Abstract Submitted
for the DPP13 Meeting of
The American Physical Society

HBT-EP Program: Active MHD Mode Dynamics & Control[1]
G.A. NAVRATIL, S. ANGELINI, J. BIALEK, A.H. BOOZER, P. BYRNE, A.J. COLE, B. DEBONO, P. HUGHES, J.P. LEVESQUE, M.E. MAUEL, Q. PENG, N. RATH, D. RHODES, C. STOAFER, Columbia University — 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 effectiveness, and (iii) explore advanced feedback algorithms. Biorthogonal decomposition is used to observe multiple simultaneous resistive wall modes (RWM) with poloidal mode numbers up to m=9 and toroidal mode numbers up to n=4. Transitions between dominant poloidal mode numbers were observed for m=4/n=1 to m=3/n=1 accompanied by a simultaneous m=7/n=2 to m=6/n=2 transition. Improved visualization of MHD kink mode structure was achieved using a toroidal viewing fast camera recording of visible light emission that augment magnetic probe array data. A partial ferritic wall has been installed onto the resistive HBT-EP wall elements to study the ferritic RWM onset. A new Thomson scattering diagnostic has been installed on HBT-EP aiming at 10 spatial point measurements of density and temperature. A 512 core GPU based low latency (<14 microsec) MIMO control has been implemented with 96 inputs and 64 parallel outputs and used to demonstrate the first observation of Adaptive Control of the RWM.

[1]Supported by US DOE Grant DE-FG02-86ER53222.

Gerald Navratil
Columbia University

Date submitted: 11 Jul 2013 Electronic form version 1.4