

WE WILL START AT 10:00 AM (CET)

SESEC V Webinar

Standardization and Policies of Quantum Information Technologies in China

You are *muted*

Use the *Q&A or Chat Panel* to submit your questions

Keep your questions *short and concise*

Contact us: assistant@sesecc.eu

Welcome to our website: <https://sesecc.eu/>



Seconded European Standardization Expert in China (SESEC) Project

SESEC INTRODUCTION

A Project co-funded by EC, EFTA, CEN CENELEC & ETSI

- ❖ **Promote** European and International standards in China
- ❖ **Improve** contacts between Project Partners and different levels of the Chinese administration, industry and standardization bodies
- ❖ **Enhance** visibility and understanding of the European Standardization System (ESS) in China.
- ❖ **Gather** regulatory and standardization intelligence
- ❖ **Undertake** technical lobbying



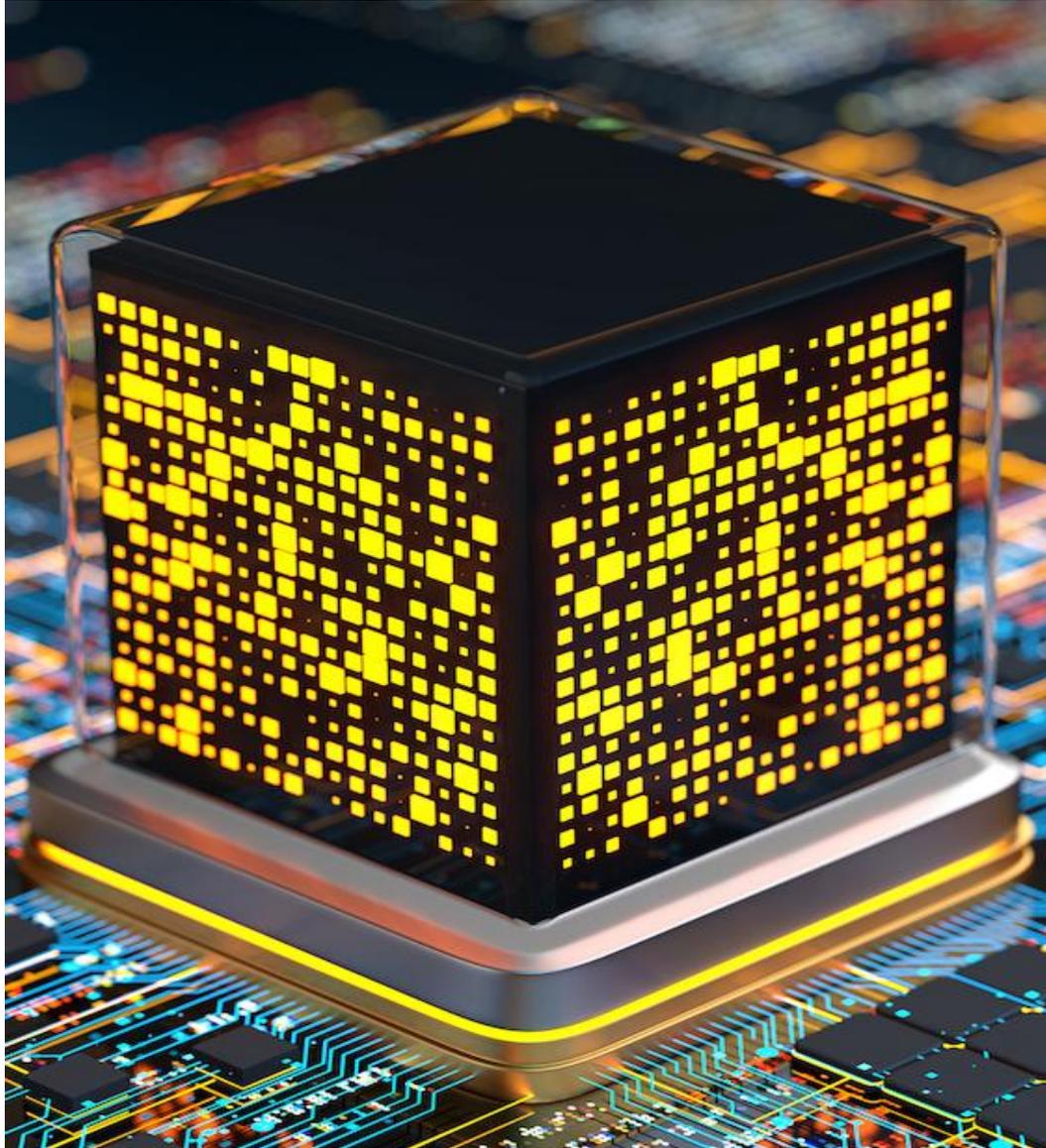
Goals

- The SESEC initiative supports **EC policy** and **ESOs strategic objectives** in China.
- Our ultimate goal is the enhancement of **EU-China dialogue and cooperation** in the field of standardization.
- It is notably expected to support the Framework Cooperation Agreement in place **between the ESOs and SAC**.

PROJECT PRIORITY DISCUSSION

Current Priority Topics

Horizontal Technical Priorities	Horizontal Political Priorities
IOT	China Standards 2035
Information Security	Belt and Road Initiative
Artificial Intelligence	Standardisation Reform
5G in digitalization of industry	Made in China 2025
Automated Transport	Institutional Changes in Chinese Government
Medical Devices	Market Access
Green Technology	14 th Five-Year Plan



Standardization and Policies of Quantum Information Technologies in China

SESEC V

Dr. Betty XU | [NOV 21, 2023]



