MA 12: INNOMAG e.V. Dissertationspreis / Ph.D. Thesis Prize (2021)

The Working Group Magnetism (Arbeitsgemeinschaft Magnetismus der DPG) awards a dissertation prize whose aim is to recognise outstanding research done within the framework of a doctorate and communication of this research in an excellent way, both verbally and in writing. The prize is kindly supported by INNOMAG e.V. In this finalists session, pre-selected nominees will present and defend their dissertation. Afterwards, the prize committee decides on the winner of the INNOMAG e.V. Dissertation Prize 2021 and the award of 1000 EURO.

Time: Wednesday 14:30–16:15 Location: H2

MA 12.1 Wed 14:30 H2

Emergent electrodynamics in non-collinear spin textures: skyrmions and beyond — •Börge Göbel — Institut für Physik, Martin-Luther-Universität Halle-Wittenberg, Halle (Saale), Germany

Magnetic skyrmions have attracted an enormous research interest since their discovery a decade ago. Especially the non-trivial real-space topology of these nano-whirls leads to fundamentally interesting and technologically relevant consequences like an enormous stability and the emergence of a topological Hall effect [1]. One issue, which is hindering the realization of spintronic applications, is the so-called skyrmion Hall effect: A skyrmion does not move parallel to an applied spin-polarized current. Instead, the skyrmion is pushed towards the edge of the sample where it annihilates. In this talk, I will present several ways, how this effect can be suppressed. Therefore, I will give an overview about observed or proposed alternative magnetic quasiparticles [1]. The stabilization, as well as the emergent electrodynamic effects will be discussed for the antiferromagnetic skyrmion [2], the bimeron [3] and the antiskyrmions. For the latter object I will present the observed coexistence with conventional skyrmions [4] which allows to suggest an advanced, less susceptible version of the racetrack data storage device.

References: [1] B. Göbel et al. Physics Reports 895, 1 (2021) [2] B. Göbel et al. PRB 96, 060406 (2017) [3] B. Göbel et al. PRB 99, 060407 (2019) [4] J. Jena*, B. Göbel* et al. Nature Communications 11, 1115 and Science Advances 6, eabc0723 (2020)

MA 12.2 Wed 14:55 H2

Complex magnetism of nanostructures on surfaces: from orbital magnetism to spin excitations — •Sascha Brinker — Peter Grünberg Institut and Institute for Advanced Simulation, Forschungszentrum Jülich & JARA, 52425 Jülich, Germany — Department of Physics, RWTH Aachen University, D-52056, Aachen, Germany

Magnetic nanostructures deposited on surfaces not only offer a promising route towards the miniaturization of future information technology devices, but also serve as ideal prototypes to explore fundamental physics at the nanoscale. In this theoretical thesis, I explore a wide range of fundamental magnetic properties in this class of materials ranging from a new component to the orbital degrees of freedom, and a new chiral interaction, which is the biquadratic equivalent of the well-known Dzyaloshinskii-Moriya interaction, to the complex dependence of the so-called Gilbert damping, which can be observed for example in the spin excitation spectrum, on the non-collinear magnetic structure. The fundamental theoretical studies are complemented by fruitful collaborations with experimental colleagues using scanning tunneling microscopy. Theoretical methods were developed and applied to describe the magnetic stability of coupled nanostructures and the emergence of boundary states in magnetic chains proximity-coupled to a superconducting substrate.

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MA 12.3 Wed 15:20 H2

Robustness and Variation of Low-Dimensional Signal Transmission in Topological Phases — •Maik Malki and Götz Uhrig — Lehrstuhl Theoretische Physik I, TU Dortmund, 44221 Dortmund, Germany

The signal transmission based on topological materials represents an important issue for the future. To this end, we investigate the variation of signal transmission in topological phases as well as their robustness in one- and two-dimensional systems by pursuing different approaches. By modifying the boundaries we show the possibilities to control the speed of signal transmission in various topological systems. Furthermore, the triplon excitations in $BiCu_2PO_6$ provide a non-trivial Zak phase while no localized edge states are present. Thus the bulk-boundary correspondence is put into perspective. Finally, present ferromagnetic Shastry-Sutherland model in order to realize topological magnon excitations.

Short break followed by bestowal of INNOMAG e.V. Dissertationspreis / Ph.D. Thesis Prize (2021)