

RMO TC Flow Report

John Wright on behalf of

Yong-Moon Choi, Elsa Batista, Roberto Arias, Alaaeldin Eltawil and Victor
Fafurin

RMO Flow Comparison Reports Posted to KCDB

<u>Comparison</u>	<u>Measurand</u>	<u>Date published</u>
COOMET.M.FF-S3	Gas Flow	July 2013
EURAMET.M.FF-S5	Air speed	Feb 2013
EURAMET.M.FF-S2	Water Flow	Jan 2013
EURAMET.M.FF-S6	Volume (1000 L)	Sept 2013
EURAMET.M.FF-K6	Low Pressure Gas Flow	Oct 2014

RMO Flow Comparisons Planned or In Process

<u>Comparison</u>	<u>Measurand</u>
APMP.M.FF-K2.a	Hydrocarbon liquid flow, Draft A
COOMET.M.FF-S2	Water flow, 2009, Draft B
COOMET.M.FF-S4	Liquid flow, Draft B
COOMET.M.FF-S5	Gas flow, Planned
COOMET.M.FF-S6	Volume (1, 2, 5, 10, 20, 50 L)
EURAMET.M.FF-K4.2.2014	Volume (100 μ L)
EURAMET.M.FF-K5a	High pressure gas flow, Protocol
SIM.M.FF-S5	Volume (50 mL)
SIM.M.FF-S6	Volume (100 mL and 20 L), Draft A
SIM.M.FF-S7	Volume (100 μ L), Draft A



The new chairperson
PhD **Victor Fafurin**, VNIIR, Russia



COMPARISONS

COOMET.M.FF-S2

Water flow, 2009, Draft B

COOMET.M.FF-S4

Liquid flow, Draft B

COOMET.M.FF-S5

Gas flow, Planned

COOMET.M.FF-S6

Volume (1, 2, 5, 10, 20, 50 L)



CMCs

1 CMC submissions of VNIIR [under review](#)

AFRIMETS.M.FF-K4.2.2015

Information

Metrology area, branch	Mass, Fluid Flow
Description	Calibration of micropipettes
Time of measurement	2014 - 2016
Status	In progress
Reference(s)	AFRIMETS.M.FF-K4.2.2015 Registration and Progress Form AFRIMETS.M.FF-K4.2.2015 Technical Protocol
Measurand	Volume: 100 µL
Transfer device(s)	Three micro pipettes of nominal volume 100 µL
Comparison type	Key comparison
Consultative Committee	CCM (Consultative Committee for Mass and Related Quantities)
Conducted by	AFRIMETS (SADC MET expansion) (Intra-Africa Metrology System)

Pilot laboratory(ies) / Contact person(s)

