Chandra Calibration Status

CUC Meeting Oct. 22, 2013

Chandra Calibration Status

- Calibration updates since the 2012 CUC meeting
- Current calibration studies
- Internal cross-calibration results
- Calibration plans for the upcoming year

Calibration products released over the past year

ACIS

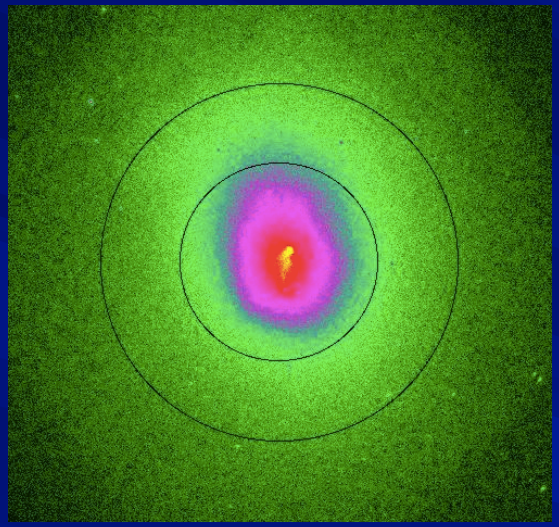
- Quarterly gain corrections for ACIS-I and ACIS-S
- A set of time-dependent QE maps (one for every two years)
- Blank sky background files for Epoch F (2009-present) for both cti-corrected and cti-uncorrected data (graded mode).

HRC

- Yearly gain maps for HRC-I and HRC-S
- Yearly background images and spectrum
- HRC-S QE for the new high voltage setting.

