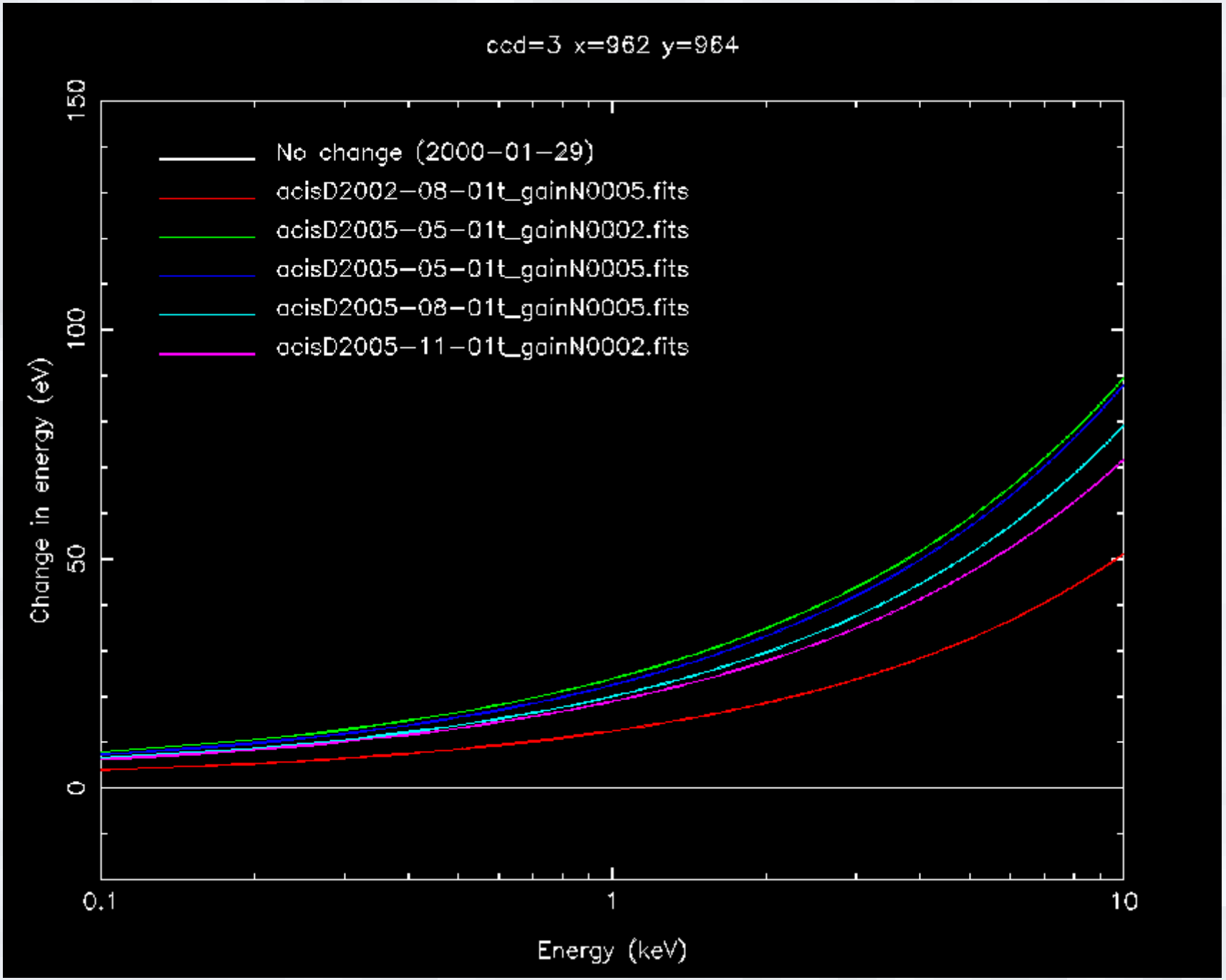
Chandra Calibration Status

Calibration Updates Since Last CUC Meeting

ACIS

1. New tgain files were released for epochs 23 and 24 (May 2005 – Nov 2005) in CALDB 3.2.2 on May 5, 2006. The new tgain files are based on a standard set of GTIs for the cti data based on the time-dependent focal plane temperature during the observations. Earlier screening of the cti data used the average focal plane temperature during the observation.

