Assessment of spectral quality in EPIC Fast Modes

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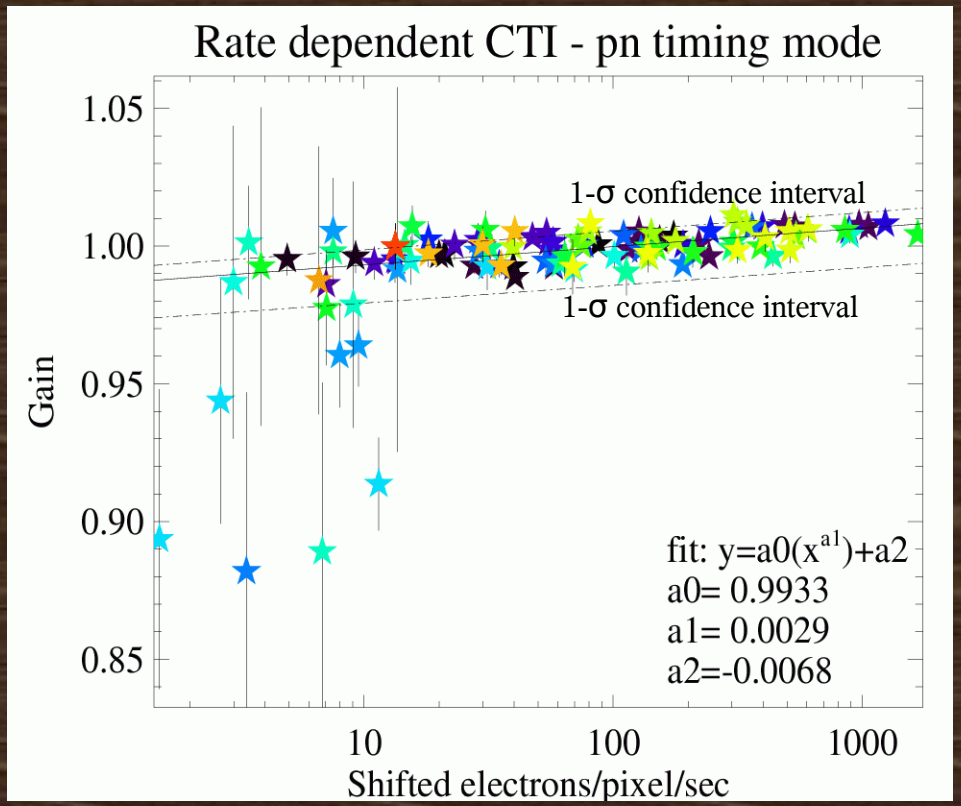
Outline

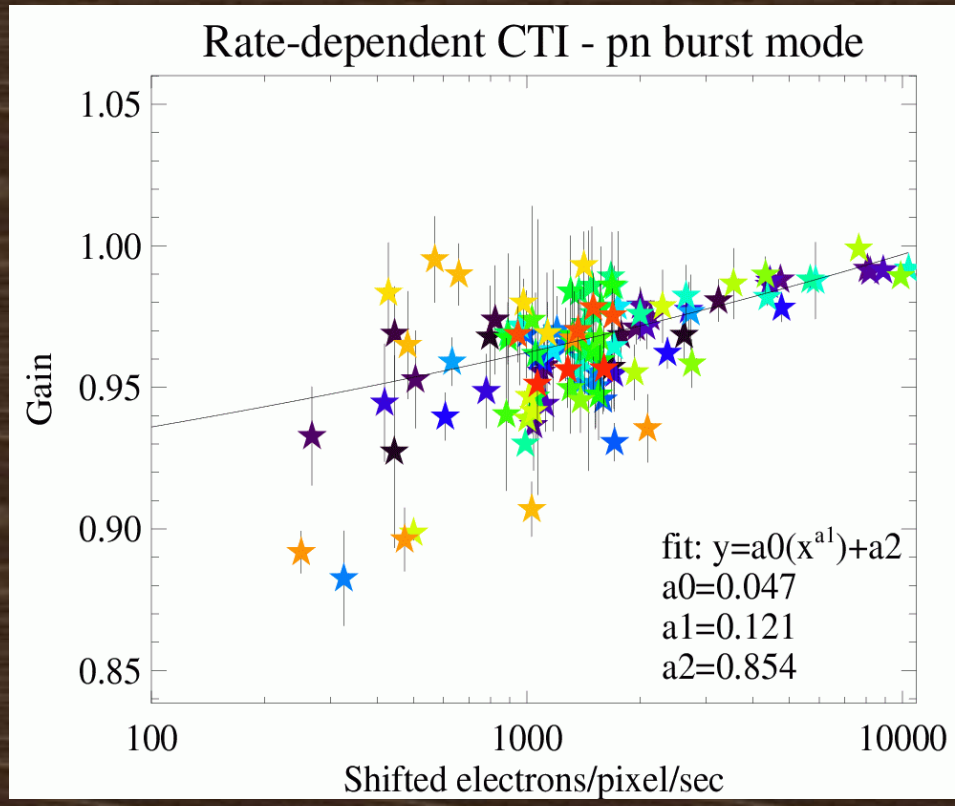
- EPIC-pn rate-dependent CTI
  - Status
  - Future work
- Assessment of spectral quality in:
  - EPIC-pn Timing Mode
  - EPIC-pn Burst Mode
  - EPIC-MOS Timing Mode
- User's perspective

