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# Improving Neutrino Experiment Physics with Hadron Production Data

*Thursday, 19 September 2024 14:45 (20 minutes)*

In accelerator-based neutrino experiments, uncertainties in neutrino flux represent a significant systematic uncertainty in baseline predictions for both near and far detectors, as well as in single-detector measurements such as neutrino cross sections and in Beyond Standard Model searches. These uncertainties stem from interaction models in the hadronic processes that follows the primary interacting proton from accelerators until the produced mesons decaying into neutrinos. Data from hadron production experiments are essential to predict the neutrino flux and its uncertainties. However, significant uncertainties remain due to interactions at phase spaces and materials that have never been measured.

Existing data are being used to significantly constrain the flux prediction in experiments using the NuMI and BNB beams (FNAL) and in the T2K experiment (J-PARC). However, as we enter a precise era with experiments such as DUNE and Hyper-K, which will be primarily dominated by systematics, better control of them is imperative. Experiments such as EMPHATIC (FNAL) and NA61 (CERN) aim to make new measurements to improve flux predictions.

This talk will review the current applications of hadron production measurements in neutrino experiments, and discuss the need for new measurements to improve neutrino flux predictions to enhance the robustness of the physics program.

## Working Group

WG 3: Accelerator Physics

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