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Nucleon Binding Energy and Transverse Momentum Imbalance in Neutrino-Nucleus Reactions

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The binding energy of nucleons from nuclei in neutrino-nucleus interactions is constrained by analyses of $(e, e'p)$ reactions in electron scattering experiments and theoretical corrections for differences between electron and neutrino induced reactions. Different neutrino interaction generators implement these constraints in distinct ways, and the resulting differences in predictions are significant for current and next generation precision neutrino oscillation experiments. We show that projections of the transverse momentum imbalance between the lepton and proton in mesonless charged current neutrino interaction events are sensitive to the removal energy, Fermi motion, and final-state interactions. We compare simulations from interaction generators to the MINERvA measurements of these projections in neutrino events on hydrocarbon at $\langle E_\nu \rangle = 3$ GeV.

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