

The simplest scoto-seesaw model: WIMP dark matter phenomenology and Higgs vacuum stability

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We have examined the consistency of electroweak breaking, neutrino and dark matter phenomenology within the minimal scoto-seesaw mechanism. The model provides a simple picture where the "atmospheric" mass scale arises from the tree-level "missing partner" seesaw, while the "solar" scale is induced radiatively by the dark sector, hence neutrino mass generation is intimately connected with dark matter. The model can have both fermionic or scalar dark matter candidate. We have studied various prospects such as relic abundance, direct detection and indirect detection for scalar dark matter case. In addition we have studied the issue of vacuum stability and for this purpose we have derived the full two-loop RGEs for the relevant parameters, such as the quartic Higgs self-coupling λ of the Standard Model. The new scalars present in the scoto-seesaw mechanism improve the stability properties of the electroweak vacuum. We have also explored the consistency of the underlying dark symmetry.

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