XMM-Newton CCF Release Note

XMM-CCF-REL-240

RGS Offset Values update

C. Gabriel

December 19, 2007

1 CCF components

Name of CCF	VALDATE	EVALDATE	Blocks changed	XSCS flag
RGS1_ADUCONV_0021	2007-08-01T06:00:00		OFFSET_GAIN	NO
RGS2_ADUCONV_0024	2007-08-17T02:00:00		OFFSET_GAIN	NO

2 Changes

The default way of subtracting offsets by the RGS data is to use the offsets maps, produced as part of the continous monitoring of the RGS instruments. They get computed as the averages of the diagnostic images over three consecutive revolutions and make possible an offset subtraction on CCD pixel level (this is done via the parameter "withdiagoffset=true" present both in the SAS tasks `rgsenergy and rgsproc. The former method of offset subtraction is still kept as alternative for special cases. It consists in the subtraction of an offset value per CCD and node. This value is present in the RGS ADUCONV calibration file, as part of the extension OFFSET_GAIN.`

`This release updates the average offset values per CCD and node contained in the extension "OFFSET_GAIN" of the RGS ADUCONV files. The reasons are:`

- `starting with revolution 1408, RGS2 data are only taken in single readout node mode, due to a defective RGS2 ADC. Therefore all the data are actually read out through the node C, with the corresponding sudden changes to the offset values of "node D". These get further nominally corrected as such (although it would be now more correct to make a distinction just between left [former C] and right [former D] CCD halves).`

- the small changes occurred since the last adjustment of all other offset values in the calibration file.

3 Analysis

The offset values (called "system peak" in RGS jargon) are monitored daily and show a high stability since the RGS instruments were cooled down, in November 2002. Due to this stability and the fact that the offset subtraction is not performed primarily anymore using these calibration values, there was no necessity of updating them regularly. However, the change to operations in single readout mode with RGS2 makes an update necessary.

Fig. 1 shows the evolution of the system peak values of RGS2 - node D throughout the whole mission. The new values of "node D" are almost identical to the new derived ones of "node C". These show differences to the old node C values of less than 2%. The new calibration files contain all the updated values. On the RGS1 side, the new derived values differ by 2-3% for the C side and by 1-2% for the D side. The start of validity is set to revolution 1400 due to a slight change applied to the voltage of CCD 2 at that time, which produced a sudden jump of 3% in the offset value (see Fig. 2).

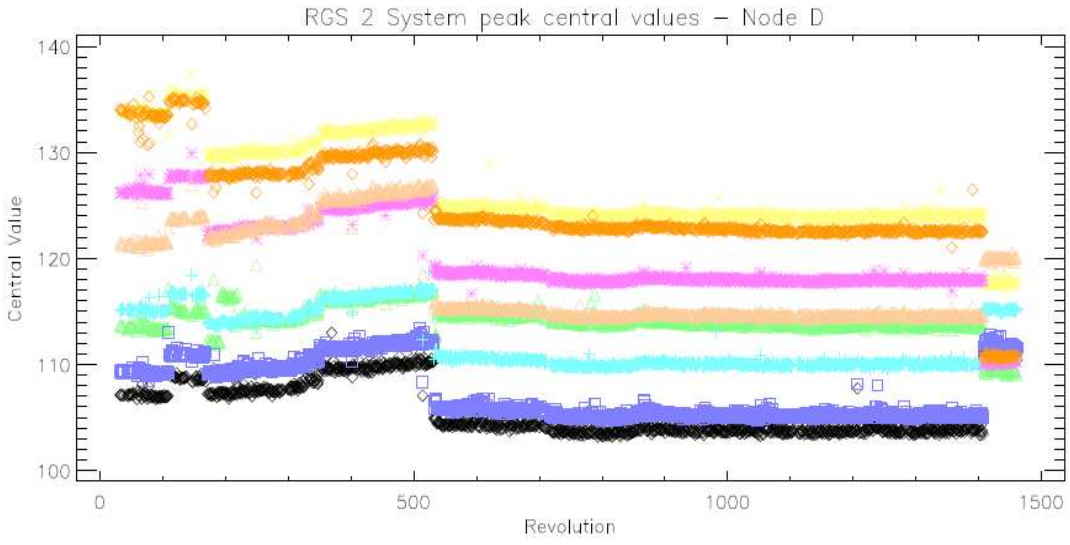

Figure 1: Evolution of RGS2 node D system peak value throughout the whole mission. The different colours and symbols represent the 8 different CCDs. Large stability is observed after revolution 535 when the operating temperature was lowered