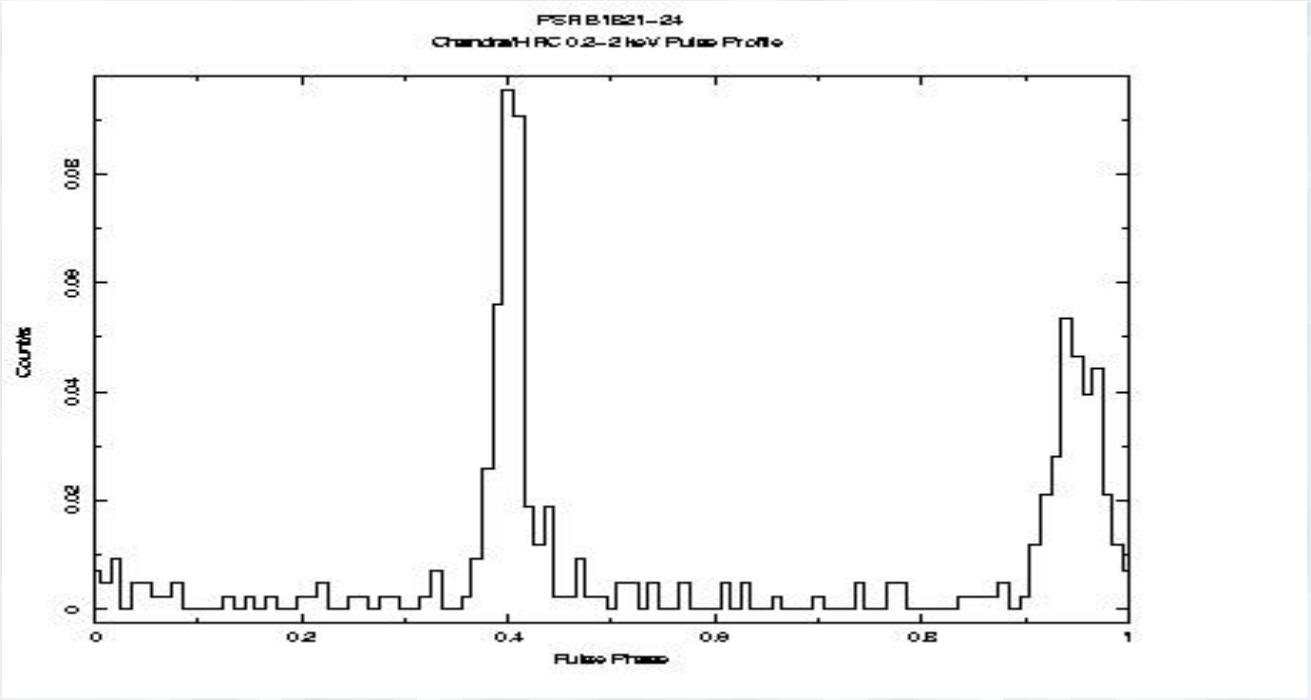

ccd=3 x=962 y=964
No change (2000-01-29)
acisD2002-08-01t_gainN0005.fits
acisD2005-05-01t_gainN0002.fits
acisD2005-05-01t_gainN0005.fits
acisD2005-08-01t_gainN0005.fits
acisD2005-11-01t_gainN0002.fits
Change in energy (eV)
150
100
50
0
0.1
1
10
Energy (keV)

