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ATLAS CIS Tech Quarterly Report

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This report covers the activities of the Chicago CIS Techs from January 1 - March 31, 2022.

The maintenance team’s work has focused on a few electronics replacements within the tile calorimeter as well as fixing a substantial number of leaks in the cooling system that emerged within January. On January 6, the Chicago techs and members of the maintenance team opened drawer LBA58 and replaced the HV-micro board to address a problem with unstable HV. The HV in the drawer did not fully recover from this intervention, but it is now more stable than previously. As such, LBA58 is currently running in emergency mode.

In the second half of January, many leaks in the cooling system emerged that had to be quickly addressed so that the cavern could finish closing. On January 12, EBC was fully closed, and there was maintenance of the cooling station. During this maintenance, the cooling system briefly became overpressurized, and the PPV cycle (which measures the amount of time between consecutive pump downs of the cooling system) dropped from around 350 minutes to almost 0. This was an indication that there were one or more leaks somewhere within the cooling system. Thanks to the Chicago tech’s recent installation of the isolation valves, the leak locations were identified in LBC33, LBC49, EBC48, and EBC49. This was done by using the pneumatic hoses connected to the isolation valves to lock the suspected modules and test if the PPV cycle increased as a result. The Chicago techs assisted with the first leak repair of LBC33 on January 19. By locking first the “IN” valve, and then the “OUT” valve, it was determined that the leak was inside of the drawer. After opening the drawer and once again locking various segments of the cooling pipes by hand, they discovered the leak was somewhere within the HV side of the drawer. As all of the scaffolding in the cavern had been removed by this point, and the maintenance was done via ladder, it was impossible to pull the drawer out more to further pinpoint the leak location. As such, they used a specialized plug to completely bypass that side of the cooling, as the remaining MB side would still be able to cool the drawer sufficiently. The same technique was used to fix the remaining 3 drawers, as the leak location was always confirmed to be in the HV side (it is unclear why the weakness was always in this spot). After these interventions, the PPV cycle increased to almost 700 minutes, which is the highest it has been in recent history.

The Chicago techs have also performed three CIS constant updates during the last period using the TileCal Unified Calibration Software (TUCS) macros. The January CIS update covered CIS runs from January 16 to 31 and updated 191 channels. The reason that this update did not cover the beginning of January is because some partitions were completely off due to the search for the cooling leaks. The February CIS update contained CIS runs from February 1 to March 1 and updated 81 channels. The March CIS update contained CIS runs from March 1 to April 1 and updated 99 channels.

The procedure for running a CIS update has remained mostly unchanged since the last quarterly report. One new addition is the development of a Root macro that will mass produce timing and amplitude/charge plots for all CIS runs. This is a quick way to tell if any runs need to be excluded from the analysis. After using this set of runs and producing plots of CIS constants vs time, 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 Chicago techs are also investigating a recent problem with LBA missing pulses in CIS runs that has also been observed in L1Calo. In about 20% of CIS runs, it has been observed that all modules in LBA are missing one or two events (out of about ~6K total). This does not appear to affect the calculation of CIS constants. The CIS techs are currently developing an informal Root macro that produces plots of recent CIS runs to easily tell if a pulse is missing, and if so, return the event number so that it can be crosschecked with L1Calo.