Skyrmions in Spin-Orbitronics and Orbitronics – novel science and applications in memory & non-conventional computing

Mathias Kläui[1,2]

[1]*Institute of Physics, Johannes Gutenberg University Mainz, 55099 Mainz, Germany*
[2]*Centre for Quantum Spintronics, Department of Physics, Norwegian University of Science and Technology, 7034 Trondheim, Norway.*

Novel spintronic devices can play a role in the quest for GreenIT if they are stable and can transport and manipulate spin with low power. Devices have been proposed, where switching by energy-efficient approaches is used to manipulate topological spin structures [1,2].

We combine ultimate stability of topological states due to chiral interactions [3,4] with ultra-efficient manipulation using novel spin torques [3-5]. In particular orbital torques [6] increase the switching efficiency by more than a factor 10.

We use skyrmion dynamics for non-conventional stochastic computing applications, where we developed skyrmion reshuffler devices [7] based on skyrmion diffusion, which also reveals the origin of skyrmion pinning [7]. Such diffusion can furthermore be used for Token-based Brownian Computing and Reservoir Computing [8].

References

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