

## KCDB REPORT TO THE JCRB

September 2019 to March 2020

### Executive Summary

The revision of the KCDB, triggered by the resolution 5 of the 25th CGPM, following the recommendations issued by the *CIPM ad hoc Working Group on Implementing the Recommendations from the Review of the CIPM MRA* has been completed. The new software is on-line since the 29 October 2019, providing an enhanced search facility of CMCs and comparisons, a user platform providing support for intra- and intra-RMO reviews, support for comparison registration and publication and a tool for user generated statistics.

Due to the transitions from the former to the new software support, there is an accumulated delay in the publication of approved CMCs in the KCDB that is presently being tackled. For the same reason, a delay in the publication of comparison results in the KCDB was faced which now has been absorbed.

The total number of published CMCs is quasi-stationary, but do not reflect the actual status of approved CMCs due to the delay. The increase of comparisons is stable and includes repeats of key comparisons.

No CMCs have yet reached approval after the inter-RMO review which makes it difficult to evaluate the impact of the platform at this stage.

### Introduction

This report summarizes the major progress and evolution of the BIPM Key Comparison Database (KCDB) over the last six months.

A new version of the KCDB - KCDB 2.0 - was implemented on 29 October 2019. It is based on the recommendations issued by the *CIPM ad hoc Working Group on Implementing the Recommendations from the Review of the CIPM MRA*. It covers the former databases recognized as "KCDB" and the JCRB restricted web tool. The KCDB 2.0 provides also new search routines, a web platform giving support for CMC edition and review from drafting a CMC until its approval and publication on the open web, support for comparisons and tailored generation of statistics.

The status of the database concerning **Calibration and Measurement Capabilities** are given in Section 1. In Section 2, recent information concerning **comparisons** carried out within the frame of the CIPM MRA is summarized. Section 3 highlights the status of **Associates** of the BIPM, and a short summary on progress made on the **revision of the KCDB**, in the context of the Review in the CIPM MRA, is presented in Section 4.

This report reflects the status as of 26 February 2020.

## 1. CIPM MRA Appendix C : Calibration and Measurement Capabilities

### 1.1. KCDB CMC data

Contrary to the previous database, the KCDB now contains not only published CMCs but all CMCs drafted by an institute, no matter at which stage is the CMC status in the review circuit. Hence, the database contains

- Published CMCs
- Drafted CMCs not yet submitted for intra-RMO review
- CMCs submitted for intra- and inter-RMO review
- Deleted CMCs
- Former versions of updated CMCs
- Greyed out CMCs

Each CMC has its unique code and an associated version number, incremented at each update. It CMC is associated with a Writer detaining a user account.

Only published CMCs are available via the open search facilities.

Deleted and obsolete CMC versions are not available to the users of the web platform.

The new database contains all CMC information that was collected in KCDB 1.0. but the KCDB 2.0 has been enlarged to notably include information associated with the review.

### 1.2. KCDB CMC data migration

The last update made of the KCDB 1.0 concerned the revision of CMCs in Mass metrology triggered by the redefinition of the kilogram and was published in September 2019.

The database was then “frozen” to allow a robust migration of the data to the new support.

The institutes have been encouraged, via the TC Chairs and Consultative Committees, to check their data via the new support. Reported errors that have been spotted until now were already present on the former support. No unconformities linked to the migration have yet been reported.

Greyed out CMCs were previously not in the database but stored separately on a set of Excel sheets. These CMCs are now successively being uploaded on the database by the KCDB Office.

### 1.3. KCDB CMC statistics

The new database became accessible in November 2019. A large number of CMCs that previously had been posted on the JCRB web were approved during the time the database was inaccessible.

The KCDB Office detected repeated anomalies of the tool for importation provided by the service provider.

These two factors have generated a delay in the publication of CMC data.

For the same reasons, the numbers given below and depicted in Figure 1 do not represent the present status of number of approved CMC, as there is a gap between approved and published CMCs. The numbers given within parenthesis represents the number of CMC reported in end of August 2019.

- 25 202 (25 241) CMCs were published in the KCDB end of February 2020 of which
  - 18 792 (18 831) in Physics
  - 6 410 (6410) in Chemistry

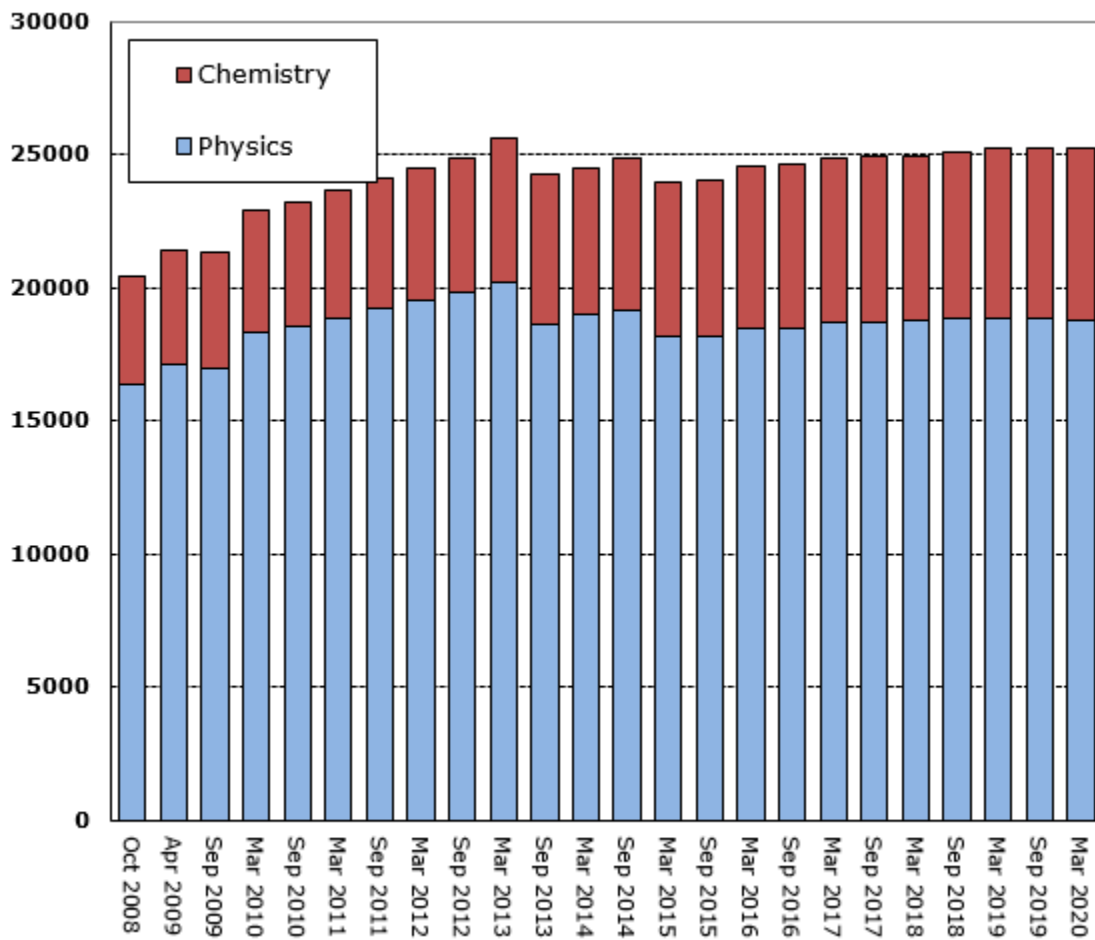
The details of the repartition of CMCs is available in real-time from the KCDB home page in “CMC statistics” <https://www.bipm.org/kcdb/cmc/statistics/public> by exporting the data to a spread sheet. The Excel files previously used as a basis for the CMC statistics are still available on the [access-restricted JCRB CMC website](#) (on “KCDB statistics”).

