

1. General Aspects

The EURAMET Mass and Related Quantities Technical Committee, TC-M, is characterized by the mass and a number of related quantities with a diversity of techniques employed in the realization of the corresponding units. There are two dominant issues, one is the redefinition of the kilogram, which has definitely influenced the activities of some NMIs and reflects in EURAMET projects, and the other is EMPIR, where many NMI/DI are collaborating very actively.

2. Comparisons

In the following tables there is the status of comparisons based on information published at KCDB and EURAMET.

Key comparison - Table 1;

Supplementary Comparisons - Table 2;

EURAMET projects - Table 3.

Comparison ID	Project no.	Title/Range	Subfield	Pilot	Contact	Status
EURAMET.M.D-K1.1	1031	Solid 6 silicon spheres (two petals)	Density	PTB	H. Bettin	Report in progress draft B
CCM.D-K5	1440	Oscillation type density meters	Density	BEV	M. Schiebl	Protocol complete/In progress
EUROMET.M.F-K1	535	5 kN to 10 kN	Force	MIKES	A. Pusa	Report in progress draft B
EUROMET.M.F-K3	505	500 kN to 4 MN	Force	PTB	R. Kumme	In progress/In progress
EURAMET.M.G-K3	1432	Absolute Gravimeters	Gravity	VUGTK	V. Pálinkás	Measurements / In progress
EURAMET.M.H-K1.c	1445	Vickers	Hardness	INRIM	A. Germark	/ In progress
EURAMET.M.M-K2.4	-	100 mg to 10 kg	Mass	DFM	L. Nielsen	Measurements/ Protocol complete
EURAMET.M.M-K4.2015	1346	1 kg mass standards	Mass	BEV	Z. Zelenka	Measurements / In progress
EURAMET.M.P-K1.c	1179	0.7 MPa to 7 MPa	Pressure	Force	A. Atlintas	In progress/ In progress
EURAMET.M.P-K7	881	5 MPa to 500 MPa	Pressure	MIKES	M. Rantanen/ S. Saxholm	Approved for equivalence/ Completed
EURAMET.M.P-K15.1	1405	Absolute range 0.1 mPa to 1 Pa	Pressure	PTB	K. Jousten	In progress/ In progress

Table 1: Status of EURAMET Key Comparisons in KCDB.

Comparison ID	Project no.	Title/Range	Subfield	Pilot	Contact	Status
EURAMET.M.D-S3	1404	Solid 3 silicon spheres (1 kg, 125 g and 30 g)	Density	CEM	N. Medina	Approved and published/Completed
EURAMET.M.F-S2	1262	5 N to 250 kN	Force	BEV	C. Buchner	In progress/ In progress
EURAMET.M.F-S5	1472	10 kN to 500 kN	Force	NPL	A. Knott	Protocol Complete/ In progress
EURAMET.M.H-S1.a.b.c	1444	Rockwell	Hardness	INRIM	A. Germark	Protocol Complete/ In progress
EURAMET.M.H-S2.a.b.	1443	Brinell	Hardness	INRIM	A. Germark	Planned/ In progress
EURAMET.M.M-S5	-	100 mg to 1 kg	Mass	NSAI	R. Hanrahan	Planned
EURAMET.M.M-S7	1300	500 kg	Mass	MIRS	Matej Grum	In progress/ In progress
EURAMET.M.P-S13	1252	10 MPa to 100 MPa	Pressure	UME	Y.Durgut	In progress/ In progress
EURAMET.M.P-S14	1306	50 MPa to 1 GPa	Pressure	PTB	J. Koneman	Approved for equivalence/ Completed
EURAMET.M.P-S15	1376	100 Pa to 3,5 kPa	Pressure	GUM	A. Brzozowski	Protocol Complete/ In progress
EURAMET.M.P-S16	1375	250 MPa	Pressure	GUM	A. Brzozowski	Protocol Complete/ In progress
EURAMET.M.P-S17	1385	-920 to 0 hPa. Part II	Pressure	LNE	P. Otal	Planned/ Proposed
EURAMET.M.P-S18	1414	hydraulic pressure balance effective area	Pressure	HMI/F SB-LPM	L. G. Bermanec	Approved for equivalence/ Completed
EURAMET.M.T-S4	1304	0,1 N.m at 50 N.m	Torque	LNE	C. Duflon	Planned/In progress
EURAMET.M.T-S5	1428	100 N.m at 5 000 N.m	Torque	LNE	C. Duflon	Planned/Proposed

Table 2: Status of EURAMET Supplementary Comparisons in KCDB.

