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NOvA central value tuning and uncertainties for the hN FSI model in GENIE 3

Historical versions of the GENIE neutrino generator modeled the reinteraction of outgoing hadrons in neutrino scattering from heavy targets, the final state interactions (FSI), using an "effective" cascade model, hA. In this paradigm the various possible final-state combinations of outgoing hadrons after rescattering are fixed directly from hadron scattering data. For NOvA's 2020 analysis, we use a more conventional semi-classical cascade model, GENIE's hN. This model steps through the nucleus via a nuclear density model, calculating step-by-step scattering probabilities using a theory-based cross section model which relates scattering amplitudes inside the nucleus to external amplitudes that can be constrained by data. However, agreement with external pion scattering data is poor. We present a tuning of the relative pion probabilities based on world pion scattering data. In addition, we introduce reweightable uncertainties for pion scattering in hN using a boosted decision tree technique.

Mini-abstract

NOvA's tuning of semi-classical FSI model and construction of reweightable uncertainties using BDTs.

Experiment/Collaboration

NOvA

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