ABSTRACT

It has been recently proposed that, for highly turbulent discharges, there exists a consistent density profile for the trapped electrons in a high aspect ratio circular cross-section tokamak which has a radial variation proportional to 1/q(r), where q is the usual safety factor. It is shown here that this result can be extended to include passing electrons and non-circular cross section moderate aspect ratio tokamaks. This new prediction for the density profile is compared to the time evolution of the measured electron density profile in low confinement mode (L-mode) shots in the tokamak known as DIII-D, where the q profile is changed in time during the discharge. Once an expression for the consistent density profile is known, it is trivial to obtain an expression for V_p/D, where V_p is the particle pinch velocity and D is the particle diffusion coefficient. This expression is compared with the value of V_p/D which is obtained from an analysis, utilizing the ONETWO transport code, of certain high confinement mode (H–mode) DIII–D discharges which are free from edge localized modes (ELMs). The dependence of density on q can be extended to a dependence of temperature on q through the adiabatic relation. The dependence of temperature on q can then predict one type of cold pulse propagation phenomena. By way of introduction a simple analogy with a dynamic incompressible fluid system is made.

PACs Nos.: 52.55.FA, 52.55PI, 52.25FI