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Digitized adiabatic quantum computing with a superconducting circuit, part I: Theory L. LAMATA, University of the Basque Country, Spain, R. BARENDS, Google, Santa Barbara, USA , A. SHABANI, Google, Venice, USA , J. KELLY, Google, Santa Barbara, USA, A. MEZZACAPO, U. LAS HERAS, University of the Basque Country, Spain, R. BABBUSH, Google, Venice, USA, A. G. FOWLER, Google, Santa Barbara, USA, B. CAMPBELL, University of California, Santa Barbara, USA , YU CHEN, Google, Santa Barbara, USA, Z. CHEN, B. CHIARO, A. DUNSWORTH, University of California, Santa Barbara, USA, E. JEFFREY, E. LUCERO, Google, Santa Barbara, USA, A. MEGRANT, University of California, Santa Barbara, USA, J. Y. MUTUS, M. NEELEY, Google, Santa Barbara, USA, C. NEILL, P. J. J. OMALLEY, C. QUINTANA, University of California, Santa Barbara, USA, P. ROUSHAN, Google, Santa Barbara, USA, E. SOLANO, University of the Basque Country, Spain, and IKERBASQUE, Spain, H. NEVEN, Google, Venice, USA, JOHN M. MARTINIS, Google, Santa Barbara, USA, and University of California, Santa Barbara, USA — Adiabatic quantum computing (AQC) is a general-purpose optimization algorithm that in contrast to circuit-model quantum algorithms can be applied to a large set of computational problems. An analog physical realization of AQC has certain limitations that we propose can be overcome by a gate-model equivalence of the AQC. In this talk we discuss the hardware advantages of digitized AQC in particular arbitrary interactions, precision, and coherence. We could experimentally realize the principles of digitized AQC on a chain of nine qubits, and highlight the physics of adiabatic evolutions as well as the Kibble-Zurek mechanism.

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