Resistive Wall Mode Control on the DIII–D device*

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Recent experiments have demonstrated that the resistive wall mode (RWM), a branch of the ideal kink, can limit the achievable beta in present tokamaks. According to recently developed theory, the RWM can be stabilized if high plasma rotation is sustained above a critical velocity, typically, 0.02% of the Alfvén velocity [1]. It has been also suggested that as the plasma approaches toward the ideal beta limit, the RWM should manifest itself as a slowly growing global mode driven by resonance with the intrinsic error field (Error Field Amplification), which can slow the plasma rotation [2].

A recent series of DIII–D experiments near the ideal beta limit have shown that the EFA process does indeed take place over a wide range of plasma parameters [3]. More importantly, it was found that the application of RWM feedback control with external coils reduces the EFA process by automatically correcting the intrinsic error field and increasing the plasma rotation. It was observed that in the best condition, the β_N reaches to nearly twice the no-wall ideal MHD limit. When well below the critical plasma velocity, the feedback controls the RWM growth as expected from simple magnetically-coupled feedback process. These results are consistent with the stabilizing scheme suggested by Bondeson and Ward. The observed strong coupling between the plasma rotation and the error field is evidence that we need to improve our understanding of the angular momentum confinement properties in actual device environments.

[1] A. Bondeson and D. Ward, Phys. Rev. Lett. **72**, 2709 (1994).

[2] A. Boozer, Phys. Rev. Lett. **86**,5059 (2001).

[3] A. Garofalo at the APS meeting (2001).

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