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Characterization of addressability by simultaneous randomized benchmarking¹ JOHN SMOLIN, IBM Research, JAY GAMBETTA TEAM, ANTONIO CORCOLES TEAM, SETH MERKEL TEAM, IBM QUANTUM COMPUTING GROUP TEAM — The control and handling of errors arising from cross-talk and unwanted interactions in multi-qubit systems is an important issue in quantum information processing architectures. We introduce a benchmarking protocol that provides information about the amount of addressability present in the system and implement it on coupled superconducting qubits. The protocol consists of randomized benchmarking each qubit individually and then simultaneously, and the amount of addressability is related to the difference of the average gate fidelities of those experiments. We present the results on two similar superconducting transmon qubits with different amounts of cross-talk and unwanted interactions, which agree with predictions based on simple models for the amount of residual coupling.

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John Smolin
IBM Research

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