

PROGRAMME

21st INTERNATIONAL METROLOGY CONGRESS

CIM 2023

LIMITLESS
METROLOGY
AT YOUR FINGERTIPS

07
10 MARCH
LYON
FRANCE

 **CFM** L'ASSOCIATION
DE LA MESURE
INDUSTRIELLE

SUPPORTED & ORGANIZED BY

KEY APPLICATIONS



INDUSTRY 4.0



HEALTH



CLIMATE
CHALLENGES

WITH THE EXHIBITION

**GLOBAL
INDUSTRIE**

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TUESDAY 7	8:00	9:00	CLIMATEWORKSHOP (MetClimVOC) Key parameters for air monitoring	10:30	11:15	CLIMATEWORKSHOP (MetClimVOC) Key parameters for air monitoring	12:45	WELCOME	OPENING SESSION	13:45	S1 Mechanics S2 Radiofrequency and Electricity Can metrology keep up with the hydrogen revolution? round table	15:15	16:00	POSTERS <ul style="list-style-type: none">ChemistryDigitalisationElectromagnetismFlowIonising radiationMechanicsMachine learning	17:30	WELCOME APERITIVE
WEDNESDAY 8	WELCOME	S3 Machine learning S4 AC/DC Electricity Metrology in the loop of the circular economy round table	PLENARY SESSION LIMITLESS METROLOGY AT YOUR FINGERTIPS	Industry 4.0: Offline to Inline measurements round table S5 Flow S6 Chemistry	S7 Digitalisation S8 Dimensional mechanics S9 Gas analysis	EXHIBITOR NIGHT PARTY										
THURSDAY 9	WELCOME	The impact of metrology in the digital transformation: challenges and opportunities round table S10 Photonics S11 Uncertainties, Data analysis	POSTERS <ul style="list-style-type: none">BiologyMaterialsNanotechnologiesPhotonicsQuality & AccreditationThermometry, HygrometryUncertainties	S12 Digital calibration certificates S13 Nanotechnologies What does it mean to be a metrologist in the 21st century? round table	Electrical Nanometrology Stakeholder session ELENA project S14 Quality, Accreditation	GALA DINNER										
FRIDAY 10	WELCOME	S15 Biology S16 Thermometry, Hygrometry S17 Materials	Metrology challenges in medical measurements: detection, diagnosis and digitalisation round table S18 Quantum technologies	AWARD CEREMONY												



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FULL PROGRAM



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Maguelonne CHAMBON

Congress chairwoman

The world is moving rapidly, and so are the technologies:

- in the digital transformation of our society and the industry, with more and more systems and tools including for instance artificial intelligence requiring data security;
- in our lives and health management, with the early detection and diagnosis of new diseases;
- in our environment with climate change and pollution management;
- or regarding future and innovative applications based on quantum technologies; the Nobel Prize in Physics 2022, Alain Aspect, has largely demonstrated this all these years.

The congress will be a true mirror of this evolution of science and technology, of the needs of industry and society, within the framework of the "Global Industrie" exhibition, with a sector dedicated to Measure Control Vision and Instrumentation and a Metrology Village showing that metrology is an integral part of industrial measurement processes and indispensable to the competitiveness of companies.

Come and discover these developments through round tables and meetings with industrialists and scientists.

Welcome to CIM 2023!



Cosimi CORLETO

CFM president

The upcoming International Conference of Metrology (CIM2023) is taking place for the second time at Global Industrie. The CIM2023 is riding the wave of digitalization with three oral sessions and a panel discussion dedicated to this key Industry 4.0 topic. Work on how metrology can be used for measurement system validation, including AI, will be presented, as well as a lot of work on digital calibration certificates that pave the way for fully digitized metrology.

Industry 4.0 will of course be the main application of this CIM2023, with smart sensors used in many different measurement applications. A panel discussion with industry leaders will draw parallels between the manufacturing industry and the process industry, where sensors are increasingly moving from offline to online.

But the CIM goes beyond that and has a lot to say about energy (hydrogen) and the environment (gas analysis, chemistry session, circular economy), as well as metrology for health.

For sound decisions, you need reliable data, you need metrology!

Join us at CIM2023!

MARDI 7 MARS | TUESDAY MARCH 7



MetClimVOC

Stakeholder Workshop - Climate key-parameters

To attend this workshop, please send a request to kirill.berezkin@ptb.de

This workshop will deal with the monitoring of climate key parameters in atmospheric measurements. By attending this workshop, you will be able to access the restaurant on Tuesday.

Speakers:

Céline Pascale - METAS, Maitane Iturrate-Garcia, Tobias Bühlmann - METAS, Stefan Persijn - VSL, Tatiana Macé - LNE, Stefan Reimann - EMPA, Thérèse Salameh - IMT NORD EUROPE, Ralf Tillmann - FZ-Jülich, Rupert Holzinger - University of Utrecht, Anja Claude - Deutscher Wetterdienst (DWD), Maricarmen Lecuna - Politecnico di Torino, Gang Li - PTB and more...

Session 1 9:00-10:30

Introduction on MetClimVOC

Towards an unbroken SI-traceable calibration chain for VOCs at monitoring stations

- Preparation of reference gas mixtures (RGMs) of climate relevant VOCs
- Transferring SI-traceability to the field – assessment of new working standards
- New and classical techniques to measure formaldehyde – a laboratory intercomparison

Round-table: Can SI-traceability be achieved at atmospheric monitoring stations? Needs and challenges

10:30 ☕ 11:15

Session 2 11:15-12:45

Improvements on VOC sampling and analytical systems

- Sampling methods – effects of sorbent tubes, scrubbers and filters on VOC measurements
- New calibration protocols for Proton Transfer Reaction Mass Spectrometry (PTR-MS)
- A fit-for-purpose methanol analyser

Remote sensing input data – analysis and improvement strategies

Project outcomes and uptakes: uncertainty tools, open data and guidelines

Round-table: Metrology for atmospheric monitoring – uptake and further steps

12:45 🍴 13:15

13:15

OPENING SESSION



Mrs Maguelonne CHAMBON - LNE / France
Mr Cosimì CORLETO - CFM President / France

S1 MECHANICS



Mr Fredrik ARRHEN - RISE / Sweden

KEYNOTE

13:45

Calibration of high accuracy accelerometers for ESA missions at INRIM
 Mrs ASTRUA - INRIM / Italy

14:00

True dynamic pressure calibration by means of a novel secondary pressure generator
 Mr SANDER - TESTO INDUSTRIAL SERVICES / Germany

14:15

Managing the dynamical uncertainty for pressure measurement in an industrial context
 Mrs RAMIANDRISOA - EDF R&D / France

