Abstract Submitted
for the DPP16 Meeting of
The American Physical Society

Cylindrically-Symmetric Equilibria in Ideal MHD with Fractal Pressure Profiles[1] BRIAN KRAUS, STUART HUDSON, Princeton Plasma Physics Laboratory — In ideal magnetohydrodynamics, unphysical, pressure-driven currents exist where flux surfaces with rational rotational transform coincide with pressure gradients, a situation Grad termed "pathological" [1]. As an alternative, we construct a non-trivial, continuous pressure profile that is flat on sufficiently wide intervals near each rational surface. Such a profile must be self-similar and thus fractal, because intervals of flat pressure exist around high-order rational surfaces at all scales. This infinite-resolution fractal pressure is analyzed as a homeomorphism of the Cantor set. Additionally, an algorithm has been written to numerically produce an approximation of the pressure profile, where only a finite number of rational surfaces are considered. Using this algorithm, we investigate the magnetic field and current profiles associated with the fractal pressure and a given rotational transform in cylindrical geometry. [1] H. Grad, Phys. Fluids 10 (1), 137 (1967).

[1]This work was supported by DOE contract DE-AC02-09CH11466.

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Date submitted: 15 Jul 2016 Electronic form version 1.4