The CIM (International Congress of Metrology) is a unique crossroads between R&D and industrial applications. A single location, gathering together those who create metrology for today and for the future, with those who actually use it, or will be using it. This rendition of the congress highlights the role of measurements in industries and laboratories, which are becoming ever more automated, digitalised and interconnected, without forgetting the proposed changes to the SI units system, planned for 2018.

You are hoping to:
• Improve your measurement, analysis and test processes, whilst reducing any inherent risks,
• Monitor evolutions in techniques, R&D progress, and learn more about practical industrial applications.

So, come and have a look at the wide range of subjects available, for all areas of interest: from the highly practical round table meetings, to the more in-depth coverage of other sessions. Simultaneous interpretation services are available for all oral conferences.

For posters, you can communicate directly with the speakers. Finally, this is a unique opportunity to find all those involved across the sector in a single location at the same time, the perfect chance to find “the right person” and “the right solution”. In short - to help build networks.

From the concept to the final product, including prototyping, the ENOVA Exhibition represents a point of convergence for technologies in Electronics, Measurement, Vision and Optics. It federates players in industry and research looking for innovative solutions regardless of the sector of activity. Aeromil, automotive, medical, agricultural... for start-ups, research institutes, universities, industrial and scientific centers, ENOVA offers a convivial environment for meetings and exchanges that facilitates direct contact between those who are seeking the most performing solutions and products and those who design them. In particular with respect to embedded systems, IoT and solutions for the Industry 4.0. All the technological building blocks necessary to tomorrow’s innovations are at ENOVA.

The association between ENOVA and the International Metrology Congress allows to find, on the same place and same dates a full and wide event.

We wish you an excellent visit!
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Mr SMID - CMI (Czech Republic)
Mr VILLAMANAN - University of Valladolid (Spain)

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The Metrology Village is set up in the living spaces of ENOVA Paris Show. The Village is dedicated to exhibitors who wish to be close to the Metrology topics and completes the Electronics, IoT, Prototyping, Measurement, Vision and Optics environments of ENOVA Paris exhibition. The Village is the heart of the Congress.

19 to 21 SEPTEMBER 2017
Paris expo Porte de Versailles
S1 METROLOGY CUSTOM-MADE ISSUES

Chairwoman: Jenny HULLY - NPL (United Kingdom)

9:00 Industry 4.0 and metrology centers
Mr PRIETO - LOMG / Spain

9:20 Metrology and pedagogy
Mrs BEAULIEU, Mrs ENGELS - LNE / France

9:40 Examinology, a development of metrology
Mr PELLEGRINO, Mrs DIAS - IPQ / Portugal

10:00 Good practices and uncertainty assessment process on AACMM
Mrs EL ASMAI - University of Burgundy / France & all

10:20 Management of reference measurement standards as part of smart metrology: gauge blocks
Mr POU, Mr DUBOIS - Delta Mu, Mr LEBLOND - PSA Group / France
When 1/10 of millimeter weights 400 T
Mr CARREZ, Mr EMAIN - AREVA NP / France

11:00-11:35 CIM Opening and Coffee Break

S2 FLOW METERING

Chairwomen: Isabelle CARE - CETIAT (France) and Elsa BATISTA - IPQ (Portugal)

9:00 Innovations in the field of traceable calibration of liquid milli-flow and micro-flow rates with other liquids than water
Mr BISSIG, Mr TSCHANNEN, Mr HUU - METAS / Switzerland

9:25 Recent improvements of the French liquid micro-flow reference facility
Mr OGHEARD, Mrs MARGOT, Mr SAVARY - CETIAT / France

9:50 Assessment of airflow measurement uncertainty at terminal devices
Mrs CARE - CETIAT, Mrs MELOIS - CEREMA / France

10:15 Cryogenic flow rate measurement with a Laser Doppler velocimetry standard
Mr FOULON, Mr LEHOT, Mr MAURY, Mr OUEDANI - CESAME Exadibit / France

10:40 The accuracy of gas conversion factors and the significance within gas flow calibration
Mr RICKABY - TRESCAL / United Kingdom

11:05-11:35 CIM Opening and Coffee Break

TUESDAY 19 SEPTEMBER

CONFORMITY DECLARATION: NEW ISO 17 025

9:10 Expected in mid-2017, the new version of the ISO/IEC 17025 standard tries to respond to some inadequacies in the current version. One of the major changes concerns measurement uncertainty and its use in declaring compliance.

Debates about key questions:
• What are the major changes in metrology?
• What are the new decision rules for declaring compliance?
• How should the risk approach be established?

