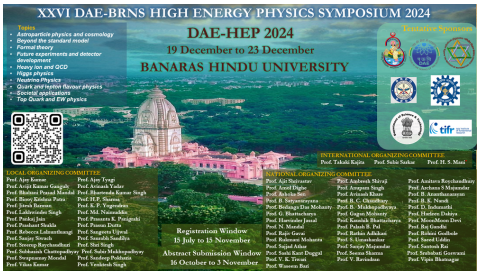

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Distinguishing between Dirac and Majorana neutrinos using temporal correlations

In the context of two flavour neutrino oscillations, it is understood that the 2×2 mixing matrix is parameterized by one angle and a Majorana phase. However, this phase does not impact the oscillation probabilities in vacuum or in matter with constant density. Interestingly, the Majorana phase becomes relevant when we describe neutrino oscillations along with neutrino decay. This is due to the fact that effective Hamiltonian has Hermitian and anti-Hermitian components which cannot be simultaneously diagonalized (resulting in decay eigenstates being different from the mass eigenstates). We consider the PT symmetric non-Hermitian Hamiltonian describing two flavour neutrino case and study the violation of Leggett-Garg Inequalities (LGI) in this context for the first time. We demonstrate that temporal correlations in the form of LGI allow us to probe whether neutrinos are Dirac or Majorana. We elucidate the role played by the mixing and decay parameters on the extent of violation of LGI. We emphasize that for optimized choice of parameters, the difference in K4 (K3) for Dirac and Majorana case is ~15% (~10%).

Field of contribution

Phenomenology

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