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# Bifurcation of Quiescent H-mode to a Wide Pedestal Regime in DIII-D and Advances in the Understanding of Edge Harmonic Oscillations

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In a recent discovery, the Quiescent H-mode (QH-mode) regime in DIII-D has been found to bifurcate into a new state at low torque in double-null shaped plasmas, characterized by increased pedestal height, width and global confinement [1, 2]. This provides an alternate path for achieving high performance ELM-stable operation at low torque, in addition to the conventional QH-mode operation sustained at low-torque with applied 3D fields [3]. Measurements and simulation indicate that in the wide pedestal state, the decreased ExB shear destabilizes broadband turbulence, which relaxes edge pressure gradients, improves peeling-ballooning stability and enables a wider and thus higher pedestal and enhanced confinement. In parallel, new experimental study and modeling [4] of low, experimentally-relevant toroidal mode number (n≤5) Edge Harmonic Oscillation (EHO), which regulates the standard QH edge, validate the proposed importance of rotational shear in exciting the EHO. The ability to accurately simulate the EHO and maintain high performance QH-mode at low torque is an essential requirement for projecting QH-mode operation to ITER.

[1] K.H. Burrell, et al., Plasma Phys. (in press)
[2] Xi Chen, et al., Nucl. Fusion (H-mode workshop, 2015)
[3] A.M. Garofalo, et al., Nucl. Fusion 51, 083018(2011)
[4] Xi Chen, et al., Nucl. Fusion (submitted)

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