Presenter: Mr LABORDE - COFRAC, Mrs MALACAIN - EA / France
With: Mr CLAUDEL - CETIAT / France, Mr DAUBELEN - PSA Group / France,
Mr LAUNEY - LNE / France, Mr VINSON - COFRAC / France,
Mr REPOSEUR - ACAC / France

TIME FLOW: 9:00-17:40
**S3 SI AND INNOVATIVE THERMAL MEASUREMENTS**

Chairwoman: Dolores DEL CAMPO - CEM (Spain)

- **11:35** The kelvin redefined
  - Mr MACHIN - NPL / United Kingdom

- **11:55** A metrological support dedicated to Raman-based distributed temperature sensing techniques applied for the structural health monitoring
  - Mr FAILLEAU - LNE / France & all

- **12:15** Measurement of temperature and gas concentration in a flame using a FTIR imager
  - Mr MANTILLA - CEM / Spain & all

- **12:35** Quantification of free and bound water in selected materials using dielectric and thermo-coulometric measurement methods
  - Mr BEN AYOUB, Mr GEORGIN - CETIAT, Mr ROCHAS - WAVES CONCEPT, Mr SABOUROUX - Fresnel Institute / France

**S5 METROLOGY IN MEDICAL LABORATORIES**

Chairwoman: Michela SEGA - INRIM (Italy)

- **11:35** Interlaboratory comparisons on the calibration of volumetric piston instruments
  - Mr GEYNET - CT2M / France

- **11:55** Monitoring of thermostatic chambers at EFS: metrology and risks analysis
  - Mr REIFENBERG - EFS / France

- **12:15** Measurement uncertainty in calibration and compliancy reporting of thermal cyclers
  - Mrs SPAN - Cyclertestn BV / The Netherlands

- **12:35** Comparison of infusion pumps calibration methods
  - Mrs BATISTA, Mrs GODINHO, Mrs FERREIRA, Mrs FURTADO - IPQ / Portugal

**S4 ELECTRICAL METROLOGY FOR INDUSTRY**

Chairman: Luc ERARD - LNE (France)

- **11:35** Calibration of the linearity of lock-in amplifiers
  - Mr CORMINBOEUF - METAS / Switzerland

- **11:55** EMPIR Project 15 RPT04 TracePQM: traceability routes for electrical power quality measurements
  - Mrs NOVAKOVA ZACHOVALOVA - CMI / Czech Republic & all, Mr PHILOMINRAJ - LNE / France

- **12:15** Low frequency and radiofrequency electrical metrology applied to 3D stacked circuits
  - Mr ALLAL - LNE / France

- **12:35** Advanced temperature control chamber for resistance standards
  - Mr PAYAGALA, Mr JARRETT - NIST / USA
### Applied Thermal Measurements

Chairmen: Miruna DOBRE - FPS Economy (Belgium) and Vito FERNICOLA - INRIM (Italy)

- **15:30** Some historical milestones of the metrology of thermal properties
  - Mr HAY, Mr HAFLEUR, Mr FILIZ - LNE / France

- **15:30** Water vapour metrology at PTB: from generators to airborne sensors
  - Mr WERHAHN, Mr NWABOR, Mr BUCHHOLZ, Mrs DESCHERMEIER, Mr EBERT - PTB / Germany

- **16:10** Good practice for hygrometric measurement in a specific application of the nuclear industry
  - Mr VASTY, Mr CHEVALIER - A+ Métrologie / France

- **16:30** Towards improved humidity measurements at high temperatures and transient conditions
  - Mr HOGSTROM - MIKES / Finland & all

- **16:50** A pan-European project for the improvement of radiation thermometry calibration and measurement capabilities
  - Mr SADLI - LNE-LCM-CNAM / France & all

- **17:10** EMPRESS: enhancing process efficiency through improved temperature measurement. Progress and outputs after two years
  - Mr PEARCE - NPL / United Kingdom & all

### SI and New Electrical Standards

Chairmen: Pierre GOURNAY - BIPM (France) and Maguelonne CHAMBON - LNE (France)

- **15:30** Change of electrical units in the New SI
  - Mr STOCK - BIPM / France

- **15:30** Towards the propagation of AC quantum voltage standards, the EMPIR ACQ-PRO Project
  - Mr CABALLERO, Mr DE AGUILAR, Mrs ALVAREZ - CEM / Spain

- **16:10** Establishing and application of programmable Josephson voltage standard at TUBITAK UME
  - Mr ARIFOVIC, Mr ORHAN, Mr KANATOGLU - TUBITAK UME / Turkey

- **16:30** On site comparison of quantum hall effect resistance standards, on-going comparison BIPMMrEMMrK12
  - Mr ROLLAND, Mr FLETCHER, Mr GOURNAY - BIPM / France

- **16:50** The enhanced performance of the DCC current comparator using AccuBridge technology
  - Mr BROWN, Mr POLLARDOLO - Measurements International / Canada

- **17:10** Establishing of traceability for waveguide S parameter measurements at LNE
  - Mr ALLAL, Mr LITWIN - LNE / France

### Metrology in the Pharmaceutical Industry

The quality of drugs depends partly on the **quality of the measurements** taken throughout the production process. These measurements are taken at each stage of production to guarantee process control and compliance with the critical parameters defined during validation, but also in the laboratory, where they are applied to the raw materials, packaging and final products.

**Debates about key questions:**
- What are the **regulations** and requirements in metrology?
- How can we define how **critical** measurement equipment is?
- How can we **control** measurement processes?

