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Radiative Neutrino Mass with GeV Scale Majorana Dark Matter in Scotogenic Model

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The experimental observations from the colliders established the standard model (SM), is the most successful phenomenological framework to explain the non-gravitational interactions of fundamental particles at high energy. Non-zero neutrino mass and dark matter cast a shadow over its success. This necessitates the extension of the SM. The most straightforward and elegant extension of the SM to explain these two phenomena is the Scotogenic model, where the SM particle spectrum extends with three isospin singlet right-handed neutrinos and one doublet scalar while all of these being odd under Z2 symmetry. In this work, we have considered the lightest right-handed neutrino as the dark matter candidate and freeze-out mechanism for producing observed dark matter relic density. The charged lepton flavor violation decay processes constrain the upper side of Yukawa coupling while observed relic density limits the lower side. We have performed a unique parameterization to attain the highest possible Yukawa coupling while satisfying LFV and DM constraints. The reduced number of free parameters and large Yukawa coupling make the model predictability at lepton colliders very high. Collider phenomenology for possible signatures performed at lepton colliders and the required luminosities estimated for detection.

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