Bureau International des Poids et Mesures

REPORT ON THE KCDB TO THE 44TH MEETING OF THE JCRB

v. 2021-09-22

www.bipm.org/

KCDB

Preface

The key comparison database - KCDB – is the supporting database for the implementation of the Mutual Recognition Arrangement of the International Committee for Weights and Measures (CIPM MRA) that was implemented in 1999. It contains data on Calibration and Measurement Capabilities (CMCs) and comparison results of measurements in physics, ionizing radiation, chemistry and biology. The KCDB is an evidence-based database: all data included have been reviewed by international groups of experts and approved for mutual recognition.

The KCDB website www.bipm.org/kcdb gives access to the following services with open access:

- searching on published CMCs in the KCDB
- searching on published comparison information, reports and results
- information on statistics and recent news on issues linked to CMCs and comparisons
- a set of guidance documents.

The KCDB Office is providing the KCDB report to each meeting of the Joint Committee of the Regional Metrology Institutes and the Bureau International des Poids et Mesures (JCRB). Those reports are made publicly available via the BIPM website:

https://www.bipm.org/en/committees/jc/jcrb

https://www.bipm.org/en/cipm-mra/kcdb-reports

KCDB Report to the JCRB

March to September 2021

Executive Summary

The KCDB 2.0 was implemented in October 2019, providing search facilities of CMCs and comparisons, a user platform supporting intra- and intra-RMO reviews, a frame for comparison registration and publication, and a tool for user-generated statistics.

The CMCs that were submitted in the previous review system have now all been published in the new database. The first CMC that was drafted, reviewed and approved on the KCDB web platform was published on 2 April 2020 - there are now 1396 such CMCs in the database.

Access to the KCDB 2.0 has been accompanied by making available a variety of guidance material and demonstrations to users within the frame of the CBKT.

An Application Programming Interface for search on CMCs published in the KCDB has been developed and implemented as a first step in a digitalization of the KCDB.

Introduction

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

The KCDB 2.0 was made available on 29 October 2019. The platform is now being used for CMC submissions, review and publication, as well as for comparison registration and updates, by all metrology areas on a daily basis.

The Chemistry and Biology community, coordinated by the CCQM, was the last group starting using the web tool for CMC review. The CMCs in Chemistry and Biology were drafted on the platform in November 2020 for their review Cycle XXII. These have been subject to intra-RMO review and were submitted for JCRB review in February 2021. The CCQM applies a JCRB review much different from that described in CIPM MRA-G-13. The review is taking place within the Working Groups, coordinated by the KCWG Chair. At least 3 RMOs, as well as each WG Chair, must review each CMC. The CMCs are discussed at organized KCWG meetings before approval or request for revision. Well in advance, the CCQM KCWG and the KCDB Office adapted a configuration in close collaboration and provided guidance and training, to allow the CCQM to as far as possible maintain their workflow. A large number of the submitted CMCs have now been approved and published.

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, and Section 3 highlights the status of **Associates** of the BIPM. The **performance of KCDB 2.0** is discussed in Section 4, and a short view on its **status** is presented in Section 5. The **BIPM KCDB and digitalization** is brought to notice in Section 6.

This report reflects the status as of 17 August 2021.

1. CIPM MRA Appendix C: Calibration and Measurement Capabilities

1.1. CMC statistics

There were[1] 25 887 (25 733) CMCs published in the KCDB on 17 August 2021 of which 19 510 (19 387) are in Physics and 6 377 (6 346) in Chemistry and Biology, see Figure 1. The total number of published CMCs have increased by 3 % over a one-year period. However, a decrease by 3 % of CMCs in Chemistry and Biology is linked to the successive implementation of broad-scope CMCs.

The repartition of CMCs on metrology area, expertise and state or economy is available in real-time from the KCDB home page in "CMC statistics"

https://www.bipm.org/kcdb/cmc/statistics/public .

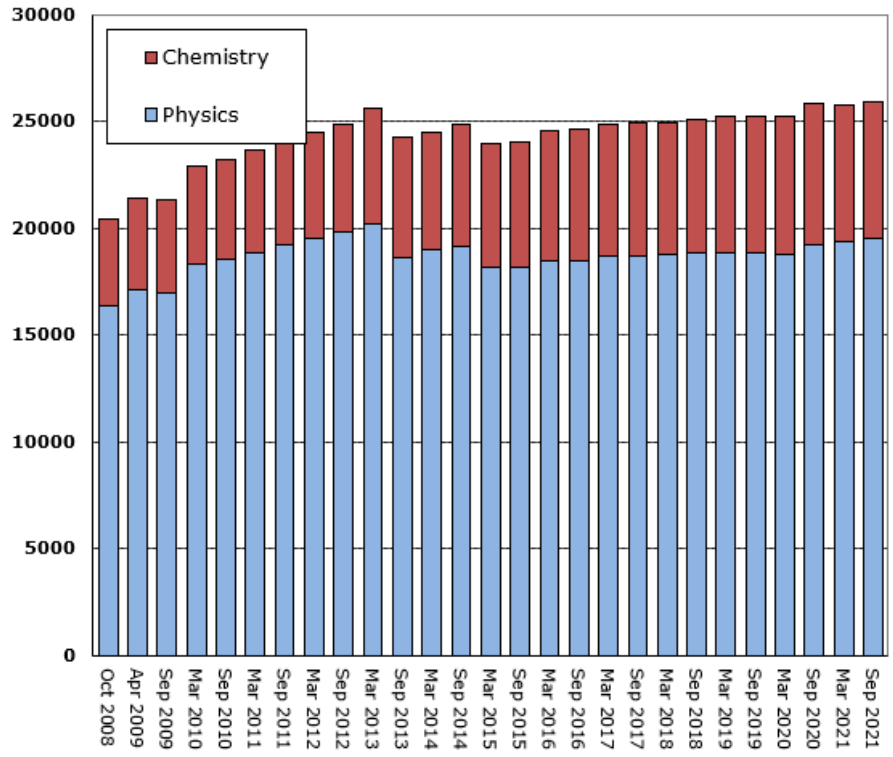

Figure 1 *Number of CMCs registered in the KCDB since October 2008.*

[1] The numbers given within parenthesis represents the number of CMC reported six months earlier.

