Shi-Kang Sun

sunsk@iphy.ac.cn | +86-18211152355 | https://pknight-ssk.github.io/

About

I am a final year PhD student working on quantum nonequilibrium physics. My interests ranges from open quantum system, non-hermitian physics, quantum chaos to quantum circuits. I like the delicate structure in both theory and practice. Currently my two works showed some neat structure of small scale matrix and many body steady state. In my up-coming work we will reveal the beautiful transition of spatial-temporal entanglement as a transition of loops.

Education

Institute of Physics, Chinese Academic of Science, PhD in physics — Sept 2019 – July 2025

- GPA: 3.44/4

Beijing Normal University, BS in Physics — Sept 2015 – July 2019

- GPA: top 20%

Publications

Emergence of the Gibbs ensemble as a steady state in Lindbladian dynamics — Oct 2024

Shi-Kang Sun, *Shu Chen* Phys. Rev. B 110, 134301

- We showed how to construct the steady state of a Lindblad master equation to be a Gibbs state with directed acyclic graph structure. The key is commutant algebra of the original hamiltonian and applying quantum detailed balance condition.

Knot topology of exceptional point and non-Hermitian no-go theorem — Jun 2022

Haiping Hu, ***Shi-Kang Sun***, *Shu Chen* Phys. Rev. Research 4, L022064

- We characterized exceptional points by the energy braiding surround them and showed a global no-go theorem that limits how EPs can merge and annihilate.

Ongoing Projects

Interpolating between Fredkin and East model and classical circuit dynamics — 2023-now

- Constructed a single parameter family of hamiltonian that interpolates between Fredkin-like model and quantum East model, which show Hilbert space fragmentation at those two special point.
- Found a series of first order quantum phase transition when changing the parameter.
- Studied both quantum and classical circuit dynamics in detail. In latter case there are integrable quasiparticles.

Integrable circuit and measurement induced entropy transition of the thermalfield double state — 2024-now

- Constructed an integrable circuit via R matrix.
- MIPT of TFDS is related to the phase transition of a loop model.

Technologies

Programming Languages: Julia, Python, Mathematica

Techniques: Symmetry reduced exact diagonalization, tensor network (with iTensors.jl), Clifford circuit

Platforms: CPU (server), GPU

Miscellaneous

- I am a level 10 (top) amateur flute player. I am also practicing the guitar.
- I enjoy photography, birdwatching, playing music, skiing, hiking, collecting mineral and playing video games.