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Cold Electronics and Signal Processing in the MicroBooNE LArTPC

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MicroBooNE is an 85-ton single-phase Liquid Argon Time Projection Chamber (LArTPC) and the first of a trio of LArTPCs in the Short Baseline Neutrino (SBN) program which will search for a light sterile neutrino and measure neutrino-argon interaction cross sections. Located in the Booster neutrino beam at Fermi National Accelerator Laboratory, MicroBooNE has been taking neutrino data since October 2015. MicroBooNE pioneered the usage of ultra-low noise cryogenic electronics, an enabling technology for large LArTPC detectors allowing excellent calorimetric capability and the ability to discriminate between electron and photon electromagnetic showers. In this talk I will show the excellent performance of the cold electronics in MicroBooNE along with mitigation of detector noise and TPC issues. I will also describe the development of drifted-charge extraction methods to accurately convert raw digitized TPC waveforms into the distribution of ionized electrons passing through both induction and collection wire planes. Finally I will use MicroBooNE data to demonstrate improved signal processing performance, including the first-ever accurate charge matching across wire planes, that is expected to benefit the reconstruction of neutrino interactions.

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