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Progress on Model-Based Shape Control for DIII-D Experimental Operations,* M.L. Walker, D.A. Humphreys, A.W. Hyatt, J.A. Leuer, B.G. Penaflor, *General Atomics* – We report on implementation and experimental use of model-based multivariable shape controllers intended for routine use in DIII-D operation. Manually-tuned shape controllers perform very well for many shapes, but can require substantial experimental time to tune, and can fail to achieve desired operational control performance. Objectives of the model-based control design techniques include reducing or eliminating experimental time for tuning, improving overall quality of control, and preventing loss of plasma discharges due to exceeding coil current limits. Over the past few years, multiple components of the control needed to address these objectives have been developed and tested experimentally. These components are now being integrated and generalized for use in routine operation. Experiments to date show that model-based techniques can produce controllers that significantly improve the quality of steady-state control for certain plasma shapes, although with consequences for other performance characteristics such as disturbance rejection.

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