Contribution ID: **107** Type: **Parallel Presentation**

Self-compensating Light Calorimetry with Liquid Argon TPC for GeV Neutrino Physics

Wednesday, November 20, 2024 1:45 PM (15 minutes)

Liquid Argon Time Projection Chamber (LArTPC) is an exceptional dual calorimeter capable of estimating the energy of incident particles through both the ionization charge and the scintillation light. This talk will show that due to the mechanisms of charge recombination and light generation involved in the energy dissipation in liquid argon, light calorimetry in LArTPCs is inherently self-compensating. The missing energy in the hadronic component is compensated for by the extra recombination luminescence compared to the electromagnetic component. Good compensation of the electron-to-hadron response ratio (e/h) around unity can be achieved across a broad range of drift electric fields from 0.2 to 1.8 kV/cm. This inherent self-compensation enhances the appeal of light calorimetry in LArTPCs, complementing the well-established charge calorimetry. Using GeV-neutrinos as a case study, we show that light calorimetry can yield an energy resolution comparable to the more sophisticated charge imaging calorimetry. The synergy between light and charge calorimetry offers a novel approach to evaluating and mitigating systematic uncertainties in energy measurements with LArTPCs.

Primary author: NING, Xuyang (BNL)

Co-authors: ZHANG, Chao (Brookhaven National Laboratory); RICCIO, Ciro (Stony Brook University); JO, Jay Hyun (Brookhaven National Laboratory); SHI, Wei (Stony Brook University)

Presenter: NING, Xuyang (BNL)

Session Classification: RDC 01 - Noble Element Detectors Parallel Session

Track Classification: RDC Parallel Sessions: RDC1: Noble Element Detectors