

Abstract Submitted
for the DPP09 Meeting of
The American Physical Society

**Characterization of Meta-Stable Equilibria of a Electron Plasma:
Relaxation Towards Minimum Enstrophy and Maximum Entropy States**

DOUGLAS RODGERS, SERGIO SERVIDIO, WILLIAM MATTHAEUS, Department of Physics and Astronomy, University of Delaware, Newark, DE 19716, DAVID MONTGOMERY, Department of Physics and Astronomy, Dartmouth College, Hanover, NH 03755, TRAVIS MITCHELL, Department of Physics and Astronomy, University of Delaware, Newark, DE 19716 — Dynamical relaxation of a pure electron plasma in a Malmberg-Penning trap is studied, comparing experiments and statistical theories of weakly dissipative two-dimensional turbulence [1]. Statistical analysis of many experimental runs favors a theoretical picture of relaxation to a near-maximum entropy state with constrained energy, circulation and angular momentum, rather than to a minimum enstrophy state [2]. However it is possible to vary experimental parameters continuously so that the results move from near-equal accord with the two theories to more strongly favoring maximum entropy. One way to accomplish this is to vary the initial distribution so that more complex electron patches are produced; this generally appears to increase the level of turbulent activity, favoring maximum entropy over minimum enstrophy. Research supported in part by USDOE Grant No. DE-FG02-06ER54853. [1] D. J. Rodgers et al, Phys. Rev. Lett., 102(24):244501, 2009. [2] X. -P. Huang, C. F. Driscoll, Phys. Rev. Lett., 72(14):2187, 1995

Douglas Rodgers
Department of Physics and Astronomy,
University of Delaware, Newark, DE 19716

Date submitted: 15 Sep 2009

Electronic form version 1.4