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ATLAS CIS Tech Quarterly Report

Katie Hughes, Dawit Belayneh

This report covers the activities of the Chicago CIS Techs from July 1 - September 30, 2021.

The maintenance team’s work has focused on the installation of isolation cooling valves in the two long barrel partitions of Tile. These valves are individually controlled by pneumatic actuators so as to allow the TileCal cooling system to bypass specific drawers without shutting down an entire cooling loop of 8-12 drawers, which would otherwise be necessary when hardware issues arise during Run 3. With cooling experts, the CIS techs have replaced radiation-sensitive screws and tested the performance and integrity on approximately 130 valves. In total, they installed 118 valves across 59 drawers on EBC. The five remaining drawers on EBC have been skipped due to difficulties with mounting. EBC 08 and 52 are blocked by Cesium source garages, and EBC 04, 14, and 16 have little to no free space on which to mount the valves.

The CIS techs also connected all 118 valves on EBC to the central cooling system. They operated on one sequential loop of connected drawers at a time. When the circulation was shut off, the cooling hoses were cut, drained, and connected to the direction-specific valves for each respective drawer. Due to the placement of the mounted valves, longer sections of hose needed to be cut and installed to minimize the bending radius. By analyzing the PPV cycles after the cooling loops on EBC were turned back on, it was determined that no leaks were caused by these installations.

The Chicago techs have also performed three CIS constant updates during the last period using the TileCal Unified Calibration Software (TUCS) macros. The July update covered CIS runs from June 1 to July 2 and updated 214 channels. The August update covered CIS runs from July 2 to August 20 and updated 178 channels. The September update covered CIS runs from August 23 to September 24 and updated 140 channels.

The Chicago techs have also updated the procedure for running a CIS update. Up to and including July, these updates simply included all runs taken across the date range. For the last two updates, the Chicago techs have undergone a run selection process to determine which runs are suitable to include in calculating the new CIS constants. The first step is to produce general plots of CIS constants versus time including all valid runs in the date region. By skimming these plots and searching for trends across partitions (for example, a single point that is always an outlier), they generate a list of CIS runs they wish to examine further. The next step is to analyze timing and amplitude/charge plots for these runs. These plots are generated manually by examining the CIS run in Root. If a module has bad timing or an unstable amplitude/charge plot for a given CIS run, all modules in that partition and of the same gain should not use that CIS run. The final step in this process is to only take one CIS run per day. Occasionally, multiple CIS runs are taken in the span of a few hours. It is not necessary to have a large cluster of points on a single day since the calibration constant should not change significantly across such a short time period. As the updated CIS constant is calculated by taking the average of all selected runs, having this many duplicate points biases the final value. Additionally, many of these kinds of runs have bad timing or a bad amplitude/charge ratio, and as such some of them are outliers. When encountering such a cluster of points, the CIS techs default to selecting the most recent run taken on that date, but make sure to ensure it is a valid run for all partitions and gains by analyzing the run in Root. If it is not valid, they examine the second to last run in the cluster, and so on.

The procedure the Chicago techs follow for the remainder of the CIS update has stayed the same. After producing plots for each partition and gain combination using the appropriate list of runs, they determine any necessary ADC flag changes, and perform manual recalibrations to the constants for channels displaying constant shifts. They also monitor channels with high deviation from the database CIS constant and those at half gain. The final results of the updates are presented to the data quality and maintenance teams and uploaded to on- and offline databases to be used in physics analysis.

The Chicago techs will present general overviews of the CIS system and updates, as well as recent maintenance work, during the TileCal Week session on October 7. They will continue assembling and testing valves to be used on EBA. These installations will begin on November 8. The pneumatic actuators that control the valves will be installed and connected in the coming months as well. Finally, they will document the new run selection process for future techs, and work to improve TUCS’s flexibility to accept different runs for different modules to streamline the update process.