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HBT-EP Program: Active MHD Mode Dynamics & Control[1]
G.A. NAVRATIL, S. ANGELINI, J. BIALEK, P.J. BYRNE, A.J. COLE, B.A. DEBONO, P.E. HUGHES, J.P. LEVESQUE, M.E. MAUEL, Q. PENG, D.J. RHODES, C.C. STOAFER, Columbia University, C.J. HANSEN, Univ of Washington — The HBT-EP active mode control research program aims to: (i) quantify external kink dynamics and multimode response to applied magnetic perturbations, (ii) understand the relationship between control coil configuration, conducting and ferritic wall effects, and active feedback control, and (iii) explore advanced feedback algorithms. Biorthogonal decomposition is used to observe multiple simultaneous resistive wall modes (RWM). Improved visualization of MHD kink mode structure is achieved using a tangential fast camera viewing visible light emission that augments magnetic probe data. A 512 core GPU-based low latency ($14\mu s$) MIMO control system uses 96 inputs and 64 outputs for Adaptive Control of RWMs. An in-vessel adjustable ferritic wall was used to study ferritic RWMs with enhanced MHD response. A biased electrode in the plasma was used to control the rotation of external kinks. A Thomson scattering diagnostic measures T_e and n_e at 3 spatial points, soon to be extended to 10 points. A quasi-linear sharp-boundary model of the plasma's multimode response to error fields is developed to determine harmful error field structures and associated NTV and resonant torques.

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