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Evaluation of Event Reconstruction Techniques Towards an Electron-Neutrino Cross Section Measurement in The Upgraded T2K Near Detector

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The Tokai to Kamioka (T2K) experiment is a long-baseline neutrino oscillation experiment aiming to measure CP-violation in the lepton sector. So far, T2K has shown results that disfavor CP conservation with a confidence level of 90%. One of the major systematic uncertainties in the current oscillation analysis is the electron-neutrino cross-section. To reduce these uncertainties, the near detector complex ND280 has been upgraded recently with the installation of three new detectors: The Super Fine-Grained Detector(SuperFGD), two high-angle Time Projection Chambers, and time of flight detectors. These new detectors will allow a better understanding of neutrino interactions by lowering the energy threshold of and improving the angular acceptance of near detector selections.
To reconstruct electron-neutrino events, we have developed dedicated electron identification methods optimized for the high-granularity of the SuperFGD: vertex finding, electromagnetic shower reconstruction, and photon background rejection. These methods have been validated using real neutrino beam, cosmic, and LED calibration data taken with the SuperFGD to begin evaluating and optimising the systematic uncertainties in a cross-section measurement. This poster reports on the techniques developed for extracting electron and photon samples used to evaluate the new SuperFGD reconstruction methods using both the existing TPC and new high-angle-TPCs for particle tagging.

Author: KOBAYASHI, Hokuto (University of Tokyo (JP))

Co-author: Dr FERLEWICZ, Daniel (The University of Tokyo)

Presenter: KOBAYASHI, Hokuto (University of Tokyo (JP))

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