

Resistive wall mode stabilization with internal feedback coils in DIII-D

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Abstract: A set of twelve coils for stability control has recently been installed inside the DIII-D [J.L. Luxon, Nucl. Fusion **42**, 614 (2002)] vacuum vessel, offering faster time response and a wider range of applied mode spectra than the previous external coils. Stabilization of the $n = 1$ ideal kink mode is crucial to many high beta, steady-state tokamak scenarios. A resistive wall converts the kink to a slowly growing resistive wall mode (RWM). With feedback-controlled error field correction, rotational stabilization of the RWM has been sustained for more than 2.5 seconds. Using the internal coils, the required correction field is smaller than with the external coils, consistent with a better match to the mode spectrum of the error field. Initial experiments in direct feedback control have stabilized the RWMs at higher beta and lower rotation than could be achieved by the external coils in similar plasmas, in qualitative agreement with numerical modeling. The new coils have also allowed wall stabilization in plasmas with toroidal beta up to 6%, almost 50% greater than the no wall limit.