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# Constraints on the antistar fraction in the Solar System neighborhood from the 10-years Fermi Large Area Telescope gamma-ray source catalog

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It is generally taken for granted that the observable Universe does not contain anti-matter objects or domains. Recently, the possible detection of anti-helium nuclei in cosmic rays by AMS-02 challenged this idea and reopened the debate on the existence of nearby reservoirs of antimatter, most plausibly in antistars. As antimatter domains surrounded by normal matter would produce a gamma-ray signal from baryon-antibaryon annihilation, we use the 10-years *Fermi* Large Area Telescope (LAT) gamma-ray source catalog to set constraints on the abundance of antistars in our local Galactic environment. We identify 14 antistar candidates not associated with any object belonging to established gamma-ray source classes and featuring spectra compatible with baryon-antibaryon annihilation. We evaluate the sensitivity of the LAT to antistars and set upper limits on the local antistar fraction with respect to normal stars using both a parametric and a Monte Carlo method. For antistars with properties similar to those of disk-population stars we derive constraints that are 20 times stronger than those previously available. For a primordial population of antistars in the Galactic halo, gamma-ray data combined with microlensing observations constrain the density of antistars to lower than $O(10^{-5}$ pc$^{-3})$ to $O(10^{-2}$ pc$^{-3})$ depending on their masses. Our limits can constrain models for the origin and propagation of anti-nuclei in cosmic rays.

## Keywords

Antistar; Monte Carlo; Antimatter; Unassociated Sources

## Collaboration

## other Collaboration

## Subcategory

Experimental Results

**Primary authors:** DUPOURQUÉ, Simon (IRAP); TIBALDO, Luigi (IRAP); VON BALLMOOS, Peter (IRAP)

**Presenter:** DUPOURQUÉ, Simon (IRAP)

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