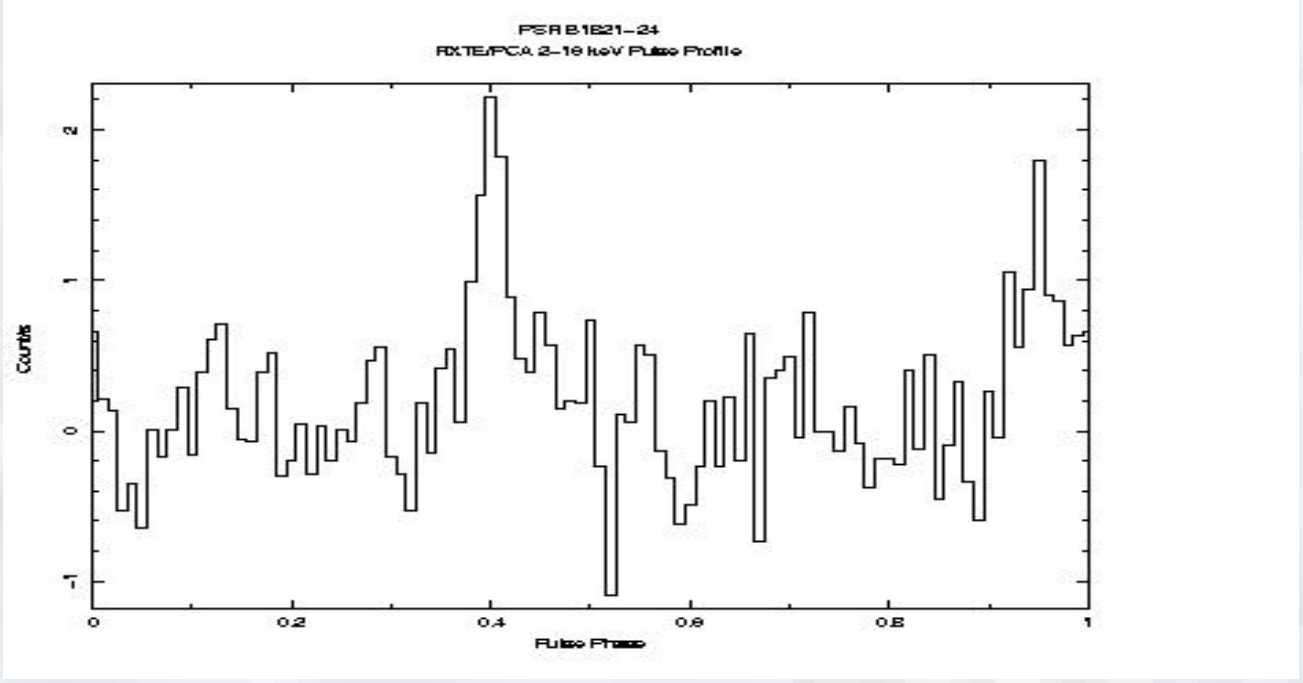
HRC

1. A revised HRC-I de-gap corrections table was released in CALDB 3.2.3 on Aug. 9, 2006. The revised de-gap is based on a raster scan (twenty 5 ksec pointings) of Capella on the central regions of the HRC-I in AO7. A similar raster scan will occur in AO8 to improve the de-gap corrections on the outer regions of the HRC-I.

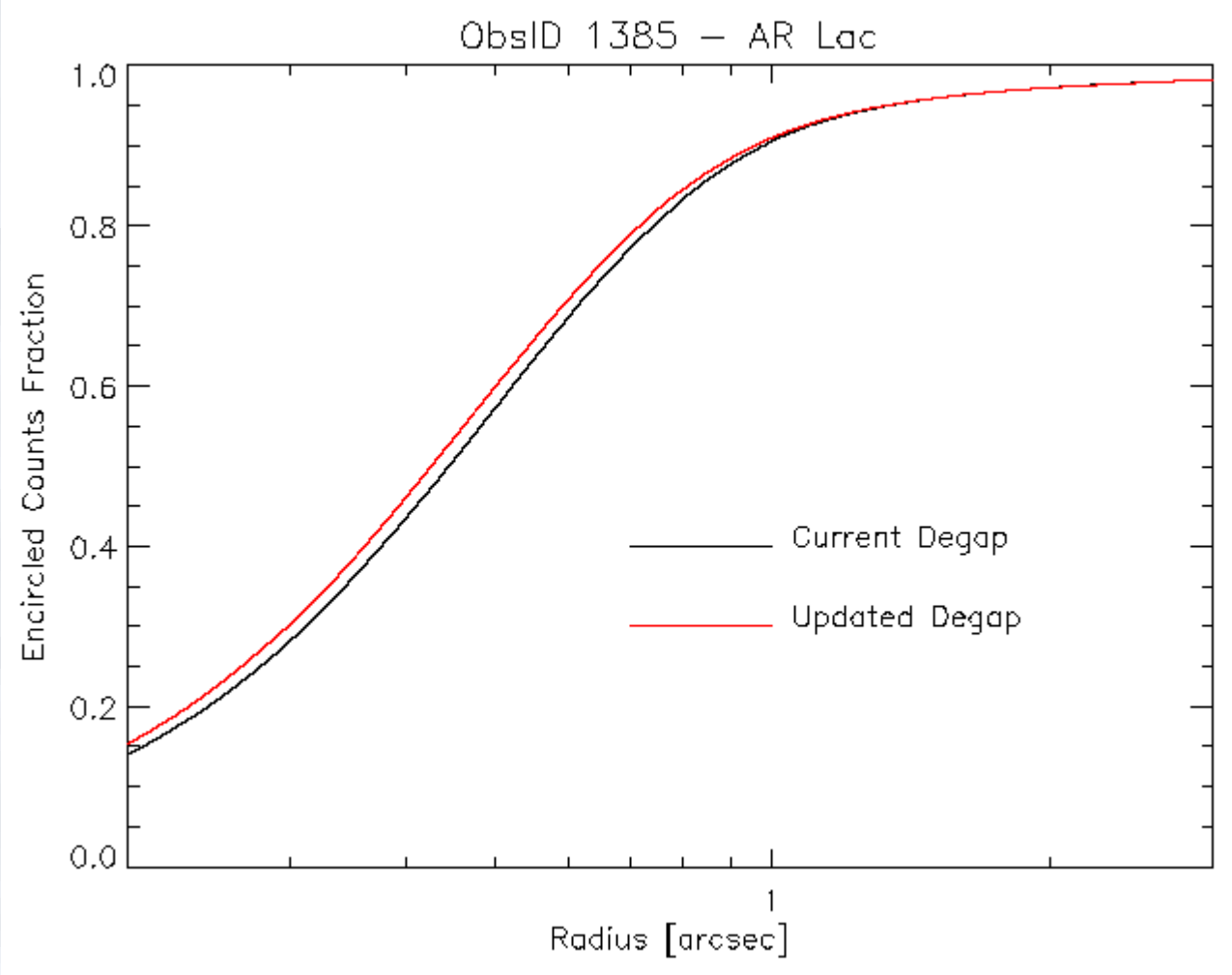
2. A revised HRC-I gain map was also released in CALDB 3.2.3 correcting a problem with an earlier version of the gain map. This map only affects the computation of the PIs in HRC-I data taken during the first two months of the mission.