NIS	National Institute for Standards <i>Egypt</i> Pilot-Web
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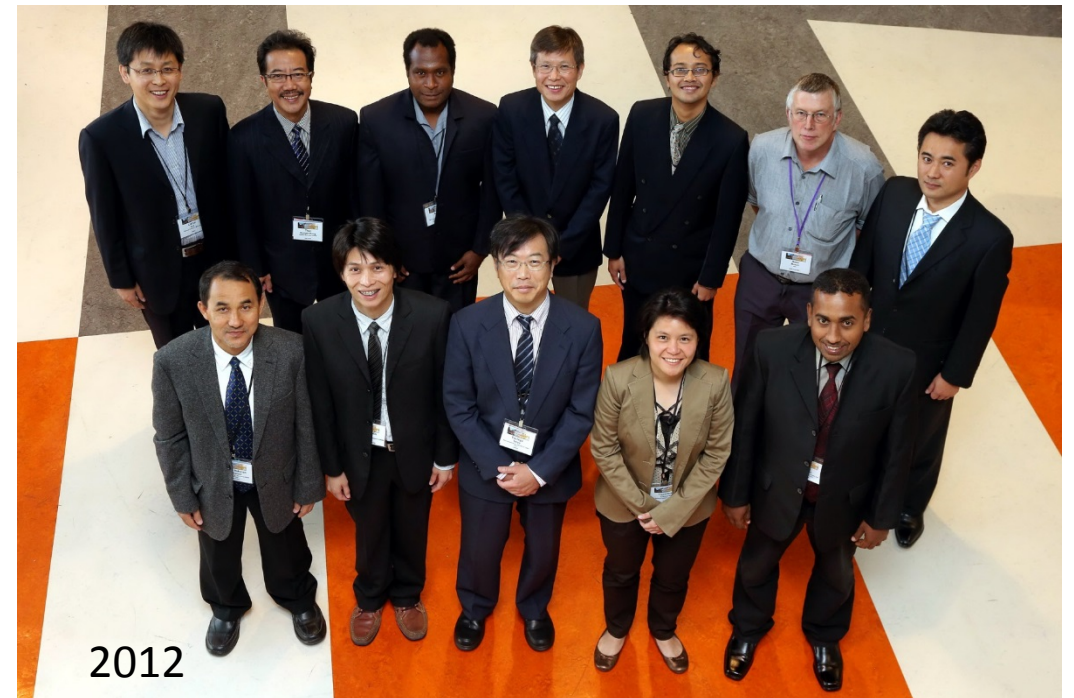
Participants

BOBS	Botswana Bureau of Standards <i>Botswana, AFRIMETS</i>
GSA	Ghana Standards Authority <i>Ghana, AFRIMETS</i>
IPQ	Instituto Português da Qualidade <i>Portugal, EURAMET</i>
KEBS	Kenya Bureau of Standards <i>Kenya, AFRIMETS</i>
LPEE	Laboratoire Public d'Essais et d'Etudes <i>Morocco, AFRIMETS</i>
NIS	National Institute for Standards <i>Egypt, AFRIMETS</i>
NMIE	National Metrology Institute of Ethiopia <i>Ethiopia, AFRIMETS</i>
NMISA	National Metrology Institute of South Africa <i>South Africa, AFRIMETS</i>
NMI-SIRDC	National Metrology Institute <i>Zimbabwe, AFRIMETS</i>
TBS	Tanzania Bureau of Standards <i>Tanzania, AFRIMETS</i>
UNBS	Uganda National Bureau of Standards <i>Uganda, AFRIMETS</i>
ZABS	Zambia Bureau of Standards <i>Zambia, AFRIMETS</i>