Contamination on the ACIS Filters

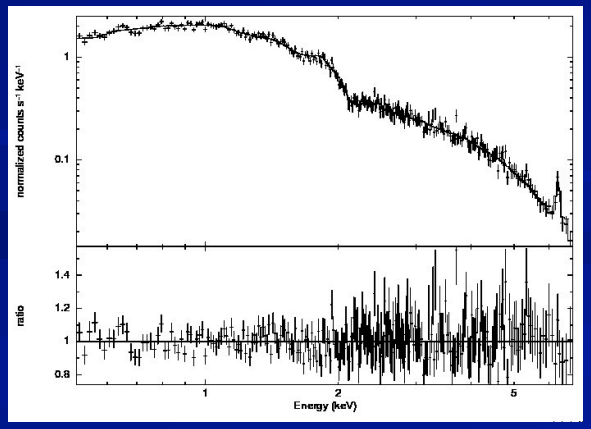
Abell 1795

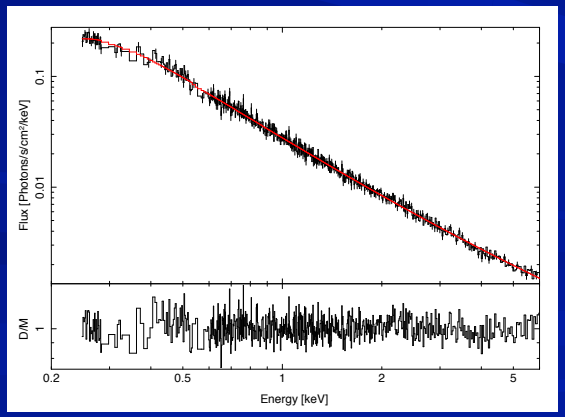


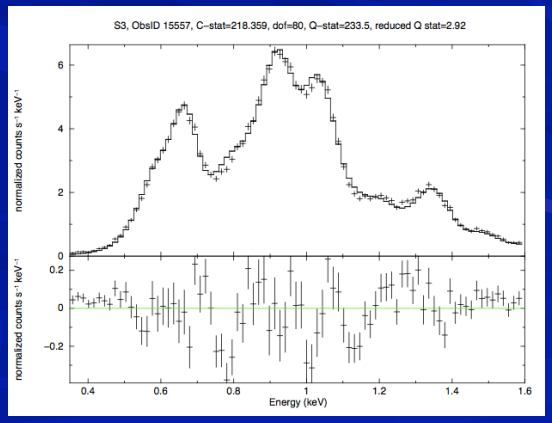
Blazars

Mkn 421
PKS 2111-304

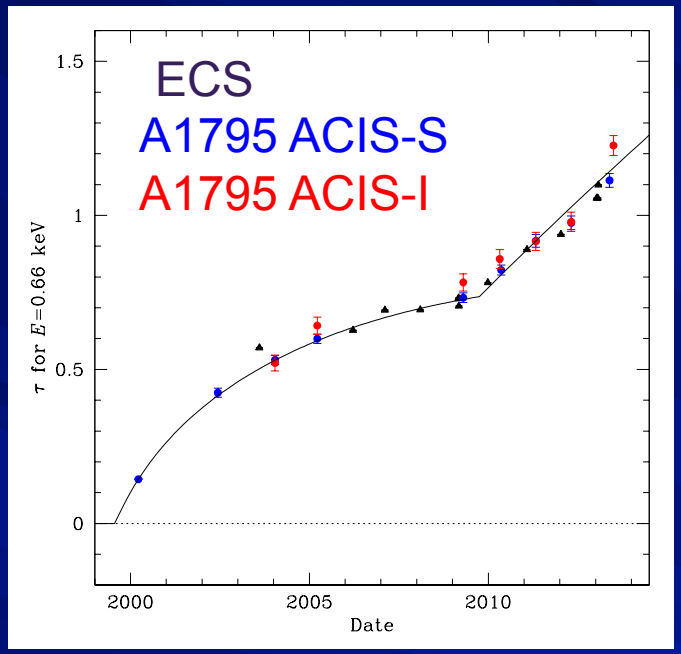
E0102-72



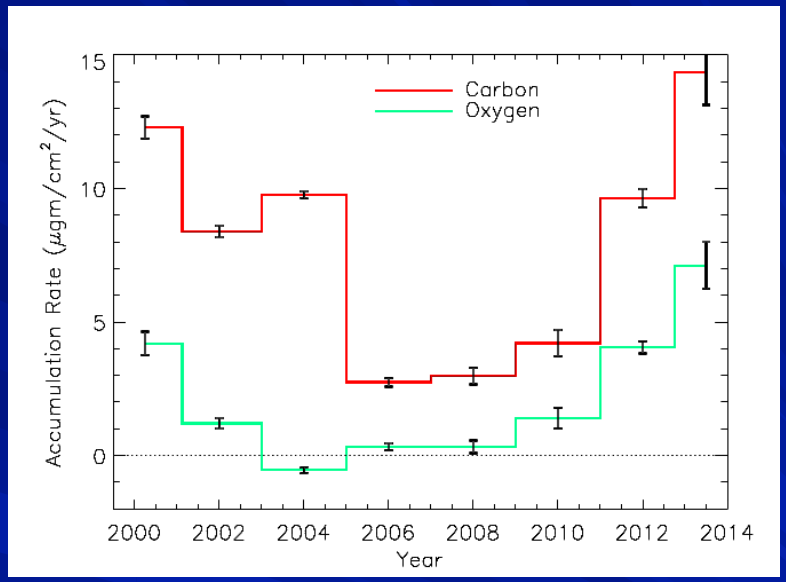


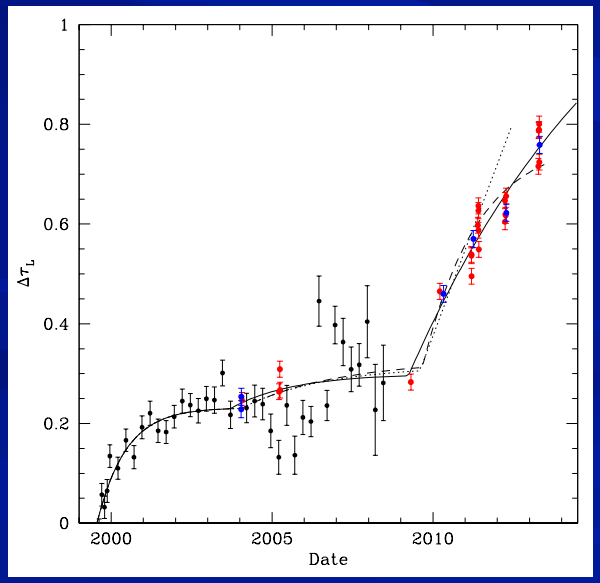


Contamination on the ACIS filters

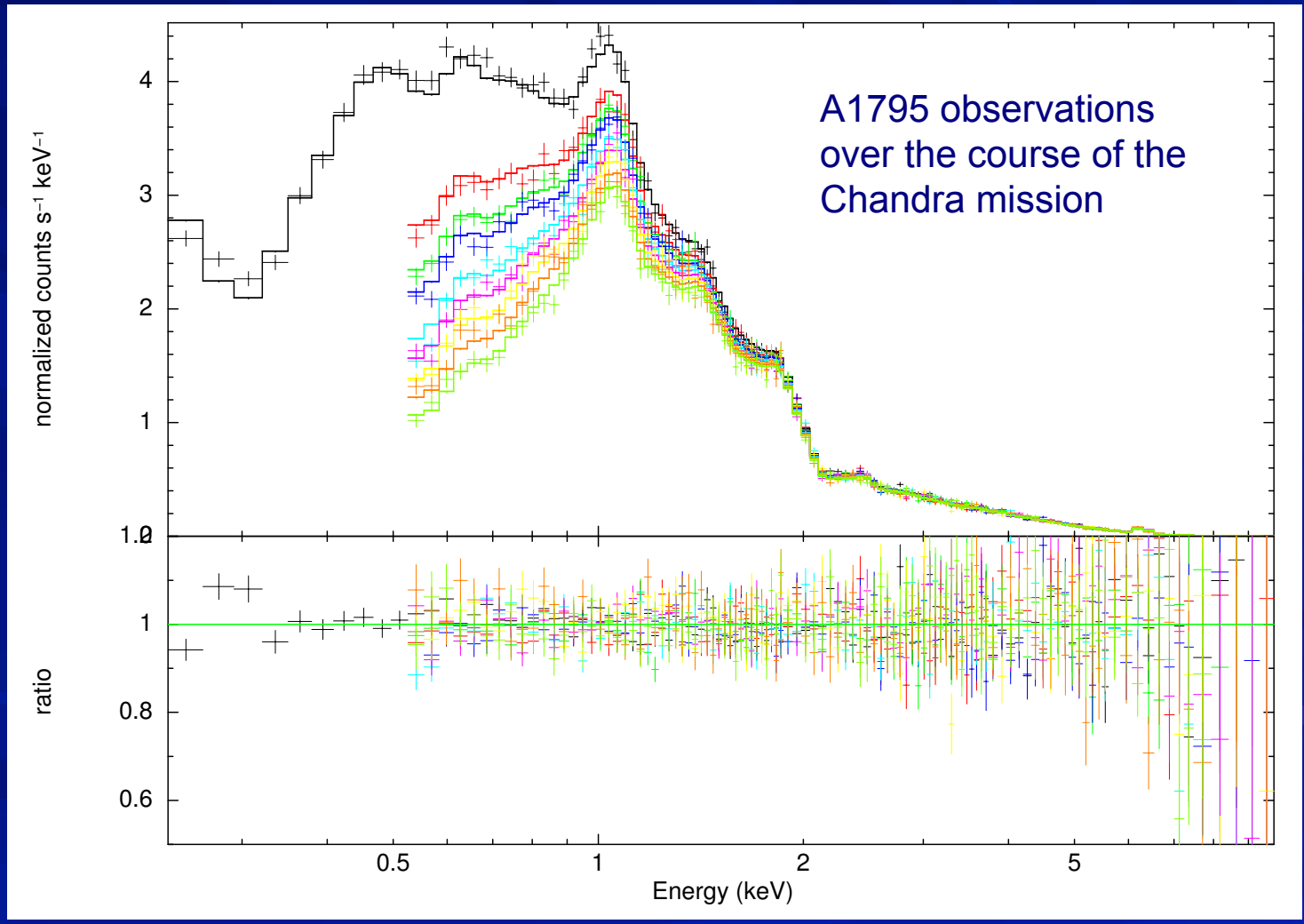


From LETG/ACIS-S data





Contamination on the ACIS filters

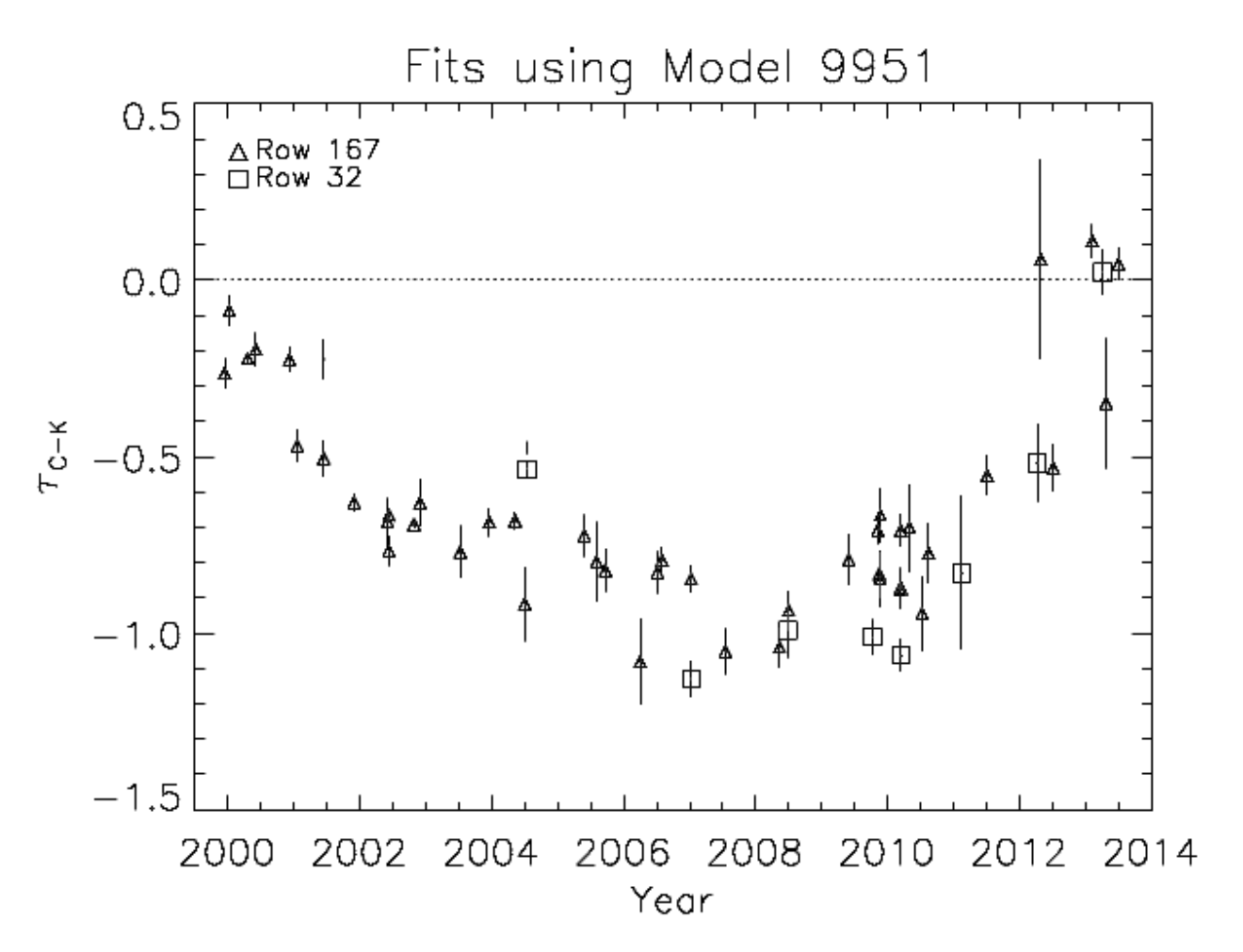


Steps to latest ACIS contamination model:

- Fit LETG/ACIS-S spectra of blazars to constrain the optical depths at the C-K, O-K and F-K edges. The gratings data is primarily restricted to two rows on ACIS-S.
- Fit the raster scans of Abell 1795 observations to a purely elemental model adopting edge constrains measured from the gratings data and determine the normalization of the contamination model as a function of position and time.
- Make final adjustment in τ(C) and τ(F) as a function of time using LETG/ACIS-S gratings data. No adjustment is needed at the O-K edge.
- Verify with E0102-72 observations.

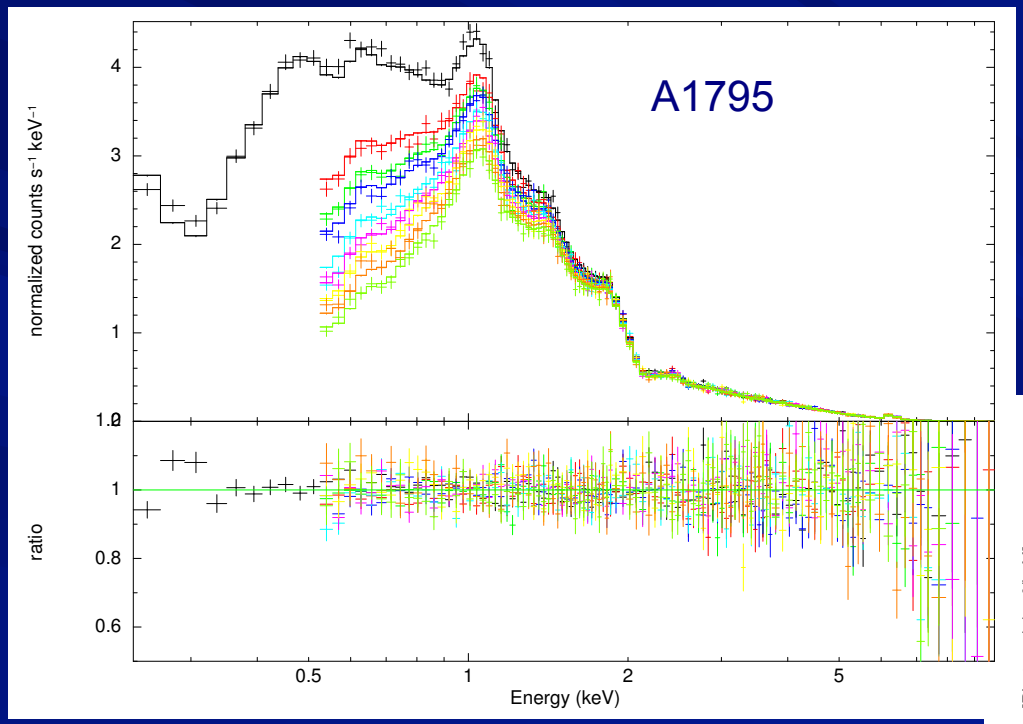
Contamination on the ACIS filters

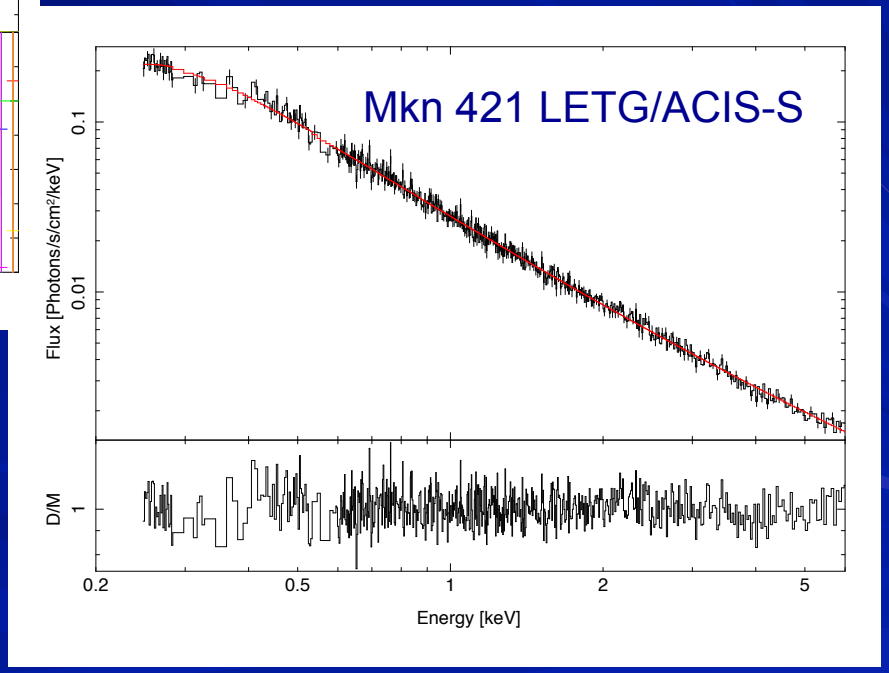
Optical depth at the C-K edge derived from LETG/ACIS-S data using the intermediate contamination model.



