

The T2K Near Detector Upgrade

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In view of the J-PARC program of upgrades of the beam intensity, the T2K collaboration is preparing towards an increase of the exposure aimed at establishing leptonic CP violation at 3σ level for a significant fraction of the possible δ_{CP} values. To reach this goal, an upgrade of the T2K near detector ND280 will be installed at J-PARC in 2022, with the aim of reducing the overall statistical and systematic uncertainties at the appropriate level of better than 4%.

We have developed an innovative concept for this neutrino detection system, comprising the totally active Super-Fine-Grained-Detector (SuperFGD), two High Angle TPC (HA-TPC) and six TOF planes.

The SuperFGD, a highly segmented scintillator detector, acting as a fully active target for the neutrino interactions, is a novel device with dimensions of $\sim 2 \times 1.8 \times 0.6 \text{ m}^3$ and a total mass of about 2 tons. It consists of about 2 millions of small scintillator cubes each of 1 cm^3 . The signal readout from each cube is provided by wavelength shifting fibers connected to MPPCs. The total number of channels will be $\sim 60,000$ and the cubes have already been produced and assembled in $x - y$ layers.

The HA-TPC will be used for 3D track reconstruction, momentum measurement and particle identification. These TPC, with overall dimensions of $2 \times 2 \times 0.8 \text{ m}^3$, will be equipped with 32 resistive MicroMegas (ERAM). The thin field cage (3 cm thickness, 4% rad. length) will be realized with laminated panels of Aramid and honeycomb covered with a kapton foil with copper strips. The $34 \times 42 \text{ cm}^2$ resistive bulk Micromegas will use a 500 kOhm/square DLC foil to spread the charge over the pad plane, each pad being $\sim 1 \text{ cm}^2$. The electronics is based on the AFTER chips.

The time-of-flight (TOF) will consist of 6 planes with about 5 m^2 surface area surrounding the SuperFGD and the TPCs. Each plane has been assembled with 2.2 m long cast plastic scintillator bars with light collected by arrays of large-area MPPCs from two ends.

In this talk we will report on the status of the construction of these detectors and their performances obtained in test beams.

Working group

WG6

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