




## Focus on #SIredefinition

### Latest News

 **At the beginning of January, EURAMET will launch the 2019 EMPIR call.**

In 2019, EMPIR will implement the following themes via a two stage process; energy, environment, normative research, research potential and support for networks. Stage 1, opening on the 9 January, offers stakeholders from any country the opportunity to influence the projects undertaken by the European community by identifying potential research topics. The highest priority topics received at Stage 1 will provide the basis for Stage 2 which will open in June. In July, a call for support for impact projects designed to increase impact of completed projects will be launched.

For more information visit <https://msu.euramet.org>

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## A YEAR FULL OF MILESTONES: FROM THE SI REDEFINITION TO EUROPEAN METROLOGY NETWORKS, EURAMET CHAIRPERSON HANS ARNE FRØYSTEIN REVIEWS 2018



## EVENTS

**TC-EM Workshop on the EMPIR 2019 Call**  
9 - 10 January 2019 - Berlin, Germany

**TC-Ionising Radiation Annual Meeting 2019**  
29 - 31 January 2019 - Ljubljana, Slovenia

**TC-Photometry and Radiometry Annual Meeting 2019**  
30 - 31 January 2019 - Caparica, Portugal

**TC-Metrology in Chemistry Annual Meeting 2019**  
4 - 7 February 2019 - Brno, Czech Republic

**EURAMET Training Course on Conformity Assessment of Non-Automatic Weighing Instruments (NAWI)**  
18 - 21 February 2019 - Sarajevo, Bosnia and Herzegovin

2018 has been a year full of positive developments and challenges and we are looking forward to continuing these developments in 2019:

Traditionally, the year will start with an EMPIR call – the themes for 2019 are environment, energy, normative, support for impact, networks and research potential. EURAMET is also continuing its efforts to establish a new metrology programme under the next framework programme, Horizon Europe, from 2021 to 2027.

Among other events, you should all save the date for the International Metrology Congress, CIM, which will be on 24 to 26 September 2019 in Paris, France. This is one of the major conferences where the measurement science community can meet stakeholders from industry (see page 10).

We hope you enjoy reading issue 14 of our newsletter and we wish you all the best for the festive season and beyond.

In November, I was at the General Conference on Weights and Measures in France witnessing a historic moment: The international community voting to redefine the International System of Units (SI). This decision changed the definition of the kilogram, the ampere, the kelvin and the mole, and means that all the SI units will be defined in terms of natural constants. This will ensure the future stability of the SI and open up opportunities for the use of new technologies.

The EURAMET community should be very proud that several joint research projects within our European Metrology Research Programmes (EMRP and EMPIR) have contributed to this measurement revolution (see page 3).

Media coverage of the event was enormous and brought a lot of attention to the metrology community as a whole. This is something we want to build on.

This historic moment was not the only highlight in 2018. The year has been marked by plenty of other noteworthy events.

In May, the General Assembly (GA) approved the first 6 European Metrology Networks on topics including Mathematics and Statistics, Laboratory Medicine, Quantum Technologies, Smart Energy Grids, Energy Gases, and Climate and Ocean Observation.

The new concept of EMNs aims to work more closely with our stakeholders on those topics, to improve the coordination among our members and create sustainable structures for future collaboration (read more on page 12).

At the GA, achievements over the last year and proposals to improve collaboration amongst Europe's measurement community were discussed. Elections also took place, and we congratulate one new and two re-elected members of the Board of Directors and one re-elected and three new Technical Committee Chairs (see pages 16 and 17). On behalf of EURAMET, I would like to express our gratitude to their predecessors: Hugo Vos (BoD), Graham Machin, Robert Edelmaier and Enver Sadikoglu (all TC Chairs).

I am also happy to congratulate Erkki Ikonen who was re-elected as EURAMET Vice-Chairperson (EMPIR) for a second term until 2021.

For me, the GA brought new responsibilities: I have taken over the position as EURAMET's Chairperson from my predecessor Beat Jeckelmann. I would like to thank Beat for his excellent leadership and fantastic commitment (see page 15), and I am really looking forward to working with all the highly engaged people in the EURAMET community.



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# Impact & Innovation

**INTERNATIONAL SYSTEM OF UNITS OVERHAULED IN HISTORIC VOTE**  
MAJOR SCIENTIFIC CONTRIBUTION FROM EUROPEAN METROLOGY RESEARCH PROGRAMME



## #SIredefinition

*Constant evolution of the International System of Units*

In a landmark decision on 16 November, representatives from 60 countries voted to redefine the International System of Units (SI), changing the world's definition of the kilogram, the ampere, the kelvin and the mole, forever. The decision, made at the General Conference on Weights and Measures (CGPM) in Versailles, France, which is organised by the International Bureau of Weights and Measures, means that all SI units will now be defined in terms of constants that describe the natural world. This will assure the future stability of the SI and open the opportunity for the use of new technologies, including quantum technologies, to implement the definitions.

The changes, which will come into force on 20 May 2019, will bring an end to the use of physical objects to define measurement units and has been described as a measurement revolution by scientists and representatives at the conference.

"This is a milestone not only for the metrology community but for the whole world. The redefined SI will be universal, based on constants of nature and no longer dependent on physical artefacts", says Hans Arne Frøystein, EURAMET Chairperson. "I am proud to say that through the European Metrology Research Programmes our members have contributed greatly to the scientific basis for the redefined system. The modernised SI is built for the future and will stimulate further development without having to be changed again. It is also very important to take this opportunity to spread the news about the new SI and metrology to remind everyone about the importance of measurement in all aspects of our lives."

EURAMET's European Metrology Research Programmes (EMRP and EMPIR) supported key European research that has contributed to the SI revision and has addressed the SI

redefinition measurement challenges. There have been 43 joint research projects on the broader scope of the SI so far; 10 of them have directly contributed to the historic redefinition of the SI involving 39 metrology institutes alongside researchers from academia and industry.

### The kilogram

Accurately measuring mass is fundamental to many areas of everyday life. From sophisticated manufacturing processes to microgram drug delivery or environmental monitoring - all rely on accurate weight measurements traceable to the SI kilogram. The definition of the kilogram for more than 130 years, the International Prototype of the Kilogram (IPK), a cylinder of a platinum alloy stored at the BIPM in France, will now be retired. It will be replaced by the Planck constant - the fundamental constant of quantum physics. While the stability of the IPK could only be confirmed by comparisons with identical copies, a difficult and potentially inaccurate process, the Planck constant is ready for use everywhere and always.