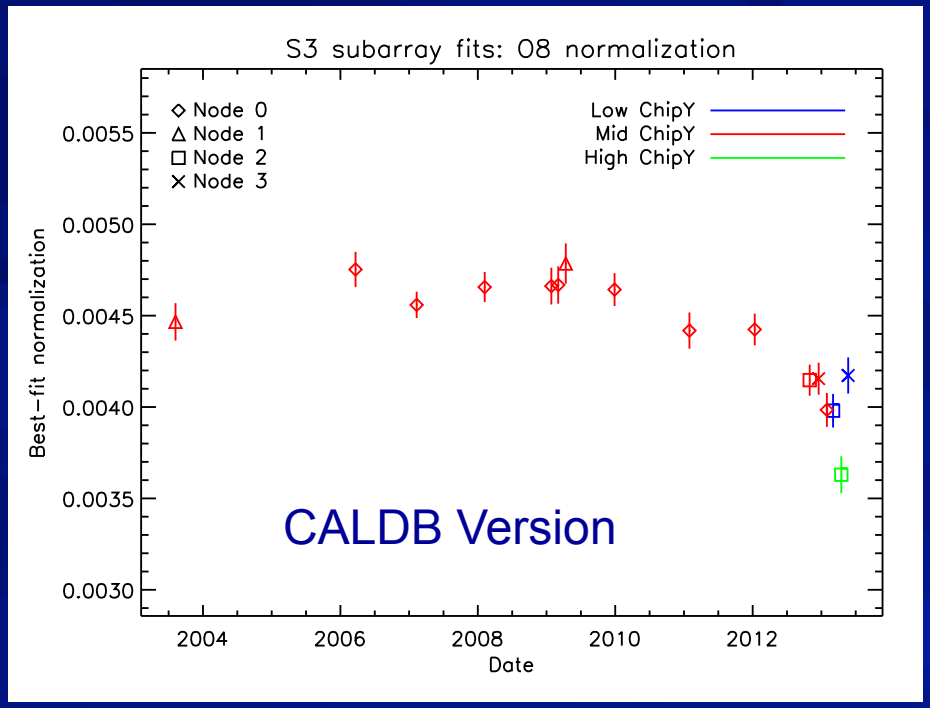
Contamination on the ACIS filters

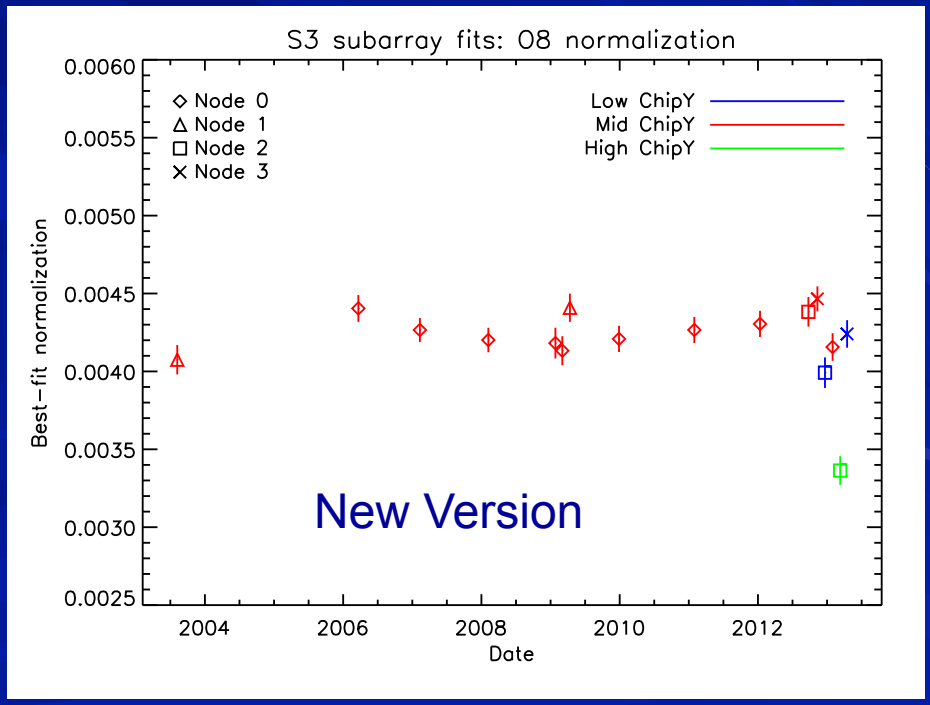
Spectral fits with the new ACIS contamination model





Fits to E0102-72 data with new contamination model



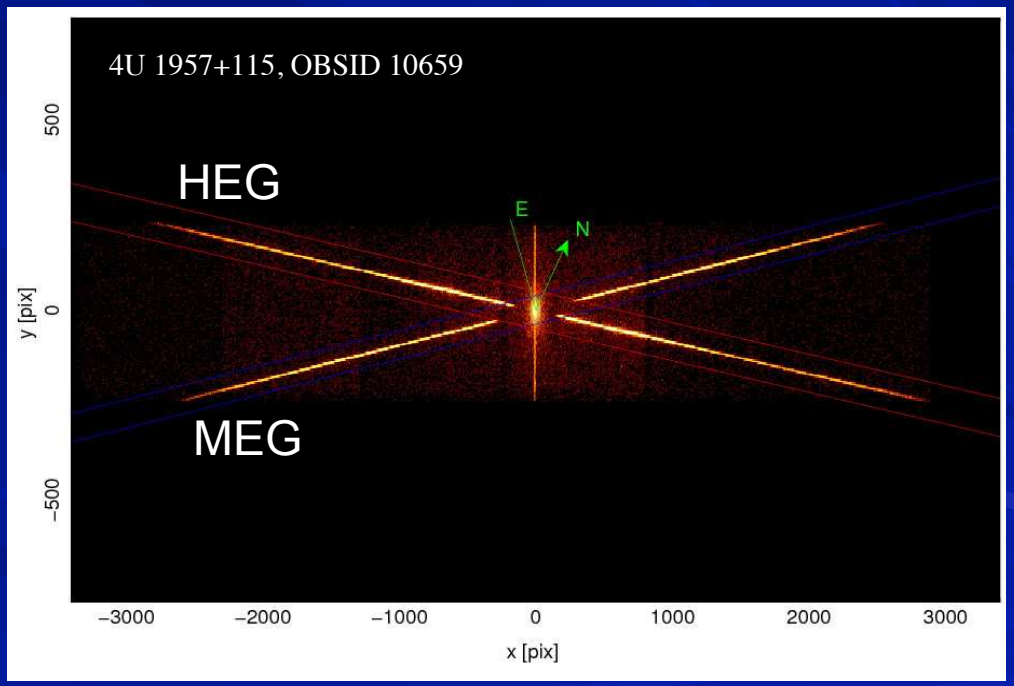


ACIS CC-Mode Calibration

A memo on analyzing HETG CC-mode data will be released shortly. This analysis does not require any additional CC-mode specific calibration products. The memo discusses several Issues concerning CC-mode calibration, including:

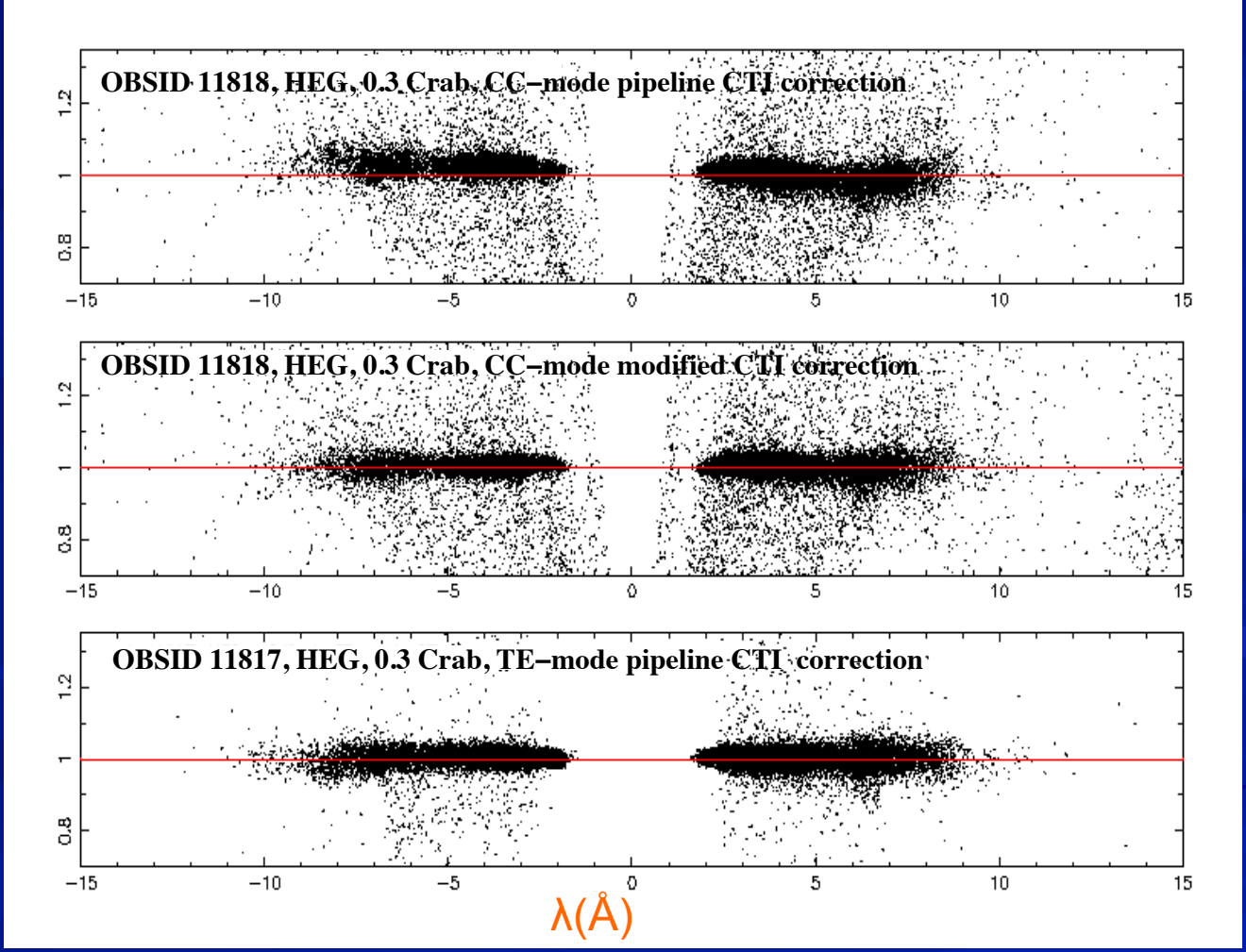
- Energy scale and gain
- Detector response
- CTI
- Grade set distribution
- Background
- Presence of dust halos

HETG/ACIS-S TE mode observation



ACIS CC-Mode Calibration

CTI-correction uses actual chipy position instead of chipy location of 0th order.

