MA 6 Invited Talks Vandersypen / Herper

Time: Monday 13:45–14:45 Room: HSZ 03

Invited Talk MA 6.1 Mon 13:45 HSZ 03

Read-out, relaxation and decoherence of electron spins in a quantum dot — •Lieven Vandersypen — Kavli Institute of NanoScience, Delft University of Technology, Lorentzweg 1, 2628 CJ Delft, The Netherlands

We have recently demonstrated two different techniques for single-shot measurement of the state of an individual electron spin in a semiconductor quantum dot, with measurement fidelities up to ˜90% [1,2]. The measurement relies on spin-to-charge conversion, combined with real-time detection of single-electron charges with a quantum point contact electrometer.

Using this readout technique, we have characterized the relaxation time, T1, for a single electron spin, as well as for two-electron spin states. In both cases, very long T1's are observed, of order 1 ms [1,2], consistent with theoretical predictions of spin-orbit dominated spin relaxation.

Phase randomization (characterized by T2), in contrast, is expected to be dominated by the randomly fluctuating hyperfine field caused by the nuclei in the semiconductor material. We have probed the effect of the nuclei via transport measurement through two dots in series, and observe a hyperfine field of about 1 mT. When averaging over different nuclear configurations, this implies an apparent dephasing time T2* of 25 ns. We can suppress its effect by applying a small external magnetic field or by increasing the interdot tunnel coupling [3].

[1] J. Elzerman et al., Nature 430, 431-435 (2004)
[2] R. Hanson et al., Phys. Rev. Lett. 94, 196802 (2005)
[3] F. Koppens, J. Folk, et al., Science, 309, 1346 (2005)

Invited Talk MA 6.2 Mon 14:15 HSZ 03

Electronic transport in ferromagnetic films and wires: An *ab initio* study — •Heike Herper — Theoretische Tieftemperaturphysik, Universiät Duisburg-Essen, Campus Duisburg, 47048 Duisburg, Germany

Domain walls can be viewed as special type of interfaces. In case of relatively thin domain walls a magnetoresistance effect can be expected due to the domain wall, which has been addressed in a considerable number of experimental and theoretical studies. However, only a few *ab initio* investigations have been done in this field. We have determined the influence of domain walls on the resistance of ferromagnetic Co and Ni layers employing the fully-relativistic, spin-polarized Screened Korringa-Kohn-Rostoker method (SKKR) and the Kubo-Greenwood formula. In order to investigate the magnetoresistance in systems with reduced dimensions like thin wires we have used a real-space SKKR and Kubo-Greenwood method. The magnetoresistance and the formation energy of the domain walls have been calculated depending on the thickness and the type of the domain wall. As expected, the formation energy decreases with increasing number of FM layers. Throughout the calculations all domain walls are assumed to be oriented parallel to the planes of the layers. To avoid contributions from the anisotropic magnetoresistance, the current is assumed to flow perpendicular to the domain walls, i.e. parallel to the surface normal. The domain wall resistance shows the same width dependence as predicted by Zhang and Levy.

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