XMM-Newton CCF Release Note

XMM-CCF-REL-200

Update of EPIC MOS gain

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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 VERS.	XSCS flag
EMOS1_ADUCONV_0028	2005-07-24T00:54:36	2005-10-19T19:03:55	OFFSET_GAIN		NO
EMOS2_ADUCONV_0028	2005-07-24T00:54:36	2005-10-19T19:03:55	OFFSET_GAIN		NO

2 Changes

A new ADUCONV CCF has been generated to correct for a large step in the line energy positions of MOS1 CCD1 and CCD5 starting at the last eclipse season.

The voltages of MOS1 CCD's in use on-board during rev. 1030-1073 were not the correct ones. They correspond to settings prior to March 2000. CCD1, CCD4 and CCD5 were affected. The inconsistency was on the following voltages:

MOS1 CCD1: VRD1=18.0 V instead of 17.0 V
CCD RESET 1= 9.0 instead of 10.0 V
CCD RESET 2= 9.0 instead of 10.0 V
MOS1 CCD4: CCD RESET 1= 9.0 instead of 10.0 V
CCD RESET 2= 9.0 instead of 10.0 V
MOS1 CCD5: CCD VOG1=1.5 V instead of 1.0 V

These changes caused a decrease/increase of the gain in CCD1/CCD5 according to figure 1 and figure 2. CCD4 did not show significant changes.

The reason for this undesired change of voltages was the following: Due to the loss of CCD6, it was decided to set all the voltages of CCD6 to 0.0V. This is done within a sequence that sets

the voltages of all the CCD's. To update an existing sequence, we use a tool that performs the updates based on the existing sequence. For some reason to be investigated, the tool did not have the last version of the sequence in its database. The one present was actually prior to March 2000. Therefore the actualization for the CCD6 voltages has been performed on a sequence with prior to March 2000 values for some CCD's. This sequence is sent only after switch-off of the instrument, i.e during the eclipse season. It explains that the problem started to be visible at the beginning of the eclipse season.

These new CCFs establish a new time period between 2005-07-24 and 2005-10-19 (rev. 1030-1073). For MOS1, new gain and offset parameters for single and double events were implemented in the CCF. This opportunity was also used to update the MOS2 gain/offset parameters for the single events, too. As the parameters for all other pattern types are still to be derived, their parameters of the latest epoch are used. Because the single and double events dominate the pattern distribution, the new CCF is able to suppress the residuals present in the energy scale due to the incorrect voltage settings onboard. Because the central MOS1 CCD1 is affected, this temporary CCFs are published to privide the user community the best MOS1 calibration of at least single and double events for the affected eclipse period, until all parameters for the other pattern types are available as well.

3 Scientific Impact of this Update

For MOS1 CCD1 and CCD5 in the new time period the energy scale is now reconstructed again to about 10 eV or better on the whole energy range.

See figure 3 and figure 4 for the MOS1 CCD1 and CCD5 energy line position of the Mn K_α and Al K from the calibration source.

4 Estimated Scientific Quality

The energy scale accuracy is below or equal to 10 eV on the whole energy range for i) not too bright sources and ii) ouside of eclipse seasons (at the start of revolutions). In this two cases, as explained in XMM-CCF-REL-124, the energy scale can be significantly over-corrected.

5 Test procedures & results

The new ADUCONV CCFs have been tested with SAS v6.5.0. The results are shown in figure 3 and figure 4.

6 Expected Updates

Current investigations re-define the complete energy treatment (CTI, gain) of all MOS CCDs for both cameras. This refinement will cover all time epochs, especially periods where the CTI/gain combination is worse than 5 eV.

