ACIS Update

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The ACIS instrument continued to perform well over the past year conducting the vast majority of Guest Observer (GO) observations with *Chandra*. There was only one interruption to the scheduled observations due to anomalies with the ACIS instrument, which was the unexpected power-off of the side A of the Digital Processing Assembly (DPA) on 9 December 2016. Side A of the DPA had spontaneously turned off on three occasions earlier in the mission. For each of those occurrences, the most likely explanation for the anomaly was a single event upset (SEU) that resulted in a spurious power off command to the electronics. An examination of the telemetry from the December 2016 event showed that this anomaly was consistent with the previous anomalies. Based on this conclusion, the ACIS instrument team prepared real-time command procedures to restore the ACIS instrument to its nominal configuration for science observations. The recovery to the nominal configuration was completed 10 hours after the anomaly was detected and science observations resumed soon afterward. Side A of the DPA has functioned nominally since the recovery. Only 29 ks of science time was lost from one observation.

Separately, on December 16, 2016, starting about 4.9 ksec into obsid 18278, data from CCD S1 were missing from every other exposure. The other chips all continued taking data without incident. This anomaly has never occurred in flight before. All subsequent observations, including one in the same ACIS configuration, executed nominally. The most likely cause is an SEU (unrelated to the one that caused the DPA shutdown) in the electronics which were processing the data from S1. It seems unlikely that precisely this anomaly will recur. The ACIS team is currently investigating this anomaly.

In 2016 the quiescent background rates continued to increase rapidly as the Sun becomes less active (see Figure 1). This increases the probability of telemetry saturation, particularly for observations that use Very Faint (VF) mode. Observers should take the increasing background rate into consideration when specifying a telemetry format and choosing the number of optional chips. The background rates will be updated at regular intervals at http://cxc.cfa.harvard.edu/cal/Acis/detailed_info.html.

The contamination layer continues to accumulate on the ACIS optical blocking filter. The contamination calibration model version N0010 was released with CALDB 4.7.3 in December 2016, which includes improved time-dependence and spatial variation of the several components (C, O, and F) known to dominate the chemical composition of the contamination layer (see http://cxc.cfa.harvard.edu/caldb/downloads/Release_notes/CALDB_v4.7.3.html#TD_ACIS_CONTAM_10 for more information). The charge-transfer inefficiency (CTI) of the front-illuminated (FI) and back-illuminated (BI) CCDs continues to increase at the expected rate.

Thermal control of the ACIS focal plane and electronics boxes continues to be a significant issue. The detector housing heater was turned off during the past year to remove one source of heating on the focal plane. It was originally turned on in August 2015 to determine if it would help slow the buildup of the contaminant, but subsequent analysis suggests it was ineffective. As in previous years, GOs are encouraged to designate chips not required for their science goals as optional (by selecting OFF1, OFF2, etc., in the order in which chips would be turned off if necessary, on the RPS form) to help mission planners manage the temperature of ACIS components. Further details are provided in the Proposers' Observatory Guide, and all users are urged to read the section on optional chips carefully. As the satellite continues to age, the need to turn off optional CCDs is likely to increase and therefore the need for GOs to properly specify the number and selection of optional CCDs will increase accordingly. ▪

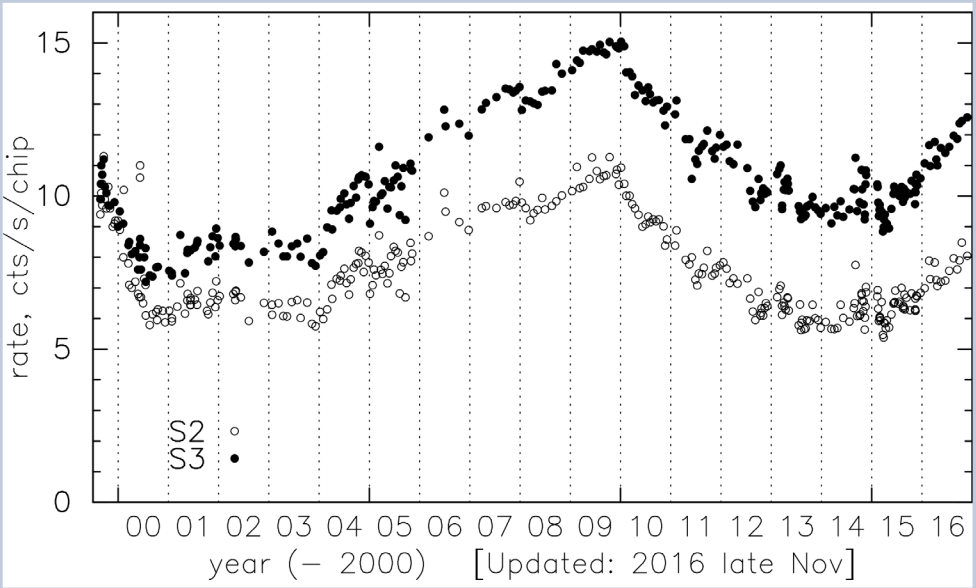

Figure 1: Quiescent background rates for ACIS. Reproduced from Figure 6.27 of the Proposer's Observatory Guide, credit Terry Gaetz; see also Tables 6.9 and 6.10 of the Proposer's Observatory Guide.