Presenter: Mr TASSERY - INTERTEK / France
With: Mr BERENBACH, Mr HIERNARD - LILLY / France, Mr SEGUIN - TEOXANE / Switzerland,
Mr DESAPHY - ENDRESS & HAUSER / France

### Cocktail

17:35
THERMAL MEASUREMENTS

- New scientific and technical thermal capabilities available for European industry
  Mr FILZ - LNE / France & all
- Implementation of alcohol heat pipe at CETIAT
  Mr FAVREAU, Mr GEORGIN - CETIAT / France, Mr MBERLONE - INRIM / Italy
- Macro-TGA/TDA development
  Mr BALME - CEA / France
- An accurate method for the enthalpy of fusion measurements from ambient to 1000°C
  Mr RAZOUK, Mr HAY, Mr BEAUMONT - LNE-LCM-CNAM / France
- Investigation of thermoelectric inhomogeneity of the Au/Pt thermocouples constructed at TUBITAK UME
  Mrs ARIFOVIĆ, Mrs HODZIC - TUBITAK UME / Turkey
- Measurement of thermal conductivity of liquid: comparative study between a steady state method and transient method
  Mr MONCHAU, Mr LALANNE - THEMACH Ingénierie, Mr BOIS - University of Paris Créteil / France
- A national temperature interlaboratory comparisons from -80°C to 1100 °C
  Mr IACOMINI - INRIM / Italy
- Passive compensation of a surface temperature probe for tribological tests
  Mr TABANDEH, Mrs ROSSO, Mr FERNICOLA - INRIM / Italy
- Good practices for calibration furnaces characterisation
  Mr FAVREAU, Mr GEORGIN - CETIAT / France
- An insulation materials of thermocouple at high temperature
  Mrs SINDELAROVA, Mr STRNAD - CMI / Czech Republic
- Home-made software development for optimising the uncertainty evaluation of silver fixed point cell used for practical realisation of ITS-90
  Mrs ARIFOVIĆ - TUBITAK UME / Turkey & all
- Expansion of European research capabilities in humidity measurement
  Mrs HODZIC - Institute of Metrology / Bosnia and Herzegovina & all
- Increasing of infrared radiation temperature measurement accuracy in real conditions
  Mrs HOIS - Lwiv Polytechnic National University / Ukraine

FLOW METERING

- Performance tests of two insertion type thermal mass flow meters
  Mrs CARE - CETIAT, Mr VEAU - EDF R&D / France
- Numerical investigation of flow rate measure using vortex counting at low Reynolds number
  Mr ZARRAOUI - University of Khemis-Miliana / Algeria
- EDF R&D industrial flow meters test bench: main past metrological performance tests results and innovative plans for the future
  Mr THIBERT, Mr VEAU - EDF R&D / France
- Numerical and experimental investigations on the shape and roughness of cylindrical critical flow venturi nozzle
  Mr LAMBERT, Mr MAURY, Mr VALIERE, Mr FOUCAUT, Mr LEHNASCH - CESAME Exadebit / France
**ELECTRICITY**

- Calibration factor comparison between TUBITAK UME and SASO NMCC  
  Mr. DANACI - TUBITAK UME / Turkey & all
- Interlaboratory measurement comparisons between INRIM and ESA on electrical quantities  
  Mr. CAPRA - INRIM / Italy & all
- 10 V, 1 Ω, 10 kΩ high accuracy standard setup for calibration of multifunction electrical  
  instruments and for interlaboratory comparisons  
  Mr. GALLIANA, Mr. CAPRA, Mr. CERRI, Mr. LANZILLOTTI - INRIM / Italy
- Characterisation of BNC type calibration standards  
  Mr. CELEP, Mr. DANACI, Mrs. SAKARYA - TUBITAK UME / Turkey
- Bilateral comparison on transmission coefficient measurements performed between TUBITAK  
  UME and SASO NMCC  
  Mr. SAKARYA, Mr. CELEP - TUBITAK UME / Turkey, Mr. ALJAWAN, Mr. ALBORAIH, Mr. ALDAWOOD - SASO / Saudi Arabia
- Binary voltage divider for verifying DC voltage linearity of calibrators and digital multimeters  
  Mr. SOMPPPI, Mr. BROWN - Measurements International / Canada
- Designing coupled coplanar waveguide standards for on-wafer mixed-mode  
  S-parameter measurement  
  Mr. PHAM, Mr. ALLAL, Mr. ZIADIE, Mr. BERGEAULT - LNE / France
- Material electromagnetic properties using S parameters measurement on transmission lines  
  Mr. CHARLES - LNE / France
- A build-up capacitance method for the determination of capacitance  
  meter nonlinearity and error  
  Mr. POURODANESH, Mr. ORTOLANO, Mr. CALLEGARO - INRIM / Italy

**METROLOGY CONCEPTS**

- Calibration laboratories challenges: service quality  
  Mr. SAIKH - Saudi Specialized Laboratories Co. Motabaqah / Saudi Arabia
- Digitalise your calibration  
  Mr. MARTINS - Eurotherm by Schneider Electric / France
- Economic feasibility for the creation and maintenance of physical quantities primary  
  measurement standards  
  Mr. NEYEZHMAKOV, Mr. PROKOPOV - National Scientific Center - Institute of Metrology / Ukraine
- Implementation of ISO/IEC 17025 standard requirements: will it be difficult?  
  Mr. REPOSEUR - ACAC / France
- Smart metrology  
  Mr. POU - Delta Mu, Mr. LEBLOND - PSA Group / France

