

High energy ion acceleration in interaction of short laser pulse with dense plasma target

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Abstract

The generation of high energy protons from the interaction of a short laser pulse with a dense plasma, accompanied by a preformed low density plasma, has been studied by particle in-cell-simulations. The ion acceleration toward the laser direction in the preformed plasma is characterized by a time-dependent model and the peak ion energy is given. The effect of electron recirculation on the rear side sheath acceleration is discussed and it is found that the peak proton energy increases in inverse proportion to the target thickness. These results shed light on the peak proton energy dependence on laser intensity, laser pulse length, and target thickness. Finally we discuss the optimal parameters of the laser pulse for large ion peak energy and conversion efficiency.

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