XMM-Newton CCF Release Note

XMM-CCF-REL-229

RGS Background Spectra Templates

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1 CCF components

Name of CCF	VALDATE	EVALDATE	Blocks changed	XSCS flag
RGS1_TEMPLATEBCKGND_0004	2000-01-01T00:00:00	–	X100_P090_1_0.00... X100_P095_2_8.00	NO
RGS2_TEMPLATEBCKGND_0004	2000-01-01T00:00:00	–	X100_P090_1_0.00... X100_P095_2_8.00	NO

2 Changes

This is the third release of the RGS background spectra templates CCFs to be used by the SAS task `rgsbkgmodel`.

The structure of the calibration files is as described in the Release Note for the previous version of the CCF (RGS[12]_TEMPLATEBCKGND_0003): 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).

These new CCFs differ from the previous ones in the way the template spectra have been derived. In previous releases, all empty fields were merged in a single event file per RGS, and the spectra of the 16 levels were extracted from it. This procedure has been found to handle incorrectly the `REJPIX` extensions, and leads to too low values of `BACKSCAL` in CCDs 1 and 2, when a large number of pixels are rejected during the processing due to the enhanced fixed-pattern noise.

In this new release, the template corresponding to each of the 16 background levels is the average of the spectra extracted for that given level from each of the 29 blank fields.

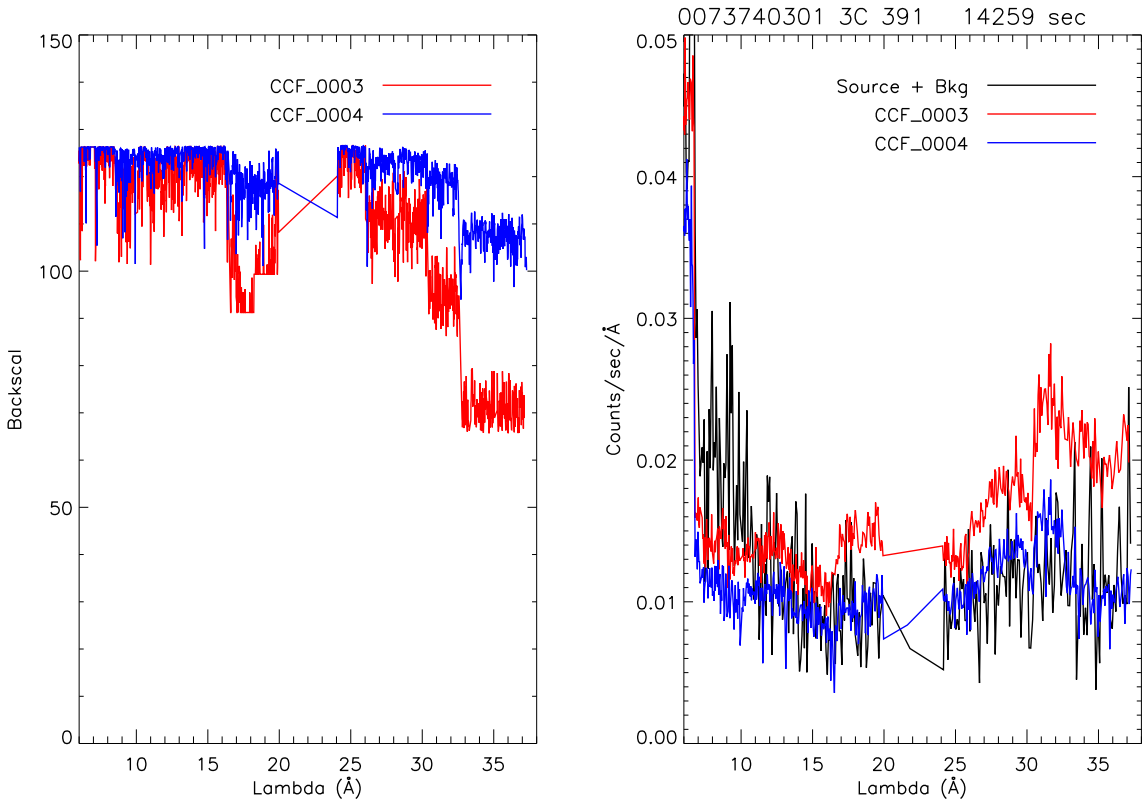

Figure 1: Left: Comparison of the `BACKSCAL` values derived from the old (blue) and the new (red) CCFs. Right: Results for Obsid. 0073740301, Supernova Remnant 3C 391, no source spectrum). The black line shows the total spectrum, as extracted with `rgsspectrum` without background subtraction. The blue and the red lines shows the resulting model background computed using CCFs 003 and 004, respectively. The improvement in the estimation of the background, is clearly visible.

As in the previous release, these new background template spectra have been extracted with version 2.6 of the SAS task `rgsspectrum`.

3 Scientific Impact of this Update

The use of the background spectra templates is an alternative to the conventional analysis, in which the background is derived from the offset region in the spatial image. The method is fully described in in XMM-SOC-CAL-TN-0058.

The procedure used to derive the spectra used in previous releases of these CCFs did not handle correctly the `REJPIX` extensions of the event files. This produced too low values of `BACKSCAL` in the templates which, in turn, gave rise to too high model background spectra once they were scaled to the extraction area used for the source.

This problem has been solved in this new version, as shown in Fig. 1.

4 Estimated Scientific Quality

The model background derived from these new CCFs shows a substantial improvement, in particular at the longest wavelengths, where the previous CCFs overestimated the background. The implementation of the present CCFs will allow more accurate measurements of relevant emission lines as e.g., the the C VI line near 34 Å.

With the exception of pathological cases (less than a few percent) the establishment of the overall background spectrum in an observation using the background spectra templates (as done by the SAS task `rgsbkgmodel`) works very well, constituting a valid alternative for any observation, and the only one for largely extended sources. A very good reproduction of the background obtained with the conventional analysis could be achieved in all the control cases tested so far, using different types of object with different levels of background.

5 Expected Updates

Further updates can 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.

6 Test procedures

General checks:

- use `fv` (or another FITS viewer) for file inspection. It should contain 64 binary extensions, each with five columns: `CHANNEL, RATE, QUALITY, BACKSCAL` and `AREASCAL`.
- use the SAS task `cifbuild` to see if the CAL digests and creates correctly the calibration index file.

7 Summary of the test results

A full description of the method and results obtained using the new SAS task rgsbkgmodel is given in the Calibration Technical Note XMM-SOC-CAL-TN-0058 "Templates for the RGS Background" [1].

General checks:

The fits viewer `fv` was used to inspect the two CCF files, wrt their structure and validity dates. Everything was OK.

The SAS task `cifbuild` was run successfully in order to check the ingestion of the files into the calibration index file.

References

[1] "Templates for the RGS Background", R. González-Riestra, XMM-SOC-CAL-TN-0058, October 2004

[2] "RGS Background Spectra Templates" R. González-Riestra, XMM-CCF-REL-217, June 2006