Condensed Matter Physics Seminar Series

Topological Spin-Orbitronics and Orbitronics for GreenIT

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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. In particular by using orbital magnets, a factor 70 stronger interaction with orbital currents is found boding well for ultra-efficient manipulation [7]. We use skyrmion dynamics for non-conventional stochastic computing applications, where we developed skyrmion reshuffler devices [8] based on skyrmion diffusion, which also reveals the origin of skyrmion pinning [8]. Such diffusion can furthermore be used for Token-based Brownian Computing and Reservoir Computing [9]. We go beyond simple ferromagnets and study multilayers with antiferromagnetic coupling termed synthetic antiferromagnets. We find that the diffusion dynamics is drastically enhanced due to the topology and efficient dynamics can be induced by spin torques [10].

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Friday, May 29th at 11am in 4-330 PAB

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