In the table 3 there is the status of comparisons only registered in EURAMET.

EURAMET Project no.	Title/Range	Subfield	Pilot	Contact	Status
1115	R-134a leak comparison	Pressure	LNE	I. Morgado	Draft B
1206	800 to 1100 hPa	Pressure	MIKES	S. Saxholm	Draft B
1207	200 kPa to 1,75 MPa	Pressure	MIKES	S. Saxholm	Draft B
1350	sub-multiples of the kilogram	Mass	MIRS	Goran Grgić	Completed
1411	Dynamic high pressure	Pressure	MIKES	S. Saxholm	In progress
1416	Bilateral study comparison in the high vacuum range from 5E-7 Pa to 9E-4 Pa	Pressure	CMI	D. Prazak	In progress
1441	Calibration guides for force and torque traceability	Force and Torque	NPL	A. Knott	In progress

Table 3: Status of EURAMET Projects in EURAMET site. With no link to KCDB Comparisons.

3. Projects

Table below shows the actual number of agreed, proposed, in progress, ongoing, completed, concluded and cancelled projects listed for TC-M in the EURAMET Projects database. Projects are divided by category and the numbers in brackets corresponds to last year information.

	Comparison	Research	Traceability	Consultation	Total
Agreed	0 (0)	0 (0)	0 (2)	0 (0)	0 (2)
Proposed	1 (2)	0 (0)	0 (0)	0 (0)	1 (2)
In progress	23 (21)	2 (2)	2 (2)	0 (1)	27 (26)
ongoing	0 (0)	0 (0)	0 (0)	0 (0)	0 (0)
Completed	78 (77)	43 (44)	8 (8)	16 (19)	145 (148)
Concluded	1 (0)	1 (0)	0 (0)	0 (0)	2 (0)
Cancelled	4 (4)	2 (2)	0 (0)	0 (0)	6 (6)
Total	107 (104)	48 (48)	10 (12)	16 (20)	181 (184)

4. CMCs

The following tables 4 and 5 are an update of new submissions since May 2018.

Concerning EURAMET submissions:

CMCs Submission	NMI	Field	State
EURAMET.M.55.2017	METAS, Switzerland	Pressure	Published
EURAMET.M.56.2018	NPL, United Kingdom	Density	Published
EURAMET.M.58.2018	INRIM, Italy	Pressure	Approved
EURAMET.M.59.2018	IPQ, Portugal	Pressure	Published
EURAMET.M.60.2018	IMBiH, Bosnia and Herzegovina	Pressure	Published
EURAMET.M.61.2018	PTB, Germany	Hardness	Published
EURAMET.M.62.2018	INRIM, Italy	Mass	Published
EURAMET.M.63.2019	VUGTK, Czech Republic	Gravimetry	under revision
EURAMET.M.64.2019	DMDM, Serbia	Pressure	under revision
EURAMET.M.66.2019	PTB, Germany	Mass	under revision

Table 4: EURAMET CMC's Submissions

Concerning Review of CMCs for other RMO's submissions:

CMCs Submission	NMI	Country	Field	State
AFRIMETS.M.6.2018	NSi	Namibia	Mass	published
AFRIMETS.M.7.2018	SIRDC-NMI	Zimbabwe	Mass	under revision
APMP.M.41.2016	NIM	China	Density, Force, Torque and Hardness	under revision
APMP.M.42.2016	A*Star	Singapore	Mass	under revision
APMP.M.44.2017	NMIA	Australia	Mass	published
APMP.M.47.2018	NIM	China	Mass	published
APMP.M.48.2019	A*Star	Singapore	Pressure	under revision
COOMET.M.31.2017	AzMI	Azerbaijan Republic	Viscosity	published
COOMET.M.32.2018	AzMI	Azerbaijan Republic	Pressure	under revision
SIM.M.36. 2017	CENAMEP	Panama	Force	under revision
SIM.M.37. 2017	INM	Colombia	Force	published
SIM.M.39. 2018	INACAL	Peru	Mass	under revision
SIM.M.40. 2019	INTN	Paraguay	Mass	under revision
SIM.M.42. 2019	INM	Colombia	Mass	under revision
SIM.M.43. 2019	LATU	Uruguay	Mass	under revision

