Electricity and Magnetism Metrology Working Group

2012 SIM EM MWG Meeting
Saturday, July 07, 09:00 h – 18:00 h, Room Annapolis 2
Gaylord National Resort, Washington DC, USA

Agenda

09:00 h – 09:15 h	**Introduction** Welcome Introduction of the participants Approval of the Agenda	Chairperson SIM representatives
09:15 h – 10:00 h	**General Issues** Matters arising from the last JCRB meeting SIM Technical Review Process for EM CMC Funding for SIM activities	Chairperson SIM representatives
10:00 h – 10:30 h	**SIM.EM-K5 Electric Power Comparison** Draft A status	Pilot: CENAM
10:30 h – 11:00 h	**SIM.EM-S7 Electric Energy Comparison** Draft A status	Pilot: CENAM
11:00 h – 11:30 h	**SIM.EM-K12 AC-DC Current Transfer Comparison** Comments on status	Pilot: INTI
11:30 h – 12:00 h	**SIM.EM-K4, SIM.EM-S4, SIM.EM-S3 Capacitance Comparison** Draft B and Executive Report status	Pilot: NIST
12:00 h – 14:00 h	**Interval**	
14:00 h – 14:30 h	**SIM.EM-S5 Digital Multimeter Comparison** Draft B status	Pilot: NIST ICE representative
14:30 h – 15:30 h	**New and Proposed Comparisons** SIM.EM-S8 Comparison on Current Transformers (Pilot: UTE) SIM Pilot Study on Current Shunts / Low-valued Resistors (Pilot: CENAM) SIM Comparison on Calibration factor of type-N thermistor mounts (Pilot: ICE). SIM.RF-K5b.CL Comparison on S-parameters (Pilot: INTI) SIM.EM-S9.b, 1 Ω and 10 kΩ Bilateral Comparison (INTI and INIMET) SIM.EM-S10 High resistance cryogenic current comparator scaling comparison (Pilot: INTI) SIM.EM-K3 Inductance Comparison (Pilot: to be defined) CCEM.EM-K2 Key comparison on 10 MΩ and 1 GΩ resistances	SIM representatives
15:30 h – 16:00 h	**SIM and Interregional CMC Reviews** CMC SIM.EM.05.2011 – Mexico - final comments CMC SIM.EM.06.2012 – Mexico and Peru New submissions for SIM CMC Review Updating the list of SIM reviewers	SIM representatives
16:00 h – 17:00 h	**SIM/IAAC/COPANT Energy Project** Presentation of results from October 2010 and May 2012 workshops and subsequent discussion Training on Electric Power Measurements and Electricity Meter Verification Training on Traceability for Power Quality and High Voltage Calibrations Energy Efficiency of Electric Household Appliances	Chairperson INTI representative
17:00 h – 17:30 h	**Other Business** Developments at the laboratories	SIM representatives
17:30 h – 18:00 h	**Next SIM EM MWG Meetings** Next meetings to be held at X Semetro at INTI, Buenos Aires, September 2013 CPEM 2014, Rio de Janeiro, August 2014	

Electricity and Magnetism Metrology Working Group

Participants

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USA	NIST	Andrew Koffman	akoffman@nist.gov
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1. SIM EM MWG Annual Meeting - Introduction

Welcome and introduction of the participants

The meeting commenced at 9:00 am with a welcome by the chairman followed by self introductions of the attendees from the various countries represented. We had 24 representatives from 12 countries.

The agenda was changed: the discussion of SIM.EM-K3 Inductance Comparison was anticipated as Torsten Funck (PTB) had to leave in the morning and it was decided to postpone the lunch to after the meeting.

The revised agenda was approved by all participants.

Andrew Koffman (NIST) volunteered to take the minutes for this meeting.

2. General Issues

2.1 Matters arising from the last JCRB meeting

JCRB actions, resolutions and recommendations are to be distributed to SIM members.

Action agreed	Responsible	Date
JCRB actions, resolutions and recommendations to be distributed to SIM members	SIM chairperson	August 03

2.2 Matters arising from the last CCEM meetings at CPEM 2012

2.2.1 CCEM Working Group on Low Frequencies (WGLF) Meeting

The CCEM WG Special Ad-Hoc Task Force Meeting - Key Comparison on Harmonic Power Measurements was held on Saturday (June 30) and chaired by Eddy So (NRC). A workshop at CPEM on 'International Comparisons - Design, Data Analysis and Reporting' (as agreed at the WGLF & CCEM meetings last year) was held on Sunday (July 01) followed immediately by a short (1 hour) WGLF meeting for members chaired by Jonathan Williams (NPL).
The workshop topics covered:

- Comparison models, how to link comparisons
- How to handle outliers
- Comparisons with many data points, multidimensional values or complex values
- Degrees of equivalence and CMCs
- Data analysis, standard formats for data presentation

The workshop was provided by members of EURAMET and speakers included Beat Jeckelmann (METAS), Markus Zeier (METAS), Luca Callegaro (INRIM) and Jonathan Williams (NPL). The presentations were based on examples drawn from real comparisons.

