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Exploring the effects of scalar Non Standard Interactions at DUNE and T2HK

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The discovery of the phenomena of neutrino oscillation was the first clear evidence of physics beyond the Standard Model (SM). It requires as extension of the SM to explain the masses and mixing of neutrinos. The models explaining beyond SM (BSM) physics naturally comes with some additional unknown interactions of neutrinos which are beyong the scope of SM, often called as Non Standard Interactions (NSIs) [1]. Wolfenstein [2] was the first to propose the idea of NSI where he explored how neutrino coupling with a vector field can give rise to matter effect in neutrino oscillations. Apart from that, there is also a possibility of neutrinos coupling with a scalar field called scalar NSI [3, 4]. Instead of appearing as a matter potential, scalar NSI appears as a medium dependent correction to the mass matrix, which may offer unique phenomenology in neutrino oscillations.

In this work, we have studied the effects of scalar NSI at two proposed flagship Long Baseline Experiments - DUNE [5] and T2HK [6]. As the effect of scalar NSI scales linearly with the matter density, it can feel the matter density variations which makes LBL experiments one of the best candidate to probe it. We have seen that the effect of scalar NSI on the oscillation probabilities of DUNE and T2HK is significant. Moreover, scalar NSI can significantly effect the CP violation sensitivity as well as θ 23 octant sensitivity of these LBL experiments. Finally, we have also done a combined sensitivity of these experiments towards finding the effects of scalar NSI. In addition, as the scalar NSI affects the neutrino mass term probing it to various neutrino mass models is quite interesting and promising.

Keywords: Neutrino Oscillations, Non Standard Interactions, Beyond Standard Model.

References

[1] O. G. Miranda and H. Nunokawa, Non standard neutrino interactions: current status and future prospects, New Journal of Physics 17 (2015) 095002.
[2] L. Wolfenstein, Neutrino Oscillations in Matter, Phys. Rev. D 17 (1978) 2369.
[3] S.-F. Ge and S. J. Parke, Scalar Nonstandard Interactions in Neutrino Oscillation, Phys. Rev. Lett. 122 (2019) 211801 [1812.08376].
[4] K. Babu, G. Chauhan and P. Bhupal Dev, Neutrino nonstandard interactions via light scalars in the Earth, Sun, supernovae, and the early Universe, Phys. Rev. D 101 (2020) 095029 [1912.13488].
[5] DUNE collaboration, Deep Underground Neutrino Experiment (DUNE), Far Detector Technical Design Report, Volume IV Far Detector Single-phase Technology, JINST 15 (2020) T08010 [2002.03010].
[6] Hyper-Kamiokande Proto- collaboration, Physics potential of a long-baseline neutrino oscillation experiment using a J-PARC neutrino beam and Hyper-Kamiokande, PTEP 2015 (2015) 053C02 [1502.05199].

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