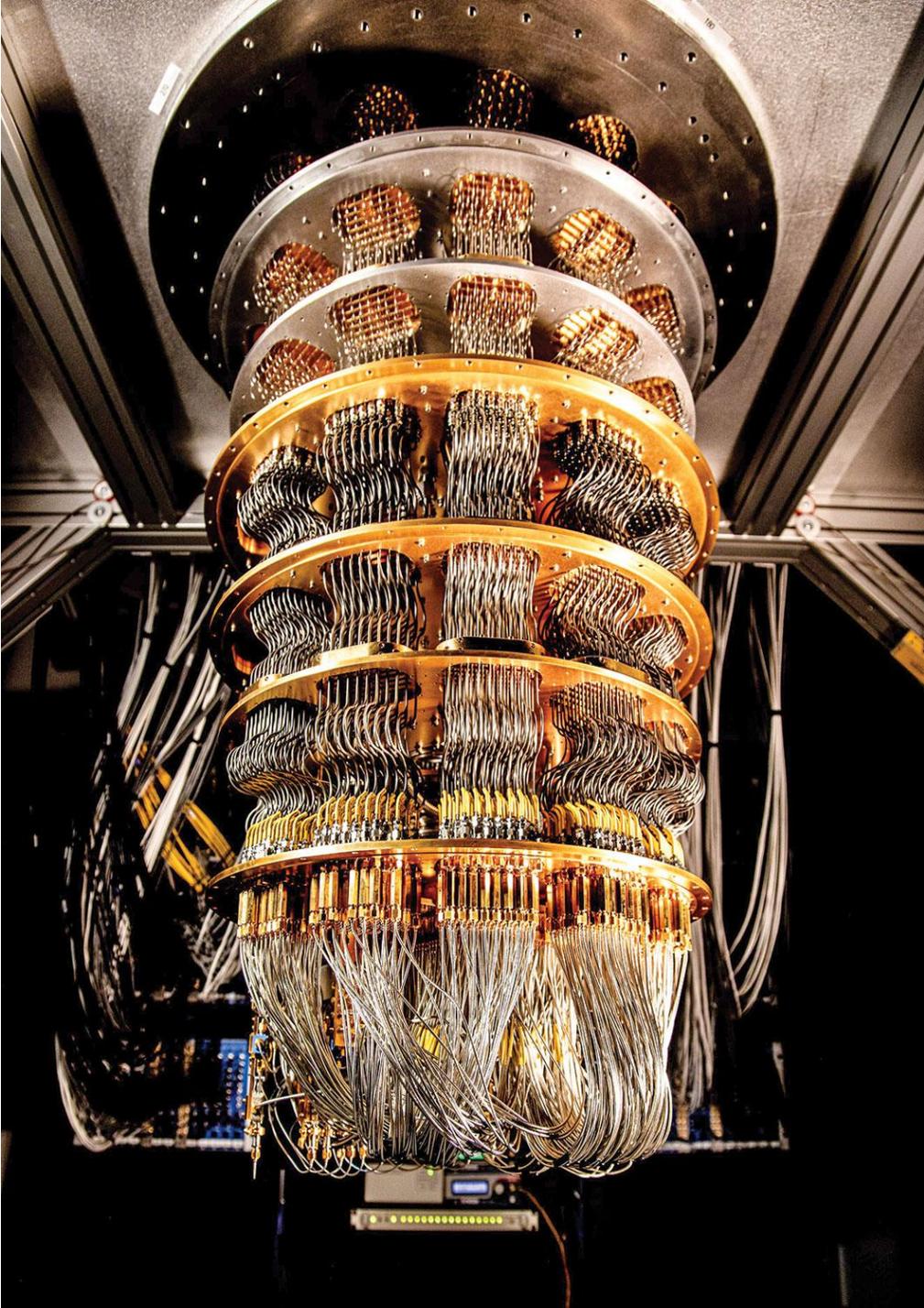
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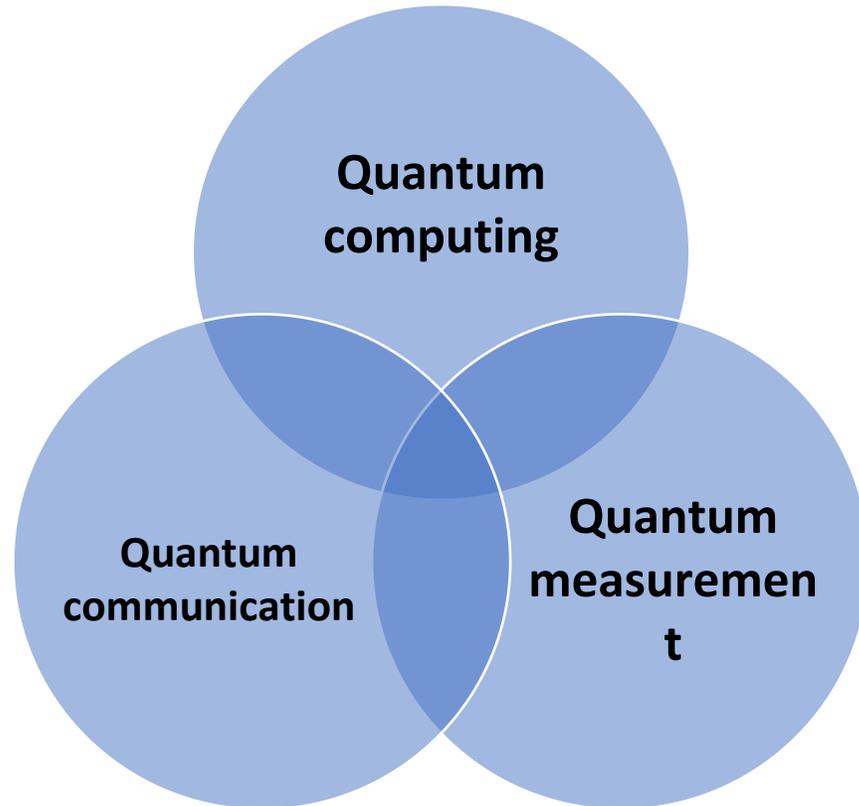
Summaries



Chapter One

Overview

Overview – Significance of Quantum Information Technology (QIT)



Main parts of quantum information technology

- Key highlights of the development and industrial upgrading of information and communication technology around the world
- Great influence in future economic development and industrial competition

