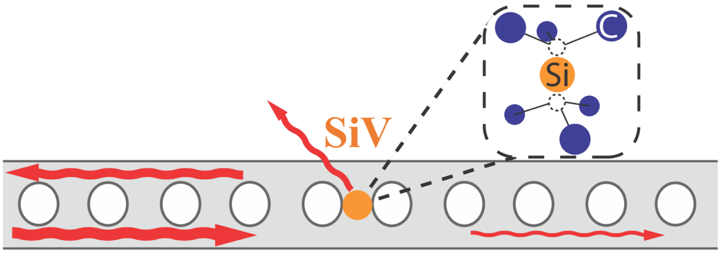
An integrated diamond nanophotonics platform for quantum optical networks

Mihir Bhaskar[1]

[1] *Department of Physics, Harvard University, 17 Oxford Street, Cambridge, Massachusetts 02138, USA*



Solid-state quantum-emitters with long spin coherence times and strong interactions with single optical photons could form the building blocks of a quantum network. To date, no solid-state quantum-emitter has yet been able to satisfy both of these requirements simultaneously. In this talk, I will discuss experiments [1,2,3,4] which demonstrate that silicon-vacancy (SiV) color centers in diamond can address both of these challenges. First, we integrate SiV centers into diamond nanophotonic devices to obtain strong interactions between a single SiV center and an optical photon. Using this platform, we demonstrate a quantum optical switch controlled by a single SiV center and entanglement generation between two SiVs in a single nanophotonic device [2]. By cooling SiVs down to 100mK, we improve the SiV spin coherence time by five orders of magnitude and achieve a coherence time of 13-milliseconds [3,4]. These results make SiV centers in nanophotonic devices a leading solid-state platform for the realization of quantum networks.

[1] A. Sipahigil, K. D. Jahnke *et al.* Phys. Rev. Lett. **113**, 113602 (2014).
[2] A. Sipahigil, R. E. Evans, D. D. Sukachev *et al.* Science, **354**, 847 (2016).
[3] K. D. Jahnke, A. Sipahigil *et al.* New J. Phys. **17** 043011 (2015)
[4] D. D. Sukachev, A. Sipahigil, C. T. Nguyen *et al.* arXiv:1708.08852 (2017).