

Phenomenology 2021 Symposium



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Where is a Miracle-less WIMP Ruled Out?

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We examine a real electroweak triplet scalar field as dark matter, abandoning the requirement that its relic abundance is determined through freeze out in a standard cosmological history (a situation which we refer to as ‘miracle-less WIMP’). We extract the bounds on such a particle from collider searches, searches for direct scattering with terrestrial targets, and searches for the indirect products of annihilation. Each type of search provides complementary information, and each is most effective in a different region of parameter space. LHC searches tend to be highly dependent on the mass of the SU(2) charged partner state, and are effective for very large or very tiny mass splitting between it and the neutral dark matter component. Direct searches are very effective at bounding the Higgs portal coupling, but ineffective once it falls below $\lambda_{\text{eff}} \sim 10^{-3}$. Indirect searches suffer from large astrophysical uncertainties due to the backgrounds and J -factors, but do provide key information for ~ 100 GeV to TeV masses. We determine the parameter space for this example of miracle-less WIMP dark matter that can be robustly excluded, and which parts of it remain viable.

Summary

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