Contribution ID: **69** Type: **Talk**

Searching for dark matter subhalos with the Fermi-LAT

Tuesday, 20 July 2021 12:24 (12 minutes)

ΛCDM predicts the existence of dark matter (DM) subhalos, most of them not massive enough to retain gas (i.e., baryons) and become visible. If DM is composed of Weakly Interacting Massive Particles (WIMPs), we expect them to annihilate in subhalos, producing gamma rays which can be detected with the Large Area Telescope (LAT) onboard the Fermi satellite, and appearing as unidentified sources (unIDs) in the gamma-ray sky. We characterize the LAT sensitivity to DM and compare the sample of unIDs in LAT catalogs - previously filtered according to the expected DM annihilation signal - to predictions from the Via Lactea II (VL-II) N-body cosmological simulation, repopulated with low-mass subhalos below its mass resolution limit. This exercise allows us to place conservative and robust constraints on the annihilation cross section vs. WIMP mass parameter space. A spectral and spatial dedicated analysis is then performed for the best DM subhalo candidates, using a decade of Fermi-LAT data. Finally, we also quantify whether spatial extension is, as often claimed, a "smoking gun"for DM subhalo detection, by simulating the LAT response to extended subhalos. This talk will be based on [1906.11896, 1910.14429] and ongoing work within the Fermi-LAT collaboration.

Keywords

dark matter; indirect detection; gamma rays; N-body simulations

Collaboration

Ferrmi-LAT

other Collaboration

Subcategory

Experimental Results

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Session Classification: Discussion

Track Classification: Scientific Field: DM | Dark Matter