INFLUENCE OF THE EXTERNAL MAGNETIC FIELD ON PARAMETERS OF PLASMAFOCUS DISCHARGE AND GENERATED PLASMA FLOWS

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The experiments on using the plasma flows, generated in the plasma-focus (PF) discharge, to simulate astrophysical process are conducted in NRC "Kurchatov Institute" successfully[1, 2]. It was shown earlier [2] that the plasma flow propagates with its own captured magnetic field. The main component is the toroidal component created by the longitudinal current. At the same time, in different theoretical models the poloidal magnetic field plays a significant role in the collimation of the astrophysical jet. For example, in a laboratory experiment in the laboratory LULI (France) it was shown [4] that a strong (20 T) external poloidal magnetic field leads to a collimation of the flow.

The purpose of this work was to investigate the effect of an external longitudinal magnetic field on the parameters of the plasma flow on a PF-3 facility. In experiments, the external magnetic field was created by passing current through a coil installed under the anode of the installation. The value of the generated magnetic field on the axis of the installation was 1.12 kG. When the current shell compresses the magnetic flux to a diameter of 1 cm, the magnetic field can reach several hundred kilograms per second in plasma flow generation. A wide range of diagnostic tools involved in research: magnetic probes, light collimators, X-ray sensors, high-speed slit and frame cameras.

X-ray sensors detected a significant decrement of hard X-ray radiation when an external axial magnetic field is applied. This may be due to the fact that the external field prevents the formation of kinetic instabilities and the formation of an electron beam. The registration by the slit chamber showed that the external field strongly influences the dynamics of compression of the current plasma shell and leads to a significant increase in the duration of the pinching stage of the discharge.

When an external magnetic field is applied, the components of the magnetic field of the jet significantly increase (*B*ϕ 2-3 times, *Bz* 5-10 times). It does not depend on the working gas (Ne or H2). The captured field is co-directed with the external field being created.

Light collimators showed a significant increase in the radiation intensity of plasma flows. Frame high-speed cameras fixed an increase in the intensity of the radiation of plasma flows too. The direction of the external magnetic field on the discharge and plasma flows does not affect cardinally.

The work was supported in part by RFBR (№ 17-02-01184-a, №16-32-00917-mol-a).

References.

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