Courtesy of NPL

Experimentally determining the redefined kilogram will either be based on Kibble balance experiments that compare electrical and mechanical power, or by the X-ray crystal density (Avogadro) experiment that counts atoms in a silicon sphere using x-rays and optical interferometry. Both approaches are complex, requiring a wide range of measurement skills and specialist equipment.

EMRP projects '[Realisation of the awaited definition of the kilogram - resolving the discrepancies](#)' and '[Developing a practical means of disseminating the new kilogram](#)' helped to resolve the small remaining differences between the Kibble balance and Avogadro practical realisations of the kilogram. This ensures there will be no discontinuity between current and future mass measurements after the kilogram's redefinition.

## The kelvin

Temperature is one of the most frequently measured physical quantities in science and industry, and many industrial processes rely on high accuracy thermometry.

Up until now, the kelvin (K), the SI unit of temperature, has been based on the triple point of water i.e. the temperature at which solid, liquid and vapour all co-exist, and is now based on a fixed value of the Boltzmann constant. The Boltzmann constant relates (among other things) the average kinetic energy of a gas molecule to its temperature. Its value at the time of the redefinition is based on prior extensive international research, including previous EURAMET research projects funded by the EU to enable the kelvin redefinition.

To support the introduction of the redefined kelvin and to meet on-going user traceability requirements into the 2020s, the EMRP has funded two projects; '[Implementing the new kelvin](#)' and '[Novel techniques for traceable temperature dissemination](#)'. New direct thermodynamic temperature measurement methods have the potential to replace the ITS-90 and PLTS-2000 but require both development and evaluation. Improvements at high temperatures, for example, will be facilitated by new high temperature fixed points which have been developed for temperature realisation and dissemination above 1100 °C. Further research to support on-going user traceability continues in a follow on EMPIR project '[Implementing the new kelvin 2](#)'.

## The ampere

An accessible definition of the ampere that allows confident and practical realisation in measurement and calibration laboratories throughout the world was needed that is nearer to the needs of modern micro- and nanofabricated electronic device performance than that previously available.

The SI unit of electric current, the ampere (A), is now redefined in terms of a fundamental physical constant, replacing the definition based on an ideal electrodynamic experiment. This removes the ampere's dependency on the definitions of the kilogram and the metre.

The redefinition has fixed the numerical value of a fundamental physical constant, the elementary charge  $e$  (expressed in coulomb) and a new practical realisation will be introduced based on counting the number of electrons passing through a conductor's cross section in a given unit of time.

The key challenges of this practical realisation are a) to reliably count single electrons flowing through the device at a sufficiently high rate, and b) to scale the generated current (in the 100 pA range) to larger magnitudes, of interest for calibration.

EMRP project '[Quantum ampere: realisation of the new SI ampere](#)' has enabled improvements to the single electron pumps required for experimentally realising the redefined ampere.

## New definitions

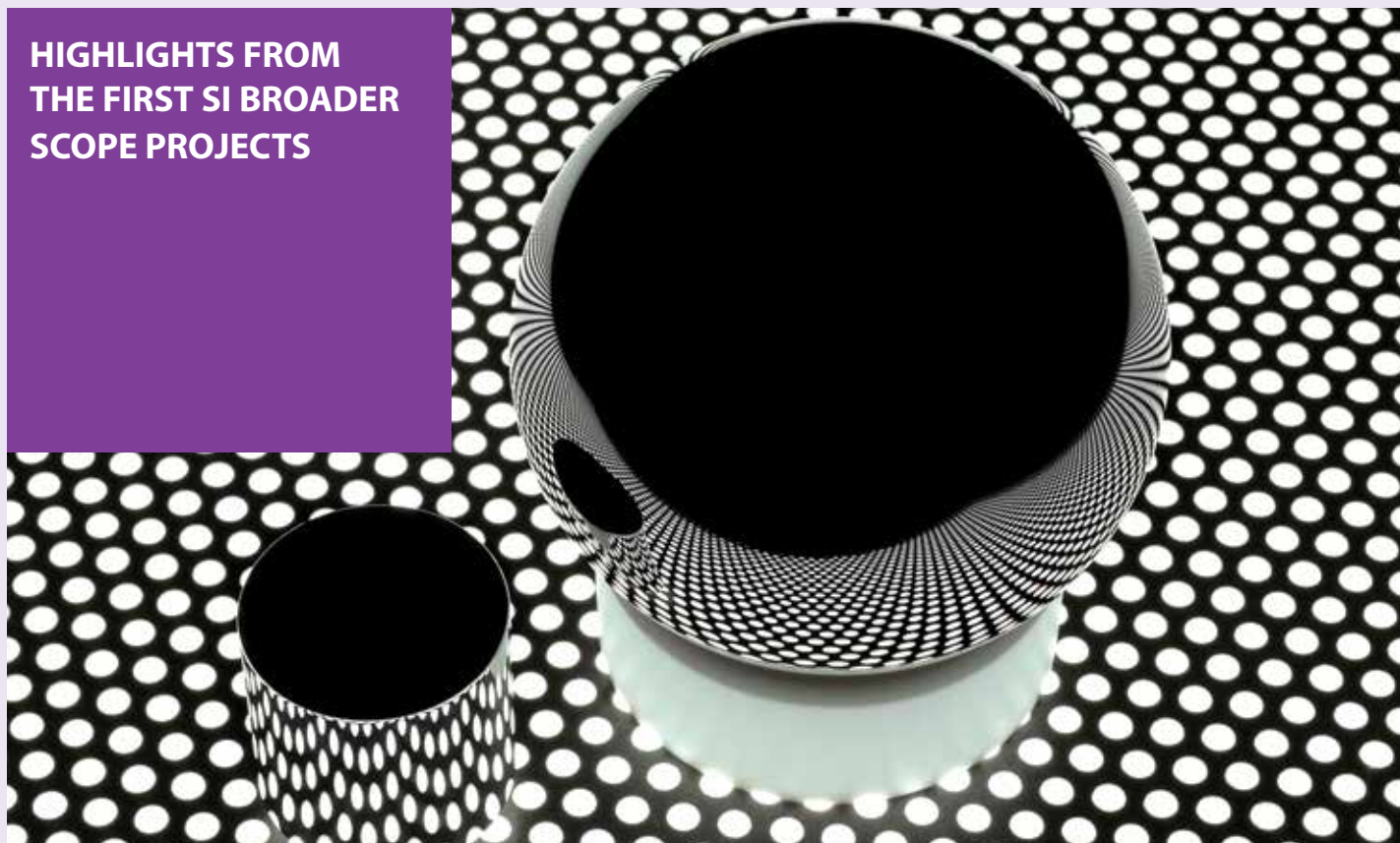
The new definitions impact four of the seven base units of the SI: the kilogram, ampere, kelvin and mole, and all units derived from them, such as the volt, ohm and joule.

