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Particle Acceleration by Magnetic Reconnection Driven by Current-Driven Kink Instability Turbulence in Relativistic Jets

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We have investigated the acceleration of particles injected into a three-dimensional relativistic magnetohydrodynamic (RMHD) simulations of propagating relativistic jet subject to current-driven (CD) kink instability. RMHD simulations show that, once turbulence driven by CD kink instability fully develops, the amplitude of excited wiggles along the jet spine attains maximum growth, causing disruption of the magnetic field lines and the formation of fast magnetic reconnections. Low-energy protons injected into the jet at this state experience exponential acceleration, mostly in directions parallel to the local magnetic field, up to maximum energies E˜10ˆ{16} eV for B˜ 0.1G. Our results can explain observed variable emission patterns, specially at very high energies observed in blazars.

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