ANNOTATION FOR BACHELOR'S WORK

"GAMMA PRODUCTION AT RELATIVISTIC LASER INTERACTION WITH STRUCTURED TARGETS"

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In study of relativistic laser-plasma interactions, much attention is given to the generation of high-energy particles (electrons and ions) and hard x-rays. Such interest is associated with prospects of using laser-plasma sources in a number of applied and fundamental problems. Gamma production depends largely on the type of target used in the experiments. In the bachelor's work the relativistic femtosecond laser-plasma interaction with structured on the sub-wavelength scale targets was studied and in particular the problem of generation of fast electrons and hard x-ray production was examined. The measurements were carried out with targets formed by chemical etching of flat silicon substrate: silicon nanopores, silicon nanowires. The targets were irradiated by pulses delivered by a Ti:Sa laser system (λ=805 nm, τ=50 fs, E=50 mJ, $I_{peak}>10^{18}$ W/cm^2).

The relativistic laser-plasma interaction with structured targets of all types revealed a significant enhancement hard x-ray yield from the plasma in the range >300keV, which is associated with increase of the absorption of optical radiation on non-uniform surface of the target. The action of a powerful laser pulse onto silicon nanowires also shown growth of the temperature of hot electrons in the plasma. So, at intensity about $2x10^{18}$ W/cm^2 the temperature increased from 150 keV for flat silicon up to 280 keV for silicon nanowires. And for intensity of about $6x10^{18}$ W/cm^2 the temperature increased up to 500 keV for silicon nanowires compared to 260 keV obtained at a flat target. At the same time the amplification of gamma yield reached five times (up to 10^{-3}%) at the same experimental conditions.

It should be mentioned, that with the increase of the intensity, the relative growth of hard x-ray yield on structured targets compared to a flat one slightly decreases, which can be explained by the limited contrast of the laser pulse. The action of pre-pulses with an increase of intensity of laser pulse can partially destroy the structures at the time of main pulse arrival.