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Contents

Chapter 1 Scientific Program

Data: 13-Jul

8:00-8:30	Onsite Registration		
Session 1: QCD Phase Diagram(Chair: Zhigang Xiao)			
8:30-9:00	Frithjof Karsch	Bielefield University	Conserved charge fluctuations and correlations in finite-density QCD
9:00-9:25	Jan Pawlowski	Heidelberg University	Locating the critical end point and the phase boundary of QCD from first principle QCD
9:25-9:50	Mei Huang	UCAS	Net proton number cumulants from viscous hydro with equation of state including a critical end point
9:50-10:15	Weijie Fu	Dalian Univ. of Science and Technology	Ripples of the QCD critical point
Photo + Coffee Break			
Session 2: QCD Phase Diagram(Chair: Hengtong Ding)			
10:50-11:15	Senger, Peter	GSI	Exploring dense nuclear matter with heavy-ion collisions
11:15-11:40	Kenji Fukushima	Tokyo University	Probing high-density states of QCD matter
11:40-12:05	Jinhui Chen	Fudan University	Progress on measurements of vector meson spin alignment and electromagnetic field effect in heavy-ion collisions at RHIC
12:05-12:30	ShinIchi Esumi	Tsukuba University	Flow and Fluctuation Studies in Beam Energy Scan at High Baryon Density
Lunch (New Physics Building)			
Session 3: SRC/HBT(Chair: Shu Lin)			
13:30-13:55	Bao-Jun Cai	Shadow Creator	Nucleon Short-range Correlations and Equation of State of Dense Nuclear Matter
13:55-14:20	Chuan Fu	IMP	Measurements of Proton-Proton, Proton $-\Lambda$ and Proton $-\Xi^-$ Correlation Functions in 3 GeV Au+Au Collisions at RHIC
14:20-14:45	Ke Mi	CCNU	Femtoscopy analysis involving light nuclei at RHIC-STAR
14:45-15:10	Youquan Qi	CCNU	Measurements of two-pion Femtoscopy in Au+Au Collisions at $\sqrt{s_{NN}}$ = 3.0, 3.2, 3.5, and 3.9 GeV from RHIC-STAR
Coffee Break			
Session 4: EOS/QCD Phase Diagram(Chair: Guoyun Shao)			
15:50-16:15	Xiaofeng Luo	CCNU	Exploring the QCD Phase Structure with RHIC Beam Energy Scan
16:15-16:40	Fan Si	USTC	Precision Measurement of Net-proton Number Fluctuations in Au+Au Collisions at RHIC
16:40-17:05	Yongjia Wang	Huzhou University	The time evolution of elliptic flow in heavy-ion collisions at intermediate energies
17:05-17:30	Kai Zhou	CUHK/Shenzhen	Exploration of QCD matter in extreme meets Deep Learning
Dinner (New Physics Building)			

Data: 14-Jul

Session 1: Hyper-nuclei(Chair: Nu Xu)			
8:30-9:00	Yifei Zhang	USTC	Hypernuclei production at high net-baryon density
9:00-9:25	Guannan Xie	UCAS	Experiment Measurements of (A=4) HyperNuclei Production from the High Baryon Density Region
9:25-9:50	Chengdong Han	IMP	Light- and Hyper-Nuclei Directed flow in Au+Au Collisions in $\sqrt{s_{NN}}$ = 3.0 - 4.5 GeV at RHIC-STAR
9:50-10:15	Kaijia Sun	Fudan University	(Anti-)Hypertriton Polarization in Heavy-Ion Collisions
Coffee Break			
Session 2: Strangeness / exotic(Chair: Xianglei Zhu)			
10:40-11:05	Jujun Xie	IMP	Hyperon Time-like Electromagnetic Form Factors within VMD Model
11:05-11:30	Qian Wang	South China Normal University	Production of double charm tetraquark in pp collision and heavy ion collision
11:30-11:55	An Gu	Huzhou University	v_2 measurement of the $f_0(980)$ in pPb collisions and determination of its quark content by CMS
11:55-12:20	Yingjie Zhou	GSI	Measurements of Strangeness Production at High Baryon Density with the STAR Experiment
Lunch (New Physics Building)			
Session 3: Instrumentation(Chair: Hao Qiu)			
13:30-13:55	Norbert Herrmann	Heidelberg University	Strangeness measurements at large baryon densities
13:55-14:20	Lei Zhao	USTC	R&D on readout electronics for particle physics experiments in USTC
14:20-14:45	Aiqiang Guo	IMP	Future experiment at HIAF: CHNS and EicC
14:45-15:10	Yapeng Zhang	IMP	Status of CSR External-target Experiment (CEE) at HIRFL
Coffee Break			
Session 4: Production in HIC(Chair: Dehua Wen)			
15:50-16:15	Shijun Mao	Xi'an Jiaotong Univ.	Mass spectra of meson nonet under external magnetic field
16:15-16:40	Zhao-Qing Feng	Southern China Univ. of Technology	Hypernucleus production and hyperon-nucleon interaction in dense matter via heavy-ion collisions
16:40-17:05	Si-Bo Wang	Chongqing University	Effective mass splitting and in-medium NN cross sections probed by a relativistic ab initio method
17:05-17:30	Jiaxing Zhao	GSI	Heavy flavor production from high to low energy heavy ion collisions
Banquet: Quanjude (全聚德)			

