Chandra X-ray Center

Bad Pixels

The thirty-two bits of the column STATUS of an ACIS bad pixel file (`bpix1.fits`) are used to describe why a pixel or column is designated as "bad." Events that occur on a bad pixel have a STATUS bit set to one in the Level 1 event data file and are excluded from the Level 2 event data file.

Common reasons for a pixel to be flagged as "bad" in Chandra data products are:

1. *Present in badpix file.*

   Individual "hot" pixels have been excluded, also node boundaries in chips since events spread across these boundaries are incorrectly graded. The badpix file appropriate for the date of the observation must be used. (e.g. For ACIS, the date maps to the focal-plane temperature, which strongly affects the number of bad pixels.)

2. *Bad bias values.*

   If ACIS detects a problem with the bias, it will set the bias value to 4094 or 4095. This is detected and identified as a bad pixel. These values include pixels that are identified as "bad" by the on-board computer (ACIS has its own on-board badpixel list).

   Note: In FAINT w/ BIAS mode, the bias is checked for each event, thus if the bias changes during the observation it is noted in the bad pixel file with the appropriate time stamp.

   Bad bias values can also appear when some of the bias data got lost. The Level 0 software will fill in the missing bias data with values that will indicated that the events should be marked as bad.

3. *Bias parity errors.*

   It is possible for the memory that holds the bias images to get corrupted during the observation (see 2). When this happens, ACIS detects this condition and sends the appropriate information down, to be used as a bad pixel.

4. *ACIS operating mode.*

   The operating mode also contributes to the observation specific file. In ACIS FAINT and VFAINT mode a 3x3 event isaldn would get marked as bad(with different status bits for the center vs. surrounding pixel). In CC mode, the entire columns are marked as bad.

   Note on VFAINT mode: originally, all of the outer 24 pixels of a 5x5 island in VFAINT mode were checked to make sure that the "adjacent" pixels to the center were not bad. However, only the center 3x3

is used to compute the pulse height and grade; the outer 16 pixels of the 5x5 are only used to search for potential cosmic-ray events if check_vf_pha=yes. To avoid discarding more events unnecessarily, the code was changed to only consider the central pixel and the eight pixels adjacent to the central pixel when searching for events where one of the pixels is bad. This change was released on 23 June 2005 in the CIAO 3.2.2 software patch, and became part of SDP at version DS 7.6.

Full details on why a pixel is flagged as "bad" in Chandra data products are described in the memo on STATUS bits in event files.

Follow the Create a New ACIS Bad Pixel File: Identify ACIS Hot Pixels and Cosmic Ray Afterglows thread to create a new bad pixel file for your data. The Use Observation-specific Bad Pixel Files thread shows how to use the observation-specific bad pixel file in your analysis.

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