

OPTIMAL QUANTUM CONTROL OF THE LANDAU–ZENER SYSTEM BY MEASUREMENTS

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In the recent works by A. Pechen et al. and F. Shuang et al. a problem of optimal control of a two-level quantum system by nonselective measurements was considered. In these works, the time instants of measurements are fixed; the maximization of a transition probability is performed over various observables. Note that, in case of two-level system, quantum dynamics without measurements is a unitary evolution in the two-dimensional complex vector space; a von Neumann observable is specified by a unit vector of the space.

In the present work, we consider a special (but important) case of two-level quantum system, namely, the Landau–Zener system (spin-1/2 charged particle in time-dependent magnetic field). We consider a problem of maximization of a transition probability when an observable is fixed, but instants of measurements are variable. We obtain full exact solution of the maximization problem in the large coupling constant limit for an arbitrary number of measurements. Also we establish a duality between two different problem statements: maximization over various observables under fixed time instants of measurements and maximization over various time instants under a fixed observable.