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[ ] Theory [X] Experiment

ELM-free, Quiescent H-mode Operation in DIII-D Under Reactor-Relevant Conditions Using Non-Axisymmetric Magnetic Fields,* K.H. Burrell, A.M. Garofalo, *General Atomics*; W.M. Solomon, *PPPL;* M.E. Fenstermacher, *LLNL* – Application of static, non-axisymmetric magnetic fields (NAMFs) to DIII-D plasmas allows sustained quiescent H-mode (QH-mode) operation under reactor-relevant conditions of beta, collisionality and torque from neutral beam injection (NBI). QH-mode is an ideal plasma for next step devices, exhibiting H-mode confinement levels while operating without edge localized modes at constant density and radiated power. Peeling-ballooning mode stability theory suggests, and previous studies confirm, that QH-mode operation requires sufficient radial shear in the toroidal rotation near the plasma edge. In past experiments, this rotation shear was predominantly produced by torque from counter-directed NBI. In recent experiments, counter torque due to neoclassical toroidal viscosity produced by the NAMFs gave rise to the necessary edge rotational shear, even overcoming small amounts of co-NBI torque. Experiments in the 2013 campaign have investigated techniques for creating QH-mode plasmas with zero net NBI torque from Ohmic plasmas, opening a path to QH-mode operation with reactor-relevant torque throughout the shot.

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