XMM-Newton CCF Release Note

XMM-CCF-REL-370

RGS Bad Pixels - upload of extended segments

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March 28, 2019

1 CCF components

| Name of CCF	VALDATE	EVALDATE	Blocks changed	XSCS flag
RGS1_BADPIX_0038	2019-03-15T00:00:00	—	BADPIX	NO

2 Changes

This release adresses an issue concerning bad segments, motivated by the RGS Diagnostic Trend Analysis Report - 2017 (XMM-CAL-TN-0217). In the previous release, the two areas identified with increased offsets ("hot spots") on both upper part sides of CCD 1 in RGS1, were extended by flagging a number of advisory hot segments. Now these advisory segments have been included in the hot stuff table used by the instruments and discarded on board, to avoid unnecessary telemetry, and subsequently marked as "uploaded" in this CCF. Basically we have now two spots of 16 pixels each in the most left and right 39 columns on each side in the upper areas of CCD 1 for where no data is telemetered.

In summary, the new uploaded hot segments include now those marked as "advisory" in the previous release. The two "spots" are flagged completely on board, each of them being boxes of 16x39 pixels in the most left and right areas on each side in the upper areas of CCD 1. This change is effective as of March 15 2019.

3 Analysis

As part of the continuous monitoring of the RGS instruments, offset maps are produced, as the averages of the diagnostic images over three consecutive revolutions. They are then taken into the
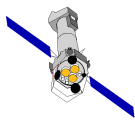
ODF data for the offset subtraction. The hot spot on the C side of the detector is clearly seen in Fig. 1, left side, showing the averaged offset map corresponding to year 2016. The hot spots are attributed to stress produced in CCD1 at the bond places.

We perform also an analysis of all the hot stuff found by running the bad pixel/column finding software (SAS task `rgsbadpixfind`) over the science data, and construct bad pixel maps. On the right side of Fig. 1 we have such a map corresponding to RGS1 - CCD 1 - C readout side, for the period between May and December 2016, i.e. after the upload of the extended region, masking the hot spot also between rows 9 and 16. It is clearly seen that, while the masking produced the desired effect of avoiding fake hot columns below the spot, there are now some not masked columns to the right of the spot giving rise to some columns being misidentified as hot. The evolution of the hot spots, growing slowly both in vertical as in horizontal direction, was the reason for extending in the former version this spot further 8 columns to the right, and so masking fully off the spot area, as advisory. After confirming these behaviour in 2017 and 2018, the hot spots have been included in the uploaded hot stuff tables, and subsequently changing the corresponding flag in this CCF from "advisory" to "uploaded".
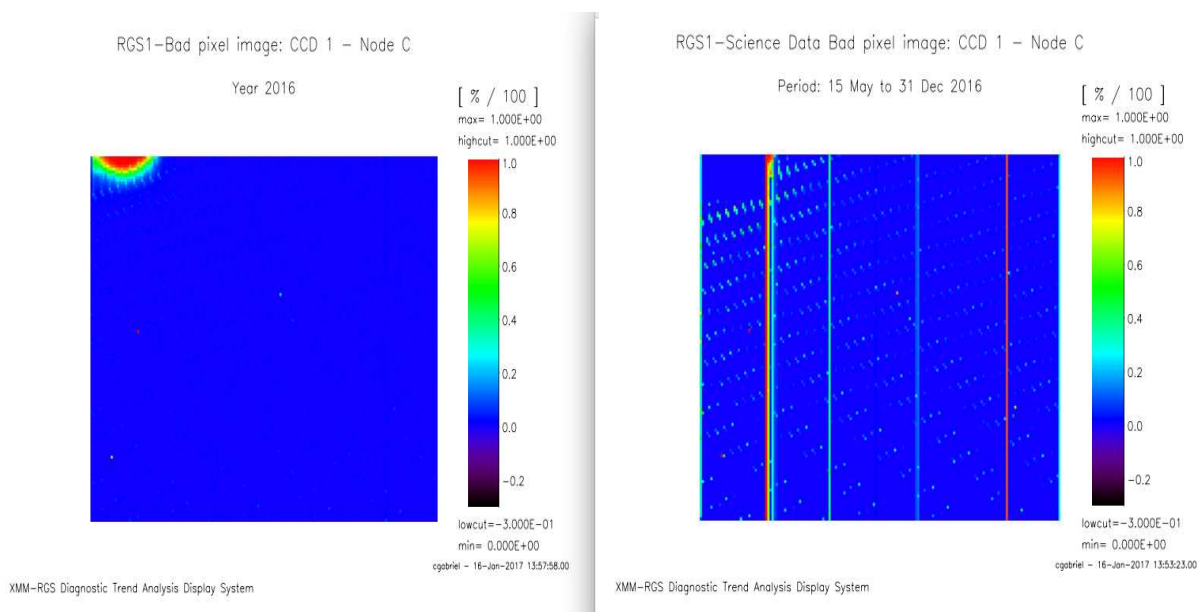

