TT 23 Posters Superconductivity, Solids at Low Temperature

Zeit: Montag 14:00–18:00 Raum: Poster TU D

TT 23.1 Mo 14:00 Poster TU D

Superconducting properties of $HoNi_2B_2C$ single crystals — •Dmitri Souptel, Günter Behr, Wolfgang Löser, Konstantin Nenkov, and Günter Fuchs — IFW Dresden, Helmholtzstr. 20, 01171 Dresden

High-quality single crystals of $HoNi_2B_2C$ intermetallic compounds have been grown by a floating zone technique with optical heating. Depending on small composition variation and the temperature of heat treatment single crystalline $HoNi_2B_2C$ samples show a variety of properties: plain superconductivity (T_c about 8 K), re-entrant superconductivity (T_c about 8 K and loss of superconductivity between 4 - 6 K due to 2 incommensurate magnetic ordering) and normal conducting behaviour. Origins of different superconducting properties and their anisotropic behaviour are related to crystal composition, lattice parameters and changes of lattice site occupancies of the composing elements.

TT 23.2 Mo 14:00 Poster TU D

In-situ synthesis of MgB_2 thin films for tunnel junctions — •R. Schneider, J. Geerk, F. Ratzel, A.G. Zaitsev, R. Heid, and K.-P. Bohnen — Forschungszentrum Karlsruhe, Institut für Festkörperphysik, P.O.B. 3640, D-76021 Karlsruhe

A novel approach to the in-situ preparation of as-grown MgB_2 thin films is presented. It comprises a conventional B sputter gun and a special Mg evaporator that provides a high Mg vapor pressure at the position of the substrate. Thin films deposited on r-plane sapphire substrates at a temperature of 440°C had a zero resistance T_c of 33 K and a residual resistivity of approximately 100 $\mu\Omega$cm. Sandwichtype tunnel junctions with a natural MgB_2 oxide as the potential barrier were prepared for superconducting tunneling spectroscopy. Conductance measurements up to 500 mV revealed estimates of the barrier thickness of 1.5 nm and height of 1.6 eV. The slowly varying conductance between ±100 mV allowed us to determine the tunneling density of states. The inversion of the tunnel data using the standard single-band Eliashberg equations yielded an effective electron-phonon spectral function accounting for the smaller energy gap. The features of the tunneling spectrum were analyzed by ab-initio LDA calculations and the two-band Eliashberg equations.

TT 23.3 Mo 14:00 Poster TU D

Laserablatierte Magnesium / Bor Multilagen in Kombination mit in-situ Temperschritten: eine Methode zur Herstellung von MgB_2-Schichten — •Andreas Klimmer[1], Roland Steiner[1], Alfred Plettl[1], Paul Ziemann[1], Jun Cai[2] und Jürgen Behm[2] — [1]Abt. Festkörperphysik, Universität Ulm — [2]Abt. Oberflächenchemie und Katalyse, Universität Ulm

Es wurden unter UHV-Bedingungen dünne Multilagen aus Magnesium und Bor bei Raumtemperatur mit Hilfe eines 193 nm - Excimer-Lasers bei hohen Energiedichten auf c-Saphir abgeschieden. Dabei wurden die Schichtdicken so eingestellt, dass sowohl nominell stöchiometrisches als auch Mg-reiches MgB_2 resultieren sollte. Als abschließende Deckschichten wurden dicke Mg-B- bzw. reine B-Schichten verwendet. Ein anschließender in-situ Temperschritt mittels eines CO_2-Lasers ermöglicht in den bereits bei der Ablation durchmischten Schichten eine Reaktion zu MgB_2. Temperatur und Dauer des Temperschritts wurden systematisch variiert und die resultierende Probenzusammensetzung und Struktur mittels Röntgen-, RBS- und XPS-Tiefenprofilmessungen bestimmt. Die Charakterisierung der supraleitenden Eigenschaften erfolgte durch Magnetisierungs- bzw. Transportmessungen.

Erste Ergebnisse liefern Schichten mit einer maximalen Sprungtemperatur von 23,8 K. Dieser, im Vergleich zum Maximalwert von 39 K reduzierte Wert wird auf Mg-Verluste während des Temperns und relativ hohe C-Verunreinigungen aus dem benützten B-Target zurückgeführt.

TT 23.4 Mo 14:00 Poster TU D

Preparation and Characterization of thin Superconducting MgB_2 Films — •A. Sidorenko[1,2], V.I. Zdravkov[2], E. Nold[3], Th. Koch[4], and Th. Schimmel[1,4] — [1]Institute of Applied Physics, Universität Karlsruhe, D-76128 Karlsruhe — [2]Institute of Applied Physics, MD-2028 Kishinev, Moldova — [3]Institute of Materials Research I, Forschungszentrum Karlsruhe, D-76021 Karlsruhe — [4]Institute of Nanotechnology, Forschungszentrum Karlsruhe, D-76021 Karlsruhe

Superconducting MgB2 films with a critical temperature, Tc , up to 39.3 K were prepared in a new way by DC-magnetron sputtering from a composite target containing MgB2 and metallic Mg in approximately equal amounts and ex-situ annealing in Mg vapour using an especially designed Nb reactor. The AFM imaging show a very smooth and homogeneous morphology of the film surfaces which were deposited with this method on (100) - sapphire substrates. Depth profile scanning auger analysis of the thin MgB2 layers detected the presence of oxygen in only small regions of 10 nm thickness near the surface of the film and near the interface between the substrate and the MgB2 layer. The parameters of the MgB2 films which influence Tc, are discussed.

TT 23.5 Mo 14:00 Poster TU D

Mn substitution in MgB_2 single crystals: influence on structural properties — •G. Schuck, N.D. Zhigadlo, S.M. Kazakov, K. Rogacki, and J. Karpinski — Solid State Physics Laboratory ETH-Hönggerberg, CH-8093 Zürich, Switzerland.

Superconducting single crystals of Mn-doped MgB_2 phase have been grown at a pressure of 30 kbar using cubic anvil technique. Critical temperature versus Mn content dependence of single crystals shows different behavior from that of polycrystalline samples [1], because even small substitution of 1.5% of Mn decreases T_c by about 15K. The lattice constant a remains almost unchanged while the c parameter slightly decreases with Mn content. Single crystal X-ray and EDX investigations show the existence of single phase crystals up to 2% Mn substitution. For crystals with higher Mn content we present single crystal determination in order to get information on what crystallographic position Mn is substituted in the MgB_2 crystal structure.

[1] S. Xu, Y. Moritomo, K. Kato and A. Nakamura, J. Phys. Soc. Japan, 70 (2001) 1889-1891

TT 23.6 Mo 14:00 Poster TU D

Influence of the stoichiometry variations on the properties of MgB_2 prepared by mechanical alloying — •Marko Herrmann, Olaf Perner, Wolfgang Hässler, Christian Rodig, and Bernhard Holzapfel — Institut für Festkörper- und Werkstoffforschung (IFW) Dresden

MgB_2 powder was prepared by mechanical alloying of Mg and amorphous boron powder which gives a partially reacted nanosized precursor powder with a high reactivity. For studying the influence of the stoichiometry the Mg/B-ratio was variied in the range of 0.8 to 1.2. Furthermore different boron qualities were used. These precursor powders were hot pressed to bulk samples and were used for the preparation of tapes with an iron sheath. The structural and superconducting properties of bulk samples and tapes are described in detail. The samples with a Mg/B-ratio>1 show the highest critical temperature (36K) and the best current density (40 kA/cm^2 at 4.2K and 7.5T).

TT 23.7 Mo 14:00 Poster TU D

Magnetron sputtering of TiN thin films for superconducting single-photon detector — •Konstantin Ilin[1], Michael Siegel[1], Alexei Semenov[2], Heinz-Wilhelm Hübers[2], Eugen Hollmann[3], and Andreas Engel[4] — [1]Institut für Mikro- und Nanoelectronische Systeme, Universität Karlsruhe — [2]DLR Institut für Planetenforschung, Berlin — [3]Forschungszentrum Jülich GmbH, Jülich — [4]Physik-Institut der Universität Zürich

Thin and especially ultra-thin superconducting films are widely used for the development of modern radiation sensors, e.g. direct detectors and mixers, providing ultimate performance in a wide range of the electromagnetic spectrum. Recently proposed single-photon detector also utilize ultra-thin films. In order to shift the cut-off wavelength of these devices to infrared and far-infrared spectral range, a superconducting material with a small value of the energy gap and an ability to form superconducting thin films is required. In this report we present our results on the development of the growing technology of thin titanium nitride films. The TiN thin films were deposited on sapphire substrate by dc magnetron sputtering of Ti target in Ar+N_2 atmosphere. The substrates were heated up to 850°C. The superconducting transition temperature of about 5 K has been obtained for 30-nm thick films. We will discuss the dependencies of the film composition, transition temperature, and residual resistivity on the deposition regime.

TT 23.8 Mo 14:00 Poster TU D

Synthesis and Characterization of new $Re_xW_{1-x}O_3$ Phases — •Ch. Helbig[1], B. Rohrmoser[1], K. Tröster[1], D. Shorokhov[1], G. Heymann[2], G. Eickerling[1], R. Herrmann[1], E.-W. Scheidt[1], and W. Scherer[1] — [1]CPM, Universität Augsburg, 86135 Augsburg, Germany — [2]Department Chemie, LMU, 81377 München, Germany

In this presentation we outline new synthetic routes to the small class of vacancy perovskites $M_{1-x}M'_xO_3$ (M, M′ = transition metal) which allows to control their physical properties by variation of the ratio of the metal cations. Employing highly topotactical *Chimie Douce* methods [1] or alternatively high pressure/high temperature routes [2] we were able to synthesize mixed WO_3 and ReO_3 phases and characterize them with respect to their crystal chemistry and physical properties. The chosen parent compounds strongly differ in their electronic and structural behavior.The d^1-system ReO_3 has metallic character and cubic symmetry ($Pm\bar{3}m$), whereas the d^0-system WO_3 is an insulator and displays various structural phase transitions between 1170 K and 230 K. However, the structures of all these WO_3 phases can be derived by group-subgroup relationships from the ReO_3 structure [3]. For $Re_xW_{1-x}O_3$ ($x = 0.25$) a metal to semiconductor transition was predicted in the literature [2]. In this contribution, however, we provide for the first time a systematic study of the electronic and magnetic properties of mixed WO_3 and ReO_3 phases. [1] See for example: M. Figlarz, Chemica Scripta 28, 3, (1988) [2] A. W. Sleight, J. L. Gillson, Sol. St. Comm. 4, 601, (1966) [3] O. Bock, U. Müller, Z. Anorg. Allg. Chem. 628, 987, (2000)

