In this work we study a nonequilibrium steady state in the Kondo model generated by periodic switching of the interaction. As has been shown in Ref. [1], at the Toulouse point the Kondo model can be mapped onto a noninteracting resonant level model even for nonequilibrium interaction quenches. Since the resonant level model is exactly solvable, we are therefore able to investigate the real-time dynamics on all time scales, especially the buildup of the steady state. We characterize this steady state by calculating the spin-spin correlation function.

[1] D. Lobaskin and S. Kehrein, J. Stat. Phys. **123**, 301-313 (2006).

TT 6.46 Mon 13:00 P1A

Continuous-Time Quantum Monte Carlo Approach to Strongly Correlated Nonlinear Transport — •Andreas Dirks[1], Thomas Pruschke[1], and Philipp Werner[2] — [1]Institut für Theoretische Physik, Universität Göttingen — [2]Institut für Theoretische Physik, ETH Zürich

The tremendous progress in nano structuring made a broad variety of physical phenomena of quantum impurity systems experimentally accessible through transport measurements. However, computational methods for a reliable description of strongly correlated transport are still rare. We investigate the application of continuous-time Quantum Monte Carlo algorithms to the imaginary-time formalism introduced by Han and Heary [1].

[1] J. E. Han, and R. J. Heary, Phys. Rev. Lett. **99**, 236808 (2007)

TT 6.47 Mon 13:00 P1A

Uniaxial pressure effects on the superconductivity of $CeCoIn_5$ — •Kai Grube[1], Sebastian Zaum[1,2], Roland Schäfer[1], Eric D. Bauer[3], Christoph Meingast[1], and Hilbert v. Löhneysen[1,2] — [1]Forschungszentrum Karlsruhe, Institut für Festkörperphysik, 76021 Karlsruhe, Germany — [2]Physikalisches Institut, Universität Karlsruhe, 76128 Karlsruhe, Germany — [3]Los Alamos National Laboratory, Los Alamos, New Mexico 87545, USA

The heavy-fermion superconductor $CeCoIn_5$ shows strongly anisotropy thermodynamic and transport properties due to its tetragonal crystal structure. A comparison with its cubic parent compound $CeIn_3$, with an order of magnitude smaller transition temperature T_c, suggests the importance of anisotropy for the superconducting pairing mechanism in these alloys. We have performed thermal expansion and magnetostriction measurements along the a- and c-axes of $CeCoIn_5$ single crystals. From measurements transverse and longitudinal to magnetic fields up to $B = 14\,\mathrm{T}$, it has been possible to calculate the uniaxial pressure effects on the superconductivity, dT_c/dp_i $(i = a, c)$ and dB_{c2}/dp_i, and the Grüneisen parameters, $\Gamma_a(T, B)$ and $\Gamma_c(T, B)$. We will discuss the stress and strain dependences of the characteristic energy scales and relate them to the effects of hydrostatic pressure, magnetic field, and doping.

TT 6.48 Mon 13:00 P1A

Coexistence of antiferromagnetism and superconductivity in Cd-doped $CeCoIn_5$ — •O. Stockert[1], U. Witte[2,3], M. Nicklas[1], R. Schedler[3], K. Kiefer[3], J. D. Thompson[4], A. D. Bianchi[5], Z. Fisk[5], and F. Steglich[1] — [1]Max-Planck-Institut CPfS, Dresden, Germany — [2]Institut für Festkörperphysik, TU Dresden, Dresden, Germany — [3]Helmholtz-Zentrum Berlin für Materialien und Energie, Berlin, Germany — [4]Los Alamos National Laboratory, Los Alamos NM, USA — [5]University of California, Irvine CA, USA

Starting from the heavy-fermion superconductor $CeCoIn_5$ with a superconducting $T_c = 2.3\,\mathrm{K}$, doping with cadmium induces antiferromagnetic order in $CeCo(In_{1-x}Cd_x)_5$ above a critical Cd concentration $x_c \approx 0.005$ with a subtle interplay between magnetism and antiferromagnetism. We report on elastic neutron scattering experiments of the heavy-fermion alloy $CeCo(In_{1-x}Cd_x)_5$ with $x = 0.0075$ to study the magnetic structure and the influence of superconductivity on the antiferromagnetism. Below $T_N = 2.4\,\mathrm{K}$ and down to lowest temperatures $T < 100\,\mathrm{mK}$ commensurate antiferromagnetic order with a propagation vector $\tau = (1/2\ 1/2\ 1/2)$ was detected. The transition into the superconducting state at $T_c = 1.7\,\mathrm{K}$ is accompanied by a kink in the magnetic intensity followed by a saturation towards lower temperatures at a reduced value. These results indicate a coexistence of antiferromagnetism and superconductivity, but reveal at the same time a strong influence of the superconducting state on the magnetic order. Our results will be discussed in comparison to other heavy-fermion superconductors.

