Abstract Submitted
for the MAR17 Meeting of
The American Physical Society

Implementing a Variational Quantum Eigensolver using Superconducting Qubits[1] JAMES COLLESS, VINAY RAMASESH, DAR DAHLEN, MACHIEL BLOK, IRFAN SIDDIQI, Quantum Nanoelectronics Laboratory, Department of Physics, University of California, Berkeley CA 94720, USA., JARROD MCCLEAN, JONATHAN CARTER, WIBE DE JONG, Computational Research Division, Lawrence Berkeley National Laboratory, Berkeley CA 94720, USA. — The problem of eigenvalue determination lies at the heart of a number of applications and technologies ranging from structural analysis to quantum simulation, and in particular quantum chemistry. While quantum computers promise to provide exponential improvements over classical techniques in our ability to solve these problems, there are significant technological challenges that must first be overcome. The variational quantum eigensolver (VQE)[2], is a hybrid quantum-classical algorithm designed to utilize both quantum and classical resources to find variational solutions to eigenvalue and optimization problems not accessible to traditional classical computers. We present initial steps towards the practical implementation of the VQE using superconducting qubits with reference to the extraction of the hydrogen energy spectrum. We explore the algorithm's ability to go beyond ground state estimation to determine molecular excited electronic states and investigate its intrinsic robustness to non-systematic sources of decoherence.

[1]This work was supported by the Department of Energy.
[2]A. Peruzzo, J. McClean et al., **Nat. Comms.** 5, 4213 (2014)

James Colless
Department of Physics, University of California

Date submitted: 20 Nov 2016 Electronic form version 1.4