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An improved muon neutrino charged-current single positive pion cross section on water using michel electron reconstruction in the T2K near detector

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The T2K experiment is a long-baseline neutrino oscillation experiment, based in Japan, which measures the oscillation probability of muon neutrinos produced at the JPARC facility, and detected at Super-Kamiokande. A detailed understanding of neutrino-nucleus cross sections is essential to measuring neutrino oscillation parameters. The off-axis near detector ND280 is used to measure a variety of neutrino interaction rates in the unoscillated beam, in order to give a better understanding of the individual cross sections. T2K has been working to add single pion production events to the oscillation analysis samples, thus increasing the impact of pion production cross section uncertainties on oscillation results.

There is an ongoing effort on T2K to measure the cross section for charged current muon neutrino events on water, with one positively charged pion in the final state (ν_μCC1π^+) using the ND280 detector. The described measurement builds on a previous result, with significant changes to the particle kinematic ranges considered, including new reconstruction methods for accessing low energy pions using the signature of the decay chain to Michel electrons (the first instance of this technique being used in a T2K analysis.) In addition, the analysis will benefit from an increase in statistics by a factor of two, an updated treatment for unfolding, and a new treatment for the evaluation and propagation of systematic uncertainties. This talk will focus on the updated analysis techniques and simulated results for a variety of potential data sets based on simulations and previous measurements of signal and background processes.

New or updated neutrino cross section measurements can be used to compare to our current interaction models, in order to reduce model-related systematics, which will be particularly important for next generation oscillation experiments.

Working group

WG2

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