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Characterizing Ensembles of Superconducting Qubits ADAM SEARS, JEFF BIRENBAUM, DAVID HOVER, DANNA ROSENBERG, STEVEN WEBER, JONILYN L. YODER, JAMIE KERMAN, MIT Lincoln Laboratory, SIMON GUSTAVSSON, ARCHANA KAMAL, FEI YAN, MIT, WILLIAM OLIVER, MIT Lincoln Laboratory — We investigate ensembles of up to 48 superconducting qubits embedded within a superconducting cavity. Such arrays of qubits have been proposed for the experimental study of Ising Hamiltonians, and efficient methods to characterize and calibrate these types of systems are still under development. Here we leverage high qubit coherence ($> 70\ \mu s$) to characterize individual devices as well as qubit-qubit interactions, utilizing the common resonator mode for a joint readout. This research was funded by the Office of the Director of National Intelligence (ODNI), Intelligence Advanced Research Projects Activity (IARPA) under Air Force Contract No. FA8721-05-C-0002. The views and conclusions contained herein are those of the authors and should not be interpreted as necessarily representing the official policies or endorsements, either expressed or implied, of ODNI, IARPA, or the US Government.

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