ACIS Update

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The ACIS instrument continued to perform well over the past year with no anomalies or unexpected degradations. The charge-transfer inefficiency (CTI) of the FI and BI CCDs is increasing at the expected rate. The contamination layer continues to accumulate on the ACIS optical-blocking filter. Data since April 2008, when the ACIS Detector Housing (DH) heater was turned off, indicate that the contaminant is increasing faster than previously predicted, especially along the edges of the filter. The CXC calibration group released an updated contaminant model in the CALDB 4.4.10 on 30 May 2012 to account for the increased rate of buildup. More recent data might indicate that the rate of buildup is leveling off, but more calibration observations in the future will be necessary to verify the trend.

The control of the ACIS focal plane (FP) temperature remains a major focus of the ACIS Operations Team. As the *Chandra* thermal environment continues to evolve over the mission, some of the components in the Science Instrument Module (SIM) close to ACIS have been reaching higher temperatures, making it more difficult to maintain the desired operating temperature of -119.7 C at the focal plane. In previous years, the ACIS (DH) heater and a heater on the SIM were turned off to provide more margin for the ACIS FP temperature. At this point in the mission, there are two effects that produce excursions in the FP temperature, both related to the attitude of the satellite. First, the Earth can be in the field of view (FOV) of the ACIS radiator (which provides cooling for the FP and DH). Second, for pitch angles larger than 130 degrees, the Sun illuminates the shade for the ACIS radiator and the rear surfaces of the SIM surrounding the ACIS DH. Starting in Cycle 14, the fraction of the time that the satellite spends at pitch angles more than 130 degrees should decrease as other spacecraft constraints are relaxed; this should result in fewer excursions in the FP temperature.

Observers can help keep the FP temperature cold and stable for their observation by reducing the number of operational CCDs, which reduces the power dissipation in the FP, thereby resulting in a lower FP temperature. Starting in Cycle 13, observers were encouraged to request 5 CCDs for their observations to keep the FP and the electronics cooler, if their science objectives could be met with 5 CCDs. Starting in Cycle 14, observers were not allowed to specify "Y" for 6 CCDs in the RPS forms when they submit their proposal. If an observer requires 6 CCDs for their observation, they are to specify 5 CCDs as "Y" and one CCD as "OPT1" at the time of proposal submission. If the proposal is selected, the observer may work with their User Uplink Support Scientist and change the "OPT1" to a "Y" if the sixth CCD is required. Observers should be aware that requesting 6 CCDs increases the likelihood of a warm FP temperature and/or may increase the complexity of scheduling the observation. Observers should review the updated material in the Proposers' Guide on selecting CCDs for their observations and on this web page: http://cxc.cfa.harvard.edu/acis/optional_CCDs/optional_CCDs.html.

The control of the ACIS electronics temperatures has also been a concern for the ACIS Operations Team. ACIS has three main electronics boxes, the Power Supply and Mechanisms Controller (PSMC), the Digital Processing Assembly (DPA), and the Detector Electronics Assembly (DEA). The PSMC reaches its highest temperatures when the satellite is in a "forward Sun" configuration, pitch angles between 45-60 degrees (*Chandra* cannot point within 45 degrees of the Sun). Since 2006, the *Chandra* Flight Operations Team (FOT) has been using the information provided by observers to turn off optional CCDs if thermal conditions require. As a result of the changing thermal environment, the DEA and DPA are reaching higher temperatures in tail-Sun orientations (pitch angles larger than 130 degrees). The recommendation in the previous paragraph to use only 5 CCDs if the science objectives can be met with 5 CCDs, will also reduce the temperature of the DEA and DPA in addition to the temperature of the FP. Starting in Cycle 14, the *Chandra* FOT has been using the optional CCDs information to turn off optional CCDs if either the DEA or DPA approach their temperature limits.

The ACIS flight SW team developed a patch to detect sudden increases in the count rates on all active CCDs as a means of detecting high radiation. This patch was developed in response to continued degradation in the performance of the primary radiation monitor on-board *Chandra* (EPHIN) due to increasing operational temperatures. The SW patch was uplinked to ACIS in November 2011. In May 2012, the SW for the spacecraft computer was patched to monitor the high radiation signal from ACIS and take appropriate safing actions in the case of high radiation. The combination of the ACIS radiation monitor and the HRC anti-coincidence signal will replace some of the capability lost due to a degraded EPHIN.