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Shaping the GeV-spectra of bright blazars

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The non-thermal spectra of jetted Active Galactic Nuclei (AGN) show a variety of shapes and degrees of curvature in their low and high energy components. From some of the brightest Fermi-LAT blazars prominent spectral breaks at a few GeV have been regularly detected which is inconsistent with conventional cooling effects. We propose that the broad variety of spectral shapes including prominent breaks can be understood as an impact of injection modes.

We therefore present an injection model embedded in a leptonic blazar emission model for external Comptonloss dominated jets of AGN which aims towards bridging jet emission with acceleration models using a phenomenological approach.
In our setup we consider the effects of continuous time-dependent injection of electrons into the jet with differing rates, durations, locations and power-law spectral indices, and evaluate its impact on the ambient emitting particle spectrum observed at a given snapshot time. We found that varying the injection parameters has indeed notable influence on the spectral shapes, which in turn can be used to set interesting constraints on the particle injection scenario. We apply our model to the flare state spectral energy distribution of 3C 454.3 and PKS 1510-089 to constrain the required injection parameters. Our results indicate that impulsive-like particle injection is disfavored here.
With this model we provide a basis for analyzing ambient electron spectra in terms of injection requirements, with implications for particle acceleration modes.

Collaboration

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