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CONTROL OF QUANTUM CORRELATIONS IN TAILORED MATTER
SFB/TR 21 – STUTTGART, ULM, TÜBINGEN

Kolloquium

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Coherent control and read-out of a single electron spin in a quantum dot

The ability to control the quantum state of single electron spins in a quantum dot array is at the heart of recent developments towards a scalable spin-based quantum computer. In this talk, I will discuss the realization of the basic elements for a quantum computer with electron spins in GaAs quantum dots. Among these are various methods for single-shot read-out and the coherent control of a single electron spin via electron spin resonance. By applying short bursts of an on-chip generated oscillating magnetic field we observe up to eight Rabi oscillations of the electron spin. Ramsey-type pulse sequences allowed a measurement of the spin decoherence time, dominated by the presence of the nuclear spins in the host material for the quantum dot. We show that these decoherence process can be erased to some extent by spin-echo techniques.

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