北京大学量子材料科学中心

International Center for Quantum Materials, PKU

Weekly Seminar

Hydrodynamics of topological spin textures and their applications

Shu Zhang

UCLA

Time: 4:00pm, Oct.14, 2020 (Wednesday)

时间：2020年10月14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

Topological spin textures, such as domain walls in one dimension, vortices in two dimensions and magnetic hedgehogs in three dimensions, are promising candidates for nonlocal transport due to their stability against local fluctuations. They follow general topological conservation laws, based on which hydrodynamic theories can be formulated. In this talk, I will introduce the physical principles to drive, transport, and detect topological spin textures, and explain them with experimentally viable proposals. In particular, I will talk about a promising all-spin hardware implementation of neuromorphic computing utilizing domain walls in quasi-one-dimensional antiferromagnets; an energy-storage proposal based on free energy stored in winding textures, which can be controlled via the vorticity flow; and a scheme for three-dimensional nonlocal transport of magnetic hedgehogs. If time permits, I will briefly discuss an electrodynamic view of the XY and Heisenberg ferromagnets.

About the speaker

Shu Zhang received her Bachelor's degree from Tsinghua University, Beijing, China in 2014. She got her Ph.D. degree of physics at Johns Hopkins University, where she worked with Prof. Oleg Tchernyshyov, focusing on quantum spin liquids and dynamics of topological defects. She was a graduate fellow at the Kavli Institute for Theoretical Physics at University of California, Santa Barbara in 2019. She joined University of California at Los Angeles as a postdoc since Sept. 2019 to work with Prof. Yaroslav Tserkovnyak. Recently she is working on hydrodynamics of topological spin textures and quantum sensing of spin noise.