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Upper Bound on The Parity Breaking Scale of WIMP Dark Matter Models

We consider weakly interacting massive particle (WIMP) dark matter in a parity solution to the strong CP problem. The WIMP phenomenology is drastically affected by the presence of parity partners of WIMP and electroweak gauge bosons. We focus on a parity extension of $SU(2)_L$ doublet fermion dark matter, identify the viable parameter space, and derive the predictions of the theory. We find that the parity symmetry breaking scale is generically bounded from above, with the bound given by $O(10)$ TeV, depending on the details of the model. The High-Luminosity Large Hadron Collider, future colliders, and direct detection experiments will probe this parameter space further.

Authors: WANG, Isaac; HARIGAYA, Keisuke; BALDWIN, Matthew

Presenter: BALDWIN, Matthew

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