TT 33.8 Fri 12:15 H18

Nonmagnetic impurities in fractionalized spin liquids — •Alexei Kolezhuk[1] and Subir Sachdev[2] — [1]Institut für Theoretische Physik, Universität Hannover, 30167 Hannover, Germany — [2]Physics Department, Harvard University, Cambridge MA 02138, USA

Spin correlations in the vicinity of a nonmagnetic impurity are analyzed for two models of gapless U(1) spin liquids in two dimensions: (1) deconfined critical point between the Neel and valence-bond-solid (VBS) phase; (2) staggered flux spin liquid. The impurity susceptibility in both cases exhibits a 1/T temperature dependence with an anomalous Curie constant. It is shown that an external magnetic field induces both uniform and staggered magnetization around the impurity in the Neel-VBS case, while in the staggered flux phase only the uniform component is present.

TT 33.9 Fri 12:30 H18

Confinement of spinons in the spiral staircase model — •Christian Brünger and Fakher Assaad — Universität Würzburg, Germany

We consider two antiferromagnetic spin 1/2 chains with coupling constants J and $J\cos^2(\theta/2)$ coupled ferromagnetically, $J_\perp$. In the limit $J_\perp \to \infty$ the model maps onto the Haldane spin 1 chain irrespective of te choice of the angle θ. The question we address here is the confinement of spinons in the weak coupling region. As expected from bosonization [1] at $\theta = 0$ the spin gap varies linearly with $J_\perp$. On the other hand in the limit $\theta = \pi$ our results suggest that this spin gap opens as $(J_\perp)^\alpha$ with $\alpha \simeq 2$. This statement follows from mean-field, exact diagonalization as well as large scale quantum Monte Carlo simulations.

[1] D. G. Shelton, A. A. Nersesyan and A.M. Tsvelik, Phys. Rev. B **53**, 8521 (1996)

TT 33.10 Fri 12:45 H18

Experimental Consequences of O(3) Deconfined Criticality in 2+1 D — •David Santiago[1] and Zaira Nazario[2] — [1]Insituut-Lorentz, Leiden University, P.O. Box 9506, NL-2300 RA Leiden, The Netherlands — [2]Max Planck Institute for the Physics of Complex Systems, Nöthnitzer Str. 38, 01187 Dresden, Germany

The paramagnetic phase of 2+1 D antiferromagnets can be described in terms of electrodynamics of charged, massive bosonic spinons interacting through an emergent compact U(1) gauge field. Spinons in the paramagnet are confined due to the presence of nontrivial tunneling effects, instantons which provide a long range interaction between the gauge fields and the charges that gaps the gauge fields and provides a linear potential for the charges. The instantons responsible for spinon confinement in the paramagnetic phase vanish at the quantum critical point. Therefore, spinons are deconfined at criticality. We have recently obtained the effective theory that describes the universal physics of these deconfined critical points. From the deconfined critical theory, we calculate the critical Neel field propagator and find a critical exponent eta=1. We also obtain measurable effects and quantities that follow from the prediction eta=1 and serve as characterization of O(3) deconfined criticality. Those are the inelastic and elastic neutron scattering response, Nuclear Magnetic Resonance (NMR) response, magnetic field response and the specific heat. All of these response functions serve to define the O(3) deconfined universality class.

TT 34: Superconductivity - Vortex Dynamics, Vortex Phases, Pinning

Time: Friday 10:15–13:00 Location: H19

TT 34.1 Fri 10:15 H19

Commensurability effects in Nb thin films with (quasi-)periodic pinning arrays — •Matthias Kemmler[1], Daniel Bothner[1], Albert Sterck[1], Michael Siegel[2], Reinhold Kleiner[1], and Dieter Koelle[1] — [1]Physikalisches Institut - Experimentalphysik II,Universität Tübingen, Auf der Morgenstelle 14, D-72076Tübingen — [2]IMS, Universität Karlsruhe,Hertzstr. 16, D-76187 Karlsruhe

We study experimentally the critical depinning current I_c versus applied magnetic field B in Nb thin films which contain 2D arrays of circular antidots placed on the nodes of a fivefold Penrose lattice.

