

Hunting for Hypercharge Anapole Dark Matter

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We conduct an analysis to investigate DM with hypercharge anapole moments, focusing on the scenario of a spin-1/2 or 1 Majorana DM interacting with SM particles through U(1) hypercharge anapole terms. We construct general and hypercharge gauge-invariant 3-point vertices for the interactions of a virtual γ/Z with two identical massive Majorana particles of any spin. We calculate the relic abundance, analyze current constraints and future sensitivities from the XENONnT direct detection and LHC (HL-LHC) experiments, and apply the naive perturbativity bound. The scenario with spin-1 DM is more tightly constrained than that with spin-1/2 DM, due to the reduced annihilation cross-section and/or the enhanced rate of LHC mono-jet events. The spin-1 scenario is almost entirely tested after the full run of the HL-LHC, with the exception of a small parameter region. Our estimations anticipate even stronger bounds for Majorana dark matter with higher spins.

Alternate track

1. Astro-particle Physics and Cosmology

I read the instructions above

Yes

Author: CHOI, Seong Youl

Co-authors: KANG, Dong Woo (Jeonbuk National University); JEONG, Jaehoon (Korea Institute for Advanced Study); SHIN, Seodong (Jeonbuk National University)

Presenter: CHOI, Seong Youl

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