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Demonstration of short pulse laser heating of solid targets to temperatures of 600eV at depths exceeding 30μm using the Orion high power laser L.M.R. HOBBS, D.J. HOARTY, P. ALLAN, C.R.D. BROWN, M.P. HILL, S.F. JAMES, AWE, R. SHEPHERD, LLNL, K.L. LANCASTER, CLF, R.J. GRAY, University of Strathcylde, E. WAGENAARS, R.J. DANCE, A.K. ROSSALL, O. CULFA, N.C. WOOLSEY, YPI — The recently completed Orion laser at AWE in the UK has the capability of delivering a petaWatt short pulse at 1.06μm in two of its twelve laser beams. In the experiments described one of the short pulse beams was converted to 2nd harmonic at sub-aperture delivering 3x10^{20}W/cm^2 (100J of 0.53μm light in 0.5ps) onto plastic foils (parylene N) with embedded tracer layers of aluminium. The target heating profile was recorded on a shot by shot basis by changing the depth of the plastic overcoat between the laser and the buried aluminium layer and recording the aluminium K-shell emission spectra. These spectra were then compared to the FLY atomic kinetics and line-shape code to infer the conditions in the target. Temperatures of 600eV were recorded through a plastic depth in excess of 30μm. In contrast to this similar experiments conducted with the Orion short pulse beam operating at wavelength 1.06μm at energy of 500J ($\sim$10^{21}W/cm^2) produced heating through only 5μm of plastic. The importance of the improved pulse contrast in 2nd harmonic operation in solid target heating is clear from these results. The data are also compared to results from similar experiments conducted on the VULCAN petaWatt laser using 1.06μm light but with improved pulse contrast.

Lauren Hobbs
AWE

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