TT 23.9 Mo 14:00 Poster TU D

$La_2Zr_2O_7$ buffer layers on Ni RABiTS for YBCO coated conductors using chemical solution deposition — •Kerstin Knoth, Sebastian Engel, Ruben Hühne, Heike Schlörb, Ludwig Schultz, and Bernhard Holzapfel — IFW Dresden, Helmholtzstrasse 20, 01069 Dresden

Chemical Solution Deposition (CSD), as a low-cost method for producing YBCO coated conductors, has been used to prepare $La_2Zr_2O_7$(LZO) buffer layers on Ni RABiTS. The LZO precursor solution was prepared by dissolving La-, and Zr-2.4-pentanedionates in propionic acid. Solutions with different concentrations as well as variable dip coating speeds were examined to obtain thick and crack free LZO layers on Ni substrates (10 mm x 10mm). During the heat treatment at temperatures around 900°C in a reducing atmosphere, highly textured LZO buffer layers were grown. The texture quality was determined using X-Ray Diffraction (XRD) and Reflection High Energy Electron Diffraction (RHEED). The LZO buffer layers show a strong c-axis orientation in $\theta - 2\theta$ scans and a very good in-plane alignment on Ni, with FWHM values of 6.9° (Ni: 6.0°) and 7.2° (Ni:6.0°) for the in-plane and out-of-plane orientations. Further analyses by SEM and Atomic Force Microscopy (AFM) show dense and crack free layers. The LZO solution was also applied to long lengths using a reel-to-reel dip coating and drying unit. XRD analyses of first longer samples show good c-axis orientation. AFM and SEM investigations are in progress.

TT 23.10 Mo 14:00 Poster TU D

Preparation of buffer layer architectures based on surface oxidized Ni tapes for coated conductor applications — •R. Hühne, D. Selbmann, J. Eickemeyer, L. Schultz, and B. Holzapfel — IFW Dresden, Germany

The preparation of cube textured NiO buffer layers on biaxially textured Ni tapes (RABiTS) using surface oxidation epitaxy (SOE) offers a cheap and scalable route for the production of long-length YBCO coated conductors. Therefore, thin highly textured NiO layers have been grown on different microalloyed Ni-tapes. A second buffer layer is necessary to ensure epitaxial growth of the YBCO as well as to prevent Ni contamination of the superconducting layer. Different perovskite buffer were successfully grown on SOE-NiO using pulsed laser deposition (PLD). Among them, $BaZrO_3$ and $SrZrO_3$ buffers show a high quality epitaxial growth on NiO with an in-plane orientation similar to the underlying NiO. The subsequent deposition of YBCO on top of these buffers requires a thin intermediate $SrTiO_3$ layer resulted in epitaxial layers with a T_c above 87 K and J_c up to 1.6 MA/cm^{-2}. Microstructural investigations showed that the surface topography of the buffer layers and the YBCO is mainly determined by the quality of the NiO layer.

TT 23.11 Mo 14:00 Poster TU D

Optimization of thick $YBa_2Cu_3O_{7-x}$ coated conductors produced by the TFA process — •Thomas Thersleff, Martina Falter, Heike Schlörb, Ludwig Schultz, and Bernhard Holzapfel — IFW Dresden, Helmholzstr. 20, 01069 Dresden

In this study, the effect of layer thickness, furnace ramp rate, and peak reaction temperature on YBCO layers chemically deposited onto single-crystal STO using the TFA process is assessed. First, layer thickness was increased by coating substrates multiple times. After each coating, the substrates were pyrolized up to 400°C in a humid flowing gas O_2 furnace. A single coating with our standard TFA precursor produces a layer $\sim$ 200 nm thick. Second, single layers were subjected to a slow heating ramp rate of 150 K/h in the 400-750°C region. Third, other single layer samples were reacted at a depressed peak temperature of 760°C to avoid reaction at the film boundary. Results show that substrates coated up to three times retain superconductivity with a ΔT_c of 3.9 K. XRD indicates the presence of BaF_2, suggesting further temperature refinement is necessary. The slower ramp rate for single layers results in superior current transport properties, with J_c as high as 5 MA/cm^2. Samples reacted at 760°C maintain superconductivity with a ΔT_c as low as 1.4 K.

TT 23.12 Mo 14:00 Poster TU D

$YBa_2Cu_3O_{7-x}$-Schichten und Schichtsysteme für supraleitende Bauelemente — •Ulrike Baldeweg, Pierre Lorenz, Susan Biering, Veit Grosse, Christoph Becker, Ralf Bechstein, Tobias Förster, Hagen Wald, Frank Schmidl und Paul Seidel — Institut für Festkörperphysik, Friedrich-Schiller-Universität Jena, Helmholtzweg 5, 07743 Jena

Es werden Ergebnisse zur LASER-gestützten, großflächigen Abscheidung von supraleitenden $YBa_2Cu_3O_{7-x}$(YBCO)-Schichten vorgestellt. Verschiedene Technologien zur Mikrostrukturierung und Passivierung werden hinsichtlich der elektrischen Eigenschaften der Proben und ihrer Stabilität verglichen. Mögliche Einsatzgebiete dieser Schichten sind Antennenstrukturen für Magnetometer und Gradiometer.

TT 23.13 Mo 14:00 Poster TU D

Optimierung von HTSC FlipChip-Gradiometern mit SiO_2 als Isolationsmaterial — •Susan Biering, Ulrike Baldeweg, Ralf Bechstein, Christoph Becker, Veit Grosse, Frank Schmidl und Paul Seidel — Institut für Festkörperphysik, Physikalisch-Astronomische Fakultät, Friedrich-Schiller-Universität Jena, Helmholtzweg 5, 07743 Jena

Es wurden Untersuchungen zur Optimierung gradiometrischer Sensoren mit einer auf einem separaten Substrat befindlichen Antenne, welche in einer FlipChip-Konfiguration mit dem Gradiometer verbunden ist, durchgeführt. Dabei wurden zur Realisierung der Josephson-Kontakte $YBa_2Cu_3O_7$-Schichten auf $SrTiO_3$-Bikristallen eingesetzt. Um langzeitstabile, gegenüber äußeren Einwirkungen unempfindliche Sensoren herstellen zu können, ist ein Isolationsmaterial erforderlich, das zudem eine sehr niederohmige Ankontaktierung ermöglicht. In den Mittelpunkt des Interesses ist dabei das Material SiO_2 gerückt. Erste Erfahrungen mit diesem Material werden vorgestellt.

TT 23.14 Mo 14:00 Poster TU D

Elektrische Eigenschaften von $SrTiO_3$ als Isolationsschicht für Tieftemperaturanwendungen — •Veit Grosse, Hagen Wald, Michael Mans, Frank Schmidl und Paul Seidel — Institut für Festkörperphysik, Physikalisch-Astronomische Fakultät, Friedrich-Schiller-Universität Jena, Helmholtzweg 5, 07743 Jena

Mittels Laserdeposition auf dünnen YBCO-Schichten abgeschiedenes $SrTiO_3$ wurde hinsichtlich seiner elektrischen Eigenschaften und Eignung als Isolationsschicht für supraleitende Bauelemente untersucht. Neben dem erwarteten Verhalten als Schottky-Kontakt, zeigten sich auch Widerstandsänderungen, die zu einem hysteretischen Verlauf der I-U-Kennlinien führten. Es werden Erklärungsversuche für diesen Effekt präsentiert. Des weiteren wird näher auf die dielektrischen Eigenschaften des $SrTiO_3$ bei tiefen Temperaturen, sowie die supraleitenden Eigenschaften der YBCO-Schichten in einem YBCO-STO-YBCO-System eingegangen.

TT 23.15 Mo 14:00 Poster TU D

Reversible and irreversible magnetostrictive effects in untwinned $YBa_2Cu_3O_7$ crystals — •P. Popovich[1], R. Lortz[1,2,3], C. Meingast[1], S. Tajima[4], and T. Masui[4] — [1]Forschungszentrum Karlsruhe, IFP, Germany — [2]Fakultät für Physik, Universität Karlsruhe, Germany — [3]present address: DCMP, University of Geneva, Switzerland — [4]ISTEC, Tokyo, Japan

The magnetostriction coefficients, $\lambda_i = 1/L_i \cdot dL_i/dH$ (i=a,b,c), of high-pressure oxygenated untwinned $YBa_2Cu_3O_7$ single crystals are determined between 40 K and 150 K and in fields up to 10 T. Above 55K, λ is nearly reversible and is, thus, proportional to the uniaxial pressure dependence of the magnetization, which in turn provides important information about the pressure dependencies of T_c(H), the vortex melting transition T_m(H), the thermodynamical critical field H_c(T=0), κ, and the normal state susceptibility. Clear signatures in λ(H) are seen at T_m(H) and at the broadened H_{c2}. Both transitions exhibit good 3D-XY scaling, which clearly demonstrate the importance of thermal phase fluctuations. The driving force for most of the reversible magnetostriction is due to dT_c/dp_i. Below 55K and above 6-8T, λ(H) becomes irreversible due to increased flux pinning at the order-disorder Bose-glass to vortex-glass transition. In contrast to the magnetization, which shows the typical monotonic peak effect, the irreversible magnetostriction exhibits reproducible fine structure within the transition region. This may be due to nucleation of distinct vortex domains in the crystal, which would provide clear evidence for a first-order transition.

TT 23.16 Mo 14:00 Poster TU D

Raman scattering from charge ordering fluctuations in cuprates — •Leonardo Tassini[1], Francesca Venturini[1], Rudi Hackl[1], Qing-Ming Zhang[2], Andreas Erb[1], Naoki Kikugawa[3], and Toshizo Fujita[3] — [1]Walther-Meissner-Institut, Bayerische Akademie der Wissenschaften, D-85748 Garching — [2]Department of Physics, Nanjing University, Nanjing 210093, P.R. China — [3]ADSM, Hiroshima University, Higashi-Hiroshima 739-8526

The electronic Raman effect has been studied in differently doped single crystals of $La_{2-x}Sr_xCuO_4$ (LSCO) and of $Y_{0.97}Ca_{0.03}Ba_2Cu_3O_6$ (YBCO). The experimental data provide direct evidence of the formation of one-dimensional charged structures in the two-dimensional CuO_2 planes. The stripes manifest themselves in a Drude-like peak at low energies and temperatures. The selection rules allow to determine the orientation to be along the principle axes at $x = p = 0.10$ in LSCO and along the diagonals at $p = 0.02$ in LSCO and YBCO. The stripes fluctuate, and the correlation length is of the order of the electronic mean free path. In LSCO the temperature is the only scale of the response at different doping levels demonstrating the importance of quantum critical behavior. We provide an estimate of the quantum critical point in LSCO at $x_c = 0.18$.

