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Electron acceleration in the interaction of intense laser pulses with sharp plasma density profile

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3D PIC calculations were performed of the laser-plasma interaction relevant to the parameters of the PHELIX facility. In simulations, plasma layer had an overcritical density and rectangular profile. The laser pulse duration 10 times shorter in comparison with the PHELIX duration was also considered. These calculations do not take into account the effect of the pre-pulse. The simulations were performed to analyze the existing theoretical concepts on the interaction of relativistic femtosecond intense laser radiation with the sharp boundary overcritical density at different pulse durations.

The other part of the work is modeling of the interaction of laser pulses with parameters of the facility at the Helmholtz Institute in Jena, Germany, incident at an angle of 45 degrees with a p-polarization at the second harmonic on the solid target with the sharp density profile. Results compared with the experiment. In particular, the temperature dependence of hot electrons on the depth of penetration into the target is calculated, which was available for the experimental measurements. The sharp density profile is really achieved in the experiment due to the high contrast of the laser pulse at the second harmonic.

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