Abstract Submitted
for the MAR12 Meeting of
The American Physical Society

Spin phase coherence of donor nuclear spins in silicon: the influence of electrical readout DANE MCCAMEY, School of Physics, University of Sydney, Australia, JOHAN VAN TOL, National High Magnetic Field Laboratory and Florida State University, Tallahasse, GAVIN MORLEY, Department of Physics, University of Warwick, UK, CHRISTOPH BOEHME, Department of Physics and Astronomy, University of Utah — Storing information in spin underpins the operation of a wide range of emerging technologies. However, the ability to interact with, and thus control electron spin implies a reasonable coupling to the environment, and a correspondingly limited spin coherence time. This problem can be overcome by using nuclear spins for long term information storage, and significant experimental progress in this direction has been seen recently. Readout of stored information can be achieved in a variety of ways, with electrical approaches offering substantial benefit with regard to integration of spintronic and classical electronic applications. Here, we discuss electrical readout of coherent nuclear spin states of donor nuclei in silicon. By utilizing nuclear Hahn echo sequences, we are able to demonstrate that nuclear spin phase coherence can exceed 3 ms with electrical readout. We find that the spin phase coherence is in this case limited by the spin lifetime of the donor electron which mediates our readout scheme, and discuss approaches to ameliorate this effect.

Dane McCamey
School of Physics, University of Sydney, Australia

Date submitted: 09 Nov 2011 Electronic form version 1.4