Diploma thesis abstract

Spectroscopy of the hot electron component in the relativistic femtosecond laser plasma

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At research of the fundamental processes of particle acceleration in relativistic laser plasma considerable attention is given to accurate registration effects, which contributes to their understanding and explanation. Commonly used methods of X-ray measurements are often unable to detect plasma hot electronic components because of the small number of accelerated particles or the spatial orientation of the dispersion. Diploma thesis is devoted to description of the concept, designing layout and using of electronic spectrometer based on permanent magnets for the measurement and detection of charged particles in the energy range from 500 keV to 4 MeV and obtaining the spectrum of relativistic laser plasma for a limited number of shots

The experiments of measuring the spectra of hot electron component of the plasma which generated on the surface of a solid target irradiated by laser pulses of relativistic intensities (over 1018 W / cm2) were conducted using this spectrometer. Workings out of methods of registration and selection signals were conducted. It is allowed us to obtain the spectrum of hot electrons. Spectral data showed that it is possible to detect several fast electronic components with temperatures of about 180 and 500 keV in the plasma. Presumably, the acceleration of the electrons is caused by mechanisms of ponderomotive acceleration and relativistic effects, such as stochastic heating in a short (on the order of several wavelengths) preplasma formed by laser prepulse. Note that the using of X-ray diagnostics to study the plasma obtained under similar conditions, does not allow to see the most high-energy component.