- CCEM-K13 Power Harmonics Comparison

Participants: NIST, NRC, SP, PTB, NPL, VNIIM, NIM
NMIA (Australia) gave up participating. VNIIM (Russia) will replace NMISA (South Africa) as the latter is not technically prepared. NMIA suggested also NIM (China) as the additional NMI from APMP.
- Discuss the merits of different transfer standards and select one
The traveling standard would be provided by NIST or NIM.
A Fluke 6105 will be first characterized by four NMIs (pilot study) and then used in the comparison. Gert Rietveld (VSL) commented that the first one would be already a comparison and suggested that NIST and NRC characterize the standard. Tom Nelson (NIST) told that NIST lacks personnel. Gregory Kyriazis (Inmetro) suggested one NMI from EURAMET and one from SIM. Jonathan Williams (NPL) will contact PTB about the interest.

Ilya Budovsky (NMIA) wondered why a source should be used in the comparison instead of a meter as all comparisons. Eddy So (NRC) informed that the main problem is to reproduce the complex waveform in all labs. NIM representative mentioned that harmonic ratio is stable for both source and meters.
NRC is not willing to be the pilot lab and asked NIST to characterize the traveling standard. Tom Nelson (NIST) argued that NIST cannot do the job. Eddy So (NRC) said to Jonathan Williams (NPL) that perhaps PTB is not willing to be the pilot either.

- Agree the technical protocol
The committee had agreed to use the same protocol as that one used in that comparison between NRC and SP. The technology has evolved however. Eddy So (NRC) clarified the previous protocol. He asked whether we want the old protocol or to write a new one. It was finally suggested to modify the old protocol to include a new waveform that would be best for metrology purposes though not a real life one. A waveform composed of a fundamental and about 50 harmonics with the same amplitude (for instance, 10% of the fundamental) was proposed and would enable to evaluate the broadband response of the meters.

- Choose a coordinator and support group
Eddy So (NRC) informed that NRC is no more an institute but a Program. A full reorganization has just been made in NRC structure. NRC could be the pilot however … Tom Nelson (NIST) commented that it is good to go to the original forum. SP, PTB and NIST would make part of the support group.

- CCEM-K5 Power Comparison

Primary power comparison
Last in 1996 – 2001
NIST coordinator – 15 labs
Quantity: 120 V, 5 A
For PF = 1, 0.5 (i, c), 0.0 (i, c)

New Proposal
120 V, 5 A, 53 Hz
240 V, 5 A, 53 Hz
Power factor: 1, 0.5c, 0.5i, 0c, 0i
Aimed uncertainty level? < 30 μW/VA

Time required per laboratory?
6 weeks per lab including transportation

Traveling standard

CCEM – K5: Rotek MSB-001

SIM.EM-K5: RD-22-311, RD-23-432
APMP.EM-K5: EMH/HEG C1-2 (currently MTE)
EURAMET.EM-K5: HEG C1-2

Tom Nelson suggested MSB-100 which was not available at the time of CCEM-K5

Experiences with these standards?
Technical protocol: as previous

Jonathan Williams (NPL) gave a presentation from PTB, whose representatives could not arrive on time for the meeting on Saturday (June 30). The digitizer designed by Guilherme Ihlenfeld (PTB) was discussed.

Eddy So (NRC) said that he does not like very much to use a commercial instrument as traveling standard. He would therefore agree that PTB standard be used in the comparison if its stability is experimentally confirmed.

Participants:
CMC uncertainty
Willing to be linking lab for RMO follow-up loop
Geographic spread – ideally all RMOs
10-12 participants

COOMET – VNIIM
AFRIMET – NMISA
SIM – Participant NMIs to be defined in the present SIM EM MWG meeting
APMP – Participant NMIs to be defined (perhaps, NIM, NMIA, KRISS)
EURAMET – still to be defined

Eddy So (NRC) suggested that a review be made on the present levels of measurement uncertainty of the representative labs from all regions.

Coordinator
Single coordinator
Sharing of coordinator tasks?
1. Organization
2. Characterization of traveling standard and multiple measurements during loop
3. Writing report

Ilya Budovsky (NMIA) suggested that PTB does the second task if their digitizer is chosen as traveling standard.

Further results from the CCEM WGLF meeting on July 01:

Guilherme Ihlenfeld (PTB) informed that his digitizer still needs to be evaluated concerning transportation robustness. A bilateral comparison is currently being made between PTB and METAS to evaluate how robust the digitizer is and which design changes need to be made in this respect.

René Carranza (CENAM) informed that CENAM could offer the SIM.EM-K5 traveling standard for use in the CCEM-K5 comparison. It was proposed to use the Radian standard donated to SIM. The internal firmware can be reset so that NMIs do not know the standard values. Gregory will inform the CCEM WGLF about that possibility.

Support group

To be defined.

2.3 Matters related to SIM

SIM delegates have started to talk about a strategic plan for SIM during the SIM Assembly in Quito, 2012, Ecuador.

2.4 EURAMET Reflection on MRA Processes

The MRA processes (CMC review and comparisons) represent an important workload for the technical committees in the RMOs. The experience with recent CMC reviews shows that the CMC processes are becoming more and more difficult to handle:

- The number of entries steadily increases.
- It is difficult to review all entries properly and to ensure their validity over time.
- For an external customer it is difficult to compare services published in the KCDB and to choose. For this purpose, the data base entries are often not comparable enough.

EURAMET issued a paper in February 2011 with this motivation criticizing the process and suggesting possible roots for improvement.

