Abstract Submitted
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Flow Stability in Closed Magnetic Field Geometry[1] GRIGORY KAGAN, PETER CATTO, MIT Plasma Science and Fusion Center — Simple dipole solutions of the Grad-Shafranov equation are known to exist [1,2]. Reference [1] gives the solution for a stationary magnetic dipole, while [2] presents a solution for a toroidally rotating dipole plasma. The MHD stability of the first solution was investigated in [3]. However, the stability of the second is far more difficult to analyze. This difficulty is a reflection of a fundamental MHD problem - the impossibility of a general Energy Principle formulation for an equilibrium with flows. The current work is aimed at analyzing the stability of the simplest limit case of a rotating dipole solution - a hard core Z-pinch with sheared axial flow. We focus on an axial flow with a particular dependence on radius that results in the simplest possible eigenvalue equation. Stable solutions are found that may be relevant to dipole configurations such as Jupiter and the Levitated Dipole Experiment (LDX). [1] "A Magnetic Dipole Equilibrium Solution at Finite Plasma Pressure," S. I. Krasheninnikov, P. J. Catto and R. D. Hazeltine, Phys. Rev. Lett. 82, 2689 (1999). [2] "Effects of Rotation on a Finite Plasma Pressure Equilibrium in a Dipolar Magnetic Field" by P. J. Catto and S. I. Krasheninnikov, Phys. Letts. A 258, 153 (1999). [3] "Resistive Stability of Magnetic Dipole and Other Axisymmetric Closed Field Line Configurations." A. N. Simakov, P. J. Catto, J. J. Ramos and R. J. Hastie, Phys. Plasmas 9, 4985 (2002).

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