Abstract Submitted
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Experimental implementation of Grover's search algorithm with neutral atom qubits[1] YUAN SUN, Department of Physics, University of Wisconsin-Madison, MARTIN LICHTMAN, Joint Quantum Institute, University of Maryland, KEVIN BAKER, MARK SAFFMAN, Department of Physics, University of Wisconsin-Madison — Grover's algorithm for searching an unsorted data base provides a provable speedup over the best possible classical search and is therefore a test bed for demonstrating the power of quantum computation. The algorithm has been demonstrated with NMR, trapped ion, photonic, and superconducting hardware, but only with two qubits encoding a four element database. We report on progress towards experimental demonstration of Grover's algorithm using two and three neutral atom qubits encoding a database with up to eight elements. Our approach uses a Rydberg blockade C_kNOT gate for efficient implementation of the Grover iterations[1]. Quantum Monte Carlo simulations of the algorithm performance[2] that account for gate errors and decoherence rates are compared with experimental results. [1] K. Mølmer, L. Isenhower, and M. Saffman, J. Phys. B **44**, 184016 (2011). [2] D. Petrosyan, M. Saffman, and K. Mølmer, arXiv: 1512.05588.

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