XMM-Newton CCF Release Note

XMM-CCF-REL-237

RGS2 CCFs for single-node readout

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1 CCF components

Name of CCF	VALDATE	List of Blocks changed	XSCS flag
RGS2_ADUCONV_0023	2007-08-17T02:00:00	OFFSET_GAIN.GAIN	NO
RGS2_CTI_0010	2007-08-17T02:00:00	CTI.CTI_X	NO
		CTI_EXTENDED.CTI_X	NO
		XCTI.CTI_X	NO

2 Changes

Following the increasing frequency of RGS2 ADC problems during instrument initialisation at the beginning of XMM revolutions, in order to avoid the condition the decision has been taken to operate this instrument only in single-node readout from rev 1408. RGS1 continues to be readout through two nodes. Pending a full recalibration of RGS2 single-node readout when Mkn421 becomes visible in the latter half of 2007, the 1357_0510610101 test observation of Mkn421 taken on 2007-05-08 has been used to provide an interim calibration in conjunction with software changes released as part of SAS v7.1.

The two nodes used thus far for readout are designated C and D. In single-node readout, because the half of the CCD data which used to be read out through node D, is now transferred in the opposite direction, the following scheme devised by Cor de Vries at SRON applies to each RGS2 CCD

- $\mathrm{CTI}(\mathrm{D}, \mathrm{SingleNode}) = -\mathrm{CTI}(\mathrm{D}, \mathrm{DoubleNode})$
- $\mathrm{GAIN}(\mathrm{D}, \mathrm{SingleNode}) = \mathrm{GAIN}(\mathrm{C}, \mathrm{SingleNode}) - 512 \times \mathrm{CTI}(\mathrm{C}, \mathrm{DoubleNode}) + 512 \times \mathrm{CTI}(\mathrm{D}, \mathrm{DoubleNode})$

In this scheme the gain and CTI are now mixed.

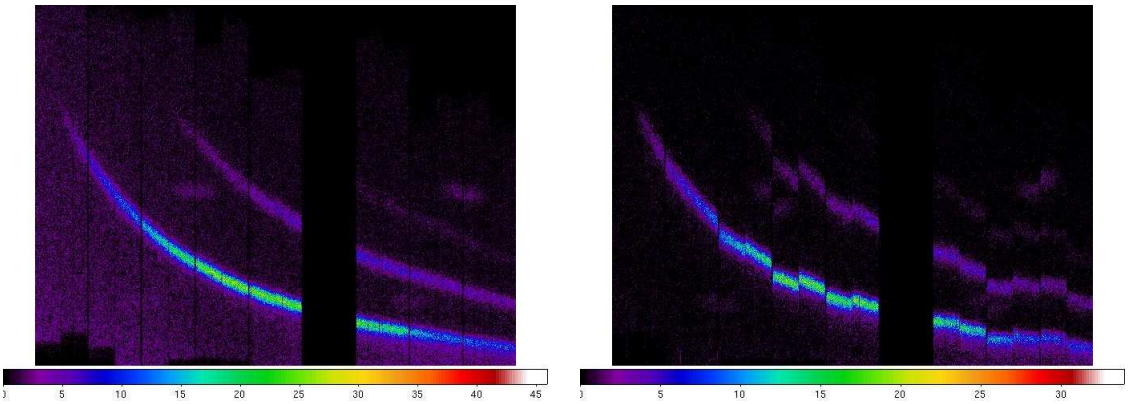

Figure 1: `PI-BETA_CORR` distributions of Mkn421 1357_0510610101 RGS2 data with SAS v7.0 and current CCFs applied to double-node data on the left and to single-node data on the right. The goal of this CCF release is the make the distribution of single-node data as smooth as double-node data.

3 Scientific Impact of this Update

These CCFs to be used with SASv7.1 are mandatory for the analysis of all RGS2 data taken in single-node readout, which became routine after 2007-08-17. Fig. 1 shows why the new CCFs are necessary.

4 Estimated Scientific Quality

5 Test procedures & results

After editing the VALDATEs by hand, the new CCFs have been run with SAS v7.1 on the test RGS2 single-node observation shown on the right-hand size of Fig. 1. The results are shown in Fig. 2. With the new CCFs, the single-node RGS2 data are smoothly distributed in the spectrum selection regions, although some irregularities can be identified on close inspection. Nevertheless, there is reasonable consistency between RGS1 and RGS2 and orders 1 and 2 in quantitative analysis with `XSPEC` as shown by the relative normalisations reported below :

