ID de Contribution: **160** Type: **Non spécifié**

The T2K Near Detector ND280 upgrade

vendredi 28 octobre 2022 17:00 (30 minutes)

The T2K experiment is a long baseline neutrino oscillation experiment located in Japan and dedicated to measuring the neutrino oscillations parameters. The muon neutrino beam produced at J-PARC is measured first by a group of near detectors, and then, after passing ~295 km, by a far water Cherenkov detector, where the appearance of electron neutrinos in a muon neutrino beam was observed for the first time. Near detectors are represented by the INGRID on-axis detector, designed to control the position and stability of the beam, and the ND280 magnetize off-axis detector, the main purpose of which is to measure and constrain the neutrino flux before oscillations. One of the current directions of the T2K experiment is to measure CP violation in the lepton sector and improve the current knowledge of neutrino cross-section models. Such measurements require both larger statistics and a better understanding of systematic uncertainties. Thus, the T2K upgrade program suggests an increase in the beam power and modernization of the ND280 near detector. The upgrade includes replacing the pi0 detector with a Super-FGD target that will improve hadron reconstruction, and it will be sandwiched between two high-angle TPCs, allowing high-angle leptons to be reconstructed. In addition, the entire structure will be covered with six Time Of Flight (TOF) planes, which will reduce the background from the outside of the Super-FGD. The talk will cover the performance of HA-TPC prototypes that have been tested in a number of test beam campaigns. In addition, it will concentrate on the validation of GUNDAM, a new generic ND280 fitter developed to perform T2K oscillation analysis for current and future ND280 configurations.

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Classification de Session: Neutrinos

Classification de thématique: Neutrinos