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Spatial, temporal and spectral emission characteristics from electron oscillation driven by an intense circularly polarized few-cycle laser pulse

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Abstract The spatial, temporal and spectral emission characteristics of radiation generated from electron oscillations driven by an intense circularly polarized few-cycle laser pulse have been investigated theoretically and numerically using a single electron model. For a femtosecond driving laser pulse with duration of one optical cycle, the maximal radiation emitted by the electron comprises only one electromagnetic pulse having durations much shorter than the optical cycle and belonging to the attosecond range. It is discovered that the influence of the initial phase on the process of full spatial characteristics of the radiation is apparent for intense few-cycle laser pulse. The characteristics can be used to measure the initial phase of intense circularly polarized few-cycle laser pulse in experiments.

Keywords Full spatial distribution · Electron oscillation · Circularly polarized few-cycle laser pulses

1 Introduction

With the advent of ultrashort pulse high-power lasers it has now become possible via strong focusing to extend the irradiance to the levels of 10^{19} W/cm^2 and with petawatt level lasers intensities much higher than this can be achieved (Zeitoun et al. 2004). In the intense laser field, the electron dynamics becomes highly relativistic and then many nonlinear effects start

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