

Antiproton and Positron Signal Enhancement in Dark Matter Mini-Spikes Scenarios

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The annihilation of dark matter (DM) in the Galaxy could produce specific imprints on the spectra of antimatter species in Galactic cosmic rays, which could be detected by upcoming experiments such as PAMELA and AMS02. Recent studies show that the presence of substructures can enhance the annihilation signal by a “boost factor” that not only depends on energy, but that is intrinsically a statistical property of the distribution of DM substructures inside the Milky Way. We investigate a scenario in which substructures consist of ~ 100 “mini-spikes” around intermediate-mass black holes. Focusing on primary positrons and antiprotons, we find large boost factors, up to a few thousand, that exhibit a large variance at high energy in the case of positrons and at low energy in the case of antiprotons. As a consequence, an estimate of the DM particle mass based on the observed cut-off in the positron spectrum could lead to a substantial underestimate of its actual value.

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