XMM-Newton CCF Release Note

XMM-CCF-REL-125

EPIC MOS gain

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November 11, 2002

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_0012	1999-12-10T00:00:00	2000-07-15T12:00:00	OFFSET_GAIN		NO
EMOS1_ADUCONV_0013	2000-07-15T12:00:01	2000-11-09T12:00:00	OFFSET_GAIN		NO
EMOS1_ADUCONV_0014	2000-11-09T12:00:01	2001-04-18T00:00:00	OFFSET_GAIN		NO
EMOS1_ADUCONV_0015	2001-04-18T00:00:01	2001-08-18T00:00:00	OFFSET_GAIN		NO
EMOS1_ADUCONV_0016	2001-08-18T00:00:01	2001-09-26T22:00:00	OFFSET_GAIN		NO
EMOS1_ADUCONV_0017	2001-09-26T22:00:01	2001-11-25T12:00:00	OFFSET_GAIN		NO
EMOS1_ADUCONV_0018	2001-11-25T12:00:01		OFFSET_GAIN		NO
EMOS2_ADUCONV_0012	1999-12-10T00:00:00	2000-07-15T12:00:00	OFFSET_GAIN		NO
EMOS2_ADUCONV_0013	2000-07-15T12:00:01	2000-11-09T12:00:00	OFFSET_GAIN		NO
EMOS2_ADUCONV_0014	2000-11-09T12:00:01	2001-04-18T00:00:00	OFFSET_GAIN		NO
EMOS2_ADUCONV_0015	2001-04-18T00:00:01	2001-08-18T00:00:00	OFFSET_GAIN		NO
EMOS2_ADUCONV_0016	2001-08-18T00:00:01	2001-09-26T22:00:00	OFFSET_GAIN		NO
EMOS2_ADUCONV_0017	2001-09-26T22:00:01	2001-11-25T12:00:00	OFFSET_GAIN		NO
EMOS2_ADUCONV_0018	2001-11-25T12:00:01		OFFSET_GAIN		NO

2 Changes

A new set of ADUCONV CCF has been generated from the values derived by Leicester . This new set of CCFs covers the same seven time periods as the CTI CCFs ISSUE 8 to 14, and shall therefore be used in conjunction. The new gain parameters have been tuned to suppress the residuals still present in the energy scale after the time periods CCF are applied (cf CCF release note XMM-CCF-REL-124)

Note that all quadratic terms have been suppressed keeping a simple linear relation (offset and gain) between measured PHA (Pulse Height Amplitude) and PI (Pulse Invariant energy) :

$PHA = a + b.PI$

for each CCD, in each time period and for the 4 event grades.

3 Scientific Impact of this Update

The use of these CCFs coupled with the new sets of MOS CTI CCFs is intended to reduce further the energy scale residuals up to revolution 532 seen with the Mn line (5899 eV) and Al (1487 eV) line of the calibration source.

The comparative results are shown is figure 1 to 4, for both pattern 0 and pattern 12, MOS1 (page 3) and MOS2 (page 4).

However the increasing trend for under-correction observed before is now replaced by an over-correction of a similar amount, so that the energy scale accuracy is not improved much.

4 Estimated Scientific Quality

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

The same accuracy without using the new ADUCONV CCFs.

5 Test procedures & results

The new ADUCONV CCFs have been tested with the Development Track (DT) version of the SAS at VilSpa using all CALCLOSED observation in the ftpexport1 area.

The results have be shown in the previous section.

6 Expected Updates

The ADUCONV CCFs could be tuned further to limit the over-correction.

A full gain calibration has to be re-exercise for the observations taken after revolution 533, as the new operating temperature of -120C has an impact on the gain. With the current ADUCONF CCF, the energy scale will otherwise be over-estimated by at least another 10eV.

