TECHNISCHE UNIVERSITÄT KAISERSLAUTERN

OPTIMAS light-spin-matter

Einladung
zum Laser- und Quantenoptikseminar

Freitag, 05.07.2019, um 10:00 Uhr

Raum 46-387/388

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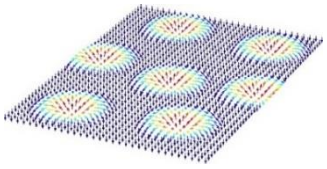
Structure, Stability and Dynamics of Topological Spin Structures

The discovery of room temperature (RT) magnetic skyrmions in multilayer films has spawned a fascinating research field witnessing synergistic progress in fundamental science and device applications [1]. A magnetic skyrmion is defined by the topological character of its spin structure, which emerges from the interplay of atomic-scale magnetic interactions. These intrinsic interactions, together with extrinsic electrodynamic and geometric factors, determine device-level skyrmion stability and dynamics.



Schematic array of skyrmions.

Here we will describe our experimental efforts to unravel the relationship between the magnetic interactions, skyrmion properties, and their emergent stability and dynamics in films and devices. First, we will outline our material platform – Ir/Fe(x)/Co(y)/Pt multilayers – wherein skyrmion properties can be systematically tailored by varying magnetic interactions [2]. Next, we will show the progressive emergence of Néel helicity [3] and evolution of chiral bubbles into skyrmions [4] with increasing interfacial chiral interactions. We will further elucidate that skyrmions and chiral bubbles have contrasting thermodynamic signatures, which point to a dichotomy in their creation and annihilation mechanisms.

We then turn to skyrmions in nanodots – wherein zero field stability is achieved by confinement [5], with promise for perpendicular electrical reading. Finally, we will outline distinct skyrmion dynamic regimes in nanowires and delineate intrinsic electrodynamics from geometric and disorder effects. We will conclude by outlining the promise of skyrmions towards next-generation electronic technologies.

References

[1] A. Soumyanarayanan et al., Nature, 539, 509–517 (2016).
[2] A. Soumyanarayanan et al., Nature Materials, 16, 898–904 (2017).
[3] A. Yagil et al., Applied Physics Letters 112, 192403 (2018).
[4] X. Chen et al., In Prep (2019)
[5] P. Ho et al., Physical Review Applied 11, 024064 (2019).
[6] A.K.C. Tan, P. Ho et al., In Prep (2019)

Der Gast wird betreut von Prof. Dr. B. Hillebrands
GÄSTE SIND HERZLICH WILLKOMMEN!

Biography

Anjan Soumyanarayanan is the Programme Head for Spin Technologies at the Agency for Science, Technology & Research (A*STAR) and an Assistant Professor of Physics at the National University of Singapore (NUS).

Anjan's research interests are in topological and quantum phenomena at the surfaces and interfaces of thin film materials. His recent work has focussed on spin-orbitronics – including magnetic skyrmions and topological materials. His team develops magnetic thin films and devices and investigates their properties using microscopic, spectroscopic, and transport techniques.

Anjan obtained his B.A. in Natural Sciences in 2005 from Cambridge University, UK, and PhD in Physics in 2013 from MIT, USA. He recently received the IEEE Magnetics Society Early Career Award and the Singapore Young Scientist Award for his work on skyrmions.