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Thermal effects in freeze-in neutrino dark matter production

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We present a detailed study of the production of dark matter in the form of a sterile neutrino via freeze-in from decays of heavy right-handed neutrinos. Our treatment accounts for thermal effects in the effective couplings, generated via neutrino mixing, of the new heavy neutrinos with the Standard Model gauge and Higgs bosons and can be applied to several low-energy fermion seesaw scenarios featuring heavy neutrinos in thermal equilibrium with the primordial plasma. We find that the production of dark matter is not as suppressed as to what is found when considering only Standard Model gauge interactions. Our study shows that the freeze-in dark matter production could be efficient.

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