

Search for gamma rays from asteroids in the Solar System with the Fermi LAT

All known small Solar System bodies have a diameter between a few km and a few thousands of km. Based on the collisional evolution of Solar System bodies, Davis et al. proposed in 2002 a model predicting the existence of a larger number of asteroids with diameters down to 10 m. In this work we propose an extension of this model to diameters of a few cm. Like all Solar System bodies, asteroids can be passive sources of high-energy gamma rays, which are produced when energetic charged cosmic rays impinge on their surfaces. Since the majority of known asteroids lie in an orbit between Mars' and Jupiter's orbits (known as the Main Belt), we expect them to produce a diffuse emission close to the ecliptic plane. In this work, we have studied the gamma-ray emission from the ecliptic by using the data collected by the Large Area Telescope (LAT) onboard the Fermi satellite. We have fitted the LAT data with a template model for the diffuse emission of small Solar System bodies obtained with a dedicated simulation based on the FLUKA Monte Carlo toolkit. The fit results provide an upper limit on the total flux, which yields a constraint on the asteroid population model.

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