Abstract Submitted
for the MAR16 Meeting of
The American Physical Society

Towards a highly efficient quantum spin-photon interface for an NV centre based quantum network STEFAN BOGDANOVIC, CRISTIAN BONATO, SUZANNE VAN DAM, ANDREAS REISERER, ANNE-MARIJE ZWERVER, RONALD HANSON, Kavli Institute of Nanoscience Delft, Delft University of Technology, QUANTUM TRANSPORT TEAM — Nitrogen-vacancy (NV) centers in diamond recently emerged as promising candidates for realizing quantum information algorithms due to their remarkable versatility. The spin of these optically active defects can be entangled with their emitted photons, making them an excellent optical interface from the perspective of quantum communication.
Recently, we have demonstrated the first building blocks of such networks, performing kilometer scale entanglement of two NV centers and teleportation of quantum information.(1) However, our current protocols are inefficient due to the low emission of NV centers resonant photons into the zero phonon line (ZPL).
Here we present our efforts of coupling a single NV center emitter in a diamond membrane to a fiber-based Fabry-Perot microcavity with high finesse ($F > 10^4$) at cryogenic temperatures. This approach allows spectral tuning of the cavity resonance to the ZPL emission of the NV center, thereby significantly enhancing the resonant photon emission via Purcell effect. Furthermore, the bulk environment of the NV centers protects their spin properties against surface proximity effects, which is of crucial importance for quantum information processing applications.
(1) B.Hensen et al, *Nature* **526**, 682 (2015)

Stefan Bogdanovic
Kavli Institute of Nanoscience Delft, Delft University of Technology

Date submitted: 06 Nov 2015 Electronic form version 1.4