

Searches for Angular Extension in High-Latitude Fermi-LAT Sources

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We present a comprehensive search for angular extension in high-latitude gamma-ray sources detected by the Fermi Large Area Telescope (LAT). While the majority of high-latitude LAT sources are extragalactic blazars that appear point-like within the LAT angular resolution, there are several physics scenarios that predict the existence of populations of spatially extended sources. Gamma-ray blazars could have extended “pair halos” produced through the deflection of pair cascades by the Intergalactic Magnetic Field (IGMF). The detection of a pair halo component around one or more LAT-detected blazars would provide constraints on the strength and coherence length scale of the IGMF. If Dark Matter (DM) consists of Weakly Interacting Massive Particles, the annihilation or decay of these particles in subhalos of the Milky Way would appear as a population of unassociated gamma-ray sources with finite angular extent. The detection of spatial extension in nearby subhalos could provide compelling evidence for a DM interpretation and would serve as an independent cross-check against searches for DM subhalos in the spectral domain. We report on an angular extension catalog based on 7.5 years of Pass 8 data and discuss the implications of these results in the context of searches for both IGMF-induced pair halos and DM subhalos.

Summary

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