two free parameters which allow to control the coupling between the Anderson-like impurity and the rest of the chain and the on-site interaction on the impurity site. It is of interest to mention that the latter can be tuned continuously without breaking the integrability of the model [2].

Starting from the Bethe Ansatz equations for the chain spectrum, our goal is to evaluate such impurities' contribution to thermodynamics quantities like magnetic susceptibilities or electronic densities.

[1] G. Bedürftig and H. Frahm, J. Phys A**32** (1999) 4585
[2] G. Bedürftig, F. H. L. Essler and H. Frahm, Nucl. Phys. B**489** (1997) 697

TT 25.11 Di 12:15 TU H2053

Quantum Creep and Variable Range Hopping of One-dimensional Interacting Electrons — •Thomas Nattermann, Serguei Malinin, and Bernd Rosenow — Institut für Theoretische Physik der Universität zu Köln, Zülpicher Str. 77, 50937 Köln

The variable range hopping results for non-interacting electrons of Mott and Shklovskii are generalized to 1D disordered charge density waves and Luttinger liquids using an instanton approach. Following a recent paper by Nattermann, Giamarchi and Le Doussal [Phys. Rev. Lett. **91**, 56603 (2003)] we calculate the quantum creep of charges at zero temperature and the linear conductivity at finite temperatures for these systems. The hopping conductivity for the short range interacting electrons acquires the same form as for non-interacting particles if the one-particle density of states is replaced by the compressibility. In the present paper we extend the calculation to dissipative systems and give a discussion of the physics after the particles materialize behind the tunneling barrier. It turns out that dissipation is crucial for tunneling to happen. Contrary to pure systems the new meta-stable state does not propagate through the system but is restricted to a region of the size of the tunneling region. This corresponds to the hopping of an integer number of charges over a finite distance. A global current results only if tunneling events fill the whole sample. We argue that rare events of extra low tunneling probability are not relevant for realistic systems of finite length. Finally we show that an additional Coulomb interaction only leads to small logarithmic corrections.

TT 25.12 Di 12:30 TU H2053

Nonlinear ac conductivity of disordered interacting 1d electrons — •Bernd Rosenow and Thomas Nattermann — Institut für Theoretische Physik, Universität zu Köln, D-50932 Germany

We consider low energy charge transport in one-dimensional (1d) electron systems with short range interactions under the influence of a random potential. For not too attractive interactions, such systems are insulators and the ac conductivity $\sigma_{\rm ac} \sim \omega^2 \ln(1/\omega)^2$ is described by a modified Mott-Halperin law [1]. At zero frequency, charge transport is only possible by the tunneling of charge carriers and the nonlinear dc conductivity is characterized by $I \sim \exp(-\sqrt{E_0/E})$ [2]. Combining RG and instanton methods, we calculate the nonlinear ac conductivity and discuss the crossover between the nonanalytic field dependence of the electric current at zero frequency and the linear ac conductivity at small electric fields and finite frequency [3].

[1] M. Fogler, Phys. Rev. Lett. **88**, 186402 (2002).
[2] T. Nattermann, T. Giamarchi, and P. Le Doussal, Phys. Rev. Lett. **91**, 056603 (2003).
[3] B. Rosenow and T. Nattermann, cond-mat/0408042.

TT 25.13 Di 12:45 TU H2053

Fermi Edge Singularities in the Mesoscopic Regime: From Rounded to Peaked Edge — •Martina Hentschel[1,2], Denis Ullmo[1], and Harold U. Baranger[1] — [1]Duke University, Durham NC 27708-0305 (USA) — [2]Universität Regensburg, D-93040 Regensburg

We study many-body effects associated with a sudden perturbation in a mesoscopic system, finding substantial differences from the bulk case. One example is the sudden, localized perturbation caused by an x-ray exciting a core electron into the conduction band. Here, Anderson orthogonality catastrophe (AOC) competes with a many-body effect caused by the interaction of the conduction electrons with the core hole. In the bulk, this produces deviations from the naively expected photoabsorption cross section in the form of a peaked or rounded edge. For a coherent system with chaotic dynamics, such as a nanoparticle or quantum dot, we use a random matrix model and find substantial changes: (1) the finite number of particles leads to an incomplete AOC, (2) the sample-to-sample fluctuations of the discrete energy levels produce a distribution of AOC overlaps, and (3) most importantly, the dipole matrix elements connecting the core and conduction electrons are substantially modified. One of our key results is that a photoabsorption cross section showing a rounded edge in the bulk will change to a slightly peaked edge on average as the system size is reduced to a mesoscopic (coherent) scale.

Supported in part by the NSF (DMR-0103003) and the Humboldt Foundation.

TT 26 Superconductivity - Heterostructures, Andreev Scattering, Proximity Effect, Coexistence

Zeit: Dienstag 10:15–11:45 Raum: TU H3027

TT 26.1 Di 10:15 TU H3027

Heterstructures of YBCO and spin-polarized manganites - Playing around with superconducting properties — •Joachim Albrecht[1,2], Soltan Soltan[2] und Hanns-Ulrich Habermeier[2] — [1]Max-Planck-Institut für Metallforschung, Heisenbergstr. 3, 70569 Stuttgart — [2]Max-Planck-Institut für Festkörperforschung, Heisenbergstr. 1, 70569 Stuttgart

We have grown epitaxial bilayers of $La_{2/3}Ca_{1/3}MnO_3$ (LCMO) and optimally doped $YBa_2Cu_3O_{7-\delta}$ (YBCO) on single-crystalline substrates. Owing to the vicinity of the ferromagnetic, highly spin-polarized LCMO layer the properties of the YBCO film can change substantially. We investigated in detail the transition temperature [1], the critical current density [2] and the resistivity in the normal conducting state [3] of YBCO films in bilayers and heterostructures with different geometry. It is shown in this contribution that both the magnetic stray field and the spin polarization of the manganite strongly influences the properties of the YBCO thin film.

[1] S. Soltan, J. Albrecht and H.–U. Habermeier, Phys. Rev. B 70, 144517 (2004).
[2] J. Albrecht, S. Soltan and H.–U. Habermeier, Physica C 408-410, 482 (2004).
[3] S. Soltan, J. Albrecht and H.–U. Habermeier, Solid State Comm., submitted

TT 26.2 Di 10:30 TU H3027

Experimental evidence for crossed Andreev reflections — •Detlef Beckmann[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

In our recent work [1], we have shown experimentally that electronic subgap transport in a superconducting non-local spin-valve can be described by the superposition of crossed Andreev reflection, i.e. the splitting of a Cooper pair into two different leads, and electron cotunneling, i.e. the transmission of an electron through the superconducting gap. Here, we report on experiments which allow us to discriminate both processes. We have extended our investigation from metallic point contacts to planar tunnel junctions, and replaced the non-local voltage detection (i.e. outside the current path) by a local detection scheme (along the current path). We observe a negative resistance which allows us to give a lower bound to the contribution due to crossed Andreev reflections alone.

[1] D. Beckmann *et al.*, PRL 93 (2004) 197003

TT 26.3 Di 10:45 TU H3027

Andreev reflection in hybrid InGaAs/InP structures with superconducting NbN contacts — •I. E. Batov[1], Th. Schäpers[2], A. A. Golubov[3], and A. V. Ustinov[1] — [1]Physikalisches Institut III, Universität Erlangen-Nürnberg — [2]ISG-1, Forschungszentrum Jülich — [3]Faculty of Applied Physics, University of Twente, The Netherlands

We have studied magnetotransport and differential current voltage