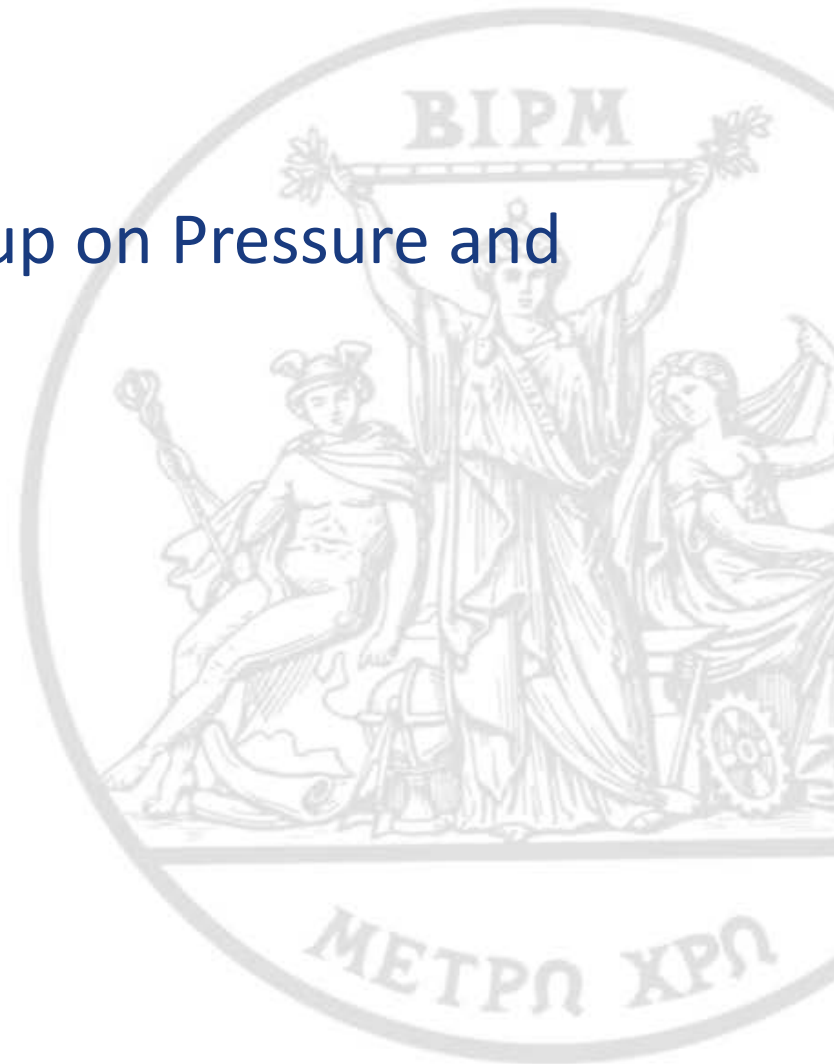


Report of the CCM Working Group on Pressure and Vacuum (CCM WG PV)

Karl Jousten, PTB, Berlin

18th CCM meeting, 20-21 May 2021

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WG Meetings held since last CCM

- ◆ Dec 1, 2020, 3.5 h, online, workshop with two European projects plus some WG issues, 44 attendees
- ◆ April 14-16, 2021, total 9 h on 3 consecutive days, online, 37 attendees

WG Meetings planned

- ◆ May 2023 in conjunction with 7th CCM International Conference on Pressure and Vacuum Metrology organised by NIST group (venue near Gaithersburgh)

Main actions taken and main achievements

- ◆ Task group for best units under calibration for CMCs made a proposal. Must be amended for some gauges/ranges by end of 2021.
- ◆ Task group formed for risk-based approach for CMC review. Goal: Guideline for RMO accessors of pressure CMCs. Statement 2 of WG PV on CMC to be revised by end of 2021.
- ◆ Proposal by WG PV of reducing CMCs: RMOs and NMIs (members of WG PV) shall take action.
- ◆ List of regular CCM KCs in PV field was amended (additional KC added).

