Abstract Submitted
for the MAR17 Meeting of
The American Physical Society

Multi-Emitter Cavity Quantum Electrodynamics in Solid State Systems[1] MARINA RADULASKI, KEVIN FISCHER, KONSTANTINOS LAGOUDAKIS, JINGYUAN LINDA ZHANG, JELENA VUCKOVIC, Stanford University — Nanophotonic devices, such as ultrafast single photon sources and optical switches, are the building blocks of scalable quantum optical circuits and quantum cryptographic systems. Their operation has been based on cavity quantum electrodynamics (CQED) in solid state platforms where a single ($N=1$) quasi-atomic emitter is strongly coupled to a nanoresonator. We have recently developed photonic devices in silicon carbide and diamond substrates that incorporate color centers as emitters. Low inhomogeneous broadening in nanofabricated structures brings us close to experimentally reaching the multi-emitter ($N>1$) strong CQED coupling regime, which would unveil novel interference effects and scale device operation rates by $\sqrt{N}$. To model such systems, we have developed an extension to the Tavis-Cummings Hamiltonian, nominally representing N atoms in a cavity, to capture the dynamics of an ensemble of nonidentical solid state emitters coupled to a nanoresonator. Analyzing collective interaction effects, we find new opportunities pertaining to color center hosts substrates with low strain. We also study the system's subpoissonian photon statistics and find interference effects that result in superior single photon emission.

[1]National Science Foundation DMR Grant Number 1406028

Marina Radulaski
Stanford University

Date submitted: 11 Nov 2016

Electronic form version 1.4