Abstract Submitted
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Prospects for Driven Particle Convection Tests in LDX[1] M.E. MAUEL, D.T. GARNIER, Columbia University, A.C. BOXER, J.E. ELLSWORTH, J. KESNER, MIT PSFC — An attractive consequence of the shear-free magnetic field of levitated dipole confinement devices is the possibility of using advanced fusion fuel cycles [Kesner et al., NF 44(2004)193]. When the pressure and density profiles are isentropic, convective interchange mixing transports particles but does not necessarily transport heat. In shear-free magnetic fields, low-frequency convective circulation is interchange-like and the size scale of the largest circulation motion extends to fill the confinement volume. As a consequence, particles may be convected from the hot central region to the edge in times much less than the energy confinement time. One goal of the Levitated Dipole Experiment (LDX) is to investigate the relative energy and particle time scales and also to explore active means to induce rapid particle circulation that do not alter the dipole's highly peaked, and isentropic, pressure profiles. Experiments that are planned include the following: (1) optical measurement of localized density and impurity transport, (2) flux-tube charging with insertable bias probes, (3) the impact of localized field errors on convective cell formation, and (4) the application of a weak toroidal field to limit the radial extent of convection and prevent inward particle transport to the dipole magnet.

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