

Gamma Rays From Galaxy Clusters?

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High-energy emission is expected from clusters of galaxies on a range of scales and via several channels, including processes driven by the AGN within the central brightest cluster galaxy (BCG), acceleration of cosmic rays at merger shocks, and the annihilation of dark matter particles. Hard X-ray and radio synchrotron signatures evidence the presence of non-thermal particles inside the cluster volume, whilst the presence of dark matter is inferred from gravitational effects. Depending on the angular size of the cluster and the source of emission, these signals may be point-like or extended when observed with the Fermi Large Area Telescope (LAT).

Three candidate source samples (totalling ~300 objects) were constructed, of clusters containing a radio-bright BCG, clusters with diffuse non-thermal emission in the radio waveband, and promising targets for dark matter annihilation signatures. LAT data were extracted and analysed for each sample, and in order to imitate a deeper observation, the output fields were stacked. Upper limits calculated on the gamma-ray emission within the target region are at least an order of magnitude more constraining than limits on individual candidate sources. The study has also established significant emission in several fields, the details of which will be presented.

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