TECHNISCHE UNIVERSITÄT DRESDEN

IFMP Institut für Festkörper- & Materialphysik

IFMP Seminar

Date: Tuesday, May 04, 2021, at 14:50
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Speaker: **Joshua Cohn**
University of Miami

Title: **Magnon heat conduction and spin-Seebeck effect in insulating helimagnets**

Abstract: We will present the results of low-T ($0.5 \leq T \leq 25$ K) experimental studies of heat conduction and spin-Seebeck effect in two novel helimagnetic insulators, Cu_2OSeO_3 and $ZnCr_2Se_4$. Though the two compounds have similar crystallographic and magnetic structures (comprising tetrahedra of S=1/2 Cu^{2+} and S=3/2 Cr^{3+} ions, respectively), they present quite different examples of magnon heat conduction due to differences in the coupling of magnons to phonons and the influence of the spin spiral on the magnon dispersion. In the case of Cu_2OSeO_3, magnon-phonon coupling is weak and the very long wavelength (≈ 62 nm) of the spin-spiral phase has little influence on the magnon dispersion in the accessible range of T. The magnon heat conductivity is the highest known for any ferro- or ferri-magnet.[1] We will focus on recent work[2] that allows new quantitative comparison of the bulk spin-Seebeck effect and its relation to magnon heat conductivity. In $ZnCr_2Se_4$ the magnon-phonon coupling is strong and a 30-fold smaller spin-spiral modulation length (≈ 22 Å) leads to a novel and anisotropic magnon dispersion (with respect to the spin spiral direction) revealed in neutron scattering studies.[3] Anisotropy of the measured thermal conductivity with heat flow along and transverse to the spin spiral direction[4] is proposed to be connected with this dispersion. Calculations of the lattice and magnon heat favor a magnonic origin to this anisotropy. Some discrepancies between experiment and the calculations motivate the possibility that chiral domain boundaries play a role in the anisotropy.

[1] Prasai *et al.*, Phys. Rev. B **95**, 224407 (2017).
[2] Akopyan *et al.*, Phys. Rev. B **101**, 100407 (R) (2020).
[3] Y. V. Tymoshenko *et al.*, Phys. Rev. X **7**, 041049 (2017)
[4] D. Inosov *et al.*, Phys. Rev. B **102**, 184431 (2020)

Host: D. Inosov