Data: 15-Jul

Session 1: Transport model(Chair: Hanzhong Zhang)			
8:30-9:00	Jan Steinheimer	Frankfurt University	High baryon density matter in Heavy Ion Collisions: a chiral mean-field equation of state in UrQMD
9:00-9:25	Rui Wang	INFN, Catania	Light-nuclei production in intermediate-energy heavy-ion collisions
9:25-9:50	Yingxun Zhang	CIAE	Probing the nucleon effective mass with HICs
9:50-10:15	Akira Ono	Tohoku University	Cluster and pion production with collision terms under momentum-dependent mean fields
Coffee Break			
Session 2: GeV Exp(Chair: Fei Gao(Beijing Institude of Technology)			
10:40-11:05	Shusu Shi	CCNU	Recent Results of Collective Flow in STAR BESII
11:05-11:30	Baohua Sun	BUAA	Charge changing reactions of exotic nuclei on various targets
11:30-11:55	Xu Sun	IMP	Spin Polarization in Heavy Ion Collisions
11:55-12:20	Xionghong He	IMP	Light nuclei collectivity in heavy-ion collisions at high baryon density
Lunch (New Physics Building)			
Session 3: Structure(Chair: Zhihong Ye)			
13:30-13:55	Anna Zdeb	University of Marie Curie Skodowska	Pairing in fission
13:55-14:20	TBA		
14:20-14:45	Junchen Pei	Peking University	Implications of neutron skin measurements on neutron stars
14:45-15:10	Michal Warda	University of Maria Curie Skolodowska	Cluster radioactivity in heavy and super-heavy nuclei
Coffee Break			
Session 4: SRC/Low Energy Domain(Chair: Li Ou)			
15:50-16:15	Zhihong Ye	Tsinghua University	SRC Study with inverse-kinematic pA collision
16:15-16:40	Fabian Rennecke	Giessen University	Mixing, moats and modulations in dense QCD matter
16:40-17:05	Yaping Wang	CCNU	Recent experiment results of strangeness production in heavy-ion collisions at high baryon density
17:05-17:30	Yijie Wang	Tsinghua University	Fermi energy heavy-ion reaction studies with the compact spectrometer for heavy-ion experiment （CSHINE）
Dinner (New Physics Building)			

Data: 16-Jul

Session 1: Structure(Chair: Pengfei Zhuang)			
8:30-9:00	Pengwei Zhao	Peking University	Nuclear structure and dynamics within Lattice Relativistic Density Functional Theory
9:00-9:25	Huichao Song	Peking University	Probing nuclear structure with relativistic heavy ion collisions
9:25-9:50	Hanlin Li	Wuhan Univ. of Science and Technology	Probing the Neutron Skin with Ultrarelativistic Isobaric Collisions
9:50-10:15	Hao-jie Xu	Huzhou University	Importance of fine nuclear structure in relativistic heavy ion collisions
Coffee Break			
Session 2: EOS/HIC(Chair: Shuzhe Shi)			
10:40-11:05	Nai-Bo Zhang	SouthEast University	Properties of dense matter in neutron stars or hybrid stars from inverting astrophysical observations
11:05-11:30	Pengcheng Li	Huzhou University	Two-pion HBT correlation in heavy-ion collisions at intermediate energies
11:30-11:55	Gaochan Yong	IMP	Constraining the Phase Transition and Hyperon Potential in Dense Matter Using Heavy Ion Collisions
11:55-12:20	Jianing Li	CCNU	Rapidity scan approach for net-baryon cumulants with a statistical thermal model
Lunch (New Physics Building)			

