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3D segmented scintillator neutrino detector SuperFGD for T2K experiment

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The T2K neutrino experiment in Japan obtained a first indication of CP violation in neutrino oscillations. To obtain better sensitivity, T2K will accumulate more statistics with a higher intensity beam and an upgraded of-axis near detector (ND280). It will allow us to reduce systematic uncertainties in oscillation measurements. The upgraded detector will have the full polar angle coverage for muons produced in neutrino charged current interactions, a low threshold for proton detection and will be able to measure neutrons using time-of-flight due to a good timing performance. Thanks to these new capabilities, the upgrade of ND280 will measure the energy spectra of muon neutrinos and antineutrinos with an unprecedented level of accuracy, and the near-to-far detector extrapolation of systematics constrains will be much less model dependent and therefore more reliable.

A novel 3D highly granular scintillator detector called SuperFGD of a mass of about 2 tons was adopted as an upgraded ND280 fully-active neutrino target and a 4π detector of charged particles from neutrino interactions. It will consist of about two millions of small optically-isolated plastic scintillator cubes with a 1 cm side. Each cube is read out in the three orthogonal directions with wave-length shifting fibers coupled to compact photosensors, micro pixel photon counters (MPPCs). Several SuperFGD prototypes tested in beams with charged particles and neutrons demonstrated good performance. It is planned that SuperFGD installed into the ND280 magnet will be ready to accept the beam in the beginning of 2023. In this talk, the main detector parameters, performance of SuperFGD prototypes in beam tests, current status and plans will be reported.

Attendance type

In-person presentation

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