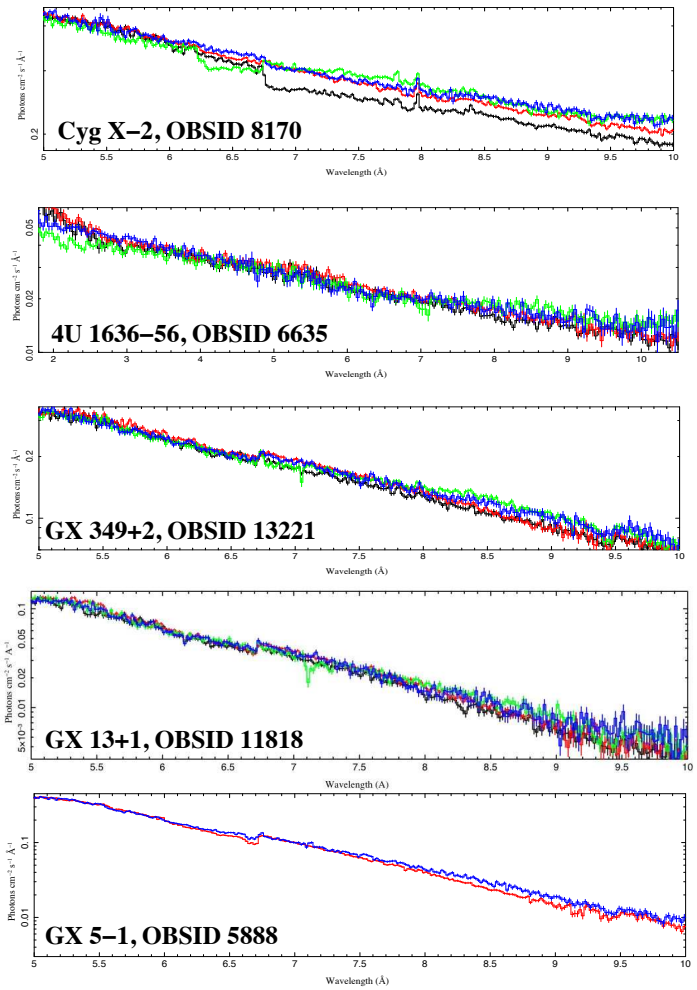


E_D/E_G

4U 1957+115

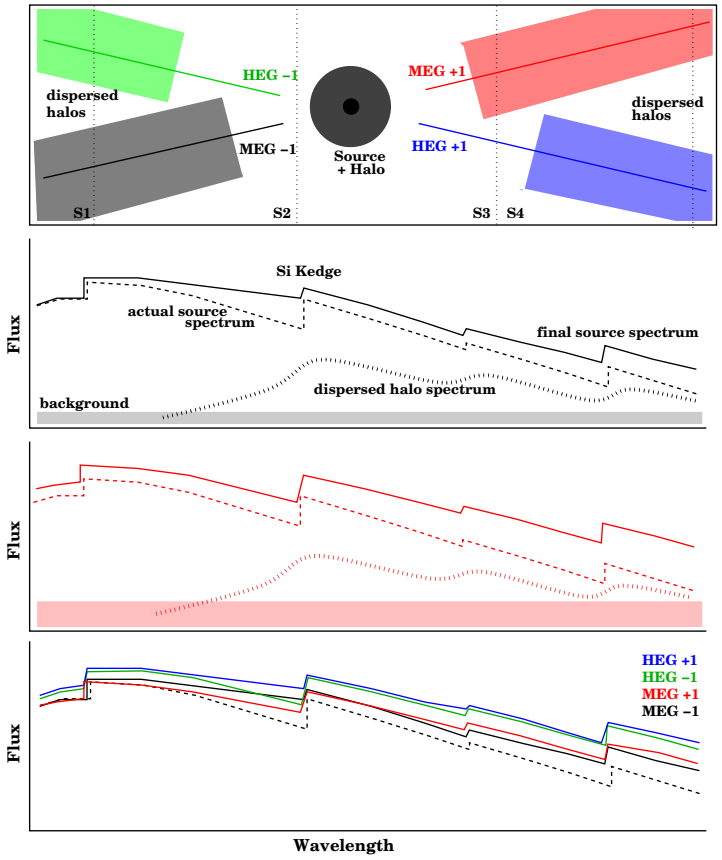
ACIS CC-Mode Calibration

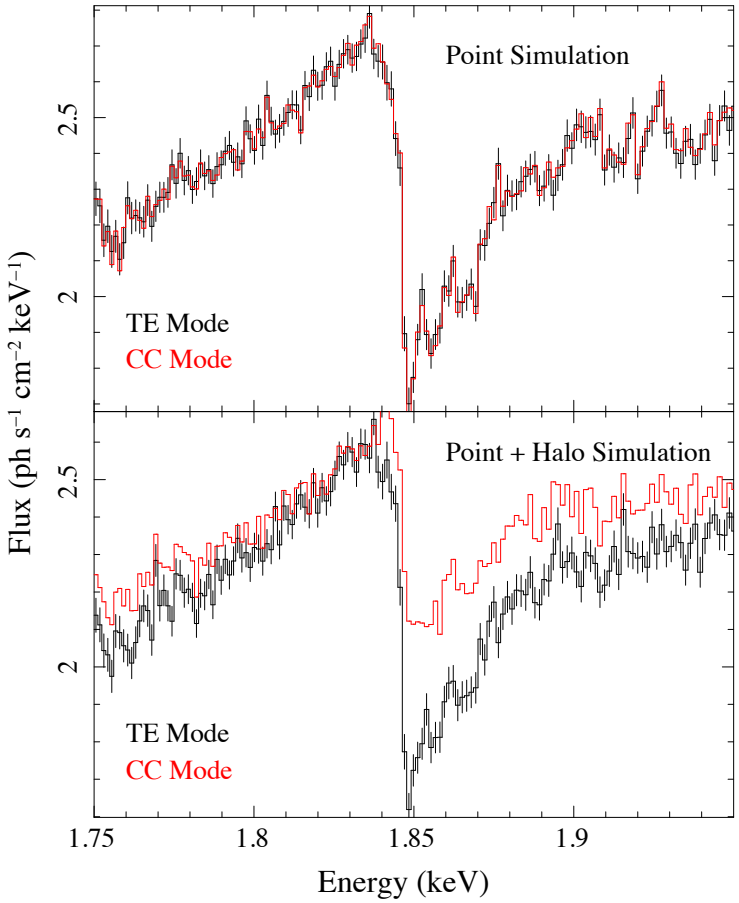
Good agreement between the four HETG spectra for sources with no dust halo.



