

Abstract Submitted
for the DPP09 Meeting of
The American Physical Society

Ionization dynamics of high-intensity laser-target interactions¹

GEORGE PETROV, Naval Research Laboratory, TZVETELINA PETROVA, Berkeley Scholars, Inc., KARL KRUSHELNICK, ANATOLY MAKSIMCHUK, LOUISE WILLINGALE, University of Michigan, KENNETH WHITNEY, Berkeley Scholars, Inc., JACK DAVIS, Naval Research Laboratory — The ionization dynamics of thin foils irradiated by an ultrashort pulse laser is investigated with a fully relativistic 2D particle-in-cell model. The PIC model is integrated with a ionization dynamics model, which includes optical field and collisional ionizations. The spatio-temporal evolution of the ion charge and electron density of a 5 micron aluminum foil are studied for peak laser intensities 10^{18} - 10^{20} W/cm² and laser pulse duration of 80 fs. The optical field ionization dominates in the pre-plasma region, creating a dense plasma of highly charged ions, while the collisional ionization is most effective in the bulk of the target. A series of ionization waves launched at the front surface of the foil propagate with high velocity ($\sim 0.2c$) through the target.

¹This work was supported by the DTRA and NRL under the 6.1 program.

George Petrov
Naval Research Laboratory

Date submitted: 14 Jul 2009

Electronic form version 1.4