TT 23.17 Mo 14:00 Poster TU D

Change of quasiparticle dispersion in crossing T_c in the underdoped cuprates — •Thomas Eckl[1], Werner Hanke[1], Sergey V. Borisenko[2], and Jörg Fink[2] — [1]Institut für Theoretische Physik und Astrophysik,Universität Würzburg, Am Hubland, D-97074 Würzburg, Germany — [2]Institute for Solid State Research, IFW-Dresden, P.O. Box 27 00 16, D-01171 Dresden, Germany

One of the most remarkable properties of the high-temperature superconductors is a pseudogap regime appearing in the underdoped cuprates above the superconducting transition temperature T_c. The pseudogap continously develops out of the superconducting gap. In this contribution, we demonstrate by means of a detailed comparison between theory and experiment that the characteristic change of quasiparticle dispersion in crossing T_c in the underdoped cuprates can be understood as being due to phase fluctuations of the superconducting order parameter. In particular, we show that within a phase fluctuation model the characteristic back-turning BCS bands disappear above T_c whereas the gap remains open. Furthermore, the pseudogap rather has a U-shape instead of the characteristic V-shape of a $d_{x^2-y^2}$-wave pairing symmetry and starts closing from the nodal $\vec{k} = (\frac{\pi}{2}, \frac{\pi}{2})$ directions, whereas it rather fills in at the anti-nodal $\vec{k} = (\pi, 0)$ regions, yielding further support to the phase fluctuation scenario.

TT 23.18 Mo 14:00 Poster TU D

Dynamical spin susceptibility in the d-density wave state: a comparison of theory and experiment — •Jan-Peter Ismer and Ilya Eremin — Institut für Theoretische Physik, Freie Universität Berlin, D-14195 Berlin, Germany

Inelastic neutron scattering (INS) experiments probing dynamical spin susceptibility in the pseudogap phase of the high-T_c cuprates are addressed in the framework of the ordered d-density wave(DDW) state. In particular, we analyze the formation of the resonance peak at the antiferromagnetic wave vector $\mathbf{Q}_{AF} = (\pi, \pi)$ and its dispersion in three different ordered states: d-wave superconductor (DSC), DDW state, and coexisting DDW and DSC states. Furthermore, we investigate the structure of the particle-hole continuum, the formation of so-called 'silent' bands, and most interestingly, the behavior of the upward part of the resonance peak dispersion. The new features arising due to DDW ordering are discussed.

TT 23.19 Mo 14:00 Poster TU D

Surface critical currents below and above $H_{c2}(T)$ of Niobium — •Lars von Sawilski and Jürgen Kötzler — Institut für Angewandte Physik und Zentrum für Mikrostrukturforschung, Universität Hamburg, Jungiusstrasse 11, D-20355 Hamburg, Germany

By using a conventional and a novel gradient [1] inductive method, the critical current at the surface of Nb-cylinders is measured below and above the upper critical field, respectively. Upon smoothing the surface of as-grown cylinders by chemical and electrical polishing from some 100 nm to 1 nm, not only the critical current below H_{c2} is decreased by a factor of three but also the flux-jumps disappears, possibly due to a reduction of pinning at the surface. On the other hand, $j_c(H > H_{c2})$ increased towards the value predicted for a multiply connected superconducting surface [2]. However, chemical impurities induced by polishing, may cause a strong degradation of j_c, though the critical fields are enhanced.

[1] J. Kötzler et al., PRL **92**, 067005 (2004)
[2] H. J. Fink and L. J. Barnes, PRL **15**, 792 (1965)

TT 23.20 Mo 14:00 Poster TU D

Feldabhängigkeit grenzflächeninduzierter Supraleitung — •V. Koerting[1,2], Qingshan Yuan[3], P.J. Hirschfeld[4], T. Kopp[1], J. Mannhart[1] und C.W. Schneider[1] — [1]Center for Electronic Correlations and Magnetism, EP6, Univ. Augsburg, Germany — [2]Institut fuer Theorie der Kondensierten Materie, Univ. Karlsruhe, Germany — [3]Texas Center for Superconductivity and Advanced Materials, Univ. Houston, USA — [4]Department of Physics, Univ. of Florida, Gainesville, USA

In einem zwei-dimensionalen (2D) Elektronengas betrachten wir die Cooper-Paarbildung, die durch einen benachbarten Film, bestehend aus polarisierbaren lokalen Anregungen, feldabängig induziert wird. Im Rahmen eines Modells, das die Wechselwirkung zwischen 2D Elektronen und lokalisierten Zwei-Niveau Systemen beschreibt, berechnen wir die kritische Temperatur T_c in Abhängigkeit der angelegten Spannung. Ausgehend von der Annahme, dass eine ausreichende Ladungsträgerdichte in diesem Feldeffekt-Bauelement induziert werden kann, zeigen wir, dass es möglich sein sollte, Supraleitung in solchen Systemen zu beobachten. Für die Sprungtemperatur T_c finden wir eine nicht-monotone Abhängigkeit sowohl von dem elektrischen Feld als auch von der Anregungsenergie der Zwei-Niveau Systeme.

TT 23.21 Mo 14:00 Poster TU D

Effects of disorder with finite range on the properties of d-wave superconductors — •Simon Scheffler, Kurt Scharnberg, Carsten T. Rieck, and Atif Ismail — I. Institut für Theoretische Physik, Universität Hamburg

It has long been established that disorder has profound effects on unconventional superconductors and it has been suggested repeatedly that observation and analysis of these disorder effects can help to identify the order parameter symmetry. In much of the relevant literature, including very sophisticated calculations of interference and weak localization effects, the disorder is represented by delta-function scatterers of arbitrary strength. One obvious shortcoming of this approximation is that resonant scattering resulting from the wavelength of the scattered quasiparticle matching the spatial extent of the defect is not included. We find that the mitigation of the Tc-reduction, expected when d-wave scattering is included, is very sensitive to the average strength of the scattering potential and is most effective for weak scatterers. Disorder with finite range not only has drastic effects on the predicted density of states at low energies, relevant for transport properties, but affects the spectral function

at all energies up to the order parameter amplitude. The gap structure, which does not appear to be of the simplest d-wave form, should show a defect-dependent variation with temperature, which could be detected in ARPES experiments.

TT 23.22 Mo 14:00 Poster TU D

Exchange integrals in 1D versus 2D cuprates - an electronic structure study — •Ulrike Nitzsche[1], Stefan-Ludwig Drechsler[1], and Helge Rosner[2] — [1]Leibniz Institute for Solid State and Materials Research Dresden — [2]MPI for Chemical Physics of Solids

We present a systematic study of the electronic structure and the exchange integrals for different types of 1D and 2D cuprate networks: edge and corner shared single-chain (Li_2CuO_2, Sr_2CuO_3), double-chain ($SrCuO_2$), ladder-type ($Sr_2Cu_2O_3$) and planar ($CaCuO_2$, $Sr_2CuO_2Cl_2$) arrangements. Based on full potential LSDA and LSDA+U band structure calculations and subsequently derived tight-binding models we estimate sign and magnitude of the most relevant exchange integrals. We compare the results of total energy calculations with those of various tight-binding models from one-band and multi-band approaches. We investigate the effect of the network configuration (edge shared vs. corner shared CuO_2 plaquettes) and of the dimensionality on the coupling strength. The influence of external parameters like pressure and doping is briefly discussed.

TT 23.23 Mo 14:00 Poster TU D

Strong spin triplet contribution of the first removal state in the insulating regime of Bi-cuprates — •R.-S. Unger[1], C. Janowitz[1], U. Seidel[1], A. Krapf[1], R. Manzke[1], V.A. Gavrichkov[2], and S.G. Ovchinnikov[2] — [1]Humboldt Universität zu Berlin, Institut für Physik, 12489 Berlin — [2]L.V.Kirensky Institute of Physics of the Sibirian Branch of the Russian Academy of Science, Krasnoyarsk, 660036, Russia

The experimental dispersion of the first removal state in the insulating regime of $Bi_2Sr_2Ca_{1-x}Y_xCu_2O_{8+\delta}$ is found to differ significantly from that of other parent materials: oxyclorides and La_2CuO_4. For Y-contents of $0.92 \geq x \geq 0.55$ the crystal lattice parameters a,b,c change very strongly. This (a,b) parameter increase and c parameter decrease results in an unconventional three peak structure at $(0,0); (\frac{\pi}{2},\frac{\pi}{2}); (\pi,\pi)$ for $x = 0.92$. We can describe the experimental data only beyond the framework of the 3-band pd-model involving the representations of a new triplet counterpart for the Zhang-Rice singlet state [1]. The former results, obtained on a cuprate with two CuO_2-layers per unit cell, is found to be universal. Measurements on single layered $Bi_2Sr_{2-x}La_xCu_2O_{6+\delta}$ give similar results.
[1] JETP Lett, 80(11) in print. (2004)

TT 23.24 Mo 14:00 Poster TU D

Angular resolved photoemission on Pb-Bi2201: Doping-dependent evolution of the pseudogap in the underdoped case — •L, Dudy[1], B. Müller[1], L. Lasogga[1], A. Krapf[1], H. Dwelk[1], C. Janowitz[1], R. Manzke[1] und H. Höchst[2] — [1]Humboldt Universität zu Berlin, Institut für Physik, Newtonstr. 15, 12489 Berlin — [2]Synchrotron Radiation Center (SRC), Madison/Wisconsin (USA)

