Abstract Submitted
for the DPP19 Meeting of
The American Physical Society

Multi-parallel-component fluid theory for magnetically confined plasmas[1] LINJIN ZHENG, University of Texas at Austin, Institute for Fusion Studies — Braginskiis two fluid theory has been widely used in this field both for theoretical analyses and numerical simulations. It extends the ideal MHD to count for the different responses from the ion and electron species. Note that Braginskiis two fluid theory relies on the high collisionality assumption, while in reality the magnetically confined plasmas in thermonuclear fusion turn to be collisionless. One cannot simply introduce the parallel fluid velocities, since some charged particles are trapped by the equilibrium field or perturbed waves and some others are circulating. To solve this difficulty the multi-parallel-component fluid theory is developed, which modifies the Braginskii two fluid theory by relaxing the collisional dominance assumption. In the perpendicular direction the particle spatial localization is solo resulted from the strong magnetic field, while the finite Larmor radius (FLR) effects are taken into account in the next order. In the parallel direction the particle mobility feature is fully retained by introducing the multi-parallel-component fuild model. Comparision with Braginskiis two fluid theory will be detailed and the application of new theory will be discussed. [1] Linjin Zheng, IOP Concise Physics: Magnetically Confined Fusion Plasma Physics.

[1]This research is supported by Department of Energy Grants DE-FG02-04ER54742.

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Date submitted: 02 Jul 2019

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