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# Multifocal Terahertz Radiation Generation by Beating of Two Cosh-Gaussian Laser Beams with Graphite Nanoparticles

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**Abstract:**

In this analytical study, we propose a model of terahertz radiation generation by considering the beating of two cosh-Gaussain beams with different frequencies of $\omega_1$ and $\omega_2$ in a spatially modulated medium of graphite nano-particles. We assumed that graphite nano-particles are in spherical shape and having two different configurations: (i) the electric fields of the propagating laser beams are perpendicular to the normal vector of the basal plane of the graphite nano-particles and (ii) laser beams are parallel to the normal vector of the basal plane. The electric fields of laser beams exert a nonlinear ponderomotive force due to spatial non-uniformity in the intensity. The electronic clouds of the graphite nanoparticles acquire nonlinear oscillatory velocity under the influence of ponderomotive force. This ponderomotive force leads to the creation of a strong nonlinear current in the direction of laser polarization and at the beat wave frequency $\omega_T(\omega_1 - \omega_2)$, which can generate terahertz radiation. We show that, when beat wave frequency ($\omega_T$) ~ $\omega_p$ (plasmon frequency of the nano-particles) and the electric field are parallel to the basal plane normal, a resonant interaction of the laser beams causes intense terahertz radiation. The effects of decentered parameter $(b)$ are analyzed for strong THz radiation generation. Analytically results show that the amplitude of THz wave enhances with decentered parameters.