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gemeinsam mit SFB TR 173 „Spin+X“

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Spin and charge transport at terahertz frequencies

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Magnetization reversal, spin transfer torque or giant magnetoresistance [1] are examples of intriguing spintronic applications, each of which relies on the controlled generation and manipulation of spin currents. To push spintronics beyond the bandwidth of conventional electronics with a cutoff ~ 100 GHz, in particular the generation of spin currents [2], one needs to extend the well-established Valet-Fert theory for spin transport [3] to the ultrafast regime [4].

In this contribution, building on the works of [4], we focus on the ultrafast transport and accumulation of spin and charge driven by terahertz electromagnetic pulses. As the driving frequencies may significantly exceed the electron momentum-relaxation rate, we extend the classical spin-diffusion approach beyond the usual assumption of instantaneous charge screening. By accounting for the dynamic charge redistribution, we describe the non-monotonous spin and charge accumulation and discuss experimental signatures of this new transport regime.

References

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