

**Stony Brook University
The Graduate School**

Doctoral Defense Announcement

Abstract

Data to NEUT and GENIE MC Generators Prediction $CC1\pi^+/CCQE$ Ratio Comparison
for Neutrino Interactions with T2K PØD Detector as input to T2K

By

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The T2K experiment is an off-axis long baseline neutrino oscillation experiment. It utilizes the intense ν_μ beam generated at the J-PARC accelerator complex in Tokai, Japan. It has a near detector, ND280, at 280m from the proton target, and Super-Kamiokande as far detector at 295 km. The cross-section measurement of the single charged current π^+ production in neutrino interactions is to contribute to our understanding of the background for measurement of the θ_{13} mixing angle. However, this cross-section is not known well in the energy region $\sim 0.6\text{GeV}$ that is the peak energy of the T2K neutrino beam. This affects the MC predicted neutrino interaction rates for both near and far detectors.

This work compares the ratio of the single charged current π^+ production rate over the charged current quasi-elastic production rate between the data and the predictions of neutrino interaction MC event generators (NEUT and GENIE) using the Pi-zero detector (PØD), a part of the ND280 near detector. This is done for both the water-in and water-out data of 9.89×10^{19} and 3.57×10^{19} protons on target respectfully. Additionally, the design, construction and the calibration of the PØD detector and its constituents, such as extruded scintillator and multi-pixel silicon photo detectors, are explained.

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