Rate-dependent CTI (RDCTI) status

- Released on December 2, 2008
- Outline of the method currently used:
  - Define sample of non-variable sources
    - 42 Timing, 36 Burst
  - Extract one spectrum for each of the 4 columns surrounding the boresight
  - `gain fit` the spectrum in the 1.5-3 keV with a `wabs*(po+bb)` model ($\Rightarrow G_{corr}$)
  - Calculate for each spectrum the number of shifted electrons, N_e
  - Fit the $G_{corr}=a_0 N_e^{a1}+a_2 \Rightarrow a_i$ go into the CCF

RDCTI results





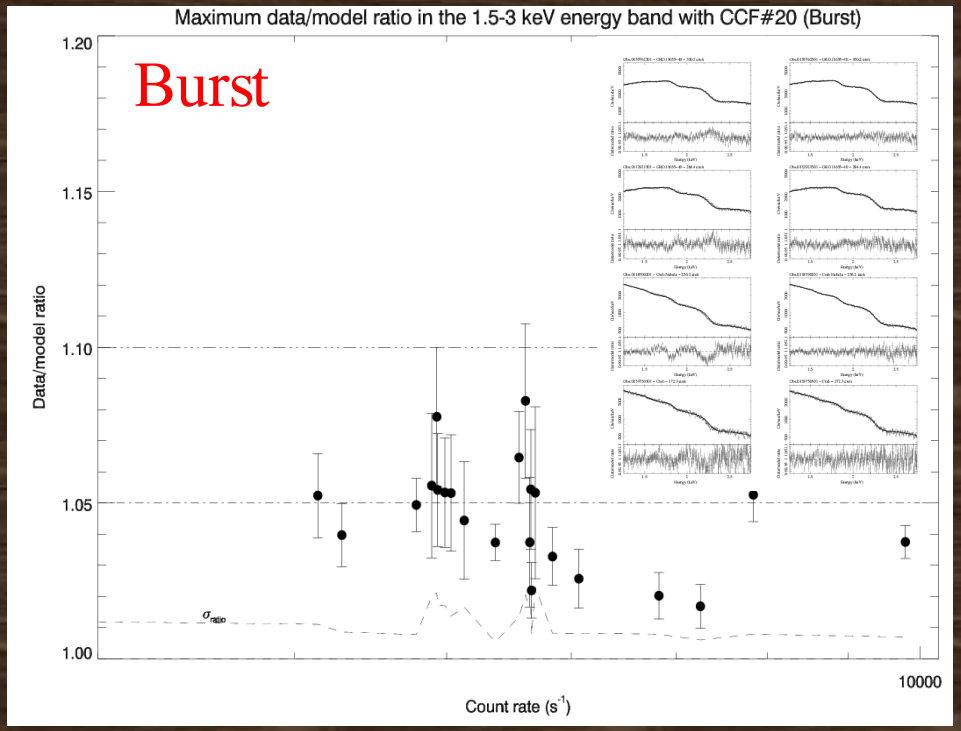
SASv8.0-based calibration

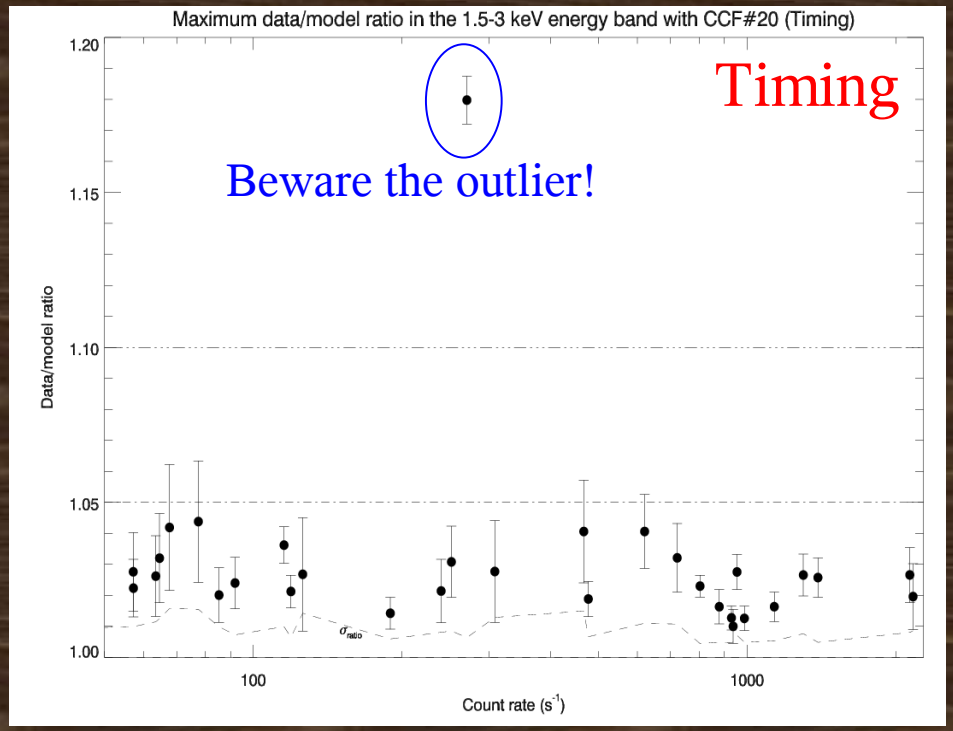
Special Burst gain correction reverted to ground-based values

Spectral quality assessment method

- Quality of the residuals in the 1.5-3 keV energy band
- Comparison between measured and expected (laboratory/astrophysics) narrow-band spectral features
- Testbed sample:
  - 48 observations in Burst Mode (21 on the Crab)
  - 142 observations in Timing Mode

