



QUANTUM  
COMMUNICATIONS  
HUB

# Quantum security at all distance scales

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[www.quantumcommshub.net](http://www.quantumcommshub.net)



## OUR TECHNOLOGIES

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### Quantum networking

We developed and deployed the UK's first Quantum Networks and are working to extend and adapt them. We are exploring technical innovations to address existing constraints such as noise and distance, and the need to network new quantum systems and devices, e.g. with entanglement distribution. We are developing novel architectures for the integration of classical and quantum communications, and using field-trials and test-beds to engage directly with users and sectors for whom the technology provides the basis for viable solutions and services.

### Handheld consumer quantum devices

Free-space quantum transmission between prototype handheld devices and a wall mounted terminal (the so-called "quantum ATM") has been demonstrated by Hub researchers, paving the way for short-range consumer devices. These could enable users to establish a quantum secured connection with institutions, or service providers, giving consumers ultimate reassurance that their personal data and transactions are safe.

### Quantum-safe secure communications

We are integrating post-quantum cryptography (PQC) and quantum communications to develop hybrid systems for a future-proof approach to quantum-safe communications.

### Chip-based devices

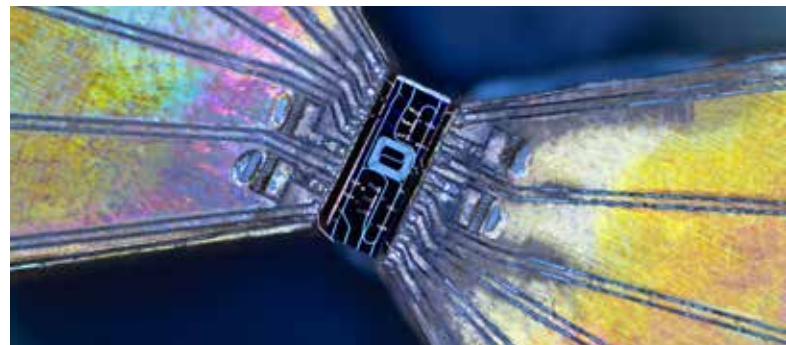
We are developing a new generation of miniature devices which are robust, cost-effective and commercially viable. These chip-scale devices can be easily mass-manufactured at scale and will have significant scope for integration with conventional technologies, such as mobile telephony and computing.

### Standards for quantum technologies

Through partners such as NPL, we are working to establish standards, interfaces, specifications and component characteristics for quantum communications systems and related technologies. We are also developing test and measurement protocols for real-world systems, to expose potential vulnerabilities and threats – enabling their removal, or the establishment of countermeasures.

### New quantum devices and protocols

We are developing new sources and detectors to improve the performance of quantum communications. We are developing new protocols, such as quantum tokens, that provide services beyond key distribution.



### Free-space quantum communications

Our exploration of quantum-secure communications in free space embraces the use of low-altitude aerial platforms, high altitude pseudo satellites in the stratosphere, and satellites in low earth orbit. We are launching our own In-Orbit Demonstration of satellite to ground quantum key distribution based on UK science. We are developing novel quantum sources and detectors for operation in free-space, as well as platform-specific supporting technologies, including those that underpin security of quantum communications in space.

## THE BUSINESS OPPORTUNITY

Quantum communications technologies have the potential to impact upon many economic sectors. The technologies being developed in the Hub are intended to enable widespread use, be compatible with current communications infrastructure and thus support integration into the next generation of business models. Some examples of sectors most likely to benefit from the applications of quantum communications technologies are offered below.

The Quantum Communications Hub welcomes enquiries about potential collaboration from those with interests closely aligned to our work. A number of options are available, including co-funded feasibility studies and involvement in externally funded schemes, both national and international in scope. For initial discussions, please contact the Hub directly via: [enquiries@quantumcommshub.net](mailto:enquiries@quantumcommshub.net).

### Finance

Quantum secure communications technologies, mainly in the form of Quantum Key Distribution (QKD), have been successfully trialled for the secure transmission of sensitive financial (and other) transactions and can be implemented over private networks. In the near term, such QKD-enabled networks could be used for CHAPS payments and two-factor authentication for transactions, instead of potentially vulnerable passwords and PIN numbers. Chip-scale, wireless and fibre-based quantum devices are paving the way for secure transactions for consumers. Unforgeable quantum tokens also have potential for supporting high-value transactions.

### ICT

With responsibility for installing and managing systems and services that underpin all aspects of information-processing-based economies around the globe, it is vital that ICT providers are early adopters of quantum-safe technologies in readiness for future cyber security threats. The ICT industry will be required to both develop new quantum safe communications products and deliver these as part of integrated networked solutions.

### Defence and Security

There is a commercial opportunity for defence and security contractors to develop capabilities for delivering quantum safe communications infrastructure on a global scale. Through engagement about the challenges faced, Hub partners can help shape technology development and ensure quantum communications meet emerging security requirements in a future quantum-enabled landscape.

### Space

Quantum safe technologies will be essential to maintain security in the world's future communications infrastructure. The sharing of encryption keys via satellites makes a very important contribution to this at a global scale, and this can be achieved with quantum safety using QKD. There is thus a huge opportunity for the space industry to collaborate in the development of new technologies for transmitting and receiving quantum keys between ground stations and satellites or other aerial vehicles and between satellites.



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The Quantum Communications Hub, funded through the **UK National Quantum Technologies Programme**, is a major collaboration of university and industrial partners brought together to accelerate development and commercialisation of quantum secure communications technologies at all distance scales.