The distribution of published CMCs along the RMOs is listed in Table 1.

The status of not yet published CMCs that are placed on the platform is listed in **Error! Reference source not found.**. 1893 (2029) CMCs are presently in an "intermediate" state.

The first CMC that was drafted, reviewed and approved on the KCDB web platform was published on 2 April 2020 - there are now 1396 such CMCs in the database.

The total number of published CMCs during the last 6 months for each metrology area is listed in Table 3. The total number gives the impression that the number of submitted CMCs have suddenly decreased. However, a larger number of CMCs issued from the former JCRB site were published during the previous 6-month period while still compensating for the previous delay (linked to the implementation of the new software).

Table 1 Number of published CMCs in KCDB per RMO on 17 August 2021 (follow-up of Action 17/1 of JCRB 2006).

RMO	Number of CMCs 2021-03-01	Number of CMCs 2021-08-17
AFRIMETS	624	655
APMP	6477	6545
COOMET	2668	2720
EURAMET	11331	11474
GULFMET	4	0
SIM	4629	4493
TOTAL	25733	25887

Table 2 Status of not yet published CMCs in KCDB on 17 August 2021.

Status	number of CMCs 2021-03-01	number of CMCs 2021-08-17
Draft	276	337
RMO: Submitted	208	558
RMO: Under Review	23	13
RMO: Review Completed	31	6
RMO: Accepted	120	16
RMO: Revision Requested	148	103
Submitted to the JCRB	29	1
JCRB: Under Review	605	225
JCRB: Revision Requested	71	74
JCRB: Revision Completed	5	41
JCRB: Approved	0	49
JCRB: Waiting for VOTE	0	23
Greyed out	513	445
Submitted to the KCDB	0	2
TOTAL	2029	1893

Table 3 Number of published CMCs per metrology area on during the last 6 months.

Metrology area	Published CMCs 2021-03-01	Published CMCs 2021-08-17
AUV	149	8
EM	469	306
L	112	15
M	179	34
PR	0	2
T	26	25
TF	66	0
QM	1280	289
RI	0	0
TOTAL	2281	679

1.2. Greyed out CMCs and reinstatements

There are presently 445 (513) greyed out CMCs.

Table 4 displays all greyed out CMCs where the most recent events are highlighted in yellow and green for increased and decreased number of greyed-out CMCs, respectively.

Table 4 Status of greyed out CMCs on 17 August 2021

RMO	Country	AUV	EM	L	M	PR	QM	RI	T	TF	Total
AFRIMETS	ZA				2			11			13
APMP	CN			1			10				11
APMP	IN			3							3
APMP	JP			3							3
APMP	KR						6				6
APMP	NZ		1							2	3
APMP	SG			4							4
APMP	TH			1				0			1
EURAMET	BG						5				5
EURAMET	DE						12	3	1		16
EURAMET	ES							2			2
EURAMET	FI			1							1
EURAMET	FR						1				1
EURAMET	IT		4	1	1		3	98			107
EURAMET	JRC						82	110			192
EURAMET	LT				5						5
EURAMET	LV		16								16
EURAMET	NO			1	4						5
EURAMET	PL			1							1
EURAMET	PT			0				1			1
EURAMET	SE		2								2
EURAMET	SK	6		0							6
GULFMET	AE									4	4
SIM	BR				3		10				13
SIM	CA				1						1
SIM	MX			1			17				18
SIM	US		5		0						5
	TOTAL:	6	28	17	16	0	146	225	1	6	445

Increased in number

Decreased in number

2. CIPM MRA Appendix B : Key and supplementary comparisons

2.1. Comparison statistics

On the 17 August 2021 the KCDB covered 1735 (1706) comparisons online distributed as listed in Table 5; 1097 of these are key comparisons and 638 supplementary comparisons. This represents a total increase of 29 comparisons.

Table 5 Key and Supplementary Comparisons on 17 August 2021.

Entity	KC	SC
BIPM	100	1
CC	533	33
AFRIMETS	8	27
APMP	147	120
COOMET	49	118
EURAMET	180	205
GULFMET	5	21
SIM	75	113
TOTAL	1097	638

Figure 2 shows the evolution of the total number of key (dark blue) and of supplementary (light blue) comparisons registered in the KCDB since September 2003. The annual increase of key comparisons seems to have stabilized to around 30, corresponding to an increase of 6 %. The ratio of supplementary comparisons, 20 % in 2006, keeps progressing and constitutes 37 % of all comparisons, see Figure 3. The graphs include repeats of key comparisons.

