Diploma thesis abstract of student Garmatina A. A.

Femtosecond laser microchanelling in multi-layer structure with the process control by laser-induced X-rays and second harmonic signal.

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It is shown that the drilling of multi-layered structures by femtosecond laser radiation with high energy density can be monitored on-line using x-rays and second harmonic induced in microchannel plasma.

For the targets composed of 2-4 layers of titanium or aluminum foils it was demonstrated that the amplitude of the x-ray signal can be associated with the moment of layers perforation during the perforation. Penetration of the beam waist at a depth comparable to the layer thickness, the amplitude of the x-ray signal reflects the moment of transition between the layers during the perforation, while using an optical signal (second harmonic signal on the background of the photoemission plasma of the target material), we can register the time of perforation only of the first layer.

For the first time, was made diagnosis of the process of the microchannel creation and perforation of hard tissue (chicken eggshell). It is established that the perforation of the shell thickness of 400 μm is successfully registered by x-ray signal and optical response.