Abstract Submitted
for the MAR11 Meeting of
The American Physical Society

Manipulating decoherence of a single solid-state spin by quantum control of its spin bath environment GIJS DE LANGE, TOENO VAN DER SAR, MACHIEL BLOK, Kavli Institute of Nanoscience Delft, Delft University of Technology, The Netherlands, ZHIHUI WANG, VIATCHESLAV DOBROVITSKI, Ames Laboratory and Iowa State University, Ames, Iowa 50011, USA, RONALD HANSON, Kavli Institute of Nanoscience Delft, Delft University of Technology, The Netherlands — The coherence of solid-state spins is limited by uncontrolled interactions with their spin environment. High-fidelity single-spin control can be used to prolong the coherence by dynamically decoupling the spin from the environment [see De Lange et al., Science 330, 60 (2010)]. Here, we demonstrate a new approach towards decoherence control based on coherent manipulation of the spin bath environment itself. Our system consists of a single NV center spin in diamond, surrounded by a bath of electronic spins belonging to nitrogen impurities. By driving the bath spins resonantly and using the NV spin as a sensor, we are able to detect all transitions of the bath spins and demonstrate independent quantum control of each of them. This newly gained control opens the door to a number of exciting experiments such as measurement of the spin bath dynamics, manipulation of the spin bath correlation time, decoherence editing, and protection of NV spin coherence by suppressing the dynamics in its spin environment. In this talk we will present our latest results towards these goals.

Ronald Hanson
Kavli Institute of Nanoscience Delft,
Delft University of Technology, The Netherlands

Date submitted: 24 Nov 2010 Electronic form version 1.4