Abstract Submitted
for the DPP06 Meeting of
The American Physical Society

Numerical Solution of the Gyrokinetic Poisson Equation in TEMPEST MILO DORR, BRUCE COHEN, RONALD COHEN, ANDRIS DIMITS, JEFFREY HITTINGER, GARY KERBEL, WILLIAM NEVINS, THOMAS ROGNLIEN, MAXIM UMANSKY, ANDREW XIONG, XUEQIAO XU, Lawrence Livermore National Laboratory, ESL TEAM — The gyrokinetic Poisson (GKP) model in the TEMPEST continuum gyrokinetic edge plasma code yields the electrostatic potential due to the charge density of electrons and an arbitrary number of ion species including the effects of gyroaveraging in the limit $k_\perp \rho \ll 1$. The TEMPEST equations are integrated as a differential algebraic system involving a nonlinear system solve via Newton-Krylov iteration. The GKP preconditioner block is inverted using a multigrid preconditioned conjugate gradient (CG) algorithm. Electrons are treated as kinetic or adiabatic. The Boltzmann relation in the adiabatic option employs flux surface averaging to maintain neutrality within field lines and is solved self-consistently with the GKP equation. A decomposition procedure circumvents the near singularity of the GKP Jacobian block that otherwise degrades CG convergence.

Milo Dorr
Lawrence Livermore National Laboratory

Date submitted: 07 Sep 2006 Electronic form version 1.4