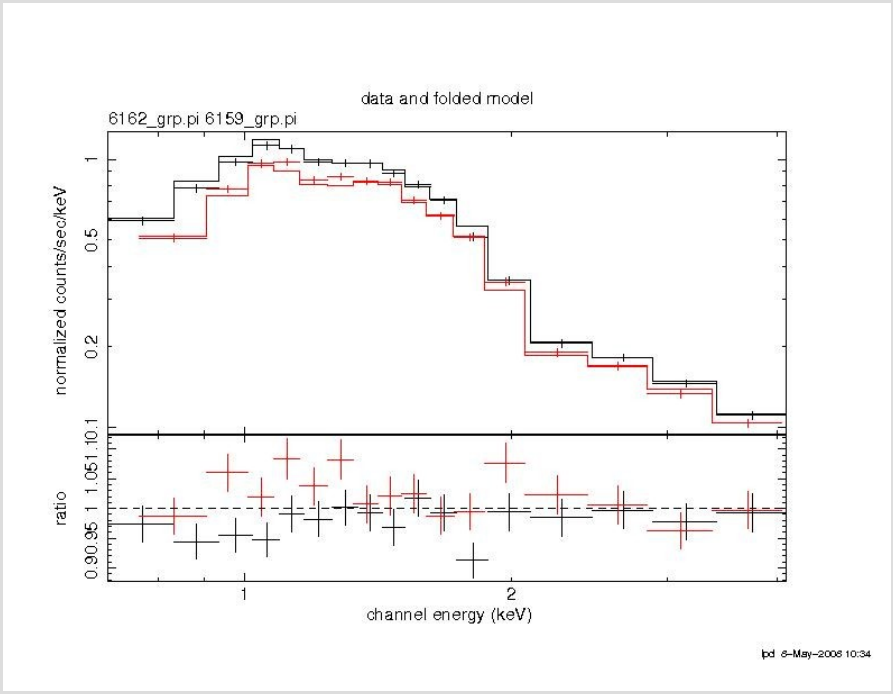
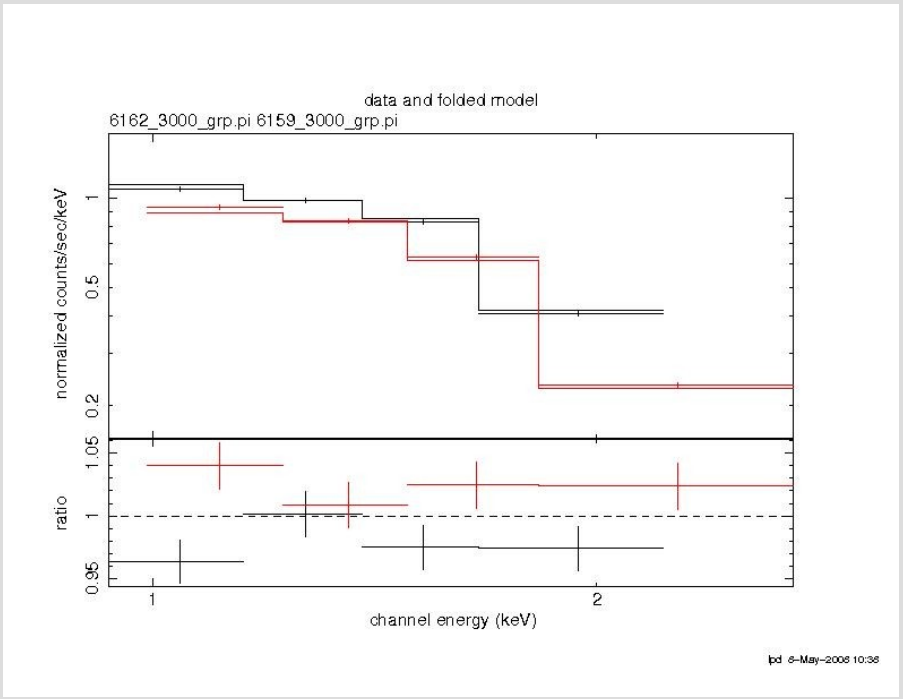


Bin = 3000

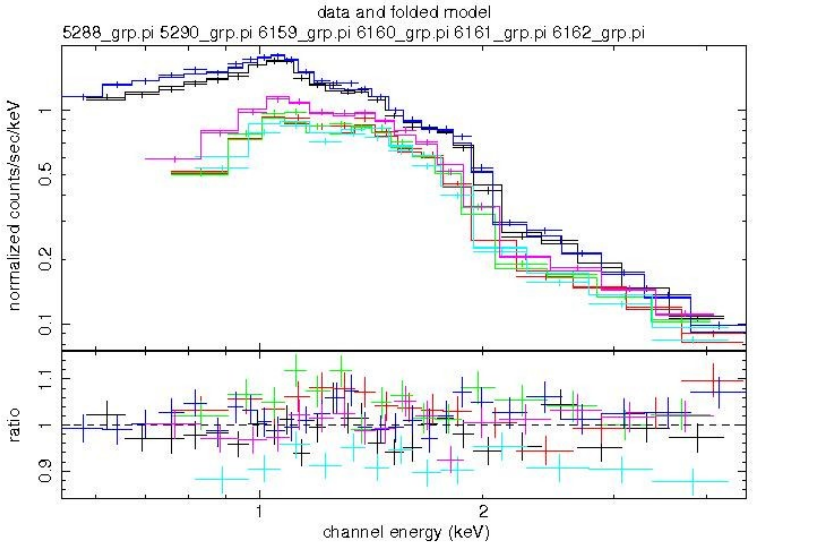


Comparison of Abell 1795 data at the I3 aim-point and corner of ACIS-I.

Bin = 1000

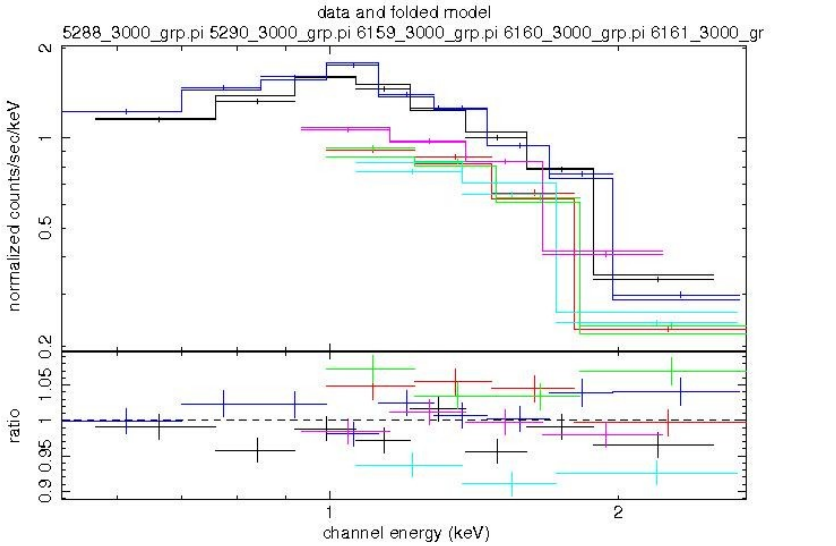


Bin = 3000



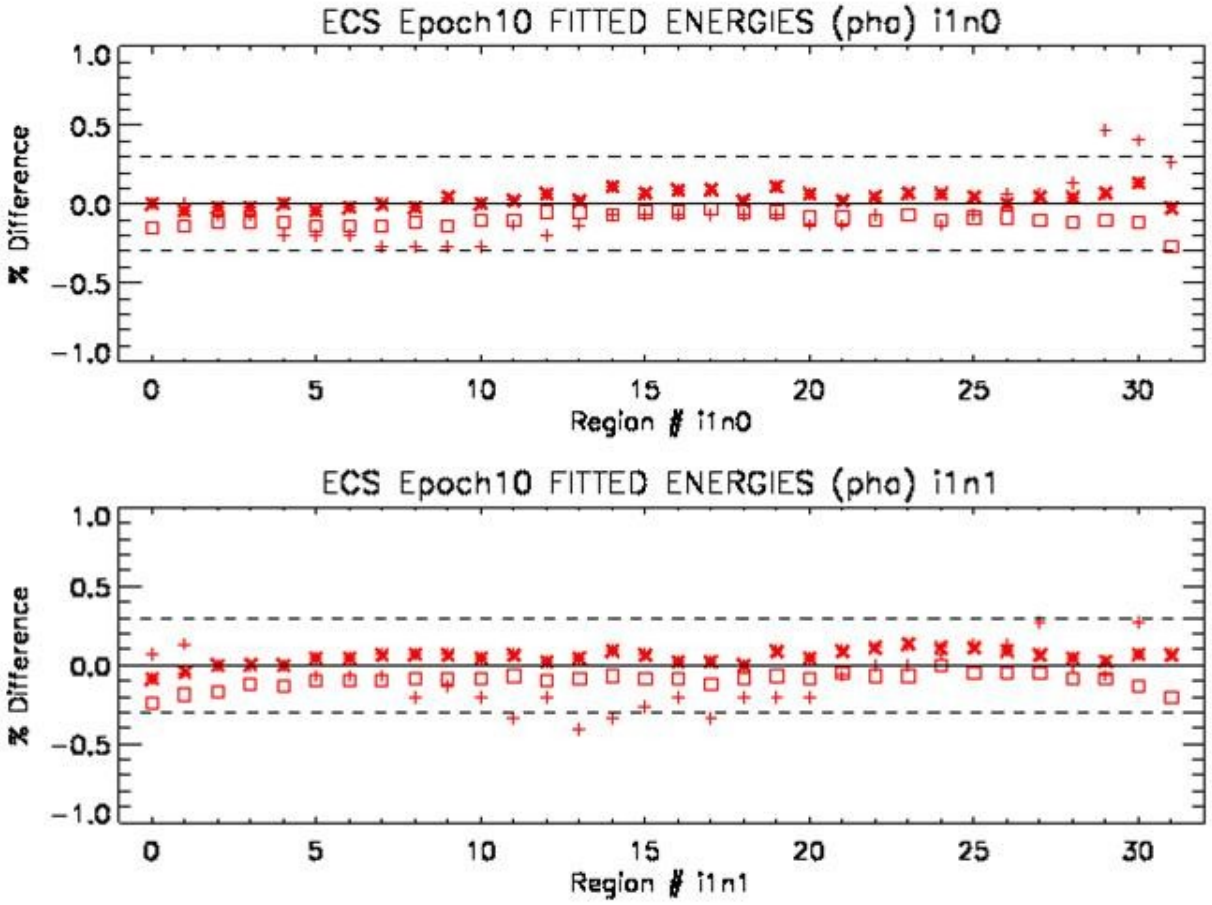
Comparison of all 6 Abell 1795 observations.

