

Locating the gamma-ray emission in Flat Spectrum Radio Quasars

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We present a study of the gamma-ray emission from the 9 brightest flat spectrum radio quasars (FSRQs) detected with the Fermi Large Area Telescope (LAT) during its first eight years of operation, with the aim of constraining the location of the gamma-ray emission from these objects.

Using the brightest flares, we find the shortest variability timescales for our sources, which we then use to constrain the size and location of the emission region assuming a simple one zone emission model. The emission was found to be predominantly from the broad line region (BLR). The flares were also studied in more detail to look for evidence of spectral cut-off as well as searching for energy dependence of cooling timescales. We found evidence of gamma-ray absorption which further supports the argument of BLR emission, although the study of energy-dependent cooling is limited by the large uncertainties in both the fluxes and decay timescales for these objects.

Finally, we use simulations to compare the expected onset of the intrinsic cut-off in our sample due to Lyman alpha absorption and compare this with the highest energy photons observed from these bright FSRQs. For most objects, the results are compatible with a BLR origin for the gamma-ray emission, with the exceptions of CTA 102 and PKS 0454-234, suggesting that at least in these objects a more sophisticated emission model is required

Primary author: ACHARYYA, Atreya

Presenter: ACHARYYA, Atreya

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