Abstract Submitted
for the MAR14 Meeting of
The American Physical Society

From remote entanglement between solid state qubits to deterministic quantum teleportation HANNES BERNIEN, BAS HENSEN, WOLFGANG PFAFF, GERWIN KOOLSTRA, SUZANNE VAN DAM, MACHIEL BLOK, LUCIO ROBLEDO, TIM TAMINIAU, Kavli Institute of Nanoscience, TU Delft, MATTHEW MARKHAM, DANIEL TWITCHEN, Element Six Ltd., LILIAN CHILDRESS, McGill University, RONALD HANSON, Kavli Institute of Nanoscience, TU Delft — Quantum networks enable the distribution of quantum information that is processed and stored in local nodes [1]. Setting up a quantum network requires the generation of entanglement between widely separated qubits combined with local long-lived quantum registers. Here we present our recent results towards the realization of scalable quantum networks with solid-state qubits. We have entangled two spin qubits, each associated with a nitrogen vacancy center in diamond [2]. The two diamonds reside in separate setups three meters apart from each other. With no direct interaction between the two spins to mediate the entanglement, we make use of a scheme based on quantum measurements: we perform a joint measurement on photons emitted by the NV centers. The detection of the photons projects the spins into an entangled state. We verify the generated entanglement by single-shot readout of the spin qubits in different bases and correlating the results. We will present these experiments along with our latest results towards deterministic quantum teleportation between distant qubits. [1] H. J. Kimble, Nature, 453, 1023 (2008) [2] H. Bernien et al., Nature 497, 86 (2013).

Hannes Bernien
Kavli Institute of Nanoscience, TU Delft

Date submitted: 14 Nov 2013 Electronic form version 1.4