Bin = 1000



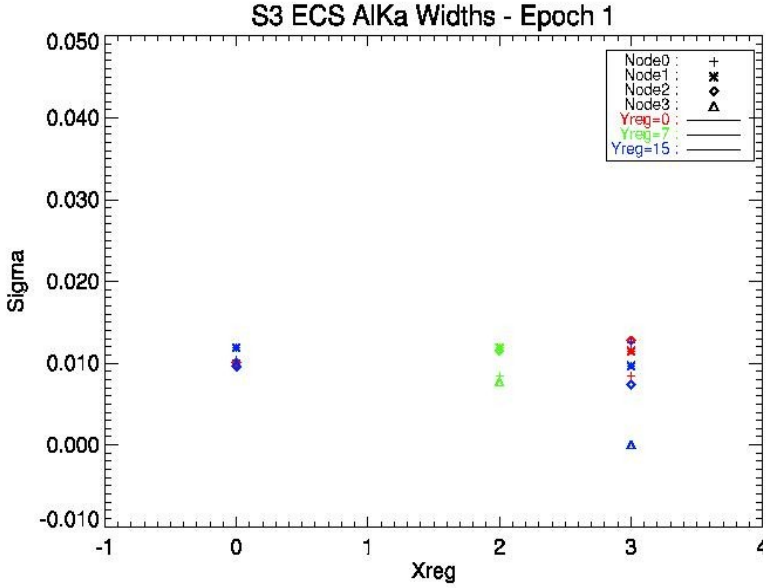
Bin = 3000

ACIS Gain Calibration



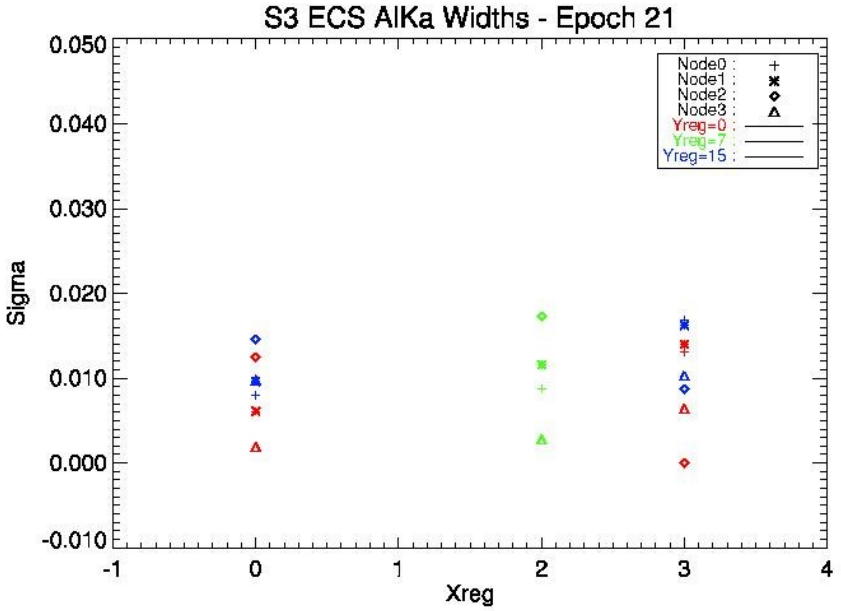
ACIS Spectral Resolution

Al-Ka



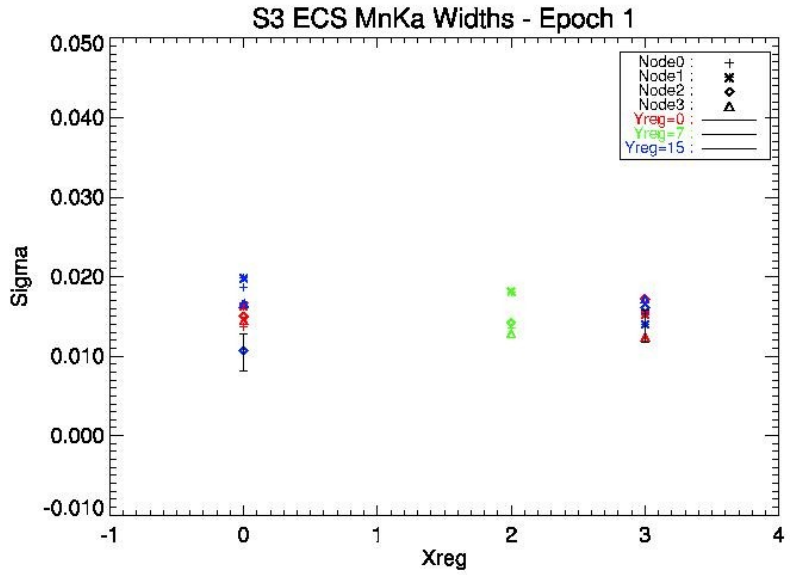
Epoch 1

Epoch 21



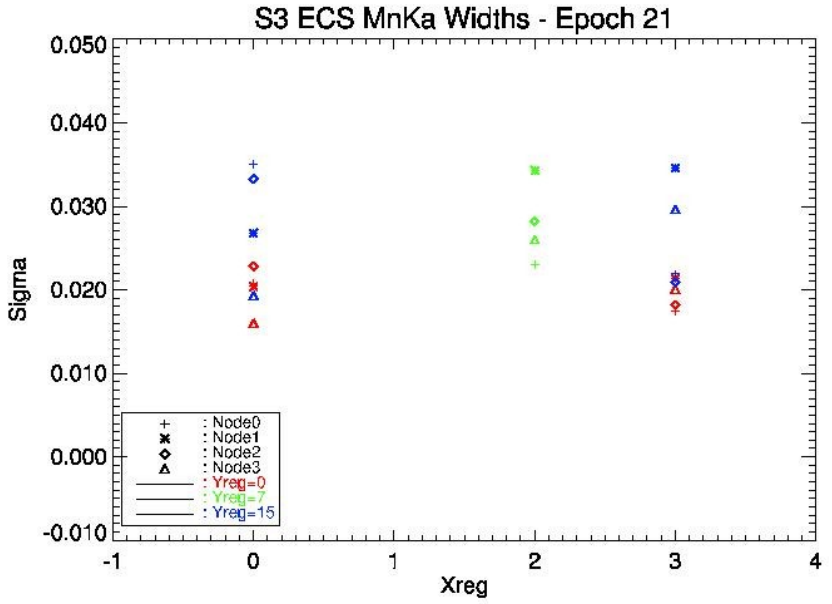
ACIS Spectral Resolution

Mn-Ka



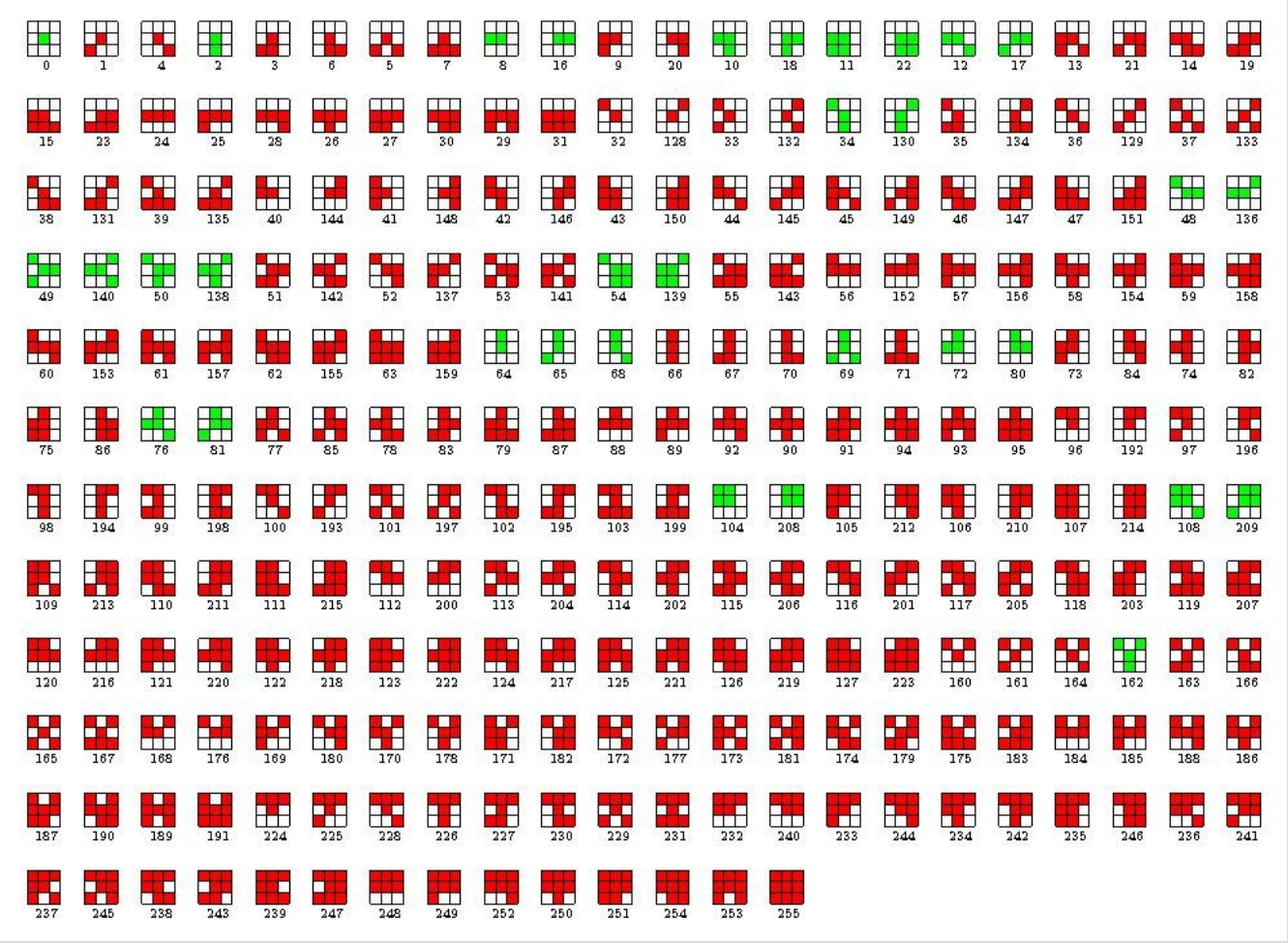
Epoch 1

Epoch 21

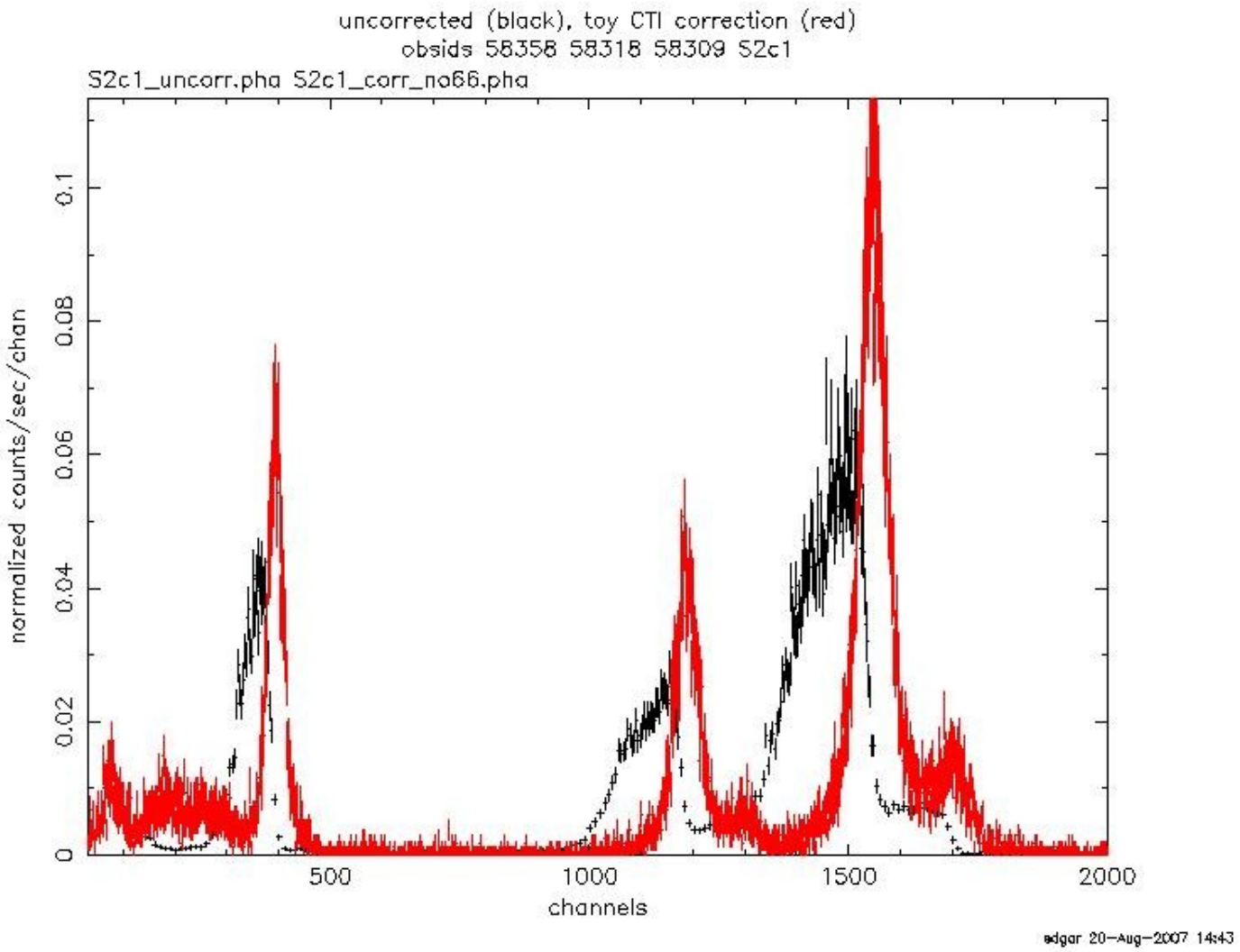


CC Mode Calibration

