

Confronting Dark Matter with Dirac Neutrinos

Thursday, September 21, 2023 11:50 AM (10 minutes)

The identity of neutrinos, Dirac or Majorana, is an essential yet unsolved puzzle of nature. By assuming that neutrinos are Dirac particles, we propose a light Dirac neutrino portal dark matter scenario which is based on the possible correlation between the relic right-handed neutrinos and present dark matter abundance. We studied the connection between dark matter and the light right-handed neutrinos produced both thermally and non-thermally and showed that the observables like ΔN_{eff} and free-streaming length of dark matter can put tight constraints on the available parameter space. For example, in the case of non-thermal dark matter, such constraints can rule out DM mass all the way up to $\mathcal{O}(100 \text{ keV})$. This can be a possible way to probe the dark matter parameter space even when the direct detection cross-section is suppressed or forbidden in the theory.

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