SWIFT-XRT-CALDB-01
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Revision 2.0
Revised by: David Morris
Pages Changed: all

SWIFT XRT CALDB REV 2.0 RELEASE NOTE

SWIFT-XRT-CALDB-01: Bad Pixels

1. Component Files:

FILENAME	VALID DATE	RELEASE DATE	CAL VERSION
swxbadpix20010101v001.fits	01 January 2001	15 October 2004	003
swxonboardbp20010101v001.fits	01 January 2001	15October 2004	003

2. Scope of Document:

This document contains a description of the latest update of the XRT bad pixel map which is installed in the XRT pipeline bad pixel calibration file as well as in the XRT on-board bad pixel table.

3. Changes:

This is the first released version of the Bad Pixel document.

4. Scientific Impact of this Update:

This is the first released version of the Bad Pixel document.

5. Caveat Emptor:

It is noted that a secondary (i.e., lower) level of instability exists in some pixels on the XRT CCD. These pixels are not included in the bad pixel tables to be strictly excluded from processing since, for much of the time, these pixels report values consistent with normal operation. These 'flakey' pixels will be tracked in a separate file which is not part of the standard processing CALDB.

6. Expected Updates:

It is expected that radiation damage during the orbital lifetime of Swift will degrade the XRT CCD by introducing more bad pixels. Periodic updates to the Bad Pixel table files will be made to account for these changes.

7. Initial Bad Pixel Table:

The initial bad pixel table created and uploaded by PSU (David Burrows) in June 2003 consists of 1 partial bad column (209 pixels in extent) and 1 other bad pixel, mapped through both the A and B amplifier:

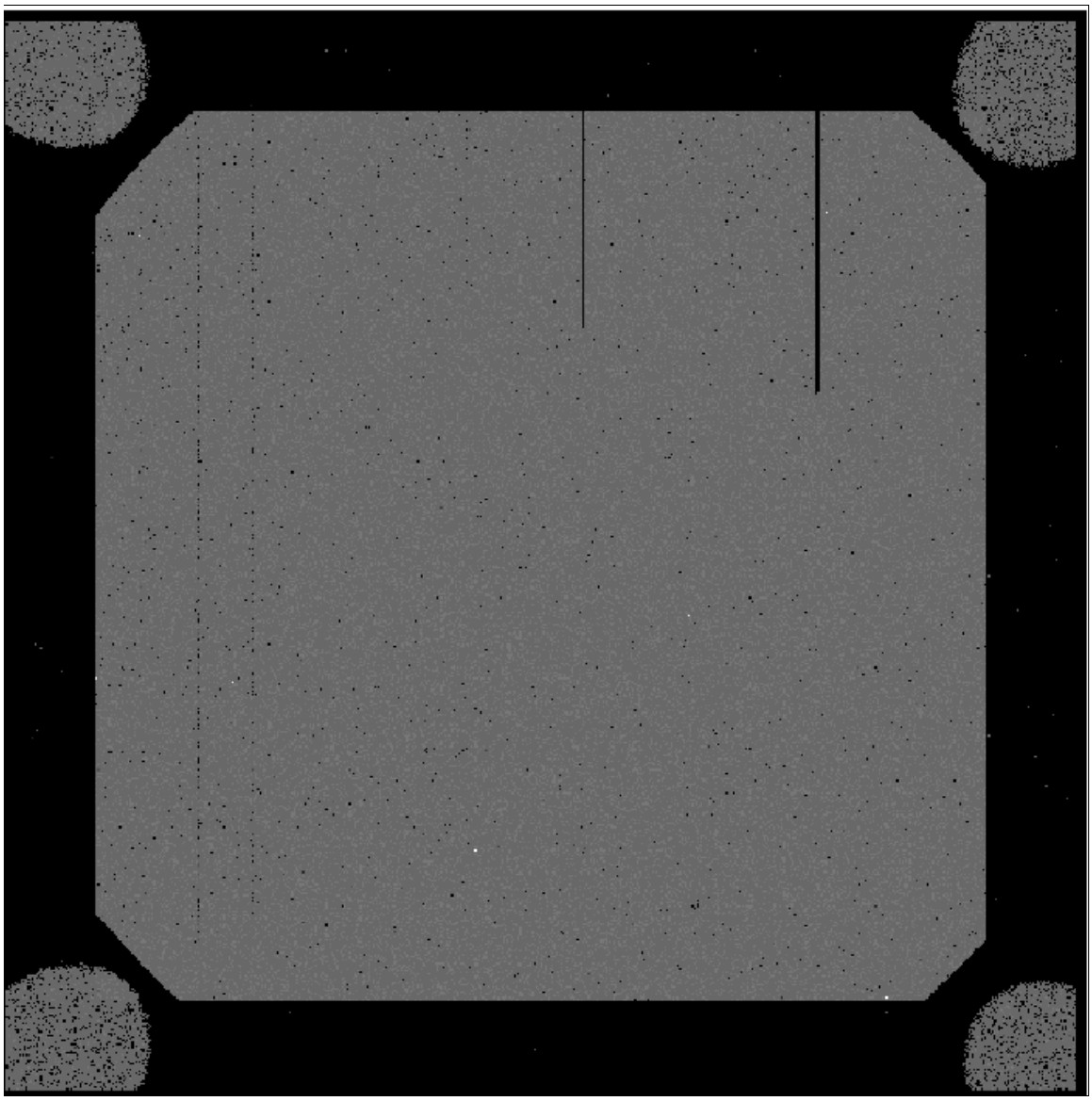
RawX	RawY	AMP	#pixels
453	391	1	209
146	391	2	209
453	390	1	1
146	390	2	1

8. Update Analysis:

To update the bad pixel files (both the ground processing table and the onboard processing table) we have taken the simple approach of collecting a very large set of single pixel corner source/door source events in photon counting mode from the Thermal Vacuum testing period and searching these events for pixels which display repeated values which are anomalously higher than the nominal Mn K_ value of ~2570DN.
The sample of events which we have searched for new hot pixels is the same sample of events from Thermal Vacuum which is used in the Gain/CTI ground calibration. The sample consists of ~2e6 single pixel events.

Currently, no new hot pixels have been located on the XRT CCD, though 7 pixels are identified which have more than one anomalously high event (where we define ‘high’ as

an event exceeding 2700DN). While these pixels cannot be accurately described as hot, since mostly the events they report are in the expected range for the Mn k-alpha or k-beta lines (and as such they should not be masked in the CALDB), they do bear tracking to see if the high DN events becomes more frequent. We note that the number of events per pixel in our dataset remains somewhat low (5 events per pixel on average) and so the results reported here need to be followed up on orbit. Since no new hot pixels have been conclusively identified in this analysis, we have made no changes to the previous bad pixel tables for this update.

Included below is an image of the XRT CCD showing the 2nd brightest DN value recorded in our analysis for each pixel. We show the 2nd brightest event to indicate pixels which may truly be showing systematic anomalous behavior rather than merely a single outlier event. Partial columns (previously noted as such by U. Leicester) can be seen at DETX positions 324 and 455 and the previously masked bad column can be seen at DETX 454 (that is, RAWX 453). The 7 pixels noted as showing more than one bright event and thus requiring further tracking can be seen as bright points at positions:

DetX	DetY
493	54
264	136
129	230
53	232
383	267
77	479
460	492