

# Fulfilling SIM's Obligations Under the CIPM MRA

Ensuring efficient and effective support and technical review of calibration and measurement capabilities (CMCs) for publication in the Key Comparison Database in order to support calibration programs of SIM NMIs/DIs

# Objectives of the Technical Committees of SIM

## **Inclusion of All Members**

- Promote the participation of all NMI and DIs with technical measurement capabilities in the respective area
- Suggest and organize training activities and collaboration projects among its members.

## **Interlaboratory Cooperation for Metrological Rigor**

- Promote cooperation between SIM and legal metrology organizations (e.g., the OIML)
- Assess, promote and coordinate SIM comparisons and dissemination of their results
- Promote cooperation between SIM and the BIPM in carrying out key and supplemental comparisons
- Work in close coordination with the Professional Development Coordinator and Project Coordinator in coordination of SIM Activities.

## **Publishing and Promoting Capabilities**

- Review CMCs of SIM members for submission to the JCRB (intra-RMO review)
- Review the CMCs of NMIs/DIs of other regional organizations within the framework of CIPM MRA (inter-RMO review)
- Encourage the development of new services in order to meet regional needs



# Members and Associates

## Metrology Working Groups

<b>MWG 1: Electricity and Magnetism</b> Chair: Lucas di Lillo, INTI/ARGENTINA	<b>MWG 2: Photometry and Radiometry</b> Chair: Thiago Menegotto, INMETRO/BRAZIL
<b>MWG 3: Thermometry*</b> Chair: Andrew Todd, NRC/CANADA	<b>MWG 4: Length</b> Chair: Karina Bastida, INTI/ARGENTINA
<b>MWG 5: Time and Frequency</b> Chair: Raúl Solís, CENAMEP/PANAMA	<b>MWG 6: Ionizing Radiation and Radioactivity</b> Chair: Raphael Galea, NRC/CANADA
<b>MWG 7: Mass &amp; Related Quantities</b> Chair: Aldo Quiroga, INACAL/PERU	<b>MWG 8: Chemistry (Amount of Substance)**</b> Chair: Valnei Da Cunha, INMETRO/BRAZIL
<b>MWG 9: Acoustics, Ultrasound and Vibration</b> Chair: Gustavo Ripper, INMETRO/BRAZIL	<b>MWG 10: Flow and Volume*</b> Chair: Hernán Brenta, INTI/ARGENTINA
<b>MWG 11: Legal Metrology</b> Chair: Paulo Roque Silva, INMETRO/BRAZIL	<b>MWG 12: Quality System</b> Chair: Elizabeth Ferreira, LATU/URUGUAY
<b>MWG 13: Statistics and Uncertainty</b> Chair: Antonio Possolo, NIST/USA	<b>*Requesting confirmation of chair</b> <b>**Requesting name change to “Chemistry and Biology”</b>

**NORAMET** (V. Lizardi, CENAM/Mexico); **CAMET** (C. A. Estrada, CIM/El Salvador); **CARIMET** (I-R. Audain, SKNBS/St. Kitts and Nevis); **SURAMET** (S. Toro, INN/Chile); **ANDIMET** (J. C. Castillo, IBMETRO/Bolivia)

**Project Coordinator:** Javier Arias (CENAMEP/Panama)  
**Professional Development Coordinator:** Rodrigo Costa-Felix (INMETRO/Brazil)



# Training and Scientific Exchange

## Building Capacity and Competence Throughout SIM

- All MWGs are open to participation and technical input from technical experts in SIM and from other RMOs
- Variety of training activities during MWG meetings and separately
  - Historically supported by IADB, SIM, OAS, PTB, NIST
  - Workshop on density (June 2019) in San José, Costa Rica, in conjunction with MWG 7
  - SIM active in BIPM “Capacity Building and Knowledge Transfer” (CBKT) events (registered MWG participants to December 2019 event exceeded SIM allotment), including as instructors
- Active idea exchanges among labs
  - Scientific “in lab” internships for first-hand experience
  - Technical training, strategic planning, comparison experience
- Training extends beyond the NMI/DI to the user community (e.g., strengthening commerce through legal metrology led by MWG 11)

Training subjects	Country/NMI	Date
Calibration of power quality analyzers” y del taller de “Calidad de la potencia en tiempo real en redes inteligentes: integrando energías renovables en el sistema eléctrico nacional”	Queretaro, Mexico	29 september to 6 October
Dialogue: Transmission & distribution agencies, Grids operators and SIM NMIs “	Mexico DF, Mexico	July 26-28. 2017
Training on “On-Site Calibration Of Voltage Measurement Transformers And Current Measurement Transformers”	Ottawa, Canada	17 to 19 July 2016.