In the last meeting of CCEM Working Group on RMO Coordination (WGRMO) held on Sunday (July 01) and chaired by Gregory Kyriazis (SIM), François Piquemal and Beat Jeckelmann (EURAMET) proposed new ways of formatting and handling CMC entries which however have not been agreed upon by Ilya Budovsky (APMP). The chair asked the EURAMET representatives to elaborate a new document with examples on how the CMC entries could be arranged to be presented and discussed in the next formal meeting of CCEM WGRMO.

2.5 NIST proposal to improve the CMC Review Process

Rand Elmquist (NIST) commented on the SIM database. A meeting was held at NIST regarding the processing of the CMC JCRB at BIPM. EURAMET proposed to more efficiently process CMC reviews. NIST might propose to develop a web-based database for CMCs. Reviewers could log in and see their review status and info. This would be a forum for information on the reviews. Gregory will address this point directly to Claudine Thomas (BIPM). Claudine is looking for means to improve the BIPM database. She has contacted Google but the cost is too large for specific application software. She is looking for alternatives. Gregory noted that BIPM could have a resistance to any NMI-based software or implementation. Rand has then suggested the use of a consultant company that has done work for NIST to do the work for BIPM for improving the KCDB.

2.6 Funding for SIM Activities

Discussion about SIM meetings and training: Funding is difficult but we must plan to meet our needs. SIM could determine training topics beneficial to the SIM members. Gregory needs to contact NMI representatives for international relations to arrange programs. Gregory informed that SIM does not have current funding for future meeting / training programs.

Is there interest in DC Josephson work? High level of resistance metrology? Resources are limited and decisions must be made to decide between meetings, trainings, and internships. Peru (INDECOPI) is sending members to NRC for training (Internship program under the SIM Interim Project). Recent internships funded by SIM Interim Project were agreed upon among NMI directors, SIM sub-regional representatives and SIM TC Chair, and finally approved by the SIM Council.

Due to scarce funding, there is an increasing trend for resource allocation to be decided among SIM sub-regional representatives, NMI directors, SIM TC Chair (Claudia Santo), and submitted to and approved by the SIM Council.

Gregory should write a meeting / training / internship plan to be presented at the next SIM TC meeting. Internships are also possible. SIM EM MWG members could send Gregory information on intended training or internships. Gregory could then address the SIM TC chair (Claudia Santo) on information about requested training or internships and some funding might perhaps be found. Such information could also be addressed independently by the interested NMI director and the SIM representative of the corresponding SIM sub-region. The SIM sub-region representative and the SIM EM MWG chairperson, both present at the SIM TC meeting, could then act harmoniously thus reinforcing the funding requests made.

Action agreed	Responsible	Date
Information on requested future SIM meetings / trainings / internships to be sent to chairperson	SIM representatives	September 15

2.6.1 2012 SIM EM MWG meeting

The SIM / OAS project ended in 2011. As a new project needs to be submitted to OAS and as that institution has not signaled, an interim project was conceived last year to bridge the funding gap. The resources were distributed among the SIM Working Groups, An amount of US$ 7,000 was made available for SIM EM MWG. An email was sent by the chairperson about the funding availability. Only three SIM members manifested interest and received funding for flight tickets.

There is no SIM funding available for the near future.

CPEM 2012 was held in Washington D.C. July 1-6, 2012. NIST provided Travel Grants (to a number of representatives of countries in the Americas who have been underrepresented in previous CPEMs). The goal was to quadruple participation (people and countries) from Central America, South America, and the Caribbean region. NIST started the process of getting the SIM National Metrology Institutes (NMIs) to begin the solicitation process in 2011. The director from each participating NMI nominated applicants who would represent their country. CPEM 2012 used the SIM EM MWG to review the applications and make recommendations to CPEM 2012 regarding who should be accepted to the program. Participants would be required to submit a two-page abstract on their work for presentation at the conference in a special poster session or as part of the general technical program. Topics might include their work in electrical metrology, establishment of calibration and measurement capabilities in their country, collaborations with other researchers, or proposed future developments in electrical metrology. Nominations were accepted starting in 2011 and final selections made in 2012. A total of US$ 67,000 was made available in the form of travel grants to provide for conference registration, lodging, per diem, and assistance with transportation. 18 SIM representatives have been awarded with NIST Travel Grants (13 of those participated in the SIM EM MWG meeting).

3. SIM.EM-K5 Key Comparison on Electric Power

Pilot - CENAM
Report by René Carranza
Draft A circulated to participants

The comparison has finished and the traveling standard is at CENAM. Draft A was issued and distributed to participants. René Carranza (CENAM) made a presentation of the Draft A results. He showed the high stability of the traveling standard (± 2 ppm) during the comparison.
He requested all participants to review the Draft A upon return from CPEM.

Measurements done with Radian RD-22-311 by CENAM, NIST, NRC, Inmetro, UTE, and INTI.
Measurements done with Radian RD-23-432 by LCPN-ME, SNM-INDECOPI, INM, CENAM, ICE, CENAMEP AIP.

