

# Xian-Zhang Chen

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## EDUCATION

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- **ICPCS, Lanzhou University** Lanzhou, China  
*Ph.D. candidate in Theoretical Physics* *September 2016 - July 2023 (expected)*  
*Thesis title: Wavefunction-related Quantum Transport and Many-body effects in Graphene*  
*Advisor: Prof. Liang Huang and Prof. Rodolfo A. Jalabert*
- **IPCMS, University of Strasbourg** Strasbourg, France  
*Joint training Ph.D. student* *December 2020 - November 2022*  
*Project title: Theory of Scanning Gate Microscopy in Graphene*  
*Advisor: Prof. Rodolfo A. Jalabert*
- **School of Physical Science and Technology, Lanzhou University** Lanzhou, China  
*Bachelor of Theoretical Physics* *September 2012 - July 2016*  
*Thesis title: Quantum Transport in an Octagonal Graphene dot*  
*Advisor: Prof. Liang Huang*

## HONORS AND AWARDS

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- Selected as a member of Programme Doctoral International (PDI) of Collège doctoral Européen (CDE), 2021
- China Scholarship Council award (EUR 32,400), China Scholarship Council, 2020
- Excellent Poster Award, The 5th National Statistical Physics Conference, 2019
- National Scholarship for Postgraduates (CNY 20,000), Ministry of Education of P. R. China, 2016

## PERSONAL STATEMENT

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I am a Ph.D. candidate at ICPCS of Lanzhou University with an interest in contributing to a deeper understanding of the classical correspondence of wavefunctions in graphene. The wavefunction is one of the most crucial fundamental concepts in quantum mechanics, which rich physical implications have been extensively debated in the areas of quantum chaos and quantum transport. Graphene has been a focus of experimental and theoretical physics for almost two decades, due to its high mobility at room temperature and the fact that its low-energy quasiparticles can be described by the massless Dirac equation. Consequently, it is important to detect and study the wavefunction properties in graphene. I prefer to do theoretical and numerical analysis that is closely related to experiments and primarily examine scanning gate microscopy (SGM) technology, magnetic transport, and many-body spectral statistics related to the wavefunctions in graphene.

### Research Interests:

- Graphene
- Quantum Transport
- Scanning Gate Microscopy
- Many-body effects

## PUBLICATIONS

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- **Quantum Transport in Graphene**
  - **Xian-Zhang Chen**, Guillaume Weick, Dietmar Weinmann, Rodolfo A. Jalabert, *Scanning gate microscopy in graphene nanostructures*, Phys. Rev. B 107, 085420 (2023).  
*Contributions: Preliminary analytical derivation, calculation and analysis of numerical results, figure making, and paper writing discussion.*
  - Guan-Qun Zhang, **Xian-Zhang Chen**, Li Lin, Hai-Lin Peng, Zhong-Fan Liu, Liang Huang, Ning Kang, and Hong-Qi Xu, *Transport signatures of relativistic quantum scars in a graphene cavity*, Phys. Rev. B 101, 085404 (2020).  
*Contributions: Numerical simulation and analysis of experimental results and supplementary materials writing.*

- **Many-body Effects in Graphene**

- **Xian-Zhang Chen**, Zhen-Qi Chen, Liang Huang, Celso Grebogi, and Ying-Cheng Lai, *Many-body spectral statistics of relativistic quantum billiard systems*, Phys. Rev. Research 5, 013050 (2023).  
*Contributions: Preliminary paper writing, calculation and analysis of numerical results, and figure making.*

- **Chaotic Scattering (spin transport, entanglement)**

- Chen-Rong Liu, **Xian-Zhang Chen**, Hong-Ya Xu, Liang Huang, and Ying-Cheng Lai, *Effect of chaos on two-dimensional spin transport*, Phys. Rev. B 98, 115305 (2018).  
*Contributions: Help in writing calculation programs and numerical results discussion.*
- Chen-Rong Liu, Pei Yu, **Xian-Zhang Chen**, Hong-Ya Xu, Liang Huang, and Ying-Cheng Lai, *Enhancing von Neumann entropy by chaos in spin-orbit entanglement*, Chin. Phys. B 28, 10 (2019).  
*Contributions: Numerical results discussion and paper writing checking.*

- **Classical-quantum Correspondence**

- Xiao-Liang Li, **Xian-Zhang Chen**, Chen-Rong Liu, and Liang Huang, *Quantization condition of scarring states in complex soft-wall quantum billiards*, Acta Phys. Sin., 69, 080506 (2020).  
*Contributions: Help in writing calculation programs, numerical results analysis, and part of figures making.*

## PRESENTATIONS

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- **Talks**

- Many-body spectral statistics of relativistic quantum billiards systems  
DPG Meeting 2022, Regensburg, Germany, 09/2022.

- **Posters**

- Transport signatures of scars in graphene dots at low magnetic field  
GDR 2426, Aussois, France, 12/2021.
- Many-body spectral statistics of relativistic quantum billiard systems  
The 5th National Statistical Physics Conference (SPCSC), Hefei, China, 07/2019.
- Transport signatures of relativistic quantum scars in a graphene cavity  
International Workshop on Experimental and Theoretical Developments on Complex Quantum Systems, Lanzhou, China, 07/2018.

## PARTICIPATED GRANTS

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- Spectral statistics of a class of pseudo-integrable quantum billiards, CNY 630,000, No. 12175090, NSFC, 2021.
- Study of spin anomalous effects in Dirac billiards, CNY 580,000, No. 11775101, NSFC, 2017.