Abstract Submitted
for the DPP08 Meeting of
The American Physical Society

Momentum Transport in Electron-Dominated Spherical Torus Plasmas[1] STANLEY KAYE, WAYNE SOLOMON, RON BELL, BENOIT LEBLANC, Princeton Plasma Physics Laboratory, FRED LEVINTON, Nova Photonics, JON MENARD, GREG REWOLDT, Princeton Plasma Physics Laboratory, STEVE SABBAGH, Columbia University, WEIXING WANG, Princeton Plasma Physics Laboratory, HOWARD YUH, Nova Photonics — NSTX plasmas operate in an electron-dominated transport regime due to suppression of ion-scale modes by large ExB shearing rates. In this regime, the ion thermal diffusivity is neoclassical, and can be up to a factor of 30 greater than the momentum diffusivity. The momentum diffusivity, however, is much larger than the neoclassical value. Analysis of perturbative experiments that used applied n=3 magnetic fields to brake the plasma rotation indicate inward pinch velocities up to 40 m/s and perturbative momentum diffusivities larger by a factor of several than those values inferred from steady-state analysis with a zero pinch velocity assumed. The inferred pinch velocity values are consistent with values based on theories in which low-k turbulence drives the inward momentum pinch. Thus, in NSTX, the momentum transport can be a better probe of low-k turbulence, since unlike the ion energy transport, the neoclassical driven momentum transport is near zero. Understanding the source of the momentum transport, and how it scales to larger devices operating at lower collisionality, is critical to the performance of future devices.

[1]This work is supported by US DOE Contract No. DE-A02-76CH03073.

Stanley Kaye
Princeton Plasma Physics Laboratory

Date submitted: 17 Jul 2008 Electronic form version 1.4