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Chaotic phenomenon in a multi-wave ionization of non- Rydberg atoms

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In last years a phenomenon of multiwzave ionization and photoionization of atomic systems in low-frequency electromagnetic fields attracts a great interest [1,2]. Above many reasons very essential moment is connected with a possibility of realizing quantum chaos phenomenon in a system. Earlier it was shown that an ionization process for highly excited H atom states by a strong low frequency electromagnetic field is realized through a mechanism of diffusion on atomic states which are strongly perturbed by a field. An important feature of process is in a stochastic character of electron vibrations. In order to describe a stochastic dynamics of hydrogen atom, several models were developed. The most simplified model uses diffusion like equation [2]. More sophisticated numerical calculations are presented in refs. [2]. Experimental observation of chaotic effect was carried out for the H atom from the state with ground quantum number n=60 in a field of frequency w=9,9 GGz. In series of papers by Casati et al [3] a dynamical chaos effect for hydrogen atom in a field was at first correctly described by the non-linear classic mechanics methods. If a hydrogen atom in a field problem is studied in many details, the analogous problem for multi-electron highly excited atoms is far from their adequate solution. In this aspect an especial interest attracts studying the highly excited dynamic Stark resonant states for alkali elements atoms in a electromagnetic field. This problem is also stimulated by experimental discoveries of the near threshold resonances in the photo ionization cross sections for hydrogen and alkali atoms in a electric field [4]. Here we study a phenomenon of multiwave ionization of non-hydrogenic Rydberg atoms on example of alkali atoms. All results are obtained by using quasi-stationary, quasi-energy states method and the model potential one [5].

References:

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