Diploma thesis abstract

Gamma-ray emission of plasma produced by superintense laser pulse and its application for lowlying nuclear states excitation

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Experimental research of laser-induced solid-body plasma gamma emission was conducted. Solid-body targets (Pb, Fe and SiO_2) were irradiated by laser pulses of sub-relativistic ($I \sim 10^{18}$ W/cm^2) intensity. An increase of hot electrons plasma subsystem temperature was discovered in case of long chirped laser pulses application. For lead and iron targets electron temperature increased from 175 and 70 keV to 560 and 270 keV respectively in comparison to excitation via short pulses, without chirp. Silica target displayed a temperature drop due to the decrease of exposed light intensity level.

An original scheme of 3rd order correlator with estimated dynamic range as high as 10^7 is presented. Using this correlator, measurements of laser pulse duration and contrast in $\pm$ 100ps temporal range were carried out.

Examples are being drawn of applications of different plasma emission (gamma-rays, protons) to isomeric nuclear states study.