Abstract Submitted
for the DPP17 Meeting of
The American Physical Society

Improved computation of two-fluid flowing equilibrium of spherical torus T. KANKI, Japan Coast Guard Academy, M. NAGATA, University of Hyogo — Two-fluid equilibrium system with small but non-zero two-fluid parameter is identified as a singular perturbation problem. This singularity is eliminated by nearby-fluids ordering that the ion and electron flow surfaces are assumed to be close to each other but do not coincide exactly [1]. This elimination of the singularity facilitates to obtain numerical equilibrium solution, but leads to a pseudo singularity when the Alfvn Mach number corrected by this ordering approaches unity. For solving this problem, a new equilibrium solver is developed to perform a high-speed, high-accuracy computation without using this ordering. This solver employs a high-speed iterative method, the multi-grid method to reduce an increase in CPU time due to an increase in the mesh numbers. The purpose of this study is to apply this solver to a two-fluid equilibrium for geometry and boundary conditions of the NSTX device and to investigate the convergence properties of the numerical solution and the CPU time. Numerical experiments show that the convergence rate of the residual for the numerical solution is kept at approximately constant with respect to the iteration number of the outer loop and that the average value of the toroidal current density at the symmetry plane converges at the inverse square with respect to the mesh numbers. The multi-grid method is effective for solving the two-fluid flowing equilibrium equations with numerical stability and high accuracy. [1]L.C. Steinhauer and A. Ishida, Phys. Plasmas **13**, 052513 2006.

T. Kanki
Japan Coast Guard Academy

Date submitted: 12 Jul 2017 Electronic form version 1.4