Calculations of two-fluid linear response to non-axisymmetric fields in tokamaks

N.M. Ferraro*

General Atomics, P.O. Box 85608,

San Diego, California 92186-5608, USA

Abstract

The zero-frequency linear plasma response to static applied non-axisymmetric fields is calculated using a resistive two-fluid model in diverted, toroidal geometry. Within this model, the effects on the plasma response of resistivity, rotation, differential ion and electron velocity, and dissipation are explored. Rotation is generally found to inhibit the formation of islands in the plasma, in qualitative agreement with theoretical results. When two-fluid effects are included, it is found that the penetration of the non-axisymmetric fields is generally greatest when the part of the electron rotation perpendicular to the equilibrium magnetic field is small at the mode-rational surface. Strong rotation shear in the edge is found to enhance the plasma response there. The entire plasma, including the separatrix and scrape-off layer, is included in the computational domain.

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*Electronic address: ferraro@fusion.gat.com