

Constraining dark matter annihilation with Fermi-LAT observations of Ultra-Faint Compact Stellar Systems

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Recent observations from optical surveys have discovered the presence of a multitude of ultra-faint compact stellar systems (UFCs) orbiting the Milky Way (MW) that have the potential to be the most compact and faintest galaxies observed so far. If they were confirmed to be dark matter (DM) dominated, these objects would be ideal for indirect searches of DM annihilation, due to their proximity and relatively high DM content. We analyze 14.3 years of Fermi-LAT gamma-ray data coincident with 26 UFCs, selected using the results from recent numerical simulations and models of galaxy formation. No excess gamma-ray emission is detected and we evaluate the gamma-ray flux upper limits for these systems. We derive the sensitivity for DM annihilation signal, assuming that these UFCs are DM-dominated and consistent to the observed population of dwarf spheroidal satellite galaxies (dSphs) of the MW. We also account for the possibility that not all the targets in our sample are DM-dominated, by evaluating the sensitivity for random subsets of the selected UFCs. This work shows the potential of the UFCs to yield constraints on DM properties that are competitive with, if not improve, the ones obtained from dSphs, and highlights the importance of kinematic studies on these systems to empirically determine their DM content.

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