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Selection of multi-ring charged current ν_{μ} CC1 π^+ 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 ~ 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 1 π 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 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 $\nu_{\mu}CC1\pi^+$ multi–ring samples and the process of estimation of detector systematic uncertainty, including these samples.

In-person participation

Yes

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