

Extremes in Mixing Angle Space: Constraining Sterile Neutrinos for the Next Generation of Searches

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Sterile neutrinos represent a clear extension of the Standard Model with multiple potential cosmological signatures. We numerically follow the cosmic production of sterile neutrino dark matter to constrain the mass-mixing angle parameter space, leading to a better understanding of the models which remain viable for further study in future experimental probes. In the small mixing angle regime, we study Shi-Fuller-based production or models with enhanced active sector self-interaction, which furthers the possibility that sterile neutrinos comprise the majority of the dark matter. In the high mixing angle regime, we explore possible mechanisms of suppressing production of keV scale sterile neutrinos, within the HUNTER experiment parameter space. Some of these new physics paths include universes with a nontrivial cosmic lepton number, new neutrino interactions with light bosons, late-time neutrino mass generation, low reheating temperature universes, or phase transitions in the early universe.

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