XMM-Newton CCF Release Note

XMM-CCF-REL-316

Update of EPIC MOS CTI

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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
EMOS1_CTI_0074	2012-12-12T10:00:01		CTI_EXTENDED CTI_COLUMN		NO

Name of CCF	VALDATE (start of val. period)	EVALDATE (end of validity period)	List of Blocks changed	CAL VERSION	XSCS flag
EMOS2_CTI_0075	2012-12-12T10:00:01		CTI_EXTENDED CTI_COLUMN		NO

2 Changes

A new CTI CCF has been derived for the MOS taking into account the latest measured degradation rate of the parallel CTI. This new CCF defines a new epoch and replaces for the most recent time period the previous CTI CCF (MOS1 issue 73, MOS2 issue 74).

The serial CTI is also updated, even though it remains nearly constant since cooling.

3 Scientific Impact of this Update

The use of this set of CCFs will improve the MOS energy scale reconstruction and also marginally the energy resolution, mainly for all observations later than revolution >2383.

The CTI CCF is released together with a new ADUCONV CCF (MOS1 issue 86, MOS2 issue 87, see XMM-CCF-REL-317), since using the new CTI CCFs with the old ADUCONV CCFs, or the old CTI CCFs with new ADUCONV CCFs, may give unexpected results!

4 Estimated Scientific Quality

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

It is recalled that since SASv5.4 the MOS parallel CTI is modelled with the simple formula of the CTI loss per transfer:

- $CTIY(E,t) = (A + B * t) * E^{\alpha}$

where A is a constant, B the degradation rate (slope), α a power index (all 3 parameters take different values for different CCDs and different time periods), E the event energy in ADUs and t the time since launch. Note that the serial CTI is also modelled with the same formula but is mostly constant since launch. Since SASv7.0, the energy correction uses an additional offset term:

- $E_{corr} = E + RAWY * CTIY + RAWX * CTIX - OFFSET(RAWX, RAWY)$

This algorithm allows an energy scaling of the CTI that fits very well the Mn and Al lines of the internal calibration source.

5 Test procedures & results

The new CTI CCF has been tested with the SASv13.5. The results are presented in Fig. 1 and Fig. 2.

Plots of the line monitoring are presented in the accompanying release note XMM-CCF-REL-317 of the corresponding updated MOS ADUCONV CCF.

6 Expected Updates

None.

