Chandra Calibration Status

11th IACHEC Meeting Feb. 29, 2016

Herman Marshall (MIT) and Jeremy Drake (SAO) for Larry David (SAO)
Contamination Build-Up on the ACIS Filters
Contamination Build-Up on the ACIS Filters

Dec. 2015 HETG/ACIS-S Big Dither observations of Mkn 421
Contamination Build-Up on the ACIS filters

Components of the ACIS contamination model
- Time-dependence
- Spatial variations
- Chemical composition C, O and F
Contamination Build-Up on the ACIS filters

Evidence for multiple sources of contamination
Contamination Build-Up on the ACIS filters
Contamination Build-Up on the ACIS filters

ACIS-S Observations of E0102-72

IACHEC Model - black solid line
ACIS Average - black dashed line
Adjustments to ACIS-S1 Low Energy Gain

Comparison of photon energies computed from the detector gain and LETG dispersion relation. The old ACIS-S1 gain tables led to the exclusion of low energy events with the default OSIPs.
ACIS Spectral Resolution

ACIS spectral resolution has degraded with time due to increasing CTI and to a lesser extent higher operating temperatures.

Work has commenced on developing a set of time-dependent scatter matrices.
LETG/HRC-S vs LETG/ACIS-S Cross-Calibration

Mkn 421 Observation

![Graph showing comparison between ACIS-S and HRC-S for Old S1 detector gains.](image)

Old S1 detector gains

![Graph showing comparison between ACIS-S and HRC-S for New S1 detector gains.](image)

New S1 detector gains
HRC-S Calibration Status

- 25% loss in gain over past two years.
- 5% loss in QE over past two years.
- Requires updates to CALDB files.
- No plans for increasing the HRC-S HV.
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LETG/HRC-S Observations of HZ43
LETG/HRC-S Calibration Status

Time-dependent tilt correction
LETG/HRC-S Calibration Status

Time-dependent tilt correction
LETG/HRC-S Calibration Status

Time-dependent tilt correction

![Graph showing time-dependent tilt correction with data points for HZ43, Mkn421, PKS2155, and Capella.](image)
LETG/HRC-S Calibration Status

Time-dependent tilt correction
LETG/HRC-S and LETG/ACIS-S Cross-Calibration

- Old LETG EFFRAC file
- Old ACIS-S1 gain
Adjustments Required to Preserve Cross-Calibration

- New ACIS-S1 gain file improves the cross-calibration between LETG/HRC-S and LETG/ACIS-S data
- New LETG/HRC-S EEFRACS file requires an adjustment to the HRC-S QE to maintain LETG/HRC-S vs. LETG/ACIS-S cross-calibration
- New HRC-S QE requires an adjustment to the HRC-I QE to maintain HRC-S vs. HRC-I cross-calibration
Adjustments Required to Preserve Cross-Calibration

- New ACIS-S1 gain file improves the cross-calibration between LETG/HRC-S and LETG/ACIS-S data.
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- New HRC-S QE requires an adjustment to the HRC-I QE to maintain HRC-S vs. HRC-I cross-calibration.
Calibration Schedule

ACIS

- Release revised ACIS contamination model with updated elemental ratios, time-dependence and spatial distribution.
- Release a set of time-dependent scatter matrices.
- Release new ACIS QE maps (these are generated about every two years).
- Release a set (Epoch G) of ACIS blank sky background images for the period 2012-2015.

Gratings

- Release updates to the HEG and MEG 0th order transmission efficiencies.
- Perform a cross-calibration study between LEG, HEG and MEG gratings data.
- Perform a cross-calibration study of the higher order transmission efficiencies of HEG and MEG.

HRC

- Release updates to the time-dependence of the HRC-S and HRC-I QE.
- Release a revised HRC-I QE map using recent calibration observations of the Coma cluster.