51 01 19, 01314 Dresden, Germany — [2]International Center for Condensed Matter Physics, 70904-910, Brasília-DF, Brazil — [3]Faculty of Mathematics and Physics, Charles University, Ke Karlovu 3, 12116 Prague 2, Czech Republic — [4]Institute of Physics, Academy of Sciences, Cukrovarnická 10, 16253 Prague 6, Czech Republic — [5]Max Planck Institute for Metals Research, D-70506 Stuttgart, Germany

A superconducting layer exposed to a perpendicular electric and parallel magnetic field is considered within the Ginzburg-Landau (GL) approach. The GL equation is solved near the surface and the surface energy is calculated [1,2]. The nucleation critical field is shown to be changed in dependence on the magnetic and electric field. Special consideration is payed to the induced magnetic-field effect caused by diamagnetic surface currents. The latter effect constitutes the main contribution to the effective inverse capacitance which determines the effective penetration depth. The surface energy becomes strongly dependent on the width of the sample. An experimental realization is suggested for determining the change in the effective capacitance of the layer.

[1] Phys. Rev. B 78 (2008)054525
[2] arXiv 0804.0138

TT 32.13 Wed 14:00 P1A

The lateral S-(S/F)-S Josephson junctions — •Ondrej Vávra, Wolfgang Pfaff, and Christoph Strunk — Inst. for Exp. and Appl. Physics, Univ. Regensburg, Germany

Up to now the proximity effect at the superconductor-ferromagnet (S-F) interface was mainly demonstrated by the transport properties across the S-F interface [A.A. Golubov, M.Yu. Kupriyanov, and E. Ilichev, Rev. Mod. Phys. **76**, 411 (2004).]. We present the results on lateral transport along the S-F interface and its utilization as a Josephson junction. We have prepared Nb based Josephson junctions which consist of Nb micro bridges with a $Pd_{0.95}Fe_{0.05}$ or Fe strip deposited perpendicular to the bridge. The width of the ferromagnetic strip was varied between 50 and 800 nm. The critical current (I_C) of the Nb-$Pd_{0.95}Fe_{0.05}$ and Nb-Fe bi-layer, respectively, is found to be significantly reduced by the proximity effect with the ferromagnet.

We have studied the temperature and magnetic field (B) dependencies of the critical current. In magnetic field an interference pattern $I_C(B)$ is observed. In perpendicular magnetic field the junction exhibits $I_C(B)$ dependence similar to a Fraunhofer pattern which proves the dc Josephson effect. We also investigate the dependence of $I_C(B)$ oscillations on the orientation of the magnetic field. The control of the Josephson junction parameters is provided by third electrode connected to the F strip.

TT 32.14 Wed 14:00 P1A

Observation of absolute negative resistance in mesoscopic samples of a-NbGe — •Florian Otto[1], Ante Bilušić[1,2], Dinko Babić[3], Christoph Sürgers[4], and Christoph Strunk[1] — [1]Inst. for Exp. and Appl. Physics, Univ. Regensburg, Germany — [2]Fac. of Nat. Sciences, Univ. of Split, Croatia — [3]Dept. Physics, Univ. Zagreb, Croatia — [4]Phys. Inst. and DFG CFN, Univ. Karlsruhe, Germany

Local and nonlocal measurements on mesoscopic samples of amorphous NbGe, a high-κ type-II superconductor with very low pinning, reveal peculiar features in close vicinity of the transition temperature T_c: in absence of magnetic field, both local and nonlocal DC voltage current characteristics clearly display absolute negative resistance in a small interval around zero current and a small temperature range immediately below T_c . At the same time, a negative voltage is also observed in both local and nonlocal measurements of $R(T)$. The temperatures at which this occurs are consistently found to be around 0.95-0.96 T_c, which is clearly below the narrow superconducting transition region. Upon application of small external magnetic fields on the order of $B = 50\,\mathrm{mT}$, the effect can be suppressed. The origin of these completely unexpected features is not clear.

TT 32.15 Wed 14:00 P1A

Spin mixing at Superconductor Ferromagnet Interfaces probed by non-local transport — •Florian Hübler[1,2], Detlef Beckmann[1], Jakob Brauer[1], and Hilbert von Löhneysen[2,3] — [1]Forschungszentrum Karlsruhe, Institut für Nanotechnologie, P.O.-Box 3640, D-76021 Karlsruhe — [2]Forschungszentrum Karlsruhe, Institut für Festkörperphysik, P.O.-Box 3640, D-76021 Karlsruhe — [3]Physikalisches Institut, Universität Karlsruhe, D-76128 Karlsruhe, Germany

We present experimental results on non-local conductance in multiterminal hybrid structures, where two or more ferromagnetic (F) contacts are attached to a single superconductor (S). For contacts with an insulating (I) tunnel barrier, and at energies below the energy gap of the superconductor, the non-local conductance is determined by the competition of crossed Andreev reflection (CAR) and elastic cotunneling (EC). In FISIF structures, the contributions of CAR and EC are expected to depend on the orientation of the magnetisation of the F contacts. Recently, an asymmetric conductance signal as consequenc of a finite spin-mixing angle has been predicted [1]. We observe first signs for similar signals in our structures.