Chapter 2 Committee members

International Advisory Committee

Name	Affiliation	Country
Jorg Aichelin	Université de Nantes	France
Liewen Chen	Shanghai Jiaotong University	China
Norbert Herrmann	Heidelberg University	Germany
Bao-An Li	Taxas A&M University-Commerce	USA
Hiroyoshi Sakurai	RIKEN Nishina Center	Japan
Giuseppe Verde	INFN Catania and University of Catania	Italy
Fuqiang Wang	Purdue University	USA
Bingsong Zou	Institute of Theoretic Physics, CAS/Tsinghua University	China
Pengfei Zhuang	Tsinghua University	China

Local Organizing Committee

Name	Affiliation	Note
Zhigang Xiao	Tsinghua University	Chair
Fei Gao	Tsinghua University	
Shuzhe Shi	Tsinghua University	
Zhihong Ye	Tsinghua University	
Xianglei Zhu	Tsinghua University	
Yapeng Zhang	Institute of Modern Physics, CAS	

Chapter 3 Research Group

Experimental Nuclear Physics Group (ENPG)
Prof. Zhigang Xiao
Email:xiaozg@tsinghua.edu.cn

Snapshots of
Experimental Nuclear Physics Group (ENPG)

【Group leader — Zhigang Xiao】

https://www.phys.tsinghua.edu.cn/phyen/info/1070/1603.htm

The Experimental Nuclear Physics Group (ENPG) was established by Prof. Zhigang Xiao in 2007. So far, ENPG has published more than **50** papers, total **14** PhD students and **1** master student have received their degrees. ENPG hosted **1** visiting scholar. Currently, ENPG has **6** PhD students, **2** undergraduate students and **1** postdoctoral researcher.

ENPG's research interests cover heavy ion collisions, nuclear equation state, short range correlation, and the development of advanced detection devices based on two domestic experiments, **CSHINE** and **CEE**. In addition, ENPG has established in-depth and practical international cooperation with some universities or large laboratories in North America, Europe, and other regions.

Research interest:

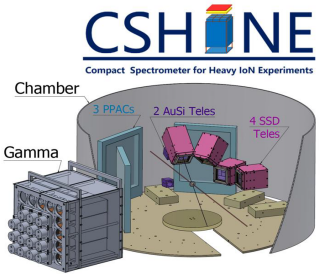
■ **Fermi energy heavy ion collisions**

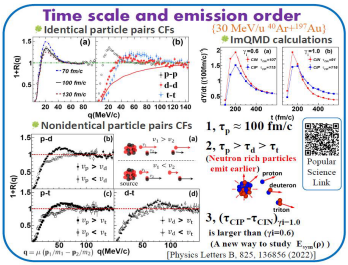
1. Experimental Studies based on CSHINE

ENPG group has developed a compact spectrometer for heavy ion experiment (CSHINE). It can measure initially charged particles and fission fragments. Detectors for high energy gamma rays and neutrons are installed later. So far 5 beam time experiments have been performed. We published a few technique papers.

✧ CSHINE construction [Nucl . Inst. Meth. A, 1011, 165592 (2021)].

- ✧ CSHINE for HBT [Nucl. Sci. Tech. 32, 4 (2021)].
- ✧ CSHINE SSDT Tracking algorithm [Nucl . Inst. Meth. A, 1029, 166461 (2022)].
- ✧ CSHINE Fission Fragments Measurement [Nucl . Sci. Tech. 33, 40 (2022)].
- ✧ CSHINE FPGA-based trigger system [Nucl . Sci. Tech. 33, 162 (2022)].
- ✧ CSHINE High energy gamma array [Nucl . Inst. Meth. A, 1053, 168330 (2023)]
- ✧ CSHINE Neutron array [arXiv:2406.18605]





2. Isospin Chronology using CSHINE silicon strip telescopes

- ✧ Using Hanbury-Brown Twiss (HBT) correlation method to measure the emission order of hydrogen isotopes.
- ✧ Providing a novel way to study isospin dynamics and nuclear symmetry energy effect.

