

Particle acceleration in AGN jets

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Jets of active galactic nuclei are observed from less than parsec scale to mega-parsec scale. They are powerful particle accelerators shining across the electromagnetic spectrum. In this talk, (1) I'll mainly present our analytical and numerical works on shear acceleration. Recent observations indicate a synchrotron origin of X-ray emission in kpc-scale, which requires in-situ acceleration of electrons up to near PeV energies. We found an exact solution of the steady-state Fokker-Planck equation for shear acceleration. This produces a power-law spectrum with an exponential-like cut-off for particles, which can naturally explain the multi-wavelength observations of the kpc-scale jets, such as Centaurus A and 3C 273. Our relativistic MHD simulations and test-particle simulations validate the assumptions of our analytical theory and show that protons can be accelerated to the Hillas limit via shear acceleration. (2) I'll also briefly discuss the particle acceleration mechanisms in sub-pc scale jets, especially for the limb-brightened structures.

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