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Generation of THz Radiation by Beating of Two Gaussian Lasers

HITENDRA MALIK, ANIL MALIK, Indian Institute of Technology Delhi —

The THz radiation generation has diverse applications in the field of material characterization, imaging, topography and remote sensing, chemical and security identificationetc. In order to develop high-power and efficient THz sources, several schemes have been proposed. For example, tunable THz radiation can be generated by superluminous laser pulse interaction with large band gap semiconductors and electro-optic crystals, by nonlinear interaction of an intense short pulse laser with a dielectric, on synchrotron radiation from bunched electron beams etc. In the present investigation, an analytical study is made for the THz radiation generation based on beating of two spatial Gaussian laser beams having same electric field amplitude but different frequencies and wave numbers in a spatially periodic density plasma. In this situation, quasistatic nonlinear ponderomotive force is obtained along the direction of propagation and in the transverse direction due to beating and the spatial variation of the laser electric field. The ponderomotive force in the presence of periodic density structure gives rise to a transverse competent of the current, which results in resonant excitation of THz radiation. The efficiency of conversion in this scheme is $\sim 10^{-4}$ and the emitted THz radiation power scales as the square of the density ripple amplitude.

Hitendra Malik
Indian Institute of Technology Delhi

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