

Purity Monitoring System for the SingleCube Detector at CSU

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SingleCube is a cubic-foot pixelated liquid argon (LAr) time-projection chamber (LArTPC) that is a small-scale prototype of the DUNE near detector. It operates in the physics department at Colorado State University (CSU) and it is used to test new technologies and techniques for the Deep Underground Neutrino Experiment (DUNE). When charged particles pass through LAr in the detector, they ionize argon atoms and produce scintillation light. In a TPC, ionization electrons drift in an electric field to the anode plane to be detected, and scintillation light is detected using light detectors. This information is used to reconstruct particle trajectories in the detector. The reduction of this charge and scintillation light due to electronegative impurities is detrimental to the successful reconstruction of particle trajectories and interactions. A purity monitor and corresponding electronics system has been developed at CSU to monitor the impurity level in SingleCube. In the purity monitor, free electrons are produced from a piece of gold at the cathode by the impingement of light from a UV light source. The electrons drift through the LAr in an applied electric field to the anode, however, some are absorbed by impurities in the argon along the way. The difference in charge measured between the cathode and the anode provides a measurement of electron lifetime, which gives valuable insight into the impurity level. In this talk, I will discuss the SingleCube purity monitoring system at CSU and developments that have been made.

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