Abstract Submitted
for the MAR17 Meeting of
The American Physical Society

Quantum metrology with a single spin-3/2 defect in silicon carbide[1] ONEY O. SOYKAL, THOMAS L. REINECKE, Naval Research Laboratory — We show that implementations for quantum sensing with exceptional sensitivity and spatial resolution can be made using the novel features of semiconductor high half-spin multiplet defects with easy-to-implement optical detection protocols. To achieve this, we use the spin-3/2 silicon monovacancy deep center in hexagonal silicon carbide based on our rigorous derivation of this defect's ground state and of its electronic and optical properties. For a single V_{Si}^{-} defect, we obtain magnetic field sensitivities capable of detecting individual nuclear magnetic moments. We also show that its zero-field splitting has an exceptional strain and temperature sensitivity within the technologically desirable near-infrared window of biological systems. Other point defects, i.e. 3d transition metal or rare-earth impurities in semiconductors, may also provide similar opportunities in quantum sensing due to their similar high spin ($S \geq 3/2$) configurations.

[1]This work was supported in part by ONR and by the Office of Secretary of Defense, Quantum Science and Engineering Program

Oney O. Soykal
Naval Research Laboratory

Date submitted: 11 Nov 2016 Electronic form version 1.4