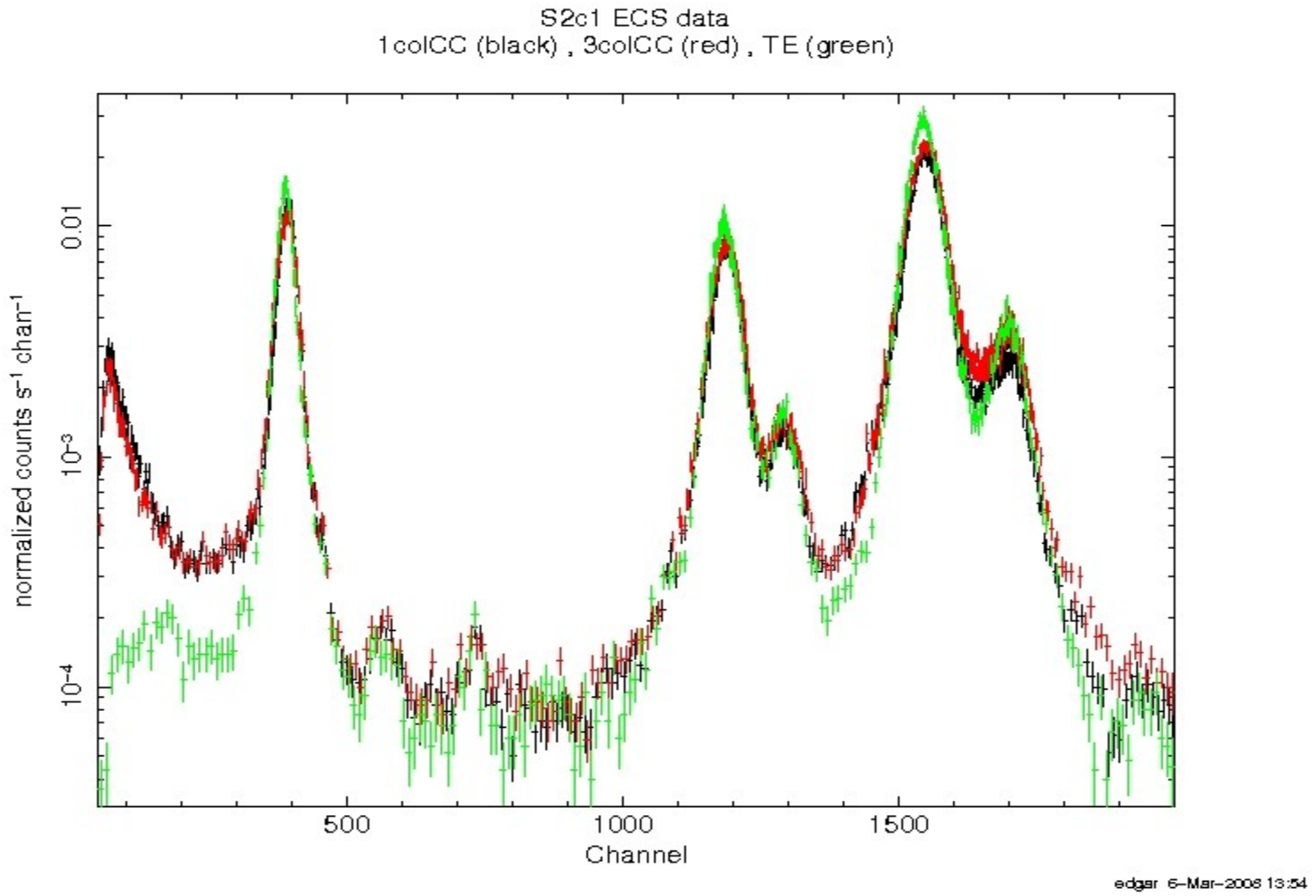
Flight Grade Distributions



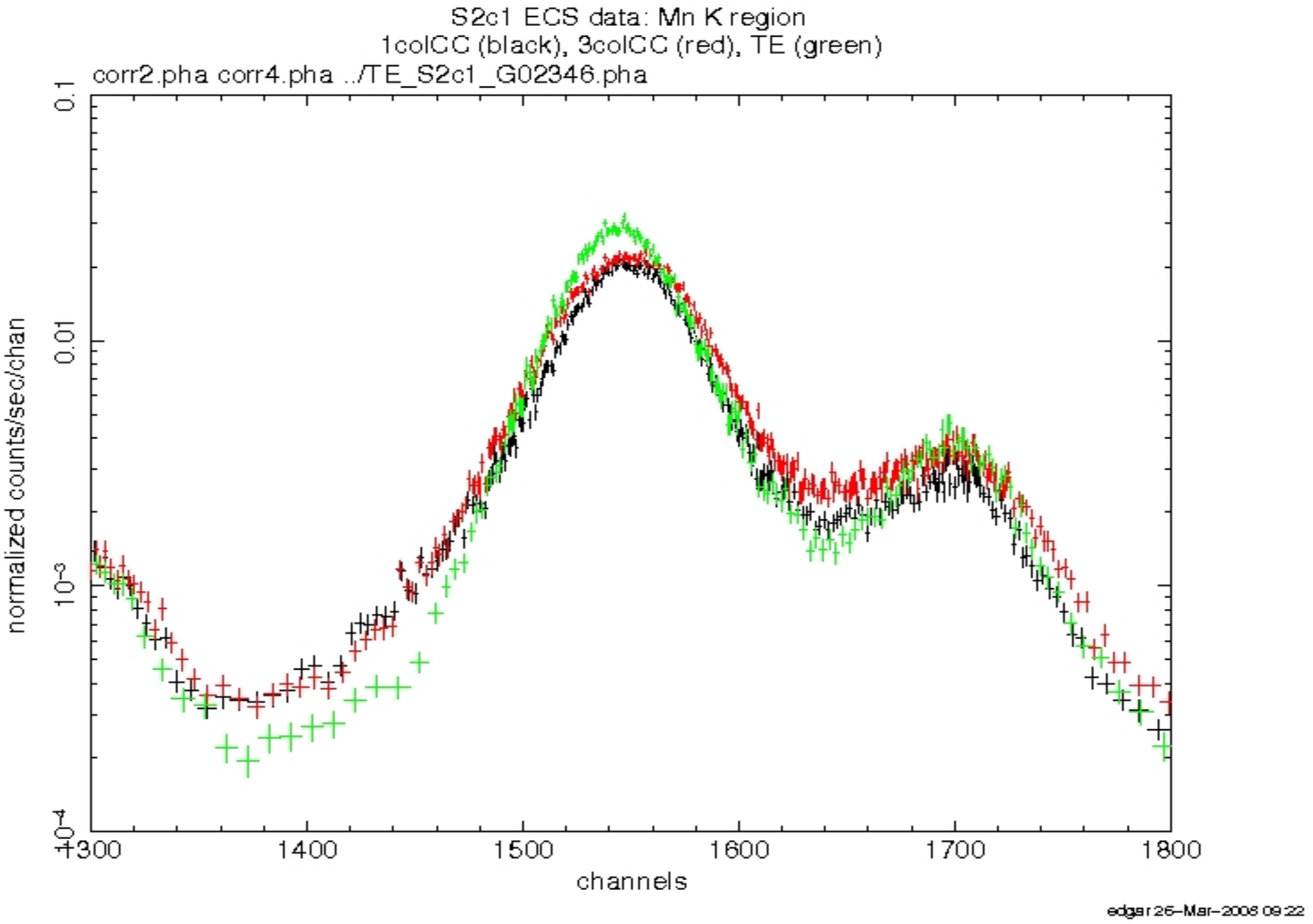
Line profiles of ECS data in CC mode



CTI-corrected CC-Mode Data

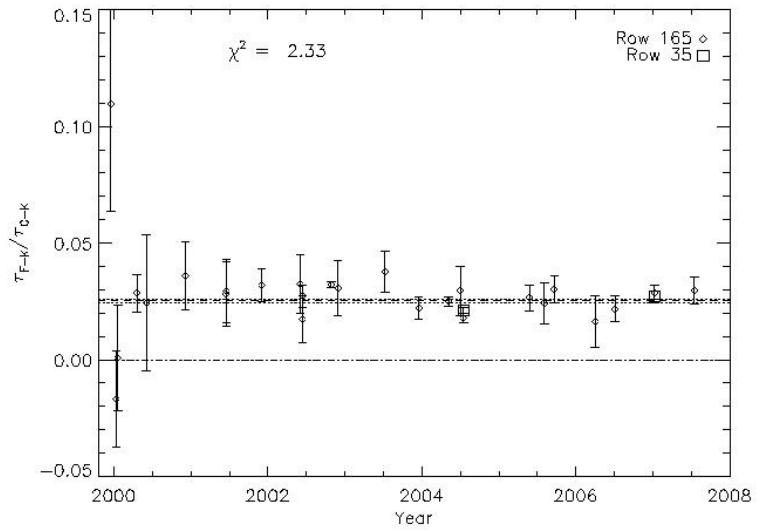


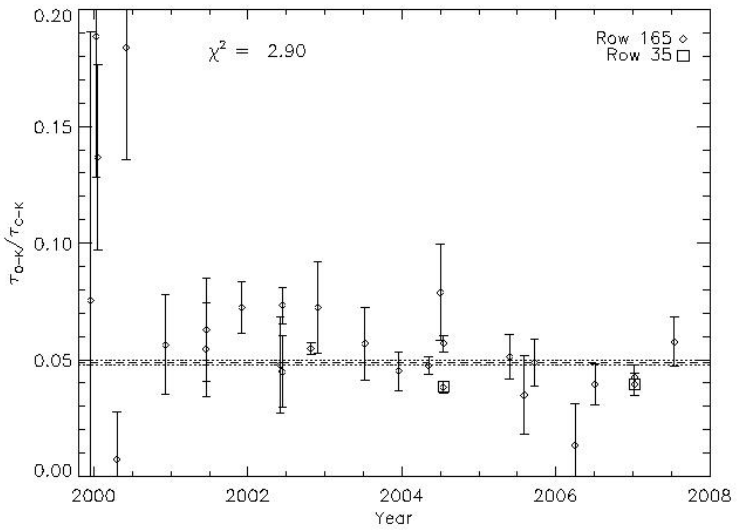
CTI-corrected CC-Mode Data



Contaminant on ACIS Filter

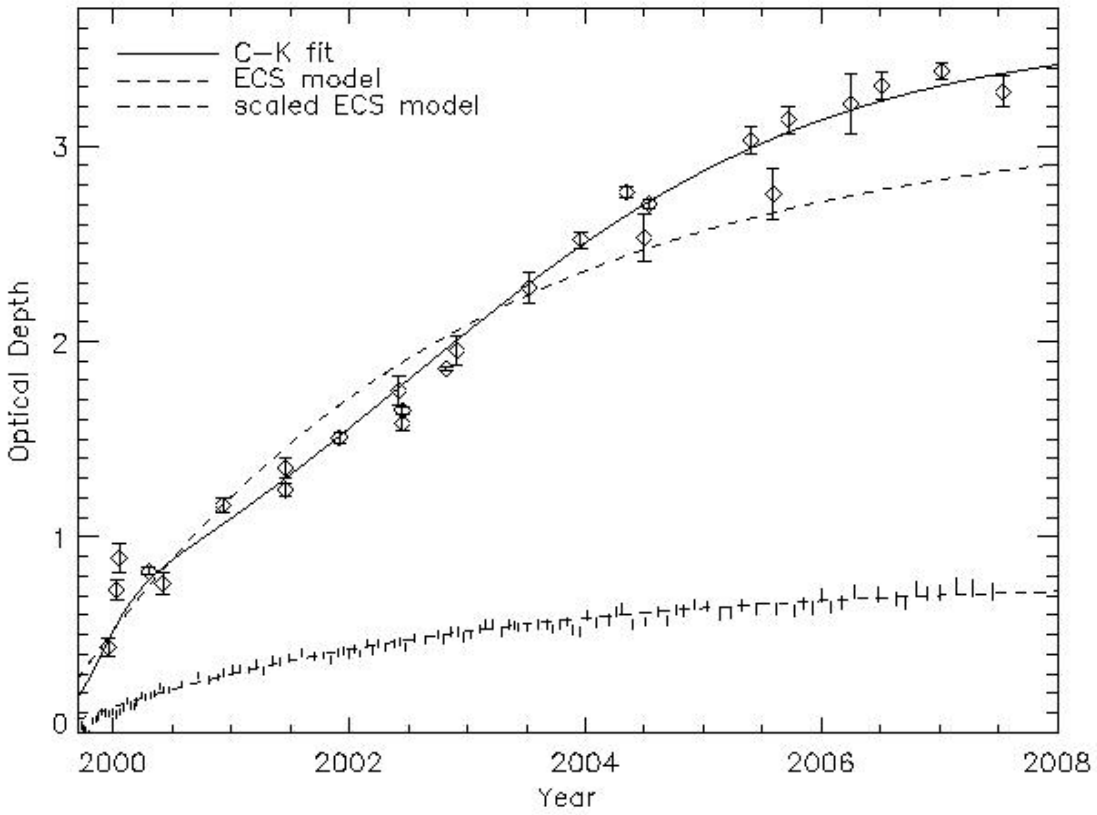
Chemical Composition





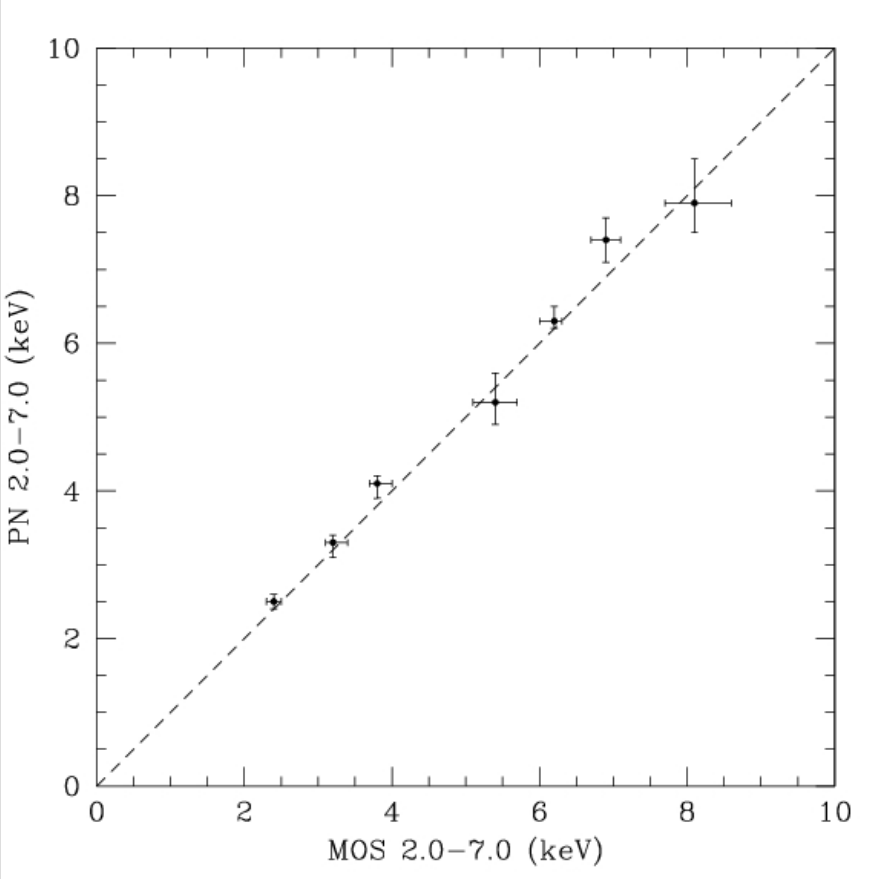
