Abstract Submitted
for the DPP08 Meeting of
The American Physical Society

Large-orbit δf simulation of non-local neoclassical effects in tokamaks R.A. KOLESNIKOV, W.X. WANG, PPPL, F.L. HINTON, UCSD, W.M. TANG, W.W. LEE, PPPL — In collisionless limit, the neoclassical equilibrium distribution is a function of three Constants of Motion (CoM). In standard δf simulation, a local Maxwellian is used as a background distribution. The difference between CoM and local Maxwellian is due to particle orbit width, which can become very large for high temperature ions and steep pressure gradients. Analogous to the conventional local Maxwellian, the new equilibrium makes no contribution to the radial particle, energy and toroidal angular momentum fluxes [1], thus the radial transport is obtained from moments of δf. Taking the CoM function as equilibrium in PIC simulations eliminates the large orbit contribution to the rapid growth of the particle weights. We illustrate this by simulating the radial transport using GTC-NEO code [2] which has been modified to support the new equilibrium. In presence of density, temperature and toroidal flow gradients the new simulation shows much smaller particle weights compared to the original Maxwellian based results. The new algorithm may be especially useful for simulation of systems with sharp gradients as well as in presence of impurities, and energetic particles. [1] F. L. Hinton, TTF, San Diego, CA (2008). [2] W. X. Wang et. al., Physics of Plasmas 13, 082501 (2006).

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Date submitted: 25 Aug 2008 Electronic form version 1.4