Abstract Submitted
for the DPP17 Meeting of
The American Physical Society

Astrophysical ZeV acceleration in the jets from an accreting blackhole TOSHIKI TAJIMA, University of California, Irvine, TOSHIKAZU EBISUZAKI, AKIRA MIZUTA, RIKEN, Japan — An accreting blackhole produces extreme amplitude Alfven waves whose wavelength (wave packet) size is characterized by its clumsiness. The ponderomotive force driven by the bow wake of these Alfven waves propagates along the AGN (blazar) jet, and accelerates protons/nuclei to extreme energies beyond Zetta-electron volt (ZeV $=10^{21}$ eV)[Ebisuzaki,Tajima (2014)]. Such acceleration is linear and does not suffer from the multiple scattering/bending involved in the Fermi acceleration that causes excessive synchrotron radiation loss beyond 10^{19} eV. This bow wake acceleration was confirmed one-dimensional particle-in-cell simulations[Lau et al (2015)]. General relativistic Magneto-hydrodynamics simulations also show the intermittent eruptions of electro-magnetic waves from the innermost region of the accretion disk around a black hole [Mizuta et al (2017) priv. comm.]. The production rate of ultra-high energy cosmic rays in M82 starburst galaxy is estimated from its gamma-ray luminosity and is found to be consistent with the observed flux of the northern hot spot by Telescope Array[Abbasi et al (2014)]. We will discuss the possible acceleration in an intermediate mass black hole candidate M82 X-1 and the magnetic bending in the cosmological filaments in the local super cluster.

Toshiki Tajima
University of California, Irvine

Date submitted: 07 Jul 2017 Electronic form version 1.4