Abstract Submitted
for the MAR17 Meeting of
The American Physical Society

Efficient Online Optimized Quantum Control for Adiabatic Quantum Computation GREGORY QUIROZ, Johns Hopkins University Applied Physics Laboratory — Adiabatic quantum computation (AQC) relies on controlled adiabatic evolution to implement a quantum algorithm. While control evolution can take many forms, properly designed time-optimal control has been shown to be particularly advantageous for AQC. Grover's search algorithm is one such example where analytically-derived time-optimal control leads to improved scaling of the minimum energy gap between the ground state and first excited state and thus, the well-known quadratic quantum speedup. Analytical extensions beyond Grover's search algorithm present a daunting task that requires potentially intractable calculations of energy gaps and a significant degree of model certainty. Here, an in situ quantum control protocol is developed for AQC. The approach is shown to yield controls that approach the analytically-derived time-optimal controls for Grover's search algorithm. In addition, the protocol's convergence rate as a function of iteration number is shown to be essentially independent of system size. Thus, the approach is potentially scalable to many-qubit systems.

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Date submitted: 11 Nov 2016 Electronic form version 1.4