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3D SuperFGD detector for T2K experiment

The T2K experiment has obtained a first indication of CP violation in neutrino oscillations. To improve its sensitivity to CP violation, the near neutrino detector ND280 will be upgraded to provide a 4π solid angle, a low threshold for proton detection and measurement of neutrons using time-of-flight.

A novel 3D highly granular scintillator detector (SuperFGD,) of a mass of 2 tons was adopted as a new active neutrino target. It will consist of two millions of small optically-isolated scintillator cubes of 1 cm^3 . Each cube is read out in three orthogonal directions with WLS fibers coupled to compact photosensors, MPPC. Parameters of individual cubes (light yield, its nonuniformity, timing) were studied using a beta source and beam particles. Several SuperFGD prototypes were tested in beams with charged particles at CERN and neutrons at Los Alamos. These prototypes showed good performance; high light yield, good timing parameters, low energy threshold for detection of protons, high efficiency for neutron detection, low cross-talk. The production of all scintillator cubes was finished in January 2021, detector is assembled using fishing lines. SFGD will be placed in a special light-protected box which is under construction. Detector electronics and mechanics for SFGD assembly are also under construction. In this talk, the results of the beam tests, obtained parameters, the SFGD current status, plans for installation and commissioning at J-PARC will be presented.

Primary experiment

Long baseline neutrino experiment T2K

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