14:30

Metrological characterisation of a commercially available gas pycnometer
 Mr BOINEAU - LNE / France

14:45

Development of a comprehensive software application for realization and dissemination of the mass scale
 Mr MALENGO - INRIM / Italy

15:00

Improved calibration and measurement capabilities - a basis of mechanical engineering
 Mr SCHAFER - HOTTINGER BRUEL & KJAER / Germany

15:15 ☕ 16:00

S2 RADIOFREQUENCY & ELECTRICITY



Mr Pierre GOURNAY - BIPM / International

KEYNOTE

13:45

Metrology for standardization of emerging wireless technologies
 Mr ALLAL - LNE / France

14:00

Toward the design of a sensor for measuring average power in the Terahertz frequency band [110 - 170 GHz]
 Mrs BECHER - LNE / France

14:15

Developments of antenna calibration facility and RF field probe calibration system at SICT
 Mr KIM - SICT / South Korea

14:30

Traceable S-parameters measurements up to 90GHz in 1.35 mm (E-Band) coaxial
 Mr STOKES - NPL / United Kingdom

14:45

Comparison of impedance measurement methods in LISN calibration between 9 kHz - 100 MHz
 Mrs KIRAZ - VESTEL ELECTRONIC CORPORATION / Turkey

15:00

Uncertainty evaluation using Bayesian and Monte Carlo simulation methods at the automatic RF Power software measurement
 Mr DANACI - TUBITAK UME / Turkey

15:15 ☕ 16:00

CAN METROLOGY KEEP UP WITH HYDROGEN REVOLUTION?

Presenter: Mrs Annarita BALDAN - VSL / The Netherlands

With : **Mr Michael DIDERICH - HYDROGEN EUROPE / Belgium**
Mrs Martine CARRE - AIR LIQUIDE / France
Mr Etienne Smith - AP2E / France
Mr Revata SENEVIRATNE - TUVSUD / United Kingdom
Mr Tarek BOUDIBA - ENGIE / France

13:45

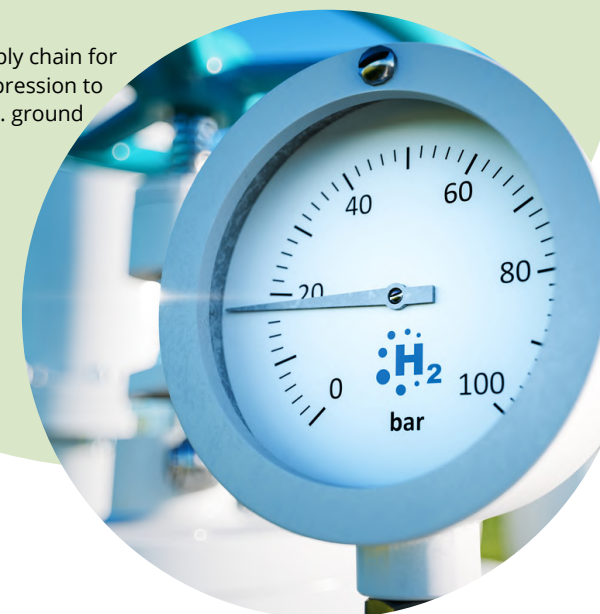
To pursue the goal of producing zero greenhouse emissions and to address the urgent need of finding alternative fuels to replace the conventional ones, large investments are being made to stimulate the scale-up of low carbon hydrogen production and use.

To enable this energy transition, a measurement infrastructure needs to be in place that accelerates research and innovation, in favour of the hydrogen industry, and that guarantees reliable and comparable measurement data for grid operators, regulatory bodies and users.

The metrological efforts needed to support the hydrogen supply chain for mobility applications, for example for ground transportation, are specifically challenging. Key needs to address cover the development of measurement and standards to analyse the quality of hydrogen for fuel cells vehicles and the provision of traceability for flow metering and the demonstration of compliance with legal metrology requirements for type approval of the Hydrogen Refuelling Stations.

Key points to be discussed:

- Define the use case: "hydrogen supply chain for mobility, from production and compression to transportation, storage and use (e.g. ground transportation)"
- Identify the standing metrological challenges of the use case
- Prioritisation of these metrology challenges for the short and long term and needs for joint research and development



15:15 ☕ 16:00

POSTERS - 16:00 to 17:30**MECHANICS**

- **Investigations on factors affecting force calibration**
Mr BINOW - SASO / Saudi Arabia
- **Metrology at the service of weighing**
Mr FOSSI - COFIP / France
- **Prototype of an innovative balance based on the diamagnetism of pyrolytic graphite - optical force balance based on the diamagnetism of pyrolytic graphite (60ng-1µg)**
Mr NOVIANT - LNE / France
- **First measurements with a milligram electrostatic force balance at LNE**
Mr THOMAS- LNE / France
- **Verification of a threaded limit gauge by CMM - continuous scanning method**
Mrs DIAFAT - FERHAT ABBAS UNIVERSITY OF SETIF / Algeria
- **Metrology in ballistics: towards the implementation of the main measurement techniques with a typical evaluation of the associated uncertainties**
Mr ELKAROUS - MILITARY ACADEMY / Tunisia
- **Numerical investigation of the heat transfer of a turbulent jet blown through staggered obstacles using the L E S method**
Mr KHELIL - CHLEF UNIVERSITY / Algeria
- **Experimental and numerical study of a multi-jet system with diffusers equipped with unbalanced lobes in positions**
Mr BRAIKIA - CHLEF UNIVERSITY / Algeria
- **Portable Linear Displacement Transducer Calibration as Solution for mechanical manufacturing**
Mr NEVES - IPQ / Portugal
- **Robotisation in pipette calibration**
Mr SHOVAL - QCC CALIBRATION TECHNOLOGIES / Israel
- **The state of the art of metrological control of cinemometers in Spain**
Mr RUIZ GONZALEZ - CEM / Spain
- **Traceability for contact probe and stylus instrument measurements**
Mr YANDAYAN - TUBITAK UME / Turkey
- **Development of a primary standard of periodic pressure disturbances with interface liquid water –dry air**
Mr DIAZ TEY - UNIVERSIDAD DE COSTA RICA / Costa Rica

POSTERS - 16:00 to 17:30**DIGITALISATION**

- **Engineering of calibration system for power supplies**
Mr LOGGIA - TRESICAL BENELUX / Belgium
- **A digital calibration certificate generator software application**
Mr BROWN - PTB / Germany
- **VIM* : Beneficial contribution of digitalization in a training sequence**
Mrs CHERIK - LNE / France

