ABOUT QPQIS-2026

Welcome to QPQIS-2026, the 8th International Symposium on Quantum Physics and Quantum Information Science, hosted by Beijing Academy of Quantum Information Sciences (BAQIS). QPQIS-2026 will be held on October 13-15, 2026 (Beijing Time).

QPQIS is a high-profile international academic forum held annually to promote global collaboration and advance the frontiers of quantum science. The symposium features not only established leaders, but also emerging young scholars, providing opportunities for comprehensive and multi-perspective communication through keynote speeches, oral presentations, and interactive poster sessions.

BEIJING ACADEMY OF QUANTUM INFORMATION SCIENCES



Beijing Academy of Quantum Information Sciences (BAQIS) was established on December 24, 2017. It is an innovative research institution initiated by Beijing Municipal Government and co-founded with China's top universities and research institutions such as Tsinghua University, Peking University, Chinese Academy of Sciences, etc.

BAQIS endeavors to address major fundamental issues of quantum physics and quantum information science to push the frontiers of quantum science and technology. BAQIS encompasses five major research fields: quantum computing, quantum communication, quantum precision measurement, quantum states of matter, quantum materials and devices. In the meantime, it has developed two state-of-the-art experimental platforms, i.e. the micro-nano processing platform and the synergetic testing platform, and a quantum engineering research center to support the research.

To build a world-class research institution, BAQIS adopts an operating mechanism in line with international standards, coordinates all partners with their distinct and favorable resources, and vigorously introduces the world's top talent. BAQIS also strives to promote international academic exchanges and collaborations through various activities, such as QPQIS (International Symposium on Quantum Physics and Quantum Information Science) and the "Distinguished International Visiting Scholar Program".

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PROGRAM

Day 1 / October 13

OPENING CEREMONY

09:00-09:10 • **Opening Speech**

SESSION 1 (Session Chair: *Heng Fan* | IOPCAS / BAQIS)

09:10-09:45 • **Invited Talk I-01: Coherent Quantum Phase-Slip Effect and Quantum Metrology**
Oleg Astafiev | Skolkovo Institute of Science and Technology, Russia

09:45-10:20 • **Invited Talk I-02: Rapid Autonomous Entanglement Distribution**
Peter Rabl | Technical University of Munich, Germany

10:20-11:00 • **Group Photo & Tea Break**

SESSION 2 (Session Chair: *Lai Zhou* | BAQIS)

11:00-11:35 • **Invited Talk I-03: On-Chip Measurement of Quantum Noise Squeezing from a SiN Micro-Ring via an On-Chip Parametric Amplifier**
Zhe Yu Jeff Ou | City University of Hong Kong, China

11:35-11:47 • **Oral Talk O-01: Realization of Poor Man's Majoranas on Pb-based Minimal Kitaev Chain**
Jie Shen | Institute of Physics, CAS, China

11:47-11:59 • **Oral Talk O-02: Broadband Purcell Filter for Superconducting Quantum Circuits**
Zhen Luo | Technical University of Munich, Germany

11:59-12:11 • **Oral Talk O-03: Flux Engineering in Superconducting Quantum Devices**
Mingtang Deng | National University of Defense Technology, China

12:11-14:00 • **Lunch / Poster Session**

SESSION 3 (Session Chair: *Tie-Fu Li* | Tsinghua University / BAQIS)

14:00-14:35 • **Invited Talk I-04: Photon-Level Frequency Sensing for Quantum Networks**
Zhiliang Yuan | BAQIS, China

14:35-14:47 • **Oral Talk O-04: Coherent Ising Machine beyond Quantum Computing — Quantum Phase Transition, Criticality-Enhanced Quantum Metrology and Quantum Battery**
Qing Ai | Beijing Normal University, China

14:47-14:59 • **Oral Talk O-05: Accelerating Quantum Adiabatic Evolution with π-Pulse Sequences**
Jiang Zhang | BAQIS, China

14:59-15:11 **Oral Talk O-06: Tensor Network Characterization and Mitigation of Readout Errors**
Shuo Yang | Tsinghua University, China

15:10-15:35 **Tea Break**

SESSION 4 (Session Chair: *Yi-Quan Zou* | BAQIS)

15:35-16:10 **Invited Talk I-05: Photonic Integrated Circuits: From Machine Learning Implementations to Quantum Protocols**
Leong-Chuan Kwek | Nanyang Technological University, Singapore

16:10-16:45 **Invited Talk I-06: Characterizing Entanglement of Multipartite Non-Gaussian Quantum States**
Qiongyi He | Peking University, China

16:45-16:57 **Oral Talk O-07: Quantum Machine Learning: A Paradigm for Reliable and Adaptive AI**
Yuqin Chen | Graduate School of China Academy of Engineering Physics, China

16:57-17:09 **Oral Talk O-08: Cavity-Enhanced Solid-State Spin Sensing: from Linear to Nonlinear Regime**
Hao Wu | Beijing Institute of Technology, China

17:09-17:21 **Oral Talk O-09: Towards Practical Quantum Advantage for Artificial Intelligence**
Zhaokai Li | University of Science and Technology of China, China

Day 2 / October 14

SESSION 5 (Session Chair: *Lai Zhou* | BAQIS)

09:00-09:35 **Invited Talk I-07: The Complexity of Quantum Measurements: From Local Certification to Universal Readout**
Xiongfeng Ma | Tsinghua University, China

09:35-10:10 **Invited Talk I-08: Neural Quantum State Spaces**
Giulio Chiribella | University of Hong Kong, China

10:10-10:35 **Tea Break**

SESSION 6 (Session Chair: *Hong-Qi Xu* | BAQIS)

10:35-11:10 **Invited Talk I-09: Silicon and Germanium Hole Spin Qubits**
Dominik Zumbühl | University of Basel, Switzerland

11:10-11:22 **Oral Talk O-10: Non-Hermitian Singularities for Quantum-Enhanced Metrology**
Changqing Wang | BAQIS, China

11:22-11:34 **Oral Talk O-11: Nuclear Spins in Silicon: From 31P Four-body Entanglement to 121Sb Electric Resonance**
Tao Xin | Shenzhen International Quantum Academy, China

11:34-11:46 **Oral Talk O-12: From Multiexcitation to Superradiant Burst in Resonant Nuclear X-Ray Emission**
Xiangjin Kong | Fudan University, China

11:46-14:00 **Lunch / Poster Session**

SESSION 7 (Session Chair: *Gui-Lu Long* | Tsinghua University / BAQIS)

14:00-14:35 **Invited Talk I-10: Long-Lived Macroscopic Quantum Coherence in a Diamond under Ambient Conditions**
Renbao Liu | Chinese University of Hong Kong, China

14:35-14:47 **Oral Talk O-13: Autonomous Floquet Engineering of Bosonic Codes via Reinforcement Learning**
Wei-Wei Zhang | Northwestern Polytechnical University, China

14:47-14:59 **Oral Talk O-14: Long-Lived Multimode Microwave Electromechanical Systems**
Yulong Liu | BAQIS, China

14:59-15:11 **Oral Talk O-15: Nonlocal Nonstabilizerness for Lightly Entangled Quantum Many-Body States**
Jian Cui | Beihang University, China

15:11-15:23 **Oral Talk O-16: Rayleigh-Wood Anomaly and Nonlinear Photon Correlations in Two-Dimensional Atomic Arrays**
Li-Ping Yang | Northeast Normal University, China

15:23-15:45 **Tea Break**

15:45-17:30 **Poster Session**

Day 3 / October 15

SESSION 8 (Session Chair: *Wen-Lan Chen* | Tsinghua University / BAQIS)

09:00-09:35 **Invited Talk I-11: Two-Dimensional Trapped-Ion Crystals for Quantum Simulation and Spin Squeezing**
Kihwan Kim | The Institute for Basic Science, Korea

09:35-10:10 **Invited Talk I-12: Fly, Atoms, Fly!**
Jaewook Ahn | Korea Advanced Institute of Science and Technology, Korea

10:10-10:35 **Tea Break**

SESSION 9 (Session Chair: *Fei Yan* | BAQIS)

10:35-11:10 **Invited Talk I-13: Fast Thermal State Preparation Beyond Native Interactions**
Florian Mintert | Imperial College London, United Kingdom

11:10-11:22 **Oral Talk O-17: Stochastic Transport of a Goldstone Mode in a Self-Organized Atomic Crystal**
Hao Zhang | Graduate School of China Academy of Engineering Physics, China

11:22-11:34 • **Oral Talk O-18: Provably Efficient Self-Calibrating Quantum Fault Tolerance**
Hong-Ye Hu | Institute of Physics, CAS, China

11:34-11:46 • **Oral Talk O-19: Quantitative Analysis of Radiation-Induced Correlated Errors in Superconducting Qubits in a Cosmic-Ray-Free Environment**
Xuegang Li | BAQIS, China

11:46-14:00 • **Lunch / Poster Session**

SESSION 10 (Session Chair: *Yue Chang* | BAQIS)

14:00-14:35 • **Invited Talk I-14: Perthermalization on Superconducting Processor**
Heng Fan | Institute of Physics, CAS/BAQIS, China

14:35-14:47 • **Oral Talk O-20: The Riemann Hypothesis Manifested in Dynamical Quantum Phase Transitions**
ShiJie Wei | BAQIS, China

14:47-14:59 • **Oral Talk O-21: Bound State in the Continuum and Multiple Atom State Transfer Applications in a Waveguide QED Setup**
Zhihai Wang | Northeast Normal University, China

14:49-15:11 • **Oral Talk O-22: Observing Quantum Correlation Dynamics in Tunable Superconducting Bose-Hubbard Simulators**
Ziting Wang | Tianjin University, China

CLOSING CEREMONY

15:11-15:40 • **Closing Remarks & Announcement of Best Poster Awards**

Invited Talks

Day 1 Oct-13 2026
Session 1 Invited talk I-01 09:10 - 09:45

Coherent Quantum Phase-Slip Effect and Quantum Metrology

Learn More

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[2]Moscow Institute of Physics and Technology, Russia

The Coherent Quantum Phase Slip (CQPS) effect – tunneling of magnetic fluxes through a superconducting nanowire – is one of the most fundamental effects in physics. This effect is dual to the tunneling of charges (Cooper pairs) through a thin insulating layer in Josephson junctions. CQPS was theoretically predicted and then experimentally confirmed in [1]. Later interference of two tunneling amplitudes (the Aharonov-Cashier effect dual to the Aharonov-Bohm effect) was also demonstrated [2]. However, the most significant is the demonstration of inverse Shapiro steps (current quantization) in the DC transport at currents I_n=2efn: Cooper-pair charge (2e) × frequency (f) × integer (n) [3], shown in Fig. 1 This observation – AC CQPS effect (dual to the AC Josephson effect) is a breakthrough in Quantum Metrology, which is especially important for the development of the quantum current standard – a missing element in electrical metrology. Unfortunately, nanowires are poorly reproducible. However, this problem can be solved by replacing the nanowires with small unshunted Josephson junctions operating in the CQPS regime. Using such junctions, current quantization was also successfully demonstrated [4].

