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Hidden-Sector Neutrinos and Freeze-In Leptogenesis

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Sterile neutrinos at the GeV scale can resolve several outstanding problems of the Standard Model (SM), such as the source of neutrino masses and the origin of the baryon asymmetry through freeze-in leptogenesis, but they can be challenging to detect experimentally due to their small couplings to SM particles. In extensions of the SM with new interactions of the sterile neutrinos, they can be produced copiously at accelerators and colliders. We systematically investigate the impact of such novel interactions on the asymmetry from freeze-in leptogenesis. We find that the interactions tend to bring the sterile neutrinos into equilibrium at early times, leading to a significant reduction in the generated asymmetry. We also show that observable rates of several hidden-sector neutrino signatures, such as SM Higgs decays to pairs of sterile neutrinos, can be inconsistent with the observed baryon asymmetry and provide an opportunity to falsify freeze-in leptogenesis.

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