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High Field Side MHD Activity During Local Helicity Injection[1]
J.L. PACHICANO, M.W. BONGARD, R.J. FONCK, J.M. PERRY, J.A. REUSCH, N.J. RICHNER, University of Wisconsin-Madison — MHD is an essential part of understanding the mechanism for local helicity injection (LHI) current drive. The new high field side (HFS) LHI system on the Pegasus ST permits new tests of recent NIMROD simulations. In that model, LHI current streams in the plasma edge undergo large-scale reconnection events, leading to current drive. This produces bursty $n = 1$ activity around 30 kHz on low field side (LFS) Mirnov coils, consistent with experiment. The simulations also feature coherent injector streams winding down the center column. Improvements to the core high-resolution poloidal Mirnov array with Cat7A Ethernet cabling and differentially driven signal processing eliminated EMI-driven switching noise, enabling detailed spectral analysis. Preliminary results from the recovered HFS poloidal Mirnov coils suggest $n = 1$ activity is present at the top of the vessel core, but does not persist down the centerstack. HFS LHI experiments can exhibit an operating regime where the high amplitude MHD is abruptly reduced by more than an order of magnitude on LFS Mirnov coils, leading to higher plasma current and improved particle confinement. This reduction is not observed on the HFS midplane magnetics. Instead, they show broadband turbulence-like magnetic features with near consistent amplitude in a frequency range of 90–200 kHz.

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