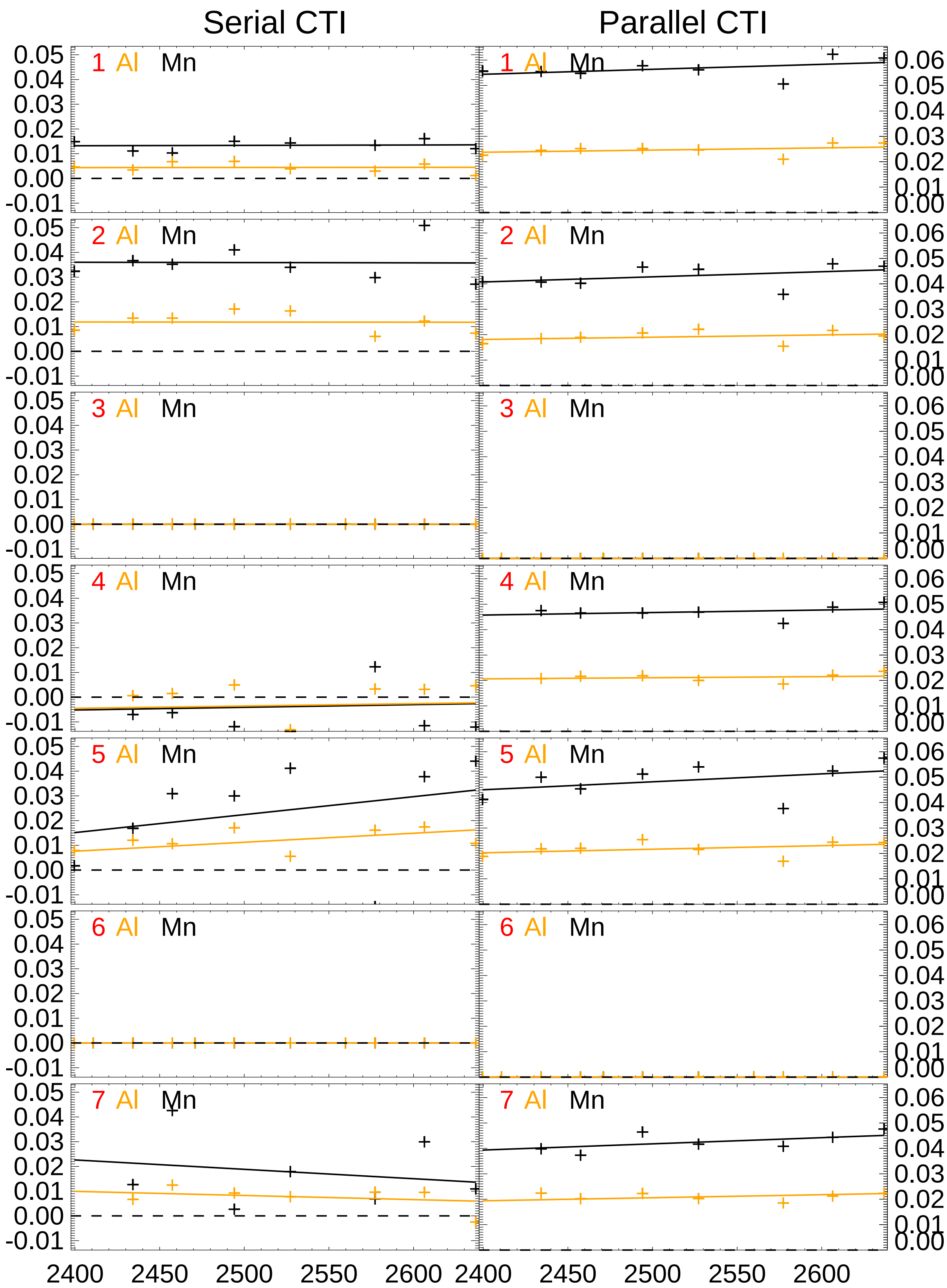

Figure 1: MOS1 serial and parallel transfer losses at about 1.5 keV and 6 keV, the energy of the Al and Mn calibration lines, for CCD1 to CCD7 (top to bottom), overlaid with the CTI models as parametrised in the new CCF.

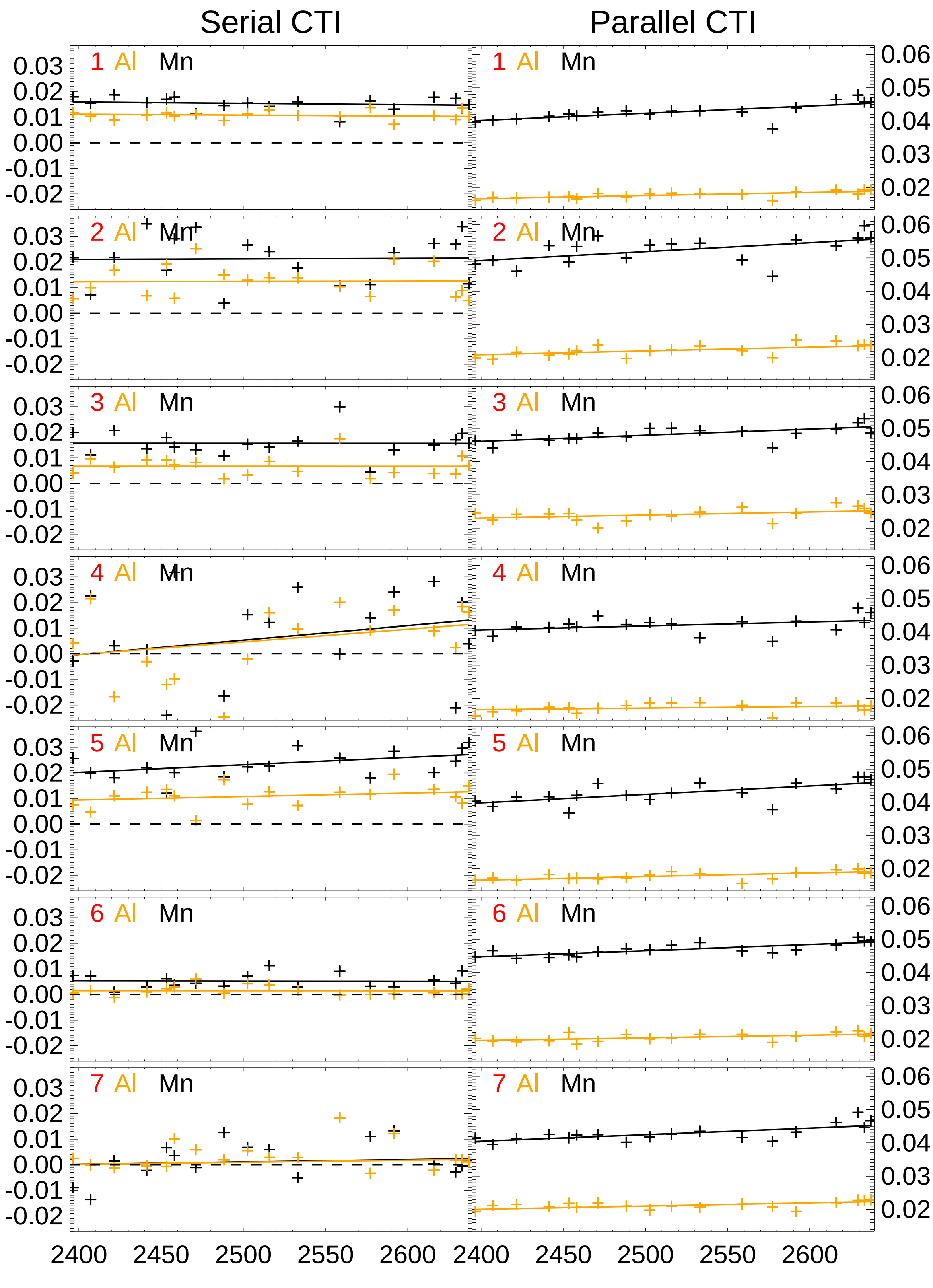

Figure 2: MOS2 serial and parallel transfer losses at about 1.5 keV and 6 keV, the energy of the Al and Mn calibration lines, for CCD1 to CCD7 (top to bottom), overlaid with the CTI models as parametrised in the new CCF.