Abstract Submitted
for the DPP11 Meeting of
The American Physical Society

Implementation of and first results from FACETS embedded core turbulence transport solver JOHAN CARLSSON, AMMAR HAKIM, Tech-X Corp, TOM EPPERLY, LLNL, FACETS TEAM — We present progress in implementation of a core-transport solver with fluxes computed from gyrofluid/gyrokinetic calculations. The gyrofluid fluxes are computed using the theory-based Trapped Gyro-Landau Fluid (TGLF) flux model while the gyrokinetic fluxes are computed from the continuum code GYRO. The solver itself is implemented in the FACETS whole-device modeling framework. Our solver uses a matrix-free Newton solver from the PETSc library, a hypersecant Jacobian evaluation and a novel grid sequencing strategy to accelerate the convergence of the non-linear iterations, minimizingg the flux evaluations. In addition, we have implemented a load balancing scheme using mixed integer linear programming techniques allowing us to achieve near-optimal parallel scaling while using GYRO. We present results of evolving temperature profiles of electrons and ions from DIII-D shot 118897. Time dependent boundary conditions are applied at the core-edge boundary and are taken from experimental measurements. Core heating profiles are held fixed during the evolution and are taken from an interpretive ONETWO simulation. Neoclassical fluxes are computed using a Chang-Hinton model. We compare the evolution with embedded turbulence fluxes to that obtained from the GLF23 model and discuss plans to validate the solver with experimental data.

Johan Carlsson
Tech-X Corp

Date submitted: 26 Jul 2011 Electronic form version 1.4