Contaminant on ACIS Filter

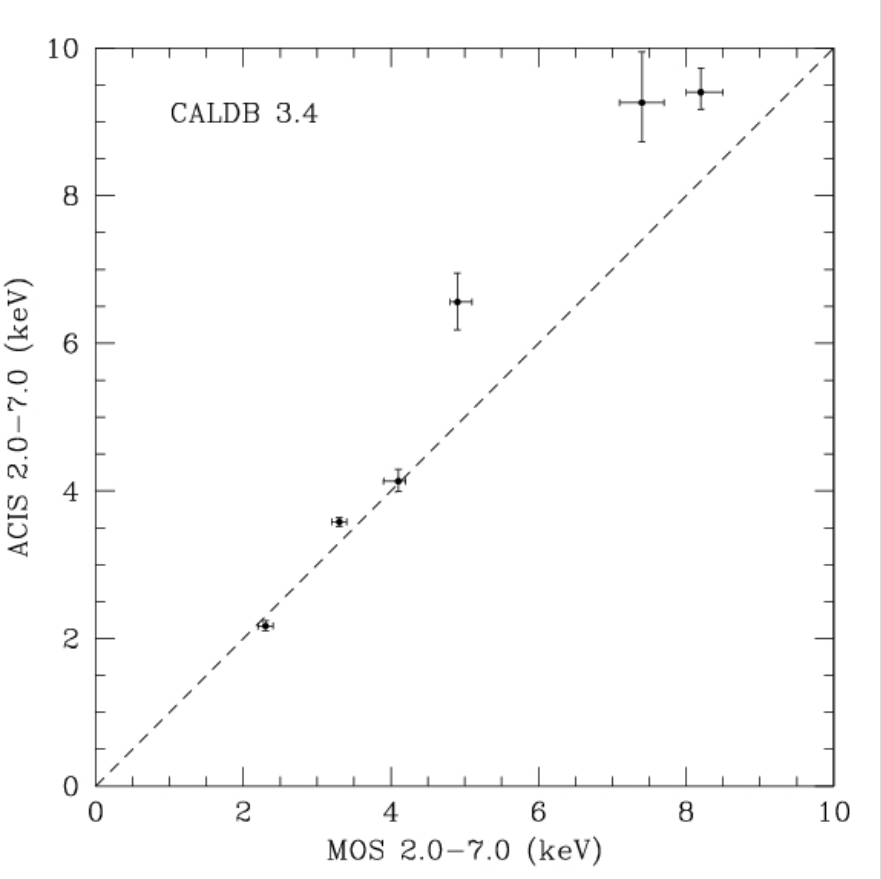
Time Dependence



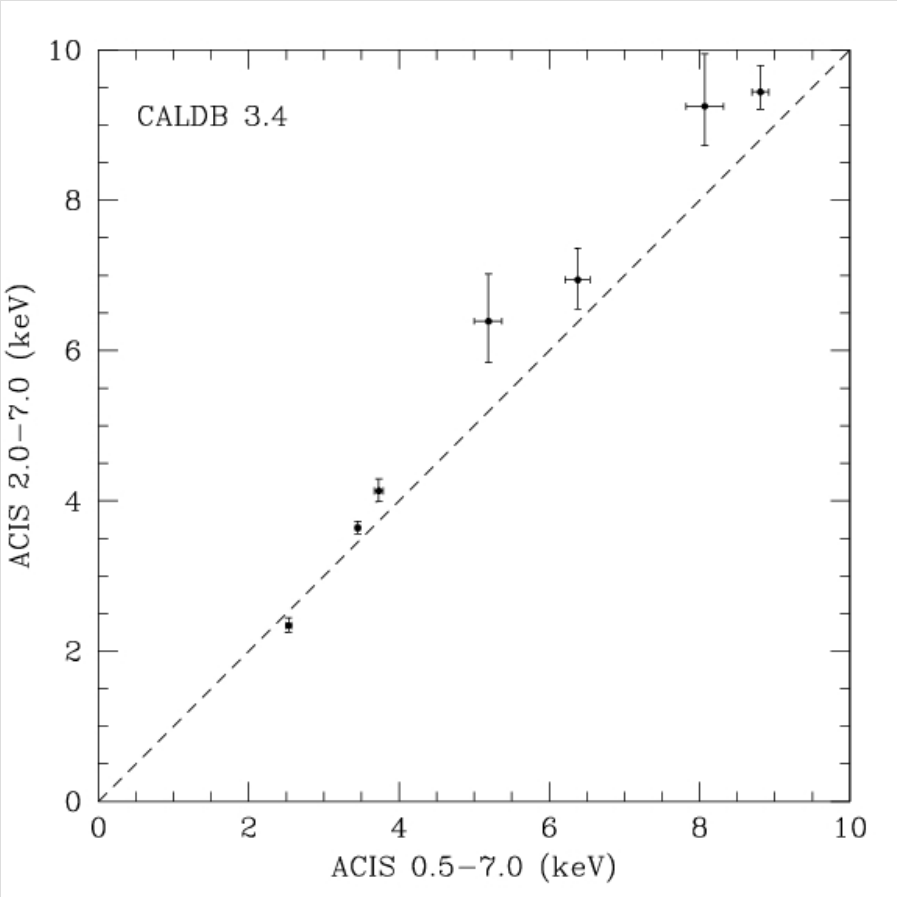
HRMA Calibration Status

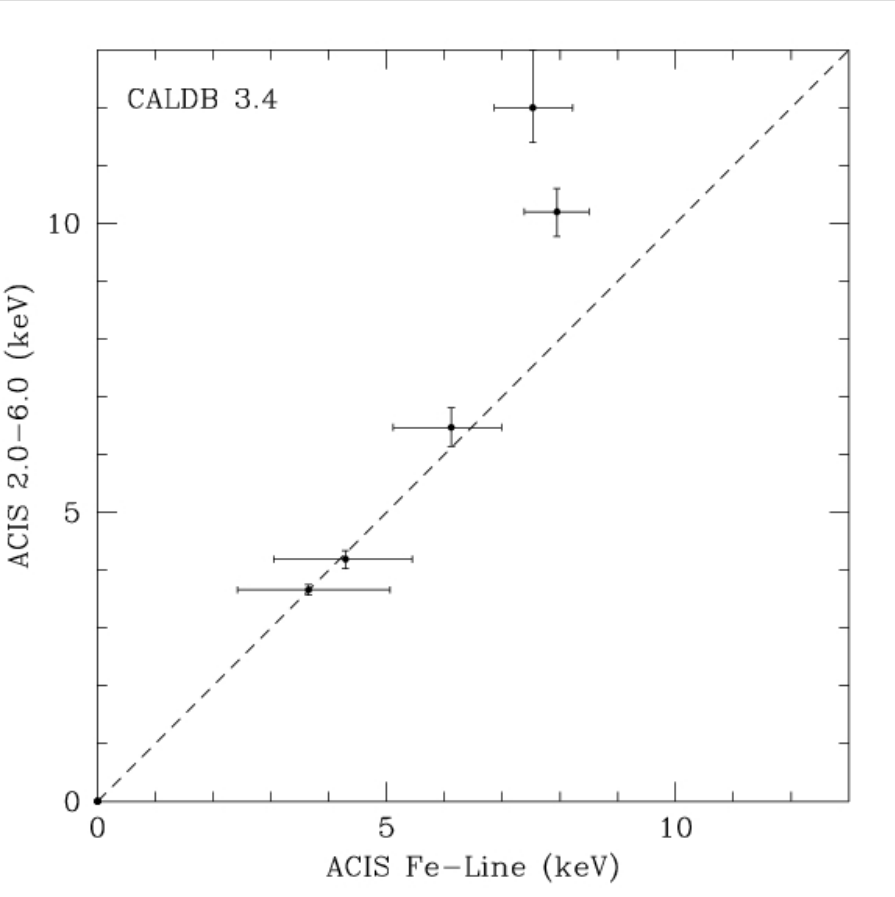
Cross-Calibration between ACIS and EPIC using Clusters of Galaxies



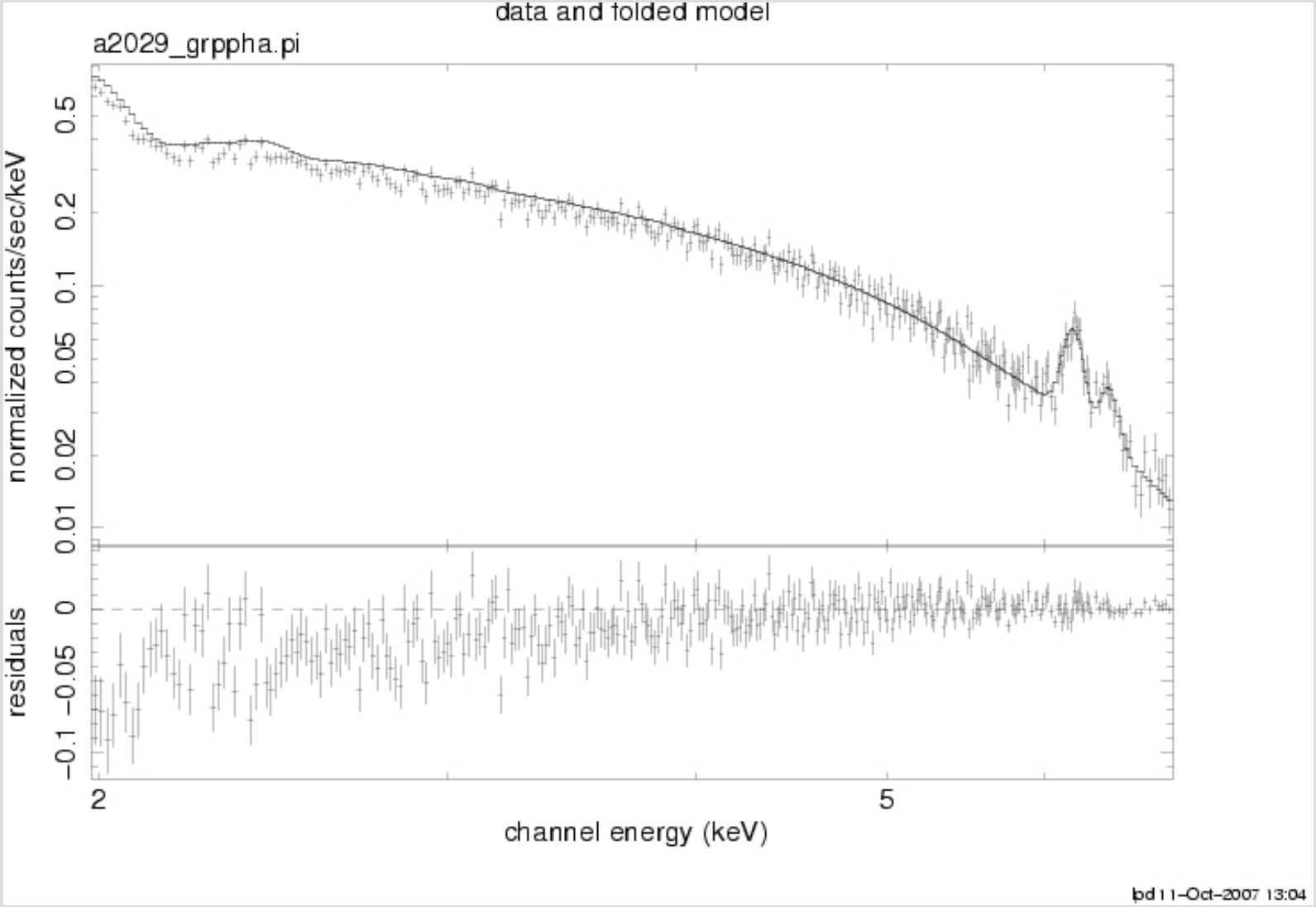


Comparison of ACIS derived temperatures in a broad band, a hard band and from the H-like to He-like Fe K alpha line ratio.



