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[ ] Theory [X] Experiment

Feedback-Driven Mode Rotation Control by Electro-Magnetic Torque,* M. Okabayashi, *PPPL*; E.J. Strait, A.M. Garofalo, R.J. La Haye, *GA*; Y. In, *FAR-TECH, Inc.*; J.M. Hanson, D. Shiraki, F. Volpe, *Columbia U.* – The recent experimental discovery of feedback-driven mode rotation control, supported by modeling, opens new approaches for avoidance of locked tearing modes that otherwise lead to disruptions. This approach is an application of electro-magnetic (EM) torque using 3D fields, routinely maximized through a simple feedback system. In DIII-D, it is observed that a feedback-applied radial field can be synchronized in phase with the poloidal field component of a large amplitude tearing mode, producing the maximum EM torque input. The mode frequency can be maintained in the 10 Hz to 100 Hz range in a well controlled manner, sustaining the discharges. Presently, in the ITER internal coils designed for edge localized mode (ELM) control can only be varied at few Hz, yet, well below the inverse wall time constant. Hence, ELM control system could in principle be used for this feedback-driven mode control in various ways. For instance, the locking of MHD modes can be avoided during the controlled shut down of multi hundreds Mega Joule EM stored energy in case of emergency. Feedback could also be useful to minimize mechanical resonances at the disruption events by forcing the MHD frequency away from dangerous ranges.

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