XMM-Newton CCF Release Note

XMM-CCF-REL-131

RGS Gains, offsets and CTI Parameters before cooling

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1 CCF components

Name of CCF	VALDATE	EVALDATE	List of Blocks changed	XSCS flag
RGS1_ADUCONV_0016	2001-05-10T06:00:00	—	OFFSET_GAIN	NO
RGS2_ADUCONV_0016	2001-05-10T06:00:00	—	OFFSET_GAIN	NO
RGS1_ADUCONV_0017	2001-09-18T23:00:00	—	OFFSET_GAIN	NO
RGS2_ADUCONV_0017	2001-09-18T23:00:00	—	OFFSET_GAIN	NO
RGS1_ADUCONV_0018	2001-11-05T20:00:00	—	OFFSET_GAIN	NO
RGS2_ADUCONV_0018	2001-11-05T20:00:00	—	OFFSET_GAIN	NO
RGS1_CTI_0003	2001-05-10T00:00:00	—	XCTI, CTIY1, CTIY2, CTIY3, CTIY4, CTIY5, CTIY6, CTIY7, CTIY8, CTIY9	NO
RGS2_CTI_0003	2001-05-10T00:00:00	—	XCTI, CTIY1, CTIY2, CTIY3, CTIY4, CTIY5, CTIY6, CTIY7, CTIY8, CTIY9	NO

2 Changes

A new set of gains and CTIs have been derived using data from orbits 440 (Mkn421) and 429 (AB Dor). For the time range covered by the results of this analysis (see below) we have determined the evolution of the system peak, recognizing three different periods to be covered by three different CCFs,

Since the previous set of gains and CTIs were determined using data from orbit 80, and the changes to the previous values are small, we have decided to set the start of validity for these

new calibration files halfway between both at revolution 260. The CTIs show an increase of 1-2% (CCD dependant), fully in agreement with the determination from the internal calibration sources. An error of 1% in CTI means about 1% error in effective area, which is well within the current uncertainty of about 10%. This CTI update will hardly affect the final spectra. The gain changes are very small and within the noise in the gain determination.

In addition the offset values ("system peak") have been determined for the period after revolution 260, using the diagnostic data. The "sytem peaks" are monitored in the framework of the RGS monitoring activities. In the period analysed we see clearly three different regions (Fig. 1). Between revolutions 326 and 349 there was high solar activity affecting the CCD offsets, finishing with a very high solar flare in rev. 349.

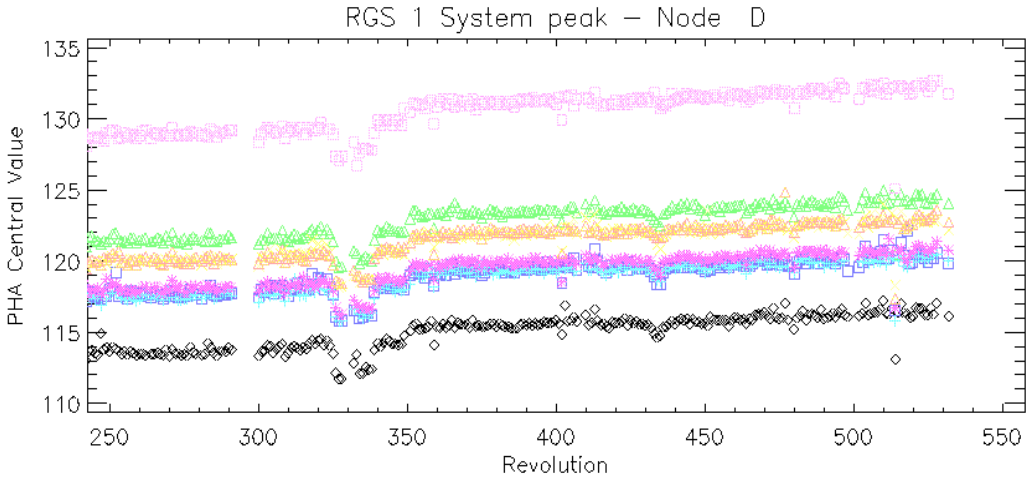

Figure 1: System Peak evolution (RGS1, D node, all CCDs) from revolution 240 to 530

The evolution of the system peak can be well approximated with a first order polynomial in each of the three different regions. This makes necessary the release of three ADUCONV calibration files per RGS instrument. Fig. 2 shows that the fitted curve to any of the three regions is a good approximation to their evolution. The lowest measurable energy by RGS is around 0.3 keV and a 1% change in PHA is considered relevant. So we see that this set of calibration files is completely sufficient to cover perfectly the given period in time.

