

XMM-Newton CCF Release Note

XMM-CCF-REL-250

RGS Background Spectra Templates

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1 CCF components

Name of CCF	VALDATE	EVALDATE	Blocks changed	XSCS flag
RGS2_TEMPLATEBCKGND_0006	2007-08-17T00:00:00	–	X100_P090_1_0.00... X100_P095_2_8.00	NO

2 Changes

This release of the RGS background spectra templates applies only to RGS2.

The update of this CCF was required due to the implementation of the single-node readout mode for RGS2. This mode started to be used in routine operations in revolution 1408 (August 17 2007), due to the increasing frequency of the RGS2 ADC anomaly. The change in some of the characteristics of the RGS2 CCDs after switching to this mode made necessary to revise this CCF.

The template corresponding to each of the 16 background levels is the average of the spectra extracted for that given level from 16 blank fields taken in the period September 2007 - May 2008.

These background template spectra have been extracted with version 2.6.3 of the SAS task `rgsspectrum`. The procedure followed to derive the templates is detailed in the Appendix.

The structure of the calibration file remains as it was in the previous release (see [1]): the file has 64 extensions, 32 for first-order and 32 for second-order background spectra. The first 32 extensions in the file correspond to an extraction region of 90% in PI (16 for first order, 16 for second order). The last 32 extensions correspond to an extraction region of 95% in PI (16 for first order, 16 for second order).

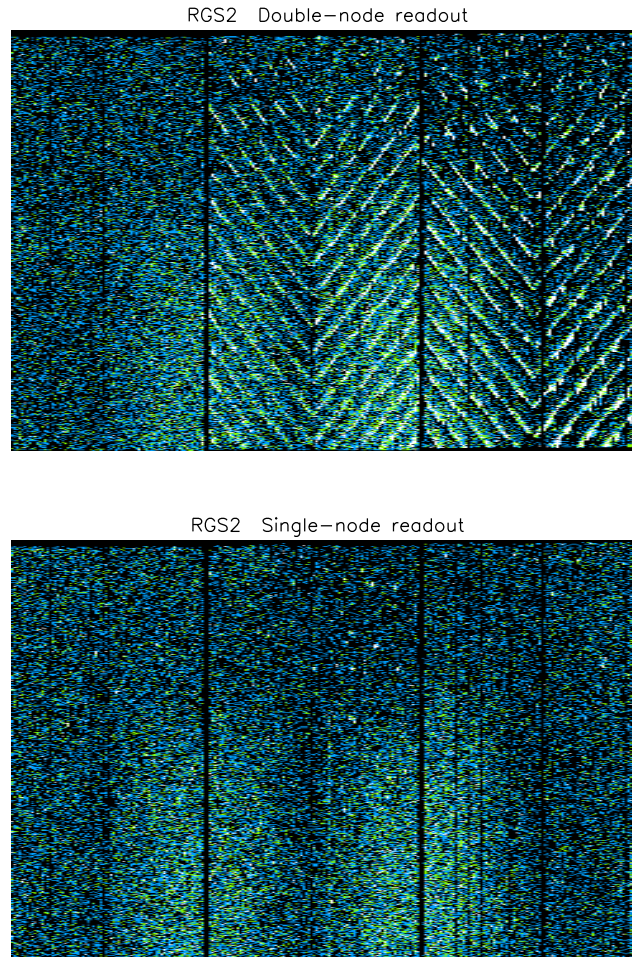
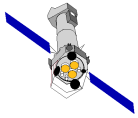


Figure 1: RGS2 event files corresponding to two observations taken in double-node (top) and single-node (bottom) readout mode. Only CCDs 3, 2 and 1 (from left to right) are shown.

3 Scientific Impact of this Update

Shortly after the implementation of the single-node readout mode for RGS2, it was noticed that the background characteristics of the RGS2 CCDs (in particular, CCD#2) had changed: the background was lower, and the fixed-pattern noise had nearly disappeared (see Fig. 1). Due to these changes, the background templates derived from double-readout mode observations overestimated largely the background at the longest wavelengths (Fig. 2).

