

Secure key generation via optical communication between ISS and a vehicle. ---Toward satellite QKD ---

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Abstract

Thanks to the tremendous efforts of many researchers, quantum computers are just one step away from practical use. However, this means that existing encryption methods based on computational security will become vulnerable, and it is recognized as a threat to the security of the current Internet. One solution to this problem is quantum cryptography, and secure key distribution using this method, known as Quantum Key Distribution (QKD), is attracting attention as a way to ensure the security of data communication in the quantum computer era.

This information-theoretically secure method of key data sharing is currently undergoing tests for social implementation in fiber networks, and while it is becoming clear that it is very useful, it has the problem of being difficult to transmit over long distances. As one way to solve this problem, the demonstration of quantum key distribution starting from a satellite is being considered.

In order to develop QKD equipment for satellites and acquire basic technology for space-to-ground single photon communications, we installed an encryption transmitter “SeCRETS” using a physical layer method on the International Space Station in August 2023 and attempted key distribution to a portable optical ground station based on the vehicle, which was successful in March 2024. In this presentation, we will introduce this attempt between the ISS and the ground, as well as the experimental plan for a QKD satellite, which is being promoted as the next plan based on the mission equipment development cultivated in the “SeCRETS” development.