



Report of the CCM Working Group on Fluid Flow

Bodo Mickan / PTB
19th CCM meeting, 25-26 May 2023

WG Meetings

held since last CCM

- Online meetings due to pandemic situation always time limited (2h, challenge by time zones)
 - 2021-04-2021 and 2021-06-24
 - 2022-11-29/2022-12-06
- Hybrid meeting 2023-05-23 (BIPM + Zoom)

planned

- August 30th 2024; Braunschweig /PTB
(in conjunction with IMEKO world congress 2024 Hamburg)
- Online-meeting in between

Main actions and main achievements **WGFF**

- **WGFF CMC review protocol:**

- Main part revised
- Appendix A: *Specific measurand acceptance criteria and minimum documentation requirement*; updated
- writing new appendix B: „*How far does the light shine*“

- **Keycomparison calculation template (Excel):**

- finalised
- including evaluation if comparison is inconclusive
(inconclusive: uncertainty contribution of transfer standard dominates)

Main actions and main achievements **RMO-TCs**

- **AFRIMET**
- APMP
- COOMET
- EURAMET
- SIM
- **AFRIMETS TC-M :**
 - last meeting was held in July 2022;
 - next meeting is planned for 16 – 19 July 2023 in Egypt.
- **Sub-Working Group Fluid Flow:**
 - Chair: Dr Mpilo Dlamini (NMISA), vice chair: Dr Ali Zahran (NIS-Egypt)
- **CMCs Recently Published / under review:**
 - Egypt (NIS); Volume of Liquid₁; 1 -1000 µL
 - Marocco (LPEE-LNM); Volume of Liquid₁; 10 -10000 µL
 - Ethopia: for micro pipettes; under review in AFRIMETS
- **Ongoing comparisons:**
 - Volume Gas Flow Rate (AFRIMETS.M.FF-S1)
 - 50 ml/min to 5 000 ml/min / protocol in preparation
- **Comparisons planned:**
 - NMSIA: Gas Flow 5 – 50 L/min and/or 5 – 50 mL/min
 - KEBS: Volume of Liquid, 20 L

(for both, participant have to be confirmed)

Main actions and main achievements **RMO-TCs**

- AFRIMET
- **APMP**
- COOMET
- EURAMET
- SIM
- TCFF chair team
 - Chair: Dr. Chunhui Li (NIM)
 - Vice chair: Dr. Woong Kang (KRISS)
 - Secretary: Ms. Mengnan Li (NIM)
- Dr. Woong Kang (KRISS) was elected as the chair elect at the end of 2022, he will start his term after the APMP GA in the end of this year.
- **In 2022, webinar meeting, 3 hours for each day**
 - Day 1 (Nov. 24, Thursday)
 - Day 2 (Nov. 25, Friday)
- **In 2023, the TCFF meeting will held in Shenzhen, China, at the end November**

Main actions and main achievements **RMO-TCs**

- AFRIMET
- **APMP**
- COOMET
- EURAMET
- SIM
- Key comparison, APMP.FF (6)
 - APMP.M.FF-K1.1.2022, CMS/ITRI, [Measurements in progress](#)
 - APMP.M.FF-K2.2021, NMIJ/AIST, [Measurements in progress](#)
 - APMP.M.FF-K3.2020, CMS/ITRI, [Report in progress, draft A](#)
 - APMP.M.FF-K4.2.2021, NIM, [Planned/Measurements in progress](#)
 - APMP.M.FF-K4.2022, NIM, [Planned /Measurements in progress](#)
 - APMP.M.FF-K6.2018, KRISS, [Report in progress, draft A](#)
- Supplementary comparison (2)
 - APMP.M.FF-S2.2016, SNSU-BSN, [Report in progress, draft B](#)
 - APMP.M.FF-S3.2020, NIMT, [Report in progress, draft A](#)
- Peer reviews (5)

Main actions and main achievements **RMO-TCs**

- AFRIMET
- APMP
- **COOMET**
- EURAMET
- SIM
- **TCFF chair:** Roman Korneev (VNIIM/VNIIR)
- **Last meetings:** 2022-12-15 and 2023-04-23
- **Recent activities:**
 - supplementary comparisons
(one approved, one report in progress, one new planned)
 - new COOMET Recommendation
„Flow transducers, flowmeters and volumetric and mass liquid meters. Calibration Method“
- **Difficult situation and restricted communication due to war in Ukraine, several members of TCFF not active**

