Abstract Submitted
for the APR08 Meeting of
The American Physical Society

Shaped mass limited target acceleration by ultra high intensity laser pulses ALEXANDER ANDREEV, KONSTANTIN PLATONOV, Vavilov State Optical Institute, VAVILOV STATE OPTICAL INSTITUTE TEAM — Ultrahigh intensity (UHI) laser pulses may accelerate ions in thin targets to big energies and highly collimated ion beams may be formed. In order to avoid the slowly moved regions of a larger foil as charge separation effects it has been proposed to use a small target with radius about laser spot size, so named mass limited target (MLT). Ion acceleration in targets irradiated by short ultra-intense laser pulses has been studied with analytical model and 2D3V PIC simulations, which describe the complete process from the electron acceleration in the laser field to the ion bunch formation. Simulations were performed for sub μm-scale sizes plane targets (foils and foil sections) and curve foil sections. Energy spectra of fast ions, laser conversion efficiency to fast ions and the divergence of ion beams are compared for various types of targets. When MLT is irradiated by UHI laser pulse, the resulting pellet plasma is strongly accelerated forward. The kinetic energy of the ions in the bunch's densest region can exceed tens MeV at about solid density. The regime of a most effective acceleration is realized in the case when laser field is about electrostatic field of ion core of MLT. It is found that maximal ion energy can be significantly enhanced by choosing of MLT instead of foil of the same thickness.

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Date submitted: 14 Jan 2008 Electronic form version 1.4