is not the case in heavy fermion compounds or magnetic systems with small exchange couplings. The latter systems have recently been studied extensively in the context of field tuned quantum phase transitions and the Bose Einstein condensation of magnons. We investigate the scattering of fast phonons from slow electronic and spin excitations and study its influence on heat transport. Here we focus on the transport properties of spin chains and spin ladders coupled to three dimensional phonons.

TT 32.9 Thu 14:00 Poster B

Kondo volume collapse and the Kondo breakdown transition in Heavy Fermions — •Andreas Hackl and Matthias Vojta — Institut für theoretische Physik, Universität zu Köln, Zülpicher Str. 77, 50937 Köln

The unconventional critical behavior near magnetic quantum phase transitions in various heavy-fermion metals, apparently inconsistent with the standard spin-density-wave scenario, has triggered proposals on the breakdown of the Kondo effect at the critical point. Here we investigate the fate of such a zero-temperature transition upon coupling of the electronic to lattice degrees of freedom. Specifically, we study a Kondo-Heisenberg model with volume-dependent Kondo coupling – this model displays both Kondo volume collapse and Kondo-breakdown transitions, as well as a Lifshitz transition associated with a change of the Fermi-surface topology. Within a large-N treatment, we find that the Lifshitz transition tends to merge with the Kondo volume collapse and hence becomes first order, whereas the Kondo breakdown transition remains of second order except for very soft lattices. Interesting physics emerges at the quantum critical endpoint of the Kondo volume collapse: In two space dimensions, this endpoint is located at the Lifshitz line for a large range of parameters, thus two critical phenomena coincide without fine tuning. We briefly analyze the critical theory for such a situation, and finally relate our findings to current heavy-fermion experiments.

TT 32.10 Thu 14:00 Poster B

Heavy-fermion metals with hybridization nodes: Unconventional Fermi liquids and competing phases — •Matthias Vojta and Heidrun Weber — Institut für Theoretische Physik, Universität Köln, 50937 Köln, Germany

Microscopic models for heavy-fermion materials often assume a local, i.e., momentum-independent, hybridization between the conduction band and the local-moment f electrons. Motivated by recent experiments, we consider situations where this neglect of momentum dependence is inappropriate, namely when the hybridization function has nodes in momentum space. We explore the thermodynamic and optical properties of the highly anisotropic heavy Fermi liquid, resulting from Kondo screening in a higher angular-momentum channel. The dichotomy in momentum space has interesting consequences: While e.g. the low-temperature specific heat is dominated by heavy quasiparticles, the electrical conductivity at intermediate temperatures is carried by unhybridized light electrons. We then discuss aspects of the competition between Kondo effect and ordering phenomena induced by inter-moment exchange: We propose that the strong momentum-space anisotropy plays a vital role in selecting competing phases. Explicit results are obtained for the interplay of unconventional hybridization with unconventional, magnetically mediated, superconductivity, utilizing variants of large-N mean-field theory. We make connections to recent experiments on CeCoIn5 and other heavy-fermion materials.

TT 32.11 Thu 14:00 Poster B

Ambient-pressure thermodynamic measurements on UGe_2 — •Frédéric Hardy[1,2], Christoph Meingast[1], Hilbert v. Löhneysen[1,2], Jacques Flouquet[3], Andrew Huxley[3], Jason Lashley[4], Robert A. Fisher[5], and Norman E. Phillips[5] — [1]Forschungszentrum Karlsruhe, Institut für Festkörperphysik, 76021 Karlsruhe, Germany — [2]Physikalisches Institut, Universität Karlsruhe, 76128 Karlsruhe, Germany — [3]SPSMS-DRFMC, CEA-Grenoble, 38054 Grenoble cedex, France — [4]Materials Science Division and Technology Division, LANL, Los Alamos, New Mexico 87545, USA — [5]Materials Science Division, LBNL, Berkeley, California 94720, USA

The pairing interaction leading to the formation of the Cooper pairs remains unidentified in the ferromagnetic superconductor UGe_2. Nevertheless, there is strong experimental evidence that superconductivity is not mediated by the magnetic fluctuations that drive $T_{\mathrm{Curie}}(p)$ to zero; it rather appears closely related to another phase boundary $T_x(p)$ that occurs at lower pressure. Theoretical works suggested that this additional phase boundary could arise either from a coupling between SDW and CDW orderings or from a peak in the electronic density of states. Although the existence of this anomaly is experimentally incontestable between 0.6 and 1.2 GPa, the situation at ambient pressure remains ambiguous. We discuss the aforementioned scenarios in the light of recent high-resolution thermal expansion and calorimetric measurements realized under high magnetic fields at ambient pressure.