The CMC batches that remain to be published on 26 February 2020 are listed in Appendix I.

#### 1.3.1. Evolutions of CMCs

The evolution from the go-live of the KCDB 2.0 is listed in Table 1-a.

- The number of published CMCs in Table 1-a does not only include the publication of new added CMCs but also the publication of updated CMCs or reinstatement of greyed out CMCs.
- None of the published CMCs represents yet a CMC that has undergone a completed CMC inter-RMO review on the platform.
- The number of greyed out CMCs do not here represent an increase of greyed out CMCs but the number of greyed out CMCs that have been uploaded by the KCDB Office from Excel sheets.



**Figure 1.** Number of CMCs registered in the KCDB since October 2008.

**Table 1-a** Status of CMCs in KCDB on 26 February 2020 since 29 October 2019

Status	number of CMCs
Draft	47
RMO: Submitted	20
RMO: Under Review	26
RMO: Review Completed	2
JCRB: Under Review	1
Deleted	89
Greyed out	20
Submitted to the KCDB	15
Published	163
<b>TOTAL</b>	<b>383</b>

The RMO distribution of the listed CMCs in Table 1-a is shown in Table 1-b.

**Table 1-b** CMC “activity” per RMO on 26 February 2020 since 29 October 2019

RMO	number of CMCs
AFRIMETS	67
APMP	71
COOMET	15
EURAMET	102
GULFMET	0
SIM	128

The distribution on metrology area of the listed CMCs in Table 1-a and Table 1-b is shown in Table 1-c.

**Table 1-c** CMC “activity” per metrology area on 26 February 2020 since 29 October 2019

Metrology area	number of CMCs
AUV	4
EM	95
L	70
M	63
PR	1
T	14
TF	62
QM	36
RI	38

**1.3.2. CMC statistics of RMOs** (Follow-up of Action 17/1 of JCRB 2006)

Table 2 summarizes the repartition of published CMCs on the different RMOs.

**Table 2** Information on CMC statistics per RMO<sup>1</sup>

RMO	Total number of CMCs March 2019
AFRIMETS	643
APMP	6285
COOMET	2484
EURAMET	11167
GULFMET <sup>2</sup>	0
SIM	4623

<sup>1</sup> International bodies are included in the statistics and contribute to the RMO at which the intra-RMO review is carried out

<sup>2</sup> The GULFMET was approved as an RMO on a provisional basis by the CIPM in October 2015.

### 1.3.3. Greyed out CMCs and reinstatements

There are presently 480 greyed out CMCs. The most recent events on greyed out CMCs from end of August 2019 is listed in Table 3. Table 4 displays the greyed out CMCs where the most recent events are highlighted in yellow.

**Table 3** *Evolution of greyed out CMCs from 27 August 2019 until 26 February 2020<sup>3</sup>*

RMO	Country	Area	Action	Date	CMCs
SIM	Mexico	PR	reinstatement	2019-08-29	+22
APMP	Australia	EM	permanent deletion	2019-11-26	-27
SIM	Brazil	QM (cat. 7)	permanent deletion	2019-12-01	-4
EURAMET	Denmark	T	reinstatement	2020-02-04	+1

## 2. CIPM MRA Appendix B : Key and supplementary comparisons

### 2.1. KCDB comparison data

The new database contains all information that was collected in KCDB 1.0. Each comparison is associated with a user account, normally belonging to the person who pilots the comparison. Other persons involved in the piloting may be added as contacts.

Deleted comparisons remain in the database but are not publically available. The list of status has been revised.

### 2.2. KCDB comparison data migration

The migration of comparison data revealed to be complicated due to the large variation in structure, formatting and expressions. In a limited number of cases of continuous comparisons (only the BIPM concerned as pilot) the references to the final comparison reports were lost, and the layout was altered in some cases.

<sup>3</sup> Slovenia has asked for the reinstatement of 2 CMCs in QM which will be uploaded as soon as the importation tool is available, cf. Sect. 1.3. Montenegro has asked for a reinstatement of their CMC in L. The KCDB Office is waiting for additional information from Montenegro to carry out the reinstatement.

