Terahertz Radiation Generation Via Laser-Magnetized Plasma Interaction

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Interaction of intense laser pulses with plasma has widespread importance in a number of applications including inertial confinement fusion schemes [1], harmonic generation [2], laser-plasma based accelerators [3] and terahertz (THz) radiation generation [4]. THz radiation sources extremely useful for explosive detection, terahertz imaging, material characterization, homeland security and spectroscopy. Intense laser pulses propagating in plasma lead to generation of terahertz radiation by several mechanisms [5, 6].

In the present study, a one-dimensional numerical model has been developed for the generation of terahertz radiation by the propagation of intense, linearly polarized laser pulses through plasma, magnetized perpendicular to the polarization as well as propagation direction of the laser pulse (extraordinary mode). The presence of the external magnetic field leads to the generation of slow nonzero vortex currents along the transverse direction, which in turn gives rise to terahertz radiation emission behind the laser pulse. A two-dimensional, particle in cell (PIC) simulation has also been performed to verify the numerically predicted results and to obtain the intensity of the generated radiation at the vacuum - plasma interface.

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References:

[1] M. Tabak, et. al., *Phys. Plasmas* **1**, 1626 (1994)

[2] S. Y. Chen, et. al., *Phys. Rev. Lett*. **84**, 5528 (2000)

[3] T. Tajima and J. M. Dawson, *Phys. Rev. Lett.* **43**, 267 (1979)

[4] H. Hamster, et. al., *Phys. Rev. Lett*. **71**, 2725 (1993)

[5] P. Jha, et. al., *Europhysics Lett*. **94**, 15001 (2011)

[6] J. Penano, et. al., *Phys. Rev. E* **81**, 026407 (2010)