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Constraining the Scalar Non-Standard Interactions in Neutrino Oscillation Experiment

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Neutrinos are unique tools to probe new physics scenarios such as non-standard interactions (NSIs) of neutrinos with matter. The coupling of neutrinos to a scalar field gives rise to a new interaction known as Scalar NSI. Unlike the vector NSI case, which contributes to the usual matter potential, the scalar NSI appears as a correction to the neutrino mass term. In this work, we perform a phenomenological study of neutrino oscillation along with the scalar NSI and its impact on the determination of neutrino mass ordering at the JUNO experiment. We find that in the presence of scalar NSI the survival probabilities P_{ee} and $\bar{P}_{ee}$ depend upon the δ_{CP} and octant of θ_{23} even in vacuum, which is not the case, had the scalar NSI been absent in the Hamiltonian. We explore the role of diagonal scalar NSI parameters η_{ee} , $\eta_{e\mu}$, and $\eta_{\tau\tau}$ and it is noted that η_{ee} significantly affect the mass ordering determination of JUNO. The constraints on diagonal scalar NSI elements have been obtained in this work.

Collaboration / Activity

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