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Performance of the Time Projection Chambers with resistive MicroMegas of the T2K near detector upgrade

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Given 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 has been launched to reduce 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 fully active Super-Fine-Grained-Detector (SuperFGD), two High Angle TPC (HA-TPC), and six TOF planes.

The HA-TPC will be used for 3D track reconstruction, momentum measurement, and particle identification. These detectors will increase near detector angular acceptance resulting in systematic uncertainty reduction in the neutrino oscillation measurements.

Two HA-TPCs with overall dimensions of $2 \times 2 \times 0.8$ m³ will be equipped with 32 resistive MicroMegas. The thin field cage (3 cm thickness, 4% rad. length) will consist of composite material with a Kapton foil with copper strips to minimize the material budget between neutrino target and HA-TPC. The 34×42 cm² resistive bulk MicroMegas will use a 200 kOhm/square DLC foil to spread the charge over the pad plane. The charge spread will allow to reaching precise track position reconstruction thus accurate momentum measurements, keeping pad size at 1cm². The front-end cards, based on the AFTER chip, will be mounted on the back of the MicroMegas and parallel to its plane.

The first resistive MicroMegas modules have been tested in a test beam at CERN and DESY. Results of these test beams will be shown in this talk.

Collaboration name

T2K

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