3. Quenched an ugly rumour that the HRC-S timing was broken by detecting the pulse in the 3 ms pulsar PSR B1821-24.


PSR B1821−24
Chandra/HRC 0.2−2 keV Pulse Profile
Counts
0
0.02
0.04
0.06
0.08
0
0.2
0.4
0.6
0.8
1
Pulse Phase


PSR B1821−24
RXTE/PCA 2−16 keV Pulse Profile
Counts
−1
0
1
2
0
0.2
0.4
0.6
0.8
1
Pulse Phase

HRC-I encircled Energy



Present Status

Effective Area

Calibration Goals Met:

1. ACIS effective area:

   Between rows 100 and 900 on ACIS-S and within 6' of the aim point on ACIS-I the present uncertainties are 5%.

   Beyond these regions the uncertainties are 10%.

2. HRC-I effective area – present uncertainties are 7%

3. HETG/ACIS-S 1st order effective area – present uncertainties are 8%

Effective Area

Goals Not Met:

1. LETG/HRC-S first order – present uncertainties are 15% - the goal is 10%

2. LETG/HRC-S higher orders – present uncertainties are 20% - the goal is 15%

3. HETG/ACIS-S higher orders – present uncertainties are 20% - the goal is 15%

Absolute Energies

Calibration Goals Met:

1. ACIS – rms deviations in the gains are 0.3%
2. LETG/HRC-S - present uncertainties are 0.010A
3. HETG/ACIS-S – present uncertainties are $\delta\lambda/\lambda = 1.0 \times 10^{-4}$

Energy Resolution (FWHM)

Calibration Goals Met:

1. HETG/ACIS-S present uncertainties are 3%
2. ACIS – present uncertainties are 20 eV

Goals Not Met:

1. LETG/HRC-S Present uncertainties are 20% - goal is 10%

Astrometry

Calibration Goals Met:

