



Cross-ministerial  
Strategic Innovation  
Promotion Program

#### Contact Information



National Institutes for  
**Quantum Science and Technology**

SIP research promotion center  
Fukoku Seimei Building 22nd Floor, 2-chome-2-2 Uchisaiwaicho, Chiyoda-City, Tokyo, 100-0011, Japan  
<https://www.qst.go.jp/site/sip3-en/>



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## SIP3 quantum Promoting Application of Advanced Quantum Technologies to Social Challenges





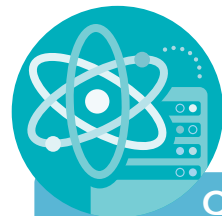
Cross-ministerial Strategic Innovation Promotion Program (SiP) is a national project in which the Council for Science, Technology and Innovation budgets beyond the boundaries of ministries and fields to promote initiatives from basic research to exit (practical application and commercialization).

The third term of the SiP, "Promoting Application of Advanced Quantum Technologies to Social Challenges" aims to accelerate the progress of Society 5.0 by extending the range of users of quantum technology as well as promoting the use of quantum technology through social challenges by cutting-edge engineers.

## Mission

In the field of quantum technology, the following goals have already been set as targets for 2030 in the "Vision of Quantum Future Society" and we aim to achieve them as our mission in this project.

- 10 million quantum technology users in Japan
- Through quantum technology, production to 50 trillion JPY
- Fostering quantum unicorn companies to create future markets



## Quantum Computing

### Research overview

The project will focus on the development of "concrete examples of solutions to real social and industrial issues (use cases)" putting emphasis on a testbed environment in which a wide range of users can use quantum computers and "quantum/classical hybrid systems" that combine quantum and classical computer systems. The project will also develop benchmarks that enable objective evaluation and comparison of performance including software, international standards based on these benchmarks, and roadmap for entire system as well as individual components: devices, materials, and so on. As a result of these efforts, we will work to attract a diverse range of companies and human resources, to secure funding, to create new business and startups on both hardware and software, and to build an ecosystem of companies that includes those for peripheral technologies.



## Quantum Security and Network

### Research overview

Emphasis will be placed on standardization and rule development, verification in collaboration with users, development of next-generation computing infrastructure, secure computation and next-generation cryptography infrastructure, and particularly advanced information processing infrastructure using the quantum secure cloud. In parallel, we will accelerate the process from development to implementation and encourage the expansion of use cases through standardization and testbed construction. The result of these efforts will be the creation of a large-scale network of quantum/classical hybrid solvers spanning multiple fields, including finance, medicine, manufacturing, and mobility.

In addition, by combining with technologies related to quantum network construction, which are being researched and developed outside of the SiP, such as quantum repeater technology, We will connect various quantum devices /systems for quantum computing and quantum sensing, thereby building secure and advanced communication network in the future toward the realization of our mission.



## Quantum Sensing

### Research overview

In order to understand and utilize quantum measurement and sensing technologies, for a wide range of users from academia to industry we will construct environments for the use, test, and evaluation of quantum sensors. We also aim to develop use cases in various fields where ultra-sensitive quantum sensing and the quantum materials that forming the basis of quantum sensing are expected to be utilized. We also develop and commercialize ultra-high precision time-frequency delivery devices toward optical lattice clock networks, which are expected to contribute to the construction of a safe, secure, and reliable infrastructure for the next generation.

As a result of these efforts, we will demonstrate the real use of quantum measurement and sensing technologies in a wide range of fields such as health and medicine, energy, automated driving, communications, disaster prevention, and resource exploration, as well as the development of technologies combined with AI, big data, and IoT, while encouraging the entry of a diverse range of companies and human resources.



## Innovation Creation Platform

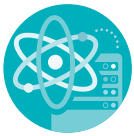
### Research overview

The "Innovation Creation Platform" will focus on creating and supporting new businesses and start-ups, fostering human resources, idea cultivation, and ecosystem building will serve as a foundation for innovation creation based on the results of the other three sub-programs.

