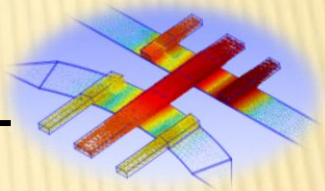
北京大学量子材料科学中心

International Center for Quantum Materials, PKU

ICQM Special Seminar



New spintronics devices for GreenIT

In our information-everywhere society IT is a major player for energy consumption and novel spintronic devices can play a role in the quest for GreenIT. Reducing power consumption of mobile devices by replacing volatile memory by fast non-volatile spintronic memory could also improve speed and a one-memory-fits-all approach drastically simplifies the microelectronic architecture design.

The best-known memory device is the magnetic hard drive and here conventional magnetic fields are used to excite spin dynamics and manipulate magnetization as necessary for switching of magnetic bits. While this approach is now reasonably well understood and widely employed, it is an energy-hungry process leading to large power dissipation. Furthermore it entails limitations for the speed of magnetic switching as intrinsically the spin dynamics is limited by the precession frequency corresponding to the magnetic field.

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Johannes Gutenberg-Universität Mainz

Novel low power storage-class memory devices have been proposed, where switching by alternative means, such as spin-polarized currents is used [1] and for this we develop new highly spin-polarized materials [2]. We study the rich physics of the interaction between spin currents, photons and the magnetization [3], and we have used spin-polarized charge carriers and photons to excite spin dynamics and manipulate the magnetization on ultrafast timescales [4].

Finally using alternative concepts with perpendicular excitation [5] and using skyrmions [6,7] might open novel avenues to ultra-low power switching of magnetization with THz read-out [8].

References:

[1] L. Heyne et al., *Phys. Rev. Lett.* 105, 187203 (2010); M. Eltschka et al., *Phys. Rev. Lett.* 105, 056601 (2010).

[2] M. Jourdan et al., *Nature Comm.* 5, 3974 (2014).

[3] A. Bisig, et al., *Nature Comm*. 4, 2328 (2013).

[4] B. Pfau et al., *Nature Comm*. 3, 1100 (2012)

[5] J.-S. Kim et al., *Nature Comm*. 5, 3429 (2014)

[6] F: Büttner et al., *Nature Phys.* 11, 225 (2015)

[7] S. Woo et al., arxiv:1502.07376

[8] Z. Jin et al., *Nature Phys.* (in press 2015)

Time:

4:00pm, May 14, 2015 (Thursday)

时间:

2015年5月14日 （周四） 下午4:00

Venue:

Room W563, Physics Building, Peking University

地点:

北京大学物理楼 西563