Contribution ID: **171** Type: **oral**

Development of the Photon-Detector System for DUNE

Thursday, 25 May 2017 17:24 (18 minutes)

This presentation will concentrate on the development of the Photon-Detector (PD) System for DUNE.
The DUNE (Deep Underground Neutrino Experiment) will observe the long-baseline neutrino oscillations to determine the neutrino mass ordering, to determine if CP symmetry is violated in the lepton sector, and to precisely measure the parameters governing neutrino oscillation to test the three-neutrino paradigm. The DUNE physics program will also include precise measurements of neutrino interactions, observation of atmospheric neutrinos, searches for nucleon decay, and sensitivity to supernova burst neutrinos. DUNE is planned to consist of the near detector systems and four liquid argon TPC (LArTPC) far detector modules, each with a fiducial mass of about 10 kton.
The single-phase DUNE far detector module design will be tested with the ProtoDUNE-SP, which is the single-phase DUNE Far Detector prototype that is under construction and will be operated at the CERN Neutrino Platform starting in 2018. ProtoDUNE-SP is a crucial part of the DUNE effort towards the construction of the first DUNE 10-kton fiducial mass far detector module (17 kton total LAr mass), and is a significant experiment in its own right. With a total LAr mass of 0.77 kton, it represents the largest monolithic single-phase LArTPC detector to be built to date. The detector elements, consisting of the time projection chamber (TPC), the cold electronics (CE), and the photon detection system (PDS), are housed in a cryostat that contains the LAr target material.
The construction and operation of ProtoDUNE-SP will serve to validate the DUNE single-phase detector design, while the charged-particle beam test will enable calibration measurements necessary for precise calorimetry and optimization the event reconstruction algorithms. Scientific results would lead to quantifying and reducing systematic uncertainties for the DUNE far detector.
The Photon-Detector (PD) System for DUNE will be integrated into the APAs. For the ProtoDUNE-SP each PD module will consist of a bar-shaped light guide and a wavelength-shifting layer (surface-coating or mounted radiator plate). The wavelength-shifting layer converts incoming VUV (128 nm) scintillation photons to longer-wavelength photons, in the visible blue range. A fraction of the converted photons are emitted into the bar where they are detected by silicon photomultipliers (SiPMs). Each APA frame is designed with ten bars into which PDs are inserted after the TPC wires have been mounted. The SiPM signals are read-out by a high-performance readout-system with a high sampling rate, wide dynamic range, and few nano-second time resolution. Additional component of the PD system is a UV-light calibration system. The status of the PD system will be described in details.

Primary author: Dr DJURCIC, ZELIMIR (Argonne National Laboratory)

Presenters: YU, Bo (Brookhaven National Lab); Dr DJURCIC, ZELIMIR (Argonne National Laboratory)

Session Classification: R4-Photon detectors(6)

Track Classification: Photon detectors