M3D Simulation Studies of NSTX

W. Park, J. Breslau, J. Chen, G.Y. Fu, S.C. Jardin, S. Klasky, J. Menard, A. Pletzer, D Stutman
Princeton University Plasma Physics Laboratory
H.R. Strauss, *New York University*
L.E. Sugiyama, *Massachusetts Institute of Technology*

The multilevel physics, massively parallel plasma simulation code, M3D has been used to study NSTX. The magnitude of outboard shift of density profiles relative to electron temperature profiles seen in NSTX under strong toroidal flow is explained. IRE's in ST discharges can be classified depending on the crash mechanism, just as in tokamak discharges; a sawtooth crash, disruption due to stochasticity, or high-β disruption. Toroidal shear flow can reduce linear growth of internal kink. It has a strong stabilizing effect nonlinearly and causes mode saturation if its profile is maintained, e.g., through a fast momentum source. Normally however, the flow profile itself flattens during the reconnection process, allowing a complete reconnection to occur. In some cases, the maximum density and pressure spontaneously occur inside the island and cause mode saturation.