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Direct Detection Signals from Absorption of Fermionic Dark Matter

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We present a new class of direct detection signals; absorption of fermionic dark matter. We enumerate the operators through dimension six which lead to fermionic absorption, study their direct detection prospects, and summarize additional constraints on their suppression scale. Such dark matter is inherently unstable as there is no symmetry which prevents dark matter decays. Nevertheless, we show that fermionic dark matter absorption can be observed in direct detection and neutrino experiments while ensuring consistency with the observed dark matter abundance and required lifetime. For dark matter masses well below the GeV scale, dedicated searches for these signals at current and future experiments can probe orders of magnitude of unexplored parameter space.

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