Abstract Submitted
for the DPP13 Meeting of
The American Physical Society

On The Origin of Super-Hot Electrons from Intense Laser Interactions with Solid Targets having Moderate Scale Length Preformed Plasmas A.G. KRYGIER, D.W. SCHUMACHER, R.R. FREEMAN, Physics Department, Ohio State University, Columbus, Ohio — The results of a numerical study investigating the acceleration mechanism for super-hot electrons by an intense laser interaction with moderate scale length preformed plasma are described. The particle-in-cell code LSP is used to model a $100J$, $175fs$, peak intensity $6x10^{20}W/cm^2$ laser in 2D Cartesian geometry. The laser interacts with a solid density Al target with a $L = 3\mu m$ scale length preformed plasma. We find that a simple three-step mechanism that we call loop-injected direct acceleration (LIDA) is overwhelmingly dominant in the acceleration of the hottest electrons. LIDA involves only well-known physics and is numerically observed over a range of pre-plasma and laser conditions. In LIDA, the laser heats the plasma near the critical surface expelling electrons from the region. Some of the expelled electrons follow looping paths away from the target, guided by quasi-static magnetic fields, and are injected into the intense region of the laser pulse where they are laser-accelerated until they escape into the target with large energy. This work is supported by DOE contracts DE-FC02-04ER54789 and DE-FG02-05ER54834 and allocations of computing time from the Ohio Supercomputer Center.

Andrew Krygier
Physics Department, Ohio State University, Columbus, Ohio

Date submitted: 11 Jul 2013 Electronic form version 1.4