Abstract Submitted
for the DPP96 Meeting of
The American Physical Society

Sorting Category: 5.1.4 (theoretical)

Stable Equilibria for Bootstrap-Current Driven Low Aspect Ratio Tokamaks[1] R.L. MILLER, Y.R. LIN-LIU, A.D. TURNBULL, V.S. CHAN, *General Atomics*, L.D. PEARLSTEIN, *Lawrence Livermore National Laboratory*, O. SAUTER, *Centre de Recherches en Physique des Plasmas* — Low aspect ratio tokamaks (LATs) can potentially provide a high ratio of plasma pressure to magnetic pressure β and high plasma current I at a modest size. A high value of the Troyon factor $\beta_{\rm N}$ and strong shaping is required to allow simultaneous operation at high β and high bootstrap fraction. We quantify the ideal MHD stability of a range of equilibria at aspect ratio 1.4 by systematically varying the pressure profile and cross-section shape. Profiles are constrained in such a way as to assure complete bootstrap current alignment with a bootstrap current fraction, $f_{\rm bs} = I_{\rm bs}/I_{\rm p}$, near unity. Plasma β increases with plasma elongation up to the highest elongation studied, $\kappa = 3$. Optimal triangularity is 0.4–0.5 due to the fully bootstrap-driven requirement. Equilibria exist with $f_{\rm bs} = 99\%$, $\beta_{\rm N} \geq 8$, and $\beta \sim 35\%$–55% (depending upon elongation) which are stable to ballooning modes, and stable to $n = 1, 2, 3$ kink modes with wall stabilization.

[1]Work supported by U.S. DOE Grant DE-FG03-95ER54309, Contract W-7405-ENG-48, and in part by the Swiss National Science Foundation.

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Special instructions: X-1-4

Date submitted: February 20, 1997 Electronic form version 1.1