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Collisional and collision-less surface heating in intense laser matter interaction[1] ANDREAS KEMP, LAURENT DIVOL, Lawrence Livermore Natl Lab — We explore the interaction of high-contrast intense sub-100 fs laser pulses with solid density tar- gets, using numerically converged collisional particle-in-cell simulations in one two and three dimen- sions. We observe a competition between two mechanisms that can lead to plasma heating. Inverse bremsstrahlung at solid density on one hand, and electrons scattering off plasma waves on the other, can both heat the skin layer to keV temperatures on a femtosecond time scale, facilitating a heat wave and a source of MeV electrons that penetrate and heat the bulk target. Collision-less effects heat the surface effectively starting at the relativistic intensity threshold, independent of plasma density. Our numerical results show that a high-contrast 1J/100fs laser can drive a solid target into the warm dense matter regime. This system is suitable to ab-initio modeling and experimental probing.

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