CALDB Version

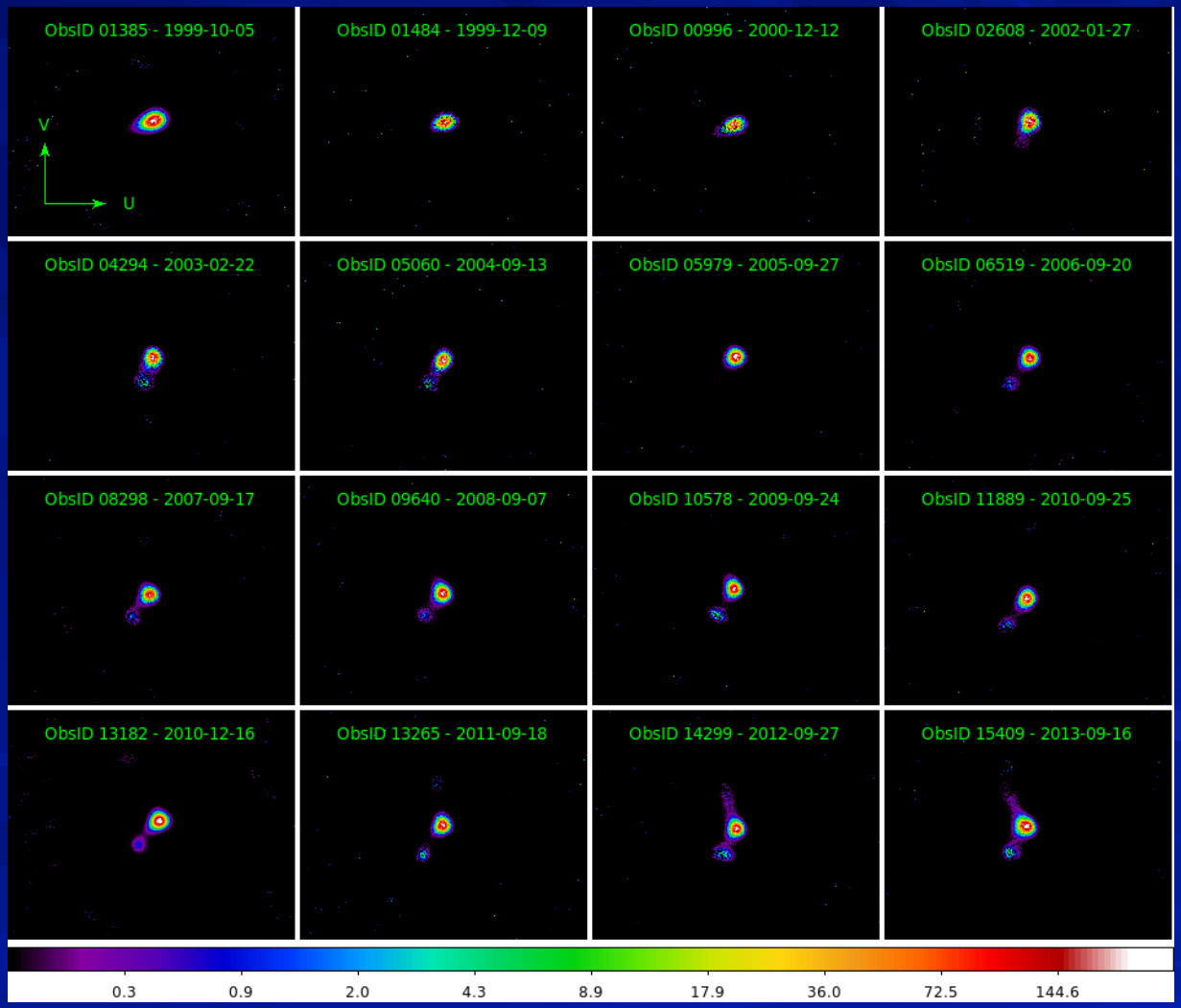
ACIS CC-Mode Calibration



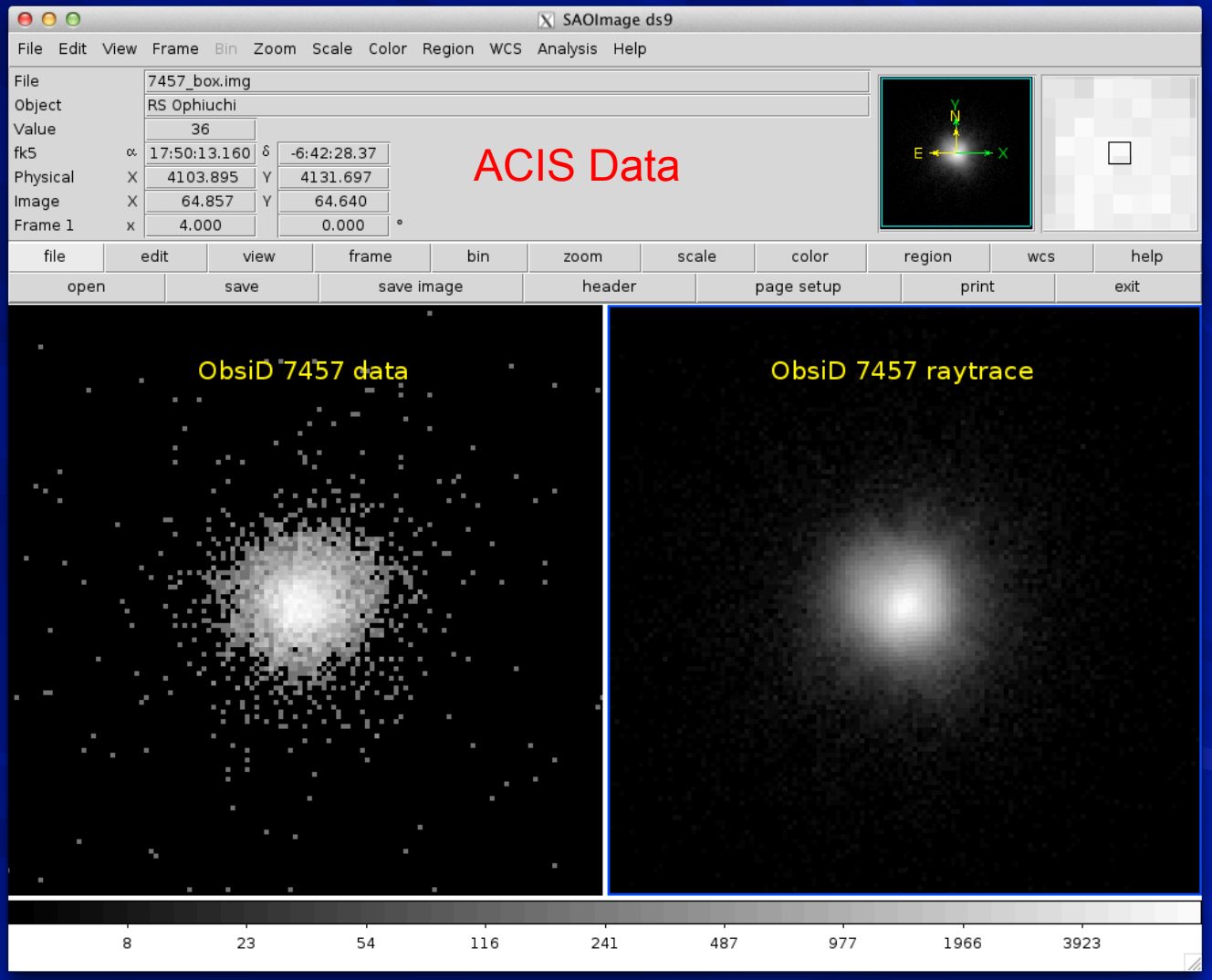


Core of the Point Spread Function

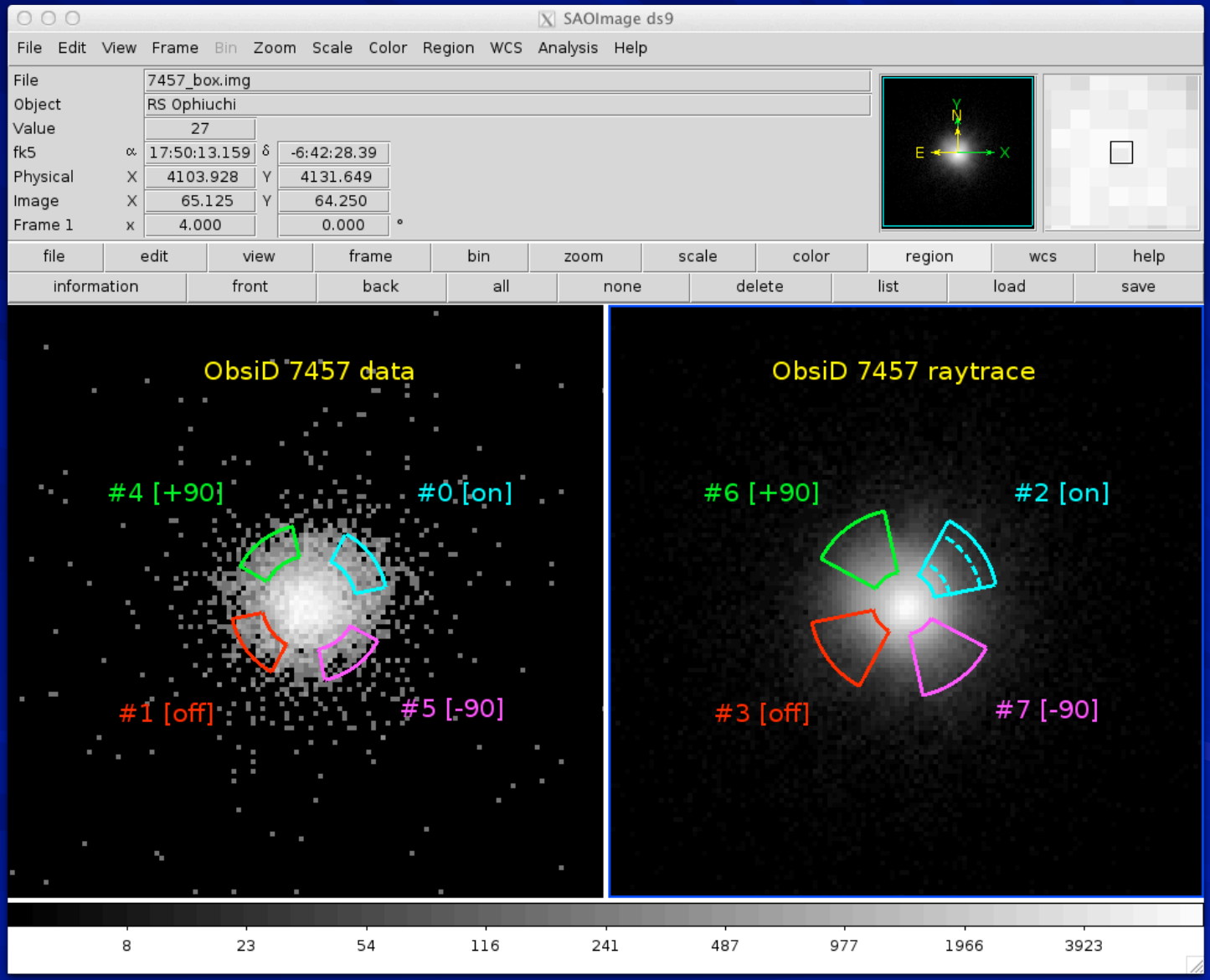
Deconvolved HRC-I images of AR Lac



Core of the Point Spread Function



Core of the Point Spread Function



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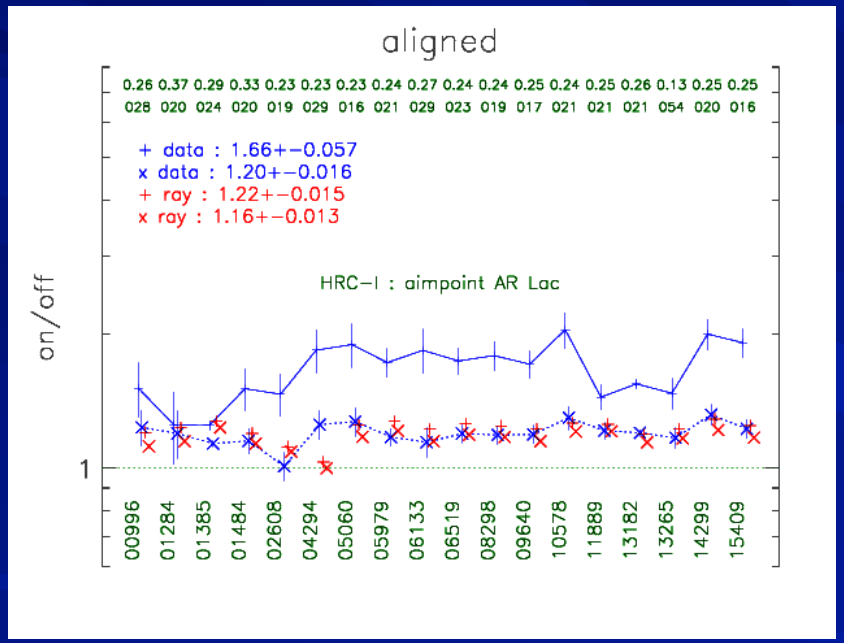
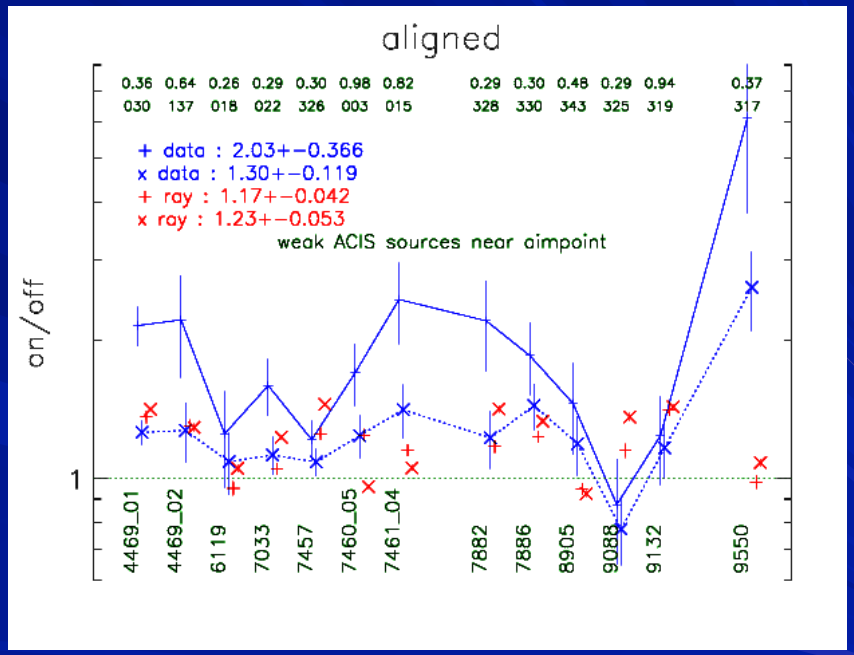
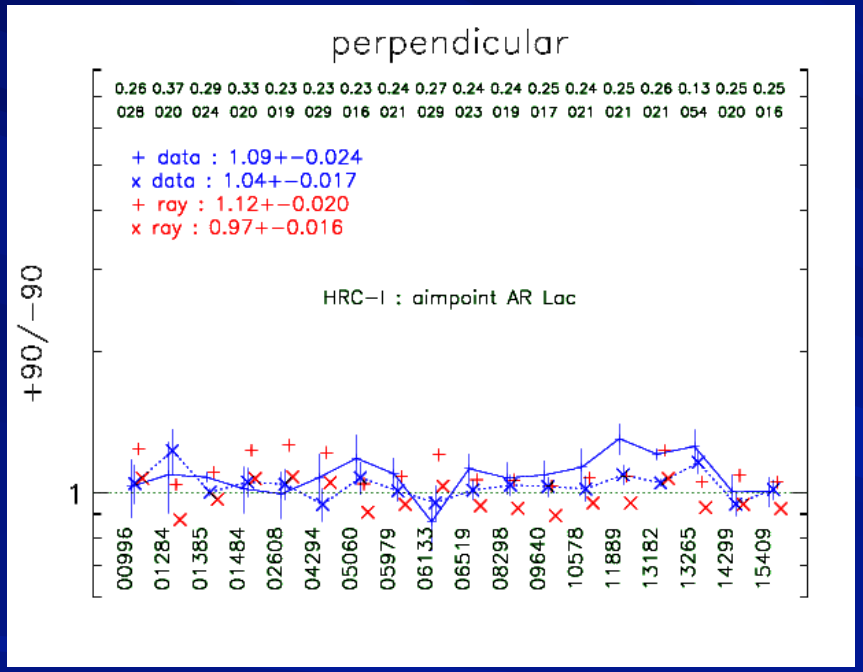
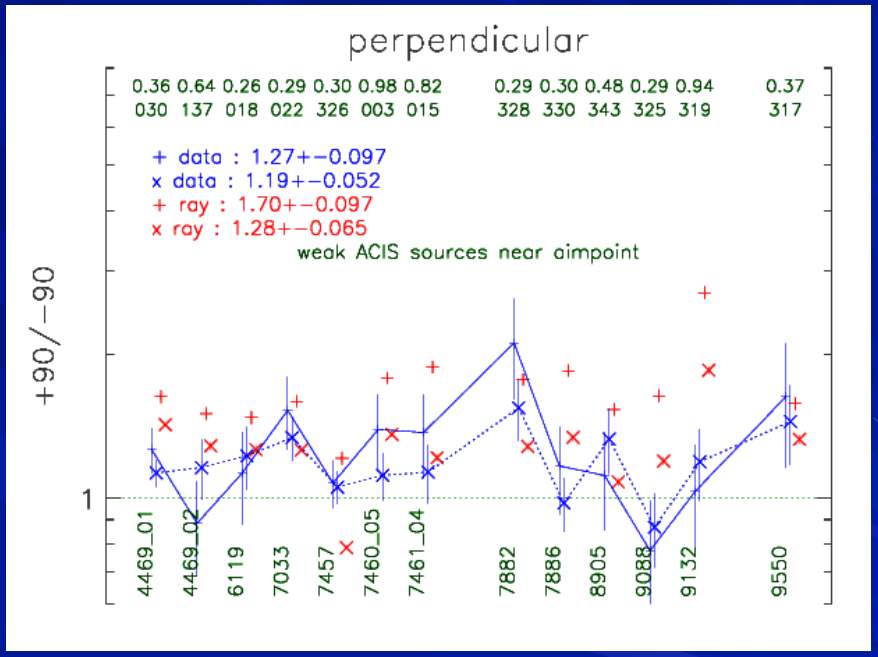




