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S E M I N A R

aus

Halbleiterphysik und Nanotechnologie

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"Ways for Coupling Spin to Charge: Examples from Solid-State"

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The quest for using the spin degree of freedom in future devices has renewed the interest in exploring spin-related phenomena in various states of matter. As for many other examples in the past, this technological quest is about to promote remarkable progress in physics, technology, and, possibly, the understanding of the world around us. In this talk I shall briefly review some of the recent activities in my group, all dealing, in one way or another, with the coupling of spin to charge in the solid state: spin-torque transfer[1], the electric control of a hole-spin qubit[2], and, in more detail, bias-anomaly in AlGaMnAs-based heterostructures[3], and the dynamics of Dirac fermions at topological insulator surfaces[4]. The theoretical approaches used to capture these phenomena range from semi-classical to fully quantum-mechanical (ballistic), however, in this talk I will try to emphasize the underlying physical mechanisms.

[1] Optimal control of magnetization dynamics in ferromagnetic heterostructures by spin-polarized currents, M. Wenin, A. Windisch, and W. P., J. Appl. Phys. 108, 103717 (2010).
[2] Electric g-Tensor Control and Spin Echo of a Hole-Spin Qubit in a Quantum Dot Molecule, R. Roloff, T. Eissfeller, P. Vogl and W. P., New J. Phys. 12, 093012 (2010).
[3] Electrical control of ferromagnetism and bias anomaly in Mn-doped semiconductor heterostructures, Christian Ertler and W.P., Phys. Rev. B 84, 165309 (2011).
[4] Dynamics of Dirac Fermions in Topological Insulators, R. Hammer, C. Ertler, W.P., and A. Arnold, ISANN 2011 poster, unpublished (www.math.tuwien.ac.at/.../poster-isann-2011.pdf); Quantum Interferometer for Dirac Fermions on Topological Insulator Surfaces, R. Hammer, C. Ertler, W.P., submitted.

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