Contribution ID: **578** Type: **Poster**

Impact of Lorentz Invariance Violation at DUNE

We examine the impact of Lorentz Invariance Violation (LIV) in measuring the octant of θ_{23} and CP phases at DUNE. We consider the LIV parameters $a_{e\mu}$ and $a_{e\tau}$, which induce an additional interference term in oscillation probabilities. Taking one LIV parameter at-a-time ($|a_{e\mu}| = |a_{e\tau}| = 5 \times 10^{-24}$ GeV), we find that the octant discovery potential of DUNE gets substantially deteriorated for unfavorable combinations of δ and $\varphi_{e\mu}/\varphi_{e\tau}$. The octant can only be resolved at 3σ if the true value of $\sin^2\theta_{23} < 0.42$ or > 0.62 for any choices of δ and φ. Interestingly, we also observe that when both $a_{e\mu}$ and $a_{e\tau}$ are present together, they significantly cancel the impact of each other and DUNE largely regains its octant resolution capability. We also reconstruct the CP phases δ and $\varphi_{e\mu}/\varphi_{e\tau}$. The typical 1σ uncertainty on δ is 10° to 15° and the same on $\varphi_{e\mu}/\varphi_{e\tau}$ is 25° to 30°.

Mini-abstract

Measuring 2-3 mixing angle and CP phases at DUNE in the presence of Lorentz Invariance Violation

Experiment/Collaboration

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Session Classification: Poster Session 2