Contribution ID: **59** Type: **Talk**

Modeling neutrino-nucleus interaction uncertainties for DUNE long-baseline sensitivity studies

Tuesday 25 October 2022 10:50 (25 minutes)

The Deep Underground Neutrino Experiment (DUNE) is a next generation experiment aiming to answer a wide range of open questions in neutrino physics. Its broad program includes a long-baseline (LBL) neutrino oscillation analysis, whose goal is to measure neutrino oscillation parameters with unprecedented precision. The intense beam exposure, coupled with the size of the near and far detectors and liquid argon (LAr) detection capabilities, will enable DUNE to reduce its statistical uncertainties to the order of 1%. At this level of precision, systematic uncertainties will become the limiting factor for the DUNE LBL analysis.

The largest systematic uncertainties currently stem from the modeling of neutrino interactions with matter. Neutrinos interact with argon nuclei, which are complex systems and difficult to model. DUNE's wide energy spectrum also covers multiple interaction regimes and their transition regions, for which several models are available. However, no theoretical or generator model seems to describe experimental data across the entire phase space relevant for DUNE. For these reasons, sufficient freedom must be provided in the neutrino interaction uncertainty model.

This talk presents the latest systematic uncertainty model for the DUNE LBL sensitivity studies. The model is based on a flexible simulation of the nuclear ground state, making it possible to test its robustness against a large spectrum of alternative predictions. We also motivate the choice of systematic uncertainties based on natural freedoms of the input model, as well as ad-hoc freedoms allowing to account for additional effects which may impact the near to far detector extrapolation.

Primary author: MUNTEANU, Laura (CERN)

Presenter: MUNTEANU, Laura (CERN)

Session Classification: Modelling on Neutrino-Nucleus Interactions