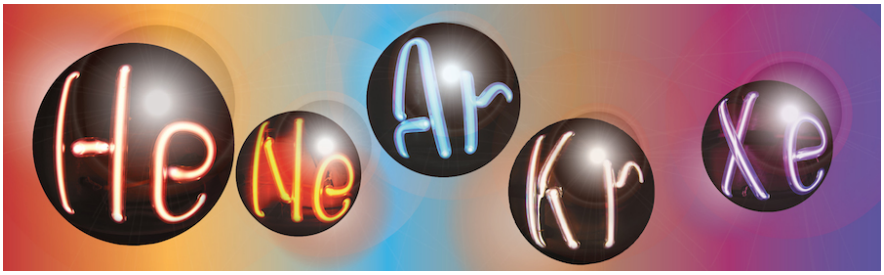

Contribution ID: **82** Type: **Talk**

Performance Comparison of PEN Foil and TPB Coating for LArTPC Light traps

Liquid Argon Time Projection Chambers (LArTPCs) rely on large-area photon detectors to detect liquid argon scintillation light necessary for precise event timing, triggering and complementary calorimetry alongside the charge readout.
Liquid argon emits scintillation light predominantly at 128 nm in the vacuum ultraviolet (VUV) region. As this wavelength cannot be efficiently detected by commonly used photon detectors, wavelength shifting techniques are required to convert the scintillation light into the visible region. In a typical light trap architecture, incident VUV photons undergo a primary wavelength-shifting stage before being trapped within a secondary WLS component, where they propagate via total internal reflection toward silicon photomultipliers (SiPMs).
Traditional designs employ a Tetraphenyl Butadiene (TPB) coating for the initial wavelength-shifting stage. An alternative approach replaces this coating with a Polyethylene Naphthalate (PEN) foil, which similarly shifts the liquid argon scintillation light into the blue region. Compared to evaporative TPB coatings, PEN foil offers superior mechanical handling and scalability, presenting a promising pathway to simplify the fabrication of future large-scale light readout systems.

This contribution presents results from in situ measurements of cosmic-ray events in a small liquid argon TPC using two light trap tiles: one fabricated with a conventional TPB coating and the other with a PEN foil. Their performance is directly compared to evaluate the viability and efficiency of PEN foil as a scalable alternative wavelength shifter for future LArTPC detectors.

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