Qing-cang Shui Ph.D.

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Fields of Interest

- **Quasi-periodic oscillations (QPOs)**: conducting joint X-ray timing and spectral analysis using novel methods, such as the Hilbert-Huang transform, to understand the physical mechanisms driving QPOs observed from accreting compact objects, including black hole X-ray binaries, ultraluminous X-ray sources and active galactic nucleus.
- **X-ray polarization**: investigating the accretion geometry of compact objects by X-ray polarimetry through current IXPE and future eXTP observations.
- **Accretion under strong magnetic fields**: studying timing and spectral properties, such as evolution of cyclotron resonate scattering features (CRSFs), from X-ray pulsars to understand the accretion physics under strong magnetic fields ($> 10^{12}$ G).

Education

Institute of High Energy Physics, Chinese Academy of Sciences Beijing, China
Ph.D. in Particle Physics and Nuclear Physics 2021.09 – 2026.06 *(expected)*
- Advisor: Prof. Shu Zhang
- Research area: High Energy Astrophysics

School of Space Science and Physics, Shandong University Weihai, China
B.S. in Space Science and Technology 2017.09 – 2021.06
- GPA: 90.6/100.0, Rank: 3/43.

Awards and Honors

- **International Cooperative Training Program Scholarship for Doctoral Students**, University of Chinese Academy of Sciences 2025.01
- **National Scholarship for Graduate Student** (Most prestigious scholarship for graduate student in China) 2024.11
- **Academic First Class Scholarship**, University of Chinese Academy of Sciences 2024.09
- **Academic First Class Scholarship**, University of Chinese Academy of Sciences 2023.09
- **Outstanding Graduate of Shandong University**, Shandong University 2021.06
- **National Scholarship for Undergraduate Student** (Most prestigious scholarship for undergraduate student in China) 2019.12
- **Academic First Class Scholarship**, Shandong University 2019.09

Approved Proposals

- **EP-FXT ToO (PI)**, 9 ks on WFST0525lxnt 2025.05
- **EP-FXT ToO (PI)**, 12 ks on EP 250512a 2025.03
- **EP-FXT ToO (PI)**, 3 ks on EP J1440.2–6317 2025.04
- **EP-FXT ToO (PI)**, 3 ks on EP 250315b 2025.03
- **EP-FXT ToO (PI)**, 9 ks on GRB 250314a 2025.03
- **EP-FXT ToO (PI)**, 3 ks on EP 250108a 2025.01
- **EP-FXT ToO (PI)**, 9 ks on 3C 273 2025.01
- **EP-FXT ToO (PI)**, 3 ks on ATO J062.5554+20.7139 2024.12
- **EP-FXT ToO (PI)**, 6 ks on EP 241119a 2024.11
- **EP-FXT ToO (PI)**, 5 ks on GOTO 065054.49+593624.51 2024.10
- **Insight-HXMT AO6 (PI)**, 100 ks on GX 339–4 2023.06
- **Insight-HXMT AO6 (PI)**, 100 ks on H 1743–322 2023.06
- **Insight-HXMT AO6 (PI)**, 100 ks on 1A 0535+262 2023.06
- **Insight-HXMT AO5 (PI)**, 100 ks on GX 339–4 2022.05
- **Insight-HXMT AO5 (PI)**, 100 ks on H 1743–322 2022.05

Projects

Tracing the Accretion Geometry of Black Hole X-ray Binary H 1743–322 during Outbursts
Undergraduate research training program 2020.05 – 2021.05

State Transitions of Black Hole X-ray Binary GX 339–4
Undergraduate research training program 2018.05 – 2020.05

Skills

Languages: Chinese, English.

Programming: `Python`, `C++`, `MATLAB`

Familiar with Instruments: XMM-Newton, NuSTAR, Insight-HXMT, NICER, EP, IXPE, RXTE

Presentations

Seminar Talk at the School of Space Science, Shandong University
Invited Talk (60 min) Weihai, China (Jun 18, 2025)

"Advances in Astronomy" Lecture of Shandong University
Invited Lecturer (100 min) Weihai, China (Jun 18, 2025)

The 5th China-India Workshop on High Energy Astrophysics
Invited Speaker (20 min) Given remotely, (Dec 19, 2024)

The 6th Symposium on X-ray Binary Multiwavelength Studies
Speaker (15 min) Qingdao, China, (Nov 15, 2024)

Unveiling the Dynamic and Energetic Universe with Insight-HXMT for Six Years and Beyond
Speaker (15 min) Zhuhai, China, (Jan 23, 2024)

