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Dark matter in Inert Doublet Model with one scalar singlet and $U(1)_X$ gauge symmetry

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he study of the abundance of dark matter is carried out in an extension of the standard model with an additional gauge symmetry $U(1)_X$. The considered extension includes two doublet and one complex singlet of scalar fields. The dark matter candidate arises from the second doublet scalar field meanwhile the singlet and first doublet scalar fields provide additional portals to the relic density. We also analyze in detail the stability of the dark matter candidate through the introduction of the discrete Z_2 symmetry or with the same gauge symmetry $U(1)_X$. We find constraints on the model parameter space which are in agreement with (i) the most up-to-date experimental results reported by CMS and ATLAS collaborations, namely, signal strengths $\mathcal{R}_{x\bar{x}}$; (ii) upper limit on WIMP-nucleon cross section imposed by XENON1T collaboration and (iii) upper limit on the production cross-section of a Z' gauge boson times the branching ratio of the Z' boson decaying into $\ell^-\ell^+$, with $\ell = e,\ \mu$. Subsequently these constraints are used to compute the relic density reported by the PLANCK collaboration and we find that also satisfy it. Considering all constraints, we find regions that include light, intermediate and heavy dark matter candidate mass.

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