Abstract Submitted
for the DAMOP18 Meeting of
The American Physical Society

Quantum sensing in the physically rotating frame[1] ROBERT SCHOLTEN, ALEXANDER WOOD, ALEX AEPPLI, EMMANUEL LILETTE, YAAKOV FEIN, VIKTOR PERUNICIC, LLOYD HOLLENBERG, ANDY MARTIN, University of Melbourne — We describe quantum measurement and control of nitrogen vacancy (NV) center qubits in rapidly rotating diamond. The rotation period is comparable to the qubit electron spin coherence time T2, allowing detection of rotationally-induced magnetic pseudo-fields acting on a bath of proximal 13C nuclear spins (Nature Physics doi:10.1038/nphys4221). By rotating the diamond at rates comparable to the nuclear spin precession frequency (>100,000 rpm) we can induce pseudo-fields large enough to cancel the conventional magnetic field for the nuclear spins while having minimal effect on the NV qubits. Our results highlight the profound connection between magnetism and physical rotation, and establish a novel way of controlling the nuclear spin bath surrounding the NV center. We discuss future work involving control of single NV qubits in a rotating diamond and possible improvements to magnetometry using rapid sensor rotation.

[1]This work was supported by the Australian Research Council Discovery Scheme (DP150101704)

Robert Scholten
University of Melbourne

Date submitted: 21 Jan 2018

Electronic form version 1.4