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A general MHD stability formulation for plasmas with flow and resistive walls JEFFREY FREIDBERG, LUCA GUAZZOTTO, Masschusetts Institute of Technology, RICCARDO BETTI, University of Rochester — Plasma rotation, induced either by means of neutral beams (e.g. in NSTX and DIII-D) or appearing spontaneously (e.g. in Alcator C-Mod, JET and Tore Supra) is routinely observed in modern tokamak experiments. Plasma rotation has a major effect on plasma stability. In particular, flow and flow shear stabilize external modes such as the resistive wall mode (as observed e.g. in DIII-D), and also have a significant influence on turbulence, internal kinks and ballooning modes. A self-consistent analysis of the effect of rotation requires the use of numerical tools. In this work, we extend our previous analysis and present a general *variational* eigenvalue formulation of the stability problem. The analysis includes arbitrary (both toroidal and poloidal) plasma rotation and a thin resistive wall of arbitrary shape and resistivity. It is shown the problem can always be reduced to a classic eigenvalue formulation of the kind $i\omega\mathbf{A}\cdot\zeta=\mathbf{B}\cdot\zeta$, where ζ is the unknown eigenvector related to the plasma displacement, and ω the (complex) evolution frequency of the perturbation. The formulation is well suited for a finite element analysis.

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