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Population transfer between two quantum states by piecewise chirping of femtosecond pulses SERGEY ZHDANOVICH, EVGENY SHAPIRO, MOSHE SHAPIRO, JOHN HEPBURN, VALERY MILNER, University of British Columbia — We show that by using a sequence of mutually coherent transform limited femtosecond pulses one can achieve complete and robust population transfer between quantum states in a two-level system. We compare this piecewise process with the conventional adiabatic passage performed with a single frequency chirped pulse by studying the excitation of $5s_{1/2}$ - $5p_{1/2}$ transition in Rubidium atoms. We introduced "piecewise chirp," a parameter of the pulse sequence defined by phase shift between two sequential pulses in the train. We demonstrate that similarly to the conventional adiabatic passage, the piecewise excitation is insensitive to the total energy of the pulse and the value of the piecewise chirp if adiabaticity conditions are satisfied. We discuss the influence of amplitudes and phases of pulses in the sequence on the excitation process. Prospects of using the piecewise method for selective population transfer in multilevel system are discussed.

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