Abstract Submitted
for the MAR17 Meeting of
The American Physical Society

Charge state control of divacancy spin defects in 4H-SiC[1] GARY WOLFOWICZ, ANDREW L. YEATS, DAVID D. AWSCHALOM, Institute for Molecular Engineering, University of Chicago, Chicago, Illinois 60637, USA — Defect spin states in silicon carbide (SiC) offer a platform for exploring quantum information science in a technologically-relevant material amenable to wafer-scale fabrication. Neutral divacancies (VV^0) are particularly attractive for their optically-addressable spin states and long spin coherence times. We investigate the charge state dynamics of ensemble divacancies in 4H-SiC using a wide range of optical excitations between the VV^0 zero-phonon line ($\approx$ 1 eV) and the bulk bandgap ($\approx$ 3.2 eV). At short wavelengths we observe a strong enhancement of the VV^0 population through both PL and ODMR measurements, which we ascribe to charge conversion. In addition, we also probe the charge state dynamics and lifetimes using two- and three-color pulsed experiments. In the dark, charge state conversion persists on a timescale of hours, increasing the ODMR intensity without any effect on the spin coherence time. Under illumination, the charge state is reshuffled to a wavelength-dependent steady state on a timescale between milliseconds and minutes, depending on the optical power.

[1]This work is funded by AFOSR and ARL.

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Date submitted: 16 Nov 2016 Electronic form version 1.4