1. HRC/ACIS absolute positions – uncertainties are 0.6 arcsec

2. ACIS relative astrometry – uncertainties are 0.1 arcsec

Goals not met

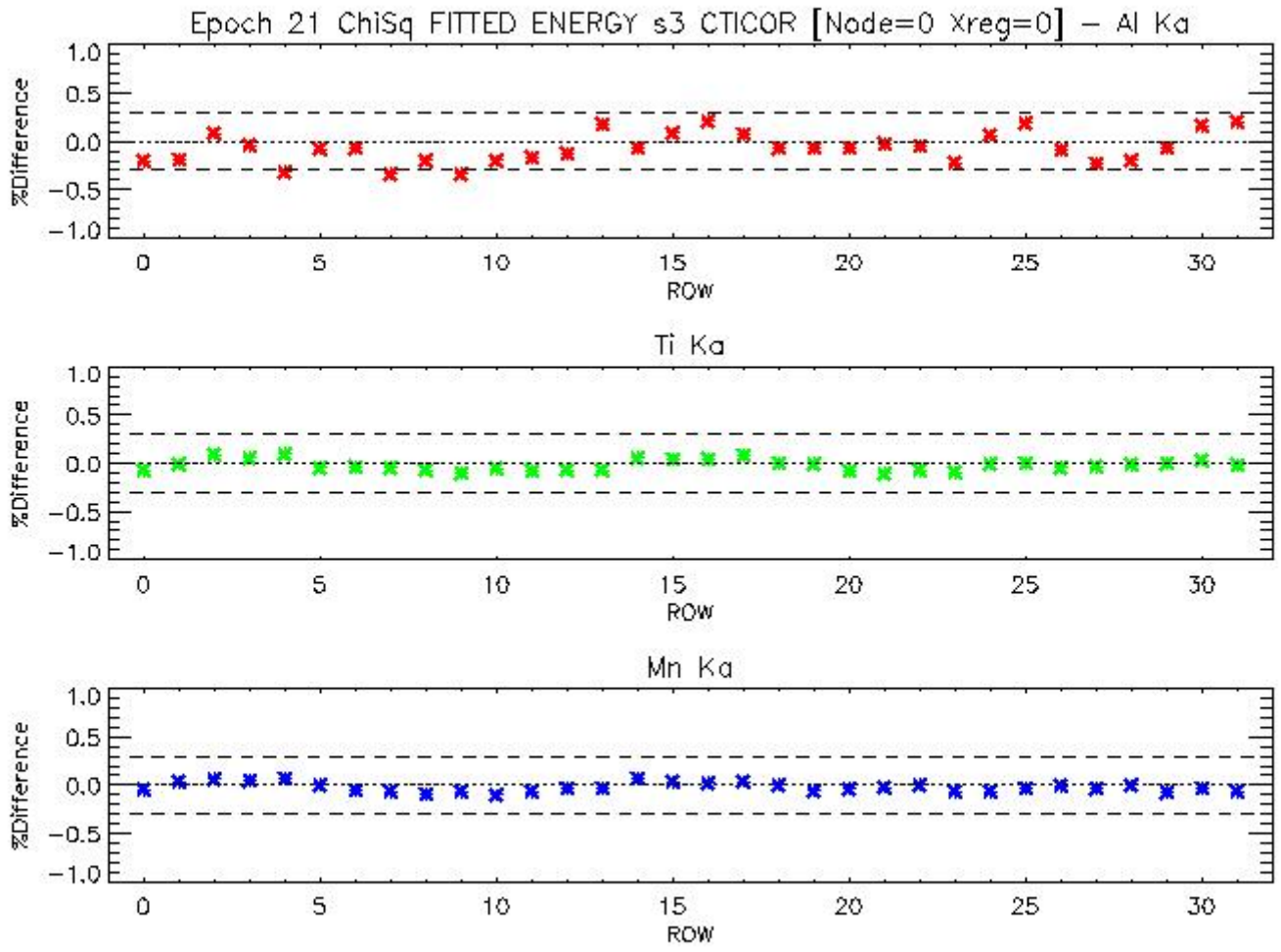