Overview – Significance of Quantum Information Technology (QIT)

- **Central Economic Work Conference of China – December of 2022, and February of 2023**
 - *stressed the need to accelerate the research and development and application of cutting-edge technologies such as quantum computing.*
- **First session of the 14th National People's Congress – March of 2023**
 - *Pointed out quantum information technology as one of the breakthrough-making sectors, together with artificial intelligence, supercomputers, manned spaceflight, satellite navigation etc.*

Overview – Main Technological Achievements

Micius Satellite

The first he world's first quantum communications satellite



Jiuzhang

Photonic quantum computer by University of Science And Technology Of China (USTC)

Quantum Information Technology

Zuchongzhi

A two-dimensional programmable superconducting quantum processor

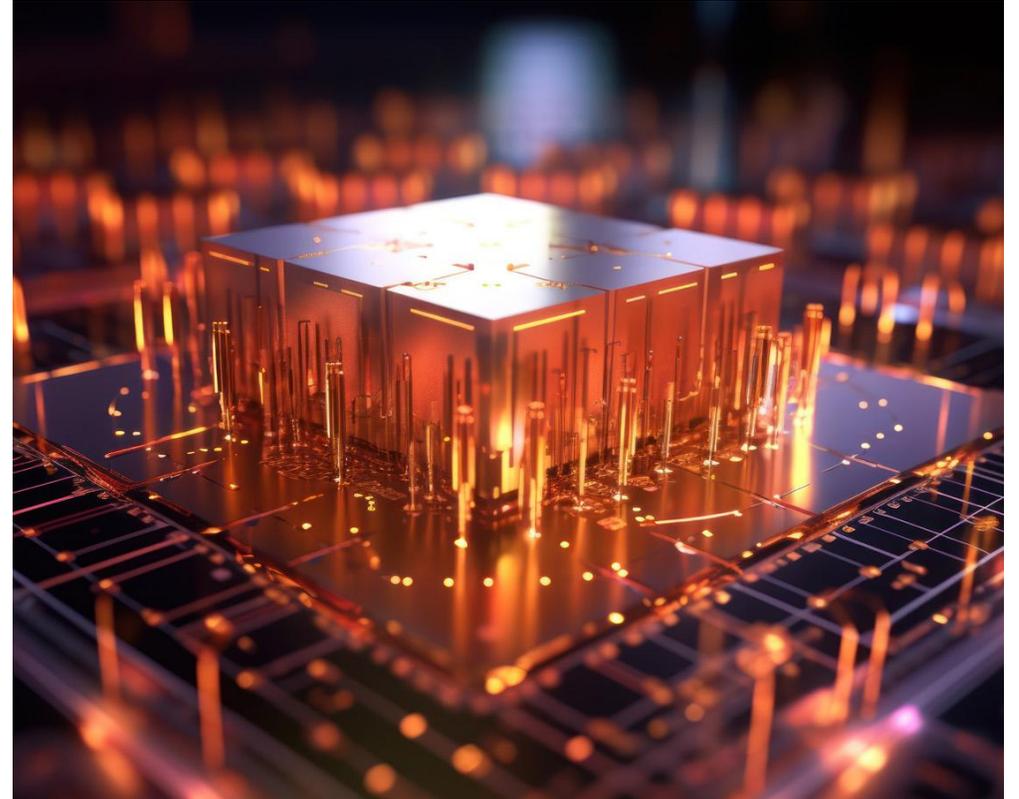


Space-to-ground quantum communication network

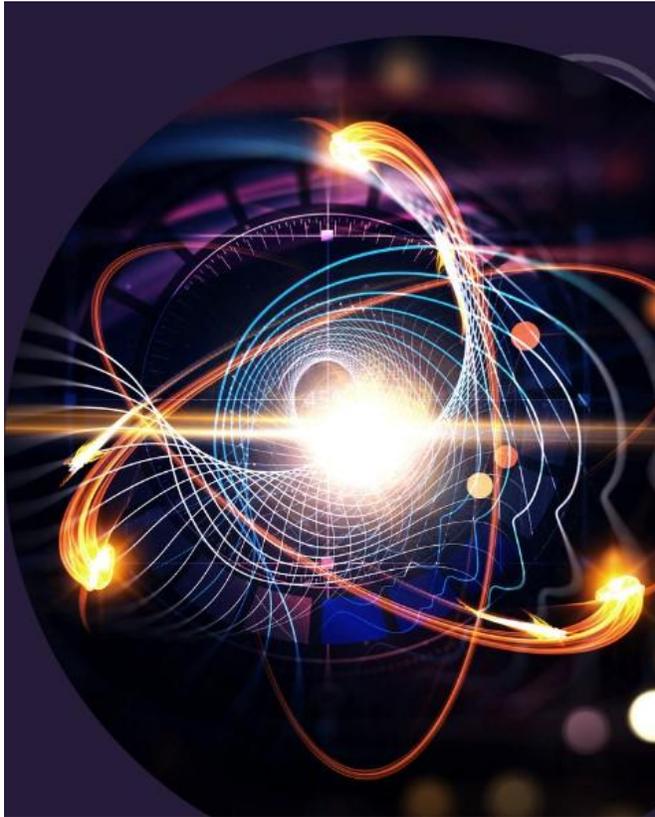
Over 4,600 kilometers by 2021

Overview – QIT Positioning in China

- A strategic high ground for national competitiveness
- View QIT of high importance
- Actively promote its development



