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Selection of multi-ring charged current ν_μCC1π^+ samples and estimation of detector systematic uncertainties at T2K far detector

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Tokai to Kamioka (T2K) is an accelerator long baseline experiment that measures the neutrino oscillation parameters by observing ν_μ ($\bar{\nu}_\mu$) disappearance and ν_e ($\bar{\nu}_e$) appearance from a ν_μ($\bar{\nu}_\mu$) beam. The experiment has both near and far detectors situated at 280 m and 295 km respectively from the beam production target. The far detector Super-Kamiokande (SK) where ν and $\bar{\nu}$ interact is a water Cherenkov detector. The dominant interactions at $\sim$ 0.6 GeV where T2K flux peaks are charged current quasi–elastic (CCQE) which result in single ring events. The next largest CC interaction at T2K energy is resonant 1π production where the events will have multi–ring topology. The addition of CC $\nu_\mu 1\pi^+$ samples to the T2K analysis is expected to improve the precision on $\sin^2\theta_{23}$ and $|\Delta m^2{}_{32}|$. Studies on the selection of CC $1\pi^+$ like events accumulated in forward horn current (FHC) operation are performed for ν_μ samples. The estimation of systematic uncertainty is important in the studies of sensitivity to neutrino oscillation parameters. One source of uncertainty is the impact of shortcomings in the detector model on the event selection. In our study, far detector systematic uncertainty is estimated via a fit to atmospheric neutrinos events collected in SK, using a Marko Chain Monte Carlo Framework. We present the selection of ν_μCC1π^+ multi–ring samples and the process of estimation of detector systematic uncertainty,including these samples.

In-person participation

Yes

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