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ATLAS CIS Tech Quarterly Report

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This report covers the activities of the Chicago CIS Techs from October 1 - December 31, 2021.

The maintenance team’s work has focused on the installation of isolation cooling valves in the two extended 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 Chicago techs have replaced radiation-sensitive screws and tested the performance and integrity on 101 new valves. Using these valves in addition to those left over from previous months, they mounted 138 valves on all 64 drawers of EBA as well as the five remaining drawers on EBC. This includes drawers that were difficult to mount on due to cesium source garages or cesium electronic boxes. Some of these modules required creative solutions, such as mounting on the adjacent module instead, or using extra-long bolts to raise the valves above the crowded areas on the module. There are currently around 20 extra tested valves in case any of the currently-installed valves need to be replaced.

The Chicago techs also connected all 138 mounted valves on EBC and EBA to the central cooling system. During connections on EBA, all cooling loops were shut off at the same time so as to expedite the process. During EBC connections, only two loops needed to be shut off as there were only 5 modules to do. 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 were turned back on, it was determined that no leaks were caused on EBC but there was an issue on EBA. The cooling team identified the problem was a loose hose connection on EBA11 and the leak was subsequently fixed.

Furthermore, the Chicago techs were also responsible for measuring, cutting, labeling, and bundling the 128 pneumatic air hoses to be connected to the valves of EBC (as well as a few of the hoses for EBA). One hose was needed for each valve, and all the hoses needed to be gathered together near a patch panel so that they could be attached to a pressurized system to cut the circulation to specific modules. After these hoses had been run around the outside of the detector by another team, the Chicago techs were responsible for connecting all 256 hoses on EBA and EBC to the appropriate module’s valve (the hoses on the long barrel had been connected previously). They also trimmed and relabeled the same 256 hoses as they were all 1-2 meters too long, making it difficult to pick out a specific module’s label as well as getting in the way of other wires underneath the tile calorimiter. Afterwards, the Chicago techs neatly arranged the hoses into bundles corresponding to the different cooling loops so that it will be easier to find specific hoses in the future.

The Chicago techs also commissioned all 512 isolation valves of the tile calorimiter. Commissioning was done by plugging the pneumatic hoses to a pressurised air system via a patch panel one at a time, and looking for a rise in the appropriate module’s temperature using DCS monitoring. If the module on the label did not match the module with the temperature increase, a note was made and a new label would be printed. On LBA and LBC, commissioning was done in early October. The commissioning of EBA and EBC was completed in late November after all of the isolation valves were connected. After commisioning was completed, the CIS techs had confirmation that all isolation valves in the tile calorimiter were working properly. Additionally, the maintenance team used the newly commissioned hoses to assist with locating the previously mentioned leak in the cooling system.

The Chicago techs have also performed two CIS constant updates during the last period using the TileCal Unified Calibration Software (TUCS) macros. The October update covered CIS runs from October 12 - October 25 and updated 159 channels. The November update covered CIS runs from Oct. 28 - Nov. 27 and updated 505 channels.

The procedure for running a CIS update has remained unchanged since the last quarterly report. While they CIS techs now have a set procedure and a better framework for using different CIS runs for different modules, this has not been necessary for either of the last two updates. Thus, after using all runs in the date range and producing plots, 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. Channels with unusual behavior are cross-referenced with the maintenance elogs and the data quality reports. 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 CIS techs also briefly worked with the laser team by checking if a number of bad PMTs as seen in the laser scans were also problematic in CIS scans. They determined that the vast majority of the 33 PMTs that had problems in the laser scans were also problematic in CIS, as the jumps in the CIS plots over the last year closesly matched those of the laser plots. This indicates that the problem is with the front-end electronics instead of the PMTs themselves, and is a sign that future maintenance may need to be done on these modules.

The Chicago techs will assist with a maintenance intervention of LBA58 on January 6, 2022 and replace the HV-micro. They will continue to document the new run selection process for future techs, and continue improving TUCS’s flexibility to accept different runs for different modules to streamline the update process.