

# XX International Workshop on Neutrino Telescopes



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## T2K latest neutrino oscillation results

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T2K is a long baseline neutrino experiment which exploits a neutrino and antineutrino beam produced at the Japan Particle Accelerator Research Centre (J-PARC) to provide world-leading measurements of neutrino oscillation. Neutrino oscillations are measured by comparing neutrino rates and spectra at a near detector complex, located at J-PARC, and at the water-Cherenkov far detector, Super-Kamiokande, located 295 Km away.

The latest T2K results include multiple analysis improvements. A new beam tuning has been developed, based on improved NA61/SHINE measurements on a copy of the T2K target and including refined modeling of the beam line materials. Improved modeling of systematic uncertainties due to neutrino-nucleus interactions have been implemented, including a more sophisticated treatment of the region of low-energy transfer to the nucleus and tuning from electron-scattering data. New selections at ND280, with proton and photon tagging, are also exploited to reach better control of such systematic uncertainties.

Furthermore, a new sample is added at the far detector requiring the presence of a pion in muon-neutrino interactions. It is the first time that a pion sample is included in the study of neutrino disappearance at T2K and, for the first time, a sample with more than one Cherenkov ring is exploited in the T2K oscillation analysis, opening the road for future samples with charged- and neutral-pion tagging. The inclusion of such a sample assures proper control of the oscillated spectrum on a larger neutrino-energy range and on subleading neutrino-interaction processes.

T2K is also engaged in a major effort to perform a joint fit with the Super-Kamiokande neutrino atmospheric measurements and another joint fit with NOvA. Such combinations allow to lift the degeneracies between the measurement of the CP violating phase  $\delta_{CP}$  and the measurement of the ordering of the neutrino mass eigenstates. Results and prospects of such joint fits will be discussed.

**Primary author:** BLANCHET, Adrien (Uni. Geneva)

**Presenter:** BLANCHET, Adrien (Uni. Geneva)

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