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Flavored Dark Matter: Direct Detection and Collider Signals

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I consider theories where the dark matter particle carries flavor quantum numbers, and has renormalizable contact interactions with the Standard Model fields. The phenomenology of this scenario depends sensitively on whether dark matter carries lepton flavor, quark flavor or its own internal flavor quantum numbers. I show that each of these possibilities is associated with a characteristic type of vertex, has different implications for direct detection experiments and gives rise to distinct collider signatures. The region of parameter space where dark matter has the right abundance to be a thermal relic is shown to be within reach of current direct detection experiments. I focus on a class of models where dark matter carries tau flavor, and show that the collider signals of these models include events with four or more isolated leptons and missing energy. A full simulation of the signal and backgrounds, including detector effects, shows that in a significant part of parameter space these theories can be discovered above Standard Model backgrounds at the Large Hadron Collider.

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