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Characterization of a 16-Channel LArASIC for a Front-end Read-out Electronics at a DUNE Experiment

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A 16-channel front-end Liquid Argon ASIC (LArASIC) has been designed for the Deep Underground Neutrino Experiment (DUNE) liquid argon (LAr) time-projection chamber (TPC). The LArASIC, fabricated in a commercial 180 nm CMOS process, was specifically designed for operation at cryogenic temperatures (77K-89K). It has 16-channels of charge amplifiers and shapers with programmable gain and filter time constant to measure the weak charge signals from TPC sensing wires and PCB strips. We will be using around 1200, 24000 and 15360 LArASIC (P5B version) packaged chips for ProtoDUNE-II, DUNE FD1 and DUNE VD1 experiments, respectively. Therefore, the systematic characterization and performance testing of the LArASIC chip at cryogenic temperature is vital for the quality and reliability of detectors at ProtoDUNE-II and DUNE experiments. We have developed a cold test stand for LArASIC characterization and functionality evaluation at cryogenic temperature. A Dual-DUT test board has been designed and developed which encompasses two pairs of LArASIC and ColdADC to carry out the characterization of two LArASIC chips in a single thermal cycle. The acquired results satisfy all the required DUNE specifications for LArASIC quality control. Since this LArASIC characterization methodology is proved to be successful and thus, it will be a reference design for future large-batch QA/QC production testing of LArASIC chips for the DUNE experiments.

Minioral

Yes

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No

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