Abstract Submitted
for the DPP16 Meeting of
The American Physical Society

Fully 3D modeling of tokamak vertical displacement events with realistic parameters[1] DAVID PFEFFERLE, NATHANIEL FERRARO, STEPHEN JARDIN, AMITAVA BHATTACHARJEE, Princeton Plasma Physics Laboratory (PPPL), Princeton 08540 NJ, USA — In this work, we model the complex multi-domain and highly non-linear physics of Vertical Displacement Events (VDEs), one of the most damaging off-normal events in tokamaks, with the implicit 3D extended MHD code M3D-C1. The code has recently acquired the capability to include finite thickness conducting structures within the computational domain [1]. By exploiting the possibility of running a linear 3D calculation on top of a non-linear 2D simulation, we monitor the non-axisymmetric stability and assess the eigen-structure of kink modes as the simulation proceeds. Once a stability boundary is crossed, a fully 3D non-linear calculation is launched for the remainder of the simulation, starting from an earlier time of the 2D run. This procedure, along with adaptive zoning, greatly increases the efficiency of the calculation, and allows to perform VDE simulations with realistic parameters and high resolution. Simulations are being validated with NSTX data where both axisymmetric (toroidally averaged) and non-axisymmetric induced and conductive (halo) currents have been measured.
[1] Ferraro, N. et al, PoP 23, 056114 (2016).

[1]This work is supported by US DOE grant DE-AC02-09CH11466.

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Date submitted: 15 Jul 2016 Electronic form version 1.4