北京大学量子材料科学中心

International Center for Quantum Materials, PKU

Weekly Seminar

Topological Magnetic Materials and Nano Spin Wave Devices

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Time: 4:00pm, Sep. 6, 2017 (Wednesday)

时间：2017年9月6日 （周三）下午4:00

Venue: Room W563, Physics building, Peking University

地点：北京大学物理楼，西563会议室

Abstract

Magnetic materials are highly correlated spin systems that do not respect the time-reversal symmetry. The low-energy excitations of magnetic materials are spin waves whose quanta are magnons. Like electronic materials that can be topologically nontrivial, a magnetic material can also be topologically nontrivial with topologically protected unidirectional edge states. These edge states should be superb channels for processing and manipulating spin waves because they are robust against perturbations and geometry changes, unlike the normal spin wave states that are very sensitive to the system changes and geometry. Therefore, the magnetic topological matter is of fundamental interest and technologically useful in magnonics. Here, we show that ferromagnetically interacting spins on a two-dimensional honeycomb lattice with nearest-neighbour interactions and governed by the Landau-Lifshitz-Gilbert equation, can be topologically nontrivial with gapped bulk spin waves and gapless edge spin waves. These edge spin waves are indeed very robust against defects under topological protection. Because of the unidirectional nature of these topologically protected edge spin waves, an interesting functional magnonic device called beam splitter can be made out of a domain wall in a strip. It is shown that an in-coming spin wave beam along one edge splits into two spin wave beams propagating along two opposite directions on the other edge after passing through a domain wall.

About the speaker

王向荣，香港科技大学终身教授；1984年毕业于武汉大学物理系，同年通过中美联合招收物理研究生选拔考试(CUSPEA) 赴美深造；1990年在美国罗彻斯特大学(University of Rochester)获博士学位。主要从事凝聚态理论研究，目前关注重点是磁动力学，自旋电子学及拓扑系统中的电子和磁子性质。