

Search for Gamma-ray Spectral Lines with the Fermi Large Area Telescope

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There is overwhelming evidence that non-baryonic dark matter constitutes $\sim 27\%$ of the energy density of the universe. Weakly Interacting Massive Particles are promising dark matter candidates that may produce monochromatic gamma rays via annihilation or decay. Such interactions would give a narrow spectral line in the Galactic diffuse gamma-ray energy spectrum. We have searched for spectral lines in the energy range 5–300 GeV using 3.7 years of data, reprocessed with updated instrument calibrations and an improved energy dispersion model compared to the previous Fermi-LAT Collaboration line searches. We searched in five regions selected to optimize sensitivity to different theoretically-motivated dark matter density distributions. We did not find any globally significant lines in our a priori search regions and present 95% confidence limits for WIMP annihilation cross sections and decay lifetimes. We will also discuss potential systematic effects in this search and why the significance of the line-like feature near 130 GeV is less than reported in other works.

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