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Sterile neutrinos as a window to new physics

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We investigate the possibility of neutrinoless double beta decay ($0\nu\beta\beta$) and leptogenesis within a low-scale seesaw mechanism with additional sterile neutrinos. The general effective field theory (EFT) considerations suggest that if there are experimentally observable signatures in $0\nu\beta\beta$-decay and the lepton asymmetry generated by the right-handed neutrinos, the low-scale leptogenesis is likely to be unviable.
However, in this work, we show that in the context of low-scale resonant leptogenesis, one can obtain the observed BAU and observable signatures of $0\nu\beta\beta$ decay in the presence of additional sterile neutrinos. In this framework, the neutrino masses are suppressed by the extended seesaw parameter, μ, rather than introducing small Yukawa couplings in other leptogenesis scenarios. These large Yukawa couplings in this model can lead to both observable experimental signatures in $0\nu\beta\beta$ decay and large washout effects. The resonant leptogenesis mechanism with light neutrino masses can overcome the latter, even in the presence of experimentally accessible $0\nu\beta\beta$-decay signatures.
We have shown that the KamLAND-Zen experiment is sensitive to MeV-scale sterile neutrinos, and future ton-scale experiments offer potential signals while maintaining viable leptogenesis.

Collaboration (if any)

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