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Sterile neutrinos with non-standard interactions in beta decay and neutrinoless double beta decay experiments

Charged currents are probed in low-energy precision β-decay experiments and at high-energy colliders, both of which aim to measure or constrain signals of beyond-the-Standard-Model physics. In light of future β-decay and LHC measurements that will further explore these non-standard interactions, we investigate what neutrinoless double-β decay ($0\nu\beta\beta$) experiments can tell us if a nonzero signal were to be found. Using a recently developed effective-field-theory framework, we consider the effects that interactions with right-handed neutrinos have on $0\nu\beta\beta$ and discuss the range of neutrino masses that current and future $0\nu\beta\beta$ measurements can probe, assuming neutrinos are Majorana particles. For non-standard interactions at the level suggested by recently observed hints in β decays, we show that next-generation $0\nu\beta\beta$ experiments can determine the Dirac or Majorana nature of neutrinos, for sterile neutrino masses larger than $\mathcal{O}(10)$ eV.

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