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Shear acceleration in AGN jets

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X-ray observations of kilo-parsec scale jets indicate that a synchrotron origin of the sustained non-thermal emission is likely. This requires distributed acceleration of electrons up to near PeV energies along the jet. The underlying acceleration mechanism is still unclear. Shear acceleration is a promising candidate. We studied the details of shear acceleration by solving the steady-state Fokker-Planck-type equation and provide a simple general solution for trans-relativistic jets for a range of magnetohydrodynamic turbulent power-law spectra. In general, the accelerated particle population is a power-law spectrum with an exponential-like cut-off, where the power-law index is determined by the turbulence spectrum and the balance of escape and acceleration of particles. We find that in this framework the multi-wavelength spectral energy distribution of X-ray jets, such as Centaurus A and 3C 273, can be well explained and protons can be accelerated up to $\sim$ EeV. Relativistic MHD simulations using PLUTO have been performed to physically motivate the shear profile and turbulence spectrum.

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