Action agreed	**Responsible**	**Date**
Draft A distributed to participants	René Carranza	OK
Draft A approval by participants	René Carranza	August 3
Draft B distributed to participants	René Carranza	August 30
Draft B approval by participants	René Carranza	September 20
Executive Report issued by participants	René Carranza	September 30
Draft B and Executive Report sent to SIM chairperson	René Carranza	October 30
Final Report published in KCDB	Chairperson	November 15

4. SIM.EM-S7 Supplementary Comparison on Electric Energy

Pilot - CENAM
Report by René Carranza
Draft A circulated to participants

The comparison has finished and the traveling standard is at CENAM. Draft A was issued and distributed to participants. René Carranza (CENAM) made a presentation of the Draft A results.
He requested all participants to review the Draft A upon return from CPEM.

Measurements done with Radian RD-22-311 by CENAM, NIST, NRC, Inmetro, UTE, and INTI.
Measurements done with Radian RD-23-432 by LCPN-ME, SNM-INDECOPI, INM, CENAM, ICE, CENAMEP AIP.

Action agreed	**Responsible**	**Date**
Draft A distributed to participants	René Carranza	OK
Draft A approval by participants	René Carranza	August 3
Draft B distributed to participants	René Carranza	August 30
Draft B approval by participants	René Carranza	September 20
Draft B sent to SIM chairperson	René Carranza	October 30
Final Report published in KCDB	Chairperson	November 15

5. SIM.EM-K12 Key Comparison on AC-DC Current Transfer

Pilot - INTI
Report by Lucas Di Lillo
Comparison in progress

Comparison carried out from July 2010 through April 2012.
Lucas Di Lillo (INTI) made a presentation on the comparison.
This comparison is being done at two values, 10 mA and 5 A, using a shunt and thermal converters all manufactured by INTI. A data logger is being used to measure temperature and humidity during testing and transportation of the standards.
Peter Filipski found an equipment problem during October 2010. This caused a delay in the comparison. The problem was resolved and the comparison is continuing. Measurements already done by INTI, UTE, NRC, NIST, CENAM, INM and INMETRO. Measurements still needed to be done by NIS (Egypt) (The latter was added after approval by SIM EM MWG in July 2011 of a request made to Lucas Di Lillo by Dr. Eng. Mamdouh Halawa, the head of electrical measurements in NIS, Egypt). Standard has to go to NIS and back to INTI.
Draft A will be submitted shortly after three months of conclusion of the comparison.
The pilot informed that CENAM and NIST have not sent their measured values yet.
Rene Carranza will ask CENAM staff about reports. Andrew Koffman will ask NIST staff (Tom Lipe) about report submission.

Action agreed	Responsible	Date
Measurements to be done by NIS, Egypt and standards returned to INTI	Lucas Di Lillo	August 15
Final measurements by INTI	Lucas Di Lillo	September 15
Draft A distributed to participants	Lucas Di Lillo	December 15
Draft A approved by participants	Lucas Di Lillo	January 15

6. SIM.EM-K4, SIM.EM-S4, SIM.EM-S3 Key and Supplementary Comparisons on Capacitance

Pilot - NIST
Report by Andrew Koffman
Draft B under review by CCEM
Technical paper published at CPEM 2012

Measurements finished by NIST, CENAM, ICE, NRC, INTI, Inmetro, UTE.
Traveling standards at NIST.
Draft B currently under review by CCEM.

Andrew Koffman made a presentation on the comparison. The Draft B was sent out and finalized. However, it cannot become the Final Report until accepted by the CCEM. Andrew should get a boiler plate from Rand for the Executive Report and should send an example report to SIM participants. The Executive Report should address the issue of whether labs are satisfied with their own CMCs. CCEM will provide some modifications to the report for finalization.

Action agreed	Responsible	Date
Draft B submitted to CCEM for approval	Chairperson	OK
Executive Report sent to SIM chairperson	Andrew Koffman	August 15

7. SIM.EM-S5 Supplementary Comparison on Digital Multimeter

Pilot - NIST
Report by Harold Sánchez (on behalf of Mark Parker now retired from NIST)
Draft B circulated to participants
Technical paper published at CPEM 2012

Measurements finished by NORAMET (only NIST participated as pilot), CAMET (ICE, CENAMEP AIP), CARIMET (TTBS), ANDIMET (SNM-INDECOPI, CMEE, SIC) and SURAMET (INTI, UTE, LCPN-ME, Inmetro)
Draft B elaborated and distributed to participants for comments.

6 (six) DMMs purchased with OAS resources for SIM.EM-S5 (only four were used in the comparison) have been distributed by NIST to the three pivot laboratories from SURAMET, ANDIMET and CAMET, namely, INTI, ICE and INDECOPI. Each NMI received 2 (two) DMMs and will be responsible for coordinating sub-regional comparisons in the future.

A bilateral comparison only for 10 Ω resistance (SIM.EM-S5.B) between UTE (Uruguay) and INTI (Argentina) will be proposed. A protocol will be written and submitted with limited parameters. CMCs should be compatible with results.

