Abstract Submitted
for the DPP15 Meeting of
The American Physical Society

Application of the Finite Orbit Width Version of the CQL3D Code to NBI+RF Heating of NSTX Plasma[1] YU.V. PETROV, R.W. HARVEY, CompX — The CQL3D bounce-averaged Fokker-Planck (FP) code [1] has been upgraded to include Finite-Orbit-Width (FOW) effects. The calculations can be done either with a fast Hybrid-FOW option or with a slower but neoclassically complete full-FOW option. The banana regime neoclassical radial transport appears naturally in the full-FOW version by averaging the local collision coefficients along guiding center orbits, with a proper transformation matrix from local (R, Z) coordinates to the midplane computational coordinates, where the FP equation is solved. In a similar way, the local quasilinear rf diffusion terms give rise to additional radial transport of orbits. The full-FOW version is applied to simulation of ion heating in NSTX plasma. It is demonstrated that it can describe the physics of transport phenomena in plasma with auxiliary heating, in particular, the enhancement of the radial transport of ions by RF heating and the occurrence of the bootstrap current. Because of the bounce-averaging on the FPE, the results are obtained in a relatively short computational time. A typical full-FOW run time is 30 min using 140 MPI cores. Due to an implicit solver, calculations with a large time step (tested up to dt = 0.5 sec) remain stable.

[1] R.W. Harvey and M. McCoy, "The CQL3D Fokker Planck Code," www.compxco.com/cql3d

[1]Supported by USDOE grants SC0006614, ER54744, and ER44649.

Yu.V. Petrov
CompX

Date submitted: 23 Jul 2015 Electronic form version 1.4