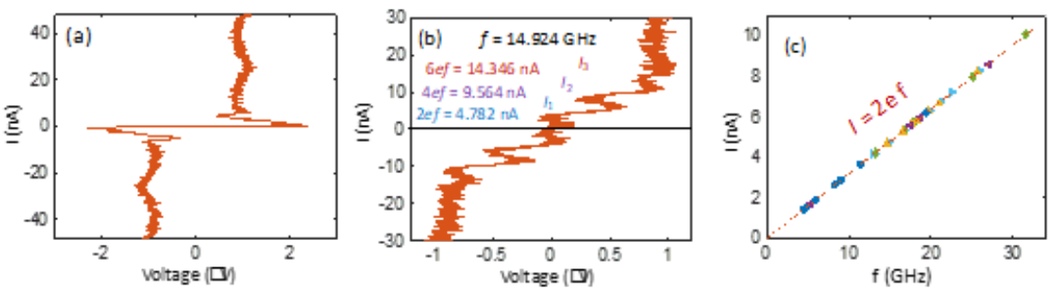


Fig. 1: *I-V characteristics of a nanowire: (a) without microwave; (b) with microwave; (c) position of first current steps I1 vs frequency for different samples.*

References

1. O. V. Astafiev, L. B. Ioffe, S. Kafanov, Yu. A. Pashkin, K. Yu. Arutyunov, D. Shahar, O. Cohen, J. S. Tsai. *Nature* **484**, 355-358 (2012).
1. S. E. de Graaf, S. T. Skacel, T. Hoenigl-Decrinis, R. Shaikhaidarov, H. Rotzinger, S. Linzen, M. Ziegler, U. Hübner, H.-G. Meyer, V. Antonov, E. Il'ichev, A. V. Ustinov, A. Ya. Tzalenchuk and O. V. Astafiev. Charge quantum interference device. *Nature Physics* **14**, 590–594 (2018).
1. R.S. Shaikhaidarov, K.H. Kim, J.W. Dunstan, I.V. Antonov, S. Linzen, M. Ziegler, D.S. Golubev, V.N. Antonov, E.V. Il'ichev, O.V. Astafiev. *Nature* **608**, 45 (2022).
1. R.S. Shaikhaidarov, K.H. Kim, J. Dunstan, I. Antonov, D. Golubev, V.N. Antonov, O.V. Astafiev. *Nature Communications*, **15**(1), (2024).

Day 1 Oct-13 2026
Session 1 Invited talk I-02 09:45 - 10:20

Rapid Autonomous Entanglement Distribution

Learn More

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In this talk, I will address the dissipative preparation of large-scale entangled states in networks of qubits that are coupled to a common waveguide or a distributed squeezed reservoir. In such settings, complex two- and multipartite entangled states can emerge fully autonomously as the steady states of a dissipative Liouvillian dynamics and used as a convenient resource for further quantum information processing applications. I will first review some of the general properties of these entangled states [1,2] and briefly point out recently proposed variants of this scheme, where entangled states can be generated even from the output of a narrow-band thermal cavity [3] or from photons emitted from a single driven two-level-system [4]. In the second part of this talk, I will then address the central open problem in autonomous entanglement distribution schemes, namely the tradeoff between the relaxation time and the entanglement of the final steady state [5]. In this context, I will present a new control scheme to overcome this bottleneck and to accelerate the preparation of complex, multi-partite entangled states by several orders of magnitude.

1. [1] K. Stannigel, P. Rabl, and P. Zoller, New J. Phys. **14**, 063014 (2012)
1. [2] J. Agustí, X. H. H. Zhang, Y. Minoguchi, and P. Rabl, PRL **131**, 250801 (2023).
1. [3] J. Agustí, et al., Quantum **10**, 2066 (2026).
[4] P. Gigon, A. Parra-Rodriguez, J. Agustí, and P. Rabl, arXiv:2605.1598
1. [5] A. Pocklington and A. Clerk, PRX Quantum **5**, 040305 (2024).

Day 1 Oct-13 2026
Session 2 Invited talk I-03 11:00 - 11:35

On-Chip Measurement of Quantum Noise Squeezing from a SiN Micro-Ring via an On-Chip Parametric Amplifier

Learn More

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The long-standing objective of integrating quantum optical components onto a single chip represents a critical pathway toward realizing scalable optical quantum computers and compact quantum sensors. Scalable quantum optics requires moving from bulky lab setups to integrated chips. Although chip-based generation of squeezed light (a key resource for quantum sensing) has progressed using micro-rings and nonlinear waveguides, its practical impact has been limited by a fundamental issue: once the light leaves the chip for detection, coupling losses destroy delicate quantum effects, limiting noise reduction to about 2 dB. On the other hand, researchers have recently proposed and demonstrated [1,2,3] a paradigm where a parametric amplifier acts as a resilient measurement device, insensitive to the external losses. This is especially desirable in tackling the coupling loss issue for integrated optics applications.

In our current work, we apply this solution to the measurement of squeezing produced by a micro-ring fabricated on a SiN integrated optics platform. We create two sequentially coupled micro-rings on a SiN chip. The first ring produces a squeezed state; the second, acting as a high-gain parametric amplifier, measures it before the light experience significant losses during off-chip coupling and detection. We will discuss the working principle and experimental details, and present the result of squeezing measurement. The device is essentially a compact SU(1,1) interferometer, paving the way for a new generation of chip-based quantum sensors. This idea can be generalized to other physical systems.

The work is supported by the General Research Fund of Hong Kong Research Grants Council (No.11307823), and State Key Laboratory of Quantum Information Technologies and Materials (the Chinese University of Hong Kong).

[1] Y. Shaked et al., “Lifting the bandwidth limit of optical homodyne measurement with broadband parametric amplification,” Nat. Comm. **9**, 609 (2018).
[2] Jiamin Li et al., “Pulsed entanglement measured by parametric amplifier assisted homodyne detection”, Optics Express **27**, 030552 (2019).
[3] J. Li et al., “Measuring continuous-variable quantum entanglement with parametric amplifier assisted homodyne detection”, Phys. Rev. A **101**, 053801 (2020).

Day 1 Oct-13 2026
Session 3 Invited talk I-04 14:00 - 14:35

Photon-Level Frequency Sensing for Quantum Networks

Learn More

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Optical-frequency sensing between remote, independent lasers underpins repeater-like quantum key distribution (QKD): twin-field (TF) and asynchronous measurement-device-independent (AMDI) QKD require phase-coherent interference at an intermediate node to attain favorable $\sqrt{\eta}$ rate-loss scaling. Our group has progressively removed the need for continuous frequency dissemination. We first demonstrated TF-QKD stabilized by locally generated optical frequency combs rather than a shared service fiber, confirming repeater-like operation and validating independent combs in a 546 km field trial [1, 2]. We then demonstrated AMDI-QKD using ultrastable lasers [3], before replacing mutual frequency tracking with local absolute optical-frequency references [4]. More recently, we developed a scheme that extracts the mutual frequency offset directly from announced quantum-signal detections, eliminating bright reference light and achieving secure key rates of 537 kbit/s at 100 km and 101 kbit/s at 201 km with compact lasers [5]. Extending coincidence pairing beyond QKD, our latest work introduces photon-pairing dual-comb spectroscopy, which exploits second-order correlations to eliminate the need for phase alignment between interferograms [6]. Together, these advances establish photon-level optical-frequency sensing as a practical foundation for quantum networks, distributed spectroscopy and frequency metrology.

[1] L. Zhou et al., "Twin-field quantum key distribution without optical frequency dissemination," *Nat. Commun.* **14**, 928 (2023).
[2] L. Zhou et al., "Independent-optical-frequency-comb-powered 546-km field test of twin-field quantum key distribution," *Phys. Rev. Appl.* **22**, 064057 (2024).
[3] L. Zhou et al., "Experimental quantum communication overcomes the rate-loss limit without global phase tracking," *Phys. Rev. Lett.* **130**, 250801 (2023).
[4] C. Ge et al., "Post-measurement pairing quantum key distribution with local optical frequency standard," *Quant. Sci. Technol.* **10**, 015046 (2025).
[5] S.-F. Shao et al., "High-rate measurement-device-independent quantum communication without optical reference light," *Phys. Rev. X* **15**, 021066 (2025).
[6] J. P. Lin et al., "Photon-pairing-enhanced distributed spectroscopy sensing over 400 km optical fiber," *Nat. Commun.* (accepted in principle, 2026).

Day 1 Oct-13 2026
Session 4 Invited talk I-05 15:35 - 16:10

Photonic Integrated Circuits: From Machine Learning Implementations to Quantum Protocols

Learn More

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Integrated photonic circuits (IPCs), also known as integrated optical circuits or photonic integrated circuits (PICs), are microchips that incorporate multiple photonic components to form a functional circuit. These circuits are designed to detect, generate, transport, and process light, enabling a wide range of applications. In recent years, IPC technology has made significant advancements and has been utilized in various fields such as quantum walk, neural network, machine learning, and boson sampling. Moreover, IPCs have emerged as a powerful technology that enables the integration of various photonic components into a single chip. In particular, integrated photonic chips have been applied to the implementation of various quantum protocols.

Day 1 Oct-13 2026
Session 4 Invited talk I-06 16:10 - 16:45

Characterizing Entanglement of Multipartite Non-Gaussian Quantum States

Learn More

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Multipartite entanglement is an essential resource for quantum information tasks, but characterizing entanglement structures in continuous-variable systems remains challenging, especially in multimode non-Gaussian scenarios, since the sheer amount of information in such states grows exponentially and makes a full characterization impossible. In this talk, I would introduce an efficient method for detecting multipartite entanglement structures in continuous-variable states. Based on the quantum Fisher information, we propose a systematic approach to identify an encoding operator that can efficiently capture the quantum correlations in multimode non-Gaussian states [1]. While high-order quadrature measurements remain more time consuming than first-order measurements, we developed a homodyne pattern-based detection method using neural networks [2]. In the task of classifying different structures of multipartite entanglement in continuous variable systems, it is necessary to simulate a large number of infinite-dimensional state data that can cover as many types of non-Gaussian states as possible. We then developed a data-augmented neural network to address this task with homodyne measurement data [3]. Furthermore, we show that “enough” Wigner negativity certifies the presence of genuine multipartite entanglement (GME) [4]. By only measuring the Wigner function over a finite region, or measuring a finite number of characteristic function points, our criterion can certify the GME of non-Gaussian states. Together, these findings fill the gap for exploring and detecting complex entanglement structures in experiment-friendly ways.

