Fast adiabatic control near the quantum speed limit JONATHAN
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Dartmouth College — The design of fast, high fidelity adiabatic waveforms is an
important open challenge in quantum control. We propose a simple optimization
scheme for designing fast, accurate adiabatic waveforms that maximize adiabaticity
in Berrys superadiabatic interaction frames and can be applied to both single and
multi-qubit control. For single qubit control, the optimized pulses are compared
against both non-adiabatic optimal control GRAPE pulses and pulses derived from
Slepian window functions, and they are shown to achieve high fidelities at pulse
lengths near the quantum speed limit. We also demonstrate the design of a two-
qubit entangling operation and implement the scheme using NMR.

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