MACHINE LEARNING AI

- **Functional safety assessment of an AI sensor according to IEC 61508**
Mr TARRISSE - INERIS / France

**ELECTROMAGNETISM**

- **Traceability routes for magnetic measurements**
Mr COISSON - INRIM / Italy
- **Fabrication and characterization of a guarded-type low frequency current comparator for resistance ratio measurements**
Mr ROLLAND - BIPM / France
- **Miniaturized Pulsed Magnet Station for Physical Properties Measurement**
Mr LEOTIN - LNCMI-CNRS / France

POSTERS - 16:00 to 17:30



CHEMISTRY

- **ACTRIS - CiGas side-by-side interlaboratory comparison of new and classical techniques for formaldehyde measurement**
Mrs SALAMEH - IMT NORD EUROPE / France
- **Toward a better monitoring of ammonia and greenhouse gases emissions from livestock production : the quantiAGREMI project**
Mr FOUQUEAU - LNE / France
- **Substitution weighing in analytical nuclear chemistry**
Mr JACOBSSON - EUROPEAN COMMISSION, JOINT RESEARCH CENTRE (JRC) / Belgium
- **Accurate quantification of the bioaccumulation of titanium dioxide particles**
Mrs NOIREAUX - LNE / France
- **Uncertainty of an empirical equation for primary pH_T values of artificial seawater**
Mrs SCHÄFER - PTB / Germany
- **TOXinTRANSPORT : project about toxicological, chemical and physical characterizations of particles in the cabin air of TRANSPORT in movement**
Mrs QUERON - INERIS / France
- **The preparation of certified reference materials of aqueous sucrose solutions for regulatory purposes and industrial control of sugar content in foods**
Mrs SAEZ-SERRANO - CEM / Spain
- **Sensitive real-time detection of metal concentrations in aqueous solution using micro-plasma emission spectroscopy**
Mrs DAS - METROLOGY RESEARCH INSTITUTE, AALTO UNIVERSITY / Finland
- **Trace Water Vapor Analysis with FT-IR Spectrometer**
Mr AHMEDOV - TUBITAKE UME / Turkey
- **Olfactometry (Environmental Odour Pollution). Calibration of Olfactometers for detection according to EN 13725**
Mr SIMOES - TRESCAL / Spain
- **Regulatory framework to water meters for uses other than clean water in Spain**
Mrs CALZADO - CEM / Spain

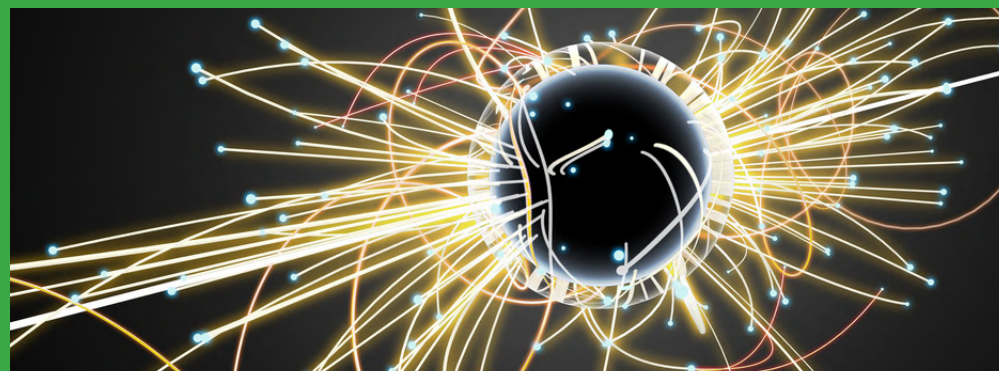
POSTERS - 16:00 to 17:30

FLOW

- **Towards dynamic calibrations in flow metrology**
Mr WARNECKE - PTB / Germany
- **Free sheet measurements in open channels in the region of Madrid**
Mr MARTIN-LOPEZ - CANAL DE ISABEL II / Spain

IONIZING RADIATION

- **High energy photon reference radiation beam for radiation protection based on medical LINAC facility**
Mr BORDY - CEA LIST LNE LNHB / France
- **Development of a primary reference standard for neutron metrology between a few keV and a several MeV neutron energy**
Mr PETIT - IRSN / France
- **The Politecnico di Milano at the service of radiation protection: calibrations and proficiency testing**
Mr GARLATI - POLITECNICO DI MILANO / Italy



WELCOME APERITIVE



..... 17:30

To close this first day, all the CIM participants will meet at the Metrology Village, on the exhibition. A relaxing moment to share a drink all together and dedicated to the good mood!

S3 MACHINE LEARNING

 Mr Guillaume AVRIN - LNE / France

KEYNOTE

- 09:00** **Uncertainty and statistical learning : propagation of input uncertainty in metrological applications**
Mr COQUELIN - LNE / France
- 09:15** **Challenges of sensor networks in smart cities with applications from air quality monitoring**
Mr TANCEV - METAS / Switzerland
- 09:30** **Visual inspection on CMM - OPTIV multisensor CMM beyond metrology**
Mr STEFFENS - HEXAGON / France
- 09:45** **The "Metrology for Artificial Metrology in Medicine (M4AIM)" programme of PTB**
Mr RABUS - PTB / Germany
- 10:00** **Epistemic and aleatoric uncertainty in soft metrology**
Mrs VALLEJO - INSTITUTO TECNOLÓGICO METROPOLITANO / Colombia
- 10:15** **GUM-compliant neural network robustness verification**
Mr LUDWIG - PTB / Germany

10:30  11:15

S4 AC/DC ELECTRICITY

 Mr Oriano BOTTAUSCIO - INRIM / Italy

KEYNOTE

- 09:00** **The European Metrology Network on Smart Electricity Grids: key metrology support to implementing the EU Green Deal strategy**
Mrs CROTTI - INRIM / Italy
- 09:15** **Dynamic characterization of current transducers with more than 100 A at audio frequencies**
Mr Ohlrogge - TESTO INDUSTRIAL SERVICES GMBH / Germany
- 09:30** **Coaxiality of the Thompson-Lampard calculable capacitor and its applications**
Mr THEVENOT - LNE / France
- 09:45** **Progress in the alignment of the main electrode bars of the BIPM calculable cross-capacitor**
Mr MORENO - BIPM / France
- 10:00** **New electric charge measurement system at CEM**
Mr RASO ALONSO - CEM / Spain
- 10:15** **On alternative DAC linearity testing traceable to length unit**
Mr IMANALIEV - LNE / France

