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Collider and Indirect Singatures of Non-Minimal Dark Matter sectors

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Recent Fermi-LAT observations of dwarf spheroidal galaxies in the Milky Way have placed strong limits on the gamma-ray flux from dark matter annihilation. In order to produce the strongest limit on the dark matter annihilation cross-section, the observations of each dwarf galaxy have typically been "stacked"in a joint-likelihood analysis, utilizing optical observations to constrain the dark matter density profile in each dwarf. These limits have typically been computed only for singular annihilation final states, such as
b
-
b
or
τ
+
τ
−
. In this paper, we generalize this approach by producing
an independent joint-likelihood analysis to set constraints on models where the dark matter particle annihilates to multiple final state fermions. We interpret these results in the context of the most popular simplified models, including those with s- and t-channel dark matter annihilation through scalar and vector mediators. We present our results as constraints on the minimum dark matter mass and the mediator sector parameters. Additionally, we compare our simplified model results to those of Effective Field Theory contact interactions in the high-mass limit.

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