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**HBT-EP Program: MHD Dynamics and Active Control through 3D Fields and Currents**[1] G.A. NAVRATIL, J. BIALEK, J.W. BROOKS, R.N. CHANDRA, J.P. LEVESQUE, BOTING LI, M.E. MAUEL, A. SAPERSTEIN, I.G. STEWART, Y. WEI, Columbia Univ, C.J. HANSEN, Univ Washington — The HBT-EP active mode control research program aims to: (i) understand the physics of scrape-off layer currents (SOLC) and interactions between the helical plasma edge and conducting boundary structures, (ii) test new methods for measurement and mode control that integrate optical and magnetic detector arrays with both magnetic and SOLC feedback, and (iii) understand fundamental MHD issues associated with disruptions, resonant magnetic perturbations, and SOLC. A two-color multi-energy EUV/SXR tangential array has been installed for the study of internal MHD mode structure and tearing mode dynamics, together with poloidal arrays of SOLC sensors. A biased electrode in the plasma edge was used to induce a strong layer of sheared ExB flow to achieve the first H-mode plasmas on HBT-EP, and the first characterization of edge turbulence dominated by the ion temperature gradient mode extending previous findings of EAST and TCABR. Previous GPU control system results demonstrating active control of MHD using non-magnetic EUV plasma emission have been extended with the first demonstration of active control of plasma rotation and rotating n=1 magnetic instability amplitude suppressed by 50% using a toroidal electrode array. Further improvement of the GPU active control system is being pursued using tomographic reconstruction of the poloidal EUV emissivity profile.

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