Abstract Submitted
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Shattered Pellet Injection Simulations With NIMROD[1] CHARLSON KIM, SLS2 Consulting, PAUL PARKS, LANG LAO, General Atomics, MICHAEL LEHNAN, ALBERTO LOARTE, ITER, VALERIE IZZO, University of California, San Diego, NIMROD TEAM — Shattered Pellet Injection (SPI) will be the Disruption Mitigation System in ITER. SPI propels a cryo-pellet of high-Z and deuterium into a sharp bend of the flight tube, shattering the pellet into a plume of shards. These shards are injected into the plasma to quench it and mitigate forces and heat loads that may damage in-vessel components. We use NIMROD to perform 3-D nonlinear MHD simulations of SPI to study the thermal quench. This work builds upon prior Massive Gas Injection (MGI) studies by Izzo[2]. A Particle-in-Cell (PIC) model is implemented to mimic the shards, providing a discrete moving source. Observations indicate that the quench proceeds in two phases. Initially, the outer plasma is shed via interchange-like instabilities while preserving the core temperature. This results in a steep gradient and triggers the second phase, an external kink-like event that collapses the core. We report on the radiation efficiency and toroidal peaking as well as fueling efficiency and other metrics that assess the efficacy of the SPI system.

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[2]V. A. Izzo, et al. NF(55) 073032

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