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# Probing scalar Non Standard Interactions at DUNE, T2HK and T2HKK

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The experimental observation of the phenomena of neutrino oscillations was the first clear hint of physics beyond the Standard Model (SM). The SM needs an extension to incorporate the neutrino masses and mixing often called as beyond SM (BSM). The models describing BSM physics usually comes with some additional unknown couplings of neutrinos termed as Non Standard Interactions (NSIs) [1]. The idea of NSI was initially proposed by Wolfenstein [2], where he explored how non standard coupling of neutrinos with a vector field can give rise to matter effect in neutrino oscillations. Furthermore, there is also an intriguing prospect of neutrinos coupling with a scalar field, called scalar NSI [3, 4]. The effect of this type of scalar NSI appears as a medium dependent correction to the neutrino masses, instead of appearing as a matter potential. Hence scalar NSI may offer unique phenomenology in neutrino oscillations.

In this work, we have performed a synergy study of the effects of scalar NSI at various proposed Long Baseline (LBL) Experiments, viz. DUNE [5], T2HK [6] and T2HKK [7]. As the effect of scalar NSI scales linearly with environmental matter density, it can experience the matter density variations which makes LBL experiments one of the suitable candidate to probe its effects. We found that the effect of scalar NSI on the oscillation probabilities of LBL experiments is notable. In addition, scalar NSI can significantly effect the CP violation sensitivities as well as θ 23 octant sensitivities of these LBL experiments. Finally, we have also performed a combined sensitivity of these experiments towards constraining these scalar NSI parameters.

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