New Version

Core of the Point Spread Function

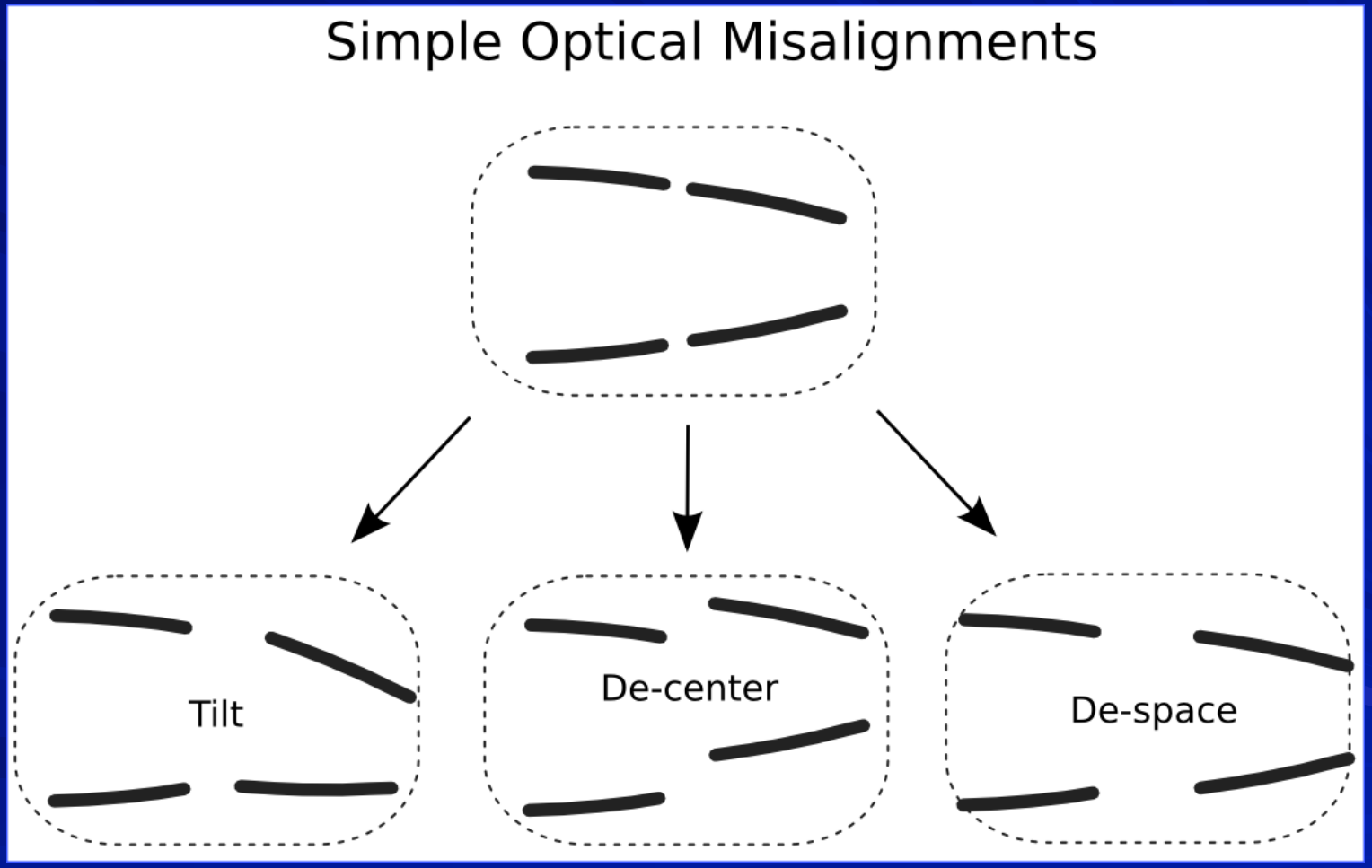




New Version

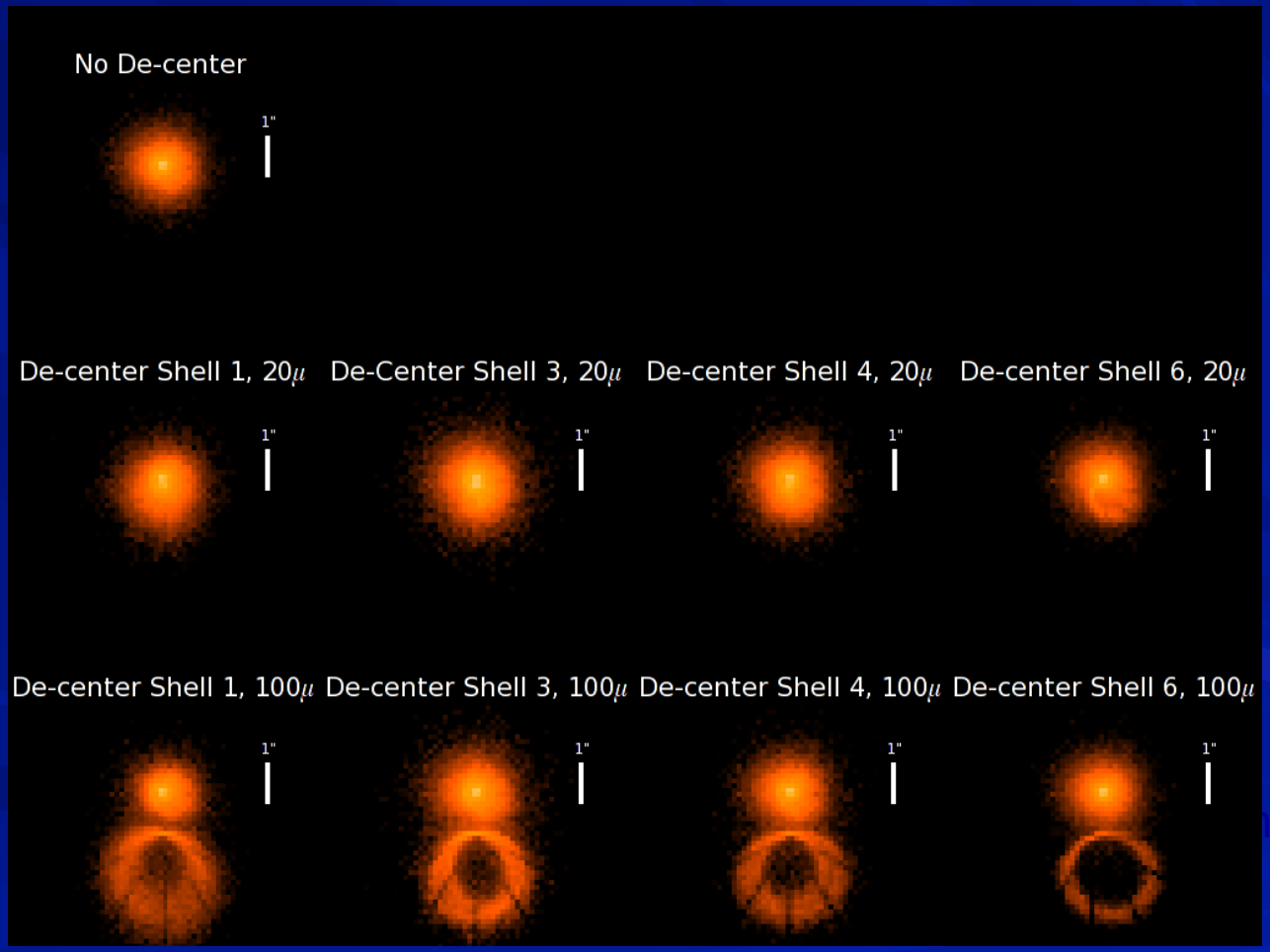
Core of the Point Spread Function

SAOTrace simulations of a single shell



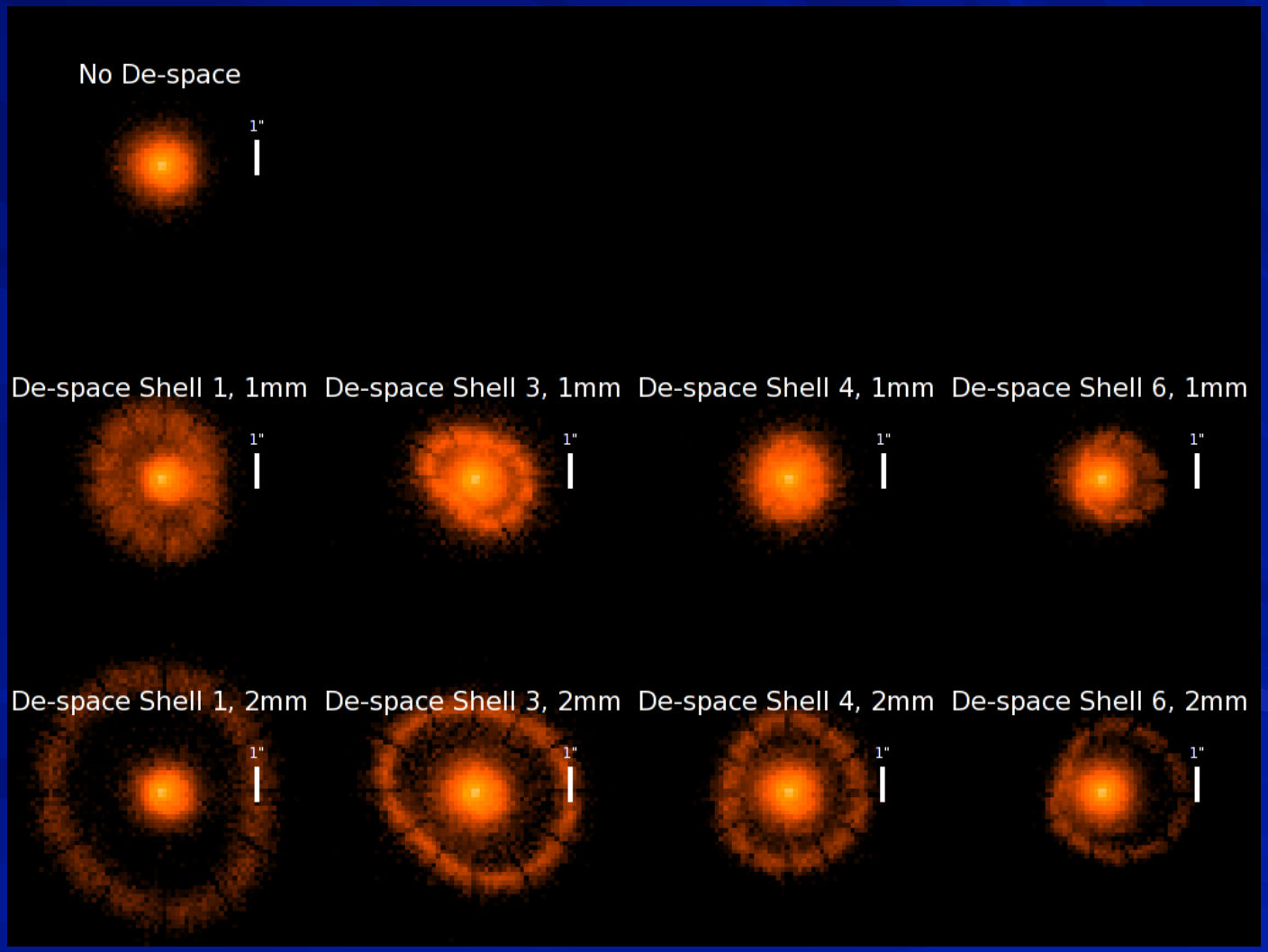
Core of the Point Spread Function

SAOTrace simulation of a single shell



