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Simulations of High-Intensity Laser Interactions with Solid Targets and Implications for Fast-Ignition Experiments on OMEGA EP

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High-intensity, laser–solid target-interaction experiments on the existing Vulcan[1] and the future OMEGA/OMEGA EP Laser Facilities[2] are modeled by a combination of techniques, including hybrid-implicit, particle-in-cell simulations,[3] with the goal of predicting the performance of cone-in-shell fast-ignition experiments. The OMEGA EP Laser Facility will have an order of magnitude more energy available than on the Vulcan Laser System,[1] with an expected concomitant increase in total hot-electron energy. For interaction energies of ∼300 J to ∼5 kJ, low-mass, mid-Z foil targets display some remarkable features that result from near-perfect hot-electron refluxing. They are efficient K-alpha radiators, with a yield that is insensitive to the details of the hot-electron spectrum.[4] The absolute K-alpha yield is sensitive to the hot-electron conversion efficiency. This is investigated for the parameters of recent experiments.[4] Calculations with an appropriate electrical conductivity and equation of state[5] show that target heating can be considerable. Additionally, hot surface layers[4] are attributed to surface retention and transport of part of the hot-electron spectrum. The degree to which these properties of "isolated" targets are active in cone geometries when refluxing is reduced by the target mass will be discussed. This work was supported by the U.S. Department of Energy Office of Inertial Confinement Fusion under Cooperative Agreement No. DE-FC52-92SF19460.
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[1]C. N. Danson *et al.*, Nucl. Fusion **44**, S239 (2004).
[2]C. Stoeckl *et al.*, Fusion Sci. Technol. **49**, 367 (2006).
[3]D. R. Welch *et al.*, Nucl. Instrum. Methods Phys. Res. A **464**, 134 (2001).
[4]W. Theobald *et al.*, Phys. Plasmas **13**, 043102 (2006).
[5]R. R. Freeman, Bull. Am. Phys. Soc. **50**, 217 (2005).