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Detector design and R&D for Water/CH Neutrino Cross Section Measurement

For a precise study of neutrino oscillation, a good understanding of neutrino interactions on nucleus is indispensable. In order to reduce the uncertainty in the neutrino interaction, we propose a new experiment at the J-PARC neutrino beamline to measure the ratio of charged current neutrino cross sections between water and plastic (CH) with an accuracy of a few percent. The energy of the neutrino is around 600 MeV. This measurement may reduce major systematic errors in neutrino oscillation analysis of the T2K experiment. The T2K near detector adopts plastic scintillators as a main target material of neutrino interactions, while the far detector, Super-Kamiokande, adopts water. The difference of the target materials induces a systematic uncertainty on neutrino cross section that is one of the major systematic errors in neutrino oscillation analysis. We will present the design of the new detector optimized by using the Monte Carlo simulation and R&D of detector components, grid-like plastic scintillators placed in water and low noise MPPCs manufactured by Hamamatsu Photonics.

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