Abstract Submitted
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A new equilibrium theory for rf discharges FRANCIS F. CHEN, DAVIDE CURRELI[1], UCLA — Two problems often encountered in RF discharges are 1) anomalous skin depth and 2) anomalous electron diffusion across magnetic fields B. Both effects can be explained if the discharges are not unusually long or short. The Simon short-circuit effect[2] then allows the electrons to follow the Boltzmann relation even across B. Once Maxwellian electrons are assumed, a remarkable result can be obtained for radial profiles of density, potential, and ion drift velocity toward the cylindrical wall. In suitably normalized units, these profiles take on a universal shape for all discharges, regardless of B. The velocity profile naturally reaches the Bohm velocity at the wall (= sheath edge). Our code EQM solves for the radial profiles of plasma and neutral density including neutral depletion. All radial dependences are taken into account exactly, and no assumption of a presheath is necessary. To get the profile of T_e requires energy balance in the specific discharge. We have done this for helicon discharges described by the HELIC code.[3] Iteration between EQM and HELIC yields all profiles and also the absolute density for given RF power.

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