Universal Quantum Approach for Description Laser Cooling in Arbitrary 1D Light Field

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We present the universal method for the solution of a quantum kinetic equation describing the evolution of the atom density matrix in 1D laser light formed by light waves with arbitrary polarisations. The method allows getting a steady-state solution for density matrix with full account the quantum recoil effects and optical pumping effects that allows getting whole information on the evolution of internal and external degrees of atom freedom and them correlations \cite{1,2}. This method is useful for a quantum description of deep laser cooling. It allows describing the effect of atom localisation in the wells of optical potentials and the atoms with above barrier motion, steady-state flows of atoms in optical potential wells and so on \cite{3,4}. This method also interesting limits for testing different semiclassical models and early developed quantum models. We also discuss new interesting effects in laser cooling of neutral atoms.

References


\cite{2} O N Prudnikov, R Ya Ilenkov, A V Taichenachev, A M Tumaikin and V I Yudin, JETP \textbf{112}, 939 (2011)
