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Control Performance and Model Validation with Different Sensor Configurations for Resistive Wall Modes in DIII-D¹

C.M. FRANSSON, Chalmers U., D.A. HUMPHREYS, M.L. WALKER, S.A. WELANDER, GA — The n=1 unstable resistive wall mode (RWM) imposes significant limits on achievable values of normalized β in tokamaks. RWM stabilization relies on either toroidal plasma rotation or on feedback which aims to cancel out RWM magnetic field perturbations using feedback coil currents. We analyze an RWM model which uses a toroidal current sheet to represent the plasma surface and “picture frame” currents to represent the conducting structure. This model does not account for plasma rotation and requires use of recent low rotation DIII-D data for validation. In previous work,² the model was used to compare simulated closed loop performance using external and internal saddle loops (measuring radial magnetic field). The model and control analysis have been extended to the use of poloidal field sensors and of all sensor arrays simultaneously. In the latter case, a matched filter³ designed to identify RWMs in the sensor signals is used.

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²C.M. Fransson, Proc. Am. Control Conf., Anchorage, AK (2002).

³D.H. Edgell, *et al.*, Rev. Sci. Instrum. **73**, 1761 (2002).

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