Abstract Submitted
for the DPP06 Meeting of
The American Physical Society

Computation of two-fluid, flowing equilibria[1] LOREN STEINHAUER, University of Washington, TAKASHI KANKI, Japan Coast Guard Academy, AKIO ISHIDA, Niigata University — Equilibria of flowing two-fluid plasmas are computed for realistic compact-toroid and spherical-tokamak parameters. In these examples the two-fluid parameter ε (ratio of ion inertial length to overall plasma size) is small, $\varepsilon \sim 0.03 - 0.2$, but hardly negligible. The algorithm is based on the nearby-fluids model [1] which avoids a singularity that otherwise occurs for small ε. These representative equilibria exhibit significant flows, both toroidal and poloidal. Further, the flow patterns display notable flow shear. The importance of two-fluid effects is demonstrated by comparing with analogous equilibria (e.g. fixed toroidal and poloidal current) for a static plasma (Grad-Shafranov solution) and a flowing single-fluid plasma. Differences between the two-fluid, single-fluid, and static equilibria are highlighted: in particular with respect to safety factor profile, flow patterns, and electrical potential. These equilibria are computed using an iterative algorithm: it employs a successive-over-relaxation procedure for updating the magnetic flux function and a Newton-Raphson procedure for updating the density. The algorithm is coded in Visual Basic in an Excel platform on a personal computer. The computational time is essentially instantaneous (seconds). [1] L.C. Steinhauer and A. Ishida, Phys. Plasmas **13**, 052513 (2006).

[1]This work was supported by the US Department of Energy

Loren Steinhauer
University of Washington

Date submitted: 21 Jul 2006 Electronic form version 1.4