SFB/TRR 21 - Seminar

27. Oktober 2010, Ulm

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Optimal control of quantum systems

We consider the optimal control problem of transferring population between states of a quantum system where the coupling proceeds only via intermediate states that are subject to decay. We pose the question whether it is generally possible to carry out this transfer. For a single intermediate decaying state, we recover the Stimulated Raman Adiabatic Passage (STIRAP) process for which we also present analytic solutions in the finite time case and show that the solutions yield perfect state transfer only in the limit of infinite time. We also present analytic solutions for the case of transfer that has to proceed via two consecutive intermediate decaying states. We show that in this case, for finite power the optimal control does not approach perfect state transfer even in the infinite time limit. We generalize our findings to characterize the topologies of paths that can be achieved by coherent control.

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