grown GaAs nanowires, p-doped at a number of different doping levels. Detailed characterization of the wires including electronic contacts fabricated by e-beam lithography and based on palladium or annealed zinc-silver alloys are discussed. Contact properties and a pronounced hysteresis of the current through the nanowires, as a backgate-voltage is swept, are explained within tentative models. In addition we present first transport measurements on quantum dots, which are defined electrostatically as well as by etched constrictions.

TT 35.6 Wed 14:00 P1A

Nonequilibrium transport through a correlated quantum dot with magnetic impurity — •Daniel Becker[1], Stephan Weiss[2], Michael Thorwart[3], and Daniela Pfannkuche[1] — [1]I. Institute for Theoretical Physics, University of Hamburg, D-20355 Hamburg, Germany — [2]Niels Bohr Instituttet, Nano-Science Centret, Universitetsparken 5, DK-2100 Copenhagen, Denmark — [3]FRIAS, Albert-Ludwigs-Universität Freiburg, Albertstr.19, 79104 Freiburg, Germany

The deterministic, non-perturbative scheme of iterative summation of path integrals (ISPI)[1] is adopted to a single-level quantum dot with one quantum spin-1/2 magnetic impurity interacting with the dot-electron spins. For two electrons on the dot, Coulomb interaction is taken into account. A generating function is obtained to calculate the dc tunneling current at finite bias voltages and the orientation of the impurity spin. This real-time path integral extends over all paths of (i) the magnetic impurity spin and of (ii) Ising-like fluctuating spin fields, which are introduced to decouple the interacting dot-electrons. With the use of the ISPI scheme, the sum over all these paths can be carried out numerically, while exactly accounting for all lead-induced self-energies within a sufficiently long, but finite coherence time. This allows to study real-time nonequilibrium transport through the considered system in the case of strong electron-impurity interaction as well as strong coupling to the leads, even at low temperatures and for a wide range of bias voltages. In particular, the mutual influence between tunneling current and the impurity spin dynamics is of interest.

[1] S. Weiss et al., Phys. Rev. B 77, 195316 (2008)

TT 35.7 Wed 14:00 P1A

Transport properties of smooth and rough interfaces — •Mohamed Fadlallah[1], Cosima Schuster[1], and Udo Schwingenschlögl[2] — [1]Institut für Physik, Universität Augsburg, D-86135 Augsburg, Germany — [2]ICCMP, Universidade de Brasilia, 70904-970 Brasila-DF, Brazil

The functionality of nanoscale devices depends crucially on the transport properties across the interfaces. As devices are reduced in size, interfaces dominate the transport. Nanocontacts hence were studied intensively over the last years and many approaches to calculate the transport were developed. Most are based on electronic structure calculations to obtain the material specific aspects. Nevertheless the properties of simple distorted interfaces are not well understood. Distortions may occur due to orientation mismatch, vacancy sites, buckling of the interface layer, or impurities. We discuss the equilibrium and non-equilibrium properties of distorted interfaces between simple metals (Au, Al) using the SMEAGOL code which combines density functional theory (DFT) and non-equilibrium Green's functions (NEGF) by using Landauer formula. The transmission coefficient is proportional to the density of states (DOS). Only in the case of a vacancy, we see a substantial reduction of the transmission coefficient near the Fermi level. Other kinds of distortion influence only the transmission at lower energies. With increasing voltage the transmission coefficient of the d-band decreases linearly, but stays constant near the Fermi level in the gold system. For Aluminum it is reduced over the whole energy range. This work was done in the collaboration with Dublin group of SMEAGOL.

TT 35.8 Wed 14:00 P1A

Current without external bias and diode effect in shuttling transport of nanoshafts — •Klaus Morawetz[1,2], Sibylle Gemming[1], Regina Luschtinetz[3], Lukas Eng[4], Gotthard Seifert[3], and Anatole Kenfack[5] — [1]Forschungszentrum Dresden-Rossendorf, PF 51 01 19, 01314 Dresden, Germany — [2]International Center for Condensed Matter Physics, 70904-910, Brasília-DF, Brazil — [3]Institute of Physical Chemistry and Electrochemistry, TU Dresden, 01062 Dresden, Germany — [4]Institute of Applied Photophysics, TU Dresden, 01062 Dresden, Germany — [5]Max-Planck-Institute for the Physics of Complex Systems, Nöthnitzer Str. 38, 01187 Dresden, Germany

A row of parallel ordered and coupled molecular nanoshafts is shown to develop a shuttling transport of charges at finite temperature. The appearance of a current without applying an external bias voltage is reported as well as a natural diode effect allowing unidirectional charge transport along one field direction while blocking the opposite direction[1]. The zero-bias voltage current appears above a threshold of initial thermal and/or dislocation energy.

