

# The role of unresolved PWNe to the gamma-ray diffuse emission at GeV

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We recently performed a population study of the HESS Galactic Plane Survey (HGPS) considering the specific assumption that most of the bright TeV gamma-ray sources observed by HESS are powered by pulsar activity, such as PWNe or TeV halos.

In this paper, we discuss the implications of the TeV source population for the interpretation of Fermi-LAT data in the GeV domain.

We show that consistency among HGPS and 3FGL catalogues requires that the ratio  $r \equiv \Phi_{\text{GeV}}/\Phi_{\text{TeV}}$ , where  $\Phi_{\text{GeV}}$  ( $\Phi_{\text{TeV}}$ ) is the integrated gamma-ray flux emitted by sources in the range 1-100 GeV (1-100 TeV) probed by Fermi-LAT (HESS), is typically  $r \sim 500$ .

Considering that the average spectral index of observed sources at TeV energies is  $\gamma \sim 2.4$ , the required value for  $r$  can be only obtained by assuming that sources have spectral break at  $\sim 0.1 - 1.0$  TeV and harder emission spectrum with  $\gamma < 2$  in the GeV domain.

Such spectral shapes are well compatible with the expected gamma-ray emission in young PWNe due to Inverse Compton scattering of high-energy electrons on background radiation fields.

Finally, we show that a relevant fraction of the TeV source population cannot be resolved by Fermi-LAT in the GeV domain. We suggest that unresolved sources can provide a not negligible contribution to the large-scale diffuse emission observed by Fermi-LAT, possibly explaining the spectral hardening of this component toward the galactic center reported by Gaggero et al. 2018, Yang et al. 2016, Acero et al. 2016.

## Keywords

gamma-ray sources; PWN; diffuse emission;

## Collaboration

## other Collaboration

## Subcategory

Theoretical Results

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