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Exploring the effect of Lorentz invariance violation with the currently running long-baseline experiments.

Neutrinos can propagate very long distances without any deviation as they undergo only through weak interactions. This characteristic property can thus provide an ideal platform to investigate Planck suppressed physics, such as CPT violation, through their long distance propagation. CPT violation can be studied through Lorentz invariance violation (LIV) in the long-baseline neutrino oscillation experiments. Considering four-dimensional Lorentz violating parameters, we obtain the sensitivity limits on the LIV parameters from $\text{NO}\nu\text{A}$ and T2K experiments. The sensitivity limits on LIV parameters obtained from T2K are much weaker than that of $\text{NO}\nu\text{A}$ and the synergy of T2K and $\text{NO}\nu\text{A}$ can improve these sensitivities. Also, we show their effects on mass hierarchy and CP violation sensitivities for $\text{NO}\nu\text{A}$ experiment. The mass hierarchy and CPV sensitivities are either enhanced or deteriorated significantly, as they crucially depend on the CP-violating phases of LIV parameters.

Mini-abstract

Sensitivity Limits on LIV parameters and their effects are studied for $\text{NO}\nu\text{A}$ and T2K experiments.

Experiment/Collaboration

$\text{NO}\nu\text{A}$

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