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Integration of DAPHNE as the warm readout electronics for DUNE ND-LAr

The DUNE Near Detector Liquid Argon Time Projection Chamber (ND-LAr) employs a light readout system (LRS) to provide precise event timing, pile-up separation, and complementary information for event reconstruction in the high-rate neutrino environment of the Long-Baseline Neutrino Facility (LBNF). The light readout system is composed of large area light trap units, read by an arrays of six silicon photomultipliers (SiPMs), cold pre-amplification and signal shaping, warm waveform digitization, and real-time data processing integrated into the Near Detector Data Acquisition (DAQ) infrastructure. This contribution presents the architecture and initial quality performance of the proposed ND-LAr light readout chain based on the DAPHNE digitization scheme. DAPHNE performs low-noise waveform acquisition, online signal processing and self-triggering, while providing an interface to the DUNE DAQ system through high-bandwidth network links. Results from test bench and a small scale TPC operation in LAr are presented, including baseline noise assessment, signal to noise ratio, data rate measurements and operational stability.

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