Abstract Submitted
for the APR09 Meeting of
The American Physical Society

Plasma Equilibria With Stochastic Magnetic Fields[1] J.A. KROMMES, A.H. REIMAN, Princeton University — Plasma equilibria that include regions of stochastic magnetic fields are of interest in a variety of applications, including tokamaks with ergodic limiters and high-pressure stellarators. Such equilibria are examined theoretically, and a numerical algorithm for their construction is described.[2,3] The balance between stochastic diffusion of magnetic lines and small effects[2] omitted from the simplest MHD description can support pressure and current profiles that need not be flattened in stochastic regions. The diffusion can be described analytically by renormalizing[4] stochastic Langevin equations for pressure and parallel current $j_\parallel$, with particular attention being paid to the satisfaction of the periodicity constraints in toroidal configurations with sheared magnetic fields. The equilibrium field configuration can then be constructed by coupling the prediction for $j_\parallel$ to Ampére's law, which is solved numerically.

[1]Work supported by U.S.D.o.E. Contract No. DE-AC02-76-CHO-3073.
[2]A. Reiman et al., Pressure-induced breaking of equilibrium flux surfaces in the W7AS stellarator, Nucl. Fusion **47**, 572–8 (2007).
[3]J. A. Krommes and A. H. Reiman, Plasma equilibrium in a magnetic field with stochastic regions, submitted to Phys. Plasmas.
[4]J. A. Krommes, Fundamental statistical theories of plasma turbulence in magnetic fields, Phys. Reports **360**, 1–351.

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Date submitted: 13 Jan 2009 Electronic form version 1.4