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Adapting Particle-In-Cell simulations to the study of short pulse laser damage ROBERT MITCHELL, DOUGLASS SCHUMACHER, ENAM CHOWDHURY, The Ohio State University — We present novel Particle-In-Cell (PIC) simulations of the full femtosecond-pulse laser damage process and the resulting damage spot morphology. At the heart of these simulations is the implementation, for the first time, of a Lennard-Jones pair potential model (LJPPM) for PIC codes. The use of PIC facilitates the first ab-initio treatment of realistic target sizes, retaining the strengths of PIC including self-consistent treatment of the laser-particle interaction and subsequent generation of plasma waves and electron heating, while the LJPPM allows a PIC code to treat a system of particles as a medium which can ablate, melt, and resolidify. Combining these two approaches, we model the effect of a femtosecond-pulse laser on metal targets near and above the damage threshold and compare to recent experimental results. In particular, we present the first simulations of the emergence of Laser-Induced Periodic Surface Structure (LIPSS) upon femtosecond-pulse laser irradiation.

Robert Mitchell
The Ohio State University

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