son tunnel junctions with a critical current density around 500 A/cm^2. We have also developed a design for reading out such qubits using inductive coupling. Results reflecting actual progress in this experiment will be presented.

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TT 26.23 Wed 14:30 P1

Long Josephson junction filters for qubit control — •H. H. Eglmeier[1], A. Kemp[1], V.S. Kaplunenko[2], and A. V. Ustinov[1] — [1]University of Erlangen-Nuremberg — [2]Stanford linear accelerator, metrol magnetic measurement

Josephson junctions have been demonstrated to perform as macroscopic quantum systems with a well-controlled Hamiltonian. Most superconducting qubits require magnetic flux control for their operation. One choice is to use rapid single flux quantum (RSFQ) logic for qubit control and interfacing with room temperature electronics.

Decoherence due to 1/f noise in the RSFQ circuitry leads to the need for efficient low-frequency isolation between the control circuitry and the qubit. We present characterization measurements and simulations of a novel low-pass filter based on a long Josephson junction.

An input signal fed into the long junction is transmitted only if its frequency exceeds the plasma frequency of the junction, otherwise it is attenuated as an exponentially vanishing (evanescent) wave. For qubit control one can use low frequency signals which are only transmitted as multiples of the flux quantum. The transmission properties of the filter in the GHz range are currently investigated experimentally.

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Preparation and readout of bistable vortex states in a long annular Josephson junction containing a lithographic microshort. — •Alexander Kemp, Astria Price, and Alexey V. Ustinov — Physikalisches Institut III, Universitaet Erlangen-Nuernberg, Erlangen D-91058, Germany

We demonstrate classical state preparation and readout for a novel type of vortex qubit, in which a short section of the insulating barrier of a long annular Josephson junction is made slightly wider. This section of the junction acts like a microshort, where the height of the potential barrier so created can be tuned during experiment by varying the strength of an applied in-plane magnetic field. We develop a model for the double well potential, based on the one-dimensional sine-Gordon equation, in which the change in vortex rest mass energy due to the wider section of the junction is explicitly considered, and find the magnetic field dependence of the barrier height. Good agreement with measured vortex depinning currents from each well is obtained. The vortex was prepared in a given well by applying a series of "shaker" bias current pulses to the junction.

TT 26.25 Wed 14:30 P1

Frequency dependence of full counting statistics in AC-biased mesoscopic conductors — •Dmitry Bagrets[1] and Fabio Pistolesi[2] — [1]Institut für Theoretische Festkörperphysik, Universität Karlsruhe, D-76128, Karlsruhe, Germany — [2]Laboratoire de Physique et Modélisation des Milieux Condensés, CNRS-UJF B.P. 166, F-38042 Grenoble, France

We develop a theory to obtain the current noise and the full counting statistics of charge transfer for AC biased mesoscopic conductors. We illustrate the theory by considering two specific examples: a diffusive wire and a chaotic quantum dot. We find that all cumulants of current fluctuations depend on the frequency Ω of the external AC field on the scale of the inverse diffusion time through the structure. This dependence stems from the multiple photon absorption processes and disappears when the AC voltage amplitude V is much smaller than $\hbar\Omega/e$ (e being the electron charge). The detection of the frequency dependence of the second cumulant, the current noise, is within reach of present experimental technology.

TT 26.26 Wed 14:30 P1

Full Counting Statistics of an Aharonov-Bohm Interferometer with an embedded Quantum Dot — •Daniel Urban and Jürgen König — Ruhr-Universität Bochum, 44780 Bochum, Germany

The electron's wave nature becomes apparent in Aharonov-Bohm interferometers, where constructive and destructive interference between two electron paths can be observed. The visivility of the Aharonov-Bohm signal provides information on the coherence of transport channels.

Correlations of electron transport are reflected in shot noise and higher moments of the current distribution. These reveal infomation not contained in the average current. All moments can be conveniently extracted from the Cumulant Generating Function, whose calculation is the aim of Full Counting Statistics (FCS).

Originally developed for situations without interaction FCS has recently been extended to strongly interacting systems such as quantum dots. Treating the coupling to the leads perturbatively, it was found that non-Markovian effects cannot be neglected [1]. We expand this scheme to describe a quantum dot embedded in an Aharonov-Bohm geometry.

[1] A. Braggio, J. König, and R. Fazio, cond-mat/0507527, submitted to Phys. Rev. Lett.

TT 26.27 Wed 14:30 P1

Revealing entanglement of spin qubits with counting statistics — •Holger Schaefers and Walter T. Strunz — Physikalisches Institut, Albert-Ludwigs-Universität Freiburg, Hermann-Herder-Str. 3, 79104 Freiburg, Germany

We investigate two electron spin qubits in quantum dots. The spins are measured by separate currents through the dots. Our approach is based on quantum trajectories, widely used in quantum optics, here adapted to describe conditional quantum dot dynamics in a fermionic environment. We use the quantum trajectory approach to simulate the quantum dynamics conditioned on the continuous measurement outcome, here the electron currents through the dots. We propose a simple experiment and give a sufficient criterion for revealing entanglement with the help of counting statistics.

TT 26.28 Wed 14:30 P1

Molecular conductance from ab initio calculations: self energies and absorbing boundary conditions — •Andreas Arnold[1] and Ferdinand Evers[2] — [1]Institut für Theorie der kondensierten Materie, Universität Karlsruhe, 76128 Karlsruhe, Germany — [2]Institut für Nanotechnologie, Forschungszentrum Karlsruhe, 76021 Karlsruhe, Germany

Calculating an exact self energy for ab initio transport calculations relevant to *Molecular Electronics* can be troublesome. Errors or insufficient approximations made at this step are a frequent reason why many molecular transport studies become inconclusive. We propose a simple and efficient approximation scheme, that follows from interpreting the self energy as an absorbing boundary condition of an effective Schroedinger equation. Our approximation is controlled by a small parameter, which essentially is the inverse number of electrode atoms, that are kept in the ab initio calculation.

The method is illustrated using a tight binding wire as a toy model, for which an analytical solution is available, against which we can check our numerical results. Also more realistic applications for transport calculations based on the density functional theory have been performed. They yield results in very good agreement with the conventional way to set up the electronic self energy.

TT 26.29 Wed 14:30 P1

Structure and conductance histogram of atomic-sized Au contacts — •Markus Dreher[1], Fabian Pauly[2], Jan Heurich[2], Carlos Cuevas[2,3], 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 — [3]Forschungszentrum Karlsruhe, Institut für Nanotechnologie, 76021 Karlsruhe

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