TT 6.49 Mon 13:00 P1A

Scanning Tunneling Spectroscopy studies on heavy fermion superconductors — •Stefan Ernst[1], Steffen Wirth[1], Hirale Jeevan[1], Christoph Geibel[1], Frank Steglich[1], and Zachary Fisk[2] — [1]Max-Planck-Institut für Chemische Physik fester Stoffe, Dresden, Germany — [2]Department of Physics and Astronomy, UC Irvine, USA

Scanning Tunneling Spectroscopy (STS) is a powerful tool for mapping the local electronic density of states (DOS) of sample surfaces. Of particular interest are experiments with superconducting (SC) materials, as information about the SC energy gap can directly be obtained. The application of STS to heavy fermion (HF) superconductors might be a valuable contribution to the understanding of this class of materials. Fundamental properties such as the symmetry of the SC order parameter or excitations due to the SC pairing interaction might be revealed.

This work reports on STM measurements carried out at low temperatures and under ultra-high vacuum (UHV) conditions with the possibility of applying a magnetic field. For the materials investigated here, spectroscopic features in the order of a few hundred μeV are expected. The sufficiently high resolution of our STM, in particular with respect to energy, has been verified. Due to the short SC coherence length of HF materials, a clean tunnel junction is required to investigate the SC gap by means of STS. Methods were developed to prepare clean surfaces of single crystals *in situ*. Preliminary STM and STS measurements were conducted on single crystalline samples of the HF superconductors $CeCoIn_5$, $CeIrIn_5$, and $CeCu_2Si_2$.

TT 6.50 Mon 13:00 P1A

Magnetic field dependency of the spin wave excitation gap in UPt_2Si_2 — •Dirk Schulze Grachtrup[1], Matthias Bleckmann[1], Stefan Süllow[1], and John A. Mydosh[2] — [1]TU Braunschweig, Institute for Physics of Condensed Matter, Mendelssohnstr. 3, 38106 Braunschweig, Germany — [2]University Cologne, II. Physikalisches Institut, Zülpicher Str. 77, 50937 Cologne, Germany

Tetragonal UPt_2Si_2 has recently been characterized as moderately mass enhanced antiferromagnetic compound, which in various physical properties reveals a resemblance to the hidden order material URu_2Si_2 [1,2].

To further characterize this resemblance we have examined UPt_2Si_2 with resistivity measurements in magnetic fields. In particular, we find the antiferromagnetic phase transition at T_N=32 K in zero field to shift slightly downwards to 31 K at B = 9 T // c-axis. Further, the temperature dependence of the resistivity in the range up to 20K can be described by an opening of a spin wave excitation gap. In contrast to T_N this gap displays a much larger reduction by about 30% with increasing magnetic field up to 9T. We discuss the relationship between spin excitation gap and magnetic ordering, this in particular with respect to the difference in field response.

[1] S. Süllow, A. Otop, A. Loose, J. Klenke, O. Prokhnenko, R. Feyerherm, R.W.A. Hendrikx, J.A. Mydosh, H. Amitsuka, J. Phys. Soc. Jpn. **77** (2008) 024708
[2] N. Johannsen, S. Süllow, A.V. Sologubenko, T. Lorenz, J.A. Mydosh, Phys. Rev. B **78** (2008) 121103

TT 6.51 Mon 13:00 P1A

Interplay between crystal-field splitting and Kondo-effect in $CeNi_9Ge_{4-x}Si_x$. — Christian Gold[1], Ludwig Peyker[1], •Ernst-Wilhelm Scheidt[1], Wolfgang Scherer[1], and Herwig Michor[2] — [1]Institut für Physik, Universität Augsburg, 86159 Augsburg, Germany — [2]Institut für Festkörperphysik, TU Wien, 1040 Wien, Austria

$CeNi_9Ge_4$ exhibits a Kondo lattice behavior with unusual single-ion non-Fermi-lquid features and with the largest ever recorded value of the electronic specific heat $\Delta C/T \approx 5.5\,\mathrm{J/mol\,K^2}$ without showing any trace of magnetic order. An entropy calculation yielding $S = Rln4$ at $T < 20\,\mathrm{K}$ suggests that in $CeNi_9Ge_4$ a crystal electrical field (CEF) ground state quasi quartet of Ce^{3+} splits into two doublets leading to an interplay between Kondo effect and CEF splitting on the same energy scale. $CeNi_9Si_4$ is a Kondo lattice system with an enhanced Sommerfeld coefficient of $\gamma \approx 155\,\mathrm{mJ/mol\,K^2}$ which can be well described by the degenerate Coqblin-Schrieffer model ($J = 5/2$). Here we report on specific heat, susceptibility and resistivity measurements of the substitution series $CeNi_9Ge_{4-x}Si_x$ which *i*) exhibits a continuous crossover from a four-folder CEF ground state to a two folder one in present of Kondo screening for $x = 0.5$ - 4 and which *ii*) follows a reduction of the Kondo temperature T_K with decreasing lattice volume between $x = 0$ and 0.1, which is in contrast to the compressible Kondo lattice model.