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Inverse Seesaw Model with a Modular S_4 Symmetry: Lepton Flavor Mixing and Warm Dark Matter

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We present a systematic investigation on simple inverse seesaw models for neutrino masses and flavor mixing based on the modular S_4 symmetry. Two right-handed neutrinos and three extra fermion singlets are introduced to account for light neutrino masses through the inverse seesaw mechanism and to provide a keV-mass sterile neutrino as the candidate for warm dark matter in our Universe. Considering all possible modular forms with weights no larger than four, we obtain twelve models, among which we find one is in excellent agreement with the observed lepton mass spectra and flavor mixing. Moreover, we explore the allowed range of the sterile neutrino mass and mixing angles, by taking into account the direct search of X-ray line and the Lyman-α observations. The model predictions for neutrino mixing parameters and the dark matter abundance will be readily testable in future neutrino oscillation experiments and cosmological observations.

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