### Acoustics (MWG 9)

- Technical visit of Thiago Milhomem/Inmetro to INTI (Feb/2019)
  - Microphone calibration in pressure field
  - Possible pilot study using the new signal processing system acquired by INTI
  - Comparison and Reciprocity calibration of 1-inch microphone in pressure field
- Technical visit of Osvaldo Llamas/Cenam to Inmetro (Jan/2019)
  - ½-inch microphone reciprocity calibration in pressure field down to infrasound
  - Informal pilot study started.

### Project Collaboration Brazil/Paraguay



### NIST-SIM Engagement Opportunity

2019 – 2020

The NIST-SIM Engagement Opportunity provides support to Active Members\*, National Metrology Institutes (NMIs) or Designated Institutes (DIs), of the Interamerican Metrology System (SIM). NIST supports SIM efforts to promote an integrated metrology infrastructure throughout the Americas.

#### Applications

Applications must have approval by NMI or DI Management. Applicants must specify what type of activity is being sought, the level of support required, and the project plan. Applicants requesting Guest Researcher appointments must meet language proficiency requirements.

#### Evaluation Criteria

Efforts will be taken to ensure support is provided to as many NMIs as possible. New activities/partnerships will be given priority. Applicants must clearly identify project objectives. Applicants should contact NIST hosts/ collaborators prior to submitting an application.

#### NIST Contact Information

For more information regarding this opportunity and to answer any questions you might have regarding the application process, please contact Andrew Conn at [andrew.conn@nist.gov](mailto:andrew.conn@nist.gov).

\*Participating SIM NMI or DI must possess an Active Membership type with SIM to receive support.

#### Activity Types

FOREIGN GUEST RESEARCHER APPOINTMENTS  
GUEST RESEARCHER EXCHANGES, RUNNING FROM 3- MONTHS TO 1-YEAR. BRING NIST LABORATORY STAFF TOGETHER WITH SIM AFFILIATED METROLOGISTS TO ADVANCE KEY MEASUREMENT SCIENCE OBJECTIVES. CALIBRATION SERVICES  
NIST OFFERS CALIBRATIONS IN A WIDE ARRAY OF MEASUREMENT FIELDS. THROUGH THIS OPPORTUNITY, NIST MAY BE ABLE TO SUPPORT PARTICULAR CALIBRATION NEEDS. VISIT [www.nist.gov/calibrations](http://www.nist.gov/calibrations)

\*NIST NIST'S SUPPORTS

#### Application Timeline

##### Deadline to Apply

11 October 2019

##### Application Review

14 October – 1 November 2019

##### Applicants Notified of Final Decision

4 November 2019



# MWG-Led Technical Projects and Workshops

## Activities to Build Competence

- Large-Scale Dimensional Metrology (MWG 4)
  - Three planning meetings (in Lima, Perú, April 2018; in Querétaro, México, September 2018; and in Córdoba, Argentina, April 2019).
  - The points to be measured (“measurand”) agreed
  - Measurements done in Querétaro and Córdoba with different laser tracking systems
  - CENAM performed data analysis (very good results)
  - Currently preparing an article for publication
- Workshop on “Photonic Thermometry, Kelvin Redefinition and Metrology and Meteorology”, October 2018 (MWG 3)
- 3 more laboratories are participating in SIMTN (time network, MWG 5): Bahamas (BBSQ), Haiti (BHN) and Belize (BBS)
- Regional Workshop on mycotoxins in foods and their measurement (September 2018), led by MWG 8
- Planned workshop on testing machine calibration (MWG 7) in 2020



Large-Scale Dimensional Metrology

**Workshop Regional**  
**MICOTOXINAS EN ALIMENTOS, MEDICIONES  
 EN LABORATORIO, TRAZABILIDAD METROLÓGICA Y  
 ASEGURAMIENTO DE LA CALIDAD DE LA MEDICIÓN**

