



(Press Release)

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NTT, Inc.

OptQC Corp.

## NTT and OptQC Sign Collaboration Agreement to Accelerate Scalable and Reliable Optical Quantum Computing

*Pioneering the Future of Quantum with Optical Technologies – Toward One Million Qubits by 2030*

### News Highlights:

- ◆ NTT and OptQC have signed a collaboration agreement to develop scalable and highly reliable optical quantum computers, aiming to achieve one million qubits by 2030.
- ◆ The partnership will leverage NTT's advanced optical communication technologies and OptQC's expertise in optical quantum computing to accelerate practical implementation.
- ◆ This initiative seeks to create use cases, develop algorithms, and establish a supply chain for optical quantum computers, contributing to solutions for complex social challenges.

**Japan—November 18, 2025** - NTT, Inc. (Headquarters: Chiyoda, Tokyo; President and CEO: Akira Shimada; hereinafter "NTT") and OptQC Corp. (Headquarters: Toshima, Tokyo; Representative Director and CEO: Kan Takase; hereinafter "OptQC") have signed a collaboration agreement to realize scalable and highly reliable optical quantum computers. Under this agreement, the two companies will apply advanced optical communication technologies—such as optical amplification and multiplexing—to the development of optical quantum computers. By doing so, they aim to accelerate the practical realization of large-scale optical quantum computers capable of addressing complex social challenges, with a goal of achieving one million quantum bits by 2030.



**Application of Optical  
Communication Technologies**  
(Quantum light sources,  
Wavelength multiplexing, etc.)



**Optical Quantum  
Computer Technologies**

**Realizing scalable and reliable optical quantum computers**

**2030: 1 million qubits - world-leading performance**

**2027: 10,000 qubits - top-level performance in Japan**

2025: hundreds of qubits in Japan | several thousand qubits in the world

(Figure 1 Toward the practical optical quantum computers)



## Background

Quantum computers are increasingly expected to tackle complex problems that require enormous computation time on conventional systems—such as drug discovery, new material design, financial optimization, and climate change prediction. However, current quantum computers are extremely sensitive; even slight noise or fluctuations can disturb quantum states and lead to incorrect results. To achieve practical realization, it is essential to generate one million physical qubits and reliably create and control thousands of logical qubits using error correction technology.

While various quantum computing approaches are being researched worldwide, most require special environments such as ultra-low temperatures or vacuum conditions, posing significant technical challenges for practical use. In this context, “optical quantum computers,” which leverage the properties of light, are gaining attention as a new approach that operates at room temperature and atmospheric pressure with low power consumption.

Under the IOWN (Innovative Optical and Wireless Network) initiative, NTT has been advancing research and development of optical communication technologies—including optical amplification and multiplexing, which can serve as quantum light sources—as well as error correction technologies expected to be applied in the quantum domain. Some of these technologies have already been applied to optical quantum computers. For example, by utilizing optical amplification technology as a quantum light source, NTT achieved quantum entanglement generation more than 1,000 times faster than conventional methods—a world-first breakthrough.

OptQC is a startup founded on 25 years of optical quantum computing research at the University of Tokyo. Its core members have pioneered key technologies for optical quantum computers, including the world’s first system operating at room temperature and atmospheric pressure, ultra-broadband quantum measurements using optical amplifiers, and the generation of qubits for quantum error correction. Through NEDO’s Research and Development Project of the Enhanced Infrastructures for Post-5G Information and Communication Systems, OptQC is currently developing a 10,000-qubit optical quantum computer.

## Overview of the Collaboration

NTT and OptQC will combine NTT’s optical communication technologies with OptQC’s expertise in optical quantum computer development to realize practical optical quantum computers that are both scalable and highly reliable. Specifically, the goal is to achieve scalability to one million qubits—a key benchmark for practical quantum computing—and to establish error-tolerant technologies that ensure reliability by 2030.