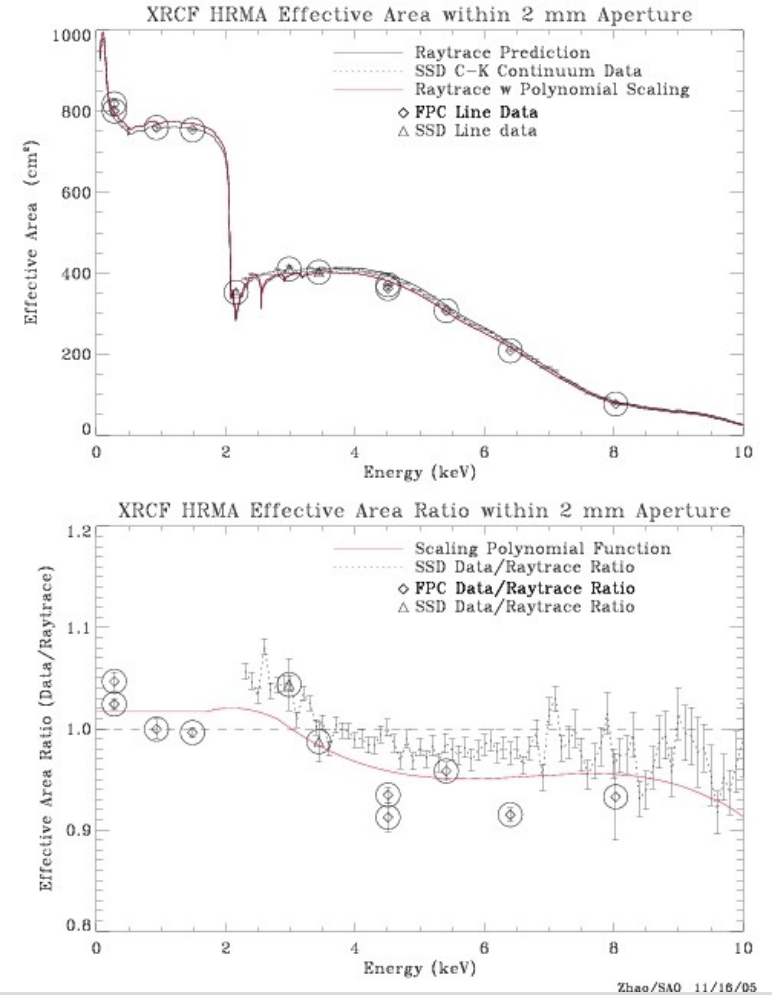


Residuals in the Abell 2029 spectrum assuming the gas temperature is given by the Fe line ratio (kT=7.9 keV).

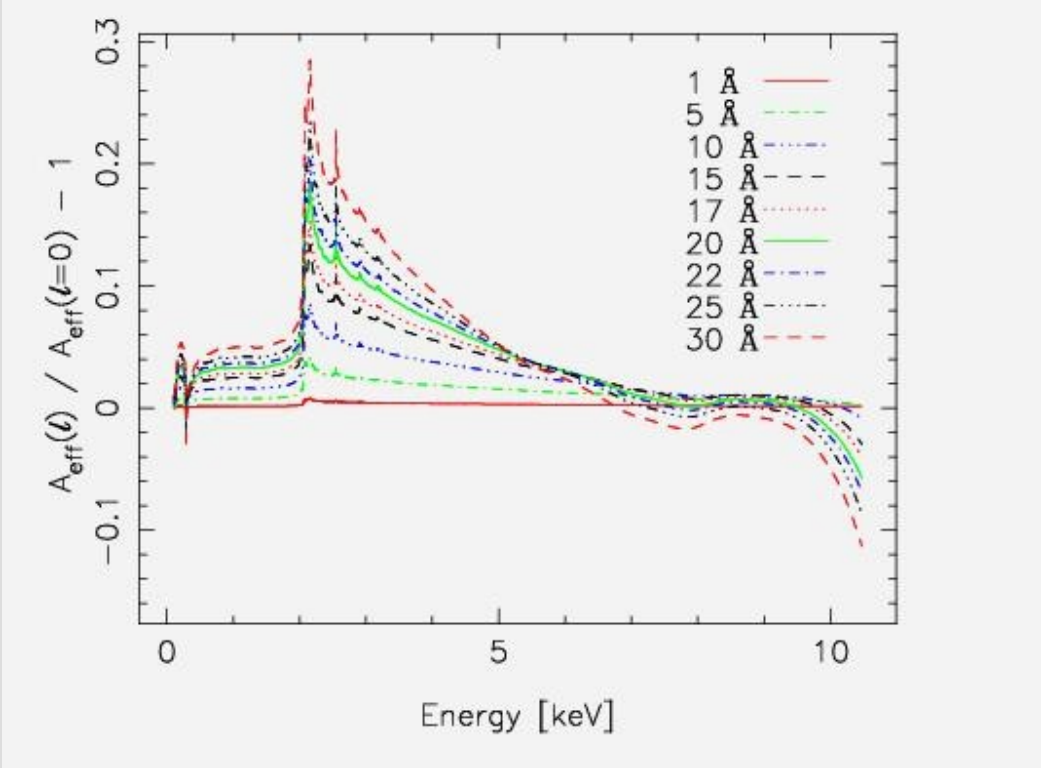


Two corrections have been applied to the predictions of the raytrace code since ground-based testing at the XRCF

