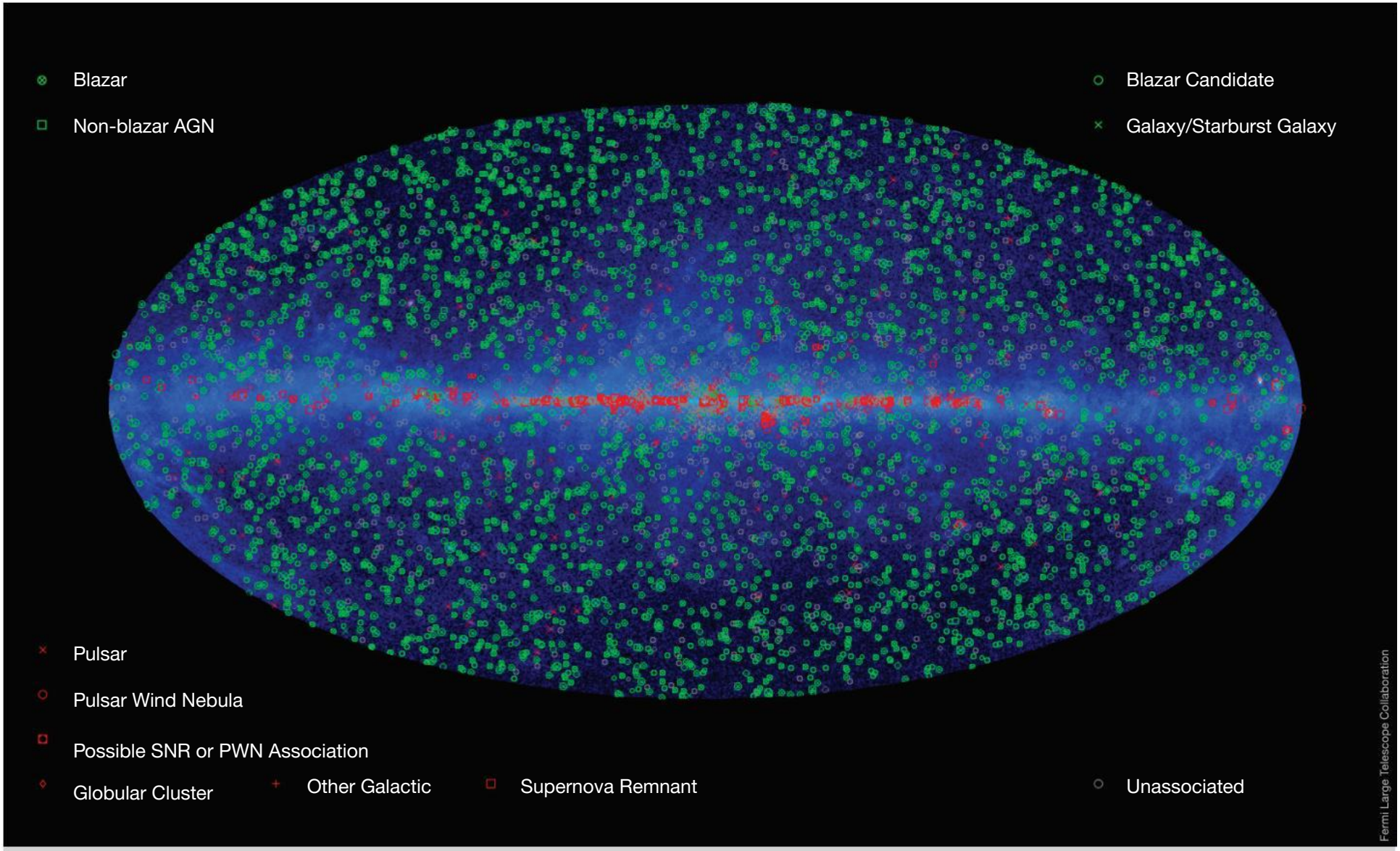
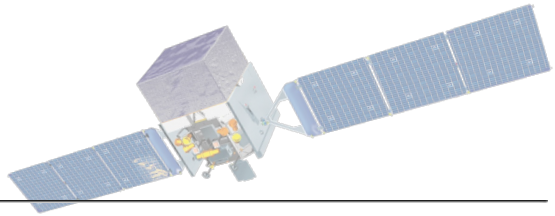
National Aeronautics and Space Administration



Fermi Large Area Telescope 4FGL Catalog. For more information visit http://fermi.gsfc.nasa.gov/

Fourth Fermi LAT Catalog (4FGL)



Characterizing the Sources in the Fourth Fermi LAT Catalog

Astronomical catalogs like the 4FGL Catalog provide a starting point for research. They serve as the basic input for population studies of source classes and offer key information about individual sources that enables deeper analysis. The Fourth Fermi LAT Catalog (4FGL) is no exception and represents the most complete catalog of gamma-ray sources available.

