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Quantization of quasistationary states for Schrödinger equation: New approach

It is proposed an advanced approach to quantization of quasistationary states of the non-stationary Schrödinger equation, based on the formalism of operator perturbation theory [1]. There are several approaches for quantization of the states of the non-stationary Schrödinger equation with different forms of the external (for example, homogeneous electric field potential, Stark task, scattering problem etc) potentials. The problem of treating the corresponding characteristics for quantum systems requires carrying out the correct procedure for calculating the optimized sets of eigen functions and correspondingly eigen values especially in a case of multi-body quantum systems. In [1] it has been proposed principally new approach to quantization of the quasistationary states of the non-stationary Schrödinger equation for H-like systems. In [2] it has been generalized on a case of the non-H systems. Here we develop more advanced version of the approach [2] to quantization of the scattering and bound states of the Schrödinger equation with singular potential within the operator perturbation theory formalism [1]. The key feature of this formalism is that the zeroth order Hamiltonian, possessing only stationary states, is determined only by its spectrum without specifying its explicit form [1]. We elaborated special numerical procedure for calculating the eigen-values and eigen-functions in a case of the strong external (electric) field. The results of the test numerical calculations for some non-H systems are presented and demonstrate an efficiency of new numerical scheme [3].

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