SFB/TRR 21 - Colloquium

7. November 2014, Stuttgart

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Spin qubits and nanomechanics in carbon nanotubes

Nanotubes are attractive materials for electron spin qubits because they can be made free of hyperfine dephasing and because spin-orbit interaction offers a route to all-electrical spin control. I will describe the first qubit in this material, the valley-spin qubit. The qubit is controlled by exploiting spin-orbit coupling in a bent nanotube and read out electrically using a generalization of Pauli blockade in a double quantum dot. I will also discuss prospects for studying spin-phonon coupling at the single-quantum level in a suspended vibrating nanotube, where the low mass and high quality factor of the nanotube are expected to lead to large zero-point motion and long-lived quantum states.

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