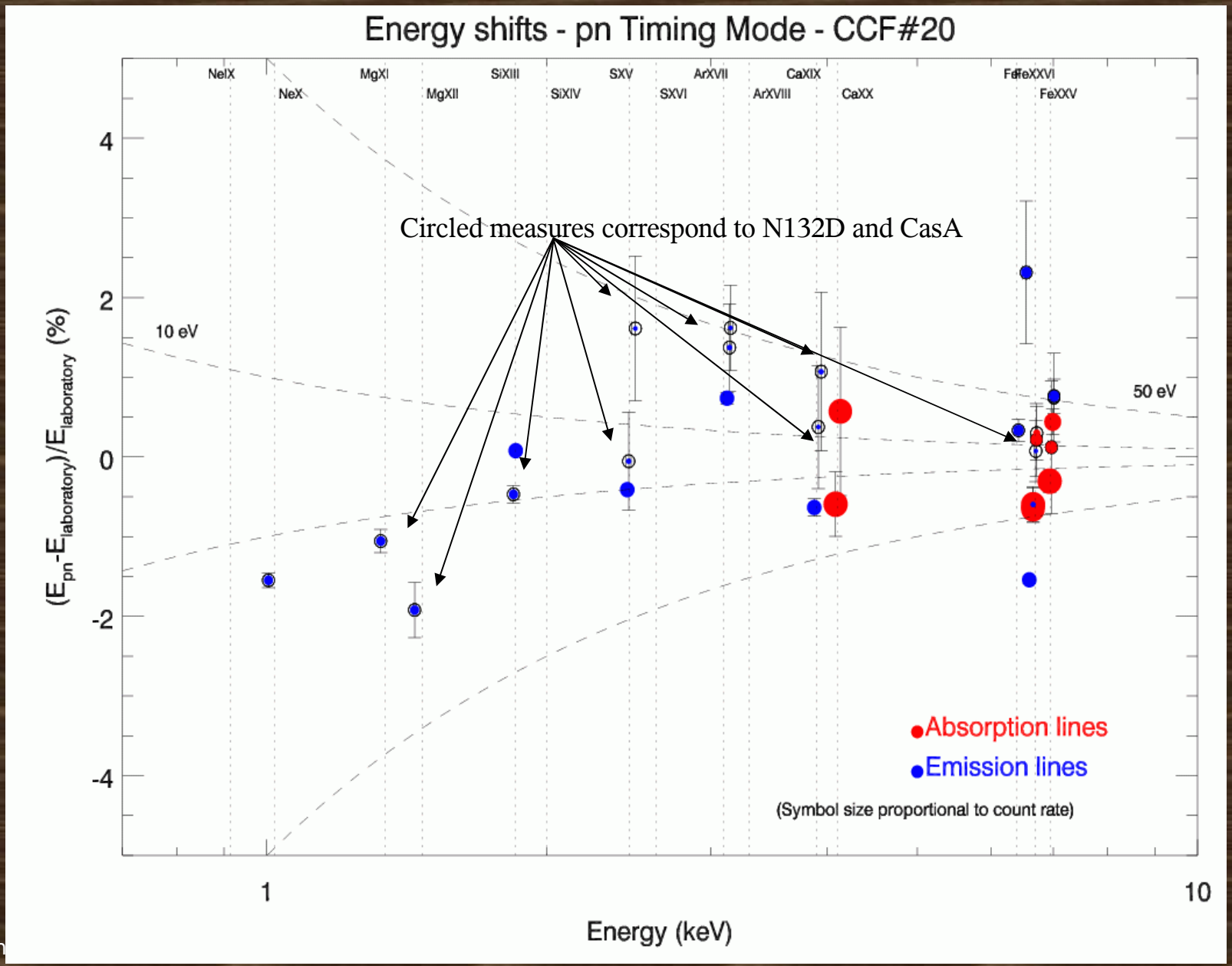
Residuals in the 1.5-3 keV band



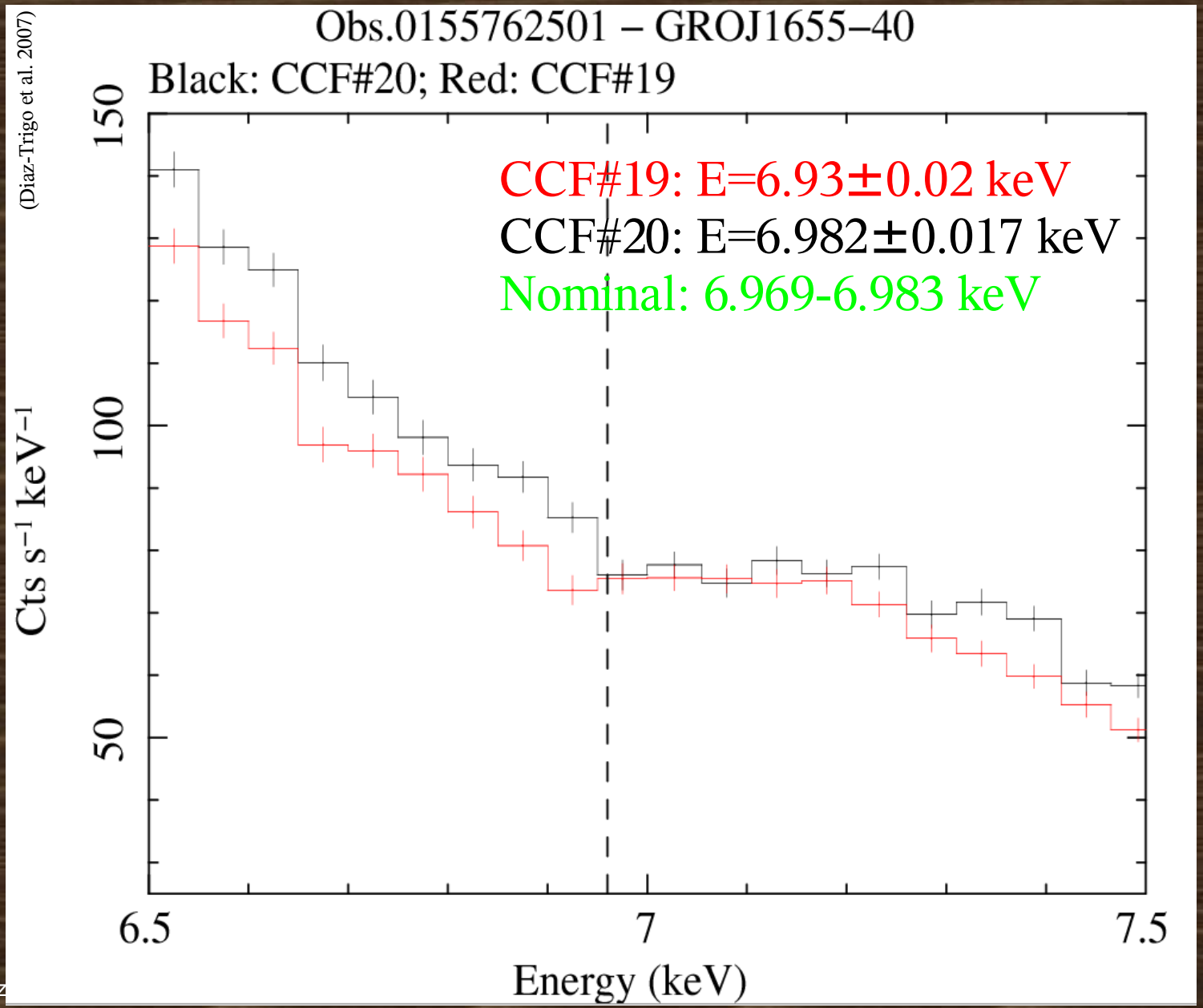


Overall satisfactory, but the correction fails miserably in a few cases

Energy reconstruction accuracy (Timing)



