Abstract Submitted
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Evidence of "Natural" Density Profiles in a Dipole-Confined Plasma[1] A.C. BOXER, J.L. ELLSWORTH, J. KESNER, MIT PSFC, D.T. GARNIER, M.E. MAUEL, Columbia University — Theoretical considerations suggest that a plasma confined by the field of dipole magnet will adopt "natural" pressure and density profiles that are not flat but centrally peaked. The "natural" pressure profile is $\delta(pV^\gamma) = 0$ which is the marginal condition for stability against MHD interchange modes driven by pressure gradients. Similarly, the density will be driven to the profile $\delta(nV) = 0$, which corresponds to an equal number of particles per flux-tube, by MHD induced flux tube mixing. The Levitated Dipole Experiment (LDX) is remarkable in that dipole-confined plasmas can be studied under conditions in which parallel losses have been eliminated. Using a four-channel microwave interferometer, we report observations of LDX plasmas spontaneously self-organizing into the preferred, "natural" density profile. The interferometer array makes these observations with unprecedented clarity, whether in the laboratory or in nature. We present, in addition, characterizations of how LDX plasmas densities are affected by levitation of the central dipole-coil and by scans of vacuum pressure, microwave heating, and plasma species.

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