**Table 4** List of greyed out CMC where evolvments from 27 August 2019 are highlighted in yellow

RMO	Country	AUV	M	PR	EM	T	RI	L	QM	TF	Total
AFRIMETS	ZA		4								4
APMP	AU				0						0
APMP	CN							1			1
APMP	IN							3			3
APMP	JP							3			3
APMP	KR								6		6
APMP	NZ				1						1
APMP	TH						3	1			4
EURAMET	DE						3		12		15
EURAMET	DK					0					0
EURAMET	ES						2				2
EURAMET	IT		31		19		98	1	3		152
EURAMET	JRC						110		82		192
EURAMET	LT		5								5
EURAMET	LV				30						30
EURAMET	ME		4			18		1			23
EURAMET	PT						1	1			2
EURAMET	SE				2						2
EURAMET	SI								2		2
EURAMET	SK	6						2			8
SIM	MX			0					1		1
SIM	US		3		8						11
SIM	BR		3						10		13
<b>TOTAL:</b>											<b>480</b>

### 2.3. KCDB comparison statistics

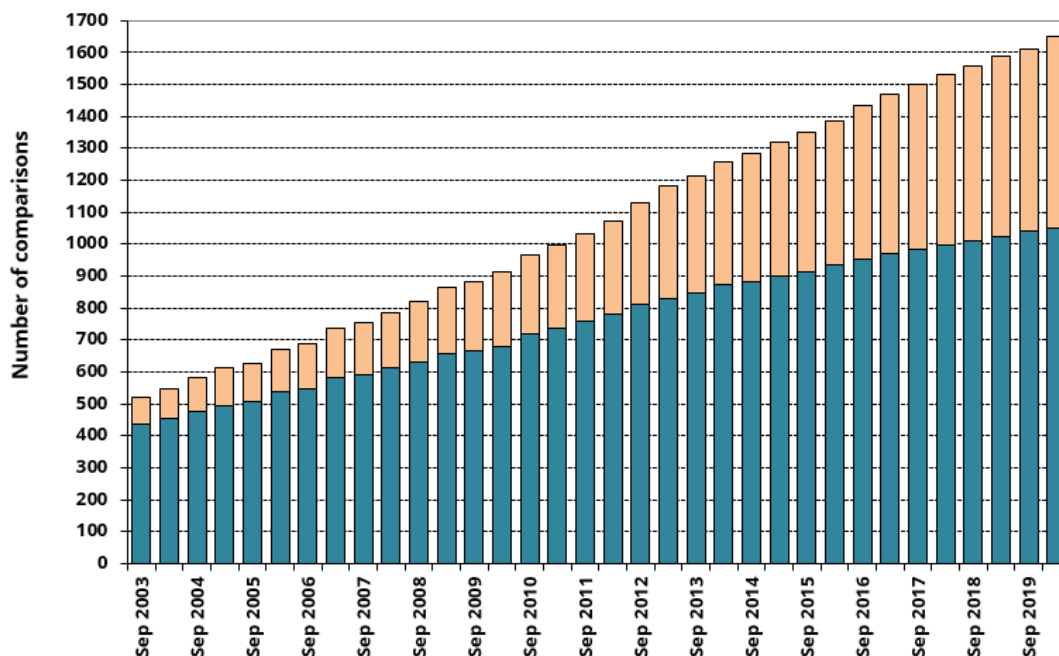
On the 26 February 2020 the KCDB covered **1648 comparisons** online distributed as listed in Table 5; 1050 key comparisons and 598 supplementary comparisons. This represent a total increase of 36 comparisons where the majority were registered by the pilots on the KCDB web platform.



**Table 5.** Key and Supplementary Comparisons on 28 August 2019.

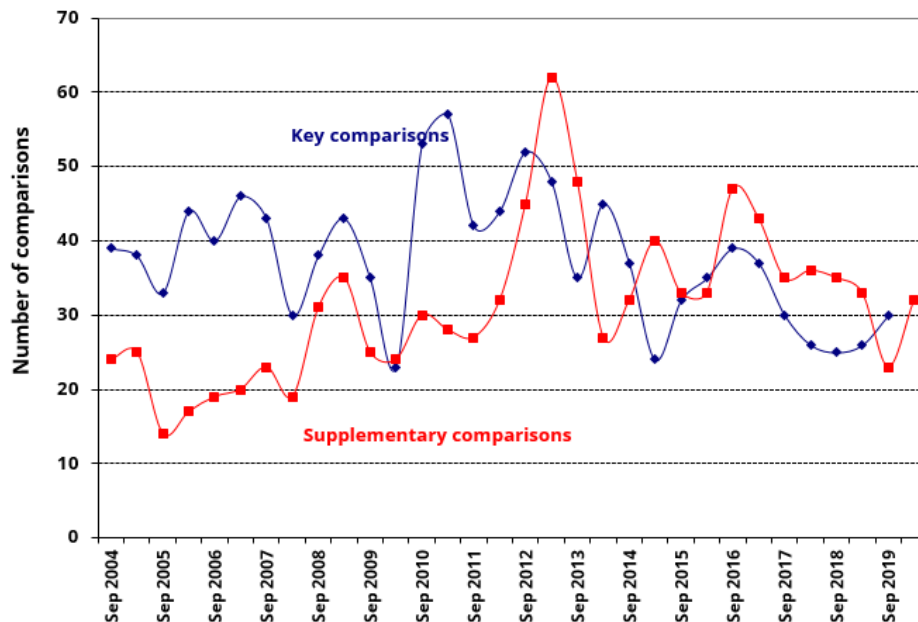
Entity	KC	SC
BIPM	96	1
CC	507	32
AFRIMETS	6	24
APMP	141	114
COOMET	48	100
EURAMET	168	188
GULFMET <sup>4</sup>	4	16
SIM	69	98

Figure 2 shows the evolution of the total number of key (dark blue) and of supplementary (peach) comparisons registered in the KCDB since September 2003. The annual increase of key comparisons seems to have stabilized to around some +40 taking into account the history since 2004. The annual increase of key- and supplementary comparisons is around 6 %. The ratio of supplementary comparisons, 20 % in 2006, has progressively increased to 35 %. The graph include repeats of key comparisons.



**Figure 2.** Total number of key comparisons (dark blue) and supplementary comparisons (peach) registered in the KCDB: evolution since September 2003

<sup>4</sup> The GULFMET was approved as an RMO on a provisional basis by the CIPM in October 2015.



**Figure 3.** Number of new comparisons registered in the KCDB over the one-year period ending at the date indicated on the abscissa.

The number of new key and supplementary comparisons registered in the KCDB over the one-year period ending at the date indicated on the the abscissa is illustrated in Figure 3.