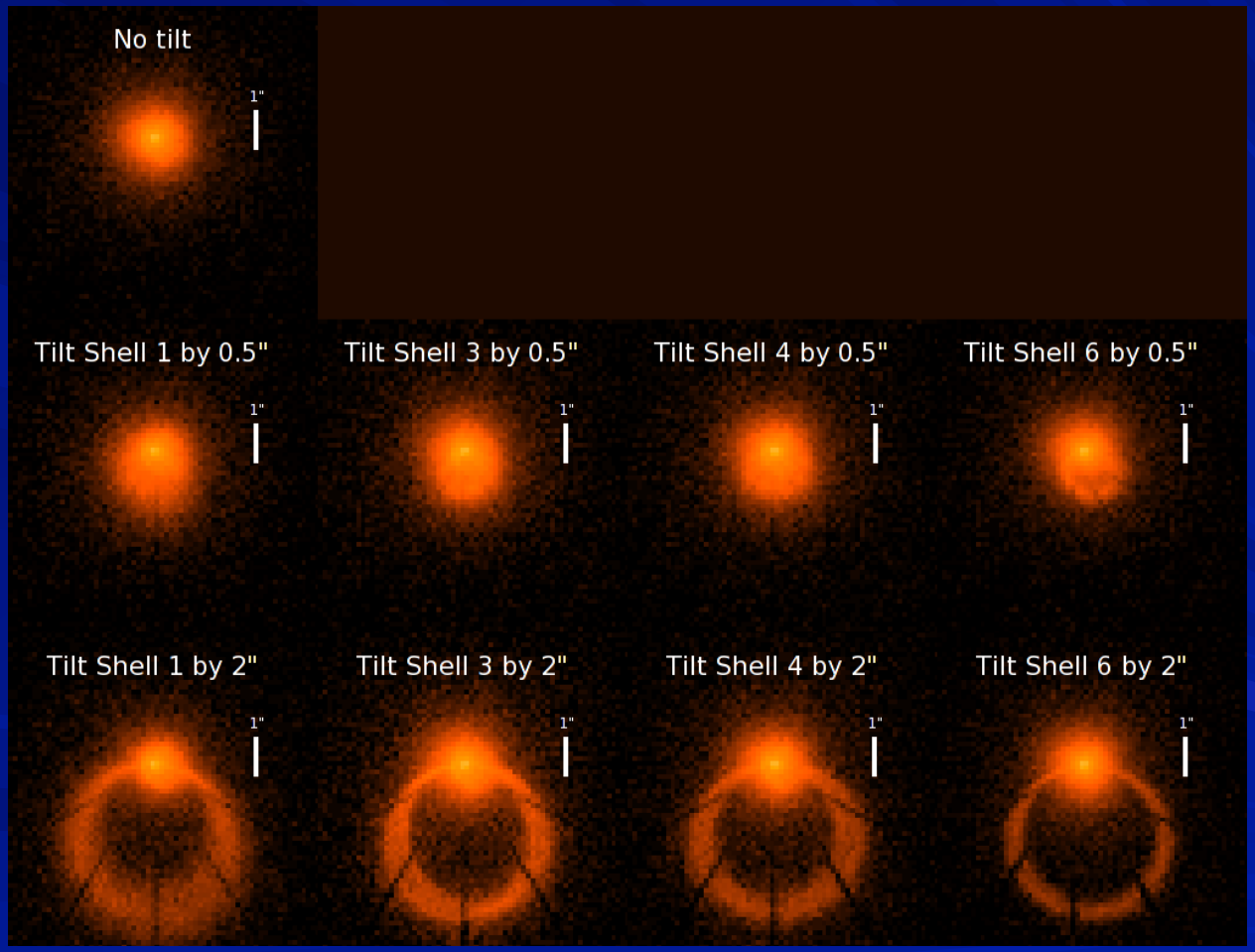
Core of the Point Spread Function

SAOTrace simulation of a single shell

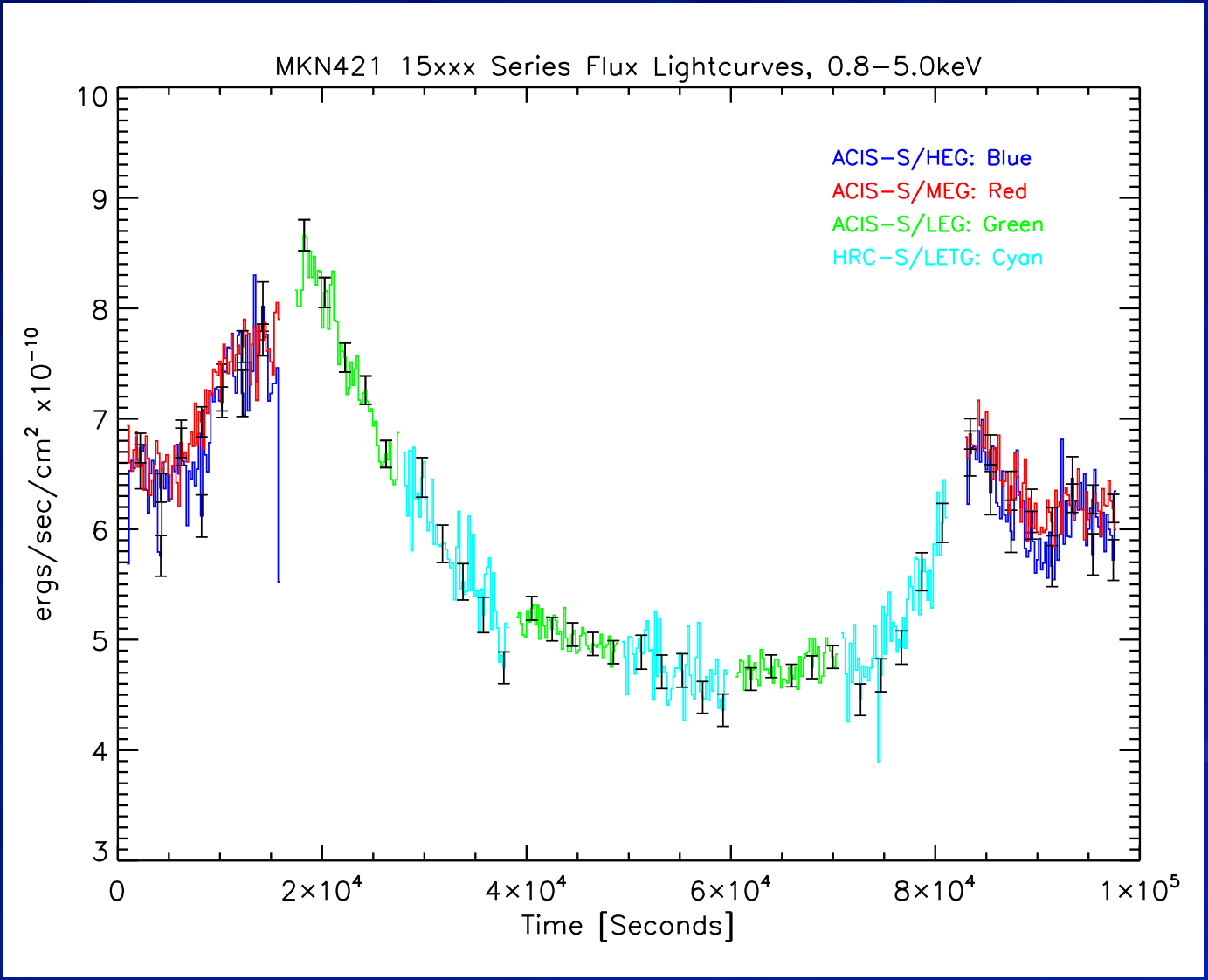


Core of the Point Spread Function

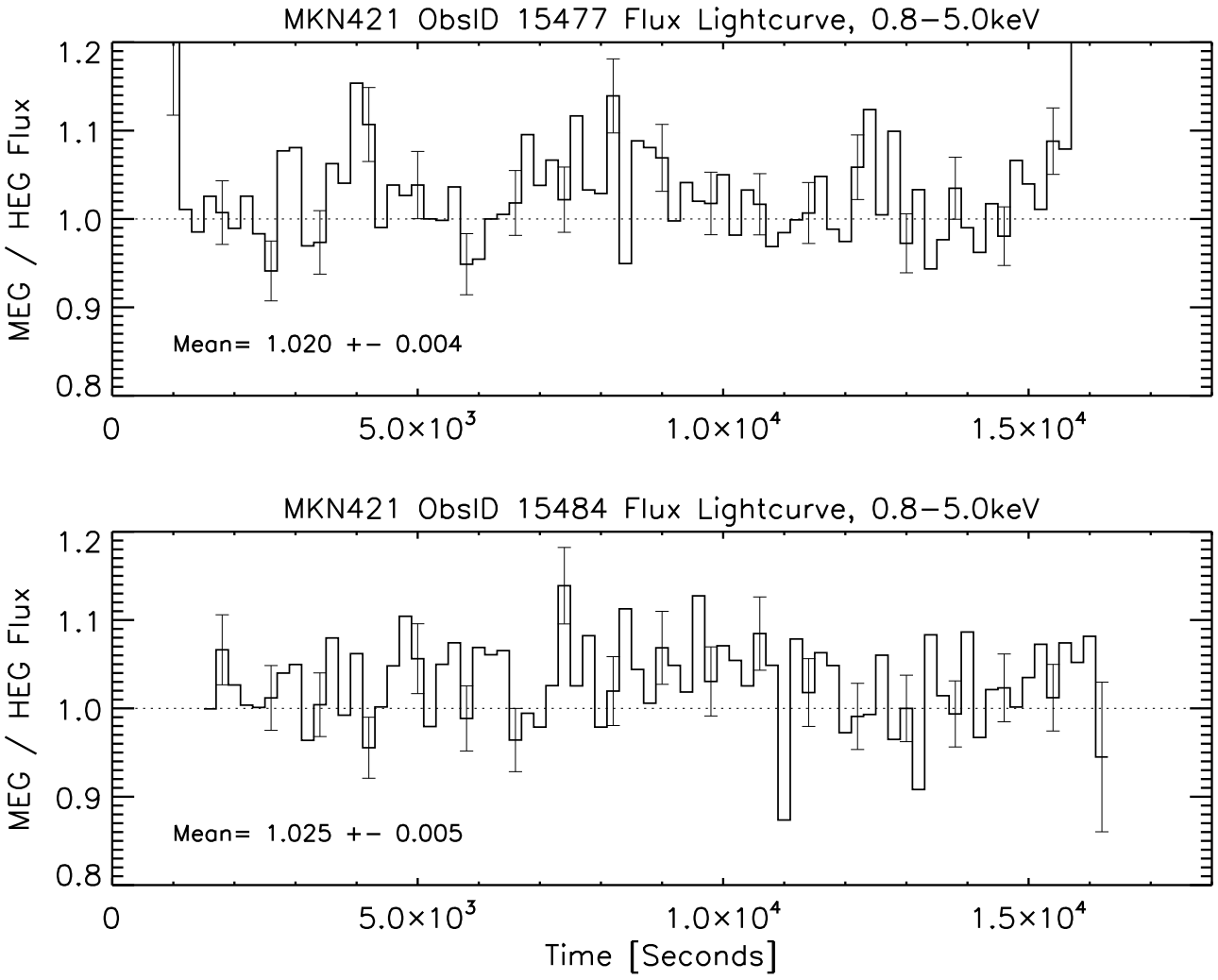
SAOTrace simulation of a single shell



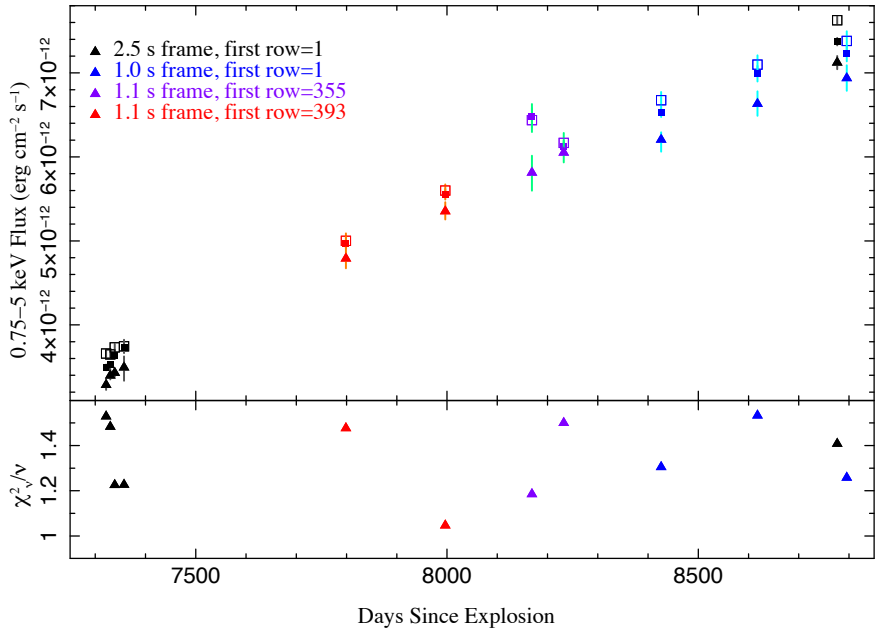
Chandra Internal Cross-Calibration with Mkn 421



