3.28 Formation time of the plasma in crossed fields in millisecond region

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Abstract

The problem of the plasma formation in crossed electric and magnetic fields at low pressure has been studied. By measuring of the formation time it was shown that an intense gas discharge initiates in the magnetron diode with considerable delay of the order of a few milliseconds, with respect to the anode voltage establishment. It was observed that the formation time increases as the square of the magnetic field and decreases with pressure.

3.29 Influence of the cathode heating current on the plasma formation time in crossed fields

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Abstract

The influence of the cathode on the plasma formation time in the gas magnetron diode with hot cathode has been investigated. It was shown that the parasitic electric and magnetic fields due to the heating current flow lead to an increase in the plasma formation time.

3.30 Gas ionisation in crossed electric and magnetic fields

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In the present paper we report preliminary calculations which attempt to explain the behaviour of the gas magnetron diode with hot cathode (as a system of crossed fields) near the cutoff. For weak magnetic fields (smaller than the cutoff magnetic field B_c) the gas magnetron diode at low pressures behaves like a simple diode without magnetic field. Paths of emitted electrons lengthen with magnetic field reaching the maximum at B_c. With lengthenning of electron paths the number of produced ions increases. At critical magnetic field the electrons graze the anode and come back to the cathode, so we could expect a jump in the ion production. Since the number of ions N_i depends also on the ionisation cross-section, i. e. on the electron energy, which changes with magnetic field, it was of interest to obtain the shape of the function $N_i = f(B)$.

The number of ions created on the path dl is

$$dN_i = N_e n_g \sigma_i \, dl, \tag{1}$$