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Flying Lessons: the Levitated Dipole Experiment without parallel losses[1] D.T. GARNIER, M.E. MAUEL, Columbia University, R.M. BERGMANN, A.C. BOXER, J.L. ELLSWORTH, J. KESNER, P.C. MICHAEL, P. WOSKOV, MIT PSFC — The Levitated Dipole Experiment (LDX) is designed to study the closed field line dipole magnetic geometry where the plasma stability is provided by compressibility and where plasma convection may allow for $\tau_E > \tau_p$. Over the past year, LDX has operated with physical supports removed from the plasma such that no plasma losses occur along field lines and has accrued over 18 hours of flight time. We note several differences with supported operation. Improved confinement of the bulk plasma is observed with higher densities achieved with reduced neutral fueling. Fast particle confinement is also improved as we observe higher diamagnetic currents. We observe a larger stable operating space to the hot electron interchange mode, due to a denser stabilizing bulk plasma, and a broader profile of the radially diffusing hot electrons. We now observe low frequency modes leading to radial convection of plasma density. A new 10.5GHz heating system has lead to higher plasma density and stored energy, and greater flexibility in heating profile. Upgrades to diagnostics (to study convective modes), the levitation control system (to improve isolation from plasma diamagnetism), and heating systems are planned.

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D.T. Garnier
Columbia University

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