[1] Kalenkov and Zaikin, Phys. Rev. B 76, 224506 (2007)

TT 32.16 Wed 14:00 P1A

Crossover from 2D-3D behaviour in superconducting Nb/CuNi bilayers in a magnetic field — •Jan-Michael Kehrle[2], Vladimir Zdravkov[1,2], Günter Obermeier[2], Roman Morari[1], Eugen Antropov[1], Andrei Prepelitsa[1], Claus Müller[2], Achim Wixforth[2], Siegfried Horn[2], Reinhard Tidecks[2], and Anatolie Sidorenko[1,2,3] — [1]Institute of Electronic Engineering and Industrial Technologies ASM, Kishinev, MD2028, Moldova — [2]Institut für Physik, Universität Augsburg, D-86159 Augsburg, Germany — [3]Institute of Nanotechnology (INT), Forschungszentrum Karlsruhe, D-76021 Karlsruhe, Germany

A dimensional crossover in an external magnetic field, applied parallel to the layers, has been found for superconductor/ferromagnet (S/F) bilayers of Nb/CuNi. For decreasing temperature the square-root 2D-behaviour of the upper critical magnetic field, Bc2||(T) on the temperature, in the vicinity of the critical temperature Tc switches to the linear 3D-behaviour below the crossover temperature, Tcr. The 2D-3D crossover also occurs concerning the temperature dependence of superconducting fluctuations in the critical fluctuation regime. The fluctuation conductivity exhibits a 2D-behaviour in zero- and weak magnetic fields close to Tc, switching to a 3D-behaviour in strong magnetic fields at low temperatures. In a S/F bilayer the quasi-one dimensional Fulde-Ferrel-Larkin-Ovchinnikov (FFLO) like state is realized, so that the superconducting properties are governed by interference effects of the pairing wave functions, i.e. by the pairing function flux through the S/F interface.

TT 32.17 Wed 14:00 P1A

Structure and local electronic properties of Ag and Co/Ag on Nb(110) — •Tihomir Tomanic[1], Christoph Sürgers[1], and Hilbert v. Löhneysen[1,2] — [1]Physikalisches Institut, Universität Karlsruhe — [2]Institut für Festkörperphysik, Forschungszentrum Karlsruhe

The local variation of the superconductive order parameter in hybrid structures of a superconductor S with a normal metal N or ferromagnet F is a topic of current interest. We have started a study of Ag and Co islands on Nb via scanning tunneling microscopy (STM) and spectroscopy (STS) at low temperatures.

As a prerequisite, we report on the surface structure of clean Nb(110) single crystals obtained after Ar^+ sputtering and flash heating up to 2300 °C in ultra-high vacuum. The atomic structure as well as the local superconducting properties have been explored by STM and STS at $T = 2.5$ and $T = 4.2\,\mathrm{K}$. We have studied the topography of a thin Ag overlayer (nominal thickness 5nm) on Nb(110) and of Co islands on top of the Ag overlayer. First results of the local electronic density of states derived from the current-voltage characteristics will be reported.

TT 32.18 Wed 14:00 P1A

Angle-dependent investigation of the upper critical field in NbN/Sm-Co bilayers — •Jan Engelmann, Silvia Haindl, Ludwig Schultz, and Bernhard Holzapfel — IFW Dresden, Institute for Metallic Materials, P.O. Box 270116, D-01171 Dresden, Germany

The coexistence of superconductivity and magnetism leads to new interesting phenomena like domain-, domain-wall-superconductivity and stray field effects. To investigate thin film bilayers of hard-magnetic Sm-Co with very fine defined domain structure and superconducting NbN, we fabricated these bilayers using pulsed laser deposition. The Sm-Co thin film layer was prepared in UHV on a MgO(100)-substrate with a Cr-buffer, and subsequently the NbN was grown in a nitrogen-atmosphere. Epitaxy and texture were measured via x-ray diffraction, the magnetic properties were determined by VSM -measurements. The angle-dependent upper critical field, $\mu_0 H_{c2}$, of the bilayer was investigated in detail by a standard four probe technique using a PPMS.