APMP TC Flow



Dr. Yong Moon Choi KRISS, Korea



Member Status of TCFF

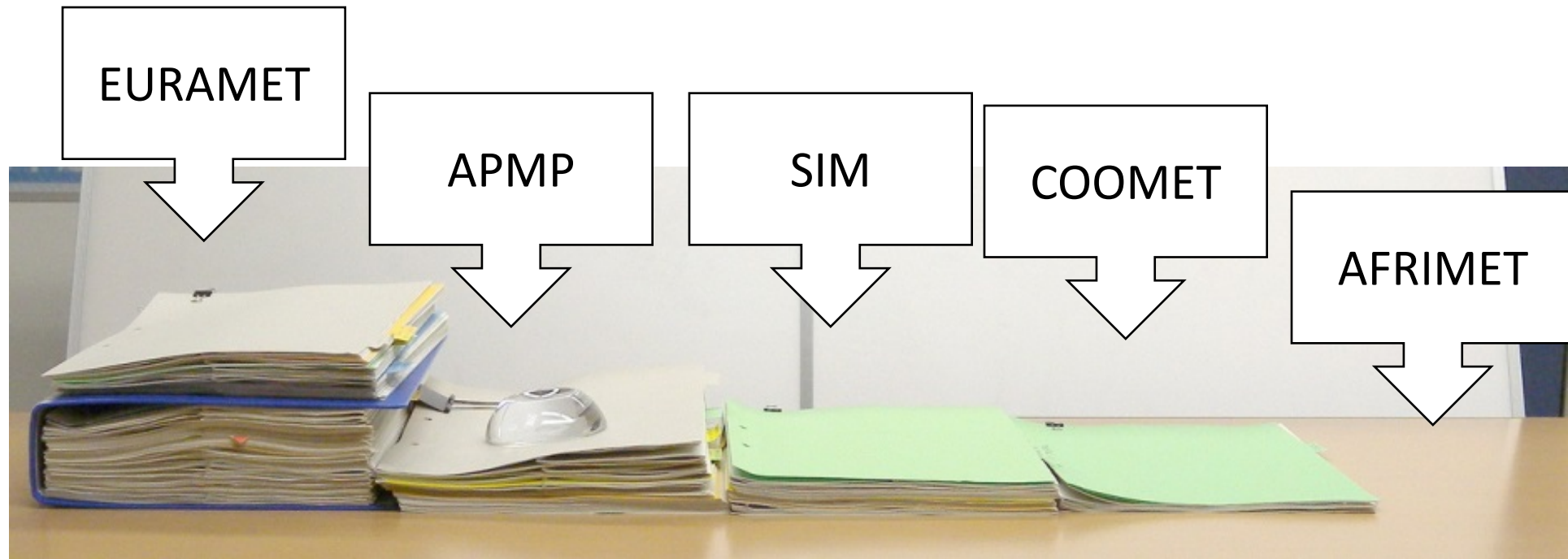
- 22 organizations from 21 economies
- Participating members in the TCFF meetings

Venue	Kobe	Wellington	Taipei
Year	2011	2012	2013
Date	05-06 Dec.	26-27 Nov.	25-26 Nov.
Participants	14	14	16
Economies	11	13	11

- In 2011, first participation from Mongolia, Russia and Papua New Guinea
- In 2012, first participation from Sri Lanka

Imbalance of RMO activities

Stack of CMCs and related documents submitted for inter-RMO review in 2.5 years



APMP/TCFF Key Comparisons

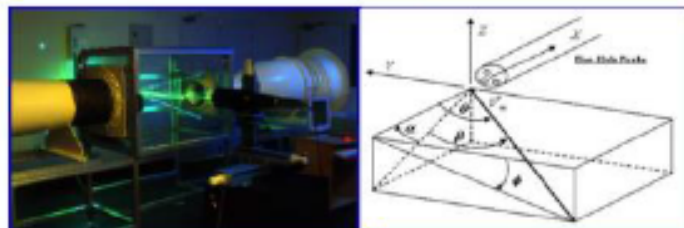
Comparison ID	Measurand	Pilot	Participants	Current status
APMP.M.FF-K1	Water Flow	KRISS	NMIJ, CMS, VMI, NIM, VNIIM, KRISS	published in KCDB on Jan. 21, 2011
APMP.M.FF-K2	Hydrocarbon Flow	CMS	CMS, VMI	published in KCDB on Mar 30, 2012
APMP.M.FF-K3	Air Speed	NMIJ	CMS, NIST, KRISS, VNIIM, A*Star, NMIJ	published in KCDB on July 30th, 2010
APMP.M.FF-K4	Liquid Volume	NMIA	CENAM, SCL, KRISS, NIM, NMISA, NMIT, NMIJ, NPSL, VMI, MUSSD, NMIA	published in KCDB on Jan. 18, 2011
APMP.M.FF-K5	High Pressure Gas Flow	KRISS	KRISS, CMS	Combined to APMP & CCM.FF-K5b, Approved for equivalence and published
APMP.M.FF-K6	Low Pressure Gas Flow	NMIJ	KRISS, NIM, CMS, A-Star, NIMT, NMIA, VMI, NMIJ	published in KCDB on Jan. 17, 2011
APMP.M.FF-K2a	Hydrocarbon Flow	NMIJ	CMS, NMIA, NMIJ	Measurement completed

All of the published comparisons have been linked to the relevant CCM KC except APMP.M.FF-K2.

