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Physics Issues for Extending the Pulse Length of High f_{NI} DIII-D Discharges,* J.R. Ferron, T.C. Luce, P.A. Politzer, J.C. DeBoo, T.W. Petrie, C.C. Petty, R.J. La Haye, S.P. Smith, *GA*; C.T. Holcomb, *LLNL*; F. Turco, *ORISE*; M. Murakami, J.-M. Park, *ORNL*; Y. In, *FAR-TECH*; M. Okabayashi, *PPPL*; E.J. Doyle, *UCLA*; H. Reimerdes, *Columbia U*. –The increase of the total available NB and gyrotron injected energies has enabled study of high f_{NI} discharges with the high β_N phase extended to >3 s. To minimize n_e for maximum EC and NB CD, discharges were produced after a boronization. Typically $H_{98}\approx1.5$, but the common decrease in n_e in the later portion of the high β_N phase correlates with reduced τ_E. The broadly deposited ECCD appears to improve n=1 tearing mode stability, but a 2/1 or 3/1 mode is more likely with longer pulses as profiles are not stationary. Scaling of J_{NI} with B_T was studied to best match J_{NBCD}, J, and the P_{beam} required for a given β_N. Short ELM-free phases, perhaps from improved H-mode pedestal stability at high β_P, and rapid fishbone-like bursts were found to affect discharge stability and capability for β_N control.

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