**TRAINING**

- Metrology in the National Agricultural Technology Institute  
  Mr. GOMEZ, Mr. KREMER, Mrs. SLEPETIS - National Institute of Agricultural Technology / Argentina
- Metrology training in the National Agricultural Technology Institute  
  Mr. GOMEZ, Mr. KREMER, Mrs. SLEPETIS - National Institute of Agricultural Technology / Argentina
- The qualification of the operators of 3D measurement  
  Mr. VINCENT - CETIM / France
### METROLOGY 4.0

Chairmen: Bernard LARQUIER - BEA METROLOGIE (France) and Alain GUERDAT - ROLEX (Switzerland)

- **9:00** The European metrology cloud
  - Mr. THIEL - PTB / Germany

- **9:20** Pragmatic Big Data and smart manufacturing
  - Mr. LIES BENENHIL, Mr. VERLEYEN - DATASWATI / France

- **9:30** Metrology 4.0 in PSA Group
  - Mr. SELSKI, Mrs. GRIES - PSA Group / France

- **10:00** Do our measuring devices speak the same language?
  - Mr. RADECK - Q-DAS / Germany

- **10:20** Errors correction in additive manufacturing: an application to parts with regular geometry
  - Mr. PHARELLI-FILHO - University of Brasilia / Brazil, Mr. HENIOU-SOULAMI, Mr. ANWER - LURRAK, Mr. MAZOUZI - University of Paris Créteil / France

- **10:40** Optical CMM evaluation for the measurement of moving parts
  - Mr. HENNEBELLE - University of Burgundy, Mr. COOREVITS - ARTS ET METIERS PARIS TECH, Mr. LARUE - INNOREM, Mr. SLISLI, Mr. GAUTHIER - CETIM / France

**11:05** Coffee breaks on the Metrology Village **11:35**

### NEW AGE ENERGY

Chairmen: Gert RIETVELD - VSL (The Netherlands) and Jean-Remy FILTZ - LNE (France)

- **9:00** Metrology for LNG custody transfer and transport fuel applications
  - Mr. NIEUWENKAMP - VSL / The Netherlands

- **9:25** Particulate content of biogas
  - Mr. HGSTROM, Mr. VESALA, Mr. HEINONEN - MIKES / Finland

- **9:50** Metrology for hydrogen energy applications: a project to address normative requirements
  - Mrs. HALOUA - LNE, Mr. DELOBELLE - MAHYTEC / France, Mr. BACQUART - NPL / United Kingdom, Mrs. ARRHENIUS - SP Metrology / Sweden, Mr. ENT - VSL / The Netherlands

- **10:15** Metrology for sustainable hydrogen energy applications. Hydrogen quality specification for fuel cell vehicles
  - Mr. ROJO, Mrs. DEL CAMPO, Mrs. FERNANDEZ - CEM / SPAIN

- **10:40** Metrological infrastructure for biogas and biomethane conformity assessment
  - Mr. VAN DER VEEEN - VSL / The Netherlands

**11:05** Coffee breaks on the Metrology Village **11:35**

### MEASUREMENTS FOR WATER QUALITY

Between earth and sky, the same water has been in constant circulation for billions of years. From its capture to its supply via sanitation and the monitoring of natural environments, water quality is the subject of extremely wide-ranging surveillance throughout the world. This water quality monitoring, in the field, in factories, or in laboratories, depends on constant measurements of bacteriological, chemical... and radioactivity indicators.

Debates about key questions:

- What are the new measurement methods?
- What are the benefits for water monitoring?

Presenter: Mr. BOUDIER - LDAR Aisne / France
With: Mr. GUARINI - AGLAE / France, Mrs. GUIGUES - LNE / France, Mrs. SALVETAT - IFREMER / France, Mr. GUETTLER - PTB / Germany, Mr. CHABROL - VEOLIA / France

**11:05** Coffee breaks on the Metrology Village **11:35**
WEDNESDAY 20 SEPTEMBER

MEASURE AND CREATE THE FUTURE
Chairman: Thomas GRENON - LNE (France)

11:35 – 12:50

The revised SI: measure to create the future
Mr ULLRICH - PTB (Germany)
Joint metrology research in Europe meeting the needs of industry and wider society
Mr JECKELMANN - EURAMET (Switzerland)
Metrology and Space
Mr SALOMON - CNRS-Laboratoire Kastler Brossel (France)

WEDNESDAY 20 SEPTEMBER

S10 METROLOGY FOR HEALTH AND BETTER LIFE
Chairman: Marc PRIEL - ip (France)

11:30
Metrology for the protection of individuals and workers in the field of radiation
Mr SUDER, Mrs VERHAEGHE - COFRAC / France

15:30
Assuring quality in person-centered healthcare
Mr PENDRILL - SP Metrology / Sweden

16:10
Calibration in unit of absorbed dose to water of low-energy x-ray sources used in radiotherapy
Mr ABUDRAA - CEA / France & all

