Quantum Transport at Nanoscale: From Heterostructures to Graphene — EXAM TOPICS

Academic year 2017/18, spring semester

Adam Rycerz
email: rycerz@th.if.uj.edu.pl
www: http://th.if.uj.edu.pl/~adamr/

1. 2DEG in semiconducting heterostructures. Forming mechanism and basic properties.
2. Adiabatic approach to quantum point contact. Conductance quantization.
3. Conductance as a scattering problem. The Landauer-Büttiker formula.
4. Counting statistics for charge transfer in nanosystems: Poissonian and non-Poissonian processes; shot noise and the Nyquist-Johnson noise.
5. Generalized Landauer formula (more terminals). Onsager relations.
6. Quantum interference. Dynamical and magnetic phases.
7. Aharonov-Bohm effect in mesoscopic rings and cylinders. Frequency doubling.
8. Quantum transport in graphene. The universal conductivity.
9. Tien-Gordon effect.

/ dr hab. Adam Rycerz /