Some time ago a dependence of the resistive superconducting transition temperature on the current direction in UNi_2Al_3 thin films was observed. Although a qualitative explanation can be given, fundamental questions about this phenomenon are still open, which motivated more detailed studies.

Morphological investigations by AFM and STM seem to rule out a growth mechanism induced origin. By using a specially designed photomask we were able to measure the transition down to current densities of 0.1 A/cm^2 and observed no vanishing of the difference in T_c. However, the magnitude of the splitting of the sc transition varies from sample to sample without any correlation to the defect density as determined by the residual resistance ratio. V(I) characteristics in the superconducting state were measured at various magnetic fields, indicating anisotropic pinning. For the current direction I‖c a thermally activated flux flow region could be identified.

Additional measurements with higher current densities prove that the observations in the relevant range are not generated by heating effects. The shift in T_c as a function of current density agrees well with the expectation for pairbreaking critical current from Ginzburg-Landau theory.

TT 20.6 Wed 14:00 Poster A

Magnetic order in $CeIn_{3-x}Sn_x$ investigated by μSR measurements — •Julia Arndt[1], Astrid Schneidewind[2], Oliver Stockert[1], Daniel Andreica[3], Nubia Caroca-Canales[1], Christoph Geibel[1], and Michael Loewenhaupt[2] — [1]MPI f. Chemische Physik fester Stoffe, D-01187 Dresden — [2]Inst. f. Festkörperphysik, TU Dresden, D-01062 Dresden — [3]Laboratory for Muon Spin Spectroscopy, PSI, CH-5232 Villigen

We report on zero-field muon spin rotation (μSR) measurements on single crystals of the cubic heavy-fermion compound $CeIn_{3-x}Sn_x$. $CeIn_3$ orders antiferromagnetically below $T_N = 10.2$ K. Substituting Sn for In suppresses the magnetic order until $T_N = 0$ at a critical concentration $x_c = 0.67$ [1]. For $x < 0.2$ the specific heat C exhibits the typical λ shaped anomaly at T_N, whereas for $x > 0.2$ C shows a broad maximum in the vicinity of the phase transition, which is taken as a sign for a change in the magnetic structure [2]. So far it has not been accomplished to detect magnetic intensity by means of neutron scattering in this region [3]. In contrast, μSR with its sensitivity to small local magnetic fields in the sample gives the opportunity to probe if magnetic order is present for $x > 0$ at all. All $CeIn_{3-x}Sn_x$ samples investigated ($x = 0; 0.2; 0.4; 0.55$) show a Kubo-Toyabe shaped μSR signal with high depolarisation below T_N and very weak damping above. This is interpreted as the first detection of a clear signature of magnetic order in $CeIn_{3-x}Sn_x$ for $x > 0$.

[1] T. Rus *et al.*, Physica B, **359-361**, 62 (2005); [2] P. Pedrazzini *et al.*, Eur. Phys. J. B, **38**, 445 (2004); [3] O.Stockert *et al.*, unpublished

TT 20.7 Wed 14:00 Poster A

Deposition of $CeCoIn_5$ thin films by co-sputtering and evaporation — •Jochen Geerk[1], Alexander Zaitsev[1], Rainer Fromknecht[1], Andre Beck[1], and Hilbert v. Löhneysen[1,2] — [1]Forschungszentrum Karlsruhe, Institut für Festkörperphysik, P.O.B. 3640, D-76021 Karlsruhe, Germany — [2]Physikalisches Institut, Universität Karlsruhe

Thin films of the heavy fermion superconductor $CeCoIn_5$ were prepared on sapphire substrates with different orientations by combining sputtering (Ce and Co) and evaporation (In). The sputter targets of Ce and Co were arranged in a face-to-face geometry with a magnetic field applied perpendicular to the target surface thus providing an oscillatory movement of the secondary electrons between the targets the latter acting as electric mirrors. Indium was evaporated from a BN oven. In the course of our studies the composition of the films, controlled by RBS and EDX, was varied between ± 30 % for the three elements and the growth temperature ranged from 500 to 750 ° C. The films obtained so far showed transition temperatures between 1.5 and 2.0 K and the characteristic maximum in resistivity near 40 K.

