3rd Asia-Pacific Conference on Plasma Physics, 4-8,11.2019, Hefei, China

Role of anamolous diffusivity on plasmoid formation in magnetic reconnection

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Magnetic reconnection is one of the fundamental processes in plasma physics that can lead to efficient conversion of magnetic energy into kinetic energy of the plasma. Apart from its occurrence in laboratory fusion devices, reconnection of magnetic field lines can play an important role in various astrophysical phenomena related to stellar coronae, planetary magnetospheres, active regions of accretion disk and interstellar medium [1]. Although numerical simulations have played a significant role in improving the understanding of reconnection phenomena, influence of strongly non-linear kinetic processes such as hydro-magnetic turbulence, various plasma instabilities etc. is still clearly not understood largely on account of computation challenges associated with simulation of these processes. Typically, such processes are modeled in MHD framework by introducing anomalous magnetic diffusivity. In this work, we aim to perform systematic study of role of diffusivity profile on the topology of magnetic fields in the reconnection process.

The simulations are performed with an open-source 2-D resistive MHD code, openMHD [2]. In particular, we investigate role of magnetic diffusivity profile on formation and coalescence of plasmoids and its influence on magnetic reconnection rate. We also study effect of magnetic field dependent ambipolar diffusivity [3] on physics of magnetic reconnection. Such diffusivity is expected to arise in partially ionized plasmas or due to the strong back-reaction of helical turbulence [4]. Results of numerical simulations along with its physical significance will be discussed in detail.

References
[1] M. Yamada et. al, Rev. Mod. Phys. **82**, 603 (2010)
[2] Zenitani, Phys. Plasmas, **22**, 032114 (2015)
[3] E. Zweibel, Astrophysical Journal, **329**, 384 (1988)
[4] K Subramanian, Phys. Rev. Lett. **83(15)**, 2957 (1999)