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

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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 introduce effective self-interactions of active neutrinos and investigate the effect on the parameter space of sterile neutrino mass and mixing. Our focus is on mixing with electron neutrinos, which is subject to constraints from several upcoming or running experiments like TRISTAN, ECHO, BeEST and HUNTER. Depending on the size of the self-interaction, the available region of the parameter space moves closer to, or further away from the one testable by those future experiments. In particular, phase 3 of the HUNTER experiment will test a larger region of parameter space in the presence of self-interactions than without them. We report also the effect of the self-interactions on the free-streaming length of the sterile neutrino dark matter, important for structure formation observables.

Topic Field

Particle Physics

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