TT 20.8 Wed 14:00 Poster A

High pressure resistivity studies on $YbIr_2Si_2$ — •Monica Macovei[1], Michael Nicklas[1], Cornelius Krellner[1], Zakir Hossain[2], Christoph Geibel[1], and Frank Steglich[1] — [1]Max Planck Institute for Chemical Physics of Solids, Nöthnitzer Str. 40, 01069 Dresden, Germany — [2]Departament of Physics, Indian Institute of Technology, Kampur 208016, India

We investigated the high pressure phase diagram on high-quality single crystals of $YbIr_2Si_2$. Electrical resistivity,ρ, was measured in the pressure range up to 10 GPa and for temperature 0.05 K $< T <$ 300 K. Ambient pressure specific heat and resistivity studies confirmed a Fermi liquid ground state below $\sim$ 200 mK [1]. The Fermi liquid ground state is persisting at low pressure $p < 2$ GPa. However, with further increasing pressure the low-temperature dependence of the resisitivity changes from a T^2 dependence to $\rho = \rho_0 + AT^n$ with $n < 2$, indicating non-Fermi liquid behavior. By applying a magnetic field the Fermi liquid ground state is stabilized again. For $p > 7$ GPa magnetic order is developing marked by a kink in resistivity similar like in other Yb based heavy fermion compounds, e.g. $YbRh_2Si_2$, $YbCu_2Si_2$ and $YbNi_2Ge_2$.

[1] Z.Hossain *et al.* Phys. Rev. B **72**, 094411 (2005).

TT 20.9 Wed 14:00 Poster A

$YbNi_2Si_3$: a new Yb based intermetallic compound — Alexander Cosceev[1], Marc Uhlarz[1], Thomas Wolf[2], Peter Adelmann[2], •Kai Grube[2], Peter Schweiss[2], Georg Roth[3], Rainer Fromknecht[2], Christoph Sürgers[1], and Hilbert v. Löhneysen[1,2] — [1]Physikalisches Institut, Universität Karlsruhe, Germany — [2]Forschungszentrum Karlsruhe, Institut für Festkörperphysik, Germany — [3]Institut für Kristallographie, RWTH Aachen, Germany

We have synthesized a new intermetallic compound $YbNi_2Si_3$ which crystallizes in the space group *Immm* with the metric $a = 3.860$Å, $b = 3.862$Å, and $c = 24.068$Å. Single crystals have been grown from Sn flux in a closed SiO_2 glass ampoule. Clean free-standing crystals could be obtained after dissolving the solid flux with liquid gallium and cleaning with a solution of iodine in dimethyl formamide. The magnetic dc susceptibility was measured parallel and perpendicular to the c axis. We find a rather strong anisotropy of the Curie-Weiss-like susceptibility down to 2.3 K. Measurements of the specific heat will be reported as well.

TT 20.10 Wed 14:00 Poster A

High-field ESR on the Kondo-system $YbRh_2Si_2$ — •Uwe Schaufuss[1], V. Kataev[1], B. Büchner[1], J. Sichelschmidt[2], C. Krellner[2], C. Geibel[2], and F. Steglich[2] — [1]Leibniz Institute for Solid State and Materials Research IFW Dresden — [2]Max Planck Institute for Chemical Physics of Solids, Dresden

$YbRh_2Si_2$ is a Kondo–system with a Kondo temperature $T_K \sim 25$ K [1] . It is located very close to a quantum critical point related to a very weak AFM order below $T_N = 65$ mK and a critical magnetic field of $B_C = 0.06$ T at ambient pressure. Surprisingly an ESR signal typical of a local Yb^{3+} spin has been observed below T_K at fields $B \leq 0.7$ T [2] . The occurrence of the ESR signal is unexpected because at $T \ll T_K$ the Yb^{3+} moments should be screened. In order to obtain a deeper insight in this unusual behaviour we have performed ESR measurements on single crystals of $YbRh_2Si_2$ at much higher fields (5 to 7.5 T) at temperatures from 3 to 25 K, i.e. in the region where one expects a crossover from a Non–Fermi liquid(NFL) to a Fermi–liquid (FL) phase [3] . We observe a strongly anisotropic signal which can be assigned to Yb^{3+} moments. The signal exhibits a pronounced dependence on temperature and the magnetic field. We discuss the puzzling controversy between the observation of ESR which shows properties characteristic of a local Yb^{3+} moment and the Kondo state of $YbRh_2Si_2$.