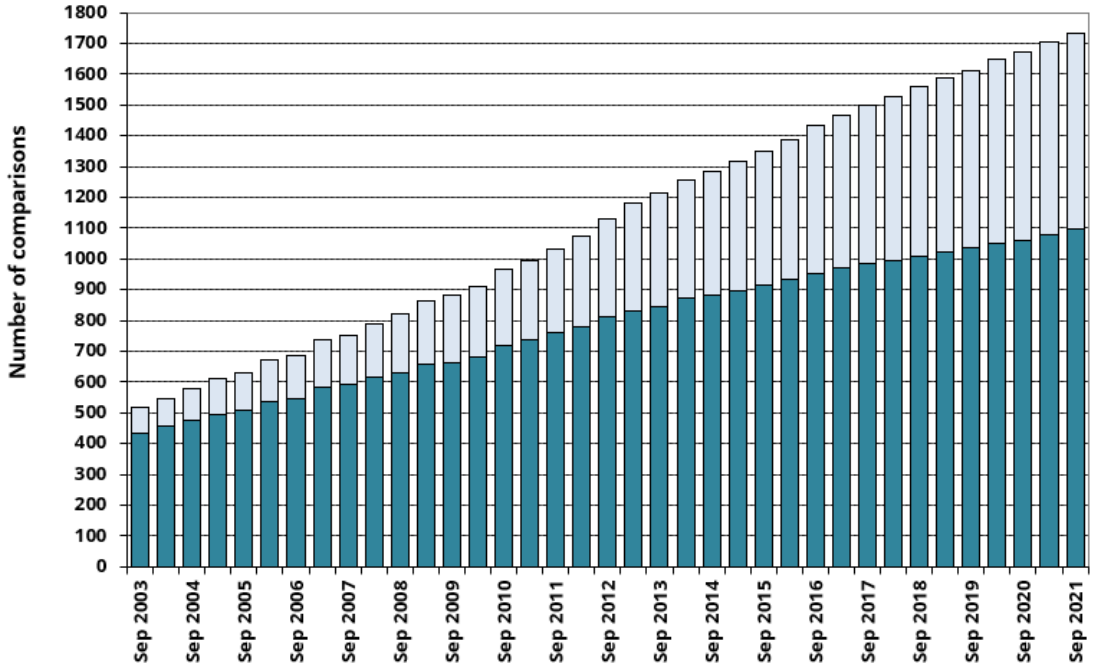

Figure 2 *Total number of key comparisons (dark blue) and supplementary comparisons (light blue).*

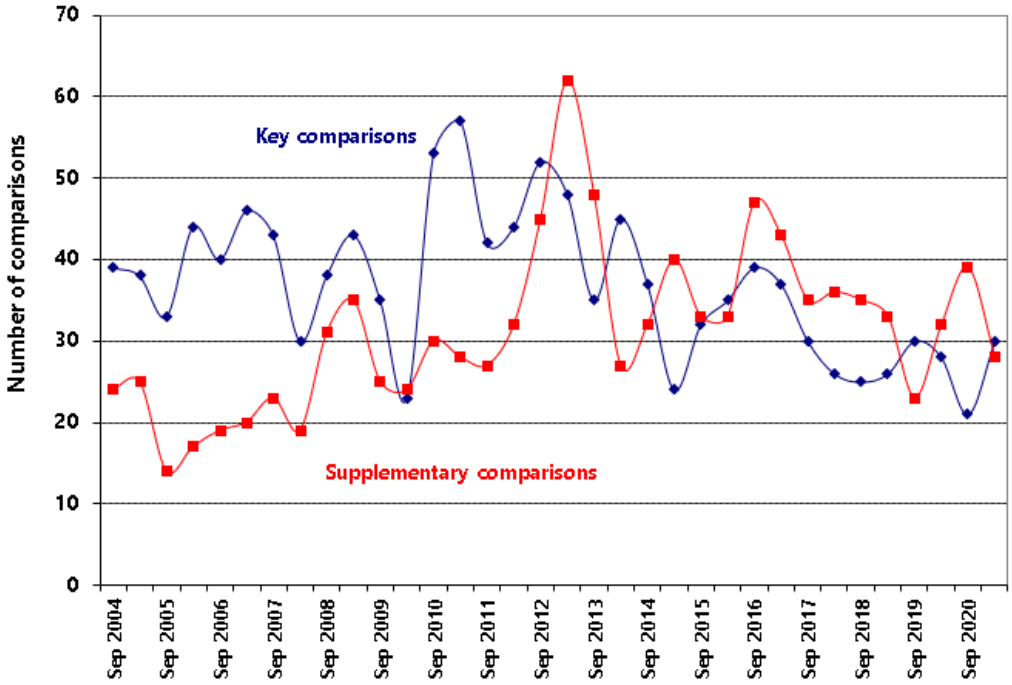

Figure 3 *Number of new comparisons registered in the KCDB over the one-year period.*

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 following 31 comparisons were registered as new during the last 6 months:

APMP.AUV.V-K5	CCQM-K86.d	EURAMET.QM-S14
APMP.L-S3.4.01	COOMET.AUV.A-S4	GULFMET.EM-K2
APMP.M.FF-K2.2021	EURAMET.L-K3.01	GULFMET.EM-S8
APMP.M.FF-K4.2.2021	EURAMET.L-S26.1	SIM.M.M-S19
APMP.QM-K90	EURAMET.M.D-K2.1	SIM.QM-S11
APMP.RI(II)-S4	EURAMET.M.D-K2.2	SIM.QM-S9
BIPM.EM-K11	EURAMET.M.FF-S15	SIM.QM-SX
CCEM-K2.2012.1	EURAMET.M.T-S6	SIM.RI(II)-K2.Zn-65
CCM.T-K2.1	EURAMET.QM-K3.2019	SIM.T-K9.3
CCQM-K176	EURAMET.QM-S13	SIM.T-S12
CCQM-K19.2018.1		

The following 40 reports were published during the last 6 months:

AFRIMETS.M.F-S2	BIPM.RI(I)-K4 (ARPANSA)	EURAMET.L-S25
APMP.L-K7	BIPM.RI(I)-K4 (BEV)	EURAMET.M.F-S5
APMP.L-S7	BIPM.RI(I)-K4 (GUM)	EURAMET.M.H-K1.b and c
APMP.M.P-K7.3	BIPM.RI(II)-K1.Tb-161	EURAMET.M.H-S2.a
APMP.QM-S14	CCQM-K146.1	EURAMET.M.M-S10
APMP.QM-S15	CCQM-K148.a	EURAMET.M.M-S7
APMP.QM-S9.2017	CCQM-K41.2017	EURAMET.RI(II)-S8.Rn-222
APMP.T-K8	CCRI(II)-Fe-55.2019	EUROMET.M.F-K1
BIPM.EM-K11.a and b (BIM)	COOMET PR-S8	GULFMET.EM-S3
BIPM.EM-K13.a and b (EMI)	EURAMET.EM.RF-S45	SIM.L-K1.2007.1
BIPM.QM-K1 (METAS)	EURAMET.EM-S33	SIM.M.P-K1
BIPM.RI(I)-K1 (ARPANSA)	EURAMET.EM-S34	SIM.M.P-K6

BIPM.RI(I)-K1 (GUM) EURAMET.EM-S37 SIM.T-S10

BIPM.RI(I)-K3 (GUM)

On 17 August 2021, 87 abandoned or superseded key and supplementary comparisons were stored in the KCDB archives (included in the presented statistics).

