EMN-Q European Metrology Network for Quantum Technologies

Ivo Pietro DEGIOVANNI

EMN-Q Chair & INRIM

Outline

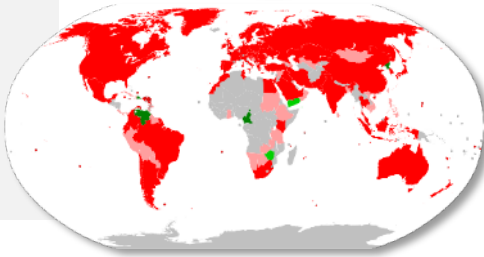
- Intro “International Metrology and EURAMET”
- EMN for Quantum Technologies (EMN-Q)
- EMN-Q and the Q-Flagship
- Strategic Research Agenda and Q-Standardisation

International Metrology and EURAMET

National Metrology Institutes (NMIs)

- **… develop and maintain metrology infrastructure worldwide** in response to the needs from science, industry and society. Their core mission includes
  - cutting-edge measurement research, and
  - sustainable capabilities for measurement, calibration, testing and conformity assessment.

- … harmonise and quality-assure their capabilities under the **Metre Convention:**
  International treaty, established in 1875 to ensure measurement conformity between countries (initially 17, now more than 60).



Source: Wikipedia, von Getsnoopy BlankMap-World.svg, CC BY-SA 4.0
https://commons.wikimedia.org/w/index.php?curid=83121097

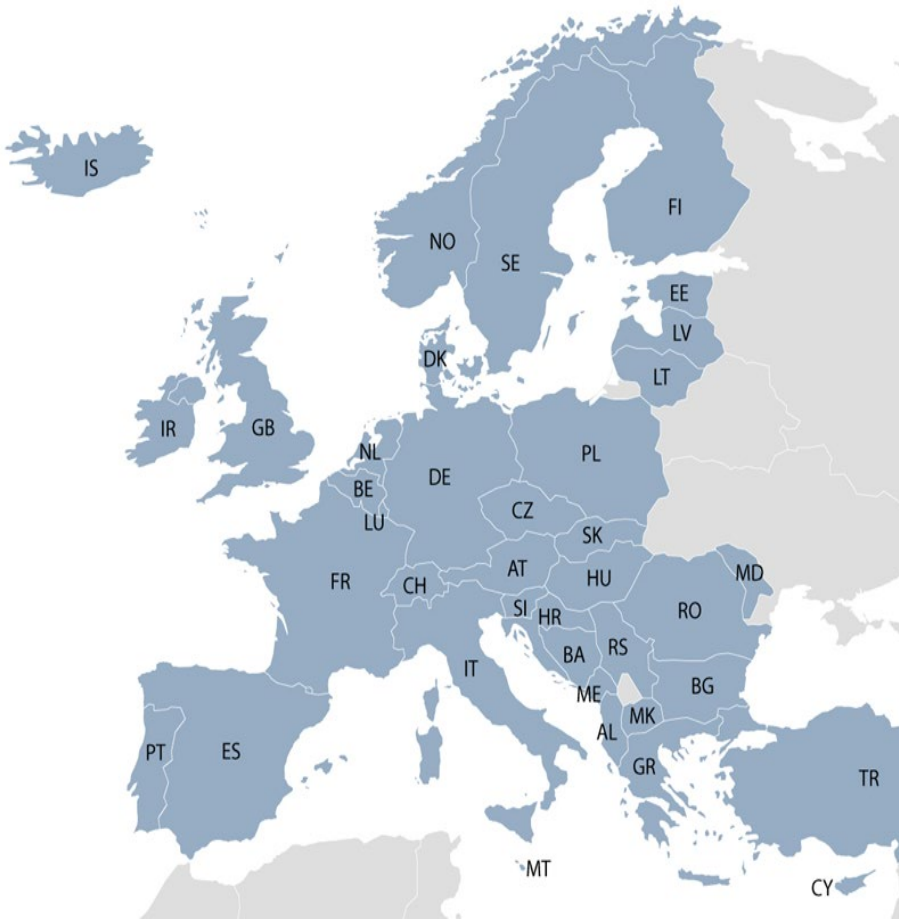
International Metrology and EURAMET

QUANTUM TECHNOLOGIES

EURAMET

EURAMET, the Regional Metrology Organisation (RMO) of Europe

- **38 National Metrology Institutes** (Members)
- **77 Designated Institutes** (Associates)
- **16 international Liaison Organisations** (e.g. IAEA, BIPM, WMO, EA, Eurachem, Eurolab)
- Providing stakeholders with **world-leading measurement solutions and standards**
- Securing **world-wide trust** and **acceptance** of measurements, for all aspects of business and society
- Implementing **Metrology Research Programmes**