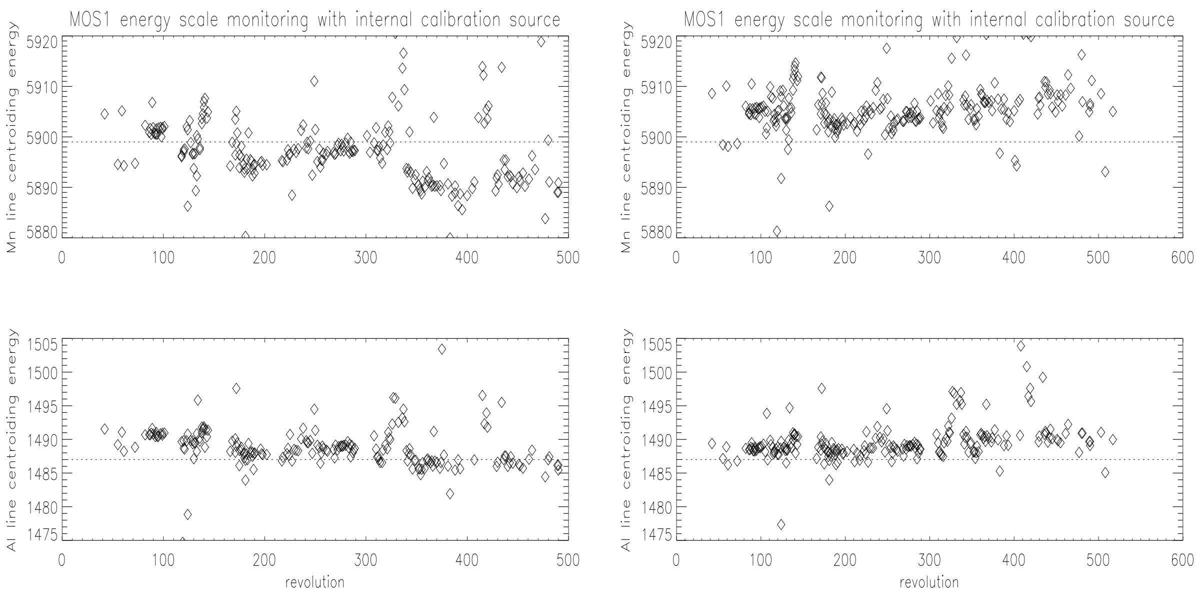

Figure 1: Mn and Al SAS reconstructed line positions for MOS1 CCD1 without the new ADUCONV CCF (left), and with (right), for patterns 1 to 12, since launch

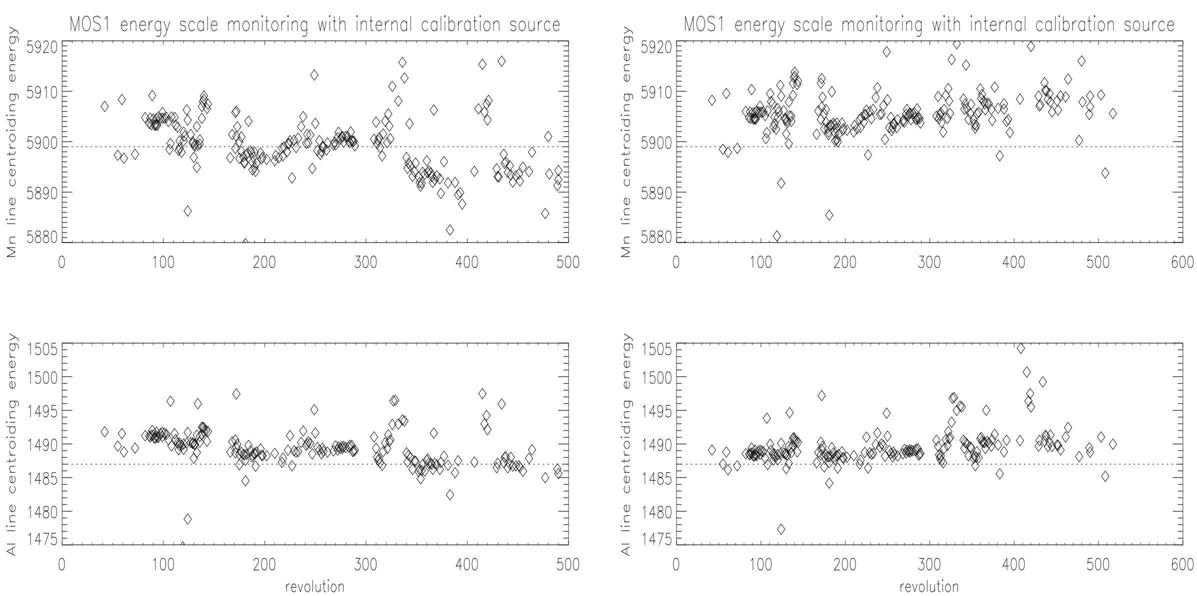

Figure 2: Mn and Al SAS reconstructed line positions for MOS1 CCD1 without the new ADUCONV CCF (left), and with (right), for pattern 0, since launch