The background derived from this new CCF shows a substantial improvement, in particular in the wavelength interval between 28 and 33 Å, that corresponds to CCD#2 of RGS2 (see Fig. 2).

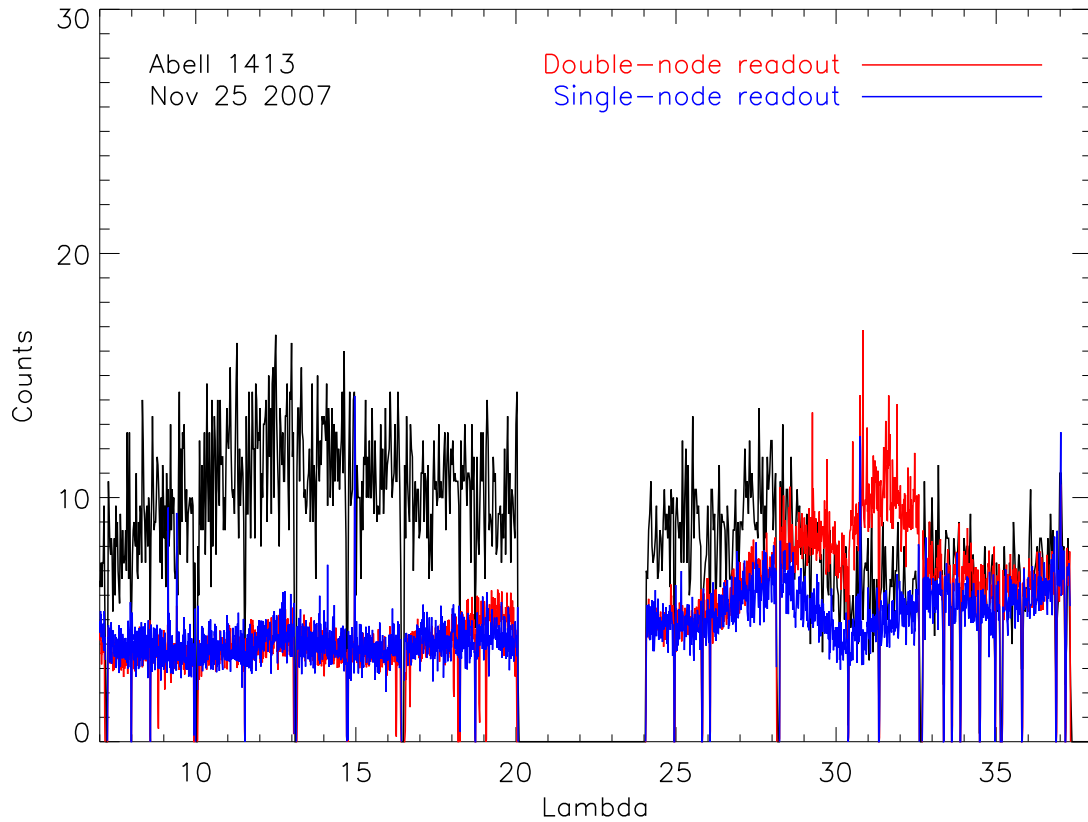
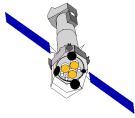
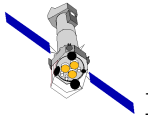


Figure 2: Comparison of the RGS2 background templates derived from the old (red) and new (blue) CCFs. The figure shows the RGS2 spectrum of the galaxy cluster Abell 1413 obtained in November 2007, that was taken in single-node readout mode. The black line is the total spectrum, as extracted with `rgsspectrum` without background subtraction. The red and the blue lines are the resulting model background computed using CCFs 004 (double-node readout) and 005 (single-node readout), respectively. The improvement in the estimation of the background in the spectral region 28-33 Å is clearly visible.



4 Expected Updates

Further updates might be made in the future to improve the signal-to-noise ratio of the templates by adding more blank fields and/or to cope with software updates.

5 Test Procedures and Results

The new templates have been used to generate the model background for a sample of RGS2 observations taken in single-node readout mode. The sample included different levels of background, first and second orders, and 90 and 95% PI extraction regions. The results were satisfactory in all cases.