In search for the pairing mechanism of the hole doped HTSCs there is still a debate about the pseudogap [1]. Some groups report a vanishing pseudogap around optimum doping [2]. Other measurements show in the overdoped region a smooth convergence of the pseudogap temperature with T_c, which gives the idea to treat the pseudogap state as a normal state precursor of the superconducting gap due to local, dynamic pairing correlations in a state without long range phase coherence[3]. An important point has been observed in the layered cuprates, which show that the pseudogap temperature T^* is almost not dependent of the number of CuO layers[4]. We focus our work on measurements of the Pb and La doped one-layer Bi2201 single crystals. Here we present temperature dependent ARPES data from the optimum doped Pb-Bi2201 ($T_c = 32K$) down to the strongly underdoped ($T_c \sim 0K$) case. The data shows the evolution of the pseudogap temperature T^* and the magnitude Δ^* with respect to doping. [1] T. Timusk et al., Rep. Prog. Phys. **62** (1999), 61-122 [2] J.L. Tallon et. al., Physica C **282-287** (1997) 236-239 [3] V.J. Emery et al., Nature **374** (1995), 434 [4] T. Honma et al., cond-mat/0309597 (2003), accepted for Phys. Rev. B

TT 23.25 Mo 14:00 Poster TU D

Four-Unit-Cell Superstructure in the Optimally Doped $YBa_2Cu_3O_{6.92}$ Superconductor — •Z. Islam[1], X. Liu[2], S.K. Sinha[2], J.C. Lang[1], S.C. Moss[3], D. Haskel[1], G. Srajer[1], P. Wochner[4], D.R. Lee[1], D.R. Haeffner[1], and U. Welp[5] — [1]Advanced Photon Source, ANL, Argonne, USA — [2]University of California, San Diego, USA — [3]University of Houston, USA — [4]MPI f. Metallforschung, Heisenbergstr. 3, 70569 Stuttgart — [5]Materials Science Division, ANL, Argonne, USA

Diffuse x-ray scattering measurements reveal that the optimally doped $YBa_2Cu_3O_{6.92}$ superconductor is intrinsically modulated due to the formation of a kinetically limited 4-unit-cell superlattice, $q_0 = (1/4, 0, 0)$, along the shorter Cu-Cu bonds. Long-range strains emanating from these modulated regions generate an inhomogeneous lattice which may play a fundamentally important role in the electronic properties of yttrium-barium-copper-oxides.

TT 23.26 Mo 14:00 Poster TU D

Competing magnetic instabilities in 214-ruthenates — •P. Steffens[1], O. Schumann[1], O. Friedt[1], M. Braden[1], Y. Sidis[2], J. Kulda[3], S. Nakatsuji[4], N. Kikugawa[4], and Y. Maeno[4] — [1]II. Physikal. Institut, Uni Köln — [2]LLB, France — [3]ILL, France — [4]Kyoto University, Japan

We present the results of inelastic neutron scattering on pure and doped Sr_2RuO_4.

The role of magnetic excitations in the pairing mechanism of the spin-triplet superconductor Sr_2RuO_4 is still unclear. The excitation spectrum is dominated by incommensurate fluctuations (caused by Fermi-surface-nesting) at q=(0.3,0.3,q_l). We determined their anisotropy of in-plane and out-of-plane component. In addition, we found a broad ferromagnetic signal (presumably the γ-band contribution) around q=0.

On minor substitution of Ru^{4+} by Ti^{4+}, the incommensurate fluctuations get enhanced and finally condense into static order. We present first results on the excitation spectra of samples with and without order.

Doping with La increases the number of electrons, and the shift of the nesting signal indicates that the filling occurs predominantly in the one-dimensional bands.

Especially interesting is the phase diagram created by substitution of Sr by Ca. The compounds near $Ca_{1.5}Sr_{0.5}RuO_4$ show almost ferromagnetic behaviour. In contrast to Sr_2RuO_4, the excitation spectrum is dominated by fluctuations at (0.22,0,0). At low energy and temperature the spectrum becomes ferromagnetic.

TT 23.27 Mo 14:00 Poster TU D

Renormalization group studies of pairing mechanism and order parameter symmetry in Sr2RuO4 — •Andrey Katanin[1,2], Arno Kampf[3], and Ivan Leonov[3] — [1]Max-Planck-Institut fuer Festkoerperforschung, 70569 Stuttgart, Germany — [2]Institute of Metal Physics, 620219 Ekaterinburg, Russia — [3]Institut fuer Physik, Theoretische Physik III, Elektronische Korrelationen und Magnetismus, Universitaet Augsburg, 86135 Augsburg, Germany

We study superconducting pairing in Sr2RuO4 by application of the functional renormalization group method combined with the Bethe-Salpeter analysis to realistic 3-band Hubbard model, which describes this compound. The competition of singlet and triplet pairings with different symmetries is investigated within this model. The results are compared to earliar proposals on the mechanism of triplet pairing in Sr2RuO4.

TT 23.28 Mo 14:00 Poster TU D

Magnetic quantum oscillations in the normal and superconducting state of YNi_2B_2C — •O. Ignatchik[1], J. Wosnitza[1], M. Jäckel[1], D. Souptel[2], G. Behr[2], and P. Canfield[3] — [1]Institut für Festkörperphysik, TU Dresden, D-01062 Dresden, Germany — [2]Leibniz-Institut für Festkörper- und Werkstoffforschung (IFW), D-01069 Dresden, Germany — [3]Ames Laboratory, Iowa State University, Ames, Iowa 50011, USA

The de Haas–van Alphen (dHvA) effect, or quantum oscillations of the magnetization, is the most direct method to study Fermi-surface properties in metals. It is remarkable, that these magnetic quantum oscillations persist deep into the vortex state of many type-II superconductors. The damping of the oscillation amplitude below the upper critical field can be related to the magnitude of the superconducting gap. For YNi_2B_2C, however, quite controversial results for the dHvA signal in the superconducting state have been reported. We will present dHvA measurements of YNi_2B_2C single crystals prepared by different methods. The flux-grown

crystals exhibit dHvA oscillation in the superconducting state down to 3 T as reported in literature. However, we observed an unexpectedly sudden vanishing of the dHvA signal in the mixed state for crystals grown by a zone-melting method. The very quick disappearance of the oscillating signal below B_{c2} suggests an unexpected fast opening of a large superconducting gap. At high magnetic fields six different dHvA frequencies could be detected.

TT 23.29 Mo 14:00 Poster TU D

Lattice dynamics and electron-phonon coupling in $YBa_2Cu_4O_8$ — •V. Pankoke[1], R. Heid[2] und K.-P. Bohnen[2] — [1]Forschungszentrum Karlsruhe, Institut für Wissenschaftliches Rechnen, P.O.B. 3640, D-76021 Karlsruhe — [2]Forschungszentrum Karlsruhe, Institut für Festkörperphysik, P.O.B. 3640, D-76021 Karlsruhe

The superconducting properties of YBaCuO depend strongly on the oxygen content thus it is of crucial importance to understand the lattice dynamics and the electron-phonon coupling as function of doping. While it has been possible to investigate these quantities recently with modern ab-initio methods [1] studying doping effects is a much more difficult task due to the loss of translational invariance. Fortunately, some ordered structures exist which can be treated rigorously with moddern density functional methods. Among these $YBa_2Cu_4O_8$ plays a special role due to the fact that this compound contains double Cu-O chains a structural building block which is very rare in the high-T_c ccompounds. Using the density functional perturbation approach we have studied the lattice dynamics and electron-phonon coupling of $YBa_2Cu_4O_8$. Results will be compared with available experimental data. Good agreement between calculated and measured vibration frequencies was obtained however eigenvectors inferred from experiments differ in some cases substantially from the calculated ones. These differences will also be discussed.

[1] K.-P. Bohnen, R. Heid, M. Krauss, Europhys. Lett. **64**, 104 (2003)

TT 23.30 Mo 14:00 Poster TU D

Electronic structure and weak electron-phonon coupling in TiB_2 — •Eugenio Forzani[1] and Helge Rosner[2] — [1]I. Physikalisches Institut, Universität Göttingen — [2]MPI for Chemical Physics of Solids, Dresden

The Fermi surface of TiB_2 was studied with the de Haas-van Alphen (dHvA) effect in order to clarify the electronic analogies with the previously investigated ZrB_2 [1]. This effort intends to revise a past work [2], which accused sample limitations, and to extend the investigation of the transition metal diborides of the fourth group. For a definite assignment of all the dHvA frequencies the angular dependencies of the extremal cross-section areas are estimated from full-potential band structure calculations [3]. In order to explain the absence of conventional superconductivity also in this diboride compound, the electron-phonon coupling constants are deduced from the experimental and theoretical datas. Developments of the measurement technique and new goals are discussed.

[1] S.L. Drechsler et al., J. of Low Temp. Phys. 131, 5/6 (2003)
[2] T. Tanaka and Y. Ishizawa, J. Phys. C: Solid St. Phys. 13, 6671-6 (1980)
[3] H. Rosner et al., Phys. Rev. B66, 024521 (2002)
*With grant of the Göttingen Graduate School of Physics

TT 23.31 Mo 14:00 Poster TU D

Electronic structure and electron phonon coupling in Sc doped MgB2 — •Vivien Petzold and Helge Rosner — MPI for Chemical Physics of Solids

Recently, Agrestini et al. reported a detailed study of the effects of Sc substitution in $Mg_{1-x}Sc_xB_2$ [1]. For the achievable Sc doping levels (x=0.12...0.27), the compound shows only a very small lattice expansion, allowing this way the separation of lattice and doping effects on the critical temperature $T_c(x)$ and on the frequency $\omega_{E_{2g}}$ of the E_{2g} phonon. To investigate the influence of the Sc concentration x on the electronic properties, we present band structure calculations using different levels of approximation: rigid band and virtual crystal approach as well as supercell calculations and coherent potential approximation. We show that the latter two lead to consistent results with respect to lattice expansion and electronic properties (density of states, Fermi surfaces). We demonstrate that the doping dependent changes in the electronic structure are strongly influenced by the sp^2(B)-d(Sc) hybridization. The dependence of the electronic topological transition proposed by Agrestini et al.[1] from the Sc concentration is discussed.

[1] Agrestini et al. Phys. Rev. B **70** 134514 (2004).

