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Refining Neutrino Final State Interactions in carbon and lead: Insights from extrapolating between extremes

Neutrino interactions with nucleons can lead to Final State Interactions (FSI), where the resulting hadrons scatter within the nucleus. However, current FSI models are often extrapolated to heavier nuclei, leading to possible discrepancies with experimental data. The MINERvA experiment employs five sets of nuclear targets, and it features an electromagnetic calorimeter (ECAL) situated at the back side of the detector, consisting of alternating layers of 2mm-thick lead and plastic scintillator. The substantial amount of lead interleaved within the ECAL, approximately 4 tons (fiducial) in total, offers the opportunity to isolate a high-statistics sample of neutrino-lead interactions. By analyzing the data collected by MINERvA's ECAL, we aim to improve our understanding of neutrino interactions with heavy nuclei and refine FSI modeling techniques. This poster provides insight into FSI model expectations scaling between hydrocarbon and lead, focusing on adapting simulation weights to mimic GENIE 3's A-dependent pion fate, with the MINERvA experiment's simulation baseline simulation based on GENIE 2.12.6. This ensures consistency with updated physics frameworks and enabling more accurate comparisons with experimental data.

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