Graphs generated in real-time illustrating the participation in key and supplementary comparisons are available under the Statistics menu on the KCDB home page:

<https://www.bipm.org/kcdb/comparison/statistics/key>

<https://www.bipm.org/kcdb/comparison/statistics/supplementary>.

The new database became accessible in November 2019. As in the case for CMCs, a number of approved comparison reports were accumulated while the database was inaccessible. The KCDB Office has published 25 comparisons in the database since the start of the platform. The delay of publication of comparisons is presently around 2 weeks.

## 2.4. Registrations and modifications of comparisons

Since end of August 2019 the following 38 comparisons were registered as new:

AFRIMETS.EM-S2	COOMET.T-S4	EURAMET.TF-S1
AFRIMETS.L-S5	EURAMET.AUV-K5	GULFMET.EM-S5.1
APMP.M.FF-K3.2020	EURAMET.EM-K5.2018	GULFMET.EM-S6
APMP.M.FF-S3.2020	EURAMET.EM-S43	GULFMET.EM-S7
APMP.QM-S17	EURAMET.L-K1.2019	GULFMET.T-S3
BIPM.RI(II)-K1.Tb-161	EURAMET.L-S28	SIM.EM.RF-S16
CCQM-K147	EURAMET.L-S29	SIM.EM.RF-S17
CCQM-K164	EURAMET.L-S30	SIM.L-K3.2019
CCQM-K165	EURAMET.M.FF-S14	SIM.L-S7
CCQM-K86.c	EURAMET.M.M-S10	SIM.L-S8
CCRI(II)-S15	EURAMET.M.P-K4.2019	SIM.M.F-S9
CCRI.RI(II)-K2.H-3.2018	EURAMET.MP.-K4.2020	SIM.T-S10
COOMET.M.FF-S9	EURAMET.RI(II)-S7.Rn-222	

End of February 2020, 69 abandoned or superseded key and supplementary comparisons were kept in the KCDB archives (included in the presented statistics).

## 2.5. Published results of key and supplementary comparisons

The following 51 reports were published during the last 6 months:

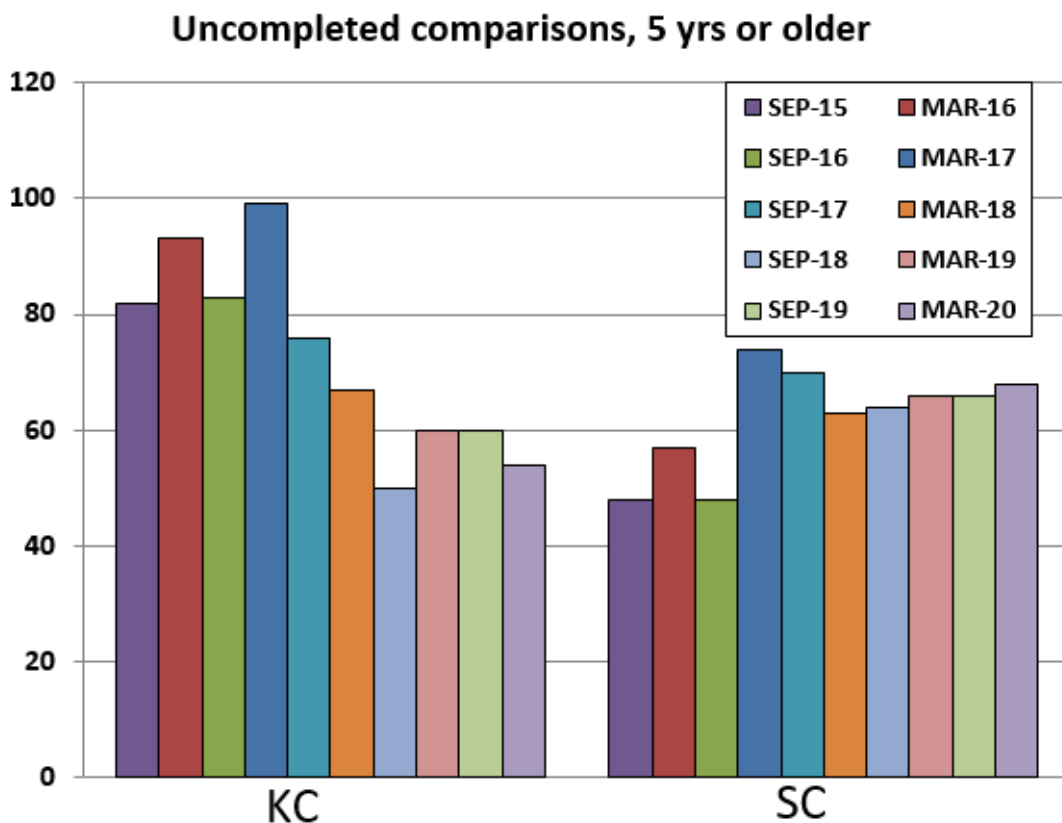
APMP.L-S5	CCM.FF-K3.2011.1	EURAMET.AUV.V-K3
APMP.M.F-S2	CCM.F-K3	EURAMET.EM-S35
APMP.M.F-S3	CCM.G-K2.2017	EURAMET.T-K9.1
APMP.M.P-K1.c	CCQM-K137	EURAMET.T-S5
APMP.PR-S6	CCQM-K147	GULFMET.EM.RF-S2
APMP.QM-S1	CCQM-K153	GULFMET.EM-S5
APMP.QM-S10	CCQM-K78.a	GULFMET.L-S2
APMP.RI(II)-K2.Fe-59	CCQM-K86.c	GULFMET.M.F-S1
BIPM.QM-K1 (ISCII)	CCRI(II)-K2.H-3	GULFMET.M.F-S2
BIPM.QM-K1 (JRC)	CCRI(II)-S12.H-3	GULFMET.M.M-K7
BIPM.QM-K1 (KRISS)	COOMET.M.H-S4	GULFMET.M.M-S1
BIPM.QM-K1 (NIST)	COOMET.M.M-S4	GULFMET.M.M-S2
BIPM.RI(I)-K1 (NPL)	COOMET.M.P-S4	GULFMET.TF-S1
BIPM.RI(I)-K2 (NIM)	COOMET.QM-S4	SIM.EM-S15
BIPM.RI(I)-K4 (NPL)	COOMET.RI(I)-S4	SIM.M.M-S16

BIPM.RI(I)-K6 (KRIS)	COOMET.T-K3.3	SIM.QM-K27
BIPM.RI(II)-K1.Fe-59	COOMET.T-S2	SIM.T-K6.7
BIPM.RI(II)-K1.Mn-54		

**2.6. Comparisons older than 5 years** (Follow-up Action 33/3 of JCRB 2015)

**Action 33/3:** *The BIPM KCDB office, as part of the KCDB report to the JCRB, to identify Key and Supplementary Comparisons which were started 5 or more years ago and have not reached a conclusion.*

The number of unfinished comparison older than 5 years seems to have reached a rather constant value, keeping in mind that the history of the data is short. The total number is decreased illustrated in Figure 4. A list of the comparisons concerned may be found in Appendix II.



