

T violation at a future neutrino factory

Thursday, 19 September 2024 16:35 (20 minutes)

We study the possibility of measuring T (time reversal) violation in a future long-baseline neutrino oscillation experiment. By assuming a neutrino factory as a staging scenario of a muon collider at the J-PARC site, we find that the $\nu_e \rightarrow \nu_\mu$ oscillation probabilities can be measured with a good accuracy at the Hyper-Kamiokande detector. By comparing with the probability of the time-reversal process, $\nu_\mu \rightarrow \nu_e$, measured at the T2K/T2HK experiments, one can determine the CP phase δ in the neutrino mixing matrix if $|\sin(\delta)|$ is large enough. The determination of δ can be made with poor knowledge of the matter density of the earth as T violation is almost insensitive to the matter effects. The comparison of CP and T-violation measurements, via the CPT theorem, provides us with a non-trivial check of the three neutrino paradigm based on the quantum field theory.

Working Group

WG 1: Neutrino Oscillation Physics

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Session Classification: Parallel: WG 1x5