Quantum theory of condensed matter II

Mesoscopic physics (Quantum transport)

Prof. Milena Grifoni	Tue	8:00 - 10:00	9.2.01
	Fri	10:00 - 12:00	9.2.01
PD Dr. Andrea Donarini	Fri	12:00 - 14:00	5.0.20

Sheet 1

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1. Questions on a scientific paper

In nanoelectronics measurements, the most typically measured observable is either the current as a function of voltage or the (linear) conductance as a function of some control parameter, such as the gate voltage or the magnetic field. Consult the papers:

> Quantized Conductance of Point Contacts in a Two-Dimensional Electron Gas,
> B. J. van Wees, H. van Houten, C. W. J. Beenakker, J. G. Williamson, and C. T. Foxo,
> Physical Review Letters **60**, 848 (1988);
>
> Coupling of spin and orbital motion of electrons in carbon nanotubes,
> F. Kuemmeth, S. Ilani, D. C. Ralph, and P. L. McEuen,
> Nature **487**, 448 (2008);
>
> Coherent electron-nuclear coupling in oligothiophene molecular wires,
> J. Repp, P. Liljeroth, and G. Meyer,
> Nature Physics **6**, 975 (2010).

Determine:

1. The length and the energy scales characteristic of the measured samples.
2. The measured observables and the control parameters reported in the experiments.
3. Which of the measured observables is quantized.

Frohes Schaffen!