Multiple-Access Quantum Key Distribution Networks

Results in Brief

Quantum technologies for future-proof data security solutions

Quantum key distribution (QKD) is an unbreakable form of computer encryption. An EU initiative worked to enable its use among multiple users on public networks.

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The answer to the increasing electronic security vulnerability could lie in quantum cryptography. In this emerging discipline, utilising the characteristics of quantum mechanics for encryption would make it almost impossible to crack – at least by conventional means.

The EU-funded MULTIPLE-ACCESS QKD (Multiple-access quantum key distribution networks) project set out to study various multiple-access configurations for hybrid quantum-classical communication networks. The main focus was QKD, which is unbreakable when compared to the vast majority of cryptosystems currently in operation.

Project partners initially examined first- and second-generation and future trust-free generations of multiple-access configurations for hybrid quantum-classical communication networks. This led to insight on what the proposed systems could offer concerning key exchange rate contrasted with the number of users and

distance. They then developed new solutions for the networks.

QKD has only been used between two parties on dedicated networks. The MULTIPLE-ACCESS QKD team sought to expand this to include multiple-user networks and make it available on public networks. To achieve this, it developed new multiple-access and multiplexing methods that separate QKD signals and exploit allocated bandwidth for a maximum number of users.

The architecture of future hybrid quantum-classical networks using passive optical networks was also investigated in terms of cost effectiveness. In addition, mechanisms for the long-distance exchange of secret keys, such as quantum repeaters, were explored.

At a time when concern is growing over online snooping and data privacy, the vision of an unbreakable public QKD encryption is closer to becoming reality thanks to MULTIPLE-ACCESS QKD.

Keywords

Quantum key distribution | encryption | public networks | quantum cryptography | multiple-access quantum key distribution networks

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