[1] New J. Phys. 10 (2008) 103014-1-8

TT 35.9 Wed 14:00 P1A

A Microscopic Model of Current-Induced Switching of Magnetization — •Niko Sandschneider and Wolfgang Nolting — AG Festkörpertheorie, Institut für Physik, Humboldt-Universität zu Berlin, Newtonstr. 15, 12489 Berlin

We study the behaviour of the magnetization in a ferromagnetic metal/nonmagnetic insulator/ferromagnetic metal/paramagnetic metal (FM1/NI/FM2/PM) tunnel junction. It is calculated self-consistently within the nonequilibrium Keldysh formalism. The magnetic regions are treated as band ferromagnets, such as Co, and are described by the single-band Hubbard model. The left (FM1) and right (PM) lead are assumed to remain in equilibrium. We developed a nonequilibrium spectral density approach to solve the Hubbard model approximately in the switching magnet FM2. By applying a voltage to the junction it is possible to switch between antiparallel (AP) and parallel (P) alignment of the magnetizations of the two ferromagnets. The transition from AP to P occurs for positive voltages while the inverse transition from P to AP can be induced by negative voltages only. This behaviour is in agreement with the Slonczewski model[1] of current-induced switching and appears self-consistently within the model, i.e. without using half-classical methods like the Landau-Lifshitz-Gilbert equation.

[1] J. Slonczewski, J. Magn. Magn. Mater. **159**, L1 (1996)

TT 35.10 Wed 14:00 P1A

Electrical-physical characteristics of Si/SiO_2/Ni nanoelectronic systems with ion tracks in strong magnetic fields — •Alexander Petrov[1], Egor Kaniukov[1], Sergey Demyanov[1], Ivan Svito[2], Alexander Fedotov[2], and Eugene Belonogov[3] — [1]Scientific-Practical Materials Research Centre NAS of Belarus, Minsk, Belarus — [2]Belarusian State University, Minsk, Belarus — [3]Voronezh State Technical University, Voronezh, Russia

The present research deals with the swift heavy ion track technology, which includes irradiation of a material by Au ions (energy 350 MeV, fluence 10^8 cm^{-2}), chemical etching of resulting swift heavy ion tracks and precision electrochemical deposition of magnetic metals in the resulting nanopores.

In this way structures on the base of SiO_2/n-Si with nanopores in silicon dioxide layers, filled with Ni nanoclusters, have been prepared and studied. Investigations of current-voltage dependences and magnetic characteristics of the obtained structures with Ni nanoclusters at strong magnetic fields up to 8 T and at low temperatures in the range of 1.8 K - 150 K have shown a possibility of control of these nanostructures properties by the effect of magnetic fields.

The obtained results confirm a feasibility of the use of the Si/SiO_2/Ni nanoelectronic systems with swift heavy ion tracks in low-temperature spintronic sensor devices.

TT 35.11 Wed 14:00 P1A

Conductance oscillations of polyacetylene at finite temperature — •Davoud Pouladsaz[1,2], Thomas Gessner[2,3], Michael Schreiber[1], and Reinhard Streiter[2,3] — [1]Institut für Physik, Technische Universität Chemnitz — [2]Zentrum für Mikrotechnologien (ZfM), Technische Universität Chemnitz — [3]Fraunhofer-Einrichtung für Elektronische Nanosysteme (ENAS), Chemnitz

The length-dependence of the differential conductance oscillations in *trans*-polyacetylenes, suspended between gold contacts, is investigated by employing the non-equilibrium Green's function technique within the density-functional-based tight-binding method (gDFTB) to study the electronic transport properties of the proposed system under the applied bias voltages at finite temperature. The results reveal the efficient influence of the sulfur atoms, as the strong bonding clips to gold atoms, in the quantum transport.

