[1] M. Elbing, PhD Thesis, FZ Karlsruhe (2005); [2] F. Pauly, PhD Thesis, Universität Karlsruhe (2007); [3] F. Pauly, J.K. Viljas, U. Huniar, M. Häfner, J.C. Cuevas, and Gerd Schön, (in preparation); [4] S. Wohlthat, Diploma thesis, Universität Karlsruhe (2006)

TT 6.2 Mon 14:15 H19

Nonequilibrium resonant spectroscopy of molecular vibrons — •Dmitry Ryndyk and Gianaurelio Cuniberti — Institut für Theoretische Physik, Universität Regensburg, 93040 Regensburg

Quantum transport through single molecules is essentially affected by molecular vibrations. We investigate the behavior of the molecular transistor with intermediate electron-vibron coupling and arbitrary coupling to the leads. We have developed a theory which allows to explore this regime via the nonequilibrium Green function formalism parallel to the widely used master equation technique. The problem is motivated by recent scanning tunneling spectroscopy experiments. We show that the nonequilibrium resonant spectroscopy is able to determine the energies of molecular orbitals and the spectrum of molecular vibrations. Our results are relevant to STS experiments, and demonstrate the importance of the systematic and self-consistent investigation of the effects of the vibronic dynamics onto the transport through single molecules.

TT 6.3 Mon 14:30 H19

Influence of vibrational modes on the electronic properties of DNA — •Benjamin Schmidt[1,2], Matthias Hellter[2], Gerd Schön[1,2], Evgeni Starikov[2], and Wolfgang Wenzel[2] — [1]Institut für Theoretische Festkörperphysik, Universität Karlsruhe, 76128 Karlsruhe, Germany — [2]Forschungszentrum Karlsruhe, Institut für Nanotechnologie, Postfach 3640, 76021 Karlsruhe, Germany

We investigate the electron (hole) transport through short double-stranded DNA wires in which the electrons are strongly coupled to the specific vibrational modes (vibrons) of the DNA. We analyze the problem starting from a tight-binding model of DNA, with parameters derived from ab-initio calculations, and describe the dissipative transport by equation-of-motion techniques. For homogeneous DNA sequences like Poly- (Guanine-Cytosine) we find the transport to be quasi-ballistic with an effective density of states which is modified by the electron-vibron coupling. At low temperatures the linear conductance is strongly enhanced, but above the 'semiconducting' gap it is affected much less. In contrast, for inhomogeneous ('natural') sequences almost all states are strongly localized, and transport is dominated by dissipative processes. In this case, a non-local electron-vibron coupling influences the conductance in a qualitative and sequence-dependent way.

TT 6.4 Mon 14:45 H19

Influence of chopped laser light onto the electronic transport through atomic-sized contacts — •Daniel Guhr, Dennis Rettinger, Johannes Boneberg, Artur Erbe, Paul Leiderer, and Elke Scheer — University of Konstanz, Germany

In our experiment we investigate the influence of laser irradiation onto the electrical conductance of gold nanocontacts established with the mechanically controllable breakjunction technique. We concentrate on the study of reversible conductance changes which can be as high as 200%. In our measurements we have varied the intensity, the polarisation and the wavelength of the laser beam in the visible range of the spectrum as well as its position on the sample. Under most conditions an enhancement of conductance is observed. We discuss several physical mechanisms which might contribute to the observed effect including thermal expansion, rectification of nonlinear current-voltage characteristics by the ac electric field of the laser light [1] and photon-assisted transport (PAT) [2]. From the analysis of our data we conclude that PAT is the dominating effect in out experiment while small contributions from thermal expansion cannot be excluded [3].

