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We will start at 9:30

SESEC IV reports on

China's Standardization on Quantum Information Technology

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Seconded European Standardization Expert in China

China’s Standardization on Quantum Information Technology

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Seconded European Standardisation Expert in China (SESEC)

01

1.1 SESEC Five partners

SESEC is a visibility project co-financed by five European partners:

European Commission (EC)

- The executive body of the European Union;
- Responsible for proposing legislation, implementing decisions, upholding the treaties and day-to-day management of the EU
- DG Grow is the main partner (80%)

European Free Trade Association (EFTA)

- Iceland, Liechtenstein, Norway and Switzerland;
- intergovernmental organisation set up for the promotion of free trade and economic integration to the benefit of its four Member States
- None EU members;

CEN

European Committee for Standardization

CENELEC

European Committee for Electrotechnical Standardization

ETSI

European Telecommunications Standards Institute

1.2 What is SESEC about?

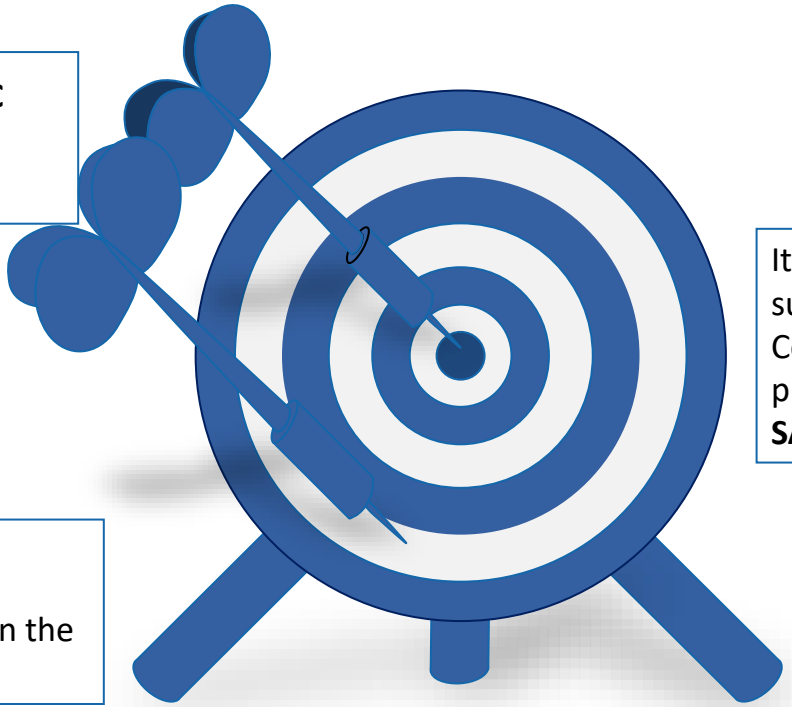
SESEC IV promotes **EU-CN dialogue and cooperation** in the area of **standardization**. It has experienced 3 phases, SESEC I (2006-2009) , SESEC II (2009-2012), and SESEC III (2014-2017).

We are currently in SESEC IV (2018-2021)

The project is **managed by CEN**, supported by a Steering Committee involving all partners.

1.3 What is the goal?

The SESEC initiative supports **EC policy** and **ESOs strategic objectives** in China.



It is notably expected to support the Framework Cooperation Agreement in place **between the ESOs and SAC**

Our ultimate goal is the enhancement of **EU-China dialogue and cooperation** in the field of standardization.