3 Scientific Impact of this Update

As already said, the corrections with respect to the former set of gains, and CTIs are small, this calibration should improve only marginally the obtained spectra in general. However, these changes together with the more accurate offsets constrain better the selection regions and make possible a better signal to noise obtainment.

4 Estimated Scientific Quality

The update of the offset values and its discrimination in the three different periods improve the PI values and therefore the selection region in energy space specially for the low energy region.

5 Expected Updates

The RGS operational temperatures were changed during revolution 532 (RGS2) and 537 (RGS1) from -80C to -110C. New calibration of gains, CTIs and offsets is necessary for the periods starting at those times.

6 Test procedures

General checks:

- use FV (or another fits viewer) for file inspection. The ADUCONV CCFs should contain 2 binary extensions (ADUCOEFF and OFFSET_GAIN), the CTI CCFs should contain 12 binary extensions (CTI, CTI extended, CTIx and the nine CTIY[1-9]).
- use the SAS task cifbuild to check that the CAL selects correctly the new files.
- process datasets covered by the new files and check the energy plot.

7 Summary of the test results

The fits viewer fv was used to inspect all 8 CCF files, wrt their structure, validity dates and contents of the changed extensions. Everything OK.

The SAS task cifbuild was run several times using data corresponding to periods covered by the different CCFs. Selections were correctly done.

In addition several datasets corresponding to the different periods were processed (rgsproc) and the results checked. Special attention was paid to the energy-dispersion image, showing the pulse heights results. Fig. 3 shows the results for one of the used sources, PKS2155-304, observed in revolution 362. For comparison, the pipeline (PPS) results obtained with the same source using the former calibration (Fig. 4. A slightly but better matching with the expected energy regions can be observed in the first image.