Table 5: Other RMO's CMC's Submissions

For Intra EURAMET review there are at the moment under revision (before submission on the KCDB):

NMI	Field
METAS	Force

Table 6: New CMC's in Intra EURAMET review

5. Meetings

The TC - Mass and Related Quantities 2019 meetings were held in Budapest, from the 8th April to the 11th April.

EURAMET –TC Mass and Related Quantities Meeting 2019

8^h – 11th April 2019, Budapest, Hungary

Day /time	Monday 8th April	Tuesday 9th April	Wednesday 10th April	Thursday 11th April	Friday 12th April
09:00-10:30		SC Pressure Meeting	SC Mass Meeting	TC Mass Contact Persons Meeting	
10:30-11:00		Coffee break	Coffee break	Coffee break	
11:00-12:30		SC Pressure Meeting	SC Mass Meeting/ New redefinition	TC Mass Contact Persons Meeting	
12:30-13:30		Lunch	Lunch	Lunch	
13:30-15:30	Strategy-WG meeting (closed session)	SC Force & Torque Meeting	Strategy-WG meeting (open session)	Laboratory visit	
15:30-16:00	Coffee break	Coffee break	Coffee break		
16:00-18:00	Strategy-WG meeting (closed session)	SC Density & Viscosity Meeting	Review of EURAMET cg 4 (Closed session)		
18:00-19:00					
19:00-22:00			Social Dinner		

Table 7: Meeting schedule of EURAMET TC-M 2019.

The TC-M Contact Persons meeting was held in Budapest, on the 11th April and, as usual, was preceded by technical meetings for the various subfields to review progress in projects and discussion of technical issues in mass, force and torque, pressure, density and viscosity.

We had also a special session on the redefinition.

5.1 Activities of the TC-M Subcommittees

TC-M has 4 SC (Mass, Pressure, Force, Density- Viscosity) and all convenors were reappointed last year for 5 years. Horst Bettin, convenor for SC-DV will retire this year. So in the meeting of SC-DV a new convenor was elected: Andreia Furtado (IPQ).

Because Horst Bettin is the CMC reviewer for Density and the CMC reviewer for Viscosity Henning Wolf also retired last year there was the need to appoint new CMC reviewers for density and viscosity.

The new CMC reviewer for Density will be Markus Schiebl (BEV) and for Viscosity the new reviewer will be Izabela Cękiel (GUM).

A 2019 questionnaire was sent to all TC-M contact persons, and the results for needs of comparisons and training were sent to all SC convenors prior to the meetings.

5.1.1 SC Density and Viscosity:

EURAMET 1031 (EURAMET.M.D-K1.1, solid density comparison, pilot: PTB/DE)
Draft B circulated in April 2019.

EURAMET 1404 (EURAMET.M.D-S3, solid density comparison, pilot: PTB/DE and CEM/ES)
Was approved and published in 2018.

EURAMET pilot study on surface tension of liquids (pilot: GUM/PL)
LNE confirmed their participation last year and also PTB and IPQ are interested in participating. INMETRO might be interested too.
GUM/PL should send an application to the EURAMET TC-M chair.

CCM.D-K3 (Density measurement of stainless steel weights, pilot: NMIJ/Japan)
Participants from EURAMET are: BEV (co-pilot), INRIM, PTB, METAS and UME.
To be discussed in next meeting of CCM-WGDV in May.

CCM.D-K5 and EURAMET comparison No. 1440 (Oscillation-type density meters, pilot: BEV/AT)
Zoltan Zelenka informed that technical protocol is completed. The liquids are expected to be sent next October.

CCM.D-K6 (Refractive index of liquids, pilot: NMIJ/JP),
Participants are NMIJ (Pilot), IPQ and PTB? Status is not clear.

CCM.D-K7 (Liquid density under high pressure, pilot: ?),
Participants from EURAMET will probably be CEM, GUM, IPQ, and PTB.