[Physics Letters B, 825, 136856 (2022)]

3. Coupling of Isospin dynamics and clustering

Transport of isospin degree and the clustering process are coupled in heavy ion reactions. How do we observe this coupling? The experimental design is quite novel and we succeed in

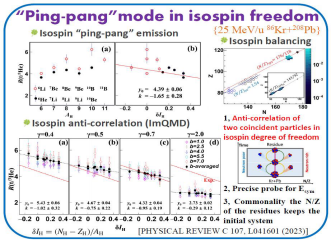
- ✧ Observation of the isospin “ping-pang” emission modality.
- ✧ Evidencing the isospin balancing effect in HICs.

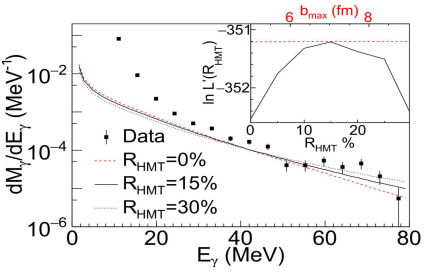
[Physical Review C 107, L041601 (2023)]

4. Bremsstrahlung gamma emission in heavy ion reactions

- ✧ Measuring Bremsstrahlung gamma spectrum in heavy ion reactions.
- ✧ Probing high-momentum component in nucleon momentum distribution by neutron-proton Bremsstrahlung gamma-rays

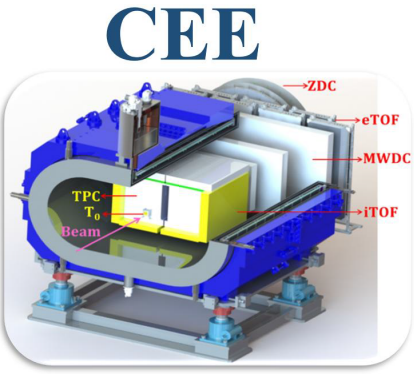
[Physics Letters B, 850, 138514 (2024)]





■ Relativistic heavy ion collisions

ENPG group dedicates to promote the construction of the CSR External-target Experiment (**CEE**), and undertakes the R&D tasks of the multi-wire drift chamber (MWDC) tracking detector and the main trigger system.



1. Development of the FPGA-based Trigger system.

✧ Trigger system adopts a "master-slave" multi-layer structure.

✧ Consisting of a self-developed electronic system based on FPGA.

✧ Supporting real-time changes in different experimental modes.

[Journal of Instrumentation 19, T02018 (2024)].

2. MWDC tracking array development

✧ Demonstrate the performance of the prototypes of MWDC.

✧ Coordinate the integration of the detector, the front end electronics and the data

acquisition system.

✧ Develop the tracking algorithm for the MWDC array.

[arXiv:2406.12878]

3. Nuclear matter equation of state studies with CEE.

✧ Simulation studies on the performance of CEE, including particle identification ability, efficiency, and momentum resolution of CEE.

✧ Verifying the feasibility of nuclear matter EOS studies on CEE.

[Eur. Phys. J. A 60, 36 (2024)].

■ Ongoing activities and future plans

1. Polarized deuteron breakup reaction experiments

ENPG group is committed to searching for new sensitive physical probes of nuclear symmetry energy and to promoting the development of related experimental measurements.

✧ Theoretical studies of isovector reorientation of deuteron.

[Phys. Rev. Lett. 115, 212501(2015); Phys. Rev. C101, 024603(2020)].

✧ Providing a new approach for studying symmetry energy.

✧ The experimental proposal has been approved in RIKEN.

2. Baryon-baryon HBT correlations

ENPG group focuses on the study of HBT correlation functions at CSHINE and STAR experiments. Baryon-baryon correlation functions and interactions are of interest.

✧ Neutron-neutron HBT correlation studies with CSHINE.

✧ Baryon-baryon HBT correlation studies with STAR.

3. International cooperation.

ENPG group is involved in a few international cooperation experiments, and cooperates with important international institutions in theoretic calculations, detector R&D and data analysis.

✧ STAR Collaboration, BNL, USA.

