Abstract Submitted
for the DPP20 Meeting of
The American Physical Society

M3D-C1 modelling of C-pellet disruption mitigation in NSTX-U[1] CESAR CLAUSER, STEPHEN JARDIN, Princeton Plasma Physics Laboratory, BRENDAN LYONS, General Atomics, NATHANIEL FERRARO, Princeton Plasma Physics Laboratory, ROGER RAMAN, University of Washington — Disruption mitigation systems are among major challenges for ITER and future tokamaks. An electromagnetic pellet injection mechanism has been proposed that would offer a fast response time and high enough speed to deposit payloads in the plasma core [1]. The NSTX-U team is interested in testing this concept. In support of this interest, and to understand the underlying physics, simulations that can predict the evolving plasma in these conditions have been performed. The M3D-C1 code has recently incorporated the KPRAD radiation model and a pellet injection module [2,3]. We have performed simulations modelling single C-pellet injections in NSTX-U. To do this, a Carbon ablation model was incorporated in M3D-C1 and tested in an ASDEX-U-like discharge for which data existed [4], obtaining excellent agreement. Next, we performed a convergence study for NSTX-U covering different modelling parameters. We show the sensitivity of the induced thermal quench and other relevant quantities on the physical input parameters and the numerical resolution. [1] R. Raman et al., Nucl. Fusion 59 016021 (2019) [2] B. Lyons et al., Plasma Phys. and Contr. Fusion 61 064001 (2019) [3] N. Ferraro et al., Nucl. Fusion 59 016001 (2019) [4] V. Sergeev et al., Plasma Phys. Rep. 32 (2006) 363

[1]Work supported by the US DOE Contract DE-AC02-09CH11466 and the SciDAC CTTS

Cesar Clauser
Princeton Plasma Physics Laboratory

Date submitted: 29 Jun 2020 Electronic form version 1.4