CCM.V-K3 (Viscosity measurements of standard liquids, pilot: NMIJ/JP)
Was approved and published in 2018.

CCM.V-K4 (Viscosity of standard liquids, pilot: CENAM/MX),
Questionnaire was distributed.
Bulgaria and Romania are allowed to participate, although they are no members of CCM WGDV.*

***There are no EURAMET comparisons on Viscosity.**

Strategic Planning of Comparisons

See EURAMET TC-M website:

Service	Comparison	2018	2019	2020	2021	2022	2023	2024
Solid density - hydrostatic weighing	CCM.D-K1							
Solid density - hydrostatic weighing	EURAMET.M.D-K1.1 (EURAMET 1031)							
Liquid density - hydrostatic weighing	CCM.D-K2							
Liquid density - hydrostatic weighing	EURAMET.M.D-Kx							
Density of weights - hydrostatic weighing	CCM.D-K3							
Density of weights - hydrostatic weighing	EURAMET.M.D-Kx							
Hydrometer calibration - Cuckow method	CCM.D-K4							
Hydrometer calibration - Cuckow method	EURAMET.M.D-Kx							
Liquid density - oscillation-type density meters	CCM.D-K5							
Liquid density - oscillation-type density meters	EURAMET.M.D-Kx (EURAMET 1440)							
Refractive index of liquids	CCM.D-K6							
Refractive index of liquids	EURAMET: not planned?							
Liquid density under high pressure	CCM.D-K7?	?	?					
Surface tension of liquids	EURAMET NN							

The CCM.D-K4 comparison on hydrometer calibration was published. EURAMET should start a hydrometer comparison. Pilot: INRIM and PTB; Participants: BFKH, BEV, UME and IPQ.

The EMPIR project 17RPT02 “Establishing traceability for liquid density measurements (RhoLiq)” started in May 2018.

The coordinator, Andreia Furtado, asked for ideas and interested persons for RMGs (Research Mobility Grants).

The Kick-off meeting was held at PTB in the week from 14 to 18 May 2018.

This project includes the development of guidelines.

Roadmap (see EURAMET website)

See EURAMET TC-M website.

The TC-M Density Viscosity SC roadmap, was discussed and Horst Bettin asked for new ideas.

CCM Working Group on Density and Viscosity

Next meeting of the CCM WGDV will be on the 13 May 2019.

5.1.2 SC Force and Torque

Revision of EURAMET cg4 - Uncertainty of Force Measurements

Revision coordinated by Andy Knott, NPL

Comparisons Status

EUROMET 505 PTB, 1 MN + 500 kN force comparison, all participants performed measurements except Greece. Greece to perform measurement before summer.

EUROMET 535 MIKES, 5 kN + 10kN comparison. Draft B will be sent to participants for acceptance. There were some corrections and linkage to correspondent CCM comparison.

EURAMET 1262 BEV, 5 N to 250 kN comparison with PTB, measurements completed, report in progress.

EURAMET 1304 LNE, 0.1Nm to 50 Nm comparison with PTB, measurements performed and results not good enough to improve CMC. A new comparison will be performed using 2 transducers instead of one.

New comparisons:

EURAMET 1428 LNE, 100Nm to 5000 Nm comparison with PTB, in progress. Will start in 2020.

EURAMET 1432 VÚGTK, Absolute Gravimeters, Wetzell, Germany 2018. Measurements completed.

EURAMET 1443 INRIM, Comparison of Brinell hardness scales. Participants: PTB and UME.

EURAMET 1444 INRIM, Comparison of Rockwell hardness scales, with UME. Poland and Hungary would like to participate. Because measurements were already done it was suggested to have a new comparison.

EURAMET 1445 INRIM, Comparison of Vickers hardness scales, with UME. Hungary can participate because it has not started yet.

EURAMET 1472 NPL, 10 kN to 500 kN comparison with Croatia.

Status of different force and torque projects

EMPIR Projects in Force and Torque

“SRT S19 Dynamic Force. Will start in September this year. (PTB, SMU and NPL).

Future Projects in Force and Torque

“Wind efficiency”, still in approval process.

Roadmaps in Force and Torque and Dynamic (Force, Torque, Pressure)

These roadmaps will be reviewed. For the Roadmap in Force and Torque the TC-L gave some input so the idea is to wait for TC-L meeting in October and then send the roadmap to SC-FT contacts for discussion.

