Abstract Submitted
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Measurement and modeling of the electron pressure profiles in the Levitated Dipole Experiment (LDX)[1] M. DAVIS, D. GARNIER, M. MAUEL, Columbia University, J. KESNER, MIT Plasma Science and Fusion Center — Electron pressure profiles in plasmas confined by a dipole are predicted to be centrally peaked whenever cross-field turbulent transport dominates over parallel losses to the poles. This central peaking of the pressure has been observed in planetary magnetospheres by spacecraft during times of magnetic activity. Using magnetic reconstructions and X-ray measurements, we also find the electron pressure is centrally peaked in the LDX laboratory magnetosphere. LDX can operate in two distinct modes: mechanically supported and magnetically levitated. When the superconducting dipole magnet is mechanically supported the electron pressure results entirely from energetic trapped electrons and the pressure gradients can exceed the MHD stability criterion because of gyrokinetic effects. Levitation strongly alters the plasma density due to the inward particle pinch [1], and increases the stored plasma energy. By comparing models of the electron pressure profile to equilibrium reconstructions and X-ray measurements we find that the thermal pressure profiles appear to be consistent with expectations of turbulent adiabatic equipartition.

[1] A. C. Boxer, et al., Nature Phys. 6, 207 (2010)

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