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Reconsideration of basic concepts for the low-pressure discharge maintenance ANTONIA SHIVAROVA, Sofia University — The Schottky condition and the concept for the ambipolar field known as bases of the low-pressure discharge maintenance are reconsidered. Whereas the Schottky condition results in a value of the electron temperature independent of the plasma density, the discussed generalized form of the Schottky condition relates – due to the nonlinear processes in the charged particle balance – the electron temperature to the plasma density, thus, ensuring self-consistency of the plasma description. The concept for equality of the electron and ion fluxes resulting into the ambipolar field is the second issue discussed. Localization of the power input outside the high plasma-density region, a common case in many rf plasma sources, breaks it down by transforming the ambipolar field into a vortex, non-conservative, field. Since the dc field in the discharge should be a potential (conservative) field, it appears to be composed by two vortex field: the ambipolar field and a field related to a vortex dc current, the latter driven by a deviation from the Boltzmann distribution of the electron density. In addition, due to the steady-state magnetic field self-induced by the vortex current in the discharge, the plasma appears magnetized without having an external magnetic field applied.

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