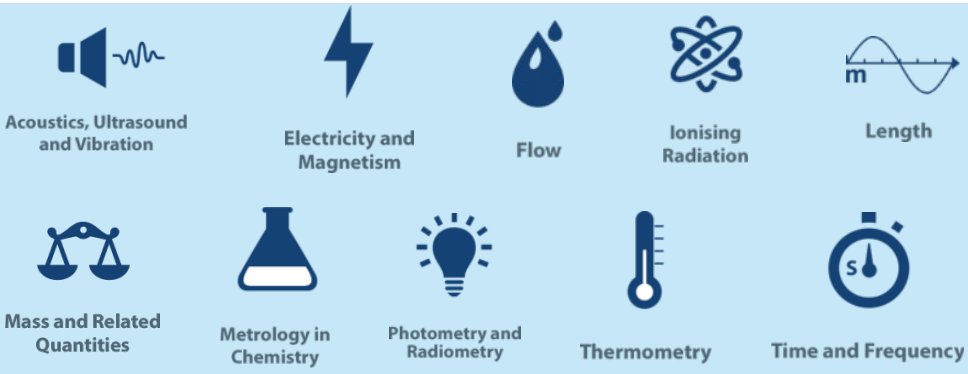
International Metrology and EURAMET

QUANTUM TECHNOLOGIES

EURAMET

EURAMET, the Regional Metrology Organisation (RMO) of Europe

- Technical/scientific collaboration in EURAMET is organised within **ten Technical Committees.**



- In addition, **two Committees deal with 'horizontal' topics**.

As new structural backbones, EURAMET recently establishes

European Metrology Networks (EMNs)

- to strengthen stakeholder interaction and to work towards a sustainable, coordinated European metrology landscape.
- Strong emphasis on interactions with stakeholders!
- 15 EMNs are already existing or proposed.

EMN for Quantum Technologies: EMN-Q

EMN-Q Strategic Agenda (22 Oct. 2020)

Rationale

- **To align with industrial requirements, those of the EC Quantum Technologies Flagship,** national and inter-governmental quantum technology (QT) programmes, and of any **relevant stakeholders;**
- **to contribute to QT developments** through NMI's and DI's research and innovation activities;
- **to give input into the standardisation & certification** of QT;
- **to promote of the benefits of metrology** to the stakeholders.

Vision

EMN-Q aims at being the recognised European unique reference point representing European metrology for Quantum Technologies.

Today, EMN-Q has **18 EURAMET Members and Partners** from 15 countries.

EMN-Q Standardisation Activities
Participation in Organisations

- **ETSI:** 'Industry Specification Group **on Quantum Key Distribution**'
- **CEN-CENELEC:**
  Focus Group on Quantum Technologies (FGQT), initiated by Flagship / JRC
- **ISO/IEC:**
  JTC1 '**Information Technology**':
    WG14 'Quantum Computing'
    SC 27/WG2 'Cryptography and security mechanisms'
    SC 27/WG3 'Security evaluation, testing and specification'
    SC 7'Software and systems engineering'/ Study Group 'Investigation of standards for quantum computing'
  TC 90 '**Superconductivity**':
    WG14 'Superconductor electronic devices'
- **IEEE:** Several standard-developing WGs
- **IMEKO:** TC25 'Quantum measurement and information'
- **QuIC:** 'Working Group on Standardisation' (WG4)

EURAMET Metrology Programme

EURAMET, the Regional Metrology Organisation (RMO) of Europe

… implemented and executed **comprehensive EU-co-funded metrology research programmes**, designed to encourage collaboration between European NMIs and **external** partners in industry and academia:

EMRP	(2009-2017)
EMPIR	(2014-2023)

