THE OPTICAL DIAGNOSTICS SYSTEM DEVELOPMENT for THE HIGH-CURRENT ELECTRONIC ACCELERATOR "Calamary" [[1]](#footnote-1)\*)

DOI: 10.34854/ICPAF.2022.49.1.129

1,3,4Kazakov E.D., 1Krutikov D.I., 1Orlov M.Yu., 2Pavlenko M.I., 1,3Smirnova A.R., 1Strizhakov M.G., 2Sunchugashev K.A.

1NRC "Kurchatov Institute", Moscow, RF  
2RUDN University, Moscow, RF  
3MIPT, Dolgoprudny, Moscow region, RF  
4NRU MPEI, Moscow, RF

At the Calamary high-current electron accelerator, studies are carried out to investigate the plasma dynamics in the vacuum diode of the accelerator [1, 2], the propagation of shock waves in transparent materials [3], and the features of the destruction of multicomponent structural materials  [4].

When studying plasma dynamics, it is desirable to be able to simultaneously register both the plasma glow and the laser shadow. Also, one of the most important tasks is to determine the relationship between the behavior of the plasma and the propagation of shock waves arising in materials. In this regard, it became necessary to create a diagnostic complex that would allow simultaneous optical registration in several channels. Moreover, it was necessary to provide for the possibility of using significantly different time scales in the channels, since the characteristic times of plasma and shock-wave processes differ by more than an order of magnitude. For this purpose, an optical scheme was developed, which was tested in experiments on studying the behavior of plasma in the diode gap. Registration was carried out using two electron-optical cameras SFER-6 and VICA-25MK, operating in chronographic mode. The method of laser shadow photography was used. An interference filter at 540 nm, corresponding to the wavelength of laser radiation, was installed in front of the VIKA-25MK. A ZS-11 color filter was installed in front of the SFER-6 camera, which allowed a small amount of its own plasma glow to pass through. The amount of intrinsic luminescence falling on the time-analyzing slit of the camera was also controlled by changing the diameter of the aperture of the objective that forms the image. The preliminary experiments carried out made it possible to separate the shadow image and the effects associated with both the intrinsic emission of the plasma and the deceleration of the plasma torch on the residual gas. Due to the fact that the laser beam has a sufficiently large diameter, and the range of registration times is wide enough, in the future, the SFER-6 can be reconfigured to observe shock-wave processes, which will significantly expand the spectrum of information obtained from the experiment.

This work was supported by the National Research Center "Kurchatov Institute" (Order No. 2073 dated 09.10.2020).

References

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1. \*) [abstracts of this report in Russian](http://www.fpl.gpi.ru/Zvenigorod/XLIX/Pt/ru/GU-Kazakov.docx) [↑](#footnote-ref-1)