Generation of Terahertz Radiation via Irradiation of aCoil Target by an Ultrashort Intense Laser Pulse

N D Bukharskii[1], Iu V Kochetkov[1], and Ph A Korneev[2,3]

[1] *Laser Physics, National Research Nuclear University MEPhI, Moscow, Russia*
[2] *Quantum Radiophysics , P.N. Lebedev Physical Institute of the Russian Academy of Sciences, Moscow, Russia*
[3] *Theoretical Physics, National Research Nuclear University MEPhI, Moscow, Russia*
Contact Email: n.bukharskii@gmail.com

One of the physical processes that accompany the interaction of intense laser pulses with solid targets is the generation of discharge currents. As the laser pulse accelerates fast electrons from the interaction region, a strong positive potential is formed there. This potential drives a strong neutralizing electromagnetic wave that propagates along the perimeter of an extended target [1].

In this work, the process of formation and propagation of such a wave in coil targets is studied numerically via Particle-in-Cell (PIC) simulations with the code Smilei [2]. According to the obtained results, with a sufficiently small target and ultra-short laser drivers, the wave becomes well-localized on the scale of the coil perimeter. Under certain conditions, a closed electric pulsed circuit may form in the target, leading to multiple quasi-oscillations of the discharge wave [3]. These quasi-oscillations trigger electromagnetic radiation with the frequency defined by the geometry of the coil.

Analytical estimates for the proposed scheme demonstrate the possibility of obtaining high-power THz radiation with good directionality and controllable frequency spectrum, making the considered technique attractive for various applications and studies requiring strong THz fields.

References

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