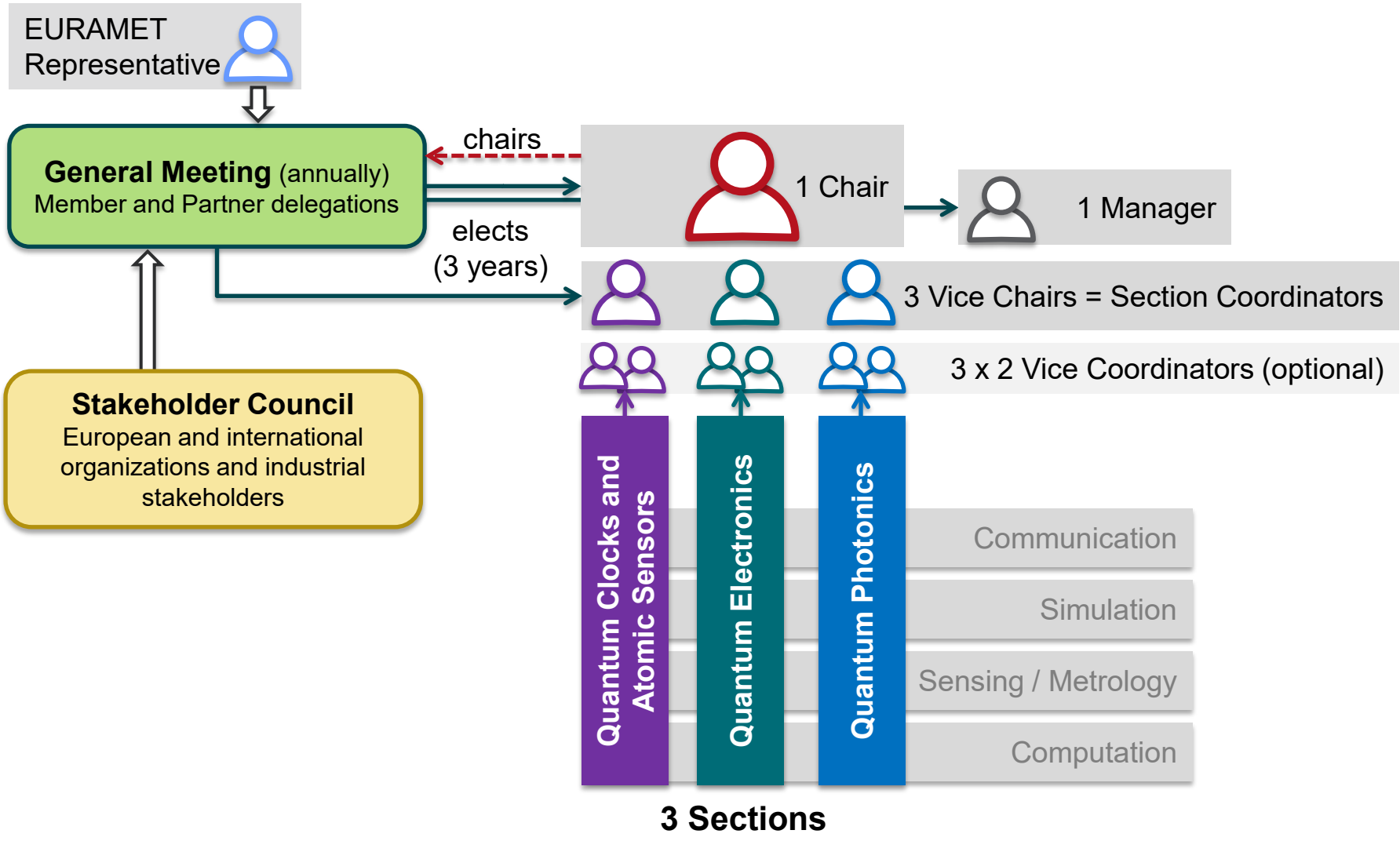
> 800 million € of EU funding for research in metrology!

~ 60 projects on Quantum Technologies via EMRP and EMPIR

Next: "European Partnership on Metrology" EMP (2021-2030)

- Aligned to other EU funding schemes such as for quantum technologies
- Projects gathering EU NMIs and external partners (with ~30% budget)
- Pre-normative calls allow for **standardisation projects to meet the needs of Flagship projects and QuIC members.**

EMN-Q Structure and Organisation



EMN-Q Structure and Organisation

Ivo P. Degiovanni
(INRIM)

Marco Gramegna
(INRIM)

EURAMET Representative

General Meeting (annually)
Member and Partner delegations

chairs

elects (3 years)

1 Chair

1 Manager

3 Vice Chairs = Section Coordinators

3 x 2 Vice Coordinators (optional)

Stakeholder Council
European and international organizations and industrial stakeholders

Quantum Clocks and Atomic Sensors

Quantum Electronics

Quantum Photonics

Communication

Simulation

Sensing / Metrology

Computation

3 Sections

EMN-Q Structure and Organisation

EURAMET Representative

General Meeting (ar
Member and Partner dele

Sébastien Bize (LNE-SYRTE)

