Effect of sheared equilibrium plasma rotation on the stability of tearing modes

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Abstract

Plasma confinement in tokamak plasma discharges is known to be degraded by the onset and growth of tearing modes. Robust high plasma performance operation of present and future magnetic confinement devices requires a thorough understanding of the possible driving mechanisms for the destabilisation of such modes (*e.g.* local bootstrap and polarisation currents for neoclassical tearing modes-NTMs) as well as finding strategies for avoiding or controlling the amplitude of such modes (including complete suppression). In this work, the effect of sheared equilibrium toroidal plasma rotation on the stability of tearing modes in an ohmic (low β) regime is investigated. It is found that plasma rotation can be both destabilising and stabilising (*i.e.* increasing or decreasing the growth rate). Anomalous perpendicular plasma viscosity plays a key role on the effect of shear flow since for Prandtl numbers (ratio of the resistive to viscous diffusion time scales) above 1-5 and parabolic-like plasma rotation profiles with above ~10kHz on axis, the mode is stable.