Main actions and main achievements **RMO-TCs**

- AFRIMET
- APMP
- COOMET
- **EURAMET**
- SIM
- **TCFF chair:**
Isabelle Care (LNE-CETIAT) => Erik Smits (VSL)
- **Last meetings:** 2023-04-18 to 2023-04-20 / Ljubljana (SLO)
- **main activities and actual objectives:**
 - Execution of the activities required by EURAMET as Regional Metrology Organisation (RMO)
 - Intra-RMO review and submission of the Calibration and Measurement Capabilities (CMCs) of EURAMET Members and Associates
 - Inter-RMO review of CMCs of other RMOs
 - Proposal of RMO Key and Supplementary Comparisons and support of their conduct

Main actions and main achievements **RMO-TCs**

- AFRIMET
- APMP
- COOMET
- **EURAMET**
- SIM

main activities and actual objectives:

- Elaboration and execution of the European Metrology Research Programmes
- Development of new flow facilities (for new fluids such as hydrogen, new flow ranges such as liquid nanoflow, dynamic liquid flow) through the European Research programmes
 - With submission of CMCs
 - Proposal of new Key or Supplementary comparisons
- Dissemination of knowledge through the organisation of workshops and of a TC Flow Summer School (planned in 2024)

Main actions and main achievements **RMO-TCs**

- AFRIMET
- APMP
- COOMET
- EURAMET
- **SIM**
 - **TCFF chair:** Hernán M. Brenta (INTI / Argentina)
 - **Comparisons, on going**
 - SIM.M.FF-K4.1.2017 (measurements)
 - SIM.M.FF-K6.2017 (Draft A)
 - SIM.M.FF-S4 (Draft B, approval pending)
 - SIM.M.FF-S8 (abandoned)
 - SIM.M.FF-S9 (Draft A)
 - SIM.M.FF-S13 (Draft B, approval pending)
 - **3 comparisons planned:** micropipettes, low pressure gas flow, air speed
 - **6 CMCs under review, ongoing**
 - **SIM-PTB Project:**
DEVELOPMENT OF BASIC METROLOGY INFRASTRUCTURE TO SUPPORT MEDICAL TESTING EQUIPMENT (VENTILATORS)
Finished, Final report May 2023

Progressing the state of the art

The further development of CMCs and related WGFF work will reflect the challenges in metering technologies:

- ◆ **Special Focus: De-carbonisation of energy supply**
 - Hydrogen (production, distribution and consumption)
 - synthetic/bio-fuels and their usage
 - Metrology for CCUS
 - Balancing in transport networks and leak quantification of CH_4 / H_2 / CO_2 incl. flare measurement
- ◆ Extension of application fields and sensor technologies:
 - Micro flow / organ on chip
 - dynamic flows
 - Multiphase flows
 - Waste water
 - Meter diagnostics and sensor networks

Liaison & stakeholders

- regular contribution from all established RMOs.
- Situation of COOMET is unclear.
- stakeholders: IMEKO TC9
 - ISO TC 48 + TC 28 (liaison type A by EURAMET TC-F)
 - ISO TC 30 (ISO 5167, 9300, 9951)
 - Legal Metrology (OIML TC 8/ notified bodies)
 - Accreditation Organizations

KCs completed and underway

Key Comparison	Measurand	Pilot Lab	Status
CCM.FF-K1.2015	Water flow	PTB	published
CCM.FF-K2.2011.1	Hydrocarbon liquid flow	VSL	Draft B
CCM.FF-K6.2017	Low pressure gas flow	ITRI	published
CCM.FF-K5.2016	High pressure gas flow	PTB	In progress
CCM.FF-K1.2019	Microflow of water	METAS	In progress

KCs planed

- **Pilot study** on comparing gravimetric mobile systems for H₂ with transfer standard will be performed (2024?), potential participants: NMIJ/KRISS /Metas /Cesame/NEL/ BEV/JV/VSL/(PTB).

Program of work for the next 2 years

- Continue effort to objectively apply KC results to CMC reviews, i.e. Appendix B in CMC review protocol.
- Clarification of judgment of $En > 1$ in comparison data sets which has been confirmed as consistent by statistical tools.
- Coordinating two-year-cycle of meetings in presence in conjunction with FLOMEKO.
- Additional Online-meetings in between to support working progress.
- **Preparing comparison technologies rsp. new key comparisons to underfeed new CMCs upcoming due to de-carbonization.**

Proposed changes (membership, chairmanship, ToRs)

- no changes;

- Re-appointment of chairmanship for the next period has been confirmed by email-voting in WGFF.

Thank you.
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