Implications of light sterile neutrinos on currently running long-baseline and neutrinoless double beta decay experiments

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Abstract

► The results of short baseline neutrino oscillation experiments indicate the possible extension of standard model by eV-scale sterile neutrino.
► The effect of active-sterile neutrino mixing at probability level and on the mass hierarchy sensitivity of the long-baseline neutrino oscillation experiments has been investigated.
► The impact of new CP-violating phases δ_{14} and δ_{34} on the maximal CP violation exclusion sensitivity for the NOvA experiment has also been illustrated.
► Implications of light sterile neutrino on neutrinoless double beta decay.

3+1 Oscillation Model

► The possible existence of additional eV-scale sterile neutrino (ν_3) is an important aspect in the neutrino sector.
► In presence of one sterile, the so-called 3+1 scenario, the neutrino mixing matrix can be represented by a 4 × 4 unitary matrix.
► Parametrization of mixing matrix requires some additional parameters, three mixing angles (θ_{14}, θ_{24}, θ_{34}) and two phases (δ_{14}, δ_{24}).

\[ U^{3+1} = V(\theta_{14}, \theta_{24}, \delta_{14})R(\theta_{13})V(\theta_{23}, \theta_{34})R(\theta_{23})V(\theta_{34}, \delta_{34})R(\delta_{34}) \]

\[ R(\theta_{ij}) = \begin{pmatrix} U_{i1} & U_{i2} & U_{i3} & U_{i4} \\ U_{1j} & U_{2j} & U_{3j} & U_{4j} \\ U_{1j} & U_{2j} & U_{3j} & U_{4j} \\ U_{1j} & U_{2j} & U_{3j} & U_{4j} \end{pmatrix} \]

► Variations of the effective Majorana mass parameter |M_{ee}| with the lightest neutrino mass.

Conclusions

► Sterile neutrino gives rise to new kinds of degeneracies among the oscillation parameters.
► MH sensitivity of NOvA experiment decreases in presence of sterile neutrino. The synergy of NOvA and T2K increases the δ_{CP} coverage.
► The sensitivity to maximal CP violation affected due to sterile neutrino. Also, the implication of sterile neutrino on neutrinoless double beta decay have shown.

References