The project will also actively disseminate information on research results, practical applications, and commercialization of quantum technology in collaboration with other sub-programs, and build an ecosystem mechanism and structure to match seeds companies (R&D results) with companies in need, thereby arousing the interest of user companies and investors, and attracting investment and human resources.

At the same time, we will find business ideas and human resources through business contests, promote human resource development through the development and implementation of educational programs, and promote the inflow of funds and human resources into quantum technology.






Sub-Program Quantum Computing

Sub-Program director HORIBE Masahiro  
Deputy Director, Global Research and Development Center for Business by Quantum-AI technology(G-QuAT),  
National Institute of Advanced Industrial Science and Technology



R&D Subject A-1 Development of the user environment for the quantum/classical hybrid testbed

Research Theme A-1a Research and development of quantum/classical hybrid basic algorithm construction and testbed utilization environment

Head of R&D : TANAKA Shu  Keio University

Collaborative Research Institutes :  WASEDA University  AIST  FIXSTARS  
Speed up your Business  Orchestrating a brighter world  NEC

Research Theme A-1b Building and operation of a domestically developed quantum computer testbed environment

Head of R&D : YOROZU Shinichi  RIKEN

Collaborative Research Institutes :  大阪大学  
OSAKA UNIVERSITY  QUNASYS

R&D Subject A-2 Development and demonstration of use cases contributing to the creation of new industries, productivity improvement, and others

Research Theme A-2a Development of quantum computer calculation system for high-precision material R&D

Head of R&D : MATSUOKA Tomoyo  QUNASYS

Research Theme A-2b Strategic initiatives to build a business ecosystem with quantum computing solutions


Head of R&D : HORIBE Masahiro  AIST

Collaborative Research Institutes :  MITSUBISHI  
CHEMICAL  
GROUP  Science  
Value  
Life.  KYUSHU  
UNIVERSITY  MIZUHO  
Mizuho Research & Technologies  WASEDA University  KDDI  
KDDI Research

 CHODAI  Q-STAR  Institute of  
SCIENCE TOKYO  SUMITOMO MITSUI TRUST BANK  MUFG

R&D Subject A-3 Benchmark and international standards developments for quantum computer software

Research Theme A-3 Development of quantum algorithm platform through establishment of standard benchmarks and global challenges

Head of R&D : YAN Tennin  QUNASYS

Collaborative Research Institutes :  Jij

R&D Subject A-4 Roadmap and technological review for large-scale quantum computer systems

Research Theme A-4 A technology overview and roadmap for large-scale quantum computer systems and their supply chain resilience

Head of R&D : KON Seitaro  AIST

Collaborative Research Institutes :  RIKEN  Orchestrating a brighter world  NEC  FUJITSU




Sub-Program Quantum Security and Network

Sub-Program director HANAOKA Goichiro  
Principal Researcher, Cyber Physical Security Research Center, National Institute of Advanced Industrial Science and Technology



R&D Subject B-1 Construction of advanced information processing infrastructure using quantum secure cloud

Research Theme B-1 Construction of advanced information processing infrastructure using quantum secure cloud


Head of R&D : MURAI Shinya  TOSHIBA

Collaborative Research Institutes :  NICT  
独立研究開発法人  
情報通信研究機構  東京大学  
THE UNIVERSITY OF TOKYO  Orchestrating a brighter world  NEC  TOPPAN

 SAKURA internet  IZUMORASE  TOSHIBA

R&D Subject B-2 Development and demonstration of use cases utilizing advanced information processing infrastructure

Research Theme B-2 Development and demonstration of use cases utilizing advanced information processing infrastructure

Head of R&D : MURAI Shinya  TOSHIBA

Collaborative Research Institutes :  NICT  
独立研究開発法人  
情報通信研究機構  東京大学  
THE UNIVERSITY OF TOKYO  Orchestrating a brighter world  NEC  TOPPAN

 SAKURA internet  IZUMORASE  TOSHIBA

R&D Subject B-3 Use of secure computation and related technologies that enable data analysis while protecting privacy and other rights

Research Theme B-3a Enhancement of secure computation technology

Head of R&D : SAKURAI Yoichi  NTT Communications

Research Theme B-3b Research and development of resource-saving and practical secure multiparty computation systems