Calibration of 3D Pitot Tubes and Flow Measurements of Greenhouse Gas Emissions

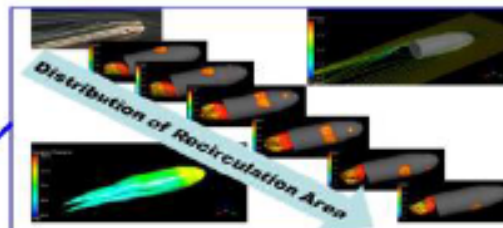
Objective of the Project

CMS
Kyle Lee



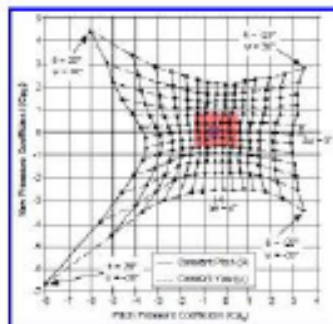
Experimental verification and theoretical analysis of pressure distribution for 3D pitot tubes

NIM
Liang Zang

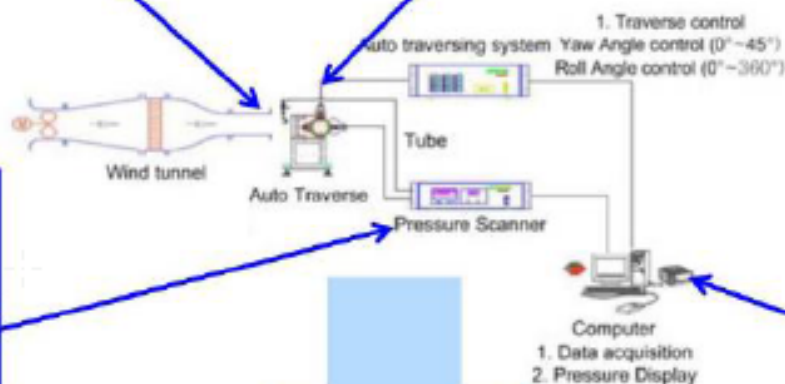


CFD simulation of flow field during 3D pitot tube calibration

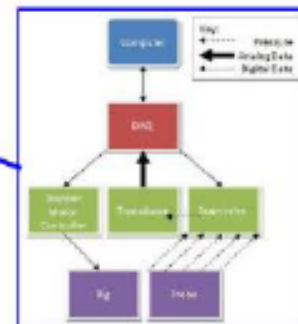
NIST
Iosif Shinder



Comparison of the nulling and non-nulling calibration method



KRISS
Woong Kang



Uncertainty analysis of 3D pitot tube calibration





Chair: Elsa Batista -> Petra Milota

MEMBERSHIP

- **29 contact persons**
- **60 flow experts**
- **34 EURAMET members organizations:**
 - **10 DI**
 - **22 NMI**
 - **2 others (CENAM, IRMM)**

STRUCTURE

- **Four sub groups**
 - **Gas Flow – Convenor - Bodo Mickan from PTB**
 - **Liquid Flow - Convenor - Petra Milota from BEV**
 - **Volume - New convenor – Miroslava Benkova from CMI**
 - **Fluid Speed – Pier Giorgio Spazzini from INRIM**



2014 EURAMET TC-F Meeting

- Last meeting 11th from 13th of March 2014: Turin, Italy hosted by INRIM
- 23 Countries: 38 Delegates
- Three day meetings
- CMC, EMRP, new facilities and comparisons results discussed

