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Numerical Study of Equilibrium, Stability, and Advanced Resistive Wall Mode Feedback Algorithms on KSTAR[1] OKSANA KATSURO-HOPKINS, S.A. SABBAGH, J.M. BIALEK, Columbia University, H.K. PARK, PPPL, J.Y. KIM, K.-I. YOU, KBSI, A.H. GLASSER, LANL, L.L. LAO, General Atomics — Stability to ideal MHD kink/ballooning modes and the resistive wall mode (RWM) is investigated for the KSTAR tokamak. Free-boundary equilibria that comply with magnetic field coil current constraints are computed for monotonic and reversed shear safety factor profiles and H-mode tokamak pressure profiles. Advanced tokamak operation at moderate to low plasma internal inductance shows that a factor of two improvement in the plasma beta limit over the no-wall beta limit is possible for toroidal mode number of unity. The KSTAR conducting structure, passive stabilizers, and in-vessel control coils are modeled by the VALEN-3D code and the active RWM stabilization performance of the device is evaluated using both standard and advanced feedback algorithms. Steady-state power and voltage requirements for the system are estimated based on the expected noise on the RWM sensor signals. Using NSTX experimental RWM sensors noise data as input, a reduced VALEN state-space LQG controller is designed to realistically assess KSTAR stabilization system performance.

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