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Nonlinear Coupling Amongst Rotating Magnetic Islands in DIII-D[1] B.J. TOBIAS, B.A. GRIERSON, M. OKABAYASHI, Princeton Plasma Physics Laboratory, C.M. MUSCATELLO, C.W. DOMIER, N.C. LUHMANN JR, UC-Davis, S.E. ZEMEDKUN, U. Colorado-Boulder, T. MUNSAT, U. Colorado- — The appearance of magnetic islands at multiple rational surfaces limits performance and increases the risk of locked-mode disruption. These islands initially rotate independently, reflecting the differential flow of the background ion fluid. As the discharges progress, however, the phase-locking of two or more islands, e.g. 3/2 and 2/1, exacerbates confinement degradation by several mechanisms, including a flattening of the core rotation profile that increases the penetration depth of edge-localized modes (ELMs). However, neoclassical tearing mode structure can be manipulated to drive an inversion in the toroidal rotation profile, accelerating the edge plasma to maintain the local shearing rate, without additional neutral beam power. Although nonlinear 3-wave coupling is still observed, phase-locking is avoided and the thermonuclear neutron rate remains elevated, despite the discharge developing larger islands (at larger radii) that damp the toroidal angular momentum and reduce β_N.

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Ben Tobias
Princeton Plasma Physics Laboratory

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