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Fermionic Dark Matter and Lepton Flavor Violation in a Scotogenic–Seesaw Model

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We study an extension of the scoto–seesaw model in a fermionic dark matter scenario, where light neutrino masses arise from both tree-level and one-loop contributions through the type-I seesaw and scotogenic mechanisms, respectively. The solar and atmospheric neutrino mass scales then arise naturally from these two contributions. In the scotogenic model, achieving an efficient annihilation rate for fermionic dark matter generally requires sizable Yukawa couplings. However, these same couplings also induce lepton flavor violating processes, which can lead to tension with current experimental constraints. The model considered here introduces an additional annihilation channel mediated by the scalar field and controlled by a new coupling. This provides an alternative contribution to the dark matter annihilation rate without necessarily requiring large values of the Yukawa couplings associated with lepton flavor violation.

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