

Spotlight on the Hub's Industry Collaborations: the case of NPL

The National Metrology Institute

The [National Physical Laboratory \(NPL\)](#) is the UK's national metrology institute with responsibility for developing and maintaining the national primary measurement standards.



NPL is also home to the [Quantum Metrology Institute \(QMI\)](#), which is funded by the Department for Business Energy and Industrial Strategy (BEIS) as part of the UK National Quantum Technologies Programme (UKNQTP). The QMI brings together all of NPL's leading-edge quantum science and quantum metrology research to provide expertise and facilities for the UK's industry and academia to test and validate new quantum technologies, ahead of commercialisation.

The partnership with the Hub

NPL has been a major delivery partner of the Hub's work since the original phase of the National Programme. A number of Hub researchers and PhD students have been seconded to NPL at Teddington. They work closely with NPL metrology experts to develop and implement methods for characterising quantum communications hardware, addressing laboratory prototypes including chip-scale devices, as well as systems deployed on the UKQNetel network. Establishing a link to the Hub-created UK Quantum Communication Network is planned; this will enable real-time testing of QKD systems on the network.

NPL is a member of the ETSI Industry Specification Group (ISG) for QKD, members of which sit on the Hub's external advisory board. Test standards developed by this group will be used to verify and validate system performance, thus providing a mechanism for QKD to become trusted in the marketplace, deployed by service providers and used with confidence. The work with the Hub has contributed to the expertise that NPL has been able to bring to its ETSI activities, two examples of which include the Group Specification on [Quantum Key Distribution component characterization](#) and the [ETSI White Paper on implementation security of quantum cryptography](#).

Beyond testing hardware on the UK Quantum Network and work on standards, a major new area of collaboration between NPL and the Hub in the current, second phase of the programme, relates to the study of Quantum Random Number Generators (QRNGs). This builds on the foundations established by a Hub Partnership Resource funded feasibility study during Phase 1; that study also led to a current major ISCF project on Assurance/Certification of QRNGs, co-ordinated by NPL and involving Hub academic (Universities of Kent and York) and industrial (CryptaLabs, IDQ, KETS, Nu Quantum, Toshiba, etc.) partners, and the National Cyber Security Centre who participate in an advisory role.



"The collaboration between NPL and the Quantum Communications Hub is an important part of the National Programme. We are very appreciative of the resources which the hub has placed alongside NPL scientists and are very pleased to offer an additional environment for research and training. The wider collaboration between our two organisations and the quantum community will undoubtedly grow in importance and value to the UK over time."

Rhys Lewis, Head of the NPL Quantum Metrology Institute

Looking ahead

In parallel to its work with the Hub, NPL lends its expertise to many large-scale quantum networking projects within the UK and abroad, such as:

- [AQaSec](#), which aims to develop new quantum resistant algorithms.
- [AIRQKD](#), which aims to trial quantum secured communication over free space.
- [3QN](#), which is focused on developing free space quantum communications at extra terrestrial scales using satellites.
- [OpenQKD](#), which aims to create and test a prototype pan European quantum network infrastructure.
- [MeTISQ](#), which aims to develop SI-traceable measurements for quantum key distribution (QKD) systems and technologies to support the standards development work of ETSI.
- [Three major collaborative projects](#) funded through the UKNQTP's Quantum Technologies for Fundamental Physics programme: 'QSNET', 'Quantum Sensors for the Hidden Sector' and 'Determination of Absolute Neutrino Mass using Quantum Technologies'.

NPL is also a partner in the [European Metrology Network for Quantum Technologies \(EMN-Q\)](#) which aims to actively co-ordinate European measurement science research to maintain European competitiveness in the field of quantum technologies.

Recently, NPL launched the '[Measurement for Quantum](#)' programme which aids the development of quantum products and services in the UK by offering quantum measurement advice and short-term measurement projects to companies at no charge. Through this programme, NPL aims to bridge the gap between prototypes and market-ready products and thus facilitate more products going to market, more quickly, within the UK.

NPL is delivering a major programme in support of the National Quantum Technologies Programme and plans to continue with this work for the future with the metrology of quantum communications systems always remaining a key part of the programme. The capabilities being developed by NPL will support the long-term UK needs for secure communications, maintaining close collaboration with industry, academia and other parts of government. NPL wishes to build stronger collaborations with organisations around the UK, aiming to deliver capability to end users in partnership with others in the quantum community.



"Future worldwide quantum communications will necessarily involve QKD in space. The Hub is therefore expanding and developing its R&D in this sector. We very much value the collaboration with Craft Prospect, as the UK takes the next steps to establish and operate quantum communications in space."

Professor Tim Spiller, Director of the Quantum Communications Hub

To view the full text of this case study please visit: quantumcommshub.net

