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Research note

Relativistic electron dynamics in ion channel guiding in the presence of a helical wiggler and an external oblique magnetic field

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Abstract

In this paper, the electron acceleration and its relativistic dynamics in an ion-channel formed due to the laser pulse propagation through plasma have been investigated under the influence of the helical wiggler and the oblique magnetic field, and ion channel space-charge, as well as the plasma wave. The equations applied to investigate the electron dynamics are the three-dimension Lorentz equations. For the analytical analysis of the obtained equations, a three-dimension single particle code and the fourth order Runge-Kutta method are used as well. The relativistic electron dynamics and its energy gain are drastically affected by the helical wiggler and the external oblique magnetic field, as well as the ion-channel potential. The results of this paper are significant in the design of compact plasma-based accelerators.

Keywords: Relativistic dynamics, magnetized ion channel, helical wiggler, external oblique magnetic field

For full article, refer to the Persian section