1C25

Electrostatic microinstabilities in high confinement and internal transport barrier discharges

A.Bottino, S.Allfrey, P.Angelino, O.Sauter, L.Villard and J.Vaclavik

Centre de Recherches en Physique des Plasmas,
Association EURATOM - Confédération Suisse,
Ecole Polytechnique Fédérale de Lausanne,
1015 Lausanne, Switzerland

Recent experiments with Internal Transport Barriers (ITB) have shown that anomalous transport is considerably reduced by a sheared radial electric field in the plasma [1]. Several theoretical models predict a strong stabilizing effect on toroidal Ion Temperature Gradient (ITG) modes due to the fluctuation suppression caused by the shear in the electric field. Although the turbulence suppression is intrinsically a nonlinear effect, the presence of a radial electric field in the plasma also changes the linear behavior of electrostatic modes: the eddy deformation due to the equilibrium $\mathbf{E}\times\mathbf{B}$ shearing reduces the radial extend and the growth rate of modes. On the other hand, a sheared radial electric field is not the only possible source of stabilization in the plasma core: other mechanisms can reduce the growth rate of electrostatic microinstabilities, i.e. the local value of $\tau = T_e/T_i$ or reverse magnetic shear [2]. In this work we study the effect of the interplay of an applied radial electric field with other equilibrium parameters on the linear stability of ITG and Trapped Electron Modes (TEM) in experimental scenarios, using the gyrokinetic global electrostatic linear PIC code LORB5 [3]. This code includes the effect of an equilibrium $\mathbf{E}\times\mathbf{B}$ velocity; trapped electrons are modeled using drift-kinetic equations. In particular we will examine the role of the absolute value of ion and electron temperature on the instability of modes dominated by trapped electrons.

[1] K.H. Burrell, Phys. Plasmas **3**, 4658 (1996)
[2] A. Bottino, T.M. Tran, O. Sauter, J. Vaclavik and L. Villard, in Theory of Fusion Plasmas, Int. Workshop, (Editrice Compositori, Societá italiana di Fisica, Bologna, 2001), pag.327
[3] A. Bottino, S.J. Allfrey, A.G. Peeters, O. Sauter, L. Villard and ASDEX Upgrade Team, 29th EPS Conference on Controlled Fusion an Plasma Physics, Montreux, 2002, Europhysics Conference Abstract Vol.**26B P1.040**