**Figure 4.** Histogram showing the number of incomplete comparisons that started more than 5 years ago.

### 3. Participation of Associates of the CGPM in CIPM MRA activities

Table 6 summarizes the participation of the 40 Associates of the CGPM in CIPM MRA activities as at 26 February 2020. The total number of CMCs and comparisons has decreased, as Belarus became Member in January 2020.

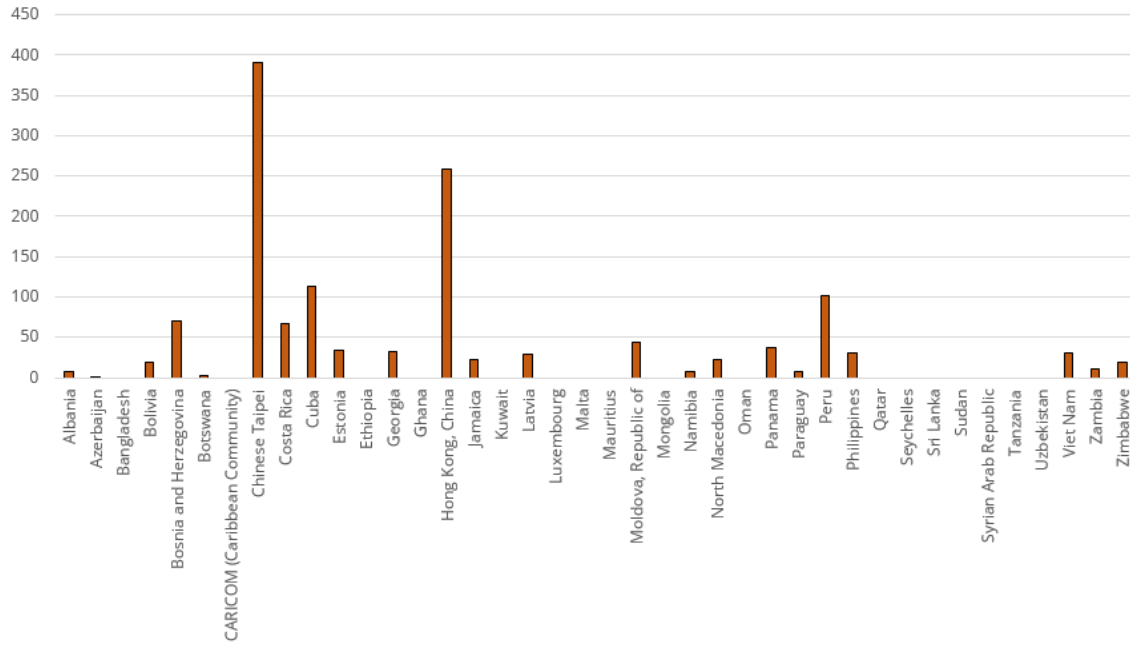
**Table 6.** CIPM MRA activity of the NMI of Associates of the CGPM: number of published CMCs and participation in key and supplementary comparisons. <sup>5</sup>

Country	Published CMCs	Greyed out CMCs	Key Comparisons	Supplementary Comparisons
Albania	7	0	8	4
Azerbaijan	1	0	1	9
Bangladesh	0	0	1	2
Bolivia	19	0	7	22
Bosnia and Herzegovina	70	0	13	12
Botswana	3	0	1	5
CARICOM (Caribbean Community)	0	0	0	7
Chinese Taipei	390	0	99	48
Costa Rica	67	0	19	31
Cuba	113	0	6	20
Estonia	34	0	8	12
Ethiopia	0	0	0	3
Georgia	32	0	6	16
Ghana	0	0	2	7
Hong Kong, China	259	0	91	27
Jamaica	22	0	6	10
Kuwait	0	0	2	3
Latvia	29	30	13	9
Luxembourg	0	0	4	1
Malta	0	0	4	3
Mauritius	0	0	2	3
Moldova, Republic of	43	0	4	16
Mongolia	0	0	4	4
Namibia	7	0	0	3
North Macedonia	23	0	8	11
Oman	0	0	0	2
Panama	37	0	8	20
Paraguay	8	0	2	18
Peru	101	0	30	34
Philippines	31	0	13	9
Qatar	0	0	3	1
Seychelles	0	0	0	3
Sri Lanka	0	0	7	2
Sudan	0	0	0	1
Syrian Arab Republic	0	0	12	3
Tanzania	0	0	0	1
Uzbekistan	0	0	0	2
Viet Nam	31	0	36	9
Zambia	11	0	2	8
Zimbabwe	19	0	1	8
<b>TOTAL</b>	<b>1338</b>	<b>30</b>	<b>422</b>	<b>401</b>

