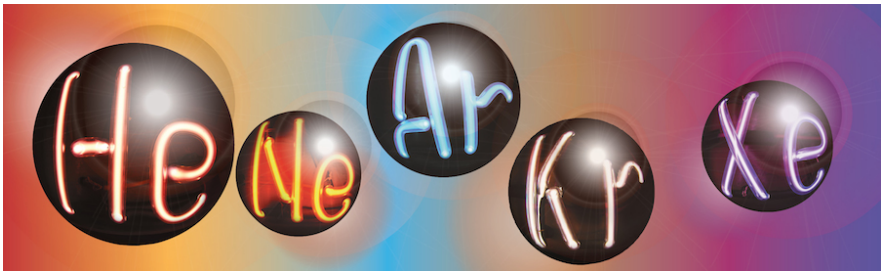

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Liquid argon scintillation detection utilizing wavelength-shifting plates and light guides

Saturday, 23 September 2017 14:45 (15 minutes)

As liquid argon (LAr) time-projection chamber (TPC) detectors are built to provide increased sensitivity to neutrino oscillation physics and other rare phenomena such as supernova neutrino bursts and nucleon decays, larger fiducial volumes have become necessary. While the ionization signals are detected by the TPC, the scintillation signals from LAr provide additional information about events and thus serve as a complementary detector system. The upcoming Deep Underground Neutrino Experiment (DUNE) will place a 40kt fiducial mass LArTPC nearly a mile underground in South Dakota. In DUNE, the event timing provided by detection of the prompt scintillation light will yield ~mm spatial resolution in the drift direction, especially useful for non-beam physics where no event time is known *a priori*. The baseline solution for the first 10kt single phase module is a design that fits the photon detector (PD) system into the natural gap between the wire planes of adjacent TPC volumes. A prototype PD technology which has been developed at Indiana University utilizes plates coated in wavelength shifter to convert the VUV scintillation signal to the visible, and a commercially-produced wavelength-shifting light guide behind the plates converts and transports photons to silicon photo-multipliers at the ends. The individual components of this system have been tested and characterized, and an integrated prototype test has been conducted at the liquid argon facilities at Fermilab. The characteristics of the system and knowledge gained through component and integrated prototype tests will be discussed.

Primary author: HOWARD, Bruce (Indiana University)

Presenter: HOWARD, Bruce (Indiana University)

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