Other topics

Revision of torque guide CG14 (PTB, LNE, CEM, INRIM, UME). It was suggested that Dirk Röske (PTB) would be the coordinator of this revision.

Announcement of IMEKO TC3, TC5, TC16, TC22 Conference - 2020 (Croatia)

5.1.3 SC Mass:

Agreement of previous minutes

Minutes agreed no addition comments.

Presentations/updates on agreed/completed projects

Matej Grum 1300 - Comparison of 500 kg stainless steel standard

The comparison is registered as EURAMET.M.M-S7 in the KCDB. It is jointly piloted by MIRS and CMI (who have provided the transfer standard). Measurements started in June 2017.

EURAMET comparison toolbox has been used.

Big delay because the transfer standard did not enter/exit correctly Switzerland, arising several problems with customs (ATA Carnet issues). High magnetic permeability measured at points on the weight (> OIML Class F1). This may affect the results and have an impact on the uncertainty claims of the participants

Zoltan Zelenka 1346 - Key comparison of 1 kg mass standards linked to CCM.M-K4 (EURAMET.M.M-K4)

Measurements complete. A pre-draft is prepared.

The question is: how to link this comparison to CCM comparison? Steering committee identifying the optimum linking method to the CCM comparison.

Goran Grgić 1350 - Comparison of sub-multiples of the kilogram

Measurements complete, final report published.

Rory Hanrahan - EURAMET.M.M-S5 (Six E2 weights)

To be registered as EURAMET projects. BEV provide link to EURAMET.M.M-K2

1 measurement sequence with 5 participants planned but it may be possible to accommodate additional participants. Magnetic susceptibility is yet to be measured

Project proposals (EMPIR PRTs)

EMPIR 19 RPT RPOT 005 – Improvement of the realisation of the mass scale for enhanced CMCs, Sejla Alisic.

Focus on dissemination of knowledge and capability building

PRT is going through the review process

Other presentations

Goran Grgić - Final report and lessons learned from EMPIR 14RPT02 AWICal - Calibration of automatic weighing instruments

3 final reports to be published once participants have completed review and TC-M Mass SC have approved

Stuart Davidson - Update on the kilogram redefinition and the interim use of a consensus value
Due to discrepancy between realisation experiments a consensus value, based on the reference value of a KC of all experiments, will be used to disseminate the kilogram
Detailed guidance to be issued by the CCM following meetings in May.

Michael Stock - News from the BIPM
The uncertainty on existing BIPM mass certificates will need to be updated following the redefinition
BIPM will issue a note, NMIs will need to review their CMC (guidance will be issued by the CCM).

Andrea Malengo - Proof of concept for a simple electrostatic balance in the milligram range.

Feedback on questionnaire

The requirements for new comparisons, as reported in responses to the questionnaire circulated by the TC-M chair were reviewed.
No significant training needs identified.
Requirement for sub-multiple comparison from about 10 NMIs.
Need for guidance on impact of the kilogram redefinition.

Mass area technical roadmap – review and update

The latest roadmap, updated after the 2017 SC-Mass meeting, was presented and it was suggested that measurements of force, torque, etc might be done directly from the Planck constant.

5.1.4 SC Pressure

Comparisons, CMCs

Pierre Otal (LNE): Project 1115, SC, "R-134a leak comparison in atmospheric pressure"
LNE, CMI, INRiM, PTB, 2 leak artifacts as TS, measurements finished, results agree, final report distributed to participants for approval

Wladimir Sabuga (PTB):
Project 1405, EURAMET.M.P-K15.1, "Key comparison of four national vacuum standards from 3

•10⁻⁴ Pa to 1 Pa with SRG as transfer standards"

PTB, UME, NIMT (Thailand), CEM, IMT, last measurements at CEM and PTB planned this year, completion in March 2020

Proposed project, "Key comparison of national pressure standards in the range 1 Pa to 15 kPa of absolute and gauge pressure"

Proposed as bilateral KC between PTB and CMI, UME and IMT indicated interest. Other NMIs will be invited too

Plan of regular EURAMET pressure KCs was discussed and agreed

All: Status update of active projects: 1179, 1206, 1252, 1375, 1376, 1385, 1405, 1411, 1416
EURAMET 1376 GUM, Bilateral comparison 100 Pa to 3.5 kPa with CMI. Not performed, and will not be continued.