1.4 What we do?

Promote

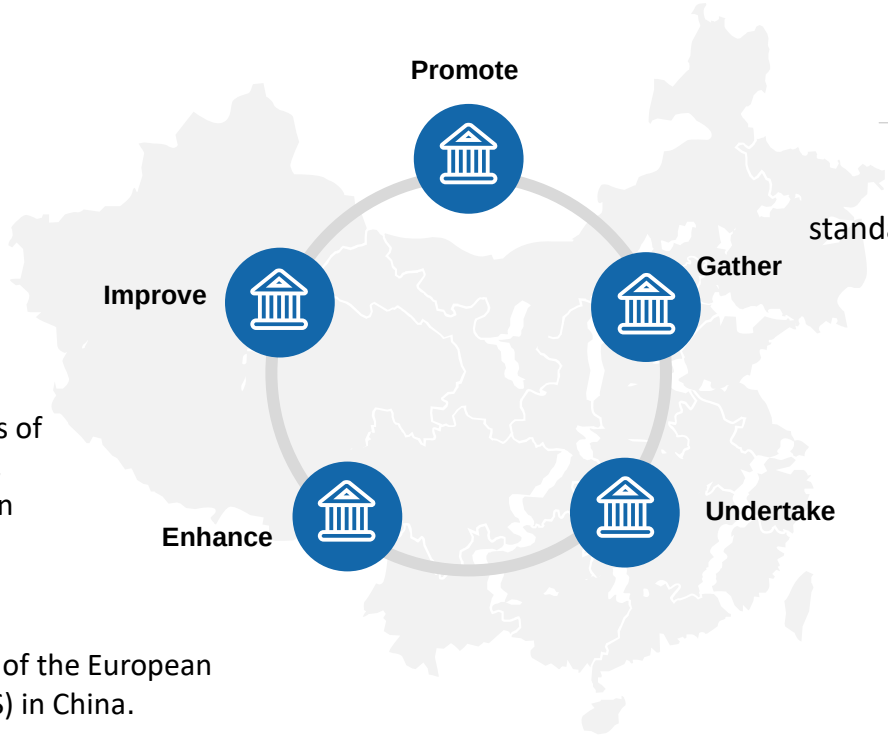
European and International standards in China

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

1.5 SESEC's Priorities

Current Priority Topics

Technical Priorities	Policy 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 like CCC
Green Deal	14th Five-year Plan

Quantum Information Technology Development in China

02

2.1 Quantum Information Technology

Three main branches of quantum information technology (QIT):

01

Quantum Measurement

More accuracy and sensitivity

02

Quantum Computing

Higher processing speed

03

Quantum Communication

Top transmission security

2.2 National Policies concerning QIT

The State Council has issued:

Made in China 2025

2015

*Actively promote the development of **quantum computing**, neural network, and other technologies and equipment*

13th Five-year Plan for Science, Technology and Innovation

2016

Urged the development of new generation information technologies, including **quantum computing**, and indicated the research and development of **quantum communications and quantum computers** as one of the S&T Megaprojects to be completed by 2030

13th Five-year Plan for National Information

2016

"… should strengthen basic research and development and cutting-edge layout of new technologies such as **quantum communication**, future network, brain-like computing and artificial intelligence to gain the leading first-mover advantage in this new arena."

2.2 National Policies concerning QIT

The State Council has issued:

13th Five-year Plan for the Development of Strategic Emerging Industries

2016

*… should promote the research and development of technologies such as terahertz communication technology, visible-light communication technology, and key technologies of **quantum information and the application of quantum encryption keys and quantum simulation**, as well as the realization of **quantum computer.”***

Development Plan for a New Generation of Artificial Intelligence

2017

*Listed **quantum information and quantum computing** as one of the important pillars of the ‘forward-looking strategy’ of the New Generation Artificial Intelligence Megaproject*

Several Opinions on Comprehensively Strengthening Basic Scientific Research

2018

*… should carry out Major Projects of Scientific and Technological Innovation toward 2030, which includes **quantum communication, quantum computer** and researches on brain science and brain-like AI technology.”*

2.3 National R&D Projects on QIT

The State Council, Ministry of Science and Technology, National Natural Science Foundation, National Development and Reform Committee， etc.,actively support research and development of quantum technology via **national funding instruments and projects**

Major Research Plan of National Natural Science Foundation
- Construction and Manipulation of the Second Generation Quantum System (Euro 16M per year)