10:30  11:15

METROLOGY IN THE LOOP OF THE CIRCULAR ECONOMY

09:00 **Presenter: Mr Jean-Rémy FILTZ - LNE / France**

With: Mrs Paola FISICARO - LNE / France
Mrs Dominique DARMENDRAIL - BRGM / France
Mr Bert van BAVEL - NORWEGIAN INSTITUTE FOR WATER RESEARCH / Norway
Mr Teemu NAYKKI - FINISH ENVIRONMENT INSTITUTE / Finland
Mr Victor MARTIN LOPEZ - CANAL DE ISABEL II / Spain
Mrs Nathalie GUIGUES - AQUAREF / France

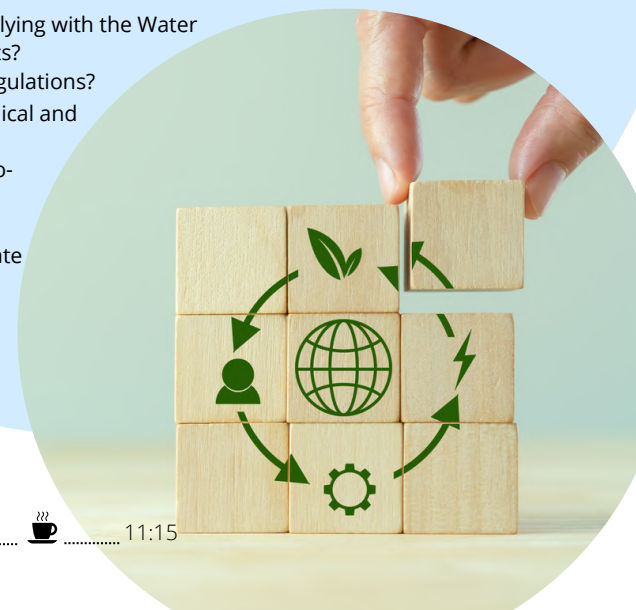
The circular economy is a key concept for the life cycle management of resources. The main objective is to significantly reducing the negative impacts of resources extraction and (re)use on the environment and the human health.

As an example "Water" resource, is a vital element of our life. The management of the life cycle of waters (surface waters, drinking water, and ocean) must now respect the European requirements on water.

As a result, standardized methodologies are applied and are continuously developed. Metrology, research and standards allows contributing to a better monitoring and use of the water.

Key points to be discussed:

- Which are the impacts on the agro-food chain, on the ecosystems and on our healthcare?
- How Metrology can help for complying with the Water Framework Directive requirements?
- What are the related European regulations?
- How metrology is a relevant technical and scientific discipline for monitoring endocrine disruptors, drugs, micro-plastics in water?
- How Metrology can support the development of even more accurate methodologies?



10:30  11:15

11:15

PLENARY SESSION

LIMITLESS METROLOGY AT YOUR FINGERTIPS

Introduction **Mr Thomas GRENON - LNE / France**
Mr Benjamin DELOZIER - DGE / France

CHAIRMAN **Mr Martin MILTON - BIPM / International**



Fueling Industry 4.0 through quantum sensors and standards

Mrs Barbara GOLDSTEIN - NIST / USA



Metrology needs for climate and ocean community

Mr Christoph WALDMANN - MARUM / Germany



Life at cellular scale: observe, detect or measure?

Mr François LACOMBE - MAUNA KEA TECHNOLOGIES / France

INDUSTRY 4.0 "OFFLINE TO INLINE MEASUREMENTS"

13:45

Presenter: Mr Wolfgang LUBCKE - ENDRESS+HAUSER / Germany

With: Mr Michael MAIWALD - BAM / Germany
Mr François HENNEBELLE - UNIVERSITÉ DE BOURGOGNE/ France
Mr Pete LOFTUS - EVALU8ION / United Kingdom
Mr Cosimi CORLETO - STIL MARPOSS / France

Quality-relevant measurements are getting closer to the point of "Process or manufacturing"

Technology advancements, continuous cost pressure combined with challenges for qualified personnel the manufacturing industry measurements already found ways directly to measurements in the shop floor.

To further enlarge this approach the round table takes a closer look at what is called "Lab to field" in the process industry with a long history since over 100 years.

Key points to be discussed:

- Analogies and differences in "Manufacturing and Process industry"
- Best practises in manufacturing "measurement to shopfloor"
- "Lab to process" lessons learned and technology outlook
- Off-line to inline and impact on comparability and traceability
- Outlook on what the manufacturing industry could learn from the process



15:15 ☕ 16:00

S5 FLOW

 **Mrs Isabelle CARE - CETIAT / France**

KEYNOTE

- 13:45** Measurement infrastructure for hydrogen supply chains
Mr VAN DER VEEN - VSL / The Netherlands
- 14:00** Validation of the primary nano-flow measurement system
Mr ROMIEU - CETIAT / France
- 14:15** On-site calibration and verification of a mass flowmeter of aerosol samplers
Mrs HEGRON - CT2M / France
- 14:30** Trace water measurement at LNE-CETIAT
Mr GEORGIN - LNE/CETIAT / France
- 14:45** Down scale calibration method for small critical flow venturi nozzles
Mr LORENZ - PTB / Germany
- 15:00** Establishing metrology standards in microfluidic devices
Mr OGHEARD - CETIAT / France

15:15 ☕ 16:00

S6 CHEMISTRY

 **Mrs Michela SEGA - INRIM / Italy**

KEYNOTE

- 13:45** Metrology support for carbon capture utilisation and storage
Mrs DE KROM - VSL / The Netherlands
- 14:00** Highlighting molecular markers of PM sources: benefits of non-target screening strategy based on HRMS combined with multivariate statistical analyses
Mr ALBINET - INERIS / France
- 14:15** Impact of different particle sources on the measurement of PM by low-cost sensors.
Mr SPINELLE - INERIS / France
- 14:30** Autonomous aerial swarm robotics for the management of the environmental and health impact in a post-accident situation
Mr BERTHELOT - INERIS / France
- 14:45** EDC-WFD: a project that successfully improve the reliability of estrogens' measurements in aquatic as required for regulatory monitoring
Mrs LALERE - LNE / France
- 15:00** Uncertainties of spectrophotometric pH from fresh to sea water
Mr PELLEGRINO - IPQ / Portugal

