UK NATIONAL QUANTUM TECHNOLOGIES PROGRAMME

Creating the right social and regulatory context for quantum technologies

The UK is at the forefront of setting new standards for quantum technologies. In 2013 the government recognised the transformative potential of new quantum technologies by announcing a £270 million investment to form the UK National Quantum Technologies Programme (UKNQTP).

The vision is to create a coherent government, industry and academic quantum technology community that gives the UK a world-leading position in the emerging multi-billion-pound new quantum technology markets, and to substantially enhance the value of some of the biggest UK-based industries.

The joint delivery by the project partners is one of the reasons the UKNQTP is ideally positioned to contribute towards creating both the right social and regulatory context for quantum technologies. This flyer aims to demonstrate examples of progress, both towards creating the right regulatory context, and towards the right social context for quantum technologies.

EPSRC Engineering and Physical Sciences Research Council
Innovate UK
KTN the Knowledge Transfer Network
GCHQ
[dstl]
NPL National Physical Laboratory
Department for Business, Energy & Industrial Strategy

Developing standards for an emerging technology

Standards enable the development of components and devices which are interoperable, and help to provide an assurance of quality against objective measures. They provide the commonality and compatibility so sought after in an emerging market, opening up new opportunities for trade with the UK as an integral part of the international supply chain.

The UKNQTP is already making progress in implementing standards for quantum technologies through its involvement with international standards agencies, giving the UK the opportunity to drive the latest developments in quantum technologies.

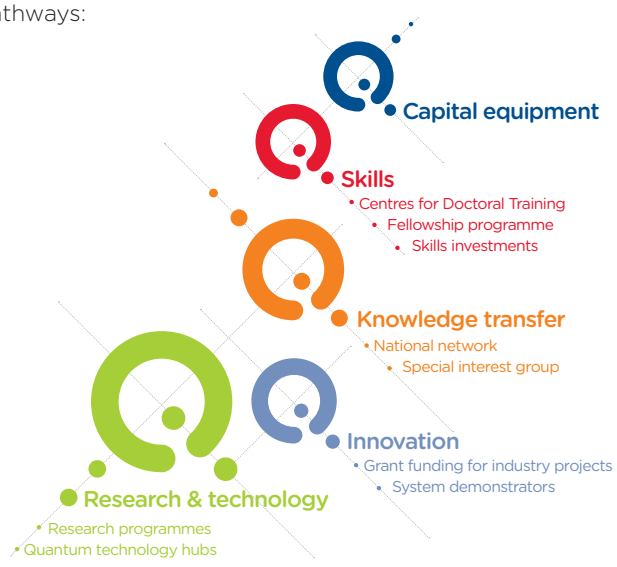
Putting quantum technologies in a social context

Quantum technologies have the potential to improve many aspects of our lives, such as healthcare, where new magnetic sensors will allow us to better monitor brain activity. Not only is the UKNQTP working towards creating the right regulatory context, but it also aims to create the right social context for these technologies; by championing responsible innovation, and by making sure that the potential impacts of quantum technologies are explored in a timely and inclusive way.

Creating the right social and regulatory context for quantum technologies is one of five areas for action identified in the UK's National Strategy for quantum technologies. The other areas are:

- Enabling a strong foundation of capability in the UK.
- Stimulating application and market opportunities.
- Growing a skilled UK workforce in quantum technologies.
- Maximising UK benefit through international engagement.

The programme delivers against the strategy through five pathways:



Find the national strategy on our website: **uknqtp.epsrc.ac.uk**

Making the Invisible Visible

Engaging with the public is important in informing the development of an emerging technology, allowing for the sharing of knowledge and ideas, as well as inspiring the next generation of quantum physicists and engineers.

QuantIC, the UK Quantum Technology Hub in Quantum Enhanced Imaging, have launched the "Making the Invisible Visible" exhibition at the Glasgow Science Centre, which allows the public to interact with the Hub's new technology such as "Light In Flight". It has attracted over 60,000 people since its launch in April 2016.

QuantIC has also run highly successful Quantum Physics workshops for teachers in Scotland and a Quantum Photonics Summer School – a week long residential course for A-level students at the University of Bristol.

International standards for quantum cryptography

Andrew Shields chairs the Industry Specification Group for Quantum Key Distribution (QKD), which is leading the way in developing standards for quantum communications.

The group, which forms part of the European Telecommunications Standards Institute (ETSI), are addressing a number of issues integral to the commercialisation of quantum cryptography, such as interoperability with other equipment used in the network and ensuring that the technology is implemented securely. Speaking of his involvement with ETSI, Andrew explains the benefits of UK involvement with international standards agencies:

"The markets for QKD and most other quantum technologies will be international. It is important therefore that the UK is at the forefront of developing industrial standards to gain maximum benefit for UK citizens and the economy."

Andrew directs Toshiba's Research and Development in Quantum Information Technology, where he leads the Quantum Information Group (QIG). The world-leading team have recently developed a pioneering system for quantum cryptography - a technology which allows us to test the secrecy of communications for the first time (see right).

Based in Toshiba Research Europe Limited's labs on the Cambridge Science Park, the QIG is involved with three of the Quantum Technology Hubs within the UKNQTP; as well as leading on the FQLight Project, co-funded by Innovate UK and EPSRC, which is developing fibre wavelength quantum light sources.

QUANTIC NQIT QUANTUM COMMUNICATIONS HUB

Andrew leads on Quantum Communication Networking within the Quantum Communications Hub, which looks to make quantum communications cheaper, smaller, and faster, in a way that utilises existing infrastructure. This technology will be implemented in a testbed network for quantum communications in the UK.

Cutting-edge research enables secure communication of genome data

TOSHIBA
Leading Innovation

Toshiba's world-leading quantum cryptography system has already undergone several field trials, and has successfully demonstrated that quantum key distribution is compatible with conventional network technologies.

Toshiba's Prototype Quantum Key Distribution System

A recent trial, supported by Innovate UK, tested the cryptography system in conjunction with ADVA Optical Networking's encryption equipment over lit fibre between Adastral Park, BT's technology research campus in Suffolk, and another BT site in Ipswich. The signals were then measured and evaluated by the Quantum Detection Group at NPL.

This was the first time QKD has been successfully demonstrated over lit fibre carrying high bandwidth data channels, signalling a leap in progress for quantum cryptography, and making high-speed quantum-secured communications a real prospect in the near future. Since then, Toshiba have set up a secure service to encrypt Genome data transmitted between their Life Science Analysis Center in Sendai, Japan and Tohoku University Medical Megabank Organisation.