



Datum: 08.01.2020

IFMP Seminar

When: **28 January 2020, 14:50 h**

Where: **REC / C 213 H**

Speaker: **Prof. Thorsten Hesjedal**
University of Oxford

Title: **X-Ray Study of Skyrmion Lattices – Microscopic Properties, 3D Structure, and Dynamics**

Abstract:

Magnetic skyrmions in noncentrosymmetric chiral magnets form ordered lattices with a periodicity ranging from 3-100 nm. This lengthscale lends itself to soft x-ray scattering experiments owing to the large resonant scattering cross-section for 3d elements, the excellent reciprocal space resolution, as well as the tunable surface sensitivity. We will present an overview of the capabilities of resonant elastic x-ray scattering (REXS) for the study of magnetic skyrmions [1], highlighting the following effects:

1. Microscopic skyrmion properties [2]: By exploiting the polarization dependence of REXS, the exact surface helicity angles of twisted skyrmions for both left- and right-handed chiral bulk Cu_2OSeO_3 was determined.
2. Full 3D spin structure of skyrmions [3]: Using polarization-dependent REXS we found a continuous transformation of the skyrmion tubes from pure Néel-twisting at the surface to pure Bloch-twisting in the bulk over a distance of several hundred nanometers.
3. Rotating lattices [4]: In a magnetic field gradient, skyrmions undergo rotation with well-defined dynamics. This provides an effective way of controlling skyrmions in racetrack memory schemes.

- [1] S. L. Zhang et al., Phys. Rev. B 93, 214420 (2016); DOI: 10.1103/PhysRevB.93.214420; S. L. Zhang et al., Nat. Commun. 8, 14619 (2017); DOI: 10.1038/ncomms14619
[2] S. L. Zhang et al., Phys. Rev. Lett. 120, 227202 (2018); DOI: 10.1103/PhysRevLett.120.227202
[3] S. L. Zhang et al., Proc. Natl. Acad. Sci. U.S.A. (2018), DOI: 10.1073/pnas.1803367115
[4] S. L. Zhang et al., Nat. Commun. 9, 2115 (2018); DOI: 10.1038/s41467-018-04563-4

Invited by Prof. Jochen Geck

