Abstract Submitted
for the DPP14 Meeting of
The American Physical Society

Dipole Transport: a New Confinement Paradigm[1] J. KESNER, MIT Plasma Science Fusion Center, D. GARNIER, M. MAUEL, Columbia University — In a tokamak-like device turbulence will grow up to a level determined by non-linear processes. The associated transport, in combination with particle and energy sources then determines the density and temperature profiles of the plasma. This paradigm is fundamentally different for a plasma that is confined in a dipole field. In a dipole, levitated to avoid losses to the supports, the plasma will assume a stationary profile determined only by the specific volume, $V(\psi)$, (which is determined by the magnetic geometry). Independent of the source and sink profiles for particles and energy, turbulence will grow up to a sufficient level so that diffusion and pinch dynamics will establish stationary profiles characterized by $n_e \propto 1/V$ and $p \propto 1/V^{5/3}$. This process is observed in magnetospheric plasmas and we have observed it in the laboratory in LDX. For example, with edge fueling in LDX we observed that the stationary (peaked) density profile ($n \propto 1/V$) was established by a turbulence-driven density pinch [1] whereas in recent experiments with core (pellet) fueling turbulence was observed to relax the density back to the stationary profile on a similar timescale.

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

[1]Supported by the NSF-DOE Partnership in Plasma Science Grants DE-FG02-00ER54585 and PHY-1201896.

Jay Kesner
MIT PSFC

Date submitted: 10 Jul 2014 Electronic form version 1.4