

PhD Studentship in Quantum Communication Networks: Researching the technology and applications for quantum communications that go beyond simple point to point networks

Fri, 2017-01-13 16:18 - [Georgia Mortzou](#) [1] **At:** Toshiba Research Europe Ltd., Cambridge Science Park

Deadline: 31 August, 2017

Location

Toshiba Research Europe Ltd., Cambridge Science Park Cambridge United Kingdom
52° 12' 19.2132" N, 0° 7' 18.5412" E

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Led by the University of York, the Quantum Communications Hub is a partnership of eight universities and numerous private sector companies <http://www.quantumcommshub.net/> [3]. The overall aim of the Hub is to develop a range of new, secure, quantum communications technologies. A PhD studentship, supported by EPSRC funding through York, is available to work on quantum communication networks, based at Toshiba Research Europe Ltd Laboratories in Cambridge (TREL).

Quantum communication is based on encoding information on single photons transmitted over optical networks. The technique provides a way of distributing secret digital keys that can subsequently be used for encrypting and authenticating data. In previous work we have reported world-best secure bit rates for quantum key distribution (QKD),[1] the first electrically-driven system for quantum teleportation,[2] multi-user quantum networks[3] and demonstrated operation on installed lit optical fibre.[4]

This project will research the technology and applications for quantum communications that go beyond simple point to point networks. It will investigate methods for distributing quantum keys between arbitrary locations in different types of multi-nodal network, as well as develop applications exploiting network based key distribution. Most work to date on quantum communications has focussed on key distribution. Digital signatures are another very important cryptographic primitive used to protect electronic data from forgery. This project will develop GHz quantum communication hardware to implement new protocols for digital signatures, the security of which is based on the laws of nature. These are based upon sharing quantum correlations between three parties: Alice, Bob and Charlie. The quantum correlations can then be used by Alice to sign messages sent to Bob, the authenticity of which can be verified by Charlie and cannot be tampered with.

The technology developed in the project will be implemented in the UK Quantum Network (UKQN) being set up by the Quantum Communications Hub, of which York and TREL are partners. The UKQN comprises metropolitan quantum networks in Cambridge and Bristol that are connected by a backbone quantum link via London.

[1] M Lucamarini et al, Opt. Ex. 21, 24550 (2013).

[2] J Nilsson et al, Nature Photonics 7, 311 (2013).

[3] B Frohlich, Nature 501, 69 (2013).

[4] I Choi et al, Opt. Ex. 22, 23121 (2014).

For more information and instructions on how to apply, please visit [here](#) [4].

- [PhD](#) [5]

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