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Phenomenological Implications of Non-Perturbative Effects for Colored Dark Sectors

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We demonstrate the impact of non-perturbative effects on the annihilation cross section of DM in a model of simplified t-channel DM. Specifically, we study the case of Majorana fermion DM coupling to the standard model (SM) quarks via a colored scalar.

For DM masses in the GeV-TeV range, direct detection experiments strongly constrain the DM coupling to the SM quarks. From a cosmological point of view however, a large coupling to the SM is not mandatory if the mass splitting between the colored scalar and the DM candidate is sufficiently small. This region of the parameter space is subject to non-perturbative effects, namely the Sommerfeld effect and bound state formation, which can significantly enhance the effective DM annihilation cross section.

We present the impact of this effect on current and upcoming collider searches as well as direct detection experiments.

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