

Competition of magnetic reconnections driven by self-generated magnetic fields and an external magnetic field

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Magnetic reconnection is one of the fundamental factors in the universe. We have investigated magnetic reconnections in laser produced plasmas driven by self-generated magnetic fields [1]. By irradiating a solid target with several beams of high-power laser pulses with finite focal spot displacements, we generate magnetic bubbles by baroclinic effect from null initial condition, and thus, magnetic reconnection can take place [1]. We also used an external magnetic field, where magnetic reconnection can be also driven by stretching the magnetic field due to plasma kinetic energy [2]. We observed spatial and temporal plasma evolutions with optical diagnostic. The local temperature, density, and velocity of electrons and ions are obtained by Collective Thomson Scattering (CTS). Observations of self-emission images provides time evolution of plasma jets. Further time passes, the plasma jet starts to separate and forms two plasma jets. These experimental results strongly indicate magnetic reconnections mainly driven by self-generated magnetic fields. There is a separation in longitudinal direction which indicates magnetic reconnection of the external magnetic field.

References:

[1] N. Khasanah et al., HEDP (2016).

[2].Y. Kuramitsu et al., PSROC (2017)