R4-P-950401

SIMULATION OF THE EXTRACTION SYSTEM OF A LABORATORY ECR ION SOURCE*

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At the NRC "Kurchatov Institute" work is underway to study the radiation resistance on heavy ion beams. Simulation experiments on heavy ion beams makes enables a preliminary radiation resistance express analysis for specimens of structural materials for nuclear and thermonuclear reactors during few hours rather than years in the research reactor. A two-beam facility is under development for these irradiation experiments. HIPr is used to accelerate heavy ions Fe^{+2} and forming defects in the material similar to neutron ones. An electrostatic accelerator implants hydrogen and helium ions into material specimens, thereby simulating the products of nuclear reactions.

The ECR ion source [1] is designed for an electrostatic ion accelerator. The scheme of the ECR ion source is shown in Figure 1. The source includes a 2.46 GHz magnetron, a rectangular waveguide 72 * 34 mm passing into a discharge chamber with a length of 580 mm. Accelerating voltage 25 kV.

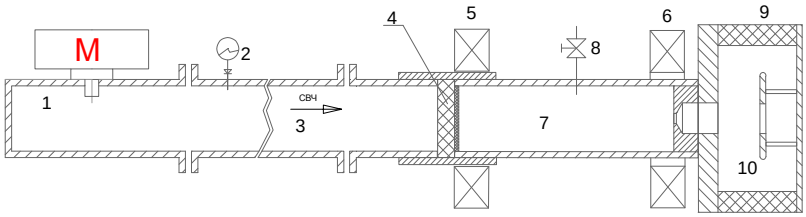

Fig.1. Scheme of a laboratory ECR ion source: 1-section with a magnetron; 2-diode detector; 3-measuring section; 4-high-frequency vacuum window; 5-magnetic coil No.1; 6-magnetic coil No.2; 7-discharge chamber; 8-gas input; 9-high-voltage insulator; 10-vacuum chamber with ion extraction system.

New beam formation system for the ECR ion source is being developed using the Kobra3-INP program to improve the beam parameters [2]. To adjust KOBRA3-INP initial parameters, the beam parameters from the current design of the ECR ion source were measured. The total beam current of the laboratory ECR ion source was measured using a Faraday cup. The emittance was measured by the "pepper-pot" method [3]. The model of existing extraction optics geometry was developed in Kobra3-INP. The parameters of the transverse temperature and longitudinal energy of gas ions were determined during the development of the model. The model will be used to develop the extraction system for the final version of the ECR source.

The report presents the results of developing a model of existing extraction system ECR ion source and preliminary results for a new extraction system.

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* This work was supported by the Russian Science Foundation, project no. 22-29-01279. The equipment of the KAMIKS Shared Access Center (https://ckp-rf.ru/ckp/502001/) at the National Research Center "Kurchatov Institute" was used.