- The kilogram – will be defined by the Planck constant ( $h$ )
- The ampere – will be defined by the elementary electrical charge ( $e$ )
- The kelvin – will be defined by the Boltzmann constant ( $k$ )
- The mole – will be defined by the Avogadro constant ( $N_A$ )

Although the size of these units will not change (a kilogram will still be a kilogram), the four redefined units will join the second, the metre and the candela to ensure that the set of SI base units will continue to be both stable and useful. The revised SI will maintain its relevance by facilitating technical innovations. Just as the redefinition of the second in 1967 provided the basis for technology that has transformed how we communicate across the globe, through GPS and the internet, the new changes will have wide-reaching impact in science, technology, trade, health and the environment, and many other sectors.

Further information can be found at <https://www.euramet.org/si-redefinition>

## HIGHLIGHTS FROM THE FIRST SI BROADER SCOPE PROJECTS



Courtesy of PTB

Counting-down to the SI redefinitions that will come into force on 20 May 2019, on the 20th of every month we'll be looking at each of the SI units. Check out November's introduction to the metre. On 20 December we'll be shining a light on the candela!

Visit <https://www.euramet.org/si-redefinition>

Whether for disease diagnosis or to manufacture energy efficient engines, the International System of Units – the SI – underpins all measurements across the globe. The SI Broader Scope call of EURAMET's European Metrology Research Programme has focused research and development to advance measurement standards and SI units and to prepare an efficient European measurement infrastructure based on National Measurement Institute (NMI) collaboration.

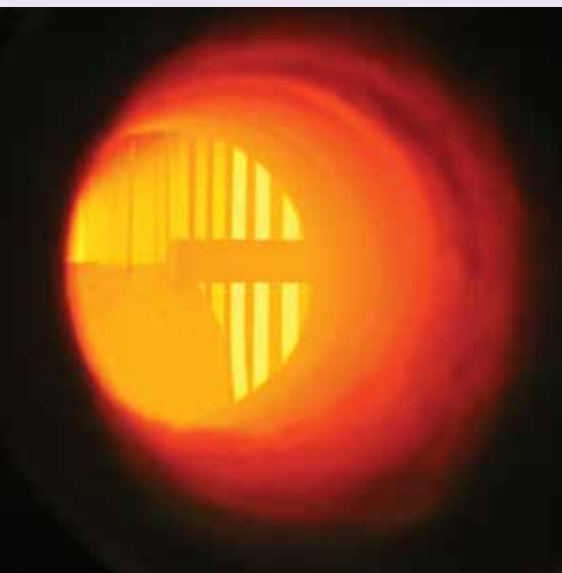
The European Union and national governments invested 37 million Euro in collaborative metrology focused research, involving research groups in 28 European NMIs and Designated Institutes (DIs), and 28 academic groups. The research addressed key needs for SI unit redefinitions and increased traceability for chemical, radio-biological and sub-nano measurements.

### Silicon spheres for routine kilogram-SI links

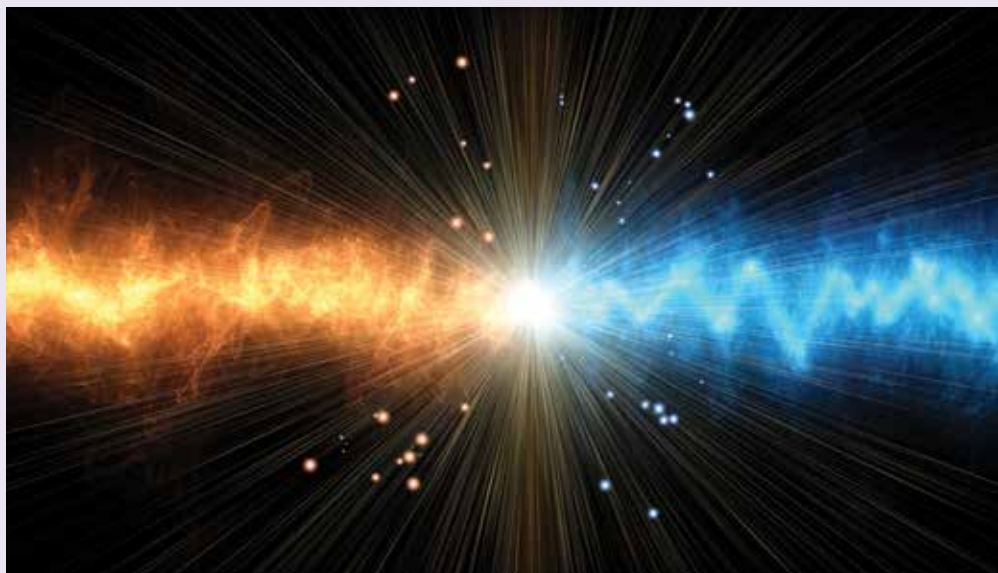
The ability to redefine the kilogram in November 2018 relied on determining the Planck constant using two different methods. One method balances a kilogram weight and a force generated by the current in a coil of wire within a magnetic field and the other relies on counting atoms in a silicon sphere. Resolving small discrepancies between the different electrical balances used to generate the kilogram experimentally and remove inconsistencies between the balancing and atom counting methods were remaining problems hampering the kilograms redefinition. The EMRP project '[Realisation of the awaited definition of the kilogram - resolving the discrepancies](#)' has enabled the international community to pool resources and successfully get agreement between these techniques.

In the long-term, the atom-counting method will make the kilogram definition accessible to any laboratory capable of carrying out surface characterisations and volume measurements. Relatively inexpensive natural silicon spheres will be usable as mass transfer standards. Spheres may transform the kilograms traceability chain and significantly increase the number of labs able to experimentally achieve an SI definition of the kilogram.





