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Disparate-scale coupling of turbulence in QH-mode plasmas on DIII-D[1] C.M. MUSCATELLO, K.H. BURRELL, XI CHEN, GA, N.C. LUHMANN, JR., UCD, B.A. GRIERSON, G.J. KRAMER, B.J. TOBIAS, PPPL — Analysis of incoherent fluctuations in quiescent H-mode (QH-mode) plasmas suggests nonlinear coupling between high- and low-frequency turbulence. In QH-mode plasmas with edge harmonic oscillations (EHO), transport levels are enhanced when incoherent fluctuations are present compared to QH-mode plasmas with only EHO. Furthermore, in some cases without EHO, the incoherent fluctuations alone can sustain QH-mode. Bispectral analysis of microwave imaging reflectometer (MIR) data indicates nonlinear 3-wave coupling among disparate spatial scales of the turbulence. The bicoherence is above noise levels for high-frequency ($300 < f < 500$ kHz), intermediate-scale ($k_\theta \approx 0.2$ - 0.6 cm $^{-1}$) and low-frequency ($f < 50$ kHz), large-scale ($k_\theta < 0.2$ cm $^{-1}$) turbulence. Cross-phase analysis reveals that the high-frequency turbulence rotates in the electron diamagnetic drift direction, while the low-frequency turbulence rotates in the ion diamagnetic drift direction, suggesting coupling between different instabilities.

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