Session 26aD

Electron energy and phase relaxation on magnetic impurities **26aD1**

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We discuss the effect of magnetic impurities on the inelastic scattering and dephasing of electrons. At small energy transfers E and in the absence of the Zeeman splitting the two-particle collision integral has a kernel $K \propto 1/E^2$ in a broad energy range. In a magnetic field, this mechanism is suppressed at E below the Zeeman energy. The Zeeman splitting of the impurity spin states reduces the electron dephasing rate, thus enhancing the effect of electron interference on conduction. We find the weak localization correction to the conductivity and the magnitude of the conductance fluctuations in the presence of magnetic field of arbitrary strength. Our results can be compared quantitatively with the experiments on energy relaxation in short metallic wires and on Aharonov-Bohm conductance oscillations in wire rings.

Structure and nonequilibrium transport in Kondo systems **26aD2**

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Recent advances in nanotechnology have made it possible to fabricate tunable quantum dots in the Kondo regime. This has raised the necessity to explore structure and transport in such correlated systems in more complex situations as well as in nonequilibrium. It is shown that the presence of several correlated local orbitals in a Kondo defect gives rise to multiple Kondo peaks. A generalized Friedel sum rule leads to an approximate conductance quantization in such systems, relevant for transport through multi-level nano-constrictions. Multiple Kondo resonances have recently been identified experimentally in Ce-based heavy fermion systems by high-resolution photoemission spectroscopy. Furthermore, the Kondo effect is analyzed at large transport bias voltage, using a novel, perturbative renormalization group technique valid in nonequilibrium. The results for the nonlinear differential conductance through Kondo quantum dots in a magnetic field, comparison with experiments, and a possible application are discussed.

26aD3 Coulomb Blockade and the Kondo Effect in Single Atom Transistors

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We have fabricated three-terminal electronic devices in which charge flow occurs through electronic states on a single atom within one molecule. We study two different molecules, which are coordination complexes in which one cobalt ion is attached to external gold leads by two organic tethers. Current flows by tunneling via the cobalt ion. For the longer molecule, tunneling spectra taken at 50 mK reveal Coulomb blockade and multiple quantum resonances with a sequence of states below 6 meV energy. In the shorter molecule we observe the Kondo effect. We will discuss the details of the transport through these molecules as a function of source bias, gate voltage, temperature and magnetic field. We have also synthesized devices using iron and manganese ions instead of cobalt in an effort to observe different spin states.

26aD4 Current and Shot Noise in Superconducting Junctions with a Quantum Dot in the Kondo Regime.

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Transport through an Anderson impurity in the Kondo regime situated between two superconductors is considered. Here the analysis is performed within the slave boson mean field approximation. The new physics follows due to multiple Andreev reflections at the boundary between the dot and superconductor. The important new parameter which enters the transport characteristics is the ratio of the Kondo temperature to the superconducting gap. The current, shot noise power and Fano factor are displayed versus the applied bias voltage in the subgap region and found to be strongly dependent on this ratio. In particular, the $I - V$ curve exposes an excess current in the limit of high Kondo temperature.