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Press Release

17 October 2023

イベント通知

Japan-made Quantum Computer Open to the Public! @ Osaka University's *Machikane* Festival

Friday 3 November 10:00am-5:00pm @ Osaka University, Toyonaka Campus

❖ Outline

On Friday 3 November 2023 between 10:00am-5:00pm Japan's third quantum computer[1], which is primarily being developed by QIQB, will be opened to the public.

The event will start at 10:00am with the opening of the freezer. At 11:00am, there will be a demonstration involving the replacement of qubit chips provided by RIKEN. The entire process will be open to the public. From 10.30am onwards, there will be 15-minute presentation every hour introducing the quantum computer.

There will be an overview in English at 2.30pm.

❖ Outline of the event

Date and time: Friday 3 November 10:00am - 5:00pm
Venue: Graduate School of Engineering Science J Building Room B07, Toyonaka Campus, Osaka University
Target audience: *Machikane* Festival attendees
QIQB Presenters:

- Makoto Negoro (QIQB Deputy Director, Associate Professor)
- Hidehisa Shiomi (Specially Appointed Associate Professor, QIQB)
- Kazuhisa Ogawa (Lecturer, QIQB)

QIQB Laboratory (taken in 2022)

❖ Background

On 27 March 2023, Japan's first quantum computer went into operation at RIKEN. It uses superconducting qubit (quantum bit) chips[2]. The computer is controlled by microwave pulses under commands from quantum software via the cloud. QIQB developed the microwave control equipment and cloud software.

On 5 October 2023, Fujitsu and RIKEN announced the successful development of a second quantum computer. QIQB has been building a testbed for the development of quantum software, cloud software and control equipment, with test chips provided by RIKEN.

In the future, QIQB is planning to open the cloud to the public as the third Japan-made quantum computer. When QIQB opens its laboratory to the public during the festival, there will be a demonstration of the chip exchange and wiring changes necessary for this purpose. QIQB's

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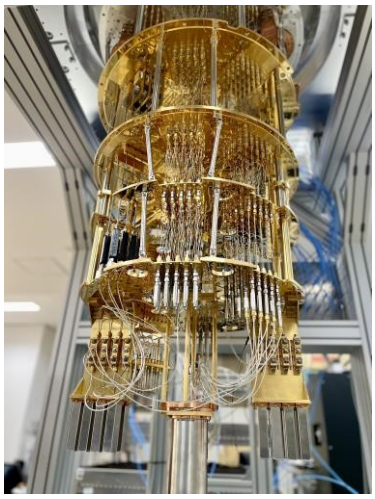
quantum computer is characterized by the fact that, with the exception of the dilution refrigerator and a few low-temperature microwave components, most components (low-temperature microwave cables, low-temperature amplifiers, low-noise power supplies, magnetic shielding, chip packages, control units, superconducting amplifiers, superconducting cables, quantum bit chips, etc.) are made in Japan. The production of these components has recently been completed. In the future, QIQB will show that domestically produced components can perform as a cloud quantum computer.

❖ Event details



＜Program＞

10:00 Opening of the refrigeration system
10:30 Overview of quantum computers
10:45 Q&A session
11:00 Replacement of quantum bit chips, etc.
11:30 Overview of quantum computers (15 min)
12:30 Overview of quantum computers (15 min)
13:30 Overview of quantum computers (15 min)
14:30 Overview (in English) of quantum computers (15 mins)
15:30 Overview of quantum computers (15 mins)
16:30 Overview of quantum computers (15 mins)
17:00 Conclusion

Makoto Negoro (Deputy Director and Associate Professor, QIQB), Hidehisa Shiomi (Specially Appointed Associate Professor, QIQB) or Kazuhisa Ogawa (Lecturer, QIQB) will be available at each presentation session. Outside of the presentation times, an introductory video about QIQB will be shown. If you wish to visit or film QIQB, please ask the staff in advance.

The introductory presentation on quantum computers will discuss how quantum computers work, how superconducting qubits work, their components, where quantum computers can be applied and the latest research at QIQB.

This project is funded by the JST Program on Open innovation Platforms for Industry-academia Co-Creation (CI-NEXT) "Quantum Software Research Hub".

❖ Keywords

※1 *Quantum computer*

A computer that performs calculations using qubit (quantum bit) which operates according to the principles of quantum mechanics, as the fundamental unit of information. By utilizing quantum superposition and quantum entanglement, which do not exist in conventional computers, it is expected to be able to efficiently simulate quantum behavior such as electronic states in molecules and solve various problems such as machine learning and prime factorization at high speed.

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※2 *Superconducting qubits*

A quantum computer scheme in which a qubit is realized by using an element called a Josephson junction on an electronic circuit made of superconducting materials. As the scale of the energy difference between '0' and '1' in a qubit is so small that it resonates with electromagnetic waves in the microwave band, it must be cooled to a cryogenic temperature of about 10mK (about -273°C) in a dilution refrigerator to suppress thermal noise.

❖ Contact

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