Contribution ID: **7** Type: **not specified**

Liquid Argon Technology for Theorists

Thursday 30 May 2019 17:30 (45 minutes)

Available estimates for the energy resolution of DUNE vary by as much as a factor of four. To address this controversy, and to connect the resolution to the underlying physical processes, we build an independent simulation pipeline for neutrino events in liquid argon, combining the public tools GENIE and FLUKA. Using this pipeline, we first characterize the channels of non-hermeticity of DUNE, including subthreshold particles, charge recombination, and nuclear breakup. Particular attention is paid to the role of neutrons, which are responsible for a large fraction of missing energy in all channels. Next, we determine energy resolution, by quantifying event-to-event stochastic fluctuations in missing energy. In the future, this framework can be used to assess the impact of cross section uncertainties on oscillation sensitivity.

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Session Classification: Session 8