EURAMET 1206 and EURAMET 1207, comparisons piloted by VTT have draft B.

Wladimir Sabuga (PTB): Needs for new comparisons, CMC submissions

Gas

gauge pressure up to 10 MPa – Serbia, Bulgaria, Moldova, Romania

absolute pressure up to 700 kPa – Finland, Netherlands

Oil

100 MPa – Serbia, Bulgaria, Moldova, Bosnia and Herzegovina

500 MPa – Austria, Bosnia and Herzegovina, Hungary

Requested comparisons should be organized by interested NMIs

Research projects and activities

Dominik Pražák (CMI):

“Intraocular and blood pressure metrology within EMPIR”

EMPIR 16RPT03 inTENSE, Project progress

New project adOSSIG. Will start in June.

“New SI and medical pressure measurements”

New SI, BIPM SI Brochure and use of pressure units in medical practice

Jani Korhonen (VTT MIKES): “Development of measurement and calibration techniques for dynamic pressures and temperatures”,

EMPIR 17IND07 DynPT, Project progress

Wladimir Sabuga (PTB):

“Industrial standards in the intermediate pressure-to-vacuum range”

EMPIR 14IND06 pres2vac, Project results

“Towards quantum-based realisations of the pascal”

EMPIR 18SIB04 QuantumPascal, Project contents

Beste Korutlu (UME): “Determination of effective area of PCU based on dimensional measurements”

Proposal of new consultation project. Interest to participate - UME, PTB, FORCE, HMI-LPM, IMBiH, LNE, METAS, CMI

Wladimir Sabuga (PTB): Pressure roadmap

Version of 2017, no changes

Calibration Guides

Wladimir Sabuga (PTB): Pressure calibration guides

cg3 - Version of 2011, no changes

cg17 - Version of 2017, small editorial changes, update to be uploaded 2019

New cg draft “Guidelines on methods for positive and negative pressure and digital piston gauges calibration” under development by LNE and RISE

Lovorka Grgec Bermanec (HMI/FSB-LPM):

Announcement of IMEKO TC3, TC5, TC16, TC22 Conference - 2020

5.2 Plenary Meeting

Agenda of the TC-M Contact Persons meeting:

1. Welcome to BFKH; Presentation of BFKH Government Office of the Capital City Budapest - Péter Gál
2. Opening of the meeting and adoption of the agenda
3. BIPM Activities - Michael Stock
4. News from EURAMET – Duncan Jarvis
5. TC-M Activities– Isabel Spohr
6. Report of Strategy WG session – Stuart Davidson
7. Reports of subcommittees technical sessions:
 - Mass - Stuart Davidson
 - Density and Viscosity - Horst Bettin
 - Force and Torque - Rolf Kumme
 - Pressure - Wladimir Sabuga
8. Welcome of new TC-M Chair
9. Date and place of next meeting and any other business

All presentations and list of participants are published on TC-M page under events.

Apart from a representative from the BIPM, the COOMET TC-M chair and a representative from Kosovo attended the meeting.

The manufacturers from Mettler-Toledo attended the kilogram redefinition Session.

In total around 90 people attended the EURAMET TC Mass meeting itself or other sessions in Budapest this year.



Photograph of the TC-M 2019 meeting in Budapest

This year there was no representation from Latvia, Luxembourg and Republic of Moldova. Malta has no contact person appointed for TC-M.

The TC-M 2020 meeting will be held in Borås in April.

The next Chair of TC-M Fredrik Arrhén (RISE) from Sweden was welcomed.

6. Participation in EMRP/ EMPIR

Information of the participation of on-going projects:

For EMPIR call 2016:

Research potential call:

Number	Short name	Full Name
16RPT03	inTense	Developing research capabilities for traceable intraocular pressure measurements

Normative call:

Number	Short name	Full Name
16NRM05	Ion gauge	Towards a documentary standard for an ionisation vacuum gauge

For EMPIR call 2017:

Research potential call:

Number	Short name	Full Name
17RPT02	rhoLiq	Establishing traceability for liquid density measurements

Industry call:

Number	Short name	Full Name
17IND07	DynPT	Development of measurement and calibration techniques for dynamic pressures and temperatures

For EMPIR call 2018:

Research potential call:

Number	Short name	Full Name
18RPT02	adOSSIG	Developing an infrastructure for improved and harmonized metrological checks of blood-pressure measurements in Europe.

