PARAMETERS OF THE PLASMA FLOW FORMED BY THE CERA-RI-2 INJECTOR

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The work is devoted to an experimental study of the plasma flow parameters generated by the ECR injector CERA-RI-2.

The injector consists of a plasma source and an electrode system for the extraction of charged particles. Plasma is formed in a narrow coaxial resonator (2.45 GHz), placed in a magnetic field, surrendered by permanent ring-shaped magnets. The spatial distributions of the microwave electric and constant magnetic fields of the plasma source form an axially symmetric, ring-shaped ECR region remote from the walls of the resonator. To register the microwave field in the cavity, a near-wall loop antenna was used. The working gas was introduced into the discharge chamber through the side cylindrical wall of the resonator. Extraction of charged particles was carried out by a system of electrodes placed symmetrically with the axis of the injector. The parameters of the formed plasma flow were diagnosed using a multigrid analyzer of the longitudinal energies of charged particles and a single electric probe.

Previously, conditions (working gas pressure (Ar), input microwave power) were determined under which the concentration of particles in the plasma formation region can exceed the critical value for the frequency of the microwave field [1] used, and the mechanism that ensures this [2].

The purpose of this work was to study the characteristics of the plasma flow formed by the extraction of charged particles by a system of electrodes, the potential on which could vary.

It was established that under the conditions of the experiments, a quasi-neutral plasma flow is formed, the longitudinal energy of the ionic component and the ion current in which is determined by the pressure of the working gas (Ar) in the ECR region of the discharge introduced by the microwave power and the potentials on the extraction electrodes. The optimal conditions are determined under which the magnitude of the ion current is maximum.

The results obtained are in qualitative agreement with the results of the computational experiment presented in [3]. In this regard, we believe that the use of heavier gases, as was shown in [4], can significantly improve the results obtained.

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References

1. Balmashnov A.A., Kalashnikov A.V., Umnov A.M. Plasma Physics Reports. 2018. T.44, No. 6, p. 520.
2. Balmashnov A.A., Butko N.B., Kalashnikov A.V., Stepina S.P., Umnov A.M. Prikl. Fiz. 2018. № 5.
3. Balmashnov A.A., Stepina S.P., Butko N.B., Umnov A.M., Jimenez M.Kh. Usp. Prikl. Fiz. 2015. V. 3, № 2, p. 34.
4. Balmashnov A.A., Stepina S.P., Umnov A.M., Khimenez M.Kh. Prikl. Fiz. 2016. № 2, p. 61.