[1] Metrological Characterization of Multipartite Continuous-Variable non-Gaussian Entanglement Structure, Phys. Rev. Lett. 135, 140201 (2025).
[2] Correlation-pattern-based Continuous-variable Entanglement Detection through Neural Networks, Phys. Rev. Lett. 132, 220202 (2024).
[3] Classifying Multipartite Continuous Variable Entanglement Structures through Data-augmented Neural Networks, Nature Machine Intelligence (2026). https://doi.org/10.1038/s42256-026-01284-y
[4] Sufficient Wigner negativity implies genuine multipartite entanglement, Phys. Rev. Lett. 137, 040202 (2026).

Day 2 Oct-14 2026
Session 5 Invited talk I-07 09:00 - 09:35

The Complexity of Quantum Measurements: From Local Certification to Universal Readout

Learn More

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How much can we learn about a large quantum system using experimentally realistic measurements? In the first part of this talk, I will introduce localizable quantumness—a generic phenomenon where global quantum properties remain robustly encoded in the projected states of a small subsystem after local measurements are performed on the remainder of the system. Leveraging this physical principle, we present a unified framework to certify multipartite entanglement, circuit complexity, quantum magic, and state fidelity using solely non-adaptive local Pauli measurements. For broad classes of many-body states, these protocols achieve constant sample complexity, constant robustness, and soundness for mixed states. This provides a highly scalable approach to benchmarking increasingly large quantum processors and offers a fresh perspective on how global quantum resources can be concentrated and revealed locally.

In the second part, I will address a complementary question: what is the fundamental relationship between a measurement's complexity and its readout capability? We uncover a sharp “hidden-to-visible” transition dictated entirely by measurement circuit depth. Below specific critical depths, there exist pure-state encodings whose information remains exponentially inaccessible to any allowed measurement. However, immediately above these depth thresholds, randomized measurements utilizing approximate unitary 3-designs can universally recover a constant fraction of the encoded information. Together, we reveal both the surprising power and the fundamental limitations of complexity-restricted quantum measurements, delineating the definitive measurement resource boundaries required for quantum certification, learning, and metrology.

References:
[1] Zhenyu Du, Jinchang Liu, Elias X. Huber, Zi-Wen Liu and Xiongfeng Ma. “Certifying localizable quantum properties with constant sample complexity.” arXiv:2509.17580 (2025).
[2] Zhenyu Du, Siyuan Cheng, Han Ye, Junjie Chen, Xiao Yuan and Xiongfeng Ma. “Complexity-driven transitions in quantum observation.” arXiv:2606.09765 (2026).

Day 2 Oct-14 2026
Session 5 Invited talk I-08 09:35 - 10:10

Neural Quantum State Spaces

Learn More

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Advances in quantum engineering opened up a new generation of multiparticle quantum systems to experimental investigation, enabling us to access an increasingly large portion of their exponentially large state space. Exploring the frontier of large-scale quantum systems is an exciting new opportunity, but, at the same time, it is a formidable challenge due to the difficulty in experimentally characterizing these systems. A powerful way to address this challenge is to exploit deep neural networks for representing quantum systems and making predictions about them. In this talk, I will present an approach developed in my group, based on the idea of letting neural networks develop their own way of representing quantum states. In this approach, a pair of neural networks is trained with measurement data from a set of quantum states: one network constructs a mapping from measurement data to state representations, without any built-in knowledge about quantum physics, and the other network generates predictions from the state representation. In this way, the first network constructs an analogue of the quantum state space, which is what I call a neural state space here. A benefit of this approach is that it allows one to compare different quantum states, to cluster them based on their physical properties, and to transfer knowledge learnt from systems with a lower number of particles to systems with larger number of particles, thereby providing a useful tool for exploring quantum systems just beyond the boundary reachable with classical simulations.

References

1. Y. Du, Y. Zhu, Y.-H. Zhang, M.-H. Hsieh, P. Rebentrost, W. Gao, J. Eisert, G. Chiribella, D. Tao, B. Sanders, and Y.-D. Wu,
Artificial intelligence for representing and characterizing quantum systems
Nature Reviews Physics, https://doi.org/10.1038/s42254-026-00962-5 (2026).

2. Y.-D. Wu, Y. Zhu*, Y.-X. Wang, and G. Chiribella,
Learning quantum properties from short-range correlations using multi-task networks, Nature Communications 15, 8796 (2024).

3. Y. Zhu, Y.-D. Wu, G. Bai, D.-S. Wang, Y. Wang, and G. Chiribella,
Flexible learning of quantum states with generative query neural networks,
Nature Communications 13, 6222 (2022).

Day 2 Oct-14 2026
Session 6 Invited talk I-09 10:35 - 11:10

Silicon and Germanium Hole Spin Qubits

Learn More

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Keywords: Quantum Science: Quantum Computing, Spin qubits, Quantum transport, AI machine learning

Semiconductor spins are leading candidates for scaling qubits for quantum computation due to industrial nanofabrication and their advantageous quantum properties. Holes spins can be coherently manipulated with all-electrical control due to the spin-orbit interaction (SOI) without requiring micromagnets, but this also opens the door for decoherence by charge noise. Across a broad range of qubits, a pervasive trade-off becomes obvious: increased speed seems only possible at the cost of qubit coherence. This qubit speed-coherence dilemma is posing a fundamental challenge for quantum computation.

In this talk, I will present recent progress on building spin-orbit qubits with holes in Ge/Si core/shell nanowires and Si finFETs, touching upon hole spin driving mechanisms, anisotropic exchange, autonomous tuning, maximizing qubit speed and coherence at the same time using a sweet-spot. Further, I will present our recent compact semiconductor gyrator implementing a novel self-impedance matching concept, as well as all-electrical driving of industrial electron spin qubits in absence of micromagnets.

This work was supported by the NCCR SPIN, the Swiss National quantum computation program of the Swiss NSF, the Swiss Nanoscience Institute (SNI), the Georg H. Endress Foundation, and the EU H2020 European Microkelvin Platform EMP, TOPSQUAD and QUSTEC.

[1] In-situ control of hole-spin driving mechanisms, S. Geyer*, R. S. Eggli*, C. dos Santos, M. J. Carballido, P. Stano, D. Loss, D. M. Zumbühl, R. J. Warburton, A. V. Kuhlmann, Phys. Rev. Res. (in press, 2026).
[2] Anisotropic exchange interaction in a fin field-effect transistor, S. Geyer, B. Hetényi, et al., Nature Physics 20, 1152 (2024).
[3] Fully autonomous tuning of a spin qubit, J. Schuff, M. J. Carballido, et al., Nature Electronics 9, 304 (Feb 2026).
[4] Compromise-free scaling of qubit speed and coherence, M. J. Carballido et al., Nature Communications, Nature Communications 16, 7616 (2025).
[5] Compact self-matched gyrators using edge magnetoplasmons, A. Tarascio, Y. Zhao, R. S. Eggli, T. Patlatiuk, C. Reichl, W. Wegscheider, S. Bosco, and D. M. Zumbühl, arXiv:2602.05439 (Feb 6, 2026),

Day 2 Oct-14 2026
Session 7 Invited talk I-10 14:00 - 14:35

Long-Lived Macroscopic Quantum Coherence in a Diamond under Ambient Conditions

Learn More

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Macroscopic quantum coherence, such as those in laser, Bos-Einstein condensates, superfluids, and superconductors, is important to fundamental physics and useful for quantum technologies. Superradiance provides a mechanism to produce coherence among a large number of particles and photons. Its implementation, however, has been limited to gaseous systems, solids at very low temperature, or short pulses. We demonstrate a superradiant maser under ambient conditions, in which coherent oscillations of approximately 1014 nitrogen-vacancy spins and about 109 intra-cavity microwave photons are synchronized and sustained [1]. By varying the optical pump rate, cavity quality factor and spin-cavity detuning, we observed three distinct superradiant phases. Just above the threshold, the spins and photons synchronize to a fixed frequency and generate a continuous wave superradiant maser. Well above the threshold, the collective spins develop a stable limit cycle, producing periodically amplitude-modulated superradiant maser, which can be viewed as a coherent continuous time crystal. Deep above the threshold, the synchronization among collective spins breaks down and the maser exhibits superradiant bursts, which have random relative phases and intervals. These results show that macroscopic quantum coherence can be spontaneously generated and sustained in a solid under ambient conditions and establish a platform for exploring non-equilibrium quantum many-body physics and bright light sources with collective quantum correlations [2].

This work was done in collaboration with Dawu Xiao, Chong Chen, Weijiang Wu, Wentao, Xinyu Chen, Xianfeng Wang, Mingzhong AI, and Quan Li and was supported by the New Cornerstone Science Foundation, the National Natural Science Foundation of China/Hong Kong Research Council Collaborative Research Scheme Project CRS-CUHK401/22, and the Hong Kong Research Grants Council Senior Research Fellow Scheme Project SRFS2223-4S01.

References:
1. W.-J. Wu, D.-W. Xiao, W.-T. Wang, X.-Y. Chen, X.-F. Wang, M.-Z. Ai, Q. Li, R.-B. Liu, arXiv:2608.23748 (2026).
2. W. Xiao, C. Chen, and R.-B. Liu, arXiv:2602.16215 (2026).

Day 3 Oct-15 2026
Session 8 Invited talk I-11 09:00 - 09:35

Two-Dimensional Trapped-Ion Crystals for Quantum Simulation and Spin Squeezing

Learn More

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Two-dimensional trapped-ion crystals provide a controllable platform for exploring interacting quantum many-body systems beyond one-dimensional ion chains. In this talk, I will briefly introduce the basic principles of trapped-ion quantum information experiments and then focus on recent progress enabled by two-dimensional ion crystals. I will discuss the experimental ingredients required to realize and control such systems, including trap design, stabilization of collective motional modes, and efficient cooling based on electromagnetically induced transparency. I will then describe how these tools enable quantum simulation with programmable spin-dependent interactions in two-dimensional ion crystals. Finally, I will present recent progress toward generating spin-squeezed states, highlighting the platform's potential for both many-body quantum physics and quantum-enhanced metrology.

