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# Fermi-LAT detection of the supernova remnant G312.4-0.4 in the vicinity of 4FGL J1409.1-6121e

by P. Chambery, M. Lemoine-Goumard,  
A. Jardin-Blicq, and J. Eagle (Including A. Sinha)

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Plaza de las Ciencias, 1 28040 Madrid, Spain

[www.ucm.es/iparcos/](http://www.ucm.es/iparcos/)



UNIVERSIDAD  
**COMPLUTENSE**  
MADRID



## Abstract

Gamma-ray emission provides constraints on the non-thermal radiation processes at play in astrophysical particle accelerators. This allows both the nature of accelerated particles and the maximum energy that they can reach to be determined. Notably, it remains an open question to what extent supernova remnants (SNRs) contribute to the sea of Galactic cosmic rays. In the Galactic plane, at around  $312^\circ$  of Galactic longitude, Fermi-LAT observations show an extended source (4FGL J1409.1-6121e) around five powerful pulsars. This source is described by one large disk of  $0.7^\circ$  radius with a high significance of 45 sigma in the 4FGL-DR3 catalog. Using 14 years of Fermi-LAT observations, we revisited this region with a detailed spectro-morphological analysis in order to disentangle its underlying structure. Three sources have been distinguished, including the supernova remnant G312.4-0.4 whose gamma-ray emission correlates well with the shell observed at radio energies. The hard spectrum detected by the LAT, extending up to 100 GeV without any sign of cut-off, is well reproduced by a purely hadronic model.

