Contribution ID: **11** Type: **not specified**

Launching magnetized relativistic jets and cosmic ray acceleration by wake field acceleration by strong Alfvenic wave.

Thursday, 15 October 2015 11:25 (20 minutes)

Astrophysical jets which are collimated plasma flows are observed in many astrophysical systems in the universe. The jets from the system of super-massive black hole (M˜10ˆ8 solar masses) and accreting gas are known as the active galactic nuclei (AGN) jet. The bulk speed of AGN jet is highly relativistic, i.e., almost speed of light. The physical mechanisms of how the AGN jet is launched and how the AGN jet is accelerated to relativistic speed are not well understood yet. The AGN jet is also known as a strong candidate for the acceleration site of ultra high energy cosmic rays (UHECRs) up to 10ˆ{20}eV. It is not still under debate where is the acceleration site and how UHECRs are accelerated. We study comprehensibly these issues by taking into account a magnetic field, since the magnetic fields play an important role in the accretion disks and launching process of the jet. We have performed 3 dimensional general relativistic magnetohydrodynamic simulations of this system. We observed magnetized outflow is intermittently launched. This jet includes strong magnetic fields. The possibility of UHECRs acceleration by wake field acceleration by relativistic strong Alfven waves inside the jet is discussed.

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Session Classification: Applications Physics of Giant Acceleration

Track Classification: Presentations