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GENIE models and global fits of neutrino scattering data

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Neutrino Monte Carlo generators are the single interface between theory and experiment and, as such, they are an essential ingredient in any attempt to connect neutrino data with the answers to fundamental physics questions. GENIE is the world's most widely-used neutrino Monte Carlo generator. Indeed, its physics model is employed by nearly all current and near future experiments.
A key ingredient of the current effort to overhaul the GENIE phenomenological descriptions of neutrino scattering is to develop the capability to perform a global physics tuning using both the increasing body of neutrino scattering data and the vast complementary array of electron-nucleus and hadron-nucleus scattering data.
GENIE already contains extensive curated data archives and, quite uniquely, it can simulate the nuclear scattering of neutrinos, electrons and hadronic probes in the exact same physics framework. The vast set of GENIE comparisons to published data, along with GENIE machinery that allows the efficient incorporation of physics uncertainties in the GENIE predictions, will underlie the global tuning effort. A new collaboration with the Professor system authors used for Monte Carlo generator tuning for the Large Hadron Collider (LHC) experiments, provides the main algorithmic procedure for obtaining new physics tunes.
In this talk we will outline the development of GENIE models for the simulation of CC 0π events (a crucial event topology both for oscillation measurements and for probing nuclear dynamics) and present results of the first GENIE global fits of CC 0π data.

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