Chapter Two



China's Policies on Quantum Information Technology

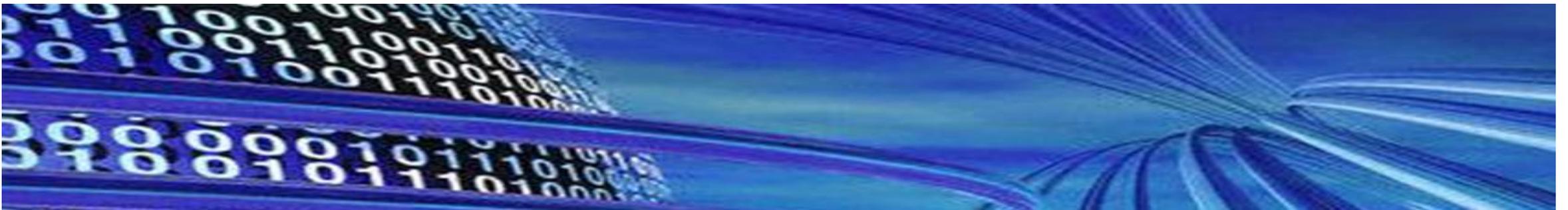
Policies– Summary

- ❖ NONE independent policy document/planning on QIT
- ❖ QIT planning is integrated into policies of other sectors
- ❖ Despite the above facts, quantum technologies share consistent emphases among all the policy documents as:

- **A key area and a frontier basic science of innovation technologies**
- **A disruptive technology that can lead to industrial transformation or even paradigm shift.**

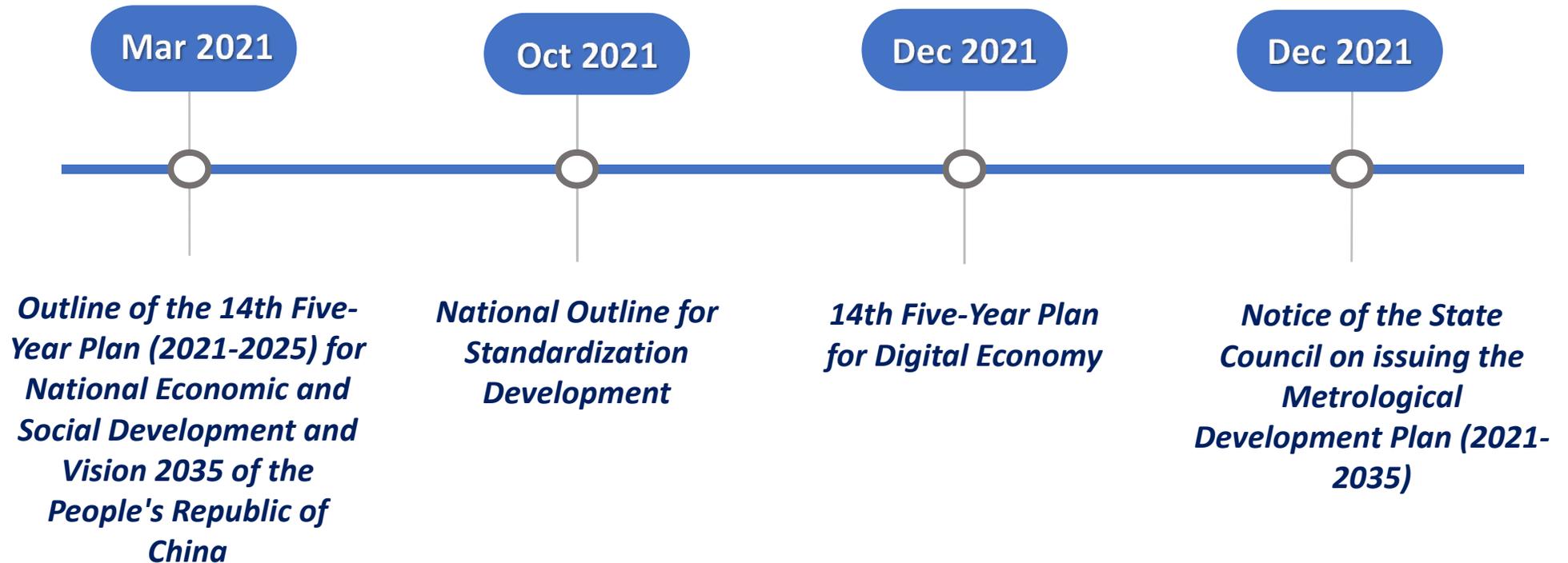
Policies – Early Policy Documents

- **Outline of the National Strategy of Innovation-Driven Development – May of 2016**
 - Issued by **the State Council**
 - *“emphasizing scientific innovation is the strategic support for improving social productivity and comprehensive national strength, therefore it must be placed the core of the overall development of the country”*
- **Development Plan on the New Generation of Artificial Intelligence – July of 2017**
 - Issued by **the State Council**
 - defines quantum as *“a direction that may trigger the paradigm shift for the artificial intelligence”* and it calls on promotion of crossover cooperation among AI and other fundamental subjects like quantum.



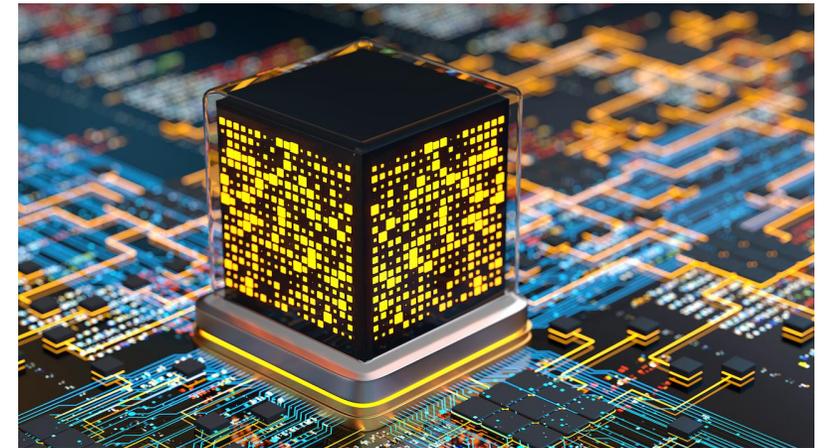
Policies– Overall National Policies

Main Policy Timeline



Policies– Overall National Policies

- ❖ **Outline of the 14th Five-Year Plan (2021-2025) for National Economic and Social Development and Vision 2035 of the People's Republic of China**
 - Issued by ***the State Council***
 - An overall plan for China's national economic and social development for 2021-2025
 - Quantum is naturally categorized as one of the core innovative technologies
 - Appears in the second place among all emerging technologies after AI, demonstrating its strategic significance in national development of QIT.
 - Possible developing pattern: autonomous, open, cooperative and self-controllable under the nation's strong support



Policies– Overall National Policies

❖ National Outline for Standardization Development

- Issued by *the State Council*



Key document that guides the mid and long term development of China's standardization

Specifies the need to “carry out standardization research in the fields of artificial intelligence, quantum information and biotechnology”, as well as “strengthen the research on standards in key technical fields”.

