

Abstract Submitted
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The cryogenic performance of opto-electronic components for a liquid argon time projection chamber in neutron physics¹ LIN ZHU, ANDY LIU, JINGBO YE, SMU Department of Physics — A Liquid Argon Time Projection Chamber (LArTPC) has been proposed as a potential far site detector for the long baseline neutrino experiment (LBNE). A cold front-end electronics scheme operates in liquid argon (89 K) is under development. In this talk, I will present functional and reliability studies of opto-electronic components in liquid nitrogen (LN2, 77 K). Components of an optical data link, including a serializer ASIC, laser diodes, optical fibers, and optical connectors, have been tested to function in LN2. One type of Field Programmable Gate Arrays (FPGAs) chip is found to function at 77 K. For an optical link with its transmitting side in LAr without access for maintenance for 15+ years, the challenge lies in the system reliability. To meet this challenge, we need to understand the reliability at component level and based on that knowledge design a system with redundancy so that we do not lose data over the lifetime of the system Preliminary reliability test results on component level, including those from the FPGA chip, will be presented. A methodology is proposed to check the hot carrier issue, the most concerned failure mode in electronics operating in deep cryogenic temperatures.

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