17, 18 y 19 de Septiembre de 2018  
 Auditorio de INTI Av. Gral Paz 5445 San Martín Buenos Aires





# Measurement Comparisons

## The Technical Basis of the CIPM MRA

- Key and Supplementary comparisons are both needed and both “count” to support CMCs
- Strategic planning to optimize measurement comparisons
  - Surveys to assess needed comparisons
  - Training opportunities for stakeholders to inform potential needs
- MWG participation in CC KCWGs assures SIM interests are represented
  - Working toward “expanding the light shine” of comparisons (i.e., one comparison to support multiple CMCs)
  - Technical expertise for input to “broad scope” CMCs (i.e., one CMC to support multiple services)
- New version of **SIM-D-07** approved and posted on SIM website
  - Reiterates CIPM MRA guidance on comparisons
  - Reinforces need to register comparisons at the earliest stage on the KCDB
- MWG 13 (Statistics and Uncertainty) available as resource (revitalized in September 2019)

Active (pre-published) Key and Supplementary Comparisons with SIM Participation (3 Sept. 2019)

Technical Area	SIM	CC and other RMOs	Planned (SIM, CC, other RMO)
Electricity and Magnetism	3	5	1
Photometry and Radiometry	1	11	2
Thermometry	6	6	3
Length	1	6	1
Time and Frequency		1	
Ionizing Radiation and Radioactivity	2	15	3
Mass and Related Quantities	17	2	6
Chemistry and Biology	3	9	2
AUV	1	5	
Flow and Volume	3	4	4
<b>TOTAL ACTIVE COMPARISONS WITH SIM PARTICIPATION</b>	<b>37</b>	<b>64</b>	<b>22</b>

New Comparisons in Electricity and Magnetism (MWG 1)

Comparison	Pilot
Intercomparison on Harmonics	CENAM
Comparison of voltage ratio Standards 5-10-20-30 / 0,1 kV	INTI or UTE

# Calibration and Measurement Capabilities (CMCs)

## Documenting SIM's Capabilities

- Defined as “a calibration and measurement capability available to customers under normal conditions” as published in the KCDB or described in scope of accreditation
- CMCs can be “broad scope” to support multiple services
- Based on an NMI/DI's capabilities
- Evidenced by active participation in projects, comparisons, publications, etc.
- Supported by active and approved quality management system
- Absolute number of CMCs is less relevant than demonstration of current activity in the technical field

Technical Area	Number of SIM Economies with Published CMCs
Electricity and Magnetism	10
Photometry and Radiometry	5
Thermometry	10
Length	9
Time and Frequency	9
Ionizing Radiation and Radioactivity	5
Mass AND Flow and Volume	15
Chemistry	7
Acoustics, Ultrasound, Vibration	5



**Bureau International des Poids et Mesures**

Home > CMCs Search > ADV search form > Country list > CMC Information

**CMCs - Result of the search**

**Physics**

- Acoustics, Ultrasound, Vibration
- Electricity and Magnetism
- Length
- Mass and related quantities
- Photometry and Radiometry
- Ionizing Radiation
- Thermometry
- Time and Frequency

**Chemistry**

**Related links**

- KCDB Statistics
- KCDB FAQs
- KCDB Reports
- CIPM MRA
- JCRIL
- Find my NMI
- Metrolgia

**Contact us**

- BIPM.KCDB@bipm.org

**Calibration and Measurement Capabilities Acoustics, Ultrasound, Vibration**

In the CMCs uncertainty statements, the notation  $Q[a, b]$  stands for the root-sum-square of the terms between brackets:  $Q[a, b] = [a^2 + b^2]^{1/2}$

**Result of the search**

**Your selection :** Acoustics, Ultrasound, Vibration, Vibration

**Brazil, INMETRO (Instituto Nacional de Metrologia, Qualidade e Tecnologia)**  
Complete CMCs in Acoustics, Ultrasound, Vibration for Brazil (.PDF file)

**Acceleration (modulus). Acceleration measuring instrument, 0.01 m/s<sup>2</sup> to 100 m/s<sup>2</sup>**  
Relative expanded uncertainty ( $k = 2$ , level of confidence 95 %) in %: **0.5**  
ISO 16063-21 (comparison)  
Frequency: 0.4 Hz to 1 kHz  
Sinusoidal excitation  
Approved on 26 September 2014  
Internal NMI service identifier: INMETRO/8351

