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PROGRAM AND ABSTRACTS

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Th-D-1.3-26

Helically ordered ferromagnets MnSi and Ho investigated using point contact Andreev reflection, manifestation of the long range spin triplet proximity effect or artefact?

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It has been predicted that a superconductor, in contact with a magnetically inhomogeneous system will manifest a novel form of long range proximity effect into the magnetic material, the long range spin triplet proximity effect"(LRSTPE) [1]. There has been some evidence of such a proximity effect in helical magnetic systems such as holmium [2]. Point contact Andreev reflection (PCAR), which measures the conductance across the superconductor-ferromagnet interface offers to be a novel probe of such a proximity effect [3,4]. We investigate the helical system MnSi which shows a change from the helical to the ferromagnetic state in applied magnetic field. We observe several anomalous changes at key magnetic fields and discuss whether these results are due to the LRSTPE by carefully analysing the data and comparing with PCAR results on holmium thin films. [1] FS Bergeret et al., Rev. Mod Phys, 77, 1321 (2005) [2] I Sosnin et al., Phys Rev Lett, 96, 157002 (2008) [3] KA Yates et al, Appl Phys Lett, 91, 172504 (2007) [4] VN Krivorucho et al., Phys Rev B, 78, 054522 (2008)

Th-D-1.3-27

Resonant impurity scattering on the ±s-wave state of the iron-based superconductors *

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We studied the impurity scattering on the ±s-wave superconductor (SC), with realistic parameters for the Fe pnictide SCs. We found that the strong scattering limit of impurities forms an off-centered resonance state inside the superconducting gap, which modifies, surprisingly, the density of states (DOS) of a fully opened gap to a V-shaped DOS as if in the case of a d-wave SC. This behavior provides coherent explanations to the several conflicting experiments of the Fe-based SC: (1) the V-shaped DOS observed in photoemission and tunneling spectroscopy but with an isotropic gap; (2) the power law behavior of the nuclear-spin-lattice relaxation rate $1/T_1$ ($\propto T^\alpha$ with $\alpha \sim 3$) down to very low temperatures; and (3) a continuous evolution of $\Delta\lambda(T)$: exponentially flat $\rightarrow T^3 \rightarrow T^2$ with increasing impurity concentration.

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Poster Thursday

Th-D-3.2-01

Crystallographic and magnetic properties of ^{57}Fe doped $LiCoPO_4$

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The $LiCo_{0.99}$ $^{57}Fe_{0.01}PO_4$ polycrystalline sample has been studied by x-ray diffraction, superconducting quantum-interference device (SQUID) magnetometry, and Mössbauer spectroscopy. The crystal structure is found to be an orthorhombic, space group *Pnma*, with the lattice constants $a_0 = 10.241$, $b_{0,} = 5.924$, and $c_{0,} = 4.698$ Å. The magnetic susceptibility measured by SQUID magnetometry show that magnetic Néel temperature is 23 K. Mössbauer spectra of $LiCo_{0.99}$ $^{57}Fe_{0.01}PO_4$ have been taken at various temperatures ranging from 4.2 to 295 K. The iron ions are ferrous and occupy the octahedral sites. Magnetic hyperfine and quadrupole interaction in $LiCo_{0.99}$ $^{57}Fe_{0.01}PO_4$ at 4.2 K have been studied, yielding the following results; $H_{hf} = 127$ kOe, $1/2e^2qQ(1+1/3\eta^2)^{1/2} = 2.99$ mm/s, $\theta = 23.5°$, $\varphi = 10.5°$, and $\eta = 1$. The Debye temperature of the $LiCo_{0.99}$ $^{57}Fe_{0.01}PO_4$ was found to be $\Theta = 604 \pm 5$ K.

Th-D-3.2-02

The Unconventional Magnetic Order in $NbFe_2$ Studied by Magnetoresistance

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The C14 Laves phase $NbFe_2$ is one of the few low-temperature antiferromagnets among the transition metal compounds. The magnetic order has been reported to be of spin-density-wave (SDW) type with transition temperature $T_N = 10$ K for the stoichiometric compound. While muon spin relaxation has shown evidence of static moments, neutron scattering has so far not revealed any information about the nature of this magnetic order. Although the phase boundary is not observable in temperature dependent resistivity measurements, magnetoresistance results on polycrystaline samples show clear jumps when the SDW order is suppressed by magnetic field.

We carried out a systematic study of the low-temperature magnetoresistance on a single crystal with currents applied along both crystallographic directions in order to get more insight into the nature of the ordered state. Our results reveal a strong anisotropy in agreement with reported thermodynamic measurements.

*also at: Hochfeldmagnetlabor, Dresden-Rossendorf, Germany

Th-D-3.2-03

Theory of Magnetic Excitation for Coupled Spin Dimer and Spin Chain System $Cu_2Fe_2Ge_4O_{13}$*

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$Cu_2Fe_2Ge_4O_{13}$ is a quantum magnet consisting of Cu spin dimers and Fe spin chains. It shows an antiferromagnetic phase transition at low temperatures due to the magnetic moment of Fe. Since the two parts are weakly coupled, magnetic excitations are well separated into high-energy Cu dimer part and low-energy Fe chain part. We studied the magnetic excitations in the ordered phase of $Cu_2Fe_2Ge_4O_{13}$ based on a theory used for spin dimer systems such as $TlCuCl_3$. Analyzing the dynamical spin correlation functions, we found several high-energy modes with longitudinal spin fluctuations peculiar to the coupled spin dimer and spin chain system. This is consistent with the recent experimental result of inelastic neutron scattering. We also discuss a possibility to detect such longitudinal modes with magnetic Raman scattering in $Cu_2Fe_2Ge_4O_{13}$.

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Th-D-3.2-04

Incommensurate magnetic ordering in $GdVO_3$

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The perovskite orthovanadates RVO_3 (R = rare earth or Y) display a variety of *commensurate* magnetic structures, and these series of compounds have generated intense interest in recent years due to the observation of magnetisation reversal and the interaction between spin and orbital degrees of freedom. Until now the magnetic structure of $GdVO_3$ has not been determined by neutron diffraction due to the strong absorption at thermal wavelengths. However, magnetisation measurements for $GdVO_3$ reveal intriguing magnetic properties including an unusual magnetic memory effect and a series of magnetic-field-induced phase transitions at low temperature [1]. We have now studied the complex magnetic ordering in $GdVO_3$ using hot neutrons on D9 at the ILL and using resonant x-ray scattering on ID20 at the ESRF. We shall present the extremely rich magnetic phase diagram of $GdVO_3$ at low temperature, which we find to be comprised of *incommensurate* orderings of the Gd moments. [1] L.D. Tung Phys. Rev. B 73, 024428 (2006).