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Laser wakefield generation by R, L, X and O modes in magnetized plasma

Y Heydarzadeh and H Akou

Department of Physics, Faculty of Basic Sciences, Babol Noshirvani University of Technology, Babol, Iran

E-mail: h.akou@nit.ac.ir

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Abstract

Short and intense laser pulse propagation in a plasma produces an electrostatic wakefield that is widely used in the laser acceleration of charged particles. Amplitude of the wakefield depends on several factors including the laser pulse polarization. Magnetized plasma is anisotropic for various laser polarizations and in different conditions, different modes can propagate in plasma. In this paper, we investigate the propagation conditions of each mode; by finding the governing equations, the excitation of wakefield due to the laser pulse with different modes, including circular (R and L modes), elliptic (X mode) and linear (L mode) polarizations, will be determined. By using the forth-order Runge-Kutta algorithm, the differential equations have been simultaneously solved. The results show that the amplitude of the wakefield depends not only on the laser mode, but also on the plasma density, external magnetic field and laser frequency.

Keywords: laser wakefield, magnetized plasma, laser pulse polarization

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