Still lack of details for QIT comparing with other emerging technologies.

Policies– Overall National Policies

❖ 14th Five-Year Plan for Digital Economy - issued by *the State Council*

- The overall plan for China's high-quality development for digital economy during the 14th Five-year Plan period
- QIT is listed as a "key technology" together with network communication, big data, AI and blockchain etc.
- Contents on standardization is relatively general: emphasizes the need to "promote the construction of data resource standard system"; clearly requires the improvement of "intelligent manufacturing standard system"; and the establishment of third-party professional service institutions in the direction of standard formulation, testing and evaluation in order to "increase the size and vitality of the digital transformation services market".

Policies– Overall National Policies



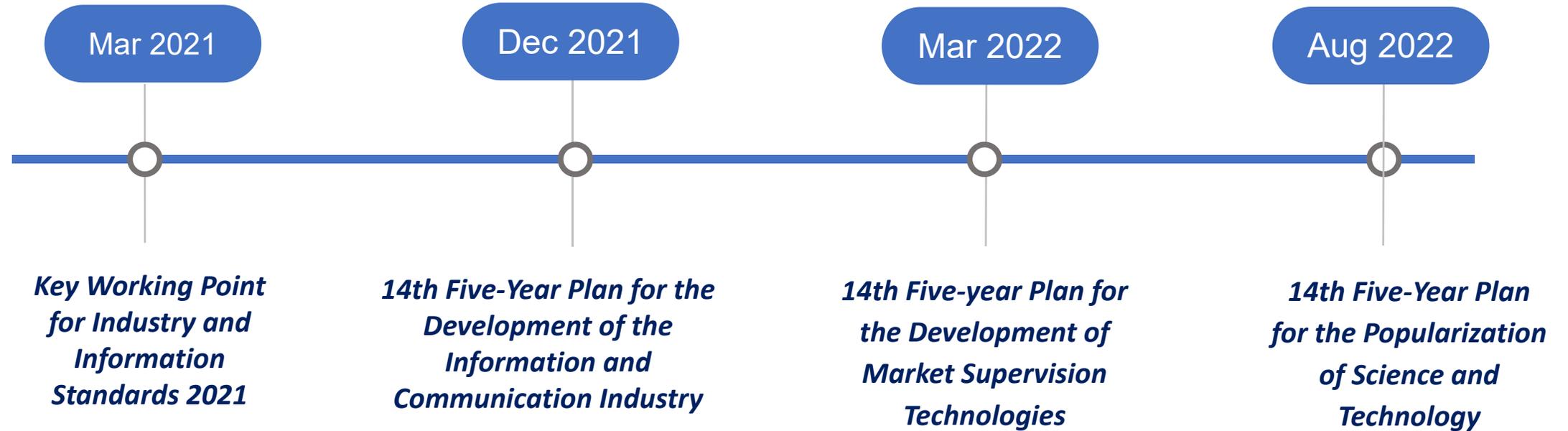
❖ Notice of the State Council on issuing the Metrological Development Plan (2021-2035)

- Issued by *the State Council*

- The actual 14th Five-year plan for the metrology development
 - Quantum measurement was mentioned in several chapters, emphasizing its core position, and significance to metrology, as well as sensing.
- Set up a goal as to “strengthen research on quantum metrology, flattening of quantum value transfer and digital transformation of metrology, establish a new generation of world-class national metrology benchmarks, and overcome a number of key metrology testing technologies”

Policies– Sector Policies

Main Policy Timeline

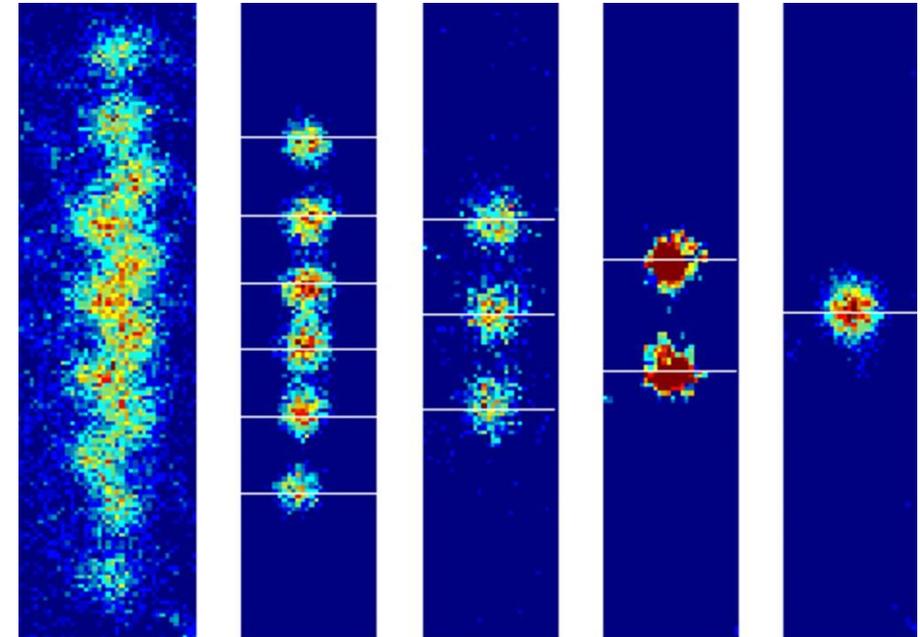


Policies– Sector Policies

❖ Key Working Point for Industry and Information Standards 2021

- issued by **the Ministry of Industry and Information Technology (MIIT)**

- A practical guidance for China's standardization development in industry and information technologies.
- No similar document was issued for the year of 2022 and 2023 therefore remains of value.
- As a scientific and technological field that is given strategic importance by the country, QIT is expected to have further standardization development in the next two years.