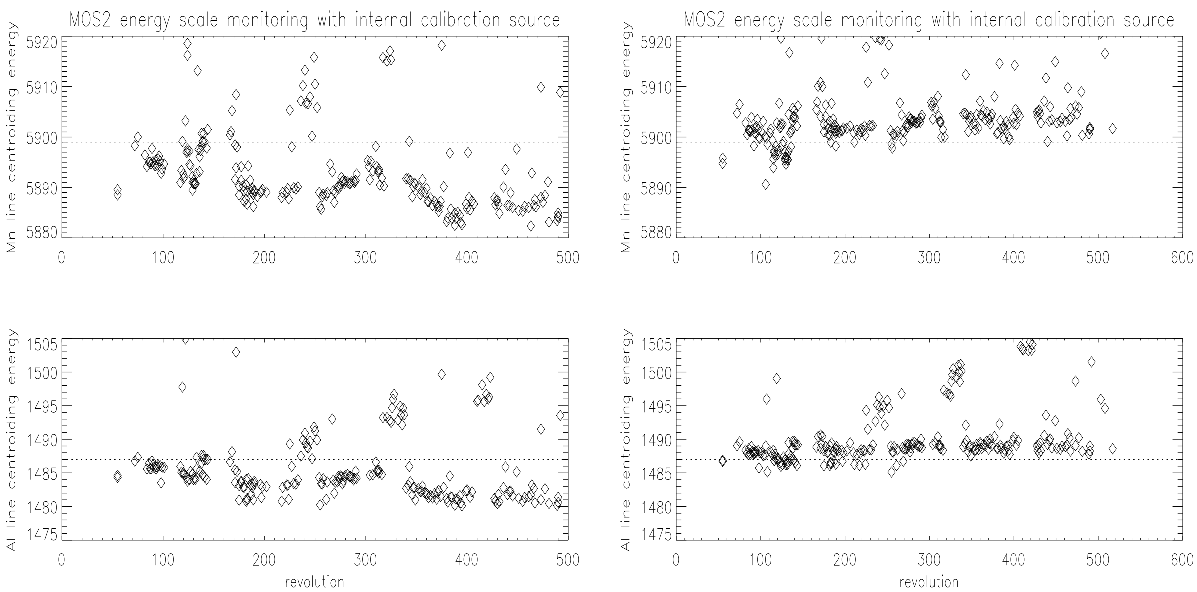

Figure 3: Mn and Al SAS reconstructed line positions for MOS2 CCD1 without the new ADUCONV CCF (left), and with (right), for patterns 1 to 12, since launch

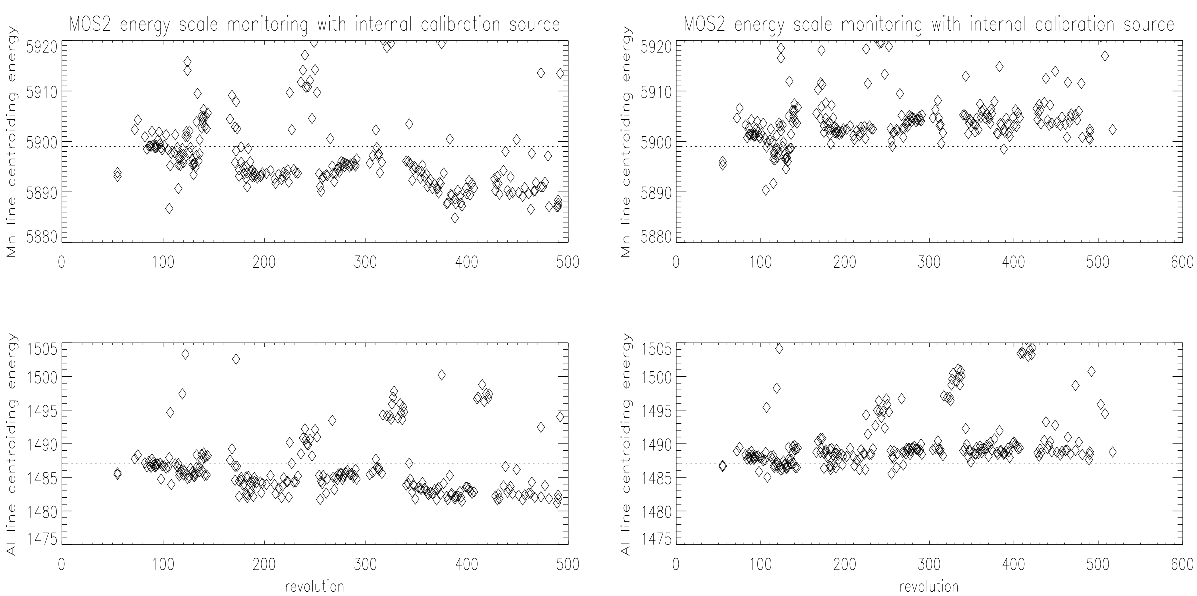

Figure 4: Mn and Al SAS reconstructed line positions for MOS2 CCD1 without the new ADUCONV CCF (left), and with (right), for pattern 0, since launch