XMM-Newton CCF Release Note

XMM-CCF-REL-132

RGS Gains, offsets and CTI Parameters after cooling down CCDs in November 2002

C. Gabriel, A. Pollock and Cor de Vries

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1 CCF components

Name of CCF	VALDATE	EVALDATE	List of Blocks changed	XSCS flag
RGS1_ADUCONV_0019	2002-11-13T23:00:00	—	OFFSET_GAIN	YES
RGS2_ADUCONV_0019	2002-11-04T00:00:00	—	OFFSET_GAIN	YES
RGS2_ADUCONV_0020	2002-11-04T00:00:00	2002-11-13T23:00:00	OFFSET_GAIN	NO
RGS2_CTI_0004	2002-11-04T00:00:00	—	XCTI, CTIY1, CTIY2, CTIY3, CTIY4, CTIY5, CTIY6, CTIY7, CTIY8, CTIY9	NO
RGS1_CTI_0004	2002-11-13T23:00:00	—	XCTI, CTIY1, CTIY2, CTIY3, CTIY4, CTIY5, CTIY6, CTIY7, CTIY8, CTIY9	NO
RGS2_CTI_0005	2002-11-13T23:00:00	—	XCTI, CTIY1, CTIY2, CTIY3, CTIY4, CTIY5, CTIY6, CTIY7, CTIY8, CTIY9	NO

2 Changes

In November 2002 the operational temperature of the RGS CCDs was decreased from -80 C to finally -110 C degrees, with corresponding changes in CCDs' offsets and gains.

The initially proposed temperature of -115 C was given up after a few revolutions (532 - 536) because the time to reach this temperature after perigee passage was not offering enough safety margin and could have, under worst conditions, impeded the start of observations in the foreseen science window. In the beginning of revolution 532 the RGS2 operational temperature was reduced from -80 C to -115 C. In the beginning of revolution 537 the RGS1 operational temperature was brought down to -110 C, and at the same time the RGS2 operational temperature raised to the same value. In addition coinciding with the last date, the clock voltage of CCD 2 in RGS2 had to be fine tuned. Therefore the affected calibration files have to cover one new period (starting at rev 537) for RGS1 and two for RGS2 (532 to 536 and from 537 on).

Gains and CTIs have been derived using Mkn421 data on and off-axis taken at the "cooling" RGS revolutions 532 and 537, respectively. In addition the offset values ("system peak") have been determined using diagnostic data corresponding to several revolutions in the same periods.

The parallel CTI has improved considerably and there is almost no difference from the CTI near the edges (previously a factor 10 to 100 worse). The changes in gain are less than 2% and the relative difference beween CCDs is clearly less than 1%. A very clear system peak drop was observed after cooling down the instruments (see points corresponding to revolution 532 in fig. 1). The values were brought down to pre-flight levels. The single drops observed before (eg. by revolution 514) correspond to a revolution, in which to a large extent single CCDs were read-out, influencing the system level values.

Details of the results of RGS2 cooling can be obtained in den Herder et al 2002.

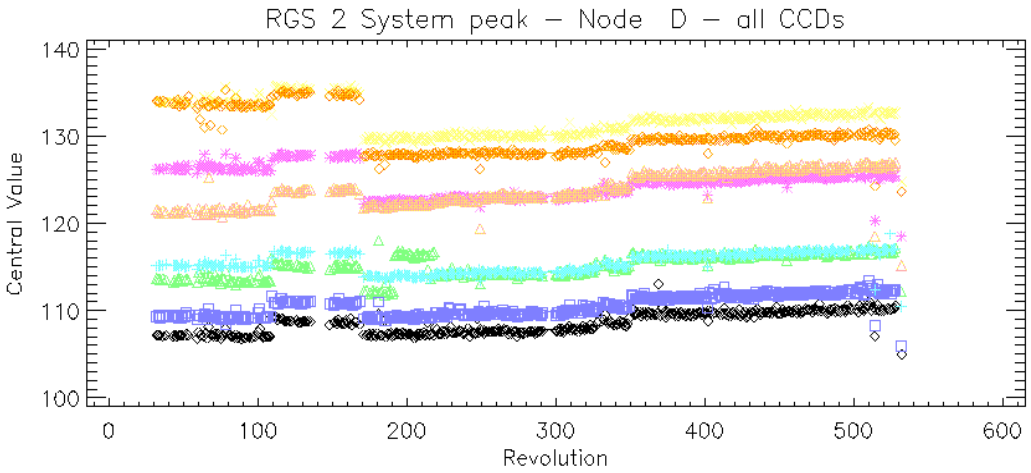

Figure 1: System Peak (RGS2, C node, all CCDs) evolution during the whole mission

3 Scientific Impact of this Update

These files are essential for the calibration of the RGSs after cooling.

