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Improving T2K near detector fit by adding proton information

T2K (Tokai to Kamioka) is a long-baseline neutrino oscillation experiment located in Japan. One of the most challenging tasks of T2K is to determine whether CP is violated in the lepton sector, what the recent T2K results suggest. By utilizing the near detector (ND280) data, T2K can constrain neutrino interaction and flux uncertainties by fitting a parametrised model to data. This allows a significant reduction of the systematic uncertainties in neutrino oscillation analyses. The fit to ND280 data currently uses several samples which are based on muon kinematics and pion multiplicity. There is ongoing work to expand these samples by incorporating the reconstructed proton multiplicity in order to enhance ND280 sensitivity to the nuclear physics processes which drive current systematic uncertainties. The poster presents the properties of new ND280 samples and sensitivity to several effect dominant in the energy range relevant for T2K. Furthermore, it details how the addition of the proton multiplicity will help reduce systematics uncertainties that affect neutrino oscillation measurements at T2K.

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