Action agreed	**Responsible**	**Date**
Draft B approved by participants	Harold Sanchez	August 03
Final Report published in the KCDB	Chairperson	August 15
Protocol on bilateral comparison between UTE and INTI to be issued	Daniel Slomovitz	August 07
Protocol on bilateral comparison to be sent to Chairperson	Daniel Slomovitz	September 14

8. New and Proposed Comparisons

SIM.EM-K3 Key Comparison on Inductance

Old SIM.EM-K3 was abandoned due to difficulties with the traveling standard.
The question arose of whether to wait for a new CCEM inductance to which to link.
Torsten Funck (PTB) informed that PTB could in principle provide a link to the K3 comparison, but they would not like to do so, because the comparison is very old. They instead recommend to wait for a new CCEM comparison and recommend, that at least two SIM Laboratories with reasonably small uncertainties participate. A SIM comparison might be launched prior to the CCEM comparison, linking can be done also afterwards. PTB has no standards available, that could be used for a SIM or CCEM comparison, instead we recommend that BIPM would buy them for the CCEM comparison and the participants share the cost.
CCEM-K3 was postponed but may restart. After March, CCEM should know the status of that comparison.
Felipe Hernandez (CENAM) made a presentation on the new comparison: Proposed that CENAM will pilot new SIM Inductance Comparison.
Standards: 2 (two) from NIST, 1 (one) from NRC, 1 (one) from CENAM (these standards could be sent to CENAM for test). An oven to keep the traveling standard temperature during the comparison could also be needed.
CENAM has been characterizing standards.
Rand Elmquist raised the possibility of a small test comparison to test the stability of standards.
It was proposed to start SIM comparison and carry to completion prior to or in parallel with CCEM comparison. Then linkage could be provided as available from new CCEM comparison. It was proposed to use CENAM and NRC as linking labs. CENAM should begin writing the protocol, characterizing the standards, filing comparison in KCDB.
Vote taken to start comparison: All Members Agreed.

Action agreed	Responsible	Date
Traveling standards to be characterized	Angel Moreno	February 2013
Protocol distributed to participants	Angel Moreno	March 2013
Protocol and registration sent to chairperson	Angel Moreno	April 2013

SIM.EM-S8 Supplementary Comparison on current ratios using instrument transformers

Measurement ratios: 5 A, 10 A, 50 A, 100 A, 500 A, 1000 A to 5 A.
Currents for each ratio: 1%, 5%, 20%, 100% and 120% of nominal current (In).
Frequency: 50 Hz or 60 Hz or both.
Pilot: UTE
Participants: UTE, Inmetro, INM, CENAMEP, NRC and INTI.
Status: Protocol distributed

UTE prepared a draft protocol and distributed it. It has been already circulated for approval.

There is a delay due to a bad traveling standard. It became unstable. A new one has been purchased.
Daniel asks whether the uncertainty values are okay. Please respond!
Transformer, circuit box, and battery will be sent for comparison. Daniel asks labs to inform if that equipment is okay for the labs. Please respond!
The primary windings could be altered. Please inform Daniel if new configuration is okay.
Daniel will deliver a detailed e-mail to Gregory for distribution.
Is the technical support group to be changed? Additionally, CENAMEP Panama will participate.
Are the calibration points the same?
This comparison cannot be a Key Comparison because it cannot be linked to a CCEM comparison. Therefore, it will remain a supplementary comparison.

Action agreed	Responsible	Date
Problems with traveling standard to be solved	Daniel Slomovitz	October 31
Detailed email to be delivered to participants	Daniel Slomovitz	July 30

SIM.EM-S11 Supplementary Comparison Low-value Standard Resistors
Test points: 1 mΩ, 10 mΩ and 100 mΩ at 10 mW and 100 mW power.
Pilot lab: CENAM
Participants: not defined yet.
Status: Proposed by CENAM

Felipe Hernandez (CENAM) made a presentation on this comparison. CENAM would like to propose a comparison with three values: 100 mΩ, 10 mΩ, 1 mΩ at 10 mW or 100 mW. He will send (by September 2012) a survey to SIM NMIs in order to identify the values and the power conditions for the comparison. Felipe would arrange with Marlin Kraft (NIST) in the writing of the protocol and the establishment of the standards (NIST would provide some standards). Test transport could be performed to test the traveling characteristics of the standards. Rand Elmquist (NIST) suggests that CENAM send their standards to NIST and Marlin would test them. Felipe will send the standards to Marlin. Felipe will send Gregory an e-mail to query participants. Tentative NMIs interested are: INMETRO, UTE, ICE, NRC, (INTI under consideration).

Action agreed	Responsible	Date
Survey to be distributed to NMIs	Felipe Hernandez	September 2012
Traveling standards to be characterized	Felipe Hernandez	February 2013
Protocol distributed to participants	Felipe Hernandez	March 2013
Protocol and Registration to be sent to Chairperson	Felipe Hernandez	April 2013

SIM.EM-K4.b, SIM.EM-S4.b, SIM.EM-S3.b Capacitance
Participants: NIST and ICE
Status: Bilateral comparison already done

A Bilateral Comparison between NIST and ICE has already been incorporated to SIM.EM-K4, SIM.EM-S4, SIM.EM-S3 Draft B. This helped ICE in elaborating the corrective actions added to that report.

