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On the connection of radio and γ-ray emission of blazars

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Blazars are a sub-category of radio-loud Active Galactic Nuclei having their jet pointing towards us and are known for their emission covering practically all frequencies of the electromagnetic spectrum. These sources, in some cases, exhibit a correlation between gamma-ray and radio emission, especially during flaring episodes. In this work, we construct a one zone leptonic model in order to explain these correlations. Adopting the hypothesis that high energy photons are by relativistic electrons close to the central black hole, we study the evolution of this population of particles as they move down the jet and lose energy by radiation and adiabatic expansion. Utilizing a numerical code, we calculate the multi-wavelength emission of these particles as a function of the radial distance which can be translated into a time coordinate once the velocity of the emitting region is known. In this scenario, gamma-rays are produced early on, when the electrons are still very energetic, while radio emission at a later time when the electrons have cooled and the emission region becomes optically thin to synchrotron self-absorption due to expansion. We will discuss the parameters entering our calculations (like the magnetic field strength, the density of relativistic electrons, etc) in connection to the observational data.

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