**Acceleration (modulus). Acceleration measuring instrument, 0.01 m/s<sup>2</sup> to 100 m/s<sup>2</sup>**  
Relative expanded uncertainty ( $k = 2$ , level of confidence 95 %) in %: **0.6**  
ISO 16063-21 (comparison)  
Frequency: > 1 kHz to < 5 kHz  
Sinusoidal excitation  
Approved on 26 September 2014  
Internal NMI service identifier: INMETRO/8351

**Acceleration (modulus). Acceleration measuring instrument, 0.01 m/s<sup>2</sup> to 500 m/s<sup>2</sup>**  
Relative expanded uncertainty ( $k = 2$ , level of confidence 95 %) in %: **0.8**  
ISO 16063-21 (comparison)  
Frequency: 5 kHz to 10 kHz  
Sinusoidal excitation  
Approved on 26 September 2014  
Internal NMI service identifier: INMETRO/8351

**Acceleration (modulus). Acceleration measuring instrument, 0.01 m/s<sup>2</sup> to 500 m/s<sup>2</sup>**  
Relative expanded uncertainty ( $k = 2$ , level of confidence 95 %) in %: **1**  
ISO 16063-21 (comparison)  
Frequency: > 6.5 kHz to 10 kHz  
Sinusoidal excitation  
Approved on 26 September 2014  
Internal NMI service identifier: INMETRO/8351



# Calibration and Measurement Capabilities (CMCs)

## Reviewing CMCs in SIM and Beyond

CMCs Published, Revised and Reviewed by  
SIM: 2018-2019

- SIM remains active in submitting CMCs in all technical areas
  - 7 files (sets) submitted in 2018
  - 9 files (sets) submitted in 2019
- Transition to KCDB 2.0
  - Document (“Information on the New Key Comparison Database”) reviewed and commented on by most MWG Chairs
  - SIM input in KCDB 2.0 functionality (from MWG 6)
- New version of **SIM-D-05** approved and posted on SIM website
  - Stipulates expectations for timely CMC reviews
  - Instructions on preparing CMC files
  - The intra-RMO and inter-RMO review processes
  - Criteria for acceptance
- Time-sink continues to be revision by submitting laboratory, but it is improving

Technical Area	CMC Sets Reviewed/Under Review (intra and inter-RMO)
Electricity and Magnetism	6
Photometry and Radiometry	9
Thermometry	10
Length	7
Time and Frequency	4
Ionizing Radiation and Radioactivity	7*
Mass & Flow and Volume	6
Chemistry	8 (~300 CMCs)
Acoustics, Ultrasound, Vibration	5

\* Based on JCRB CMC website

### CMC summary (MWG 10)

NMI	Volume	Liquid Flow	Gas Flow	Air speed
NRC	1			
TCC			2	
NIST	1	1 + 1 + 1	3 + 1	1
CENAM	11	1	3	
INMETRO	4			
INTI	4			
LACOMET	8			
INACAL	7			
LATU	4			
	40	4	9	1



# SIM Activities Supporting Strategic Objectives

## IADB Funding and Planning for the 4<sup>th</sup> Industrial Revolution

- Metrology for Innovation, Sustainable Development, Renewable Energies, Energy Efficiency, Climate Science, Biodiversity and Green Economy.
- Increase the technical capabilities of SIM NMIs
- Implementation of the redefinition of the SI in the region
- Workshop Challenges and Opportunities for NMIs in the Americas
  - Role of metrology in advanced manufacturing
  - Public-private dialogue workshop
  - Context included the revision of the SI and impact on supporting transitioning the manufacturing base into the 4<sup>th</sup> industrial revolution
  - Representatives of NMIs from the SIM community (especially from economies developing and improving manufacturing capabilities)
- White paper finalized early September





# Quality Management Systems (QS)

## The Foundation Supporting Consistent Realization of CMCs

- CMCs represent capability at a point in time
- All CMCs under review must be supported by an approved QS
- On-going validity is supported by
  - Participation in comparisons, etc.
  - An active QS
- Usually based on standards ISO/IEC 17025 and 17034 (and others)
- Revision to standards impacting CMCs preparing for submission
- Training in the new version ISO/IEC 17025:2017 held in the framework of the QICA (July 2019; MWG 12)