1 O. Trovarelli *et al.*: Phys. Rev. Lett. **85,** 626 (2000)
2 J. Sichelschmidt *et al.*: Phys. Rev. Lett. **91,** 156 401 (2003)
3 K. Ishida *et al.*: Phys. Rev. Lett. **89,** 107 202 (2002)

TT 20.11 Wed 14:00 Poster A

Magnetotransport across the field-induced quantum phase transition in $CeCu_{5.8}Au_{0.2}$ — •Marc Uhlarz[1], Moritz Röger[1], Thomir Tomanic[1], and Hilbert v. Löhneysen[1,2] — [1]Physikalisches Institut, Universität Karlsruhe (TH), D-76128 Karlsruhe — [2]Forschungszentrum Karlsruhe, Institut für Festkörperphysik, D-76021 Karlsruhe

We report on magnetoresistivity and Hall effect of $CeCu_{0.58}Au_{0.2}$, magnetic field B applied along the hard direction (b axis in orthorhombic notation) and current I along the a axis. At $B = 0$, $CeCu_{0.58}Au_{0.2}$ orders antiferromagnetically below $T_N = 0.25$ K [1]. As observed previously [1], the longitudinal electrical resistivity $\rho_{xx}(T)$ rises towards lower T below T_N for current directions containing a component of the magnetic ordering vector $\mathbf{Q} = (0.625, 0, 0.275)$. With increasing B, the rise of $\rho_{xx}(T)$ becomes smaller and T_N shifts to lower T, vanishing at $B_c = 3.6$ T. Likewise, the field derivative of the transverse resistivity $d\rho_{xy}/dB$ (independent of B at high temperatures) becomes

field-dependent in the vicinity of B_c below T_N. This signals (in a simple single-band picture) an increase of the effective carrier concentration when B exceeds the critical field B_c of antiferromagnetic order. Our data will be compared to recent experiments on $YbRh_2Si_2$, where a kink of the Hall coefficient R_H at B_c was inferred for $T \to 0$ from the gradual change of slope of $\rho_{xy}(B)$ for finite T, becoming more pronounced for $T \to 0$ [2].

[1] H. v. Löhneysen et al., Eur. Phys. J. B **5** (1998) 447
[2] S. Paschen et al., Nature **432** (2004) 881.

TT 20.12 Wed 14:00 Poster A

DC-Susceptibility of $CeCu_{6-x}Au_x$ at very low temperatures — •Andreas Hamann[1], Tihomir Tomanic[1], Hilbert v. Löhneysen[1,2], and Oliver Stockert[3] — [1]Physikalisches Institut, Universität Karlsruhe, 76128 Karlsruhe — [2]Forschungszentrum Karlsruhe, Institut für Festkörperphysik, 76021 Karlsruhe — [3]MPI für chemische Physik fester Stoffe, 01187 Dresden

$CeCu_6$ is a prototype heavy-fermion system that is rather well described by Fermi liquid (FL) theory. Au doping introduces long-range incommensurate antiferromagnetism for $x > x_c \approx 0.1$. In the vicinity of the quantum critical point x_c significant deviations from FL theory have been observed in measurements of the specific heat, magnetic susceptibility and the electrical resistivity. In addition, highly unusual features were observed in inelastic neutron scattering [1,2]. In particular, the energy integrated dynamical as well as the statical susceptibility could be described by $\chi^{-1} \propto (\theta(q))^\alpha + cT^\alpha$ with $\alpha = 0.75$ [1]. We report measurements of the low-field dc-susceptibility $\chi(T)$ of $CeCu_{5.9}Au_{0.1}$ and $CeCu_{5.85}Au_{0.15}$ down to temperatures around 40 mK. Our data for $x = 0.1$ show for $T \lesssim 200$ mK deviations from the above χ^{-1} expression signaling a crossover for a smaller exponent α than previously found for higher T and B. For $x = 0.15$ we see clear experimental evidence for the sharp onset of antiferromagnetic order below $T_N \approx 82$ mK for $x = 0.15$. We compare our data in detail with the previous work [1].

