ABSTRACT

The kinetic stability properties in a number of high performance discharges from the DIII–D tokamak [R.D. Stambaugh, *et al.*, *Plasma Phys. and Contr. Nucl. Fusion Research, 1994* (International Atomic Energy Agency, Vienna, 1995), Vol. 1, p. 83] have been analyzed utilizing a comprehensive kinetic eigenvalue code. The instability considered is the toroidal drift mode (trapped-electron-ion temperature gradient (η_i) mode). This code has been interfaced with equilibria specific to DIII–D plasmas. Experimentally measured kinetic profile data, along with Motional Stark effect (MSE) data and external magnetic data, were used, and the corresponding magnetohydrodynamic (MHD) equilibria were computed numerically. In particular, a low confinement mode (L–mode) case, a high-ℓ_i high confinement mode (H–mode) case, a very high confinement mode (VH–mode) case, and a high plasma pressure/poloidal magnetic pressure (β_p) case have been analyzed. For the L–mode case, a wide region of instability was found, while for the H–mode and VH–mode and high-β_p cases, only relatively narrow regions of instability were found. An assessment of the influence of velocity-shear flow on these instabilities has also been made, as well as of changes in the electron and ion temperature gradients and density gradients. While the experimental values of the sheared toroidal flow velocity are not sufficient to stabilize the instability, an increase by a factor of two to four in the flow velocity could completely stabilize this mode.