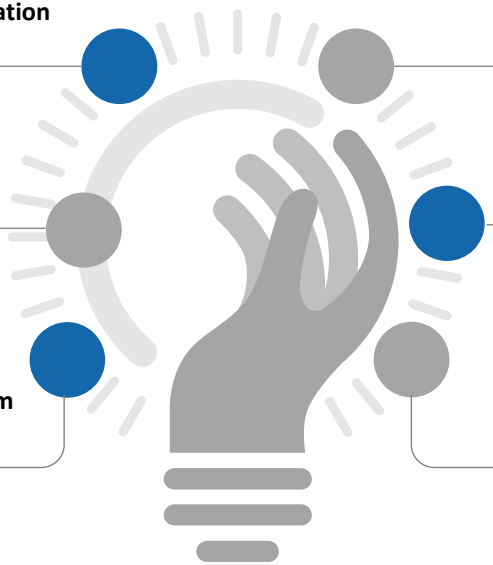
National Natural Science Award
- Experimental discovery of the quantum anomalous Hall effect (Euro 4.7m in 2020)

National Key R&D Plan
- Quantum Manipulation and Quantum Information

National Key Fundamental R&D Plan （973 Plan）
- Several Quantum-related projects every year

Next Generation Information Infrastructure Construction Projects:
- Construction Project for National Wide Area Quantum Secure Communication Trunk Line

Science and Technology Innovation 2030 — Major Project



2.4 Development Layout of QIT in Provincial Level

In 2016, the National Development and Reform Commission and Ministry of Housing and Urban-Rural Development unveiled ***Yangtze's River Delta's city cluster development plan***, which introduced the project of Beijing-Shanghai quantum communication link to fasten the construction of metropolitan quantum network in major cities and wide-area quantum communication network in Yangtze's River Delta's city cluster

Anhui Province

In August 2020, the State Council approved ***the Overall Plan on China (Anhui) Pilot Free Trade Zone***, which will support quantum computing and quantum communication as key priority industries for Anhui Province.

Beijing:

Beijing released the ***Overall Plan for Strengthening the Construction of National Science, Technology and Innovation Centre*** in September 2016 – which clearly positions quantum computing and quantum communication at the core of Beijing's efforts to lead scientific research in frontier sciences in China.

2.4 Developments of QIT Technology

With the support of policies and national projects, China's quantum technology has achieved remarkable progress.

1. Government-led Investment on Research Projects:

Top 2 in the world in terms of the number of publications and patent applications.

