Using and Extending Randomized Benchmarks for Trapped-Ion Quantum Computing ADAM MEIER, NIST Boulder / CU Boulder, EMANUEL KNILL, NIST Boulder — Randomized benchmarking is a procedure that extracts a "typical" error probability for an experimental quantum computer. This number describes the failure rate of a typical gate in the middle of a long computation and is a worthwhile figure of merit for quantum control demonstrations. I will present a practical, systematic approach to randomized benchmarking using examples from planned experiments in ion traps. I will discuss ways to extend the data analysis to reveal information about individual gates. Finally, I will look at the simplifying assumptions made regarding the error models and randomness of the experimental gates and how they could be generalized. This work has been done in collaboration with K. Brown, D. Hanneke, and J. Home.

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