

Quantum Communications Technologies

Professor Tim Spiller

UNIVERSITY *of York*

Director: Quantum Communications Hub



UK NATIONAL
QUANTUM
TECHNOLOGIES
PROGRAMME

Quantum Communications Technologies...

- ...offer secure communications with the security underpinned by the laws of quantum physics.
- Currently the most technologically advanced systems offer Quantum Key Distribution (QKD).
- Quantum keys are consumables (use once only). The distribution and replenishment of the keys is where “quantum” comes in – the use and applications of the keys are conventional.

Quantum Keys

- Quantum keys enable a wide range of secure information tasks: communication or data encryption (e.g. as keys for symmetric crypto AES), financial transactions, entry, passwords, ID/passports...

Current QKD Technology

- Currently available QKD systems are relatively bulky and operate through a fibre link.
- Currently accessible markets are thus somewhat restricted to select, high-value or ultra-high-security transactions.

Quantum Communications Hub

- Our vision is to develop new technologies that will reach **new markets**, enabling **widespread use** and adoption in many scenarios – from government and commercial transactions through to consumers and the home.

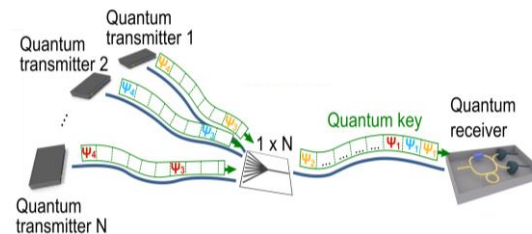
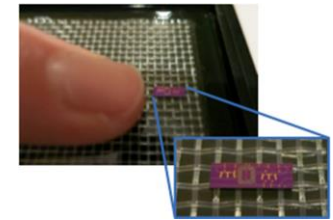
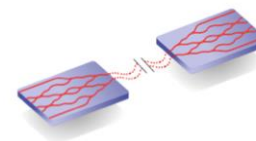
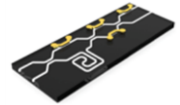
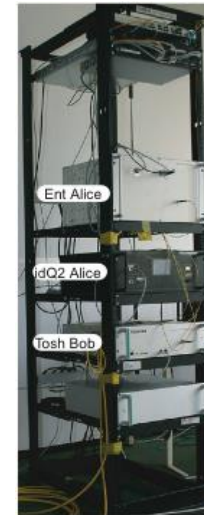
“Consumer QKD”

- Alice in your `phone
- Bob with your bank/
employer/government/
public service/...
- Many Alices, fewer
Bobs
- See [Exhibit 6](#)



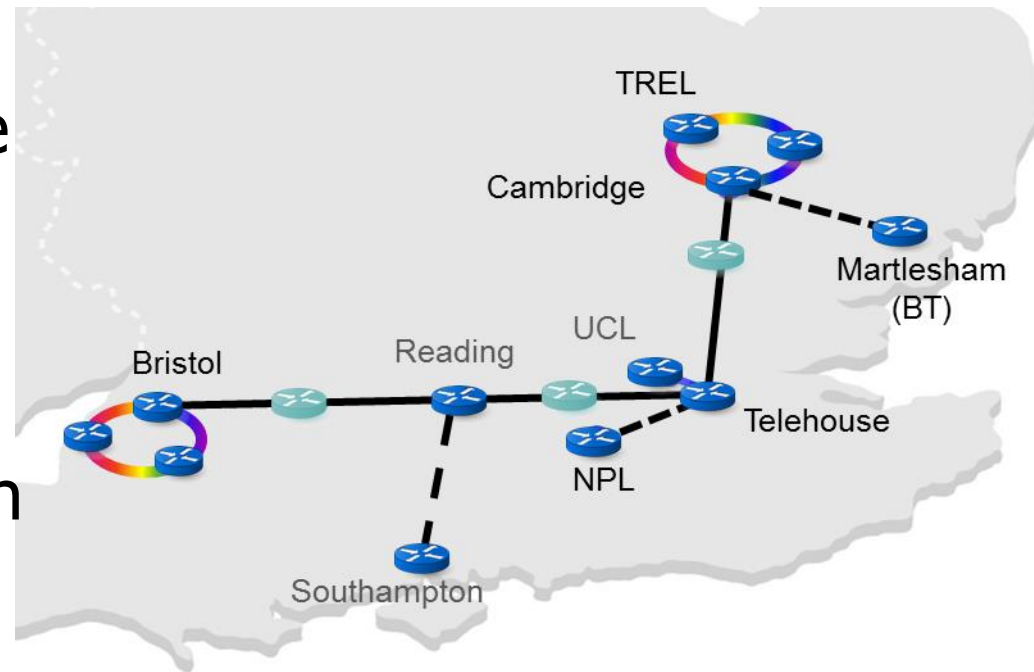
Chip-based QKD modules

- Chip-based modules offer:
- Low cost; compact size, energy efficiency; mass manufacture capability; compatibility with current microelectronics...
- All these features open up wider applications and markets



UK Quantum Network (UKQCN)

- A focus for **development of new applications and standards, user-engagement and market generation**
- A showcase for new quantum technologies
- Metro networks in Bristol and Cambridge
- Access networks for multi-user scenarios
- Recent ADVA, BT and Toshiba demonstration of 200G over 100km
- See **Exhibits 7 and 8**



Quantum Communications Deliverables

- Handheld Alice (credit-card size or `phone compatible) for consumer applications
- Chip-based Alice and then Bob modules
- Establishment and operation of the UK Quantum Network and user- engagement
- “Next-generation” (beyond QKD) technologies demonstrated on the UKQN

• www.quantumcommshub.net/