

**Stony Brook University
The Graduate School**

Doctoral Defense Announcement

Abstract

Observation of ν_e appearance from an off-axis ν_μ
beam utilizing neutrino energy spectrum

By

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T2K (Tokai to Kamiokande) is a long baseline neutrino experiment located in Japan. It uses a 30 GeV proton beam at the J-PARC accelerator in Tokai to produce an intense off-axis muon neutrino beam that travels 295 km through the Earth to Super-Kamiokande. One of its primary goals is to measure neutrino oscillation parameters by directly detecting ν_e at Super-Kamiokande that have oscillated from the ν_μ beam. The measurement of $\nu_\mu \rightarrow \nu_e$ oscillations are of a particular interest because this mode is sensitive to both mixing angle θ_{13} and CP phase δ_{CP} of the PMNS matrix. Precision measurement of $\nu_\mu \rightarrow \nu_e$ allows us to explore the possibility of CP violation in the lepton sector.

This dissertation will describe the recent 2013 ν_e appearance oscillation analysis using the reconstructed neutrino energy spectrum by means of a maximum likelihood fit. The data used for this analysis corresponds to 6.57×10^{20} POT. A total of 28 ν_e candidate events were observed, corresponding to a 7.2σ significance of ν_e appearance by non-zero θ_{13} . These result are then combined with the world average value of θ_{13} from reactor experiments and some values of δ_{CP} are disfavored at the 90% CL.

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