✧ Sπrit Collaboration, RIKEN

✧ Maria Curie Skłodowska University, Poland

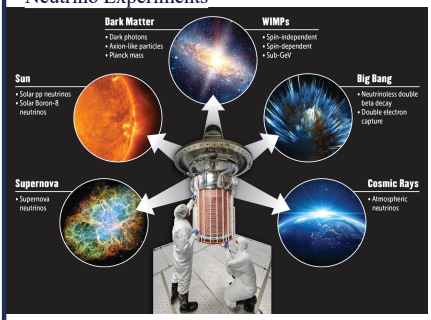
Development of high-sensitivity liquid xenon detectors for identifying characteristic signals from dark matter and neutrinos

Prof. Fei Gao

Email:feigao@mail.tsinghua.edu.cn

Principal Investigator:
Fei Gao

Research Focus: Particle Astrophysics Experiments
•Dark Matter Detection
•Neutrino Experiments

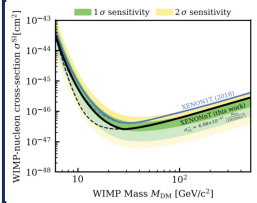


Group Members:
•Professor: Fei Gao
•PhD Students:
2021: Kexin Liu
Chang Cai
2022: Lingfeng Xie
2023: Kaihang Li
2024: Yifei Zhao

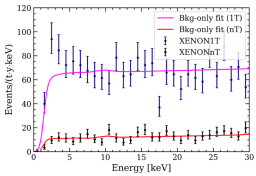
1st Row (from left to right):
Yifei, Mingzhuo, Jiayi, Jian, Yang, Minghao
2nd Row (from left to right):
Chang, Lingfeng, Kaihang, Kexin, Fei

Recent Research Activities:

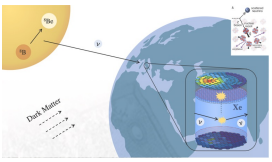
•Participate in the XENON Dark Matter Experiment
•Construct China's first Liquid Xenon Coherent Elastic Neutrino-Nucleus Scattering Experiment (RELICS)
•Participate in the China Jinping CDEX Experiment for 0-Neutrino Double Beta Decay Measurement



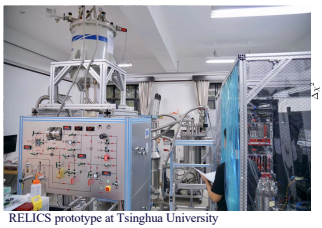
Strongest experimental constraints on dark matter-nucleon scattering cross-sections
PRL 121, 111302 (2018);
PRL 131, 041003 (2023)



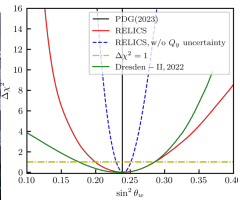
Achieved the world's lowest electronic recoil background in keV energy region, excluding XENON1T excess signals from new physics
PRL 129, 161805 (2022)

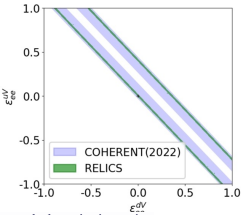


Search the solar B8 neutrinos CEVNS singals in XENONnT detector



RELICS prototype at Tsinghua University





RELICS's expected sensitivity of the non-standard neutrino interaction (NSI) and the Weinberg angle under low momentum transfer. arXiv: 2405.05554

Theoretical High-energy Nuclear Physics

Prof. Shuzhe Shi

Email:shuzhe-shi@tsinghua.edu.cn

Shuzhe Shi

High-energy Nuclear Physics

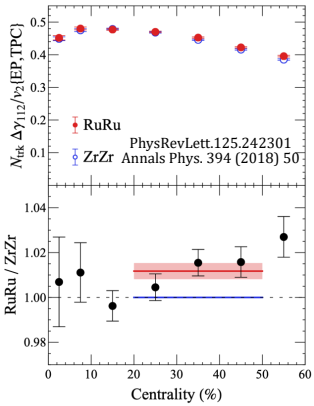
Assit. Prof.

shuzhe-shi@tsinghua.edu.cn

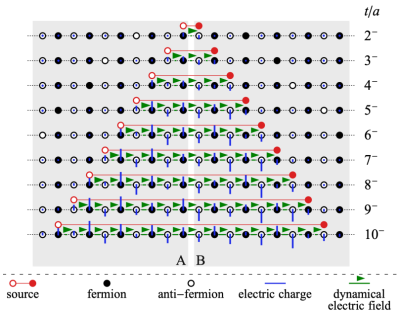
HEP-Inspire

Shuzhe Shi's research focuses on different phenomenologies in heavy-ion collisions, which employs not only traditional analytical and numerical methods but also new techniques such as machine learning and quantum computation. Specific physics aspects are listed as follows.

