

Calibration Status

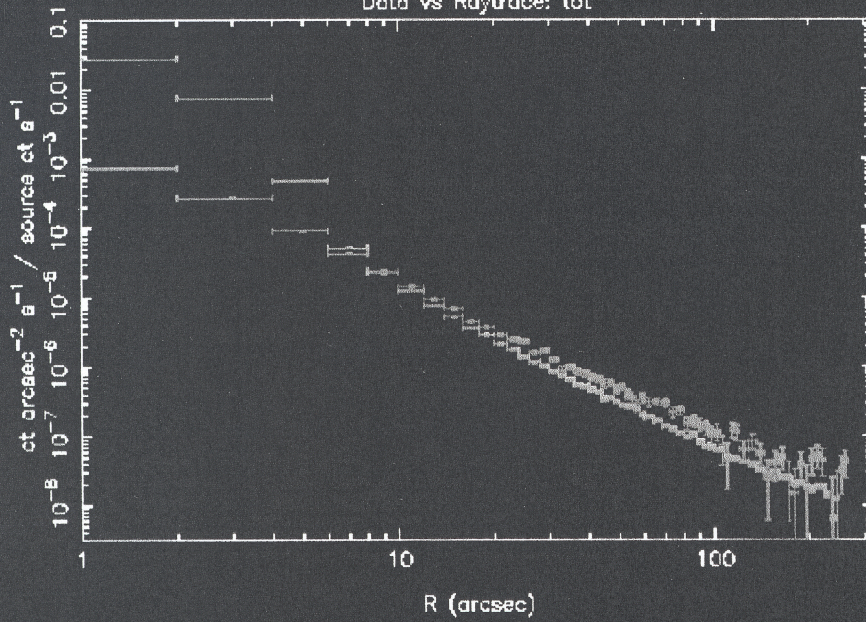
- 1) HRMA
- 2) ACIS
- 3) HRC
- 4) LETG
- 5) HETG

62 Calibration products in
CALDB 2.0

50 are complete

30273 (obsid 1712; ACIS-S3)

