



Report of the CCM Working Group on Fluid Flow

Bodo Mickan (PTB)

20th CCM meeting, 26-27 June 2025



WG Meetings



Meeting WGFF chair with RMO-TC-Flow chairs

25th March 2024 on-line

- discussion of priority work items proposed by RMO-TCs
- decision on WGFF meeting 2024 to be held on-line in Autumn

WGFF meetings:

28th / 29th Oct. 2024, on-line UTC 12:00~14:00

24th June 2025, hybrid, BIPM

Next Meeting:

May 2026, Tsukuba/Japan (with Flomeko 2026)
meeting in presence only

Main actions and achievements: RMO-TCs



- **AFRIMET**
 - APMP
 - COOMET
 - EURAMET
 - SIM
- **AFRIMETS TC-M :**
Thomas Mautjana
 - **Sub-Working Group Fluid Flow:**
Bongani Ndlovu
- new person in charge
 - we lost contact for a while
 - could clarified just before this meeting
 - Thomas Mautjana reported to WGS

Main actions and achievements: RMO-TCs



— AFRIMET

— **APMP**

— COOMET

— EURAMET

— SIM

- **TCFF chair team**

- TCFF Chair: Dr. Woong KANG (KRISS)
- TCFF Vice Chair: Dr. Chun-Lin CHIANG (CMS/ITRI)
- TCFF Secretary: Dr. Seok-Hwan LEE (KRISS)

- **TCFF-Meetings :**

- regular once per year (Nov),
- 2023 Shenzhen/China,
- 2024 NPLI/India

- **Workshop 2024:**

Topic Primary Calibration System in DEC NMIs

- **Peer reviews:**

5 in 2024



Main actions and achievements: RMO-TCs



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- Key Comparison, APMP.M.FF-K (6 on-going)
 - APMP.M.FF-K1.1.2022(Water Flow), CMS/ITRI, draft A
 - APMP.M.FF-K2.2021(Hydrocarbon Flow), NMIJ/AIST, in progress
 - APMP.M.FF-K3.2020(Air Speed), CMS/ITRI, Draft B
 - APMP.M.FF-K4.2022(Volume), NIM, in progress
 - APMP.M.FF-K6.2018(Gas Flow), KRISS, Draft B
 - APMP.M.FF-K6.2024(Gas Flow), CMS/ITRI, in progress
- Supplementary Comparison, APMP.M.FF-S (2 on-going)
 - APMP.M.FF-S2.2016(Water Flow), SNSU, draft B
 - APMP.M.FF-S3.2020(Water Flow), NIMT, draft B

Main actions and achievements: RMO-TCs



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- **TSC-FF chair team:**

- Chair: Roman Korneev (VNIIM/VNIIR)
- Secretary: Olga Shabalina (VNIIM/VNIIR)

- **Last meetings (5):** 2023-10-13, 2023-12-27, 2024-03-20, 2024-08-15, 2024-11-01

- **Supplementary comparison (5+3)**

- COOMET.M.FF-S6 (NSC IM) Measurements in progress
- COOMET.M.FF-S7 (GEOSTM) Measurements completed
- COOMET.M.FF-S10 (VNIIM) Approved
- COOMET.M.FF-S11 (VNIIM) Measurements in progress
- COOMET.M.FF-S12 (VNIIM) Planned
- +3 planned (no KCDB identifier yet)

- **Peer reviews (24+2)**

- Inter-RMO reviews (24)
- Intra-RMO reviews (2)

- **1 new CMC under COOMET review**

Main actions and achievements: RMO-TCs



— AFRIMET

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— **EURAMET**

— SIM

- **TC-Flow chair:** Erik Smits (VSL) re-elected for second 2-year term in June
- **TC-Meeting:** 36th Annual meeting 1-3 April 2025 at CEM, Madrid, Spain
- **Main activities and actual objectives:**
 - Intra-RMO review and submission of the CMCs of EURAMET Members and Associates through its review work group
 - Inter-RMO review of CMCs of other RMOs by same work group
 - TC Flow projects in EURAMET project database (May 2025):

Status	Comparison	Research	Consultation	Total
Agreed	0	0	0	0
In progress	11	0	1	12
Ongoing	0	2	0	2
Completed	85	14	10	109
Concluded	7	1	0	8
Total	103	17	11	131