Under this collaboration, the companies will jointly explore:

1. Development of multiplexing and error correction technologies applicable to optical quantum computers
2. Creation of use cases and development of algorithms and software for optical quantum computers
3. Building a supply chain for optical quantum computers
4. Promoting social implementation of optical quantum computers and related use cases



## Roadmap

NTT and OptQC will conduct joint studies over the next five years. In the first year, they will initiate technical investigations and foster partnerships with organizations that support this initiative to develop use cases. In the second year, they will establish a development environment, and in the third year, they will carry out use case verification. By 2030, NTT and OptQC aim to realize an optical quantum computer with one million qubits and develop applications that help address social challenges.

## Related Information

[1] "Ultra-Fast real-time optical entanglement generation

A new era pioneered by fast generation of quantum correlations 1000 times higher than the conventional rate" (2025/1/29)

<https://group.ntt/en/newsrelease/2025/01/29/250129a.html>

## [Glossary]

### <sup>1</sup> Quantum Computer

*A computer that operates based on the principles of quantum mechanics, unlike conventional (classical) computers. It is expected to solve certain problems at high speed, such as efficient simulation of quantum systems and prime factorization.*

### <sup>2</sup> Optical Quantum Computer

*In conventional computers, information represented by electrical signals is processed by semiconductor processors. In optical systems, light serves as the carrier of information. Various approaches use physical properties of light such as photon number, polarization, and amplitude.*

### <sup>3</sup> Logical Qubit

*A unit of quantum information created by combining multiple physical qubits with error correction to enable stable computation. Logical qubits are a key metric for practical quantum computing.*

### <sup>4</sup> Optical Amplification Technology

*A technology that strengthens optical signals. In communications, it is used to amplify weakened light during long-distance transmission to deliver information accurately. In quantum computing, this technology is applied to stably supply light that carries quantum states, enabling quantum light sources necessary for large-scale computation.*

### <sup>5</sup> Optical Multiplexing Technology

*A technology that transmits multiple optical signals simultaneously over a single channel. Examples include wavelength-division multiplexing, which assigns different data to different wavelengths, and time-division multiplexing, which assigns data to different time slots.*

### <sup>6</sup> Error Correction Technology

*A technology that detects and corrects errors during computation. Quantum computers are extremely sensitive, and even slight noise can disrupt results, making error correction essential. Mechanisms*



*developed in communications are applied to enhance the reliability of quantum computation.*

### *<sup>7</sup> Quantum Entanglement*

*A quantum phenomenon where physical quantities exhibit special correlations. Even when two entangled particles are far apart, they influence each other. This cannot be explained by classical physics; Einstein famously referred to it as “spooky action at a distance.” Its existence has been experimentally confirmed, and in 2022, three researchers who contributed to its demonstration were awarded the Nobel Prize.*

### **About NTT**

NTT contributes to a sustainable society through the power of innovation. We are a leading global technology company providing services to consumers and businesses as a mobile operator, infrastructure, networks, applications, and consulting provider. Our offerings include digital business consulting, managed application services, workplace and cloud solutions, data center and edge computing, all supported by our deep global industry expertise. We are over \$90B in revenue and 340,000 employees, with \$3B in annual R&D investments. Our operations span across 80+ countries and regions, allowing us to serve clients in over 190 of them. We serve 75% of Fortune Global 100 companies, thousands of other enterprise and government clients and millions of consumers.

### **About OptQC**

OptQC is a startup developing a highly scalable, general-purpose optical quantum computer operating at room temperature. With a mission to realize a truly smart and sustainable society, OptQC is on track to complete its first commercial optical quantum computer in April next year. Building on this milestone, the company is advancing the development of a new large-scale processor targeting 10,000 quantum modes, scheduled for completion in 2028. To date, OptQC has raised \$14.3M through its seed and Series A1 rounds and is building a \$100M development framework that incorporates both private financing and governmental grants. By delivering unprecedented computational capability for fields such as AI, optimization, drug discovery, and finance, OptQC aims to redefine the future of computing through the power of photonics.

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