[3] J. Schmalian and P. G. Wolynes, Phys. Rev. Lett. **85**, 836 (2000) .
[4] S. Mahmoudian *et al.*, Phys. Rev. Lett. **115**, 025701(2015).

Postersession 4
Tuesday, 15 August 2017
16.30-18.30
G Foyer

P.973

Frist-principle study on spin reorientation transitions in $R_2Fe_{14}B$ systems

Yoshioka T.[1], *Tsuchiura H.*[1], *Novak P.*[2]
[1]Tohoku University, Sendai, Japan, [2]Institute of Physics ASCR, Prague, Czech Republic

$Nd_2Fe_{14}B$, the main phase of strong permanent magnet Nd-Fe-B, exhibits non-trivial magnetic behavior at the low-temperatures. That is the so-called spin-reorientation (SR) transition where the ferromagnetic easy-axis rotates about 30 degrees gradually from the c-axis direction below T~135K. Among the $R_2Fe_{14}B$ compounds (R: rare-earth), such transition appears in R=Nd, Ho, Er, Tm, and Yb with several transition temperatures T_{SR} and maximum angles θ_{max} for each R [1]. A multi-parameter analysis of the magnetization curves of these systems have been successfully carried out within the crystal field theory based on a conventional single ion model [2], which is followed by the study on the first-principles-based crystal field theory [3,4]. These studies, however, assumed a completely localized 4f electronic picture that may not be plausible for $R_2Fe_{14}B$ systems with lighter R-ions such as Nd. Thus, theoretical examination of this SR transitions based on fully first-principles method is needed not only to obtain a satisfactory understanding of the magnetic properties of $R_2Fe_{14}B$ but also to establish a way to predict the properties of newly found or newly emerging magnetic materials. In this contribution, we deeply understand the magnetic properties of $R_2Fe_{14}B$ systems.

References:

[1] J. F. Herbst, Rev. Mod. Phys. **63**, 819 (1991).
[2] M. Yamada, H. Kato, H. Yamamoto, and Y. Nakagawa, Phys. Rev. B **38**, 620 (1988).
[3] K. Hummler and M. Fähnle, Phys. Rev. B **53**, 3290 (1996).
[4] T. Yoshioka, H. Tsuchiura, P. Novák MATER RES INNOV **19**, S34-S38 (2015).

Postersession 4
Tuesday, 15 August 2017
16.30-18.30
G Foyer

P.974

Multistage RF filtering system for ultralow temperature nanoelectronic experiments

Zavyalov V.[1], *Chernyaev S.*[2], *Shein K.*[2], *Shukaleva A.*[2], *Arutyunov K.*[1,2]
[1]Kapitza Institute for Physical Problems, RAS, Moscow, Russian Federation, [2]National Research University Higher School of Economics, Moscow Institute of Electronics and Mathematics, Moscow, Russian Federation

At ultralow temperatures (T< 100 mK) rather small external disturbance might lead to a noticeable overheating. While electron transport measurements the inevitable external EM noise, picked-up and transmitted through electric wires, results in a mismatch between the electron Te and the phonon Tph temperatures P~W(Te^5-Tph^5), where P is the power dissipated at the sample with volume W. Hence, for sufficiently small nanoelectronic systems the effect might be clearly pronounced. Multiple methods have been suggested to reduce the undesired electron heating. Typically various RF filters are used to cut the impact of noisy EM environment. Often the supporting amplitude vs. frequency data are obtained only at room temperatures analyzing the impact of 'isolated' elements without taking into consideration the wires. Here we describe the custom made multistage RLC filtering system for ultralow temperature nanoelectronic experiments. The amplitude vs. frequency characteristics were measured down to very low temperatures. Distributed elements theory analysis supports experimental data.

Postersession 4
Tuesday, 15 August 2017
16.30-18.30
G Foyer

P.975
Puzzling thermal counterflow turbulence in superfluid helium-4

Gao J.[1]*, Varga E.*[1,2]*, Guo W.*[1]*, Vinen W.*[3]
[1]Florida State University, National High Magnetic Field Lab, Mechanical Engineering Department, Tallahassee, United States, [2]Charles University, Department of Physics, Prague, Czech Republic, [3]University of Birmingham, School of Physics and Astronomy, Birmingham, United Kingdom

Thermal counterflow turbulence in superfluid helium-4 is the first type of quantum turbulence to be identified and studied [1]. The generation of turbulence in the superfluid as a random tangle of vortices, assuming a spatially uniform laminar flow of the normal fluid, has been understood for years [2]. However, our recent flow visualization studies, based on imaging thin lines of He_2 molecular tracers, have revealed that this small-scale turbulence can be accompanied by large-scale turbulence in both fluids with a novel energy spectrum [3,4]. Recent theoretical work suggests that this spectrum arises from a balance between two processes: the counterflow that tends to pull eddies in the two fluids apart, and mutual friction that tends to keep them coincident [5]. The latter process ought to win at high heat fluxes, leading to a spectrum more of the classical Kolmogorov form. Here we report our latest studies showing that the energy spectrum of the large-scale turbulence deviates more strongly from the classical form as the heat flux is increased, in apparent disagreement with the theory. This result shows that our current understanding of the large-scale turbulence in counterflow remains seriously incomplete, which calls for more studies of this interesting form of turbulence.

References:

[1] W. F. Vinen, Proc. R. Soc. London. Ser. **A 242**, 493 (1957).
[2] K.W. Schwarz, Phys. Rev. **B 18**, 245-262 (1978).
[3] A. Marakov, J. Gao, W. Guo, S.W. Van Sciver, G.G. Ihas, D.N. McKinsey, and W.F. Vinen, Phys. Rev. **B 91**, 094503 (2015).
[4] J. Gao, W. Guo, V.S. L´Vov, A. Pomyalov, L. Skrbek, E. Varga, and W.F. Vinen, JETP Letters, **103**, 732 (2016).
[5] S. Babuin, V. S. L´vov, A. Pomyalov, L. Skrbek, and E. Varga, Phys. Rev. **B 94**, 174504 (2016).

Postersession 4
Tuesday, 15 August 2017
16.30-18.30
G Foyer