



Department of Physics

THE UNIVERSITY OF HONG KONG

Physics
Colloquium

Quantum Simulation Basing on Exciton Polariton Condensate

Date: July 9, 2024 (Tuesday)

Time: 3:00 p.m.

Venue: CYP3, LG1/F, Chong Yuet Ming
Physics Building, Main Campus, HKU



Prof. Zhanghai CHEN

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Abstract:

A large number of optimization problems of extremely complex systems in the real world remain highly challenging for conventional digital computers. Some such problems can be mapped into the Ising model, and then efficiently solved by searching for the global minimum of the Ising Hamiltonian. Finding an appropriate physical system for efficient simulation of the Ising model is a promising way of addressing such optimization problems that has recently emerged. Here we report on the realization of analog-spin chains of exciton-polariton condensates that mimic a chain of classical spins. This is done with a room-temperature system based on a one-dimensional polariton lattice that is induced by exciting a ZnO microrod with a controllable periodic laser pattern. Depending on the lattice constant chosen, the spontaneously phase-locked condensates show either an antiphase (π) or an in-phase (zero) ordering in the steady state, which mimics the antiferromagnetic or ferromagnetic state in the one-dimensional classical Ising model. In addition, when the external excitation power is increased, a chain of coupled condensate pairs, characterized by a small phase shift between the neighboring condensates that is induced by the tunneling effect, arises at a lower energy. These observations pave the way to the realization at room temperature of analog-spin simulators based on periodic condensates of exciton polaritons.

Biography:

Zhanghai Chen received his B.Sc. and M. Sc. degrees from the department of physics, Xiamen University, China in 1991 and 1994 and Ph.D. degree in physics from Shanghai Institute of Technical Physics, Chinese Academy of Sciences, Shanghai, China in 1997. During his Ph.D. study, he focused on the infrared spectroscopy of semiconductor nanostructures such as quantum wells and wires for infrared detectors. From 1999 to 2003, he was a postdoctoral research fellow in the Institute of Multidisciplinary Research for Advanced Materials, Tohoku University, Japan, working on the spin dynamics of diluted magnetic semiconductors. He joined the department of physics, Fudan University, Shanghai, China in 2003 as a Professor of Physics. He moved to Xiamen University in 2019. Since 2003, his main research interest is on the light-matter interaction in semiconductor nano/micro structures (e.g. cavity excitonic polaritons, exciton magnetic polaron etc.) and their applications in optoelectronics. He won the Kun Huang Prize from the Chinese Physical Society in 2011.

Anyone interested is welcome to attend!

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