

The T2K ND280 upgrade project

The T2K neutrino oscillation experiment established the $\nu_\mu \rightarrow \nu_e$ appearance with only 10% of the original beam request of 7.8×10^{21} 30 GeV protons on target (p.o.t.). In view of the J-PARC program of upgrades of the beam intensity, the T2K-II proposal requires to run up to 20×10^{21} p.o.t., i.e. an increase in the exposure by more than a factor 10 aimed at establishing CP violation at 3σ level for a significant fraction of the possible δ_{CP} values. The Hyper-K proposal consists in a further increase by a factor 10 of the far detector mass. Facing the potential increase of statistics by two orders of magnitude, it is of great importance to undertake a vigorous program of near detector upgrades, with the aim of reducing the overall statistical and systematic uncertainties at the appropriate level of better than 4%.

The T2K collaboration has launched in 2017 the upgrade project for its near detector ND280. In January 2018 the proposal has been submitted to the CERN SPSC (CERN-SPSC-P357) and to the JPARC PAC. The project aims at installing innovative detectors to significantly increase the physics capabilities. It includes two High-Angle TPCs, a highly segmented Scintillator Detector built with the Super-FGD technology (arXiv:1707.01785, 2018_JINST_13_P02006), and TOF detectors.

The rectangular TPCs will be built with a light field cage and resistive Micromegas detectors for the charge readout. The SuperFGD is based on small plastic scintillator cubes (appr. 1cm side) read-out by three WLS fibers, providing detailed informations for tracking and PID. TOF will complement the TPC and SuperFGD PID information and determine the track direction. With these detectors we will reach a full polar angle coverage for Charged Current Neutrino interactions, improve the tracking performance for low energy pions and protons, and select a clean electron neutrino sample.

We will report on the goals of the project and its development program including prototypes, beam tests at CERN and in Japan in 2018, and projected performances.

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