

The role of electron-driven microinstabilities in particle transport observed during electron Internal Transport Barriers

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Abstract

Experimental results obtained in TCV electron Internal Transport Barriers (eITBs) show a strong coupling between the plasma density and the electron temperature logarithmic gradients [1]. The plasma density is sustained by an inward thermodiffusive pinch whose theoretical understanding has not been achieved yet. The level of particle diffusivity, as estimated in transient transport experiments, indicates anomalous transport as the main mechanism to create this pinch. On the other hand, a clear improved heat and particle transport confinement is observed. Quasi-linear kinetic calculations of the pinch coefficients are studied in the limits of negligible magnetic curvature drift and zero collisionality, limits which are reasonable for an eITB. The results show that the contribution of the parallel dynamics of passing electrons to the pinch gives a value consistent with the experiment. However, the presence of trapped particles introduces a strong parametric dependence in the thermodiffusive pinch. It gives an outward pinch which dominates the contribution from passing particles and reverses the pinch direction for the typical eITB parameters, in disagreement with the experimental observation. A discussion of the various contributions to the particle pinch, of their link to microinstabilities, and of the possible solutions to this contradictory behavior is presented.

[1] E. Fable *et al.*, *Plasma Phys. and Contr. Fus.* **48**, 1-13 (2006)