Electric field control using waves in collisional magnetized plasma filters

T. Nicolas[1]

[1] CPHT, CNRS, École polytechnique, Institut Polytechnique de Paris, 91120 Palaiseau, France

contact: timothee.nicolas ⊕ polytechnique.edu

The radial electric field is an important quantity in fusion plasmas, as it is strongly related to the L to H transition in tokamaks, or can be used to improve confinement in mirrors. It also constitutes the most essential feature of plasma filters referred to as Ohkawa filters, where the electric field can be generated either *via* electrode biasing or *via* coupling with an azimuthal momentum carrying wave. In this contribution, we focus on the latter case. The electric field is treated self-consistently with ion and electron radial motion. The injection of angular momentum by the wave causes radial currents leading to charge penetration and electric field build up. The electric field varies until an equilibrium with the friction forces is reached. Both collisions with neutrals and Coulomb collisions are considered. In the case where the electric field is driven by the resonant wave, the maximum achievable electric field (the so-called Brillouin limit) decreases when the collision frequency is increased, which contrasts with the case of electrode biasing. When two species are present, one that undergoes the wave forcing while the second does not interact with the wave, we find the following: the first species is confined, while the second species can be expelled or confined depending on the charge to mass ratio and the collisionalities. The model underpinning these conclusions will be discussed.