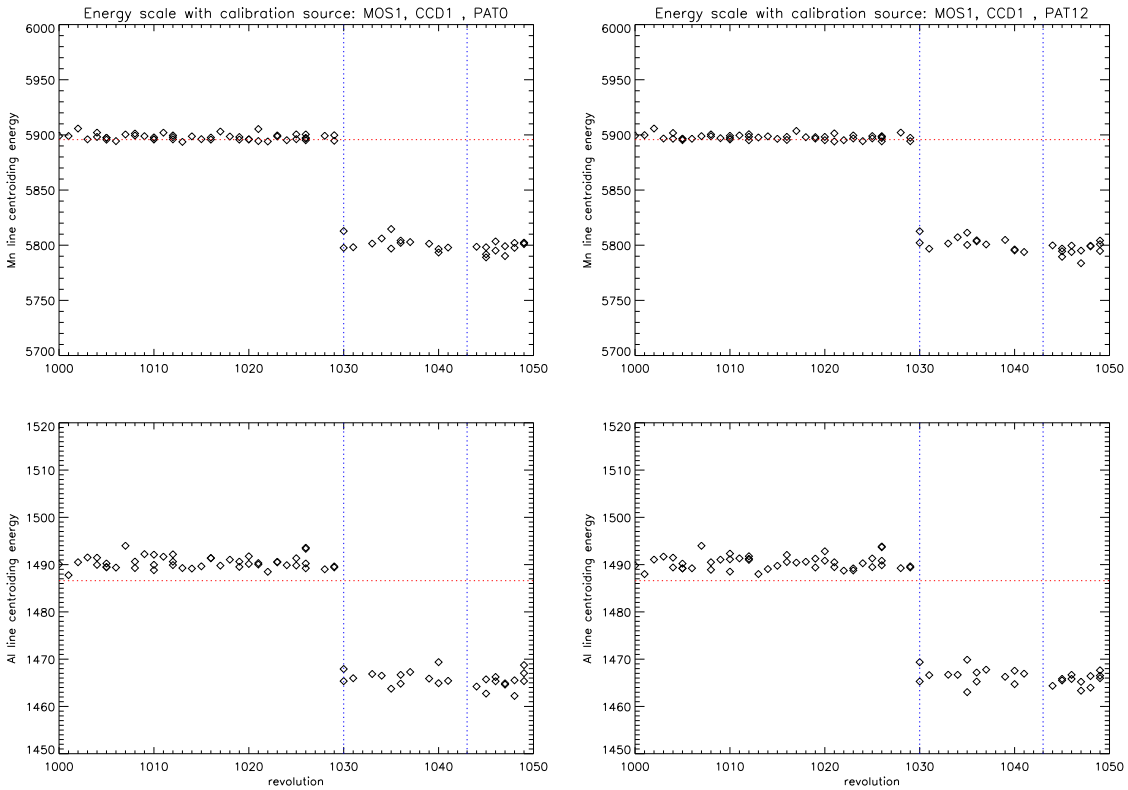

Figure 1: Mn K_α and Al K line energy scale for MOS1 CCD1 with the old ADUCONV CCFs (left: single events, right: PATTERN 0-12).

