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CPA backlighting using 1ω and 2ω light STEVEN JAMES, COLIN BROWN, DAVID HOARTY, AWE Aldermaston — A number of materials modelling and radiation hydrodynamics experiments proposed for high power laser systems have requirements for high-energy (>20keV), high resolution (∼10μm), short duration (>100ps) backlighters. One method of producing such a radiation source is the use of CPA lasers to produce fast-electron induced Kα fluorescence. The work outlined here covers the use of foils and fibres to produce radiographs of test resolution grids. Ag and Pd targets were illuminated with both 1ω and 2ω light from the HELEN CPA laser. Image plates were used to record an image of the test grid, which was used to determine source size and signal to background. An absolutely calibrated transmission crystal spectrograph was used to record the strength of the Kα line, and the conversion efficiency calculated. A hard X-ray spectrometer was used to measure the electron temperature. Conversion efficiencies of 10^{-4} were measured for 5μm thick foil targets, which produced <10μm resolution in one dimension. Slightly lower efficiencies were measured for 10μm fibre targets, ∼10μm resolution was measured parallel and perpendicular to the laser axis. No measurable effect of pre-pulse on the resolution was measured. The conversion efficiency with S-pol. 2ω laser light was significantly less than with P, as was the hot-electron fraction. P-pol. 2ω light produced lower K-alpha conversion efficiency than P-pol. 1ω, but with the advantage of reduced background.

Steven James
AWE Aldermaston

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