2. Implementation of Engineering Projects：

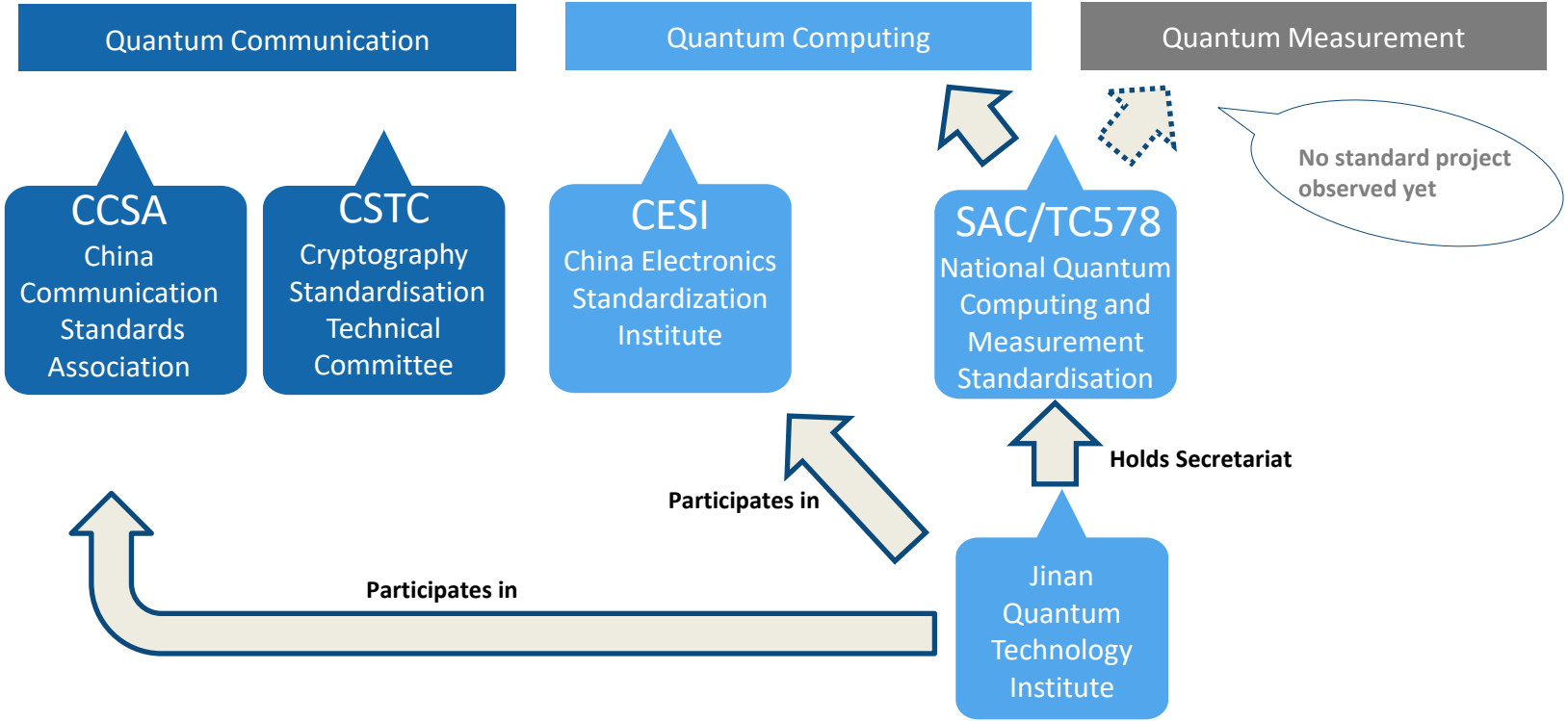
- Quantum Satellite: Mozi （2016）
- Jing-Hu (Beijing-Shanghai) Quantum Secure Communication Trunk Line;（2017）
- National Wide Area Quantum Secure Communication Trunk Line (First Stage)
- Quantum Computer: Jiuzhang （2020）

3. Rolling out of standardisation works

Quantum Information Technology Standardisation in China

03

3.1 Main SDOs in China's QIT Standardisation



3.2 Quantum Communication

CCSA is leading the standardisation work of quantum communication in China.

Special Task Group ST7 (Quantum Communication and Information Technology)