1. HRC-I relative astrometry – uncertainties are 0.3 arcsec – goal is 0.1 arcsec

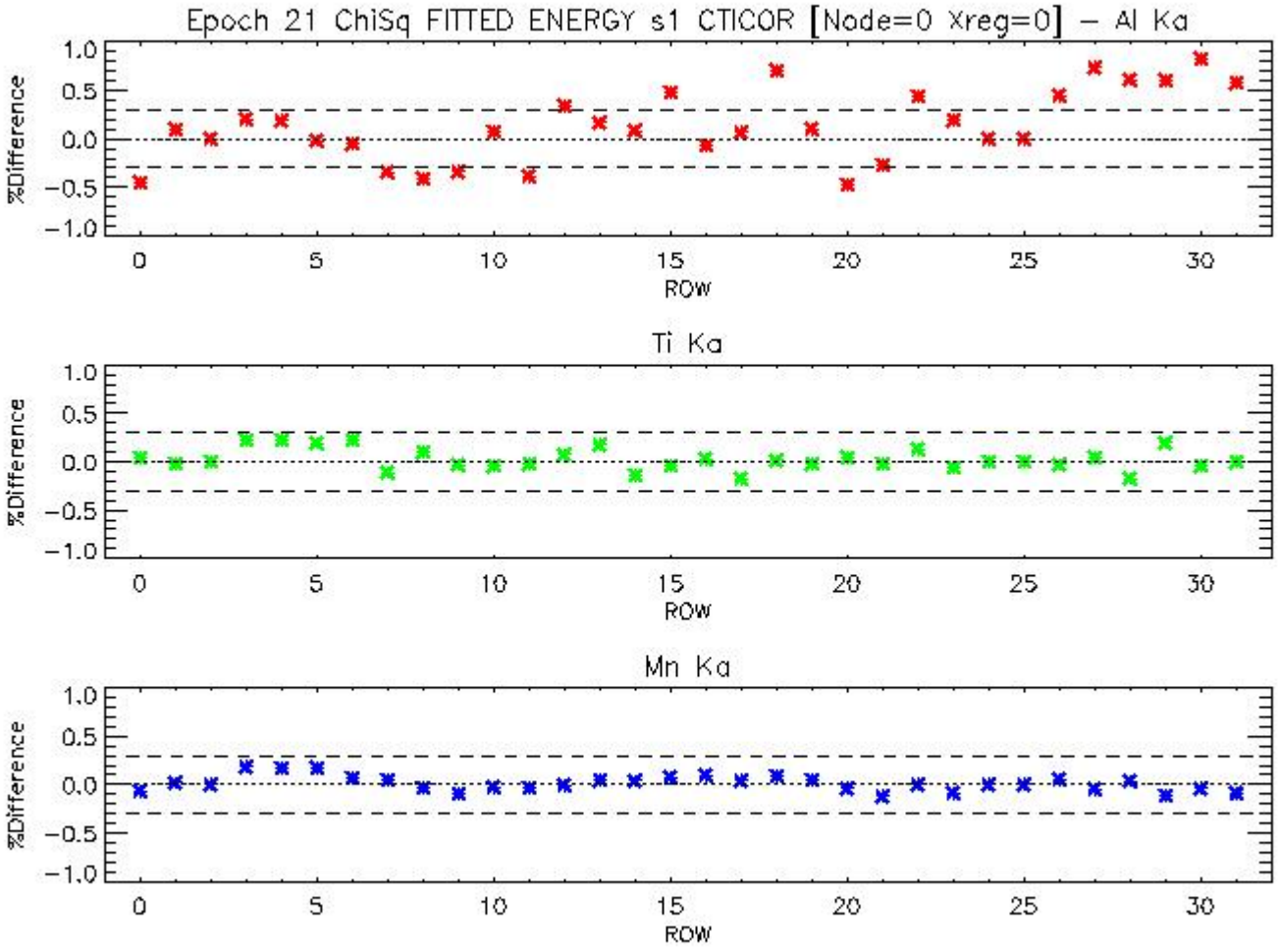
Timing – relative and absolute timing goals have been achieved.

