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C-pellet simulations in NSTX-U with M3D-C1

Disruption mitigation is one of the major challenges for ITER and future tokamaks. As an alternative to massive gas and shattered pellet injection, an electromagnetic pellet injection (EPI) mechanism has been proposed that would offer a fast response time and high enough speed to deposit the payloads in the plasma core [1]. This technique is expected to be tested during the next NSTX-U campaign. To understand the physics involved, reliable simulations that can evaluate and predict the evolving plasma in this situation are essential. Recently, an impurity radiation and pellet injection module has been incorporated in the M3D-C1 code [2,3] which allows one to perform these kinds of studies. We have carried out a series of simulations modelling single C-pellets injection in NSTX-U. To do this, a Carbon ablation model [4] was incorporated in M3D-C1. As a first step, the ablation model was tested by performing an ASDEX-U discharge mitigation simulation for which data existed [4] obtaining excellent agreement. Next, we performed a convergence study for NSTX-U covering different modelling parameters. We compare these cases and show the sensitivity of the induced thermal quench and other relevant parameters on the physical input parameters and the numerical resolution. For selected cases we also evaluated the current quench.

[1] R. Raman et al., Nucl. Fusion **59** 016021 (2019)
[2] B. Lyons, C. Kim, Y. Liu, N. Ferraro, S. Jardin, J. McClenaghan, P. Parks, L. Lao, Plasma Phys. and Contr. Fusion **61** 064001 (2019)
[3] N.M. Ferraro, B. C. Lyons, C.C. Kim, Y.Q. Liu, and S.C. Jardin, Nucl. Fusion **59** 016001 (2019)
[4] V. Y. Sergeev et al., Plasma Phys. Rep. **32** (2006) 363

Member State or International Organization

United States of America

Affiliation

Princeton Plasma Physics Laboratory

Primary author: CLAUSER, Cesar (Princeton Plasma Physics Laboratory)

Co-authors: JARDIN, Stephen C. (Princeton Plasma Physics Laboratory); LYONS, Brendan (General Atomics); FERRARO, Nathaniel (Princeton Plasma Physics Laboratory)

Presenter: CLAUSER, Cesar (Princeton Plasma Physics Laboratory)

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