北京大学量子材料科学中心

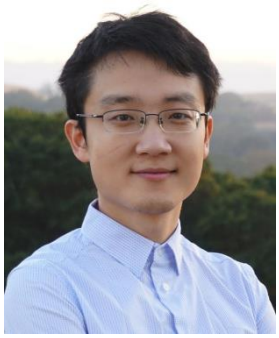
International Center for Quantum Materials, PKU

Seminar

The quantum breakdown model

Lian Biao

Princeton University



Time: 3:00pm, June. 30, 2023 (Friday)

时间：2023年6月30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

We propose a quantum model of fermions simulating the electrical breakdown process of dielectrics. The model consists of M sites with N fermion modes per site, and an interaction of strength J restricting each fermion to excite two more fermions when moving forward by one site. We show the N=3 model with zero disorder exhibits a Hilbert space fragmentation into Krylov subspaces and is exactly solvable in most sectors. Generically, exact diagonalization suggests a MBL to quantum chaos crossover at small disorder as M/N decreases across 1. Furthermore, at zero disorder, many-body scar states exist in many charge Q sectors. The time evolution study shows a dielectric to breakdown phase transition as the interaction strength increases.

About the speaker

Dr. Lian Biao is an assistant professor at the Department of Physics, Princeton University. He received his B.Sc. from the Department of Physics, Tsinghua University in 2012, and completed his Ph.D. study from Stanford University in 2017. He then worked as a postdoctoral fellow in Princeton Center for Theoretical Science from 2017 to 2020. His research interests are theoretical condensed matter physics and nonequilibrium many-body quantum systems. He received awards including Sloan Research Fellowship (2021) and NSF early career award (2022).