

XMM-Newton CCF Release Note

XMM-CCF-REL-368

OM bad pixels: Update

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1 CCF components

Name of CCF	VALDATE	EVALDATE	List of Blocks changed	XSCS flag
OM_BADPIX_0007	2000-01-01T00:00:00	—	BADPIX	NO
OM_BADPIX_0008	2017-07-17T00:00:00	—	BADPIX	NO

2 Changes

The accidental observation of Jupiter with the OM in revolution 3224 on July 16 2017 led to a small but central area of the OM detector being exposed to an intense photon flux that resulted in a patch of decreased sensitivity, hereafter referred to as the Jupiter depletion patch (JDP). The sensitivity loss is higher in the V filter (up to $\sim 30\%$ in raw counts), although all filters are affected.

While a spatially-dependent and filter-dependent correction for the diminished sensitivity is the optimum solution, the interim approach adopted was to identify and flag the pixels in the JDP in the OM bad pixel map so that sources detected by the OM SAS source detection task, *omdetect*, can be flagged as affected. The JDP pixels were added to the previous release of the OM bad pixel map CCF (OM_BADPIX_0006) and described in the associated CCF release note (XMM-CCF-REL-353). In that release, all pixels associated with the JDP (and other low-sensitivity pixels) were assigned descriptions that yield values of 1 in the quality images associated with each OM sky image, values generated by the OM SAS task, *omcosflag*.

In these CCF file updates, OM_BADPIX_0008, and OM_BADPIX_0007, the characterisation of low sensitivity pixels in the bad pixel table is modified such that they are subsequently represented by values of 2048 in the quality image, distinct from bad pixels that acquire a quality value of 1. This has been done in conjunction with changes to the tasks, *omcosflag* (version 1.35+), *omdetect* (version 5.41+) and *ommosaic* (version 2.10+). Version (0008) includes the pixels from the JDP, with the validity date starting from revolution 3225, while version 0007 excludes them and has a

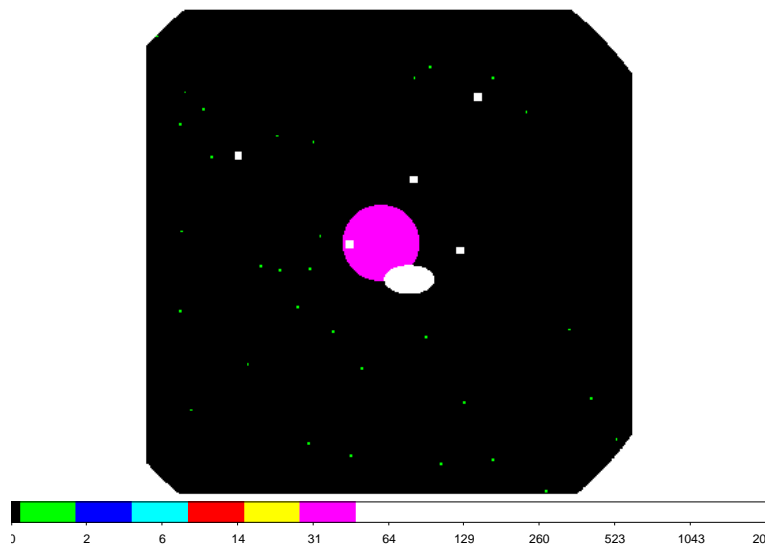
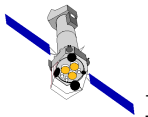


Figure 1: Distribution of bad pixels and low sensitivity patches in the new OM_BADPIX_0008.CCF. The colours relate to their quality map values, ranging from 0 (black) for good pixels, to 2048 (white) for low sensitivity pixels.

validity date from the beginning of the mission. For reference, the spatial distribution of the pixels from version 0008 of the bad pixel CCF is shown in Figure 1.

The previously known bad pixels are listed in Table 1 (reproduced from XMM-REL-353). It gives the center (sub-pixel) of the bad pixels, excluding the triangular edge emission regions extending for as much as 100 pixels from the corners of the detector. The size of the bad pixel is defined to be slightly larger than a physical one as a conservative approach accounting for the fact that a sub-pixel comes from interpolation into more than one physical pixel. The JDP is elliptical in shape and centered at (1110, 910), with semi-major (X) and semi-minor (Y) axes of 105 and 60 respectively - note that the centroid X position of the JDP was erroneously reported as 1010 in the previous release note, # 353.

3 Scientific Impact of this Update

The bad pixels CCF is used by the SAS to indicate (flag) the quality of the count rate measurement of a detected source containing one or more of them. The presence of non-zero quality flags in source lists indicates a need to treat the source parameters with caution. The flagging mechanism is carried on through all processing steps, to the final combined source list. There is no scientific impact from the changes made here. The main effect is that the changes differentiate pixels in the JDP and other low-sensitivity areas from bad pixels, enabling sources affected by them to be more easily recognized via their flag values in the images and source lists included in OM products generated by the SAS.

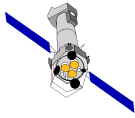
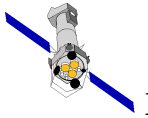


Table 1: OM Bad Pixels

X	Y	Description	Size (sub-pixel)
396 860 1128 1320 1394	1426 1056 1326 1030 1670	low sensitivity patch	31 x 31
159 199 866 1680 1869	1112 365 176 28 412	dead pixel	9 x 9
909 1180 1340 1459	540 668 396 155	hot pixel	9 x 9
59 154 155 173 252 285 435 492 557 571 644 690 693 710 738 794 1092. 1132 1197 1243 1459 1598 1974 1778	1925 1557 779 1692 1619 1420 558 965 1510 949 794 224 955 1484 1090 692 1002 1749 1796 140 1750 1607 242 701	low sensitivity pixel	9 x 9
1110	910	sensitivity depletion patch	ellipse semi major and minor axes of 105 x 60 respectively



4 Estimated Scientific Quality

There is no impact on the scientific quality except that sources falling in the JDP will now be flagged, as explained in section 3.

5 Expected Updates

The appearance of new bad pixels is monitored through the inspection of flat fields. A variation in the depletion patch and/or aging of the detector may require the table to be updated again in the future.

6 Test procedures

The new CCFs have been verified with *calview* and the fits viewer, *fv*. The validity date, structure and contents are correct and the spatial distributions of pixels in the files before (version 0007) and after (version 0008) the Jupiter observation, correspond with expectations.

Inspection of the products from observations before (rev 3200) and after (rev 3249) the Jupiter observation, using *omichain* in SAS 18.0, which includes use of the aforementioned, changed, OM SAS tasks, shows the pixel values from the patch are being marked with the correct values in the quality maps and are propagated, accordingly, to source lists.

This new badpixel CCF is not compatible with versions of the SAS earlier than SAS 18.0 as the conversion of flag values in the CCF calibration file to pixel values in the quality maps and source flag columns in source lists produced by the SAS require use of SAS 18 versions of *omcosflag*, *omdetect* and *ommosaic*.

Public access and usage of the new OM_BADPIX_0007.CCF and OM_BADPIX_0008.CCF files are tied to the SAS 18 release.

References