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Simplified DM models with the full SM gauge symmetry

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The general strategy for dark matter (DM) searches at colliders currently relies on simplified models, which typically have a limited number of free parameters. In the case of t-channel colored mediators, these simplified models often have assumptions on the chirality of the DM-SM interactions with quarks, though generically a UV-complete model with such colored mediators would lead to the existence of more free parameters. In this study we look at the effect this broader set of free parameters has on direct detection and the mono-X + MET (X=jet,W,Z) signatures at 13 TeV LHC while maintaining gauge invariance of the simplified model under the full SM gauge group. We find that the direct detection constraints require DM masses less than 10 GeV in order to produce phenomenologically interesting collider signatures. Additionally, for a fixed mono-W cross section it is possible to see very large differences in the mono-jet cross section when the usual simplified model assumptions are loosened and isospin violation between RH and LH DM-SM quark couplings are allowed.

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