Head of R&D : MATSUMOTO Tsutomu  AIST

Collaborative Research Institute :  NRI SECURE  NRI

Research Theme B-3c Building social implementation examples of secure computation technology

Head of R&D : SAKURAI Yoichi  NTT Communications

Collaborative Research Institutes :  国立研究開発法人  
国立成育医療研究センター  
National Center for Child Health and Development  大阪大学  
OSAKA UNIVERSITY  GMO サイバーセキュリティ  
IERAE



Sub-Program Quantum Sensing

Sub-Program director OHSHIMA Takeshi  
Director General, Quantum Materials and Applications Research Center, National Institute of Advanced Industrial Science and Technology



R&D Subject C-1 Environment development for application, test, and evaluation of quantum sensing and related technologies

Research Theme C-1a Environment development for practical use of solid-state quantum sensors: towards social implementation

Head of R&D : OHSHIMA Takeshi  National Institutes for Quantum and Radiological Science and Technology

Collaborative Research Institutes :      
    

Research Theme C-1b Development of testbed for quantum computers and sensor hardware components

Head of R&D : KANEKO Nobu-Hisa  Collaborative Research Institutes : 


R&D Subject C-2 Development and demonstration of use cases based on quantum sensing and related technologies

Research Theme C-2a Development of hyperpolarization platform and technology for cancer treatment evaluation using triplet dynamic nuclear polarization (DNP)

Head of R&D : NEGORO Makoto  National Institutes for Quantum and Radiological Science and Technology

Collaborative Research Institutes :    

Research Theme C-2b Quantum electrical power sensing with Nitrogen-Vacancy (NV) centers in a diamond

Head of R&D : AMAGAI Yasutaka 

Collaborative Research Institutes :  



Research Theme C-2c Development of quantum spintronic sensor and its applications

Head of R&D : OOGANE Mikihiro 

Collaborative Research Institutes :     

Research Theme C-2d Quantum sensing technology-based diagnostic platform for ultra-early in vitro detection – developing quantum liquid biopsy for early, efficient, and affordable diagnosis of various diseases

Head of R&D : OKADA Yasushi 

Collaborative Research Institutes :  National Institutes for Quantum and Radiological Science and Technology 

R&D Subject C-3 Building a spatio-temporal business infrastructure to support ultrafast communications, mobility, and others

Research Theme C-3 Frequency signal distribution infrastructure referenced to optical lattice clocks via optical fiber network

Head of R&D : OHMAE Noriaki 

Collaborative Research Institutes :   



Sub-Program Innovation Creation Platform

Sub-Program director OKADA Shunsuke  
Chair, Executive Committee, Quantum Strategic Industry Alliance for Revolution (Q-STAR)



R&D Subject D-1 New business/startup creation and support

Research Theme D-1 Creative unit for new business using quantum computers

Head of R&D : OHZEKI Masayuki 

R&D Subject D-2 Development and implementation of educational programs

Research Theme D-2 Industry-academia collaborative development educational programs

Head of R&D : NEMOTO Kae  OKINAWA INSTITUTE OF SCIENCE AND TECHNOLOGY

Collaborative Research Institutes :  

R&D Subject D-3 Idea cultivation

Research Theme D-3a Creative unit for new business using quantum computers

Head of R&D : OHZEKI Masayuki 

Research Theme D-3b Development of trial content presenting the results of Q-LEAP and other programs


Head of R&D : NEMOTO Kae  OKINAWA INSTITUTE OF SCIENCE AND TECHNOLOGY

Head of R&D : OHSHIMA Takeshi  National Institutes for Quantum and Radiological Science and Technology

As part of human resource development under R&D theme D-2 "Industry-Academia Collaborative Development Educational programs " this project will be conducted in collaboration with Research Theme C-1a "Environment development for practical use of solid-state quantum sensors: towards social implementation"

R&D Subject D-4 Ecosystem building

Research Theme D-4 Support for market participation of start-up companies, both vendors and users, related to quantum technology

Head of R&D : Shimada Hiroshi 

Collaborative Research Institutes : 