Abstract Submitted
for the DPP20 Meeting of
The American Physical Society

**Laser driven electron acceleration in nanoscale grated targets**[1]

ALEXEY KNYAZEV, YANZENG ZHANG, SERGEI KRASHENINNIKOV, University of California, San Diego —

Interaction of high-intensity lasers with solid targets can result in a high yield of energetic electrons. Experimental and computational research shows that structured targets can absorb more of the incident laser pulse energy, enhancing the acceleration of electrons. However, the details of the electron acceleration mechanism during the laser-target interaction is not yet understood. In this work, we study a relativistic laser interaction with a grated target both numerically and analytically, and reveal the physics processes governing the electron acceleration. The laser-target interaction is simulated with the relativistic particle-in-cell code EPOCH. Simulation results show that, during the laser-target interaction, quasi-static electric and magnetic fields are developed in the gratings due to the laser-induced electron extraction from the solid. These quasi-static fields promote electron acceleration in the laser field beyond the ponderomotive energy scaling. We employ a 3/2-dimensional Hamiltonian approach to describe the electron dynamics in both laser and quasi-static electromagnetic fields and show that the electrons can be stochastically accelerated in these fields to high energies. We verify our analysis with numerical simulation.

[1]University of California Office of the President Lab Fee Grant No. LFR-17- 449059.

Alexey Knyazev
University of California, San Diego

Date submitted: 28 Jun 2020

Electronic form version 1.4