Analytic Description of Laser Assisted Electron Scattering Plateau Spectra for Elliptical Polarization

ALEXANDER V. FLEGEL, The University of Nebraska, USA, MIKHAIL V. FROLOV, NIKOLAI L. MANAKOV, Voronezh State University, Voronezh, Russia, ANTHONY F. STARACE, The University of Nebraska, USA — We present an analytic description of laser-assisted electron scattering (LAES) for the case of an elliptically polarized laser field. A closed-form analytic formula describing plateau features in LAES is derived quantum mechanically in the low-frequency limit. This formula provides an analytic explanation for the oscillatory patterns of LAES cross sections in the high-energy part of the LAES spectra. This formula generalizes the result for a linearly polarized laser field presented in [1] to the case of elliptical polarization and confirms the possibility of factorizing the LAES cross section into the product of two atomic factors involving the field-free cross sections for elastic electron-atom scattering and a factor (insensitive to atomic parameters) describing the elliptically polarized laser-driven motion of the electron. These results provide a fully quantum justification of the classical rescattering scenario for LAES in an elliptically polarized laser field.


This work was supported in part by RFBR Grants No. 09-02-00541 and No. 10-02-00235, and by NSF Grant No. PHYS-0901673.

Anthony F. Starace
Dept of Physics and Astronomy, The University of Nebraska, USA