TT 32.12 Thu 14:00 Poster B

Dynamic magnetic order in $CeCu_2Si_2$ — •O. Stockert[1], J. Arndt[1], E. Faulhaber[2], H.S. Jeevan[1], C. Geibel[1], P. Fouquet[3], and F. Steglich[1] — [1]Max-Planck-Institut CPfS, Dresden, Germany — [2]Institut für Festkörperphysik, TU Dresden, Dresden, Germany — [3]Institut Laue-Langevin, Grenoble, France

The heavy-fermion compound $CeCu_2Si_2$ attracts still considerable interest due to the competition between antiferromagnetic order and superconductivity. The nature of the magnetic order is an incommensurate spin-density wave below $T_N \approx 800\,\mathrm{mK}$ determined by the nesting properties of the Fermi surface. Recently we observed that the magnetic Bragg peaks in only magnetically ordered $CeCu_2Si_2$ are broadened in q space. Starting from long-range order the magnetic Bragg peaks broaden below $T \approx 550\,\mathrm{mK}$. At $T = 100\,\mathrm{mK}$ a correlation length $\xi \approx 130\,\text{Å}$ has been estimated. From this finite correlation length/domain size at lowest temperature a finite lifetime of the magnetic peaks was expected. However, in neutron scattering experiments using a triple-axis spectrometer no broadening in energy was observed. Hence, the neutron spin-echo technique was chosen for this investigation due to the higher energy resolution. Data were recorded at different temperatures below T_N. From the spin-echo spectra some dynamic nature of the magnetic order in only magnetically ordered $CeCu_2Si_2$ can be inferred. The fluctuation rate of the antiferromagnetic order is estimated to be in the order of 50 MHz at lowest temperatures. Our results will be discussed in comparison to other measurements.

TT 32.13 Thu 14:00 Poster B

Magnetic excitations in $CeCu_2Ge_2$ — •Astrid Schneidewind[1], Oliver Stockert[2], Karin Schmalzl[3], Micha Deppe[2], Julia Arndt[2], Christoph Geibel[2], Frank Steglich[2], and Michael Loewenhaupt[1] — [1]Inst. f. Festkörperphysik, TU Dresden, D-01062 Dresden, Germany — [2]Max-Planck-Institut-CPfS, D-01178 Dresden, Germany — [3]Jülich Centre of Neutron Science, D-52425 Jülich, Germany, and Institut Laue-Langevin, F-38042 Grenoble, France

$CeCu_2Ge_2$ is a heavy-fermion compound showing incommensurate antiferromagnetic order with Kondo-compensated moments below $T_N = 4.15$ K [1,2]. Calculations of the Fermi surface show that a local character of the Ce 4f moments is not able to explain the incommensurate nesting vector as observed [3]. Involving an also itinerant component of the Ce 4f moments results in a nesting vector $\mathbf{q}$ which agrees well with the experimental values of $\mathbf{q}$ [3]. Since magnetic excitations are sensitive on the localization of the magnetic moments, we started to study the magnetic excitation spectrum to understand the magnetic order in $CeCu_2Ge_2$. In a first neutron scattering experiment on a $CeCu_2Ge_2$ single crystal the magnetic propagation vector was confirmed to be incommensurate and temperature dependent as reported by Krimmel et al. [2]. Furthermore, magnetic excitations have clearly been detected at low energies ($\hbar\omega \leq 2$ meV) below T_N displaying different temperature and $\mathbf{q}$-dependences.

[1] A. Krimmel et al., Physica B 234-236 (1997) 877.
[2] A. Krimmel et al., Phys. Rev. B 55 (1997) 6416.
[3] G. Zwicknagl, J. of Low Temp. Phys. 147 (2007) 123.

TT 32.14 Thu 14:00 Poster B

μSR-studies on the Heavy-Fermion-Superconductor $CeCoIn_5$ — •Johannes Spehling[1], Jeff Sonier[2], Eric Bauer[3], Robert Heffner[3], and Hans-Henning Klauss[1] — [1]Institut für Festkörperphysik, TU-Dresden, D-01069 Dresden, Germany — [2]Department of Physics, Simon Fraser University, Burnaby, BC, Canada V5A 156 — [3]Los Alamos National Laboratory, Los Alamos, New Mexico 87545, USA

In strong magnetic fields the Heavy Fermion superconductor $CeCoIn_5$ shows a first order transition from the normal state into the superconducting phase [1]. It is suggested that a specifically modulated superconducting state is formed, the FFLO state, theoretically predicted by Fulde, Ferrell, Larkov and Ovchinikov in 1964/1965. We have carried out transverse field μSR-measurements between 2T and 5T ($\hat{c}$-axis parallel H) on single-crystalline $CeCoIn_5$ in a temperature range between 25mK and 7K. In addition to the standard modulation