世纪物理情·系列讲座

Mixed-state quantum anomaly and multipartite entanglement

【报告人】
王翀
Perimeter Institute

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【摘要】

Quantum entanglement measures of many-body states have been increasingly useful to characterizephases of matter. Here we explore a surprising connection between symmetry-protected topology (SPT) and separability of their boundary mixed states. Specifically, we consider 1d lattice systems with anomalous symmetry G, and prove that any mixed state ρ that is strongly symmetric under G, in the sense that Gρ~ρ, is necessarily tripartite non-separable. Furthermore, such states cannot be prepared from any tripartite separable states using finite-depth local quantum channels, so the non-separability is long-ranged in nature. The anomaly-nonseparability connection thus allows us to generate simple examples of mixed states with nontrivial long-ranged multi-partite entanglement. We further conjecture (with some evidence) that in general dimension d, a strongly symmetric mixed state under an anomalous symmetry is necessarily (d+2)- partite non-separable, in a long-ranged sense.

【报告人简介】

Chong Wang obtained his Ph.D. in Physics from M. I. T. in 2015, and was a Harvard Junior Fellow during 2015-2018. He is currently a faculty member at the Perimeter Institute for Theoretical Physics in Canada. Chong Wang works on exotic quantum phases of matter, especially those arising from strongly correlated many-body systems. In particular he is interested in topological phases of matter, quantum spin liquids, quantum Hall effects, quantum phase transitions and related topics in quantum field theories such as anomalies and dualities. Recently he is interested in generalizing the notions of topological phases and quantum anomaly to disordered or open quantum systems.

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