16:30
Metrology for biopharmaceuticals: higher order protein structural analysis
Mrs QUAGLIA - LGC / United Kingdom & all

16:50
The standardisation of protein measurements: from the diagnosis of Alzheimer’s disease to the prevention of antimicrobial resistance
Mr MARTOS - LNE / France & all

17:10
Quantification of human cytomegalovirus in the scope of EMRP project «Infec-Met»
Mrs MILAVEC - National Institute of Biology / Slovenia

S11 METROLOGY FOR A CLEANER ENVIRONMENT
Chairman: Bernd GUETTLER - PTB (Germany)

15:30
Enhancement factor measurements under atmospheric conditions
Mr GEORGIOU - CETIAT / France

15:30
First ISO 17025 laboratory accredited for measuring traffic emissions remotely
Mrs DE LA FUENTE EGIDO, Mr MUNOZ - Remote Sensing Lab / Spain

16:10
Characterisation of the INRIM low-frost point generator operating at sub-atmospheric pressure
Mr CUCCARO, Mrs ROSSO, Mr BELTRAMINO, Mr FERNICOLA - INRIM / Italy

16:30
Effect of suspended sand on seawater conductivity measurements
Mr LE MENN - SHOM / France

16:50
New outlook in BOD measurement and bioprocess management
Mr MULLER - AMS Envolure / France

17:10
Production and validation of primary carbon dioxide reference standards at INRIM
Mrs ROLLE, Mrs PENNECHI, Mrs PESSANA, Mrs SEGA - INRIM / Italy
DYNAMIC MEASUREMENT AND THE FACTORY OF THE FUTURE

15:30
In the flexible, automated and interconnected factory of the future, the product is tracked throughout its production based on its characteristics and particularities. Measurement thus becomes dynamic, meaning that parts are measured during the flow of production, and can even be inspected while moving. The challenge is to produce «right first time» and to react as early as possible in the manufacturing chain.

Debates about key questions:
- What place for measurement in the factory of the future?
- How is metrology a central tool for efficient production?
- How can all measurement results be exploited to the full?

Presenter: Mr HENNEBELLE - University of Burgundy / France
With: Mr CORLETO - STIL / France, Mr DAUBENFELD - PSA Group / France, Mr GALIBERT - LNE / France, Mr LARUE - INNOREM / France, Mr VINCENT - CETIM / France

17:30

HEALTH

Thermocyclers: a new metrological approach adapted to needs
Mr BOZONNET - Tumorothèque Caen Basse Normandie, Mr CHERPIN - APODIS TECHNOLOGIES / France

Estimation of measurement uncertainty in infusion pumps using gravimetric methods of analysis
Mr RAMIREZ, Mr DELGADO - Technological Metropolitan Institute / Colombia

Validation of the photometric method used for micropipette calibration
Mrs BATISTA, Mrs GODINHO - IPQ / Portugal, Mr RODRIGUES, Mrs RUPEY - Ains / USA

Metrology of the vitamin-D-synthetic activity of UV lamps
Mrs TERENETSKAYA, Mrs ORLOVA - Institute of Physics NAS / Ukraine

Forensic metrology: its importance and evolution
Mr FERRERO, Mrs SCOTTI - Polytechnic University of Milan / Italy

Development of an alternative method for the calibration of ECG simulators
Mr BENTEZ, Mrs URESTI, Mrs SOLORZANO - ETALONS / Mexico

The convergence of technologies, generates convergence in the regulations
Mr VALDES MESA - Center of Biomaterial / Cuba

Metrological approach to measurements for emotions being expected in response to acoustic impacts
Mrs SAPHONIKOVA, Mr TAYMANOV - DI Mendelejev Metrology Institute / Russia & all

Analysis of calibration data on a sample of anemometers
Mr LECHENE, Mr FONTAINE - INRS, Mr BLANQUART - MEZY / France
AI AND DATA METROLOGY

- Avoiding AI Armageddon with metrologically oriented psychometrics
  Mr. BARNEY, Mr. FISHER - University of Berkeley / USA

- Metrology, psychometrics and new horizons for innovation
  Mr. FISHER - University of Berkeley / USA

- Topical metrology problems in the era of cyber-physical systems and internet of things
  Mr. TARYANOV, Mrs. SAPPOZHNIKOVA, Mr. IONOV - DI Mendeleyev Metrology Institute / Russia

- Metrology for quantum cryptography
  Mrs. MEDA - INRIM / Italy

ENERGY

- A full-scale thermo-hydraulic simulator for the characterisation of building heat cost allocation methods
  Mr. MASOERO - Politecnico di Torino, Mr. FERNICOLA, Mr. SABA - INRIM / Italy

- Calibration of primary measuring converter by using of modeling and experimental evaluation of the initial data
  Mr. SKLITOV, Mr. MUNTEAN, Mr. TIMOFEEV - National Scientific Center - Institute of Metrology / Ukraine

- Modelling and evaluation of the energy saving under the improvements of the calibrators of temperature by finite element method
  Mr. SKLITOV, Mr. ZALIHKIN, Mrs. KIL - National Scientific Center - Institute of Metrology / Ukraine

