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 $\Delta E/E = 1$–5×10^{-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