1

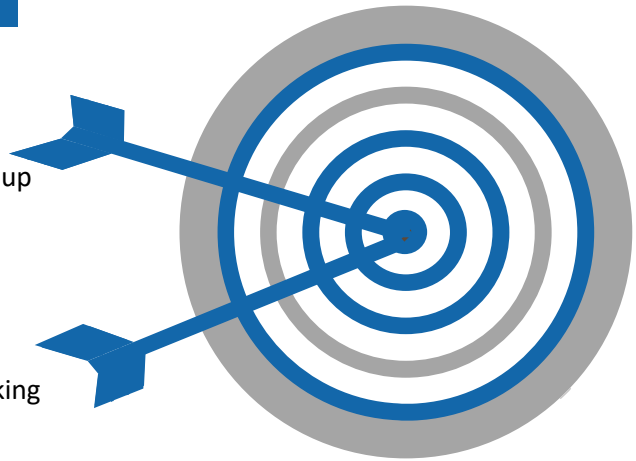
WG1

Quantum Communication Working Group

2

WG2

Quantum Information Processing Working Group

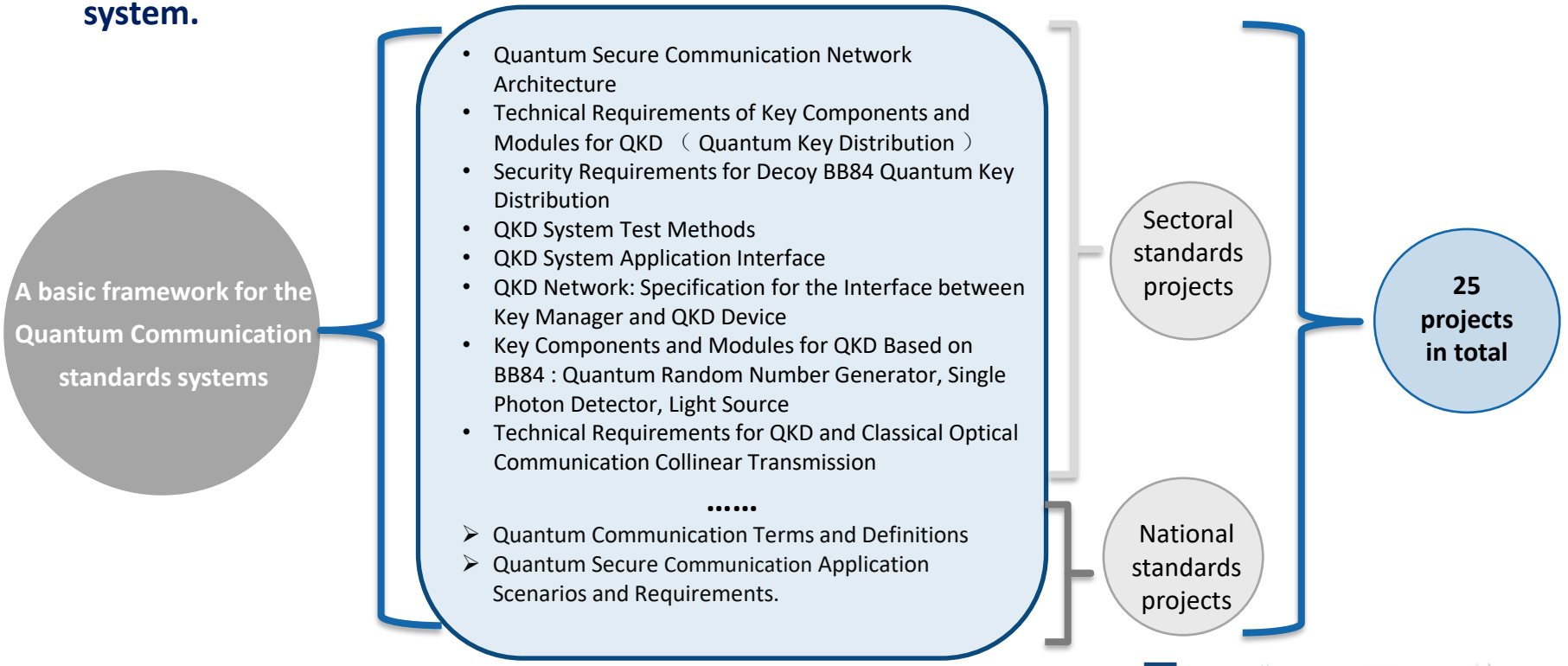


Research topics:

1. quantum communication technology
2. network
3. quantum computing technology related to quantum communication
4. key devices for general quantum information

3.2 Quantum Communication

CCSA/ST7 has established a basic framework for the quantum communication standards system.



3.2 Quantum Communication

CCSA/ST7 also completed six reports and published a white paper.