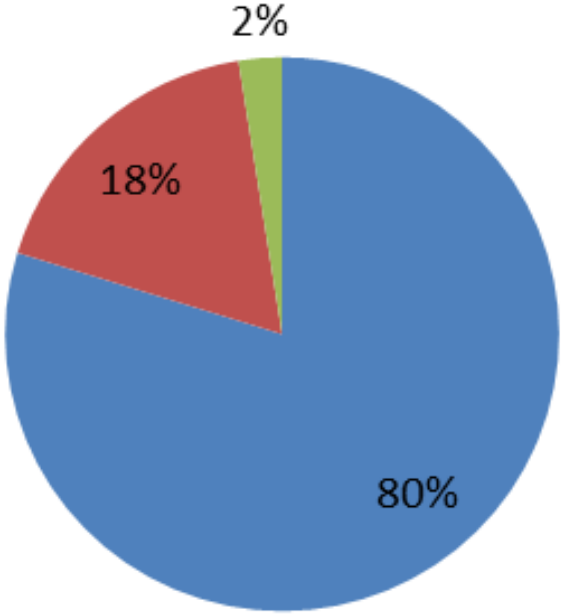


EURAMET PROJECTS

- Total 79
- Gas flow – 27
- Liquid flow – 28
- Volume – 18
- Fluid speed - 6

Type of project

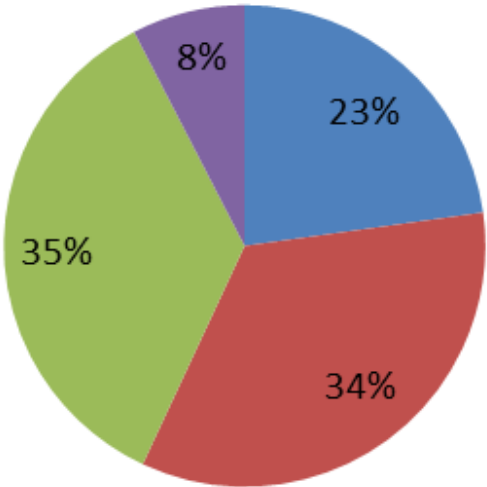
■ Comparison ■ Research ■ Consultation



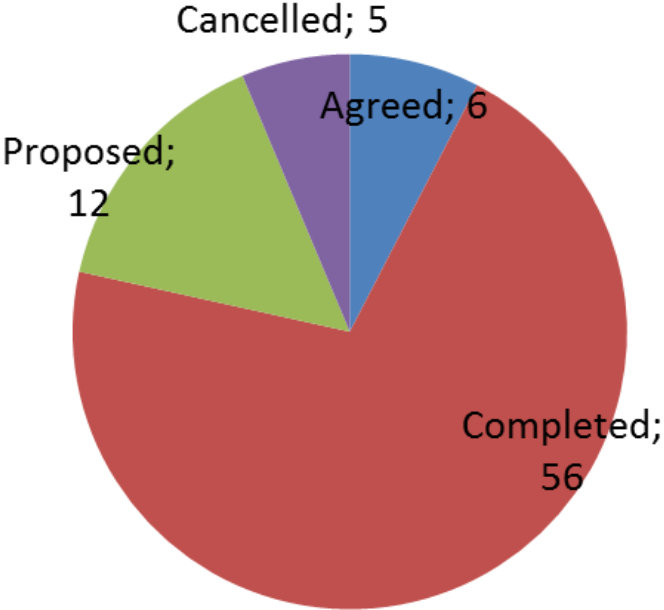
EURAMET PROJECTS

Field of Application

■ Volume ■ Gas ■ Liquid ■ Fluid Speed



EURAMET Project Status