Courtesy of NPL



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## Direct thermodynamic measurement for kelvin

Future temperature measurements based on atomic vibrations have been brought closer as a result of EMRP funding. These atomic vibrations are the basis of thermodynamic temperature and could remove the need for complex calibration chains or even a temperature scale. EMRP project [‘Implementing the new kelvin’](#) increased links between the existing temperature scale, the ITS-90, and this fundamental atomic property - a crucial step towards introducing this new temperature system.

Extending the current ITS-90 temperature scale’s range and plugging remaining gaps are needed to increase the reliability of temperature measurements. EMRP project [‘Novel techniques for traceable temperature dissemination’](#) developed low-temperature high-accuracy thermometers enabling cryostat manufacturers and their customers to accurately demonstrate product performance with greater ease. Novel devices based on near infrared radiation thermometry or acoustic thermometry have been developed leading to commercial interest in the acoustic thermometry technology. Users will be able to make direct SI traceable thermodynamic temperature measurements for the first time.

## Travelling standard for ampere generation

The redefinition of the ampere based on single electron transport (SET) devices has been made possible because of a highly accurate pico-amp meter developed in an EMRP project. The device is based on conventional electronics, operates at room temperature and has been validated for use with small direct currents. This innovative ultra-stable low-noise current amplifier (patent pending) provides unparalleled performance and now acts as a travelling electrical standard. Using the amplifier, the EMRP project [‘Quantum ampere: Realisation of the new SI ampere’](#) demonstrated the superior accuracy of a SET-based cryogenic quantum ampere standard compared to state-of-the-art generation of the ampere based on ‘classical’ (non-quantum) experiments used in existing experimental SI ampere realisations.

## Extending chemical analysis SI traceability

SI traceability for physical measurements has existed since the 1889 introduction of the international prototype kilogram. However chemical traceability still has gaps. The lack of chemical analysis standards is limiting accuracy in industrial processes, healthcare and compliance with EU directives. EMRP funding has helped address this problem by co-ordinating the development of new methods for producing high purity single element standards. The project produced traceable high purity standards for magnesium, molybdenum, rhodium and zinc – all important for industry and healthcare. The methods used can be readily extended to other metals, increasing SI traceability and helping to resolve the gaps in chemical analysis accuracy.



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**HORIZON EUROPE:  
EUROPEAN  
COMMISSION PROPOSES  
MOST AMBITIOUS  
RESEARCH AND  
INNOVATION  
PROGRAMME YET**



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For the next long-term EU budget 2021-2027, the European Commission (EC) is proposing 100 billion euro for research and innovation. Building on the achievements and successes of Horizon 2020, an ambitious new programme - Horizon Europe – will keep the EU at the forefront of global research and innovation.

While continuing to drive scientific excellence through the European Research Council (ERC) and the Marie Skłodowska-Curie fellowships and exchanges, Horizon Europe will introduce new features, including:

- **A European Innovation Council (EIC)** to help the EU become a frontrunner in market-creating innovation.
- **New EU-wide research and innovation missions** focusing on societal challenges and industrial competitiveness.
- **Maximising the innovation potential across the EU:** Support will be doubled for Member States lagging behind in their efforts to make the most of their national research and innovation potential.
- **More openness:** The principle of 'open science' will become the modus operandi of Horizon Europe, requiring publications and data to be open access.

- **A new generation of European Partnerships and increased collaboration with other EU programmes:** To increase effectiveness and impact, Horizon Europe will streamline the number of partnerships that the EU co-programmes or co-funds with partners from industry, civil society and funding foundations. This will help to achieve Europe's policy priorities.

EURAMET is in discussions with national ministries and the European Commission over a potential European Partnership in Metrology, to follow on from the European Metrology Research Programmes EMRP and EMPiR.

For more information visit the [Horizon Europe webpage](#).

# Collaboration & Networks

**ONE-YEAR ANNIVERSARY:  
WELMEC MOVED  
ITS SECRETARIAT TO  
EURAMET –  
KEY EUROPEAN  
MEASUREMENT  
ORGANISATIONS  
INTENSIFY  
COLLABORATION**



Participants of the WELMEC Committee Meeting 2018 - Courtesy of WELMEC

One year on from WELMEC moving its secretariat to EURAMET, the two key European organisations leading the legal and scientific measurement communities continue to strengthen their collaboration.

Legal metrology plays an important role in society, providing the technical and administrative procedures established in law that guarantee the quality of measurements made during commercial transactions and official controls. WELMEC, the European Cooperation in Legal Metrology, coordinates the collaboration between legal metrology authorities in member states of the European Union and European Free Trade Association countries and countries in transition to EU membership.

WELMEC and EURAMET have a long history of mutually beneficial cooperation, exchanging expertise on various topics through several working groups, such as the joint WELMEC-EURAMET task group to explore opportunities for closer collaboration. In 2010 this partnership was fortified with a Memorandum of Understanding, and since October 2017 the WELMEC secretariat is provided by EURAMET.

The WELMEC secretariat supports on daily administrative needs and website maintenance. They have also supported the organisation of meetings, including the 34th WELMEC Committee Meeting earlier this year – the main event of the WELMEC community, held in Sarajevo, Bosnia and Herzegovina. The Committee Meeting was attended by more than 60 participants, and over the course of the three-day event valuable discussions took place on the future of the organisation.

*“Organising the WELMEC Committee Meeting was a very positive experience for me and my colleagues from the new WELMEC Secretariat. It gave us a better insight into EURAMET’s sister organisation, their special features, objectives and way of working, but also the common ground of EURAMET and WELMEC.” says Wolfgang Schmid, EURAMET Member Service Manager.*

*“The first year of operating the WELMEC secretariat has been a very interesting and positive experience. Having a joint secretariat is an important element in coming to a better mutual understanding of both organisations. On top of this, we appreciated the very effective and pleasant collaboration with the WELMEC Chair Gregor Dudle and the warm and friendly way we were received in the WELMEC community”*

## About WELMEC

Created in 1990, WELMEC is the primary source for trusted advice on legal metrology issues in Europe. It aims at establishing a consistent approach to legal metrology for the benefit of all stakeholders including consumers, businesses, EU and national authorities. To date, WELMEC has 31 members and 8 associate members. From the beginning, they have shared a common vision to foster free movement of measuring instruments by reducing barriers to trade. Over the years WELMEC has gained importance and become the main platform to identify, address and act on issues in legal metrology.

