SSE-778 (JMA-778)

Excitation of Terahertz Radiation using Gaussian Laser Beams from Spherical Nanoparticles Placed in Magnetic Field

Moses Simon* and Prashant Chauhan

Department of Physics and Materials Science and Engineering, Jaypee Institute of Information Technology, Noida, UP-201304, India

*Corresponding author's e-mail: mosessimon113@gmail.com

ABSTRACT

This communication focuses on an analytical study that deals with terahertz (THz) wave generation by nonlinear mixing of two circularly-symmetric Gaussian laser beams with slightly different frequencies ω_1 and ω_2 simultaneously propagating through an array of spatially corrugated noble-metal spherical nanoparticles placed under the influence of an externally applied static magnetic field. The two laser beams exert a nonlinear ponderomotive force on the plasma electrons, causing them to acquire nonlinear oscillatory velocity. This velocity leads to generation of nonlinear macroscopic current density at the beat frequency ω $(\omega_1 - \omega_2)$ which further gives rise to strong terahertz radiation. The beat frequency lies in the THz region and density ripple provide the necessary phase-matching conditions. The incorporation of the external magnetic field results in an efficient coupling between the lasers' electric fields and further causes a resonant interaction between the laser beam and the electrons within the nanoparticles. The study demonstrates that magnetic field strength and dimensions of the nanoparticles play pivotal role in THz generation process. This study has direct relevance in optoelectronic and photovoltaic devices, material characterization, biomedical and pharmaceutical fields along with various communication and networking applications.

Keywords: Terahertz, Nanoparticles, Ponderomotive force

How to Cite

M. Simon and P. Chauhan, "Excitation of Terahertz Radiation using Gaussian Laser Beams from Spherical Nanoparticles Placed in Magnetic Field", *AIJR Abstracts*, pp. 80–80, Feb. 2024.

DOI: 10.21467/abstracts.165 ISBN: 978-81-965621-7-5 (eBook), 978-81-965621-4-4 (Paperback)