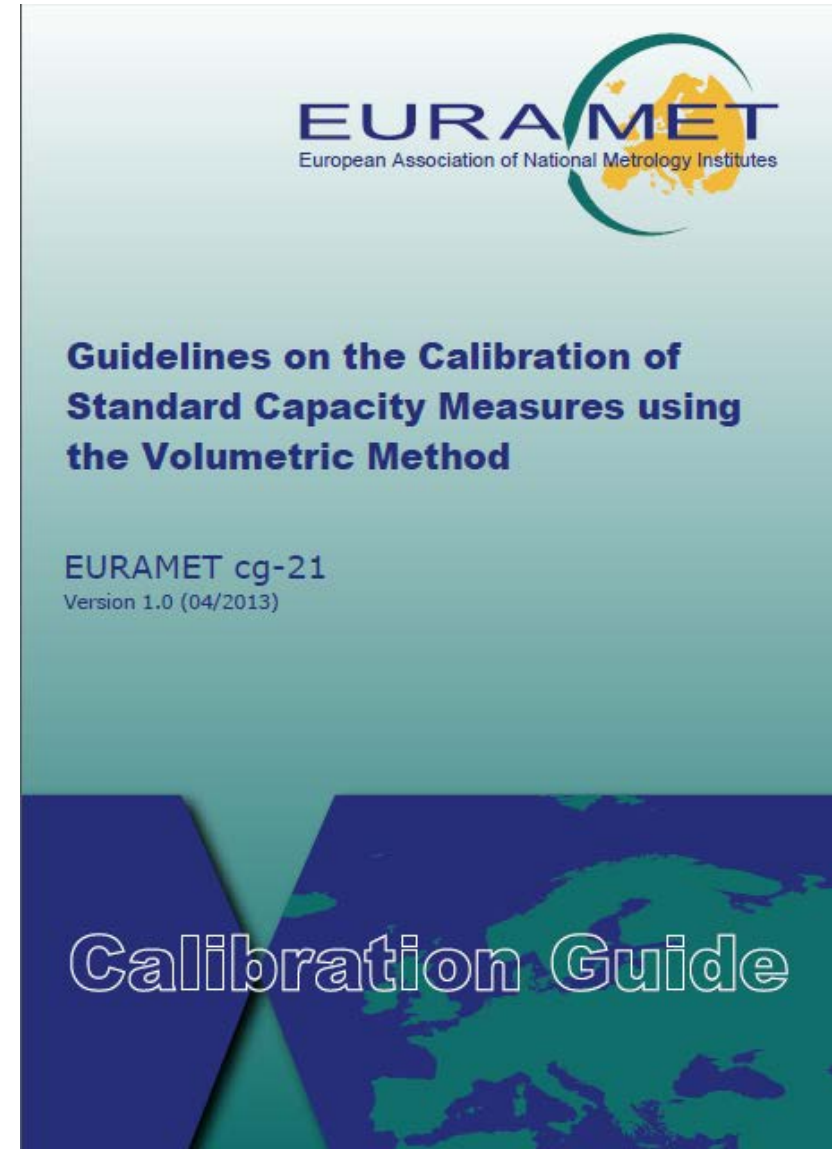


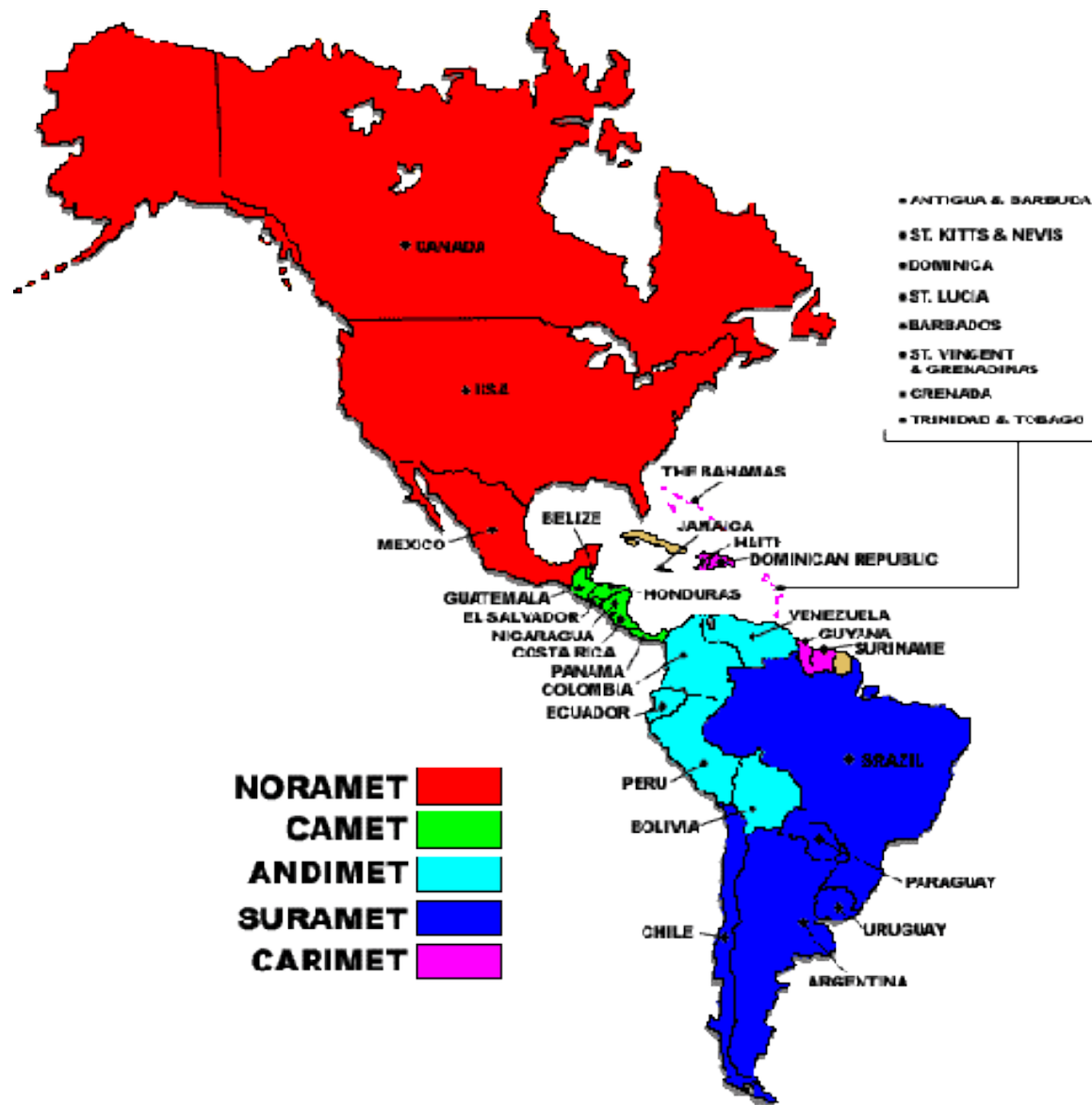
EURAMET PROJECTS

- Concluded in 2013/2014 (6 projects)
 - 1247 - Bi-Lateral Intercomparison of Oil Flow Facilities between NEL and FMC Technologies (NEL)
 - 1161 - Intercomparison on water/heat meter calibration at 50 °C, (6 – 25) L/h (LNE-CETIAT)
 - 1158 - Harmonization of the uncertainty budget and calibration method for volumetric volume calibration (MIRS/IPQ)
 - 1157 - Inter-comparison of 1000 L proving tank (VSL)
 - 1050 - Comparison of Airspeed measurements at high speeds (2-50) m/s (INRIM)
 - 800 - The Harmonization of Reference Values for High-Pressure Natural Gas Volume (VSL)

TC-F EURAMET Guides

EURAMET Guide nº 21 - Guidelines on the calibration of standard capacities measures using the volumetric method published in 2013

