Influence of the non-uniform rf electromagnetic field on reproduction of electrical potential in plasma with magnetized electrons

Kuzmichev S D, Gavrikov A V, Melnikov A D, Vorona N A, Liziakin G D[@] and Smirnov V P

Joint Institute for High Temperatures of the Russian Academy of Sciences, Izhorskaya 13 Bldg 2, Moscow 125412, Russia

[@] glizyakin@gmail.com

This work is dedicated to the study of the influence of the Gaponov–Miller gradient forces associated with non-uniform electric rf fields on the possibility of formation of the spatial distribution of electrostatic potential in the magnetic field in the plasma volume. The paper deals with the plasma characterized by following parameters: the temperature of electrons is about several eV, the temperature of ions is fractions of an eV, constant magnetic field is about 10^2–10^3 G, the frequency of the rf field that generates plasma is about 5 MHz. It has been shown using assessments and numerical modeling in the HELIC 1.0 software that the influence of the Gaponov–Miller forces can be manifested primarily as border effects near rf antennas. However, even for relatively large amplitudes of rf fields generated by an antenna (dozens of kV/m), potential wells of the Gaponov–Miller for electrons do not exceed 1 eV, and "hills" for ions are several eV. Thus, it has been demonstrated that the Gaponov–Miller gradient forces should be taken into account only as a clarifying, but not determining factor governing the possibility of creation electrical potentials about 10^2 V in the plasma.

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