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Investigating the influence of the injection angle on electron acceleration in a laser wake-field accelerator in the presence of an external magnetic field

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Abstract

In this paper, the influence of the initial momentum and the injection angle of electron into the magnetized plasma has been studied in a laser wake-field accelerator. It is seen that the use of an external magnetic field in the opposite direction of laser pulse propagation leads to an increase in the wake-field amplitude and a decrease in the laser pulse group velocity, as compared to the use of the external magnetic field in same direction of laser pulse propagation or the unmagnetized plasma case. The results show that the effect of the initial momentum variation on the final energy gained by electron is lower in comparison with that of injection angle variation. It is observed that when the injection angle is increased, the electron can stay more in the acceleration phase and get more final energy. The maximum final energy of the accelerated electron is about 2.5 GeV when the magnetic field is applied along the reverse direction. Also, the electron energy is raised with the increase of injection angle and lowest energy is related to the case of the magnetic field applied along the reverse direction.

Keywords: electron injection, magnetized plasma, laser wake-field, electron acceleration

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