

Abstract Submitted
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Merging Spheromak as Axisymmetric Plasma Equilibrium with Flow JANG-YU HSU, Department of Physics and Plasma and Space Science Center, NCKU, Tainan, Taiwan, CHANGMO RYU, Department of Physics, Postech, Pohang 790-784, Korea — It was reported that merging two spheromaks with opposite toroidal magnetic fields does not always lead to another spheromak, but may relax to a Field Reversed Configuration (FRC) with a high- β value when the initial magnetic helicity is below certain critical value. The high- β FRC rules out the relaxation to the force-free Taylor state. The plasma is self-organized under other invariant than the magnetic helicity. It was shown by Montgomery et. al. that maximizing the entropy for the given total current leads to the canonical profile. Hsu et. al. applied successfully the total current constraint to describe the tokamak plasma relaxation to bifurcated equilibrium solutions. The current conservation seems likely during the annihilation process of equal but opposite currents of merging spheromaks. In this paper, we show that a poloidal flow faster than the poloidal Alfvén velocity provides a high- β plasma equilibrium. As the toroidal current is annihilated and the poloidal Alfvén velocity is vanishingly small, it goes to the hydrodynamic limit.

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