Policies– Sector Policies

- ❖ **14th Five-Year Plan for the Development of the Information and Communication Industry - issued by MIIT**
 - A planning document in the field of information communication
 - Some local experts consider it of great importance because it was a guiding document for the next five years to accelerate the building of a cyber power and a digital China
 - makes a relatively detailed plan for quantum communication and quantum computing in the Chapter called "Development Focus"
 - Further plans the application fields for QIT in infrastructure, industry management and network security



Policies– Sector Policies

❖ 14th Five-year Plan for the Development of Market Supervision Technologies – *issued by the State Administration for Market Regulation (SAMR)*

- A separate policy document shows that China regards market regulation technology as an important part of the national science and technology innovation system.
- In addition to the common "disruptive" positioning in the quantum field, it also mentions "innovation triggers industrial restructuring", further emphasizing the importance of the QIT development.
- Gives more detailed goals and tasks in the specific research field of quantum computing,

Policies– Sector Policies

❖ 14th Five-Year Plan for the Popularization of Science and Technology

- issued by
the Ministry of Science and Technology (MOST)
the Publicity Department of the Communist Party of China
China Association for Science and Technology

- The policy document that plans S&T popularization in the country
- Quantum computing was listed as one of the fundamental research area that need further popularization actions, to provide better research and development environment for scientists and stakeholders.



Policies - Summary

- Although the developing goals of quantum communication, computing and measurement vary from each other regarding sector positioning and application prospective, there is no doubt from any level within the country on its significance.
- Despite the repeating emphasize in the QIT, very few standardization progress is made, due to the fact the technologies are in preliminary and even uncertain development
- National level documents actually guide the further implementation policy documents on ministerial level, forming a consistency on basic principles and goals

Chapter Three

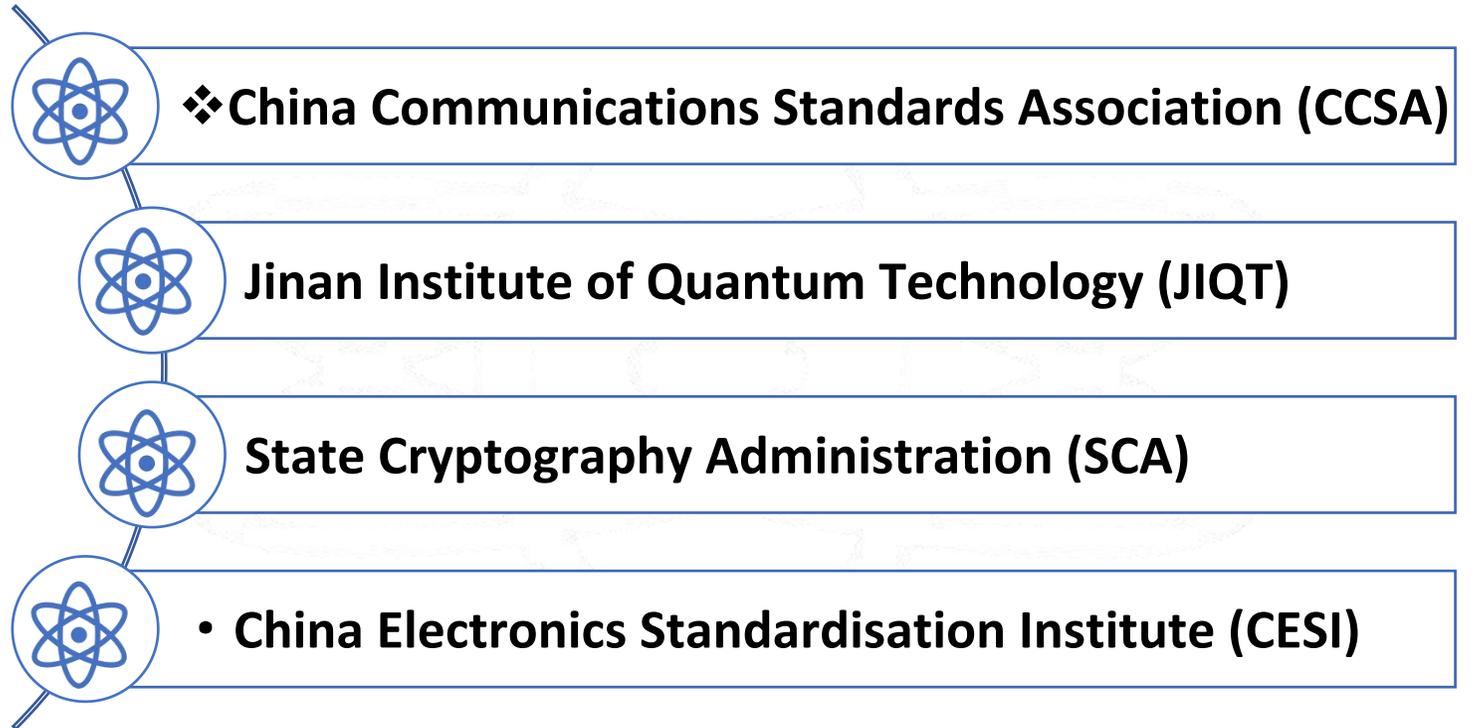


Standardization System and Key SDOs



Standardization System and Key SDOs – Main Organizations

Key Organizations (besides SAC)



Standardization System and Key SDOs – SAC/TC 578

- **National Quantum Computing and Measurement Standardization Technical Committee (SAC/TC578)**
 - The **only** TC under SAC that is responsible for QIT or even quantum technology
 - **Secretariat hosting organization:** Jinan Institute of Quantum Technology (JIQT)
 - **Scope:** quantum computing and measurement, mainly involving the standardization terminology and classification, quantum computing and measurement hardware, quantum computing and measurement software, architecture, application platform and other technical fields within the technical scope.