TT 23.32 Mo 14:00 Poster TU D

Observation of a second energy gap in Nb_3Sn — •M. Marz[1], R. Lortz[2], A. Junod[2], W. Goldacker[3], and G. Goll[1] — [1]Physikalisches Institut, Universität Karlsruhe, D-76128 Karlsruhe, Germany — [2]Department of Condensed Matter Physics, University of Geneva, CH-1211 Geneva 4, Switzerland — [3]Forschungszentrum Karlsruhe, Institut für Technische Physik, D-76021 Karlsruhe, Germany

Nb_3Sn is a well-known technically applied superconductor with critical temperature $T_c \approx 18$ K. Recently, a low-temperature anomaly in the specific-heat data on a particularly dense and homogeneous polycrystalline sample has been interpreted in terms of the presence of a second superconducting gap [1]. We performed point-contact spectroscopy on samples of the same batch using the break-junction technique. A small bar of Nb_3Sn has been broken at liquid-helium temperature in order to obtain a freshly cleaved surface. We measured the differential resistance as a function of applied voltage in the temperature range between 1.5 and 20 K. Several characteristic minima in the dV/dI vs V curves can be interpreted only under the assumption of two superconducting energy gaps in Nb_3Sn. From a comparison with calculated curves for superconductor-superconductor contacts we deduced a large gap $\Delta_L = 3.5 \pm 0.2$ meV and a small gap of $\Delta_S = 0.8 \pm 0.2$ meV. This is the first spectroscopic confirmation of two-gap superconductivity in Nb_3Sn. We note that Δ_L is in line with previous tunnelling measurements and the result confirms the interpretation of the specific-heat data.

[1] V. Guritanu *et al.*, Phys. Rev. B (2004) in print.

TT 23.33 Mo 14:00 Poster TU D

Investigation of $CeCoIn_5$/Pt point contacts in the normal and superconducting states — •Stefan Kontermann[1], Gernot Goll[1], Todd Sayles[2], and M. Brian Maple[2] — [1]Physikalisches Institut, Universität Karlsruhe, 76128 Karlsruhe — [2]Institute for Pure and Applied Physical Sciences, University of California, San Diego, La Jolla, CA 92093, USA

The ternary rare-earth compound $CeCoIn_5$ becomes superconducting for temperatures $T \leq 2.3$ K, the highest transition temperature among the heavy-fermion superconductors. Power-law behavior of the specific heat and the thermal conductivity in the superconducting state give evidence that the superconductivity in this material is unconventional. We report on investigations of $CeCoIn_5$ by point-contact spectrocopy with Pt as the normal-metal counterelectrode. In the normal state a pronounced asymmetry of the differential resistance dV/dI as a function of applied bias V is observed which becomes more pronounced as the temperature is reduced. For a contact in the ballistic regime the asymmetry can be attributed to the emergence of the coherent heavy-fermion liquid. In the superconducting state Andreev reflection of quasiparticles at a normal metal/superconductor interface leads to characteristic minima in the dV/dI vs V spectra. We measured spectra which show either a reduced resistance for bias $|V| < \Delta/e$ or a single minimum of dI/dV for $V = 0$, i. e. a zero-bias anomaly. The observation of a zero-bias anomaly is expected only if the order parameter exhibits a sign change as a function of $\vec{k}$ which leads to an Andreev bound state at the surface.

TT 23.34 Mo 14:00 Poster TU D

Unusual electronic and magnetic properties of intermetallic antiperovskites — •Claire Loison, Andreas Leithe-Jasper, and Helge Rosner — Max Planck Institut für Chemische Physik fester Stoffe, Nöthnitzerstrasse 40, 01187 Dresden, Germany

In the last years, cubic perovskites XYT_3 (X=Mg,Cu,La..., Y=B,C,N... and T a transition metal) have received considerable attention because of many unusual physical properties caused by different competing interactions. Examples are the recently discovered superconductor $MgCNi_3$ or the non-collinear magnet $CuNMn_3$. Here, we present a systematic study of a series of antiperovskites (RB_xPd_3 where R is a rare-earth metal, and x varies between 0 and 1) using density functional theory (DFT) electronic structure calculations within the local spin density approximation (LSDA). To investigate the role of possible strong Coulomb repulsion we applied as well LSDA+U. We investigate the effects of pressure and doping on the electronic properties and magnetism. In order to interpret the discrepancies between the results on the lattice constants of LaB_xPd_3 as published by Dhar et al.[1] and our theoretical calculations, we examined this compound experimentally too. The insertion of boron in $LaPd_3$ (a=4.1862(1)Å) could not be detected, but the exposure to oxygen resulted in an increased lattice constant of a=4.2368(2)Å close to the value published in [1]. They report a lattice constant independent of x; according to our calculations, it should increase almost linearly and sub-

stantially with x. Thus, our results are inconsistent with the formation of LaB_xPd_3.
[1] Dhar et al. Mat. Res. Bull. **16** 1557 (1981).

TT 23.35 Mo 14:00 Poster TU D

Mirage phenomena in quantum corrals of s-wave superconductors — •Markus Schmid and Arno P. Kampf — Theoretical Physics III, Center for Electronic Correlations and Magnetism, Institute of Physics, University of Augsburg, 86135 Augsburg

We investigate the local density of states (LDOS) for an s-wave superconductor in an elliptic quantum corral. Using a T-matrix analysis we explore the spatial structure of the LDOS in the presence of one or two magnetic/non-magnetic impurities and observe a variety of quantum mirage phenomena. In particular, we discuss mirage effects for localized impurity bound states and analyze the interference patterns for the scattering processes from two magnetic impurities in the quantum corral.

TT 23.36 Mo 14:00 Poster TU D

Josephson current through a Pb/Cu/Pb nanobridge — •Jonas Hanisch[1], Alexander Cosceev[1], Christoph Sürgers[1], Hilbert v. Löhneysen[1,2], and Gernot Goll[1] — [1]Physikalisches Institut, Universität Karlsruhe, D-76128 Karlsruhe, Germany — [2]Forschungszentrum Karlsruhe, Institut für Festkörperphysik, D-76021 Karlsruhe, Germany

The superconducting state is a macroscopic quantum state characterized by a macroscopic wave function with amplitude and phase. The Josephson effect which occurs through a weak link between two superconductors is a direct consequence of the macroscopic phase carried by each superconductor. There exist several possibilities to manufacture a weak link. Here we report on a simple fabrication method and the characterization of planar Josephson contacts between two Pb electrodes weakly coupled through a Cu nanobridge on a sapphire substrate. In these superconductor (S)/normal metal (N)/superconductor junctions the Josephson coupling is mediated via the proximity effect at the S/N interfaces. For a long dirty junction ($l \ll \xi_N$, where l is the mean-free-path and ξ_N is the coherence length in N) the Josephson current I_c is proportional to $L/\xi_N \cdot \exp(-L/\xi_N)$ which gives an upper limit for the length L of the normal-metal bridge in order to observe Josephson coupling. A Josephson current of up to $750\,\mu$A at $1.5\,$K was observed in junctions with L well below $1\,\mu$m which is only 1/8 of the theoretically expected value. The reduction might originate from oxide layers at the normal metal/superconductor interfaces. The temperature and magnetic-field dependence of the Josephson current was investigated as well.

TT 23.37 Mo 14:00 Poster TU D

Alternative mechanism of the sign-reversal effect in Superconductor-Ferromagnet-Superconductor Josephson Junctions — •Alexandra Anishchanka[1] and Anatoli Volkov[1,2] — [1]Theoretische Physik III, Ruhr-Universität Bochum, D-44801, Germany — [2]Institute of Radioengineering and Electronics of the Russian Academy of Sciences, 103907 Moscow, Russia

We consider a simple model of a multidomain superconductor-ferromagnet-superconductor (SFS) Josephson junction. Sign-alternating magnetization M in domains leads to a spatial modulation of the phase difference $\phi(x)$. Due to this modulation the Josephson critical current I_c may have a different sign depending on the ratio of the magnetic flux in a domain, $4\pi Ma(2d_F)$, and the magnetic flux quantum. Just this, but not a nonmonotonic dependence of the local critical current density j_c, may be the reason for oscillations of the current I_c as a function of the F layer thickness $2d_F$ or temperature, observed in experiments.

TT 23.38 Mo 14:00 Poster TU D

Superconducting/ferromagnetic proximity effect mediated by Cr-spacer layers in the Fe/Cr/V/Cr/Fe thin film system — •M. Fattakhov[1], I. Garifullin[2], L. R. Tagirov[3], K. Westerholt[1], and H. Zabel[1] — [1]Institut für Experimentalphysik/Festkörperphysik Ruhr-Uni 44780 Bochum — [2]Zavoisky Physical-Technical Institute, 420029 Kazan, Russia — [3]Kazan State University, 420008 Kazan, Russia

We have studied the superconducting proximity effect in the thin film system Fe/Cr/V/Cr/Fe where the Cr layers play the role of screening layers between the superconducting V-layer and the strongly pair breaking Fe-layers. When keeping the thickness of the Fe-layers d_{Fe} fixed and varying the thickness of the Cr-layers d_{Cr}, the superconducting transition temperature T_c first rises reaching a maximum at d_{Cr}=40 Å and then sharply drops for larger Cr-thickness. Keeping d_{Cr} constant and varying d_{Fe} the superconducting transition temperature becomes independent on d_{Fe} for $d_{Cr} > 40$Å. The results demonstrate that the Cooper pairs penetrate into the Cr-layer to a depth of about 40 Å. From our experimental results we suggest that the Cr-layer is nonmagnetic for $d_{Cr} < 40$ Å and undergoes a transition to an incommensurate spin density wave state for $d_{Cr} > 40$Å.

TT 23.39 Mo 14:00 Poster TU D

Non-ideal artificial phase discontinuity and fractional vortex dynamics in long Josephson 0-κ-junctions. — •Edward Goldobin[1], Tobias Gaber[1], Dieter Koelle[1], Reinhold Kleiner[1], Michael Siegel[2], and Manfred Neuhaus[2] — [1]Physikalisches Institut — Experimentalphysik II, Universität Tübingen, Auf der Morgenstelle 14, 72076 Tübingen — [2]Institut für Mikro- und Nanoelektronische Systeme, Universität Karlsruhe, Hertzstr. 16, 76187 Karlsruhe

We investigate the creation of an arbitrary κ-discontinuity of the Josephson phase in a long Nb-AlO_x-Nb Josephson junction (LJJ) using a pair of tiny current injectors, and study the formation of fractional vortices formed at this discontinuity. The current $I_{\rm inj}$, flowing from one injector to the other, creates a phase discontinuity $\kappa \propto I_{\rm inj}$. The calibration of injectors is discussed in detail. The small but finite size of injectors leads to some deviations of the properties of such a 0-κ-LJJ from the properties of a LJJ with an ideal κ-discontinuity. These experimentally observed deviations in the dependence of the critical current on $I_{\rm inj}$ and magnetic field can be well reproduced by numerical simulation assuming a finite injector size. The physical origin of these deviations is discussed. Furthermore, we present new experimental results on the dynamics of arbitrary fractional vortices and report the observation of semi-integer zero field steps corresponding to $n = \frac{3}{2}$ and $n = \frac{5}{2}$.

