PAUL SCHERRER INSTITUT

UNIVERSITÉ DE GENÈVE
FACULTY OF SCIENCE
Department of Quantum Matter Physics

Elastic properties in low dimensional quantum systems

Master project within the MaMaSELF program at the Department of Quantum Matter Physics, University of Geneva and the Paul Scherrer Institute, Villigen, Switzerland

Contact:
Dr. Björn Wehinger
E-mail: bjorn.wehinger@unige.ch
Telephone: +41 22 379 6365

The coupling between magnetic and lattice degrees of freedom gives rise to many interesting effects. It can induce multiferroic order with ferroelectric polarisation coupled to the magnetic structure or it can generate dynamic mixed magnon-phonon excitations [1]. Strong magneto-elastic coupling is realized for example in $LiCrO_2$, were the corresponding excitations can be probed by inelastic x-ray scattering [2], see Figure 1.

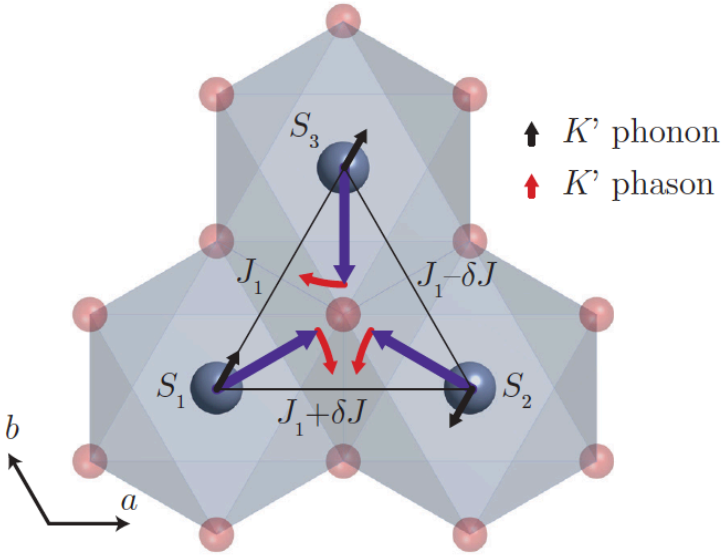

Figure 1. Magnetoelastic coupling in $LiCrO_2$, an excellent realization of the two-dimensional spin 3/2 Heisenberg triangular lattice antiferromagnet with coupling J. Purple arrows depict the helical magnetic structure rotated into the ab-plane for better visibility; the phonon and phason amplitude is shown by black and red arrows, respectively.

Within this project we propose to investigate the influence of magneto-elastic coupling on the elasticity tensor which will help understanding the underlying mechanism.

The successful candidate will conduct diffuse x-ray scattering studies at the Paul Scherrer Institute and the European Synchrotron Radiation Facility. The data analysis is based on a recent approach for the determination of elastic constants [3] and advanced model calculations at University of Geneva.

PAUL SCHERRER INSTITUT

UNIVERSITÉ DE GENÈVE
FACULTY OF SCIENCE
Department of Quantum Matter Physics

[1] W. Eerenstein, *et al*., Multiferroic and magnetoelectric materials, *Nature* **442**, 759-765 (2006).
[2] S. Toth and B. Wehinger *et al*., Electromagnon dispersion probed by inelastic X-ray scattering in $LiCrO_2$, *Nature Communications* **7**, 13547 (2016).
[3] B. Wehinger *et al*., Full elasticity tensor from thermal diffuse scattering, accepted for publication in *Physical Review Letters*, *arXiv:1608.08061* (2016).