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Latest T2K Oscillation Results: New Data and Analysis Improvements

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The T2K (Tokai to Kamioka) experiment is a long-baseline neutrino oscillation experiment that studies accelerator-produced muon neutrino and antineutrino oscillations over a 295 km baseline from J-PARC to the Super-Kamiokande detector in Japan. Its primary goals are the precise measurement of the PMNS mixing angles θ_{23} and θ_{13} , the mass-squared splitting Δm^2_{32} , and the search for CP violation through the δCP phase.

This talk presents the latest oscillation results from T2K, based on a beam exposure of 2.52×10^{21} protons on target (POT) in neutrino mode and 1.75×10^{21} POT in antineutrino mode. For the first time, this analysis includes Far Detector data collected with the upgraded neutrino beam (representing an additional 0.38×10^{21} neutrino POT and 0.12×10^{21} antineutrino POT), which delivers a narrower flux shape, higher beam purity, and increased efficiency, resulting in improved sensitivity to oscillation parameters and reduced systematic uncertainties.

The analysis also incorporates a new multi-ring sample and a new neutrino interaction model, implementing a more comprehensive treatment of low momentum transfer interactions, further improving the robustness of the Δm^2_{32} measurement.

These developments mark the beginning of a new era for oscillation analyses in T2K, setting the stage for further improvements as additional data are being collected both at Super-Kamiokande and in the upgraded Near Detector complex.

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