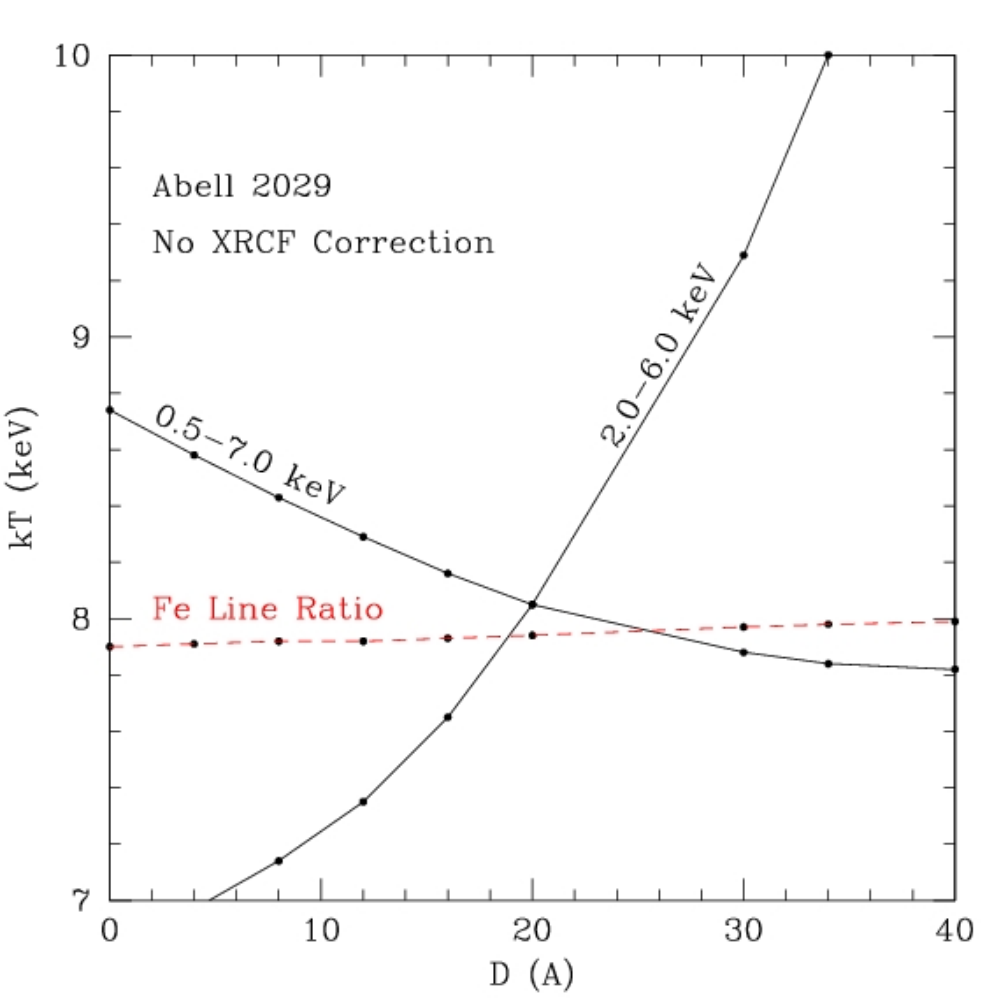
Empirical XRCF correction



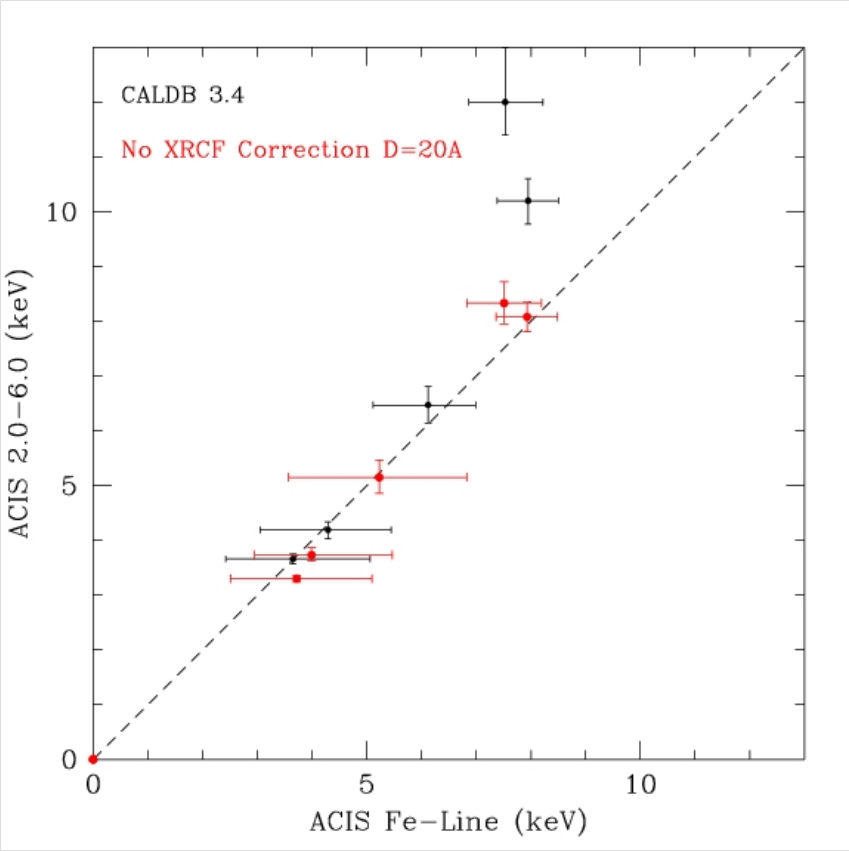
HRMA overlayer of 22A

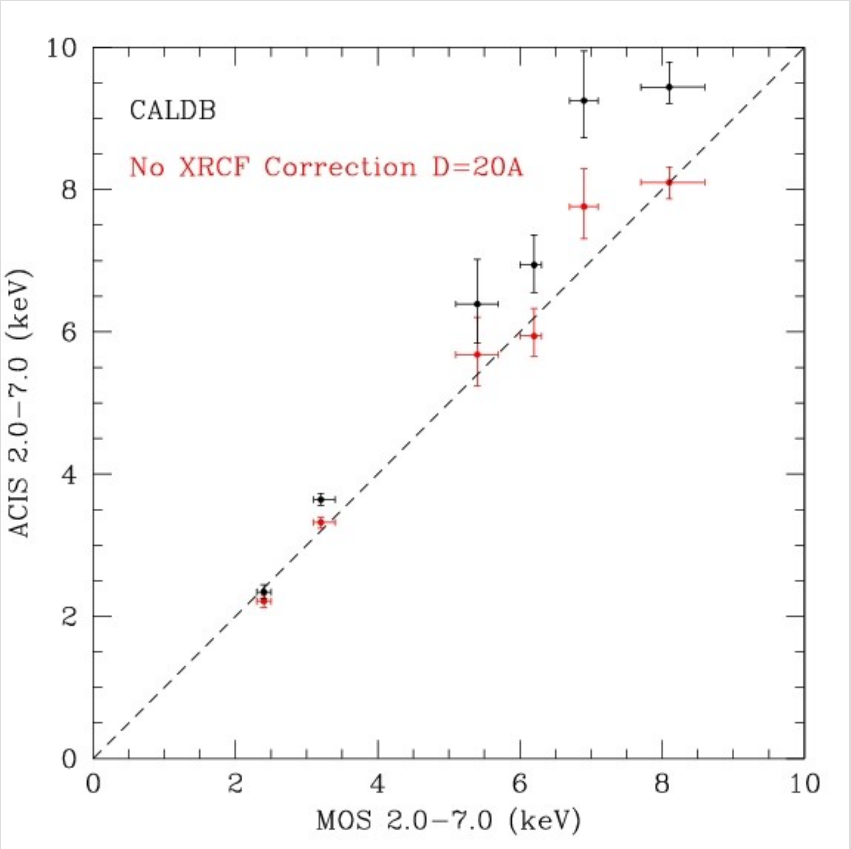


Sensitivity of derived cluster temperatures on the depth of the HRMA overlayer without the empirical XRCF correction.

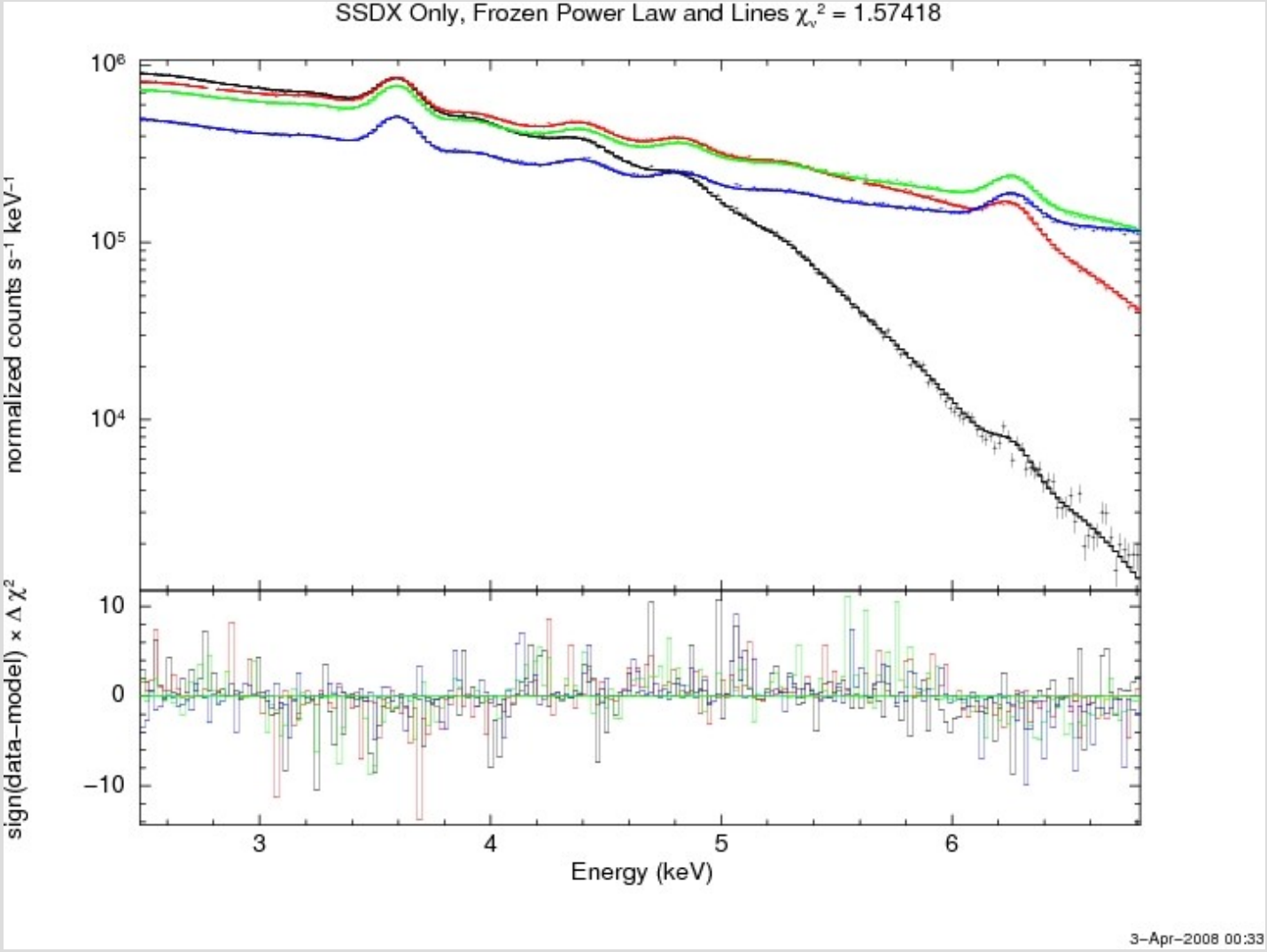


Spectra fitting results with a HRMA effective area model without the XRCF empirical correction and a depth of 20A for the overlayer.



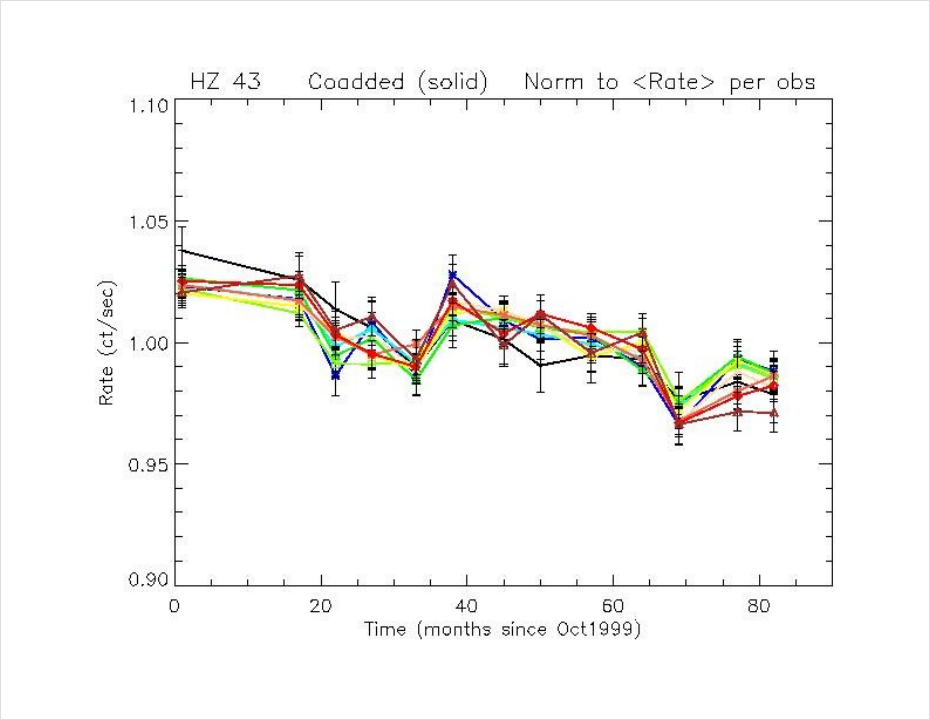


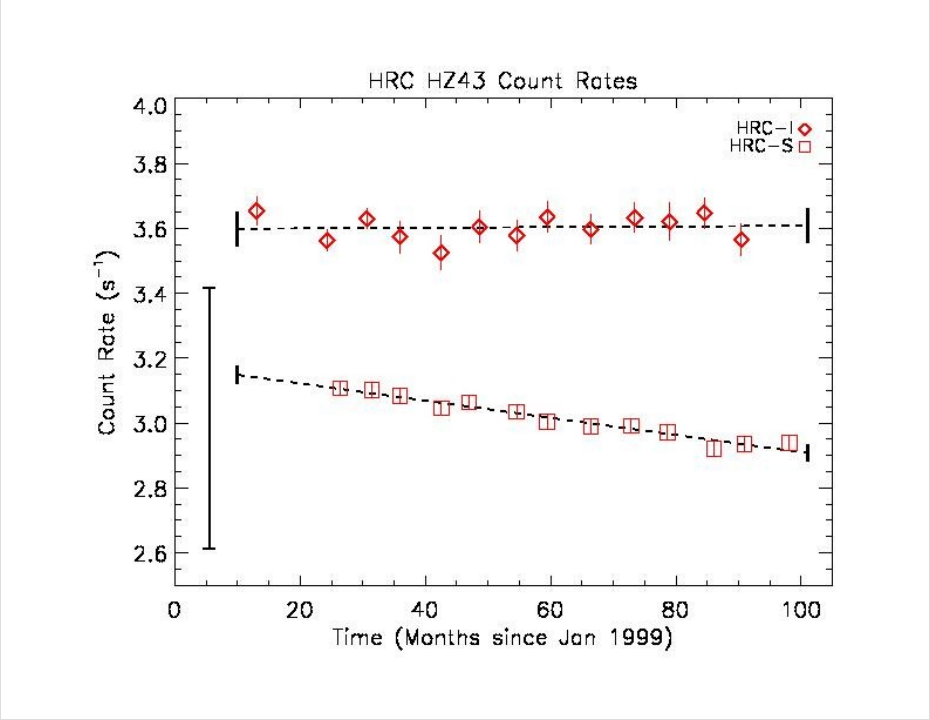
Ground-based continuum measurements fit to the raytrace predictions for the HRMA with a variable depth for the contaminant on each shell



