Seminar

Domain wall motion and spin wave

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Time: 4:00pm, June. 17, 2013 (Monday)
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地点： 理科五号楼607会议室

Abstract

In this talk, I will discuss the interplay between magnetic domain wall (DW) motion and spin wave (SW) [1-2] absorption and emission. Both DW and SW are the fundamental excitations of magnetic systems. In a magnetic nanowire, we show that DW propagation accompanies normally spin wave emission on the one hand. On the other hand, a SW passing through a DW tends to drive the DW moving against the SW propagating direction. This interplay between DW and SW leads to very rich physics. I shall present our recent progress on the subject: 1) Magnon, quanta of SW, can efficiently mediate spin angular momentum transfer between SW and DW because magnons are spin-1 particles [1]. 2) Magnonic spin-transfer torque can drive a DW to propagate at a high speed [1]. 3) DW motion will generate SW, and, as a result, a static magnetic field can even drive a DW to propagate along a dissipationless nanowire through SW emission [2]. 4) The widely believed Walker rigid-body propagation mode is not stable in a dissipated wire because of the SW emission, and DW propagation is locked into a soliton mode [2]. Furthermore, our studies imply that two DWs can interact with other through the SWs.

[1] P. Yan, X.S. Wang, and X.R. Wang, Phys.Rev. Lett., 107, 177207(2011).
[2] X. S. Wang, P. Yan, Y. H. Shen, G. E.W. Bauer, and X. R. Wang, Phys.Rev. Lett., 109, 167209 (2012).

About the Speaker

Professor Xiangrong Wang obtained his BSc degree (1984) from Wuhan University and PhD degree (1990) from the University of Rochester. He joined the Physics Department of HKUST in 1992.

Professor Wang was a CUSPEA (China-US Physics Examination and Application) student in class 1984 (from Wuhan University) and a Minnesota Supercomputer Institute Research Fellow (1991-92). He is a guest professor of Shangdong University, Wuhan University, Beijing Normal University, Institute of Solid State Physics, Chinese Academy of Sciences. He is on the Advisory Board, Division of Theoretical and Computational Physics, Institute of Physics, Chinese Academy of Sciences.

Professor Wang is working in the field of theoretical condensed matter physics and statistical physics. His main research interests include spintronics, metal-insulator transitions and quantum Hall effect; mesoscopic physics in hopping and variable-range hopping conductions; nonlinear electron transport in superlattices, quantum wires and quantum dots; quantum entanglements and quantum computation; novel properties in nano-structures; and critical phenomena.