Data vs Raytrace: tot

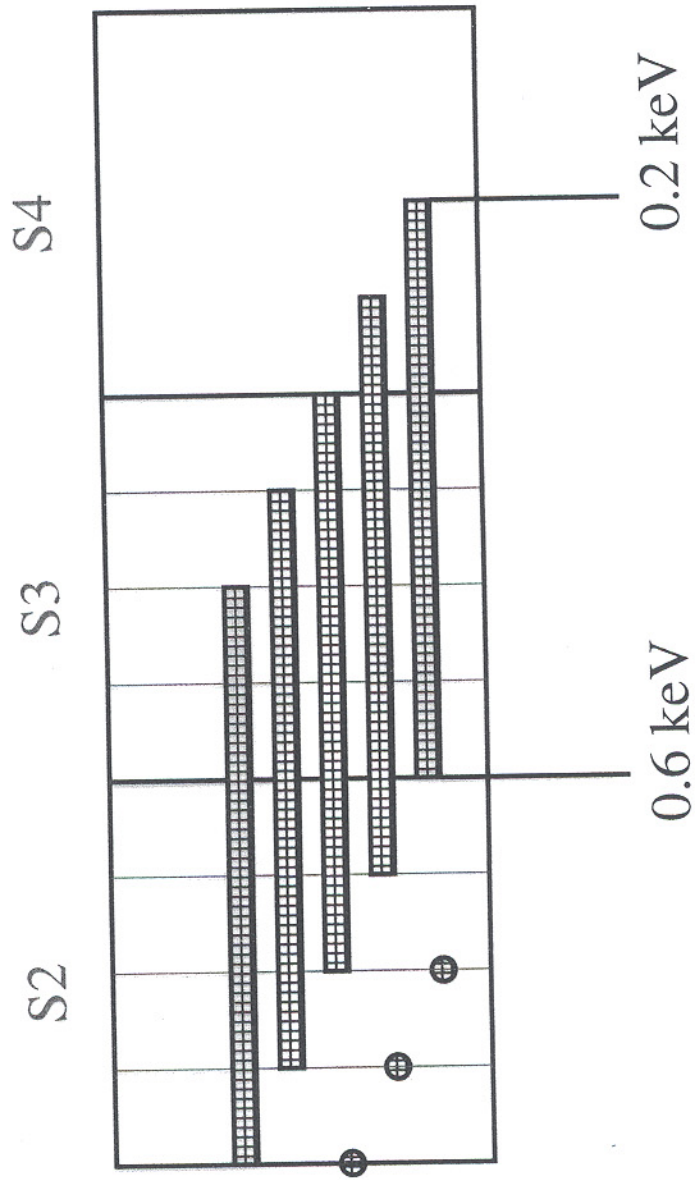


1712
raytrace

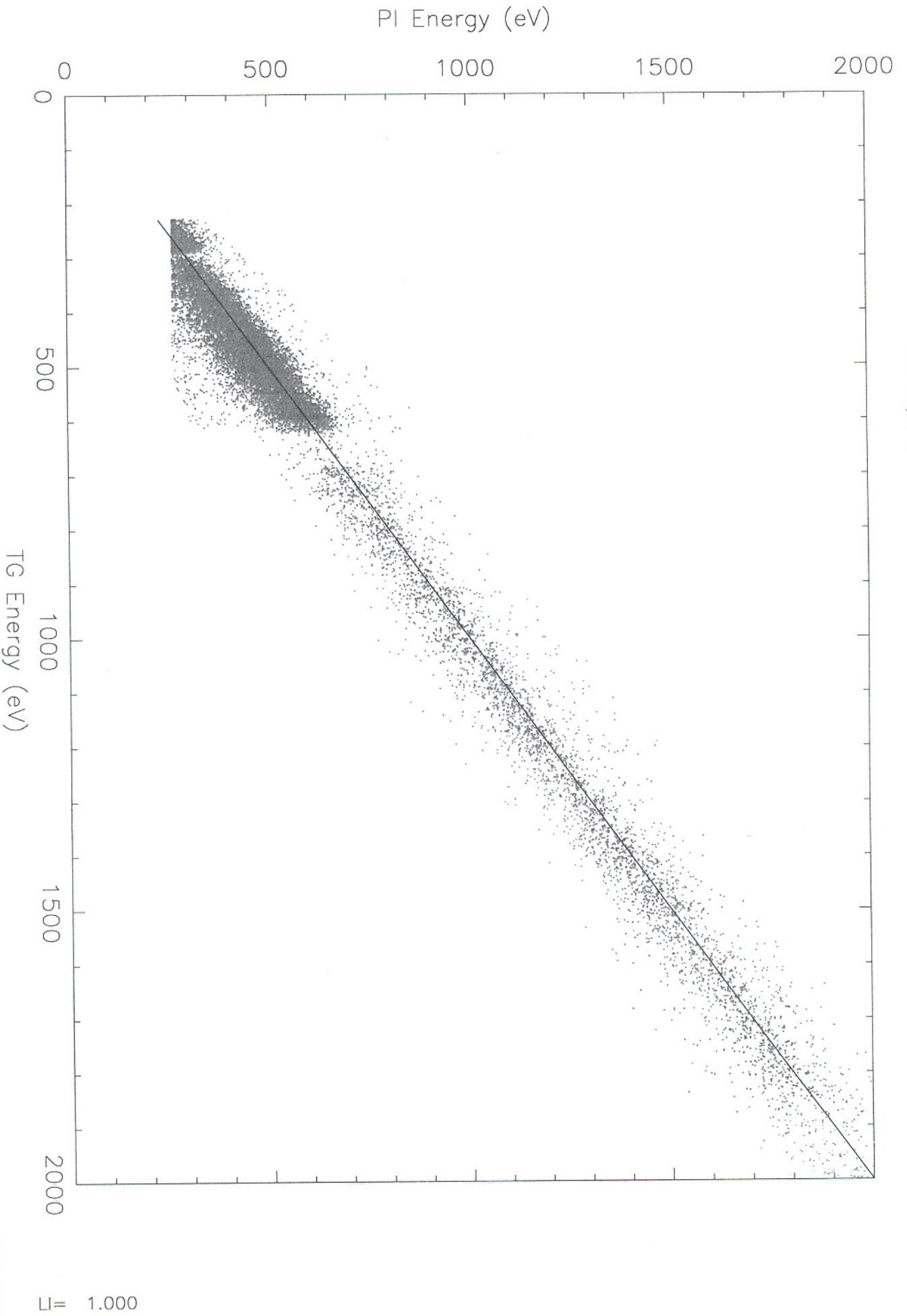
ACIS Calibration Issues