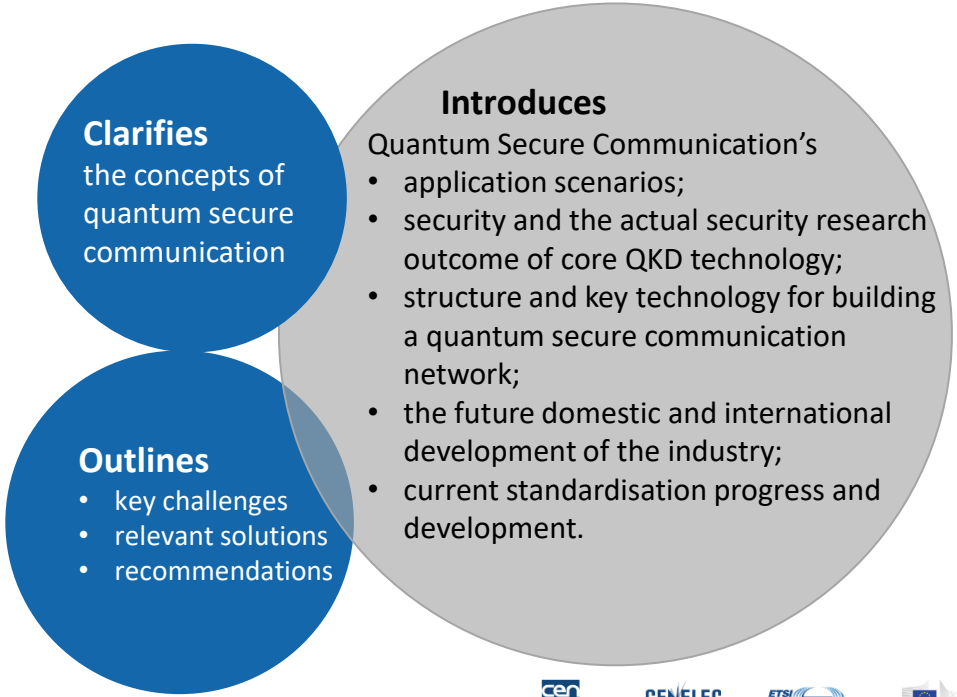
Reports:

- *Research on Quantum Random Number Preparation and Detection Technology*
- *Research on Quantum Key Distribution Security*

……

White Paper:

Quantum Secure Communication Technology (2019)



3.3 Quantum Computing

CESI holds the secretariat of SAC/TC28 (Information Technology), which is the leading organization in the standardization of information technology in China., mirroring ISO/IEC/JTC1.
CESI supported the establishment of SG2(Advanced Computing Research Group) under SAC/TC28/SC41 (Internet of Things) .

SAC/TC28/ SC41/SG2

Work Scope

categorise and conduct research on the standardisation requirements of advanced computing technology systems

Current task

collect research proposals for standardisation

Work in QIT

completed the report: *Status and Trends of Superconducting Quantum Computing.*

Key Project ：*standards system for advanced computing*

Project Proposal ：*quantum cloud infrastructure-oriented resource allocation requirements*

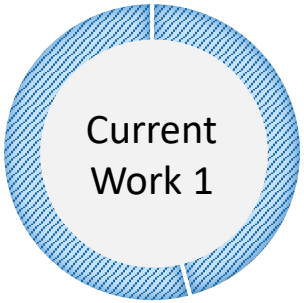
3.3 Quantum Computing

CESI established the Mirror Working Group of ISO/IEC JTC1/WG14 (Quantum Computing Standard Working Group) in June 2020.

Purpose

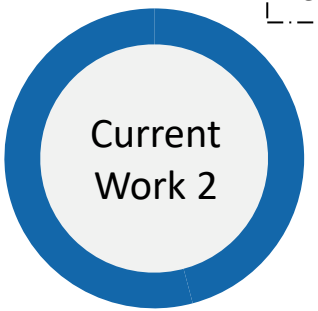
Convey China's quantum computing standard projects to ISO/IEC JTC1.

To categorise the technological development and industrial performance of quantum computing in order to compile and maintain two key reports:



Promote the international standard project:

Terms and Vocabulary of Information Technology Quantum Computing.



(i) the Quantum Computing Research Report,
(ii) Quantum Computing ICT Standardisation Demand Report

3.3 Quantum Computing

SAC/TC578 National Quantum Computing and Measurement Standardisation Technical Committee was established in Jan 2019**.**
Its secretariat is held by the **Jinan Institute of Quantum Technology**
TC578's current standardisation work includes:

- **One national standard project:**
  - *Quantum Computing Terms and Definitions.*
- **Four research projects:**
  - *(i) Quantum Computing Development Future and Standardisation Requirements;*
  - *(ii) Quantum Computing Application Scenarios;*
  - *(iii) Quantum Cloud Computing Technology Application Development and Evaluation;*
  - *(iv) Quantum Programming Language in the NISQ (Noisy Intermediate-Scale Quantum) Era .*

