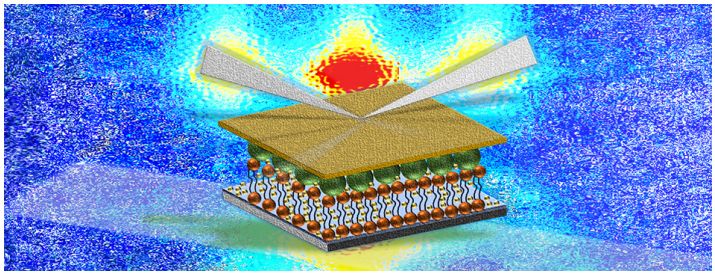

Beitrag ID: **25** Typ: **Invited talk**

Magnetic chirality in superconducting/ferromagnetic heterostructures: insight via polarized GISANS

Freitag, 11. Oktober 2024 10:15 (30 Minuten)

The coexistence of different order parameters can lead to exotic new quantum phenomena. In hard condensed matter materials, their interplay often generates magnetic chiral structures with correlations on the nanometer and mesoscopic length scale, which can be explored by polarization-analyzed Small-Angle-Neutron-Scattering (SANS) in bulk systems, and by its surface-sensitive counterpart Grazing-Incidence-SANS (GISANS) in thin film structures. Thin film Nb/FePd exhibits coexisting superconducting and ferromagnetic phases, affecting both the superconducting and the magnetic order around its superconducting Tc [1,2]. While around Tc in Nb the superconducting state is confined above the domain walls of FePd, the superconducting state itself is affecting the width wDW of magnetic domain walls in FePd [1].
Although a Dzyaloshinskii–Moriya Interaction (DMI) leading to magnetic chirality is not expected in the L10-structured FePd, its domain walls obtain a preferred chiral direction, unveiled by polarized GISANS. An extensive study combining GISANS, circular-dichroism X-ray Resonant Magnetic Scattering (CD-XRMS), and Density Functional Theory (DFT), yields unique insight into the chiral wall formation and its origin.
At the ESS, neutron polarization analysis will be supported on many instruments [3], and together with a wide range of sample environments will enable pioneering science projects. Based on the above-mentioned science case using polarized GISANS, I will additionally present the impact from instrumentational and data reduction aspects.

[1] A. Stellhorn, PhD thesis, RWTH Aachen University (2021).
[2] A. Stellhorn et al., New Journal of Physics 22, 093001 (2020).
[3] W. T. Lee et al., Report on ESS Polarisation Workshop, ESS-3549713 (2020).

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