北京大学量子材料科学中心

International Center for Quantum Materials, PKU

Seminar

Emergent conformal symmetry and spin dynamics of many-body bound states in one-dimensional spin systems

Dr. Wang Yang

University of British Columbia

Time: 10:00am, April. 2, 2021 (Friday)

时间：2021年4月2日 （周五）上午10:00

Tencent Meeting Link： https://meeting.tencent.com/s/HvObyv7l6tcJ

Tencent Meeting ID： 678 460 390

Abstract

One-dimensional (1D) spin systems are prototypical models with strong correlations, which -- compared with higher dimensional cases -- are more amenable to both analytical and numerical techniques including conformal field theory, bosonization, Bethe ansatz, and the density matrix renormalization group (DMRG) numerical method. The notions and intuitions obtained from such systems can be inspiring for more complicated interacting systems. In the first part of my talk, I will discuss a series of our recent works on the phase diagram of the 1D spin-1/2 generalized Kitaev models. In particular, for the spin-1/2 Kitaev-Gamma chain, we are able to demonstrate the existence of an extended gapless phase with an emergent SU(2)_1 conformal symmetry using a combination of symmetry and field theory analysis. Strikingly, our DMRG calculations show that about 67% of the entire phase diagram is occupied by this emergent SU(2)_1 phase. On the other hand, the “bridge” between the "Planck scale" lattice spin operators and the low energy SU(2)_1 degrees of freedom breaks the SU(2) symmetry. A modified nonabelian bosonization formula is proposed to capture such emergent “partial” SU(2) symmetry. In the second part of my talk, I will discuss our work on the spin dynamics of many-body bound states in the spin-1/2 antiferromagnetic XXZ model. Using the algebraic Bethe ansatz method, we are able to systematically study the dynamical spin structure factors of this model under longitudinal magnetic fields. In particular, at intermediate and high energies, the spin dynamics are found to be dominated by many-body excitations involving multi-magnon bound states. The theoretical predictions are in excellent agreements with the electron spin resonance and inelastic neutron scattering experiments.

About the speaker

Dr. Wang Yang's research interest is in theoretical condensed matter physics. He works on strongly correlated one-dimensional physics, including applications of conformal field theory and bosonization to one-dimensional systems, and spin dynamics in integrable spin chains. He also works on multicomponent topological superconductivity, and unconventional superconductivity with broken time reversal symmetry. Dr. Wang Yang is currently a postdoc fellow in University of British Columbia working with Prof. Ian Affleck. He obtained a Ph.D. degree from University of California San Diego in 2018 supervised by Prof. Congjun Wu, and a Bachelor of Science degree from Tsinghua University in 2012.