MF-I68

1st Asia-Pacific Conference on Plasma Physics, 18-23, 09.2017, Chengdu, China

The impact of anisotropy and plasma flow on tokamak plasma configuration and plasma stability

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Large scale neutral beam heating, the growing importance of either deliberate or spontaneous equilibrium 3D structure, and the increased diversity, accuracy and resolution of plasma diagnostics have driven more advanced force balance models as well as new approaches to equilibrium reconstruction, such as Bayesian inference techniques.

Recently, equilibrium models and reconstruction codes have been generalised to include physics of anisotropy and toroidal flow[1]. These codes have been used to explore the impact on the magnetic configuration in regimes with large neutral beam heating, as well as determine the impact on particular discharges.[2] In parallel to these developments, a single adiabatic extensions of MHD stability models that capture anisotropy and flow has been developed [3], and together with CGL models, implemented into the ideal MHD stability code MISHKA-ATF[4]. In this work we highlight the differences in the CGL / single adiabatic model continuum, and report on the impact of anisotropy and flow on the equilibrium, frequency and mode structure of a range of energetic particle driven modes in MAST. [5] We also update development of generalisation of the wave-particle interaction code HAGIS to simulate plasmas with anisotropy and flow.

We will also discuss wave-particle driven mode activity in H1 [6] and KSTAR plasmas, as well as a new model for EGAM wave mode activity, as identified in DIIID plasmas. [7]

Acknowledgements: This work is funded by China Scholarship Council, ARC Projects DP1093797 and FT0991899, and the RCUK Energy Programme (Grant No. EP/I501045). Z. S. Qu would like to thank AINSE Ltd for providing financial assistance (Award–PGRA).

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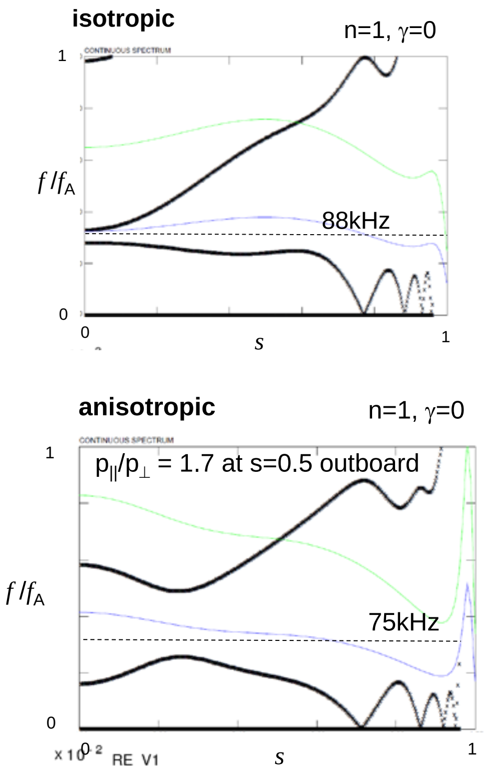

Figure 1 : Comparison of n=1, γ=0 continuum of mode frequencies for MAST 29221@190ms, for isotropic and anisotropic cases. The dashed lines denote different frequency global Toroidal Alfven Eigenmodes.