



## Poster session 4 – Friday 8 July

### P4.023 First joint analysis of neutrino and antineutrino oscillation at T2K

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*on behalf of T2K Collaboration*

This poster contains details of the first T2K neutrino and antineutrino oscillation results, from data collected using both a muon neutrino-enhanced neutrino beam and a muon antineutrino-enhanced neutrino beam. Previous T2K results have shown a 90% limit on the CP-violating phase  $\delta_{CP}$  when combining T2K data with measurements of  $\sin^2\theta_{13}$  from reactor experiments, favouring  $\delta_{CP} = -\pi/2$ . However, T2K neutrino-mode data alone are not able to constrain  $\delta_{CP}$ .

By combining both neutrino-mode and antineutrino-mode data sets, T2K may have sensitivity to  $\delta_{CP}$  over a significant range without the need for external measurements of  $\sin^2\theta_{13}$ . This poster presents the first such analysis, in which disappearance and appearance data from both the neutrino- and antineutrino-mode beam are combined in a joint fit. This will give the most precise T2K measurement of the oscillation parameters  $\sin^2\theta_{23}$ ,  $\sin^2\theta_{13}$ , and  $\Delta m^2_{32}$ , and the first ever potential sensitivity to  $\delta_{CP}$  from T2K alone.

The results shown here are produced by a Bayesian oscillation analysis based on a Markov Chain Monte Carlo method in which data from the near detector and far detector are fit simultaneously. The analysis method has been significantly updated from previous T2K results, most notably by the inclusion of a sample of neutrino and antineutrino interactions on water at the near detector which is expected to considerably reduce the systematic uncertainty at the far detector.