SI Broader Scope call:

Number	Short name	Full Name
18SIB04	QuantumPascal	Towards quantum-based realisations of the pascal.

7. Calibration Guides

In Revision:

EURAMET cg 4 - Uncertainty of Force Measurements (Project EURAMET 1441)

New Calibration Guides from EMPIR Projects:

- Under project EMPIR 14IND06 (pres2vac):
Calibration of Negative Gauge Pressures
Calibration of Force-Balanced Piston Gauges
- Under project EMPIR 14RPT02 (AWICal)
Guidelines on the Calibration of Automatic Catchweighing Instruments
Guidelines on the Calibration of Automatic instruments for weighing road vehicles in motion and measuring axle loads
Guidelines on the Calibration of Automatic Gravimetric Filling Instruments
- Under project EMPIR 17RPT02 (rhoLiq)
Liquid density measurement using a hydrostatic weighing apparatus

8. Capacity Building: Activities and future needs

The results of the questionnaire circulated among the Contact Persons of requirements for training were sent to Tanasko Tasić.

9. Issues

Issues with linking EURAMET.M.M-K4 to the corresponding CCM comparison, taking into account the adjustment of the BIPM “as-maintained” mass unit, have largely been resolved. The BIPM will take part on the EURAMET comparison to provide additional linking to CCM.M-K4 and to the new as-maintained unit.

Mass CMCs for a number of EURAMET NMIs will need to be reviewed and adjusted following the redefinition of the kilogram since the way the new definition will be maintained and disseminated will add an additional 10 μg uncertainty (at the kilogram level). This can be performed in conjunction with a review of the results of EURAMET.M.M-K4.

CCM.D-K4 (Hydrometer): LNE, MKEH and several participants in EURAMET 1019 (Density of liquid by hydrostatic weighing) with E n-value > 1.

10. Strategic Planning

The Strategy WG of the TC-M met at the April meeting in Budapest prior to the open meetings. The main areas discussed were;

10.1 Training and Knowledge Transfer

The TC-M Chair circulated a questionnaire to Contact Persons requesting details of requirements for comparison and training. These were reviewed by the TC-M technical subcommittees. The need for a structured approach to Key Comparisons was noted with the aim of minimizing the number of supplementary comparison and ad-hoc bilateral comparisons.

Training in Mass (E1 level) delivered last year by NPL, UK

No major needs for further training identified from questionnaire feedback

Possibility of “shadowing” also proposed as an alternative to formal training delivery

Peer review – need for visibility, coordination with TC-Q needed

Guides – additional guide in Torque uncertainties to be prepared

A database of additional information (reports and papers) will be set up within the TC-M webpages.

10.2 Comparisons

All Sub-committees to publish a timetable for EURAMET Key Comparisons for next 15 years.

10.3 CMCs

Need for rationalisation of CMCs stressed (minimise the number of entries, “Broader scope CMCs”). CMCs should be validated (by KC participation) on a regular basis as part of MRA (e.g. ILAC require 4 yearly participation in ILCs) – will be raised at CCM WG-S and then with CIPM.

10.4 Cooperation

Cooperation with the COOMET committee for Mass and Related Quantities (TC 1.6) has been continued. The Chair of COOMET TC 1.6 participated also in this TC-M meeting. The Ukrainian NMI has already taken part in EURAMET.M.M-S9 (a comparison of sub-milligram standard) and the EURAMET TC-M will assist with the delivery and linking of the COOMET comparison of kilogram mass standards.

11. Outlook for 2019/2020

The ratification of the redefinition of the kilogram took place at the meeting of the General Conference on Weights and Measures (CGPM) in November 2018. EMPIR PRTs submitted by the TC-M were, in general, not well received by the reviewing committee. Nevertheless the need for collaborative research, particularly with respect to the effective implementation of the kilogram redefinition and the maximization of end-user benefit, needs to be coordinated.