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Quantum speed limit and optimal control TOMMASO CANEVA, International School for Advanced Studies (SISSA), Via Beirut 2-4, I-34014 Trieste, Italy, MICHAEL MURPHY, TOMMASO CALARCO, Institut fur Quanteninformationsverarbeitung, Universitat Ulm, D-89069 Ulm, Germany, ROSARIO FAZIO, NEST-CNR-INFM & Scuola Normale Superiore, Piazza dei Cavalieri 7, I-56126 Pisa, Italy, SIMONE MONTANGERO, Institut fur Quanteninformationsverarbeitung, Universitat Ulm, D-89069 Ulm, Germany, VITTORIO GIOVANNETTI, NEST-CNR-INFM & Scuola Normale Superiore, Piazza dei Cavalieri 7, I-56126 Pisa, Italy, GIUSEPPE E. SANTORO, International School for Advanced Studies (SISSA), Via Beirut 2-4, I-34014 Trieste, Italy — The Heisenberg uncertainty principle, $\Delta E \Delta t \geq \hbar$, implies that a system cannot pass through distinguishable, i.e. orthogonal, states within arbitrarily short time. In the case of a time-independent Hamiltonian, the presence of this ultimate bound has been well established and summarized in the concept of a maximum allowed velocity, called *quantum speed limit* (QSL). On other hand for a time-dependent Hamiltonian the problem started to be addressed only very recently and is still open. Optimal control theory offers a valuable tool to explore this issue: we test its performance in two paradigmatic cases, Landau-Zener model and transfer of information along a chain of coupled spins, and show that the results are compatible with the ultimate limits enabled by quantum mechanics.

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