STUDIES OF ANODE PLASMA DYNAMICS DURING INTERACTION OF RELATIVISTIC ELECTRON BEAM WITH EPOXY RESIN ANODE

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The results of the experiment, which is a continuation of studies of plasma dynamics in the interaction of a relativistic electron beam with anodes of epoxy resin in the vacuum diode of the high-current generator "Kalamary" [1] conducted in 2015–2016, are demonstrated.

Then, along with the typical movement of the registered luminous substance (from the electrodes to the center of the diode), in certain cases we observed the propagation of the glow from the center of the interelectrode gap to its edges, starting after the polarity of the diode current – the “Cobra Tooth” effect, which is more often observed at the epoxy anode than at the polystyrene one. The speed of atypical expansion is hundreds of kilometers per second, which is an order of magnitude higher than the speed of plasma from the electrodes. The image of plasma in the visible spectrum was recorded by the streak camera SFER-6 operating with the time-slit [2].

Laser shadow diagnostics was used in this experiment. The source of probing radiation was a solid-state pulsed laser based on yttrium orthoaluminate with neodymium. We used the second harmonic (wavelength 540 nm, pulse duration 200 µs at the base, pulse energy up to 100 mJ) of radiation generated by a nonlinear crystal of potassium titanyl phosphate placed inside the laser resonator. The image was recorded by the streak camera SFER-6, on the time-slit of which the anode region of the vacuum diode was projected.

Own light of the plasma was either suppressed completely by selective green filters, or partially passed to create combined images (laser shadow + own light).

Based on a series of experimental data, in this report we try to analyze the possible causes of "atypical" dynamics of the radiance.

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References

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