

Studying Neutrino-Nucleus Interactions at SBND with Muon Neutrino Charged-Current Pionless Events

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The Short-Baseline Near Detector (SBND), a liquid argon time projection chamber (LArTPC) located at Fermilab, is on track to collect the world's largest neutrino-argon scattering dataset, at a rate of over two million interaction events per year. Such statistics, combined with advanced detector and software capabilities, will enable excellent cross section measurements, addressing previous limitations on statistical and systematic uncertainties of the experiment's predecessors. Modeling neutrino-nucleus interactions with heavy nuclei at the GeV energy range is a critical challenge for neutrino experiments like the Short-Baseline Neutrino (SBN) program and the Deep Underground Neutrino Experiment (DUNE), and broadly impacts neutrino interaction physics, oscillation measurements, as well as exotic searches. In this energy range, neutrinos scatter on nuclei through multiple interaction modes, and various nuclear effects further complicate the interpretation of the observed final states. The nuclear effects can be investigated in detail through the muon neutrino charged-current interaction with a single proton and no pions in the final state, the channel which is representative of quasi-elastic scattering. This poster demonstrates the high-purity, high-statistics selection on this channel at SBND and discusses its implications for a better understanding of neutrino-nucleus interactions.

Working Group

WG 2: Neutrino Scattering Physics

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