INTEGRATED MODELING OF SHORT-PULSE LASER-PLASMA INTERACTIONS WITH BURIED-LAYER TARGETS

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We present the results of integrated hydrodynamic and hybrid Particle-in-Cell modeling of the interaction of short, intense laser pulses with solid targets that contain buried layers. We are predominantly interested in the experiments carried out on the UK's Orion laser facility, which hope to measure the opacity of various materials under high energy-density conditions.

Our ultimate aim is to reduce the number of free parameters needed to simulate such interactions and arrive at a model which is able to predict the buried-layer temperature and density for both 1w and 2w light.

We have found that it is very important to correctly account for target ablation due to fine-scale features in the laser prepulse with hydrodynamic simulations. The results of the hydro simulations are then used as initial conditions for a new type of hybrid PIC code, which is able to correctly capture the fast-electron generation and target heating without the very high levels of resolution normally required to reach computational convergence [1].

We attempt to include as much relevant physics as possible, including cold-target modifications to transport, in-line time-dependent ionization and radiation-transport during the short-pulse phase.

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