TT 23.40 Mo 14:00 Poster TU D

Polarised SANS measurements of the FLL in niobium — •Sebastian Mühlbauer[1], Robert Georgii[2] und Peter Böni[1] — [1]TU-München Physikdepartment E21 — [2]ZWE FRM II TU-München

We report on polarised small angle neutron scattering (SANS) on the flux line lattice (FLL) of a well known classic superconductor, niobium on the reflectometer MIRA at the FRM-II in Garching. The six-fold symmetry of the scattering pattern of the FLL was recorded with a two-dimensional position sensitive SANS detector using a horizontal and vertical field geometry and an incident wavelenght of 10 Å. Even the second order peaks could be observed. We examined the chirality of the FLL, especially close to the on-set of the so-called flux line melting. The results of these measurements will be dicussed with special emphasis on future measurements on high T_c superconducters.

TT 23.41 Mo 14:00 Poster TU D

Surface potential in superconductors — P. Lipavský[1], •K. Morawetz[2,3], Jan Koláček[1], J.J. Mares[1], E.H. Brandt[4], and M. Schreiber[2] — [1]Institute of Physics, Academy of Sciences, Cukrovarnická 10, 16258 Praha 6, Czech Republic — [2]Institute of Physics, Chemnitz University of Technology, 09107 Chemnitz, Germany — [3]Max-Planck-Institute for the Physics of Complex Systems, Nöthnitzer Str. 38, 01187 Dresden, Germany — [4]Max-Planck-Institute for Metal Research, D-70506 Stuttgart, Germany

The electrostatic potential close to the surface of superconductors in the Meissner state is discussed. We show that beside the Bernoulli potential, the quasiparticle screening, and the thermodynamic contribution due to Rickayzen, there is a non-local contribution which is large for both type-I and weak type-II superconductors [1]. A generalization of the Budd-Vannimenus theorem is found which allows one to evaluate the observed potential without the explicit solution of the charge profile at the surface [2]. The electrostatic potential above the Abrikosov vortex lattice is evaluated numerically. We propose an experimental measurement by NMR [3] to access this field which can yield informations about material parameters.
[1] P. Lipavský, K. Morawetz, J. Koláček, J. J. Mareš, E. H. Brandt, M. Schreiber, Phys. Rev. B 69 (2004) 024524-1-7
[2] P. Lipavský, K. Morawetz, J. Koláček, J. J. Mareš, E. H. Brandt, M. Schreiber, Phys. Rev. B 70 (2004) 104518-1-7
[3] P. Lipavský, J. Kolacek, K. Morawetz, E. H. Brandt, Phys. Rev. B 66 (2002) 134525

TT 23.42 Mo 14:00 Poster TU D

Vortex dynamics in Nb films on faceted substrate surfaces — •Oleksiy K. Soroka[1], Michael Huth[2], Valerij A. Shklovskij[3], Jens Oster[1], and Hermann Adrian[1] — [1]Institute of Physics, Johannes Gutenberg-University, Staudinger Weg 7, D-55099 Mainz, Germany — [2]Institute of Physics, Johann Wolfgang Goethe-University, Robert-Mayer-Str. 2-4, D-60054 Frankfurt, Germany — [3]Kharkiv National University, Physical Department, 4 Svobody Sq., 61077 Kharkiv, Ukraine

Anisotropy of the viscous damping force in superconductor can lead to the existence of the preferred directions for the vortices to move. Such a guided vortex motion leads to the appearance of new components in the galvanomagnetic response of the sample: an additional odd longitudinal and even transversal magnetoresistive components with respect to magnetic field reversal.

Perfect vortex guiding alon the facet rigdes was proved in Nb-films on faceted α-Al_2O_3 by magnetoresistivity measurements. The thin film sample consisted of five microbridges oriented at the angles 0°, 30°, 45°, 60° and 90° with respect to the facet ridges. Field inversion was used to separate the even and odd components of the magnetoresistivities to obtain the contributions caused by the guided vortex motion.

The temperature dependences of the even longitudinal magnetoresistivity of the samples could be well fitted within the theoretical approach proposed by V. A. Shklovskij, using for the isotropic and anisotropic pinning potential a simple potential with a symmetric triangular wells whose depths were estimated from the experimental data.

TT 23.43 Mo 14:00 Poster TU D

Einfluss akustischer Oberflächenwellen auf die gemischte Phase in MgB_2 — •Andreas Heinrich[1], Christian Leirer[1], Rudolf Schneider[2], Bernd Stritzker[1] und Achim Wixforth[3] — [1]Universität Augsburg, EP IV, 86135 Augsburg — [2]Forschungszentrum Karlsruhe, IFP, Karlsruhe — [3]Universität Augsburg, EPI, 86135 Augsburg

Durch Einkoppeln elektromagnetischer Wellen in piezoelektrische Substrate können in diesen akustische Oberflächenwellen erzeugt werden. Dabei begleitet die Gitterdeformation einer solchen Welle immer auch ein elektrisches Feld. Beide Größen können dazu genutzt werden, um dünne Filme, welche auf das Substrat abgeschieden wurden, zu untersuchen bzw. zu beeinflussen. In dieser Arbeit wollen wir die Untersuchung von MgB_2 in der gemischten Phase mit Hilfe von akustischen Oberflächenwellen vorstellen. Einerseits wird auf die strukturellen und supraleitenden Untersuchungen der auf $LiNbO_3$ abgeschiedenen Schichten eingegangen. Trotz der stark unterschiedlichen Gitterparameter zwischen MgB_2 und $LiNbO_3$ konnten Schichten mit hoher kritischer Temperatur abgeschieden werden. Andererseits werden die Ergebnisse der Dämpfungsmessungen vorgestellt. Dabei zeigt sich, dass der Verlauf der Dämpfung durch ein BCS-artiges Verhalten beschrieben werden kann. Letztlich werden noch Anzeichen eines Akusto-elektrischen Effektes skizziert.

TT 23.44 Mo 14:00 Poster TU D

Shadow on the wall cast by an Abrikosov vortex — •Siegfried Graser, Christian Iniotakis, Thomas Dahm, and Nils Schopohl — Lehrstuhl für Theoretische Festkörperphysik, Auf der Morgenstelle 14, 72076 Tübingen

At the surface of a d-wave superconductor, a zero-energy peak in the quasiparticle spectrum can be observed. This peak appears due to Andreev bound states and is maximal if the nodal direction of the d-wave pairing potential is perpendicular to the boundary. We examine the effect of a single Abrikosov vortex in front of a reflecting boundary on the zero-energy density of states. We can clearly see a splitting of the low-energy peak and therefore a suppression of the zero-energy density of states in a shadow-like region extending from the vortex to the boundary. This effect is stable for different models of the single Abrikosov vortex, for different mean free paths and also for different distances between the vortex center and the boundary. This observation promises to have also a substantial influence on the differential conductance and the tunneling characteristics for low excitation energies.

TT 23.45 Mo 14:00 Poster TU D

Vortex core structure of a two-gap superconductor — •Andreas Gumann, Siegfried Graser, Thomas Dahm und Nils Schopohl — Universität Tübingen, Lehrstuhl für Theoretische Festkörperphysik, Auf der Morgenstelle 14, 72076 Tübingen, Germany

The recently discovered superconductor MgB_2 is believed to be a superconductor with two gaps. A single vortex line in such a system thus consists of two components, which are coupled to each other. Here, we present theoretical calculations of the core structure of such a vortex. Recently, it has been argued that Ginzburg-Landau theory cannot give a sufficient description of this situation. Therefore, we use quasiclassical Eilenberger theory employing the Riccati method. We present results for the self-consistently determined gap function and the local density of states in the vicinity of the vortex in the clean limit.

TT 23.46 Mo 14:00 Poster TU D

Local density of states at faceted boundaries of d-wave superconductors — •Christian Iniotakis, Siegfried Graser, Thomas Dahm, and Nils Schopohl — Universität Tübingen, Lehrstuhl für Theoretische Festkörperphysik, Auf der Morgenstelle 14, 72076 Tübingen, Germany

The local density of states at the boundary of a superconductor is a crucial factor in many experiments, for example tunneling measurements. For conventional s-wave superconductors, the local density of states at the boundary is practically the same as in the bulk. In particular, the specific boundary geometry is irrelevant. In the case of d-wave symmetry, however, the situation is completely different. Apart from the well-known formation of Andreev bound states at the surface, it is important to realize that for d-wave symmetry also the boundary geometry itself can have strong influence on the local density of states. In this work, we examine the local density of states at the surface of a d-wave superconductor for some basic examples of polygonal and faceted boundary geometries. We also consider the additional influence of a single Abrikosov vortex pinned near the boundary geometry.

TT 23.47 Mo 14:00 Poster TU D

Elektrische Untersuchung serieller intrinsischer Josephsonkontaktarrays an dünnen $Tl_2Ba_2CaCu_2O_{8+x}$ Schichten auf r-cut Saphir und 20° vicinalem $LaAlO_3$ — •Matthias Büenfeld[1], Ralf Bechstein[1], Michael Mans[1], Frank Schmidl[1], Alexandr Grib[2], Henrik Schneidewind[3] und Paul Seidel[1] — [1]Institut für Festkörperphysik, Friedrich-Schiller-Universität Jena, Helmholtzweg 5, 07743-Jena, Deutschland — [2]Physics Department, Kharkov National University, 61077 Kharkov, Ukraine — [3]IPHT Jena, Albert - Einstein - Str. 9, 07745-Jena, Deutschland

Zur Messung intrinsischer Josephsoneffekte wurden TBCCO Schichten zum einen auf Saphir hergestellt und zu Mesas strukturiert, zum anderen auf 20° vicinalem $LaAlO_3$ hergestellt und zu brückenartigen Strukturen strukturiert. Für eine Anwendung dieser Kontaktarrays ist es wichtig eine Synchronisation der Kontakte zu erreichen. Aus diesem Grund haben wir die Arrays in Resonatoren platziert. Zur Optimierung der Resonatoreigenschaften für Mesa-artige Arrays ist es nötig die Eigenschaften der dielektrischen Zwischenschicht zu kennen. Zu diesem Zweck wurden verschiedene Isolatormaterialien von uns untersucht. Für die brückenartigen Kontaktarrays wird gezeigt, wie sich ein zusätzlicher normalleitender Shunt auf die Möglichkeit der Synchronisation auswirkt. Sie wurden hierzu mit Goldschichten versehen und in einem Resonator platziert. Erste Ergebnisse werden vorgestellt. Diese Arbeit wurde gefördert durch die DFG (Nr. Se 664/10-3)

