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Magnetic Measurements of MHD Toroidal Dynamics and Its Influence on Massive Gas Injection in DIII-D[1] D. SHIRAKI, N. COMMAUX, Oak Ridge National Laboratory, N.W. EIDIETIS, General Atomics, E.M. HOLMANN, V.A. IZZO, R.A. MOYER, University of California San Diego — Measurements from the DIII-D magnetic diagnostic system are used to characterize the low-order MHD activity leading up to the thermal quench during fast shutdowns induced by massive gas injection (MGI). The evolution of the 3D fields measured at the vessel wall are found to be consistent with the destabilization of modes by the inwardly propagating cold front passing low-order rational surfaces. This MHD activity, which is dominantly n=1, can be characterized by the n=1 magnetic signal measured on the low-field side of the plasma. The toroidal evolution of this MHD is found to be influenced by three factors: the injector location, pre-MGI plasma rotation, and large n=1 error fields. The effects of the toroidal phase of this n=1 mode on toroidal radiation asymmetries are discussed. Experimental results are compared with simulations of MGI in DIII-D equilibria using the NIMROD code [1]. The effects of existing MHD structures prior to MGI, such as locked islands, are compared.

[1] V.A. Izzo, Phys. Plasmas **20**, 056107 (2013).

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