Standardization System and Key SDOs – SAC/TC578

- Main works: **8** national standards

No	Standard No.	Standard Name	Status
1	GB/T 42565-2023	Quantum computing—Terminology and definition	Implement on Dec 1, 2023
2	N/A	Test method for performance parameters of optical frequency comb in precision optical frequency measurement	Under approval
3	N/A	Terminology for quantum measurement	Under approval
4	N/A	Method to characterize and measure single photon sources	Under approval
5	N/A	Requirements and test methods for performances of the atomic gravimeters	Under approval
6	N/A	Method to characterize and measure the performance of optical clocks	Under approval
7	N/A	Methods for the preparation of Rydberg atoms for precision quantum measurement	Under approval
8	N/A	A weak static magnetic field imaging method based on nitrogen-vacancy center	Under review

Standardization System and Key SDOs - SAC/TC578

- Main works: **5** Research projects:

No	Research Name	Status
1	Study on quantum computing development trend and standardization requirements	Under research
2	Study on quantum computing application scenarios	Under research
3	Study on quantum cloud computing technology application development and evaluation	Under research
4	Study on quantum programming language standards in NISQ era	Under research
5	Study on Ultra-high sensitive atomic inertial metrology test standard	Under research

Standardization System and Key SDOs – SAC/TC 485

- **National Communication Standardization Technical Committee (SAC/TC485)**
 - Secretariat hosting organization: CCSA
 - **Scope:** the formulation revision of national standards in the fields of communication network, system and equipment performance requirements, communication basic protocols and related test methods.
- **Main Works: 2 national standards on quantum**

No	Standard No.	Standard Name	Status
1	GB/T 42829-2023	Basic requirements of quantum secure communication applications	Implement on Mar 1, 2024
2	N/A	Quantum communication terminology and definition	Under approval

Standardization System and Key SDOs – CCSA/ST7

■ ST7 of Quantum Communication and Information Technology (CCSA/ST7)



- Founded by CCSA on June 14, 2017, with two WGs:
 - WG1 (Quantum Communication and Information Technology)
 - WG2 (Quantum Information Processing Working Group)
- **Scope:** standardization research on quantum communication and related quantum information processing technologies, to solve relevant standardization problems for the needs of industrial development, and to prospectively layout standard research in new quantum technology

Standardization System and Key SDOs – CCSA/ST7

- Main works: **multiple** sector standards on quantum communication

Part of the implemented sector standards:

No	Standard No.	Sector/Association Standard	Status
1	YD/T 3834.1-2021	Technical requirements for quantum key distribution(QKD) system-Part1: Decoy state BB84 protocol QKD system	Implemented Apr 1, 2021
2	YD/T 3835.1-2021	Test methods for Quantum Key Distribution(QKD) system-part1: Decoy state BB84 protocol QKD system	Implemented Apr 1, 2021
3	YD/T 3907.1-2022	Key components and modules for quantum key distribution(QKD) based on BB84 Protocol Part1: optical source	Implemented on Jan 1, 2023
4	YD/T 3907.2-2022	Key components and modules for quantum key distribution(QKD) based on BB84 Protocol Part2: Single photon detector	Implemented on Jan 1, 2023
5	YD/T 3907.3-2022	Key components and modules for quantum key distribution(QKD) based on BB84 Protocol Part3: Quantum random number generator(QRNG)	Implemented Jul 1, 2021
6	YD/T 4301-2023	Quantum Secure Communication Network Aechitecture	Implemented Aug 1, 2023

Standardization System and Key SDOs - CSTC

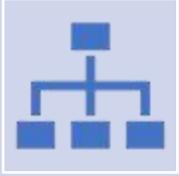
■ Cryptography Standardization Technical Committee (CSTC)

- Established in October of 2011 under the approval of SAC and SCA
- **Scope:** the standardization of cryptographic technology, products, systems and management. The main responsibilities of the TC are to organize the formulation and review of cryptographic sector standards.

■ Main Works: 2 sector standards on quantum

No	Standard No.	Sector/Association Standard	Status
1	GM/T 0108-2021	Decoy-state BB84 quantum key distribution product technology specification	Implemented May 1, 2022
2	GM/T 0114-2021	Decoy-state BB84 quantum key distribution product test specification	Implemented May 1, 2022

Standardization – ISO/JTC 1/WG14 Mirror Group



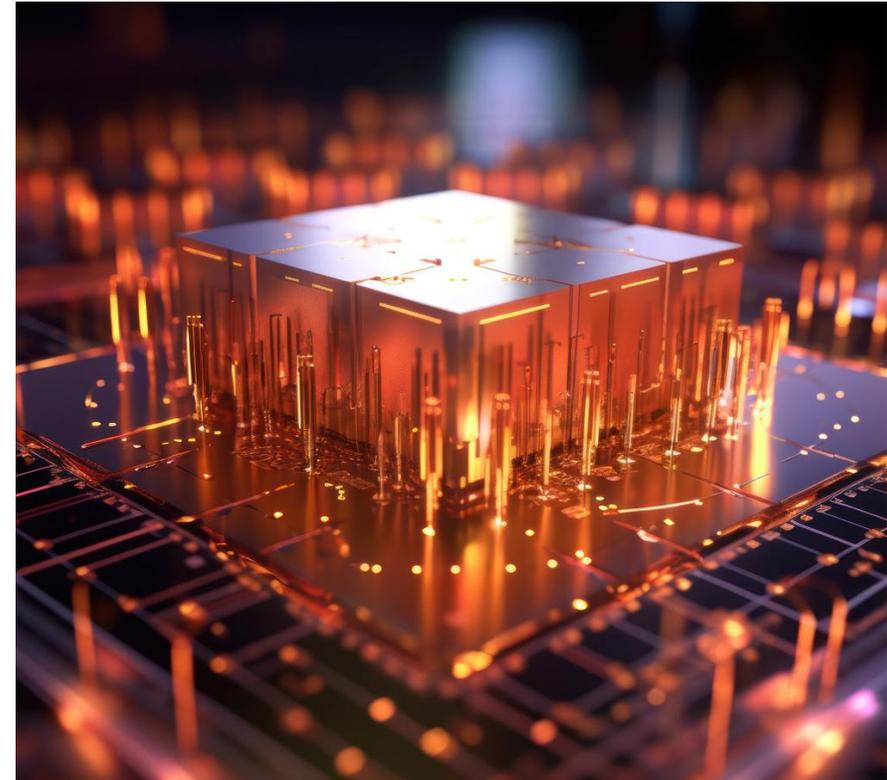
Organized and hosted by CESI.



