XMM-Newton CCF Release Note

XMM-CCF-REL-221

Update of EPIC MOS2 CTI epoch revs. 446-533

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1 CCF components

Name of CCF	VALDATE (start of val. period)	EVALDATE (end of validity period)	List of Blocks changed	CAL VERSION	XSCS flag
EMOS2_CTI_0030	2002-05-16T05:00:01	2002-11-07T05:00:00	CTI_EXTENDED		NO

2   Changes

The new MOS2 CTI CCF issue 30 has been created with updated CTI parameters for all MOS2 CCDs. This new CCF replaces the previous MOS2 CTI CCF issue 24 (see XMM-CCF-REL-206) and covers the same time period 2002-05-16 to 2002-11-07 (revs. 446-533).

Using CCF EMOS2_CTI_0024.CCF it was found that low energy images of MOS2 CCD4 were incomplete; high RAWX columns were not present in the images. There was also a RAWX/PI dependence — as the upper PI selection threshold was lowered the area of blank CCD increased. The effect is presented in Fig. 1. The cause was found in the parameter setting of the MOS2 CCD4 serial CTI

$$CTIY(E) = 601.97 * E^{-1.83}$$

For this epoch the serial CTI is not time dependent, therefore the parameter describing the time dependency is set to zero. This parameter set returned very high CTI values at low energies, therefore after a certain amount of shifts no event could pass the energy threshold any more. As low RAWX columns are shifted less than columns with high RAWX values, the low energy images showed only the low RAWX columns and the high RAWX columns were missing.

For this particular epoch alone, and for MOS2 CCD4 only, the serial CTI loss for the Mn-Kα calibration line (at $\approx$6 keV) appeared to reduce to almost zero, whilst the serial CTI at Al-K ($\approx$1.5 keV) remained nominal. The new CTI calculations prevent the serial CTI from having such a negative energy dependence.

Beside of this low energy cut-off, the interaction of CTI and ADUCONV parameters took care that the energy reconstruction of the events were correct. The energy positions of the internal calibration lines were accurate by better than 5 eV at Al-K and Mn-K.
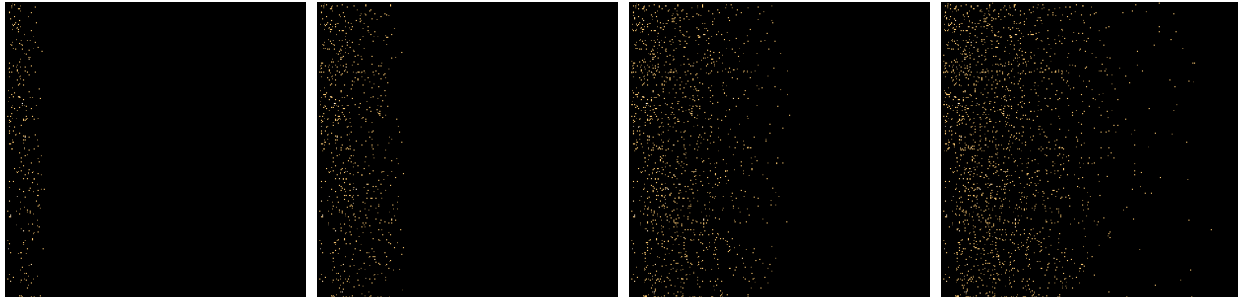

Figure 1: MOS2 CCD4 RAWX/RAWY low energy images using the incorrect MOS2 CCD4 serial CTI parameters. Left to right: PI < 300 eV; PI < 400 eV; PI < 500 eV; PI < 600 eV

3   Scientific Impact of this Update

The use of this CCF will enable correct low energy analyses on MOS2 CCD4 for the corresponding epoch. The new CTI CCF is released together with a new ADUCONV CCFs (issue 42, see XMM-CCF-REL-222), since the new cti with old gains, and old cti with new gains may give unexpected results!

4   Estimated Scientific Quality

This issue assures that the MOS energy scale remains within 5 eV at 2 keV, and 10 eV at 6 keV for most sources (not too bright), for all observations (see a more detailed discussion in XMM-CCF-REL-124).

5   Test procedures & results

The new CTI CCFs have been tested with the SASv7.0. No RAWX/PI dependence in low energy images was found any more.

6   Expected Updates

So far a common CTI model has been used for all columns of a single MOS CCD. In reality, the CTI differs slightly between different columns. Some MOS columns show significantly different CTI behaviour within different sections of the column.

The calibration team is currently working on a column dependent CTI which can take into account different CTI behaviour of the individual columns as well as different behaviour of sections within a single column.