LETG Calibration Status

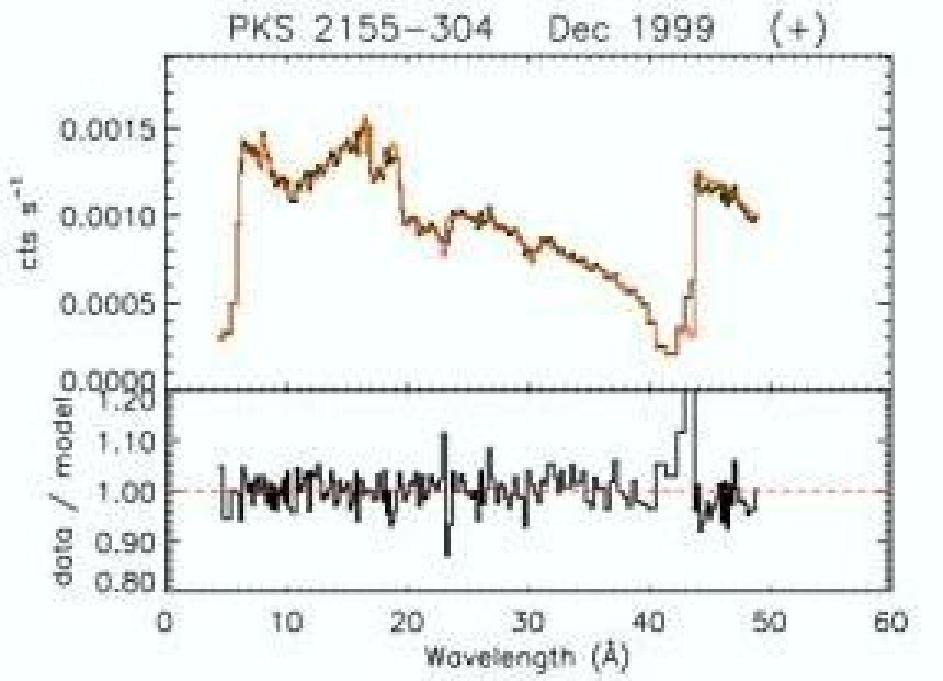
HRC-S QE

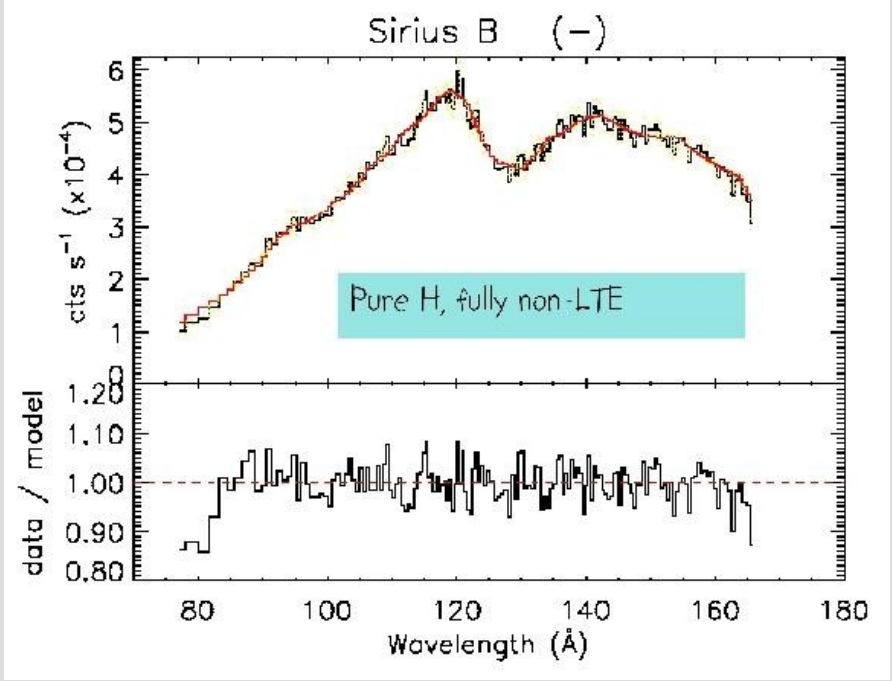




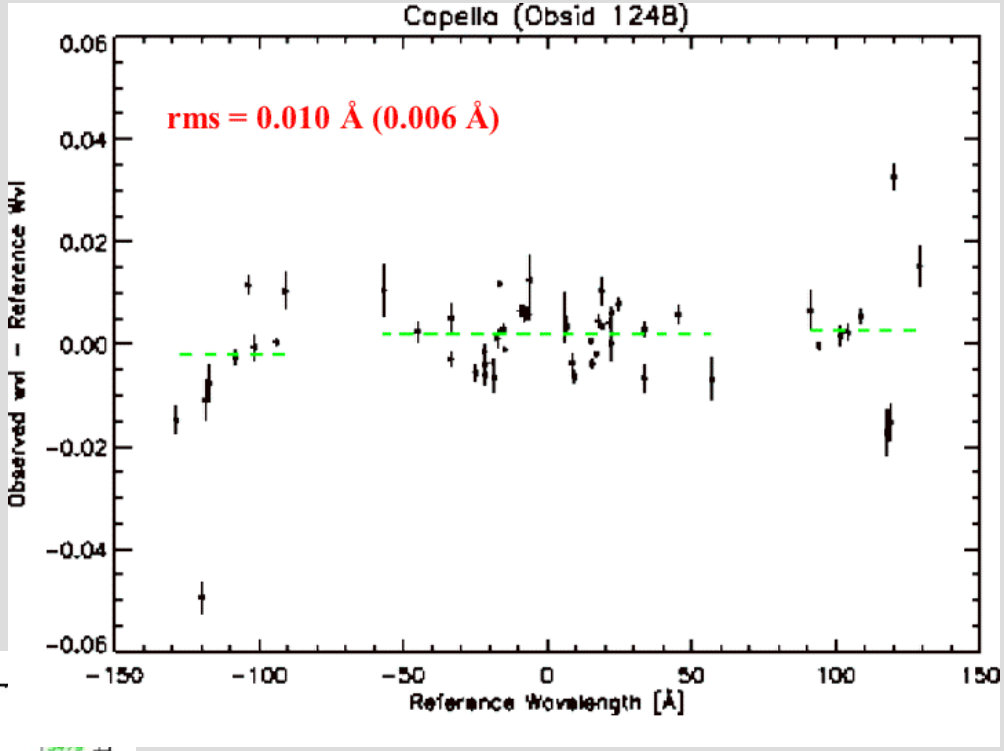
LETG/HRC-S Observations of PKS2155-304 and Sirius B

