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**Adaptive Extremum Seeking Control of ECCD for NTM Stabilization** J. WOODBY, L. LUO, E. SCHUSTER, G. BATEMAN, A.H. KRITZ, F.D. HALPERN, Lehigh University — Neoclassical Tearing Modes (NTMs) drive magnetic islands to grow to their saturated widths, at which they can persist stably in the plasma. The presence of magnetic islands leads to a local flattening of the current density and pressure profiles, which degrade plasma confinement. Since the bootstrap current density is proportional to the pressure gradient, this current is nearly absent within each island. One common method of stabilizing NTMs and therefore shrinking the island widths involves replacing the lost current via Electron Cyclotron Current Drive (ECCD). In order for ECCD to be successful at shrinking the island widths, the current must be driven at the flux surfaces that contain the islands. Moreover, in order to shrink each island with minimal ECCD power, the current must be deposited as close to the center of the island as possible. The difficulty lies in determining the locations of both the island flux surface and the ECCD deposition in real time. The Extremum Seeking feedback method is considered in this work for non- model based optimization of ECCD suppression of NTMs in tokamaks. Both ECCD steering and plasma position change will be considered as mechanisms to maximize in real-time the alignment between the island flux surface and the current deposition location, and thus to minimize the ECCD power required for NTM stabilization.

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