Hansjörg Scherer (PTB)

Chris. Chunnilall (NPL)

er

(3 years)

3 Vice Chairs = Section Coordinators

3 x 2 Vice Coordinators (optional)

Stakeholder Council
European and international organizations and industrial stakeholders

Quantum Clocks and Atomic Sensors

Quantum Electronics

Quantum Photonics

Communication

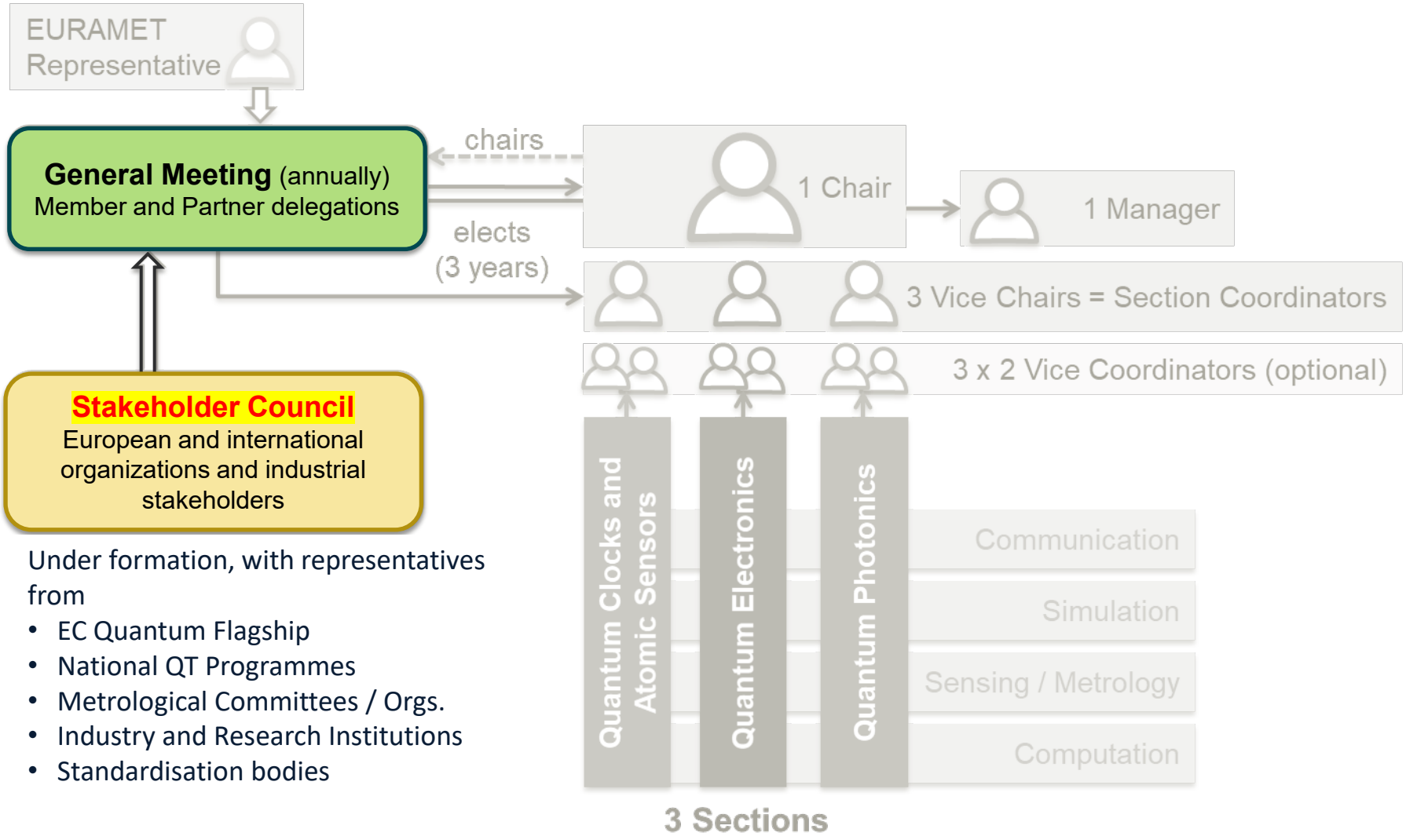
