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Imprints of scalar mediated NSI on long baseline experiments

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The experimental observation of the phenomena of neutrino oscillations, which essentially confirms non-zero masses of neutrinos, has opened a new sector to explore physics beyond the Standard Model (SM). The models describing new-physics phenomena often come with some unknown interactions of neutrinos termed as Non Standard Interactions (NSIs). It is highly important and interesting to explore the impact of NSIs in the ongoing and upcoming neutrino oscillations experiments for precise measurement of the oscillation parameters. In this work, we have probed the impact of a scalar-mediated NSI in the long baseline sector, focussing at the three upcoming long-baseline (LBL) experiments: (DUNE, T2HK and T2HKK). The effects of scalar NSI appear as a medium-dependent corrections to the neutrino mass term. Its contribution scales linearly with matter density, making LBL experiments among the most suitable candidates for probing such effects. We show that the presence of scalar NSI may significantly impact the oscillation probabilities as well as the event rates at the detectors and the χ^2-sensitivities of δ_{CP} measurements of the experiments. We also show that, a synergy among the LBL experiments (DUNE+T2HK, DUNE+T2HKK), which may offer a better capability of constraining the scalar NSI parameters as well as an improved sensitivity towards CP-violation.

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