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External Kink Control in Low Rotation Plasmas: HBT-EP Experiments and VALEN Modeling[1] D.A. MAURER, J. BIALEK, A.H. BOOZER, D. MASLOVSKY, M.E. MAUEL, G.A. NAVRATIL, T.S. PEDERSEN, Columbia University, S.F. PAUL, Princeton University — Optimized kink mode feedback is predicted to suppress these long- wavelength MHD instabilities up to the ideal-wall beta limit when (i) the sensors used to detect the instability are decoupled from the active control coils, (ii) the control coils couple more strongly to the plasma than to the surrounding conducting wall, and (iii) control loop algorithms have low latency, are noise immune, and have sufficient bandwidth. To quantify the effect of changes in kink mode rotation frequency on control algorithm optimization, plasma and kink rotation is externally adjusted on HBT-EP by applying a voltage to an insertable electrode. The biased electrode has induced large changes in plasma rotation, including the complete reversal of the rotation direction of external m/n = 3/1 kink perturbations. To aid in optimized feedback design in these low rotation plasmas, a method has been developed to extract the single circuit theory coupling constants of Boozer [2] directly from the VALEN inductance formalism. Comparison of these low dimensional models of kink mode dynamics will be discussed and compared to VALEN predictions and HBT-EP biased probe experiments.

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[2]A. H. Boozer, Phys. Plasmas 11, 110 (2004).

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