# Development of Quantum Interfaces for Building Quantum Computer Networks

Project manager

## KOSAKA Hideo

**Director of Quantum Information Research Center / Professor of Faculty of Engineering and Institute of Advanced Sciences, Yokohama National University**

leader's institution

Yokohama National University (YNU)

R&D institutions

AIST, NIMS, TMDU, U. of Tokyo, QST, YNU

## Summary of the project

This project aims to develop an integrated system of quantum computers and quantum communication to realize a large-scale distributed quantum computer with fault tolerance (Fig. 1). We develop quantum interfaces that connect superconducting quantum computer chips via fiber-optic quantum communication (Fig. 2). With quantum memory and optomechanical crystals as our core technologies, we conduct research and development from diamond growth and diamond nanofabrication to 3D implementation.

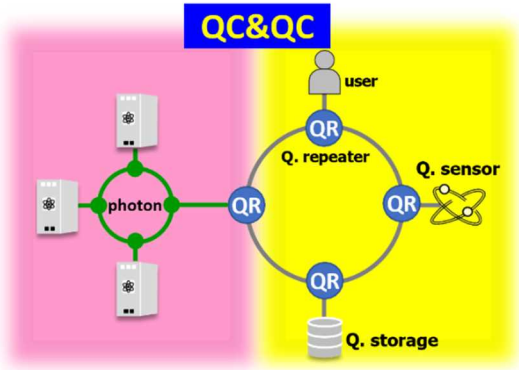


Fig. 1. Integration of quantum computers (QC) and quantum communication (QC).

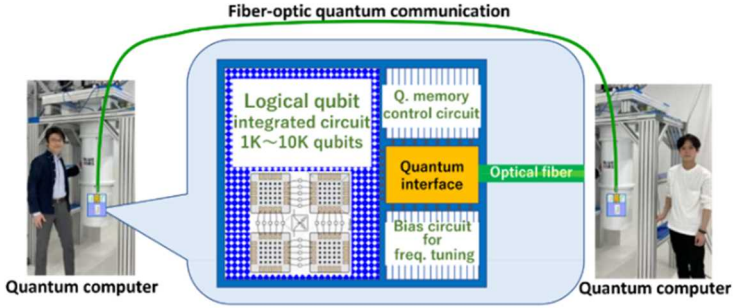


Fig. 2. Fiber-optic quantum communication between quantum computers.

## Milestone by year 2030

The hybrid quantum interface and large-capacity quantum memory enable network connectivity with quantum error correction (Fig. 1).

## Milestone by year 2025

To show that the number of qubits can be expanded to the scale needed for quantum error correction, we will realize a connection between quantum computers via quantum communication using a hybrid quantum interface (Fig. 2).

## R&D theme structure of the project

This project consists of the following 1-3 R&D themes and members (Fig. 3).

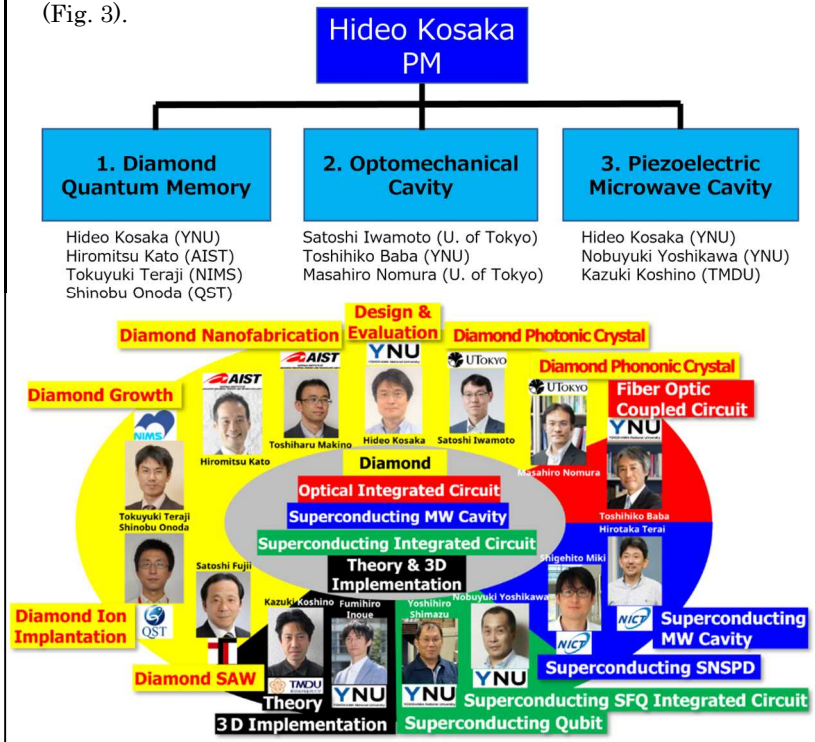


Fig. 3. Diamond quantum interface manufacturing team.