Abstract Submitted
for the MAR15 Meeting of
The American Physical Society

Fast Room-Temperature Phase Gate on a Single Nuclear Spin in Diamond[1] S. SANGTAWESIN, T.O. BRUNDAGE, J.R. PETTA, Department of Physics, Princeton University — Nuclear spins support long lived quantum coherence due to weak coupling to the environment, but are difficult to rapidly control using nuclear magnetic resonance as a result of the small nuclear magnetic moment. We demonstrate a fast ~ 500 ns nuclear spin phase gate on a ^{14}N nuclear spin qubit intrinsic to a nitrogen-vacancy center in high purity diamond [1]. This phase gate is achieved by utilizing electron-nuclear hyperfine interaction. By driving off-resonant Rabi oscillations on the electronic spin, we can generate an arbitrary phase gate on the nuclear spin. We also demonstrate that repeated applications of π-phase gates can bang-bang decouple the nuclear spin from the environment, locking the spin state for up to 140 μs.

[1] S. Sangtawesin, T. O. Brundage, and J. R. Petta, Phys. Rev. Lett. 113, 020506 (2014)

[1]Research was supported by the Sloan and Packard Foundations, the National Science Foundation through awards DMR-0819860 and DMR-0846341, and the Army Research Office through PECASE award W911NF-08-1-0189.

Sorawis Sangtawesin
Department of Physics, Princeton University

Date submitted: 10 Nov 2014 Electronic form version 1.4