

SciNeGHE 2016 High-energy gamma-ray experiments at the dawn of gravitational wave astronomy



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Gamma-ray catalogs and unidentified sources

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The Fermi Large Area Telescope (LAT) has been surveying the full sky since August 2008. The third LAT source catalog (3FGL, about 3000 sources) is still the largest general gamma-ray catalog, but it is based on only 4 years of data. Going deeper over the full energy band (down to 100 MeV) requires more robust methods.

The analysis is much simpler at high energies due to the good spatial resolution and low confusion. The third high-energy catalog (3FHL above 10 GeV) reaches much deeper in that energy range (yielding about 1700 sources) thanks to the longer data set (7 years) and the improved effective area and point-spread function (from the Pass 8 event reconstruction and classification). It provides a large reservoir of extragalactic targets for pointed TeV instruments.

The fraction of unassociated sources (1/3 in 3FGL at the time of its publication, 1/5 in 3FHL) reflects the balance between the depth of counterpart catalogs and that of the LAT catalogs, as well as the localization precision. Most of those unassociated sources should be of the same types as the major known contributors (BL Lacs above 10 GeV, flat-spectrum radio quasars and pulsars below 10 GeV) but surprises probably hide there.

In terms of numbers of sources and sky coverage, the TeV catalogs are still far from the GeV ones. However, their description of sources in the Galactic plane (particularly extended sources) is often better, thanks to their better spatial resolution.

The next-generation ground-based gamma-ray observatory (CTA) will provide an even deeper, more precise and broader view of the Galactic sources.

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