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Simultaneous Control of Multiple Resistive Wall Modes on the DIII-D Tokamak[1] ALEXANDER BATTEY, JEREMY HANSON, MITCHELL CLEMENT, JIM BIALEK, GERALD NAVRATIL, Columbia University — Resistive wall modes (RWM) with toroidal mode number n>1 have been observed on the DIII-D tokamak following successful stabilization of the n=1 mode. This motivates the development of a feedback algorithm for simultaneous multi-n control. In order to determine the optimal control coil configuration, simulations were conducted for various internal and external control coil configurations for both current and voltage control power supplies. The simulations factored in realistic limits on the power supplies as well as studied the effects of various latency values. Both the power supply limits and latency are found to reduce the maximum controllable normalized beta. The simulations also predict significant n=1 and n=2 plasma response when the plasma pressure is near, but below the marginal points of these modes. This response is a key point of comparison with experimental measurements and indicates the importance of feedback even below the marginal point. The feedback algorithm has been implemented on real-time GPU hardware using parallelized matrix operations to achieve a 5 μs latency, with the latency increasing logarithmically with matrix size. We will report on the first experimental tests of this new multi-mode control technique and comparisons with simulations.

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