SIM.EM.RF-K8 Key Comparison on Calibration Factor of Type-N Thermistor Mounts
Test points: to be defined
Pilot lab: To be defined
Participants: ICE, CENAM, INTI, NIST and NRC
Status: Proposed by ICE

ICE may not be equipped to pilot the lab so they will not be the pilot.
Tentative participants: NRC, CENAM, INTI, NIST
This comparison will be delayed due to no present need. CENAM will contact RF personnel to pilot. NIST staff member Ron Ginley will be contacted.
Ronald Ginley received the Type N Microwave Power standards proposed to be used in the comparison. Numerous attempts to measure one of the M1110s (SN 2902) resulted in very noisy measurements with high short term standard deviations. Further investigation revealed a loose center conductor on the type N RF interface. The center conductor has somehow loosened from the bead. SN 2903 appears normal and measures well.
NIST then sent the unit to be fixed at TEGAM. Ron Ginley will check the current status.

The discussion of this comparison has been postponed to the next meeting.

Action agreed	Responsible	Date
NIST to check current status of the traveling standards	Ronald Ginley	August 15
CENAM RF personnel to pilot?	David Avilés	August 03

SIM.EM.RF-K19.CL Key Comparison on RF Attenuation
Test points: 10 dB, 20 dB and 30 dB (30MHz, 1 GHz and 10 GHz)
Pilot lab: INTI
Participants: ICE, CENAM, INTI, NIST and NRC
Status: Proposed by INTI

This comparison is cancelled and will not be considered further.

SIM.RF-K5b.CL Key Comparison on Scattering Coefficients by Broad-Band Methods
2 GHz - 18 GHz - Type N Connector
Test points:
Pilot lab: INTI
Participants: CENAM, INTI, NIST and NRC
Status: Protocol distributed and approved

Scattering parameters of Type N connector devices selected for this comparison will be measured from 2 GHz to 18 GHz (inclusive) in 1 GHz steps. For one-port devices (matched and mismatched loads) the measurand is the complex-valued reflection coefficient S11. The VSWR 1.0 (matched) load and VSWR 2.0 (mismatched) load were chosen to perform reaction measurements with low and high magnitude values. When measuring two-port devices (3 dB and 20 dB attenuators) the measurands are the four complex-valued S-parameters (S11, S21, S12 and S22). The values of 3 dB and 20 dB were chosen to cover transmission measurements with high and low magnitude values.

The analysis of the results will be done only for S11 (for one-port devices) and S21 (for two-port devices) in 2 GHz, 9 GHz and 18 GHz to reduce the amount of data to be analyzed for the comparison. These three frequencies were chosen to cover the low, medium and high frequency range.

The pilot informed that the comparison will start in October. Schedule will be sent for agreement. INTI is ready to start by October. This is SIM´s first comparison on RF!

Action agreed	Responsible	Date
Protocol approved by CCEM	Chairperson	August 24
INTI to distribute the schedule to comparison participants	Lucas Di Lillo	September 03
INTI to prepare the registration form	Lucas Di Lillo	September 30
Registration form and updated protocol to be published in the KCDB	Chairperson	October 15

SIM.EM-S10 Supplementary Comparison on High resistance Cryogenic Current Comparator Scaling
Test points: 1 MΩ, 10 MΩ, (two standards), 100 MΩ, (two standards), 1 GΩ
Pilot lab: NIST
Participants: CENAM, INTI, NIST (NIST will be pilot, INTI will do the analysis. CENAM will participate.)
Status: Protocol in elaboration

Purpose: The purpose of this comparison is to compare the high resistance cryogenic current comparator scaling of the participating institutes. Only measurements with a cryogenic current comparator are accepted.

Action agreed	Responsible	Date
Protocol to be distributed to participants	Marcos Bierzychudek	August 03
Protocol and registration to be sent to chairperson	Marcos Bierzychudek	August 30

9. CCEM Comparisons

CCEM.EM-K2 Key comparison on 10 MΩ and 1 GΩ resistances
Participants: CENAM, NIST, NRC and INTI representing SIM

At the CCEM meeting in March 2011, the forthcoming Key Comparison of 10 MΩ and 1 GΩ resistors was discussed. It is intended that this be a repeat of K2 carried out some years ago but now with better accuracy and precision as many laboratories have improved their instrumentation and methods in the meantime.

All SIM members have been invited by the chairperson to participate but only CENAM and NIST responded by July 25, 2011. It was agreed that three countries would suffice to represent SIM in the comparison as representatives from five RMOs are expected to participate. INTI was independently included in the comparison. Thus, now four countries are representing SIM in this comparison.

CCEM.EM-K5 Key comparison on Electric Power

A new CCEM Key Comparison is to be restarted. Only active power will be compared as the previous one from 1996-1999. See details on page 4 of this report. Gregory was asked by Jonathan Williams (NPL, CCEM WGLF Chair) to provide some participants from South America, instead of having only North American participants.

A discussion was held about the requirements to participate in a CCEM Key Comparison. Hector Laiz (INTI) asked if it is necessary to be a CCEM member in order to participate. Gregory was not sure but will investigate if there are any rules. Alain Michaud (NRC) commented that participants should be NMIs. Héctor added that participants should also provide a good link with low uncertainties with independent realization.
David Avilés (CENAM) commented that the opportunities to participate should be shared.

SIM could offer a traveling standard for use in the CCEM comparison. It was proposed to use the Radian standard donated to SIM which showed high stability (±2 parts in 10^6) in SIM.EM-K5 comparison. The internal firmware can be reset so that NMIs will not know the standard values.