[1] A. Schröder et al., Nature 407, 6802 (2000)
[2] O. Stockert et al., Phys. Rev. Lett. 80, 5627 (1998)

TT 20.13 Wed 14:00 Poster A

Quantenphasenübergänge in $NbFe_2$ — •Carsten Albrecht[1], Manuel Brando[2], Will Duncan[1], Dennis Moroni-Klementowicz[1], Daniel Grüner[2], Rafik Ballou[3], Bjorn Fak[4], Guido Kreiner[2] und F. Malte Grosche[1] — [1]Dept. of Physics, Royal Holloway, University of London, Egham, UK — [2]MPI-CPfS, Nöthnitzer Str. 40, Dresden — [3]CNRS, Grenoble — [4]CEA DRFMC, SPSMS, Grenoble

Was geschieht mit metallischen Ferromagneten bei Annäherung an ihren quantenkritischen Punkt (QKP), wenn der magnetische Übergang kontinuierlich unterdrückt wird?

In einigen bisher untersuchten Fällen, insbesondere den stoichiometrischen Verbindungen MnSi und $ZrZn_2$, verdeckt die Wandlung zu Phasenübergängen 1. Ordnung den erwarteten QKP. Ein anderes Szenario wird möglicherweise in dem verwandten System $NbFe_2$ realisiert: $NbFe_2$ existiert dicht an der Schwelle zum Ferromagnetismus, erkennbar an seinem stark erhöhten Stonerfaktor $\simeq 120$ (bezogen auf die gerechnete Zustandsdichte), nimmt aber unterhalb von etwa 20 K vermutlich eine bisher nicht genau identifizierte Spindichtewellenordnung an. Sowohl leichter Fe- als auch leichter Nb- Überschuss im Bereich von einem Prozent führen zu itinerantem Ferromagnetismus. Unsere Untersuchungen an Proben aus den bisher identifizierten Bereichen des Zusammensetzungs-Phasendiagramms sowie eine Reihe von Hochdruckmessungen weisen darauf hin, dass in $NbFe_2$ der ferromagnetische QKP durch Wandlung von Ferromagnetismus zu langwellig modulierter Spindichtewellen- bzw. Spiralordnung verdeckt wird.

TT 20.14 Wed 14:00 Poster A

Magnetic-field-induced Change of the Fermi Surface in CeBiPt — •M Bartkowiak[1], B Bergk[1], Y Skourski[1], J Wosnitza[1], I Opahle[2], S Elgazzar[2], M Richter[2], H v Löhneysen[3,4], T Yoshino[5], and T Takabatake[5] — [1]Hochfeld-Magnetlabor Dresden (HLD) FZ Dresden-Rossendorf, 01328 Dresden — [2]IFW Dresden,PO Box 270116, 01171 Dresden — [3]Physikalisches Institut, Universität Karlsruhe — [4]Institut für Festkörperphysik, FZ Karlsruhe — [5]Department of Quantum Matter, ADSM, Hiroshima University

Comparative experiments between the two semimetals CeBiPt and LaBiPt reveal changes of the Fermi surface in CeBiPt with respect to temperature, applied magnetic, field and chemical composition. It must be concluded that the strong temperature dependence of the Shubnikov-de Haas (SdH) frequency as well as the change of carrier concentration above a sample dependent critical field are associated with the $4f$ electrons introduced by the Ce atoms. We present Hall and magnetoresistance measurements up to 70 T obtained at our new pulsed high magnetic field laboratory in Dresden. We observe the disappearance of the SdH signal and a change of the Hall coefficient above a sample-dependent threshold field. Rather than at 25 T, as reported previously, we measured a threshold field of ≈ 40 T demonstrating the strong dependence of the Fermi surface on stoichiometry.