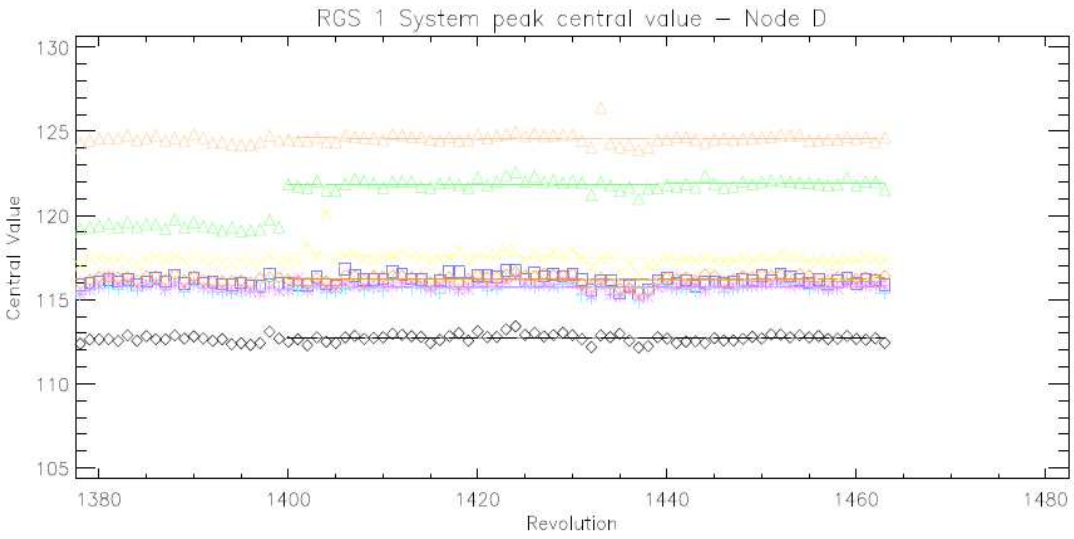

Figure 2: RGS1 - node D offset values of the latest 100 revolutions. On top of the distributions corresponding to the different CCDs, a fitted 1st order polynomial for deriving the values and stability from revolution 1400 on.

4 Scientific Impact of this Update

A more accurate offset subtraction is possible in case that the better method of subtracting offset images is not possible. Especially necessary for the offset subtraction of the right half of the RGS2 CCDs, due to operating the instrument in single readout node since revolution 1408.

5 Estimated Scientific Quality

The quality of spectral fitting is improved for those cases in which offset images cannot be used. This actually happens extremely rarely.

6 Expected Updates

Updates of these values are expected to be very infrequent, unless changes take place in the way the instruments are operated.

7 Test procedures

General checks:

- use fv (or another fits viewer) for file inspection. It should contain 2 binary extensions (ADUCOEFF and OFFSET_GAIN).
- analyze an observation taken in the validity period of the new files, running rgsproc with the parameter "withdiagoffset=NO" and overriding ccffiles parameter pointing to these new files. Compare to normally processed data, using "withdiagoffset=YES".

8 Summary of the test results

The fits viewer fv was used to inspect both CCF files, wrt their structure, validity dates and contents of the second extension (OFFSET_CONST). Everything OK.

The SAS task cifbuild was run several times using data corresponding to periods covered and not covered by these CCFs in order to check the correct selections. Selections were correctly done.

A Mkn421 observation taken in November 2007 has been reduced with rgsproc using both methods of offset subtraction, including the new produced files. The resulting first order spectra and corresponding matrices were used to fit a simple power law model. As expected the subtraction of the offset images deliver better fitting results (ChiSquare / dof of 1.21 compared to 1.23 using the new offset values). These results reproduce perfectly the ones obtained at the time of implementing the pixel-to-pixel offset subtraction.