Two new guides, ‘Information on units of weight or volume used on prepackages’ (Guide 6.14) and ‘External auxiliary power supply of electrical energy meters’ (Guide 11.8), were accepted by the WELMEC Committee in 2018. Revision was also approved for a further seven guides.

All WELMEC guides including the new and revised ones can be found on WELMEC’s website (<https://www.welmec.org/documents/guides/>).



## TWO REGIONAL METROLOGY ORGANISATIONS INTENSIFY LONG-LASTING PARTNERSHIP – EURAMET AND COOMET SIGN MEMORANDUM OF UNDERSTANDING



Signing the Memorandum of Understanding: COOMET President Dr Valery Hurevich and Dr Beat Jeckelmann, at that time EURAMET Chairperson – Courtesy of COOMET

Emphasising the importance of creating a harmonised and collaborative global metrological infrastructure, a Memorandum of Understanding (MoU) was signed by EURAMET and COOMET earlier this year. Drawing on strengths, aims, and commonalities, the MoU outlines mechanisms for joint activities and opportunities in mutual areas of interest for both organisations.

COOMET, the Euro-Asian Cooperation of National Metrology Institutions, and EURAMET, the European Association of National Metrology Institutes, have a long tradition of partnership and currently run many complementary functions. The recent signing aims to continue and extend their participation over the next five years.

As part of the MoU, present and future cooperative activities were set out, including:

- An annual delegation meeting between EURAMET and COOMET to discuss existing matters and strategic orientation of the cooperation.
- Mutually inviting the Technical Committee (TC) Chairs to the annual meetings of the TCs in their respective organisations.
- Exploring opportunities to hold joint workshops within the BIPM Capacity and Knowledge Transfer Programme.

EURAMET and COOMET also agreed to facilitate the participation of COOMET members in the European Metrology Research Programmes, supporting such measures as inviting members to take part in preparation meetings and preparing guidance documents in Russian and English.

Signed by Dr Beat Jeckelmann, at that time EURAMET Chairperson, and COOMET President Dr Valery Hurevich, it is hoped that this statement of collaboration will encourage and promote increased engagement between the organisations. Over its five-year term, this should help to build a more coordinated global infrastructure for metrology, and lead to the strategic sharing of resources for a robust metrological community across Europe and Asia.

19<sup>th</sup> INTERNATIONAL METROLOGY CONGRESS

# CIM2019

24-26 SEPT  
PARIS  
FRANCE

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CFM  
L'ASSOCIATION DE MESURE INDUSTRIELLE

CALL FOR PAPERS

COMMUNICATE AND EXPAND YOUR NETWORK

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- ✓ book a **stand** and exhibit
- ✓ plan your **participation**

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Miruna DOBRE - SFP ECONOMIE (BE)  
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MW Measurement, OIML, Bureau International des Poids et Mesures, EURAMET, EA EUROPEAN ASSOCIATION, Trescal

**INTERNATIONAL METROLOGY CONGRESS (CIM 2019) CALL FOR PAPERS IS OPEN!**  
24 – 26 SEPTEMBER 2019 PARIS, FRANCE

### The congress

The [19th International Metrology Congress](#) is a unique crossroads between R&D and industrial applications for all actors and all fields including mechanics, health and biology, agro-food industry, environment, energy, pharmaceuticals and chemicals.

The congress deals with the R&D and best practices for measurement and metrology in industry through:

- a diversified conference programme and round tables sessions
- an exhibition showcasing innovations and solutions
- industrial site visits and demonstrations
- professional networking opportunities during social events

### Aims

As a delegate you will:

- improve your measurement, analysis and testing processes and control your risks
- explore the evolution of techniques, advances in R&D and industrial applications
- meet industrial counterparts and measurement professionals

### Who will attend?

Around 1000 participants from 50 different countries, made up of:

- end-users of measurement technology in industry and laboratories
- quality managers and decision makers
- manufacturers of measurement equipment and service providers
- academics and researchers

**Take part and submit a paper.**

[Call for papers](#) deadline 15 January 2019.

# BEST PRACTICES, R&D and PROSPECTS for MEASUREMENT in INDUSTRY

A diversified **conference programme** and **round tables sessions** ■ An **exhibition showcasing** innovations and solutions



## AIMS

- improve your **measurement, analysis and testing processes**,
- **control** your manufacturing **risks**
- explore the **evolution** of techniques, advances in **R&D** and **industrial applications**



## PARTICIPANTS

- 1,000 participants**  
**from 50 countries**
- end-users of measurement **technology in industry** and **laboratories**
  - **quality managers** and **decision makers**
  - **academics** and **researchers**

## AUTHORS INFOS

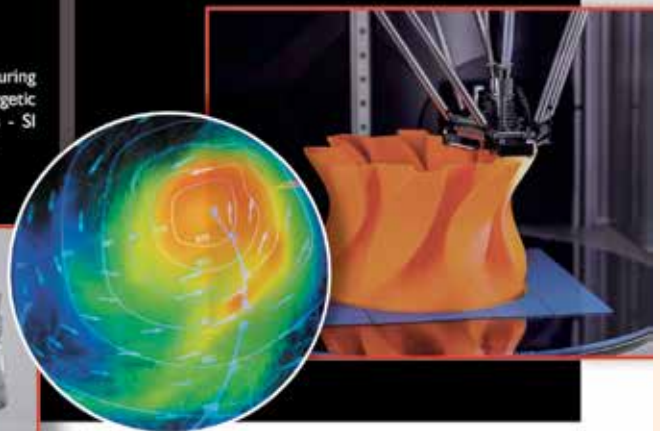
- Reply to authors 1<sup>st</sup> March 2019
- Final papers due 10 July 2019
- Selection for publication in Measurement Science and Technology - IOP

## TOPICS

- **Processes**  
Uncertainties - Traceability - Cost-optimisation - Certification - Conformity and risks
- **Techniques**  
Mass - Force - Flow - Pressure - Dimensional - Electricity - Time-frequency - Temperature - Hygrometry - Optics and photonics - Ionising radiation - Acoustics - Chemical and biological measures
- **R&D and Prospects**  
Data quality and security - Advanced manufacturing - Predictive maintenance - Industrial IOT - Energetic efficiency - Renewable resources - Health diagnosis - SI evolution - Recruitment - Quantum technologies - AI

## ROUND TABLES SESSIONS

- **Smart sensors** for production optimisation
- **Additive manufacturing**: the challenges for measurement and control
- **Training 4.0**: the major issues?
- New technologies for **security and traceability of the measurement chain**
- Metrology for **Meteorology**
- **ISO/CEI 17025** and risks management



## Play an active part in the future of measurement!

This congress is organised by CFM (Collège Français de Métrologie), an association of measurement professionals and end-users in Europe, which aims to disseminate measurement and metrology good practice.

