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Active control of ECCD-induced tearing mode stabilization in coupled NIMROD/GENRAY HPC simulations[1] THOMAS JENKINS, SCOTT KRUGER, Tech-X Corporation, ERIC HELD, Utah State University — Actively controlled ECCD applied in or near magnetic islands formed by NTMs has been successfully shown to control/suppress these modes, despite uncertainties in island O-point locations (where induced current is most stabilizing) relative to the RF deposition region. Integrated numerical models of the mode stabilization process can resolve these uncertainties and augment experimental efforts to determine optimal ITER NTM stabilization strategies. The advanced SWIM model incorporates RF effects in the equations/closures of extended MHD as 3D (not toroidal or bounce-averaged) quasilinear diffusion coefficients. Equilibration of driven current within the island geometry is modeled using the same extended MHD dynamics governing the physics of island formation, yielding a more accurate/self-consistent picture of island response to RF drive. Additionally, a numerical active feedback control system gathers data from synthetic diagnostics to dynamically trigger & spatially align the RF fields. Computations which model the RF deposition using ray tracing, assemble the 3D QL operator from ray & profile data, calculate the resultant xMHD forces, and dynamically realign the RF to more efficiently stabilize modes are presented; the efficacy of various control strategies is also discussed.

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