The Study OF FILLING THE VACUUM DIODE gap OF A HIGH-CURRENT generator WITH DENSE PLASMA [[1]](#footnote-1)\*)

DOI: 10.34854/ICPAF.2020.47.1.126

1Demidov B.A., 1,2,3Kazakov E.D., 1Kalinin Yu.G., 1Krutikov D.I., 1Kurilo A.A., 1Orlov M.Yu., 1Strizshakov M.G., 1,2Tkachenko S.I., 1Shashkov A.Yu.

1National Research Centre “Kurchatov Institute”, Moscow, Russia, [Strizhakov\_MG@nrcki.ru](mailto:Strizhakov_MG@nrcki.ru)  
2National Research University “Moscow Institute of Physics and Technology”, Dolgoprudny,  
 Russia  
3National Research University “Moscow Power Engineering Institute ", Moscow, Russia

Previously, the interaction of relativistic electron beams of the high-current generator "Calamari" [1] with polymer targets revealed an effect that occurs under certain experimental parameters and, as a rule, more often on epoxy target anodes [2]. To study the processes in a vacuum diode, laser shadow diagnostics was implemented using the second harmonic (λ=540 nm, pulse duration 200 microseconds at the base, pulse energy up to 100 MJ) of a solid-state pulsed laser based on yttrium orthoaluminate with neodymium, which was described in detail in [3].

When conducting a series of "shots", a bright self-glow of the plasma was observed at the second half-period of the current, which often exceeded the brightness of the probing laser radiation. In this regard, it was suggested that the occurrence of instability in the plasma filling the diode gap. Effective in this case would be chronography in the laser shadow with vertical section of the gap “cathode-anode " vacuum diode high-current generator. In accordance with the above, the diagnostic path of shadow photography was modified, including the reversing prism in front of the time-analyzing slit. Thus, the picture of the process was taken in the section, deployed relative to the original 90º.

In a series of experiments with the “vertical” slit were overseen near-cathode and near-anode region of the vacuum diode, as well as the middle of the interelectrode gap. A well-distinguishable distribution of the substance in the anode region and the appearance of luminescence at diameters significantly smaller than the diameter of the beam were observed.

The study have been done at financial support RFBR, research project No. 18-32-00678\19 mol\_a.

References

1. Demidov B.A., Ivkin M.V., Petrov V.A. et al. //Atomnaja Energija, 1979 vol. 46, № 2, p. 101—116.
2. Ananyev S.S.,Dan'ko S.A., Kazakov E.D.,Kalinin Y.G., Kurilo A.A.,Strizhakov M.G. Behavior specificities of the plasma in the REB – polymeric anode interactions //Journal of Physics: Conference Series 2016 V. 747, № 1, P. 012003.
3. Strizshakov M.G., Kazakov E.D., Kalinin Yu.G., Kurilo A.A., Shashkov A.Yu. Studying of the plasma dynamics when relativistic electron beam interacts with epoxy resin anode // Proceedings of the XLVI Zvenigorod int. conf. on Plasma physics and Controlled Fusion, Zvenigorod, 2019, p. 236.

1. \*) [abstracts of this report in Russian](http://www.fpl.gpi.ru/Zvenigorod/XLVII/Lt/ru/FB-Strizhakov.docx) [↑](#footnote-ref-1)