

MeV neutrino dark matter: Relic density, lepton flavour violation and electron recoil

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Right-handed neutrinos with MeV to GeV mass are very promising candidates for dark matter (DM). Not only can they solve the missing satellite puzzle, the cusp-core problem of inner DM density profiles, and the too-big-to-fail problem, i.e. that the unobserved satellites are too big to not have visible stars, but they can also account for the Standard Model (SM) neutrino masses at one loop. We perform a comprehensive study of the right-handed neutrino parameter space and impose the correct observed relic density and SM neutrino mass differences and mixings. We find that the DM masses are in agreement with bounds from big-bang nucleosynthesis, but that these constraints induce sizeable DM couplings to the charged SM leptons. We then point out that previously overlooked limits from current and future lepton flavour violation experiments heavily constrain the allowed parameter space. Since the DM is leptophilic, we also investigate electron recoil as a possible direct detection signal, in particular in the XENON1T experiment.

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