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The T2K Near Detector upgrade

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Neutrino oscillation physics has now entered the precision era. In parallel with needing larger detectors to collect more data, future experiments further require a significant reduction of systematic uncertainties. In neutrino oscillation measurements at T2K, the systematic uncertainties related to neutrino interaction cross sections are currently dominant. To reduce this uncertainty, a significantly improved understanding of neutrino-nucleus interactions is required to better characterise nuclear effects.

The upgraded ND280 detector will consist of a totally active Super-Fine-Grained-Detector (Super-FGD) composed of 2 million 1 cm^3 scintillator cubes with three 2D readouts, two High Angle TPC (HA-TPC) instrumented with resistive MicroMegas, and six TOF planes. It will probe our knowledge of neutrino interactions due to its full polar angle acceptance and a much lower proton tracking threshold. Furthermore, neutron tagging capabilities, in addition to precision timing information, will allow the upgraded detector to measure neutron kinematics from neutrino interactions. Such improvements permit access to a much larger kinematic phase space and the analysis of transverse kinematic imbalances, to offer nuclear physics constraints for T2K analyses.

New reconstruction algorithms are being developed to benefit from the improved capabilities of the Super-FGD and of the HA-TPC and will be described in this talk together with the expected performances of the ND280 upgrade.

Submitted on behalf of a Collaboration?

Yes

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