

Abstract Submitted  
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**Using a Kalman Filter during Active Feedback of External Kink Modes in HBT-EP**<sup>1</sup> J.M. HANSON, J. BIALEK, O. KATSURO-HOPKINS, M.E. MAUEL, D.A. MAURER, G.A. NAVRATIL, T.S. PEDERSEN, Columbia University — Active feedback stabilization has been shown to stabilize the  $(m, n) = (3, 1)$  external kink mode in tokamak discharges, but noise may limit system performance. In numerical simulations, Kalman filtering has been shown to enhance external kink feedback by mitigating the effects of sensor noise.<sup>2</sup> The HBT-EP tokamak is equipped with a versatile, high-speed, digital mode control system that enables rapid development and testing of new feedback schemes. Kink mode suppression in plasmas near the ideal wall limit has been achieved using a Discrete Fourier Transform (DFT) decomposition of sensor coil signals in conjunction with a static lead-lag compensator.<sup>3</sup> The Kalman filter makes dynamic estimates for the state of a system based on sensor inputs and an internal model. Experimental studies of Kalman filter implementations using HBT-EP's digital mode control system are presented.

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<sup>2</sup>M. E. Mauel, *et al.*, Bull. Amer. Phys. Soc. Paper BP1.00007 (2005).

<sup>3</sup>A. Klein, *et al.*, Phys. Plasmas, **12**, 040703 (2005).

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