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论文

周期量级激光脉冲作用下原子电离不对称性研究

邵初寅[1], 张敬涛[2]

1. 常熟理工学院 物理与电子工程学院,江苏 常熟 215500;
2. 中国科学院上海光学精密机械研究所 强场激光物理国家重点实验室,上海 201800

摘要:

应用不对称性参量对周期量级强激光脉冲下原子电离分布的反演不对称性进行了定量分析.采用非微扰的散射理论解析方法和三个激光模式模拟超短脉冲,研究不对称性参量随激光强度、包络位相和脉冲宽度的变化.计算表明,这种不对称性是随着波包的绝对位相以正弦形式变化而变化,其最大不对称程度依赖于脉冲强度和脉冲宽度.随着激光强度的提高,不对称性参量是先降低到最小值然后增加.对脉冲宽度相对长、有几个周期量级的高强度激光,其不对称性具有显著的特点.因此,提高脉冲强度有助于对包络绝对位相变化的观察.

关键词: 反演不对称 周期量级激光脉冲 光电子角分布 包络位相

Asymmetry in Photoionization of Atoms Irradiated by Few-cycle Laser Pulses

SHAO Chu-yin[1], ZHANG Jing-tao[2]

1. College of Physics &|Electronic Engineering, Changshu Institute of Technology, Changshu, Jiangsu 215500, China;
2. State Key Laboratory of High-field Laser Physics, Shanghai Institute of Optics and Fine Mechanics, Chinese Academy of Sciences, Shanghai 201800, China

Abstract:

Photoionization of atoms in intense, few-cycle laser pulses is inversion asymmetry. An asymmetric parameter is used to quantitatively analyze the asymmetry degree. By means of a non-perturbative quantum scattering theory and employing a three-mode laser field to mimic the short pulse, the variation of the asymmetric parameter are researched with the carrier-envelope phase and duration of the pulses. It is found that the asymmetry degree varies with the carrier-envelope phase as a sine-like pattern, and the maximum of asymmetry degree varies with pulse intensity and pulse duration. Along with the increasing laser intensities, the maximal asymmetry firstly decreases and then increases after it reaches a minimal value. At higher intensities, the asymmetry is still distinctive for relative-long few-cycle pulses. Thus, increasing the pulse intensity is helpful to observe the carrier-envelope phase-dependence.

Keywords: Inversion asymmetry Few-cycle laser pulse Photoelectron angular distribution Carrier-envelope phase

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通讯作者: 邵初寅

作者简介:

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