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Real-time plasma response control for disruption avoidance[1]
JEREMY HANSON, FRANCESCA TURCO, GERALD NAVRATIL, Columbia U, NIKOLAS LOGAN, PPPL, EDWARD STRAIT, GA, DIII-D TEAM — DIII-D experiments demonstrate the viability of using the plasma response to applied non-axisymmetric perturbations as a real-time control variable for disruption avoidance in low-torque ITER baseline demonstration discharges. The response to long-wavelength, low-frequency perturbations like the those used here correlates with plasma stability. Consequently, it is sensitive to key parameters that influence stability, increasing with β_N and decreasing with plasma rotation. In the experiments, the plasma response amplitude was used to feedback modulate the neutral beam (NB) power, and thereby the plasma stored energy and stability. While the response was being controlled, the NB torque was slowly ramped down, resulting in a decrease in stored energy as the feedback acted to keep the response constant under the changing conditions. A case where the torque was ramped through zero to -0.5 Nm while maintaining stability was demonstrated, indicating that control can be maintained in the challenging ITER-like parameter regime.

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