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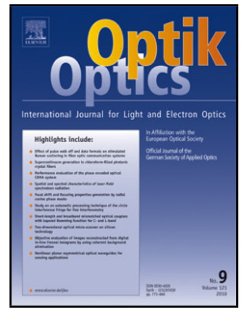

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Authors: Mehdi Asri, Hossein Akou

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Influence of sense rotation of circularly polarized laser pulse on the wake-field acceleration in magnetized plasma

Mehdi Asri [1] and Hossein Akou[2]
[1] Department of Physics, Faculty of Basic Science, Gonbad Kavous University, Gonbad Kavous, 49717-99151, Iran
[2] Department of Physics, Faculty of Basic Science, Babol University of Technology, Babol, 47148-71167, Iran
E-mail: mehdi.asri@gonbad.ac.ir

Abstract

The present paper investigates the effect of different sense rotations of circularly polarized (CP) Gaussian laser pulse on wake-field generation and electron acceleration when there is an axial static magnetic field. The nonlinear equation, which explains the interaction of intense CP laser beam with magnetized plasma in the quasi static approximation, is derived. The numerical analysis of our results indicates that the amplitude of plasma wake for both sense of circular polarization is similar, but affected by propagation direction of exterior magnetic field. It is found that the dephasing length is increased for the left-hand polarized laser fields, while decreased for the right-hand ones, which is reinforced as the enhancement of the forward exterior magnetic field. It is shown that the right-hand polarization laser pulse with reversed exterior magnetic field could leads to much larger electron energy (about 2.4 GeV) than that of other cases.

Keywords: Laser wake-field; ; ; , Circularly polarized laser pulse, Dephasing length, Magnetized plasma
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1. Introduction

The ultrahigh power, short laser pulses interaction with a plasma is related to a wide area of interesting nonlinear effect, such as self-focusing [1], parametric instabilities [2-3], optical harmonic generation [4-5], strong electromagnetic fields generation [6-7], X-ray sources[8], laser fusion scheme[9], and laser wake-field generation[10]. Following the development of short pulse high intensity lasers, based on chirped pulse amplification technic, the interest in conducting research in terms of charged particle acceleration in vacuum and a plasma was rekindled [11-16]. When an intense short laser pulse interacts with under dense plasma, it can produce accelerating gradients in order of hundreds of GV/m that is thousands of times, higher than conventional accelerators [17-19]. The accelerated electrons in this acceleration gradients is beneficial for a variety of applications in industry, medical sciences, biology, nuclear reactions, and high energy physics [20-27]. Applying large amplitude plasma waves so as to