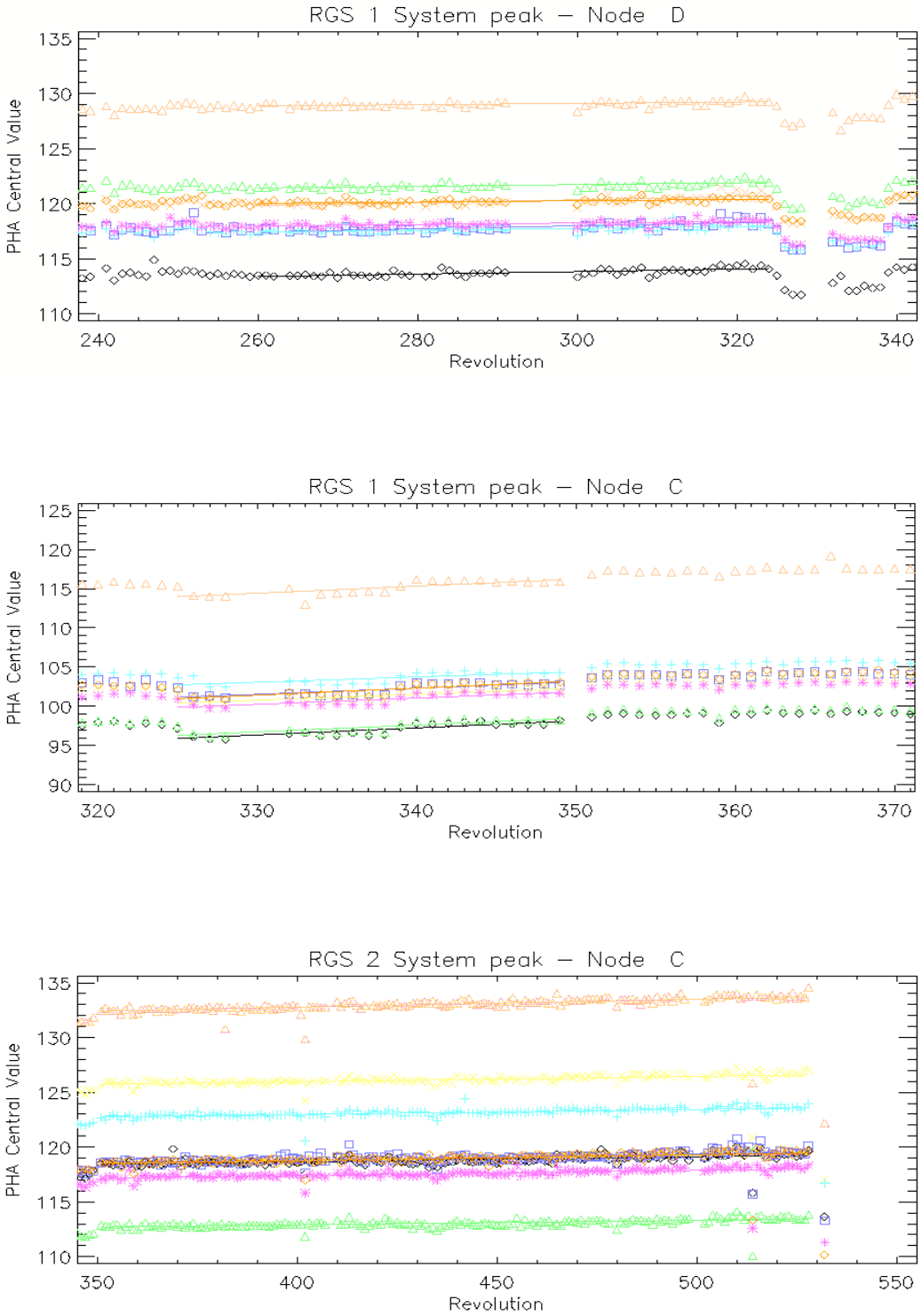

Figure 2: Examples of System Peak evolution fits: RGS1 D side from 260 to 325, RGS1 C side from 326 to 349 and RGS2 C side from 350 to 530

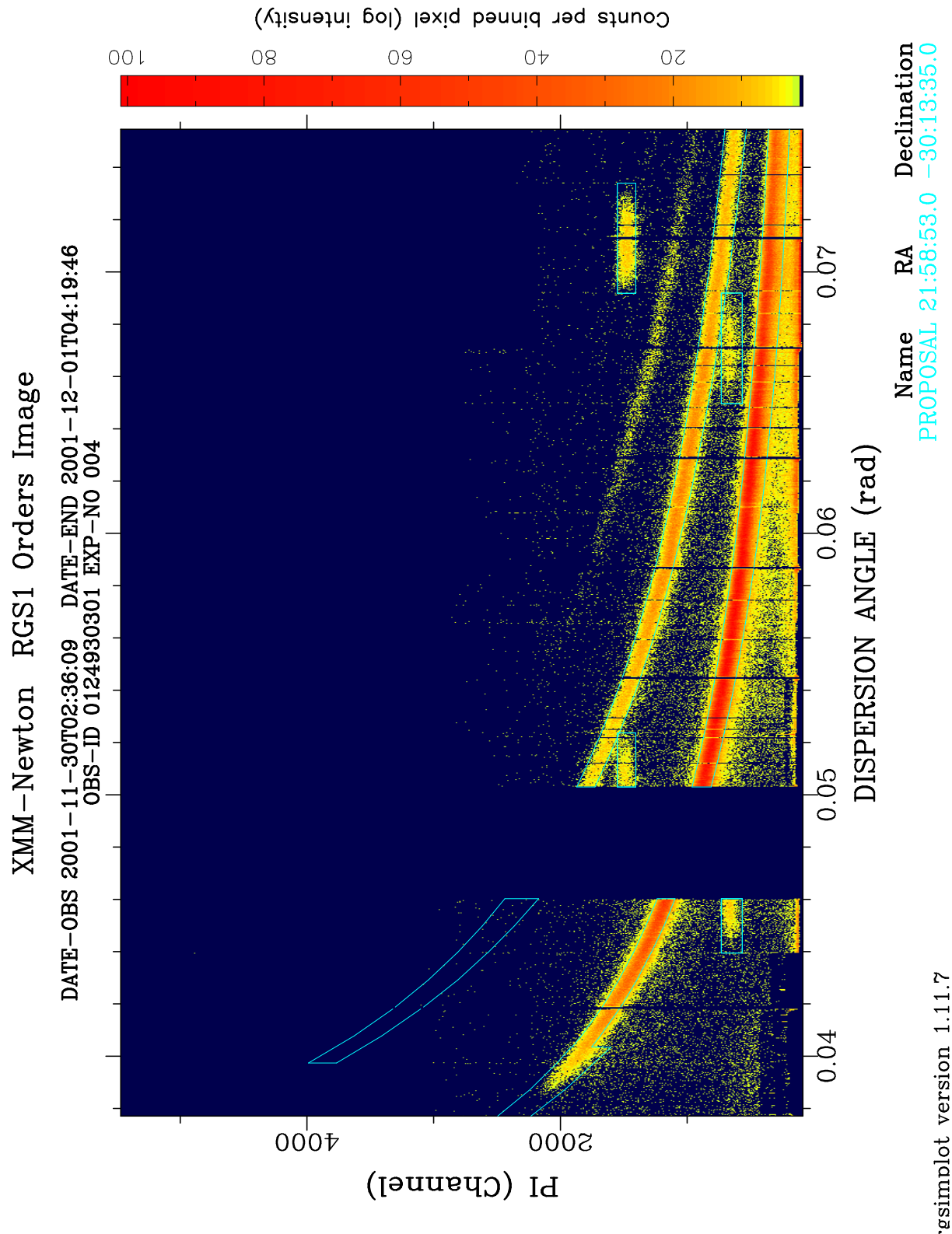

Figure 3: Energy-dispersion plot with selection regions: RGS1 PKS2155-304 observation in rev. 362

