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Resistive MHD Stability Analysis in Near Real-time[1] ALEXANDER GLASSER, EGEMEN KOLEMEN, Princeton Plasma Physics Laboratory — We discuss the feasibility of a near real-time calculation of the tokamak Δ' matrix, which summarizes MHD stability to resistive modes, such as tearing and interchange modes. As the operational phase of ITER approaches, solutions for active feedback tokamak stability control are needed. It has been previously demonstrated that an ideal MHD stability analysis is achievable on a sub-$\mathcal{O}$(1s) timescale, as is required to control phenomena comparable with the MHD-evolution timescale of ITER. In the present work, we broaden this result to incorporate the effects of resistive MHD modes. Such modes satisfy ideal MHD equations in regions outside narrow resistive layers that form at singular surfaces. We demonstrate that the use of asymptotic expansions at the singular surfaces, as well as the application of state transition matrices, enable a fast, parallelized solution to the singular outer layer boundary value problem, and thereby rapidly compute Δ'.

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