

News from Poli

Wednesday 21 June 2017 10:30 (30 minutes)

Solving complex magnetic structures like direct distinguishing between cycloidal, helical and amplitude modulated spin arrangements; interplay between the crystal and magnetic chirality; short range magnetic/nuclear correlations in frustrated systems; local spin anisotropy (susceptibility tensor approach) at the unit cell level; magnetic domains distribution and their dynamics in complex antiferromagnets are only few examples of the actual applications of the single crystal diffraction with polarized neutrons and polarization analysis in addition to the classical spin densities mapping and separation of nuclear-magnetic and nuclear-spin-incoherent scattering contributions in different types of materials (multiferroics, superconductors, magnetic shape memory alloys, giant-magnetoresistance oxides, molecular magnets, etc.). Dedicated instrument Polarization Investigator POLI have been developed, built and commissioned in the last years at MLZ in cooperation between JCNS and RWTH Aachen. 2014 first neutron beam on the dedicated beam-port SR 9a in front of the hot neutron source of FRM II reactor was obtained. 2015 POLI enters into user operation with Spherical Neutron Polarimetry technique using third generation Cryopad [1-5]. POLI is the first instrument worldwide routinely using ^3He spin filters both to produce and to analyze neutron polarization. This results in the enhanced flux of the polarized short wavelength neutrons and increased in the comparison to other instrument of this type resolution [6]. 2016 new polarized diffraction setup for Flipping-Ratio measurements in magnetic field using 2.2 T HTS magnet was implemented on POLI [7]. Dedicated for polarised neutron diffraction of hot neutrons 8 T magnet with recondensing cryostat, asymmetric field, active shielding and large vertical and horizontal access was developed and is under production at Oxford Instruments Company. First factory tests are successfully pass in April 2017. Until the end of 2017 new magnet is planned to be implemented on POLI. Also implementation of the new supermirror polarizers developed in cooperation with NOB (Neutron Optics Berlin GmbH), optimized for short wavelength neutrons and largely divergent beam from the focused monochromator is planned to finish in 2017 on POLI.

Available on POLI polarized neutrons with very short wavelength (0.5 Å) are rather unique feature, and they are interesting not only for the solid state physics and magnetism community but also for fundamental nuclear physics for study of the parity violation in the resonance decay process in the U and La nuclei. First feasible experiments of this type, using dedicated setup on POLI have been successfully performed in 2016. The preliminary results show the confirmation of the expected effect. Continuation with more detailed studies are planned in 2017. [8]

[1] V. Hutanu, W. Luberstetter, E. Bourgeat-Lami, M. Meven, A. Sazonov, A. Steffen, G. Heger, G. Roth, and E. Lelièvre-Berna, "Implementation of a new Cryopad on the diffractometer POLI at MLZ", *Review of Scientific Instruments* 87, 105108 (2016)

[2] V. Hutanu, A. P. Sazonov, M. Meven, G. Roth, A. Gukasov, H. Murakawa, Y. Tokura, D. Szaller, S. Bordács, I. Kézsmárki, V. K. Guduru, L. C. J. M. Peters, U. Zeitler, J. Romhányi, and B. Náfrádi, "Evolution of two-dimensional antiferromagnetism with temperature and magnetic field in multiferroic $\text{Ba}_2\text{CoGe}_2\text{O}_7$ ", *Phys. Rev. B* 89, 064403 (2014)

[3] V. Hutanu, A. Sazonov, G. Roth, I.-H. Oh, M. Baum, J. Stein, M. Braden, H. Murakawa, Y. Tokura, S. Bordács, I. Kézsmárki and B. Náfrádi, "Spherical neutron polarimetry in multiferroics under external stimuli", *Acta Cryst. A* 70, C151 (2014)

[4] J. Stein, M. Baum, S. Holbein, V. Hutanu, A.C. Komarek and M. Braden, "Control of multiferroic domains by external electric fields in TbMnO_3 ", *J. Phys.: Condens. Matter* 27, 446001 (2015)

[5] D. Fobes, E. Bauer, J. Thompson, A. Sazonov, V. Hutanu, S. Zhang, F. Ronning, M. Janoschek, "Low temperature magnetic structure of CeRhIn_5 by neutron diffraction on absorption-optimized samples" *J. Phys.: Condens. Matter*, 29 17LT01 (2017)

[6] V. Hutanu "POLI: Polarised hot neutron diffractometer" *Journal of large-scale research facilities*, 1, A16. <http://dx.doi.org/10.17815/jlsrf-1-22> (2015)

[7] H. Thoma, "Setup for polarized neutron diffraction on POLI diffractometer at MLZ", Bachelor thesis TU München University 2016.

[8] Yu. Kopatch, V. Novitsky, G. Ahmadov, A. Gagarsky, D. Berikov, G. Danilyan, V. Hutanu, J. Klenke, S. Massalovich, "Measurement of T-odd effects in the resonance neutron induced fission of ^{235}U on a hot source of polarized neutrons", Presentation on ISINN25 Dubna, Russia, 2017

Author: HUTANU, Vladimir

Presenter: HUTANU, Vladimir

Session Classification: Parallel Session