SFB/TRR 21 - Seminar

13. September 2011, Ulm

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Developement of new techniques of Optimal Control in Quantum Dynamics

Since the introduction of control theory in quantum mechanics during the 80s, optimal control theory become a key tool for the manipulation and control of dynamical quantum systems. A lot of techniques aiming at designing the optimal field have been introduced up to date. Among others, we can cite deterministic algorithms such as Grape of Krotov algorithm and heuristic algorithm such as the genetic algorithm. In this talk we report on some recent developments in this domain.

In a first part, we recall the basics of geometric optimal control theory which is a powerful tool to solve control problems for systems of small dimensions. We apply this method to the control of the dynamics of spin systems in presence of dissipation. Some experimental applications will be given in Nuclear Magnetic Resonance spectroscopy and imaging.

In a second part of the talk, we present some extensions of monotonic algorithms in order to threat the non-linear interaction between the system and the control field or to take into account spectral constraints on the optimal solution. Some example will be given for the rotational dynamics of a linear molecule controlled by a laser pulses.

13. September 2011, 11:00 Uhr

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