

KE LIN

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RESEARCH INTEREST

Disordered system and time-dependent quantum physics

Novel topological states in AMO system, interplay between periodic system and disorder

PUBLICATIONS & PREPRINT

(*: equal contribution)

• **K. Lin**, Z. Y. Liu, J. W. Qin, Q. D. Fu, P. Wang, F. W. Ye, “[Observation of two-dimensional branched flow of light](#)”, *Phys. Rev. Lett.* (Submitted 15 May 2023, now under review)

Note: Click the link to see the draft.

• Z. P. Fu*, Z. W. Zhang*, **K. Lin***, D. Wu, J. Zhang, “**Stopping power of high-density alpha-particle clusters in warm dense deuterium-tritium fuels**”, *Physics of Plasmas* 1 July 2023; 30 (7): 072708. <https://doi.org/10.1063/5.0156388> (Featured as cover, Editor’s pick)

EDUCATION

Massachusetts Institute of Technology (MIT), MA, USA

Spring 2023

Major: Physics (Semester exchange program)

Shanghai Jiao Tong University (SJTU), Shanghai, China

Sep.2020-Jun.2024 (expected)

Major: Physics (**Zhiyuan Honor Program, Talented Student Program in SJTU, Top 10%**)

• GPA: 3.92/4.30 Average Score: 90.38/100 RANK: 3/31

RESEARCH EXPERIENCE

Dynamic tunneling effect of superwire

Mar.2023-Now

Instructor: Professor Eric. J. Heller (Harvard Physics & Chemistry, Member of American Academy of Art and Science, Email: eheller@fas.harvard.edu)

- Figure out the difference between superwire and supercollimation beam in Photonics Crystal
- Find breathing parallel superwire and its analogy with Gaussian wave packet in a harmonic well
- Find disorder-free superwire based on phonon scattering rate calculation
- Construct band structure of square lattice with Fermi potential and find corresponding flat band in high index band (High Brillouin Zone)
- Analyze the dynamical confined electrons in terms of a paraxial approximation

Branched flow of the light (Zhiyuan Scholar Program, CN\$100,000)

Sept.2021-Mar.2023

Instructor: Professor Fangwei Ye (SJTU, Email: fangweiye@sjtu.edu.cn)

Part 1: (1+1)D and (2+1)D experimental realization

- Use Split-Step FFT to simulate branch flow of light in both 2D & 3D random potential field (weak disorder)
- Construct 2D&3D, isotropic&anisotropic Gaussian-correlated random potential in a photorefractive SBN:61 crystal
- Observe both (1+1)D and (2+1)D branched flow in a photorefractive SBN:61 crystal

Part 2: Theoretical study of nonlinear branched flow

- Use Fokker-Planck approach to explain the formation of caustics and branched flow
- Explain the influence of the non-linear self-trap effect on the characteristics of the branch flow
- Use 8th Gaussian beam to create initial effective refractive index to verify the non-linear effect
- Discover smartly non-linear self-routing of soliton propagating in weak disorder random potential

Publication: **K. Lin**, Z. Y. Liu, J. W. Qin, Q. D. Fu, P. Wang, F. W. Ye, “[Observation of Stable Branched Flow of Light in Photorefractive Crystals](#),” *Phys. Rev. Lett.* (under review)

Nonlinear topological Thouless pumping in optical lattice

Jun.2022-Aug.2022

Instructor: Professor Fangwei Ye (SJTU, Email: fangweiye@sjtu.edu.cn)

- Mastered the theory of topological insulator, topological photonics and photonics band gap material
- Stimulate the wave packet transportation in Thouless pumping with different nonlinear coefficient

- Use MATLAB code calculating band structure for Thouless pumping in both one and two dimensions
- Measuring forces with magnetic field homopolar motor** **May.2021-Sept.2021**
Instructor: Professor Wei Pan (SJTU, Email: jtushelswill@sjtu.edu.cn)
- Assemble the stable self-designed homopolar motor using batteries and button magnets
 - Model the motion of homopolar motor on a circular aluminum foil with classical electrodynamics

SELECTED COURSE PROJECT & RESEARCH

Measuring forces with the optical trap **2020 Fall**
Instructor: Professor Dan Czajkowsky (SJTU, Email: dczaj@sjtu.edu.cn)

- Measure the laser's power-dependent force on water droplets
- Assemble the self-designed optical trap, use it to capture glass beads and control their motion
- Use optical trap to measure the twisting force that the bacterial motor (E. coli) generates

Study of stopping power of α -clusters in warm dense hydrogen **2022 Fall**
Instructor:

Prof. Dong Wu (SJTU, Email: dwu.phys@sjtu.edu.cn), Prof. Jie Zhang (CAS, Email: jzhang@iphy.ac.cn)

- Use Tianhe-2 supercomputer to simulate alpha-cluster propagation in Warm Dense Matter (WDM)
 - Explain the influence of alpha-clusters by the interference of wake field
- Publication:** Z. P. Fu*, Z. W. Zhang*, K. Lin*, D. Wu, J. Zhang, "Stopping power of high-density alpha-particle clusters in warm dense deuterium-tritium fuels", *Physics of Plasmas* 1 July 2023; 30 (7): 072708.
<https://doi.org/10.1063/5.0156388> (Featured as cover, Editor's pick)

(Optical) Rogue wave formation in 2D and 3D random system **2023 Spring**
Instructor: Professor Lydia Bourouiba (MIT, Email: lbouro@mit.edu)

- Construct 2D & 3D random media based on Wiener-Khintchine theorem
- Use Kick-Drift model to demonstrate the stability of rogue wave
- Discover the different power law relationships between 2D space and 3D space

CONFERENCE & TALK

(Oral Presentation) 18th National Challenge Cup College Research Competition, S.H. China **May. 2023**
 K. Lin, P. Wang, and F. Ye, "Observation of stable two-dimensional branched flow in SBN crystal"

(Oral presentation) National Conference of Optical Soliton of China, Xi'an, China **Aug. 2023**
 P. Wang, K. Lin, and F. Ye, "Observation of stable two-dimensional branched flow in SBN crystal"

(Oral presentation) APS March Meeting, Minnesota, USA **Mar. 2024**
 K. Lin, A.M. Graf, M. Kim, J. K. Rahkonen, and E. Heller, "Quantum superwires: dynamically confined electrons in superlattices"

AWARDS & HONORS

- Outstanding Medal, 18th National "Challenge Cup" College Student Curricular Academic Science and Technology Works Competition, Shanghai, China (Only 6 projects in SJTU have won this award) 2023
- Rongchang Scholarship of Science Innovation (Best 10 undergraduates in SJTU) 2022&2023
- A-Level Scholarship, Shanghai Jiao Tong University (Top 1%) 2021&2022&2023
- Hanyingjuhua Scholarship (Best 15 undergraduates in Zhiyuan Collage) 2022
- Merit Student, Shanghai Jiao Tong University 2021
- National Scholarship, China (Highest academic honor for undergraduates, top 1%) 2021
- 1st Prize in China Undergraduate Physics academic Tournament (CUPT, Chinese IYPT) 2021
- * As a leader of the team on behalf of SJTU, won 1st Prize for the first time
- Meritorious winners in Mathematical Contest in Modeling (MCM) 2021
- Zhiyuan Honor Scholarship, Shanghai Jiao Tong University (CN\$20,000) 2020&2021&2022&2023

ADDITIONS

- Programming Skills: C/C++, Python, MATLAB, Mathematica, COMSOL
- Presenting Tools: LaTeX, Markdown, Slidev on VSCode
- Leadership: President of the Student Union, Zhiyuan College, SJTU