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Multi-n Resistive Wall Modes Controlled at Non-Zero Amplitude[1] ALEXANDER BATTEY, JEREMY HANSON, JIM BIALEK, GERALD NAVRATIL, Columbia Univ, COLUMBIA UNIVERSITY TEAM — A new model-based feedback algorithm has the ability to simultaneously control n=1 and n=2 resistive wall modes in DIII-D. Higher-n RWMs are sometimes observed following successful stabilization of the n=1 mode, motivating the development of multi-n control. The algorithm is based on the VALEN RWM stability model and has been implemented on real-time GPU hardware. In order to know when multiple n-number feedback is necessary, the marginal stability points of the n=1 and 2 modes need to be better understood. Historically, MHD spectroscopy has been used to validate stability models through comparisons of the plasma response to applied, open-loop perturbations. Our new closed-loop technique allows for RWMs to be controlled at nonzero amplitudes, thereby enabling the response to be studied while maintaining stability. VALEN simulations demonstrate a link between the closed-loop response and plasma stability, with the response amplitude increasing as the open-loop marginal point is approached and exceeded. The robust application of multi-n control has the potential to allow for greater fusion-power density by enabling safe operation at elevated values of normalized beta.

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