

Protecting coherence in optimal control theory

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Quantum optimal control theory allows for shaping the time dependence of parameters that control the evolution of quantum systems relevant for quantum information processing. Fidelities well above the fault tolerance threshold can be attained in a variety of implementations of quantum gates under ideal conditions. Unfortunately, real experimental set-ups are always affected by imperfections that limit the performance of actual operations. Examples include anharmonicity in the trapping potentials, noise in the control parameters, limited bandwidth, imperfect pulse calibration, finite temperature, inhomogeneous broadening, all leading to decoherence and gate errors. In this talk I will show how quantum optimal control methods can be applied to tackle each of these implementation challenges, in many cases yielding fidelities beyond the fault-tolerance threshold for realistic conditions.