

XMM-Newton CCF Release Note

XMM-CCF-REL-256

Rate-dependent CTI correction for EPIC-pn Timing Modes: SASv9.0 update

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1 CCF components

Name of CCF	VALDATE	List of Blocks changed	Change in CAL HB
EPN_CTI0022	2000-01-01T00:00:00	RATE_DEPENDENT_CTI	NO

2 Changes

2.1 Rate-dependent CTI correction

This update of the EPIC-pn CTI CCF constituent includes a recalibration of the rate-dependent CTI correction for Timing Modes with SASv9.0. This re-calibration was driven by the fix of an energy-dependent bug in the calculation of the PSF encircled energy fraction in Timing Modes by `arfgen`. This bug may have affected in principle the values of the energy-independent gain factor, G_{corr} on which the calibration of this correction is based (see the CCF Release Note XMM-CCF-REL-248 for further details).

2.2 Calibration results

The SASv9.0-based recalibration of the G_{corr} as a function function of the number of shifted electron per pixel per second, N_e

$$G_{corr} = a_0 * N_e^{a_1} + a_2$$

is shown in Fig. 1

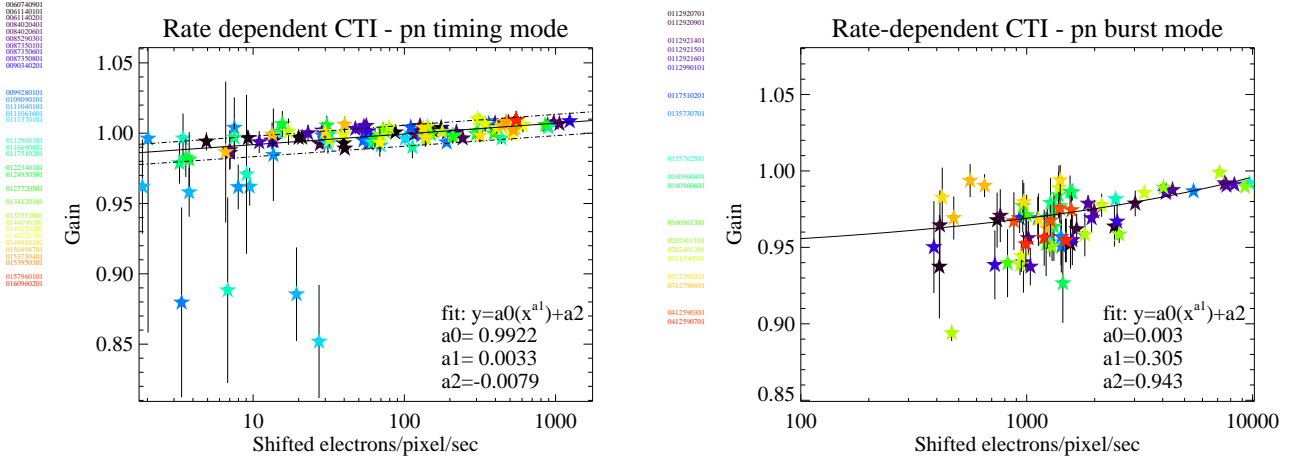
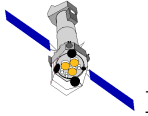


Figure 1: G_{corr} versus N_e relation for the sample EPIC-pn exposures in Timing (*left panel*) and Burst (*right panel*) Modes, respectively. The *solid line* indicates the best fit with the functional form: $a_0 * N_e^{a_1} + a_2$. The *dot-dashed line* in the *left panel* indicates the envelope corresponding to the 1- σ errors on the best-fit parameters.

Table 1: a_i parameters in the EPN-CTI CCF version #22

Mode	a_0	a_1	a_2
Timing	9.920×10^{-1}	3.300×10^{-3}	-7.900×10^{-3}
Burst	3.200×10^{-3}	3.050×10^{-1}	9.426×10^{-1}

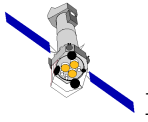
In Tab. 1 the new a_i coefficient are listed.

3 Estimated scientific quality

It was expected that this change might have an impact of at most a few percent in the spectral residuals.

4 Test procedure and results

The whole testbed of 142 exposures in Timing Mode and 48 observations in Burst Mode used to test previous versions of this CCF constituent has been re-analysed. An updated evaluation of the spectral quality with the new CCF is summarised in the following document: “Evaluation of the spectral calibration accuracy in EPIC-pn fast modes” by M. Guainazzi, M. Kirsch, F. Haberl, and M. de Ovelar (XMM-SOC-CAL-TN-0083).



5 Expected Updates

Further updates of this extension will include:

- recalibration of the pattern fraction in EPIC-pn Timing Mode, explicitly introducing its **RAWY** dependency
- inclusion of an energy-dependent term in the determination of the rate-dependent G_{corr} values for Timing Mode