The 32nd Texas Symposium on Relativistic Astrophysics
Speaker (12 min) Shanghai, China, (Dec 15, 2023)

The 5th Symposium on X-ray Binary Multiwavelength Studies
Speaker (15 min) Wuhan, China, (Nov 17, 2023)

The Insight-HXMT Workshop of 2023
Speaker (15 min) Qingdao, China, (Jul 10, 2023)

The Insight-HXMT and X-ray Binaries Workshop at Shandong University
Speaker (15 min) Weihai, China, (Jul 14, 2021)

The Insight-HXMT and X-ray Binaries Workshop at Xiangtan University
Speaker (15 min) Xiangtan, China, (Apr 3, 2020)

Members

Einstein Probe Science Topical Panels 4 and 6
Associate Member 2023 – present

eXTP Science Team
Contribute to the white papers 2024 – present

Publications (First-author)

1. **Shui Q.-C.**, Zhang S.*, Feng H.*, et al., 2025, **ApJ, 984, 130**
   A Phase-resolved View of Millihertz Quasiperiodic Oscillations in the Ultraluminous X-Ray Source M51 ULX-7: Evidence for a Magnetically Truncated Disk and Geometrical Beaming
2. **Shui Q.-C.***, Zhang S.*, Peng J.-Q.*, et al., 2024, **ApJ, 973, 92**
   A Phase-resolved View of "Heartbeat"-like Variability in IGR J17091-3624 during the 2022 Outburst
3. **Shui Q.-C.***, Zhang S.*, Peng J.-Q.*, et al., 2024, **ApJ, 973, 59**
   Phase-resolved Spectroscopy of Low-frequency Quasiperiodic Oscillations from the Newly Discovered Black Hole X-Ray Binary Swift J1727.8-1613
4. **Shui Q.-C.***, Zhang S.*, Zhang S.-N.*, et al., 2024, **ApJL, 965, L7**
   Recovery of High-energy Low-frequency Quasiperiodic Oscillations from Black Hole X-Ray Binary MAXI J1535–571 with a Hilbert–Huang Transform Method
5. **Shui Q.-C.***, Zhang S.*, Wang P.-J.*, et al., 2024, **MNRAS, 528, 7320**
   Cyclotron line evolution revealed with pulse-to-pulse analysis in the 2020 outburst of 1A 0535+262
6. **Shui Q.-C.***, Zhang S.*, Zhang S.-N.*, et al., 2023, **ApJ, 957, 84**
   A Phase-resolved View of the Low-frequency Quasiperiodic Oscillations from the Black Hole Binary MAXI J1820+070
7. **Shui Q.-C.***, Zhang S.*, Chen Y.-P.*, et al., 2023, **ApJ, 943, 165**
   Tracing the Accretion Geometry of H1743-322 with Type C Quasiperiodic Oscillations in Multiple Outbursts
8. **Shui Q.-C.**, Yin H.-X.*, Zhang S., Qu J.-L., et al., 2021, **MNRAS, 508, 287**
   State transitions of GX 339-4 during its outburst rising phase

Publications (Corresponding-author)

1. Peng J.-Q.*, Zhang S.*, **Shui Q.-C.***, et al., 2024, **ApJL, 973, L7**
   Insight-HXMT, NICER, and NuSTAR Views to the Newly Discovered Black Hole X-Ray Binary Swift J151857.0–572147
2. Peng J.-Q.*, Zhang S.*, **Shui Q.-C.***, et al., 2024, **ApJL, 965, L22**
   NICER, NuSTAR, and Insight-HXMT Views to Black Hole X-Ray Binary SLX 1746–331
3. Peng J.-Q.*, Zhang S.*, **Shui Q.-C.***, et al., 2024, **ApJL, 960, L17**
   NICER, NuSTAR, and Insight-HXMT Views to the Newly Discovered Black Hole X-Ray Binary Swift J1727.8–1613
4. Peng J.-Q.*, Zhang S.*, **Shui Q.-C.***, et al., 2024, **ApJ, 975, 4**
   The Peculiar Disk Evolution of 4U 1630–472 Observed by Insight-HXMT During its 2022 and 2023 Outbursts

Publications (Co-author)