Chandra Internal Cross-Calibration with Mkn 421

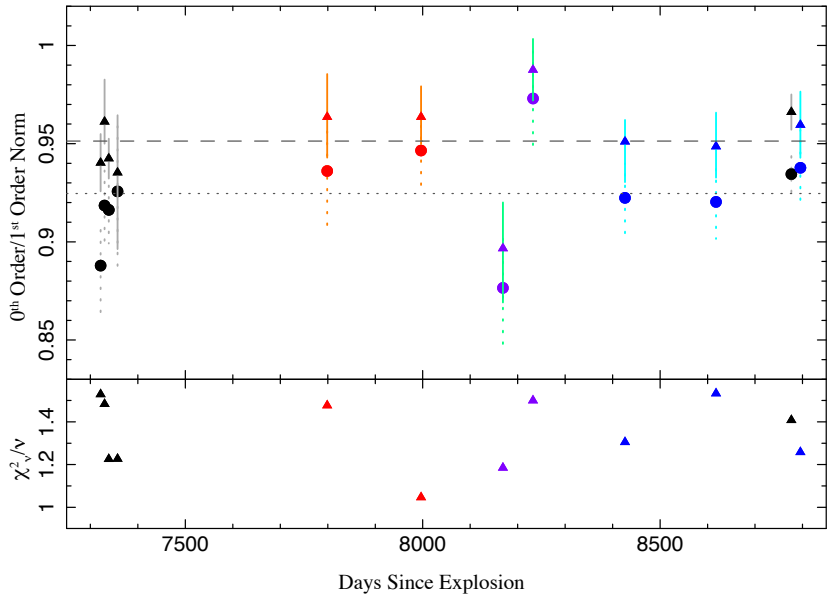


HETG 0th Order Calibration



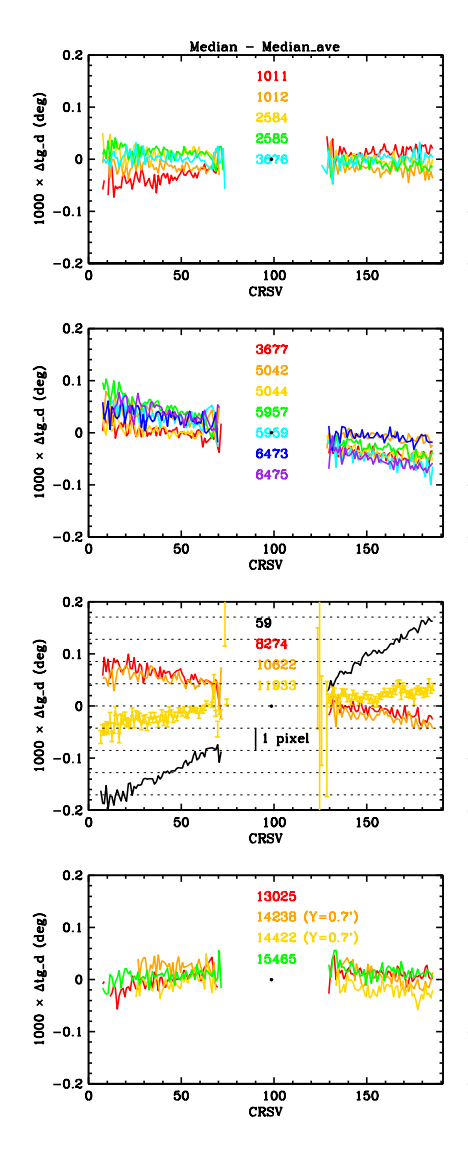
SN 1987a
0.5-5keV band

Triangles – fit to 0th order
Empty squares – model independent flux
Filled squares – simultaneous fit to 0th and 1st order.



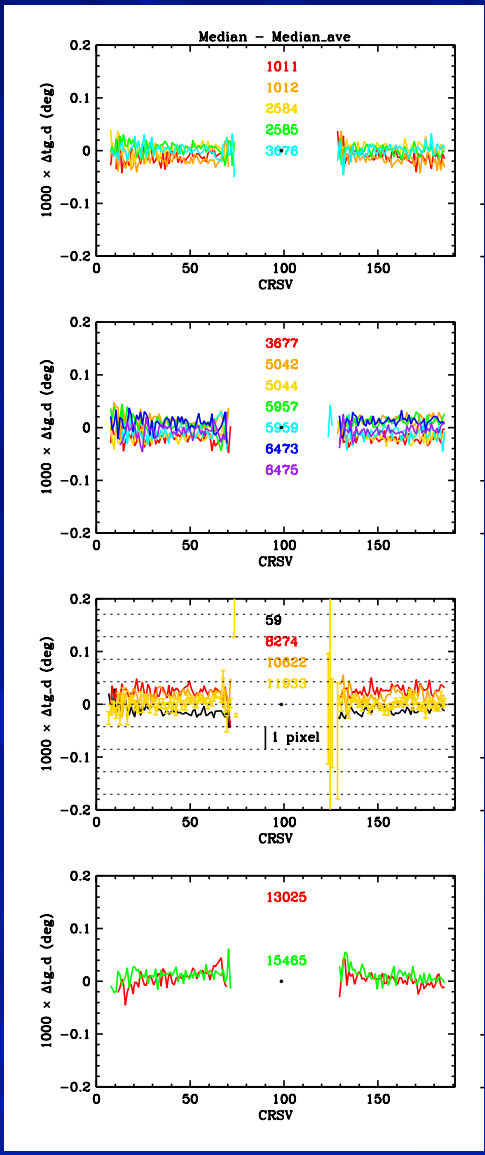
LETG/HRC-S Calibration

Uncorrected

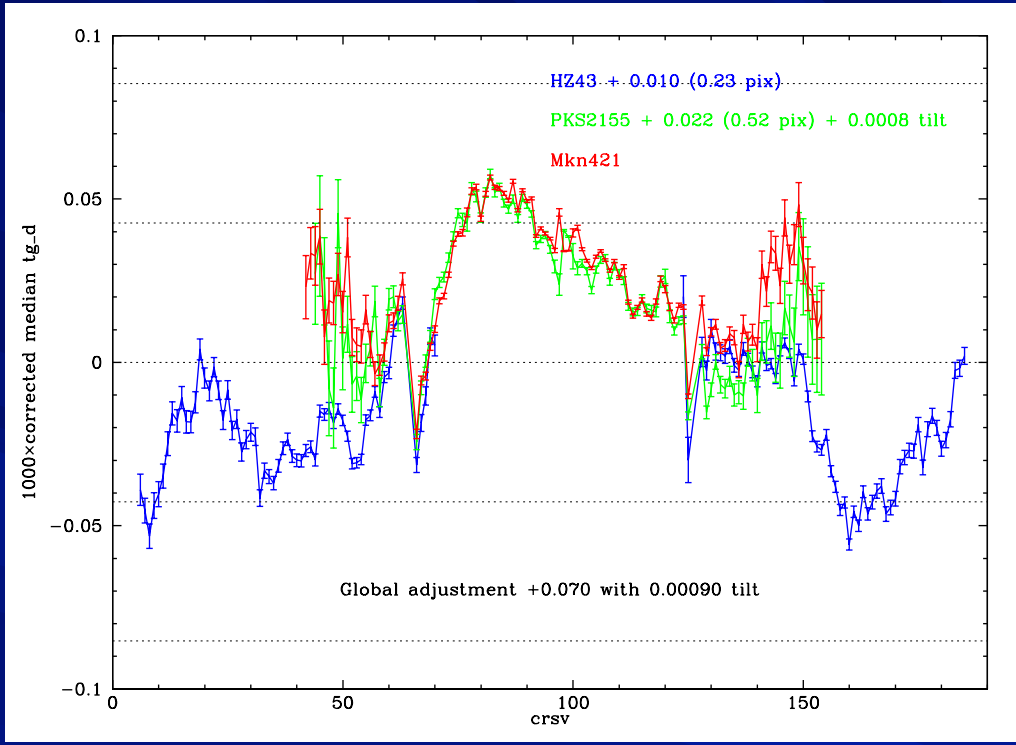


Time-dependent tilt in the dispersion axis

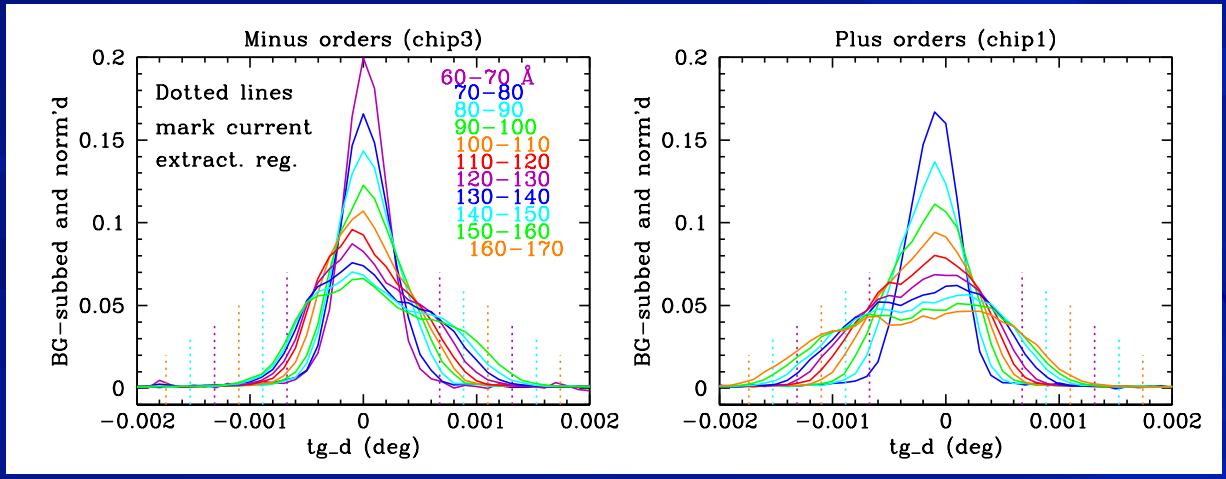
Corrected



LETG/HRC-S Calibration



After correcting for time-dependent tilts and 0th order position. With these corrections the extraction region and background can be reduced by 25%



New Version

Summary of Present Calibration Activities

ACIS

- Release updated contamination model Nov-Dec 2013
- Release improved low energy (E<500 eV) for the BI chips
- Further cross-calibration studies

HETG

- Post memo on the analysis of HETG/ACIS-S CC-mode data
- Examine MEG/HEG cross-calibration

LETG

- Post memo on optimizing the extraction region of LETG/HRC-S spectra
- Release updated OSIP file for LETG/ACIS-S spectra
- Update LETG extraction efficiencies

Summary of Present Calibration Activities

HRC

- Updated HRC-S QE at the new high voltage setting
- Characterize spatial and temporal variations in the HRC background
- Update the HRC-I QEU

HRMA

- Calibrate PSF/wing profiles using Her X-1 data and an improved prescription for out-of-plane scattering.
- Investigate the PSF anomaly