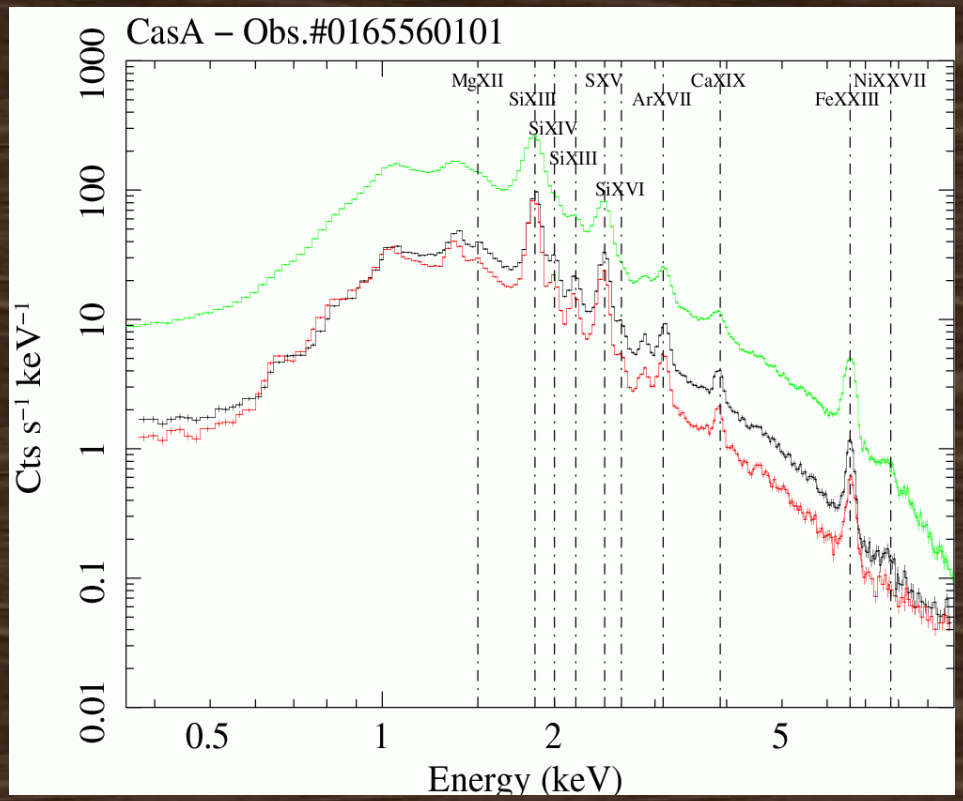
Energy reconstruction accuracy (Burst)