There is now a need to decide on the list of participants. In order that the comparison is delivered in a timely manner, CCEM expect to have between 10 and 12 participants and this should be spread amongst the RMOs.

It was agreed at the CCEM WG Special Ad-Hoc Task Force Meeting - Key Comparison on Harmonic Power Measurements - on Saturday, June 30, that three countries would suffice to represent SIM in the comparison as representatives from five RMOs are expected to participate. Tom Nelson (NIST) is willing for NIST not to participate in this comparison. NRC could participate instead. We need two additional NMIs to participate from SIM. SIM.EM-K5 comparison data were then evaluated to determine appropriate labs to participate.

Resolution: Vote taken and All Members Agreed that NRC, CENAM, and INMETRO will participate in CCEM-K5.

CCEM.EM-K13 Key Comparison on Power Harmonics

See details in section 2.2.1 on page 3 of this report.

10. SIM and inter-regional CMC reviews

SIM NMI CMCs

CMC SIM.EM.05.2011 - published in the KCDB

SIM NMI CMCs

CMC SIM.EM.06.2012 – reviewed by AFRIMETS
Two NMIs: CENAM (Service Category 11 - RF) and INDECOPI (Service Categories 1 (voltage), 2 (resistance), 3 (dc current), 5 (ac-dc voltage and 6 (ac-dc current)
Current status: CENAM needs to get final approval from AFRIMETS and send final version of the CMC to SIM Chairperson.

Participation of SIM reviewers in inter-regional reviews

APMP.EM.7.2011 – approved by SIM and published in the KCDB

Proposals for new CMCs in the region

CENAMEP – Service Category 7 (first submittal on power and uncertainty reduction on energy) and Service Category 5 (Based on the S5 Comparison, CENAMEP will create CMCs on Voltage, Current, and Resistance (DMM).

List of SIM EM CMC Reviewers

We need additional secondary reviewers for service categories 5, 6, 8, 10 and 11.

Categories		Primary reviewer	Secondary reviewer
1.	DC voltage	Yi-hua Tang (NIST)	David Avilés (CENAM)
2.	Resistance	Rand Elmquist (NIST)	Felipe Hernandez (CENAM)
3.	DC current	Regis Landim (Inmetro)	Sara Campos (CENAM)
4.	Impedance	Marcel Coté (NRC)	Andrew Koffman (NIST)
5.	Ac voltage	Lucas Di Lillo (INTI)	
6.	Ac current	Lucas Di Lillo (INTI)	
7.	Power	Daniel Slomovitz (UTE)	Lucas Di Lillo (INTI)
8.	High voltage and current	Rejean Arseneau (NRC)	
9.	Other DC and low frequency		
10.	E&M fields	Perry Wilson (NIST)	
11.	Radio frequency	Perry Wilson (NIST)	
12.	Measurements on materials		

As can be seen there are vacant places in the table. We kindly request SIM members to nominate volunteers for those places. We need in special secondary reviewers that would accompany present reviews and replace current reviewers

in the future. An updated list of SIM reviewers is needed. Gregory will send a note to all SIM reviewers to update the information. The review period is two years with a starting point as the submission of these meeting minutes.

Complaints on SIM Review Process from EURAMET and APMP

The SIM EM MWG chair has received complaints from EURAMET and APMP chairs that SIM is delaying the interregional review process too much. They say that SIM reviewers are not contacting the NMIs contact persons during the interregional review. EURAMET and APMP have a procedure that if the NMI does not respond on time the questioned entry is automatically rejected.

Daniel Slomovitz (UTE), one of SIM reviewers, argued that some NMIs from EURAMET and APMP do not even respond.

Gregory suggested that reviewers anticipate the problems and suggest corrections.

Suggestion: based on a deadline, reviewers should have enough time (1.5 months from time of receipt); then two weeks should be given for laboratories to respond. Two weeks must be provided before CMC review is to be completed. If the technical staff member does not respond in two weeks, Gregory should be contacted to intervene.

Resolution: Rand will draft a memo to send to Gregory for improving interregional CMC review in SIM.

Action agreed	**Responsible**	**Date**
CENAM to inform status of the AFRIMETS review to Chairperson	David Avilés	July 30
Secondary reviewers to be nominated	Chairperson	September 30
CENAM CMC (on service category 11) to be approved by AFRIMETS	David Avilés	August 15
CENAMEP to submit CMC for SIM review	Carlos Espinosa	September 30
Memo to be sent to chairperson on suggestions to improve interregional review	Rand Elmquist	August 03
A note will be sent to SIM reviewers to update the list of reviewers	Chairperson	August 03

11. SIM/IAAC/COPANT Energy Project

Objective: To improve the energy infrastructure in Latin America and the Caribbean
PTB has supported this project first phase (2011-2015) at the level of 2 million Euros.

Gregory, representing the SIM EM MWG, participated in the Planning Workshop, Project Steering Group "Quality Infrastructure for Renewable Energies and Energy Efficiency in Latin America and the Caribbean" in Buenos Aires, Argentina – November 28 and 29, 2011. Héctor Laiz (INTI, SIM SURAMET representative) is SIM delegate in the Project Steering Group. A documentation on this workshop was elaborated by PTB in December 2011.

Gregory is now SIM deputy delegate in the Project Steering Group. His nomination was approved by the SIM Council in January 2012.