- 1) Low Energy Gain
- 2) Spectral Response (RMF)
- 3) Quantum Efficiency

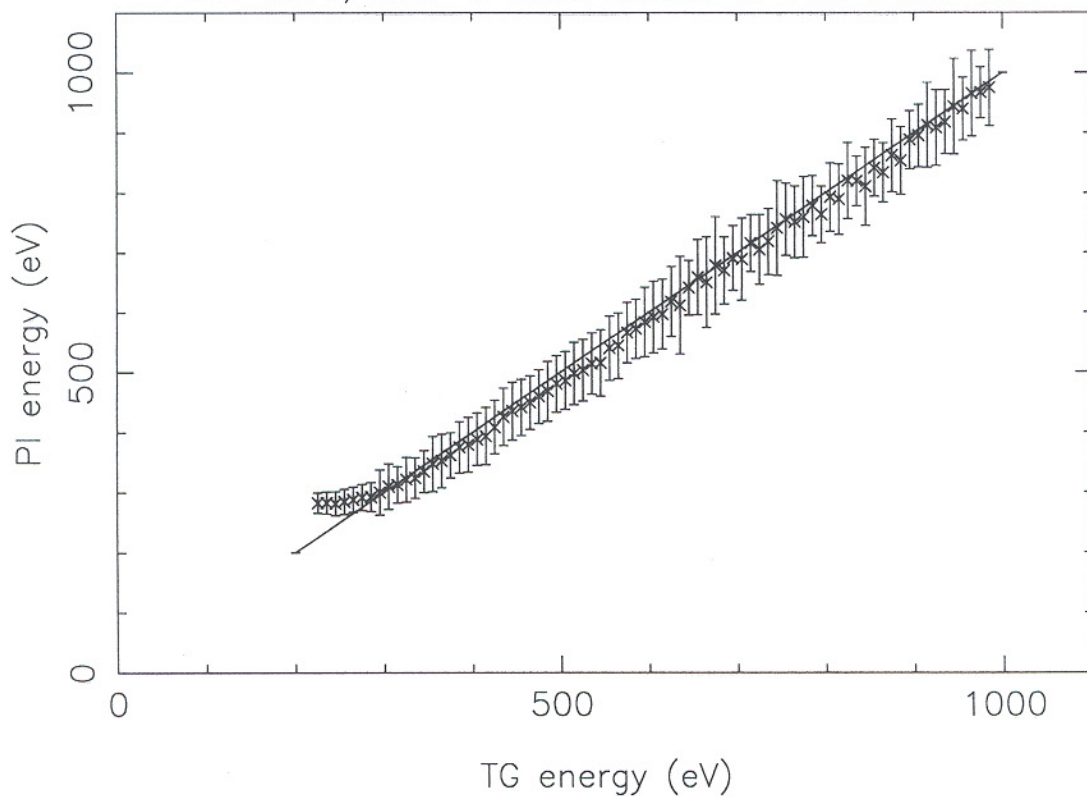
LETG/ACIS-S Observations of PKS2155-304



