XMM-Newton CCF Release Note

XMM-CCF-REL-241

Refinement of pn long term CTI and temperature dependent gain

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1 CCF components

Name of CCF	VALDATE	List of Blocks changed	Change in CAL HB
EPN_CTI_0017	2000-01-01T00:00:00	LONG_TERM_CTI	NO
EPN_CTI_0017	2000-01-01T00:00:00	QBOXTEMP_GAIN	NO

2 Changes

2.1 Individual longterm CTI for each CCD for FF and eFF

The implemented long term CTI in values version 16 had been calculated on a basis of observations until revolution 1000. A bigger data base up to revolution 1450 allows now to refine the long term CTI values making also use of the cubic term in the correction function. The values have been refined for FF and eFF mode for all CCDs.

2.2 Temperature dependent gain correction for eFF

The peak gain of the pn camera is affected by the temperature of the quadrant box electronics. A higher/lower than nominal temperature leads to a higher/lower gain such that detected photons would be shifted to higher or lower energies (for more details see XMM-CCF-REL-223).

The correction is enabled as default as of SAS 7.1.2 with the parameter *withtempcorrection=Y*. The correction has been performed only for the FF mode (all CCDs with the same parameters). Now the correction is also applied for eFF mode using the same parameters as for the FF mode.

3 Scientific Impact of this Update

Energy accuracy is further refined and brings FF and eFF mode in better agreement. The time evolution of the CTI correction and the consistency between CCDs improves.

4 Estimated Scientific Quality

EPIC-pn energy accuracy will stay within 5-10 eV, now also for special cases where temperature excursions occur in eFF mode.

5 Test procedures & results

Figure 1 shows the line position of the internal calibration source for Mn-K for EPN_CTI_0016.CCF (using for FF and eFF mode the old long term CTI correction and for FF mode using the parameter *withtempcorrection=Y*)

Figure 2 shows the line position of the internal calibration source for Mn-K for EPN_CTI_0017.CCF (using for FF and eFF mode the new long term CTI correction and for FF and eFF mode using the parameter *withtempcorrection=Y*)

6 Expected Updates

The special gain (Extension EFF_GAIN in the EPN_CTI_xxxx.CCF) correction for the eFF mode may now be refined in another iteration. Small differences between eFF and FF mode can be seen for CCD1 in particular.