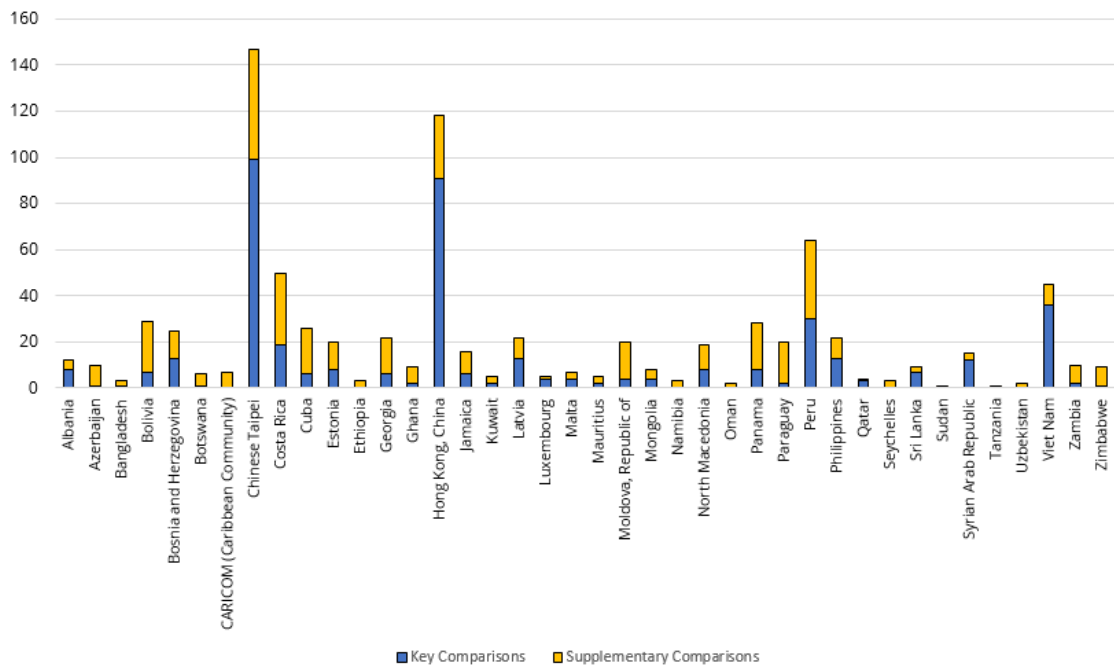
The repartition of CMCs and comparisons among Associates is illustrated in Figures 5 and 6.

<sup>5</sup> These numbers take into account all comparisons registered in the KCDB, disregarding status, for which at least one laboratory of the Associate is listed in the participants list.

S. Picard and S. Maniguet



**Figure 5.** Graph on the number of CMCs declared by Associates of the CGPM



**Figure 6.** Graph on the participation of Associates of the CGPM in key and supplementary comparisons

## 4. Implementation of the BIPM KCDB 2.0

The new version of the KCDB - KCDB 2.0 - has been implemented, developed using open source tools where no licences are associated.

The KCDB 2.0 combines the two previous separate databases on CMCs and comparisons into one single database. The data was migrated from the former databases into the new (MySQL). A new search facility was adopted (Elasticsearch).

KCDB 2.0 provides a web platform giving support for CMC edition and review from drafting a CMC until its approval and publication on the open web. The platform notably covers the facilities previously provided by the JCRB CMC Review area and Members working area cf. <https://www.bipm.org/en/committees/jc/jcrb>. CMC data is included in the database in a numeric format allowing a numerical search for data. Registration and publication of comparison reports are supported. It is possible to export CMC data and comparison information to spread sheets, and customized statistics can be generated by the users.

KCDB went live on 29 October 2019, first giving access to the search facilities on the database. Access to the KCDB web platform, providing technical support for inclusion of CMCs and comparisons, was then given successively to different metrology areas. Complete access for all users was achieved on 10 December 2019.

The KCDB Office published the first comparison via the platform on 27 November 2019, supported by new software and layout.

The first CMCs, albeit submitted and reviewed on the former support, were published on 31 January 2020. No CMCs have yet reached approval after the inter-RMO review which makes it difficult to evaluate the impact of the platform at this stage.

### 4.1. Information

An important part of the implementation is to inform the stakeholders on the new support.

At each time that access were given to a metrology area, the TC Chairs concerned were invited to participate at a Webex demonstration. The TC Chair received at this time information how to access the platform. It is of course important that the TC Chairs transmit this information to the members of their technical committee and other co-workers concerned.

A target has been to make the platform as user friendly as possible. Nevertheless, the complexity of the review process creates the need for instructions. A number of sources is given below.

**Written information** has been realized: two written guides on the search facilities,

“**Help with searching**”

[https://www.bipm.org/utis/common/pdf/KCDB\\_2.0/Help\\_with\\_searching\\_guide.pdf](https://www.bipm.org/utis/common/pdf/KCDB_2.0/Help_with_searching_guide.pdf) , and

“**Getting started, KCDB restricted web portal**”

[https://www.bipm.org/utis/common/pdf/KCDB\\_2.0/Getting\\_started\\_KCDB\\_platform.pdf](https://www.bipm.org/utis/common/pdf/KCDB_2.0/Getting_started_KCDB_platform.pdf)

have been drafted.

A series of **short guides** is targeted in which the first guide on comparisons,

“**Quick start: comparisons**”

[https://www.bipm.org/utis/common/pdf/KCDB\\_2.0/QUICK\\_START\\_comparisons.pdf](https://www.bipm.org/utis/common/pdf/KCDB_2.0/QUICK_START_comparisons.pdf) is available

A series of **videos** is also presently being realized, today there are 3 videos accessible:

“The KCDB Home Page”

[https://www.bipm.org/utis/common/pdf/KCDB\\_2.0/Home\\_page\\_clip.mp4](https://www.bipm.org/utis/common/pdf/KCDB_2.0/Home_page_clip.mp4)

“The KCDB user accounts”

[https://www.bipm.org/utis/common/pdf/KCDB\\_2.0/KCDB\\_User\\_accounts.mp4](https://www.bipm.org/utis/common/pdf/KCDB_2.0/KCDB_User_accounts.mp4)

“How to write a CMC for General Physics”

[https://www.bipm.org/utis/common/pdf/KCDB\\_2.0/Write\\_a\\_cmc\\_General\\_Physics\\_KCDB.mp4](https://www.bipm.org/utis/common/pdf/KCDB_2.0/Write_a_cmc_General_Physics_KCDB.mp4)

These video clips last from 3 to 5 minutes and are available on YouTube.

All instructive support is available from the bottom of the KCDB home page.

## 4.2. Training

Two courses within the Competence Building and Knowledge Transfer (CBKT) program included training on the new web platform in form of demonstrations and interactive sessions with in total around 50 participants.