Inter-American Metrology System

*SIM QSTF: Quality System Task Force*  
*Quality Management System Reviews*



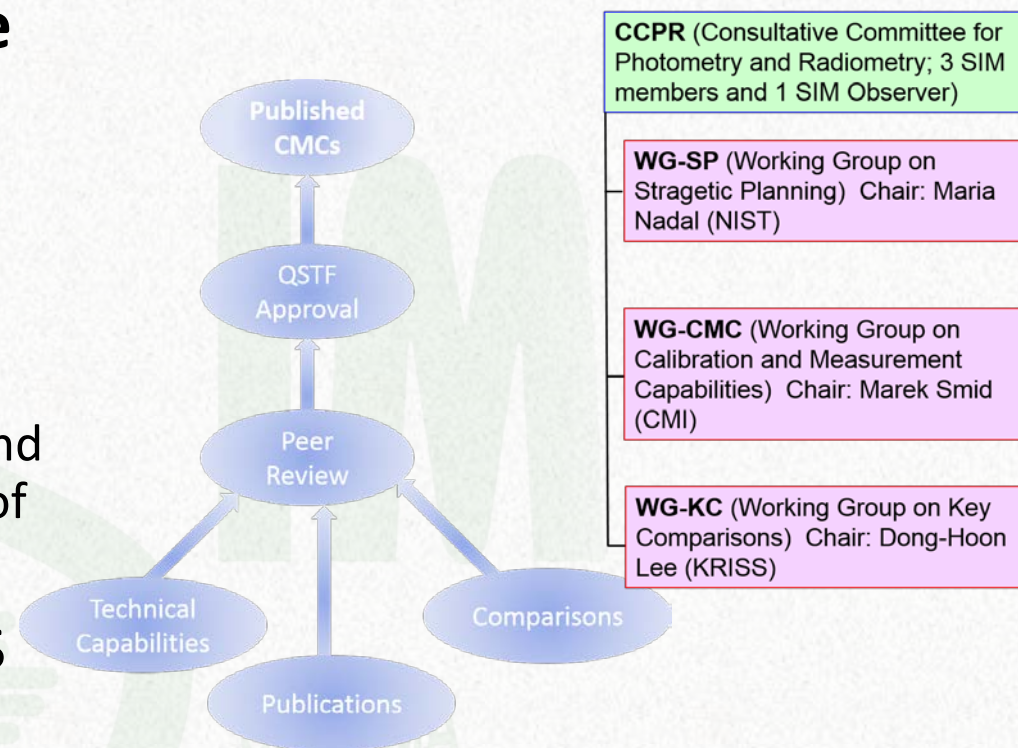
Meeting of the QSTF  
in San José, Costa  
Rica (1 April 2019)



# Interactions with the QSTF

## Leveraging Expertise for Review Confidence

- Joint workshops/meetings continue to provide opportunities for direct communication on new requirements and changes
  - Quality Workshop on transition to revised ISO/IEC 17025 (September 2018)
  - Joint TC/QSTF Workshop on revisions to ISO/IEC 17025 and 17034, TC support for QSTF reviews, and the usefulness of “Train the Trainers” courses
- Advantages to having technical expert advice on QS reviews
  - Input from the CC level
  - Guidance on the validity of technical relationships between comparisons and claims
- MWGs encouraged to communicate with the QSTF regarding status of the QMS during intra-RMO CMC review



To strengthen relationships with other organizations supporting Regional Quality Infrastructure, MWG 12 (Quality Systems) participates in COPANT (regional normalization body) and IAAC (regional accreditation body) General Assemblies



# JCRB Update

- The 41<sup>st</sup> JCRB Meeting was held 9-11 September 2019 in Dubai, UAE
- Several topics discussed
  - Highlights from the Regional Metrology Organizations
  - Discussion on hybrid comparisons
  - Updates of ILAC activities (as related to the NMIs)
  - Updates of CIPM MRA documents
  - Status and scope of the KCDB 2.0
- Several resolutions considered, and will be available in the near future





Stay Tuned for:

**Rodrigo Costa-Felix (PDC):**  
internships and other collaborative  
trainings (e.g., with the BIPM)

Thank You!  
¡Gracias!  
Obrigado!

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