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High energy emission component and population of gamma-ray emitting radio galaxies

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In this study, we systematically studied the X-ray to GeV gamma-ray spectra of 61 {\it Fermi} Large Area Telescope (LAT) detected radio galaxies. We found an anticorrelation between peak frequency and peak luminosity in the high-energy spectral component of radio galaxies, similar to blazars. With this sample, we also constructed a gamma-ray luminosity function (GLF) of gamma-ray-loud radio galaxies. We found that blazar-like GLF shapes can reproduce their redshift and luminosity distribution, but the $\log N$-$\log S$ relation prefers models with more low-z radio galaxies. This indicates many low-z gamma-ray-loud radio galaxies. By utilizing our latest GLF, the contribution of radio galaxies to the extragalactic gamma-ray background is found to be 1–10\%. We further investigated the nature of gamma-ray-loud radio galaxies. Compared to radio or X-ray flux-limited radio galaxy samples, the gamma-ray selected sample tends to lack high radio power galaxies like FR-II radio galaxies. We also found that only $\sim$10\% of radio galaxies are GeV gamma-ray loud. Radio galaxies may contribute to the cosmic MeV gamma-ray background comparable to blazars by considering this fraction and their high-energy spectral shape.

Track

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