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Photogalvanic effects originating from the violation of the Einstein relation in a 2D electron gas in high Landau levels[1]

IVAN DMITRIEV, Institute of Nanotechnology, Karlsruhe Institute of Technology

This talk will present a quantum kinetic theory [1] of the microwave-induced photocurrent and photovoltage magnetooscillations emerging in a spatially nonuniform 2D electron system in the absence of external dc driving [2]. It will show that in an irradiated sample the Landau quantization leads to violation of the Einstein relation between the dc conductivity and diffusion coefficient. Then, in the presence of a built-in electric field in a sample, the microwave illumination causes photo-galvanic signals which oscillate as a function of magnetic field as observed in the experiment. The discussed effects should also play an essential role for the transport in the zero resistance states where the system breaks into current domains and peculiarities of the transport properties of the inhomogeneous system become of central importance.

[1] I. A. Dmitriev, S. I. Dorozhkin, and A. D. Mirlin, "Theory of microwave-induced photocurrent and photovoltage magnetooscillations in a spatially nonuniform two-dimensional electron gas ", Phys. Rev. B **80**, 125418 (2009).

[2] S. I. Dorozhkin, I. V. Pechenezhskiy, L. N. Pfeiffer, K. W. West, V. Umansky, K. von Klitzing, and J. H. Smet, "Photocurrent and Photovoltage Oscillations in the Two-Dimensional Electron System: Enhancement and Suppression of Built-In Electric Fields", Phys. Rev.Lett. **102**, 036602 (2009).

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