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Fermi/LAT observations of Dwarf Galaxies highly constrain a Dark Matter Interpretation of Excess Positrons seen in AMS-02, HEAT, and PAMELA

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It is shown that a Weakly Interacting Massive dark matter Particle (WIMP) interpretation for the positron excess observed in a variety of experiments, HEAT, PAMELA, and AMS-02, is highly constrained by the Fermi/LAT observations of dwarf galaxies. In particular, this paper has focused on the annihilation channels that best fit the current AMS-02 data (Boudaud et al., 2014). The Fermi satellite has surveyed the γ-ray sky, and its observations of dwarf satellites are used to place strong bounds on the annihilation of WIMPs into a variety of channels. For the single channel case, we find that dark matter annihilation into $\{b\bar{b}$, e^+e^-, $\mu^+\mu^-$, $\tau^+\tau^-$, 4-e, or 4-$\tau\}$ is ruled out as an explanation of the AMS positron excess (here b quarks are a proxy for all quarks, gauge and Higgs bosons). In addition, we find that the Fermi/LAT 2σ upper limits, assuming the best-fit AMS-02 branching ratios, exclude multichannel combinations into $b\bar{b}$ and leptons. The tension between the results might relax if the branching ratios are allowed to deviate from their best-fit values, though a substantial change would be required. Of all the channels we considered, the only viable channel that survives the Fermi/LAT constraint and produces a good fit to the AMS-02 data is annihilation (via a mediator) to 4-μ, or mainly to 4-μ in the case of multichannel combinations.

Oral or Poster Presentation

Oral

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