As a spin-off, a dedicated training area is now accessible at <http://kcdb-cbkt.bipm.org/kcdb/> . It is here possible to log in as a user and use the training platform and associated database without any interference with official data. Some groups have used the platform to simulate the intra- or inter-RMO review. This platform has also served as support for TC Chairs when giving presentations and demonstrations to their colleagues.



### 4.3. Quality System

The Quality System underpinning the previous version of the KCDB is obsolete.

A main quality procedure has been drafted and the KCDB Office underwent an internal audit in the end of November 2019. The issued instructions on the KCDB 2.0 (cf. section 4.1) are incorporated in the Quality System for the KCDB. The main procedure is now being replenished by technical instructions, in particular those covering back office procedures realized by the KCDB Office.

A form dedicated to alerts on anomalies or suggestions for modifications is also a part of the Quality System and is publically available at

[https://www.bipm.org/utis/common/pdf/KCDB\\_2.0/Form\\_for\\_declaring\\_an\\_anomaly\\_or\\_request.docx](https://www.bipm.org/utis/common/pdf/KCDB_2.0/Form_for_declaring_an_anomaly_or_request.docx)

### Acknowledgement

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**APPENDIX I Approved CMC batches not yet published on 26 February 2020**

<b>Approval date</b>	<b>Batch</b>
15/08/2019	APMP.T.16.2019
03/09/2019	COOMET.EM.14.2019
06/09/2019	EURAMET.L.20.2019
11/09/2019	COOMET.M.33.2019
11/09/2019	EURAMET.M.65.2019
11/09/2019	APMP.L.29.2019
26/09/2019	COOMET.PR.14.2019
28/09/2019	COOMET.L.16.2019
29/09/2019	SIM.M.42.2019
05/10/2019	APMP.PR.10.2018
09/10/2019	SIM.M.44.2019
15/10/2019	EURAMET.QM.34.2019
15/10/2019	SIM.EM.11.2019
18/10/2019	SIM.M.41.2019
23/10/2019	APMP.QM.31.2019
23/10/2019	COOMET.QM.29.2019
23/10/2019	SIM.QM.25.2019
16/11/2019	EURAMET.RI.33.2019
27/11/2019	EURAMET.RI.31.2019
27/11/2019	EURAMET.RI.31.2019
11/12/2019	EURAMET.AUV.21.2019
16/12/2019	SIM.RI.20.2019
07/02/2020	EURAMET.PR.17.2019
10/02/2020	APMP.M.49.2019

## APPENDIX II List of uncompleted comparisons older than 5 years

### a) Key Comparisons

KC identifier	Indicated year	Status Mar-2020	Pilot
APMP.T-K3.6	2013 - 2014	Planned	NIM
APMP.T-K4.1	2013 - 2014	Planned	NIM
APMP.T-K6.2013	2013 - 2014	Planned	MSL
CCQM-K118	2015	Planned	VSL
CCQM-K117	2015	Planned	VSL
CCT-K3.1	2009	Planned	BIPM
COOMET.T-K3.3	2014 - 2015	Planned	VNIIM
APMP.EM-K12	2014 - 2015	Protocol complete	NMC, A*STAR
CCPR-K3.2014	2014	Protocol complete	NRC
SIM.M.P-K1	2008 - 2010	Protocol complete	CENAM
CCRI(II)-K2.Tc-99	2012 - 2013	Measurements in progress	NPL
APMP.PR-K3.a	2012 - 2014	Measurements in progress	NMIJ AIST
AFRIMETS.M.P-K2	2012 - 2013	Measurements in progress	NMISA
APMP.EM-K2	2010 - 2011	Measurements in progress	KRISS
APMP.T-K8	2011 - 2013	Measurements in progress	MSL
EURAMET.M.P-K1.c	2011 - 2014	Measurements in progress	FORCE
CCEM.RF-K5.c.CL	2012 - 2015	Measurements in progress	NMIJ AIST
CCEM-K2.2012	2012 - 2015	Measurements in progress	NRC
CCL-K1.2011	2011 - 2014	Measurements in progress	CENAM
CCT-K4.1	2012 - 2014	Measurements in progress	NMIA
CCT-K2.2	2014	Measurements in progress	INRIM
EURAMET.L-K4.2005.1	2013 - 2014	Measurements in progress	VSL
EURAMET.RI(I)-K1.1	2013 - 2014	Measurements in progress	METAS
EURAMET.RI(I)-K4.1	2013 - 2014	Measurements in progress	METAS
APMP.PR-K3.a.1	2006	Measurements completed	NIM
EURAMET.PR-K2.a	2010 - 2012	Measurements completed	VSL
APMP.EM.RF-K8.CL	2012 - 2013	Measurements completed	NMIJ AIST
APMP.M.P-K15	2013 - 2014	Measurements completed	NMIJ AIST
CCT-K9	2011 - 2012	Measurements completed	NIST
CCT-K6.2	2015	Measurements completed	NIST
CCRI(III)-K9.AmBe.1	2012 - 2013	Report in progress, draft A	NPL
COOMET.PR-K3.a	2009 - 2011	Report in progress, draft A	VNIIOFI
APMP.EM-K5.1	2010 - 2013	Report in progress, draft A	NIM
APMP.M.D-K4	2007 - 2008	Report in progress, draft A	KRISS
APMP.PR-K2.b	2014	Report in progress, Draft A	KRISS
APMP.RI(I)-K5	2013 - 2014	Report in progress, draft A	KRISS
APMP.RI(I)-K4	2009 - 2010	Report in progress, draft A	INER
CCQM-K122	2014	Report in progress, draft A	PTB

(continued...)

