

Goal 6 Realization of a fault-tolerant universal quantum computer that will revolutionize economy, industry, and security by 2050.

Development of scalable Silicon quantum computer technology

Project manager

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leader's institution

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R&D institutions

RIKEN, Osaka University,
Nagoya University, The
University of Tokyo

Summary of the project

This project aims to develop scalable multi-qubit devices toward realization of Silicon quantum computer. We will use sparse integration and medium-distance quantum coupling to implement a unit structure of qubits and scale up the qubit system by integrating the unit structures. Based on this method we will develop technology bases appropriate to implement large-scale quantum computers by 2030, and expand them in cooperation with the semiconductor industry to realize universal quantum computers by 2050.

Milestone by year 2030

We establish technology bases for fabricating multi-qubit devices toward development of large-scale quantum computers in cooperation with semiconductor industries. In parallel, we perform characterization and high-fidelity quantum operation of the fabricated qubit devices and demonstrate the principles of quantum phase error correction in the multi-qubit devices.

Milestone by year 2025

We use high-quality substrate of silicon/silicon-germanium (Si/SiGe) to establish fabrication technologies for implementing multi-qubit devices with high fidelity, and use them to construct a prototype of small- to middle-scale quantum computers.

R&D theme structure of the project

Seigo Tarucha, PM

Development of scalable fault-tolerant Si quantum bit devices

Takashi Nakajima, RIKEN

Development of middle-distance quantum link

Takafumi Fujita, Osaka University

Development of isotopically controlled Si/SiGe substrate technology

Satoshi Miyamoto, Nagoya University

Development of electron wave-packet qubits with new principle

Michihisa Yamamoto, RIKEN, The University of Tokyo

Shintaro Takada, Osaka University