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Neutrinoless double beta decay in seesaw models

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We study the general phenomenology of neutrinoless double beta decay in seesaw models. In particular, we focus on the dependence of the neutrinoless double beta decay rate on the mass of the extra states introduced to account for the Majorana masses of light neutrinos. For this purpose, we compute the nuclear matrix elements as functions of the mass of the mediating fermions and estimate the associated uncertainties. We then discuss what can be inferred on the seesaw model parameters in the different mass regimes and clarify how the contribution of the light neutrinos should always be taken into account when deriving bounds on the extra parameters. Conversely, the extra states can also have a significant impact, cancelling the Standard Model neutrino contribution for masses lighter than the nuclear scale and leading to vanishing neutrinoless double beta decay amplitudes even if neutrinos are Majorana particles. We also discuss how seesaw models could reconcile large rates of neutrinoless double beta decay with more stringent cosmological bounds on neutrino masses.

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