MIT Kavli Institute

Chandra X-Ray Center

MEMORANDUM
October 27, 2009

To: Jonathan McDowell, SDS Group Leader
From: Glenn E. Allen, SDS
Subject: Bias repair
Revision: 1.0
URL: http://space.mit.edu/CXC/docs/docs.html#bias_rep
File: /nfs/cxc/h2/gea/sds/docs/memos/bias_repair_1.0.tex

1 Introduction

Biases can be adversely affected for a number of reasons, including the interaction of charged particles in the detector, the transmission of optical light through the optical-blocking filter, and the loss of part or all of the bias telemetry. In order to produce the most accurate ACIS event data possible, biases may have to be repaired or replaced. If a problem affects an entire CCD, then replacement of the bias for the CCD is necessary. The following describes how to replace a bias for one observation with a modified version of a bias from another observation.

2 Replacement

The following steps are performed to replace the bias for a CCD with another bias for the same CCD.

1. Copy a suitable bias B to be used as a replacement.
2. For the first node of the bias (i.e. columns 1–256), modify the values of every pixel in the node such that
$$B' = B - \texttt{INITOCLA} + \texttt{INITOCLA}', \qquad (1)$$
where `INITOCLA` is a keyword in the header of the replacement bias and $\texttt{INITOCLA}'$ is a keyword in the header of the bias being replaced.
3. Repeat step 2 for the other three nodes, using `INITOCLB`, `INITOCLC`, and `INITOCLD`, instead of `INITOCLA`, for columns 257–512, 513–768, and 769–1024, respectively.
4. Process the ACIS event data using the replacement bias B'.
5. Examine the pulse-height information of the event data after it has been processed with the replacement bias. If `DATAMODE` = `FAINT`, then prepare a histogram of the pulse heights of the 4 corner pixels for every event on the first node. The peak of the distribution should be at a pulse height of 0 adu. If it is not, then adjust the values of the bias B' for the node and reprocess. Repeat this process for the other three nodes on the CCD. Note that if `DATAMODE` = `VFAINT`, then prepare a histogram using the pulse heights of the outer 16 pixels instead of the 4 corner pixels.

6. Repeat steps 2–5 until the condition specified in step 5 is satisfied.

3 Caveats

1. If the bias being adjusted suffers from a light leak, then some events near the event threshold will have been lost and cannot be recovered.