

# Quantum key distribution network and quantum internet toward next generation communication infrastructure

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## Abstract

We are conducting research and development on quantum key distribution (QKD) networks as well as quantum internet. Even with optical fibers or satellite links, communication paths are subject to significant losses, therefore, the global quantum communication requires the use of protocols that are tolerant of quantum bits losses and errors, as well as the implementation of functions unique to quantum technology. Regarding quantum Internet, we define the quantum Internet as a communication network with remote transmission of quantum states and high-precision synchronization. Our definition of the quantum Internet is a future communication infrastructure that can coexist with trusted nodes based QKD networks would provide more secure communication. Specifically, we aim to synchronize distant atom clocks for high-precision synchronization and frequency stabilization of light sources to achieve higher performance such as twin field (TF) QKD, and to combine the keys obtained from Quantum Internet with secure network coding techniques such as secret sharing schemes on QKD networks based on trusted nodes. By combining such technologies, we would like to realize more secure key and data transmission. This lecture will explain the details.