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A multicomponent dark matter scenario consistent with experiment

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We review a dark matter scenario [1-6] which is consistent with recent analyses of observations from Fermi-LAT, AMS-02, and Planck. In this scenario, with both supersymmetry and an extended Higgs sector, the mass of the dominant dark matter WIMP is rigorously ≤ 125 GeV/c^2, its gauge couplings are precisely defined, and its Higgs-mediated couplings should be comparable to those of a neutralino. Very recent and earlier analyses of the data from Planck, Fermi-LAT, AMS-02, and other experiments indicate that (i) the positron excess at ~ 800 GeV or above is not evidence of high-mass dark matter particles (which would have disconfirmed the present theory), (ii) the Galactic center excess of gamma rays observed by Fermi-LAT may be evidence for dark matter particles with a mass near or below 100 GeV, (iii) the gamma-ray excess from Omega Centauri may provide similar evidence of annihilation of such relatively low-mass particles, and (iv) the antiproton excess observed by AMS is again possible evidence of roughly 100 GeV dark matter particles. The present scenario, with two stable spin 1/2 WIMPs (a high-mass neutralino and a more abundant "Higgson") is consistent with these results, and it also suggests that true detection should be near in direct, indirect, or collider detection experiments.

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