TT 20.15 Wed 14:00 Poster A

Inelastic Neutron Scattering on the Antiferromagnetic Half-Heusler Alloy CeBiPt — •Gernot Goll[1], Oliver Stockert[2], Tobias Unruh[3], Peter Link[3], K. Shigetoh[4], and T. Takabatake[4] — [1]Physikalisches Institut, Universität Karlsruhe, 76128 Karlsruhe — [2]Max-Planck-Institut CPfS, 01187 Dresden — [3]ZWE FRM-II, Technische Universität München, 85747 Garching — [4]Hiroshima University, Higashi-Hiroshima, Japan

CeBiPt is a semimetal with a rather low charge carrier concentration $n = 7.7 \cdot 10^{17}\,\mathrm{cm}^{-3}$. Below $T_N \approx 1$ K antiferromagnetic order occurres as evidenced by sharp maxima in the thermodynamic properties. Neutron diffraction experiments have revealed an AF-type I structure with a propagation vector $\tau = (1\ 0\ 0)$ and moments also along [1 0 0]. The ordered moment $\mu \approx 0.6\,\mu_B$ is much lower than the effective moment determined from the Curie-Weiss behavior of the susceptibility at higher T. Crystal-electric field (CEF) splitting of the Ce^{3+} level might be one origin of a lowered ordered moment. We performed inelastic neutron scattering experiments on TOFTOF at the FRM-II with energy of the incident neutrons $E_i = 2.7$, 5.7, and 16.9 meV and on PANDA with $E_i = 5.6$ meV at $2.8 < T < 50$ K. We found only one CEF excitation at $\hbar\omega \approx 9.5$ meV at $T = 2$ K in line with previous measurements on SV29 at FRJ-2 with fixed $E_i = 30$ meV. This excitation has been identified with the transition between a Γ_7 doublet and a Γ_8 quartet state. No further inelastic excitations have been observed except for a quasielastic contribution which increases in width with increasing temperature.

TT 20.16 Wed 14:00 Poster A

Kondo effect in low-carrier systems — •Robert Hager and Ralf Bulla — Theoretische Physik III, Elektronische Korrelationen und Magnetismus, Institut für Physik, Universität Augsburg

Recent experiments on dilute U impurities in semiconducting CaB_6 show typical Kondo phenomena with a Kondo temperature $T_K \approx 2K$ (G.A. Wigger *et al.*, Europhys. Lett. **68**, 685 (2004)). This observation is rather unusual for magnetic moments due to 5f electrons because of the large hybridization between impurities and the conduction electrons. We perform numerical renormalization group calculations for an Anderson impurity model with a low concentration of conduction electrons, believed to be the relevant model for $(U,Ca)B_6$. We present results for thermodynamic and dynamic quantities for various carrier concentrations and investigate the crossover from mixed-valent to Kondo behaviour upon decreasing the filling of the conduction band.

TT 20.17 Wed 14:00 Poster A

Strong inhomogeneities and non-Fermi liquids in randomly depleted Kondo lattices — •Matthias Vojta[1] and Ribhu Kaul[2] — [1]Institut für Theoretische Physik, Universität Köln — [2]Physics Department, Harvard University

We discuss the low-temperature behavior of Kondo lattices upon random depletion of the local f moments. For a large range of intermediate doping levels, between the coherent Fermi liquid of the dense lattice and the single-impurity Fermi liquid of the dilute limit, we find strongly inhomogeneous states that exhibit distinct non-Fermi liquid characteristics. In particular, the interplay of dopant disorder and strong interactions leads to rare weakly screened moments which dominate the bulk susceptibility. Our results are relevant to compounds like $(Ce,La)CoIn_5$.

TT 20.18 Wed 14:00 Poster A

Unusual Single Ion Behavior in $CeNi_{8.6}Cu_{0.4}Ge_4$ near a Quantum Critical Phase Transition — •Ludwig Peyker[1], Ernst-Wilhelm Scheidt[1], Wolfgang Scherer[1], Stephan Kehrein[2], and Herwig Michor[3] — [1]Chemische Physik und Materialwissenschaften, Universität Augsburg, 86159 Augsburg, Germany — [2]Fakultät für Physik, LMU München, 80333 München, Germany — [3]Institut für Festkörperphysik, TU Wien, 1040 Wien, Austria