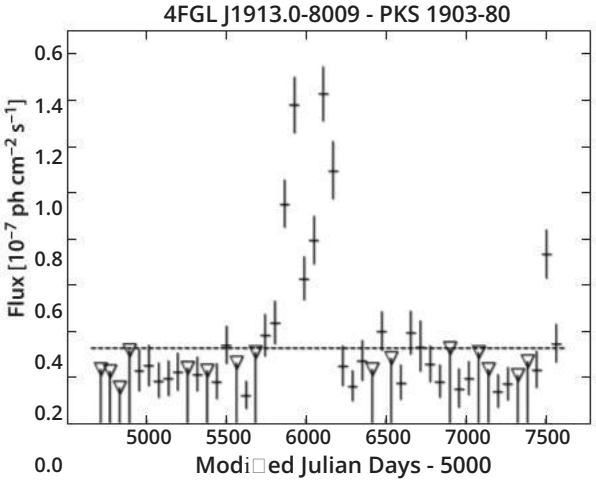
Creating the 4FGL catalog required an understanding of the full gamma-ray sky. Models of diffuse gamma-ray emission from the Galaxy and isotropic emission have been developed, as well as templates for sources that show significant spatial extension. The LAT team simultaneously fits multiple components with a set of seed source locations. This iterative procedure results in a suite of measured parameters for each significantly detected source. The parameters include:

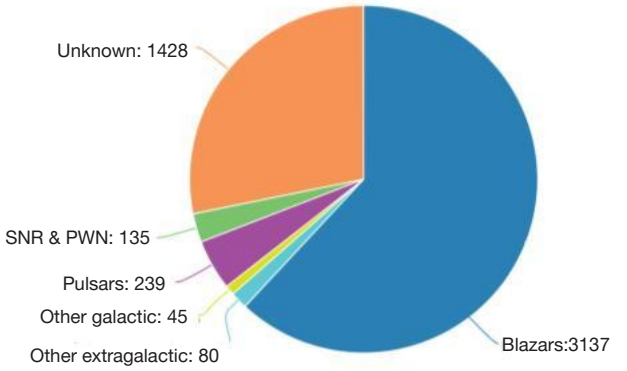
- Position, flux, spectral index, and their uncertainties
- Associations with sources at other wavelengths
- Statistical significance
- Preferred spectral shape

Variability

The 4FGL catalog includes a variability measure for every source. Variability is a valuable tool both for identifying sources and for studying their properties. The strong gamma-ray variability seen in the blazar PKS 1903-80 (graph at left), can be compared to variability at other wavelengths to learn about the high-energy processes taking place in the jet.

PKS 1903-80

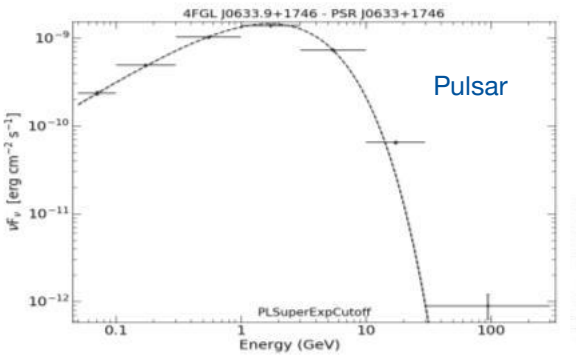


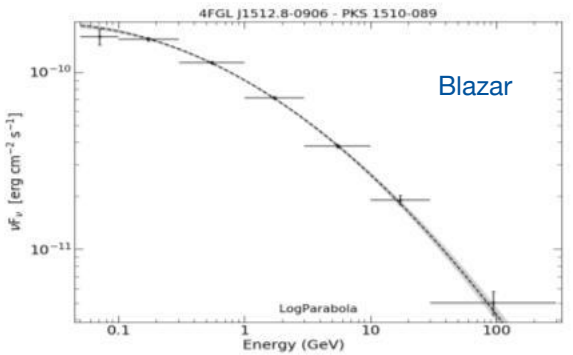


Demographics of the gamma-ray sky
Blazars - Active Galactic Nuclei with jets pointed toward the Earth - constitute the single largest source class seen by Fermi's LAT. The next most common class is "unknown," holding the promise of astrophysics mysteries waiting to be solved. Other types of sources reflect the high-energy, non-thermal nature of all LAT sources.

Gamma-ray energy – a diagnostic of physics

The plots below show the energy spectra of a pulsar and the jet of a blazar. The pulsar shows a sharp cutoff above a few GeV, which is characteristic of the curvature radiation process taking place around this rotating neutron star. By contrast, the blazar jet spectrum shows a much gentler slope that results from processes not yet fully understood.





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