MOS Timing Mode calibration

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• energy calibration
• flux calibration
• MOS Timing versus pn
• Timing mode is overcorrected by up to 1.5%

• trend is similar for both MOSs
reason for over correction

- CTI correction is performed for events with y-values from 0-1024 (just a counter with no meaning in that mode) with the mean of $\sim 500$
- CTI correction should however be performed for $y=300$ for ALL events

Now implemented in SAS 6.0
0.4-2.0 keV:
Timing mode agrees with LW mode within +/- 0.5%.
• \( pn(\text{Timing}) > \text{MOS} \) ?
• \( pn(\text{Timing}) = pn(\text{FF}) \pm 0.3\% \) at 6 keV \( \sim +0.3\% \)
Cas-A analysis 2002

- $\text{pn} < \text{Chandra} < \text{MOS}$
- Rational:
  - CAS-A is very bright
  - MOS CTI model does not take precursors into account CTI over correction
- contradictory to SS433 ??
Flux: Calibration source

- MOS1 flux in Timing mode at Mn seems to be 10 % lower.
Flux: NGC 5548 (rev 290)

- Fit:\ const*(model\_linked)
  - M1: 1.0
  - M2: 1.02
  - PN: 1.16
- below 0.6 keV:
  - MOSs agree
  - but less flux than pn
- above 8 keV problem
  in MOS Timing mode
Flux: SS433 (rev 610)

- Fit
  - const*(model_linked)
  - pn: 1.0
  - M1: 0.94
  - M2: 0.52 (pileup)

- below 0.6 keV: problem in MOS Timing mode
- above 8 keV problem in MOS Timing mode
Flux: HER-X1 (rev 207)

Fit with linked parameters and const

- **pn**: 1
- **MOS**: 0.9

Fit with free parameters and const = 1

- flux in 0.315-10.0 keV
  - **pn**: 1.66E-09 erg cm\(^{-2}\)s\(^{-1}\)
  - **MOS**: 1.55E-09 erg cm\(^{-2}\)s\(^{-1}\)
  - MOS/pn: 0.93
Summary

Energy calibration:
- MOS timing mode energy calibration agrees within ± 0.3 % with MOS-LW data
- at ~ 6-7 keV
  - pn Timing mode > MOS Timing mode by 0.3 % (SS433)
  - pn Timing mode > pn FF mode by 0.3 % (Cas-A)
  - MOS FF mode should agree there with MOS Timing mode if source is not extended and bright
- For bright extended sources MOS would need a rate dependent CTI model!
- Rev 832: Cas-A observation in
  - pn: FF and extFF
  - MOS: Timing and LW

Cas-A data for all EPIC modes + other SNR data will allow overall energy calibration analysis

Flux calibration:
- Discrepancy of up to 10-15 % at energies below 1keV
- Contradictory results for different targets and observations

Is the MOS timing mode not stable in flux?