THE CHINESE UNIVERSITY OF HONG KONG

Department of Physics

COLLOQUIUM

Spintronics with Quantum Materials and Systems

by

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Time: 4:00 - 5:00 p.m.
Place: L2, Science Centre, CUHK

ALL INTERESTED ARE WELCOME
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Abstract

Ubiquitous smart devices and the internet of things create tremendous data every day, shifting computing diagrams towards data-driven. Traditional computers' computing and memory units are physically separated, which leads to substantial energy costs and time delays. Novel computer architectures bring computing and memory units together for data-intensive applications. These units preferably need to be fast, energy-efficient, scalable, and nonvolatile. We work on spin-orbit torque devices and employ quantum materials and systems to enable potentially unprecedented technological advances. The highest energy efficiency of magnetic memory requires the largest charge-to-spin conversion efficiency that allows the minimum power to manipulate the magnetization. We utilize topological insulators and two-dimensional materials and aim to generate giant and unconventional spin-orbit torques. To have the best scaling performance, we investigate emerging topological skyrmions in magnetic thin films, arguably the smallest spin texture in nature. We introduce first room temperature chiral spin interactions and topological Hall effect in magnetic insulator-based heterostructures. Besides, we demonstrate the magnetic dynamics of these ferrimagnetic insulators can be efficiently manipulated by spin-orbit torques from the heavy metal layer.

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