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Constraining magnetic fields and gamma-ray production zones in blazar jets by fitting the broad-band spectral energy distribution.

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Active galaxies are complex astrophysical objects in that many physical processes occur almost simultaneously. They emit at all electromagnetic frequencies. Active galactic nuclei (AGNs) are the parent class of blazars which are the brightest of active galaxies. There are a number of models that can explain the spectral energy distribution (SED) of blazars. However, the complexity of blazars requires that these models have a relatively large number of parameters, such as the magnetic field in the jet environment, the location region of gamma-ray production, and the doppler factor of the bulk flow of particles in the jets, to name a few. To better understand these objects, work has to be done to place feasible constraints on all the parameters that play a role in the physical processes taking place in blazars. In this work, we place constraints on the gamma-ray production location and the magnetic fields in blazar jets. We place these constraints by doing a pilot case study on the well-studied bright blazar 3C 279. Using a broad-line region (BLR) model we developed in earlier work, we fit the broad-band SED of 3C 279. By accounting for this blazar's broad-line region, we show that the BLR can play an essential role in absorbing gamma-rays; this places some constraints on the location of these gamma-rays. Also, by filling the gamma-ray flux absorbed by the BLR, synchrotron self-Compton (SSC) emission from the electron-positron pairs produced in the BLR gives a way of constraining the magnetic field in blazars.

Track

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