Es wurde ein neuartiges optisches Verfahren zur Messung des makroskopischen thermischen Ausdehnungskoeffizienten entwickelt, bei welchem dessen Verhalten in unterschiedlichen Richtungen gleichzeitig ermittelt werden kann. Zudem zeichnet es sich durch die Möglichkeit aus, Proben mit Abmessungen bis zu einigen Dezimetern zu vermessen. Hauptsächliches Anwendungsgebiet ist die Untersuchung neuer Verbundwerkstoffe für thermische Isolierungen mit meist stark anisotropem Ausdehnungsverhalten. Das Messprinzip kann für unterschiedliche kryogene Medien eingesetzt werden. Darüber hinaus wird mit einem Messgerät für die Wärmeleitfähigkeit, das auf der Ermittlung der Abdampfrate einer kryogenen Flüssigkeit basiert, ein weiteres Prinzip zu Messung einer thermodynamischen Größe an ausgedehnten Proben vorgestellt.

TT 32.33 Wed 14:00 P1A

A scanning tunneling microscope for low temperatures — •Michael Marz[1,2], Gernot Goll[1], and Hilbert v. Löhneysen[1,2,3] — [1]Physikalisches Institut, Universität Karlsruhe, 76128 Karlsruhe — [2]DFG-Centrum für Funktionelle Nanostrukturen der Universität Karlsruhe (TH), 76128 Karlsruhe — [3]Institut für Festkörperphysik Forschungszentrum Karlsruhe, 76021 Karlsruhe

Scanning tunneling microscopy (STM) and spectroscopy (STS) are widely used to study topological and electronic properties of conducting materials. We installed a home-built STM into a dilution refrigerator, where we can reach temperatures down to 30 mK and apply magnetic fields up to 13 T. Calibration of the piezo of the scanning head was done on HOPG and $NbSe_2$ at room temperature, on both we achieved atomic resolution. At low temperatures we imaged with atomic resolution the topography of $NbSe_2$ as well as the flux-line lattice in small magnetic fields. The lattice constant a of the Abrikosov lattice shows the expected field dependence $a \propto 1/\sqrt{B}$. Spectroscopy clearly shows the superconducting density of states and Andreev bound states in the vortex core. The energy gap determined from a fit of the dI/dV vs. V curves reveals a distribution of the gap values probably due to the presence of the charge-density wave in $NbSe_2$.

TT 32.34 Wed 14:00 P1A

Design of a 300 mK, UHV, 9 T scanning tunneling microscope — •Danny Baumann[1], Torben Hänke[1], Paul Sass[1], Christian Hess[1], Marko Kaiser[2], Ralf Voigtländer[2], Dirk Lindackers[2], and Bernd Büchner[1] — [1]IFW Dresden, Institute for Solid State Research, P.O. Box 270116, D-01171 Dresden, Germany — [2]IFW Dresden, Bereich Forschungstechnik, P.O. Box 270116, D-01171 Dresden, Germany

We present our progress in assembling an ultra high vacuum (UHV) scanning tunneling microscope (STM). This STM is designed for operating temperatures down to 300 mK and magnetic fields up to 9 T. Our system comprises an in-situ tip exchange and coarse xy-sample positioning system. Furthermore, five electrical leads are available on the sample holder to combine STM with transport measurements. The STM is mounted on a ^{3}He UHV cryostat which is connected to a three-chamber UHV system. In this work we will present first measurements on standard samples at low temperatures and UHV conditions.

TT 32.35 Wed 14:00 P1A

Design of a dip stick 4K scanning tunneling microscope — •Ronny Schlegel[1], Torben Hänke[1], Danny Baumann[1], Christian Hess[1], Marko Kaiser[2], Ralf Voigtländer[2], Dirk Lindackers[2], and Bernd Büchner[1] — [1]Institut für Festkörperorperforschung,IFW Dresden — [2]Bereich Forschungstechnik, IFW Dresden

We present the design of a Scanning Tunneling Microscope (STM) for measurements at variable temperatures from 300K down to 4K. The microscope will be placed in a ^{4}He cryogenic system with a superconducting coil. This will allow measurements in cryogenic vacuum and optionally in static magnetic fields up to 17 Tesla. The STM is equipped with a sample cleaving mechanism to prepare samples in vacuum and at low temperatures.

