TT 8.7 Fr 14:00 Poster TU C

Zero-Bias Anomaly in Disordered Multiwall Carbon Nanotubes — •N. Kang, L. Lu, Z. W. Pan, and S. S. Xie — Institute of Physics, Chinese Academy of Science, Beijing, People's Republic of China

Multiwall carbon nanotubes (MWNTs) provide a unique system for studying electron-electron (e-e) interaction effects in disordered wires. We have studied tunneling of electrons into MWNTs as a function of voltage and temperature. The conductance of MWNTs exhibits a strong suppression at low energies, showing a sign of strong e-e correlation. At high energy, the differential conductance obeys a power law behavior, which is predicted by the environmental quantum fluctuation theories. At lower energy, we observed a crossover to an exponential dependence, in accordance with recent theoretical calculation. For an analytic description of our data at low temperatures, it would require a nonperturbative theory for the e-e interaction, being consistent with our previous transport measurements on the same batch of MWNTs [1,2].

[1] N. Kang, et al., Phys. Rev. B 66, 241403 (2002). [2] N. Kang, et al., Phys. Rev. B 67, 33404 (2003).

TT 8.8 Fr 14:00 Poster TU C

Nonequilibrium transport in nanostructured palladium-nickel alloy films — •Jakob Brauer[1], Heiko B. Weber[1], and Hilbert v. Löhneysen[2,3] — [1]Forschungszentrum Karlsruhe, Institut für Nanotechnologie — [2]Forschungszentrum Karlsruhe, Institut für Festkörperphysik — [3]Physikalisches Institut, Universität Karlsruhe

We investigated electronic transport properties of short nanostructured metallic bridges. Our samples consisted of short palladium-nickel alloy films contacted by thick gold electrodes acting as reservoirs, thereby establishing a nonequilibrium electronic distribution under applied bias[1]. The nickel concentration of the alloy was chosen near the onset of ferromagnetic ordering. The motivation for this was to study the interplay between electronic nonequilibrium distribution and exchange splitting. We measured the dependency of the resistance on magnetic field, bias and temperature. Our data show a zero-bias anomaly, which depends on the magnetic field in a nontrivial fashion.

[1] H.B. Weber *et al.*, PRB 63 (2001) 165426

TT 8.9 Fr 14:00 Poster TU C

Theoretical analysis of the conductance histograms of Au atomic contacts — •Markus Dreher[1], Jan Heurich[2], Carlos Cuevas[2], Elke Scheer[1], and Peter Nielaba[1] — [1]Physics Department, University of Konstanz, 78457 Konstanz, Germany — [2]Institut für Theoretische Festkörperphysik, University of Karlsruhe, 76128 Karlsruhe, Germany

Many experiments have shown that the conductance histograms of metallic atomic-sized contacts exhibit a peak structure, which is characteristic for the corresponding material. The origin of these peaks still remains as an open problem. In order to shed some light on this issue, we present a theoretical analysis of the conductance histograms of Au atomic contacts. We have combined classical molecular dynamics simulations of the breaking of nanocontacts with conductance calculations based on a tight-binding model. This combination gives us access to crucial information such as contact geometries, forces, minimum cross section, total conductance and transmission coefficients of the individual conduction channels.

The ensemble of our results suggests that the low temperature Au conductance histograms are a consequence of a subtle interplay between mechanical and electrical properties of these nanocontacts. At variance with other suggestions in the literature, our results indicate that the Au conductance histograms are not a simple consequence of conductance quantization or of existence of exceptionally stable radii.

TT 8.10 Fr 14:00 Poster TU C

Electron transport in metallic multi-island geometries: Coulomb blockade and quantum fluctuations — •Björn Kubala[1], Göran Johansson[2], and Jürgen König[1] — [1]Theoretische Physik III, Ruhr-Universität Bochum, 44780 Bochum, Germany — [2]MC2, Chalmers University of Technology, S-412 96 Göteborg, Sweden

Experiments on coupled single-electron transistors investigate, how charging effects on one island are modified by capacitive and tunnel coupling to other islands [1]. We developed a method to study electron transport through such systems, driven by finite thermal or voltage bias. Based on real-time transport theory [2], all diagrams up to second order in tunneling coupling are automatically generated and evaluated. This computational approach captures all different sequential and cotunneling processes.

In particular, we find a class of cotunneling processes involving correlated tunneling onto two different islands. These can be linked to tunneling rates for an SET in a noisy environment -constituted by another SET- as calculated within a $P(E)$ theory. We will discuss applications to different setups and strength and limitations of our method.

