北京大学量子材料科学中心

International Center for Quantum Materials, PKU

Seminar

Statistics-induced entanglement from Andreev-like tunneling in anyonic colliders

Gu Zhang

Nanjing University



Time: 3:00 pm, Nov 27, 2026 (Friday)

时间：2026年11月27日（周五）下午3:00

Venue: Room w563, Physics building, Peking University

地点：北京大学物理楼，西563会议室

Abstract

Anyons, quasiparticles that obey fractional exchange statistics, are of fundamental interest in the study of strongly correlated quantum systems and topological quantum information processing. While considerable progress has been made in identifying their fractional charge and braiding statistics, the role of fractional statistics in generating quantum entanglement remains less explored. In this talk, I will discuss the emergence of statistics-induced entanglement in an anyonic Hong–Ou–Mandel collider operating in the fractional quantum Hall regime, where two dilute beams of anyons are coupled through a quantum point contact that allows only electron tunneling, referred to as Andreev-like tunneling. We demonstrate that, although conventional time-domain braiding is absent in this configuration, fractional statistics can nevertheless generate entanglement between the two subsystems through a distinct mechanism involving anyon–quasihole braiding. To characterize this entanglement, we introduce an experimentally accessible entanglement pointer constructed from current-noise correlations, which allows the contribution originating from fractional statistics to be identified and quantified. Our theoretical predictions are further supported by experimental measurements performed at filling factor (\nu=1/3), showing quantitative agreement between theory and experiment. These results establish a direct connection between fractional statistics and quantum entanglement, and provide a basis for further investigations of statistics-induced entanglement in fractional quantum Hall systems.

GZ, Pierre Glidic, Frédéric Pierre, Igor Gornyi, Yuval Gefen, Nature Communications 16, 6558 (2025)
GZ, Changki Hong, Tomer Alkalay, Vladimir Umansky, Moty Heiblum, Igor Gornyi and Yuval Gefen, Nature Communications 15, 3428 (2024)

About the speaker

Dr. Gu Zhang received his Bachelor's Degree from the School of Physics of Nanjing University, in 2012. He then studied in the group of Prof. Harold U. Baranger of Duke University, where he obtained his PhD Degree in 2018. After graduation, he worked as a post-doctoral researcher from 2018 to 2021, in Institut für Theorie der Kondensierten Materie (TKM) of Karlsruhe Institute of Technology, with Prof. Igor V. Gornyi and Prof. Alexander Mirlin. From 2021 to early 2025, he joined the Group of Prof. Ke He of Beijing Academy of Quantum Information and Sciences, where he worked as an Assistant Researcher. Starting from April 2025, he became an Associated Professor of the School of Physics, Nanjing University. His research mainly focuses on quantum transport in Mesoscopic systems and quantum devices, and anyonic braiding of topological edge states.