15:15 ☕ 16:00

S7 DIGITALISATION

 Mr Sascha EICHSTAEDT - PTB / Germany

KEYNOTE

- 16:00** **Metrology for sustainable smart cities**
Mrs JUNG - PTB / Germany
- 16:15** **How to federate metrology 4.0 in industries ?**
Mrs COURTOIS - DELTAMU / France
- 16:30** **Redesign of metrological services : towards the extension of traceability chain for industrial innovations and applications**
Mr GRASSO TORO - METAS / Switzerland
- 16:45** **Digital TILSAM systems – providing FAIR data and SI traceability to smart sensor networks for air quality monitoring**
Mr PETERSEN - DFM / Denmark
- 17:00** **Machine-readable data and metadata of international key comparisons in radionuclide metrology**
Mr COULON - BIPM / France
- 17:15** **The Units of Measurement Interoperability Service (UMIS) and FAIR Digital Units of measurement**
Mr CHALK - UNIVERSITY OF NORTH FLORIDA / USA

S8 DIMENSIONAL MECHANICS

 Mr François HENNEBELLE - UNIVERSITE DE BOURGOGNE / France

KEYNOTE

- 16:00** **Improving the accuracy of dimensional measurements with 3D X-ray microscopes**
Mr VILLARRAGA-GOMEZ - ZEISS / USA
- 16:15** **Hexagon Automation: How metrology drives productivity?**
Mr SCHMID - HEXAGON / France
- 16:30** **Investigation of the dimensional performances of industrial XCT**
Mrs OBATON - LNE / France
- 16:45** **Modeling of a measuring chain including a CT system to estimate the dimensional uncertainties of additive manufacturing parts**
Mr ENNIAFA - CETIM / France
- 17:00** **Cofrac accreditation of an innovative method for checking measuring arms in the shopfloor and assessments of associated uncertainties**
Mr HENNEBELLE - UNIVERSITE DE BOURGOGNE / France
- 17:15** **Investigations of precise displacement actuators to provide traceability for contact probe and stylus instruments**
Mr YANDAYAN - TUBITAK UME / Turkey

EXHIBITOR NIGHT PARTY

S9 GAS ANALYSIS

 Mrs Martine CARRE - AIR LIQUIDE / France

KEYNOTE

- 16:00** **Novel SI traceable gaseous reference materials for calibrating chemical ionisation mass spectrometers**
Mrs HRISTOVA - NPL / United Kingdom
- 16:15** **Combination of OFCEAS Spectroscopy and low pressure sampling, for impurities measurement in hydrogen production & storage**
Mr NATON - AP2E / France
- 16:30** **Purity analysis for the production of primary gas mixtures**
Mrs ROLLE - INRIM / Italy
- 16:45** **Production of gaseous reference materials: a technical challenge**
Mr LACHAUD - AIR LIQUIDE FRANCE / France
- 17:00** **A new look at the adsorption and desorption dynamics in cylinders**
Mr PERSIJN - VSL - The Netherlands
- 17:15** **Sampling and characterisation of some polycyclic aromatic hydrocarbon (PAHs) in natural gas samples by TD-GC-MS**
Mr VORIN - GRTGAZ RICE - France



EXHIBITOR NIGHT PARTY

Reserved for the exhibitors only, organised by
Global Industrie. More information soon...

THE IMPACT OF METROLOGY IN THE DIGITAL TRANSFORMATION: CHALLENGES AND OPPORTUNITIES

09:00

Presenter: Mr Sascha EICHSTAEDT - PTB / Germany

With: Mr Romain COULON - BIPM / France
 Mr Ulrich KAISER - ENDRESS+HAUSER / Germany
 Mrs Dorothea KNOPF - PTB / Germany
 Mr Robert HANISH - NIST / USA
 Mr Sami KOSKINEN - BEAMEX / Finland
 Mr Franck TARENA - TRESICAL / France

Digital technologies have become an essential part of our day-to-day tool set. These digital tools have changed the way we work, communicate and perform businesses rapidly and fundamentally.

This digital transformation has led to novel approaches such as remote access and control, cloud infrastructures and artificial intelligence in all areas. Hence, the digital transformation affects and influences the metrology landscape.

At the same time, metrology can itself impact and benefit the digital transformation in economy and society: machine-readable certificates, digital traceability, data quality, remote calibration, and digital reference standards are just some examples.

Key points to be discussed:

- How will metrological traceability change with digital transformation? What role will it play in digitised industries?
- What are challenges faced by the panelist's organizations in moving forward with digitalisation?
- Reliable and high-quality data is the basis for trust and confidence in AI. What are opportunities for metrology?



10:30 ☕ 11:15

S10 PHOTONICS

Mrs Kate CHERNYSHEVA - VSL / The Netherlands

KEYNOTE

- 09:00** Development and validation of a real-time gas quantification algorithm for airborne hyperspectral data
 Mr GUYOT - TELOPS / Canada
- 09:15** RevStdLED: project towards the revision of standards for LED lamps and luminaires performances measurements and uncertainty evaluation
 Mr ELOI - LNE / France
- 09:30** Metro-PV: metrology for enhanced performance photovoltaic technologies and application (IoT)
 Mr DUBARD LNE / France
- 09:45** BRDF measurements on commercial spectrophotometer
 Mr VAN NIJNATTEN - OMT SOLUTIONS / The Netherlands
- 10:00** Characterization of pillar hall test chip structures using reflectometry technique
 Mr DANILENKO - AALTO UNIVERSITY, METROLOGY RESEARCH INSTITUTE / Finland
- 10:15** A multi-wavelength laser calorimeter for optical thin film characterization
 Mr OĞUZ AYTEKIN - TÜBİTAK UME / Turkey

10:30 ☕ 11:15

S11 UNCERTAINTY, DATA ANALYSIS

Mr Alexandre ALLARD - IFREMER / France

KEYNOTES

- 09:00** MATHMET, the Datascience network for metrology
 Mr FISCHER - LNE / France
- 09:15** Mathmet measurement uncertainty training activity: lessons learned from a European community workshop
 Mr CAEBERGS - FPS ECONOMY / Belgium
- 09:30** How virtual experiments can aid a targeted decision about exclusion criteria for patients carrying implants during hyperthermia treatments
 Mr BOTTAUSCIO - INRIM / Italy
- 09:45** Metrological and statistical logistic regressions in conformity assessment
 Mrs MELIN - RISE / Sweden
- 10:00** Dynamic metrology in practice: from concepts to calibration services
 Mr OGHEARD - CETIAT / France
- 10:15** Spatio-temporal uncertainty propagation for interpolated temperatures in measurement rooms
 Mr VERDURMUDI - PTB / Germany

