Contribution ID: **128** Type: **Poster Presentation**

A Feasible Production Strategy for Large Scale Cryogenic Readout Electronics in Giant LArTPCs

Wednesday, November 20, 2024 7:06 PM (1 minute)

Deep Underground Neutrino Experiment (DUNE) experiment aims to answer several fundamental questions about the universe such as why matter dominates antimatter and whether protons can decay. The four 10k-ton far detector (FD) modules built upon the LArTPC's superior particle tracking and energy calorimetry capabilities are crucial to fulfill the physics potential. While the Long Baseline Neutrino Facility (LBNF) is excavating underground space for FD modules, the current DUNE-US project scope (phase I) only includes two modules, the first LArTPC FD module utilizing modular multi-wire-plane anodes in a horizontal drift (HD) configuration and the second LArTPC FD module with Printed Circuit Board (PCB) anode planes in a vertical drift (VD) configuration. The third and fourth FD modules remain open in DUNE phase II for next generation LArTPC detectors with improved physics capabilities and cost-effective construction techniques. VD configuration with enhanced light coverage is the preferred solution under R&D. One of the key challenges is to readout enormous channels of charge and light signals with reliable and cost-effective construction techniques. It is expected that the integration density of readout electronics will significantly increase, the data throughput will be much higher, new power and data transmission schemes (such as signal over fiber and power over fiber in cryogenic temperatures) will be applied etc.
In this paper, we will first summarize the production strategy developed for charge readout electronics in FD1 and FD2 modules, analyze the capability of the existing cryogenic quality control test stands, discuss the lessons learned, and explore their potential capabilities to fulfill the production need of readout electronics in DUNE phase II.

Primary author: Dr KE, Lingyun (Brookhaven national laboratory)

Co-authors: Dr DEPTUCH, Grzegorz (Brookhaven national laboratory); Dr CHEN, Hucheng (Brookhaven national laboratory); Dr FRIED, Jack (Brookhaven national laboratory); DONOHUE, Jillian (Brookhaven national laboratory); TELLEZ GIRON FLORES, Karla (Brookhaven national laboratory); MUKIM, Prashansa (Brookhaven national laboratory); Dr GAO, Shanshan (Brookhaven national laboratory); Dr KETTEL, Steve (Brookhaven national laboratory); Dr TISHCHENKO, Vladimir (Brookhaven national laboratory); Dr NING, Xuyang (Brookhaven national laboratory)

Presenter: Dr KE, Lingyun (Brookhaven national laboratory)

Session Classification: Poster Session

Track Classification: RDC Parallel Sessions: RDC4: Readout and ASICs