X-RAY SPECTRA OF TARGETS IRRADIATED BY ULTRASHORT LASER PULSES

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The experiments were performed on 10 TW picosecond laser facility SOKOL-P [1] where massive thick aluminium targets and targets with buried Al layer were irradiated at intensities up to 10^{18} W/cm^2. The last sort of targets consisted of three layers. Al layer of about 4 μm thickness was covered by 2 μm polyethylene coatings.

X-ray pinhole – cameras recorded a spatial distribution of target luminosity in several spectral ranges. X-ray continuum in quantum energy range $\varepsilon=0.8\div10$ keV was measured with the help of multichannel absolutely calibrated spectrometer. The spectrometer is based on gray filter method and semiconductor Si detectors. Focusing fon Hamoshi spectrograph with mica crystal recorded line spectrum of He- and H- like ions of aluminium.

Numerical simulation was conducted and matched with experimental results. This simulation was based on the sequence of radiation hydrodynamics [2], ion kinetics and radiation transport [3]. There is a good accordance experimental results and results of simulation for massive Al targets. Time averaged continuum in the range $\varepsilon=2\div10$ keV correspond to electron temperature $T_e=0.8$ keV, and maximum value of temperature can reach of about several keV. The accordance is considerably worse for the targets with buried Al layer. Measured and calculated values of detector signals diverges two – fivefold. Significant difference is observed in line spectra obtained in experiments and in simulation too. The expected reasons for these differences are high sensitivity of plasma emissivity to electron thermal conduction koefficient and fast electron energy transport into target.

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