

## **Cosmic Rays origin studies in the W 44 region with Fermi-LAT and MAGIC observations**

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W 44 is a well-known Supernova Remnant (SNR) observed in high-energy gamma-rays, widely studied to investigate cosmic ray (CR) acceleration. Several analyses of the W 44 surroundings showed the presence of a gamma-ray emission offset from the radio SNR shell. This emission is thought to originate from escaped high-energy CRs.

We present a detailed analysis of the W 44 region as seen by Fermi-LAT, focusing on the spatial and spectral characteristics of both W 44 SNR and its surroundings. The spatial analysis was limited to energies above 1 GeV in order to exploit the improved angular resolution of the instrument, deriving a detailed description of the region morphology. The spectral analysis was extended down to 100 MeV, favouring the hadronic origin of gamma-rays.

Observations of the North Western region of W 44, also known as SRC-1 from previous works, were conducted with the MAGIC telescopes in the very-high-energy gamma-ray band. We analysed MAGIC data above 130 GeV exploiting the spatial information derived from the Fermi-LAT analysis above 1 GeV.

Here we show the results of both analyses and the combined Fermi-LAT and MAGIC spectra. An interpretation model was developed, assuming that the gamma-ray emission from the surroundings is due to clouds located near W 44 and illuminated by CRs escaping along the SNR's magnetic field lines, thus obtaining constraining information on the diffusion coefficient of the escaped CRs.

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