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Nonlinear Transport of 2D Electrons in Crossed Electric and Quantizing Magnetic Fields¹

SERGEY VITKALOV, Physics Department, City College of the City University of New York, 10031 USA

Nonlinear transport of highly mobile two-dimensional electrons placed in crossed electric and quantizing magnetic fields will be discussed. The nonlinearity is remarkably strong and is unusual for degenerate electron systems. At small electric fields the nonlinear response originates from an energy dependent heating, which occurs in conducting systems with quantized or discrete spectrum. The quantal heating results in nontrivial spectral distribution of 2D carriers, radical change of the electron transport, transition of the electrons into a state with zero differential resistance (ZDR)[1,2,3]. Finally the heating leads to an apparent dc-driven metal-insulator transition, which coincides with the transition into the ZDR state. The phenomena are very unexpected and are not understood.

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[2] A.A. Bykov, J.Q. Zhang, S. Vitkalov, A.K. Kalagin, and A.K. Bakarov, Phys. Rev. Lett. **99**, 116801 (2007);

[3] S. A. Vitkalov, Int. Journal of Modern Physics **B**, **23**, 4727 (2009).

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