



Seminar

Many-body quantum geometry in time-dependent systems with instantaneously emergent quantum integrability

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Time: 1:30 pm, June 2, 2026 (Tuesday)

时间: 2026年6月2日 (周二) 下午1:30

Venue: Room w563, Physics building, Peking University

地点: 北京大学物理楼, 西563会议室

Abstract

We study quantum geometric effects in instantaneously quantum-integrable time-dependent systems. We establish a theorem stating that the Berry connection matrix thus all associated geometric quantities of the system can be precisely characterized by excitations up to two particles from the initial quantum integrable system. To illustrate the many-body geometric influence, we analyze an Ising chain subjected to both a small longitudinal field and a slowly rotating transverse field, whose low-energy physics in the scaling limit is instantaneously governed by the quantum E_8 integrable field. Focusing on the quantum geometric potential (QGP), we show the QGP continuously suppresses the instantaneous energy gaps with decreasing longitudinal field, thereby enhancing many-body Landau-Zener tunneling as evidenced by the Loschmidt echo and its associated spectral entropy. The critical threshold for the longitudinal field strength is determined, where the spectral entropy linearly increases with system size and exhibits hyperscaling behavior when approaching to the threshold. As the longitudinal field passes the threshold and decreases toward zero, the QGP continuously leads to vanishing instantaneous energy gaps involving more low-energy excitations, resulting in increasing spectral entropy indicative of many-body Landau-Zener tunneling. Our results unveil telltale quantum geometric signatures in time-dependent many-body systems, elucidating the intricate interplay between quantum geometry and dynamics in quantum many-body systems.

About the speaker

Prof. Jianda Wu has long been committed to the research work in quantum phase transitions, quantum critical thermodynamics and dynamics, Bethe ansatz, and dynamics in quantum integrable systems. He obtained BS (2004) and MS (2007) degrees from University of Science and Technology of China, and got PhD (2014) from Rice University. From 2014-2017 he carried out postdoc research at University of California at San Diego, then (2017-2018) became a guest scientist at Max Planck Institute for the Physics of Complex Systems. From 2018 to 2025 he continues his career as a Tsung-Dao Lee Fellow at Tsung-Dao Lee Institute and a faculty member at School of Physics and Astronomy at Shanghai Jiao Tong University. Since 2026 he becomes a tenured associate professor at School of Physics Science and Engineering at Tongji University. Jianda has published more than 40 papers including Nature, Nature Physics, Nature Communications, and Phys. Rev. Lett. etc. So far, he has delivered more than 100 invited talks at international conferences/workshops, universities and institutes around the world.