Calibration Status Report

1) HRMA
2) ACIS
3) HRC
4) LETG
5) HETG

Summary can be found at asc.harvard.edu/cal/Cal_Status_Report_011901.html
ACIS Calibration Issues

1) Low Energy Gain
2) Spectral Response
3) Quantum Efficiency
LETG/ACIS-S Observations of PKS2155–304

0.2 keV

0.6 keV

S4

S3

S2
True energy vs. PI energy (ACIS S3c1)
From LETG/ACIS-S observations of PKS 2155-304

Residuals of True energy vs. PI energy (ACIS S3c1)
From LETG/ACIS-S observations of PKS 2155-304
correctionmap_J3-120C.xdr, Energy: 5.100 keV

Mean Uncertainty: 4.0%

MIT/CXC Thu Aug 17 17:59:20 2000
correctionmap_S3-120C.xdr, Energy: 5.298 keV

Mean Uncertainty: 9.1%
HRC Imaging Calibration (cont.)

RECENTLY COMPLETED

- QE Uniformity Maps: Single energy independent map for I is now available and being adapted for pipelines by SDS group. S maps at 4+3 energies available; will upgrade (hopefully) to single map after removal of UVIS spatial variations (release spring)

- Timing response: S (in S_TIMING SIMode) has 16μs resolution and is the preferred detector for precision timing measurements.

- Filtering/Flagging Algorithms: Characterized and implemented in software pipelines

- “De-ringing” software: implemented for I processing, S data being adapted by SDS

- Degap maps: Version 3 for I recently released by IPI team and adapted for general use. Work on new S map (using “de-rung” data) has commenced, preliminary results spring.
HRC Imaging Calibration (cont.)

WORK IN PROGRESS

- Point-Spread Function: Analysis of XRCF data complete; awaiting implementation of new degap maps before commencing on-orbit analysis, preliminary release late spring.

- UV Ion Shield: addition of fine structure around Carbon edge being implemented for all filters expect release late winter.

- MCP Quantum Efficiency: Above 0.828 keV model good to < 10% for I, from 0.277 to 0.828 model good to < 15%, below 0.277 still not well constrained. Present on-orbit data indicate that model above 0.277 should increase in QE slightly (~ 4%) and accuracy will improve to < 5%. Below 0.277 waiting for January data to determine amount of required adjustment to model and accuracy should improve to < 20%, release spring. Current S model above 0.277 keV good to < 20%, below 0.277 keV is not well constrained. Using the new LETG dispersed model and ongoing QEU analysis will have model good to < 15% at all energies, preliminary release late winter.

- Full HRC Effective Area: Dependent upon update of on-axis QE results and final QEU maps. Expected releases late spring.
LOG contours: 3.4, 10, 30, 67, 256
753, 2218, 6606, and half-power=19,125

Log contours: 4.9, 14.5, 42.5, 125, 387
1080, 3173, 9325, and half-power=27,420
<table>
<thead>
<tr>
<th>Product</th>
<th>Status</th>
<th>Accuracy</th>
</tr>
</thead>
<tbody>
<tr>
<td>LETG/HRC-S EA on-axis</td>
<td>updated 11/00</td>
<td>15% over whole range--much better edge structure</td>
</tr>
<tr>
<td>EA off-axis (based on HRC-S QE maps)</td>
<td>early 2001</td>
<td>20%</td>
</tr>
<tr>
<td>LETG efficiency (m=0,1,3)</td>
<td>updated 3/00</td>
<td>5%</td>
</tr>
<tr>
<td>LETG efficiency (higher orders)</td>
<td>early 2001</td>
<td>better than now</td>
</tr>
<tr>
<td>HRC-S gain map (PHA--&gt;PI)</td>
<td>completed 4/00</td>
<td>5%</td>
</tr>
<tr>
<td>Bowtie spectrum extraction region</td>
<td>completed 4/00</td>
<td>improved S/N</td>
</tr>
<tr>
<td>Dispersion relation</td>
<td>updated 7/00</td>
<td>0.02%</td>
</tr>
</tbody>
</table>
Summary of HETGS Calibration

Herman L. Marshall
(MIT Center for Space Research)

Dispersion Relation

• Found and eliminated systematic wavelength errors of about 0.05%
  Rowland spacing was changed for reprocessing
  --> accuracy of 0.02 - 0.01% is not possible
Later, we determined that the ACIS pixel size is smaller, instead
  Was 24.000 μ, now will be 23.987 μ due to thermal contraction
  Verification awaits reprocessing and more emission line IDs

• Line location uncertainties due to chip position uncertainties < 0.005Å
  Outer chips (S0, S1, S5) are accurate to < 0.5 pix, others to < 0.2 pix
  MEG (HEG): < 0.005 Å (0.0025 Å) at long wavelengths
  MEG (HEG): < 0.002 Å (0.0005 Å) at short wavelengths
Better chip locations will be measured in new processing

Effective Area

• Ratio of BI/FI data for a given grating indicates QE errors < 15%
  Systematic errors are < 10% for 1.5 < E < 7 keV
  FI/FI ratios are all consistent with pre-launch QE models

• Ratios of MEG/HEG data indicate efficiency errors up to 8%
  New efficiencies have been released

Line Profiles

• No deviations from ground-based models yet noted

Cross Dispersion Profiles

• Flight data used to compute aperture losses
  Results agree qualitatively with pre-flight models
  Results added to Proposers' Observatory Guide
May 2000, -90'' offset

Dec. 2000, +90'' offset

Flux (ph/cm²/s/keV)