Abstract Submitted
for the DPP15 Meeting of
The American Physical Society

Kinetic equilibria of very high-β plasmas LOREN STEINHAUER, Tri Alpha Energy, TAE TEAM — Plasma equilibria with many large ion orbits, such as an advanced beam-driven field-reversed configuration, are neither static (Grad-Shafranov) nor describable as a flowing, multi-fluid. A fully-kinetic treatment of the ions is essential for such high-β plasmas. A kinetic equilibrium is needed to properly support realistic stability and transport analyses, both of which are strongly affected by large-orbit ions. A hybrid equilibrium model has been developed with a fully-kinetic treatment of both thermal ions and a rapidly-rotating "beam-ion" component, such as produced by neutral beam injection, relevant to the C-2U experiments at TAE. It employs analytic Vlasov solutions in that the distribution depends only on the two constants of motion, the Hamiltonian (H) and the canonical angular momentum (P_θ). Electrons are treated as a pressure-bearing fluid. Since realistic forms of $f(H,P_\theta)$ are affected by collisions, f is limited to solutions of a simplified Fokker-Planck equation. Importantly, a kinetic end-loss condition applies to unconfined ions, using a particle sink at a rate consistent with Monte-Carlo-like simulations of end loss accounting for a strong end mirror.

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Date submitted: 27 Jul 2015 Electronic form version 1.4