Preprint Series in Particles and Cosmos Physics
nº IPARCOS-UCM-26-044

4FHL: The Fourth Catalog of Hard {it Fermi}-LAT Sources

by Fermi-LAT Collaboration
(including A. Dominguez as corresponding author)

September 2026

Plaza de las Ciencias, 1 28040 Madrid, Spain
www.ucm.es/iparcos/

INSTITUTO DE FÍSICA
DE PARTÍCULAS Y DEL COSMOS
IPARCOS

UNIVERSIDAD COMPLUTENSE MADRID

INSTITUTO DE FÍSICA
DE PARTÍCULAS Y DEL COSMOS

IPARCOS

Abstract

We present a catalog of sources detected above 50 GeV by the Fermi Large Area Telescope (LAT) on board the Fermi Gamma-ray Space Telescope using 16 years of observations. This is the Fourth Catalog of Hard Fermi-LAT Sources (4FHL), containing 673 objects detected in the 50 GeV-2 TeV energy range. The sensitivity and localization are improved by factors of about 2 relative to the previous LAT catalog at the same energies (i.e., the 2FHL catalog). The increased photon statistics, nearly doubling the number of detections relative to 2FHL, enables more detailed population studies, including the identification of fainter sources detected above 50 GeV. The majority of the sources (84.7%) are associated with extragalactic counterparts, primarily BL Lacertae objects, including 36 objects at a redshift greater than 1. Galactic sources account for 10% of the sample, mainly pulsar wind nebulae and supernova remnants, while about 5% remain unassociated or of uncertain classification. Twenty sources are reported with no counterpart in previous LAT catalogs. The 4FHL catalog provides the deepest all-sky survey above 50 GeV to date. By focusing on this high-energy regime, it provides a fundamental link between space-based gamma-ray observations and the TeV range probed by current and future ground-based observatories. It serves as a useful reference for guiding future observations, including new potential targets for follow-up with Cherenkov telescopes.

UNIVERSIDAD
COMPLUTENSE
MADRID