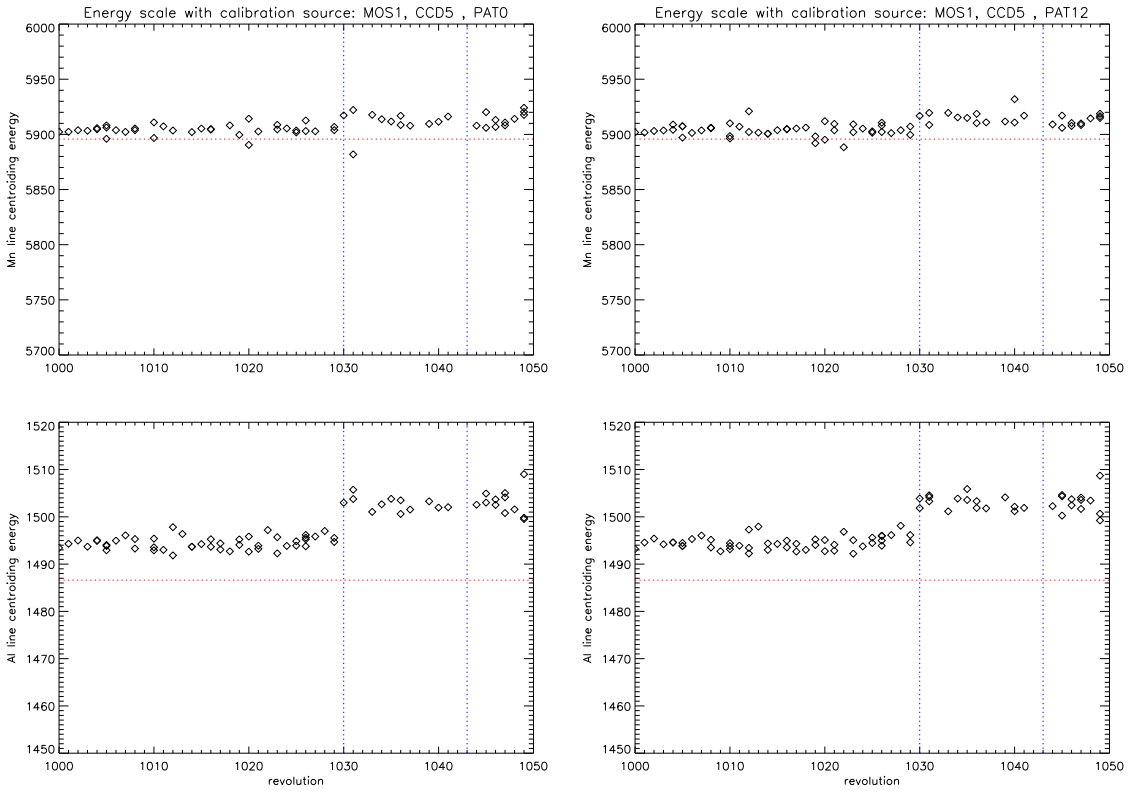

Figure 2: Mn K_α and Al K line energy scale for MOS1 CCD5 with the old ADUCONV CCFs (left: single events, right: PATTERN 0-12).