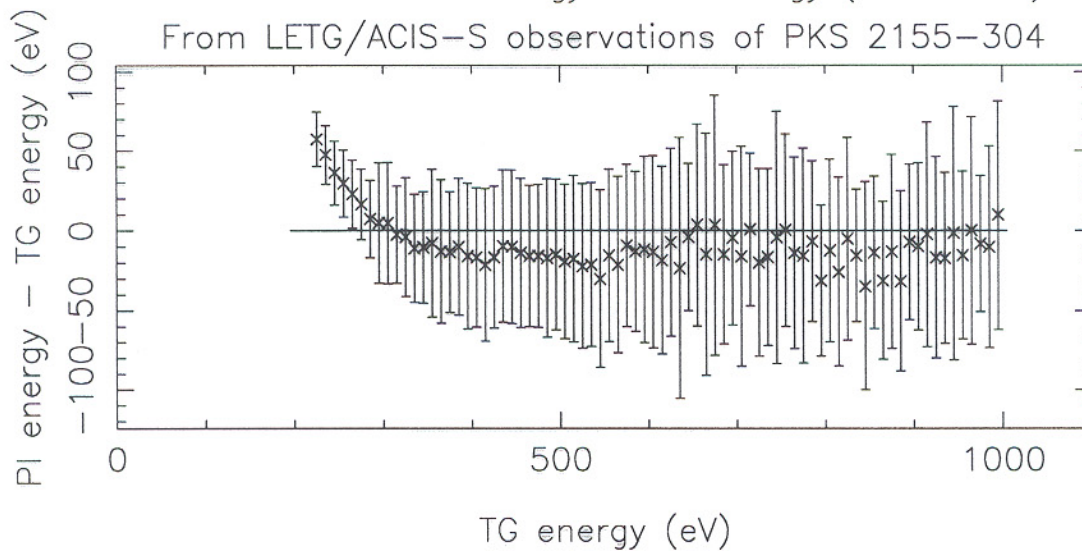
ACIS S3c1 PI energy vs. Grating energy
LETG/ACIS-S observations of PKS 2155-304



