JOHANNES GUTENBERG UNIVERSITÄT MAINZ

Seminar: Hard Condensed Matter Theory

Room: Galileo room, 01-128 (Staudinger Weg 9)
Time: Tuesday, 21.05.2019, 14:00

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Going beyond skyrmions

Magnetic skyrmions are topologically non-trivial spin textures which are stable at small sizes and which exhibit emergent electrodynamic effects: they show a topological contribution to the Hall effect, and can be driven by currents. Skyrmions are considered as the bits in future data storage devices, where information can be stored very densely and accessed with an enormous energetic efficiency. One issue, which is hindering the realization of this application, 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 give an overview about the different observed or proposed magnetic quasiparticles. The stabilization, as well as the emergent electrodynamic effects will be discussed for the antiferromagnetic skyrmion [1], the skyrmionium [2], the bimeron [3], and the biskyrmion [4]. These magnetic objects are either remarkable from a fundamental point of view, or are advantageous application-wise. As an example, the antiferromagnetic skyrmion is understood as the combination of two skyrmions with mutually reversed magnetic moments. The compensation of topological charge leads to the suppression of the skyrmion Hall effect for these objects. Consequently, the resulting velocity is drastically increased when they are driven by currents.

Included publications:
[1] B. Göbel, A. Mook, J. Henk, I. Mertig. Phys. Rev. B. 96, 060406(R) (2017).
[2] B. Göbel, A. Schäffer, J. Berakdar, I. Mertig, S. Parkin. arXiv: 1902.06295
[3] B. Göbel, A. Mook, J. Henk, I. Mertig, O. Tretiakov. Phys. Rev. B. 99, 060407(R) (2019)
[4] B. Göbel, J. Henk, I. Mertig. arXiv: 1902.10491

All interested are cordially welcome!

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