

Abstract Submitted
for the DAMOP13 Meeting of
The American Physical Society

Coherent control of population transfer in multilevel atomic systems using pulse train VLADIMIR MALINOVSKY, QUDSIA QURAIISHI, PATRICIA LEE, Army Research Laboratory, Adelphi, MD 20783 — Quantum control of the internal states of the atoms typically involves a combination of microwave, radio and optical fields. An all optical approach has distinct advantages for coherent control experiments which requires discrete momentum changes of the atomic cloud. Optical frequency comb, emitted by ultrafast modelocked pulsed laser, is an excellent tool to perform quantum information processing and quantum control in atomic media. Here we discuss several adiabatic passage techniques which are shown to be efficient for coherent population transfer in multilevel atomic systems using pulse trains. We present a general treatment and show some applications of the technique to manipulate population of the hyperfine levels of ^{87}Rb atom. Also, we propose a pulse train arrangement to substantially reduce the detrimental effect of spontaneous emission.

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Date submitted: 28 Jan 2013

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