Seminar on Condensed Matter Theory

Group of Theoretical Physics at the Department of Condensend Matter Physics
of Charles University has a pleasure to invite you to attend the seminar

on 10 January 2019 at 13:00

at Faculty of Mathematics and Physics of Charles University, Ke Karlovu 5, 121 16 Praha 2

Seminar room F052

Ing. Vojtěch Uhlíř, Ph.D.

CEITEC BUT, Brno University of Technology, Brno, Czech Republic

Imaging of asymmetric magnetic phase transition in FeRh structures

This seminar was cancled and will be rescheduled

The advantage of ferromagnetic materials is the nonvolatility of the information encoded in the internal magnetic configuration, which can be used for memory storage, logic and sensing devices. Antiferromagnets are another class of magnetic materials that features nonvolatile magnetic ordering, yet its applications have been largely overlooked until recently [1]. In materials featuring a first-order metamagnetic phase transition between the antiferromagnetic (AF) and ferromagnetic (FM) states, the nature of the phase transition can be tuned by strain, pressure, chemical doping, temperature, as well as magnetic and electric fields, potentially offering very high recording densities and huge changes in the order parameters controlled with very low power.

Moreover, metamagnetic materials are outstanding candidates for finding and exploiting new functionalities and emergent phenomena on the mesoscale [2,3]. For instance, the transition from the AF order to FM order in sub-micron-wide FeRh wires becomes greatly asymmetric when comparing the heating and cooling cycles [3,4]. This recovery of the abrupt transition in nanostructures could allow low-energy, efficient routes to control magnetic properties, leading to potential applications, for instance, in spintronics.Using magnetic imaging via magnetic force microscopy, we investigated phase nucleation and switching as a function of temperature in micron and submicron sized FeRh structures, which can be linked to electrical transport measurements [3] probing the resistance as an order parameter.

Furthermore, we show the dynamic response of the electronic and magnetic order to ultrafast laser excitation can be followed by time-resolved photoemission electron spectroscopy [5], which unlike techniques probing the total magnetization in the sample provides a direct comparison to the dynamic response of the structural order.

[1] T. Jungwirth et al., Nature Mater. 11, 231 (2016).
[2] F. Pressacco et al., Sci. Rep. 6, 22383 (2016).
[3] V. Uhlíř et al., Nat. Commun. 7, 13113 (2016).

For more information follow: theory.kfkl.cz/seminars.php
If you wish to receive regular updates on fothcoming seminars, contact T. Novotný (tno@karlov.mff.cuni.cz).

[4] J. A. Arregi et al., J. Phys. D: Appl. Phys. 51, 105001 (2018).
[5] F. Pressacco et al., Struct. Dyn. 5, 034501 (2018).