TT 15 Transport: Nanoelectronics II - Spintronics and Magnetotransport - Part 1

Time: Tuesday 12:30–13:00 Room: HSZ 02

Invited Talk TT 15.1 Tue 12:30 HSZ 02

Electric field control of spin transport in carbon nanotubes — •Takis Kontos[1,2], Sangeeta Sahoo[1], Juerg Furer[1], Christian Hoffmann[1,3], Matthias Gräber[1], Audrey Cottet[1,4], and Christian Schönenberger[1] — [1]Institute of Physics, University of Basel, Klingelbergstrasse 82, CH-4056, Basel, Switzerland — [2]LPA, ENS, 24, rue Lhomond, 75231 Paris Cedex 05, France — [3]CRTBT, Grenoble, France — [4]LPS, Université Paris-Sud, 91405, Orsay, France

Spintronics is an approach to electronics in which the spin of the electron is exploited to control the electric resistance R of devices. One basic building block is the spin-valve, which is formed if two ferromagnetic electrodes are separated by a thin tunnelling barrier. In such devices, R depends on the orientation of the magnetization of the electrodes. It is usually larger in the antiparallel than in the parallel configuration. The relative difference of R, the so-called magneto-resistance (MR), is then positive.

The MR may become anomalous (negative), if the transmission probability of electrons through the device is spin or energy dependent. This offers a route to the realization of gate-tunable MR devices. Using carbon nanotubes with a new type of ferromagnetic contacts [1] (based on the $Pd_{1-x}Ni_x$ alloy), we demonstrate a spin field-effect transistor (Spin-FET), in which the amplitude and the sign of the MR are tunable with the gate voltage in a predictable manner [2].

[1] S. Sahoo, T.Kontos, C. Schönenberger and C. Sürgers , Appl. Phys. Lett. 86, 112109 (2005)

[2] S. Sahoo, T. Kontos, J. Furer, C. Hoffmann, M. Gräber, A. Cottet and C. Schönenberger Nature Phys. 2, 99 (2005)