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Mapping Neutrino-Nuclei Interactions Using Electrons

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Next generation neutrino facilities, such as DUNE, rely on precise modelling of neutrino induced hadron knockout processes from nuclei in the detector medium (e.g Argon) to determine the initial (untagged) neutrino beam energy and determine the neutrino flux. However, uncertainty in the modelling of these nuclear interactions is currently the largest systematic uncertainty in extracting the key physics, including the neutrino oscillation parameters.

Within the e4nu collaboration at the Thomas Jefferson National Laboratory (JLab) we address this by studying the same knockout reactions exploited at neutrino facilities, but using incident electron beams of precisely determined energy (Up to 12 GeV). A range of hadron knockout reactions from light to heavy nuclesr targets are determined with nearly complete acceptance by the CLAS12 spectrometer. This expansive data set will be used to benchmark nuclear calculations (GiBUU and GENIE) in the poorly constrained kinematic regime of DUNE and will directly affect the achievable accuracy for the key physics outputs of DUNE. Our current results, the first from e4nu at CLAS12, will be presented and implications for neutrino facilities discussed.

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