

Abstract Submitted
for the DPP16 Meeting of
The American Physical Society

What is the surface temperature of a solid irradiated by a Petawatt laser?¹ ANDREAS KEMP, Lawrence Livermore Natl Lab, LAURENT DIVOL, LLNL — When a solid target is irradiated by a Petawatt laser pulse, its surface is heated to tens of millions of degrees within a few femtoseconds, facilitating a diffusive heat wave and the acceleration of electrons to MeV energies into the target. Using numerically converged collisional particle-in-cell simulations, we observe a competition between two surface heating mechanisms - inverse bremsstrahlung in solid density on one hand, and electrons scattering on turbulent electric fields on the other. Collision-less heating effectively dominates above the relativistic intensity threshold. Our numerical results show that a high-contrast 40fs, $f/5$ laser pulse with 1J energy will heat the skin layer to 5keV, and the inside of the target over several microns deep to a bulk temperature of 100s eV at solid density.

¹Work performed under the auspices of the U.S. Department of Energy by the Lawrence Livermore National Laboratory under Contract DE-AC52-07NA27344

Andreas Kemp
Lawrence Livermore Natl Lab

Date submitted: 13 Jul 2016

Electronic form version 1.4