CFM's Creative Metrology working group, consisting of experts representing the major players in the fields of metrology, digital technology, industry and laboratories, aims to establish the foundations for a new metrology able to challenge projects associated with the connected factory of the future.

The CFM working group has launched an international survey to review the current state of metrology in the context of the connected factory.

[Take part in the creative metrology survey.](#)



# Community News

## EURAMET IMPLEMENTS EUROPEAN METROLOGY NETWORKS CLOSE COLLABORATION IN MEASUREMENT SCIENCE WITH A NEW SUSTAINABLE STRUCTURE



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The vision of EURAMET and its members is to ensure Europe has a world-leading metrology capability, based on high-quality scientific research and an effective and inclusive infrastructure, that meets the rapidly advancing needs of end users. Establishing collaborative structures which go beyond joint research, the European Metrology Networks (EMNs), will be the next step in realising this aim.

At the 2018 EURAMET General Assembly six initiatives were selected to become the first set of European Metrology Networks: Mathematics and Statistics, Laboratory Medicine, Quantum Technologies, Smart Energy Grids, Energy Gases, and Climate and Ocean Observation.

These six EMNs are currently in the process of signing their Memoranda of Understanding and are getting ready to start their work.

### Concept of the EMNs

There is a long tradition of cooperation in EURAMET, as highlighted by the strong role of the Technical Committees and the European Metrology Research Programmes, EMRP and EMPIR in European measurement science. Nevertheless, there has been a widely-held view within the NMI and DI community that there are still a number of underexploited opportunities for increased coordination.

The positive attitudes expressed in EURAMET's membership for further collaboration resulted in a workshop in 2017. Attended by senior executive management of NMIs and DIs, views, expectations and ambitions of member countries were collected, leading to a consensus of the creation of European Metrology Networks. These were regarded as a necessary tool to take on future challenges in measurement science and deliver added value for Europe.

The EMNs will cover fields relevant at the European level, but too wide for players to address individually.

The EMNs will analyse the European and global metrology needs and address these needs in a coordinated manner. EMN members will then formulate common metrology strategies including aspects such as research, infrastructure, knowledge transfer and services. The members will be committed to contributing to the EMN, helping to establish sustainable structures that are strategically planned from the outset.

By providing a single point of contact for information, underpinning regulation and standardisation, promoting best practice and establishing a comprehensive, longer-term infrastructure, the EMNs aim to create and disseminate knowledge, gain international leadership and recognition, and build collaboration across the measurement science community.

### Types of networks

Three types of EMNs are under development: science, societal challenges, and infrastructure and services.

### Science:

EMNs with a focus on science strive for leadership and scientific excellence in challenging and competitive fields. Their aim will be to increase visibility and acceptance in the research community, and to reach critical mass and make use of synergies of the partners involved.

### Societal challenges:

The focus of these EMNs is on metrology that supports developments in response to societal challenges. To increase impact, the EMNs will provide a single point of contact for metrology questions in their field, establishing the relevant stakeholder network, and identifying the affected policy areas and mechanisms to contribute. Through research, knowledge transfer and services, the networks will also underpin regulation and standardisation.

### Infrastructure and services:

To raise the overall level of metrology capability and quality of service throughout Europe, a coordinated approach in the development of the metrology infrastructure is necessary. The focus of infrastructure EMNs is to facilitate complementary development, sharing of resources, avoid unnecessary duplication, establish joint facilities, and support knowledge transfer.

### Membership

The EMNs are a fully integrated part of EURAMET, organised under its roof. Membership in an EMN is open to EURAMET members and associates. Partnership is open to stakeholder organisations.

### Further EMNs within EURAMET

The establishment of an EMN must be approved by the EURAMET General Assembly. Proposals for further EMNs are currently under development and will be discussed at the General Assembly 2019.

## SETTING TRENDS IN EUROPEAN METROLOGY EURAMET GENERAL ASSEMBLY 2018



### ROMANIA'S NATIONAL METROLOGY INSTITUTE HOSTED EURAMET'S GENERAL ASSEMBLY

The 2018 General Assembly of EURAMET took place in Romania's capital city, Bucharest. The week-long event, with over 100 participants, was professionally and cordially hosted by INM, Romania's National Metrology Institute.

Mirella Buzoianu, Director of INM and EURAMET Delegate, and her team provided a wonderful atmosphere for the meetings, which proved to be effective and productive for all involved.

INM was established in 1951 and is one of EURAMET's founding members, having been part of the community for almost 20 years. INM participates in a number of joint research projects within EURAMET's European Metrology Research Programmes (EMRP and EMPIR).

EURAMET is grateful for the support and excellent organisation of the General Assembly 2018, creating the perfect environment for a week full of valuable and constructive meetings.

### SAVE THE DATE – 13TH EURAMET GENERAL ASSEMBLY IN 2019

EURAMET's 13th General Assembly will take place in Borås, Sweden from 21 to 24 May 2019. It will be hosted by RISE, the Swedish National Metrology Institute. Further information will be available beginning of 2019.

Hans Arne, new Chairperson, acknowledged the great work and achievements Beat accomplished and expressed his and the community's gratitude (see page 15).

The vibrant city of Bucharest in Romania set the scene for EURAMET's 12th General Assembly, from 28 May to 1 June 2018. The annual meeting is one of the main events of Europe's measurement community. It offers the opportunity to discuss trends and needs in measurement science, new ways of collaboration, and the future development of EURAMET.

For the first time, the General Assembly (GA) selected six 'European Metrology Networks' (EMNs). EMNs are new bodies within EURAMET assigned to build sustainable structures of collaboration in areas of strategic relevance for the association and European metrology. EMNs consist of EURAMET Members and Associates, as well as stakeholder organisations. One of the main objectives of the networks is to improve coordination in specific fields by fostering research activities and the transfer of knowledge and technology (see page 12). Proposals for further EMNs will be developed over the next months and discussed at the General Assembly 2019.