- Validation of a guarded hot plate apparatus by using the IRMM-440 certified reference material
  Mr. STEPANIC, Mrs. TERZIC, Mr. MILOSEVIC - Institute VINCA / Serbia

- Determination of fuel quantity in commercial transactions
  Mrs. MEIKUOTIENE, Mr. KRASOKA, Mr. URBONAVICIUS - Kaunas University of Technology / Lithuania

DIMENSIONAL

- Free form defects measurement by interferometry
  Mr. MEGUELLAT - University of Ferhat Abbas Setif / Algeria

- Performance evaluation of low cost laser scanner using a granite square gauge
  Mr. PIRATELLI-FILHO, Mr. DOS REIS - University of Brasilia, Mrs. VALDES - University of Uberlandia / Brazil

- Geometric control by a laser tracker of a cracked cradle base of a high-speed train trailer
  Mr. NIÖCHE - A+ Metrologie / France
CHEMISTRY

- The contact surface of oak chips/wine determined by image analysis
  Mr. I. CHICIUC, Mr. A. CHICIUS - Technical University / Moldova
- Features and problems of metrological traceability of gas mixtures using UV absorption, FTIR, and CRD spectroscopy
  Mr. KONOPELKO, Mr. BELOBORODOV - Mendeleev Institute of Metrology, Mr. CHUBCHENKO, Mr. RUMIANTSEV - University of Information Technologies, Mechanics and Optics / Russia
- Challenges of traceable electrolytic conductivity measurements in water
  Mr. THIRSTRUP, Mr. SNEDDEN, Mrs. DELEEBEECK - DFR / Denmark

ENVIRONMENT

- Verification of Sr-90 determination using ALMERA proficiency test samples
  Mrs. VISEPOJANAKIT - Office of Atoms for Peace / Thailand
- ReGas: mobile generators to dynamically produce reference gas mixtures for reactive compounds at atmospheric amount of fractions
  Mrs. PASCALE - METAS / Switzerland
- Verification of Cs-137 determination in seawater using Cu-hexacyanoferrate filters
  Mrs. VISEPOJANAKIT - Office of Atoms for Peace / Thailand
- New model of uncertainty for the variability of water microbiological enumerations in a proficiency testing scheme
  Mr. MOLINIER, Mr. GIARINI - AGLAE / France
- Proficiency tests: measurement of the mass activity of radioactive samples
  Mrs. CORBEL, Mrs. LOURENCO - CEA / France
- New matrix-based leaves reference material for elemental agrochemical purposes
  Mr. ABUBAKR - King Khalid University / Saudi Arabia
### S12 METROLOGY CONCEPTS AND UNCERTAINTY

**Chairmen:** Carol HOCKERT - NIST (USA) and Alexandre ALLARD - LNE (France)

<table>
<thead>
<tr>
<th>Time</th>
<th>Session</th>
<th>Presenter(s)</th>
</tr>
</thead>
<tbody>
<tr>
<td>9:00</td>
<td>The interlaboratory comparisons are inescapable</td>
<td>Mr LELONG - PSA Group / France</td>
</tr>
<tr>
<td>9:20</td>
<td>Method of the drift FD X 07 014: more than just an optimisation method</td>
<td>Mr DEMARS, Mr DOBOIS - Delta Mu / France</td>
</tr>
<tr>
<td>9:40</td>
<td>Determination of measurement uncertainty by simulation</td>
<td>Mr HESSELMANN, Mr FRANKE, Mr WENDT - PTB, Mr KISTNER - CARL ZEISS, Mr SCHWEIN - Hexagon Manufacturing Intelligence / Germany</td>
</tr>
<tr>
<td>10:00</td>
<td>Structured method for assessing uncertainties on CMM</td>
<td>Mr COOREVITS - ARTS ET METIERS PARIS TECH, Mr HENNEBELLE - University of Burgundy, Mrs GOUTAGNEUX, Mr VINCENT - CETIM, Mr GRZESIAK - RENISHAW / France</td>
</tr>
<tr>
<td>10:20</td>
<td>Analysis of interlaboratory comparisons testing: when the measurements are not normally distributed</td>
<td>Mr ALLARD, Mrs AMAROUQUE - LNE / France</td>
</tr>
<tr>
<td>10:40</td>
<td>Towards an alignment of engineering and psychometric approaches to uncertainty in measurement</td>
<td>Mr FISHER - University of Berkeley, Mr STEINER - MetaMetrics / USA</td>
</tr>
</tbody>
</table>

