HL 47: Invited Talk: Dieter Weiss

Time: Wednesday 9:30–10:00 Location: EW 201

Topical Talk HL 47.1 Wed 9:30 EW 201

Spin transistor action via tunable adiabaticity — Christian Betthausen[1], Tobias Dollinger[2], Henri Saarikoski[2], Valery Kolkovsky[3], Grzegorz Karczewski[3], Tomasz Wojtowicz[3], Klaus Richter[2], and •Dieter Weiss[1] — [1]Experimentelle und Angewandte Physik, Universität Regensburg, 93040 Regensburg, Germany — [2]Theoretische Physik, Universität Regensburg, 93040 Regensburg, Germany — [3]Institute of Physics, Polish Academy of Sciences, 02668 Warsaw, Poland

Spin-transistor prototypes, employing spin-orbit interaction, principally suffer from low signal levels due to limitations in spin injection efficiency, fast spin relaxation and dephasing processes. Here we present an alternative concept to implement spin transistor action where efficiency is improved by keeping spin transport adiabatic. To this end a helical stray field B, generated by ferromagnetic dysprosium stripes, is superimposed upon a two-dimensional electron system in CdMnTe. Due to the giant spin splitting, occurring at low temperatures and small B in CdMnTe quantum wells, the B-helix translates into a spin-helix and the electron spins follow adiabatically the imposed spin texture. Within this approach the transmission of spin-polarized electrons between two contacts is regulated by changing the degree of adiabaticity, i.e. an electron's ability to follow the spin helix. This is done by means of a small applied homogeneous magnetic field while the degree of adiabaticity is monitored by the channel resistance. Our scheme allows spin information to propagate efficiently over typical device distances and provides an alternative route to realize spintronics applications.