APPLICATION OF LASER-SHADOW DIAGNOSTICS FOR THE STUDY OF SHOCK WAVES PROPAGATION IN TRANSPARENT MATERIALS UNDER THE HIGH-CURRENT ELECTRON BEAM impact [[1]](#footnote-1)\*)

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It is not the first decade that has been studying the propagation of shock waves in various materials, but obtaining new experimental data in this area remains a very urgent task. This is associated with significant difficulties in creating a universal theory or model for various materials and modes of exposure. This is especially true for cases of powerful pulsed energy release in a bulk surface layer [1]. This paper presents the results of an experimental study of the propagation of shock waves in transparent materials using laser-shadow diagnostics. The experiments were performed on a Kalmar high-current electron accelerator [2] at electron energies up to 300 keV and currents up to 40 kA.

For laser diagnostics, a pulsed solid-state laser with an active element from a single crystal of yttrium orthoaluminate with neodymium was used. The duration of the pulse smooth in time was 200 μs at the base, which significantly exceeds the total duration of the studied processes. Pulse energy up to 100 mJ. As a recorder, an SFER-6 streak-camera was used. The obtained shadowgrams with continuous image registration in time are very visual and informative. A shock propagation front, reflection from the free surface and the destruction, propagation of the destruction wave, and multiple features were observed. In some cases, the expansion of the spall substance from the back surface of the samples was also observed. In addition, in some experimental schemes there was the possibility of simultaneous observation of shock wave phenomena in samples and plasma processes in the vacuum diode of the accelerator. This allows us to correlate the features of the generated shock waves with the features of the interaction of the electron beam with dielectric anodes. To obtain the most complete picture, the study used a fairly wide range of transparent materials: optical glasses, PMMA, polystyrene, epoxy.

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References

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