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JOHANNES GUTENBERG UNIVERSITÄT MAINZ

Theory of Condensed Matter: Hard Condensed Matter

July 6, 2016 at 12:45 p.m.
Gernott-Gräff-Raum

Mikhail Raikh
University of Utah

Slow dynamics of spin pairs in random hyperfine field and organic magneto-resistance

The focus of the talk is the dynamics of spin-dependent recombination in electron-hole pairs subject to external magnetic field, B. This recombination is at the core of the phenomenon of organic magnetoresistance (OMAR) in bipolar devices, where recombination rate governs the passage of current via the spin-blocking process. Without recombination, the spins of electron and holeprecess independently in effective fields b_e + B and b_h + B, where b_e and b_h are the random hyperfine fields acting on electron and hole, respectively. In the presence of recombination, the precession acquires a correlated character due to the fact that the carriers recombine only when their spins are in a singlet state. This correlation, in turn, exerts a feedback on the recombination rate, and consequently, on the current. Within the simplest transport model, when the current flows through the system of parallel chains, the sensitivity of current,I, to external field, B, is dominated by configurations of b_e , b_h for which the recombination is anomalously slow. We evaluate the statistical weights of these configurations and relate them to the shape, I(B), of the OMAR response.

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