QUANTUM
COMMUNICATIONS
HUB

Partnership Resource

Quantum Communications Hub investments in strategic potential:

Feasibility Studies

Proofs of Concept

Preliminary Developments

Demonstrators

www.QuantumCommsHub.net

3D Photonic Components for Quantum Optical Communications:
development of 3D integrated multiport interferometers for state elimination measurement in quantum optical fibre communication systems using ultrafast laser inscription technology and offering considerable benefits over bulk optic systems, while also researching photonic lanterns-based components for communicating with orbiting satellites.

Autonomous System for Measurement Device Independent QKD:
realisation of a MDI-QKD prototype that can operate continuously and with spatial separation of the two communicating parties, tackling challenges such as realisation of high-speed, real-time modulation of indistinguishable pulses from remote locations, and synchronisation of those remote locations.

Continuous Variable-QKD:
CV-QKD offers significant potential for high performance secure key distribution over metro (city-scale) distances, utilising existing data-communications infrastructure for the purpose. Demonstration of CV-QKD at higher clock rates with enhanced secure key rates will provide the basis for determining feasible implementation, with the reduced complexities and costs associated with standard optical communications.

CubeSat QKD and Groundstations:
realisation of satellite QKD with cube satellites, through exploitation of their lower development, launch costs and rapid development, and culminating in a terrestrial demonstration and engineering model of a CubeSat QKD system and optical ground station ready for full mission capability and in-orbit-demonstration.

Flexible Quantum Wireless System:
practical application of QKD in securing short-range wireless communications between a terminal such an ATM and a handheld device (e.g. mobile phone) for quantum security.

Frequency Down-Conversion to Telecom Wavelengths of On-Demand Indistinguishable Single Photons from a Quantum Dot:
aiming to realise the world's brightest on-demand telecom wavelength source of single photons – essential for quantum repeaters and long-distance quantum networks – while using the most technologically mature platform for implementation of next generation quantum communication protocols.

High Speed (100 Gbps) Encrypted Optical Communications System Based on QKD and Optical Code Scrambling:
combination of approaches for jointly achieving computational security and optical layer security.

New UK Industry for Satellite QKD Optical Receivers:
feasibility study to determine availability of capabilities in both advanced optical technologies and manufacturing processes to develop new optical ground receivers, as

part of an assessment of UK capability to become a manufacturing base for OGRs on a scale appropriate to a new global market.

Realistic Threat Models for Satellite Quantum Key Distribution:
in-depth security study of satellite QKD, examining various assumptions about the physical channel between satellites and ground stations and aiming to add new capabilities through maximising the user exploitability of current and future quantum satellite missions.

Satellite Visibility Simulator for Quantum Optical Services and Experiments:
development of an an atmospheric visibility model, based on high temporal and spatial resolution data used to determine realistic optical transmission statistics derived from short (90 minutes) to medium (1 year) timescale data, and of value to missions currently in planning.

Towards Assurance/Certification of Physical Quantum Random Number Generators:
authoritative accreditation of outputs, through development of the necessary theoretical and experimental understanding, expertise and techniques to test physical QRNGs.

Quantum Ambassadors – inspiring the UK's future quantum community of scientists and engineers:
comprehensive scheme of quantum related CPD and classroom-based activities for A-level students and teachers, seeking to increase awareness and understanding of the importance and relevance of quantum technologies to UK society, culture and the economy, and signposting career pathways in the field for science graduates.

Quantum Network Token Schemes:
development of quantum-enabled secure tokens allowing access authentication with no cross-checking delays for use on financial and other networks where time is critical and the light speed signalling bound is significant.

Quantum N.O.D.E (Network Operational Device rEceiver):
investment in new node-based network architecture to dramatically reduce resources required for secure quantum communications networks. Integrated photonics approaches significantly reduce the technology footprint, while enabling scaling, thus alleviating the need for bulky and costly high performing detectors through concentration of resource into a single central location.

Wide Angle Receivers for Long-Distance Free-Space QKD:
precursor technology to satellite QKD, combining quantum key detection and pointing-and-tracking hardware into a single receiver, capable of providing spatial information directly from the quantum signal.

The Hub consortium brings together leading researchers and pioneering industrial partners for the development, testing, demonstration and trialling of products and services for a global market in quantum communications.

We embrace a range of activities to deliver this strategy – from technical development of hardware and software in some of the most advanced labs in communications globally, to nurturing commercial relationships with multi-national corporates and SMEs.

To find out more, please contact the Hub Business Development Manager, Klitos Andrea (klitos.andrea@york.ac.uk)

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