10:20 Viktor Sverdlov, Technische Universität Wien (sverdlov@iue.tuwien.ac.at)
with S. Selberherr

Spin-Dependent Hopping in Tunnel Junctions

The Pauli exclusion principle results in strong spin correlations affecting transport through quantum dots and causing large magnetoresistance and luminescence effects in OLEDs. The spin-dependent resonant tunneling is responsible for a large signal in three-terminal spin accumulation experiments; however, the relevant expression for magnetoresistance is under discussion.

To resolve the controversy, we generalized the method of single-electron hopping to include spin. Only in the case, when the magnetic field is aligned with the ferromagnetic contact magnetization, the tunneling is determined by two eigenvalues of a 4x4 transition matrix corresponding to the spin-up and down Zeeman levels. In the general case of an arbitrary field orientation all four eigenvalues contribute to the transition rate. Thus, an expression for magnetoresistance obtained by considering only two eigenvalues is incomplete.

The method enables to calculate the shot noise at spin-dependent hopping. We demonstrate that, due to the Pauli blockade, the Fano factor is enhanced above its value at direct tunneling. This fact can serve as an additional characteristic capable to distinguish between spin-dependent trap-assisted tunneling and spin accumulation due to direct tunneling that causes the experimentally observed large signal in the three-terminal spin-injection setup.

10:40 COFFEE BREAK (FOYER)

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