Gregory represented SIM at the SIM/IAAC/COPANT seminar in Fortaleza, Brasil – May 10-11. A documentation on this workshop was elaborated by PTB in May/June 2012.

SIM is considering two training programs to be supported by the project:

1. Electricity Metering (INTI, 2012): Lucas will send e-mails to Gregory for distribution to the SIM members to elaborate on the training details, including approvals and forms needed for selection of experts to attend the training. Training will take place in November 2012. Maximum attendees will be around six or seven.
2. Power Quality and Instrument Transformers (HV and HC): NRC has been requested by Gregory to hold the training but NRC is not able to commit to the training at this time. It may be possible at a later time. INMETRO studied the possibility to host this training. Gregory is asking if another NMI could host such a training workshop.

René Carranza (CENAM) asked to register a complaint regarding the SIM/IAAC/COPANT Energy Project. He claims that the information was delayed in getting to SIM members so that decisions within the NMIs are difficult.

Gregory clarified that he was not responsible for communicating information on the Fortaleza training to the SIM members. Héctor Laiz (INTI) is in close contact to NMI directors and SIM Council for the discussion of the agreements between SIM and PTB, and for the decision of those who will participate in each activity in the name of SIM.

Anyway, Gregory should distribute the results of the SIM/IAAC/COPANT workshops and will start to do so soon.

Rene Carranza (CENAM) made a presentation on a proposal concerning training for ´Traceability for Power Quality´. One goal will be for SIM to be able to link to CCEM-K13 Harmonic Power Comparisons.

Workshop 1 on June 3-7, 2013;
Workshop 2 on November 4-8, 2013; both at CENAM.

Resolutions: All SIM EM MWG participants agreed with CENAM's proposal for training. The chairperson will ask Héctor Laiz and PTB for support of CENAM's training proposal. Gregory will contact Héctor Laiz to submit this training to PTB for approval of support.

Originally, the second training envisioned by SIM at the first SIM/IAAC/COPANT workshop was to address both power quality and high voltage in one event. With CENAM proposal, we still need to think also about a future training on high voltage / high current. Incidentally, Gerardo Porras (INM of Columbia) sent an email prior to the meeting proposing INM to host the training on high voltage / high current.

Action agreed	Responsible	Date
SIM/IAAC/COPANT Workshop results to be distributed	Chairperson	August 03
Submission of CENAM training proposal to PTB	Chairperson / Héctor Laiz	August 03

12. Other Business

Rand Elmquist (NIST) commented on the database for improving CMC review. See details in section 2.5 on page 6 of this report.

Alain Michaud (NRC) commented that NRC is undergoing a reorganization of the 20 or 30 organizations into 7 portfolios. One of them is the MSS (Measurement Science and Standards). Now we must refer to NRC/MSS. NRC is still used but may not be a valid acronym in the future.

René Carranza, Felipe Hernandez and David Avilés informed that CENAM is building a new laboratory for multifunction calibrations. It will provide for improved control of environmental conditions.

Carlos Espinosa informed that CENAMEP is also undergoing some changes. There are plans for a new building within next couple years about 50 meters from the present building.

Lucas Di Lillo informed that INTI is working together with NIST on graphene and Quantum Hall resistance. INTI is also implementing high voltage improvements, including new equipment, and new bridges.

Rand commented on the NIST reorganization. There are new laboratory groups. The Physical Measurement Laboratory (PML) has been formed and there is no more EEEL. The new PML contains virtually all of the NIST measurement services and includes some groups in Boulder. Part of the Boulder staff is in the Quantum Sensor Division.

Edson Afonso and Gregory commented that INMETRO´s Electrical Metrology Division has undergone restructuring. Staff was previously organized by quantities/units according to project. Now, they are separated by function. Quantum, References, Routine Calibrations are now the labs available in the Division. They believe this will allow more the efficient exchange of information between staff.

13. Next SIM EM MWG Meeting

The 2013 SIM EM MWG meeting will be held at X SEMETRO in Buenos Aires, Argentina. Gregory commented that the *III Training and Development on Electrical Metrology* could perhaps be held immediately before the congress as in the last Semetros. This still needs to be defined. Yi-hua Tang (NIST) manifested interest in participating as lecturer at the training and as plenary speaker at SEMETRO. No news concerning SIM financial support for SIM members to attend this meeting is currently available.

The 2014 SIM EM MWG meeting will be held at CPEM 2014 in Rio de Janeiro, Brazil.

René Carranza and David Avilés (CENAM) commented that from 2009 to 2014 all SIM EM MWG meetings have been or are going to be held in Brazil and Argentina. They suggest that other meeting locations be defined in the future and that the opportunities to organize meetings be shared among other countries.

The SIM EM MWG meeting ended at 14:00 p.m as the lunch was postponed to after the meeting due to early checkout of some participants.

We thank CPEM 2012 Organizing Committee for hosting the meeting in the conference venue.

Action agreed	Responsible	Date
Participation in the III Training and Development on Electrical Metrology	SIM representatives	September 23-24, 2013
Presentation of technical papers at X Semetro in Buenos Aires, Argentina	SIM representatives	September 25-27, 2013
Participation in the SIM EM MWG meeting at X Semetro	SIM representatives	September 22, 2013

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