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Neutrino Interactions with Nuclei and Long-Baseline Experiments

The extraction of neutrino mixing parameters and the CP-violating phase requires knowledge of the neutrino energy. This energy must be reconstructed from the final state of a neutrino-nucleus reaction since all long-baseline experiments use nuclear targets. This reconstruction requires detailed knowledge of the neutrino reactions with bound nucleons and of the final state interactions of hadrons with the nuclear environment. Quantum-kinetic transport theory has been used to build the event generator GiBUU for this reconstruction that takes basic nuclear properties, such as binding, into account. Results obtained both for electron-nucleus and neutrino-nucleus reactions will be discussed. Some examples will also be discussed that show the effects of nuclear interactions on observables in long-baseline experiments.

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