

Abstract Submitted
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HBT-EP Active Mode Control Research¹ G.A. NAVRATIL, J. HANSON, A. KLEIN, Y. LIU, M.E. MAUEL, D.A. MAURER, T.S. PEDERSEN, N. STILLITS, J. BIALEK, A.H. BOOZER, O. KATSURO-HOPKINS, D. MASLOVSKY, Columbia University, S.F. PAUL, PPPL, R. JAMES, US Coast Guard Acad/Stevens Inst. of Tech. — The HBT-EP active MHD mode control program is studying advanced feedback control algorithms, ITER relevant internal feedback control coil configurations, and simultaneous control of internal and external MHD modes. The HBT-EP approach incorporates a segmented adjustable conducting wall, internal modular feedback control coils driven by a high-speed (10 microsec delay) MIMO digital control system for resistive wall modes (RWM), and edge rotation control using a biased electrode with supersonic nozzle fueling and lithium wall coating. Primary research thrusts are: (i) systematically study required feedback system gain as a function of control coil modularity and toroidal angle coverage compared with VALEN model predictions testing possible breakdown in basic rigid mode model; (ii) test advanced feedback control techniques of adaptive filtering and equilibrium state estimation; (iii) study physics of RWM rotation stabilization by controlled variation of critical parameters (rotation, dissipation, and growth rate) using biased electrode ExB flow and control of ion charge exchange viscosity; (iv) use improved understanding and control capability to suppress tearing and kink type MHD modes simultaneously near the ideal wall limit.

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