Abstract Submitted
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Observer Design for Resistive Wall Mode Detection* D.A. MAURER, J. BIALEK, J.M. HANSON, O. KATSURO-HOPKINS, M.E. MAUEL, G.A. NAVRATIL, T.S. PEDERSEN, Columbia University — Design of a linear observer to detect only the unstable resistive wall mode (RWM) contribution to a realistic set of sensor coil signals is described. Accurate low order computational models of the plasma, wall, feedback, and sensor coil system are essential for reliable observer design. We use two methods to derive a reduced, state space model of the RWM constructed using the VALEN code. (1) A simple method has been developed for calculating quantitative ordinary differential equation models of the resistive wall mode using contracted matrix equations calculated by the VALEN code. Using eigenvectors of the unstable RWM system as determined by VALEN, dimensionless coupling numbers that characterize the mutual inductances of the plasma-wall-feedback coil system are calculated. These dimensionless coupling numbers are then incorporated into a scalar ordinary differential equation that can be used for data analysis, estimation of system eigenvalues, and design of complex feedback control algorithms such as observers. (2) Low order state space models have also been constructed from VALEN frequency response transfer function data. The observer performance using these two reduced model types is illustrated and compared by applying it to RWM feedback on the HBT-EP and D-IIID tokamaks. *Supported by U.S. DOE Grant DE-FG02-86ER53222.

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