Abstract Submitted
for the DPP09 Meeting of
The American Physical Society

Magnetization force in plasma physics[1] ROBERT JOHNSON, Alphawave Research — The magnetization force is well documented in materials science, thus it needs to be addressed in the context of plasma physics. Generalization of the macroscopic force densities by Lorentz-Kelvin and Korteweg-Helmholtz yields an expression $\mathbf{J} \times \mathbf{B} + \nabla \mathbf{M} \cdot \mathbf{B}$ appropriate for magnetized plasma. Application to the stationary equilibrium equation indicates its presence is necessary to enforce the reduction to the standard form in the limit of vanishing magnetization. A numerical investigation of an axially symmetric configuration confirms this behavior. Application to toroidal geometry indicates that no stationary solution exists for a curved plasma column.

[1]arXiv: 0806.4698, 0901.0732

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Date submitted: 18 Jul 2009 Electronic form version 1.4