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

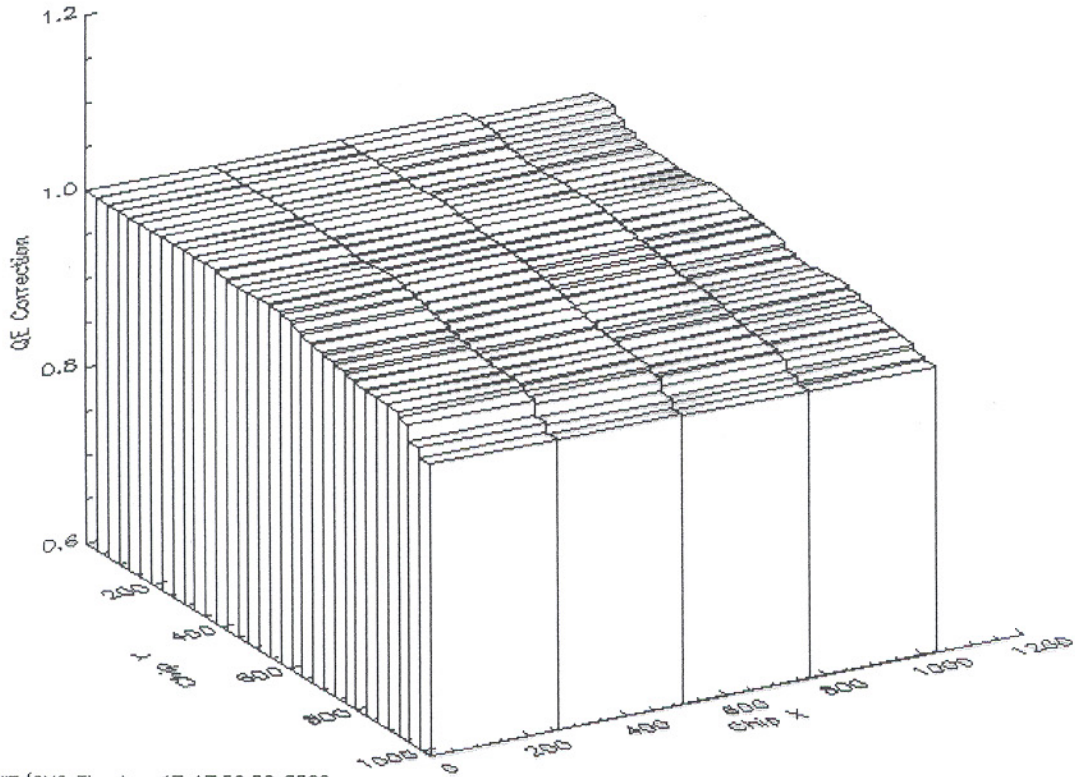


Residuals of True energy vs. PI energy (ACIS S3c1)
From LETG/ACIS-S observations of PKS 2155-304