TT 35.12 Wed 14:00 P1A

Charge transport properties of highly conducting tetrathiafulvalene (TTF) based nano-wires — •Marius Bürkle[1], Fabian Pauly[1], Janne Viljas[1,2], Juan Carlos Cuevas[3], and Gerd Schön[1,2] — [1]Institut für Theoretische Festkörperphysik and

DFG-Center for Functional Nanostructures — [2]Forschungszentrum Karlsruhe, Institut für Nanotechnologie, 76021 Karlsruhe, Germany Condensada, Universidad Autònoma de Madrid, 28049 Madrid — [3]Departamento de Física Teórica de la Materia

In a recent experiment [1], an unexpectedly high conductance was observed for tetrathiafulvalene based nanowires, when contacted by gold electrodes. Using density functional calculations [2], we demonstrate that this is due to the highest occupied molecular orbital, which aligns such that it is located only slightly below the Fermi energy of gold. We study the robustness of our findings by an analysis of different types of tetrathiafulvalene based nanowires and contact geometries.

[1] F. Giacalon et. al., Chem. Commun., 2007, 4854 - 4856, DOI: 10.1039/b710739k

[2] F. Pauly et. al., arXiv:0806.4173 and New J. Phys. (in press)

TT 35.13 Wed 14:00 P1A

Fermi-edge singularities: Bulk vs. mesoscopic systems — •Martina Hentschel and Georg Röder — MPI für Physik komplexer Systeme, Dresden

Fermi-edge singularities are among the simplest many-body effects and have been a key interest in condensed matter physics for many years. They have been extensively studied, and are understood, for bulk systems such as metals. In contrast, our focus here is on small (mesoscopic) systems like quantum dots and graphene. We mainly address the Fermi-edge singularities in the photoabsorption cross section that are known as the x-ray edge problem. They comprise the phenomena of Anderson orthogonality catastrophe and Mahan's exciton (Mahan-Nozieres-DeDominicis response) and result from the system's many-body response to the sudden, localized perturbation given by the core hole that is left behind when the x-ray excites an electron. We show that the mesoscopic regime holds surprises in form of many-body responses that strongly deviate from the macroscopic (bulk, or metallic) case. The differences originate in the finite system size, the intrinsic mesoscopic fluctuations, and most importantly, the modifications of the electron dynamics in confined ballistic systems that are typically studied in the field of quantum chaos. A particularly interesting behavior is seen in graphene where the vanishing density of states at the Dirac point significantly modifies the system's many-body response.

TT 35.14 Wed 14:00 P1A

Density functional theory on a lattice: Transport through a small interacting region — Michael Dzierzawa, Ulrich Eckern, •Stefan Schenk, and Peter Schwab — Universität Augsburg

Density functional theory is the method of choice for calculations of the electronic structure of complex materials. In recent years the method has been applied to study charge transport through systems of molecular size. However it is clearly necessary to determine the limits of the approach to assess the obtained results. To this end we suggest to study simple lattice systems, where the comparison with exact calculations is possible.

Hence we investigate a one-dimensional system with spinless fermions consisting of a small interacting region between two noninteracting leads. In particular we study the linear conductance through the interacting region. We find that for this specific system a naive calculation of the conductance, i. e. by ignoring the exchange-correlation kernel, is often sufficient. The local density approximation performs rather badly even for weak interaction, whereas the so-called exact-exchange approximation gives sensible results. We also propose an exact diagonalization procedure to obtain a non-local exchange-correlation potential for strongly interacting systems.

TT 35.15 Wed 14:00 P1A

Geometry-Dependence of 0.7 Anomaly in Quantum Point Contacts: A Study Using the Functional Renormalization Group — •Jan Heyder, Florian Bauer, and Jan von Delft — Arnold Sommerfeld Center for Physics, Ludwig-Maximilians-Universitaet, Muenchen

We study the geometry-dependence of the 0.7 anomaly of the conductance through a quantum point contact at zero temperature as a function of magnetic field, using the functional renormalization group (fRG). We model a 1-D quantum wire using a tight-binding chain with short-ranged Coulomb interactions and a prescribed onsite potential to mimick the potential barrier caused by the 2-D constriction. We study the influence of various shapes of this potential barrier on the magnetic-field dependence of the conductance, finding that it indeed does show a significant geometry-dependence.