1. Collective motion of the hot medium created in heavy-ion collisions;
2. Chiral Magnetic effect in heavy-ion collisions;
3. Spin polarization induced by rotation;
4. Static and dynamic properties of heavy quark in quark-gluon plasma;
5. Jet quenching in quark gluon plasma.



Chiral Magnetic Effect in Heavy-Ion Collisions



Quantum Simulation of High-energy physics

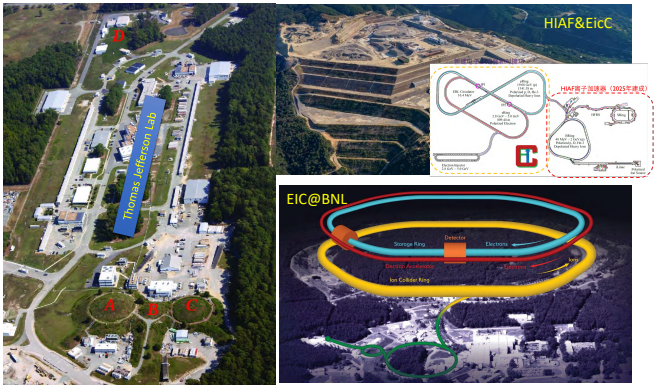
PhysRevLett.131.021902;
PhysRevD.108.L091501;
PhysRevD.108.074001;
2404.00087

Tsinghua Medium Energy Group (TMEG)
Prof. Zhihong Ye
Email:yez@tsinghua.edu.cn

Introduction

The main research direction of TMEG is guided by the theory of quantum chromodynamics, utilizing high-energy electron or ion beams produced by accelerators to bombard protons and atomic nuclei. This aims to precisely measure the complex internal properties of quarks and gluons. TMEG's main activities and contributions include:

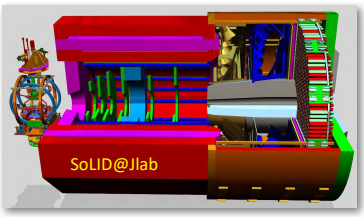
- Deep involvement in the data collection and subsequent analysis of existing experiments at JLab.
- Active participation in
  - the new Electron-Ion Collider (EIC) at Brookhaven National Laboratory (BNL) in the United States
  - the High Intensity Heavy-ion Accelerator Facility (HIAF) in Huizhou, Guangzhou, China, and its future upgrade to the China Electron-Ion Collider (EicC).

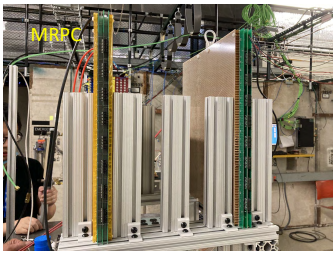


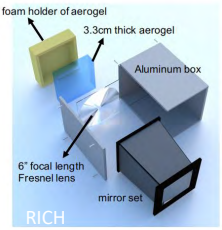
- Responsibility as a core member for the research, development, and construction of core detector components for the new gener-

ation SoLID experiment project.

- Development of new detectors for particle physics experiments, such as:
  - The Ring Imaging Cherenkov (RICH) detector.
  - 20-picosecond timing MRPC flight instruments.
  - Electromagnetic calorimeters.







- Expansion of the application of detectors in other fields, such as:
  - Medical imaging.
  - Climate change research.

Principal Investigator

Zhihong Ye's academic and professional journey includes:

- Graduated from the experimental nuclear physics group at the University of Virginia in the United States.

- Conducted postdoctoral research at:
  - Duke University
  - Argonne National Laboratory
- Served as a senior scientist at the U.S. medical research subsidiary of Canon Inc. (Canon Medical Research USA), where he developed a new generation of medical CT scanners based on photon counting technology.

In the fall of 2021, he began working in the Department of Physics at Tsinghua University, where he:

- Established a new experimental hadron physics research group.
- Conducts physics experiments based on existing international facilities.
- Participates in the design and development of large scientific installations in China.

Experimental High-energy Nuclear Physics

Prof. Xianglei Zhu

Email:zhux@tsinghua.edu.cn

Xianglei Zhu

Associate professor at Department of Engineering Physics, Tsinghua University

Email: zhux@tsinghua.edu.cn

- **Research interests:**

Experimental exploration of the QCD phase diagram and the QCD matter properties with heavy-ion collisions at intermediate and high energy ranges.

