SFB/TRR 21 - Colloquium

6. Februar 2015, Ulm

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Quantum control of NV centers in diamond: dynamical decoupling for spins and photons

The nitrogen-vacancy (NV) centers in diamond constitute promising platform for prospective solid-state quantum technologies. Advanced approaches for quantum spin control, based on the pulse dynamical decoupling, can effectively protect the quantum state of the NV center's spin from the decohering influence of the environment [1]. With such protection, the NV spin can be used for high-precision measurement of magnetic/electric fields and temperature at nanoscale. However, the control protocols should not only decouple the NV spin from its environment, but also preserve the coupling to the desired degrees of freedom. Our recent work on designing, assessing, and implementing such protocols for individual and coupled electronic and nuclear spins in diamond will be presented [2,3], as well as its applications to the quantum information processing and detection of sinlge spins at nanoscale. We will also discuss extensions of this approach to control of the photons emitted by the NV center.
[1] G. de Lange et al., Science 330, 60 (2010). [2] T. van der Sar et al., Nature 484, 82 (2012). [3] T. H. Taminiau et al., Phys. Rev. Lett. 109, 137602 (2012).

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