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Cross-field diffusion in low-temperature plasma discharges of finite length DAVIDE CURRELI, University of Illinois at Urbana Champaign — The long-standing problem of plasma diffusion across the magnetic field is here critically reviewed, focusing on low-temperature linear devices of finite length having the magnetic field aligned mainly along one axis of symmetry. After a review of the past six decades of works on both the experimental measurements and the theoretical interpretations, we compare and discuss the results obtained from different approaches. Macroscopic fluid-based models can give a first order description of the quasi-neutral region of the plasma. Microscopic calculations of the kinetic motion of plasma particles using three dimensional Particle-in-Cells evidence the big relevance of electrons kinetics, not revealed when electrons are simply approximated as Boltzmann-like. We highlight the relevance of including into the description also the non-neutral region of the sheath boundary, where quasi-neutrality is broken and ions become supersonic, and the wall, whose electrical short-circuiting interaction with the plasma can't be neglected.

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