11:05  **Coffee breaks on the Metrology Village**  11h35

### S13 NANO: SMALL IS BEAUTIFUL

**Chairmen:** François PIQUEMAL - LNE (France) and Patrice CONNER - AFNOR / France

<table>
<thead>
<tr>
<th>Time</th>
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<th>Presenter(s)</th>
</tr>
</thead>
<tbody>
<tr>
<td>9:00</td>
<td>Validation of the French metrological atomic force microscope for dimensional nanometrology applications</td>
<td>Mr BOUKELLAL, Mr DUCOURTIEUX, Mr CERIA - LNE / France</td>
</tr>
<tr>
<td>9:25</td>
<td>Computational nanometrology of nanostructure morphologies: why and how?</td>
<td>Mr CONSTANTOUDIS - Institute of Nanoscience and Nanotechnology / Greece</td>
</tr>
<tr>
<td>9:50</td>
<td>Traceable measurement with AFM: an experimental approach for realistic uncertainty assessment</td>
<td>Mrs PETRY, Mr DE BOECK, Mr SEBAHI, Mrs COENEGRACHTS, Mrs DOBRE - SPF Economy / Belgium</td>
</tr>
<tr>
<td>10:00</td>
<td>Fast in-line characterisation of nanostructures using a Fourier lens system</td>
<td>Mr JENSEN - DFM / Denmark &amp; all</td>
</tr>
<tr>
<td>10:20</td>
<td>Modelling pixel size uncertainty for AFM nanoparticle sizing</td>
<td>Mr CAEBERGS, Mrs PETRY, Mr SEBAHI, Mr DE BOECK, Mrs DOBRE - SPF Economy / Belgium</td>
</tr>
</tbody>
</table>

11:05  **Coffee breaks on the Metrology Village**  11h35

### DRONE-BASED INSPECTION: NEW CHALLENGES FOR MEASUREMENT

<table>
<thead>
<tr>
<th>Time</th>
<th>Session</th>
<th>Presenter(s)</th>
</tr>
</thead>
<tbody>
<tr>
<td>9:10</td>
<td>The use of drones has become widespread in industry: facility inspections, mapping, surveillance… With their capacity to acquire accurate, comprehensive data without disrupting industrial operations, drones certainly seem to offer a powerful tool. But what is the role of measurement in this ecosystem?</td>
<td>Mrs BROTHER - EDF / France and Mr VIGUIER - SNCF / France, Mr CARREAUD - SITES / France, Mr KADDON - LEICA GEOSYSTEMS / France, Mr THOMAS - Professional Federation of Civil Drones / France, Mr BERTRAND - ONERA / France</td>
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<tr>
<td>10:10</td>
<td>Debates about key questions:</td>
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<td></td>
<td>• What kind of measurements can be made with drones?</td>
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<td></td>
<td>• Can the drone be a new measurement tool?</td>
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<td></td>
<td><strong>Presenter:</strong> Mrs BROTHER - EDF / France and Mr VIGUIER - SNCF / France</td>
<td></td>
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<td></td>
<td><strong>With:</strong> Mr CARREAUD - SITES / France, Mr KADDON - LEICA GEOSYSTEMS / France, Mr THOMAS - Professional Federation of Civil Drones / France, Mr BERTRAND - ONERA / France</td>
<td></td>
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</table>

11:00 **Coffee breaks on the Metrology Village**  11h35
**THURSDAY 21 SEPTEMBER**

**S14 DYNAMICS OF PRESSURE**

Chairman: Thierry COOREVITS - ARTS ET METIERS PARIS TECH (France)

- 13:45 Optical methods for pressure estimation in fluids  
  Mr GOMIT, Mr DAVID, Mr CHATELLIER - University of Poitiers / France

- 14:05 Development of a dynamic standard to evaluate the metrological performance of pressure measurement systems  
  Mr DIAZ TEY - University of Costa Rica / Costa Rica

- 14:25 Dynamic pressure transducer calibration: traceable?  
  Mr MENDE, Mr PLATTE - SPEKTRA / Germany

- 14:45 Dynamic pressure sensitivity determination with Mach number method  
  Mr SARRAF, Mr DAMION - ARTS ET METIERS PARIS TECH / France

- 15:05 Calibration techniques for negative pressure measurement down to -100 kPa  
  Mr BENTOUATI - LNE / France & all

- 15:25 A high-accuracy working standard for absolute pressure from 5 kPa to 130 kPa  
  Mr BOINEAU, Mr HURET, Mr OTAL - LNE, Mr PLIMMER - LNE-LCM-CNAM / France

**S15 OPTICAL AGILE MEASUREMENT**

Chairman: François HENNEBELLE - UNIVERSITY of BURGUNDY (France) and André SCHAEFER - HBM (Germany)

- 13:45 Development of optical methods for surface and volumetric measurements  
  Mr GOMIT - University of Poitiers / France & all

- 14:10 Ombrosurf a high-performance metrology machine for both surface and contour measurement  
  Mr CORLETO - STIL / France & all

- 14:35 Automated grinding station guided by stereovision  
  Mr DERRIEN, Mr EQUOY - GIPS VISION / France

- 15:00 Robot solutions for automated 3D surface measurement  
  Mrs CALVEZ - ALICONA / France

- 15:25 A new type of compact precision amplifier for strain gauge based transducers  
  Mr SCHAEFER - HBM / Germany

**THURSDAY 21 SEPTEMBER**

**WHAT PROGRESS FOR MEASUREMENT AT THE NANO SCALE?**

- 13:45 Products containing nanomaterials are already part of our daily lives: nanoparticles used as drug vectorisation, therapeutic treatment etc. However, all players point to the lack of metrology as a major obstacle to the development of this industrial field. The fundamental parameters characterising the properties of these materials and their performance need to be defined, along with the appropriate measurement techniques and methods.

