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Single chirped pulse control of hyperfine states population in Rb atom in the framework of the four-level system VLADISLAV ZAKHAROV, SVETLANA MALINOVSKAYA, Stevens Institute of Technology — Electron population dynamics within the hyperfine structure in the Rb atom induced by a single ns pulse is theoretically investigated. The aim is to develop a methodology of the implementation of linearly chirped laser pulses for the desired excitations in the Rb atoms resulting in the creation of predetermined non-equilibrium states. A semi-classical model of laser pulse interaction with a four-level system representing the hyperfine energy levels of the Rb atom involved into dynamics has been developed. The equations for the probability amplitudes were obtained from the Schrodinger equation with the Hamiltonian that described the time evolution of the population of the four states in the field interaction representation. A code was written in Fortran for a numerical analysis of the time evolution of probability amplitudes as a function of the field parameters. The dependence of the quantum yield on the pulse duration, the linear chirp parameter and the Rabi frequency was studied to reveal the conditions for the entire population transfer to the upper hyperfine state of the $5S_{1/2}$ electronic level. The results may provide a robust tool for quantum operations in the alkali atoms.

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