4 Estimated Scientific Quality

A full assessment of the scientific quality of data post-cooling and a comparison to previous figures have still to be made. The general calibration accuracy should be at least in the same level as for the data before.

5 Expected Updates

The evolution of CTI, gains and offsets will continue to be monitored. The general degradation with radiation will lead to an update in the frametime of 1-2 years.

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 7 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 the two periods covered by the different CCFs. Selections were correctly done.

In addition several datasets corresponding to both periods were processed with rgsproc and the results checked. Figs. 2 and 3 show the spatial and energy selection regions of one of the Mkn421 observations in revolution 537 with both cameras at -110 C.

References

J.W. den Herder, C.P. de Vries, A. Pollock, C. Gabriel and J. Fauste, "Cooling RGS2 camera to -115; first results", V1.0, November 2002

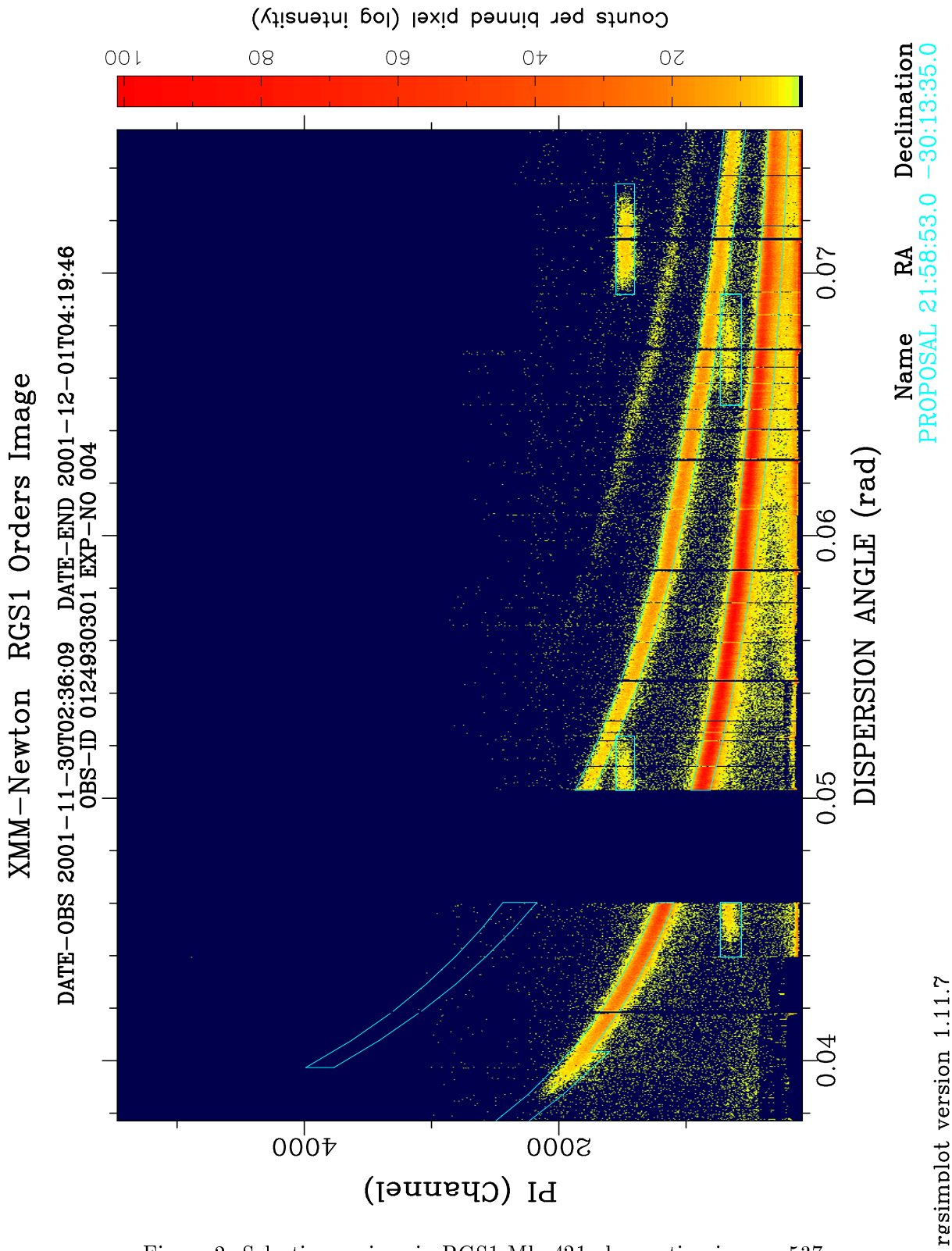

Figure 2: Selection regions in RGS1 Mkn421 observation in rev. 537

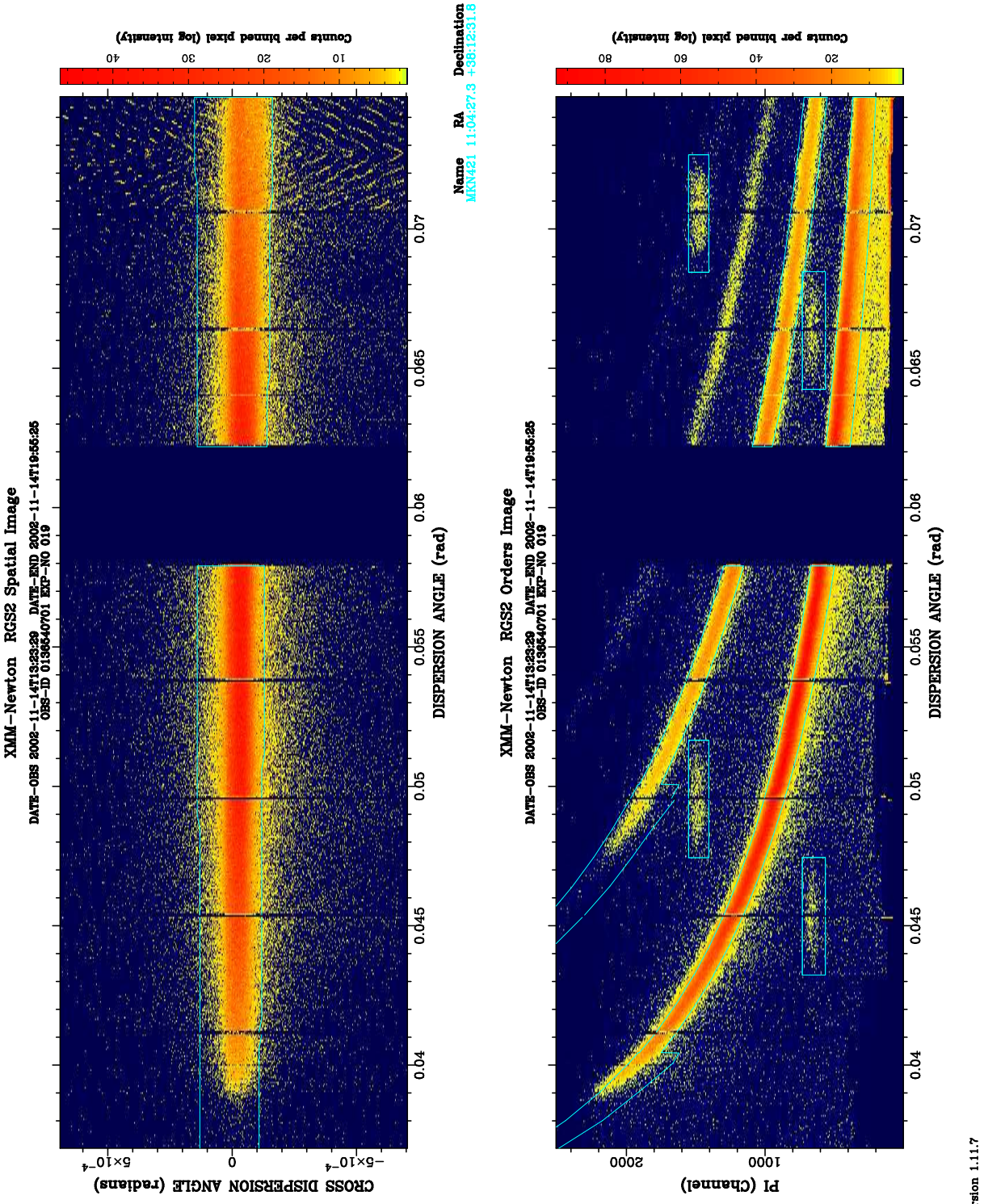

Figure 3: Selection regions in RGS2 Mkn421 observation in rev. 537