



Neutron polarimetry study on the phonon-crystal field coupling in CeAuAl₃

Monday 20 March 2023 16:00 (2 hours)

The magnetoelastic coupling between phonons and f-electron transitions in crystal electric field (CEF) has been of interest for long time already but still lacks a systematic understanding. It was first recognized in 1980s in CeAl₂ that showed an unexpected excitation spectrum. It was explained by a qualitative theory developed by Thalmaier and Fulde [2] but limited to this case. Such phonon-CEF coupling in CeAuAl₃ seems to be exceptionally interesting. Just as CeAl₂ it hosts a coupled phonon-CEF excitation that manifests in the measured spectra as an additional non-dispersive excitation at 8 meV. However, it also shows an anti-crossing of the CEF excitation at 5 meV and an acoustic phonon [3].

We have performed polarized inelastic neutron scattering measurements on CeAuAl₃ to elucidate on the polarization of the coupled excitation as well as on the phonon-CEF anti-crossing. We have observed a transfer of the spectral weight between the magnetic and nuclear channels in the anti-crossing region. Most importantly we have adapted and extended the Thalmaier-Fulde model and performed calculations with McPhase software [4] that allow to quantitatively reproduce the measured spectra and the spectral weight transfer.

- [1] M. Loewenhaupt et al, Phys. Rev. Lett, 42, 1709, (1979).
- [2] P. Thalmeier and P. Fulde, Phys. Rev. Lett., 49, 1588, (1982).
- [3] P. Cermak et al, PNAS, 116, 6695-6700, (2019).
- [4] M. Rotter et al, J. Phys.: Condens. Matter, 24, 213201, (2012).

Authors: STEKIEL, Michal (Technische Universität München); ČERMÁK, Petr (MGML, Charles University); FRANZ, Christian; Dr ROTTER, Martin (McPhase project); SCHMALZL, Karin (Jülich Centre for Neutron Science JCNS, Forschungszentrum Jülich GmbH, Outstation at ILL, Grenoble, France); SCHMIDT, Wolfgang (JCNS @ ILL); PFLEIDERER, Christian; SCHNEIDEWIND, Astrid

Presenter: STEKIEL, Michal (Technische Universität München)

Session Classification: Poster Session MONDAY

Track Classification: Magnetism, Superconductivity, Topological Systems, Magnetic Thin Films and other electronic phenomena