Abstract Submitted
for the DPP13 Meeting of
The American Physical Society

Nonambipolar Transport and Torque in Perturbed Equilibria[1] N.C. LOGAN, J.-K. PARK, Z.R. WANG, PPPL, J.W. BERKERY, Columbia, K. KIM, J.E. MENARD, PPPL — A new Perturbed Equilibrium Nonambipolar Transport (PENT) code has been developed to calculate the neoclassical toroidal torque from radial current composed of both passing and trapped particles in perturbed equilibria. This presentation outlines the physics approach used in the development of the PENT code, with emphasis on the effects of retaining general aspect-ratio geometric effects. First, nonambipolar transport coefficients and corresponding neoclassical toroidal viscous (NTV) torque in perturbed equilibria are re-derived from the first order gyro-drift-kinetic equation in the "combined-NTV" PENT formalism. The equivalence of NTV torque and change in potential energy due to kinetic effects [J-K. Park, Phys. Plas., 2011] is then used to showcase computational challenges shared between PENT and stability codes MISK and MARS-K. Extensive comparisons to a reduced model, which makes numerous large aspect ratio approximations, are used throughout to emphasize geometry dependent physics such as pitch angle resonances. These applications make extensive use of the PENT code's native interfacing with the Ideal Perturbed Equilibrium Code (IPEC), and the combination of these codes is a key step towards an iterative solver for self-consistent perturbed equilibrium torque.

[1]Supported by US DOE contract #DE-AC02-09CH11466 and the DOE Office of Science Graduate Fellowship administered by the Oak Ridge Institute for Science & Education under contract #DE-AC05-06OR23100.

N.C. Logan
PPPL

Date submitted: 12 Jul 2013 Electronic form version 1.4