`TBabs nH` $= 1.36 \times 10^{20}$ cm^{-2} fixed			
`powerlaw PhoIndex` $= 2.345 \pm 0.005$			
`powerlaw norm` $= 9.281 \times 10^{-2}$ fixed			
Relative Normalisations			
RGS1 m=−1	RGS2 m=−1	RGS1 m=−2	RGS2 m=−2
1.0021 ± 0.0032	0.9804 ± 0.0039	1.026 ± 0.0053	0.9808 ± 0.0086

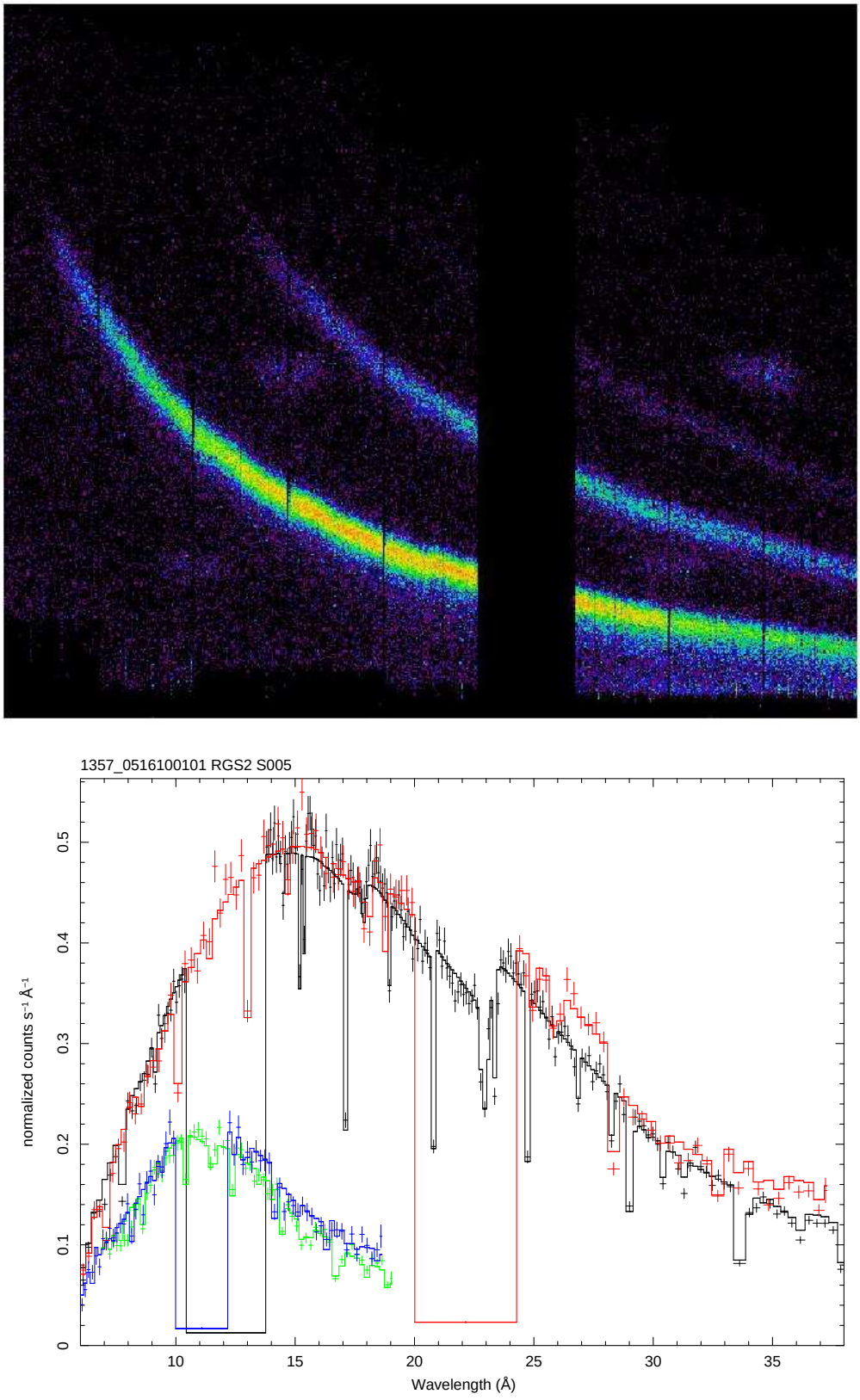

Figure 2: At the top, `PI-BETA_CORR` distributions of Mkn421 1357_0510610101 RGS2 single-node data with SAS v7.1 and the new RGS2_ADUCONV and RGS2_CTI CCFs. Below are shown the results of an `XSPEC` absorbed power-law model fitted jointly to RGS1 order 1 (black); RGS2 order 1 (red); RGS1 order 2 (blue); and RGS2 order 2 (green).

6 Expected Updates

Once a full calibration observation of Mkn421 is available in late 2007, some revisions may be required.