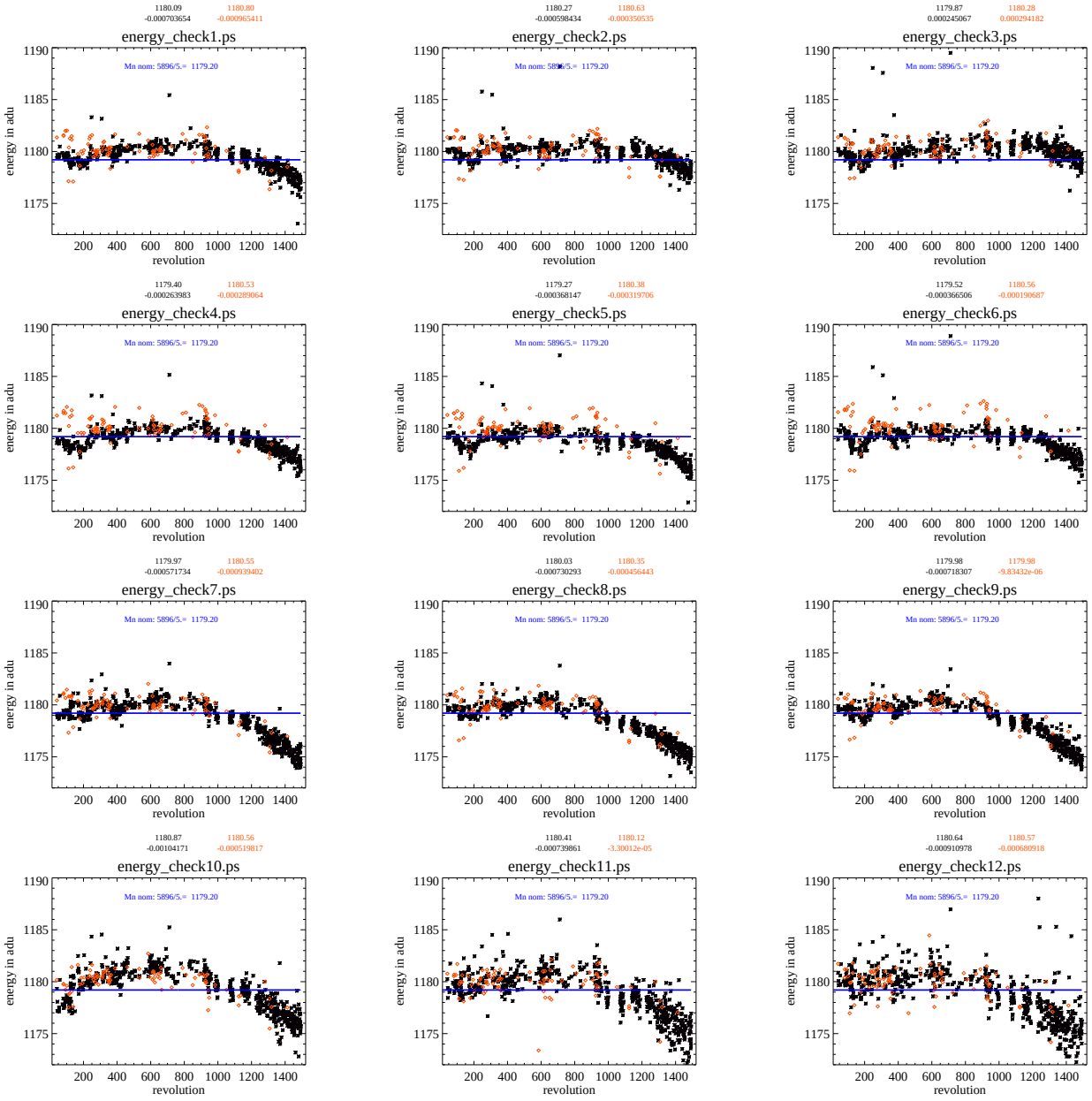

Figure 1: Line position of the internal calibration source as a function of revolution using EPN_CTI_0016.CCF. Black: FF mode, Red: eFF mode. Note the scatter in the red eFF points due to missing temperature dependent CTI/Gain correction. The numbers above each subplot show the parameters of a linear fit to the dataset in the corresponding color.

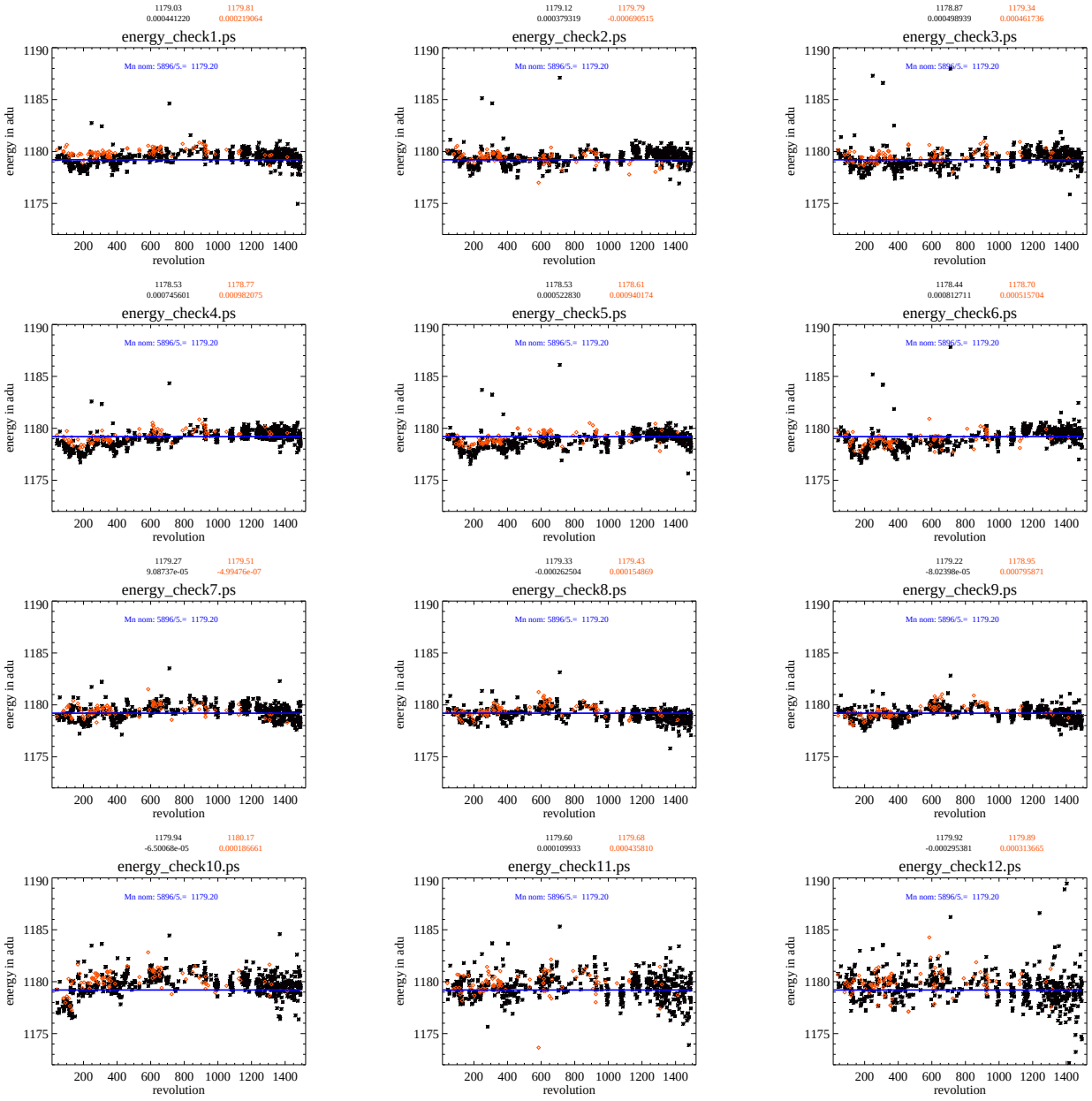

Figure 2: Line position of the internal calibration source as a function of revolution using EPN_CTI_0017.CCF. Black: FF mode, Red: eFF mode. Note that the scatter in the red eFF points is now reduced using the temperature dependent CTI/Gain correction. The numbers above each subplot show the parameters of a linear fit to the dataset in the corresponding color.