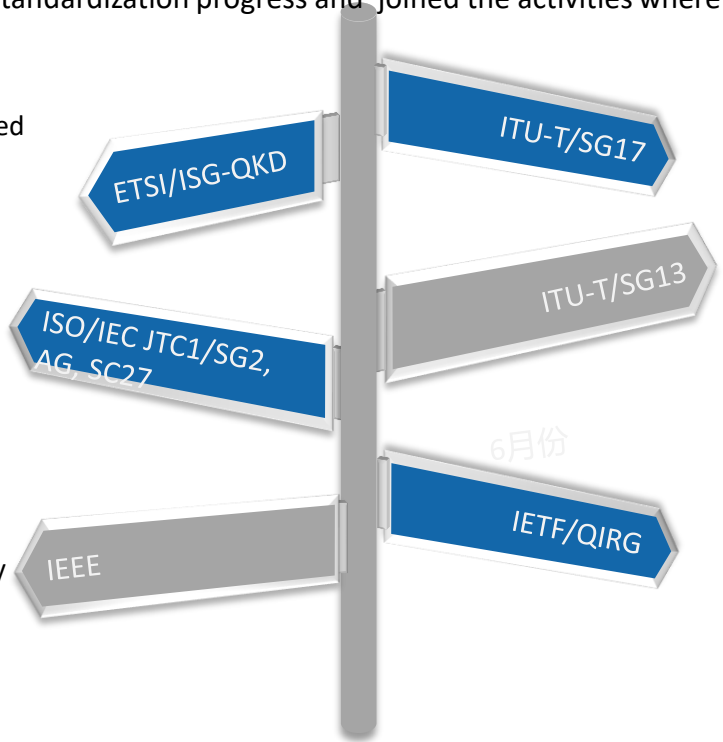
3.4 China in International QIT Standardization

Internationally, the quantum technology standards system and various standardisation research projects are currently under progress –the activities of many SDOs such as ETSI, ITU-T, IEEE, IETF, ISO/IEC, and other organizations like EU Qflagship, NIST, and others. China closely observes the standardization progress and joined the activities where they can.

Nine technical specifications completed
Three other specifications under development

Quantum Computing Research Group (SG2) and the Advisory Group (AG) released several reports.
Information Security Subcommittee (SC27) launched projects on QKD security.

launched three research projects.
The definition of quantum technology terms, quantum technology computing performance indicators and software-defined quantum communication protocols



The Cyber Security Research Group (SG17) has completed several researches

ITU-T/Future Network Research Group SG13 has carried out research projects

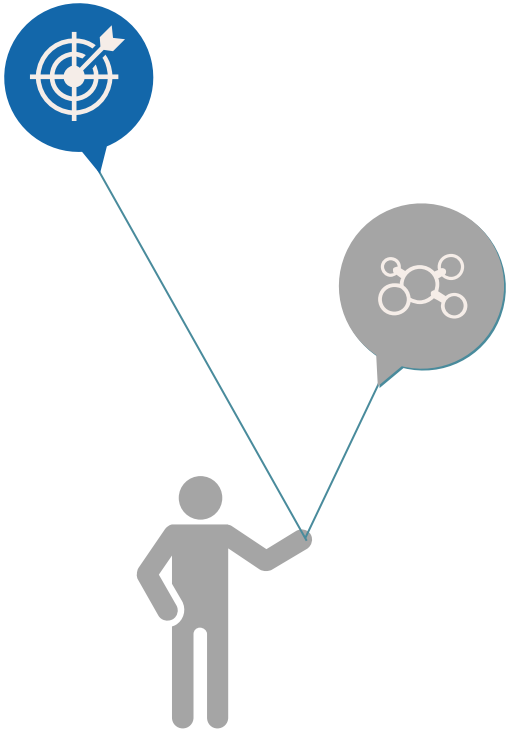
the Quantum Internet Research Group (QIRG) carries out preliminary researches

3.4 China in International QIT Standardization

China is more active in Two Platforms：ISO/IEC JTC1 and ITU:

