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.

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