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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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