For measurements of electric transport we use a highly sensitive liquid Helium-cooled dc SQUID amplifier. The sample temperature is controlled and stabilized close to the Nb transition temperature T_c via an optical, very low noise heating system.

Our experiments confirm essential features in the $I_c(B)$ patterns as predicted by Misko *et al.*[1] , close to the transition temperature T_c of the Nb films.

In order to find the arrangement of optimal pinning we compare the performance of Nb films containing quasiperiodic pinning arrays, triangular pinning arrays, randomly distributed antidots, or no antidots. Some of the results are published in [2].

[1] V.R. Misko, S.Savel'ev, F.Nori, Phys. Rev. Lett. 95 (2005) 177007

[2] M. Kemmler et al., Phys. Rev. Lett. 97 (2006) 147003

TT 34.2 Fri 10:30 H19

Vortex Structures in Tantalum, Vandium and Niobium — •Sebastian Mühlbauer[1], Peter Böni[1], Christian Pfleiderer[1], Robert Georgii[2], Edward Forgan[3], Charlotte Bowell[3], and Mark Laver[3] — [1]Physikdepartment E21, TU München, Garching — [2]Foschunsgneutronenquelle Heinz Maier-Leibnitz, Garching — [3]School of Physics and Astronomy, Birmingham (UK)

Small angle neutron scattering directly maps the fourier transform of the vortex lattice (VL) of type II superconductors and gives valuable informations on both the underlying fermi surface and the mechanism of the superconducting pairing. But the symmetry of the VL is also mainly influenced by pinning and impurity effects. Recent studies of the VL in the classical superconductors Tantalum, Vanadium and Niobium with field applied along the four-fold (100) axis will be presented. Four fold VL patterns, breaking the crystal symmetry have been identified in Niobium, which can be explained by non-local corrections in the Eilenberger model. Furthermore, recent polarised neutron studies of the VL in Niobium will be presented.

TT 34.3 Fri 10:45 H19

Effect of dc magnetic field on the microwave losses in MgB_2 thin films — •Alexander Zaitsev, Rudolf Schneider, Roland Hott, Thorsten Schwarz, and Jochen Geerk — Forschungszentrum Karlsruhe, Institut für Festkörperphysik, P.O.B. 3640, D-76021 Karlsruhe, Germany

The microwave surface impedance ($Z_s = R_s + iX_s$) of *in situ* MgB_2 thin films was measured as a function of temperature and parallel dc magnetic field at several frequencies between 5.7 GHz and 18.5 GHz using a dielectric resonator technique. The results are consistent with the expectations for a classical type-II superconductor and, consequently, quite different from those of the high-T_c cuprates. The films cooled in zero-field revealed a clear indication of the lower critical field, B_{c1}, with a small hysteresis around $B \leq B_{c1}$. In higher fields ($B > B_{c1}$) the losses followed the Coffey-Clem and Brandt model, including the frequency dependences, whereas high-T_c Y-Ba-Cu-O films did not show a reasonable agreement with this model. Both the relatively high values of $\Delta X_s/\Delta R_s$ ratio and their frequency dependence indicate a weak effect of the flux creep on the measured microwave loss in MgB_2 films. The temperature dependence of $\Delta X_s/\Delta R_s$ ratio can be described by a microscopic pinning model for BCS-superconductors.

TT 34.4 Fri 11:00 H19

Superconducting Transition Broadening in MgB_2 — •Anatolie Sidorenko[1], Vladimir Zdravkov[1], Andrej Sudru[1], Dimitriu Ghitsu[1], Thomas Koch[2], and Thomas Schimmel[2,3] — [1]Institute of Electronic Engineering and Industrial Technologies, ASM, MD-2028 Kishinev, Moldova — [2]nstitute of Nanotechnology, Forschungszentrum Karlsruhe D-76021 Karlsruhe, Germany — [3]Institute of Applied Physics, University of Karlsruhe D-76128 Karlsruhe, Germany

Superconducting properties of high-quality films of the first multiband superconductor, magnesium diboride, have been investigated. Two mechanisms with intrinsic origin of the superconducting transition broadening for MgB_2 were found. The dominating role of two-dimensional fluctuations in the vicinity of the critical temperature and