Potential for definitive discovery of a 70 GeV dark matter WIMP with only second-order gauge couplings

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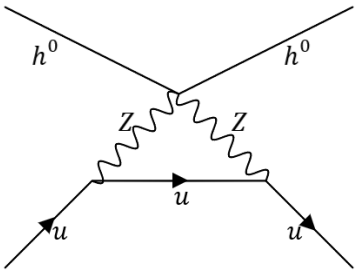
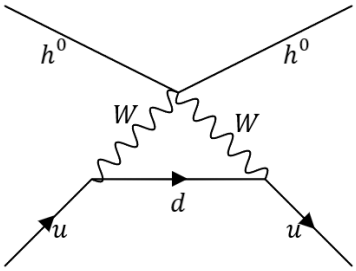
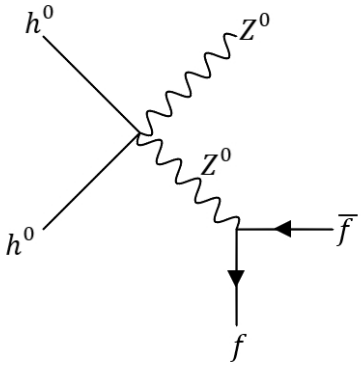
A fundamental theory [1] leads inevitably to a dark matter candidate [2-5] with no interactions other than second-order gauge couplings, to Z and W bosons.

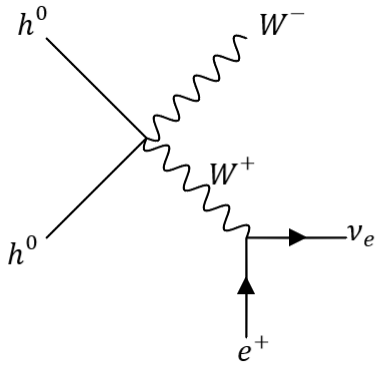
The best prospects for direct, indirect, and collider detection appear to be the processes represented respectively by the figures below.



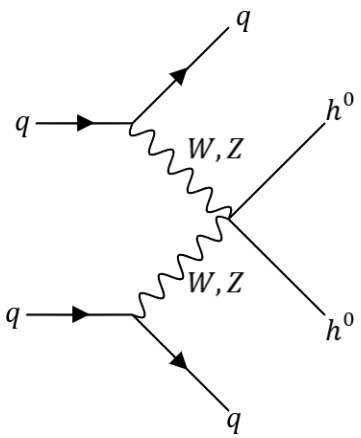


The WIMP-nucleon cross-section σ is estimated to be $\sim 10^{-48}$ cm^2, perhaps barely in reach of LZ and XENONnT, and eventually PandaX and other direct-detection experiments.





The mass of 70 GeV and calculated annihilation cross-section $\langle \sigma_{ann} v \rangle \approx 1.2 \times 10^{-26}$ cm^3/s are consistent with the analyses of Fermi-LAT gamma-ray and AMS-02 antiproton observations cited in Refs. 1-5 (Hooper, Slatyer, Leane, ...)



The cross-section for production through vector boson fusion, accompanied by two jets, is estimated to be ~ 1 femtobarn, perhaps accessible to the high-luminosity LHC.

[1] Roland E. Allen, "Some unresolved problems from a fresh perspective", arXiv:2302.10241.
[2] Reagan Thornberry, Maxwell Throm, John Killough, Dylan Blend, Michael Erickson, Brian Sun, Brett Bays, Gabriel Frohaug, and Roland E. Allen, ``Experimental signatures of a new dark matter WIMP", EPL [European Physics Letters] 134, 49001 (2021), arXiv:2104.11715 [hep-ph], and references therein.
[3] Caden LaFontaine, Bailey Tallman, Spencer Ellis, Trevor Croteau, Brandon Torres, Sabrina Hernandez, Diego Cristancho Guerrero, Jessica Jaksik, Drue Lubanski, and Roland E. Allen, ``A Dark Matter WIMP That Can Be Detected and Definitively Identified with Currently Planned Experiments", Universe 7, 270 (2021), arXiv:2107.14390 [hep-ph], and references therein.
4] Bailey Tallman, Alexandra Boone, Caden LaFontaine, Trevor Croteau, Quinn Ballard, Sabrina Hernandez, Spencer Ellis, Adhithya Vijayakumar, Fiona Lopez, Samuel Apata, Jehu Martinez, and Roland Allen, ``Indirect detection, direct detection, and collider detection cross-sections for a 70 GeV dark matter WIMP", Proceedings of Science, https://pos.sissa.it/414/988/pdf [proceedings of the 1st International Conference on High Energy Physics, ICHEP 2022], arXiv:2210.05380 [hep-ph].
[5] Bailey Tallman, Alexandra Boone, Adhithya Vijayakumar, Fiona Lopez, Samuel Apata, Jehu Martinez, and Roland Allen, ``Potential for definitive discovery of a 70 GeV dark matter WIMP with only second-order gauge couplings", Letters in High Energy Physics LHEP-342 (2023), doi.org/10.31526/lhep.2023, arXiv:2210.15019 [hep-ph].