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Commissioning and performance of the TOF detector for the T2K ND280 Upgrade

T2K is a long-baseline neutrino oscillation experiment in Japan, featuring SuperKamiokande as a far detector and a near detector complex. The primary near detector, ND280, has recently undergone an upgrade, incorporating three new sub-detectors: the SuperFGD (SFGD), two High-Angle TPCs (HATs), and a Time-Of-Flight (TOF) system.

In this poster, we present the TOF detector, which consists of six planes of plastic scintillator bars enclosing the SFGD and HATs, and the first analyses performed on TOF data. After a development and commissioning phase at CERN, the installation at the Japan Proton Accelerator Research Centre (J-PARC) was carried out between 2023 and 2024, and the whole ND280 upgrade has been taking data since June 2024. Already during the commissioning phase, the first data have been analyzed, including both beam neutrinos and cosmics.

The time resolution has been assessed to be 180ps, a value that can be further improved with more precise calibration measurements, but already close to the nominal resolution computed in a preliminary study in <https://arxiv.org/pdf/2109.03078>. Such resolution enables efficient background rejection for out-of-fiducial-volume interactions and particle identification (PID) by time of flight. In this poster, we present these and other analyses on the data collected in 2024 and 2025, already demonstrating the capabilities of the TOF detector.

Secondary track

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