10:30 ☕ 11:15

POSTERS - 11:15 to 12:45

THERMOMETRY, HYGROMETRY

- **Determining water-vapour enhancement factors in ultra high pure process gases at VSL**
Mr PANMAN - VSL / The Netherlands
- **Evaluation of thermal radiation on temperature measurements in climatic chamber**
Mr FAVREAU - CETIAT / France
- **Commissioning of gas-controlled heat pipe (GCHP) temperature generators for thermometers calibration**
Mr FAVREAU - CETIAT / France
- **Investigation of the Self-Heating effect of Pt100 Thermometers for Measurements in Liquid Bath and in Climatic chamber**
Mr ANANG - GHANA STANDARDS AUTHORITY / Germany
- **Expanding the range of initial temperature measurment using crystal optical thermal transducer**
Mr STEPANYAK - LVIVSKA POLYTECHNICA / Ukraine
- **Realization of new fixed point cells at the LNE-Cnam**
Mr PAVLASEK - SMU / Slovak Republic
- **Realization of Fe-C Eutectic Point at UME**
Mr OĞUZ AYTEKIN - TÜBİTAK UME / Turkey
- **New high-temperature references for industrial applications**
Mr BOURSON - LNE / France
- **Check standard in hygrometry**
Mr SANCHEZ - INM / Colombia



POSTERS - 11:15 to 12:45

BIOLOGY

- **The discrimination threshold: a new criterion based on measurement uncertainty to define the conditions of use of analytical methods in research**
Mr ANDANSON - INRAE / France
- **New Sterilization Requirements: new Annex 1 EU GMP (steam requirements)**
Mr ESPAGNOL - QTI TRESICAL / Spain
- **Metrology in Health - Electromedecine**
Mr SIMOES - TRESICAL / Spain



MATERIALS

- **Theoretical and numerical studies of the Brillouin function and its inverse**
Mr RICKABY - TRESICAL / United Kingdom
- **An Update on the European Metrology Network (EMN) for Advanced Manufacturing**
Mr FAVRE - LNE / France
- **Sensor for real-time measurement of hydrogen concentration in gas networks**
Mr MOYNET - CMR GROUP / France
- **Influence of the thermal gradients on residual stress and distortions for metallic parts made by additive manufacturing**
Mr FOURNET-FAYARD - LNE / France
- **Permelectives poperties measurement of low density polyethylene films**
Mr HASSINI / UNIVERSITY OF MOSTAGANEM - Algeria
- **Eddy-Current directional probe for in-line monitoring of automated carbon fiber reinforced polymers production**
Mr MUSSATAYEV - UNIVERSITY OF BRISTOL / United Kingdom
- **An ellipsometer in reflection to characterize of transparent thin films homogeneity**
Mr PIOMBINI - CEA / France



POSTERS - 11:15 to 12:45



NANOTECHNOLOGIES

- **Area-selective growth of Zinc Oxide nanowire arrays for improved piezoelectric output**
Mr ANANG - TU BRAUNSCHWEIG / Germany
- **Hybrid metrology for nanometric energy harvesting devices**
Mrs SIAUDINYTE - VSL / The Netherlands

QUALITY, ACCREDITATION

- **M.E.S. and M.D.A for an efficient metrology system**
Mr CREPET - PRODUCTYS / France
- **ISO 10012: assess staff competence and the impact of a training programme**
Mr BOZONNET - INDEPENDANT / France
- **Accreditation of testing (qualification) in clean rooms**
Mr CAMARGO - TRESICAL BRAZIL / Brazil
- **Performance qualification of a Novel transportable dew point calibrator**
Mr FARLEY - QROMETRIC / United Kingdom
- **Metrology and the Green Deal**
Mrs BLANC - DELTAMU / France
- **State of the art on-site characterization of climatic chambers for industry 4.0**
Mr HAWES / QROMETRIC / United Kingdom
- **Risk approach in the processes of calibration activities within the scope of the Inmetro Pressure Laboratory (Lapre)**
Mr MAGALHAES - INMETRO / Brazil
- **Calibration capability of acoustic laboratory at NMCC**
Mr ALADHYANI - NMCC / Saudi Arabia
- **S8000 -100 : First chilled mirror on the market to reach -100°Cdp**
Mr MEILLER - PST / France
- **Market Surveillance Activities of Inmetro and the Case of Electrical Cables-Wires and Jewelry**
Mr SMARCARO DA CUNHA - INMETRO / Brazil

POSTERS - 11:15 to 12:45

UNCERTAINTIES

- **Development of a methodology and software for characterizing nuclear material by weighing**
Mrs DOMENECH - CT2M / France
- **Deconvolution-based methods to extract uncertainty components**
Mr FERRERO - POLITECNICO DI MILANO / Italy
- **Uncertainty in U-tube Coriolis mass flow meters for liquid hydrogen measurements**
Mrs GUGOLE - VSL / The Netherlands
- **Urine cytology - External quality assessment as a tool to compare laboratory measurement uncertainties**
Mrs MARECHAL - AGLAE / France
- **Experience from International Laboratory Comparisons/ILC performed in different fields**
Mr KALLGREN - SWEDISH METROLOGY AND QUALITY AB (SMQ) / Sweden
- **Validation of the choice of methods for evaluation of the uncertainties of micropipette calibration using the Monte-Carlo simulation method.**
Mrs MAKHLOUF / NAFATI - AEQUO LTD / France
- **Interlaboratory comparison for climate chamber characterization**
Mrs Piette - FPS ECONOMY / Belgium
- **Towards measuring instruments designed for calibration**
Mrs DOBRE - FPS ECONOMY / Belgium

PHOTONICS

- **Compact type of Illuminometer Calibration System using integrating sphere**
Mr BAE - SICT IN TRESICAL GROUP / South Korea
- **Measuring spectral transmittance of light diffusing samples**
Mr VAN NIJNATTEN - OMT SOLUTIONS BV / The Netherlands
- **Online detection of reactive gases in clean room manufacturing environment**
Mr RAJAMAKI - VTT MIKES / Finland



S12 DIGITAL CALIBRATION CERTIFICATES



Mrs Miruna DOBRE - SPF ECONOMIE / Belgium

KEYNOTE

13:45 GEMIMEG-II - How Metrology can go digital...