1. Yu Z.-L.*, Zhang S.*, ..., **Shui Q.-C.**, et al., 2025, **A&A, 699, A130**
   An investigation into the X-ray bursts in Cir X–1
2. Peng J.-Q.*, Zhang S.*, **Shui Q.-C.**, et al., 2025, **JHEAp, 45, 316**
   A possible jet and corona configuration for Swift J1727.8–1613 during the hard state
3. Dai X.-H.*, Kong L.-D.*, ..., **Shui Q.-C.**, et al., 2025, **A&A, 692, A117**
   Unveiling the rebrightening mechanism of GRS 1915+105: Insights from a change in the quasi-periodic oscillations and from a wind analysis
4. Yu Z.-L.*, Zhang S.*, ..., **Shui Q.-C.**, et al., 2024, **A&A, 690, A279**
   The correlation between dip width and peak flux in Cir X–1
5. Wang P.-J.*, Zhang S.*, ..., **Shui Q.-C.**, et al., 2024, **A&A, 689, A47**
   Burst-recurrence properties revealed with Insight-HXMT and NICER for the newly discovered accreting millisecond pulsar MAXI J1816–195
6. Chen Y.-P.*, Zhang S.*, ..., **Shui Q.-C.**, et al., 2024, **MNRAS, 531, 1756**
   Insight-HXMT observations of thermonuclear X-ray bursts from 4U 1608–52 in the low/hard state: the energy-dependent hard X-ray deficit and cooling saturation of the corona
7. Kong L.-D.*, Ji L.*, ..., **Shui Q.-C.**, et al., 2024, **A&A, 686, A211**
   Likely detection of magnetic field related LFQPO in the soft X-ray rebrightening of GRS 1915+105
8. Peng J.-Q.*, Zhang S.*, ..., **Shui Q.-C.**, et al., 2024, **A&A, 685, A71**
   New insight into the hard X-ray emission influenced by the type I bursts observed by Insight-HXMT during the outburst of 4U 1636–536
9. Li P.-P., Tao L.*, ..., **Shui Q.-C.**, et al., 2024, **MNRAS, 529, 1187**
   Broad-band noise and quasi-periodic oscillation characteristics of the X-ray pulsar RX J0440.9+4431
10. Wang P.-J.*, Chen Y.-P.*, ..., **Shui Q.-C.**, et al., 2024, **JHEAp, 41, 106**
    Type-I X-ray burst evolution of the new millisecond pulsar MAXI J1816–195 revealed by Insight-HXMT
11. Zhao Q.-C., Tao L.*, ..., **Shui Q.-C.**, et al., 2024, **ApJL, 961L, 42**
    The First Polarimetric View on Quasiperiodic Oscillations in a Black Hole X-Ray Binary
12. Yu Z.-L.*, Zhang S.*, ..., **Shui Q.-C.**, et al., 2024, **MNRAS, 527, 8029**
    The post-quiescence properties of Cir X–1 at orbital phase around periastron observed by NuSTAR and NICER
13. Li P.-P., Tao L.*, ..., **Shui Q.-C.**, et al., 2023, **MNRAS, 526, 3637**
    Timing properties of the X-ray accreting pulsar RX J0440.9+4431 studied with Insight-HXMT and NICER
14. Chen Y.-P.*, Zhang S.*, ..., **Shui Q.-C.**, et al., 2023, **JHEAp, 40, 76**
    Insight-HXMT observations on thermonuclear X-ray bursts from 4U 1608–52 in 2022: The accretion rate dependent anisotropy of burst emission
15. Peng J.-Q.*, Zhang S.*, ..., **Shui Q.-C.**, et al., 2023, **ApJ, 955, 96**
    Back to Business: SLX 1746–331 after 13 Years of Silence
16. Zhang P.*, Soria R.*, ..., **Shui Q.-C.**, et al., 2023, **A&A, 677, A178**
    Intermittent properties of the quasi-periodic oscillations of MAXI J1820+070 revealed by Insight-HXMT
17. Peng J.-Q.*, Zhang S.*, ..., **Shui Q.-C.**, et al., 2023, **MNRAS, 518, 2521**
    A possible overall scenario for the outburst evolution of MAXI J1820+070 revealed by Insight-HXMT
18. Chen Y.-P.*, Zhang S.*, ..., **Shui Q.-C.**, et al., 2023, **ApJL, 942L, 12**
    Return of 4U 1730-22 after 49 yr Silence: The Outburst Properties Observed by NICER and Insight-HXMT
19. Chen Y.-P.*, Zhang S.*, ..., **Shui Q.-C.**, et al., 2023, **ApJL, 942L, 12**
    Return of 4U 1730-22 after 49 yr Silence: The Outburst Properties Observed by NICER and Insight-HXMT