correctionmap_13-120C.xdr, Energy: 5.100 keV

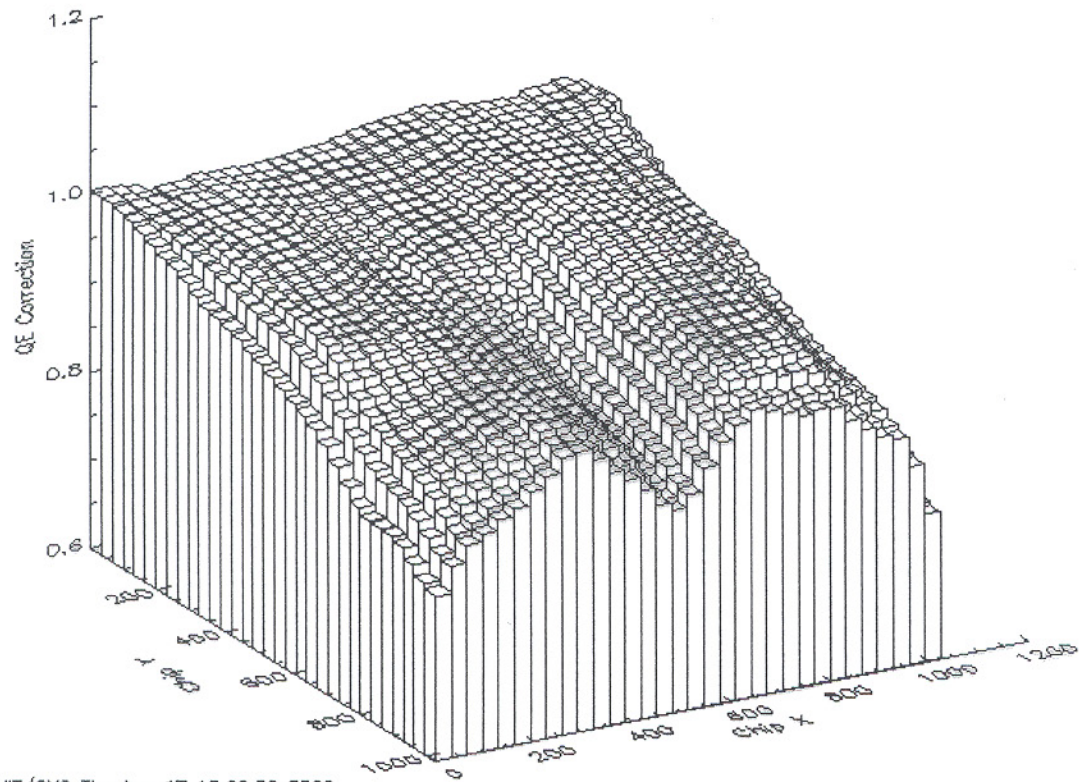
Mean Uncertainty: 4.0%



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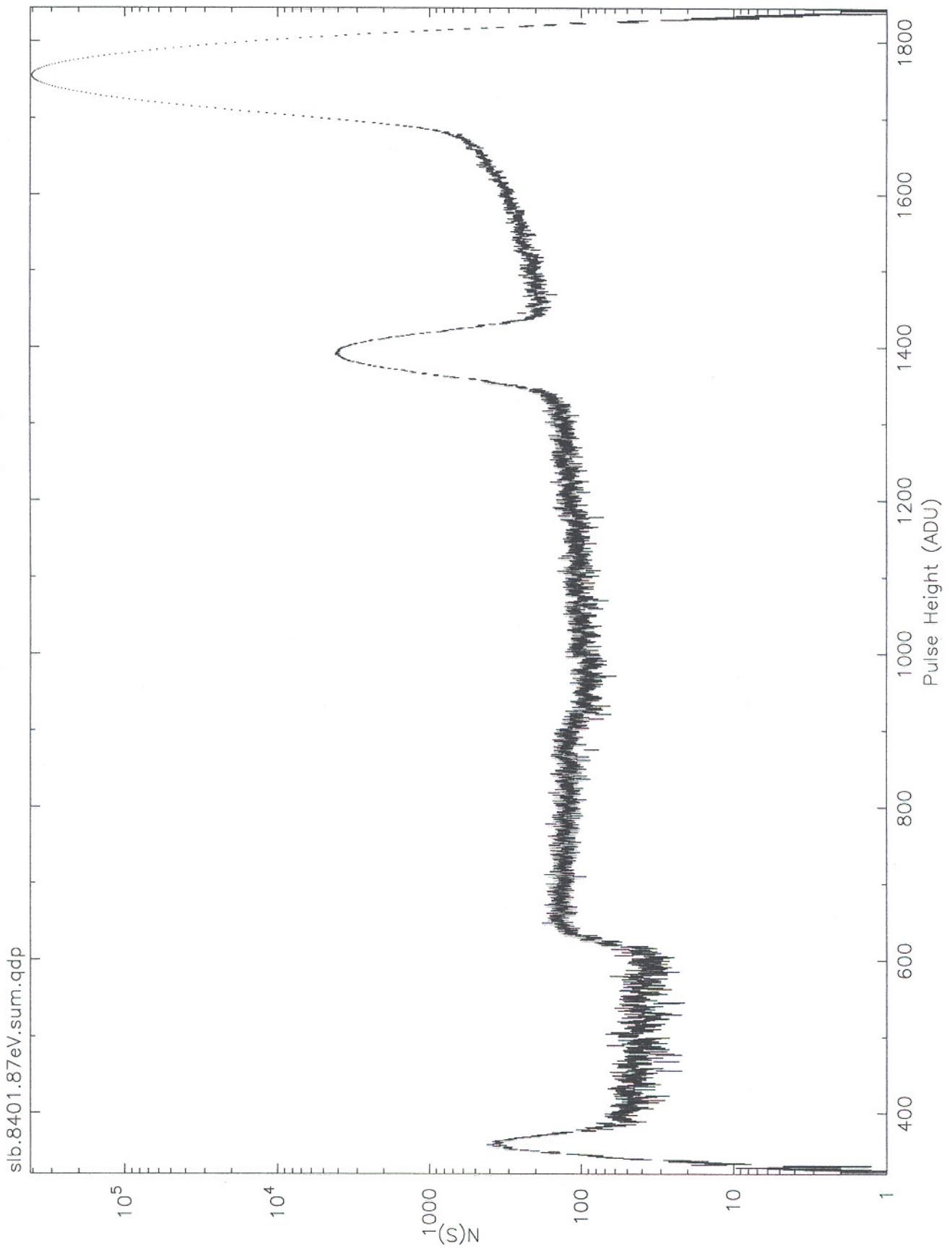
correctionmap_S3-120C.xdr, Energy: 5.298 keV