Figure 1: Left: RGS1 - CCD1 - C side offset map averaged over all data from year 2016, showing the "hot spot". Right: RGS1 - CCD1 - C side bad pixel map obtained with science data after the previous upload, extending the masked area horizontally. This behaviour has been confirmed with data from 2017 and 2018

The same data corresponding to the years 2015 and 2016 respectively for the node D side (Fig. 2), shows the effects of the evolution of the hot spot on the D side. Several columns appear more time as hot, due to the increase of the hot spot, both below and to the left of the spot. It was necessary therefore, as explained in the former CCF release (RGS1_BADPIX_0037) to extend the "advisory" area to avoid losing data due to misidentification of columns as hot. This behaviour has been confirmed with data from 2017 and 2018 (report is in preparation). Current CCF corresponds to the extension of the uploaded masked area also to 39 columns and 16 pixels, ie. symmetric to the C side.
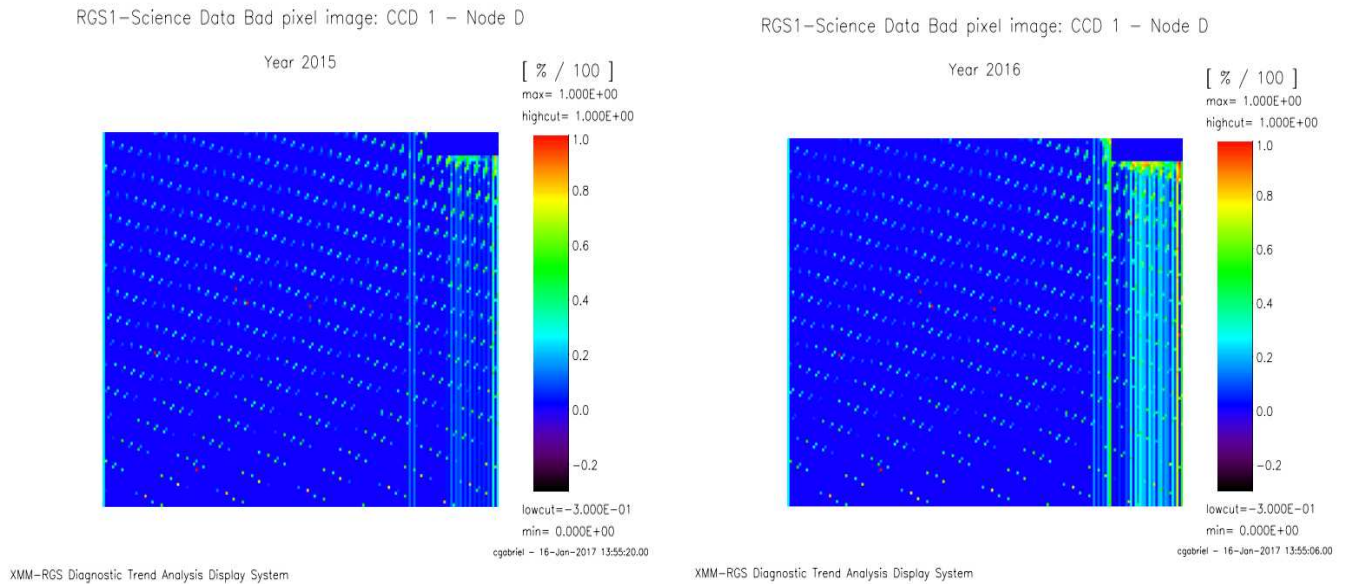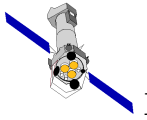
Figure 2: RGS1 - CCD1 D readout side science bad pixel maps corresponding to data from 2015 on the left and 2016 on the right. This behaviour has been confirmed with data from 2017 and 2018

# 4   Scientific Impact of this Update

The start date of validity is set to the beginning of March 15 2019, when the table was uploaded as part of DPP 19 15 02. For data taken after this date, the data from pixels in these areas will not be downloaded.

5   Estimated Scientific Quality

The inclusion of the extended hot segments in the former CCF has reduced the number of fake hot columns, both to the right of the spot on the C side, as to the left of and below the spot on the D side. This new CCF is now necessary due to the upload of the new tables to the instrument avoiding telemetry from the affected areas.

6   Expected Updates

Further analysis of bad pixels with diagnostic and science data should lead to updates, although this is expected to happen very infrequently.
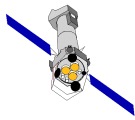
7   Test procedures

General checks:

- Use fv (or another fits viewer) for file inspection. It should contain 2 binary extensions (BADPIX and BADPIX1)

- Use the SAS task CALVIEW to see if the CAL digests and uses the new files.

- Check that the differences between RGS1_BADPIX_0035 and _0038 are exclusively the conversion to uploaded ("h") of the advisory ("H") segments corresponding to the hot spots in RGS1 CCD1 C and D readout side.

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 first extension (BADPIX). Everything OK.

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

The SAS task calview was used to prove that these calibration files are ingested correctly by the CAL, by pointing to the different Calibration Index Files and producing bad pixel plots.

`fdiff` (FTOOLS) has been used to check that the differences to the former valid bad pixel CCF file (RGS1_BADPIX_0035).