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Neutrino non-standard self-interactions and their impact on sterile neutrino dark matter

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Sterile neutrinos with keV-scale masses are popular candidates for warm dark matter. In the most straightforward case, they are produced via oscillations with active neutrinos. We focus on mixing with electron neutrinos and antineutrinos, which is object of test in several upcoming or running experiments like TRISTAN, ECHo, and HUNTER. We introduce effective self-interactions of active neutrinos and investigate the effect on the parameter space of sterile neutrino mass and mixing. We demonstrate that depending on the size of the self-interaction, the available parameter space moves closer to, or further away from, the region testable by the mentioned future experiments. In particular, we show that phase 3 of the HUNTER experiment would test a larger amount of parameter space in the presence of self-interactions than without them. We also investigate the effect of the self-interactions on the free-streaming length of the sterile neutrino dark matter, which is important for structure formation observables.

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