TT 23.48 Mo 14:00 Poster TU D

Intrinsic Josephson effects in the ferromagnetic superconductor $RuSr_2GdCu_2O_8$ — •T. Nachtrab[1], D. Koelle[1], R. Kleiner[1], C. T. Lin[2], C. Bernhard[2], R. Koch[3], and P. Müller[3] — [1]Physikalisches Institut - Experimentalphysik II, Universität Tübingen, 72076 Tübingen — [2]Max-Planck-Institut für Festkörperforschung, 70569 Stuttgart — [3]Physikalisches Institut III, Universität Erlangen-Nürnberg, 91058 Erlangen

The crystal lattice of the ruthenocuprate $RuSr_2GdCu_2O_8$ (Ru1212) can be described as an alternating stack of weakly ferromagnetic ($T_{mag} \approx 130\,\mathrm{K}$) RuO_2 and superconducting ($T_c \approx 55\,\mathrm{K}$) CuO_2 layers, separated by an insulating barrier of SrO. Besides the existence of an intrinsic Josephson effect as, e.g., in $Bi_2Sr_2CaCu_2O_{8+\delta}$ (Bi2212), more exotic phenomena, like the formation of intrinsic π-junctions, have been predicted due to the coexistence of ferromagnetism and superconductivity.

We present magnetization and electrical interlayer transport measurements on micron-sized single crystals of Ru1212. The magnetization data differ from former results on polycrystalline samples, confirming the anisotropic structure of the system. The transport measurements show clear evidence for an intrinsic Josephson effect below T_c [1]. Data

obtained in magnetic fields reveal that fluxon motion takes place in a very similar fashion as in Bi2212. Although the RuO_2 subsystem gives a clear fingerprint in the transport data near T_{mag}, we did not observe any unconventional behavior due to the interplay of magnetism and superconductivity at low temperatures.

[1] T. Nachtrab *et al.*, Phys. Rev. Lett. **92**, 117001 (2004)

TT 23.49 Mo 14:00 Poster TU D

A LT-STM for spectroscopy on finite superconducting proximity structures — •Christian Debuschewitz, Frank Münstermann, Vojko Kunej, and Elke Scheer — Department of Physics, University of Konstanz, 78457 Konstanz

We present a low temperature STM for spectroscopy on finite superconducting proximity structures. The nonmagnetic STM head is based on a slip-stick coarse approach and works in a conventional ^{3}He cryostat at $T = 240$ mK and a magnetic field up to 1 T. All electrical lines are radio-frequency filtered at low temperature in order to achieve the required energy resolution. For the determination of the energy resolution we measure the superconducting gap of aluminium at 240 mK. The proximity sturcture is fabricated by e-beam lithography and consists of normal metal islands (Au) on top of a superconducting plane (Al).

TT 23.50 Mo 14:00 Poster TU D

Fractional thermal magnetoconductance of one-dimensional proximity systems — •Grigory Tkachov — Institute for Theoretical Physics, Regensburg University, 93040 Regensburg, Germany

While phase-coherent charge transport in mesoscopic normal metal/superconductor systems has been receiving considerable attention, heat conduction properties of such proximity structures have been explored to a much lesser extent (see, e.g. Refs. [1,2]). The purpose of this talk is to present a theoretical study of anomalous magnetic field behaviour of heat transport in quasi-one-dimensional ballistic wires coupled in parallel to superconductors [3,4]. The proximity effect is described in terms of Andreev bound states whose spectrum acquires a minigap due to the mixing of particle and hole states in the wire. In the presence of a magnetic field B, a specific interplay between the Zeeman spin splitting and the effect of a proximity-induced screening supercurrent is found to preserve time-reversal symmetry for certain groups of Andreev states with the minigap independent (or weakly dependent) of B. In this regime the low-temperature thermal magnetoconductance of the wire is predicted to increase in portions equal to half of the thermal conductance quantum.

[1] J. Eom, C.-J. Chien, and V. Chandrasekhar, Phys. Rev. Lett. **81** 437 (1998); A. Parsons, I. A. Sosnin, and V. T. Petrashov, Phys. Rev. B **67** 140502 (2003).
[2] E. V. Bezuglyi and V. Vinokur, Phys. Rev. Lett. **91** 137002 (2003).
[3] G. Tkachov, to appear in Physica C (2005);cond-mat/0402158.
[4] G. Tkachov and V. I. Fal'ko, Phys. Rev. B **69** 092503 (2004).

TT 23.51 Mo 14:00 Poster TU D

Oscillations of Superconducting T_c in Nb/Cu_xNi_{1-x} Bilayers With Subnanometer Thick Ferromagnetic Layer — •V. I. Zdravkov[1,2], A. S. Sidorenko[1,3], V. Ryazanov[4], V. Oboznov[4], M. Schreck[2], S. Gsell[2], S. Horn[2], C. Mueller[2], and A. Wixforth[2] — [1]Institute of Applied Physics, MD-2028 Kishinev, Moldova — [2]Institut für Physik, Universität Augsburg, D-86159 Augsburg, Germany — [3]Institute of Applied Physics, Universität Karlsruhe, D-76128 Karlsruhe — [4]Institute of Solid State Physics, RU-Chernogolovka, Russia

Present work reports the results of proximity effect investigation for superconducting Nb/CuNi-bilayers with the thickness of the ferromagnetic layer (Cu_xNi_{1-x}) being in sub-nanometer scale. It was found a non-monotonic behavior of the critical temperature, T_c ,i.e. its growth with the ferromagnetic layer thickness increasing , dF,for series of samples with constant thicknesses of Nb layer, dNb = const. The samples were prepared on Si substrates using magnetron sputtering for Nb layer and RF-cathode sputtering for CuNi layer. Each set of the samples (with constant thickness of Nb layer and variable ferromagnetic layer thickness) was prepared within a one-deposition run using the special method of wedge-shaped films deposition technique. The thickness dF and the Cu/Ni-ratio were precisely measured by RBS spectroscopy. The possible reasons of the T_c non-monotonic behavior at the sub-nanometer range of dF variation are discussed.

TT 23.52 Mo 14:00 Poster TU D

Superconductivity in Pd films on $Eu_xSr_{1-x}S$ — •A. Cosceev[1,2], A. Faisst[1], C. Pfleiderer[1], C. Sürgers[1,2], and H. v. Löhneysen[1,2,3] — [1]Physikalisches Institut, Universität Karlsruhe, D-76128 Karlsruhe, Germany — [2]DFG Center for Functional Nanostructures (CFN), Universität Karlsruhe, D-76128 Karlsruhe, Germany — [3]Forschungszentrum Karlsruhe, Institut für Festkörperphysik, D-76021 Karlsruhe, Germany

Superconductivity in Pd was reported earlier for He^+-irradiated films [1] and for Ag/Pd/Ag sandwiches [2]. Here we investigate the effect of ferromagnetic order on the superconductivity of Pd films (thickness $d_{Pd} = 5$ - 20 nm) deposited on insulating $Eu_xSr_{1-x}S$. Samples have been prepared at different substrate temperatures T_S on 50-nm thick $Eu_xSr_{1-x}S$ films on Si(111). For films with $d_{Pd} \leq 7$ nm prepared at $T_S = 300$ K a maximum $T_c = 0.9$ K is observed for $x = 0$, i.e. on nonmagnetic SrS. T_c decreases to 0.7 K for $x = 0.6$ possibly due to the contact with the magnetic insulator. For larger d_{Pd}, superconductivity is suppressed towards lower T which suggests that the superconducting phase is only stabilized in a narrow region near the Pd/$Eu_xSr_{1-x}S$ interface. Application of a magnetic field clearly shows the gradual transition towards insulating behavior as seen by a logarthmic increase of the resistance R with decreasing temperature T. The magnetoresistance is positive up to a maximum field of 18 T supporting the presence of strong electron-electron interaction effects.

[1] B. Stritzker, Phys. Rev. Lett. **42**, 1769 (1979)
[2] M. B. Brodsky, Phys. Rev. B **25**, 6060 (1982)

TT 23.53 Mo 14:00 Poster TU D

Andreev reflection in nanostructured Al/Ni point contacts — •D. Weissenberger[1,2], F. Pérez-Willard[2,3], C. Sürgers[1,2], and H. v. Löhneysen[1,2,4] — [1]Physikalisches Institut, Universität Karlsruhe, D-76128 Karlsruhe — [2]DFG Center for Functional Nanostructures (CFN), Universität Karlsruhe, D-76128 Karlsruhe — [3]Laboratorium für Elektronenmikroskopie, Universität Karlsruhe, D-76128 Karlsruhe — [4]Forschungszentrum Karlsruhe, Institut für Festkörperphysik, D-76021 Karlsruhe

The electronic transport through nanostructured Al/Ni contacts is studied by point-contact spectroscopy at low temperatures. Samples were fabricated by means of electron-beam lithography, reactive ion etching, and deposition of Al and Ni onto both sides of a Si_3N_4 membrane as previously reported [1]. Andreev spectra, i.e. conductance vs. voltage, were measured in dependence of temperature and applied magnetic field. The degree of current spin polarization P is obtained by fitting the whole set of experimental data with a theoretical model [1] which takes into account the spin-dependent transmission coefficients due to the majority and minority spin bands of the ferromagnet. For Ni the value of P determined from the spectra is smaller than for Co reported earlier [1].

[1] F. Pérez-Willard et al., Phys. Rev. B **69**, 140502(R) (2004)

TT 23.54 Mo 14:00 Poster TU D

Superconducting noise bolometer as a direct detector — •Alexei Semenov[1], Heinz-Wilhelm Hübers[1], Konstantin Ilin[2], Michael Siegel[2], and Andreas Engel[3] — [1]DLR Institute of Planetary Research, Berlin — [2]Institute of Micro- and Nanosystems, University of Karlsruhe — [3]Institute of Physics, University of Zürich

An advantage of superconducting detectors is a much lower noise in comparison to their semiconductor counterparts. We have studied the magnitude and spectrum of electric noise in thin superconducting NbN nanostrips carrying a subcritical current. Analysis of the experimental data suggests that the noise appears due to fluctuations in the two-dimensional vortex gas below the Kosterlitz-Thouless phase transition. Basing on our understanding of the noise source, we proposed a novel detector concept. The novelty is the use of the noise, which generally hampers the performance of conventional detectors, as the physical quantity that itself senses radiation. Our detector is a meander line patterned from a superconducting thin film and connected to the terminals of a planar log-periodic antenna. The detector operates in the current-carrying superconducting state and exhibits the noise that changes under irradiation. At 4.2 K measured noise-equivalent power amounted at 10^{-14} W $Hz^{-1/2}$ and is likely to improve at lower temperatures.