Day 3 Oct-15 2026
Session 8 Invited talk I-12 9:35 - 10:10

Fly, Atoms, Fly!

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Optical tweezers have given us remarkable control over individual atoms—not only where they sit, but also how they move. Moving atoms opens exciting possibilities for quantum technologies, from rearranging atoms into defect-free arrays to dynamically connecting memory and gate zones, building reconfigurable quantum simulators, and even linking distant quantum processors. But this raises a simple and intriguing question: What happens when we let atoms fly—and collide?[1,2] In this presentation, we explore flying Rydberg atoms and what happens when their internal quantum states become coupled to their motion. By launching atoms toward one another with controlled trajectories, we investigate collision dynamics beyond the conventional frozen-gas picture. We observe interaction-induced loss of quantum coherence, and, at stronger interactions, directly watch atomic wave packets reshape and split through a throwing-and-catching protocol [3]. We develop a unified picture of the resulting entanglement between the atoms' internal states and their motion, characterized by a simple motional-overlap parameter. These experiments show that flying atoms are more than objects to be rearranged—they could become a new dynamical resource for controlling and processing quantum information.

[1] H. Hwang, A. Byun, J. Park, S. de Léséleuc, and J. Ahn, "Optical tweezers throw and catch single atoms," Optica 10(3), 401 (2023).
[2] H. Hwang, S. Hwang, J. Ahn, S. Yoshida, and J. Burgdorfer, "Impact-parameter selective Rydberg atom collision by optical tweezers," J. Phys. B: At. Mol. Phys. 58, 115202 (2025)
[3] S. Hwang, H. Hwang, J. Park, and J. Ahn, "Collision-Induced Entanglement in Two Flying Atoms," preprint

Day 3 Oct-15 2026
Session 9 Invited talk I-13 10:35 - 11:10

Fast thermal State Preparation Beyond Native Interactions

Learn More

[1]Alexander van Lomwel, [2]Paul M. Schindler, [1]Modesto Orozco-Ruiz, [2]Marin Bukov, [1]Nguyen H. Le & , [1*]Florian Mintert
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While questions on quantum simulation of ground state physics are mostly focussed on the realization of effective interactions, most work on quantum simulation of thermal physics explores the realization of dynamics towards a thermal mixed state under native interactions. Many open questions that could be answered with quantum simulations, however, involve thermal states with respect to synthetic interactions.

We present a framework based solely on unitary dynamics to design quantum simulations for thermal states with respect to Hamiltonians that include non-native interactions, suitable for both present day digital and analogue devices. By classical means, our method finds the control sequence to reach a target thermal state for system sizes well out of reach of state-vector or density-matrix control methods, even though quantum hardware is required to explicitly simulate the thermal state dynamics. With the illustrative example of the cluster Ising model that includes non-native threebody interactions, we find that required experimental resources, such as the total evolution time, are independent of temperature and criticality.

Day 3 Oct-15 2026
Session 10 Invited talk I-14 14:00- 14:35

Perthermalization on Superconducting Processor

Learn More

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We report a quantum simulation of prethermalization by random multipolar driving with a superconducting processor. By measuring both the particle imbalance and subsystem entanglement entropy, we monitor the entire heating process over 1,000 driving cycles and observe the existence of the prethermal plateau. Some other closely related quantum computation by superconducting processors will also reported.

Oral Talks

Day 1 Oct-13 2026
Session 2 Oral Talk O-01 11:35-11:47

Realization of Poor Man's Majoranas on Pb-based Minimal Kitaev Chain

Jie Shen[1,2], Yuxiao Song[1,2], Ruixuan Zhang[1,2], Ziwei Dou[1], and Li Lu[1,2,3]
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[3]Hefei National Laboratory, Hefei, China.

A minimal Kitaev chain—two quantum dots coupled through a shared Andreev bound state (ABS) via crossed Andreev reflection and elastic co-tunnelling—hosts 'poor man's Majorana' bound states at sweet spots where the two couplings balance. Existing realizations rely on aluminum-based hybrid devices, whose low critical temperature, small gap and low critical field constrain both the protection of the zero-energy states and the accessible magnetic-field range. Here we realize poor man's Majorana states in a minimal Kitaev chain based on an InSb nanowire proximitized by a thick lead film [1], exploiting the high critical temperature, large parent gap and high three-dimensional critical field of Pb. Two bottom-gate-defined quantum dots are strongly coupled to a gapped, spatially extended ABS in the hybrid segment, so that the dot excitations hybridize into Yu–Shiba–Rusinov states that serve as the chain's two sites. By rotating the in-plane magnetic field and tuning the hybrid-segment gate voltage, we locate the sweet spots in the θ–VGM parameter space and observe zero-bias peaks protected by an excitation gap of about 0.1 meV with enhanced robustness. Furthermore, we recover the sweet spots and zero-bias peaks under full three-dimensional rotation of the magnetic field. Our results establish InSb–Pb hybrids as a promising platform for scaling Kitaev chains towards topologically protected Majorana qubits.

[1] Guoan Li, Xiaofan Shi, Ruixuan Zhang, Yuxiao Song, Marco Rossi, Ghada Badawy, Zhiyuan Zhang, Anqi Wang, Xingchen Guo, Xiao Deng, Xiao Chen, Liangqian Xu, Bingbing Tong, Peiling Li, Xiaohui Song, Zhaozheng Lyu, Guangtong Liu, Fanming Qu, Michał P. Nowak, Paweł Wójcik, Ziwei Dou, Erik P. A. M. Bakkers, Li Lu, and Jie Shen, *arXiv:2510.10064*.

Day 1 Oct-13 2026
Session 2 Oral Talk O-02 11:47-11:59

Broadband Purcell Filter for Superconducting Quantum Circuits

Zhen Luo[1], Amelie Hagelauer[1,2]
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Fast multiplexed readout of superconducting qubits requires strong resonator–feedline coupling, which enhances qubit relaxation through the Purcell effect. Conventional approaches either employ individual Purcell filters, increasing footprint and frequency-matching requirements [1], or use a shared single-pole filter with limited bandwidth [2]. We address this scaling challenge with a compact broadband Purcell filter implemented in a 3-D flip-chip architecture [3].

The Purcell filter is realized as a four-pole broadband bandpass network comprising coupled spiral and coplanar-waveguide resonators. To demonstrate its compatibility with frequency-multiplexed readout, six floating quarter-wavelength readout resonators are coupled to the two inner filter resonators and distributed within passband. A geometry-based analytical model guides filter synthesis and resonator-coupling design. The fabricated device, integrated on a compact 10x6 mm^2 chip using in-house Niobium process, is characterized at 20 mK and exhibits a flat 1 GHz passband centered at 7.68 GHz, together with more than 45 dB suppression around 4.5 GHz. All six readout resonators are individually resolved and characterized from the measured complex response using a standard resonator-fitting procedure [4]. The fabricated device, its 3-D implementation, and cryogenic measurement results will be presented.

[1] J. Heinsoo *et al., Phys. Rev. Appl.*, **10**, 034040 (2018).
[2] E. Jeffrey *et al., Phys. Rev. Lett.*, **112**, 190504 (2014).
[3] Z. Luo *et al., IEEE Trans. Microwave Theory Tech.*, (2026)
[4] S. Probst *et al., Rev. Sci. Instrum.*, **86**, 024706 (2015).

Day 1 Oct-13 2026
Session 2 Oral Talk O-03 11:59-12:11

Flux Engineering in Superconducting Quantum Devices

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Flux engineering serves as a unifying paradigm for enhancing coherence, enabling topological operations, and revealing emergent phenomena in superconducting quantum devices. This report synthesizes recent advances across four key platforms: full-shell hybrid nanowires host Caroli-de Gennes-Matricon analogs whose energy skewness within Little-Parks lobes directly visualizes flux-induced confinement; programmable spin-transfer torque matrices enable high-fidelity braiding and fusion of vortex-bound Majorana zero modes in two-dimensional topological superconductors; Kondo-correlated quantum dot Josephson junctions exhibit anomalous negative magnetoresistance arising from quasiparticle trapping by vortices in the superconducting leads; and gradiometric transmon qubits employing a doubly connected figure-eight geometry achieve two- to three-fold improvements in coherence times through spatial filtering of long-wavelength flux noise. Together, these studies demonstrate that flux engineering provides a versatile toolkit for suppressing decoherence, enabling topological quantum computation, and uncovering rich physics in strongly correlated hybrid systems.

[1].Deng, M. T. et al. Caroli–de Gennes–Matricon Analogs in Full-Shell Hybrid Nanowires. *Phys. Rev. Lett.* **134**, 206302 (2025);
[2] Deng, M. et al. Anomalous negative magnetoresistance in quantum dot Josephson junctions with Kondo correlations. *Sci. China Phys. Mech. Astron.* **67**, 280362 (2024);
[3] Huang, G. et al. Scheme for braiding Majorana zero modes in vortices using STT-matrix. *Sci. China Phys. Mech. Astron.* **69,** 247411 (2026);
[4] Fu, J. B. et al. Flux-noise-resilient transmon qubit via a doubly-connected gradiometric design. *arXiv*:2601.02137v1;
[5] Fu, J. B. et al. Low-loss, high-coherence airbridge interconnects fabricated by single-step lithography. *Chin. Phys. B* **35**, 040312 (2026).

Day 1 Oct-13 2026
Session 3 Oral Talk O-04 14:35-14:47

Coherent Ising Machine beyond Quantum Computing — Quantum Phase Transition, Criticality-Enhanced Quantum Metrology and Quantum Battery

Qing Ai[1], Shuang-Quan Ma[1], Jing-Yi-Ran Jin[1], and Jin-Tian Zhang[1]
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Generally speaking, the coherent Ising machine (CIM) is widely used in quantum computing. In this talk, we theoretically show that the CIM can be used to study quantum phase transition, and design schemes for criticality-enhanced quantum metrology. Furthermore, after finishing the quantum computing, the CIM can be used as a quantum battery and the energy therein can be used to supply other quantum devices. Quantum criticality has received extensive attention due to its ability to significantly enhance quantum sensing. But its realization and control in many-body quantum systems remain challenging. We present an effective scheme to simulate the Lipkin–Meshkov–Glick (LMG) model using a CIM composed of a network of degenerate optical parametric oscillators (DOPO). In our work, the spin variables of the LMG model are mapped onto the phases of DOPO pulses, and the spin–spin interactions are realized by all-to-all couplings among them. Through our investigation of the critical behavior in the antiferromagnetically coupled LMG model in the thermodynamic limit, i.e. $N \to \infty$, and its application in quantum sensing near the critical point, we verify that the CIM does not only effectively capture the second-order quantum phase transition (QPT) at the critical point but also reconstructs its complete phase diagram under ferromagnetic coupling. Furthermore, we demonstrate how the critical dynamics of this simulation platform can be utilized for quantum-enhanced metrology, achieving a measurement precision that diverges near the critical point of the LMG model. These results highlight the capability of the CIM as a flexible experimental platform for investigating the QPT in the fundamental quantum magnetic models, providing valuable insights into quantum simulation and critical phenomena.

