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Dynamics of the plasma dipole field for highly efficient emission of the THz radiation HYUNGSEON SONG, SALIZHAN KYLYCHBEKOV, MIN-SUP HUR¹, Ulsan National Institute of Science and Technology — In our previous work, we suggested a new method to generate the plasma dipole oscillation, which can emit THz radiation from the narrow plasma strips. The idea was colliding two short, detuned laser pulses in a plasma. Over the overlapped region of the pulses, the in-phase oscillation of a bunch of electrons (plasma dipole oscillation, PDO) is generated, and a strong electromagnetic wave in the THz regime is emitted from the PDO. From the theoretical estimation, it was expected that the conversion efficiency of the driving laser pulse energy to the plasma dipole energy can be increased by optimizing the laser pulse duration and frequency detuning. We have investigated the effect of controlled laser pulse duration and frequency detuning by monitoring the dynamical evolution of plasma dipole field. The study shows that the efficiency tends to increase as those two parameters increase, while the applicable ranges of parameters are limited; too long pulse duration leads to the breaking of in-phase motion of the electrons. We show that such a problem can be remedied by obliquely shooting the laser pulses. We demonstrate how the efficiency and total power of the THz radiation evolve dynamically as the system parameters are changed.

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