A key member of the WG as the founding of JTC 1/WG 14 was lead and applied by the Chinese members in JTC 1/AG 4 (also organized by CESI), and one of the experts is now the WG 14's



Leading the formulation of ***ISO/IEC 4879 Information technology - Quantum computing- Terminology and vocabulary*** (under development).



Standardization System and Key SDOs

■ Summary of China's QIT standardization development strategy

Unified national strategies

- Lays foundation for standardization

Supportive policy and finance strategy

- Encourage market stakeholders on standardization

Active international cooperation and engagement

- Stimulate international communication on technology and standardization to improve domestic standardization

Summary



Participants of China QIT standardization was originated from an overlapping group of organizations or enterprises. Now it's opening for new faces.



International participation in standardizations is being emphasized in China. The country may apply similar participation pattern and methods on QIT like other emerging technologies like AI or 5G.



More discussion or changes may be carried out on working structure and next steps. Efforts on technical development, talent training for standardization may take place.

Conclusion



Quantum technologies was and will remain essential in China's development and strategies due to its great potentials



China's quantum standardization system is just unfolding, just like that in the rest of the world and the international community.

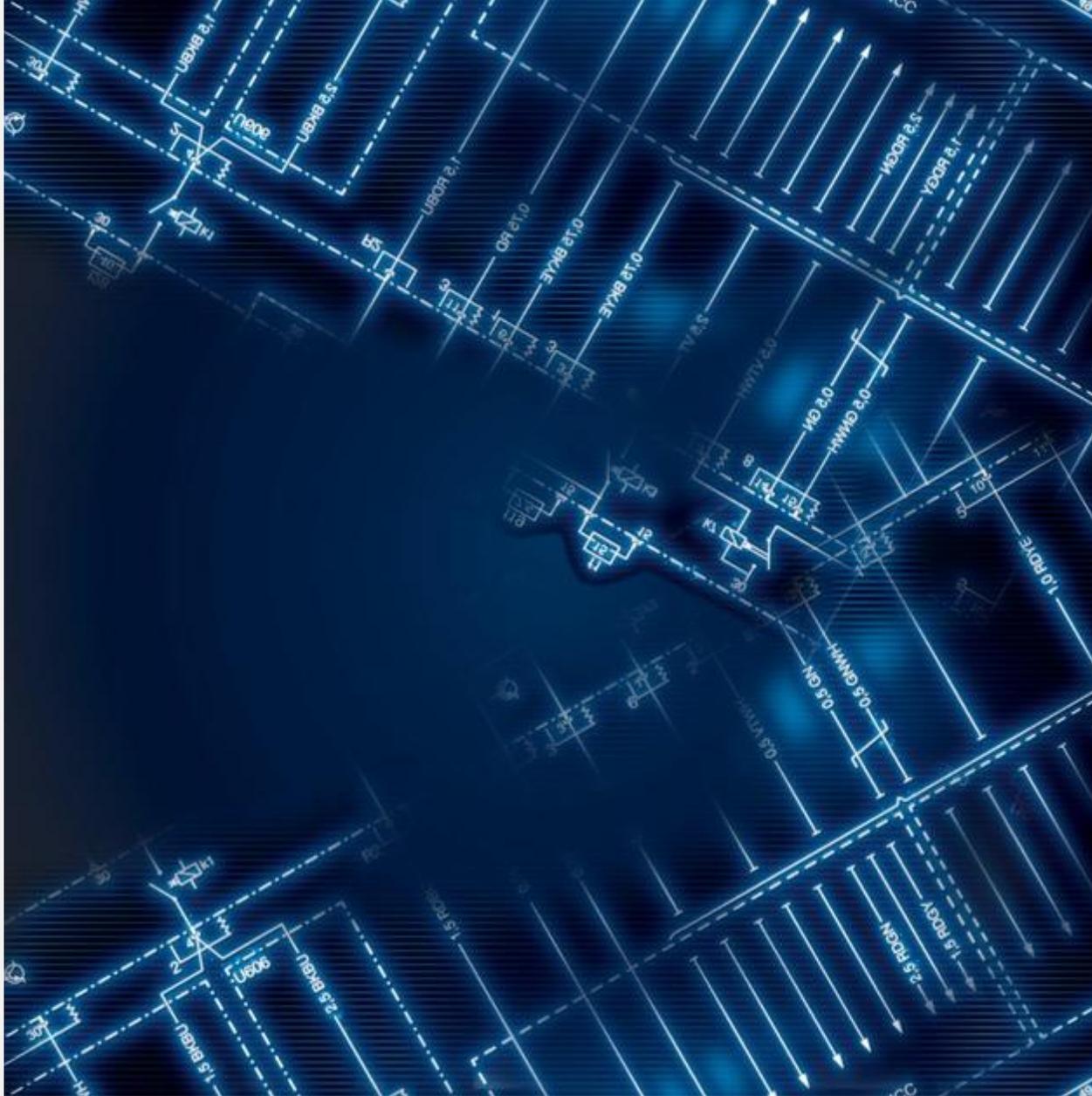


The application of quantum technologies probably is valued more on its integration with other sectors in the country.



China's playing an active role in QIT standardization in the international SDOs and will keep inputting.





Thank you!

Nov 21 2023

[SPEAKER] | [DATE]