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TT 6.5 Mon 15:00 H19

Role of electronic structure in photo-assisted transport through atomic-sized contacts — •Janne Viljas[1,2] and Juan Carlos Cuevas[1,2,3] — [1]Institut für Theoretische Festkörperphysik, Universität Karlsruhe, D-76128 Karlsruhe — [2]Forschungszentrum Karlsruhe, Institut für Nanotechnologie, D-76021 Karlsruhe — [3]Departamento de Física Teórica de la Materia Condensada C-V, Universidad Autónoma de Madrid, E-28049 Madrid, Spain

We study theoretically quantum transport through laser-irradiated metallic atomic-sized contacts [1]. The radiation is treated classically, assuming its effect to be the generation of an ac voltage over the contact. We derive an expression for the dc current and compute the linear conductance in ideal one-atom thick contact geometries as a function of the ac frequency, concentrating on the role played by electronic structure. In particular, we present results for three metals (Al, Pt, and Au), the electronic structures of which are described with an *spd* tight-binding parametrization. Depending on the frequency and the metal, the ac voltage can either enhance or reduce the conductance. This can be intuitively understood in terms of the energy dependence of the transmission in the absence of radiation. Recent experiments [2] on laser-irradiated gold contacts support the view that photo-assisted processes may play an important role in the transport through such systems.

[1] J. K. Viljas and J. C. Cuevas, cond-mat/0607505.
[2] D. Guhr, D. Rettinger, J. Boneberg, A. Erbe, P. Leiderer, and E. Scheer, cond-mat/0612117 and this conference.

15 min. break

TT 6.6 Mon 15:30 H19

Electron transport in bundles of metallic single-walled carbon nanotubes — •Ines Barbara Klugius[1], Christoph Wolfgang Marquardt[1], Frank Hennrich[1], Hilbert v. Löhneysen[2,3], and Ralph Krupke[1] — [1]Forschungszentrum Karlsruhe, Institut für Nanotechnologie, 76021 Karlsruhe, Germany — [2]Universität Karlsruhe, Physikalisches Institut, 76128 Karlsruhe, Germany — [3]Forschungszentrum Karlsruhe, Institut für Festkörperphysik, 76021 Karlsruhe, Germany

Electron transport in individual metallic single-walled carbon nanotubes (SWNT) has been described within a Luttinger liquid model (LL) which can explain the power law behaviour found in the temperature dependent conductance, as well as in the voltage dependent differential conductance. In heterogeneous bundles of SWNTs, that are composites of metallic and semiconducting tubes, similar power law behaviour has been observed.

During the fabrication of carbon nanotubes both metallic and semicon-ducting ones are produced. Using dielectrophoresis as a method to separate these types, we are able to prepare samples of bundles of exclusively metallic SWNTs. In this configuration, the SWNTs are still surrounded by the surfactant that is necessary for the separation process. On such samples we measure the transport characteristics and anticipate a deviation from the LL behaviour due to enhanced intertube coupling. To enforce the coupling, we anneal the samples assuming that in this manner, the amount of surfactant inbetween the tubes is abated and the tube-tube distance is reduced.

TT 6.7 Mon 15:45 H19

Coulomb repulsion effects in driven electron transport through molecules — •Franz J. Kaiser, Peter Hänggi, and Sigmund Kohler — Institut für Physik, Universität Augsburg, 86135 Augsburg

We investigate the influence of strong Coulomb repulsion on the current through molecular wires. The molecule is described by a tight-binding model whose first and last site is coupled to a respective lead. The leads are eliminated within a perturbation theory yielding a master equation for the wire. In the non-driven case, we explore the transport properties of a bridged molecular wire, where the current decays exponentially as a function of the wire length [1]. For studying conductors driven by external electromagnetic fields, we decompose the reduced density operator into a Floquet basis. This enables an efficient treatment of the time-dependent transport problem. For the electronic excitations in bridged molecular wires, we find that strong Coulomb repulsion significantly sharpens resonance peaks which broaden again with increasing temperature [2].

[1] F.J. Kaiser, M. Strass, S. Kohler, and P.Hänggi, Chem. Phys. **322**, 193 (2006)
[2] F.J. Kaiser, P.Hänggi, and S. Kohler, Eur. Phys. J. (in press); cond-mat/0606457

TT 6.8 Mon 16:00 H19

Multishell Coulomb blockade in multiwall carbon nanotubes — •Emiliano Pallecchi[1], Shidong Wang[1], Csilla Miko[2], Laszlo Forro[2], Milena Grifoni[1], and Christoph Strunk[1] — [1]University of Regensburg, D-93040 Regensburg, Germany — [2]FBS Swiss Federal