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Examining the Relative Role of Wakefields and Laser Fields for Electron Acceleration in SM-LWFA and LWFA Using High-Fidelity Particle-in-Cell Simulations KYLE MILLER, University of California, Los Angeles, PAUL KING, Lawrence Livermore National Laboratory, FEI LI, University of California, Los Angeles, NUNO LEMOS, FELICIE ALBERT, Lawrence Livermore National Laboratory, CHAN JOSHI, WARREN MORI, University of California, Los Angeles — There is interest in generating moderately relativistic electrons (10–100 MeV) to produce X-rays for the probing of hot, dense material. One way to produce such hot electrons involves using a high-intensity picosecond laser, which generates relativistic plasma waves and goes unstable due to self-modulational and Raman scattering instabilities. Hot electrons, produced by a combination of plasma wakefield acceleration and direct laser acceleration (DLA), can radiate X-rays via betatron emission or bremsstrahlung radiation. Recent work has determined the energy contribution to hot electrons from the laser fields (DLA) and plasma wakefields by calculating work done by fields perpendicular to and parallel to the laser propagation direction, respectively. However, a finite-width laser in reality has fields along the laser propagation direction. Using a quasi-3D decomposition into azimuthal modes in the particle-in-cell code OSIRIS, we extract the longitudinal laser fields from the longitudinal wakefields in an SM-LWFA simulation and find that the work done by the axial laser fields is significant and negative. In addition, we show evidence of DLA through particle tracking even without the formation of an ion channel. Examples for both short- and long-pulse lasers is presented.

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