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Impact of Non-isotropic LIV on Standard neutrino oscillation parameters in DUNE

Lorentz invariance violation (LIV) is a significant factor that can influence the determination of standard unknown oscillation parameters in neutrino physics. This study examines how non-isotropic LIV, particularly with sidereal effects, impacts neutrino oscillation dynamics in the Deep Underground Neutrino Experiment (DUNE). Our analysis reveals that LIV presents considerable challenges in accurately determining key oscillation parameters, including the leptonic CP phase, mass hierarchy, and the mixing angle θ_{23} . While the sensitivity to mass hierarchy remains largely intact, it is notably influenced by the $c_{\mu\tau}^{XY}$ parameter. In contrast, the parameters $c_{e\mu}^{XY}$ and $c_{e\tau}^{XY}$ significantly diminish CP sensitivity. Furthermore, the presence of non-isotropic LIV complicates DUNE's ability to resolve the octant ambiguity of θ_{23} and exacerbates the degeneracy between the Dirac CP phase and θ_{23} . These findings underscore the importance of incorporating LIV effects, especially those with sidereal variations, into the design and analysis of future neutrino experiments.

Field of contribution

Phenomenology

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