XMM-Newton CCF Release Note

XMM-CCF-REL-371

Update of the correction to the RGS Effective Area

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1 CCF components

Name of CCF	VALDATE	List of Blocks changed	XSCS flag
RGS1_EFFAREACORR_0013	2000-01-01T00:00:00	AREACORR_1	NO
		AREACORR_2	NO
RGS2_EFFAREACORR_0013	2000-01-01T00:00:00	AREACORR_1	NO
		AREACORR_2	NO

2 Changes

The time and wavelength dependent correction to the RGS effective area was first implemented at the beginning of 2017, in parallel with the release of SASv16. It was later modified to allow extrapolation of the correction beyond the last tabulated value, revolution 2816 –24th April 2015–, see González-Riestra (2017).

This correction has been now updated using data taken until the end of 2018. Furthermore, the algorithm has been improved, as follows (see details in Kaastra et al. 2019):

- Refinement of the treatment of the Galactic absorption.
- Use of smoothed background in the fitting.
- Extrapolation of the broken power–law model out of the 5-37 Å range.
- More accurate detection of chip boundaries.
- Improvements in the fitting and smoothing of the correction factors.

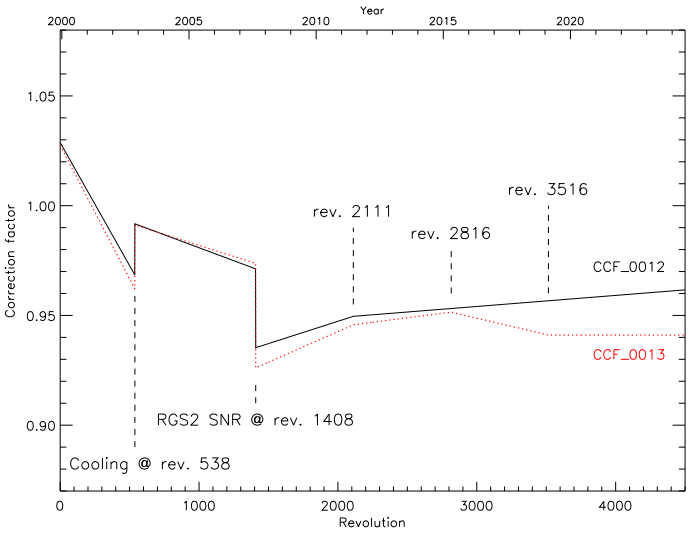

Figure 1: Example of the parametrisation used for the fit to the residuals. The figure shows the average correction in the spectral range 16–19 Å for RGS2, first order.

3 Scientific Impact of this Update

The RGS effective area correction was initially derived using the results of the work by Kaastra et al. (2015). These authors have used a large sample of observations of bright blazars taken from the beginning of the mission until October 2014. Each spectrum was fitted to an absorbed broken power-law, and the residuals (in bins of 0.05 Å) as a function of time were fitted according to the expression given in Kaastra et al. (2015) and González-Riestra (2016) and shown schematically in Fig.1.

In this update, the parameters have been derived for five different epochs: before revolution 538 (instrument cooling), between revolutions 538 and 1408 (change to RGS2 Single-Node-Readout mode), between revolutions 1408 and 2112, between revolutions 2112 and 2816, and between revolution 2816 and 3516. No extrapolation is made beyond the last date. Instead, the values corresponding to rev. 3516 are used for later dates.

4 Estimated Scientific Quality

With this new calibration files, the effective area correction is formally valid until February 2019. Beyond that date, the values are kept constant.

5 Test procedures & results

The new CCFs have been fully tested in SASv17.

- The fits viewer `fv` has been used to inspect the new CCFs, their structure, validity dates and contents
- The SAS task `cifbuild` has been run to confirm that the right CCFs version is selected.

6 Expected Updates

This is the second update of this correction. The time evolution of the effective area should be closely monitored, and new records will be added (or the existing ones modified) to cope with potential changes.

7 References

[1] "Effective area calibration of the RGS", J. Kaastra, C. de Vries, J.W. den Herder, SRON-RGS Internal Report, August 2015

[2] "Correction to the RGS Effective Area", R. González-Riestra, XMM-CCF-REL-340, December 2016.

[3] "Extrapolation of the correction to the RGS Effective Area", R. González-Riestra, XMM-CCF-REL-349, June 2017.

[4] "Effective area calibration of the RGS", J. Kaastra, C. de Vries, J.W. den Herder, SRON-RGS Internal Report, April 2019.