Main actions and achievements: RMO-TCs



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— **EURAMET**

— SIM

- **Elaboration and execution of the European Metrology Research Programmes**
- **Knowledge transfer through the organisation of workshops Summer School:**
9-13 Sep 2024 TC Flow Summer School (Lectures are recorded for BIPM platform).
Participation from other RMO's: APMP, SIM, AFRIMETS



- **Next annual meetings (next two years):**
 - April 2026 at LNE-CETIAT, Villeurbanne, France (37th)
 - April 2027 at PTB, Braunschweig, Germany (38th)

Main actions and achievements: RMO-TCs



— AFRIMET

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— **SIM**

- **SIM MWG10 Flow and Volume:**

- Chair: BRENTA, Hernán (INTI / Argentina)
- Vice-chair: MORALES, Abed (INACAL / Perú)

- **Comparisons**

- SIM.M.FF-K4.1.2017: Report in progress, draft A
- SIM.M.FF-K6.2017: to be published
- SIM.M.FF-S14: Report in progress, draft A
- SIM.M.FF-S15: Report in progress, draft A
- SIM.M.FF-S16: Measurement in progress
- SIM.M.FF-S17: Protocol complete, to be started

- **Finalized comparisons**

- SIM.M.FF-S4 (abandoned)
- SIM.M.FF-S8 (abandoned)
- SIM.M.FF-S9 (approved)
- SIM.M.FF-S13 (approved)

Main actions and achievements: RMO-TCs



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- **CMCs review process:**

- Organized by chair and vice-chair in collaboration with specialist from NMIs
- Specialists data base was developed over last years, intentions to review were observed as well as a lack of enough available time to respond as expected
- Proposed: Ask for collaboration to NMIs authorities to secure the necessary time for reviewers, to participate in international cooperation activities

- **Planned**

- Flow and Volume Workshop
- Organized by SIM Metrology Working Group N°10
- Activities: Knowledge Transfer and Working Group Meeting
- Proposed location: Laboratorio Costarricense de Metrología, LCM, Costa Rica
- Status: Program and budget details presented to SIM Technical Committee

Progressing the state of the art



- ◆ **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



Two new ISO activities where WGFF members are involved

- regular contribution from all established RMOs.
- stakeholders: IMEKO TC9
ISO TC 48 + TC 28 (liaison type A by EURAMET TC-F)
ISO TC 30 (ISO 5167, 9300, 9951, 5168, 17089)
Legal Metrology (OIML TC 8/ notified bodies)
Accreditation Organizations

CIPM MRA: KCs & CMCs



Key Comparison	Measurand	Pilot Lab	Status
CCM.FF-K2.2011	Hydrocarbon liquid flow	VSL	Draft B, delayed
CCM.FF-K5.2021	High pressure gas flow	PTB	Draft A
CCM.FF-K1.2022	Microflow of water	METAS	(published)
CCM.FF-K1.2024	Large Water flow	PTB	Measurement in progress
CCM.FF-K3.2025	Air speed (LDV fringe spacing)	PTB	To be registered
CCM.FF-K4.2025	Micro pipettes	IPQ	To be started

Pilot study: on comparing gravimetric mobile systems for H₂ across the RMOs with transfer standard
aim is to approve the references used to verify re filling stations
technical preparations in progress, several pre-testing of the transfer standard needed

CIPM MRA: KCs & CMCs



Clarification about CMCs for Molar Flow between WGFF and WGPV:

CMCs for molar flow had been placed under WGFF in 2011,
probably because of the unit indicating a flow

proposal to shift the entries for molar flow back to WGPV
because the technical activities as well as
the experts who can review CMCs are located there

intermediate agreement for CMC reviews:

WGPV has appointed technical experts to act as “guest reviewers” for WGFF,
as long as the CMCs are not yet back to WGPV

WGFF and WGPV will monitor the situation in future because
due to extending CMC ranges, the claimed measurements range are coming closer

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 => Draft Jan 2026
(approval by WGFF May 2026 if possible).
- Utilization of Bayesian Hypothesis testing in KCs of WGFF and RMO-TCs
for the approval of CMCs (see also workshop second day)
- Coordinating two-year-cycle of meetings in presence in conjunction with FLOMEKO.
- Additional Online-meetings in between to support working progress.
- Preparing comparison technologies resp. new key comparisons to underfeed new CMCs
upcoming due to de-carbonization.

Proposals (KCs, chairmanship, membership...)



proposals submitted by WG to the CCM for approval

- **proposal to shift the CMC entries for molar flow back to WGPV**



Thank you.

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