

Positivity Bounds on Higgs-Portal Dark Matter

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We consider the positivity bounds for scalar dark matter with effective Higgs-portal couplings up to dimension-8 operators. Taking the superposed states for Standard Model Higgs and scalar dark matter, we show that the part of the parameter space for the effective couplings, otherwise unconstrained by phenomenological bounds, is ruled out by the positivity bounds on the dimension-8 derivative operators. For a WIMP DM case, we find that dark matter relic density, direct and indirect detection, and LHC constraints are complementary to the positivity bounds in constraining the effective Higgs-portal couplings. In the effective theory obtained from massive graviton or radion, there appears a correlation between dimension-8 operators and other effective Higgs-portal couplings for which the strong constraint from direct detection can be evaded. Nailing down the parameter space mainly by relic density, direct detection, and positivity bounds, we find that there are observable cosmic ray signals coming from the dark matter annihilations into a pair of Higgs bosons, WW or ZZ . We also consider a FIMP DM case.

Please choose your flavour

Dark

Primary authors: Mr KIM, Seong-Sik (Chung-Ang University); Prof. LEE, Hyun Min (Chung-Ang University); YAMASHITA, Kimiko (Ibaraki University)

Presenter: YAMASHITA, Kimiko (Ibaraki University)

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