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Signal and Power transmission over Fiber in the DUNE Far Detector

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The 1st Far Detector of the Deep Underground Neutrino Experiment (DUNE) will be instrumented with a Vertical Drift Liquid Argon Time Projection Chamber (VD LArTPC). It will also be equipped with a Photo-Detection System (PDS), which provides the time stamp of non-beam events, a precise time measurement as well as contributing to the energy reconstruction. The characteristics of this new type of LArTPC required an innovative approach to the placement of the photo-detectors. In order to achieve a high light yield and uniform coverage of the detector, the PDS detectors in the VD LArTPC will be placed not only on the membrane of the cryostat, but also on the high voltage surface of the TPC's cathode. Such placement enhances the coverage of the PDS but presents an important technical challenge, since the powering and signal readout of the detectors must be done using non-conducting materials. To this end the Power-over-Fiber and Signal-over-Fiber transmission technologies were developed within the DUNE collaboration, opening a door to further enhance the coverage of future PD systems. This talk will describe the technical solutions developed to this end, as well as presenting the final performance results from laboratory characterization of the devices and the prototype testing campaigns carried out at the CERN Neutrino Platform.

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