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Linear Quadratic Gaussian (LQG) Shape Control in ITER JOSIAH WAI, EGEMEN KOLEMEN, Princeton University — We develop a shape control algorithm for the ITER tokamak using linear quadratic Gaussian (LQG) control techniques. In ITER, the large distance between the plasma and poloidal field (PF) coils introduces a high degree of coupling into the model. Combined with ITER's high performance constraints the shape controller must utilize all coils in an efficient manner. LQG is a type of optimal control that can handle this type of multi-input multi-output design effectively and also in the presence of noise and uncertainty. The algorithm controls the boundary flux at a large number of locations as well as the x-point and strike point positions. The goal that flux errors at the control locations approach zero is treated as a tracking problem for the linearized system. The control design is validated in the 15 MA inductive scenario using a closed loop nonlinear simulation.

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