Simulation

Sensing / Metrology

Computation

3 Sections

EMN-Q Structure and Organisation

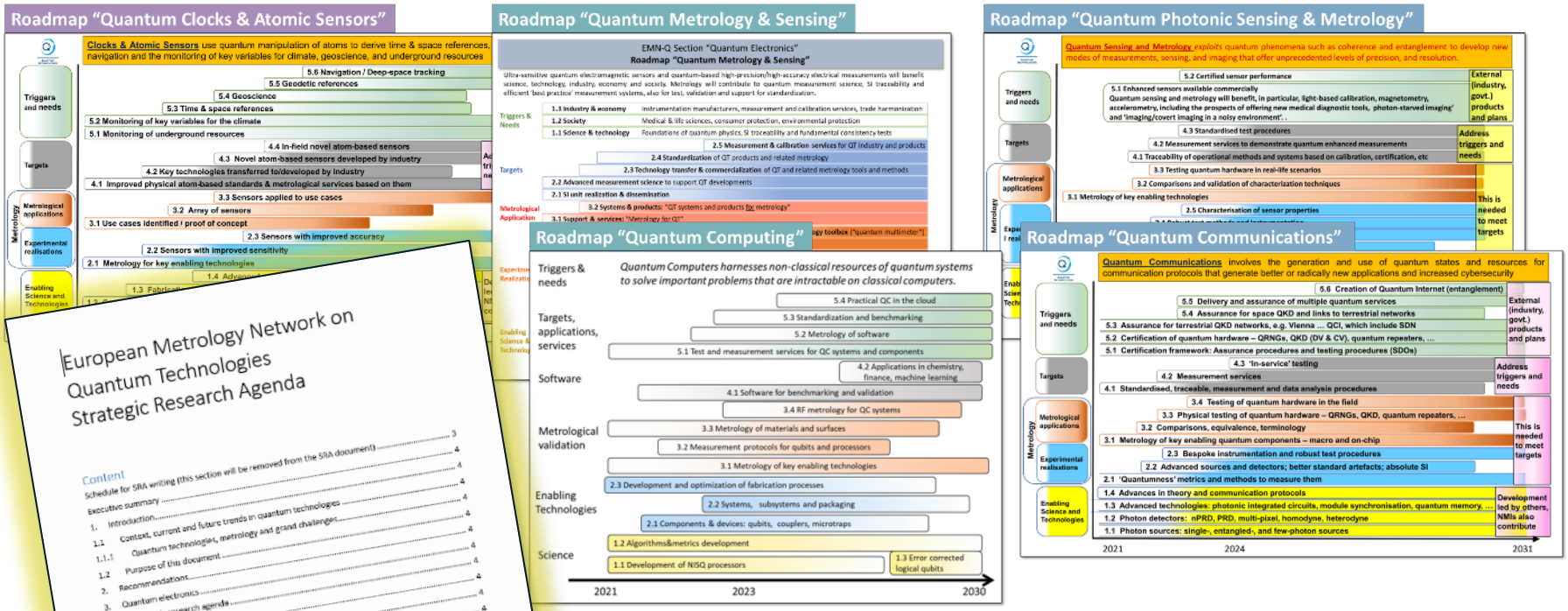


Under formation, with representatives from

- EC Quantum Flagship
- National QT Programmes
- Metrological Committees / Orgs.
- Industry and Research Institutions
- Standardisation bodies