[1] S.-Q. Ma, et al., *Quantum Science & Technology* 11, 025019 (2026).
[2] J.-T. Zhang, et al., *Physical Review Research* 8, 023187 (2026).
[3] J.-Y.-R. Jin, S.-Q. Ma, and Q. Ai, *arXiv*:2512.23248 (2025).
[4] X.-Y. Long, et al., *Physical Review Letters* 129, 070502 (2022).
[5] X.-Y. Chen, et al., *npj Quantum Information* 8, 22 (2022).
[6] B.-X. Wang, et al., *npj Quantum Information* 4, 52 (2018).
[7] Z.-S. Yang, et a., *Annals of Physics* 413, 168063 (2020).
[8] M. Onizhuk, et a., *PRX Quantum* 2, 010311 (2021).

Day 1 Oct-13 2026
Session 3 Oral Talk O-05 14:47-14:59

Accelerating Quantum Adiabatic Evolution with π-Pulse Sequences

Jiang Zhang
Beijing Academy of Quantum Information Sciences

In quantum information processing, the development of fast and robust control schemes remains a central challenge. Although quantum adiabatic evolution is inherently robust against control errors, it typically demands long evolution times. In this talk, we present a scheme to achieve rapid adiabatic evolution, in which nonadiabatic transitions induced by fast changes in the system Hamiltonian are mitigated by flipping the nonadiabatic transition matrix using π pulses. This enables a faster realization of adiabatic evolution while preserving its robustness. We demonstrate the effectiveness of our scheme in both two-level and three-level systems. Numerical simulations show that, for the same evolution duration, our scheme achieves higher fidelity and significantly suppresses nonadiabatic transitions compared to the traditional STIRAP protocol.

Day 1 Oct-13 2026
Session 3 Oral Talk O-06 14:59-15:11

Tensor Network Characterization and Mitigation of Readout Errors

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Readout errors are a major bottleneck to extracting reliable information from near-term quantum processors, especially when spatial correlations are non-negligible. We present a unified tensor-network framework that models the readout process as a matrix product operator (MPO), enabling efficient characterization and mitigation beyond uncorrelated approximations. The MPO model is trained via likelihood optimization on calibration data and applies to multiple tasks, including nonlocal observable estimation, random circuit sampling, and random-measurement protocols, such as classical shadows and learning-based tomography. Experiments on a superconducting processor and numerical simulations up to 20 qubits show that the MPO model captures correlated readout errors that uncorrelated models miss, with a sample cost that grows only near-linearly with system size. When extended to two-dimensional systems, the framework can also be integrated with tensor-network quantum error-correction decoders by performing joint inference over data and readout errors. These results establish tensor-network readout error mitigation as a scalable and versatile approach for noise-aware quantum data processing.

[1] Y. Guo and S. Yang, arXiv:2606.25974 (2026).

Day 1 Oct-13 2026
Session 4 Oral Talk O-07 16:45-16:57

Quantum Machine Learning: A Paradigm for Reliable and Adaptive AI

Yuqin Chen
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Real-world AI faces critical challenges in trustworthiness (e.g., data poisoning) and adaptability (loss of plasticity across sequential tasks). This talk explores the intrinsic advantages of quantum machine learning (QML) in addressing these issues. Comparing quantum neural networks with classical multilayer perceptrons, we demonstrate that quantum models exhibit phase-transition-like robustness against data poisoning, enable efficient machine unlearning, and maintain long-term learning plasticity in continual learning scenarios without catastrophic collapse. We analyze the underlying physical mechanisms—such as loss landscape stability and unitary evolution constraints—and discuss their implications for trustworthy AI and lifelong learning. Ultimately, this work highlights that near-term quantum computing offers valuable, highly robust, and adaptive learning paradigms beyond mere computational speedups.

Day 1 Oct-13 2026
Session 4 Oral Talk O-08 16:57-17:09

Cavity-Enhanced Solid-State Spin Sensing: from Linear to Nonlinear Regime

Hao Wu
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Microwave cavity quantum electrodynamics (cavity QED) provides a powerful framework for controlling spin–photon interactions and developing room-temperature solid-state quantum sensors[1]. This talk will present our recent works on solid-state-spin-based microwave quantum electronics from the linear to the nonlinear regime. In the linear regime, photoexcited pentacene spins enable room-temperature masers[2] and microwave spin refrigeration[3], demonstrating coherent microwave generation and thermal-noise reduction under ambient conditions. In the nonlinear regime, magnon–polaritons formed by strongly coupled microwave photons and collective spin excitations display bistability, frequency combs, and chaos[4]. Together, these studies establish cavity QED with solid-state spins as a fruitful platform for investigating cavity-enhanced quantum sensing at room temperature.

[1] E. R. Eisenach, J. F. Barry, M. F. O'Keeffe, J. M. Schloss, M. H. Steinecker, D. R. Englund and D. A. Braje, Nature Communications **12**:1357 (2021).
[2] K. Wang, H. Wu, B. Zhang, X. Yao, J. Zhang, M. Oxborrow, and Q. Zhao, Advanced Science **11**, 2401904 (2024).
[3] H. Wu, S. Mirkhanov, W. Ng and M. Oxborrow, Physical Review Letters **127**, 053604 (2021)
[4] H. Wu, Q. Liu, Y. Fan, Y. Liu and Q. Zhao, arXiv:2604.27668 (2026)

Day 1 Oct-13 2026
Session 4 Oral Talk O-09 17:09-17:21

Towards Practical Quantum Advantage for Artificial Intelligence

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The development of AI relies on large models and massive datasets, resulting in rapidly growing computational and resource demands. Quantum computing offers a fundamentally different approach by exploiting high-dimensional Hilbert spaces and complex quantum dynamics for information processing. In this talk, I will present our recent efforts to apply quantum resources to several core artificial intelligence tasks. These include a resource-efficient quantum matrix algorithm based on resonant quantum principal component analysis for feature extraction and dimensionality reduction, as well as a quantum neural network implemented on a trapped-ion qudit processor with hybrid quantum-classical backpropagation. I will also present our recent work on experimental quantum reservoir computing, in which a nine-spin system achieved higher prediction accuracy than classical reservoirs with thousands of nodes in long-term weather forecasting. These results demonstrate complementary ways in which quantum systems can enhance artificial intelligence and open promising directions toward resource-efficient learning models, broader real-world applications, and practical quantum advantage.

[1] Z. Li[#], Z. Chai[#], Y. Guo, W. Ji, M. Wang, F. Shi, Y. Wang, S. Lloyd, and J. Du, *Science Advances* **7**, eabg2589 (2021).
[2] Y. Hou[#], J. Hua[#], Z. Wu, W. Xia, Y. Chen, X. Li[*], Z. Li[*], X. Peng[*], and J. Du[*], *Physical Review Letters* **136**, 120602 (2026).
[3] Y. Yuan, Z. Xu, Z. Du, X. Zhao, X. Cheng, Y. Li, W. Hou, Y. Zhou, Z. Li,[*] and Y. Lin,[*] *National Science Review* (**in press**).

Day 2 Oct-15 2026
Session 4 Oral Talk O-10 11:10-11:22

Non-Hermitian Singularities for Quantum-Enhanced Metrology

Changqing Wang[1], Deyuan Hu[2], Silvia Zorzetti[1], Anna Grassellino[1], Alexander Romanenko[1], and Zheshen Zhang[2]
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Exceptional points (EPs) in non-Hermitian systems exhibit singular spectral and scattering properties that offer enhanced responses to perturbations, yet their ultimate precision is bounded by quantum noise. Here in a nonlinear quantum optics framework, we integrate squeezing—a quantum resource that redistributes uncertainty—into EP-based sensors to overcome this limit. Using a unified quantum noise theory, we derive an ultralow precision bound that emerges near the parametric oscillation threshold, surpassing conventional sensors. This bound is accessible via heterodyne/homodyne detection and is further enhanced at higher-order EPs, where interplay between non-Hermitian degeneracy and squeezed fluctuations yields significant gain in sensitivity. This work unifies non-Hermitian singularity with quantum metrology for next-generation ultra-precision sensing.

[1] Wang, C. et al. Phys. Rev. Lett. 136, 250801 (2026).

Day 2 Oct-14 2026
Session 6 Oral Talk O-11 11:22-11:34

Nuclear Spins in Silicon: From 31P Four-body Entanglement to 121Sb Electric Resonance

Tao Xin
International Quantum Academy, Shenzhen, Guangdong, China

Silicon spin qubits combine high-fidelity control with CMOS compatibility, yet systematic preparation and full characterization of multipartite entanglement have remained elusive. In this talk, we report the complete preparation of four-qubit entangled states in silicon donor spins, achieved through hardware-efficient quantum circuits that leverage native multi-qubit gate operations. By employing advanced overlapping tomography and multifaceted verification, we confirm genuine multipartite entanglement and resolve the full entanglement structure for each family. On the prepared GHZ state, we further observe a noise-induced dynamical evolution of entanglement: the state transitions from distillable to bound entanglement and finally to separability, with the bound regime unlocked via joint measurements. In addition, we also explore high-spin antimony nuclei in silicon, which offer electrical control and support cat-code logical encoding, promising reduced overhead for fault-tolerant quantum computing in this platform.

[1] Xu, F., Deng, Y., Hu, G., Yang, K., Li, C., Wei, C., ... & Xin, T. Multiparticle entanglement of nuclear spins in silicon. Nature Communications (2026).

Day 2 Oct-14 2026
Session 6 Oral Talk O-12 11:34-11:46

From Multiexcitation to Superradiant Burst in Resonant Nuclear X-Ray Emission

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The advent of X-ray free-electron lasers (XFELs) has opened the door to exploring X-ray–nuclei interactions in the multiexcitation regime [1-3]. In this talk, I will discuss how the emission properties of X-ray photons from an ensemble of identical resonant nuclei depend on the number of excitations, based on theoretical methods we have developed [4]. We find that, under multiexcitation conditions, the detection of emitted X-ray quanta becomes emission-order selective, with a clear dependence on the excitation number.