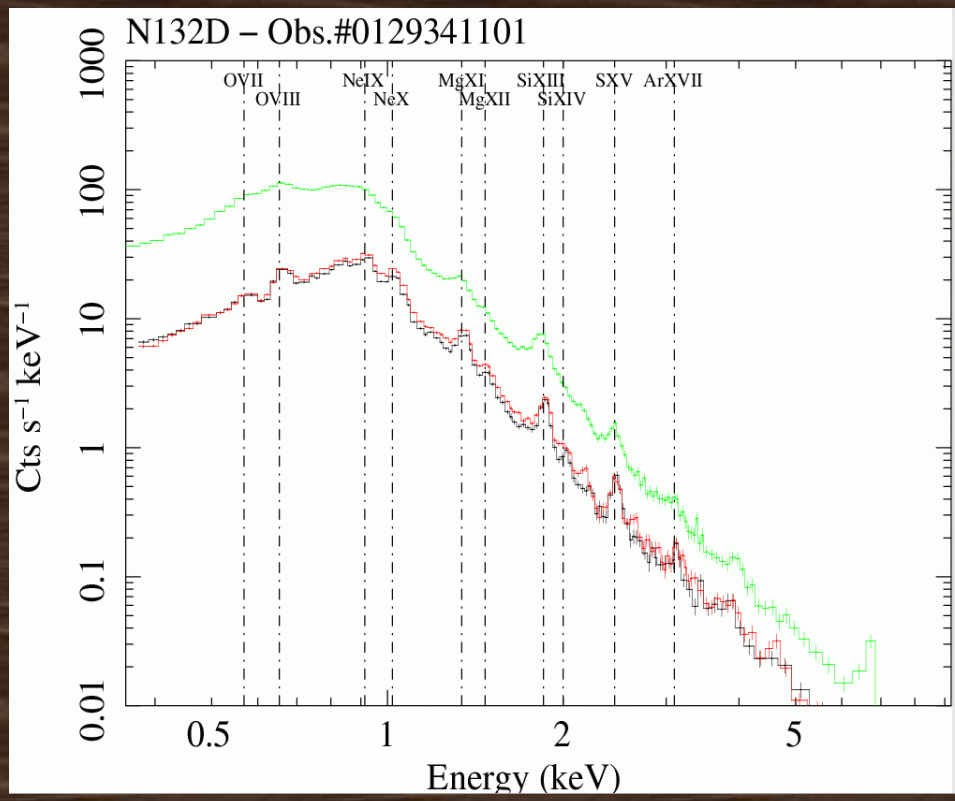


MOS Timing Mode: method

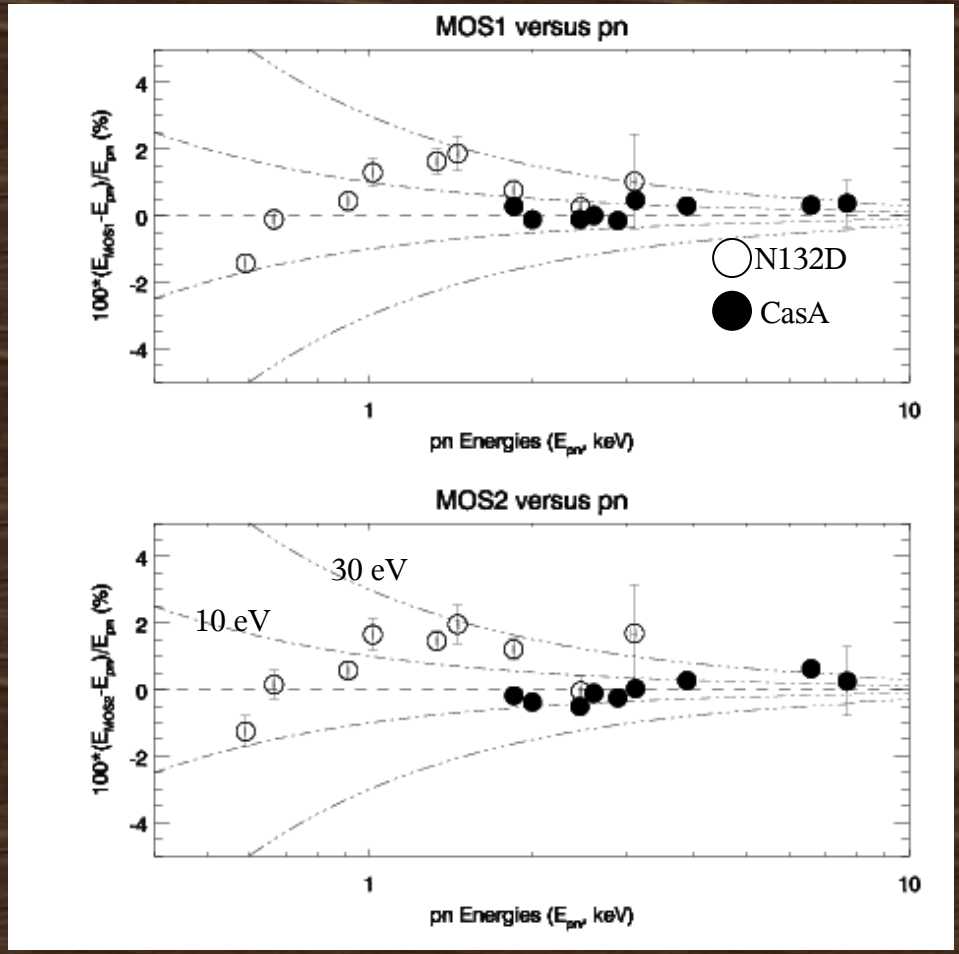
- Comparison between the centroid energy measured in CasA and N132D between:
  - MOS Timing and pn Full Frame exposures
  - MOS Timing and imaging Modes
- Comparison (via `gain fit`) between RGS (phenomenological) model and MOS2 Timing Mode spectrum of Au Microscopii

