

CTCP SEMINAR

Recognizing gapless phases in
quantum many-body physics

Prof. Yuan YAO

Shanghai Jiao Tong University

Wednesday, February 11, 2026, 4:00pm

Room 522, 5/F, Chong Yuet Ming Physics Building,

The University of Hong Kong

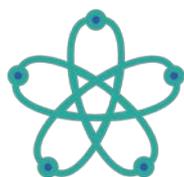
Abstract:

The spectral gap of quantum many-body Hamiltonians is an important but difficult concept in condensed matter. Its identification is complicated and, quite often, controversial because the gap, together with the ground-state degeneracy is a thermodynamic limit notion rather than any finite-size energy splitting.

In this talk, we will discuss a gaplessness indicator. Specifically, we prove that the ground state(s) of an $SO(3)$ -symmetric gapped spin chain must be spin singlet(s), and the expectation value of a twisting operator asymptotically approaches unity in the thermodynamic limit, where finite-size corrections are inversely proportional to the system size. This theorem provides (i) supporting evidence for various conjectured gapped phases, and, contrapositively, (ii) a sufficient criterion for identifying gapless spin chains. We test the efficiency of our theorem by numerical simulations for a variety of spin models and show that it indeed offers a novel efficient way to identify gapless phases in spin chains with spin-rotation symmetry.

ANYONE INTERESTED IS WELCOME TO ATTEND!

HK Institute of Quantum Science & Technology,
Room 525, Chong Yuet Ming Physics Building, The University of Hong Kong
Phone: 3917 1108



HK Institute of
Quantum Science & Technology
香港量子研究院



Department of Physics
THE UNIVERSITY OF HONG KONG