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Constraining Flavored Dark Matter: A Systematic Study in the DMFV Framework

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The null results of dark matter searches targeting weakly interacting massive particles (WIMPs) put increasing pressure on the simplest realizations of WIMP models. In response, we explore an extended dark sector with a non-trivial flavor structure within the Dark Minimal Flavor Violation (DMFV) framework. These models extend the standard dark matter paradigm by introducing flavor-dependent interactions between dark matter and the Standard Model. Flavored dark matter models offer a rich phenomenology, linking dark matter properties to the flavor structure of the visible sector, which leads to distinctive signatures in cosmology, direct detection, flavor observables, and collider experiments. We therefore develop a framework to perform an automated systematic study of the phenomenology of different DMFV models. Using this framework, we analyze the viable parameter space of a specific flavored dark matter model and identify which constraints have a significant impact on the parameter space. Furthermore, we discuss new potential opportunities for searches for the model at colliders.

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