EMN-Q Roadmaps

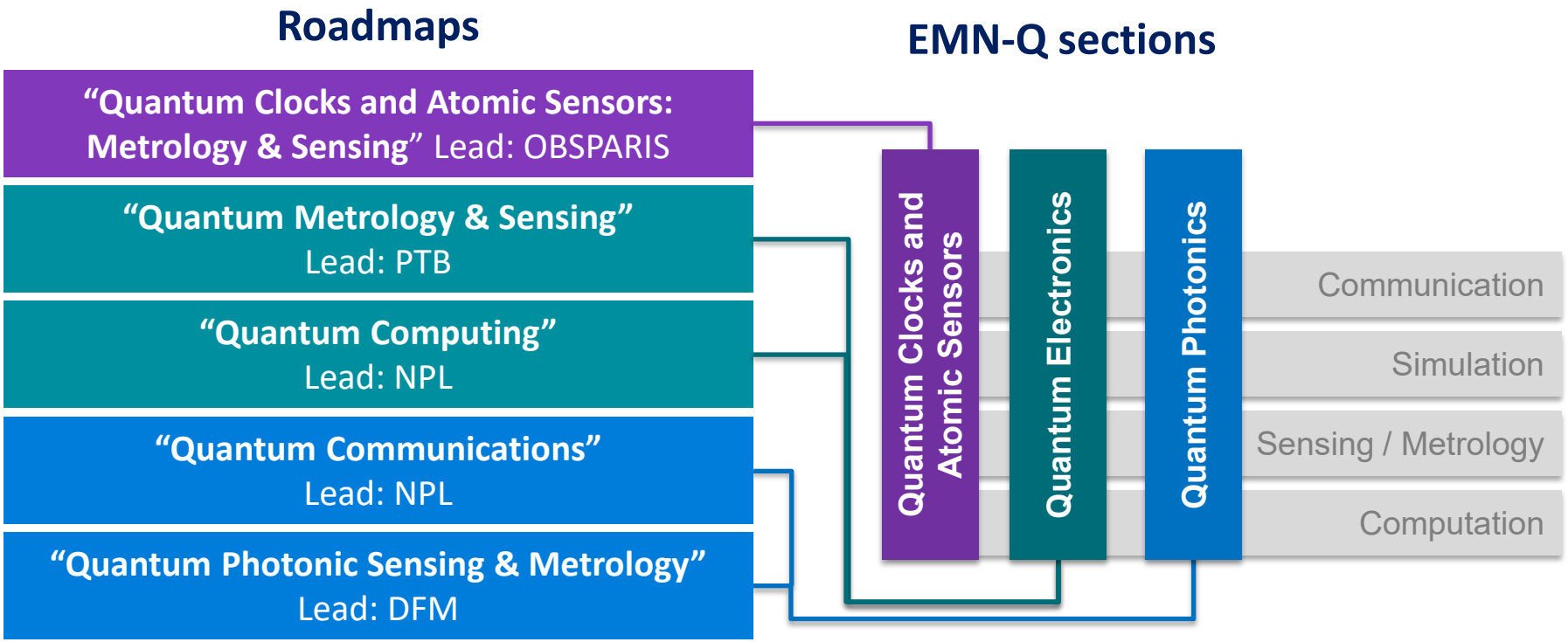
Towards a Strategic Research Agenda



- A Strategic Research Agenda (SRA) for EMN-Q, based on the roadmaps, will be published soon!
- Stakeholder consultation on the SRA is planned to start soon.

EMN-Q Roadmaps

- EMN-Q has drafted 5 strategical roadmaps in the 3 sections, related to the Quantum Flagship pillars.
- Roadmap drafts were circulated among the EMN-Q community and EURAMET TCs, and feedback was collected.



EMN-Q & Q-Flagship

EMN-Q Capabilities and Services Portfolio

EMN-Q C&Ss Portfolio provides a coherent view of the full spread of metrological facilities and capabilities of the EMN-Q members.
EMN-Q coordinates the action of the members in

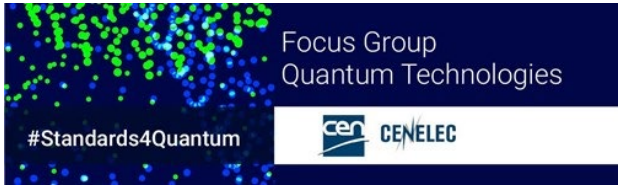
- EURAMET research programme
- European Quantum Infrastructures calls in DEP
- European Framework Partnership Agreements calls (Quantum-related) in Horizon Europe
- Quantum Flagship calls in Horizon Europe
- National Programs and infrastructures (e.g. UK Q-Hubs, PTB QTZ, INRIM Italian Quantum Backbone, LNE in FR National Quantum Strategy …)

EMN-Q & Q-Flagship

- EMN-Q (Chair) is Member of the “Q-Flag SRA working group” (Sensing and Metrology Team)

- EMN-Q has created a link with QUIC

- EMN-Q participates in FGQT CEN-CENELEC



- EMN-Q is active in the Q-Flagship networking

EMN-Q @ FPA

Qu-Test

Framework Partnership Agreement for open testing and experimentation for quantum technologies

Call: *HORIZON-CL4-2021-DIGITAL-EMERGING-02-22*
Topic: *Framework Partnership Agreements for open testing and experimentation and for pilot production capabilities for quantum technologies (FPA)*
Type of action: *Framework Partnership Agreement*
Duration of the project: *48 months*

Coordinating person details:

Name	
Organisation	Nederlandse Organisatie voor Toegepast-natuurwetenschappelijk onderzoek
Email	
Phone	

TNO

QUANTUM TECHNOLOGIES

Thanks for your attention!

QUANTUM
TECHNOLOGIES