

Abstract Submitted
for the DPP05 Meeting of
The American Physical Society

Spheromak plasma flow injection into a torus chamber and the HIST plasmas AKINORI HATUZAKI, RYOHEI NISHIMOTO, YUJI OHNISHI, NAOYUKI FUKUMOTO, MASAYOSHI NAGATA, University of Hyogo — The importance of plasma flow or two-fluid effect is recognized in understanding the relaxed states of high-beta torus plasmas, start-up and current drive by non-coaxial helicity injection, magnetic reconnection and plasma dynamo in fusion, laboratory and space plasmas. As a new approach to create a flowing two-fluid plasma equilibrium, we have tried to inject tangentially the plasma flow with spheromak-type magnetic configurations into a torus vacuum chamber with an external toroidal magnetic field (TF) coil. In the initial experiments, the RFP-like configuration with helical magnetic structures was realized in the torus vessel. The ion flow measurement with Mach probes showed that the ion flow keeps the same direction despite the reversal of the toroidal current and the axial electric field. The ion fluid comes to flow in the opposite direction to the electron fluid by the reversal of TF. This result suggests that not only electron but also ion flow contributes significantly on the reversed toroidal current. In this case, the ratio of u_i to the electron flow velocity u_e is estimated as $u_i/u_e \sim 1/2$. We also will inject the spheromak flow into the HIST spherical torus plasmas to examine the possibilities to embedding the two-fluid effect in the ST plasmas.

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Date submitted: 24 Jul 2005

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