2.2. **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.*

"Hanging" Key Comparisons, connected to the Consultative Committees, have reduced in number since the follow-up action was triggered by the JCRB six years ago. It is however surprising to observe that the same 30 % of the most recent listed comparisons were already listed 6 years ago. Several of the automatic notifications sent to the comparison Pilots, requesting to update the comparison status, have not been replied to, which could indicate that a group of these comparisons are no longer coordinated.

The data also shows that 20 % of the Supplementary Comparisons older than 5 years were initiated 2010 or earlier. It is doubtful to which extent these comparisons will be completed. The total number is illustrated in Figure 4. A list of the comparisons concerned is available in Appendix I.

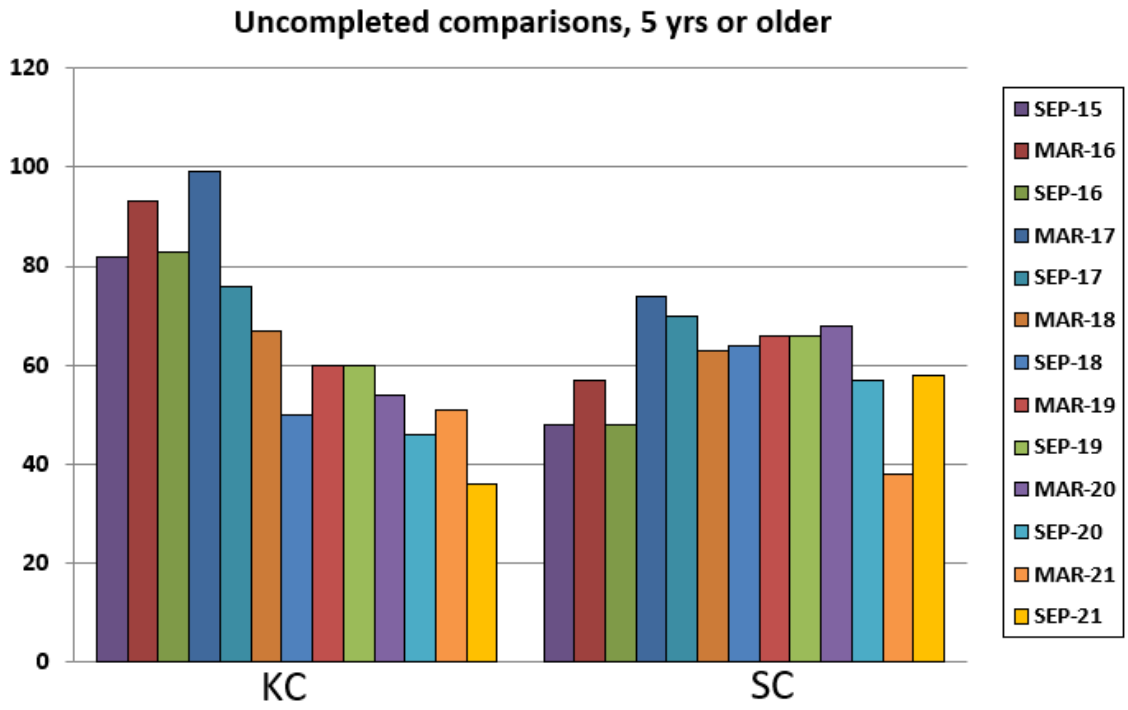

Figure 4 *Histogram showing the number of incomplete comparisons that started more than 5 years ago.*

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

Table 5 summarizes the participation of the 39 Associates of the CGPM[2] in CIPM MRA activities as of 17 August 2021.[3]

Table 6 CIPM MRA activity of the Associates of the CGPM: number of published CMCs and participation in key and supplementary comparisons.

Country	Published CMCs	Greyed out CMCs	Key Comparisons	Supplementary Comparisons
Albania	10	0	8	4
Azerbaijan	31	0	1	8
Bangladesh	0	0	2	2
Bolivia	21	0	9	26
Bosnia and Herzegovina	74	0	15	17
Botswana	3	0	1	5
Cambodia	0	0	0	0
CARICOM (Caribbean Community)	1	0	1	11
Chinese Taipei	394	0	105	49
Costa Rica	71	0	19	32
Cuba	113	0	6	22
Ethiopia	0	0	0	3
Georgia	65	0	6	18
Ghana	0	0	2	7
Hong Kong, China	298	0	100	28
Jamaica	22	0	6	11
Kuwait	0	0	2	2
Latvia	15	16	13	9
Luxembourg	0	0	4	1
Malta	0	0	4	3
Mauritius	0	0	2	3
Moldova, Republic of	76	0	6	17
Mongolia	16	0	4	4
Namibia	7	0	0	3
North Macedonia	21	0	9	11
Oman	0	0	0	2
Panama	37	0	8	22
Paraguay	8	0	2	19
Peru	108	0	31	35
Philippines	32	0	13	9
Qatar	0	0	3	2
Seychelles	0	0	0	3
Sri Lanka	0	0	8	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	38	10
Zambia	11	0	2	8
TOTAL	**1465**	**16**	**442**	**415**

[2] Zimbabwe no longer taking part as Associate

[3] 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.

The repartition of CMCs and comparisons among Associates is illustrated in Figure 5 and Figure 6, respectively.

