Contribution ID: **80** Type: **Parallel session talk**

Power-over-Fiber Development for DUNE VD Photon Detection System

The Deep Underground Neutrino Experiment (DUNE) aims to answer fundamental questions about neutrinos, including CP violation, mass hierarchy, and proton decay searches, and to observe neutrinos from supernova bursts. To support these goals, DUNE will implement Power-over-Fiber (PoF) technology to safely deliver power to its Far Detector Vertical Drift (FD-VD) photon detection system. This system operates in a high-voltage environment (˜300 kV), where traditional electrical cabling is not feasible. PoF enables optical power transmission through fibers, offering a reliable and scalable solution for supplying power to electronics located near the cathode. Following its successful deployment and operation in one of the DUNE prototypes at CERN, preparations are now underway for full-scale production and integration into the DUNE FD-VD module. This presentation will detail the development, performance, and integration strategy of the PoF system, emphasizing its novel implementation in large-scale neutrino detectors.

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Session Classification: RDC 2 Photodectors

Track Classification: RDC 2 Photodectors