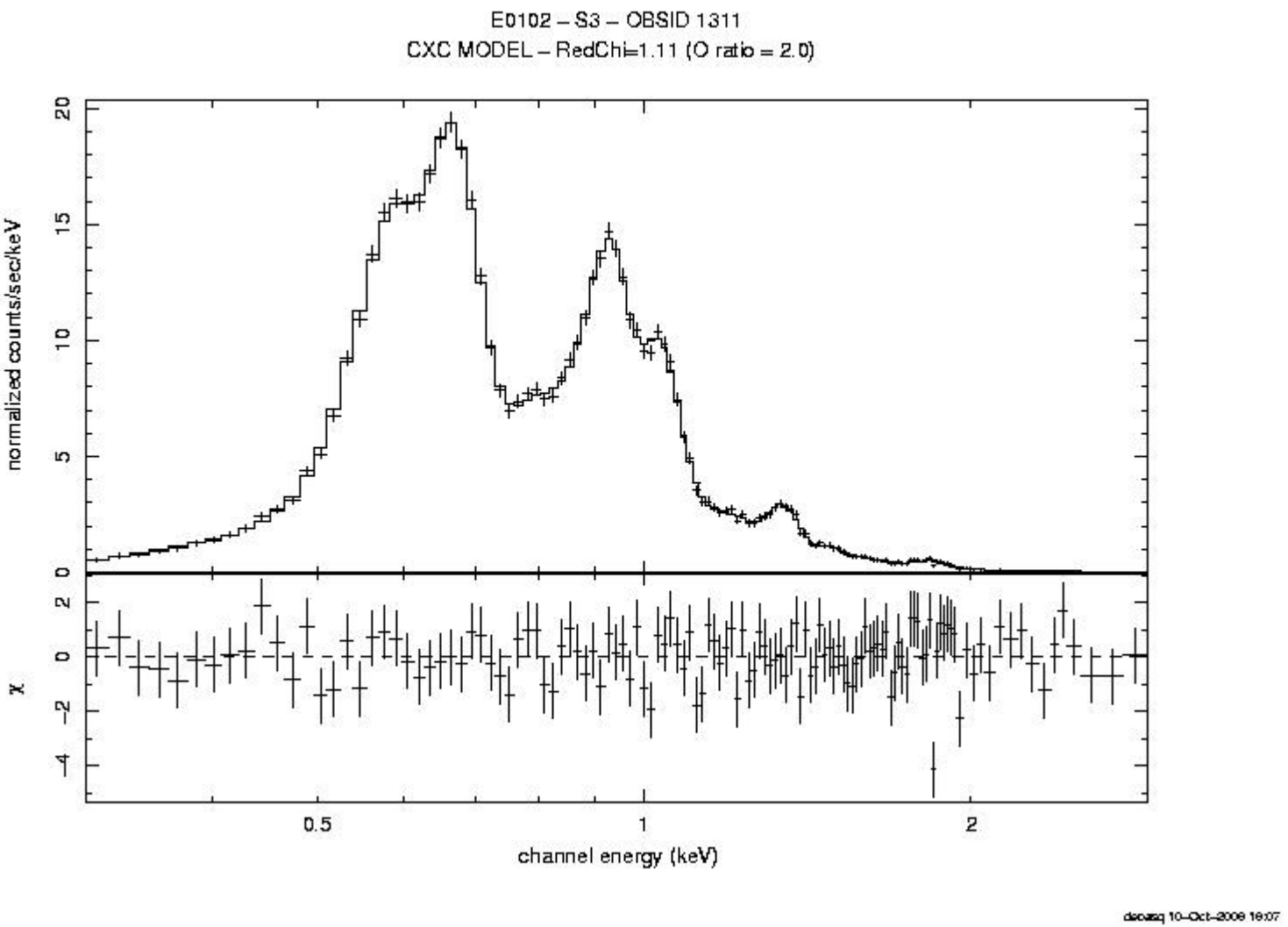
Present and Future Calibration Activies

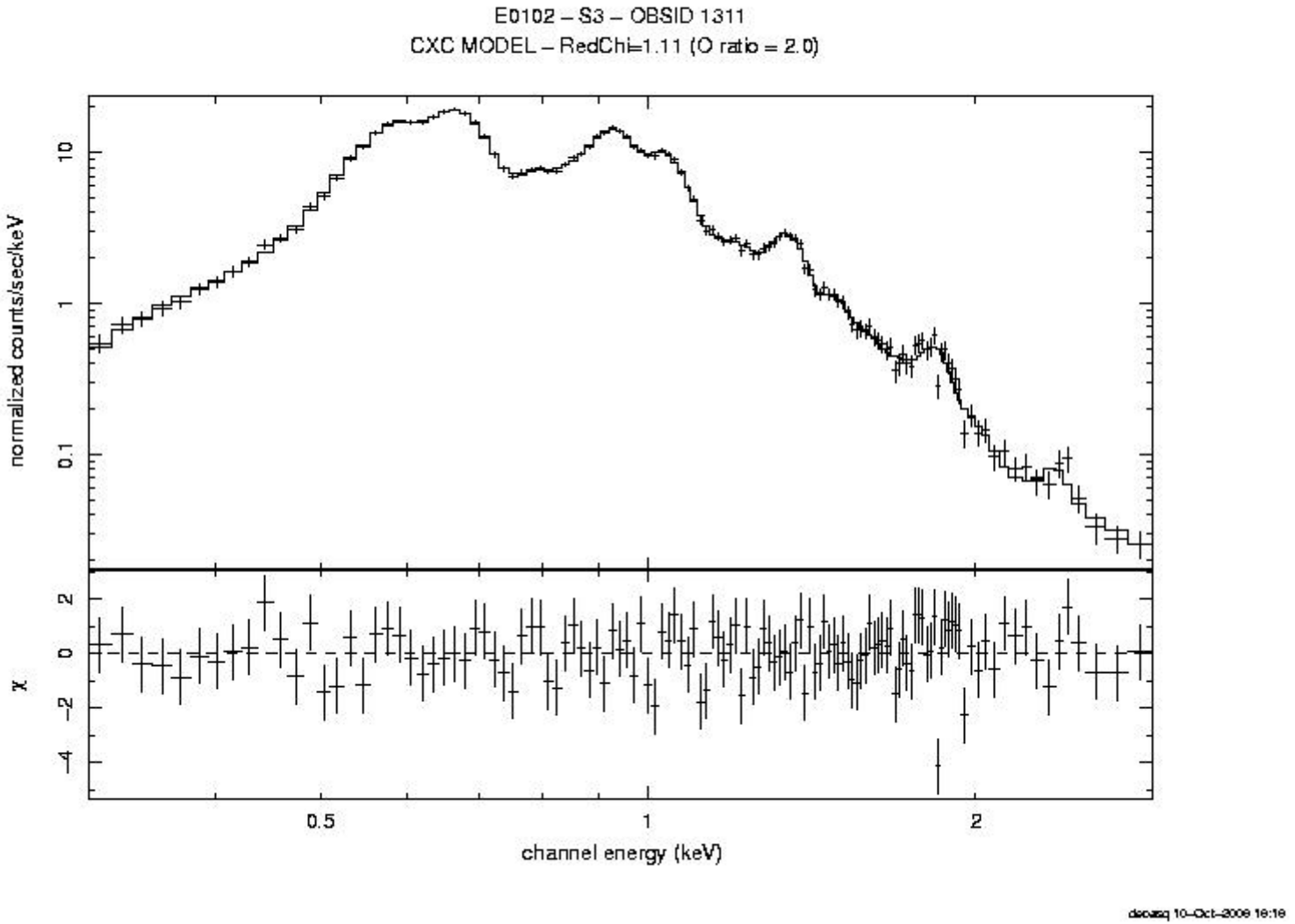
ACIS

1. CTI-corrected calibration products for the BI chips at T= -120 C.
   These products are scheduled for release in Dec. 2006 and will include new trap maps, cti-corrected gain files, response file, and QEU file.
2. A revised ACIS QE file with corrections near the Si-K edge is scheduled for release in Dec. 2006.
3. CTI- corrected calibration products for all 10 chips at T=-110C.
   There will only be one gain file (i.e., no time-dependence).
4. Improve CC mode calibration
5. The gain in 2.5% greater in the transfer streak in S3 and 7% greater in the transfer streak in the FI chips. This is under investigation.


Epoch 21 ChiSq FITTED ENERGY s3 CTICOR [Node=0 Xreg=0] – Al Ka
%Difference
1.0
0.5
0.0
−0.5
−1.0
0
5
10
15
20
25
30
ROW
Ti Ka
%Difference
1.0
0.5
0.0
−0.5
−1.0
0
5
10
15
20
25
30
ROW
Mn Ka
%Difference
1.0
0.5
0.0
−0.5
−1.0
0
5
10
15
20
25
30
ROW


Epoch 21 ChiSq FITTED ENERGY s1 CTICOR [Node=0 Xreg=0] – Al Ka
%Difference
1.0
0.5
0.0
−0.5
−1.0
0
5
10
15
20
25
30
ROW
Ti Ka
%Difference
1.0
0.5
0.0
−0.5
−1.0
0
5
10
15
20
25
30
ROW
Mn Ka
%Difference
1.0
0.5
0.0
−0.5
−1.0
0
5
10
15
20
25
30
ROW


E0102 – S3 – OBSID 1311
CXC MODEL – RedChi=1.11 (O ratio = 2.0)
normalized counts/sec/keV
20
15
10
5
0
χ
2
0
−2
−4
0.5
1
2
channel energy (keV)
dcoasq 10-Oct-2008 16:07


E0102 – S3 – OBSID 1311
CXC MODEL – RedChi=1.11 (O ratio = 2.0)
normalized counts/sec/keV
10
1
0.1
χ
2
0
−2
−4
0.5
1
2
channel energy (keV)
dcalsq 10-Oct-2006 16:16

HRC

1. Update the HRC-S degap correction coefficients table to include emiprical corrections from both line and continuum sources observed by the LETG/HRC-S. This is scheduled for release in Dec. 2006

