

**Stony Brook University
The Graduate School**

Doctoral Defense Announcement

Abstract

Measurement of the Inclusive Charged Current ν_e Interaction rate on Water
with the T2K π^0 Detector

By

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The T2K (Tokai to Kamioka) experiment is a long-baseline neutrino experiment designed to measure ν_μ disappearance and ν_e appearance from the ν_μ beam. The T2K experimental setup consists of J-PARC (Japan Proton Accelerator Research Complex) accelerator, a near detector (ND280) and a far detector (Super-Kamiokande).

With the recent firm establishment of ν_e appearance by T2K, future precision ν_e appearance measurements can be used to explore CP-violation in neutrino interactions. However such an exploration requires detailed understanding of the ν_e interactions, as well as contamination of ν_e in the ν_μ beam. The presence of the ν_e component in the beam accounts for 1.2% of the beam, which is the main background in the ν_e appearance measurement. Moreover, as Super-Kamiokande is a large water Cherenkov detector, neutrino interaction measurements on water are important to constrain the neutrino cross-section systematic uncertainty.

To this end, the T2K off-axis π^0 detector (PØD) has been used to measure ν_e charged current interaction rates on water. The details of the analysis including the selection criteria and the systematic uncertainties are presented in this thesis. In addition, prospects for the charged current $\bar{\nu}_e$ interaction rate measurement with the PØD will be discussed. These are pioneering measurements of the ν_e interaction rate, particularly on water, which will become crucial in future CP-violation searches.

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