TT 23.55 Mo 14:00 Poster TU D

Design und Entwicklung von Arrays kalorimetrischer Tieftemperatur Detektoren für die Energiemessung von Schwerionen — •J.P. Meier[1,2], A. Bleile[1,2], P. Egelhof[1,2], A. Kiseleva[1], O. Kiselev[1] und S. Kraft-Bermuth[1,2] — [1]Gesellschaft für Schwerionenforschung, Darmstadt — [2]Institut für Physik, Johannes Gutenberg Universität, Mainz

Kalorimetrische Tieftemperatur Detektoren mit Al-Phasenübergangsthermometer haben sehr gute Auflösungen für den Energienachweis von Schwerionen in einem breiten Energie- und Massenbereich. Für Schwerionen mit Energien von E = 0.1–100 MeV/amu wurde $\Delta E/E = 1–5x10^{-3}$ erzielt. Damit eignen sich die Detektoren für den Energienachweis in verschiedenen Anwendungen der Schwerionen-Physik. Das aktuelle Detektorkonzept hat eine aktive Detektorfläche von ca. 2x3 mm^2. In Anwendungen wie der Identifikation superschwerer Elemente, der Beschleuniger-Massenspektrometrie oder für Reaktionen mit radioaktiven Schwerionenstrahlen werden größere aktive Detektorflächen gefordert. Hierfür ist der Aufbau eines Detektor-Arrays notwendig. In einem ^{4}He-Badkryostaten sollen die einzelnen Pixel eines Arrays mit deren spezifischen Arbeitstemperaturen im Bereich von T_{WP} = 1.4–1.5 K betrieben werden. Im Design eines Prototypen-Arrays sind 5x2 Pixel vorgesehen. Resultate erster Testmessungen mit einem 2-Pixel-Detektor werden diskutiert.

TT 23.56 Mo 14:00 Poster TU D

Metallic magnetic calorimeters: design considerations for large area detectors and arrays — •M. Linck, A. Burck, T. Daniyarov, H. Rotzinger, T. Scarbrough, A. Fleischmann, and C. Enss — Kirchhoff-Institut für Physik, Heidelberg, Germany

Metallic magnetic calorimetry is well suited for energy dispersive quantum detection. A metallic paramagnetic sensor, which is in tight thermal contact with a metallic absorber, is placed in a weak magnetic field. The sensor's magnetization is used to monitor the temperature. Changes in magnetization upon the absorption of a quantum are measured by a low-noise, high-bandwidth DC SQUID system.

Design considerations have been made to find different geometries of metallic magnetic calorimters. Different shapes and sizes of a possible detector have been simulated, the energy resolution of such detectors has been calculated. It can be shown, that it is possible to increase the signal size and therefore the energy resolution by optimizing the geometry. We present the first results with a meander shaped geometry, which was also developed for large area detection. We discuss the energy resolution and show applications, such as the detection of molecule fragments, which require large detection areas.

TT 23.57 Mo 14:00 Poster TU D

Neues Verfahren zur räumlichen Abbildung der Leistungsverteilung von Mikrowellen — •Andre Kaestner, Felix Stewing und Meinhard Schilling — Institut für elektrische Messtechnik und Grundlagen der Elektrotechnik, TU Braunschweig, Hans-Sommer-Straße 66, D-38106 Braunschweig

Die Leistungsverteilung von Mikrowellen-Signalen auf dem Chip ist in sehr vielen Anwendungen eine wichtige Messgröße, insbesondere wenn es um die Analyse und Reduktion von parasitären Effekten geht. Bei den Frequenzen oberhalb von 100 GHz, die inzwischen in der Kommunikationstechnik erreicht werden, ist die Minimierung des Übersprechens zwischen den Mikrowellenleitungen und die Charakterisierung neuer dielektrischer Dünnschichtmaterialien interessant.

Unser messtechnischer Ansatz zur räumlichen Abbildung der Leistungsverteilung von Mikrowellen erlaubt durch den Einsatz von Josephson-Kontakten aus Hochtemperatur-Supraleitern eine Analyse der Signale von wenigen GHz bis weit in den THz-Bereich hinein. Die räumliche Auflösung hängt von den eingesetzten Antennenstrukturen und damit von der angestrebten Messbandbreite ab und kann vom Millimeterbereich bis unter 1 μm variiert werden. Die minimale Schrittweite unseres Scanners liegt in allen drei Raumrichtungen bei 100 nm.

TT 23.58 Mo 14:00 Poster TU D

Josephson effects in cold atomic fermionic gases near a Feshbach resonance — •Flavio Nogueira — Institut für Theoretische Physik, Freie Universität Berlin

The Josephson effects that emerge out of a system featuring two fermionic atomic gases in contact through a weak link is considered. The subsystems are assumed to be near a Feshbach resonance. The results will be derived both microscopically and phenomenologically. In the Josephson current appears three types of phase differences: (i) a phase difference $\Delta\theta = \theta_1 - \theta_2$ corresponding to the phases θ_1 and θ_2 of the molecular bosons of subsystems 1 and 2, respectively; (ii) a phase difference $\Delta\varphi = \varphi_1 - \varphi_2$, corresponding to the phases φ_1 and φ_2 of the Cooper pairs of of subsystems 1 and 2, respectively; (iii) and a phase difference between molecular bosons and Cooper pairs across the link. The time dependence of the phase difference between molecules can be controlled by the detuning parameter. While for $\Delta\varphi$ the familiar Josephson time evolution holds, i.e., $d\Delta\varphi/dt = 2\Delta\mu$, where $\Delta\mu = \mu_1 - \mu_2$ is the difference between the chemical potentials, we obtain $d\Delta\theta/dt = 2\Delta\mu + \Delta\delta$, where $\delta_1 - \delta_2$ is the detuning difference. This type of effect may be used experimentally to probe the presence of Cooper pairs in the system by controlling the BCS-BEC crossover.

TT 23.59 Mo 14:00 Poster TU D

Density flutuations of a hard-core Bose gas in a one-dimensional lattice — •Christopher Moseley, Cenap Ates, and Klaus Ziegler — Institut für Physik, Universität Augsburg, 86135 Augsburg

We consider a hard-core Bose gas on a one-dimensional optical lattice with and without confining potential. For this purpose a model of the statistics of directed polymers in two dimensions is applied to the world lines of the hard-core bosons, such that a crossing of different world lines is prohibited. We find characteristic oscillations in the density-density correlation function. Their wavelength diverges as the system undergoes a continuous transition from an incommensurate to a Mott insulating phase. The associated static structure factor vanishes as the Mott insulating phase is approached.

TT 23.60 Mo 14:00 Poster TU D

Magnetic field dependence of polarisation echos generated in mixtures of amorphous glycerin and heavy water — •C. Fischer, M. Bartkowiak, S. Hunklinger, and C. Enss — Kichhoffinstitut für Physik, Universität Heidelberg, Germany

The properties of glasses at temperatures below a few kelvin are dominated by atomic tunneling systems. Measuring dielectric polarization echos are one way to gain a better understanding of these energetically low-lying excitations.

In this work we present measurements on glassy mixtures of glycerin and heavy water as well as on deuterated glycerin. We observed oscillations superimposed on the decay of spontaneous echos, the so-called quantum beating, as well as the alteration of the integrated echo amplitude by the application of an external magnetic field.

Both effects originate from the introduction of nuclear quadrupole moments to the amorphous system, they are a direct consequence of the deuteration. The beating frequencies measured were in good agreement with quadrupole frequencies determined in NMR experiments.

Having a technique sensitive to tunneling systems with nuclear quadrupoles only, we can use selective isotopic substitution as a marker method. This opens a new way to microscopic studies of the tunneling systems.

TT 23.61 Mo 14:00 Poster TU D

1/f-noise in quench condensed Ag films — •Michael Burst[1], Swastik Kar[2], Arup K. Raychaudhuri[3], and Georg Weiss[1] — [1]Physikalisches Institut,Universität Karlsruhe, Karlsruhe, Germany — [2]Rensselaer Polytechnic Institute, Troy, USA — [3]Indian Institute of Science, Bangalore, India

We present data of quench condensed silver films with a thickness of 10-20 nm. The samples are as small as $300 \times 100\,nm^2$. Experiments focus on the temperature region between 350 mK and 4.2 K. We show measurements on virgin films immediately after the deposition at low temperatures as well as measurements after annealing of the films. Our results of annealed films are in good agreement with former experiments under similar conditions. New and surprising results are obtained of the virgin samples: non-linear I-V characteristics and normalized noise power which is up to 5 orders of magnitude higher than those of annealed samples.

TT 23.62 Mo 14:00 Poster TU D

Low-temperature investigation on thermal properties of glasses — •Astrid Netsch, Hsin-Yi Hao, Sabine Wolf, Andreas Rost, Andreas Fleischmann, and Christian Enss — Kirchhoff-Institut für Physik,Universität Heidelberg, Im Neuenheimer Feld 227, D-69120 Heidelberg

The thermal conductivity of glasses at temperatures below 1 K is generally described by phonon thermal transport. The mean free path of the phonons is limited by scattering processes between the heat-carrying

phonons and the tunneling systems in the glasses. At further low temperature, it is possible that the interactions between the tunneling systems also contribute to the thermal conductivity. To investigate such an additional heat transport mechanism one has to reduce the phonon mean-free-path to cut down the phonon contribution. That means one has to make some restrictions to the geometry of the glass sample.

We present measurements of the thermal conductivity of a glass capillary array which is used to introduce extra scattering of the thermal phonons. For measuring thermal conductivity of such diminutive magnitude, our contact-free technique is proved to be ideal owing to its surpassingly small parasitic heating to the system. Our results show a thermal conductivity, which varies proportional to T^3 down to about 50 mK as expected for boundary scattering. Below this temperature the heat transport deviates from this dependence, being larger than expected. This might be an indication for non-phonon thermal transport of heat in glasses.