characteristics of highly transparent superconductor/normal metal/two-dimensional electron gas junctions formed by a superconducting NbN electrode, a thin (10nm) Au interlayer, and a two-dimensional electron gas in an InGaAs/InP heterostructure. A decrease in the differential resistance with pronounced double dip structure has been observed within the superconducting energy gap. It is argued that the double-dip structure in the differential resistance is related to the transport in SN-2DEG contacts in the ballistic regime. It has been found that the reduced subgap resistance is preserved in high quantizing magnetic fields. We observed resistance oscillations as a function of magnetic field at zero dc bias current in our junctions. The effect of temperature and dc bias current on the amplitude of the magnetoresistance oscillations was studied. The experimental results are qualitatively explained by taking Andreev reflection in high magnetic fields into account.

TT 26.4 Di 11:00 TU H3027

Diamagnetic screening in Nb/Ag double layers in contact with a ferromagnet — •H. Stalzer[1], A. Cosceev[1], C. Sürgers[1], and H. v. Löhneysen[1,2] — [1]Physikalisches Institut and DFG Center for Functional Nanostructures (CFN), Universität Karlsruhe, D-76128 Karlsruhe — [2]Forschungszentrum Karlsruhe, Institut für Festkörperphysik, D-76021 Karlsruhe

The magnetization $M(T,B)$ of planar superconducting Nb/Ag and Nb/Ag/Fe heterostructures (thicknesses $d_{Nb} = 200\,nm$, $d_{Ag} = 35$ - $800\,nm$, and $d_{Fe} = 40\,nm$) epitaxially grown on sapphire $(11\bar{2}0)$ is studied in parallel magnetic fields B between temperatures of $T = 0.06$ - $10\,K$. Below the superconducting phase transition of Nb a further diamagnetic signal occurs at a temperature $T^\star$ due to screening currents in Ag induced by the proximity effect. In contact with an additional Fe layer the proximity effect vanishes for thick Ag layers ($d_{Ag} \geq 200\,nm$). Surprisingly the diamagnetic transition at $T^\star$ reappears in Nb/Ag/Fe triple layers with a thickness of 20 - 35 nm. Furthermore, we investigate the effect of an additional SiO_2 spacer layer of thickness $d_{SiO_2} = 1$ - $5\,nm$, separating the Ag and Fe film, on the diamagnetic phase diagram. We propose the realization of a tunable π-contact using weak ferromagnets.

TT 26.5 Di 11:15 TU H3027

Switching superconductivity in S/F bilayers by multiple-domain structures — •Thierry Champel and Matthias Eschrig — Institut TFP, Universitaet Karlsruhe, 76128 Karlsruhe, GERMANY

We consider the effect of a multiple magnetic domain structure in a superconductor/ferromagnet bilayer, modeled by a ferromagnetic layer with a rotating magnetic moment. The domain walls in this model are of equal size as the domains, and are of Néel type. We study the superconducting critical temperature as a function of the rotation wavelength of the magnetic moment. The critical temperature of the bilayer is found to be always enhanced by the domain structure, and exhibits an interesting reentrant behavior. We suggest that this effect can be used for a new device where superconductivity may be controlled by the domain structure of the magnetic layer.

TT 26.6 Di 11:30 TU H3027

Charge Transport in Andreev Billiards with a Superconducting Antidot — •A. Lassl[1], K. Richter[1], P. Schmelcher[2], F. Diakonos[3], M. Scheid[1], and N. Fitas[3] — [1]University of Regensburg — [2]University of Heidelberg — [3]University of Athens

We study the transport properties of a normal conducting electron billiard in contact with a superconductor. In particular we are interested in the magnetic field dependence of the particle and hole transmission and reflection coefficients. For our numerical simulations we chose a Sinai billiard with a superconducting antidot in the center of the quadratic scattering region. The presence of the superconductor changes the dynamics of the system due to Andreevreflection. The results of a purely classical and a quantum mechanical approach are presented and they show to be in very good agreement.

TT 27 Solids at Low Temperature - New Materials

Zeit: Dienstag 12:00–12:30 Raum: TU H3027

TT 27.1 Di 12:00 TU H3027

Wigner crystallization in $Na_3Cu_2O_4$ and $Na_8Cu_5O_{10}$ chain compounds — •P. Horsch, M. Sofin, M. Mayr, and M. Jansen — Max-Planck-Institut fuer Festkoerperforschung, D-70569 Stuttgart, Germany

We report the synthesis of novel edge-sharing chain systems $Na_3Cu_2O_4$ and $Na_8Cu_5O_{10}$, which form insulating states with commensurate charge order. We identify these systems as one-dimensional Wigner lattices, where the charge order is determined by long-range Coulomb interaction and the number of holes in the d-shell of Cu. Our interpretation is supported by X-ray structure data as well as by an analysis of magnetic susceptibility and specific heat data. Remarkably, due to large second neighbor Cu-Cu hopping, these systems allow for a distinction between the (classical) Wigner lattice and the $4k_F$ charge-density wave of quantum mechanical origin.

TT 27.2 Di 12:15 TU H3027

Influence of structural distortions on electronic properties of Ba_6Ge_{25} clathrate — •Ivica Zerec[1], Wilder Carrillo-Cabrera[1], Vladimir Voevodin[1], Jörg Sichelschmidt[1], Alexander Yaresko[2], Peter Thalmeier[1], and Yuri Grin[1] — [1]Max-Planck-Institut für Chemische Physik fester Stoffe, Nöthnitzer Str. 40, 01187 Dresden — [2]Max-Planck-Institut für Physik komplexer Systeme, Nöthnitzer Str. 38, 01187 Dresden

Clathrates are cage compounds, recently investigated as interesting candidates for thermoelectric applications. The complex structure poses a major challenge in understanding the variety of their interesting physical properties. We present the electronic band structure calculations for Ba_6Ge_{25} clathrate. It undergoes an involved structural phase transition, accompanied with stepwise changes of many physical quantities. We construct the ordered structural models for different temperatures, in accordance with the experimental data and calculate the corresponding electronic band structures. We show how the changes of electronic properties across the phase transition may be understood from the modifications of the band structure induced by the structural distortions. In particular we show how the shift of the optical spectral weights towards higher frequencies, observed in the optical conductivity below the phase transition, is well reproduced by the theoretical calculations based on the electronic band structure.

TT 28 Superconductivity - Applications I : Cryodetectors

Zeit: Dienstag 14:00–16:00 Raum: TU H104

Hauptvortrag TT 28.1 Di 14:00 TU H104

Cryogenic Detectors for X-ray Astronomy — •Piet de Korte — Sorbonnelaan 2, 3584CA Utrecht, The Netherlands

The future of X-ray astronomy will be directed towards the study of very high redshift sources, that are therefore extremely weak. Some observational cases will be presented.

In addition to extremely large area collection optics this requires detectors with a high detection efficiency in combination with very good spectral resolution and imaging. Such a mission is conceptualized by the European Space Agency under the name XEUS.

The only type of sensors fulfilling those requirements are cryogenic sensors with single photon detection capability and an intrinsic en-