

Addressing barriers to commercialisation – identifying quantum standards priorities for the UK

A Quantum Standards Network—Pilot event,
organised by the National Physical Laboratory



National Physical Laboratory (NPL)

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Workshop report, 17 October 2024, Royal Society

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Introduction

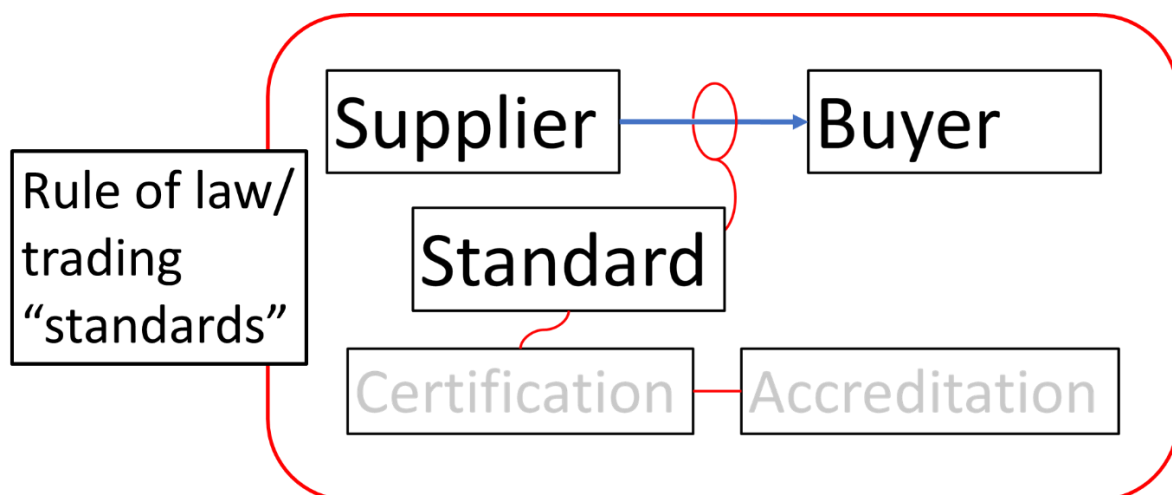
This workshop was run in tandem with an NPL-organised workshop on quantum industry needs in support infrastructure, for which a separate report will be drafted. This workshop had the objective of prioritising standards needs for the UK quantum industry: valuable information for the resourcing of the UK Quantum Programme and the Quantum Standards Network—Pilot in particular.

Tom Newby, Head of the Office for Quantum, set the context for the task in hand, and John Devaney, Quantum Standards Manager at NPL set the questions for discussion.

Approximately 40 people from the UK quantum community discussed the issues they saw with sales of quantum products and services and with the supply chains they rely upon. Standards are often helpful in reducing and removing barriers to sales and supply.

The wider context

Understandably, much of the conversation was not about standards specifically, but about issues that would not be solved by the development of standards or about the larger ecosystem in which standards play a part.



Transactions that could be supported by a relevant standard, the standard itself and any possible assurance (certification, etc) exists within the framework of regulation and government policy.

Navigating this ecosystem is difficult enough for large, well-established organisations but quantum is mainly populated by small-to-medium-sized start-ups, with limited resources and limited experience. Suggestions for support mechanisms that were shared during the workshop included:

- guidance on relevant regulations and how to comply,
- guidance on existing, relevant standards such as quality management, information security and electromagnetic compatibility,
- guidance on sector-specific regulations and standards, such as medical devices, finance, telecoms,
- case studies on how new products are brought to market,
- educational resources on quantum technology (its benefits and limitations) and relevant standards,
- consultation services on finding and applying relevant standards (“S4Q”),
- training on how to get involved and develop the standards that meet start-ups’ needs, and
- advice on how government can support and drive development, such as being a customer or investor.

These are all ideas that could be considered by the Quantum Standards Network and its partner-members; some are already draft deliverables for the Network.

The workshop report: “An Internal NPL Report About Coordination of the UK Quantum Technology Sector” also gives constructive suggestions about how many of the above needs could be met. The report will be available from the NPL website.

Standards proposals

The following categories are approximately those used in the European committee on quantum technology, CEN/CENELEC/JTC 22 and the global committee IEC/ISO/JTC 3. Where standards have already been identified as a priority by the Network and work is underway, they are labelled as “EXISTING”. Where standards have already been identified as a priority by the Network work has not started yet, they are labelled as “IDENTIFIED”. Where standards were proposed by the workshop, they are labelled as “NEW”.

Vocabulary and quantities

EXISTING	Metrology – fundamental metrics and test methods
NEW	Laser linewidths and photonic integrated circuit design
NEW	Definition of a quantum sensor

Quantum enabling technology

EXISTING	Metrology – fundamental metrics and test methods
IDENTIFIED	Quantum materials standards
NEW	Laser linewidths and photonic integrated circuit design
NEW	Common standards for components, packaging and testing, including smaller/slenderised options
NEW	Characterisation of non-linear crystals, eg purity
NEW	Characterisation of advanced materials, fabrication
NEW	Interoperability/interchangeability of components
NEW	Optically pumped magnetometers (OPMs), pump laser characterisation

Quantum communications

EXISTING	QKD security assurance
NEW	QKD-PQC compatibility

Quantum computing

EXISTING	Benchmarking metrics for computing, including performance (application)
EXISTING	Standards on responsible development of quantum computers
NEW	Qubit validation
NEW	Data centre/remote access standards

Quantum sensing and imaging

EXISTING	Standards on responsible use of sensing/imaging technology
IDENTIFIED	Benchmarking of sensors to establish sensitivity thresholds, quality assurance, etc
IDENTIFIED	Interoperability and compatibility standards in sensing/metrology technology
NEW	Definition of a quantum sensor
NEW	Optically pumped magnetometers (OPMs), performance
NEW	Optically pumped magnetometers (OPMs), pump laser characterisation

Quantum related

EXISTING	Standards for PQC algorithms
NEW	Standards specific to defence applications
NEW	Standards (not just algorithms?) for post-quantum cryptography

Next steps

The workshop raised some excellent ideas for new standards for quantum technology. Some are likely to be addressed in anticipated proposals to JTC 22 or JTC 3 from other countries. Some require elaboration and evaluation. Then there some that will be supported by the Quantum Standards Network and developed into proposals on behalf of the UK.

Individuals responsible for proposals that the Network agrees should be developed further will be contacted to check that their proposals have been understood and to see if those individuals can and wish to be involved in standards development.

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