Abstract Submitted
for the MAR14 Meeting of
The American Physical Society

High-Confidence Quantum Gate Tomography[1] BLAKE JOHNSON, MARCUS DA SILVA, COLM RYAN, Raytheon BBN Technologies, SHELBY KIMMEL, Massachusetts Institute of Technology, BRIAN DONOVAN, THOMAS OHKI, Raytheon BBN Technologies — Debugging and verification of high-fidelity quantum gates requires the development of new tools and protocols to unwrap the performance of the gate from the rest of the sequence. Randomized benchmarking tomography[2] allows one to extract full information of the unital portion of the gate with high confidence. We report experimental confirmation of the technique's applicability to quantum gate tomography. We show that the method is robust to common experimental imperfections such as imperfect single-shot readout and state preparation. We also demonstrate the ability to characterize non-Clifford gates. To assist in the experimental implementation we introduce two techniques. "Atomic Cliffords" use phase ramping and frame tracking to allow single-pulse implementation of the full group of single-qubit Clifford gates. Domain specific pulse sequencers allow rapid implementation of the many thousands of sequences needed.

[1]This research was funded by the Office of the Director of National Intelligence (ODNI), Intelligence Advanced Research Projects Activity (IARPA), through the Army Research Office contract no. W911NF-10-1-0324
[2]Kimmel et al. arXiv:1306.2348 [quant-ph] (2013)

Blake Johnson
Raytheon BBN Technologies

Date submitted: 15 Nov 2013 Electronic form version 1.4