Building on this framework, I will present our theoretical results on nonlinear collective emission in the strongly excited regime, where superradiant bursts of X-ray photons emerge from resonant nuclear ensembles [5]. We establish the excitation conditions required for observing such bursts with current XFEL capabilities and analyze their dynamical behavior. In particular, we identify nonlinear relationships between the peak emission intensity, the time required to reach the peak, and the excitation number. We further introduce a dimensionless parameter that quantitatively characterizes the onset and strength of the burst behavior for different excitation configurations.

References

[1] A I Chumakov, A Q R Baron, I Sergueev, et al., Nat. Phys. 14, 261 (2018)
[2] M Gerharz, W Hippler, B Marx-Glowna, et al., arXiv:2509.15833 (2025)
[3] M Gerharz and J Evers, arXiv:2510.00970 (2025)
[4] X Kong, Y Chang, L Zhang, J Yuan and Y-G Ma, Phys. Rev. Res. 7, 013030 (2025)
[5] J Shan, Y Chang, L Zhang, et al., Phys. Rev. Lett. 136, 113601 (2026)

Day 2 Oct-14 2026
Session 7 Oral Talk O-13 14:35-14:47

Autonomous Floquet Engineering of Bosonic Codes via Reinforcement Learning

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Bosonic codes represent a promising route toward quantum error correction in continuous-variable systems, with direct relevance to experimental platforms such as circuit QED and optomechanics . However, their preparation and stabilization remain highly challenging, requiring ultra-precise control of nonlinear interactions to create entangled superpositions, suppress decoherence, and mitigate dynamic errors. Here, we present a Floquet engineering framework in which reinforcement learning is used to realize the autonomous design of the control waveforms for bosonic code preparation, yielding a general, efficient and noise-resilient strategy. By leveraging reinforcement learning to optimize.

Floquet driving parameters, our method achieves over two orders of magnitude reduction in evolution time—requiring only about one percent of that in conventional adiabatic schemes—while maintaining high-fidelity state generation even under reasonably strong dissipative and dephasing noise. This approach not only demonstrates the power of artificial intelligence in quantum control but also establishes a scalable and experimentally feasible foundation toward fault-tolerant bosonic quantum computation. Beyond the specific application to bosonic code preparation, our results suggest a general paradigm for integrating machine learning and Floquet engineering to overcome decoherence challenges in next-generation quantum technologies..

[1] Wu, Z., Guo, L., Shi, H. and Zhang, W.W., 2025. Autonomous Floquet Engineering of Bosonic Codes via Reinforcement Learning. arXiv:2510.22227.

Day 2 Oct-14 2026
Session 7 Oral Talk Q-14 14:47-14:59

Long-Lived Multimode Microwave Electromechanical Systems

Yulong Liu[1], Huanying Sun[1], Qichun Liu[1], Haihua Wu[1], Mika A. Sillanpää[2], and Tiefu Li[3]
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The cubic silicon-carbide crystals (3C-SiC) material demonstrates excellent microwave compatibility with superconducting circuits. Thus, we can establish a coherent electromechanical interface, enabling precise control over 20 high-Q mechanical modes from a single 3C-SiC square membrane[1]. Benefiting from extremely high mechanical frequency stability, this interface enables tunable light slowing with group delays extending up to an impressive duration of an hour. Coherent energy transfer between distinct mechanical modes are also presented[2]. The studied 3C-SiC membrane crystal with their significant properties of multiple acoustic modes and high-quality factors, provide unique opportunities for the encoding[3], storage[4], and modulating the cavity field[5] via bosonic phonon channels.

[1] Yulong Liu*, Huanying Sun, Qichun Liu, Haihua Wu, Mika A. Sillanpää, and Tiefu Li, *Nature Communications* **16**, 1207(2025).
[2] Huanying Sun, Yanlin Chen, Qichun Liu, Haihua Wu, Yuqing Wang, Tiefu Li‡ and Yulong Liu#, Superior frequency stability and long-lived state-swapping in cubic-SiC mechanical mode pairs, *npj Quantum Information* **12**, 60 (2026).
[3] Yulong Liu‡, Qichun Liu, Huanying Sun, Mo Chen, Shuaipeng Wang, and Tiefu Li#, Coherent memory for microwave photons based on long-lived mechanical excitations, *npj Quantum Information* **9**, 80 (2023).
[4] Yulong Liu, Qichun Liu, Shuaipeng Wang, Zhen Chen, Mika A. Sillanpää*, and Tiefu Li#, Optomechanical Anti-Lasing with Infinite Group Delay at a Phase Singularity, *Physic Review Letters* **127**, 273603 (2021).
[5] Sihan Wang, Cheng Wang, Matthijs H. J. de Jong, Laure Mercier de Lépinay, Jingwei Zhou‡, Mika A. Sillanpää, and Yulong Liu#, Pump-Threshold-Free Frequency Comb via Cavity Floquet Engineering, *Nature Communications* **17**, 5811 (2026)

Day 2 Oct-14 2026
Session 7 Oral Talk O-15 14:59-15:11

Nonlocal Nonstabilizerness for Lightly Entangled Quantum Many-Body States

Lei-Yi-Nan Liu[1], and Jian Cui[1],
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Nonlocal nonstabilizerness [1] quantifies the irreducible magic resource encoded in bipartite entanglement, but its evaluation is generally hindered by a highly nonconvex optimization over local unitary transformations. Here we propose a Schmidt-reference-state framework that replaces this optimization by a direct construction from the sorted Schmidt spectrum. We conjecture that the nonlocal stabilizer R´enyi entropy (SRE) is given by the SRE of the corresponding reference state, and support this conjecture through analytical and numerical evidences. Our framework makes nonlocal nonstabilizerness efficiently accessible for weakly entangled many-body states whenever the entanglement spectrum is available. Applying it to Haar-random states, critical spin chains, and PXP dynamics, we show that nonlocal SRE captures nonstabilizer structures in the entanglement spectrum that are invisible to conventional entanglement measures. Our results establish entanglement spectra as a powerful window into irreducible nonstabilizer correlations, opening a broadly applicable route to studying nonlocal magic resources of quantum many-body systems in and out of equilibrium.

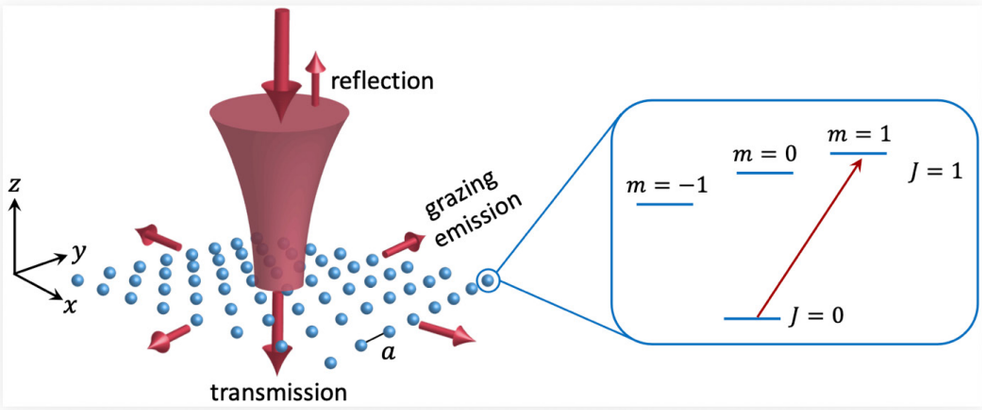
[1] Lei-Yi-Nan Liu, Su Yi, and Jian Cui, *Physical Review A* ***113***, 062414 (2026).
[2] Lei-Yi-Nan Liu, and Jian Cui, *arXiv:*2607.10714 (2026).

Day 2 Oct-14 2026
Session 7 Oral Talk O-16 15:11-15:23

Rayleigh-Wood Anomaly and Nonlinear Photon Correlations in Two-Dimensional Atomic Arrays

Zai-Cheng Xiao and Li-Ping Yang*
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Two-dimensional atomic arrays provide versatile free-space quantum optical interfaces by coupling photons to collective lattice modes. Here we show that the Rayleigh--Wood anomaly provides a sharp control mechanism for both linear and nonlinear scattering from a single atomic layer. As the lattice spacing crosses the diffraction threshold, newly opened radiative channels rapidly broaden the dominant collective modes, converting specular reflection into diffuse off-axis scattering. In transmission, momentum-space Fano interference between the incident and collectively scattered fields produces single-photon intensity zeros that strongly reshapes the normalized correlation function. An integrated nonlinear contrast reveals a pronounced channel asymmetry: the transmitted contrast collapses by more than an order of magnitude when the Rayleigh channels open, whereas the reflected contrast remains of order unity. These results establish radiative diffraction thresholds as a control principle for quantum nonlinear optics in single-layer atomic arrays.



ORAL TALKS

Day 3 Oct-15 2026
Session 9 Oral Talk O-17 11:10-11:22

Stochastic Transport of A Goldstone Mode in a Self-Organized Atomic Crystal

Hao Zhang[1]
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Spontaneous breaking of a continuous symmetry produces a massless Goldstone mode that can evolve across a degenerate manifold at zero energy cost. Previous experiments have primarily accessed Goldstone modes through mode softening, collective oscillations and spectroscopic response. However, the free motion of a spatially uniform Goldstone mode covering the entire symmetry-degenerate manifold has not been directly tracked in real time. Here we directly observe the stochastic transport of a spatially uniform Goldstone mode in a self-organized atomic crystal as it evolves under its own fundamental stochastic fluctuations. Without any external perturbation or probe, we monitor individual trajectories of the collective motion of atoms and their self-generated optical lattice inside an optical ring cavity. We find the normalized collective diffusion constant collapses onto a universal curve. This work extends the study of continuous symmetry breaking from excitation-frequency measurements to real-time tracking of transport, and connects the stochastic motion of a Goldstone mode to cavity optomechanics. It opens routes for studying non-equilibrium collective transport, phonon dynamics, and defect formation in driven-dissipative quantum matter.

Day 3 Oct-15 2026
Session 9 Oral Talk O-18 11:22-11:34

Provably Efficient Self-Calibrating Quantum Fault Tolerance

Weiyuan Gong[1] and Hong-Ye Hu[2,3]
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Quantum error correction protects logical information only when every physical operation remains below the fault-tolerance threshold, a condition that must be maintained continuously rather than only at the initial calibration. In practice, however, analog control parameters inevitably drift because of environmental fluctuations. As future fault-tolerant quantum computations are expected to run for days or even months, interrupting computation for repeated recalibration becomes fundamentally impractical. A promising alternative is to integrate calibration directly into computation by repurposing syndrome measurements as a calibration signal, but whether such self-calibration can be achieved with provable efficiency remains an open question.

