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Highly-efficient terahertz radiation generation from laser-microplasma-waveguide interactions[1] KE HU, LONGQING YI, TNDE FLP, Chalmers University of Technology — When a relativistic laser pulse entersa micro-sized plasma waveguide, electrons are extracted from the inner surface and accelerated to hundreds of MeV. They emit a powerful THz pulse at the channel exit due to coherent diffraction radiation. In this work we investigate the dependence of THz generation on different target parameters via 3D particle-in-cell simulations, aiming at achieving a laser-to-THz conversion efficiency beyond the state-of-art. We find that when the transverse light pressure (TLP) of the fundamental waveguide mode is significantly strong (typically when the laser is intense and channel radius is small), the efficiency approaches its maximum on normal incidence. With appropriately choosing the channel length, one can control the divergence and charge of the electron bunch, maximizing the conversion efficiency. In the case that TLP is weak (due to practical issues with laser facilities or micro-engineering techniques), the laser incidence angle should be optimized in order to obtain a sufficient number of energetic electrons. Simulation results indicate that a conversion efficiency of over 1% can be reached with the state-of-art laser facilities and micro-waveguide targets.

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