XMM-Newton CCF Release Note

XMM-CCF-REL-11

RGS CCD Properties

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1 CCF components

Name of CCF	VALDATE	List of Blocks changed	CAL VERSION	XSCS flag
RGS1_ADUCONV_0004	2000-02-06T16:50:00	ADUCOEFF, OFFSET_GAIN	—	NO
RGS2_ADUCONV_0005	2000-01-25T16:27:00	ADUCOEFF, OFFSET_GAIN	—	NO
RGS1_CTI_0001	1998-01-01T00:00:00	CTI, CTI_EXTENDED, XCTI, CTIY1, CTIY2, CTIY3, CTIY4, CTIY5, CTIY6, CTIY7,CTIY8, CTIY9	—	NO
RGS2_CTI_0001	1998-01-01T00:00:00	CTI, CTI_EXTENDED, XCTI, CTIY1, CTIY2, CTIY3, CTIY4, CTIY5, CTIY6, CTIY7,CTIY8, CTIY9	—	NO
RGS1_REDIST_0003	1999-01-01T00:00:00	EBOUNDS, CCD_REDISTRIBUTION	—	NO
RGS2_REDIST_0003	1999-01-01T00:00:00	EBOUNDS, CCD_REDISTRIBUTION	—	NO
RGS1_BADPIX_0004	2000-02-06T16:50:00	BADPIX	—	NO
RGS2_BADPIX_0004	2000-01-25T19:30:00	BADPIX	—	NO
RGS1_DARKFRAME_0003	1998-01-01T00:00:00	DARKFRAME	—	NO
RGS2_DARKFRAME_0003	1998-01-01T00:00:00	DARKFRAME	—	NO

2 Changes

Before application of the gain correction the zero level is subtracted from the CCD PHA data. The dark frame that was measured during pre-flight calibrations exhibits some higher values closer to the edges of the CCD's, and additionally higher offsets as a function of distance (time) to the readout node. These were averaged for all CCD's measured and stored as the nominal dark frame in `RGS_DARKFRAME`. This dark frame is linearly shifted based on the individual offset values per CCD (see [1] for details).

The gains for the CCD's were calibrated from in-flight data by using the continuum as well as discrete emission lines with known energies (see [2]). The gain corrections are adjusted such that the corrected pulse invariant (PI) values match the CCD redistribution function.

The CTI was compared with the parameterizations that were obtained with higher statistics during pre-flight calibrations and no significant deviation from pre-flight conditions were found. Therefore the pre-flight CTI calibration data remain applicable.

The CCD redistribution function is described with a phenomenological model [1, 3], whose parameters are stored in `RGS_REDIST`. The response model operates in pulse invariant (PI) units, and therefore the CCD have to be gain corrected before. Currently these parameters of the response model are identical for all CCD's.

The bad pixel tables were updated based on early flight data.

3 Scientific Impact of this Update

First release.

4 Estimated Scientific Quality

It should be noted that the CCD's exhibit poorer CTI along the parallel direction close to their edges. Insufficient correction of the CTI may produce smaller or higher PI, depending on the kind of correction, and subsequently more events may be rejected close to these areas by the order selection. Based on current knowledge, this should not exceed a few percent.

The CCD redistribution model was tested with isolated lines of coronal emission spectra and has generally proven to correctly describe the CCD data well. Uncertainties become apparent in errors in the effective area, and are estimated to be less than 1%.

References

[1] Christian Erd, Phillipe Gondoin, David Lumb, Rudi Much, Uwe Lammers, and Giuseppe Vacanti. *Calibration Access and Data Handbook*. XMM-PS-GM-20, issue 1.0, ESA/SSD, September 2000.

[2] C. de Vries. *In-flight CCD PHA model gains*. RGS-SRON-CAL-ME-00/cv2, Space Research Organization of the Netherlands, June 2000. http://ws13.sron.nl:8080/xmmdoc/effective_area/rgs-sron-cal-me-00_cv2.ps.

[3] C. de Vries. *A simple CCD pulse height model function*. RGS-SRON-CAL-ME-98/010, Space Research Organization of the Netherlands, November 1998. http://ws13.sron.nl:8080/xmmdoc/effective_area/rgs-sron-cal-me-98_010.ps.