Abstract Submitted
for the DAMOP18 Meeting of
The American Physical Society

Collective coherent and dissipative dynamics of two quantum emitters in a nanophotonic cavity. DENIS SUKACHEV, MIHIR BHASKAR, RUFFIN EVANS, MIKE BUREK, CHRISTIAN NGUYEN, Harvard University, ALP SIPAHIGIL, California Institute of Technology, BARTHOLOMEUS MACHIELSE, Harvard University, ED BIELEJEC, Sandia National Laboratories, MARCO LONCAR, MISHA LUKIN, Harvard University — Interactions between two quantum emitters are a key ingredient for quantum networks. We demonstrate photon-mediated interactions in a platform consisting of two negatively-charged silicon-vacancy (SiV) color centers in diamond coupled with high cooperativity (C$\sim$20) to a nanophotonic cavity. We access cavity-coupled spin-selective optical transitions to initialize and read the SiV spin in a single shot with 96% fidelity. When the optical transitions of the two SiV centers are near-resonant, the coupling of each SiV center to the cavity mode results in a cavity-mediated interaction between the two SiVs. This interaction hybridizes the two-SiV states into collective bright and dark states. Tuning of the magnetic field allows us to control the strength of this effect and observe a direct optical interaction between two SiV spin states. Thus, SiV centers which also have a long spin coherence of 10 ms may form building blocks for future quantum networks.

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Date submitted: 11 Jan 2018 Electronic form version 1.4