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Theory Experiment

GATO Code Modification to Compute Plasma Response to External Perturbations,* A.D. Turnbull, M.S. Chu, GA, E. Ng, X.S. Li, LBNL, A. James, UCSD – It has become increasingly clear that the plasma response to an external nonaxisymmetric magnetic perturbation cannot be neglected in many situations of interest. This response can be described as a linear combination of the eigenmodes of the ideal MHD operator. The eigenmodes of the system can be obtained numerically with the GATO ideal MHD stability code, which has been modified for this purpose. A key requirement is the removal of inadmissible continuum modes. For Finite Hybrid Element codes such as GATO, a prerequisite for this is their numerical restabilization by addition of small numerical terms to δW to cancel the analytic numerical destabilization. In addition, robustness of the code was improved and the solution method speeded up by use of the SuperLU package to facilitate calculation of the full set of eigenmodes in a reasonable time. To treat resonant plasma responses, the finite element basis has been extended to include eigenfunctions with finite jumps at rational surfaces. Some preliminary numerical results for DIII-D equilibria will be given.

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