



Contribution ID: 128

Type: Talk

Search for dark matter-related features in the Galactic gamma-ray energy spectra

Thursday 24 July 2025 09:30 (30 minutes)

Dark Matter (DM) particles in the Milky Way's halo could self-annihilate or decay, producing Standard Model (SM) particles such as gamma rays. These processes may generate detectable excesses in the gamma-ray energy spectra observed at Earth. We search for such signatures using a sample of data collected by the Fermi Large Area Telescope in the energy range from 1 GeV to 1 TeV energy range in its first 15 years of operation. We employ a maximum likelihood fitting method with sliding energy windows to identify possible line-like spectral features. Our analysis targets five optimized regions of interest (RoIs), selected to enhance sensitivity to different theoretical DM distributions within the Milky Way's halo, and incorporates a combined likelihood approach. Systematic uncertainties are constrained by using the Galactic Plane as a control region. Additionally, we explore possible box-shaped features that could arise if DM interactions in the halo involve long-lived mediators decaying into gamma-ray final states. Across both scenarios we find no statistically significant excesses. Consequently, we derive new and more stringent upper limits on the DM velocity-averaged annihilation cross section, surpassing previous constraints in the literature.

Internet talk

No

Is this an abstract from experimental collaboration?

Yes

Name of experiment and experimental site

Fermi LAT

Is the speaker for that presentation defined?

Yes

Details

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Session Classification: Cosmology, Astrophysics, Gravity, Mathematical Physics

Track Classification: Main topics: Cosmology, Astrophysics, Gravity, Mathematical Physics