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

<table>
<thead>
<tr>
<th>MWG 1: Electricity and Magnetism</th>
<th>MWG 2: Photometry and Radiometry</th>
</tr>
</thead>
<tbody>
<tr>
<td>Chair: Lucas di Lillo, INTI/ARGENTINA</td>
<td>Chair: Thiago Menegotto, INMETRO/BRAZIL</td>
</tr>
</tbody>
</table>

**MWG 3: Thermometry**<sup>*</sup>
Chair: Andrew Todd, NRC/CANADA

**MWG 4: Length**
Chair: Karina Bastida, INTI/ARGENTINA

**MWG 5: Time and Frequency**
Chair: Raúl Solís, CENAMEP/PANAMA

**MWG 6: Ionizing Radiation and Radioactivity**
Chair: Raphael Galea, NRC/CANADA

**MWG 7: Mass & Related Quantities**
Chair: Aldo Quiroga, INACAL/PERU

**MWG 8: Chemistry (Amount of Substance)**<sup>**</sup>
Chair: Valnei Da Cunha, INMETRO/BRAZIL

**MWG 9: Acoustics, Ultrasound and Vibration**
Chair: Gustavo Ripper, INMETRO/BRAZIL

**MWG 10: Flow and Volume**<sup>*</sup>
Chair: Hernán Brenta, INTI/ARGENTINA

**MWG 11: Legal Metrology**
Chair: Paulo Roque Silva, INMETRO/BRAZIL

**MWG 12: Quality System**
Chair: Elizabeth Ferreira, LATU/URUGUAY

**MWG 13: Statistics and Uncertainty**
Chair: Antonio Possolo, NIST/USA

*Requesting confirmation of chair
**Requesting name change to “Chemistry and Biology”

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**NORAMET** (V. Lizardi, CENAM/Mexico); **CAME**T (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)
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
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)

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

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

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

New Comparisons in Electricity and Magnetism (MWG 1)

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

New Comparisons in Electricity and Magnetism (MWG 1)
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

<table>
<thead>
<tr>
<th>Technical Area</th>
<th>Number of SIM Economies with Published CMCs</th>
</tr>
</thead>
<tbody>
<tr>
<td>Electricity and Magnetism</td>
<td>10</td>
</tr>
<tr>
<td>Photometry and Radiometry</td>
<td>5</td>
</tr>
<tr>
<td>Thermometry</td>
<td>10</td>
</tr>
<tr>
<td>Length</td>
<td>9</td>
</tr>
<tr>
<td>Time and Frequency</td>
<td>9</td>
</tr>
<tr>
<td>Ionizing Radiation and Radioactivity</td>
<td>5</td>
</tr>
<tr>
<td>Mass AND Flow and Volume</td>
<td>15</td>
</tr>
<tr>
<td>Chemistry</td>
<td>7</td>
</tr>
<tr>
<td>Acoustics, Ultrasound, Vibration</td>
<td>5</td>
</tr>
</tbody>
</table>
Calibration and Measurement Capabilities (CMCs)
Reviewing CMCs in SIM and Beyond

- 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

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

* Based on JCRB CMC website

### CMC summary (MWG 10)

<table>
<thead>
<tr>
<th>NMI</th>
<th>Volume</th>
<th>Liquid Flow</th>
<th>Gas Flow</th>
<th>Air speed</th>
</tr>
</thead>
<tbody>
<tr>
<td>NRC</td>
<td>1</td>
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</tr>
<tr>
<td>TCC</td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>NIST</td>
<td>1</td>
<td>1 + 1 + 1</td>
<td>3 + 1</td>
<td>1</td>
</tr>
<tr>
<td>CENAM</td>
<td>11</td>
<td>1</td>
<td>3</td>
<td></td>
</tr>
<tr>
<td>INMETRO</td>
<td>4</td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>INTI</td>
<td>4</td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>LACOMET</td>
<td>8</td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>INACAL</td>
<td>7</td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>LATU</td>
<td>4</td>
<td></td>
<td></td>
<td></td>
</tr>
</tbody>
</table>

|       | 40     | 4          | 9        | 1         |

CMCs Published, Revised and Reviewed by SIM: 2018-2019
**SIM Activities Supporting Strategic Objectives**

**IADB Funding and Planning for the 4th Industrial Revolution**

- 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 4th 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)
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 41st 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 NMI)ls)
  • 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!

Salvador Echeverría
saleche@cenam.mx

(Report prepared by Lisa Karam, TC Deputy lisa.karam@nist.gov)