Proposal of WG PV for action by CCM (1)

- ◆ **The WG PV requests that the CCM recommends the JCRB to amend part of the text in Appendix A1 in CIPM-MRA-P11:**

Why? The present text has caused and will cause confusion. The passage in Annex A1 that should be changed is the following: "**A CMC is deemed to cover services that meet all of the following criteria: a) Use the same instrument type/measurement method as that identified in the CMC, noting that more than one instrument type/measurement method can be listed in one CMC, b)...**"

This wording indicates that it is not allowed to use the CIPM MRA logo when a worse gauge as listed in the CMC line (higher intrinsic uncertainty of the instrument) has been calibrated. The text encourages to list all possible instruments that an NMI is ready to calibrate so that the calibration is in line with the MRA.

Proposal of WG PV for action by CCM (2)

This, however, was not the idea of the CMCs. If we list several instruments with largely different quality in one CMC, how one should know, to which one the uncertainty applies?

This is in conflict with the CIPM-MRA-G13:

Section 2.3 "There should be no ambiguity as to the best measurement uncertainty that can be expected from a CMC."

and

Appendix A, Note 1, "The meanings of the terms Calibration and Measurement Capability, CMC,(as used in the CIPM MRA), and Best Measurement Capability, BMC, (as used historically in connection with the uncertainties stated in the scope of an accredited laboratory) are identical."

and

Note 5 "CMC uncertainty statements anticipate this situation by incorporating agreed-upon values for the best existing devices."

and

Proposal of WG PV for action by CCM (3)

also, indirectly, to Section 4 "The KCDB is not intended to be a catalogue of CRMs that can be delivered by the institutes." , although this is dealing with reference materials.

We propose to rephrase the text in Appendix A1 in CIPM-MRA-P11 as follows:

"A CMC is deemed to cover services that meet all of the following criteria:

a) Use the same *reference standard* as that identified in the CMC, b) ..."

Progressing the state of the art

- ◆ optical methods and atom traps for total pressure and partial pressure measurement standards
- ◆ traceable partial pressure measurement
- ◆ traceable outgassing rate measurement
- ◆ dynamic pressures (vacuum and pressures higher 100 kPa)
- ◆ standardized ionization gauge
- ◆ oil micromanometer with integrated density measurement

Liaison & stakeholders

- ◆ ISO TC 112 Vacuum technology
- ◆ Project in the European Union EMPIR 18SIB04 " Towards quantum-based realisations of the pascal" (short: "Quantum Pascal")
- ◆ IMEKO TC 16
- ◆ IUVSTA Committee Vacuum Science and Technique
- ◆ Semiconductor industry

KCs completed and underway

- ◆ K1b/K1c/K2 (CCMPK1b: 35 – 350 kPa; CCMPK1c: 1 – 7 MPa; CCMPK2: 25 – 200 kPa. 200 kPa is optional): Measurements ongoing.
- ◆ CCM.P-K4.2012.1 NIST(UIM/optical)-PTB(SE2/SE3), 1 Pa – 10 kPa. Protocol complete. Technical problems at NIST, then pandemic, presently no progress.

KCs planned

- ◆ C-ATL (pilot LNE); leak rate against atmosphere, begin planned for early 2022
- ◆ K3 (pilot NMIJ, overdue); $1\text{E-}9$ Pa to $9\text{E-}4$ Pa, begin planned for summer 2021

Both KCs already approved by CCM.

Program of work for the next 5 years

- ◆ Further investigate optical methods and atom traps for partial and total pressure measurement standards
- ◆ By end of 2021: New Statement 2 of WG PV for CMCs (UUCs for CMCs defined, guideline for risk-based approach of CMC review)
- ◆ Promote and perform KCs as planned (see last slide).
- ◆ Support work of ISO TC 112 Vacuum technology related to vacuum metrology (standardized ionization gauge).
- ◆ Act as advisory group for project in the European Union EMPIR 18SIB04 "Towards quantum-based realisations of the pascal" (short: "Quantum Pascal").

Proposed changes (membership, chairmanship, ToRs)

- ◆ Memberships were under review: NRC-MSS (Canada), INRIM (Italy), NMIA (Australia), NPLI (India). The WG PV decided on its last meeting to confirm membership of all 4 laboratories.
- ◆ New member: MIRS-IMT (Slovenia): **The WG PV recommends the CCM to approve the membership of the IMT.**
- ◆ Chairman (Jousten) and vice chair (Torres) announce to step down in 2023.

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