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Simulation Study of Enhanced Terahertz Radiation Generation by Two-Color Laser Plasma Interaction

Authors : Nirmal Kumar Verma, Pallavi Jha

Abstract : Terahertz (THz) radiation generation by propagation of two-color laser pulses in plasma is an active area of research due to its potential applications in various areas, including security screening, material characterization and spectroscopic techniques. Due to non ionizing nature and the ability to penetrate several millimeters, THz radiation is suitable for diagnosis of cancerous cells. Traditional THz emitters like optically active crystals when irradiated with high power laser radiation, are subject to material breakdown and hence low conversion efficiencies. This problem is not encountered in laser - plasma based THz radiation sources. The present paper is devoted to the simulation study of the enhanced THz radiation generation by propagation of two-color, linearly polarized laser pulses through magnetized plasma. The two laser pulses orthogonally polarized are co-propagating along the same direction. The direction of the external magnetic field is such that one of the two laser pulses propagates in the ordinary mode, while the other pulse propagates in the extraordinary mode through homogeneous plasma. A transverse electromagnetic wave with frequency in the THz range is generated due to the presence of the static magnetic field. It is observed that larger amplitude terahertz can be generated by mixing of ordinary and extraordinary modes of two-color laser pulses as compared with a single laser pulse propagating in the extraordinary mode.

Keywords : two-color laser pulses, terahertz radiation, magnetized plasma, ordinary and extraordinary mode
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