

# Neutron polarimetry at SINQ: first results

M. Janoschek<sup>1,3</sup>, S. Klimko<sup>3</sup>, B. Roessli<sup>1</sup>, M. Medarde<sup>1,2</sup>, P. Böni<sup>4</sup>

<sup>1</sup>Laboratory for Neutron Scattering ETHZ & Paul Scherrer Institut, CH-5232 Villigen PSI, Switzerland, <sup>2</sup>Laboratory for Development and Methods, Paul Scherrer Institute, 5232 Villigen PSI, Switzerland, <sup>3</sup>Département de Recherche Fondamentale sur la Matière Condensée, CEA-Grenoble, SPSMS-MDN, 17 rue des Martyrs, 38054 Grenoble, Cedex 9, France, <sup>4</sup>Technische Universität München, Physics Department, Institute E21, D-85747 Garching, Germany

Over the last decade systematic application of spherical neutron polarimetry (SNP) has been successfully used to attack scientific questions which were intractable before. Some of them are:

- study of magneto-electric crystals such as  $\text{LiCoPO}_4$  and  $\text{MnGeO}_3$ [1]. in order to determine the antiferromagnetic structure factors in these compounds and hence the magnetisation distribution leading to magneto-electricity.
- study of non-collinear magnetic structures which can not be studied by other techniques because they are not able to determine the directional information contained in the magnetic structure factors[2].
- investigation of hybrid correlation functions in inelastic neutron scattering in compounds where nuclear and magnetic degrees of freedom or different magnetic degrees of freedom interfere[3].

Until now CryoPAD (Cryogenic Polarization Analysis Device), presented by Tasset et al. [4] in 1989, was the only device to perform routine SNP measurements at finite scattering angles. It is based on a zero field chamber, realized through a double superconducting Meissner-shield.

However, in June 2004 we proved successfully with an prototype of MuPAD (Mu-Metal Polarization Analysis Device) at Institute Laue Langevin that an alternative setup based on a zero-field chamber out of highly permeable mu-metal is also feasible [5]. After the successful test a cooperation between the Laboratory for Neutron Scattering at the Paul Scherrer Institute (PSI) in Switzerland and the Physics Department E21 at the Technical University Munich in Germany associated with the FRM-II reactor with the aim to construct a full featured version of the MuPAD SNP device for each of the two neutron sources was launched. The MuPAD option for the three-axis-spectrometer TASP at the cold source of SINQ at the PSI was finished in September 2005.

In this seminar we will give an introduction into the SNP technique, give insight in the technical progress of MuPAD and present the results achieved during the first tests performed in September and October of 2005.

- [1] P. J. Brown, J. B. Forsyth, and F. Tasset. *Solid State Sciences*, 7:682–689, 2005.
- [2] D. Mannix, S. Coad, G. H. Lander, J. Rebizant, P. J. Brown, J. A. Paix ao, S. Landgridge, S. Kawamata, and Y. Yamaguchi. *Phys. Rev. B.*, 62(6):3801–3810, 2000.
- [3] L.P. Regnault, C. Boullier H.M. Rønnow and, J.E. Lorenzo, and C. Marin. *Physica B*, 345:111–118, 2004.
- [4] F. Tasset. *Physica B*, 156-157:627, 1989.
- [5] M. Janoschek. Master's thesis, Technical University Munich, <http://mupad.wired-things.de>, 2004.