第三届地下和空间粒子物理与宇宙物理前沿问题研讨会

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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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