**Debates about key questions:**

- What is the role of metrology for future nanotechnology and the nanomaterial sector?
- How is measurement currently integrated into the value chain?
- What kind of nanometrology can serve all the industrial sectors concerned?

Presenter: Mr AUBLANT - LNE / France  
With: Mr ARTOUS - CEA / France, Mr FOUCHER - POLLEN METROLOGY / France,  
Mr HOGHOJ - XENOCS / France, Mr GHANEM - Solvay/Belgium

Mr FELTIN - LNE / France
CLOSING SESSION

15:50 - 16:30

Closing talk of Mrs Sautter
National Museum of Natural History (France)
Mineralogist involved in the instrumentation of the MARS Rover Curiosity 2014 NASA Collective Awards and 2016 CNRS Silver Medal.

Prospects and slideshow of best moments. Best oral and poster presentations prizegiving
Mr FILZ - LNE (France)

CLOSING DRINK
ON THE METROLOGY VILLAGE

THURSDAY 21 SEPTEMBER

POSTERS AND VISIT OF THE EXHIBITION - 11:15 to 12:45

NANOMETROLOGY
- To‘DeNano.be: towards a toxicologically-relevant definition of nanomaterials
Mr SEBAIHI - SMD / SPF Economy / Belgium & all
- Electrical characterisation of multi-junction solar cells by scanning probe microscopy (SMM and Resiscope)
Mrs DELVALLEE, Mr KHAN, Mr ALLAL, Mr PIQUEMAL - LNE / France

MECHANICAL QUANTITIES
- An underground laboratory for gravity measurement with the Reliability Measure Label
Mrs GONNET - CT2M / France
- The influence of automation on calibration result uncertainty of the highest accuracy classes mass standards and weights
Mr DANASIEWICZ - Radwag Wagi Elektroniczne / Poland
- Calibration of specific masses, how to meet the needs of clients?
Mrs DOMENECH - CT2M / France
- Ultrasounds and intelligent fasteners to secure your bolted joint
Mr GODIN - Polymesure / France
A new methodology for checking and calibration of GNSS receivers by using the relative static positioning method
Mrs LAMBROU, Mr KANELLOPOULOS - National Technical University of Athens / Greece

GPU-based raytracing for accelerating deflectometric asphere measurements
Mr FISCHER, Mr PETZ, Mr PUSCHKE, Mr TUTSCH - Technical University of Braunschweig / Germany

A new type of compact precision amplifier for strain gauge based transducers
Mr SCHAEFER - HBM / Germany

Force calibration with buildup system
Mr KLECKERS - HBM / Germany

An investigation on the effect of humidity on the torque measuring system
Mr GOUDA - NIS / Egypt

Traceable calibration of automatic weighing instruments in dynamic operation
Mr GRUM - Metrology Institute / Republic of Slovenia

Traceable calibration of accelerometers in a wide frequency and temperature range
Mr MENDE, Mr IWANCIK, Mr BEGOFF - SPEKTRA / Germany

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**DIMENSIONAL**

- High resolution computed tomography systems for nondestructive dimensional measurement in industrial applications
  Mr BATZ, Mr BEERLINK, Mr ZEPP - YXLON International / Germany

- Improving roughness measurement on involute helical gears
  Mr KOUIN, Mr ZHANG, Mr FRAZER, Mr SHAW, Mr WILSON - University of Newcastle / United Kingdom

- An assessment of filter recommendations in ISO 1328-1 for gear from measurement
  Mr FRAZER, Mr WILSON, Mr SHAW - University of Newcastle / United Kingdom

**OPTICAL MEASUREMENTS**

- New optical power sensors using pyrolytic graphite
  Mr PINOT, Mr SILVESTRI - LNE-LCM-CNAM / France

- Predictable quantum efficient detector based on n-type silicon photodiodes
  Mr DONSBERG - Aalto University, Mr TUVINEN - VTT / Finland

- A fast focusing lenses
  Mr THIERIAULT - TAG OPTICS / USA
MATHEMATICAL MODELS FOR METROLOGY

- Calibration of gamma ray spectrometer spatial response
  Mr Sauré - CEA / France

- Application of autoregressive model for realisation of the national time scale of Ukraine
  Mr Neyezhmakov, Mr Koretisky - National Scientific Center - Institute of Metrology / Ukraine

- Interlaboratory comparisons and correlations
  Mr PellegriNO, Mrs Dias - IPQ / Portugal

- C2I, a monitoring method for conditional calibrations
  Mr Coquet - ACEI / France

- Investigation of laboratories performance carrying out verifications in legal mass metrology
  Mrs Valcu, Mr Baciu - National Institute of Metrology, Mr Iacobescu - RBLM, Mrs Todor - ROLAB / Romania

- Reconstructing signals from heterogeneous time averages
  Mr Forbes - NPL / United Kingdom

- Towards a new uncertainty determination approach in test-defined measurement systems
  Mr Surdu - National Technical University of Ukraine / Ukraine

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- DÓSEO
- DRONE DEMONSTRATION

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