Dark matter with hidden U(1) gauge interaction and kinetic mixing

We explore the Dirac fermionic and complex scalar dark matter in the framework of a hidden $U(1)_X$ gauge theory with kinetic mixing between the $U(1)_X$ and $U(1)_Y$ gauge fields. The $U(1)_X$ gauge symmetry is spontaneously broken due to a hidden Higgs field. The kinetic mixing provides a portal between dark matter and standard model particles. Besides, an additional Higgs portal can be realized in the complex scalar case. Dark matter interactions with nucleons are typically isospin violating, and direct detection constraints can be relieved. Although the kinetic mixing has been stringently constrained by electroweak oblique parameters, we find that there are several available parameter regions predicting an observed relic abundance through the thermal production mechanism. Moreover, these regions have not been totally explored in current direct and indirect detection experiments. Future direct detection experiments and searches for invisible Higgs decays at a Higgs factory could further investigate these regions.

Primary author: 余, 钊焕 (Sun Yat-Sen University)

Co-authors: Dr CAI, Chengfeng (Sun Yat-Sen University); Prof. ZHANG, Hong-Hao (School of Physics, Sun Yat-Sen University, Guangzhou 510275, China); Mr LAO, Juebin (Sun Yat-Sen University); Mr ZENG, Yu-Pan (Sun Yat-Sen University)

Presenter: 余, 钊焕 (Sun Yat-Sen University)

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