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Water/Scintillator cross section ratio for CCQE interactions using ND280 near detector of T2K experiment

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T2K experiment is a long-baseline neutrino oscillation experiment in Japan, muon (anti-)neutrino beam is produced at J-PARC in Tokai and detected then 295 km away at the Super-Kamiokande (SK), a water cherenkov far detector in Kamioka. T2K main puropose is to observe electronic (anti-)neutrino appareance and muonic (anti-)neutrino disappereace, oscillation parameters are determined then by comparing the neutrino interactions observed at the near and far detectors. T2K includes also two near detectors placed at 280 meters downstream from (anti-)neutrino production point, an on-axis detector, INGRID and an off-axis detector ND280 used to measure (anti-)neutrino-nucleus charged currect interactions (CC). The observed CC interactions are then used to constraint neutrino oscillation parameters. T2K flux peaks at 600 MeV so CC quasi-elastic (CCQE) interactions dominate the total cross-section, understanding this channel is thus crucial for a precision measurements. The cross-section of neutrino CCQE-like interactions in water is measured with the near detector ND280 of the T2K experiment. ND280 tracker system is composed of 3 Time Projection Chamber (TPCs) interleaved with 2 Fine Grained Detectors FGD1 and FGD2 installed inside a 0.2 T dipole magnet. The FGD2 consists of polystyrene scintillator bars interleaved with water passive layers. This analysis uses T2K data Run I-IV to extract the ratio between CCQE-like interactions that took place in water and scintillators in the FGD2 sub-detector as a function of neutrino reconstructed energy and muon kinematic parameters.

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