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The Spectral Index Distribution of Blazars: Prospects for GLAST

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Abstract content

The intrinsic distribution of spectral indices in GeV energies of gamma-ray-loud blazars is a critical input in determining the spectral shape of the unresolved blazar contribution to the diffuse extragalactic gamma-ray background, as well as an important test of blazar emission theories. We present a maximum-likelihood method of determining the intrinsic spectral index distribution (ISID) of a population of gamma-ray emitters which accounts for error in measurement of individual spectral indices, and we apply it to the case of Energetic Gamma-Ray Experiment Telescope (EGRET) blazars. We find that the most likely Gaussian ISID for EGRET blazars has a mean of 2.27 and a standard deviation of 0.20. The most likely ISID is significantly narrower than one would conclude if measurement error had not been taken into account. This in turn implies that the curvature of the unresolved blazar spectrum is expected to be relatively small. We additionally find some indication that FSRQs and BL Lacs may have different ISIDs (with BL Lacs being harder). We also test for spectral index hardening associated with blazar variability, and for dependence of the spectral index on luminosity or redshift, and we find no evidence for any of these effects. Finally, we produce simulated Gamma-ray Large Area Space Telescope (GLAST) spectral index datasets and perform the same analyses. We find that with the improved statistics due to the much larger number of resolvable blazars, GLAST data will help us determine the ISIDs with much improved accuracy. Should any difference exist between the ISIDs of BL Lacs and FSRQs or between the ISIDs of blazars in the quiescent and flaring states, GLAST data will be adequate to separate these ISIDs at a significance better than 3 sigma.

If this paper is presented for a collaboration, please specify the collaboration

Summary

Reference

Proceedings of the 30th International Cosmic Ray Conference; Rogelio Caballero, Juan Carlos D'Olivo, Gustavo Medina-Tanco, Lukas Nellen, Federico A. Sánchez, José F. Valdés-Galicia (eds.); Universidad Nacional Autónoma de México, Mexico City, Mexico, 2008; Vol. 3 (OG part 2), pages 1017-1020

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