ECCD-induced tearing mode stabilization in coupled IPS/NIMROD/GENRAY HPC simulations[1] THOMAS JENKINS, S.E. KRUGER, Tech-X, E.D. HELD, Utah State, R.W. HARVEY, CompX, W.R. ELWASIF, ORNL, SWIM PROJECT TEAM — We summarize ongoing developments toward an integrated, predictive model for determining optimal ECCD-based NTM stabilization strategies in ITER. We demonstrate the capability of the SWIM Project's Integrated Plasma Simulator (IPS) framework to choreograph multiple executions of, and data exchanges between, physics codes modeling various spatiotemporal scales of this coupled RF/MHD problem on several thousand HPC processors. As NIMROD evolves fluid equations to model bulk plasma behavior, self-consistent propagation/deposition of RF power in the ensuing plasma profiles is calculated by GENRAY. Data from both codes is then processed by computational geometry packages to construct the RF-induced quasilinear diffusion tensor; moments of this tensor (entering as additional terms in NIMROD's fluid equations due to the disparity in RF/MHD spatiotemporal scales) influence the dynamics of current, momentum, and energy evolution as well as the MHD closures. Initial results are shown to correctly capture the physics of magnetic island stabilization; we also discuss the development of a numerical plasma control system for active feedback stabilization of tearing modes.

Thomas Jenkins
Tech-X

Date submitted: 06 Jan 2012   Electronic form version 1.4