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Kinetic numerical simulations of particle acceleration mechanisms in relativistically magnetized jets of blazars

High-energy astrophysical phenomena reveal signatures of non-thermal particle energy distributions. Among them stand blazars with very broad photon spectra, from radio up to very high energy (\sim TeV) gamma rays and variability on timescales ranging from decades to minutes. Relativistic magnetic reconnection offers an attractive scenario for the explanation of efficient particle acceleration and multi-scale time variability of the emission. We will present the results of kinetic simulations using the particle-in-cell code Zeltron of relativistic magnetic reconnection that include synchrotron radiation reaction in a domain with open boundaries.

Recent kinetic simulations of magnetized cylindrical jets demonstrated that kink instability can accelerate particles in two special cases: (1) jets supported by gas pressure, and (2) jets supported by poloidal magnetic field. We implemented in Zeltron a generalized cylindrical jet configuration, and we are currently investigating a broad range of models that bridge those two limits.

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