[1] R. Schäfer et al., cond-mat/0205223; Physica E 18, 87, (2003); K. W. Lehnert et al., Phys. Rev. Lett. 91, 106801 (2003).

[2] H. Schoeller and G. Schön, Phys. Rev. B 50, 18 436 (1994); J. König, H. Schoeller, and G. Schön, Phys. Rev. Lett. 78, 4482 (1997).

TT 8.11 Fr 14:00 Poster TU C

Competition of Coherence and Decoherence: the Phase Diagram of the Non-Equilibrium Kondo Model — •Stefan Kehrein — Theoretische Physik III - Elektronische Korrelationen und Magnetismus, Institut für Physik, Universität Augsburg

We study the Kondo effect in quantum dots in a non-equilibrium state due to an applied dc-voltage bias. Using the method of infinitesimal unitary transformations (flow equations), we develop a perturbative scaling picture that naturally contains both equilibrium coherent and non-equilibrium decoherence effects (cond-mat/0410341). The competition of these effects determines the phase diagram of the non-equilibrium Kondo model, and e.g. establishes a large single-channel Kondo physics dominated regime for asymmetrically coupled quantum dots. We present results for the conductance, the local density of states and the spin-spin correlation function at various points in this phase diagram.

TT 8.12 Fr 14:00 Poster TU C

Density of states of interacting electrons in quasi one-dimensional metallic wires — •Wolfgang Körner[1], Peter Schwab[2], and Hermann Grabert[1] — [1]Albert-Ludwigs-Universität Freiburg — [2]Universität Augsburg

Based on the quasiclassical Green's function approach [1] we determine the tunneling density of states $\rho(\varepsilon)$ of a diffusive metallic nanowire in presence of electron-electron interactions. The perturbative result by Altshuler and Aronov, $\rho(\varepsilon) \propto \varepsilon^{-1/2}$, is extended to the nonperturbative regime near the Fermi edge where $\rho(\varepsilon) \propto \sqrt{\varepsilon}\exp(-\varepsilon_0/\varepsilon)$, in accordance with calculations based on the nonlinear σ-model [2]. Further extensions, including contributions from the spin triplet channel, will also be discussed.

[1] P. Schwab and R. Raimondi, Ann. Phys. (Leipzig) **12**, 471-516 (2003)

[2] J. Rollbühler and H. Grabert, Phys. Rev. Lett. **87**, 126804 (2001)

TT 8.13 Fr 14:00 Poster TU C

A Gate-Controlled Atomic Quantum Switch — •Fangqing Xie[1], Laurent Nittler[1], Stefan Brendelberger[1], Christian Obermair[1], and Thomas Schimmel[1,2] — [1]Institute for Applied Physics, University of Karlsruhe, D-76128 Karlsruhe, Germany — [2]Institute of Nanotechnology, Forschungszentrum Karlsruhe, D-76021 Karlsruhe Germany

An atomic-scale quantum conductance switch is demonstrated which allows to open and close an electrical circuit by the controlled and reproducible reconfiguration of silver atoms within an atomic-scale junction [1]. The only movable parts of the switch are the contacting atoms. The switch is entirely controlled by an external electrochemical voltage applied to an independent third gate electrode. Controlled switching was performed between a quantized, electrically conducting "on-state"exhibiting a conductance of $G_0 = 2e^2/h\,(\approx 1/12.9k\Omega)$ or preselectable multiples of this value and an insulating "off-state"[2].

[1] F.-Q. Xie, L. Nittler, Ch. Obermair and Th. Schimmel, Phys. Rev. Lett. 93, 128303 (2004).

[2] F.-Q. Xie, Ch. Obermair and Th. Schimmel, Solid State Communications 132, 437-442 (2004).

TT 8.14 Fr 14:00 Poster TU C

Supersymmetry for disordered systems with interaction — •Georg Schwiete[1] and Konstantin B. Efetov[1,2] — [1]Institut für Theoretische Physik III, Ruhr-Universität Bochum — [2]L. D. Landau Institute for Theoretical Physics, Moscow

Considering disordered electron systems we suggest a scheme that allows to include an electron-electron interaction into a supermatrix sigma-model [1]. The method is based on replacing the initial model of interacting electons by a fully supersymmetric model. Although this replacement is not exact, it is a good approximation for a weak short range interac-