TT 32.36 Wed 14:00 P1A

Control of vibrational modes and dissipation in nanomechanical resonators — •Stefan Bächle, Clemens Müthing, Elke Scheer, and Artur Erbe — Department of Physics, University of Konstanz

Nanomechanical systems are of interest for a wide range of practical applications (e.g. sensors, actuators) as well as for basic research. The main topic of the latter is to get a better understanding of the processes taking place at the transition of the macro-mechanical and quantum-mechanical regime. Scaling down a resonator to a point when its eigenfrequency exceeds 1 GHz, $\hbar\omega$ can be larger than the thermal energy k_BT. To reach this limit resonators with very low dissipation and damping are required. Up to date the correlation between e.g. size and shape of a nanomechanical resonator is still not understood. We present a magneto-electrical and an optical measurement setup, the sample preparation, as well as Finite Element Simulations on nanomechanical resonators. The eigenfrequencies of these silicon cantilever resonators are between several hundred MHz and up to 5GHz. The measurement setup is based on a HF-signal applied to the resonator, which is placed in a cryostat at 4K. A magnetic field of 1T up to 10T is applied perpendicularly to the samples surface. As a result the resonator is excited and starts to oscillate due to the Lorentz force. The optical measurements are based on a method called ASOPS (Asynchronous Optical Sampling).

TT 33: Postersession Correlated Electrons: Metal Insulator Transition, Spin Systems and Itinerant Magnets

Time: Wednesday 14:00–18:00 Location: P1A

TT 33.1 Wed 14:00 P1A

Optical conductivity and correlated bands of $LaVO_3$ and YVO_3 — •David Heilmann and Eva Pavarini — Institut für Festkörperforschung, Forschungszentrum Jülich, 52425 Jülich, Germany

We calculate the optical conductivities and momentum-resolved spectral functions for the $3d^2$ vanadates $LaVO_3$ and YVO_2.

As a method we adopt the LDA+DMFT technique, using Quantum Monte Carlo as an impurity solver. We obtain the self-energy matrix on the real axis by means of the Maximum-Entropy technique and a self-consistent procedure. We use the self-energy matrix to calculate the correlated band structure and the optical conductivity of $LaVO_3$ and YVO_2 both for the high-temperature orthorhombic and the low-temperature monoclinic structure. The effects of orbital fluctuations are discussed.

TT 33.2 Wed 14:00 P1A

Thermodynamic and electrical properties of EuC_{2+x} — •Oliver Heyer[1], Derk Wandner[2], Nils Hollmann[1], Uwe Ruschewitz[2], Thomas Lorenz[1], and John A. Mydosh[1] — [1]II. Physikalisches Institut, Universiät zu Köln, D-50937 Köln — [2]Institut für Anorganische Chemie, Universität zu Köln, D-50939 Köln

We have investigated the magnetization M, specific heat c_p and resistivity ρ of high-purity EuC_{2+x} (-0.1≤ x ≤ 0.3) compounds. The magnetization of EuC_2 shows a ferromagnetic ordering at $T_C \simeq 14$K with a saturation moment of $\simeq 7\frac{\mu_B}{FE}$. This imply that EuC_2 is composed of Eu^{2+} and the acetylide ion (C_2^{2-}). T_C hardly changes with x. In the paramagnetic phase all compounds are semiconductors with small bandgaps $(10-20$meV). A very interesting feature is that the onset of the ferromagnetic order decreases the resistivity ρ over several orders of magnitude indicating a metal-insulator transition (MIT). Applying magnetic fields up to 14 tesla, we find a systematic shift of the MIT temperature to higher values, resulting in a colossal magnetoresistance with changes in the resistivity up to 6 orders of magnitude. This behaviour resembles the colossal magnetoresistance of the better known Eu-rich EuO. Furthermore we carried out magnetization and specific heat measurements of YbC_2. The data identify this compound as a diamagnet without structural phase transitions. On this account YbC_2 is used as a non magnetic reference system.

TT 33.3 Wed 14:00 P1A

Co-tunneling in two-dimensional lattices of EBID-nanoparticles — •Roland Sachser, Fabrizio Porrati, and Michael Huth — Physikalisches Institut, Johann Wolfgang Goethe-