2. A rmf for the HRC-S is scheduled for release in Dec. 2006. This will help with the generation of hardness ratio images.

3. Update the HRC-I degap correction coefficients table using the AO8 raster scan of Capella on the outer portions of the HRC-I

4. Develop time-dependent gain correction tables for the HRC-I and HRC-S

5. The HZ43 data show a slow drop of 5% in the QE at wavelengths longer than 50A since launch. Superimposed on the monotonic 5% drop are 1 to 2% fluctuations. This is under investigation.

HRMA

1. Most of the optics team's time over the past 6 months has been spent porting the SAOsac raytrace package to Linux for installation into CIAO Level III processing.

2. Finish a memo on the drift of the optical-axis. This should be posted by Nov.

3. Release the ECFs derived from elliptical rather than circular apertures

4. Post a memo on the unpiled-up ACIS PSF based on the analysis of stacked faint sources

5. Finish analysis of the ACIS-S piled-up observations and post a report.

6. Investigate a potential problem with the tilt of shell 6 due to residuals in the LSF of HEG spectra.

LETG

1. Update the HRC-S QE file – the new product will include a better treatment of the QE near the O-K edge. This is complicated due to the inability of separating the OI and OII edges in the ISM and the molecular oxygen O edge in the HRC-S filter. The new QE will also include updates on the theoretical flux predictions of the white dwarf models for HZ43 and Sirius B.

2. Incorporate the spatial non-linearities in the LETG/HRC-S dispersion relation in the LRFs.

3. Search for any time-dependence in the non-linearities of the LETG/HRC-S dispersion relation

HETG

1. Use the HETG data taken in CC mode to improve the CC mode calibration.

2. Improve HETG higher order efficiencies

3. Examine the effects of pile-up in grating spectra