Atom in a laser field. Multi-photon resonances. QED approach to light scattering in molecules

A.V. Glushkov

Atom.-Mol.-Laser Spectr. Centre & Inst. Appl.Math. OHMI
a/c 108, Odessa-9, 65009, Ukraine
E-mail: glushkov@paco.net

A quantum-electrodynamical (QED) approach is utilized for studing the interaction of the atom with the laser field. Method bases on a description of atom in the field by the k- photon emission and absorption lines [1]. The lines are described by their QED moments of different order which are calculated with the use of the Gell-Mann & Low adiabatic formalism. To calculate the values m, we use the Gell-Mann and Low adiabatic formula for the Lorentz & Gauss (single-,multimode, coherent,stochastic) laser pulse shape.An account for the stochastic fluctuations in a field effect is of a great importance. Multiphoton resonance and multiphoton ionization profile in H, Na,Cs atoms. It is studied the phenomenon when an energy spectrum liberated in the high intensiy multiphoton ionization exhibits succession of peaks separated by photon energy (above threshold ionization). Efficiency of method is demonstrated by calculating two-photon ionization cross-sections and photoelectron angular distribution for extended photon energy range (including above-threshold ionization) in magnesium. Comparison with the eigenchannel R-matrix claculations of Luc-Koenig et al [2] is given. There is considered a phenomenon of the Rydberg stabilization of the H atom in a strong laser field and estimated the rate of transition between the stabilized Rydberg state (n=40, m=2; E $\sim$ 10(8)V/cm) and ground state, when it's possible the radiation of photons with very high energy(the short-wave laser amplification). There are presented the generalization of method for description of the multiphoton processes in molecules. .The multiphoton resonances in the SF(6) molecule are calculated and analysed [3]. It has been developed the consistent QED theory for the Relay and Raman vibration scattering of the light on the metastable molecular levels. As example the H2, HD, D2 molecules are considered. The polarizability estimates and depolarization degree under Relay and Raman light scattering on the frequencies of Nd and Rb lasers are presented.

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