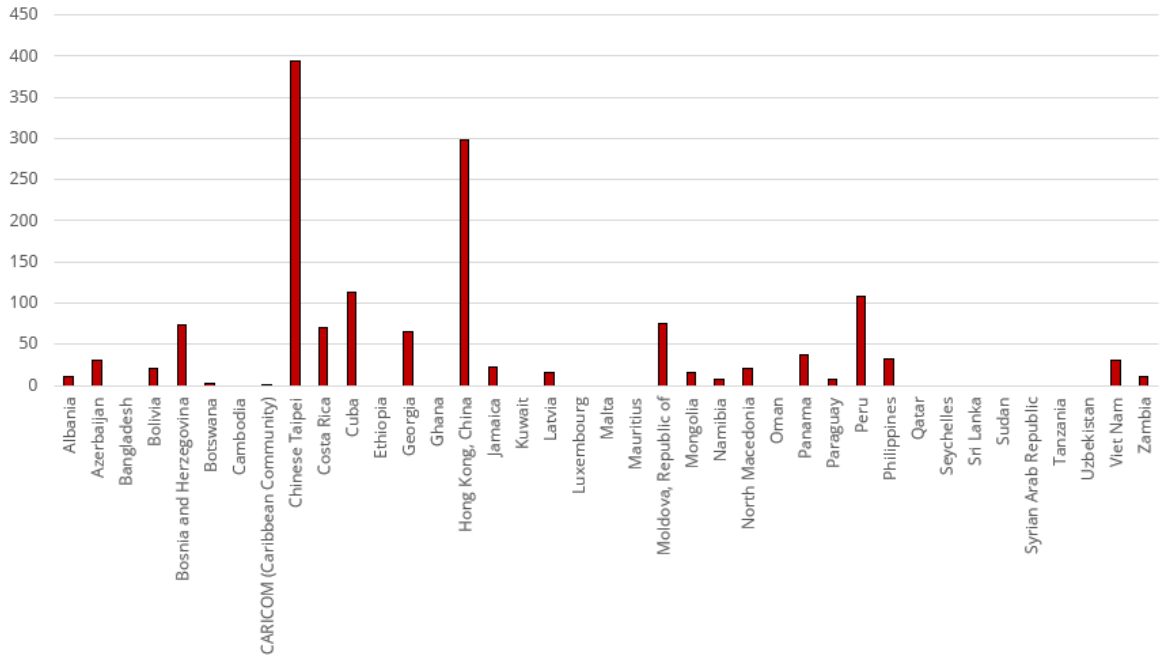

Figure 5 *Graph on the number of CMCs declared by Associates of the CGPM.*

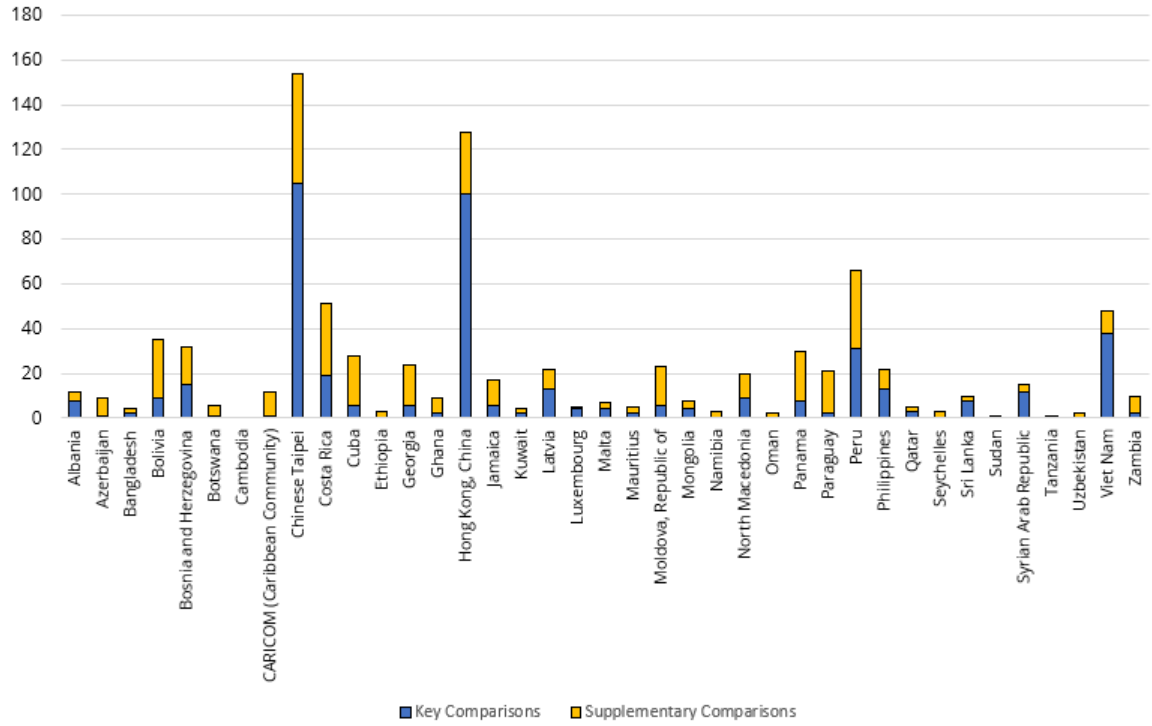

Figure 6 *Graph on the participation of Associates of the CGPM in key and supplementary comparisons.*

4. Performance of the BIPM KCDB 2.0

An evaluation of the performance of the KCDB 2.0 was presented so far by comparison to the previous version of the KCDB. A summary of this was prepared and presented by Sten Bergstrand in Sept. 2020 and March 2021, as the JCRCB Executive Secretary of that time. For this, the present report refers to the presentations given at the 43rd JCRB meeting, 2021 March 15 – 17 and the related material online available under the BIPM JCRB website[4].The present performance report is focusing on the new options the KCDB 2.0 offers and is structured such that the evaluation criteria are first set, followed by an outlook for the future development. Finally, those criteria that are possible to evaluate and interpret are detailed below.

i. To evaluate the performance of the KCDB 2.0 the following criteria ca be studied:
   a. duration of CMC reviews to reach publication, i.e., from initial submission to final publication and its temporal evolution;
   b. temporal evolution of the total number of published CMCs;
   c. number of greyed-out CMCs and their evolution in time;
   d. uncompleted comparisons older than five years;;
   e. loss of rights for the JCRB review;
   f. number of revisions in the JCRB review, and
   g. number of comments and their corresponding categories within JCRB review.

ii. Currently there are a number of criteria already possible to be evaluated using the new database, but others cannot be treated yet properly due to the lack of accumulated statistics. However, for those ones this report foresees options to get increasingly interesting information on the performance of the KCDB with more time to come.

iii. The analysis in March 2020 revealed the 2020 data in the KCDB 2.0, recalled in Table 7. At that time, they were compared to an analysis of the corresponding numbers across the years 2004 to 2019 in the previous KCDB version, also given in the Table.

