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Searching for dark matter annihilation in Galactic substructure with photon statistics

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We propose a novel method to search for signatures of dark matter annihilation in Galactic substructure using gamma-ray data from the *Fermi* Large Area Telescope. The method takes advantage of the fundamentally different photon-count statistics that describe dark matter annihilation from a population of subhalos versus from the smooth Milky Way halo. In addition, it exploits differences in the spatial distribution of subhalos and other astrophysical populations to improve the sensitivity to the substructure signature. We apply this analysis method to simulated *Fermi* data and derive the projected sensitivity to dark matter annihilation in substructure. We can probe theoretically well-motivated regions of parameter space, providing a complementary method to existing dark matter searches.

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