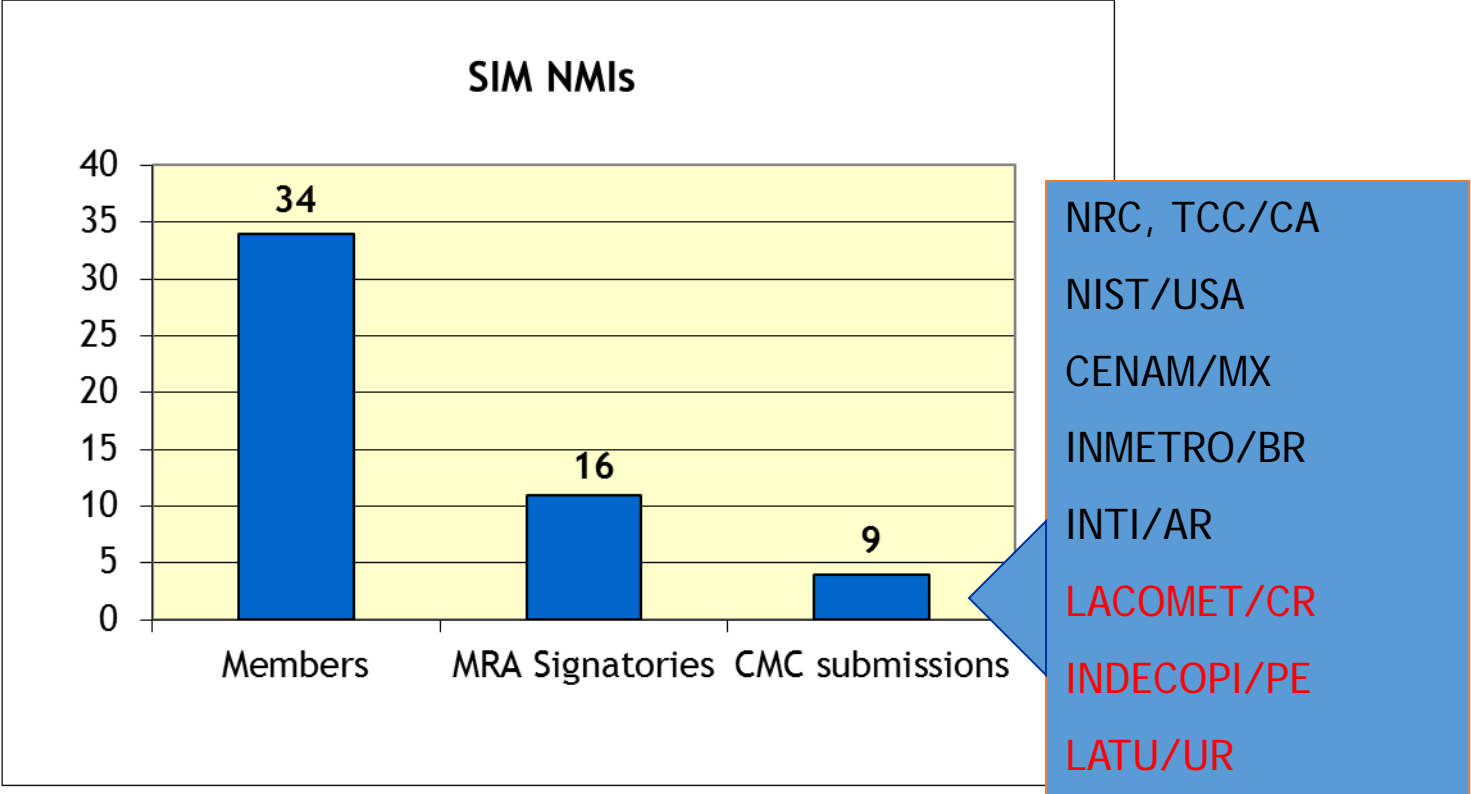




SIM WG10

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Members



Last meeting: October, 2012

Querétaro, Mexico; Simposio de Metrologia 2012



Next meeting: April 12, 2015, Washington D.C.