TT 35.16 Wed 14:00 P1A

Using wave packet propagation to calculate conductivities — •Christoph Kreisbeck[1], Viktor Krückl[1], and Tobias Kramer[1,2] — [1]Institute for Theoretical Physics, University of Regensburg, 93040 Regensburg, Germany — [2]Department of Physics, Harvard University, Cambridge, MA 02138, USA

The solution of the time dependent Schrödinger equation contains a lot of information about the stationary properties of the system under consideration. To reveal these information we consider the time evolution of a single wave packet and perform the Fourier transform of the autocorrelation function leading to the local density of states (LDOS), which is a key ingredient for the calculation of currents through semiconductor devices. Another way to calculate transport properties is to use flux lines - kind of charge sensors - detecting the energy dependent flux. Using these lines we obtain transmission propabilities, which are closely connected to the conductance, for a whole range of energies from a single wave packet run. In this contribution we illustrate the described technique for a multi-terminal device.

TT 35.17 Wed 14:00 P1A

Multiple electron transfer and transport through a DNA dimer — •Sabine Tornow[1], Gertrud Zwicknagl[1], Ralf Bulla[2], and Frithjof Anders[3] — [1]Inst. math. Physik, TU Braunschweig — [2]Inst. th. Physik, U Köln — [3]Inst. th. Physik, U Dortmund

We investigate multiple electron transfer in a donor-bridge-acceptor system where the molecular bridge comprises a DNA dimer (AT-AT or GC-GC) strongly coupled to a bosonic bath. The time dependent population probabilities and transfer characteristics of multiple electrons is calculated with the time-dependent renormalization group method at low temperatures and kinetic equations at large temperatures. The related transport properties for a system where donor and acceptor are replaced by left and right leads is discussed in different temperature and coupling regimes.

TT 35.18 Wed 14:00 P1A

Laser excitation of atomic point contacts on silicon membranes — •Reimar Waitz[1], Olivier Schecker[1,2], and Elke Scheer[1] — [1]University of Konstanz, D-78457 Konstanz, Germany — [2]IMEP-LAHC, MINATEC-INPG, F-38016 Grenoble, France

Light-induced conductance changes in metallic atomic-sized contacts in the tunneling and in the contact regime are studied. For this purpose, a new type of mechanically controlled break-junction (MCBJ) has been used [1].

MCBJs are made of a metallic wire with a suspended constriction. This constriction, forming a 100 nm wide bridge, can be elongated until having - just before breaking - a diameter of one atom. The elongation is achieved by stretching the substrate, consisting of a 340 nm thin crystalline silicon membrane, in contrast to MCBJs on bulk substrates, which use the bending of the substrate.

Compared to MCBJs on bulk substrates, this new type is advantageous for measuring the conductance of atomic point contacts under laser irradiation. Both the very low absorption and the low reflectivity of the membranes for visible light, make it possible to separate effects caused by the metal from effects caused by the substrate.

On our Poster we present results on light-induced reversible conductance changes of gold contacts. The dependence on intensity, wavelength and polarisation of the incident light has been investigated.

[1] R. Waitz, O. Schecker, and E. Scheer, Rev. Sci. Instrum. 79, 093901 (2008)

TT 35.19 Wed 14:00 P1A

Magneto-resistance of atomic-sized contacts of magnetic metals — •Stefan Egle[1], Hans-Fridtjof Pernau[1], Cécile Bacca[1], Magdalena Hüfner[2], and Elke Scheer[1] — [1]University of Konstanz, Germany — [2]ETH Zürich, Switzerland

We report electronic transport measurements carried out on atomic-size contacts made of ferromagnetic metals or noble metals with ferromagnetic electrodes. The magneto-resistance (MR) curves show very rich behavior with strong magneto-resistance ratios (MRR) up to 1,000 %. We study the possible influence due to the micro-magnetic order of the domains in the vicinity of the contact, giant MR, tunnel MR, ballistic MR and magneto-striction by analyzing MR curves in different orientations of the applied magnetic field with respect to the film plane and current direction. In order to separate the influence of the large electrodes from the influence of the contacts themselves, we used different sample geometries. We used cobalt samples within a symmet-