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keV sterile neutrino dark matter together with large neutrino mass in cosmology from a dark sector

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We investigate the phenomenology of a dark sector, extension of the neutrino sector, that simultaneously provides a viable dark matter (DM) candidate, reconciles cosmological constraints with active neutrino masses possibly measurable in laboratories such as KATRIN, and yields near-future testable predictions.
The dark sector comes into thermal equilibrium with Standard Model neutrinos after neutrino decoupling and before recombination via a new $U(1)$ gauge interaction in the dark sector. It contains a sterile neutrino DM candidate with mass in the $\mathcal{O}(10-100)$keV range, along with a large number of massless fermions that dilute the abundance of active neutrinos. This dilution allows for larger neutrino masses without conflicting with cosmological bounds. The DM relic abundance is determined by freeze-out within the dark sector, naturally avoiding X-ray constraints.
A key prediction of this framework is a small increase in the effective number of relativistic species, $N_{\rm eff}$, at recombination, within the sensitivity of upcoming CMB experiments - making the scenario experimentally accessible and testable in the near future.

Secondary track

T03 - Neutrino Physics

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