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Physical Effects of Rotation and Rotational Shear on Quiescent H-mode[1] XI CHEN, K. BURRELL, T. OSBORNE, GA, N. AIBA, QST, K. BARADA, UCLA, D. ERNST, MIT, J. KING, Tech-X, G. MCKEE, UW-Madison, A. PANKIN, Tech-X, T. RHODES, UCLA, T. WILKS, MIT, Z. YAN, UW-Madison — Quiescent H-mode (QH) is an attractive naturally ELM-stable regime that operates at ITER relevant collisionality and good confinement. Experimentally, strong NBI torque is usually required to excite the EHO that regulates the QH edge. ExB rotation and shear were found to destabilize the EHO in M3D-C1 linear simulation [Chen NF 2017]. New linear MINERVA-DI modelling suggests an optimal window of ion diamagnetic drift to utilize this effect. Nonlinear NIMROD simulation show the rotation is essential for the EHO saturation. On the other hand, wide-pedestal QH (WPQH) can operate at low rotation with pedestal ExB shear lower than ELMy H-mode while maintaining H98>1. This may ease the concern that the low ExB shear in the ITER pedestal may be insufficient to excite EHOs or to suppress ion-scale turbulence to achieve high pedestal for good confinement. Low- to intermediate-k turbulence co-located with flattened pedestal profiles arise in WPQH. It is posited that high edge turbulence resulting from weak ExB shear, relaxes the pedestal gradients, and enables a wider and higher pedestal. WPQH also exhibits improved confinement with increasing ECH power, and switching from LSN to DN shape. Turbulence suppression by increased ExB shear inboard of pedestal top plays an important role in these observations.

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