The typical review duration for CMCs that were submitted to the KCDB 2.0 and that underwent the intra-regional RMO review first, followed by the JCRB review over the years 2020 to 2021, are illustrated in Fig 7 which shows the average, maximum, and minimum time it took for the CMCs to pass the JCRB review.

[4] https://www.bipm.org/en/committees/jc/jcrb

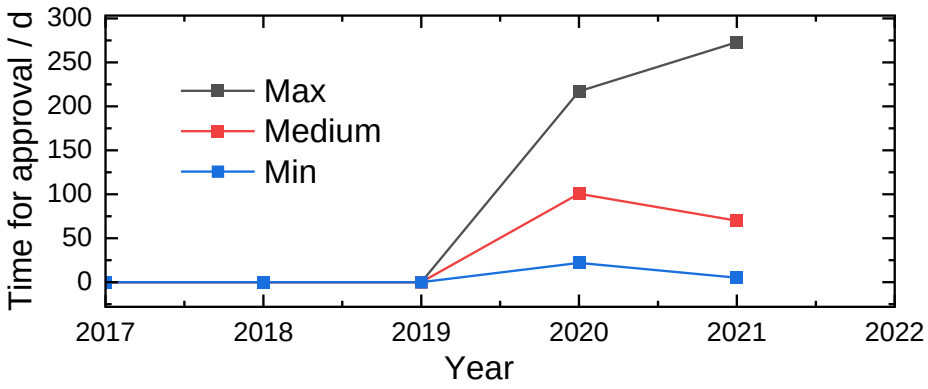

Figure 7 : *Graph on the duration of the CMC approval for the JCRB review as directly retrieved from the statistics on the CMCs menu of the KCDB. The KCDB 2.0 has started in 2020.*

For the year 2021 a more detailed picture is given in Fig. 8. Here, the CMC approval time from first submission to the KCDB via intraregional RMO and subsequent JCRB review up to publication in the KCDB is depicted for CMCs submitted by the respective RMOs, and where the metrology area for which the highest duration time outliers have been recorded are indicated.

From Fig. 8 it is obvious that the mean duration across all CMC submissions is levelling now at about 50 days, covering both the intraregional RMO and the JCRB reviews. However, outliers are present that are quite far away from this figure, approaching one year's time in some cases.

It should be noted that, based on the far-off outliers visible in Fig. 8 as red squares, the previous KCDB as predecessor of the KCDB 2.0 would have set the whole approval process in the metrology area of this particular outlier on a hold. This was because before the KCDB 2.0, the approval process realized in the JCRB review was based on a batch mode, where a single, more difficult to get approved CMC submission has stopped all the other CMC submissions as long. Saying this, it becomes obvious that the performance of the KCDB 2.0 with its fully compatibility on a single CMC submission base is of great value for the CIPM MRA.

Table 7 *JCRB review duration for individual CMCs, comparison and development with time.*

JCRB review duration	Year 2004 – 2019 / d	Year 2020 / d	*Year 2021 / d
minimum	*not computed*	*not computed*	5
median	140	*not computed*	63
mean	188	93	70
maximum	>365	*not computed*	273

*Computed from the KCDB 2.0 menu 'Statistics on review performance'

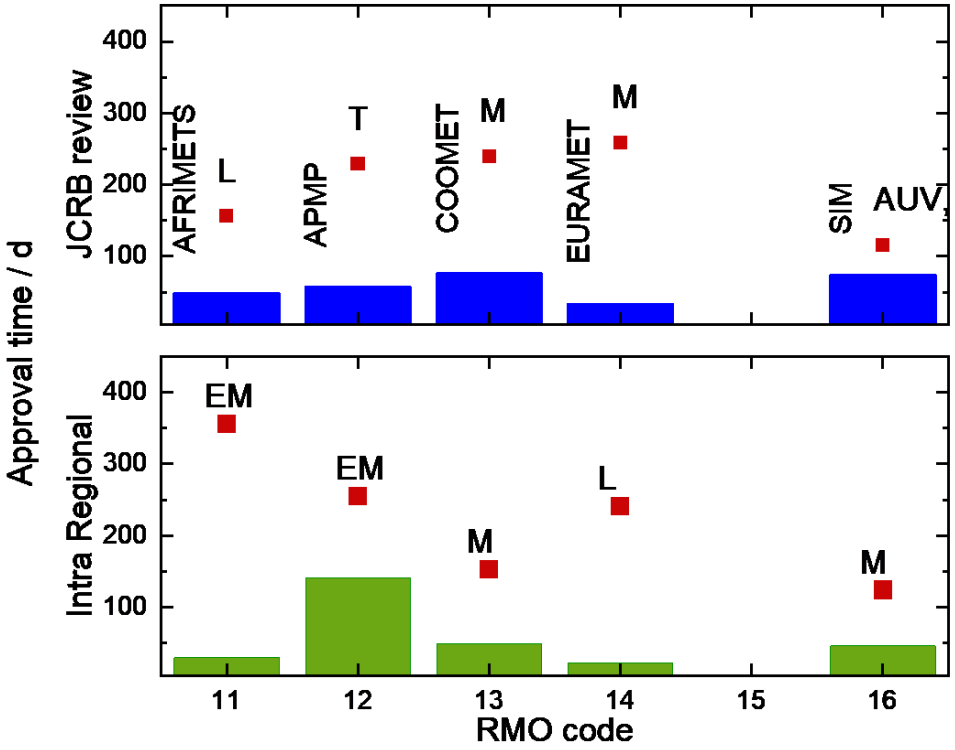

Figure 8 *Approval times for CMCs before being published in the KCDB 2.0 in 2021. The timing reflects intraregional reviewing in the bottom panel and JCRB reviewing durations in the upper panel for those CMCs submitted by RMOs indicated in the x axis. The bars represent the mean durations. Red squares in both panels indicate the most upper duration time and the metrology area where this occurred. GULFMET (RMO code 15) did not submit any CMC in 2021.*

Performance numbers regarding criteria b. and c. are given on pp. 2 to 5 of this report. To evaluate and conclude from those figures, it is worth to recall that in 2021, all metrology areas became fully compatible with the KCDB 2.0 including Chemistry and Biology having now fully adapted the KCDB 2.0 technical features. For this particular metrology area, Fig. 9 gives the 2021 numbers of the contributing metrology areas to the total number of 1030 new submissions. From this it is evident that the chemistry area has a large contribution that all went through the KCDB 2.0.

