Abstract Submitted
for the MAR17 Meeting of
The American Physical Society

An efficient quantum spin-photon interface in diamond for a quantum network SUZANNE VAN DAM, STEFAN BOGDANOVIC, CRISTIAN BONATO, MADELAINE LIDDY, BAS HENSEN, LISANNE COENEN, ANNE-MARIJE ZWERVER, ANDREAS REISERER, QUTech Kavli Institute of Nanoscience, Delft University of Technology, MARKO LONCAR, School of Engineering and Applied Sciences, Harvard University, Cambridge, RONALD HANSON, QUTech Kavli Institute of Nanoscience, Delft University of Technology — In a future quantum network distant nodes will be connected via entanglement. Nitrogen-vacancy (NV) centers in diamond have developed into a building block for such a network. The current success probability of heralded entanglement generation is limited by the probability that the NV center emits a photon in the zero-phonon line, as well as by the photon collection efficiency from the diamond. We can address both by embedding the NV in a Fabry-Perot cavity at cryogenic temperatures, benefitting from Purcell enhancement and an improved collection efficiency. Here we report the latest results on such a system with a thin diamond membrane in a tunable fiber-based microcavity at cryogenic temperatures. This new quantum interface should enable significant speed-up in the remote entangling rate, and allow us to extend a quantum network over multiple nodes and longer distance.

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Date submitted: 11 Nov 2016 Electronic form version 1.4