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Category Number and Subject: 5.6.2 DIII-D Tokamak

Theory Experiment

Eluding Neoclassical Tearing Modes in DIII-D by Prior Application of Electron Cyclotron Current Drive,* R.J. La Haye, J.R. Ferron, D.A. Humphreys, T.C. Luce, C.C. Petty, R. Prater, E.J. Strait, and A.S. Welander, *General Atomics*, F.W. Perkins, *PPPL* – Electron cyclotron current drive (ECCD) is applied early, i.e., at lower beta, before an $m=3$, $n=2$ neoclassical tearing mode (NTM) would otherwise occur. As beta is raised, no mode is observed. Comparison discharges without ECCD are uniformly unstable to these modes. Real-time MHD equilibrium reconstruction using the motional Stark effect (MSE) diagnostic for accurate q -profile determination allows the plasma control system to align the $q = 3/2$ rational surface on the peak ECCD current density by making very small changes in the plasma major radius. Higher stable beta without the mode is enabled up to the eventual onset of an $m=2$, $n=1$ NTM, which is not (yet) being simultaneously controlled. This direct feedback on the reconstructed q -profile developed for the $m=3$, $n=2$ NTM, will also be used on the more deleterious $m=2$, $n=1$ NTM.

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