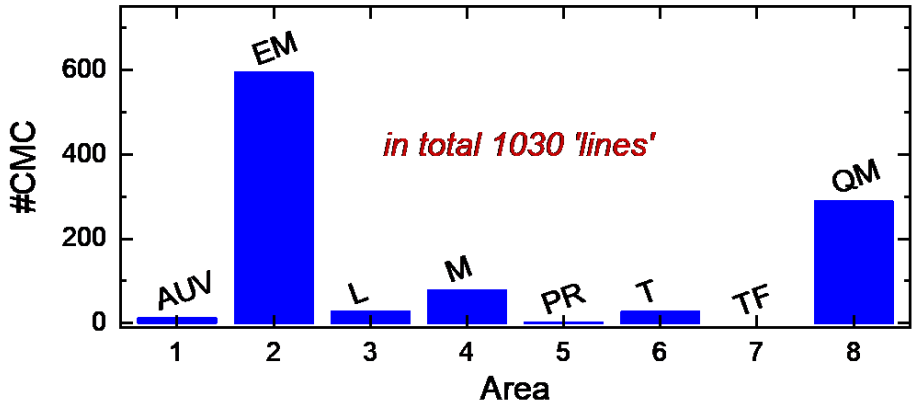

Figure 9 *Newly published CMCs in 2021 and the contributing metrology areas.*

The performance figure regarding criteria a. for the QM area are given in Table 8.

Table 8 *Duration of CMCs submitted in the QM area for JCRB reviewing.*

Year	Mean / d	Maximum / d	Minimum / d
2021	109.7	164	22

5. Present Status of the BIPM KCDB 2.0

The KCDB 2.0 was placed online in October 2019, and the KCDB web platform was successively made available to the different metrology areas, where now all metrology areas use the KCDB platform for CMCs and comparisons. The KCDB facility has now reached a level where all CMC reviews are using the web support.

5.1. Guidance

The KCDB implementation is accompanied by providing a variety of guidance material, cf. https://www.bipm.org/en/about-us/kcdb-help.html that successively has been enlarged. Further, several online demonstrations to users within the frame of the CBKT https://www.bipm.org/en/cbkt/ have been organized, focused on different user profiles or requested needs.

5.2. Development

The KCDB 2.0 software is presently supported by an Application Management contract giving the opportunity to correct for revealed anomalies, but also improve the support; the software has been updated at a number of occasions since start. Anomalies and suggestions for improvements may be communicated by the users by completing the form https://www.bipm.org/utils/common/pdf/KCDB_2.0/Form_for_declaring_an_anomaly_or_request.docx.

5.3. Quality System

The Quality System underpinning the previous version of the KCDB has been updated. An internal audit was held in June 2021.

6. BIPM KCDB and digitalization

Much attention is drawn by the metrology community to FAIR[5] machine-readable data for calibration issues but also for future emerging applications. Industry is urgently requesting possibilitis to use Digital Calibration Certificates which will contribute to both versatile technical advantages, cost effectiveness and improvements from a quality perspective.

The BIPM has recently developed an Application and Programming Interface for the KCDB (API KCDB). This interface allows external users to make CMC queries from a support other than the KCDB web and to collect machine readable data.

The API KCDB was beta-tested by members from NMIs and is now accessible from the KCDB web: https://www.bipm.org/en/cipm-mra/kcdb-api .

This API can further be adapted to provide access to Digital CMCs that can be implemented in the Digital Calibration Certificates of CIPM MRA participants.

KCDB 2.0 contains all CMC versions since its launch. That is, published CMCs can be accessed, but also CMCs that in future are no longer valid while the calibration certificate is, could be traced.

Digital CMCs could technically be achieved within a foreseeable time frame. However, representation of units and taxonomy, notably expressions for quantities, device under test/calibration and calibration method/instrument included in the CMC declarations need to be reviewed and confirmed. Several Consultative Committees are now paying attention to this issue.

Digital access to comparison data could potentially also be realized. Digital access to comparison data could potentially also be realized. Data included as images in the former KCDB version is now successively being updated to numerical data.

Acknowledgement

We warmly thank Dr Sten Bergstrand (former JCRB Executive Secretary) for his collaboration and enthusiasm. The input from METAS, VNIIM and PTB on the API has been much appreciated. Many thanks also to the BIPM IT team for their continued support.

