Abstract Submitted
for the DPP08 Meeting of
The American Physical Society

New perspectives on FRC confinement[1] LOREN STEINHAUER, University of Washington — Four factors relevant to FRC's motivate a rethinking the nature of confinement in FRCs. (1) Particle loss at the separatrix is regulated by drift turbulence with an oblique wave vector and perpendicular component comparable to the inverse of the ion gyroradius. The resulting transport scaling is better than gyroBohm, This mechanism gives a reasonable prediction of the particle confinement observed in FRC experiments. (2) The scrape-off layer can be modeled as a quasi-steady balance between radial particle diffusion and streaming endloss to the divertor region. (3) "Tearing relaxation," i.e. tearing that maintains the internal profile at the marginal stability condition appears to explain the anomalous flux loss rate in FRCs. Application of the so-called nearby-equilibrium analysis led to this implication. If so, then the "apparent" resistivity at the O-point is only the manifestation of a completely different flux annihilation mechanism, namely tearing. (4) The transport of energy is convective, i.e. proportional to the particle diffusivity. Past extrapolations of FRC confinement were based on empirical scalings; these new advances allow, for the first time, a physics-based model of transport. This should foster more convincing extrapolations to next-generation experiments.

[1]Supported by the U.S. Department of Energy

Loren Steinhauer
University of Washington

Date submitted: 09 Jul 2008 Electronic form version 1.4