- **Recent research activities:**
  - Strange hadron productions in RHIC beam energy scan and fixed-target Au+Au collisions.
    STAR, Phys. Rev. C 103, 034908 (2021)
    STAR, Phys. Rev. C 102, 034909 (2020)
    STAR, Phys. Rev. C 96, 044904 (2017)
  - Heavy quarkonium productions in Au+Au collisions at RHIC with dimuon channels.
    STAR, Phys. Rev. Lett. 130, 112301 (2023)
    STAR, Phys. Lett. B 797, 134917 (2019)
  - Open charm production in proton-lead collisions at LHC
    LHCb, Phys. Rev. Lett. 131, 102301 (2023)
    LHCb, JHEP 01, 070 (2024); JHEP 02, 102 (2019)
  - Charmonium production in proton-proton collisions at LHC
    LHCb, JHEP 05, 243 (2024); JHEP 05, 259 (2024); JHEP 03, 088 (2024); JHEP 11, 181 (2021)
  - Lead the embedding calibration and production team in STAR collaboration.

- **Group members**
  - Postdocs: Jianqiao Wang
  - PhD students: Youen Kang, Chenzhi Dong, Yi Fang, Weiguang Yuan, Zhengcheng Lian, Xiongxiong Xu
  - Former members: Di Yang, Li Xu, Chenxi Gu, Yiheng Luo, Yan Huang (postdoc), Anping Huang (postdoc), Jiayin Sun (postdoc), Muhammad Usman Ashraf, Xinjie Huang, Xiaoping Zhang (postdoc)

Chapter 4 Transport information

Symposium Venue

Lecture Hall
New Physics Building, Department of Physics
Tsinghua University

清华大学物理系
新物理楼报告厅

Hotels

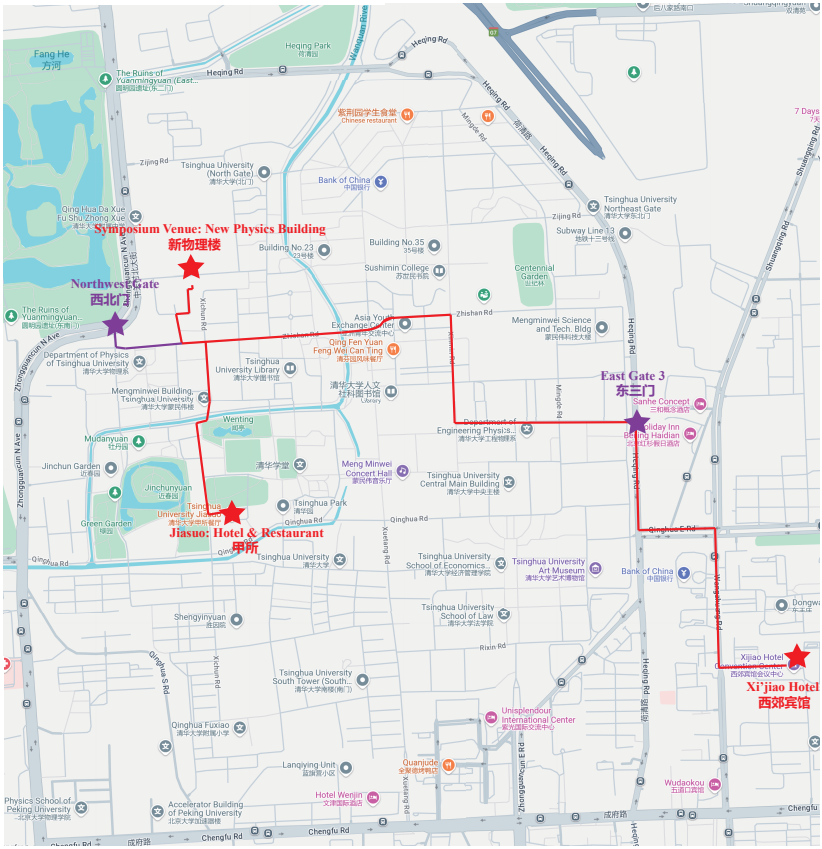
- Jiasuo Restaurant (甲所)

  > Please send me to jiasuo Restaurant.
  > 请把我带到清华甲所. 地址: 清华大学校内

- Xijiao Hotel(西郊宾馆)

  > Please send me to Xijiao Hotel.
  > 请把我带到西郊宾馆. 地址: 清华大学东门外.

Conference Map



Chapter 5 Note