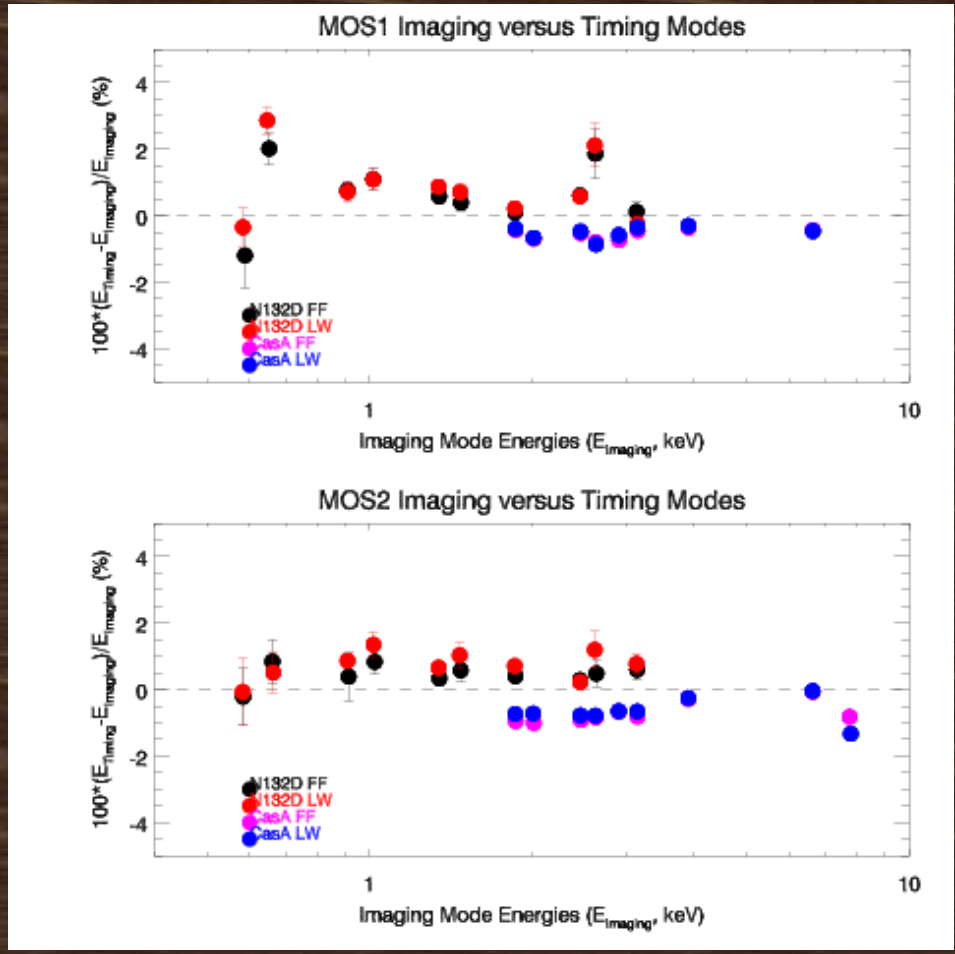
CasA and N132D spectra



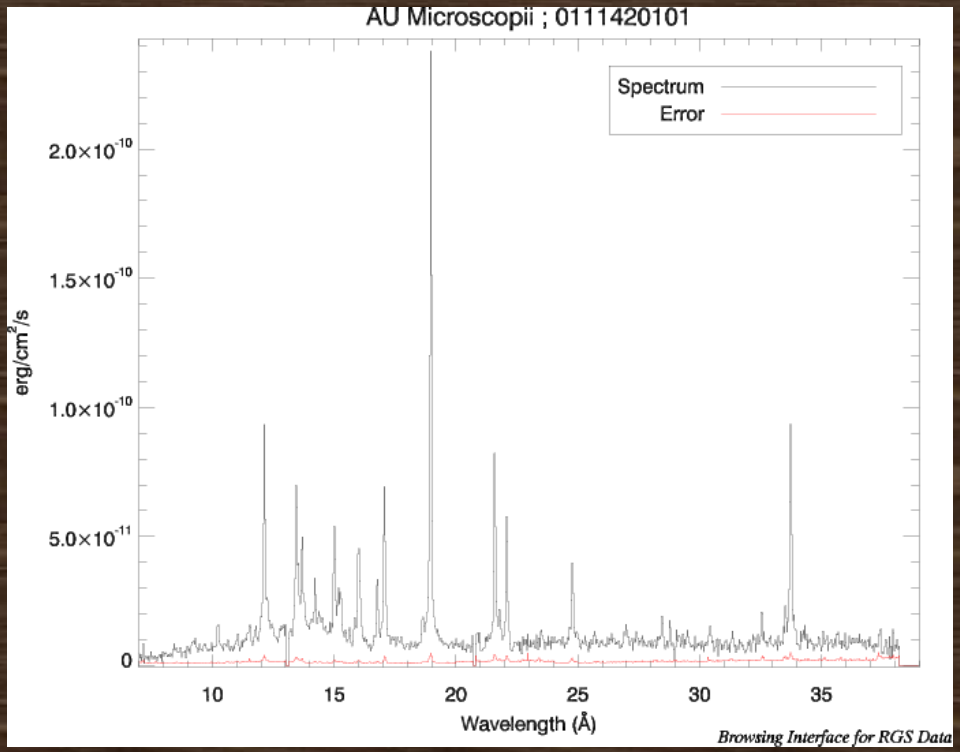


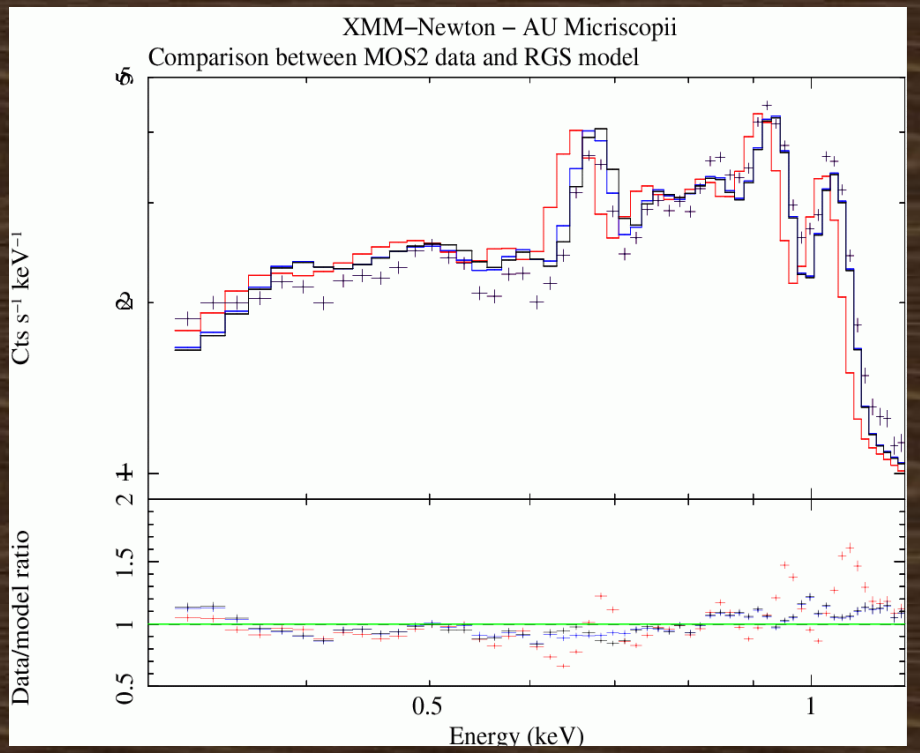
Line spectral accuracy





Au Mic MOS2 vs. RGS





`gain fit` offset: 18.8±0.4 eV

MOS2/RGS relative normalization: 97.9±0.5 %

User's document

Following an explicit recommendation of the User's Group, two Technical Notes have being prepared – to be made public before the next User's Group Meeting

XMM-Newton SOC Technical Note

XMM-SOC-CAL-TN-0082

Accuracy of energy reconstruction in EPIC-MOS Timing Mode

M. Guainazzi

March 21, 2009

History

Version	Date	Editor	Note
0.1	October 1, 2008	M.Guainazzi	First draft
0.2	March 21, 2009	M.Guainazzi	First review by the SOC and the EPIC-MOS IT

XMM-Newton Calibration Technical Note

XMM-SOC-CAL-TN-083

Evaluation of the spectral calibration accuracy in EPIC-pn Fast Modes

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et al. (*other institutes*)

March 21, 2009

History

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Conclusions

- Numbers for the EPIC Calibration Status Document on the energy reconstruction accuracy:
  - EPIC-MOS: **≲20 eV**
    - Are we happy with this level?
  - EPIC-pn Timing: **≲20 eV (E<2 keV), ≲50 eV (E≅6 keV)**
    - See later for a possible strategy to improve
  - EPIC-pn Burst: good agreement in the only case where this measurement has been possible so far
    - More archival observations? NRCO?

Further work on EPIC-pn

- Re-calibration after the Timing PSF `arfgen` fix
- Expansion of the objects sample used for the calibration of the RDCTI
  - Time-dependent effects?
- Recalibration of the pn pattern fraction in Fast Modes
- Inclusion of a linear term in the RDCTI gain correction
- Observation-based RDCTI

Zoom on the RDCTI