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Electrons for Neutrinos: Using Electron Scattering to Develop New Energy Reconstruction for Future Deuterium-Based Neutrino Detectors[1] ADRIAN SILVA, BARAK SCHMOOKLER, AFRODITI PAPADOPOULOU, AXEL SCHMIDT, OR HEN, Massachusetts Inst of Tech-MIT, MARIANA KHACHATRYAN, LAWRENCE WEINSTEIN, Old Dominion University — Using wide phase-space electron scattering data, we study a novel technique for neutrino energy reconstruction for future neutrino oscillation experiments. Accelerator-based neutrino oscillation experiments require detailed understanding of neutrino-nucleus interactions, which are complicated by the underlying nuclear physics that governs the process. One area of concern is that neutrino energy must be reconstructed event-by-event from the final-state kinematics. In charged-current quasielastic scattering, Fermi motion of nucleons prevents exact energy reconstruction. However, in scattering from deuterium, the momentum of the electron and proton constrain the neutrino energy exactly, offering a new avenue for reducing systematic uncertainties. To test this approach, we analyzed $d(e, e'p)$ data taken with the CLAS detector at Jefferson Lab Hall B and made kinematic selection cuts to obtain quasielastic events. We estimated the remaining inelastic background by using $d(e, e'p\pi^-)$ events to produce a simulated dataset of events with an undetected π^-. These results demonstrate the feasibility of energy reconstruction in a hypothetical future deuterium-based neutrino detector.

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