Here we establish a theoretical framework for self-calibrating quantum fault tolerance. We prove that, for a broad class of control-induced errors, the detection rate defines a locally strongly convex surrogate objective for analog calibration with high probability. This geometric property enables efficient online optimization using only syndrome measurements collected during normal error correction. We prove convergence to an ε detection rate within $O(1/\varepsilon^2)$ epochs for time-independent drifts, and we also establish guarantees for time-dependent drifts. We further show that the convergence rate is independent of the code distance for quantum low-density parity-check (LDPC) codes.

Pulse-level simulations of neutral-atom arrays and large-scale circuit-level Clifford simulations confirm these theoretical predictions. Our results establish self-calibrating fault tolerance as a provably efficient paradigm in which the same syndrome measurements simultaneously protect logical information and stabilize the underlying hardware.

Day 3 Oct-15 2026
Session 9 Oral Talk O-19 11:34-11:46

Quantitative Analysis of Radiation-Induced Correlated Errors in Superconducting Qubits in a Cosmic-Ray-Free Environment

Xuegang Li[1]
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Radiation-induced correlated errors are a key bottleneck for fault-tolerant quantum error correction in superconducting qubit systems. We quantitatively investigate these errors via a 96-qubit superconducting processor at the China Jinping Underground Laboratory which creates a cosmic-ray-free environment. A 10-cm iron shield further lowers the residual correlated error rate to 4.7 mHz. Through traditional radioactivity measurements and Geant4 simulations, we also obtain a total error rate of 4.99 mHz, which is consistent with our experimen tal value of 4.7 mHz. We measure the qubit responses to irradiations of Cs-137 and Co-60 and use a simple transport model between phonons and quasiparticles to quantitatively analyze the relationship between the radiations and the correlated errors. We believe this work offers a robust tool for evaluating the effect of radiation-induced correlated errors in large-scale superconducting qubit systems.

Day 3 Oct-15 2026
Session 10 Oral Talk O-20 14:35-14:47

The Riemann Hypothesis Manifested in Dynamical Quantum Phase Transitions

Shijie Wei
Beijing Academy of Quantum Information Sciences

The Riemann Hypothesis (RH), one of the most profound unsolved problems in mathematics, concerns the nontrivial zeros of the Riemann zeta function. Linking these zeros to physical phenomena offers new perspectives on their origin and verification. We establish a direct correspondence between these zeros and dynamical quantum phase transitions in two complementary engineered quantum many-body systems, characterized by the average accumulated phase factor and the Loschmidt amplitude, respectively. This precise correspondence recasts the RH as the occurrence of phase transitions at a unique temperature. We propose a quantum computational framework that implements both systems with polynomial resources, suggesting quantum advantage in probing the hypothesis. Our work bridges nonequilibrium quantum dynamics and number theory, positioning quantum computing as a powerful platform for exploring mathematical conjectures, phase transitions and beyond.

Day 3 Oct-15 2026
Session 10 Oral Talk O-21 14:47-14:59

Bound State in the Continuum and Multiple Atom State Transfer Applications in a Waveguide QED Setup

Zhihai Wang
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Bound states in the continuum (BICs) have been extensively exploited to enhance light-matter interactions in metamaterials, yet their emergence and utility in multi-atom waveguide platforms remain far less explored. Here we study atom-waveguide-dressed BICs in a one-dimensional coupledresonato waveguide, where two spatially separated atomic arrays couple to distinct resonators with time-dependent strengths. We show that these BICs host standing-wave photonic components and enable the transfer of unknown atomic quantum states encoded in the single-excitation subspace between the two arrays, with fidelities exceeding 99%. Going beyond traditional cascaded-quantumnetwork protocols, our scheme leverages BIC-assisted interference to remain robust against both disorder and intrinsic dissipation[1]. Our results establish BICs as long-lived resources for high-fidelity quantum information processing in waveguide-QED architectures.

[1]. X. Guo, X. Zhang, M. Weng, Q. Bin, H.-d. Liu, H..-J.. Xing, X.-Y. Lv, and Z..Wang, Accepted by PRL.

Day 3 Oct-15 2026
Session 10 Oral Talk O-22 14:59-15:11

Observing Quantum Correlation Dynamics in Tunable Superconducting Bose-Hubbard Simulators

Ziting Wang[1], Si-Yun Zhou[2,3], Yun-Hao Shi[4,2], Kaixuan Huang[1], Z. H. Yang[2,3], Jingning Zhang[1], Kui Zhao[1], Yueshan Xu[1], Hao Li[1], Shoukuan Zhao[1], Yulong Feng[1], Guangming Xue[1], Yu Liu[2,3], Wei-Guo Ma[2,3], Cai-Ping Fang[2,3], Hao-Tian Liu[2,3], Yong-Yi Wang[2,3], Kai Xu[2,1,5], Haifeng Yu[1,5], Heng Fan[2,1,5], Shiping Zhao[1,2]
[1] Beijing Key Laboratory of Fault-Tolerant Quantum Computing, Beijing Academy of Quantum Information Sciences, Beijing 100193, China
[2] Beijing National Laboratory for Condensed Matter Physics, Institute of Physics, Chinese Academy of Sciences, Beijing 100190, China
[3] School of Physical Sciences, University of Chinese Academy of Sciences, Beijing 100190, China
[4] School of Physics, Xi'an Jiaotong University, Xi'an 710049, China
[5] Hefei National Laboratory, Hefei 230088, China

Quantum correlations are central to understanding the dynamics of interacting quantum systems, but their experimental characterization beyond probability distributions remains challenging. We report an experimental study of two-particle quantum correlation dynamics in superconducting Bose-Hubbard qutrit arrays with tunable on-site interaction. The simulator is implemented on a superconducting processor containing nine transmon qutrits and twelve tunable couplers, where selected qutrit chains are configured through coupler control. By applying longitudinal microwave drives to even-labeled qutrits, we use Floquet engineering to realize an effective Bose-Hubbard Hamiltonian with continuously tunable interaction strength U while maintaining a fixed tunneling rate J.

We first characterize the tunability of U/J through energy spectrum measurements, where a two-band structure emerges as the interaction increases. We then investigate two-particle quantum walks for different initial states, including adjacent single excitations, a Bell state, and two particles initialized on the same qutrit. The measured density-density correlations show a clear crossover from bosonic bunching to fermionic antibunching as U/J increases. More importantly, by reconstructing two-qutrit reduced density matrices, we directly track the dynamics of negativity and quantum discord during particle walks. We find that entanglement propagation can be strongly suppressed by increasing interaction, while quantum discord can still propagate with considerably larger amplitude. Depending on the initial state, the form of entanglement can either remain robust during the walk or be modified by interaction-induced suppression of population transfer between single- and double-excitation subspaces.

These results demonstrate that superconducting qutrit arrays provide a flexible platform for probing quantum correlations in interacting Bose-Hubbard systems. Our experiment highlights the role of tunable interaction in shaping nonequilibrium quantum dynamics and opens a route toward studying correlated many-body physics with particle-number non-conserving measurements that are difficult to access in other platforms.

POSTER LIST

1.Two-photon Interference between Mutually-detuned Resonance Fluorescence Signals Scattered off a Semiconductor Quantum Dot
Jian Wang | BAQIS

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2.Quantum Geometry Induced Anomalous Chiral Transport and Hidden Symmetry Breaking in Centrosymmetric 2M-WS2
Hang Cui | Peking University

3.Semiconductor Spin-Qubit Arrays for Axion Dark Matterand Weak-Field Detection
Xiangjun Tan | University College London

4.Calibrating Informative Parity Measurements under Operational No-disturbance Constraints
Zhanning Wang | ICMM CSIC

5.Flat Band Induced Quasi-one-dimensional Magnon Transport in a Two-Dimensional Spin Lattice
Bingcheng Luo | Peking University

6.Highly Symmetric InAs/InP Quantum Dots based on Droplet Epitaxyfor Broadband telecom Single-Photon Emissions
Shichen Zhang | BAQIS

7. In-situ Optical Visualization and Continuous Strain Control of Coupled Ferroic Orders in Freestanding Multiferroic Films
Jiesu Wang | BAQIS

8.The Hyperfine Sweet Plane of a Long-lived Singlet-triplet Hole Spin Qubit
Chenggang Yang | BAQIS

9.Selective Stabilization of Antiferromagnetic orders in FeTe Films via Local Strain Engineering
Hao Xu | BAQIS

10.Flexible Readout and Unconditional Reset for Superconducting Multiqubit Processors with Tunable Purcell Filters
Yongxi Xiao | Institute of Physics, CAS

11. High-Fidelity Hole Spin Qubits Reveal Quadrupolar Nuclear-Bath Dynamics in Isotopically Purified Planar Germanium
Jian Zeng | BAQIS

12. Qudit-native Framework for Discrete Time Crystals
Weiguo Ma | **Institute of Physics, CAS**

13. LoRe: Adaptive Interaction-Evaluation Routing with Per-Step Interaction Budgets for Iterative Graph Solvers
Jintao Li | BAQIS

14. Global Geometric Structures: Algorithms Bridge Abstraction and Quantum Applications
Hui Zhao | The Lab of Computational Discrete Global Geometric Structures

15. Coherent-Phase-Corrected Shortwave Quantum Cascade Laser Dual-Comb System for Multi-Gas Spectroscopy
Zejun Ma | BAQIS

16. Observation and Modulation of the Quantum Mpemba Effect on a Superconducting Quantum Processor
Yueshan Xu | BAQIS

17. Revealing Entanglement-Growth Mechanisms through the Magic Barrier
Lv Zhang | Institute of Physics, CAS

18. Derivative-Field Quantum Feature Maps----Infrared Divergence, Gram-Matrix Collapse, and AQFT-Canonical Structural Robustness
Yuren Wang | Tsinghua University

19. Engineering Electromagnetic Environments for Low-Loss Superconducting Quantum Processors
Xuyang Gu | Institute of Physics, CAS

20.Performances of Low-noise Large-bandwidth High-gain Cyogenic Transimpedance Amplifier for Cryogenic STM
Ying-Xin Liang | BAQIS

21.Spin Splitting, Kondo Correlation and Singlet-doublet Quantum Phase Transition in a Superconductor-coupled InSb Nanosheet Quantum Dot
Xingjun Wu | BAQIS

