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Effect of Hot Ions with Large Orbits on MHD Spectrum in Tokamaks

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Abstract

Hot ions with orbit widths much larger than the scale length of MHD perturbations can non-perturbatively affect the Alfvén spectrum and induce an Alfvén Cascade eigenmode in tokamak plasma with a reversed magnetic shear [1]. Though the hot ions do not experience, on average, the **E**×**B** drift due to the MHD perturbation, the plasma electrons compensating the charge of the hot ions do interact with the MHD perturbation and this interaction depends on parameters of the hot ions. An MHD-type model is developed for effect of hot ions with very large orbits, and this model is incorporated in the MISHKA code as an extension of the ideal MHD model with ion drift effects [2]. The effect of hot ions on both stable (waves) and on unstable (instabilities) parts of the MHD spectrum is assessed for two examples; the Alfvén Cascades in a shear-reversal equilibrium, and for $n = 1$ ideal MHD kink mode.

This work was partly supported by the UK Department of Trade and Industry and Euratom

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