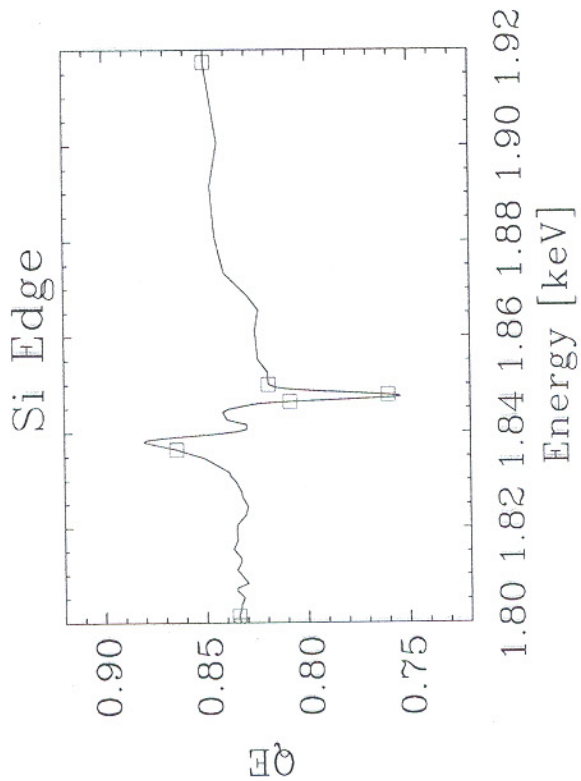
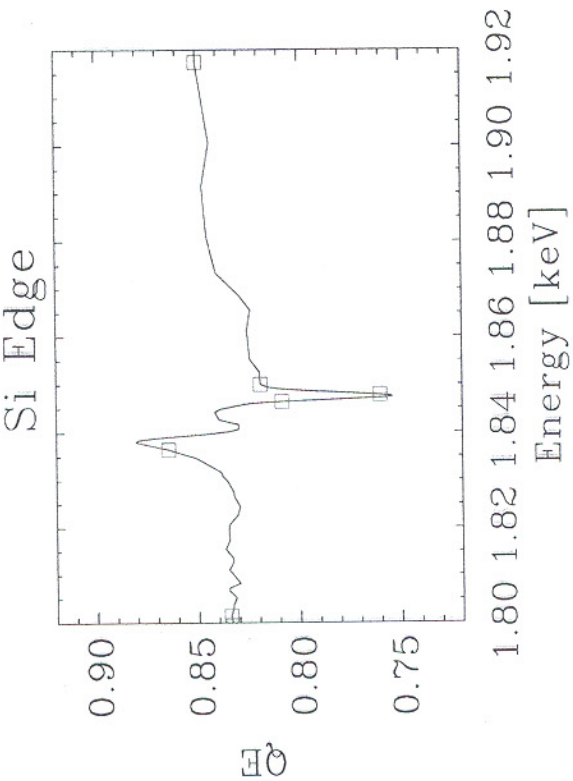
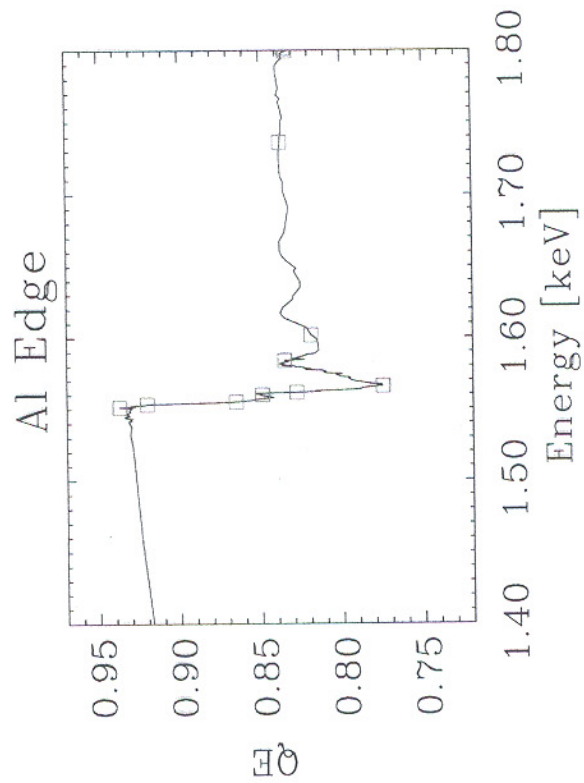
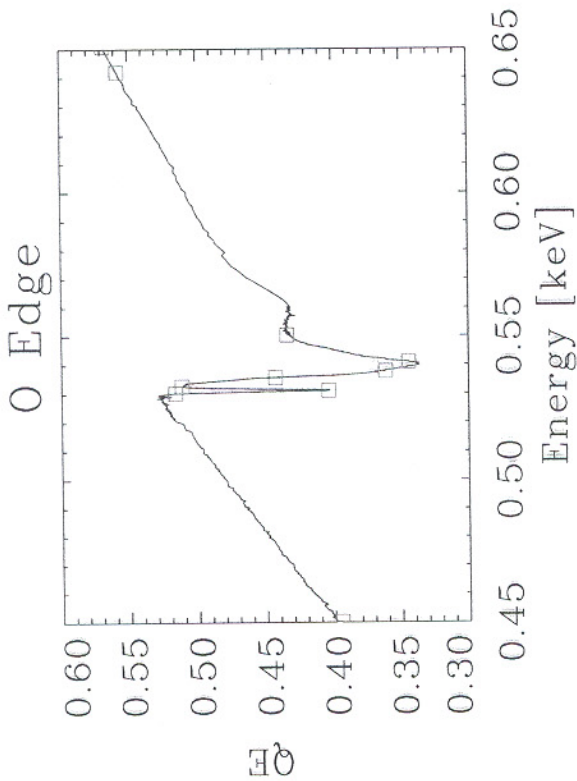
Mean Uncertainty: 9.1%



