Kinetic Properties of Shear Alfvén Modes in Tokamak Plasmas

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The ability to predict the stability of fast-particle-driven Alfvén eigenmodes in burning fusion plasmas requires a detailed understanding of the dissipative mechanisms that damp these modes. In order to address this question, the linear gyro-kinetic, electromagnetic code Ligka[1] is employed to investigate their behaviour in realistic tokamak geometry. The eigenvalue formulation of Ligka allows to calculate self-consistently the coupling of large-scaled MHD modes to the gyroradius scalelength kinetic Alfvén waves. Therefore, the properties of the kineticly modified TAE mode in or near the gap (KTAE, radiative damping or 'tunnelling') and its coupling to the continuum close to the edge can be analysed numerically. In addition, an antenna-like version of Ligka allows for a frequency scan, analogous to an external antenna.

The model and the implementation of Ligka were recently extended in order to capture the coupling of the shear Alfvén waves to the sound waves. This coupling becomes important for the investigation of kinetic effects on the low-frequency phase of cascade modes[2], where e.g. geodesic acoustic effects play a significant role[3,4].

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