Abstract Submitted
for the MAR15 Meeting of
The American Physical Society

Quantum memory in a single nucleus in silicon[1] SOLOMON FREER, STEPHANIE SIMMONS, ARNE LAUCHT, JUHA MUHONEN, JUAN PABLO DEHOLLAIN, RACHPON KALRA, FAY HUDSON, ANDREW DZURAK, UNSW Australia, KOHEI ITOH, Keio University, JEFFREY MCCALLUM, DAVID JAMIESON, University of Melbourne, ANDREA MORELLO, UNSW Australia — Long coherence times and fast manipulation are two desirable qualities of a qubit that for many systems are mutually incompatible. Storing quantum information in an ancillary qubit, i.e. a 'quantum memory', is a strategy to address this issue. It is a advantageous property of donor impurities in silicon to have qubits of both qualities in a single lattice site. Here we demonstrate storage and retrieval of quantum information from a single donor electron spin to its host phosphorus nucleus in isotopically-enriched ^{28}Si. We demonstrate a high fidelity memory process characterised via both state and process tomography. We use dynamical decoupling sequences during the nuclear storage to extend the memory time, and demonstrate storage and retrieval of a single qubit of information multiple times before decay. These results underline the inherent versatility and high fidelity of our two qubit system.

[1]Funded by the Australian Research Council (CE11E000127) and the U.S. Army Research Office (W911NF-13-1-0024)

Solomon Freer
UNSW Australia

Date submitted: 14 Nov 2014 Electronic form version 1.4