[5] Findable Accessible Interoperable Reusable

APPENDIX I List of uncompleted comparisons older than 5 years

a) Key Comparisons

KC indentifier	Indicated year	Status Sep-2020	Pilot
APMP.EM.BIPM-K11.2	2004	Puslit KIM-LIPI	Report in progress, draft B
APMP.EM.RF-K8.CL	2012 - 2013	NMIJ AIST	Measurements
APMP.M.D-K4	2007 - 2008	KRISS	Report in progress, draft
APMP.M.P-K15	2013 - 2014	NMIJ AIST	Measurements
APMP.M.P-K4	2015 - 2016	KRISS	Measurements
APMP.M.P-K7.2	2015 - 2016	NIMT	Report in progress, draft B
APMP.M.T-K1	2015 - 2016	KRISS	Planned
APMP.PR-K2.b	2014	KRISS	Report in progress, draft
APMP.PR-K3.a	2012 - 2014	NMIJ AIST	Measurements in
APMP.PR-K3.a.1	2006	NIM	Measurements
APMP.RI(I)-K3.2013	2015 - 2016	INER	Planned
APMP.RI(I)-K4	2009 - 2010	INER	Report in progress, draft
APMP.RI(I)-K5	2013 - 2014	KRISS	Report in progress, draft
APMP.T-K3.6	2013 - 2014	NIM	Planned
APMP.T-K4.1	2013 - 2014	NIM	Planned
CCEM.RF-K26	2014 - 2016	NMIJ AIST	Measurements
CCEM.RF-K5.c.CL	2012 - 2015	NMIJ AIST	Measurements in
CCL-K1.2011	2011 - 2014	CENAM	Report in progress, draft
CCM.FF-K2.2011	2013 - 2015	VSL	Report in progress, draft B
CCPR-K3.2014	2014	NRC	Report in progress, draft B
CCQM-K110	2012	GL	Postponed
CCRI(II)-K2.Tc-99	2012 - 2013	NPL	Measurements in
CCRI(III)-K9.AmBe.1	2012 - 2013	NPL	Report in progress, draft
CCT-K1.1	2006 - 2014	NIST	Report in progress, draft
CCT-K10	2014 - 2016	NPL	Report in progress, draft B
CCT-K4.1	2012 - 2014	NMIA	Report in progress, draft
CCT-K6.1	2008 - 2010	MSL	Report in progress, draft
CCT-K9	2011 - 2012	NIST	Measurements
COOMET.AUV.V-K1	2007 - 2008	VNIIM	Report in progress, draft B
COOMET.L-K3	2011 - 2012	VNIIM	Report in progress, draft
EURAMET.T-K8	2008 - 2012	PTB	Report in progress, draft
EURAMET.T-K9	2014 - 2016	LNE-LCM/Cnam	Protocol complete
EUROMET.M.F-K3	2005 - 2008	PTB	Measurements in
SIM.M.P-K6.1	2011 - 2013	LACOMET	Report in progress, draft B
SIM.M.P-K7	2001	CENAM	Report in progress, draft B
SIM.QM-K1	2009	INMETRO	Report in progress, draft B

b) Supplementary Comparisons

SC indentifier	Indicated year	Status Sep-2020	Pilot
APMP.EM.RF-S5.CL	2013 - 2015	Protocol complete	NMIJ AIST
APMP.EM-S8	2011 - 2013	Protocol complete	NPLI
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-S5	2008 - 2009	Measurements in progress	NMIJ AIST
APMP.PR-S7	2015 - 2016	Protocol complete	NIM
APMP.QM-S13	2016	Planned	NIM
APMP.RI(I)-S1	2010 - 2011	Report in progress, draft B	OAP
APMP.RI(II)-S3.Cs-134.Cs-137	2013	Report in progress, draft B	NMIJ AIST
APMP.T-S10	2013	Planned	KRISS
APMP.T-S11	2013 - 2016	Report in progress, draft A	NMIJ AIST
APMP.T-S13	2014 - 2016	Measurements in progress	NMC, A*STAR
APMP.T-S8	2011 - 2015	Measurements in progress	NMLPHIL
APMP.T-S9	2013	Measurements in progress	NMIJ AIST
CCRI(II)-S10	2011 - 2012	Report in progress, draft B	ENEA-INMRI
CCRI(II)-S9	2011	Report in progress, draft A	KRISS
COOMET.EM-S10	2010 - 2012	Report in progress, draft B	VNIIMS
COOMET.EM-S16	2013 - 2015	Planned	VNIIOFI
COOMET.EM-S18	2013 - 2016	Report in progress, draft A	VNIIMS
COOMET.EM-S6	2007 - 2010	Report in progress, draft B	VNIIMS
COOMET.EM-S7	2009 - 2011	Report in progress, draft B	VNIIMS
COOMET.L-S20	2016	Measurements in progress	NMI (MD)
COOMET.M.D-S1	2012 - 2015	Protocol complete	VNIIM
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.H-S2	2014 - 2016	Report in progress, draft A	VNIIFTRI
COOMET.M.H-S3	2014 - 2016	Measurements completed	NSC "Institute of Metrology"
COOMET.M.P-S1	2014 - 2015	Report in progress, draft A	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	Report in progress, draft B	VNIIOFI
EURAMET.M.F-S2	2012 - 2013	Measurements in progress	BEV
EURAMET.M.P-S16	2016	Protocol complete	GUM
EURAMET.M.T-S4	2015	Measurements completed	LNE

(continued…)

SC indentifier	Indicated year	Status Sep-2020	Pilot
EURAMET.PR-S4	2012 - 2013	Measurements completed	LNE
EURAMET.RI(I)-S17	2016	Protocol complete	IST-LPSR
EURAMET.T-S6	2015 - 2016	Measurements in progress	NPL
SIM.M.FF-S4	2006	Report in progress, draft B	CENAM
SIM.M.FF-S8	2014	Report in progress, draft A	CENAMEP AIP
SIM.M.FF-S9	2016	Protocol complete	CENAM
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-S2	2009 - 2011	Measurements in progress	INMETRO
SIM.M.P-S8	2012	Planned	LCPN-P
SIM.M.T-S1	2016	Report in progress, draft A	CENAM
SIM.QM-S3	2012	Report in progress, draft A	NIST
SIM.QM-S4	2012	Report in progress, draft A	NIST
SIM.QM-S5	2015	Report in progress, draft A	CENAM
SIM.QM-S6	2016	Protocol complete	INMETRO
SIM.T-S4	2008	Report in progress, draft B	LATU
SIM.T-S6	2012 - 2014	Report in progress, draft A	NIST
SIM.T-S7	2015 -	Protocol complete	CENAM
SIM.T-S8	2014	Report in progress, draft A	CESMEC

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BIPM - Pavillon de Breteuil F-92312 Sèvres Cedex FRANCE