Z-PINCH STUDY WITH ELECTRON BEAM DISCHARGE INITIATION [[1]](#footnote-1)\*)

DOI: 10.34854/ICPAF.2020.47.1.109

1Drozdovsky A., 2Sasorov P., 1Bogdanov A., 1Drozdovsky S., 1Gavrilin R., 1Kantsyrev A., 3Karpov M., 1Panyushkin V., 1Roudskoy I., 1Savin S.

1NRC «Kurchatov Institute» - ITEP, Moscow, Russia, [drozdovsky@mail.ru](mailto:drozdovsky@mail.ru)  
2Keldysh Institute of Applied Mathematics, Moscow, Russia, [Pavel.Sasorov@gmail.com](mailto:Pavel.Sasorov@gmail.com)  
3RFNC-VNIIEF, Moscow, Sarov, [maksim.karpov@gmail.com](mailto:maksim.karpov@gmail.com)

The study of the processes of breakdown, discharge development and formation of Z-pinch is the most important direction of plasma research. Typically, the discharge process begins with a breakdown on the surface of the discharge tube after applying a high voltage to the tube. But it is also possible to initiate the discharge by injecting a beam of electrons along the axis of the discharge tube. The ITEF studies the discharge initiated by the electron beam. An experimental setup is including an electron beam source [1]. An electron energy is 250 Kev, a current is up to 100 A with a duration of up to 100 NS. The main method of observing the dynamics of the plasma discharge is the registration of its own plasma radiation from the middle section of the discharge tube in the visible and ultraviolet range. The process of development of the discharge initiated by the electron beam differs significantly from the usual method of Z-pinch formation. Figures 1a and 1b shows a time sweep of the plasma luminosity during the first LC-period of discharge in an oxygen atmosphere at a pressure of 0,25 mbar and a discharge current of 40 kA. The quartz discharge tube has a length of 20 cm and a diameter of 4 cm. Currently, we are developing a technique for recording discharge plasma radiation in the field of vacuum ultraviolet and soft x-rays, which significantly expands the energy range of research. Since this radiation is strongly absorbed in the air, a special vacuum channel was made in which the camera-obscura technique is used to obtain an image of the studied discharge. The first debugging observations of vacuum ultraviolet and soft x-ray for 40 kA discharge current at a pressure of 0,25 mbar were made. As can be seen from the distributions (Fig. 2), the emission zone of hard z-pinch radiation is enclosed in a cylindrical region of half the diameter compared to the visible radiation.

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| Fig. 1а. Scanning (6 msec) of discharge luminosity at surface breakdown. |
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| Рис.1в. Scan (6 msec) of the discharge luminosity when initiating a breakdown by an electron beam. |

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| Fig. 2. The radial distribution of emitters for the visible region – (---) and the region with λ< 200 нм – ( ). |

The work is executed at support of RFBR, grant 18-02-01187.

References

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