1 ISO/IEC JTC1

- led the establishment of the **ISO/IEC JTC1/WG14** and took the responsibility of the **convenor**;
- China-led project: ***Information Technology Quantum Computing Terms and Vocabulary*** get approved in ISO/IEC JTC1/WG14;
- China-led project: **QKD Security Requirements and Evaluation Methods** get approved in ISO/IEC JTC1/SC27;
- actively participated in the research work of ISO/IEC JTC1/SG2 (Quantum Computing) and ISO/IEC JTC1/AG4 (Quantum Computing)



2 ITU

- actively participated in the work of ITU-T/SG13 and ITU-T/SG17；served as the editor of several standards；
- promoted the establishment of the **Focus Group of Quantum Information Technology for Network (FG-QIT4N)** in ITU-T, aiming at carrying out standardisation pre-research on the QKD network, QIN and other related areas.

Conclusions 04

4.1.1 Conclusions

Highly Valued and Supported

National policies and a mass of national projects and funding

Solid Progress Achieved

One of Top 2 in the number of publications and patent applications and Implementation of engineering projects; no commercial application so far

Rolling out of Standardization

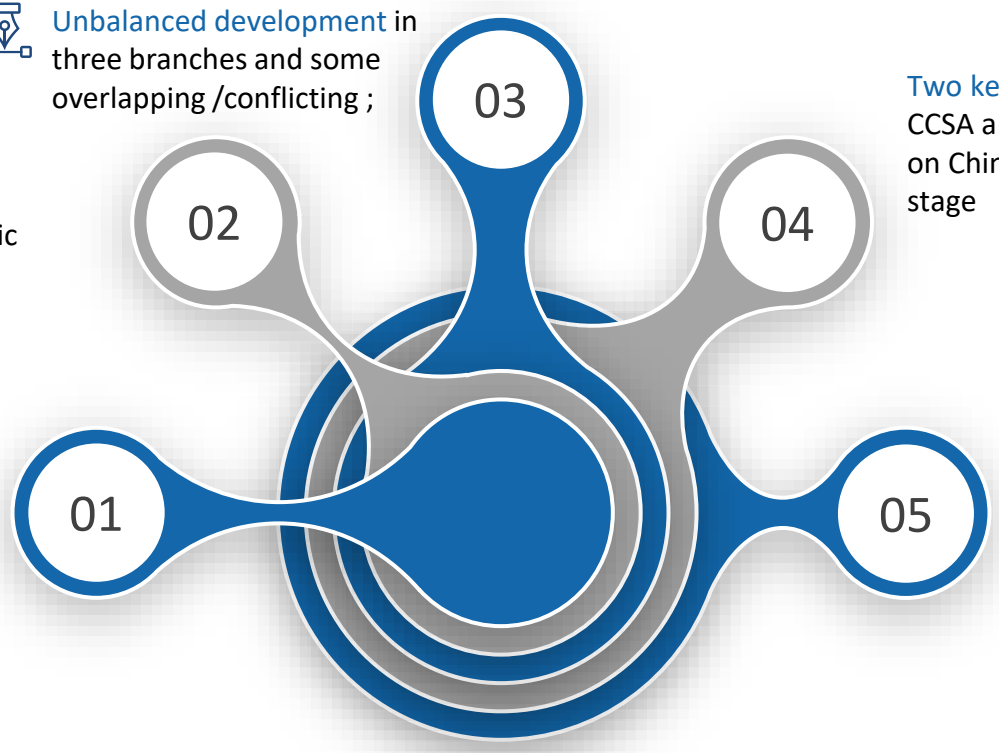
Standardization works has been launched in multiple SDOs and TCs

4.1.2 Conclusions - Standardisation

Unbalanced development in three branches and some overlapping /conflicting ;

Insufficient systematic planning and coordination;

QIT Standardisation in China is still in its infancy;



Two key SDOs:
CCSA and CESI active on China and the world stage

Active participation in international standardization, ISO/IEC JTC1 and ITU

CESI and CCSA are the keys to China's QIT standardisation work.

Upcoming Quantum Related Virtual Event

Please Register this event via
https://www.etsi.org/events/1870-etsi-quantum-safe-cryptography-technical-event#pane-1/

Thank you !

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