Formal checks:

- The fits viewer `fv` was used to inspect the CCF file, their structure and validity dates. Everything was OK: It contains 64 binary extensions, each with five columns: `CHANNEL`, `RATE`, `QUALITY`, `BACKSCAL` and `AREASCAL`.
- The SAS task `cifbuild` was run successfully in order to check the ingestion of the files into the calibration index file.

References

- [1] “RGS Background Spectra Templates” R. González-Riestra, XMM-CCF-REL-217, June 2006
- [2] “Templates for the RGS Background”, R. González-Riestra, XMM-SOC-CAL-TN-0058, October 2004

Appendix

The RGS2 observations listed in Table 1, corresponding to blank fields taken in single-node readout mode, were selected for the extraction of the background templates specific for this observing mode. All the observations were processed with SAS 8.1 following the procedure detailed in [2].

For each of these observations, spectra were extracted for the standard 16 background levels as defined in [2]. The spectra for each of the levels were added together. This was done for first and second orders, and for PI extraction regions of 90 and 95%. No valid data were found for the three highest background levels (i.e. $BLI > 4$ cts/sec). For compatibility with previous releases, dummy files were created for these three levels, having the same values as the last valid file (that corresponds to $2 < BLI \leq 4$).

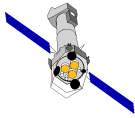


Table 1: Sample of observations

Obsid	Target	Date	Texp (sec)
05002401	V838 Mon	2008-03-17	116803
05003001	G330.2+1.0	2008-03-20	68249
05005009	PG 2112+059	2007-11-05	51456
05021401	SGR 1627-41	2008-02-12	90722
05024302	RX J0957.8+6534	2007-09-30	58464
05024303	RX J2328.8+1453	2007-12-01	10439
05025001	3C 457	2007-12-02	52785
05027601	B2 0902+343	2008-04-09	55570
05028601	CL 0016+1609 offset	2007-12-14	61448
05029501	CL 2038.4-0125	2007-11-07	52759
05029502	CL 0035.9+8513	2008-02-11	61575
05037401	IRDC G053.11+00.05	2008-03-29	54793
05040101	vb 10	2008-04-06	47703
05054001	PHL 1092	2008-01-20	63565
05059201	PSR J1856+0245	2008-03-27	53961
05523501	MGRO J2019+37	2008-05-08	47983

Table 2: Characteristics of the background templates

BLI*	n	Texp(sec)	counts	rate (cts/sec)
≤ 0.01	8	33921	3568	0.077 ± 0.006
$0.01 < \text{BLI} \leq 0.02$	13	74950	6274	0.078 ± 0.005
$0.02 < \text{BLI} \leq 0.04$	16	240188	19726	0.083 ± 0.006
$0.04 < \text{BLI} \leq 0.06$	16	194077	16705	0.086 ± 0.004
$0.06 < \text{BLI} \leq 0.08$	16	90387	8332	0.092 ± 0.003
$0.08 < \text{BLI} \leq 0.10$	9	32528	4543	0.105 ± 0.008
$0.10 < \text{BLI} \leq 0.20$	13	77491	11220	0.142 ± 0.016
$0.20 < \text{BLI} \leq 0.40$	13	72382	17125	0.241 ± 0.032
$0.40 < \text{BLI} \leq 0.60$	12	41563	16296	0.398 ± 0.045
$0.60 < \text{BLI} \leq 0.80$	12	25285	13754	0.550 ± 0.099
$0.80 < \text{BLI} \leq 1.00$	11	18891	12681	0.688 ± 0.100
$1.00 < \text{BLI} \leq 2.00$	11	41309	44120	0.980 ± 0.217
$2.00 < \text{BLI} \leq 4.00$	4	6927	11652	1.681 ± 0.240
$4.00 < \text{BLI} \leq 6.00$	0	-	-	-
$8.00 < \text{BLI} \leq 8.00$	0	-	-	-
$\text{BLI} > 8.00$	0	-	-	-

*BLI: countrate in the off-axis region of CCD#9 (see [2])

n: number of spectra

Texp: accumulated exposure time in the level

counts: number of counts in the accumulated spectrum. They correspond to first order and an extraction region of 95% in PI