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Cornering top-philic dark matter: a comprehensive study from colliders to cosmology

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Studies of dark matter lie at the interface of collider physics, astrophysics and cosmology. Constraining models featuring dark matter candidates entails the capability to provide accurate predictions for large sets of observables and compare them to a wide spectrum of data. We present a framework which, starting from a model Lagrangian, allows one to consistently and systematically make predictions, as well as to confront those predictions with a multitude of experimental results.

As an application, we consider several classes of simplified dark matter models where the dark sector is connected to the Standard Model via couplings to the top quark. We study in detail the complementarity of relic density, direct/indirect detection and collider searches in constraining the model parameter space. Our study goes beyond the tree-level approximation and we show examples of how higher- order corrections can affect the interpretation of the experimental results, both on for cosmological and collider observables.

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