KC identifier	Indicated year	Status Mar-2020	Pilot
CCQM-K112	2014	Report in progress, draft A	VSL
CCT-K1.1	2006 - 2014	Report in progress, draft A	NIST
CCT-K6.1	2008 - 2010	Report in progress, draft A	MSL
COOMET.L-K3	2011 - 2012	Report in progress, draft A	VNIIM
EURAMET.T-K8	2008 - 2012	Report in progress, draft A	PTB
EURAMET.T-K3.4	2010 - 2011	Report in progress, draft A	MIRS/UL-FE/LMK
SIM.M.P-K6	2008 - 2011	Report in progress, draft A	CENAM
CCRI(II)-K2.Rn-222	2015	Report in progress, draft B	LNE-LNHB
APMP.EM.BIPM-K11.2	2004	Report in progress, draft B	Puslit KIM-LIPI
CCQM-K114	2014	Report in progress, draft B	NIM
COOMET.AUV.V-K1	2007 - 2008	Report in progress, draft B	VNIIM
EURAMET.M.D-K1.1	2008 - 2012	Report in progress, draft B	PTB
EUROMET.M.F-K1	2002 - 2004	Report in progress, draft B	MIKES
SIM.QM-K1	2009	Report in progress, draft B	INMETRO
SIM.M.P-K6.1	2011 - 2013	Report in progress, draft B	LACOMET
SIM.M.P-K7	2001	Report in progress, draft B	CENAM

## b) Supplementary Comparisons

SC identifier	Indicated year	Status Mar-2020	Pilot
AFRIMETS.T-S3	2012	Measurements in progress	NMISA
APMP.EM.RF-S5.CL	2013 - 2015	Protocol complete	NMIJ AIST
APMP.EM.RF-S6.CL	2015	Protocol complete	NMIJ AIST
APMP.EM-S8	2011 - 2013	Protocol complete	NPLI
APMP.L-S7	2014 - 2015	Measurements in progress	NPLI
APMP.M.FF-S1	2015	Measurements in progress	KRISS
APMP.M.G-S1	2012	Report in progress, draft A	NIM
APMP.M.H-S4	2011	Report in progress, draft A	KRISS
APMP.M.MM-S1	2012 - 2013	Measurements in progress	KRISS
APMP.M.P-S1	2003 - 2005	Measurements completed	CMS/ITRI
APMP.M.P-S7	2015	Report in progress, draft B	NIMT
APMP.PR-S1.2	2008	Protocol complete	NMC, A*STAR
APMP.PR-S5	2008 - 2009	Measurements completed	NMIJ AIST
APMP.RI(I)-S1	2010 - 2011	Report in progress, draft B	OAP
APMP.RI(I)-S3	2013 - 2014	Measurements in progress	ARPANSA
APMP.RI(II)-S3.Cs-134.Cs-137	2013	Report in progress, draft B	NMIJ AIST
APMP.T-S10	2013	Planned	KRISS
APMP.T-S8	2011 - 2015	Measurements in progress	NMLPHIL
APMP.T-S9	2013	Planned	NMIJ AIST
CCRI(II)-S10	2011 - 2012	Report in progress, draft A	ENEA-INMRI
CCRI(II)-S9	2011	Report in progress, draft A	KRISS
CCT-S3	2007 - 2008	Report in progress, draft A	NMIJ AIST
COOMET.EM-S10	2010 - 2012	Report in progress, draft B	VNIIMS
COOMET.EM-S16	2013 - 2015	Planned	VNIIOFI
COOMET.EM-S6	2007 - 2010	Report in progress, draft B	VNIIMS
COOMET.EM-S7	2009 - 2011	Report in progress, draft B	VNIIMS
COOMET.M.D-S1	2012 - 2015	Protocol complete	VNIIM
COOMET.M.FF-S2	2008 - 2009	Report in progress, draft B	NSC "Institute of Metrology"
COOMET.M.FF-S4	2009 - 2010	Report in progress, draft B	NSC "Institute of Metrology"
COOMET.M.F-S1	2008 - 2010	Report in progress, draft B	VNIIM
COOMET.M.P-S1	2014 - 2015	Measurements in progress	NSC "Institute of Metrology"
COOMET.PR-S1	2012 - 2013	Measurements completed	VNIIOFI
COOMET.PR-S5	2008 - 2011	Measurements completed	INIMET
COOMET.PR-S7	2013 - 2014	Measurements completed	VNIIOFI
EURAMET.EM-S33	2010 - 2011	Measurements in progress	LCOE
EURAMET.EM-S34	2010 - 2011	Protocol complete	LCOE
EURAMET.EM-S37	2011 - 2013	Measurements in progress	CMI
EURAMET.EM-S40	2014	Measurements completed	LNE

(continued...)

SC identifier	Indicated year	Status Mar-2020	Pilot
EURAMET.EM-S41	2014	Protocol complete	LNE
EURAMET.M.F-S2	2012 - 2013	Measurements in progress	BEV
EURAMET.M.M-S10	2015	Report in progress, Draft B	MIRS
EURAMET.M.P-S13	2014 - 2015	Measurements in progress	UME
EURAMET.M.T-S4	2015	Measurements completed	LNE
EURAMET.PR-S4	2012 - 2013	Measurements completed	LNE
EURAMET.PR-S5	2012 - 2013	Measurements completed	PTB
EURAMET.T-S3	2014 - 2015	Report in progress, Draft B	CEM
SIM.EM.RF-S17	2020 - 2012	Protocol complete	INTI
SIM.EM-S8	2013 - 2014	Measurements in progress	UTE
SIM.M.FF-S4	2006	Report in progress, draft B	CENAM
SIM.M.FF-S8	2014	Report in progress, draft A	CENAM EP AIP
SIM.M.F-S2	2012	Report in progress, draft A	IDIC
SIM.M.F-S3	2012 - 2013	Report in progress, draft B	NIST
SIM.M.M-S12	2012 - 2015	Report in progress, draft A	CESMEC
SIM.M.M-S6	2009	Report in progress, draft B	CESMEC
SIM.M.P-S10	2015	Planned	INDECOPI
SIM.M.P-S11	2015	Measurements in progress	CENAM
SIM.M.P-S2	2009 - 2011	Measurements in progress	INMETRO
SIM.M.P-S3	2010	Protocol complete	LCPN-P
SIM.M.P-S4	2010	Protocol complete	LCPN-P
SIM.M.P-S8	2012	Planned	LCPN-P
SIM.M.P-S9	2012	Planned	LCPN-P
SIM.QM-S3	2012	Report in progress, draft A	NIST
SIM.QM-S4	2012	Report in progress, draft A	NIST
SIM.QM-S5	2015	Planned	NIST
SIM.T-S3	2007 - 2008	Report in progress, draft B	INEN
SIM.T-S4	2008	Report in progress, draft B	LATU
SIM.T-S6	2012 - 2014	Report in progress, draft A	NIST
SIM.T-S8	2014	Measurements in progress	CESMEC