

Simplified models of $d = 7$ lepton number violation

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Lepton number violation is present in models of leptogenesis and Majorana neutrino masses, but has so far not been observed experimentally. Beyond the conventional seesaw mechanisms, lepton number violation may be induced at a higher mass dimension, e.g. from effective operators at mass dimension 7. Just like the seesaw mechanisms generate the dimension-5 Weinberg operator, these dimension-7 operators have a finite number of possible tree-level UV-completions. In this work we explore the phenomenology of the full range of such dimension-7 UV-completions, including the generation of Majorana neutrino masses in 1- and 2-loop diagrams. We find that there are several regions of parameter space close to the discovery reach of both colliders and neutrinoless double beta decay experiments that can lead to the observed value of neutrino masses.

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