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Searches for Angular Extension in High Latitude Fermi-LAT Sources

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We report on the Fermi High-Latitude Extended Source Catalog (FHES), a systematic search for spatial extension of gamma-ray point sources detected with the Fermi Large Area Telescope (LAT) at Galactic latitudes $|b| > 5$ degrees. Point sources listed in the 3FGL and 3FHL catalogs are used for this search. 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. If dark matter 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. Gamma-ray emission from blazars could also be extended (so-called pair halos) due to the deflection of electron-positron pairs in the intergalactic magnetic field (IGMF). The pairs are produced in the absorption of gamma rays in the intergalactic medium and subsequently up-scatter photons of background radiation fields to gamma-ray energies. The measurement of pair halos would constrain the strength and coherence length scale of the IGMF. We report on new extended source candidates and their associations found in the FHES as well as limits on the IGMF based on the non-observation of the cascade.

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