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Neutrino Beam Simulations for the Hyper-Kamiokande experiment and target alternatives

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A simulation of the neutrino beam for the upcoming Hyper-Kamiokande (Hyper-K) experiment is essential for predicting neutrino fluxes accurately at the near and far detectors, which is crucial for measuring various neutrino oscillation parameters such as mixing angles, mass differences and the CP-violating phase. G4Jnubeam is a new beam simulation software based on the GEANT4 package currently under development for Hyper-K. It has been designed to simulate all aspects of neutrino production including proton beam simulation, decays of hadrons and muons into neutrinos, and ultimately the neutrino incident fluxes at both the near and far detectors. Additionally, G4Jnubeam is used to investigate alternative target configurations for the Hyper-K design that can lead to reduced wrong-sign contaminations in neutrino beam flux calculations. Some simulation results for validation against external hadron production measurements from the NA61/SHINE experiment, neutrino flux predictions for the Hyper-K near and far detectors, and the effects of having a longer and denser target on the neutrino beam production are presented.

Poster prize

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