22. Polarized Single-Photon Emission from an Anisotropic Dirac Cavity
Xinrui Mao | BAQIS

23. Electrical Tunning of Optical Stark Effect in Monolayer WS_2
Haiyun Liu | BAQIS

24. Low Charge Noise Level of Holes in Ge/SiGe Quantum Dots
Junhang Liu | BAQIS

25. Excess Photon-assisted Noise of Majorana and Andreev Bound States
Qiang Lin | BAQIS

26.Differential Indium Bonding for High-Coherence 3D-Integrated Spuerconducting Qubits
Haiyang Hu | Walther-Meißner-Institut

27. Revealing Entanglement Laws at Logarithmic Depth in Local Quantum Circuits
YiHang He | Sun Yat-sen University

28. Non-equilibrium Ciricality-enhanced Sensing with Superconducting Qubits
Kaixuan Huang | BAQIS

29. Purcell-enhanced Two-photon Emission from a Quantum Dot via Dark-state Biexciton Loading
Bang Wu | BAQIS

30. Energy Relaxation via Quantum Thermalization
Xue-Yi Guo | BAQIS

31. Robust Spin Qubit Coupler via Minimal Kitaev Chain
Jiaan Qi | BAQIS

32. Nonperturbative-to-Perturbative Crossover of Nonlinear Hall Harmonics in Fe_3GaTe_2
Junhai Ren | BAQIS

33. Coherent Manipulations in a Neutral Alkaline-earth-like Atom Array
Yunkun Yang | Tsinghua University

34. Origin of Antibunching in Resonance Fluorescence in the Heitler Regime: Quantum Interference
Chuanyu Zeng | BAQIS

35. Microscopic Mechanisms of Exciton Polariton Relaxation in Monolayer WS_2 Microcavities
Zhiyuan An | BAQIS

36. Towards Room-Temperature Exciton–Polariton Supersolidity Driven by Guided Optical Parametric Oscillation
Huawen Xu | BAQIS

37.Mitigating Sloppiness in Quantum-Enhanced Multiparameter Spin Interferometry
Hai Feng | Tsinghua University

38.Colossal Seebeck Caused by Temperature Gradient Control in Superionic Semiconductors during Structural Phase Transition
Shilin Li | BAQIS

39. Static, Dynamic, and Tunneling Fingerprints of Antiferromagnetism in Layered $NiCl_2$
Liguo Zhang | BAQIS

40. Preparation of Fractional Quantum Hall States on Quantum Computers
Hao Wu | Beihang University

41. Room-Temperature Manipulation of Polariton-Phonon Coupling Dynamics in Two-Dimensional Perovskite Photonic Crystals
Tingxiao Qin | BAQIS

42. Scalable Quantum Computation Based on a Periodic Ion Crystal
Xuan Fan | Tsinghua University

43. Deterministic and Programmable Fusion for Scalable Generation of

Photonic Graph States
Yan Li | BAQIS

44. Time-Addressable Atmospheric State Reconstruction via Quantum-Reservoir Implicit Representation
Fu Wang | CMA Earth system Modeling and prediction Centre, China Meteorological Administration

45. Detecting Dynamical Casimir Effect in a Cavity-HBAR System
Longhao Wu | Aalto University

46. Quantum Jump Approach for Photosynthetic Complexes: An Time-Economic Computational Approach
Rui Li | Beijing Normal University

47. Supercritical Fluid of Quantum Electrons in Three-Dimensional Superconducting Fullerides
Xinying Li | BAQIS

48. Nonlinear Breit-Wheeler Process Driven by Intense Squeezed Light
Xin Ge | Beijing Normal University

49. Programmable Spectral Symmetries in an Anisotropic Quantum Rabi Simulator
Jia-cheng Song | Institute of physics, CAS

50. Enhanced Sensing with Non-Hermitian Skin Geometry and Liouvillian Skin Dynamics
Qinxin Liu | Tsinghua University

51. Quantum Criticality in Coherent Ising Machines: Spin-Model Simulation and Enhanced Sensing
Shuangquan Ma | Beijing Normal University

52. Bath-engineering Technique for Criticality-based Quantum Metrology with Amplitude Noise
Rong-Hang Chen | Beijing Computational Science Research Center & Beijing Normal University

53. Charge-spin Dynamics & Excited-state-lifetime-based Quantum Sensing of NV Centers in Diamond
Yan Liu | BAQIS

54. Searching Axion-like Dark Matter by Amplifying Weak Magnetic Field with Quantum Zeno Effect
Jing Dong | Beijing Normal University

55. Surface-Code Hardware Hamiltonian
Xuexin Xu | Forschungszentrum Juelich

56. QROB: Quantifying Realization Overhead in Quantum Compilation via Reverse Construction
Zheng-An Wang | BAQIS

57. Stability Study of Microscopic Two-Level System
Yujia Zhang | BAQIS

58. Structural Variation Characterization of Two-Dimensional $SnSe_2$ by Second Harmonic Generation
Qiyuan Miao | Nanjing University of Science and Technology

59. Dissipative Acousto-Mechanical Parametric Interface between High-Overtone Acoustics and Flexural Phonons
Xun Ji | BAQIS

60. Entropic Rigidity in Quantum Memories: How Geometry and Algebra Control the Onset of Degeneracy Corrections
Yixin Zhao | BAQIS

61. Intrinsic Coexistence of Polarity and Itinerant Ferromagnetism in a Metal and its Nonlinear Optical Evidence
Jinhui Zou | BAQIS

62. Modulation of Electronic Liquid Crystal Phases in Few-layer FeSe Films
Xuesong Gai | BAQIS

63. Emergent Many-body Phenomena in Dual-species Rydberg Arrays: Unconventional Orders, Quantum Scars, and Multicriticality
Lei-Yi-Nan Liu | Beihang University

64. Anisotropic Modulation of 2DHG Properties in Ge/SiGe Quantum Wells by [110] Uniaxial Strain
Zhengshan Guo | BAQIS

65. Direct Evidence of Interfacial Coherent Electron-Phonon Coupling in Single-Unit-Cell FeSe Film on Nb-Doped SrTiO3
Mengdi Zhang | BAQIS

66. The Geometric Phase as a Diagnostic for Driven-Dissipative Oscillators
Zeen Sun | National University of Singapore

67. Topological Andreev Zero Modes in Bilayer-Graphene Hybrids
Tom Lane | BAQIS

68. Zero-field vortex-Majorana Composite Excitations Pinned by Magnetic Islands
Panagiotis Kotetes | BAQIS

69. Strain-Controlled Superconducting Diode Effect in a Kagome Superconductor
Yang Li | BAQIS

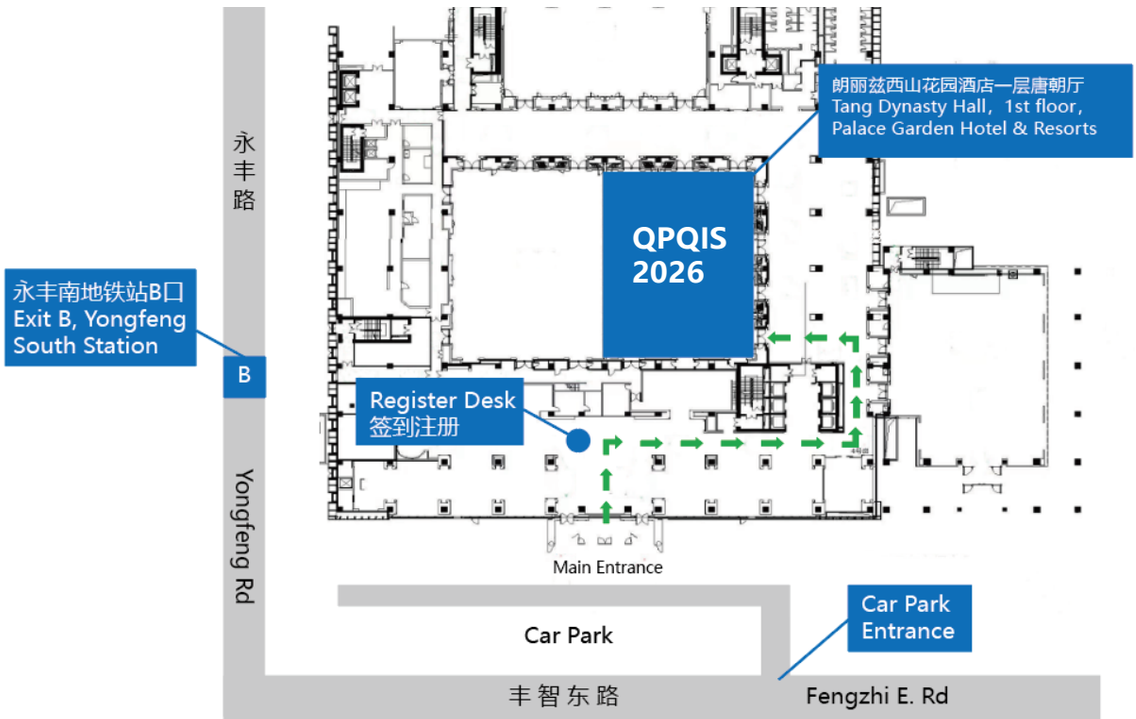
70. Non-Standard Axion Electrodynamics in Magnetic Topological Insulators
Miklos Horvath | BAQIS

71. Möbius-Guided Diagonal-Gate Compilation with Native Multiqubit Controlled-Phase Gates on Neutral-Atom Processors
Hairuo Huang | BAQIS

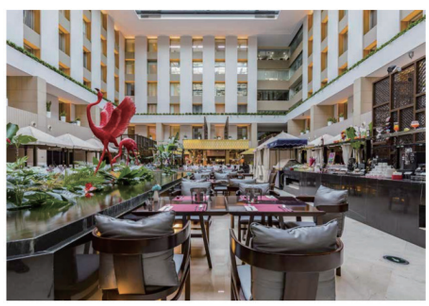
All posters will be exhibited both onsite and online.

- **Onsite Poster Exhibition:** Tang Dynasty Hall (BC) (1st floor)
- **Online Poster Exhibition:** http://qpqis.baqis.ac.cn/2026/poster/poster-list
- **Poster Sessions:** 12:11 - 14:00 October 13 (Lunch/Poster Session)
  11:46 - 14:00 October 14 (Lunch/Poster Session)
  16:00 - 17:30 October 14 (Poster Session)
  11:46 - 14:00 October 15 (Lunch/Poster Session)
- **Announcement of Best Poster Awards:** 15:11 - 15:40 October 15

LOCATION & MAPS







Address: Palace Garden Hotel & Resorts，13 Fengzhi East Road, Haidian District, Beijing, 100094，China
Conference Venue: Tang Dynasty Hall (BC), 1st floor.
Lunch: Buffet in Palace Restaurant, 3rd floor.