EMPIR Call 2018 – Networks

Selected Network Topic number: **SNT-w04**
Version: 1.0

Title: Support for a European Metrology Network on quantum technologies

Abstract

EURAMET intends to establish a collaborative network for quantum technologies which will co-ordinate and promote the development and application of metrology for quantum photonics technologies, quantum electronics and quantum clocks, for quantum-enhanced measurements, quantum communication, imaging, simulation, and sensing in Europe. The Network will provide a focus for addressing future requirements of these technologies, e.g. those emerging from the European Quantum Flagship. The network will collaborate in the preparation of international guidelines and standards and will work as a de-localised research department. The Network website will be the unique European contact point for stakeholders interested in Metrology for quantum technologies.

This SNT is intended to support that EMN in their initial tasks.

Keywords

Quantum Sensing & Metrology, Quantum Communication, Quantum Simulation, Quantum Technologies, Quantum Enhanced Measurements, Standardisation

Background

Quantum technologies will be one of the major challenges, but also a major future opportunity, for European industry with respect to innovation and high technology. This can be seen from the currently starting European 1 billion € “Quantum-Flagship” programme triggered by the “Quantum Manifesto” [1] and the related European and national programmes and projects, see e.g. the German “QUTEGA” initiative, the UK Quantum Technologies programme (the Quantum-Hub), Quant-ERA and the expected follow-on programmes. For the national metrology institutes (NMIs) this means that large demands from industry, standardisation bodies and governments are expected, which requires a co-ordinated action, because single NMIs will not be able to respond adequately to the challenges. The EMN will react to the upcoming requirements by active coordination of the European NMI research activities, by aligning them with the objectives of the EC Quantum Technologies Flagship and with the industrial requirements, by contributing to standardisation and certification of quantum technologies, and by developing a strategic research agenda for the next decades. It will also be proactive in promoting take-up of metrology in the development of these technologies, and provide linkage with other technical areas.

The alignment of the work of the EMN with the objectives of the EC Quantum Technologies Flagship, and national and intergovernmental programmes, is necessary to ensure the consideration of the metrological aspects, which will play a significant role in the transition of quantum technology research into quantum technology applications. The network will focus on the pillars of the flagship, i.e. quantum sensing & metrology, quantum communication and quantum simulation.

Alignment of European NMI activities with industrial requirements is also required, because quantum devices have started to have impact in industry, and several large companies have started to develop quantum devices or started to integrate them in their products. It will be important for industry to have a unique contact/reference point for their quantum-technology-related metrological and technological requirements.

The contribution of the network to standardisation and certification of quantum technologies is essential to ensure the quality of products and European / worldwide acceptance of European products. Especially at the beginning of the development of new technologies and products, standardisation is one of the key elements for the commercial success of any new technology. The development of globally-accepted standards and an anticipatory approach would facilitate the growth of the quantum-technology market worldwide.

EURAMET MSU, Hampton Road, Teddington, Middlesex, TW11 0LW, UK
Phone: +44 20 8943 6666 Email: msu@npl.co.uk
msu.euramet.org

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A strategic research agenda for the metrology needs in quantum technologies, addressing the requirements described within this section, is required to help formulate and coordinate the activities required of the European NMIs in an efficient manner.

How and where NMIs should focus limited resources in this area to obtain maximum impact for society, urgently requires a strategic plan and significant coordination at European level. No single NMI has the expertise or resource to tackle all or even a significant fraction of the most critical priorities without collaboration. Without coordination, there is a strong likelihood of unnecessary duplication, with NMIs (nationally and/or regionally) potentially independently choosing to focus efforts on the same challenge with consequential neglect of others. EURAMET intends to establish a European Metrology Network to coordinate the European NMI response, to establish close links to the stakeholder community, to develop and implement a strategic agenda and establish a knowledge, technology transfer and promotion plan, to ensure an effective response is put in place. This SNT is intended to support that network in their initial tasks.

Objectives

Proposers should address the objectives stated below, which are based on the PNT submissions. Proposers may identify amendments to the objectives or choose to address a subset of them in order to maximise the overall impact, or address budgetary or scientific / technical / legal / regulatory / market constraints, but the reasons for this should be clearly stated in the protocol.

The JNP shall focus on developing a long term ongoing dialogue between the metrology community and relevant stakeholders. This dialogue should support the take-up of research outputs from the metrology community and the collection of needs from industry to inform future research.

The specific objectives are

1. To develop a plan for a joint sustainable European metrology infrastructure for quantum technologies by stimulating smart specialisation of European NMI facilities and services, ensuring an efficient use of the funds available at the National and European level and avoiding unnecessary duplication between present and future EMN members.
2. To develop processes to align the activities of the EMN with the objectives and funded projects of the EC Quantum Technologies Flagship, in order to contribute to the success of these novel technologies.
3. To develop processed to align the EMN activities with relevant industrial requirements, by knowledge transfer and a portfolio of dedicated services. This should include the establishment of an Advisory Board composed mainly of representatives of European Industries
4. To develop processes to liaise with relevant standards organisations to ensure the activities of the EMN can provide major contributions to the standardisation and certification of quantum technologies.
5. To develop a short, middle and long term strategic research agenda for the EMN. These should exploit the current capabilities and future needs of the members of the EMN and by focussing on the industrial and standardisation metrological needs identified by the Advisory Board.

The proposed activities shall be justified by clear reference to the measurement needs within strategic documents published by the relevant stakeholders. Proposers should establish the current state of the coordination in this area, and explain how their proposed project goes beyond this.

The proposed activities should not include those essential for the establishment and operation of the EMN. EMNs will be established and operated by the EURAMET members using their own national resources regardless of whether specific EMPIR proposals are funded. EMPIR funding is for specific tasks aimed at ensuring a planned EMN will progress quickly towards contributing to the objectives of the programme.

EURAMET expects the average EU Contribution for the selected JNPs in this TP to be 0.4 M€, and has defined an upper limit of 0.5 M€ for this project.

Potential Impact

Proposals must demonstrate adequate and appropriate participation/links to the “end user” community, describing how the project partners and collaborators will engage with relevant communities during the project

to facilitate knowledge transfer and accelerate the sustainability of the organisation. Evidence of support from the "end user" community (e.g. letters of support) is also encouraged.

You should detail how your JNP results are going to:

- Address the SNT objectives and deliver solutions to the documented needs,
- Provide a lasting improvement to coordination in the European metrological community and communication with their stakeholders beyond the lifetime of the project,

You should detail other impacts of your proposed JNP.

You should also detail how your approach to realising the objectives will further the aim of EMPIR to develop a coherent approach at the European level in the field of metrology and include the best available contributions from across the metrology community. Specifically, the opportunities for:

- improvement of the efficiency of use of available resources to better meet metrological needs and to assure the traceability of national standards
- the metrology capacity of EURAMET Member States whose metrology programmes are at an early stage of development to be increased

Time-scale

The project should be of up to 5 years duration.

Additional information

The references were provided by PNT submitters; proposers should therefore establish the relevance of any references.

[1] https://ec.europa.eu/digital-single-market/en/news/european-commission-will-launch-eu1-billion-quantum-technologies-flagship