

Development of water-based liquid scintillator tracker for a precise measurement of neutrino-water interactions

T2K experiment is a long-baseline neutrino oscillation experiment in Japan. One of the T2K goals is to obtain evidence of CP-violation in the leptonic sector at 3σ confidence level. To archive this goal, the reduction of systematic errors is needed, and a new plastic scintillator tracker (Super-FGD) will be installed in the near detector in 2023.

However, in the era of Hyper-Kamiokande (HK) experiment, which is the successor of the T2K experiment, measurements of neutrino interactions with Super-FGD may not be sufficient due to the difference of target nuclei. Since T2K and HK use a water Cherenkov detector as a far detector, the measurements of neutrino interaction with a water-targeted near detector are required.

We are developing a Water-based Liquid Scintillator (WbLS) tracker as a candidate for the water-targeted near detector. WbLS is the liquid that dissolves liquid scintillator in water with a surfactant, allowing observation of scintillation light while keeping a high water ratio. In October 2022, we made the first prototype of the WbLS tracker and tested it with a 500 MeV/c positron beam at ELPH, Tohoku University. I will present the status of the development and the result of the beam test.

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