

Exploring the effects of LIV on the CP-sensitivities of long-baseline experiments

Arnab Sarker^a, Abinash Medhi^b, and Moon Moon Devi^c

^{a,b,c} Tezpur University, Sonitpur, Assam-784028, INDIA,

Email: arnabs@tezu.ernet.in^a, amedhi@tezu.ernet.in^b, devimm@tezu.ernet.in^c

Keywords: Lorentz Invariance Violation, Neutrino oscillations, Beyond Standard Model

Abstract:

The theoretical possibility of a small deviation from the fundamental space-time symmetry is referred to as Lorentz invariance violation (LIV). This violation of the Lorentz invariance symmetry implies that laws of physics can vary under Lorentz transformation. LIV is intrinsic in nature and can exist even in a vacuum. The weakly interacting neutrinos can be a probe for better understanding any possible violation of Lorentz invariance symmetry. We consider these non-standard effects as sub-dominant terms and use the Standard Model Extension (SME) framework to incorporate LIV as a small perturbation to the standard neutrino Hamiltonian.

We particularly probe the effects of CPT-Violating LIV elements on the neutrino oscillation probabilities for a long-baseline (LBL) experiment. In this work, we first investigate the effects of LIV on the neutrino oscillation probabilities. We then further explore the effects of LIV on the CP-measurement sensitivity for the LBL experiment. We will present our findings on how the possible violation of Lorentz symmetry can compromise the CP-measurement sensitivity in the LBL experiment.

References

- [1] Sarker, A., Medhi, A. & Devi, M. Investigating the effects of Lorentz Invariance Violation on the CP-sensitivities of the Deep Underground Neutrino Experiment. (2023,2)
- [2] Kostelecky, V. & Mewes, M. Lorentz and CPT violation in neutrinos. *Phys. Rev. D.* **69** pp. 016005 (2004)
- [3] Majhi, R., Chembra, S. & Mohanta, R. Exploring the effect of Lorentz invariance violation with the currently running long-baseline experiments. *Eur. Phys. J. C.* **80**, 364 (2020)
- [4] Sahoo, S., Kumar, A. & Agarwalla, S. Probing Lorentz Invariance Violation with atmospheric neutrinos at INO-ICAL. *JHEP.* **3** pp. 050 (2022)
- [5] Kumar Agarwalla, S. & Masud, M. Can Lorentz invariance violation affect the sensitivity of deep underground neutrino experiment?. *Eur. Phys. J. C.* **80**, 716 (2020)