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High Energy Gamma-Ray Emission from the Coma Cluster Region: Deep Morphological and Spectral Studies.

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The Coma Cluster of Galaxies (at z=0.023) is one of the largest gravitationally-bound astrophysical structures in the local Universe (linear size of more than 2 Mpc). Considering the proximity of Coma in addition to the relatively large intracluster density and the high-velocity accretion shocks (estimated speed of 2-3 thousand km/s) that occur within-cluster, it provides a unique environment to search for high energy (HE) gamma-rays. Using 12.3 years of Fermi-LAT Pass 8 data, we analyzed the Coma cluster region between 100 MeV and 1 TeV energies. Here we report the detection of HE gamma-ray emission from the direction of the Coma cluster with significance ~5.6 sigma, which confirms the first detection of gamma-ray emission toward the Coma cluster region (Xi et al. (2018)). The resulting energy flux is $(1.43 \pm 0.31) \times 10^{-12}$ erg cm^{-2} s^{-1} with $\Gamma = 2.53 \pm 0.22$ photon spectral index. To understand the origin of the γ-ray excess, detailed morphological and spectral studies of the cluster region have been implemented by applying different spatial models based on the residual structures in the 100 MeV-1 GeV and >1 GeV energy bands. Within the Coma cluster's virial radius, two point-like structures have been investigated, at ~ 0.34 Mpc distance from each other. They were successfully modelled with two similar $\Gamma \sim 2.5$ power-law spectral indexes above 100 MeV with the detection significances of 4.2 σ and 3.3 σ, respectively. Finally, we briefly discuss the origin of the detected gamma-ray emission.

Keywords

Gamma Rays from Cluster of Galaxies; Coma Cluster; etc

Collaboration

other Collaboration

Subcategory

Experimental Methods & Instrumentation

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