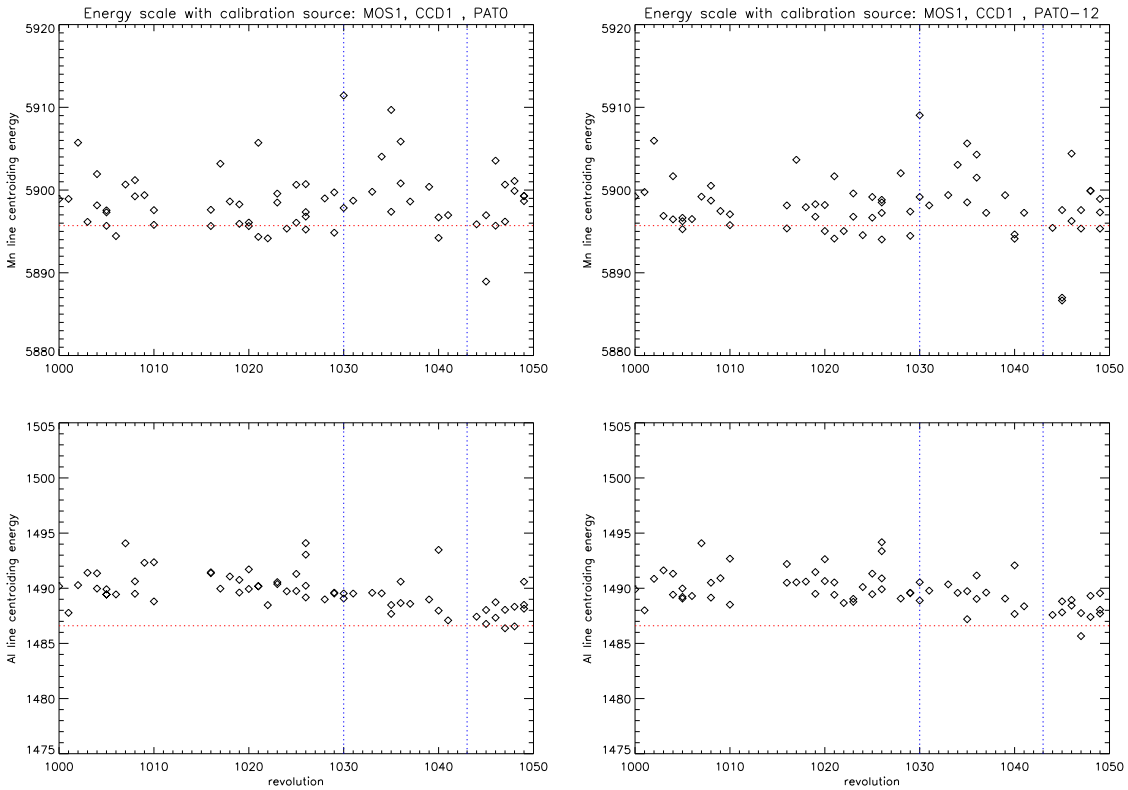

Figure 3: Mn K_α and Al K line energy scale for MOS1 CCD1 with the new ADUCONV CCFs (left: single events, right: PATTERN 0-12).

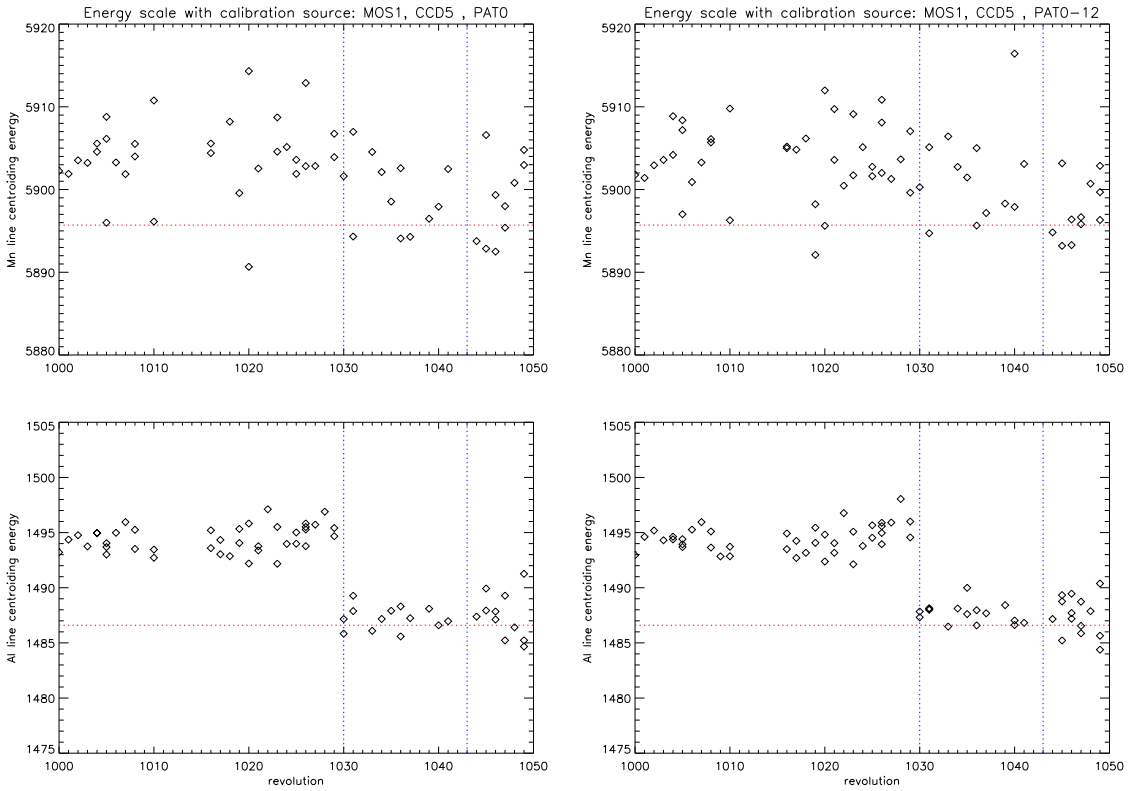

Figure 4: Mn K_α and Al K line energy scale for MOS1 CCD5 with the new ADUCONV CCFs (left: single events, right: PATTERN 0-12).