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T2K status and plans

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Tokai-to-Kamioka (T2K) is a long baseline neutrino experiment which uses the proton beam at the Japan Particle Accelerator Research Centre (JPARC) to produce a beam of muon neutrinos and antineutrinos. T2K determines neutrino oscillation parameters of interest by comparing the measured neutrino rate and spectrum at a near detector complex, located at JPARC, and at Super-Kamiokande, a water-Cherenkov detector, located 295 km away.

The T2K experiment performs world-leading measurements of the PMNS oscillation parameters Δm^2_{32} , $\sin^2(\theta_{23})$ and the CP violating phase δ_{CP} , providing an exclusion at 3σ for some values of this parameter.

T2K is now undergoing major improvements and refurbishment. The Super-Kamiokande detector has been loaded with 0.02% of Gadolinium in 2020, enabling enhanced neutron tagging. An upgrade of the ND280 near detector, located 2.5 degrees off-axis, is scheduled for installation in 2022. The WAGASCI near detector, installed in 2018 and located 1.5 degrees off-axis, is also collecting statistics and a joint analysis at different off-axis angles is being prepared.

The T2K collaboration is working on an updated oscillation analysis to improve the control of systematic uncertainties and enable future inclusion of improved near and far detector data. A new beam tuning has been developed, based on an improved NA61/SHINE measurement which used a replica of the T2K target and which includes a refined modeling of the materials in the beam line. New selections have been developed as well; ND280 selections now include proton and photon tagging, and the muon-neutrino samples at Super-Kamiokande now includes pion tagging. The collaboration has also developed a more robust model of systematic uncertainties for the nuclear effects in neutrino-nucleus interactions, notably for the Spectral Function approach and for pion tagging.

This talk will review the latest measurements of oscillation parameters from T2K, the status of the new selection and systematic developments and the plans for upcoming data runs from T2K.

Collaboration / Activity

T2K

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