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Experimental signatures of a new dark matter WIMP

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The dark matter WIMP proposed here has the following properties: (1) According to a rigorous theorem, its mass is $\leq$ 125 GeV. (2) According to approximate calculations of its annihilation cross-section, it will yield the observed dark matter abundance if its mass is $\sim$ 75 GeV. We also estimate that (3) the cross-section for nuclear scattering is consistent with the limits from direct detection experiments, (4) the cross-section for collider production is consistent with limits from the LHC, and (5) the cross-section for annihilation is consistent with the general (multiple-channel) limits from gamma-ray observations of dwarf spheroidal galaxies. The mass and annihilation cross-section (through 29 different channels) are in agreement with (6) analyses of the observations of gamma rays from the Galactic center by Fermi-LAT (supporting the hypothesis of WIMP annihilation) and (7) analyses of the antiprotons observed by AMS-02 (supporting this same hypothesis). (8) The most promising signature for collider detection appears to be missing transverse energy of $\sim$ 150 GeV following creation through vector boson fusion. (9) The best hope for direct detection is still Higgs exchange, although the coupling to the Higgs boson is undetermined. (10) According to another rigorous theorem, the present dark matter particle and the lightest neutralino of supersymmetry (susy) can stably coexist in a multicomponent dark matter scenario. This new dark matter candidate results from an extended Higgs sector which, if susy is included, implies a doubly rich plethora of new particles and new physics that should be observable in the foreseeable future.

Summary

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