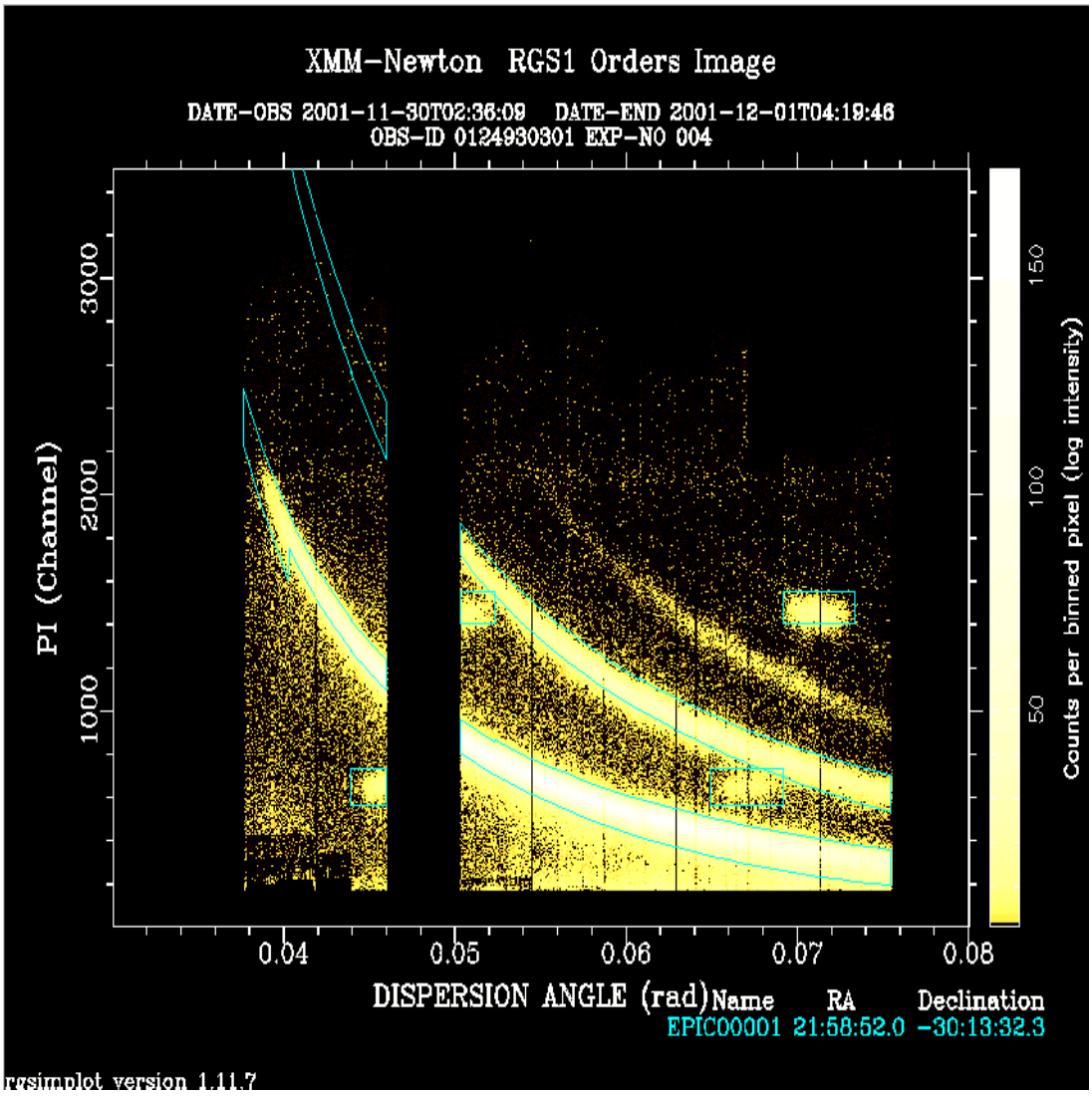

Figure 4: Same as Fig. 3 using former calibration