XMM-Newton CCF Release Note

XMM-CCF-REL-193

EPIC MOS Fixed Offset Tables

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1 CCF Components

Name of CCF	VALDATE	EVALDATE	Blocks Changed	CAL Version	XSCS Flag
EMOS1_DARKFRAME _0018.CCF	2005-08-13T06:25:00	2005-08-13T09:32:00	OFFSET_CCD1 OFFSET_CCD3 OFFSET_CCD5		NO
EMOS1_DARKFRAME _0019.CCF	2005-08-13T10:00:00	2005-08-14T18:40:00	OFFSET_CCD3 OFFSET_CCD5		NO
EMOS1_DARKFRAME _0020.CCF	2005-08-15T03:00:00	2005-08-18T18:00:00	OFFSET_CCD1 OFFSET_CCD3 OFFSET_CCD5		NO
EMOS1_DARKFRAME _0021.CCF	2005-08-21T00:20:00		OFFSET_CCD1 OFFSET_CCD3 OFFSET_CCD5		NO
EMOS2_DARKFRAME _0015.CCF	2005-08-13T06:25:00	2005-08-18T18:00:00	OFFSET_CCD5 OFFSET_CCD6		NO
EMOS2_DARKFRAME _0016.CCF	2005-08-21T00:20:00		OFFSET_CCD5 OFFSET_CCD6		NO

2 Changes

The OFFSET blocks in the DARKFRAME CCFs reflect the uploaded MOS fixed offset tables. Changes mentioned here are with respect to EMOS1_DARKFRAME_0014.CCF and EMOS2_DARKFRAME_0014.CCF.

Following the appearance of the MOS1 CCD1 hot column at diagnostic RAWX = 323 (as a result of the suspected revolution 961 impact event) the on board offsets for pixels in this column were raised to 123 ADU for all modes (an increase of 19 ADU for Full Frame mode, 18 ADU for windowed modes and 20 ADU for Timing mode).
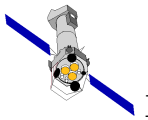
Additionally, the analysis of MOS background maps shows a continued decrease in background for several MOS1 and MOS2 CCDs by, typically, ~ 1 ADU per year. It is therefore deemed necessary to lower the overall uploaded offset levels for MOS1 CCDs 3 and 5 and MOS2 CCD 5 by 1 ADU and MOS2 CCD 6 by 2 ADUs. This is done through a corresponding change in the fixed column offsets for these CCDs, and is reflected in the new CCFs.

Owing to replanning of revolutions and manual commanding during observations there is a period of time in which the uploaded MOS fixed offset tables switch betweeen versions; in addition, the version used in one observation may differ from CCD to CCD, i.e. there are cases in which for the central CCD (CCD1) a diferent version is in use than for the peripheral CCDs (CCD2-7). All these changes are reflected in the CCFs released here.

3   Scientific Impact and Estimated Quality

Regarding the MOS1 CCD1 hot column: owing to the increased offset subtracted on board, the noise level of the hot column is substantially lowered. Additionally, as the average energy of pixels in the hot column is shifted by 19 ADU due to blooming from damaged pixels, the energy of real events detected in the column will be correctly restored by subtracting the new on-board offsets. A detailed description of the MOS1 CCD1 hot column, its effects on data quality and corrective actions is given in [1].

Regarding the overall CCD offsets: the lowering of the overall offset level will restore the fixed offset to the level of the actual CCD offset. Too high offsets would result in the loss of events (or partial event charge) below threshold, whereas too low offsets would increase noise above threshold, potentially creating false events or adding charge to real events.

Note that the values in the OFFSET extensions of the DARKFRAME CCFs are *not* used to determine the E1 event energies; this is already done on board in the EDU. The main reason for reflecting the on board offset values in the DARKFRAME CCFs is correctly to determine the *reconstructed* event energies, for which knowledge of the contemporary on board offsets is required. Reconstructed event energies of 4095 ADU (so-called truncated events) can be useful in e.g. flare screening.

4   Expected Updates

The offset of the MOS1 CCD1 hot column, as well as the long term noise of all CCDs may change in time and will need to be compensated through changes of the fixed offsets. These will have to be reflected in the OFFSET extensions of the DARKFRAME CCFs.
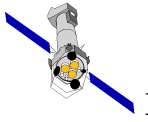
5   Test Procedures and Results

Correct functionality tested with `emchain` and `emproc` (SAS version 6.5.0). Reducing data obtained with the new uploaded fixed offsets and the old DARKFRAME CCF issues results in SAS warnings `** emevents:  (spGatti11), reconstructed energy larger than 4095`. As expected, use of the CCFs in this release result in correct reconstructed energies and no such warnings are issued.

References

[1] The new hot column in MOS1 CCD1 after the MOS1 event in rev. 0961 - Proposal for corrective actions, XMM-SOC-INST-TN-0024, M. Stuhlinger et al.