Further topics on the agenda included:

- Strategic activities of EURAMET
- Discussions on cornerstones of a possible future European Metrology Research Programme
- Highlights from Technical Committees (TC) and Task Groups
- The planned redefinition of the International System of Units (SI) and the contribution of EURAMET TCs and joint research projects (see page 3)
- Important developments amongst EURAMET Members, Associates and Liaison Organisations

Elections took place in a closed session. The Board of Directors welcomes one new and three re-elected members: Vincent Fokkema (VSL, Netherlands), Maguelonne Chambon (LNE, France), Pavel Klenovský (CMI, Czech Republic) and Jörn Stenger (PTB, Germany), respectively. They were elected for the period June 2018 to May 2020.

In addition, Ulrike Ankerhold (PTB, Germany) was re-elected as chair of the TC for Ionising Radiation for a second term. A further three TC-Chairs started their first term at the GA (see page 16-17): Miruna Dobre (SMD, Belgium) for TC Interdisciplinary Metrology, Dolores del Campo (CEM, Spain) for TC Thermometry and Kai Stoll-Malke (PTB, Germany) for TC Quality.

In the EMPIR Committee meeting, which took place during the GA week, Erkki Ikonen (VTT, Finland) was re-elected as EURAMET Vice-Chairperson (EMPIR) for a second term until 2021.

EURAMET congratulates Erkki Ikonen for the re-election as Vice-Chairperson (EMPIR), the new and re-elected BoD Members and Technical Committee Chairs and wishes them all the best in their positions.

EURAMET also welcomes a new institute: The Croatian Designated Institute 'Meteorological and Hydrological Service' (HMI/DHMZ-SOUL) was accepted by the GA as new Associate.

Happening only once every three years, EURAMET's chairmanship was also transferred to the new Chairperson during the GA: Beat Jeckelmann (METAS, Switzerland) handed over to Hans Arne Frøystein (JV, Norway). Beat, now Past Chairperson, thanked all Delegates and colleagues for the support they provided and their good spirit during his term of office.



Re-elected Technical Committee Chairs

Technical Committee	Re-elected chair	Period
Ionising Radiation	Ulrike Ankerhold (PTB, Germany)	June 2018 to May 2020

New Technical Committee Chairs

Technical Committee	Chair	Period
Interdisciplinary Metrology	Miruna Dobre (SMD, Belgium)	June 2018 to May 2020
Thermometry	Dolores del Campo (CEM, Spain)	June 2018 to May 2020
Quality	Kai Stoll-Malke (PTB, Germany)	June 2018 to May 2020



EURAMET's Research Council met during the General Assembly week.



Former Technical Committee Chairs Robert Edelmaier (TC Interdisciplinary Metrology), Graham Machin (TC Thermometry) and Enver Sadikoglu (TC Quality) receiving thanks from Beat Jeckelmann on behalf of EURAMET.



Speakers at EURAMET's symposium on European Networks: Hans Arne Frøystein, EURAMET Chairperson, Nicolae-Victor Zamfir, ELI Romania, Jana Kolar, CERIC-ERIC Research Infrastructure and Sean O'Reagain, DG Research, European Commission.



# People & EURAMET

## BEAT JECKELMANN'S TERM AS EURAMET CHAIRPERSON ENDED FOSTERING A FIT-FOR-PURPOSE AND COORDINATED METROLOGY INFRASTRUCTURE IN EUROPE



Many thanks to and positive feedback for Beat Jeckelmann expressed by Hans Arne Frøystein, EURAMET Chairperson, on behalf of EURAMET (picture on the right) and Jutta Bender (Member Service Officer) and Wolfgang Schmid (Member Service Manager) on behalf of the EURAMET Secretariat (picture on the left).

How quickly time is running can be easily measured when it comes to the terms of EURAMET's Chairpersons. It seems as if Dr Beat Jeckelmann (METAS, Switzerland) was only recently elected as the EURAMET Chairperson, just starting his three-year term. But, that was June 2015, and at this year's General Assembly in Bucharest, Romania, he handed over the important position to his successor Hans Arne Frøystein from Norway.

"EURAMET is now a very well-run association, highly regarded both by our members and our stakeholders, not least due to the excellent leadership of Beat during the last three years. I am really inspired by his way of working, focussing on the important strategic decisions and making us move forward, and always in a friendly and inclusive style", said Hans Arne.

During his term of office Beat focussed on increasing the sustainability and integration of measurement research in Europe as the basis for the development of a coordinated measurement landscape.

Beat was the main driver behind EURAMET's efforts to establish a fit-for-purpose and truly coordinated metrology infrastructure in Europe, by using common infrastructures and services to best effect. His work led to the new concept of European Metrology Networks, collaborative structures which go beyond joint research, which has been one of the major initiatives of EURAMET within the past three years.

In addition, Beat found it equally important to encourage the EURAMET members and associates in expanding appropriate measurement infrastructure around Europe, and was particularly interested in providing support to new and evolving National Metrology Institutes.

People in the EURAMET community really enjoyed working with Beat, describing him as goal-oriented, efficient and effective in decision making, steady, and with a Swiss sense of humour.

Wolfgang Schmid, EURAMET Member Service Manager stated: "Me and all colleagues at the Secretariat enjoyed working with Beat very much. Before he became chair, he made an analysis of the Secretariat which paved the way towards a stronger and more effective organisation. As chair Beat was always open for the needs of the Secretariat and made sure we had excellent conditions for our work. We appreciated his very friendly and respectful way towards people. It has been a great time with him."

In his final speech as Chairperson Beat emphasised that he appreciated the opportunity to work with so many highly committed colleagues and enjoyed spreading the word about metrology throughout EURAMET's stakeholder groups.

"The time as chairperson was very exciting and enriching. It was a great pleasure and honour to participate in the further development of the association. I thank the secretariat team and all EURAMET colleagues for their great commitment and the good collaborative spirit. I wish my successor, Hans Arne, much success and satisfaction."

Beat is both the Chief Science Officer and Member of the extended management board at METAS, the Federal Institute of Metrology of Switzerland, and has been a EURAMET Delegate since 2008.

