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Control of Resistive Wall Mode Using a Matched Filter Eigenmode Approach JOSEPH BLAIR, EUGENIO SCHUSTER, Lehigh University, DAVID HUMPHREYS, General Atomics, YONGKYOON IN, Far-Tech, Inc., MICHAEL WALKER, ANDERS WELANDER, General Atomics, LEHIGH UNIVERSITY TEAM, GENERAL ATOMICS TEAM, FAR-TECH, INC. TEAM —
One of the major non-axisymmetric instabilities under study in the DIII-D tokamak is the resistive wall mode (RWM), a form of plasma kink instability whose growth rate is moderated by the influence of a resistive wall. The Far-Tech RWM model represents the plasma surface as a toroidal current sheet and represents the wall using an eigenmode approach [1]. Although the plasma surface deformation cannot be directly measured in real time, the magnitude and direction of the deformation can be deduced from measurements by a set of 22 magnetic field sensors and saddle loops. An array of 6 control coils can then be used to return the plasma to its original shape. Using an estimator for the two orthogonal components (related by quadrature in toroidal angle) of the assumed n=1 mode, the resultant plant is reduced from a 22 by 6 system to a simple 2 by 2 system. Several control techniques are considered to stabilize this system. The various approaches are compared for their individual advantages and disadvantages. Implications for experimental implementation and use are discussed. [1] Y. In, et al, "Model-based dynamic resistive wall mode identification and feedback control in the DIII-D tokamak," Phys. Pl. **13** (2006) 062512

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