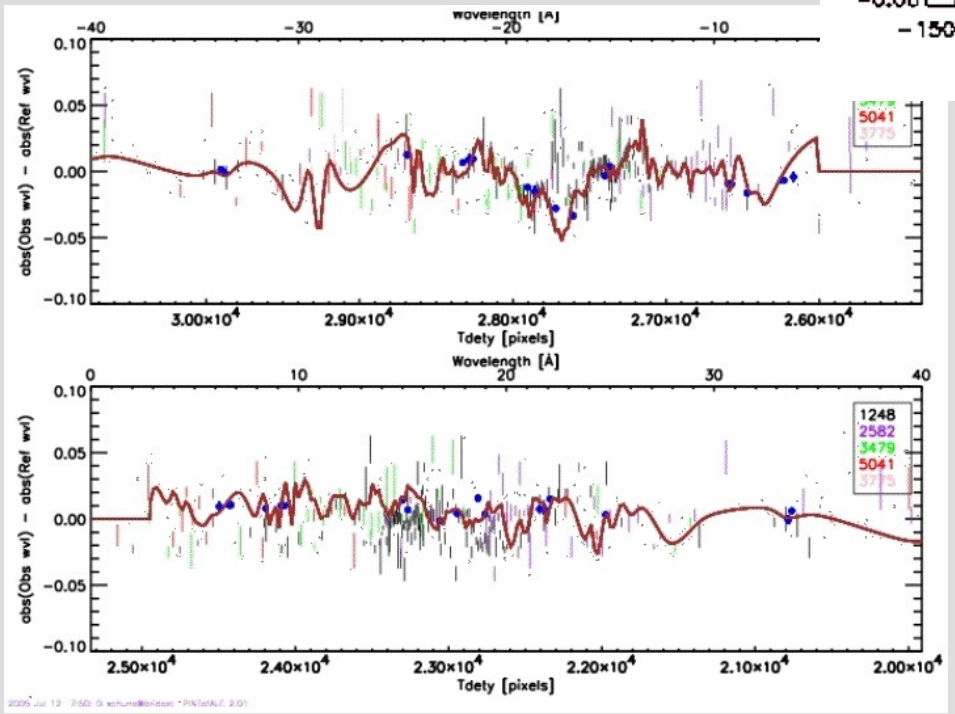
Uses HETG model for PKS2155-304



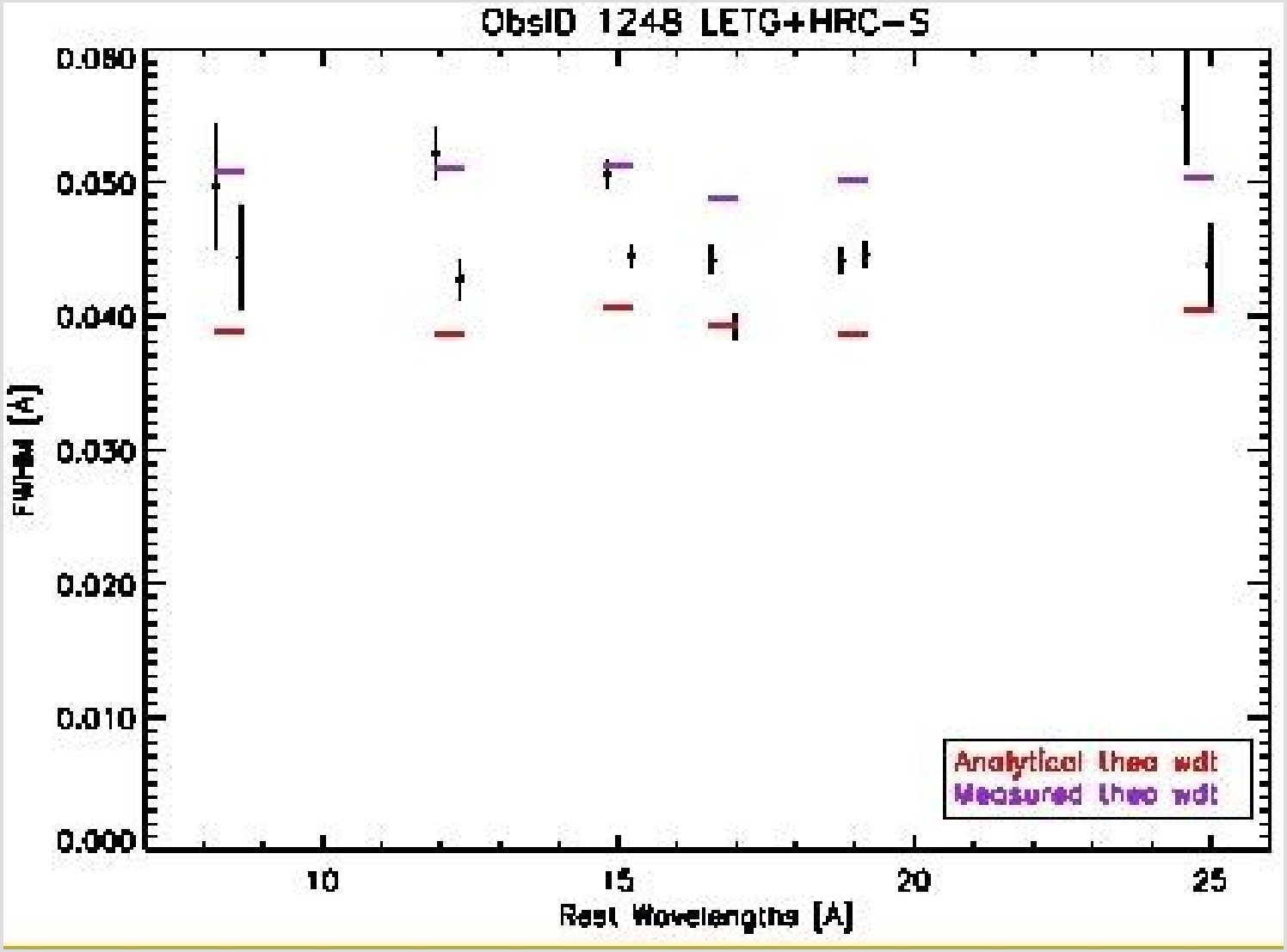


LETG/HRC-S Dispersion Relation

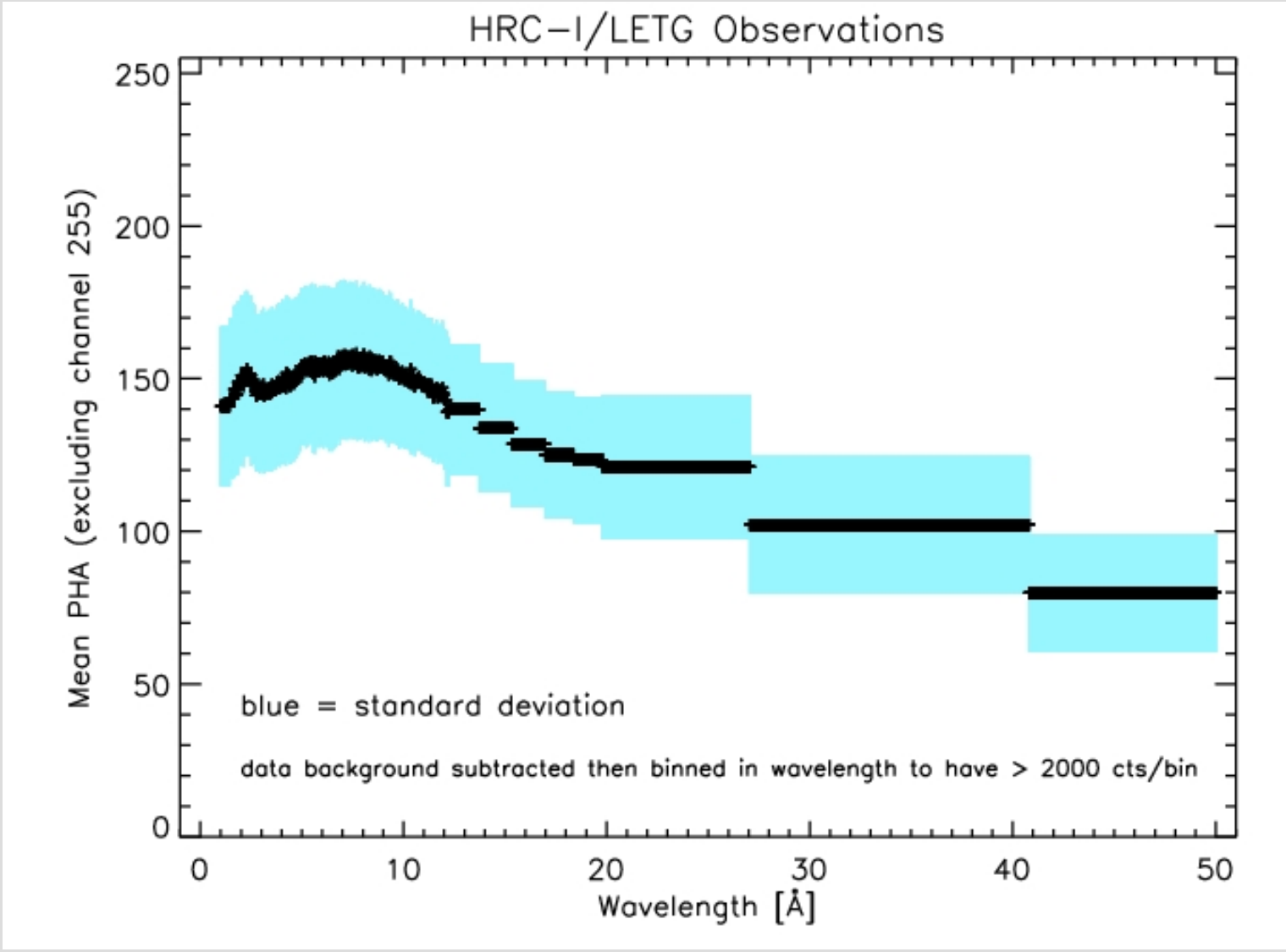




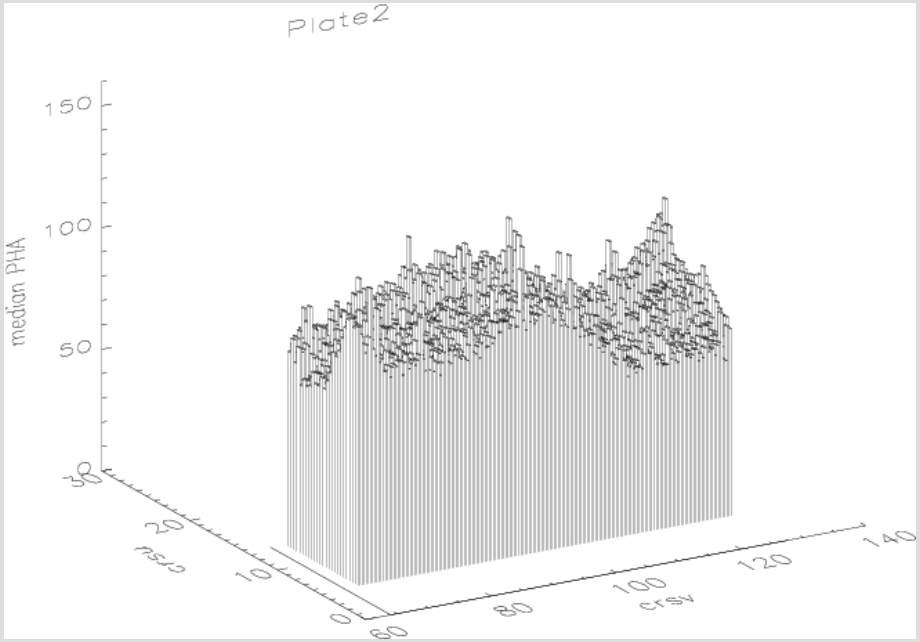
LETG/HRC-S Line Widths



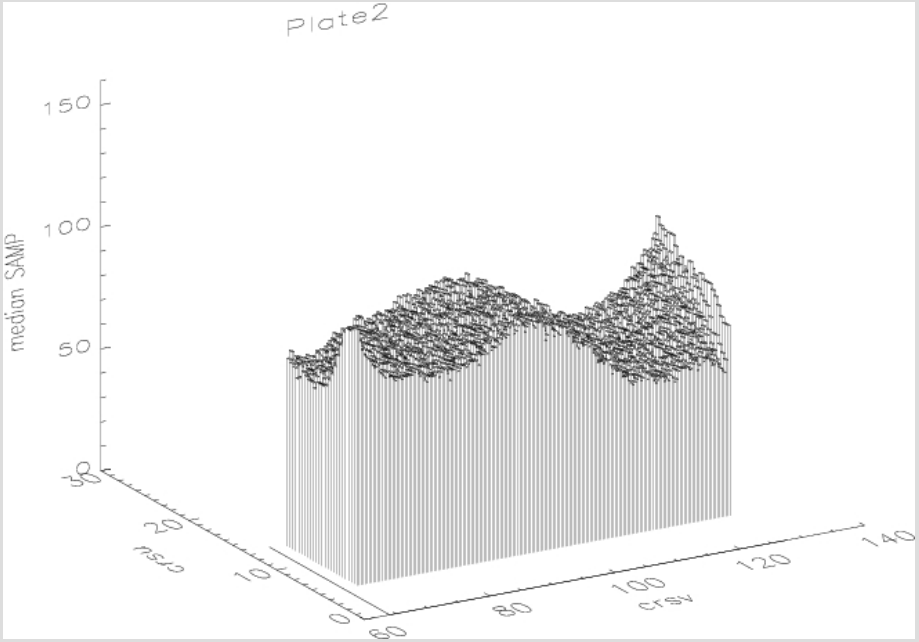
HRC-S gain calibration



Ground-based flat field C-Ka data

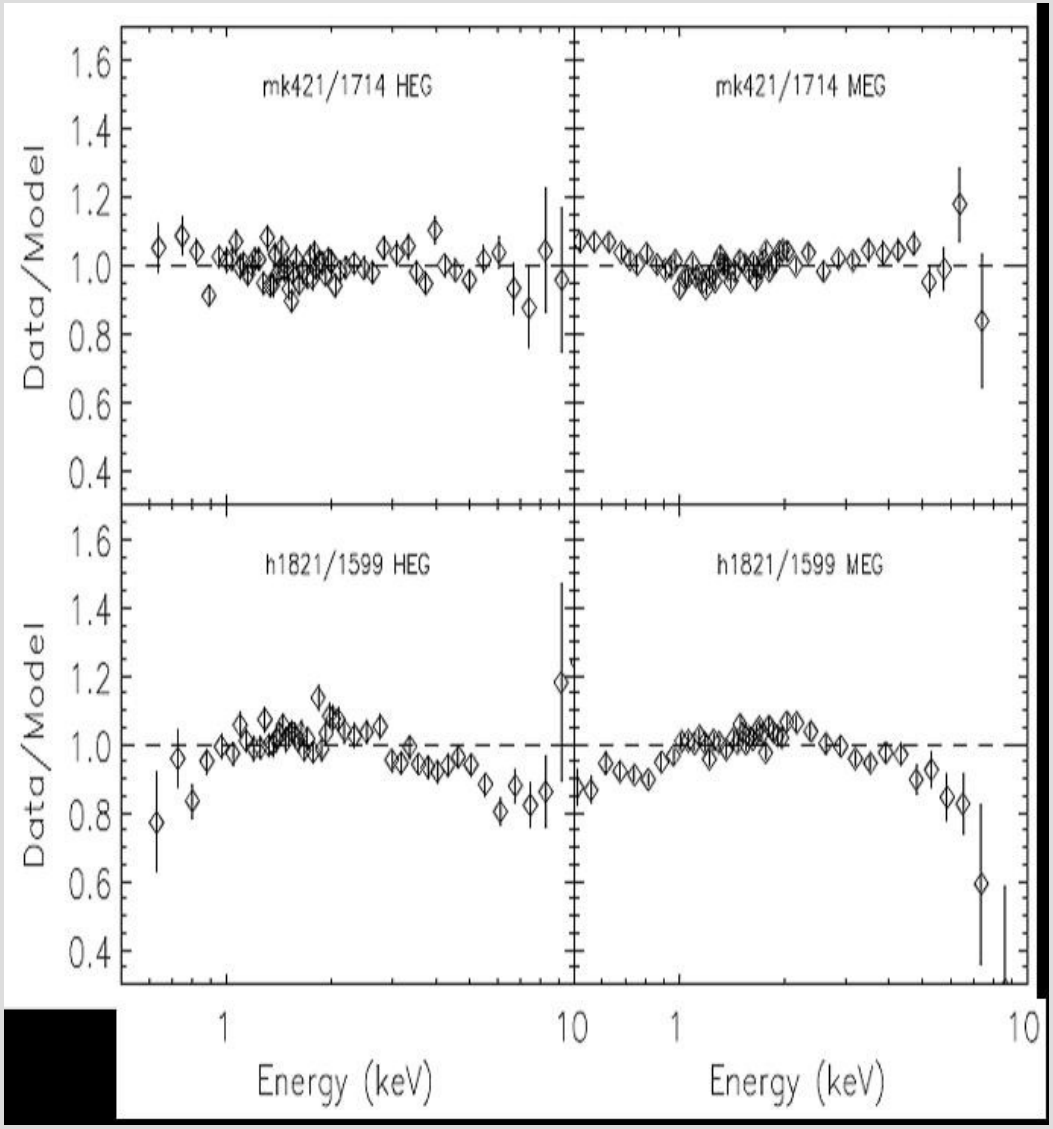


PHA distribution (sum of all pre-amps)



SUMAPMS distribution (sum of the 6 pre-amps with the most charge read-out)

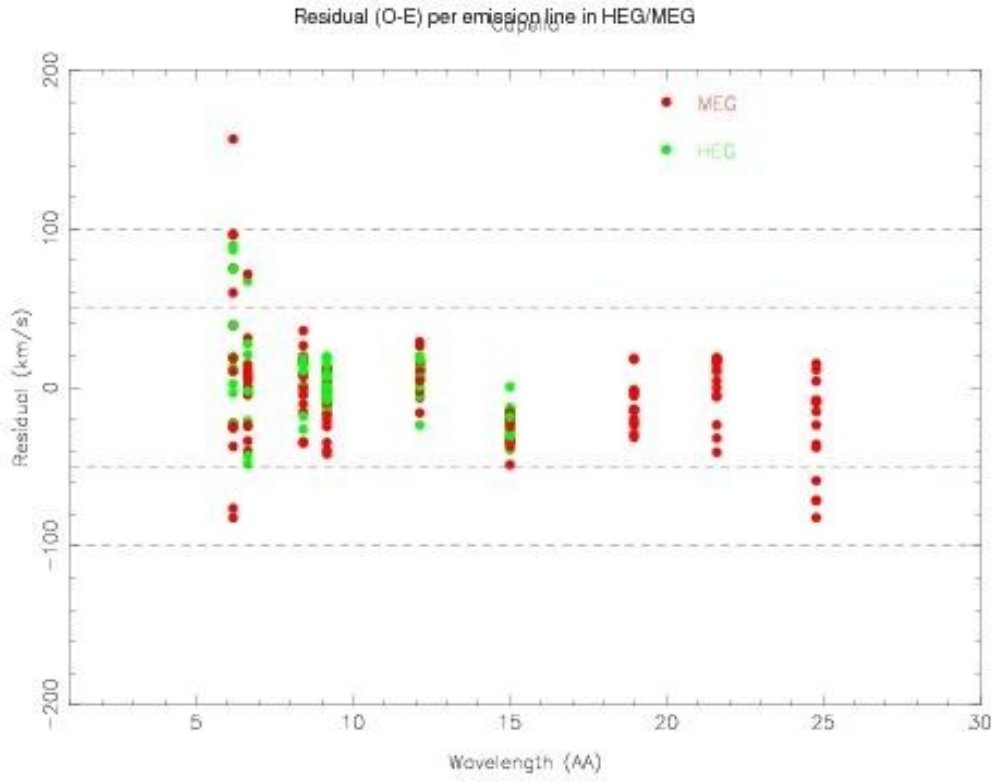
HETG/ACIS-S Calibration Status



HETG Absolute Wavelengths

CAL Observations of Capella

- Residual per wavelength $\approx$ 100km/s (3σ)
- $\delta\lambda/\lambda \approx 1 \times 10^{-4}$



Comparison of TE and CC Mode Grade Distributions