Beat has almost 30 years' experience working within the EURAMET community: He was previously the Chair of the Technical Committee (TC) for Electricity and Magnetism, TC Contact Person and Subcommittee Convenor. He is currently a Representative in the EMPIR Committee and the Research Subcommittee, and since 2010 has been a Member of EURAMET's Board of Directors. Beat will remain on the Board of Directors as Past-Chairperson until 2019.

## VINCENT FOKKEMA (VSL) NEW BOARD OF DIRECTORS MEMBER



Prior to joining VSL, the Dutch metrology institute, Vincent completed his PhD in experimental physics at Leiden University, where he developed a scanning tunnelling microscope dedicated to atomic-scale, real-time observations of physical vapour deposition of thin films and ion erosion. Vincent then took these skills forward in his role as a Research and Development Scientist at VSL in the field Nanometrology, working on various projects within EMRP including investigating novel scanning probe microscopy techniques for characterising nanometer-sized objects. During this time, Vincent was also the Project Manager for Dimensional Metrology, which saw him negotiating and carrying out the yearly contract with the Ministry of Economic Affairs that supports the maintenance and development of national measurement standards in the Netherlands.

In 2015, he switched to a managerial position within VSL as head of Calibrations and Reference Materials Department, focussing on providing accurate and traceable services in a wide range of technical areas. Now

managing director of VSL, a position he has held since 2017, Vincent is responsible for both R&D and commercial activities.

“As member of the BoD, I would like to promote the acceleration of results from research projects being taken up by our stakeholders in industry and society. Owing to VSL’s business model as a private company, the true valorization of science is always at the center of my attention. Regarding impact and collaboration on the European level, the best playing field will be within the European Metrology Networks, and so I would like to help shape these into robust collaboration instruments that bring together research and application. Another vital point I will address in my appointment as member of the BoD is the ‘popularity’ of metrology, especially amongst students in the technical sciences. For a truly sustainable metrology infrastructure, investing in human capital development is at least as important as optimising the output and impact of our research projects, programmes, and networks.”

## DOLORES DEL CAMPO TC FOR THERMOMETRY

Having spent 25 years working in thermometry at the Centro Español de Metrología (CEM), from laboratory technician to head of the CEM Thermodynamics and Environment Department, Dolores has gained a wealth of technical and organisational experience. Over this time, she has performed many different functions, including her role as Technical Auditor of the Spanish Accreditation Body (ENAC) in the fields of temperature, humidity, and gas concentration. An active member of the EURAMET community, Dolores participated in numerous EMRP and EMPIR projects, and acted as lead facilitator for an Industry EMPIR call. In 2007, Dolores became the CEM contact person in the EURAMET Technical Committee for Thermometry. During the 26th meeting of the General Conference on Weights and Measure she has been elected as one of the 18 members of the International Committee for Weights and Measures (CIPM).

“As the Technical Committee chair for thermometry I would like to continue building in the excellent foundations laid by the past TC-T chairs by promoting the development of closer ties between the TC-T members and encouraging representatives from small size institutes to be more involved in the committee’s work.

I believe it is also necessary to increase our knowledge transfer efforts, in which the organisation of workshops, training courses, and fostering the exchange of researchers and technicians could play an important role. Finally, I would like to highlight the need to update the roadmaps for the main TC-T fields of temperature, humidity, and thermophysical quantities, and to develop a strategy research agenda – both issues that should be addressed in the near future.”



## MIRUNA DOBRE TC FOR INTERDISCIPLINARY METROLOGY



Before joining the Belgian National Metrology Institute (SMD) in 2003, Miruna spent several years conducting research at the University of Leuven in Belgium, where she completed her PhD in applied sciences. During this time, Miruna was involved in the theoretical and experimental design of ultrasonic atomisers, as well as studies on diesel engine injectors. After spending ten years as the head of the thermometry laboratory, Miruna is now the research manager at SMD, in charge of the national research and development programme in metrology. She has also been closely involved in many EURAMET activities and is currently EMPIR Committee Representative.

“The TC for Interdisciplinary Metrology (IM) was first designed as an open forum for ideas, but its cross-disciplinary work has evolved towards project-oriented actions and I am convinced that small subgroups

working in depth on a few topics is an efficient operational mode for TC-IM. The creation of the Board of Directors focus group on capacity building opened the way to an increased participation of small NMIs, and we have to continue to create an inclusive organisation where a large number of members are active in the Technical Committees and Task Groups.

Building networks is the first action, and TC-IM can contribute by bringing its specific bottom-up, inclusive approach. We will also continue our work on knowledge transfer by developing e-learning modules, encouraging the development and dissemination of best practice guides, and finding new ways to share the results of research projects. Increasing impact is still an open question and TC-IM is the best forum to propose new answers.”

## KAI STOLL-MALKE TC FOR QUALITY

Kai's metrology career began in 1990 when he undertook a PhD in frequency measurement standards at PTB, the German National Metrology Institute. Since, he has also worked at the national metrology institutes in France and Italy, conducting further fundamental research on frequency measurement. Kai returned to PTB in 1997 as project coordinator in the Technical Cooperation department, working on quality infrastructure for international cooperation, acquisition, and preparation of projects, as well as the development of internal quality management systems. He is now the Quality Manager at PTB, Head of Central Quality Management. Before becoming chair, Kai has been a member of EURAMET'S Technical Committee for Quality.

“I would like to continue the fantastic work of TC-Q members and the previous chair, retaining the Peer Review System for approving Quality Management Systems for NMIs and DIs in its current efficient and successful form. I also believe it will be important to promote the international recognition of the Peer Review System of Quality Management Systems, assuring the metrological community of the benefits it can bring. Another key objective in my time as chair will be to ensure appropriate management of the transitioning to the new standards ISO/IEC 17025:2017 and ISO/IEC 17034:2016.”





# Season's Greetings



With the redefinition of the SI units, 2018 has been an exciting year for the metrology community. It's been fantastic to see so many people interested in measurement science, and so many of you sharing your research and passion with the wider world! We hope this will continue into 2019.

We'd also like to say thank you to our members, friends, partners, and stakeholders for all your hard work and support throughout 2018. It has been a year full of successful events, scientific achievements, and thriving collaborations.

We hope you and your families have festive and relaxing holidays, and wish you a very happy New Year.

Your EURAMET community.

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