Mr ENGEL - SIEMENS / Germany

14:00 Developing and testing an industrial application

Mr KOSKINEN - BEAMEX / Finland

14:15 The Importance of dynamic controlled vocabulary in the context of metrological interoperability use cases

Mrs NEUMANN - PTB / Germany

14:30 Method for verifying measurement uncertainties in a digital calibration certificate by using scope of accreditation

Mr DANACI - TUBITAK UME / Turkey

14:45 Digital calibration workflows – challenges for calibration systems and calibration laboratories

Mr MENDE - SPEKTRA / Germany

15:00 ☕ 16:00

S13 NANOTECHNOLOGIES



Mrs Jasmine PETRY - NESTLE / Switzerland

KEYNOTE

13:45 Traceable refractive index, size, and concentration determination of nanoparticles in liquid by metrological flow cytometry

Mrs KUIPER - VSL / The Netherlands

14:00 ELENA: a European project for electrical nanoscale metrology in industry

Mr PIQUEMAL - LNE / France

14:15 Assessment of the measurement uncertainty related to nanoparticles characterisation by "SINGLE-PARTICLE"-ICP-MS using an in-house data treatment software

Mrs BASTARDO FERNANDEZ - LNE / France

14:30 Thermal nanoimprint lithography fabrication and metrological characterization of step grating structures on polymethyl methacrylate

Mr PAREDES - TEKNIKER / Spain

14:45 Towards calibrated measurements of dopant concentrations on vertical nanowires by scanning microwave microscopy

Mr KAJA - LNE France

15:00 Nanoelectrical characterisation of vertical nanowires used for energy harvesting

Mr ZHI - PTB / Germany

15:15 ☕ 16:00

WHAT DOES IT MEAN TO BE A METROLOGIST IN THE 21st CENTURY?

13:45

Presenter: Mr Hugo LEHMANN - METAS / Switzerland

With: Mr Jean-Clair BALLOT - IUT / France

Mrs Michèle DESENFANT - LNE / France

Mr François DAUBENFELD - EX-STELLANTIS / France

Mrs Peggy COURTOIS - DELTAMU / France

Mr Tim OSBORNE - AWPT / USA

Mr Daniele MARI - EPFL / Switzerland

Technological progress without the pertinent measurement capabilities is simply not possible. Thus, metrology as a basic infrastructure of our modern world contributes to the development of technology.

On the other hand, new technologies and new trends also affect metrology. Artificial intelligence, machine learning, advanced manufacturing, IoT, the second quantum revolution have a huge potential and are or will be broadly used in technology and adopted by society.

It is therefore key to adapt to them whatever your area of expertise. This holds especially for metrology, which is present in most industrial and lab processes.

Key points to be discussed:

- What does it mean to be a metrologist in the 21st century?
- What are the future needs of metrologists?
- Which skills are relevant?



This round table will tackle these questions, share some insights and try to give clues how to adapt to these new trends.

15:15 ☕ 16:00

Electrical Nanometrology Stakeholder session "ELENA project"

The measurement of electrical properties at the nanoscale allows evaluating the performances of nanomaterials developed for consumer electronics, innovative quantum technologies, and IoT applications. Local DC resistance and high- frequency (HF) impedance are among the most prominent properties to measure for nowadays advanced devices.

Currently, Conductive Atomic Force Microscopy and Scanning Microwave Microscopy are the two main techniques used for the characterisation of these properties. Although powerful, they suffer from major drawbacks: their cost, complicated implementation, and lack of traceability. Measurements are thus unreliable.

The project ELENA aims at pioneering the traceability of such measurements, with stated uncertainties. It also aims at increasing the affordability of these methods by developing and testing cost effective instrumentation and reference standards spanning the range from DC to GHz.

Robust calibration methods and good practice guides using simplified uncertainty budgets will underpin this effort.

WELCOME

16:00 Overview EMPIR project "20IND12 Elena"
Mr PIQUEMAL - LNE / France

16:10 WP 1: Instrumentation for electrical nano-metrology in the frequency range DC to GHz
Mr HOFFMANN - METAS / Switzerland

16:30 WP 2: Calibration methods for two electrical Scanning Probe Microscope (eSPM) techniques: C AFM and SMM
Mr KAJA - LNE / France

16:50 WP 3: 3D multi-physics modelling, based on analytical or numerical approaches
Mr GAUTIER - CNRS / France

17:10 WP4: Simplified uncertainty budgets for industrial use
Mr HERTWIG - BAM / Germany

17:30 DISCUSSION

S14 QUALITY, ACCREDITATION

 Mr Sébastien LABORDE - COFRAC / France

16:00 Management of laboratory competence: what is at stake?
Mr PIERSON - LABOPERF / France

16:20 Application of optimisation methods of measuring equipment calibration and verification frequencies at Safran Group
Mr BURY - SAFRAN GROUP / France

16:40 ISO conformity decision risk applications for asset managers
Mr OSBORNE - A2LA WORKPLACE TRAINING / USA

17:00 Uncertainty in measurement for quality control in food industry
Mrs PETRY - NESTLE / Switzerland



GALA DINNER

19:30

Take a break from everyday life and climb aboard the restaurant boat Bateaux Lyonnais.

Indulge in a gourmet meal and explore Lyon's majestic landscapes by night, while listening to commentary. There's no doubt: those lucky few who attend this evening dinner will share in a genuine signature moment.

Places are limited.

S15 BIOLOGY



Mrs Sophie VASLIN - LNE / France

KEYNOTE

09:00

Measurement challenges of quantifying milk protein allergens in foods

Mr BUNK - NIST / USA

09:15

Development of a methodology to study the induced effects of particles from the railway environment on lung cells

Mrs DELATER - INERIS / France

09:30

Developing SI-traceable reference materials to address challenges in intracellular delivery

Mrs BRIONES - NPL / United Kingdom

09:45

New method based on minimum deviation for automated traceable absolute refractive index measurements

Mrs KUIPER - VSL / The Netherlands

10:00

Uncovering the importance of nucleic acid extraction for quantification - two bacterial case studies

Mrs BOGOZALEC KOSIR - NATIONAL INSTITUTE OF BIOLOGY / Slovenia

10:15 ☕ 11:15

S16 THERMOMETRY, HYGROMETRY



Mrs Dolores DEL CAMPO - CEM / Spain

KEYNOTE

09:00

Techniques for measuring the temperature of cold seas and sea ices

Mr LE MENN - SHOM / France

09:15

SI-traceable inline measurements of water content in biomass at CHP plants

Mr KJELDSEN - DTI / Denmark

09:30

An industrial approach towards traceable moisture measurements in microwave domain

Mrs TALLAWI - CETIAT / France

09:45

Phosphor thermometry: lifetime calibration curve (Mg₄FG₀₆: Mn) for traceable surface temperature measurement up to 400 °C

Mr DAM SORENSEN - DTI / Denmark

10:00

A new measurement infrastructure for trace water in ultra-pure process gases

Mr FERNICOLA - INRIM / Italy

10:15

Assigning thermodynamic temperatures to a set high-temperature fixed points in the range 1400 K to 3000 K

