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The Spectrum and Morphology of the Fermi Bubbles

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The Fermi bubbles are two large structures in the gamma-ray sky extending up to 55 deg above and below the Galactic center. We present our analysis of 50 months of Fermi-LAT pass7 reprocessed data from 100 MeV to 500 GeV above 10 deg in Galactic latitude to derive the spectrum and morphology of the Fermi bubbles. We perform a detailed study of the systematic uncertainties due to the modeling of the Galactic diffuse emission. We find a cutoff in the energy spectrum around 110 GeV with more than 7 sigma significance, an excess of the emission in the south-east side of the bubbles, but no evidence for the existence of a jet and no spectral variations as a function of latitude within the systematic uncertainties. The width of the bubble boundary is estimated to be around 3 deg. Both inverse Compton (IC) models and hadronic models including IC emission from secondary leptons fit the gamma-ray data well. In the IC scenario, the synchrotron emission from the same population of electrons can also explain the WMAP and Planck microwave haze with a magnetic field between 5 and 20 μ G.

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