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Extended Higgs Sectors in Radiative Neutrino Models

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Abstract

Testable Higgs partners may be sought within the extensions of the SM Higgs sector aimed at generating neutrino masses at the loop level. We study a viability of extended Higgs sectors for two selected models of radiative neutrino masses: a one-loop mass model, providing the Higgs partner within a real triplet scalar representation, and a three-loop mass model, providing it within its two-Higgs-doublet sector. The Higgs sector in the one-loop model may remain stable and perturbative up to the Planck scale, whereas the three-loop model calls for a UV completion around 10^6 GeV. Additional vector-like lepton and exotic scalar fields, which are required to close one- and three-loop neutrino-mass diagrams, play a decisive role for the testability of the respective models. We constrain the parameter space of these models using LHC bounds on diboson resonances.

Keywords: Extensions of Higgs sector; Neutrino mass; Collider phenomenology