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EXTREME REGIMES OF EMISSION IN RELATIVISTIC OUTFLOWS

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In the broad-band spectra of blazars there are two broad and widely separated maxima. According to the existing paradigm, the origin of the lower-frequency maximum is explained by the synchrotron radiation of accelerated electrons, and the higher-frequency maximum is produced via inverse Compton radiation from the same population electrons. This paradigm makes it necessary to adopt such physical parameters in the radiating region (magnetic field energy density, electron acceleration rate, etc.), which differ by orders of magnitude from their natural values dictated by dimensional considerations and comparison with other sources of synchrotron radiation. We analyse the extreme regimes of particle acceleration and radiation, discuss physical limits to the parameters of blazars' emitting zones, and show that in many cases model requirements cannot fit into these fundamental limits.

We also propose another paradigm in which both maxima in blazars' spectra are explained by synchrotron radiation of different populations of particles. The higher-frequency maximum is associated with the emission of primary accelerated particles directly in the acceleration zone, and the lower-frequency maximum with emission of secondary electron-positron pairs, which are produced outside of the acceleration zone. Then the required physical parameters in emitting zones of blazars turn out to be close to their natural values, and the resulting spectra qualitatively agree with the observed ones.

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