Mr SADLI - LNE / France

10:30 ☕ 11:15

S17 MATERIALS



Mr Jean-Rémy FILTZ - LNE / France

KEYNOTE

09:00

Development and testing of a graphene-based thermal strap for space applications

Mr HOGSTROM - VTT / Finland

09:15

Scanning thermal microscopy modeling by 3D FEM in vacuum and in air conditions

Mrs DOURI - LNE / France

09:30

Assessment of uncertainty associated with very high temperature thermal diffusivity measurements

Mr HAY - LNE / France

09:45

Metrological sound reference products for quality assurance and quality control measures in material emissions testing

Mr RICHTER - BAM / Germany

10:00

Metrological traceability of measurement data from nano to small-microplastics for a greener environment and food safety

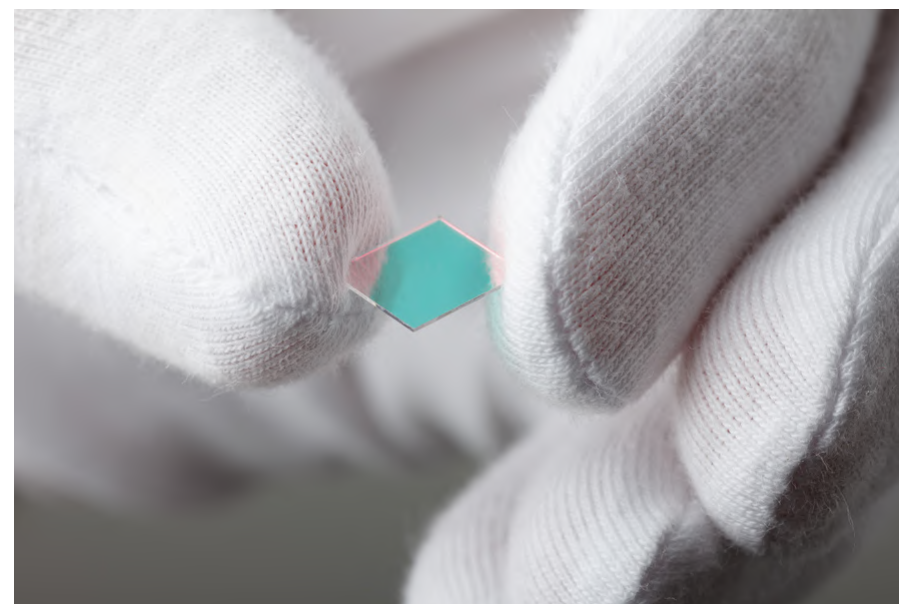
Mr VAN BAVEL - NORWEGIAN INSTITUTE FOR WATER RESEARCH / Norway

10:15

A new branch of metrology: industrial positronics / damage measurements

Mr REY - POSITHOT / France

10:30 ☕ 11:15



METROLOGY CHALLENGES IN MEDICAL MEASUREMENTS: DETECTION, DIAGNOSIS AND DIGITALISATION

11:15

Presenter: **Mrs Jennifer CLARKE** - NPL / United Kingdom

With: **Mr Richard LUXTON** - INSTITUTE OF BIOSENSING TECHNOLOGY / United Kingdom
Mr Alex DEXTER - NPL / United Kingdom
Mr Stéphane GUEU - ESSLOR / France
Mr Jan WOLBER - GE HEALTHCARE / United Kingdom
Mr Lionel DREUX - GMED / France

The COVID-19 pandemic has shown that the world needs to be better prepared to respond to global health emergencies.

Access to world class care for as many patients as possible relies on faster and more accurate diagnosis. In addition, there is movement away from clinical settings for treatment, and a trend towards access to home-based healthcare. Supporting earlier diagnostics through improved digital infrastructures will provide more effective disease management to increase confidence and reproducibility in diagnosis and treatment.

Measurement infrastructure is needed to accelerate innovation and technological advances that enable to diagnosis, monitoring, treating, curing and prevention of a wide range of diseases and reduce health inequalities. Metrology supports the translation of technologies from the research environment into novel medical devices.

This round table will see several actors from the medical and healthcare industry sharing their views on the role of metrology in medical measurements and the different roles of industry, metrology, regulators and academia.

Key points to be discussed:

- How do we coordinate to promote the benefits of metrology within medical measurements?
- What challenges will the sector face in future?
- Where should metrologists be focusing their effort?



S18 QUANTUM TECHNOLOGIES

 **Mr Ivo DEGIOVANNI** - INRIM / Italy

KEYNOTE

11:15

The importance of standards in the emerging quantum economy

Mr PRIOR - NPL / France

11:30

Programmable quantum current generator : new developments

Mrs DJORDJEVIC - LNE / France

11:45

Quantum information theory and noise characterization in quantum measurements

Mr AHMEDOV - TUBITAK UME / Turkey

12:00

European effort to develop metrology for the implementation security of quantum communication (an EMN-Q Project)

Mr GRAMEGNA - INRIM / Italy

12:15

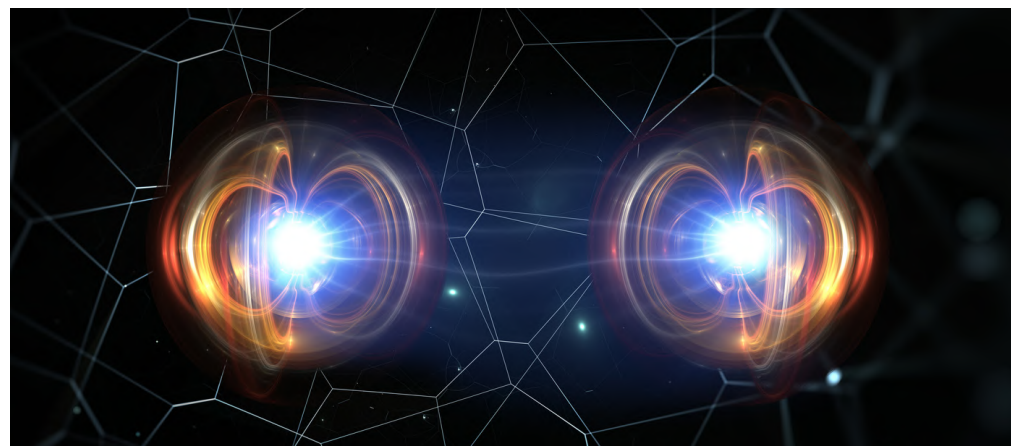
Towards quantum thermometry

Mr FERREUX - LNE / France

12:30

Metrology for quantum computers

Mr AGARWAL - NPL / United Kingdom



CLOSING SESSION

12:45

Announce of the best lecture and the best poster presentation.
 Prize-giving ceremony.