

W16a Wakefield Acceleration in the M87 Jet

Yoshiaki Kato (RIKEN), Toshikazu Ebisuzaki (RIKEN), Toshiki Tajima (UCI)

We investigate electromagnetic pulses in one of the powerful radio jet in M87. The recent observations have revealed that the origin of its jet has been constrained within a few tens of Schwarzschild radii in the vicinity of the supermassive black hole. We therefore consider the strong Alfvénic impulses generated by episodic eruptive accretions in the innermost region of a magnetized accretion disk, which give rise to the collective ponderomotive forces. Such a ponderomotive force provides the so-called wakefield acceleration of the charged particles. This acceleration mechanism has advantages over the Fermi acceleration because the characteristic length scale is relatively short and the efficiency is robust, and therefore it is one of the most promising mechanisms for a central engine of the M87 jet. By measuring the collimation profile in the M87 jet from the latest observations, we examine the characteristic length scales of the wakefield acceleration under the astrophysical context. We also discuss implications of jets in the stellar-mass black holes.