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Superconducting qubits with adjustable coupling, Part III: Simulating topological properties of quantum systems PEDRAM ROUSHAN, C. NEILL, Y. CHEN, University of California, Santa Barbara, M. KOLODRUBETZ, Boston University, R. BARENDS, I. HOI, E. JEFFREY, J.Y. MUTUS, B. CAMPBELL, Z. CHEN, B. CHIARO, A. DUNSWORTH, J. KELLY, A. MEGRANT, P. O'MALLEY, C. QUINTANA, D. SANK, T. WHITE, J. WENNER, University of California, Santa Barbara, A. POLKOVNIKOV, Boston University, A. CLELAND, J. MARTINIS, University of California, Santa Barbara — The g-mon architecture with its adjustable qubit-qubit coupling makes a promising candidate for building a quantum simulator. Here, we demonstrate the versatility of this system to simulate the topological properties of interacting Hamiltonians. So far, experimental studies of topological invariants in condensed matter systems have been limited to transport measurements. Recently, it was proposed [1] that the topological properties of Hamiltonians can be inferred from quantum dynamics. The Berry curvature, a quantity that reflects the geometrical properties of the eigenstates, can emerge as the non-adiabatic response to the rate of change of an external parameter. Using superconducting g-mon qubits, we measure the Berry curvature for various eigenstates of the Hamiltonian of the system. We will discuss the robustness of the measured Chern numbers, by showing their path independence in the parameter space.

[1] Gritsev and Polkovnikov, PNAS, 109, 6457 (2012).

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