Abstract Submitted
for the DPP13 Meeting of
The American Physical Society

Properties of two-fluid flowing equilibria observed in double-pulsing coaxial helicity injection on HIST T. KANKI, Japan Coast Guard Academy, M. NAGATA, University of Hyogo — Multi-pulsing coaxial helicity injection (M-CHI) method which aims to achieve both quasi-steady sustainment and good confinement has been proposed as a refluxing scenario of the CHI. To explore the usefulness of the M-CHI for spherical torus (ST) configurations, the double-pulsing operations have been carried out in the HIST, verifying the flux amplification and the formation of the closed flux surfaces after the second CHI pulse. The purpose of this study is to investigate the properties of the magnetic field and plasma flow structures during the sustainment by comparing the results of plasma flow, density, and magnetic fields measurements with those of two-fluid equilibrium calculations. The two-fluid flowing equilibrium model which is described by a pair of generalized Grad-Shafranov equations for ion and electron surface variables and Bernoulli equations for density is applied to reconstruct the ST configuration with poloidal flow shear observed in the HIST. Due to the negative steep density gradient in high field side, the toroidal field has a diamagnetic profile (volume average beta, $<\beta>$=68 %) in the central open flux column region. The ion flow velocity with strong flow shear from the separatrix in the inboard side to the core region is the opposite direction to the electron flow velocity due to the diamagentic drift through the density gradient. The electric field is relatively small in the whole region, and thus the Lorentz force nearly balances with the two-fluid effect which is particularly significant in a region with the steep density gradient due to the ion and electron diamagnetic drifts.

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Date submitted: 11 Jul 2013 Electronic form version 1.4