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Experimentally Viable Mass of the Fermionic Dark Matter

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We take into account a generic form of a Dirac fermionic dark matter (DM), which communicates with the Standard Model quarks via a scalar mediator, in a model-independent way. Four special interaction scenarios are investigated, where one is parity conserving and the other three are parity violating. Three of them result in the v suppressed DM-nucleon cross sections, where v ˜10ˆ-3c is the velocity of the DM in the laboratory frame. We constrain the masses of the dark matter and mediator as well as the couplings from the thermal relic abundance, and the recent results of the XENON100 direct detection and collider experiments involving the two channels: (i) monojet plus large missing transverse energy, and (ii) dijet. The current monojet constraint is not stronger than that from the requirement of the correct relic density and the null result by the XENON100 direct detection. We find that the dijet resonance measurements can exclude a large portion of the parameter space (m_\chi, mY), where the couplings for the mediator coupled to the dark matter and to the quarks are small and have roughly the same magnitude. The constraint from indirect detections and diphoton resonance searches is also briefly discussed.

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