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DETERMINATION OF THE PARAMETERS OF THE OUTGOING PLASMA FLOW FROM A HELICON SOURCE BY EMISSION SPECTROSCOPY *)

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According to the Doppler shift and the width of the contour of the transition lines, the velocity of the incoming flow and the temperature of ions were determined [1] using spectroscopic diagnostics (M-522 monochromator and ISP-51 spectrograph with Fabry–Pérot interferometer) for various configurations of the magnetic field and gas flow in various geometric configurations of the mirror and lens system in order to study various areas of collection plasma radiation on the EPRE simulator stand PN-3 [1].

To carry out such measurements, an aluminum mirror was installed in the magnetic nozzle at an angle of 45 $^{\circ}$ to the incoming ion flow, thus, the radiation of atoms and ions was redirected to a focusing lens collecting radiation at various distances from the diagnostic window in the magnetic nozzle (Fig. 1). 3 series of experiments were conducted:

1. Investigation of ion radiation coming from the entire volume of the gas discharge chamber (using a 45 $^{\circ}$ mirror to the flow), the collecting lens is installed directly in front of the diagnostic window.

2. Investigation of ion radiation escaping from lines of force in a diverging magnetic field (using a mirror set at an angle of 5 $^{\circ}$ to the position from the previous series of experiments).

3. The results of processing data from ions flying from the volume of the gas discharge chamber, depending on the focus coordinate along the flow (by shifting the focusing lens along the rail).



Figure 1 is a scheme for collecting radiation from ions escaping from field line in a diverging magnetic field: (1-a flow of incoming ions; 2- an aluminum mirror in a magnetic nozzle installed in 2 positions (45 ° to the incoming ion stream, to study the flow velocity, at an angle of no more than 10 ° to the previous location for studying the velocity of ions moving along the field lines); 3, 4 – the flow of ions observed using a mirror mounted at an angle of 45 ° to the flow and with a deviation of no more than 5 °, respectively; 5,6 lens system; 7,8 – monochromator M-522 and spectrograph ISP-51)

The results of ion velocity and temperature measurements obtained using the M-522 monochromator and the ISP-51 spectrograph are in good agreement in the case of high intensities.

References

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^{*)} abstracts of this report in Russian