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Event = 38 Split = 13 Source = /dev/null





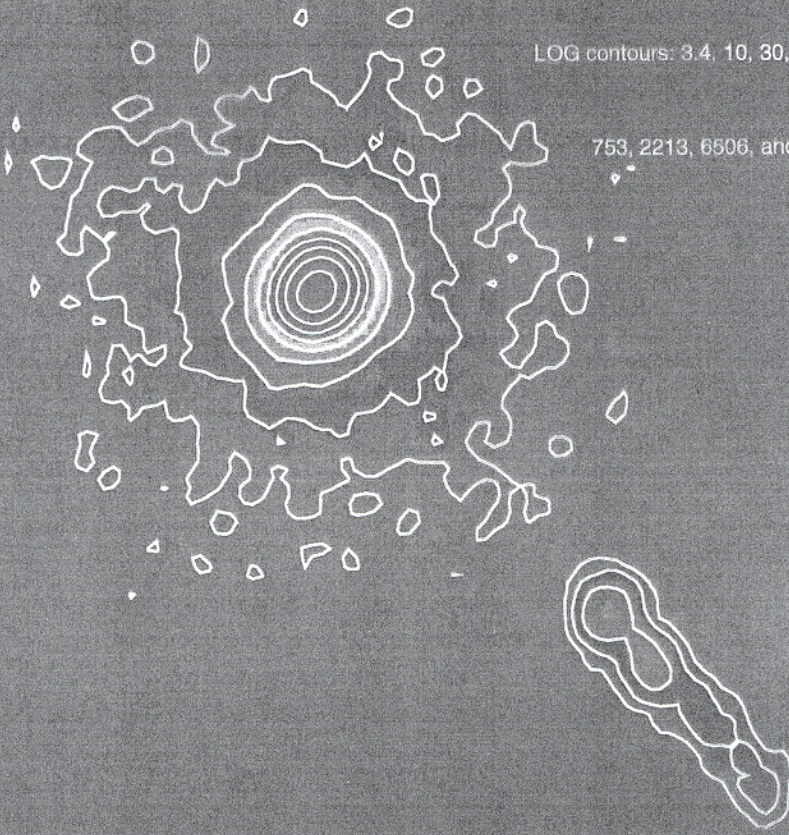
HRC Imaging Calibration (cont.)

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 $16\mu\text{s}$ 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.

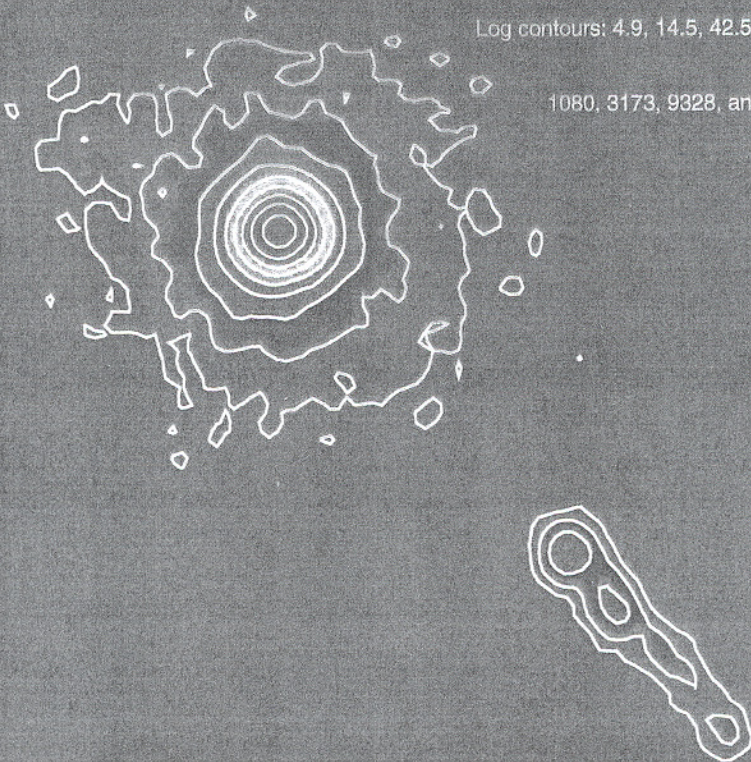
LOG contours: 3.4, 10, 30, 87, 256

753, 2213, 6506, and halfpower=19,125



Log contours: 4.9, 14.5, 42.5, 125, 367

1080, 3173, 9328, and halfpower=27,420



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 ($\sim 4\%$) 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.

LETG Calibration

Product	Status	Accuracy
LETG/HRC-S EA on-axis	updated 11/00	15% over whole range-- much better edge structure
EA off-axis (based on HRC-S QE maps)	early 2001	20%
LETG efficiency (m=0,1,3)	updated 3/00	5%
LETG efficiency (higher orders)	early 2001	better than now
HRC-S gain map (PHA-->PI)	completed 4/00	5%
Bowtie spectrum extraction region	completed 4/00	improved S/N
Dispersion relation	updated 7/00	0.02%

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 < 0.005 Å
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